

FEATURES

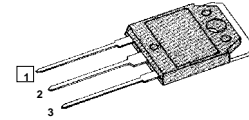
- ◆ Avalanche Rugged Technology
- ◆ Rugged Gate Oxide Technology
- ◆ Lower Input Capacitance
- ◆ Improved Gate Charge
- ◆ Extended Safe Operating Area
- ◆ Lower Leakage Current: 10 μ A (Max.) @ $V_{DS} = 500V$
- ◆ Lower $R_{DS(ON)}$: 0.197 Ω (Typ.)

$$BV_{DSS} = 500 V$$

$$R_{DS(on)} = 0.25\Omega$$

$$I_D = 22 A$$

TO-3P



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings

| Symbol | Characteristic | Value | Units |
|----------------|---|--------------|---------------|
| V_{DSS} | Drain-to-Source Voltage | 500 | V |
| I_D | Continuous Drain Current ($T_C=25^\circ C$) | 22 | A |
| | Continuous Drain Current ($T_C=100^\circ C$) | 13.4 | |
| I_{DM} | Drain Current-Pulsed (1) | 88 | A |
| V_{GS} | Gate-to-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (2) | 2151 | mJ |
| I_{AR} | Avalanche Current (1) | 22 | A |
| E_{AR} | Repetitive Avalanche Energy (1) | 27.8 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (3) | 3.5 | V/ns |
| P_D | Total Power Dissipation ($T_C=25^\circ C$) | 278 | W |
| | Linear Derating Factor | 2.22 | 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 | -- | 0.45 | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink | 0.24 | -- | |
| $R_{\theta JA}$ | Junction-to-Ambient | -- | 40 | |

Rev. B

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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 | 500 | -- | -- | V | $V_{GS}=0V, I_D=250\mu A$ |
| $\Delta BV/\Delta T_J$ | Breakdown Voltage Temp. Coeff. | -- | 0.69 | -- | $V/^\circ\text{C}$ | $I_D=250\mu A$ See Fig 7 |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | -- | 4.0 | V | $V_{DS}=5V, I_D=250\mu A$ |
| I_{GSS} | Gate-Source Leakage, Forward | -- | -- | 100 | nA | $V_{GS}=30V$ |
| | Gate-Source Leakage, Reverse | -- | -- | -100 | | $V_{GS}=-30V$ |
| I_{DSS} | Drain-to-Source Leakage Current | -- | -- | 10 | μA | $V_{DS}=500V$ |
| | | -- | -- | 100 | | $V_{DS}=400V, T_C=125^\circ\text{C}$ |
| $R_{DS(on)}$ | Static Drain-Source On-State Resistance | -- | -- | 0.25 | Ω | $V_{GS}=10V, I_D=11A$ (4) |
| g_{fs} | Forward Transconductance | -- | 17.31 | -- | S | $V_{DS}=50V, I_D=11A$ (4) |
| C_{iss} | Input Capacitance | -- | 3940 | 5120 | pF | $V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$ See Fig 5 |
| C_{oss} | Output Capacitance | -- | 465 | 535 | | |
| C_{rss} | Reverse Transfer Capacitance | -- | 215 | 250 | | |
| $t_{d(on)}$ | Turn-On Delay Time | -- | 27 | 65 | ns | $V_{DD}=250V, I_D=22A,$ $R_G=5.3\Omega$ See Fig 13 (4) (5) |
| t_r | Rise Time | -- | 30 | 70 | | |
| $t_{d(off)}$ | Turn-Off Delay Time | -- | 150 | 310 | | |
| t_f | Fall Time | -- | 43 | 95 | | |
| Q_g | Total Gate Charge | -- | 182 | 236 | nC | $V_{DS}=400V, V_{GS}=10V,$ $I_D=22A$ See Fig 6 & Fig 12 (4) (5) |
| Q_{gs} | Gate-Source Charge | -- | 26 | -- | | |
| Q_{gd} | Gate-Drain (. Miller.) Charge | -- | 79.6 | -- | | |

Source-Drain Diode Ratings and Characteristics

| Symbol | Characteristic | Min. | Typ. | Max. | Units | Test Condition |
|----------|---------------------------|------|------|------|---------------|--|
| I_S | Continuous Source Current | -- | -- | 22 | A | Integral reverse pn-diode in the MOSFET |
| I_{SM} | Pulsed-Source Current (1) | -- | -- | 88 | | |
| V_{SD} | Diode Forward Voltage (4) | -- | -- | 1.4 | V | $T_J=25^\circ\text{C}, I_S=22A, V_{GS}=0V$ |
| t_{rr} | Reverse Recovery Time | -- | 528 | -- | ns | $T_J=25^\circ\text{C}, I_F=22A$ |
| Q_{rr} | Reverse Recovery Charge | -- | 8.35 | -- | μC | $di_F/dt=100A/\mu\text{s}$ (4) |

Notes;

- (1) Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- (2) $L=8\text{mH}, I_{AS}=22A, V_{DD}=50V, R_G=27\Omega,$ Starting $T_J=25^\circ\text{C}$
- (3) $I_{SD} \leq 22A, di/dt \leq 300A/\mu\text{s}, V_{DD} \leq BV_{DSS},$ Starting $T_J=25^\circ\text{C}$
- (4) Pulse Test: Pulse Width = 250 μs , Duty Cycle $\leq 2\%$
- (5) Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

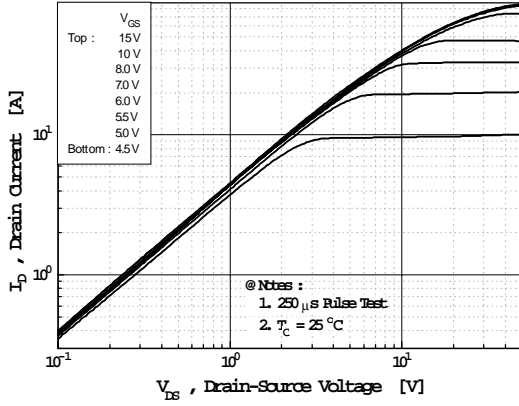


Fig 2. Transfer Characteristics

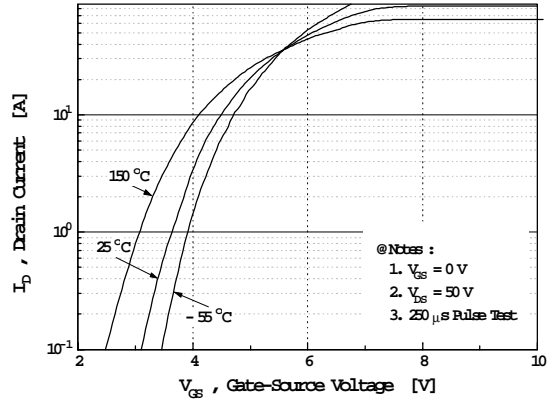


Fig 3. On-Resistance vs. Drain Current

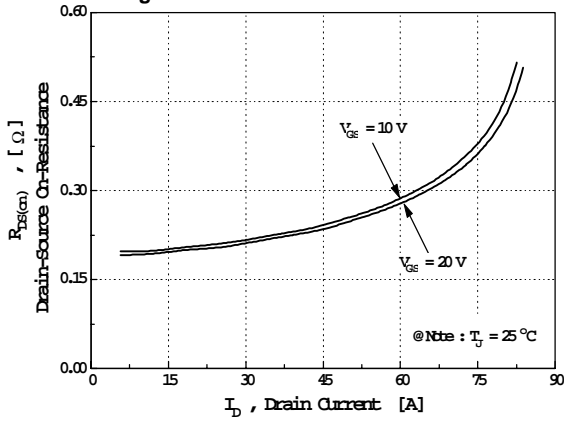


Fig 4. Source-Drain Diode Forward Voltage

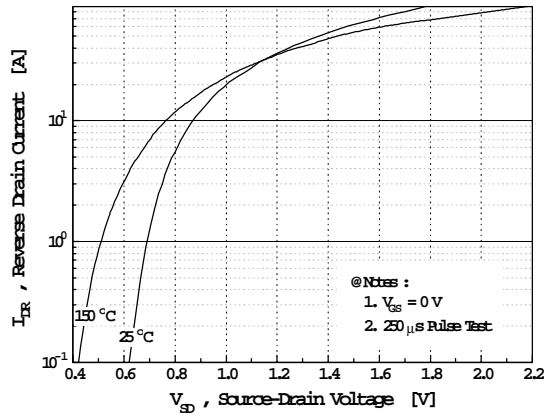


Fig 5. Capacitance vs. Drain-Source Voltage

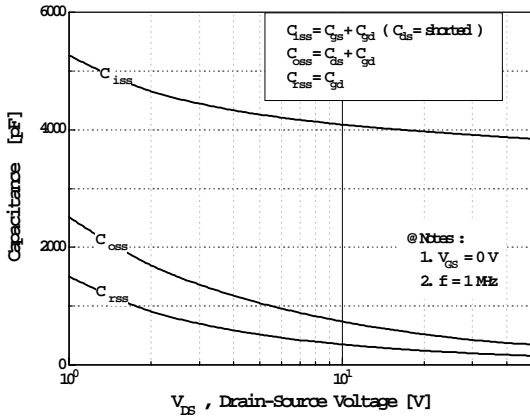


Fig 6. Gate Charge vs. Gate-Source Voltage

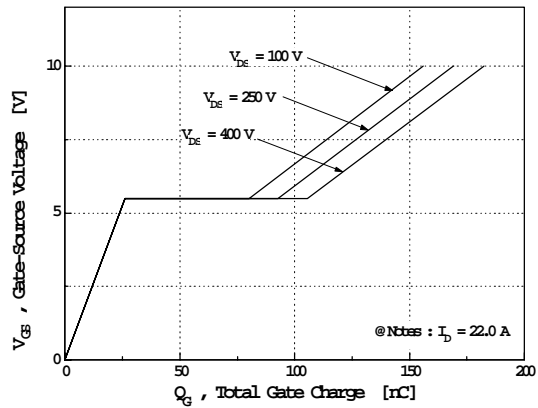


Fig 7. Breakdown Voltage vs. Temperature

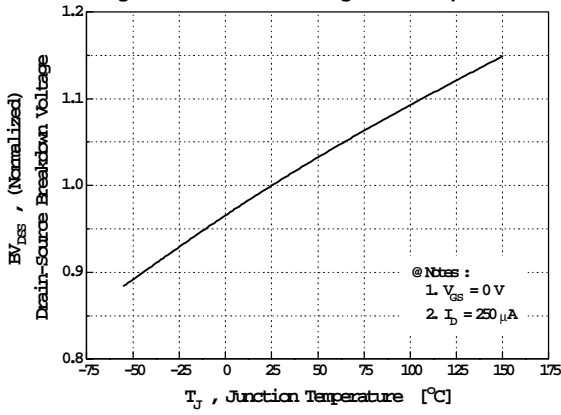


Fig 8. On-Resistance vs. Temperature

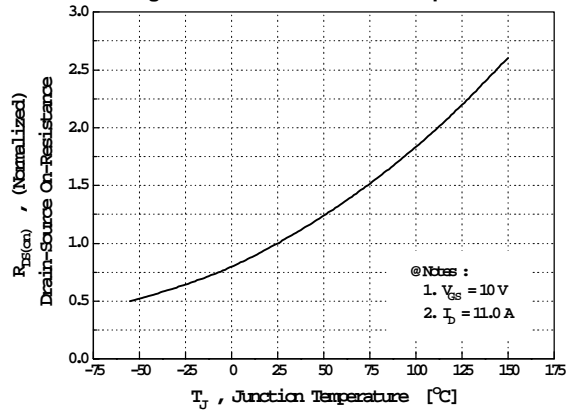


Fig 9. Max. Safe Operating Area

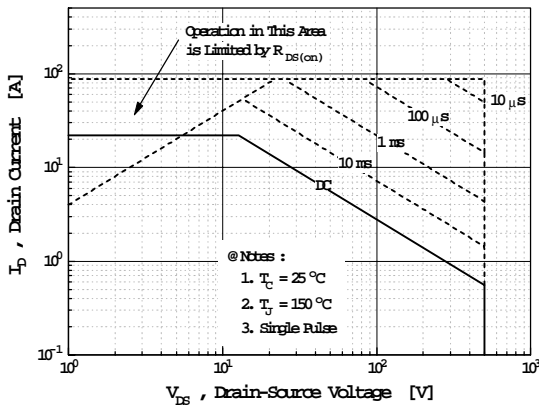


Fig 10. Max. Drain Current vs. Case Temperature

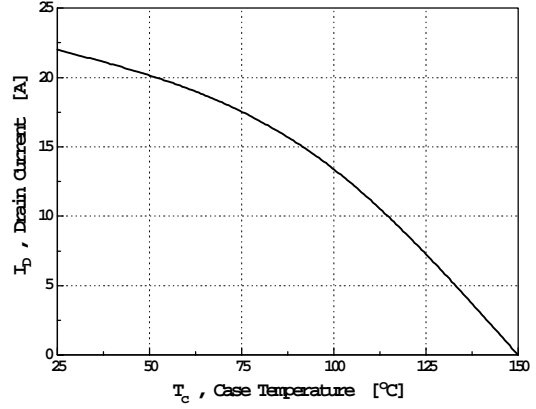


Fig 11. Thermal Response

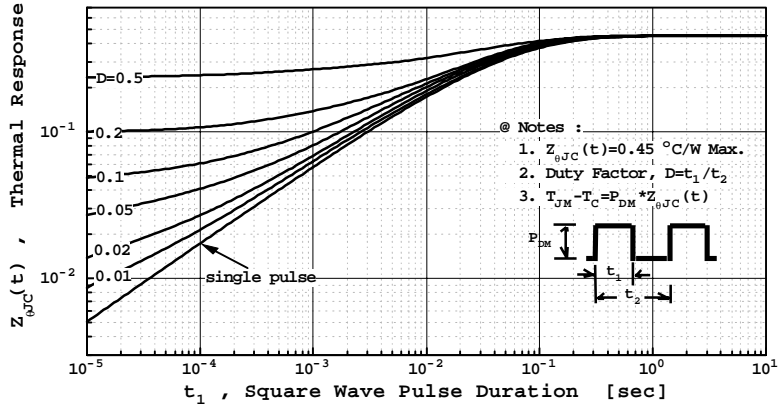


Fig 12. Gate Charge Test Circuit & Waveform

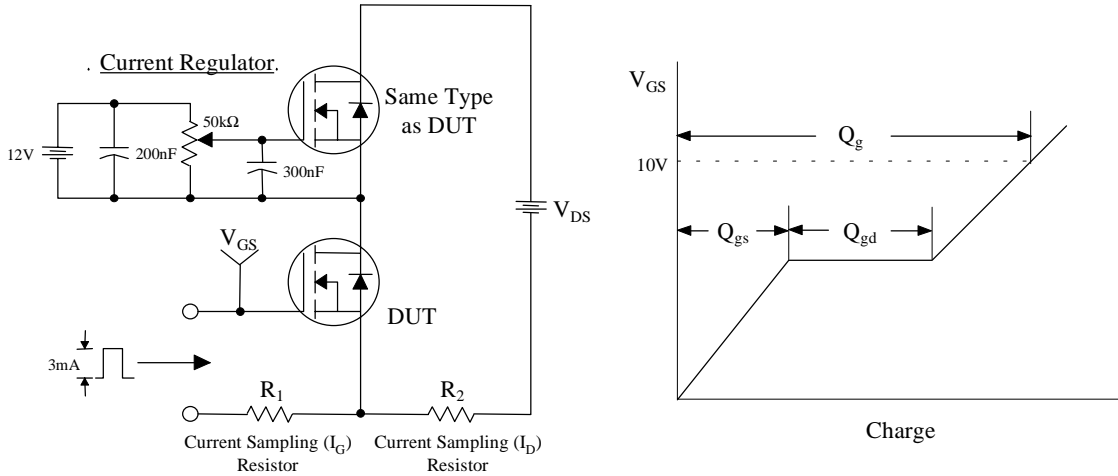


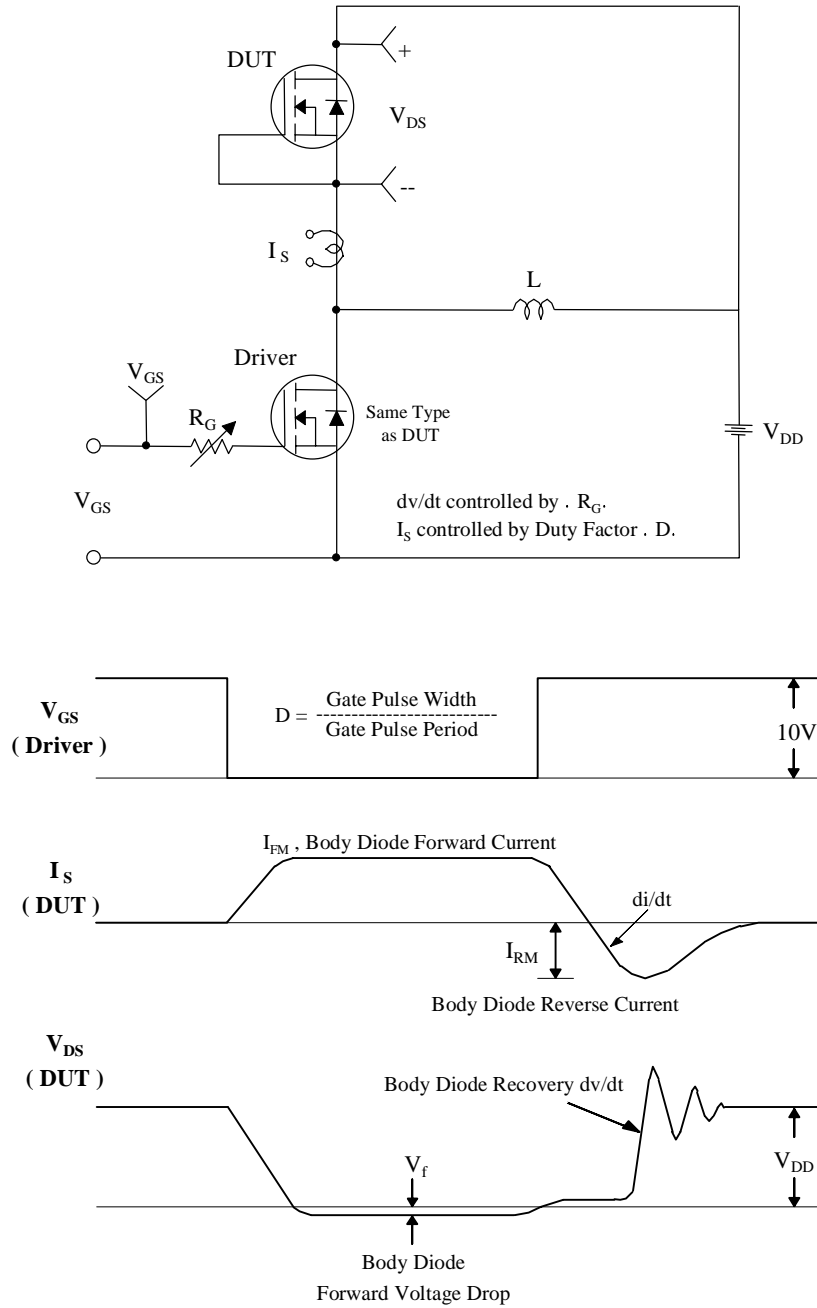
Fig 13. Resistive Switching Test Circuit & Waveforms



Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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



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