

## FEATURES

- ◆ Avalanche Rugged Technology
- ◆ Rugged Gate Oxide Technology
- ◆ Lower Input Capacitance
- ◆ Improved Gate Charge
- ◆ Extended Safe Operating Area
- ◆ Lower Leakage Current: 10 $\mu$ A (Max.) @  $V_{DS} = 200V$
- ◆ Lower  $R_{DS(ON)}$ : 1.185 $\Omega$  (Typ.)

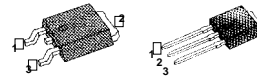
$$BV_{DSS} = 200 V$$

$$R_{DS(on)} = 1.5\Omega$$

$$I_D = 2.7 A$$

**D-PAK**

**I-PAK**



1. Gate 2. Drain 3. Source

## Absolute Maximum Ratings

| Symbol         | Characteristic  | Value        | Units         |
|----------------|---|--------------|---------------|
| $V_{DSS}$      | Drain-to-Source Voltage   | 200          | V             |
| $I_D$          | Continuous Drain Current ( $T_C=25^\circ C$ )                           | 2.7          | A             |
|                | Continuous Drain Current ( $T_C=100^\circ C$ )                          | 1.7          |               |
| $I_{DM}$       | Drain Current-Pulsed (1)  | 9            | A             |
| $V_{GS}$       | Gate-to-Source Voltage  | $\pm 20$     | V             |
| $E_{AS}$       | Single Pulsed Avalanche Energy (2)                                      | 24           | mJ            |
| $I_{AR}$       | Avalanche Current (1)   | 2.7          | A             |
| $E_{AR}$       | Repetitive Avalanche Energy (1)   | 2.1          | mJ            |
| dv/dt          | Peak Diode Recovery dv/dt (3)   | 5            | V/ns          |
| $P_D$          | Total Power Dissipation ( $T_A=25^\circ C$ ) *                          | 2.5          | W             |
|                | Total Power Dissipation ( $T_C=25^\circ C$ )                            | 21           | W             |
|                | Linear Derating Factor  | 0.17         | W/ $^\circ C$ |
| $T_J, T_{STG}$ | Operating Junction and Storage Temperature Range                        | - 55 to +150 | $^\circ C$    |
| $T_L$          | Maximum Lead Temp. for Soldering Purposes, 1/8. from case for 5-seconds | 300          |               |

## Thermal Resistance

| Symbol          | Characteristic        | Typ. | Max. | Units        |
|-----------------|-----------------------|------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case      | --   | 5.7  | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction-to-Ambient * | --   | 50   |              |
| $R_{\theta JA}$ | Junction-to-Ambient   | --   | 110  |              |

\* When mounted on the minimum pad size recommended (PCB Mount).

Rev. B

### Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise specified)

| Symbol                 | Characteristic                          | Min. | Typ. | Max. | Units              | Test Condition   |
|------------------------|---|------|------|------|--------------------|--|
| $BV_{DSS}$             | Drain-Source Breakdown Voltage          | 200  | --   | --   | V                  | $V_{GS}=0V, I_D=250\mu A$  |
| $\Delta BV/\Delta T_J$ | Breakdown Voltage Temp. Coeff.          | --   | 0.19 | --   | $V/^\circ\text{C}$ | $I_D=250\mu A$ <b>See Fig 7</b>  |
| $V_{GS(th)}$           | Gate Threshold Voltage                  | 1.0  | --   | 2.0  | V                  | $V_{DS}=5V, I_D=250\mu A$  |
| $I_{GSS}$              | Gate-Source Leakage, Forward            | --   | --   | 100  | nA                 | $V_{GS}=20V$   |
|                        | Gate-Source Leakage, Reverse            | --   | --   | -100 |                    | $V_{GS}=-20V$  |
| $I_{DSS}$              | Drain-to-Source Leakage Current         | --   | --   | 10   | $\mu A$            | $V_{DS}=200V$  |
|                        |   | --   | --   | 100  |                    | $V_{DS}=160V, T_C=125^\circ\text{C}$   |
| $R_{DS(on)}$           | Static Drain-Source On-State Resistance | --   | --   | 1.5  | $\Omega$           | $V_{GS}=5V, I_D=1.35A$ (4)   |
| $g_{fs}$               | Forward Transconductance                | --   | 1.9  | --   | $\text{S}$         | $V_{DS}=40V, I_D=1.35A$ (4)  |
| $C_{iss}$              | Input Capacitance                       | --   | 185  | 240  | pF                 | $V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$<br><b>See Fig 5</b>                       |
| $C_{oss}$              | Output Capacitance                      | --   | 35   | 45   |                    |  |
| $C_{rss}$              | Reverse Transfer Capacitance            | --   | 14   | 20   |                    |  |
| $t_{d(on)}$            | Turn-On Delay Time                      | --   | 9    | 30   | ns                 | $V_{DD}=100V, I_D=3.3A,$<br>$R_G=22\Omega$<br><b>See Fig 13</b> (4) (5)          |
| $t_r$                  | Rise Time                               | --   | 9    | 30   |                    |  |
| $t_{d(off)}$           | Turn-Off Delay Time                     | --   | 20   | 50   |                    |  |
| $t_f$                  | Fall Time                               | --   | 6    | 20   |                    |  |
| $Q_g$                  | Total Gate Charge                       | --   | 6.1  | 9    | nC                 | $V_{DS}=160V, V_{GS}=5V,$<br>$I_D=3.3A$<br><b>See Fig 6 &amp; Fig 12</b> (4) (5) |
| $Q_{gs}$               | Gate-Source Charge                      | --   | 1.4  | --   |                    |  |
| $Q_{gd}$               | Gate-Drain (. Miller. ) Charge          | --   | 2.8  | --   |                    |  |

### Source-Drain Diode Ratings and Characteristics

| Symbol   | Characteristic            | Min. | Typ. | Max. | Units         | Test Condition                              |
|----------|---------------------------|------|------|------|---------------|---|
| $I_S$    | Continuous Source Current | --   | --   | 2.7  | A             | Integral reverse pn-diode in the MOSFET     |
| $I_{SM}$ | Pulsed-Source Current (1) | --   | --   | 9    |               |   |
| $V_{SD}$ | Diode Forward Voltage (4) | --   | --   | 1.5  | V             | $T_J=25^\circ\text{C}, I_S=2.7A, V_{GS}=0V$ |
| $t_{rr}$ | Reverse Recovery Time     | --   | 123  | --   | ns            | $T_J=25^\circ\text{C}, I_F=3.3A$            |
| $Q_{rr}$ | Reverse Recovery Charge   | --   | 0.38 | --   | $\mu\text{C}$ | $di_F/dt=100A/\mu\text{s}$ (4)              |

#### Notes;

- . Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- .  $L=5\text{mH}, I_{AS}=2.7A, V_{DD}=50V, R_G=27\Omega,$  Starting  $T_J=25^\circ\text{C}$
- .  $I_{SD} \leq 3.3A, di/dt \leq 140A/\mu\text{s}, V_{DD} \leq BV_{DSS},$  Starting  $T_J=25^\circ\text{C}$
- . Pulse Test: Pulse Width =  $250\mu\text{s},$  Duty Cycle  $\leq 2\%$
- . Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

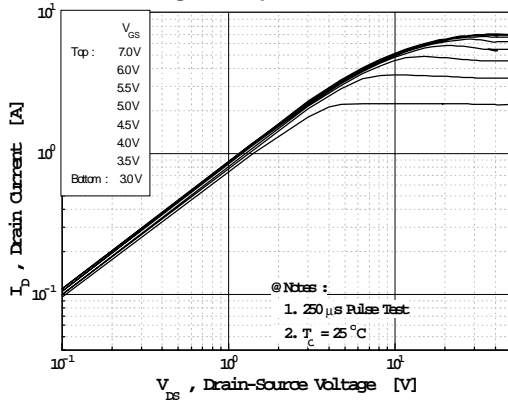


Fig 2. Transfer Characteristics

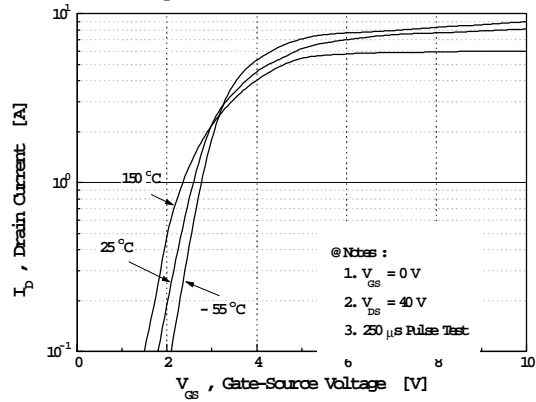


Fig 3. On-Resistance vs. Drain Current

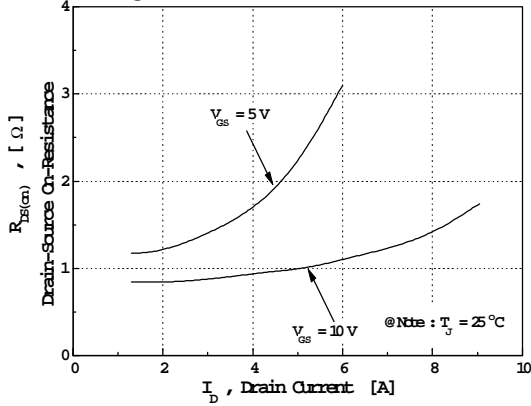


Fig 4. Source-Drain Diode Forward Voltage

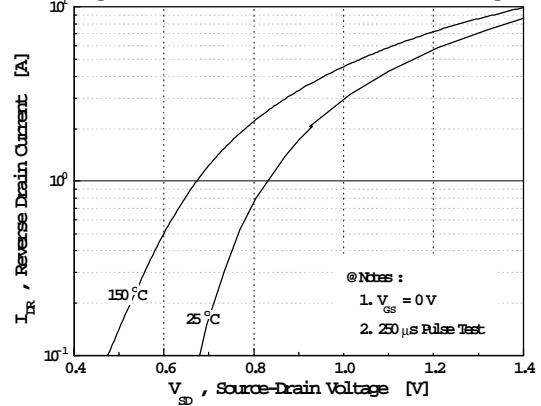


Fig 5. Capacitance vs. Drain-Source Voltage

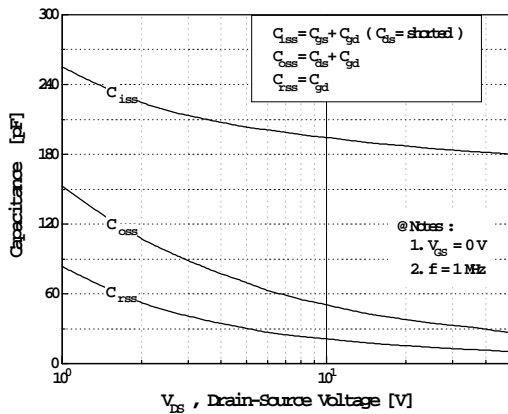


Fig 6. Gate Charge vs. Gate-Source Voltage

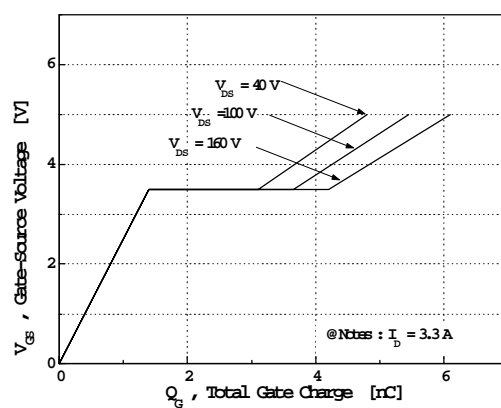


Fig 7. Breakdown Voltage vs. Temperature

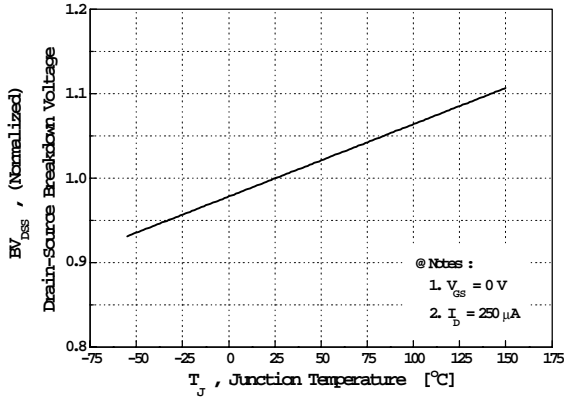


Fig 8. On-Resistance vs. Temperature

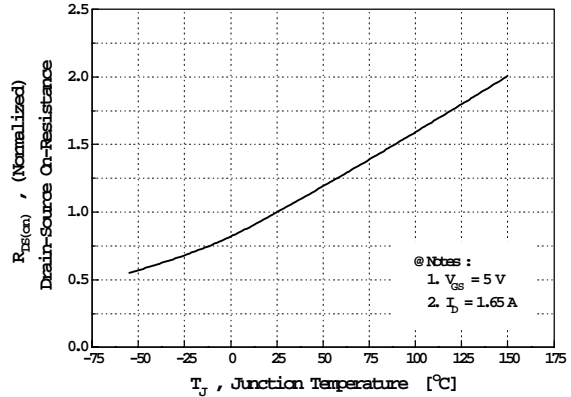


Fig 9. Max. Safe Operating Area

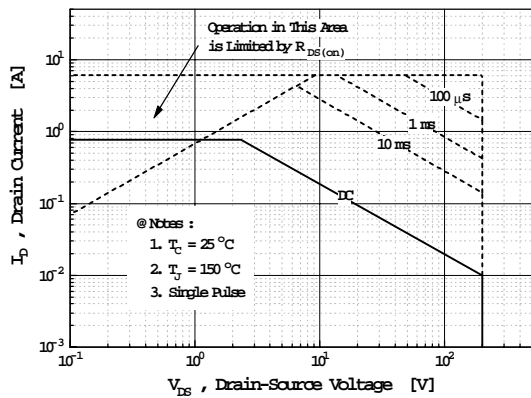


Fig 10. Max. Drain Current vs. Ambient Temperature

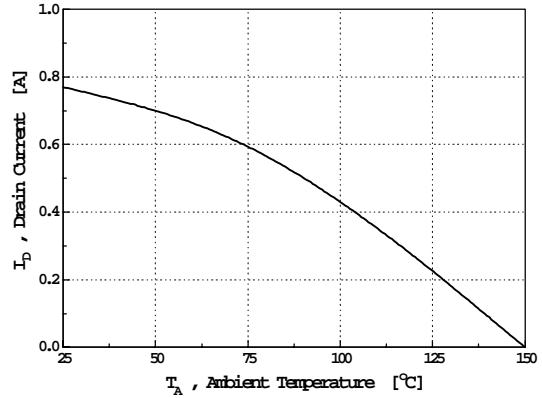
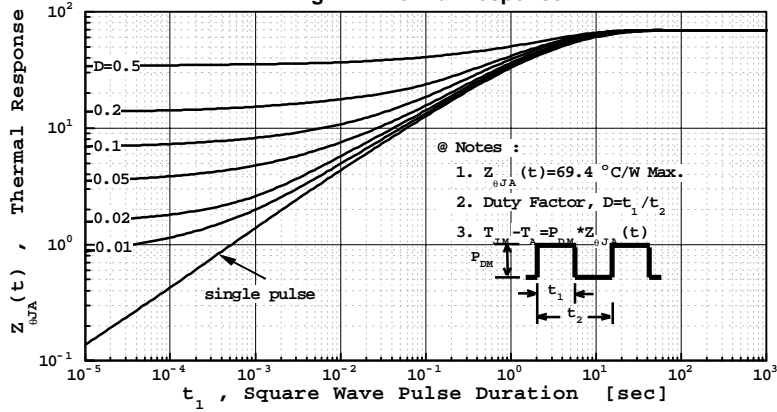
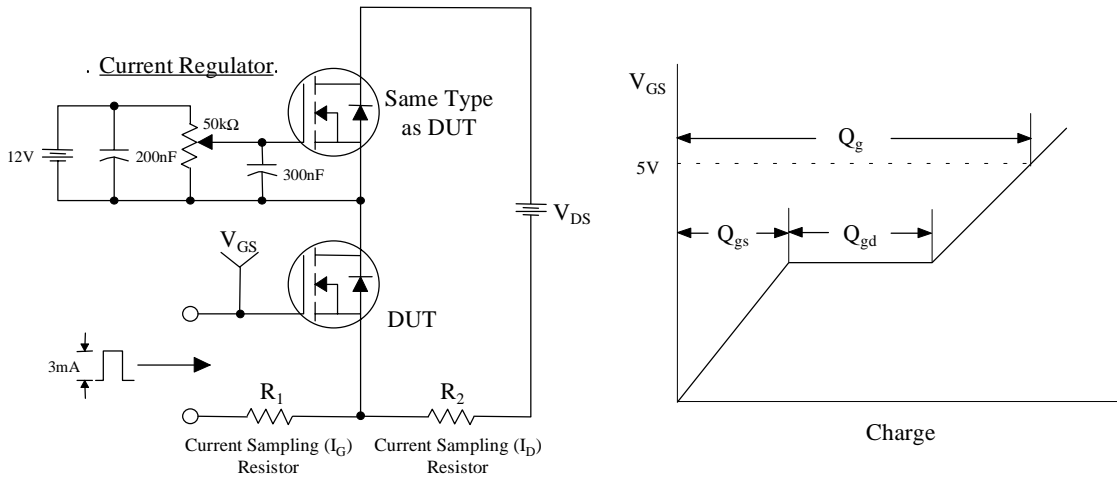


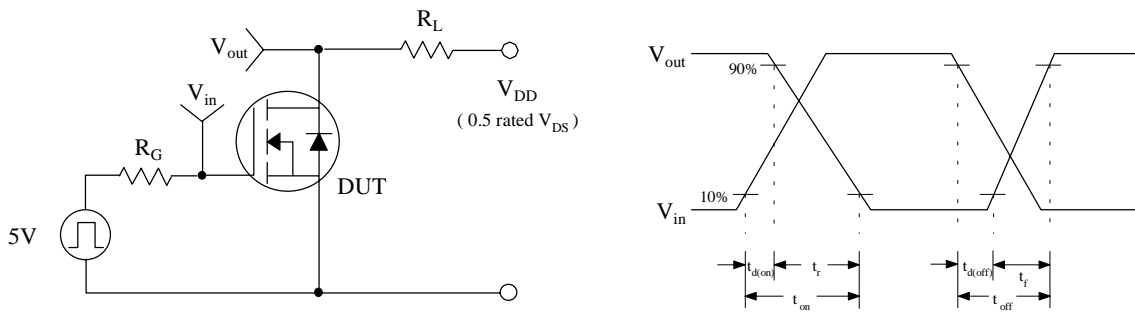
Fig 11. Thermal Response



**Fig 12. Gate Charge Test Circuit & Waveform**



**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

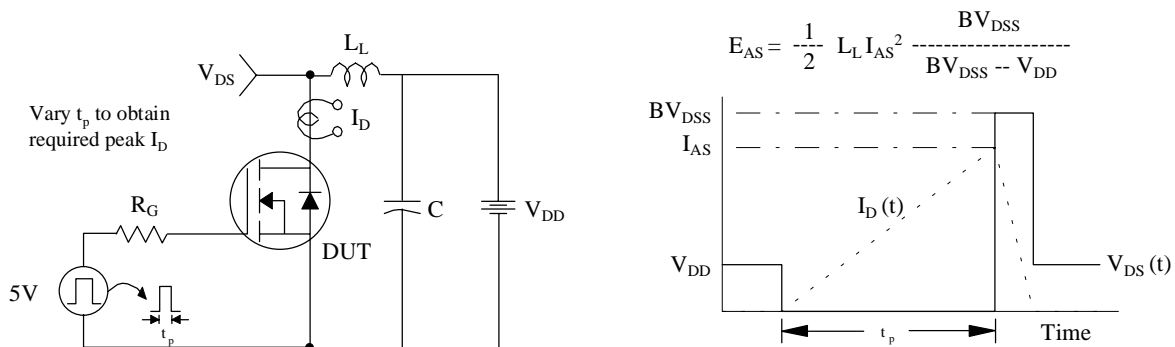
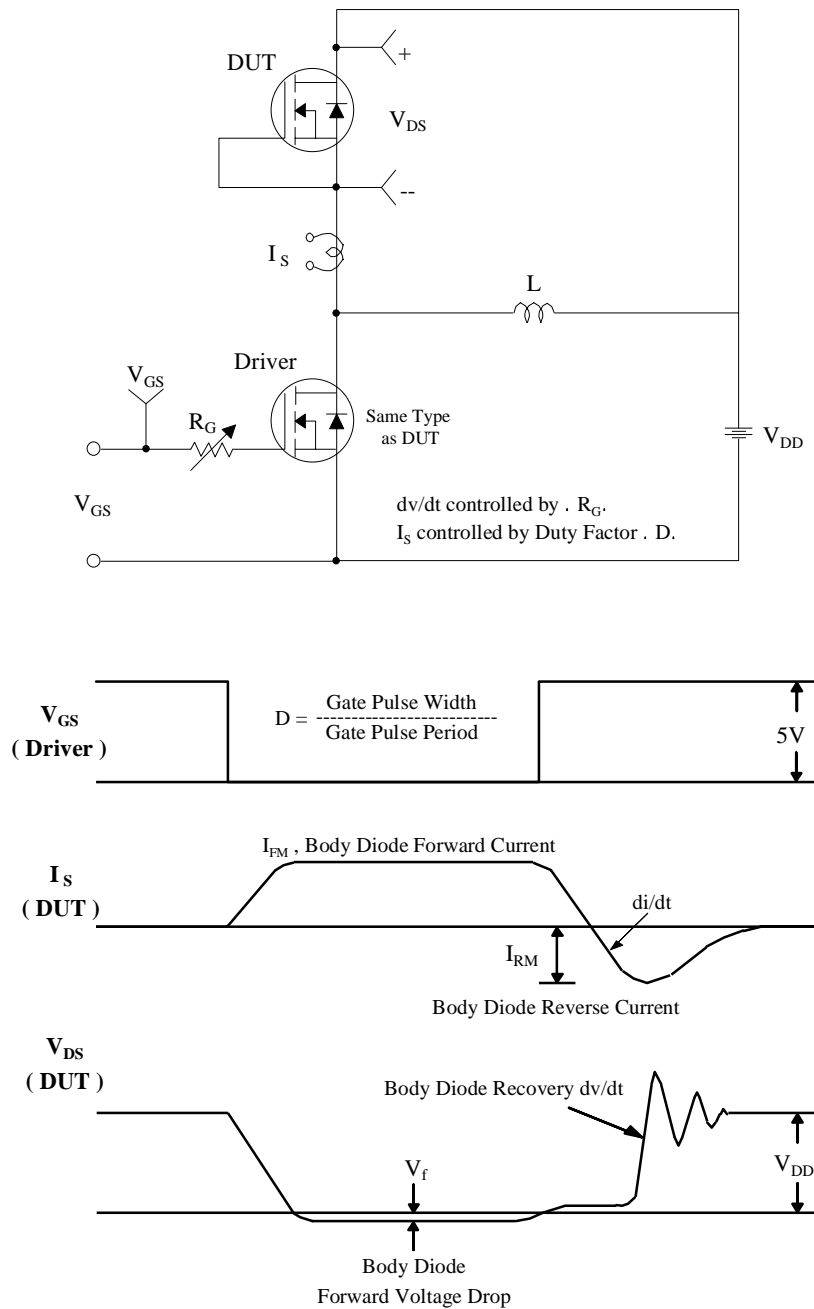


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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200V N-Channel Logic Level A-FET /

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