THE DATASHEET OF

SN65LVELT22D

3.3 V Dual LVTTL to DIfferential LVPECL Translator

FEATURES

- **450 ps (typ) Propagation Delay**
- **Operating Range: V_{CC} 3.0 V to 3.8 with GND = 0 V**
- **<50 ps (max) Output to Output Skew**
- **Built-in Temperature Compensation**
- **Drop in Compatible to MC100LVELT22**

APPLICATIONS

- **Data and Clock Transmission Over Backplane**
- **Signaling Level Conversion for Clock or Data**

DESCRIPTION

The SN65ELT22 is a dual LVTTL to differential LVPECL translator buffer. It operates on +3V supply and ground only. The output is driven default high when the inputs are left floating or unused. The low output skew makes the device the ideal solution for clock or data signal translation.

The SN65LVELT22 is housed in an industry standard SOIC-8 package and is also available in TSSOP-8 package option.

PINOUT ASSIGNMENT

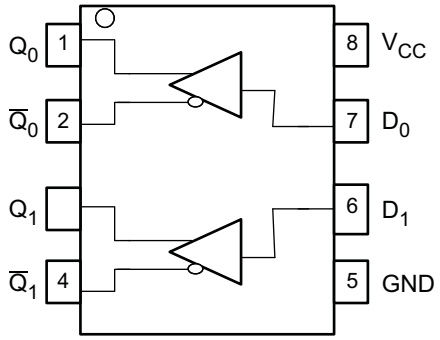


Table 1. Pin Description

PIN	FUNCTION
D_0, D_1	TTL inputs
Q_0, $\overline{Q}_0$, Q_1, $\overline{Q}_1$	PECL/ECL outputs
V_{CC}	Positive supply
GND	Ground

ORDERING INFORMATION(1)

PART NUMBER	PART MARKING	PACKAGE	LEAD FINISH
SN65LVELT22D	SN65LVELT22	SOIC	NiPdAu
SN65LVELT22DGK	SN65LVELT22	SOIC-TSSOP	NiPdAu

(1) Leaded device options not initially available. Contact TI sales representative for further details.

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.

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ABSOLUTE MAXIMUM RATINGS(1)

		VALUE	UNIT
Absolute PECL mode supply voltage, V_{CC}	GND = 0 V	6	V
V_{IN} input voltage	$V_I \le V_{CC}$	6	V
Output current	Continuous	50	mA
	Surge	100	
Operating temperature range		–40 to 85	°C
Storage temperature range		–65 to 150	°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.

POWER DISSIPATION RATINGS

PACKAGE	CIRCUIT BOARD MODEL	POWER RATING T_A < 25°C (mW)	THERMAL RESISTANCE, JUNCTION TO AMBIENT NO AIRFLOW	DERATING FACTOR T_A > 25°C (mW/°C)	POWER RATING T_A = 85°C (mW)
SOIC	Low-K	719	139	7	288
	High-K	840	119	8	336
SOIC-TSSOP	Low-K	469	213	5	188
	High-K	527	189	5	211

THERMAL CHARACTERISTICS

PARAMETER		PACKAGE	VALUE	UNIT
θ_{JB}	Junction-to Board Thermal Resistance	SOIC	79	°C/W
		SOIC-TSSOP	120	
θ_{JC}	Junction-to Case Thermal Resistance	SOIC	98	°C/W
		SOIC-TSSOP	74	

KEY ATTRIBUTES

CHARACTERISTICS	VALUE
Moisture sensitivity level	Level 1
Flammability rating (Oxygen Index: 28 to 34)	UL 94 V-0 at 0.125 in
ESD-HBM	4 kV
ESD-machine model	200 V
ESD-charge device model	2 kV
Meets or exceeds JEDEC Spec EIA/JESD78 latchup test	

PECL DC CHARACTERISTICS[1] (V_{CC} = 3.3 V, GND = 0.0 V[2])

CHARACTERISTICS		–40°C			25°C			85°C			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
I_{CC}	Power Supply Current		23	33		25	33		26	33	mA
V_{OH}	Output HIGH Voltage [3]	2275	2317	2420	2275	2331	2420	2275	2343	2420	mV
V_{OL}	Output LOW Voltage[3]	1490	1558	1680	1490	1556	1680	1490	1555	1680	mV

(1) Device will meet the specifications after thermal balance has been established when mounted in a socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are assured only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.
(2) Input parameters vary 1:1 with V_{CC}. V_{CC} can vary ±0.15 V
(3) Outputs are terminated through a 50-Ω resistor to V_{CC} – 2.0 V.

TTL DC CHARACTERISTICS[1] (V_{CC} = 3.3 V; T_A = –40°C to 85°C)

CHARACTERISTIC		CONDITION	MIN	TYP	MAX	UNIT
I_{IH}	Input HIGH current	V_{IN} = 2.7 V			20	µA
I_{IHH}	Input HIGH current max	V_{IN} = V_{CC}			100	µA
I_{IL}	Input LOW current	V_{IN} = 0.5 V			–0.2	mA
V_{IK}	Input clamp diode voltage	I_{IN} = –18 mA			–1.2	V
V_{IH}	Input HIGH voltage		2.0			V
V_{IL}	Input LOW voltage				0.8	V

(1) Device will meet the specifications after thermal balance has been established when mounted in a socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are assured only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

AC CHARACTERISTICS [1](V_{CC} = 3.3 V; GND = 0.0 V)

CHARACTERISTIC		–40°C			25°C			85°C			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
f_{MAX}	Max switching frequency[2], see Figure 5		1750			1750			1700		MHz
t_{PLH}/t_{PHL}	Propagation delay to output at 1.5V, see Figure 4	200	425	550	200	445	550	200	460	550	ps
t_{SKEW}	Within – device skew[3]		20	50		20	50		20	50	ps
	Device-to-device skew[4]		30	100		30	100		30	100	
t_{JITTER}	Random clock jitter (RMS)		0.5	1.0		0.5	1.0		0.5	1.0	ps
t_r/t_f	Output rise/fall times Q (20%–80%)	300		500	300		500	300		500	ps

(1) Device will meet the specifications after thermal balance has been established when mounted in a socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are assured only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.
(2) Maximum switching frequency measured at output amplitude of 300 mV_{pp}.
(3) This is measured between outputs under the identical transitions and conditions on any one device.
(4) Device-Device Skew is defined as identical transitions at identical V_{CC} levels.

Typical Termination for Output Driver

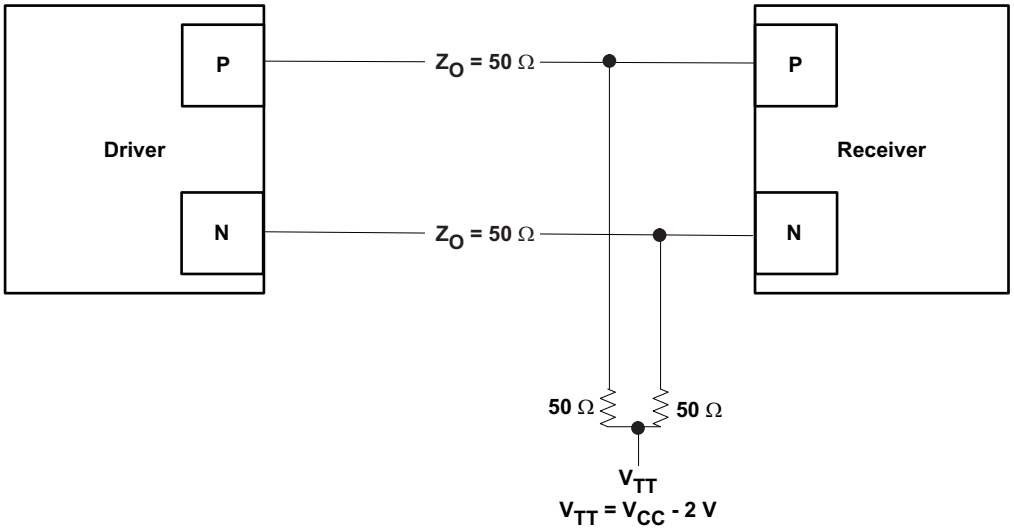


Figure 1. Termination for Output Driver

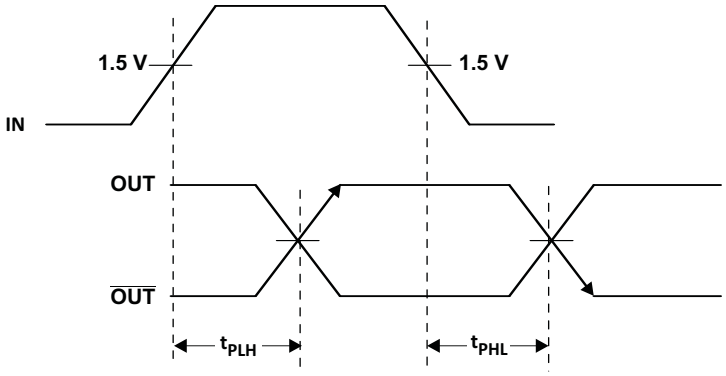


Figure 2. Output Propagation Delay

Figure 3. Output Rise and Fall Times

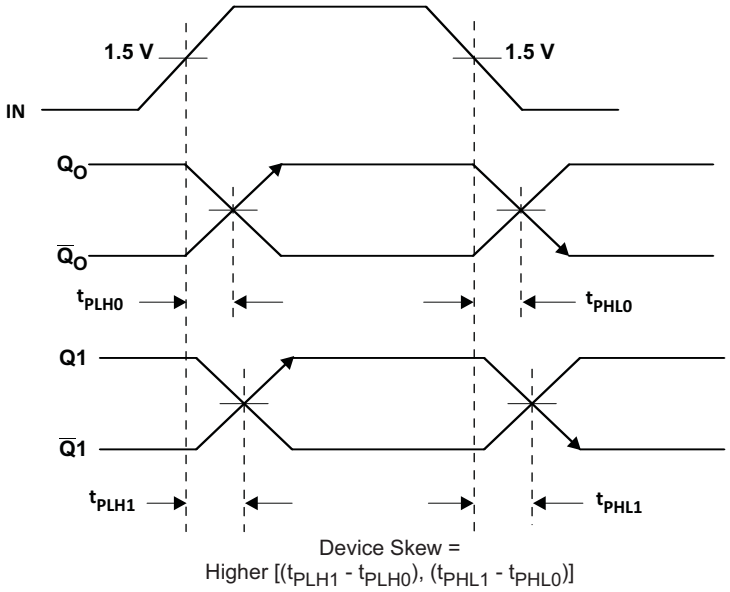


Figure 4. Device Skew

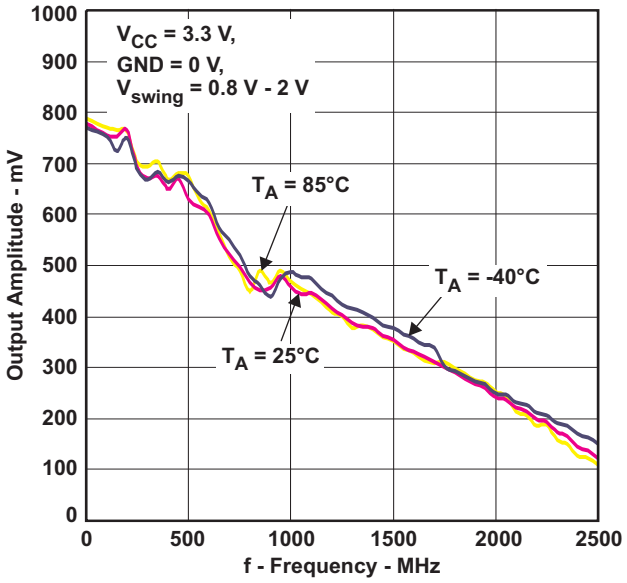
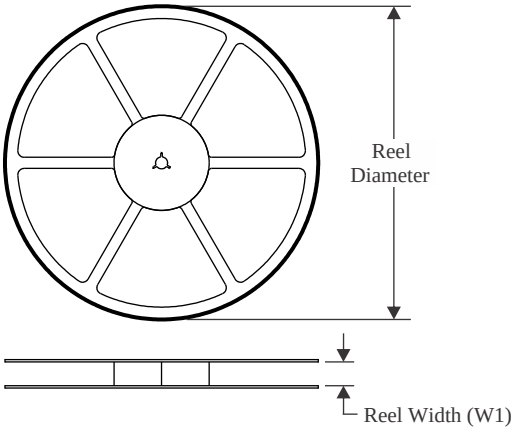


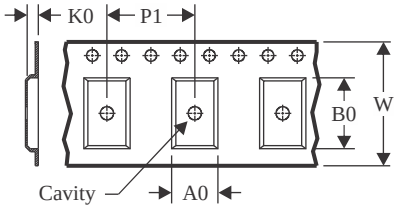
Figure 5. Output Amplitude vs. Frequency

TAPE AND REEL INFORMATION

REEL DIMENSIONS

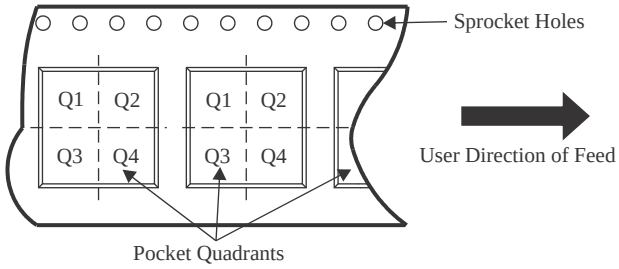


TAPE DIMENSIONS



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

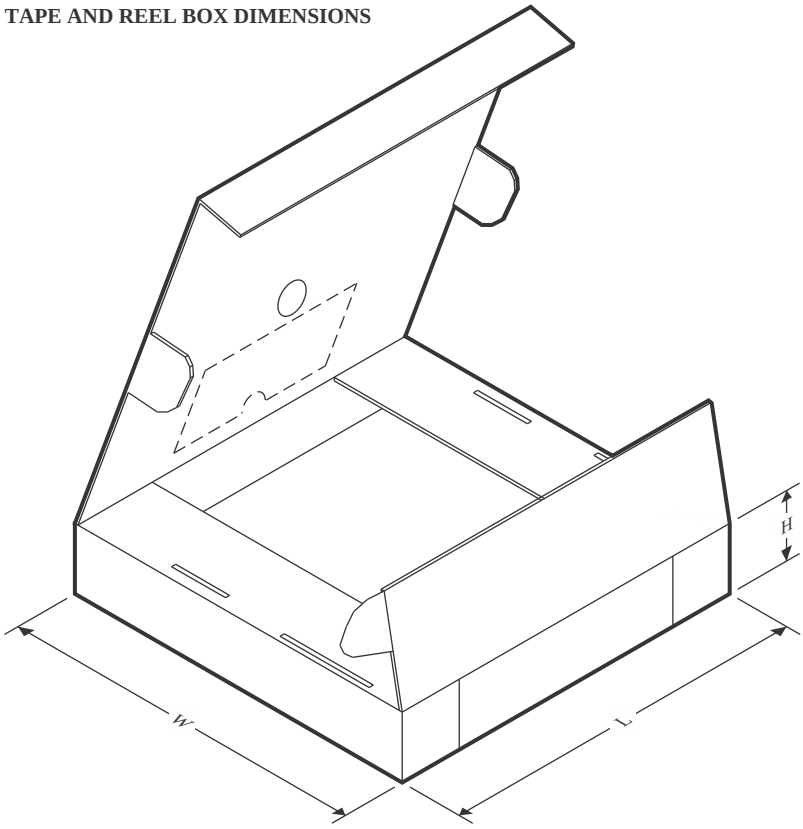
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN65LVELT22DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
SN65LVELT22DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

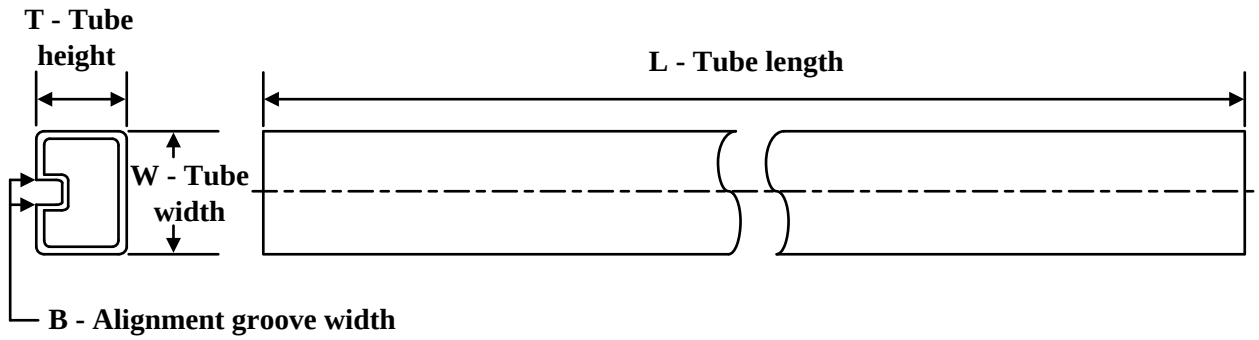
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

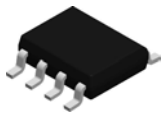
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65LVELT22DGKR	VSSOP	DGK	8	2500	356.0	356.0	35.0
SN65LVELT22DR	SOIC	D	8	2500	356.0	356.0	35.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN65LVELT22D	D	SOIC	8	75	506.6	8	3940	4.32
SN65LVELT22DGK	DGK	VSSOP	8	80	330.2	6.6	3005	1.88

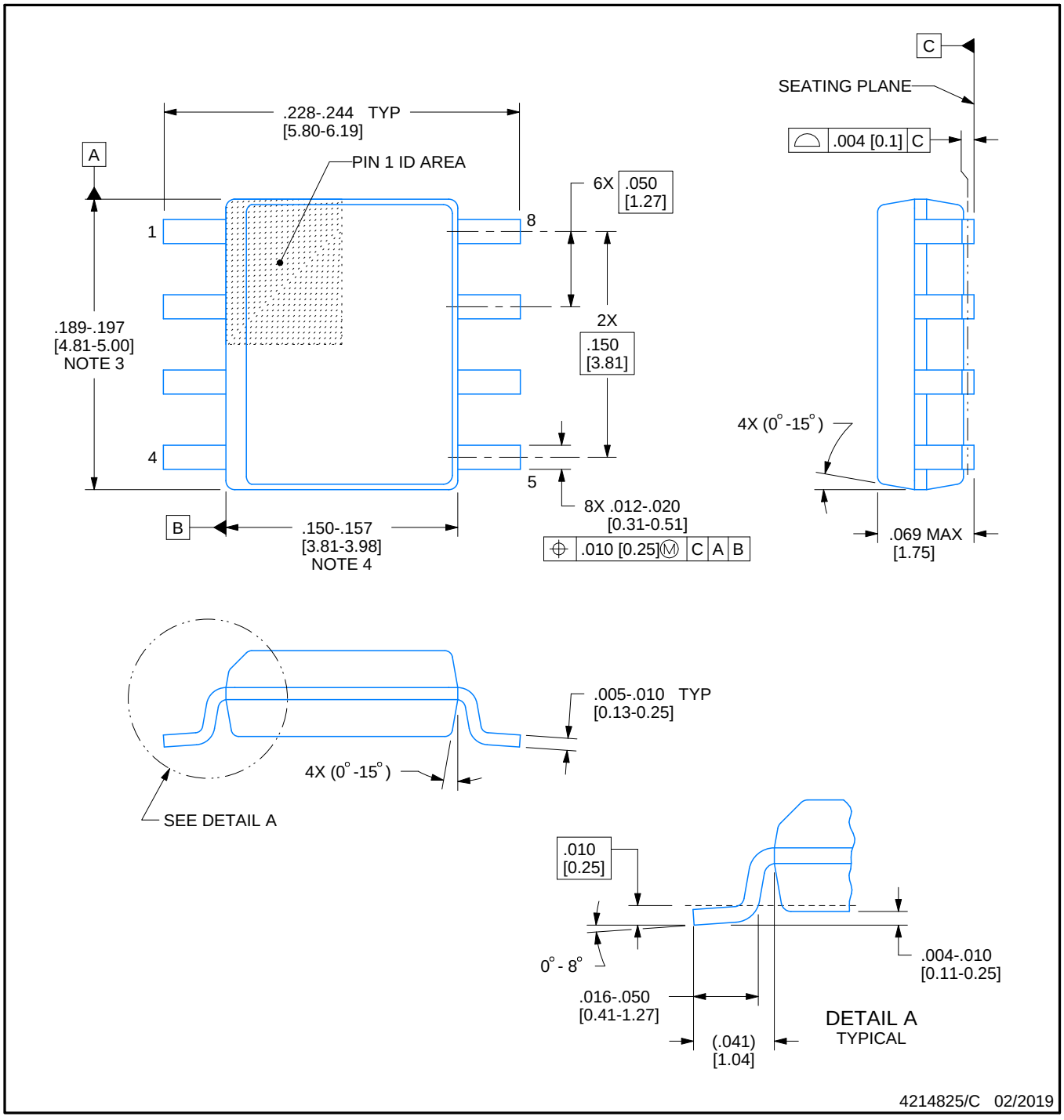


PACKAGE OUTLINE

D0008A

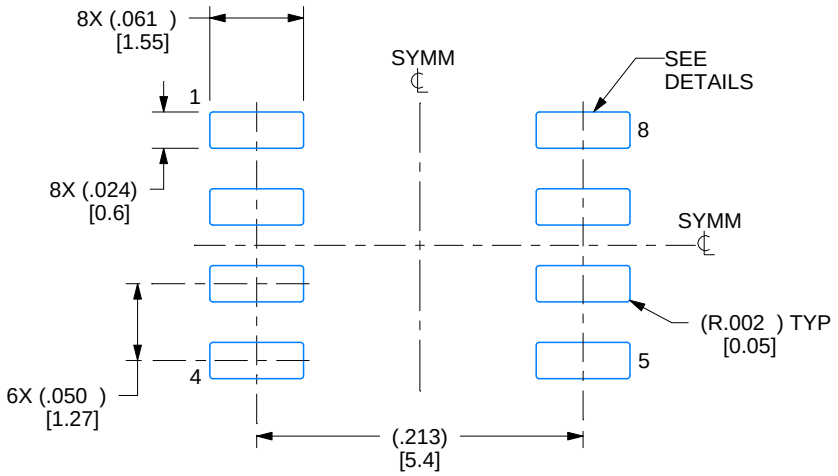
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

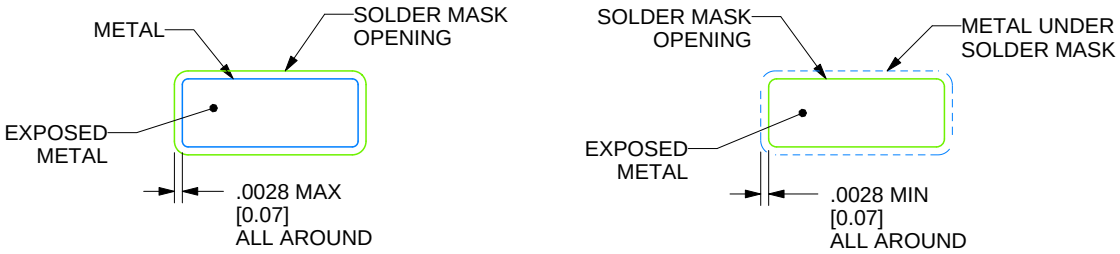


NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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 .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

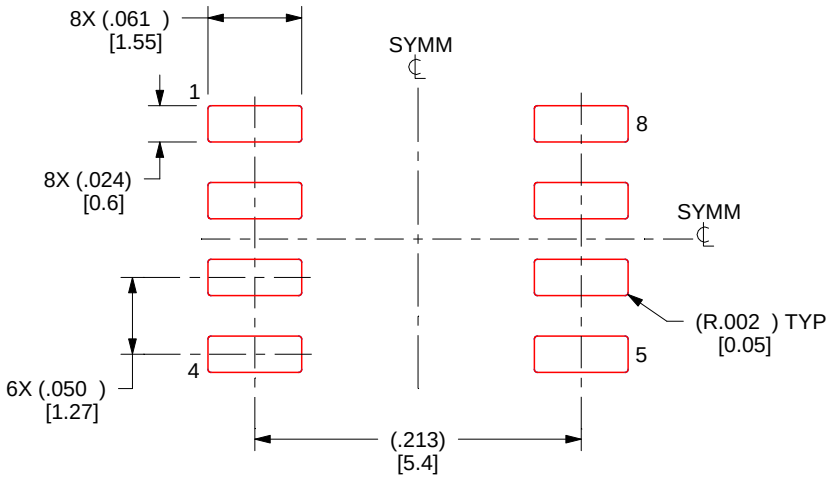
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

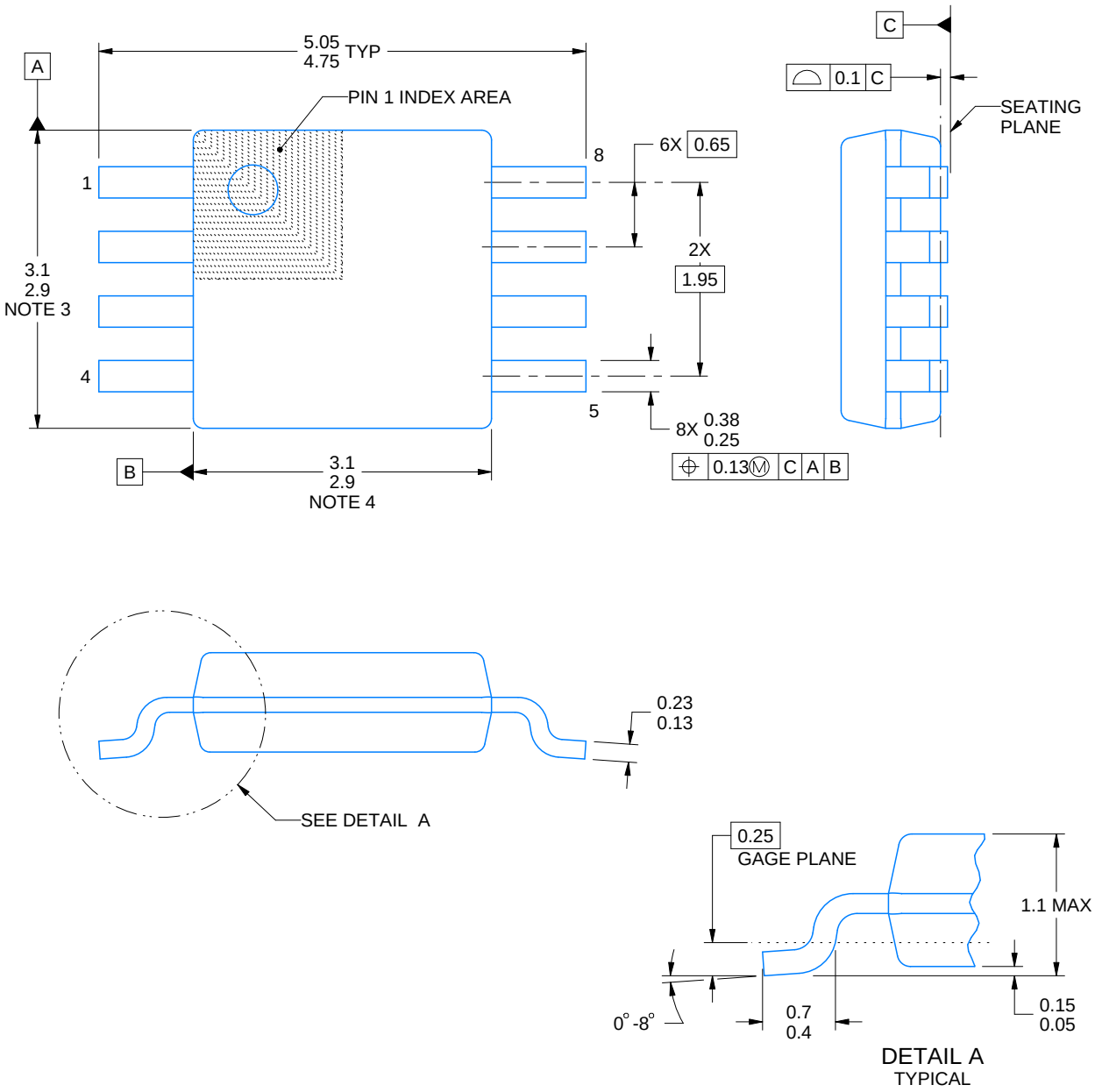
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PACKAGE OUTLINE

DGK0008A

VSSOP - 1.1 mm max height

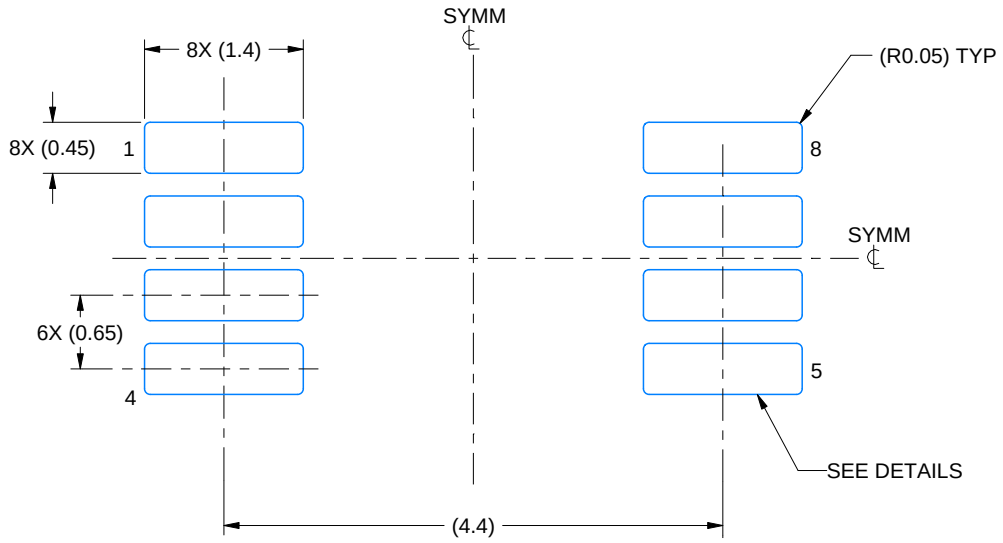
SMALL OUTLINE PACKAGE



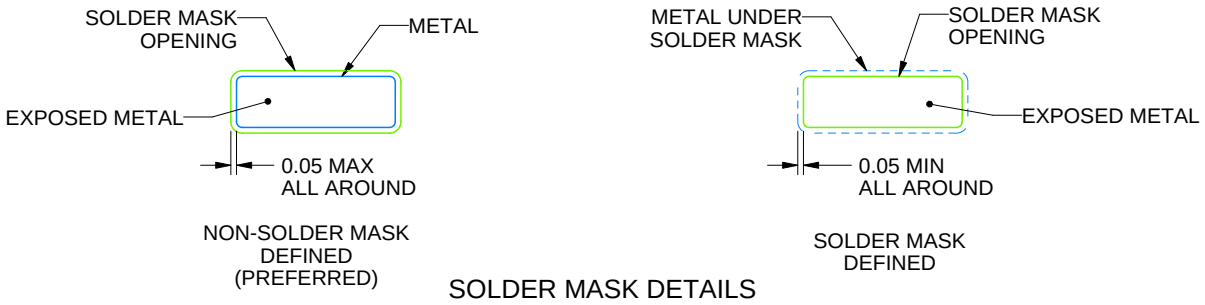
PowerPAD is a trademark of Texas Instruments.

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-187.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 15X

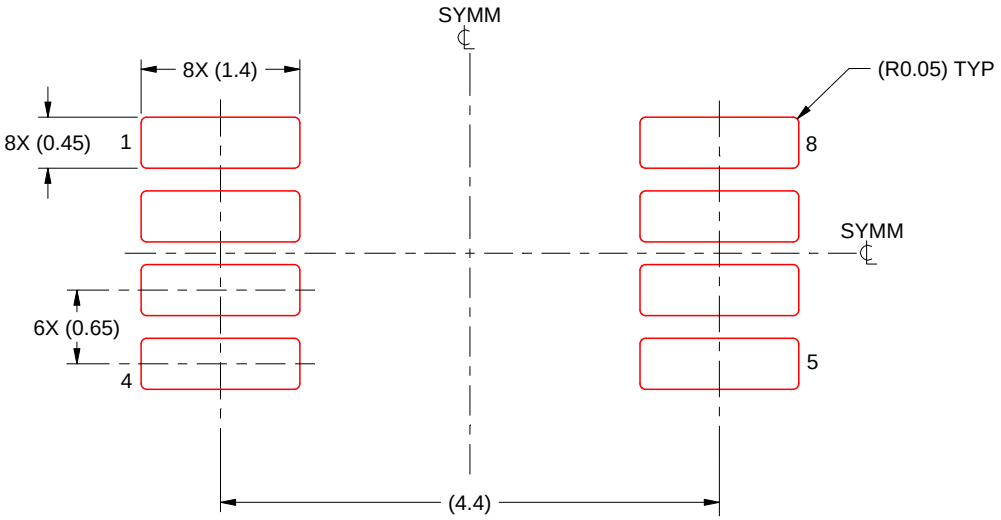


SOLDER MASK DETAILS

4214862/A 04/2023

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.
8. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.
9. Size of metal pad may vary due to creepage requirement.



SOLDER PASTE EXAMPLE
SCALE: 15X

4214862/A 04/2023

NOTES: (continued)

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

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