
Features

- Current-controlled Output Current Source with 5 Input Channels
- 2 Selectable Outputs for Grounded Laser Diodes
- Output Current per Channel up to 200 mA
- Total Output Current up to 250 mA
- Rise Time 1.0 ns / Fall Time 1.1 ns
- On-chip RF Oscillator
- Control of 2 Different Frequencies and Swings by Use of 4 External Resistors
- Oscillator Frequency Range from 200 MHz to 600 MHz
- Oscillator Swing to 100 mA
- Single 5-V Power Supply
- Common Enable/Disable Input
- TTL/CMOS Control Signals
- Small SSO24 Package and HP-VFQFP-N28 Package

Applications

- Combo Drives (DVD + CD-RW)
- DVD-RAM with CD-RW Capability
- DVD-RW with CD-RW Capability

Description

The T0800 is a laser diode driver for the operation of two different, grounded laser diodes for DVD-RAM (650 nm) and CD-RW (780 nm). It includes five channels for five different optical power levels which are controlled by a separate IC. The read channel generates a continuous output level. The channels 2 to 5 are provided as write channels with very fast switching speeds. When a 'low' signal is applied to the NE pins, write current pulses are enabled. All channels are summed together and switched to one of the two outputs IOUTA or IOUTB by the select input SELA. Each channel can contribute up to 200 mA to the total output current of up to 250 mA. A total gain of 100 is provided between each reference current input and the selected output. Although the reference inputs are current inputs, voltage control is possible by using external resistors. An on-chip RF oscillator reduces laser mode hopping noise during read mode. Frequency and swing can be set independently for the two selectable outputs with two pairs of resistors. Oscillation is enabled by a 'high' signal at the ENOSC pin. Complete output current and oscillator switch-off is achieved by a 'low' signal at the ENABLE input.



5-Channel Laser Driver with RF Oscillator and 2 Outputs

T0800

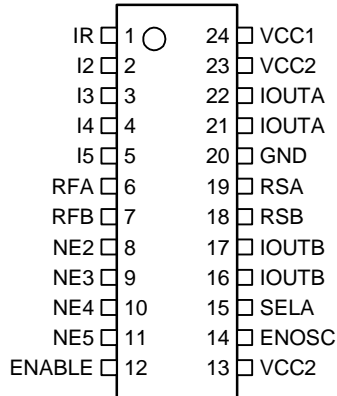
Preliminary

Rev. 4503B-DVD-06/02



Pin Configuration

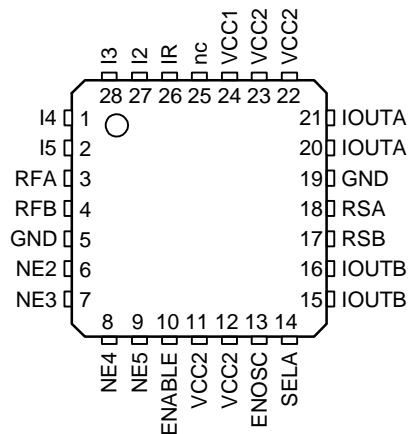
Figure 1. Pinning SSO24



Pin Description: SSO24

Pin	Symbol	Type	Function
1	IR	Analog	Input current, bias voltage approximately GND
2	I2	Analog	Input current, bias voltage approximately GND
3	I3	Analog	Input current, bias voltage approximately GND
4	I4	Analog	Input current, bias voltage approximately GND
5	I5	Analog	Input current, bias voltage approximately GND
6	RFA	Analog	External resistor to GND sets frequency of oscillator A
7	RFB	Analog	External resistor to GND sets frequency of oscillator B
8	NE2	Digital	Digital control of channel 2 (low active)
9	NE3	Digital	Digital control of channel 3 (low active)
10	NE4	Digital	Digital control of channel 4 (low active)
11	NE5	Digital	Digital control of channel 5 (low active)
12	ENABLE	Digital	Enables output current (high active)
13	VCC2	Supply	+5 V power supply for IOUT
14	ENOSC	Digital	Enables RF oscillator (high active)
15	SELA	Digital	High: selects IOUTA, RFA, RSA Low: selects IOUTB, RFB, RSB
16/17	IOUTB	Analog	Output current source B for laser diode
18	RSB	Analog	External resistor to GND sets swing of oscillator B
19	RSA	Analog	External resistor to GND sets swing of oscillator A
20	GND	Supply	Ground
21/22	IOUTA	Analog	Output current source A for laser diode
23	VCC2	Supply	+5 V power supply for IOUT
24	VCC1	Supply	+5 V power supply for circuit

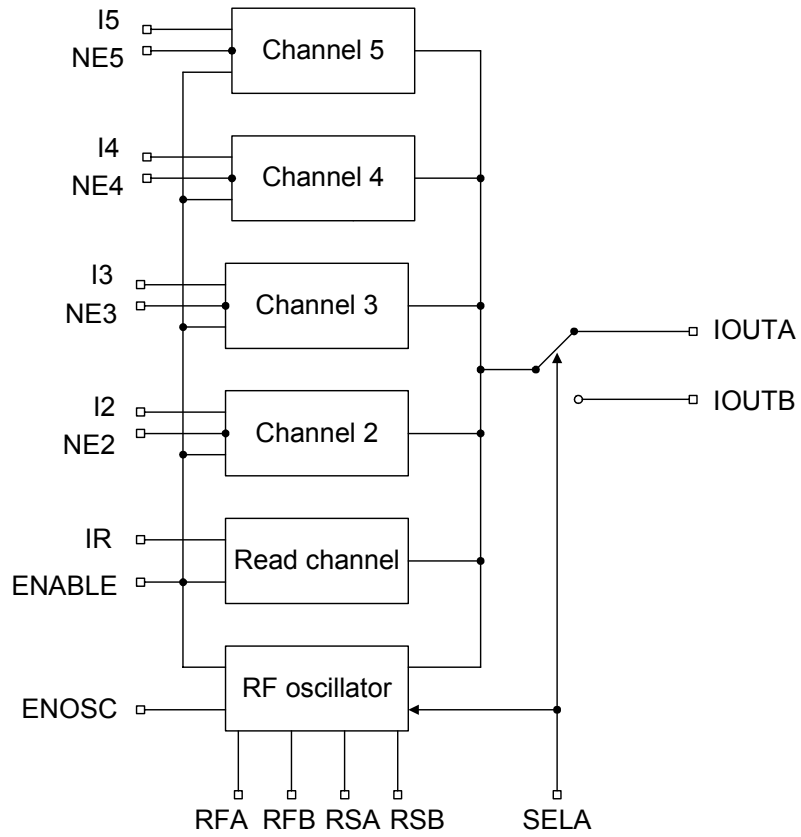
Figure 2. Pinning HP-VFQFP-N28



Pin Description: HP-VFQFP-N28

Pin	Symbol	Type	Function
1	I4	Analog	Input current, bias voltage approximately GND
2	I5	Analog	Input current, bias voltage approximately GND
3	RFA	Analog	External resistor to GND sets frequency of oscillator A
4	RFB	Analog	External resistor to GND sets frequency of oscillator B
5	GND	Supply	Ground
6	NE2	Digital	Digital control of channel 2 (low active)
7	NE3	Digital	Digital control of channel 3 (low active)
8	NE4	Digital	Digital control of channel 4 (low active)
9	NE5	Digital	Digital control of channel 5 (low active)
10	ENABLE	Digital	Enables output current (high active)
11, 12	VCC2	Supply	+5 V power supply IOU
13	ENOSC	Digital	Enables RF oscillator (high active)
14	SELA	Digital	High: selects IOUTA, RFA, RSA Low: selects IOUTB, RFB, RSB
15	IOUTB	Analog	Output current source B for laser diode
16	IOUTB	Analog	Output current source B for laser diode
17	RSB	Analog	External resistor to GND sets swing of oscillator B
18	RSA	Analog	External resistor to GND sets swing of oscillator A
20	IOUTA	Analog	Output current source A for laser diode
21	IOUTA	Analog	Output current source A for laser diode
22, 23	VCC2	Supply	+5 V power supply IOU
24	VCC1	Supply	+5 V power supply circuit
25	nc	-	Not connected
26	IR	Analog	Input current, bias voltage approximately GND
27	I2	Analog	Input current, bias voltage approximately GND
28	I3	Analog	Input current, bias voltage approximately GND

Figure 3. Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	-0.5 to +6.0	V
Input voltage at IR, I2, I3, I4, I5	V_{IN1}	-0.5 to +0.5	V
Input voltage at NE2, NE3, NE4, NE5, ENOSC	V_{IN2}	-0.5 to $V_{CC} + 0.5$	V
Output voltage	V_{OUT}	-0.5 to $V_{CC} - 1$	V
Power dissipation	P_{tot}	0.7 ⁽¹⁾ to 1 ⁽²⁾	W
Junction temperature	T_J	150	°C
Storage temperature range	T_{stg}	-65 to +125	°C

Notes: 1. $R_{thJA} \leq 115$ K/W, $T_{amb} = 70^\circ\text{C}$

2. $R_{thJA} \leq 115$ K/W, $T_{amb} = 25^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction ambient	R_{thJA}	135	K/W

Operating Range

Parameter	Symbol	Value	Unit
Supply voltage range	V_{CC}	4.5 to 5.5	V
Input current	$I_{IR}, I_{I2}, I_{I3}, I_{I4}, I_{I5}$	< 3	mA
External resistor to GND to set oscillator frequency	RFA, RFB	> 3	k Ω
External resistor to GND to set oscillator swing	RSA, RSB	> 100	Ω
Operating temperature range	T_{amb}	0 to +70	°C

Electrical Characteristics

$V_{CC} = 5\text{ V}$, $T_{amb} = 25^\circ\text{C}$, ENABLE = High, NE2 = NE3 = NE4 = NE5 = High, ENOSC = Low, unless otherwise specified

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Power supply						
Supply current, power down	ENABLE = Low, NE2=NE3=NE4=NE5=Low	ICC_{PD2}		0.5		mA
Supply current, read mode, oscillator disabled	$I_{IR}=I_{12}= I_3= I_4= I_5= 500\ \mu\text{A}$	ICC_{R1}		90		mA
Supply current, read mode, oscillator enabled, output A selected	$I_{IR}=I_{12}= I_3= I_4= I_5=$ 500 μA , ENOSC=High, RS = 430 Ω , RF = 7.5 k Ω , SELA = High	ICC_{R2}		100		mA
Supply current, write mode	$I_{IR}=I_{12}= I_3= I_4= I_5= 500\ \mu\text{A}$, NE2=NE3=NE4=NE5=Low	ICC_W		195		mA
Supply current, input off	$I_{IR}=I_{12}=I_3=I_4= I_5=$ 0 μA	ICC_{off}		18		mA
Digital inputs						
NE2/NE3/NE4/NE5 low voltage		VNE_{LO}			1.3	V
NE2/NE3/NE4/NE5 high voltage		VNE_{HI}	2.0			V
SELA low voltage		$VSELA_{LO}$			0.5	V
SELA high voltage		$VSELA_{HI}$	2.7			V
ENABLE low voltage		VEN_{LO}			0.5	V
ENABLE high voltage		VEN_{HI}	3.0			V
ENOSC low voltage		VEO_{LO}			0.5	V
ENOSC high voltage		VEO_{HI}	2.0			V
Currents at digital inputs						
NE2/NE3/NE4/NE5 low current	NE = 0 V	INE_{LO}	-300			μA
NE2/NE3/NE4/NE5 high current	NE = 5 V	INE_{HI}			800	μA
SELA low current	SELA = 0 V	$ISELA_{LO}$	-50			μA
SELA high current	SELA = 5 V	$ISELA_{HI}$			150	μA
ENABLE low current	ENABLE = 0 V	IEN_{LO}	-150			μA
ENABLE high current	ENABLE = 5 V	IEN_{HI}			100	μA
ENOSC low current	ENOSC = 0 V	IEO_{LO}	-100			μA
ENOSC high current	ENOSC = 5 V	IEO_{HI}			800	μA

Electrical Characteristics: Laser Amplifier

$V_{CC} = 5\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, ENABLE = High, unless otherwise specified

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Outputs IOUTA and IOUTB						
Best fit current gain	Any channel ⁽¹⁾	GAIN	90	100	130	mA/mA
Best fit current offset	Any channel ⁽¹⁾	IOS	-8		+4	mA
Output current linearity	Any channel ⁽¹⁾	ILIN	-3		+3	%
Input current range	Input is sinking	IDAC	0		3	mA
Output current per channel	Output is sourcing	I_{OUTR}	200			mA
Total output current		I_{OUT}	250			mA
I_{IN} input impedance	R_{IN} is to GND	R_{IN}	150	200	250	Ω
NE threshold	Temperature stabilized	VTH		1.68		V
Output off current 1	ENABLE = Low	I_{OFF1}			1	mA
Output off current 2	NE2=NE3=NE4=NE5=High	I_{OFF2}			1	mA
Output off current 3	NE2=NE3=NE4=NE5=Low, $I_{IR}=I_{12}=I_{13}=I_{14}=I_{15}=0\ \mu\text{A}$	I_{OFF3}			5	mA
I_{OUT} supply sensitivity, read mode	$I_{OUT} = 40\text{ mA}$, $V_{CC} = 5\text{ V} \pm 10\%$, read-only	VSE_R	-4		1	%V
I_{OUT} supply sensitivity, write mode	$I_{OUT} = 80\text{ mA}$, 40 mA read + 40 mA write, $V_{CC} = 5\text{ V} \pm 10\%$	VSE_W	-6		0	%V
I_{OUT} current output noise	$I_{OUT} = 40\text{ mA}$, ENOSC = Low	INO_O		TBD		nA/ rt-Hz
I_{OUT} temperature sensitivity, read mode	$I_{OUT} = 40\text{ mA}$, read only	TSE_R		100		ppm/ $^{\circ}\text{C}$
I_{OUT} temperature sensitivity, write mode	$I_{OUT} = 80\text{ mA}$, 40 mA read + 40 mA write	TSE_W		100		ppm/ $^{\circ}\text{C}$

Note: 1. Linearity of the amplifier is calculated using a best fit method at three operating points of I_{OUT} at 20 mA, 40 mA, and 60 mA, $I_{OUT} = (I_{IN} \times \text{GAIN}) + I_{OS}$

Electrical Characteristics: Laser Current Amplifier Outputs AC Performance

VCC = +5 V, I_{OUT} = 40 mA DC with 40-mA pulse, T_{amb} = 25°C unless otherwise specified

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Outputs IOUTA and IOUTB						
Write rise time	I _{OUT} = 40 mA (read) +40 mA (10%-90%) ¹⁾	t _{RISE}		1.0	3.0	ns
Write fall time	I _{OUT} = 40 mA (read) +40 mA (10%-90%) ¹⁾	t _{FALL}		1.1	3.0	ns
Output current overshoot	I _{OUT} = 40 mA (read) + 40 mA ¹⁾	OS		5		%
I _{OUT} ON prop delay	NE 50% High-Low to I _{OUT} at 50% of final value	t _{ON}		2.0		ns
I _{OFF} OFF prop delay	NE 50% Low-High to I _{OUT} at 50% of final value	t _{OFF}		2.0		ns
Disable time	ENABLE 50% High-Low to I _{OUT} at 50% of final value	t _{DIS}		20		ns
Enable time	ENABLE 50% Low-High to I _{OUT} at 50% of final value	t _{EN}		20		ns
Disable time oscillator	ENOSC 50% Low-High to I _{OUT} at 50% of final value	T _{DISO}		4		ns
Enable time oscillator	ENOSC 50% High-Low to I _{OUT} at 50% of final value	T _{ENO}		2		ns
SELA delay	SELA Low-High 50% to I _{OUT} at 50% of final value	T _{SAH}		TBD		ns
SELA delay	SELA High-Low 50% to I _{OUT} at 50% of final value	T _{SAL}		TBD		ns
Amplifier bandwidth	I _{OUT} = 50 mA, all channels, -3 dB value	BW _{LCA}		20		MHz
Oscillator frequency	RF = 4.7 kΩ	F _{OSC}	380	470	560	MHz
Oscillator temperature coefficient	RF = 4.7 kΩ	TC _{OSC}		-150		ppm/°C

Note: 1) Load resistor at IOUT 10 Ω, measurement with a 50-Ω oscilloscope and a 39-Ω series resistor.

Application Information Oscillator

Figure 4. Frequency vs. Resistor RFA and RFB ($R_S = 525 \Omega$)

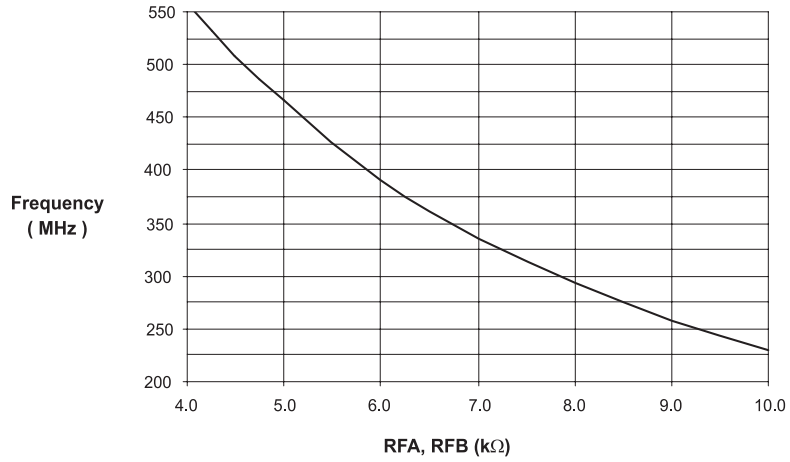


Figure 5. Swing vs. Resistor RSA and RSB ($R_F = 7.82 \text{ k}\Omega$)

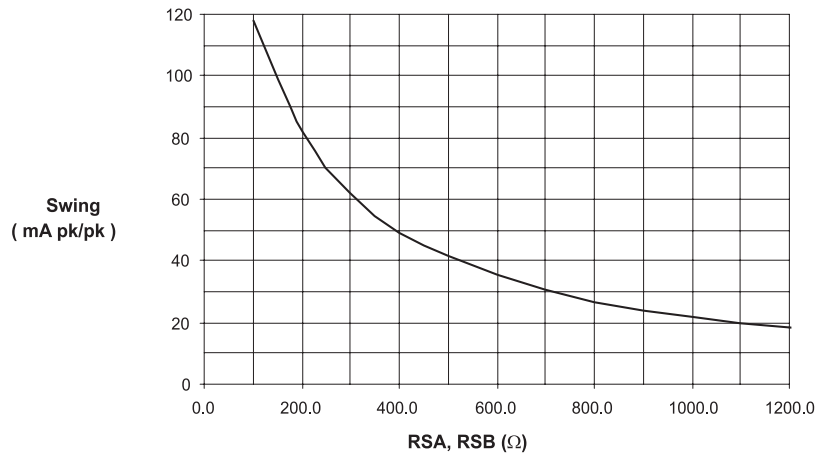


Figure 6. Frequency Dependency of Swing

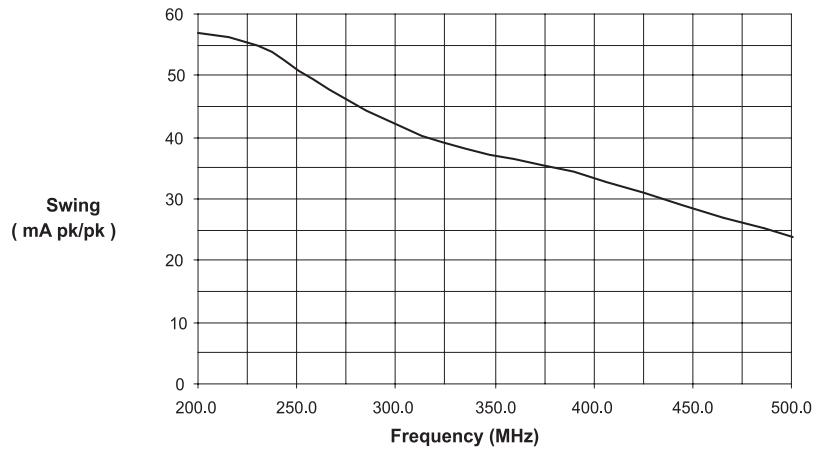


Figure 7. Transfer Characteristic of all Channels (gain = 111)

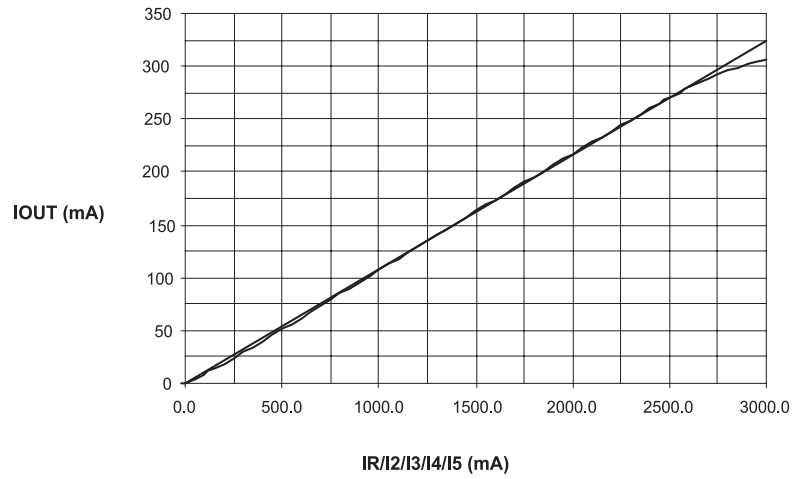


Figure 8. Output Characteristic (Voltage Compliance) $R(IOUT) = 5.8 \Omega$

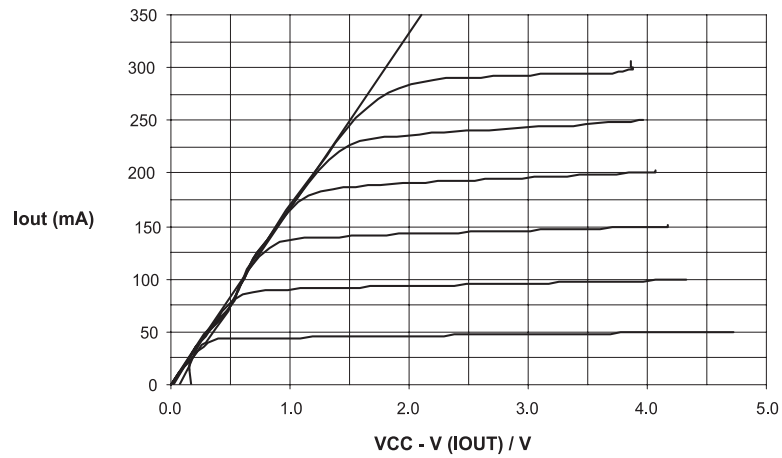


Figure 9. Output Pulse, Read: 50 mA, Write: 250 mA pk-pk

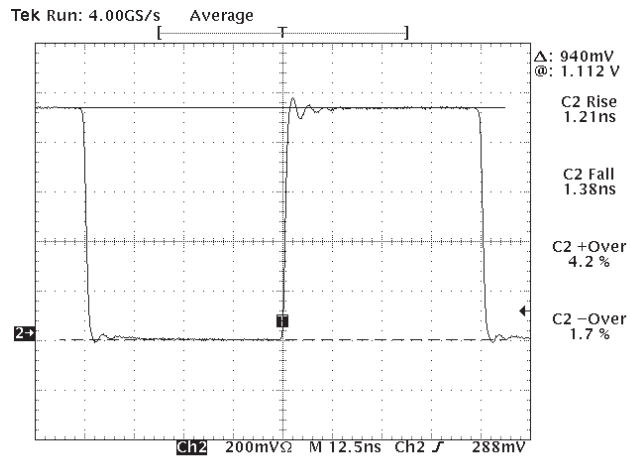


Figure 10. Timing Diagram of IOUT

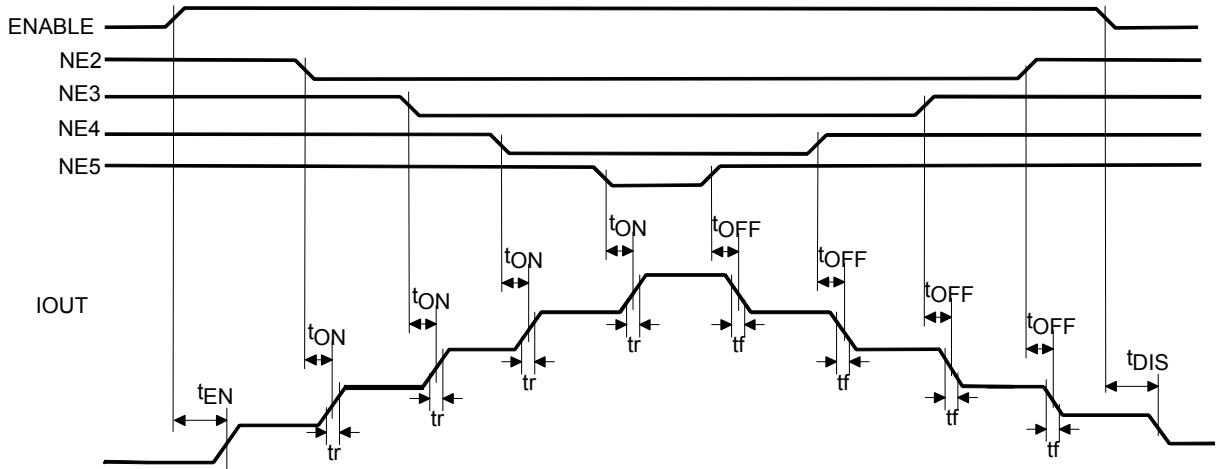
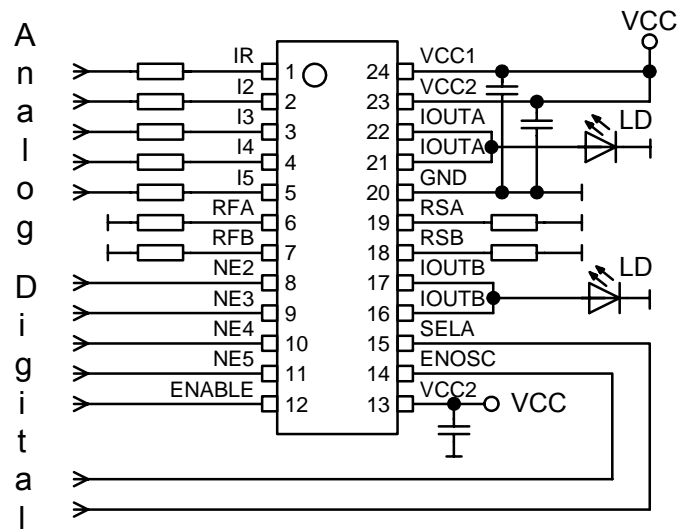


Figure 11. Application Circuit



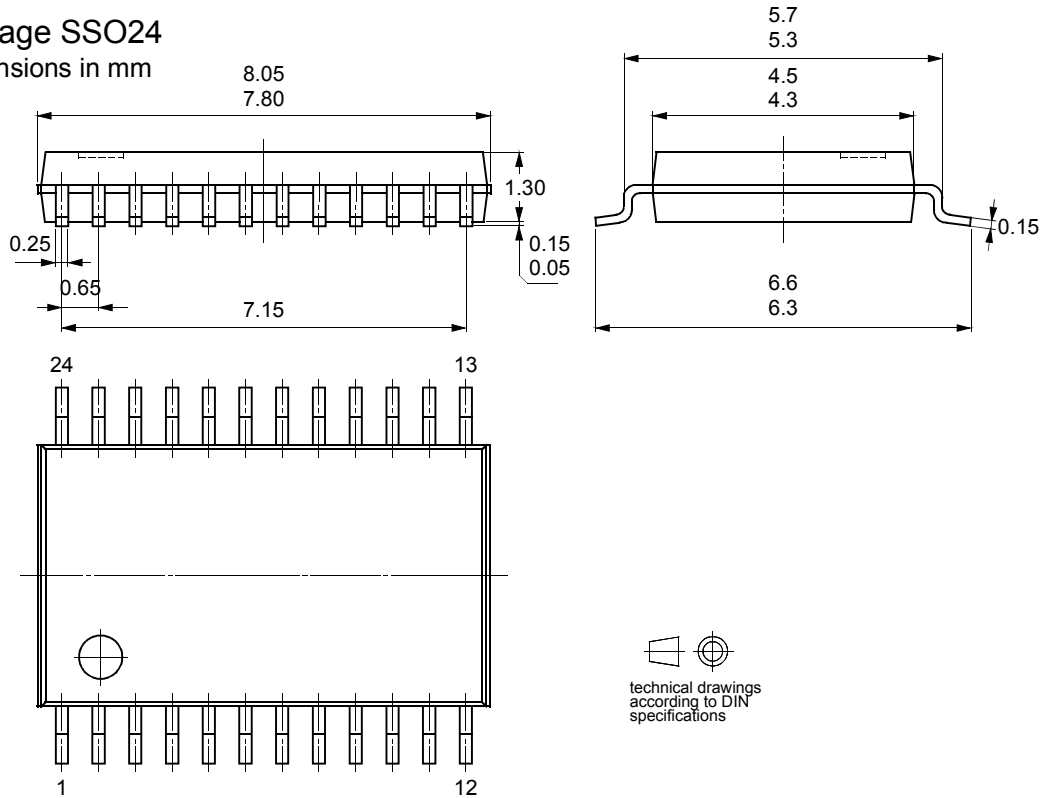
Ordering Information

Extended Type Number	Package	Remarks
T0800-TNQ	SSO24	Taped and reeled
T0800-PJQ	HP-VFQFP-N28	Taped and reeled

Package Information

Package SSO24

Dimensions in mm



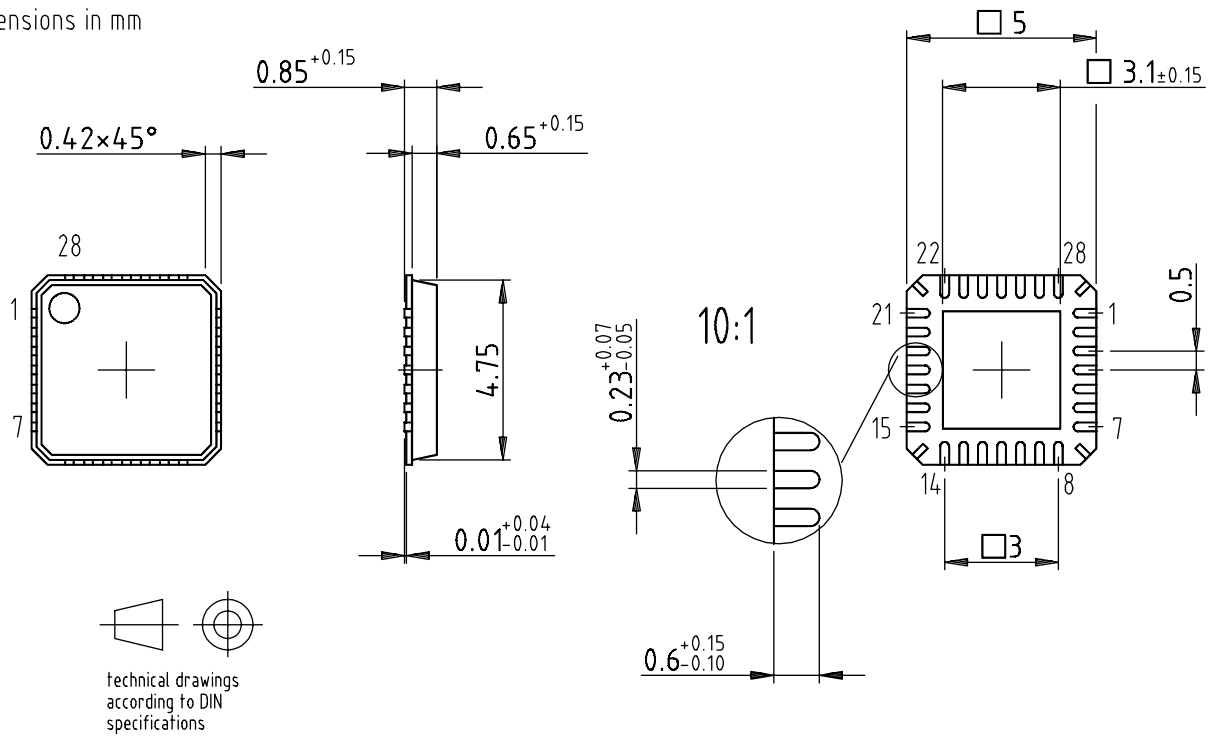
technical drawings

 according to DIN

 specifications

Package: HP-VFQFP-N28
 Exposed pad Var. A
 (acc. JEDEC OUTLINE No. MO-220)

Dimensions in mm



Drawing-No.: 6.543-5081.01-4

Issue: 2; 08.04.02

Subcontractor: Amkor



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