



CSD13306W 12V N 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

1 特性

- 超低导通电阻
- 低 Q_g 和 Q_{gd}
- 1mm x 1.5mm 小尺寸封装
- 低高度（高度为 0.62mm）
- 无铅
- 符合 RoHS 环保标准
- 无卤素

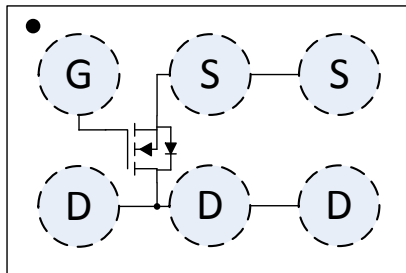
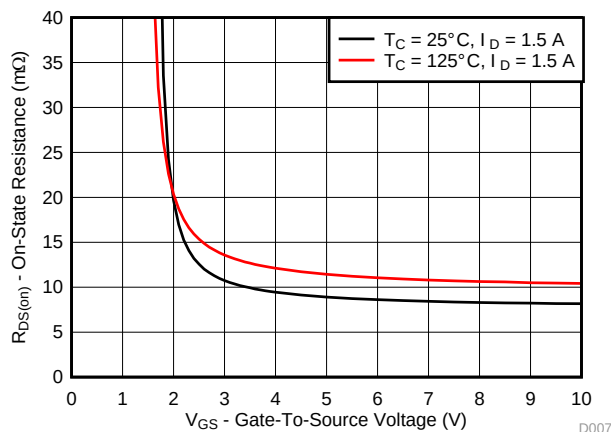
2 应用范围

- 电池管理
- 负载开关
- 电池保护

3 说明

这款 8.8mΩ、12V N 通道器件设计用于在超薄且具有出色散热特性的 1.5 mm × 1mm 小外形封装内提供最低的导通电阻和栅极电荷。

顶视图

 $R_{DS(on)}$ 与 V_{GS} 间的关系

D007

产品概要

$T_A = 25^\circ\text{C}$		典型值	单位
V_{DS}	漏源电压	12	V
Q_g	栅极电荷总量 (4.5V)	8.6	nC
Q_{gd}	栅极电荷 (栅极到漏极)	3.0	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 2.5\text{V}$	12.9 mΩ
		$V_{GS} = 4.5\text{V}$	8.8 mΩ
$V_{GS(th)}$	电压阈值	1.0	V

订购信息⁽¹⁾

器件	数量	介质	封装	出货
CSD13306W	3000	7 英寸卷带	1.0mm x 1.5mm 晶圆级封装	卷带封装
CSD13306WT	250	7 英寸卷带		

(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。

最大绝对额定值

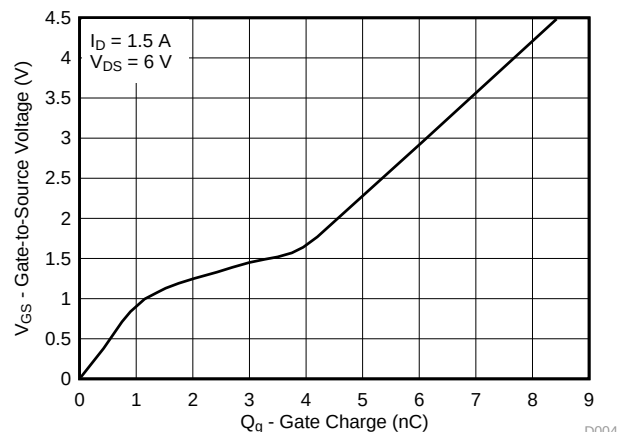
$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	12	V
V_{GS}	栅源电压	±10	V
I_D	持续漏极电流 ⁽¹⁾	3.5	A
I_{DM}	脉冲漏极电流 ⁽²⁾	44	A
P_D	功率耗散 ⁽³⁾	1.9	W
T_{stg}	储存温度范围	-55 至 150	°C
T_J	工作结温范围		

(1) 器件在 105°C 温度下运行

(2) $R_{\theta JA} = 230^\circ\text{C/W}$ (覆铜面积最小时的典型值)，脉宽 ≤ 100μs，占空比 ≤ 1%

(3) $R_{\theta JA} = 65^\circ\text{C/W}$ (覆铜面积最大时的典型值)

栅极电荷



D004



目录

1	特性	1	5.3	Typical MOSFET Characteristics	4
2	应用范围	1	6	器件和文档支持	7
3	说明	1	6.1	商标	7
4	修订历史记录	2	6.2	静电放电警告	7
5	Specifications	3	6.3	术语表	7
5.1	Electrical Characteristics	3	7	机械封装和可订购信息	8
5.2	Thermal Information	3	7.1	CSD13306W 封装尺寸	8
			7.2	卷带信息	9

4 修订历史记录

日期	修订版本	注释
2015 年 3 月	*	最初发布。

5 Specifications

5.1 Electrical Characteristics

(T_A = 25°C unless otherwise stated)

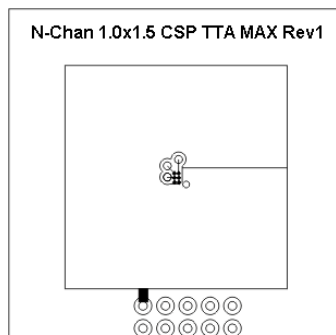
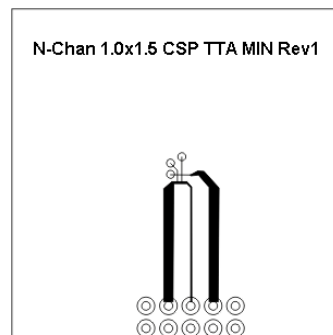
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV _{DSS}	Drain-to-Source Voltage	V _{GS} = 0 V, I _D = 250 μA	12			V
I _{DSS}	Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = 9.6 V			1	μA
I _{GSS}	Gate-to-Source Leakage Current	V _{DS} = 0 V, V _{GS} = 10 V			100	nA
V _{GS(th)}	Gate-to-Source Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	0.7	1.0	1.3	V
R _{DS(on)}	Drain-to-Source On-Resistance	V _{GS} = 2.5 V, I _D = 1.5 A		12.9	15.5	mΩ
		V _{GS} = 4.5 V, I _D = 1.5 A		8.8	10.2	mΩ
g _{fs}	Transconductance	V _{DS} = 1.2 V, I _D =1.5 A		15		S
DYNAMIC CHARACTERISTICS						
C _{ISS}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 6 V, f = 1 MHz		1050	1370	pF
C _{OSS}	Output Capacitance			324	421	pF
C _{RSS}	Reverse Transfer Capacitance			226	294	pF
R _g				4.2	8.4	Ω
Q _g	Gate Charge Total (4.5V)	V _{DS} = 6 V, I _D = 1.5 A		8.6	11.2	nC
Q _{gd}	Gate Charge Gate-to-Drain			3.0		nC
Q _{gs}	Gate Charge Gate-to-Source			1.1		nC
Q _{g(th)}	Gate Charge at V _{th}			1.2		nC
Q _{OSS}	Output Charge	V _{DS} = 6 V, V _{GS} = 0 V		3.3		nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 6 V, V _{GS} = 4.5 V, I _D = 1.5 A R _G = 4 Ω		7		ns
t _r	Rise Time			11		ns
t _{d(off)}	Turn Off Delay Time			20		ns
t _f	Fall Time			8		ns
DIODE CHARACTERISTICS						
V _{SD}	Diode Forward Voltage	I _S = 1.5 A, V _{GS} = 0 V		0.7	1.0	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 6 V, I _F = 1.5 A, di/dt = 200 A/μs		14.8		nC
t _{rr}	Reverse Recovery Time			23		ns

5.2 Thermal Information

(T_A = 25°C unless otherwise stated)

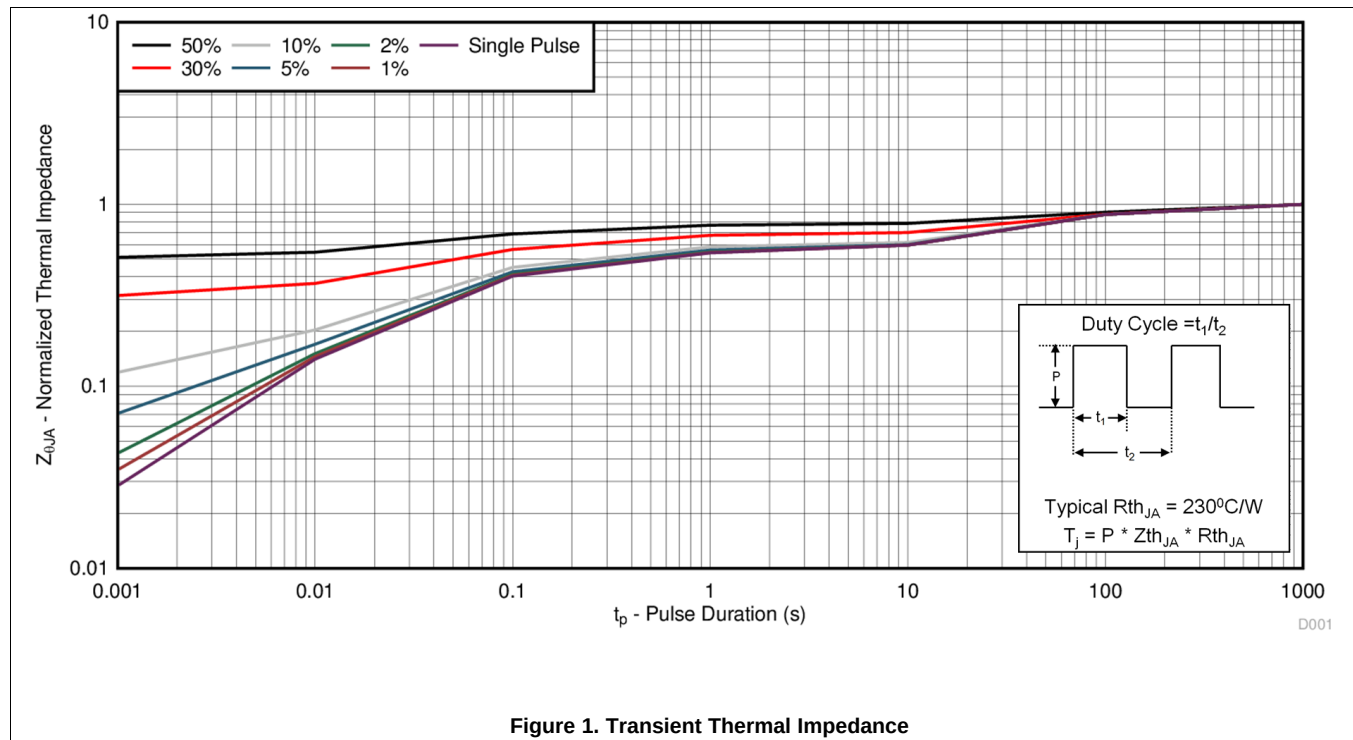
THERMAL METRIC		MIN	TYP	MAX	UNIT
R _{θJA}	Junction-to-Ambient Thermal Resistance ⁽¹⁾		230		°C/W
	Junction-to-Ambient Thermal Resistance ⁽²⁾		65		

(1) Device mounted on FR4 material with minimum Cu mounting area

(2) Device mounted on FR4 material with 1 inch² (6.45 cm²), 2 oz. (0.071 mm thick) Cu.

Typ R_{θJA} = 65°C/W
when mounted on
1 inch² of 2 oz. Cu.

Typ R_{θJA} = 230°C/W
when mounted on
minimum pad area of
2 oz. Cu.

5.3 Typical MOSFET Characteristics

($T_A = 25^\circ\text{C}$ unless otherwise stated)



Typical MOSFET Characteristics (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

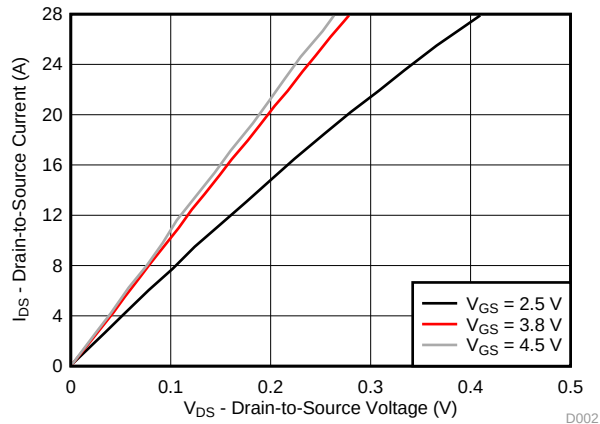


Figure 2. Saturation Characteristics

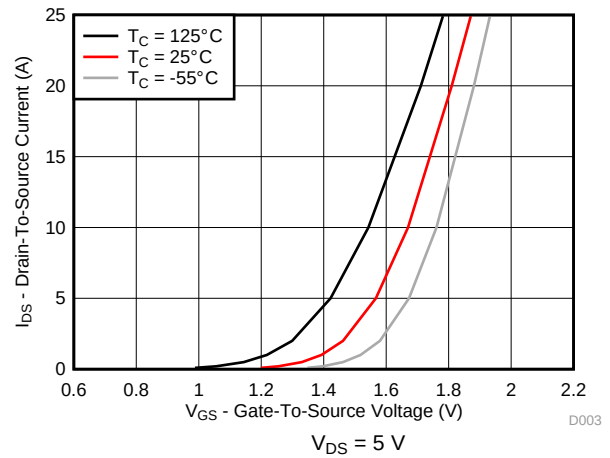


Figure 3. Transfer Characteristics

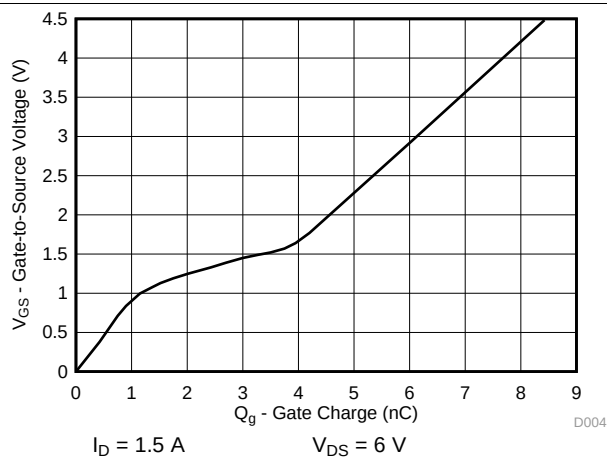


Figure 4. Gate Charge

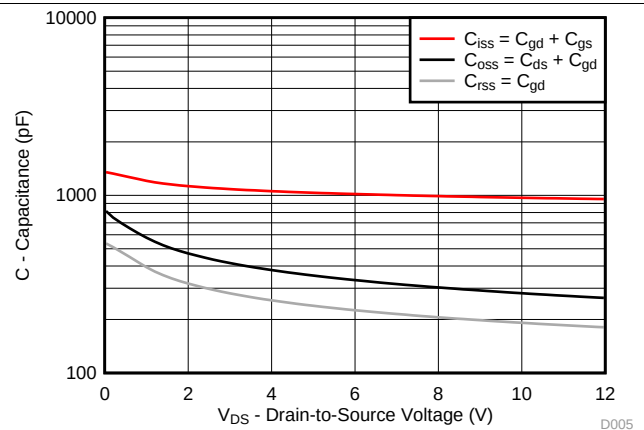


Figure 5. Capacitance

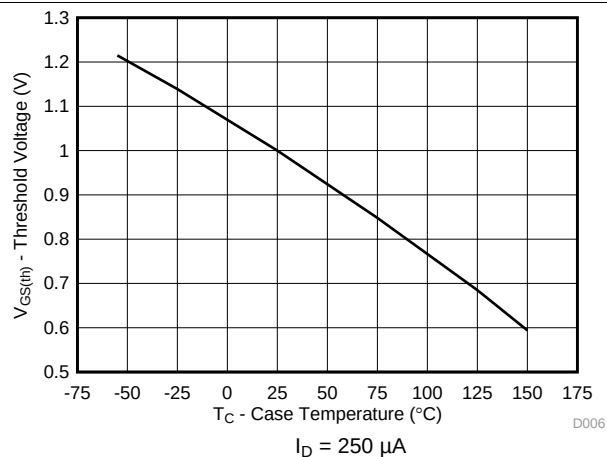


Figure 6. Threshold Voltage vs Temperature

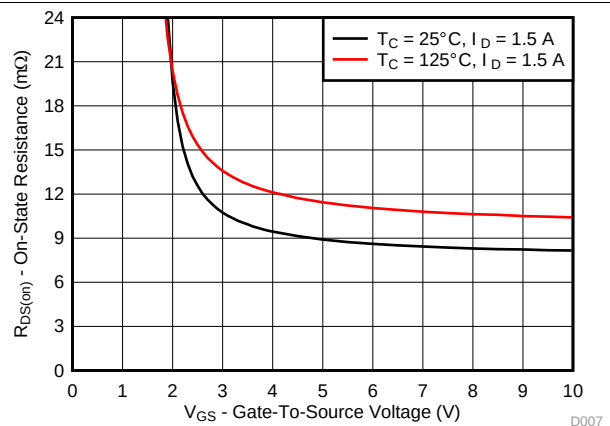


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

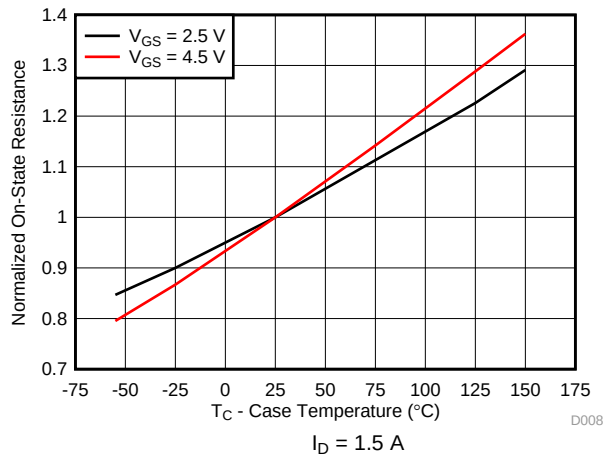


Figure 8. Normalized On-State Resistance vs Temperature

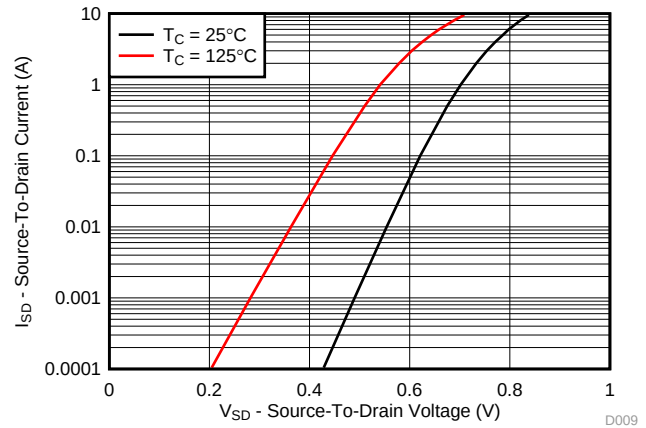


Figure 9. Typical Diode Forward Voltage

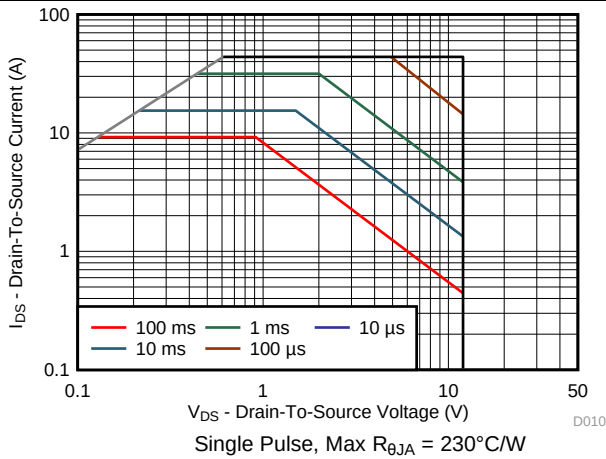


Figure 10. Maximum Safe Operating Area

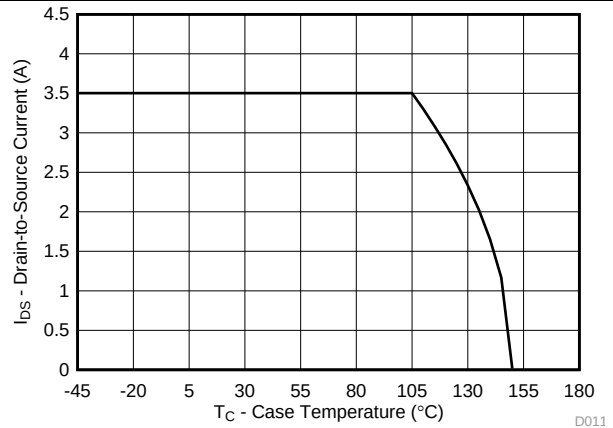


Figure 11. Maximum Drain Current vs Temperature

6 器件和文档支持

6.1 商标

NexFET is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

6.2 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。

6.3 术语表

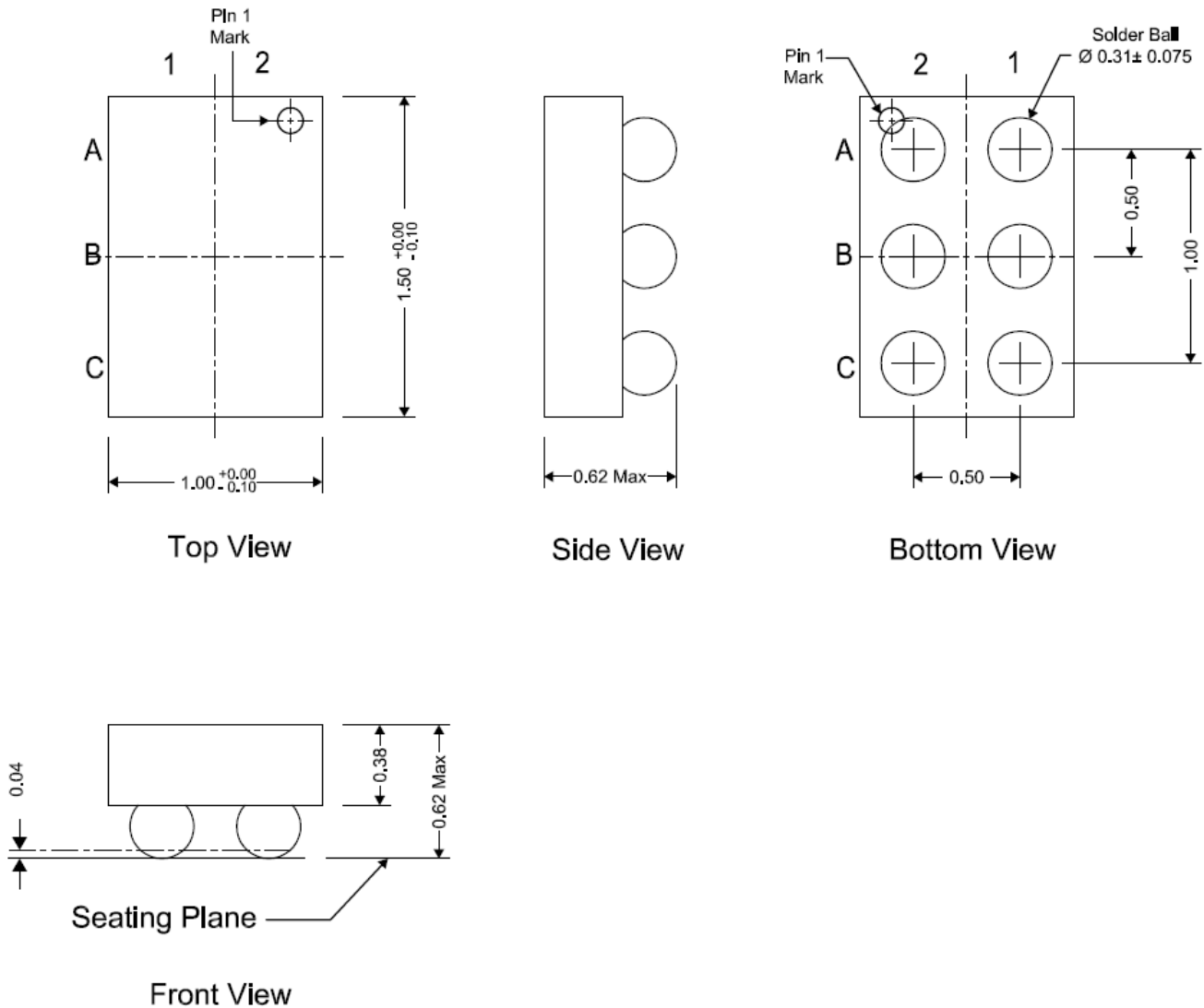
[SLYZ022](#) — TI 术语表。

这份术语表列出并解释术语、首字母缩略词和定义。

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。

7.1 CSD13306W 封装尺寸

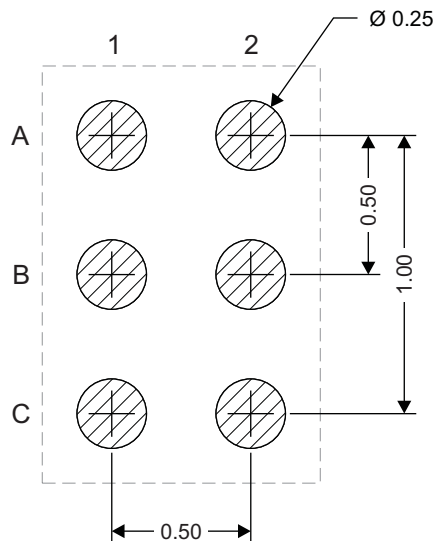


NOTE: 全部尺寸单位为 mm（除非另外注明）

引脚分配

位置	名称
C2, B2	源极
A2	栅极
A1, B1, C1	漏极

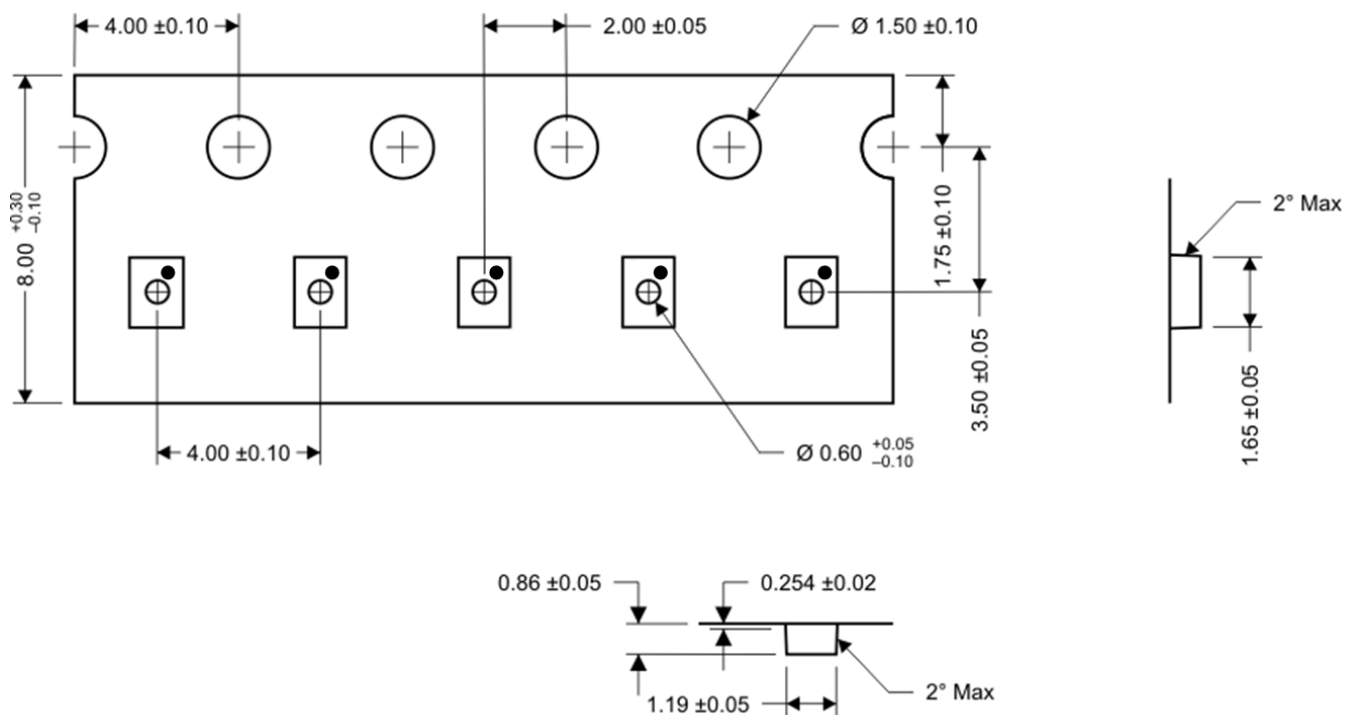
焊盘布局建议



M0158-01

NOTE: 全部尺寸单位为 mm (除非另外注明)

7.2 卷带信息



M0159-01

NOTE: 全部尺寸单位为 mm (除非另外注明)

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)
CSD13306W	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13306
CSD13306W.B	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13306
CSD13306WT	Active	Production	DSBGA (YZC) 6	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13306
CSD13306WT.B	Active	Production	DSBGA (YZC) 6	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13306

⁽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.

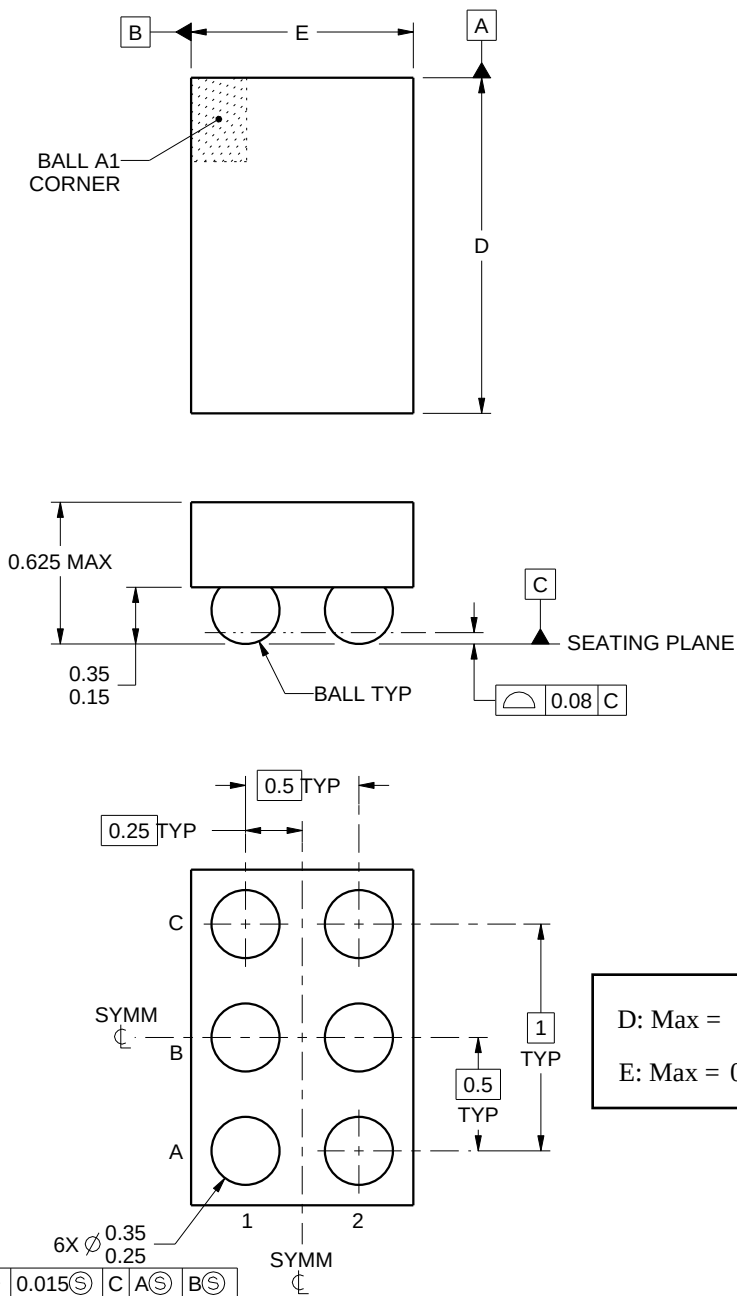
YZC0006



PACKAGE OUTLINE

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



4219522/A 02/2015

NOTES:

NanoFree is a trademark of Texas Instruments.

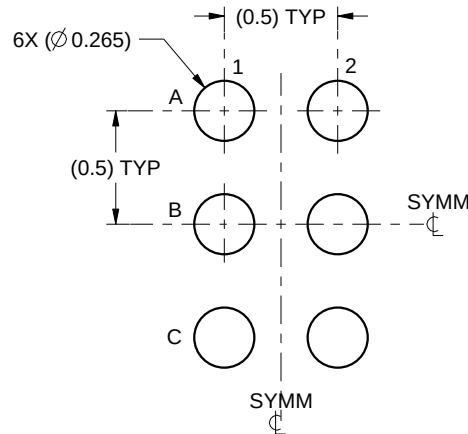
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. NanoFree™ package configuration.

EXAMPLE BOARD LAYOUT

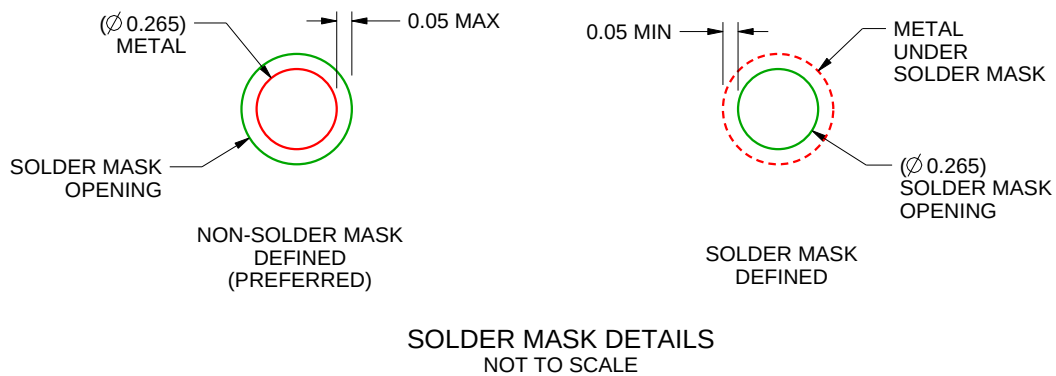
YZC0006

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE
SCALE:30X



SOLDER MASK DETAILS
NOT TO SCALE

4219522/A 02/2015

NOTES: (continued)

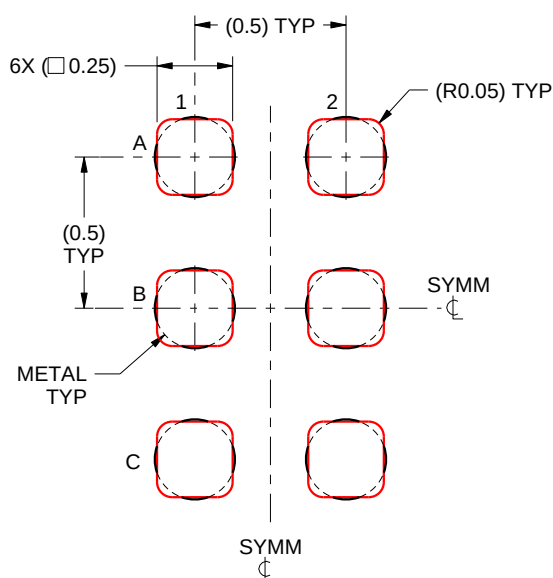
4. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints.
For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).

EXAMPLE STENCIL DESIGN

YZC0006

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:40X

4219522/A 02/2015

NOTES: (continued)

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

重要通知和免责声明

TI“按原样”提供技术和可靠性数据（包括数据表）、设计资源（包括参考设计）、应用或其他设计建议、网络工具、安全信息和其他资源，不保证没有瑕疵且不做任何明示或暗示的担保，包括但不限于对适销性、与某特定用途的适用性或不侵犯任何第三方知识产权的暗示担保。

这些资源可供使用 TI 产品进行设计的熟练开发人员使用。您将自行承担以下全部责任：(1) 针对您的应用选择合适的 TI 产品，(2) 设计、验证并测试您的应用，(3) 确保您的应用满足相应标准以及任何其他安全、安保法规或其他要求。

这些资源如有变更，恕不另行通知。TI 授权您仅可将这些资源用于研发本资源所述的 TI 产品的相关应用。严禁以其他方式对这些资源进行复制或展示。您无权使用任何其他 TI 知识产权或任何第三方知识产权。对于因您对这些资源的使用而对 TI 及其代表造成的任何索赔、损害、成本、损失和债务，您将全额赔偿，TI 对此概不负责。

TI 提供的产品受 [TI 销售条款](#)、[TI 通用质量指南](#) 或 [ti.com](#) 上其他适用条款或 TI 产品随附的其他适用条款的约束。TI 提供这些资源并不会扩展或以其他方式更改 TI 针对 TI 产品发布的适用的担保或担保免责声明。除非德州仪器 (TI) 明确将某产品指定为定制产品或客户特定产品，否则其产品均为按确定价格收入目录的标准通用器件。

TI 反对并拒绝您可能提出的任何其他或不同的条款。

版权所有 © 2025，德州仪器 (TI) 公司

最后更新日期：2025 年 10 月