

## Dual P-Channel NexFET™ Power MOSFET

 Check for Samples: [CSD75204W15](#)

### FEATURES

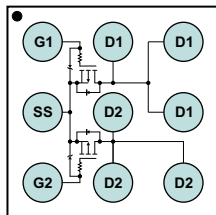
- Dual P-Ch MOSFETs
- Common Source Configuration
- Small Footprint 1.5-mm × 1.5-mm
- Gate-Source Voltage Clamp
- Gate ESD Protection –3kV
- Pb Free
- RoHS Compliant
- Halogen Free

### APPLICATIONS

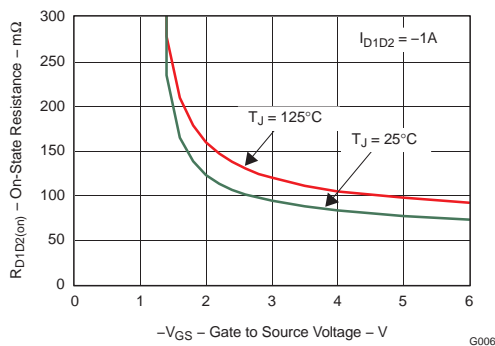
- Battery Management
- Battery Protection

### DESCRIPTION

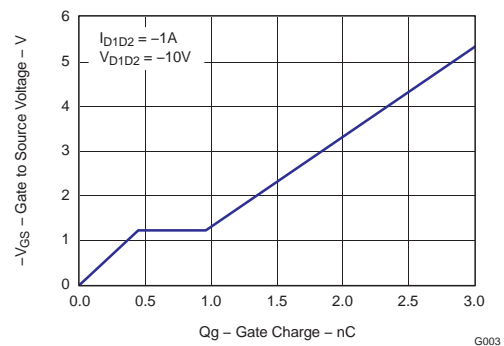
The device has been designed to deliver the lowest on resistance and gate charge in the smallest outline possible with excellent thermal characteristics in an ultra low profile. Low on resistance coupled with the small footprint and low profile make the device ideal for battery operated space constrained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

**Top View**


P0109-01

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


G006

**Gate Charge (Per MOSFET)**


G003

### PRODUCT SUMMARY

|                |                              |                  |        |
|----------------|------------------------------|------------------|--------|
| $V_{D1D2}$     | Drain to Drain Voltage       | -20              | V      |
| $Q_g$          | Gate Charge Total (-4.5V)    | 2.8              | nC     |
| $Q_{gd}$       | Gate Charge Gate to Drain    | 0.6              | nC     |
| $R_{D1D2(on)}$ | Drain to Drain On Resistance | $V_{GS} = -1.8V$ | 140 mΩ |
|                |                              | $V_{GS} = -2.5V$ | 105 mΩ |
|                |                              | $V_{GS} = -4.5V$ | 80 mΩ  |
| $V_{GS(th)}$   | Threshold Voltage            | -0.7             | V      |

### ORDERING INFORMATION

| Device      | Package                             | Media       | Qty  | Ship          |
|-------------|-------------------------------------|-------------|------|---------------|
| CSD75204W15 | 1.5-mm × 1.5-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             |
|--|---|------------|------------------|
| $V_{D1D2}$                                       | Drain to Drain Voltage  | -20        | V                |
| $V_{GS}$   | Gate to Source Voltage  | -6         | V                |
| $I_{D1D2}$                                       | Continuous Drain to Drain Current, $T_C = 25^\circ\text{C}^{(1)}$ | -3         | A                |
|  | Pulsed Drain to Drain Current, $T_C = 25^\circ\text{C}^{(2)}$     | -28        | A                |
| $I_S$  | Continuous Source Pin Current                                     | -1.2       | A                |
|  | Pulsed Source Pin Current <sup>(2)</sup>                          | -15        | A                |
| $I_G$  | Continuous Gate Clamp Current                                     | -0.5       | A                |
|  | Pulsed Gate Clamp Current <sup>(2)</sup>                          | -7         | A                |
| $P_D$  | Power Dissipation <sup>(1)</sup>                                  | 0.7        | W                |
| $T_J, T_{STG}$                                   | Operating Junction and Storage Temperature Range                  | -55 to 150 | $^\circ\text{C}$ |

- (1) Per device, both sides in conduction
- (2) Pulse duration 10μs, 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). Specifications and graphs are Per MOSFET unless otherwise stated. Drain to Drain measurements are done with both MOSFETs in series (common source configuration).

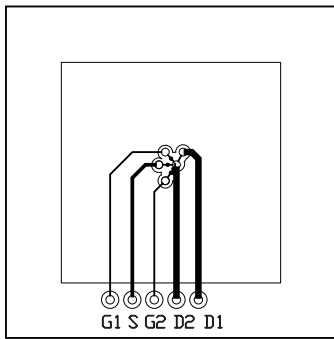
| PARAMETER                      |                                  | TEST CONDITIONS  | MIN  | TYP  | MAX  | UNIT       |
|--------------------------------|----------------------------------|--|------|------|------|------------|
| <b>Static Characteristics</b>  |                                  |  |      |      |      |            |
| $BV_{D1D2}$                    | Drain to Drain Voltage           | $V_{GS} = 0V, I_{D1D2} = -250\mu A$                                    | -20  |      |      | V          |
| $BV_{GSS}$                     | Gate to Source Voltage           | $V_{D1D2} = 0V, I_G = -250\mu A$                                       | -6.1 |      | -7.2 | V          |
| $I_{DDs}$                      | Drain to Drain Leakage Current   | $V_{GS} = 0V, V_{D1D2} = -16V$   |      |      | -1   | $\mu A$    |
| $I_{GSS}$                      | Gate to Source Leakage Current   | $V_{D1D2} = 0V, V_{GS} = -6V$  |      |      | -100 | nA         |
| $V_{GS(th)}$                   | Gate to Source Threshold Voltage | $V_{D1D2} = V_{GS}, I_{DS} = -250\mu A$                                | -0.5 | -0.7 | -0.9 | V          |
| $R_{D1D2(on)}$                 | Drain to Drain On Resistance     | $V_{GS} = -1.8V, I_{D1D2} = -1A$                                       |      | 140  | 175  | m $\Omega$ |
|                                |                                  | $V_{GS} = -2.5V, I_{D1D2} = -1A$                                       |      | 105  | 130  | m $\Omega$ |
|                                |                                  | $V_{GS} = -4.5V, I_{D1D2} = -1A$                                       |      | 80   | 100  | m $\Omega$ |
| $g_{fs}$                       | Transconductance                 | $V_{D1D2} = -10V, I_{D1D2} = -1A$                                      |      | 5.3  |      | S          |
| <b>Dynamic Characteristics</b> |                                  |  |      |      |      |            |
| $C_{ISS}$                      | Input Capacitance                | $V_{GS} = 0V, V_{D1D2} = -10V,$<br>$f = 1MHz$                          |      | 315  | 410  | pF         |
| $C_{OSS}$                      | Output Capacitance               |  |      | 128  | 165  | pF         |
| $C_{RSS}$                      | Reverse Transfer Capacitance     |  |      | 43   | 55   | pF         |
| $Q_g$                          | Gate Charge Total (-4.5V)        |  |      | 2.8  | 3.9  | nC         |
| $Q_{gd}$                       | Gate Charge - Gate to Drain      | $V_{D1D2} = -10V,$<br>$I_{D1D2} = -1A$                                 |      | 0.6  |      | nC         |
| $Q_{gs}$                       | Gate Charge - Gate to Source     |  |      | 0.5  |      | nC         |
| $Q_{g(th)}$                    | Gate Charge at $V_{th}$          |  |      | 0.2  |      | nC         |
| $Q_{OSS}$                      | Output Charge                    | $V_{D1D2} = -9.5V, V_{GS} = 0V$  |      | 2.2  |      | nC         |
| $t_{d(on)}$                    | Turn On Delay Time               | $V_{D1D2} = -10V, V_{GS} = -4.5V,$<br>$I_{D1D2} = -1A, R_G = 30\Omega$ |      | 7.8  |      | ns         |
| $t_r$                          | Rise Time                        |  |      | 6.7  |      | ns         |
| $t_{d(off)}$                   | Turn Off Delay Time              |  |      | 45   |      | ns         |
| $t_f$                          | Fall Time                        |  |      | 26   |      | ns         |
| <b>Diode Characteristics</b>   |                                  |  |      |      |      |            |
| $V_{SD}$                       | Diode Forward Voltage            | $I_{D1D2} = -1A, V_{GS} = 0V$  |      | 0.75 | 1    | V          |
| $Q_{rr}$                       | Reverse Recovery Charge          | $V_{dd} = -9.5V, I_F = -1A, di/dt = 200A/\mu s$                        |      | 10.5 |      | nC         |
| $t_{rr}$                       | Reverse Recovery Time            | $V_{dd} = -9.5V, I_F = -1A, di/dt = 200A/\mu s$                        |      | 23   |      | ns         |

## THERMAL CHARACTERISTICS

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

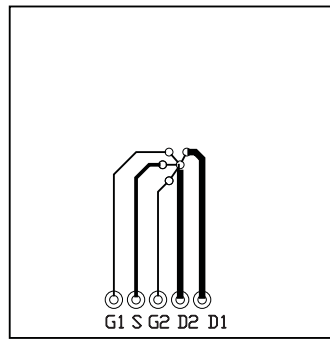
| PARAMETER       |  | MIN | TYP | MAX | UNIT                      |
|-----------------|--|-----|-----|-----|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient <sup>(1)</sup> <sup>(2)</sup> |     |     | 200 | $^\circ\text{C}/\text{W}$ |
|                 | Thermal Resistance Junction to Ambient <sup>(3)</sup> <sup>(2)</sup> |     |     | 94  | $^\circ\text{C}/\text{W}$ |

- (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-inch<sup>2</sup> of Cu (2oz).



M0169-01

Max  $R_{\theta JA} = 94^{\circ}\text{C/W}$   
when mounted on  
1 inch<sup>2</sup> (6.45 cm<sup>2</sup>) of  
2-oz. (0.071-mm thick)  
Cu.

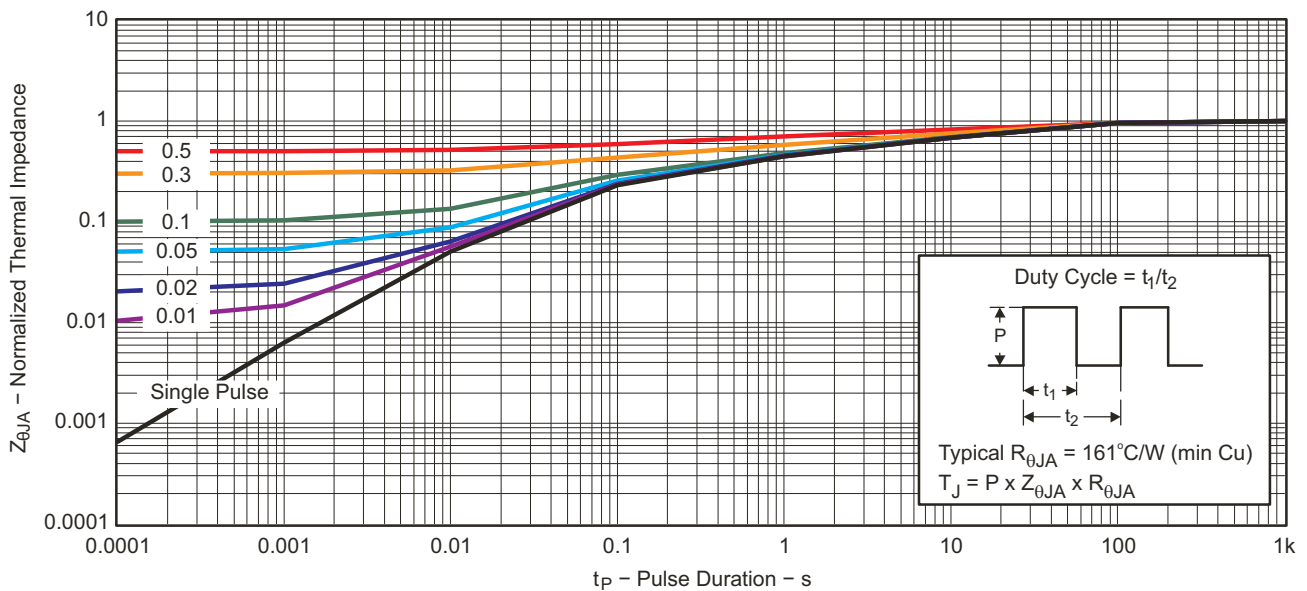


M0170-01

Max  $R_{\theta JA} = 200^{\circ}\text{C/W}$   
when mounted on  
minimum pad area of  
2-oz. (0.071-mm thick)  
Cu.

### TYPICAL MOSFET CHARACTERISTICS

Graphs are Per MOSFET at  $T_A = 25^{\circ}\text{C}$ , unless stated otherwise. Drain to Drain measurements are done with both MOSFETs in series (common source configuration).

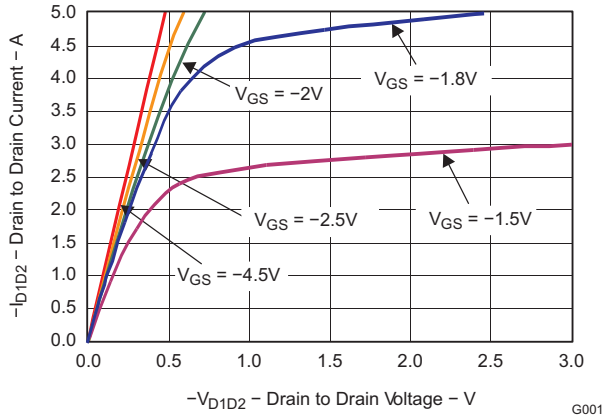


G012

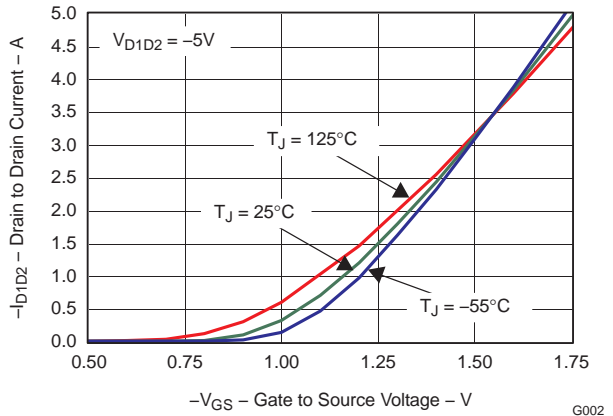
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

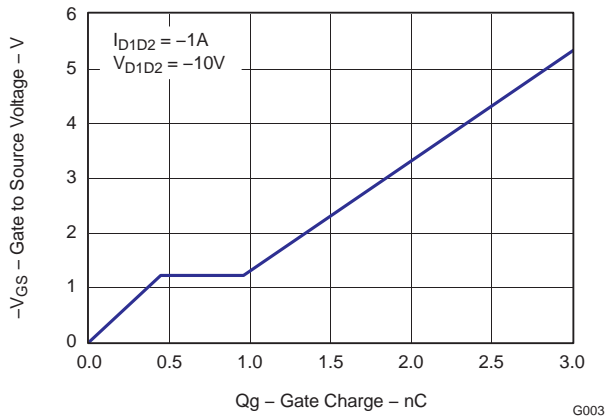
Graphs are Per MOSFET at  $T_A = 25^\circ\text{C}$ , unless stated otherwise. Drain to Drain measurements are done with both MOSFETs in series (common source configuration).



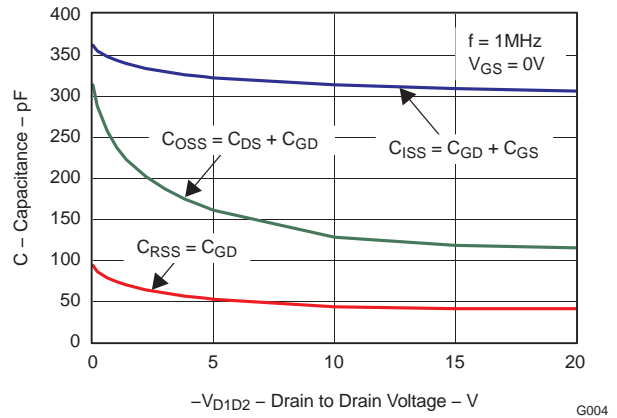
**Figure 2. Saturation Characteristics**



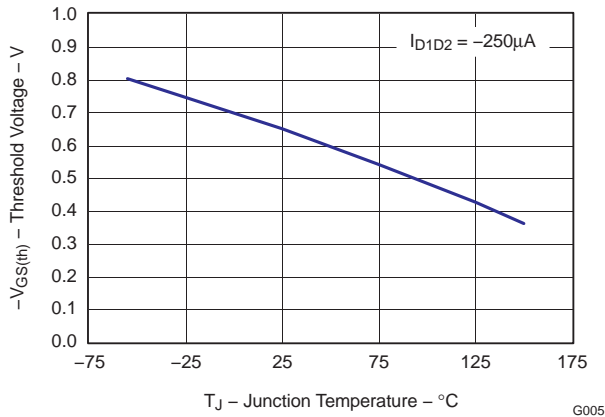
**Figure 3. Transfer Characteristics**



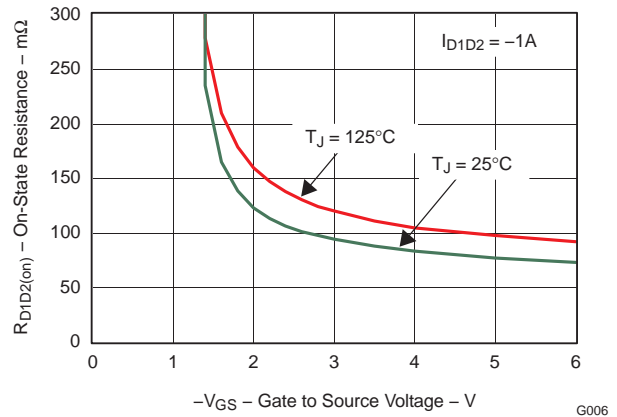
**Figure 4. Gate Charge**



**Figure 5. Capacitance**



**Figure 6. Threshold Voltage vs. Temperature**



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

**TYPICAL MOSFET CHARACTERISTICS (continued)**

Graphs are Per MOSFET at  $T_A = 25^\circ\text{C}$ , unless stated otherwise. Drain to Drain measurements are done with both MOSFETs in series (common source configuration).

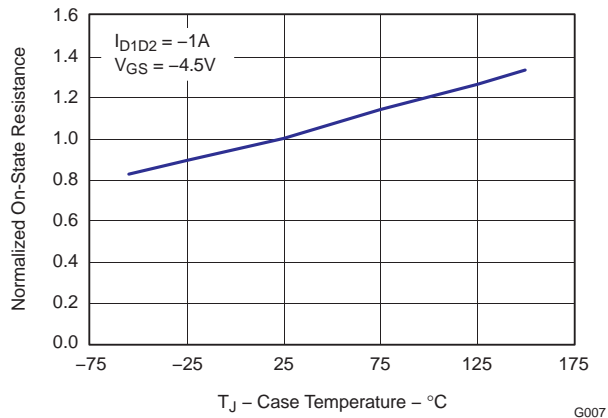


Figure 8. Normalized On-State Resistance vs. Temperature

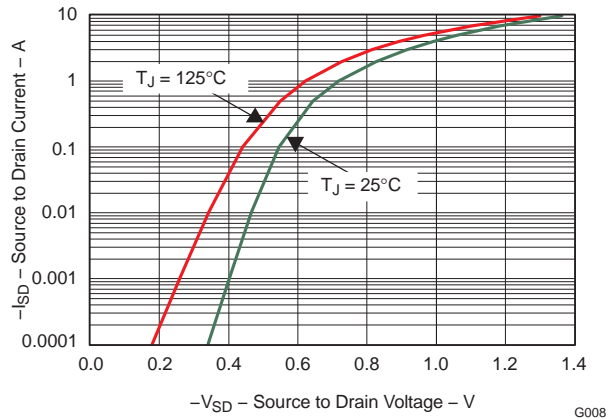


Figure 9. Typical Diode Forward Voltage

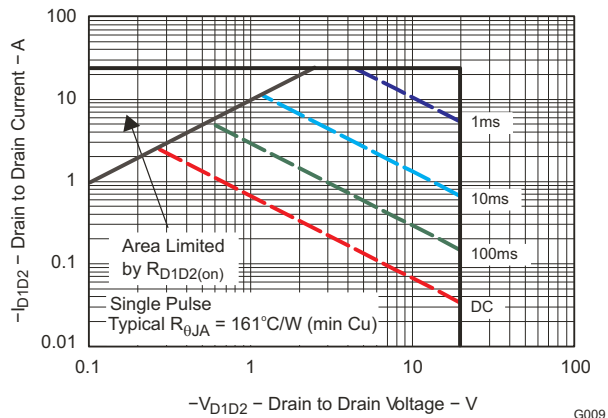


Figure 10. Maximum Safe Operating Area

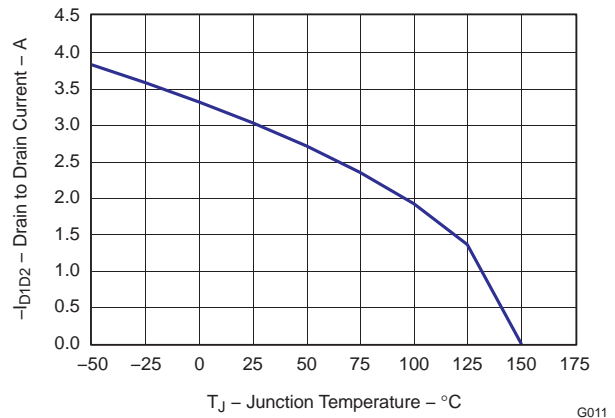
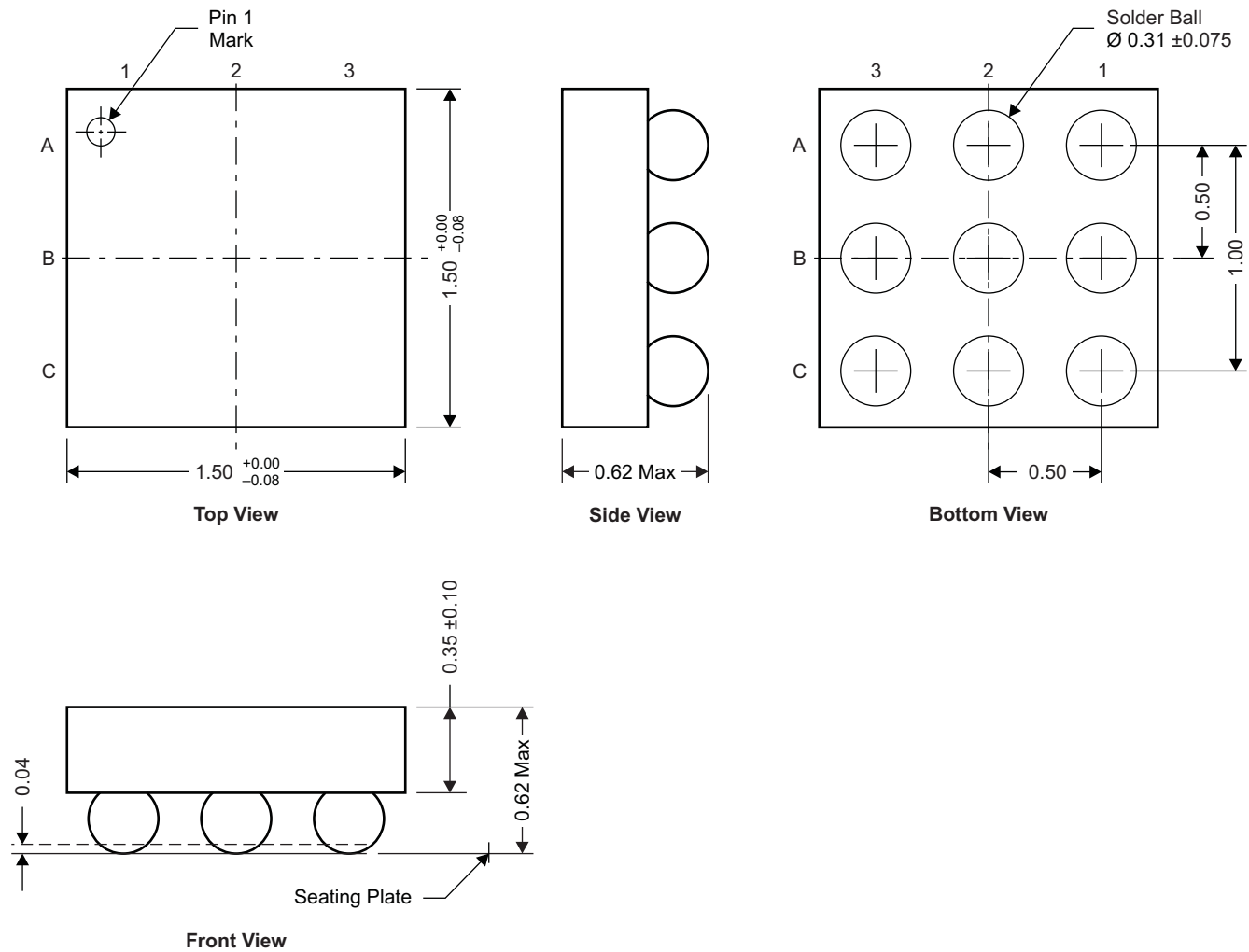


Figure 11. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

**CSD75204W15 Package Dimensions**



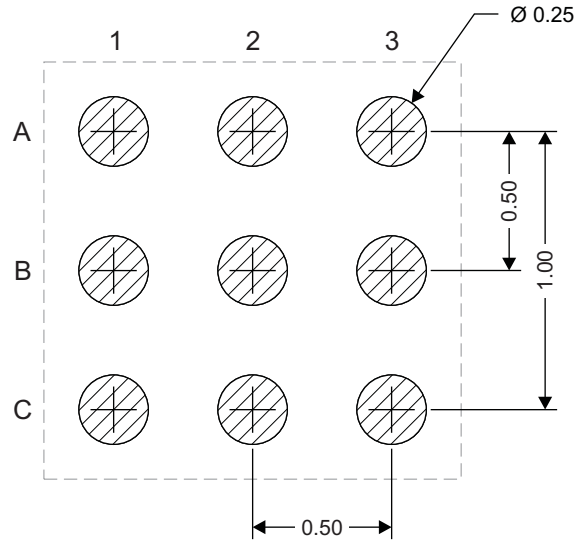
M0171-01

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

**Pinout**

| POSITION   | DESIGNATION  |
|------------|--------------|
| A1         | Gate1        |
| A2, A3, B3 | Drain1       |
| C1         | Gate2        |
| C2, C3, B2 | Drain2       |
| B1         | Source Sense |

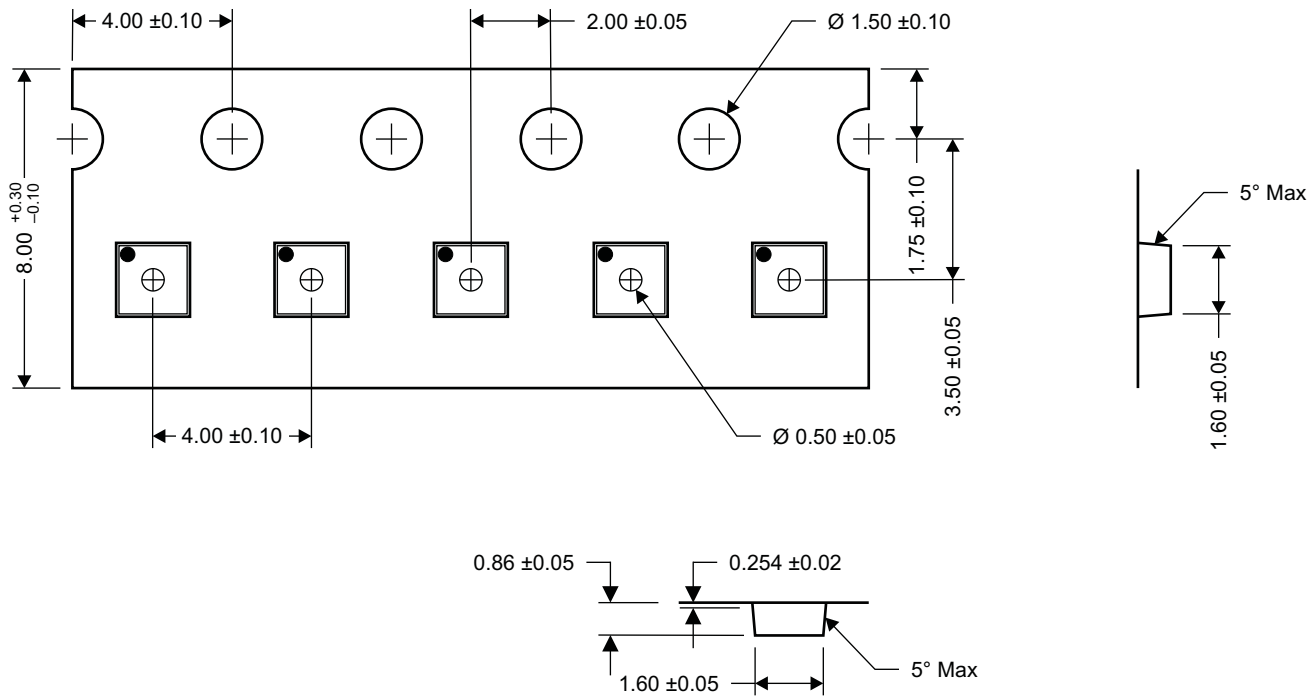
**Land Pattern Recommendation**



M0172-01

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

**Tape and Reel Information**



M0173-01

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

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## REVISION HISTORY

| Changes from Original (October 2009) to Revision A      | Page              |
|---|-------------------|
| • Deleted the Package Marking Information section ..... | <a href="#">7</a> |

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|                               |  |
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