

CSD22206W –8-V P-Channel NexFET™ Power MOSFET

1 Features

- Ultra-Low Resistance
- Small Footprint 1.5 mm × 1.5 mm
- Lead Free
- Gate ESD Protection
- RoHS Compliant
- Halogen Free
- Gate-Source Voltage Clamp

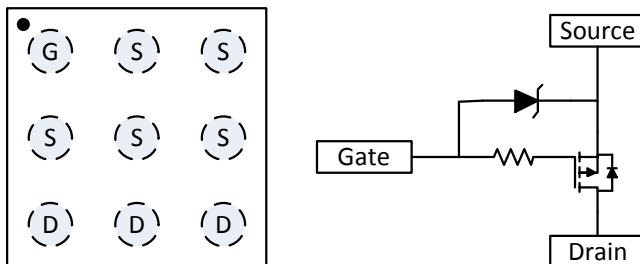
2 Applications

- Load Switch Applications
- Battery Management
- Battery Protection

3 Description

This –8-V, 4.7-mΩ, 1.5-mm × 1.5-mm device is designed to deliver the lowest on resistance and gate charge in the smallest outline possible with excellent thermal characteristics in an ultra-low profile. Low on resistance coupled with the small footprint and low profile make the device ideal for battery operated space constrained applications.

Top View and Circuit Configuration



Product Summary

$T_A = 25^\circ\text{C}$		TYPICAL VALUE		UNIT
V_{DS}	Drain-to-Source Voltage	–8		V
Q_g	Gate Charge Total (–4.5 V)	11.2		nC
Q_{gd}	Gate Charge Gate-to-Drain	1.8		nC
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = -2.5\text{ V}$	6.8	mΩ
		$V_{GS} = -4.5\text{ V}$	4.7	
$V_{GS(th)}$	Threshold Voltage	–0.7		V

Device Information

DEVICE	QTY	MEDIA	PACKAGE	SHIP
CSD22206W	3000	7-Inch Reel	1.50-mm × 1.50-mm	Tape and Reel
CSD22206WT	250		Wafer BGA Package	

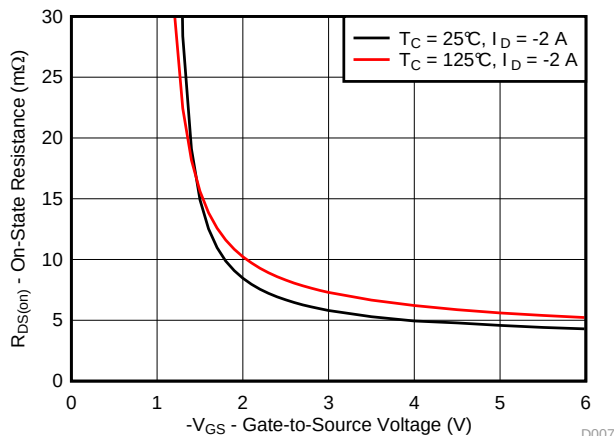
Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage	–8	V
V_{GS}	Gate-to-Source Voltage	–6	V
I_D	Continuous Drain Current ⁽¹⁾	–5	A
	Pulsed Drain Current ⁽²⁾	–108	A
P_D	Power Dissipation	1.7	W
T_J , T_{stg}	Operating Junction, Storage Temperature	–55 to 150	$^\circ\text{C}$

(1) Device operating at a temperature of 105 $^\circ\text{C}$.

(2) Typ $R_{\theta JA} = 75^\circ\text{C/W}$, mounted on FR4 material with maximum Cu mounting area, pulse width $\leq 100\text{ }\mu\text{s}$, duty cycle $\leq 1\%$.

$R_{DS(on)}$ vs V_{GS}



Gate Charge

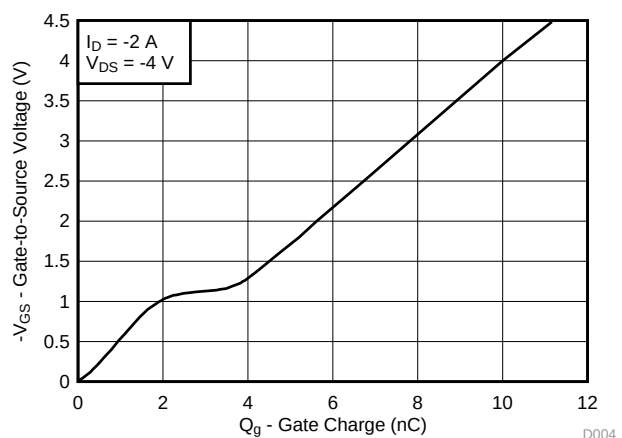


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4 Revision History

DATE	REVISION	NOTES
May 2017	*	Initial release.

5 Specifications

5.1 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV _{DSS}	Drain-to-source voltage	V _{GS} = 0 V, I _{DS} = −250 μA	−8			V
BV _{GSS}	Gate-to-source voltage	V _{DS} = 0 V, I _G = −250 μA	−6			V
I _{DSS}	Drain-to-source leakage current	V _{GS} = 0 V, V _{DS} = −6.4 V			−1	μA
I _{GSS}	Gate-to-source leakage current	V _{DS} = 0 V, V _{GS} = −6 V			−100	nA
V _{GS(th)}	Gate-to-source threshold voltage	V _{DS} = V _{GS} , I _{DS} = −250 μA	−0.4	−0.7	−1.05	V
R _{DS(on)}	Drain-to-source on resistance	V _{GS} = −2.5 V, I _{DS} = −2 A		6.8	9.1	mΩ
		V _{GS} = −4.5 V, I _{DS} = −2 A		4.7	5.7	
g _{fs}	Transconductance	V _{DS} = −0.8 V, I _{DS} = −2 A		20		S
DYNAMIC CHARACTERISTICS						
C _{ISS}	Input capacitance	V _{GS} = 0 V, V _{DS} = −4 V, f = 1 MHz		1750	2275	pF
C _{OSS}	Output capacitance			960	1250	pF
C _{RSS}	Reverse transfer capacitance			340	440	pF
R _G	Series gate resistance			30		Ω
Q _g	Gate charge total (−4.5 V)	V _{DS} = −4 V, I _D = −2 A		11.2	14.6	nC
Q _{gd}	Gate charge gate-to-drain			1.8		nC
Q _{gs}	Gate charge gate-to-source			2.1		nC
Q _{g(th)}	Gate charge at V _{th}			1.3		nC
Q _{OSS}	Output charge	V _{DS} = −4 V, V _{GS} = 0 V		7.2		nC
t _{d(on)}	Turnon delay time	V _{DS} = −4 V, V _{GS} = −4.5 V, I _{DS} = −2 A, R _G = 0 Ω		37		ns
t _r	Rise time			17		ns
t _{d(off)}	Turnoff delay time			118		ns
t _f	Fall time			45		ns
DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	I _{DS} = −2 A, V _{GS} = 0 V	−0.69	−1.0		
Q _{rr}	Reverse recovery charge	V _{DS} = −4 V, I _F = −1 A, di/dt = 200 A/μs		24		nC
t _{rr}	Reverse recovery time			59		ns

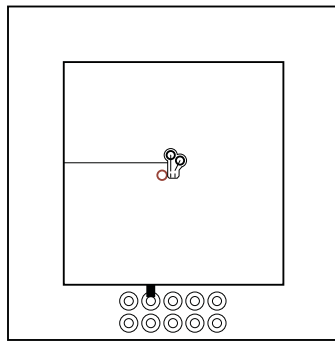
5.2 Thermal Information

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

THERMAL METRIC		TYPICAL VALUES	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	75	$^\circ\text{C}/\text{W}$
	Junction-to-ambient thermal resistance ⁽²⁾	230	

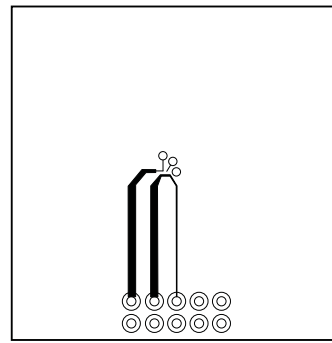
(1) Device mounted on FR4 material with 1-in² (6.45-cm²), 2-oz (0.071-mm) thick Cu.

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



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Typ $R_{\theta JA} = 75^{\circ}\text{C/W}$
when mounted on 1 in²
of 2-oz Cu.

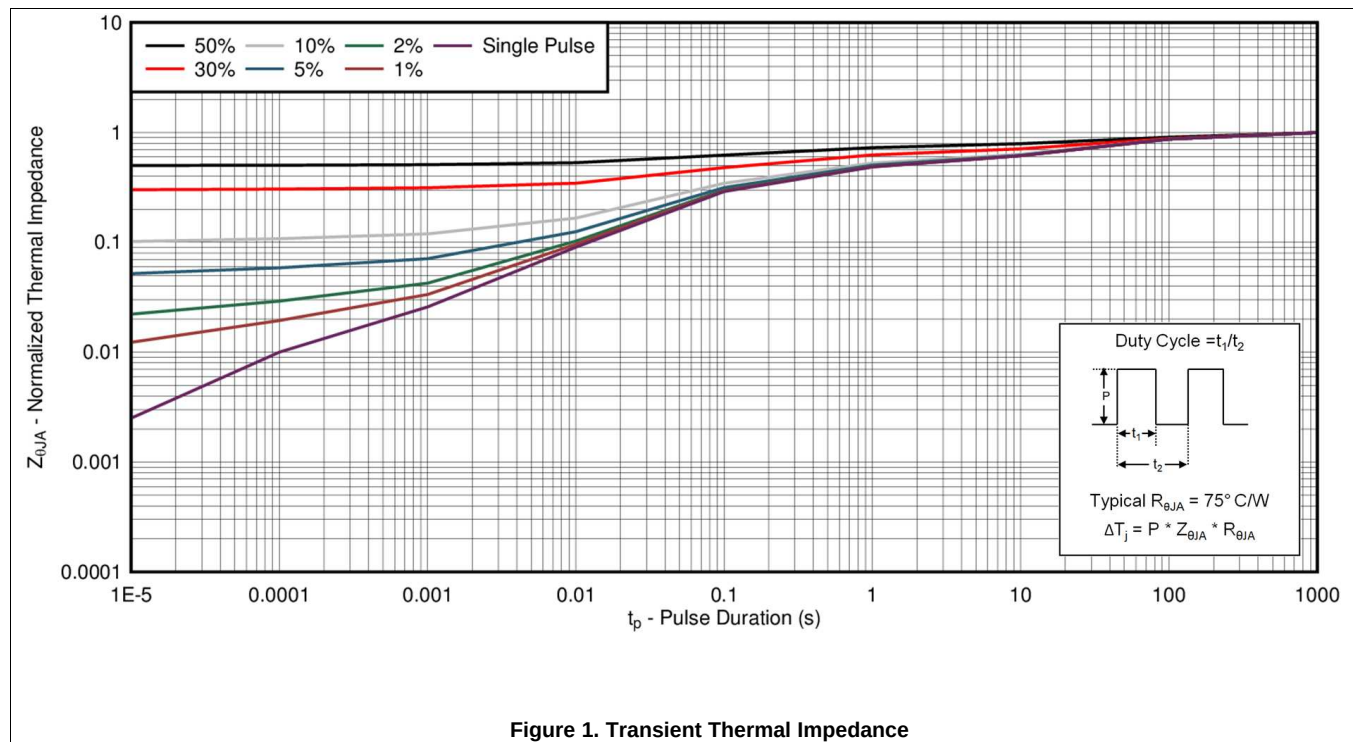


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Typ $R_{\theta JA} = 230^{\circ}\text{C/W}$
when mounted on
minimum pad area of
2-oz Cu.

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)

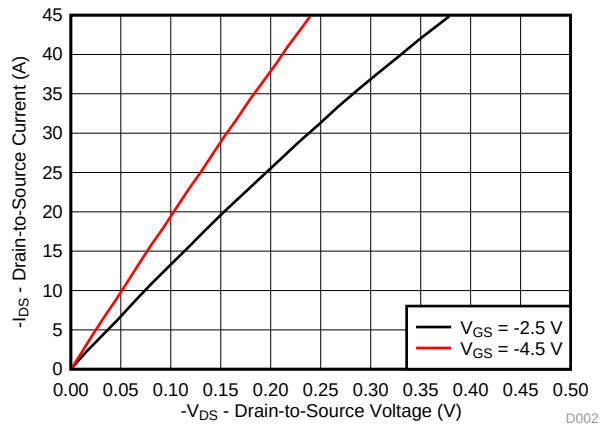


Figure 2. Saturation Characteristics

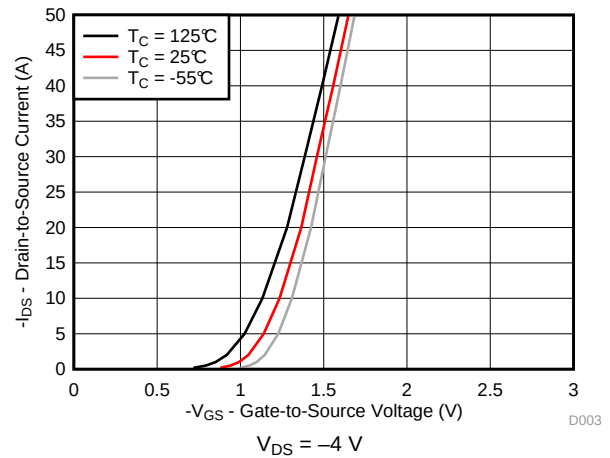


Figure 3. Transfer Characteristics

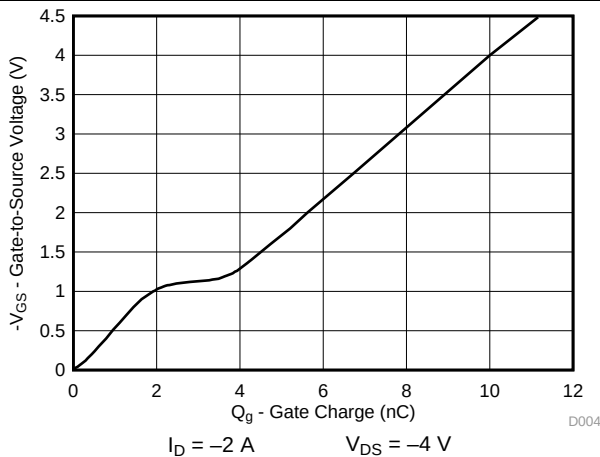


Figure 4. Gate Charge

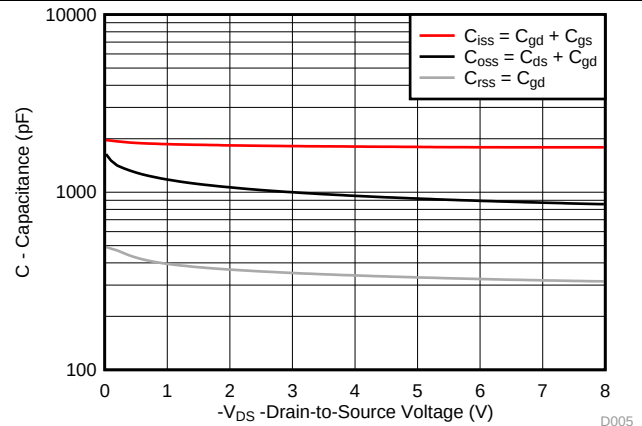


Figure 5. Capacitance

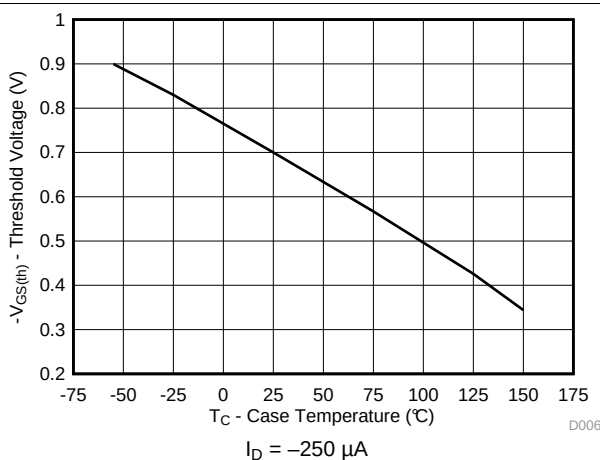


Figure 6. Threshold Voltage vs Temperature

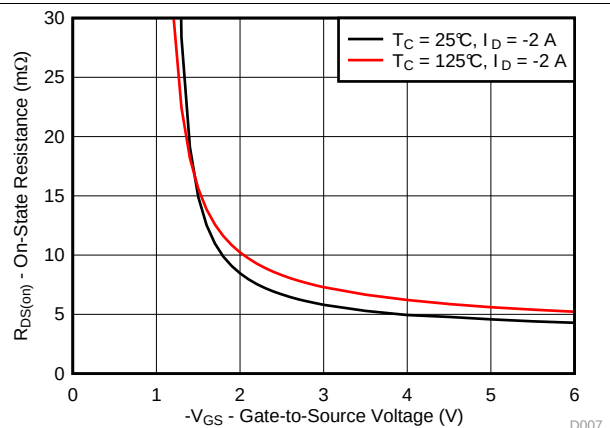


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

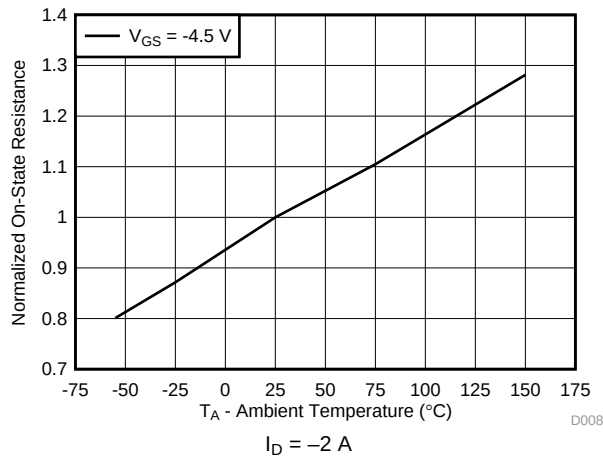


Figure 8. Normalized On-State Resistance vs Temperature

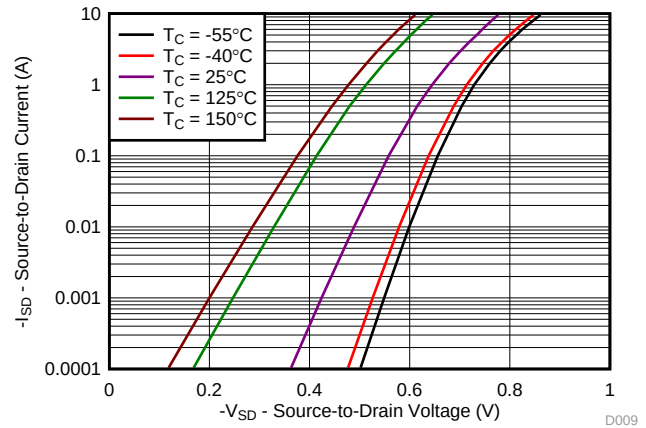


Figure 9. Typical Diode Forward Voltage

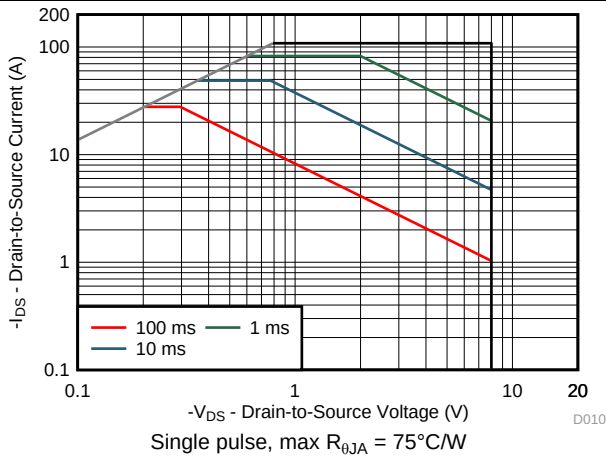


Figure 10. Maximum Safe Operating Area

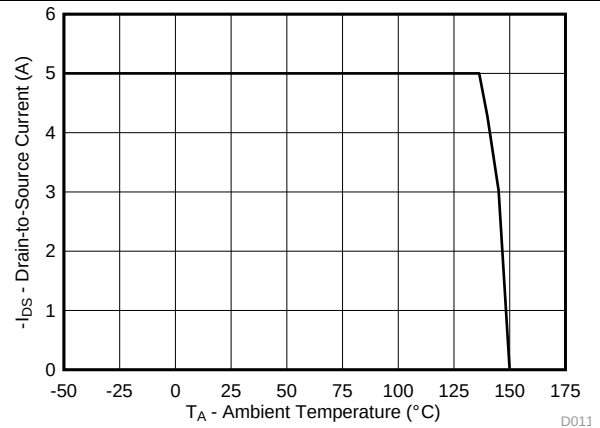


Figure 11. Maximum Drain Current vs Temperature

6 Device and Documentation Support

6.1 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.

6.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

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

6.3 Trademarks

NexFET, E2E are trademarks of Texas Instruments.
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6.4 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

6.5 Glossary

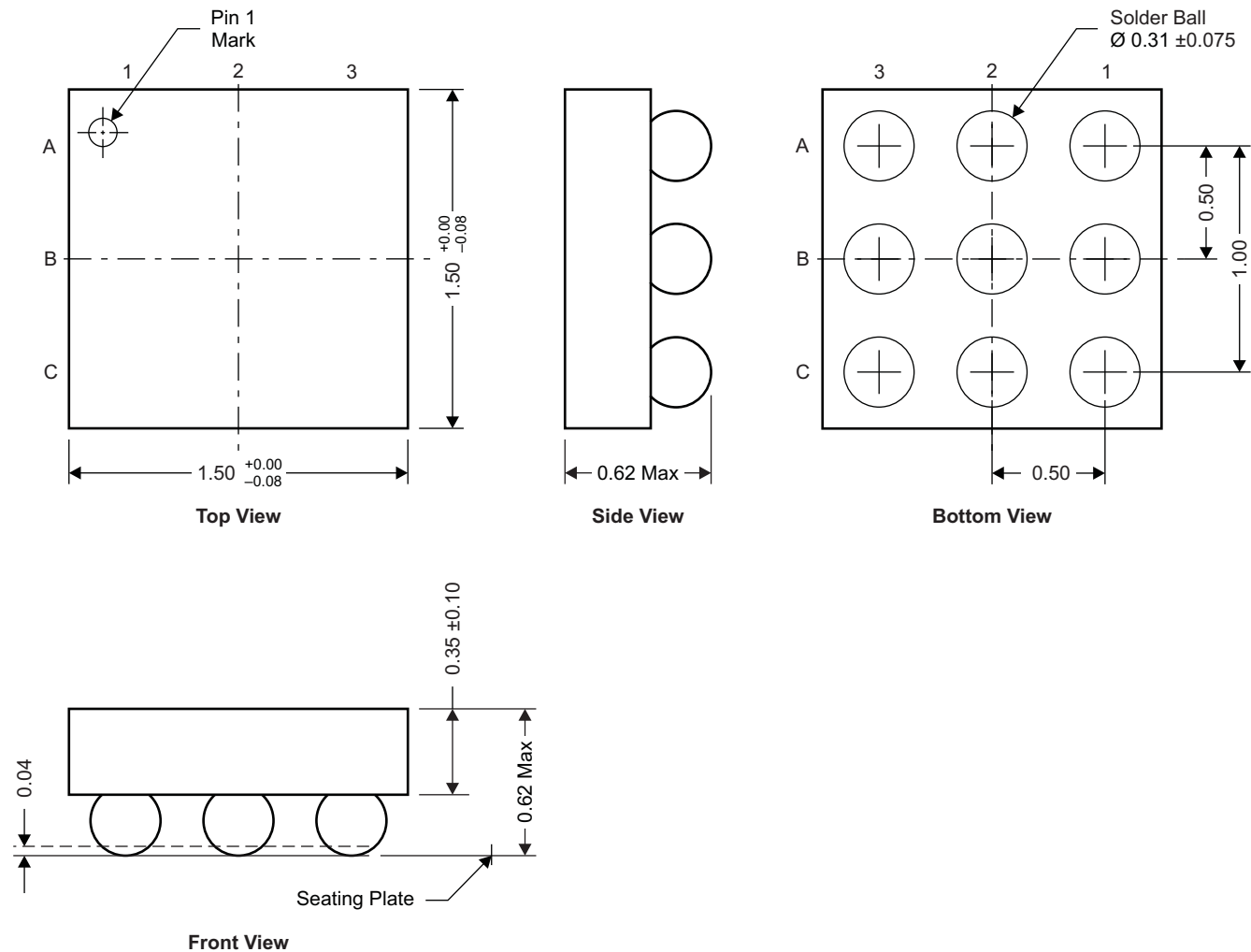
[SLYZ022](#) — *TI Glossary*.

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

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.

7.1 CSD22206W Package Dimensions



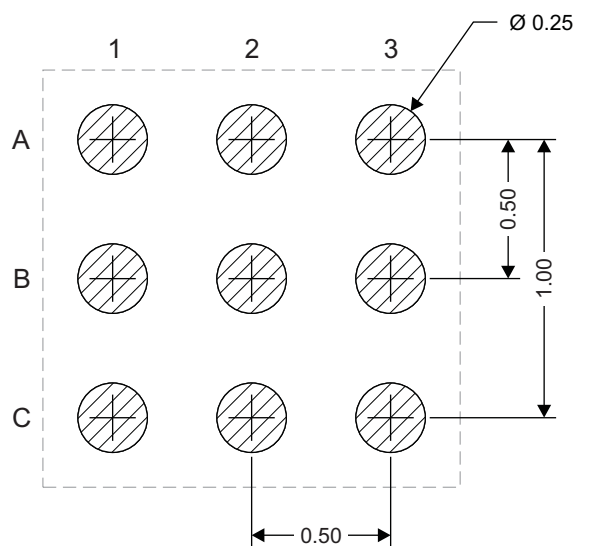
NOTE: All dimensions are in mm (unless otherwise specified).

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Table 1. Pinout

POSITION	DESIGNATION
A1	Gate
A2, A3, B1, B2, B3	Source
C1, C2, C3	Drain

7.2 Recommended Land Pattern



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NOTE: All dimensions are in mm (unless otherwise specified).

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)
CSD22206W	Active	Production	DSBGA (YZF) 9	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22206
CSD22206W.B	Active	Production	DSBGA (YZF) 9	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22206
CSD22206WT	Active	Production	DSBGA (YZF) 9	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22206
CSD22206WT.B	Active	Production	DSBGA (YZF) 9	250 SMALL T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	22206

⁽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.

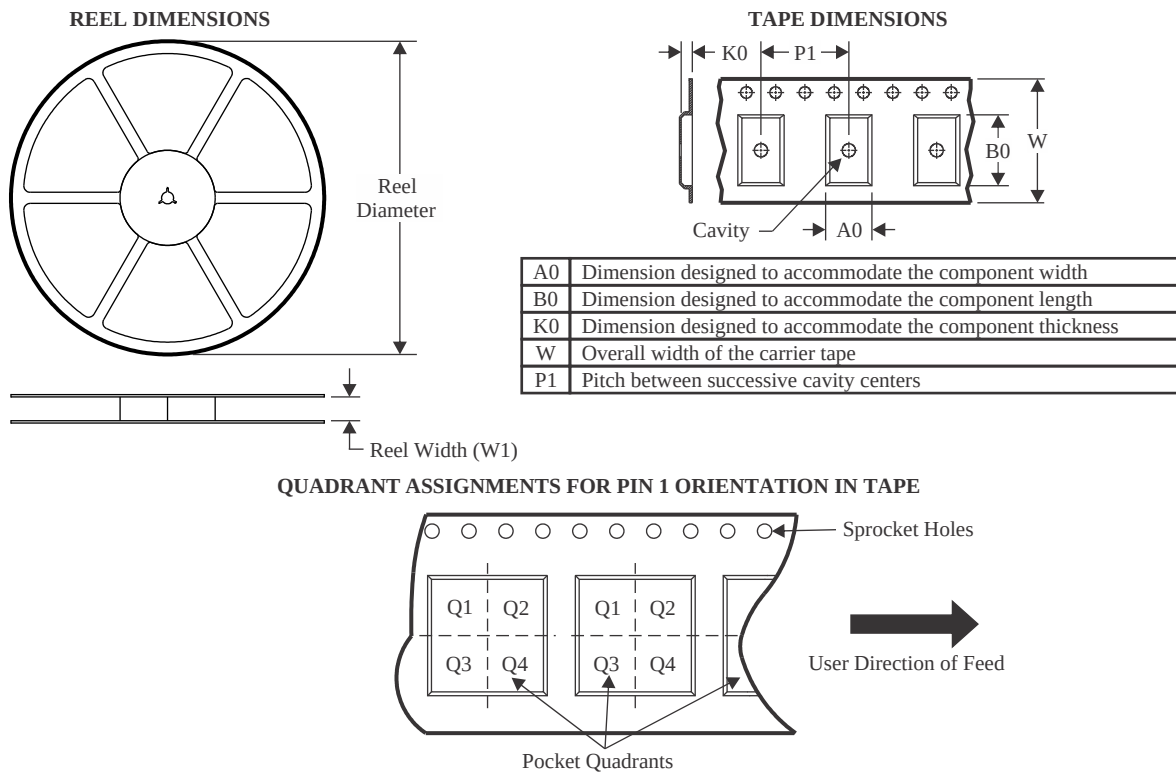
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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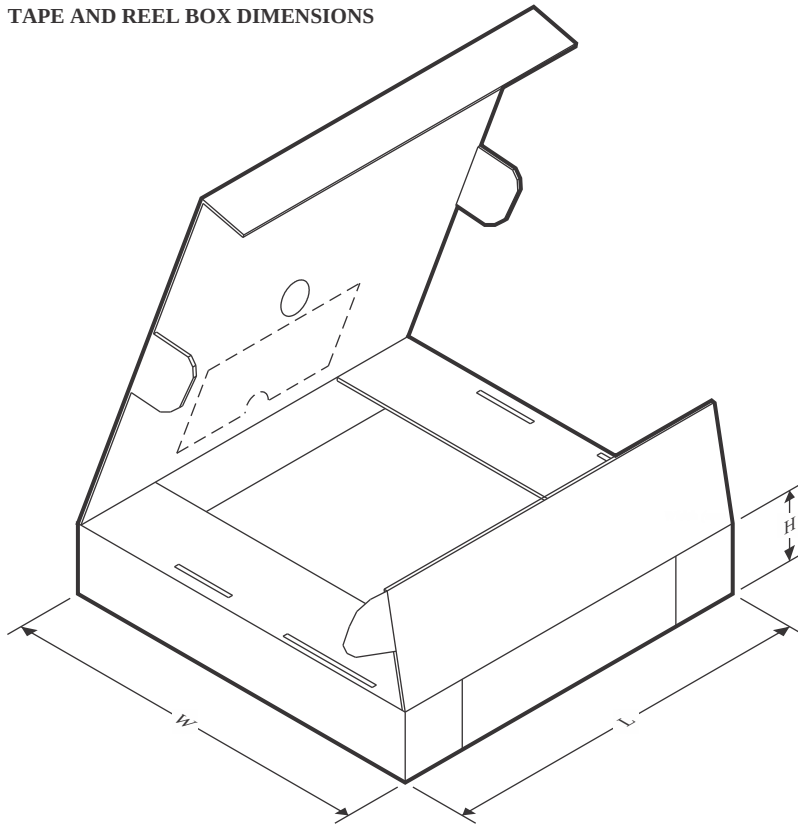
TAPE AND REEL INFORMATION



*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
CSD22206W	DSBGA	YZF	9	3000	180.0	8.4	1.65	1.65	0.81	4.0	8.0	Q1
CSD22206WT	DSBGA	YZF	9	250	180.0	8.4	1.65	1.65	0.81	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)
CSD22206W	DSBGA	YZF	9	3000	182.0	182.0	20.0
CSD22206WT	DSBGA	YZF	9	250	182.0	182.0	20.0

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