

CSD75208W1015 Dual 20-V Common Source P-Channel NexFET™ Power MOSFET

1 Features

- Dual P-Channel MOSFETs
- Common Source Configuration
- Small Footprint 1 mm x 1.5 mm
- Gate-Source Voltage Clamp
- Gate ESD Protection –3 kV
- Pb Free
- RoHS Compliant
- Halogen Free

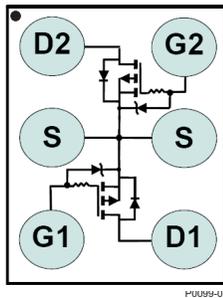
2 Applications

- Battery Management
- Load Switch
- Battery Protection

3 Description

This 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



Product Summary

$T_A = 25^\circ\text{C}$		TYPICAL VALUE		UNIT
V_{DS}	Drain-to-Source Voltage	–20		V
Q_g	Gate Charge Total (–4.5 V)	1.9		nC
Q_{gd}	Gate Charge Gate-to-Drain	0.23		nC
$R_{DS(on)}$	Drain-to-Source On-Resistance	$V_{GS} = -1.8\text{ V}$	100	m Ω
		$V_{GS} = -2.5\text{ V}$	70	m Ω
		$V_{GS} = -4.5\text{ V}$	56	m Ω
$R_{D1D2(on)}$	Drain-to-Drain On-Resistance	$V_{GS} = -1.8\text{ V}$	190	m Ω
		$V_{GS} = -2.5\text{ V}$	120	m Ω
		$V_{GS} = -4.5\text{ V}$	90	m Ω
$V_{GS(th)}$	Threshold Voltage	–0.8		V

Ordering Information⁽¹⁾

Device	Qty	Media	Package	Ship
CSD75208W1015	3000	7-Inch Reel	1.0 mm x 1.5 mm	Tape and Reel
CSD75208W1015T	250	7-Inch Reel	Wafer Level Package	

(1) For all available packages, see the orderable addendum at the end of the data sheet.

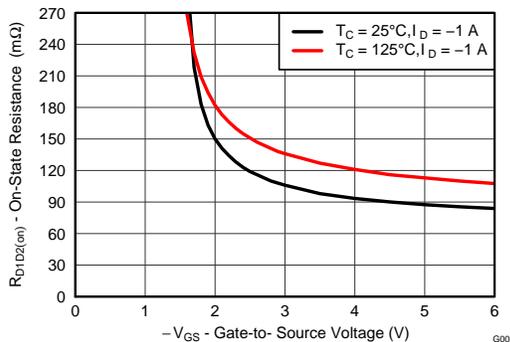
Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage	–20	V
V_{GS}	Gate-to-Source Voltage	–6	V
I_{D1D2}	Continuous Drain-to-Drain Current, $T_C = 25^\circ\text{C}$	–1.6	A
	Pulsed Drain-to-Drain Current, $T_C = 25^\circ\text{C}$ ⁽¹⁾	–22	A
I_S	Continuous Source Pin Current	–3	A
	Pulsed Source Pin Current ^{(1) (2)}	–39	A
I_G	Continuous Gate Clamp Current	–0.5	A
	Pulsed Gate Clamp Current ⁽¹⁾	–7	A
P_D	Power Dissipation	0.75	W
$T_{J, stg}$	Operating Junction and Storage Temperature Range	–55 to 150	$^\circ\text{C}$

(1) Max $R_{\theta JA} = 165^\circ\text{C/W}$, pulse duration $\leq 100\ \mu\text{s}$, duty cycle $\leq 1\%$

(2) Both devices in parallel

$R_{D1D2(on)}$ vs V_{GS}



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

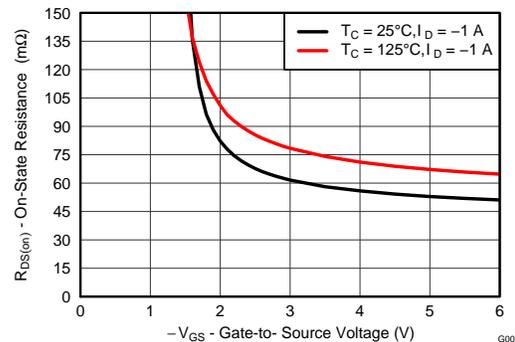


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4 Revision History

DATE	REVISION	NOTES
July 2014	*	Initial release.

5 Specifications

5.1 Electrical Characteristics

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

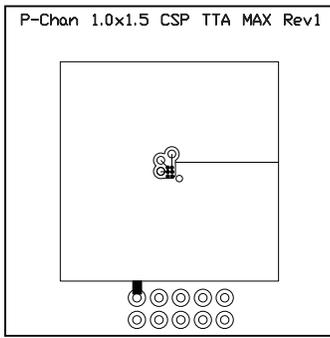
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV_{DSS}	Drain-to-Source Voltage	$V_{GS} = 0\text{ V}, I_{DS} = -250\ \mu\text{A}$	-20			V
BV_{GSS}	Gate-to-Source Voltage	$V_{DS} = 0\text{ V}, I_G = -250\ \mu\text{A}$	-6.1		-7.2	V
I_{DSS}	Drain-to-Source Leakage Current	$V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$			-1	μA
I_{GSS}	Gate-to-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = -6\text{ V}$			-100	nA
$V_{GS(th)}$	Gate-to-Source Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = -250\ \mu\text{A}$	-0.5	-0.8	-1.1	V
$R_{DS(on)}$	Drain-to-Source On-Resistance	$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		100	150	m Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		70	88	m Ω
		$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		56	68	m Ω
$R_{D1D2(on)}$	Drain-to-Drain On-Resistance	$V_{GS} = -1.8\text{ V}, I_{D1D2} = -1\text{ A}$		190	285	m Ω
		$V_{GS} = -2.5\text{ V}, I_{D1D2} = -1\text{ A}$		120	150	m Ω
		$V_{GS} = -4.5\text{ V}, I_{D1D2} = -1\text{ A}$		90	108	m Ω
g_{fs}	Transconductance	$V_{DS} = -2\text{ V}, I_D = -1\text{ A}$		7.5		S
DYNAMIC CHARACTERISTICS						
C_{ISS}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = -10\text{ V},$ $f = 1\text{ MHz}$		315	410	pF
C_{OSS}	Output Capacitance			132	172	pF
C_{RSS}	Reverse Transfer Capacitance			7.7	10	pF
Q_g	Gate Charge Total (-4.5 V)	$V_{DS} = -10\text{ V},$ $I_{DS} = -1\text{ A}$		1.9	2.5	nC
Q_{gd}	Gate Charge, Gate-to-Drain			0.23		nC
Q_{gs}	Gate Charge, Gate-to-Source			0.48		nC
$Q_{g(th)}$	Gate Charge at V_{th}			0.31		nC
Q_{OSS}	Output Charge	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}$		2.1		nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V},$ $I_{DS} = -1\text{ A}, R_G = 0\ \Omega$		9		ns
t_r	Rise Time			5		ns
$t_{d(off)}$	Turn Off Delay Time			29		ns
t_f	Fall Time			11		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode Forward Voltage	$I_{DS} = -1\text{ A}, V_{GS} = 0\text{ V}$		-0.75	-1	V
Q_{rr}	Reverse Recovery Charge	$V_{DD} = -10\text{ V}, I_F = -1\text{ A}, di/dt = 200\text{ A}/\mu\text{s}$		4.3		nC
t_{rr}	Reverse Recovery Time			9		ns

5.2 Thermal Information

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

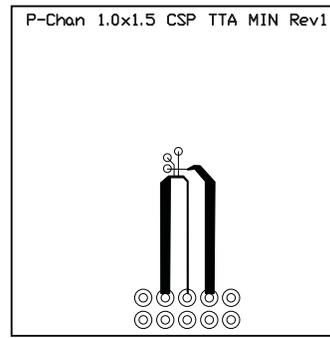
THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Junction-to-Ambient Thermal Resistance ⁽¹⁾ ⁽²⁾		165		$^\circ\text{C}/\text{W}$
	Junction-to-Ambient Thermal Resistance ⁽²⁾ ⁽³⁾		95		

- (1) Device mounted on FR4 material with minimum Cu mounting area
- (2) Measured with both devices biased in a parallel condition.
- (3) Device mounted on FR4 material with 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.



M0155-01

Typ $R_{\theta JA} = 95^{\circ}\text{C/W}$ when mounted on 1 inch² (6.45 cm²) of 2-oz. (0.071-mm thick) Cu.

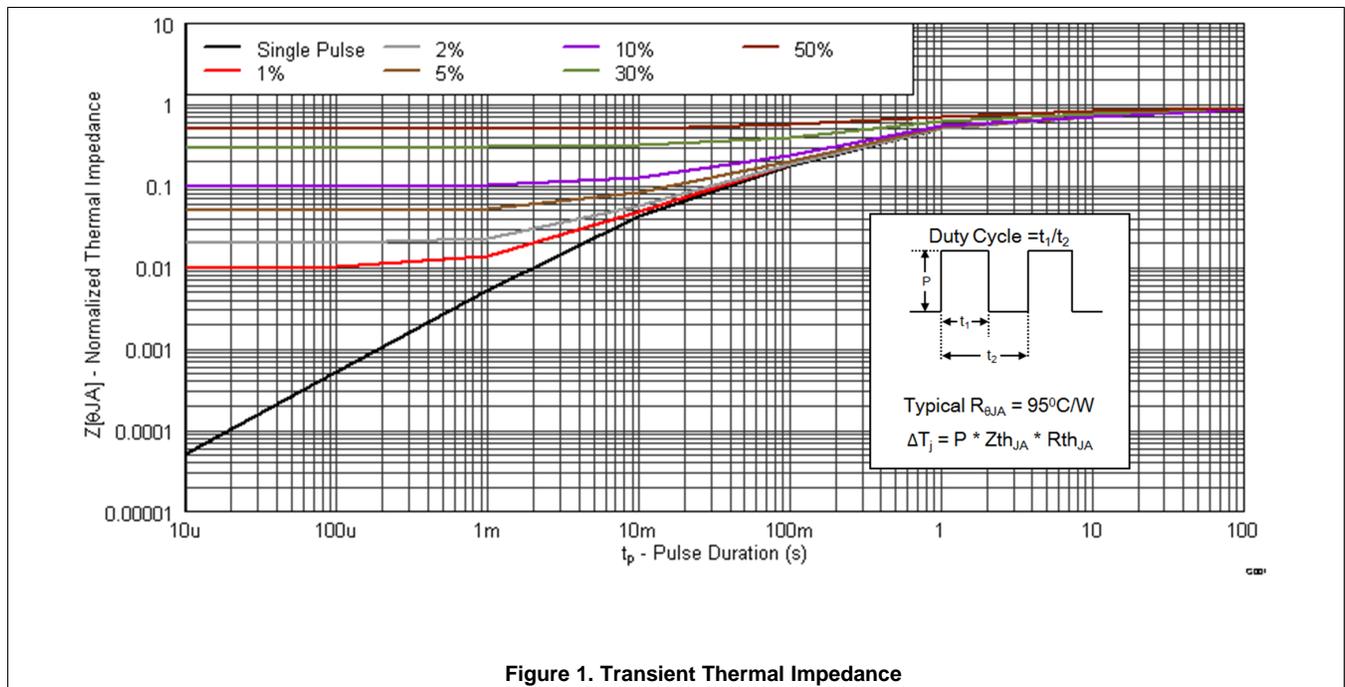


M0156-01

Typ $R_{\theta JA} = 165^{\circ}\text{C/W}$ when mounted on minimum pad area of 2-oz. (0.071-mm thick) 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)

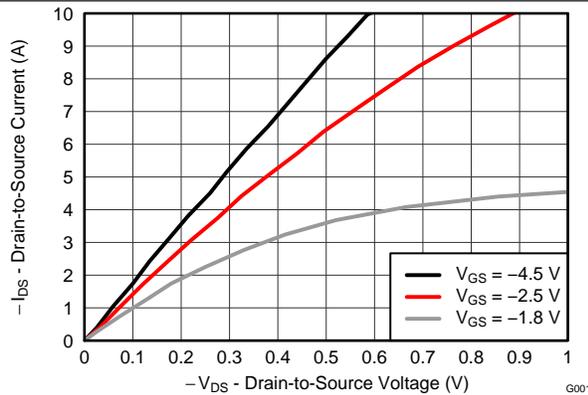


Figure 2. Saturation Characteristics

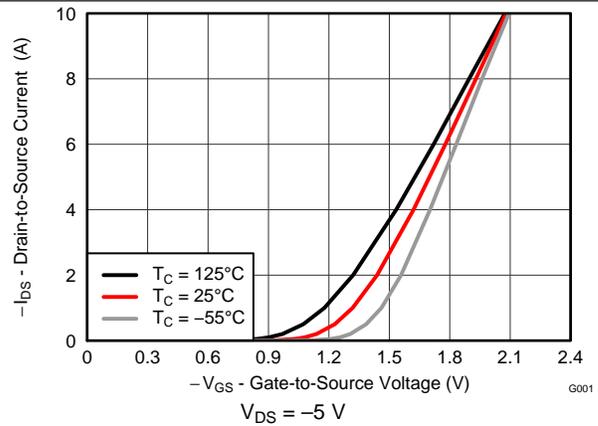


Figure 3. Transfer Characteristics

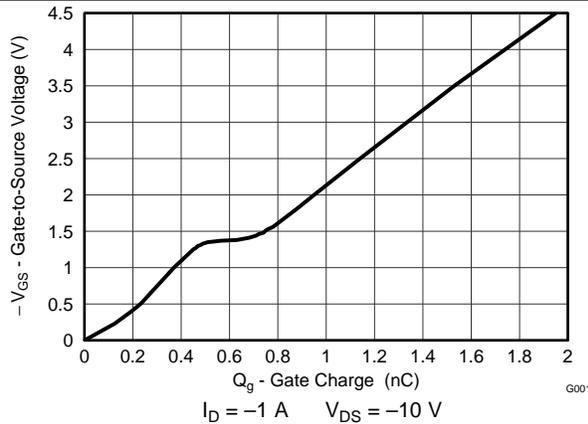


Figure 4. Gate Charge

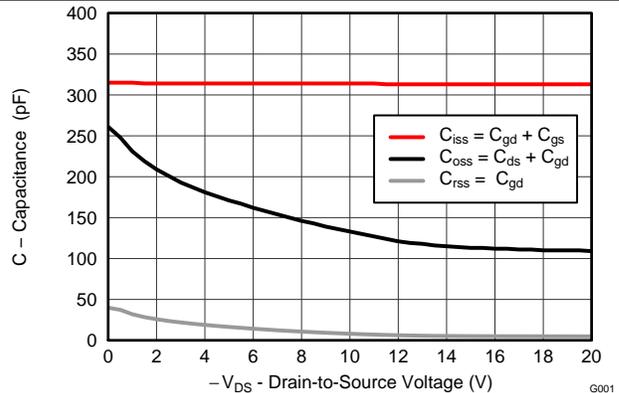


Figure 5. Capacitance

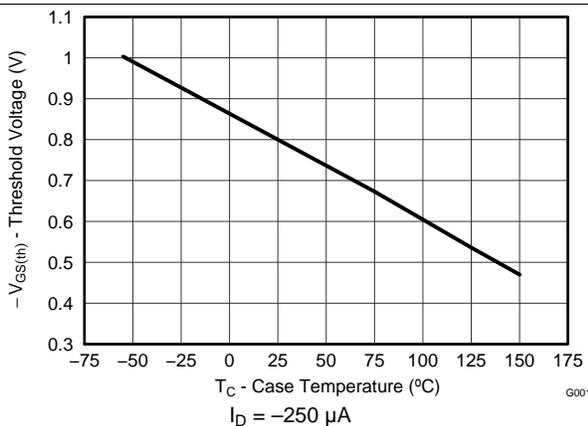


Figure 6. Threshold Voltage vs Temperature

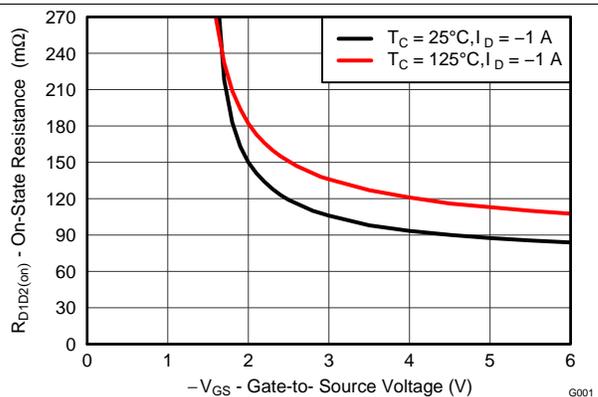


Figure 7. On-State Drain-to-Drain Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

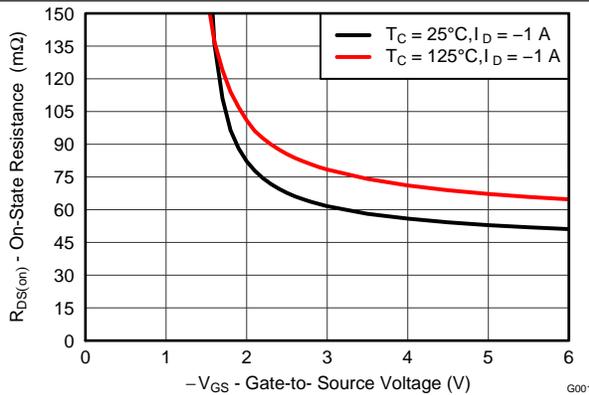


Figure 8. On-State Drain-to-Source Resistance vs Gate-to-Source Voltage

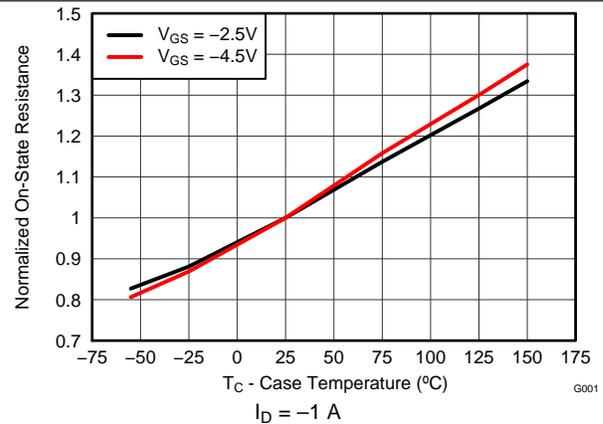


Figure 9. Normalized On-State Resistance vs Temperature

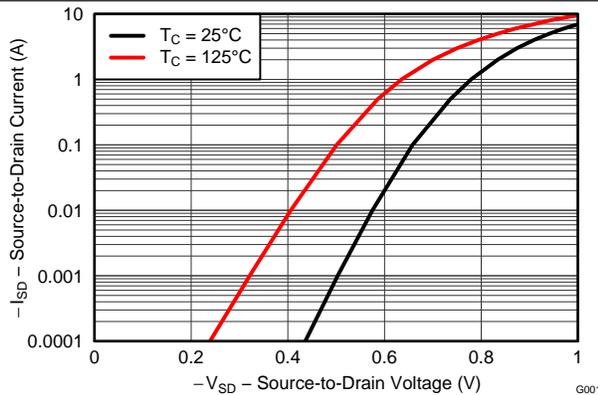


Figure 10. Typical Diode Forward Voltage

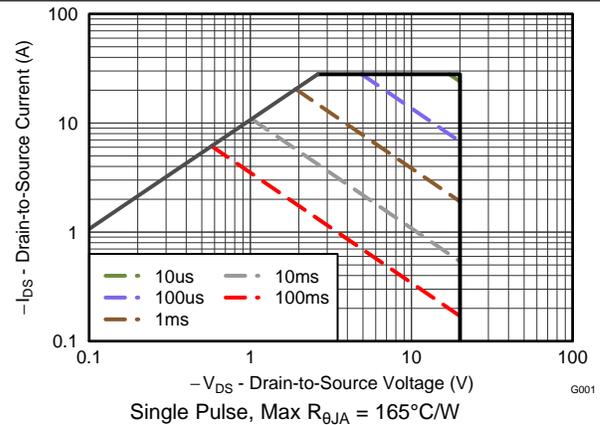


Figure 11. Maximum Safe Operating Area

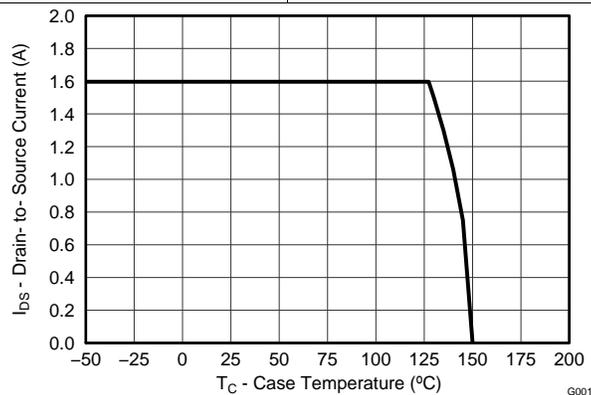
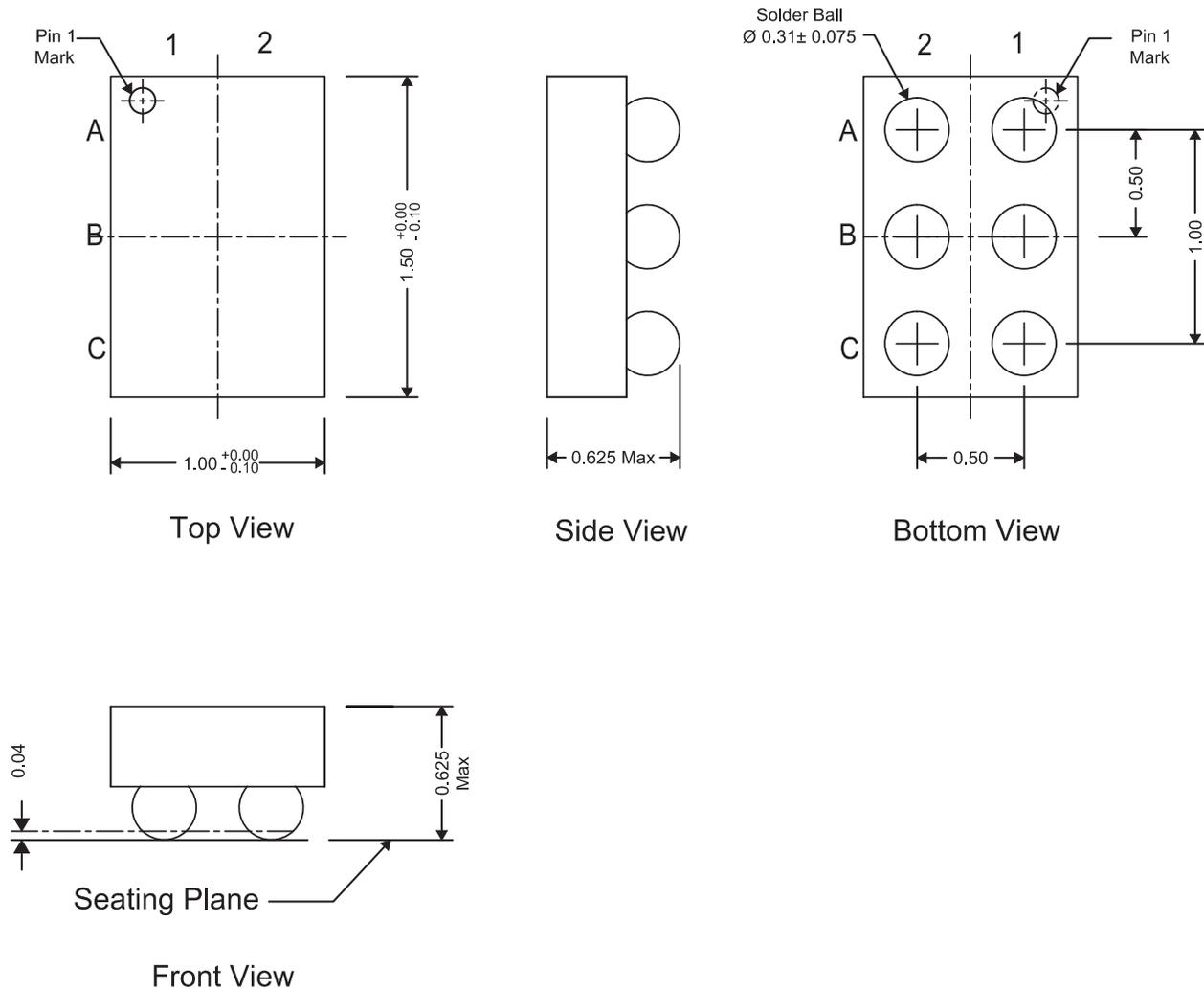


Figure 12. Maximum Drain Current vs Temperature

6 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.

6.1 CSD75208W1015 Package Dimensions

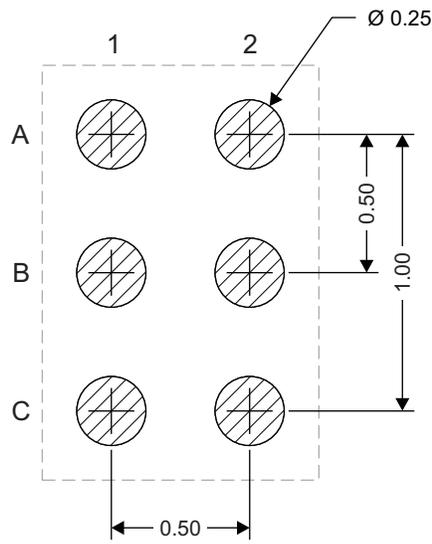


NOTE: All dimensions are in mm (unless otherwise specified).

Pinout

POSITION	DESIGNATION
B1, B2	Source
C1	Gate1
C2	Drain1
A2	Gate2
A1	Drain2

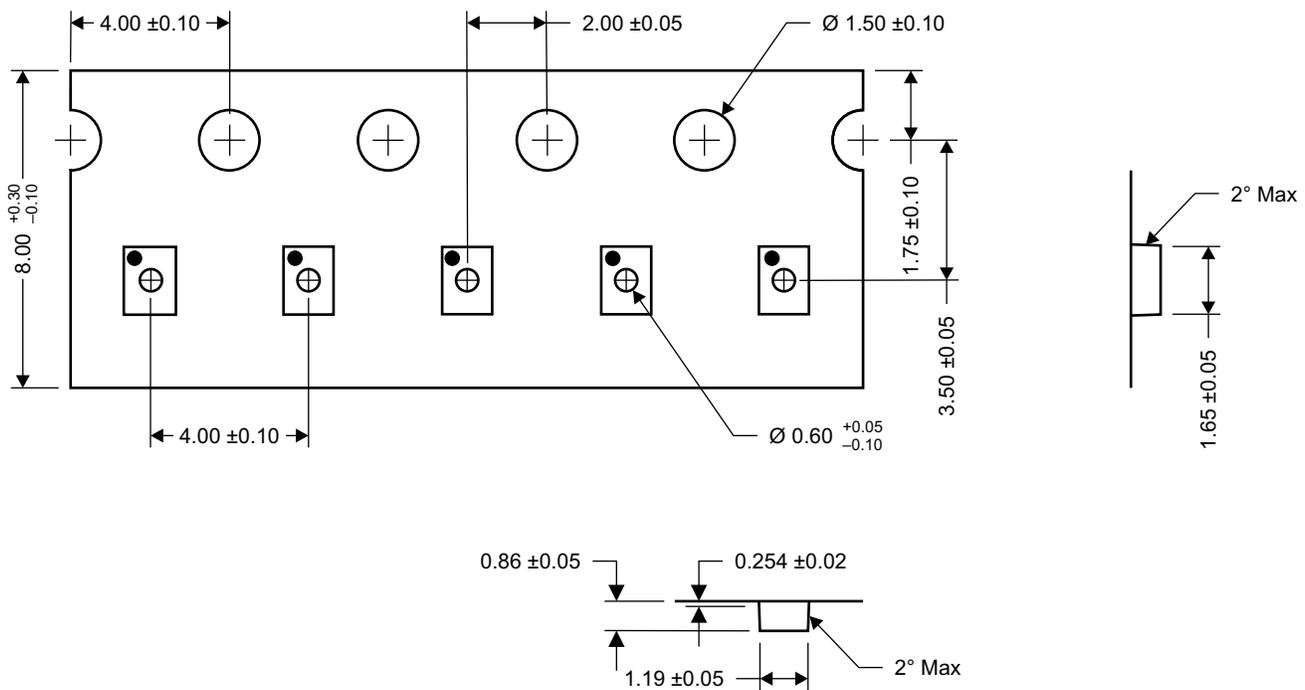
6.2 Recommended PCB Land Pattern



M0158-01

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

6.3 Tape and Reel Information



M0159-01

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

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
CSD75208W1015	PREVIEW	DSBGA	YZC	6	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	-40 to 85	75208	
CSD75208W1015T	PREVIEW	DSBGA	YZC	6	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	-40 to 85	75208	

(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.

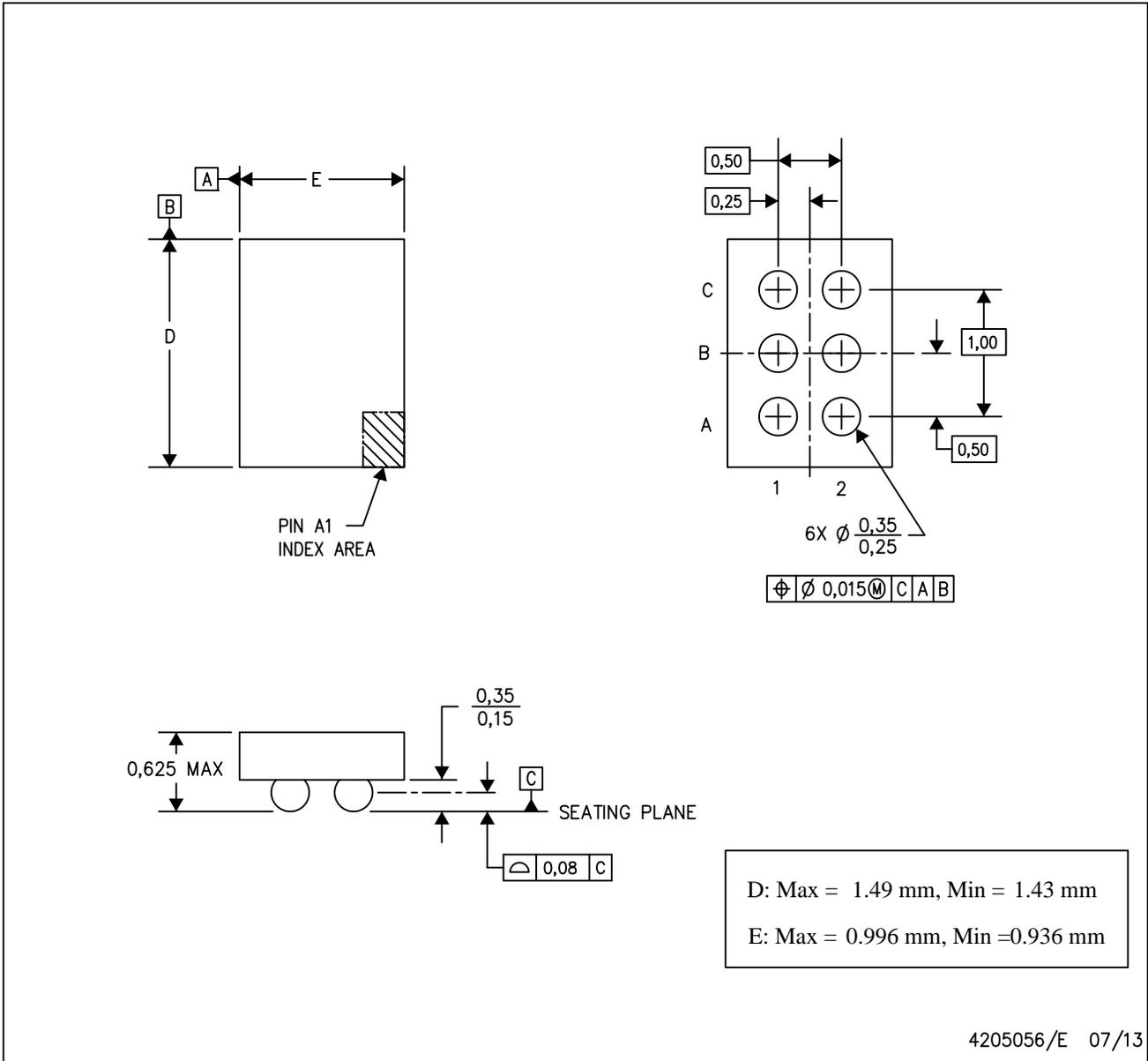
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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YZC (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 B. This drawing is subject to change without notice.
 C. NanoFree™ package configuration.

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