



CSD25304W1015 20V P 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 Q_g 和 Q_{gd}
- 小封装尺寸
- 低高度（高度为 0.62mm）
- 无铅
- 符合 RoHS 环保标准
- 无卤素
- 芯片级封装 (CSP) 1 x 1.5mm 晶圆级封装

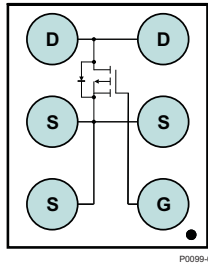
2 应用范围

- 电池管理
- 负载开关
- 电池保护

3 说明

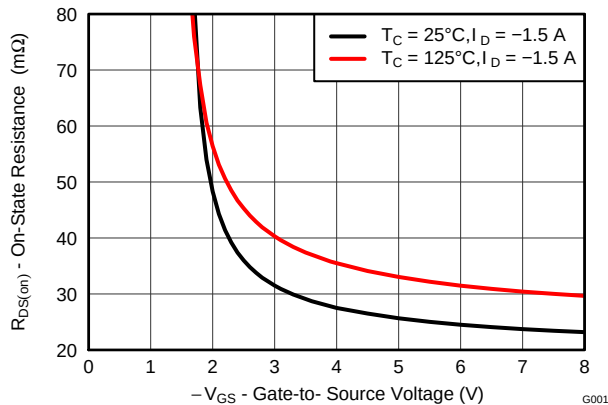
这款 27mΩ, 20V P 通道器件设计用于在超薄且具有出色散热特性的 1.0mm × 1.5mm 小外形封装内提供最低的导通电阻和栅极电荷。

顶视图



PD099-01

$R_{DS(on)}$ 与 V_{GS} 间的关系



G001

产品概要

$T_A = 25^\circ\text{C}$		典型值	单位
V_{DS}	漏源电压	-20	V
Q_g	栅极电荷总量 (4.5V)	3.3	nC
Q_{gd}	栅漏栅极电荷	0.5	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = -1.8\text{V}$	65 mΩ
		$V_{GS} = -2.5\text{V}$	36 mΩ
		$V_{GS} = -4.5\text{V}$	27 mΩ
$V_{GS(th)}$	电压阈值	-0.8	V

订购信息⁽¹⁾

器件	数量	介质	封装	出货
CSD25304W1015	3000	7 英寸卷带	1.0mm × 1.5mm 晶圆级封装	卷带封装
CSD25304W1015T	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。

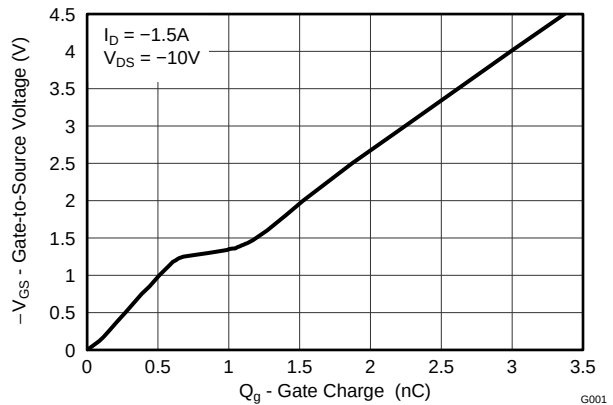
最大绝对额定值

$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	-20	V
V_{GS}	栅源电压	±8	V
I_D	持续漏极电流 ⁽¹⁾	-3.0	A
I_{DM}	脉冲漏极电流 ⁽²⁾	-41	A
P_D	功率耗散	0.75	W
T_J , T_{stg}	运行结温和 储存温度范围	-55 至 150	°C

(1) 器件在 105°C 温度下运行

(2) $R_{\theta JA}$ 典型值 = 165°C/W, 脉宽 ≤ 100μs, 占空比 ≤ 1%

栅极电荷



G001



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4 修订历史记录

Changes from Original (July 2014) to Revision A	Page
• 已将功耗额定值降至 0.75W（Cu 计算得出的最小值）	1
• Corrected Min Thermal Information from 85 to 165	3
• Corrected Max Thermal Information from 165 to 85	3
• 已更新机械制图以提高精度	8

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	–20			V
I _{DSS}	Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = –16 V			–1	μA
I _{GSS}	Gate-to-Source Leakage Current	V _{DS} = 0 V, V _{GS} = ±8 V			–100	nA
V _{GS(th)}	Gate-to-Source Threshold Voltage	V _{DS} = V _{GS} , I _D = –250 μA	–0.55	–0.8	–1.15	V
R _{DS(on)}	Drain-to-Source On-Resistance	V _{GS} = –1.8 V, I _D = –1.5 A		65	92	mΩ
		V _{GS} = –2.5 V, I _D = –1.5 A		36	45.5	mΩ
		V _{GS} = –4.5 V, I _D = –1.5 A		27	32.5	mΩ
g _{fs}	Transconductance	V _{DS} = –10 V, I _D = –1.5 A		12		S
DYNAMIC CHARACTERISTICS						
C _{ISS}	Input Capacitance	V _{GS} = 0 V, V _{DS} = –10 V, f = 1 MHz		458	595	pF
C _{OSS}	Output Capacitance			231	300	pF
C _{RSS}	Reverse Transfer Capacitance			12	15.6	pF
Q _g	Gate Charge Total (–4.5 V)	V _{DS} = –10 V, I _D = –1.5 A		3.3	4.4	nC
Q _{gd}	Gate Charge Gate-to-Drain			0.5		nC
Q _{gs}	Gate Charge Gate-to-Source			0.7		nC
Q _{g(th)}	Gate Charge at V _{th}			0.4		nC
Q _{OSS}	Output Charge	V _{DS} = –10 V, V _{GS} = 0 V		3.7		nC
t _{d(on)}	Turn On Delay Time	V _{DS} = –10 V, V _{GS} = –4.5 V, I _D = –1.5 A R _G = 20 Ω		6		ns
t _r	Rise Time			4		ns
t _{d(off)}	Turn Off Delay Time			24		ns
t _f	Fall Time			10		ns
DIODE CHARACTERISTICS						
V _{SD}	Diode Forward Voltage	I _S = –1.5 A, V _{GS} = 0 V	–0.75		–1	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = –10 V, I _F = –1.5 A, di/dt = 200 A/μs		7.2		nC
t _{rr}	Reverse Recovery Time	V _{DS} = –10 V, I _F = –1.5 A, di/dt = 200 A/μs		11.6		ns

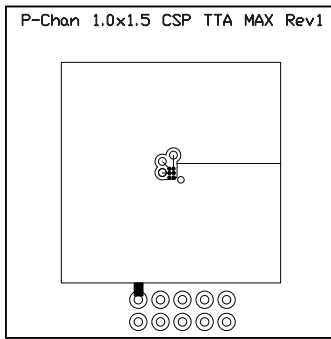
5.2 Thermal Information

(T_A = 25°C unless otherwise stated)

THERMAL METRIC		MIN	TYP	MAX	UNIT
R _{θJA}	Junction-to-Ambient Thermal Resistance ⁽¹⁾		165		°C/W
	Junction-to-Ambient Thermal Resistance ⁽²⁾		85		

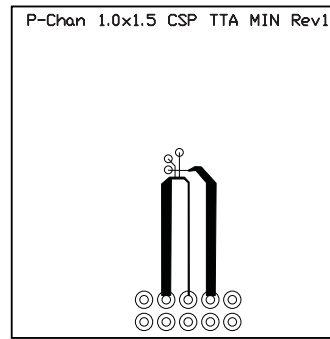
(1) Device mounted on FR4 material with minimum Cu mounting area.

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



M0155-01

Typ $R_{\theta JA} = 85^{\circ}\text{C/W}$
when mounted on
1 inch² of 2 oz. Cu.



M0156-01

Typ $R_{\theta JA} = 165^{\circ}\text{C/W}$
when mounted on
minimum pad area of
2 oz. Cu.

5.3 Typical MOSFET Characteristics

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

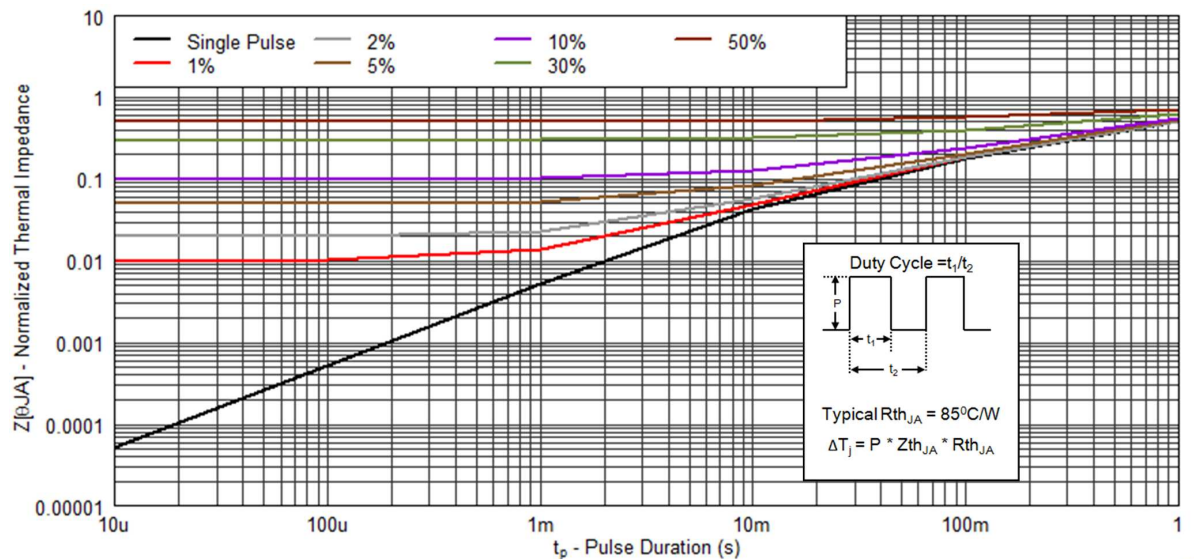


Figure 1. Transient Thermal Impedance

Typical MOSFET Characteristics (continued)

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

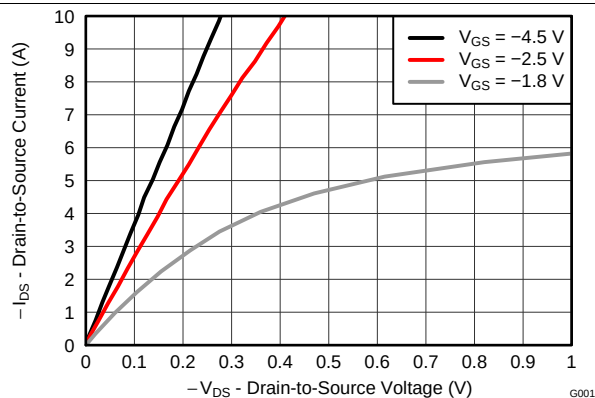


Figure 2. Saturation Characteristics

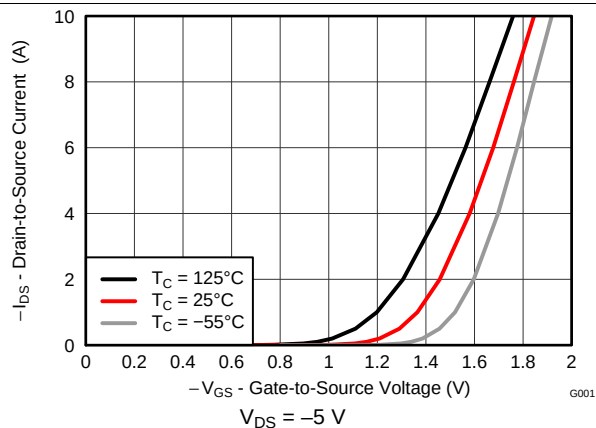


Figure 3. Transfer Characteristics

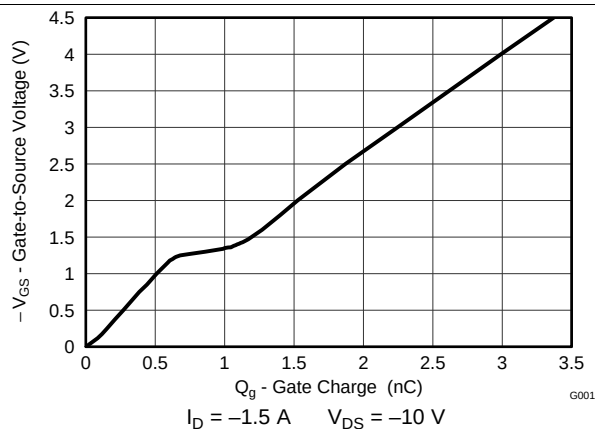


Figure 4. Gate Charge

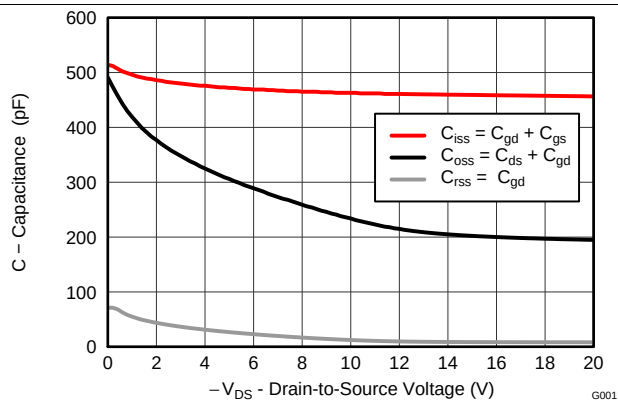


Figure 5. Capacitance

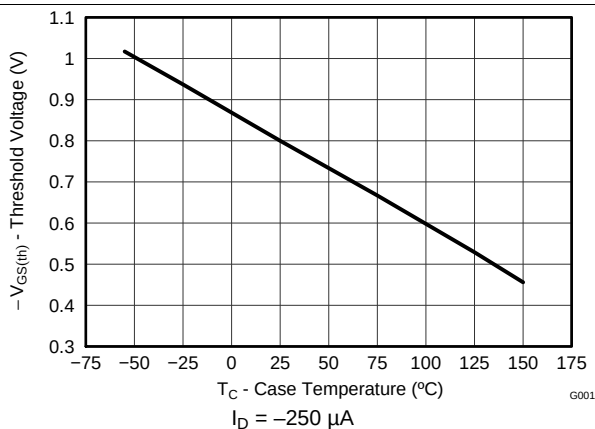


Figure 6. Threshold Voltage vs Temperature

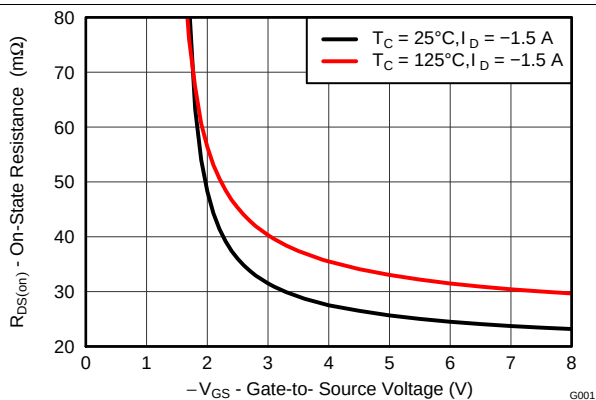


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

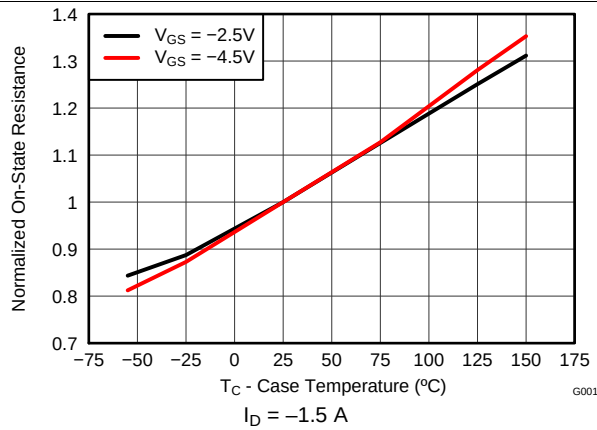


Figure 8. Normalized On-State Resistance vs Temperature

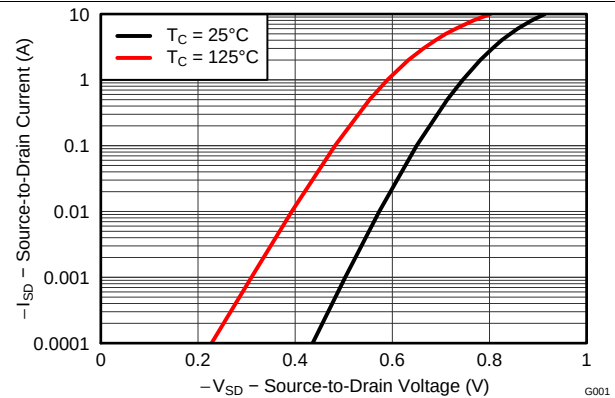


Figure 9. Typical Diode Forward Voltage

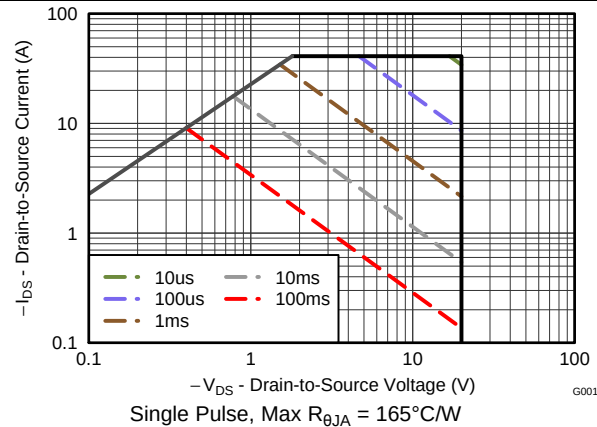


Figure 10. Maximum Safe Operating Area

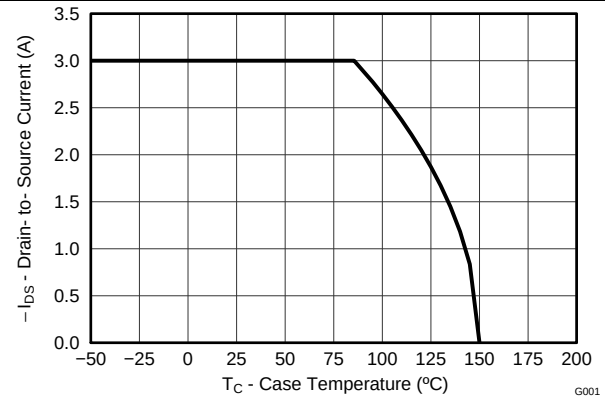


Figure 11. Maximum Drain Current vs Temperature

6 器件和文档支持

6.1 商标

NexFET is a trademark of Texas Instruments.

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

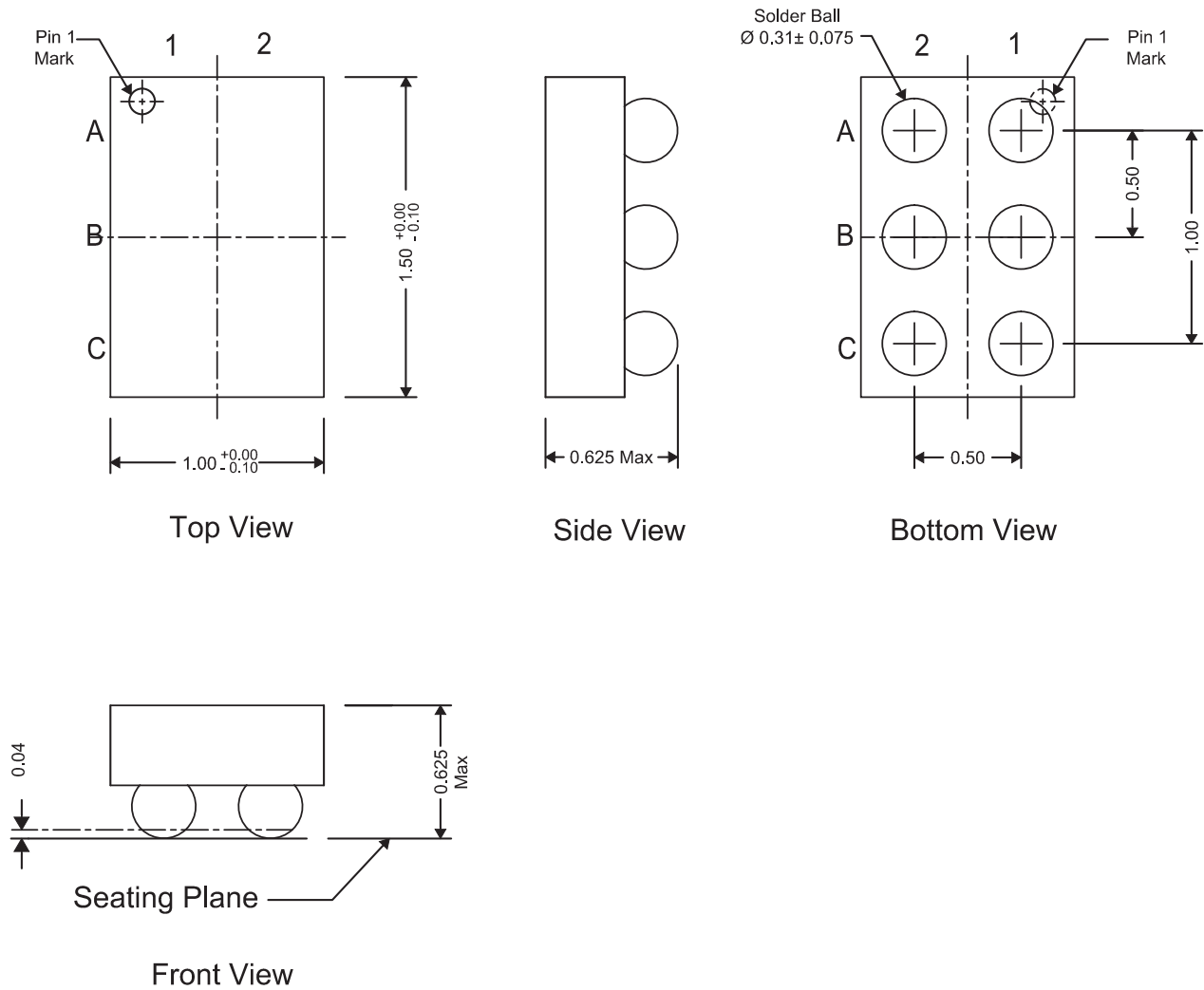
[SLYZ022](#) — *TI* 术语表。

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 CSD25304W1015 封装尺寸

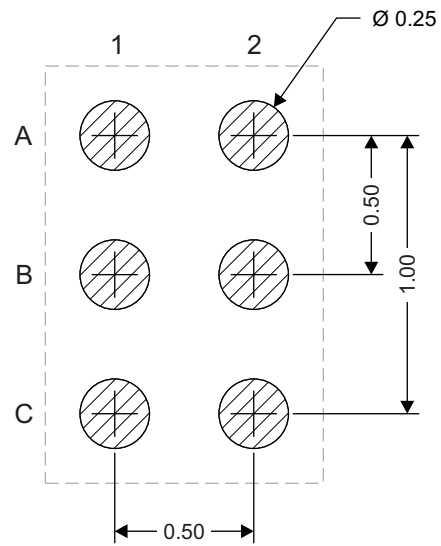


注意：全部尺寸单位为 mm（除非另外注明）。

引脚分配

位置	名称
C1, C2	漏极
A1	栅极
A2, B1, B2	源极

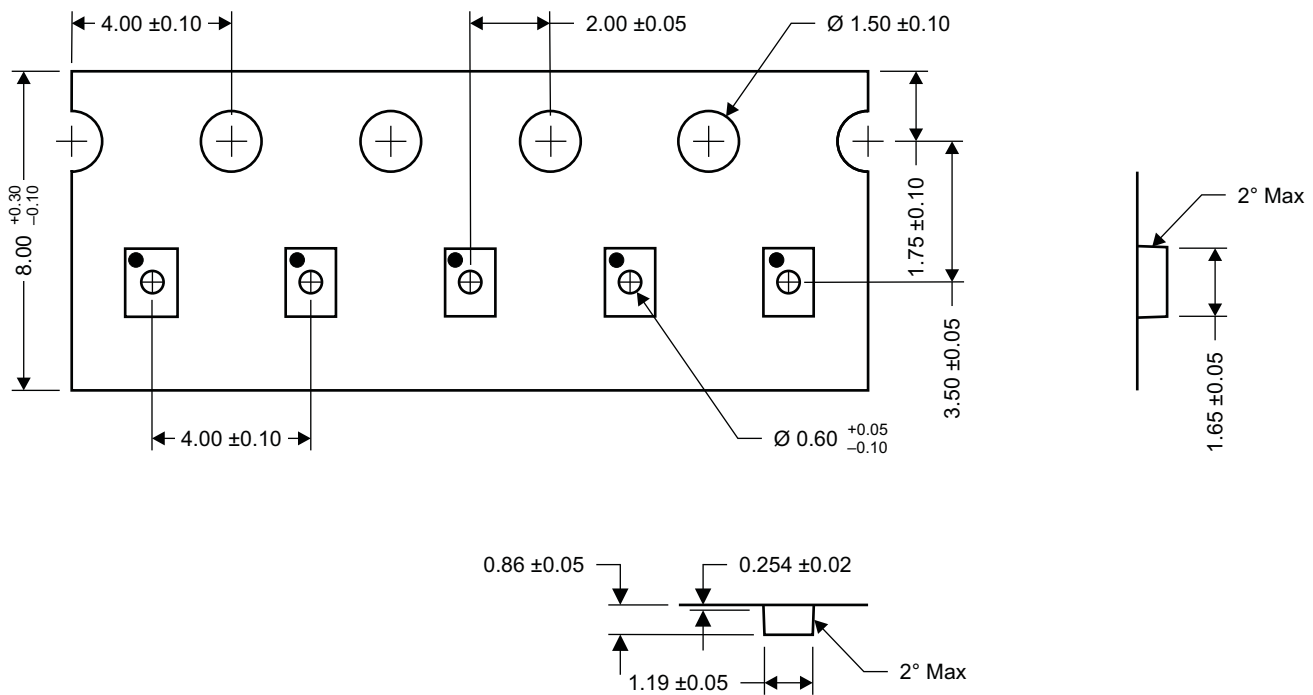
7.2 焊盘布局建议



M0158-01

注意：全部尺寸单位为 mm（除非另外注明）。

7.3 卷带封装信息



M0159-01

注意：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)
CSD25304W1015	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-	25304
CSD25304W1015.B	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	25304
CSD25304W1015T	Active	Production	DSBGA (YZC) 6	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	25304
CSD25304W1015T.B	Active	Production	DSBGA (YZC) 6	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	25304

⁽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.

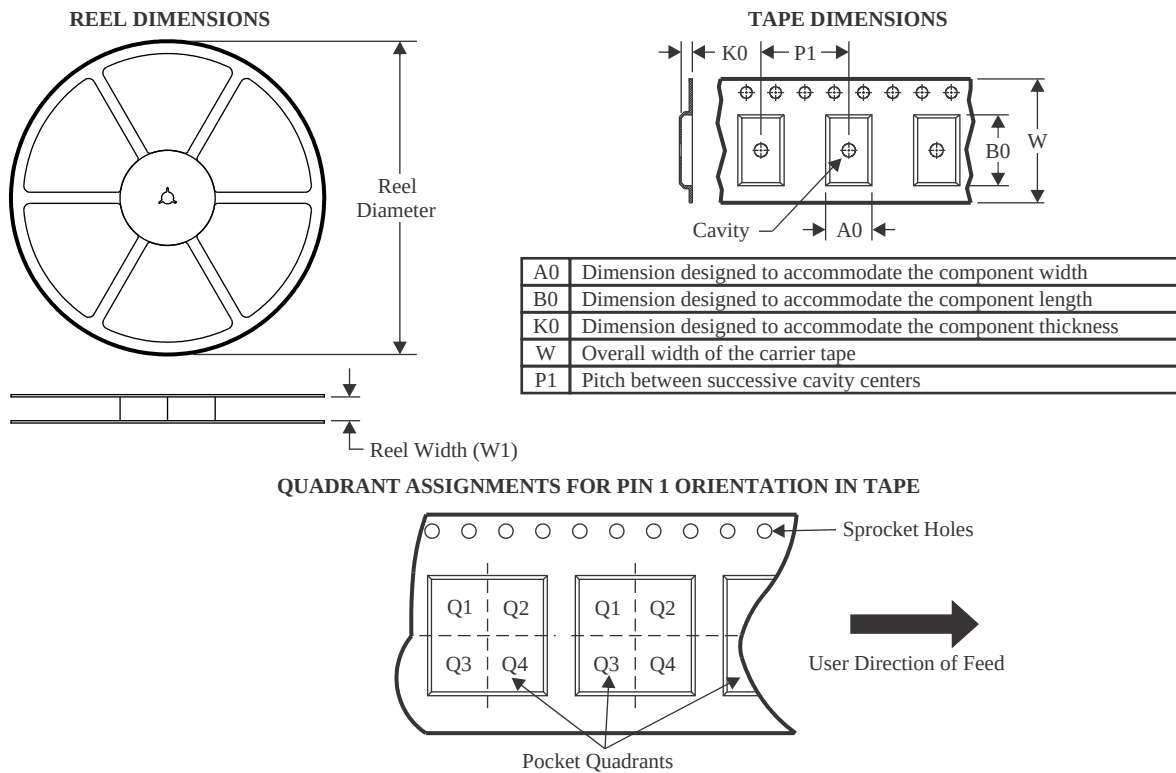
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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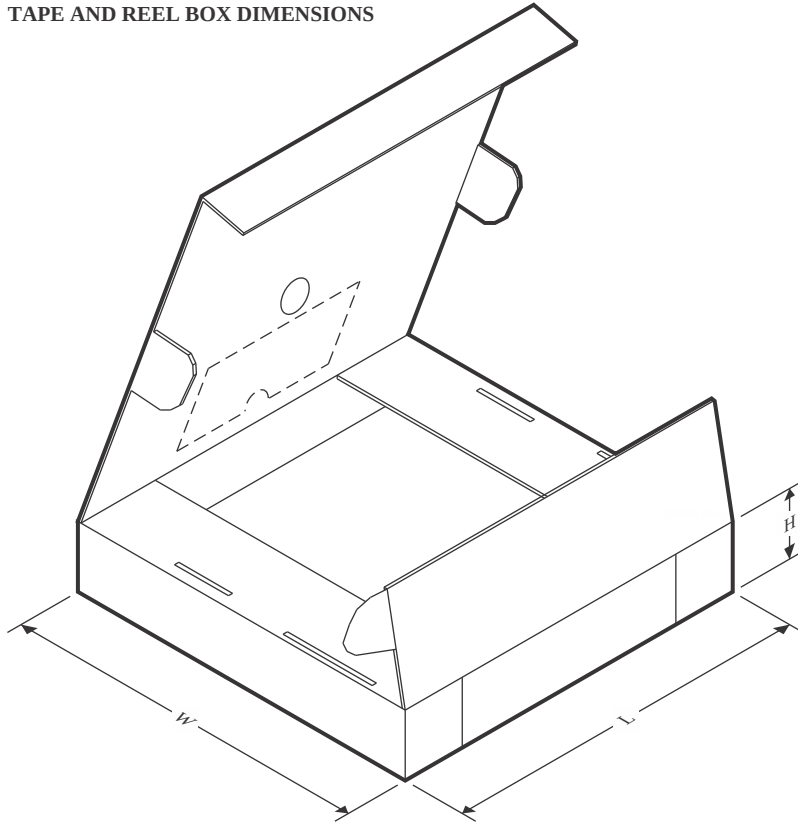
TAPE AND REEL INFORMATION



*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
CSD25304W1015	DSBGA	YZC	6	3000	180.0	9.0	1.18	1.68	0.83	4.0	8.0	Q1
CSD25304W1015T	DSBGA	YZC	6	250	180.0	9.0	1.18	1.68	0.83	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD25304W1015	DSBGA	YZC	6	3000	195.0	210.0	39.0
CSD25304W1015T	DSBGA	YZC	6	250	195.0	210.0	39.0

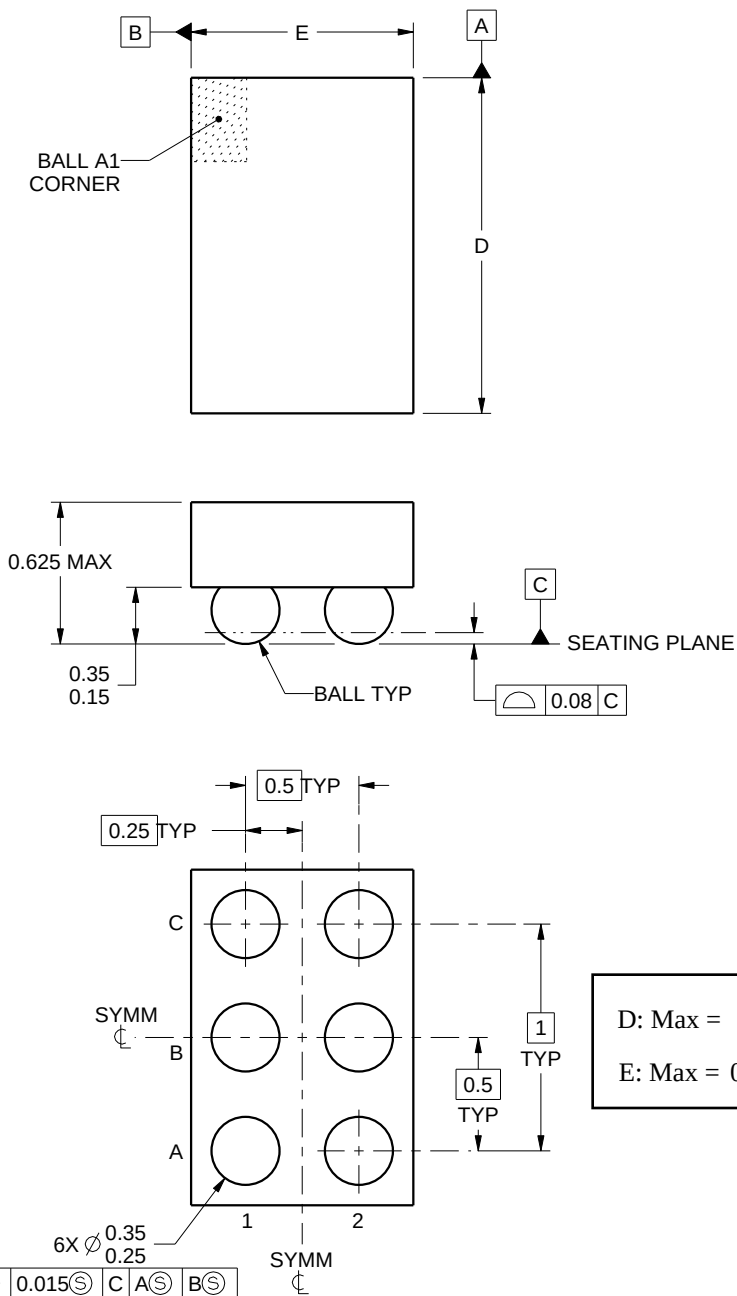
YZC0006



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.

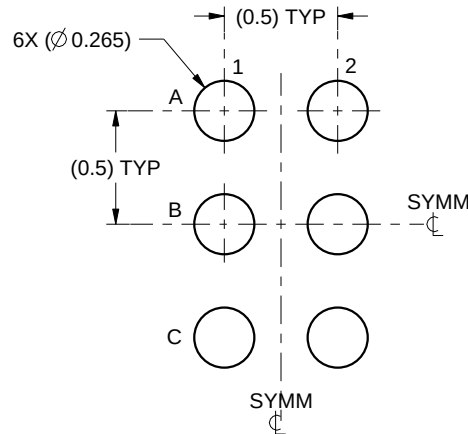
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. NanoFree™ package configuration.

EXAMPLE BOARD LAYOUT

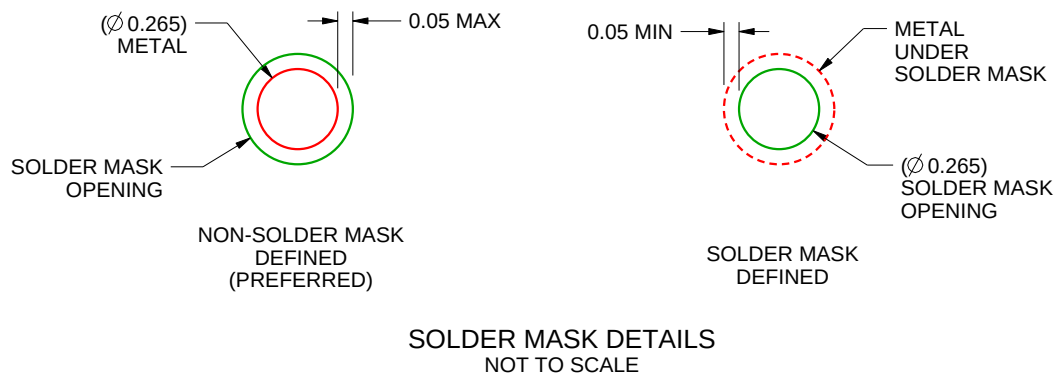
YZC0006

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE
SCALE:30X



4219522/A 02/2015

NOTES: (continued)

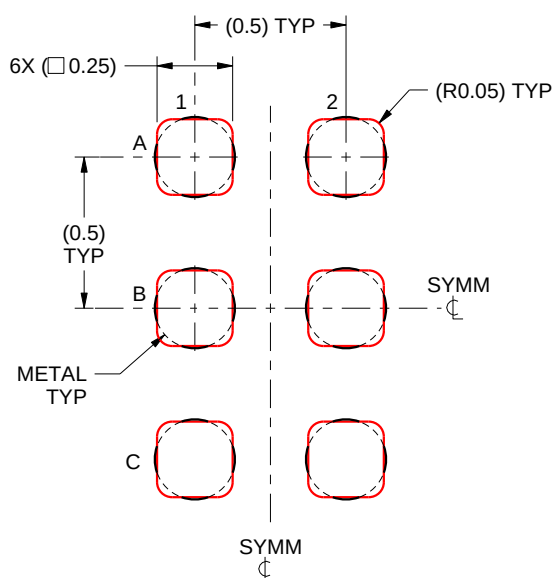
4. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).

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.

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