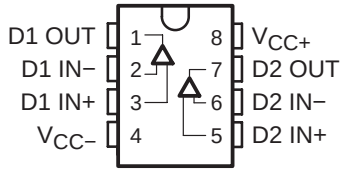
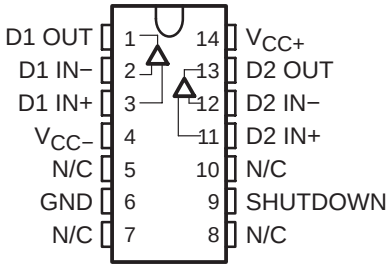
- **Remote Terminal ADSL Line Driver**
  - **Ideal for Both Full Rate ADSL and G.Lite**
  - **Compatible With 1:2 Transformer Ratio**
- **Wide Supply Voltage Range +5 V to +14 V**
  - **Ideal for Single Supply +12-V Operation**
- **Low 2.1 pA/$\sqrt{\text{Hz}}$ Noninverting Current Noise**
  - **Reduces Noise Feedback Through Hybrid Into Downstream Channel**
- **Wide Output Swing**
  - **18.4 Vpp Differential Output Voltage, R_L = 50 Ω, 12-V Single Supply**
- **High Output Current**
  - **275 mA (typ)**
- **High Speed**
  - **100 MHz (−3 dB, G=1, 12-V Single Supply)**
  - **600 V/μs Slew Rate (G = 4, 12-V Single Supply)**
- **Low Distortion, Single-Ended, G = 4**
  - **−72 dBc (250 kHz, 2 Vpp, 25 Ω load)**
  - **−78 dBc (250 kHz, 2 Vpp, 100 Ω load)**
- **Low Power Shutdown (THS6093)**
  - **300 μA Total Standby Current**
- **Thermal Shutdown and Short Circuit Protection**
- **Standard SOIC, SOIC PowerPAD™, and TSSOP PowerPAD™ Package**
- **Evaluation Module Available**

THS6092
SOIC (D) AND
SOIC PowerPAD™ (DDA) PACKAGE
(TOP VIEW)

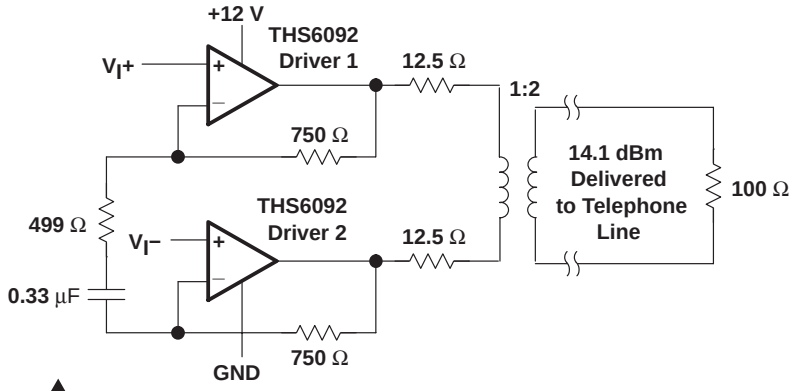


THS6093
SOIC (D) AND
TSSOP PowerPAD™ (PWP) PACKAGE
(TOP VIEW)



description

The THS6092/3 is a high-speed line driver ideal for driving signals from the remote terminal to the central office in asymmetrical digital subscriber line (ADSL) applications. It can operate from a single +12-V supply voltage while drawing only 7.3 mA of supply current per channel. It offers low –72 dBc total harmonic distortion driving a 25-Ω load (2 Vpp). The THS6092/3 offers a high 18.4-Vpp differential output swing across a 50-Ω load from a single +12-V supply. The THS6093 features a low-power shutdown mode, consuming only 300 μA quiescent current per channel. The THS6092/3 is packaged in a standard SOIC, SOIC PowerPAD™, and TSSOP PowerPAD™ package.



RELATED PRODUCTS

DEVICE	DESCRIPTION
THS6042/3	350-mA, ±12 ADSL CPE line driver
THS6052/3	175-mA, ±12 V ADSL CPE line driver
OPA2677	380-mA, +12 V ADSL CPE line driver
THS6062	Low noise ADSL receiver

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.

PowerPAD is a trademark of Texas Instruments.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICE				EVALUATION MODULES
	SOIC-8† (D)	SOIC-8† PowerPAD (DDA)	SOIC-14† (D)	TSSOP-14† PowerPAD (PWP)	
0°C to 70°C	THS6092CD	THS6092CDDA	THS6093CD	THS6093CPWP	THS6092EVM THS6093EVM
−40°C to 85°C	THS6092ID	THS6092IDDA	THS6093ID	THS6093IPWP	—

† All packages are available taped and reeled. Add an R-suffix to the device type (i.e., THS6092IDR).

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V_{CC+} to V_{CC-} . . . . . 14.7 V
Input voltage . . . . . ± V_{CC}
Output current (see Note 1) . . . . . 350 mA
Differential input voltage . . . . . ± 3 V
Maximum junction temperature . . . . . 150°C
Total power dissipation at (or below) 25°C free-air temperature . . . . . See Dissipation Ratings Table
Operating free-air temperature, T_A: Commercial . . . . . 0°C to 70°C
Industrial . . . . . −40°C to 85°C
Storage temperature, T_{stg} : Commercial . . . . . −65°C to 125°C
Industrial . . . . . −65°C to 125°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 300°C

† 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.

NOTE 1: The THS6092 and THS6093 may incorporate a PowerPAD™ on the underside of the chip. This acts as a heatsink and must be connected to a thermally dissipating plane for proper power dissipation. Failure to do so may result in exceeding the maximum junction temperature which could permanently damage the device. See TI Technical Brief SLMA002 for more information about utilizing the PowerPAD™ thermally enhanced package.

DISSIPATION RATING TABLE

PACKAGE	θ_{JA}	θ_{JC}	T_A = 25°C§ POWER RATING	T_A = 70°C§ POWER RATING	T_A = 85°C§ POWER RATING
D-8	95°C/W‡	38.3°C/W‡	1.1 W	0.63 W	0.47 W
DDA	45.8°C/W	9.2°C/W	2.3 W	1.31 W	0.98 W
D-14	66.6°C/W‡	26.9°C/W‡	1.6 W	0.90 W	0.68 W
PWP	37.5°C/W	1.4°C/W	2.8 W	1.60 W	1.20 W

‡ This data was taken using the JEDEC proposed high-K test PCB. For the JEDEC low-K test PCB, the Θ_{JA} is168°C/W for the D−8 package and 122.3°C/W for the D−14 package.

§ Power rating is determined with a junction temperature of 130°C. This is the point where distortion starts to substantially increase. Thermal management of the final PCB should strive to keep the junction temperature at or below 125°C for best performance.

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC+} to V_{CC-}	Dual supply	±2.5		±7	V
	Single supply	+5		+14	
Operating free-air temperature, T_A	C-suffix	0		70	°C
	I-suffix	−40		85	

electrical characteristics over recommended operating free-air temperature range, T_A = 25°C, V_{CC+} = 12 V, V_{CC-} = GND, $R_{FEEDBACK}$ = 750 Ω, R_L = 25 Ω (unless otherwise noted)

dynamic performance

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
BW	Small-signal bandwidth (−3 dB) G=1	V_{CC} = 12 V		100		MHz
		V_{CC} = 5 V		90		
SR	Slew rate (see Note 2)	V_{CC} = 12 V		600		V/μs
		V_{CC} = 5 V		400		

NOTE 2: Slew rate is defined from the 25% to the 75% output levels.

noise/distortion performance

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
THD	Total harmonic distortion (single-ended configuration)		Gain = 4, R_L = 25 Ω, V_{CC} = 5 V, f = 250 kHz	$V_{O(pp)}$ = 2 V		−70		dBc
			Gain = 4, R_L = 25 Ω, V_{CC} = 12 V, f = 250 kHz	$V_{O(pp)}$= 2 V		−72		
				$V_{O(pp)}$= 7 V		−68		
V_n	Input voltage noise		V_{CC} = 12 V, 5 V, f = 10 kHz			2.1		nV/√Hz
I_n	Input current noise	+Input	V_{CC} = 12 V, 5 V, f = 10 kHz			2.1		pA/√Hz
		−Input				10.9		
X_T	Crosstalk		f = 250 kHz, G = 4, V_O = 2 Vpp, R_L= 25 Ω	V_{CC} = 5 V		−65		dBc
				V_{CC} = 12 V		−63		

dc performance

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OS}	Input offset voltage	V_{CC} = 12 V, 5 V	T_A = 25°C		6	16	mV
			T_A = full range			21	
	Differential offset voltage		T_A = 25°C		1	6	
			T_A = full range			8	
	Offset drift		T_A = full range		20		μV/°C
I_{IB}	− Input bias current	V_{CC} = 12 V, 5 V	T_A = 25°C		3	10	μA
			T_A = full range			12	
	+ Input bias current		T_A = 25°C		1	6	
			T_A = full range			7	
	Differential input bias current		T_A = 25°C		3	10	
			T_A = full range			12	
Z_{OL}	Open loop transimpedance	R_L = 1 kΩ	V_{CC} = 12 V, 5 V		0.9		MΩ

electrical characteristics over recommended operating free-air temperature range, T_A = 25°C, V_{CC+} = 12 V, V_{CC-} = GND, $R_{FEEDBACK}$ = 750 Ω, R_L = 25 Ω (unless otherwise noted) (continued)

input characteristics

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{ICR}	Input common-mode voltage range	V_{CC} = 5 V	T_A = 25°C	1.5 to 3.5	1.1 to 3.9		V
			T_A = full range	1.6 to 3.4			
		V_{CC} = 12 V	T_A = 25°C	2.3 to 9.7	1.8 to 10.2		
			T_A = full range	2.4 to 9.6			
CMRR	Common-mode rejection ratio	V_{CC} = 5 V	T_A = 25°C	56	63		dB
			T_A = full range	54			
		V_{CC} = 12 V	T_A = 25°C	50	56		
			T_A = full range	48			
R_I	Input resistance	+ Input			1		MΩ
		−Input			15		Ω
C_I	Input capacitance				2		pF

output characteristics

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_O	Output voltage swing	Single ended 100 mV overdrive	R_L = 25 Ω	V_{CC} = 5 V	1.4 to 3.6	1.1 to 3.9		V
				V_{CC} = 12 V	1.9 to 10.1	1.4 to 10.6		
			R_L = 100 Ω	V_{CC} = 5 V	1.3 to 3.7	1.05 to 3.95		
				V_{CC} = 12 V	1.5 to 10.5	1.1 to 10.9		
I_O	Output current		R_L = 3.6 Ω,	V_{CC} = 5 V		240		mA
			R_L = 10 Ω,	V_{CC} = 12 V	240	275		
I_{SC}	Short-circuit current		R_L = 0 Ω,	V_{CC} = 12 V		325		mA
	Output resistance		Open loop			15		Ω

power supply

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{CC}	Operating range	Dual supply			±2.25		±7	V
		Single supply			4.5		14	
I_{CC}	Quiescent current (each driver)		V_{CC} = 5 V	T_A = 25°C		6.7	8.8	mA
				T_A = full range			10	
			V_{CC} = 12 V	T_A = 25°C		7.3	9.5	mA
				T_A = full range			10.5	
PSRR	Power supply rejection ratio		V_{CC} = 5 V	T_A = 25°C	-54	−58		dB
				T_A = full range	-46	−		
			V_{CC} = 12 V	T_A = 25°C	-58	−70		
				T_A = full range	-50			

electrical characteristics over recommended operating free-air temperature range, T_A = 25°C, V_{CC+} = 12 V, V_{CC-} = GND, $R_{FEEDBACK}$ = 750 Ω, R_L = 25 Ω (unless otherwise noted) (continued)

shutdown characteristics (THS6093 only)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{IL(SHDN)}$	Shutdown pin voltage for power up	V_{CC} = 12 V, GND = 6 V (GND Pin as Reference)			0.8	V
$V_{IH(SHDN)}$	Shutdown pin voltage for power down	V_{CC} = 12 V, GND = 6 V (GND Pin as Reference)	2			V
$I_{CC(SHDN)}$	Total quiescent current when in shutdown state	V_{SHDN} = 8 V, V_{GND} = 6 V, V_{CC} = 12 V		0.3	0.7	mA
t_{DIS}	Disable time (see Note 3)	V_{CC} = 12 V		0.2		µs
t_{EN}	Enable time (see Note 3)	V_{CC} = 12 V		0.5		µs
$I_{IL(SHDN)}$	Shutdown pin input bias current for power up	V_{SHDN} = 6 V, V_{GND} = 6 V, V_{CC} = 12 V		40	100	µA
$I_{IH(SHDN)}$	Shutdown pin input bias current for power down	V_{SHDN} = 9.3 V, V_{GND} = 6 V, V_{CC} = 12 V		50	100	µA

NOTE 3: Disable/enable time is defined as the time from when the shutdown signal is applied to the SHDN pin to when the supply current has reached half of its final value.

APPLICATION INFORMATION

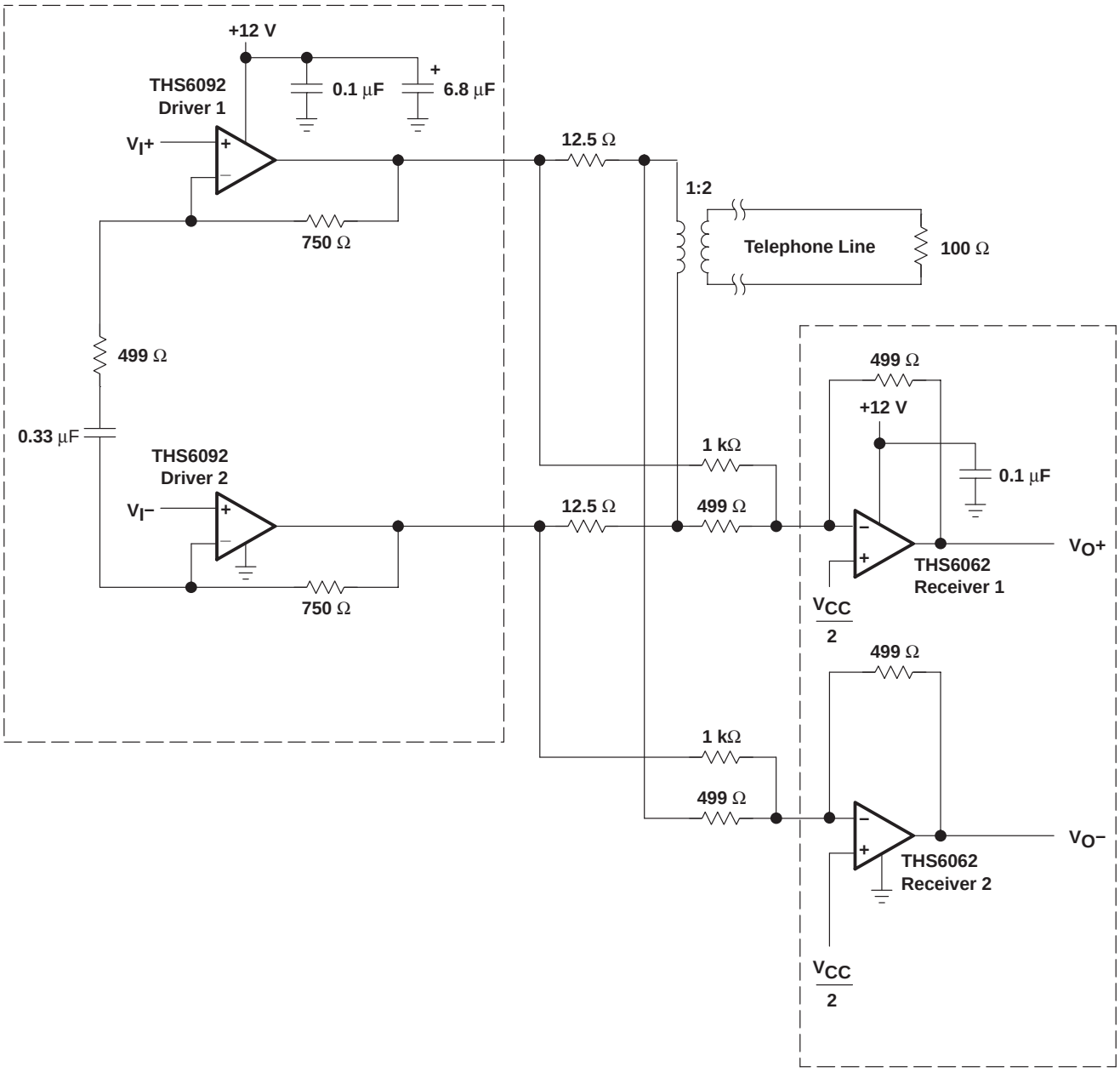
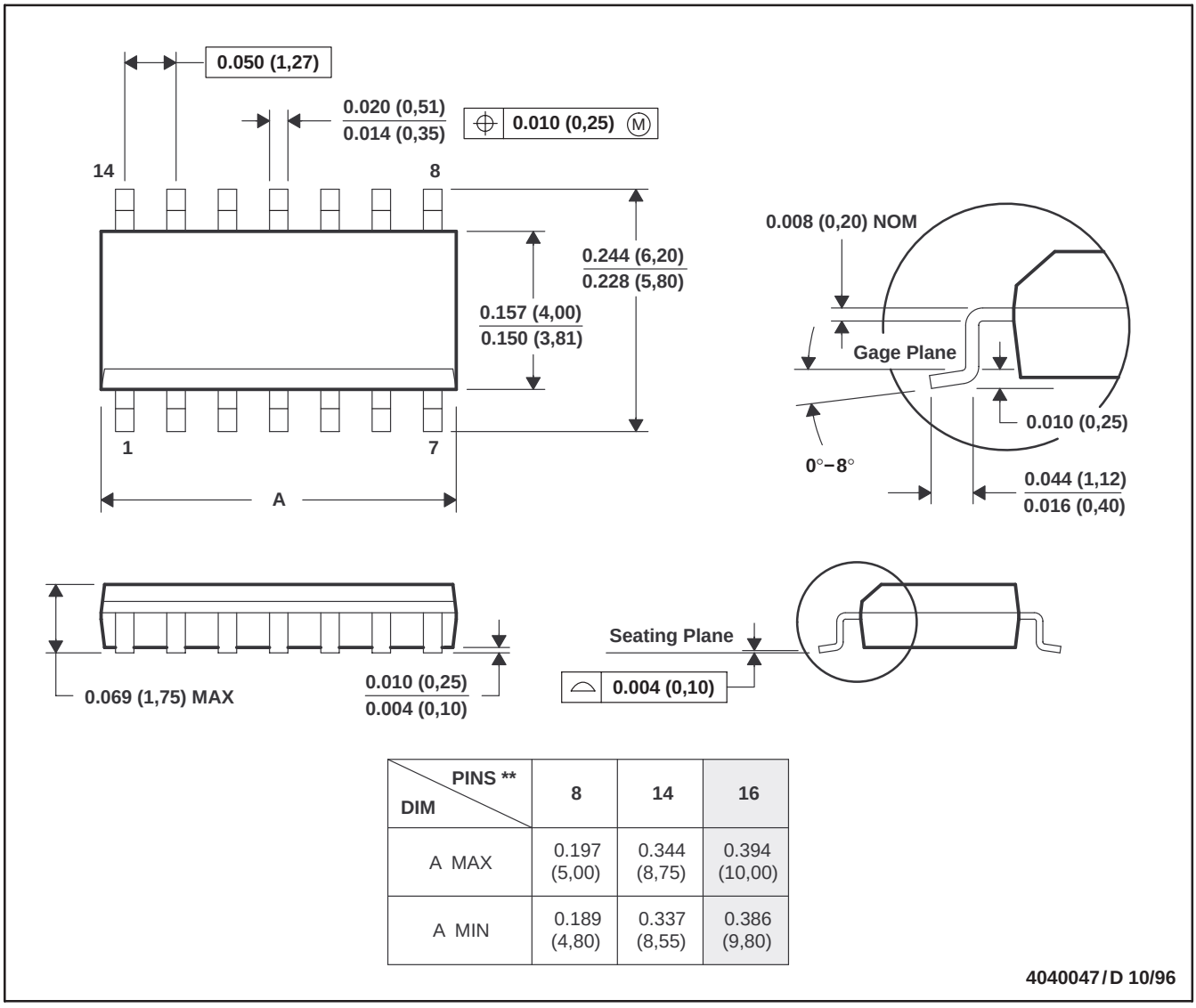


Figure 1. THS6092 ADSL Application With 1:2 Transformer Ratio

MECHANICAL DATA

D (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14 PINS SHOWN



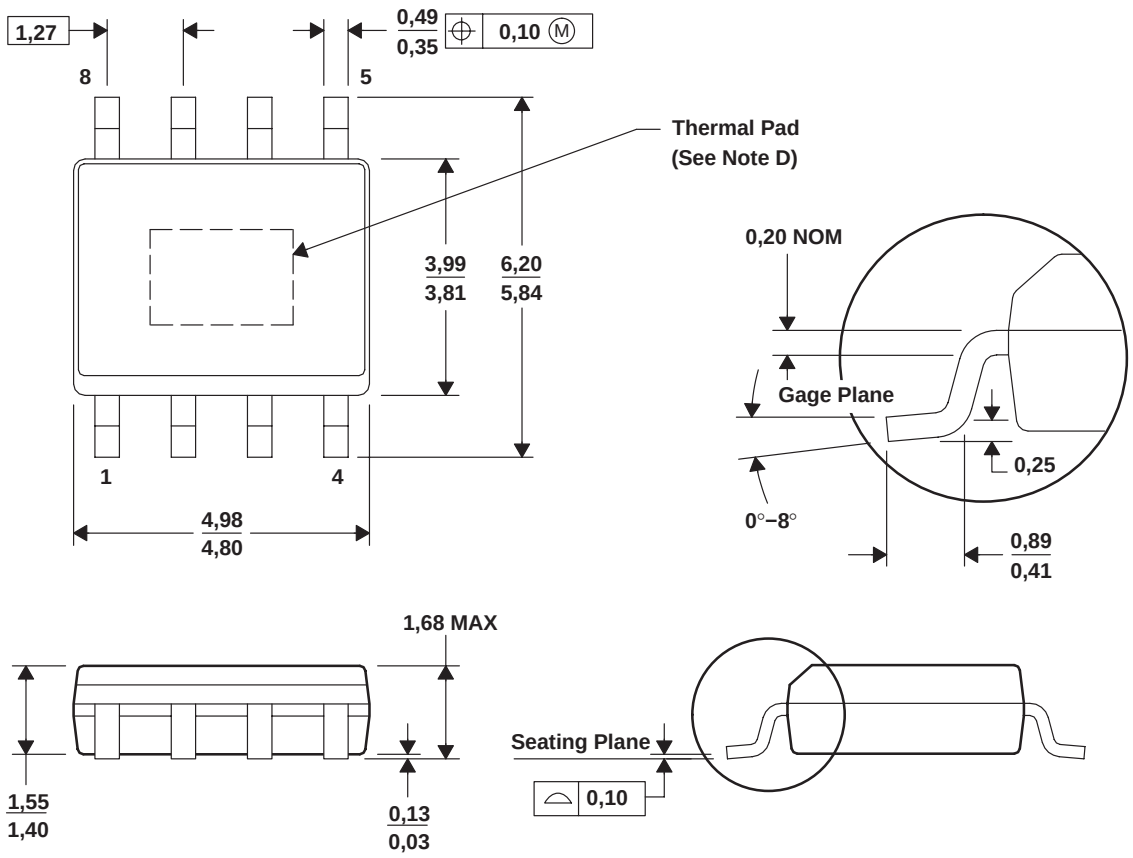
DIM \ PINS **	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

4040047/D 10/96

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
D. Falls within JEDEC MS-012

MECHANICAL DATA

DDA (S−PDSO−G8) **Power PAD™ PLASTIC SMALL-OUTLINE**



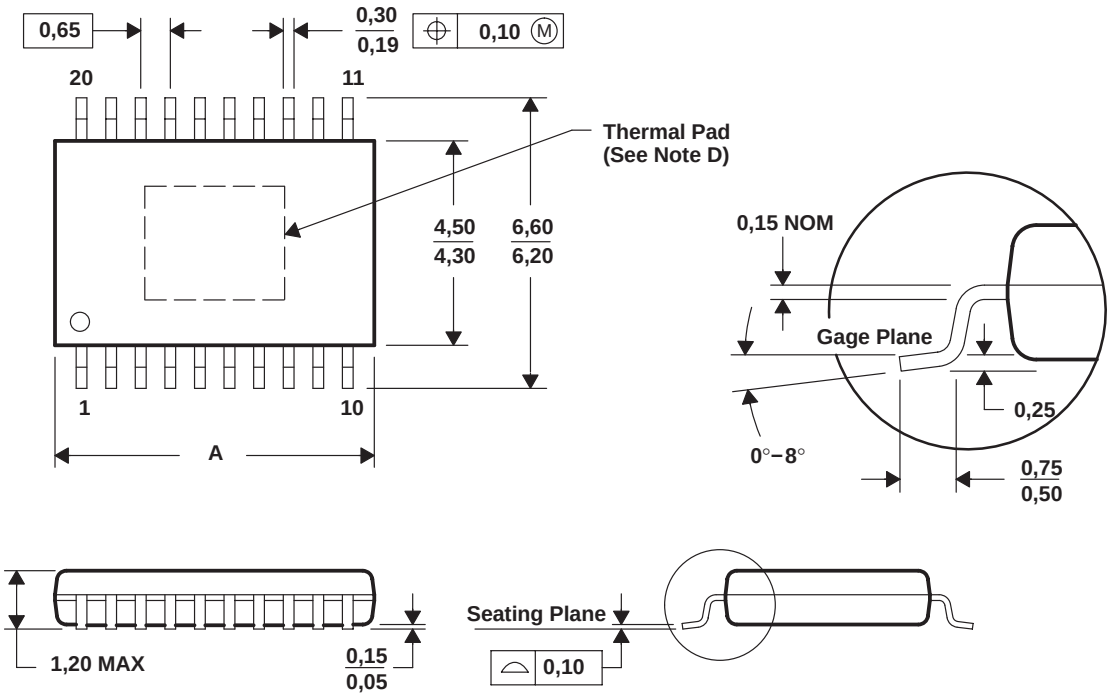
NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
D. The package thermal performance may be enhanced by bonding the thermal pad to an external thermal plane. This pad is electrically and thermally connected to the backside of the die and possibly selected leads.

PowerPAD is a trademark of Texas Instruments.

MECHANICAL INFORMATION

PWP (R-PDSO-G)** **PowerPAD™ PLASTIC SMALL-OUTLINE PACKAGE**

20-PIN SHOWN



DIM \ PINS **	14	16	20	24	28
A MAX	5,10	5,10	6,60	7,90	9,80
A MIN	4,90	4,90	6,40	7,70	9,60

4073225/E 03/97

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusions.
D. The package thermal performance may be enhanced by bonding the thermal pad to an external thermal plane. This pad is electrically and thermally connected to the backside of the die and possibly selected leads.
E. Falls within JEDEC MO-153

PowerPAD is a trademark of Texas Instruments.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
THS6092CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092CDDA	ACTIVE	SO Power PAD	DDA	8	75	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM
THS6092CDDAG3	ACTIVE	SO Power PAD	DDA	8	75	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM
THS6092CDDAR	ACTIVE	SO Power PAD	DDA	8	2500	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM
THS6092CDDARG3	ACTIVE	SO Power PAD	DDA	8	2500	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM
THS6092CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092IDDA	ACTIVE	SO Power PAD	DDA	8	75	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM
THS6092IDDAG3	ACTIVE	SO Power PAD	DDA	8	75	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM
THS6092IDDAR	ACTIVE	SO Power PAD	DDA	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM
THS6092IDDARG3	ACTIVE	SO Power PAD	DDA	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM
THS6092IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6092IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093CD	ACTIVE	SOIC	D	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093CDG4	ACTIVE	SOIC	D	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093CDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093CDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093CPWP	ACTIVE	HTSSOP	PWP	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093CPWPG4	ACTIVE	HTSSOP	PWP	14	90	Green (RoHS &	CU NIPDAU	Level-2-260C-1 YEAR

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
						no Sb/Br)		
THS6093CPWPR	ACTIVE	HTSSOP	PWP	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093CPWPRG4	ACTIVE	HTSSOP	PWP	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
THS6093IPWP	ACTIVE	HTSSOP	PWP	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093IPWPG4	ACTIVE	HTSSOP	PWP	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093IPWPR	ACTIVE	HTSSOP	PWP	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
THS6093IPWPRG4	ACTIVE	HTSSOP	PWP	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

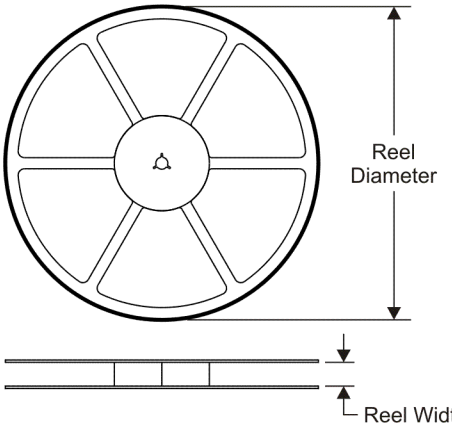
[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

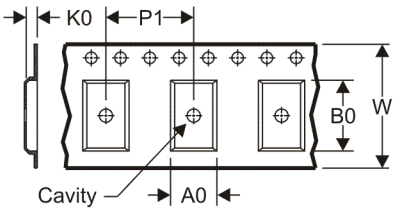
[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

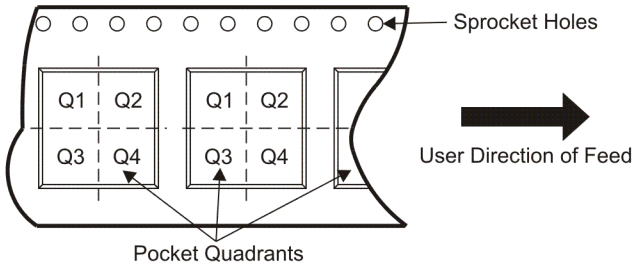


TAPE DIMENSIONS



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

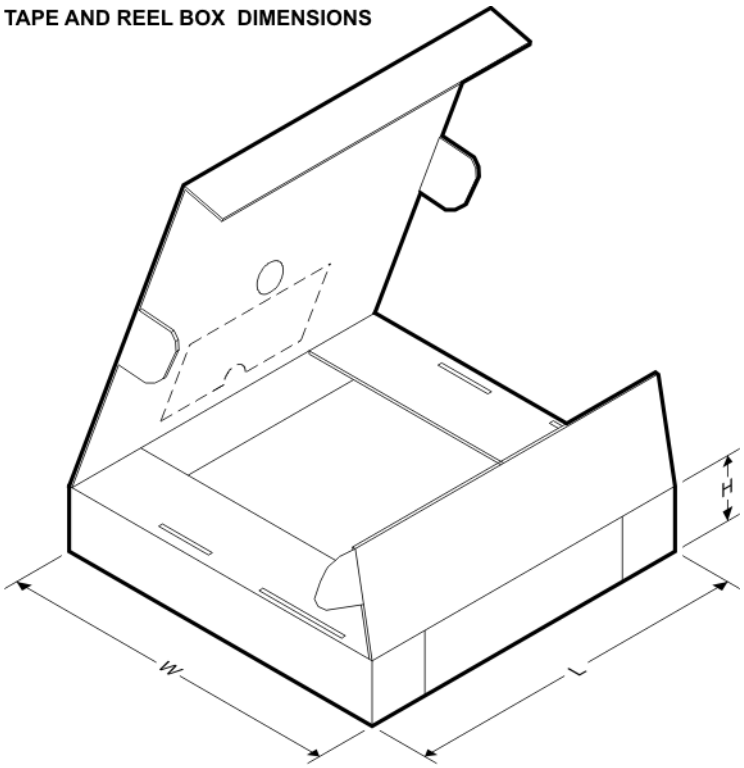
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
THS6092CDDAR	SO Power PAD	DDA	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
THS6092CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
THS6092IDDAR	SO Power PAD	DDA	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
THS6092IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
THS6093CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
THS6093CPWPR	HTSSOP	PWP	14	2000	330.0	12.4	6.67	5.4	1.6	8.0	12.0	Q1
THS6093IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
THS6093IPWPR	HTSSOP	PWP	14	2000	330.0	12.4	6.67	5.4	1.6	8.0	12.0	Q1

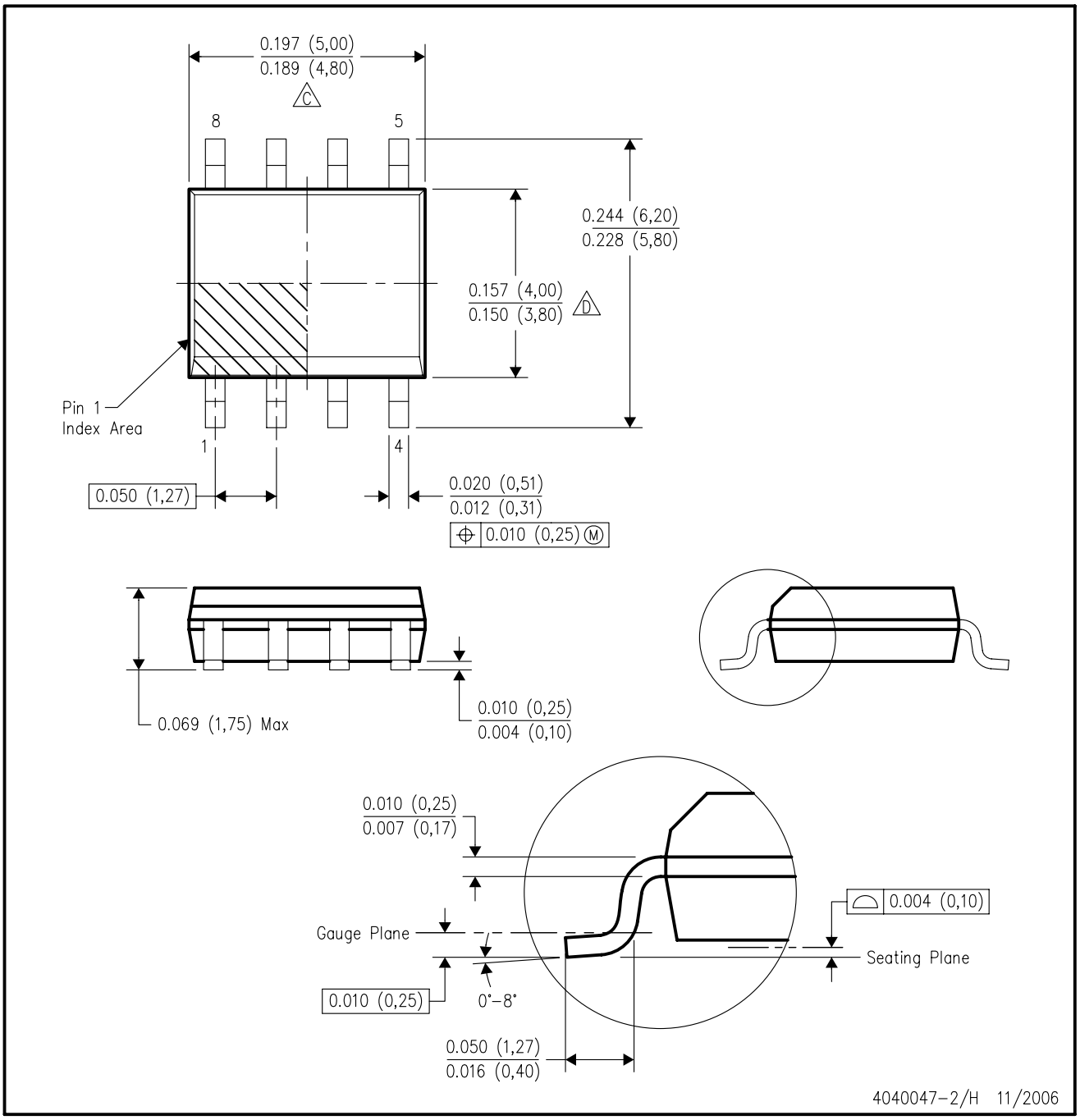
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

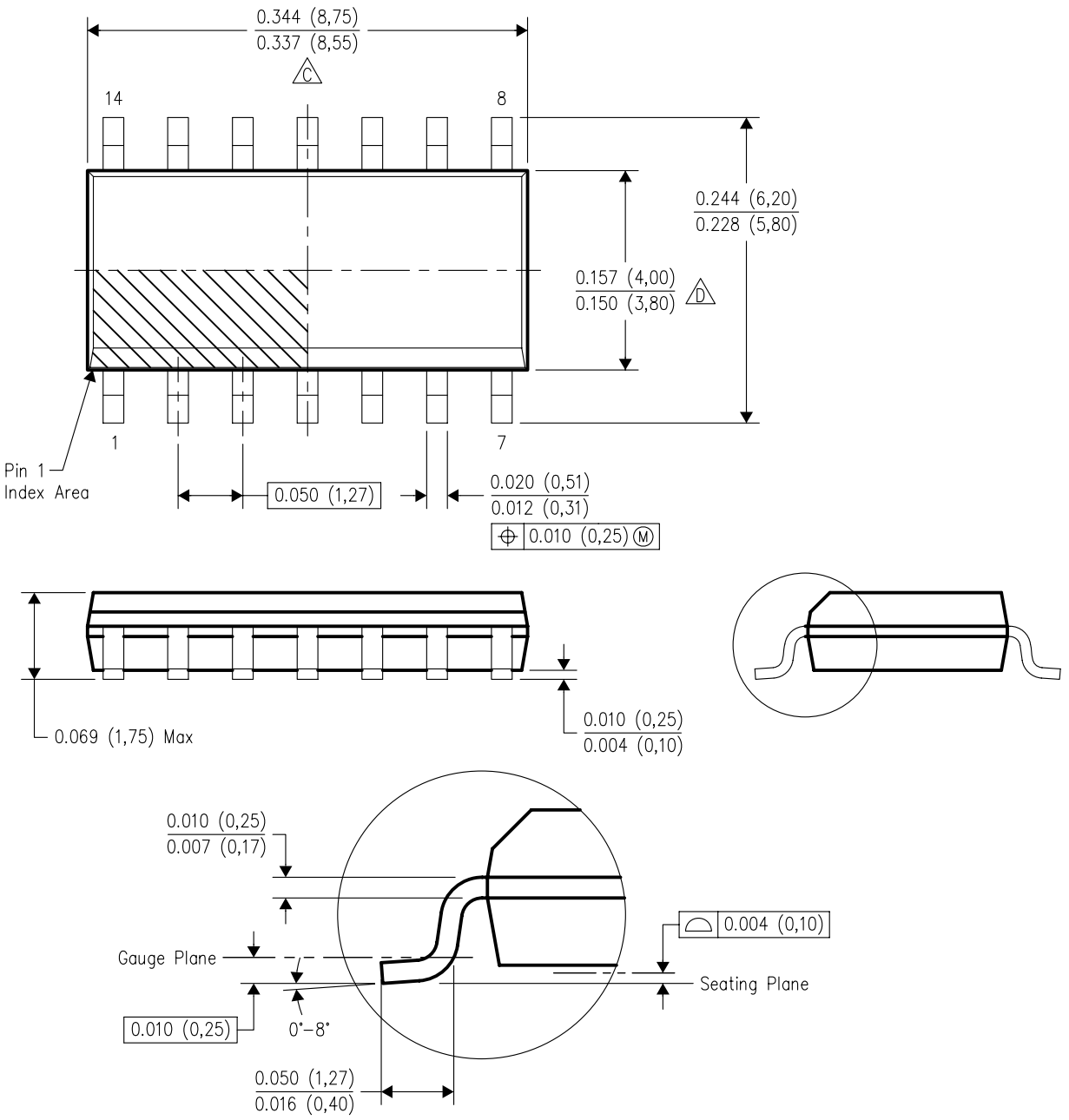
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
THS6092CDDAR	SO PowerPAD	DDA	8	2500	346.0	346.0	29.0
THS6092CDR	SOIC	D	8	2500	346.0	346.0	29.0
THS6092IDDAR	SO PowerPAD	DDA	8	2500	346.0	346.0	29.0
THS6092IDR	SOIC	D	8	2500	346.0	346.0	29.0
THS6093CDR	SOIC	D	14	2500	346.0	346.0	33.0
THS6093CPWPR	HTSSOP	PWP	14	2000	346.0	346.0	29.0
THS6093IDR	SOIC	D	14	2500	346.0	346.0	33.0
THS6093IPWPR	HTSSOP	PWP	14	2000	346.0	346.0	29.0

D (R–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



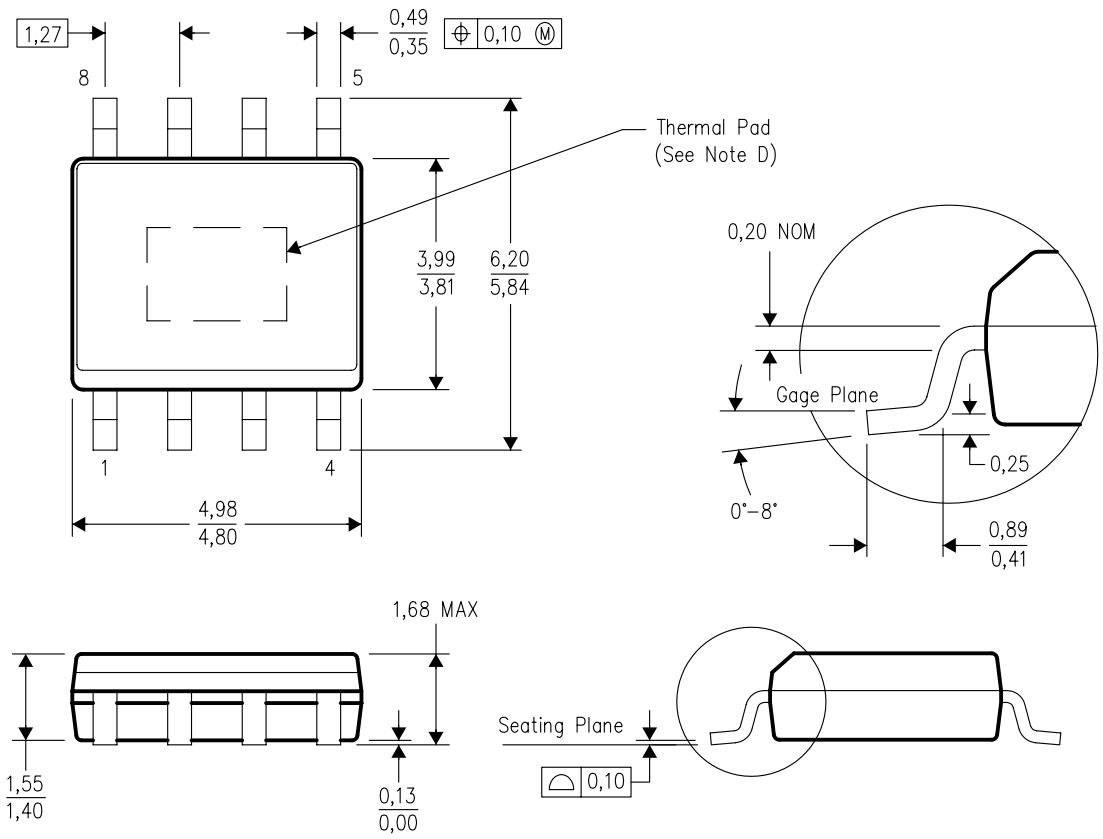
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
E. Reference JEDEC MS–012 variation AA.

D (R–PDSO–G14) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
E. Reference JEDEC MS–012 variation AB.

DDA (R–PDSO–G8) PowerPAD™ PLASTIC SMALL–OUTLINE PACKAGE



4202561/D 04/04

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <http://www.ti.com>.

PowerPAD is a trademark of Texas Instruments.

THERMAL PAD MECHANICAL DATA

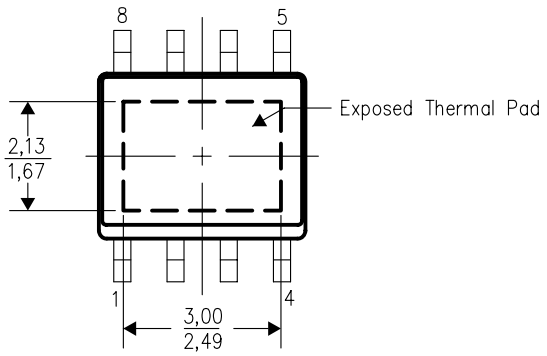
DDA (R–PDSO–G8)

THERMAL INFORMATION

This PowerPAD™ package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For additional information on the PowerPAD package and how to take advantage of its heat dissipating abilities, refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 and Application Brief, PowerPAD Made Easy, Texas Instruments Literature No. SLMA004. Both documents are available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

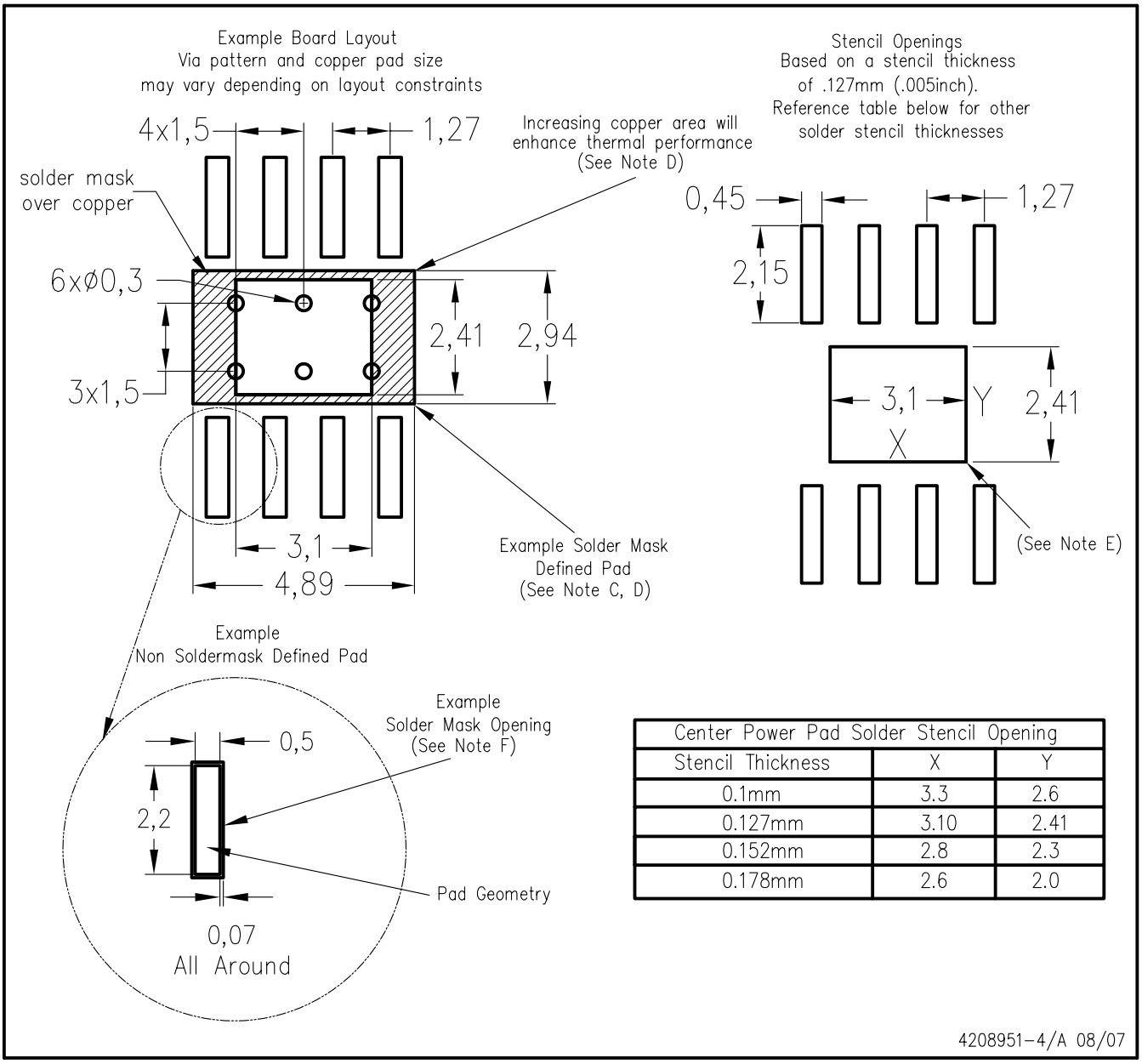


Top View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

DDA (R–PDSO–G8) PowerPAD™



Center Power Pad Solder Stencil Opening		
Stencil Thickness	X	Y
0.1mm	3.3	2.6
0.127mm	3.10	2.41
0.152mm	2.8	2.3
0.178mm	2.6	2.0

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002, SLMA004, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>. Publication IPC–7351 is recommended for alternate designs.
E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.
F. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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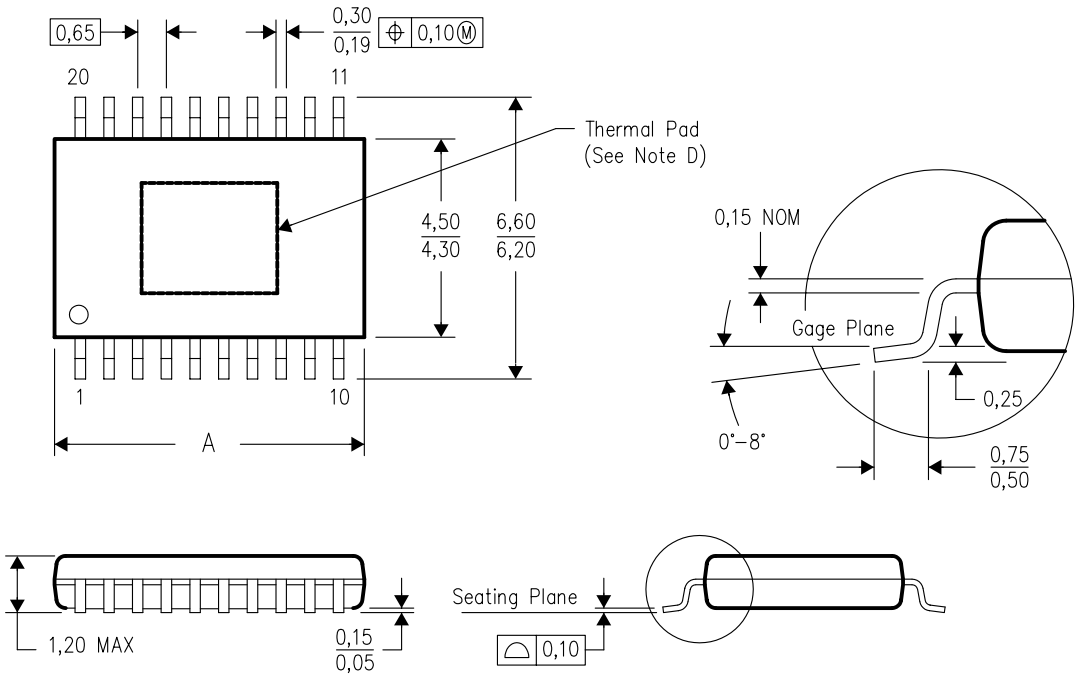
PWP (R–PDSO–G**) PowerPAD™ PLASTIC SMALL–OUTLINE PACKAGE

20 PIN SHOWN



DIM \ PINS **	14	16	20	24	28
A MAX	5,10	5,10	6,60	7,90	9,80
A MIN	4,90	4,90	6,40	7,70	9,60

4073225/H 12/05

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusions. Mold flash and protrusion shall not exceed 0.15 per side.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <http://www.ti.com>.
E. Falls within JEDEC MO–153

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THERMAL PAD MECHANICAL DATA

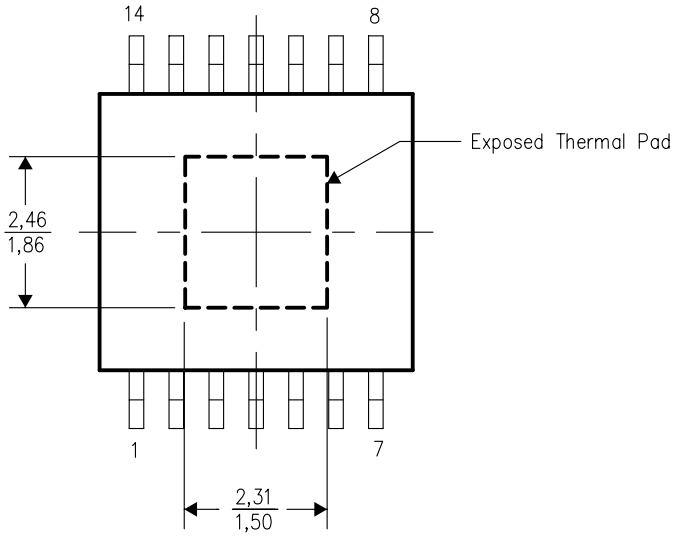
PWP (R–PDSO–G14)

THERMAL INFORMATION

This PowerPAD™ package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For additional information on the PowerPAD package and how to take advantage of its heat dissipating abilities, refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 and Application Brief, PowerPAD Made Easy, Texas Instruments Literature No. SLMA004. Both documents are available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

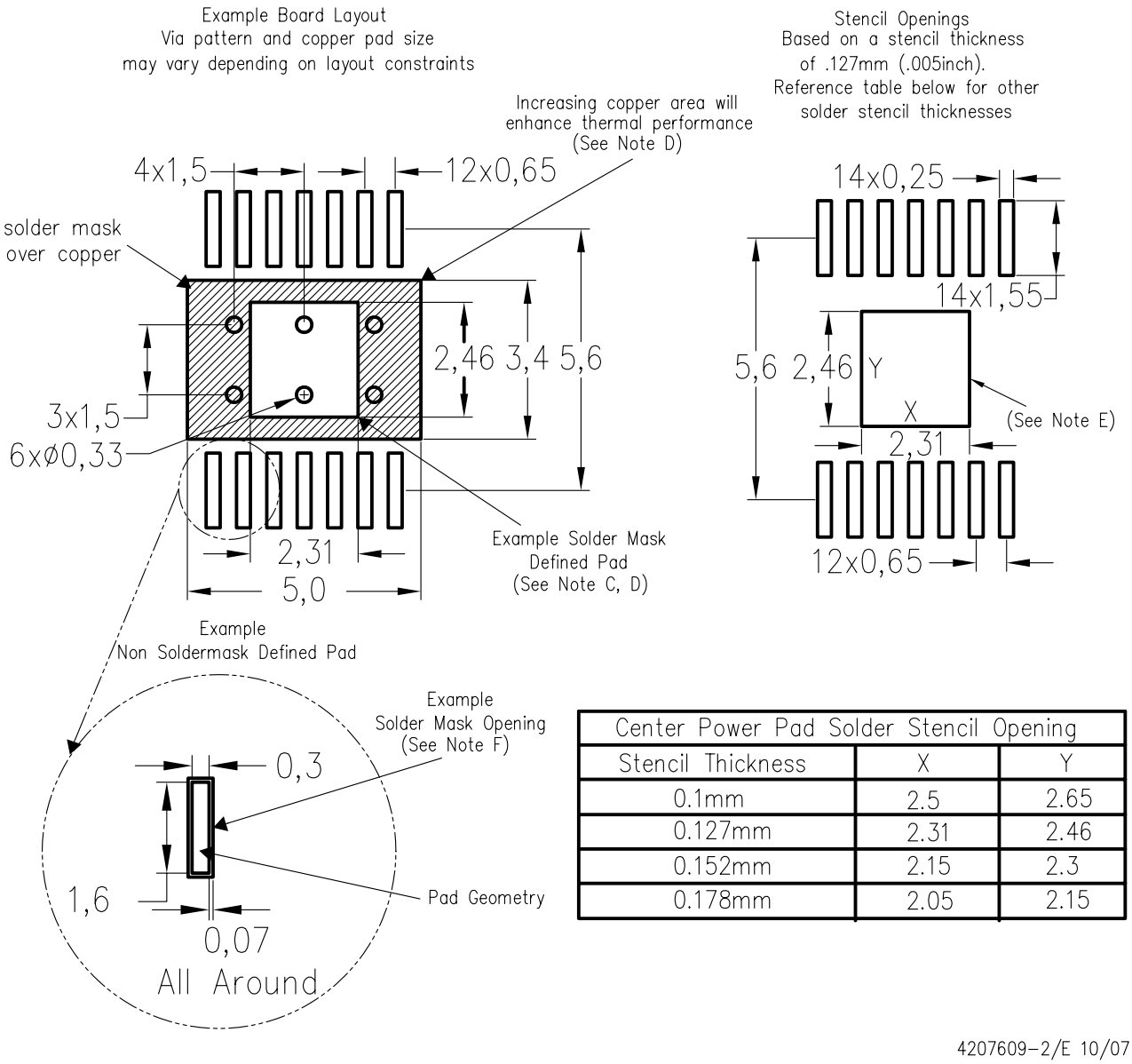


Top View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

PWP (R–PDSO–G14) PowerPAD™



Center Power Pad Solder Stencil Opening		
Stencil Thickness	X	Y
0.1mm	2.5	2.65
0.127mm	2.31	2.46
0.152mm	2.15	2.3
0.178mm	2.05	2.15

4207609–2/E 10/07

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002, SLMA004, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>. Publication IPC–7351 is recommended for alternate designs.
E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.
F. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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