

Dual N-Channel NexFET™ Power MOSFET

 Check for Samples: [CSD86311W1723](#)

FEATURES

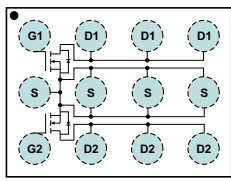
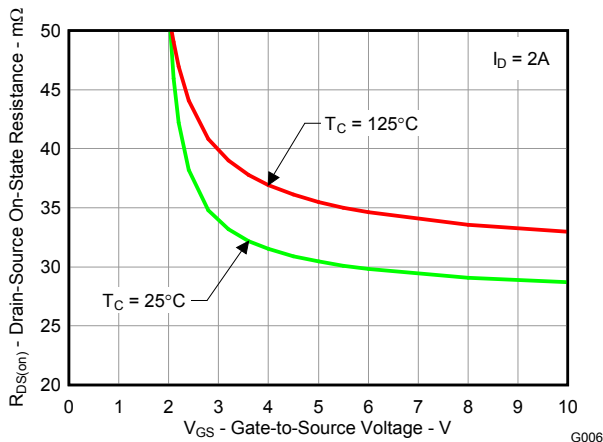
- Dual N-Ch MOSFETs
- Common Source Configuration
- Small Footprint 1.7 mm × 2.3 mm
- Ultra Low Q_g and Q_{gd}
- Pb Free
- RoHS Compliant
- Halogen Free

APPLICATIONS

- Battery Management
- Battery Protection
- DC-DC Converters

DESCRIPTION

The device has been designed to deliver the lowest on resistance and gate charge in the smallest outline possible with thermal characteristics in an ultra low profile. Low on resistance and gate charge coupled with the small footprint and low profile make the device ideal for battery operated space constrained application in load management as well as DC-DC converter applications

Top View

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


PRODUCT SUMMARY

V_{DS}	Drain to Source Voltage	25	V
Q_g	Gate Charge Total (4.5V)	3.1	nC
Q_{gd}	Gate Charge Gate to Drain	0.33	nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 2.5V$	37 mΩ
		$V_{GS} = 4.5V$	31 mΩ
		$V_{GS} = 8V$	29 mΩ
$V_{GS(th)}$	Threshold Voltage	1	V

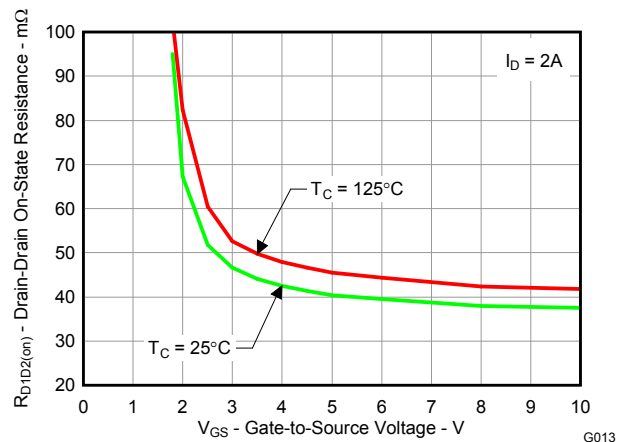
ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD86311W1723	1.7-mm × 2.3-mm 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	25	V
V_{GS}	Gate to Source Voltage	+10 / -8	V
I_D	Continuous Drain Current ^{(1) (2)(3)}	4.5	A
	Pulsed Drain Current ^{(1) (2)(3)}		
I_G	Continuous Gate Clamp Current ⁽⁴⁾	6	A
	Pulsed Gate Clamp Current ⁽⁴⁾		
P_D	Power Dissipation ⁽¹⁾	1.5	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

- (1) May be limited by Max source current
- (2) Based on Min Cu footprint
- (3) Per MOSFET
- (4) Total for device

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


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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)

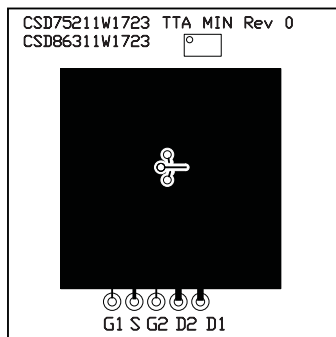
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV_{DSS}	Drain to Source Voltage	$V_{GS} = 0V, I_D = 250\mu A$	25			V
I_{DSS}	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 20V$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = +10 / -8V$			± 100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.85	1	1.4	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 2.5V, I_{DS} = 2A$		37	51	m Ω
		$V_{GS} = 4.5V, I_{DS} = 2A$		31	42	m Ω
		$V_{GS} = 8V, I_{DS} = 2A$		29	39	m Ω
$R_{DD(on)}$	Drain to Drain On Resistance	$V_{GS} = 2.5V, I_D = 2A$		52	75	m Ω
		$V_{GS} = 4.5V, I_{DS} = 2A$		41	55	m Ω
		$V_{GS} = 8V, I_{DS} = 2A$		38	50	m Ω
g_{fs}	Transconductance	$V_{DS} = 10V, I_D = 2A$		6.4		S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	$V_{GS} = 0V,$ $V_{DS} = 12.5V,$ $f = 1MHz$		450	585	pF
C_{OSS}	Output Capacitance			250	325	pF
C_{RSS}	Reverse Transfer Capacitance			10	13	pF
R_G	Series Gate Resistance			1.4	2.8	Ω
Q_g	Gate Charge Total (4.5V)	$V_{DS} = 12.5V,$ $I_D = 2A$		3.1	4	nC
Q_{gd}	Gate Charge Gate to Drain			0.33		nC
Q_{gs}	Gate Charge Gate to Source			0.85		nC
$Q_{g(th)}$	Gate Charge at V_{th}			0.48		nC
Q_{OSS}	Output Charge		$V_{DS} = 12.2V, V_{GS} = 0V$		4.5	
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 12.5V, V_{GS} = 4.5V,$ $I_D = 2A, R_G = 2\Omega$		5.4		ns
t_r	Rise Time			4.3		ns
$t_{d(off)}$	Turn Off Delay Time			13.2		ns
t_f	Fall Time			2.9		ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	$I_S = 2A, V_{GS} = 0V$		0.78	1	V
Q_{rr}	Reverse Recovery Charge	$V_{dd} = 12.2V, I_F = 2A,$ $di/dt = 300A/\mu s$		4.2		nC
t_{rr}	Reverse Recovery Time			13.4		ns

THERMAL CHARACTERISTICS

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

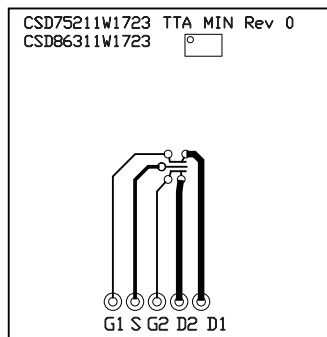
PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Minimum Cu area) ⁽¹⁾ ⁽²⁾			165	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (1 in ² Cu area) ⁽²⁾ ⁽³⁾			68	$^\circ\text{C}/\text{W}$

- (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 in² of 2oz. Cu.



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Max $R_{\theta JA} = 68^{\circ}\text{C/W}$
when mounted on
1inch² of 2 oz. Cu.

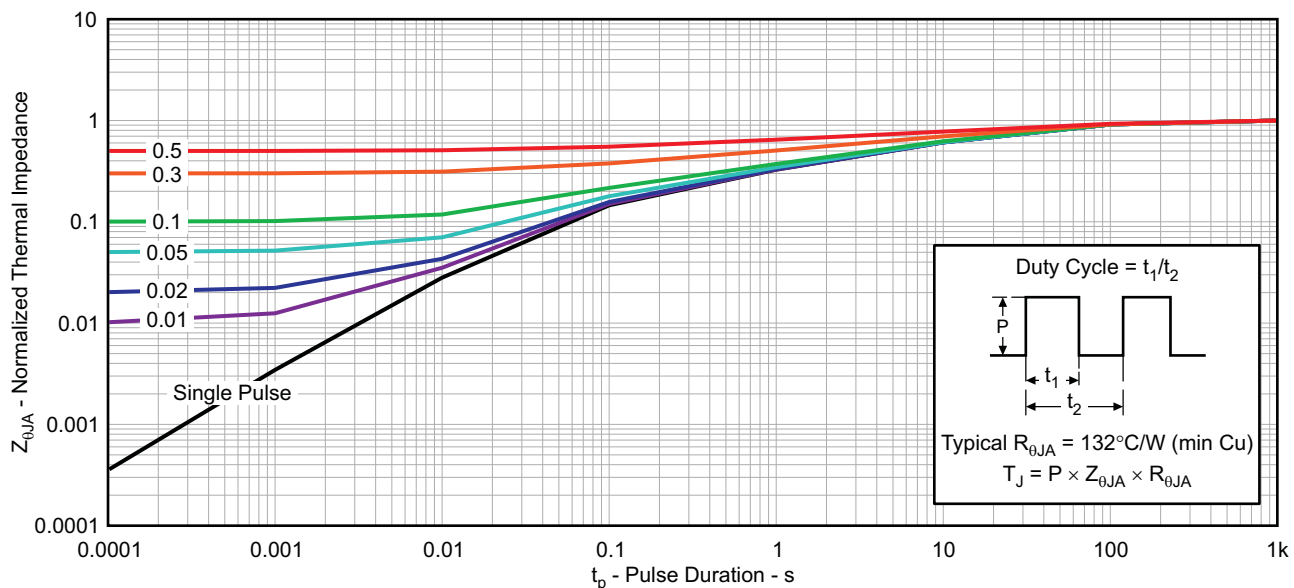


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Max $R_{\theta JA} = 165^{\circ}\text{C/W}$
when mounted on
minimum pad area of 2
oz. Cu.

TYPICAL MOSFET CHARACTERISTICS

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



G012

Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

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

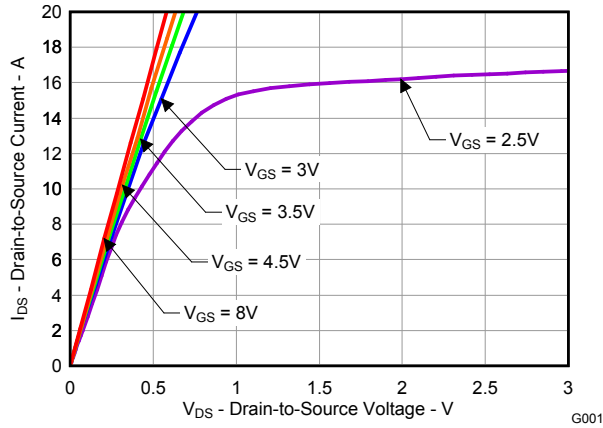


Figure 2. Saturation Characteristics

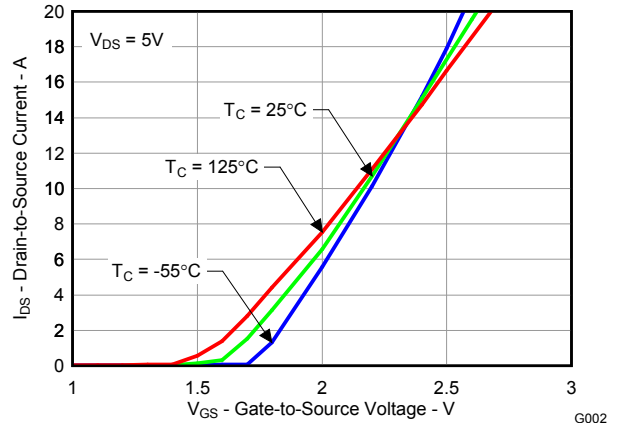


Figure 3. Transfer Characteristics

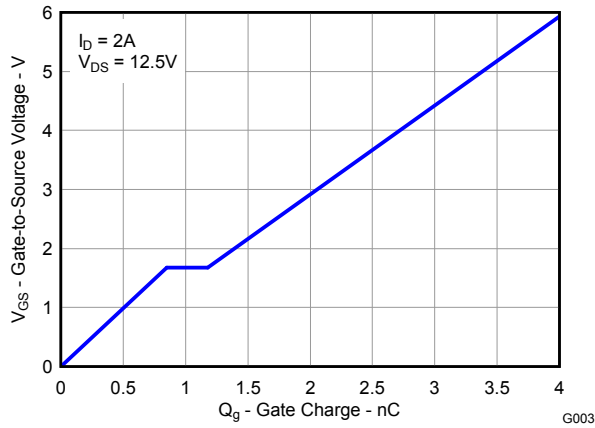


Figure 4. Gate Charge

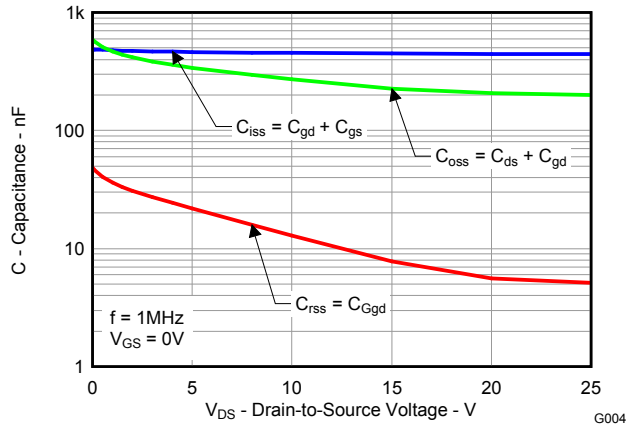


Figure 5. Capacitance

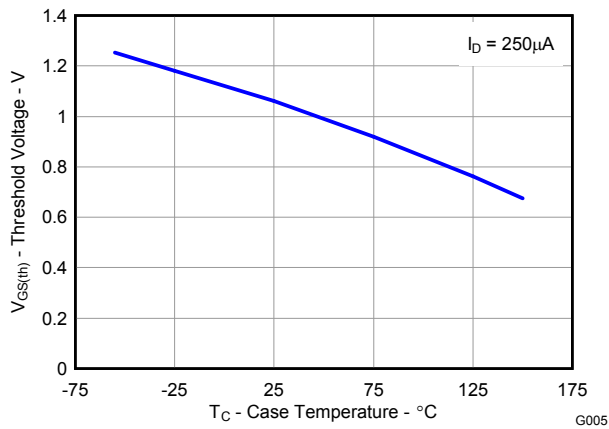


Figure 6. Threshold Voltage vs. Temperature

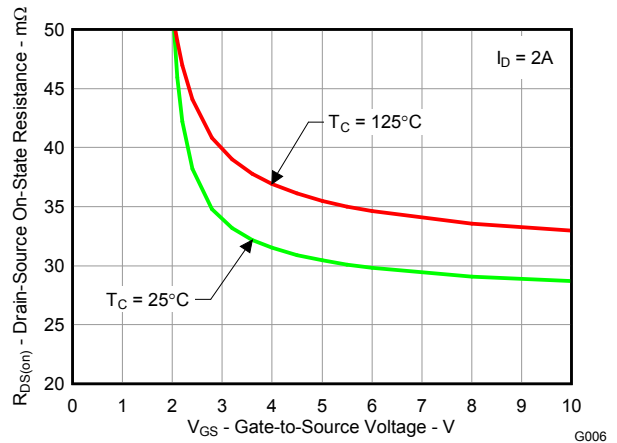


Figure 7. $R_{DS(on)}$ vs. Gate-to-Source Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

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

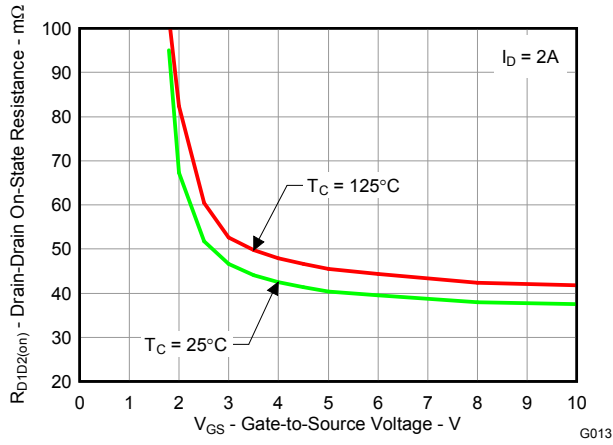


Figure 8. $R_{D1D2(on)}$ vs. Gate-to-Source Voltage

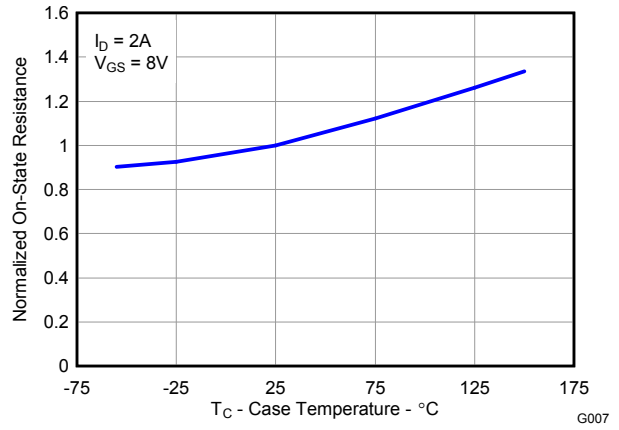


Figure 9. On Resistance vs. Temperature

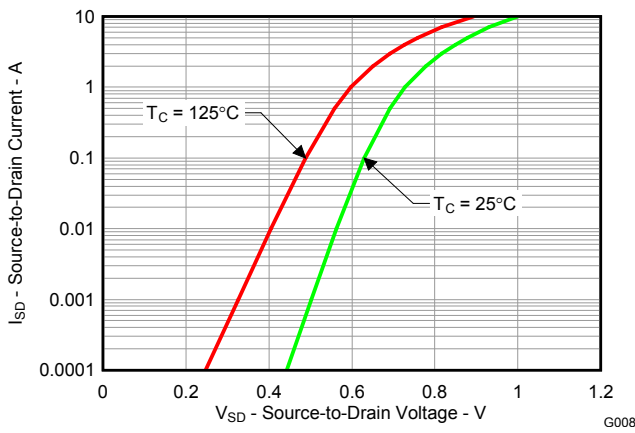


Figure 10. Typical Diode Forward Voltage

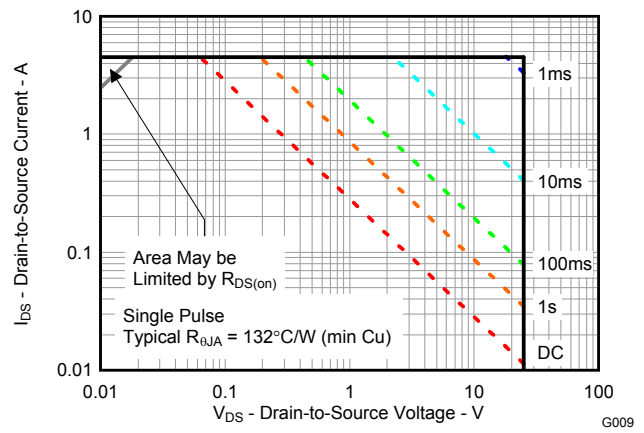


Figure 11. Maximum Safe Operating Area

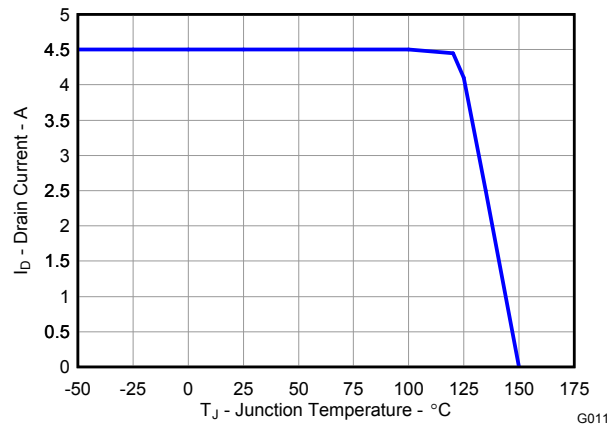
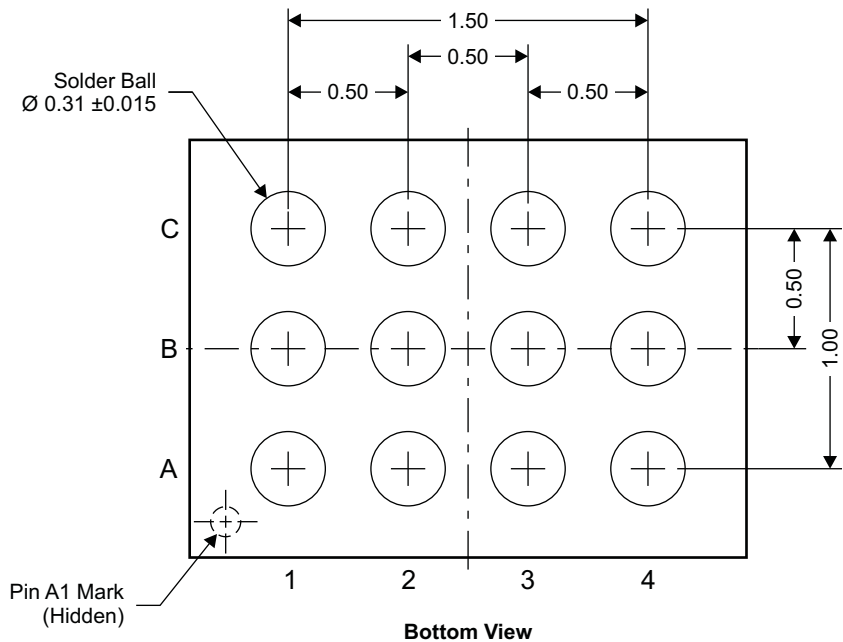
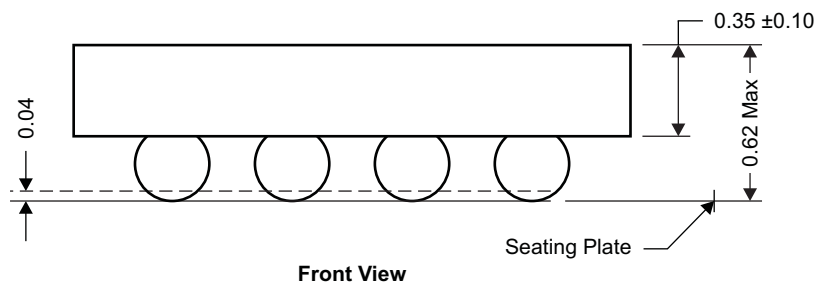
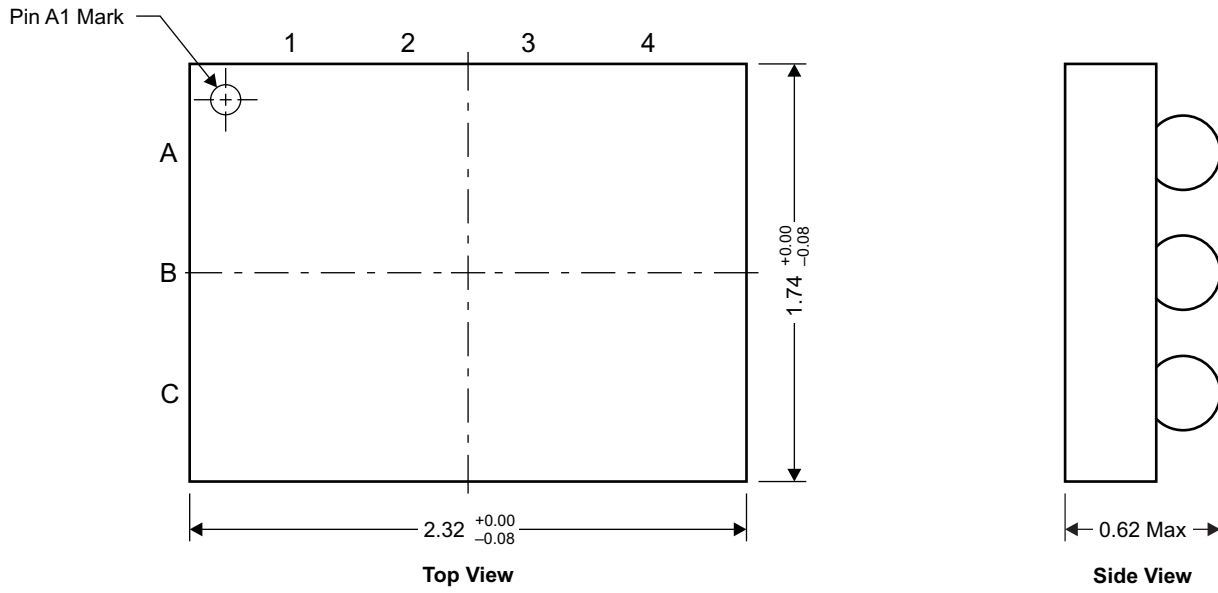


Figure 12. Maximum Drain Current vs. Temperature

MECHANICAL DATA

CSD86311W1723 Package Dimensions

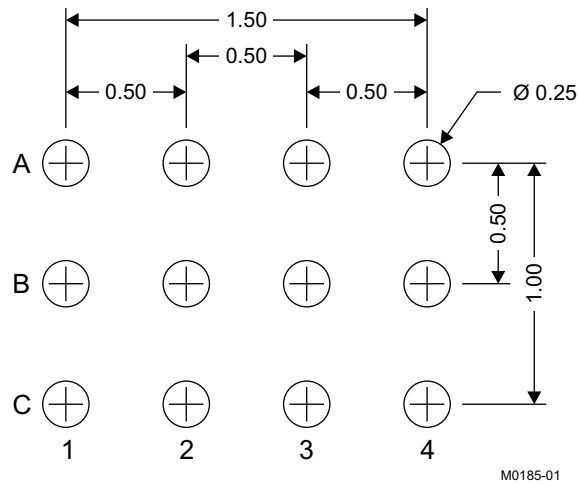


Pinout	
Position	Designation
A2, A3, A4	Drain 1
C2, C3, C4	Drain 2
A1	Gate 1
C1	Gate 2
B1, B2, B3, B4	Source

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

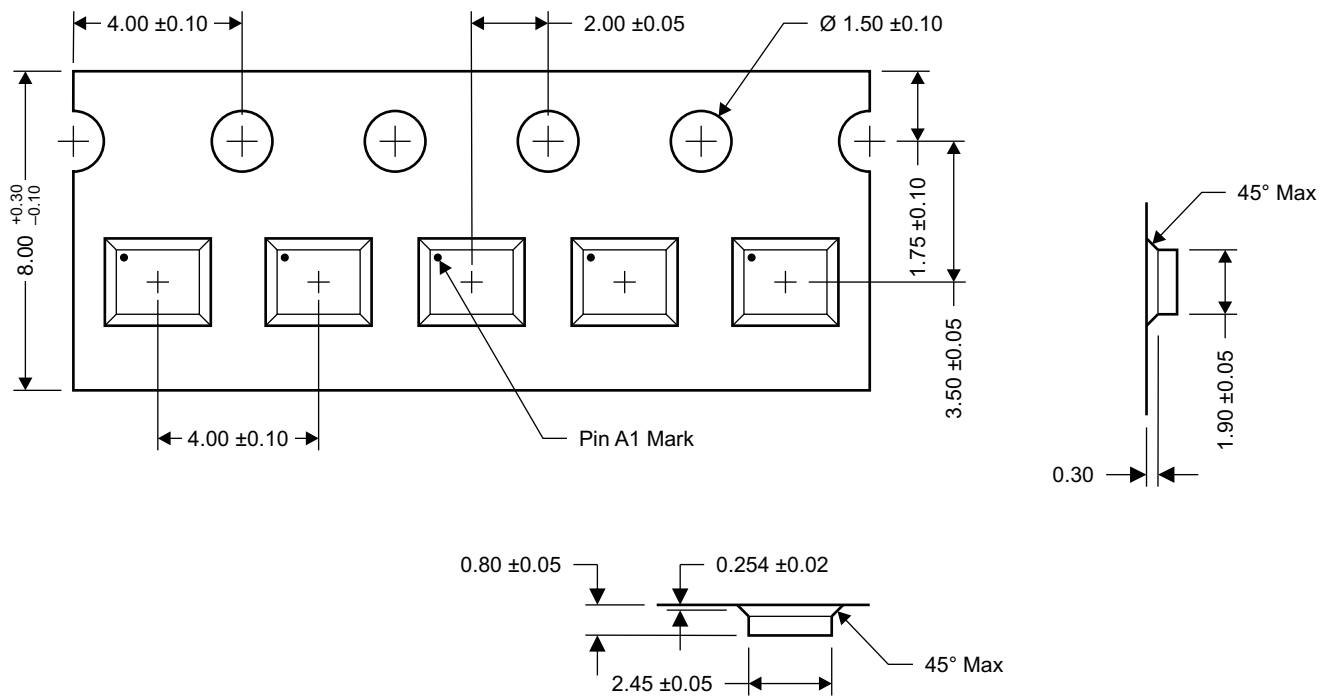
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Land Pattern Recommendation



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

Tape and Reel Information



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

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)
CSD86311W1723	Active	Production	DSBGA (YZG) 12	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	86311
CSD86311W1723.B	Active	Production	DSBGA (YZG) 12	3000 LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-55 to 150	86311

(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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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
CSD86311W1723	DSBGA	YZG	12	3000	180.0	8.4	2.38	1.8	0.69	4.0	8.0	Q2

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD86311W1723	DSBGA	YZG	12	3000	182.0	182.0	20.0

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