TL5580, TL5580A
DUAL LOW-NOISE WIDE-BANDWIDTH PRECISION AMPLIFIER

SLOS477A–JUNE 2005–REVISED JULY 2005

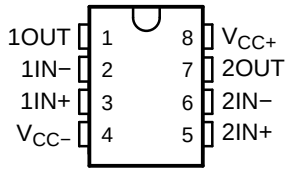
FEATURES

- **Operating Voltage**…**±2 V to ±18 V**
- **Low Offset Voltage**…**1 mV Max at 25°C, TL5580A**
- **Wide GBW**…**12 MHz Typ**
- **Slew Rate**…**5 V/μs Typ**
- **Low THD**…**0.0005% Typ**
- **Low-Noise Voltage**…**7 nV/√Hz at 1 kHz Typ**

APPLICATIONS

- **Audio**
- **Test Equipment**
- **Industrial Process Controls**
- **Data-Acquisition Systems**
- **Active Filters**
- **Power-Supply Regulation**

D, P, OR PW PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

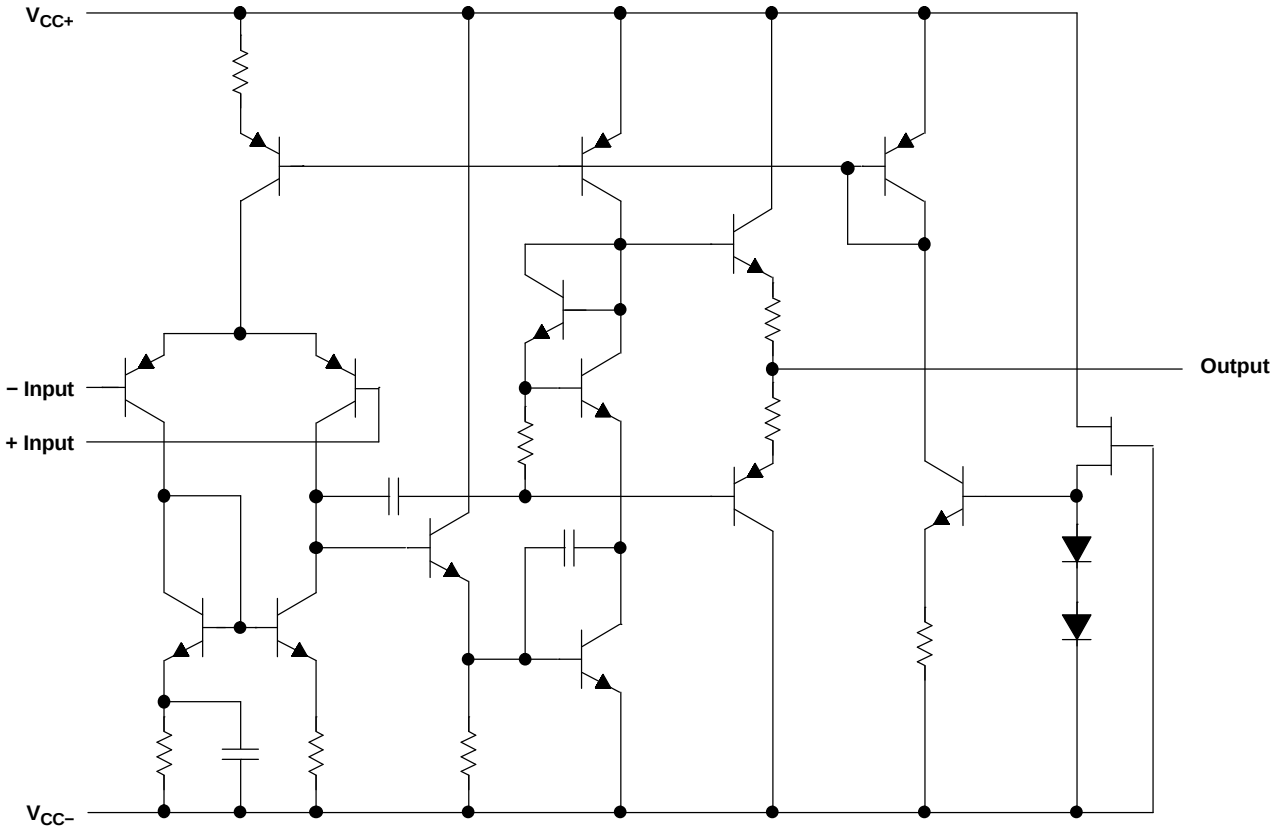
The TL5580 is a dual bipolar operational amplifier that combines both high dc and ac performance with its low offset voltage, high-gain bandwidth, low harmonic distortion, and low-noise characteristics. In addition, its output is capable of driving 600-Ω loads. All these characteristics make the device ideally suited for use in audio, active filtering, and industrial measurement applications.

ORDERING INFORMATION

T_A	V_{IO} (25°C, MAX)	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	Standard grade 1.5 mV	PDIP – P	Tube of 50	TL5580IP	TL5580IP
		SOIC – D	Tube of 75	TL5580ID	Z5580
			Reel of 2500	TL5580IDR	
		TSSOP – PW	Tube of 150	TL5580IPW	Z5580
			Reel of 2000	TL5580IPWR	
	A grade 1 mV	PDIP – P	Tube of 50	TL5580AIP	TL5580AIP
		SOIC – D	Tube of 75	TL5580AID	Z5580A
			Reel of 2500	TL5580AIDR	
		TSSOP – PW	Tube of 150	TL5580AIPW	Z5580A
			Reel of 2000	TL5580AIPWR	

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

EQUIVALENT SCHEMATIC



Absolute Maximum Ratings[1]

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

			MIN	MAX	UNIT
$V_{CC\pm}$	Supply voltage			±18	V
V_I	Input voltage (any input)			±15	V
V_{ID}	Differential input voltage			±30	V
I_O	Output current			±50	mA
θ_{JA}	Package thermal impedance[2][3]	D package		97	°C/W
		P package		85	
		PW package		149	
T_J	Operating virtual junction temperature			150	°C
T_{stg}	Storage temperature range		–60	125	°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) Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
(3) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

		MIN	MAX	UNIT
V_{CC+}	Supply voltage	2	16	V
$V_{CC–}$		–2	–16	
T_A	Operating free-air temperature	–40	85	°C

Electrical Characteristics

$V_{CC\pm}$ = ±15 V (unless otherwise noted)

PARAMETER			TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	TL5580A	$R_S \le 10\ k\Omega$	25°C		0.3	1	mV
				–40°C to 85°C			1.35	
		TL5580		25°C		0.3	1.5	
				–40°C to 85°C			2	
αV_{IO}	Average temperature coefficient of input offset voltage			–40°C to 85°C		1.8	5	µV/°C
I_{IO}	Input offset current			25°C		5	75	nA
				–40°C to 85°C			100	
I_{IB}	Input bias current			25°C		100	500	nA
				–40°C to 85°C			800	
A_{VD}	Large-signal differential-voltage amplification		$R_L \ge 2\ k\Omega$, V_O = ±10 V	25°C	90	110		dB
				–40°C to 85°C	87			
V_{OM}	Output voltage swing		$R_L \ge 2\ k\Omega$	25°C	12.75 – 12.25	±13.5		V
				–40°C to 85°C	12.5 –12			
V_{ICR}	Common-mode input voltage range			25°C	±13	±13.5		V
				–40°C to 85°C	±12			
CMRR	Common-mode rejection ratio		$R_S \le 10\ k\Omega$, V_{ICR} = –12 V to 12 V	25°C	90	110		dB
				–40°C to 85°C	85			
k_{SVR} (1)	Supply-voltage rejection ratio		$R_S \le 10\ k\Omega$	25°C	85	110		dB
				–40°C to 85°C	83			
I_{CC}	Supply current (all amplifiers)			25°C		6	9	mA
				–40°C to 85°C			12	

(1) Measured with $V_{CC\pm}$ varied simultaneously

Operating Characteristics

$V_{CC\pm}$ = ±15 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TYP	UNIT
SR	Slew rate at unity gain	$R_L \ge 2\ k\Omega$	5	V/µs
GBW	Gain bandwidth product	f = 10 kHz	12	MHz
THD	Total harmonic distortion	V_O = 5 V, R_L = 2 kΩ, f = 1 kHz, A_{VD} = 20 dB	0.0005	%
V_n	Equivalent input noise voltage	f = 1 kHz	7	nV/√Hz

TYPICAL CHARACTERISTICS

MAXIMUM OUTPUT VOLTAGE SWING vs LOAD RESISTANCE

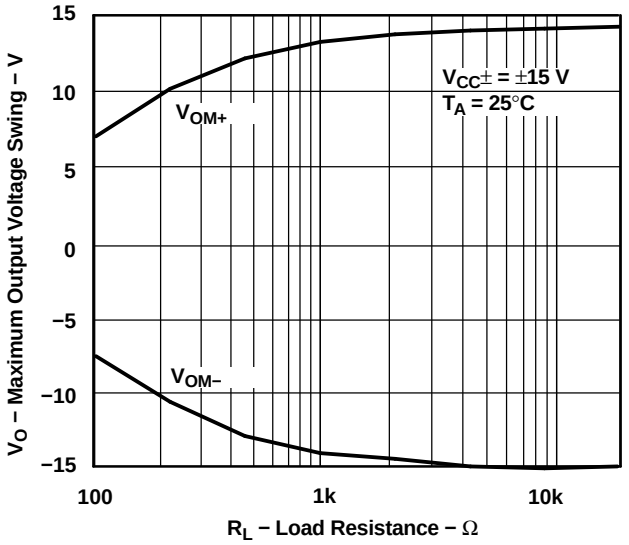


Figure 1.

MAXIMUM OUTPUT VOLTAGE SWING vs FREQUENCY

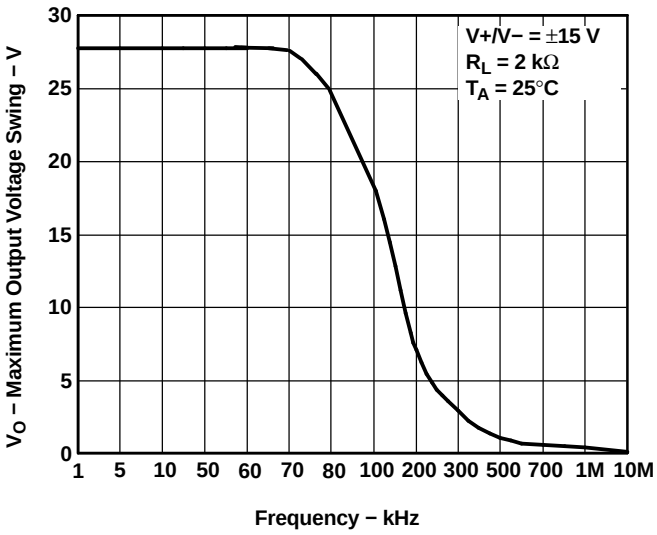


Figure 2.

OUTPUT VOLTAGE SWING vs OUTPUT CURRENT

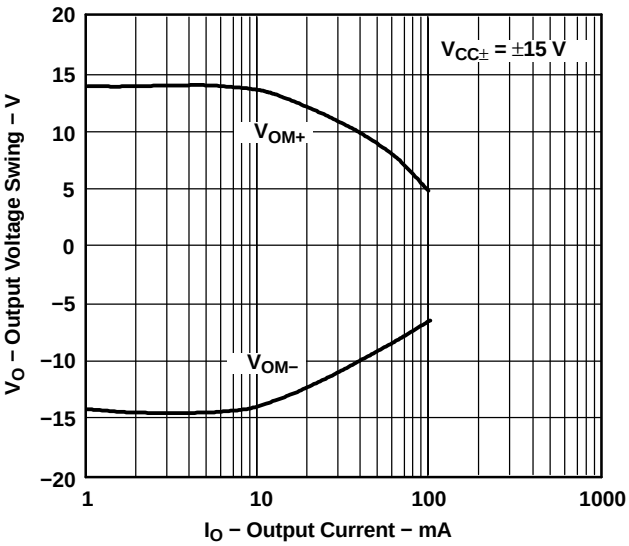


Figure 3.

EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY

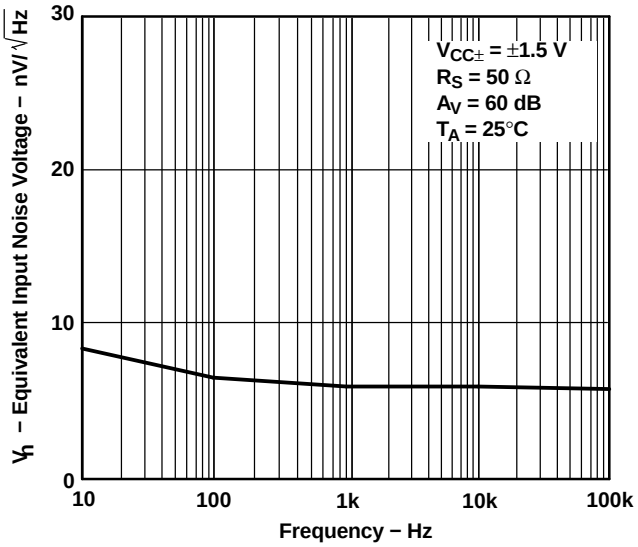


Figure 4.

TYPICAL CHARACTERISTICS (continued)

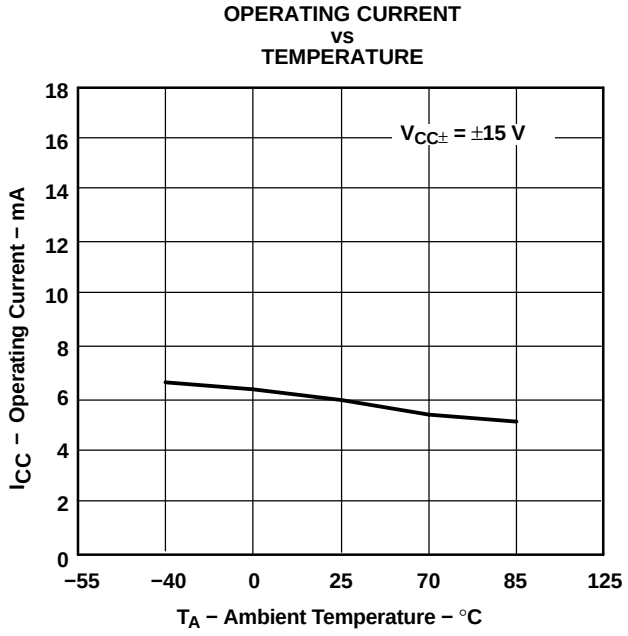


Figure 5.

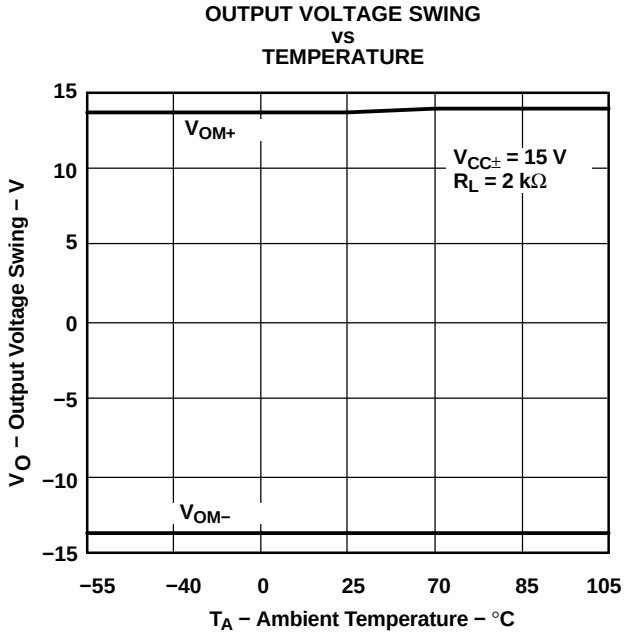


Figure 6.

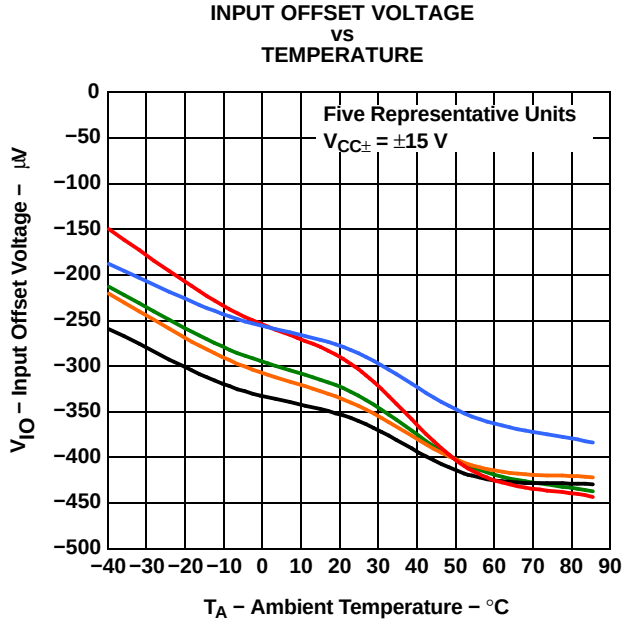


Figure 7.

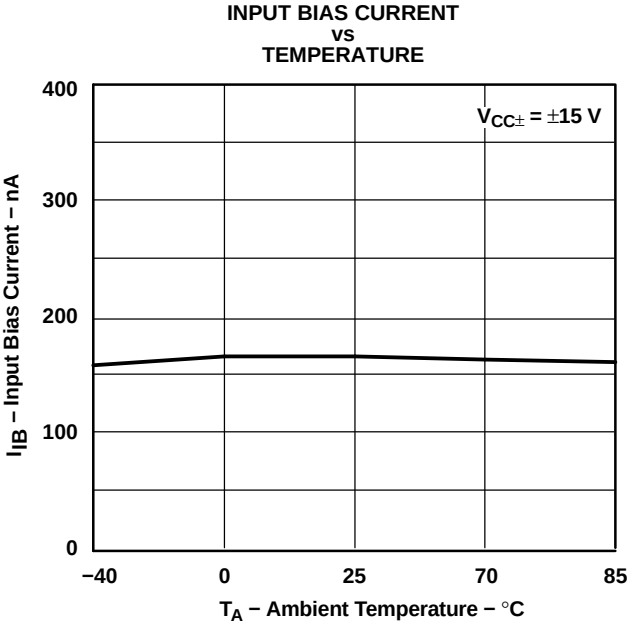


Figure 8.

TYPICAL CHARACTERISTICS (continued)

MAXIMUM OUTPUT VOLTAGE SWING vs OPERATING VOLTAGE

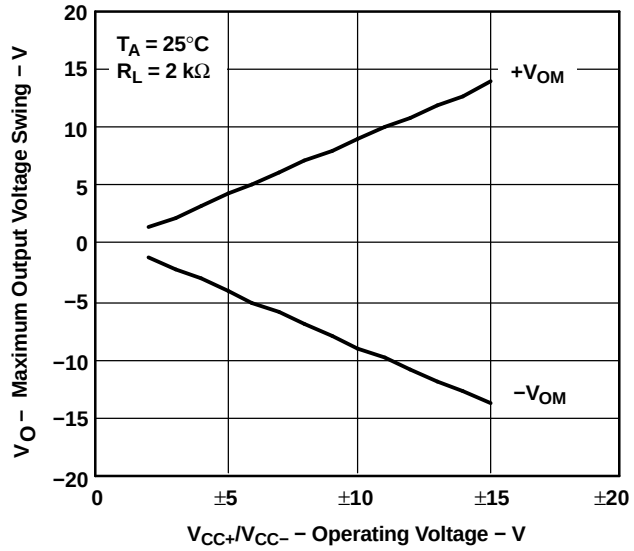


Figure 9.

OPERATING CURRENT vs OPERATING VOLTAGE

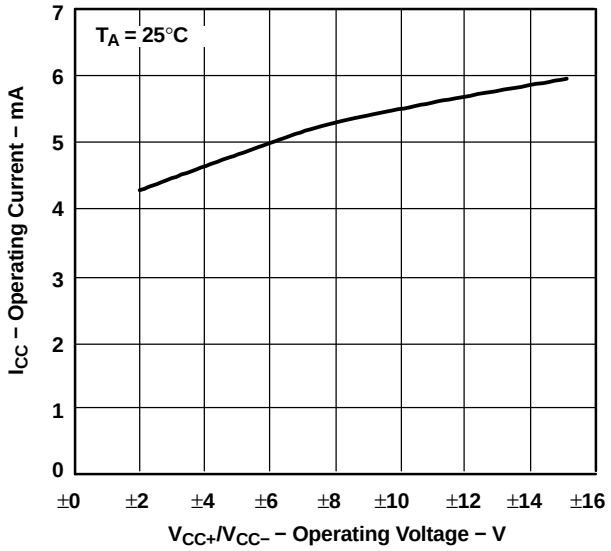


Figure 10.

TOTAL HARMONIC DISTORTION vs OUTPUT VOLTAGE

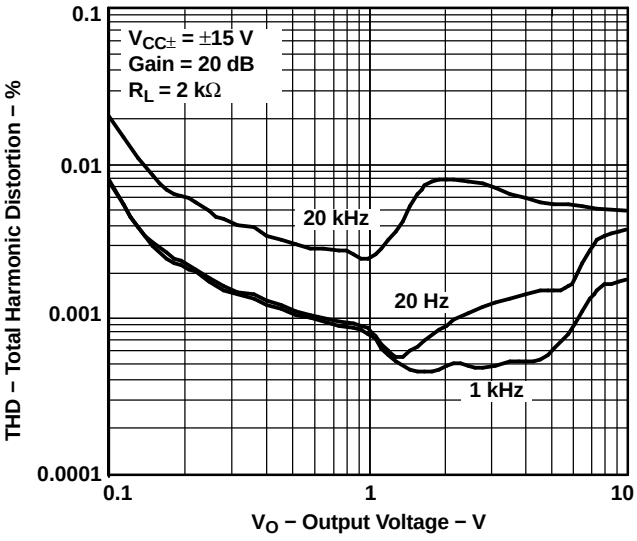


Figure 11.

VOLTAGE GAIN, PHASE vs FREQUENCY

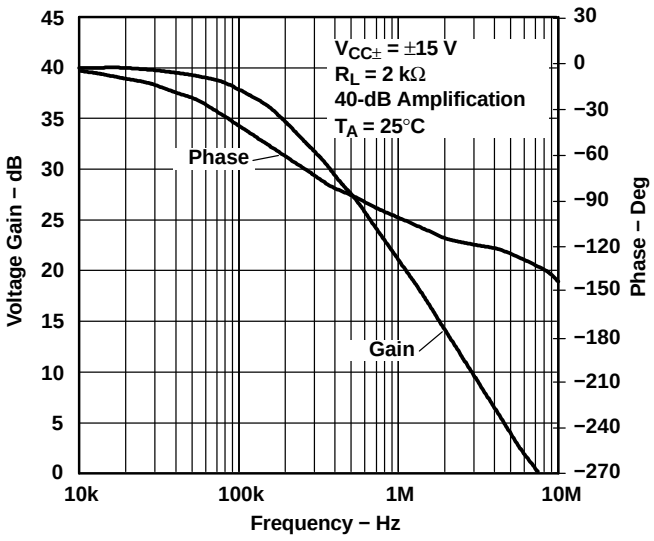


Figure 12.

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)
TL5580AID	Obsolete	Production	SOIC (D) | 8	-	-	Call TI	Call TI	-40 to 85	Z5580A
TL5580AIDR	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A
TL5580AIDR.A	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A
TL5580AIP	Active	Production	PDIP (P) | 8	50 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TL5580AIP
TL5580AIP.A	Active	Production	PDIP (P) | 8	50 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TL5580AIP
TL5580AIPWR	Active	Production	TSSOP (PW) | 8	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A
TL5580AIPWR.A	Active	Production	TSSOP (PW) | 8	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A
TL5580IDR	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580
TL5580IDR.A	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580
TL5580IP	Active	Production	PDIP (P) | 8	50 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TL5580IP
TL5580IP.A	Active	Production	PDIP (P) | 8	50 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TL5580IP
TL5580IPWR	Active	Production	TSSOP (PW) | 8	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580
TL5580IPWR.A	Active	Production	TSSOP (PW) | 8	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580

(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.

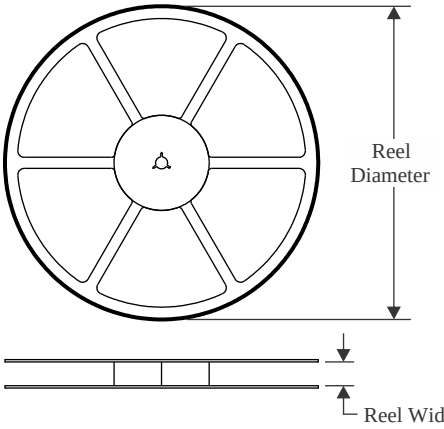
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will 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.

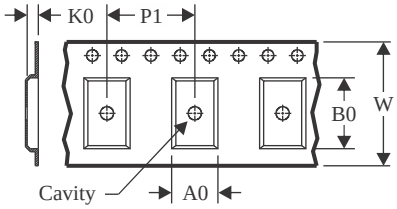
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

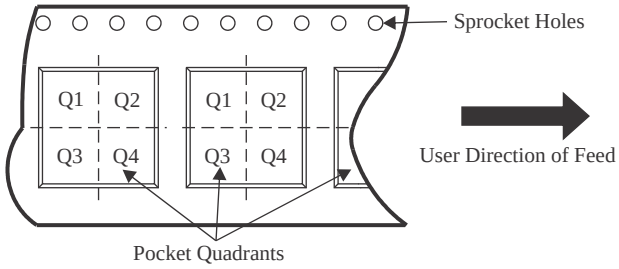


TAPE DIMENSIONS



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

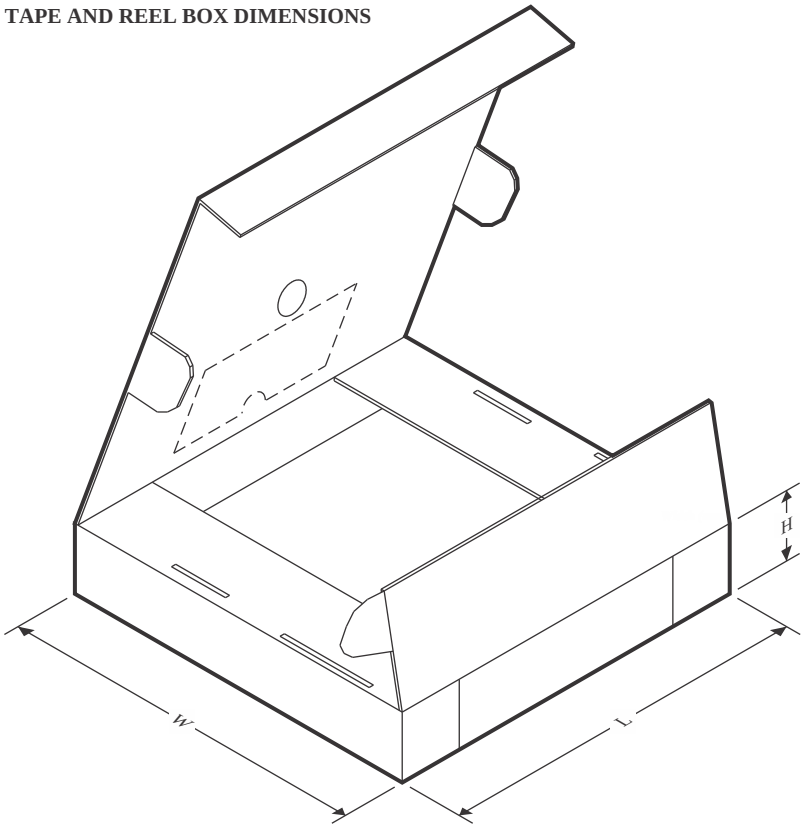
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TL5580AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TL5580AIPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TL5580IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TL5580IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

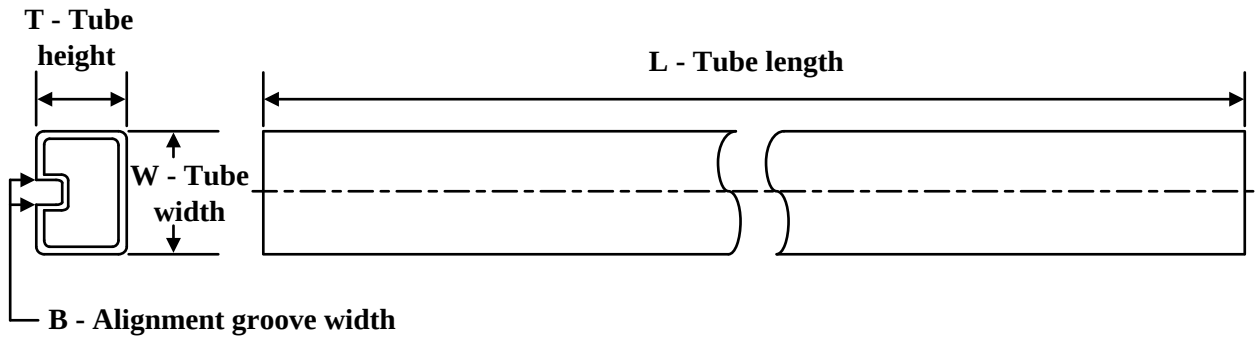
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

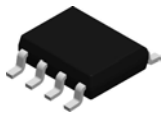
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL5580AIDR	SOIC	D	8	2500	353.0	353.0	32.0
TL5580AIPWR	TSSOP	PW	8	2000	353.0	353.0	32.0
TL5580IDR	SOIC	D	8	2500	353.0	353.0	32.0
TL5580IPWR	TSSOP	PW	8	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
TL5580AIP	P	PDIP	8	50	506	13.97	11230	4.32
TL5580AIP.A	P	PDIP	8	50	506	13.97	11230	4.32
TL5580IP	P	PDIP	8	50	506	13.97	11230	4.32
TL5580IP.A	P	PDIP	8	50	506	13.97	11230	4.32

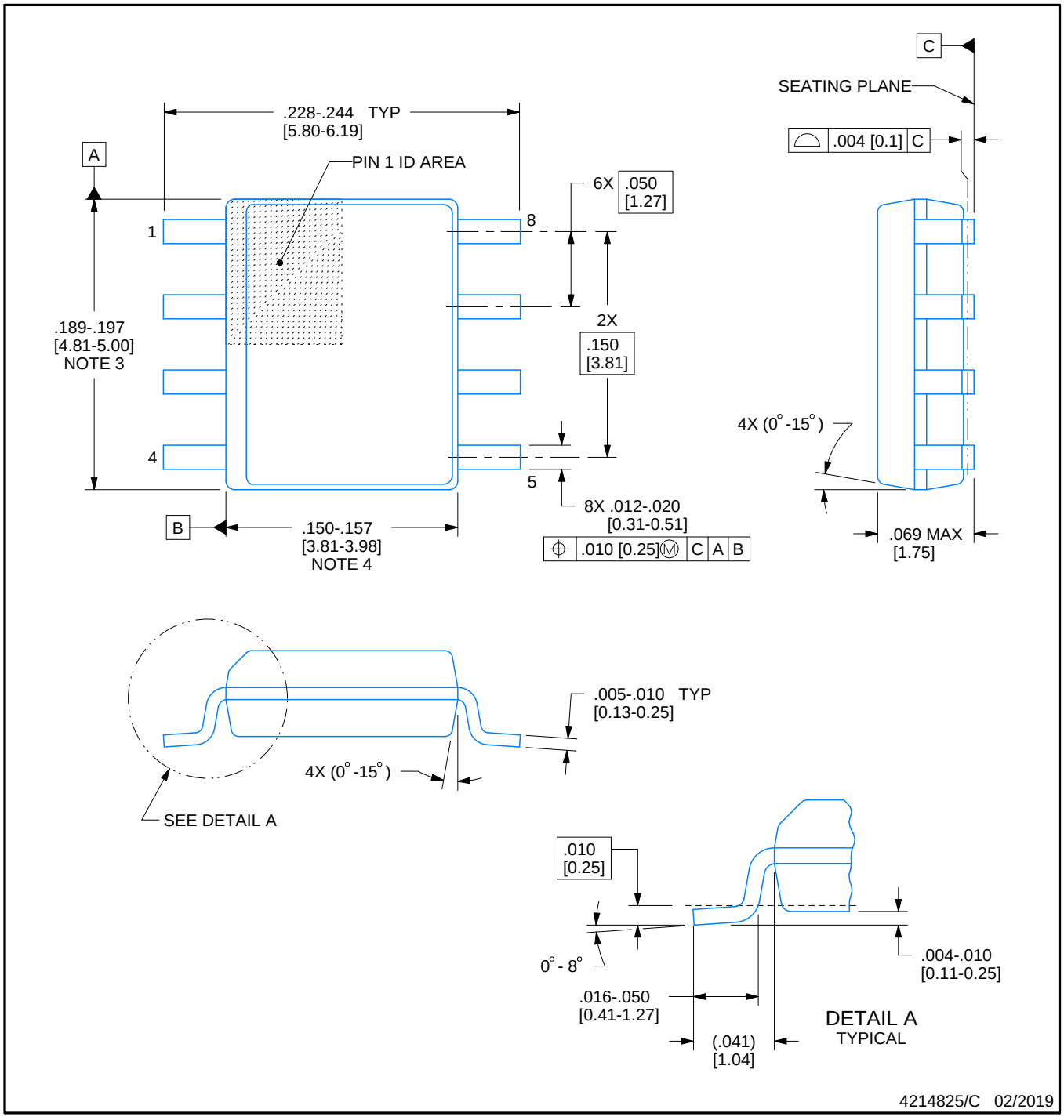


PACKAGE OUTLINE

D0008A

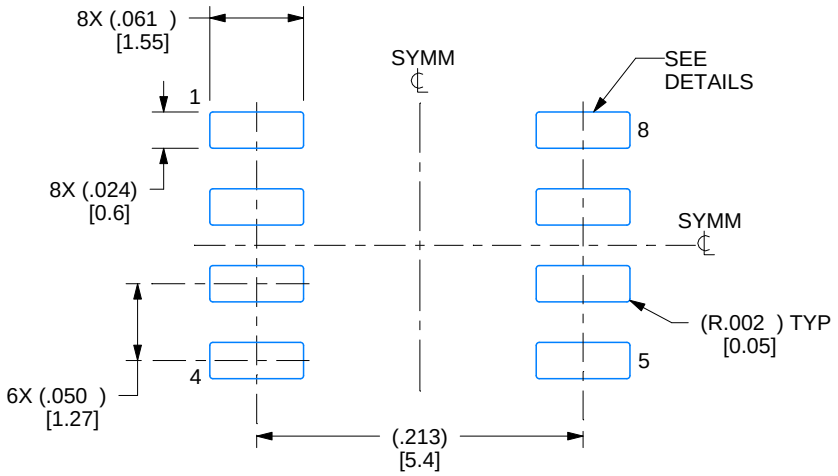
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

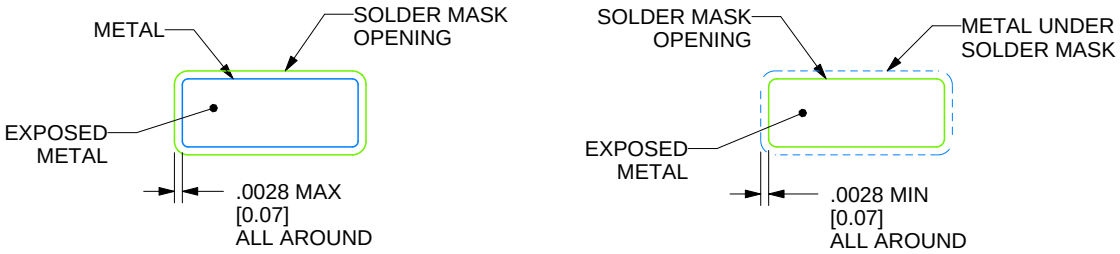


NOTES:

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)

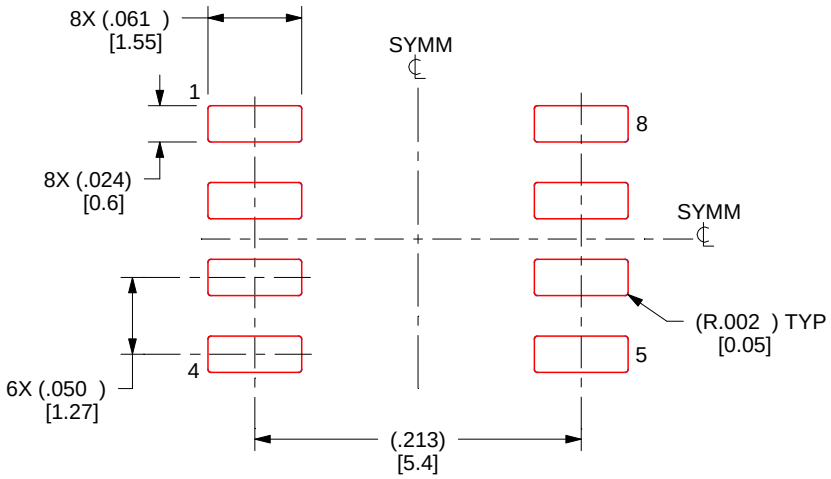
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



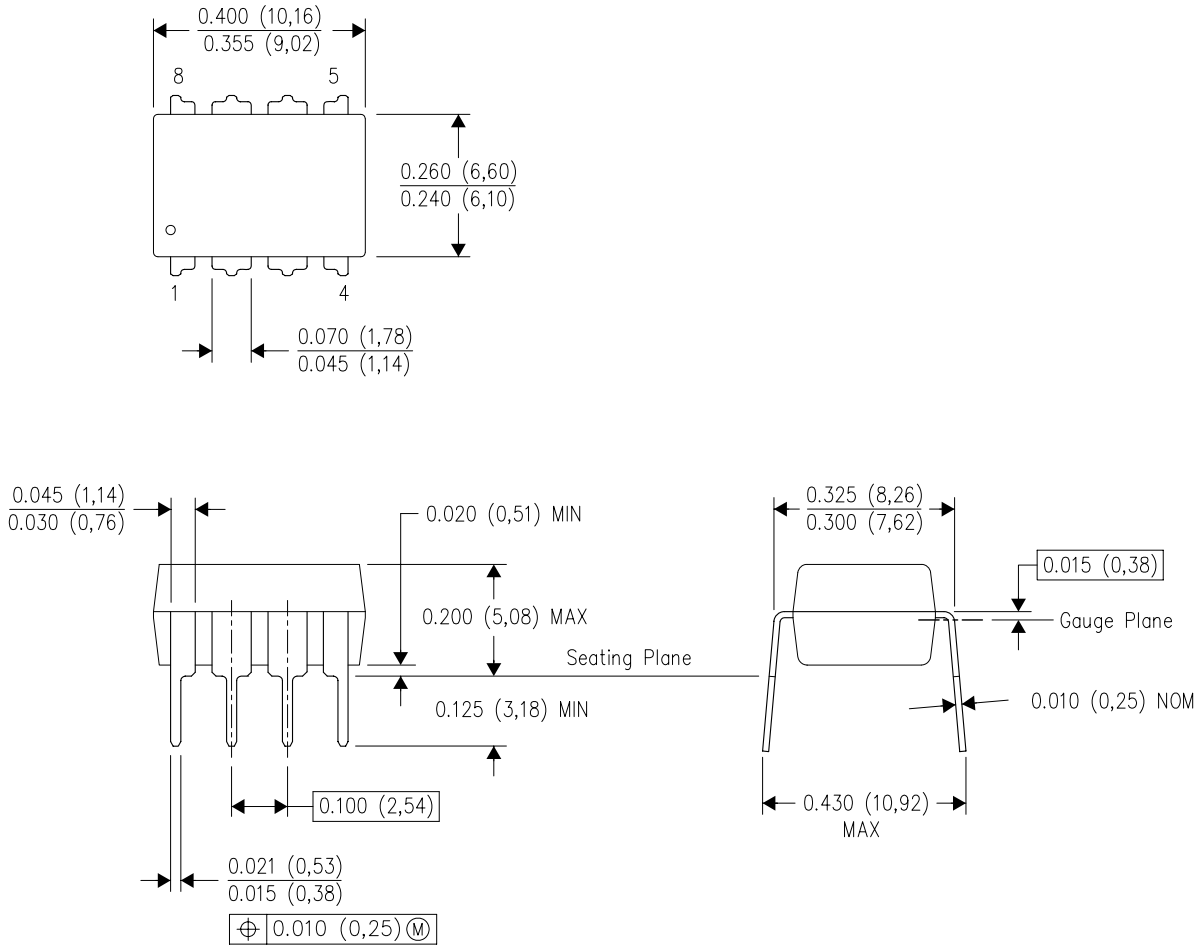
SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

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.

P (R–PDIP–T8) PLASTIC DUAL–IN–LINE PACKAGE



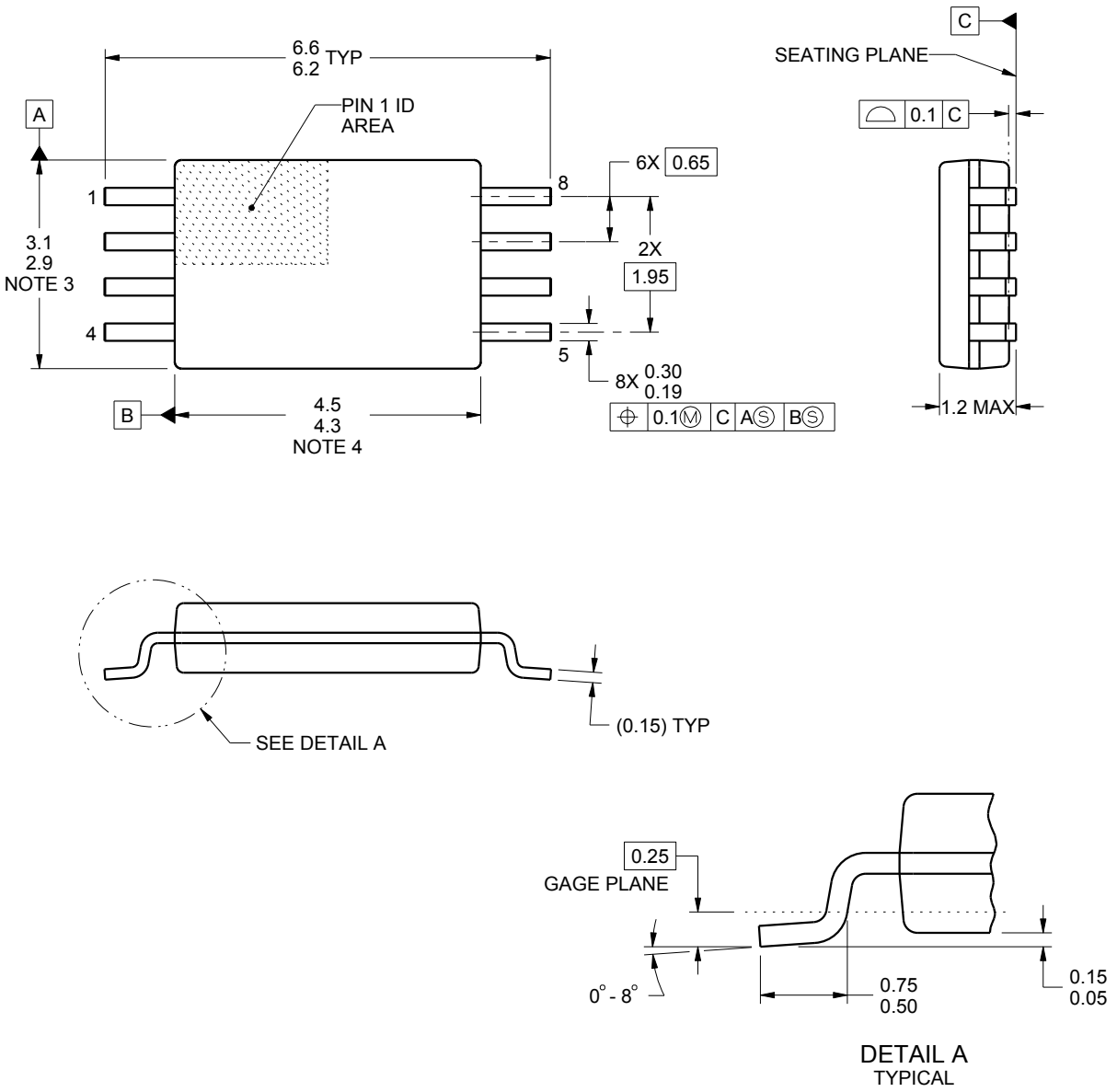
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001 variation BA.

PACKAGE OUTLINE

PW0008A

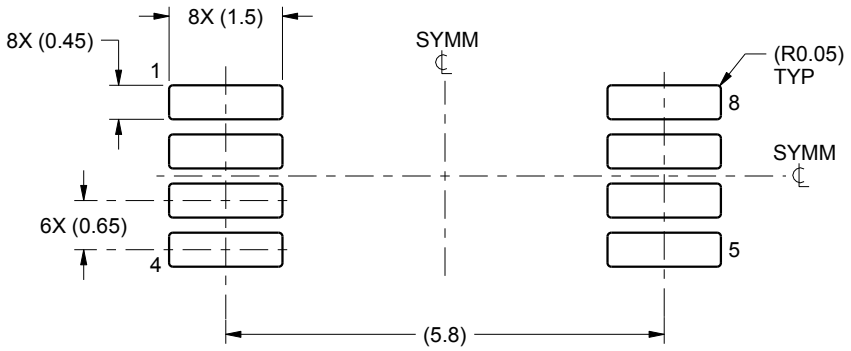
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

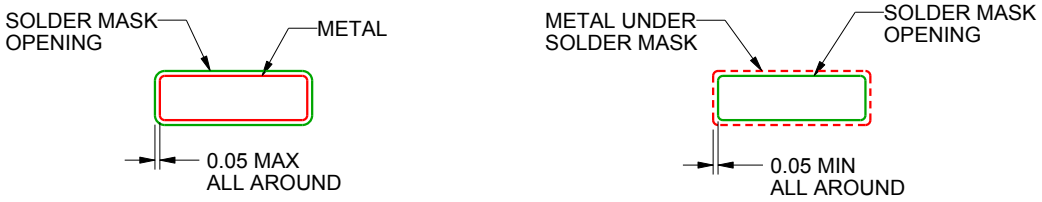


NOTES:

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, variation AA.



LAND PATTERN EXAMPLE
SCALE:10X

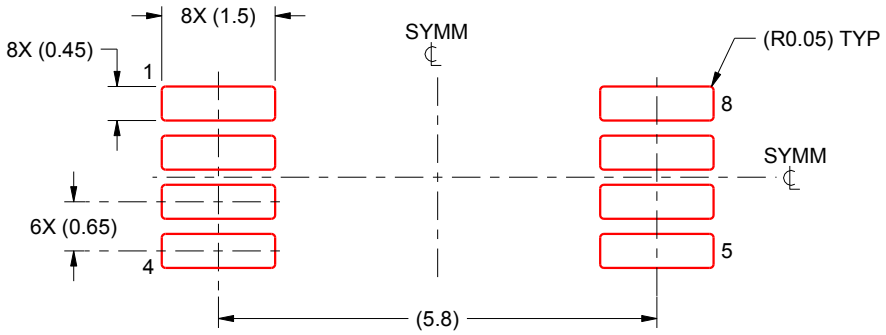


SOLDER MASK DETAILS
NOT TO SCALE

4221848/A 02/2015

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.



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

4221848/A 02/2015

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.

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