

## P-Channel NexFET™ Power MOSFET

 Check for Samples: **CSD23201W10**

### FEATURES

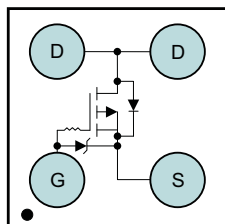
- Ultra Low Qg and Qgd
- Small Footprint 1mm x 1mm
- Low Profile 0.62mm Height
- Pb Free
- Gate ESD Protection – 3kV
- RoHS Compliant
- Halogen Free

### APPLICATIONS

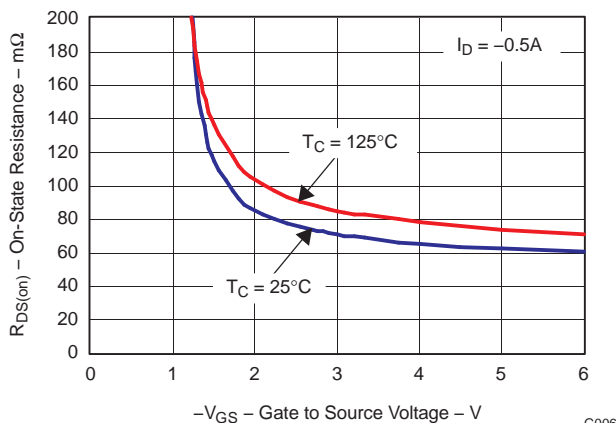
- Battery Management
- Load Switch
- Battery Protection

### DESCRIPTION

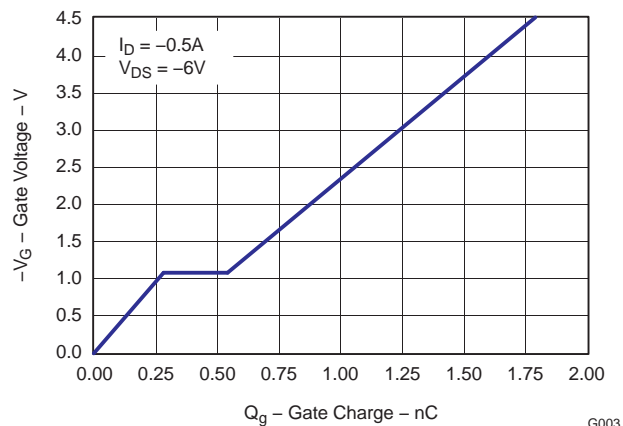
The device has been designed to deliver the lowest on resistance and gate charge in the smallest outline possible with excellent thermal characteristics in an ultra low profile.

**Top View**


P0097-01

**R<sub>DS(ON)</sub> vs V<sub>GS</sub>**


G006

**Gate Charge**


G003

### PRODUCT SUMMARY

V <sub>DS</sub>	Drain to Source Voltage	-12	V
Q <sub>g</sub>	Gate Charge Total (4.5V)	1.8	nC
Q <sub>gd</sub>	Gate Charge Gate to Drain	0.26	nC
R <sub>DS(on)</sub>	Drain to Source On Resistance	V <sub>GS</sub> = -1.5V	110 mΩ
		V <sub>GS</sub> = -2.5V	77 mΩ
		V <sub>GS</sub> = -4.5V	66 mΩ
V <sub>GS(th)</sub>	Threshold Voltage	-0.6	V

### ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD23201W10	1 x 1 Wafer Level Package	7-inch reel	3000	Tape and Reel

### ABSOLUTE MAXIMUM RATINGS

T <sub>A</sub> = 25°C unless otherwise stated		VALUE	UNIT
V <sub>DS</sub>	Drain to Source Voltage	-12	V
V <sub>GS</sub>	Gate to Source Voltage	-6	V
I <sub>D</sub>	Continuous Drain Current, T <sub>C</sub> = 25°C <sup>(1)</sup>	-2.2	A
I <sub>DM</sub>	Pulsed Drain Current, T <sub>A</sub> = 25°C <sup>(2)</sup>	-8.8	A
I <sub>G</sub>	Continuous Gate Clamp Current	-0.5	A
	Pulsed Gate Clamp Current	-7	A
P <sub>D</sub>	Power Dissipation <sup>(1)</sup>	1	W
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range	-55 to 150	°C

(1) R<sub>θJA</sub> = 100°C/W on 1in<sup>2</sup> Cu (2 oz.) on 0.060" thick FR4 PCB.

(2) Pulse width ≤300μs, duty cycle ≤2%



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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

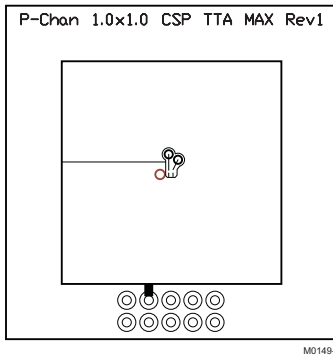
( $T_A = 25^\circ\text{C}$  unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain to Source Voltage	$V_{GS} = 0V, I_D = -250\mu A$	-12			V
$BV_{GSS}$	Gate to Source Voltage;	$V_{DS} = 0V, I_G = -250\mu A$	-6.1		-7.2	V
$I_{DSS}$	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = -9.6V$			-1	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = -6V$			-100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.4	-0.6	-1.0	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -1.5V, I_D = -0.5A$		110	138	m $\Omega$
		$V_{GS} = -2.5V, I_D = -0.5A$		77	96	m $\Omega$
		$V_{GS} = -4.5V, I_D = -0.5A$		66	82	m $\Omega$
$g_{fs}$	Transconductance	$V_{DS} = -6.0V, I_D = -0.5A$		9		S
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = -6.0V, f = 1MHz$		250	325	pF
$C_{OSS}$	Output Capacitance			125	155	pF
$C_{RSS}$	Reverse Transfer Capacitance			32	42	pF
$Q_g$	Gate Charge Total (-4.5V)			1.8	2.4	nC
$Q_{gd}$	Gate Charge Gate to Drain	$V_{DS} = -6.0V, I_D = -0.5A$		0.26		nC
$Q_{gs}$	Gate Charge Gate to Source			0.28		nC
$Q_{g(th)}$	Gate Charge at $V_{th}$			0.11		nC
$Q_{OSS}$	Output Charge	$V_{DS} = -6.0V, V_{GS} = 0V$		1.7		nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = -6.0V, V_{GS} = -2.5V, I_D = -0.5A$ $R_G = 20\Omega$		24		ns
$t_r$	Rise Time			19		ns
$t_{d(off)}$	Turn Off Delay Time			68		ns
$t_f$	Fall Time			29		ns
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$I_S = -0.5A, V_{GS} = 0V$	-0.77		-1.0	V
$Q_{rr}$	Reverse Recovery Charge	$V_{dd} = -4.0V, I_F = -0.5A, di/dt = 100A/\mu s$		2		nC
$t_{rr}$	Reverse Recovery Time	$V_{dd} = -4.0V, I_F = -0.5A, di/dt = 100A/\mu s$		9.5		ns

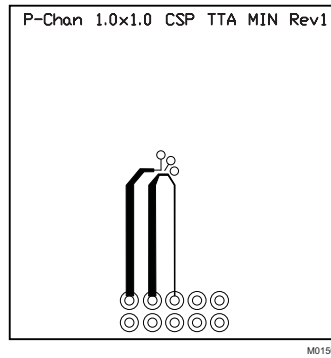
## THERMAL CHARACTERISTICS

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

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Ambient (Minimum Cu area)			245	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (1 in <sup>2</sup> Cu area)			125	$^\circ\text{C}/\text{W}$



Max  $R_{\theta JA} = 125^{\circ}\text{C/W}$   
when mounted on  
1inch<sup>2</sup> of 2 oz. Cu.



Max  $R_{\theta JA} = 245^{\circ}\text{C/W}$   
when mounted on  
minimum pad area of 2  
oz. Cu.

### TYPICAL MOSFET CHARACTERISTICS

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

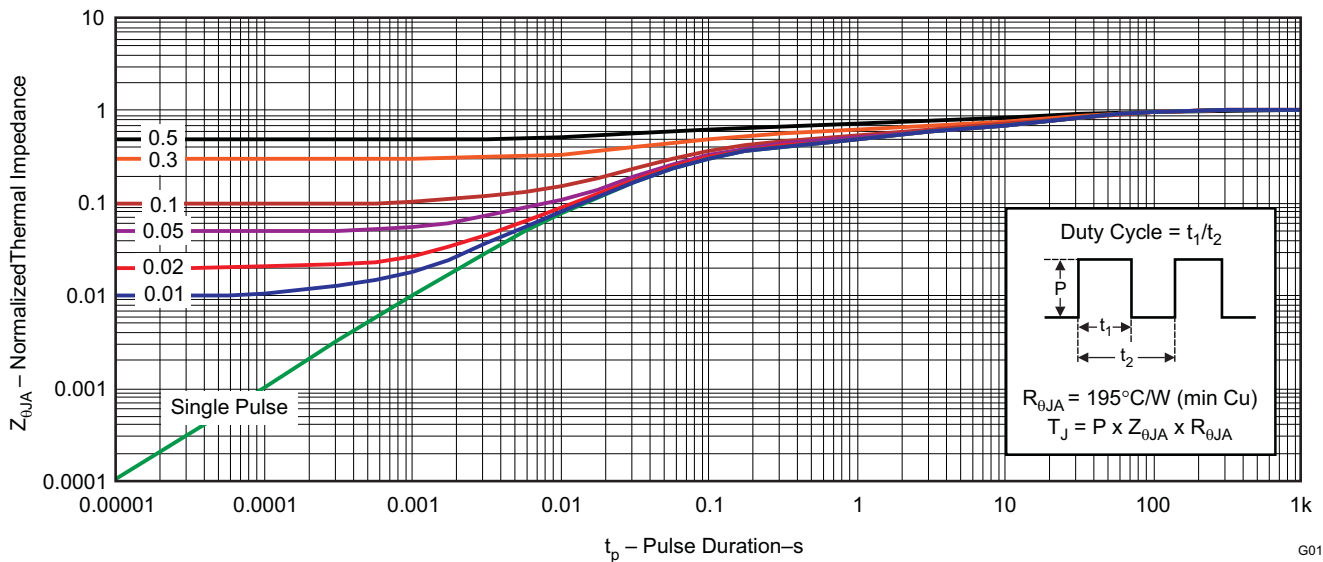
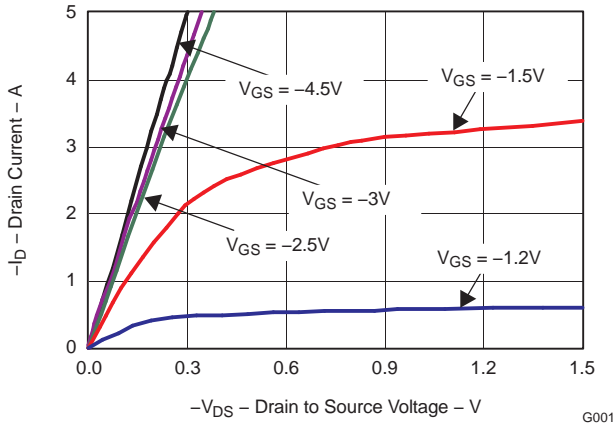


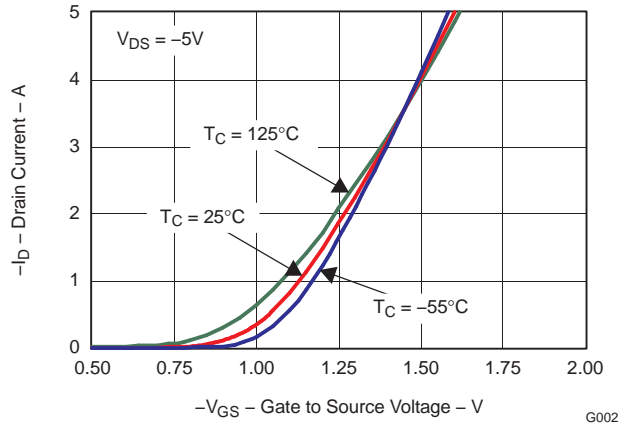
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

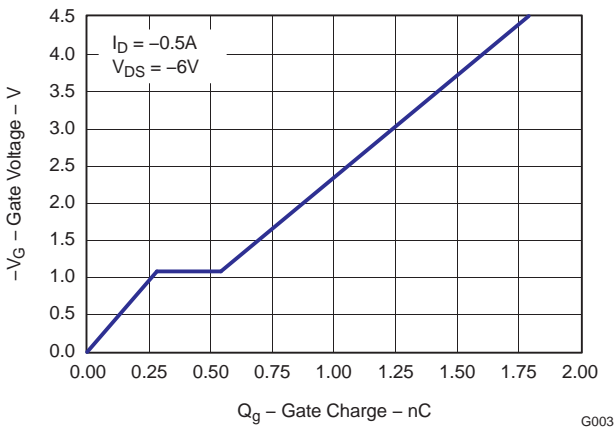
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



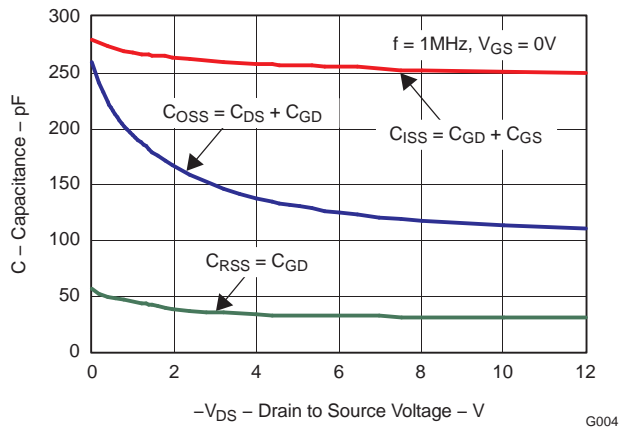
**Figure 2. Saturation Characteristics**



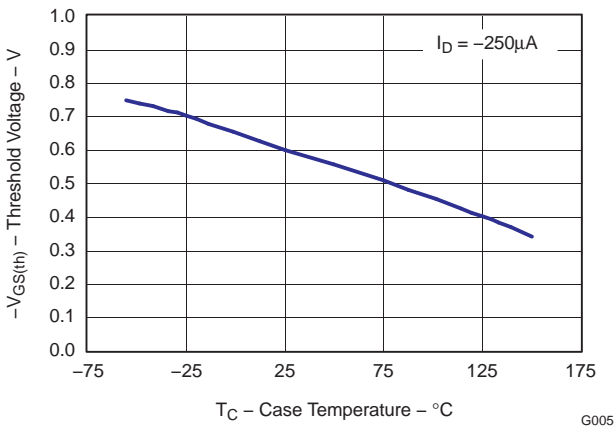
**Figure 3. Transfer Characteristics**



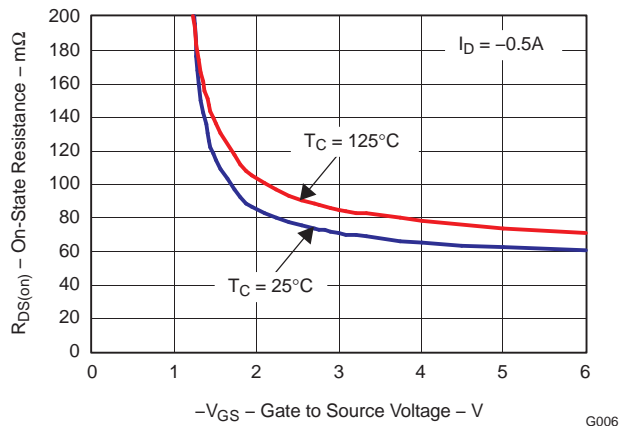
**Figure 4. Gate Charge**



**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)

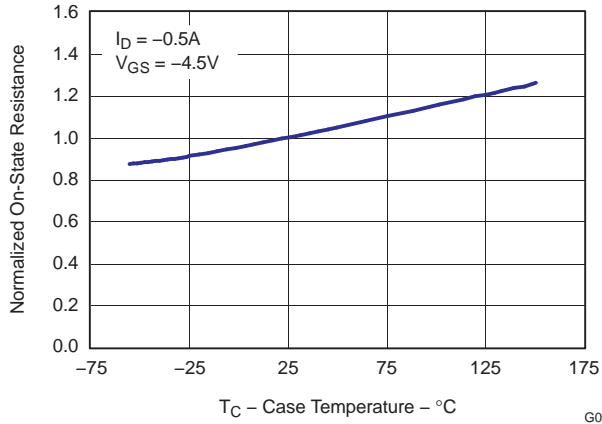


Figure 8. On Resistance vs. Temperature

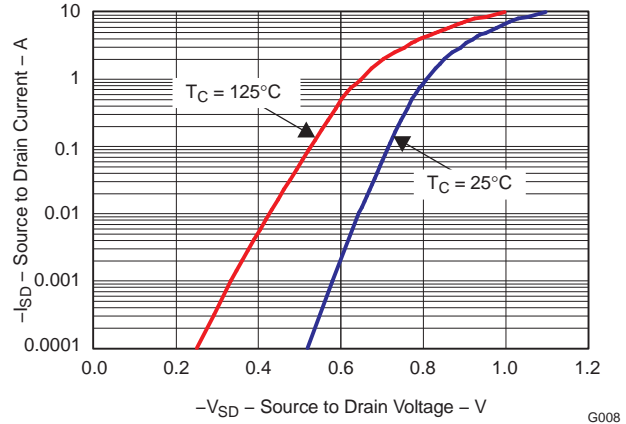


Figure 9. Typical Diode Forward Voltage

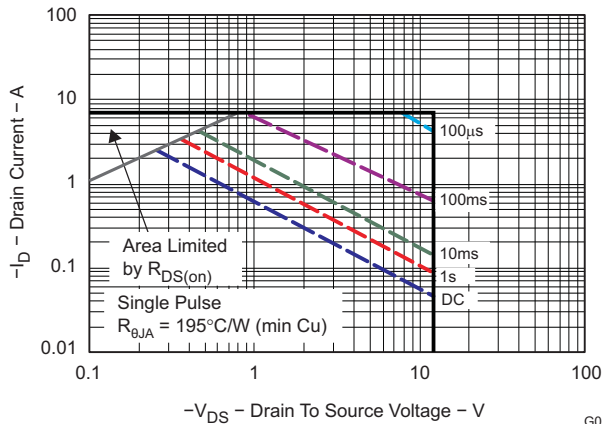


Figure 10. Maximum Safe Operating Area

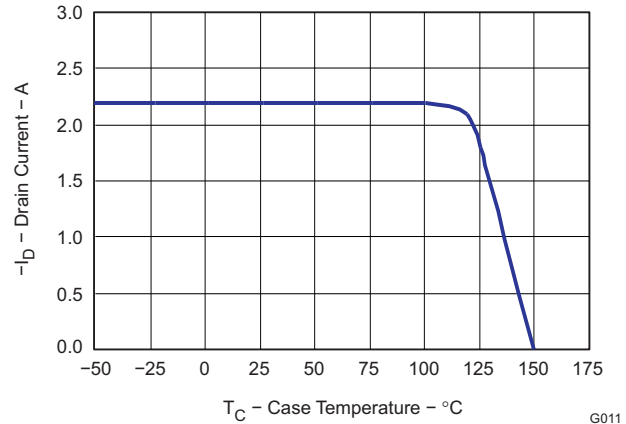
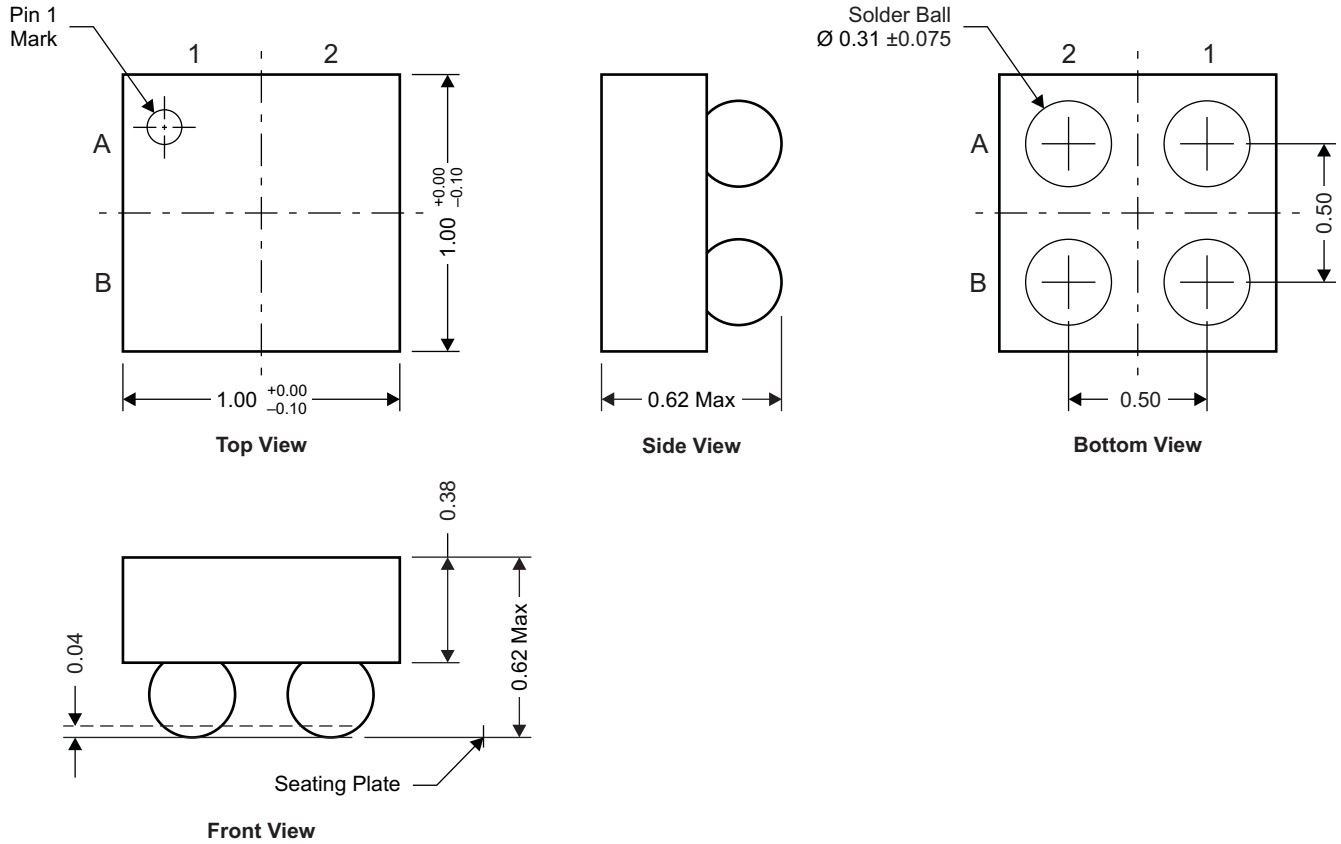


Figure 11. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

**CSD23201W10 Package Dimensions**



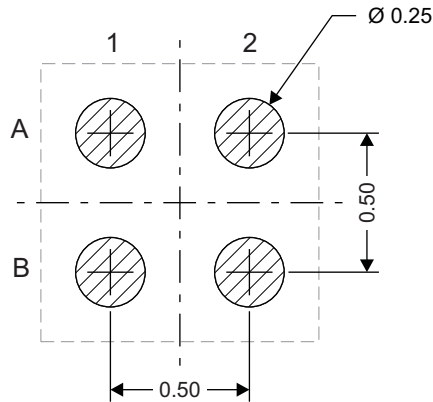
M0151-01

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

**Pin Configuration Table**

POSITION	DESIGNATION
B1	Source
A1	Gate
A2, B2	Drain

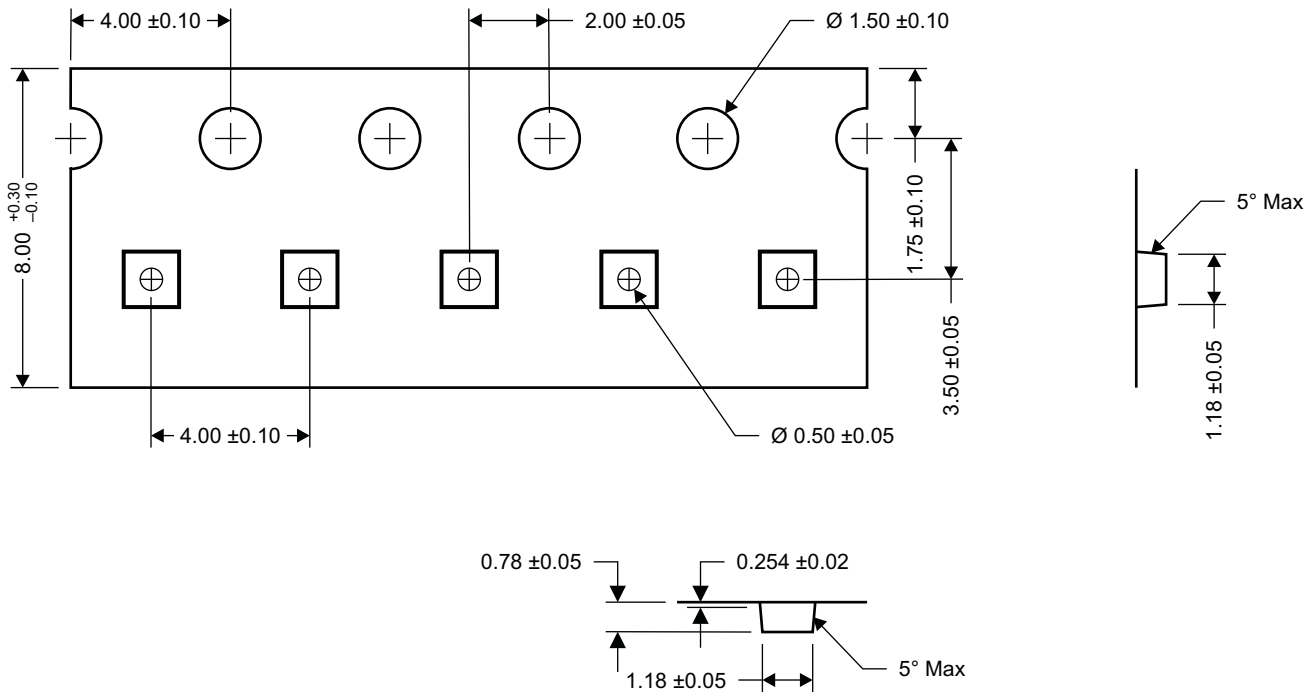
**Land Pattern Recommendation**



M0152-01

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

**Tape and Reel Information**



M0153-01

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

**REVISION HISTORY**

Changes from Original (August 2009) to Revision A	Page
Deleted the Package Marking Information section .....	7

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