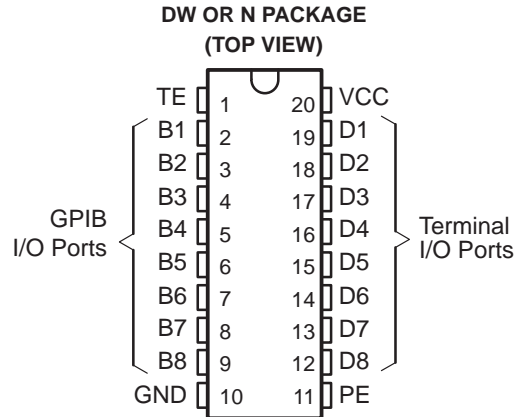


- Meets IEEE Standard 488-1978 (GPIB)
- 8-Channel Bidirectional Transceiver
- Power-Up/Power-Down Protection (Glitch Free)
- High-Speed, Low-Power Schottky Circuitry
- Low Power Dissipation . . . 72 mW Max Per Channel
- Fast Propagation Times . . . 22 ns Max
- High-Impedance pnp Inputs
- Receiver Hysteresis . . . 650 mV Typ
- Open-Collector Driver Output Option
- No Loading of Bus When Device Is Powered Down ($V_{CC} = 0$)



description

The SN75160B 8-channel general-purpose interface bus (GPIB) transceiver is a monolithic, high-speed, low-power Schottky device designed for two-way data communications over single-ended transmission lines. It is designed to meet the requirements of IEEE Standard 488-1978. The transceiver features driver outputs that can be operated in either the passive-pullup or 3-state mode. If talk enable (TE) is high, these ports have the characteristics of passive-pullup outputs when pullup enable (PE) is low and of 3-state outputs when PE is high. Taking TE low places these ports in the high-impedance state. The driver outputs are designed to handle loads up to 48 mA of sink current.

Output glitches during power up and power down are eliminated by an internal circuit that disables both the bus and receiver outputs. The outputs do not load the bus when $V_{CC} = 0$. When combined with the SN75161B or SN75162B management bus transceivers, the pair provides the complete 16-wire interface for the IEEE-488 bus.

The SN75160B is characterized for operation from 0°C to 70°C.

Function Tables

EACH DRIVER			
INPUTS			OUTPUT B
D	TE	PE	
H	H	H	H
L	H	X	L
H	X	L	Z†
X	L	X	Z†

EACH RECEIVER			
INPUTS			OUTPUT D
B	TE	PE	
L	L	X	L
H	L	X	H
X	H	X	Z

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

† This is the high-impedance state of a normal 3-state output modified by the internal resistors to V_{CC} and GND.



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.

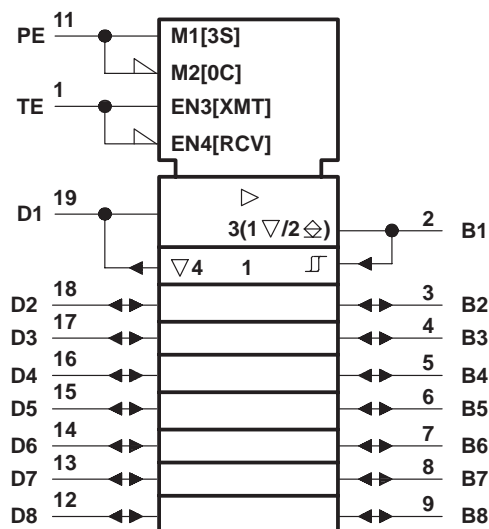
**TEXAS
INSTRUMENTS**

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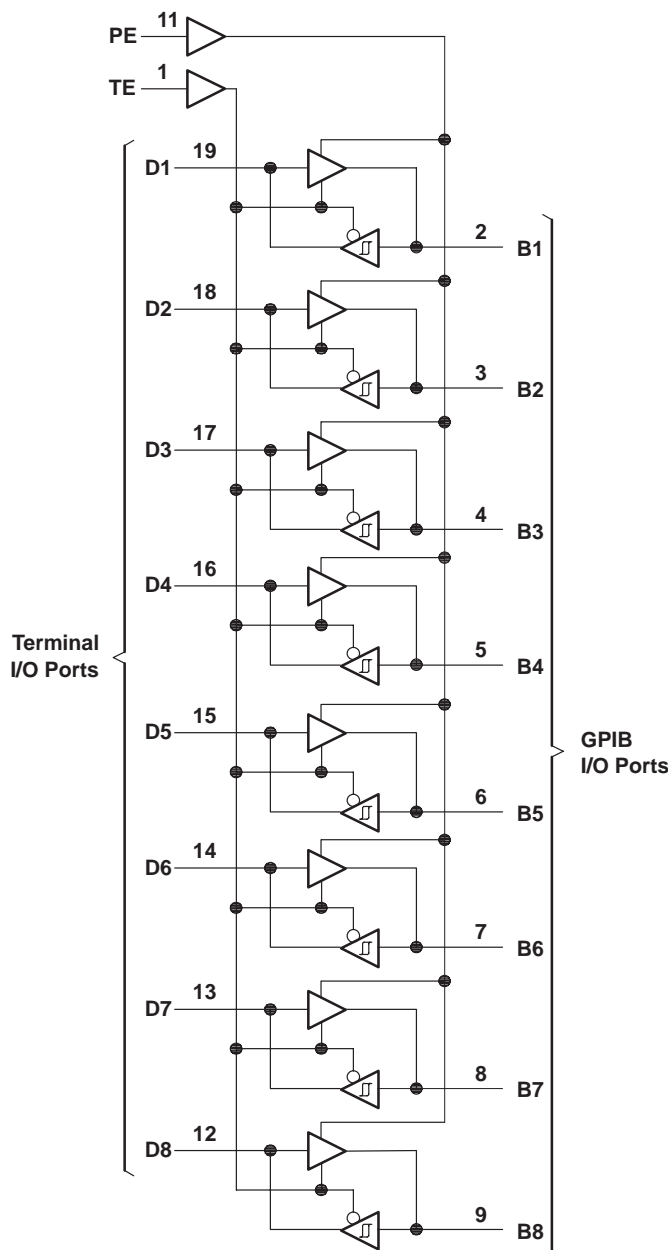
SN75160B
OCTAL GENERAL-PURPOSE
INTERFACE BUS TRANSCEIVER
 SLLS004B – OCTOBER 1985 – REVISED MAY 1995

logic symbol†

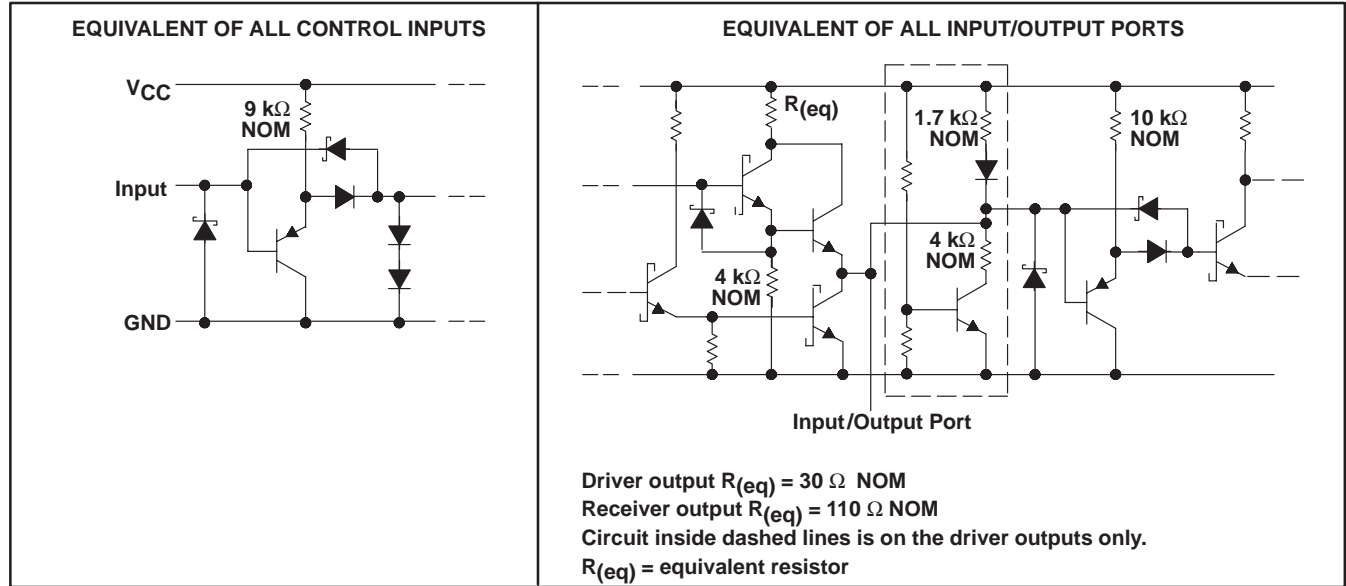


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
 ▽ Designates 3-state outputs
 ⊕ Designates passive-pullup outputs

logic diagram (positive logic)



schematics of inputs and outputs



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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage, V_I	5.5 V
Low-level driver output current, I_{OL}	100 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	0°C to 70°C
Storage temperature range, T_{stg}	–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. 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. All voltage values are with respect to network ground terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
DW	1125 mW	9.0 mW/°C	720 mW
N	1150 mW	9.2 mW/°C	736 mW

SN75160B

OCTAL GENERAL-PURPOSE INTERFACE BUS TRANSCEIVER

SLLS004B – OCTOBER 1985 – REVISED MAY 1995

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level input voltage, V_{IH}		2			V
Low-level input voltage, V_{IL}				0.8	V
High-level output current, I_{OH}	Bus ports with pullups active			–5.2	mA
	Terminal ports			–800	μ A
Low-level output current, I_{OL}	Bus ports			48	mA
	Terminal ports			16	
Operating free-air temperature, T_A		0		70	$^{\circ}$ C

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

PARAMETER			TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	Input clamp voltage		$I_I = -18$ mA			–0.8	–1.5	V
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)	Bus	See Figure 8		0.4	0.65		V
V_{OH}	High-level output voltage	Terminal	$I_{OH} = -800$ μ A, TE at 0.8 V		2.7	3.5		V
		Bus	$I_{OH} = -5.2$ mA, PE and TE at 2 V		2.5	3.3		
V_{OL}	Low-level output voltage	Terminal	$I_{OL} = 16$ mA, TE at 0.8 V			0.3	0.5	V
		Bus	$I_{OL} = 48$ mA, TE at 2 V			0.35	0.5	
I_I	Input current at maximum input voltage	Terminal	$V_I = 5.5$ V			0.2	100	μ A
I_{IH}	High-level input current	Terminal	$V_I = 2.7$ V			0.1	20	μ A
I_{IL}	Low-level input current	Terminal	$V_I = 0.5$ V			–10	–100	μ A
$V_{I/O}(\text{bus})$	Voltage at bus port	Driver disabled	$I_{I(\text{bus})} = 0$		2.5	3.0	3.7	V
			$I_{I(\text{bus})} = -12$ mA				–1.5	
$I_{I/O}(\text{bus})$	Current into bus port	Power on	Driver disabled	$V_{I(\text{bus})} = -1.5$ V to 0.4 V	–1.3			mA
				$V_{I(\text{bus})} = 0.4$ V to 2.5 V	0		–3.2	
				$V_{I(\text{bus})} = 2.5$ V to 3.7 V			2.5	
				$V_{I(\text{bus})} = 3.7$ V to 5 V	0		2.5	
				$V_{I(\text{bus})} = 5$ V to 5.5 V	0.7		2.5	
				$V_{CC} = 0$, $V_{I(\text{bus})} = 0$ to 2.5 V			–40	
		Power off						
I_{OS}	Short-circuit output current	Terminal			–15	–35	–75	mA
		Bus			–25	–50	–125	
I_{CC}	Supply current	No load	Receivers low and enabled			70	90	mA
			Drivers low and enabled			85	110	
$C_{I/O}(\text{bus})$	Bus-port capacitance		$V_{CC} = 0$ to 5 V, $V_{I/O} = 0$ to 2 V, $f = 1$ MHz			16		pF

† All typical values are at $V_{CC} = 5$ V, $T_A = 25^{\circ}$ C.

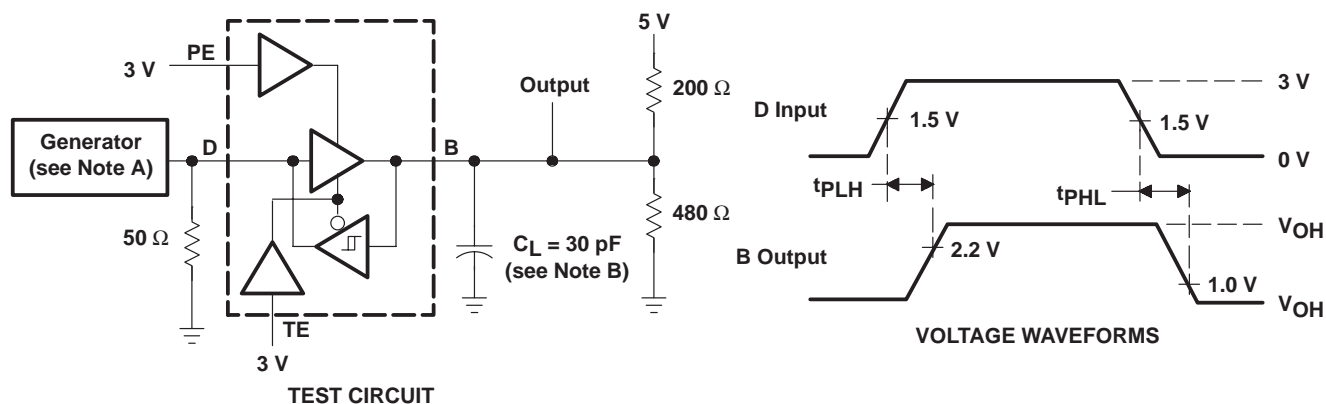


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switching characteristics, $V_{CC} = 5\text{ V}$, $C_L = 15\text{ pF}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

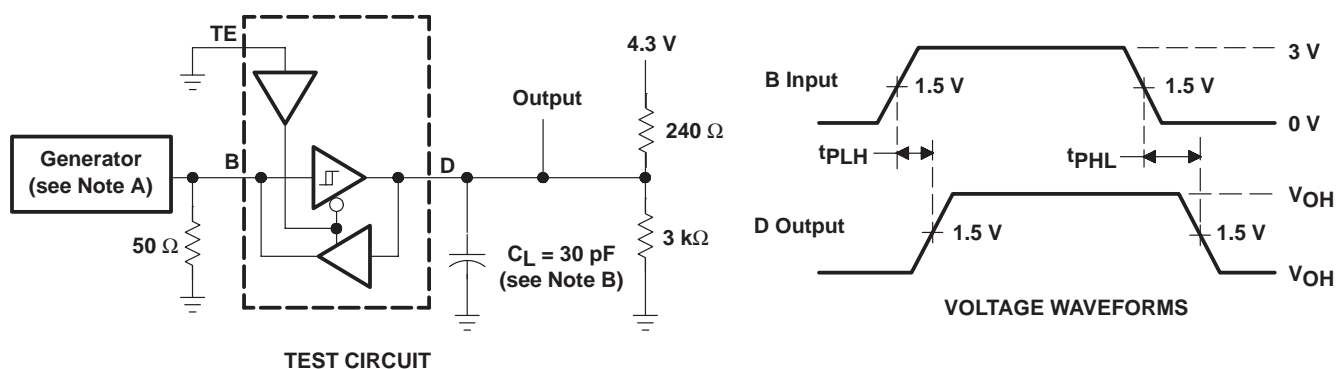
PARAMETER		FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propation delay time, low- to high-level output	Terminal	Bus	$C_L = 30\text{ pF}$, See Figure 1		14	20	ns
t_{PHL}	Propagation delay time, high- to low-level output					14	20	
t_{PLH}	Propagation delay time, low- to high-level output	Bus	Terminal	$C_L = 30\text{ pF}$, See Figure 2		10	20	ns
t_{PHL}	Propagation delay time, high- to low-level output					15	22	
t_{PZH}	Output enable time to high level	TE	BUS	See Figure 3		25	35	ns
t_{PHZ}	Output disable time from high level					13	22	
t_{PZL}	Output enable time to low level					22	35	
t_{PLZ}	Output disable time from low level					22	32	
t_{PZH}	Output enable time to high level	TE	Terminal	See Figure 4		20	30	ns
t_{PHZ}	Output disable time from high level					12	20	
t_{PZL}	Output enable time to low level					23	32	
t_{PLZ}	Output disable time from low level					19	30	
t_{en}	Output pullup enable time	PE	Bus	See Figure 5		15	22	ns
t_{dis}	Output pullup disable time					13	20	

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR \leq 1 MHz, 50% duty cycle, t_r \leq 6 ns, t_f \leq ns, Z_O = 50 Ω .
 B. C_L includes probe and jig capacitance.

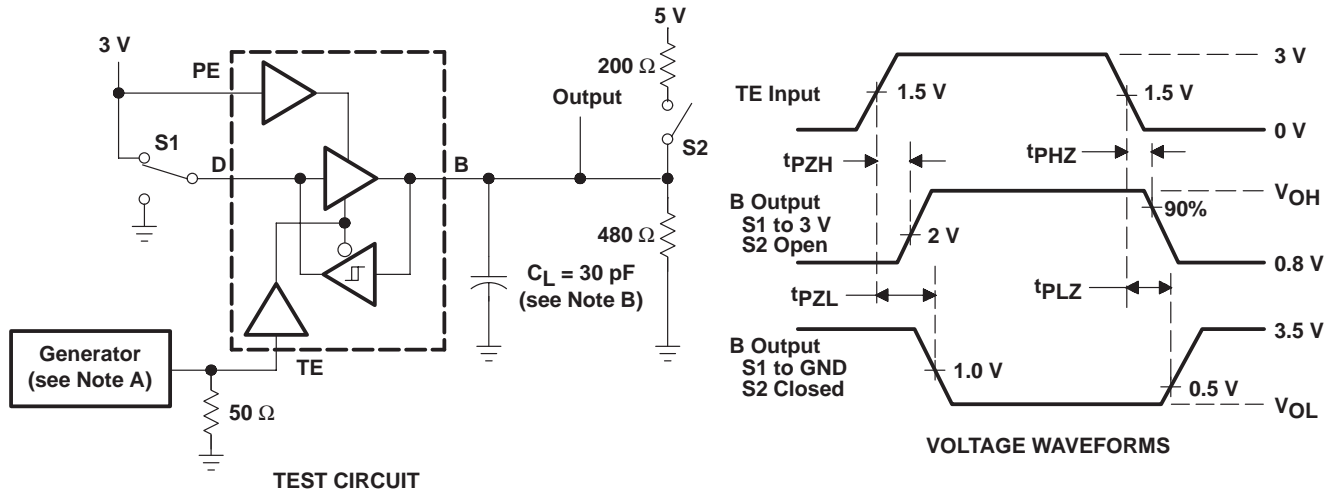
Figure 1. Terminal-to-Bus Test Circuit and Voltage Waveforms



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR \leq 1 MHz, 50% duty cycle, t_r \leq 6 ns, t_f \leq ns, Z_O = 50 Ω .
 B. C_L includes probe and jig capacitance.

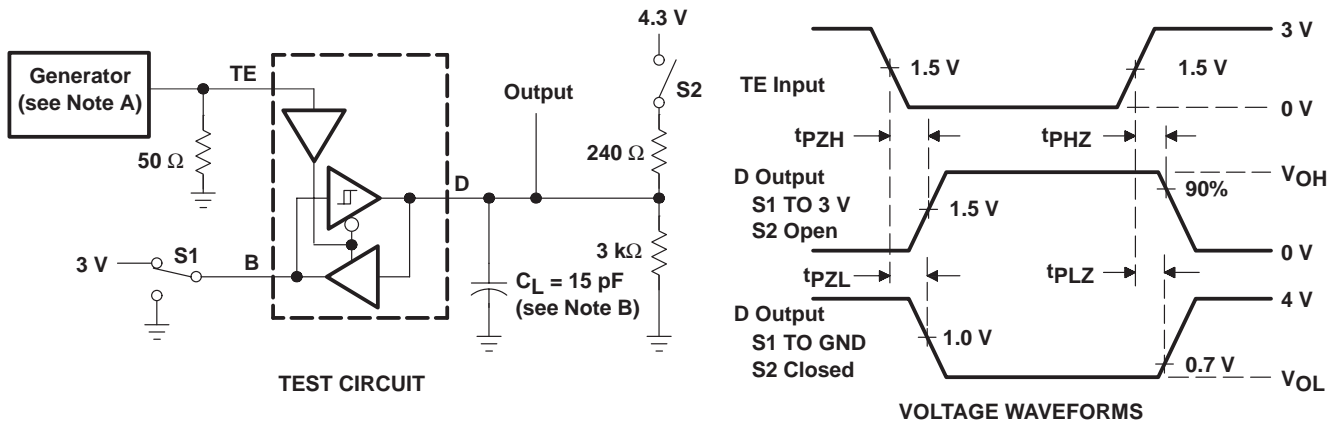
Figure 2. Bus-to-Terminal Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1 \text{ MHz}$, 50% duty cycle, $t_r \leq 6 \text{ ns}$, $t_f \leq \text{ns}$, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

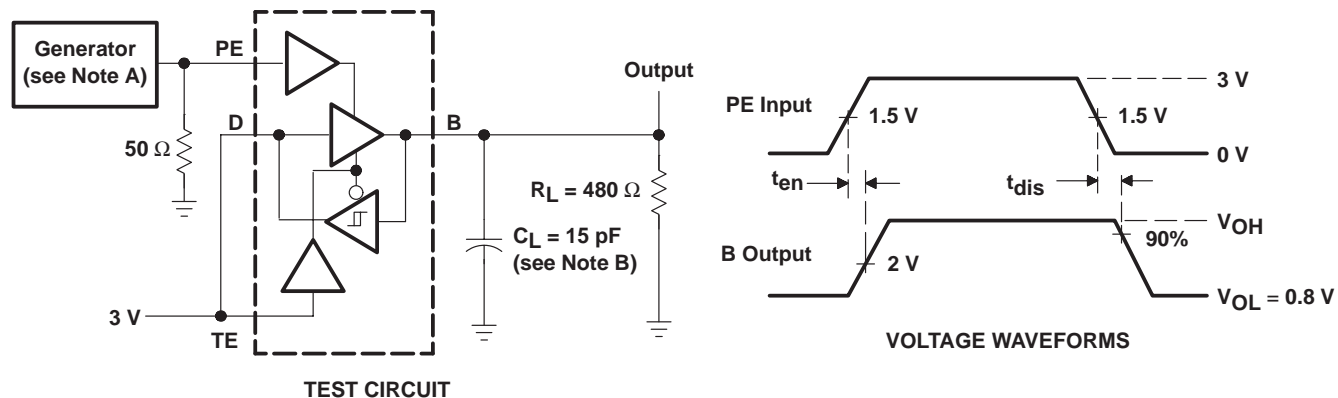
Figure 3. TE-to-Bus Test Circuit and Voltage Waveforms



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1 \text{ MHz}$, 50% duty cycle, $t_r \leq 6 \text{ ns}$, $t_f \leq \text{ns}$, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

Figure 4. TE-to-Terminal Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1 \text{ MHz}$, 50% duty cycle, $t_r \leq 6 \text{ ns}$, $t_f \leq \text{ns}$, $Z_O = 50 \Omega$.
- B. C_L includes probe and jig capacitance.

Figure 5. PE-to-Bus Pullup Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

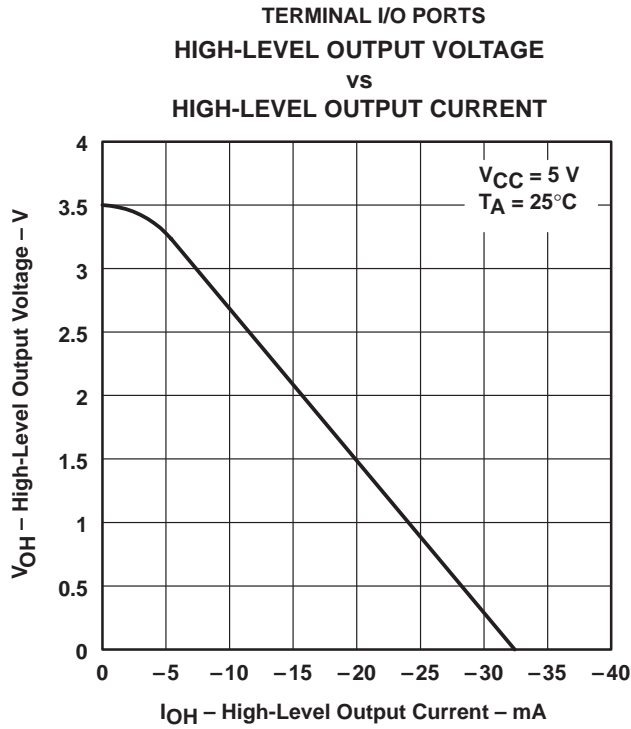


Figure 6

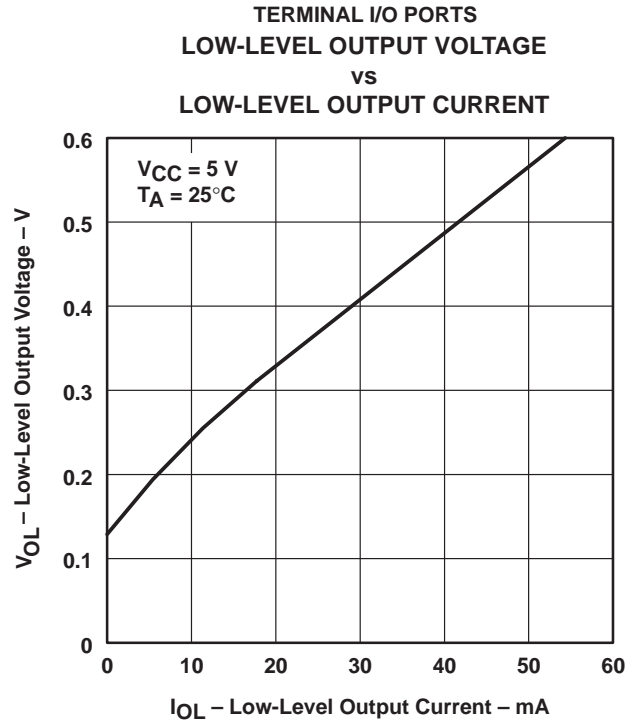


Figure 7

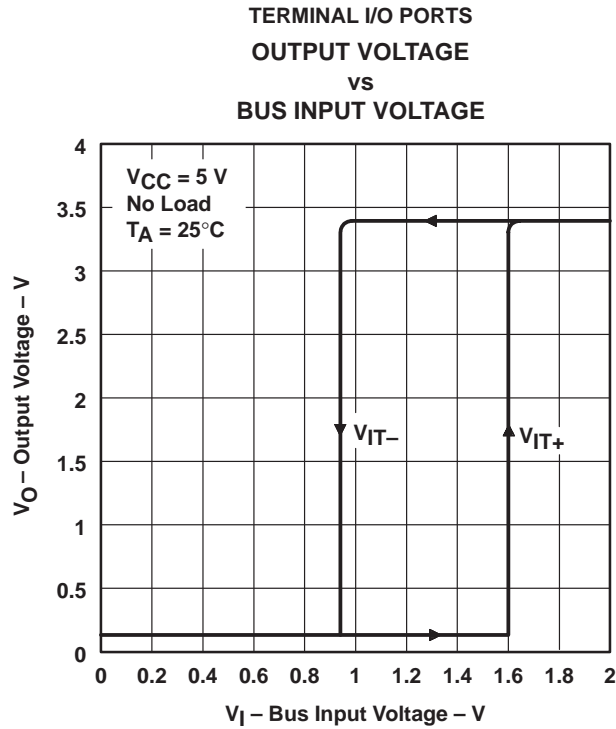


Figure 8

TYPICAL CHARACTERISTICS

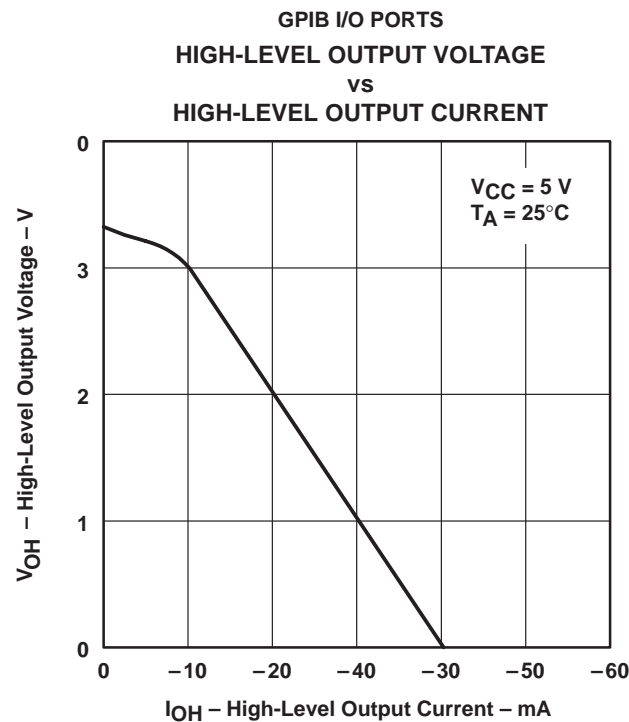


Figure 9

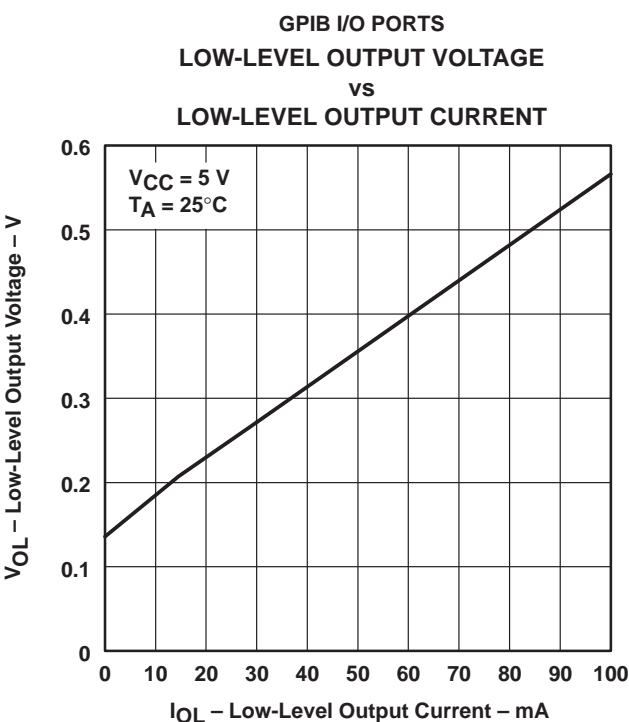


Figure 10

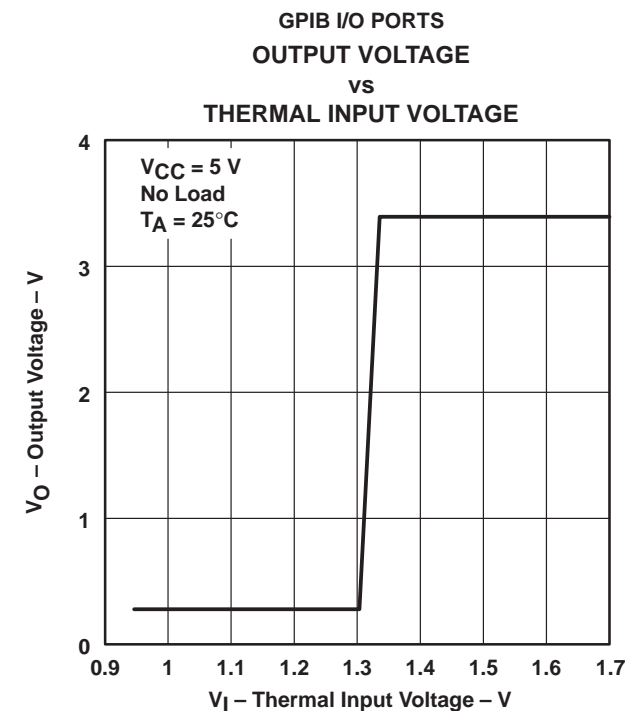


Figure 11

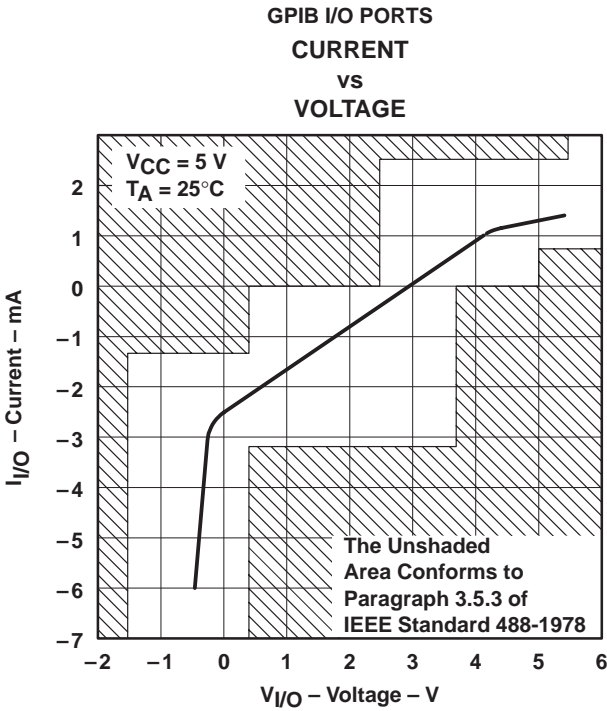


Figure 12

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)
SN75160BDW	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDW.A	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWE4	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWG4	Active	Production	SOIC (DW) 20	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWR	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWR.A	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWRE4	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BDWRG4	Active	Production	SOIC (DW) 20	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	SN75160B
SN75160BN	Active	Production	PDIP (N) 20	20 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN75160BN
SN75160BN.A	Active	Production	PDIP (N) 20	20 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN75160BN

⁽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.

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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
SN75160BDWR	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)
SN75160BDWR	SOIC	DW	20	2000	356.0	356.0	45.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN75160BDW	DW	SOIC	20	25	507	12.83	5080	6.6
SN75160BDW	DW	SOIC	20	25	506.98	12.7	4826	6.6
SN75160BDW.A	DW	SOIC	20	25	506.98	12.7	4826	6.6
SN75160BDW.A	DW	SOIC	20	25	507	12.83	5080	6.6
SN75160BDWE4	DW	SOIC	20	25	506.98	12.7	4826	6.6
SN75160BDWE4	DW	SOIC	20	25	507	12.83	5080	6.6
SN75160BDWG4	DW	SOIC	20	25	506.98	12.7	4826	6.6
SN75160BDWG4	DW	SOIC	20	25	507	12.83	5080	6.6
SN75160BN	N	PDIP	20	20	506	13.97	11230	4.32
SN75160BN.A	N	PDIP	20	20	506	13.97	11230	4.32

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE

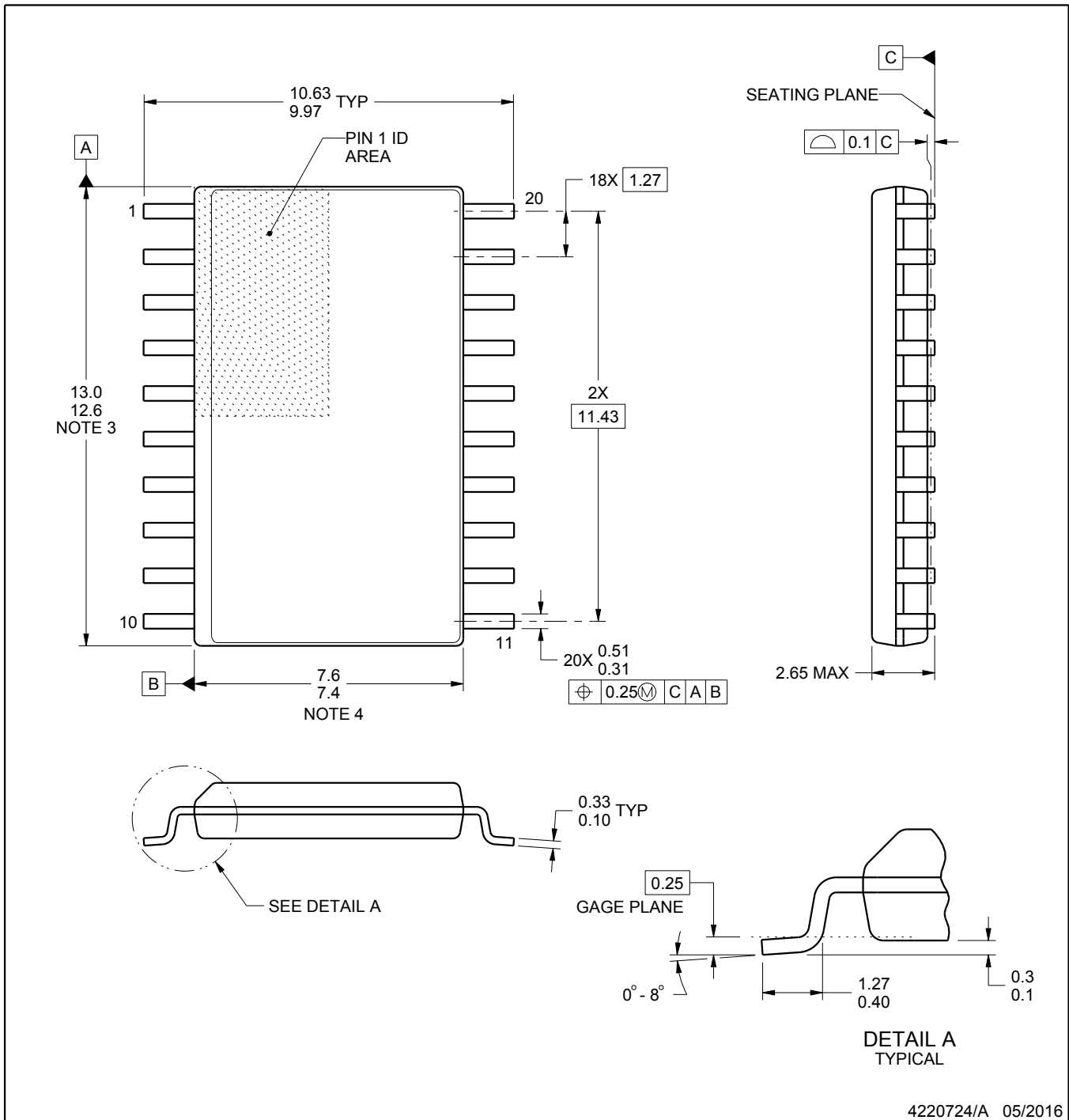
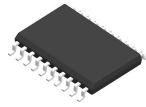


PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



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.



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 0.43 mm per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

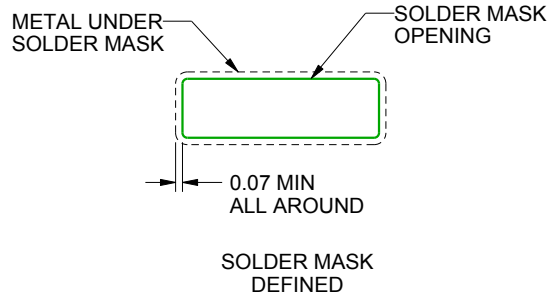
DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

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.

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