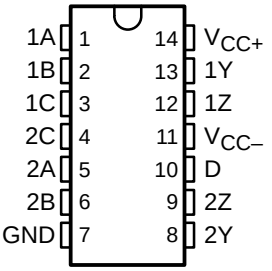
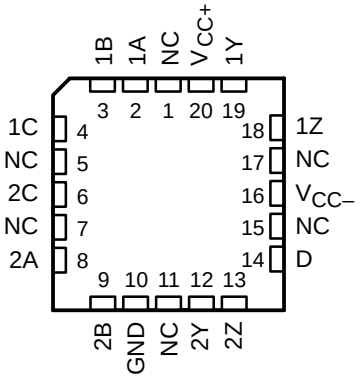
- **Improved Stability Over Supply Voltage and Temperature Ranges**
- **Constant-Current Outputs**
- **High Speed**
- **Standard Supply Voltages**
- **High Output Impedance**
- **High Common-Mode Output Voltage Range . . . –3 V to 10 V**
- **TTL-Input Compatibility**
- **Inhibitor Available for Driver Selection**
- **Glitch Free During Power Up/Power Down**
- **SN75112 and External Circuit Meets or Exceeds the Requirements of CCITT Recommendation V.35**

SN55110A . . . J OR W PACKAGE
SN75110A . . . D, N, OR NS PACKAGE
SN75112 . . . D OR N PACKAGE
(TOP VIEW)



SN55110A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The SN55110A, SN75110A, and SN75112 dual line drivers have improved output current regulation with supply-voltage and temperature variations. In addition, the higher current of the SN75112 (27 mA) allows data to be transmitted over longer lines. These drivers offer optimum performance when used with the SN55107A, SN75107A, and SN75108A line receivers.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (N)	Tube of 25	SN75110AN	SN75110AN
			SN75112N	SN75112N
	SOIC (D)	Tube of 50	SN75110AD	SN75110A
		Reel of 2500	SN75110ADR	
		Tube of 50	SN75112D	SN75112A
		Reel of 2500	SN75112DR	
	SOP (NS)	Reel of 2000	SN75110ANSR	SN75110A
–55°C to 125°C	CDIP (J)	Tube of 25	SN55110AJ	SN55110AJ
			SNJ55110AJ	SNJ55110AJ
	CFP (W)	Tube of 150	SNJ55110AW	SNJ55110AW
	LCCC (FK)	Tube of 55	SNJ55110AFK	SNJ55110AFK

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

description/ordering information (continued)

These drivers feature independent channels with common voltage supply and ground terminals. The significant difference between the three drivers is in the output-current specification. The driver circuits feature a constant output current that is switched to either of two output terminals by the appropriate logic levels at the input terminals. The output current can be switched off (inhibited) by low logic levels on the enable inputs. The output current is nominally 12 mA for the ’110A devices, and is 27 mA for the SN75112.

The enable/inhibit feature is provided so the circuits can be used in party-line or data-bus applications. A strobe or inhibitor (enable D), common to both drivers, is included for increased driver-logic versatility. The output current in the inhibited mode, $I_{O(off)}$, is specified so that minimum line loading is induced when the driver is used in a party-line system with other drivers. The output impedance of the driver in the inhibited mode is very high. The output impedance of a transistor is biased to cutoff.

The driver outputs have a common-mode voltage range of –3 V to 10 V, allowing common-mode voltage on the line without affecting driver performance.

All inputs are diode clamped and are designed to satisfy TTL-system requirements. The inputs are tested at 2 V for high-logic-level input conditions and 0.8 V for low-logic-level input conditions. These tests ensure 400-mV noise margin when interfaced with TTL Series 54/74 devices.

The SN55110A is characterized for operation over the full military temperature range of –55°C to 125°C. The SN75110A and SN75112 are characterized for operation from 0°C to 70°C.

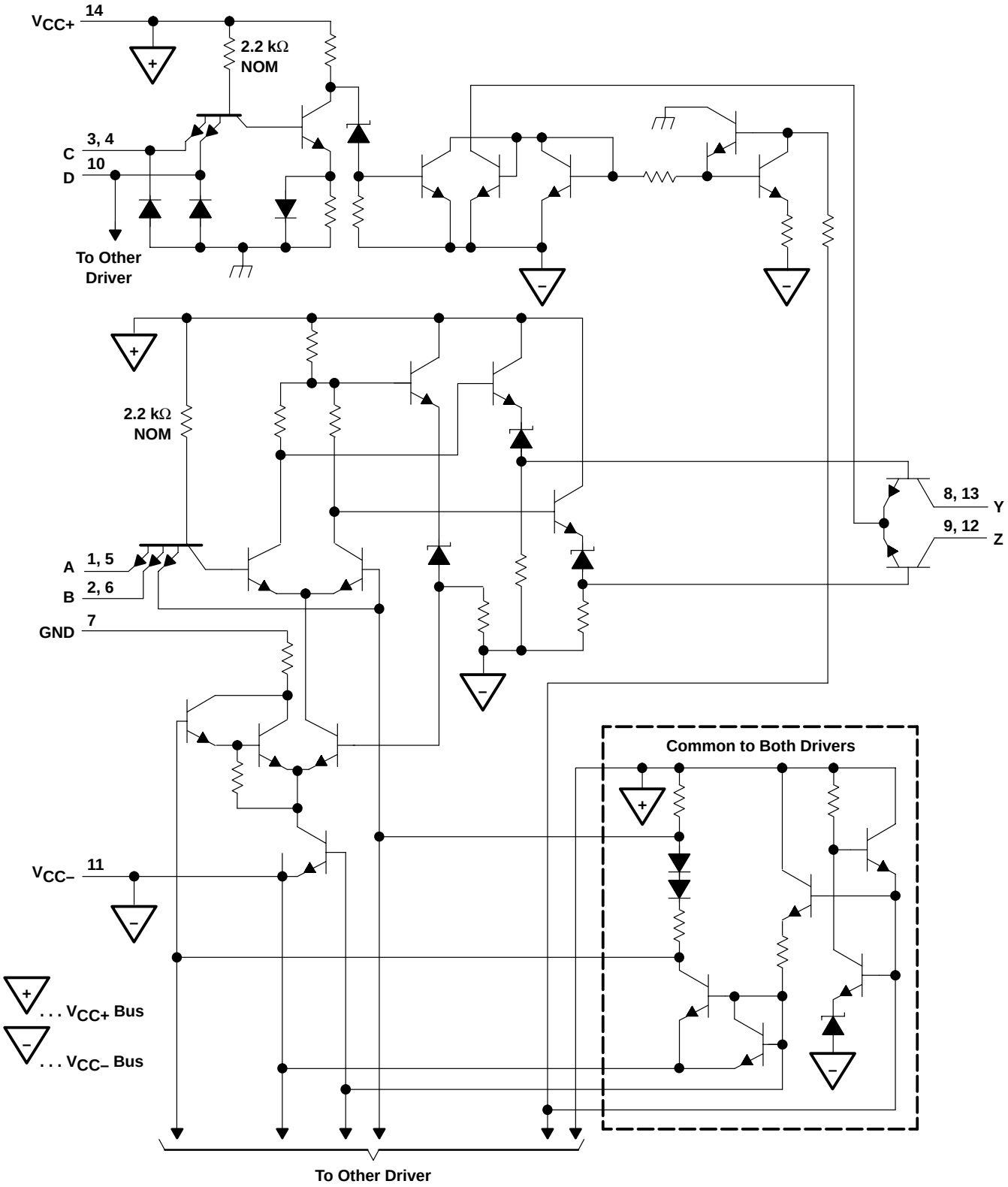
FUNCTION TABLE
(each driver)

LOGIC INPUTS		ENABLE INPUTS		OUTPUTS†	
A	B	C	D	Y	Z
X	X	L	X	Off	Off
X	X	X	L	Off	Off
L	X	H	H	On	Off
X	L	H	H	On	Off
H	H	H	H	Off	On

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

† When using only one channel of the line drivers, the other channel should be inhibited and/or have its outputs grounded.

schematic (each driver)



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

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

Supply voltage: V_{CC+} (see Note 1) . . . . . 7 V
V_{CC-} (see Note 1) . . . . . –7 V
Input voltage, V_I . . . . . 5.5 V
Output voltage range, V_O . . . . . –5 V to 12 V
Package thermal impedance, θ_{JA} (see Notes 2 and 3): D package . . . . . 86°C/W
N package . . . . . 80°C/W
NS package . . . . . 76°C/W
Package thermal impedance, θ_{JC} (see Notes 4 and 5): FK package . . . . . 13.42°C/W
J package . . . . . 15.05°C/W
W package . . . . . 14.65°C/W
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
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, or NS package . . . . . 260°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. Voltage values are with respect to network ground terminal.
2. 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 $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
3. The package thermal impedance is calculated in accordance with JESD 51-7.
4. Maximum power dissipation is a function of $T_J(max)$, θ_{JC}, and T_C. The maximum allowable power dissipation at any allowable case temperature is $P_D = (T_J(max) – T_C)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
5. The package thermal impedance is calculated in accordance with MIL-STD-883.

recommended operating conditions (see Note 6)

		SN55110A			SN75110A SN75112			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC+}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{CC-}	Supply voltage	–4.5	–5	–5.5	–4.75	–5	–5.25	V
	Positive common-mode output voltage	0		10	0		10	V
	Negative common-mode output voltage	0		–3	0		–3	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level output current			0.8			0.8	V
T_A	Operating free-air temperature	–55		125	0		70	°C

NOTE 6: When using only one channel of the line drivers, the other channel should be inhibited and/or have its outputs grounded.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS†	SN55110A SN75110A			SN75112			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	Input clamp voltage		$V_{CC\pm}$ = MIN, I_L = –12 mA		–0.9	–1.5		–0.9	–1.5	V
$I_{O(on)}$	On-state output current		$V_{CC\pm}$ = MAX, V_O = 10 V		12	15		27	40	mA
			V_{CC} = MIN to MAX, V_O = –1 V to 1 V, T_A = 25°C				24	28	32	
			$V_{CC\pm}$ = MIN, V_O = –3 V	6.5	12		15	27		
$I_{O(off)}$	Off-state output current		$V_{CC\pm}$ = MIN, V_O = 10 V			100			100	μA
I_I	Input current at maximum input voltage	A, B, or C inputs	$V_{CC\pm}$ = MAX, V_I = 5.5 V			1			1	mA
		D input				2			2	
I_{IH}	High-level input current	A, B, or C inputs	$V_{CC\pm}$ = MAX, V_I = 2.4 V			40			40	μA
		D input				80			80	
I_{IL}	Low-level input current	A, B, or C inputs	$V_{CC\pm}$ = MAX, V_I = 0.4 V			–3			–3	mA
		D input				–6			–6	
$I_{CC+(on)}$	Supply current from V_{CC} with driver enabled		$V_{CC\pm}$ = MAX, A and B inputs at 0.4 V, C and D inputs at 2 V		23	35		25	40	mA
$I_{CC-(on)}$	Supply current from V_{CC-} with driver enabled		$V_{CC\pm}$ = MAX, A and B inputs at 0.4 V, C and D inputs at 2 V		–34	–50		–65	–100	mA
$I_{CC+(off)}$	Supply current from V_{CC-} with driver inhibited		$V_{CC\pm}$ = MAX, A, B, C, and D inputs at 0.4 V		21			30		mA
$I_{CC-(off)}$	Supply current from $V_{CC\pm}$ with driver inhibited		$V_{CC\pm}$ = MAX, A, B, C, and D inputs at 0.4 V		–17			–32		mA

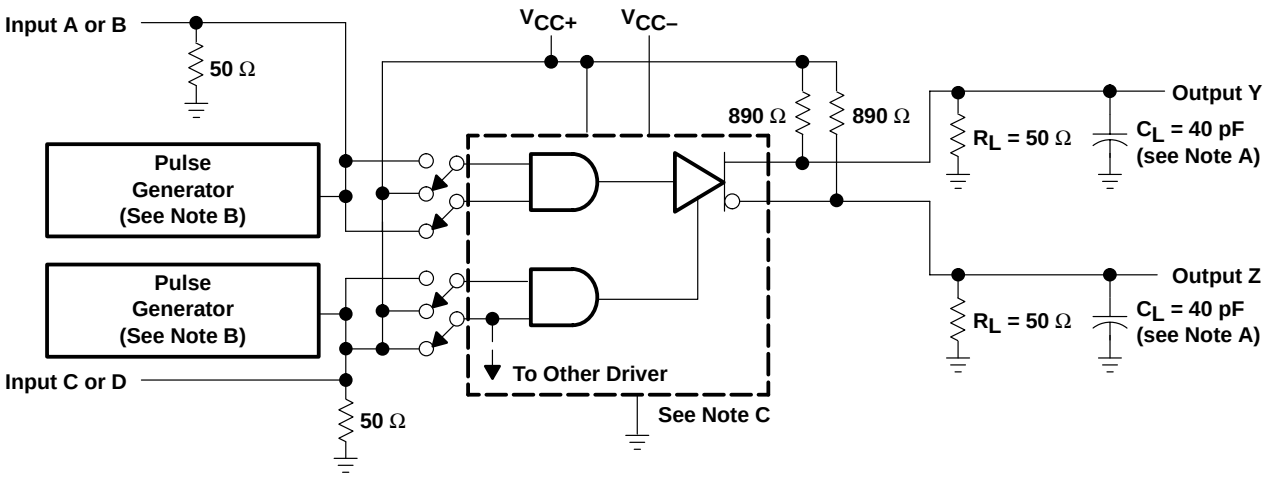
† For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC+} = 5 V, V_{CC-} = –5 V, T_A = 25°C.

switching characteristics, $V_{CC\pm}$ = ±5 V, T_A = 25°C (see Figure 1)

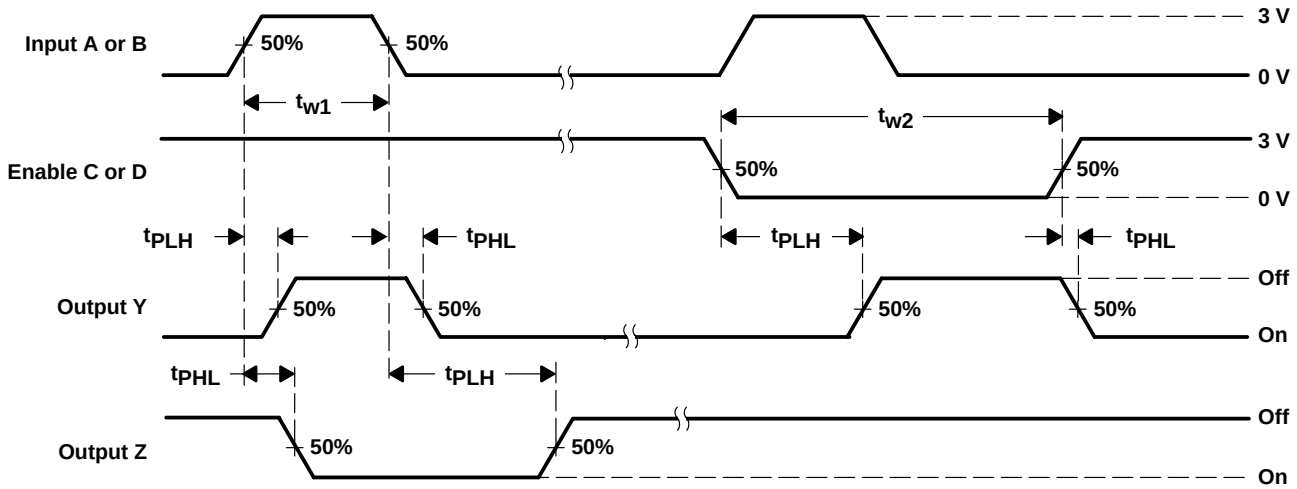
PARAMETER§	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y or Z	C_L = 40 pF, R_L = 50 Ω,		9	15	ns
t_{PHL}					9	15	
t_{PLH}	C or D	Y or Z	C_L = 40 pF, R_L = 50 Ω,		16	25	ns
t_{PHL}					13	25	

§ t_{PLH} = Propagation delay time, low- to high-level output
t_{PHL} = Propagation delay time, high- to low-level output

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generators have the following characteristics: $Z_O = 50\ \Omega$, $t_r = t_f = 10 \pm 5$ ns, $t_{w1} = 500$ ns, PRR ≤ 1 MHz, $t_{w2} = 1\ \mu$s, PRR ≤ 500 kHz.
C. For simplicity, only one channel and the enable connections are shown.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

SN55110A, SN75110A
ON-STATE OUTPUT CURRENT
vs
NEGATIVE SUPPLY VOLTAGE

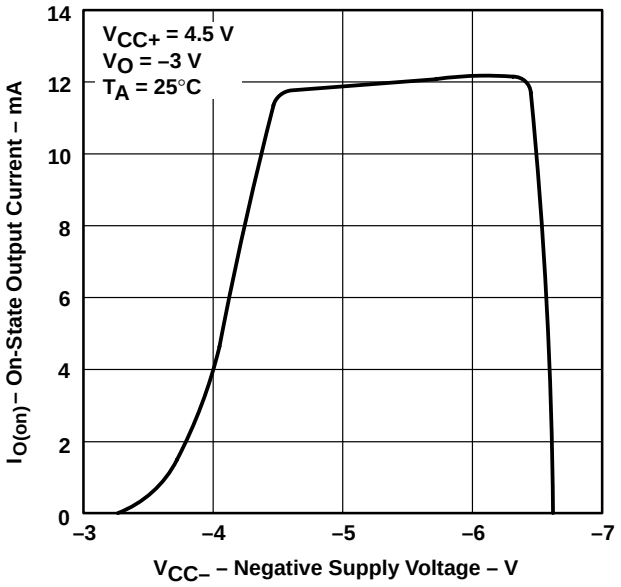


Figure 2

SN75112
ON-STATE OUTPUT CURRENT
vs
NEGATIVE SUPPLY VOLTAGE

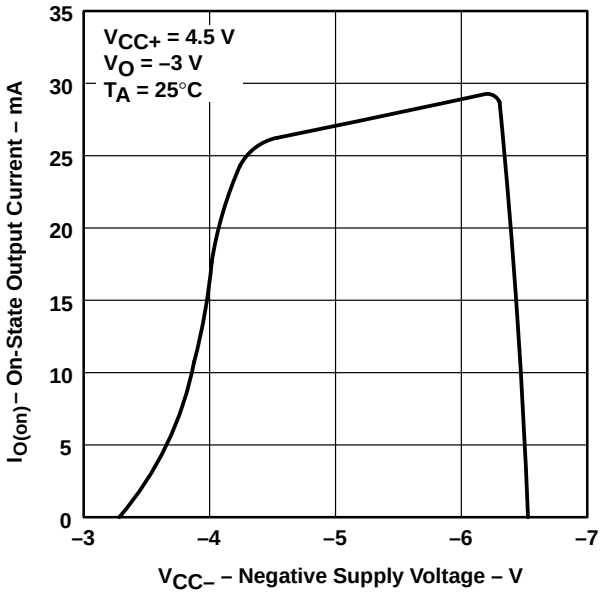


Figure 3

APPLICATION INFORMATION

special pulse-control circuit

Figure 4 shows a circuit that can be used as a pulse-generator output or in many other testing applications.

INPUT A	OUTPUTS Y	OUTPUTS Z
High	Off	On
Low	On	Off

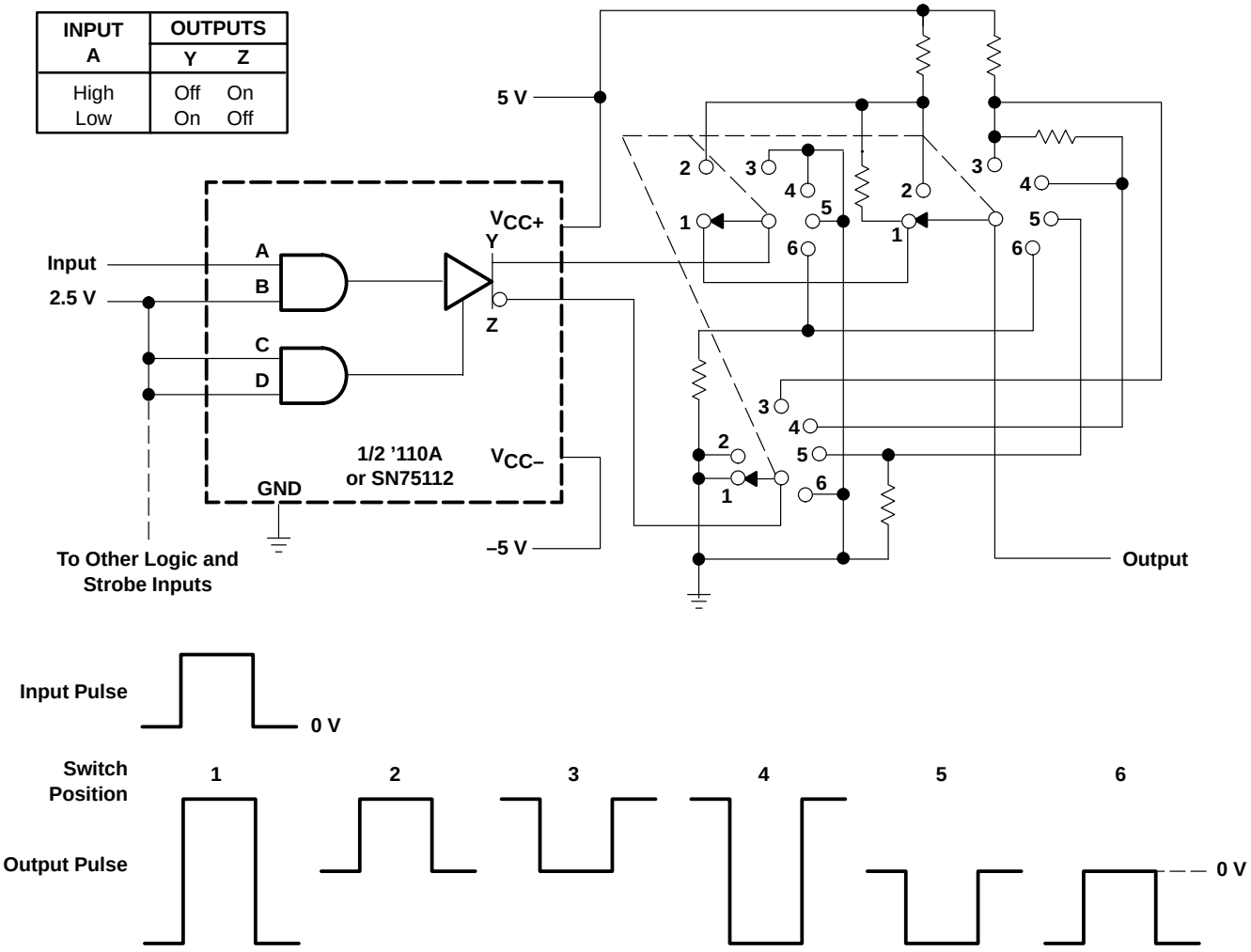


Figure 4. Pulse-Control Circuit

APPLICATION INFORMATION

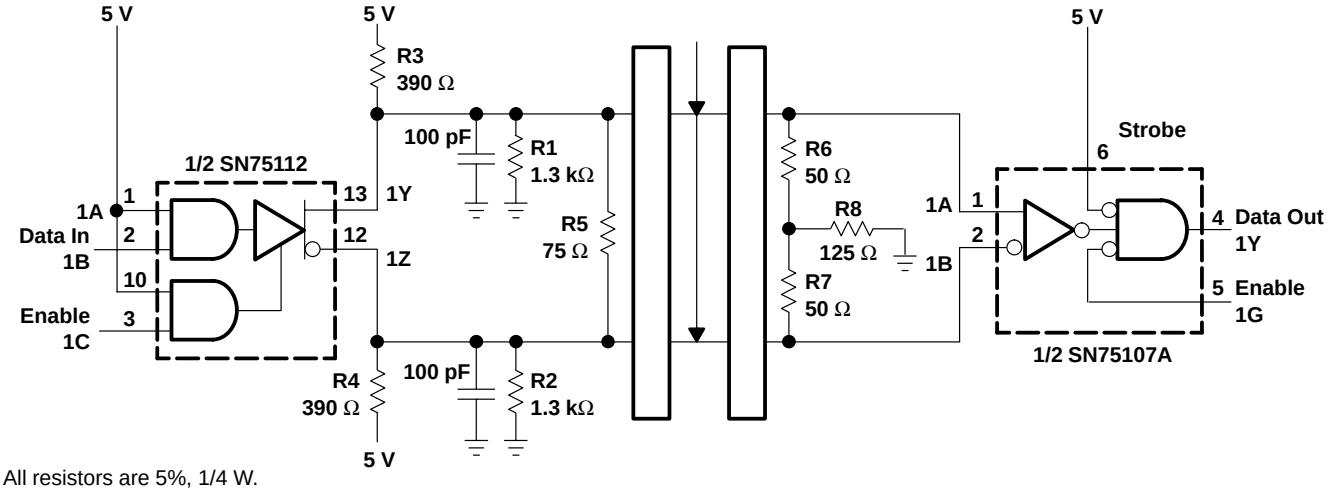
using the SN75112 as a CCITT-recommended V.35 line driver

The SN75112 dual line driver, the SN75107A dual line receiver, and some external resistors can be used to implement the data-interchange circuit of CCITT recommendation V.35 (1976) modem specification. The circuit of one channel is shown in Figure 1 and meets the requirement of the interface as specified by Appendix 11 of CCITT V.35 and is summarized in Table 1 (V.35 has been replaced by ITU V.11).

Table 1. CCITT V.35 Electrical Requirements

GENERATOR	MIN	MAX	UNIT
Source impedance, Z_{source}	50	150	Ω
Resistance to ground, R	135	165	Ω
Differential output voltage, V_{OD}	440	660	mV
10% to 90% rise time, t_r	40		ns
or		$0.01 \times ui^{\dagger}$	
Common-mode output voltage, V_{OC}	–0.6	0.6	V
LOAD (RECEIVER)	**MIN**	**MAX**	**UNIT**
Input impedance, Z_I	90	110	Ω
Resistance to ground, R	135	165	Ω

† ui = unit interval or minimum signal-element pulse duration



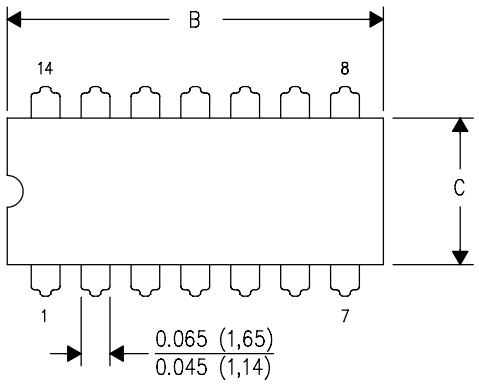
All resistors are 5%, 1/4 W.

Figure 5. CCITT-Recommended V.35 Interface Using the SN75112 and SN75107A

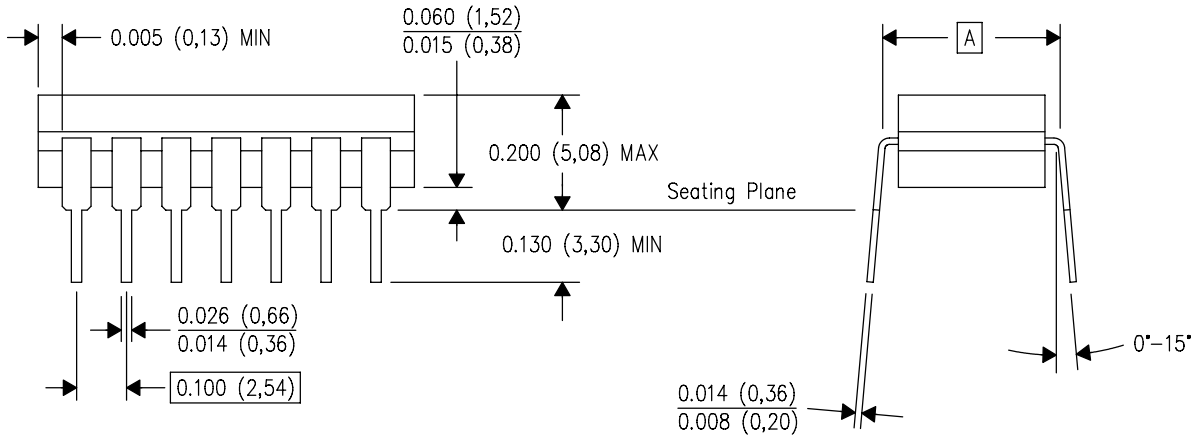
J (R–GDIP–T**)

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.

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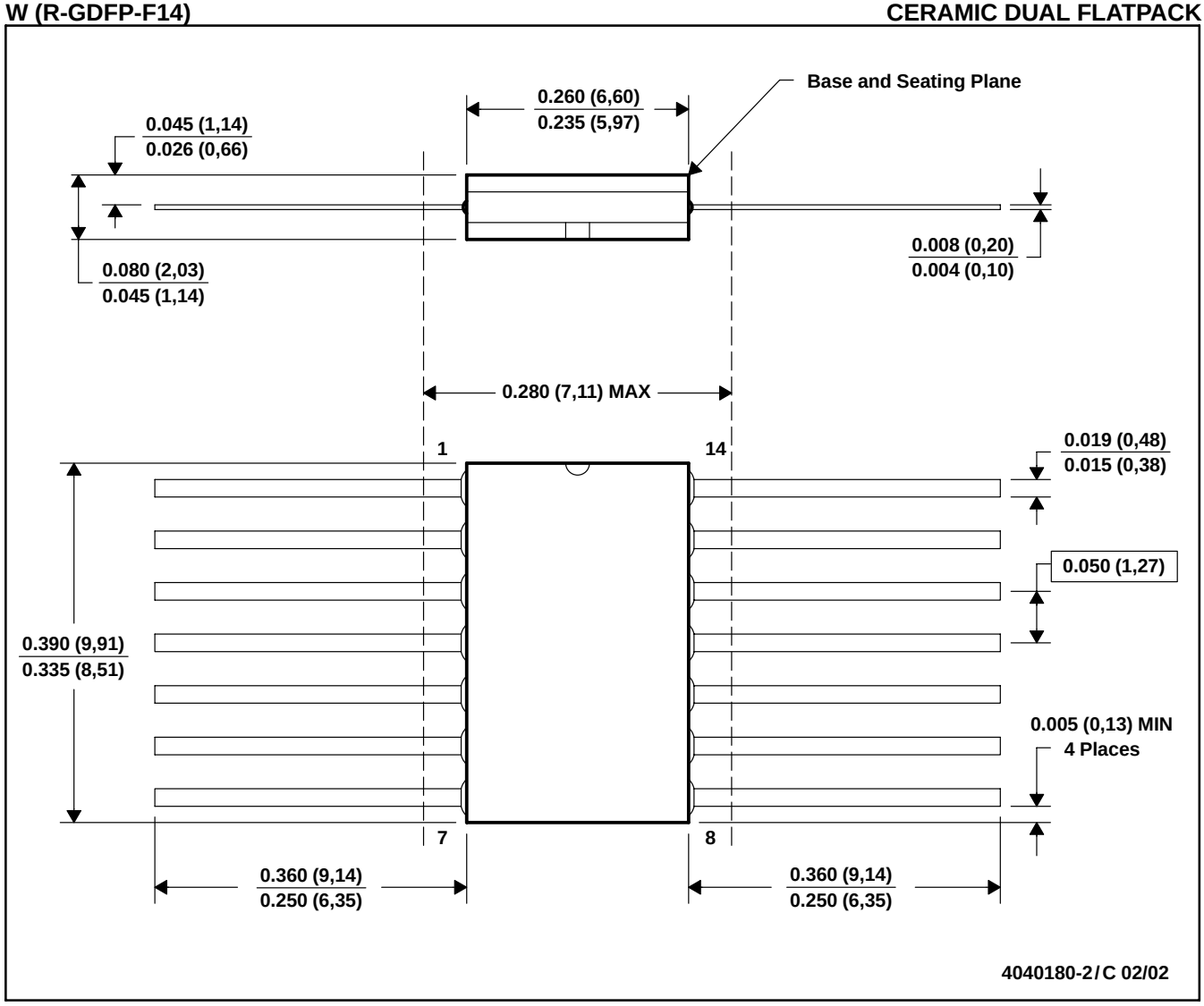
W (R-GDFP-F14) **CERAMIC DUAL FLATPACK**

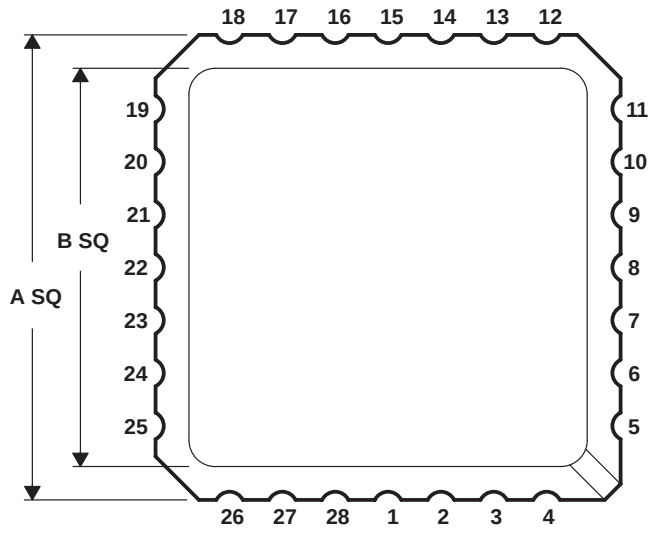


NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1-F14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

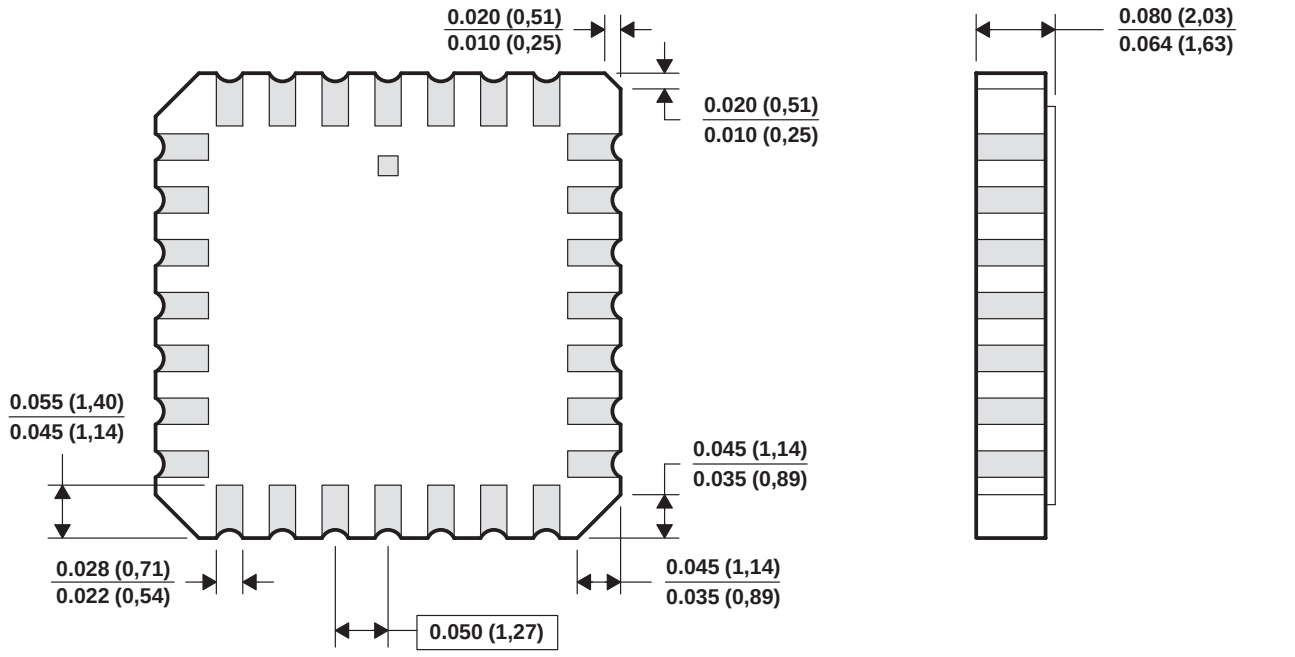
FK (S-CQCC-N**)

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)



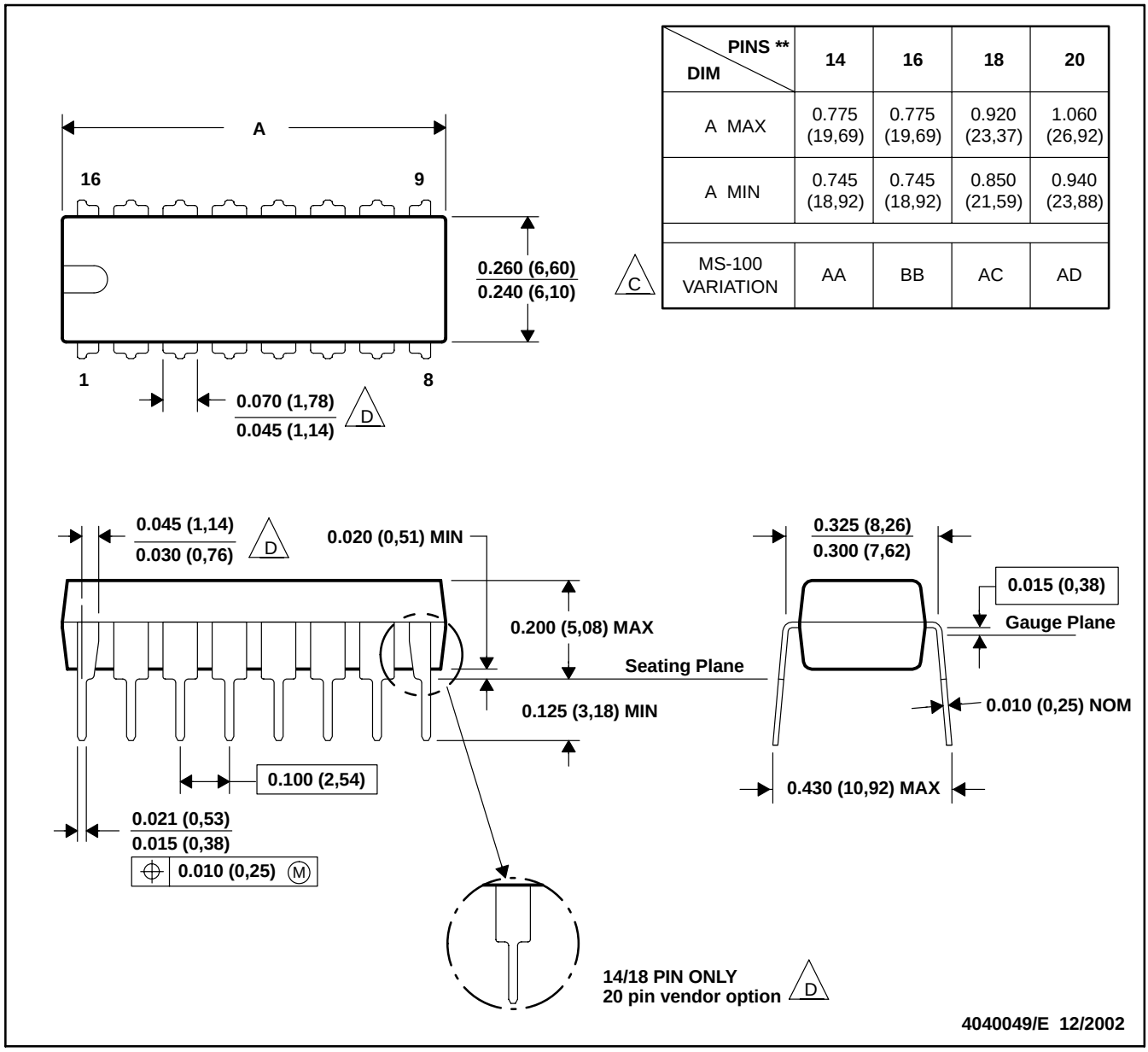
4040140/D 10/96

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-100 VARIATION	AA	BB	AC	AD

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 lrngth (Dim A).

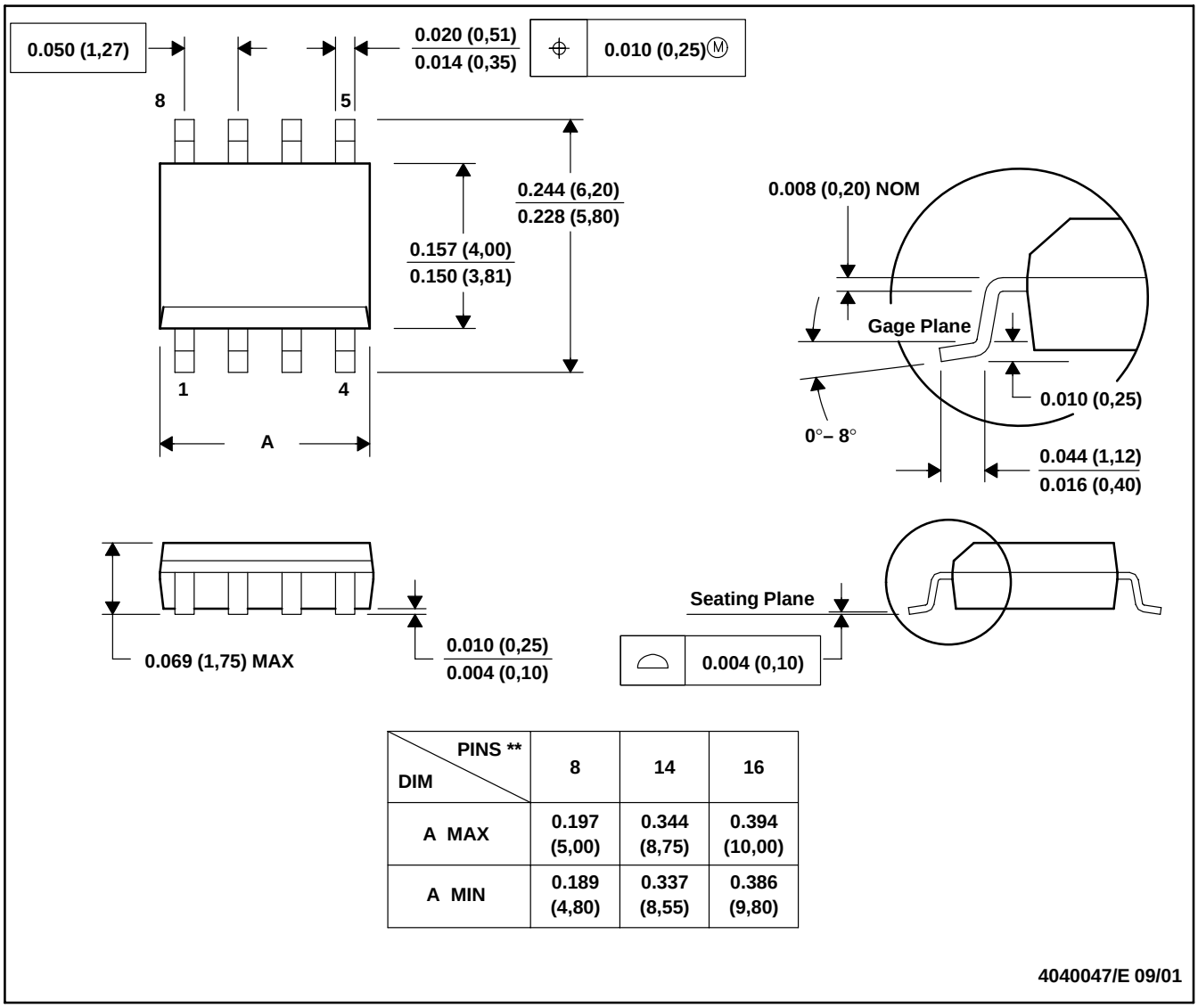
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

MSOI002B – JANUARY 1995 – REVISED SEPTEMBER 2001

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



DIM \ PINS **	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

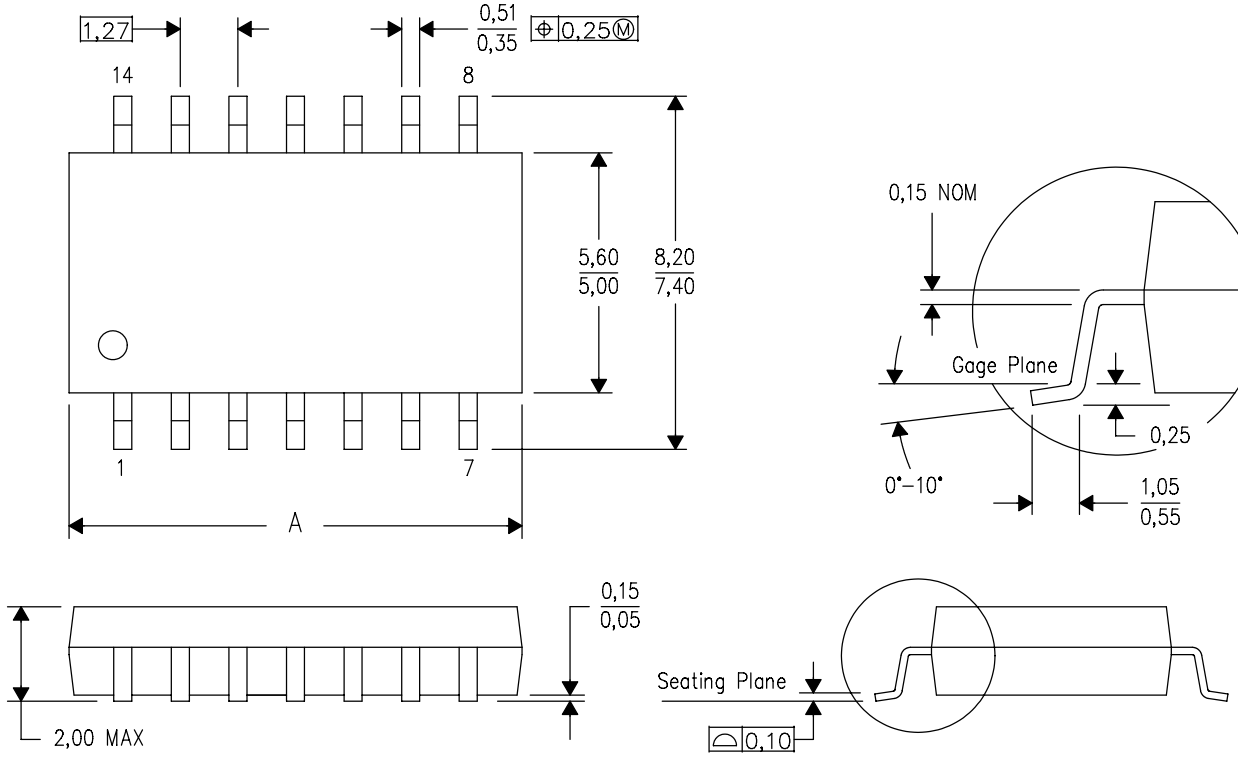
4040047/E 09/01

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



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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