气囊部署四通道驱动器

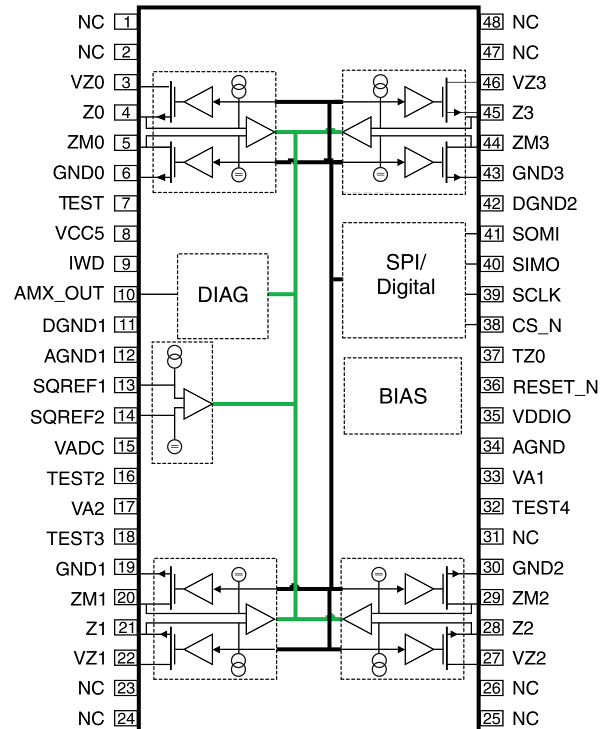
查询样品: TPIC71004-Q1

特性

- 气囊应用的四通道爆管驱动器
- 环路诊断监控报告
- 两个逻辑输入可为启用 / 禁用部署提供独立的安全逻辑
- **4** 个独立热保护高侧驱动器，可向每个爆管负载源出部署或诊断电流级
- **4** 个独立突崩电压及热保护低侧驱动器，可从每个爆管负载吸收部署或诊断电流级。
- 每个输出支持 **1.2 A/1.75 A** 的点火电流，通常持续 **2 ms/0.5 ms**
- **SPI** 从接口支持具有奇偶校验的串行总线通信
- 点火 **VZx** 电压范围为 **10 V** 至 **35 V** 之间，瞬时电压达 **40 V**
- 可编程点火时间高达 **8.2 ms**
- 所有部署环路的通用负载电流设置均采用寄存器
- 每个部署环路采用寄存器设置单个点火电流定时器限制
- 点火电流定时器可监控每个部署环路部署时间的点火电流
- 高低侧开关的独立开关控制
- 故障检测诊断模式
- 支持安全操作的内部故障监控
- 可多路复用的输出缓冲器支持模拟电压测量
- 爆管引脚使用外部钳位器件，对于部署过程中动态短路接地造成的基板插入效应无需保护部署 **ASIC**
- 外部引脚连接至微处理器 **ADC** 电源时，可实现比例爆管电阻测量
- 除 **GNDx**、**AGND**、**DGND**、**VCC5**、**VDDIO** 以及 **AMX_OUT** 外的所有引脚都支持 **40 V** 引脚功能
- 工作环境温度范围：**–40°C** 至 **105°C**
- 散热增强型 **48** 引脚 **TSSOP DCA PowerPad™** 封装

应用

- 气囊应用的爆管驱动器



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PowerPad is a trademark of 德州仪器 (TI).

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English Data Sheet: SLVSAT2

说明

TPIC71004-Q1 是一款适用于汽车应用气囊部署的 4 通道爆管驱动器。 每个通道包括高侧与低侧开关，所提供的独立控制逻辑可防止不慎部署。 高侧与低侧开关都支持内部电流限制与过温保护。

IC 寄存器可用于 4 通道配置、控制与状态监控。 为了避免不慎部署，高低侧开关只有在采用适当配置排序、且部署控制器逻辑的多个输入达到标准水平时才可打开。 该寄存器采用串行通信接口编程。

为了避免过高功耗，每通道最大接通时间由可编程点火定时器限定。 此外，还可使用电流限制寄存器在部署时通过开关对最大电流进行编程。 低侧开关上的电流限制高于相应高侧开关。 部署过程中，低侧开关将全面增强，可在 RDS_ON 模式下工作，而高侧开关则在电流调节模式下工作。

实施诊断功能可监控部署 ASIC 引脚电压，实现高侧开关测试、低侧开关测试、爆管电阻测量以及电池、接地及任何爆管通道的爆管漏电测量。 此外， Zx 与 ZMx 引脚提供的爆管漏电测量无需爆管负载，便可平稳工作。 诊断信息通过 AMX_OUT 引脚（针对模拟信号）与 SPI 映射状态寄存器（针对数字内核锁存的状态信号）进行通信。

高侧与低侧爆管驱动器都具有诊断级电流限制与部署级电流限制。 默认的高侧及低侧爆管驱动器电流限制为诊断级电流限制。 所有高侧驱动器的高侧开关部署电流限制都可通过 SPI 映射寄存器和器件 EEPROM 设置（见表 1）设为 1.2 A（最小值）或 1.75 A（最小值）（见 表 2）。 低侧部署电流限制不可编程，固定为大于高侧驱动器电流限制水平。 每个不同爆管驱动器的接通时长可通过 SPI 映射寄存器进行编程。

部署排序需要一系列特定的软件命令与外部硬件启用逻辑线路（TZ=H，IWD=L）相结合来提供部署功能。 高侧驱动器与低侧驱动器的打开顺序可通过 SPI 命令进行软件控制，而关闭程序则可通过部署 ASIC 自动实现。 在达到可编程接通时间持续时间之后，首先失效的是高侧开关，大约 100μsec 后低侧驱动器也跟着失效。

RESET_N 是活动低输入复位信号。 一旦外部电压电源处于特定限制范围，该输入便由电源单元和 / 或 μC 释放为高。 通过串行通信接口配置和控制器件，需要外部微处理器。 可靠的软件对系统工作非常重要。

表 **1.** 典型点火电流的潜在部署设置

点火电压	**VZX** 和 **ZX** 引脚之间实现部署的最大平均点火电压	典型点火电流	停留（点火）时间[(1)]
35 V	32.56 V	1.2 A	2 ms
35 V	35.0 V	1.75 A	0.5 ms

(1) 对编程所需的停留（点火）时间而言

延长部署时间会激活过温保护电路并终止部署。 如果在部署时出现短路至接地的情况，则在整个 HS_FET 上完全下降 35 V 点火电压，这将启动热关闭保护机制来保护器件。

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表 **2.** 最大点火电流的潜在部署设置

点火电压	**VZX** 和 **ZX** 引脚之间实现部署的最大平均点火电压	最大点火电流(1)	停留（点火）时间(2)
35 V	30 V	2.6 A（针对 1.75 A 电流设置）	0.7 ms
35 V	31 V	2.0 A（针对 1.2 A 电流设置）	2.0 ms

(1) 最大点火电流级别可通过器件 EEPROM 设置设定
(2) 对编程所需的停留（点火）时间而言

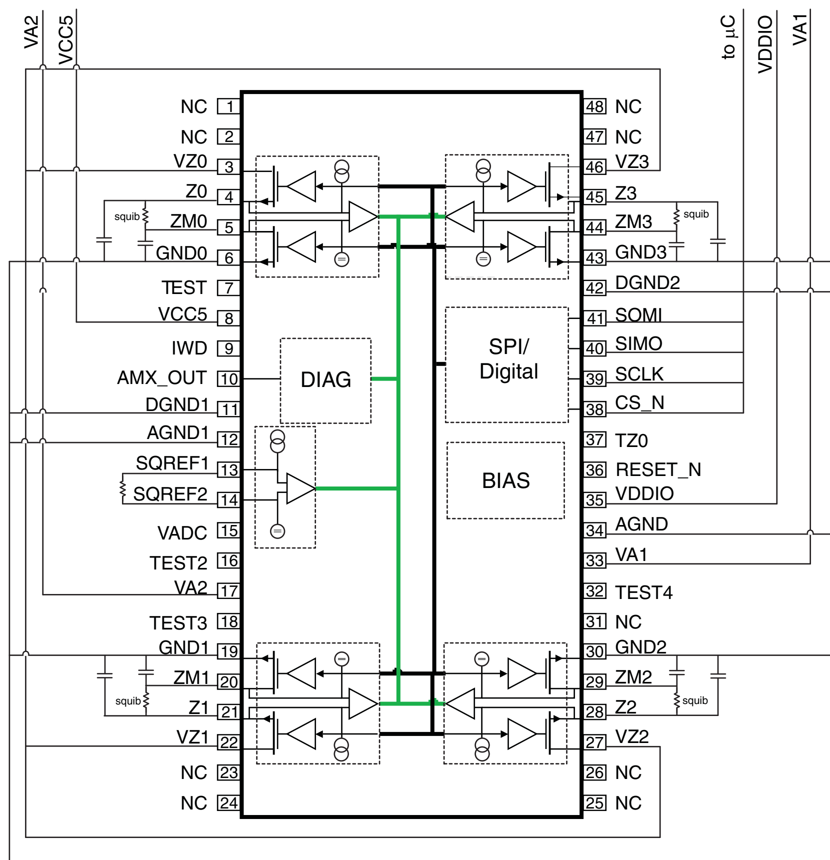
如欲阅读本文档全部版本，敬请联系 msamktg@list.ti.com 。

ORDERING INFORMATION

T_A	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	HTSSOP – DCA	Tape and reel	TPIC71004TDCAQ1	TPIC71004
			TPIC71004TDCARQ1	

(1) “Pb-Free” is defined to be compliant with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials unless exempt. Where designed to be soldered at high temperatures, TI "Pb-Free" and "RoHS Compliant" products are suitable for use in specified lead-free processes.

Functional Block Diagram



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
TPIC71004TDCARQ1	ACTIVE	HTSSOP	DCA	48	2000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 105	TPIC71004T	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.
OBSOLETE: 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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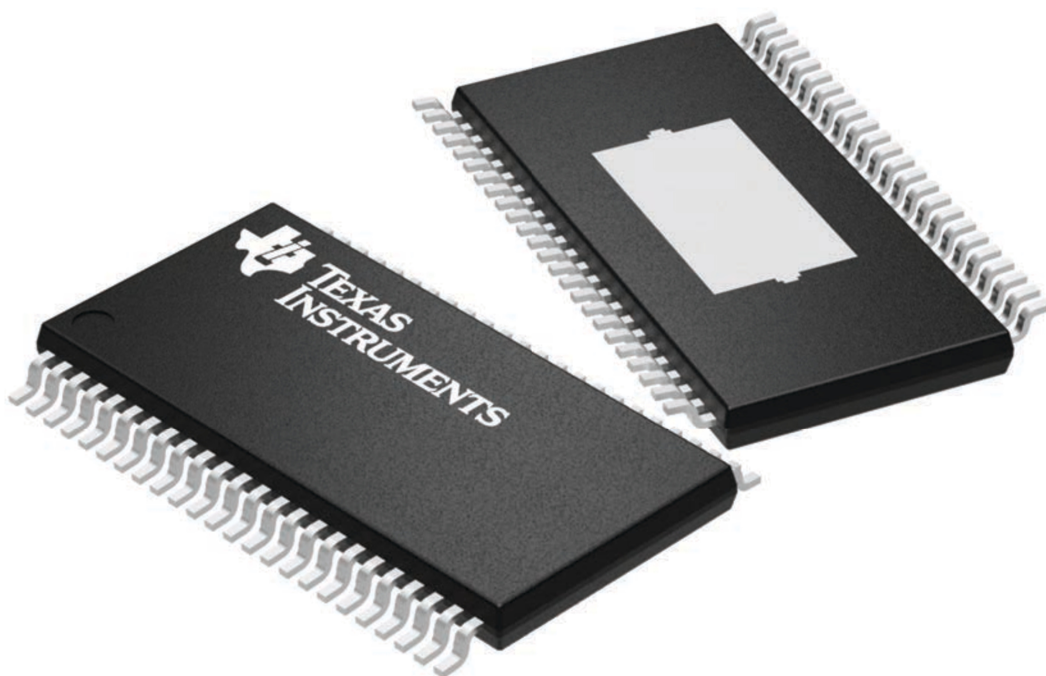
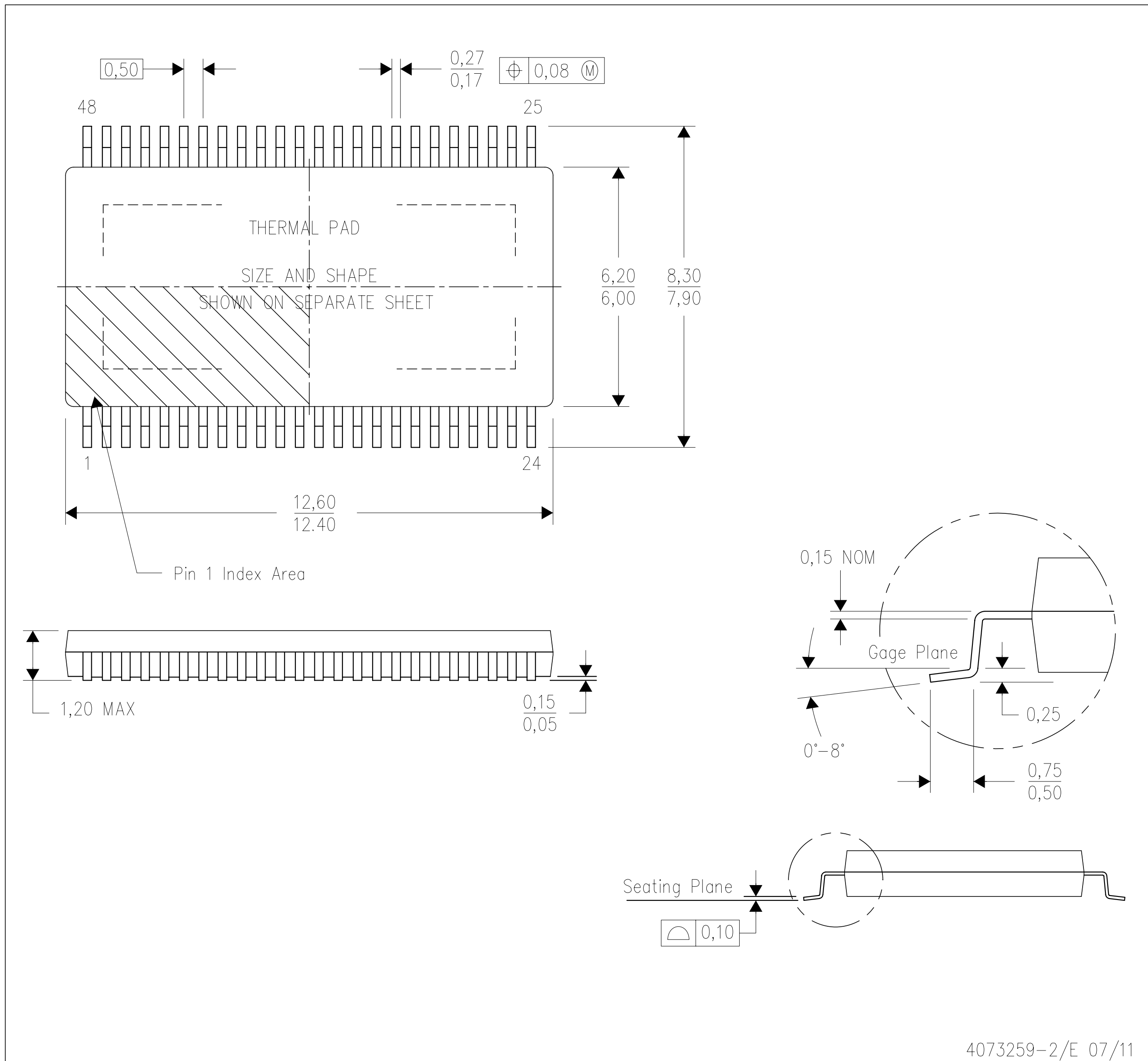
This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



DCA (R-PDSO-G48) PowerPAD™ PLASTIC SMALL-OUTLINE



NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- 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>.
- E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
- F. Falls within JEDEC MO-153

PowerPAD is a trademark of Texas Instruments.

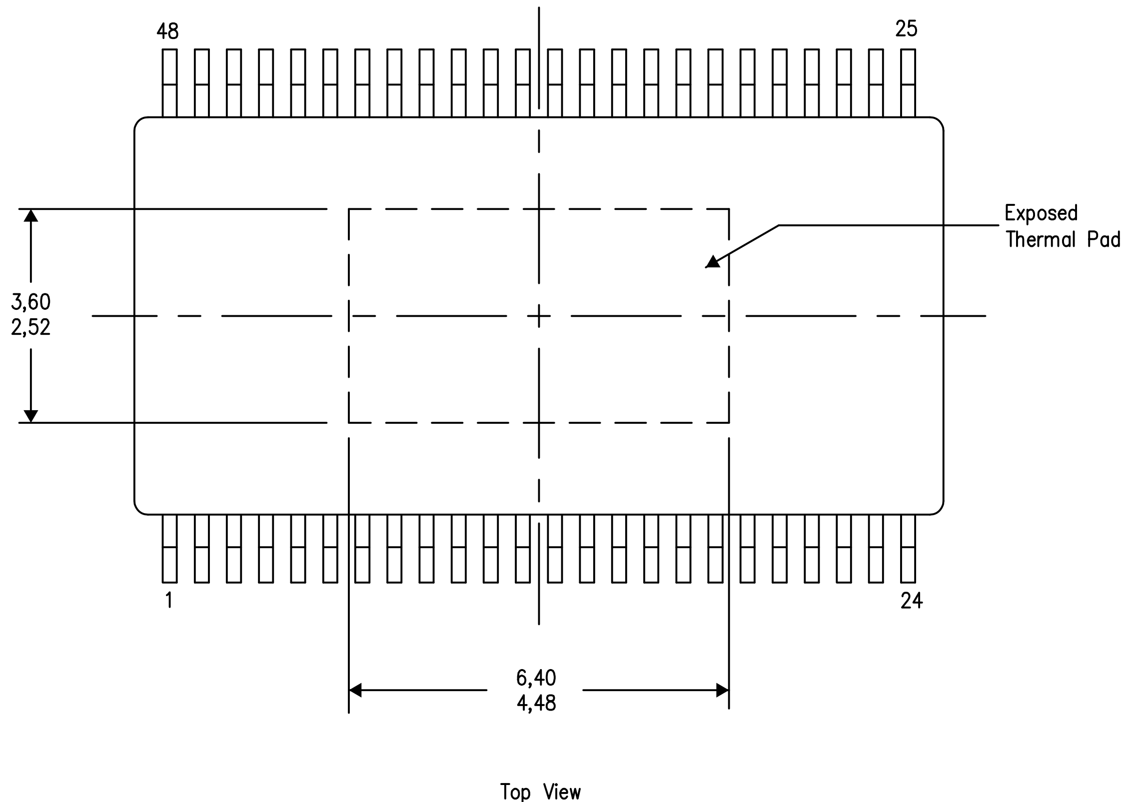
DCA (R-PDSO-G48) PowerPAD™ PLASTIC SMALL OUTLINE

THERMAL INFORMATION

This PowerPAD™ package incorporates an exposed thermal pad that is designed to be attached to a printed circuit board (PCB). The thermal pad must be soldered directly to the 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.



Exposed Thermal Pad Dimensions

4206320-4/S 11/14

NOTE: A. All linear dimensions are in millimeters

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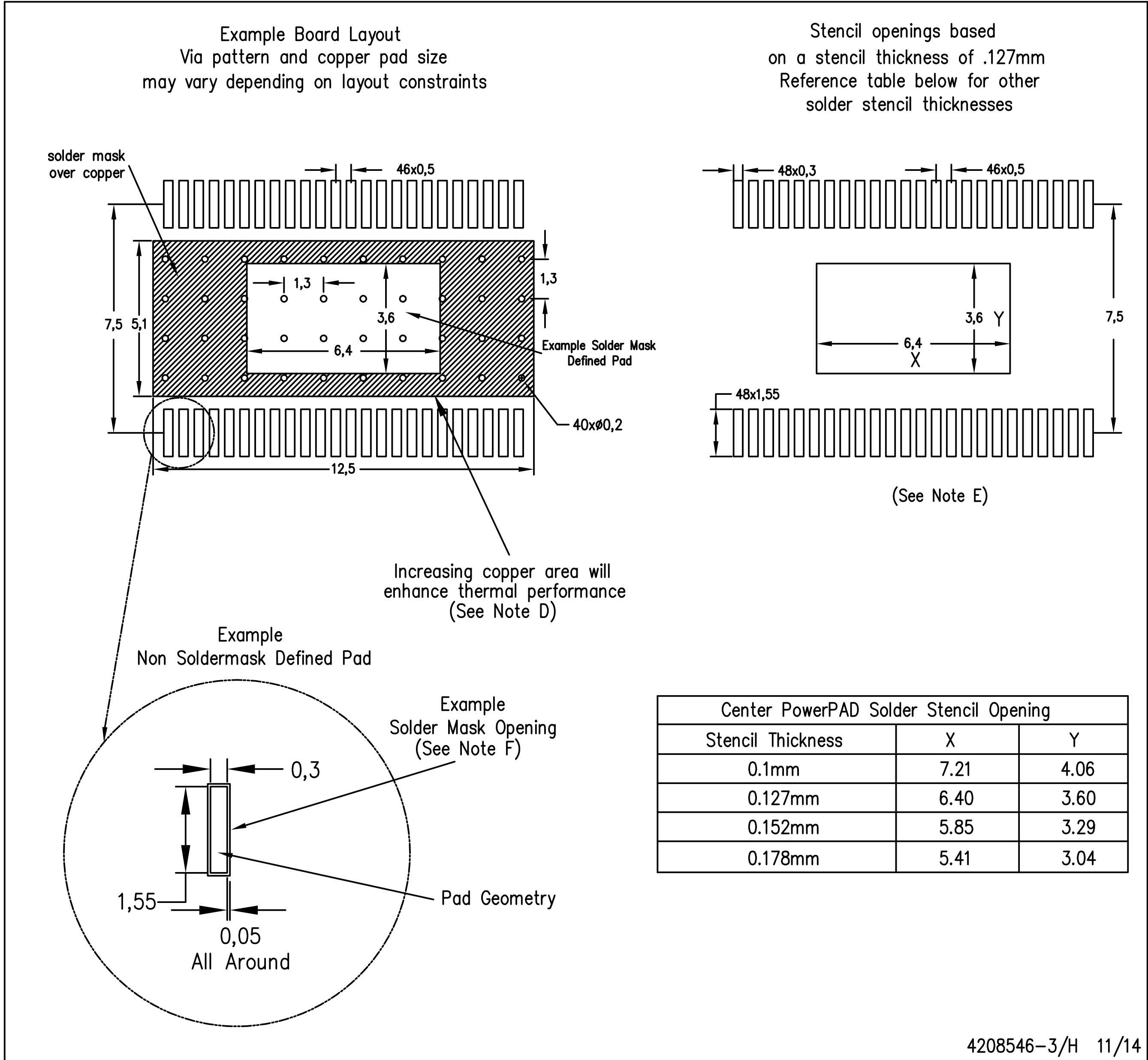
DCA (R–PDSO–G48) PowerPAD™ PLASTIC SMALL OUTLINE PACKAGE



Center PowerPAD Solder Stencil Opening		
Stencil Thickness	X	Y
0.1mm	7.21	4.06
0.127mm	6.40	3.60
0.152mm	5.85	3.29
0.178mm	5.41	3.04

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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