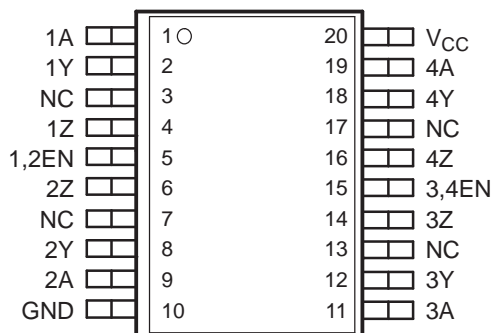


FEATURES

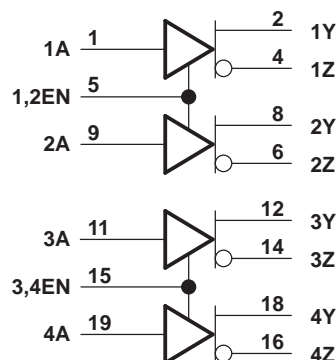
- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree ⁽¹⁾**
- **Designed for TIA/EIA-485, TIA/EIA-422, and ISO 8482 Applications**
- **Signaling Rates up to 30 Mbps ⁽²⁾**
- **Propagation Delay Times <11 ns**
- **Low Standby Power Consumption 1.5 mA Max**
- **Output ESD Protection Exceeds 13 kV**
- **Driver Positive- and Negative-Current Limiting**
- **Power-Up and Power-Down Glitch Free for Line-Insertion Applications**
- **Thermal Shutdown Protection**
- **Industry Standard Pinout, Compatible With SN75174, MC3487, DS96174, LTC487, and MAX3042**

- (1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.
- (2) The signaling rate of a line is the number of voltage transitions that are made per second, expressed in the unit bits per second (bps).

20-PIN DW PACKAGE
(TOP VIEW)



logic diagram (positive logic)



DESCRIPTION/ORDERING INFORMATION

The SN65LBC174A-EP is a quadruple differential line driver with 3-state outputs, designed for TIA/EIA-485 (RS-485), TIA/EIA-422 (RS-422), and ISO 8482 applications.

This device is optimized for balanced multipoint bus transmission at signaling rates up to 30-million bits per second (Mbps). The transmission media may be printed-circuit-board traces, backplanes, or cables. The ultimate rate and distance of data transfer is dependent upon the attenuation characteristics of the media and the noise coupling to the environment.

Each driver features current limiting and thermal-shutdown circuitry, making it suitable for high-speed multipoint applications in noisy environments. The device is designed using LinBiCMOS™ technology, facilitating low power consumption and robustness.



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.

LinBiCMOS is a trademark of Texas Instruments.

SN65LBC174A-EP

QUADRUPLE RS-485 DIFFERENTIAL LINE DRIVER

SLLS732–OCTOBER 2006–REVISED DECEMBER 2006

The two enable (EN) inputs provide pair-wise driver enabling, or can be externally tied together to provide enable control of all four drivers with one signal. When disabled or powered off, the driver outputs present a high impedance to the bus for reduced system loading.

The SN65LBC174A-EP is characterized for operation over the temperature range of -55°C to 125°C .

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-55°C to 125°C	20-pin SOIC – DW	SN65LBC174AMDWREP	65LBC174EP

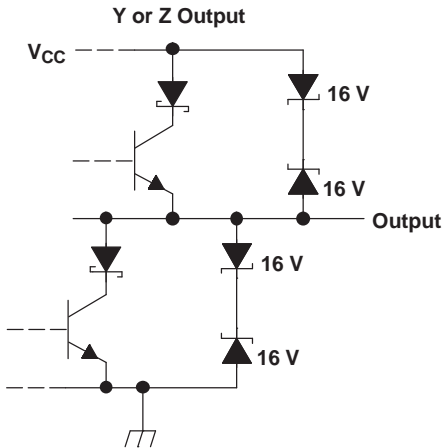
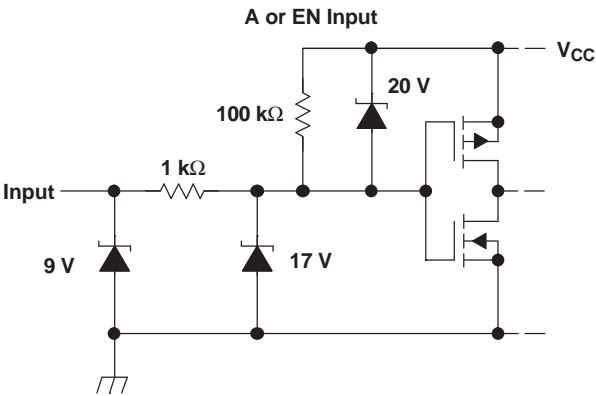
(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE⁽¹⁾
(each driver)

INPUT A	ENABLE G	OUTPUTS	
		Y	Z
L	H	L	H
H	H	H	L
OPEN	H	H	L
L	OPEN	L	H
H	OPEN	H	L
OPEN	OPEN	H	L
X	L	Z	Z

(1) H = high level, L = low level, X = irrelevant,
Z = high impedance (off)

EQUIVALENT INPUT AND OUTPUT SCHEMATIC DIAGRAMS



Absolute Maximum Ratings⁽¹⁾

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range ⁽²⁾		–0.3	6	V
	Voltage range at any bus (dc)		–10	15	V
	Voltage range at any bus (transient pulse through 100 Ω , see Figure 8)		–30	30	V
V_I	Input voltage range at any A or EN terminal		–0.5	$V_{CC} + 0.5$	V
Electrostatic discharge	Human-Body Model ⁽³⁾	Y, Z, and GND		13	kV
		All pins		5	
	Charged-Device Model ⁽⁴⁾	All pins		1	
T_{stg}	Storage temperature range ⁽⁵⁾		–65	150	°C
	Continuous power dissipation		See Dissipation Rating Table		
	Lead temperature 1,6 mm (1/16 in) from case for 10 s			260	°C

- (1) 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.
- (2) All voltage values, except differential I/O bus voltages, are with respect to GND.
- (3) Tested in accordance with JEDEC standard 22, Test Method A114-A.
- (4) Tested in accordance with JEDEC standard 22, Test Method C101.
- (5) Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See http://www.ti.com/ep_quality for additional information on enhanced plastic packaging.

DISSIPATION RATING TABLE

PACKAGE	JEDEC BOARD MODEL	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ⁽¹⁾ ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
20-pin DW	Low K	1483 mW	11.86 mW/°C	949 mW	297 mW
	High K	2753 mW	22 mW/°C	1762 mW	553 mW

- (1) This is the inverse of the junction-to-ambient thermal resistance when board mounted with no air flow.

SN65LBC174A-EP

QUADRUPLE RS-485 DIFFERENTIAL LINE DRIVER

SLLS732–OCTOBER 2006–REVISED DECEMBER 2006

Recommended Operating Conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		4.75	5	5.25	V
	Voltage at any bus terminal	Y, Z	–7		12	V
V_{IH}	High-level input voltage	A, EN	2		V_{CC}	V
V_{IL}	Low-level input voltage	A, EN	0		0.8	V
	Output current		–60		60	mA
T_A	Operating free-air temperature		–55		125	°C

Electrical Characteristics

over recommended operating conditions

PARAMETER		TEST CONDITIONS		MIN	TYP ⁽¹⁾	MAX	UNIT	
V _{IK}	Input clamp voltage	I _I = −18 mA		−1.5	−0.77		V	
V _O	Open-circuit output voltage	Y or Z, No load		0		V _{CC}	V	
V _{OD(SS)}	Steady-state differential output voltage magnitude ⁽²⁾	No load (open circuit)		3		V _{CC}	V	
		R _L = 54 Ω, See Figure 1		0.8	1.6	2.5		
		With common-mode loading, See Figure 2		0.8	1.6	2.5		
ΔV _{OD(SS)}	Change in steady-state differential output voltage between logic states	See Figure 1		−0.1		0.1	V	
V _{OC(SS)}	Steady-state common-mode output voltage	See Figure 3		2	2.4	2.8	V	
ΔV _{OC(SS)}	Change in steady-state common-mode output voltage between logic states	See Figure 3		−0.04		0.04	V	
I _I	Input current	A, G, \overline{G}		−70		70	μA	
I _{OS}	Short-circuit output current	V _{TEST} = −7 V to 12 V, See Figure 7	V _I = 0 V	−200		200	mA	
			V _I = V _{CC}					
I _{OZ}	High-impedance-state output current			EN at 0 V	−50		50	μA
I _{O(OFF)}	Output current with power off			V _{CC} = 0 V	−10		10	
I _{CC}	Supply current	V _I = 0 V or V _{CC} , No load	All drivers enabled			25	mA	
			All drivers disabled			1.5		

(1) All typical values are at $V_{CC} = 5$ V and 25°C.

(2) The minimum V_{OD} may not fully comply with TIA/EIA-485-A at operating temperatures below 0°C. System designers should take the possibility of lower output signal into account in determining the maximum signal transmission distance.

Switching Characteristics

over recommended operating conditions

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low- to high-level output	R _L = 54 Ω, C _L = 50 pF, See Figure 4	T _A =25°C	4.0	8	11	ns
			T _A = -55°C to 125°C	4.0		16	ns
t _{PHL}	Propagation delay time, high- to low-level output		T _A =25°C	4.0	8	11	ns
			T _A = -55°C to 125°C	4.0		16	ns
t _r	Differential output voltage rise time		T _A =25°C	3	7.5	11	ns
			T _A = -55°C to 125°C	3		24	ns
t _f	Differential output voltage fall time		T _A =25°C	3	7.5	11	ns
			T _A = -55°C to 125°C	3		24	ns
t _{sk(p)}	Pulse skew t _{PLH} – t _{PHL}				0.6		ns
					0.6		
t _{sk(o)}	Output skew ⁽¹⁾				2	ns	
t _{sk(pp)}	Part-to-part skew ⁽²⁾				3	ns	
t _{PZH}	Propagation delay time, high impedance to high-level output	See Figure 5				25	ns
t _{PHZ}	Propagation delay time, high-level output to high impedance					25	ns
t _{PZL}	Propagation delay time, high impedance to low-level output	See Figure 6				30	ns
t _{PLZ}	Propagation delay time, low-level output to high impedance					20	ns

- (1) Output skew ($t_{sk(o)}$) is the magnitude of the time delay difference between the outputs of a single device with all of the inputs connected together.
- (2) Part-to-part skew ($t_{sk(pp)}$) is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same input signals, the same supply voltages, at the same temperature, and have identical packages and test circuits.

PARAMETER MEASUREMENT INFORMATION

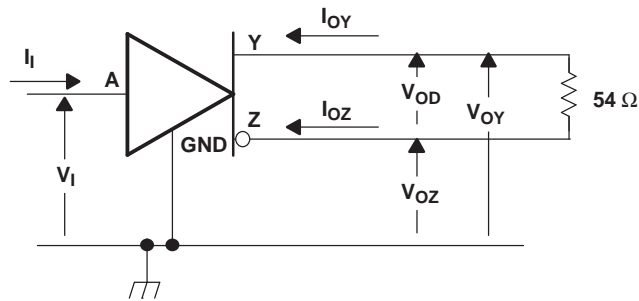


Figure 1. Test Circuit, V_{OD} Without Common-Mode Loading

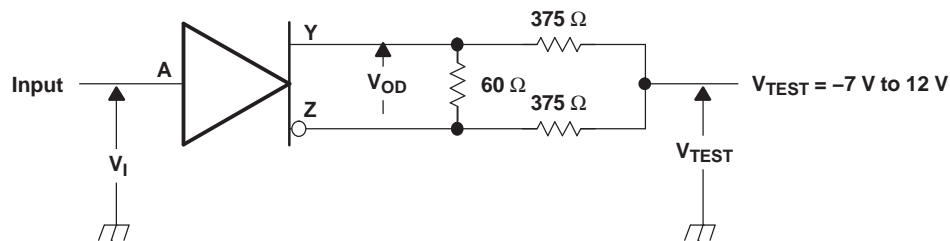
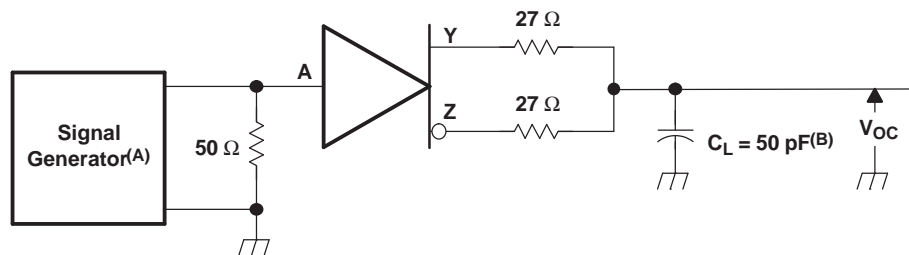


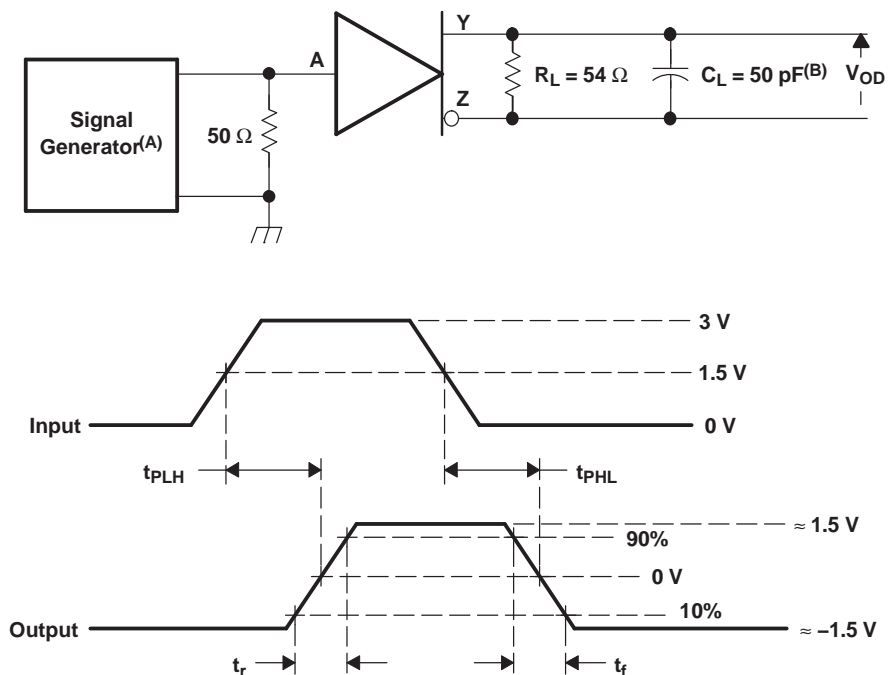
Figure 2. Test Circuit, V_{OD} With Common-Mode Loading



- A. PRR = 1 MHz, 50% duty cycle, $t_r < 6$ ns, $t_f < 6$ ns, $Z_O = 50 \Omega$
- B. Includes probe and jig capacitance

Figure 3. V_{OC} Test Circuit

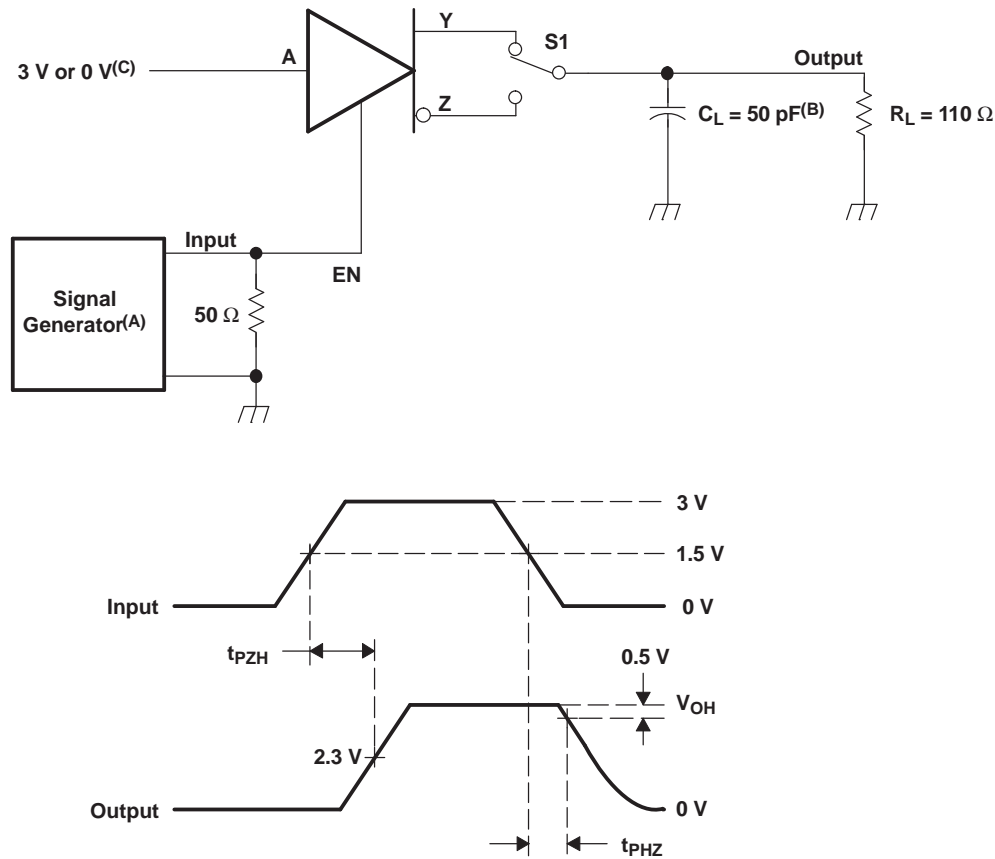
PARAMETER MEASUREMENT INFORMATION (continued)



- A. PRR = 1 MHz, 50% duty cycle, $t_r < 6$ ns, $t_f < 6$ ns, $Z_O = 50 \Omega$
- B. Includes probe and jig capacitance

Figure 4. Output Switching Test Circuit and Waveforms

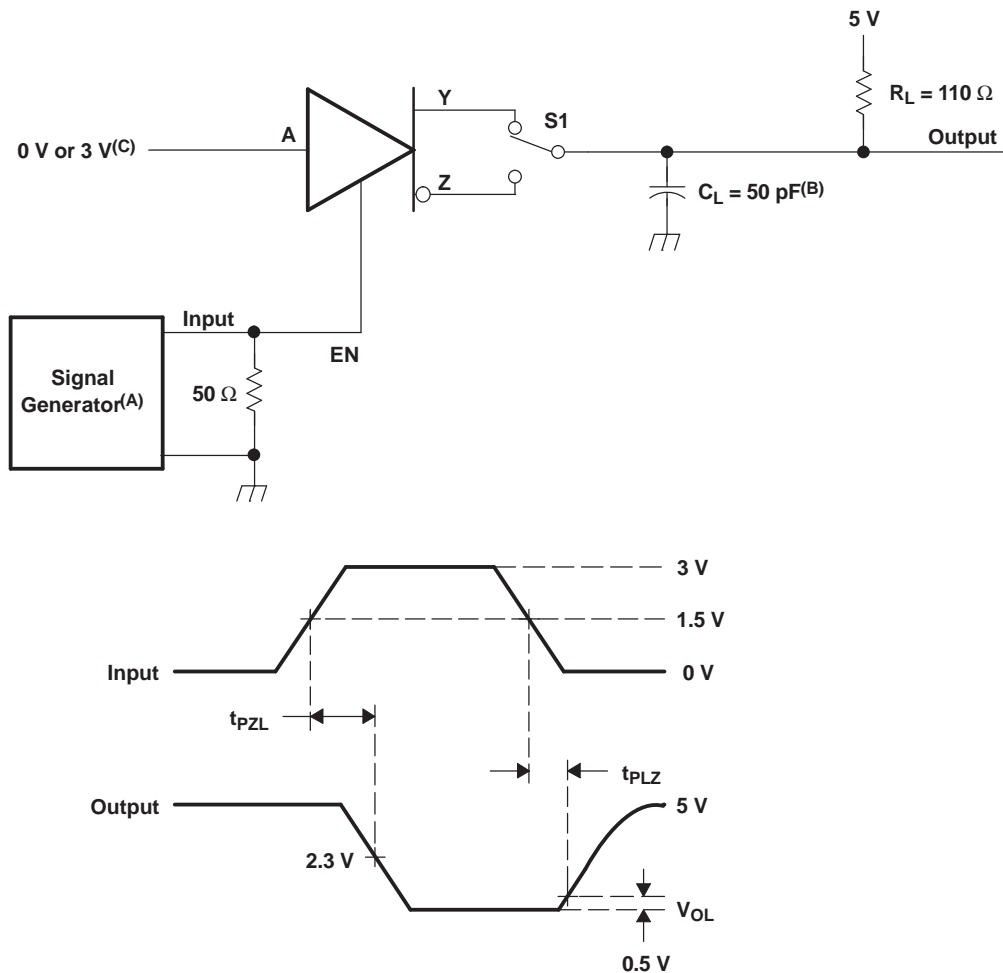
PARAMETER MEASUREMENT INFORMATION (continued)



- A. PRR = 1 MHz, 50% duty cycle, $t_r < 6$ ns, $t_f < 6$ ns, $Z_O = 50 \Omega$
- B. Includes probe and jig capacitance
- C. 3 V if testing Y output, 0 V if testing Z output

Figure 5. Enable Timing Test Circuit and Waveforms, t_{PZH} and t_{PHZ}

PARAMETER MEASUREMENT INFORMATION (continued)



- A. PRR = 1 MHz, 50% duty cycle, $t_r < 6$ ns, $t_f < 6$ ns, $Z_O = 50 \Omega$
- B. Includes probe and jig capacitance
- C. 3 V if testing Y output, 0 V if testing Z output

Figure 6. Enable Timing Test Circuit and Waveforms, t_{PZL} and t_{PLZ}

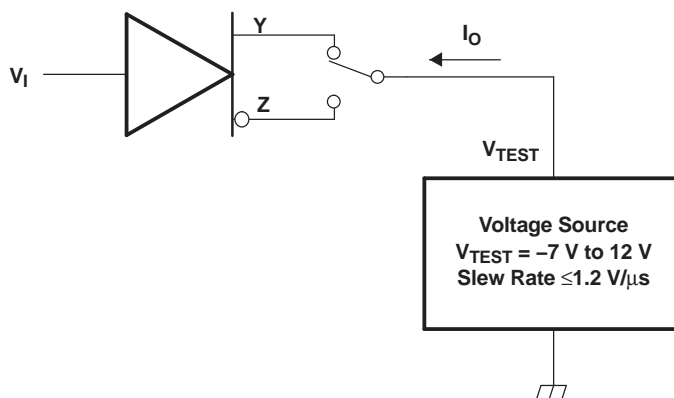


Figure 7. Test Circuit, Short-Circuit Output Current

PARAMETER MEASUREMENT INFORMATION (continued)

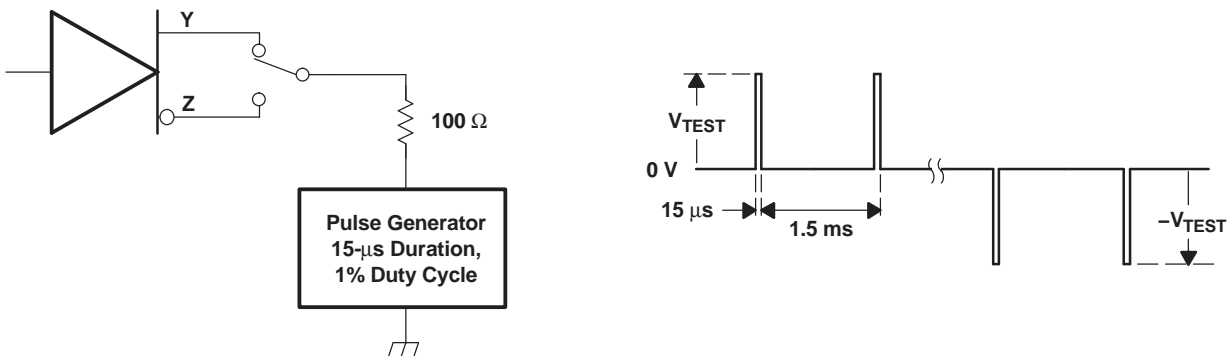


Figure 8. Test Circuit Waveform, Transient Overvoltage Test

TYPICAL CHARACTERISTICS

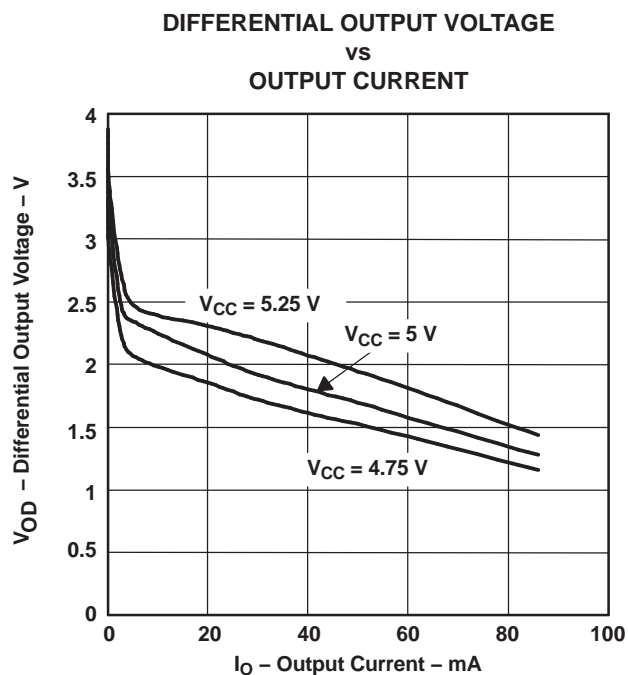


Figure 9.

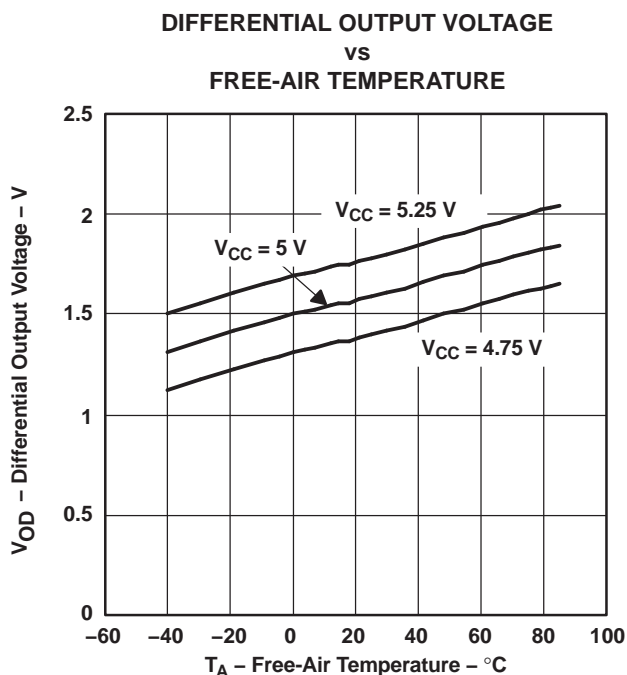


Figure 10.

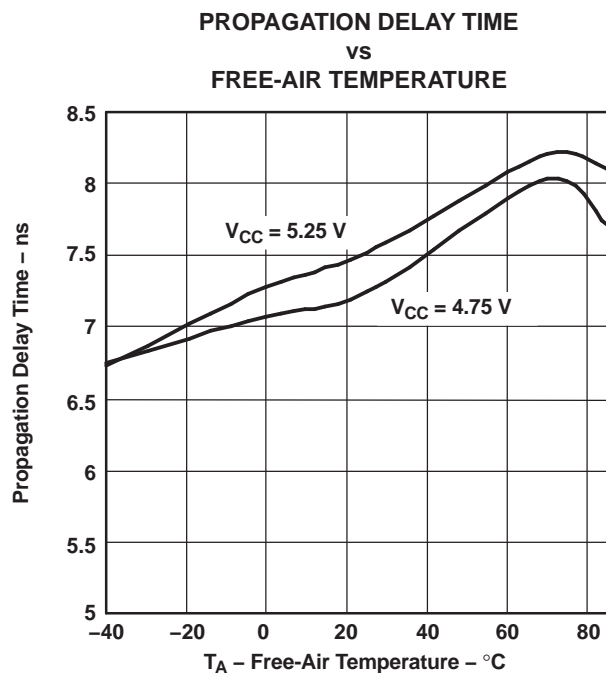


Figure 11.

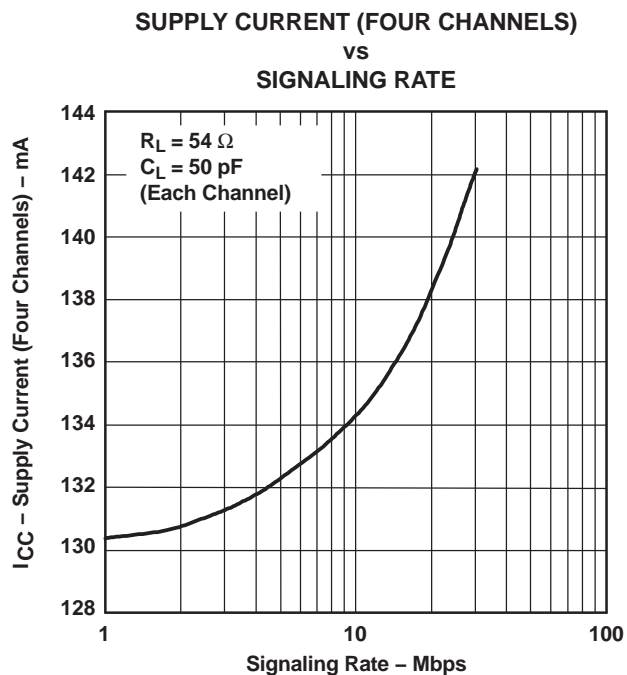


Figure 12.

TYPICAL CHARACTERISTICS (continued)

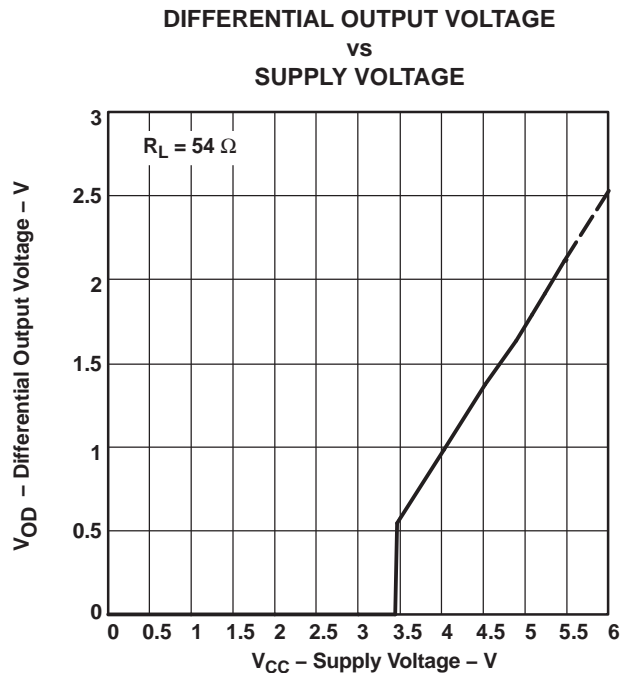


Figure 13.

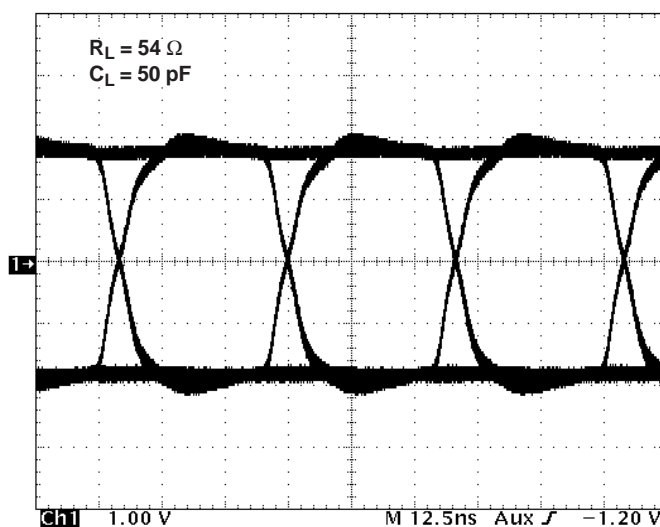


Figure 14. Eye Pattern, Pseudo-Random Data at 30 Mbps

APPLICATION INFORMATION

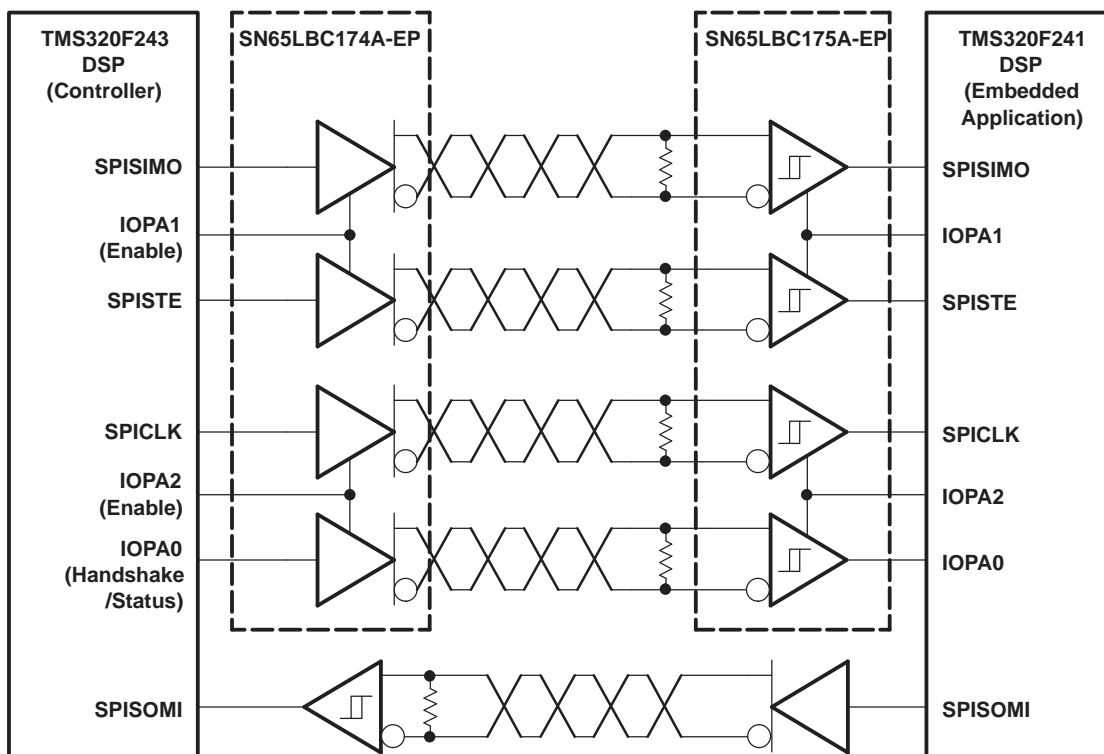


Figure 15. Typical Application Circuit, DSP-to-DSP Link Via Serial Peripheral Interface

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN65LBC174AMDWREP	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	65LBC174EP	Samples
V62/07611-01XE	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	65LBC174EP	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

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.

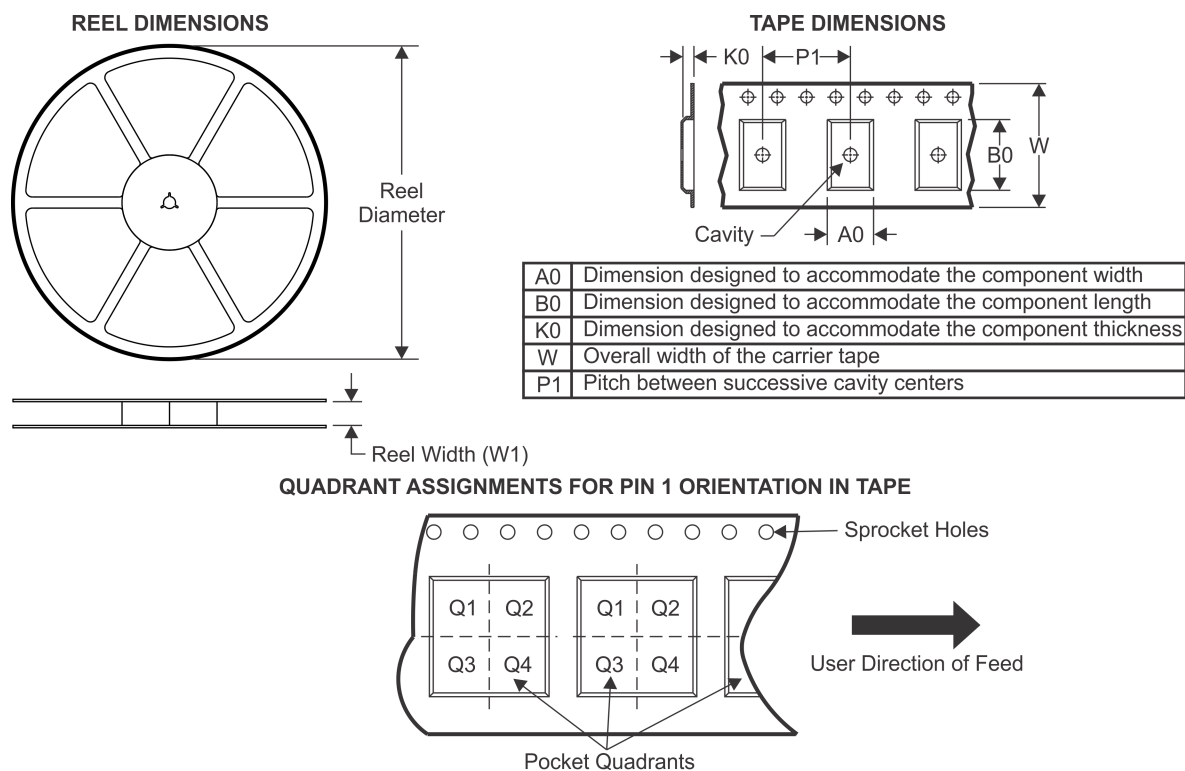
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN65LBC174A-EP :

- Catalog: [SN65LBC174A](#)

NOTE: Qualified Version Definitions:

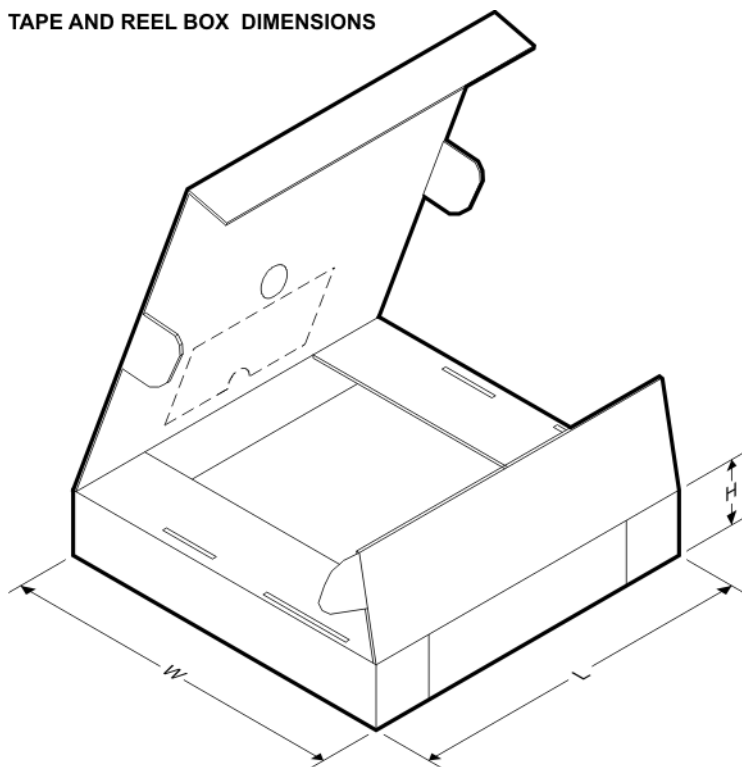
- Catalog - TI's standard catalog product

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
SN65LBC174AMDWREP	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS

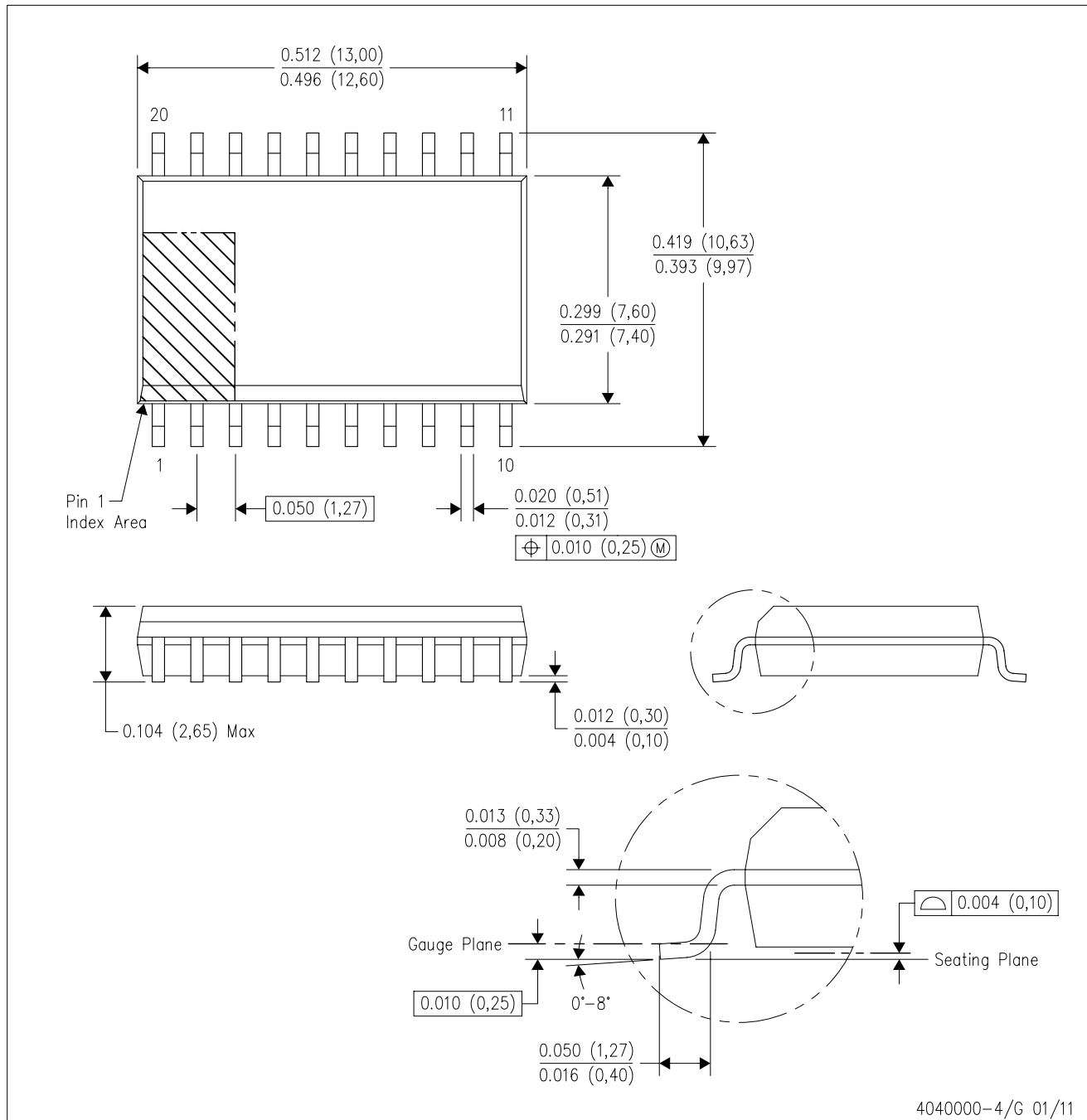


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65LBC174AMDWREP	SOIC	DW	20	2000	367.0	367.0	45.0

DW (R-PDSO-G20)

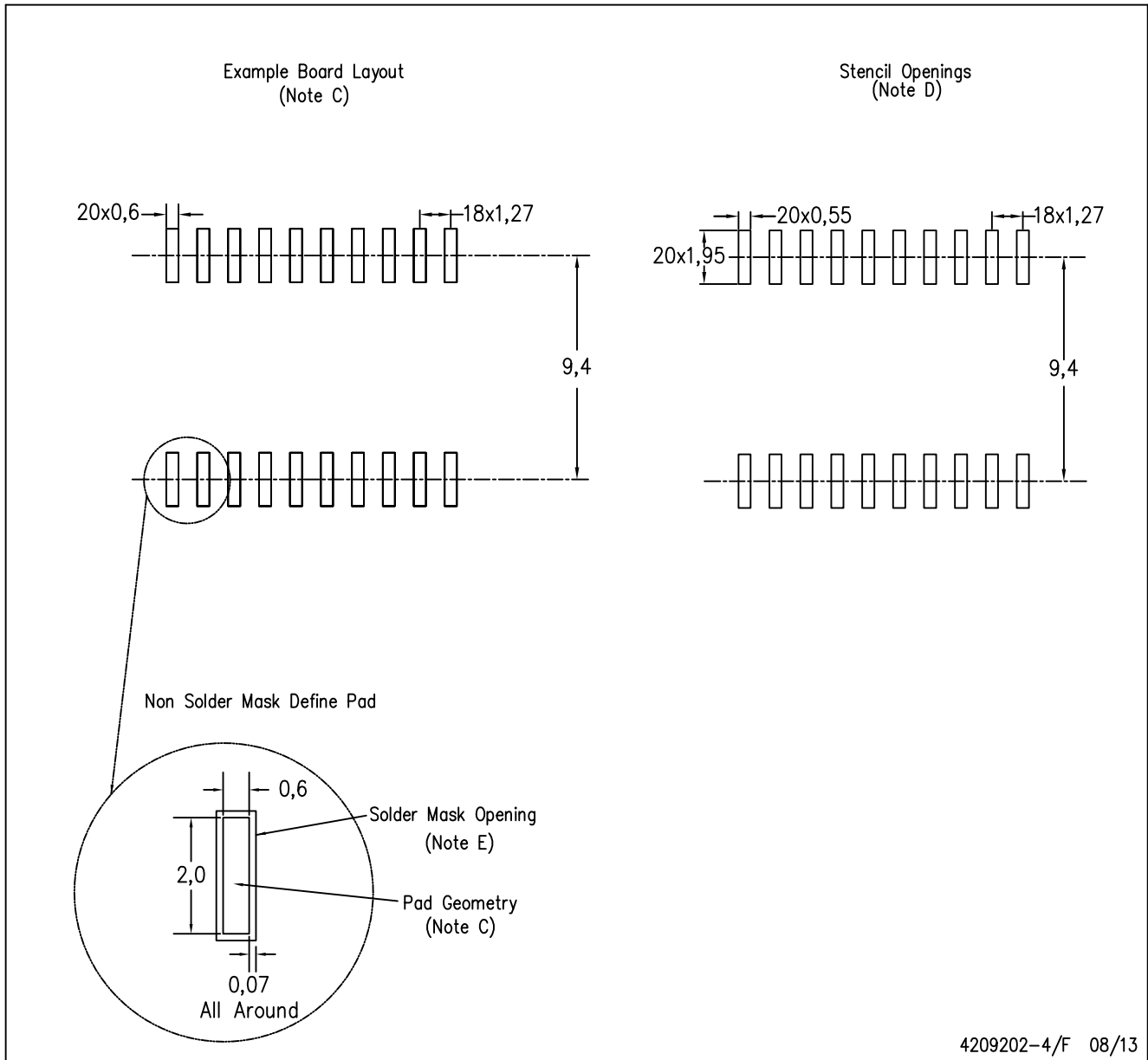
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/F 08/13

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Refer to IPC7351 for alternate board design.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions of TI 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com