

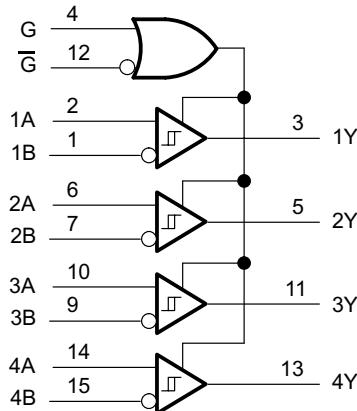
# AM26LS32Ax, AM26LS33Ax Quadruple Differential Line Receivers

## 1 Features

- AM26LS32A Devices meet or exceed the requirements of ANSI TIA/EIA-422-B, TIA/EIA-423-B, and ITU recommendations V.10 and V.11
- AM26LS32A Devices have  $\pm 7$ -V Common-mode range with  $\pm 200$ -mV sensitivity
- AM26LS33A Devices have  $\pm 15$ -V common-mode range with  $\pm 500$ -mV sensitivity
- Input hysteresis 50 mV typical
- Operate from a single 5-V supply
- Low-power Schottky circuitry
- 3-State outputs
- Complementary output-enable inputs
- Input impedance  $12\text{ k}\Omega$  minimum
- Open input fail-safe

## 2 Applications

- High-reliability automotive applications
- Factory automation
- ATM and cash counters
- Smart grids
- AC and servo motor drives



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Pin numbers are for D, N, NS, or PW packages only.

## Logic Diagram (Positive Logic)

## 3 Description

The AM26LS32Ax and AM26LS33Ax devices are quadruple differential line receivers for balanced and unbalanced digital data transmission. The enable function is common to all four receivers and offers a choice of active-high or active-low input. The 3-state outputs permit connection directly to a bus-organized system. When the inputs are open, the fail-safe design makes sure the outputs always are high.

Compared to the AM26LS32 and the AM26LS33, the AM26LS32A and AM26LS33A incorporate an additional stage of amplification to improve sensitivity. The input impedance has been increased, resulting in less loading of the bus line. The additional stage has increased propagation delay; however, this does not affect interchangeability in most applications.

The AM26LS32AC and AM26LS33AC are characterized for operation from  $0^\circ\text{C}$  to  $70^\circ\text{C}$ . The AM26LS32AI is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ . The AM26LS32AM and AM26LS33AM are characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ .

## Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>
AM26LS3xAC	PDIP (16)	19.3 mm $\times$ 9.4 mm
	SOIC (16)	9.9 mm $\times$ 6 mm
AM26LS32AC	SO (16)	10.2 mm $\times$ 7.8 mm
	TSSOP (16)	5. mm $\times$ 6.4 mm
AM26LS3xAM	CDIP (16)	19.56 mm $\times$ 6.92 mm
	LCCC (20)	8.9 mm $\times$ 8.9 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

(2) The package size (length  $\times$  width) is a nominal value and includes pins, where applicable.



An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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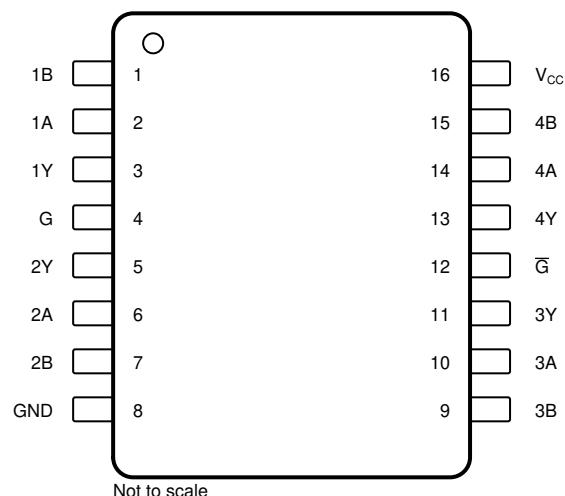
## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

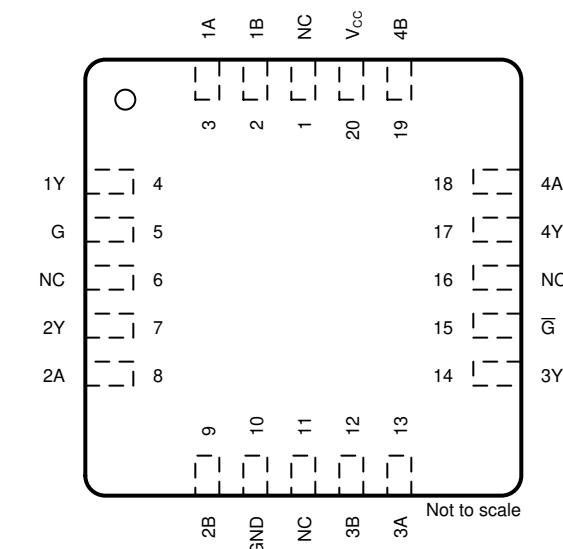
<b>Changes from Revision F (August 2016) to Revision G (August 2023)</b>	<b>Page</b>
• Changed the Device Information table to the <i>Package Information</i> table.....	<b>1</b>
• Changed the <i>Thermal Information</i> table.....	<b>5</b>
• Changed the <i>Typical Characteristics</i> .....	<b>8</b>

<b>Changes from Revision E (October 2007) to Revision F (August 2016)</b>	<b>Page</b>
• Added <i>Applications</i> section, <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section.....	<b>1</b>
• Changed $R_{\theta JA}$ values in the <i>Thermal Information</i> table: 73 to 75.7 for (D), 67 to 45.3 (N), 64 to 75.8 (NS), and 108 to 102.7 (PW).....	<b>5</b>

## 5 Pin Configuration and Functions



**Figure 5-1. D, J, N, NS, and PW Package 16-Pin  
SOIC, CDIP, PDIP, SO, and TSSOP  
(Top View)**



NC - No internal connection

**Figure 5-2. FK Package, 20-Pin LCCC (Top View)**

PIN			TYPE	DESCRIPTION
NAME	SOIC, CDIP, PDIP, SO, TSSOP	LCCC		
1A	2	3	I	RS422/RS485 differential input (noninverting)
1B	1	2	I	RS422/RS485 differential input (inverting)
1Y	3	4	O	Logic level output
2A	6	8	I	RS422/RS485 differential input (noninverting)
2B	7	9	I	RS422/RS485 differential input (inverting)
2Y	5	7	O	Logic level output
3A	10	13	I	RS422/RS485 differential input (noninverting)
3B	9	12	I	RS422/RS485 differential input (inverting)
3Y	11	14	O	Logic level output
4A	14	18	I	RS422/RS485 differential input (noninverting)
4B	15	19	I	RS422/RS485 differential input (inverting)
4Y	13	17	O	Logic level output
$\bar{G}$	12	15	I	Active-Low select
G	4	5	I	Active-High select
GND	8	10	—	Ground
NC	—	1, 6, 11, 16	—	No internal connection
V <sub>CC</sub>	16	20	—	Power supply

## 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
Supply voltage, $V_{CC}$ <sup>(2)</sup>		7		V
Input voltage, $V_I$	Any differential input	$\pm 25$		V
	Other inputs	7		
Differential input voltage, $V_{ID}$ <sup>(3)</sup>		$\pm 25$		V
Continuous total power dissipation		See <a href="#">Section 6.7</a>		
Case temperature, $T_C$ , FK package (60 s)		260		°C
Lead temperature <sup>(4)</sup>	D or N package (10 s)	260		°C
	J package (60 s)	300		
Storage temperature, $T_{stg}$		-65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.  
 (2) All voltage values, except differential voltages, are with respect to the network ground terminal.  
 (3) Differential voltage values are at the noninverting (A) input terminals with respect to the inverting (B) input terminals.  
 (4) 1.6 mm (1/16 inch) from case

### 6.2 ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup> Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup>	$\pm 500$ $\pm 2000$
			V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.  
 (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 6.3 Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	AM26LS32AC, AM26LS32AI, AM26LS33AC AM26LS32AM, AM26LS33AM	4.75 4.5	5 5	5.25 5.5
$V_{IH}$	High-level input voltage		2		V
$V_{IL}$	Low-level input voltage			0.8	V
$V_{IC}$	Common-mode input voltage	AM26LS32A AM26LS33A		$\pm 7$ $\pm 15$	V
$I_{OH}$	High-level output current			-440	$\mu A$
$I_{OL}$	Low-level output current			8	mA
$T_A$	Operating free-air temperature	AM26LS32AC, AM26LS33AC AM26LS32AI AM26LS32AM, AM26LS33AM	0 -40 -55	70 85 125	°C

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>	AM26LS3xAC, AM26LS32AI				AM26LS32AC				UNIT
	D (SOIC)	DR (SOIC-Reel)	N (PDIP)	NR (PDIP-Reel)	NS (SO)	NSR (SO-Reel)	PW (TSSOP)	PWR (TSSOP-Reel)	
	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	
R <sub>θJA</sub> Junction-to-ambient thermal resistance	75.7	84.6	45.3	60.6	75.8	88.5	102.7	107.5	°C/W
R <sub>θJC(top)</sub> Junction-to-case (top) thermal resistance	35	43.5	32.7	48.1	32.9	46.2	37.8	38.4	°C/W
R <sub>θJB</sub> Junction-to-board thermal resistance	33.3	43.2	25.3	40.6	36.6	50.7	47.7	53.7	°C/W
Ψ <sub>JT</sub> Junction-to-top characterization parameter	6.6	10.4	17.8	27.5	6	13.5	3	3.2	°C/W
Ψ <sub>JB</sub> Junction-to-board characterization parameter	33	42.8	25.1	40.3	36.3	50.3	47.1	53.1	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 6.5 Electrical Characteristics

over recommended ranges of  $V_{CC}$ ,  $V_{IC}$ , and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	UNIT
$V_{IT+}$	Positive-going input threshold voltage	$V_O = V_{OH\min}$ , $I_{OH} = -440 \mu A$	AM26LS32A		0.2	V
			AM26LS33A		0.5	
$V_{IT-}$	Negative-going input threshold voltage	$V_O = 0.45 V$ , $I_{OL} = 8 mA$	AM26LS32A	-0.2 <sup>(2)</sup>		V
			AM26LS33A	-0.5 <sup>(2)</sup>		
$V_{hys}$	Hysteresis voltage ( $V_{IT+} - V_{IT-}$ )			50		mV
$V_{IK}$	Enable-input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = -18 mA$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN}$ , $V_{ID} = 1 V$ , $V_{I(G)} = 0.8 V$ , $I_{OH} = -440 \mu A$	AM26LS32AC, AM26LS33AC	2.7		V
			AM26LS32AM, AM26LS32AI, AM26LS33AM	2.5		
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{ID} = -1 V$ , $V_{I(G)} = 0.8 V$	$I_{OL} = 4 mA$		0.4	V
			$I_{OL} = 8 mA$		0.45	
$I_{OZ}$	Off-state (high-impedance state) output current	$V_{CC} = \text{MAX}$	$V_O = 2.4 V$		20	$\mu A$
			$V_O = 0.4 V$		-20	
$I_I$	Line input current	$V_I = 15 V$ , other input at -10 V to 15 V $V_I = -15 V$ , other input at -15 V to 10 V			1.2	mA
					-1.7	
$I_{I(EN)}$	Enable input current	$V_I = 5.5 V$			100	$\mu A$
$I_H$	High-level enable current	$V_I = 2.7 V$			20	$\mu A$
$I_L$	Low-level enable current	$V_I = 0.4 V$			-0.36	mA
$r_i$	Input resistance	$V_{IC} = -15 V$ to 15 V, one input to ac ground	12	15		$k\Omega$
$I_{OS}$	Short-circuit output current <sup>(3)</sup>	$V_{CC} = \text{MAX}$		-15	-85	mA
$I_{CC}$	Supply current	$V_{CC} = \text{MAX}$ , all outputs disabled	52	70		mA

(1) All typical values are at  $V_{CC} = 5 V$ ,  $T_A = 25^\circ C$ , and  $V_{IC} = 0$ .

(2) The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for threshold levels only.

(3) Not more than one output must be shorted to ground at a time, and duration of the short circuit must not exceed one second.

## 6.6 Switching Characteristics

$C_L = 15 \text{ pF}$ ,  $V_{CC} = 5 \text{ V}$ , and  $T_A = 25^\circ\text{C}$  (see [Section 7](#); unless otherwise noted)

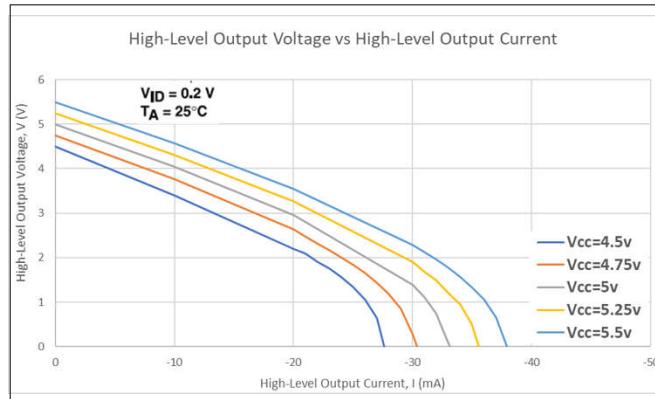
PARAMETER		MIN	TYP <sup>(1)</sup>	MAX	UNIT
$t_{PLH}$	Propagation delay time, low-to-high-level output		20	35	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output		22	35	ns
$t_{PZH}$	Output enable time to high level		17	22	ns
$t_{PZL}$	Output enable time to low level		20	25	ns
$t_{PHZ}$	Output disable time from high level		21	30	ns
$t_{PLZ}$	Output disable time from low level		30	40	ns

(1) All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $V_{IC} = 0$ .

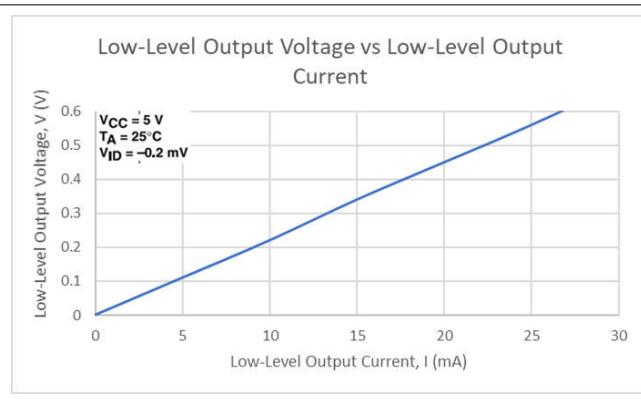
## 6.7 Dissipation Ratings

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATION 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 mW/°C	880 mW	275 mW
J	1375 mW	11 mW/°C	880 mW	275 mW

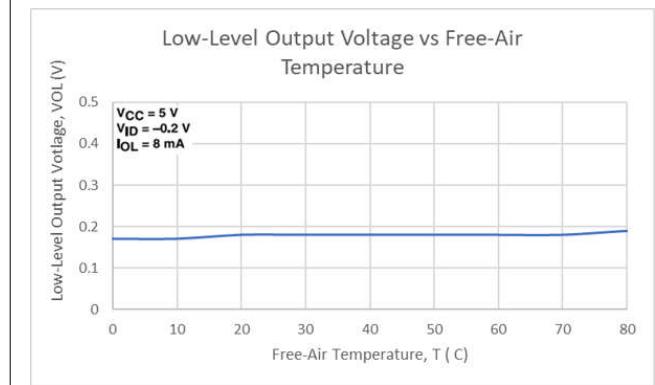
## 6.8 Typical Characteristics



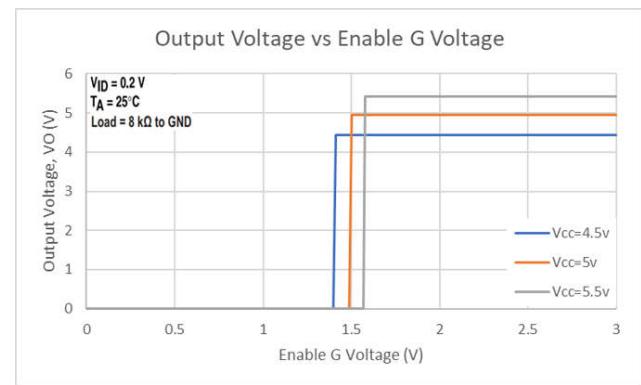
**Figure 6-1. High-Level Output Voltage vs High-Level Output Current**



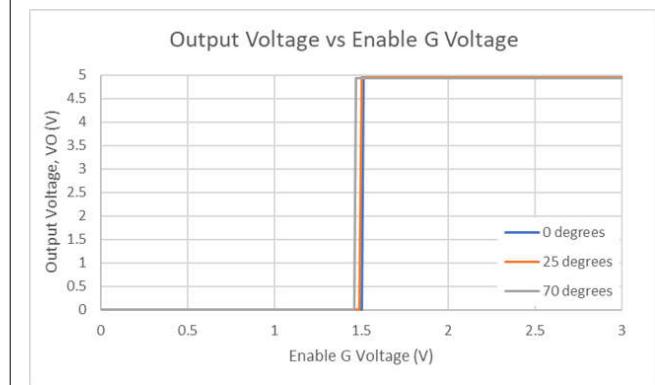
**Figure 6-2. Low-Level Output Voltage vs Low-Level Output Current**



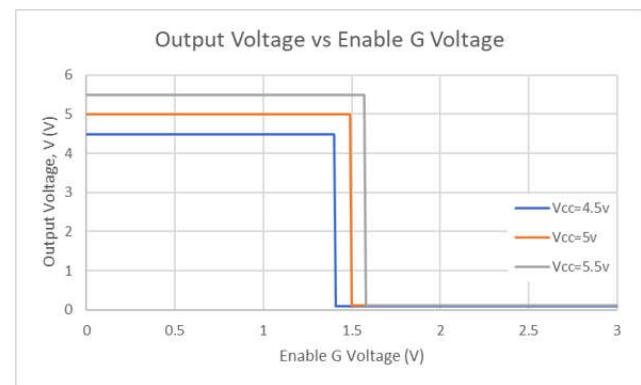
**Figure 6-3. Low-Level Output Voltage vs Free-Air Temperature**



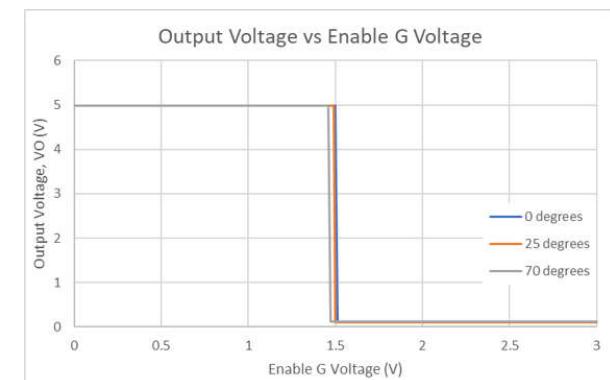
**Figure 6-4. Output Voltage vs Enable G Voltage**



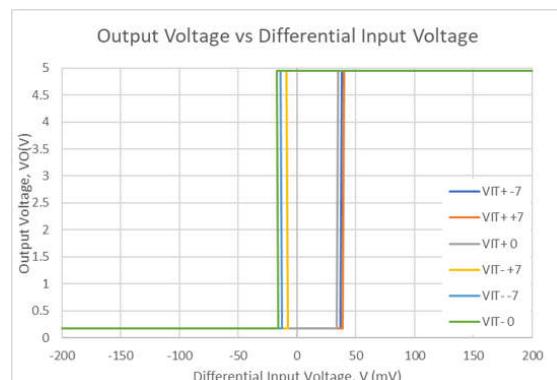
**Figure 6-5. Output Voltage vs Enable G Voltage**



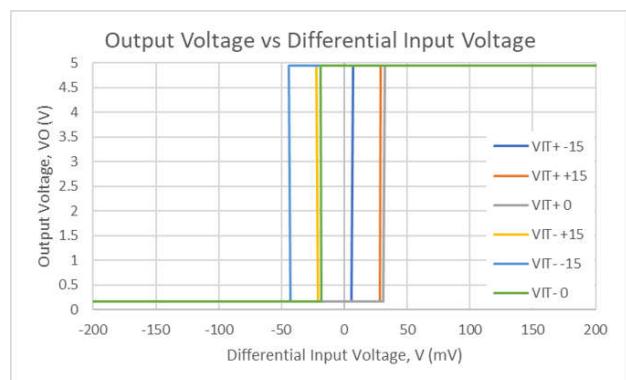
**Figure 6-6. Output Voltage vs Enable G Voltage**



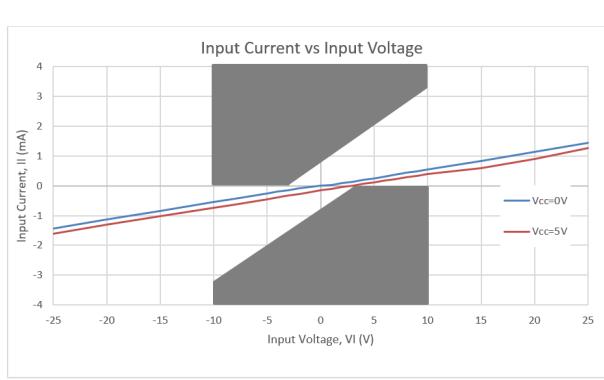
**Figure 6-7. Output Voltage vs Enable G Voltage**



**Figure 6-8. AM26LS32A Output Voltage vs Differential Input Voltage**



**Figure 6-9. AM26LS33A Output Voltage vs Differential Input Voltage**



The unshaded area shows requirements of paragraph 4.2.1 of ANSI Standards EIA/TIA-422-B and EIA/TIA-423-B.

**Figure 6-10. Input Current vs Input Voltage**

## 7 Parameter Measurement Information

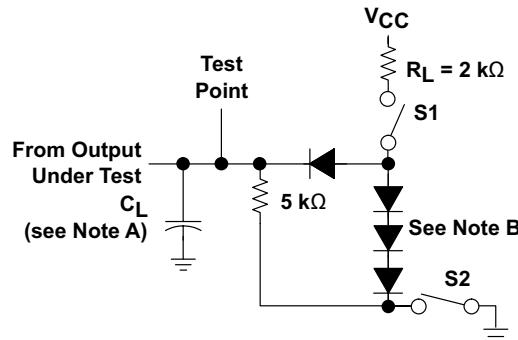


Figure 7-1. Test Circuit

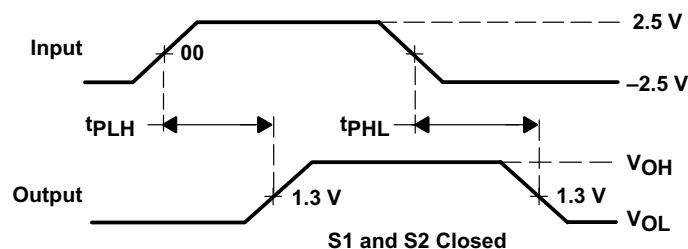


Figure 7-2. Voltage Waveforms For  $t_{PLH}$ ,  $t_{PHL}$

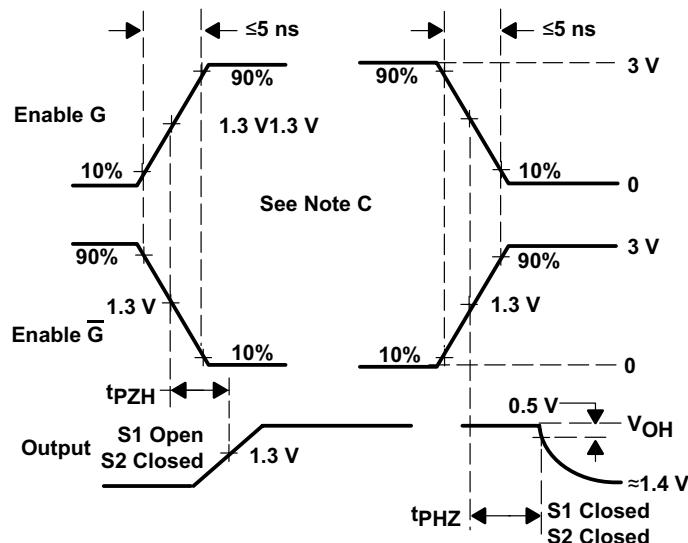
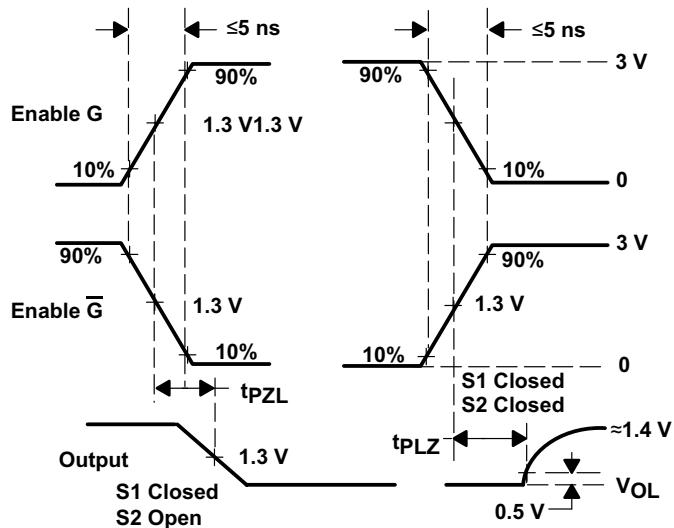
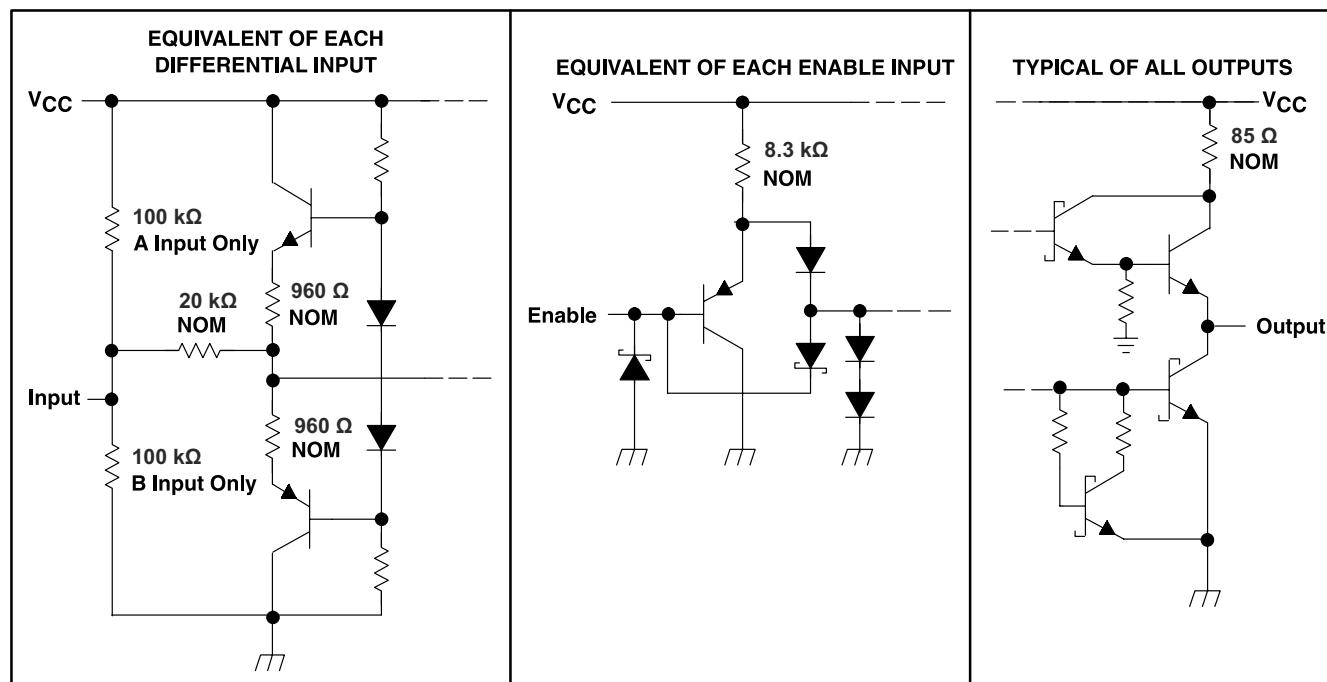


Figure 7-3. Voltage Waveforms For  $t_{PHZ}$ ,  $t_{PZH}$



- A. CL includes probe and jig capacitance.
- B. All diodes are 1N3064 or equivalent.
- C. Enable G is tested with  $\bar{G}$  high,  $\bar{G}$  is tested with G low.

Figure 7-4. Voltage Waveforms For  $t_{PLZ}$ ,  $t_{PZL}$



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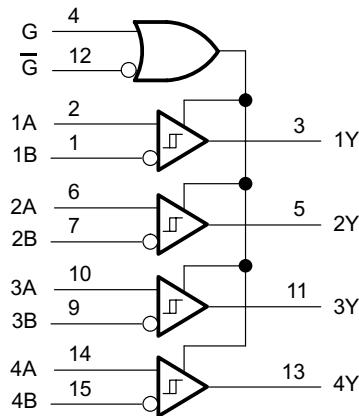
Figure 7-5. Schematics of Inputs and Outputs

## 8 Detailed Description

### 8.1 Overview

The AM26LS32 is a quadruple-differential line receiver that meets the necessary requirements for NSI TIA/EIA-422-B, TIA/EIA-423-B, and ITU Recommendation V.10 and V.11. This device allows a low-power or low-voltage MCU to interface with heavy machinery, subsystems, and other devices through long wires of up to 1000 m, giving any design a reliable and easy-to-use connection. As any RS422 interface, the AM26LS32 works in a differential voltage range, which enables very good signal integrity.

### 8.2 Functional Block Diagram



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Figure 8-1. Logic Diagram (Positive Logic)

### 8.3 Feature Description

The device can be configured using the G and  $\bar{G}$  logic inputs to select receiver output. The high voltage or logic 1 on the G pin allows the device to operate on an active-high, and having a low voltage or logic 0 on the G enables active low operation. These are simple ways to configure the logic to match that of the receiving or transmitting controller or microprocessor.

### 8.4 Device Functional Modes

The receivers implemented in these RS422 devices can be configured using the G and  $\bar{G}$  logic pins to be enabled or disabled. This allows users to ignore or filter out transmissions as desired.

Table 8-1. Function Table, Each Receiver

DIFFERENTIAL A-B	ENABLES <sup>(1)</sup>		OUTPUT <sup>(1)</sup> Y
	G	$\bar{G}$	
$V_{ID} \geq V_{IT+}$	H	X	H
	X	L	H
$V_{IT-} \leq V_{ID} \leq V_{IT+}$	H	X	?
	X	L	?
$V_{ID} \leq V_{IT-}$	H	X	L
	X	L	L
X	L	H	Z
Open	H	X	H
	X	L	H

(1) H = High level, L = Low level, X = Irrelevant, Z = High impedance (off), ? = Indeterminate

## 9 Application and Implementation

### Note

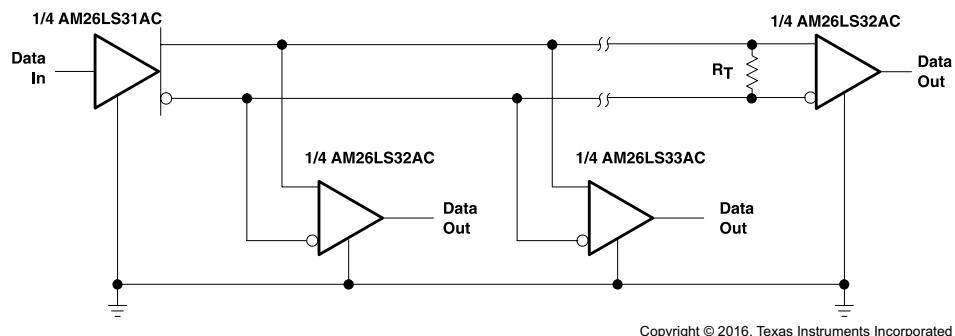
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

### 9.1 Application Information

When using AM26LS32A as a receiver, the AM26LS31AC can allow multiple AM26LS32As to be used causing an increase in the amount of outputs.

### 9.2 Typical Application

Figure 9-1 shows a configuration with no termination. Although reflections are present at the receiver inputs at a data signaling rate of 200 kbps with no termination, the RS-422-compliant receiver reads only the input differential voltage and produces a clean signal at the output.



<sup>†</sup>R<sub>T</sub> equals the characteristic impedance of the line.

**Figure 9-1. Application Diagram**

#### 9.2.1 Design Requirements

Resistor and capacitor (if used) termination values are shown for each laboratory experiment, but vary from system to system. For example, the termination resistor, R<sub>T</sub>, must be within 20% of the characteristic impedance, Z<sub>0</sub>, of the cable and can vary from about 80 Ω to 120 Ω.

#### 9.2.2 Detailed Design Procedure

Add a V<sub>CC</sub> bypass capacitor (0.1 μF or more). Either enable (G pin) input can turn on the receivers, so connect the desired enable to a compatible logic line output. The other enable input must be tied to the inactive state supply rail. If the receivers must always be active, then connect both enables to the supply rail such that at least one is set to an active-state rail. V<sub>CC</sub> must be 5 V within 10% and logic inputs must provide TTL-compatible voltage levels. A & B Inputs can lead to an external connector or can be left unconnected. The last receiver on a cable requires termination, either on-board or use as an external resistor. Unused Y outputs can be left unconnected.

### 9.2.3 Application Curve

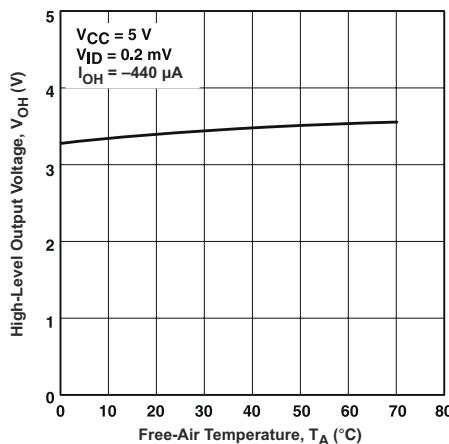


Figure 9-2. High-Level Output Voltage vs Free-Air Temperature

## 9.3 Power Supply Recommendations

Place 0.1- $\mu$ F bypass capacitors close to the power-supply pins to reduce errors coupling in from noisy or high-impedance power supplies.

## 9.4 Layout

### 9.4.1 Layout Guidelines

For best operational performance of the device, use good PCB layout practices including:

- Noise can propagate into analog circuitry through the power pins of the circuit as a whole, as well as the operational amplifier. Bypass capacitors are used to reduce the coupled noise by providing low impedance power sources local to the analog circuitry.
- Connect low-ESR, 0.1- $\mu$ F ceramic bypass capacitors between each supply pin and ground, placed as close to the device as possible. A single bypass capacitor from V+ to ground is applicable for single supply applications.
- Separate grounding for analog and digital portions of circuitry is one of the simplest and most-effective methods of noise suppression. One or more layers on multilayer PCBs are usually devoted to ground planes. A ground plane helps distribute heat and reduces EMI noise pickup. Make sure to physically separate digital and analog grounds, paying attention to the flow of the ground current.
- To reduce parasitic coupling, run the input traces as far away from the supply or output traces as possible. If it is not possible to keep them separate, it is much better to cross the sensitive trace perpendicular as opposed to in parallel with the noisy trace.
- Place the external components as close to the device as possible. Keeping RF and RG close to the inverting input minimizes parasitic capacitance.
- Keep the length of input traces as short as possible. Always remember that the input traces are the most sensitive part of the circuit.
- Consider a driven, low-impedance guard ring around the critical traces. A guard ring can significantly reduce leakage currents from nearby traces that are at different potentials.

#### 9.4.2 Layout Example

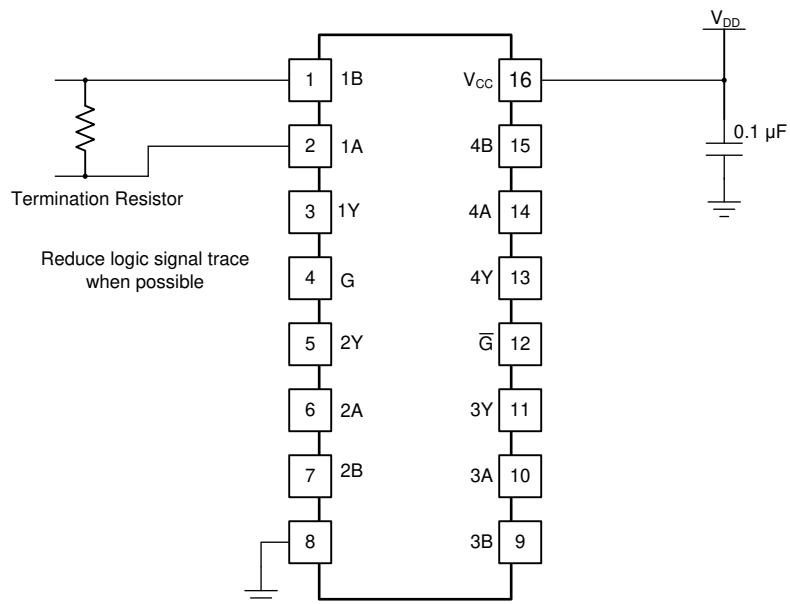


Figure 9-3. Layout with PCB Recommendations

## 10 Device and Documentation Support

### 10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 10.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 10.4 Electrostatic Discharge Caution

 This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 10.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**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)
5962-7802003M2A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003M2A AM26LS 32AMFKB
5962-7802003MEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003ME A AM26LS32AMJB
5962-7802003MFA	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003MF A AM26LS32AMWB
5962-7802004M2A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004M2A AM26LS 33AMFKB
5962-7802004MEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004ME A AM26LS33AMJB
5962-7802004MFA	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004MF A AM26LS33AMWB
AM26LS32ACD	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	26LS32AC
AM26LS32ACDR	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32AC
AM26LS32ACDR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32AC
AM26LS32ACDRE4	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32AC
AM26LS32ACDRG4	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32AC
AM26LS32ACN	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS32ACN
AM26LS32ACN.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS32ACN
AM26LS32ACNG4	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS32ACN
AM26LS32ACNG4.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS32ACN
AM26LS32ACNSR	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32A
AM26LS32ACNSR.A	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32A
AM26LS32ACNSRG4	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS32A
AM26LS32ACPW	Obsolete	Production	TSSOP (PW)   16	-	-	Call TI	Call TI	0 to 70	SA32A

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)
<a href="#">AM26LS32ACPWR</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SA32A
AM26LS32ACPWR.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SA32A
AM26LS32ACPWRE4	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SA32A
<a href="#">AM26LS32AID</a>	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	-40 to 85	26LS32AI
<a href="#">AM26LS32AIDR</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	26LS32AI
AM26LS32AIDR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	26LS32AI
AM26LS32AIDRG4	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	26LS32AI
<a href="#">AM26LS32AIN</a>	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	AM26LS32AIN
AM26LS32AIN.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	AM26LS32AIN
<a href="#">AM26LS32AMFKB</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003M2A AM26LS 32AMFKB
AM26LS32AMFKB.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003M2A AM26LS 32AMFKB
<a href="#">AM26LS32AMJ</a>	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	AM26LS32AMJ
AM26LS32AMJ.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	AM26LS32AMJ
<a href="#">AM26LS32AMJB</a>	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003ME A AM26LS32AMJB
AM26LS32AMJB.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003ME A AM26LS32AMJB
<a href="#">AM26LS32AMWB</a>	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003MF A AM26LS32AMWB
AM26LS32AMWB.A	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802003MF A AM26LS32AMWB
<a href="#">AM26LS33ACD</a>	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	26LS33AC
<a href="#">AM26LS33ACDR</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS33AC
AM26LS33ACDR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	26LS33AC

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)
<a href="#">AM26LS33ACN</a>	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS33ACN
AM26LS33ACN.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	AM26LS33ACN
<a href="#">AM26LS33AMFKB</a>	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 7802004M2A AM26LS 33AMFKB
AM26LS33AMFKB.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 7802004M2A AM26LS 33AMFKB
<a href="#">AM26LS33AMJ</a>	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	AM26LS33AMJ
AM26LS33AMJ.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	AM26LS33AMJ
<a href="#">AM26LS33AMJB</a>	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004ME A AM26LS33AMJB
AM26LS33AMJB.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004ME A AM26LS33AMJB
<a href="#">AM26LS33AMWB</a>	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004MF A AM26LS33AMWB
AM26LS33AMWB.A	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7802004MF A AM26LS33AMWB

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

<sup>(2)</sup> **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.

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

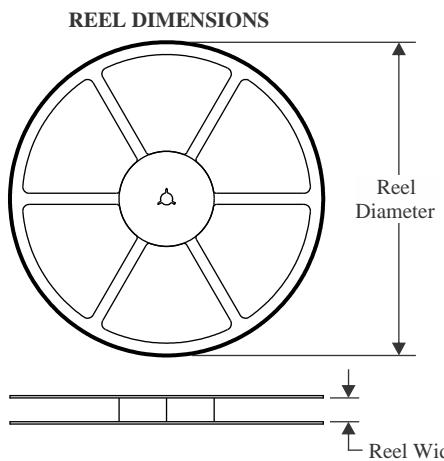
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF AM26LS32A, AM26LS32AM, AM26LS33A, AM26LS33AM :**

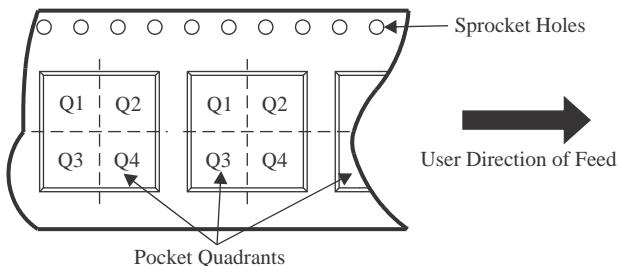
- Catalog : [AM26LS32A](#), [AM26LS33A](#)
- Military : [AM26LS32AM](#), [AM26LS33AM](#)
- Space : [AM26LS33A-SP](#), [AM26LS33A-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

**TAPE AND REEL INFORMATION**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


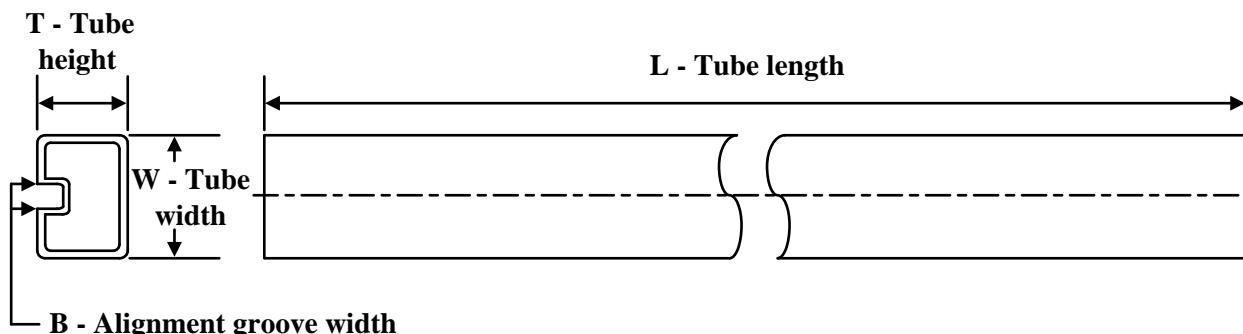
\*All dimensions are nominal

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
AM26LS32ACDR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
AM26LS32ACNSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
AM26LS32ACPWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
AM26LS32AIDR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
AM26LS33ACDR	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)
AM26LS32ACDR	SOIC	D	16	2500	353.0	353.0	32.0
AM26LS32ACNSR	SOP	NS	16	2000	353.0	353.0	32.0
AM26LS32ACPWR	TSSOP	PW	16	2000	353.0	353.0	32.0
AM26LS32AIDR	SOIC	D	16	2500	340.5	336.1	32.0
AM26LS33ACDR	SOIC	D	16	2500	340.5	336.1	32.0

**TUBE**


\*All dimensions are nominal

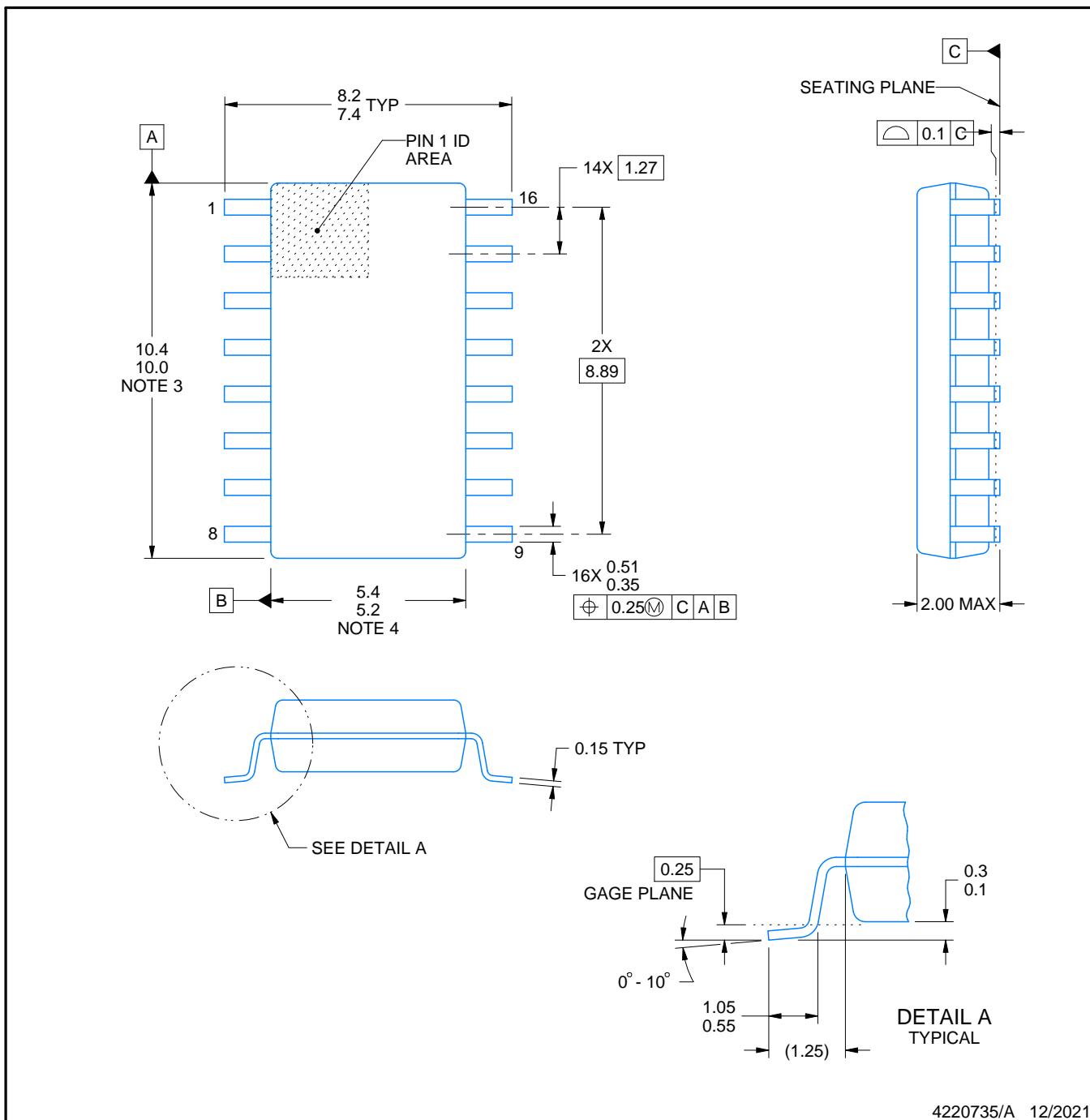
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-7802003M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-7802003MFA	W	CFP	16	25	506.98	26.16	6220	NA
5962-7802004M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-7802004MFA	W	CFP	16	25	506.98	26.16	6220	NA
AM26LS32ACN	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32ACN.A	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32ACNG4	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32ACNG4.A	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32AIN	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32AIN.A	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS32AMFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
AM26LS32AMFKB.A	FK	LCCC	20	55	506.98	12.06	2030	NA
AM26LS32AMWB	W	CFP	16	25	506.98	26.16	6220	NA
AM26LS32AMWB.A	W	CFP	16	25	506.98	26.16	6220	NA
AM26LS33ACN	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS33ACN.A	N	PDIP	16	25	506	13.97	11230	4.32
AM26LS33AMFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
AM26LS33AMFKB.A	FK	LCCC	20	55	506.98	12.06	2030	NA
AM26LS33AMWB	W	CFP	16	25	506.98	26.16	6220	NA
AM26LS33AMWB.A	W	CFP	16	25	506.98	26.16	6220	NA



# PACKAGE OUTLINE

## SOP - 2.00 mm max height

SOP



### NOTES:

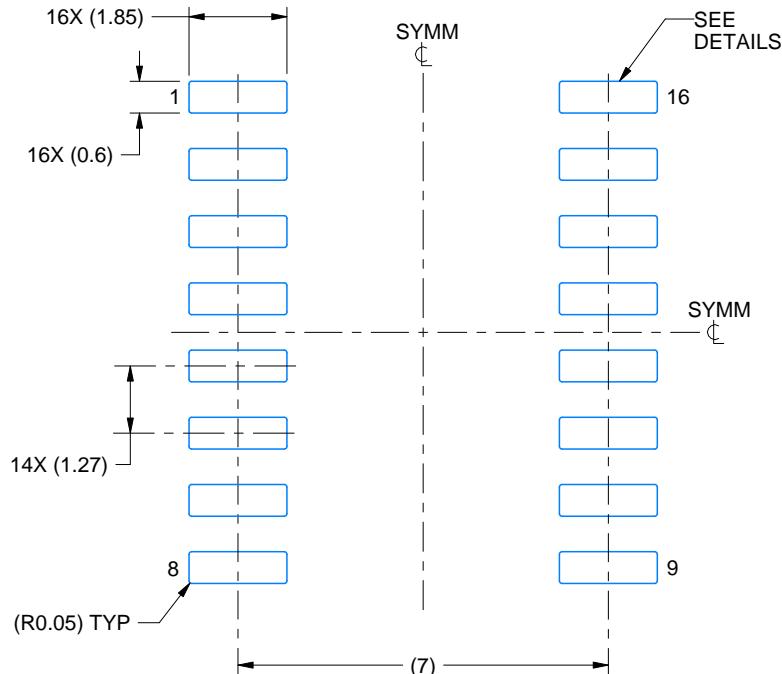
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

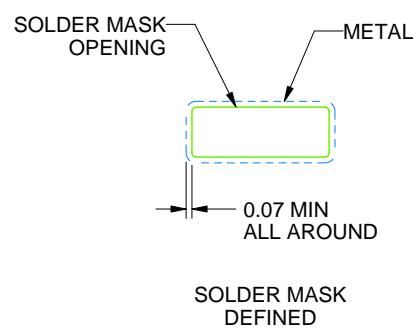
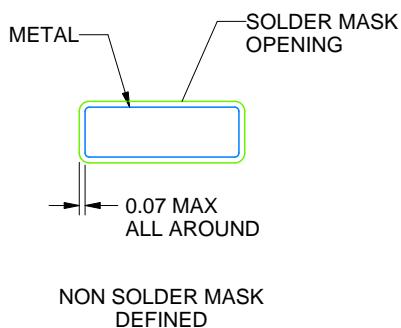
NS0016A

SOP - 2.00 mm max height

SOP



LAND PATTERN EXAMPLE  
SCALE:7X



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

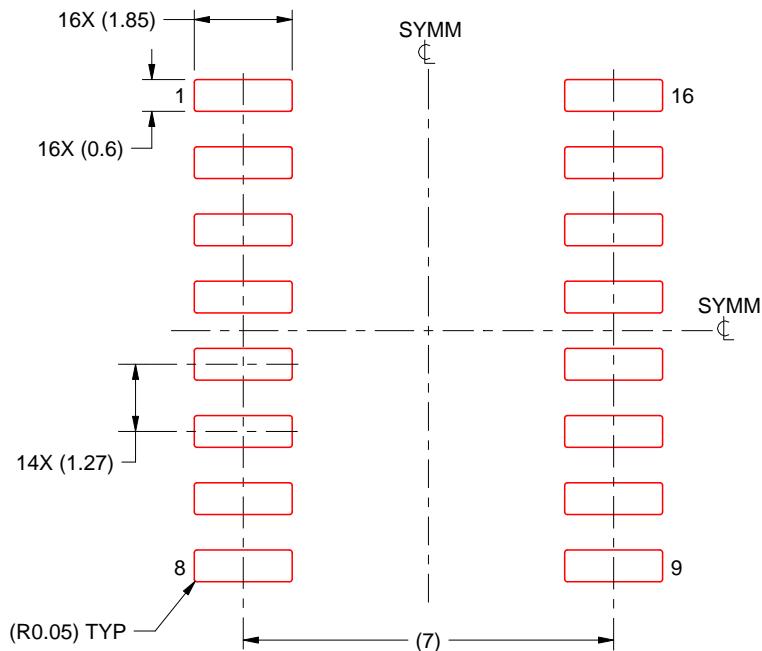
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

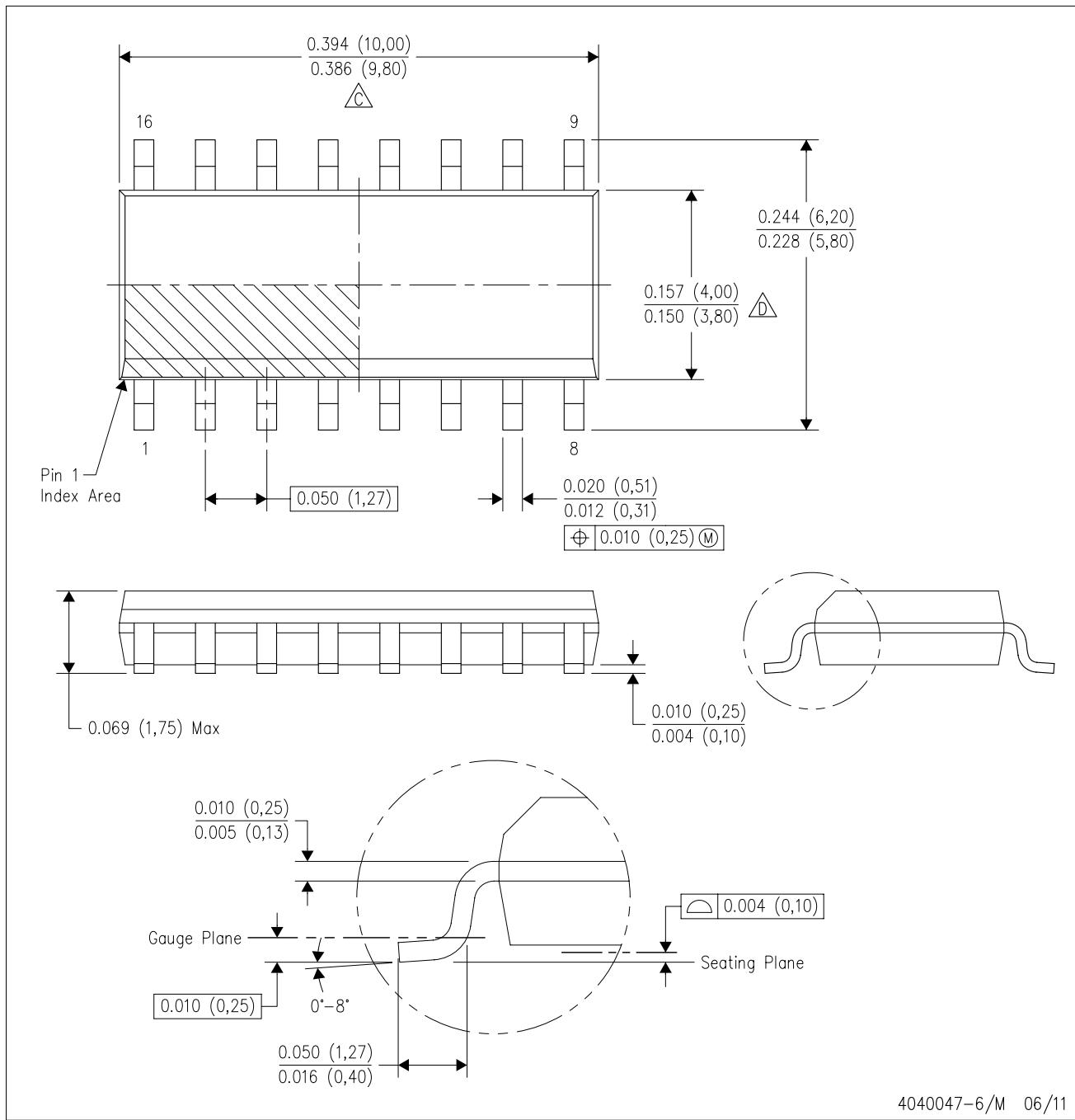
4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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.

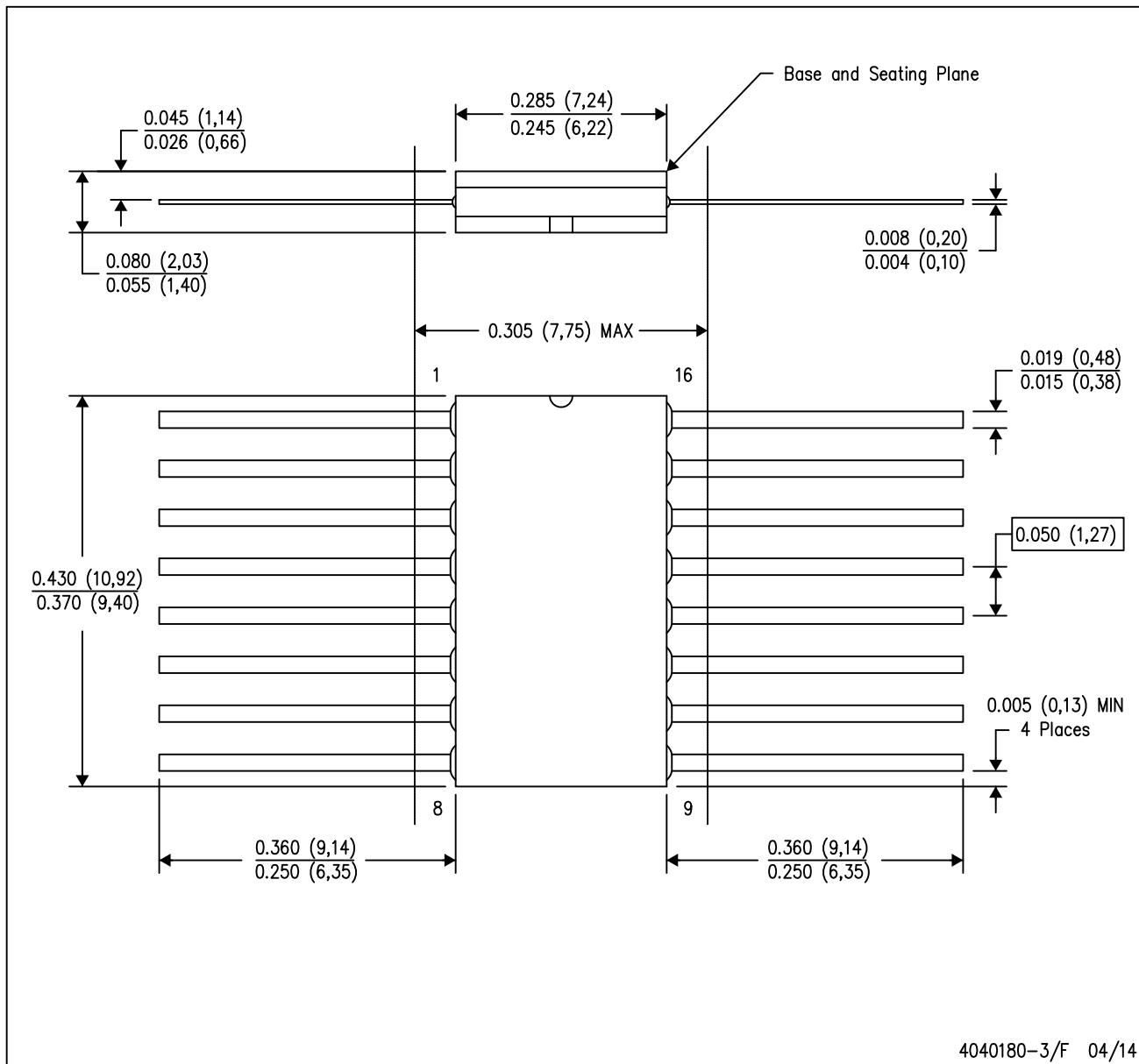
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.

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.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



4040180-3/F 04/14

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 GDFP2-F16

# GENERIC PACKAGE VIEW

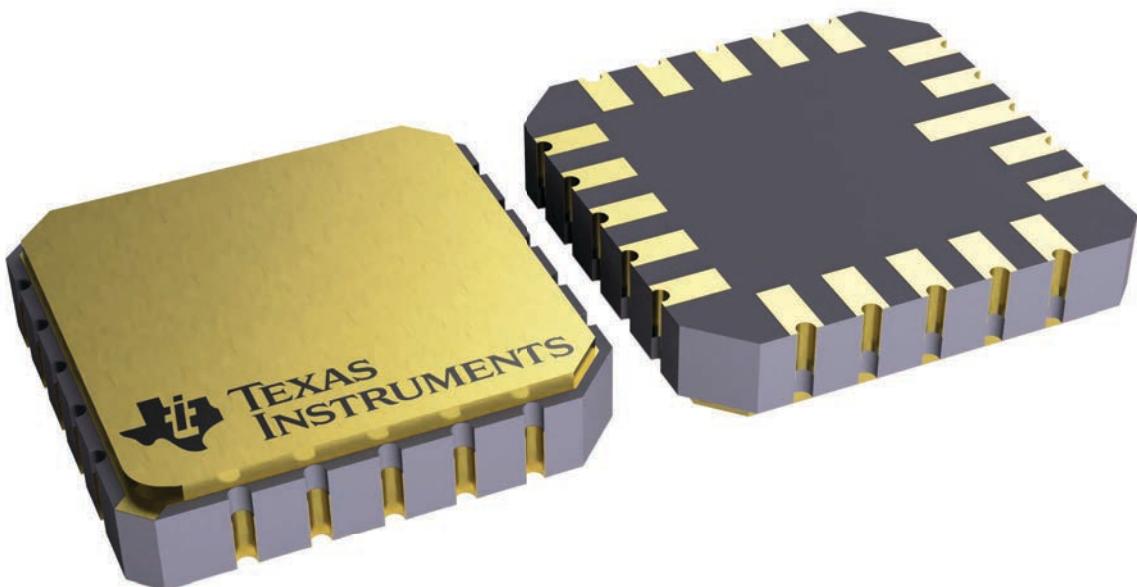
**FK 20**

**LCCC - 2.03 mm max height**

**8.89 x 8.89, 1.27 mm pitch**

**LEADLESS CERAMIC CHIP CARRIER**

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

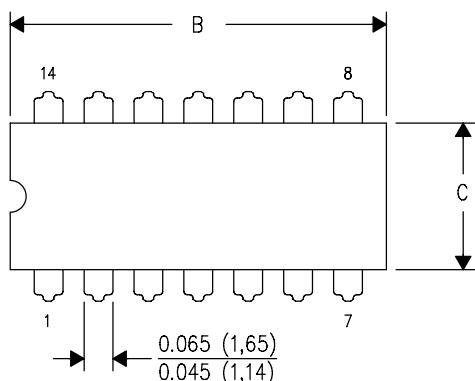


4229370VA\

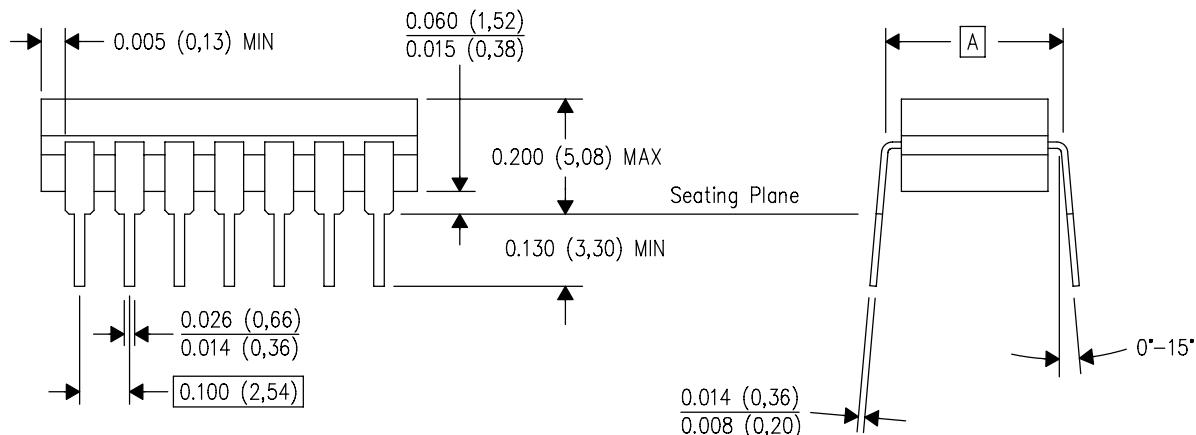
J (R-GDIP-T\*\*)

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.

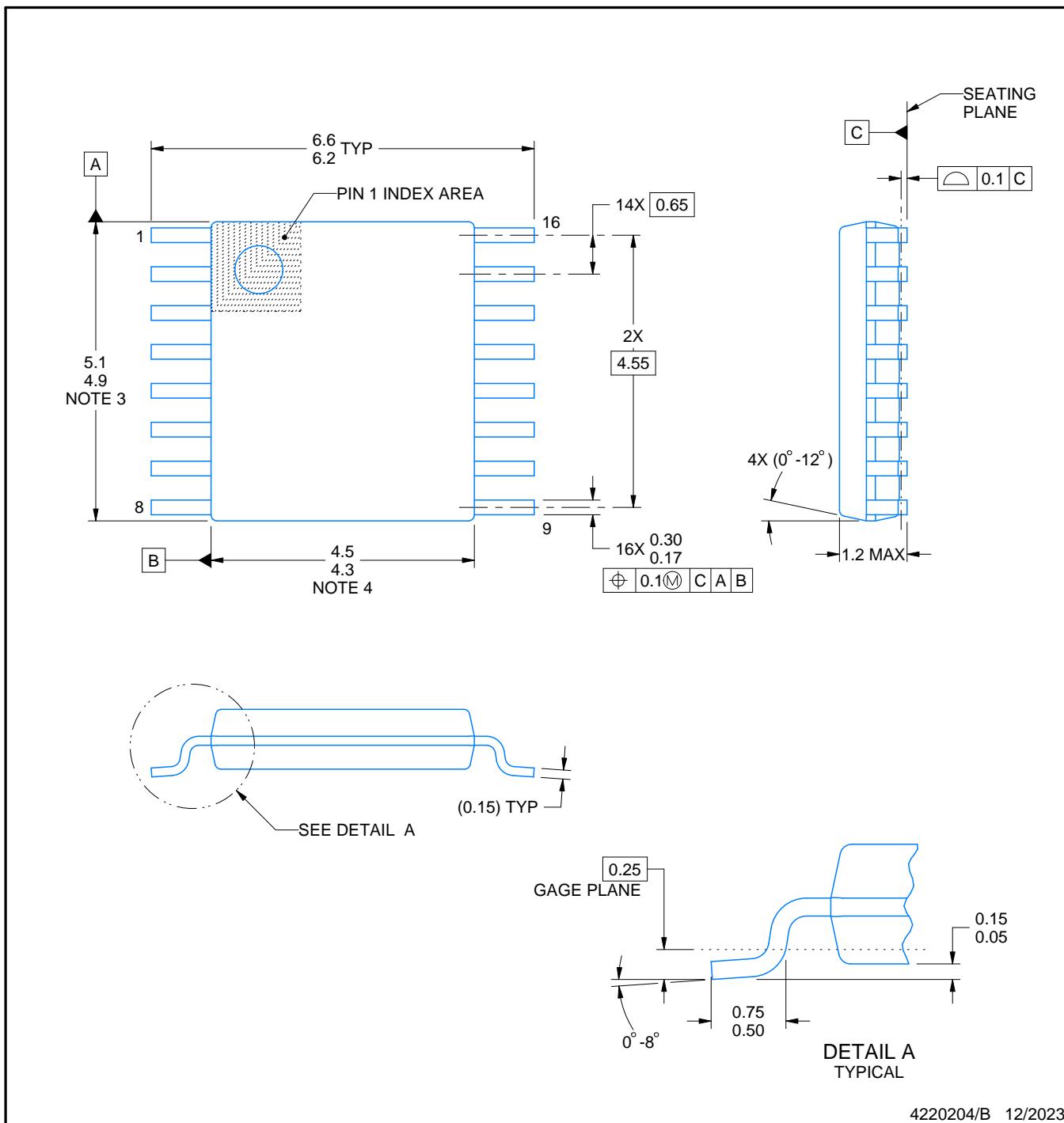
# PACKAGE OUTLINE

PW0016A



TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



## NOTES:

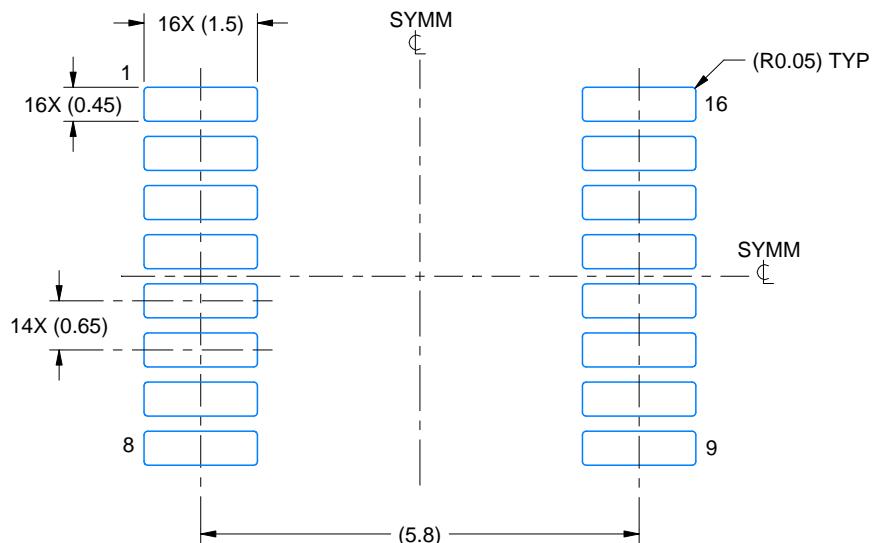
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

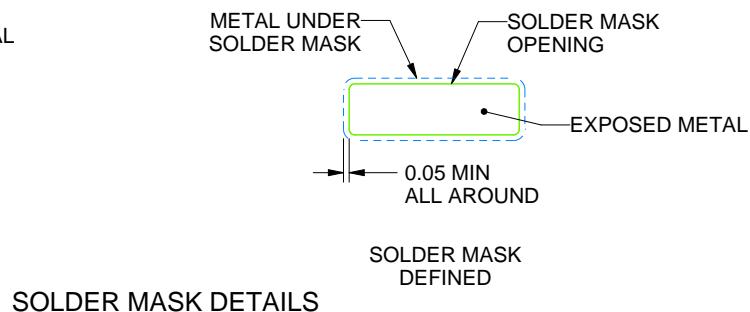
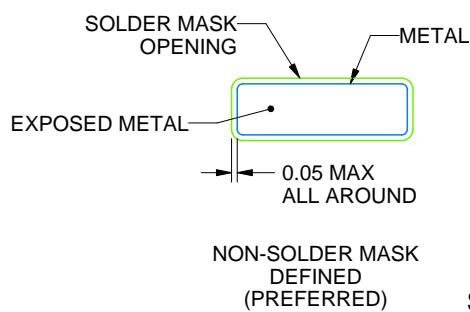
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



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NOTES: (continued)

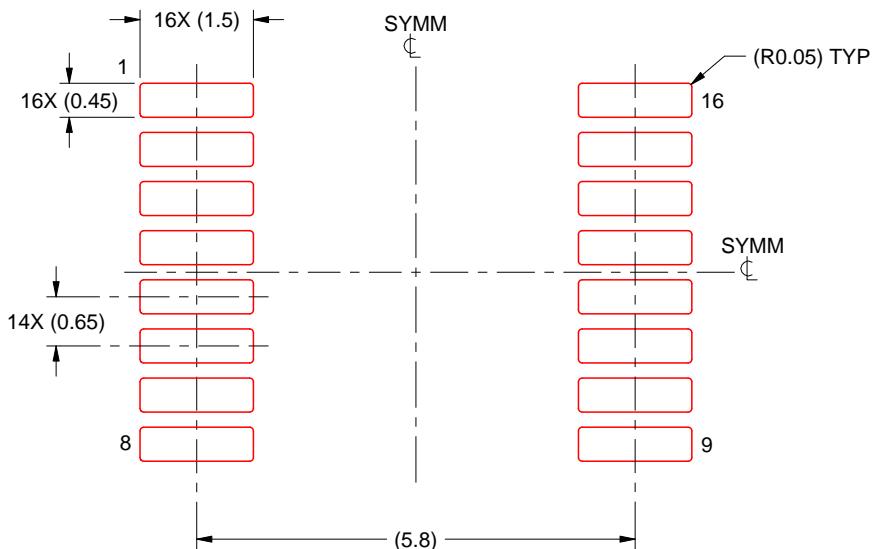
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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.

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