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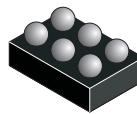
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[CSD13303W1015](#)

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N-Channel NexFET™ Power MOSFET

 Check for Samples: [CSD13303W1015](#)

FEATURES

- Ultra Low on Resistance
- Ultra Low Q_g and Q_{gd}
- Small Footprint
- Low Profile 0.62 mm Height
- Pb Free
- RoHS Compliant
- Halogen Free
- CSP 1 x 1.5 mm Wafer Level Package

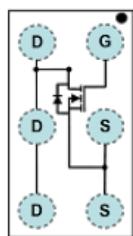
APPLICATIONS

- 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



$T_A = 25^\circ\text{C}$ 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	$V_{GS} = 2.5\text{V}$	18	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}$	16	$\text{m}\Omega$
$V_{GS(th)}$	Voltage Threshold	0.85		V

ORDERING INFORMATION

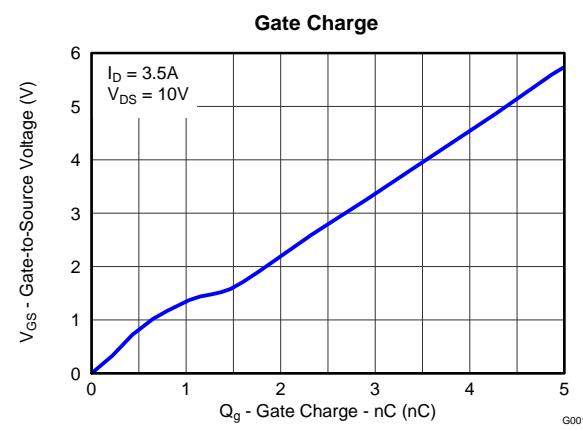
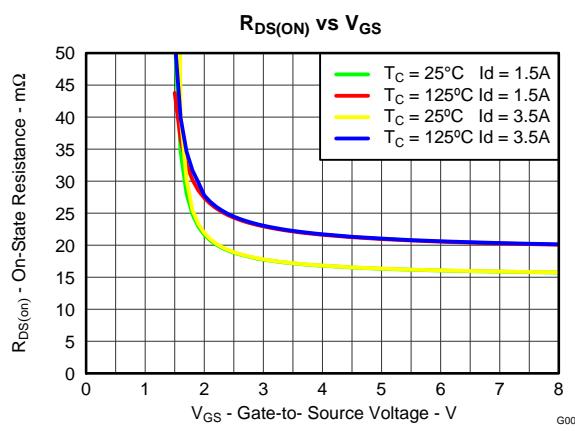
Device	Package	Media	Qty	Ship
CSD13303W1015	1 x 1.5 Wafer Level Package	7-inch reel	3000	Tape and Reel

ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ 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, $T_C = 25^\circ\text{C}^{(1)}$	3.5	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ\text{C}^{(2)}$	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 $R_{DS(on)} = 75.7^\circ\text{C}/\text{W}$ on 1 in² Cu (2 oz.) on 0.060" thick FR4 PCB.

(2) Pulse width $\leq 1\text{ms}$, duty cycle $\leq 2\%$



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CSD13303W1015



SLPS298A – MAY 2012 – REVISED MAY 2012

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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

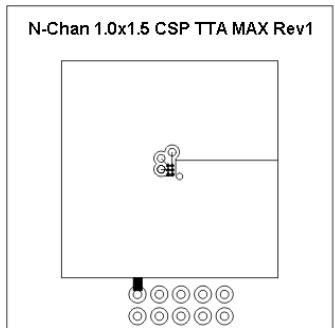
($T_A = 25^\circ\text{C}$ unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV_{DSS}	Drain to Source Voltage	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_D = 250\mu\text{A}$		12		V
I_{DSS}	Drain to Source Leakage Current	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{V}_{\text{DS}} = 9.6\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$\text{V}_{\text{DS}} = 0\text{V}$, $\text{V}_{\text{GS}} = +8\text{V}$			100	nA
$\text{V}_{\text{GS}(\text{th})}$	Gate to Source Threshold Voltage	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$, $\text{I}_D = 250\mu\text{A}$	0.65	0.85	1.2	V
$\text{R}_{\text{DS}(\text{on})}$	Drain to Source On Resistance	$\text{V}_{\text{GS}} = 2.5\text{V}$, $\text{I}_D = 1.5\text{A}$		18	23	$\text{m}\Omega$
		$\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 1.5\text{A}$		16	20	$\text{m}\Omega$
g_{fs}	Transconductance	$\text{V}_{\text{DS}} = 6\text{V}$, $\text{I}_D = 1.5\text{A}$		14		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{V}_{\text{DS}} = 6\text{V}$, $f = 1\text{MHz}$		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)	$\text{V}_{\text{DS}} = 6\text{V}$, $\text{I}_D = 1.5\text{A}$		3.9	4.7	nC
Q_{gd}	Gate Charge Gate to Drain			0.4		nC
Q_{gs}	Gate Charge Gate to Source			1		nC
$\text{Q}_{\text{g}(\text{th})}$	Gate Charge at V_{th}			0.6		nC
Q_{oss}	Output Charge			4.9		nC
$\text{t}_{\text{d}(\text{on})}$	Turn On Delay Time	$\text{V}_{\text{DS}} = 6\text{V}$, $\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 1.5\text{A}$ $\text{R}_G = 4\Omega$		4.6		ns
t_r	Rise Time			10		ns
$\text{t}_{\text{d}(\text{off})}$	Turn Off Delay Time			14.7		ns
t_f	Fall Time			3.2		ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	$\text{I}_S = 1.5\text{A}$, $\text{V}_{\text{GS}} = 0\text{V}$		0.7	1	V
Q_{rr}	Reverse Recovery Charge	$\text{V}_{\text{DS}} = 6\text{V}$, $\text{I}_F = 1.5\text{A}$, $\text{dI}/\text{dt} = 200\text{A}/\mu\text{s}$		14		nC
t_{rr}	Reverse Recovery Time			38.7		ns

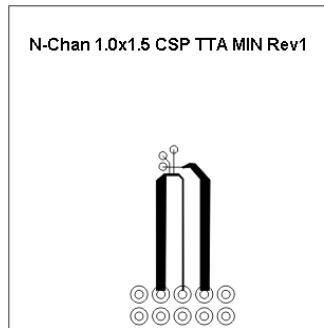
THERMAL CHARACTERISTICS

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

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



Max $R_{\theta JA}$ = 94.6°C/W
when mounted on 1
inch² of 2 oz. Cu.



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

TYPICAL MOSFET CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

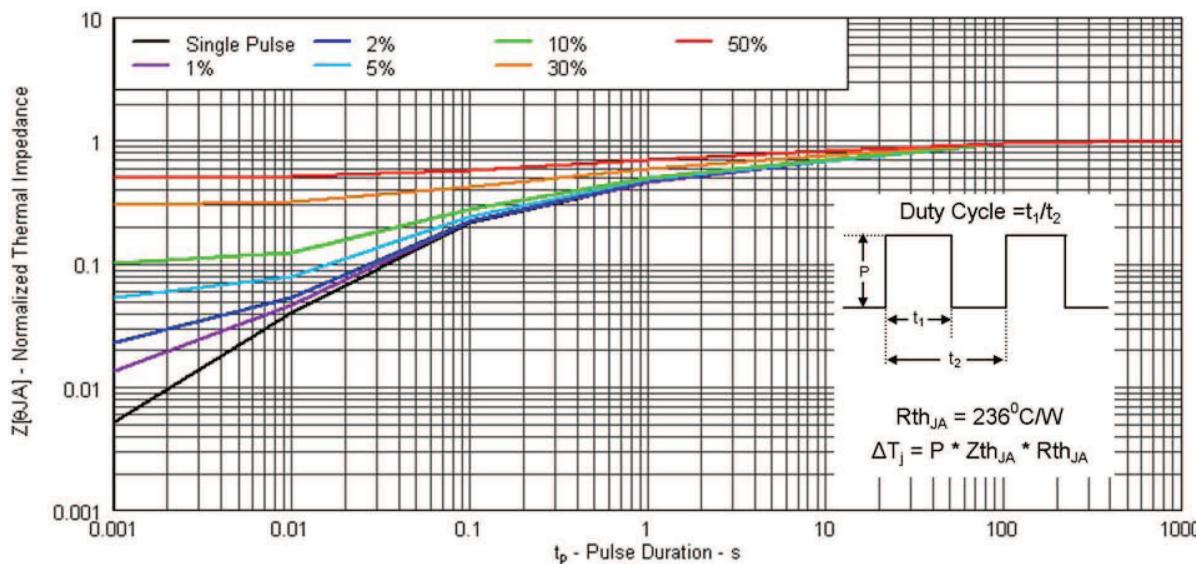


Figure 1. Transient Thermal Impedance

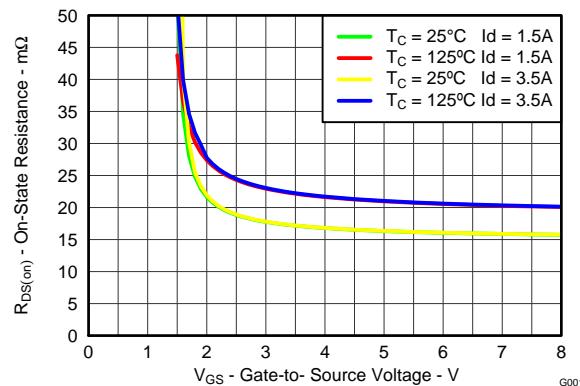
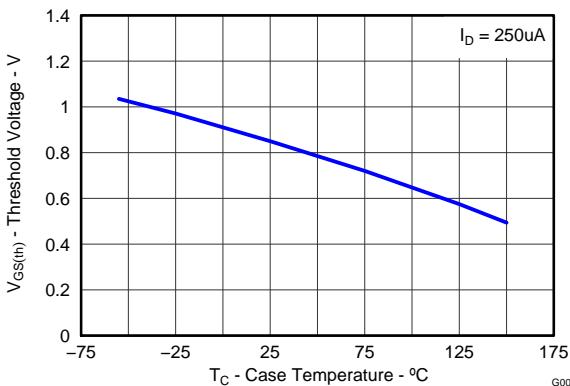
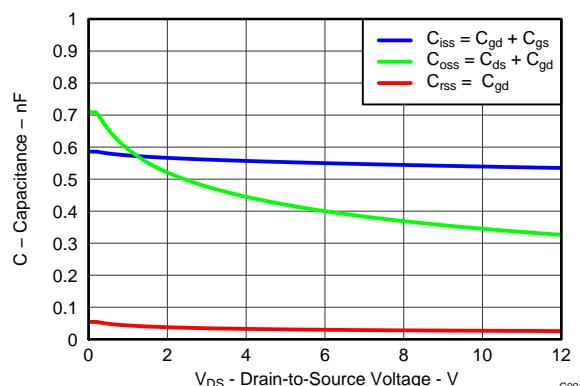
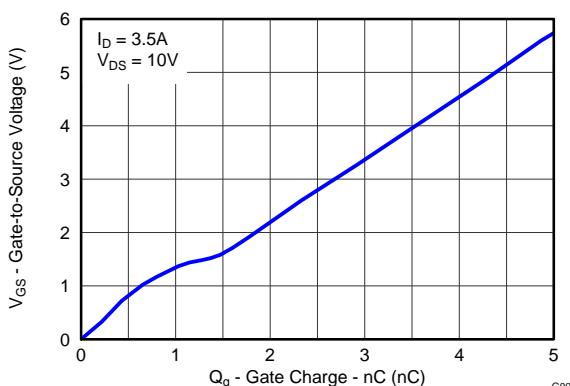
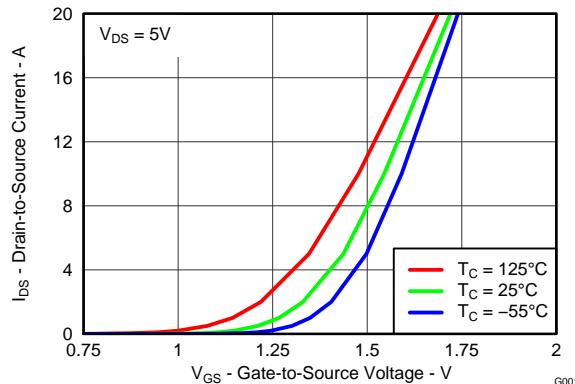
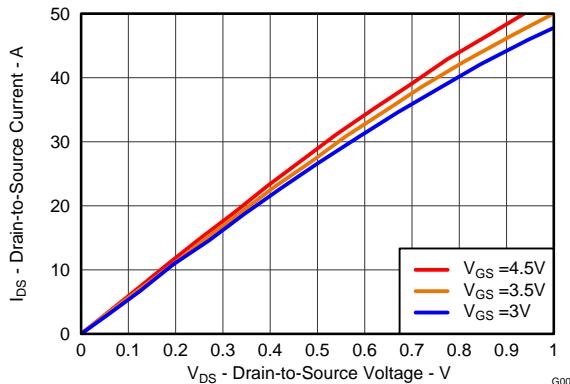
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TYPICAL MOSFET CHARACTERISTICS (continued)

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



TYPICAL MOSFET CHARACTERISTICS (continued)

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

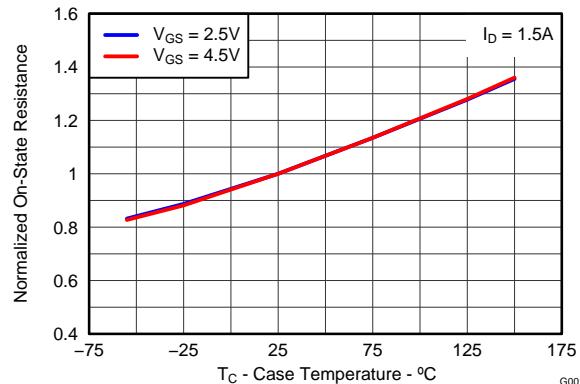


Figure 8. Normalized On Resistance vs. Temperature

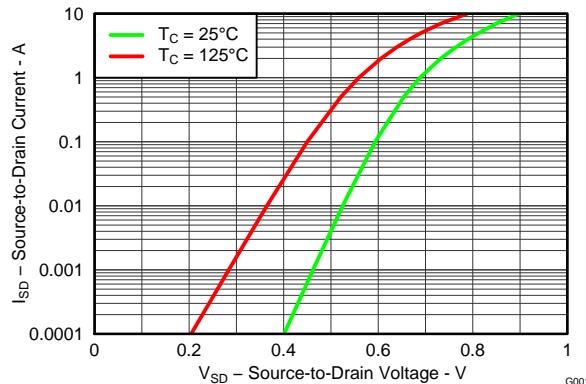


Figure 9. Typical Diode Forward Voltage

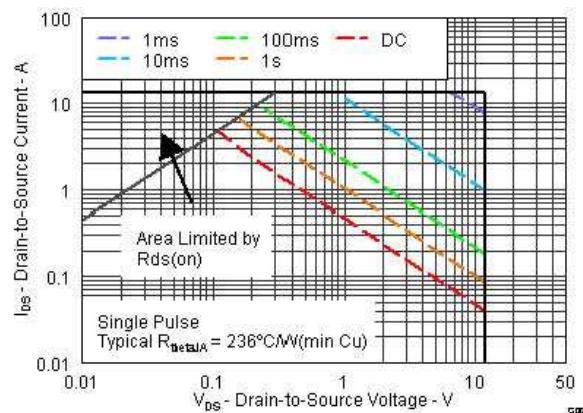


Figure 10. Maximum Safe Operating Area

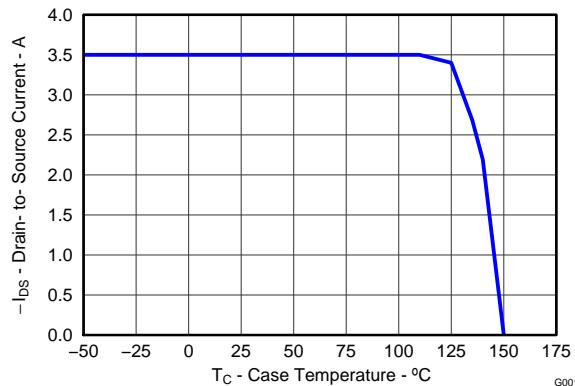


Figure 11. Maximum Drain Current vs. Temperature

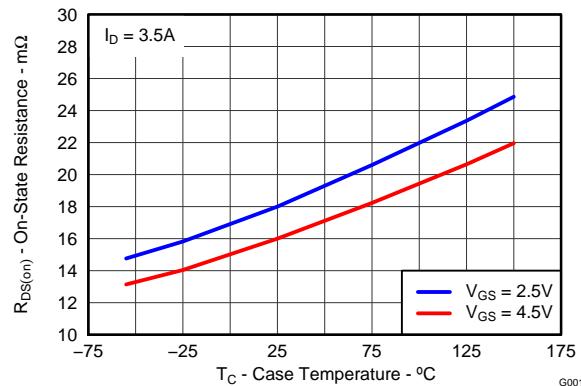
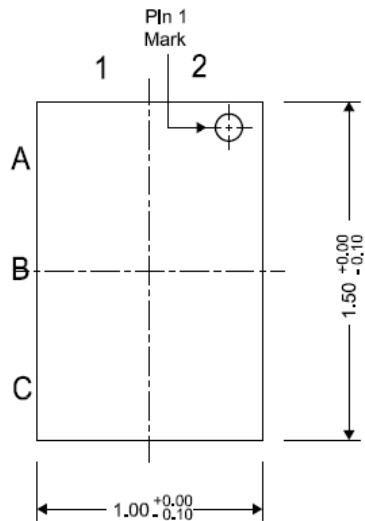


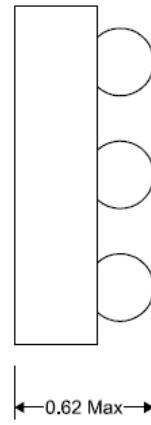
Figure 12. On Resistance vs. Temperature

MECHANICAL DATA

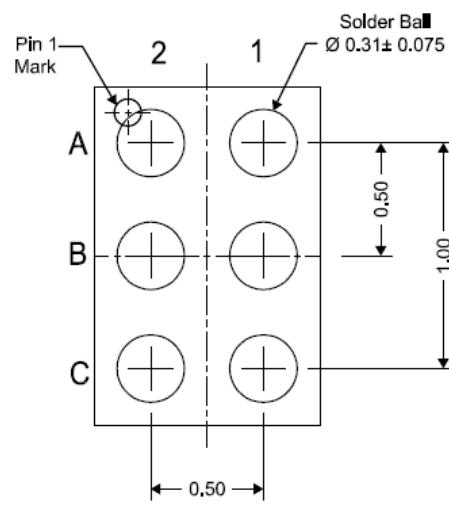
CSD13303W1015 Package Dimensions



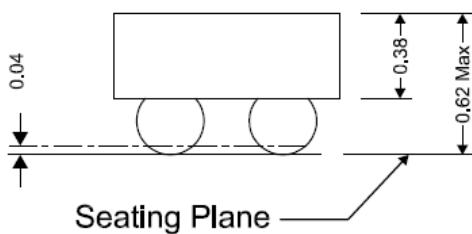
Top View



Side View



Bottom View



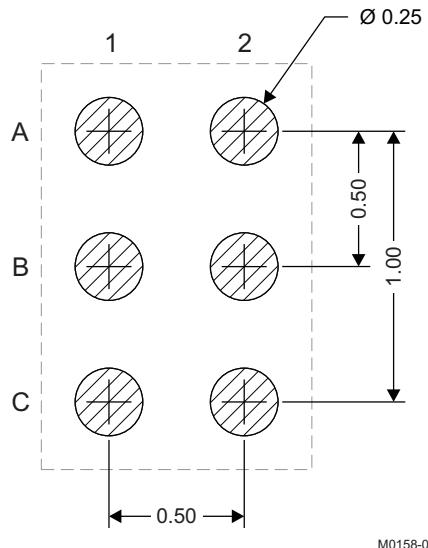
Front View

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

Pinout

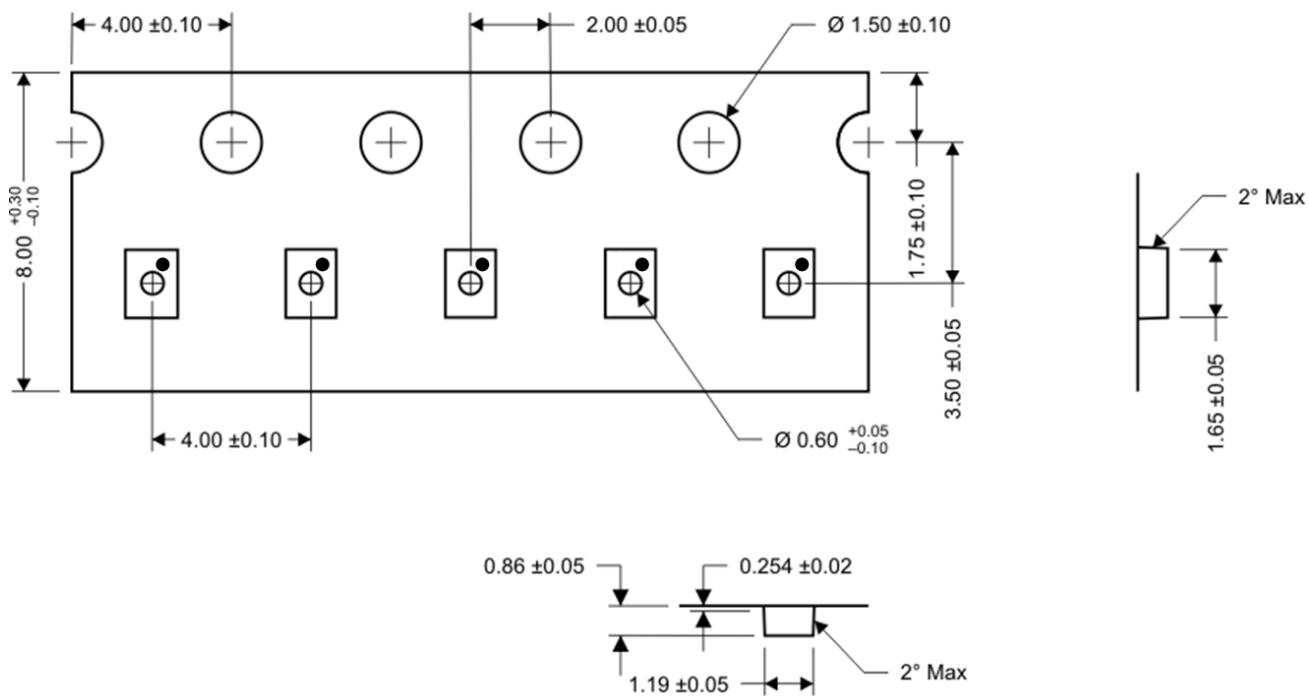
POSITION	DESIGNATION
C2, B2	Source
A2	Gate
A1, B1, C1	Drain

Land Pattern Recommendation



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

Tape and Reel Information



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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CSD13303W1015	ACTIVE	DSBGA	YZC	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-55 to 150	13303	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.**OBSOLETE:** TI has discontinued the production of the device.(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.**TBD:** The Pb-Free/Green conversion plan has not been defined.**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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