LOW INPUT VOLTAGE, 1-A LOW-DROPOUT LINEAR REGULATORS WITH SUPERVISOR

Check for Samples: TPS726126, TPS72615, TPS72616, TPS72618, TPS72625

FEATURES

- **1-A Low-Dropout Regulator Supports Input Voltages Down to 1.8-V**
- **Available in 1.26-V, 1.5-V, 1.6-V, 1.8-V, 2.5-V**
- **Stable With Any Type/Value Output Capacitor**
- **±2% Output Voltage Tolerance Over Line, Load, and Temperature (–40°C to +125°C)**
- **Integrated Supervisor (SVS) With 200-ms $\overline{\text{RESET}}$ Delay Time**
- **Low 170-mV Dropout Voltage at 1 A (TPS72625)**
- **Low 210-μA Ground Current at Full Load**
- **Less than 1-μA Standby Current**
- **Integrated UVLO with Thermal and Overcurrent Protection**
- **5-Lead SOT223 or DDPAK Surface-Mount Package**

APPLICATIONS

- **PCI Cards**
- **Modem Banks and Telecom Boards**
- **DSP, FPGA, and Microprocessor Power Supplies**
- **Portable, Battery-Powered Applications**
- **1.26-V Core Voltage for the Following DSPs:**
  - **TMS320vC5501**
  - **TMS320vC5502**

DESCRIPTION

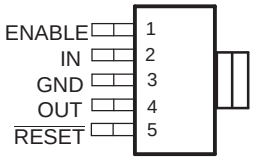
The TPS726xx family of 1-A low-dropout (LDO) linear regulators has fixed voltage options available that are commonly used to power the latest DSPs, FPGAs, and microcontrollers. The integrated supervisory circuitry provides an active low $\overline{\text{RESET}}$ signal when the output falls out of regulation. The no capacitor/any capacitor feature allows the customer to tailor output transient performance as needed. Therefore, compared to other regulators capable of providing the same output current, this family of regulators can provide a stand alone power supply solution or a post regulator for a switch mode power supply.

These regulators operate over a wide range of input voltages (1.8 V to 6 V) and have very low dropout (170 mV at 1-A). Ground current is typically 210 μA at full load and drops to less than 80 μA at no load. Standby current is less than 1 μA.

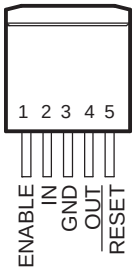
Unlike some regulators that have a minimum current requirement, the TPS726xx family is stable with no output load current. The low noise capability of this family, coupled with its high current operation and ease of power dissipation, make it ideal for telecom boards, modem banks, and other noise sensitive applications.

The TPS726xx is available in either a SOT223 or DDPAK package. The TPS726126 is available in a SOT223 package only.

DCQ PACKAGE
SOT223-5
(TOP VIEW)



KTT PACKAGE
DDPAK
(TOP VIEW)



Note: Tab is GND for both packages

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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2002–2010, Texas Instruments Incorporated

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.

ORDERING INFORMATION(1)

PRODUCT	V_{OUT}
TPS726**xx** ***xyyy*** *z*	**XXX** is nominal output voltage (for example, 126 = 1.26V, 15 = 1.5V). **YYY** is package designator. **Z** is package quantity.

(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.

ABSOLUTE MAXIMUM RATINGS

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

		UNIT
Input voltage, V_I (2)	–0.3 to 7	V
Voltage range at EN	–0.3 to V_I + 0.3	V
Voltage on $\overline{\text{RESET}}$	V_{IN} + 0.3	V
Voltage on OUT	6	V
ESD rating, HBM	2	kV
Continuous total power dissipation	See Dissipation Rating Table	
Operating junction temperature range, T_J	–50 to 150	°C
Maximum junction temperature range, T_J	150	°C
Storage temperature, T_{stg}	–65 to 150	°C

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values are with respect to network ground terminal.

PACKAGE DISSIPATION RATINGS

PACKAGE	BOARD	$R_{\theta JC}$	$R_{\theta JA}$
DDPAK	High K(1)	2 °C/W	23 °C/W
SOT223	Low K(2)	15 °C/W	53 °C/W

(1) The JEDEC high K (2s2p) board design used to derive this data was a 3-inch x 3-inch (7,5-cm x 7,5-cm), multilayer board with 1 ounce internal power and ground planes and 2 ounce copper traces on top and bottom of the board.
(2) The JEDEC low K (1s) board design used to derive this data was a 3-inch x 3-inch (7,5-cm x 7,5-cm), two-layer board with 2 ounce copper traces on top of the board.

Copyright © 2002–2010, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range $V_I = V_{O(typ)} + 1$ V, I_O= 1 mA, EN = IN, C_O = 1 µF, C_I = 1 µF (unless otherwise noted). Typical values are at +25°C.

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_I (1)	Input voltage				1.8		6	V
I_O	Continuous output current				0		1	A
	Bandgap voltage reference				1.177	1.220	1.263	V
V_O	Output voltage	TPS726126	0 µA < I_O < 1 A	1.8 V ≤ V_I ≤ 5.5 V	1.222	1.26	1.298	V
		TPS72615	0 µA < I_O < 1 A	1.8 V ≤ V_I ≤ 5.5 V	1.47	1.5	1.53	
		TPS72616	0 µA < I_O < 1 A	2.6 V ≤ V_I ≤ 5.5 V	1.568	1.6	1.632	
		TPS72618	0 µA < I_O < 1 A	2.8 V ≤ V_I ≤ 5.5 V	1.764	1.8	1.836	
		TPS72625	0 µA < I_O < 1 A	3.5 V ≤ V_I ≤ 5.5 V	2.45	2.5	2.55	
I	Ground current		I_O = 0 µA			75	120	µA
			I_O = 1 A			210	300	
	Standby current		EN < 0.4 V			0.2	1	µA
V_n	Output noise voltage		BW = 200 Hz to 100 kHz	C_O = 10 µF		150		µV
PSRR	Ripple rejection		f = 1 kHz, C_o = 10 µF			60		dB
	Current limit (2)				1.1	1.6	2.3	A
	Output voltage line regulation ($\Delta V_O/V_O$) (3)		V_O + 1 V < V_I ≤ 5.5 V		–0.15	0.02	0.15	%/V
	Output voltage load regulation		0 µA < I_O < 1 A		–0.25	0.05	0.25	%/A
V_{IH}	EN high level input				1.3			V
V_{IL}	EN low level input				–0.2		0.4	
I_I	EN input current		EN = 0 V or V_I			0.01	100	nA
	UVLO threshold		V_{CC} rising		1.45	1.57	1.70	V
	UVLO hysteresis		V_{CC} rising			50		mV
	UVLO deglitch		V_{CC} rising			10		µs
	UVLO delay		V_{CC} rising			100		µs
V_{DO}	Dropout voltage (4)	TPS72625	I_O = 1 A			170	280	mV
		TPS72618	I_O = 1 A			210	320	
$\overline{\text{RESET}}$	Minimum input voltage for valid $\overline{\text{RESET}}$ (V_{RES})				1.3			V
	Trip threshold voltage				90	93	96	$\%V_O$
	Hysteresis voltage					10		mV
	$t_{(RESET)}$ delay time				100	200	300	ms
	Rising edge deglitch					10		µs
	Output low voltage (at 700 µA)				–0.3		0.4	V
	Leakage current						100	nA
T_J	Operating junction temperature				–40		+125	°C

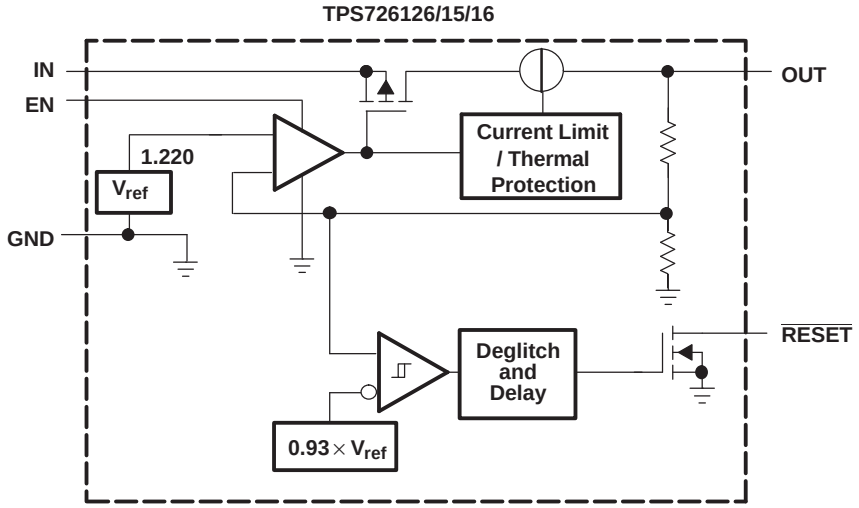
(1) Minimum V_{IN} is 1.800 V or $V_O + V_{DO}$, whichever is greater.
(2) Test condition includes, output voltage $V_O = V_O$ – 15% and pulse duration = 10 ms.
(3) V_{Imin} = (V_O + 1) or 1.8 V whichever is greater.

$$\text{Line regulation (mV)} = (\%/V) \times \frac{V_O\left(5.5\ V - V_{Imin}\right)}{100} \times 1000$$

(4) Dropout voltage is defined as the differential voltage between V_O and V_I when V_O drops 100 mV below the value measured with $V_I = V_O$ + 1 V.

Copyright © 2002–2010, Texas Instruments Incorporated

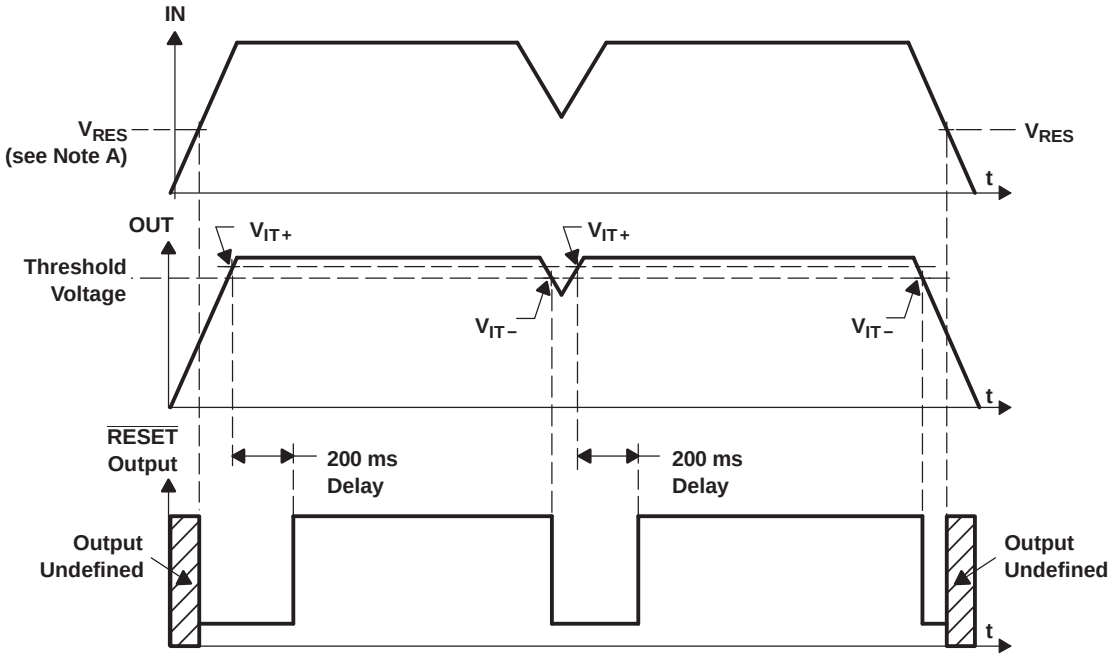
FUNCTIONAL BLOCK DIAGRAM



Terminal Functions

TERMINAL NAME	TERMINAL NO.	DESCRIPTION
GND	3	Ground
ENABLE	1	Enable input
IN	2	Input supply voltage
$\overline{\text{RESET}}$	5	This terminal is the $\overline{\text{RESET}}$ output. When used with a pull-up resistor, this open-drain output provides the active low $\overline{\text{RESET}}$ signal when the regulator output voltage drops more than 5% below its nominal output voltage. The $\overline{\text{RESET}}$ delay time is typically 200 ms.
OUT	4	Regulated output voltage

$\overline{\text{RESET}}$ TIMING DIAGRAM



NOTES:A. V_{RES} is the minimum input voltage for a valid $\overline{\text{RESET}}$.

Copyright © 2002–2010, Texas Instruments Incorporated

TYPICAL CHARACTERISTICS

TPS72618 OUTPUT VOLTAGE vs OUTPUT CURRENT

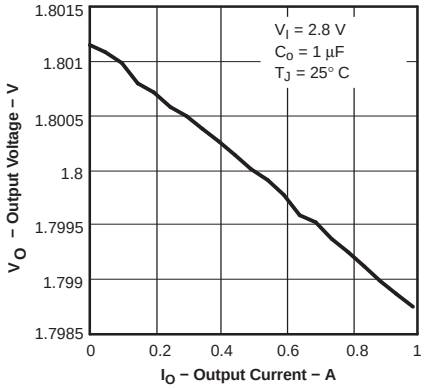


Figure 1.

TPS72618 OUTPUT VOLTAGE vs JUNCTION TEMPERATURE

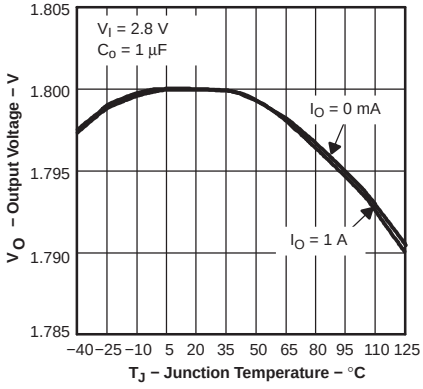


Figure 2.

TPS72618 GROUND CURRENT vs JUNCTION TEMPERATURE

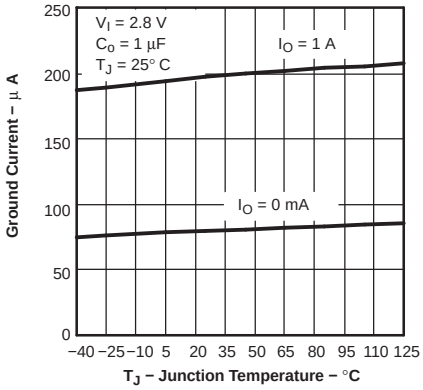


Figure 3.

TPS72618 GROUND CURRENT vs OUTPUT CURRENT

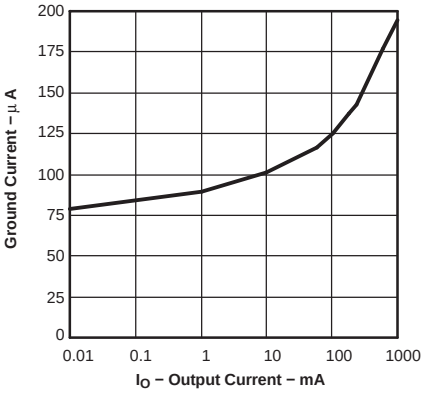


Figure 4.

TPS72625 DC DROPOUT VOLTAGE vs OUTPUT CURRENT

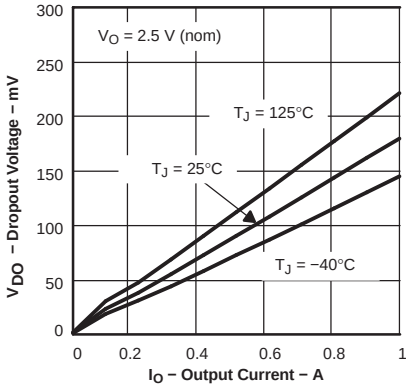


Figure 5.

TPS72618 DROPOUT VOLTAGE vs JUNCTION TEMPERATURE

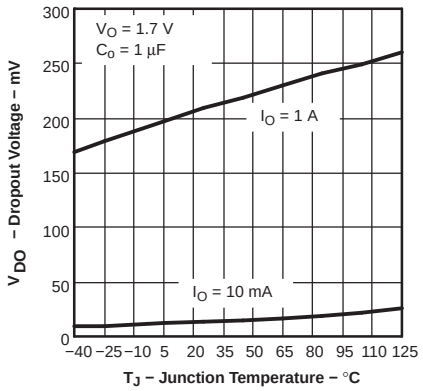


Figure 6.

Copyright © 2002–2010, Texas Instruments Incorporated

TYPICAL CHARACTERISTICS (continued)

MINIMUM REQUIRED INPUT VOLTAGE vs OUTPUT VOLTAGE

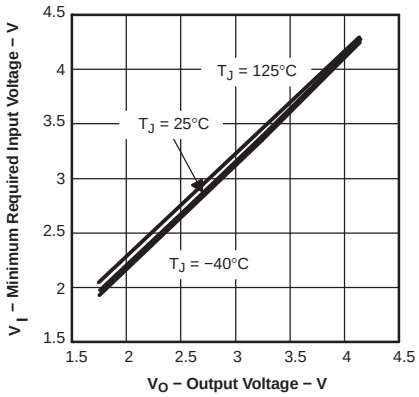


Figure 7.

TPS72618 LINE TRANSIENT RESPONSE

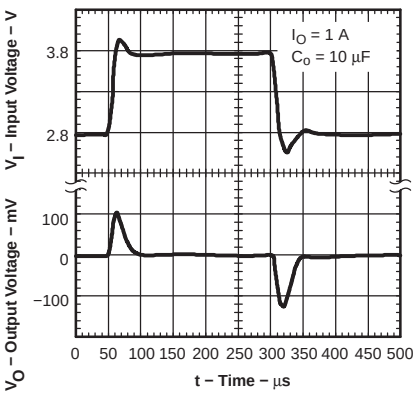


Figure 8.

TPS72618 LOAD TRANSIENT RESPONSE

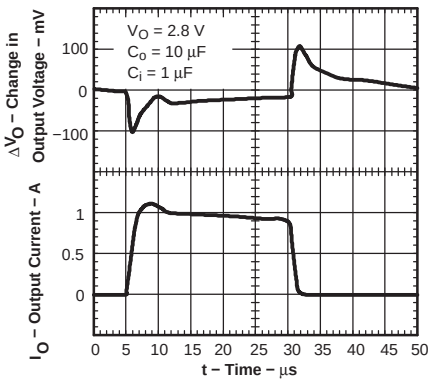


Figure 9.

TPS72618 LOAD TRANSIENT RESPONSE

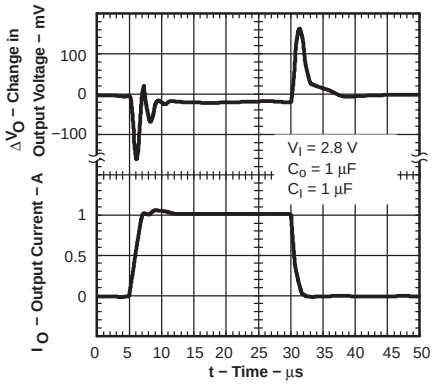


Figure 10.

TPS72618 OUTPUT VOLTAGE, ENABLE VOLTAGE vs TIME (START-UP)

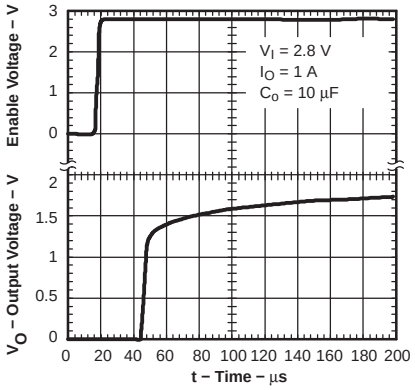


Figure 11.

TPS72618 POWER UP/POWER DOWN

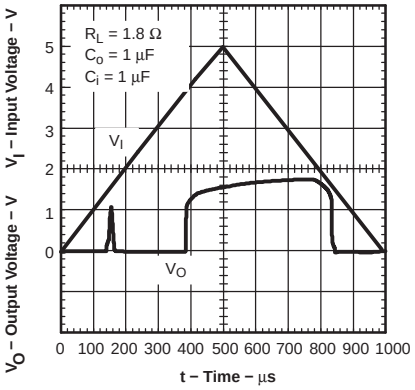


Figure 12.

Copyright © 2002–2010, Texas Instruments Incorporated

TYPICAL CHARACTERISTICS (continued)

TPS72618
OUTPUT SPECTRAL NOISE DENSITY
vs
FREQUENCY

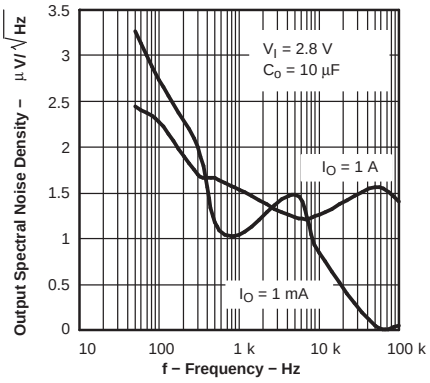


Figure 13.

TPS72618
RIPPLE REJECTION
vs
FREQUENCY

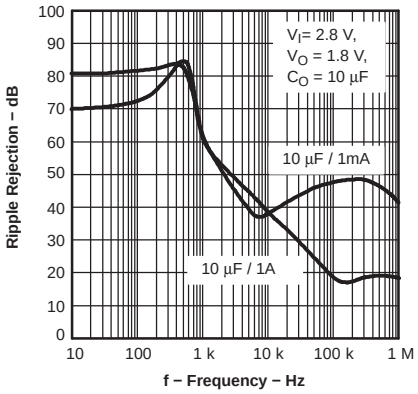


Figure 14.

CURRENT LIMIT
vs
INPUT VOLTAGE

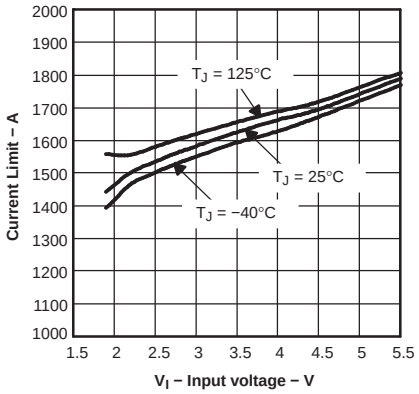


Figure 15.

TPS72615
GROUND CURRENT
vs
INPUT VOLTAGE

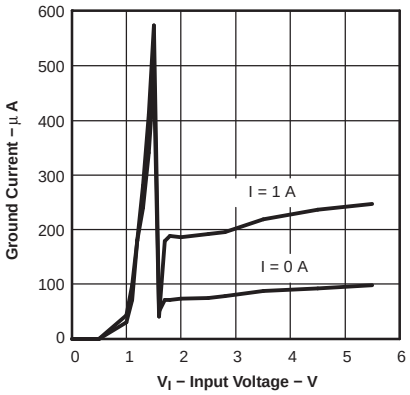


Figure 16.

DROPOUT VOLTAGE
vs
INPUT VOLTAGE

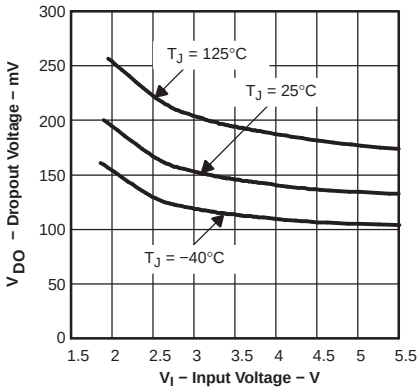


Figure 17.

Copyright © 2002–2010, Texas Instruments Incorporated

APPLICATION INFORMATION

The TPS726xx family of low-dropout (LDO) regulators have numerous features that make it apply to a wide range of applications. The family operates with very low input voltage (≥1.8 V) and low dropout voltage (typically 200 mV at full load), making it an efficient stand-alone power supply or post regulator for battery or switch mode power supplies. Both the active low $\overline{\text{RESET}}$ and 1-A output current, make the TPS726xx family ideal for powering processor and FPGA supplies. The TPS726xx family also has low output noise (typically 150 μV_{RMS} with 10-µF output capacitor), making it ideal for use in telecom equipment.

External Capacitor Requirements

A 1-µF or larger ceramic input bypass capacitor, connected between IN and GND and located close to the TPS726xx, is required for stability. To improve transient response, noise rejection, and ripple rejection, an additional 10-µF or larger, low ESR capacitor is recommended. A higher-value, low ESR input capacitor may be necessary if large, fast-rise-time load transients are anticipated and the device is located several inches from the power source, especially if the minimum input voltage of 1.8 V is used.

Although an output capacitor is not required for stability, transient response and output noise are improved with a 10-µF output capacitor.

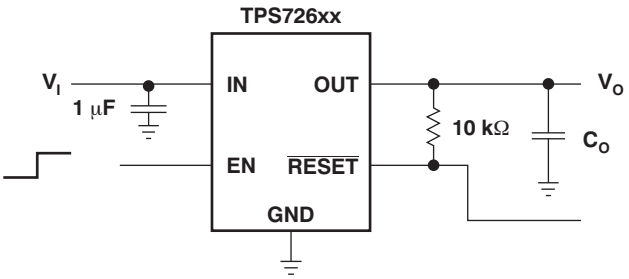


Figure 18. TPS726xx Fixed Output Typical Application Diagram

Regulator Protection

The TPS726xx pass element has a built-in back diode that safely conducts reverse current when the input voltage drops below the output voltage (e.g., during power down). Current is conducted from the output to the input and is not internally limited. If extended reverse voltage is anticipated, external limiting might be appropriate.

The TPS726xx also features internal current limiting and thermal protection. During normal operation, the TPS726xx limits output current to approximately 1.6 A. When current limiting engages, the output voltage scales back linearly until the overcurrent condition ends. While current limiting is designed to prevent gross device failure, care should be taken not to exceed the power dissipation ratings of the package. If the temperature of the device exceeds 165°C, thermal-protection circuitry shuts it down. Once the device has cooled down to below 145°C, regulator operation resumes.

THERMAL INFORMATION

The amount of heat that an LDO linear regulator generates is directly proportional to the amount of power it dissipates during operation. All integrated circuits have a maximum allowable junction temperature ($T_J$max) above which normal operation is not assured. A system designer must design the operating environment so that the operating junction temperature (T_J) does not exceed the maximum junction temperature ($T_J$max). The two main environmental variables that a designer can use to improve thermal performance are air flow and external heatsinks. The purpose of this information is to aid the designer in determining the proper operating environment for a linear regulator that is operating at a specific power level.

Copyright © 2002–2010, Texas Instruments Incorporated

In general, the maximum expected power ($P_{D(max)}$) consumed by a linear regulator is computed as:

$$P_D max = \left(V_{I(avg)} - V_{O(avg)}\right) \times I_{O(avg)} + V_{I(avg)} \times I_{(Q)} \quad (1)$$

Where:

- $V_{I(avg)}$ is the average input voltage.
- $V_{O(avg)}$ is the average output voltage.
- $_{O(avg)}$ is the average output current.
- $I_{(Q)}$ is the quiescent current.

For most TI LDO regulators, the quiescent current is insignificant compared to the average output current; therefore, the term $V_{I(avg)} \times I_{(Q)}$ can be neglected. The operating junction temperature is computed by adding the ambient temperature (T_A) and the increase in temperature due to the regulator's power dissipation. The temperature rise is computed by multiplying the maximum expected power dissipation by the sum of the thermal resistances between the junction and the case ®$_{\theta JC}$), the case to heatsink ®$_{\theta CS}$), and the heatsink to ambient ®$_{\theta SA}$). Thermal resistances are measures of how effectively an object dissipates heat. Typically, the larger the device, the more surface area available for power dissipation and the lower the object's thermal resistance.

Figure 19 illustrates these thermal resistances for (a) a SOT223 package mounted in a JEDEC low-K board, and (b) a DDPAK package mounted on a JEDEC high-K board.

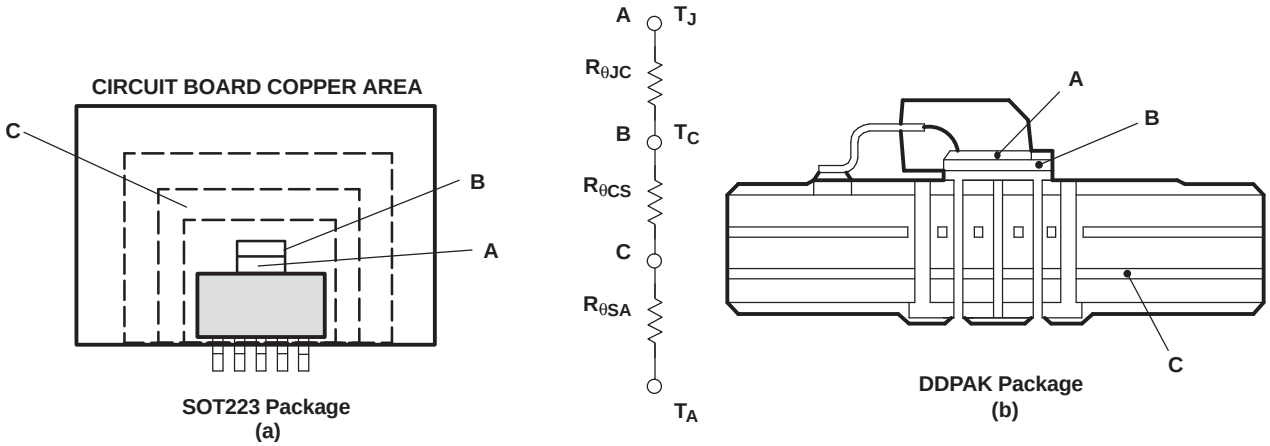


Figure 19. Thermal Resistances

Equation 2 summarizes the computation:

$$T_J = T_A + P_D max \times \left(R_{\theta JC} + R_{\theta CS} + R_{\theta SA}\right) \quad (2)$$

The $R_{\theta JC}$ is specific to each regulator as determined by its package, lead frame, and die size provided in the regulator's data sheet. The $R_{\theta SA}$ is a function of the type and size of heatsink. For example, *black body radiator* type heatsinks can have $R_{\theta CS}$ values ranging from 5°C/W for very large heatsinks to 50°C/W for very small heatsinks. The $R_{\theta CS}$ is a function of how the package is attached to the heatsink. For example, if a thermal compound is used to attach a heatsink to a SOT223 package, $R_{\theta CS}$of 1°C/W is reasonable.

Even if no external *black body radiator* type heatsink is attached to the package, the board on which the regulator is mounted provides some heatsinking through the pin solder connections. Some packages, like the DDPAK and SOT223 packages, use a copper plane underneath the package or the circuit board's ground plane for additional heatsinking to improve their thermal performance. Computer-aided thermal modeling can be used to compute very accurate approximations of an integrated circuit's thermal performance in different operating environments (e.g., different types of circuit boards, different types and sizes of heatsinks, and different air flows, etc.). Using these models, the three thermal resistances can be combined into one thermal resistance between junction and ambient ®$_{\theta JA}$). This $R_{\theta JA}$is valid only for the specific operating environment used in the computer model.

Copyright © 2002–2010, Texas Instruments Incorporated

Equation 2 simplifies into Equation 3:

$$T_J = T_A + P_D max \times R_{\theta JA} \quad (3)$$

Rearranging Equation 3 gives Equation 4:

$$R_{\theta JA} = \frac{T_J - T_A}{P_D max} \quad (4)$$

Using Equation 3 and the computer model generated curves shown in Figure 20 and Figure 23, a designer can quickly compute the required heatsink thermal resistance/board area for a given ambient temperature, power dissipation, and operating environment.

DDPAK Power Dissipation

The DDPAK package provides an effective means of managing power dissipation in surface mount applications. The DDPAK package dimensions are provided in the *Mechanical Data* section at the end of the data sheet. The addition of a copper plane directly underneath the DDPAK package enhances the thermal performance of the package.

To illustrate, the TPS72625 in a DDPAK package was chosen. For this example, the average input voltage is 5 V, the output voltage is 2.5 V, the average output current is 1 A, the ambient temperature 55°C, the air flow is 150 LFM, and the operating environment is the same as documented below. Neglecting the quiescent current, the maximum average power is:

$$P_D max = (5 - 2.5)\ V \times 1\ A = 2.5\ W \quad (5)$$

Substituting $T_J max$ for T_J into Equation 4 gives Equation 6:

$$R_{\theta JA} max = (125 - 55)°C/2.5\ W = 28°C/W \quad (6)$$

From Figure 20, *DDPAK Thermal Resistance vs Copper Heatsink Area*, the ground plane needs to be 1 cm^2 for the part to dissipate 2.5 W. The operating environment used in the computer model to construct Figure 20 consisted of a standard JEDEC High-K board (2S2P) with a 1 oz. internal copper plane and ground plane. The package is soldered to a 2 oz. copper pad. The pad is tied through thermal vias to the 1 oz. ground plane. Figure 21 shows the side view of the operating environment used in the computer model.

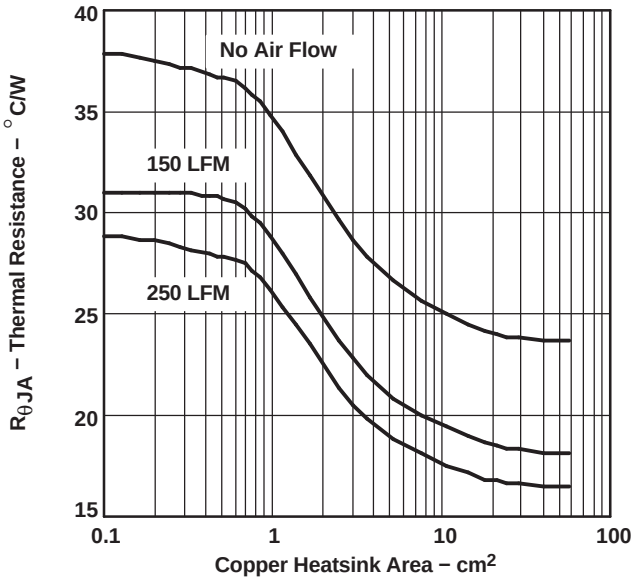


Figure 20. DDPAK Thermal Resistance vs Copper Heatsink Area

Copyright © 2002–2010, Texas Instruments Incorporated

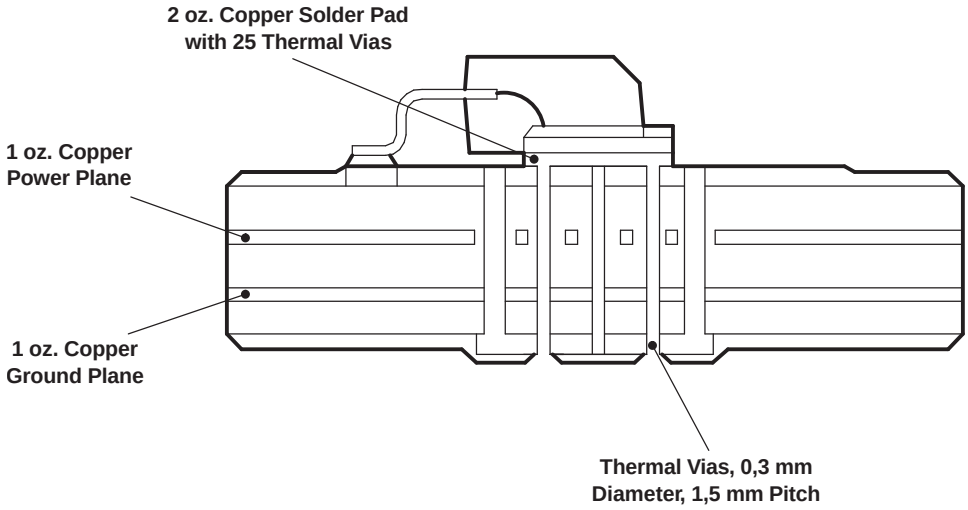


Figure 21. DDPAK Thermal Resistance

From the data in Figure 22 and rearranging Equation 4, the maximum power dissipation for a different ground plane area and a specific ambient temperature can be computed.

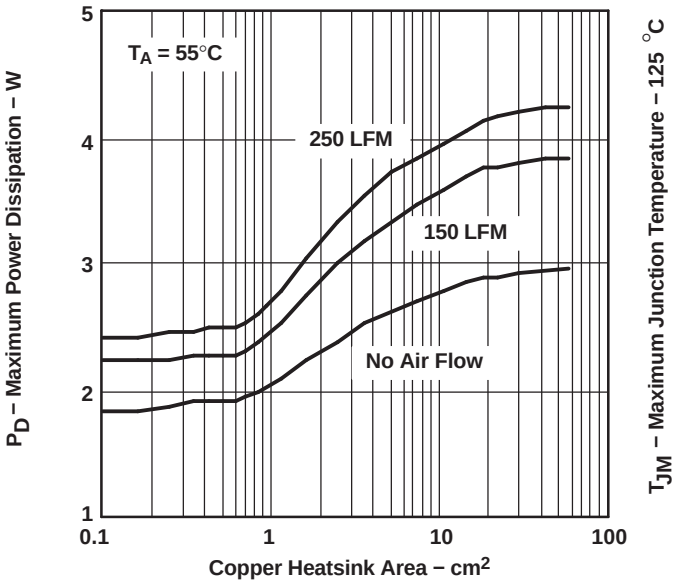


Figure 22. Maximum Power Dissipation vs Copper Heatsink Area

SOT223 Power Dissipation

The SOT223 package provides an effective means of managing power dissipation in surface mount applications. The SOT223 package dimensions are provided in the *Mechanical Data* section at the end of the data sheet. The addition of a copper plane directly underneath the SOT223 package enhances the thermal performance of the package.

To illustrate, the TPS72625 in a SOT223 package was chosen. For this example, the average input voltage is 3.3 V, the output voltage is 2.5 V, the average output current is 1 A, the ambient temperature 55°C, no air flow is present, and the operating environment is the same as documented below. Neglecting the quiescent current, the maximum average power is:

$$P_D max = (3.3 - 2.5)\ V \times 1\ A = 800\ mW \quad (7)$$

Substituting $T_J max$ for T_J into Equation 4 gives Equation 8:

$$R_{\theta JA}max = (125 - 55)°C/800\ mW = 87.5°C/W \quad (8)$$

From Figure 23, *$R_{\theta JA}$ vs PCB Copper Area*, the ground plane needs to be 0.55 in^2 for the part to dissipate 800 mW. The operating environment used to construct Figure 23 consisted of a board with 1 oz. copper planes. The package is soldered to a 1 oz. copper pad on the top of the board. The pad is tied through thermal vias to the 1 oz. ground plane.

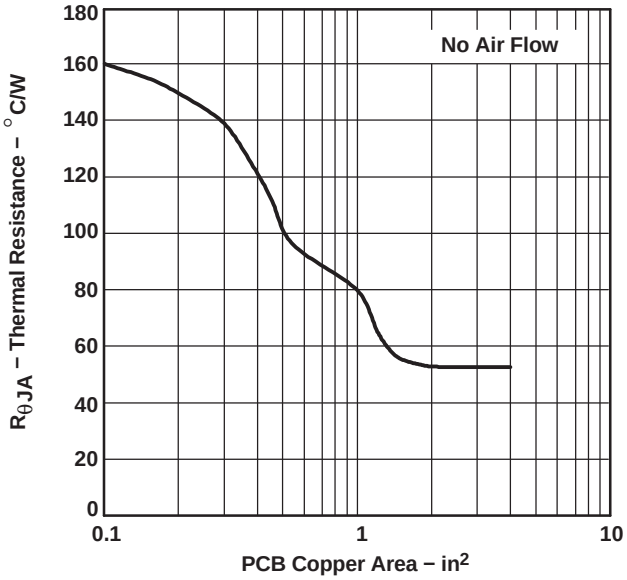


Figure 23. SOT223 Thermal Resistance vs PCB AREA

From the data in Figure 23 and rearranging Equation 4, the maximum power dissipation for a different ground plane area and a specific ambient temperature can be computed (as shown in Figure 24).

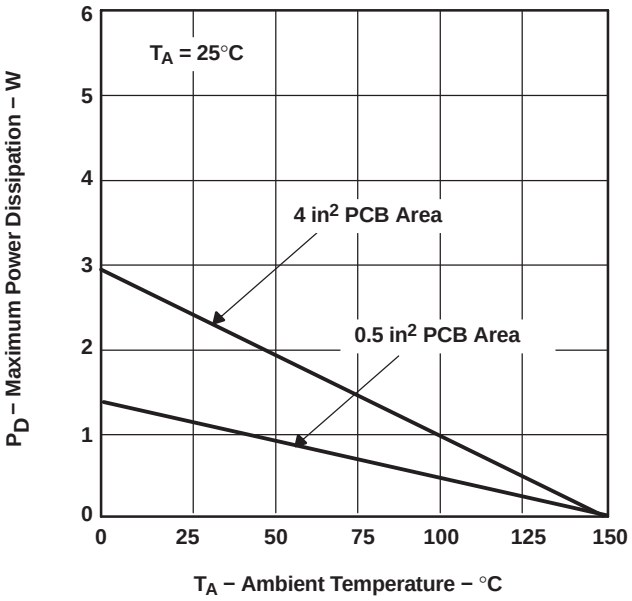


Figure 24. SOT223 Power Dissipation

Copyright © 2002–2010, Texas Instruments Incorporated

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision G (May 2006) to Revision H	Page
• Deleted Figure 14, *Output Impedance vs Frequency*	7
• Added Figure 18	8

Copyright © 2002–2010, Texas Instruments Incorporated

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)
TPS726126DCQ	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-40 to 125	726126
TPS726126DCQR	Active	Production	SOT-223 (DCQ) | 6	2500 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	726126
TPS726126DCQR.B	Active	Production	SOT-223 (DCQ) | 6	2500 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	726126
TPS72615DCQ	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-40 to 125	PS72615
TPS72615DCQR	Active	Production	SOT-223 (DCQ) | 6	2500 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	PS72615
TPS72615DCQR.B	Active	Production	SOT-223 (DCQ) | 6	2500 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	PS72615
TPS72615KTTR	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	TPS 72615
TPS72615KTTR.B	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	TPS 72615
TPS72616DCQ	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-40 to 125	PS72616
TPS72616DCQR	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-40 to 125	PS72616
TPS72616KTTR	Obsolete	Production	DDPAK/ TO-263 (KTT) | 5	-	-	Call TI	Call TI	-	TPS 72616
TPS72618DCQ	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-	PS72618
TPS72618DCQR	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-	PS72618
TPS72618KTTR	Obsolete	Production	DDPAK/ TO-263 (KTT) | 5	-	-	Call TI	Call TI	-	TPS 72618
TPS72625DCQ	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-	PS72625
TPS72625DCQR	Obsolete	Production	SOT-223 (DCQ) | 6	-	-	Call TI	Call TI	-	PS72625
TPS72625KTTT	Obsolete	Production	DDPAK/ TO-263 (KTT) | 5	-	-	Call TI	Call TI	-40 to 125	TPS 72625

(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.

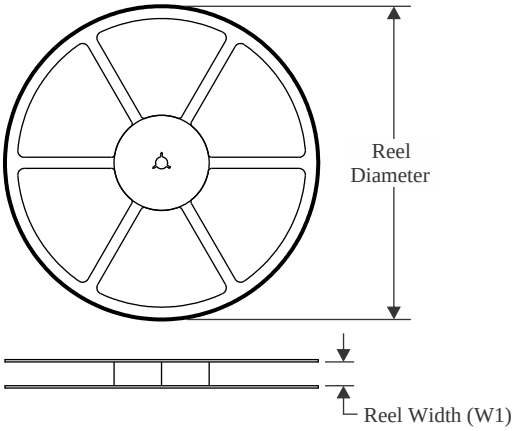
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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.

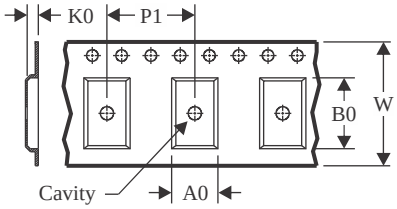
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

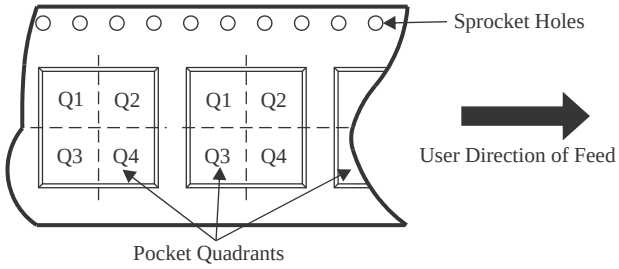


TAPE DIMENSIONS



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

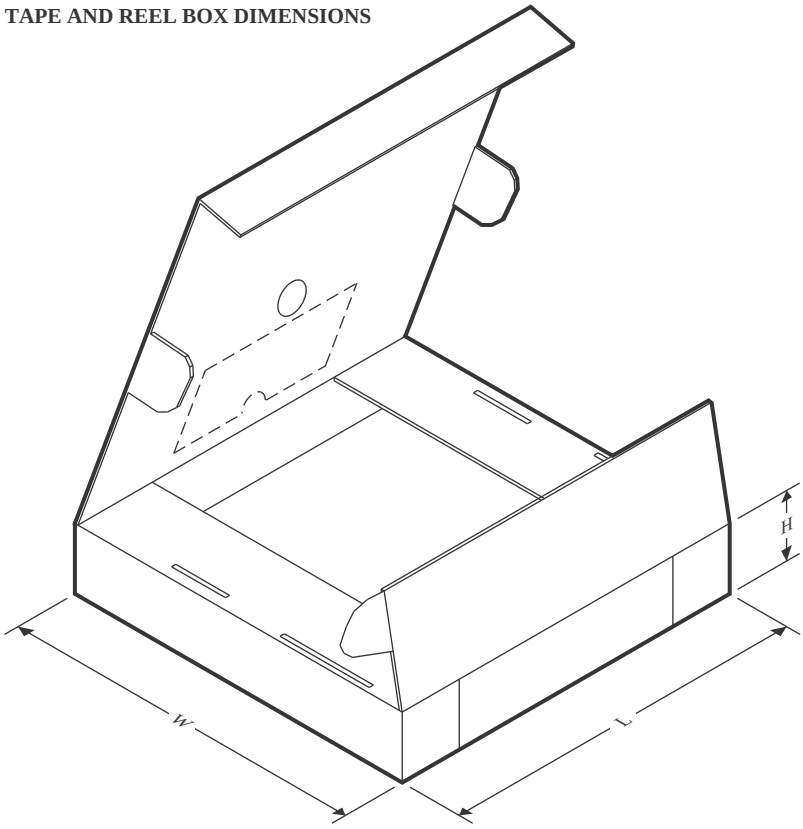
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS726126DCQR	SOT-223	DCQ	6	2500	330.0	12.4	7.1	7.45	1.88	8.0	12.0	Q3
TPS72615DCQR	SOT-223	DCQ	6	2500	330.0	12.4	7.1	7.45	1.88	8.0	12.0	Q3
TPS72615KTTR	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.9	16.1	4.9	16.0	24.0	Q2

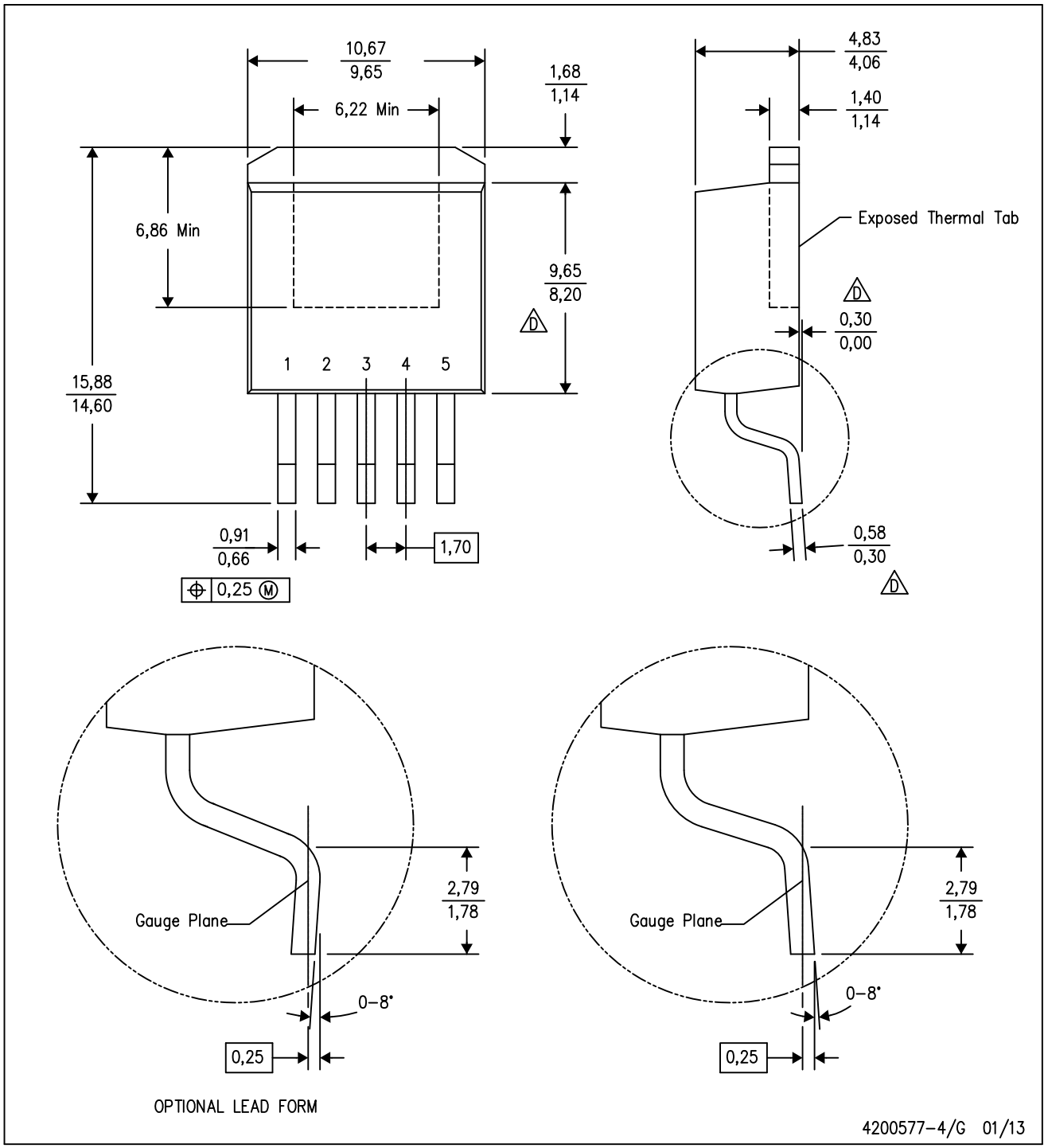
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

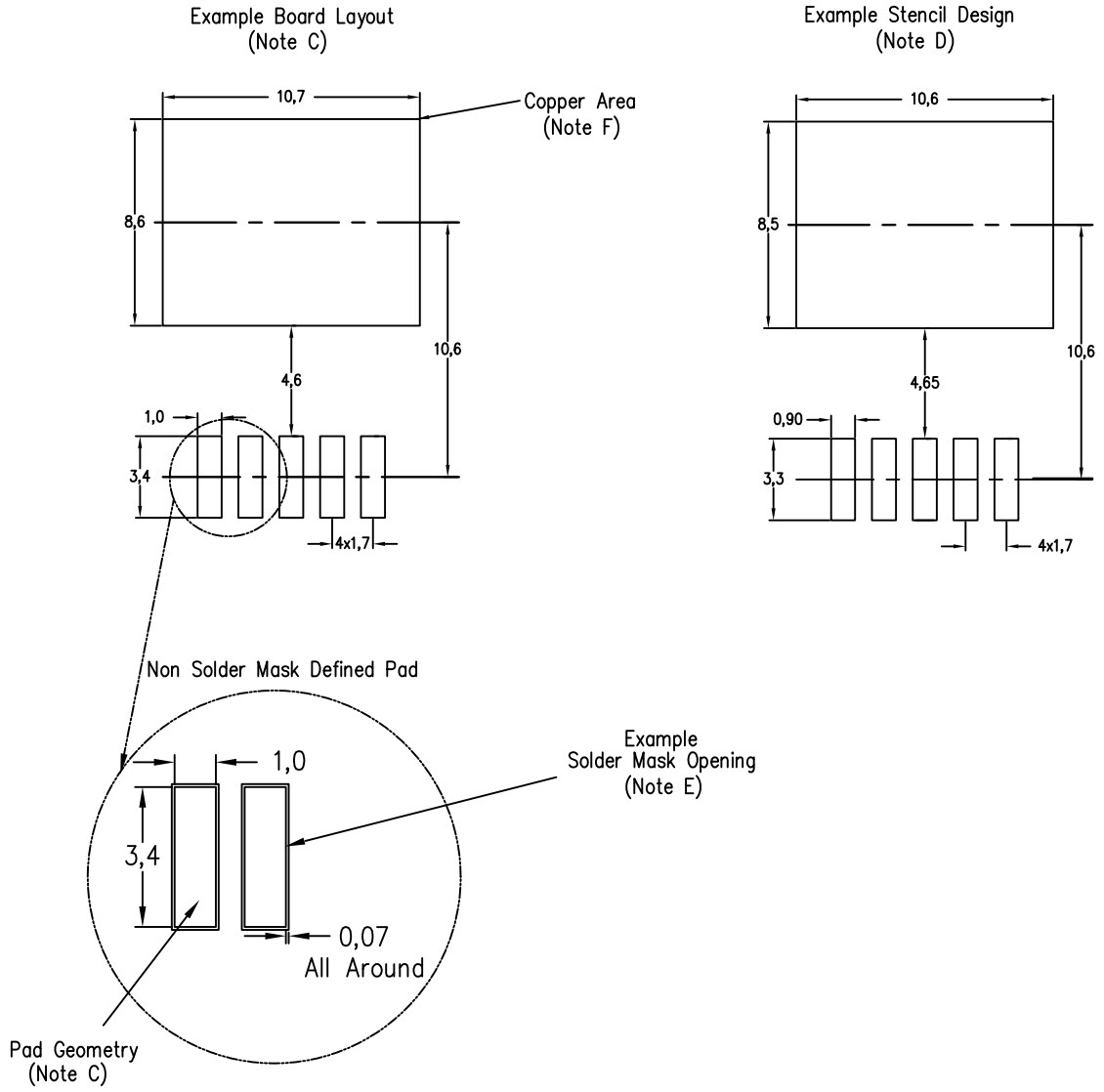
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS726126DCQR	SOT-223	DCQ	6	2500	346.0	346.0	41.0
TPS72615DCQR	SOT-223	DCQ	6	2500	346.0	346.0	29.0
TPS72615KTTR	DDPAK/TO-263	KTT	5	500	356.0	356.0	45.0

KTT (R–PSFM–G5) PLASTIC FLANGE–MOUNT PACKAGE



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. Mold flash or protrusion not to exceed 0.005 (0,13) per side.
D. Falls within JEDEC TO–263 variation BA, except minimum lead thickness, maximum seating height, and minimum body length.

KTT (R–PSFM–G5) PLASTIC FLANGE–MOUNT PACKAGE



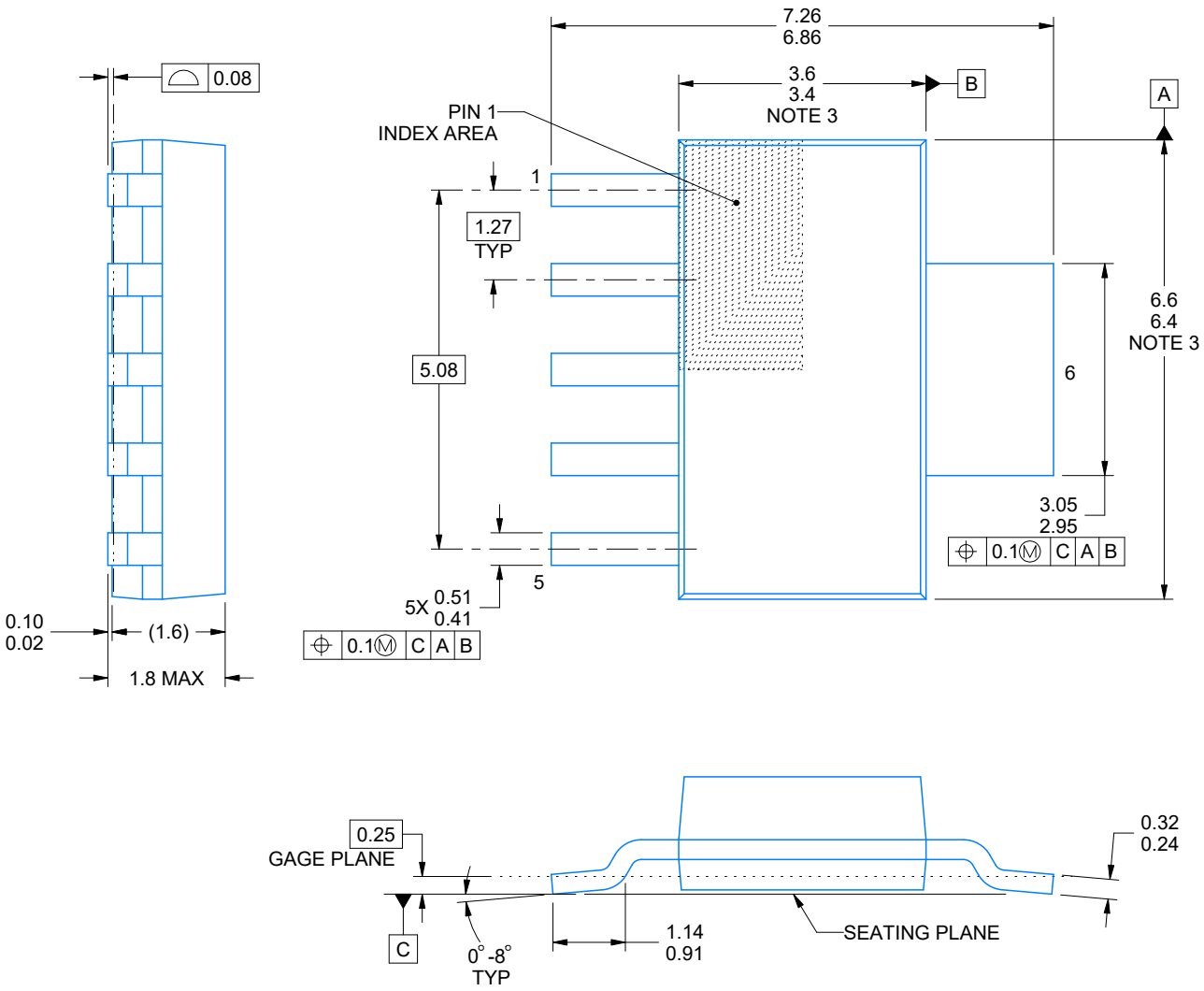
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–SM–782 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.
F. This package is designed to be soldered to a thermal pad on the board. Refer to the Product Datasheet for specific thermal information, via requirements, and recommended thermal pad size. For thermal pad sizes larger than shown a solder mask defined pad is recommended in order to maintain the solderable pad geometry while increasing copper area.

PACKAGE OUTLINE

DCQ0006A

SOT - 1.8 mm max height

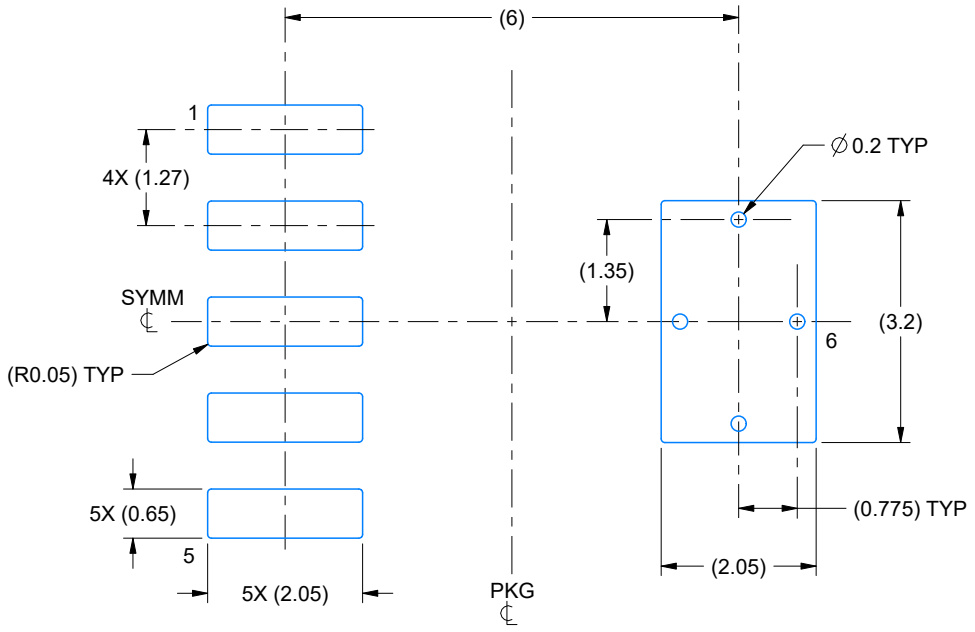
PLASTIC SMALL OUTLINE



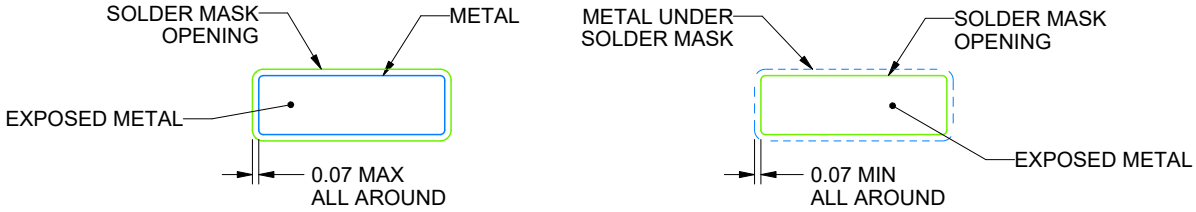
4214845/C 11/2021

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

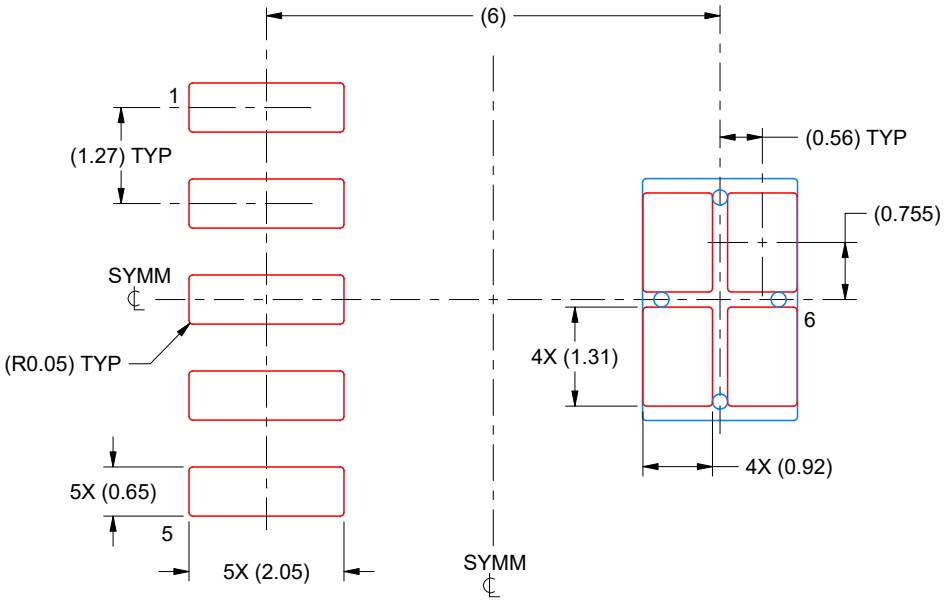


SOLDER MASK DETAILS

4214845/C 11/2021

NOTES: (continued)

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



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

4214845/C 11/2021

NOTES: (continued)

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

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale, TI’s General Quality Guidelines, or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025

ENTEGRECİ

Bu belge www.entegreci.com üzerinden sunulmaktadır.

Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

www.entegreci.com

Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

www.entegreci.com | **destek@entegreci.com** | **0850 305 90 34**

Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.