

N-Channel NexFET™ Power MOSFET

Check for Samples: [CSD13303W1015](#)

FEATURES

- Ultra Low on Resistance
- Ultra Low Qg and Qgd
- Small Footprint
- Low Profile 0.62 mm Height
- Pb Free
- RoHS Compliant
- Halogen Free
- CSP 1 × 1.5 mm Wafer Level Package

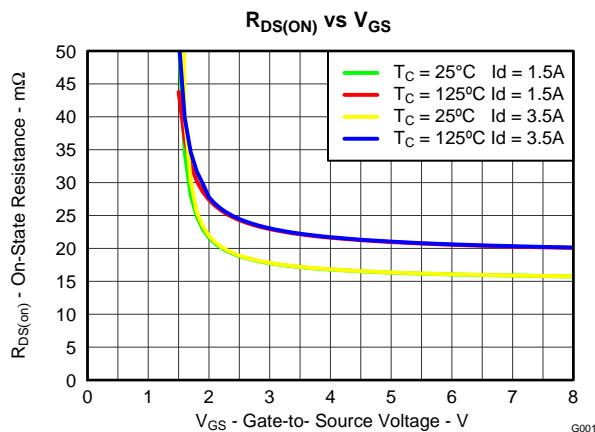
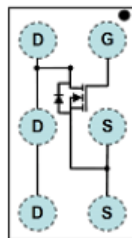
APPLICATIONS

- Battery Management
- Load Switch
- Battery Protection

DESCRIPTION

The device has been designed to deliver the lowest on resistance and gate charge in the smallest outline possible with excellent thermal characteristics in an ultra low profile.

Top View



PRODUCT SUMMARY

T _A = 25°C unless otherwise stated		TYPICAL VALUE	UNIT
V _{DS}	Drain to Source Voltage	12	V
Q _g	Gate Charge Total (4.5V)	3.9	nC
Q _{gd}	Gate Charge Gate to Drain	0.4	nC
R _{DS(on)}	Drain to Source On Resistance	V _{GS} = 2.5V	18 mΩ
		V _{GS} = 4.5V	16 mΩ
V _{GS(th)}	Voltage Threshold	0.85	V

ORDERING INFORMATION

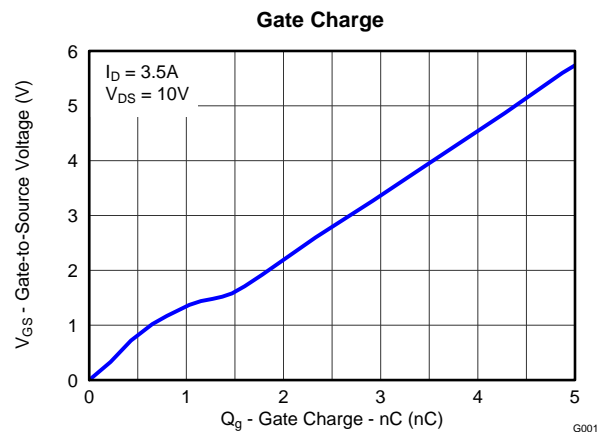
Device	Package	Media	Qty	Ship
CSD13303W1015	1 × 1.5 Wafer Level Package	7-inch reel	3000	Tape and Reel

ABSOLUTE MAXIMUM RATINGS

T _A = 25°C unless otherwise stated		VALUE	UNIT
V _{DS}	Drain to Source Voltage	12	V
V _{GS}	Gate to Source Voltage	±8	V
I _D	Continuous Drain Current, T _C = 25°C ⁽¹⁾	3.5	A
I _{DM}	Pulsed Drain Current, T _A = 25°C ⁽²⁾	31	A
P _D	Power Dissipation ⁽¹⁾	1.65	W
T _{STG}	Storage Temperature Range	-55 to 150	°C
T _J	Operating Junction Temperature Range		

(1) Typical R_{θJA} = 75.7°C/W on 1in² Cu (2 oz.) on 0.060" thick FR4 PCB.

(2) Pulse width ≤1ms, duty cycle ≤2%



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



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.

ELECTRICAL CHARACTERISTICS

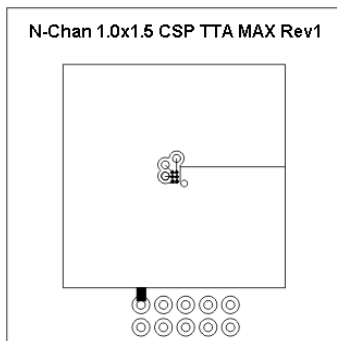
($T_A = 25^\circ\text{C}$ unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV _{DSS}	Drain to Source Voltage	V _{GS} = 0V, I _D = 250μA	12			V
I _{DSS}	Drain to Source Leakage Current	V _{GS} = 0V, V _{DS} = 9.6V			1	μA
I _{GSS}	Gate to Source Leakage Current	V _{DS} = 0V, V _{GS} = +8V			100	nA
V _{GS(th)}	Gate to Source Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	0.65	0.85	1.2	V
R _{DS(on)}	Drain to Source On Resistance	V _{GS} = 2.5V, I _D = 1.5A		18	23	mΩ
		V _{GS} = 4.5V, I _D = 1.5A		16	20	mΩ
g _{fs}	Transconductance	V _{DS} = 6V, I _D =1.5A		14		S
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{GS} = 0V, V _{DS} = 6V, f = 1MHz		550	715	pF
C _{OSS}	Output Capacitance			400	480	pF
C _{RSS}	Reverse Transfer Capacitance			29	36	pF
R _g				3	4.6	Ω
Q _g	Gate Charge Total (4.5V)	V _{DS} = 6V, I _D = 1.5A		3.9	4.7	nC
Q _{gd}	Gate Charge Gate to Drain			0.4		nC
Q _{gs}	Gate Charge Gate to Source			1		nC
Q _{g(th)}	Gate Charge at V _{th}			0.6		nC
Q _{OSS}	Output Charge	V _{DS} = 6V, V _{GS} = 0V		4.9		nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 6V, V _{GS} = 4.5V, I _D = 1.5A R _G = 4Ω		4.6		ns
t _r	Rise Time			10		ns
t _{d(off)}	Turn Off Delay Time			14.7		ns
t _f	Fall Time			3.2		ns
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _S = 1.5A, V _{GS} = 0V		0.7	1	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 6V, I _F = 1.5A, di/dt = 200A/μs		14		nC
t _{rr}	Reverse Recovery Time			38.7		ns

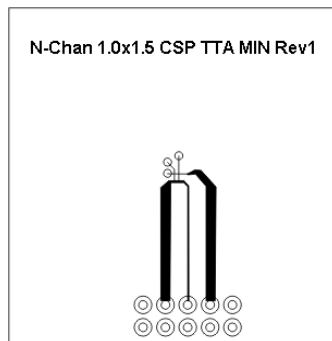
THERMAL CHARACTERISTICS

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

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Minimum Cu area)			295.5	$^\circ\text{C/W}$
	Thermal Resistance Junction to Ambient (1 in ² Cu area)			94.6	$^\circ\text{C/W}$



Max $R_{\theta JA} = 94.6^{\circ}\text{C/W}$
when mounted on 1
 inch^2 of 2 oz. Cu.



Max $R_{\theta JA} = 295.5^{\circ}\text{C/W}$
when mounted on
minimum pad area of 2
oz. Cu.

TYPICAL MOSFET CHARACTERISTICS

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

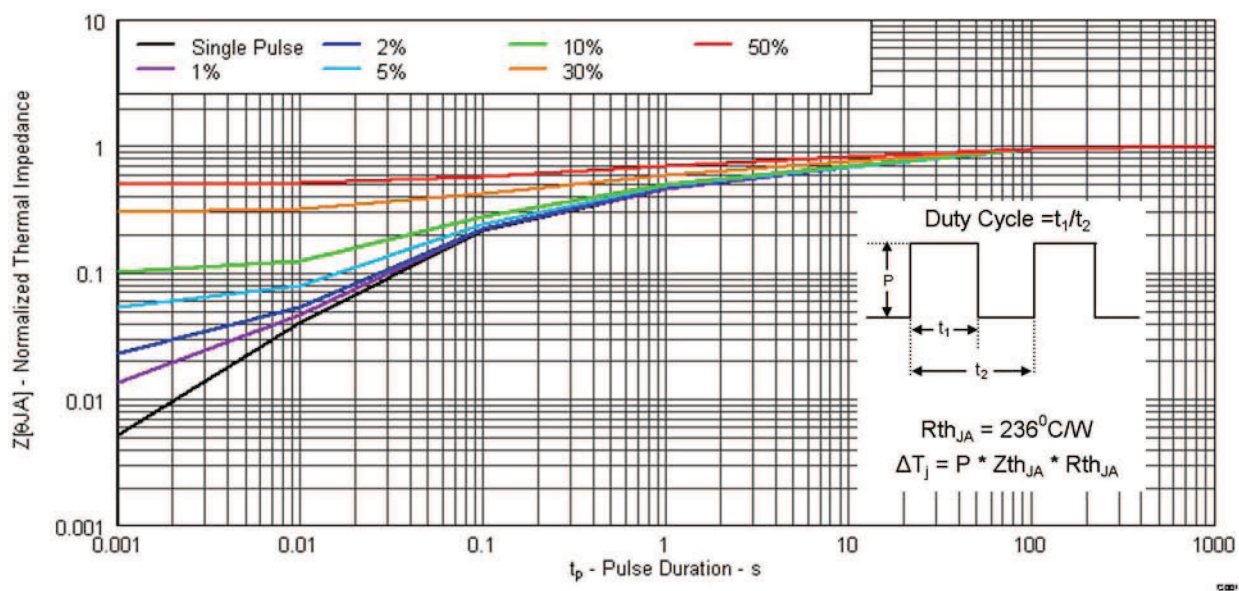


Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

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

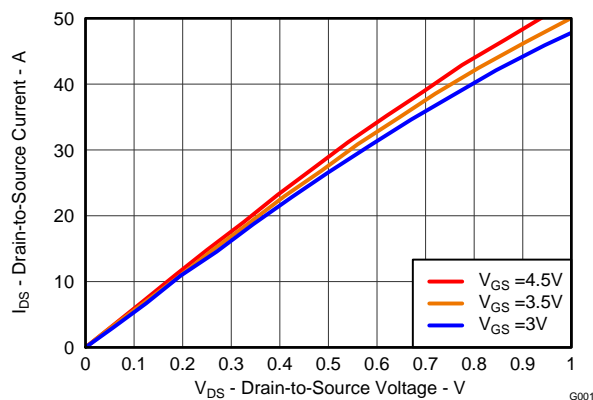


Figure 2. Saturation Characteristics

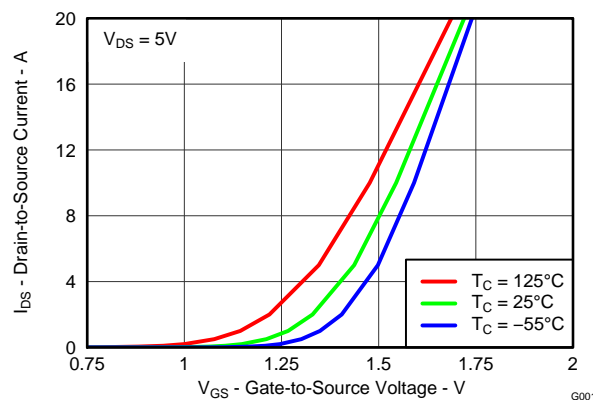


Figure 3. Transfer Characteristics

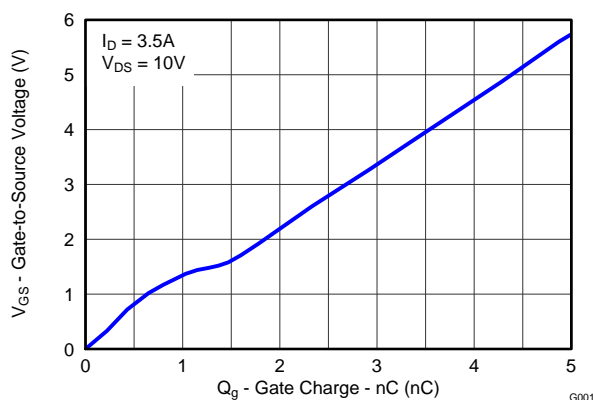


Figure 4. Gate Charge

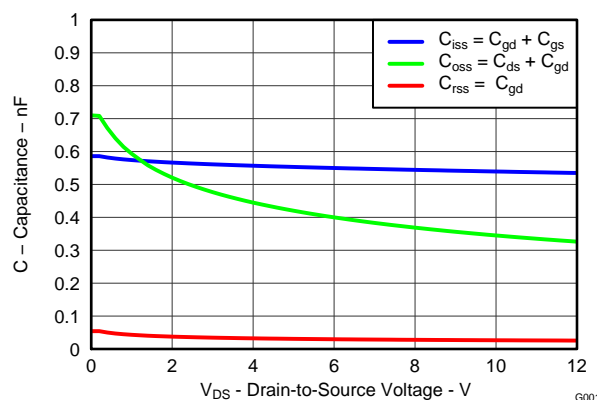


Figure 5. Capacitance

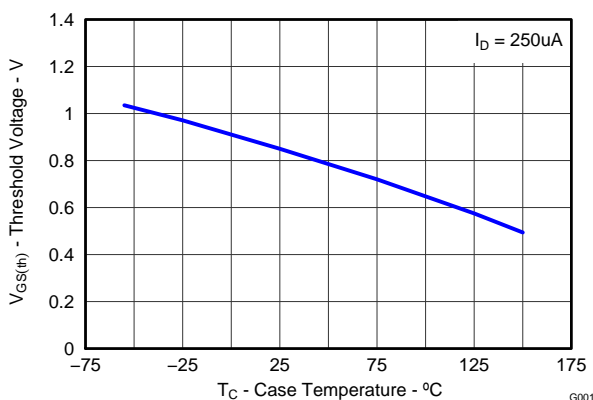


Figure 6. Threshold Voltage vs. Temperature

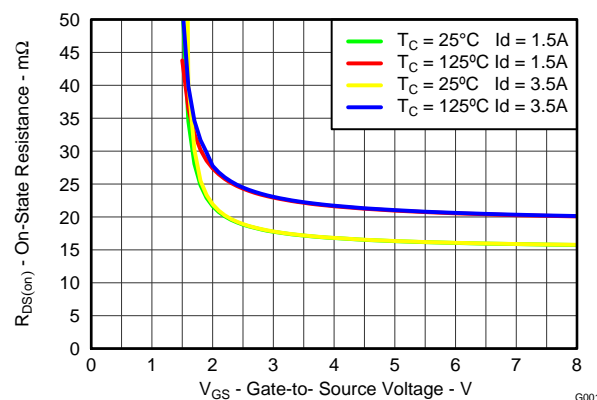


Figure 7. On Resistance vs. Gate Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

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

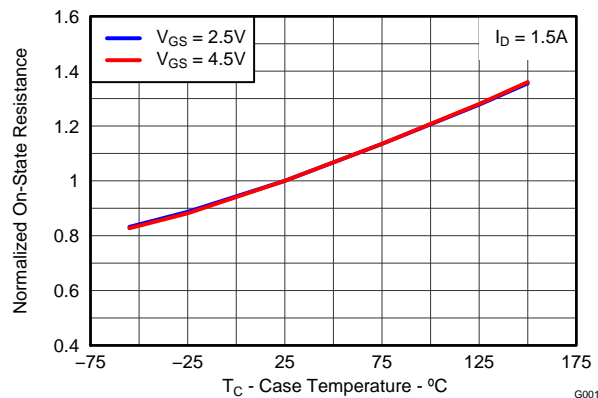


Figure 8. Normalized On Resistance vs. Temperature

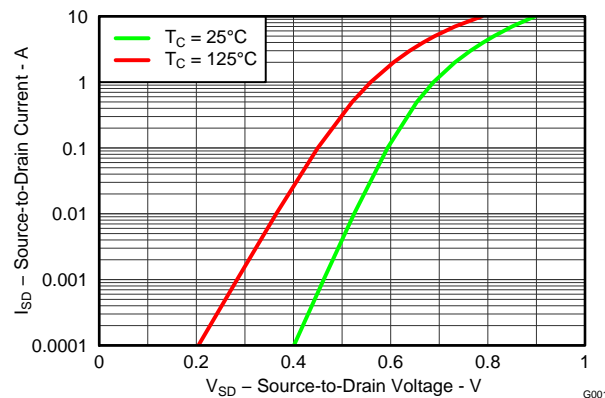


Figure 9. Typical Diode Forward Voltage

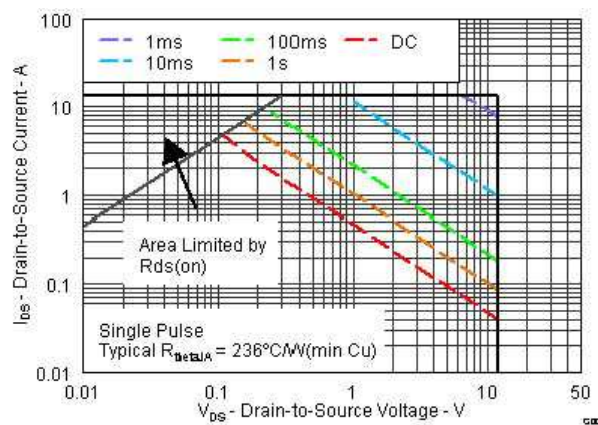


Figure 10. Maximum Safe Operating Area

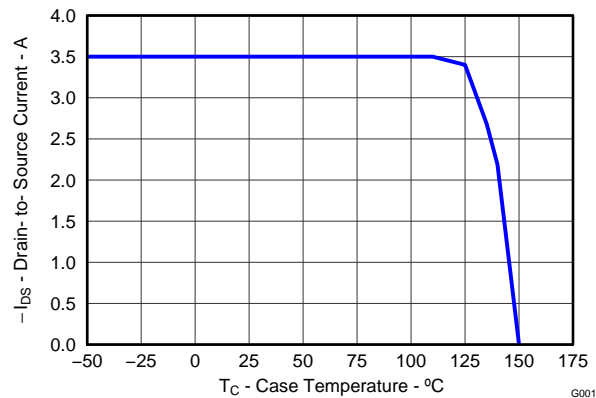


Figure 11. Maximum Drain Current vs. Temperature

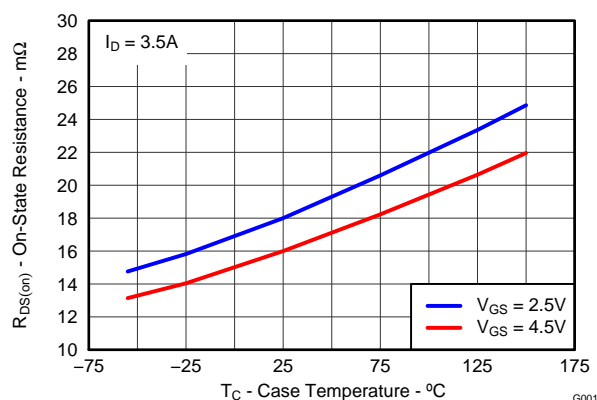
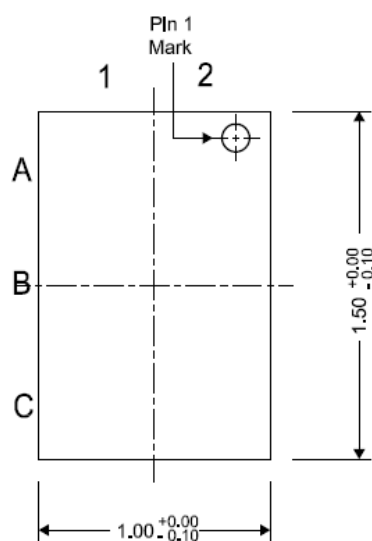
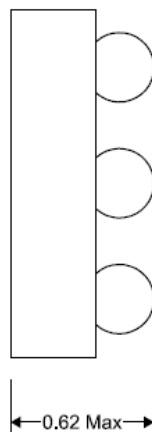
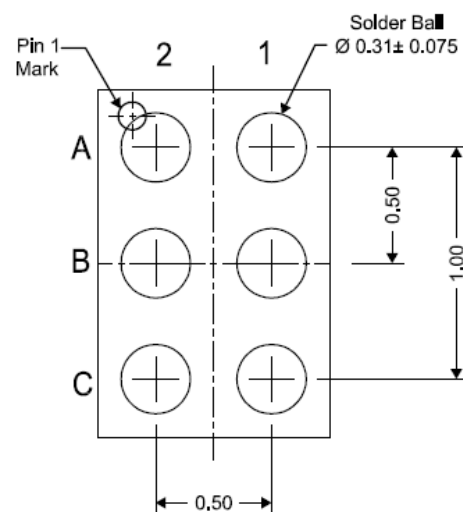
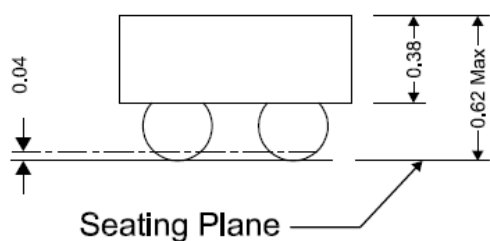


Figure 12. On Resistance vs. Temperature

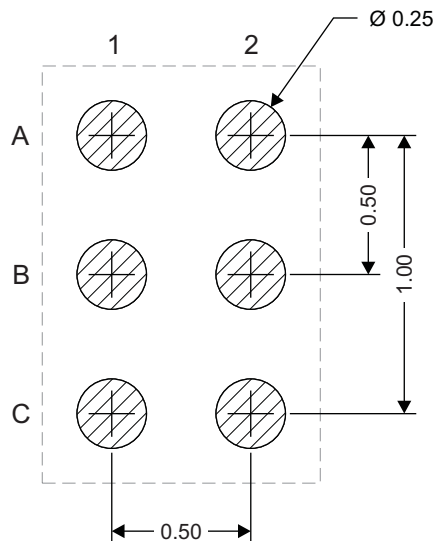
MECHANICAL DATA**CSD13303W1015 Package Dimensions****Top View****Side View****Bottom View****Front View**

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

Pinout

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

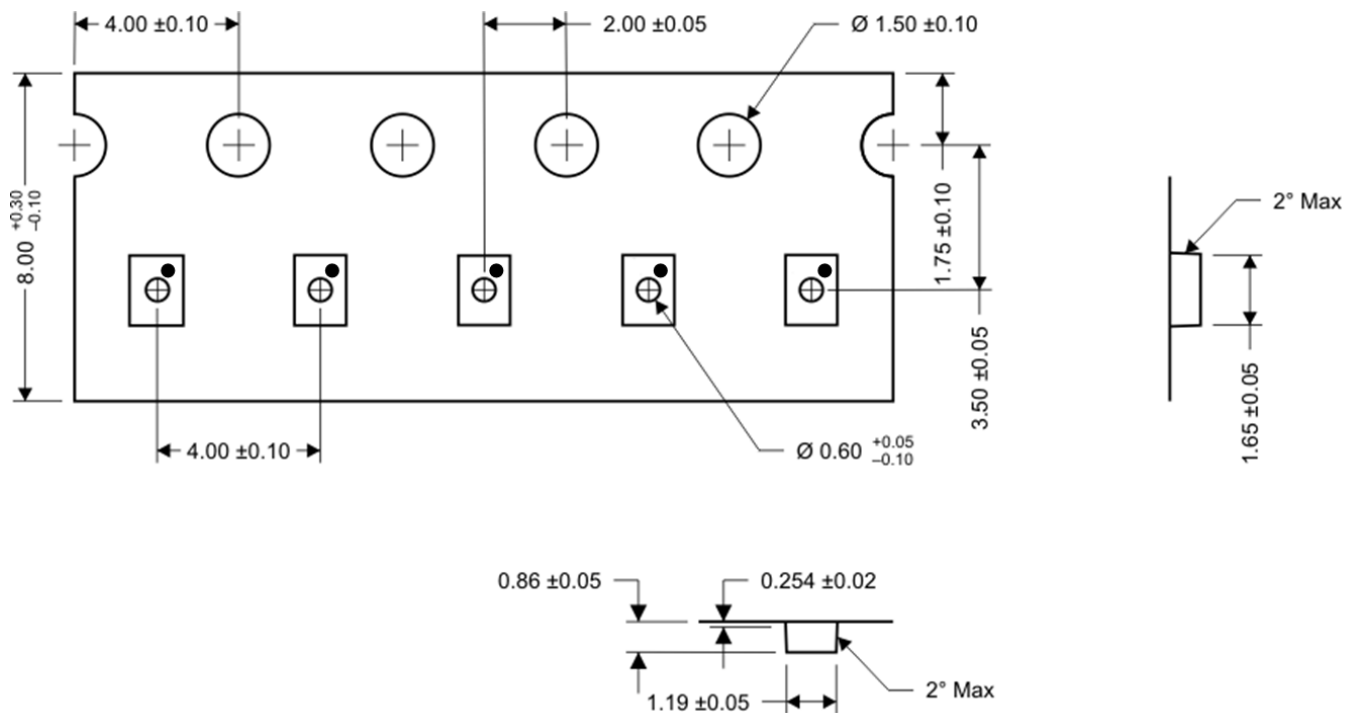
Land Pattern Recommendation



M0158-01

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

Tape and Reel Information



M0159-01

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

REVISION HISTORY

Changes from Original (May 2012) to Revision A	Page
• Changed the Tape and Reel Information section	7

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)
CSD13303W1015	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13303
CSD13303W1015.B	Active	Production	DSBGA (YZC) 6	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13303

⁽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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