Samurai

6 Port 10/100 Mbit/s Single Chip Ethernet Switch Controller (ADM6996LCX - Green Package Version; ADM6996LHX - Heat Sink and Green Package)

Version AC

Communications

Never stop thinking

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Samurai 6 Port 10/100 Mbit/s Single Chip Ethernet Switch Controller (ADM6996LCX - Green Package Version)

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Previous Version: 2005-04-28, Rev.1.1	
Page/ Date	**Subjects (major changes since last revision)**
Page19	Modify LNKFP5 pin description
Page 71~156	Add 16bits mode registers description
2005-08-30	Changed to the new Infineon format
2005-08-30	Rev. 1.1 changed to Rev. 1.3 Update in content
2005-11-07	Revision 1.3 changed to Revision 1.31Minor change. Included Green package information and heat sind information

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1 Product Overview

1.1 Overview

The Samurai (ADM6996LC/LCX/LHX) is a high performance, low cost, highly integrated (Controller, PHY and Memory) five-port 10/100 Mbit/s TX/FX plus one 10/100 MAC port Ethernet switch controller with all ports supporting 10/100 Mb/s Full/Half duplex. The ADM6996LC/LCX/LHX is intended for applications for stand alone bridges for low cost SOHO markets such as Wire/ADSL/Wireless Router, IP Set Top Box, VDSL2, Gateway and HomePNA/HomePlug applications. The ADM6996LCX is the environmentally friendly “green” package version. The LH solution contains a heat sink which can be used in special circumstances but is not recommended for all projects.

ADM6996LC/LCX/LHX provides advanced functions such as:**802.1p(Q.O.S.), Port-based/Tag-based VLAN, Port MAC address Locking, Management, Port Status, MAC Address Access and Bandwidth Control**.

The ADM6996LC/LCX/LHX also supports Back Pressure in Half-Duplex mode and 802.3x Flow Control Pause packet in Full-Duplex mode to prevent packet loss when buffer is full. When Back Pressure is enabled, and there is no receive buffer available for the incoming packet, the ADM6996LC/LCX/LHX will issue a JAM pattern on the receiving port in Half Duplex mode and transmit the 802.3x Pause packet back to receiving end in Full Duplex mode.

The built-in SRAM used for packet buffering is divided into 256 bytes/block to achieve the optimized memory utilization through complicated link lists on packets with various lengths.

ADM6996LC/LCX/LHX also supports priority features by Port-Base, VLAN, IP TOS, TCP/UDP Layer4 destination port number, MAC destination address field checking. Users can be easily set different priority modes in individual ports, through a small low-cost micro controller to initialize or on-the-fly to configure. Each output port supports four queues in the way of fixed N:1 or programmable fairness queuing to fit the bandwidth demand on various types of packets such as Voice, Video and Data. Tag/Untag, and up to 16 groups of VLAN also is supported.

An intelligent address recognition algorithm makes ADM6996LC/LCX/LHX to recognize up to 2K different MAC addresses and enables filtering and forwarding at full wire speed.

Port MAC address Locking function is also supported by ADM6996LC/LCX/LHX to use on Building Internet access to prevent multiple users sharing one port traffic.

1.2 Features

- Supports five 10M/100M auto-detect Half/Full duplex switch ports with TX/FX interfaces and one MII/GPSI port.
- Supports 2K MAC addresses table with 4-ways associative hash algorithm.
- Supports four queue for QoS
- Supports priority features by Port-Based, 802.1p, IP TOS of packets, Layer4 TCP/UDP destination port number and MAC address DA.
- Supports MAC dress accessible such as Search, Add and Delete.
- Supports Engress/Ingress 64K Scalable Bandwidth control.
- Supports Store & Forward architecture and performs forwarding and filtering at non-blocking full wire speed.
- Supports buffer allocation with 256 bytes per block
- Supports Aging function Enable/Disable.
- Supports per port Single/Dual color mode with Power On auto diagnostic.
- Supports 802.3x Flow Control pause packet for Full Duplex in case buffer is full.
- Supports Back Pressure function for Half Duplex operation in case buffer is full.
- Supports packet length up to 1518/1522 (Default)/1536/1784 bytes in maximum.
- Broadcast/Multicast Storm Suppression.

- Supports Tag-based VLAN. Up to 16 VLAN groups is implemented by the last four bits of VLAN ID.
- 2bit MAC clone to support multiple WAN application
- Supports TP interface Auto MDIX function for auto TX/RX swap by strapping-pin.
- Easy Management 32bits smart counter for per port RX/TX byte/packet count, 16-bit smart counter for per port ERROR count and Collision count through serial 32/16 bits mode access. 16 bits mode is MDC/MDIO timing compatible.
- Supports PHY status output for management system.
- 25M Crystal only for the whole system.
- 128 QFP package with 0.18um technology. 1.8 V/3.3 V power supply.
- 1.0 W low power consumption.

1.3 Applications

ADM6996LC/LCX/LHX in 128-pin PQFP:

- Wire/ADSL/Wireless/VDSL2 Router
- IP Setop Box, HomePNA, HomePlug application.

1.4 Block Diagram

Figure 1 below shows a simple block diagram of the ADM6996LC/LCX/LHX internal blocks.

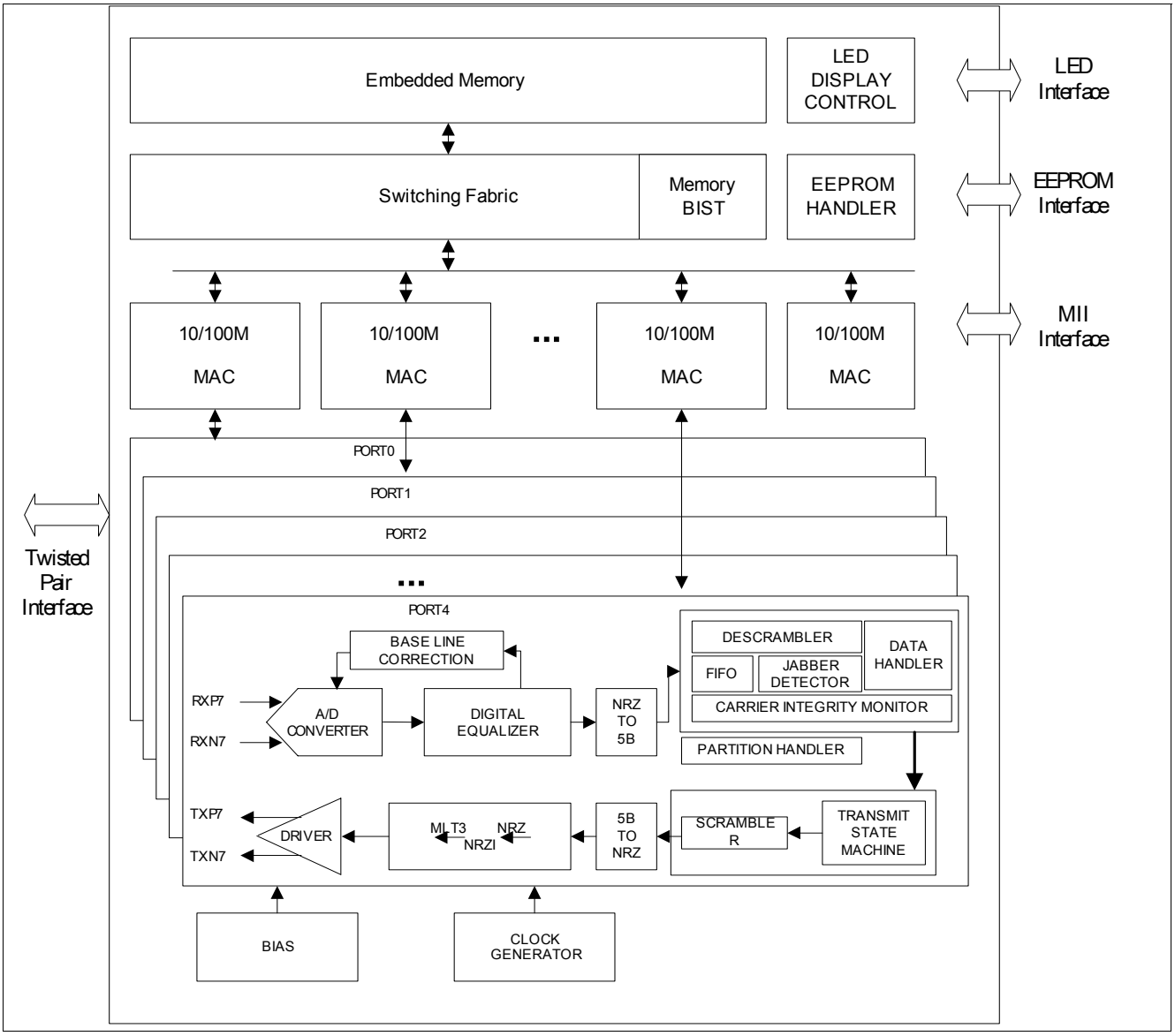


Figure 1 ADM6996LC/LCX/LHX Block Diagram

2 Interface Description

This chapter describes the interface descriptions for the ADM6996LC/LCX/LHX

- Pin Diagram
- Abbreviations
- Pin Description by Function

2.1 Pin Diagram

Figure 2 shows the pin diagram for the ADM6996LC/LCX/LHX.

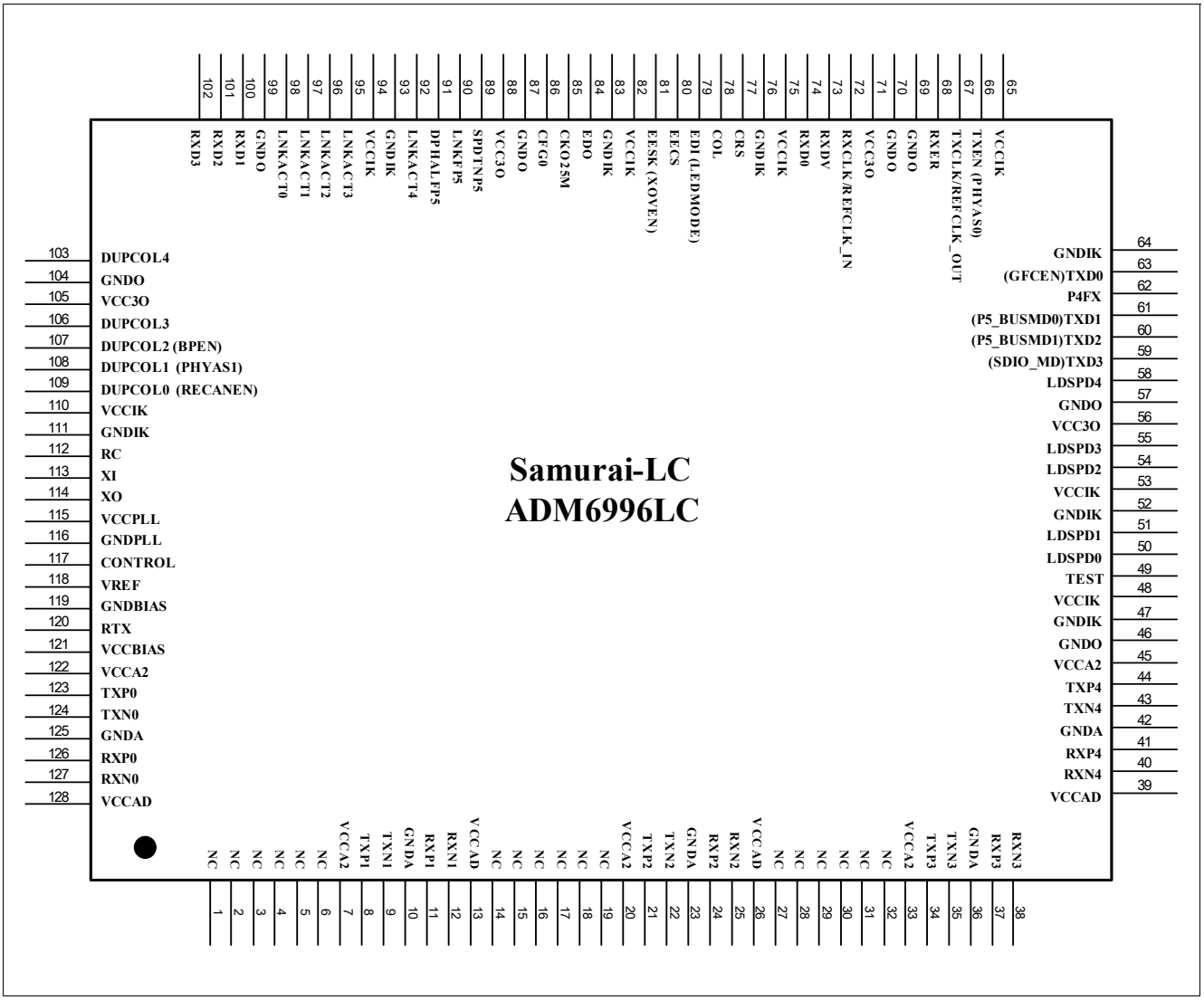


Figure 2 5 TP/FX PORT + 1 MII PORT 128 Pin Diagram

2.2 Abbreviations

Standard abbreviations for I/O tables:

Table 1 Abbreviations for Pin Type

Abbreviations	Description
I	Standard input-only pin. Digital levels.
O	Output. Digital levels.
I/O	I/O is a bidirectional input/output signal.
AI	Input. Analog levels.
AO	Output. Analog levels.
AI/O	Input or Output. Analog levels.
PWR	Power
GND	Ground
MCL	Must be connected to Low (JEDEC Standard)
MCH	Must be connected to High (JEDEC Standard)
NU	Not Usable (JEDEC Standard)
NC	Not Connected (JEDEC Standard)

Table 2 Abbreviations for Buffer Type

Abbreviations	Description
Z	High impedance
PU	Pull up, 10 kΩ
PD	Pull down, 10 kΩ
TS	Tristate capability: The corresponding pin has 3 operational states: Low, high and high-impedance.
OD	Open Drain. The corresponding pin has 2 operational states, active low and tristate, and allows multiple devices to share as a wire-OR. An external pull-up is required to sustain the inactive state until another agent drives it, and must be provided by the central resource.
OC	Open Collector
PP	Push-Pull. The corresponding pin has 2 operational states: Active-low and active-high (identical to output with no type attribute).
OD/PP	Open-Drain or Push-Pull. The corresponding pin can be configured either as an output with the OD attribute or as an output with the PP attribute.
ST	Schmitt-Trigger characteristics
TTL	TTL characteristics

2.3 Pin Description by Function

ADM6996LC/LCX/LHX pins are categorized into one of the following groups:

- Network Media Connection
- Port 5 MII Interface
- LED Interface
- EEPROM Interface
- Power/Ground, 48 pins
- Miscellaneous

*Note: **Table 1** can be used for reference.*

Table 3 IO Signals

Ball No.	Name	Pin Type	Buffer Type	Function
Network Media Connection				
41	RXP_4	AI/O	ANA	**Receive Pair** Differential data is received on this pin.
37	RXP_3			
24	RXP_2			
11	RXP_1			
126	RXP_0			
40	RXN_4	AI/O	ANA	
38	RXN_3			
25	RXN_2			
12	RXN_1			
127	RXN_0			
44	TXP_4	AI/O	ANA	**Transmit Pair** Differential data is transmitted on this pin.
34	TXP_3			
21	TXP_2			
8	TXP_1			
123	TXP_0			
43	TXN_4	AI/O	ANA	
35	TXN_3			
22	TXN_2			
9	TXN_1			
124	TXN_0			
Port 5 MII Interface				
63	GFCEN	I	PU, LVTTL	**Global Flow Control Enable** Value on this pin will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL(**RC**) as Flow control enable. *Note: Power On Setting* 0_B Flow Control Capability is depended upon the register setting in corresponding EEPROM register 1_B All ports flow control capability is enabled
	MII_TXD0	O	4 mA, PU, LVTTL	**Port 5 Transmit Data Bit 0 in MII Mode** The bit[0] of MII Transmit data of port 5. Synchronous to the rising edge of MII_TXCLK.
	GPSI_TXD	O	4 mA, PU, LVTTL	**Port 5 Transmit Data in GPSI Mode** When port 5 is operating in GPSI mode, this pin acts as GPSI Transmit Data. Synchronous to the rising edge of GPSI_TXCLK.
	RMII_TXD0	O	4 mA, PU, LVTTL	**Port 5 Transmit Data Bit 0 in RMII Mode** When port 5 is operating in RMII mode, this pin acts as RMII Transmit Data Bit [0]. Synchronous to the rising edge of REFCLK_IN.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
61	P5_BUSMD0	I	PD, LVTTL	**Port 5 Bus Mode Selection Bit 0** Value on this pin will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL as port 5 bus mode selection bit 0. Combined with **P5_BUSMD1**, ADM6996LC/LCX/LHX provides 3 bus type for port 5. P5_BUSMD[1:0], Interface *Note: Power On Setting* 00_B MII 01_B GPSI 10_B RMII 11_B Reserved and not allowed
	MII_TXD1	O	4 mA, PD, LVTTL	**Port 5 Transmit Data Bit 1 in MII Mode** The bit[1] of MII Transmit data of port 5. Synchronous to the rising edge of MII_TXCLK.
	RMII_TXD1	O	4 mA, PD, LVTTL	**Port 5 Transmit Data Bit 1 in RMII Mode** The bit[1] of RMII Transmit data of port 5. Synchronous to the rising edge of REFCLK_IN.
60	P5_BUSMD1	I	PD, LVTTL	**Port 5 Bus Mode Selection Bit 1** Value on this pin will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL as port 5 bus mode selection bit 1. Combined with **P5_BUSMD0**, ADM6996LC/LCX/LHX provides 3 bus type for port 5. *Note: Power On Setting*
	MII_TXD2	O	4 mA, PD, LVTTL	**Port 5 Transmit Data Bit 2 in MII Mode** The bit[2] of MII Transmit data of port 5. Synchronous to the rising edge of MII_TXCLK.
59	SDIO_MD	I	PD, LVTTL	**SDC/SDIO Mode Selection** Value on this pin will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL for SDIO 32/16 bits selection. 0_B 32 Bits Mode 1_B 16 Bits Mode. Same timing as MDC/MDIO.
	MII_TXD3	O	4 mA, PD, LVTTL	**Port 5 Transmit Data Bit 3 in MII Mode** The bit[3] of MII Transmit data of port 5. Synchronous to the rising edge of MII_TXCLK.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
66	PHYAS0	I	PD, LVTTL	**PHY Address MSB Bit 0** During power on reset, value will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL as PHY start address select. PHYAS[1:0] = 00_B and PHY address starts from 01000_B. *Note: Power On Setting*
	MII_TXEN	O	8 mA, PD, LVTTL	**Port 5 Transmit Enable TXEN in MII Mode** Active high to indicate that the data on MII_TXD[3:0] is valid. Synchronous to the rising edge of MII_TXCLK.
	GPSI_TXEN	O	8 mA, PD, LVTTL	**Port 5 Transmit Enable TXEN in GPSI Mode** Active high to indicate that the data on GPSI_TXD is valid. Synchronous to the rising edge of GPSI_TXCLK.
	RMII_TXEN	O	8 mA, PD, LVTTL	**Port 5 R Transmit Enable TXEN in RMII Mode** Active high to indicate that the data on RMII_TXD[1:0] is valid. Synchronous to the rising edge of REFCLK_IN.
74	MII_RXD0	I	PD, LVTTL	**Port 5 Receive Data Bit 0 in MII Mode** The bit[0] of MII receive data, synchronous to the rising edge of MII_RXCLK.
	GPSI_RXD	I	PD, LVTTL	**Port 5 Receive Data in GPSI Mode** In GPSI Mode, this acts as Receive Data Input, synchronous to the rising edge of GPSI_RXCLK.
	RMII_RXD0	I	PD, LVTTL	**Port 5 Receive Data Bit 0 in RMII Mode** The bit[0] of RMII receive data, synchronous to the rising edge of REFCLK_IN.
100	MII_RXD1	I	PD, LVTTL	**Port 5 Receive Data Bit 1in MII Mode** The bit[1] of MII receive data, synchronous to the rising edge of MII_RXCLK.
	RMII_RXD1	I	PD, LVTTL	**Port 5 Receive Data Bit 1in RMII Mode** Bit[1] of RMII receive data, synchronous to the rising edge of REFCLK_IN.
101	MII_RXD2	I	PD, LVTTL	**Port 5 Receive Data Bit 2 in MII Mode** The bit[2] of MII receive data. Synchronous to the rising edge of MII_RXCLK.
102	MII_RXD3	I	PD, LVTTL	**Port 5 Receive Data Bit 3 in MII Mode** The bit[3] of MII receive data. Synchronous to the rising edge of MII_RXCLK.
73	MII_RXDV	I	PD, LVTTL	**Port 5 Receive Data Valid in MII Mode** Active high to indicate that the data on MII_RXD[3:0] is valid. Synchronous to the rising edge of MII_RXCLK.
	RMII_CRSDV	I	PD, LVTTL	**Port 5 Carrier Sense and Receive Data Valid in RMII Mode** Active high to indicate that the data on RMII_RXD[1:0] is valid. Synchronous to the rising edge of REFCLK _IN.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
68	MII_RXER	I	PD, LVTTL	**Port 5 Receive Error in MII Mode** Active high to indicate that there is error on the MII_RXD [3:0]. Upon receiving this signal, ADM6996LC/LCX/LHX will send Error Symbol onto the medium. Only valid in 100M operation.
	RMII_RXER	I	PD, LVTTL	**Port 5 Receive Error in RMII Mode** Active high to indicate that there is error on the RMII_ RXD[1:0]. Upon receiving this signal, ADM6996LC/LCX/LHX will send Error Symbol onto the medium. Only valid in 100M operation.
77	MII_CRS	I	PD, LVTTL	**Port 5 Carrier Sense in MII Mode** In full duplex mode, MII_P5CRS reflects the receive carrier sense situation on medium only; In Half Duplex, MII_CRS will be high both in receive and transmit condition.
	GPSI_CRS	I	PD, LVTTL	**Port 5 Carrier Sense in GPSI Mode** In full duplex mode, GPSI_CRS reflects the receive carrier sense situation on medium only; In Half Duplex, GPSI_CRS will be high both in receive and transmit condition.
78	MII_COL	I	PD, LVTTL	**Port 5 Collision Input in MII Mode** Active high to indicate that there is collision on the medium. Stay low in full duplex operation.
	GPSI_COL	I	PD, LVTTL	**Port 5 Collision Input in GPSI Mode** Active high to indicate that there is collision on the medium. Stay low in full duplex operation.
72	MII_RXCLK	I	PD, LVTTL	**Port 5 Receive Clock Inputin MII Mode** MII_RXDV and MII_RXD[3:0] are synchronous to the rising edge of this clock. It is free running 25 MHz clock in 100M mode and 2.5 MHz clock in 10M mode.
	GPSI_ RXCLK	I	PD, LVTTL	**Port 5 Receive Clock Input in GPSI Mode** GPSI_RXD are synchronous to the rising edge of this clock. It is non-continuous 10 MHz Clock input.
	REFCLK_IN	I	PD, LVTTL	**50MHz Reference Clock Input in RMII mode** RMII_RXD[1:0], RMII_TXD[1:0], RMII_TXEN and RMII_CRSDV are synchronous to the rising edge of this clock.
67	MII_TXCLK	I	PD, LVTTL	**Port 5 Transmit Clock Input in MII Mode** MII_TXEN and MII_TXD[3:0] are output at the rising edge of this clock. It is free running 25 MHz clock in 100M mode and 2.5 MHz clock in 10M mode.
	GPSI_TXCLK	I	PD, LVTTL	**Port 5 Transmit Clock Input in GPSI Mode** GPSI_TXEN and GPSI_TXD are synchronous to the rising edge of this clock. It is continuous 10 MHz Clock input.
	REFCLK _ OUT	O	8 mA, PD, LVTTL	**50MHz Reference Clock Output in RMII mode** This pin is used as 50 MHz reference clock signal output pin when port 5 operates in RMII mode.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
89	SPDTNP5	I	PD, LVTTL	**Port 5 Speed Input** 0_B 100M 1_B 10M
90	LNKFP5	I	PD, LVTTL	**Port 5 Link Fail Status Input** 0_B Link Up 1_B Link Failed
91	DPHALFP5	I	PD, LVTTL	**Port 5 Duplex Status Input** 0_B Full Duplex 1_B Half Duplex
LED Interface				
103	DUPCOL4	O	8 mA, PD, LVTTL	**Port 4 Duplex /Collision LED** In Full duplex mode, this pin acts as DUPLEX LED for port 4, respectively; in half duplex mode, it is collision LED for each port. See **Chapter 3.23 LED Display** for more detail.
106	DUPCOL3	O	8 mA, PD, LVTTL	**Port 3 Duplex /Collision LED** In Full duplex mode, this pin acts as DUPLEX LED for port 3, respectively; in half duplex mode, it is collision LED for each port. See **Chapter 3.23 LED Display** for more detail.
107	BPEN	I	PU, LVTTL	**Recommend Back-Pressure in Half-Duplex** The value on this pin will be latched by ADM6996LC/LCX/LHX during power on reset as the beck-pressure enable in half-duplex mode. *Note: Power On Setting* 0_B Disable Back-Pressure 1_B Enable Back-Pressure
	DUPCOL2	O	8 mA, PU, LVTTL	**Port 2 Duplex-collision LED** In Full duplex mode, this pin acts as port 2 DUPLEX LED; in half duplex mode, it is collision LED for port 2. See **Chapter 3.23 LED Display** for more detail.
108	PHYAS1	I	PD, LVTTL	**Recommend PHY Address Bit 1** Value on this pin will be latched by ADM6996LC/LCX/LHX during power on reset as the PHY address recommend value bit 1. See **PHYAS0** description for more detail. *Note: Power On Setting*
	DUPCOL1	O	8 mA, PD, LVTTL	**Port 1 Duplex-collision LED** In Full duplex mode, this pin acts as port 1 DUPLEX LED; in half duplex mode, it is collision LED for port 1. See **Chapter 3.23 LED Display** for more detail.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
109	RECANEN	I	PU, LVTTL	**Recommend Auto Negotiation Enable** Only valid for Twisted pair interface. Programming this bit to 1 has no effect on the Fiber port. *Note: Power On Setting.* 0_B Disable all TP port auto negotiation capability 1_B Enable all TP port auto negotiation capability
	DUPCOL0	O	8 mA, PU, LVTTL	**Port 0 Duplex-collision LED** In Full duplex mode, this pin acts as port 0 DUPLEX LED; in half duplex mode, it is the collision LED for port 0. See **Chapter 3.23 LED Display** for more detail.
92	LNKACT_4	O	8 mA, PD, LVTTL	**LINK/Activity LED of Port 4 to 0** Used to indicate corresponding port' s link/activity status, see **Chapter 3.23 LED Display** for more detail.
95	LNKACT_3			
96	LNKACT_2			
97	LNKACT_1			
98	LNKACT_0			
58	LDSPD_4	O	8 mA, PD, LVTTL	**Port 4 to Port 0 Speed LED** Used to indicate corresponding port' s speed status, see **Chapter 3.23 LED Display** for more detail.
55	LDSPD_3			
54	LDSPD_2			
51	LDSPD_1			
50	LDSPD_0			
EEPROM Interface				
84	EDO	I	PU, LVTTL	**EEPROM Data Output** This pin is used to input EEPROM data when reading EEPROM. During ADM6996LC/LCX/LHX initialization, ADM6996LC/LCX/LHX will drive EEPROM interface signal to read settings from EEPROM. Any other devices attach to EEPROM interface SHOULD drive Hi-Z or keep tristate during this period. See **Chapter 4.6 EEPROM Access** for more detail.
80	IFSEL	I	PD, LVTTL	**Interface Selection** After ADM6996LC/LCX/LHX initialization, this pin is used to select using EEPROM interface or SDC/SDIO interface. EECS/IFSEL interface 0_B SDC/SDIO interface 1_B EEPROM interface
	EECS	O	4 mA, PD, LVTTL	**EEPROM Chip Select** During ADM6996LC/LCX/LHX initialization, this pin is used as the EEPROM chip select signal. During ADM6996LC/LCX/LHX initialization, ADM6996LC/LCX/LHX will drive EEPROM interface signal to read settings from the EEPROM. Any other devices attached to the EEPROM interface SHOULD drive Hi-Z or keep tristate during this period. See **Chapter 4.6 EEPROM Access** for more detail.

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
81	XOVEN	I	PD, LVTTL	**Cross Over Enable** Value on this pin (active low) will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL for port 4~0 crossover auto detect (Only available in TP interface). *Note: Power On Setting.* 0_B Disable 1_B Enable
	EESK	I/O	4 mA, PD, LVTTL	**EEPROM Serial Clock** During ADM6996LC/LCX/LHX initialization, this pin is used to output clock to EEPROM. After ADM6996LC/LCX/LHX initialization process is done, this pin is used as EEPROM interface clock input if **IFSEL** = 1.
	SDC	I	PD, LVTTL	**Serial Management interface Clock input** If **IFSEL** = 0, this pin is used as a serial management interface clock input.
79	LED_MODE	I	PD, LVTTL	**Enable Mac to Choose LED Display Mode** Value on this pin will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL as Dsingle/dual color LED mode control signal. See **Chapter 3.23 LED Display** for more detail. *Note: Power On Setting.*
	EDI	I/O	8 mA, PD, LVTTL	**EEPROM Serial Data Input** During ADM6996LC/LCX/LHX initialization, this pin is used to output address and command to access EEPROM. After the initialization process is done, this pin becomes an input pin to monitor EEPROM data if **IFSEL** = 1.
	SDIO	I/O	8 mA, PD, LVTTL	**Serial Management interface Data input/Output** If **IFSEL** = 0, this pin is used as data input/output pin of serial management interface.
Power/Ground, 48 Pins				
10, 23, 36, 42, 125	GNDA	GND	–	**Ground** Used by AD Block
7, 20, 33, 45, 122	VCCA2	PWR	–	**1.8 V, Power** Used by TX Line Driver
13, 26, 39, 128	VCCAD	PWR	–	**3.3 V, Power** Used by AD Block
119	GNDBIAS	GND	–	**Ground** Used by Bias Block
121	VCCBIAS	PWR	–	**3.3 V, Power** Used by Bias Block.
116	GNDPLL	GND	–	**Ground** Used by PLL

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
115	VCCPLL	PWR	–	**1.8 V, Power** Used by PLL
47, 52, 64, 76, 83, 93	GNDIK	GND	–	**Ground** Used by Digital Core
48, 53, 75, 82, 94, 110	VCCIK	PWR	–	**1.8 V, Power** Used by Digital Core
46, 57, 70, 87, 99, 104	GNDO	GND	–	**Ground** Used by Digital Pad
56, 71, 88, 105	VCC3O	PWR	–	**3.3 V, Power** Used by Digital Pad
Miscellaneous				
62	P4FX	I	PD, LVTTL	**Port 4 Fiber Selection** During power on reset, value will be latched by ADM6996LC/LCX/LHX at the rising edge of RESETL as Port 4 Fiber select. 0_B Twisted Pair Mode 1_B Fiber Mode
65	INT_N	O	OD,8 mA	**Interrupt** Active low interrupt signal to indicate the status change in the interrupt status register. Interrupt signal will keep active low until host read the status of ISR register. 0_B Interrupt 1_B Not interrupt
69	WAIT_INIT	I	PD, LVTTL	**Wait Initialization** This pin will be used to pause all activities after power up until EEPROM is loaded successfully or CPU initialization is done. 0_B pause until loading EEPROM is done. 1_B pause until EEPROM successfully loaded or CPU initialization is done.
1, 2, 3, 4, 5, 6, 14, 15, 16, 17, 18, 19, 27, 28, 29, 30, 31, 32	NC	-	-	**Not Connected**
49	TEST	I	PD, LVTTL	**Test Mode** Reserved and should be kept 0 when under normal operation.
86	CFG0	I	PU, LVTTL	**Configuration 0** Reserved and should be kept 0 when under normal operation.
85	CKO25M	O	8 mA, PD, LVTTL	**25MHz Clock Output** Free Running 25 MHz Clock output (Even during power on reset)

Table 3 IO Signals (cont'd)

Ball No.	Name	Pin Type	Buffer Type	Function
112	RC	I	ST	**RC Input For Power On Reset** This pin is sampled by using the 25 MHz free running clock signal which inputs from **XI** to generate the low-active reset signal, RESETL. See **Chapter 7.3.2 Power On Reset** for the timing requirement.
113	XI	AI	ANA	**25MHz Crystal /Oscillator Input** 25MHz Crystal or Oscillator Input. Variation is limited to +/-50ppm.
114	XO	AO	ANA	**25M Crystal Output** When connected to oscillator, this pin should be left unconnected.
120	RTX	AI	ANA	**Constant Voltage Reference** External 1.0 kΩ 1% resistor connection to ground.
118	VREF	AI	ANA	**Analog Reference Voltage** Used by Internal Bias Circuit for voltage reference. External 0.1uF capacitor connection to ground for noise filter.
117	CONTROL	AI/O	ANA	**FET Control Signal** The pin is used to control FET for 3.3 V to 1.8 V regulator. External 0.1uF capacitor connection to ground for noise filter, even the pin is un-connected.

3 Function Description

3.1 Functional Descriptions

The ADM6996LC/LCX/LHX integrates five 100Base-X physical sub-layer (PHY), 100Base-TX physical medium dependent (PMD) transceivers, five complete 10Base-T modules, a 6 port 10/100 switch controller and one 10/100 MII/GPSI MAC and memory into a single chip for both 10Mbit/s, 100Mbit/s Ethernet switch operation. It also supports 100Base-FX operation through external fiber-optic transceivers. The device is capable of operating in either Full Duplex mode or Half-Duplex mode in 10Mbit/s and 100Mbit/s. Operational modes can be selected by hardware configuration pins, software settings of management registers, or determined by the on-chip auto negotiation logic.

The ADM6996LC/LCX/LHX consists of three major blocks:

- 10/100M PHY Block
- Switch Controller Block
- Built-in SSRAM

The interfaces used for communication between the PHY block and switch core is an MII interface.

An auto MDIX function is supported in this block. This function can be Enabled and Disabled by the hardware pin.

3.2 10/100M PHY Block

The 100Base-X section of the device implements the following functional blocks:

- 100Base-X physical coding sub-layer (PCS)
- 100Base-X physical medium attachment (PMA)
- Twisted-pair transceiver (PMD)

The 100Base-X and 10Base-T sections share the following functional blocks:

- Clock synthesizer module
- MII Registers
- IEEE 802.3u auto negotiation

3.3 100Base-X Module

The ADM6996LC/LCX/LHX implements a 100Base-X compliant PCS and PMA and 100Base-TX compliant TP-PMD as illustrated in Figure 2. Bypass options for each of the major functional blocks within the 100Base-X PCS provides flexibility for various applications. 100Mbit/s PHY loop back is included for diagnostic purpose.

3.4 100Base-X Receiver

The 100Base-X receiver consists of functional blocks required to recover and condition the 125Mbit/s receive data stream. The ADM6996LC/LCX/LHX implements the 100Base-X receiving state machine diagram as given in the ANSI/IEEE Standard 802.3u, Clause 24. The 125Mbit/s receive data stream may originate from the on-chip twisted-pair transceiver in a 100Base-TX application. Alternatively, the receive data stream may be generated by an external optical receiver as in a 100Base-FX application.

The receiver block consists of the following functional sub-blocks:

- A/D Converter
- Adaptive Equalizer and timing recovery module
- NRZI/NRZ and serial/parallel decoder
- De-scrambler
- Symbol alignment block
- Symbol Decoder

- Collision Detect Block
- Carrier sense Block
- Stream decoder block

3.4.1 A/D Converter

A high performance A/D converter with a 125 MHz sampling rate converts signals received on the RXP/RXN pins to 6 bits data streams. It possess an auto-gain-control capability that will further improve receive performance especially under long cabling or harsh detrimental signal integrity. Due to high pass characteristic on a transformer, a built in base-line-wander correcting circuit will be cancelled out and its DC level restored.

3.4.2 Adaptive Equalizer and timing Recovery Module

All digital design is especially immune to noise environments and achieves better correlation between production and system testing. Baud rate Adaptive Equalizer/Timing Recovery compensates for line loss induced from twisted pairs and tracks a far end clock at 125M samples per second. Adaptive Equalizer's implemented with Feed forward and Decision Feedback techniques meet the requirement of BER with less than 10-12 for transmission on a CAT5 twisted pair cable ranging from 0 to 120 meters.

3.4.3 NRZI/NRZ and Serial/Parallel Decoder

The recovered data is converted from NRZI to NRZ. The data is not necessarily aligned to the 4B/5B code group's boundary.

3.4.4 Data De-scrambling

The de-scrambler acquires synchronization with the data stream by recognizing idle bursts of 40 or more bits and locking its deciphering Linear Feedback Shift Register (LFSR) to the state of the scrambling LFSR. Upon achieving synchronization, the incoming data is XORed by the deciphering LFSR and de-scrambled.

In order to maintain synchronization, the de-scrambler continuously monitors the validity of the unscrambled data that it generates. To ensure this, a link state monitor and a hold timer are used to constantly monitor the synchronization status. Upon synchronization of the de-scrambler the hold timer starts a 722 micro second countdown. Upon detection of sufficient idle symbols within the 722 micro sec. period, the hold timer will reset and begin a new countdown. This monitoring operation will continue indefinitely given an operating network connection operating with good signal integrity. If the link state monitor does not recognize sufficient unscrambled idle symbols within the 722 micro second period, the de-scrambler will be forced out of the current state of synchronization and reset in order to re-acquire synchronization.

3.4.5 Symbol Alignment

The symbol alignment circuit in the ADM6996LC/LCX/LHX determines code word alignment by recognizing the /J/K delimiter pair. This circuit operates on unaligned data from the de-scrambler. Once the /J/K symbol pair ($11000\ 10001_B$) is detected, subsequent data is aligned on a fixed boundary.

3.4.6 Symbol Decoding

The symbol decoder functions is a look-up table that translates incoming 5B symbols into 4B nibbles as shown in Table 1. The symbol decoder first detects the /J/K symbol pair preceded by idle symbols and replaces the symbol with a MAC preamble. All subsequent 5B symbols are converted to the corresponding 4B nibbles for the duration of the entire packet. This conversion ceases upon the detection of the /T/R symbol pair denoting the end of stream delimiter (ESD). The translated data is presented on the internal RXD[3:0] signal lines where RXD[0] represents the least significant bit of the translated nibble.

3.4.7 Valid Data Signal

The valid data signal (RXDV) indicates that recovered and decoded nibbles are being presented on the internal RXD[3:0] synchronous receive clock, RXCLK. RXDV is asserted when the first nibble of a translated /J/K is ready for transfer over the internal MII. It remains active until either the /T/R delimiter is recognized, link test indicates failure, or no signal is detected. On any of these conditions, RXDV is de-asserted.

3.4.8 Receive Errors

The RXER signal is used to communicate receiver error conditions. While the receiver is in a state of holding RXDV asserted, the RXER will be asserted for each code word that does not map to a valid code-group.

3.4.9 100Base-X Link Monitor

The 100Base-X link monitor function allows the receiver to ensure that reliable data is being received. Without reliable data reception, the link monitor will halt both transmit and receive operations until such time that a valid link is detected.

The ADM6996LC/LCX/LHX performs the link integrity test as outlined in IEEE 100Base-X (Clause 24) link monitor state diagram. The link status is multiplexed with 10Mbit/s link status to form the reportable link status bit in the serial management register 1h, and driven to the LNKACT pin.

When persistent signal energy is detected on the network, the logic moves into a Link-Ready state after approximately 500 micro secs, and waits for an enable from the auto negotiation module. When received, the link-up state is entered, and the transmission and reception logic blocks become active. Should auto negotiation be disabled, the link integrity logic moves immediately to the link-up state after entering the link-ready state.

3.4.10 Carrier Sense

Carrier sense (CRS) for 100Mbit/s operation is asserted upon the detection of two non contiguous zeros occurring within any 10-bit boundary of the received data stream.

The carrier sense function is independent of symbol alignment. In switch mode, CRS is asserted during either packet transmission or reception. For repeater mode, CRS is asserted only during packet reception. When the idle symbol pair is detected in the received data stream, CRS is de-asserted. In repeater mode, CRS is only asserted due to receive activity. CRS is intended to encapsulate RXDV.

3.4.11 Bad SSD Detection

A Bad Start of Stream Delimiter (Bad SSD) is an error condition that occurs in the 100Base-X receiver if a carrier is detected (CRS asserted) and a valid /J/K set of code-group (SSD) is not received.

If this condition is detected, then the ADM6996LC/LCX/LHX will assert RXER and present RXD[3:0] = 1110_B to the internal MII for the cycles that correspond to received 5B code-groups until at least two idle code-groups are detected. Once at least two idle code groups are detected, RXER and CRS become de-asserted.

3.4.12 Far-End Fault

Auto negotiation provides a mechanism for transferring information from the Local Station to the link Partner that a remote fault has occurred for 100Base-TX. As auto negotiation is not currently specified for operation over fiber, the far end fault indication function (FEFI) provides this capability for 100Base-FX applications.

A remote fault is an error in the link that one station can detect while the other cannot. An example of this is a disconnected wire at a station's transmitter. This station will be receiving valid data and detect that the link is good via the link integrity monitor, but will not be able to detect that its transmission is not propagating to the other station.

A 100Base-FX station that detects such a remote fault may modify its transmitted idle stream from all 1_B's to a group of 84 1_B's followed by a single 0_B. This is referred to as the FEFI idle pattern.

3.5 100Base-TX Transceiver

The ADM6996LC/LCX/LHX implements a TP-PMD compliant transceiver for 100Base-TX operation. The differential transmit driver is shared by the 10Base-T and 100Base-TX subsystems. This arrangement results in one device that uses the same external magnetic for both the 10Base-T and the 100Base-TX transmissions with a simple RC component connection. The individually wave-shaped 10Base-T and 100Base-TX transmit signals are multiplexed in the transmission output driver selection.

3.5.1 Transmit Drivers

The ADM6996LC/LCX/LHX 100Base-TX transmission driver implements MLT-3 translation and wave-shaping functions. The rise/fall time of the output signal is closely controlled to conform to the target range as specified in the ANSI TP-PMD standard.

3.5.2 Twisted-Pair Receiver

For 100Base-TX operation, the incoming signal is detected by the on-chip twisted-pair receiver that consists of a differential line receiver, an adaptive equalizer and a base-line wander compensation circuits.

The ADM6996LC/LCX/LHX uses an adaptive equalizer that changes filter frequency response in accordance with cable length. The cable length is estimated based on the incoming signal strength. The equalizer tunes itself automatically for any cable length to compensate for the amplitude and phase distortions incurred from the cable.

3.6 10Base-T Module

The 10Base-T Transceiver Module is IEEE 802.3 compliant. It includes the receiver, transmitter, collision, heartbeat, loop back, jabber, wave shaper, and link integrity functions, as defined in the standard. Figure 3 provides an overview for the 10Base-T module.

The ADM6996LC/LCX/LHX 10Base-T module is comprised of the following functional blocks:

- Manchester encoder and decoder
- Collision detector
- Link test function
- Transmit driver and receiver
- Serial and parallel interface
- Jabber and SQE test functions
- Polarity detection and correction

3.6.1 Operation Modes

The ADM6996LC/LCX/LHX 10Base-T module is capable of operating in either half-duplex mode or full-duplex mode. In half-duplex mode, the ADM6996LC/LCX/LHX functions as an IEEE 802.3 compliant transceiver with fully integrated filtering. The COL signal is asserted during collisions or jabber events, and the CRS signal is asserted during transmit and receive. In full duplex mode the ADM6996LC/LCX/LHX can simultaneously transmit and receive data.

3.6.2 Manchester Encoder/Decoder

Data encoding and transmission begins when the transmission enable input (TXEN) goes high and continues as long as the transceiver is in a good link state. Transmission ends when the transmission enable input goes low. The last transition occurs at the center of the bit cell if the last bit is a 1_B, or at the boundary of the bit cell if the last bit is 0_B.

Decoding is accomplished using a differential input receiver circuit and a phase-locked loop that separate the Manchester-encoded data stream into clock signals and NRZ data. The decoder detects the end of a frame when

no more mid bit transitions are detected. Within one and a half bit times after the last bit, carrier sense is de-asserted.

3.6.3 Transmit Driver and Receiver

The ADM6996LC/LCX/LHX integrates all the required signal conditioning functions in its 10Base-T block such that external filters are not required. Only one isolation transformer and impedance matching resistors are needed for the 10Base-T transmit and receive interface. The internal transmit filtering ensures that all the harmonics in the transmission signal are attenuated properly.

3.6.4 Smart Squelch

The smart squelch circuit is responsible for determining when valid data is present on the differential receive. The ADM6996LC/LCX/LHX implements an intelligent receive squelch on the RXP/RXN differential inputs to ensure that impulse noise on the receive inputs will not be mistaken for a valid signal. The squelch circuitry employs a combination of amplitude and timing measurements (as specified in the IEEE 802.3 10Base-T standard) to determine the validity of data on the twisted-pair inputs.

The signal at the start of the packet is checked by the analog squelch circuit and any pulses not exceeding the squelch level (either positive or negative, depending upon polarity) will be rejected. Once this first squelch level is overcome correctly, the opposite squelch level must then be exceeded within 150ns. Finally, the signal must exceed the original squelch level within an additional 150ns to ensure that the input waveform will not be rejected.

Only after all these conditions have been satisfied will a control signal be generated to indicate to the remainder of the circuitry that valid data is present.

Valid data is considered to be present until the squelch level has not been generated for a time longer than 200 ns, indicating the end of a packet. Once good data has been detected, the squelch levels are reduced to minimize the effect of noise, causing premature end-of-packet detection. The receive squelch threshold level can be lowered for use in longer cable applications. This is achieved by setting bit 10 of register address 11_H.

3.7 Carrier Sense

Carrier Sense (CRS) is asserted due to receive activity once valid data is detected via the smart squelch function. For 10 Mbit/s half duplex operation, CRS is asserted during either packet transmission or reception. For 10 Mbit/s full duplex and repeater mode operations, the CRS is asserted only due to receive activity.

3.8 Jabber Function

The jabber function monitors the ADM6996LC/LCX/LHX output and disables the transmitter if it attempts to transmit a longer than legal sized packet. If TXEN is high for greater than 24ms, the 10Base-T transmitter will be disabled. Once disabled by the jabber function, the transmitter stays disabled for the entire time that the TXEN signal is asserted. This signal has to be de-asserted for approximately 256 ms (the un-jab time) before the jabber function re-enables the transmit outputs. The jabber function can be disabled by programming bit 4 of register address 10_H to high.

3.9 Link Test Function

A link pulse is used to check he integrity of the connection with the remote end. If valid link pulses are not received, the link detector disables the 10Base-T twisted-pair transmitter, receiver, and collision detection functions.

The link pulse generator produces pulses as defined in IEEE 802.3 10Base-T standard. Each link pulse is nominally 100ns in duration and is transmitted every 16 ms, in the absence of transmit data.

3.10 Automatic Link Polarity Detection

The ADM6996LC/LCX/LHX's 10Base-T transceiver module incorporates an "automatic link polarity detection circuit". The inverted polarity is determined when seven consecutive link pulses of inverted polarity or three consecutive packets are received with inverted end-of-packet pulses. If the input polarity is reversed, the error condition will be automatically corrected and reported in bit 5 of register 10_H.

3.11 Clock Synthesizer

The ADM6996LC/LCX/LHX implements a clock synthesizer that generates all the reference clocks needed from a single external frequency source. The clock source must be a TTL level signal at 25 MHz +/- 50ppm

3.12 Auto Negotiation

The Auto Negotiation function provides a mechanism for exchanging configuration information between two ends of a link segment and automatically selecting the highest performance mode of operation supported by both devices. Fast Link Pulse (FLP) Bursts provide the signaling used to communicate auto negotiation abilities between two devices at each end of a link segment. For further detail regarding auto negotiation, refer to Clause 28 of the IEEE 802.3u specification. The ADM6996LC/LCX/LHX supports four different Ethernet protocols, so the inclusion of auto negotiation ensures that the highest performance protocol will be selected based on the ability of the link partner.

Highest priority is relative to the following list:

- 100Base-TX full duplex (highest priority)
- 100Base-TX half duplex
- 10Base-T full duplex
- 10Base-T half duplex (lowest priority)

3.13 Memory Block

The ADM6996LC/LCX/LHX's built in memory is divided into two blocks. One is a MAC addressing table and the other one is a data buffer.

The MAC address Learning Table size is 2K entries with each entry occupying eight bytes length. These eight bytes of data include a 6 byte source address, VLAN information, Port information and an aging counter.

A data buffer is divided into 256 bytes/block. The ADM6996LC/LCX/LHX buffer management is per port fixed block number and all ports share one global buffer. This architecture can get better memory utilization and network balance at different speeds and duplex test conditions.

Received packets will separate into several 256 bytes/block and chain together. If a packet size is more than 256 bytes then the ADM6996LC/LCX/LHX will chain two or more blocks to store receiving packets.

3.14 Switch Functional Description

The ADM6996LC/LCX/LHX uses a "store & forward" switching approach for the following reason:

- Store & forward switches allow switching between different speed media (e.g. 10BaseX and 100BaseX). Such switches require large elastic buffers especially when bridging between a server on a 100 Mbit/s network and clients on a 10 Mbit/s segment.
- Store & forward switches improve overall network performance by acting as a "network cache"
- Store & forward switches prevent the forwarding of corrupted packets by the frame check sequence (FCS) before forwarding to the destination port.

3.15 Basic Operation

The ADM6996LC/LCX/LHX receives incoming packets from one of its ports, searches in the Address Table for the Destination MAC Address and then forwards the packet to the other port within the same VLAN group, where

appropriate. If the destination address is not found in the address table, the ADM6996LC/LCX/LHX treats the packet as a broadcast packet and forwards the packet to the other ports within the same VLAN group.

The ADM6996LC/LCX/LHX automatically learns the port number of attached network devices by examining the Source MAC Address of all incoming packets at wire speed. If the Source Address is not found in the Address Table, the device adds it to the table.

3.15.1 Address Learning

A four-way hash algorithm is implemented to allow the maximum of 4 different addresses with the same hash key to be stored at the same time. Up to 2K entries can be created and all entries are stored in the internal SSRAM. An address is stored in the Address Table. The ADM6996LC/LCX/LHX searches for the Source Address (SA) of an incoming packet in the Address Table and acts as below:

1. If the SA was not found in the Address Table (a new address), the ADM6996LC/LCX/LHX waits until the end of the packet (non-error packet) and updates the Address Table. If the SA was found in the Address Table, then the aging value of each corresponding entry will be reset to 0_B.
2. When the DA is PAUSE command, then the learning process will be disabled automatically by ADM6996LC/LCX/LHX.

3.15.2 Address Recognition and Packet Forwarding

The ADM6996LC/LCX/LHX forwards the incoming packets between bridged ports according to the Destination Address (DA) as below. All the packet forwarded will check the VLAN first. A forwarding port must be the within the same VLAN as the source port.

If the DA is a UNICAST address and the address was found in the Address Table, the ADM6996LC/LCX/LHX will check the port number and act as follows:

- If the port number is equal to the port on which the packet was received, the packet is discarded.
- If the port number is different, the packet is forwarded across the bridge.
- If the DA is a UNICAST address and the address was not found, the ADM6996LC/LCX/LHX treats it as a multicast packet and forwards it across the bridge.
- If the DA is a Multicast address, the packet is forwarded across the bridge.
- If the DA is a PAUSE Command (01 80 C2 00 00 01_H), then this packet will be dropped by the ADM6996LC/LCX/LHX. The ADM6996LC/LCX/LHX can issue and learn PAUSE commands.
- The ADM6996LC/LCX/LHX will forward the packet with a DA of (01 80 C2 00 00 00_H), filter out the packet with a DA of (01 80 C2 00 00 01_H), and forward a packet with a DA of (01-80-C2-00-00-02_H to 01 80 C2 00 00 $0F_H$)

3.15.3 Address Aging

Address aging is supported for topology changes such as an address moving from one port to another. When this happens, the ADM6996LC/LCX/LHX internally has a 300 second timer which will “age-out” (remove) the address from the address table. The aging function can be enabled/disabled by the user. Normally, disabling an aging function is for security purposes.

3.15.4 Back off Algorithm

The ADM6996LC/LCX/LHX implements the truncated exponential back off algorithm compliant to the 802.3 CSMA-CD standard. The ADM6996LC/LCX/LHX will restart the back off algorithm by choosing 0-9 collision counts. The ADM6996LC/LCX/LHX resets the collision counter after 16 consecutive retransmit trials.

3.15.5 Inter-Packet Gap (IPG)

IPG is the idle time between any two successive packets from the same port. The typical number is 96 bits at a time. The value is 9.6 micro secs for 10 Mbit/s Ethernet, 960ns for 100 Mbit/s fast Ethernet and 96ns for 1000M.

The ADM6996LC/LCX/LHX provides an option of 92 bit gap in an EEPROM to prevent packet loss when Flow Control is turned off and clock P.P.M. values differ.

3.15.6 Illegal Frames

The ADM6996LC/LCX/LHX will discard all illegal frames such as runt packets (less than 64 bytes), oversized packets (greater than 1518 or 1522 bytes) and bad CRC. Dribbling packing with good CRC value will be accepted by the ADM6996LC/LCX/LHX. In case of bypass mode enable, the ADM6996LC/LCX/LHX will support tag and untagged packets with sizes up to 1522 bytes. In case of non-bypass mode, the ADM6996LC/LCX/LHX will support tag packets up to 1526bytes and untagged packets up to 1522bytes.

3.15.7 Half Duplex Flow Control

A back pressure function is supported for half-duplex operations. When the ADM6996LC/LCX/LHX cannot allocate a receive buffer for an incoming packet (buffer full), the device will transmit a jam pattern on the port, thus forcing a collision. Back Pressure is enabled by the BPEN set during RESET assertion. An Infineon proprietary algorithm is implemented inside the ADM6996LC/LCX/LHX to prevent the back pressure function causing HUB partitioned under heavy traffic environment and reducing the packet loss rate to increase the whole system performance.

3.15.8 Full Duplex Flow Control

When full duplex port run out of its receive buffer, a PAUSE packet command will be issued by ADM6996LC/LCX/LHX to notice the packet sender to pause transmission. This frame based flow control is totally compliant to IEEE 802.3x. ADM6996LC/LCX/LHX can issue or receive pause packet.

3.15.9 Old Broadcast Storm filter (0x0b[0]=0 and 0x11[6]=0)

If the Broadcast Storm filter is enabled, the broadcast packets over 50 ms of the threshold will be discarded by the threshold setting. See EEPROM Reg.10_H.

Broadcast storm mode:

Time interval: 50ms

Max. packet number = 7490 in 100Base, 749 in 10Base

Table 4 The max. packet number = 7490 in 100Base, 749 in 10Base

Per Port Falling Threshold				
	00_B	01_B	10_B	11_B
All 100TX	Disable	7440fps	14880fps	29760fps
Not All 100TX	Disable	744fps	1488fps	2976fps

Table 5 The max. packet number = 7490 in 100Base, 749 in 10Base

Per Port Rising Threshold				
	00_B	01_B	10_B	11_B
All 100TX	Disable	14880fps	29760fps	59520fps
Not All 100TX	Disable	1488fps	2976fps	5952fps

3.15.10 New Broadcast/Multicast Storm (0x0b[0]=1 and 0x11[6]=1)

ADM6996LC/LCX allows users to limit the traffic of the broadcast address (DA = $FFFFFFFFFFFF_H$) to prevent them from blocking the switch bandwidth. If users also want to limit the multicast packets(DA[40] = 1_B), they can

set the Multicast Packet Counted into Storming Counter (see 0010_H[5]) function. Two thresholds and storm enable bits (see $003B_H$ and $003C_H$) are used to control the broadcast storm.

1. Time Scale. ADM6996LC/LCX uses 50ms as a scale to meter the storm packets.

Parameter	Rising Threshold	Falling Threshold
All link ports are 100M	100M Threshold (See $003B_H$[12:0])	1/2 100M Threshold
All link ports are not all 100M	10M Threshold (See $003C_H$[12:0])	1/2 10M Threshold

2. Storm keeps on at least 1.6 seconds if any of the ports meets the rising threshold in the 4 consecutive 50 ms intervals. In these 1.6 seconds, the ports meeting the rising threshold will start to discard the broadcast or multicast packets until the 50 ms interval expires. Users could also disable Input Filter (see $000B_H$[14]) function to forward above packets to the un-congested port instead of discarding directly.

3. Storm finishes. After the 1.6-second storm period, ADM6996LC/LCX will check the port that makes the storm on. If all of these ports meet the falling threshold in the 2 consecutive 50 ms intervals and no other ports satisfy the rising threshold at the same time, the storm will finish.

3.16 Auto TP MDIX function

At normal application which Switch connect to NIC card is by one by one TP cable. If Switch connect other device such as another Switch must by two way. First one is Cross Over TP cable. Second way is use extra RJ45 which crossover internal TX+- and RX+- signal. By second way customer can use one by one cable to connect two Switch devices. All these effort need extra cost and not good solution. ADM6996LC/LCX/LHX provide Auto MDIX function which can adjust TX+- and RX+- at correct pin. User can use one by one cable between ADM6996LC/LCX/LHX and other device. This function can be Enable/Disable by hardware pin and EEPROM configuration register 01_H ~ 09_H bit 15. If hardware pin set all port at Auto MDIX mode then EEPROM setting is useless. If hardware pin set all port at non Auto MDIX mode then EEPROM can set each port this function enable or disable.

3.17 Port Locking

Port locking function will provide customer simple way to limit per port user number to one. If this function is turn on then ADM6996LC/LCX/LHX will lock first MAC address in learning table. After this MAC address locking will never age out except Reset signal. Another MAC address which not same as locking one will be dropped. ADM6996LC/LCX/LHX provide one MAC address per port. This function is per port setting. When turn on Port Locking function, recommend customer turn off aging function. See EEPROM register 12_H bit 0~8.

3.18 VLAN setting & Tag/Untag & port-base VLAN

ADM6996LC/LCX/LHX supports bypass mode and untagged port as default setting while the chip is power-on. Thus, every packet with or without tag will be forwarded to the destination port without any modification by ADM6996LC/LCX/LHX. Meanwhile port-base VLAN could be enabled according to the PVID value (user define 4bits to map 16 groups written at register 13_H to register 22_H) of the configuration content of each port.

ADM6996LC/LCX/LHX also supports 16 802.1Q VLAN groups. In VLAN four bytes tag include twelve VLAN ID. ADM6996LC/LCX/LHX learn user define four bits of VID. If user need to use this function, two EEPROM registers are needed to be programmed first:

* Port VID number at EEPROM register 01_H ~ 09_H bit 13~10, register 28_H ~ $2B_H$ and register $2C_H$ bit 7~0: ADM6996LC/LCX/LHX will check coming packet. If coming packet is non VLAN packet then ADM6996LC/LCX/LHX will use PVID as VLAN group reference. ADM6996LC/LCX/LHX will use packet's VLAN value when receive tagged packet.

* VLAN Group Mapping Register. EEPROM register 13_H ~ 22_H define VLAN grouping value. User use these register to define VLAN group.

User can define each port as Tag port or Untag port by Configuration register Bit 4. The operation of packet between Tag port and Untag port can explain by follow example:

Example1: Port receives Untag packet and send to Untag port.

ADM6996LC/LCX/LHX will check the port user define four bits of VLAN ID first then check VLAN group resister. If destination port same VLAN as receiving port then this packet will forward to destination port without any change. If destination port not same VLAN as receiving port then this packet will be dropped.

Example2: Port receives Untag packet and send to Tag port.

ADM6996LC/LCX/LHX will check the port user define fours bits of VLAN ID first then check VLAN group resister. If destination port same VLAN as receiving port than this packet will forward to destination port with four byte VLAN Tag and new CRC. If destination port not same VLAN as receiving port then this packet will be dropped.

Example3: Port receives Tag packet and send to Untag port.

ADM6996LC/LCX/LHX will check the packet VLAN ID first then check VLAN group resister. If destination port same VLAN as receiving port than this packet will forward to destination port after remove four bytes with new CRC error. If destination port not same VLAN as receiving port then this packet will be dropped.

Example4: Port receives Tag packet and send to Tag port.

ADM6996LC/LCX/LHX will check the user define packet VLAN ID first then check VLAN group resister. If destination port same VLAN as receiving port than this packet will forward to destination port without any change. If destination port not same VLAN as receiving port then this packet will be dropped.

3.19 Old Fixed Ingress Bandwidth Control (0x0b[0]=0)

ADM6996LC/LCX/LHX also supports ADM6996L compatible Bandwidth Control with fixed rate.

Table 6 Fixed Ingress Bandwidth Control

000	001	010	011	100	101	110	111
256K	512k	1M	2M	5M	10M	20M	50M

3.20 New Scalable Egress/Ingress Bandwidth Control (0x0b[0]=1 and 0x33[12]=1)

Bandwidth control function is useful on community networks for different levels of service. ADM6996LC/LCX/LHX provides Scalable Egress/Ingress Bandwidth Control. Users can set any value that is based on a 64K unit.

3.21 MAC Table Accessible

CPU accesses Switch internal MAC table is provided by ADM6996LC/LCX/LHX. CPU can Search, Add, Delete and Set ADM6996LC/LCX/LHX internal MAC table through a serial interface.

Search: CPU can search target MAC address Switch port number.

Add: CPU can add MAC address to learning table.

Delete: CPU can delete MAC address from learning table.

Set MAC Address: CPU can set MAC address as Static or no Static address. Static means not aging out.

3.22 Priority Setting

It is a trend that data, voice and video will be put on networking, Switch not only deal data packet but also provide service of multimedia data. ADM6996LC/LCX/LHX provides two priority queues on each port with N:1 rate. See EEPROM Reg.10_H.

This priority function can set three ways as below:

* By Port Base: Set specific port at specific queue. ADM6996LC/LCX/LHX only check the port priority and not check packet's content VLAN and TOS.

* By VLAN first: ADM6996LC/LCX/LHX check VLAN three priority bit first then IP TOS priority bits.

* By IP TOS first: ADM6996LC/LCX/LHX check IP TOS three priority bit first then VLAN three priority bits.

If port set at VLAN/TOS priority but receiving packet without VLAN or TOS information then port base priority will be used.

* By TCP/UDP Destination Port Number: ADM6996LC/LCX/LHX check Layer4 TCP/UDP Destination Port number to map the priority queue.

* By MAC Destination Address: User can set MAC address to map priority queue.

3.23 LED Display

Three LEDs per port are provided by ADM6996LC/LCX/LHX. Link/Act, Duplex/Col. & Speed are three LED display of ADM6996LC/LCX/LHX. Dual color LED mode also supported by ADM6996LC/LCX/LHX. For easy production purpose ADM6996LC/LCX/LHX will send test signal to each LED at power on reset stage. EEPROM register 12_H define LED configuration table.

1. **LED_MODE**: It is the value latched on the EDI pin during the power on reset. It's also used to control the dual or single color mode and is useless when the value wait_init is high.
2. **DCS** (see 0012_H): Dupcol LEDs indicate the duplex status only.
3. **DHCOL** (See 0030_H): When enabled, pin DUPCOL0 shows col_10m status and pin DUPCOL1 shows col_100m status. These two LEDs are necessary in the dual-speed hub.

ADM6996LC/LCX/LHX LED is active Low signal. Dupcol0 & Dupcol1 will check external signal at Reset time. If external signal add pull high then LED will active Low. If external signal add pull down resister then LED will drive high.

3.23.1 Single Color LED Display

Table 7 Single Color LED Display

Pin Name	Status
LNKACT4/LNKACT3/ LNKACT2/LNKACT1/ LNKACT0	These pins have no power on reset values on them, and ADM6996LC/LCX/LHX uses active low value to drive the led. So the output values of these pins after the power on reset are shown as follows: 1. First period: This period lasts 1.28 s for LED on test. ADM6996LC/LCX/LHX drives value 0 to open the LED. 2. Second period: This period lasts 0.48 s for LED off test. ADM6996LC/LCX/LHX drives value 1 to close the LED. 3. Normal Period: Tis period indicates the link status. 0_B Port links up and LED is ON. 1_B Port links down and LED is OFF. $0/1_B$ Port links up and is transmitting or receiving. The LED flashes at 10 Hz.
LDSPD4/LDSPD3/ LDSPD2/LDSPD1/ LDSPD0	The behavior of these pins is the same as the LNKACT, except the normal period. Normal period: This period indicates the speed status. 0_B Port links up and its speed is 100M. LED is ON. 1_B Port links down or its speed is 10M. LED is OFF.

Table 7 Single Color LED Display (cont'd)

Pin Name	Status
DUPCOL2/ DUPCOL1/ DUPCOL0	These 3 pins have power on reset values on them. ADM6996LC/LCX/LHX needs to consider these values to drive the correct value. If the power on reset value is value_power_on, then the display is as follows: 1. First period: This period lasts 1.28 s for LED on test. ADM6996LC/LCX/LHX drives ~value_power_on to open the LED. 2. Second period: This period lasts 0.48 s for LED off test. ADM6996LC/LCX/LHX drives value_power_on to close the LED. 3. Normal Period: Tis period indicates the duplex/collision status. ~value_power_on = Port links up in the full-duplex mode. LED is ON. value_power_on = Port links down. LED flashes at 10 Hz. $0/1_B$ Port links up and collision is detected. The LED flashes at 10 Hz. If **DCS** is enabled, the normal period changes its way to display. ~value_power_on = Port links up in the duplex mode. LED is ON. value_power_on = Port links down or links up in the half-duplex mode. LED is OFF. $0/1_B$ This value is cancelled. LED doesn't blink. If **DHCOL** is enabled, the display in the normal period is as follows: DUPCOL0: 10m collision indicator. $0/1_B$ One of the ports links up in 10M half-duplex mode and detects a collision event. The LED flashes at 20 Hz. value_power_on = When the above event is not satisfied, the LED is OFF. DUPCOL1: 100 m collision indicator. $0/1_B$ One of the ports links up in 100M half-duplex mode and detects a collision event. The LED flashes at 20 Hz. value_power_on = The above event is not satisfied. LED is OFF.
DUPCOL4/ DUPCOL3	The behavior of these pins is the same as the LNKACT, except for the normal period. Normal period: This period indicates the duplex/collision status. ~value_power_on = Port links up in the full-duplex mode. LED is ON. value_power_on = Port links down. LED is OFF. $0/1_B$ Port links up and collision is detected. The LED flashes at 10 Hz. If **DCS** is enabled, the normal period changes its way to display. ~value_power_on = Port links up in the duplex mode. LED is ON. value_power_on = Port links down or links up in the half-duplex mode. LED is OFF. $0/1_B$ This value is cancelled. LED doesn't blink.

3.23.2 Dual Color LED Display

Users should be careful that DUPCOL LED only supports the single color mode. The only difference between single and dual color for DUPCOL LED is the self-test time.

Table 8 Dual Color LED Display

Pin Name	Status
(LNKACT4, LDSPD4)/ (LNKACT3, LDSPD3) (LNKACT2, LDSPD2) (LNKACT1, LDSPD1) (LNKACT0, LDSPD0)	First Period: Test LED on with green color. It lasts 1.28 s. 01_B LED is on with green color. Second Period: Test LED on with yellow color. It lasts 1.28 s. 10_B LED is on with yellow color. Third period: Test LED off. 00_B LED is off. Normal Period: This period shows the status of the link and speed at the same time. 00_B Port links down.LED is off. 11_B Port links down. LED is off. 01_B Port links up in 100M. LED glows green. 10_B Port links up in 10M. LED glows yellow. $0/1,1_B$ Port links up in 100M and is receiving or transmitting. LED blinks with green color at 10 Hz. $0/1,0_B$ Port links up in 10M and is receiving or transmitting. LED blinks with yellow color at 10 Hz.
DUPCOL4/DUPCOL3/ DUPCOL2/DUPCOL1/ DUPCOL0	The behavior of these pins is the same as the single mode, except the self-test period. The LED on test period is 2.56 s instead of 1.28 s.

3.23.3 Circuit for Single LED Mode

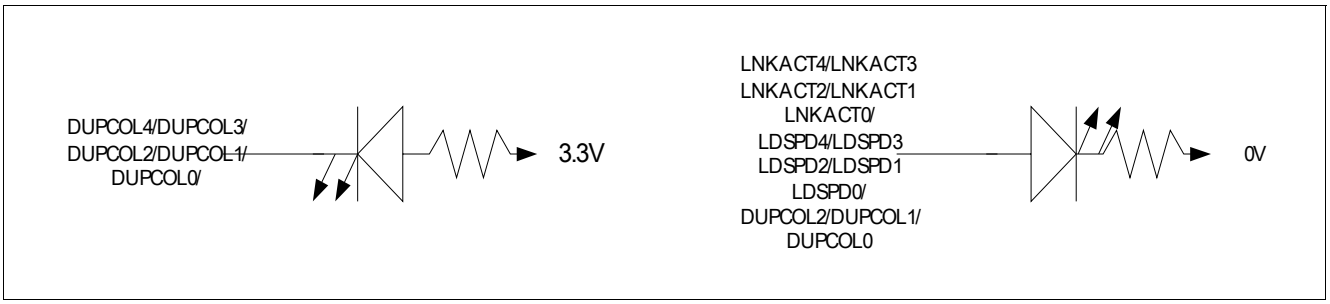


Figure 3 Circuit for Single Color LED Mode

3.23.4 Circuit for Dual Led Mode

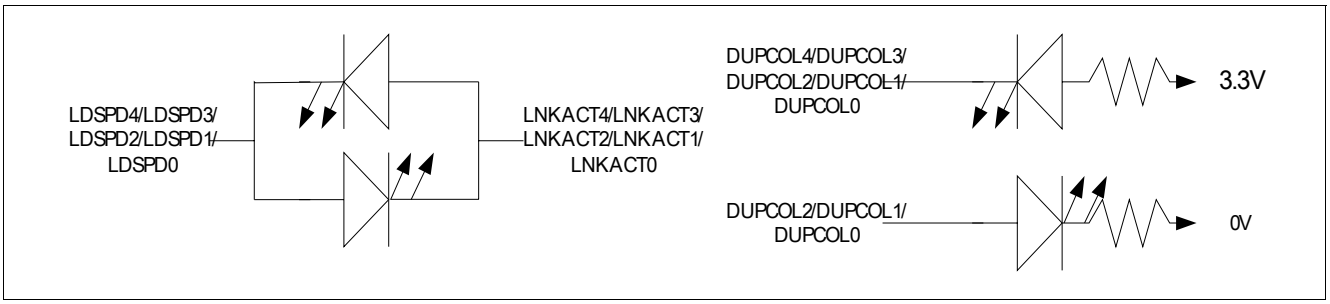


Figure 4 Circuit for Dual Color LED Mode

3.24 MAC Clone and Port5 MII connection

In ADM6996LC/LCX, there are three different configurations (MAC type MII mode, GPSI mode and RMII, **P5_BUSMD0**) for Port5 to connect the CPU's MII/GPSI or RMII interface.

Here we dipicted a general router applications of ADM6996LC/LCX, connected to CPU with single MII. In **Figure 5**, we can see either LAN to WAN or WAN to LAN, the packets will go through the same MII port. Because the CPU need to send out the packets with the registered MAC ID to the WAN port, and this MAC ID may also come in from the LAN ports. We know the switch learning scheme can't permit the packets with same MAC ID input from different port. In the ADM6996LC/LCX design, we use the MAC clone and VLAN group to solve this problem. From **Figure 6**, users can have more details for this implementation.

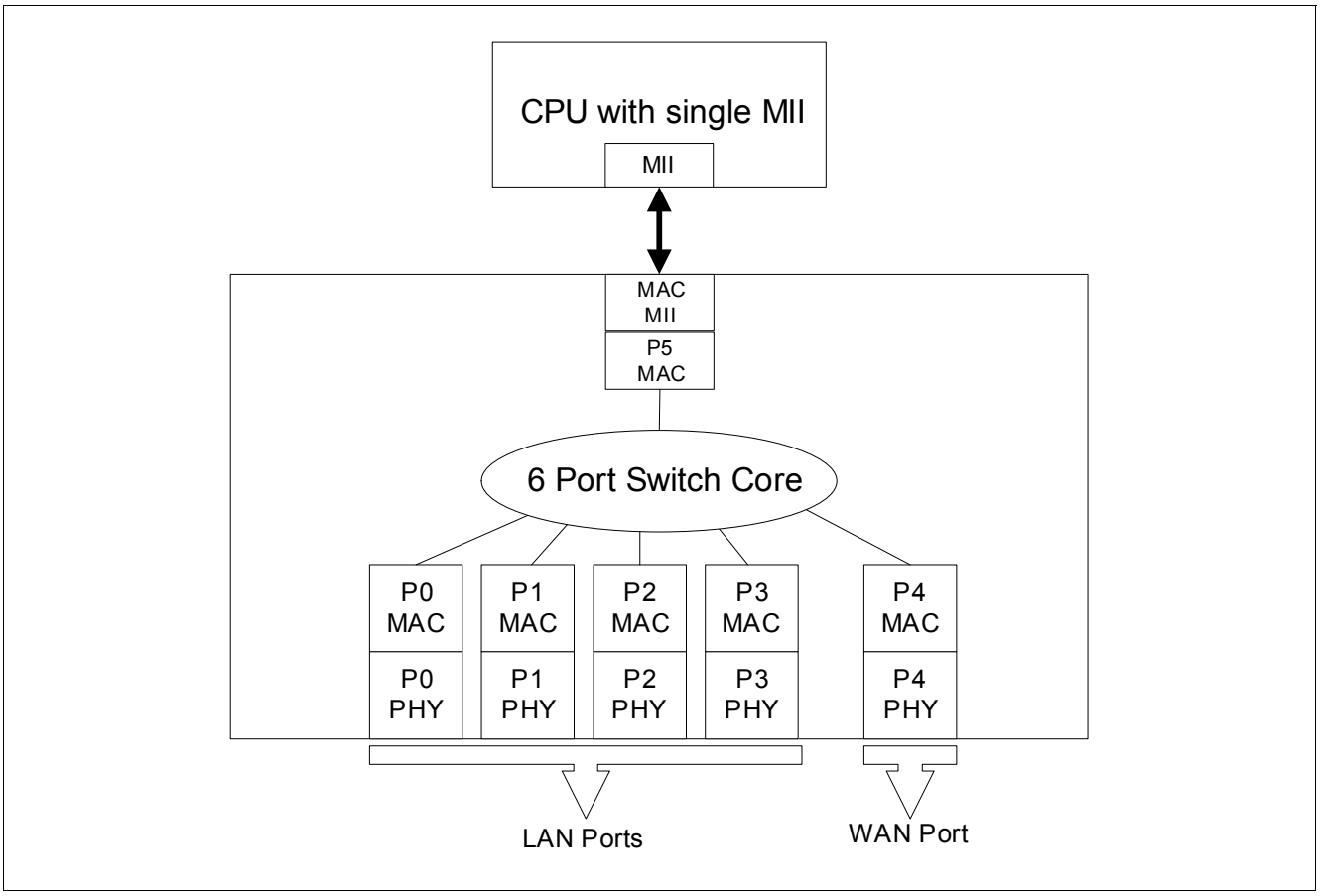


Figure 5 ADM6996LC/LCX to CPU with single MII Connection

Here we use an example to describe how to enable the MAC clone and set the VLAN group to reach this LAN/WAN routing activity.

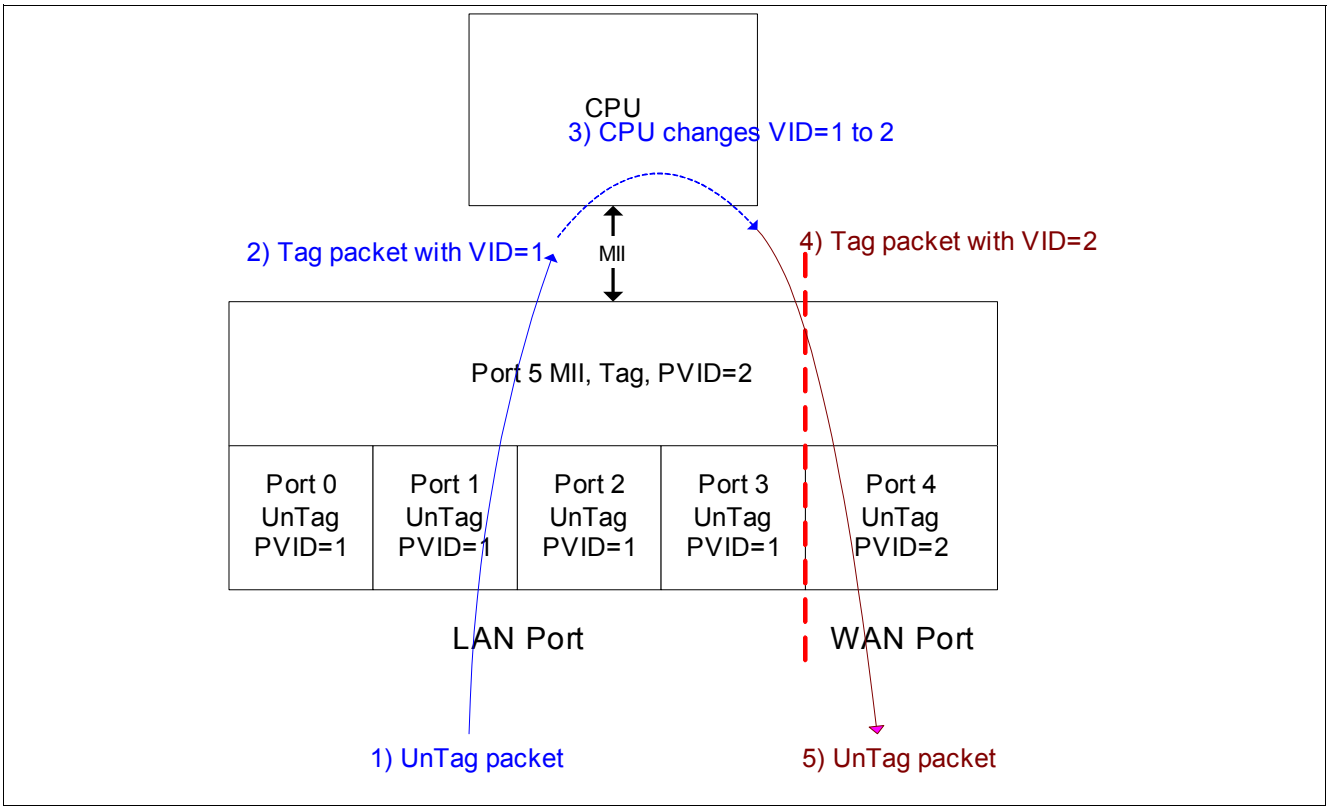


Figure 6 MAC Clone Enable and VLAN Setting

Step1: Set ADM6996LC/LCX to tag-based VLAN mode -- set EEPROM $0x11_H$ to $0xff20_H$

Step2: Set per port PVID and Tag/UnTag output port --

Port0, UnTag, PVID=1, set EEPROM $0x01_H$ to $0x840f_H$

Port1, UnTag, PVID=1, set EEPROM $0x03_H$ to $0x840f_H$

Port2, UnTag, PVID=1, set EEPROM $0x05_H$ to $0x840f_H$

Port3, UnTag, PVID=1, set EEPROM $0x07_H$ to $0x840f_H$

Port4, UnTag, PVID=2, set EEPROM $0x08_H$ to $0x880f_H$

Port5, Tag, PVID=2, set EEPROM $0x09_H$ to $0x881f_H$

Step3: Set WAN/LAN group

Group1: Port 0/1/2/3/5, set EEPROM $0x14_H$ to $0x0155_H$

Group2: Port 4/5, set EEPROM $0x15_H$ to $0x0180_H$

If Untag packet received from LAN port and forwards to CPU port, ADM6996LC/LCX will use ingress port PVID as the egress tag VID. CPU can recognize the source group of the packet by VID. If VID=1, it means the packet is received from the LAN port. Otherwise, if VID=2, it means the packet is received from the WAN port.

CPU has to change the tag VID to determine the destination group. The tag packet received from CPU port will follow tag-based VLAN to determine the broadcast domain. If the tag packet with VID=1 will follow VLAN group 1 (LAN group) and the tag packet with VID=2 will follow the VLAN group 2 (WAN group).

Normally, the MAC mode MII should be connected to the PCS mode MII. But in some applications, we need to connect both MAC mode MII to each other as shown in above figures. In **Figure 7**, due to most CPU's MII being MAC mode, so Port5 is MAC to MAC connected.

Through the hardware setting, it is easy to set ADM6996LC/LCX Port5 MII to operate in 100M Full Duplex mode. This mode (100M Full) is normally the operation mode to be with CPU, the interface connection is described in the following diagram.

(1) CKO25M is the 25M clock driven out by ADM6996LC/LCX to fit 100M MII operation. This clock output provides 8mA driving capability and it can directly connected to TXCLK/RXCLK.

(2) Due to it is operated in Full duplex mode, so COL is tied to GND.

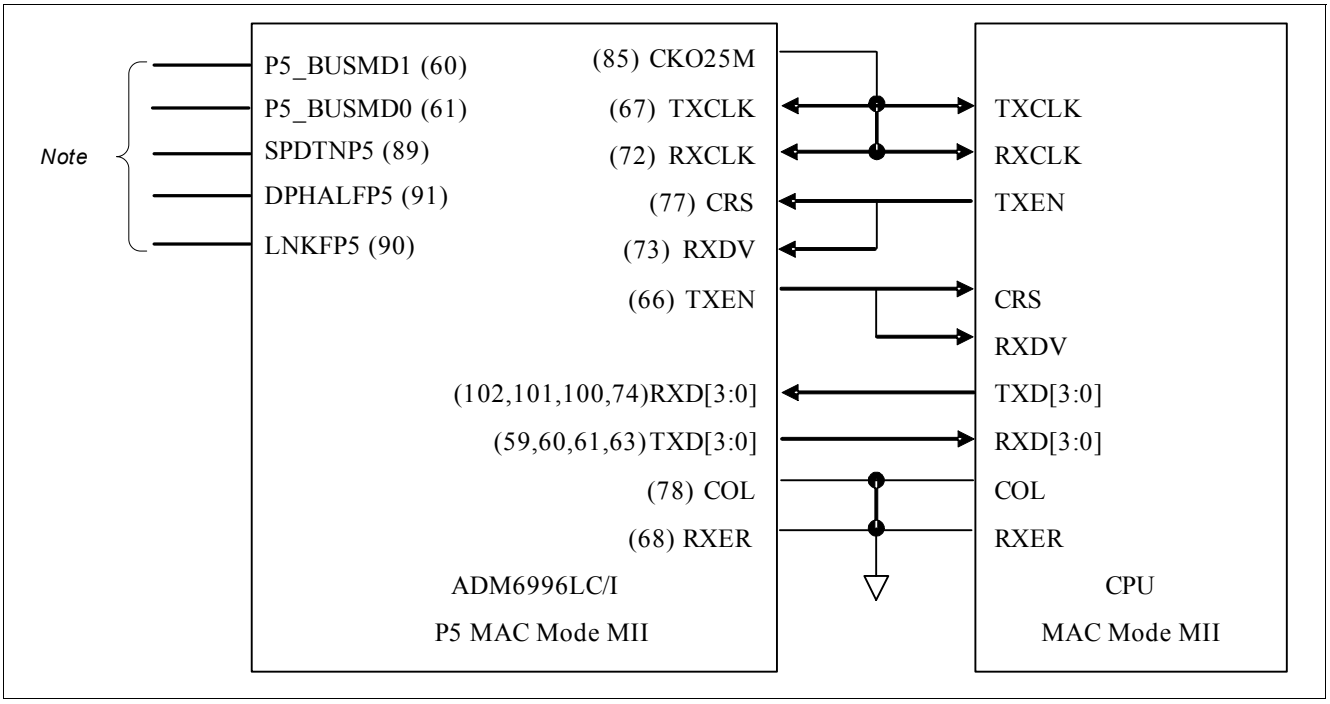


Figure 7 100M Full duplex MAC to MAC MII Connection

Note:

1. *Pin 60 and pin 61 should be pull low to let P5_BUSMD be latched as "00" and make Port5 be operating in MII mode (**P5_BUSMD0**).*
2. *Pin 89 (SPDTNP5) should be pull low or floating to set Port5 be operating in 100Mbit/s.*
3. *Pin 91 (DPHALFP5) should be pull low or floating to set Port5 be operating in full duplex mode.*
4. *Pin 90 (LNKFP5) should be pull low or floating to set Port5 Link up.*

3.25 The Hardware Difference between ADM6996LC/LCX/I and ADM6996L

ADM6996LC/LCX is power-down version to replace ADM6996L and ADM6996I is advanced function version to new application.

Pin Description(QFP128)

Table 9 Pin Description(QFP128)

Pin No.	ADM6996LC/LCX	ADM6996L	Notes
47	GNDIK(GND Digital)	NC	GNDIK in ADM6996L datasheetAsk the customer to double-check
48	VCCIK(1.8V Digital)	NC	VCCIK in ADM6996L datasheetAsk the customer to double-check
59	P5TXD3(SDIO_MD)	P5TXD3(VOL23)	For ADM6996LC/LCX, SDIO_MD=0 default 32bit modeFor ADM6996I, SDIO_MD=0 default 16bit modeAdd pull-up/down resistor for ADM6996L/LC/I compatible design to avoid wrong power-on-latch.
60	P5TXD2(RMIISEL)	P5TXD2(ROMCODE25)	Add pull down resistor for ADM6996L/LC/I P5 MII mode to avoid wrong power-on-latch.
61	P5TXD1(7WIRE)	P5TXD1(P5GPSI)	Add pull down resistor for ADM6996L/LC/I P5 MII mode to avoid wrong power-on-latch.
65	INT_N	VCCIK(1.8V Digital)	Interrupt for Learning Table Access/Port Security/Counter Overflow/Port StatusAdd a option design to CPU INT_N pin

4 32 Bits Mode Registers Description

4.1 EEPROM Registers (0x0b[0]=0)

Table 10 Registers Address Space

Module	Base Address	End Address	Note
EEPROM	00_H	33_H	Independent Address Space

Table 11 Registers Overview

Register Short Name	Register Long Name	Offset Address	Page Number
SigReg	Signature Register	00_H	**43**
CtrlReg_0	Basic Control Register 0	01_H	**44**
ResReg_0	Reserved Register 0	02_H	**45**
CtrlReg_P1	Basic Control Register 1	03_H	**45**
ResReg_1	Reserved Register 1	04_H	**45**
CtrlReg_P2	Basic Control Register 2	05_H	**45**
ResReg_2	Reserved Register 2	06_H	**45**
CtrlReg_P3	Basic Control Register 3	07_H	**45**
CtrlReg_P4	Basic Control Register 4	08_H	**45**
ResReg_3	Reserved Register 3	09_H	**45**
ResReg_4	Reserved Register 4	$0A_H$	**46**
ConfigReg_1	Configuration Register 1	$0B_H$	**46**
ResReg_5	Reserved Register 5	$0C_H$	**46**
ResReg_6	Reserved Register 6	$0D_H$	**47**
VLAN_Map_P	VLAN priority Map Register	$0E_H$	**47**
TOS_Priority	TOS priority Map Register	$0F_H$	**48**
ConfigReg_2	Configuration Register 2	10_H	**48**
VLAN_Mode	VLAN Mode Select Register	11_H	**49**
ConfigReg_3	Miscellaneous Configuration Register 3	12_H	**52**
VLAN_Map_0	VLAN mapping table registers 0	13_H	**53**
VLAN_Map_1	VLAN mapping table registers 1	14_H	**54**
VLAN_Map_2	VLAN mapping table registers 2	15_H	**54**
VLAN_Map_3	VLAN mapping table registers 3	16_H	**54**
VLAN_Map_4	VLAN mapping table registers 4	17_H	**54**
VLAN_Map_5	VLAN mapping table registers 5	18_H	**54**
VLAN_Map_6	VLAN mapping table registers 6	19_H	**54**
VLAN_Map_7	VLAN mapping table registers 7	$1A_H$	**54**
VLAN_Map_8	VLAN mapping table registers 8	$1B_H$	**54**
VLAN_Map_9	VLAN mapping table registers 9	$1C_H$	**54**
VLAN_Map_10	VLAN mapping table registers 10	$1D_H$	**54**

Table 11 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
VLAN_Map_11	VLAN mapping table registers 11	$1E_H$	54
VLAN_Map_12	VLAN mapping table registers 12	$1F_H$	54
VLAN_Map_13	VLAN mapping table registers 13	20_H	54
VLAN_Map_14	VLAN mapping table registers 14	21_H	54
VLAN_Map_15	VLAN mapping table registers 15	22_H	54
ResReg_7	Reserved Register 7	23_H	54
ResReg_8	Reserved Register 8	24_H	55
ResReg_9	Reserved Register 9	25_H	55
ResReg_10	Reserved Register 10	26_H	55
ResReg_11	Reserved Register 11	27_H	55
ConfigReg_4	Configuration Register 4	28_H	55
ConfigReg_5	Configuration Register 5	29_H	55
ConfigReg_6	Configuration Register 6	$2A_H$	56
ConfigReg_7	Configuration Register 7	$2B_H$	56
ConfigReg_8	Configuration Register	$2C_H$	56
ResReg_12	Reserved Register 12	$2D_H$	57
ResReg_13	Reserved Register 13	$2E_H$	58
PH_Restart	PHY Restart	$2F_H$	58
ConfigReg_	Miscellaneous Configuration Register 9	30_H	59
BWCon_0	Bandwidth Control Register 0	31_H	59
BWCon_1	Bandwidth Control Register 1	32_H	60
BWConEn	Bandwidth Control Enable Register	33_H	61

The register is addressed wordwise.

Table 12 Register Access Types

Mode	Symbol	Description HW	Description SW
read/write	rw	Register is used as input for the HW	Register is read and writable by SW
read	r	Register is written by HW (register between input and output -> one cycle delay)	Value written by software is ignored by hardware; that is, software may write any value to this field without affecting hardware behavior (= Target for development.)
Read only	ro	Register is set by HW (register between input and output -> one cycle delay)	SW can only read this register
Read virtual	rv	Physically, there is no new register, the input of the signal is connected directly to the address multiplexer.	SW can only read this register
Latch high, self clearing	lhsc	Latch high signal at high level, clear on read	SW can read the register
Latch low, self clearing	llsc	Latch high signal at low-level, clear on read	SW can read the register
Latch high, mask clearing	lhmk	Latch high signal at high level, register cleared with written mask	SW can read the register, with write mask the register can be cleared (1 clears)

Table 12 Register Access Types (cont'd)

Mode	Symbol	Description HW	Description SW
Latch low, mask clearing	llmk	Latch high signal at low-level, register cleared on read	SW can read the register, with write mask the register can be cleared (1 clears)
Interrupt high, self clearing	ihsc	Differentiate the input signal (low->high) register cleared on read	SW can read the register
Interrupt low, self clearing	ilsc	Differentiate the input signal (high->low) register cleared on read	SW can read the register
Interrupt high, mask clearing	ihmk	Differentiate the input signal (high->low) register cleared with written mask	SW can read the register, with write mask the register can be cleared
Interrupt low, mask clearing	ilmk	Differentiate the input signal (low->high) register cleared with written mask	SW can read the register, with write mask the register can be cleared
Interrupt enable register	ien	Enables the interrupt source for interrupt generation	SW can read and write this register
latch_on_reset	lor	rw register, value is latched after first clock cycle after reset	Register is read and writable by SW
Read/write self clearing	rwsc	Register is used as input for the hw, the register will be cleared due to a HW mechanism.	Writing to the register generates a strobe signal for the HW (1 pdi clock cycle) Register is read and writable by SW.

Table 13 Registers Clock Domains

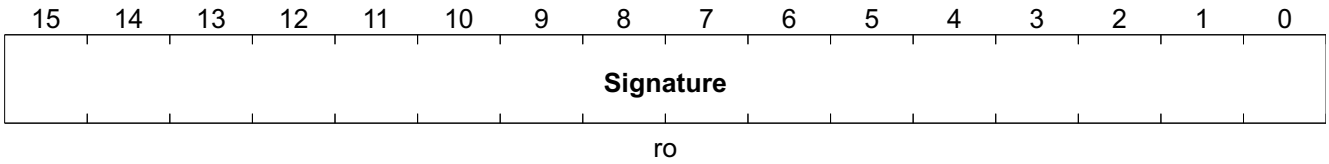
Clock Short Name	Description
–	–

4.1.1 EEPROM Register Descriptions

Signature Register

Description

SigReg	Offset	Reset Value
Signature Register	**00_H**	**4154_H**



Field	Bits	Type	Description
Signature	15:0	ro	**Signature** 4154_H **SigReg** Obligatory value (AT)

Note: ADM6996LC/LCX/LHX will check register 0 value before read all EEPROM content. If this value not match with 0x4154h then other values in EEPROM will be useless. ADM6996LC/LCX/LHX will use internal default value. User cannot write Signature register when programming ADM6996LC/LCX/LHX internal register.

Basic Control Register 0

Used to configure chip settings

CtrlReg_0	Offset	Reset Value
Basic Control Register 0	**01_H**	**$040F_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CAM	**FSE**	**PV**				**PP**		**PPE**	**TV**	**PD**	**OT**	**DUP**	**OPS**	**AN**	**FC**
rw	rw	rw				rw		rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
CAM	15	rw	**Crossover Auto MDIX** 0_B **D** Disable *Note: Hardware Reset latch value EESK can be set globally using the Auto MDIX function.* 1_B **E** Enable
FSE	14	rw	**Fx Select Enable** 0_B **TP** Tp Mode *Note: If this bit has been set to Fx in hardware then the bit does not have the power to change from Fx to Tp* 1_B **FX** Fx Mode
PV	13 :10	rw	**Port VLAN ID**
PP	9:8	rw	**Port Based Priority**
PPE	7	rw	**Port Based Priority Enable** 0_B **VTE** VLAN or TOS Priority Enable *Note: This bit is default 0_B to enable VLAN or TOS priority check. If user would like to check the VLAN priority, Tag mode should be enabled.* 1_B **PBE** Port Based Priority Enable *Note: If this bit is set to 1_B, only port based priority will be checked.*
TV	6	rw	**TOS over VLAN priority** 0_B **V** VLAN Enable 1_B **T** TOS Enable
PD	5	rw	**Port Disable** 0_B **E** Enable 1_B **D** Disable
OT	4	rw	**Output Packet Tagging** 0_B **U** Un-tag 1_B **T** Tag

Field	Bits	Type	Description
DUP	3	rw	**Duplex Enable** 0_B **H** Half 1_B **F** Full
OPS	2	rw	**Operating Speed** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
AN	1	rw	**Auto-negotiation** 0_B **D** Disable 1_B **E** Enable
FC	0	rw	**802.x Flow Control Command** 0_B **D** Disable 1_B **E** Enable

Similar Registers

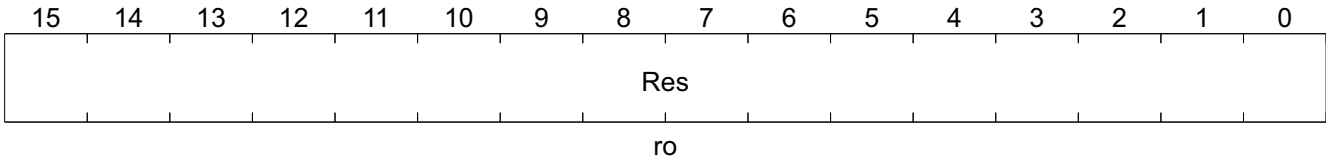
Table 14 Basic Control Registers 1 to 4

Register Short Name	Register Long Name	Offset Address	Page Number
CtrlReg_P1	Basic Control Register 1	03_H	
CtrlReg_P2	Basic Control Register 2	05_H	
CtrlReg_P3	Basic Control Register 3	07_H	
CtrlReg_P4	Basic Control Register 4	08_H	

Reserved Register 0

Register reserved for future use

ResReg_0	Offset	Reset Value
Reserved Register 0	**02_H**	**$040F_H$**



Field	Bits	Type	Description
Res	15:0	ro	**Reserved**

Similar Registers

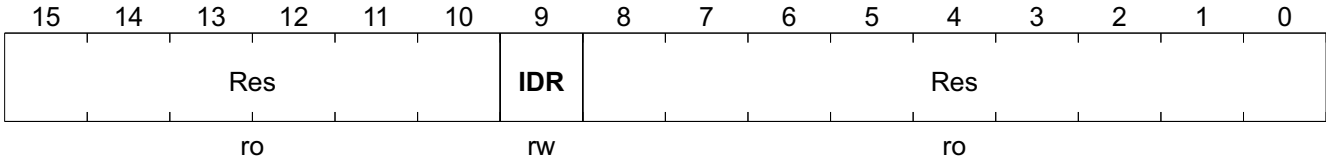
Table 15 Reserved Register 1 to 3

Register Short Name	Register Long Name	Offset Address	Page Number
ResReg_1	Reserved Register 1	04_H	
ResReg_2	Reserved Register 2	06_H	
ResReg_3	Reserved Register 3	09_H	

Reserved Register 4

Register reserved for future use

ResReg_4	Offset	Reset Value
Reserved Register 4	$0A_H$	5902_H

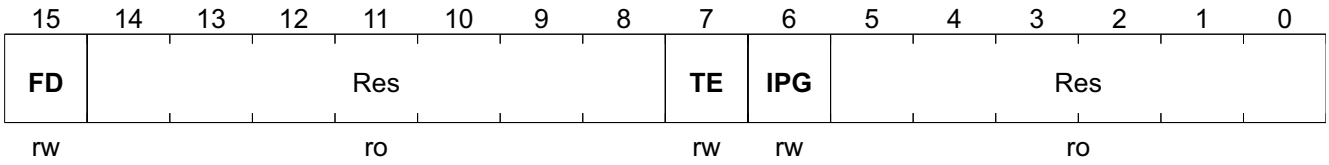


Field	Bits	Type	Description
Res	15:10	ro	**Reserved**
IDR	9	rw	**Replace Packet ID** 0_B **N** Not replaced 1_B **Y** Replaced with 1 by PVID
Res	8:0	ro	**Reserved**

Configuration Register 1

Used to configure the chip

ConfigReg_1	Offset	Reset Value
Configuration Register 1	$0B_H$	8000_H

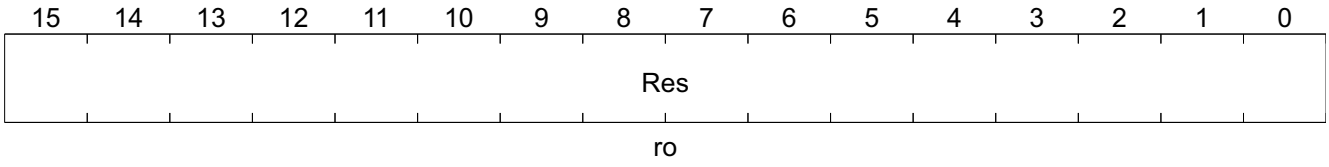


Field	Bits	Type	Description
FD	15	rw	**Far End Fault Detection** 0_B **D** Disable 1_B **E** Enable
Res	14:8	ro	**Reserved**
TE	7	rw	**Trunk Enable** 0_B **D** Disable Port 3 and 4 1_B **E** Enable Port 3 and 4
IPG	6	rw	**Inter Packet Gap Setting** 0_B **96B** 96 bits 1_B **92B** 92 bits
Res	5:0	ro	**Reserved**

Reserved Register 5

Reserved for future use

ResReg_5	Offset	Reset Value
Reserved Register 5	$0C_H$	$FA50_H$



Field	Bits	Type	Description
Res	15:0	ro	**Reserved**

Similar Registers

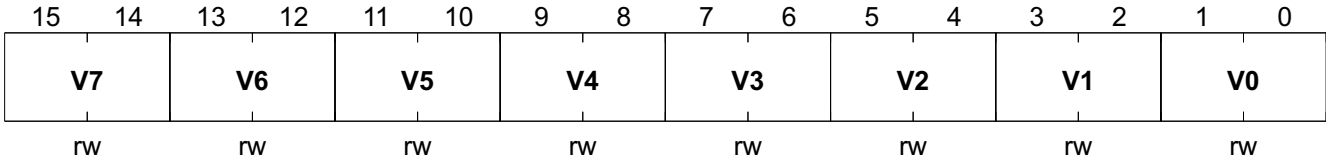
Table 16 Reserved Register 6

Register Short Name	Register Long Name	Offset Address	Page Number
ResReg_6	Reserved Register 6	$0D_H$	

VLAN Priority Map Register

Sets the VLAN priorities

VLAN_Map_P	Offset	Reset Value
VLAN priority Map Register	$0E_H$	5500_H



Field	Bits	Type	Description
V7	15:14	rw	**Mapped priority of tag value (VLAN)**
V6	13:12	rw	
V5	11:10	rw	
V4	9:8	rw	
V3	7:6	rw	
V2	5:4	rw	
V1	3:2	rw	
V0	1:0	rw	

Note: Value 3 ~ 0 are for priority queue Q3~Q0 respectively.The Weight ratio is Q3: Q2: Q1: Q0 = 8: 4: 2: 1. The default is port-base priority for un-tagged packets and non_IP frame.

Type of Service (TOS) Priority Map Register

Sets TOS priority

TOS_Priority	Offset	Reset Value
TOS priority Map Register	$0F_H$	5500_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T7		T6		T5		T4		T3		T2		T1		T0	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
T7	15:14	rw	**Mapped priority of tag value (TOS)**
T6	13:12	rw	
T5	11:10	rw	
T4	9:8	rw	
T3	7:6	rw	
T2	5:4	rw	
T1	3:2	rw	
T0	1:0	rw	

Note: Value 3 ~ 0 are for priority queues Q3~Q0 respectively. The Weight ratio is Q3: Q2: Q1: Q0 = 8: 4: 2: 1. The default is port-based priority for un-tagged packets and non_IP frames.

Configuration Register 2

Used to configure the chip

ConfigReg_2	Offset	Reset Value
Configuration Register 2	10_H	0040_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Q3		Q2		Q1		Q0		AGE	Res		XC	Res	SF	ST	
rw		rw		rw		rw		rw	ro		rw	rw	rw	rw	

Field	Bits	Type	Description
Q3	15:14	rw	**Discard mode** Drop scheme for Queue n. See **Table 19** for details on the drop scheme of each queue
Q2	13:12	rw	
Q1	11:10	rw	
Q0	9:8	rw	

Field	Bits	Type	Description
AGE	7	rw	**Aging Status** 0_B **E** Enable 1_B **D** Disable
Res	6:5	ro	**Reserved**
XC	4	rw	**CRC Check** 0_B **E** Enable CRC check 1_B **D** Disable CRC check
Res	3	rw	**Reserved**
SF	2	rw	**Broadcast Storm Filter** 0_B **D** Disable 1_B **E** Enable
ST	1:0	rw	**Broadcast Storm Threshold** See below **Table 17** and **Table 18** for details on the Broadcast Storm Threshold

Note: Broadcast storm initial time interval = 50ms. The max. packet number = 7490 in 100Base, 749 in 10Base

Table 17 The max. packet number = 7490 in 100Base, 749 in 10Base

Per Port Rising Threshold				
	00_B	01_B	10_B	11_B
All 100TX	Disable	14880fps	29760fps	59520fps
Not All 100TX	Disable	1488fps	2976fps	5952fps

Table 18 The max. packet number = 7490 in 100Base, 749 in 10Base

Per Port Falling Threshold				
	00_B	01_B	10_B	11_B
All 100TX	Disable	7440fps	14880fps	29760fps
Not All 100TX	Disable	744fps	1488fps	2976fps

Table 19 Drop Scheme for Each Queue

Discard Mode Utilization	**00**	**01**	**10**	**11**
TBD	0%	0%	25%	50%

VLAN mode select Register

Selects VLAN Mode

VLAN_Mode	**Offset**	**Reset Value**
VLAN Mode Select Register	**11_H**	**$FF00_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res										VM	MAC	Res			
ro										rw	rw	ro			

Field	Bits	Type	Description
Res	15:6	ro	**Reserved**
VM	5	rw	**VLAN Mode Select** 0_B **P** Port based by-pass mode 1_B **Q** 802.1Q based
MAC	4	rw	**MAC Clone Enable** 0_B **N** Normal Mode.Learning with SA only. The MAC table will be searched or filled using only SA or DA. 1_B **M** Mac Mode. Learned using SA VID0. MAC table will be searched or filled using VID0 SA or DA. This bit allows two identical addresses with different VID0 to be learned.
Res	3:0	ro	**Reserved**

Note:

Below is an example of a VLAN Tag and a MAC application for Bit4 and Bit5.

Below is an old router architecture example. The disadvantages of this are:

1. WAN port only supports 10M Half-Duplex and non-MDIX functions
2. Needs extra 10M NIC cost.
3. ISA bus will become a bottleneck for the whole system

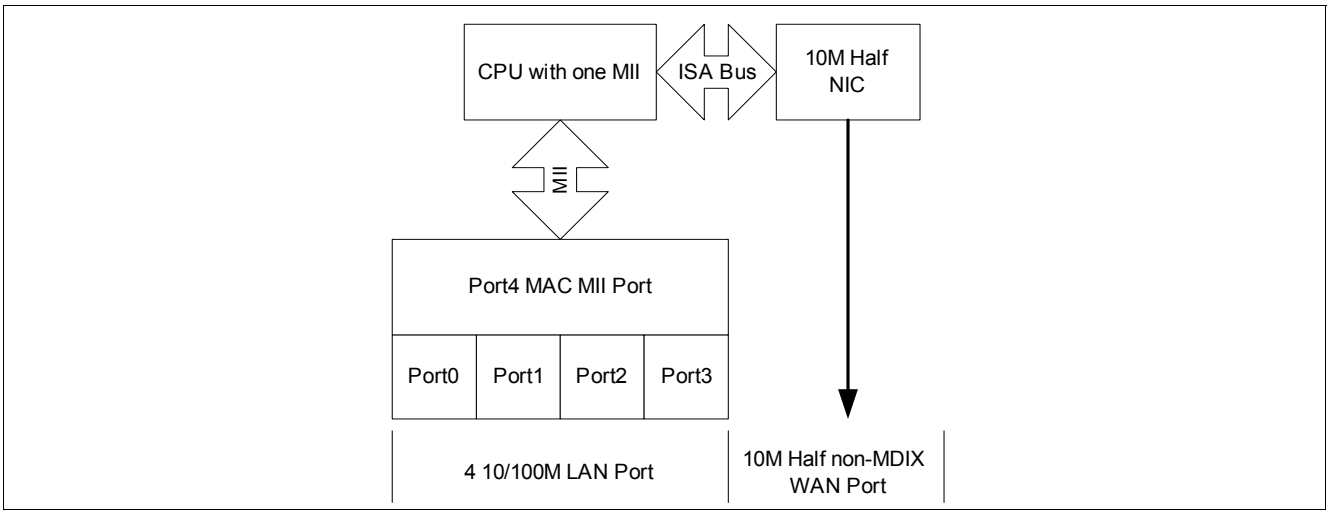


Figure 8 Old Router Architecture Example

Below is new architecture by using ADM6996LC/LCX/LHX serial chip VLAN function. The advantages of below are:

1. WAN Port can upgrade to 100/10 Full/Half, Auto MDIX.
2. WAN/LAN Port is programmable and put on same Switch.

3. No need extra NIC and save lot of cost.
4. High bandwidth of MII port up to 200M speed.

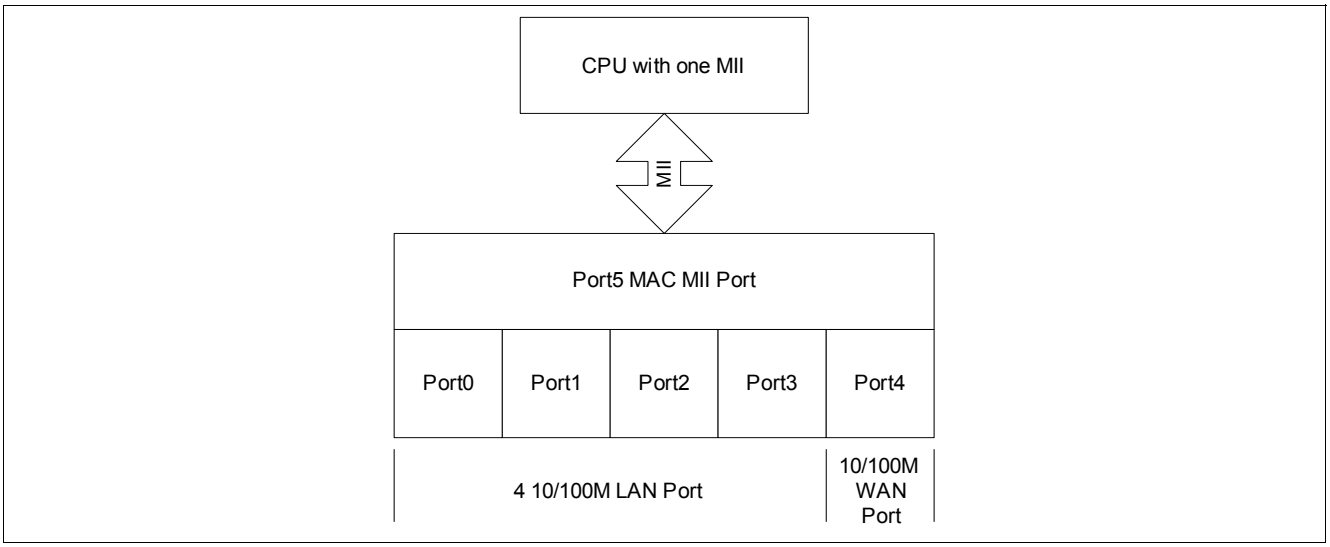


Figure 9 New Router Architecture using ADM6996LC/LCX/LHX

New Router application works well on normal application. If user's ISP vendor(cable modem) lock Registration Card's ID then Router CPU must send this Lock Registration Card's ID to WAN Port. One condition happen is there exist two same MAC ID on this Switch. One is original Card and another one is CPU. This will make Switch learning table trouble.

ADM6996LC/LCX/LHX provide MAC Clone function that allow two same MAC address with different VLAN ID0 on learning table. This will solve Lock registration Card's ID issue. ADM6996 series chip will put these two same MAC addresses with different VLAN ID0 at different learning table entry.

How to Set ADM6996LC/LCX/LHX on Router

Port0~3: LAN Port.

Port4: WAN Port.

Port5: MII Port as CPU Port.

Step1: Set Register 0x11h bit4 and bit5 to 1.

{Coding: Write Register 0x11h as 0xff30h}

Step2: Set Port0~3 as Untag Port and set PVID=1.

{Coding: Write Register 0x01h, 0x03h, 0x05h, 0x07h as 0x840f. Port0~3 as Untag, PVID=1, Enable MDIX}

Step3: Set Port4 as Untag Port and set PVID=2.

{Coding:Write Register 0x08h as 0x880fh. Port4 as Untag, PVID=2, Enable MDIX.}

Step4: Set Port5 MII Port as Tag Port and set PVID=2.

{Coding:Write Register 0x09h as 0x881fh. Port5 MII port as Tag, PVID=2.}

Step5: Group Port0, 1, 2, 3, 5 as VLAN 1.

{Coding: Write Register 0x14h as 0x0155h. VLAN1 cover Port0, 1, 2, 3, 5.}

Step6: Group Port4, 5 as VLAN 2.

{Coding: Write Register 0x15h as 0x0180h. VLAN2 cover Port4, 5.}

How MAC Clone Operation

- LAN to LAN/CPU Traffic.

ADM6996LC/LCX/LHX LAN traffic to LAN/CPU only. Traffic to another LAN port will be

untag packet. Traffic to CPU is Tag packet with VID=1. CPU can check VID to distinguish LAN traffic or WAN traffic.

- WAN to CPU Traffic.

ADM6996LC/LCX/LHX WAN traffic to CPU only. Traffic to CPU is Tag packet with VID=2. CPU can check VID to distinguish LAN traffic or WAN traffic.

- CPU to LAN Packet.

ADM6996LC/LCX/LHX CPU Packet to LAN port must add VID=1 in VLAN field. ADM6996LC/LCX/LHX check VID to distinguish LAN traffic or WAN traffic. LAN output packet is Untag.

- CPU to WAN Packet.

ADM6996LC/LCX/LHX CPU Packet to WAN port must add VID=2 in VLAN filed. ADM6996LC/LCX/LHX check VID to distinguish LAN traffic or WAN traffic. WAN output packet is Untag.

- ADM6996LC/LCX/LHX learning sequence

ADM6996LC/LCX/LHX will check VLAN mapping setting first then check learning table. User does not worry LAN/WAN traffic mix up.

Bit 10: Half Duplex Back Pressure enable. 1/enable, 0/disable.

Configuration Register 3

ConfigReg_3	Offset	Reset Value
Miscellaneous Configuration Register 3	**12_H**	**3600_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CD	**DCS**	Res					**ML5**	**ML4**	**ML3**	Res	**ML2**	Res	**ML1**	Res	**ML0**
rw	rw	rw					rw	rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
CD	15	rw	**Excessive Collision Drop** 0_B **D** Disable 1_B **E** Enable
DCS	14	rw	**Duplex and Col Separate** 0_B **D** Indicate the duplex and collision status at the same time 1_B **LM** Indicate the duplex status only
Res	13:9	rw	**Reserved**
ML5	8	rw	**Port5 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC Source Address
ML4	7	rw	**Port4 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC Source Address

Field	Bits	Type	Description
ML3	6	rw	**Port3 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC Source Address
Res	5	rw	**Reserved**
ML2	4	rw	**Port 2 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC source address
Res	3	rw	**Reserved**
ML1	2	rw	**Port1 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC source address
Res	1	rw	**Reserved**
ML0	0	rw	**Port0 MAC Lock** 0_B **D** Disable 1_B **LM** Lock first MAC source address

VLAN Mapping Table Registers 0

VLAN_Map_0	Offset	Reset Value
VLAN mapping table registers 0	13_H	$FFFF_H$

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res							**VM5**	**VM4**	**VM3**	Res	**VM2**	Res	**VM1**	Res	**VM0**
ro							rw	rw	rw	ro	rw	ro	rw	ro	rw

Field	Bits	Type	Description
Res	15:9	ro	**Reserved**
VM5	8	rw	**Port 5 VLAN Mapping** 0_B **NM** Port 5 is not the member of the VLAN. 1_B **M** Port 5 is the member of the VLAN.
VM4	7	rw	**Port 4 VLAN Mapping** 0_B **NM** Port 4 is not the member of the VLAN. 1_B **M** Port 4 is the member of the VLAN.
VM3	6	rw	**Port 3 VLAN Mapping** 0_B **NM** Port 3 is not the member of the VLAN. 1_B **M** Port 3 is the member of the VLAN.
Res	5	ro	**Reserved**
VM2	4	rw	**Port 2 VLAN Mapping** 0_B **NM** Port 2 is not the member of the VLAN. 1_B **M** Port 2 is the member of the VLAN.
Res	3	ro	**Reserved**

Field	Bits	Type	Description
VM1	2	rw	**Port 1 VLAN Mapping** 0_B **NM** Port 1 is not the member of the VLAN. 1_B **M** Port 1 is the member of the VLAN.
Res	1	ro	**Reserved**
VM0	0	rw	**Port 0 VLAN Mapping** 0_B **NM** Port 0 is not the member of the VLAN. 1_B **M** Port 0 is the member of the VLAN.

Note: 16 VLAN Group: See Register 0x2ch bit 11. Select the VLAN group ports and set the corresponding bits to 1.

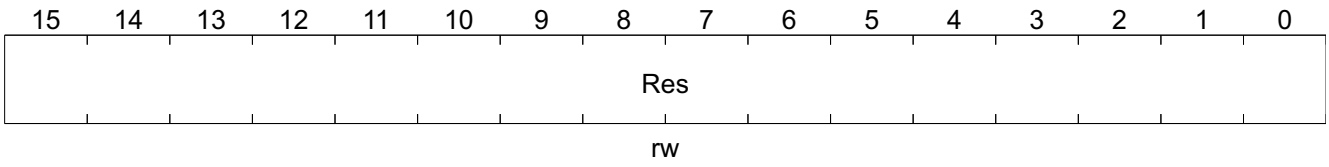
Similar Registers

Table 20 VLAN Mapping Table Registers 1 to 15

Register Short Name	Register Long Name	Offset Address	Page Number
VLAN_Map_1	VLAN mapping table registers 1	14_H	
VLAN_Map_2	VLAN mapping table registers 2	15_H	
VLAN_Map_3	VLAN mapping table registers 3	16_H	
VLAN_Map_4	VLAN mapping table registers 4	17_H	
VLAN_Map_5	VLAN mapping table registers 5	18_H	
VLAN_Map_6	VLAN mapping table registers 6	19_H	
VLAN_Map_7	VLAN mapping table registers 7	$1A_H$	
VLAN_Map_8	VLAN mapping table registers 8	$1B_H$	
VLAN_Map_9	VLAN mapping table registers 9	$1C_H$	
VLAN_Map_10	VLAN mapping table registers 10	$1D_H$	
VLAN_Map_11	VLAN mapping table registers 11	$1E_H$	
VLAN_Map_12	VLAN mapping table registers 12	$1F_H$	
VLAN_Map_13	VLAN mapping table registers 13	20_H	
VLAN_Map_14	VLAN mapping table registers 14	21_H	
VLAN_Map_15	VLAN mapping table registers 15	22_H	

Reserved Register 7

ResReg_7	Offset	Reset Value
Reserved Register 7	**23_H**	**0000_H**



Field	Bits	Type	Description
Res	15:0	rw	**Reserved**

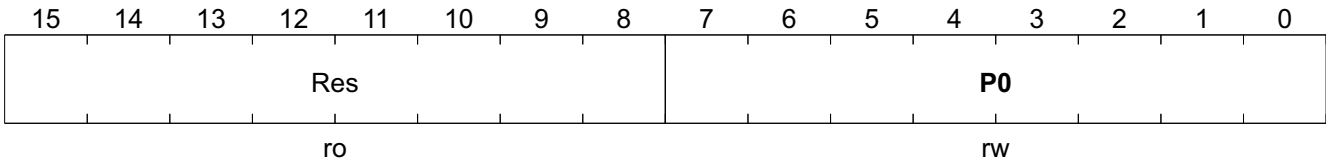
Similar Registers

Table 21 Reserved Register 8 to 11

Register Short Name	Register Long Name	Offset Address	Page Number
ResReg_8	Reserved Register 8	24_H	
ResReg_9	Reserved Register 9	25_H	
ResReg_10	Reserved Register 10	26_H	
ResReg_11	Reserved Register 11	27_H	

Configuration Register 4

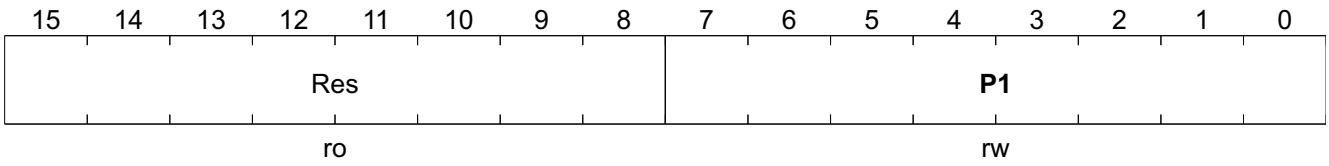
ConfigReg_4	Offset	Reset Value
Configuration Register 4	**28_H**	**0000_H**



Field	Bits	Type	Description
Res	15:8	ro	**Reserved**
P0	7:0	rw	**Port 0 PVID** 0001_H **PVID** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.

Configuration Register 5

ConfigReg_5	Offset	Reset Value
Configuration Register 5	**29_H**	**0000_H**

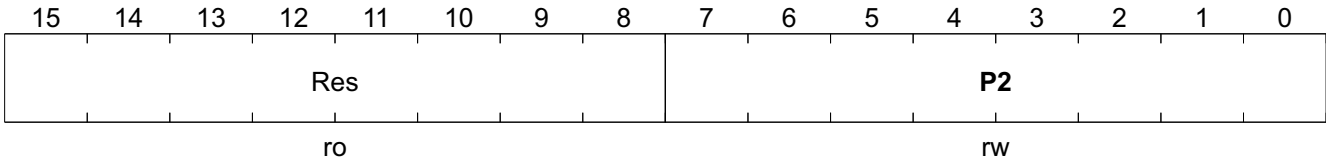


Field	Bits	Type	Description
Res	15:8	ro	**Reserved**

Field	Bits	Type	Description
P1	7:0	rw	**Port1 PVID bit 11~4.** 0003_H **PVID 1** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.

Configuration Register 6

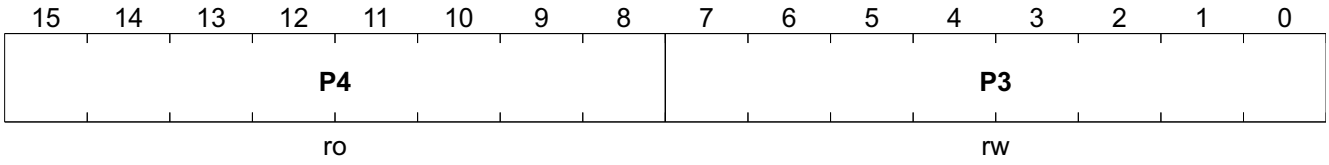
ConfigReg_6	Offset	Reset Value
Configuration Register 6	**$2A_H$**	**0000_H**



Field	Bits	Type	Description
Res	15:8	ro	**Reserved**
P2	7:0	rw	**Port2 PVID bit 11~4.** 0005_H **PVID 2** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.

Configuration Register 7

ConfigReg_7	Offset	Reset Value
Configuration Register 7	**$2B_H$**	**0000_H**

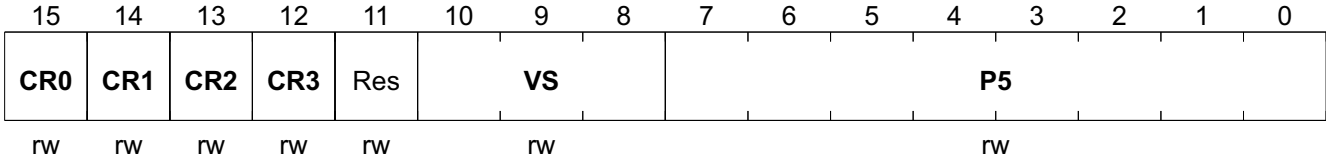


Field	Bits	Type	Description
P4	15:8	ro	**Port4 PVID bit 11~4.** 0008_H **PVID 1** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.
P3	7:0	rw	**Port3 PVID bit 11~4.** 0007_H **PVID 1** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.

Configuration Register 8

ConfigReg_8 **Offset** **Reset Value**

Configuration Register **$2C_H$** **$D000_H$**



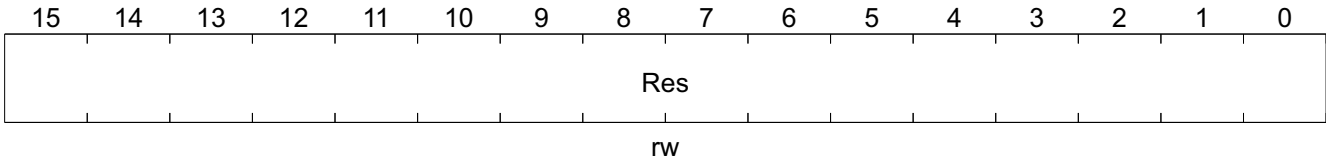
Field	Bits	Type	Description
CR0	15	rw	**Control Reserved MAC** Control reserved MAC (0180C2000000) 0_B **D** Discard 1_B **F** Forward
CR1	14	rw	**Control Reserved MAC** Control reserved MAC (0180C2000001) 0_B **D** Discard 1_B **F** Forward
CR2	13	rw	**Control Reserved MAC** Control reserved MAC (0180C2000002- 0180C200000F) 0_B **D** Discard 1_B **F** Forward
CR3	12	rw	**Control Reserved MAC** Control reserved MAC (0180C2000010-0180C20000FF) 0_B **D** Discard 1_B **F** Forward
Res	11	rw	**Reserved**
VS	10:8	rw	**VLAN Grouping Tag Shift** 0_D **VID0** VID [3:0] 1_D **VID1** VID [4:1] 2_D **VID2** VID [5:2] 3_D **VID3** VID [6:3] 4_D **VID4** VID [7:4] 5_D **VID5** VID [8:5] 6_D **VID6** VID [9:6] 7_D **VID7** VID [10:7]
P5	7:0	rw	**Port5 PVID bit 11~4.** 0009_H **PVID 1** These 8 bits combine with the register in the hex values bit's [13~10] as the full 12 bits of the VID.

Note: Bit[10:8]: VLAN Tag shift register. ADM6996LC/LCX/LHX will select 4 bit form total 12 bit VID as VLAN group reference. Bit[15:12]: IEEE 802.3 reserved DA forward or drop police.

Reserved Register 12

ResReg_12 **Offset** **Reset Value**

Reserved Register 12 **$2D_H$** **4442_H**

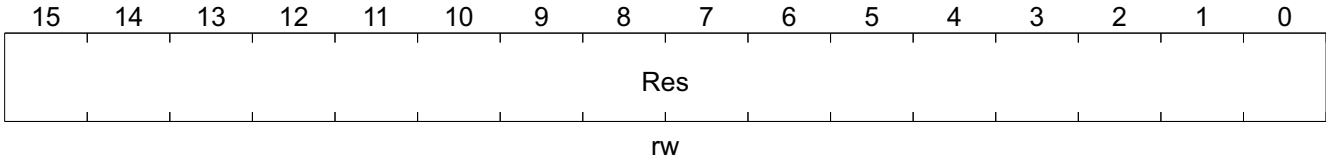


Field	Bits	Type	Description
Res	15:0	rw	**Reserved**

Reserved Register 13

ResReg_13 **Offset** **Reset Value**

Reserved Register 13 **$2E_H$** **0000_H**

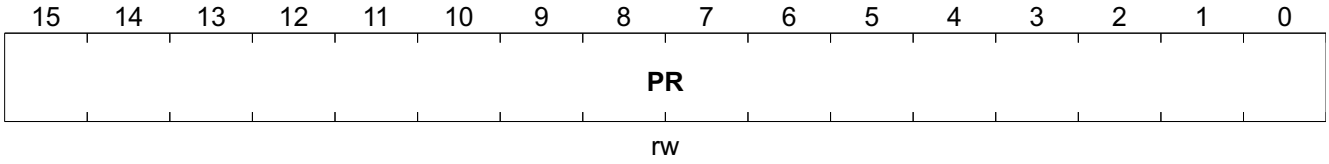


Field	Bits	Type	Description
Res	15:0	rw	**Reserved**

PHY Restart

PH_Restart **Offset** **Reset Value**

PHY Restart **$2F_H$** **0000_H**



Field	Bits	Type	Description
PR	15:0	rw	**PHY Restart** 0000_H **PHY Restart** Writing this Hex value to this register restarts the internal PHYs.

Configuration Register 9

ConfigReg_	Offset	Reset Value
Miscellaneous Configuration Register 9	**30_H**	**0987_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res			**LM**	Res	Res	**DHCOL**	Res		**RCL**	**MAC**	Res				
rw			rw	rw	rw	rw	rw		rw	rw	rw				

Field	Bits	Type	Description
Res	15:13	rw	**Reserved**
LM	12	rw	**Port 4 LED Mode** 0_B **D** LinkAct/DupCol/Speed 1_B **S** LinkAct/Speed
Res	11	rw	**Reserved**
Res	10	rw	**Reserved**
DHCOL	9	rw	**Dual Speed Hub COL_LED Enable** 0_B **N** Normal LED display. 1_B **D** Dual Speed Hub LED display. Port0 Col LED: 10M Col LED. Port1 Col LED: 100M Col LED.
Res	8:7	rw	**Reserved**
RCL	6	rw	**MII Speed Double** 0_B **25** TxCLK max speed is 25 MHz 1_B **50** TxCLK max speed is 50 MHz
MAC	5	rw	**Mac Clone Enable** MAC Clone Enable Bit[1].
Res	4:0	rw	**Reserved**

Bandwidth Control Register

BWCon_0	Offset	Reset Value
Bandwidth Control Register 0	**31_H**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RC3	**P3T**			**RC2**	**P2T**			**RC1**	**P1T**			**RC0**	**P0T**		
rw	rw			rw	rw			rw	rw			rw	rw		

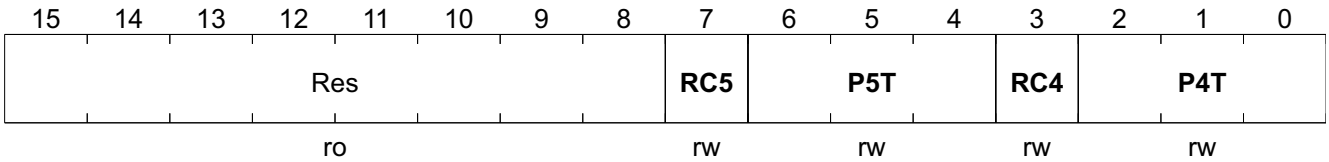
Field	Bits	Type	Description
RC3	15	rw	**Receive Packet Length Count** Counted on the Source Port 3. 0_D **R3** The switch will add length to the P3 counter
P3T	14:12	rw	**Port 3 Threshold Control Meter** Reference **Table 22** in note below.
RC2	11	rw	**Receive Packet Length Count** Counted on the Source Port 2. 0_D **R2** The switch will add length to the P2 counter
P2T	10:8	rw	**Port 2 Threshold Control Meter** Reference **Table 22** in note below.
RC1	7	rw	**Receive Packet Length Count** Counted on the Source Port 1. 0_D **R1** The switch will add length to the P1 counter
P1T	6:4	rw	**Port 1 Threshold Control Meter** Reference **Table 22** in note below.
RC0	3	rw	**Receive Packet Length Count** Counted on the Source Port 0. 0_D **R0** The switch will add length to the P2 counter
P0T	2:0	rw	**Port 0 Threshold Control Meter** Reference **Table 22** in note below.

Table 22 Note: Reference Table

000	001	010	011	100	101	110	111
256K	512K	1M	2M	5M	10M	20M	50M

Bandwidth Control Register 1

BWCon_1 **Offset** **Reset Value**
Bandwidth Control Register 1 **32_H** **0000_H**



Field	Bits	Type	Description
Res	15:8	ro	**Reserved**
RC5	7	rw	**Receive Packet Length Count** Counted on the Source Port 5. 0_D **Count5** The switch will add length to the P5 counter

Field	Bits	Type	Description
P5T	6:4	rw	**Port 5 Threshold Control Meter** Reference **Table 22** in note below.
RC4	3	rw	**Receive Packet Length Count** Counted on the Source Port 4. 0_D **Count4** The switch will add length to the P4 counter
P4T	2:0	rw	**Port 4 Threshold Control Meter** Reference **Table 22** in note below.

Bandwidth Control Enable Register

BWConEn	Offset	Reset Value
Bandwidth Control Enable Register	**33_H**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res							**BW5**	**BW4**	**BW3**	Res	**BW2**	Res	**BW1**	Res	**BW0**
ro							rw	rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
Res	15:9	ro	**Reserved**
BW5	8	rw	**Port 5 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable
BW4	7	rw	**Port 4 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable
BW3	6	rw	**Port 3 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable
Res	5	rw	**Reserved**
BW2	4	rw	**Port 2 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable
Res	3	rw	**Reserved**
BW1	2	rw	**Port 1 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable
Res	1	rw	**Reserved**
BW0	0	rw	**Port 0 Bandwidth Control Enable** 0_B **D** Disable 1_B **E** Enable

4.2 Serial Registers

Table 23 Registers Address Space

Module	Base Address	End Address	Note
Serial Registers	00_H	$3C_H$	Independent Address Space

Table 24 Registers Overview

Register Short Name	Register Long Name	Offset Address	Page Number
ChipID	Chip Identifier Register	00_H	63
PortStat_0	Port Status Register 0	01_H	63
PortStat_1	Port Status Register 1	02_H	65
CabStat	Cable Broken Status	03_H	66
P0_RP_CNT	Port 0 Receive Packet Count	04_H	66
P1_RP_CNT	Port 1 Receive Packet Count	06_H	67
P2_RP_CNT	Port 2 Receive Packet Count	08_H	67
P3_RP_CNT	Port 3 Receive Packet Count	$0A_H$	67
P4_RP_CNT	Port 4 Receive Packet Count	$0B_H$	67
P5_RP_CNT	Port 5 Receive Packet Count	$0C_H$	67
P0_RB_CNT	Port 0 Receive Byte Count	$0D_H$	67
P1_RB_CNT	Port 1 Receive Byte Count	$0F_H$	67
P2_RB_CNT	Port 2 Receive Byte Count	11_H	67
P3_RB_CNT	Port 3 Receive Byte Count	13_H	67
P4_RB_CNT	Port 4 Receive Byte Count	14_H	67
P5_RB_CNT	Port 5 Receive Byte Count	15_H	67
P0_TP_CNT	Port 0 Transmit Packet Count	16_H	67
P1_TP_CNT	Port 1 Transmit Packet Count	18_H	67
P2_TP_CNT	Port 2 Transmit Packet Count	$1A_H$	67
P3_TP_CNT	Port 3 Transmit Packet Count	$1C_H$	67
P4_TP_CNT	Port 4 Transmit Packet Count	$1D_H$	67
P5_TP_CNT	Port 5 Transmit Packet Count	$1E_H$	67
P0_TB_CNT	Port 0 Transmit Byte Count	$1F_H$	67
P1_TB_CNT	Port 1 Transmit Byte Count	21_H	67
P2_TB_CNT	Port 2 Transmit Byte Count	23_H	67
P3_TB_CNT	Port 3 Transmit Byte Count	25_H	67
P4_TB_CNT	Port 4 Transmit Byte Count	26_H	67
P5_TB_CNT	Port 5 Transmit Byte Count	27_H	67
P0_COL_CNT	Port 0 Collision Count	28_H	67
P1_COL_CNT	Port 1 Collision Count	$2A_H$	67
P2_COL_CNT	Port 2 Collision Count	$2C_H$	67
P3_COL_CNT	Port 3 Collision Count	$2E_H$	67
P4_COL_CNT	Port 4 Collision Count	$2F_H$	67
P5_COL_CNT	Port 5 Collision Count	30_H	67

Table 24 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
P0_ERR_CNT	Port 0 Error Count	31_H	67
P1_ERR_CNT	Port 1 Error Count	33_H	68
P2_ERR_CNT	Port 2 Error Count	35_H	68
P3_ERR_CNT	Port 3 Error Count	37_H	68
P4_ERR_CNT	Port 4 Error Count	38_H	68
P5_ERR_CNT	Port 5 Error Count	39_H	68
OverFlow_0	Over Flow Flag Register 0	$3A_H$	68
OverFlow_1	Over Flow Flag Register 1	$3B_H$	68
OverFlow_2	Over Flow Flag Register 2	$3C_H$	69

The register is addressed wordwise.

For Register Access Types see Table 12 "Register Access Types" on Page 42.

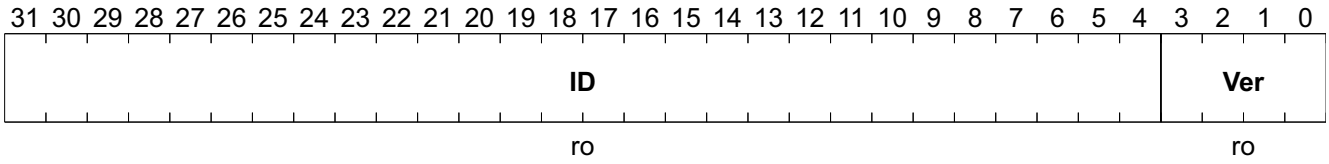
Table 25 Registers Clock Domains

Clock Short Name	Description
–	–

4.2.1 Serial Register Map

Chip Identifier Register

ChipID	Offset	Reset Value
Chip Identifier Register	**00_H**	**$0007\ 1022_H$**



Field	Bits	Type	Description
ID	31:4	ro	**Chip Identifier Register** $000\ 7102_H$ **ID** Chip Identifier
Ver	3:0	ro	**Version No** 2_H **Ver** Version No.

Port Status Register 0

PortStat_0	Offset	Reset Value
Port Status Register 0	**01_H**	**$0000\ 0000_H$**

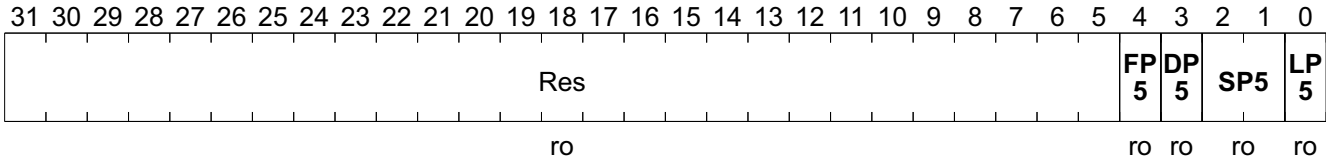
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FP4	DP4	SP4	LP4	FP3	DP3	SP3	LP3	Res				FP2	DP2	SP2	LP2	Res				FP1	DP1	SP1	LP1	Res				FP0	DP0	SP0	LP0
ro	ro	ro	ro	ro	ro	ro	ro	ro				ro	ro	ro	ro	ro				ro	ro	ro	ro	ro				ro	ro	ro	ro

Field	Bits	Type	Description
FP4	31	ro	**Port 4 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC4** 802.3X on for full duplex or back pressure on for half duplex.
DP4	30	ro	**Port 4 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex
SP4	29	ro	**Port 4 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP4	28	ro	**Port 4 Linkup Status** 0_B **NE** Link is not established. 1_B **E** Link is established.
FP3	27	ro	**Port 3 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC3** 802.3X on for full duplex or back pressure on for half duplex.
DP3	26	ro	**Port 3 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex
SP3	25	ro	**Port 3 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP3	24	ro	**Port 3 Linkup Status** Port 3 Linkup Status: 0_B **N** Link is not established. 1_B **E** Link is established.
Res	23:20	ro	**Reserved**
FP2	19	ro	**Port 2 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC2** 802.3X on for full duplex or back pressure on for half duplex.
DP2	18	ro	**Port 2 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex
SP2	17	ro	**Port 2 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP2	16	ro	**Port 2 Linkup Status** Port 2 Linkup Status: 0_B **NE** Link is not established. 1_B **E** Link is established.
Res	15:12	ro	**Reserved**

Field	Bits	Type	Description
FP1	11	ro	**Port 1 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC1** 802.3X on for full duplex or back pressure on for half duplex.
DP1	10	ro	**Port 1 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex
SP1	9	ro	**Port 1 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP1	8	ro	**Port 1 Linkup Status** 0_B **NE** Not established. 1_B **E** Established.
Res	7:4	ro	**Reserved**
FP0	3	ro	**Port 0 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC0** 802.3X on for full duplex or back pressure on for half duplex.
DP0	2	ro	**Port 0 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex
SP0	1	ro	**Port 0 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP0	0	ro	**Port 0 Linkup Status** 0_B **NE** Not established. 1_B **E** Established.

Port Status Register 1

PortStat_1	Offset	Reset Value
Port Status Register 1	**02_H**	**$0000\ 0000_H$**

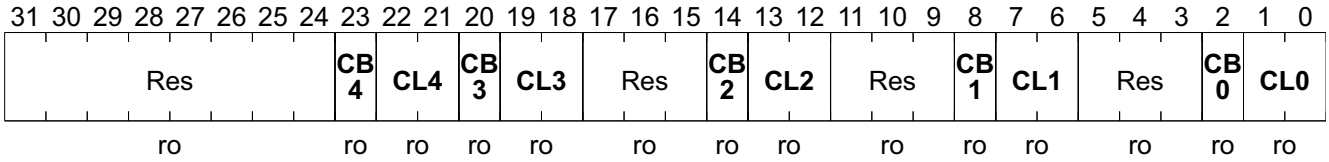


Field	Bits	Type	Description
Res	31:5	ro	**Reserved**
FP5	4	ro	**Port 5 Flow Control Enable** 0_B **D** Flow Control Disable 1_B **FC5** 802.3X on for full duplex or back pressure on for half duplex.
DP5	3	ro	**Port 5 Duplex Status** 0_B **H** Half Duplex 1_B **F** Full Duplex

Field	Bits	Type	Description
SP5	2:1	ro	**Port 5 Speed Status** 0_B **10** 10 Mbit/s 1_B **100** 100 Mbit/s
LP5	0	ro	**Port 5 Linkup Status** 0_B **NE** Not established. 1_B **E** Established.

Cable Broken Status Register

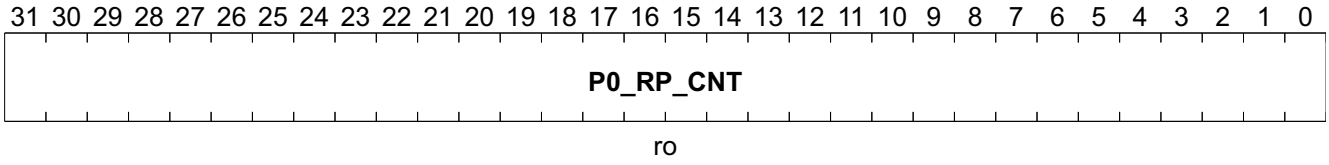
CabStat	Offset	Reset Value
Cable Broken Status	**03_H**	**0000 0000$_H$**



Field	Bits	Type	Description
Res	31:24	ro	**Reserved**
CB4	23	ro	**Port 4 Cable Broken**
CL4	22:21	ro	**Port 4 Cable Broken Length**
CB3	20	ro	**Port 3 Cable Broken**
CL3	19:18	ro	**Port 3 Cable Broken Length**
Res	17:15	ro	**Reserved**
CB2	14	ro	**Port 2 Cable Broken**
CL2	13:12	ro	**Port 2 Cable Broken Length**
Res	11:9	ro	**Reserved**
CB1	8	ro	**Port 1 Cable Broken**
CL1	7:6	ro	**Port 1 Cable Broken Length**
Res	5:3	ro	**Reserved**
CB0	2	ro	**Port 0 Cable Broken**
CL0	1:0	ro	**Port 0 Cable Broken Length**

Port 0 Receive Packet Count

P0_RP_CNT	Offset	Reset Value
Port 0 Receive Packet Count	**04_H**	**0000 0000$_H$**



Field	Bits	Type	Description
P0_RP_CNT	31:0	ro	**Counter**

Similar Registers

Table 26 Per Port Counters

Register Short Name	Register Long Name	Offset Address	Page Number
P1_RP_CNT	Port 1 Receive Packet Count	06_H	
P2_RP_CNT	Port 2 Receive Packet Count	08_H	
P3_RP_CNT	Port 3 Receive Packet Count	$0A_H$	
P4_RP_CNT	Port 4 Receive Packet Count	$0B_H$	
P5_RP_CNT	Port 5 Receive Packet Count	$0C_H$	
P0_RB_CNT	Port 0 Receive Byte Count	$0D_H$	
P1_RB_CNT	Port 1 Receive Byte Count	$0F_H$	
P2_RB_CNT	Port 2 Receive Byte Count	11_H	
P3_RB_CNT	Port 3 Receive Byte Count	13_H	
P4_RB_CNT	Port 4 Receive Byte Count	14_H	
P5_RB_CNT	Port 5 Receive Byte Count	15_H	
P0_TP_CNT	Port 0 Transmit Packet Count	16_H	
P1_TP_CNT	Port 1 Transmit Packet Count	18_H	
P2_TP_CNT	Port 2 Transmit Packet Count	$1A_H$	
P3_TP_CNT	Port 3 Transmit Packet Count	$1C_H$	
P4_TP_CNT	Port 4 Transmit Packet Count	$1D_H$	
P5_TP_CNT	Port 5 Transmit Packet Count	$1E_H$	
P0_TB_CNT	Port 0 Transmit Byte Count	$1F_H$	
P1_TB_CNT	Port 1 Transmit Byte Count	21_H	
P2_TB_CNT	Port 2 Transmit Byte Count	23_H	
P3_TB_CNT	Port 3 Transmit Byte Count	25_H	
P4_TB_CNT	Port 4 Transmit Byte Count	26_H	
P5_TB_CNT	Port 5 Transmit Byte Count	27_H	
P0_COL_CNT	Port 0 Collision Count	28_H	
P1_COL_CNT	Port 1 Collision Count	$2A_H$	
P2_COL_CNT	Port 2 Collision Count	$2C_H$	
P3_COL_CNT	Port 3 Collision Count	$2E_H$	
P4_COL_CNT	Port 4 Collision Count	$2F_H$	
P5_COL_CNT	Port 5 Collision Count	30_H	
P0_ERR_CNT	Port 0 Error Count	31_H	

Table 26 Per Port Counters (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
P1_ERR_CNT	Port 1 Error Count	33_H	
P2_ERR_CNT	Port 2 Error Count	35_H	
P3_ERR_CNT	Port 3 Error Count	37_H	
P4_ERR_CNT	Port 4 Error Count	38_H	
P5_ERR_CNT	Port 5 Error Count	39_H	

Over Flow Flag Register 0

OverFlow_0	Offset	Reset Value
Over Flow Flag Register 0	$3A_H$	0000 0000_H

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res														OR5	OR4	OR3	Res	OR2	Res	OR1	Res	OR0	OF5	OF4	OF3	Res	OF2	Res	OF1	Res	OF0
ro														ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro

Field	Bits	Type	Description
Res	31:18	ro	**Reserved**
OR5	17	ro	**Overflow of Port 5 Receive Packet Byte Count**
OR4	16	ro	**Overflow of Port 4 Receive Packet Byte Count**
OR3	15	ro	**Overflow of Port 3 Receive Packet Byte Count**
Res	14	ro	**Reserved**
OR2	13	ro	**Overflow of Port 2 Receive Packet Byte Count**
Res	12	ro	**Reserved**
OR1	11	ro	**Overflow of Port 1 Receive Packet Byte Count**
Res	10	ro	**Reserved**
OR0	9	ro	**Overflow of Port 0 Receive Packet Byte Count**
OF5	8	ro	**Overflow of Port 5 Receive Packet Count**
OF4	7	ro	**Overflow of Port 4 Receive Packet Count**
OF3	6	ro	**Overflow of Port 3 Receive Packet Count**
Res	5	ro	**Reserved**
OF2	4	ro	**Overflow of Port 2 Receive Packet Count**
Res	3	ro	**Reserved**
OF1	2	ro	**Overflow of Port 1 Receive Packet Count**
Res	1	ro	**Reserved**
OF0	0	ro	**Overflow of Port 0 Receive Packet Count**

Over Flow Flag Register 1

OverFlow_1 | **Offset** | **Reset Value**
Over Flow Flag Register 1 | **$3B_H$** | **$0000\ 0000_H$**

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res														OB5	OB4	OB3	Res	OB2	Res	OB1	Res	OB0	OF5	OF4	OF3	Res	OF2	Res	OF1	Res	OF0
ro														ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro

Field	Bits	Type	Description
Res	31:18	ro	**Reserved**
OB5	17	ro	**Overflow of Port 5 Transmit Packet Byte Count**
OB4	16	ro	**Overflow of Port 4 Transmit Packet Byte Count**
OB3	15	ro	**Overflow of Port 3 Transmit Packet Byte Count**
Res	14	ro	**Reserved**
OB2	13	ro	**Overflow of Port 2 Transmit Packet Byte Count**
Res	12	ro	**Reserved**
OB1	11	ro	**Overflow of Port 1 Transmit Packet Byte Count**
Res	10	ro	**Reserved**
OB0	9	ro	**Overflow of Port 0 Transmit Packet Byte Count**
OF5	8	ro	**Overflow of Port 5 Transmit Packet Count**
OF4	7	ro	**Overflow of Port 4 Transmit Packet Count**
OF3	6	ro	**Overflow of Port 3 Transmit Packet Count**
Res	5	ro	**Reserved**
OF2	4	ro	**Overflow of Port 2 Transmit Packet Count**
Res	3	ro	**Reserved**
OF1	2	ro	**Overflow of Port 1 Transmit Packet Count**
Res	1	ro	**Reserved**
OF0	0	ro	**Overflow of Port 0 Transmit Packet Count**

Over Flow Flag Register 2

OverFlow_2 | **Offset** | **Reset Value**
Over Flow Flag Register 2 | **$3C_H$** | **$0000\ 0000_H$**

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res														OE5	OE4	OE3	Res	OE2	Res	OE1	Res	OE0	OF5	OF4	OF3	Res	OF2	Res	OF1	Res	OF0
ro														ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro	ro

Field	Bits	Type	Description
Res	31:18	ro	**Reserved**
OE5	17	ro	**Overflow of Port 5 Error Count**
OE4	16	ro	**Overflow of Port 4 Error Count**
OE3	15	ro	**Overflow of Port 3 Error Count**
Res	14	ro	**Reserved**
OE2	13	ro	**Overflow of Port 2 Error Count**
Res	12	ro	**Reserved**
OE1	11	ro	**Overflow of Port 1 Error Count**
Res	10	ro	**Reserved**
OE0	9	ro	**Overflow of Port 0 Error Count**
OF5	8	ro	**Overflow of Port 5 Collision Count**
OF4	7	ro	**Overflow of Port 4Collision Count**
OF3	6	ro	**Overflow of Port 3Collision Count**
Res	5	ro	**Reserved**
OF2	4	ro	**Overflow of Port 2 Collision Count**
Res	3	ro	**Reserved**
OF1	2	ro	**Overflow of Port 1 Collision Count**
Res	1	ro	**Reserved**
OF0	0	ro	**Overflow of Port 0 Collision Count**

4.3 Packet with Priority: Normal packet content

Table 27 Ethernet Packet from Layer 2

Preamble/SFD	Destination (6 bytes)	Source (6 bytes)	Packet length (2 bytes)	Data (46-1500 bytes)	CRC (4 bytes)
	Byte 0~5	Byte 6~11	Byte 12~13	Byte 14~	

4.4 VLAN Packet

Table 28 VLAN Packet

Tag Protocol TD 8100	Tag Control Information TCI	LEN Length	Routing Information
Byte 12~13	Byte14~15	Byte 16~17	Byte 18

Note: ADM6996LC/LCX/LHX will check packet byte 12 &13. If byte[12:13]=8100h then this packet is a VLAN packet

Byte 14~15: Tag Control Information TCI

Bit[15:13]: User Priority 7~0

Bit 12: Canonical Format Indicator (CFI)

Bit[11~0]: VLAN ID. The ADM6996LC/LCX/LHX will use bit[3:0] as VLAN group.

4.5 TOS IP Packet

Table 29 IP Packet

Type 0800	IP Header
Byte 12~13	Byte 14~15

Note: ADM6996LC/LCX/LHX checks bytes 12 &13. If this value is 0800h then the ADM6996LC/LCX/LHX knows this is a TOP priority packet.

IP header define

Byte 14

Bit[7:0]: IP protocol version number & header length.

Byte 15: Service type

Bit[7~5]: IP Priority (Precedence) from 7~0

Bit 4: No Delay (D)

Bit 3: High Throughput

Bit 2: High Reliability (R)

Bit[1:0]: Reserved

4.6 EEPROM Access

Customer can select ADM6996LC/LCX/LHX read EEPROM contents as chip setting or not. ADM6996LC/LCX/LHX will check the signature of EEPROM to decide read content of EEPROM or not.

Table 30 RESETL & EEPROM content relationship

RESETL	CS	SK	DI	DO
0	High Impedance	High Impedance	High Impedance	High Impedance
Rising edge 01 (30ms)	Output	Output	Output	Input
1 (after 30ms)	Input	Input	Output	Input

Keep at least 30ms after RESETL from 01. ADM6996LC/LCX/LHX will read data from EEPROM. After RESETL if CPU update EEPROM that ADM6996LC/LCX/LHX will update configuration registers too.

When CPU programming EEPROM & ADM6996LC/LCX/LHX, ADM6996LC/LCX/LHX recognizes the EEPROM WRITE instruction only. If there is any Protection instruction before or after the EEPROM WRITE instruction, CPU needs to generate separated CS signal cycle for each Protection & WRITE instruction.

CPU can directly program ADM6996LC/LCX/LHX after 30ms of Reset signal rising edge with or without EEPROM

ADM6996LC/LCX/LHX serial chips will latch hardware-reset value as recommend value. It includes EEPROM interface:

EECS: Internal Pull down 40K resister.

EESK: TP port Auto-MDIX select. Internal pull down 40K resister as non Auto-MDIX mode.

EDI: Dual Color Select. Internal pull down 40K resister as Single Color Mode.

EDO: EEPROM enable. Internal pull up 40K resister as EEPROM enable.

Below Figure is ADM6996LC/LCX/LHX serial chips EEPROM pins operation at different stage. Reset signal is control by CPU with at least 100ms low. Point1 is Reset rising edge. CPU must prepare proper value on EECS(0),

EESK, EDI, EDO(1) before this rising edge. ADM6996LC/LCX/LHX will read this value into chip at Point2. CPU must keep these values over point2. Point2 is 200ns after Reset rising edge.

ADM6996LC/LCX/LHX serial chips will read EEPROM content at Point4 which 800ns far away from the rising edge of Reset. CPU must turn EEPROM pins EECS, EESK, EDI and EDO to High-Z or pull high before Point4.

If user want change state to High-Z or pull high on EEPROM pins, the order is CS-> DI -> DO -> SK is better.

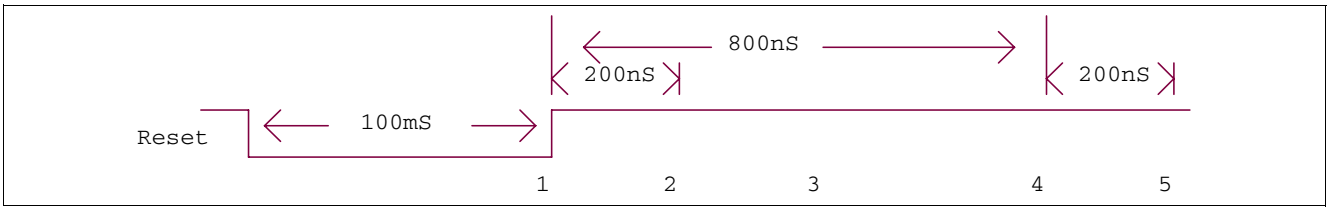


Figure 10 CPU Generated Reset Signal Requirement

A little bit different with the timing on writing EEPROM. See below graph. Must be careful when CS goes down after writing a command, SK must issue at least one clock. This is a difference between ADM6996LC/LCX/LHX with EEPROM write timing. If system without EEPROM then user must write ADM6996LC/LCX/LHX internal register by 93C66 timing. If user uses EEPROM then the writing timing is depend on EEPROM type.

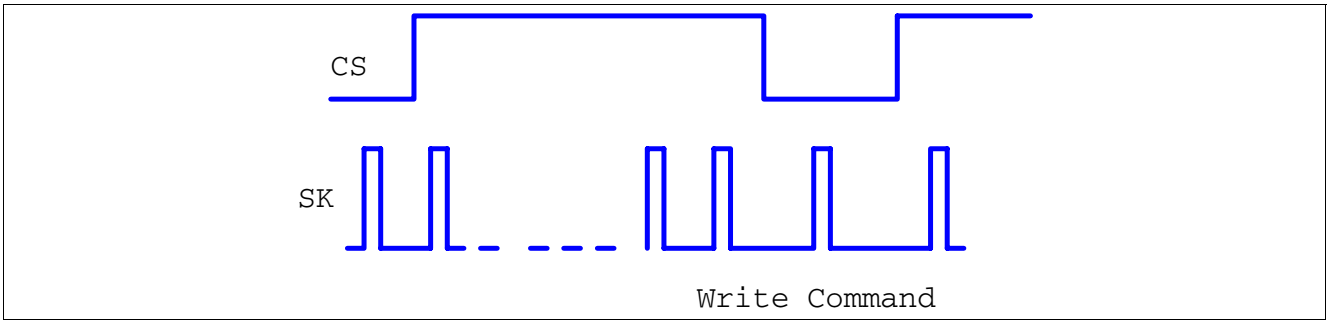


Figure 11 CPU Write EEPROM Command Requirement

4.7 Serial Interface Timing

ADM6996LC/LCX/LHX serial chip's internal counter or EEPROM access timing

EESK: Similar to the MDC signal.

EDI: Similar to the MDIO signal

ECS: Must keep be kept low.

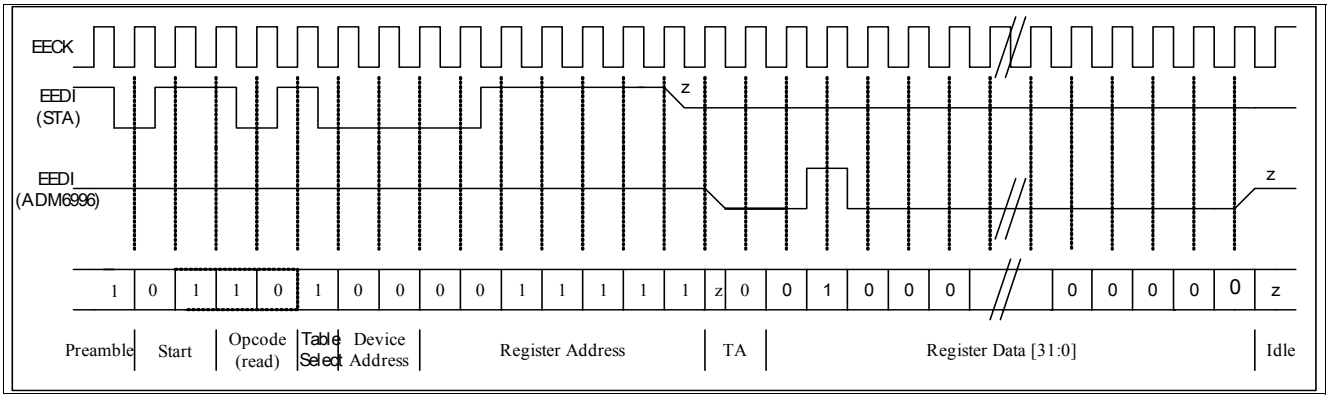


Figure 12 Serial Interface Read Command Timing

Preamble: At least 32 continuous 1_B's

Start: 01_B(2 bits)

Opcode: 10_B (2 bits, Only supports a read command)

Table select: 1_B = Counter, 0_B = EEPROM (1 bit)

Register Address: Read Target register address. (7 bits)

TA: Turn Around.

Register Data: 32 bit data.

Counter output bit sequence is bit 31 to bit 0.

If a user reads the EEPROM then 32 bits of data will separate as two EEPROM registers. The sequence is:

1. Register +1, Register (Register is even number)
2. Register, Register-1(Register is Odd number)

Example:

Read Register 00_H then the ADM6996LC/LCX/LHX will drive 01_H & 00_H

Read Register 03_H then ADM6996LC/LCX/LHX will drive 03_H & 02_H

Idle: EESK must send at least one clock pulse at idle time

ADM6996LC/LCX/LHX issue Reset internal counter command

EESK: Similar to the MDC signal

EDI: Similar to the MDIO signal

ECS: Must keep low.

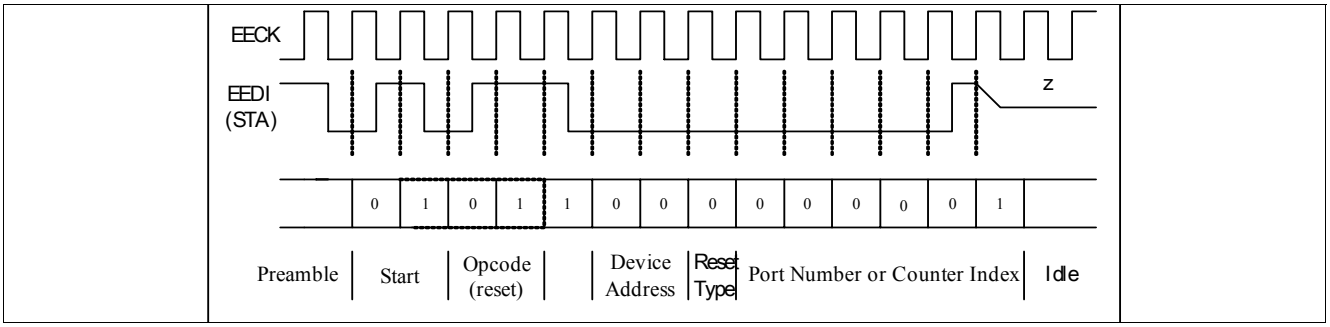


Figure 13 Serial Interface Reset Command Timing

Preamble: At least 32 continuous 1_B's

Start: 01_B(2 bits)

Opcode: 01_B (2 bits, Reset command)

Device Address: Chip physical address as PHYAS[1:0].

Reset_type: Reset the counter by port number or by counter index

1_B = Clear dedicate port's all counters

0_B = Clear dedicate counter

Port_number or counter index: User defines clear port or counter

Idle: EESK must send at least one clock pulse at idle time

5 16 Bits Mode Registers Description

Broadcast Storm

ADM6996LC/LCX/LHX allows users to limit the traffic of the broadcast address (DA = $FFFFFFFFFFF_H$) to prevent them from blocking the switch bandwidth. If users also want to limit the multicast packets(DA[40] = 1_B), they can set the Multicast Packet Counted into Storming Counter (see 0010_H, **MP**) function. Two threshold and storm enable bits (see $003B_H$ and $003C_H$, **STORM_EN**, **STORM_100_TH**, **STORM_10_TH**) are used to control the broadcast storm. The threshold is described in **Table 31 Broadcast Storming Threshold**.

1. Time Scale. ADM6996LC/LCX/LHX uses 50ms as the scale to meter the storm packets.

2. Storm keeps on at least 1.6 seconds if any of the ports meet the rising threshold in the 4 consecutive 50 ms intervals. In these 1.6 seconds, the ports meet the rising threshold and will start to discard the broadcast or multicast packets until the 50 ms interval expires. Users could also disable Input Filter (see $000B_H$, **IF**) function to forward above packets to the un-congested port instead of discarding directly.

3. Storm finishes. After the 1.6-second storm period, ADM6996LC/LCX/LHX will check the port that makes the storm on. If all of these ports meet the falling threshold in the 2 consecutive 50 ms intervals and no other ports meet the rising threshold at the same time, ADM6996LC/LCX/LHX will treat it the storm has finished.

Priority Queue

ADM6996LC/LCX/LHX supports 4 priority queues and each is assigned a weight. User can see **Priority Queue Weight Ratio** for more detail.

The EEPROM provides ADM6996LC/LCX/LHX with many option settings

Main Settings

- Port Configuration: Speed, Duplex, Flow Control Capability and Tag/ Untag.
- VLAN & TOS Priority Mapping
- Broadcast Storming rate and Trunk.
- Fiber Select, Auto MDIX select
- VLAN Mapping
- Per Port Buffer number
- Priority queue and smart discard ratio

Table 31 Broadcast Storming Threshold

Parameter	Rising Threshold	Falling Threshold
All link ports are 100M	100M Threshold (See $003B_H$)	1/2 100M Threshold
Not All link ports are 100M	10M Threshold (See $003C_H$)	1/2 10M Threshold

Table 32 Priority Queue Weight Ratio

Queue	Weight
Queue 0	Weight = 1
Queue 1	Weight = “Queue 1 Weight” bits in 0025_H
Queue 2	Weight = “Queue 2 Weight” bits in 0026_H
Queue 3	Weight = “Queue 3 Weight” bits in 0027_H

Table 33 Registers Address Space

Module	Base Address	End Address	Note
EEPROM Basic Register Map	0000_H	$003F_H$	
EEPROM Extended Register Map	0040_H	$009C_H$	
Counter and Switch Status Map	$00A0_H$	0143_H	
PHY Register Map	0200_H	$02FF_H$	

Table 34 Registers Overview

Register Short Name	Register Long Name	Offset Address	Page Number
SIG	Signature Register	00_H	85
P0BC	P0 Basic Control Register	01_H	85
Res0	Reserved Register 0	02_H	87
P1	Basic Control Register 1	03_H	86
Res1	Reserved Register 1	04_H	87
P2	Basic Control Register 2	05_H	86
Res2	Reserved Register 2	06_H	87
P3	Basic Control Register 3	07_H	86
P4	Basic Control Register 4	08_H	87
P5	Basic Control Register 5	09_H	87
SC0	System Control Register 0	$0A_H$	88
SC1	System Control Register 1	$0B_H$	89
Res3	Reserved Register 3	$0C_H$	87
Res4	Reserved Register 4	$0D_H$	87
VPM	VLAN Priority Map Register	$0E_H$	90
TPM	TOS Priority Map Register	$0F_H$	91
SC2	System Control Register 2	10_H	92
SC3	System Control Register 3	11_H	92
SC4	System Control Register 4	12_H	94
P0SO	Port 0 Security Option	13_H	95
P1SO	Port 1 Security Option	14_H	96
P2SO	Port 2 Security Option	15_H	96
P3SO	Port 3 Security Option	16_H	96
P4SO	Port 4 Security Option	17_H	96
P5SO	Port 5 Security Option	18_H	96
UFGPM	Unicast Port Map and Forward Group Port Map	19_H	96
BFGPM	Broadcast Port Map andForward Group Port Map	$1A_H$	97
MFGPM	Multicast Port Map and Forward Group Port Map	$1B_H$	98
RFGPM	Reserve Port Map and Forward Group Port Map	$1C_H$	98
PIOFGPM	Packet Identification Option, Forward Group Port Map	$1D_H$	99

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
VPEFGPM	VLAN Priority Enable and Forward Group Port Map	$1E_H$	100
SPEFGPM	Service Priority Enable and Forward Group Port Map	$1F_H$	101
IFNTFGPM	Input Force No Tag and Forward Group Port Map	20_H	102
IFFGPM	Ingress Filter andForward Group Port Map	21_H	103
VSDFGPM	VLAN Security Disable and Forward Group Port Map	22_H	104
Res5	Reserved Register 5	23_H	87
Res6	Reserved Register 6	24_H	87
IMEIJT	IGMP/MLDTRAP Enable and Input Jam Threshold Register	25_H	105
Q2WVECPO	Queue 2 Weight, VID Exist Check, and PPPOE Port Only	26_H	105
Q3WBPVAO	Queue 3 Weight, Back to Port VLAN, and Admit Only VLAN-Tagged	27_H	106
IDTEP	Input Double Tag Enable, and P0VID[11:4]	28_H	106
ODTEP	Output Double Tag Enable, and P1VID[11:4]	29_H	107
OTBP	Output Tag Bypass, and P2VID[11:4]	$2A_H$	107
P11_4	P3VID[11:4], and P4VID[11:4]	$2B_H$	108
RACP	Reserved Address Control, and P5VID[11:4]	$2C_H$	108
PHYC	PHY Control Register	$2D_H$	108
ATET	ADM TAG Ether Type	$2E_H$	109
PR	PHY Restart Register	$2F_H$	109
MISC	Miscellaneous Register	30_H	110
BBC0	Basic Bandwidth Control Register 0	31_H	111
BBC1	Basic Bandwidth Control Register 1	32_H	111
BCE	Bandwidth Control Enable Register	33_H	112
EBC0	Extended Bandwidth Control Register 0	34_H	114
EBC1	Extended Bandwidth Control Register 1	35_H	114
EBC2	Extended Bandwidth Control Register 2	36_H	115
EBC3	Extended Bandwidth Control Register 3	37_H	115
EBC4	Extended Bandwidth Control Register 4	38_H	116
EBC5	Extended Bandwidth Control Register 5	39_H	117
DVMEBC6	Default VLAN Member and Extended Bandwidth Control Register 6	$3A_H$	117
NS0	New Storm Register 0	$3B_H$	118
NS1	New Storm Register 1	$3C_H$	118
NRAC0	New Reserve Address Control Register 0	$3D_H$	119
NRAC1	New Reserve Address Control Register 1	$3E_H$	120
Res7	Reserved Register 7	$3F_H$	87
VF0L	VLAN Filter 0 Low	40_H	122

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
VF0H	VLAN Filter 0 High	41_H	123
VF1L	VLAN Filter 1 Low	42_H	122
VF1H	VLAN Filter 1 High	43_H	123
VF2L	VLAN Filter 2 Low	44_H	122
VF2H	VLAN Filter 2 High	45_H	123
VF3L	VLAN Filter 3Low	46_H	122
VF3H	VLAN Filter 3 High	47_H	123
VF4L	VLAN Filter 4 Low	48_H	122
VF4H	VLAN Filter 4 High	49_H	123
VF5L	VLAN Filter 5 Low	$4A_H$	122
VF5H	VLAN Filter 5 High	$4B_H$	123
VF6L	VLAN Filter 6 Low	$4C_H$	122
VF6H	VLAN Filter 6 High	$4D_H$	123
VF7L	VLAN Filter 7 Low	$4E_H$	122
VF7H	VLAN Filter 7 High	$4F_H$	123
VF8L	VLAN Filter 8 Low	50_H	122
VF8H	VLAN Filter 8 High	51_H	123
VF9L	VLAN Filter 9 Low	52_H	122
VF9H	VLAN Filter 9 High	53_H	123
VF10L	VLAN Filter 10 Low	54_H	122
VF10H	VLAN Filter 10 High	55_H	123
VF11L	VLAN Filter 11 Low	56_H	122
VF11H	VLAN Filter 11 High	57_H	123
VF12L	VLAN Filter 12 Low	58_H	122
VF12H	VLAN Filter 12 High	59_H	123
VF13L	VLAN Filter 13 Low	$5A_H$	122
VF13H	VLAN Filter 13 High	$5B_H$	123
VF14L	VLAN Filter 14 Low	$5C_H$	122
VF14H	VLAN Filter 14 High	$5D_H$	123
VF15L	VLAN Filter 15 Low	$5E_H$	122
VF15H	VLAN Filter 15 High	$5F_H$	123
TF0	Type Filter 0	60_H	124
TF1	Type Filter 1	61_H	124
TF2	Type Filter 2	62_H	124
TF3	Type Filter 3	63_H	124
TF4	Type Filter 4	64_H	124
TF5	Type Filter 5	65_H	124
TF6	Type Filter 6	66_H	124
TF7	Type Filter 7	67_H	124
PF_1_0	Protocol Filter 1 and 0	68_H	124
PF_3_2	Protocol Filter 3 and 2	68_H	125

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
PF_5_4	Protocol Filter 5 and 4	69_H	125
PF_7_6	Protocol Filter 7 and 6	$6A_H$	125
Res8	Reserved Register 8	$6C_H$	87
Res9	Reserved Register 9	$6D_H$	87
Res10	Reserved Register 10	$6E_H$	87
Res11	Reserved Register 11	$6F_H$	87
Res12	Reserved Register 12	70_H	87
Res13	Reserved Register 13	71_H	87
Res14	Reserved Register 14	72_H	87
Res15	Reserved Register 15	73_H	87
Res16	Reserved Register 16	74_H	87
Res17	Reserved Register 17	75_H	87
Res18	Reserved Register 18	76_H	87
Res19	Reserved Register 19	77_H	87
Res20	Reserved Register 20	78_H	87
Res21	Reserved Register 21	79_H	88
Res22	Reserved Register 22	$7A_H$	88
Res23	Reserved Register 23	$7B_H$	88
Res24	Reserved Register 24	$7C_H$	88
Res25	Reserved Register 25	$7D_H$	88
Res26	Reserved Register 26	$7E_H$	88
Res27	Reserved Register 27	$7F_H$	88
Res28	Reserved Register 28	80_H	88
Res29	Reserved Register 29	81_H	88
Res30	Reserved Register 30	82_H	88
Res31	Reserved Register 31	83_H	88
Res32	Reserved Register 32	84_H	88
Res33	Reserved Register 33	85_H	88
Res34	Reserved Register 34	86_H	88
Res35	Reserved Register 35	87_H	88
Res36	Reserved Register 36	88_H	88
Res37	Reserved Register 37	89_H	88
Res38	Reserved Register 38	$8A_H$	88
Res39	Reserved Register 39	$8B_H$	88
TUF0	TCP/UDP Filter 0	$8C_H$	125
TUF1	TCP/UDP Filter 1	$8D_H$	125
TUF2	TCP/UDP Filter 2	$8E_H$	125
TUF3	TCP/UDP Filter 3	$8F_H$	125
TUF4	TCP/UDP Filter 4	90_H	125
TUF5	TCP/UDP Filter 5	91_H	125
TUF6	TCP/UDP Filter 6	92_H	125

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
TUF7	TCP/UDP Filter 7	93_H	125
TFA	Type Filter Action	94_H	126
PFA	Protocol Filter Action	95_H	126
TUA0	TCP/UDP Action 0	96_H	127
TUA1	TCP/UDP Action 1	97_H	128
TUA2	TCP/UDP Action 2	98_H	129
Res40	Reserved Register 40	99_H	88
IE	Interrupt Enable Register	$9A_H$	130
IS	Interrupt Status Register	$9B_H$	130
Res41	Reserved Register 41	$9C_H$	88
CI0	Chip Identifier 0	$A0_H$	131
CI1	Chip Identifier 1	$A1_H$	131
PS0	Port Status 0	$A2_H$	132
PS1	Port Status 1	$A3_H$	133
PS2	Port Status 2	$A4_H$	134
Res42	Reserved Register 42	$A5_H$	88
Res43	Reserved Register 43	$A6_H$	88
Res44	Reserved Register 44	$A7_H$	88
CL0	Port 0 Receive Packet Counter Low	$A8_H$	134
CH0	Port 0 Receive Packet Counter High	$A9_H$	136
CL1	Port 1 Receive Packet Counter Low	AC_H	135
CH1	Port 1 Receive Packet Counter High	AD_H	136
CL2	Port 2 Receive Packet Counter Low	$B0_H$	135
CH2	Port 2 Receive Packet Counter High	$B1_H$	136
CL3	Port 3 Receive Packet Counter Low	$B4_H$	135
CH3	Port 3 Receive Packet Counter High	$B5_H$	136
CL4	Port 4 Receive Packet Counter Low	$B6_H$	135
CH4	Port 4 Receive Packet Counter High	$B7_H$	136
CL5	Port 5 Receive Packet Counter Low	$B8_H$	135
CH5	Port 5 Receive Packet Counter High	$B9_H$	136
CL6	Port 0 Receive Packet Byte Count Low	BA_H	135
CH6	Port 0 Receive Packet Byte Count High	BB_H	136
CL7	Port 1 Receive Packet Byte Count Low	BE_H	135
CH7	Port 1 Receive Packet Byte Count High	BF_H	136
CL8	Port 2 Receive Packet Byte Count Low	$C2_H$	135
CH8	Port 2 Receive Packet Byte Count High	$C3_H$	136
CL9	Port 3 Receive Packet Byte Count Low	$C6_H$	135
CH9	Port 3 Receive Packet Byte Count High	$C7_H$	136
CL10	Port 4 Receive Packet Byte Count Low	$C8_H$	135
CH10	Port 4 Receive Packet Byte Count High	$C9_H$	136
CL11	Port 5 Receive Packet Byte Count Low	CA_H	135

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
CH11	Port 5 Receive Packet Byte Count High	CB_H	136
CL12	Port 0 Transmit Packet Count Low	CC_H	135
CH12	Port 0 Transmit Packet Count High	CD_H	136
CL13	Port 1 Transmit Packet Count Low	$D0_H$	135
CH13	Port 1 Transmit Packet Count High	$D1_H$	136
CL14	Port 2 Transmit Packet Count Low	$D4_H$	135
CH14	Port 2 Transmit Packet Count High	$D5_H$	136
CL15	Port 3 Transmit Packet Count Low	$D8_H$	135
CH15	Port 3 Transmit Packet Count High	$D9_H$	137
CL16	Port 4 Transmit Packet Count Low	DA_H	135
CH16	Port 4 Transmit Packet Count High	DB_H	137
CL17	Port 5 Transmit Packet Count Low	DC_H	135
CH17	Port 5 Transmit Packet Count High	DD_H	137
CL18	Port 0 Transmit Packet Byte Count Low	DE_H	135
CH18	Port 0 Transmit Packet Byte Count High	DF_H	137
CL19	Port 1 Transmit Packet Byte Count Low	$E2_H$	135
CH19	Port 1 Transmit Packet Byte Count High	$E3_H$	137
CL20	Port 2 Transmit Packet Byte Count Low	$E6_H$	135
CH20	Port 2 Transmit Packet Byte Count High	$E7_H$	137
CL21	Port 3 Transmit Packet Byte Count Low	EA_H	135
CH21	Port 3 Transmit Packet Byte Count High	EB_H	137
CL22	Port 4 Transmit Packet Byte Count Low	EC_H	135
CH22	Port 4 Transmit Packet Byte Count High	ED_H	137
CL23	Port 5 Transmit Packet Byte Count Low	EE_H	135
CH23	Port 5 Transmit Packet Byte Count High	EF_H	137
CL24	Port 0 Collision Count Low	$F0_H$	135
CH24	Port 0 Collision Count High	$F1_H$	137
CL25	Port 1 Collision Count Low	$F4_H$	135
CH25	Port 1 Collision Count High	$F5_H$	137
CL26	Port 2 Collision Count Low	$F8_H$	135
CH26	Port 2 Collision Count High	$F9_H$	137
CL27	Port 3 Collision Count Low	FC_H	135
CH27	Port 3 Collision Count High	FD_H	137
CL28	Port 4 Collision Count Low	FE_H	135
CH28	Port 4 Collision Count High	FF_H	137
CL29	Port 5 Collision Count Low	100_H	135
CH29	Port 5 Collision Count High	101_H	137
CL30	Port 0 Error Count Low	102_H	136
CH30	Port 0 Error Count High	103_H	137
CL31	Port 1 Error Count Low	106_H	136
CH31	Port 1 Error Count High	107_H	137

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
CL32	Port 2 Error Count Low	$10A_H$	136
CH32	Port 2 Error Count High	$10B_H$	137
CL33	Port 3 Error Count Low	$10E_H$	136
CH33	Port 3 Error Count High	$10F_H$	137
CL34	Port 4 Error Count Low	110_H	136
CH34	Port 4 Error Count High	111_H	137
CL35	Port 5 Error Count Low	112_H	136
CH35	Port 5 Error Count High	113_H	137
OFF0	Over-Flow Flag 0	114_H	137
OFF1	Over-Flow Flag 1	115_H	138
OFF2	Over-Flow Flag 2	116_H	139
OFF3	Over-Flow Flag 3	117_H	140
OFF4	Over-Flow Flag 4	118_H	140
OFF5	Over-Flow Flag 5	119_H	141
HSL	Hardware Setting Low Register	130_H	142
HSH	Hardware Setting High Register	131_H	142
Res45	Reserved Register 45	132_H	88
Res46	Reserved Register 46	133_H	88
Res47	Reserved Register 47	134_H	88
AO	Assign Option Register	135_H	143
Res48	Reserved Register 48	136_H	88
Res49	Reserved Register 49	137_H	88
SVP	Security Violation Port	138_H	144
SS0	Security Status 0	139_H	144
SS1	Security Status 1	$13A_H$	145
FLAS	First Lock Address Search	$13B_H$	145
FLA1	First Lock Address [15:0]	$13C_H$	146
FLA2	First Lock Address [31:16]	$13D_H$	146
FLA3	First Lock Address [47:32]	$13E_H$	146
FLF	First Lock FID	$13F_H$	147
CCL	Counter Control Low Register	140_H	147
Res50	Reserved Register 50	141_H	88
CSL	Counter Status Low Register	142_H	148
CSH	Counter Status High Register	143_H	148
PHY_C0	PHY Control Register of Port 0	200_H	148
PHY_S0	PHY Status Register of Port 0	201_H	151
PHY_I0_A	PHY Identifier Register of Port 0 (A)	202_H	152
PHY_I0_B	PHY Identifier Register of Port 0 (B)	203_H	153
ANAP0	Auto Negotiation Advertisement Register of Port 0	204_H	154
ANLPA0	Auto Negotiation Link Partner Ability Register of Port 0	205_H	155

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
ANE0	Auto Negotiation Expansion Register of Port 0	206_H	156
NPT0	Next Page Transmit Register of Port 0	207_H	157
LPNP0	Link Partner Next Page Register of Port 0	208_H	158
PHY_C1	PHY Control Register of Port 1	220_H	150
PHY_S1	PHY Status Register of Port 1	221_H	152
PHY_I1_A	PHY Identifier Register of Port 1 (A)	222_H	153
PHY_I1_B	PHY Identifier Register of Port 1 (B)	223_H	153
ANAP1	Auto Negotiation Advertisement Register of Port 1	224_H	155
ANLPA1	Auto Negotiation Link Partner Ability Register of Port 1	225_H	156
ANE1	Auto Negotiation Expansion Register of Port 1	226_H	157
NPT1	Next Page Transmit Register of Port 1	227_H	158
LPNP1	Link Partner Next Page Register of Port 1	228_H	159
PHY_C2	PHY Control Register of Port 2	240_H	150
PHY_S2	PHY Status Register of Port 2	241_H	152
PHY_I2_A	PHY Identifier Register of Port 2 (A)	242_H	153
PHY_I2_B	PHY Identifier Register of Port 2 (B)	243_H	153
ANAP2	Auto Negotiation Advertisement Register of Port 2	244_H	155
ANLPA2	Auto Negotiation Link Partner Ability Register of Port 2	245_H	156
ANE2	Auto Negotiation Expansion Register of Port 2	246_H	157
NPT2	Next Page Transmit Register of Port 2	247_H	158
LPNP2	Link Partner Next Page Register of Port 2	248_H	159
PHY_C3	PHY Control Register of Port 3	260_H	150
PHY_S3	PHY Status Register of Port 3	261_H	152
PHY_I3_A	PHY Identifier Register of Port 3 (A)	262_H	153
PHY_I3_B	PHY Identifier Register of Port 3 (B)	263_H	154
ANAP3	Auto Negotiation Advertisement Register of Port 3	264_H	155
ANLPA3	Auto Negotiation Link Partner Ability Register of Port 3	265_H	156
ANE3	Auto Negotiation Expansion Register of Port 3	266_H	157
NPT3	Next Page Transmit Register of Port 3	267_H	158
LPNP3	Link Partner Next Page Register of Port 3	268_H	159
PHY_C4	PHY Control Register of Port 4	280_H	150
PHY_S4	PHY Status Register of Port 4	281_H	152
PHY_I4_A	PHY Identifier Register of Port 4 (A)	282_H	153
PHY_I4_B	PHY Identifier Register of Port 4 (B)	283_H	154
ANAP4	Auto Negotiation Advertisement Register of Port 4	284_H	155
ANLPA4	Auto Negotiation Link Partner Ability Register of Port 4	285_H	156
ANE4	Auto Negotiation Expansion Register of Port 4	286_H	157

Table 34 Registers Overview (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
NPT4	Next Page Transmit Register of Port 4	287_H	158
LPNP4	Link Partner Next Page Register of Port 4	288_H	159

The register is addressed wordwise.

Table 35 Register Access Types

Mode	Symbol	Description HW	Description SW
read/write	rw	Register is used as input for the HW	Register is read and writable by SW
read	r	Register is written by HW (register between input and output -> one cycle delay)	Value written by software is ignored by hardware; that is, software may write any value to this field without affecting hardware behavior (= Target for development.)
Read only	ro	Register is set by HW (register between input and output -> one cycle delay)	SW can only read this register
Read virtual	rv	Physically, there is no new register, the input of the signal is connected directly to the address multiplexer.	SW can only read this register
Latch high, self clearing	lhsc	Latch high signal at high level, clear on read	SW can read the register
Latch low, self clearing	llsc	Latch high signal at low-level, clear on read	SW can read the register
Latch high, mask clearing	lhmk	Latch high signal at high level, register cleared with written mask	SW can read the register, with write mask the register can be cleared (1 clears)
Latch low, mask clearing	llmk	Latch high signal at low-level, register cleared on read	SW can read the register, with write mask the register can be cleared (1 clears)
Interrupt high, self clearing	ihsc	Differentiate the input signal (low->high) register cleared on read	SW can read the register
Interrupt low, self clearing	ilsc	Differentiate the input signal (high->low) register cleared on read	SW can read the register
Interrupt high, mask clearing	ihmk	Differentiate the input signal (high->low) register cleared with written mask	SW can read the register, with write mask the register can be cleared
Interrupt low, mask clearing	ilmk	Differentiate the input signal (low->high) register cleared with written mask	SW can read the register, with write mask the register can be cleared
Interrupt enable register	ien	Enables the interrupt source for interrupt generation	SW can read and write this register
latch_on_reset	lor	rw register, value is latched after first clock cycle after reset	Register is read and writable by SW
Read/write self clearing	rwsc	Register is used as input for the hw, the register will be cleared due to a HW mechanism.	Writing to the register generates a strobe signal for the HW (1 pdi clock cycle) Register is read and writable by SW.

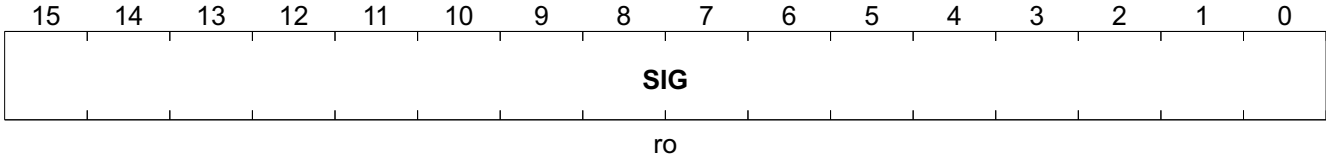
Table 36 Registers Clock Domains

Clock Short Name	Description
–	–

5.1 EEPROM Basic Registers

Signature Register

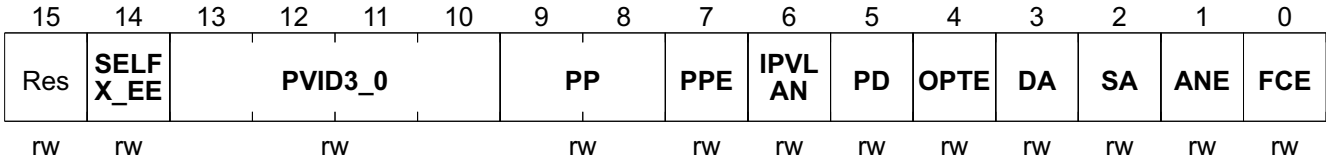
SIG	Offset	Reset Value
Signature Register	00_H	4154_H



Field	Bits	Type	Description
SIG	15:0	ro	**Signature** The value must be 4154_H . ADM6996LC/LCX/LHX uses this value to check if the EEPROM is attached. If the value in the EEPROM does not equal to 4154_H , ADM6996LC/LCX/LHX will stop loading the EEPROM even if the EEPROM is attached. ADM6996LC/LCX/LHX will use the default value to initialize.

P0 Basic Control Register

P0BC	Offset	Reset Value
P0 Basic Control Register	01_H	$040F_H$



Field	Bits	Type	Description
Res	15	rw	**Reserved**
SELFX_EE	14	rw	**Select FX** This bit is used together with the value (p4fx_hw) on the pin **P4FX** during the power on reset to decide if the PHY operates on the fiber mode. This bit is useless in Port 5. Port 0, 1, 2, 3: selfx_ee Description Port 4: {p4fx_hw, selfx_ee} Description $1x_B$ Port 4: Port 4 will operate in the fiber mode 00_B Port 4: Port 4 will operate in the twisted mode 01_B Port 4: Port 4 will operate in the fiber mode

Field	Bits	Type	Description
PVID3_0	13:10	rw	**Private VID** See 0028_H ~ $002C_H$ to find the other PVID [11:4]
PP	9:8	rw	**Port Priority** 00_B Assign packets to Queue 0 01_B Assign packets to Queue 1 10_B Assign packets to Queue 2 11_B Assign packets to Queue 3
PPE	7	rw	**Port Priority Enable** 0_B The port priority is disabled 1_B The port priority is enabled
IPVLAN	6	rw	**IP over VLAN PRI** 0_B Use the priority bits in the tag header to assign the priority queue 1_B Use the IP PRI to assign the priority queue
PD	5	rw	**Port Disable** 0_B Port 0, 1, 2, 3, 4: PHY work s normally. Port 5: Port 5 works normally 1_B Port 0, 1, 2, 3, 4. PHY is disabled. Port 5: Port 5 is forced to link down
OPTE	4	rw	**Output Packet Tagging Enable** 0_B Untagged packets are transmitted 1_B Tagged packets are transmitted
DA	3	rw	**Duplex Ability** It is useless in Port 5. 0_B Recommend PHY to work in the half duplex mode 1_B Recommend PHY to work in the full duplex mode
SA	2	rw	**Speed Ability** 0_B Recommend PHY to work in the 10M mode 1_B Recommend PHY to work in the 100M mode
ANE	1	rw	**Auto Negotiation Enable** 0_B Recommend PHY to work without Auto Negotiation 1_B Recommend PHY to work with Auto Negotiation, when the value on the pin DUPCOL0 during the power on reset is 1
FCE	0	rw	**Flow Control Enable** 0_B Recommend MAC to work without Pause or Back Pressure 1_B In full duplex, recommend MAC to work with Pause when the value on the TXD0 during the power on reset is 1. In half duplex, recommend MAC to work with Back Pressure when the value on the DUPCOL2 during the power on reset is 1

Similar Registers

Table 37 Basic Control Registers 1 to 5

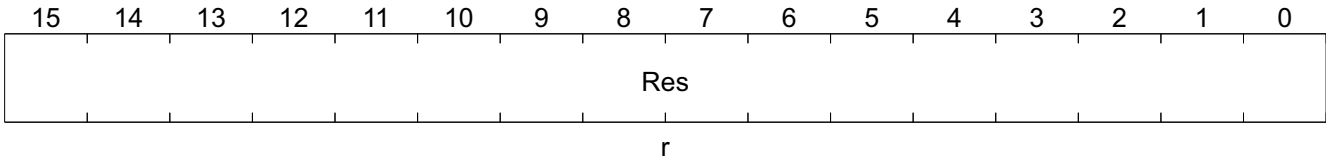
Register Short Name	Register Long Name	Offset Address	Page Number
P1	Basic Control Register 1	03_H	
P2	Basic Control Register 2	05_H	
P3	Basic Control Register 3	07_H	

Table 37 Basic Control Registers 1 to 5 (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
P4	Basic Control Register 4	08_H	
P5	Basic Control Register 5	09_H	

Reserved Register 0

Res0	Offset	Reset Value
Reserved Register 0	**02_H**	**0000_H**



Field	Bits	Type	Description
Res	15:0	r	**Reserved**

Similar Registers

Table 38 Reserved Registers

Register Short Name	Register Long Name	Offset Address	Page Number
Res1	Reserved Register 1	04_H	
Res2	Reserved Register 2	06_H	
Res3	Reserved Register 3	$0C_H$	
Res4	Reserved Register 4	$0D_H$	
Res5	Reserved Register 5	23_H	
Res6	Reserved Register 6	24_H	
Res7	Reserved Register 7	$3F_H$	
Res8	Reserved Register 8	$6C_H$	
Res9	Reserved Register 9	$6D_H$	
Res10	Reserved Register 10	$6E_H$	
Res11	Reserved Register 11	$6F_H$	
Res12	Reserved Register 12	70_H	
Res13	Reserved Register 13	71_H	
Res14	Reserved Register 14	72_H	
Res15	Reserved Register 15	73_H	
Res16	Reserved Register 16	74_H	
Res17	Reserved Register 17	75_H	
Res18	Reserved Register 18	76_H	
Res19	Reserved Register 19	77_H	
Res20	Reserved Register 20	78_H	

Table 38 Reserved Registers (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
Res21	Reserved Register 21	79_H	
Res22	Reserved Register 22	$7A_H$	
Res23	Reserved Register 23	$7B_H$	
Res24	Reserved Register 24	$7C_H$	
Res25	Reserved Register 25	$7D_H$	
Res26	Reserved Register 26	$7E_H$	
Res27	Reserved Register 27	$7F_H$	
Res28	Reserved Register 28	80_H	
Res29	Reserved Register 29	81_H	
Res30	Reserved Register 30	82_H	
Res31	Reserved Register 31	83_H	
Res32	Reserved Register 32	84_H	
Res33	Reserved Register 33	85_H	
Res34	Reserved Register 34	86_H	
Res35	Reserved Register 35	87_H	
Res36	Reserved Register 36	88_H	
Res37	Reserved Register 37	89_H	
Res38	Reserved Register 38	$8A_H$	
Res39	Reserved Register 39	$8B_H$	
Res40	Reserved Register 40	99_H	
Res41	Reserved Register 41	$9C_H$	
Res42	Reserved Register 42	$A5_H$	
Res43	Reserved Register 43	$A6_H$	
Res44	Reserved Register 44	$A7_H$	
Res45	Reserved Register 45	132_H	
Res46	Reserved Register 46	133_H	
Res47	Reserved Register 47	134_H	
Res48	Reserved Register 48	136_H	
Res49	Reserved Register 49	137_H	
Res50	Reserved Register 50	141_H	

System Control Register 0

SC0	Offset	Reset Value
System Control Register 0	$0A_H$	5902_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ERCMPTH				Res	PCE	RVID	Res	RVID FFF	DFID				Res		
rw				rw	rw	rw	rw	rw	rw				rw		

Field	Bits	Type	Description
ERCMPTH	15:12	rw	**Earlier Cycles for Transmission** It means the earlier cycles for transmission used in ADM6996LC/LCX/LHX. It is for the engineer debug purpose.
Res	11	rw	**Reserved**
PCE	10	rw	**Priority Change Enable** 0_B Do not change the priority in the tag header 1_B Change the priority field in the tag header
RVID	9	rw	**Replace VID0 and VID1** 0_B Do not replace 1_B Replace
Res	8	rw	**Reserved**
RVIDFFF	7	rw	**Replace VIDFFF** Always Drop
DFID	6:3	rw	**Default FID** Always 0000_B
Res	2:0	rw	**Reserved**

System Control Register 1

SC1 **Offset** **Reset Value**

System Control Register 1 **$0B_H$** **8001_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DFEFD	**IF**	Res					**CMS**	**TE**	**TSIE**	Res					**NE**
rw	rw			rw			rw	rw	rw			rw			rw

Field	Bits	Type	Description
DFEFD	15	rw	**Disable Far-End-Fault Detection** 0_B Far-End-Fault detect ion is enabled 1_B Far-End-Fault detect ion is disabled
IF	14	rw	**Input Filter** 0_B Discard packets directly when storming or the lack of input buffers 1_B Forward packets to the un-congested port when storming or the lack of input buffers
Res	13:9	rw	**Reserved**
CMS	8	rw	**Carrier Mask Select** 0_B Mask CRS of 4 Cycles 1_B Mask CRS of 5 Cycles
TE	7	rw	**Port 3 and Port 4 Trunk Enable** 0_B No trunk is enabled 1_B Port 3 and Port 4 are trunked

Field	Bits	Type	Description
TSIE	6	rw	**Transmit Short IPG Enable** 0_B 96 bits time is used 1_B 88/96 bits time is used
Res	5:1	rw	**Reserved**
NE	0	rw	**New EEPROM** 0_B Use old EEPROM functions 1_B New EEPROM function is enabled

VLAN Priority Map Register

VPM	Offset	Reset Value
VLAN Priority Map Register	$0E_H$	$FA50_H$

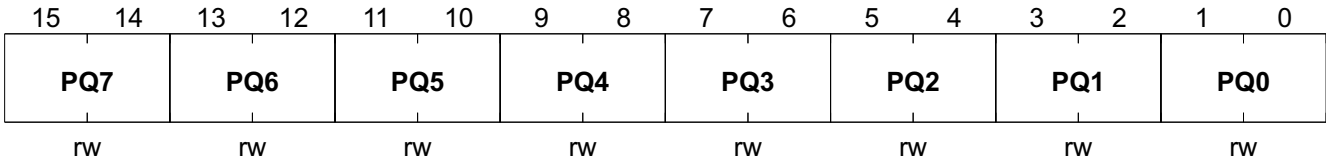
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PQ7		PQ6		PQ5		PQ4		PQ3		PQ2		PQ1		PQ0	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
PQ7	15:14	rw	**Priority Queue 7** These 2 bits are used as the priority queue when the tagged packets with the user priority = 111_B are received on the port. 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3
PQ6	13:12	rw	**Priority Queue 6** These 2 bits are used as the priority queue when the tagged packets with the user priority = 110_B are received on the port.
PQ5	11:10	rw	**Priority Queue 5** These 2 bits are used as the priority queue when the tagged packets with the user priority = 101_B are received on the port.
PQ4	9:8	rw	**Priority Queue 4** These 2 bits are used as the priority queue when the tagged packets with the user priority = 100_B are received on the port.
PQ3	7:6	rw	**Priority Queue 3** These 2 bits are used as the priority queue when the tagged packets with the user priority = 011_B are received on the port.
PQ2	5:4	rw	**Priority Queue 2** These 2 bits are used as the priority queue when the tagged packets with the user priority = 010_B are received on the port.
PQ1	3:2	rw	**Priority Queue 1** These 2 bits are used as the priority queue when the tagged packets with the user priority = 001_B are received on the port.

Field	Bits	Type	Description
PQ0	1:0	rw	**Priority Queue 0** These 2 bits are used as the priority queue when the tagged packets with the user priority = 000_B are received on the port.

TOS Priority Map Register

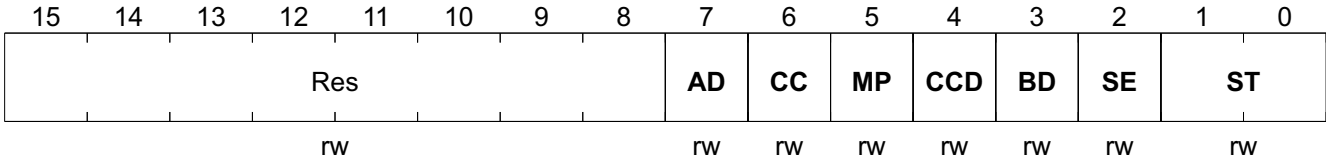
TPM	Offset	Reset Value
TOS Priority Map Register	**$0F_H$**	**$FA50_H$**



Field	Bits	Type	Description
PQ7	15:14	rw	**Priority Queue 7** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 111_B 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3
PQ6	13:12	rw	**Priority Queue 6** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 110_B
PQ5	11:10	rw	**Priority Queue 5** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 101_B
PQ4	9:8	rw	**Priority Queue 4** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 100_B
PQ3	7:6	rw	**Priority Queue 3** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 011_B
PQ2	5:4	rw	**Priority Queue 2** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 010_B
PQ1	3:2	rw	**Priority Queue 1** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 001_B
PQ0	1:0	rw	**Priority Queue 0** These 2 bits are used as the priority queue, when the most significant 3 bits in the TOS field are 000_B

System Control Register 2

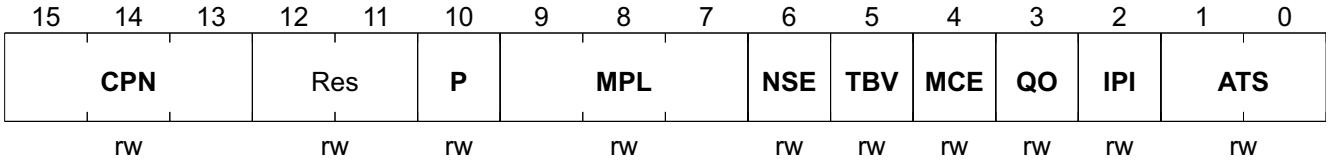
SC2	Offset	Reset Value
System Control Register 2	10_H	0040_H



Field	Bits	Type	Description
Res	15:8	rw	**Reserved**
AD	7	rw	**Aging Disable** Useless in ADM6996LC/LCX/LHX 0_B Age enable 1_B Age disable
CC	6	rw	**Rx Clock Change to Tx Clock for GPSI Interface** 0_B ADM6996LC/LCX/LHX does not use Tx clock to replace Rx clock when Rx clock stops. 1_B ADM6996LC/LCX/LHX uses Tx clock to replace Rx clock when Rx clock stops
MP	5	rw	**Multicast Packet Counted into the Storm Counter** 0_B Only broadcast packets are counted into the storming counter 1_B Multicast and broadcast packets are counted into the storming counter
CCD	4	rw	**CRC Check Disable** 0_B Check CRC 1_B Do not check CRC
BD	3	rw	**Back Off Disable** 0_B Back-off is enabled 1_B Back-off is disabled
SE	2	rw	**Storming Enable** It is used in ADM6996L/F style storm control. 0_B Disable broadcast/multicast storm protection. 1_B Enable boradcast/multicast storm protection.
ST	1:0	rw	**Storming Threshold[1:0]** It is used in ADM6996L/F style storm control.

System Control Register 3

SC3	Offset	Reset Value
System Control Register 3	11_H	$E300_H$



Field	Bits	Type	Description
CPN	15:13	rw	**CPU Port Number** 000_B The CPU is attached to Port 0 001_B The CPU is attached to Port 1 010_B The CPU is attached to Port 2 011_B The CPU is attached to Port 3 100_B The CPU is attached to Port 4 101_B The CPU is attached to Port 5 111_B No CPU exists
Res	12:11	rw	**Reserved**
P	10	rw	**Pause** Also add s Speci a l Tag when Special TAG Transmit is enabled . 0_B Do not add Special Tag on the PAUSE packets 1_B Add Special Tag in the PAUSE packets
MPL	9:7	rw	**Max Packet Length** 000_B 1518 bytes 001_B 1536 bytes 010_B 1664 bytes 110_B 1522 bytes $x11_B$ 1784 bytes $10x_B$ 1784 bytes
NSE	6	rw	**New Storming Enable** 0_B Use the ADM6996L/F style storming control 1_B Use the ADM6996LC/LCX/LHX style storming control
TBV	5	rw	**Tag Base VLAN** 0_B Port VLAN 1_B Tagged VLAN
MCE	4	rw	**MAC Clone Enable** 0_B MAC Clone is disabled 1_B MAC Clone is enabled
QO	3	rw	**Queue Option** It ' s the test for the designer in the queue control.
IPI	2	rw	**Interrupt Polarity Inverter** 0_B The interrupt signal is active pull low 1_B The interrupt signal is active pull high
ATS	1:0	rw	**Aging Timer Select** 00_B 300 Seconds 01_B 75 Seconds 10_B 18 Seconds 11_B 1 Second

System Control Register 4

SC4	Offset	Reset Value
System Control Register 4	12_H	3600_H

15	14	13 12	11	10 9	8	7	6	5	4	3	2	1	0
DP	DCS	Res	TLE	Res	O5FL	O4FL	O3FL	PI	O2FL	DUAL_CO*	O1FL	LED_ENA*	O0FL
rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
DP	15	rw	**Drop Packet When Excessive Collision Happen** 0_B Do not drop 1_B Drop
DCS	14	rw	**Duplex and Col Separate** 0_B Indicate the duplex and collision status at the same time 1_B Indicate the duplex status only
Res	13:12	rw	**Reserved**
TLE	11	rw	**Ten Limit Enable** This function works only when Full Flow Control/Half Back Pressure is enabled. 0_B The switch will not ignore 10 Mbit/s paths even when the ten limit reaches 1_B The switch will forward packets with Multicast, Broadcast, or Unicast but not learned DA addresses from 100 Mbit/s only to 100 Mbit/s ports and ignore the 10M paths when the ten limit reaches. This function allows the switch to balance the high and the low speed
Res	10:9	rw	**Reserved**
O5FL	8	rw	**OLD P5 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled
O4FL	7	rw	**OLD P4 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled
O3FL	6	rw	**OLD P3 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled
PI	5	rw	**Pause Ignore** 0_B Do not ignore Pause packets 1_B Ignore Pause packets in half duplex or in full duplex when flow control is not enabled
O2FL	4	rw	**OLD P2 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled

Field	Bits	Type	Description
DUAL_COLOR_EE	3	rw	**Dual Color in MDC / MDIO with CPU** See **Chapter 3.23 LED Display** for more detail information. 0_B Single Color 1_B Dual Color
O1FL	2	rw	**OLD P1 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled
LED_ENABLE	1	rw	**LED Enable** 0_B Disable 1_B Enable
O0FL	0	rw	**OLD P0 First Lock** 0_B First Lock is disabled 1_B First Lock is enabled

Port 0 Security Option

Port Spanning Tree State and Forward Group Port Map.

P0SO	Offset	Reset Value
Port 0 Security Option	**13_H**	**$01D5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res							**P5**	**P4**	**P3**	Res	**P2**	Res	**P1**	Res	**P0**
r							rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15:9	r	**Reserved**
P5	8	rw	**Port 5 is a Member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a Member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a Member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a Member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a Member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**

Field	Bits	Type	Description
P0	0	rw	**Port 0 is a Member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Similar Registers

Table 39 PxSO Registers

Register Short Name	Register Long Name	Offset Address	Page Number
P1SO	Port 1 Security Option	14_H	
P2SO	Port 2 Security Option	15_H	
P3SO	Port 3 Security Option	16_H	
P4SO	Port 4 Security Option	17_H	
P5SO	Port 5 Security Option	18_H	

Unicast Port Map andForward Group Port Map

UFGPM	Offset	Reset Value
Unicast Port Map andForward Group Port Map	19_H	$FFD5_H$

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	UP						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
UP	14:9	rw	**Unicast Portmap** See **Chapter 3.15.2** Packet Forwarding for more detail information.
P5	8	rw	**Port 5 is a Member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a Member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a Member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a Member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**

Field	Bits	Type	Description
P1	2	rw	**Port 1 is a Member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a Member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Broadcast Port Map andForward Group Port Map

BFGPM	Offset	Reset Value
Broadcast Port Map andForward Group Port Map	**$1A_H$**	**$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	BP						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
BP	14:9	rw	**Broadcast Portmap** Always 111111_B
P5	8	rw	**Port 5 is a Member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a Member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a Member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a Member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a Member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**

Field	Bits	Type	Description
P0	0	rw	**Port 0 is a Member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Multicast Port Map and Forward Group Port Map

MFGPM **Offset** **Reset Value**

Multicast Port Map and Forward Group Port Map **$1B_H$** **$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	MP						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
MP	14:9	rw	**Multicast Portmap** Always 111111_B
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Reserve Port Map and Forward Group Port Map

RFGPM — **Offset** — **Reset Value**

Reserve Port Map and Forward Group Port Map — **$1C_H$** — **$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	RP						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
RP	14:9	rw	**Reserve Portmap** Always 111111_B
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Packet Identification Option, Forward Group Port Map

PIOFGPM — **Offset** — **Reset Value**

Packet Identification Option, Forward Group Port Map — **$1D_H$** — **$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	**DIVS**	**DII6P**	Res		**DIIP**	Res	**P5**	**P4**	**P3**	Res	**P2**	Res	**P1**	Res	**P0**
rw	rw	rw	rw		rw	rw	rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	rw	**Reserved**
DIVS	14	rw	**Do not Identify VLAN after SNAP** 0_B Identify 1_B Do not identify
DII6P	13	rw	**Do not Identify IPV6 in PPPOE** 0_B Identify 1_B Do not identify
Res	12:11	rw	**Reserved**
DIIP	10	rw	**Do not Identify IP in PPPOE** 0_B Identify 1_B Do not identify
Res	9	rw	**Reserved**
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

VLAN Priority Enable and Forward Group Port Map

VPEFGPM — **Offset** — **Reset Value**

VLAN Priority Enable and Forward Group Port Map — **$1E_H$** — **$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	VPE						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
VPE	14:9	rw	**VLAN Priority Enable** 0_B Do not care the PRI in the tag header 1_B PRI in the tag header will be taken into priority determination consideration
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a membe
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Service Priority Enable and Forward Group Port Map

SPEFGPM — **Offset** — **Reset Value**

Service Priority Enable and Forward Group Port Map — **$1F_H$** — **$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	SPE						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
SPE	14:9	rw	**Service Priority Enable** 0_B Don't care IPV4 TOS /IPV6 Traffic Class 1_B Care IPV4 TOS/IPV6 Traffic for priority decision
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Input Force No Tag and Forward Group Port Map?

IFNTFGPM	Offset	Reset Value
Input Force No Tag and Forward Group Port Map	20_H	$FFD5_H$

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	IFNTE						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
IFNTE	14:9	rw	**Input Force No TAG Enable** 0_B Disabled 1_B Enabled
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

Ingress Filter andForward Group Port Map

IFFGPM	Offset	Reset Value
Ingress Filter andForward Group Port Map	**21_H**	**$FFD5_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	IFE						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
IFE	14:9	rw	**Ingress Filter Enable** Always 111111_B

Field	Bits	Type	Description
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

VLAN Security Disable and Forward Group Port Map

VSDFGPM	Offset	Reset Value
VLAN Security Disable and Forward Group Port Map	22_H	$FFD5_H$

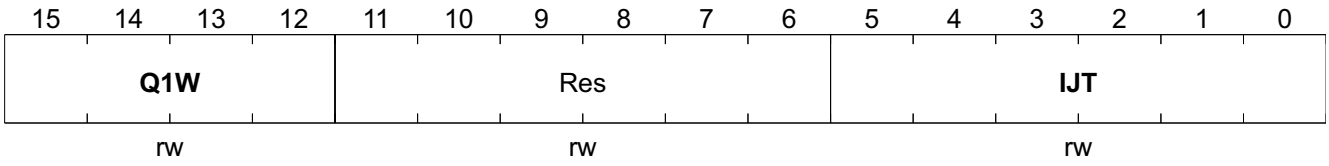
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	VSD						P5	P4	P3	Res	P2	Res	P1	Res	P0
r	rw						rw	rw	rw	r	rw	r	rw	r	rw

Field	Bits	Type	Description
Res	15	r	**Reserved**
VSD	14:9	rw	**VLAN Security Disable** Always 111111_B
P5	8	rw	**Port 5 is a member of the Forwarding Group** 0_B Port 5 is not a member 1_B Port 5 is a member
P4	7	rw	**Port 4 is a member of the Forwarding Group** 0_B Port 4 is not a member 1_B Port 4 is a member

Field	Bits	Type	Description
P3	6	rw	**Port 3 is a member of the Forwarding Group** 0_B Port 3 is not a member 1_B Port 3 is a member
Res	5	r	**Reserved**
P2	4	rw	**Port 2 is a member of the Forwarding Group** 0_B Port 2 is not a member 1_B Port 2 is a member
Res	3	r	**Reserved**
P1	2	rw	**Port 1 is a member of the Forwarding Group** 0_B Port 1 is not a member 1_B Port 1 is a member
Res	1	r	**Reserved**
P0	0	rw	**Port 0 is a member of the Forwarding Group** 0_B Port 0 is not a member 1_B Port 0 is a member

IGMP/MLDTRAP Enable and Input Jam Threshold Register

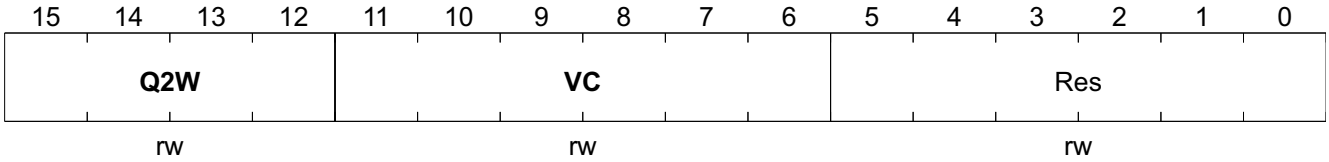
IMEIJT	Offset	Reset Value
IGMP/MLDTRAP Enable and Input Jam Threshold Register	**25_H**	**1000_H**



Field	Bits	Type	Description
Q1W	15:12	rw	**Queue 1 Weight** See **Table 32 Priority Queue Weight Ratio** for more detail information.
Res	11:6	rw	**Reserved**
IJT	5:0	rw	**Input Jam Threshold**

Queue 2 Weight, VID Exist Check, and PPPOE Port Only

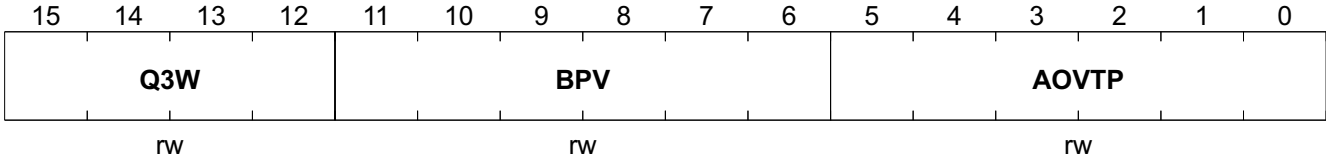
Q2WVECPO	Offset	Reset Value
Queue 2 Weight, VID Exist Check, and PPPOE Port Only	**26_H**	**1000_H**



Field	Bits	Type	Description
Q2W	15:12	rw	**Queue 2 Weight** See **Table 32** for more detail information.
VC	11:6	rw	**VID Check** Always 000000_B
Res	5:0	rw	**Reserved**

Queue 3 Weight, Back to Port VLAN, and Admit Only VLAN-Tagged

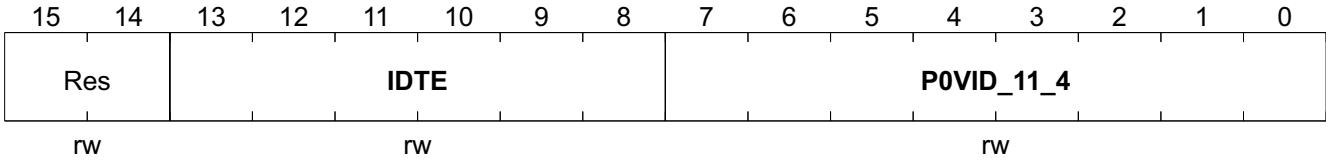
Q3WBPVAO	Offset	Reset Value
Queue 3 Weight, Back to Port VLAN, and Admit Only VLAN-Tagged	**27_H**	**1000_H**



Field	Bits	Type	Description
Q3W	15:12	rw	**Queue 3 Weight** See **Table 32** for more detail information.
BPV	11:6	rw	**Back To Port VLAN** Always 000000_B
AOVTP	5:0	rw	**Admit Only VLAN_Tagged Packet** Always 000000_B

Input Double Tag Enable, and P0VID[11:4]

IDTEP	Offset	Reset Value
Input Double Tag Enable, and P0VID[11:4]	**28_H**	**0000_H**

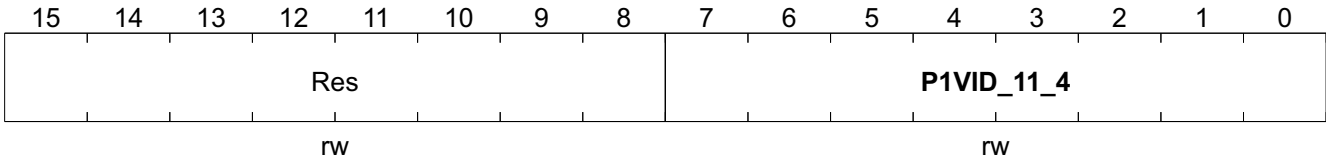


Field	Bits	Type	Description
Res	15:14	rw	**Reserved**
IDTE	13:8	rw	**Input Double Tag Enable** The register is reserved for internal use only and should be kept 0B
P0VID_11_4	7:0	rw	**P0VID[11:4]** VID bit 11 ~ 4 fo Port 0

Output Double Tag Enable, and P1VID[11:4]

ODTEP **Offset** **Reset Value**

Output Double Tag Enable, and P1VID[11:4] **29_H** **0000_H**

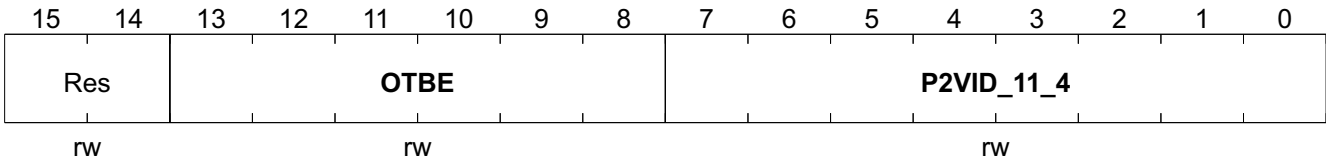


Field	Bits	Type	Description
Res	15:8	rw	**Reserved**
P1VID_11_4	7:0	rw	**P1VID[11:4]** VID bit 11 ~ 4 of Port 1.

Output Tag Bypass, and P2VID[11:4]

OTBP **Offset** **Reset Value**

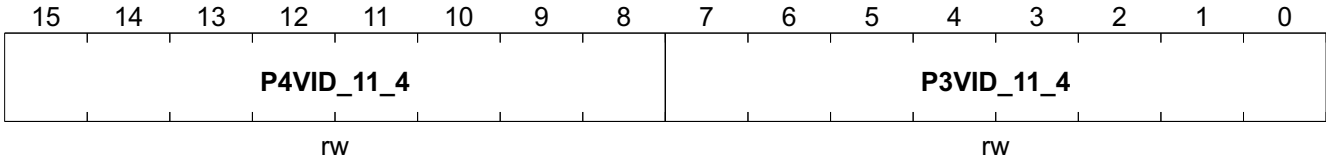
Output Tag Bypass, and P2VID[11:4] **$2A_H$** **$3F00_H$**



Field	Bits	Type	Description
Res	15:14	rw	**Reserved**
OTBE	13:8	rw	**Output Tag Bypass Enable** Always 000000_B
P2VID_11_4	7:0	rw	**P2VID[11:4]** VID bit 11 ~ 4 of Port 2.

P3VID[11:4], and P4VID[11:4]

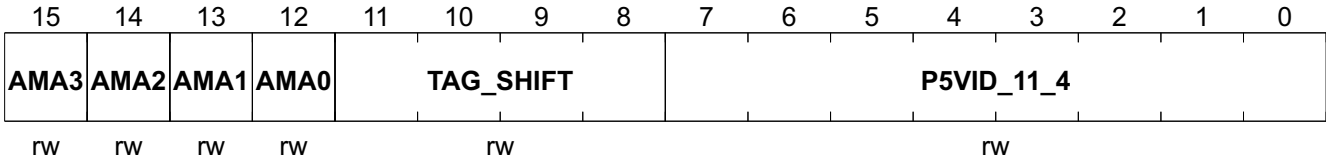
P11_4	Offset	Reset Value
P3VID[11:4], and P4VID[11:4]	**$2B_H$**	**0000_H**



Field	Bits	Type	Description
P4VID_11_4	15:8	rw	**P4VID[11:4]** VID bit 11 ~ 4 of Port 4.
P3VID_11_4	7:0	rw	**P3VID[11:4]** VID bit 11 ~ 4 of Port 3.

Reserved Address Control, and P5VID[11:4]

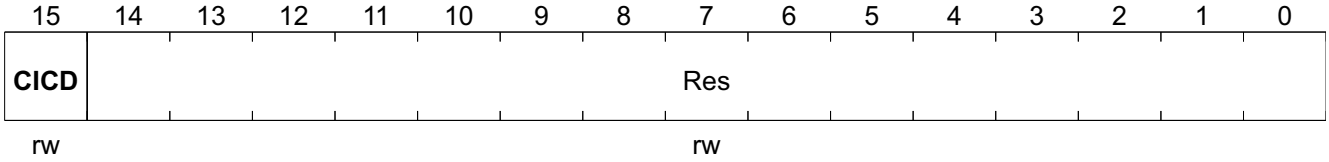
RACP	Offset	Reset Value
Reserved Address Control, and P5VID[11:4]	**$2C_H$**	**$D000_H$**



Field	Bits	Type	Description
AMA3	15	rw	**Action of MAC Address 3** The Action of MAC Address = $0180C2000010_H$ ~ $0180C20000FF_H$
AMA2	14	rw	**Action of MAC Address 2** The Action of MAC Address = $0180C2000002_H$ ~ $0180C200000F_H$
AMA1	13	rw	**Action of MAC Address 1** The Action of MAC Address = $0180C2000001_H$
AMA0	12	rw	**Action of MAC Address 0** The Action of MAC Address = $0180C2000000_H$
TAG_SHIFT	11:8	rw	**Tag Shift**
P5VID_11_4	7:0	rw	**P5VID[11:4]** VID bit 11 ~ 4 of Port 5

PHY Control Register

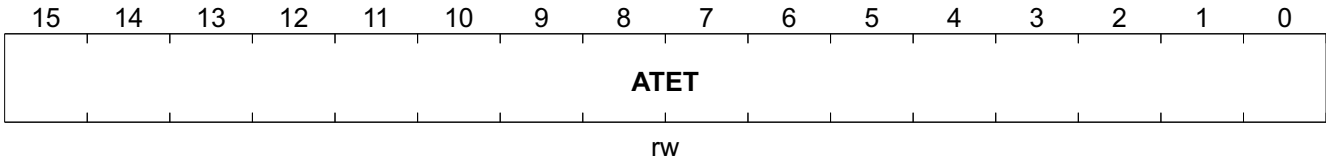
PHYC **Offset** **Reset Value**
PHY Control Register **$2D_H$** **4442_H**



Field	Bits	Type	Description
CICD	15	rw	**Chip ID Check Disable** 0_B Check CHIP ID in 32 bit SDC/SDO 1_B Do not check CHIP ID in 32 bit SDC/SDIO
Res	14:0	rw	**Reserved**

ADM TAG Ether Type

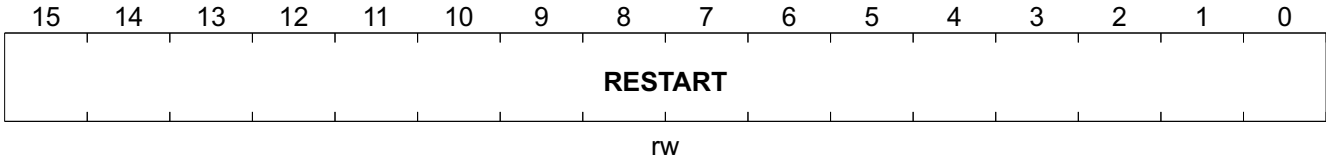
ATET **Offset** **Reset Value**
ADM TAG Ether Type **$2E_H$** **0000_H**



Field	Bits	Type	Description
ATET	15:0	rw	**ADM TAG Ether Type** This value is used by the user to define their Ether-Type. When Special Tag Receive is enabled, ADM6996LC/LCX/LHX checks the packets on the CPU port to see if the two bytes following the SA are the same as ADM TAG Ether Type . If they are different, ADM6996LC/LCX/LHX bypasses the Special Tag. If the same, ADM6996LC/LCX/LHX will use the value in the Special Tag to do switching decisions .

PHY Restart Register

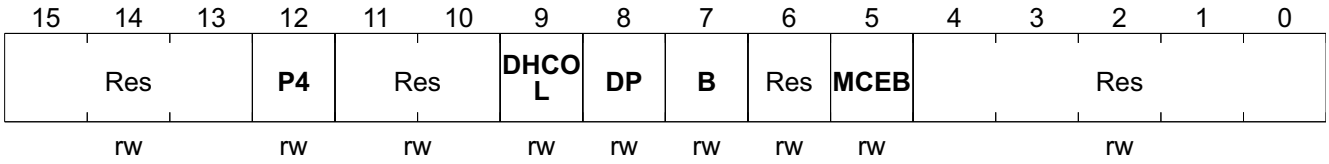
PR **Offset** **Reset Value**
PHY Restart Register **$2F_H$** **0000_H**



Field	Bits	Type	Description
RESTART	15:0	rw	**Restart** ADM6996LC/LCX/LHX writes this register to restart all the PHYs in the switch. The value written is not important.

Miscellaneous Register

MISC	Offset	Reset Value
Miscellaneous Register	**30_H**	**0987_H**



Field	Bits	Type	Description
Res	15:13	rw	**Reserved**
P4	12	rw	**Port 4 LED Mode** 0_B LinkAct/DupCol/Speed. 1_B Link/Act/Speed.
Res	11:10	rw	**Reserved**
DHCOL	9	rw	**Dual Speed Hub COL_LED Enable** 0_B Normal LED display. 1_B Dual Speed Hub LED display. Port0 Col LED: 10M Col LED. Port1 Col LED: 100M Col LED.
DP	8	rw	**Drop Packets** Drop packets when the link partner does not follow the PAUSE protocol. 0_B Disable. 1_B Enable to drop packets.
B	7	rw	**BYPASS** Bypass Tag/Untag function. 0_B Disable. 1_B Enable to bypass Tag/Untag function
Res	6	rw	**Reserved**
MCEB	5	rw	**MAC Clone Enable Bits Select** 0_B Select 1 bit MAC Clone function. 1_B Select 2 bits MAC Clone function.
Res	4:0	rw	**Reserved**

Basic Bandwidth Control Register 0

BBC0 — **Basic Bandwidth Control Register 0**

Offset 31_H

Reset Value 0000_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
R3BW_TH1	R3BW_TH0			R2BW_TH1	R2BW_TH0			R1BW_TH1	R1BW_TH0			R0BW_TH1	R0BW_TH0		
rw	rw			rw	rw			rw	rw			rw	rw		

Field	Bits	Type	Description
R3BW_TH1	15	rw	**Port 3 Receive Bandwidth Maximum[3].** See register 0033_H, **P3RBCE** for more detail.
R3BW_TH0	14:12	rw	**Port 3 Receive Bandwidth Configuration** See register 0033_H, **P3RBCE** for more detail.
R2BW_TH1	11	rw	**Port 2 Receive Bandwidth Maximum[3].** See register 0033_H, **P2RBCE** for more detail.
R2BW_TH0	10:8	rw	**Port 2 Receive Bandwidth Configuration** See register 0033_H, **P2RBCE** for more detail.
R1BW_TH1	7	rw	**Port 1 Receive Bandwidth Maximum[3].** See register 0033_H, **P1RBCE** for more detail.
R1BW_TH0	6:4	rw	**Port 1 Receive Bandwidth Configuration** See register 0033_H, **P1RBCE** for more detail.
R0BW_TH1	3	rw	**Port 0 Receive Bandwidth Maximum[3].** See register 0033_H, **P0RBCE** for more detail.
R0BW_TH0	2:0	rw	**Port 0 Receive Bandwidth Configuration** See register 0033_H, **P0RBCE** for more detail.

Basic Bandwidth Control Register 1

BBC1 — **Basic Bandwidth Control Register 1**

Offset 32_H

Reset Value 0000_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T1BW_TH1	T1BW_TH0			T0BW_TH1	T0BW_TH0			R5BW_TH1	R5BW_TH0			R4BW_TH1	R4BW_TH0		
rw	rw			rw	rw			rw	rw			rw	rw		

Field	Bits	Type	Description
T1BW_TH1	15	rw	**Port 1 Transmit Bandwidth Maximum[3].** See register 0033_H, **P1TBCE** for more detail.

Field	Bits	Type	Description
T1BW_TH0	14:12	rw	**Port 1 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P1TBCE** for more detail.
T0BW_TH1	11	rw	**Port 0 Transmit Bandwidth Maximum[3].** See register 0033_H, **P0TBCE** for more detail.
T0BW_TH0	10:8	rw	**Port 0 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P0TBCE** for more detail.
R5BW_TH1	7	rw	**Port 5 Receive Bandwidth Maximum[3].** See register 0033_H, **P5RBCE** for more detail.
R5BW_TH0	6:4	rw	**Port 5 Receive Bandwidth Configuration** See register 0033_H, **P5RBCE** for more detail.
R4BW_TH1	3	rw	**Port 4 Receive Bandwidth Maximum[3].** See register 0033_H, **P4RBCE** for more detail.
R4BW_TH0	2:0	rw	**Port 4 Receive Bandwidth Configuration** See register 0033_H, **P4RBCE** for more detail.

Bandwidth Control Enable Register

BCE	Offset	Reset Value
Bandwidth Control Enable Register	**33_H**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IPCP	**CLC**	Res	**ANBCE**	**P5TBCE**	**P4TBCE**	**P3TBCE**	**P5RBCE**	**P4RBCE**	**P3RBCE**	**P2TBCE**	**P2RBCE**	**P1TBCE**	**P1RBCE**	**P0TBCE**	**P0RBCE**
rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
IPCP	15	rw	**Invert P4 Clock in PCS** 0_D Disable 1_D Enable
CLC	14	rw	**Check the Length of CRS** 0_D Enable 1_D Disable
Res	13	rw	**Reserved**
ANBCE	12	rw	**ADM6996LC/LCX/LHX New Bandwidth Control Enable** 0_B Disable 1_B Enable
P5TBCE	11	rw	**Port 5 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T5BW_TH3**, **T5BW_TH2**, **T5BW_TH1**, **T5BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable

Field	Bits	Type	Description
P4TBCE	10	rw	**Port 4 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T4BW_TH3**, **T4BW_TH2**, **T4BW_TH1**, **T4BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P3TBCE	9	rw	**Port 3 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T3BW_TH3**, **T3BW_TH2**, **T3BW_TH1**, **T3BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P5RBCE	8	rw	**Port 5 Receive Bandwidth Control Enable** The receive bandwidth is {**R5BW_TH3**, **R5BW_TH2**, **R5BW_TH1**, **R5BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P4RBCE	7	rw	**Port 4 Receive Bandwidth Control Enable** The receive bandwidth is {**R4BW_TH3**, **R4BW_TH2**, **R4BW_TH1**, **R4BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P3RBCE	6	rw	**Port 3 Receive Bandwidth Control Enable** The receive bandwidth is {**R3BW_TH3**, **R3BW_TH2**, **R3BW_TH1**, **R3BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P2TBCE	5	rw	**Port 2 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T2BW_TH3**, **T2BW_TH2**, **T2BW_TH1**, **T2BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P2RBCE	4	rw	**Port 2 Receive Bandwidth Control Enable** The receive bandwidth is {**R2BW_TH3**, **R2BW_TH2**, **R2BW_TH1**, **R2BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P1TBCE	3	rw	**Port 1 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T1BW_TH3**, **T1BW_TH2**, **T1BW_TH1**, **T1BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P1RBCE	2	rw	**Port 1 Receive Bandwidth Control Enable** The receive bandwidth is {**R1BW_TH3**, **R1BW_TH2**, **R1BW_TH1**, **R1BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable

Field	Bits	Type	Description
P0TBCE	1	rw	**Port 0 Transmit Bandwidth Control Enable** The transmit bandwidth is {**T0BW_TH3**, **T0BW_TH2**, **T0BW_TH1**, **T0BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable
P0RBCE	0	rw	**Port 0 Receive Bandwidth Control Enable** The receive bandwidth is {**R0BW_TH3**, **R0BW_TH2**, **R0BW_TH1**, **R0BW_TH0**, 000000_B} kbit/s. K = 1000. 0_B Disable 1_B Enable

Extended Bandwidth Control Register 0

EBC0	Offset	Reset Value
Extended Bandwidth Control Register 0	**34_H**	**0000_H**

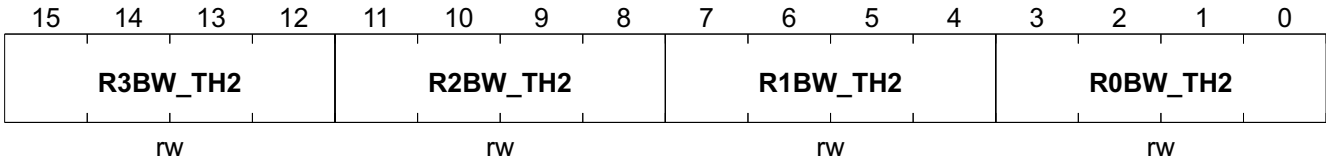
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
T5BW_TH1	**T5BW_TH0**			**T4BW_TH1**	**T4BW_TH0**			**T3BW_TH1**	**T3BW_TH0**			**T2BW_TH1**	**T2BW_TH0**		
rw	rw			rw	rw			rw	rw			rw	rw		

Field	Bits	Type	Description
T5BW_TH1	15	rw	**Port 5 Transmit Bandwidth Maximum[3].** See register 0033_H, **P5TBCE** for more detail.
T5BW_TH0	14:12	rw	**Port 5 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P5TBCE** for more detail.
T4BW_TH1	11	rw	**Port 4 Transmit Bandwidth Maximum[3].** See register 0033_H, **P4TBCE** for more detail.
T4BW_TH0	10:8	rw	**Port 4 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P4TBCE** for more detail.
T3BW_TH1	7	rw	**Port 3 Transmit Bandwidth Maximum[3].** See register 0033_H, **P3TBCE** for more detail.
T3BW_TH0	6:4	rw	**Port 3 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P3TBCE** for more detail.
T2BW_TH1	3	rw	**Port 2 Transmit Bandwidth Maximum[3].** See register 0033_H, **P2TBCE** for more detail.
T2BW_TH0	2:0	rw	**Port 2 Transmit Bandwidth Maximum[2:0].** See register 0033_H, **P2TBCE** for more detail.

Extended Bandwidth Control Register 1

EBC1 **Offset** **Reset Value**

Extended Bandwidth Control Register 1 **35_H** **0000_H**

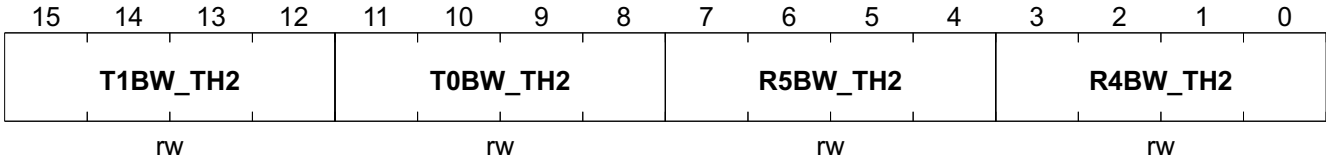


Field	Bits	Type	Description
R3BW_TH2	15:12	rw	**Port 3 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P3RBCE** for more detail.
R2BW_TH2	11:8	rw	**Port 2 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P2RBCE** for more detail.
R1BW_TH2	7:4	rw	**Port 1 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P1RBCE** for more detail.
R0BW_TH2	3:0	rw	**Port 0 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P0RBCE** for more detail.

Extended Bandwidth Control Register 2

EBC2 **Offset** **Reset Value**

Extended Bandwidth Control Register 2 **36_H** **0000_H**

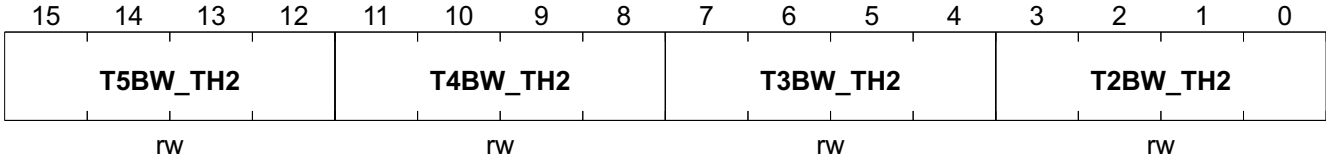


Field	Bits	Type	Description
T1BW_TH2	15:12	rw	**Port 1 Transmit Bandwidth Maximum[7:4]** See register 0033_H, **P1TBCE** for more detail.
T0BW_TH2	11:8	rw	**Port 0 Transmit Bandwidth Maximum[7:4].** See register 0033_H, **P0TBCE** for more detail.
R5BW_TH2	7:4	rw	**Port 5 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P5RBCE** for more detail.
R4BW_TH2	3:0	rw	**Port 4 Receive Bandwidth Maximum[7:4].** See register 0033_H, **P4RBCE** for more detail.

Extended Bandwidth Control Register 3

EBC3 **Offset** **Reset Value**

Extended Bandwidth Control Register 3 **37_H** **0000_H**

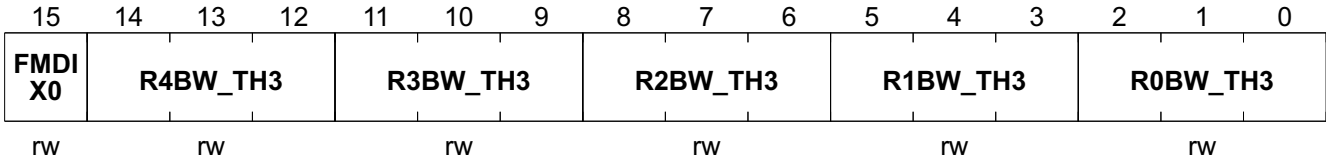


Field	Bits	Type	Description
T5BW_TH2	15:12	rw	**Port 5 Transmit Bandwidth Maximum[7:4].** See register 0033_H, **P5TBCE** for more detail.
T4BW_TH2	11:8	rw	**Port 4 Transmit Bandwidth Maximum[7:4].** See register 0033_H, **P4TBCE** for more detail.
T3BW_TH2	7:4	rw	**Port 3 Transmit Bandwidth Maximum[7:4].** See register 0033_H, **P3TBCE** for more detail.
T2BW_TH2	3:0	rw	**Port 2 Transmit Bandwidth Maximum[7:4].** See register 0033_H, **P2TBCE** for more detail.

Extended Bandwidth Control Register 4

EBC4 **Offset** **Reset Value**

Extended Bandwidth Control Register 4 **38_H** **0000_H**

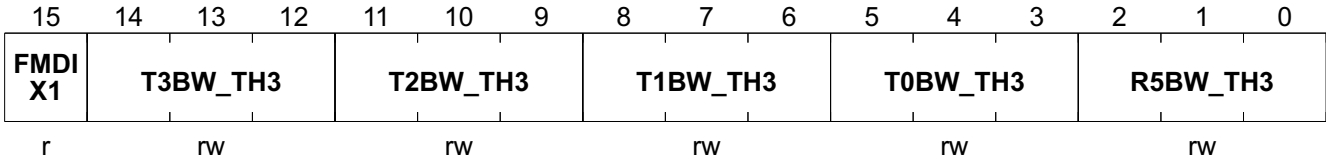


Field	Bits	Type	Description
FMDIX0	15	rw	**Port 0 MDIX Control** This bit can be used for Port 0 MDI/MDIX selection. It is useful when Port 0 Crossover Auto Detect is disabled and 16 bits management interface (SDC/SDIO) is used. 0_B Using MDI 1_B Using MDIX
R4BW_TH3	14:12	rw	**Port 4 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P4RBCE** for more detail.
R3BW_TH3	11:9	rw	**Port 3 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P3RBCE** for more detail.
R2BW_TH3	8:6	rw	**Port 2 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P2RBCE** for more detail.
R1BW_TH3	5:3	rw	**Port 1 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P1RBCE** for more detail.

Field	Bits	Type	Description
R0BW_TH3	2:0	rw	**Port 0 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P0RBCE** for more detail.

Extended Bandwidth Control Register 5

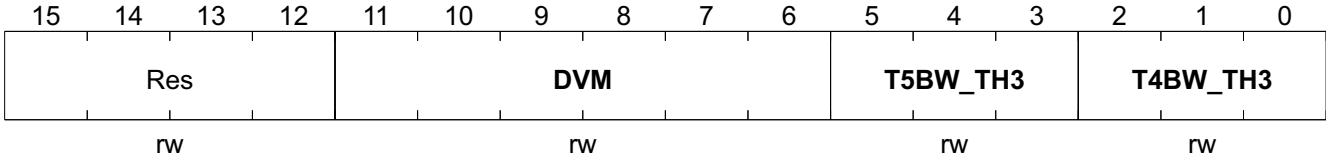
EBC5	Offset	Reset Value
Extended Bandwidth Control Register 5	**39_H**	**0000_H**



Field	Bits	Type	Description
FMDIX1	15	r	**Port 1 MDIX Control** This bit can be used for Port 1 MDI/MDIX selection. It is useful when Port 1 Crossover Auto Detect is disabled and 16 bits management interface (SDC/SDIO) is used. 0_B Using MDI 1_B Using MDIX
T3BW_TH3	14:12	rw	**Port 3 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P3TBCE** for more detail.
T2BW_TH3	11:9	rw	**Port 2 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P2TBCE** for more detail.
T1BW_TH3	8:6	rw	**Port 1 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P1TBCE** for more detail.
T0BW_TH3	5:3	rw	**Port 0 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P0TBCE** for more detail.
R5BW_TH3	2:0	rw	**Port 5 Receive Bandwidth Maximum[10:8].** See register 0033_H, **P5RBCE** for more detail.

Default VLAN Member and Extended Bandwidth Control Register 6

DVMEBC6	Offset	Reset Value
Default VLAN Member and Extended Bandwidth Control Register 6	**$3A_H$**	**$0FC0_H$**



Field	Bits	Type	Description
Res	15:12	rw	**Reserved**
DVM	11:6	rw	**Default VLAN Member** Always 111111_B
T5BW_TH3	5:3	rw	**Port 5 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P5TBCE** for more detail.
T4BW_TH3	2:0	rw	**Port 4 Transmit Bandwidth Maximum[10:8].** See register 0033_H, **P4TBCE** for more detail.

New Storm Register 0

NS0 **Offset** **Reset Value**

New Storm Register 0 **$3B_H$** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res	STORM_D*	STORM_EN	STORM_100_TH												
r	rw	rw	rw												

Field	Bits	Type	Description
Res	15	r	**Reserved**
STORM_DROP_EN	14	rw	**Storm Drop Enable** 0_B Do not drop in the storming period 1_B Drop in the storming period
STORM_EN	13	rw	**Storm Enable** 0_B Disable ADM6996LC/LCX/LHX style broadcast storm protection 1_B Enable ADM6996LC/LCX/LHX style broadcast storm protection
STORM_100_TH	12:0	rw	**100M Threshold** See **Table 31** for more detail information. It is used when all ports link up in the 100M. The upper bound is reached when the number of the packets received during the 50 ms is over 100M Threshold.

New Storm Register 1

NS1 **Offset** **Reset Value**

New Storm Register 1 **$3C_H$** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FMDIX4	FMDIX3	FMDIX2	STORM_10_TH												
rw	rw	rw	rw												

Field	Bits	Type	Description
FMDIX4	15	rw	**Port 4 MDIX Control** This bit can be used for Port 4 MDI/MDIX selection. It is useful when Port 4 Crossover Auto Detect is disabled and 16 bits management interface (SDC/SDIO) is used. 0_B Using MDI 1_B Using MDIX
FMDIX3	14	rw	**Port 3 MDIX Control** This bit can be used for Port 3 MDI/MDIX selection. It is useful when Port 3 Crossover Auto Detect is disabled and 16 bits management interface (SDC/SDIO) is used. 0_B Using MDI 1_B Using MDIX
FMDIX2	13	rw	**Port 2 MDIX Control** This bit can be used for Port 2 MDI/MDIX selection. It is useful when Port 2 Crossover Auto Detect is disabled and 16 bits management interface (SDC/SDIO) is used. 0_B Using MDI 1_B Using MDIX
STORM_10_TH	12:0	rw	**10M Threshold** See Table 31 for more detail information. It is used when one of ports link up in the 10M. The upper bound is reached when the number of the packets received during the 50 ms is over 10M Threshold.

New Reserve Address Control Register 0

NRAC0 **Offset** **Reset Value**

New Reserve Address Control Register 0 **$3D_H$** **$00FD_H$**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NRTB		PG		PRI_S		PRI_B		R3PP	R2PP	GPP	R1PP	R0PP	PPP	SPP	BPP
rw		rw		rw		rw		rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
NRTB	15:14	rw	**New Reserve TXTAG for BPDU** 00_B System Default Tag 01_B Unmodified 10_B Always Tagged 11_B Always Untagged
PG	13:12	rw	**PRI for GXRP** 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3

Field	Bits	Type	Description
PRI_S	11:10	rw	**PRI for SLOW/PAE/RESER_R0/RESER_R1/RESER_R2/RESER_R3** 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3
PRI_B	9:8	rw	**PRI for BPDU** 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3
R3PP	7	rw	**RESER_R3 Pass Portmap** 0_B RESER_R3 Pass Portmap is 000000_B 1_B RESER_R3 Pass Pormap is 111111_B
R2PP	6	rw	**RESER_R2 Pass Portmap** 0_B RESER_R2 Pass Portmap is 000000_B 1_B RESER_R2 Pass Pormap is 111111_B
GPP	5	rw	**GXRP Pass Portmap** 0_B GXRP Pass Portmap is 000000_B 1_B GXRP Pass Pormpap is 111111_B
R1PP	4	rw	**RESER_R1 Pass Portmap** 0_B RESER_R1 Pass Portmap is 000000_B 1_B RESER_R1 Pass Portmap is 111111_B
R0PP	3	rw	**RESER_R0 Pass Portmap** 0_B RESER_R0 Pass Portmap is 000000_B 1_B RESER_R0 Pass Portmap is 111111_B
PPP	2	rw	**PAE Pass Portmap** 0_B PAE Pass Portmap is 000000_B 1_B PAE Pass Portpap is 111111_B
SPP	1	rw	**Slow Pass Portmap** 0_B SLOW Pass Portmap is 000000_B 1_B SLOW Pass Portpap is 111111_B
BPP	0	rw	**BPDU Pass Portmap** 0_B BPDU Pass Portmap is 000000_B 1_B BPDU Pass Portpap is 111111_B

New Reserve Address Control Register 1

NRAC1	Offset	Reset Value
New Reserve Address Control Register 1	**$3E_H$**	**0000_H**

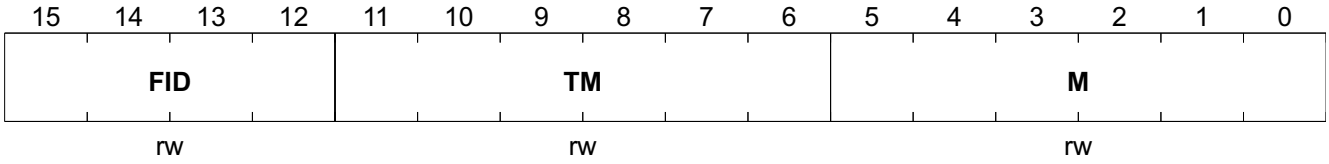
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res			NRMG	NRMS	MRMB	NRSG	NRSS	NRSB	NRCG	NRCS	NRCB	NRTG		NRTS	
rw			rw	rw	rw	rw	rw	rw	rw	rw	rw	rw		rw	

Field	Bits	Type	Description
Res	15:13	rw	**Reserved**
NRMG	12	rw	**New Reserve Management for GXRP** 0_B Do not identify as management packets 1_B Identify as management packets
NRMS	11	rw	**New Reserve Management for SLOW/PAE/RESER_R0/RESER_R1/RESER_R2/RESER_R3** 0_B Do not identify as management packets 1_B Identify as management packets
MRMB	10	rw	**New Reserve Management for BPDU** 0_B Do not identify as management packets 1_B Identify as management packets
NRSG	9	rw	**New Reserve Span.for GXRP** 0_B Do not identify as management packets 1_B Identify as management packets
NRSS	8	rw	**New Reserve Span for SLOW/PAE/RESER_R0/RESER_R1/RESER_R2/RESER_R3** 0_B Do not identify as span packets 1_B Identify as span packets
NRSB	7	rw	**New Reserve SPAN for BPDU** 0_B Do not identify as span packets 1_B Identify as span packets
NRCG	6	rw	**New Reserve Cross_VLAN for GXRP** 0_B Follow VLAN 1_B Cross VLAN
NRCS	5	rw	**New Reserve Cross_VLAN. for SLOW/PAE/RESER_R0/RESER_R1/RESER_R2/RESER_R3** 0_B Follow VLAN 1_B Cross VLAN
NRCB	4	rw	**New Reserve Cross_VLAN for BPDU** 0_B Follow VLAN 1_B Cross VLAN
NRTG	3:2	rw	**New Reserve TXTAG for GXRP** 00_B System Default Tag 01_B Unmodified 10_B Always Tagged 11_B Always Untagged
NRTS	1:0	rw	**New Reserve TXTAG for SLOW/PAE/RESER_R0/RESER_R1/RESER_R2/RESER_R3** 00_B System Default Tag 01_B Unmodified 10_B Always Tagged 11_B Always Untagged

5.2 EEPROM Extended Registers

VLAN Filter 0 Low

VF0L	Offset	Reset Value
VLAN Filter 0 Low	40_H	$003F_H$



Field	Bits	Type	Description
FID	15:12	rw	**FID** The forwarding or learning group that the VID is assigned.
TM	11:6	rw	**Tagged Member** These bits indicate which ports associated with the VID should transmit tagged packets.Tagged Member[x] Description. 0_B Port x should transmit untagged packets 1_B Port x should transmit tagged packets
M	5:0	rw	**Member** These bits indicate which ports are the members of the VLAN.Member[x] Description. 0_B Port x is not a VLAN member 1_B Port x is a VLAN member

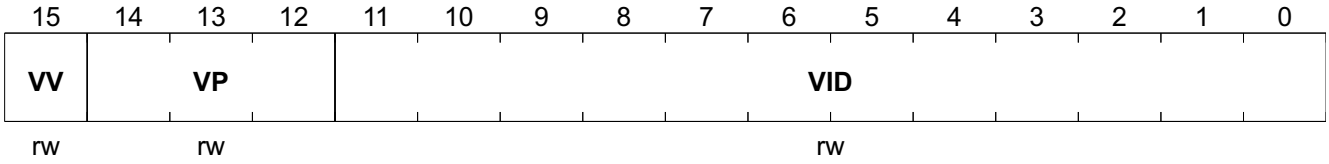
Similar Registers

Table 40 VFxL Registers

Register Short Name	Register Long Name	Offset Address	Page Number
VF1L	VLAN Filter 1 Low	42_H	
VF2L	VLAN Filter 2 Low	44_H	
VF3L	VLAN Filter 3Low	46_H	
VF4L	VLAN Filter 4 Low	48_H	
VF5L	VLAN Filter 5 Low	$4A_H$	
VF6L	VLAN Filter 6 Low	$4C_H$	
VF7L	VLAN Filter 7 Low	$4E_H$	
VF8L	VLAN Filter 8 Low	50_H	
VF9L	VLAN Filter 9 Low	52_H	
VF10L	VLAN Filter 10 Low	54_H	
VF11L	VLAN Filter 11 Low	56_H	
VF12L	VLAN Filter 12 Low	58_H	
VF13L	VLAN Filter 13 Low	$5A_H$	
VF14L	VLAN Filter 14 Low	$5C_H$	
VF15L	VLAN Filter 15 Low	$5E_H$	

VLAN Filter 0 High

VF0H	Offset	Reset Value
VLAN Filter 0 High	41_H	8001_H



Field	Bits	Type	Description
VV	15	rw	**VLAN_Valid** 0_B VLAN filter is not valid 1_B VLAN Filter is valid
VP	14:12	rw	**VLAN PRI** It indicates the VLAN priority associated with VID.
VID	11:0	rw	**VID** It indicates the VLAN ID that is associated with FID, Tagged Member, Member and VLAN PRI.

Similar Registers

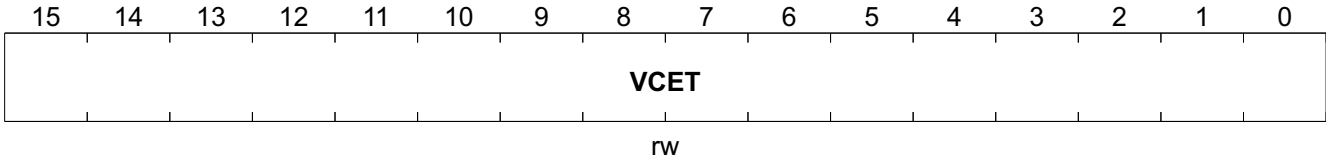
All VFxH registers have the same structure and characteristics, see **VF0H**.
The offset addresses of the other VFxH registers are listed in **Table 41**.

Table 41 VFxH Registers

Register Short Name	Register Long Name	Offset Address	Page Number
VF1H	VLAN Filter 1 High	43_H	
VF2H	VLAN Filter 2 High	45_H	
VF3H	VLAN Filter 3 High	47_H	
VF4H	VLAN Filter 4 High	49_H	
VF5H	VLAN Filter 5 High	$4B_H$	
VF6H	VLAN Filter 6 High	$4D_H$	
VF7H	VLAN Filter 7 High	$4F_H$	
VF8H	VLAN Filter 8 High	51_H	
VF9H	VLAN Filter 9 High	53_H	
VF10H	VLAN Filter 10 High	55_H	
VF11H	VLAN Filter 11 High	57_H	
VF12H	VLAN Filter 12 High	59_H	
VF13H	VLAN Filter 13 High	$5B_H$	
VF14H	VLAN Filter 14 High	$5D_H$	
VF15H	VLAN Filter 15 High	$5F_H$	

Type Filter 0

TF0	Offset	Reset Value
Type Filter 0	60_H	0000_H



Field	Bits	Type	Description
VCET	15:0	rw	**Value Compared with Ether-Type**

Similar Registers

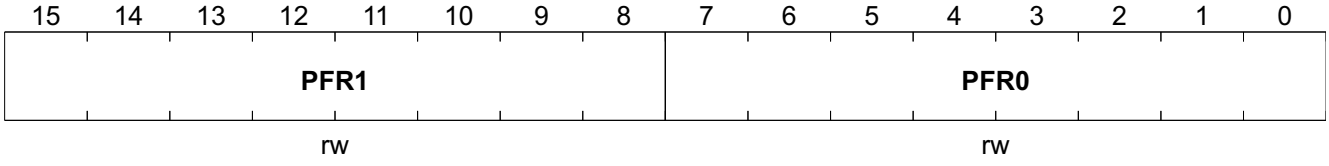
All TFx registers have the same structure and characteristics, see **TF0**.
The offset addresses of the other TFx registers are listed in **Table 42**.

Table 42 TFx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
TF1	Type Filter 1	61_H	
TF2	Type Filter 2	62_H	
TF3	Type Filter 3	63_H	
TF4	Type Filter 4	64_H	
TF5	Type Filter 5	65_H	
TF6	Type Filter 6	66_H	
TF7	Type Filter 7	67_H	

Protocol Filter 1 and 0

PF_1_0	Offset	Reset Value
Protocol Filter 1 and 0	68_H	0000_H



Field	Bits	Type	Description
PFR1	15:8	rw	**Value Compared with Protocol in IP Header** (Protocol Filter 1, 3, 5, 7)

Field	Bits	Type	Description
PFR0	7:0	rw	**Value Compared with Protocol in IP Header** (Protocol Filter 0, 2, 4, 6)

Similar Registers

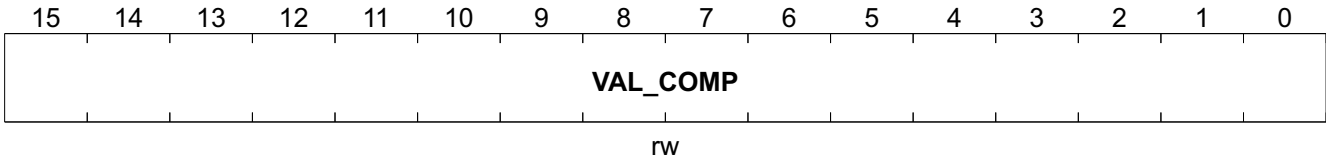
All PFx registers have the same structure and characteristics, see **PF_1_0**.
The offset addresses of the other PFx registers are listed in **Table 43**.

Table 43 PFx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
PF_3_2	Protocol Filter 3 and 2	68_H	
PF_5_4	Protocol Filter 5 and 4	69_H	
PF_7_6	Protocol Filter 7 and 6	$6A_H$	

TCP/UDP Filter 0

TUF0 **Offset** **Reset Value**
TCP/UDP Filter 0 **$8C_H$** **0000_H**



Field	Bits	Type	Description
VAL_COMP	15:0	rw	**Value Compared with the Destination Port Number in the TCP/UDP Header**

Similar Registers

All TUFx registers have the same structure and characteristics, see **TUF0**.
The offset addresses of the other TUFx registers are listed in **Table 46**.

Table 44 TUFx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
TUF1	TCP/UDP Filter 1	$8D_H$	
TUF2	TCP/UDP Filter 2	$8E_H$	
TUF3	TCP/UDP Filter 3	$8F_H$	
TUF4	TCP/UDP Filter 4	90_H	
TUF5	TCP/UDP Filter 5	91_H	
TUF6	TCP/UDP Filter 6	92_H	
TUF7	TCP/UDP Filter 7	93_H	

Type Filter Action

TFA	Offset	Reset Value
Type Filter Action	94_H	0000_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATF7		ATF6		ATF5		ATF4		ATF3		ATF2		ATF1		ATF0	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
ATF7	15:14	rw	**Action for Type Filter 7** See register 0094_H, **ATF0** for more detail.
ATF6	13:12	rw	**Action for Type Filter 6** See register 0094_H, **ATF0** for more detail.
ATF5	11:10	rw	**Action for Type Filter 5** See register 0094_H, **ATF0** for more detail.
ATF4	9:8	rw	**Action for Type Filter 4** See register 0094_H, **ATF0** for more detail.
ATF3	7:6	rw	**Action for Type Filter 3** See register 0094_H, **ATF0** for more detail.
ATF2	5:4	rw	**Action for Type Filter 2** See register 0094_H, **ATF0** for more detail.
ATF1	3:2	rw	**Action for Type Filter 1** See register 0094_H, **ATF0** for more detail.
ATF0	1:0	rw	**Action for Type Filter 0** 00_B Type Portmap is Default Output Ports 01_B Type Portmap is 000000_B 10_B Type Portmap is the CPU port if the incoming port is not the CPU port. But if the incoming port is the CPU port, then Type Portmap contains Defa ult Output Ports , excluding the CPU port 11_B Type Portmap contains Defa ult Output Ports , excluding the CPU port

Protocol Filter Action

PFA	Offset	Reset Value
Protocol Filter Action	95_H	0000_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
APF7		APF6		APF5		APF4		APF3		APF2		APF1		APF0	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
APF7	15:14	rw	**Action for Protocol Filter 7** See register 0095_H, **APF0** for more detail.
APF6	13:12	rw	**Action for Protocol Filter 6** See register 0095_H, **APF0** for more detail.
APF5	11:10	rw	**Action for Protocol Filter 5** See register 0095_H, **APF0** for more detail.
APF4	9:8	rw	**Action for Protocol Filter 4** See register 0095_H, **APF0** for more detail.
APF3	7:6	rw	**Action for Protocol Filter 3** See register 0095_H, **APF0** for more detail.
APF2	5:4	rw	**Action for Protocol Filter 2** See register 0095_H, **APF0** for more detail.
APF1	3:2	rw	**Action for Protocol Filter 1** See register 0095_H, **APF0** for more detail.
APF0	1:0	rw	**Action for Protocol Filter 0** 00_B Protocol Portmap is Default Output Ports 01_B Protocol Portmap is 000000_B 10_B Protocol Portmap is the CPU port if the incoming port is not the CPU port. But if the incoming port is the CPU port, then Type Portmap contains Defa ult Output Ports , excluding the CPU port 11_B Protocol Portmap contains Defa ult Output Ports , excluding the CPU port

TCP/UDP Action 0

TUA0 **Offset** **Reset Value**
TCP/UDP Action 0 **96_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATUF3		TUPF3		ATUF2		TUPF2		ATUF1		TUPF1		ATUF0		TUPF0	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
ATUF3	15:14	rw	**Action for TCP/UDP Filter 3.** See register 0096_H, **ATUF0** for more detail.
TUPF3	13:12	rw	**TCP/UDP PRI for TCP/UDP Filter 3** See register 0096_H, **TUPF0** for more detail.
ATUF2	11:10	rw	**Action for TCP/UDP Filter 2** See register 0096_H, **ATUF0** for more detail.
TUPF2	9:8	rw	**TCP/UDP PRI for TCP/UDP Filter 2** See register 0096_H, **TUPF0** for more detail.

Field	Bits	Type	Description
ATUF1	7:6	rw	**Action for TCP/UDP Filter 1** See register 0096_H, **ATUF0** for more detail.
TUPF1	5:4	rw	**TCP/UDP PRI for TCP/UDP Filter 1** See register 0096_H, **TUPF0** for more detail.
ATUF0	3:2	rw	**Action for TCP/UDP Filter 0** 00_B Protocol Portmap is Default Output Ports 01_B Protocol Portmap is 000000_B 10_B Protocol Portmap is the CPU port if the incoming port is not the CPU port. But if the incoming port is the CPU port, then Type Portmap contains Defa ult Output Ports , excluding the CPU port 11_B Protocol Portmap contains Defa ult Output Ports , excluding the CPU port
TUPF0	1:0	rw	**TCP/UDP PRI for TCP/UDP Filter 0** 00_B Queue 0 01_B Queue 1 10_B Queue 2 11_B Queue 3

TCP/UDP Action 1

TUA1 **Offset** **Reset Value**

TCP/UDP Action 1 **97_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATUF7		**TUPF7**		**ATUF6**		**TUPF6**		**ATUF5**		**TUPF5**		**ATUF4**		**TUPF4**	
rw		rw		rw		rw		rw		rw		rw		rw	

Field	Bits	Type	Description
ATUF7	15:14	rw	**Action for TCP/UDP Filter 7** See register 0096_H, **ATUF0** for more detail.
TUPF7	13:12	rw	**TCP/UDP PRI for TCP/UDP Filter 7** See register 0096_H, **TUPF0** for more detail.
ATUF6	11:10	rw	**Action for TCP/UDP Filter 6** See register 0096_H, **ATUF0** for more detail.
TUPF6	9:8	rw	**TCP/UDP PRI for TCP/UDP Filter 6** See register 0096_H, **TUPF0** for more detail.
ATUF5	7:6	rw	**Action for TCP/UDP Filter 5** See register 0096_H, **ATUF0** for more detail.
TUPF5	5:4	rw	**TCP/UDP PRI for TCP/UDP Filter 5** See register 0096_H, **TUPF0** for more detail.
ATUF4	3:2	rw	**Action for TCP/UDP Filter 4** See register 0096_H, **ATUF0** for more detail.

Field	Bits	Type	Description
TUPF4	1:0	rw	**TCP/UDP PRI for TCP/UDP Filter 4** See register 0096_H, **TUPF0** for more detail.

TCP/UDP Action 2

TUA2 **Offset** **Reset Value**

TCP/UDP Action 2 **98_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res		**COMP**		**P5I**	**P4I**	**P3I**	**P2I**	**P1I**	**P0I**	**P5T**	**P4T**	**P3T**	**P2T**	**P1T**	**P0T**
r		rw		rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

Field	Bits	Type	Description
Res	15:14	r	**Reserved**
COMP	13:12	rw	**Compare TCP/UDP Source Port or Destination Port** 00_B Do not Compare 01_B Compare Destination Port 10_B Compare Source Port 11_B Compare Destination Port or Source Port
P5I	11	rw	**Port 5 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P4I	10	rw	**Port 4 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P3I	9	rw	**Port 3 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P2I	8	rw	**Port 2 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P1I	7	rw	**Port 1 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P0I	6	rw	**Port 0 IP over TCP/UDP** 0_B Use TCP/UDP field when packets contain both TCP/UDP and IP 1_B Use IP field when packets contain both TCP/UDP and IP
P5T	5	rw	**Port 5 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority
P4T	4	rw	**Port 4 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority

Field	Bits	Type	Description
P3T	3	rw	**Port 3 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority
P2T	2	rw	**Port 2 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority
P1T	1	rw	**Port 1 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority
P0T	0	rw	**Port 0 TCP/UDP PRIEN** 0_B Do not use TCP/UDP priority 1_B Use TCP/UDP priority

Interrupt Enable Register

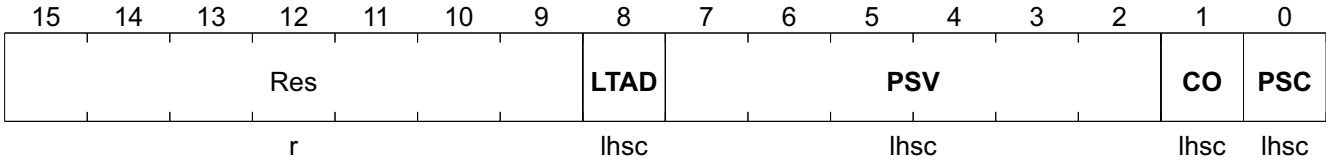
IE	Offset	Reset Value
Interrupt Enable Register	**$9A_H$**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res							LTAD IE	PSIE						COIE	PSIE
r							rw	rw						rw	rw

Field	Bits	Type	Description
Res	15:9	r	**Reserved**
LTADIE	8	rw	**Leaning Table Access Done Interrupt Enable** 0_B Interrupt disable 1_B Interrupt enable
PSIE	7:2	rw	**Port Security Interrupt Enable** It's a per port setting 0_B Interrupt disable 1_B Interrupt enable
COIE	1	rw	**Counter Overflow Interrupt Enable** 0_B Interrupt disable 1_B Interrupt enable
PSIE	0	rw	**Port Status Interrupt Enable** 0_B Interrupt disable 1_B Interrupt enable

Interrupt Status Register

IS	Offset	Reset Value
Interrupt Status Register	**$9B_H$**	**0000_H**

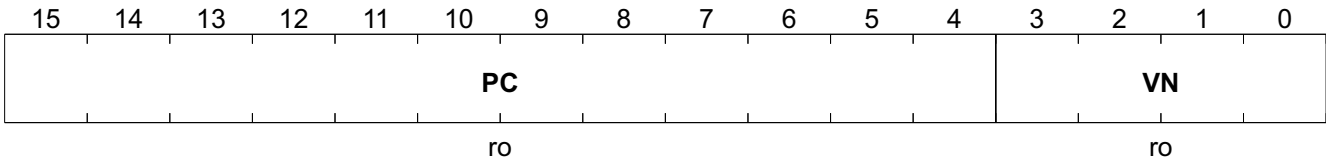


Field	Bits	Type	Description
Res	15:9	r	**Reserved**
LTAD	8	lhsc	**Leaning Table Access Done** 0_B Access does not end 1_B Access end
PSV	7:2	lhsc	**Port Security Violation** It's a per port setting 0_B Security did not violate 1_B Security violated
CO	1	lhsc	**Counter Overflow** 0_B Overflow did not happen 1_B Overflow happened for any of the counters
PSC	0	lhsc	**Port Status Change** 0_B No status (link, speed, duplex, flow control) changed for any port 1_B Status changed for any of 6 ports

5.3 Counter and Switch Status Registers

Chip Identifier 0

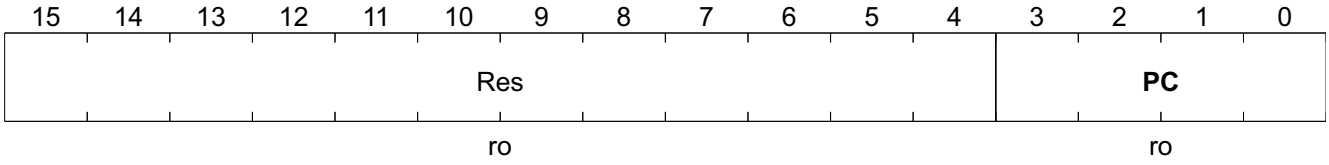
CI0	Offset	Reset Value
Chip Identifier 0	**$A0_H$**	**1022_H**



Field	Bits	Type	Description
PC	15:4	ro	**Product Code[11:0]**
VN	3:0	ro	**Version Number**

Chip Identifier 1

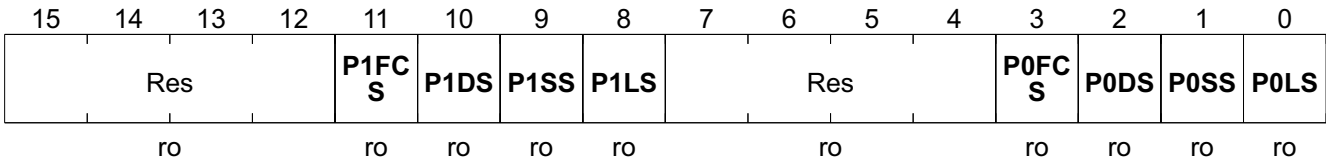
CI1	Offset	Reset Value
Chip Identifier 1	**$A1_H$**	**0007_H**



Field	Bits	Type	Description
Res	15:4	ro	**Reserved**
PC	3:0	ro	**Product Code[15:12]**

Port Status 0

PS0	Offset	Reset Value
Port Status 0	**$A2_H$**	**0000_H**



Field	Bits	Type	Description
Res	15:12	ro	**Reserved**
P1FCS	11	ro	**Port 1 Flow Control Status** 0_B Port 1 disables the Full Flow Control/Half Back Pressure Function 1_B Port 1 enabled the Full Flow Control/Half Back Pressure Function
P1DS	10	ro	**Port 1 Duplex Status** 0_B Port 1 operates in the Half Duplex 1_B Port 1 operates in the Full Duplex
P1SS	9	ro	**Port 1 Speed Status** 0_B Port 1 operates in the 10M 1_B Port 1 operates in the 100M
P1LS	8	ro	**Port 1 Link Status** 0_B Port 1 links down 1_B Port 1 links up
Res	7:4	ro	**Reserved**
P0FCS	3	ro	**Port 0 Flow Control Status** 0_B Port 0 disables the Full Flow Control/Half Back Pressure Function 1_B Port 0 enabled the Full Flow Control/Half Back Pressure Function
P0DS	2	ro	**Port 0 Duplex Status** 0_B Port 0 operates in the Half Duplex 1_B Port 0 operates in the Full Duplex
P0SS	1	ro	**Port 0 Speed Status** 0_B Port 0 operates in the 10M 1_B Port 0 operates in the 100M

Field	Bits	Type	Description
P0LS	0	ro	**Port 0 Link Status** 0_B Port 0 links down 1_B Port 0 links up

Port Status 1

PS1	Offset	Reset Value
Port Status 1	**$A3_H$**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P4FCS	**P4DS**	**P4SS**	**P4LS**	**P3FCS**	**P3DS**	**P3SS**	**P3LS**	Res				**P2FCS**	**P2DS**	**P2SS**	**P2LS**
ro	ro	ro	ro	ro	ro	ro	ro	ro				ro	ro	ro	ro

Field	Bits	Type	Description
P4FCS	15	ro	**Port 4 Flow Control Status** 0_B Port 4 disables the Full Flow Control/Half Back Pressure Function 1_B Port 4 enabled the Full Flow Control/Half Back Pressure Function
P4DS	14	ro	**Port 4 Duplex Status** 0_B Port 4 operates in the Half Duplex 1_B Port 4 operates in the Full Duplex
P4SS	13	ro	**Port 4 Speed Status** 0_B Port 4 operates in the 10M 1_B Port 4 operates in the 100M
P4LS	12	ro	**Port 4 Link Status** 0_B Port 4 links down 1_B Port 4 links up
P3FCS	11	ro	**Port 3 Flow Control Status** 0_B Port 3 disables the Full Flow Control/Half Back Pressure Function 1_B Port 3 enabled the Full Flow Control/Half Back Pressure Function
P3DS	10	ro	**Port 3 Duplex Status** 0_B Port 3 operates in the Half Duplex 1_B Port 3 operates in the Full Duplex
P3SS	9	ro	**Port 3 Speed Status** 0_B Port 3 operates in the 10M 1_B Port 3 operates in the 100M
P3LS	8	ro	**Port 3 Link Status** 0_B Port 3 links down 1_B Port 3 links up.
Res	7:4	ro	**Reserved**
P2FCS	3	ro	**Port 2 Flow Control Status** 0_B Port 2 disables the Full Flow Control/Half Back Pressure Function 1_B Port 2 enabled the Full Flow Control/Half Back Pressure Function

Field	Bits	Type	Description
P2DS	2	ro	**Port 2 Duplex Status** 0_B Port 2 operates in the Half Duplex 1_B Port 2 operates in the Full Duplex
P2SS	1	ro	**Port 2 Speed Status** 0_B Port 2 operates in the 10M 1_B Port 2 operates in the 100M
P2LS	0	ro	**Port 2 Link Status** 0_B Port 2 links down 1_B Port 2 links up

Port Status 2

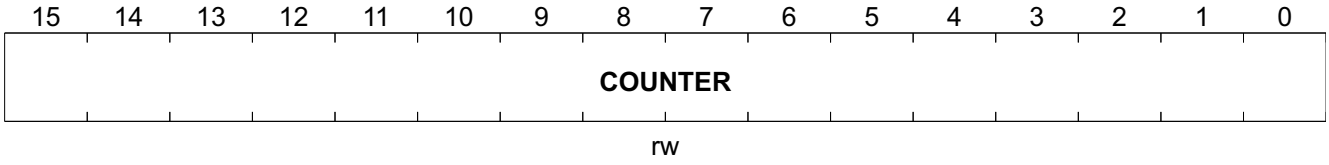
PS2	Offset	Reset Value
Port Status 2	**$A4_H$**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res											P5FCE	P5DS	Res	P5SS	P5LS
ro											ro	ro	ro	ro	ro

Field	Bits	Type	Description
Res	15:5	ro	**Reserved**
P5FCE	4	ro	**Port 5 Flow Control Enable** 0_B Port 5 disables the Full Flow Control/Half Back Pressure Function 1_B Port 5 enabled the Full Flow Control/Half Back Pressure Function
P5DS	3	ro	**Port 5 Duplex Status** 0_B Port 5 operates in the Half Duplex 1_B Port 5 operates in the Full Duplex
Res	2	ro	**Reserved**
P5SS	1	ro	**Port 5 Speed Status** 0_B Port 5 operates in the 10M 1_B Port 5 operates in the 100M
P5LS	0	ro	**Port 5 Link Status** 0_B Port 5 links down 1_B Port 5 links up

Counter Low 0

CL0	Offset	Reset Value
Port 0 Receive Packet Counter Low	**$A8_H$**	**0000_H**



Field	Bits	Type	Description
COUNTER	15:0	rw	**Counter[15:0]**

Similar Registers

All CLx registers have the same structure and characteristics, see **CL0**.
The offset addresses of the other CLx registers are listed in **Table 45**.

Table 45 CLx Registers

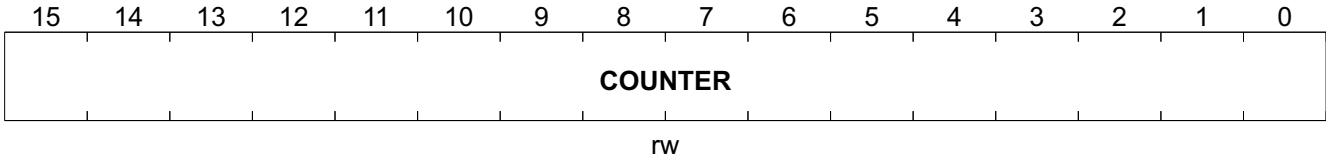
Register Short Name	Register Long Name	Offset Address	Page Number
CL1	Port 1 Receive Packet Counter Low	AC_H	
CL2	Port 2 Receive Packet Counter Low	$B0_H$	
CL3	Port 3 Receive Packet Counter Low	$B4_H$	
CL4	Port 4 Receive Packet Counter Low	$B6_H$	
CL5	Port 5 Receive Packet Counter Low	$B8_H$	
CL6	Port 0 Receive Packet Byte Count Low	BA_H	
CL7	Port 1 Receive Packet Byte Count Low	BE_H	
CL8	Port 2 Receive Packet Byte Count Low	$C2_H$	
CL9	Port 3 Receive Packet Byte Count Low	$C6_H$	
CL10	Port 4 Receive Packet Byte Count Low	$C8_H$	
CL11	Port 5 Receive Packet Byte Count Low	CA_H	
CL12	Port 0 Transmit Packet Count Low	CC_H	
CL13	Port 1 Transmit Packet Count Low	$D0_H$	
CL14	Port 2 Transmit Packet Count Low	$D4_H$	
CL15	Port 3 Transmit Packet Count Low	$D8_H$	
CL16	Port 4 Transmit Packet Count Low	DA_H	
CL17	Port 5 Transmit Packet Count Low	DC_H	
CL18	Port 0 Transmit Packet Byte Count Low	DE_H	
CL19	Port 1 Transmit Packet Byte Count Low	$E2_H$	
CL20	Port 2 Transmit Packet Byte Count Low	$E6_H$	
CL21	Port 3 Transmit Packet Byte Count Low	EA_H	
CL22	Port 4 Transmit Packet Byte Count Low	EC_H	
CL23	Port 5 Transmit Packet Byte Count Low	EE_H	
CL24	Port 0 Collision Count Low	$F0_H$	
CL25	Port 1 Collision Count Low	$F4_H$	
CL26	Port 2 Collision Count Low	$F8_H$	
CL27	Port 3 Collision Count Low	FC_H	
CL28	Port 4 Collision Count Low	FE_H	
CL29	Port 5 Collision Count Low	100_H	

Table 45 CLx Registers (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
CL30	Port 0 Error Count Low	102_H	
CL31	Port 1 Error Count Low	106_H	
CL32	Port 2 Error Count Low	$10A_H$	
CL33	Port 3 Error Count Low	$10E_H$	
CL34	Port 4 Error Count Low	110_H	
CL35	Port 5 Error Count Low	112_H	

Counter High 0

CH0	Offset	Reset Value
Port 0 Receive Packet Counter High	**$A9_H$**	**0000_H**



Field	Bits	Type	Description
COUNTER	15:0	rw	**Counter[31:16]**

Similar Registers

All CHx registers have the same structure and characteristics, see **CH0**.
The offset addresses of the other CLH registers are listed in **Table 46**.

Table 46 CHx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
CH1	Port 1 Receive Packet Counter High	AD_H	
CH2	Port 2 Receive Packet Counter High	$B1_H$	
CH3	Port 3 Receive Packet Counter High	$B5_H$	
CH4	Port 4 Receive Packet Counter High	$B7_H$	
CH5	Port 5 Receive Packet Counter High	$B9_H$	
CH6	Port 0 Receive Packet Byte Count High	BB_H	
CH7	Port 1 Receive Packet Byte Count High	BF_H	
CH8	Port 2 Receive Packet Byte Count High	$C3_H$	
CH9	Port 3 Receive Packet Byte Count High	$C7_H$	
CH10	Port 4 Receive Packet Byte Count High	$C9_H$	
CH11	Port 5 Receive Packet Byte Count High	CB_H	
CH12	Port 0 Transmit Packet Count High	CD_H	
CH13	Port 1 Transmit Packet Count High	$D1_H$	
CH14	Port 2 Transmit Packet Count High	$D5_H$	

Table 46 CHx Registers (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
CH15	Port 3 Transmit Packet Count High	$D9_H$	
CH16	Port 4 Transmit Packet Count High	DB_H	
CH17	Port 5 Transmit Packet Count High	DD_H	
CH18	Port 0 Transmit Packet Byte Count High	DF_H	
CH19	Port 1 Transmit Packet Byte Count High	$E3_H$	
CH20	Port 2 Transmit Packet Byte Count High	$E7_H$	
CH21	Port 3 Transmit Packet Byte Count High	EB_H	
CH22	Port 4 Transmit Packet Byte Count High	ED_H	
CH23	Port 5 Transmit Packet Byte Count High	EF_H	
CH24	Port 0 Collision Count High	$F1_H$	
CH25	Port 1 Collision Count High	$F5_H$	
CH26	Port 2 Collision Count High	$F9_H$	
CH27	Port 3 Collision Count High	FD_H	
CH28	Port 4 Collision Count High	FF_H	
CH29	Port 5 Collision Count High	101_H	
CH30	Port 0 Error Count High	103_H	
CH31	Port 1 Error Count High	107_H	
CH32	Port 2 Error Count High	$10B_H$	
CH33	Port 3 Error Count High	$10F_H$	
CH34	Port 4 Error Count High	111_H	
CH35	Port 5 Error Count High	113_H	

Over-Flow Flag 0

OFF0	Offset	Reset Value
Over-Flow Flag 0	**114_H**	**0000_H**

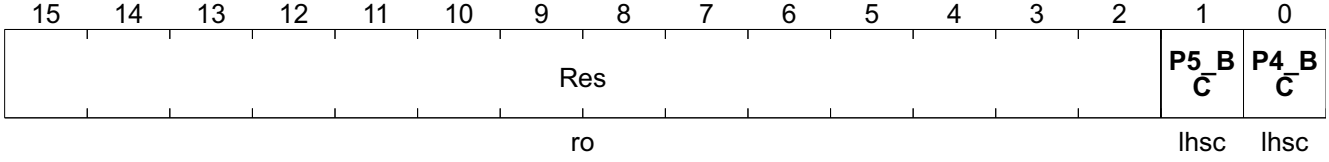
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P3_BC	Res	**P2_BC**	Res	**P1_BC**	Res	**P0_BC**	**P5_C**	**P4_C**	**P3_C**	Res	**P2_C**	Res	**P1_C**	Res	**P0_C**
lhsc	ro	lhsc	ro	lhsc	ro	lhsc	lhsc	lhsc	lhsc	ro	lhsc	ro	lhsc	ro	lhsc

Field	Bits	Type	Description
P3_BC	15	lhsc	**Overflow of Port 3 Receive Packet Byte Count** 0_B No overflow 1_B Overflow
Res	14	ro	**Reserved**
P2_BC	13	lhsc	**Overflow of Port 2 Receive Packet Byte Count** 0_B No overflow 1_B Overflow

Field	Bits	Type	Description
Res	12	ro	**Reserved**
P1_BC	11	lhsc	**Overflow of Port 1 Receive Packet Byte Count** 0_B No overflow 1_B Overflow
Res	10	ro	**Reserved**
P0_BC	9	lhsc	**Overflow of Port 0 Receive Packet Byte Count** 0_B No overflow 1_B Overflow
P5_C	8	lhsc	**Overflow of Port 5 Receive Packet Count** 0_B No overflow 1_B Overflow
P4_C	7	lhsc	**Overflow of Port 4 Receive Packet Count** 0_B No overflow 1_B Overflow
P3_C	6	lhsc	**Overflow of Port 3 Receive Packet Count** 0_B No overflow 1_B Overflow
Res	5	ro	**Reserved**
P2_C	4	lhsc	**Overflow of Port 2 Receive Packet Count** 0_B No overflow 1_B Overflow
Res	3	ro	**Reserved**
P1_C	2	lhsc	**Overflow of Port 1 Receive Packet Count** 0_B No overflow 1_B Overflow
Res	1	ro	**Reserved**
P0_C	0	lhsc	**Overflow of Port 0 Receive Packet Count** 0_B No overflow 1_B Overflow

Over-Flow Flag 1

OFF1	Offset	Reset Value
Over-Flow Flag 1	**115_H**	**0000_H**



Field	Bits	Type	Description
Res	15:2	ro	**Reserved**

Field	Bits	Type	Description
P5_BC	1	lhsc	**Overflow of Port 5 Receive Packet Byte Count** 0_B No overflow 1_B Overflow
P4_BC	0	lhsc	**Overflow of Port 4 Receive Packet Byte Count** 0_B No overflow 1_B Overflow

Over-Flow Flag 2

OFF2 **Offset** **Reset Value**
Over-Flow Flag 2 **116_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P3_BC	Res	**P2_BC**	Res	**P1_BC**	Res	**P0_BC**	**P5_C**	**P4_C**	**P3_C**	Res	**P2_C**	Res	**P1_C**	Res	**P0_C**
lhsc	ro	lhsc	ro	lhsc	ro	lhsc	lhsc	lhsc	lhsc	ro	lhsc	ro	lhsc	ro	lhsc

Field	Bits	Type	Description
P3_BC	15	lhsc	**Overflow of Port 3 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow
Res	14	ro	**Reserved**
P2_BC	13	lhsc	**Overflow of Port 2 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow
Res	12	ro	**Reserved**
P1_BC	11	lhsc	**Overflow of Port 1 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow
Res	10	ro	**Reserved**
P0_BC	9	lhsc	**Overflow of Port 0 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow
P5_C	8	lhsc	**Overflow of Port 5 Transmit Packet Count** 0_B No overflow 1_B Overflow
P4_C	7	lhsc	**Overflow of Port 4 Transmit Packet Count** 0_B No overflow 1_B Overflow
P3_C	6	lhsc	**Overflow of Port 3 Transmit Packet Count** 0_B No overflow 1_B Overflow
Res	5	ro	**Reserved**

Field	Bits	Type	Description
P2_C	4	lhsc	**Overflow of Port 2 Transmit Packet Count** 0_B No overflow 1_B Overflow
Res	3	ro	**Reserved**
P1_C	2	lhsc	**Overflow of Port 1 Transmit Packet Count** 0_B No overflow 1_B Overflow
Res	1	ro	**Reserved**
P0_C	0	lhsc	**Overflow of Port 0 Transmit Packet Count** 0_B No overflow 1_B Overflow

Over-Flow Flag 3

OFF3 **Offset** **Reset Value**
Over-Flow Flag 3 **117_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res														**P5_BC**	**P4_BC**
ro														lhsc	lhsc

Field	Bits	Type	Description
Res	15:2	ro	**Reserved**
P5_BC	1	lhsc	**Overflow of Port 5 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow
P4_BC	0	lhsc	**Overflow of Port 4 Transmit Packet Byte Count** 0_B No overflow 1_B Overflow

Over-Flow Flag 4

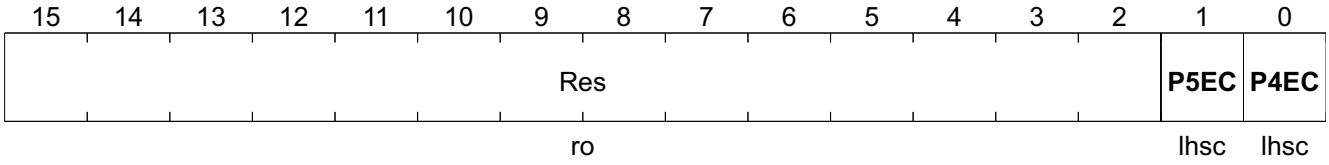
OFF4 **Offset** **Reset Value**
Over-Flow Flag 4 **118_H** **0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P3EC	Res	**P2EC**	Res	**P1EC**	Res	**P0EC**	**P5CC**	**P4CC**	**P3CC**	Res	**P2CC**	Res	**P1CC**	Res	**P0CC**
lhsc	ro	lhsc	ro	lhsc	ro	lhsc	lhsc	lhsc	lhsc	ro	lhsc	ro	lhsc	ro	lhsc

Field	Bits	Type	Description
P3EC	15	lhsc	**Overflow of Port 3 Error Count** 0_B No overflow 1_B Overflow
Res	14	ro	**Reserved**
P2EC	13	lhsc	**Overflow of Port 2 Error Count** 0_B No overflow 1_B Overflow
Res	12	ro	**Reserved**
P1EC	11	lhsc	**Overflow of Port 1 Error Count** 0_B No overflow 1_B Overflow
Res	10	ro	**Reserved**
P0EC	9	lhsc	**Overflow of Port 0 Error Count** 0_B No overflow 1_B Overflow
P5CC	8	lhsc	**Overflow of Port 5 Collision Count** 0_B No overflow 1_B Overflow
P4CC	7	lhsc	**Overflow of Port 4 Collision Count** 0_B No overflow 1_B Overflow
P3CC	6	lhsc	**Overflow of Port 3 Collision Count** 0_B No overflow 1_B Overflow
Res	5	ro	**Reserved**
P2CC	4	lhsc	**Overflow of Port 2 Collision Count** 0_B No overflow 1_B Overflow
Res	3	ro	**Reserved**
P1CC	2	lhsc	**Overflow of Port 1 Collision Count** 0_B No overflow 1_B Overflow
Res	1	ro	**Reserved**
P0CC	0	lhsc	**Overflow of Port 0 Collision Count** 0_B No overflow 1_B Overflow

Over-Flow Flag 5

OFF5	Offset	Reset Value
Over-Flow Flag 5	**119_H**	**0000_H**

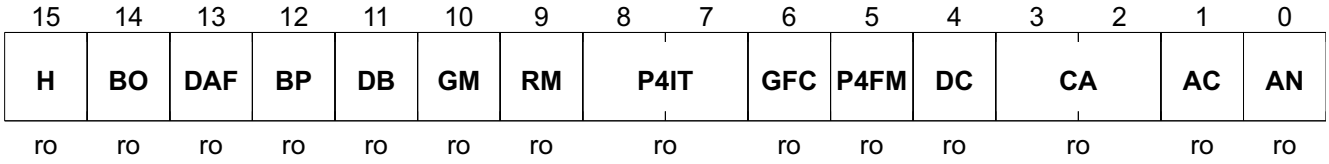


Field	Bits	Type	Description
Res	15:2	ro	**Reserved**
P5EC	1	lhsc	**Overflow of Port 5 Error Count** 0_B No overflow 1_B Overflow
P4EC	0	lhsc	**Overflow of Port 4 Error Count** 0_B No overflow 1_B Overflow

Hardware Setting Low Register

HSL **Offset** **Reset Value**

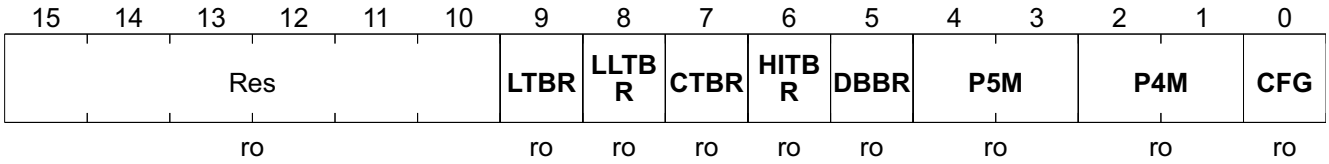
Hardware Setting Low Register **130_H** **0000_H**



Field	Bits	Type	Description
H	15	ro	**Resreved**
BO	14	ro	**Bond**
DAF	13	ro	**Disable ADM6996LC/LCX/LHX Function**
BP	12	ro	**BPEN**
DB	11	ro	**16/32 Bit Data Bus**
GM	10	ro	**GPSI Mode**
RM	9	ro	**RMII Mode**
P4IT	8:7	ro	**Port 4 Interface Type**
GFC	6	ro	**Global Flow Control**
P4FM	5	ro	**Port 4 Fiber Mode**
DC	4	ro	**Dual Color**
CA	3:2	ro	**Chip Address**
AC	1	ro	**Auto-Crossover**
AN	0	ro	**Auto-Negotiation**

Hardware Setting High Register

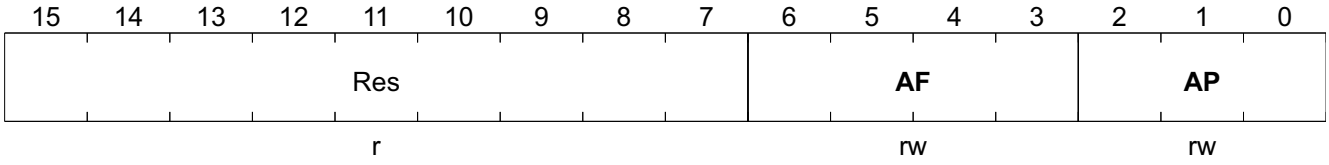
HSH	Offset	Reset Value
Hardware Setting High Register	131_H	0000_H



Field	Bits	Type	Description
Res	15:10	ro	**Reserved**
LTBR	9	ro	**Learning Table Bist Result** 0_B Work 1_B Do not Work
LLTBR	8	ro	**Linklist Table Bist Result** (Linklist Table does not do bist test in normal mode) 0_B Work 1_B Do not Work
CTBR	7	ro	**Control Table Bist Result** 0_B Work 1_B Do not Work
HITBR	6	ro	**Hardware IGMP Table Bist Result** 0_B Work 1_B Do not Work
DBBR	5	ro	**Data Buffer Bist Result** 0_B Work 1_B Do not Work
P5M	4:3	ro	**P5 Mode** 00_B GPSI 01_B RMII 10_B MII
P4M	2:1	ro	**P4 Mode** 00_B Port 4 uses inner PHY 01_B Port 4 uses MII 11_B Port 4 isolated PHY
CFG	0	ro	**CFG**

Assign Option Register

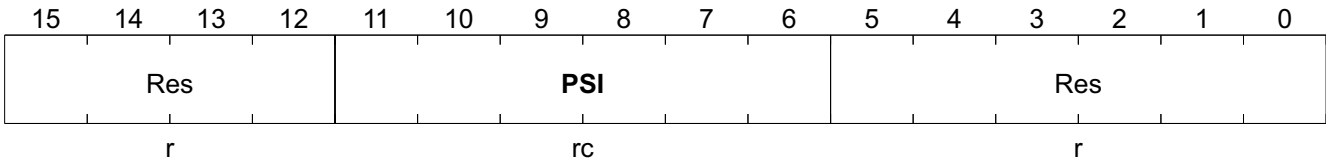
AO	Offset	Reset Value
Assign Option Register	135_H	0000_H



Field	Bits	Type	Description
Res	15:7	r	**Reserved**
AF	6:3	rw	**Assign Fid** It is used for assign lock FID.
AP	2:0	rw	**Assign Port** It is used for the port that the user wants to assign or for the monitor port.

Security Violation Port

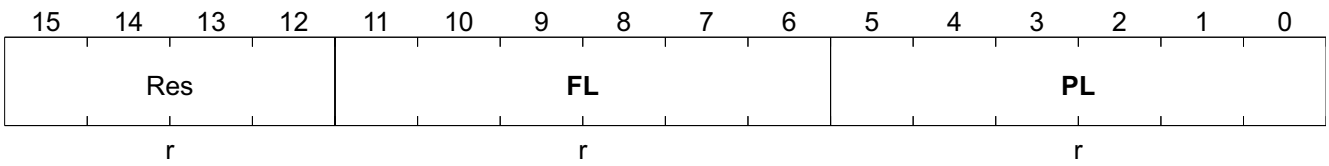
SVP	Offset	Reset Value
Security Violation Port	**138_H**	**0000_H**



Field	Bits	Type	Description
Res	15:12	r	**Reserved**
PSI	11:6	rc	**Port Source Intrusion** 0_B Source Intrusion did not happen 1_B Source Intrusion happened
Res	5:0	r	**Reserved**

Security Status 0

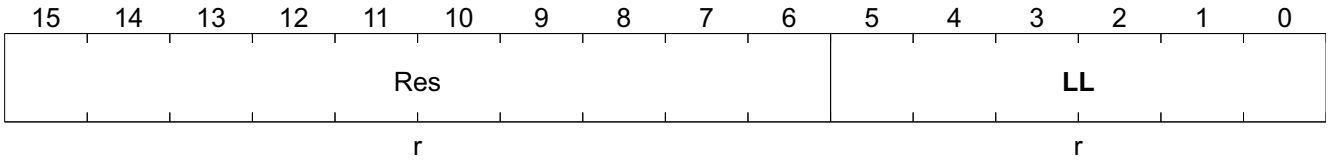
SS0	Offset	Reset Value
Security Status 0	**139_H**	**0000_H**



Field	Bits	Type	Description
Res	15:12	r	**Reserved**
FL	11:6	r	**First Lock** 0_B Port did not lock the address 1_B Port locked the address
PL	5:0	r	**Port Locked** 0_B Port did not close 1_B Port closed because of source violation

Security Status 1

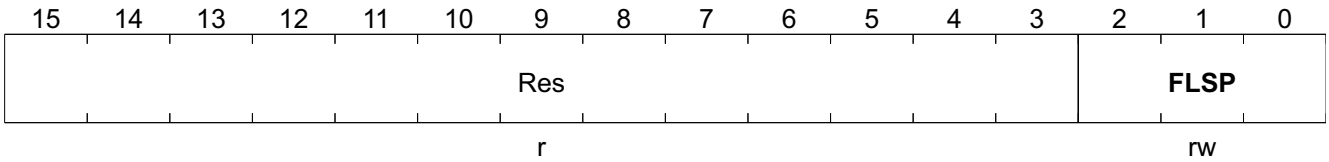
SS1 **Offset** **Reset Value**
Security Status 1 **$13A_H$** **0000_H**



Field	Bits	Type	Description
Res	15:6	r	**Reserved**
LL	5:0	r	**Link Lock** 0_B Link Lock did not happen 1_B Link Lock happened

First Lock Address Search

FLAS **Offset** **Reset Value**
First Lock Address Search **$13B_H$** **0000_H**



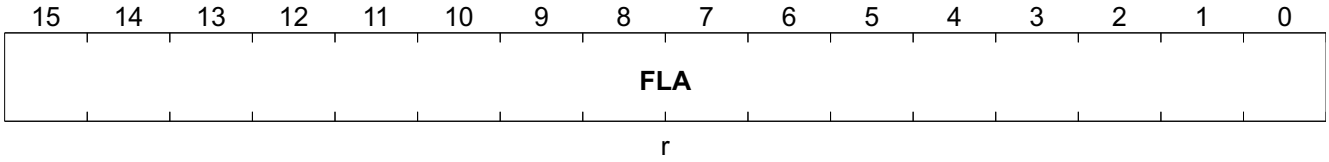
Field	Bits	Type	Description
Res	15:3	r	**Reserved**

Field	Bits	Type	Description
FLSP	2:0	rw	**First Lock Search Port** Users could write this register to get the lock address and the lock FID (returned in the $13C_H$, $13D_H$, $13E_H$, $13F_H$) associated with the port. 000_B Search the address and FID locked on the port 0 001_B Search the address and FID locked on the port 1 010_B Search the address and FID locked on the port 1 011_B Search the address and FID locked on the port 1 100_B Search the address and FID locked on the port 1 101_B Search the address and FID locked on the port 1

First Lock Address [15:0]

FLA1 **Offset** **Reset Value**

First Lock Address [15:0] **$13C_H$** **0000_H**

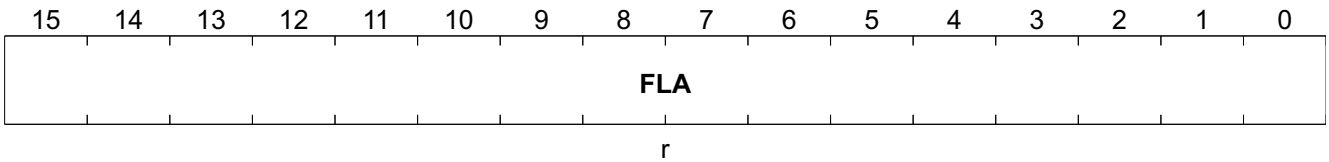


Field	Bits	Type	Description
FLA	15:0	r	**First Lock Address [15:0]**

First Lock Address [31:16]

FLA2 **Offset** **Reset Value**

First Lock Address [31:16] **$13D_H$** **0000_H**

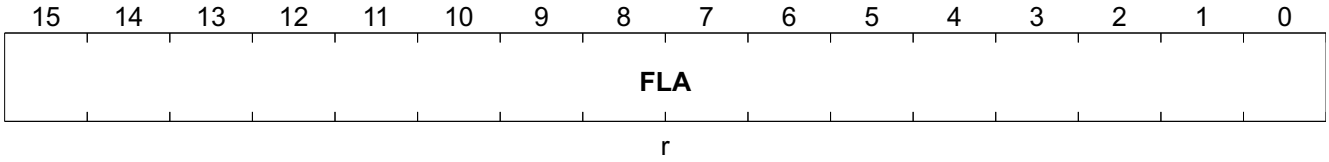


Field	Bits	Type	Description
FLA	15:0	r	**First Lock Address [31:16]**

First Lock Address [47:32]

FLA3 **Offset** **Reset Value**

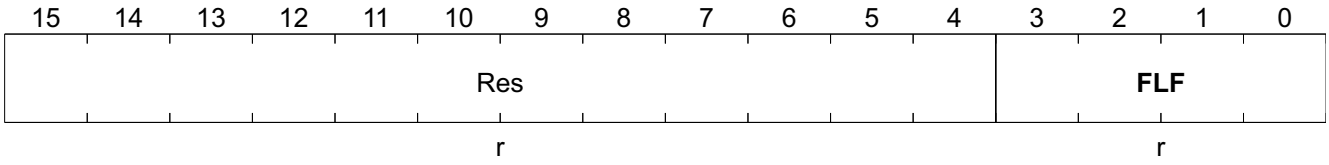
First Lock Address [47:32] **$13E_H$** **0000_H**



Field	Bits	Type	Description
FLA	15:0	r	**First Lock Address [47:32]**

First Lock FID

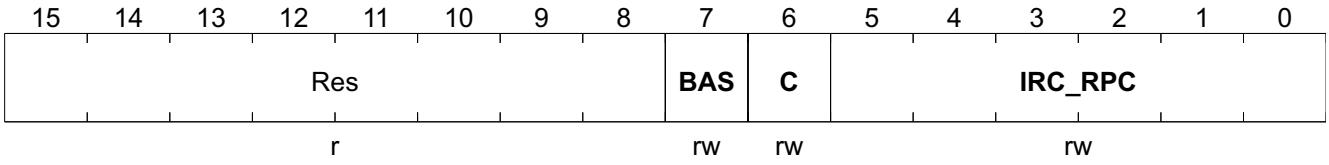
FLF **Offset** **Reset Value**
First Lock FID **$13F_H$** **0000_H**



Field	Bits	Type	Description
Res	15:4	r	**Reserved**
FLF	3:0	r	**First Lock FID**

Counter Control Low Register

CCL **Offset** **Reset Value**
Counter Control Low Register **140_H** **0000_H**

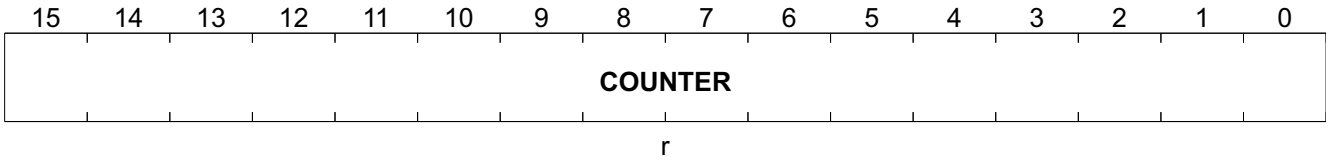


Field	Bits	Type	Description
Res	15:8	r	**Reserved**
BAS	7	rw	**Busy/Access Start** 0_B The counter control is free 1_B The counter control is busy, or users should write 1_B into this bit to start the access when the engine is free

Field	Bits	Type	Description
C	6	rw	**Counter** 0_B Indirect Read Counter 1_B Renew Port Counter
IRC_RPC	5:0	rw	**Indirect Read Counter** It means the counter address **Renew Port Counter** It means the counters on each port to renew

Counter Status Low Register

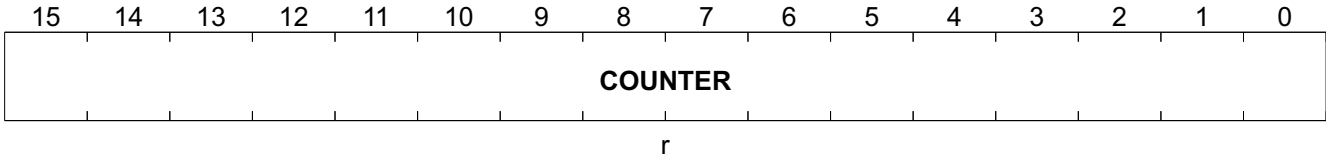
CSL	Offset	Reset Value
Counter Status Low Register	**142_H**	**0000_H**



Field	Bits	Type	Description
COUNTER	15:0	r	**Counter [15:0]**

Counter Status High Register

CSH	Offset	Reset Value
Counter Status High Register	**143_H**	**0000_H**



Field	Bits	Type	Description
COUNTER	15:0	r	**Counter [31:16]**

5.4 PHY Registers

PHY Control Register of Port 0

PHY_C0	Offset	Reset Value
PHY Control Register of Port 0	200_H	3100_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RST	LPBK	SPEED_L*	ANEN	PDN	ISO	ANEN_RST	DPLX	COLTST	SPEED_M*	Res					
rwsc	rw	rw	rw	rw	rw	rwsc	rw	rw	ro						

Field	Bits	Type	Description
RST	15	rwsc	**RESET** Setting this bit initiates the software reset function that resets the selected port, except for the phase-locked loop circuit. It will re-latch in all hardware configuration pin values The software reset process takes 25 µs to complete. This bit, which is self-clearing, returns a value of 1 until the reset process is complete. 0_B Normal operation 1_B PHY Reset
LPBK	14	rw	**Loop Back Enable** This bit controls the PHY loopback operation that isolates the network transmitter outputs (TXP and TXN) and routes the MII transmit data to the MII receive data path. This function should only be used when auto negotiation is disabled (bit 12 = 0). The specific PHY (10Base-T or 100Base-X) used for this operation is determined by bits 12 and 13 of this register 0_B Disable Loopback mode 1_B Enable loopback mode
SPEED_LSB	13	rw	**Speed Selection LSB, 0.6, 0.13** Link speed is selected by this bit or by auto negotiation if bit 12 of this register is set (in which case, the value of this bit is ignored).If it is fiber mode, 0.13 is always 1. Any write to this bit will have no effect. 00_B 10 Mbit/s 01_B 100 Mbit/s 10_B 1000 Mbit/s 11_B Reserved
ANEN	12	rw	**Auto Negotiation Enable** This bit determines whether the link speed should set up by the auto negotiation process or not. It is set at power up or reset if the RECANEN pin detects a logic 1 input level in Twisted-Pair Mode.If it is set when fiber mode is configured, any write to this bit will be ignored . 0_B Disable Auto negotiation process 1_B Enable auto negotiation process

Field	Bits	Type	Description
PDN	11	rw	**Power Down Enable** Ored result with PI_PWRDN pin. Setting this bit high or asserting the PI_PWRDN puts the PHY into power down mode. During the power down mode, TXP/TXN and all LED outputs are tristated and the MII interfaces are isolated. 0_B Normal Operation 1_B Power Down
ISO	10	rw	**Isolate PHY from Network** Setting this control bit isolates the part from the MII, with the exception of the serial management interface. When this bit is asserted, the PHY does not respond to TXD, TXEN and TXER inputs, and it presents a high impedence on its TXC, RXC, CRSDV, RXER, RXD , COL and CRS outputs. 0_B Normal Operation 1_B Isolate PHY from MII
ANEN_RST	9	rwsc	**Restart Auto Negotiation** Setting this bit while auto negotiation is enabled forces a new auto negotiation process to start. This bit is self-clearing and returns to 0 after the auto negotiation process has commenced. 0_B Normal Operation 1_B Restart Auto Negotiation Process
DPLX	8	rw	**Duplex Mode** If auto negotiation is disabled, this bit determines the duplex mode for the link. 0_B Half Duplex mode 1_B Full Duplex mode
COLTST	7	rw	**Collision Test** When set, this bit will cause the COL signal of MII interface to be asserted in response to the assertion of TXEN. 0_B Disable COL signal test 1_B Enable COL signal test
SPEED_MSB	6	ro	**Speed Selection MSB** Set to 0 all the time indicate that the PHY does not support 1000 Mbit/s function.

Similar Registers

All PHY_Cx registers have the same structure and characteristics, see **PHY_C0**.
The offset addresses of the other PHY_Cx registers are listed in **Table 47**.

Table 47 PHY_Cx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
PHY_C1	PHY Control Register of Port 1	220_H	
PHY_C2	PHY Control Register of Port 2	240_H	
PHY_C3	PHY Control Register of Port 3	260_H	
PHY_C4	PHY Control Register of Port 4	280_H	

PHY Status Register of Port 0

PHY_S0	Offset	Reset Value
PHY Status Register of Port 0	201_H	7849_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CAP_T4	CAP_TXF	CAP_TXH	CAP_TF	CAP_TH	CAP_T2	Res			CAP_SUPR	AN_COMP	REM_FLT	CAP_ANEG	LINK	JAB	EXTREG
ro	ro	ro	ro	ro	ro				ro	ro	ro	ro	ro	ro	ro

Field	Bits	Type	Description
CAP_T4	15	ro	**100Base-T4 Capable** Set to 0 all the time to indicate that the PHY does not support 100Base-T4
CAP_TXF	14	ro	**100Base-X Full Duplex Capable** Set to 1 all the time to indicate that the PHY does support Full Duplex mode
CAP_TXH	13	ro	**100Base-X Half Duplex Capable** Set to 1 all the time to indicate that the PHY does support Half Duplex mode
CAP_TF	12	ro	**10M Full Duplex Capable** TP : Set to 1 all the time to indicate that the PHY does support 10M Full Duplex mode FX : Set to 0 all the time to indicate that the PHY does not support 10M Full Duplex mode
CAP_TH	11	ro	**10M Half Duplex Capable** TP : Set to 1 all the time to indicate that the PHY does support 10M Half Duplex mode FX : Set to 0 all the time to indicate that the PHY does not support 10M Half Duplex mode
CAP_T2	10	ro	**100Base-T2 Capable** Set to 0 all the time to indicate that the PHY does not support 100Base-T2
CAP_SUPR	6	ro	**MF Preamble Suppression Capable** This bit is hardwired to 1 indicating that the PHY accepts management frame without preamble. Minimum 32 preamble bits are required following power-on or hardware reset. One idle bit is required between any two management transactions as per IEEE 802.3u specification.
AN_COMP	5	ro	**Auto Negotiation Complete** If auto negotiation is enabled, this bit indicates whether the auto negotiation process has been completed or not. Set to 0 all the time when Fiber Mode is selected. 0_B Auto Negotiation process not completed 1_B Auto Negotiation process completed

Field	Bits	Type	Description
REM_FLT	4	ro	**Remote Fault Detect** This bit is latched to 1 if the RF bit in the auto negotiation link partner ability register (bit 13, register address 05_H) is set or the receive channel meets the far end fault indication function criteria. It is unlatched when this register is read. 0_B Remote Fault not detected 1_B Remote Fault detected
CAP_ANEG	3	ro	**Auto Negotiation Ability** TP : This bit is set to 1 all the time, indicating that PHY is capable of auto negotiation. FX : This bit is set to 0 all the time, indicating that PHY is not capable of auto negotiation in Fiber Mode. 0_B Not capable of auto negotiation 1_B Capable of auto negotiation
LINK	2	ro	**Link Status** This bit reflects the current state of the link – test-fail state machine. Loss of a valid link causes a 0 latched into this bit. It remains 0 until this register is read by the serial management interface. Whenever Linkup, this bit should be read twice to get link up status 0_B Link is down 1_B Link is up
JAB	1	ro	**Jabber Detect** 0_B Jabber condition not detected 1_B Jabber condition detected
EXTREG	0	ro	**Extended Capability** This bit defaults to 1, indicating that the PHY implements extended registers. 0_B No extended register set 1_B Extended register set

Similar Registers

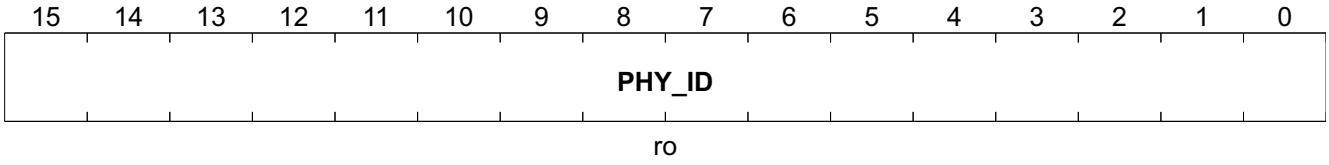
All PHY_Sx registers have the same structure and characteristics, see **PHY_S0**.
The offset addresses of the other PHY_Sx registers are listed in **Table 48**.

Table 48 PHY_Sx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
PHY_S1	PHY Status Register of Port 1	221_H	
PHY_S2	PHY Status Register of Port 2	241_H	
PHY_S3	PHY Status Register of Port 3	261_H	
PHY_S4	PHY Status Register of Port 4	281_H	

PHY Identifier Register of Port 0 (A)

PHY_I0_A	Offset	Reset Value
PHY Identifier Register of Port 0 (A)	**202_H**	**0302_H**



Field	Bits	Type	Description
PHY_ID	15:0	ro	**IEEE Address**

Similar Registers

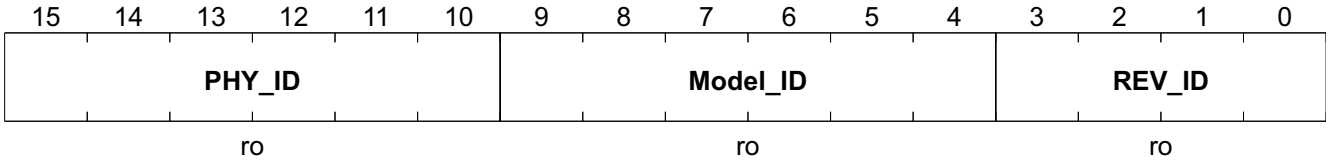
All PHY_Ix_A registers have the same structure and characteristics, see **PHY_I0_A**.
The offset addresses of the other PHY_Ix_A registers are listed in **Table 49**.

Table 49 PHY_Ix_A Registers

Register Short Name	Register Long Name	Offset Address	Page Number
PHY_I1_A	PHY Identifier Register of Port 1 (A)	222_H	
PHY_I2_A	PHY Identifier Register of Port 2 (A)	242_H	
PHY_I3_A	PHY Identifier Register of Port 3 (A)	262_H	
PHY_I4_A	PHY Identifier Register of Port 4 (A)	282_H	

PHY Identifier Register of Port 0 (B)

PHY_I0_B **Offset** **Reset Value**
PHY Identifier Register of Port 0 (B) **203_H** **6071_H**



Field	Bits	Type	Description
PHY_ID	15:10	ro	**IEEE Address**
Model_ID	9:4	ro	**IEEE Model No.**
REV_ID	3:0	ro	**IEEE Revision No.**

Similar Registers

All PHY_Ix_B registers have the same structure and characteristics, see **PHY_I0_B**.
The offset addresses of the other PHY_Ix_B registers are listed in **Table 50**.

Table 50 PHY_Ix_B Registers

Register Short Name	Register Long Name	Offset Address	Page Number
PHY_I1_B	PHY Identifier Register of Port 1 (B)	223_H	
PHY_I2_B	PHY Identifier Register of Port 2 (B)	243_H	

Table 50 PHY_Ix_B Registers (cont'd)

Register Short Name	Register Long Name	Offset Address	Page Number
PHY_I3_B	PHY Identifier Register of Port 3 (B)	263_H	
PHY_I4_B	PHY Identifier Register of Port 4 (B)	283_H	

Auto Negotiation Advertisement Register of Port 0

ANAP0	Offset	Reset Value
Auto Negotiation Advertisement Register of Port 0	204_H	$05E1_H$

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NP	Res	RF	Res	ASM_DIR	PAUSE	T4	TX_FDX	TX_HDX	10_FDX	10_HDX	SF				
ro		ro		rw	rw	ro	rw	rw	rw	rw			ro		

Field	Bits	Type	Description
NP	15	ro	**Next Page** This bit is defaults to 1, indicating that PHY is next page capable
RF	13	ro	**Remote Fault** This bit is written by serial management interface for the purpose of communicating the remote fault condition to the auto negotiation link partner. 0_B No remote fault has been detected 1_B Remote Fault has been detected
ASM_DIR	11	rw	**Asymmetric Pause Direction** Bit[11:10] Capability 00_B No Pause 01_B Symmetric PAUSE 10_B Asymmetric PAUSE toward Link Partner 11_B Both Symmetric PAUSE and Asymmetric PAUSE toward local device
PAUSE	10	rw	**Pause Operation for Full Duplex** Value on PAUREC will be stored in this bit during power on reset.
T4	9	ro	**Technology Ability for 100Base-T4** Defaults to 0.
TX_FDX	8	rw	**100Base-TX Full Duplex** 0_B Not capable of 100M Full duplex operation 1_B Capable of 100M Full duplex operation
TX_HDX	7	rw	**100Base-TX Half Duplex** 0_B Not capable of 100M operation 1_B Capable of 100M operation
10_FDX	6	rw	**10BASE-T Full Duplex** 0_B Not capable of 10M full duplex operation 1_B Capable of 10M Full Duplex operation

Field	Bits	Type	Description
10_HDX	5	rw	**10Base-T Half Duplex** *Note: Bit 8:5 should be combined with REC100, RECFUL pin input to determine the finalized speed and duplex mode.* 0_B Not capable of 10M operation 1_B Capable of 10M operation
SF	4:0	ro	**Selector Field** These 5 bits are hardwired to 00001_B, indicating that the PHY supports IEEE 802.3 CSMA/CD.

Similar Registers

All ANAPx registers have the same structure and characteristics, see **ANAP0**.
The offset addresses of the other ANAPx registers are listed in **Table 51**.

Table 51 ANAPx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
ANAP1	Auto Negotiation Advertisement Register of Port 1	224_H	
ANAP2	Auto Negotiation Advertisement Register of Port 2	244_H	
ANAP3	Auto Negotiation Advertisement Register of Port 3	264_H	
ANAP4	Auto Negotiation Advertisement Register of Port 4	284_H	

Auto Negotiation Link Partner Ability Register of Port 0

ANLPA0	Offset	Reset Value
Auto Negotiation Link Partner Ability Register of Port 0	205_H	$01E1_H$

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NPAGE	ACK	RF	Res	LP_DIR	LP_PAU	LP_T4	LP_FDX	LP_HDX	LP_F10	LP_H10	SF				
ro	ro	ro		ro	ro	ro	ro	ro	ro	ro	ro				

Field	Bits	Type	Description
NPAGE	15	ro	**Next Page** 0_B Not capable of next page function 1_B Capable of next page function
ACK	14	ro	**Acknowledge** 0_B Not acknowledged 1_B Link Partner acknowledges reception of the ability data word
RF	13	ro	**Remote Fault** 0_B No remote fault has been detected 1_B Remote Fault has been detected
LP_DIR	11	ro	**Link Partner Asymmetric Pause Direction**

Field	Bits	Type	Description
LP_PAU	10	ro	**Link Partner Pause CapabilityValue on PAUREC** Will be stored in this bit during power on reset.
LP_T4	9	ro	**Link Partner Technology Ability** For 100Base-T4Defaults to 0.
LP_FDX	8	ro	**100Base-TX Full Duplex** 0_B Not capable of 100M Full duplex operation 1_B Capable of 100M Full duplex operation
LP_HDX	7	ro	**100Base-TX Half Duplex** 0_B Not capable of 100M operation 1_B Capable of 100M operation
LP_F10	6	ro	**10BASE-T Full Duplex** 0_B Not capable of 10M full duplex operation 1_B Capable of 10M Full Duplex operation
LP_H10	5	ro	**10Base-T Half Duplex** 0_B Not capable of 10M operation 1_B Capable of 10M operation
SF	4:0	ro	**Selector Field** Encoding Definitions

Similar Registers

All ANLPAx registers have the same structure and characteristics, see **ANLPA0**.
The offset addresses of the other ANLPAx registers are listed in **Table 52**.

Table 52 ANLPAx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
ANLPA1	Auto Negotiation Link Partner Ability Register of Port 1	225_H	
ANLPA2	Auto Negotiation Link Partner Ability Register of Port 2	245_H	
ANLPA3	Auto Negotiation Link Partner Ability Register of Port 3	265_H	
ANLPA4	Auto Negotiation Link Partner Ability Register of Port 4	285_H	

Auto Negotiation Expansion Register of Port 0

ANE0	Offset	Reset Value
Auto Negotiation Expansion Register of Port 0	206_H	0000_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Res											PFAULT	LPNPABLE	NPABLE	PGRCV	LPANABLE
											ro, lh	ro	ro	ro	ro

Field	Bits	Type	Description
PFAULT	4	ro, lh	**Parallel Detection Fault** 0_B No Fault Detect 1_B Fault has been detected
LPNPABLE	3	ro	**Link Partner Next Page Able** 0_B Link Partner is not next page capable 1_B Link Partner is next page capable
NPABLE	2	ro	**Next Page Able** Defaults to 0, indicating PHY is not capable of next page.
PGRCV	1	ro	**Page Received** 0_B No new page has been received 1_B A new page has been received
LPANABLE	0	ro	**Link Partner Auto Negotiation Able** 0_B Link Partner is not auto negotiable 1_B Link Partner is auto negotiable

Similar Registers

All ANEx registers have the same structure and characteristics, see **ANE0**.
The offset addresses of the other ANEx registers are listed in **Table 53**.

Table 53 ANEx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
ANE1	Auto Negotiation Expansion Register of Port 1	226_H	
ANE2	Auto Negotiation Expansion Register of Port 2	246_H	
ANE3	Auto Negotiation Expansion Register of Port 3	266_H	
ANE4	Auto Negotiation Expansion Register of Port 4	286_H	

Next Page Transmit Register of Port 0

NPT0	Offset	Reset Value
Next Page Transmit Register of Port 0	**207_H**	**2001_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TNPAGE	Res	**TMSG**	**TACK2**	**TTOG**	**TFLD**										
ro		rw	rw	ro	rw										

Field	Bits	Type	Description
TNPAGE	15	ro	**Transmit Next Page** Transmit Code Word Bit 15
TMSG	13	rw	**Transmit Message Page** Transmit Code Word Bit 13

Field	Bits	Type	Description
TACK2	12	rw	**Transmit Acknowledge 2** Transmit Code Word Bit 12
TTOG	11	ro	**Transmit Toggle** Transmit Code Word Bit 11
TFLD	10:0	rw	**Transmit Message Field** Transmit Code Word Bit 10..0

Similar Registers

All NPTx registers have the same structure and characteristics, see **NPT0**.
The offset addresses of the other NPTx registers are listed in **Table 54**.

Table 54 NPTx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
NPT1	Next Page Transmit Register of Port 1	227_H	
NPT2	Next Page Transmit Register of Port 2	247_H	
NPT3	Next Page Transmit Register of Port 3	267_H	
NPT4	Next Page Transmit Register of Port 4	287_H	

Link Partner Next Page Register of Port 0

LPNP0	Offset	Reset Value
Link Partner Next Page Register of Port 0	**208_H**	**0000_H**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PNPAGE	PACK	PMSGP	PACK2	PTOG	PFLD										
ro	ro	ro	ro	ro	ro										

Field	Bits	Type	Description
PNPAGE	15	ro	**Link Partner Next Page** Receive Code Word Bit 15
PACK	14	ro	**Link Partner Acknowledge** Receive Code Word Bit 14
PMSGP	13	ro	**Link Partner Message Page** Receive Code Word Bit 13
PACK2	12	ro	**Link Partner Acknowledge 2** Receive Code Word Bit 12
PTOG	11	ro	**Link Partner Toggle** Receive Code Word Bit 11
PFLD	10:0	ro	**Link Partner Message Field** Receive Code Word Bit 11

Similar Registers

All LPNPx registers have the same structure and characteristics, see **LPNP0**.
The offset addresses of the other LPNPx registers are listed in **Table 55**.

Table 55 LPNPx Registers

Register Short Name	Register Long Name	Offset Address	Page Number
LPNP1	Link Partner Next Page Register of Port 1	228_H	
LPNP2	Link Partner Next Page Register of Port 2	248_H	
LPNP3	Link Partner Next Page Register of Port 3	268_H	
LPNP4	Link Partner Next Page Register of Port 4	288_H	

6 Hardware, EEPROM and SMI Interface for Configuration

Three ways are supported to configure the setting in the ADM6996LC/LCX/LHX: (1) Hardware Setting (2) EEPROM Interface (3) SMI Interface. Users could use EEPROM and SMI interfaces combined with the CPU port to provide proprietary functions. Four pins are needed when using these two interfaces. See **Figure 14** for the description.

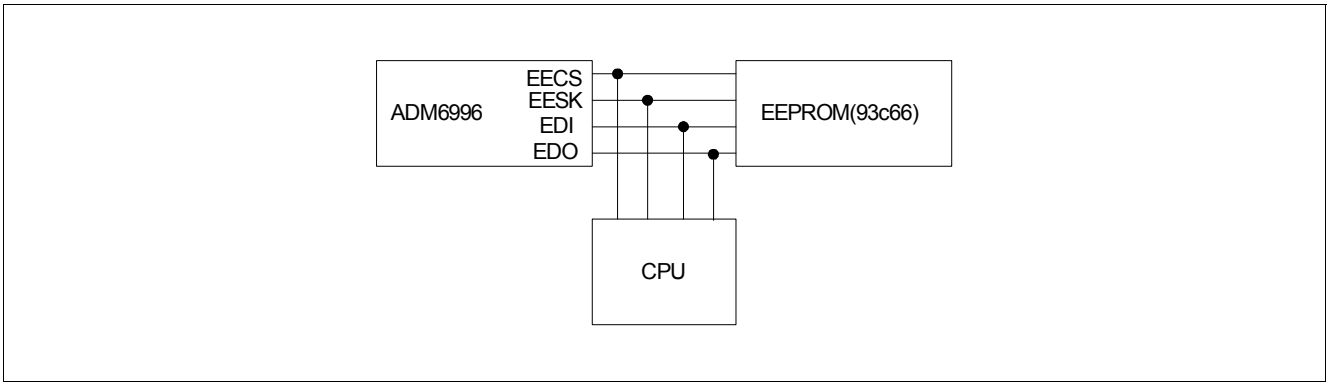


Figure 14 Interconnection between ADM6996LC/LCX/LHX, EEPROM and CPU

6.1 Hardware Setting

The ADM6996LC/LCX/LHX provides some hardware pins, where values reside on will be strapped for the default setting during the power on or reset.

Table 56 Hardware Setting

Setting Name	Description
GFCEN	Global Flow Control Enable. 0_B Flow Control Capability is depended upon the register setting in corresponding EEPROM register 1_B All ports flow control capability is enabled.
SDIO_MD	SDC/SDIO mode selection. 0_B 16 bits mode 1_B 32 bits mode

Table 56 Hardware Setting (cont'd)

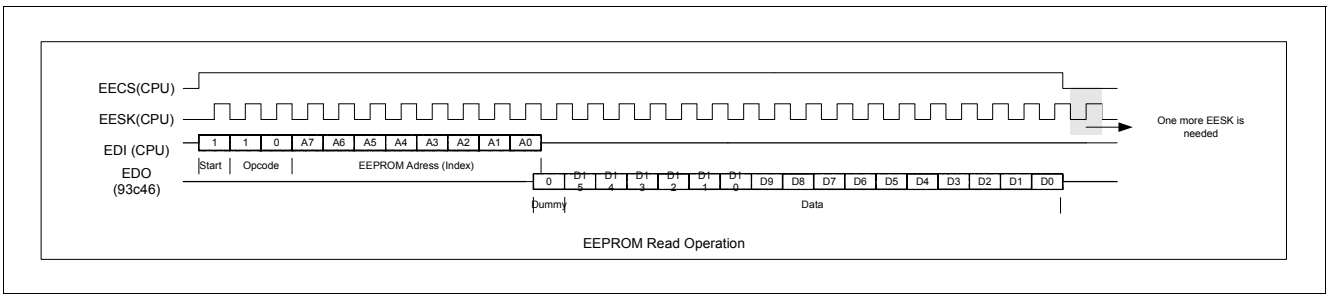
Setting Name	Description
P5_BUSMD[1:0]	Port 5 bus mode selection bit 0. P5_BUSMD[1:0] ,Interface 00_B MII 01_B GPSI 10_B RMII 11_B Reserved and Not Allowed.
BPEN	Recommend Back-Pressure in half-duplex. 0_B Disable Back-Pressure. 1_B Enable Back-Pressure
RECANEN	Recommend Auto Negotiation Enable. Only valid for Twisted pair interface. Programmed this bit to 1 has no effect to Fiber port. 0_B Disable all TP port auto negotiation capability 1_B Enable all TP port auto negotiation capability
XOVEN	Cross Over Enable. Only available in TP interface. 0_B Disable 1_B Enable
LED_MODE	Enable Mac to choose LED Display Mode. 0_B Single color LED 1_B Dual color LED

6.2 EEPROM Interface

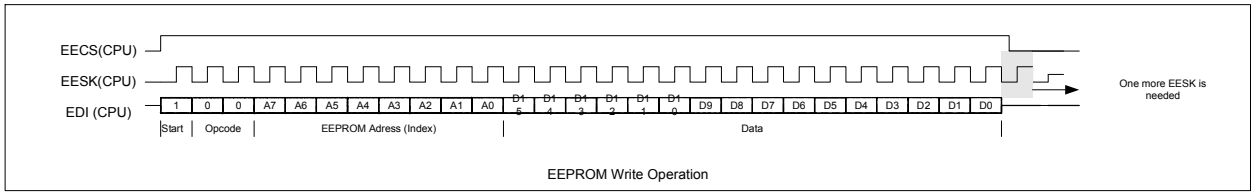
The EEPROM Interface is provided so the users could easily configure the setting without CPU's help. Because the EEPROM Interface is the same as the 93c66, it also allows the CPU to write the EEPROM register and renew the 93c66 at the same time. After the power up or reset (default value from the hardware pins fetched in this stage), the ADM6996LC/LCX/LHX will automatically detect the presence of the EEPROM by reading the address 0 in the 96c66. If the value = 4154_H, it will load all the data in the 93c66. If not, the ADM6996LC/LCX/LHX will stop loading the 93c66. The user also could pull down the EDO to force the ADM6996LC/LCX/LHX not to load the 93c66. The 93c66 loading time is around 30ms. Then CPU should drive the high-z value in the EECS, EESK and EDI pins in this period if existing the CPU to read or write the registers in the ADM6996LC/LCX/LHX.

The EEPROM Interface needs only one Write command to complete a "Write" operation to the ADM6996LC/LCX/LHX. If users would like to update the 93c66 at the same time, then three commands, Write Enable, Write, and Write Disable, are needed to complete this operation (See 93c66 Spec. for the reference). User should note that the EERPOM interface only allows the CPU to write the EEPROM register in the ADM6996LC/LCX/LHX and doesn't support the READ command. If CPU sends out the Read Command, then 93c66 will respond with the value inside, instead of ADM6996LC/LCX/LHX. Users should also note that one additional EESK cycle is needed between any continuous commands (Read or Write).

(1) Read 93c66 via the EEPROM Interface (Index = 2, Data = 1111_H).



(2) Write EEPROM registers in the ADM6996LC/LCX/LHX (Index = 2, Data =16'h2222).



6.3 SMI Interface

The SMI consists of two pins, management data clock (EESK) and management data input/output (EDI). The ADM6996LC/LCX/LHX is designed to support an EESK frequency up to 25 MHz. The EDI pin is bi-directional and may be shared with other devices. EECS pin is needed to pull low if EEPROM interface is also used.

The EDI pin requires a 1.5 KΩ pull-up which, during idle and turnaround periods, will pull EDI to a logic one state. ADM6996LC/LCX/LHX requires a single initialization sequence of 32 bits of preamble following power-up/hardware reset. The first 32 bits are preamble consisting of 32 contiguous logic one bits on EDI and 32 corresponding cycles on EESK. Following preamble is the start-of-frame field indicated by a $<01_B>$ pattern. The next field signals the operation code (OP): $<10_B>$ indicates read from management register operation, and $<01_B>$ indicates write to management register operation. The next field is the management register address. It is 10 bits wide and the most significant bit is transferred first.

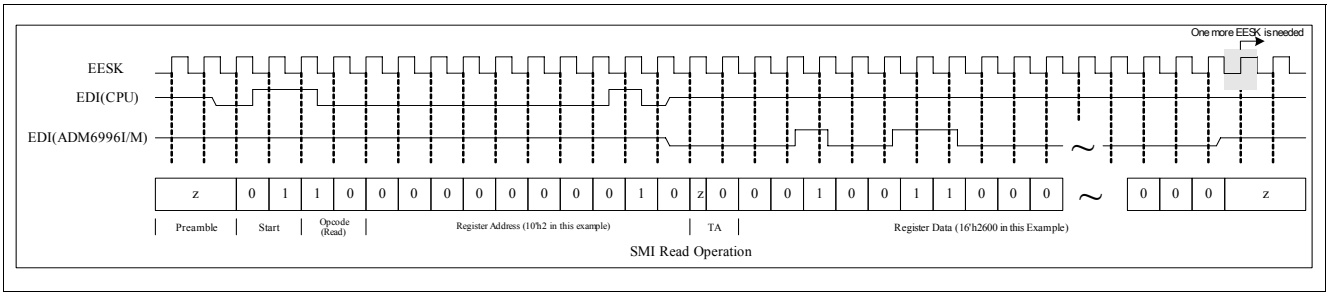
During Read operation, a 2-bit turn around (TA) time spacing between the register address field and data field is provided for the EDI to avoid contention. Following the turnaround time, a 16-bit data stream is read from or written into the management registers of the ADM6996LC/LCX/LHX.

(A) Preamble Suppression

The SMI of ADM6996LC/LCX/LHX supports a preamble suppression mode. The ADM6996LC/LCX/LHX requires a single initialization sequence of 32 bits of preamble following power-up/hardware reset. This requirement is generally met by pulling-up the resistor of EDI While the ADM6996LC/LCX/LHX will respond to management accesses without preamble, a minimum of one idle bit between management transactions is required.

When ADM6996LC/LCX/LHX detects that there is address match, then it will enable Read/Write capability for external access. When address is mismatched, then ADM6996LC/LCX/LHX will tri-state the EDI pin.

(B) Read Switch Register via SMI Interface (Offset Hex = 10'h2, Data = 16'h2600)



(C) Write Switch Register via SMI Interface (Offset Hex = 10'h180, Data = 16'h1300)

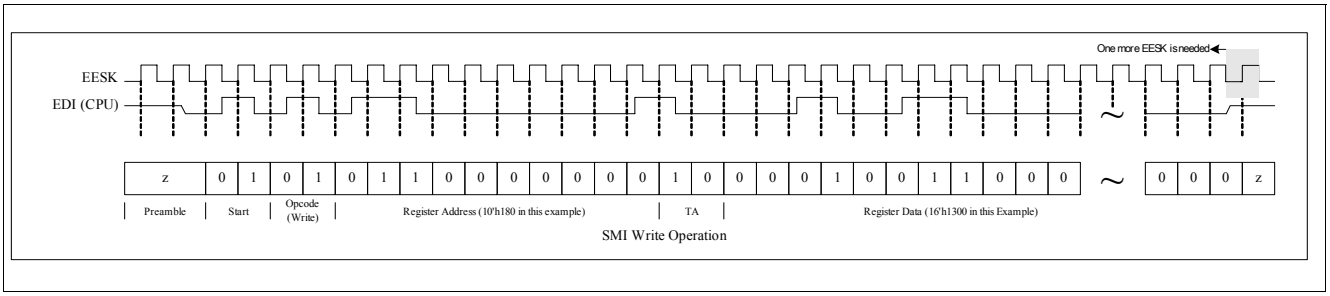


Table 57 (D) The Pin Type of EECS, EESK, EDI and EDO during the Operation

Pin Name	Reset Operation	Load EEPROM	Write Operation	Read Operation
EECS	Input	Output	Input	Input
EESK	Input	Output	Input	Input
EDI	Input	Output	Input	Input/Output
EDO	Input	Input	Input	Input

7 Electrical Specification

7.1 TX/FX Interface

7.1.1 TP Interface

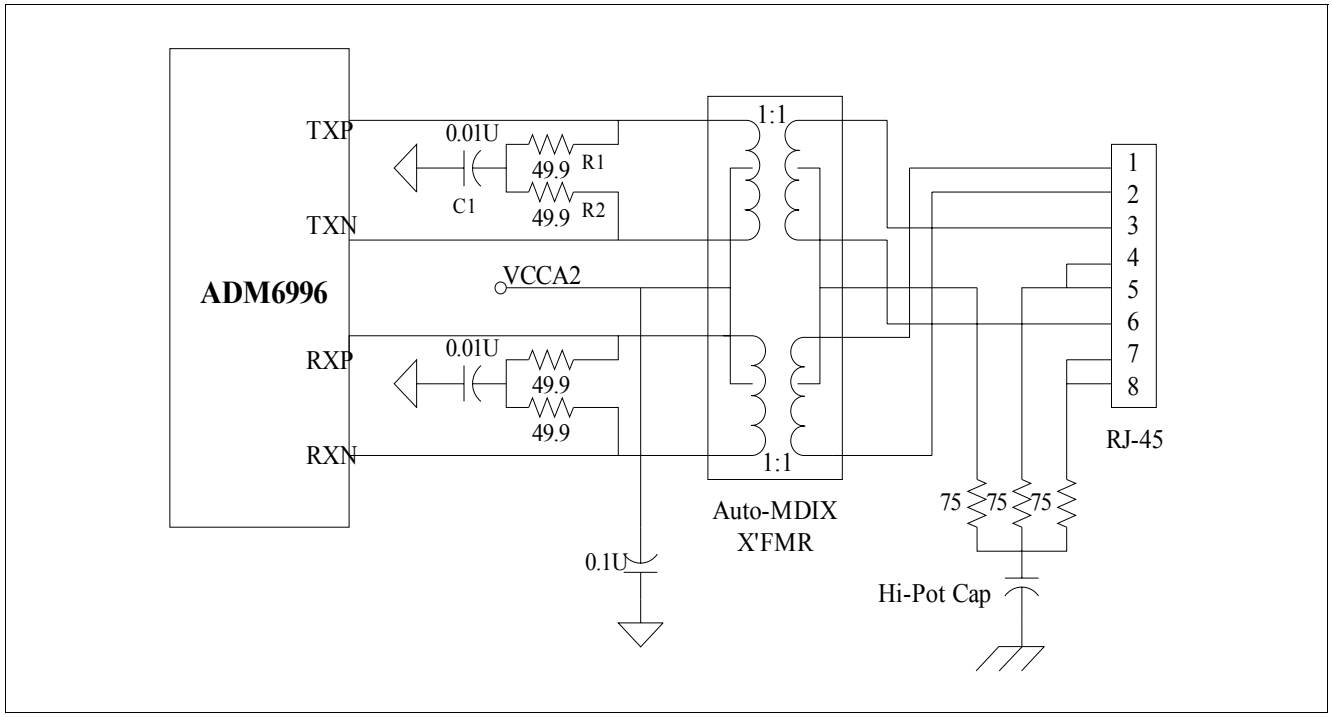


Figure 15 TP Interface

Transformer requirements:

- TX/RX rate 1:1
- TX/RX central tap connect together to VCCA2

Users can change the TX/RX pin for easy layout but do not change the polarity. ADM6996LC/LCX/LHX supports auto polarity on the receiving side.

7.1.2 FX Interface

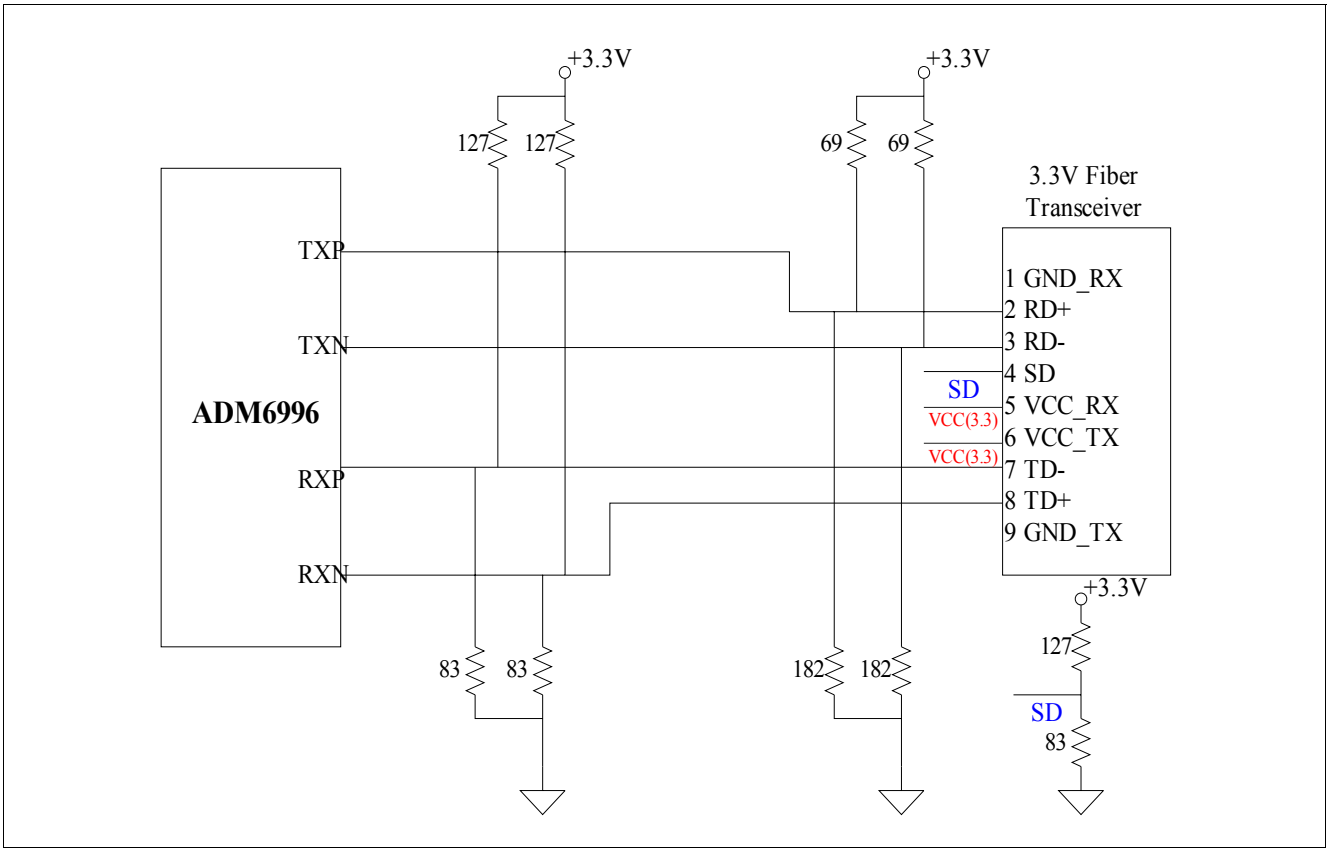


Figure 16 FX Interface

7.2 DC Characterization

Table 58 Power Consumption

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Power consumption when all twisted pair ports are linked at 100 Mbit/s.	P_{100M_5TP}	–	980	–	mW	Under EEPROM Register 29_H = $C000_H$, and 30_H = 985_H
Power consumption when all twisted pair ports are linked at 10 Mbit/s (include transformer).	P_{10M_5TP}	–	1450	–	mW	Under EEPROM Register 29_H = $C000_H$, and 30_H = 985_H
Power consumption when all twisted pair ports are disconnected.	P_{DIS_5TP}	–	500	–	mW	Under EEPROM Register 29_H = $C000_H$, and 30_H = 985_H

Table 59 Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
3.3 V Power Supply for I/O pad	V_{CC3O}	2.97	3.3	3.63	V	–
3.3 V Power Supply for bias circuit	V_{CCBS}	2.97	3.3	3.63	V	–
3.3 V Power Supply for A/D converter	V_{CCAD}	2.97	3.3	3.63	V	–
1.8 V Power Supply for line driver	V_{CCA2}	1.62	1.8	1.98	V	–
1.8 V Power Supply for PLL	V_{CCPLL}	1.62	1.8	1.98	V	–
1.8 V Power Supply for Digital core	V_{CCIK}	1.62	1.8	1.98	V	–
Input Voltage	V_{IN}	-0.3	–	V_{CC3O} + 0.3	V	–
Output Voltage	V_{out}	-0.3	–	V_{CC3O} + 0.3	V	–
Maximum current for 3.3 V power supply	$I_{3.3VMAX}$	–	–	100	mA	–
Maximum current for 1.8 V power supply (include transformer)	$I_{1.8VMAX}$	–	–	800	mA	–
Storage Temperature	T_{STG}	-55	–	155	°C	–
ESD Rating	ESD	1.0	–	–	kV	–

Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

Table 60 Recommended Operating Conditions

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
3.3 V Power Supply for I/O pad	V_{CC3O}	3.135	3.3	3.465	V	–
3.3 V Power Supply for bias circuit	V_{CCBS}	3.135	3.3	3.465	V	–
3.3 V Power Supply for A/D converter	V_{CCAD}	3.135	3.3	3.465	V	–
1.8 V Power Supply for line driver	V_{CCA2}	1.71	1.8	1.89	V	–
1.8 V Power Supply for PLL	V_{CCPLL}	1.71	1.8	1.89	V	–
1.8 V Power Supply for Digital core	V_{CCIK}	1.71	1.8	1.89	V	–
Input Voltage	V_{in}	0	–	V_{CC}	V	–
Junction Operating Temperature	T_j	0	25	115	°C	–

Table 61 DC Electrical Characteristics for 3.3 V Operation[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input Low Voltage	V_{IL}	–	–	0.8	V	TTL
Input High Voltage	V_{IH}	2.0	–	–	V	TTL
Output Low Voltage	V_{OL}	–	–	0.4	V	TTL
Output High Voltage	V_{OH}	2.4	–	–	V	TTL
Input Pull-up/down Resistance	R_I	–	50	–	kΩ	V_{IL} = 0 V or V_{IH} = V_{cc3o}

1) Under V_{CC3O} = 2.97V ~ 3.63 V, T_j = 0 °C ~ 115 °C

7.3 AC Characterization

7.3.1 XTAL/OSC Timing

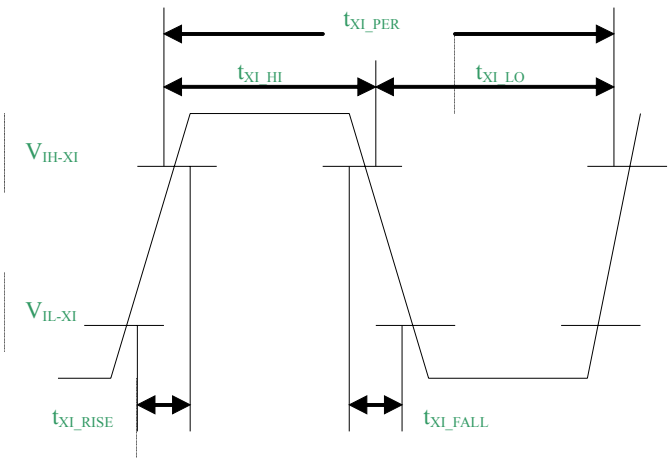


Figure 17 XTAL/OSC Timing

Table 62 XTAL/OSC Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
XI/OSCI Clock Period	$t_{\_XI\_PER}$	40.0 - 50ppm	40.0	40.0 + 50ppm	ns	–
XI/OSCI Clock High	$t_{\_XI\_HI}$	14	20.0	–	ns	–
XI/OSCI Clock Low	$t_{\_XI\_LO}$	14	20.0	–	ns	–
XI/OSCI Clock Rise Time, V_{IL} (max) to V_{IH} (min.)	$t_{\_XI\_RISE}$	–	–	4	ns	–
XI/OSCI Clock Fall Time, V_{IH} (min.) to V_{IL} (max)	$t_{\_XI\_FALL}$	–	–	4	ns	–

7.3.2 Power On Reset

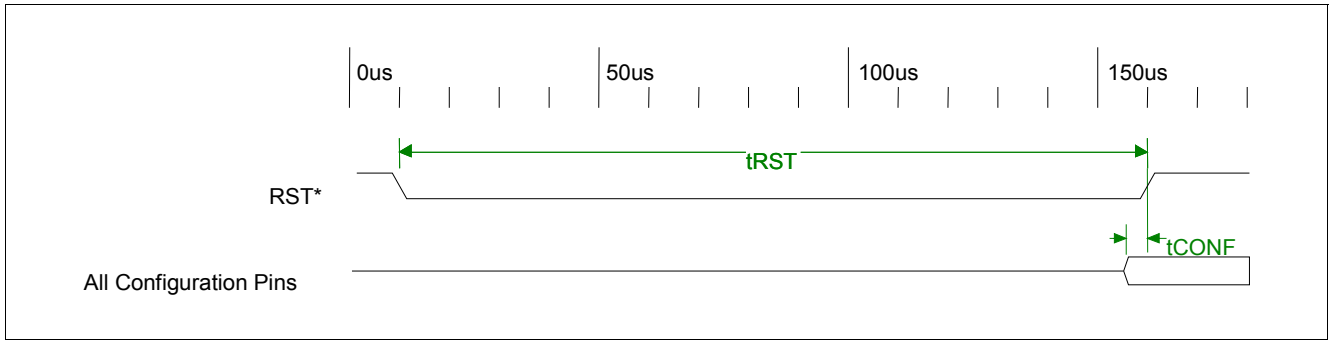


Figure 18 Power On Reset Timing

Table 63 Power On Reset Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
RST Low Period	t_{RST}	100	–	–	ms	–
Start of Idle Pulse Width	t_{CONF}	100	–	–	ns	–

7.3.3 EEPROM Interface Timing

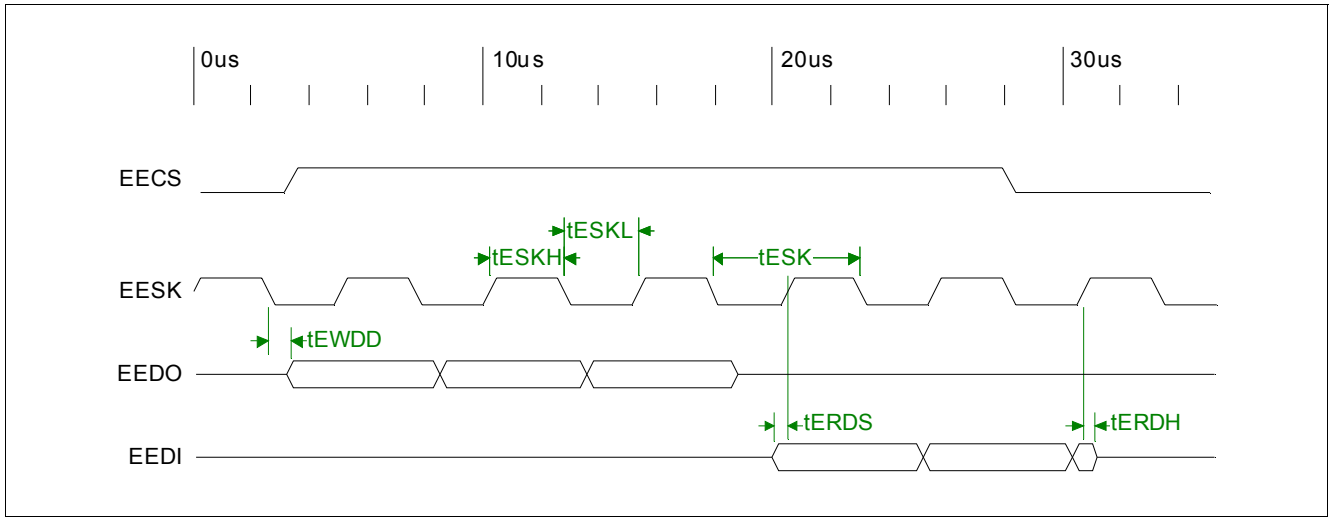


Figure 19 EEPROM Interface Timing

Table 64 EEPROM Interface Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
EESK Period	t_{ESK}	–	5120	–	ns	–
EESK Low Period	t_{ESKL}	2550	–	2570	ns	–
EESK High Period	t_{ESKH}	2550	–	2570	ns	–

Table 64 EEPROM Interface Timing (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
EEDI to EESK Rising Setup Time	t_{ERDS}	10	–	–	ns	–
EEDI to EESK Rising Hold Time	t_{ERDH}	10	–	–	ns	–
EESK Falling to EEDO Output Delay Time	t_{EWDD}	–	–	20	ns	–

7.3.4 10Base-TX MII Input Timing

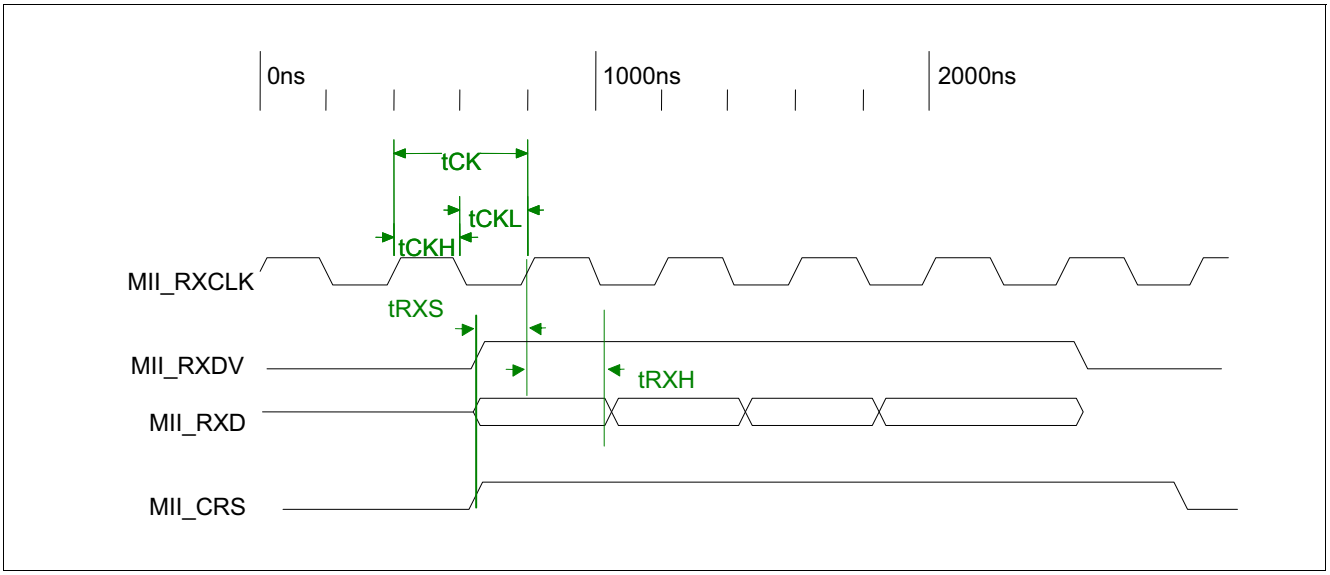


Figure 20 10Base-TX MII Input Timing

Table 65 10Base-TX MII Input Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
MII_RXCLK Period	t_{CK}	–	400	–	ns	–
MII_RXCLK Low Period	t_{CKL}	180	–	220	ns	–
MII_RXCLK High Period	t_{CKH}	180	–	220	ns	–
MII_CRS, MII_RXDV and MII_RXD to MII_RXCLK rising setup	t_{RXS}	10	–	–	ns	–
MII_CRS, MII_RXDV and MII_RXD to MII_RXCLK rising hold	t_{RXH}	10	–	–	ns	–

7.3.5 10Base-TX MII Output Timing

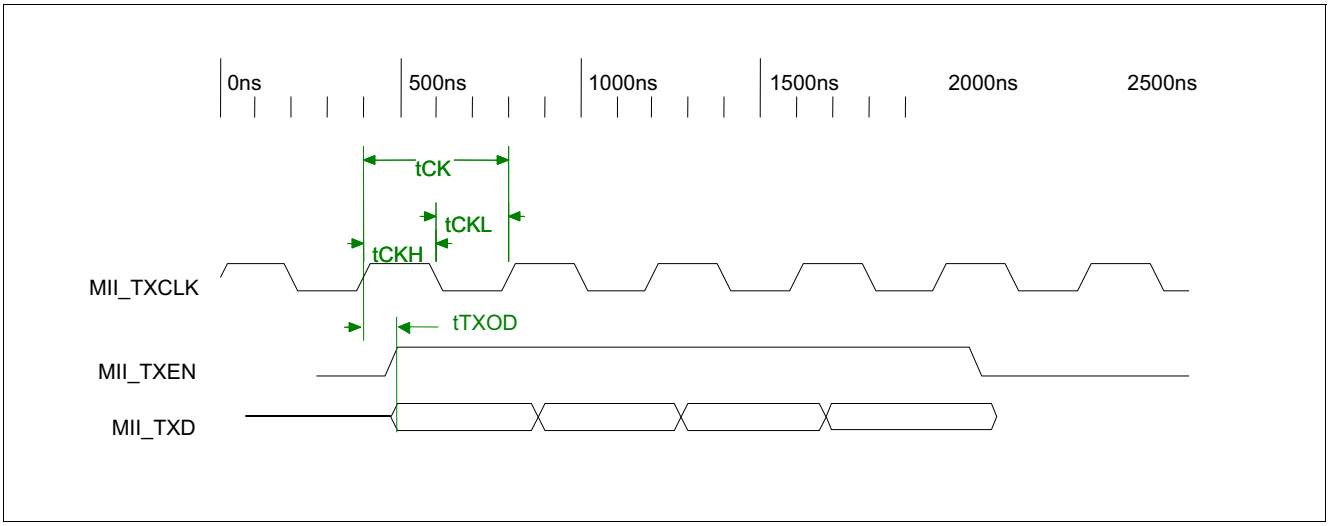


Figure 21 10Base-TX MII Output Timing

Table 66 10-Base-TX MII Output Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
MII_TXCLK Period	t_{CK}	–	400	–	ns	–
MII_TXCLK Low Period	t_{CKL}	180	–	220	ns	–
MII_TXCLK High Period	t_{CKH}	180	–	220	ns	–
MII_TXD, MII_TXEN toMII_TXCLK Rising Output Delay	t_{TXOD}	0	–	25	ns	–

7.3.6 100Base-TX MII Input Timing

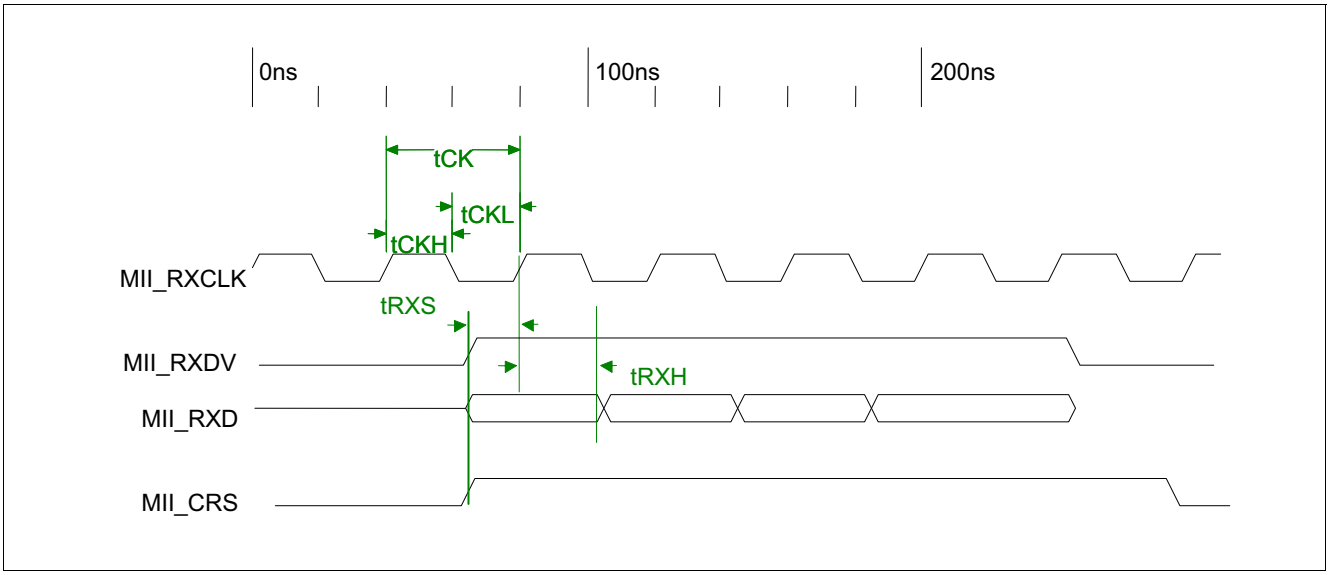


Figure 22 100Base-TX MII Input Timing

Table 67 100Base-TX MII Input Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
MII_RXCLK Period	t_{CK}	–	40	–	ns	–
MII_RXCLK Low Period	t_{CKL}	18	–	22	ns	–
MII_RXCLK High Period	t_{CKH}	18	–	22	ns	–
MII_CRS, MII_RXDV and MII_RXD to MII_RXCLK rising setup	t_{RXS}	10	–	–	ns	–
MII_CRS, MII_RXDV and MII_RXD to MII_RXCLK rising hold	t_{RXH}	10	–	–	ns	–

7.3.7 100Base-TX MII Output Timing

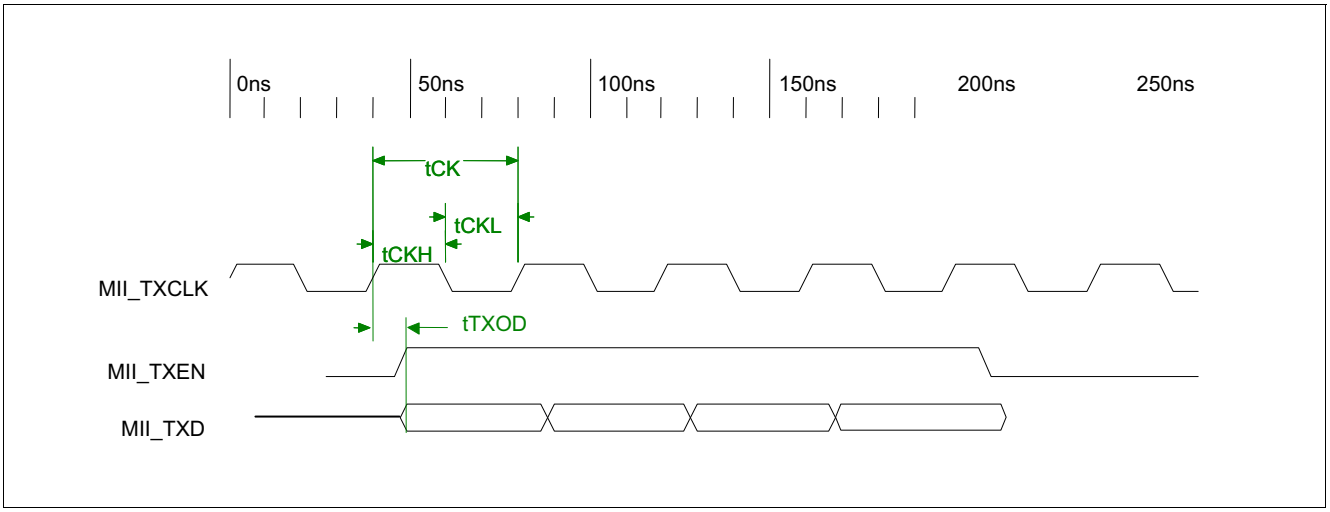


Figure 23 100Base-TX MII Output Timing

Table 68 100Base-TX MII Output Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
MII_TXCLK Period	t_{CK}	–	40	–	ns	–
MII_TXCLK Low Period	t_{CKL}	18	–	22	ns	–
MII_TXCLK High Period	t_{CKH}	18	–	22	ns	–
MII_TXD, MII_TXEN toMII_TXCLK Rising Output Delay	t_{TXOD}	0	–	25	ns	–

7.3.8 RMII REFCLK Input Timing

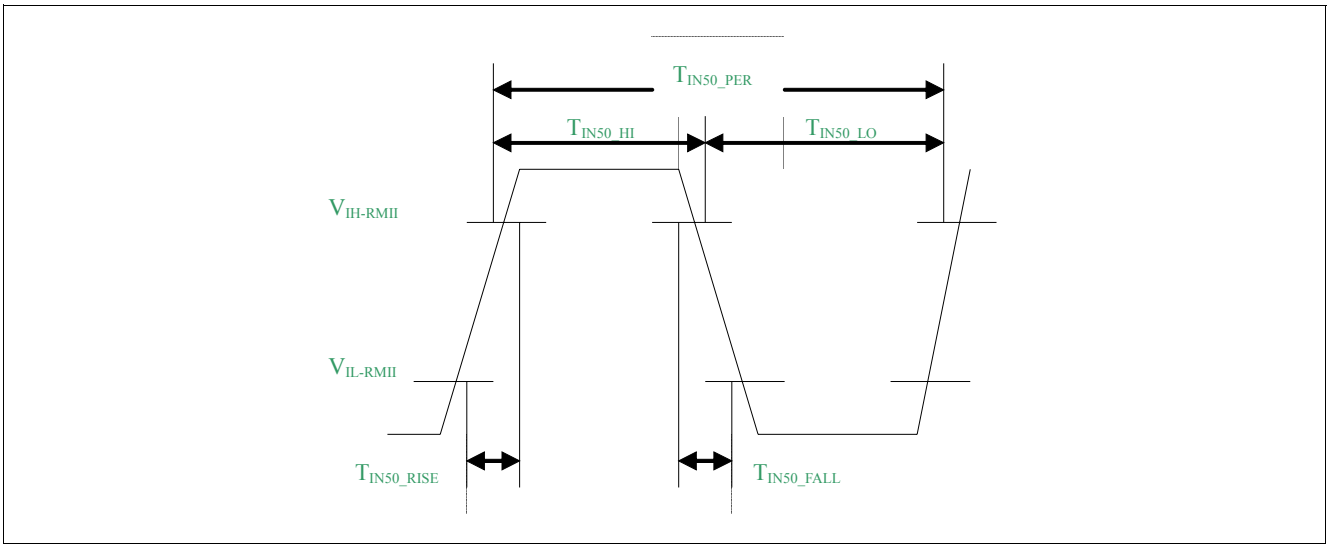


Figure 24 RMII REFCLK Input Timing

Table 69 RMII REFCLK Input Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
REFCLK Clock Period	t_{IN50_PER}	40.0 - 50ppm	40.0	40.0 + 50ppm	ns	–
REFCLK Clock High	t_{IN50_HI}	14	20.0	–	ns	–
REFCLK Clock Low	t_{IN50_LO}	14	20.0	–	ns	–
REFCLK Clock Rise Time, V_{IL} (max) to V_{IH} (min.)	t_{IN50_RISE}	–	–	2	ns	–
REFCLK Clock Fall Time, V_{IH} (min.) to V_{IL} (max)	t_{IN50_FALL}	–	–	2	ns	–

7.3.9 RMII REFCLK Output Timing

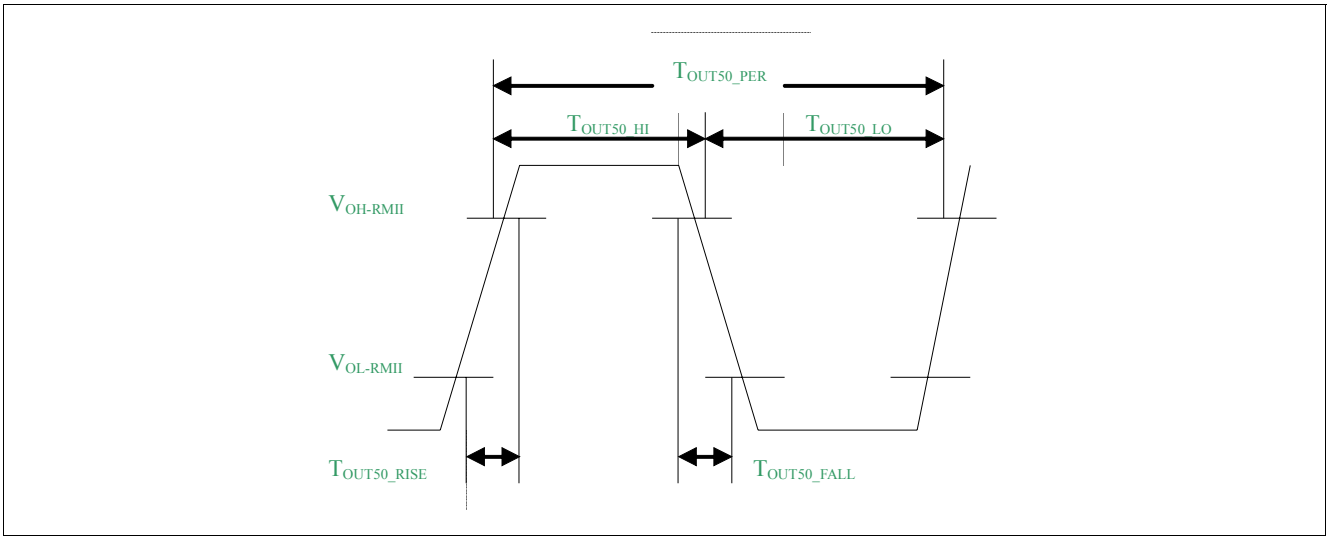


Figure 25 RMII REFCLK Output Timing

Table 70 RMII REFCLK Output Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
REFCLK Clock Period	t_{OUT50_PER}	40.0 - 50ppm	40.0	40.0 + 50ppm	ns	–
REFCLK Clock High	t_{OUT50_HI}	14	20.0	26	ns	–
REFCLK Clock Low	t_{OUT50_LO}	14	20.0	26	ns	–
REFCLK Clock Rise Time, V_{OL} (max) to V_{OH} (min.)	t_{OUT50_RISE}	–	–	2	ns	–
REFCLK Clock Fall Time, V_{OH} (min.) to V_{OL} (max)	t_{OUT50_FALL}	–	–	2	ns	–
REFCLK Clock Jittering (p-p)	t_{OUT50_JIT}	–	0.15	–	ns	–

7.3.10 Reduce MII Timing

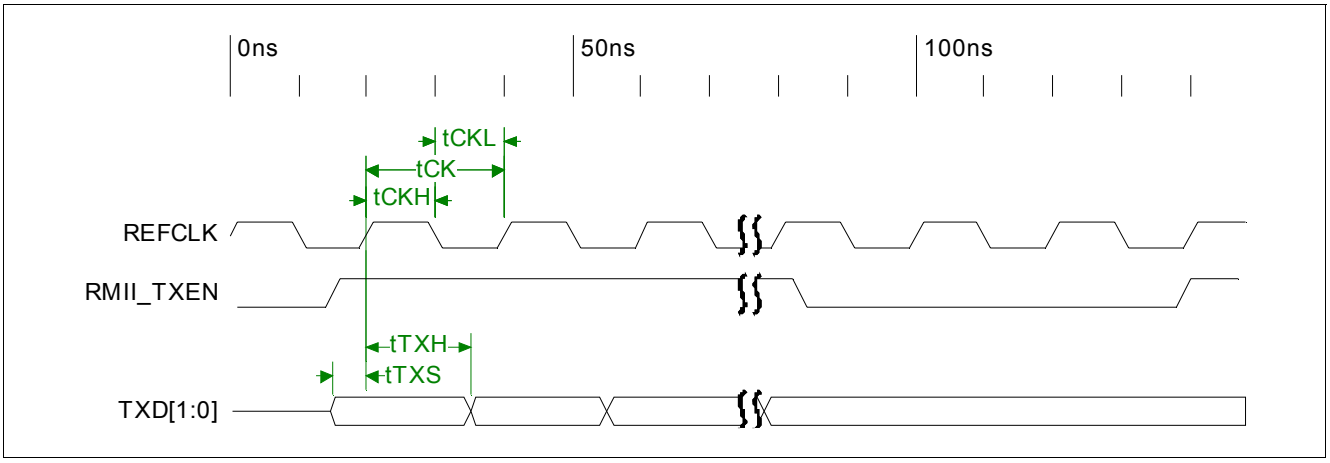


Figure 26 Reduce MII Timing (1 of 2)

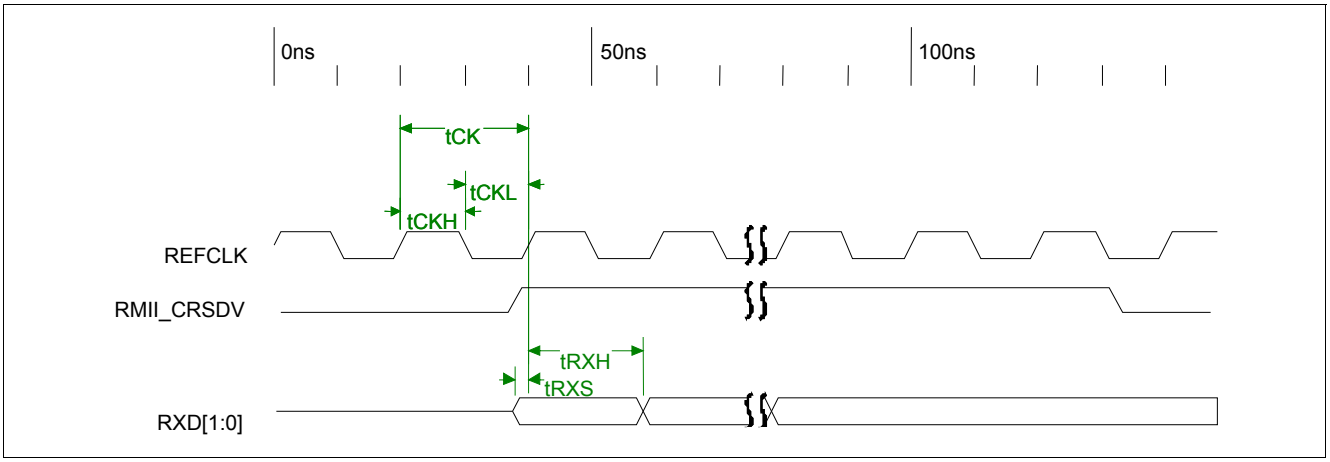


Figure 27 Reduce MII Timing (2 of 2)

Table 71 Reduce MII Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
RMII_REFCLK Period	t_{CK}	–	20	–	ns	–
RMII_REFCLK Low Period	t_{CKL}	–	10	–	ns	–
RMII_REFCLK High Period	t_{CKH}	–	10	–	ns	–
TXEN, TXD to REFCLK rising setup time	t_{TXS}	4	–	–	ns	–
TXE, TXD to REFCLK rising hold time	t_{TXH}	2	–	–	ns	–
CSRDV, RXD to REFCLK rising setup time	t_{RXS}	4	–	–		–
CRSDV, RXD to REFCLK rising hold time	t_{RXH}	2	–	–		–

7.3.11 GPSI (7-wire) Input Timing

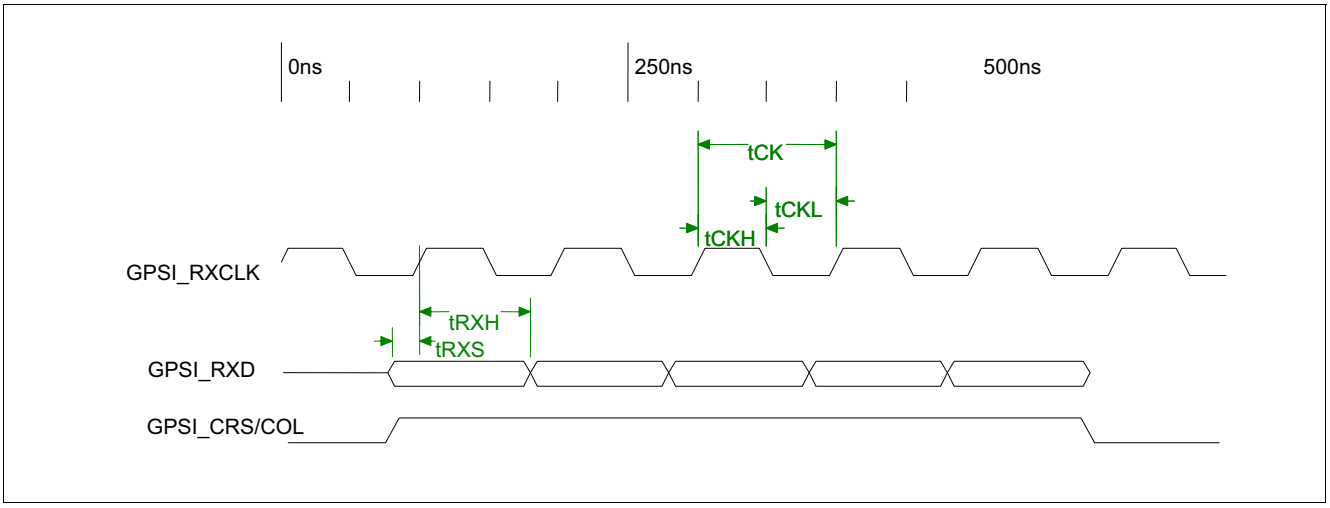


Figure 28 GPSI (7-wire) Input Timing

Table 72 GPSI (7-wire) Input Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
GPSI_RXCLK Period	t_{CK}	–	100	–	ns	–
GPSI_RXCLK Low Period	t_{CKL}	40	–	60	ns	–
GPSI_RXCLK High Period	t_{CKH}	40	–	60	ns	–
GPSI_RXD, GPSI_CRS/COL to GPSI_RXCLK Rising Setup Time	t_{RXS}	10	–	–	ns	–
GPSI_RXD, GPSI_CRS/COL to GPSI_RXCLK Rising HoldTime	t_{RXH}	10	–	–	ns	–

7.3.12 GPSI (7-wire) Output Timing

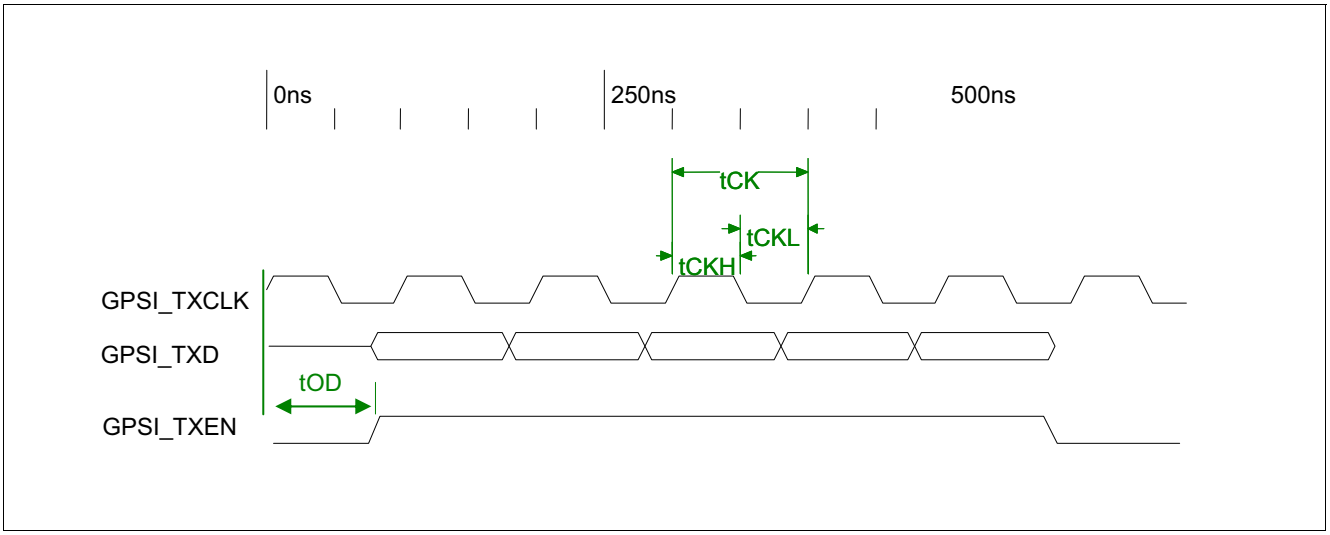


Figure 29 GPSI (7-wire) Output Timing

Table 73 GPSI (7-wire) Output Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
GPSI_TXCLK Period	t_{CK}	–	100	–	ns	–
GPSI_TXCLK Low Period	t_{CKL}	40	–	60	ns	–
GPSI_TXCLK High Period	t_{CKH}	40	–	60	ns	–
GPSI_TXCLK Rising toGPSI_TXEN/GPSI_TXD Output Delay	t_{OD}	50	–	70	ns	–

7.3.13 SDC/SDIO Timing

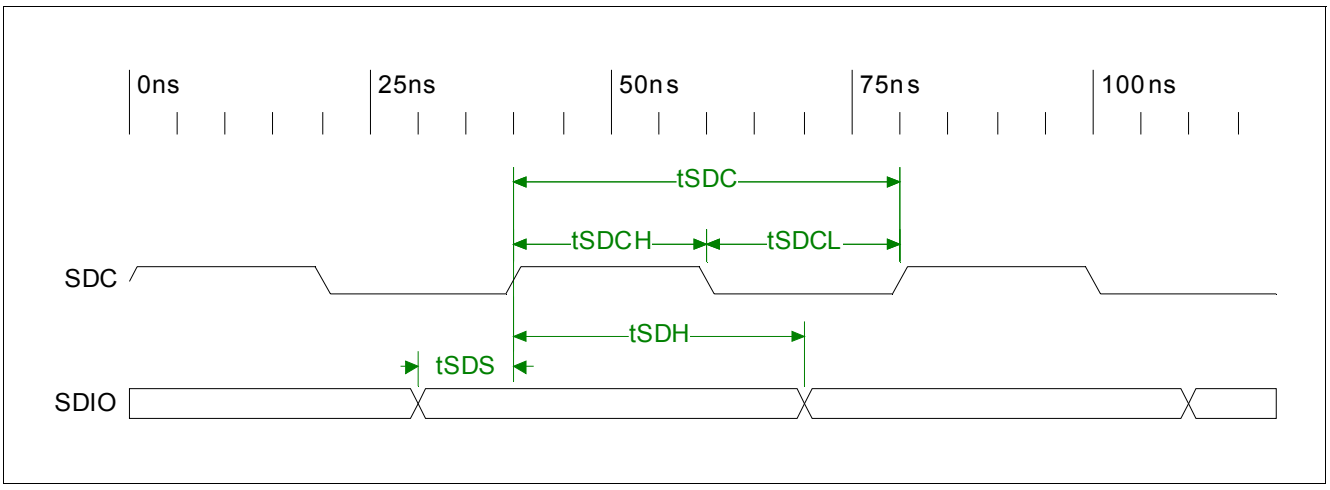
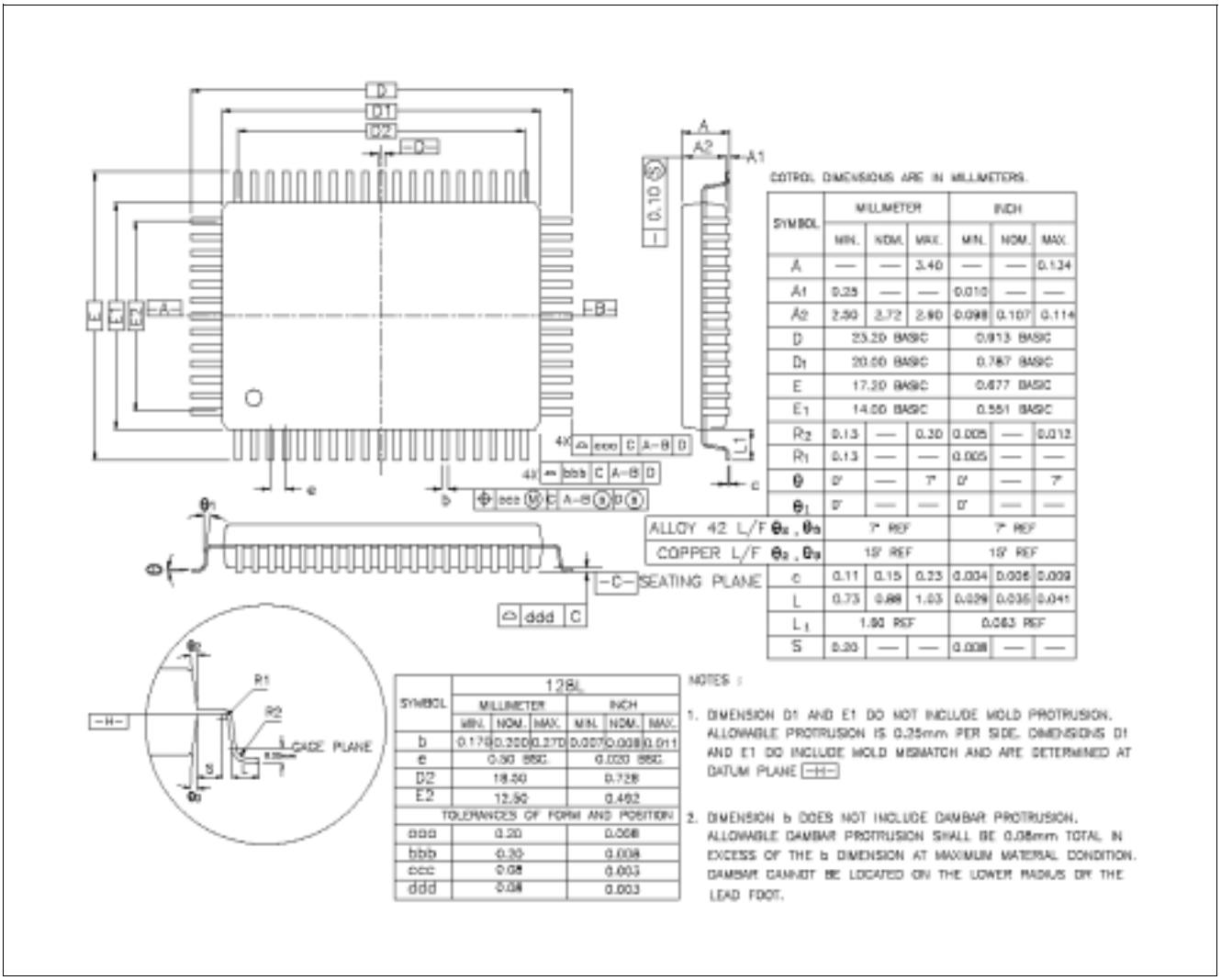


Figure 30 SDC/SDIO Timing

Table 74 SDC/SDIO Timing

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
SDC Period	t_{CK}	20	–	–	ns	–
SDC Low Period	t_{CKL}	10	–	–	ns	–
SDC High Period	t_{CKH}	10	–	–	ns	–
SDIO to SDC rising setup time on read/write cycle	t_{SDS}	4	–	–	ns	–
SDIO to SDC rising hold time on read/write cycle	t_{SDH}	2	–	–	ns	–

8 Package Outlines



SYMBOL	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	—	—	3.40	—	—	0.134
A1	0.25	—	—	0.010	—	—
A2	2.90	3.72	2.90	0.098	0.107	0.114
D	23.20 BASIC			0.913 BASIC		
D1	20.00 BASIC			0.787 BASIC		
E	17.20 BASIC			0.677 BASIC		
E1	14.00 BASIC			0.551 BASIC		
R2	0.13	—	0.30	0.005	—	0.012
R1	0.13	—	—	0.005	—	—
θ	0°	—	7°	0°	—	7°
θ1	0°	—	—	0°	—	—
c	0.11	0.15	0.23	0.004	0.006	0.009
L	0.73	0.88	1.03	0.029	0.035	0.041
L1	1.80 REF			0.063 REF		
S	0.20	—	—	0.008	—	—

SYMBOL	128L					
	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
b	0.17	0.22	0.27	0.007	0.009	0.011
e	0.50 BSC			0.020 BSC		
D2	18.50			0.728		
E2	12.50			0.492		
TOLERANCES OF FORM AND POSITION						
aaa	0.20			0.008		
bbb	0.30			0.012		
ccc	0.08			0.003		
ddd	0.08			0.003		

Figure 31 P-PQFP-128 Outside Dimension

8.1 Package Information

Product Name	Product Type	Package
6-Port 10/100 Mbit/s Single Chip Ethernet Switch Controller	Samurai, ADM6996LC/LCX/LHX-AC-T-1), Version AC	P-PQFP-128

Terminology

B	
BER	Bit Error Rate
C	
CFI	Canonical Format Indicator
COL	Collision
CRC	Cyclic Redundancy Check
CRS	Carrier Sense
CS	Chip Select
D	
DA	Destination Address
DI	Data Input
DO	Data Output
E	
EDI	EEPROM Data Input
EDO	EEPROM Data Output
EECS	EEPROM Chip Select
EESK	EEPROM Clock
ESD	End of Stream Delimiter
F	
FEFI	Far End Fault Indication
FET	Field Effect Transistor
FLP	Fast Link Pulse
G	
GND	Ground
GPSI	General Purpose Serial Interface
I	
IPG	Inter-Packet Gap
L	
LFSR	Linear Feedback Shift Register
M	
MAC	Media Access Controller
MDIX	MDI Crossover
MII	Media Independent Interface
N	
NRZI	Non Return to Zero Inverter
NRZ	Non Return to Zero
P	
PCS	Physical Coding Sub-layer
PHY	Physical Layer
PLL	Phase Lock Loop
PMA	Physical Medium Attachment

PMD	Physical Medium Dependent
Q	
QoS	Quality of Service
QFP	Quad Flat Package
R	
RST	Reset
RXCLK	Receive Clock
RXD	Receive Data
RXDV	Receive Data Valid
RXER	Receive Data Errors
RXN	Receive Negative (Analog receive differential signal)
RXP	Receive Positive (Analog receive differential signal)
S	
SA	Source Address
SOHO	Small Office Home Office
SSD	Start of Stream Delimiter
SQE	Signal Quality Error
T	
TOS	Type of Service
TP	Twisted Pair
TTL	Transistor Logic
TXCLK	Transmission Clock
TXD	Transmission Data
TXEN	Transmission Enable
TXN	Transmission Negative
TXP	Transmission Positive

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