National Semiconductor

MILITARY DATA SHEET

MNCOP244-X REV 0A0

Original Creation Date: 08/25/94
Last Update Date: 08/25/94
Last Major Revision Date: 08/25/94

4-BIT CMOS MICRO-CONTROLLER

General Description

The MM57408 and COP244 fully static, Single-Chip CMOS Microcontrollers are members of the COPS(TM) family, fabricated using double-poly, silicon gate microCMOS technology. These Controller Oriented Processors are complete microcomputers containing all system timing, internal logic, ROM, RAM, and I/O necessary to implement dedicated control functions in a variety of applications. Features include single supply operation, a variety of output configuration options, with an instruction set, internal architecture and I/O scheme designed to facilitate keyboard input, display output and BCD data manipulation. The MM57408 and COP244 are 28 pin chips. These microcontrollers are appropriate choices in many demanding control environments especially those with human interface.

Industry Part Number

COP244

NS Part Numbers

COP244XXX/D/883

Prime Die

NS544C

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Lowest power dissipation (600 uW typical)
- Fully static (can turn off the clock)
- Power saving IDLE state and HALT mode
- 4.4 uS instruction time
- 2k x 8 ROM, 128 x 4 RAM
- 23 I/O lines
- True vectored interrupt, plus restart
- Three-level subroutine stack
- Single supply operation (4.5 to 5.5V)
- Programmable read/write 8-bit timer/event counter
- Internal binary counter register with MICROWIRE(TM) serial I/O capability
- General purpose and TRI-STATE(R) outputs
- LSTTL/CMOS output compatible
- Software/hardware compatible with COP400 family
- -55 C to +125 C operation

(Absolute Maximum Ratings)
(Note 1)

Supply Voltage(Vcc)	6V
Voltage at any Pin	-0.3V to Vcc +0.3V
Total Allowable Source Current	25mA
Total allowable Sink Current	25mA
Total Power Dissipation	150mW
Operating Temperature Range	-55 C to +125 C
Storage Temperature Range	-65 C to +150 C
Lead Temperature (soldering, 10 seconds)	300 C

Note 1: Absolute maximum ratings indicate limits beyond which damage to the device may occur. DC and AC electrical specifications are not ensured when operating the device at absolute maximum ratings.

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: 5.3V <= Vcc <= 3V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IDD1	Supply Current	Vcc = 4V, fIN = 64KHz	1			85	uA	1, 3
			1			155	uA	2
IDD2	Halt Current	Vcc = 4V	1			35	uA	1, 3
			1			125	uA	2
VIH1	Input Voltage Logic High (Reset, CKI)		1		.9Vcc		V	1, 2, 3
VIL1	Input Voltage Logic Low (Reset, CKI)		1			.1Vcc	V	1, 2, 3
VIH2	Input Voltage Logic High (All Other Inputs)		1		.7Vcc		V	1, 2, 3
VIL2	Input Voltage Logic Low (All Other Inputs)		1			.2Vcc	V	1, 2, 3
VOH1	Output Voltage Logic High (LSTTL Operation)	Vcc = 4.75V, IOH = -100uA	1		2.7		V	1, 2, 3
VOL1	Output Voltage Logic Low (LSTTL Operation)	Vcc = 4.75V, IOL = +400uA	1			.4	V	1, 2, 3
VOH2	Output Voltage Logic High (CMOS Operation)	Vcc = 4.75V, IOH = -10uA	1		Vcc-.2		V	1, 2, 3
VOL2	Output Voltage Logic Low (CMOS Operation)	Vcc = 4.75V, IOL = 10uA	1			.2	V	1, 2, 3
IOH	Output Current Logic High	Vcc = 3V, VOH = 0	1		-100		uA	1, 2, 3
IOL	Output Current Logic Low	Vcc = 3V, VOL = 3V	1		200		uA	1, 2, 3
IIN1	Input Leakage High-Z		1		-2.5	2.5	uA	1, 2, 3
IIN2	Input Leakage TRI-STATE or Open Drain		1		-4	4	uA	1, 2, 3

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: 5.3V <= Vcc <= 3V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tC	Instruction Cycle Time	Mode divided by 8, Vcc = 3V	1		80	125	us	9, 10, 11
FIN	Operating Clock Frequency	Vcc = 3V, 30% $\leq$ DUTY CYCLE $\leq$ 50%	1		64	100	KHz	9, 10, 11
	Inputs (tSETUP)	Vcc = 4.5V	2		2		us	9, 10, 11
	Inputs (tSETUP-G Inputs For SKGZ & SKGBZ)	Vcc = 4.5V	2		32		us	9, 10, 11
	Inputs (tHOLD)	Vcc = 4.5V	1		.6		us	9, 10, 11
tPD1	Output Prop Delay	RL=5K, CL=100pF, Vout=1.5V, Vcc=4.5V	1			6	us	9, 10, 11
tPD2	Output Prop Delay	RL=5K, CL=100pF, Vout=1.5V, Vcc=4.5V	1			6	us	9, 10, 11

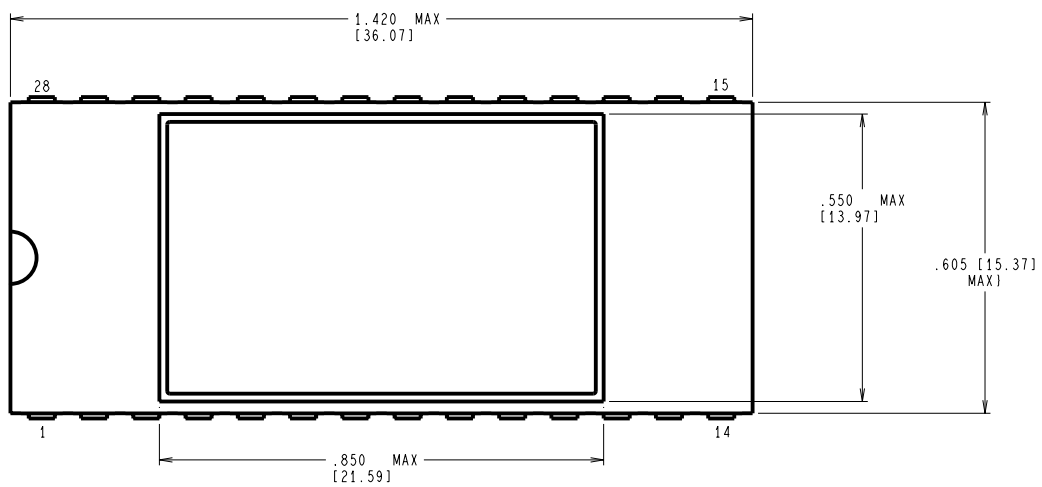
Note 1: Parameter tested go-no-go only
Note 2: Guaranteed by design and not tested

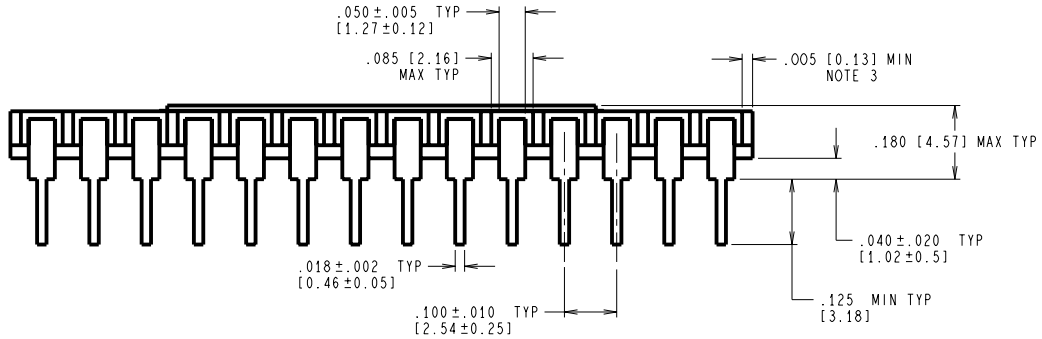
Graphics and Diagrams

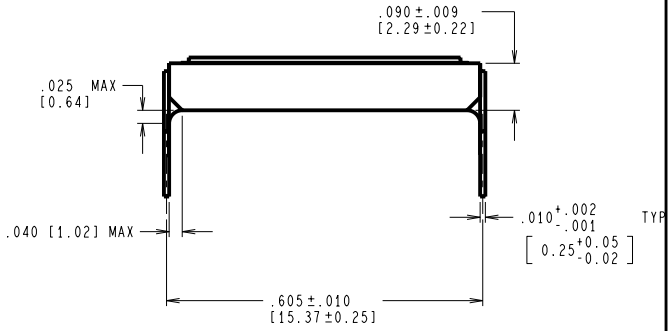
GRAPHICS#	DESCRIPTION
5640HRC3	DIP, SIDEBRAZED CERAMIC, 28 LEAD (B/I CKT)
D28DRF	DIP, S/B CERAMIC, 28LD (P/P DWG)
P000008A	DIP, SIDEBRAZED CERAMIC, 28 LEAD (PIN OUT)

See attached graphics following this page.

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
E	REVISE AND REDRAW PER NEW STANDARD.	10382	04/10/94	DEG/TP
F	.085 MAX WAS .080 ± .008; .605 MAX WAS .595 ± .006.	10476	07/01/94	DEG/







CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

NOTES: UNLESS OTHERWISE SPECIFIED.

1. LEAD FINISH TO BE ONE OF THE FOLLOWING:
   a. 200 MICROINCHES/5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
   b. 50 MICROINCHES/1.27 MICROMETERS MINIMUM GOLD OVER 50 TO 350 MICROINCHES/1.27 TO 8.89 MICROMETERS NICKEL UNDERPLATE.
2. LEAD FINISH, NICKEL UNDERPLATE AND BASIS METAL SHALL CONFORM TO THE REQUIREMENTS OF MIL-M-38510.
3. DIMENSION .005 IN/0.13mm MINIMUM SHALL BE MEASURED FROM THE EDGE OF THE FURTHEST EXTENSION OF THE METAL PAD OR LEAD.
4. REFERENCE JEDEC REGISTRATION MS-015, VARIATION CB, DATED 7/90.

MIL/AERO
CONFIGURATION CONTROL

MIL-M-38510
CONFIGURATION CONTROL

APPROVALS	DATE
DRAWN: Dwayne Grady	04/10/94
DFTG. CHK.	
ENGR. CHK.	
APPROVAL	

PROJECTION

INCH [MM]

NATIONAL SEMICONDUCTOR CORPORATION
2900 Semiconductor Drive, Santa Clara, CA 95052-8090

DIP, SIDEBRAZED CERAMIC, 28 LEAD

SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-D28D	F

DO NOT SCALE DRAWING | SHEET 1 of 1

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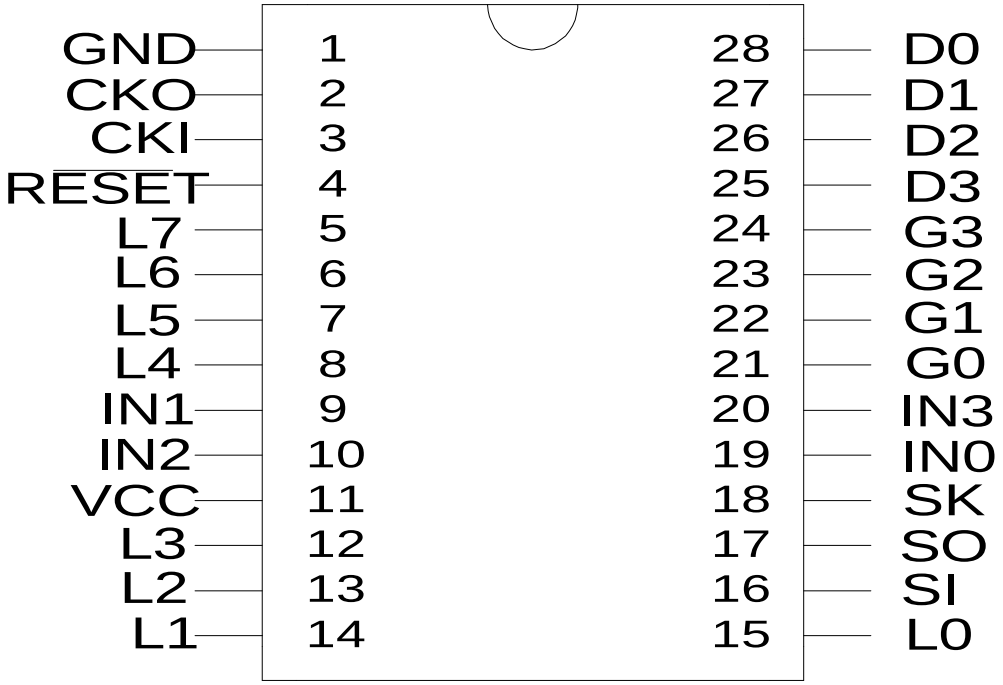

MM57408D/883, COP244XXX/D/883

CONNECTION DIAGRAM

28 - LEAD DIP
(TOP VIEW)

P000008A