

## P-Channel NexFET™ Power MOSFET

Check for Samples: [CSD75301W1015](#)

### FEATURES

- Dual P-Ch MOSFETs
- Common Source Configuration
- Small Footprint 1mm × 1.5mm
- Low Profile – 0.62mm
- Ultra Low Qg and Qgd
- Pb Free / RoHS Compliant
- Halogen Free

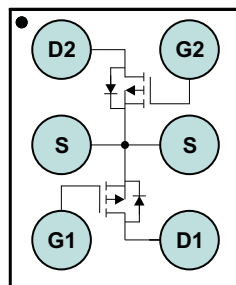
### APPLICATIONS

- 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.

Figure 1. Top View



### PRODUCT SUMMARY

| (Per MOSFET unless otherwise stated) |                               |                  |        |
|--------------------------------------|-------------------------------|------------------|--------|
| $V_{DS}$                             | Drain to Source Voltage       | -20              | V      |
| $Q_g$                                | Gate Charge Total (4.5V)      | 1.5              | nC     |
| $Q_{gd}$                             | Gate Charge Gate to Drain     | 0.3              | nC     |
| $R_{DS(on)}$                         | Drain to Source On Resistance | $V_{GS} = -1.8V$ | 150 mΩ |
|                                      |                               | $V_{GS} = -2.5V$ | 105 mΩ |
|                                      |                               | $V_{GS} = -4.5V$ | 80 mΩ  |
| $V_{GS(th)}$                         | Voltage threshold             | -0.7             | V      |

### ORDERING INFORMATION

| Device        | Package                     | Media       | Qty  | Ship          |
|---------------|-----------------------------|-------------|------|---------------|
| CSD75301W1015 | 1 × 1.5 Wafer Level Package | 7-inch reel | 3000 | Tape and Reel |

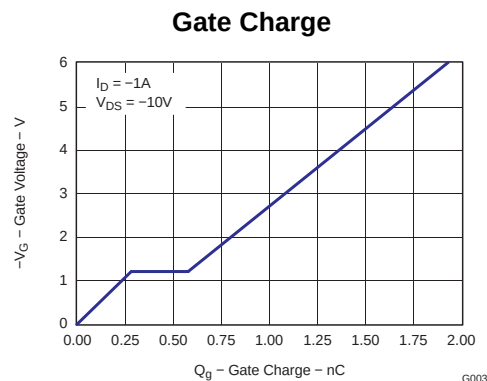
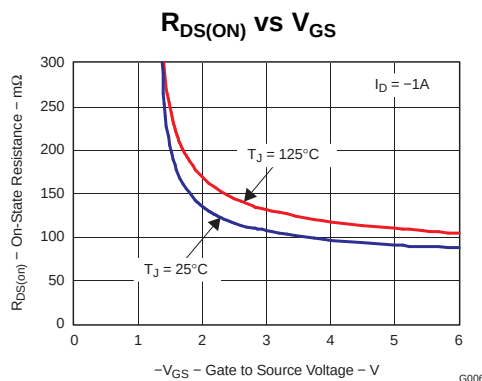
### ABSOLUTE MAXIMUM RATINGS

| $T_A = 25^\circ\text{C}$ unless otherwise stated |                                                              | VALUE      | UNIT |
|--------------------------------------------------|--------------------------------------------------------------|------------|------|
| $V_{DS}$                                         | Drain to Source Voltage                                      | -20        | V    |
| $V_{GS}$                                         | Gate to Source Voltage                                       | ±8         | V    |
| $I_D$                                            | Continuous Drain Current, $T_C = 25^\circ\text{C}^{(1) (2)}$ | -1.2       | A    |
| $I_{DM}$                                         | Pulsed Drain Current, $T_A = 25^\circ\text{C}^{(1) (2) (3)}$ | -17.5      | A    |
| $P_D$                                            | Power Dissipation <sup>(1) (2)</sup>                         | 0.8        | W    |
| $T_J$ ,<br>$T_{STG}$                             | Operating Junction and Storage Temperature Range             | -55 to 150 | °C   |

(1) Per device, both devices in conduction.

(2)  $R_{\theta JA} = 74^\circ\text{C/W}$  on 1in<sup>2</sup> Cu (2 oz.) on 0.060" thick FR4 PCB.

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



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## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise stated) (Per MOSFET unless otherwise stated)

| PARAMETER               |                                  | TEST CONDITIONS                                                                               | MIN   | TYP  | MAX  | UNIT |
|-------------------------|----------------------------------|-----------------------------------------------------------------------------------------------|-------|------|------|------|
| Static Characteristics  |                                  |                                                                                               |       |      |      |      |
| BV <sub>DSS</sub>       | Drain to Source Voltage          | V <sub>GS</sub> = 0V, I <sub>D</sub> = −250μA                                                 | −20   |      |      | V    |
| I <sub>DSS</sub>        | Drain to Source Leakage Current  | V <sub>GS</sub> = 0V, V <sub>DS</sub> = −16V                                                  |       |      | −1   | μA   |
| I <sub>GSS</sub>        | Gate to Source Leakage Current   | V <sub>DS</sub> = 0V, V <sub>GS</sub> = −8V                                                   |       |      | −100 | nA   |
| V <sub>GS(th)</sub>     | Gate to Source Threshold Voltage | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = −250μA                                   | −0.4  | −0.7 | −1.0 | V    |
| R <sub>DS(on)</sub>     | Drain to Source On Resistance    | V <sub>GS</sub> = −1.8V, I <sub>D</sub> = −1A                                                 |       | 150  | 190  | mΩ   |
|                         |                                  | V <sub>GS</sub> = −2.5V, I <sub>D</sub> = −1A                                                 |       | 105  | 135  | mΩ   |
|                         |                                  | V <sub>GS</sub> = −4.5V, I <sub>D</sub> = −1A                                                 |       | 80   | 100  | mΩ   |
|                         |                                  |                                                                                               |       |      |      |      |
| g <sub>fs</sub>         | Transconductance                 | V <sub>DS</sub> = −10V, I <sub>D</sub> = −1A                                                  |       | 5.2  |      | S    |
| Dynamic Characteristics |                                  |                                                                                               |       |      |      |      |
| C <sub>ISS</sub>        | Input Capacitance                | V <sub>GS</sub> = 0V, V <sub>DS</sub> = −10V, f = 1MHz                                        |       | 150  | 195  | pF   |
| C <sub>OSS</sub>        | Output Capacitance               |                                                                                               |       | 67   | 87   | pF   |
| C <sub>RSS</sub>        | Reverse Transfer Capacitance     |                                                                                               |       | 24   | 31   | pF   |
| Q <sub>g</sub>          | Gate Charge Total (−4.5V)        | V <sub>DS</sub> = −10V, I <sub>D</sub> = −1A                                                  |       | 1.5  | 2.1  | nC   |
| Q <sub>gd</sub>         | Gate Charge Gate to Drain        |                                                                                               |       | 0.3  |      | nC   |
| Q <sub>gs</sub>         | Gate Charge Gate to Source       |                                                                                               |       | 0.28 |      | nC   |
| Q <sub>g(th)</sub>      | Gate Charge at V <sub>th</sub>   |                                                                                               |       | 0.12 |      | nC   |
| Q <sub>OSS</sub>        | Output Charge                    | V <sub>DS</sub> = −9.5V, V <sub>GS</sub> = 0V                                                 |       | 1.1  |      | nC   |
| t <sub>d(on)</sub>      | Turn On Delay Time               | V <sub>DS</sub> = −10V, V <sub>GS</sub> = −4.5V, I <sub>D</sub> = −1A<br>R <sub>G</sub> = 30Ω |       | 3    |      | ns   |
| t <sub>r</sub>          | Rise Time                        |                                                                                               |       | 1.7  |      | ns   |
| t <sub>d(off)</sub>     | Turn Off Delay Time              |                                                                                               |       | 38   |      | ns   |
| t <sub>f</sub>          | Fall Time                        |                                                                                               |       | 16   |      | ns   |
| Diode Characteristics   |                                  |                                                                                               |       |      |      |      |
| V <sub>SD</sub>         | Diode Forward Voltage            | I <sub>S</sub> = −1A, V <sub>GS</sub> = 0V                                                    | −0.81 |      | −1   | V    |
| Q <sub>rr</sub>         | Reverse Recovery Charge          | V <sub>dd</sub> = −9.5V, I <sub>F</sub> = −1A, di/dt = 200A/μs                                |       | 2    |      | nC   |
| t <sub>rr</sub>         | Reverse Recovery Time            | V <sub>dd</sub> = −9.5V, I <sub>F</sub> = −1A, di/dt = 200A/μs                                |       | 7.5  |      | ns   |

## THERMAL CHARACTERISTICS

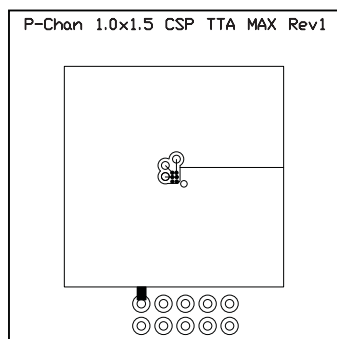
(T<sub>A</sub> = 25°C unless otherwise stated)

| PARAMETER        |                                                           | MIN | TYP | MAX | UNIT |
|------------------|-----------------------------------------------------------|-----|-----|-----|------|
| R <sub>θJC</sub> | Thermal Resistance Junction to Ambient <sup>(1) (2)</sup> |     |     | 136 | °C/W |
| R <sub>θJA</sub> | Thermal Resistance Junction to Ambient <sup>(2) (3)</sup> |     |     | 93  | °C/W |

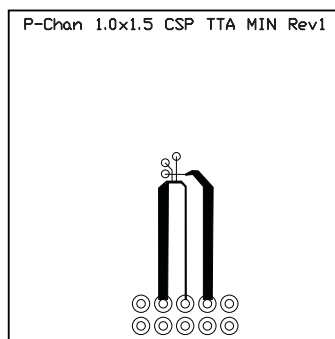
(1) Device mounted on FR4 material with Minimum Cu mounting area.

(2) Measured with both devices biased in a parallel condition.

(3) Device mounted on FR4 material with 1in<sup>2</sup> of 2 oz Cu.



Max  $R_{\theta JA} = 93^{\circ}\text{C/W}$   
when mounted on  
1inch<sup>2</sup> of 2 oz. Cu.



Max  $R_{\theta JA} = 136^{\circ}\text{C/W}$   
when mounted on  
minimum pad area of 2  
oz. Cu.

## TYPICAL MOSFET CHARACTERISTICS

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

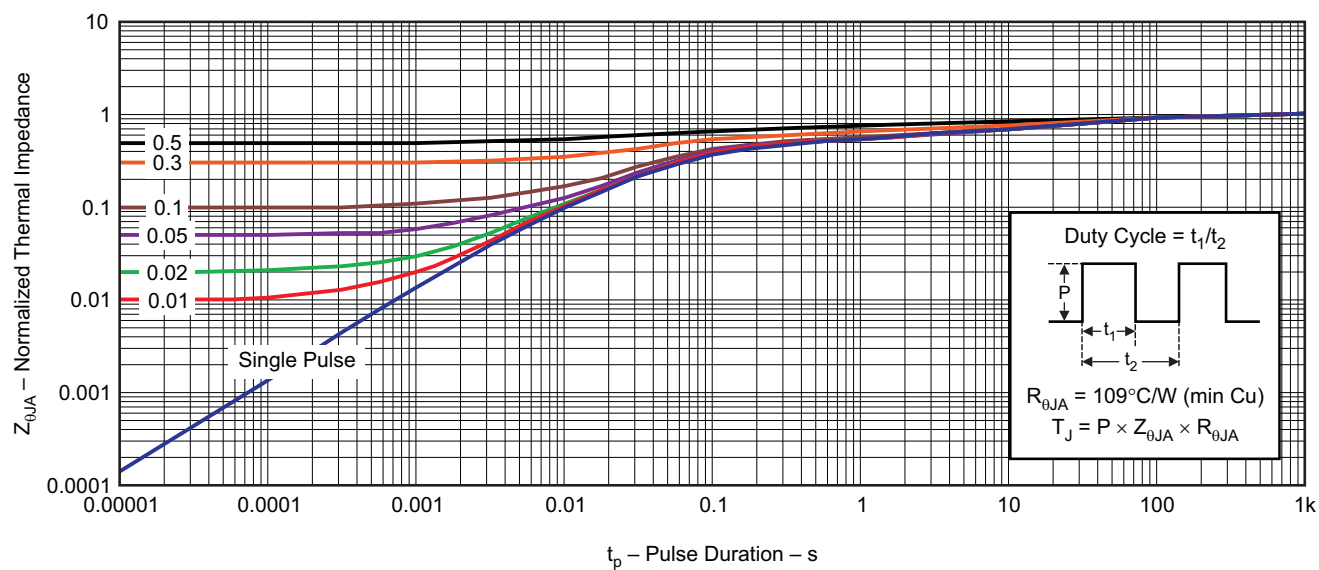
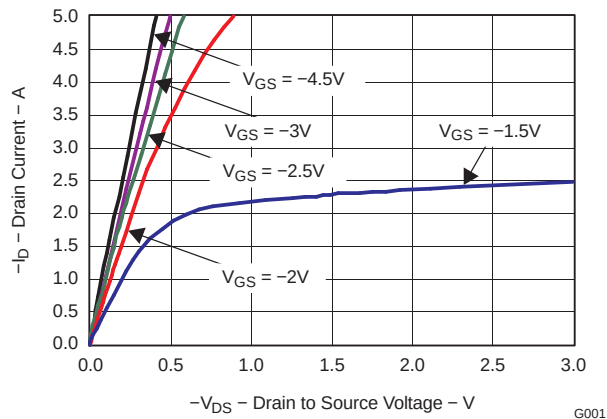


Figure 2. Transient Thermal Impedance

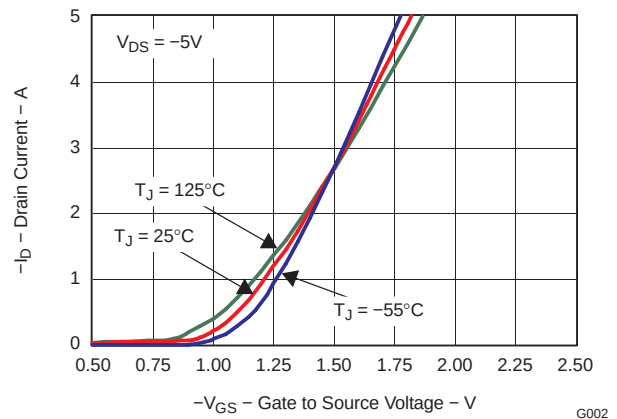
G012

## TYPICAL MOSFET CHARACTERISTICS (continued)

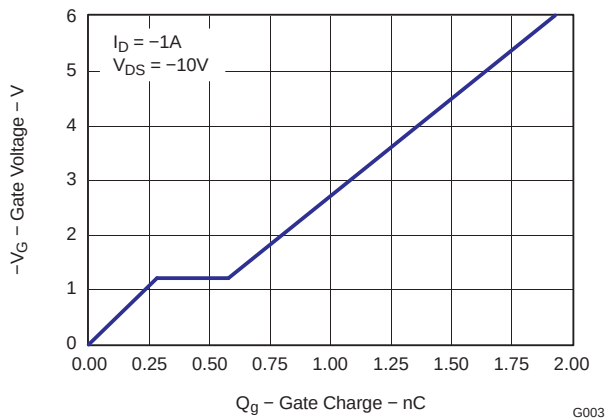
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



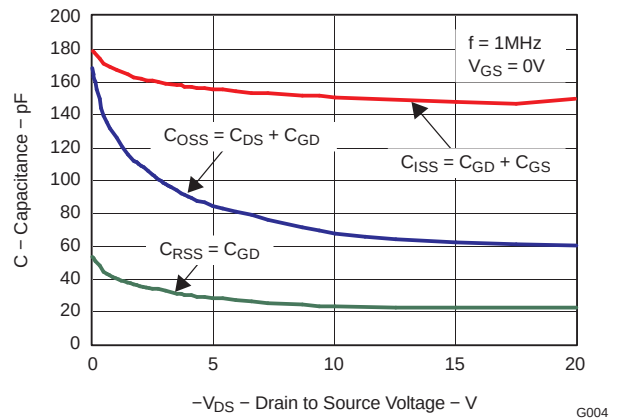
**Figure 3. Saturation Characteristics**



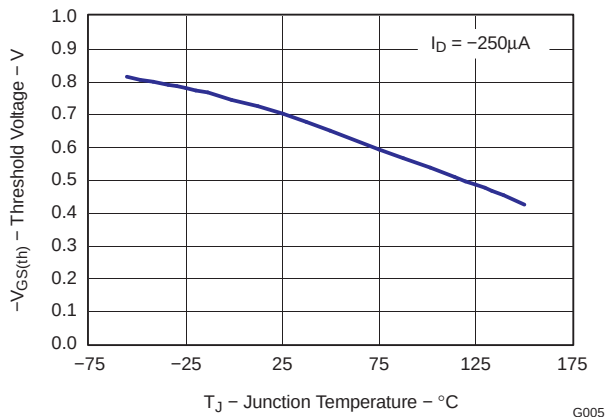
**Figure 4. Transfer Characteristics**



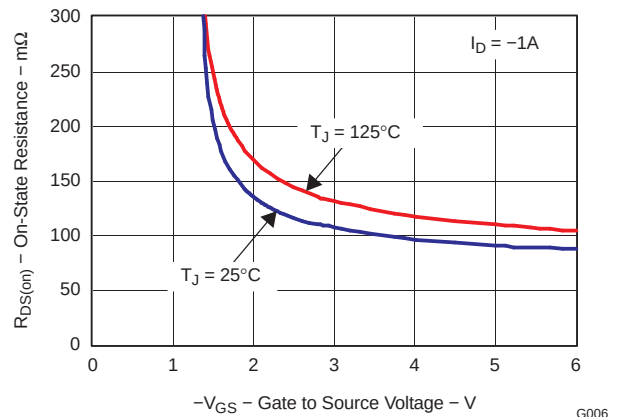
**Figure 5. Gate Charge**



**Figure 6. Capacitance**



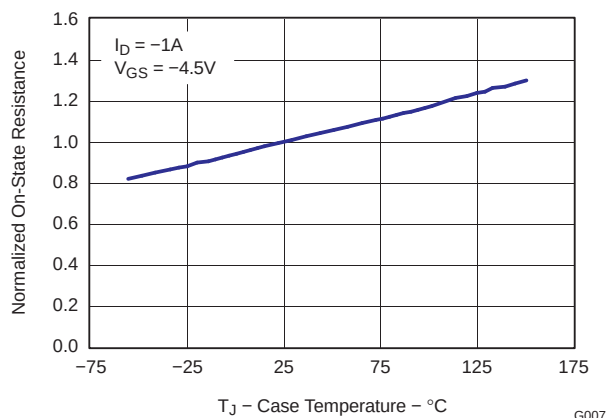
**Figure 7. Threshold Voltage vs. Temperature**



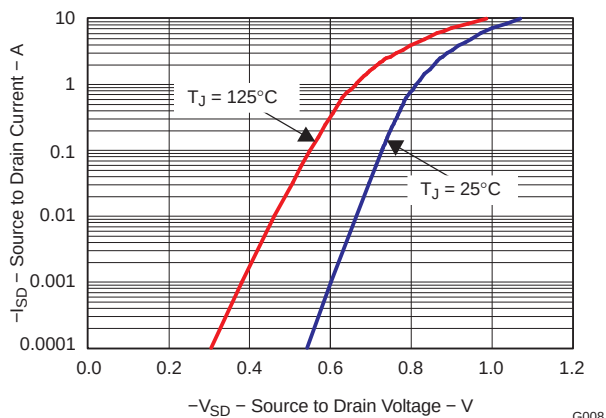
**Figure 8. On Resistance vs. Gate Voltage**

## TYPICAL MOSFET CHARACTERISTICS (continued)

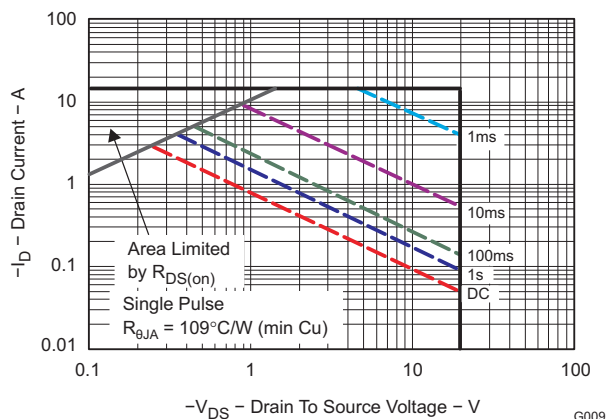
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



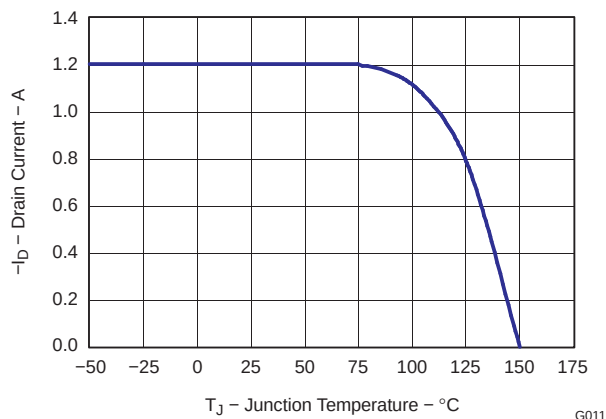
**Figure 9. On Resistance vs. Temperature**



**Figure 10. Typical Diode Forward Voltage**



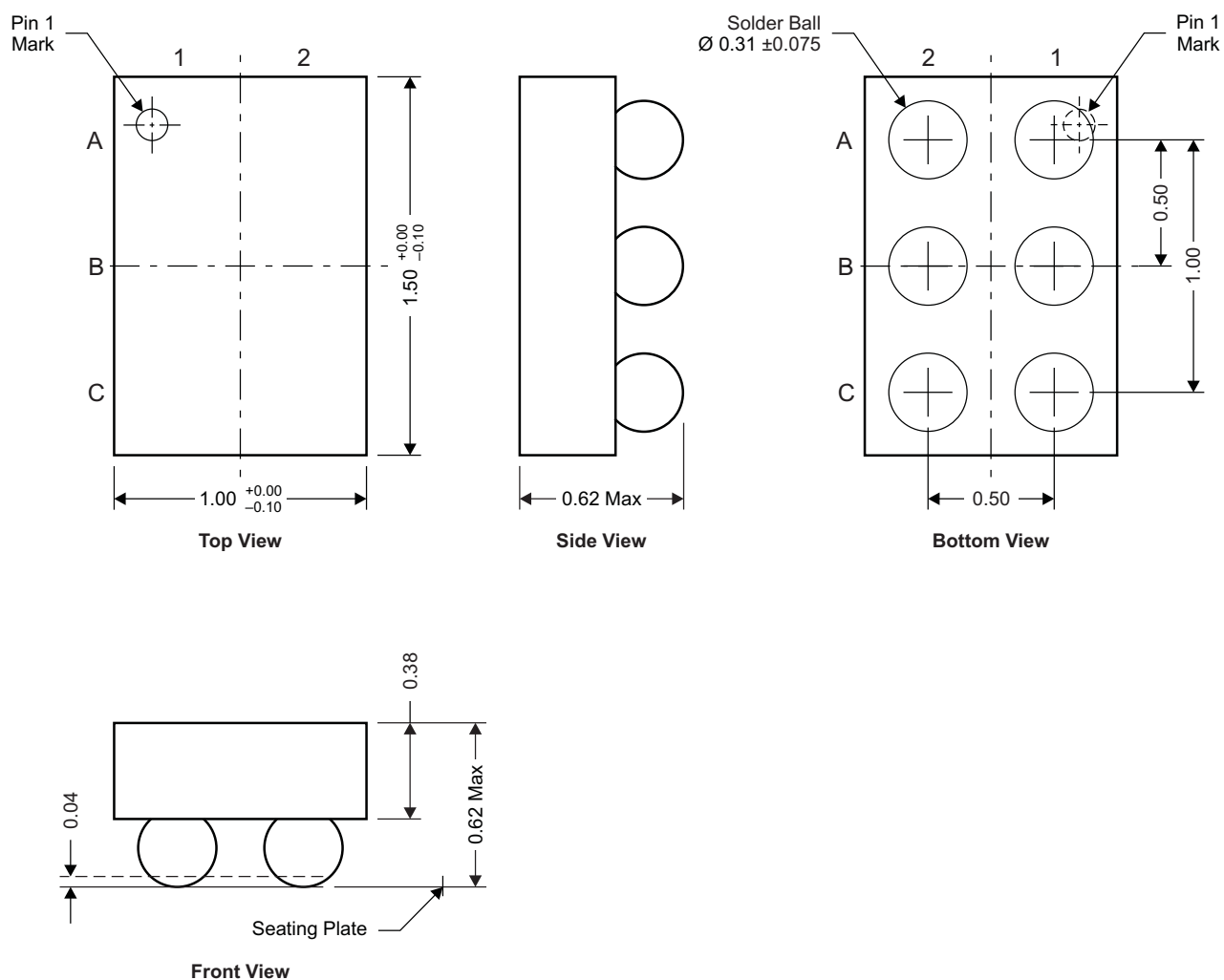
**Figure 11. Maximum Safe Operating Area**



**Figure 12. Maximum Drain Current vs. Temperature**

## MECHANICAL DATA

### CSD75301W1015 Package Dimensions



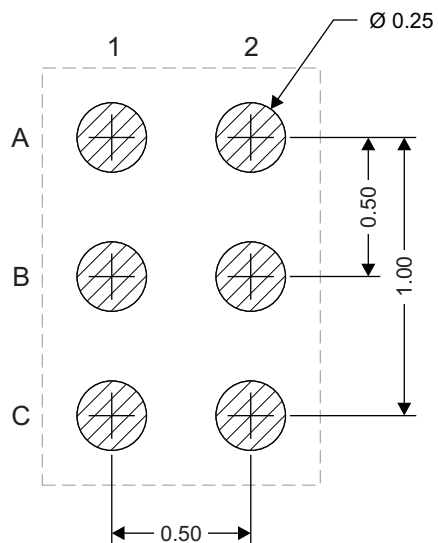
NOTE: All dimensions are in mm (unless otherwise specified)

M0157-01

### Pinout

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

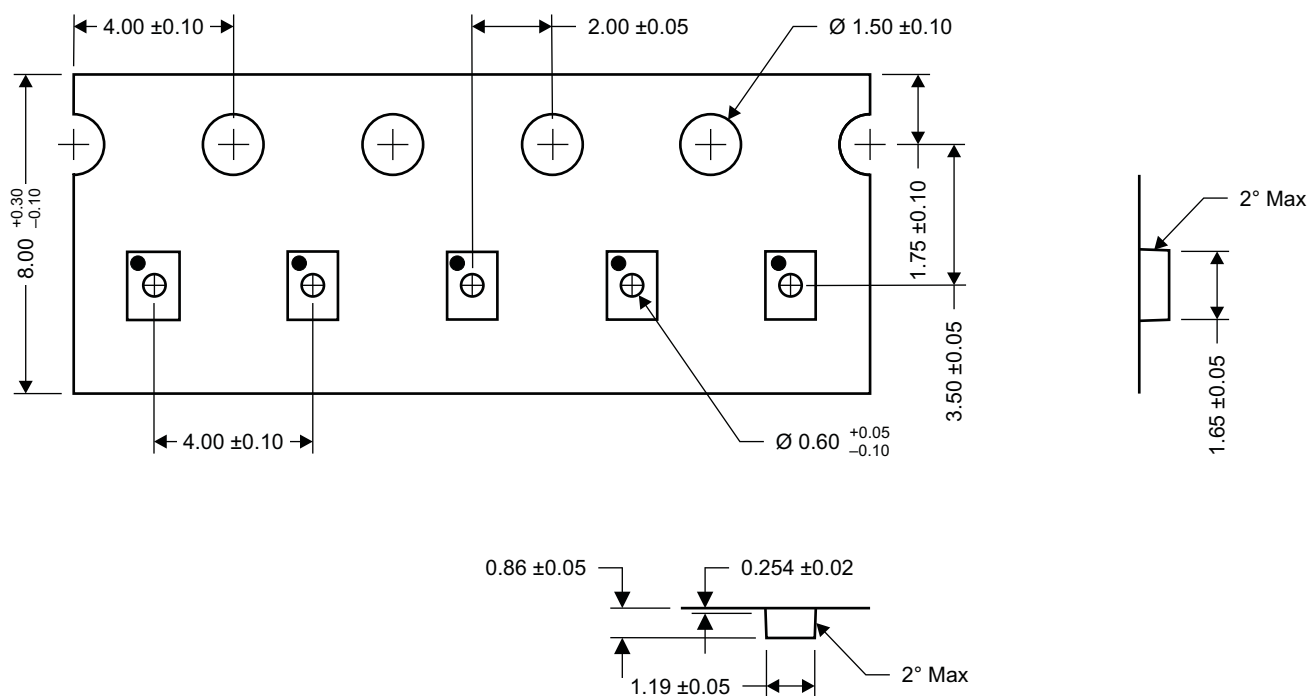
## Land Pattern Recommendation



M0158-01

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

## Tape and Reel Information



M0159-01

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

## REVISION HISTORY

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| Changes from Original (August 2009) to Revision A | Page |
|---------------------------------------------------|------|
|---------------------------------------------------|------|

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- |                                                                                 |                   |
|---------------------------------------------------------------------------------|-------------------|
| • Changed location of the Pin 1 indicator dot in the pin out illustration. .... | <a href="#">1</a> |
|---------------------------------------------------------------------------------|-------------------|
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| Changes from Revision A (November 2009) to Revision B | Page |
|-------------------------------------------------------|------|
|-------------------------------------------------------|------|

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

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- |                                                                                             |                   |
|---------------------------------------------------------------------------------------------|-------------------|
| • Changed the CSD75301W1015 Package Dimensions section. Top View From: 15.00 To: 1.50 ..... | <a href="#">6</a> |
|---------------------------------------------------------------------------------------------|-------------------|
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### Applications

|                               |                                                                                          |
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