TEXAS INSTRUMENTS
DS560MB410
ZHCSRB0 – DECEMBER 2022

DS560MB410 具有交叉点的低功耗 56Gbps PAM4 4 通道线性转接驱动器

1 特性

- 四通道多协议线性均衡器，支持高达 28GBd (PAM4) 和 32GBd (NRZ) 的接口
- 适用于高达 CEI-56G、以太网 (400 GbE)、光纤通道 (64GFC)、InfiniBand™ (HDR) 和 CPRI/eCPRI PCB 和铜缆应用
- 可选择的 CTLE 升压曲线，用于补偿 PCB 或电缆损耗
- 具有引脚或寄存器控制的集成 2x2 交叉点，适用于多路复用器、扇出和信号交叉
- 低功耗：160mW/通道（典型值）
- 无需散热器
- 无缝支持 CR/KR 链路训练、自动协商和 FEC 直通功能的 CTLE 线性均衡
- 在 13.28GHz 下，将远距离链路扩展至比正常的 ASIC 至 ASIC 性能高 18dB+
- 用于 PAM-4 眼图对称性增强的眼图扩展器
- 低输入至输出延迟：80ps（典型值）
- 低附加随机抖动
- 小型 6.00mm x 6.00mm 小型球状引脚栅格阵列 (BGA) 封装，可轻松实现直通布线
- 无需参考时钟
- 单个 2.5V ±5% 电源
- –40°C 至 +85°C 的环境温度范围

2 应用

- 背板 (KR) 和中板 C2C 连接单元接口 (AUI) 范围扩展
- 有源铜缆 (ACC)（SFP56、QSFP56、QSFP-DD 或 OSFP）
- 实现故障转移冗余的多路复用器/多路信号分离器

3 说明

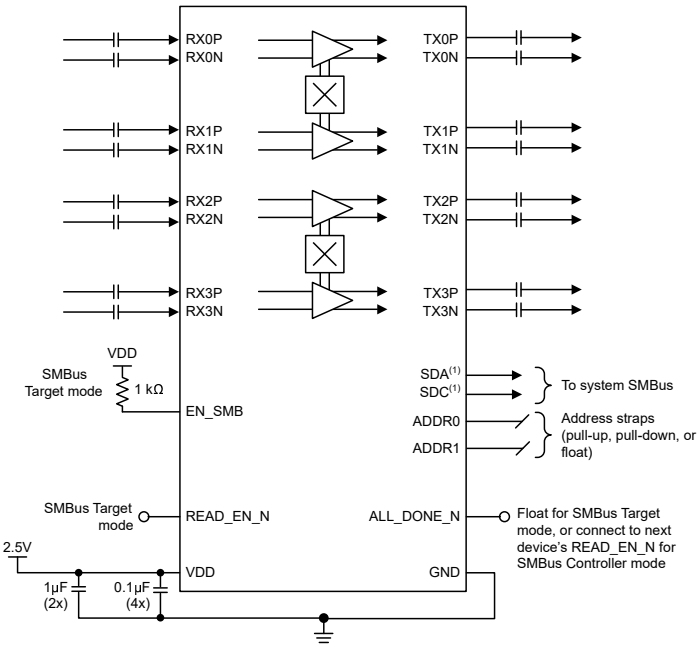
DS560MB410 是一款低功耗、高性能四通道线性均衡器，支持多速率、多协议接口，使用四级脉冲振幅调制 (PAM4) 时最高可达 28GBD，使用非归零码 (NRZ) 调制时最高可达 32GBD。它用于扩展背板、中板和有源铜缆 (ACC) 应用中高速串行链路的覆盖范围并提升稳定性。DS560MB410 可将两个 ASIC 之间的覆盖范围增加至比正常的 ASIC 到 ASIC 范围高 18dB 以上。

每个通道独立运行，用户可选择的 CTLE 升压曲线经过优化，可均衡 PCB 或铜缆损耗曲线。DS560MB410 均衡的线性特性保留了流经转接驱动器的输入信号特性。这种透明性使链路伙伴 ASIC 能够在链路训练期间自由协商 Tx 均衡器系数，并支持任务模式下的单个通道正向纠错 (FEC) 直通，同时更大限度地降低对延迟的影响。

封装信息(1)

器件型号	封装	封装尺寸（标称值）
DS560MB410	ZAS (nFBGA, 101)	6.00mm × 6.00mm

(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。



(1) SMBus signals need to be pulled up elsewhere in the system.

简化原理图

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4 Revision History

DATE	REVISION	NOTES
December 2022	*	Initial Release

5 说明（续）

DS560MB410 在每对相邻通道之间包含一个完整的 2×2 交叉点，可支持 2 到 1 多路复用和 1 到 2 多路分解以实现故障转移冗余，还支持 1 对 2 扇出以实现诊断监控，以及支持信号交叉以实现 PCB 布线灵活性。交叉点可通过引脚或 SMBus 寄存器接口进行控制。

DS560MB410 具有小型封装尺寸和经优化的高速信号退出，非常适合小型应用。简化的均衡控制、低功耗和超低附加抖动使其适用于背板和中板上的芯片至芯片范围扩展和信号分配。6.00mm × 6.00mm 小尺寸可轻松适应有源铜缆 (ACC) 装配应用，无需散热器。

DS560MB410 采用单个电源，可尽可能减少对外部组件的需求。这些特性降低了 PCB 布局布线复杂度以及物料清单 (BOM) 成本。DS560MB410 可通过 SMBus 或外部 EEPROM 进行配置。单个 EEPROM 最多可由 16 个器件共享。

6 Device and Documentation Support

6.1 Documentation Support

6.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, *DS560MB410 Programmer's Guide*
- Texas Instruments, *50 GbE PAM4 Equalization Optimization with TI DS560MB410 Redrivers*

6.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.3 Support Resources

6.4 Trademarks

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6.5 Electrostatic Discharge Caution

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.

6.6 术语表

TI 术语表	本术语表列出并解释了术语、首字母缩略词和定义。

7 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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
DS560MB410ZASR	ACTIVE	NFBGA	ZAS	101	2500	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	DS56MB410	Samples
DS560MB410ZAST	ACTIVE	NFBGA	ZAS	101	250	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	DS56MB410	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.

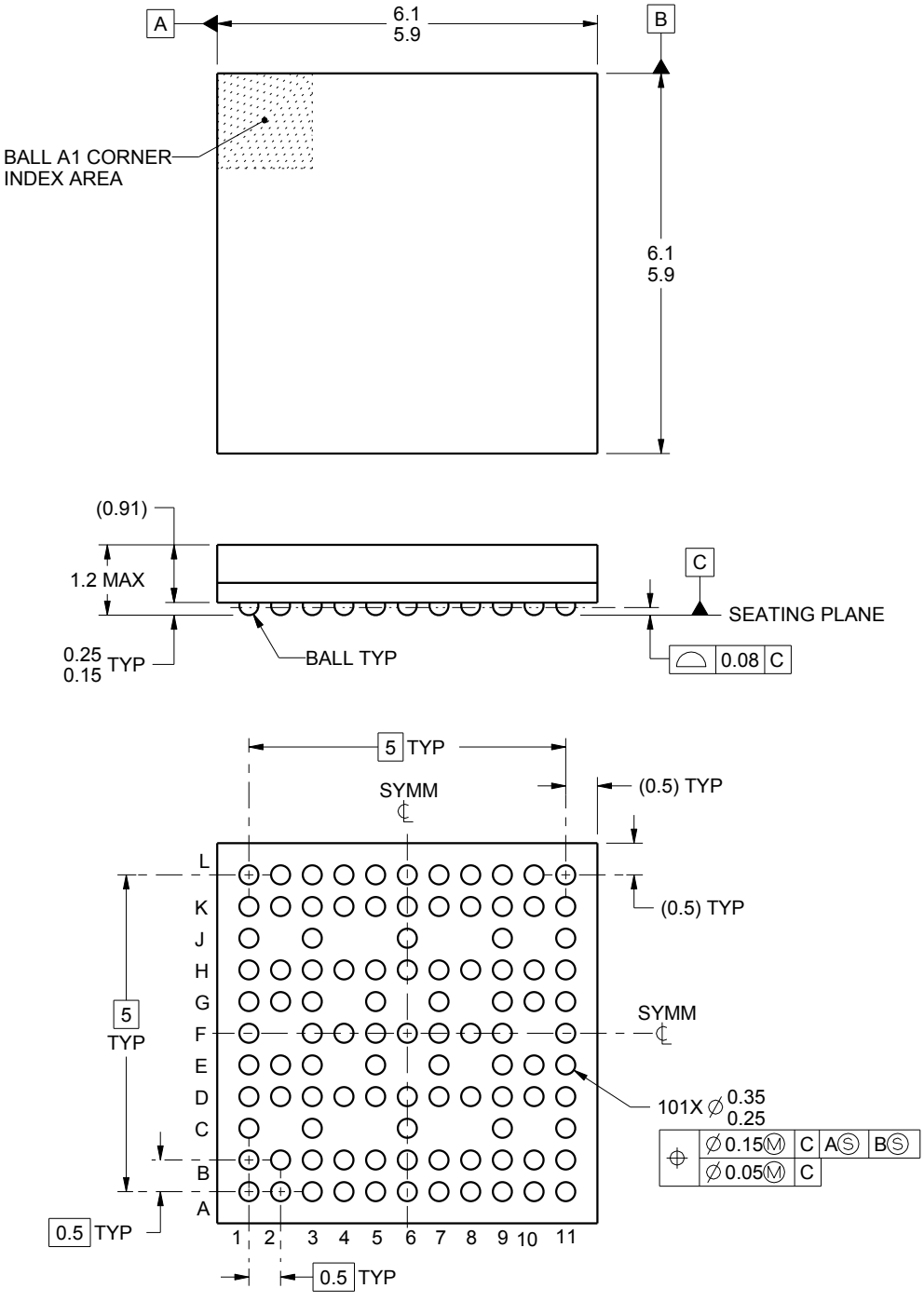
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

PACKAGE OUTLINE

ZAS0101A

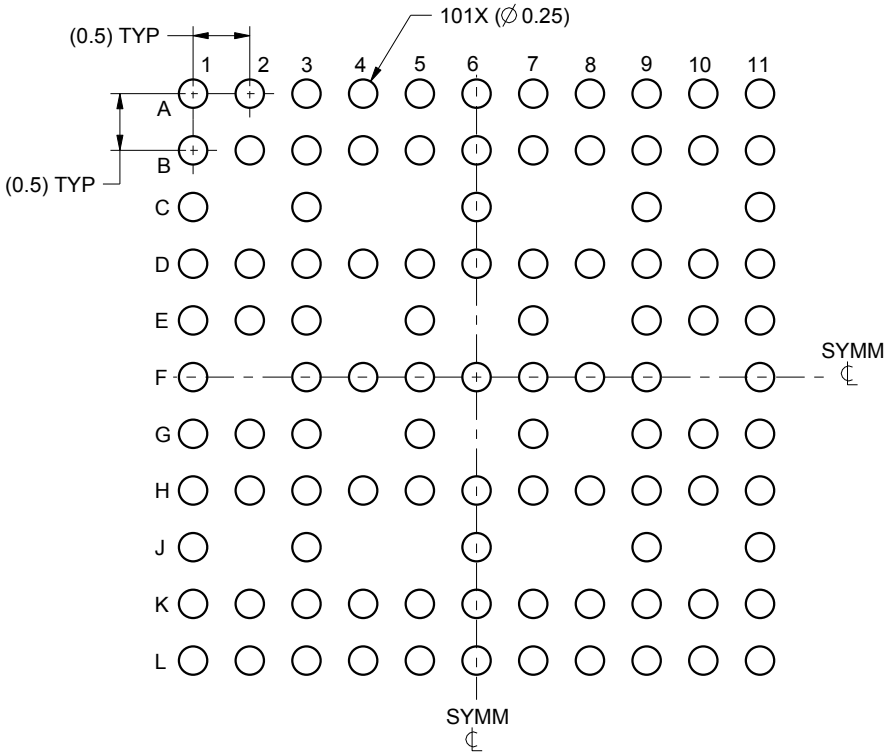
NFBGA - 1.2 mm max height

PLASTIC BALL GRID ARRAY

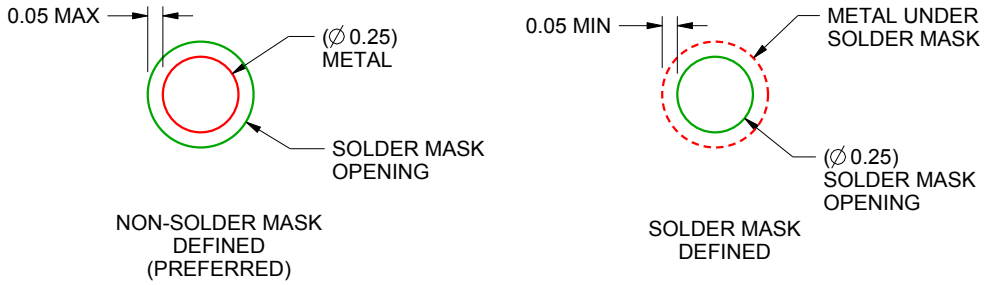


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:15X

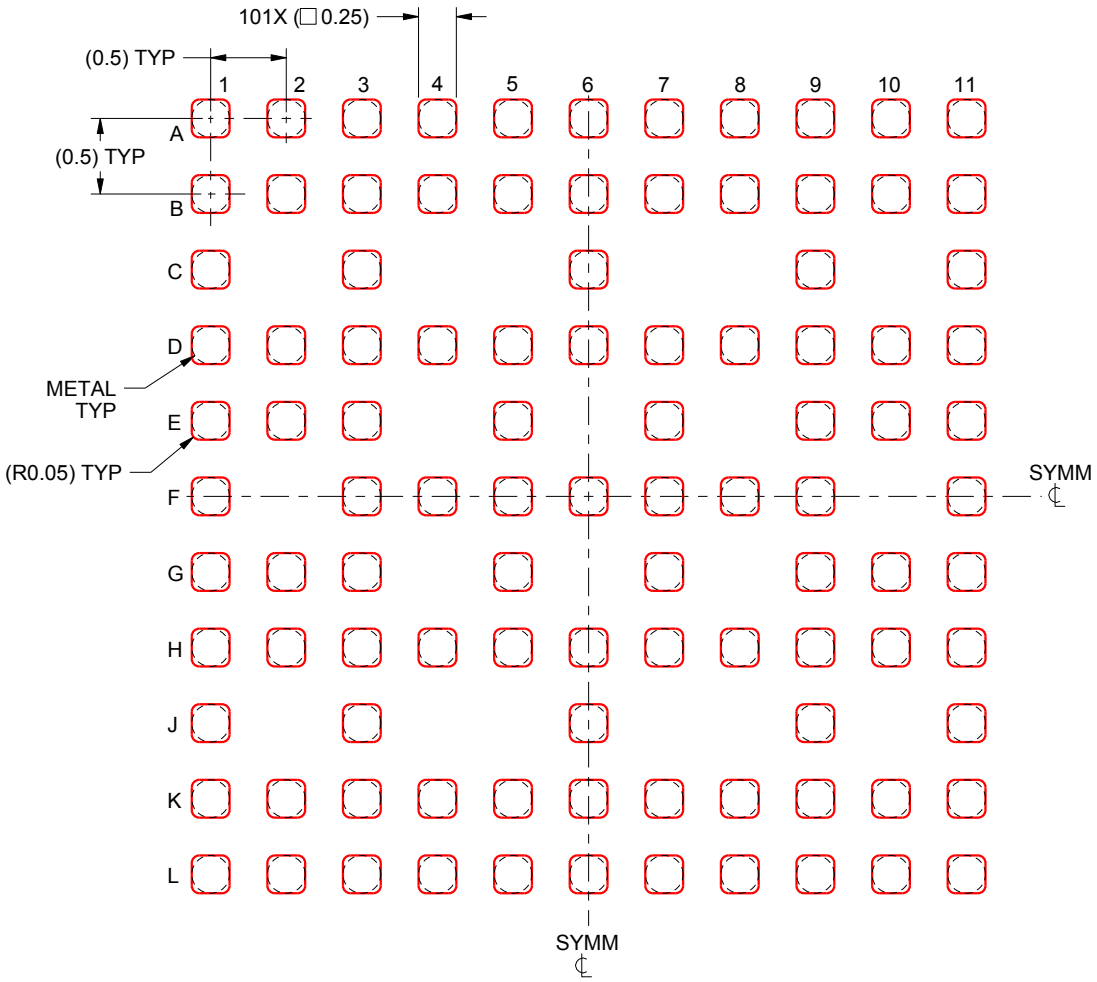


SOLDER MASK DETAILS
NOT TO SCALE

4222303/A 09/2015

NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints.
For information, see Texas Instruments literature number SPRAA99 (www.ti.com/lit/spraa99).



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:20X

4222303/A 09/2015

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

重要声明和免责声明

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