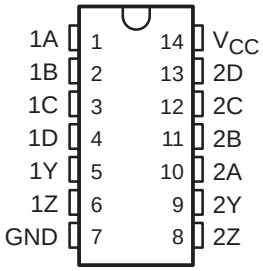
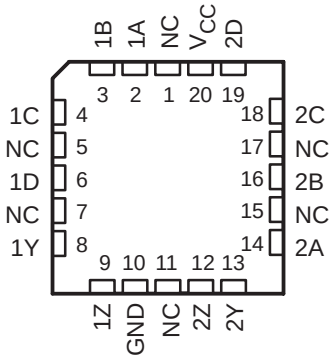
SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

- **Single 5-V Supply**
- **Differential Line Operation**
- **Dual Channels**
- **TTL Compatibility**
- **Short-Circuit Protection of Outputs**
- **Output Clamp Diodes to Terminate Line Transients**
- **High-Current Outputs**
- **Quad Inputs**
- **Single-Ended or Differential AND/NAND Outputs**
- **Designed for Use With Dual Differential Drivers SN55182 and SN75182**
- **Designed to Be Interchangeable With National Semiconductor DS7830 and DS8830**

SN55183 . . . J OR W PACKAGE
SN75183 . . . D OR N PACKAGE
DS8830 . . . N PACKAGE
(TOP VIEW)



SN55183 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

THE DS8830 AND SN55183 ARE NOT RECOMMENDED FOR NEW DESIGNS

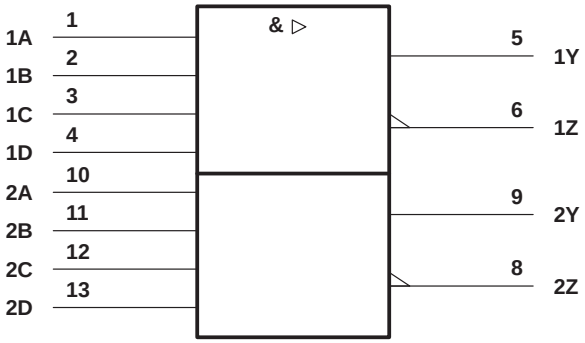
description

The DS8830, SN55183, and SN75183 dual differential line drivers are designed to provide differential output signals with high current capability for driving balanced lines, such as twisted pair, at normal line impedances without high power dissipation. These devices can be used as TTL expander/phase splitters, because the output stages are similar to TTL totem-pole outputs.

The driver is of monolithic single-chip construction, and both halves of the dual circuits use common power supply and ground terminals.

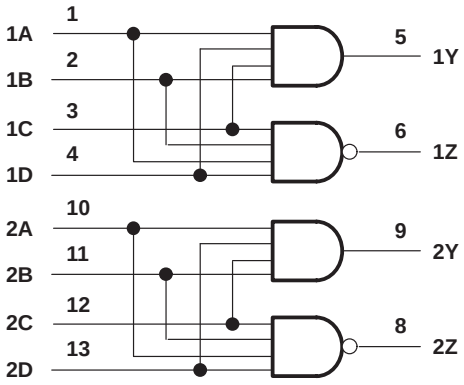
The SN55183 is characterized for operation over the full military temperature range of –55°C to 125°C. The DS8830 and SN75183 are characterized for operation from 0°C to 70°C.

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, N, and W packages.

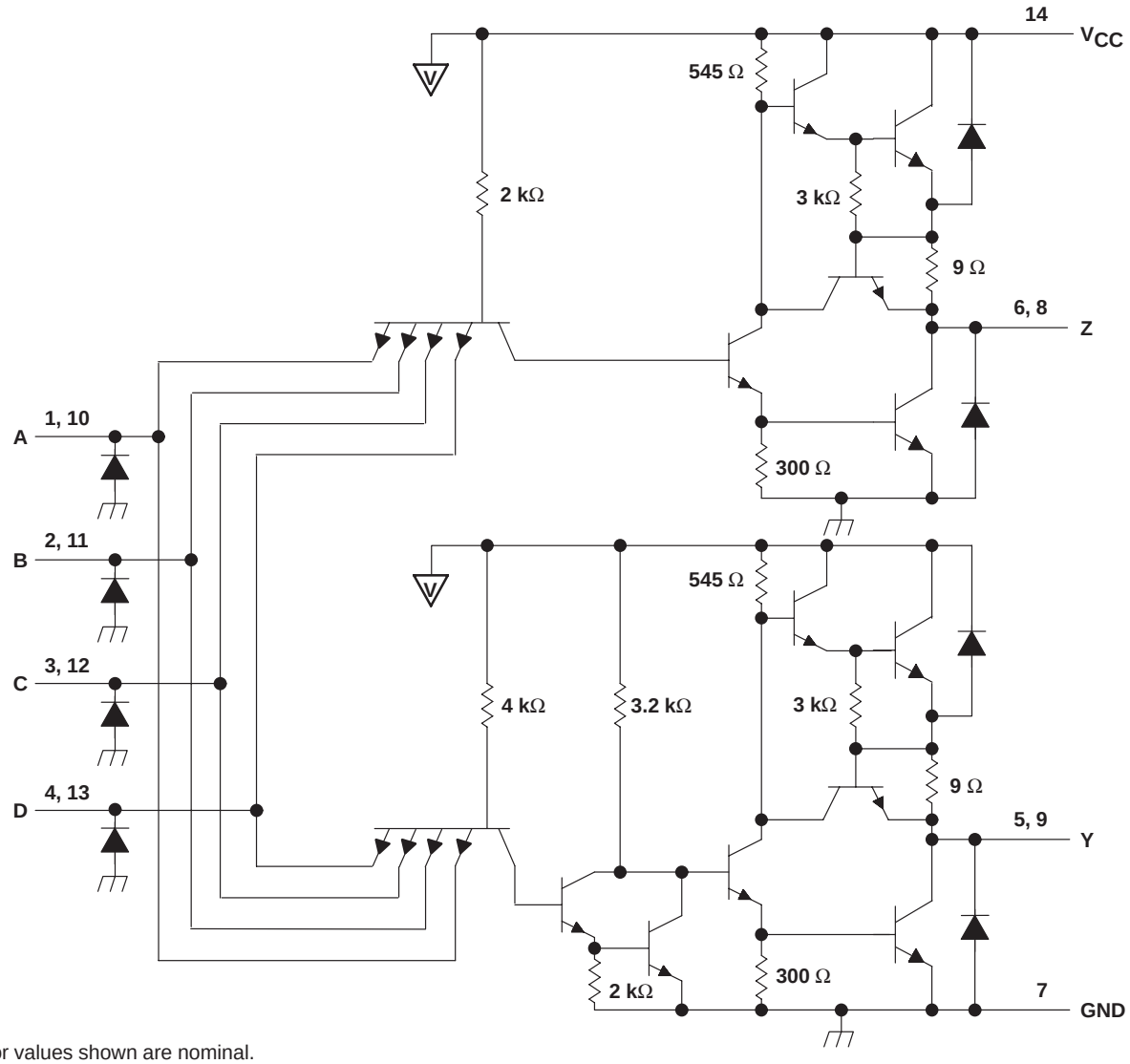
logic diagram (positive logic)



Positive logic: $y = ABCD$, $Z = \overline{ABCD}$

Pin numbers shown are for the D, J, N, and W packages.

schematic (each driver)



Resistor values shown are nominal.
Pin numbers shown are for the D, J, N, and W packages.

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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage, V_I . . . . . 5.5 V
Duration of output short circuit (see Note 2) . . . . . 1 s
Continuous total power dissipation . . . . . See Dissipation Rating Table
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package . . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package . . . . . 300°C
Case temperature for 60 seconds, T_c: FK package . . . . . 260°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, except differential voltages, are with respect to network ground terminal.
2. Not more than one output should be shorted to ground at any one time.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	–
FK‡	1375 mW	11.0 mW/°C	880 mW	275 mW
J‡	1375 mW	11.0 mW/°C	880 mW	275 mW
N	1150 mW	9.2 mW/°C	736 mW	–
W‡	1000 mW	8.0 mW/°C	640 mW	200 mW

‡ In the FK, J, and W packages, SN55183 chips are alloy mounted and SN75183 chips are glass mounted.

recommended operating conditions

	SN55183			DS8830, SN75183			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level input voltage, V_{IH}	2			2			V
Low-level input voltage, V_{IL}			0.8			0.8	V
High-level output current, I_{OH}			–40			–40	mA
Low-level output current, I_{OL}			40			40	mA
Operating free-air temperature, T_A	–55		125	0		70	°C

electrical characteristics over recommended ranges of V_{CC} and operating free-air temperature (unless otherwise noted)

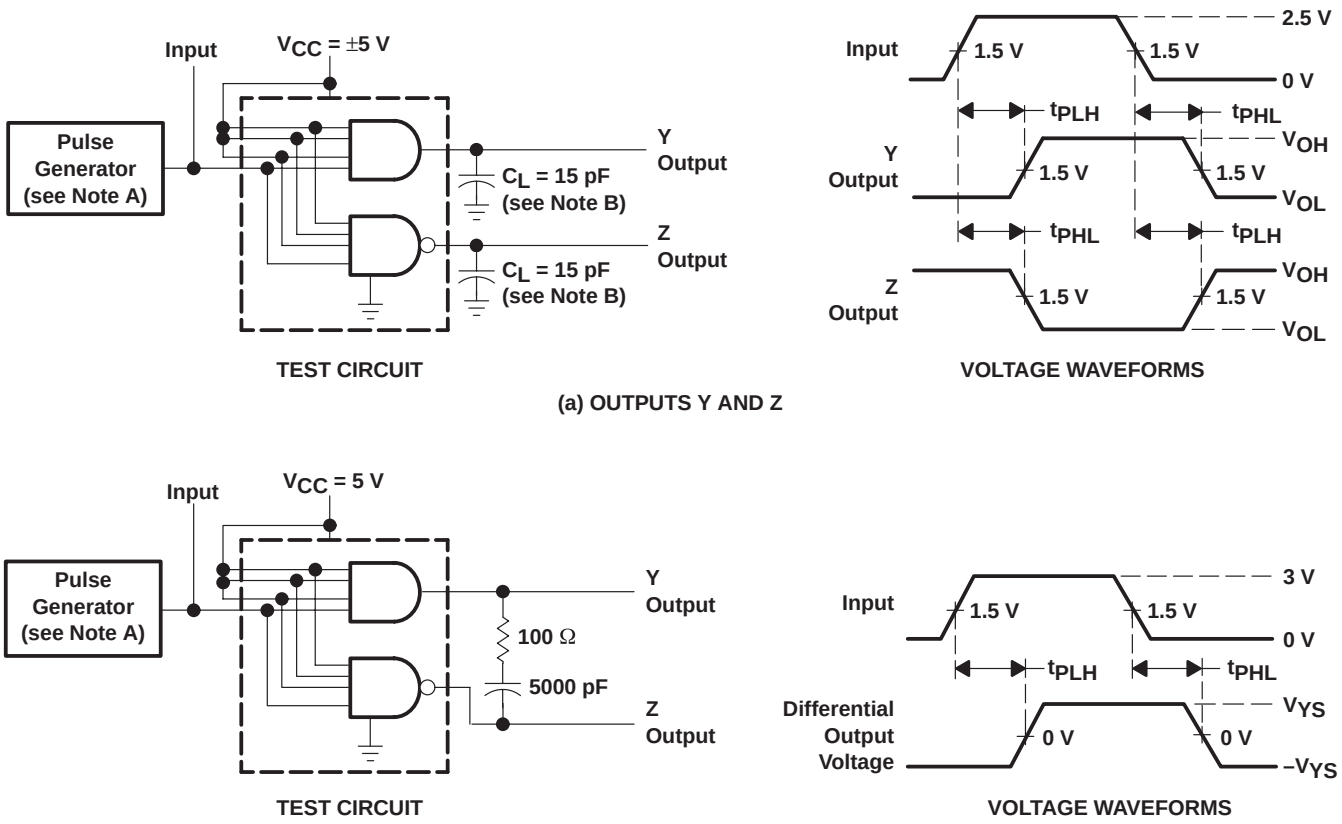
PARAMETER			TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{OH}	High-level output voltage	Y (AND) outputs	V_{IH} = 2 V	I_{OH} = –0.8 mA	2.4			V
				I_{OH} = –40 mA	1.8	3.3		
V_{OL}	Low-level output voltage	Y (AND) outputs	V_{IL} = 0.8 V	I_{OL} = 32 mA		0.2		V
				I_{OL} = 40 mA		0.22	0.4	
V_{OH}	High-level output voltage	Z (NAND) outputs	V_{IL} = 0.8 V	I_{OH} = –0.8 mA	2.4			V
				I_{OH} = –40 mA	1.8	3.3		
V_{OL}	Low-level output voltage	Z (NAND) outputs	V_{IH} = 2 V	I_{OL} = 32 mA		0.2		V
				I_{OL} = 40 mA		0.22	0.4	
I_{IH}	High-level input current		V_{IH} = 2.4 V				120	μA
I_I	Input current at maximum input voltage		V_{IH} = 5.5 V				2	mA
I_{IL}	Low-level input current		V_{IL} = 0.4 V				–4.8	mA
I_{OS}	Short-circuit output current‡		V_{CC} = 5 V,	T_A =125°C§	–40	–100	–120	mA
I_{CC}	Supply current (average per driver)		V_{CC} = 5 V,	All inputs at 5 V, No load		10	18	mA

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ Not more than one output should be shorted to ground at a time, and duration of the short circuit should not exceed one second.
§ T_A = 125°C is applicable to SN55183 only.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level Y output	AND gates	C_L = 15 pF, See FIgure 1(a)		8	12	ns
t_{PHL}	Propagation delay time, high- to low-level Y output	AND gates	C_L = 15 pF, See FIgure 1(a)		12	18	ns
t_{PLH}	Propagation delay time, low- to high-level Z output	NAND gates	C_L = 15 pF, See FIgure 1(a)		6	12	ns
t_{PHL}	Propagation delay time, high- to low-level Z output	NAND gates	C_L = 15 pF, See FIgure 1(a)		6	8	ns
t_{PLH}	Propagation delay time, low- to high-level differential output	Y output with respect to Z output, R_L = 100 Ω in series with 5000 pF, See Figure 1(b)			9	16	ns
t_{PHL}	Propagation delay time, high- to low-level differential output	Y output with respect to Z output, R_L = 100 Ω in series with 5000 pF, See Figure 1(b)			8	16	ns

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generators have the following characteristics: Z_O = 50 Ω, $t_r \le 10$ ns, $t_f \le 10$ ns, t_W = 0.5 µs, PRR ≤ 1 MHz.
B. C_L includes probe and jig capacitance.
C. Waveforms are monitored on an oscilloscope with $r_i \ge 1$ MΩ.

Figure 1. Test Circuits and Voltage Waveforms

TYPICAL CHARACTERISTICS†

INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

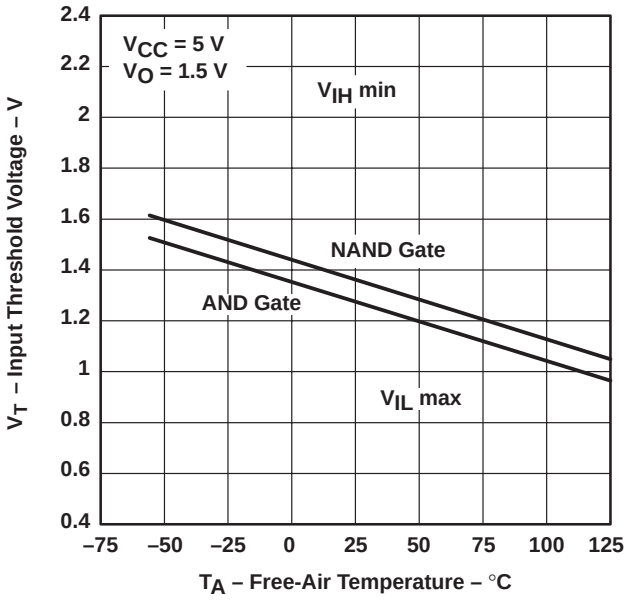


Figure 2

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

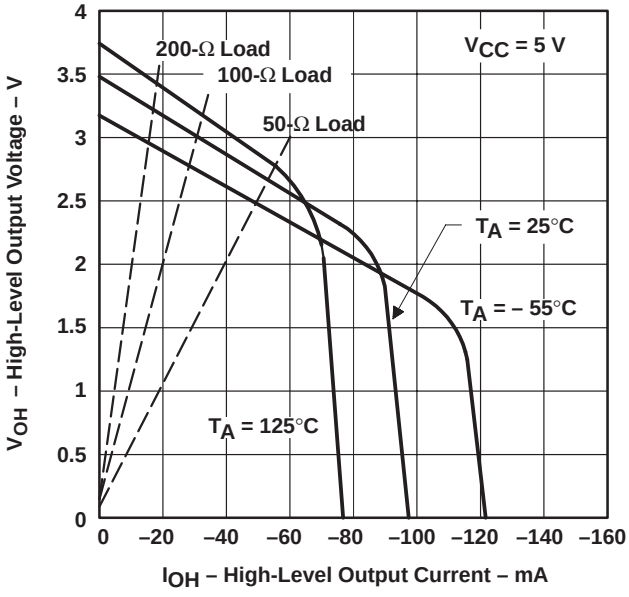


Figure 3

DIFFERENTIAL OUTPUT VOLTAGE vs DIFFERENTIAL OUTPUT CURRENT

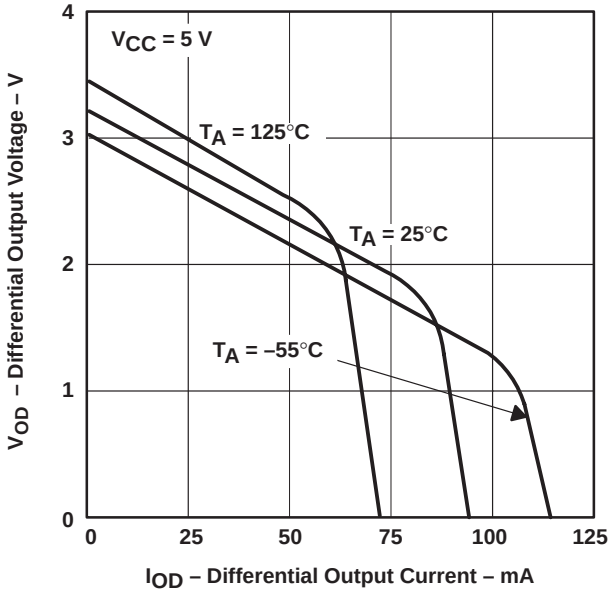


Figure 4

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

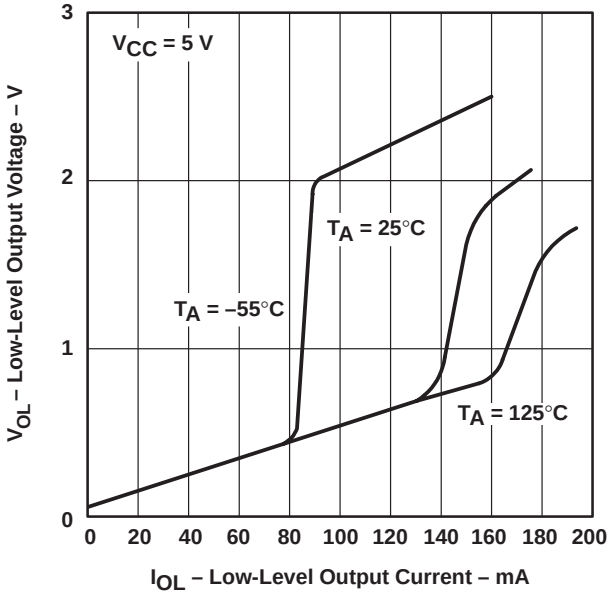


Figure 5

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS†

PROPAGATION DELAY TIME (DIFFERENTIAL OUTPUT) vs FREE-AIR TEMPERATURE

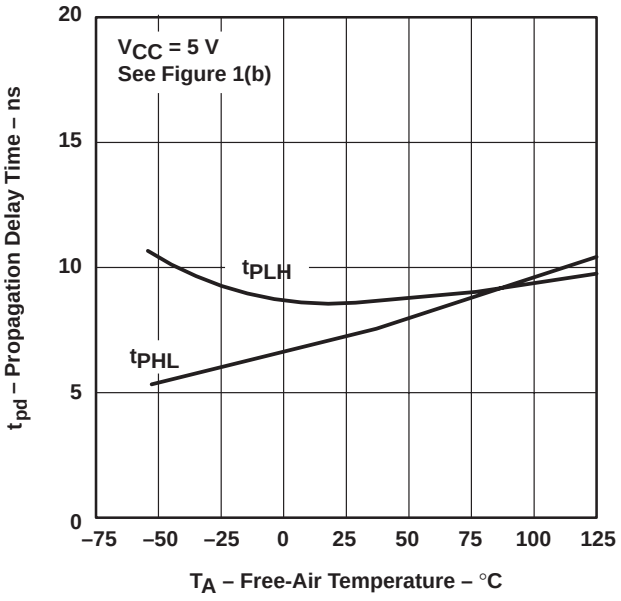


Figure 6

TOTAL POWER DISSIPATION (BOTH DRIVERS) vs FREQUENCY

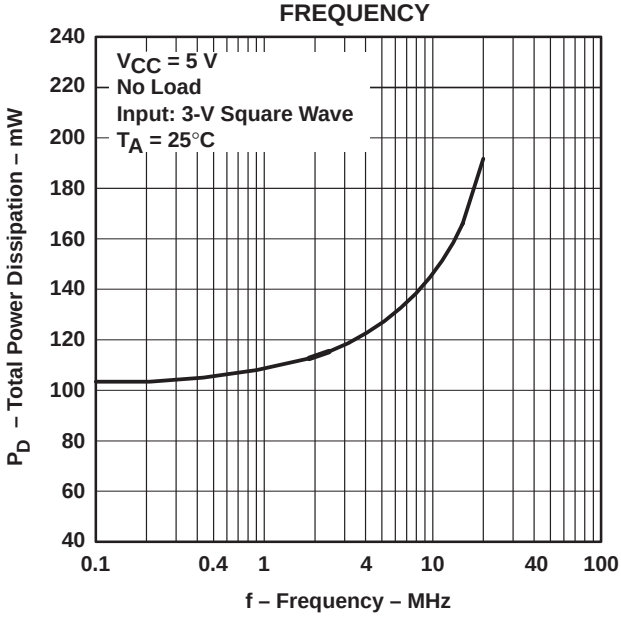
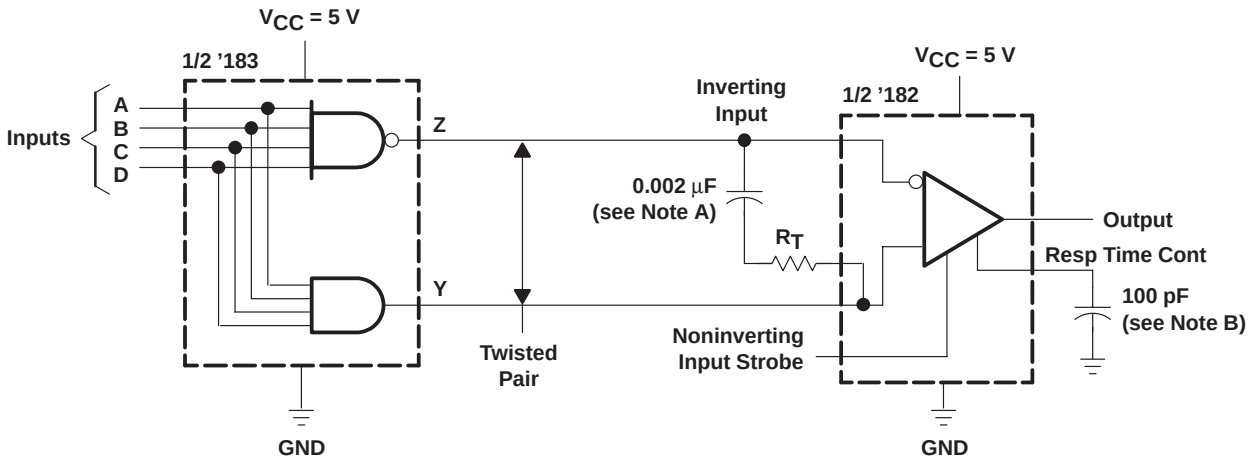


Figure 7

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

APPLICATION INFORMATION



NOTES: A. When the inputs are open circuited, the output is high. A capacitor may be used for dc isolation of the line-terminating resistor. At the frequency of operation, the impedance of the capacitor should be relatively small.

Example: let f = 5 MHz
C = 0.002 μF

$$Z_{(circuit)} = \frac{1}{2\pi fC} = \frac{1}{2\pi\left(5 \times 10^{6}\right)\left(0.002 \times 10^{-6}\right)}$$

$$Z_{(circuit)} \approx 16\Omega$$

B. Use of a capacitor to control response time is optional.

Figure 8. Transmission of Digital Data Over Twisted-Pair Line

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
7900901CA	ACTIVE	CDIP	J	14	1	None	A42 SNPB	Level-NC-NC-NC
7900901DA	ACTIVE	CFP	W	14	1	None	A42 SNPB	Level-NC-NC-NC
DS8830N	OBSOLETE	PDIP	N	14		None	Call TI	Call TI
SN55183J	ACTIVE	CDIP	J	14	1	None	A42 SNPB	Level-NC-NC-NC
SN75183D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN75183DR	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN75183N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN75183NSR	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SNJ55183FK	ACTIVE	LCCC	FK	20	1	None	POST-PLATE	Level-NC-NC-NC
SNJ55183J	ACTIVE	CDIP	J	14	1	None	A42 SNPB	Level-NC-NC-NC
SNJ55183W	ACTIVE	CFP	W	14	1	None	A42 SNPB	Level-NC-NC-NC

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

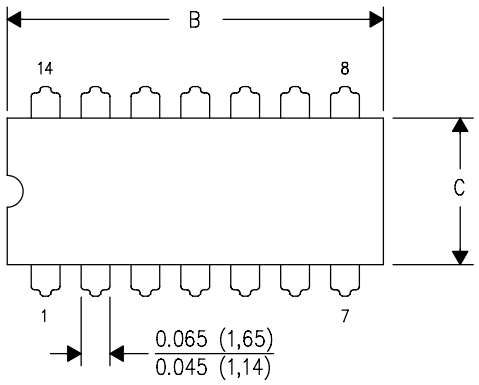
(2) Eco Plan - May not be currently available - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
None: Not yet available Lead (Pb-Free).
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder temperature.

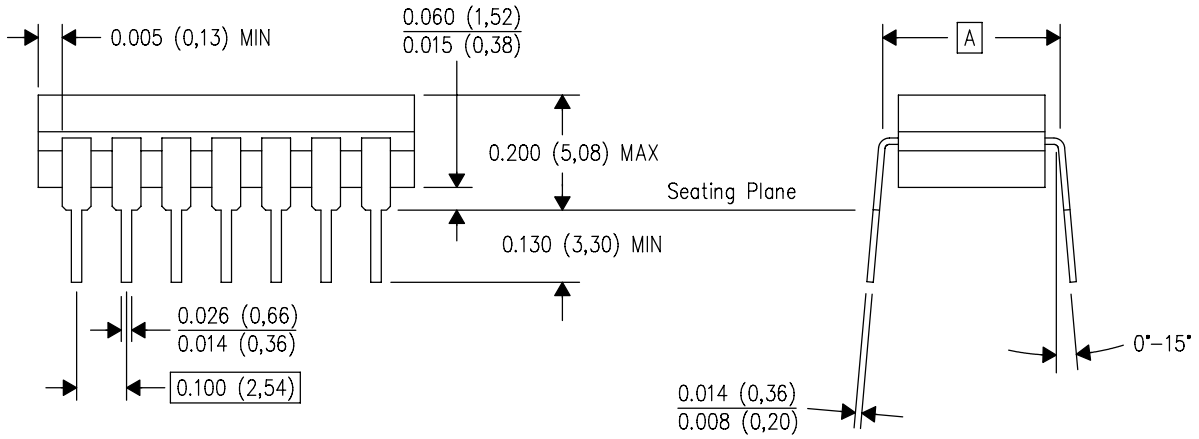
J (R–GDIP–T**)

14 LEADS SHOWN

CERAMIC DUAL IN–LINE PACKAGE



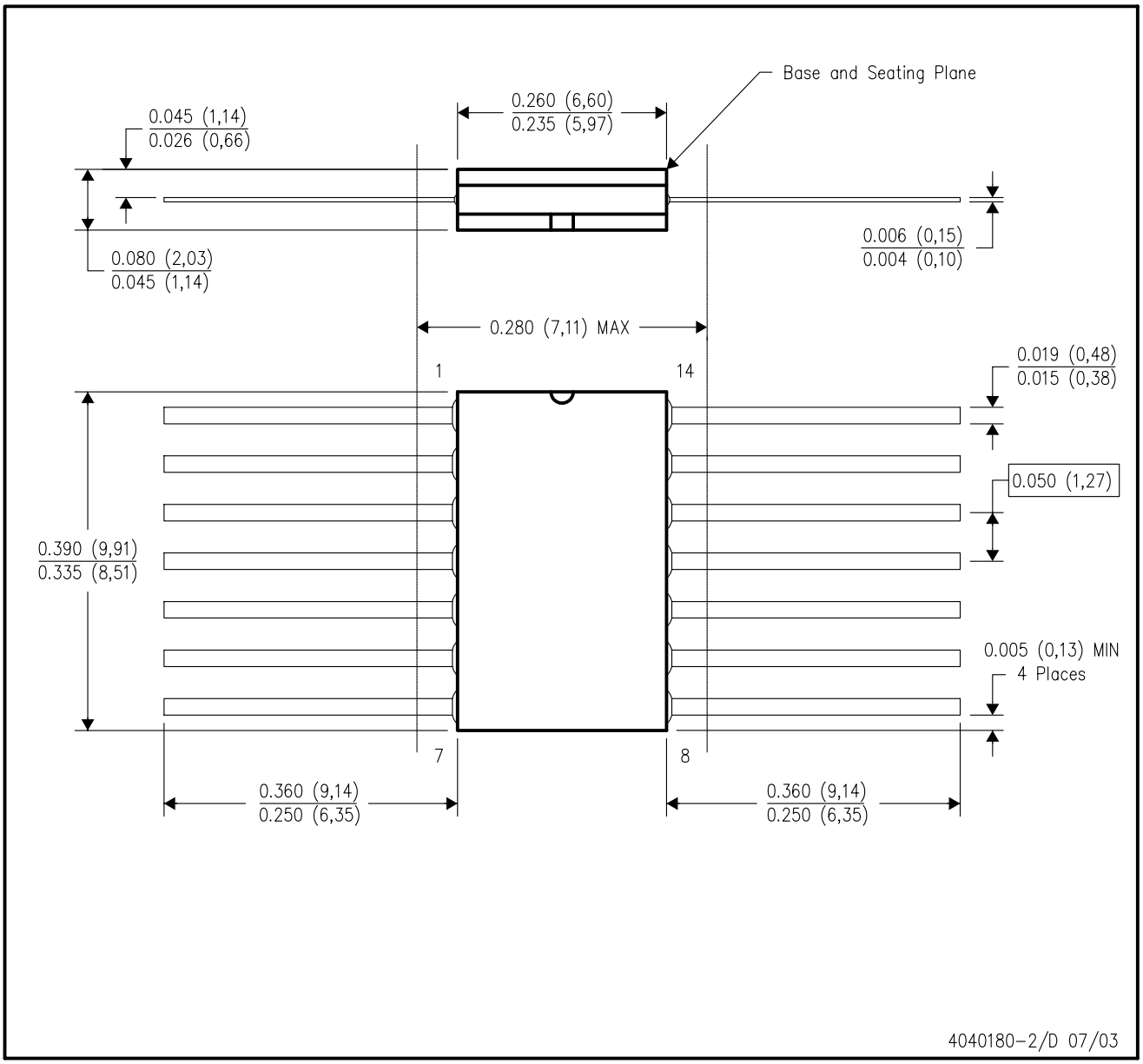
DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

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

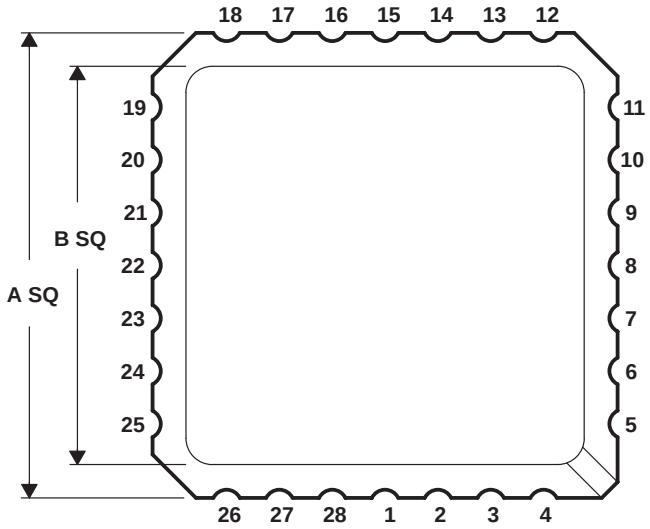
W (R–GDFP–F14) CERAMIC DUAL FLATPACK



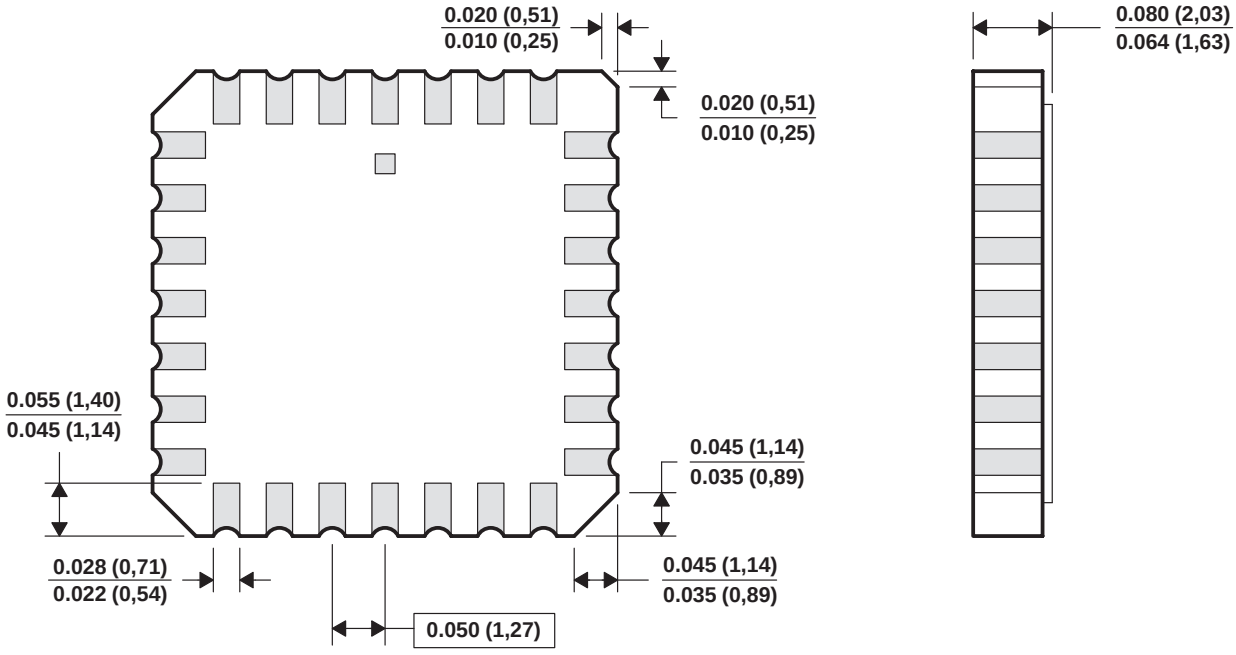
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F14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

FK (S-CQCC-N)** **LEADLESS CERAMIC CHIP CARRIER**

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.739 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



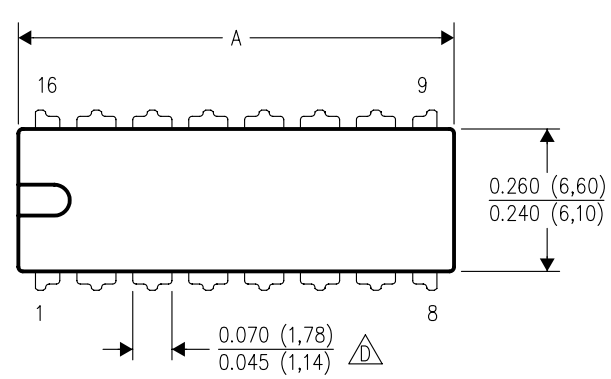
4040140/D 10/96

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

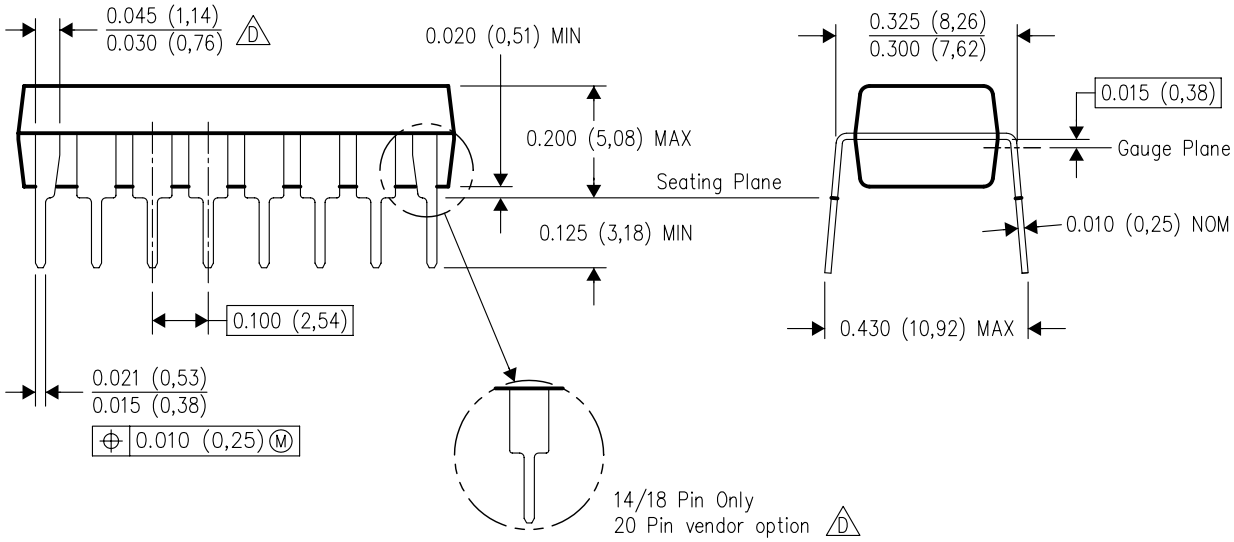
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



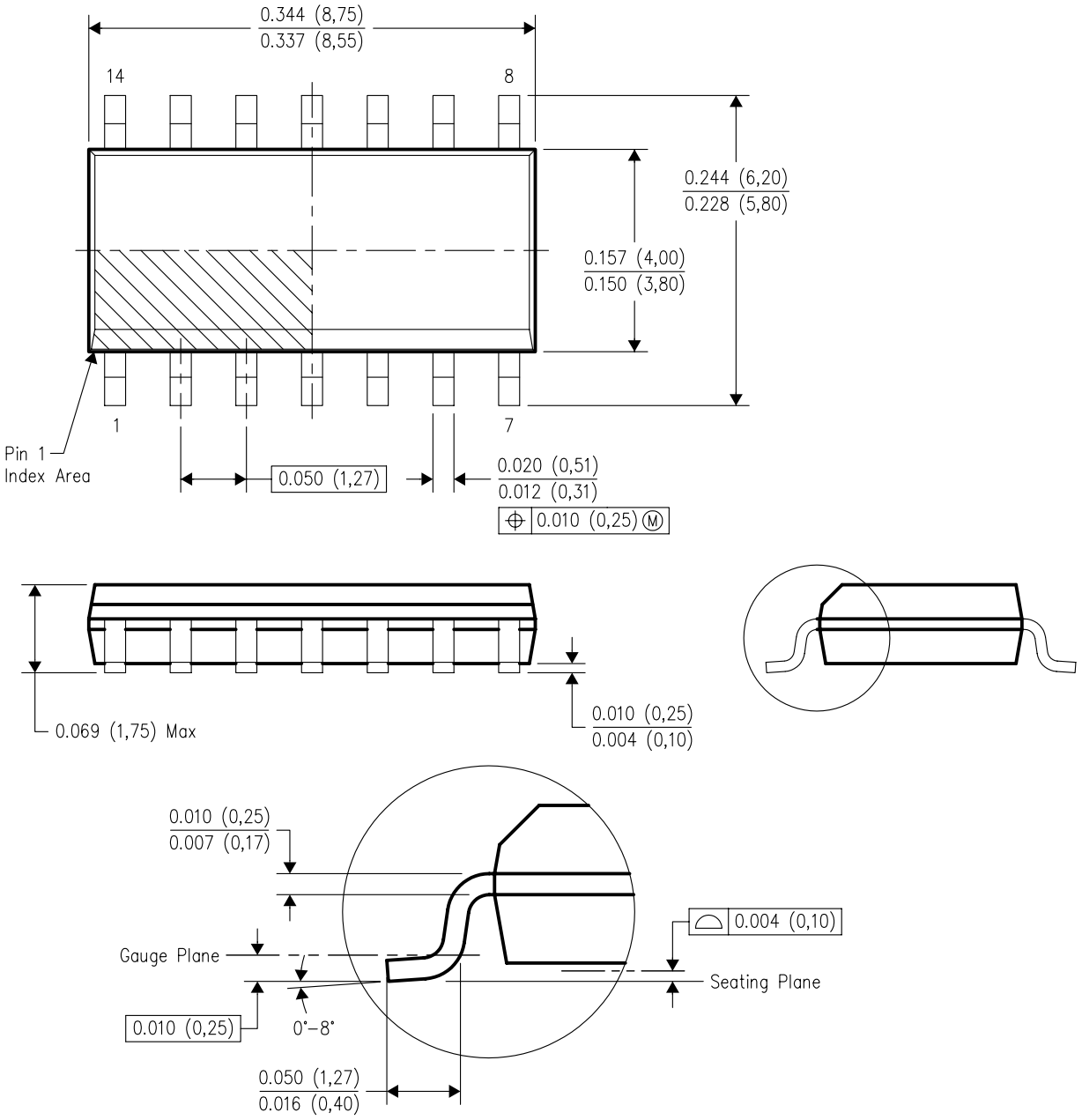
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

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

D (R–PDSO–G14) PLASTIC SMALL–OUTLINE PACKAGE

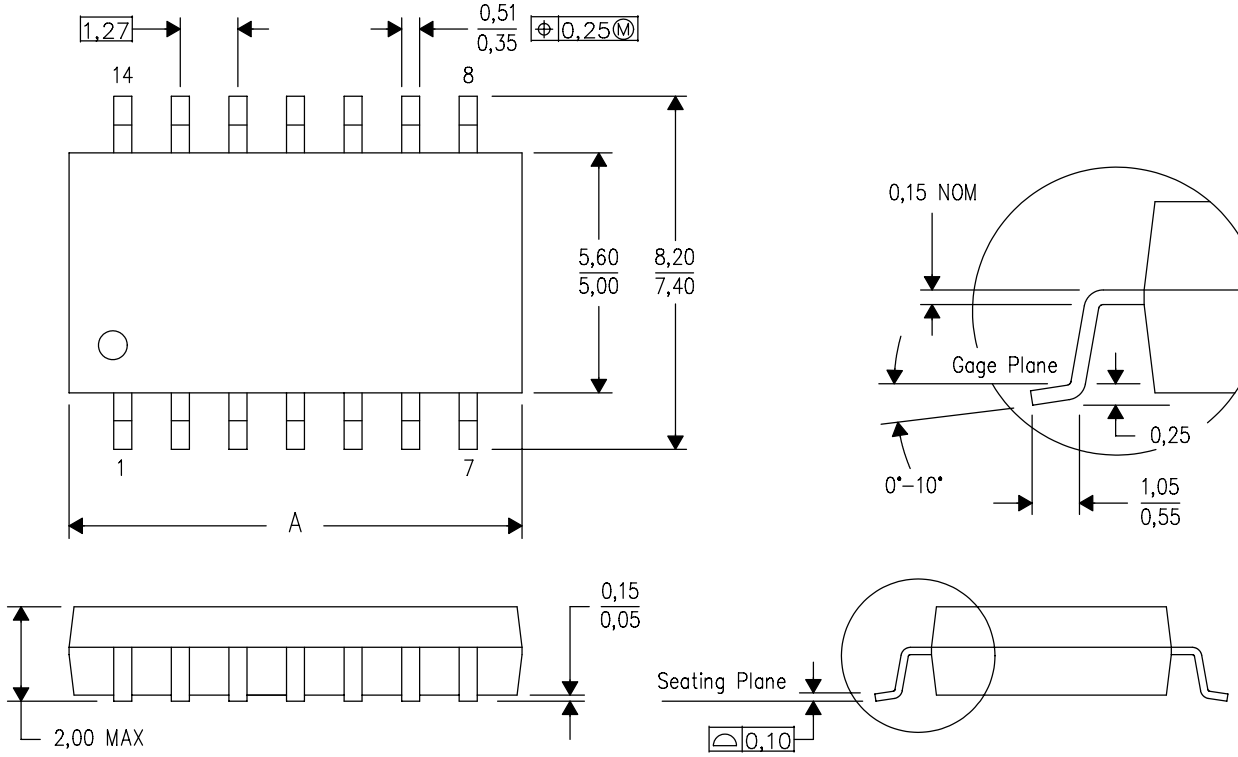


NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–012 variation AB.

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

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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