

# CSD22204W – 8V P 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

## 1 特性

- 低电阻
- 小尺寸封装 1.5mm x 1.5mm
- 无铅
- 栅极静电放电 (ESD) 保护
- 符合 RoHS 环保标准
- 无卤素
- 栅 - 源电压钳位

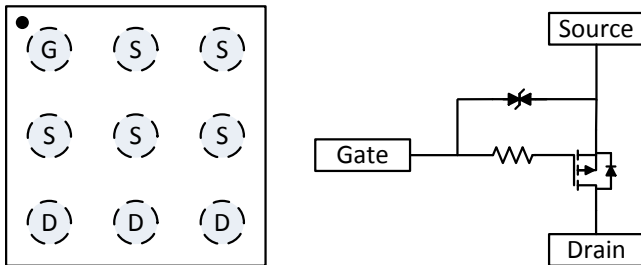
## 2 应用范围

- 电池管理
- 电池保护
- 负载开关应用

## 3 说明

这款 -8V、8.2mΩ、1.5mm x 1.5mm 器件设计用于在超薄且具有出色散热特性的超小外形尺寸封装内提供最低的导通电阻和栅极电荷。低导通电阻与小型封装尺寸和超薄特性结合在一起，使得此器件非常适合于电池供电运行的空间受限应用。

顶视图和电路配置



### 产品概要

$T_A = 25^\circ\text{C}$		典型值		单位
$V_{DS}$	漏源电压	-8		V
$Q_g$	栅极电荷总量 (-4.5V)	18.9		nC
$Q_{gd}$	栅极电荷 (栅极到漏极)	4.2		nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = -2.5\text{V}$	11.5	mΩ
		$V_{GS} = -4.5\text{V}$	8.2	mΩ
$V_{GS(th)}$	阈值电压	-0.7		V

### 订购信息<sup>(1)</sup>

器件	数量	介质	封装	出货
CSD22204W	3000	7 英寸卷带	1.5mm x 1.5mm 晶圆级球状引脚栅格阵列 (BGA) 封装	卷带封装
CSD22204WT	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。

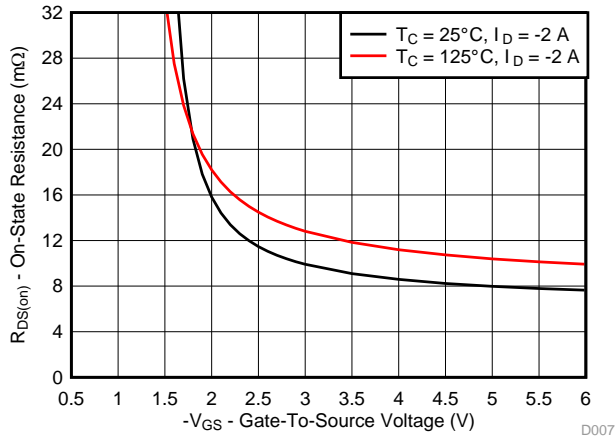
### 最大绝对额定值

$T_A = 25^\circ\text{C}$		值	单位
$V_{DS}$	漏源电压	-8	V
$V_{GS}$	栅源电压	-6	V
$I_D$	持续漏极电流 <sup>(1)</sup>	-5	A
	脉冲漏极电流 <sup>(2)</sup>	-80	A
$P_D$	功率耗散	1.7	W
$T_J, T_{stg}$	运行结温和储存温度范围	-55 至 150	$^\circ\text{C}$

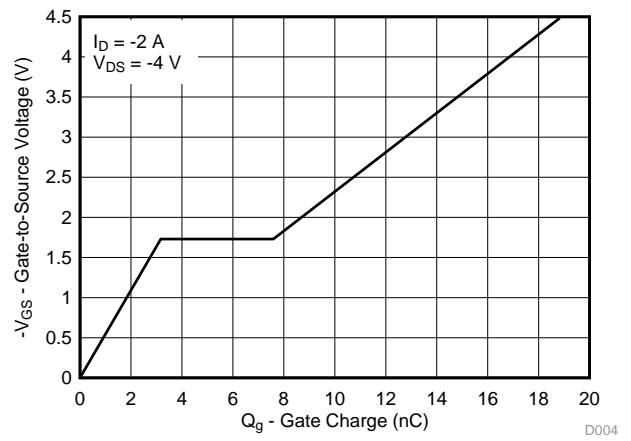
(1) 器件在 105 $^\circ\text{C}$  温度下运行。

(2)  $R_{\theta JA}$  典型值 = 75 $^\circ\text{C}/\text{W}$ ，脉宽  $\leq 100\mu\text{s}$ ，占空比  $\leq 1\%$ 。

$R_{DS(on)}$  与  $V_{GS}$  间的关系



栅极电荷



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## 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<sub>A</sub> = 25°C unless otherwise stated)

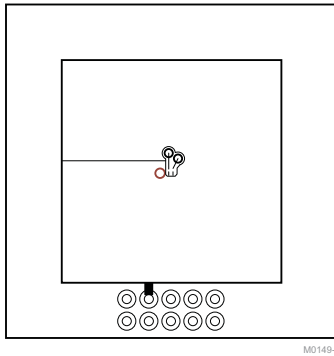
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>STATIC CHARACTERISTICS</b>						
B <sub>V</sub> DSS	Drain-to-Source Voltage	V <sub>GS</sub> = 0 V, I <sub>DS</sub> = -250 μA	-8			V
B <sub>V</sub> GSS	Gate-to-Source Voltage	V <sub>DS</sub> = 0 V, I <sub>G</sub> = -5 μA	-6			V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -6.4 V			-1	μA
I <sub>GSS</sub>	Gate-to-Source Leakage Current	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = -6 V			-4	μA
V <sub>GS(th)</sub>	Gate-to-Source Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = -250 μA	-0.45	-0.7	-0.95	V
R <sub>DS(on)</sub>	Drain-to-Source On-Resistance	V <sub>GS</sub> = -2.5 V, I <sub>DS</sub> = -2 A		11.5	14.0	mΩ
		V <sub>GS</sub> = -4.5 V, I <sub>DS</sub> = -2 A		8.2	9.9	mΩ
g <sub>fs</sub>	Transconductance	V <sub>DS</sub> = -0.8 V, I <sub>DS</sub> = -2 A		18		S
<b>DYNAMIC CHARACTERISTICS</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -4 V, f = 1 MHz		870	1130	pF
C <sub>OSS</sub>	Output Capacitance			445	580	pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			204	265	pF
R <sub>G</sub>	Series Gate Resistance			300		Ω
Q <sub>g</sub>	Gate Charge Total (-4.5 V)	V <sub>DS</sub> = -4 V, I <sub>D</sub> = -2 A		18.9	24.6	nC
Q <sub>gd</sub>	Gate Charge - Gate-to-Drain			4.2		nC
Q <sub>gs</sub>	Gate Charge - Gate-to-Source			3.2		nC
Q <sub>g(th)</sub>	Gate Charge at V <sub>th</sub>			0.7		nC
Q <sub>OSS</sub>	Output Charge		V <sub>DS</sub> = -4 V, V <sub>GS</sub> = 0 V		3.1	
t <sub>d(on)</sub>	Turn On Delay Time	V <sub>DS</sub> = -4 V, V <sub>GS</sub> = -4.5 V, I <sub>DS</sub> = -2 A, R <sub>G</sub> = 0 Ω		58		ns
t <sub>r</sub>	Rise Time			600		ns
t <sub>d(off)</sub>	Turn Off Delay Time			3450		ns
t <sub>f</sub>	Fall Time			2290		ns
<b>DIODE CHARACTERISTICS</b>						
V <sub>SD</sub>	Diode Forward Voltage	I <sub>DS</sub> = -2 A, V <sub>GS</sub> = 0 V	-0.7	-1.0		V

### 5.2 Thermal Information

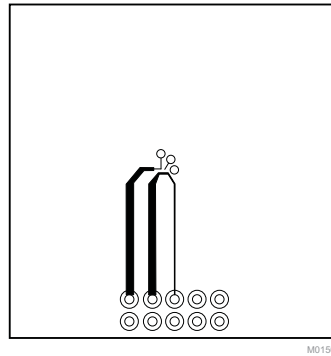
 (T<sub>A</sub> = 25°C unless otherwise stated)

THERMAL METRIC		TYPICAL VALUES	UNIT
R <sub>θJA</sub>	Junction-to-Ambient Thermal Resistance <sup>(1)</sup>	75	°C/W
	Junction-to-Ambient Thermal Resistance <sup>(2)</sup>	230	

- (1) Device mounted on FR4 material with 1 inch<sup>2</sup> (6.45 cm<sup>2</sup>), 2 oz. (0.071 mm thick) Cu.  
 (2) Device mounted on FR4 material with minimum Cu mounting area.



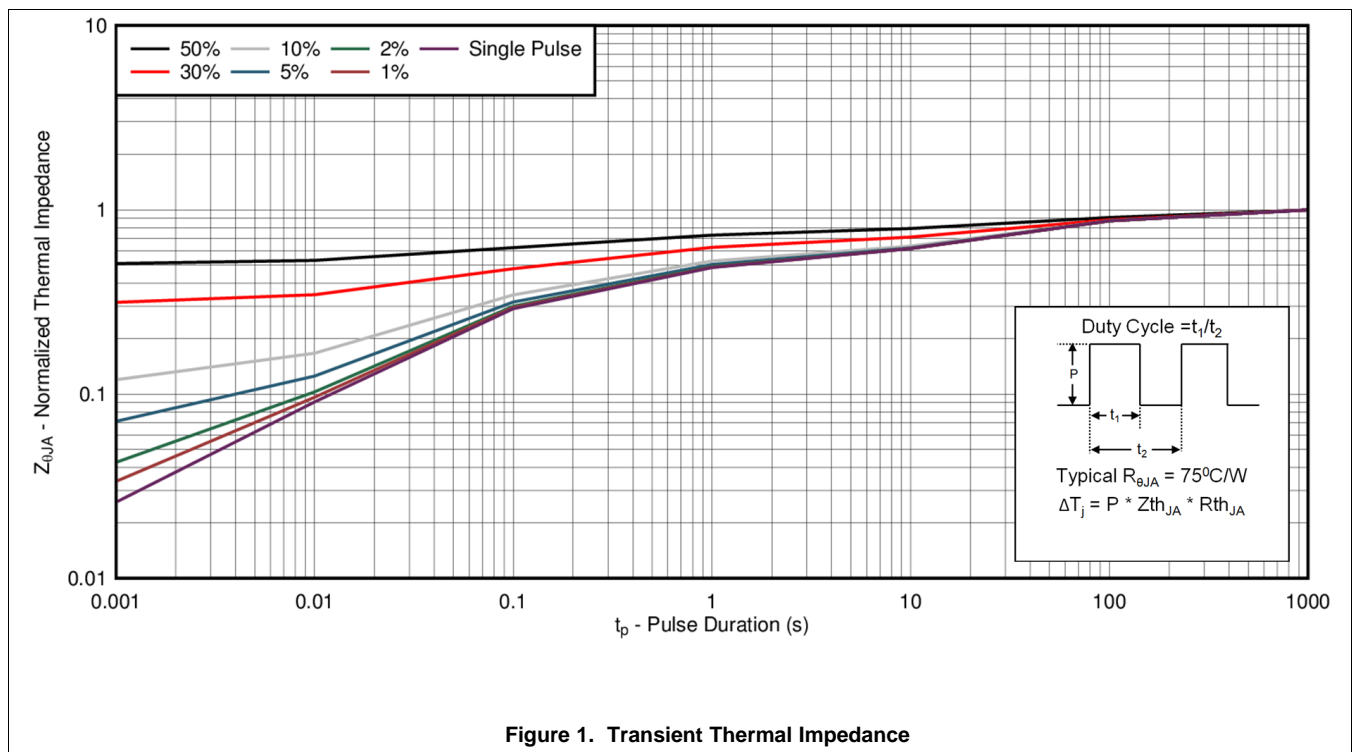
Typ  $R_{\theta JA} = 75^{\circ}\text{C/W}$   
when mounted on  
1inch<sup>2</sup> of 2 oz. Cu.



Typ  $R_{\theta JA} = 230^{\circ}\text{C/W}$   
when mounted on  
minimum pad area of  
2 oz. Cu.

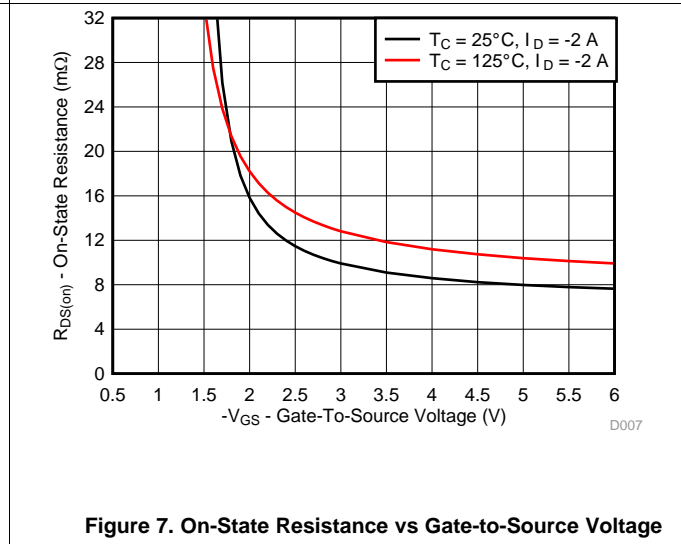
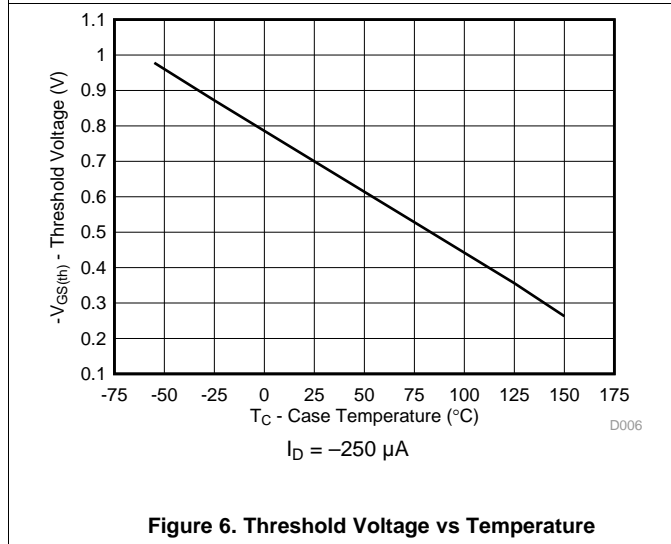
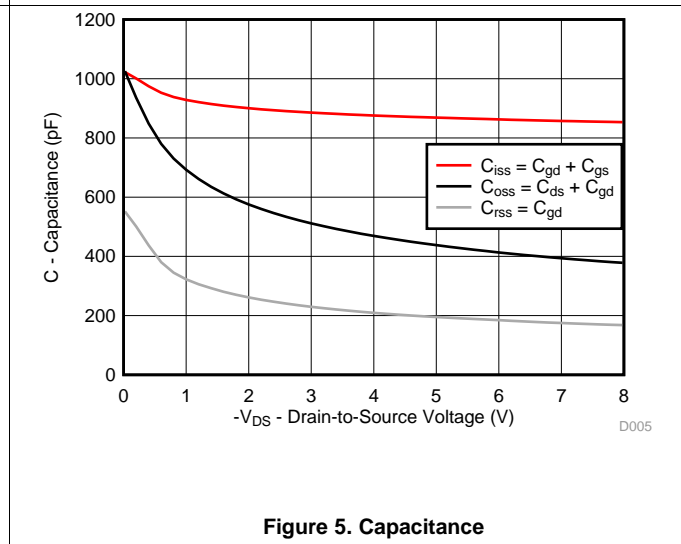
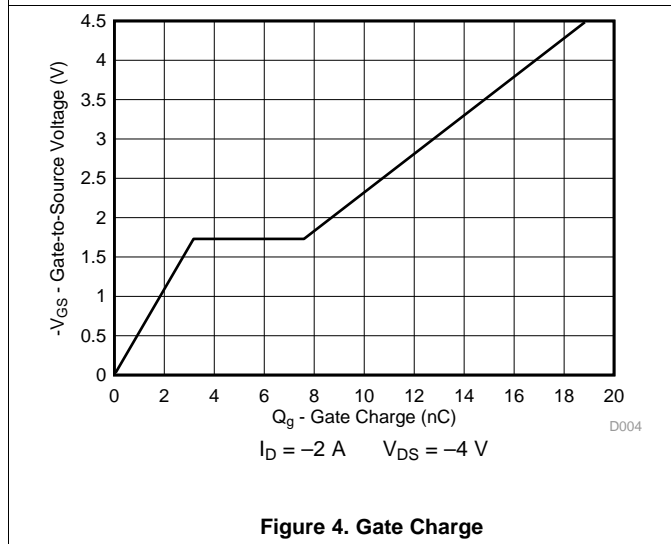
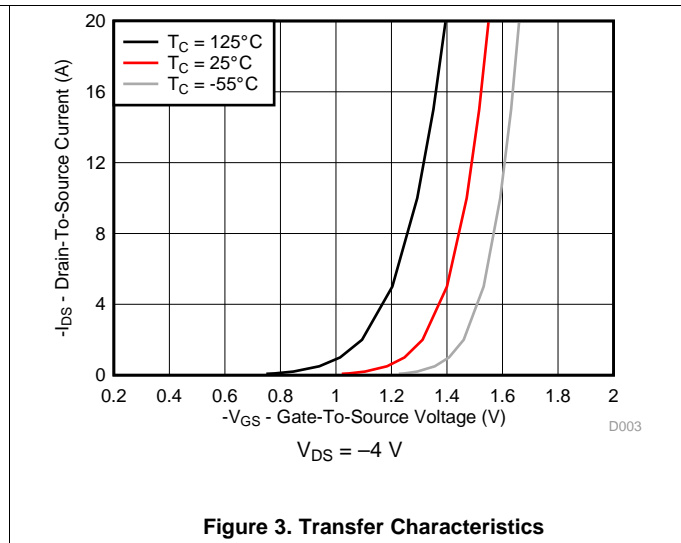
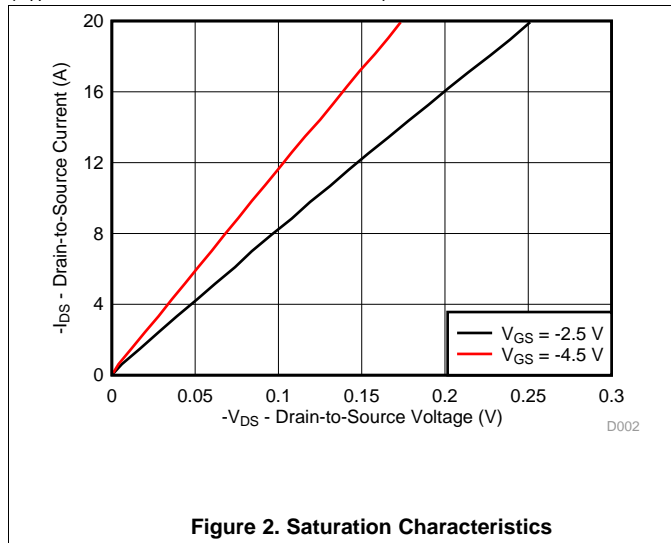
### 5.3 Typical MOSFET Characteristics

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



### Typical MOSFET Characteristics (continued)

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



Typical MOSFET Characteristics (continued)

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

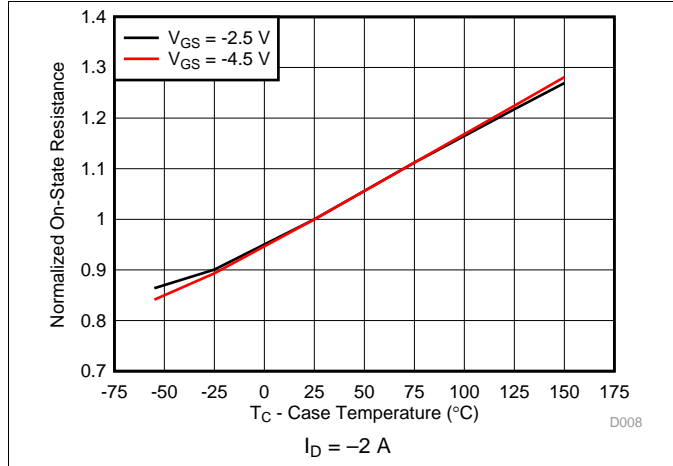


Figure 8. Normalized On-State Resistance vs Temperature

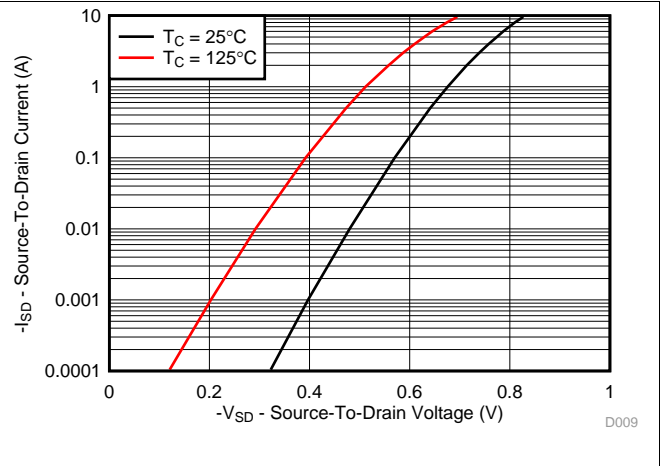


Figure 9. Typical Diode Forward Voltage

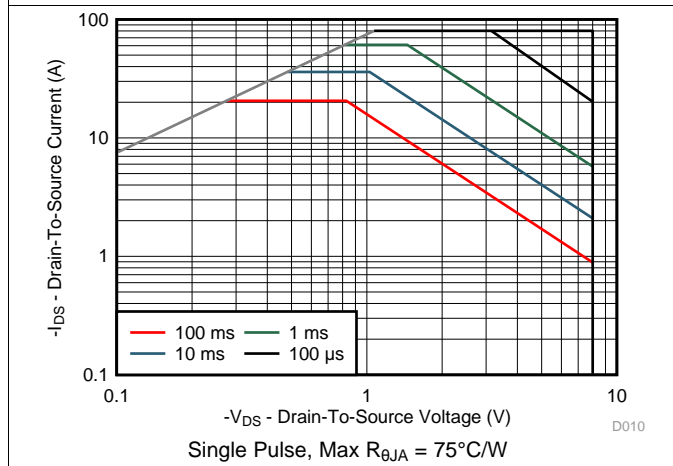


Figure 10. Maximum Safe Operating Area

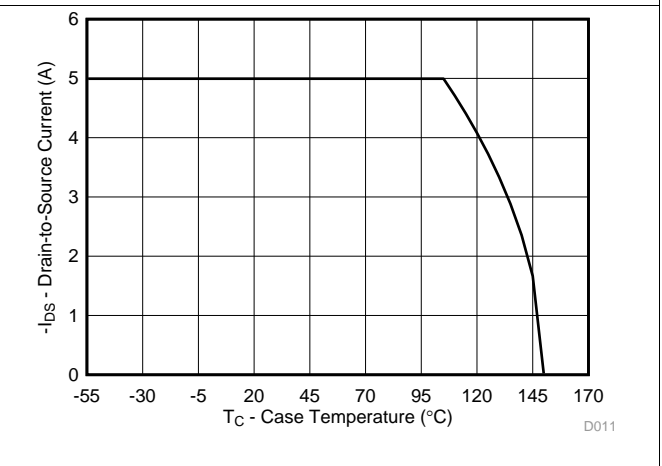


Figure 11. Maximum Drain Current vs Temperature

## 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。

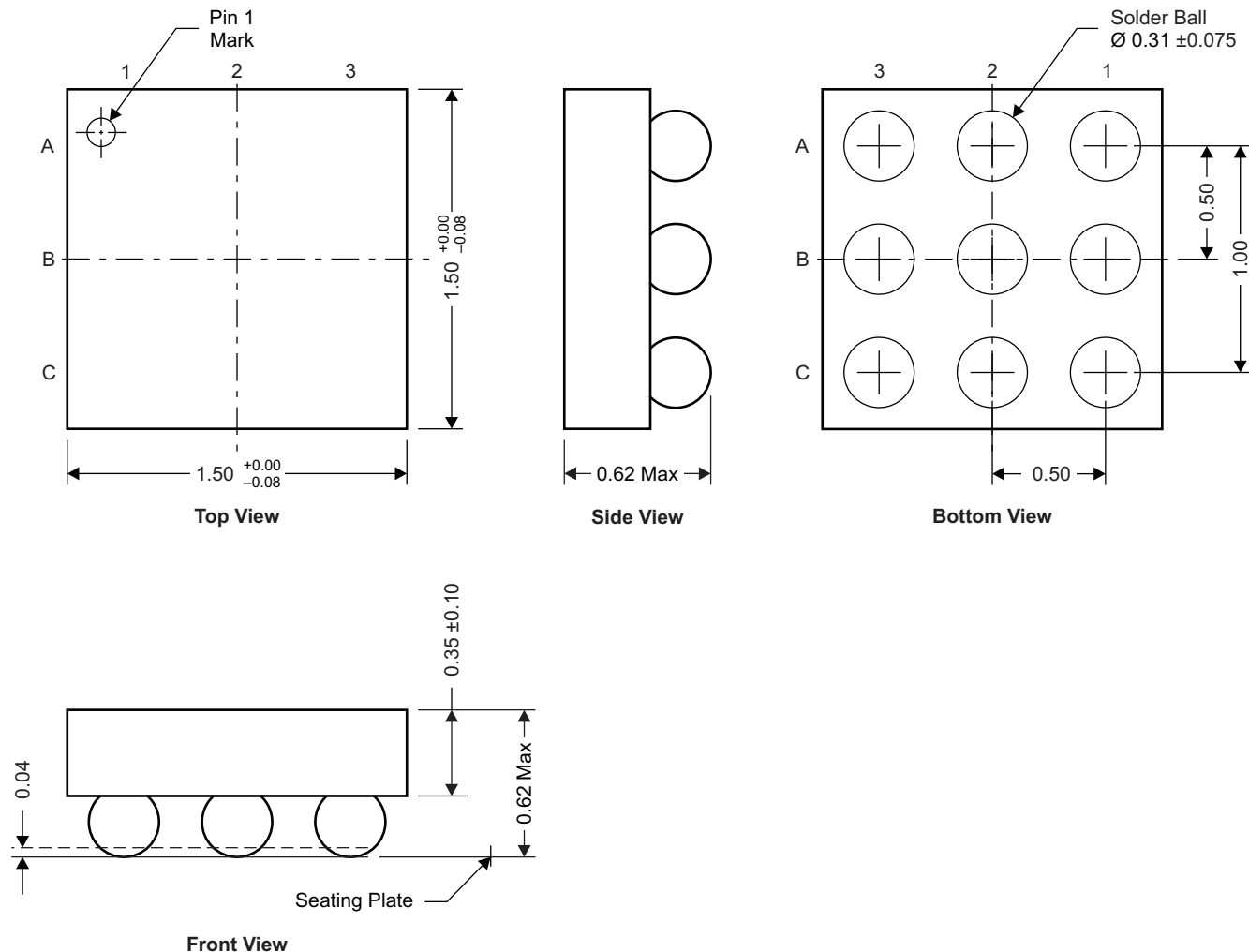
这份术语表列出并解释术语、首字母缩略词和定义。



## 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。 如需本数据表的浏览器版本，请查阅左侧的导航栏

### 7.1 CSD22204W 封装尺寸



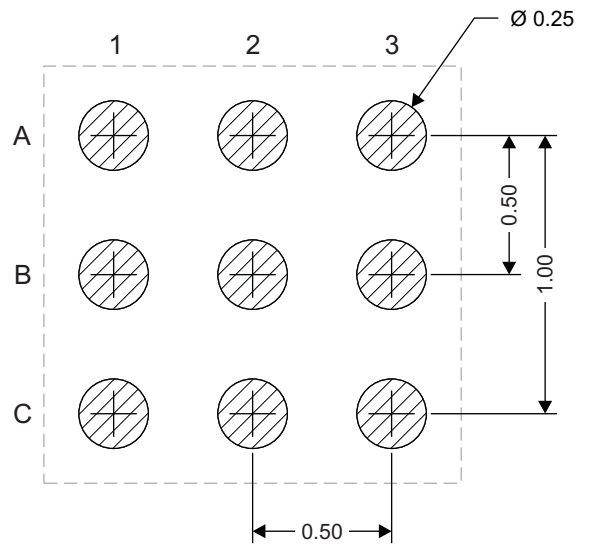
NOTE: 全部尺寸单位为 mm (除非另外注明)

M0171-01

#### 引脚分配

位置	名称
A1	栅极
A2, A3, B1, B2, B3	源极
C1, C2, C3	漏极

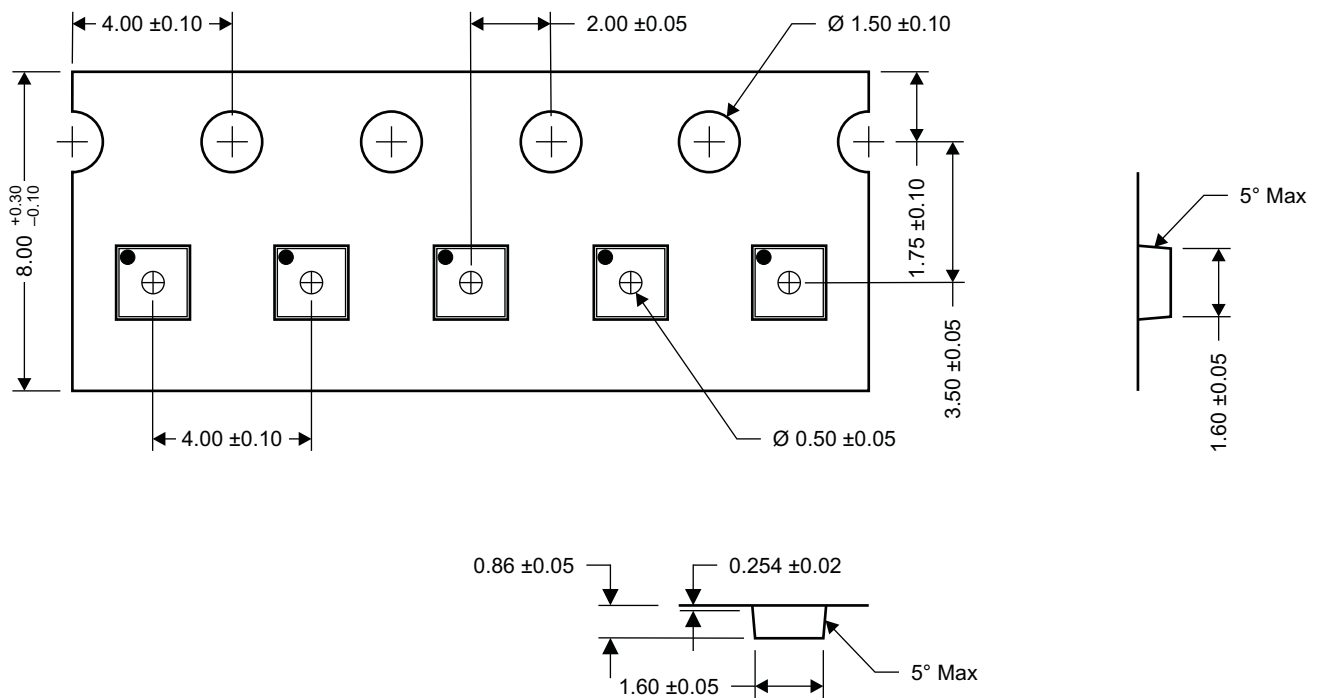
## 7.2 建议的焊盘图案



M0172-01

NOTE: 全部尺寸单位为 mm (除非另外注明)

## 7.3 卷带信息



M0173-01

- NOTES:
1. 10 个链齿孔的累积容差为  $\pm 0.2$
  2. 每 100mm 长度的翘曲不能超过 1mm, 在 250mm 长度上不累积
  3. 材料: 黑色防静电聚苯乙烯
  4. 全部尺寸单位为 mm (除非另外注明)
  5. 厚度:  $0.30 \pm 0.05$ mm
  6. MSL1 260°C (红外 (IR) 和传导) 无铅回流焊兼容

**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)
<a href="#">CSD22204W</a>	Active	Production	DSBGA (YZF)   9	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-	22204
CSD22204W.B	Active	Production	DSBGA (YZF)   9	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22204
<a href="#">CSD22204WT</a>	Active	Production	DSBGA (YZF)   9	250   SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22204
CSD22204WT.B	Active	Production	DSBGA (YZF)   9	250   SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22204

(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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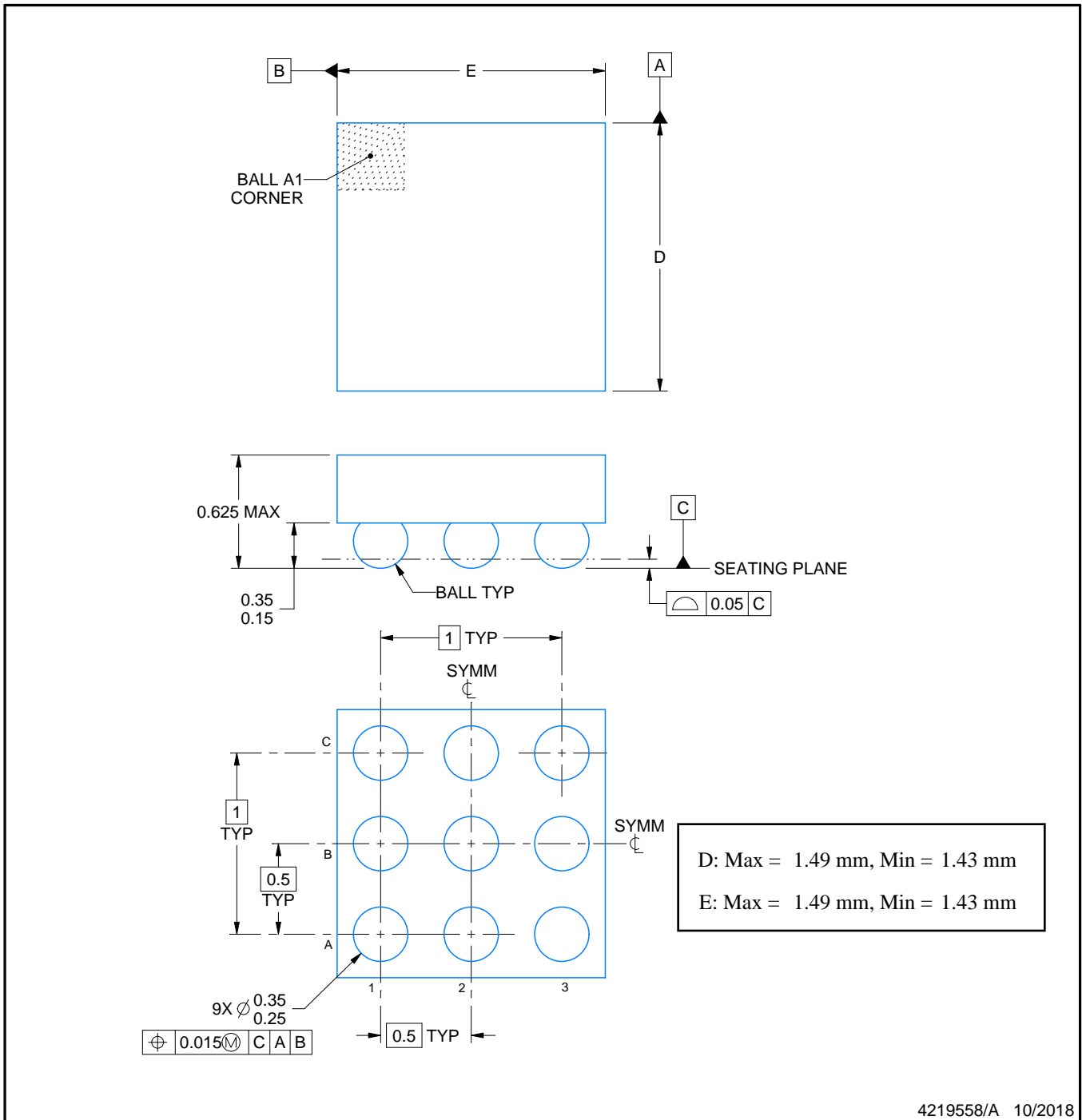
YZF0009



# PACKAGE OUTLINE

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



NOTES:

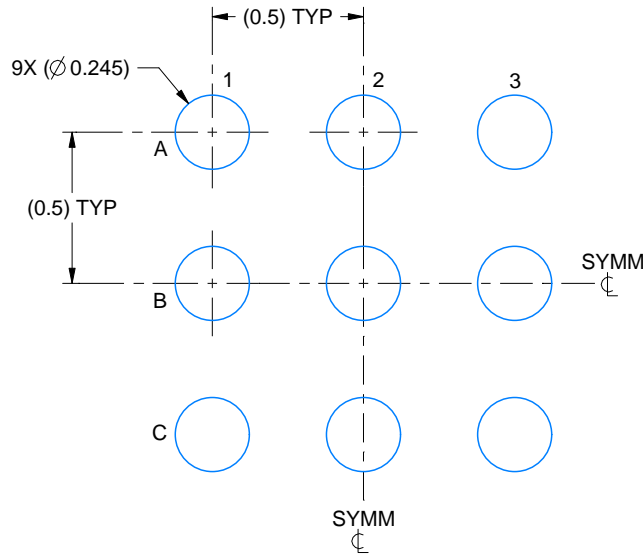
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

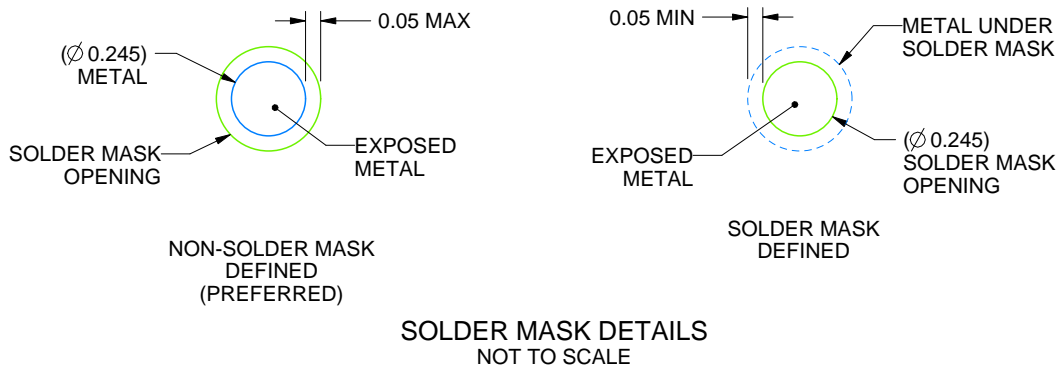
YZF0009

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 40X



4219558/A 10/2018

NOTES: (continued)

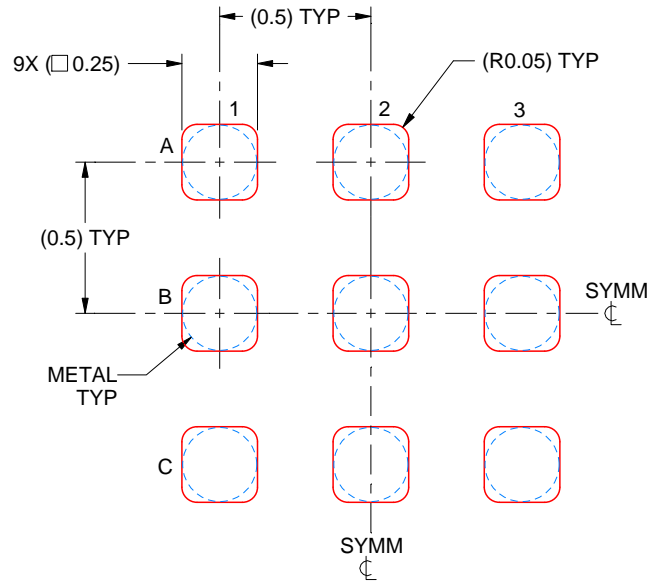
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. See Texas Instruments Literature No. SNVA009 ([www.ti.com/lit/snva009](http://www.ti.com/lit/snva009)).

# EXAMPLE STENCIL DESIGN

YZF0009

DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY



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

4219558/A 10/2018

NOTES: (continued)

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

## 重要通知和免责声明

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