

SN55110A, SN75110A, SN75112 DUAL LINE DRIVERS

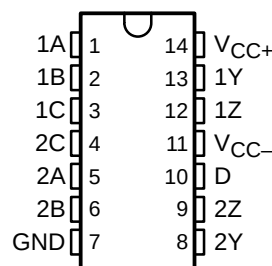
SLLS106F – DECEMBER 1975 – REVISED JULY 2003

- 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

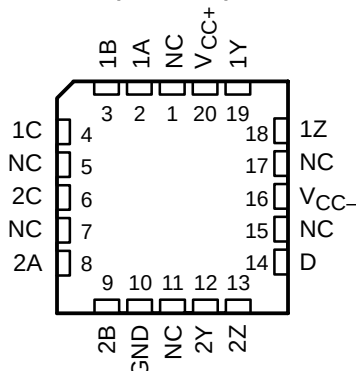
description/ordering information

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.

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

ORDERING INFORMATION

TA	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	
-55°C to 125°C	SOP (NS)	Reel of 2000	SN75110ANSR	SN75110A
	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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2003, Texas Instruments Incorporated
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN55110A, SN75110A, SN75112 DUAL LINE DRIVERS

SLLS106F – DECEMBER 1975 – REVISED JULY 2003

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 .

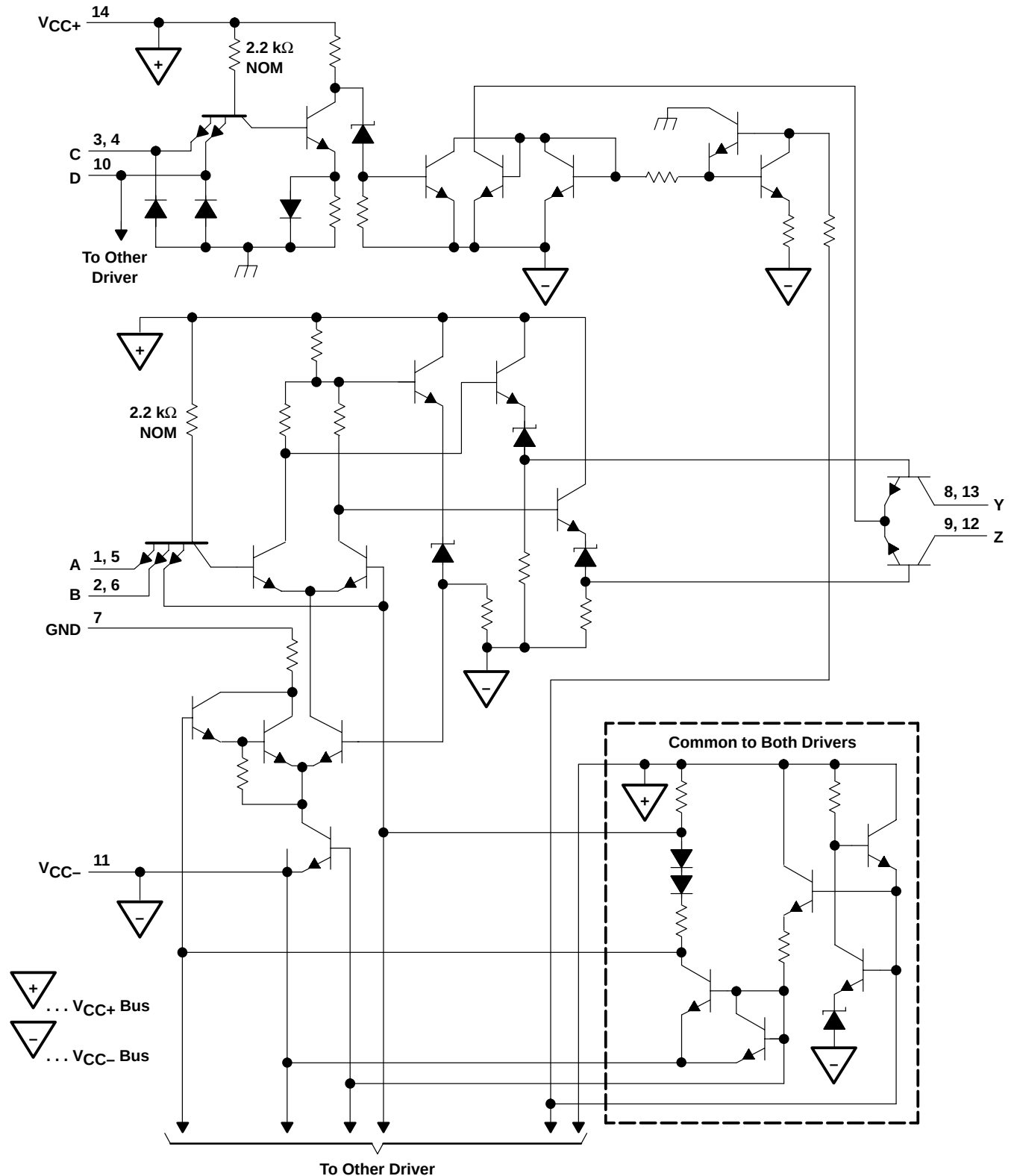
FUNCTION TABLE
(each driver)

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.

SN55110A, SN75110A, SN75112

DUAL LINE DRIVERS

SLLS106F – DECEMBER 1975 – REVISED JULY 2003

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 $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. 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 $T_J(\text{max})$, θ_{JC} , and T_C . The maximum allowable power dissipation at any allowable case temperature is $P_D = (T_J(\text{max}) - T_C)/\theta_{JC}$. 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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

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±} = MIN, I _L = –12 mA	–0.9	–1.5		–0.9	–1.5		V
I _{O(on)}	On-state output current	V _{CC±} = 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±} = MIN, V _O = –3 V	6.5	12		15	27		
I _{O(off)}	Off-state output current	V _{CC±} = MIN, V _O = 10 V			100			100	µA
I _I	Input current at maximum input voltage	A, B, or C inputs			1			1	mA
		D input			2			2	
I _{IH}	High-level input current	A, B, or C inputs			40			40	µA
		D input			80			80	
I _{IL}	Low-level input current	A, B, or C inputs			–3			–3	mA
		D input			–6			–6	
I _{CC+(on)}	Supply current from V _{CC} with driver enabled	V _{CC±} = 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±} = 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±} = MAX, A, B, C, and D inputs at 0.4 V		21			30		mA
I _{CC–(off)}	Supply current from V _{CC±} with driver inhibited	V _{CC±} = 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±} = ±5 V, T_A = 25°C (see Figure 1)

PARAMETERS [§]	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	

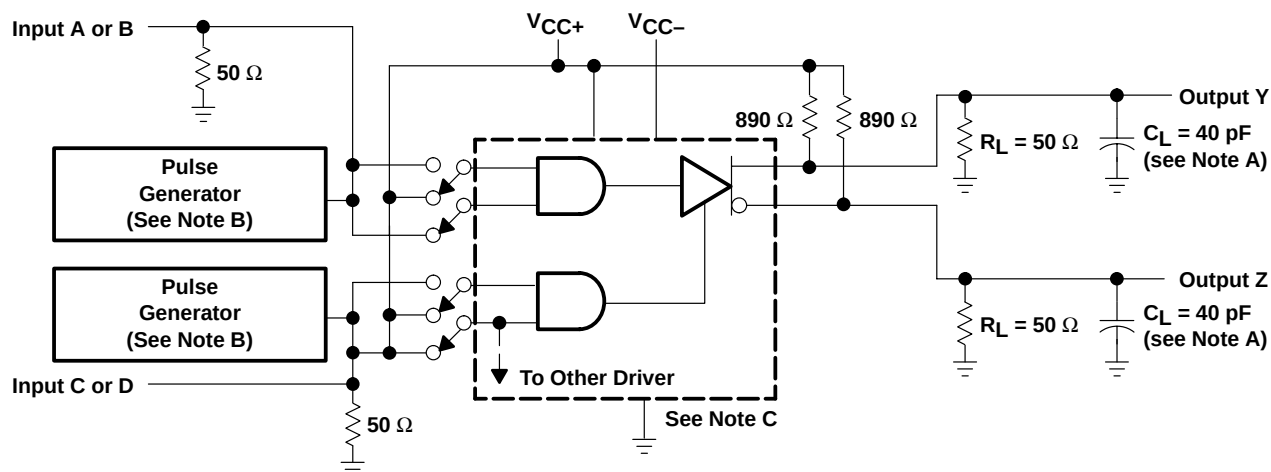
[§] t_{PLH} = Propagation delay time, low- to high-level output

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

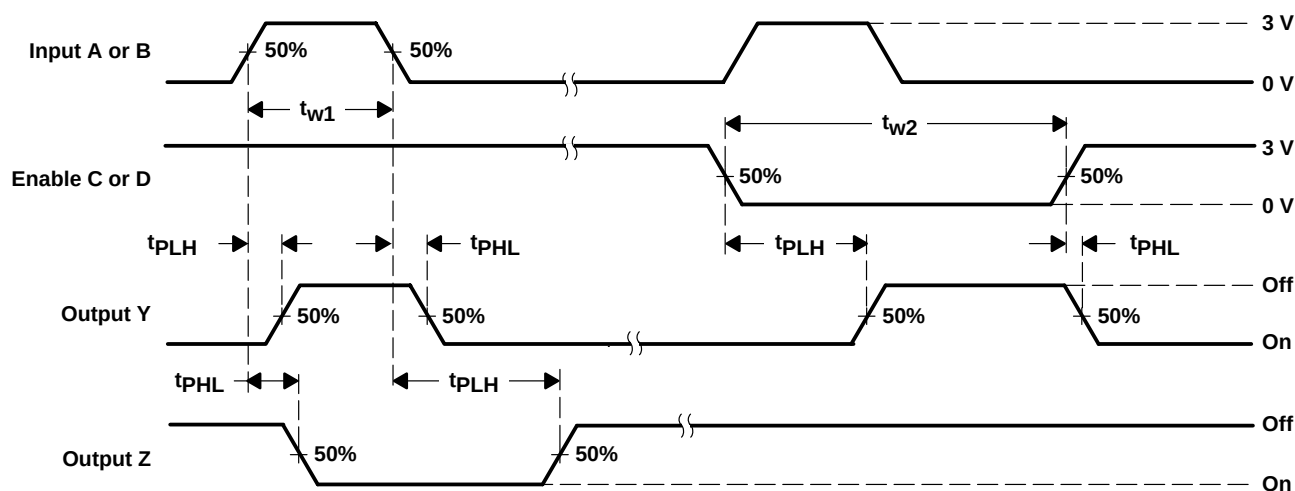
SN55110A, SN75110A, SN75112 DUAL LINE DRIVERS

SLLS106F – DECEMBER 1975 – REVISED JULY 2003

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 Ω , t_r = t_f = 10 $\pm$ 5 ns, t_{w1} = 500 ns, PRR $\leq$ 1 MHz, t_{w2} = 1 μ s, PRR $\leq$ 500 kHz.

C. For simplicity, only one channel and the enable connections are shown.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

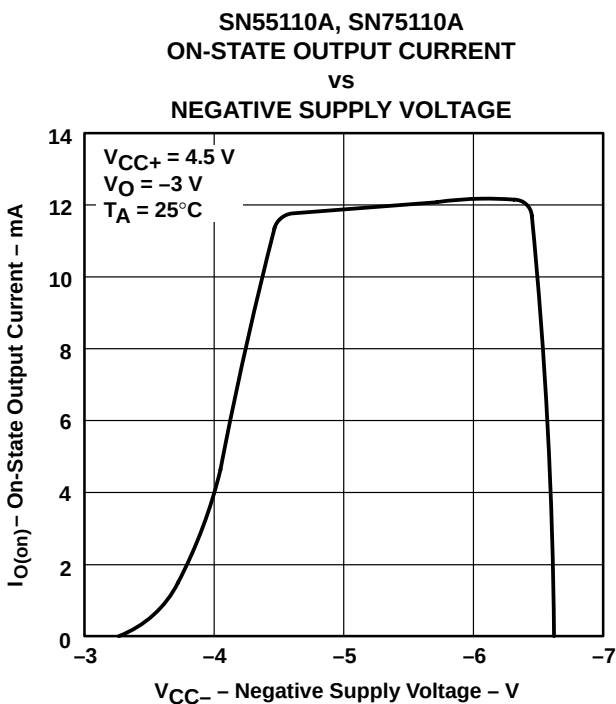


Figure 2

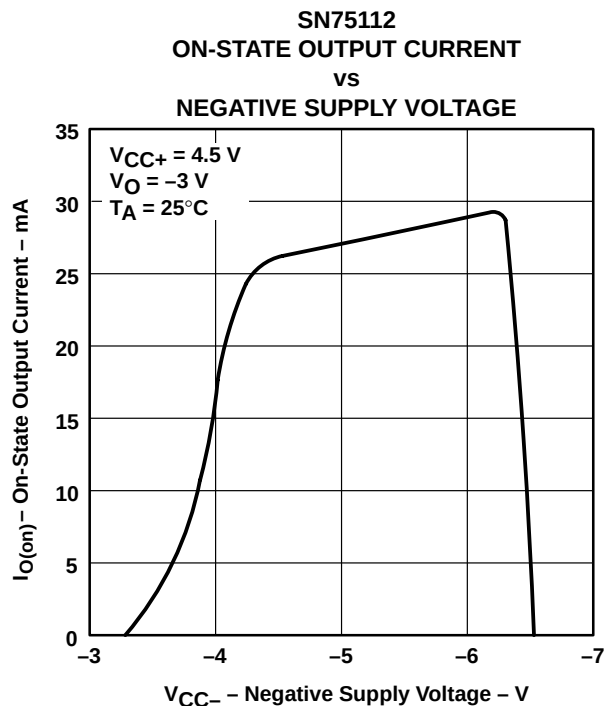
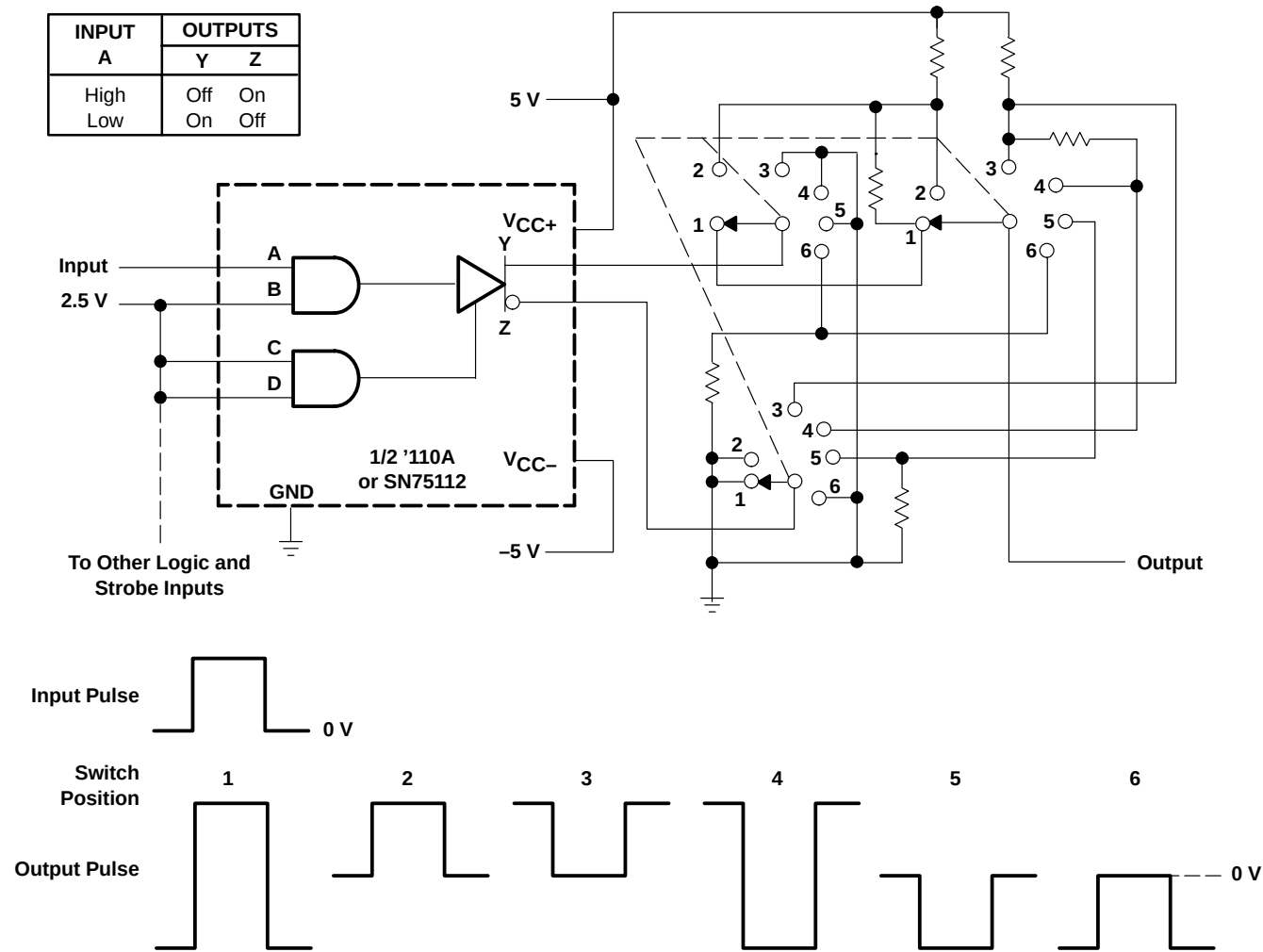


Figure 3

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.



APPLICATION INFORMATION

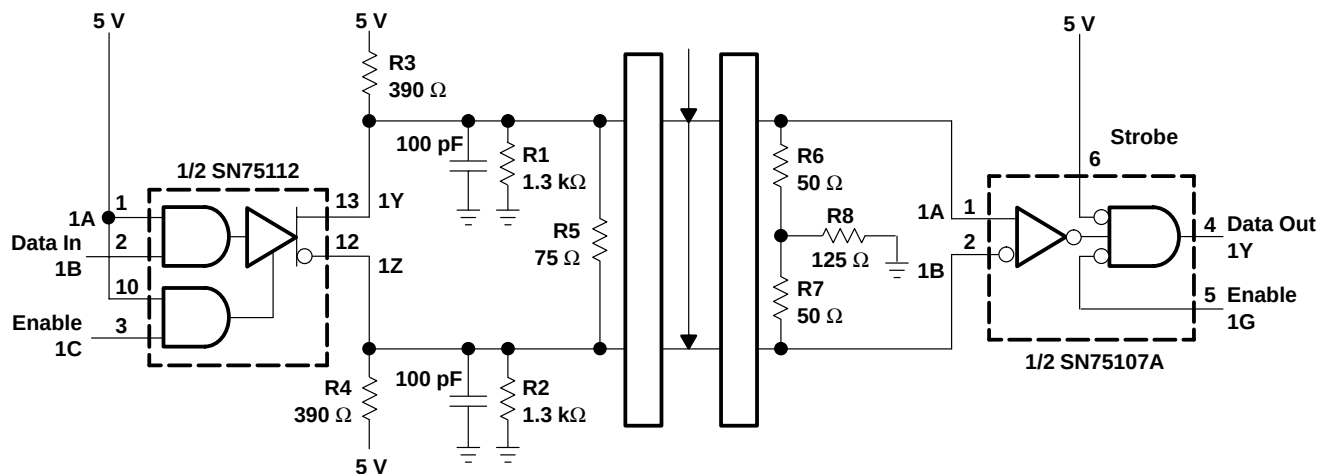
using the SN75112 as a CCITT-recommended V.35 line driver

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 or	40	$0.01 \times u_i^\dagger$	ns
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

$^\dagger u_i$ = unit interval or minimum signal-element pulse duration



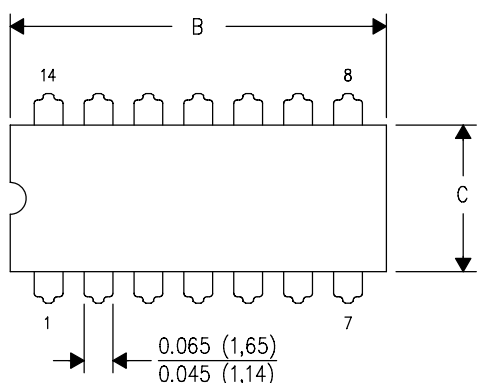
All resistors are 5%, 1/4 W.

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

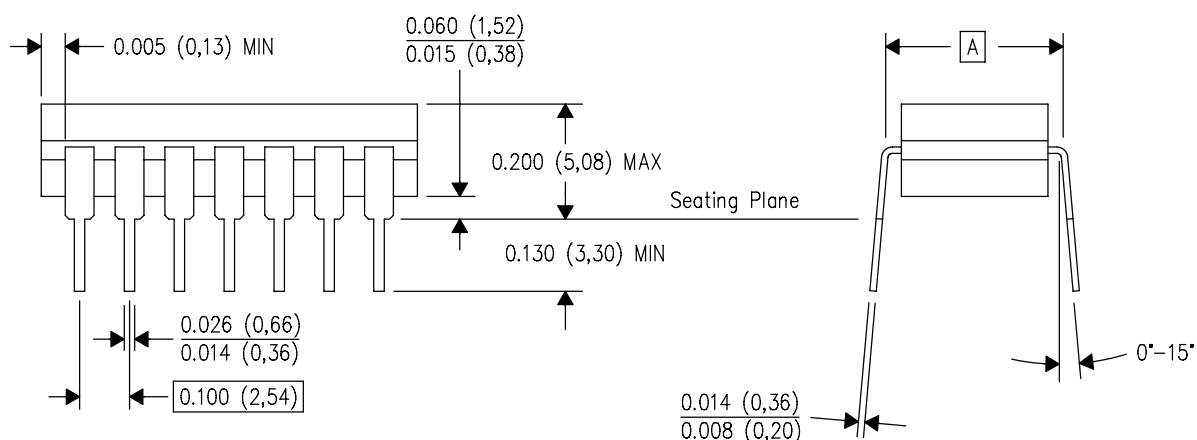
J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	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)

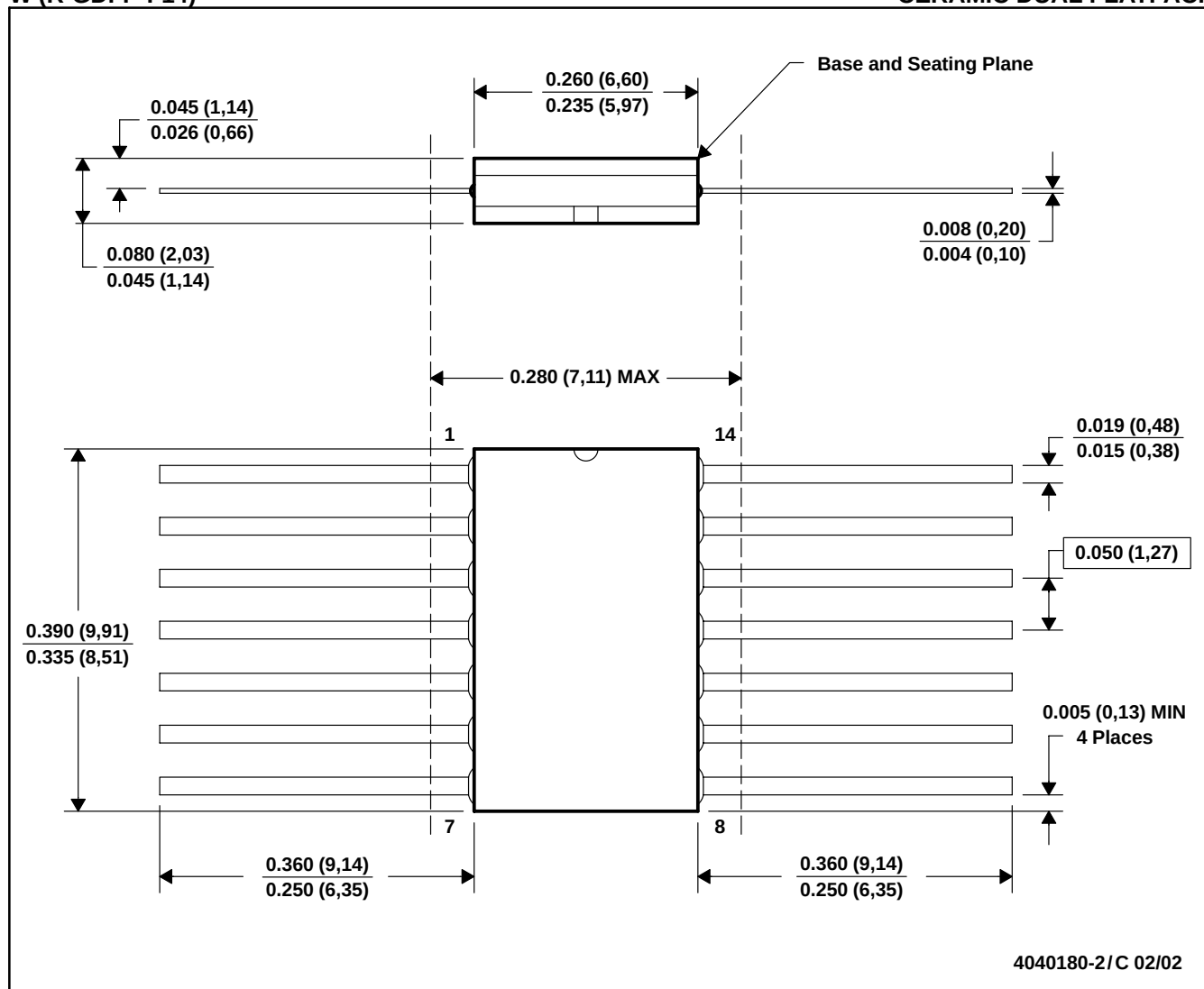


4040083/F 03/03

- 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

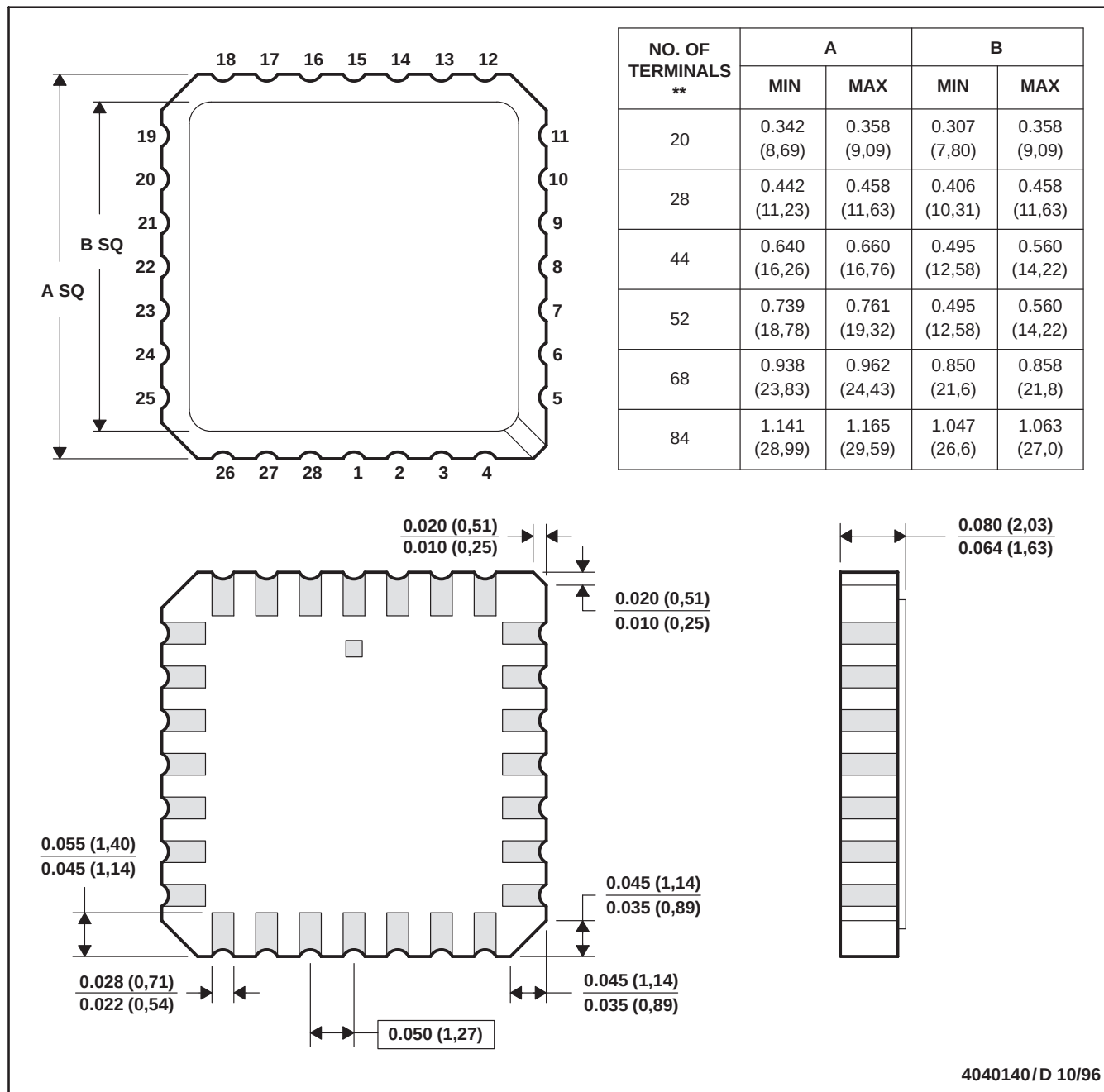


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification only.
 E. Falls within MIL STD 1835 GDFP1-F14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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

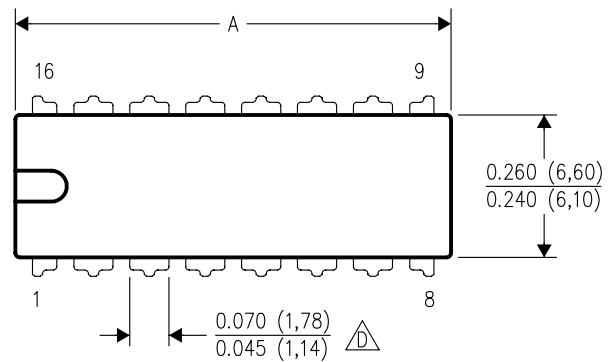


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - The terminals are gold plated.
 - Falls within JEDEC MS-004

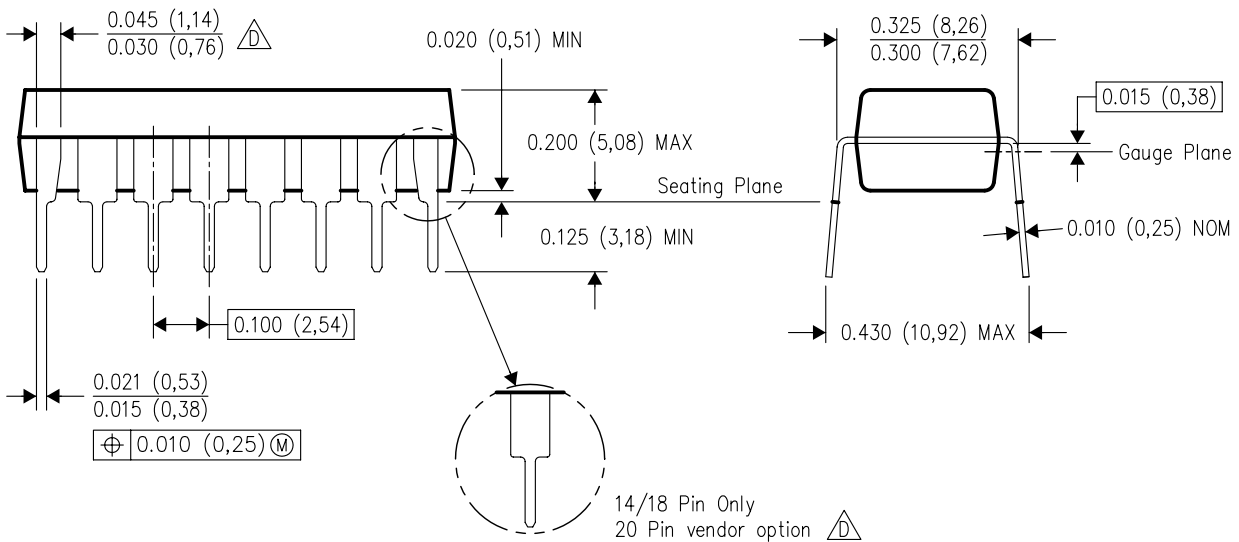
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS **	14	16	18	20
DIM				
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	AA	BB	AC	AD



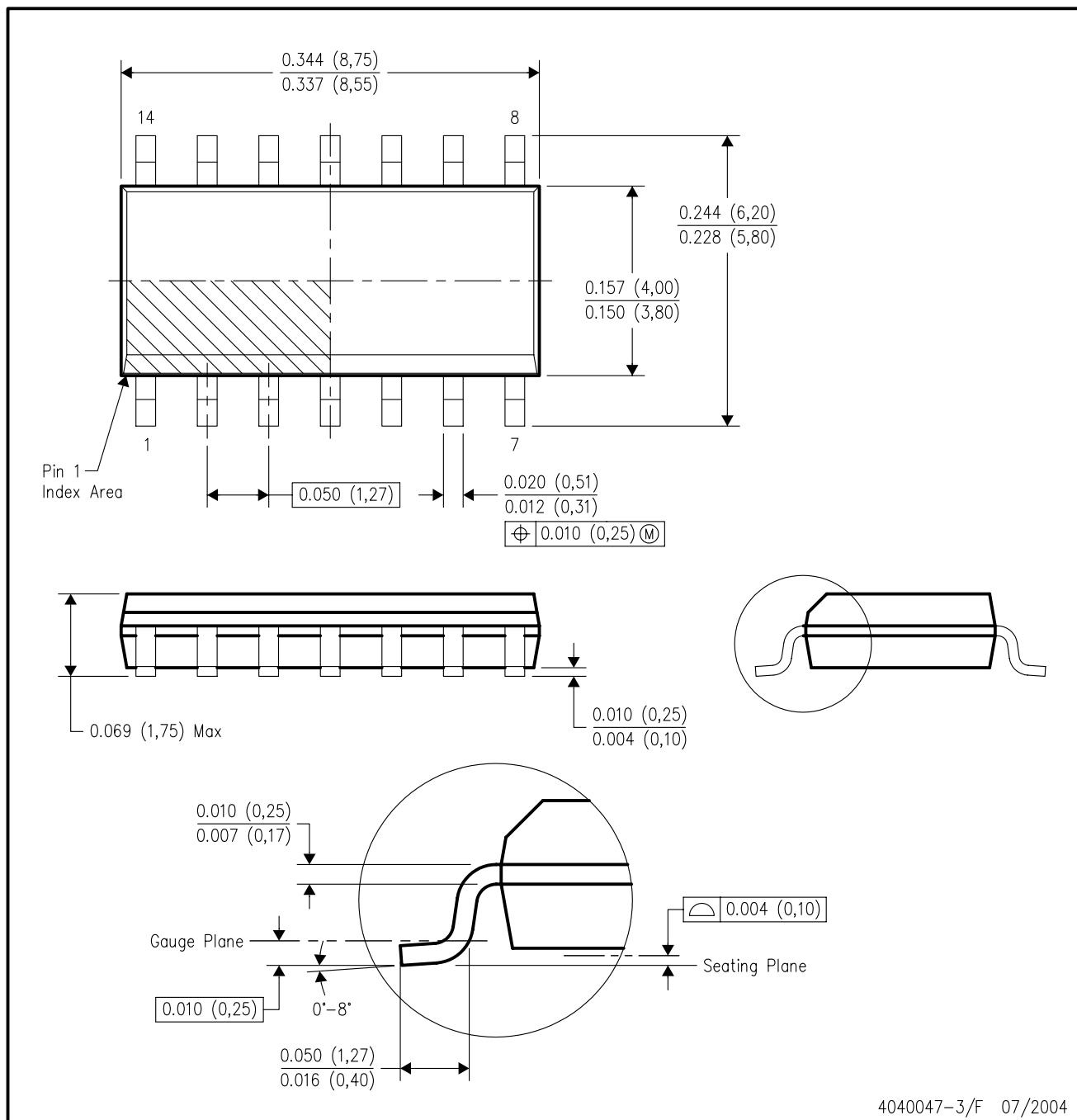
14/18 Pin Only
20 Pin vendor option

4040049/E 12/2002

- 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.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



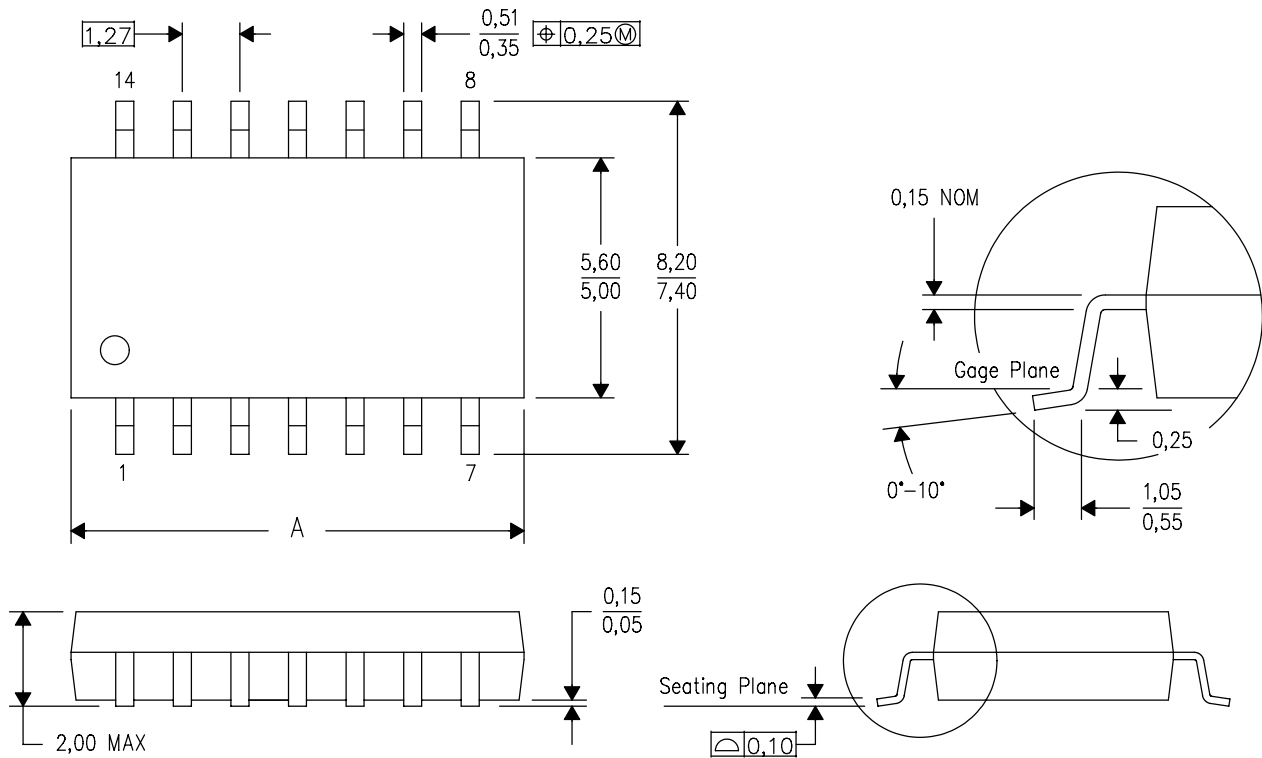
4040047-3/F 07/2004

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.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2004, Texas Instruments Incorporated