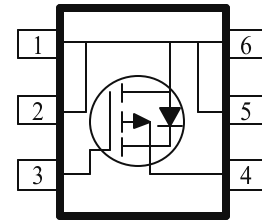
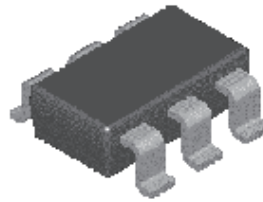


## P-Channel 20-V (D-S) MOSFET

These miniature surface mount MOSFETs utilize High Cell Density process. Low  $r_{DS(on)}$  assures minimal power loss and conserves energy, making this device ideal for use in power management circuitry. Typical applications are DC-DC converters, 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
- Miniature TSOP-6 Surface Mount Package Saves Board Space



| PRODUCT SUMMARY |                          |           |
|-----------------|--------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ (mΩ)        | $I_D$ (A) |
| -20             | 0.038 @ $V_{GS} = -4.5V$ | -5.6      |
|                 | 0.054 @ $V_{GS} = -2.5V$ | -4.8      |
|                 | 0.072 @ $V_{GS} = -1.8V$ | -4.0      |

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                          |                |                             |
|-----------------------------------------------------------------------------|--------------------------|----------------|-----------------------------|
| Parameter                                                                   |                          | Symbol         | Maximum Units               |
| Drain-Source Voltage                                                        |                          | $V_{DS}$       | 20                          |
| Gate-Source Voltage                                                         |                          | $V_{GS}$       | $\pm 8$                     |
| Continuous Drain Current <sup>a</sup>                                       | $T_A = 25^\circ\text{C}$ | $I_D$          | -5.6                        |
|                                                                             | $T_A = 70^\circ\text{C}$ |                | -4.5                        |
| Pulsed Drain Current <sup>b</sup>                                           |                          | $I_{DM}$       | $\pm 20$                    |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                   |                          | $I_S$          | -1.7                        |
| Power Dissipation <sup>a</sup>                                              | $T_A = 25^\circ\text{C}$ | $P_D$          | 2.0                         |
|                                                                             | $T_A = 70^\circ\text{C}$ |                | 1.3                         |
| 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> | $t \leq 5 \text{ sec}$ | $R_{THJA}$ | 62.5    | $^\circ\text{C/W}$ |

### 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   |      |
| Static                                                        |                      |                                                                                                     |        |       |       |      |
| Drain-Source Breakdown Voltage                                | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 uA                                                     | -20    |       |       | V    |
| Gate-Threshold Voltage                                        | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA                                         | -0.45  |       |       |      |
| 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> = -20 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> = -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> = -5.5 A                                                   |        | 24    | 38    | mΩ   |
|                                                               |                      | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -4.8 A                                                   |        | 30    | 54    |      |
|                                                               |                      | V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -4.0 A                                                   |        | 43    | 72    |      |
| Forward Tranconductance <sup>A</sup>                          | g <sub>fs</sub>      | V <sub>DS</sub> = -5 V, I <sub>D</sub> = -3.5 A                                                     |        | 23    |       | S    |
| Diode Forward Voltage                                         | V <sub>SD</sub>      | I <sub>S</sub> = 1.3 A, V <sub>GS</sub> = 0 V                                                       |        | -0.70 | -1.20 | V    |
| Dynamic <sup>b</sup>                                          |                      |                                                                                                     |        |       |       |      |
| Total Gate Charge                                             | Q <sub>g</sub>       | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -2.5 V,<br>I <sub>D</sub> = -3.5 A                       |        | 19.0  | 31    | nC   |
| Gate-Source Charge                                            | Q <sub>gs</sub>      |                                                                                                     |        | 4.20  |       |      |
| Gate-Drain Charge                                             | Q <sub>gd</sub>      |                                                                                                     |        | 7.60  |       |      |
| Switching                                                     |                      |                                                                                                     |        |       |       |      |
| 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 |        | 13    | 24    | ns   |
| Rise Time                                                     | t <sub>r</sub>       |                                                                                                     |        | 12    | 19    |      |
| Turn-Off Delay Time                                           | t <sub>d(off)</sub>  |                                                                                                     |        | 91    | 140   |      |
| Fall-Time                                                     | t <sub>f</sub>       |                                                                                                     |        | 44    | 73    |      |

## Notes

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

## Typical Electrical Characteristics (P-Channel)

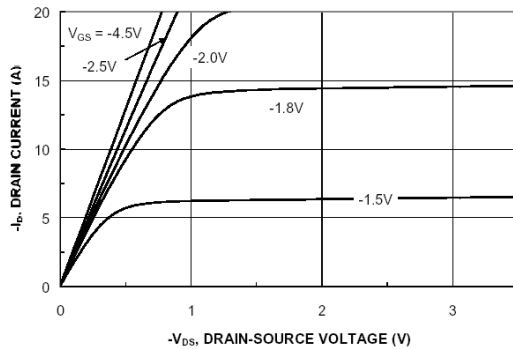


Figure 1. On-Region Characteristics.

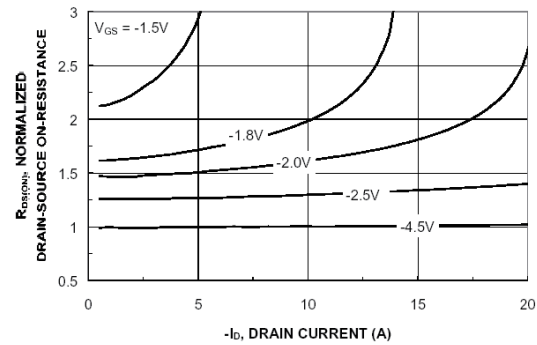


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

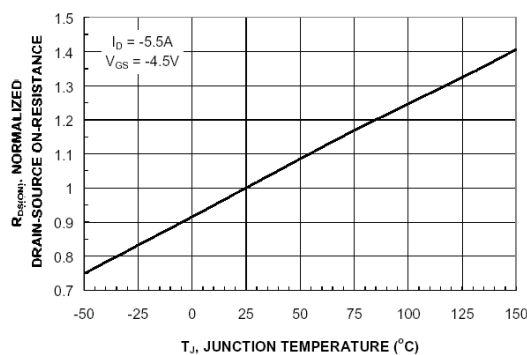


Figure 3. On-Resistance Variation with Temperature.

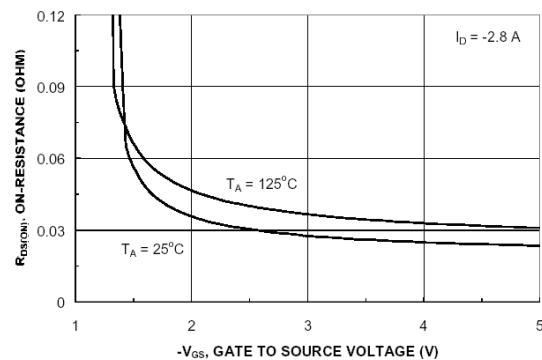


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

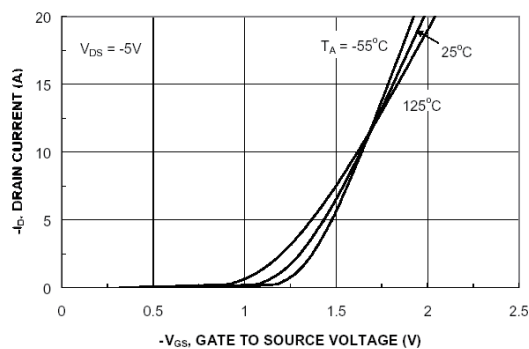


Figure 5. Transfer Characteristics.

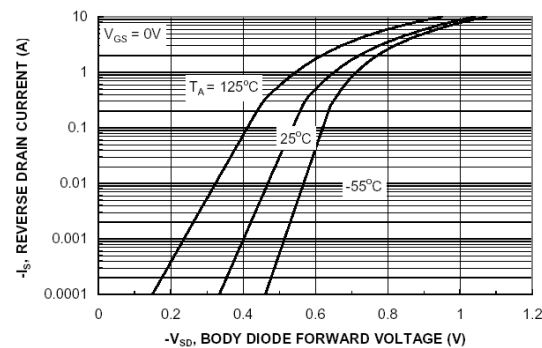


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (P-Channel)

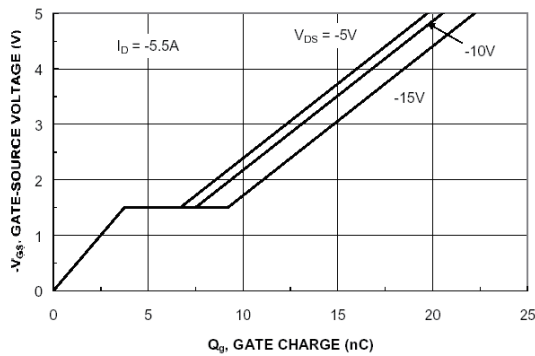


Figure 7. Gate Charge Characteristics.

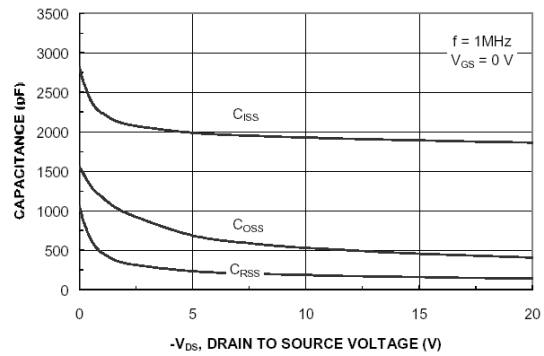


Figure 8. Capacitance Characteristics.

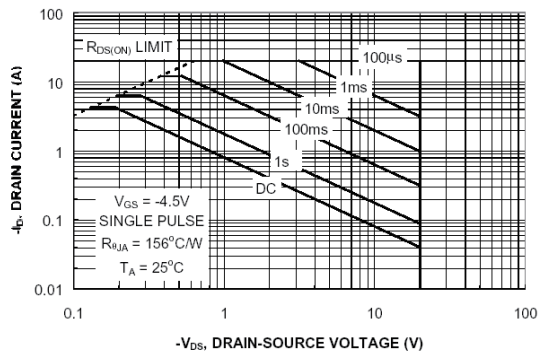


Figure 9. Maximum Safe Operating Area.

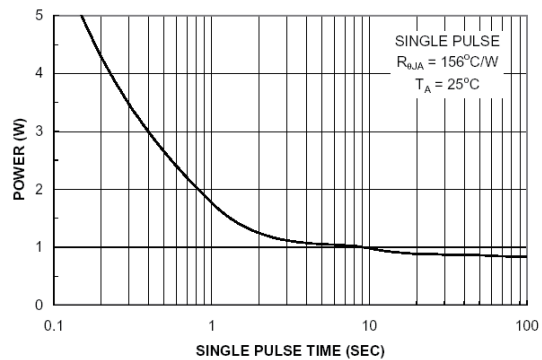


Figure 10. Single Pulse Maximum Power Dissipation.

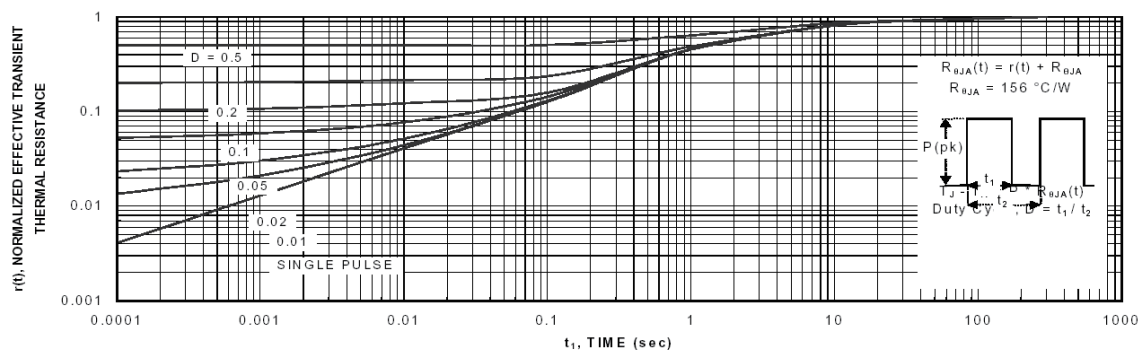
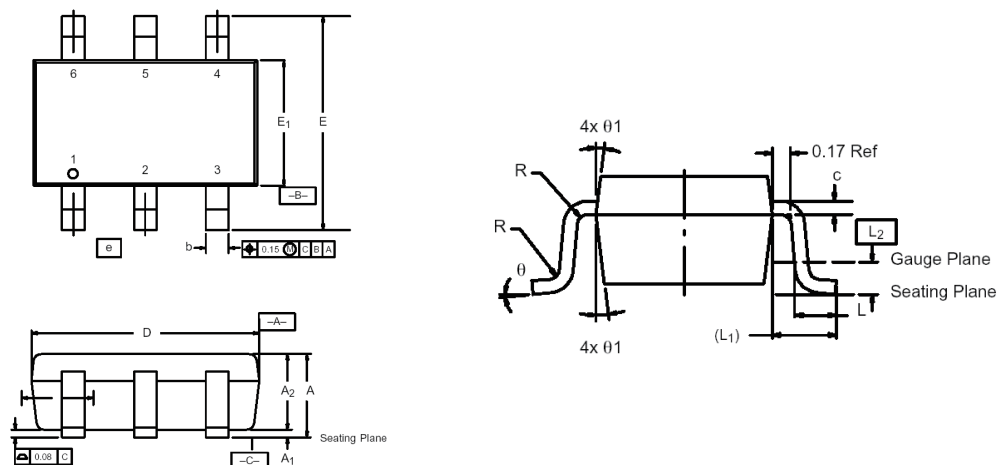


Figure 11. Transient Thermal Response Curve.

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      | —     | —     |
| θ              | 0°          | 4°   | 8°   | 0°         | 4°    | 8°    |
| θ <sub>1</sub> | 7° Nom      |      |      | 7° Nom     |       |       |