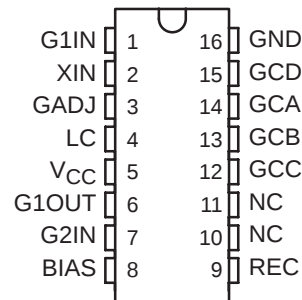


- Designed for Use With the TL851 in Sonar Ranging Modules Like the SN28827
- Digitally Controlled Variable-Gain Variable-Bandwidth Amplifier
- Operational Frequency Range of 20 kHz to 90 kHz
- TTL-Compatible
- Operates From Power Sources of 4.5 V to 6.8 V
- Interfaces to Electrostatic or Piezoelectric Transducers
- Overall Gain Adjustable With One External Resistor

N PACKAGE
(TOP VIEW)



NC – No internal connection

description

The TL852 is an economical sonar ranging receiver integrated circuit for use with the TL851 control integrated circuit. A minimum of external components is required for operation, and this amplifier easily interfaces to Polaroid's 50-kHz electrostatic transducer. An external 68-k Ω $\pm$ 5% resistor from BIAS to GND provides the internal biasing reference. Amplifier gain can be set with a resistor from G1IN to GADJ. Required amplifier gain will vary for different applications. Using the detect-level measurement circuit of Figure 1, a nominal peak-to-peak value of 230 mV input during gain step 2 is recommended for most applications. For reliable operation, a level no lower than 50 mV should be used. The recommended detect level of 230 mV can be obtained for most amplifiers with an R1 value between 5 k Ω and 20 k Ω .

Digital control of amplifier gain is provided with gain control inputs GCA, GCB, GCC, and GCD. These inputs must be driven synchronously (all inputs stable within 0.1 μ s) to avoid false receive output signals due to invalid logic counts. This can be done easily with the TL851 control integrated circuit. A plot showing relative gain for the various gain steps versus time can be seen in Figure 2. To dampen ringing of the 50-kHz electrostatic transducer, a 5-k Ω resistor from G1IN to XIN is recommended.

An external parallel combination of inductance and capacitance between LC and VCC provides an amplifier with an externally controlled gain and Q. This not only allows control of gain to compensate for attenuation of signal with distance, but also maximizes noise and sidelobe rejection. Care must be taken to accurately tune the L-C combination at operating frequency or gain and Q will be greatly reduced at higher gain steps.

AC coupling between stages of the amplifier is accomplished with a 0.01-mF capacitor for proper biasing.

The receive output is normally held at a low level by an internal 1- μ A current source. When an input of sufficient amplitude is received, the output is driven alternately by the 1- μ A discharge current and a 50- μ A charging current. A 1000-pF capacitor is required from REC to GND to integrate the received signal so that one or two noise pulses will not be recognized.

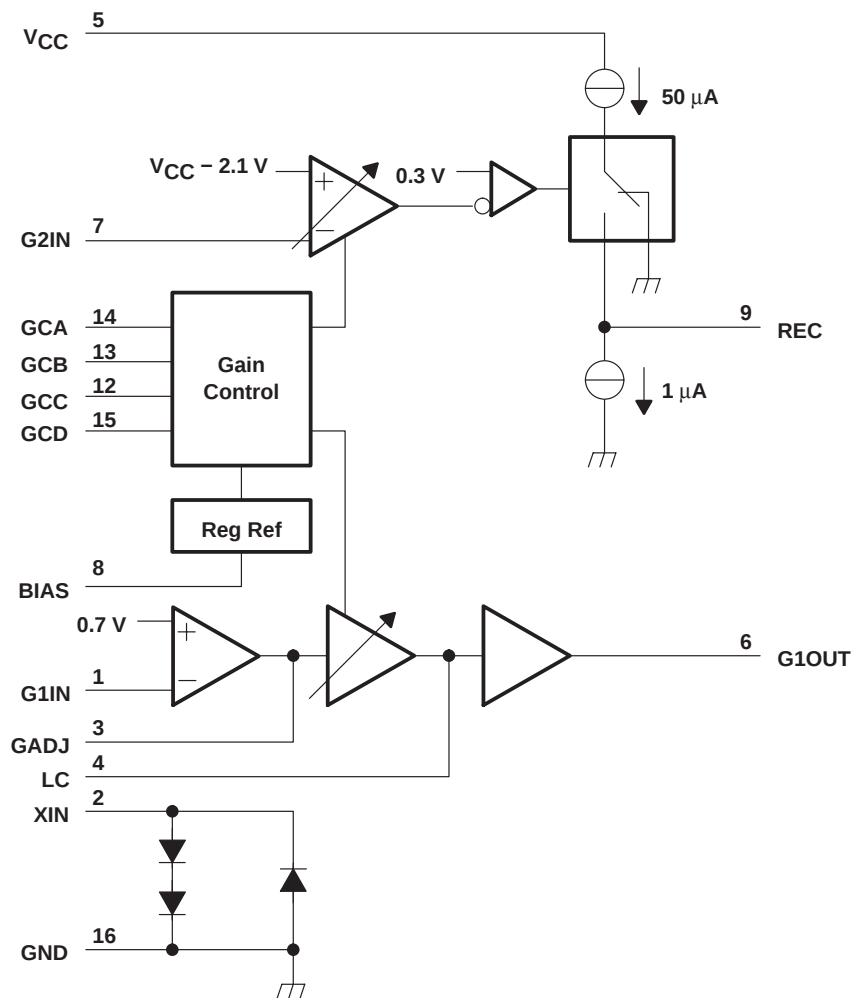
XIN provides clamping for the transformer secondary when used for transducer transmit drive as shown in Figure 4 of the SN28827 data sheet.

The TL852 is characterized for operation from 0°C to 40°C.

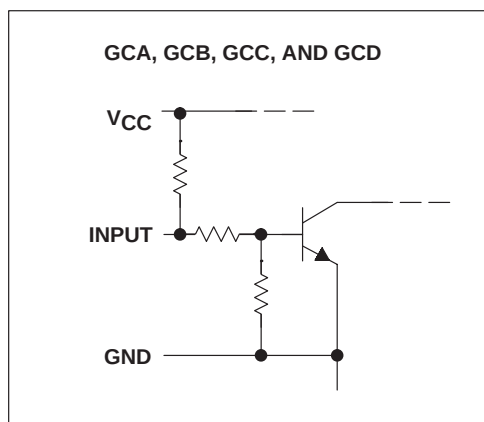
TL852 SONAR RANGING RECEIVER

SLSS003 – SEPTEMBER 1983 – REVISED MARCH 1988

functional block diagram



schematic of gain control inputs



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

Voltage at any pin with respect to GND	– 0.5 V to 7 V
Voltage at any pin with respect to V_{CC}	– 7 V to 0.5 V
XIN input current (50% duty cycle)	±60 mA
Continuous power dissipation at (or below) 25°C free-air temperature (see Note 1)	1150 mW
Operating free-air temperature range	– 40°C to 85°C
Storage temperature range	– 65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

[†] Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the recommended operating conditions section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: For operation above 25°C, derate linearly at the rate of 9.2 mW/°C.

recommended operating conditions

	MIN	MAX	UNIT
Supply voltage, V_{CC}	4.5	6.8	V
High-level input voltage, V_{IH}	2.1		V
Low-level input voltage, V_{IL}		0.6	
Bias resistor between BIAS and GND	64	72	kΩ
Operating free-air temperature, T_A	0	40	°C

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [‡]	MAX	UNIT
Input clamp voltage at XIN	$I_I = 40$ mA		2.5		V
	$I_I = -40$ mA		– 1.5		
Open-circuit input voltage at GCA, GCB, GCC, GCD	$V_{CC} = 5$ V, $I_I = 0$		2.5		V
High-level input current, I_{IH} , into GCA, GCB, GCC, GCD	$V_{CC} = 5$ V, $V_{IH} = 2$ V		– 0.5		mA
Low-level input current, I_{IL} , into GCA, GCB, GCC, GCD	$V_{CC} = 5$ V, $V_{IL} = 0$			– 3	mA
Receive output current	$I_{G2IN} = -100$ μA, $V_O = 0.3$ V		1		μA
	$I_{G2IN} = 100$ μA, $V_O = 0.1$ V		– 50		
Supply current, I_{CC}				45	mA

[‡] Typical values are at $V_{CC} = 5$ V and $T_A = 25$ °C.

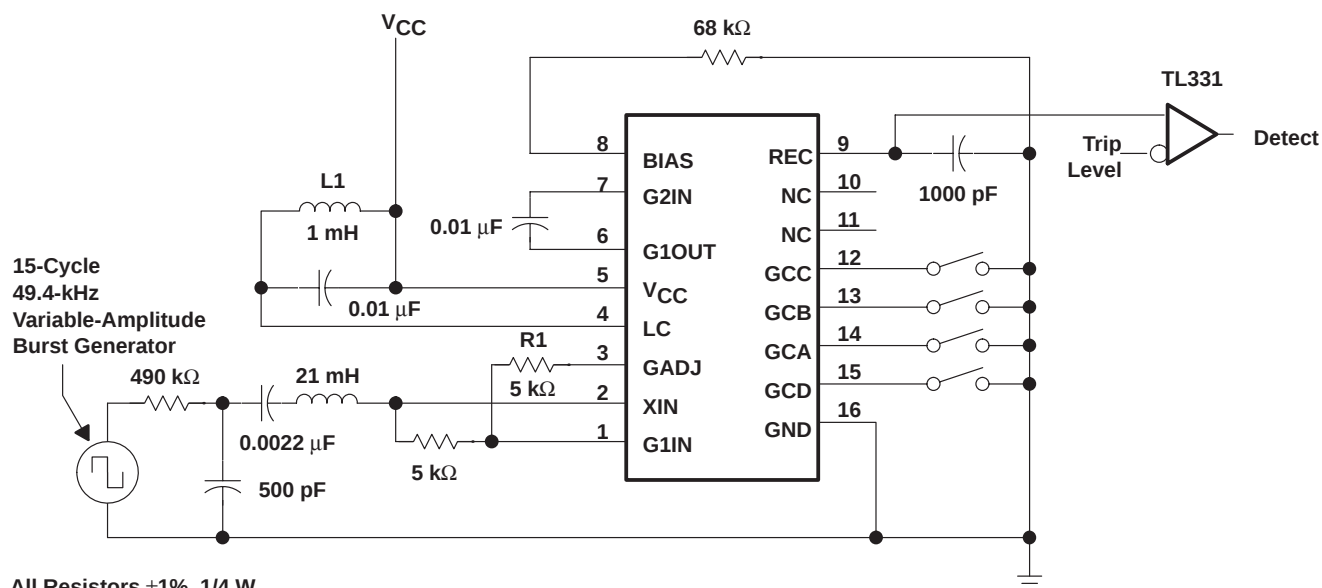
TL852 SONAR RANGING RECEIVER

SLSS003 – SEPTEMBER 1983 – REVISED MARCH 1988

APPLICATION INFORMATION

detect level versus gain step

Detect level is measured by applying a 15-cycle burst of 49.4 kHz square wave just after the beginning of the gain step to be tested. The least burst amplitude that makes REC reach the trip level is defined to be the detect level. System gain is then inversely proportional to detect level. See the test circuit in Figure 1.



All Resistors $\pm 1\%$, 1/4 W
All Capacitors $\pm 1\%$, Film
L1 Q > 60 at 50 kHz
C1 Q > 500 at 50 kHz

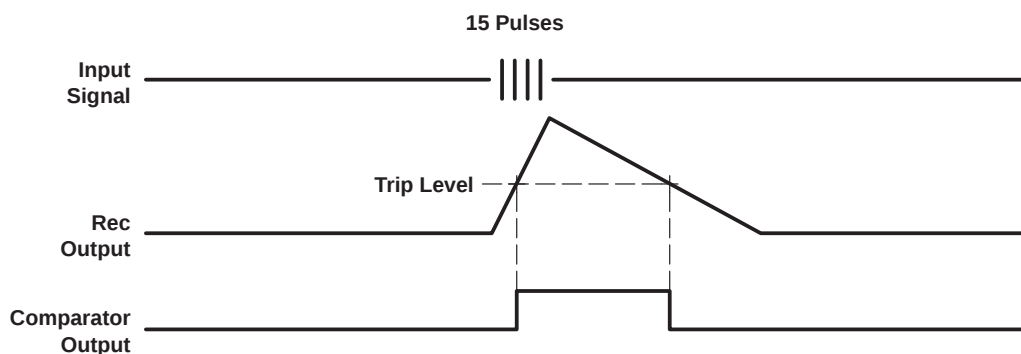


Figure 1. Detect-Level Measurement Circuit and Waveforms

APPLICATION INFORMATION

GAIN STEP TABLE

GCD	GCC	GCB	GCA	STEP NUMBER
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	L	L	L	8
H	L	L	H	9
H	L	H	L	10
H	L	H	H	11

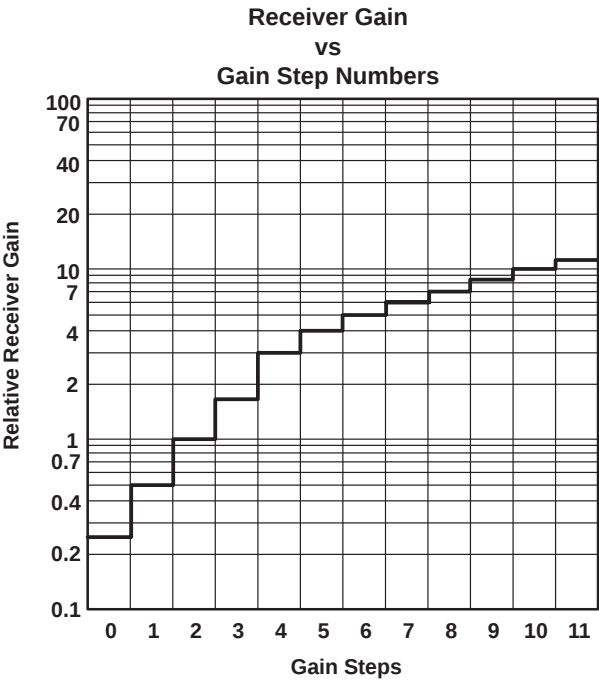


Figure 2

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TL852CDR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TL852C
TL852CDR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	See TL852CDR	TL852C
TL852CN	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TL852CN
TL852CN.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	See TL852CN	TL852CN
TL852CNE4	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	See TL852CN	TL852CN

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

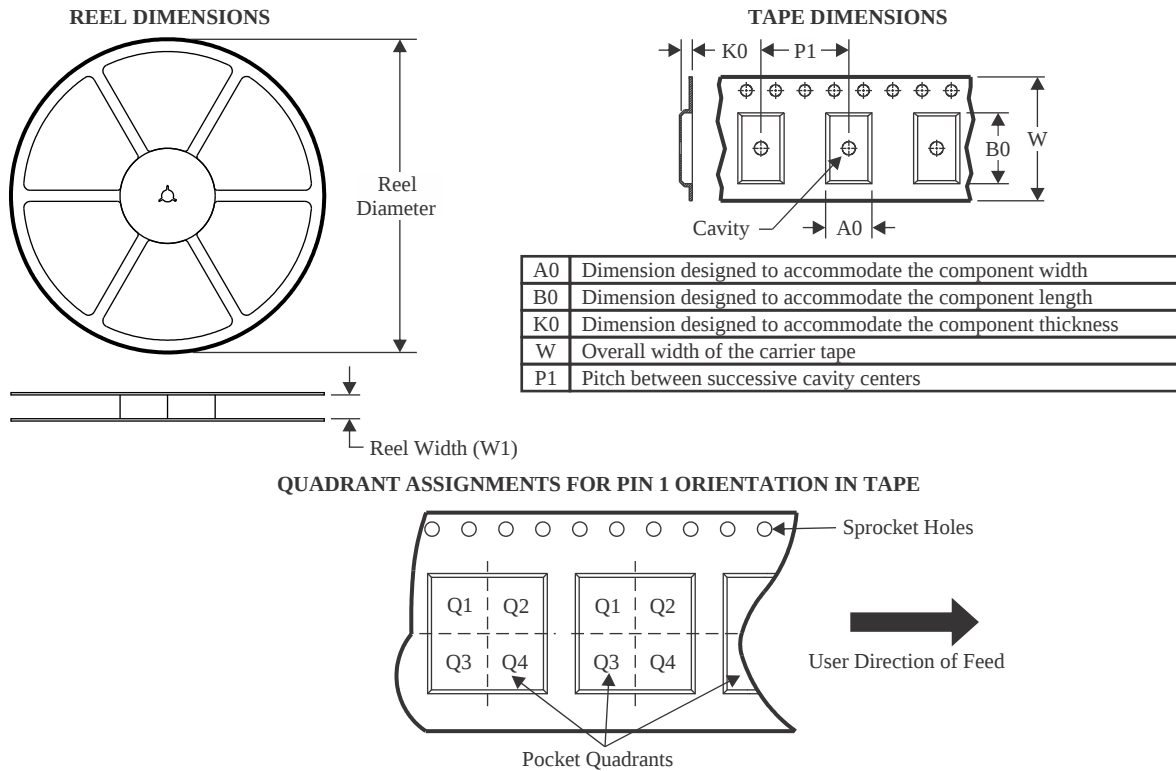
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "--" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TL852CDR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL852CDR	SOIC	D	16	2500	350.0	350.0	43.0

TUBE

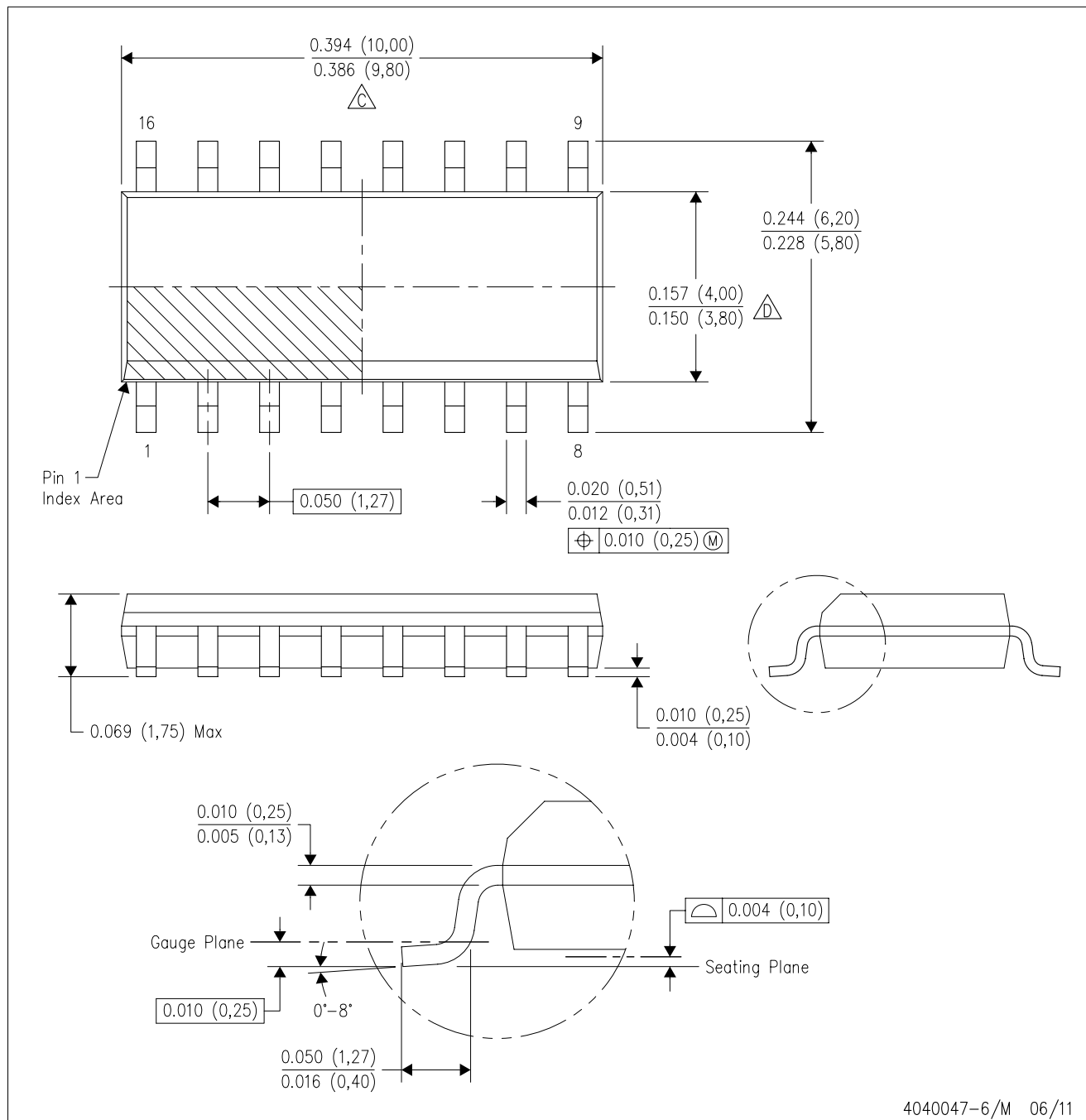


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TL852CN	N	PDIP	16	25	506	13.97	11230	4.32
TL852CN.A	N	PDIP	16	25	506	13.97	11230	4.32
TL852CNE4	N	PDIP	16	25	506	13.97	11230	4.32

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.

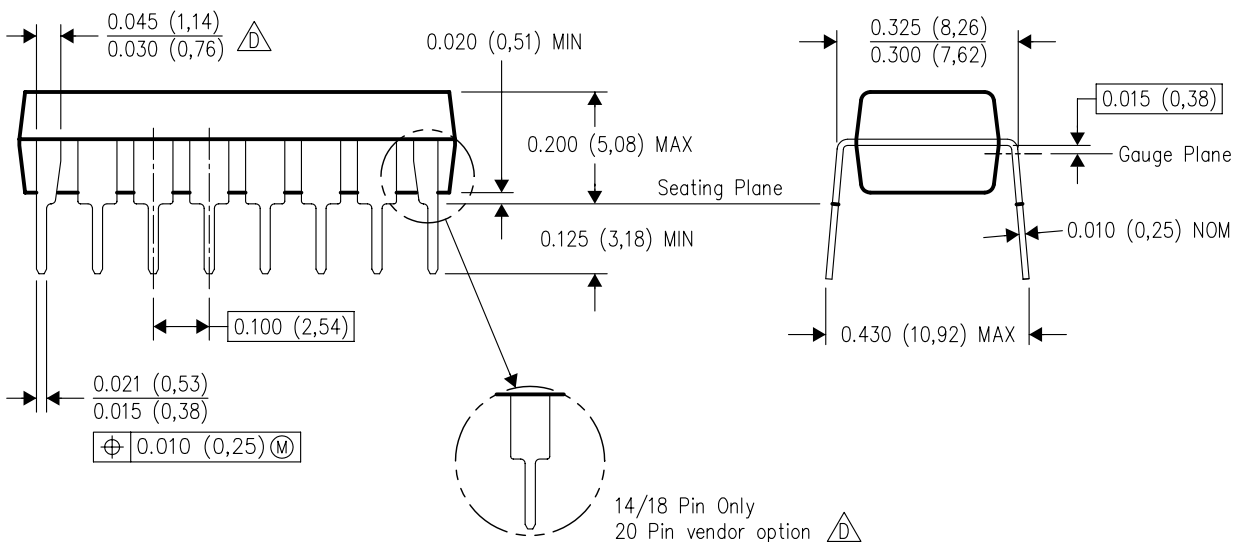
N (R-PDIP-T**)

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.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2025, Texas Instruments Incorporated

Last updated 10/2025