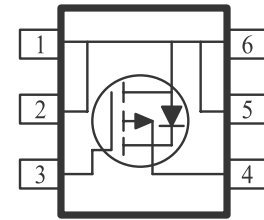
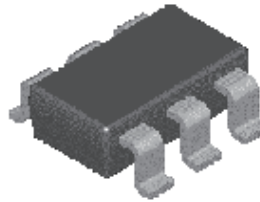


## P-Channel 20-V (D-S) MOSFET

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.

- 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



### PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ m( $\Omega$ ) | $I_D$ (A) |
|--------------|----------------------------|-----------|
| -20          | 42 @ $V_{GS} = -4.5V$      | -5.7      |
|              | 57 @ $V_{GS} = -2.5V$      | -4.9      |
|              | 80 @ $V_{GS} = -1.8V$      | -4.1      |

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ UNLESS OTHERWISE NOTED)

| Parameter                                                 |                    | Symbol         | Maximum    | Units      |
|-----------------------------------------------------------|--------------------|----------------|------------|------------|
| Drain-Source Voltage                                      |                    | $V_{DS}$       | -20        | V          |
| Gate-Source Voltage                                       |                    | $V_{GS}$       | $\pm 8$    |            |
| Continuous Drain Current <sup>a</sup>                     | $T_A = 25^\circ C$ | $I_D$          | -5.7       | A          |
|                                                           | $T_A = 70^\circ C$ |                | -4.7       |            |
| Pulsed Drain Current <sup>b</sup>                         |                    | $I_{DM}$       | $\pm 20$   |            |
| Continuous Source Current (Diode Conduction) <sup>a</sup> |                    | $I_S$          | -1.7       | A          |
| Power Dissipation <sup>a</sup>                            | $T_A = 25^\circ C$ | $P_D$          | 2.0        | W          |
|                                                           | $T_A = 70^\circ C$ |                | 1.3        |            |
| Operating Junction and Storage Temperature Range          |                    | $T_J, T_{stg}$ | -55 to 150 | $^\circ C$ |

### THERMAL RESISTANCE RATINGS

| Parameter                                |                | Symbol          | Maximum | Units        |
|------------------------------------------|----------------|-----------------|---------|--------------|
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 5$ sec | $R_{\theta JA}$ | 50      | $^\circ C/W$ |
|                                          | Steady State   |                 | 90      | $^\circ C/W$ |

#### 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  |      |
| Static                                  |                     |                                                                                                     |        |      |      |      |
| Gate-Threshold Voltage                  | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 uA                                        | -0.4   |      |      |      |
| Gate-Body Leakage                       | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8 V                                                       |        |      | ±100 | nA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V                                                      |        |      | -1   | uA   |
|                                         |                     | V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C                               |        |      | -5   |      |
| On-State Drain Current <sup>A</sup>     | I <sub>D(on)</sub>  | V <sub>DS</sub> = -4.5 V, V <sub>GS</sub> = -4.5 V                                                  | -20    |      |      | A    |
| Drain-Source On-Resistance <sup>A</sup> | r <sub>DS(on)</sub> | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.7 A                                                   |        |      | 42   | mΩ   |
|                                         |                     | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -4.9 A                                                   |        |      | 57   |      |
|                                         |                     | V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -4.1 A                                                   |        |      | 80   |      |
| Forward Tranconductance <sup>A</sup>    | g <sub>fs</sub>     | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -4.9 A                                                    |        | 10   |      | S    |
| Diode Forward Voltage                   | V <sub>SD</sub>     | I <sub>S</sub> = 1.7 A, V <sub>GS</sub> = 0 V                                                       |        | -0.7 |      | V    |
| Dynamic <sup>b</sup>                    |                     |                                                                                                     |        |      |      |      |
| Total Gate Charge                       | Q <sub>g</sub>      | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V,<br>I <sub>D</sub> = -5.7 A                       |        | 8    |      | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                                     |        | 1.8  |      |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                                     |        | 1.9  |      |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | V <sub>DD</sub> = -10 V, R <sub>L</sub> = 6 Ω , I <sub>D</sub> = -1 A,<br>V <sub>GEN</sub> = -4.5 V |        | 22   |      | nS   |
| Rise Time                               | t <sub>r</sub>      |                                                                                                     |        | 35   |      |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                                     |        | 45   |      |      |
| Fall-Time                               | t <sub>f</sub>      |                                                                                                     |        | 25   |      |      |

## Notes

- Pulse test: PW ≤ 300us duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.

## Typical Electrical Characteristics

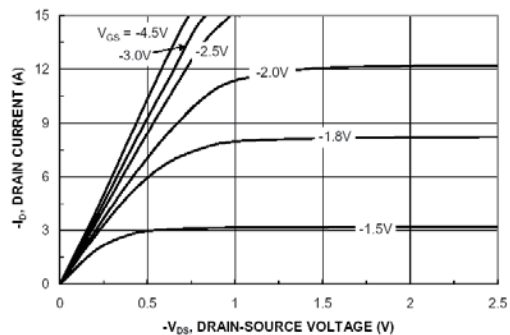


Figure 1. On-Region Characteristics

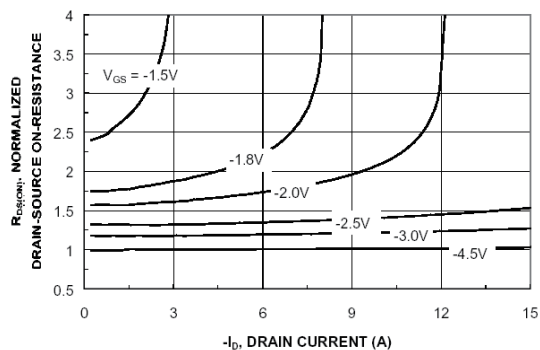


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

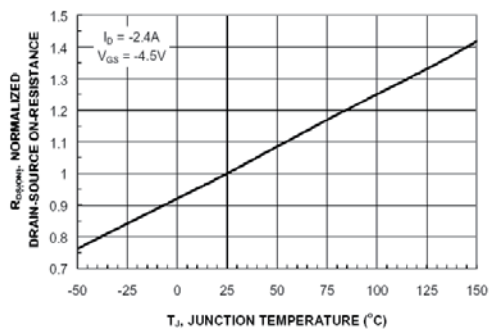


Figure 3. On-Resistance Variation with Temperature

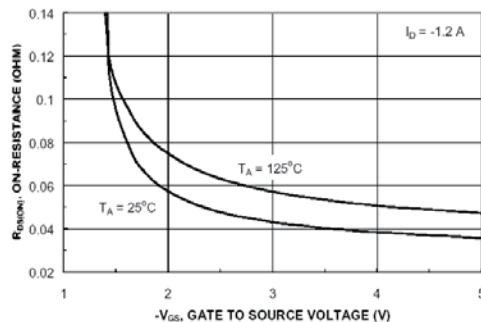


Figure 4. On-Resistance Variation with Gate to Source Voltage

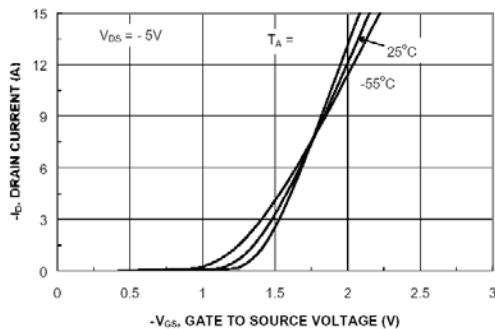


Figure 5. Transfer Characteristics

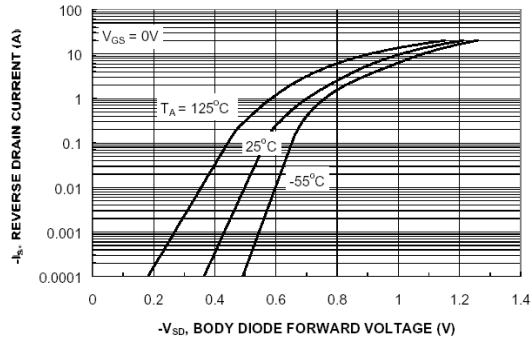


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

## Typical Electrical Characteristics

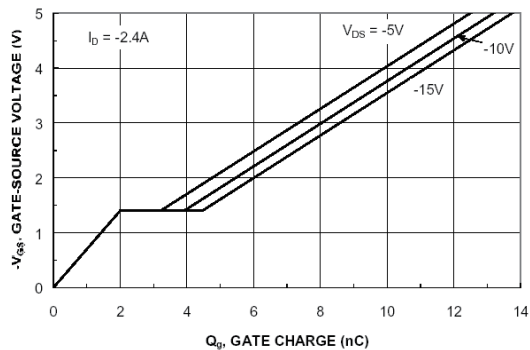


Figure 7. Gate Charge Characteristic

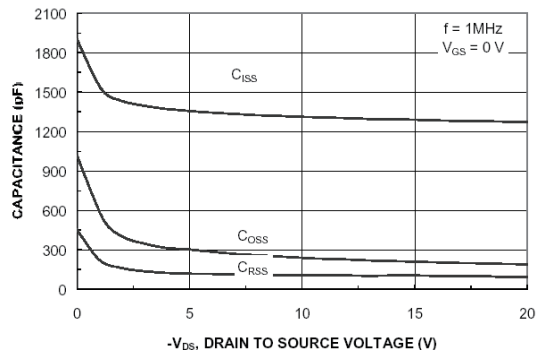


Figure 8. Capacitance Characteristic

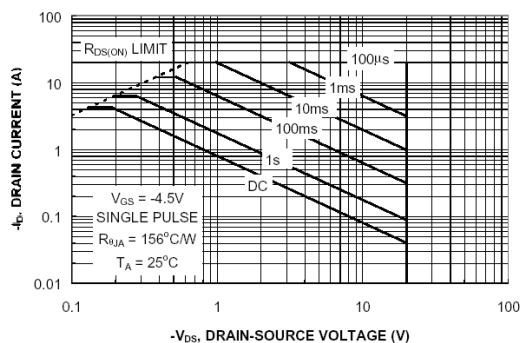


Figure 9. Maximum Safe Operating Area

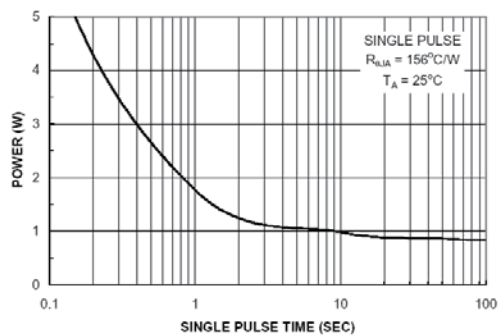


Figure 10. Single Pulse Maximum Power Dissipation

## Normalized Thermal Transient Junction to Ambient

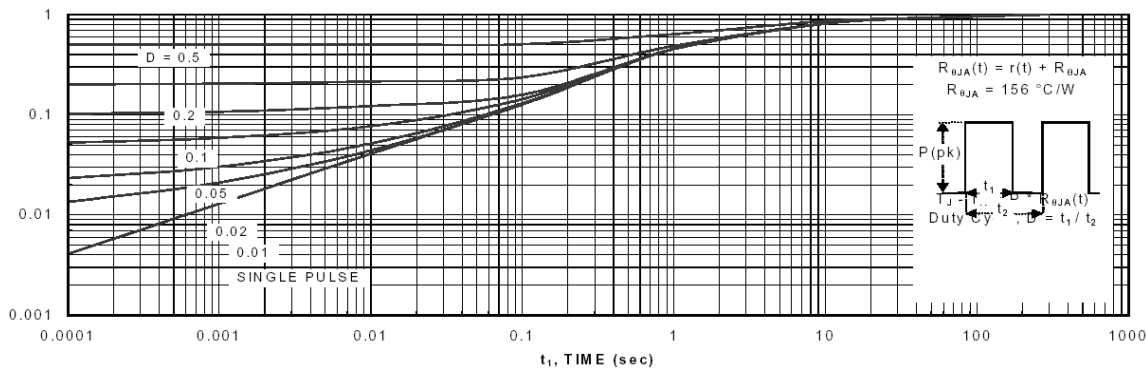
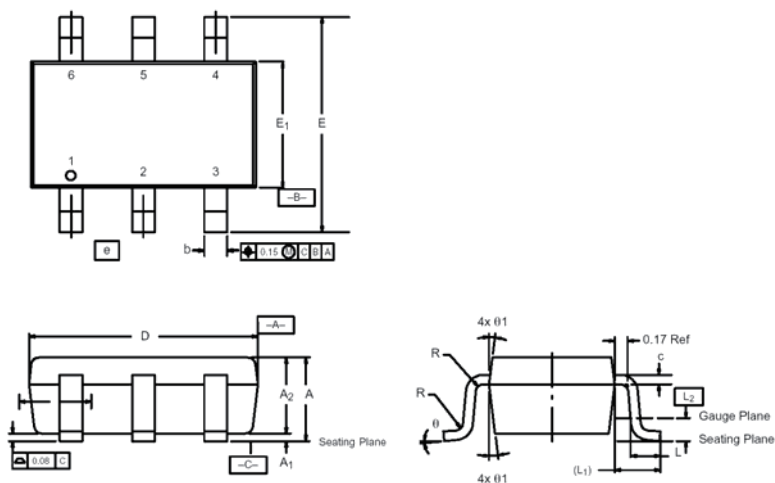


Figure 11. Transient Thermal Response Curve.

Package Information

TSOP-6: 6LEAD



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