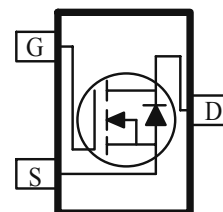
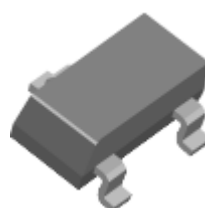


**N-Channel 20-V (D-S) MOSFET**

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
- Low gate charge 7nC
- High performance
- High current handling
- Miniature SOT-23 Surface Mount Package Saves Board Space

| PRODUCT SUMMARY |                           |           |
|-----------------|---------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
| 20              | 0.035 @ $V_{GS} = 4.5V$   | 4.3       |
|                 | 0.050 @ $V_{GS} = 2.5V$   | 3.5       |



| 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>                                 | $T_A = 25^\circ C$ | $I_D$          | 4.3        | A          |
|   | $T_A = 70^\circ C$ |                | 3.3        |            |
| Pulsed Drain Current <sup>b</sup>                                     |                    | $I_{DM}$       | 10         |            |
| Continuous Source Current (Diode Conduction) <sup>a</sup>             |                    | $I_S$          | 0.46       | A          |
| Power Dissipation <sup>a</sup>  | $T_A = 25^\circ C$ | $P_D$          | 1.25       | W          |
|   | $T_A = 70^\circ C$ |                | 0.8        |            |
| 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 | $R_{THJA}$ | 100     | $^\circ C/W$ |
|  | Steady-State   |            | 166     |              |

Notes

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

| SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |              |  |        |      |      |            |
|---|--------------|--|--------|------|------|------------|
| Parameter   | Symbol       | Test Conditions  | Limits |      |      | Unit       |
|   |              |  | Min    | Typ  | Max  |            |
| <b>Static</b>   |              |  |        |      |      |            |
| Gate-Threshold Voltage  | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$   | 0.7    |      |      |            |
| Gate-Body Leakage   | $I_{GSS}$    | $V_{DS} = 0 \text{ V}, V_{GS} = 8 \text{ V}$   |        |      | 100  | nA         |
| Zero Gate Voltage Drain Current                                   | $I_{DSS}$    | $V_{DS} = 16 \text{ V}, V_{GS} = 0 \text{ V}$  |        |      | 1    | uA         |
|   |              | $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$                    |        |      | 10   |            |
| On-State Drain Current <sup>A</sup>                               | $I_{D(on)}$  | $V_{DS} = 5 \text{ V}, V_{GS} = 4.5 \text{ V}$   | 10     |      |      | A          |
| Drain-Source On-Resistance <sup>A</sup>                           | $r_{DS(on)}$ | $V_{GS} = 4.5 \text{ V}, I_D = 4.3 \text{ A}$  |        | 30   | 35   | m $\Omega$ |
|   |              | $V_{GS} = 2.5 \text{ V}, I_D = 3.5 \text{ A}$  |        | 40   | 50   |            |
| Forward Transconductance <sup>A</sup>                             | $g_{fs}$     | $V_{DS} = 5 \text{ V}, I_D = 3.0 \text{ A}$  |        | 11   |      | S          |
| Diode Forward Voltage   | $V_{SD}$     | $I_S = 0.46 \text{ A}, V_{GS} = 0 \text{ V}$   |        | 0.65 | 1.20 | V          |
| <b>Dynamic<sup>b</sup></b>  |              |  |        |      |      |            |
| Total Gate Charge   | $Q_g$        | $V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V},$<br>$I_D = 3.0 \text{ A}$                |        | 7.0  |      | nC         |
| Gate-Source Charge  | $Q_{gs}$     |  |        | 1.20 |      |            |
| Gate-Drain Charge   | $Q_{gd}$     |  |        | 1.90 |      |            |
| Input Capacitance   | $C_{iss}$    | $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V},$<br>$f = 1\text{MHz}$                      |        | 700  |      | pF         |
| Output Capacitance  | $C_{oss}$    |  |        | 175  |      |            |
| Reverse Transfer Capacitance                                      | $C_{rss}$    |  |        | 85   |      |            |
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{DD} = 10 \text{ V}, I_D = 1 \text{ A},$<br>$R_G = 6 \Omega, V_{GEN} = 4.5 \text{ V}$ |        | 9    |      | ns         |
| Rise Time   | $t_r$        |  |        | 11   |      |            |
| Turn-Off Delay Time   | $t_{d(off)}$ |  |        | 18   |      |            |
| Fall-Time   | $t_f$        |  |        | 5    |      |            |

## Notes

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

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## Typical Electrical Characteristics

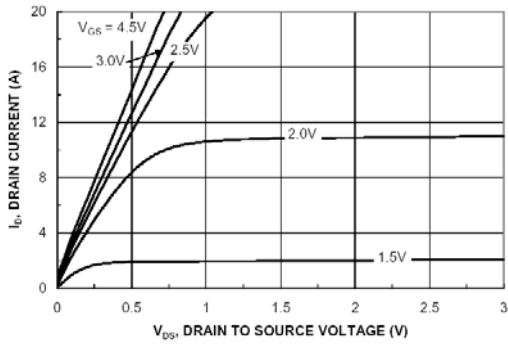


Figure 1. On-Region Characteristics

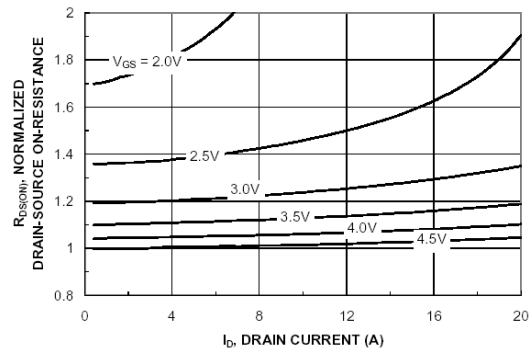


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

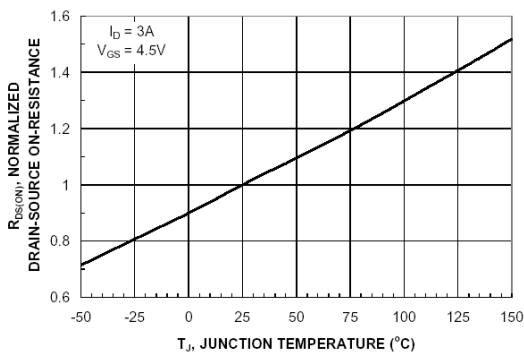


Figure 3. On-Resistance Variation with Temperature

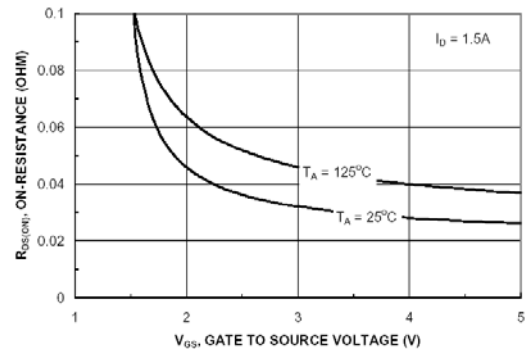


Figure 4. On-Resistance Variation with Gate to Source Voltage

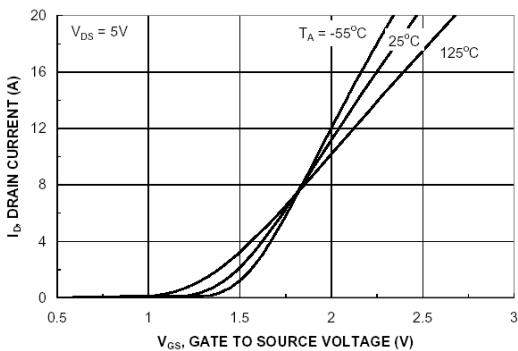


Figure 5. Transfer Characteristics

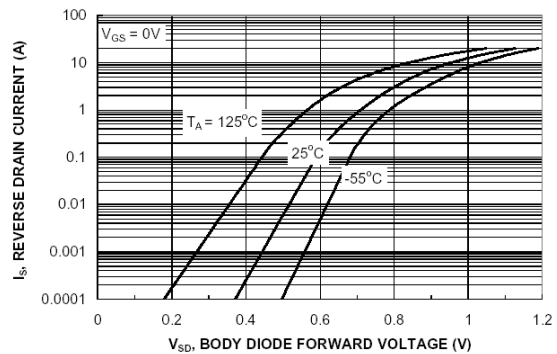


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

### Typical Electrical Characteristics

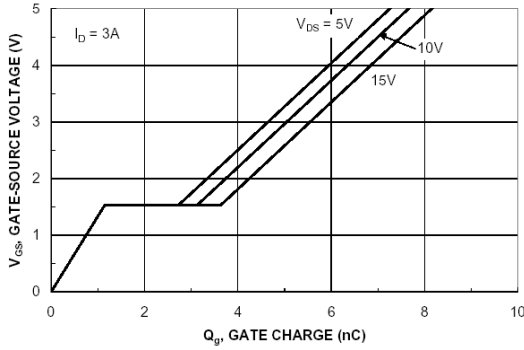


Figure 7. Gate Charge Characteristic

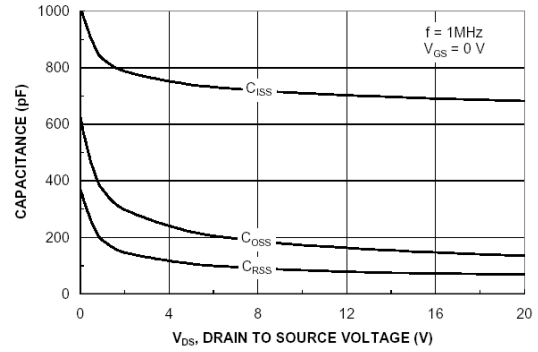


Figure 8. Capacitance Characteristic

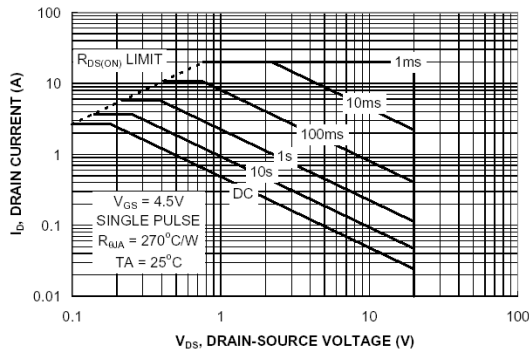


Figure 9. Maximum Safe Operating Area

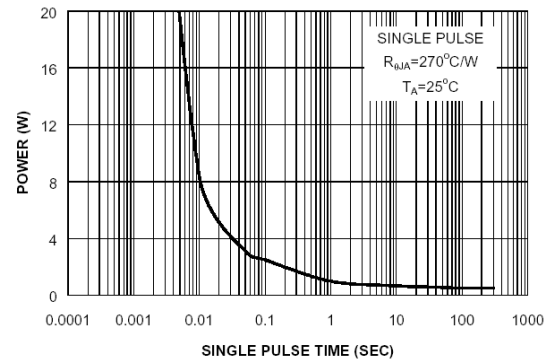


Figure 10. Single Pulse Maximum Power Dissipation

### Normalized Thermal Transient Impedance, Junction to Ambient

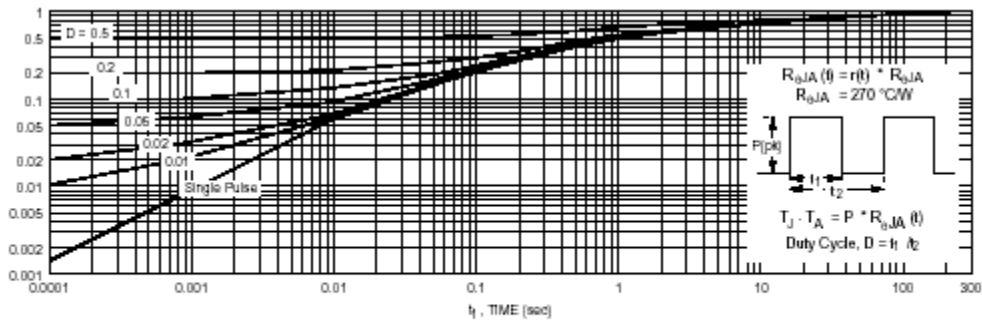
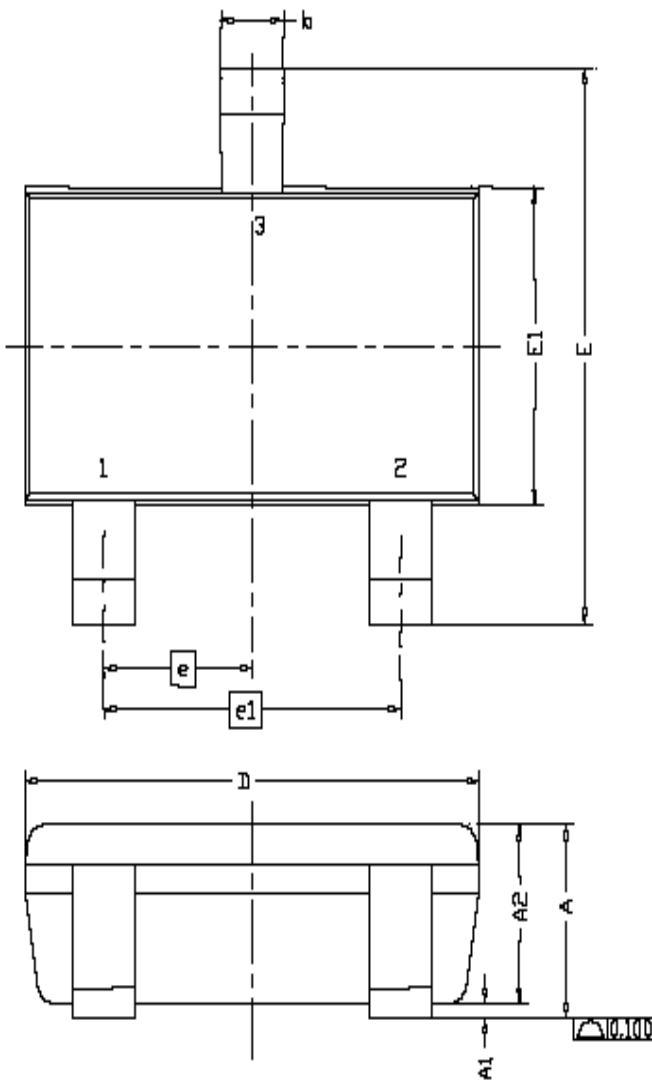


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

# Package Information



| DIM. | MILLIMETERS |      |       |
|------|-------------|------|-------|
|      | MIN         | NOM  | MAX   |
| A    | 0.935       | 0.95 | 1.10  |
| A1   | 0.01        | ---  | 0.10  |
| A2   | 0.85        | 0.90 | 0.925 |
| b    | 0.30        | 0.40 | 0.50  |
| c    | 0.10        | 0.15 | 0.25  |
| D    | 2.70        | 2.90 | 3.10  |
| E    | 2.60        | 2.80 | 3.00  |
| E1   | 1.40        | 1.60 | 1.80  |
| e    | 0.95 BSC    |      |       |
| e1   | 1.90 BSC    |      |       |
| L    | 0.30        | 0.40 | 0.60  |
| L1   | 0.60REF     |      |       |
| L2   | 0.25BSC     |      |       |
| R    | 0.10        | ---  | ---   |
| θ    | 0°          | 4°   | 8°    |
| θ1   | 7°NOM       |      |       |

