

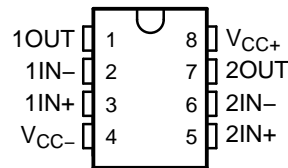
## FEATURES

- Operating Voltage... $\pm 2$  V to  $\pm 18$  V
- Low Offset Voltage...1 mV Max at 25°C, TL5580A
- Wide GBW...12 MHz Typ
- Slew Rate...5 V/ $\mu$ s Typ
- Low THD...0.0005% Typ
- Low-Noise Voltage...7 nV/ $\sqrt{\text{Hz}}$  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- $\Omega$  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 <sup>(1)</sup>		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	
	A grade 1 mV	TSSOP – PW	Tube of 150	TL5580IPW	Z5580
			Reel of 2000	TL5580IPWR	
		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](http://www.ti.com/sc/package).

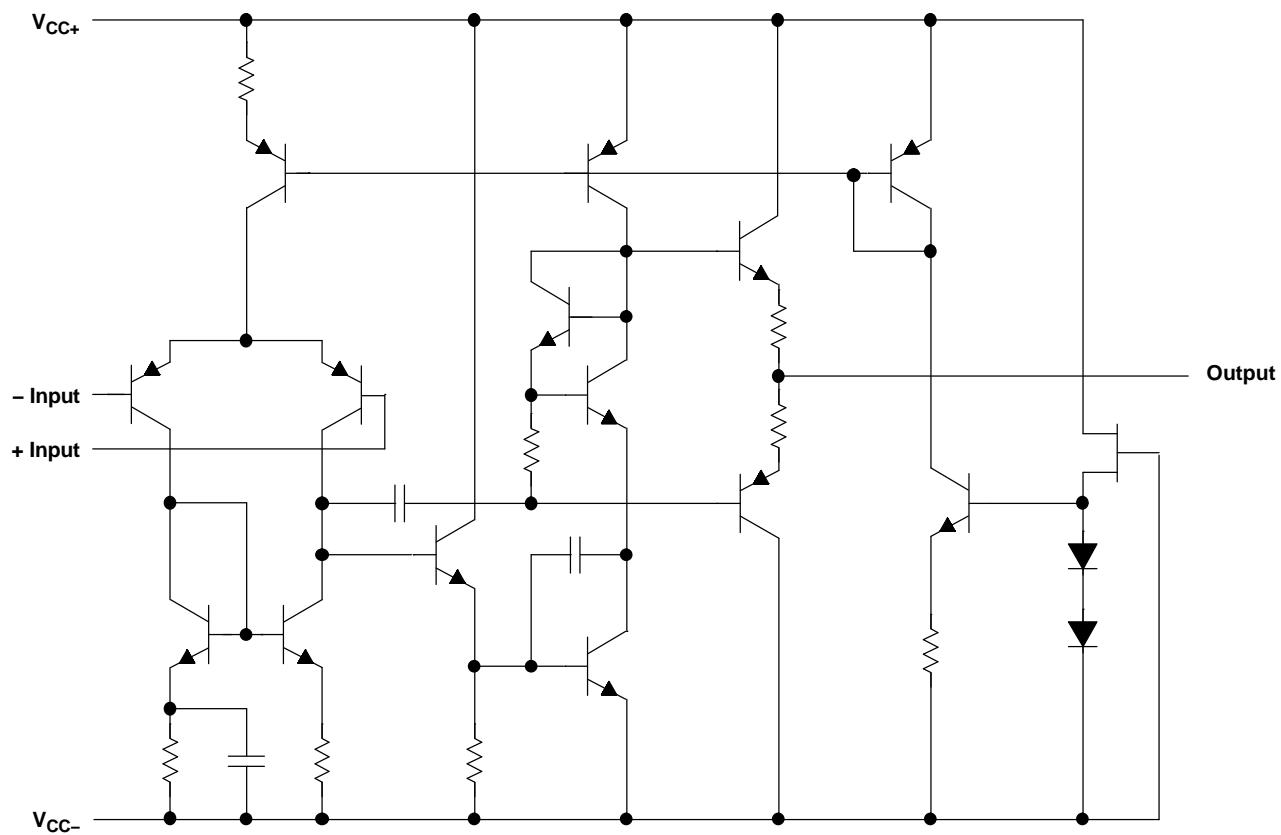


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# TL5580, TL5580A DUAL LOW-NOISE WIDE-BANDWIDTH PRECISION AMPLIFIER

SLOS477A—JUNE 2005—REVISED JULY 2005

## EQUIVALENT SCHEMATIC



### Absolute Maximum Ratings<sup>(1)</sup>

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
$\theta_{JA}$	Package thermal impedance <sup>(2)(3)</sup>	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  $T_J(\text{max})$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$ . 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

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

SLOS477A–JUNE 2005–REVISED JULY 2005

## Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
$V_{IO}$	Input offset voltage	$R_S \leq 10\text{ k}\Omega$	25°C	0.3	1		mV
			–40°C to 85°C		1.35		
			25°C	0.3	1.5		
			–40°C to 85°C		2		
$\alpha V_{IO}$	Average temperature coefficient of input offset voltage		–40°C to 85°C	1.8	5		$\mu\text{V}/^\circ\text{C}$
$I_{IO}$	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	$R_L \geq 2\text{ k}\Omega$ , $V_O = \pm 10\text{ V}$	25°C	90	110		dB
			–40°C to 85°C		87		
$V_{OM}$	Output voltage swing	$R_L \geq 2\text{ k}\Omega$	25°C	12.75 – 12.25	$\pm 13.5$		V
			–40°C to 85°C		12.5 – 12		
$V_{ICR}$	Common-mode input voltage range		25°C	$\pm 13$	$\pm 13.5$		V
			–40°C to 85°C		$\pm 12$		
CMRR	Common-mode rejection ratio	$R_S \leq 10\text{ k}\Omega$ , $V_{ICR} = -12\text{ V to } 12\text{ V}$	25°C	90	110		dB
			–40°C to 85°C		85		
$k_{SVR}^{(1)}$	Supply-voltage rejection ratio	$R_S \leq 10\text{ k}\Omega$	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

$V_{CC\pm} = \pm 15\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)

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

**TYPICAL CHARACTERISTICS**

**MAXIMUM OUTPUT VOLTAGE SWING**  
**VS**  
**LOAD RESISTANCE**

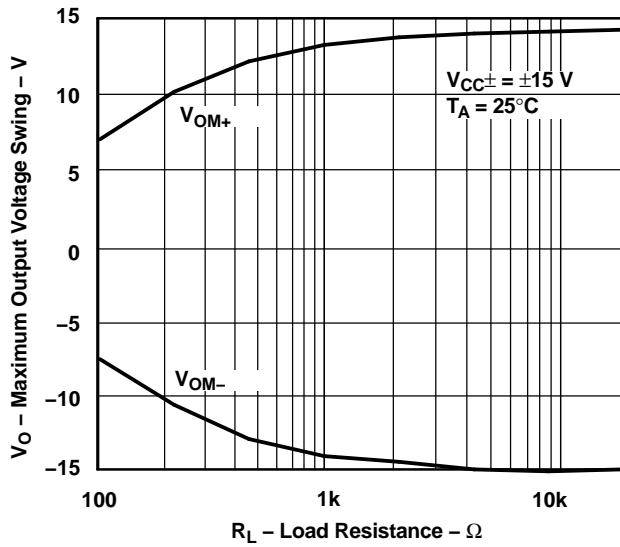


Figure 1.

**MAXIMUM OUTPUT VOLTAGE SWING**  
**VS**  
**FREQUENCY**

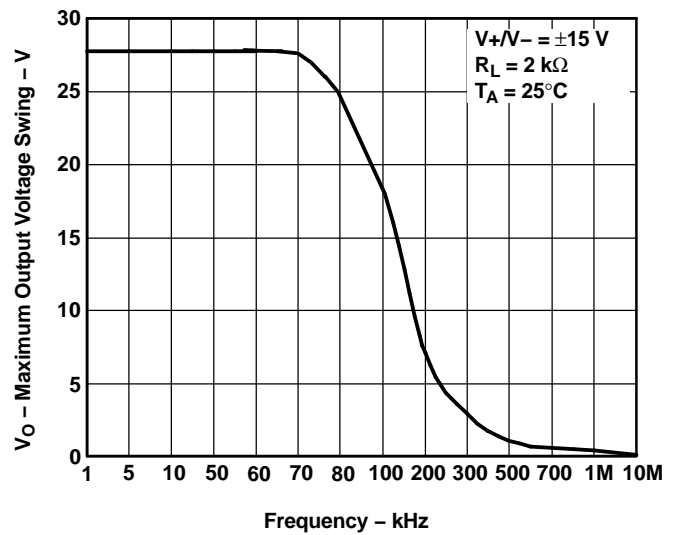


Figure 2.

**OUTPUT VOLTAGE SWING**  
**VS**  
**OUTPUT CURRENT**

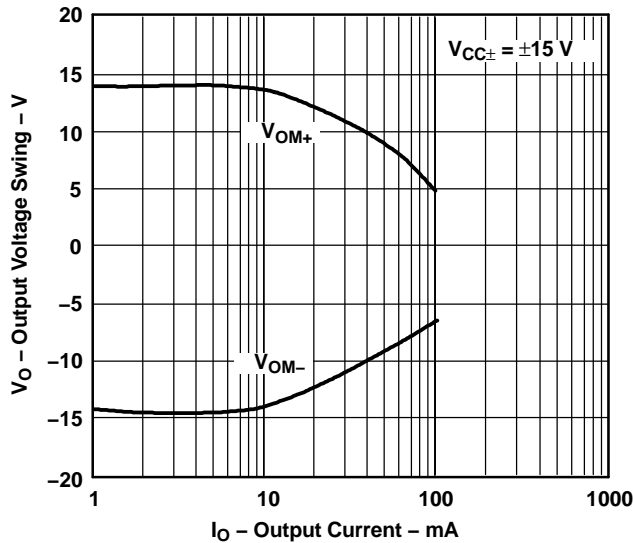


Figure 3.

**EQUIVALENT INPUT NOISE VOLTAGE**  
**VS**  
**FREQUENCY**

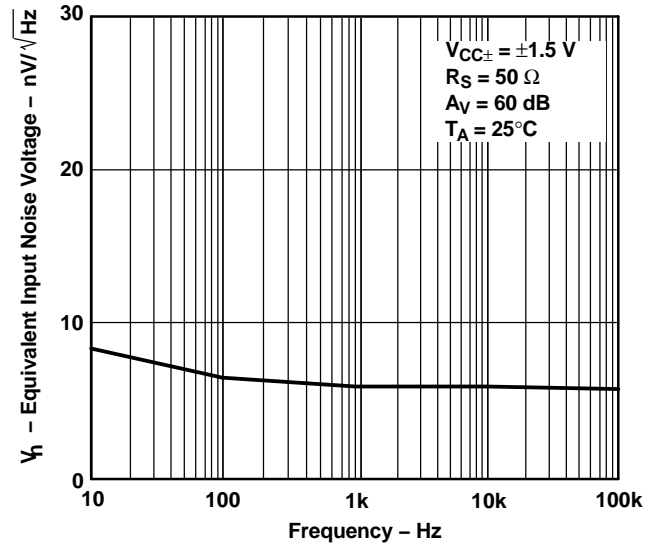


Figure 4.

TYPICAL CHARACTERISTICS (continued)

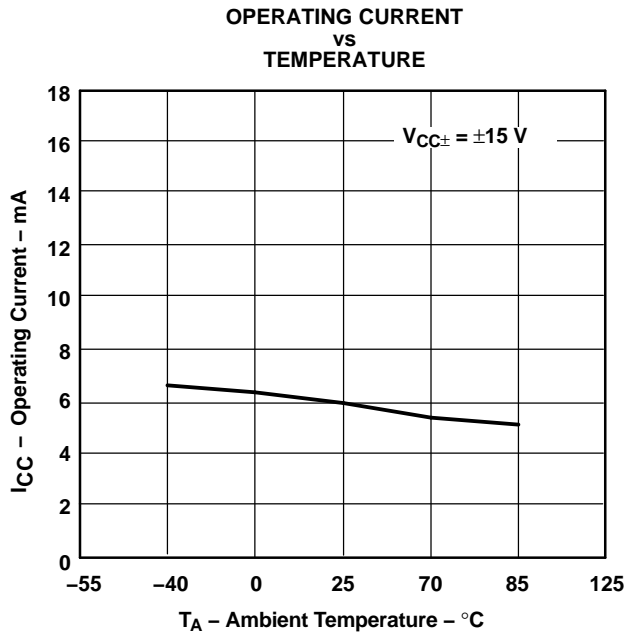


Figure 5.

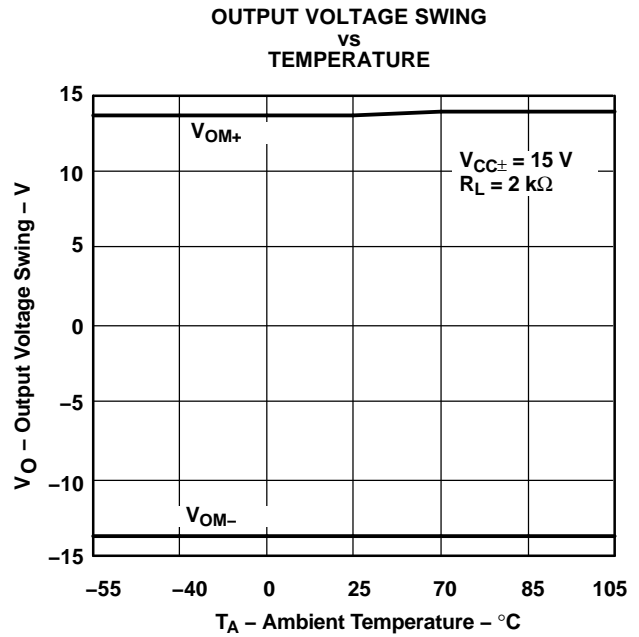


Figure 6.

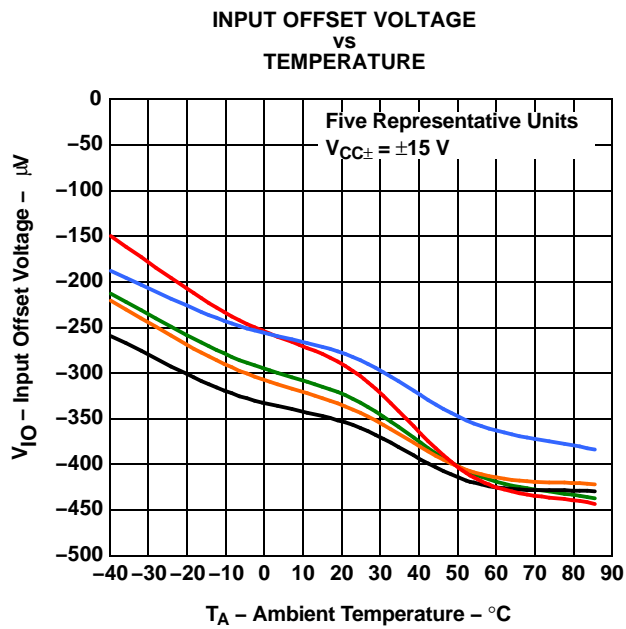


Figure 7.

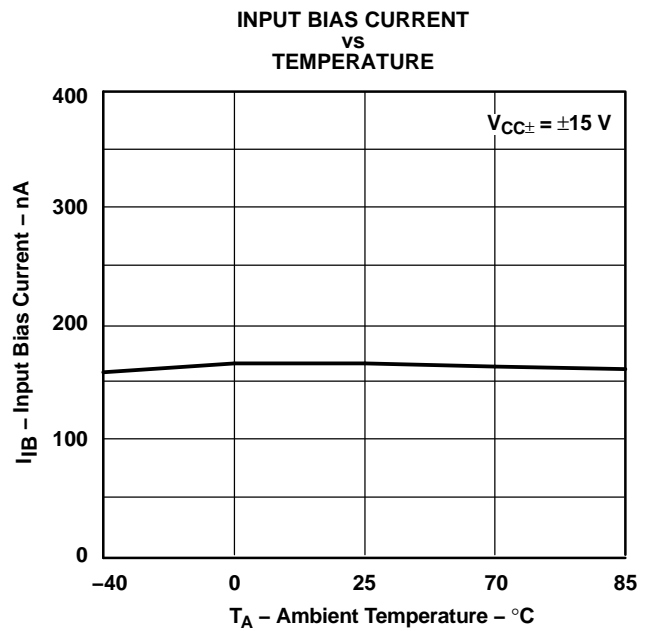


Figure 8.

**TYPICAL CHARACTERISTICS (continued)**

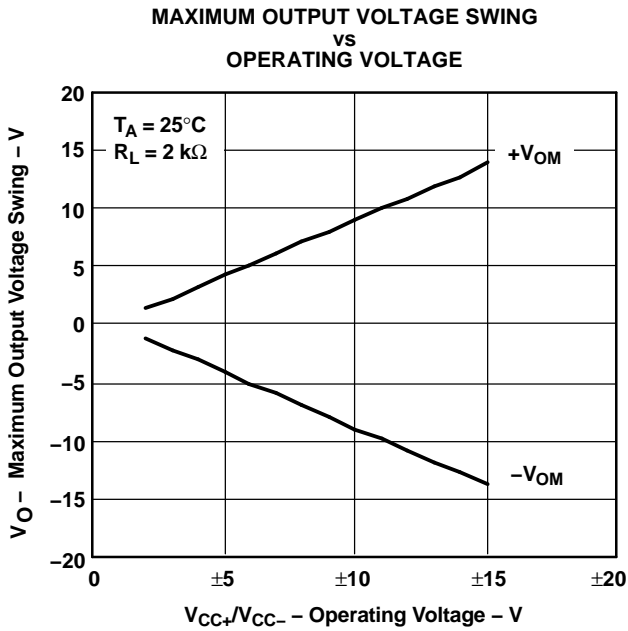


Figure 9.

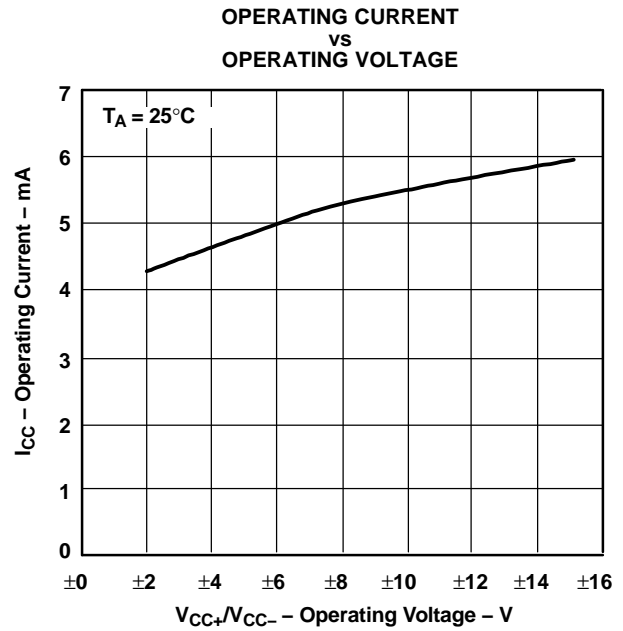


Figure 10.

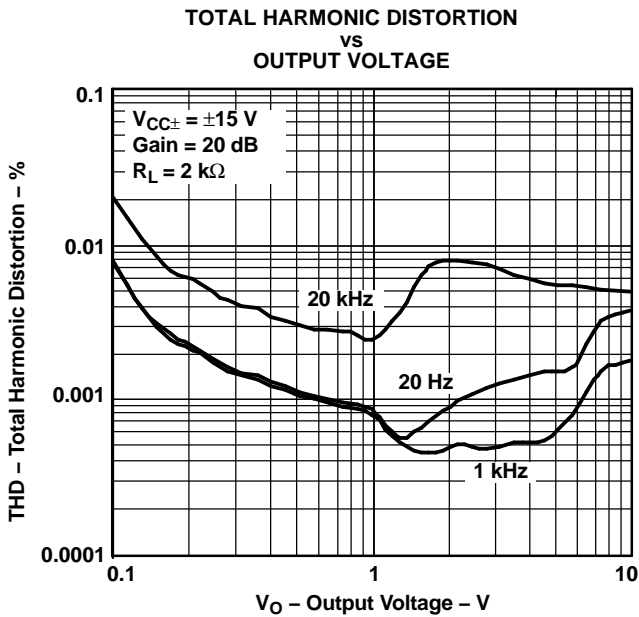


Figure 11.

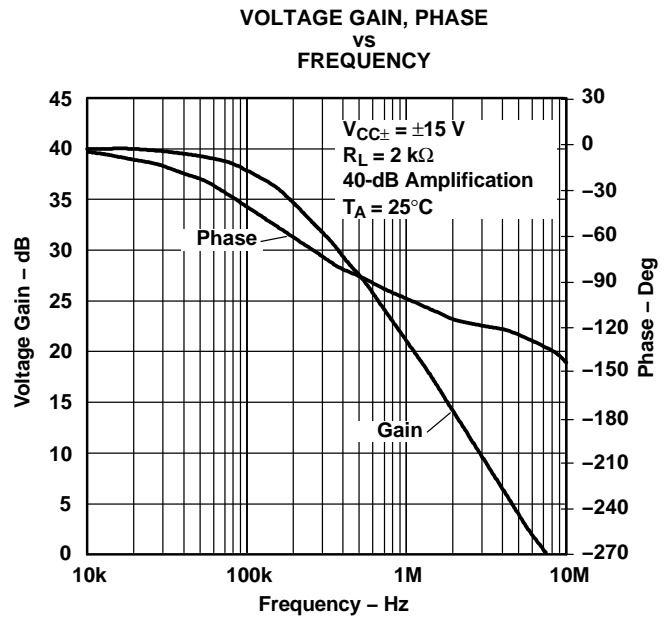


Figure 12.

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TL5580AID	LIFEBUY	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A	
TL5580AIDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A	Samples
TL5580AIP	LIFEBUY	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TL5580AIP	
TL5580AIPWR	LIFEBUY	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580A	
TL5580IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580	Samples
TL5580IP	LIFEBUY	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TL5580IP	
TL5580IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Z5580	Samples

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSELETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.



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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
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	340.5	336.1	25.0
TL5580AIPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TL5580IDR	SOIC	D	8	2500	340.5	336.1	25.0
TL5580IPWR	TSSOP	PW	8	2000	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)
TL5580AID	D	SOIC	8	75	507	8	3940	4.32
TL5580AIP	P	PDIP	8	50	506	13.97	11230	4.32
TL5580IP	P	PDIP	8	50	506	13.97	11230	4.32



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



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

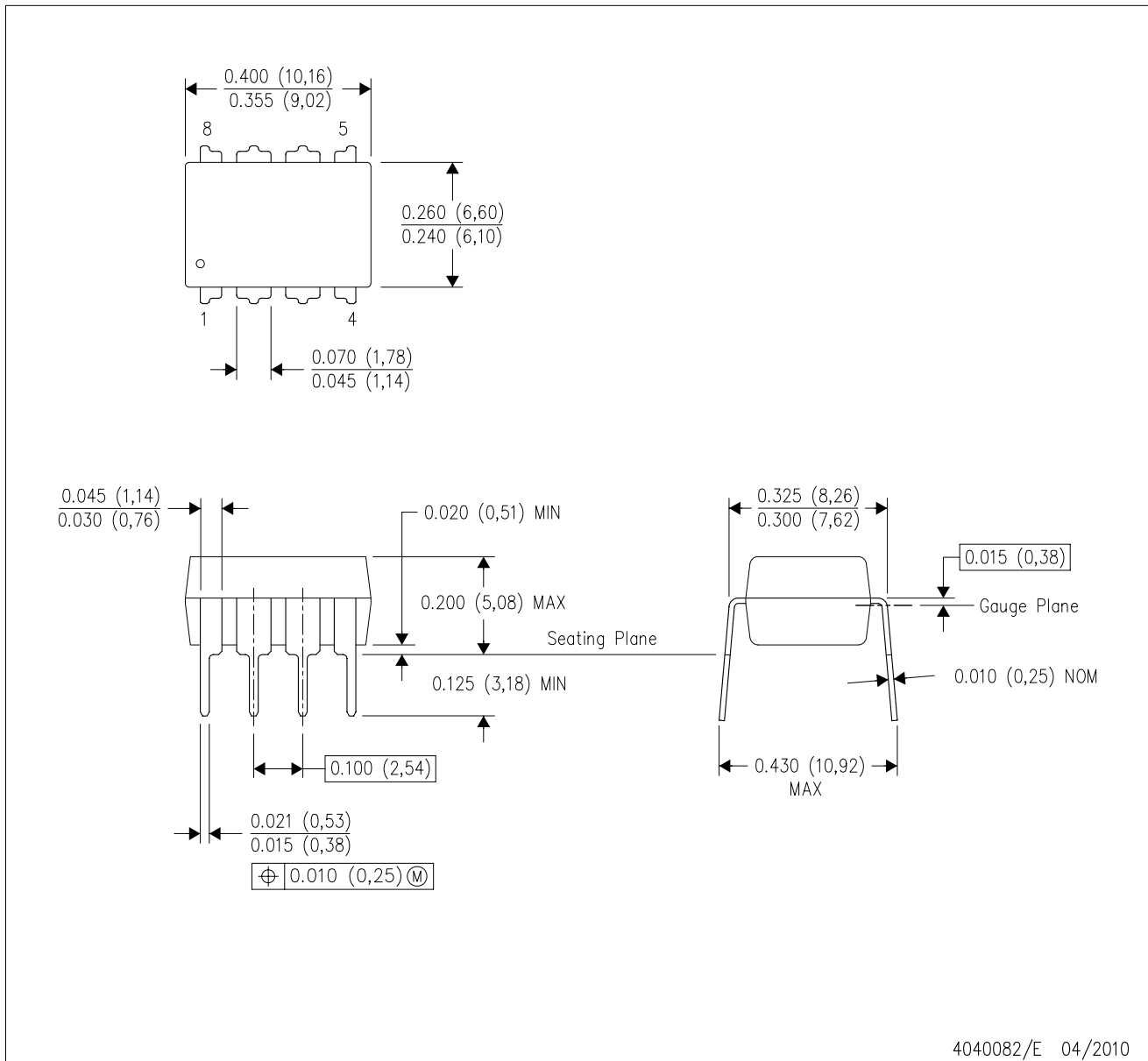
4214825/C 02/2019

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.



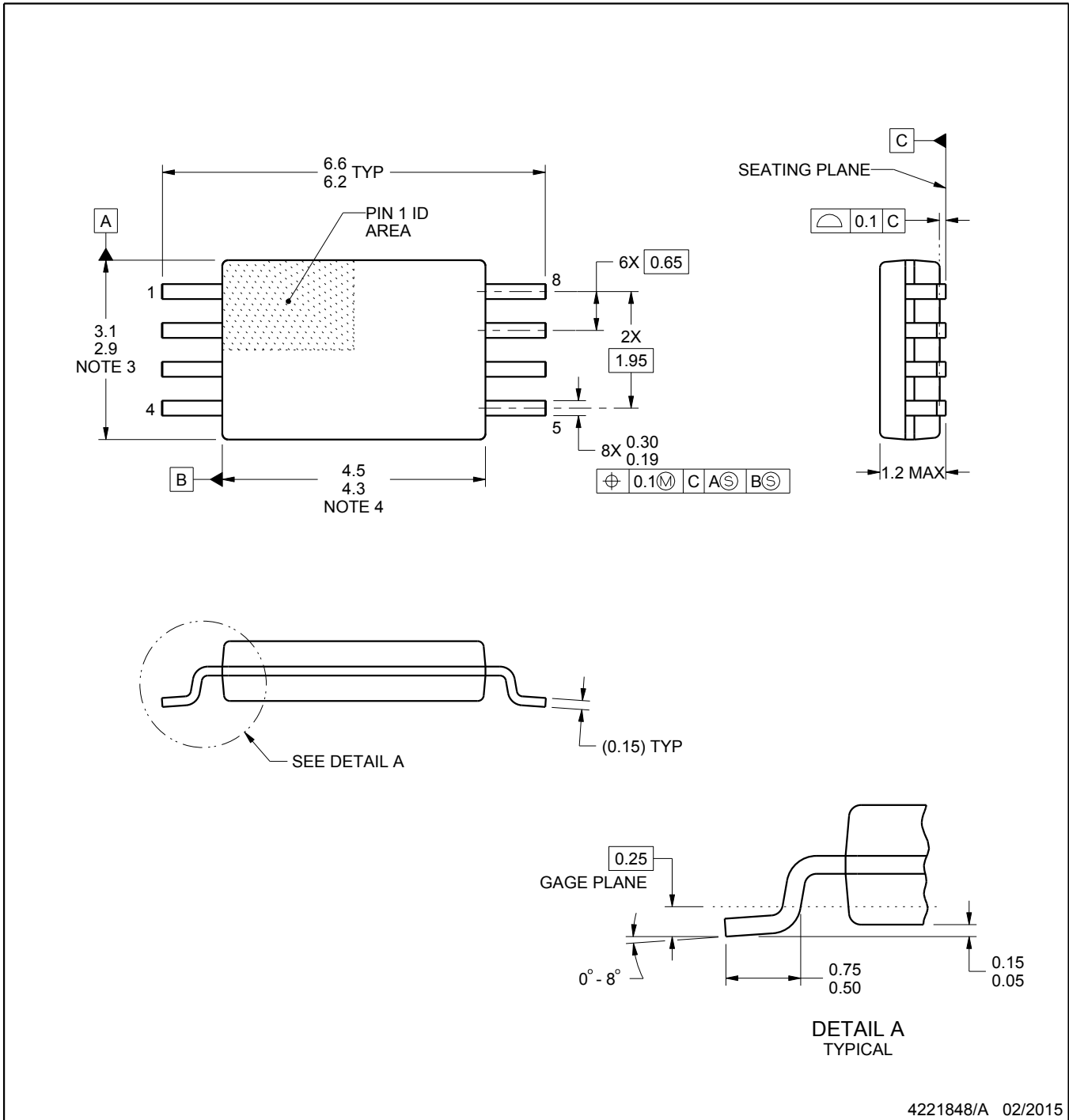
# PW0008A



# PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4221848/A 02/2015

### NOTES:

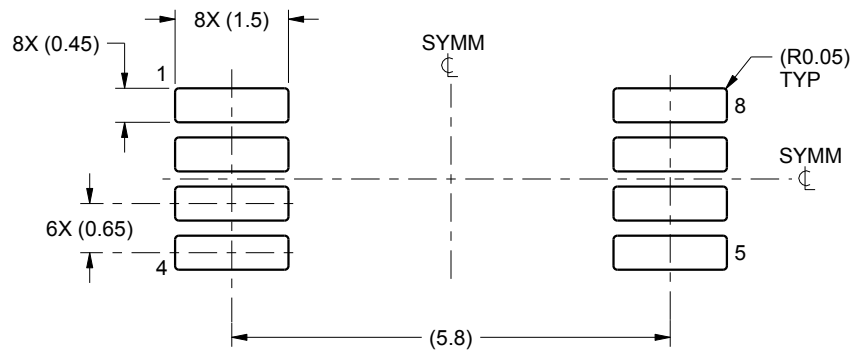
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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-153, variation AA.

# EXAMPLE BOARD LAYOUT

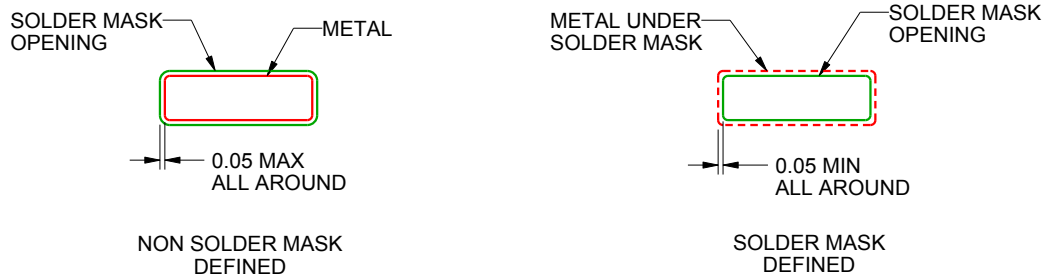
PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:10X



SOLDER MASK DETAILS  
NOT TO SCALE

4221848/A 02/2015

NOTES: (continued)

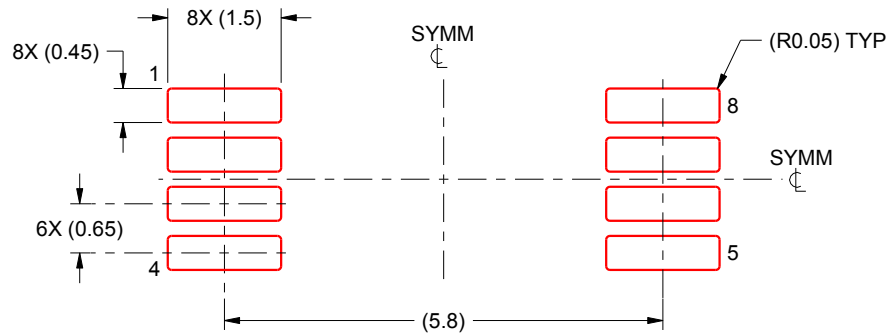
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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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