

FPC401 四端口控制器

1 特性

- 支持跨四个端口进行控制信号管理和 I2C 聚合
- 结合多个 FPC401 可通过一个主机接口控制 56 个端口
- 无需使用分立式 I2C 多路复用器、LED 驱动器和高引脚计数现场可编程门阵列 (FPGA)/复杂可编程逻辑器件 (CPLD) 控制器件
- 通过处理接近端口的全部低速控制信号来降低 PCB 布线复杂性
- 可选 I2C (高达 1MHz) 或 SPI (高达 10MHz) 主机控制接口
- 从模块中自动预取用户指定的重要数据
- 单端口和多端口读/写延迟短: SPI 模式 <50μs, I2C 模式 <400μs
- 广播模式允许对所有 FPC401 控制器的全部端口同步执行写操作
- 用于指示端口状态的高级 LED 特性, 包括可编程闪烁和调光
- 可定制中断事件
- 单独的主机侧 I/O 电压: 1.8V 至 3.3V
- 采用小型四方扁平无引线 (QFN) 封装, 能够放置在 PCB 底部的端口下方

2 应用

- ToR/聚合/核心交换机和路由器 SFP+/QSFP+ 端口控制
- SAS 外部电缆管理接口控制
- 视频交换机和路由器 SFP+/QSFP+ 端口控制

3 说明

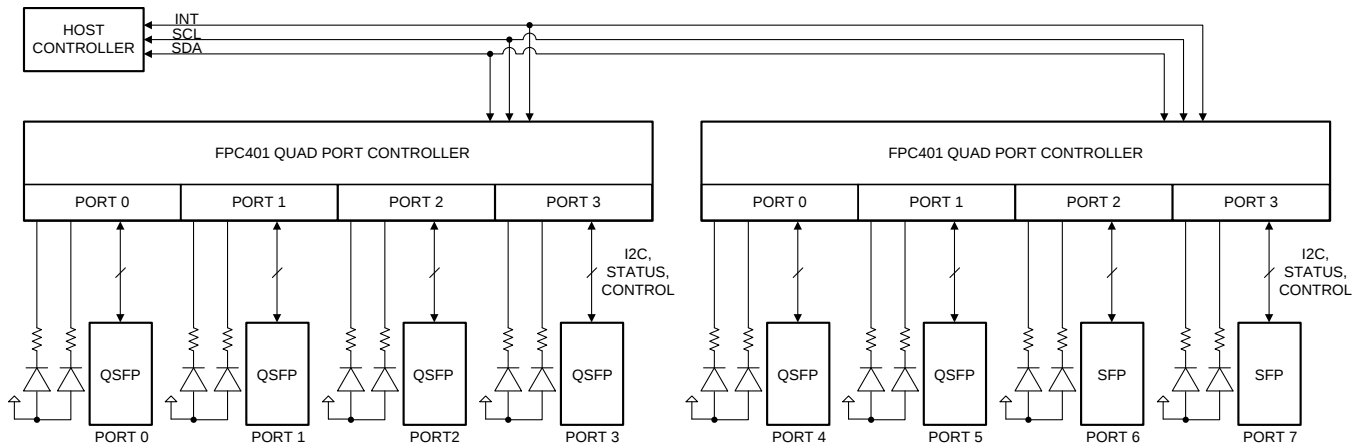
FPC401 四端口控制器用作低速信号聚合器, 适用于 SFP+、QSFP+ 和 SAS 等通用端口类型。FPC401 能够跨四个端口聚合所有低速控制和 I2C 信号, 并为主机提供了一个方便使用的管理接口 (I2C 或 SPI)。对于高端口数应用来说, 可以搭配使用多个 FPC401, 而且同样能够为主机提供一个公共控制接口。FPC401 所采用的设计允许放置在 PCB 底部的压合连接器下, 这样方便布线。凭借这种本地控制端口低速信号的方法, 可以使用 IO 数更少的控制器件 (FPGA、CPLD、MCU) 并减少布线层拥塞, 从而降低系统物料清单 (BOM) 成本。

器件信息⁽¹⁾

器件型号	封装	封装尺寸 (标称值)
FPC401	QFN (56)	5.00mm x 11.00mm

(1) 要了解所有可用封装, 请见数据表末尾的可订购产品附录。

简化框图



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4 修订历史记录

日期	修订版本	注释
2016 年 12 月	*	首次发布。

5 说明（续）

FPC401 能够与标准的 SFF-8431、SFF-8436 和 SFF-8449 低速管理接口兼容，包括一个连接每个端口的专用 100/400kHz I2C 接口。该器件还提供有其他通用引脚来驱动端口状态 LED 或控制电源开关。LED 驱动器具有可编程闪烁和调光等便捷功能。连接主机控制器的接口可接受 1.8V 至 3.3V 的单独电源电压以支持低压 I/O。

FPC401 可以从每个模块中用户指定的寄存器中预取数据，这样方便主机通过一个快速 I2C（速度高达 1MHz）或 SPI（速度高达 10MHz）接口来读取数据。此外，FPC401 还可以触发主机中断，提示某受控端口上发生了重要的用户可配置事件。这样一来，便无需再持续轮询模块。

6 器件和文档支持

6.1 文档支持

6.1.1 相关文档

相关文档如下：

- 《FPC401 编程人员指南》
- 《FPC401 评估模块 (EVM) 用户指南》

6.2 接收文档更新通知

如需接收文档更新通知，请访问 www.ti.com.cn 网站上的器件产品文件夹。点击右上角的提醒我 (Alert me) 注册后，即可每周定期收到已更改的产品信息。有关更改的详细信息，请查阅已修订文档中包含的修订历史记录。

6.3 社区资源

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Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

6.4 商标

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6.5 静电放电警告



ESD 可能会损坏该集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理措施和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

6.6 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

7 机械、封装和可订购信息

以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。欲获得该数据表的浏览器版本，请查阅左侧的导航栏。

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)
FPC401RHUR	Active	Production	WQFN (RHU) 56	2000 LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 85	FPC401
FPC401RHUR.A	Active	Production	WQFN (RHU) 56	2000 LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 85	FPC401
FPC401RHUT.A	Active	Production	WQFN (RHU) 56	250 SMALL T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 85	FPC401

⁽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.

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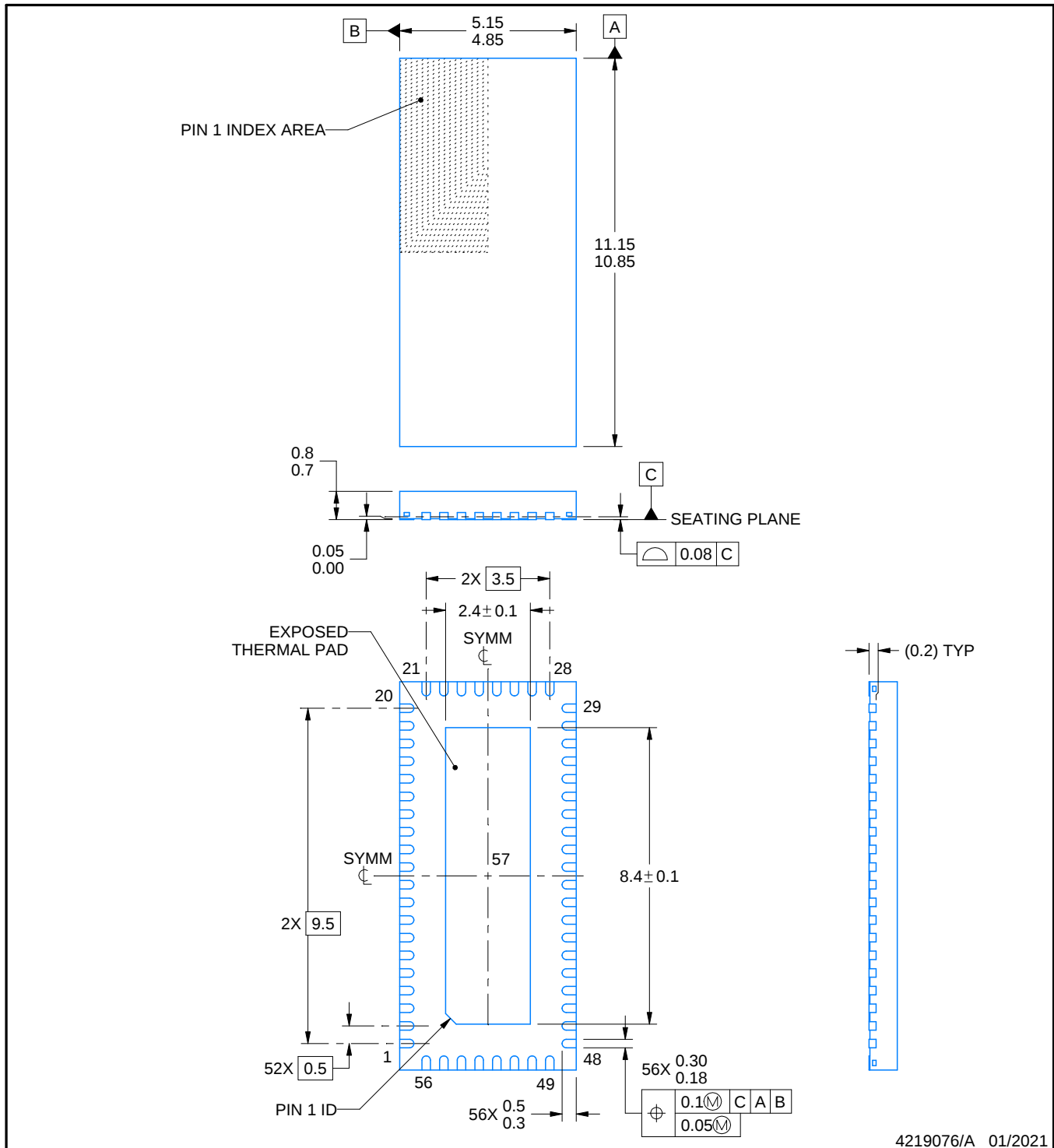
RHU0056A



PACKAGE OUTLINE

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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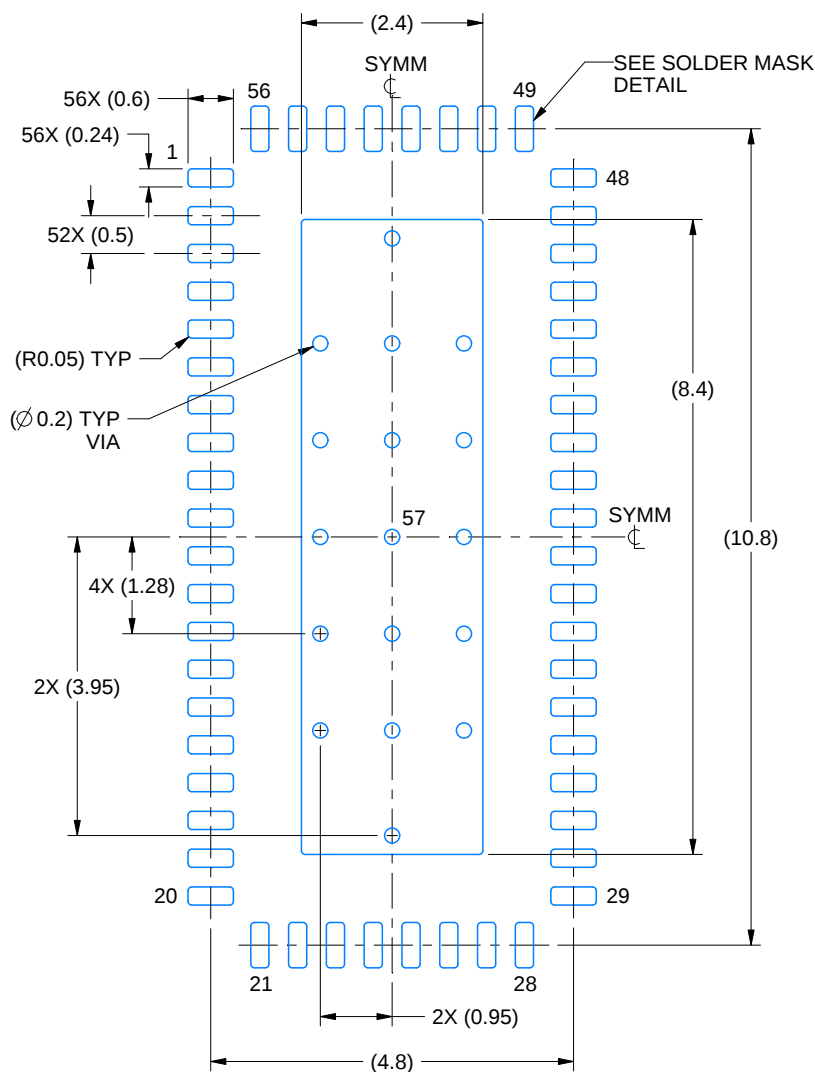
NOTES:

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. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

RHU0056A

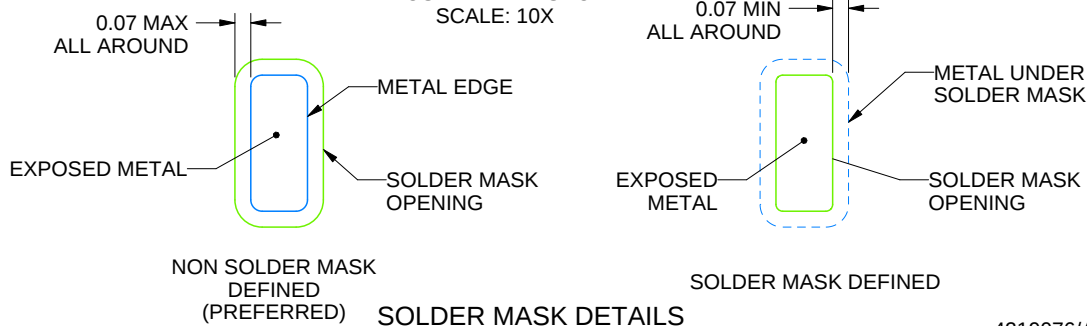
WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN
SCALE: 10X



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NOTES: (continued)

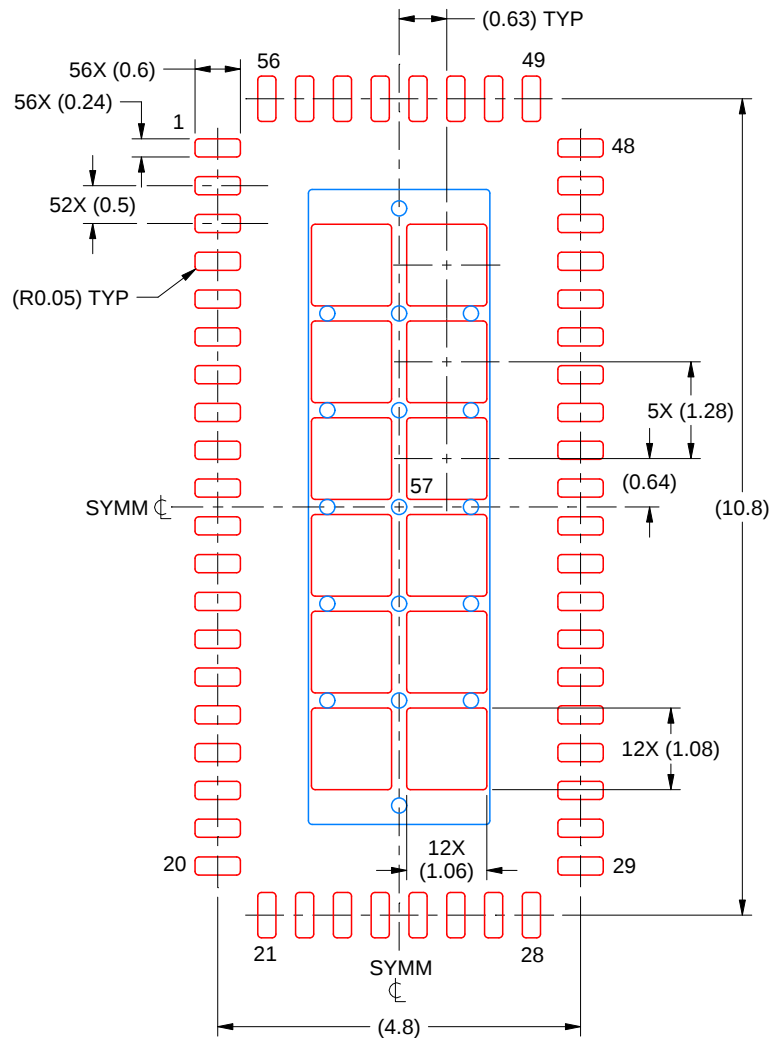
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

RHU0056A

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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

EXPOSED PAD 57
68% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

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NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

重要通知和免责声明

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