

TPA6404-Q1 45W、2MHz 模拟输入 通道汽车用 D 类音频放大器，带有负载突降保护和 I²C 诊断功能

1 特性

- 高级负载诊断
 - 交流诊断可进行高频扬声器检测，提供阻抗和相位响应
 - 集成正弦波发生器
- 轻松满足 CISPR25-L5 EMC 规范
- 具有适用于汽车应用且符合 AEC-Q100 标准的下列特性：
 - 器件温度 1 级：-40°C 至 125°C 的环境运行温度范围
 - 器件 HBM ESD 分类等级：3A
 - 器件 CDM ESD 分类等级：C4B
- 音频输入
 - 4 通道差分模拟输入
 - 四个 I²C 控制增益选项
 - 可进行低值交流耦合的高输入阻抗
- 音频输出
 - 四通道桥接式负载 (BTL)，具有并行 BTL (PBTL) 模式
 - 最高可达 2.1MHz 的输出开关频率
 - 在 4Ω 负载、25V 电源电压的条件下输出功率为 75W，THD 为 10%
 - 在 2Ω 负载、14.4V 电源电压的条件下，输出功率为 45W，THD 为 10%
 - 在 14.4V PBTL，1Ω 负载的条件下，输出功率为 85 W，THD 为 10%；
- 在 4Ω 负载和 14.4V、1 kHz 电源电压条件下的音频性能
 - THD+N < 0.01%
 - 42 μV_{RMS} 输出噪声
 - -90dB 串扰
- 负载诊断功能
 - 输出负载开路和短路
 - 输出至电池短路或接地短路
 - 线路输出检测高达 6kΩ
 - 无输入时钟的情况下也可运行
- 保护
 - 输出限流
 - 输出短路保护
 - 40V 负载突降
 - 意外接地开路和电源开路
 - 直流失调电压
 - 过热

– 欠压和过压

- 常规运行
 - 4.5V 至 18V 电源电压
 - I²C 控制，具有 4 个地址选项
 - 削波探测和热折返

2 应用

- 汽车音响主机
- 汽车外部放大器模块

3 说明

该 TPA6404-Q1 器件是一款采用 2.1MHz PWM 开关频率的四通道模拟输入 D 类音频放大器，以非常小的 4.5cm² PCB 尺寸实现成本优化的解决方案，可针对启停事件在低至 4.5V 的电压下全面运行，并可在高达 100kHz 的音频带宽下提供卓越的音质。

TPA6404-Q1 D 类音频放大器的设计十分出色，可适用于入门级汽车音响主机，以作为系统设计的一部分提供模拟音频输入信号。

与传统的线性放大器解决方案相比，D 类拓扑技术显著提高了器件效率。

输出开关频率高于 AM 频带，这样可以消除 AM 频带干扰并降低输出滤波器尺寸及成本。

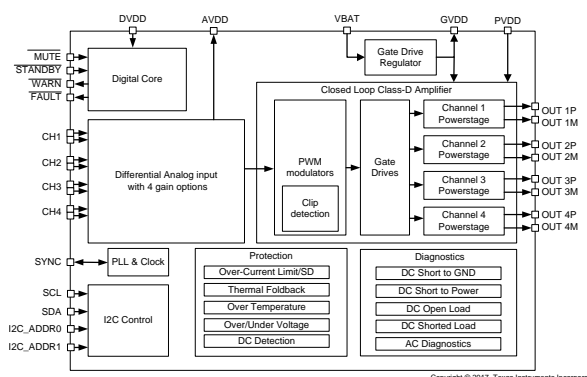
该器件采用带外露散热焊盘的 56 引脚 HSSOP 封装。

器件信息(1)

器件型号	封装	封装尺寸 (标称值)
TPA6404-Q1	HSSOP (56)	18.41mm x 7.49mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

方框图



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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Original (October 2017) to Revision A	Page
• 将数据表发布为“生产数据”	1

5 器件和文档支持

5.1 文档支持

5.1.1 相关文档

请参阅如下相关文档：

[PurePath™ Console 3](#) 图形开发套件

5.2 接收文档更新通知

要接收文档更新通知，请导航至 TI.com.cn 上的器件产品文件夹。单击右上角的 [通知我](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

5.3 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

TI E2E™ 中文在线社区 [TI 的工程师对工程师 \(E2E\) 社区](#)。此社区的创建目的在于促进工程师之间的协作。在 e2echina.ti.com 中，您可以咨询问题、分享知识、拓展思路并与同行工程师一道帮助解决问题。

E2E 音频放大器论坛 [TI 的音频放大器工程师对工程师 \(E2E\) 社区](#) 此社区的创建目的在于促进工程师之间的协作。用户可进行实时问答。

5.4 商标

PurePath, E2E are trademarks of Texas Instruments.

5.5 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

5.6 术语表

[SLYZ022](#) — TI 术语表。

这份术语表列出并解释术语、缩写和定义。

6 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。如需获取此数据表的浏览器版本，请查看左侧的导航栏。

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
TPA6404QDKQRQ1	ACTIVE	HSSOP	DKQ	56	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	TPA6404	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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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

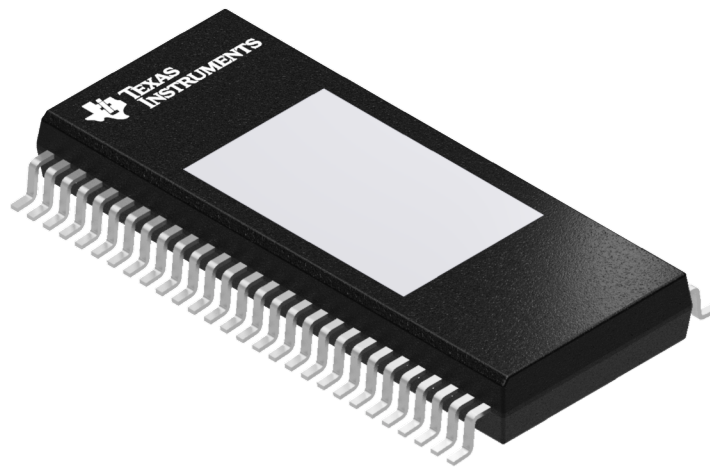
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TPA6404QDKQRQ1	HSSOP	DKQ	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1

TAPE AND REEL BOX DIMENSIONS



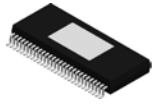
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPA6404QDKQRQ1	HSSOP	DKQ	56	1000	367.0	367.0	55.0



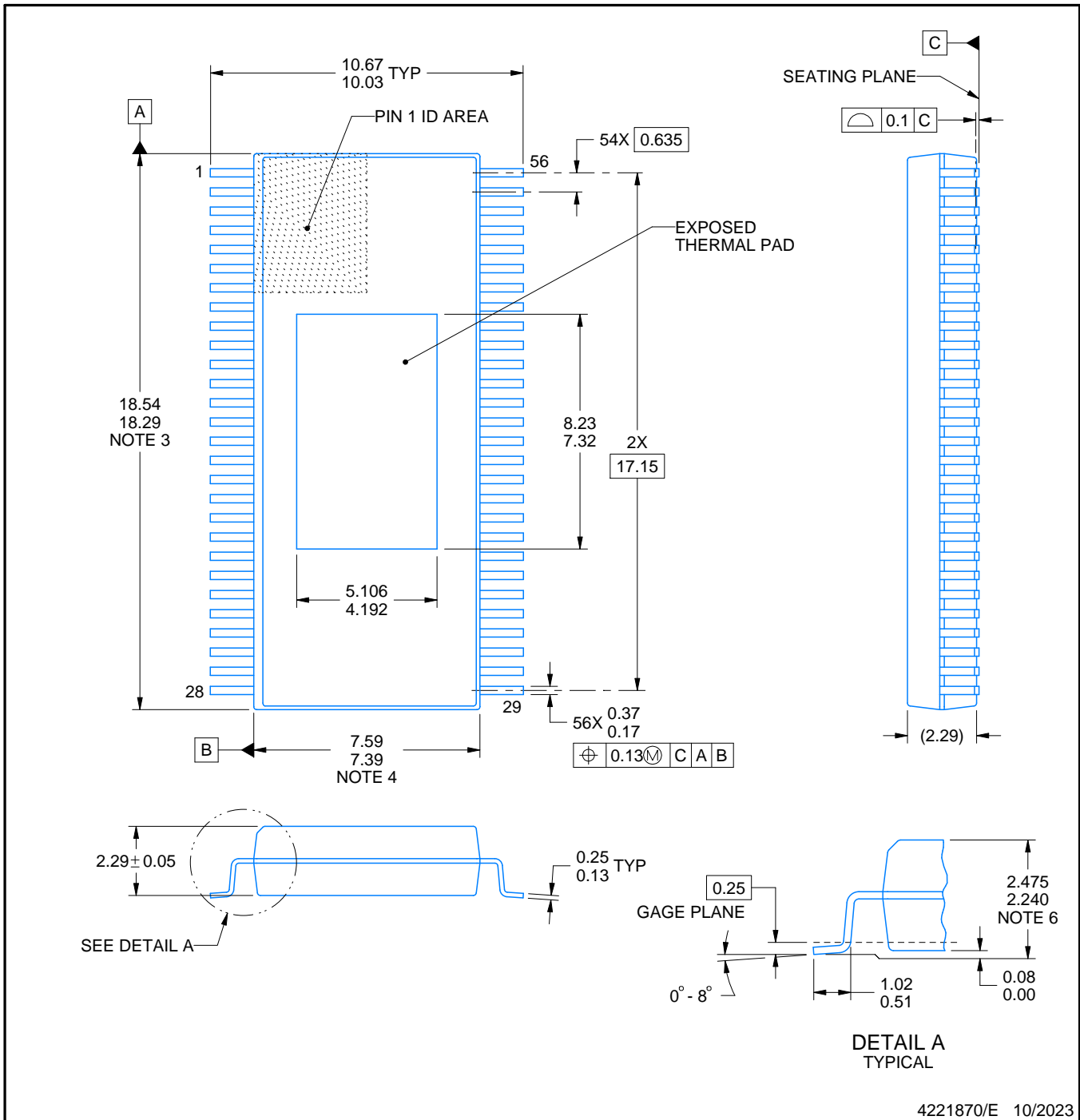
Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

DKQ0056A



PACKAGE OUTLINE
PowerPAD™ HSSOP - 2.475 mm max height

PLASTIC SMALL OUTLINE



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NOTES:

PowerPAD is a trademark of Texas Instruments.

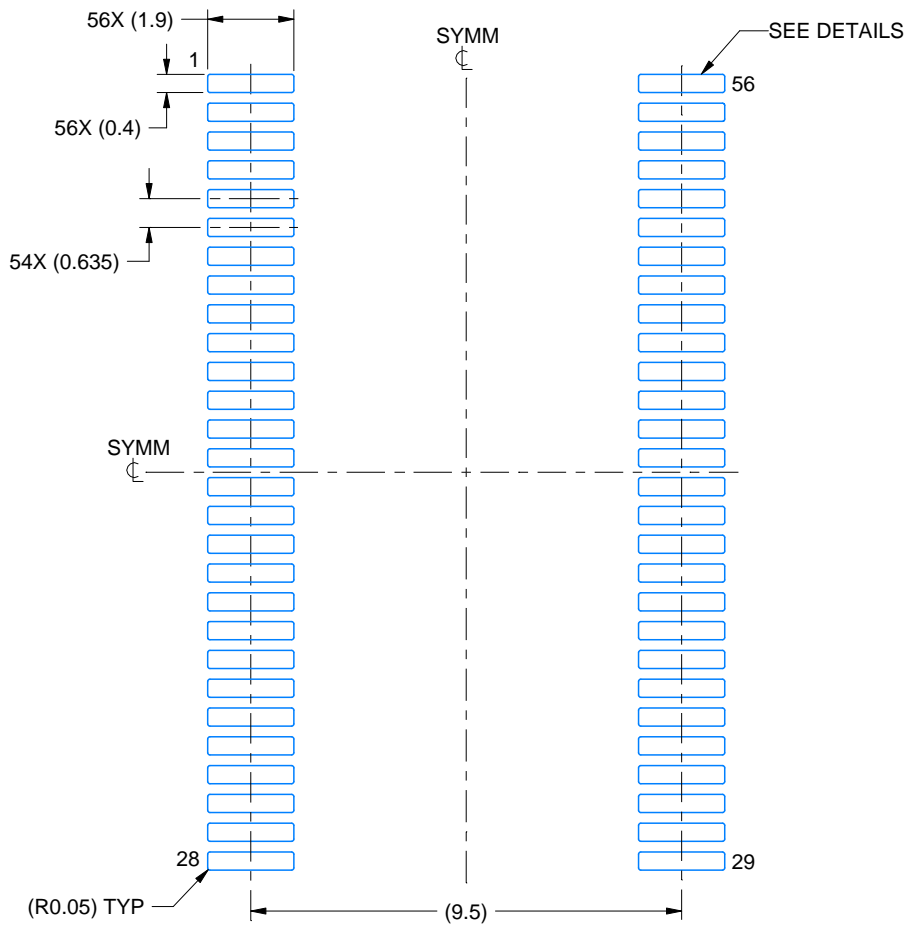
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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. The exposed thermal pad is designed to be attached to an external heatsink.
6. For clamped heatsink design, refer to overall package height above the seating plane as 2.325 +/- 0.075 and molded body thickness dimension.

EXAMPLE BOARD LAYOUT

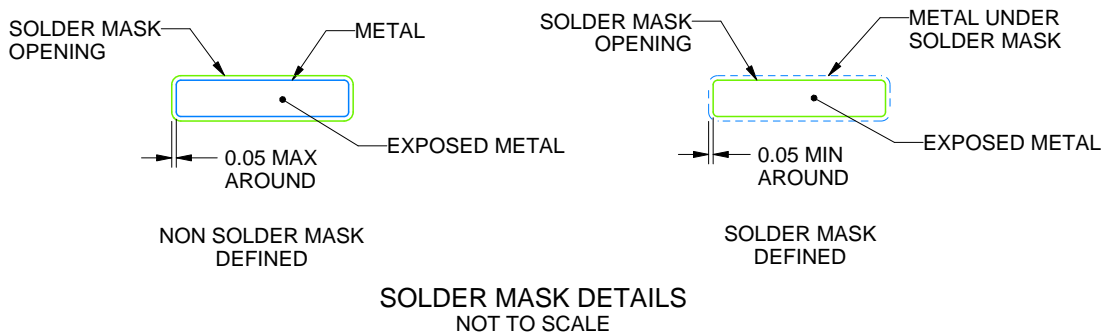
DKQ0056A

PowerPAD™ HSSOP - 2.475 mm max height

PLASTIC SMALL OUTLINE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:6X



SOLDER MASK DETAILS
NOT TO SCALE

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NOTES: (continued)

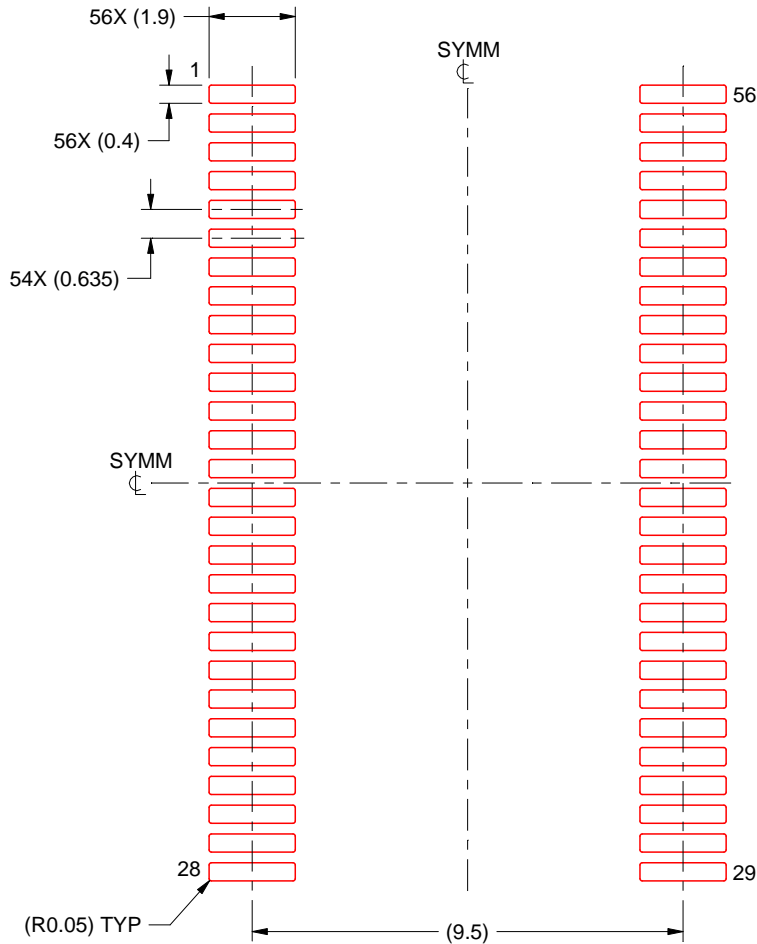
- 7. Publication IPC-7351 may have alternate designs.
- 8. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
- 9. Size of metal pad may vary due to creepage requirement.

EXAMPLE STENCIL DESIGN

DKQ0056A

PowerPAD™ HSSOP - 2.475 mm max height

PLASTIC SMALL OUTLINE



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE:6X

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NOTES: (continued)

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

重要声明和免责声明

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