

MC1488, SN55188, SN75188 QUADRUPLE LINE DRIVERS

SLLS094C – SEPTEMBER 1983 – REVISED MAY 2004

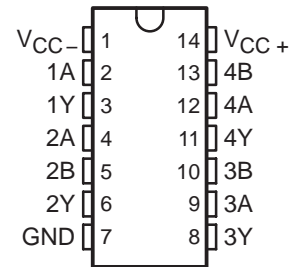
- Meet or Exceed the Requirements of ANSI TIA/EIA-232-E and ITU Recommendation V.28
- Current-Limited Output: 10 mA Typical
- Power-Off Output Impedance: 300 Ω Minimum
- Slew Rate Control by Load Capacitor
- Flexible Supply-Voltage Range
- Input Compatible With Most TTL Circuits

description/ordering information

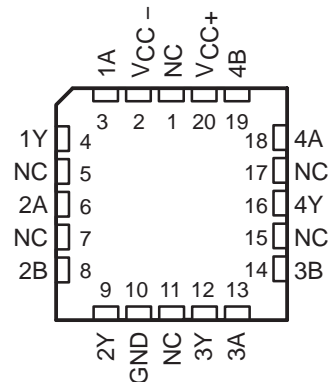
The MC1488, SN55188, and SN75188 are monolithic quadruple line drivers designed to interface data terminal equipment with data communications equipment in conformance with ANSI TIA/EIA-232-E, using a diode in series with each supply-voltage terminal as shown under typical applications.

The SN55188 is characterized for operation over the full military temperature range of -55°C to 125°C . The MC1488 and SN75188 are characterized for operation from 0°C to 70°C .

SN55188 . . . J OR W PACKAGE
SN75188 . . . D, N, OR NS PACKAGE
MC1488 . . . N PACKAGE
(TOP VIEW)



SN55188 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (N)	Tube of 25	MC1488N	MC1488N
		Tube of 25	SN75188N	SN75188N
	SOIC (D)	Tube of 50	SN75188D	SN75188
		Reel of 2500	SN75188DR	
	SOP (NS)	Reel of 2000	SN75188NSR	SN75188
-55°C to 125°C	CDIP (J)	Tube of 25	SN55188J	SN55188J
			SNJ55188J	SNJ55188J
	CFP (W)	Tube of 150	SNJ55188W	SNJ55188W
	LCCC (FK)	Tube of 55	SNJ55188FK	SNJ55188FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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 **TEXAS
INSTRUMENTS**

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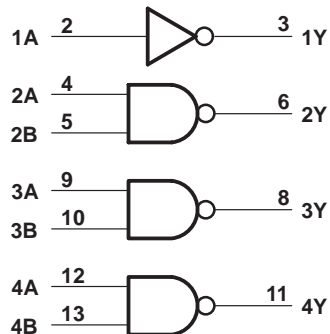
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FUNCTION TABLE
(drivers 2–4)

A	B	Y
H	H	L
L	X	H
X	L	H

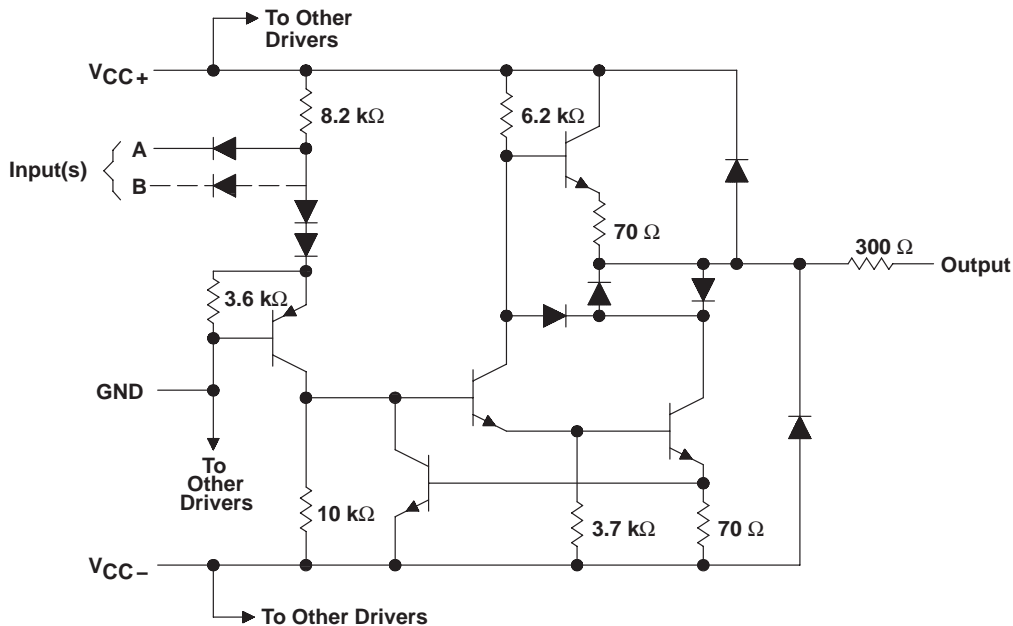
H = high level, L = low level,
X = irrelevant

logic diagram (positive logic)



Positive logic
 $Y = \overline{A}$ (driver 1)
 $Y = AB$ or $\overline{A} + \overline{B}$ (drivers 2 thru 4)

schematic (each driver)



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V_{CC+} at (or below) 25°C free-air temperature (see Notes 1 and 2)	15 V
Supply voltage, V_{CC-} at (or below) 25°C free-air temperature (see Notes 1 and 2)	–15 V
Input voltage, V_I	–15 V to 7 V
Output voltage, V_O	–15 V to 15 V
Continuous total power dissipation (see Note 2)	See Dissipation Rating Table
Package thermal impedance, θ_{JA} (see Notes 3 and 4): D package	86°C/W
N package	80°C/W
NS package	76°C/W
Operating virtual junction temperature, T_J	150°C
Case temperature for 60 seconds, FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package	300°C
Storage temperature range, T_{stg}	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values are with respect to the network ground terminal.
 2. For operation above 25°C free-air temperature, refer to the maximum supply voltage curve, Figure 6. In the J package, SN55188 chips are alloy mounted.
 3. Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Selecting the maximum of 150°C can affect reliability.
 4. The package thermal impedance is calculated in accordance with JESD 51-7.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J	1375 mW	11.0 mW/°C	880 mW	275 mW
W	1000 mW	8.0 mW/°C	640 mW	200 mW

recommended operating conditions

		SN55188			MC1488, SN75188			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC+}	Supply voltage	7.5	9	15	7.5	9	15	V
V_{CC-}	Supply voltage	–7.5	–9	–15	–7.5	–9	–15	V
V_{IH}	High-level input voltage	1.9			1.9			V
V_{IL}	Low-level input voltage			0.8			0.8	V
T_A	Operating free-air temperature	–55		125	0		70	°C

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electrical characteristics over operating free-air temperature range, $V_{CC\pm} = \pm 9\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		SN55188			MC1488, SN75188			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{OH} High-level output voltage	$V_{IL} = 0.8\text{ V}$, $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$	6	7		6	7		V
		$V_{CC+} = 13.2\text{ V}$, $V_{CC-} = -13.2\text{ V}$	9	10.5		9	10.5		
V_{OL} Low-level output voltage	$V_{IH} = 1.9\text{ V}$, $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$		-7‡	-6		-7	-6	V
		$V_{CC+} = 13.2\text{ V}$, $V_{CC-} = -13.2\text{ V}$		-10.5‡	-9		-10.5	-9	
I_{IH} High-level input current	$V_I = 5\text{ V}$				10			10	μA
I_{IL} Low-level input current	$V_I = 0$			-1	-1.6		-1	-1.6	mA
$I_{OS(H)}$ Short-circuit output current at high level§	$V_I = 0.8\text{ V}$	$V_O = 0$	-4.6	-9	-13.5	-6	-9	-12	mA
$I_{OS(L)}$ Short-circuit output current at low level§	$V_I = 1.9\text{ V}$	$V_O = 0$	4.6	9	13.5	6	9	12	mA
r_o Output resistance, power off	$V_{CC+} = 0$, $V_O = -2\text{ V to } 2\text{ V}$	$V_{CC-} = 0$	300			300			Ω
I_{CC+} Supply current from V_{CC+}	$V_{CC+} = 9\text{ V}$, No load	All inputs at 1.9 V	15		20	15		20	mA
		All inputs at 0.8 V	4.5		6	4.5		6	
	$V_{CC+} = 12\text{ V}$, No load	All inputs at 1.9 V	19		25	19		25	
		All inputs at 0.8 V	5.5		7	5.5		7	
	$V_{CC+} = 15\text{ V}$, No load, $T_A = 25^\circ\text{C}$	All inputs at 1.9 V			34			34	
		All inputs at 0.8 V			12			12	
I_{CC-} Supply current from I_{CC-}	$V_{CC-} = -9\text{ V}$, No load	All inputs at 1.9 V	-13		-17	-13		-17	mA
		All inputs at 0.8 V			-0.5			-0.015	
	$V_{CC-} = -12\text{ V}$, No load	All inputs at 1.9 V	-18		-23	-18		-23	
		All inputs at 0.8 V			-0.5			-0.015	
	$V_{CC-} = -15\text{ V}$, No load, $T_A = 25^\circ\text{C}$	All inputs at 1.9 V			-34			-34	
		All inputs at 0.8 V			-2.5			-2.5	
P_D Total power dissipation	$V_{CC+} = 9\text{ V}$, No load	$V_{CC-} = -9\text{ V}$	333			333			mW
	$V_{CC+} = 12\text{ V}$, No load	$V_{CC-} = -12\text{ V}$	576			576			

† All typical values are at $T_A = 25^\circ\text{C}$.

‡ The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic voltage levels only, e.g., if -6 V is a maximum, the typical value is a more negative voltage.

§ Not more than one output should be shorted at a time.



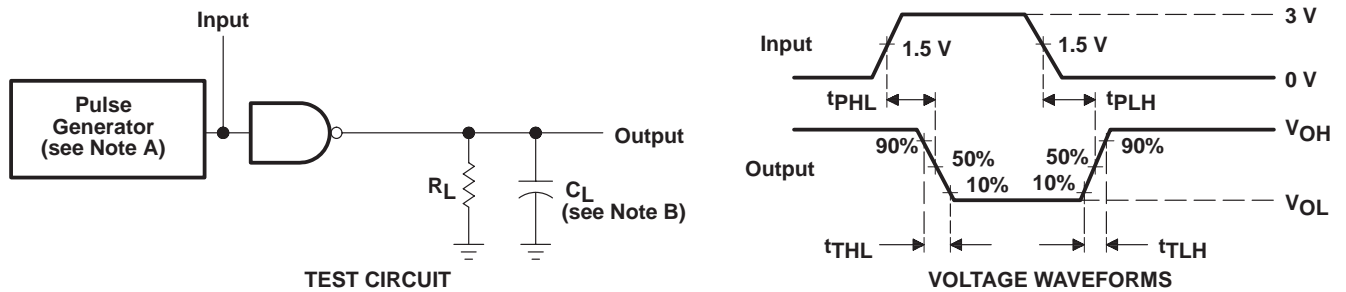
switching characteristics, $V_{CC\pm} = \pm 9\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low- to high-level output	$R_L = 3\text{ k}\Omega$, See Figure 1 $C_L = 15\text{ pF}$		220	350	ns
t_{PHL} Propagation delay time, high- to low-level output			100	175	ns
t_{TLH} Transition time, low- to high-level output [†]			55	100	ns
t_{THL} Transition time, high- to low-level output [†]			45	75	ns
t_{TLH} Transition time, low- to high-level output [‡]	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, See Figure 1 $C_L = 2500\text{ pF}$		2.5		μs
t_{THL} Transition time, high- to low-level output [‡]			3.0		μs

[†] Measured between 10% and 90% points of output waveform

[‡] Measured between 3 V and -3 V points on the output waveform (TIA/EIA-232-E conditions)

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generator has the following characteristics: $t_w = 0.5\ \mu\text{s}$, $\text{PRR} \leq 1\ \text{MHz}$, $Z_O = 50\ \Omega$.
B. C_L includes probe and jig capacitance.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS†

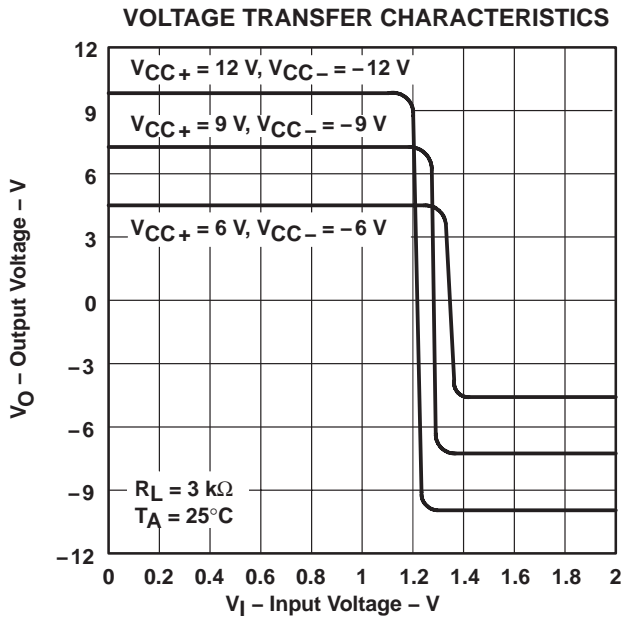


Figure 2

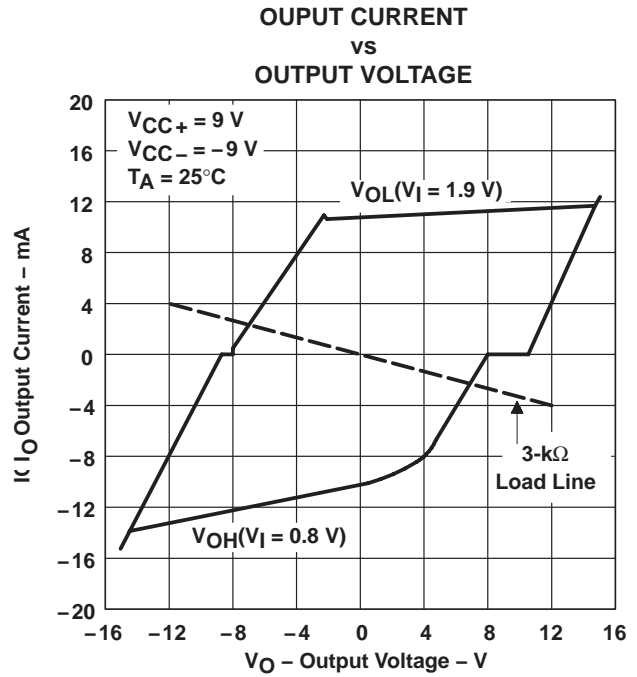


Figure 3

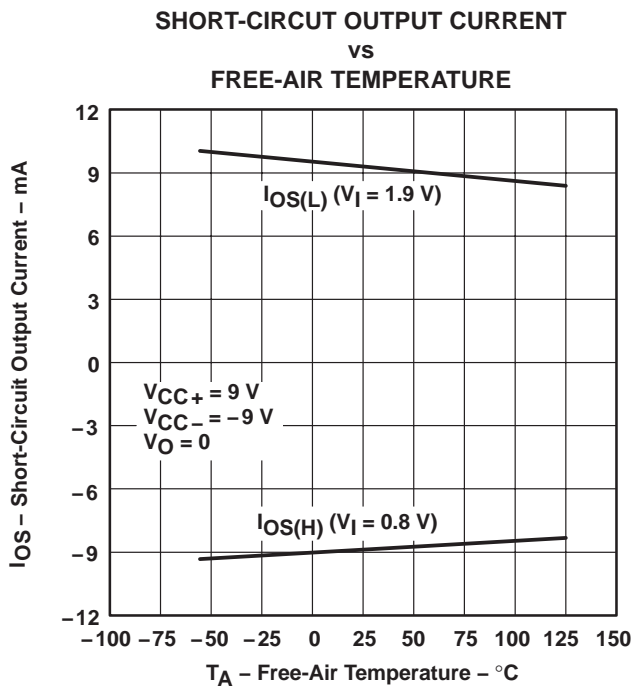


Figure 4

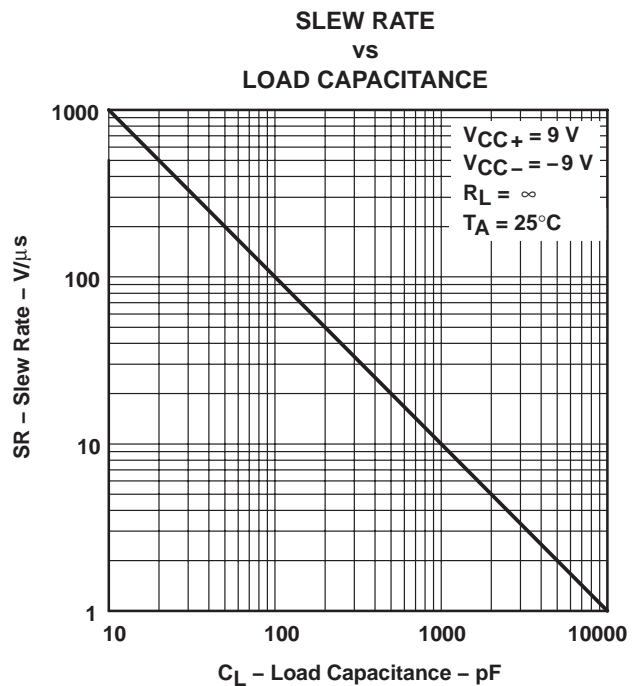


Figure 5

† Data for temperatures below 0°C and above 70°C are applicable to SN55188 circuit only.

THERMAL INFORMATION†

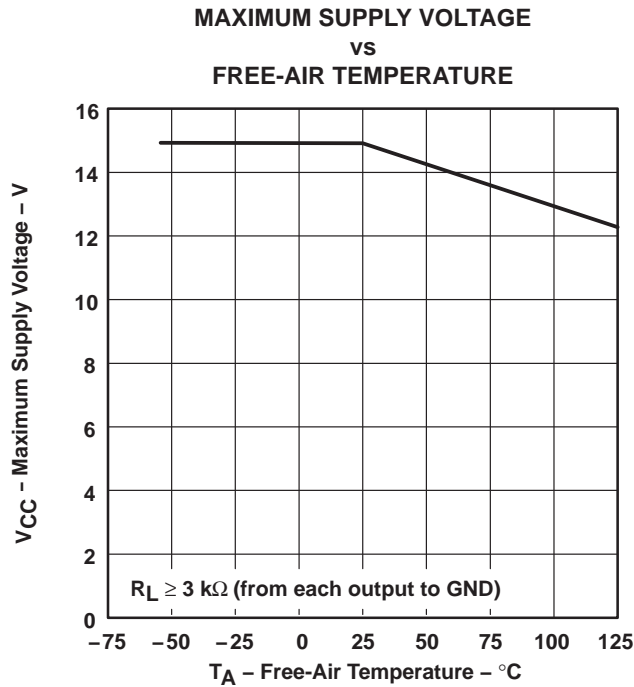


Figure 6

APPLICATION INFORMATION

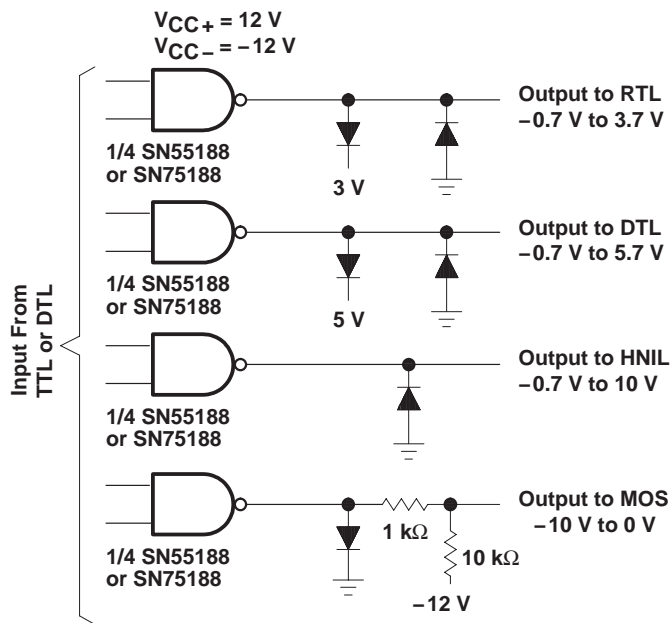
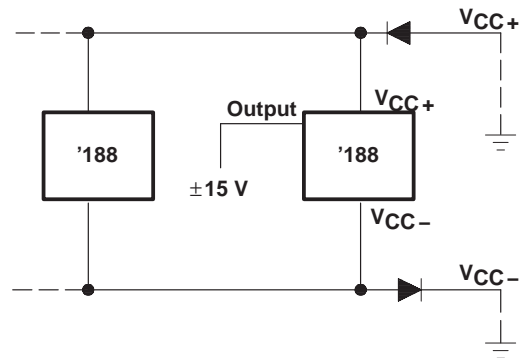


Figure 7. Logic Translator Applications



Diodes placed in series with the V_{CC+} and V_{CC-} leads protect the SN55188/SN75188 in the fault condition in which the device outputs are shorted to $\pm 15\text{ V}$, and the power supplies are at low voltage and provide low-impedance paths to ground.

Figure 8. Power-Supply Protection to Meet Power-Off Fault Conditions of ANSI TIA/EIA-232-E

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

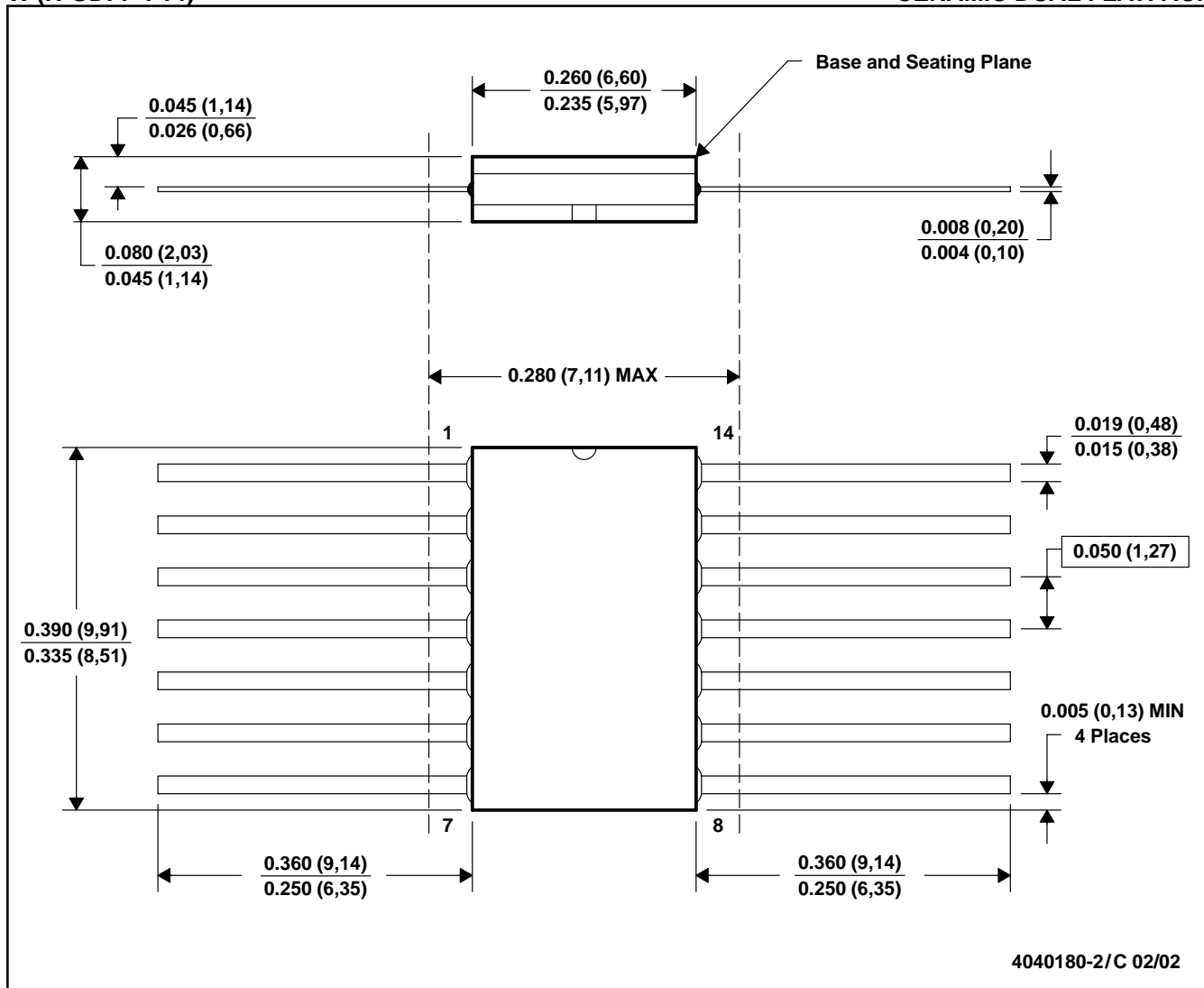


4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification only.
 E. Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



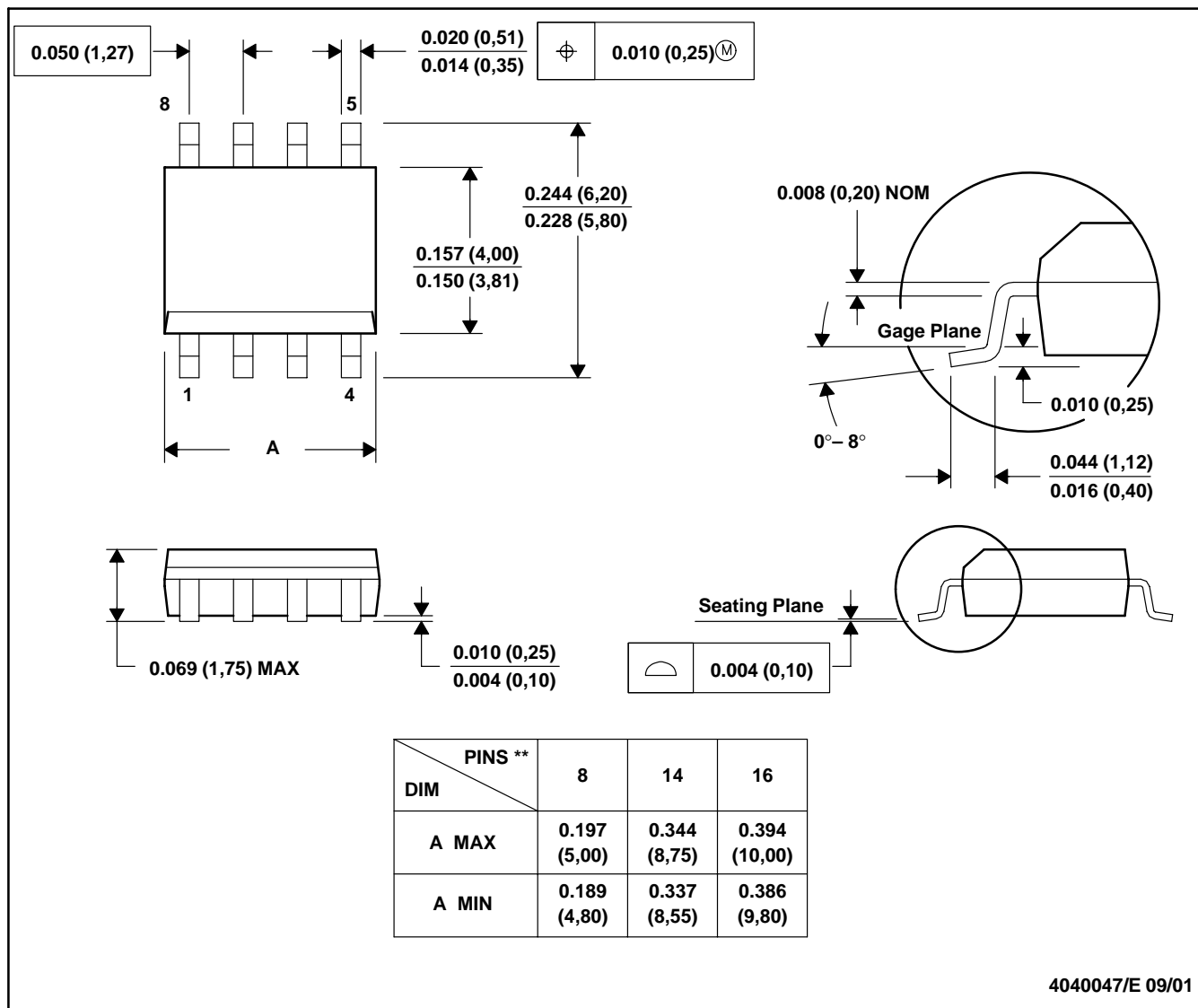
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
 D. Falls within JEDEC MS-012

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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