

## N-Channel Logic Level MOSFET

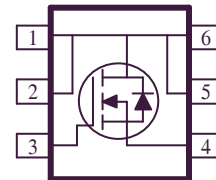
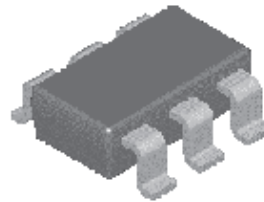
These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

| PRODUCT SUMMARY |                           |           |
|-----------------|---------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
| 30              | 0.027 @ $V_{GS} = 10$ V   | 6.3       |
|                 | 0.035 @ $V_{GS} = 4.5$ V  | 5.5       |

- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe TSOP-6 saves board space
- Fast switching speed
- High performance trench technology



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**



| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                          |                |            |                  |
|-----------------------------------------------------------------------------|--------------------------|----------------|------------|------------------|
| Parameter                                                                   |                          | Symbol         | Maximum    | Units            |
| Drain-Source Voltage                                                        |                          | $V_{DS}$       | 30         | V                |
| Gate-Source Voltage                                                         |                          | $V_{GS}$       | $\pm 20$   |                  |
| Continuous Drain Current <sup>a</sup>                                       | $T_A = 25^\circ\text{C}$ | $I_D$          | 6.3        | A                |
|                                                                             | $T_A = 70^\circ\text{C}$ |                | 5.2        |                  |
| Pulsed Drain Current <sup>b</sup>                                           |                          | $I_{DM}$       | $\pm 20$   |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                   |                          | $I_S$          | 1.3        | A                |
| Power Dissipation <sup>a</sup>                                              | $T_A = 25^\circ\text{C}$ | $P_D$          | 1.6        | W                |
|                                                                             | $T_A = 70^\circ\text{C}$ |                | 1.0        |                  |
| Operating Junction and Storage Temperature Range                            |                          | $T_J, T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS               |                |            |         |                    |
|------------------------------------------|----------------|------------|---------|--------------------|
| Parameter                                |                | Symbol     | Maximum | Units              |
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 5$ sec | $R_{THJA}$ | 78.0    | $^\circ\text{C/W}$ |

### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

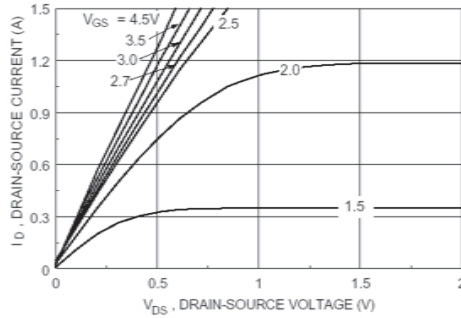
| SPECIFICATIONS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED) |                     |                                                                                                |        |      |      |      |
|---------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------|--------|------|------|------|
| Parameter                                                     | Symbol              | Test Conditions                                                                                | Limits |      |      | Unit |
|                                                               |                     |                                                                                                | Min    | Typ  | Max  |      |
| Switch Off Characteristics                                    |                     |                                                                                                |        |      |      |      |
| Gate-Body Leakage                                             | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V                                                 |        |      | ±100 | nA   |
| Zero Gate Voltage Drain Current                               | I <sub>DSS</sub>    | V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V                                                  |        |      | 1    | uA   |
|                                                               |                     | V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C                           |        |      | 10   |      |
| Switch On Characteristics                                     |                     |                                                                                                |        |      |      |      |
| Gate-Threshold Voltage                                        | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA                                    | 1.0    |      | 3.0  | V    |
| Drain-Source On-Resistance <sup>A</sup>                       | r <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6.3 A                                                 |        |      | 27   | mΩ   |
|                                                               |                     | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6.3 A T <sub>J</sub> = 55°C                           |        |      | 39   |      |
|                                                               |                     | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5.5 A                                                |        |      | 35   |      |
| Forward Tranconductance <sup>A</sup>                          | g <sub>fs</sub>     | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6.3 A                                                 |        | 45   |      | S    |
| On-State Drain Current <sup>A</sup>                           | I <sub>D(on)</sub>  | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V                                                  | 20     |      |      | A    |
| Diode Forward Voltage                                         | V <sub>SD</sub>     | I <sub>S</sub> = 1.3 A, V <sub>GS</sub> = 0 V                                                  |        | 0.75 |      | V    |
| Dynamic <sup>b</sup>                                          |                     |                                                                                                |        |      |      |      |
| Total Gate Charge                                             | Q <sub>g</sub>      | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 6.3 A<br>R <sub>L</sub> = 6 Ω  |        | 9    |      | nC   |
| Gate-Source Charge                                            | Q <sub>gs</sub>     |                                                                                                |        | 2.9  |      |      |
| Gate-Drain Charge                                             | Q <sub>gd</sub>     |                                                                                                |        | 3.2  |      |      |
| Switching Characteristics                                     |                     |                                                                                                |        |      |      |      |
| Turn-On Delay Time                                            | t <sub>d(on)</sub>  | V <sub>DS</sub> = 15 V, R <sub>L</sub> = 6 Ω, I <sub>D</sub> = 1 A,<br>V <sub>GEN</sub> = 10 V |        | 6    |      | ns   |
| Rise Time                                                     | t <sub>r</sub>      |                                                                                                |        | 10   |      |      |
| Turn-Off Delay Time                                           | t <sub>d(off)</sub> |                                                                                                |        | 18   |      |      |
| Fall-Time                                                     | t <sub>f</sub>      |                                                                                                |        | 5    |      |      |

**Notes**

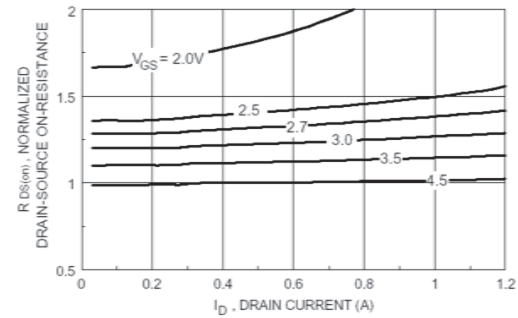
- Pulse test:  $PW \leq 300\mu\text{s}$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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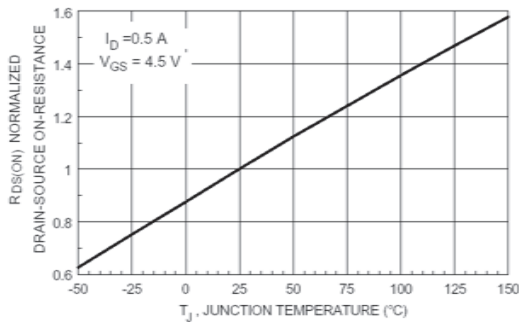
## Typical Electrical Characteristics (N-Channel)



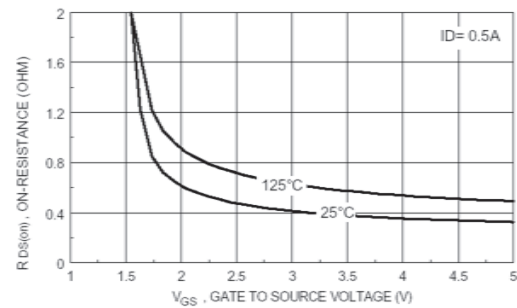
**Figure 1. On-Region Characteristics**



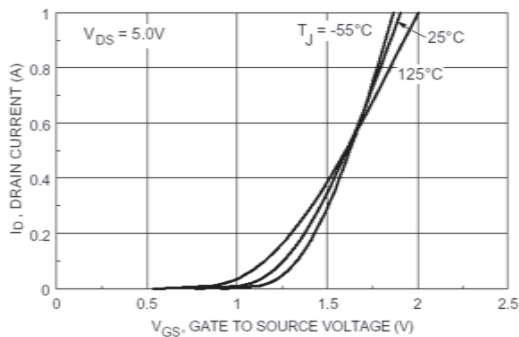
**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage**



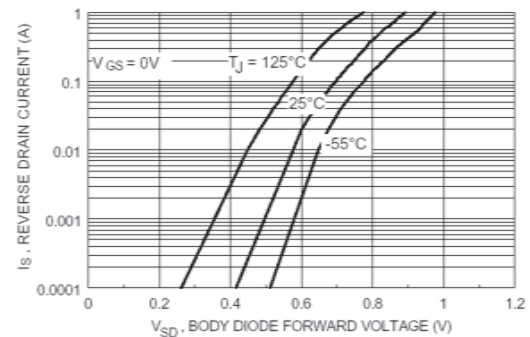
**Figure 3. On-Resistance Variation with Temperature**



**Figure 4. On-Resistance Variation with Gate to Source Voltage**



**Figure 5. Transfer Characteristics**



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature**

## Typical Electrical Characteristics (N-Channel)

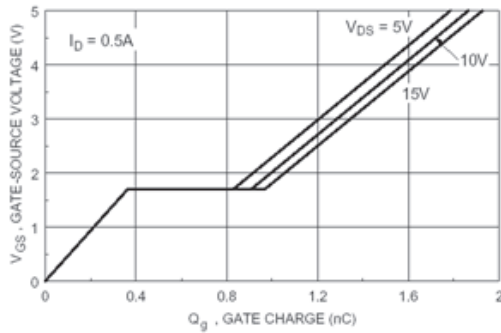


Figure 7. Gate Charge Characteristics.

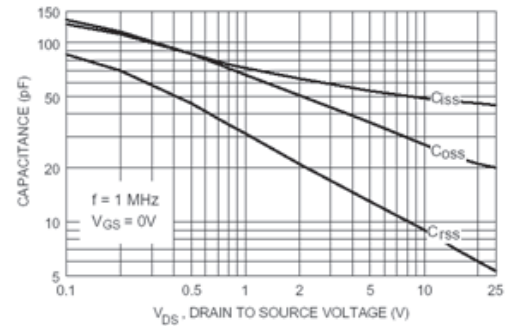


Figure 8. Capacitance Characteristics.

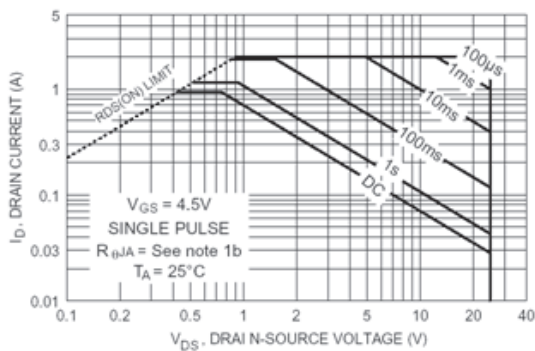


Figure 9. Maximum Safe Operating Area.

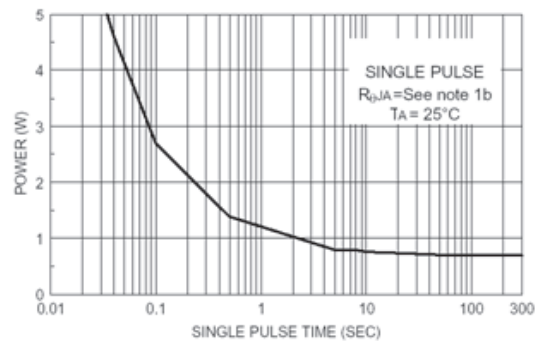


Figure 10. Single Pulse Maximum Power Dissipation.

### Normalized Thermal Transient Junction to Ambient

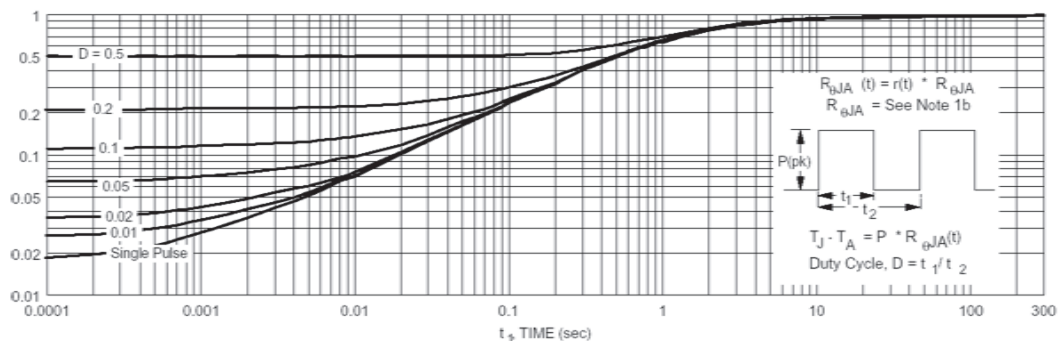
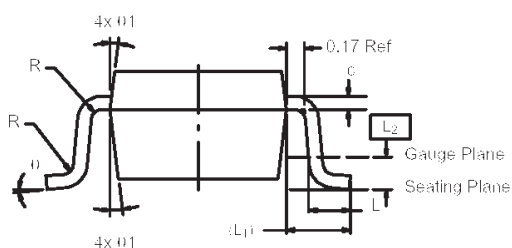
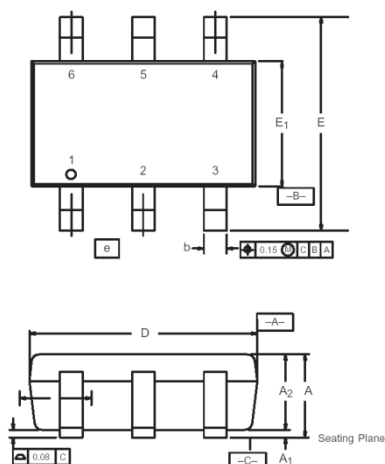


Figure 11. Transient Thermal Response Curve

## Package Information

### TSOP-6: 6LEAD



| Dim                  | MILLIMETERS |      |      | INCHES     |       |       |
|----------------------|-------------|------|------|------------|-------|-------|
|                      | Min         | Nom  | Max  | Min        | Nom   | Max   |
| <b>A</b>             | 0.91        | —    | 1.10 | 0.036      | —     | 0.043 |
| <b>A<sub>1</sub></b> | 0.01        | —    | 0.10 | 0.0004     | —     | 0.004 |
| <b>A<sub>2</sub></b> | 0.84        | —    | 1.00 | 0.033      | 0.038 | 0.039 |
| <b>b</b>             | 0.30        | 0.32 | 0.45 | 0.012      | 0.013 | 0.018 |
| <b>c</b>             | 0.10        | 0.15 | 0.20 | 0.004      | 0.006 | 0.008 |
| <b>D</b>             | 2.95        | 3.05 | 3.10 | 0.116      | 0.120 | 0.122 |
| <b>E</b>             | 2.70        | 2.85 | 2.98 | 0.106      | 0.112 | 0.117 |
| <b>E<sub>1</sub></b> | 1.55        | 1.65 | 1.70 | 0.061      | 0.065 | 0.067 |
| <b>e</b>             | 1.00 BSC    |      |      | 0.0394 BSC |       |       |
| <b>L</b>             | 0.35        | —    | 0.50 | 0.014      | —     | 0.020 |
| <b>L<sub>1</sub></b> | 0.60 Ref    |      |      | 0.024 Ref  |       |       |
| <b>L<sub>2</sub></b> | 0.25 BSC    |      |      | 0.010 BSC  |       |       |
| <b>R</b>             | 0.10        | —    | —    | 0.004      | —     | —     |
| <b>θ</b>             | 0°          | 4°   | 8°   | 0°         | 4°    | 8°    |
| <b>θ<sub>1</sub></b> | 7° Nom      |      |      | 7° Nom     |       |       |