

SN74CB3T3257 4-Bit 1-of-2 FET Multiplexer/Demultiplexer 2.5V/3.3V Low-Voltage Bus Switch With 5V-Tolerant Level Shifter

1 Features

- Output voltage translation tracks V_{CC}
- Supports mixed-mode signal operation on all data I/O ports
 - 5V input down to 3.3V output level shift with 3.3V V_{CC}
 - 5V/3.3V input down to 2.5V output level shift with 2.5V V_{CC}
- 5V-tolerant I/Os with device powered up or powered down
- Bidirectional data flow with near-zero propagation delay
- Low ON-state resistance (r_{on}) characteristics ($r_{on} = 5\Omega$ typ)
- Low input/output capacitance minimizes loading ($C_{io(OFF)} = 5pF$ typ)
- Data and control inputs provide undershoot clamp diodes
- Low power consumption ($I_{CC} = 20\mu A$ max)
- V_{CC} operating range from 2.3V to 3.6V
- Data I/Os support 0V to 5V signaling levels (0.8V, 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V)
- Control inputs can be driven by TTL or 5V/3.3V CMOS outputs
- I_{off} supports partial-power-down mode operation
- Latch-up performance exceeds 250mA per JESD 17
- ESD performance tested per JESD 22
 - 2000V human-body model (A114-B, Class II)
 - 1000V charged-device model (C101)

2 Applications

- Supports digital applications:
 - Level translation
 - USB interface

- Memory interleaving
- Bus isolation
- Designed for low-power portable equipment

3 Description

The SN74CB3T3257 is a high-speed TTL-compatible FET multiplexer/demultiplexer with low ON-state resistance (r_{on}), allowing for minimal propagation delay. The device fully supports mixed-mode signal operation on all data I/O ports by providing voltage translation that tracks V_{CC} . The SN74CB3T3257 supports systems using 5V TTL, 3.3V LVTTTL, and 2.5V CMOS switching standards, as well as user-defined switching levels.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} feature verifies that damaging current does not backflow through the device when the device is powered down. The device has isolation during power off.

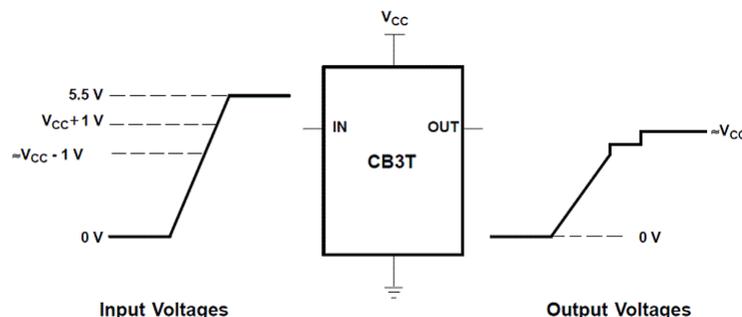
Package Information

PART NUMBER	PACKAGE (1)	BODY SIZE (NOM)
SN74CBTLV3257PW	TSSOP (16)	5.00mm × 4.40mm
SN74CBTLV3257DGV	TVSOP (16)	3.60mm × 4.40mm

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

Device Information

INPUTS		INPUT/OUTPUT A	FUNCTION
\overline{OE}	S		
L	L	B1	A port = B1 port
L	H	B2	A port = B2 port
H	X	Z	Disconnect



If the input high voltage (V_{IH}) level is greater than or equal to $V_{CC} + 1V$, and less than or equal to 5.5 V, the output high voltage (V_{OH}) level will be equal to approximately the V_{CC} voltage level.

Typical DC Voltage Translation Characteristics



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4 Pin Configuration and Functions

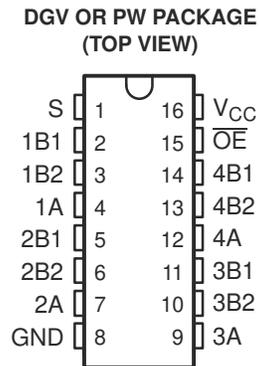


Figure 4-1. DGV or PW Package, 16 PinTVSOP, and TSSOP (Top View)

Table 4-1. Pin Functions

PIN		I/O	DESCRIPTION
NAME	TVSOP, TSSOP		
1A	4	I/O	Channel 1 out/in common
1B1	2	I/O	Channel 1 in/out 1
1B2	3	I/O	Channel 1 in/out 2
2A	7	I/O	Channel 2 out/in common
2B1	5	I/O	Channel 2 in/out 1
2B2	6	I/O	Channel 2 in/out 2
3A	9	I/O	Channel 3 out/in common
3B1	11	I/O	Channel 3 in/out 1
3B2	10	I/O	Channel 3 in/out 2
4A	12	I/O	Channel 4 out/in common
4B1	14	I/O	Channel 4 in/out 1
4B2	13	I/O	Channel 4 in/out 2
GND	8	—	Ground
\overline{OE}	15	I	Output Enable, active low
S	1	I	Select
V _{CC}	16	—	Power

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage ⁽²⁾	-0.5	7	V
V _{IN}	Control input voltage ^{(2) (3)}	-0.5	7	V
V _{I/O}	Voltage range applied to any output in the high-impedance or power-off state ^{(2) (3) (4)}	-0.5	7	V
I _{IK}	Control input clamp current V _{IN} < 0	-50		mA
I _{I/O}	I/O port diode current V _{I/O} < 0	-50		mA
I _{I/O}	On-state switch current ⁽⁵⁾ V _{I/O} = 0 to V _{CC}	-128	128	mA
	Continuous current through V _{CC} or GND	-100	100	mA
T _J	Junction temperature		150	C
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 voltages are with respect to ground unless otherwise specified.
- (3) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (4) V_I, V_O are used to denote specific conditions for V_{I/O}.
- (5) I_I, I_O are used to denote specific conditions for I_{I/O}.

5.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	±2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	±1000	

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

5.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	NOM	MAX	UNIT
V _{CC}	Supply voltage		2.3		3.6	V
V _{I/O}	Switch input or output voltage		0		5.5	V
V _{IH}	High-level input voltage, control input	V _{CC} = 2.3V to 2.7V	1.7		5.5	V
V _{IH}	High-level input voltage, control input	V _{CC} = 2.7V to 3.6V	2		5.5	V
V _{IL}	Low-level input voltage, control input	V _{CC} = 2.3V to 2.7V	0		0.7	V
V _{IL}	Low-level input voltage, control input	V _{CC} = 2.7V to 3.6V	0		0.8	V
T _A	Operating free-air temperature		-40		85	°C

- (1) All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the [Implications of Slow or Floating CMOS Inputs](#) application note.

5.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74CBTLV3257		UNIT
		DGV	PW	
		16 PINS	16 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	120	129.1	°C/W

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

5.5 Electrical Characteristics

Over operating free-air temperature range

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
SIGNAL INPUTS (V_{IS}) AND OUTPUTS (V_{OS})									
		V_{CC} V	$V_{I/O}$ V or I_I or V_{IN}	I_O mA or V_O or V_{IN}	T_A				
r_{ON}	ON-state switch resistance	2.3, TYP at 2.5V	$V_I = 0$ V	$I_O = 24$ mA	-40°C to $+85^\circ\text{C}$		5	8	Ω
r_{ON}	ON-state switch resistance	2.3, TYP at 2.5V	$V_I = 0$ V	$I_O = 16$ mA	-40°C to $+85^\circ\text{C}$		5	8	Ω
r_{ON}	ON-state switch resistance	3, TYP at 3.3V	$V_I = 0$ V	$I_O = 64$ mA	-40°C to $+85^\circ\text{C}$		5	7	Ω
r_{ON}	ON-state switch resistance	3, TYP at 3.3V	$V_I = 0$ V	$I_O = 32$ mA	-40°C to $+85^\circ\text{C}$		5	7	Ω
I_{off}	Power down switch leakage current	0	$V_I = 0$ V	$0 \leq V_O \leq 5.5$ V	-40°C to $+85^\circ\text{C}$	-10		10	μA
I_{oz}	Switch OFF leakage current	3.6	$V_I = 0$ V, $V_{in} = V_{CC}$ or GND	$0 \leq V_O \leq 5.5$ V	-40°C to $+85^\circ\text{C}$	-10		10	μA
I_I	ON-state switch leakage current	3.6	$V_I = V_{CC} - 0.7$ to 5.5V	$V_{IN} = V_{CC}$ or GND	-40°C to $+85^\circ\text{C}$	-20		20	μA
I_I	ON-state switch leakage current	3.6	$V_I = 0.7$ to $V_{CC} - 0.7$	$V_{IN} = V_{CC}$ or GND	-40°C to $+85^\circ\text{C}$			-40	μA
I_{II}	ON-state switch leakage current	3.6	$V_I = 0$ to 0.7V	$V_{IN} = V_{CC}$ or GND	-40°C to $+85^\circ\text{C}$	-5		5	μA
I_{IN}	Control input current	3.6	$V_{CC} \leq V_{IN} \leq 5.5$ or $V_{in} = 0$ V		-40°C to $+85^\circ\text{C}$	-10		10	μA
I_{CC}	Supply current	3.6	$V_I = V_{CC}$ or GND, $I_{I/O} = 0$	$V_{IN} = V_{CC}$ or GND	-40°C to $+85^\circ\text{C}$			20	μA
I_{CC}	Supply current	3.6	$V_I = 5.5$ V, $I_{I/O} = 0$	$V_{IN} = V_{CC}$ or GND	-40°C to $+85^\circ\text{C}$			20	μA
ΔI_{CC}	Quiescent Device Current w.r.t Control inputs	3 to 3.6V	$V_{IN} = V_{CC} - 0.6$ V	Other inputs at 0/VCC	-40°C to $+85^\circ\text{C}$			300	μA
C_I	Control input capacitance	3.3	$V_{IN} = V_{CC}$ or GND		25°C		3		pF
$C_{io(off)}$	A port: Switch input/output capacitance	3.3	$V_I = 5.5$ V, 3.3V, 0V	$V_{IN} = 0$ /VCC s.t switch is off	25°C		8		pF
$C_{io(on)}$	A port: Switch input/output capacitance	3.3	$V_I = 5.5$ V or 3.3V	$V_{IN} = 0$ /VCC s.t switch is on	25°C		6		pF
$C_{io(on)}$	A port: Switch input/output capacitance	3.3	$V_I = 0$ V	$V_{IN} = 0$ /VCC s.t switch is on	25°C		16		pF
$C_{io(off)}$	B port: Switch input/output capacitance	3.3	$V_I = 5.5$ V, 3.3V, 0V	$V_{IN} = 0$ /VCC s.t switch is off	25°C		5		pF
$C_{io(on)}$	B port: Switch input/output capacitance	3.3	$V_I = 5.5$ V or 3.3V	$V_{IN} = 0$ /VCC s.t switch is on	25°C		4		pF
$C_{io(on)}$	B port: Switch input/output capacitance	3.3	$V_I = 0$ V	$V_{IN} = 0$ /VCC s.t switch is on	25°C		16		pF
V_{ik}	Clamp voltage	3	$I_I = -18$ mA		-40°C to $+85^\circ\text{C}$			-1.2	V

5.6 Switching Characteristics 85C

over operating free-air temperature range (unless otherwise noted)^{(1) (2) (3)}

PARAMETER WITH TEST CONDITIONS		FROM (INPUT)	TO (OUTPUT)	V _{CC}	MIN	NOM	MAX	UNIT
t _{pd}	R _L = 1GΩ, C _L = 30pF, V _{load} = 0V. Calculated T _{pd} with switch resistance*CL	A or B	B or A	2.5 V ± 0.2 V			0.15	ns
t _{pd}	R _L = 1GΩ, C _L = 50pF, V _{load} = 0V. Calculated T _{pd} with switch resistance*CL	A or B	B or A	3.3 V ± 0.3 V			0.25	ns
t _{en}	ZL: R _L = 250Ω, C _L = 30pF, V _{load} = V _{CC} , ZH: R _L = 500Ω, C _L = 30pF, V _{load} = GND, 50ohm termination at input	OE	A or B	2.5 V ± 0.2 V	1		10.4	ns
t _{en}	ZL: R _L = 250Ω, C _L = 50pF, V _{load} = V _{CC} , ZH: R _L = 500Ω, C _L = 50pF, V _{load} = GND, 50ohm termination at input	OE	A or B	3.3 V ± 0.3 V	1		8.3	ns
t _{dis}	LZ: R _L = 250Ω, C _L = 30pF, V _{load} = V _{CC} , V _▲ = 0.15V; HZ: R _L = 500Ω, C _L = 30pF, V _{load} = GND, V _▲ = 0.15V; 50ohm termination at input	OE	A or B	2.5 V ± 0.2 V	1		7.4	ns
t _{dis}	LZ: R _L = 250Ω, C _L = 50pF, V _{load} = V _{CC} , V _▲ = 0.3V; HZ: R _L = 500Ω, C _L = 50pF, V _{load} = GND, V _▲ = 0.3V; 50ohm termination at input	OE	A or B	3.3 V ± 0.3 V	1		8	ns
t _{pd(s)}	R _L = 500Ω, C _L = 30pF, V _{load} = 0V. V _{input} = 3.6V domain. 50ohm termination at input	S	A	2.5 V ± 0.2 V			13.4	ns
t _{pd(s)}	R _L = 500Ω, C _L = 50pF, V _{load} = 0V. V _{input} = 5.5V domain. 50ohm termination at input	S	A	3.3 V ± 0.3 V			10.1	ns
t _{en(s)}	ZL: R _L = 250Ω, C _L = 30pF, V _{load} = V _{CC} , ZH: R _L = 500Ω, C _L = 30pF, V _{load} = GND; 50ohm termination at input	S	B	2.5 V ± 0.2 V	1		13	ns
t _{en(s)}	ZL: R _L = 250Ω, C _L = 50pF, V _{load} = V _{CC} , ZH: R _L = 500Ω, C _L = 50pF, V _{load} = GND; 50ohm termination at input	S	B	3.3 V ± 0.3 V	1		10.1	ns
t _{dis(s)}	LZ: R _L = 250Ω, C _L = 30pF, V _{load} = V _{CC} , V _▲ = 0.15V; HZ: R _L = 500Ω, C _L = 30pF, V _{load} = GND, V _▲ = 0.15V; 50ohm termination at input	S	B	2.5 V ± 0.2 V	1		9.1	ns
t _{dis(s)}	LZ: R _L = 250Ω, C _L = 50pF, V _{load} = V _{CC} , V _▲ = 0.3V; HZ: R _L = 500Ω, C _L = 50pF, V _{load} = GND, V _▲ = 0.3V; 50ohm termination at input	S	B	3.3 V ± 0.3 V	1		8.3	ns

- (1) t_{pd} is the slower of t_{pLH} or t_{pHL}. The propagation delay is calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance when driven by an ideal voltage source (zero output impedance).
- (2) t_{en} is the slower of t_{pZL} or t_{pZH}.
- (3) t_{dis} is the slower of t_{pLZ} or t_{pHZ}.

5.7 Typical Characteristics

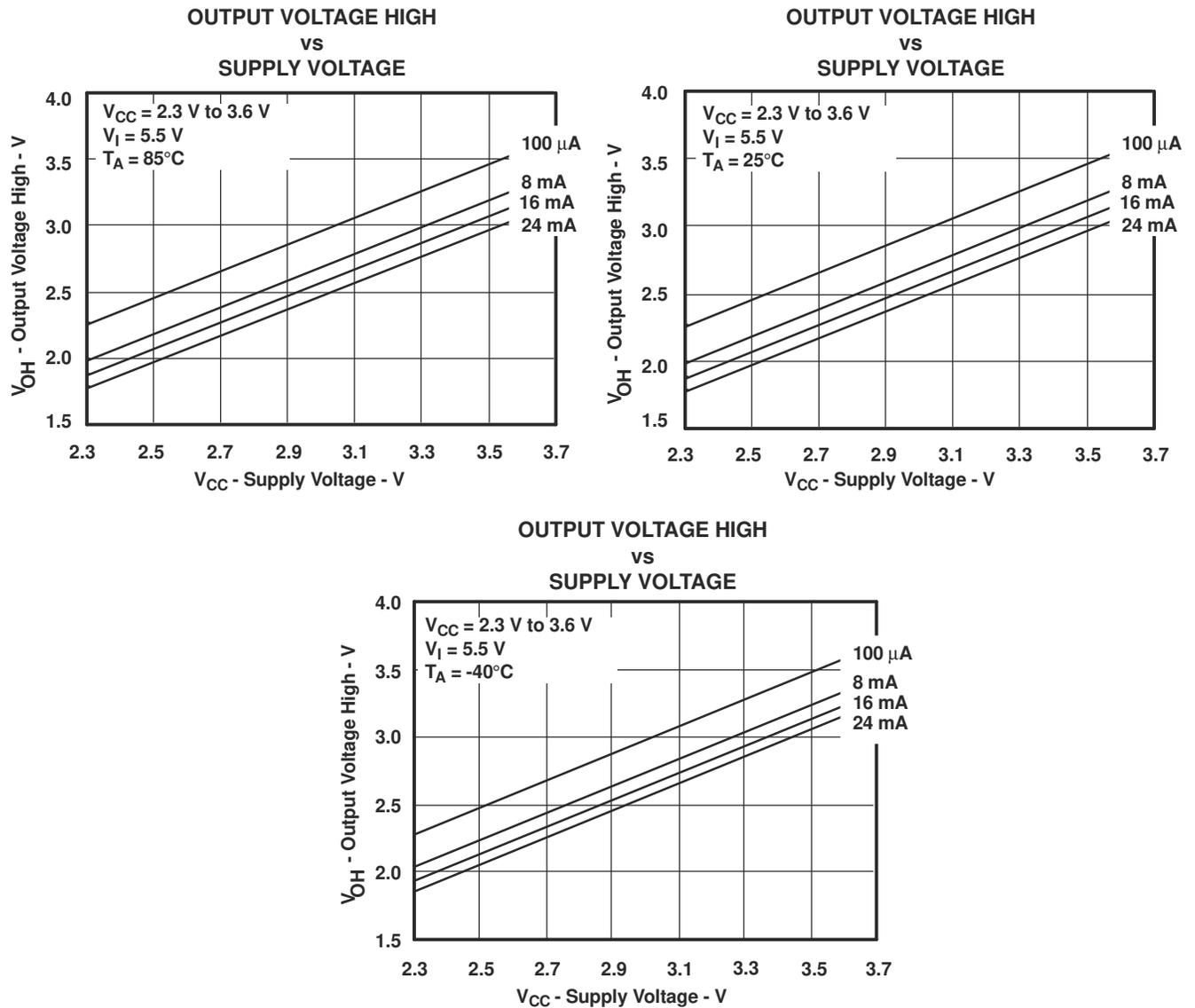
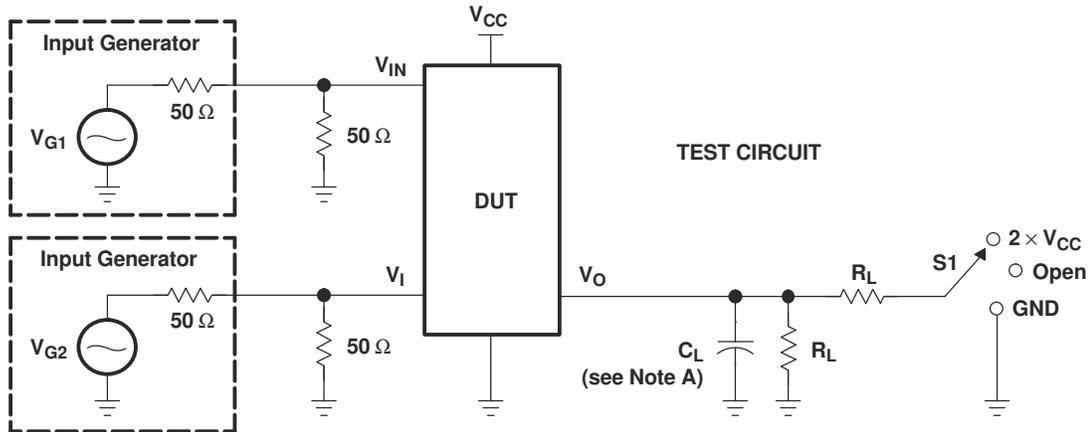
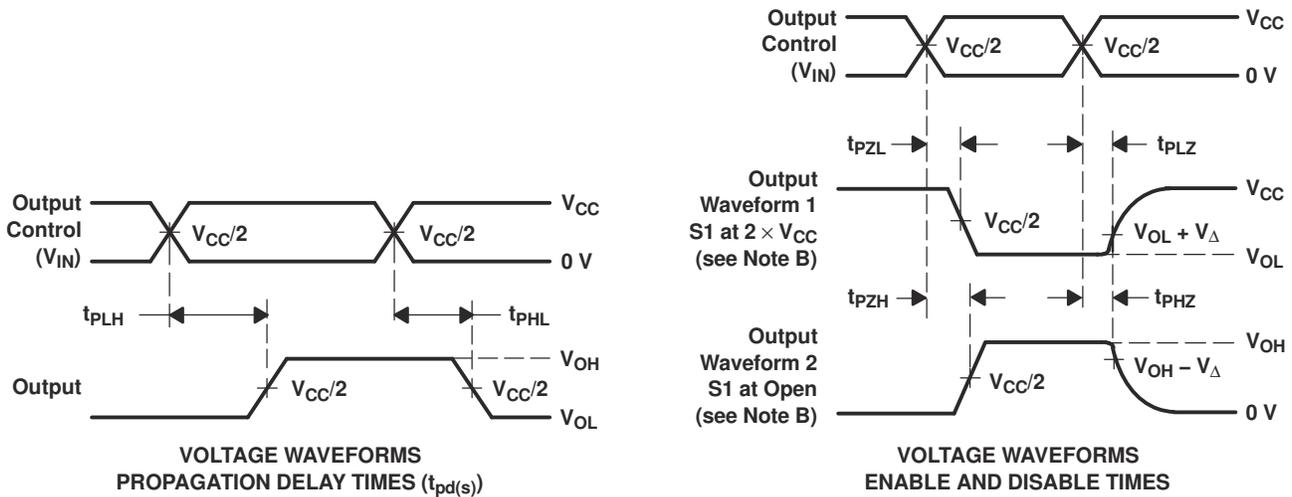


Figure 5-1. V_{OH} Values

6 Parameter Measurement Information



TEST	V _{CC}	S1	R _L	V _I	C _L	V _Δ
t _{pd(s)}	2.5 V ± 0.2 V	Open	500 Ω	3.6 V or GND	30 pF	
	3.3 V ± 0.3 V	Open	500 Ω	5.5 V or GND	50 pF	
t _{PLZ} /t _{PZH}	2.5 V ± 0.2 V	2 × V _{CC}	500 Ω	GND	30 pF	0.15 V
	3.3 V ± 0.3 V	2 × V _{CC}	500 Ω	GND	50 pF	0.3 V
t _{PHZ} /t _{PZH}	2.5 V ± 0.2 V	Open	500 Ω	3.6 V	30 pF	0.15 V
	3.3 V ± 0.3 V	Open	500 Ω	5.5 V	50 pF	0.3 V



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
 - F. t_{PZL} and t_{PZH} are the same as t_{en}.
 - G. t_{PLH} and t_{PHL} are the same as t_{pd(s)}. The t_{pd} propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).
 - H. All parameters and waveforms are not applicable to all devices.

Figure 6-1. Test Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

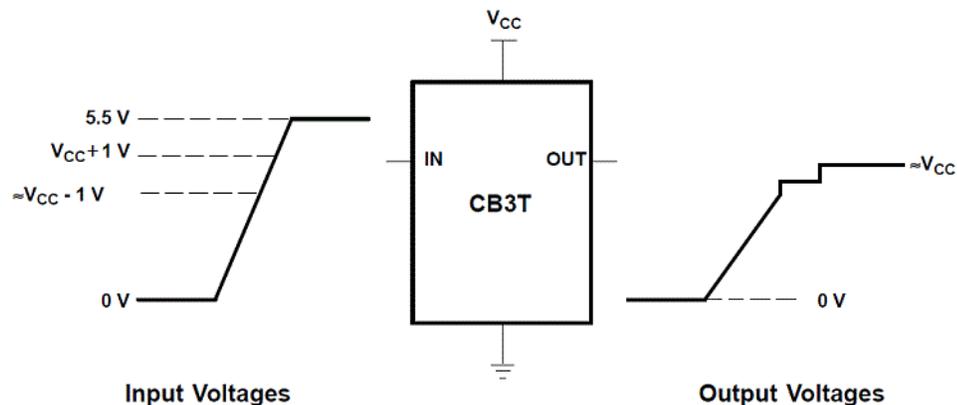
The SN74CB3T3257 is a high-speed TTL-compatible FET multiplexer/demultiplexer with low ON-state resistance (r_{on}), allowing for minimal propagation delay. The device fully supports mixed-mode signal operation on all data I/O ports by providing voltage translation that tracks V_{CC} . The SN74CB3T3257 supports systems using 5V TTL, 3.3V LVTTTL, and 2.5V CMOS switching standards, as well as user-defined switching levels (see [Typical DC Voltage Translation Characteristics](#)).

The SN74CB3T3257 is a 4-bit 1-of-2 multiplexer/demultiplexer with a single output-enable (\overline{OE}) input. The select (S) input controls the data path of the multiplexer/demultiplexer. When \overline{OE} is low, the multiplexer/demultiplexer is enabled, and the A port is connected to the B port, allowing bidirectional data flow between ports. When \overline{OE} is high, the multiplexer/demultiplexer is disabled, and a high-impedance state exists between the A and B ports.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} feature verifies that damaging current does not backflow through the device when the device is powered down. The device has isolation during power off.

To confirm the high-impedance state during power up or power down, tie \overline{OE} to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

7.2 Functional Block Diagram



If the input high voltage (V_{IH}) level is greater than or equal to $V_{CC} + 1V$, and less than or equal to 5.5 V, the output high voltage (V_{OH}) level will be equal to approximately the V_{CC} voltage level.

Figure 7-1. Typical DC Voltage-Translation Characteristics

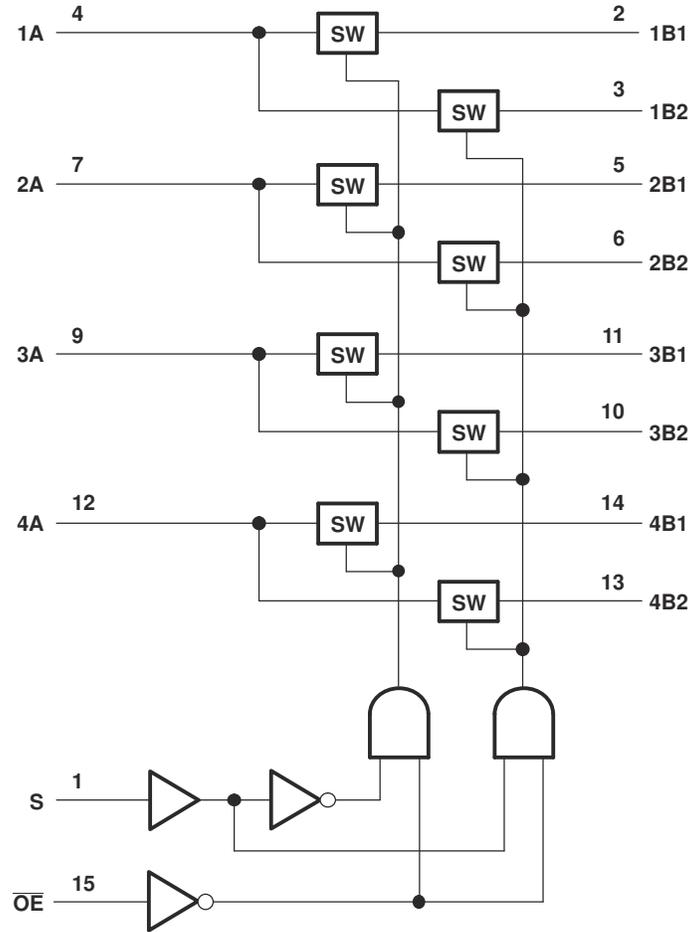
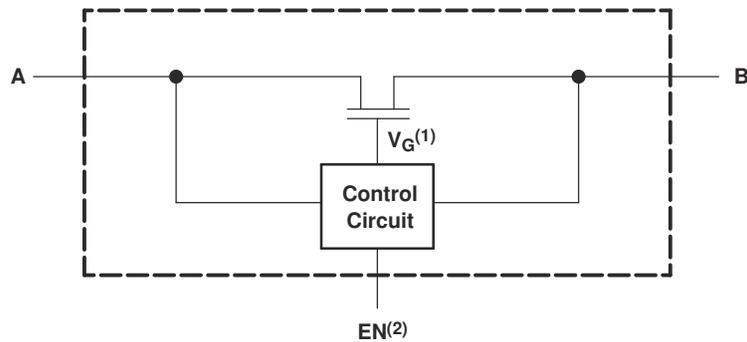


Figure 7-2. Logic Diagram (Positive Logic)



- (1) Gate voltage (V_G) is approximately equal to $V_{CC} + V_T$ when the switch is ON and $V_I > V_{CC} + V_T$.
- (2) EN is the internal enable signal applied to the switch.

Figure 7-3. Simplified Schematic, Each FET Switch (SW)

7.3 Feature Description

The SN74CB3T3257 features 5Ω switch connection between ports, allowing for low signal loss across the switch. Rail-to-rail switching on data I/O allows for full voltage swing outputs. I_{off} supports partial-power-down mode operation, protecting the chip from voltages at output ports when it is not powered on. Latch-up performance exceeds 250mA per JESD 17.

7.4 Device Functional Modes

Table 7-1 shows the functional modes of SN74CBTLV3257.

Table 7-1. Function Table

INPUTS		FUNCTION
\overline{OE}	S	
L	L	A port = B1 port
L	H	A port = B2 port
H	X	Disconnect

8 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.

8.1 Application Information

The SN74CB3T3257 is used to multiplex and demultiplex up to 4 channels simultaneously in a 2:1 configuration. The application shown here is a 4-bit bus, multiplexed between two devices. The \overline{OE} and S pins are used to control the chip from the bus controller. This is a generic example, and can apply to many situations. If an application requires less than 4 bits, tie the A side to either high or low on unused channels.

8.2 Typical Application

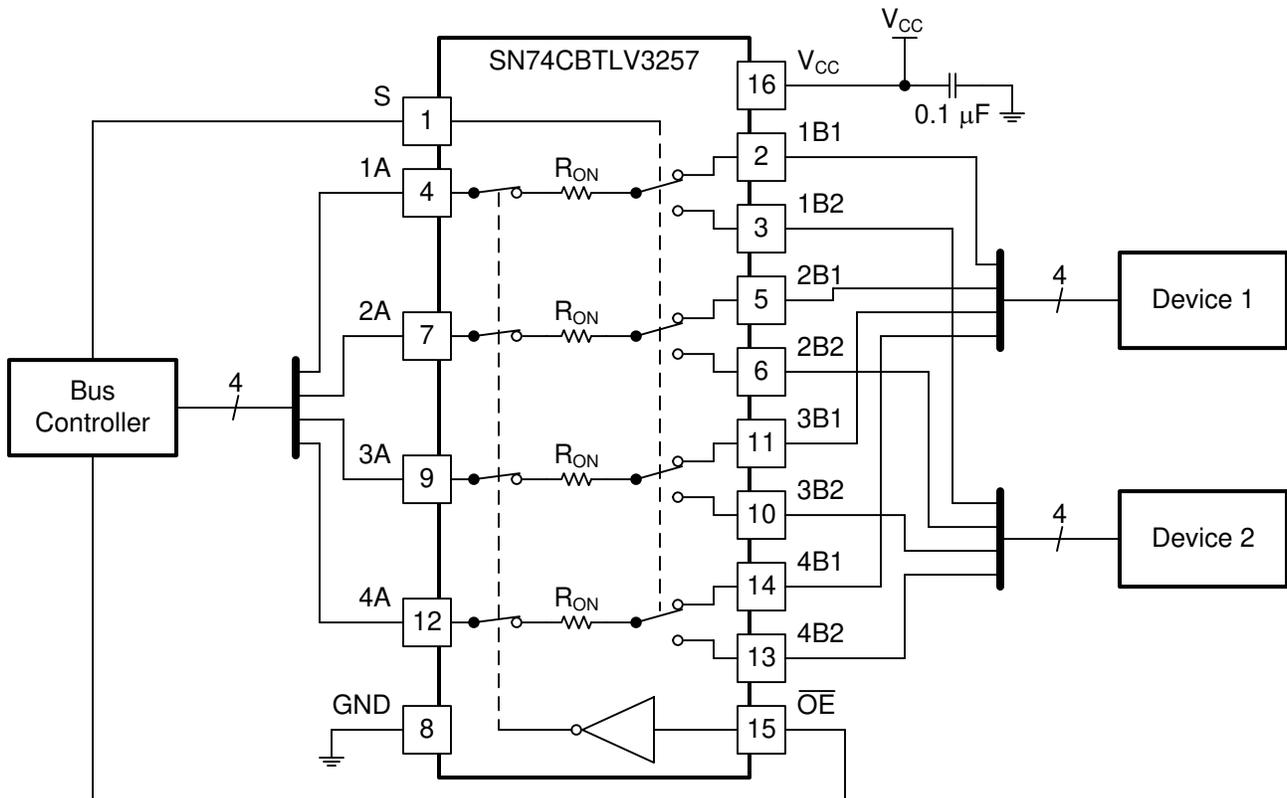


Figure 8-1. Typical Application of the SN74CBTLV3257

8.2.1 Design Requirements

- Recommended Input Conditions:
 - For specified high and low levels, see V_{IH} and V_{IL} in [Section 5.3](#).
 - Inputs and outputs are overvoltage tolerant allowing them to go as high as 4.6V at any valid V_{CC} .
- Recommended Output Conditions:
 - Load currents must not exceed $\pm 128\text{mA}$ per channel.
- Frequency Selection Criterion:
 - Maximum frequency tested is 200MHz.
 - Added trace resistance/capacitance can reduce maximum frequency capability; use layout practices as directed in [Section 8.4](#).

8.2.2 Detailed Design Procedure

The 4-bit bus is connected directly to the 1A, 2A, 3A, and 4A ports (known as the xA port) on the SN74CBTLV3257. This splits into two busses, out of the xB1 and xB2 ports. When S is high, xB2 is the active bus, and when S is low, xB1 is the active bus. This means that Device 2 is connected to the bus controller when S is high, and Device 1 is connected to the bus controller when S is low. This setup is useful when two devices are hard coded with the same address and only one bus is available. The \overline{OE} connection can be used to disconnect all devices from the bus controller if necessary.

The 0.1 μF capacitor on V_{CC} is a decoupling capacitor and must be placed as close as possible to the device.

8.2.3 Application Performance Plots

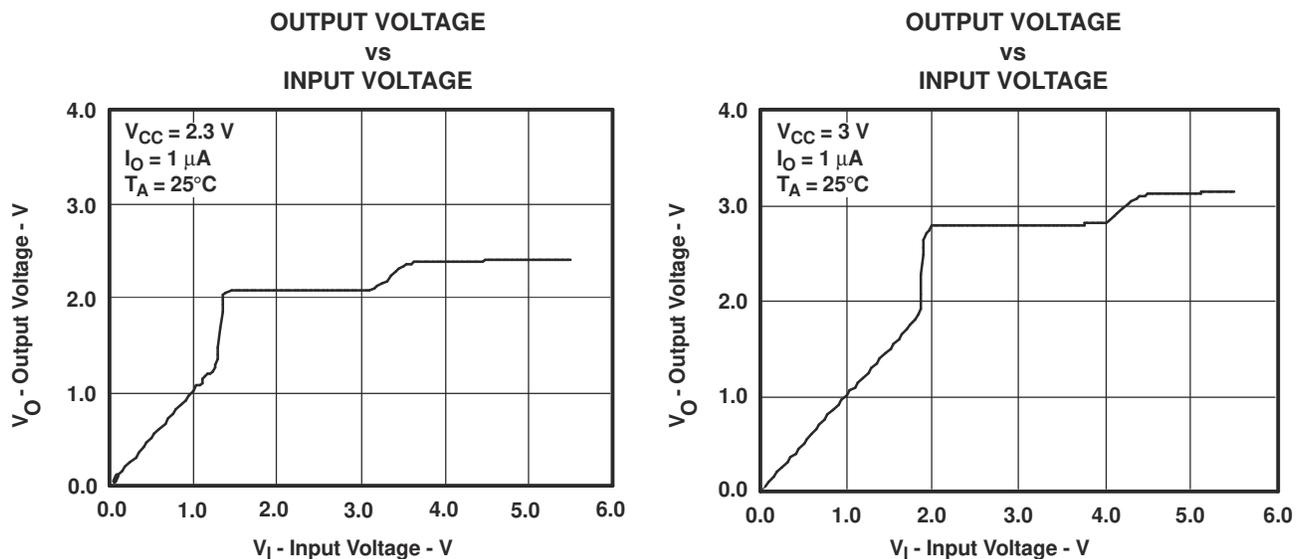


Figure 8-2. Data Output Voltage vs Data Input Voltage

8.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating listed in the [Section 5.3](#) table.

Each V_{CC} terminal must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a $0.1\mu\text{F}$ bypass capacitor is recommended. If multiple pins are labeled V_{CC} , then a $0.01\mu\text{F}$ or $0.022\mu\text{F}$ capacitor is recommended for each V_{CC} because the V_{CC} pins are tied together internally. For devices with dual-supply pins operating at different voltages, for example V_{CC} and V_{DD} , a $0.1\mu\text{F}$ bypass capacitor is recommended for each supply pin. To reject different frequencies of noise, use multiple bypass capacitors in parallel. Capacitors with values of $0.1\mu\text{F}$ and $1\mu\text{F}$ are commonly used in parallel. The bypass capacitor must be installed as close to the power terminal as possible for best results.

8.4 Layout

8.4.1 Layout Guidelines

Reflections and matching are closely related to the loop antenna theory but are different enough to be discussed separately from the theory. When a PCB trace turns a corner at a 90° angle, a reflection can occur. A reflection occurs primarily because of the change of width of the trace. At the apex of the turn, the trace width increases to 1.414 times the width. This increase upsets the transmission-line characteristics, especially the distributed capacitance and self-inductance of the trace which results in the reflection. Not all PCB traces can be straight and therefore some traces must turn corners. [Figure 8-3](#) shows progressively better techniques of rounding corners. Only the last example (BEST) maintains constant trace width and minimizes reflections.

8.4.2 Layout Example

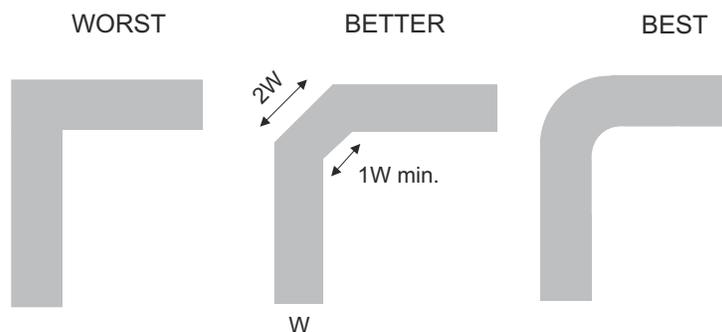


Figure 8-3. Trace Example

9 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

9.1 Documentation Support

Related Documentation

For related documentation see the following:

- Texas Instruments, [Implications of Slow or Floating CMOS Inputs](#)
- Texas Instruments, [Selecting the Right Texas Instruments Signal Switch](#)

9.1.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](#). Click on *Notifications* 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.

9.1.2 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.

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9.1.3 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.

9.1.4 Glossary

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

10 Revision History

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

Changes from Revision * (October 2003) to Revision A (May 2025) Page

- Added the *Pin Configuration and Functions, Specifications, ESD Ratings, Thermal Information, Overview, Functional Block Diagram, Device Functional Modes, Application and Implementation, Typical Applications, Power Supply Recommendations, Layout, Layout Guidelines, Layout Example, Device and Documentation Support, and Mechanical, Packaging, and Orderable Information* sections..... 1
- Updated the numbering format for tables, figures, and cross-references throughout the document..... 1
- Updated specs in the [Electrical Characteristics](#) table..... 6
- Updated specs in the [Switching Characteristics 85C](#) table..... 7

DATE	REVISION	NOTES
October 2003	*	Initial Release

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)
SN74CB3T3257DGVR	Active	Production	TVSOP (DGV) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257DGVR.B	Active	Production	TVSOP (DGV) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257DGVRG4	Active	Production	TVSOP (DGV) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257DGVRG4.B	Active	Production	TVSOP (DGV) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257PW	Obsolete	Production	TSSOP (PW) 16	-	-	Call TI	Call TI	-40 to 85	KS257
SN74CB3T3257PWR	Active	Production	TSSOP (PW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257PWR.A	Active	Production	TSSOP (PW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257
SN74CB3T3257PWR.B	Active	Production	TSSOP (PW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	KS257

(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.

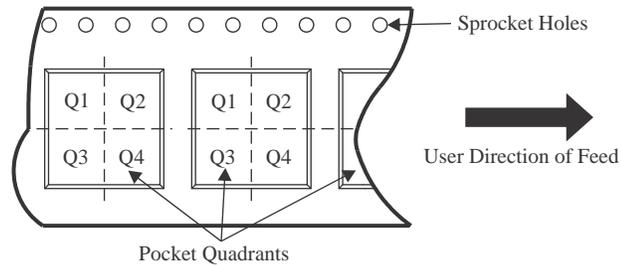
(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


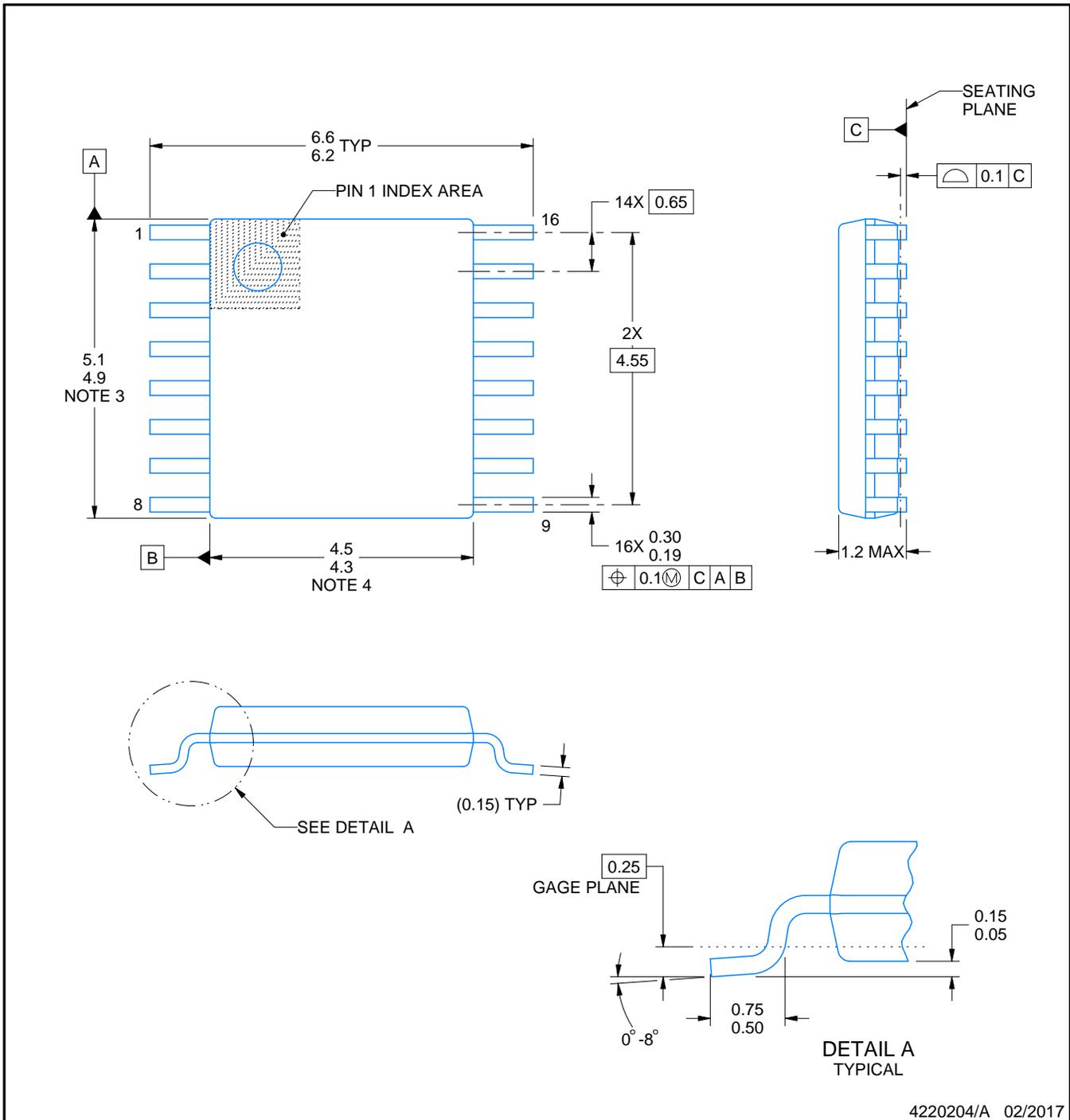
*All dimensions are nominal

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
SN74CB3T3257DGVR	TVSOP	DGV	16	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74CB3T3257DGVRG4	TVSOP	DGV	16	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74CB3T3257PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CB3T3257DGVR	TVSOP	DGV	16	2000	367.0	367.0	35.0
SN74CB3T3257DGVRG4	TVSOP	DGV	16	2000	367.0	367.0	35.0
SN74CB3T3257PWR	TSSOP	PW	16	2000	367.0	367.0	35.0



4220204/A 02/2017

NOTES:

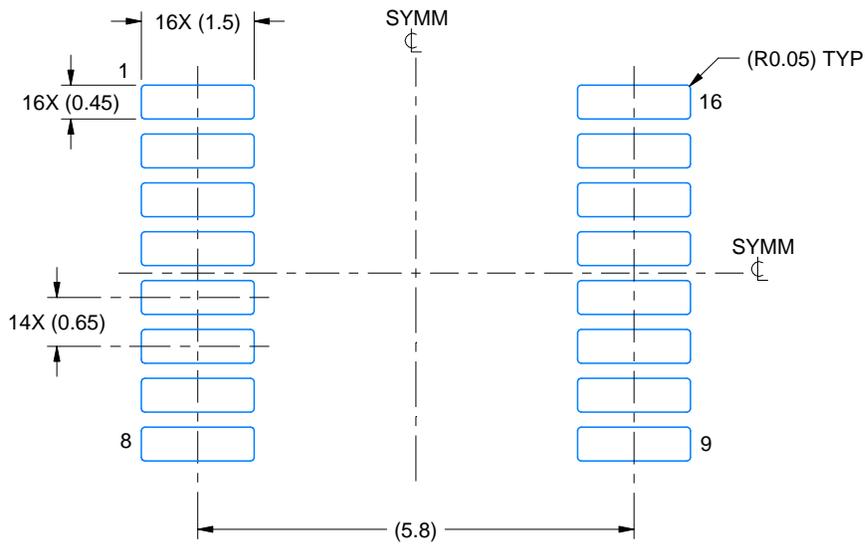
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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

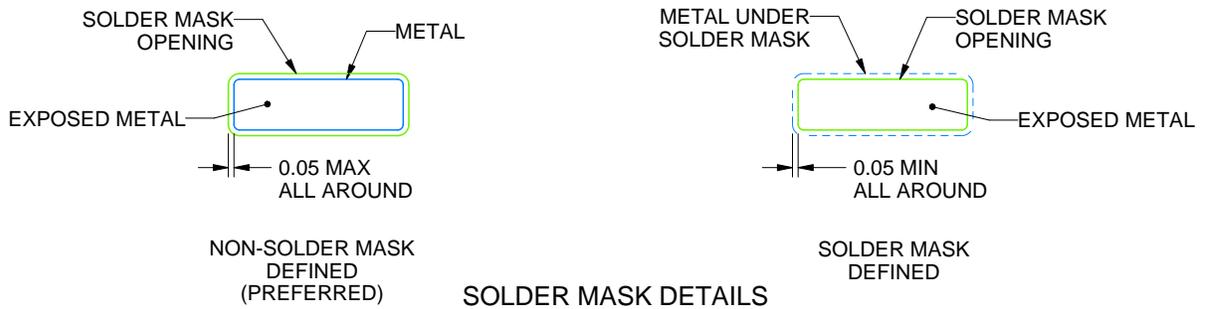
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220204/A 02/2017

NOTES: (continued)

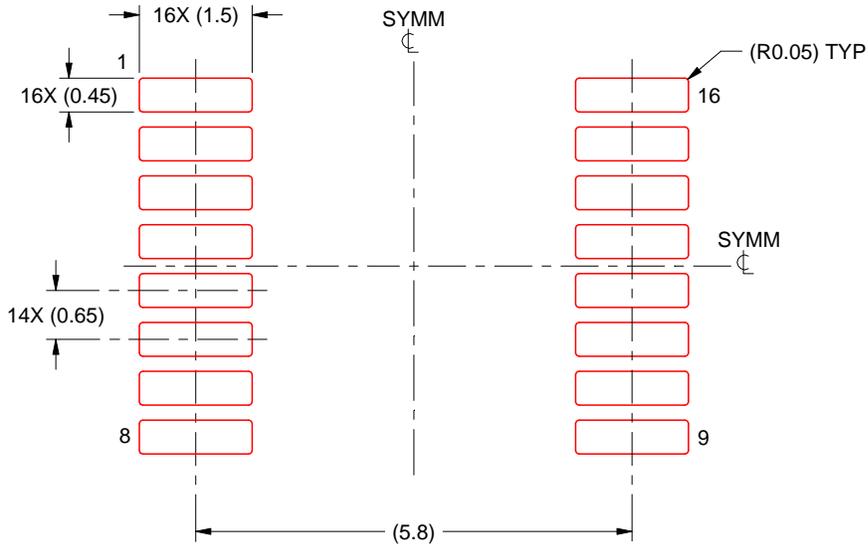
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

4220204/A 02/2017

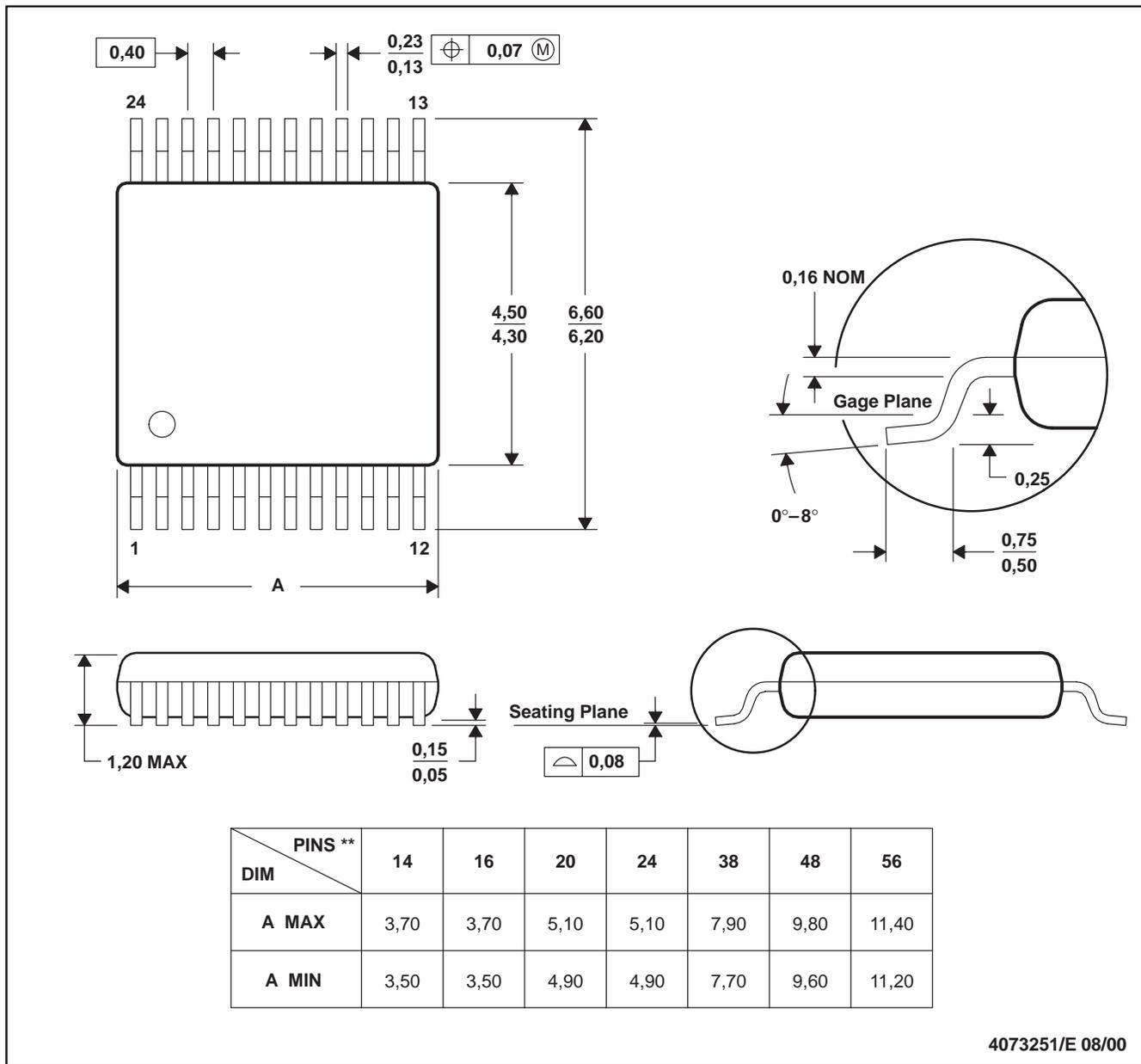
NOTES: (continued)

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.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

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