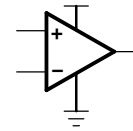


FAMILY OF LOW-POWER WIDE BANDWIDTH SINGLE SUPPLY OPERATIONAL AMPLIFIERS WITH SHUTDOWN

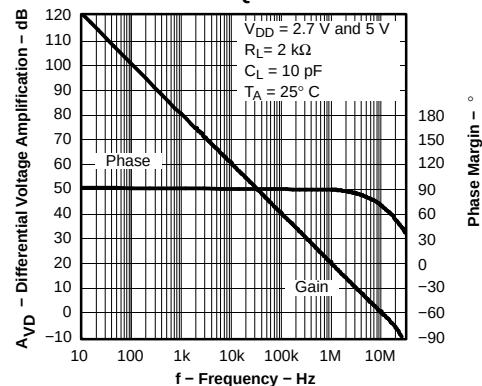
FEATURES

- CMOS Rail-To-Rail Output
- V_{ICR} Includes Positive Rail
- Wide Bandwidth . . . 11 MHz
- Slew Rate . . . 10 V/ μ s
- Supply Current . . . 800 μ A/Channel
- Input Noise Voltage . . . 27 nV/ $\sqrt{\text{Hz}}$
- Ultralow Power-Down Mode:
 $I_{DD(\text{SHDN})} = 4 \mu\text{A/Channel}$
- Supply Voltage Range . . . 2.7 V to 5.5 V
- Specified Temperature Range:
-40°C to 125°C . . . Industrial Grade
- Ultrasmall Packaging:
5 or 6 Pin SOT-23 (TLV2620/1)
8 or 10 Pin MSOP (TLV2622/3)
- Universal Opamp EVM (See SLOU060 for More Information)

Operational Amplifier



DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE
VS
FREQUENCY



DESCRIPTION

The TLV262x single supply operational amplifiers provide rail-to-rail output with an input range that includes the positive rail. The TLV262x takes the minimum operating supply voltage down to 2.7 V over the extended industrial temperature range (-40°C to 125°C) while adding the rail-to-rail output swing feature. The TLV262x also provides 11-MHz bandwidth from only 800 μ A of supply current. The maximum recommended supply voltage is 5.5 V, which, when coupled with a 2.7-V minimum, allows the devices to be operated from lithium ion cells. The combination of wide bandwidth, low noise, and low distortion makes it ideal for high speed and high resolution data converter applications. The positive input range allows it to directly interface to positive rail referred systems. All members are available in PDIP and SOIC with the singles in the small SOT-23 package, duals in the MSOP, and quads in the TSSOP package.

The 2.7-V operation makes it compatible with Li-Ion powered systems and the operating supply voltage range of many micro-power micro-controllers available today including TI's MSP430.

AMPLIFIER SELECTION TABLE

DEVICE	V_{DD} [V]	I_{DD}/ch [μ A]	V_{IO} [μ V]	I_{IB} [pA]	V_{ICR} [V]	GBW [MHz]	SLEW RATE [V/ μ s]	V_n , 1 kHz [nV/ $\sqrt{\text{Hz}}$]	I_o [mA]	SHUT- DOWN
TLV262x	2.7-5.5	750	250	1	1 V to $V_{DD} + 0.2$	11	10	27	28	Y
TLV263x	2.7-5.5	750	250	1	GND to $V_{DD} - 0.8$	10	9	27	28	Y
TLV278x	1.8-3.6	650	250	2.5	-0.2 to $V_{DD} + 0.2$	8	5	9	10	Y
TLC07x	4.5 - 16	1900	60	1.5	0.5 to $V_{DD} - 0.8$	10	19	7	55	Y
TLC08x	4.5 - 16	1900	60	3	GND to $V_{DD} - 1$	10	19	8.5	55	Y



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.



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.

TLV2620 AND TLV2621 AVAILABLE OPTIONS⁽¹⁾

T _A	V _{IO} max AT 25°C	PACKAGED DEVICES			
		SMALL OUTLINE (D) ⁽²⁾	SOT-23		PLASTIC DIP (P)
			(DBV) ⁽³⁾	SYMBOL	
-40°C to 125°C	3500 µV	TLV2620ID TLV2621ID	TLV2620IDBV TLV2621IDBV	VBAI VBBI	TLV2620IP TLV2621IP

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
(2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2620IDR).
(3) The SOT23 package devices are only available taped and reeled. The **R** Suffix denotes quantities (3,000 pieces per reel). For smaller quantities (250 pieces per mini-reel), add a **T** suffix to the part number (e.g. TLV2620IDBVT).

TLV2622 AND TLV2623 AVAILABLE OPTIONS⁽¹⁾

T _A	V _{IO} max AT 25°C	PACKAGED DEVICES						
		SMALL OUTLINE ⁽²⁾ (D)	MSOP				PLASTIC DIP (N)	PLASTIC DIP (P)
			(DGK) ⁽²⁾	SYMBOL	(DGS) ⁽²⁾	SYMBOL		
-40°C to 125°C	3500 µV	TLV2622ID TLV2623ID	TLV2622IDGK —	xxTIAKM —	— TLV2623IDGS	— xxTIALC	— TLV2623IN	TLV2622IP —

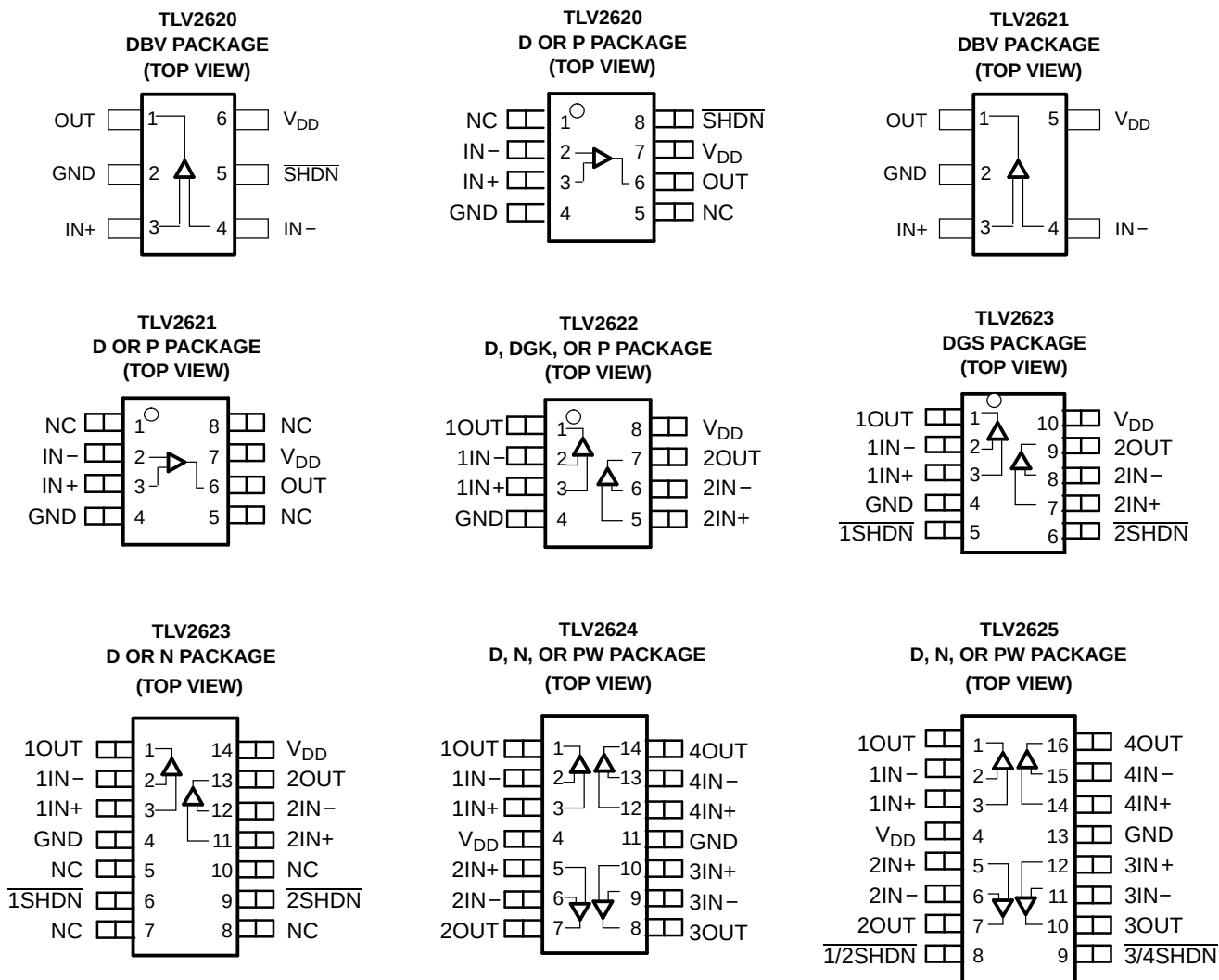
- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
(2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2622IDR).

TLV2624 AND TLV2625 AVAILABLE OPTIONS⁽¹⁾

T _A	V _{IO} max AT 25°C	PACKAGED DEVICES		
		SMALL OUTLINE (D) ⁽²⁾	PLASTIC DIP (N)	TSSOP (PW)
-40°C to 125°C	3500 µV	TLV2624ID TLV2625ID	TLV2624IN TLV2625IN	TLV2624IPW TLV2625IPW

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
(2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2624IDR).

TLV262X PACKAGE PINOUTS⁽¹⁾

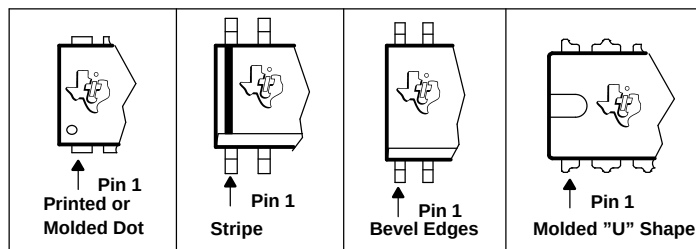


NC – No internal connection

$\overline{1/2SHDN}$ Pin (8) controls amplifiers 1 and 2.
 $\overline{3/4SHDN}$ Pin (9) controls amplifiers 3 and 4.

(1) SOT-23 may or may not be indicated.

TYPICAL PIN 1 INDICATORS



NOTE:

If there is not a Pin 1 indicator, turn device to enable reading the symbol from left to right. Pin 1 is at the lower left corner of the device.

ABSOLUTE MAXIMUM RATINGS

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

V _{DD}	Supply voltage ⁽²⁾	6 V
V _{ID}	Differential input voltage	±V _{DD}
V _I	Input voltage range ⁽²⁾	+1 to V _{DD} + 0.2 V
I _I	Input current (any input)	± 10 mA
I _O	Output current	±40 mA
	Continuous total power dissipation	See Dissipation Rating Table
T _A	Operating free-air temperature range: I-suffix	-40°C to 125°C
T _J	Maximum junction temperature	150°C
T _{stg}	Storage temperature range	-65°C to 150°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	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 voltages, are with respect to GND.

DISSIPATION RATING TABLE

PACKAGE	θ _{JC} (°C/W)	θ _{JA} (°C/W)	T _A ≤ 25°C POWER RATING	T _A = 125°C POWER RATING
D (8)	38.3	176	710 mW	142 mW
D (14)	26.9	122.3	1022 mW	204.4 mW
D (16)	25.7	114.7	1090 mW	218 mW
DBV (5)	55	324.1	385 mW	77.1 mW
DBV (6)	55	294.3	425 mW	85 mW
DGK (8)	54.2	259.9	481 mW	96.1 mW
DGS (10)	54.1	259.7	485 mW	97 mW
N (14, 16)	32	78	1600 mW	320.5 mW
P (8)	41	104	1200 mW	240.4 mW
PW (14)	29.3	173.6	720 mW	144 mW
PW (16)	28.7	161.4	774 mW	154.9 mW

RECOMMENDED OPERATING CONDITIONS

			MIN	MAX	UNIT
V _{DD}	Supply voltage	Single supply	2.7	5.5	V
		Split supply	±1.35	±2.75	
V _{ICR}	Common-mode input voltage range		1	V _{DD} +0.2	V
T _A	Operating free-air temperature	I-suffix	-40	125	°C
	Shutdown on/off voltage level ⁽¹⁾	V _{IL}	0.4		V
		V _{IH}	2		

- (1) Relative to GND.

ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{DD} = 2.7\text{ V}$, 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T _A ⁽¹⁾	MIN	TYP	MAX	UNIT
DC PERFORMANCE								
V _{IO}	Input offset voltage	V _{IC} = V _{DD} /2, V _O = V _{DD} /2, R _S = 50 Ω		25°C	250	3500	μV	
				Full range	4500			
α _{VIO}	Temperature coefficient of input offset voltage			25°C	3		μV/°C	
CMRR	Common-mode rejection ratio	V _{IC} = 1 to V _{DD} , R _S = 50 Ω	V _{DD} = 2.7 V	25°C	77	98	dB	
				Full range	63			
			V _{DD} = 5 V	25°C	78	99		
				Full range	75			
A _{VD}	Large-signal differential voltage amplification	V _{DD} = 2.7 V, R _L = 2 kΩ, V _{O(PP)} = 1.7 V		25°C	90	100	dB	
				Full range	82			
		V _{DD} = 5 V, R _L = 2 kΩ, V _{O(PP)} = 4 V		25°C	95	100		
				Full range	90			
INPUT CHARACTERISTICS								
I _{IO}	Input offset current	V _{IC} = V _{DD} /2, V _O = V _{DD} /2, R _S = 50Ω		25°C	2	50	pA	
				Full Range	100			
I _{IB}	Input bias current			25°C	2	50		
				Full Range	200			
r _{I(d)}	Differential input resistance			25°C	100		GΩ	
C _{i(c)}	Common-mode input capacitance	f = 1 kHz		25°C	8		pF	
OUTPUT CHARACTERISTICS								
V _{OH}	High-level output voltage	V _{IC} = V _{DD} /2, I _{OH} = -1 mA	V _{DD} = 2.7 V	25°C	2.6	2.67	V	
				Full range	2.55			
			V _{DD} = 5 V	25°C	4.95	4.98		
				Full range	4.9			
		V _{IC} = V _{DD} /2, I _{OH} = -10 mA	V _{DD} = 2.7 V	25°C	2.3	2.43		
				Full range	2.2			
			V _{DD} = 5 V	25°C	4.7	4.8		
				Full range	4.6			
V _{OL}	Low-level output voltage	V _{IC} = V _{DD} /2, I _{OL} = 1 mA	V _{DD} = 2.7 V	25°C	0.03	0.1	V	
				Full range	0.15			
			V _{DD} = 5 V	25°C	0.025	0.05		
				Full range	0.1			
		V _{IC} = V _{DD} /2, I _{OL} = 10 mA	V _{DD} = 2.7 V	25°C	0.26	0.4		
				Full range	0.45			
			V _{DD} = 5 V	25°C	0.2	0.25		
				Full range	0.35			
I _O	Output current	V _{DD} = 2.7 V, V _O = 0.5 V from rail	Sourcing	25°C	14	mA		
			Sinking		19			
		V _{DD} = 5 V, V _O = 0.5 V from rail	Sourcing		28			
			Sinking		28			
I _{OS}	Short-circuit output current	Sourcing	V _{DD} = 2.7 V	25°C	50	mA		
			V _{DD} = 5 V		95			
		Sinking	V _{DD} = 2.7 V		50			
			V _{DD} = 5 V		95			

(1) Full range is -40°C to 125°C for the I-suffix.

ELECTRICAL CHARACTERISTICS (continued)

at specified free-air temperature, $V_{DD} = 2.7\text{ V}$, 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T _A ⁽¹⁾	MIN	TYP	MAX	UNIT
POWER SUPPLY								
I _{DD}	Supply current (per channel)	V _O = V _{DD} /2, $\overline{\text{SHDN}}$ = V _{DD}		25°C	800	1000		μA
				Full range	1300			
PSRR	Supply voltage rejection ratio (ΔV _{DD} /ΔV _{IO})	V _{DD} = 2.7 V to 3.3 V, V _{IC} = V _{DD} /2	No load	25°C	80	98		dB
				Full range	75			
		V _{DD} = 2.7 V to 5 V, V _{IC} = V _{DD} /2		25°C	75	90		
				Full range	70			
DYNAMIC PERFORMANCE								
UGBW	Unity gain bandwidth	R _L = 2 kΩ, C _L = 10 pF		25°C	11			MHz
SR+	Positive slew rate at unity gain	R _L = 2 kΩ, C _L = 50 pF	V _{DD} = 2.7 V, V _{O(PP)} = 1.7 V	25°C	3.5	4.5		V/μs
				Full range	2.7			
			V _{DD} = 5 V, V _{O(PP)} = 3.5 V	25°C	5.4	7		
				Full range	3.4			
SR-	Negative slew rate at unity gain	R _L = 2 kΩ, C _L = 50 pF	V _{DD} = 2.7 V, V _{O(PP)} = 1.7 V	25°C	2.7	5		V/μs
				Full range	2.3			
			V _{DD} = 5 V, V _{O(PP)} = 3.5 V	25°C	4.5	6		
				Full range	3.2			
φ _m	Phase margin	R _L = 2 kΩ, C _L = 10 pF		25°C	63°			dB
	Gain margin				8			
NOISE/DISTORTION PERFORMANCE								
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = V _{DD} /2, R _L = 2 kΩ, f = 10 kHz	A _V = 1	25°C	0.002%			
			A _V = 10		0.019%			
			A _V = 100		0.095%			
V _n	Equivalent input noise voltage	f = 1 kHz	53		nV/√Hz			
		f = 10 kHz	27					
I _n	Equivalent input noise current	f = 1 kHz			0.9		fA/√Hz	
SHUTDOWN CHARACTERISTICS								
I _{DD(SHDN)}	Supply current, per channel in shutdown mode (TLV2620, TLV2623, TLV2625)	$\overline{\text{SHDN}}$ = 0.4 V		25°C	4	11	μA	
				Full range	13			
t _(on)	Amplifier turnon time ⁽²⁾	R _L = 2 kΩ	V _{DD} = 2.7 V	25°C	4.5		μs	
			V _{DD} = 5 V		1.5			
t _(off)	Amplifier turnoff time ⁽²⁾	R _L = 2 kΩ			200		ns	

(2) Disable time and enable time are defined as the interval between application of the logic signal to $\overline{SHDN}$ and the point at which the supply current has reached half its final value.

TYPICAL CHARACTERISTICS

TABLE OF GRAPHS

			FIGURE
V_{IO}	Input offset voltage	vs Common-mode input voltage	1, 2
CMRR	Common-mode rejection ratio	vs Frequency	3
V_{OH}	High-level output voltage	vs High-level output current	4, 6
V_{OL}	Low-level output voltage	vs Low-level output current	5, 7
I_{DD}	Supply current	vs Supply voltage	8
I_{DD}	Supply current	vs Free-air temperature	9
PSRR	Power supply rejection ratio	vs Frequency	10
A_{VD}	Differential voltage amplification & phase	vs Frequency	11
	Gain-bandwidth product	vs Free-air temperature	12
SR	Slew rate	vs Supply voltage	13
		vs Free-air temperature	14, 15
ϕ_m	Phase margin	vs Load capacitance	16
V_n	Equivalent input noise voltage	vs Frequency	17
	Voltage-follower large-signal pulse response		18
	Voltage-follower small-signal pulse response		19
	Crosstalk	vs Frequency	20
$I_{DD(SHDN)}$	Shutdown supply current	vs Free-air temperature	21
$I_{DD(SHDN)}$	Shutdown supply current	vs Supply voltage	22
$I_{DD(SHDN)}$	Shutdown supply current/output voltage	vs Time	23

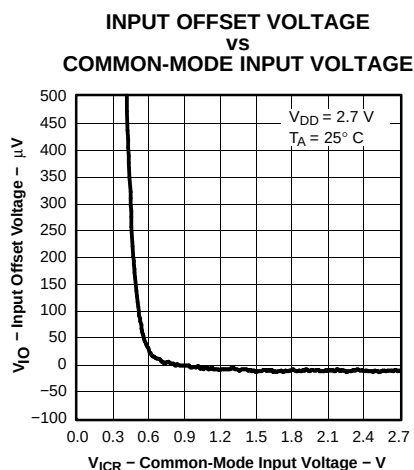


Figure 1.

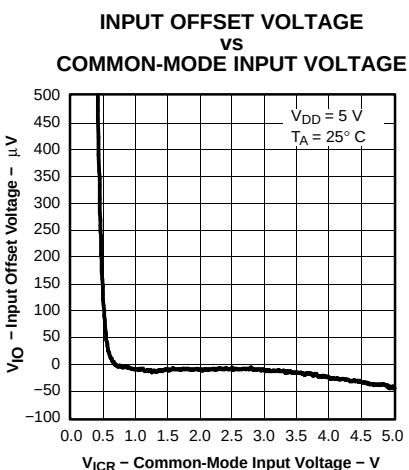


Figure 2.

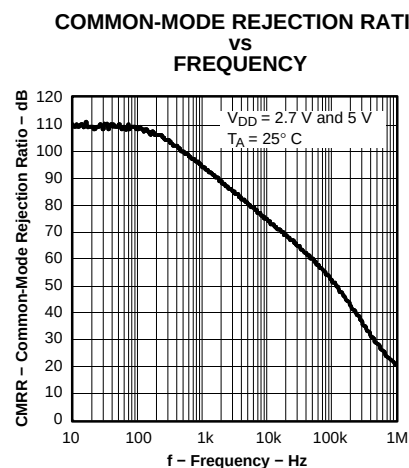


Figure 3.

**HIGH-LEVEL OUTPUT VOLTAGE
VS
HIGH-LEVEL OUTPUT CURRENT**

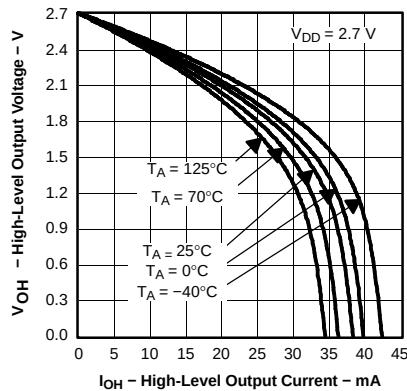


Figure 4.

**LOW-LEVEL OUTPUT VOLTAGE
VS
LOW-LEVEL OUTPUT CURRENT**

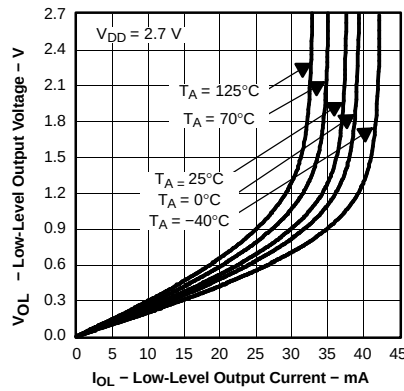


Figure 5.

**HIGH-LEVEL OUTPUT VOLTAGE
VS
HIGH-LEVEL OUTPUT CURRENT**

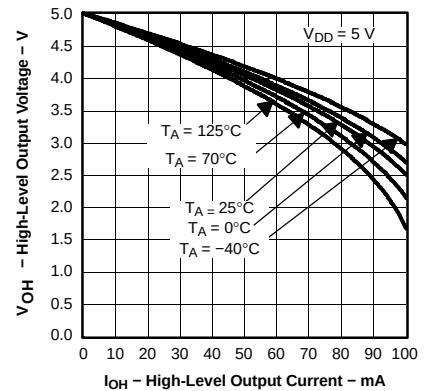


Figure 6.

**LOW-LEVEL OUTPUT VOLTAGE
VS
LOW-LEVEL OUTPUT CURRENT**

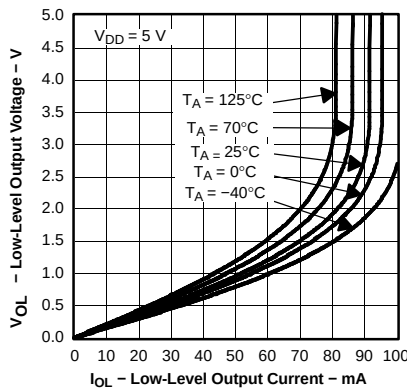


Figure 7.

**SUPPLY CURRENT
VS
SUPPLY VOLTAGE**

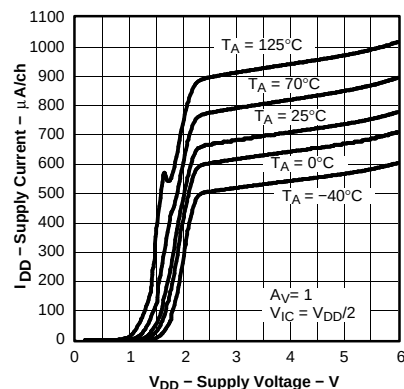


Figure 8.

**SUPPLY CURRENT
VS
FREE-AIR TEMPERATURE**

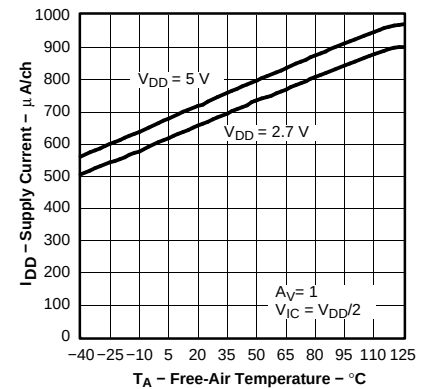


Figure 9.

**POWER SUPPLY REJECTION RATIO
VS
FREQUENCY**

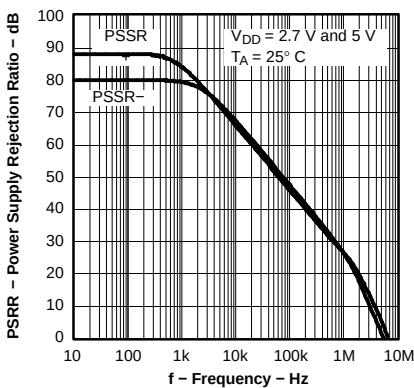


Figure 10.

**DIFFERENTIAL VOLTAGE
AMPLIFICATION AND PHASE
VS
FREQUENCY**

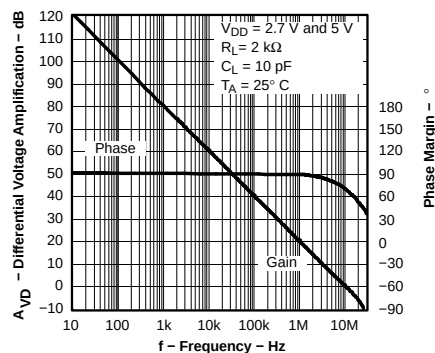


Figure 11.

**GAIN-BANDWIDTH PRODUCT
VS
FREE-AIR TEMPERATURE**

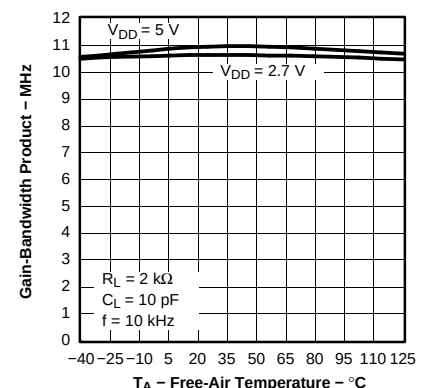


Figure 12.

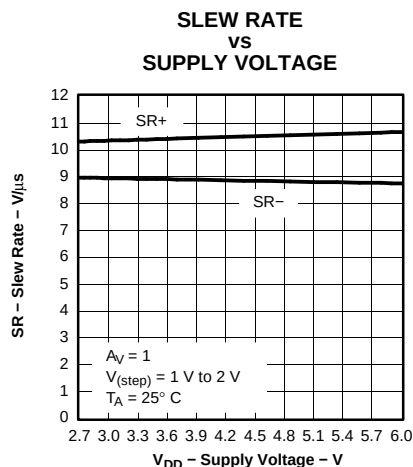


Figure 13.

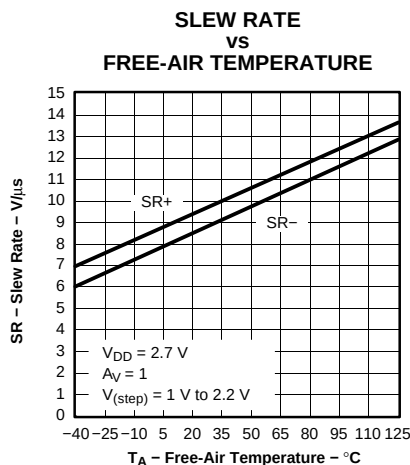


Figure 14.

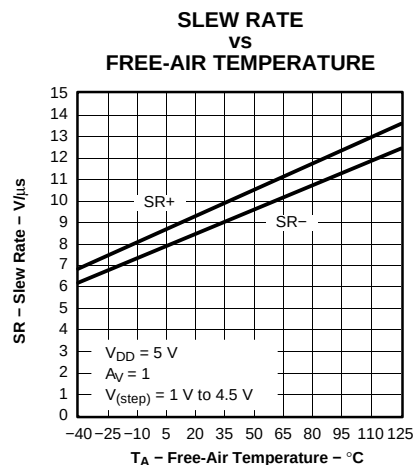


Figure 15.

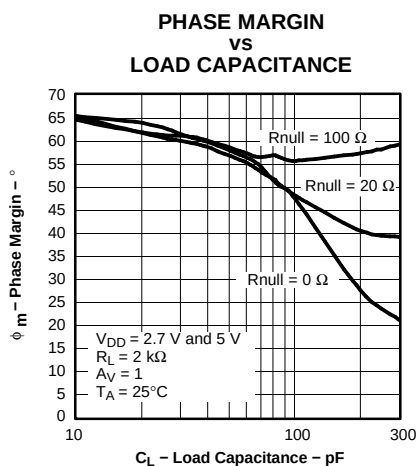


Figure 16.

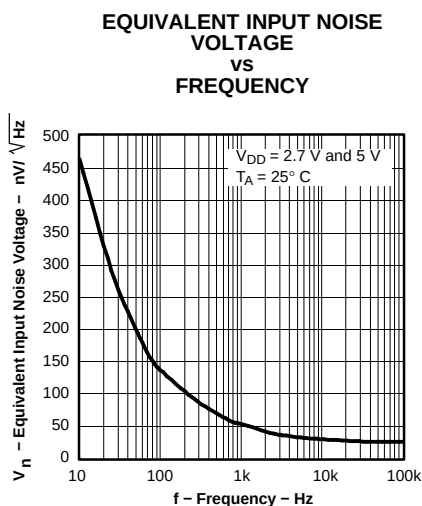


Figure 17.

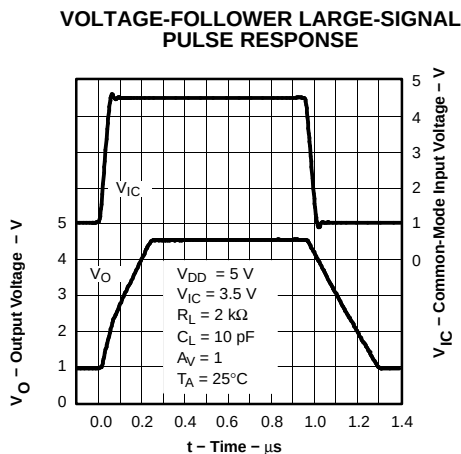


Figure 18.

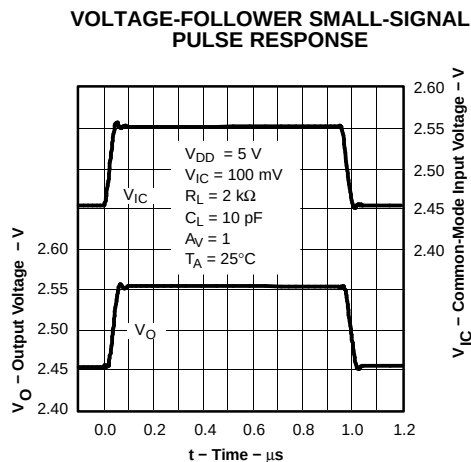


Figure 19.

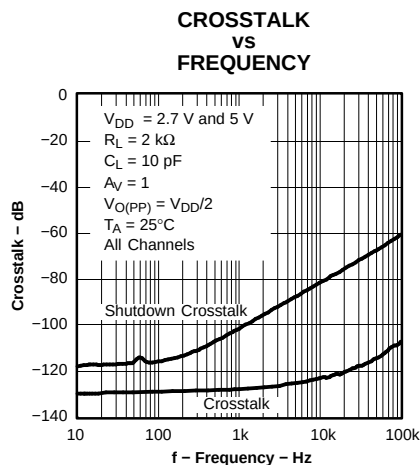


Figure 20.

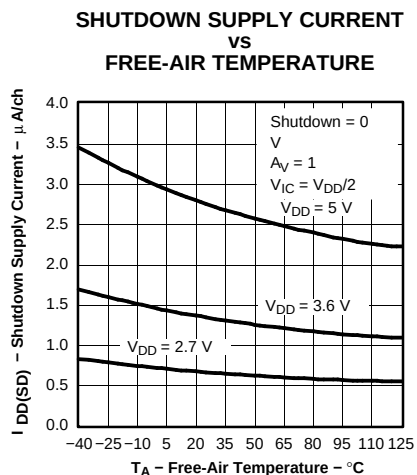


Figure 21.

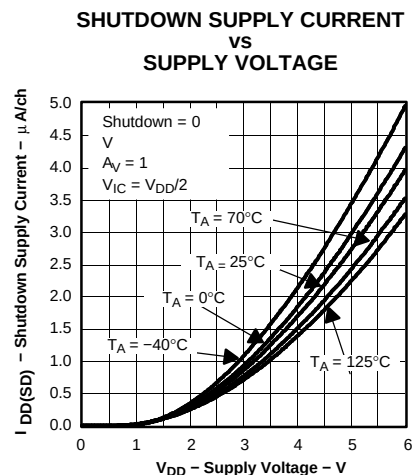


Figure 22.

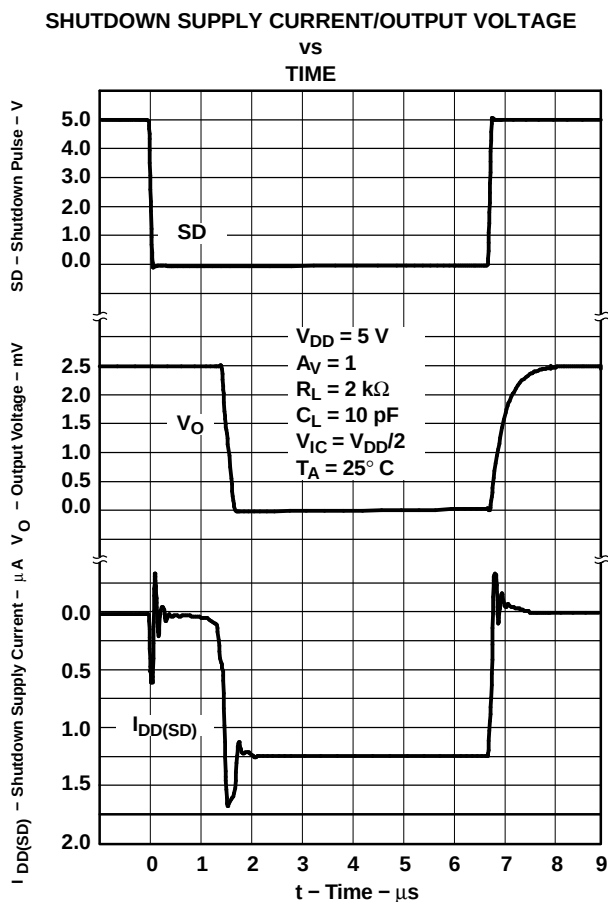


Figure 23.

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)
TLV2620IDBVR	Active	Production	SOT-23 (DBV) 6	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBAI
TLV2620IDBVR.A	Active	Production	SOT-23 (DBV) 6	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBAI
TLV2620IDBVT	Active	Production	SOT-23 (DBV) 6	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBAI
TLV2620IDBVT.A	Active	Production	SOT-23 (DBV) 6	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBAI
TLV2620IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2620I
TLV2620IDR.A	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2620I
TLV2621IDBVR	Active	Production	SOT-23 (DBV) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBBI
TLV2621IDBVR.A	Active	Production	SOT-23 (DBV) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBBI
TLV2621IDBVT	Active	Production	SOT-23 (DBV) 5	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBBI
TLV2621IDBVT.A	Active	Production	SOT-23 (DBV) 5	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	VBBI
TLV2621IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2621I
TLV2621IDR.A	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2621I
TLV2622ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2622I
TLV2622ID.A	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2622I
TLV2622IDGKR	Active	Production	VSSOP (DGK) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AKM
TLV2622IDGKR.A	Active	Production	VSSOP (DGK) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AKM
TLV2622IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2622I
TLV2622IDR.A	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2622I
TLV2623IDGS	Active	Production	VSSOP (DGS) 10	80 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	ALC
TLV2623IDGS.A	Active	Production	VSSOP (DGS) 10	80 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	ALC
TLV2623IDGSR	Active	Production	VSSOP (DGS) 10	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	ALC
TLV2623IDGSR.A	Active	Production	VSSOP (DGS) 10	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	ALC
TLV2624ID	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624ID.A	Active	Production	SOIC (D) 14	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624IDR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624IDR.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624IPW	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624IPW.A	Active	Production	TSSOP (PW) 14	90 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I
TLV2624IPWR	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I

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)
TLV2624IPWR.A	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	2624I

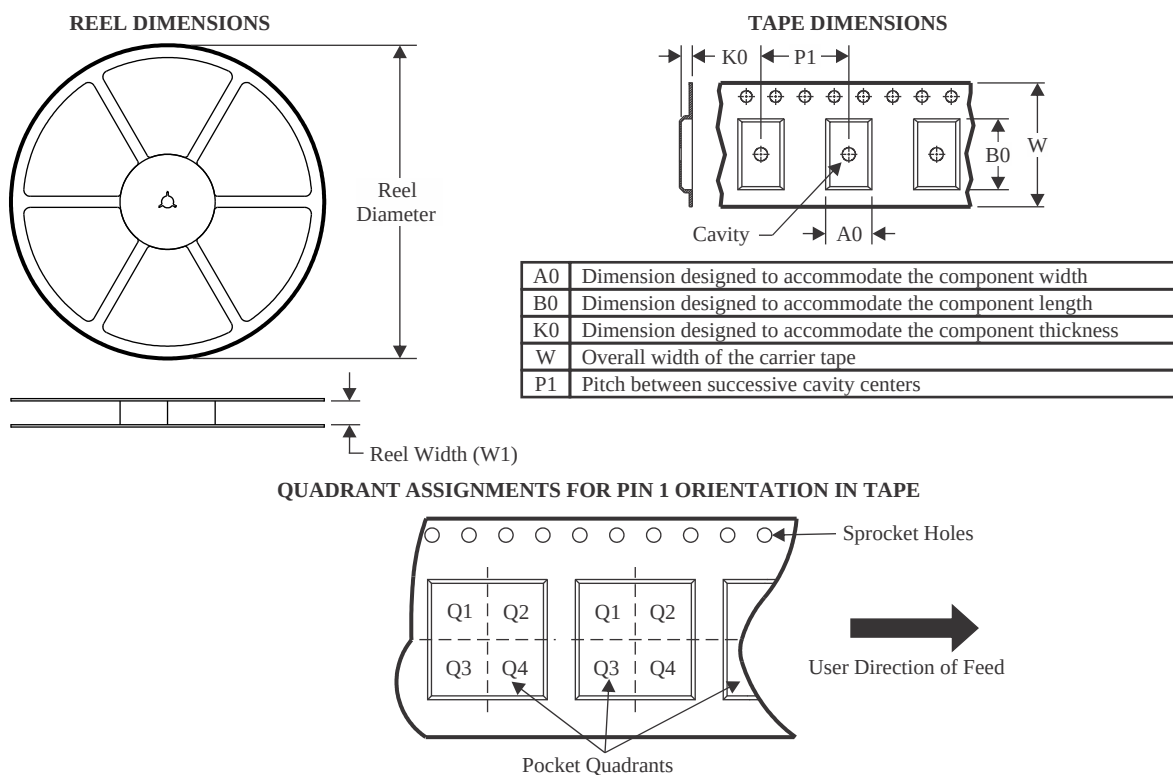
- ⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).
- ⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, 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.

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.

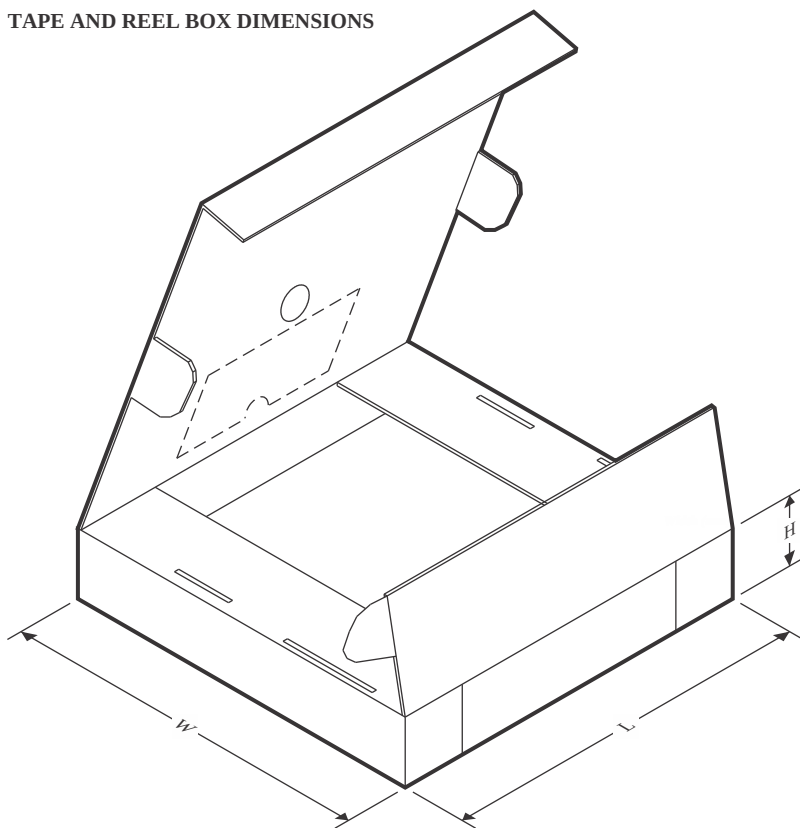
TAPE AND REEL INFORMATION



*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
TLV2620IDBVR	SOT-23	DBV	6	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV2620IDBVT	SOT-23	DBV	6	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV2620IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV2621IDBVR	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV2621IDBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV2621IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV2622IDGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TLV2622IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV2623IDGSR	VSSOP	DGS	10	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TLV2624IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLV2624IPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

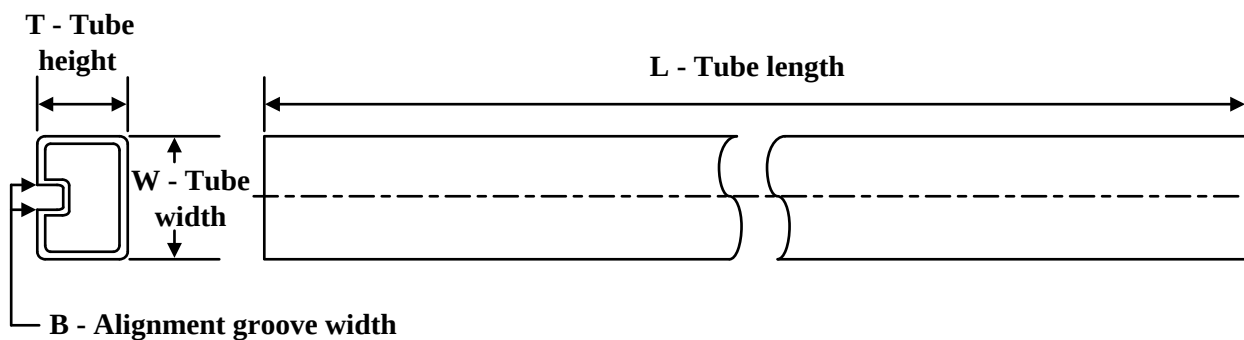
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV2620IDBVR	SOT-23	DBV	6	3000	182.0	182.0	20.0
TLV2620IDBVT	SOT-23	DBV	6	250	182.0	182.0	20.0
TLV2620IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLV2621IDBVR	SOT-23	DBV	5	3000	182.0	182.0	20.0
TLV2621IDBVT	SOT-23	DBV	5	250	182.0	182.0	20.0
TLV2621IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLV2622IDGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TLV2622IDR	SOIC	D	8	2500	353.0	353.0	32.0
TLV2623IDGSR	VSSOP	DGS	10	2500	358.0	335.0	35.0
TLV2624IDR	SOIC	D	14	2500	353.0	353.0	32.0
TLV2624IPWR	TSSOP	PW	14	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

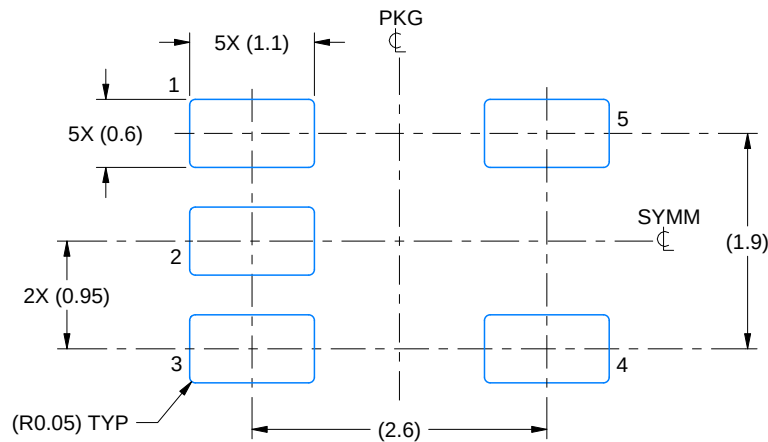
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TLV2622ID	D	SOIC	8	75	507	8	3940	4.32
TLV2622ID.A	D	SOIC	8	75	507	8	3940	4.32
TLV2623IDGS	DGS	VSSOP	10	80	274	6.2	2540	2.5
TLV2623IDGS.A	DGS	VSSOP	10	80	274	6.2	2540	2.5
TLV2624ID	D	SOIC	14	50	507	8	3940	4.32
TLV2624ID.A	D	SOIC	14	50	507	8	3940	4.32
TLV2624IPW	PW	TSSOP	14	90	530	10.2	3600	3.5
TLV2624IPW.A	PW	TSSOP	14	90	530	10.2	3600	3.5

EXAMPLE BOARD LAYOUT

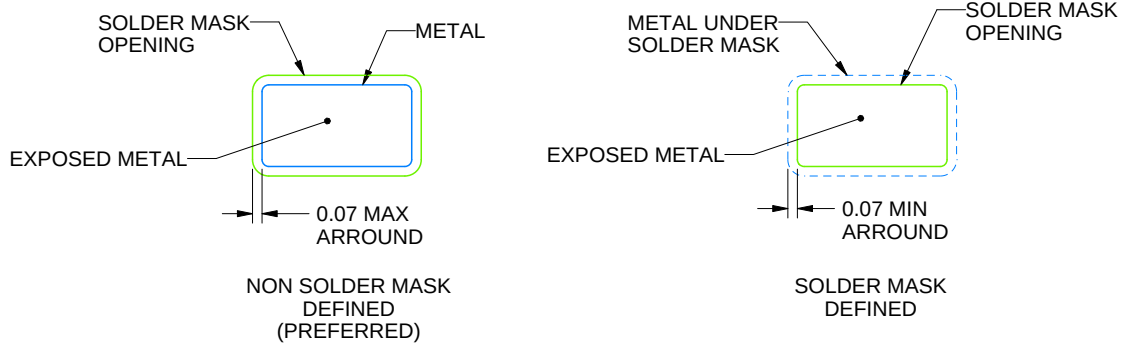
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/K 08/2024

NOTES: (continued)

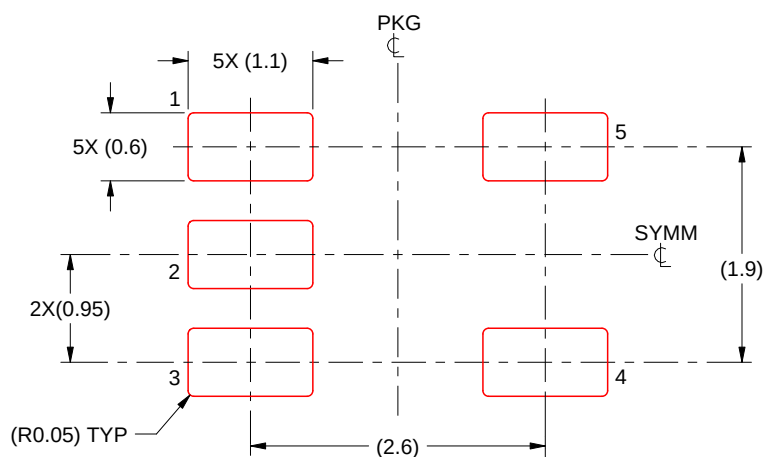
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR

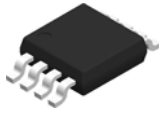


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

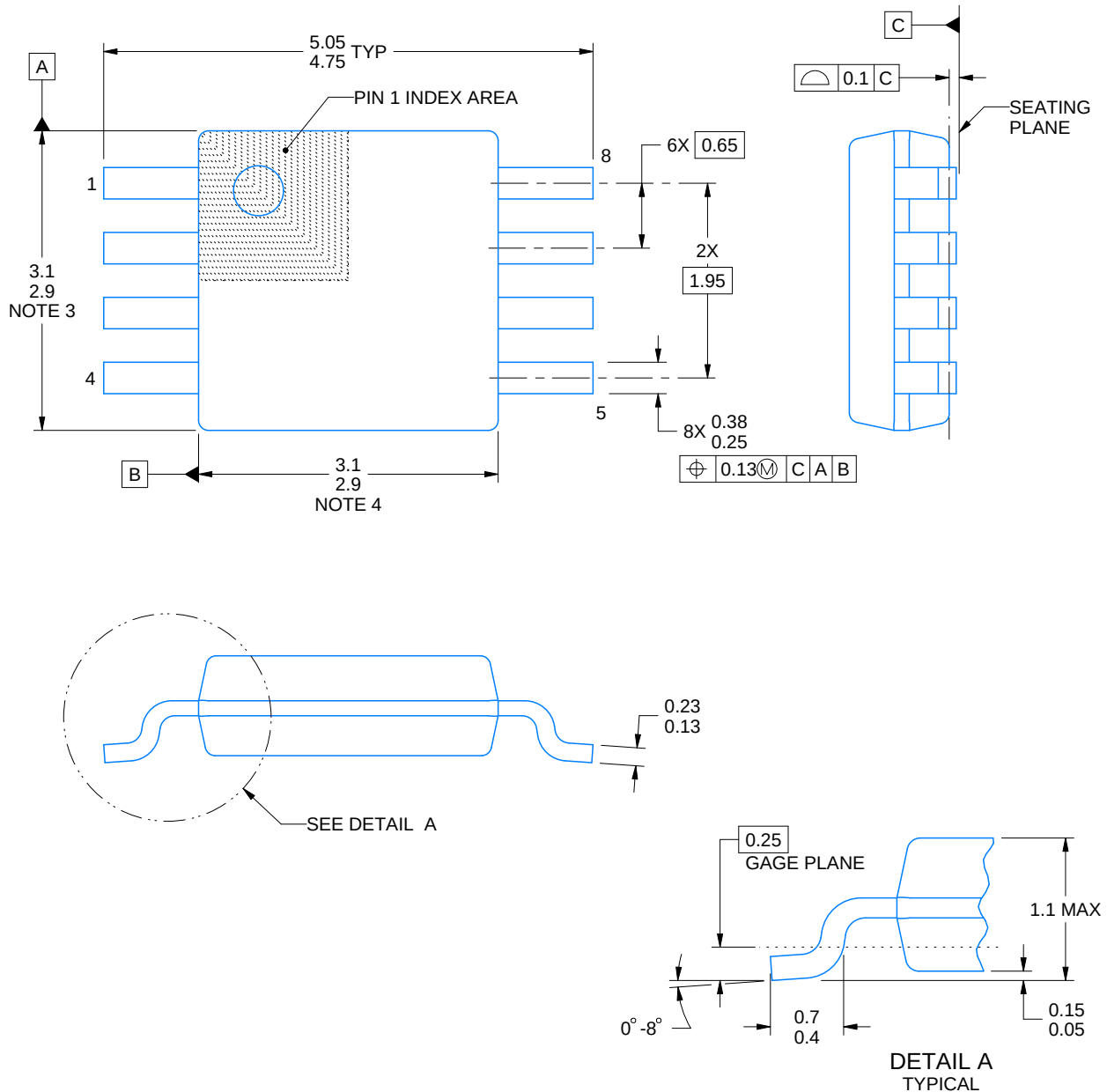
4214839/K 08/2024

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.

DGK0008A**PACKAGE OUTLINE****VSSOP - 1.1 mm max height**

SMALL OUTLINE PACKAGE



4214862/A 04/2023

NOTES:

PowerPAD is a trademark of Texas Instruments.

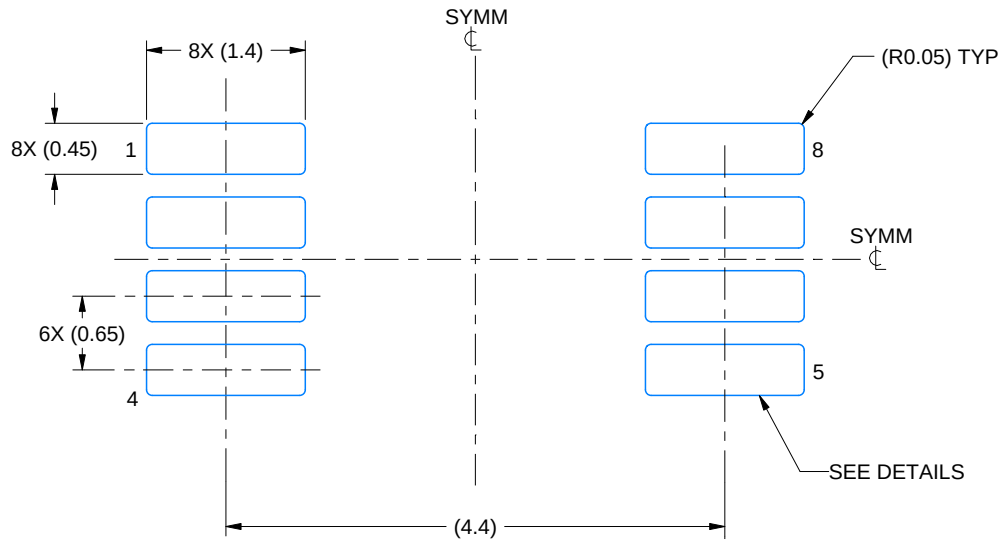
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE BOARD LAYOUT

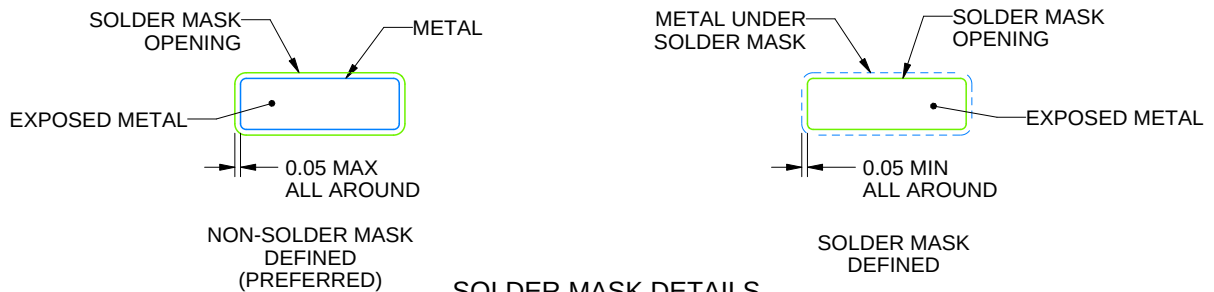
DGK0008A

™ VSSOP - 1.1 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 15X



SOLDER MASK DETAILS

4214862/A 04/2023

NOTES: (continued)

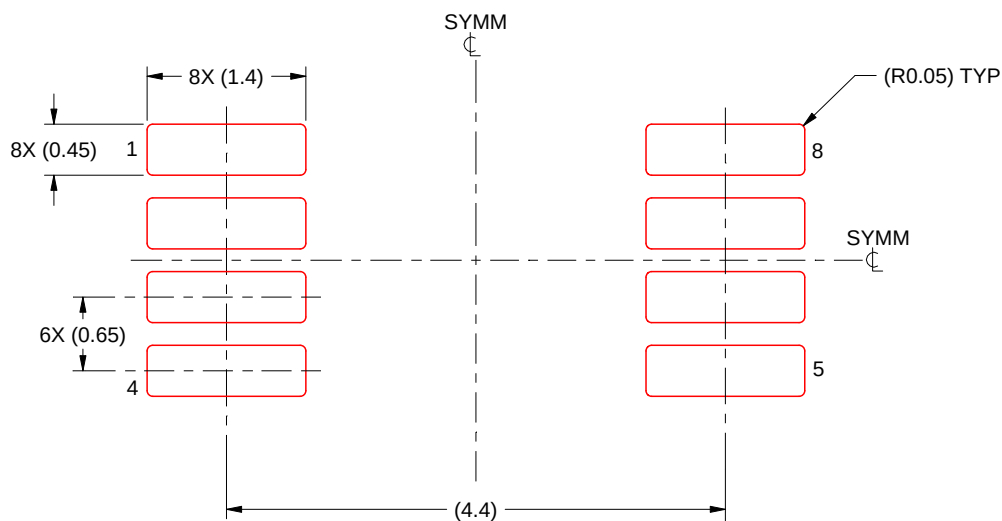
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.
9. Size of metal pad may vary due to creepage requirement.

EXAMPLE STENCIL DESIGN

DGK0008A

TM VSSOP - 1.1 mm max height

SMALL OUTLINE PACKAGE

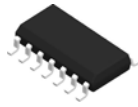


SOLDER PASTE EXAMPLE
SCALE: 15X

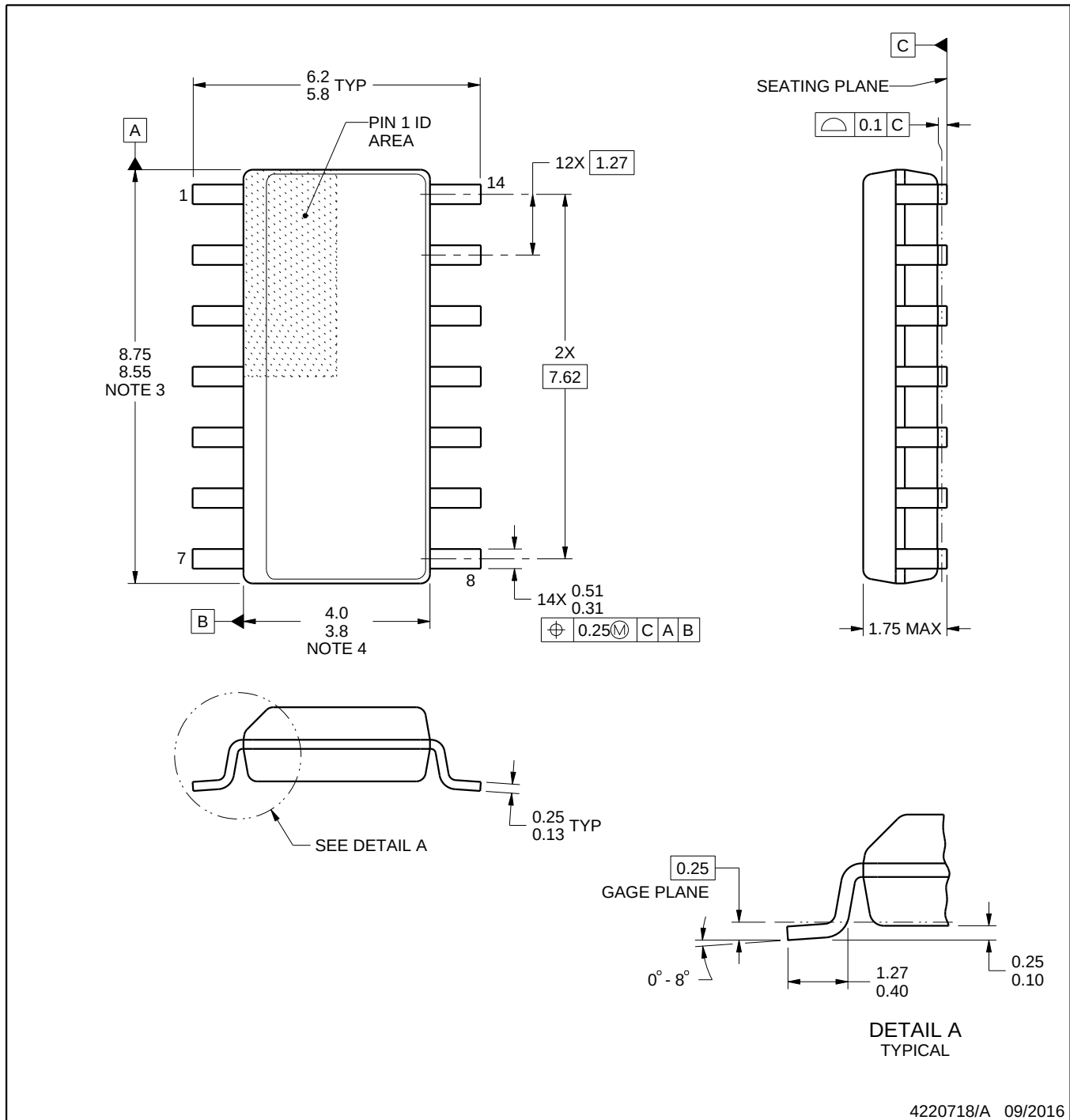
4214862/A 04/2023

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.

D0014A**PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

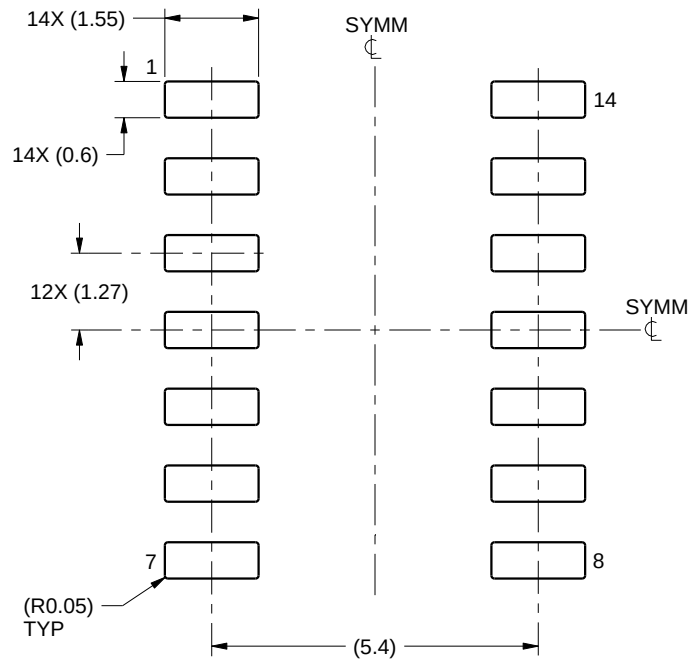
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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-012, variation AB.

EXAMPLE BOARD LAYOUT

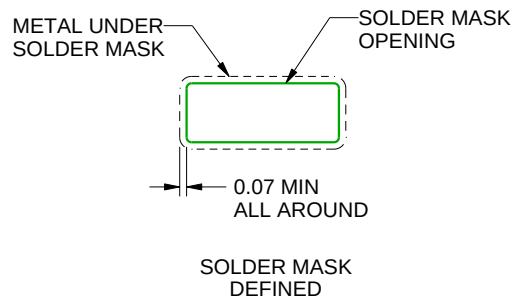
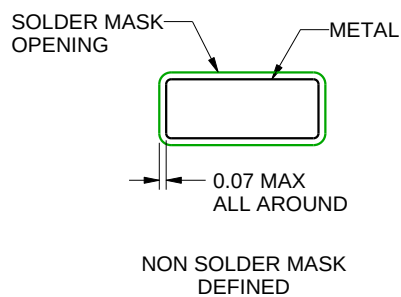
D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

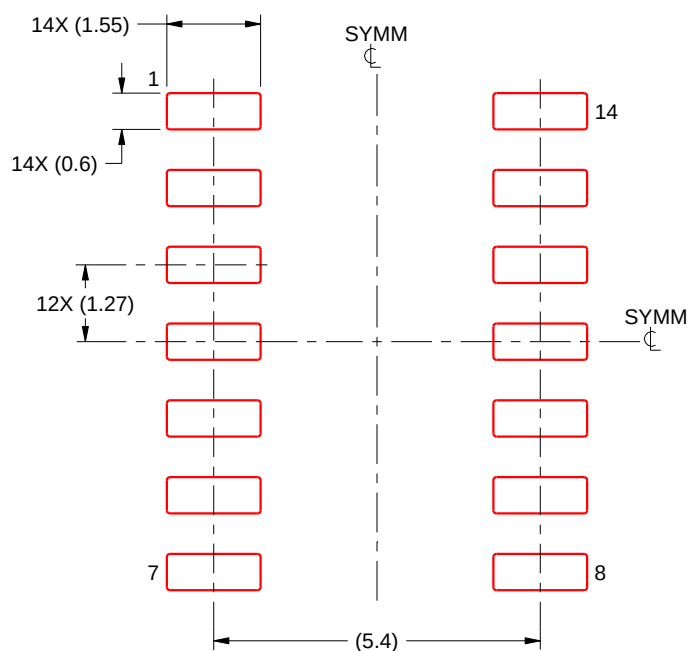
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

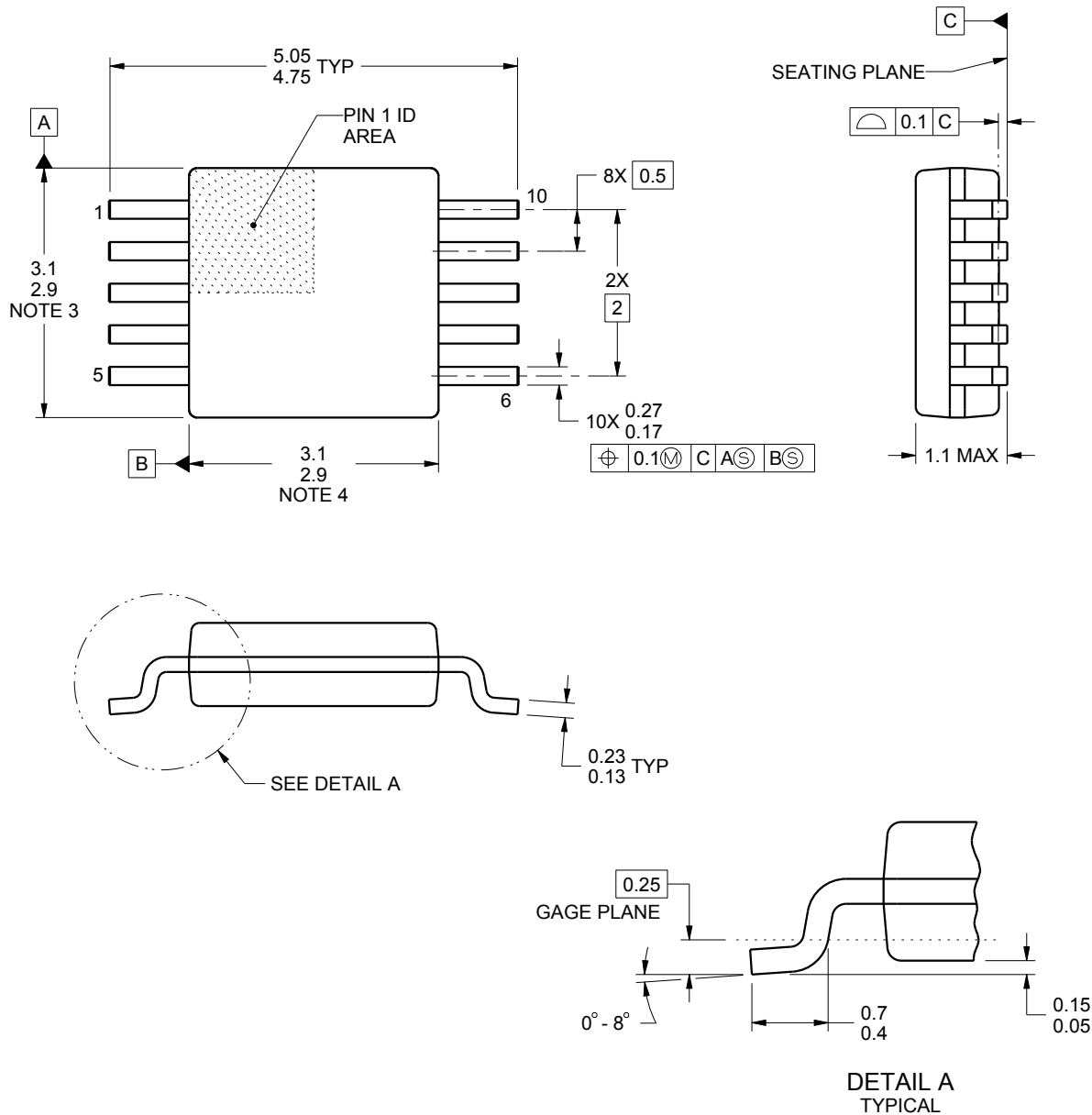


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:8X

4220718/A 09/2016

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.



4221984/A 05/2015

NOTES:

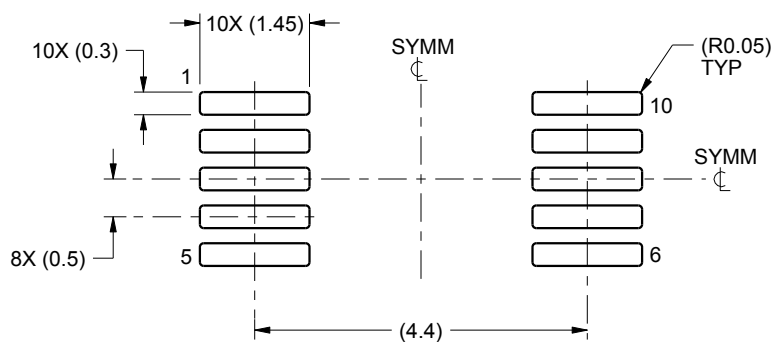
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE BOARD LAYOUT

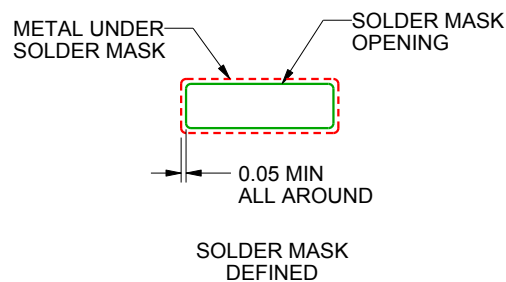
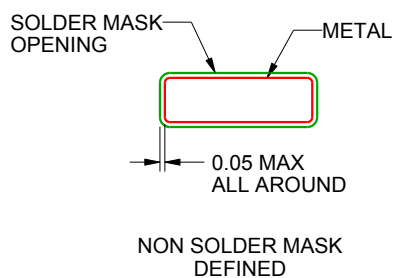
DGS0010A

VSSOP - 1.1 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:10X



SOLDER MASK DETAILS
NOT TO SCALE

4221984/A 05/2015

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

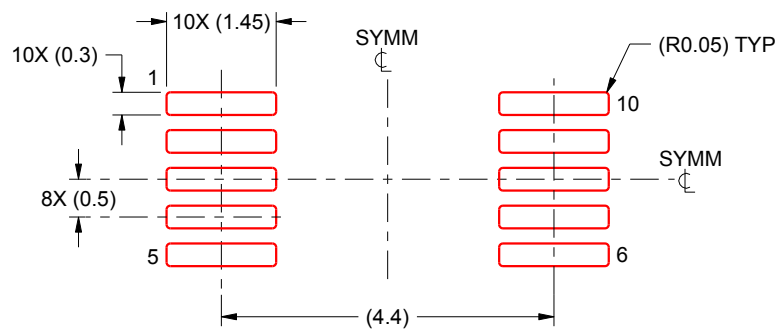
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DGS0010A

VSSOP - 1.1 mm max height

SMALL OUTLINE PACKAGE

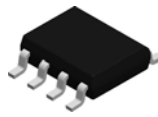


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:10X

4221984/A 05/2015

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.

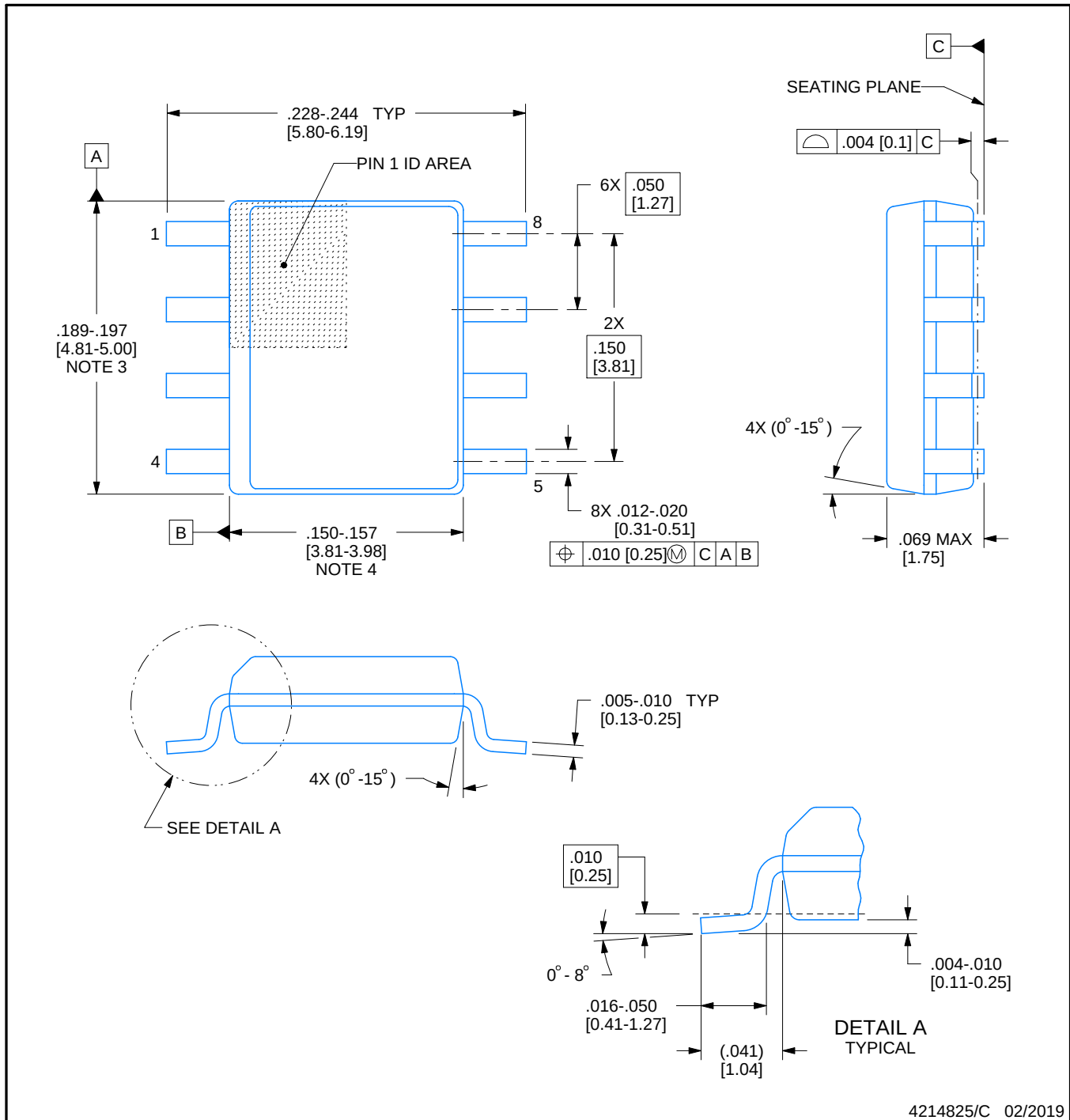


D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

NOTES:

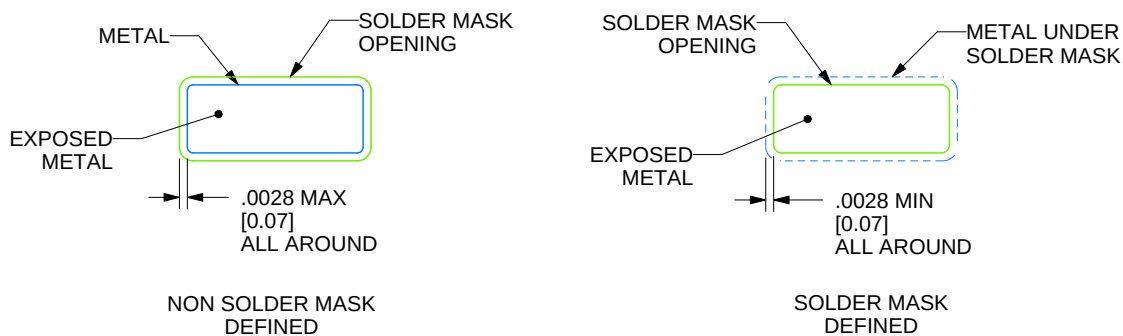
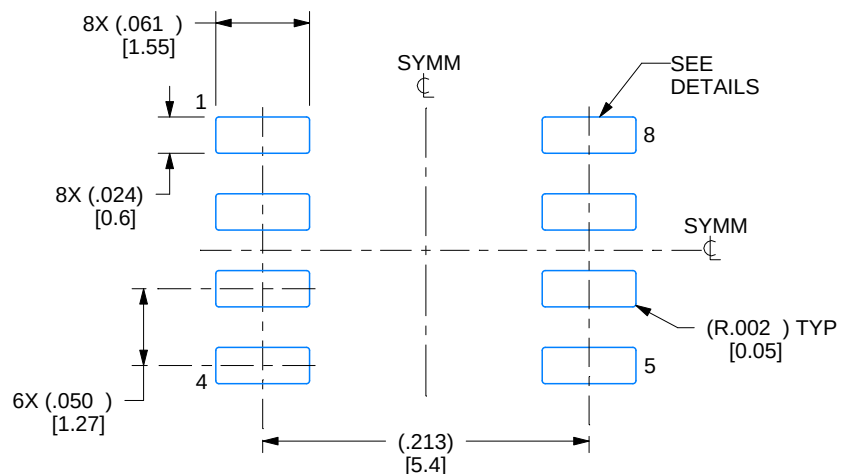
1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate 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.

EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

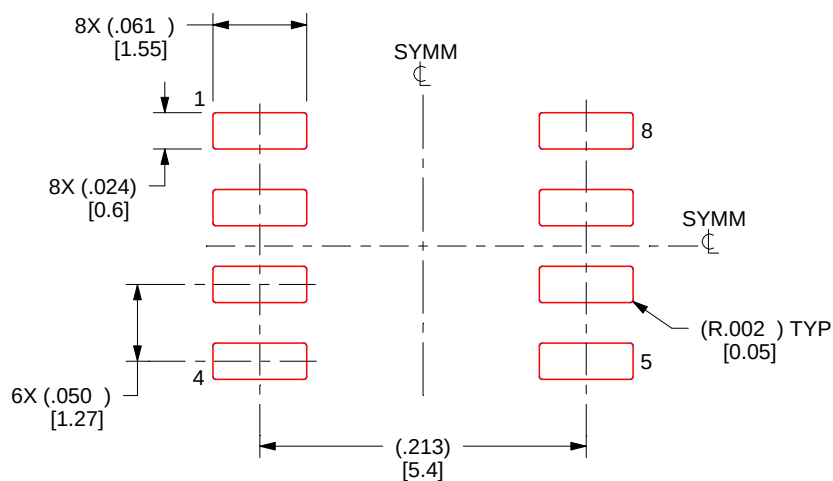
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

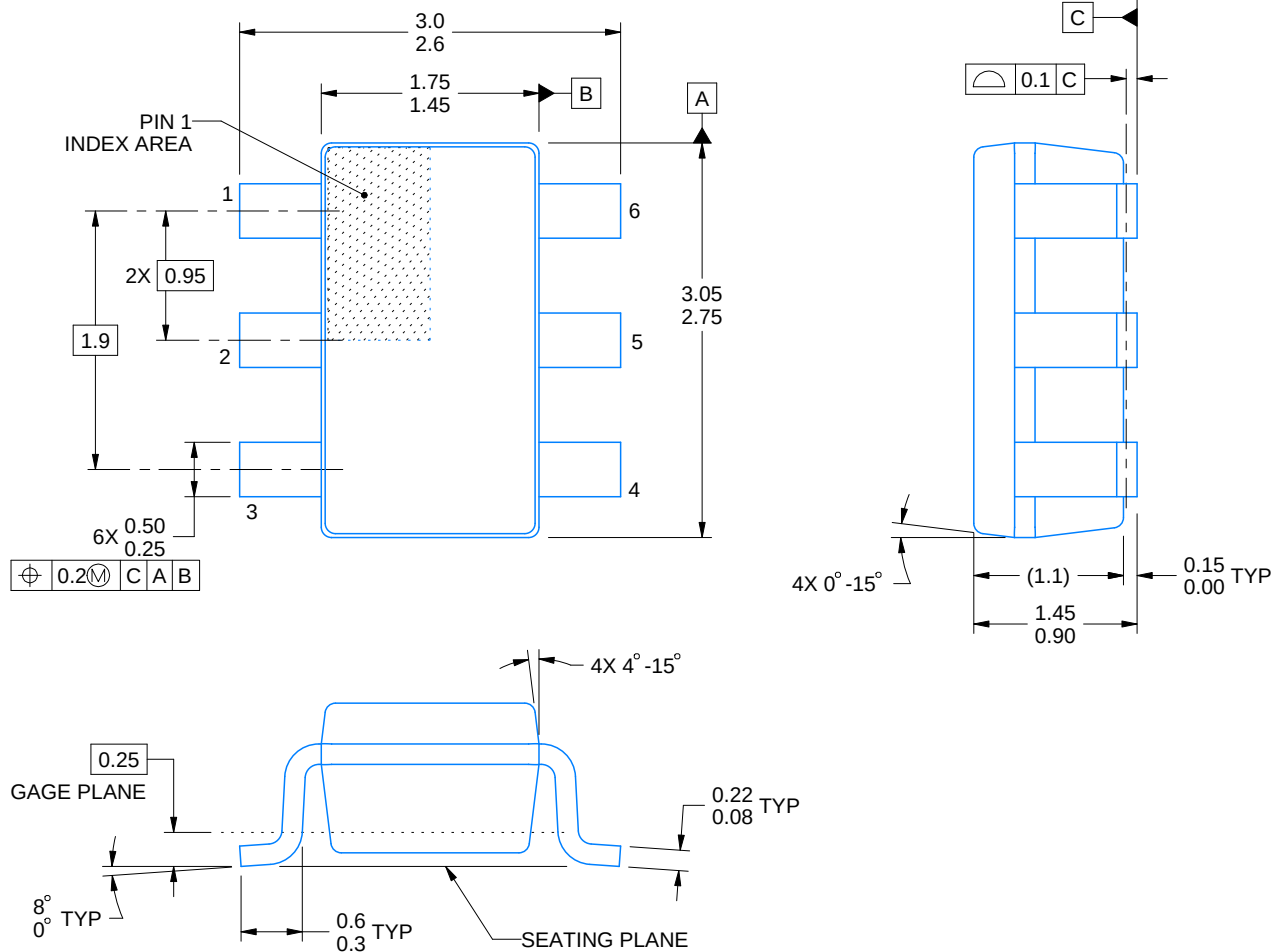
DBV0006A



PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



4214840/G 08/2024

NOTES:

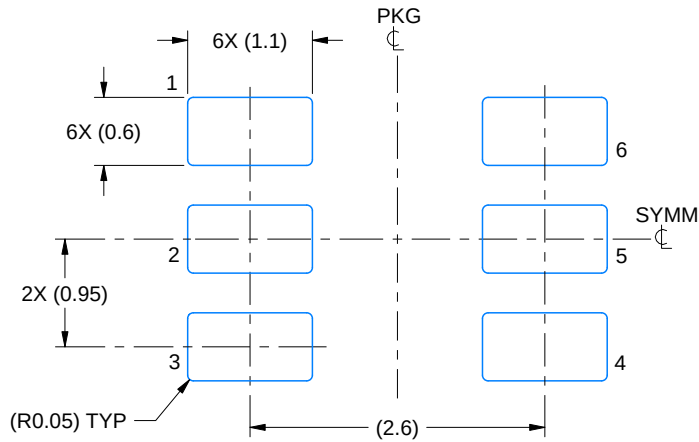
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.25 per side.
4. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
5. Reference JEDEC MO-178.

EXAMPLE BOARD LAYOUT

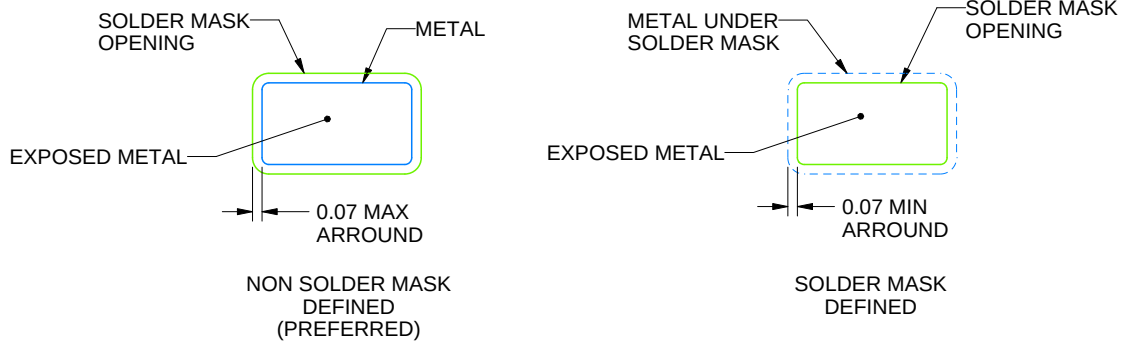
DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214840/G 08/2024

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

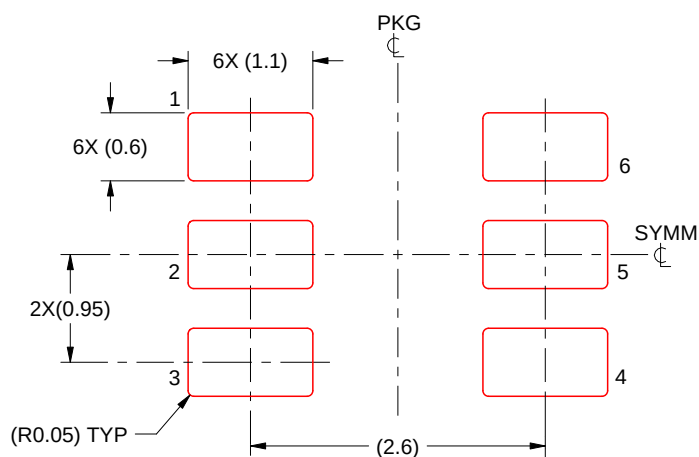
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR

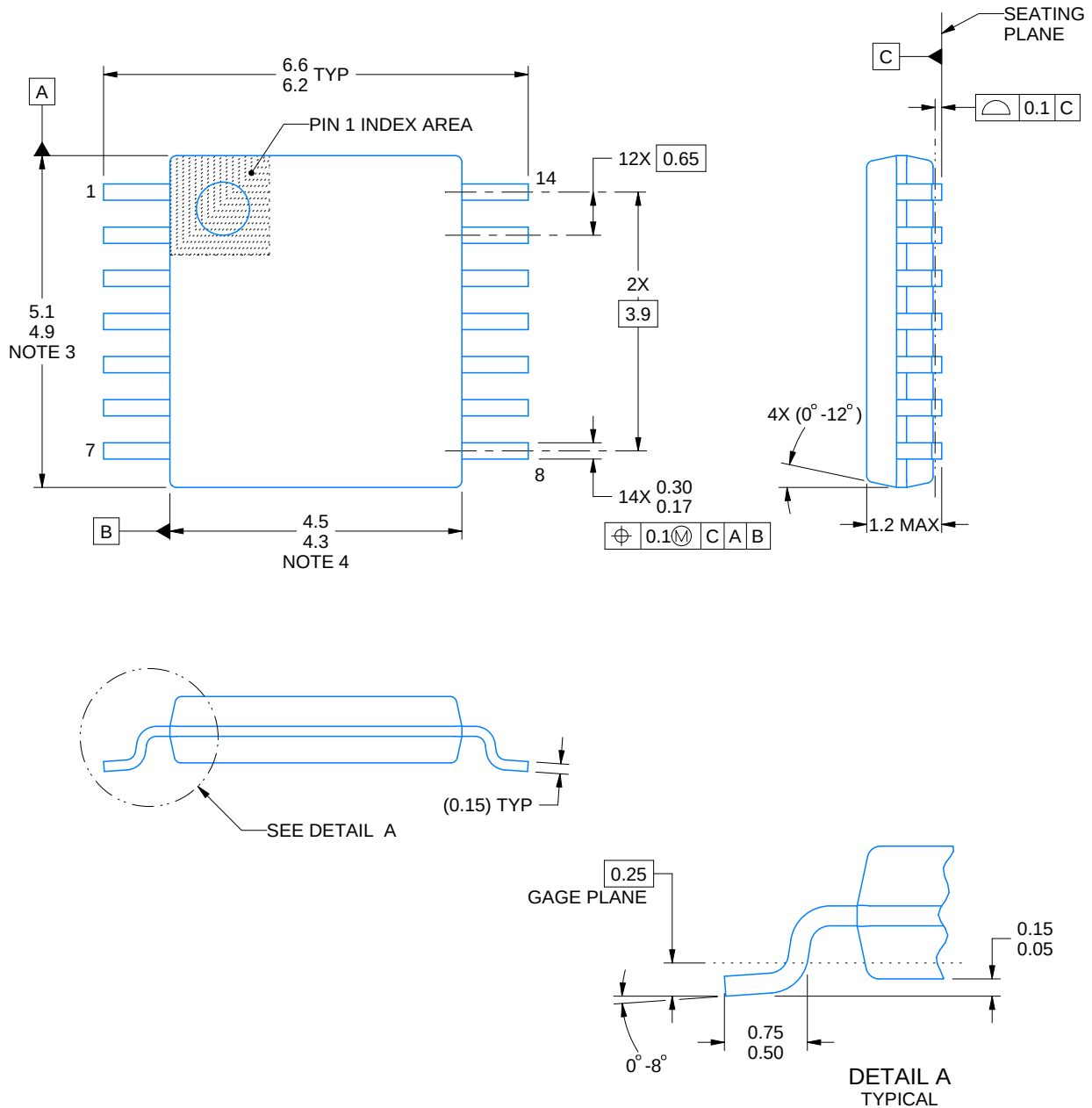
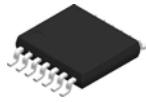


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214840/G 08/2024

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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NOTES:

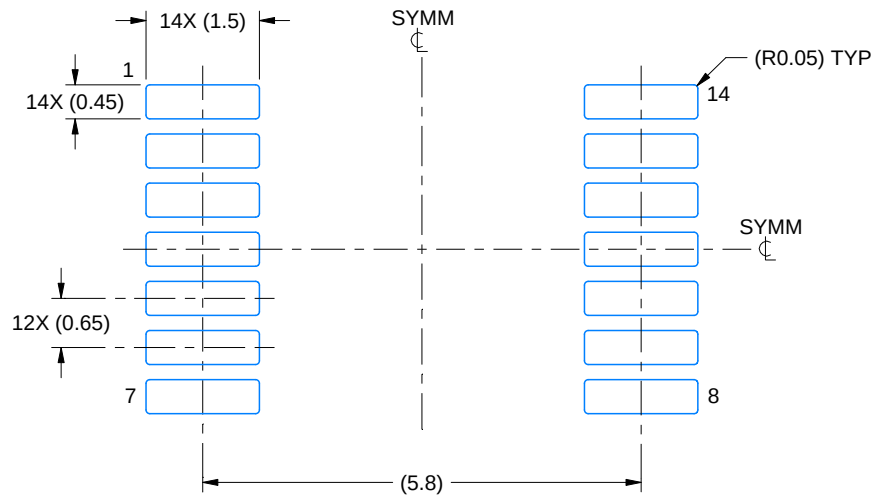
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

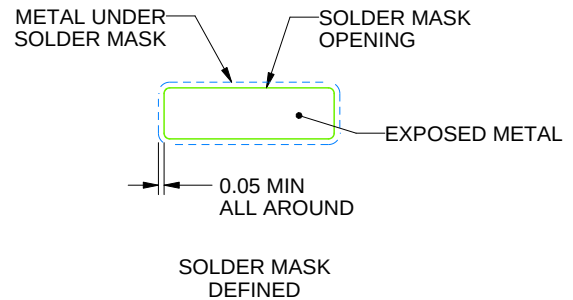
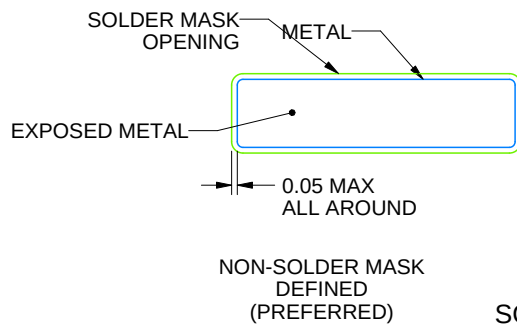
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

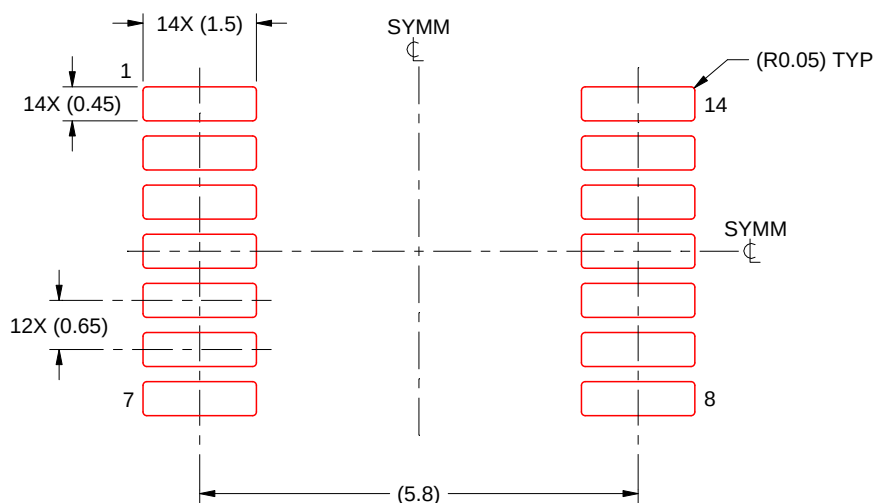
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

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NOTES: (continued)

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

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