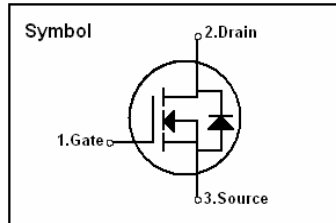


N-Channel MOSFET

Features

- 3.0A, 600V, $R_{DS(on)}=4.0\ \Omega @ V_{GS}=10V$
- Gate charge (Typical 7.0nC)
- High ruggedness
- Fast switching
- 100% Avalanche Tested
- Improved dv/dt capability



$$BV_{DSS} = 600V$$

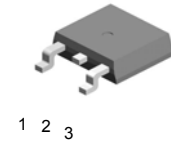
$$R_{DS(ON)} = 4.0\ \Omega$$

$$I_D = 3.0A$$

General Description

This N-channel enhancement mode field-effect power transistor using HG semiconductor's advanced planar stripe, DMOS technology intended for off-line switch mode power supply. Also, especially designed to minimize $r_{ds(on)}$ and high rugged avalanche characteristics. The D-PAK pkg is well suited for charger SMPS and small power inverter application.

D-PAK



Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|----------------|--|------------|---------------|
| V_{DSS} | Drain to Source Voltage | 600 | V |
| I_D | Continuous Drain Current(@ $T_C = 25^\circ C$) | 3.0 | A |
| | Continuous Drain Current(@ $T_C = 100^\circ C$) | 1.9 | A |
| I_{DM} | Drain Current Pulsed (Note 1) | 12 | A |
| V_{GS} | Gate to Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 148 | mJ |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 4.5 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.5 | V/ns |
| P_D | Total Power Dissipation(@ $T_C = 25^\circ C$) | 45 | W |
| | Derating Factor above $25^\circ C$ | 0.36 | W/ $^\circ C$ |
| T_{STG}, T_J | Operating Junction Temperature & Storage Temperature | - 55 ~ 150 | $^\circ C$ |
| T_L | Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds. | 300 | $^\circ C$ |

Thermal Characteristics

| Symbol | Parameter | Value | | | Units |
|-----------------|---|-------|------|------|--------------|
| | | Min. | Typ. | Max. | |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | - | - | 2.78 | $^\circ C/W$ |
| $R_{\theta CS}$ | Thermal Resistance, Case to Sink | - | - | 50 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | - | - | 110 | $^\circ C/W$ |

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------------------------------|---|--|-----|-----|----------------|--------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | 600 | - | - | V |
| BV_{DSS}/T_J | Breakdown Voltage Temperature coefficient | $I_D = 250\mu A$, referenced to $25\text{ }^\circ\text{C}$ | - | 0.4 | - | $V/^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS} = 600V, V_{GS} = 0V$ | - | - | 10 | μA |
| | | $V_{DS} = 480V, T_C = 125\text{ }^\circ\text{C}$ | - | - | 100 | μA |
| I_{GSS} | Gate-Source Leakage, Forward | $V_{GS} = 30V, V_{DS} = 0V$ | - | - | 100 | nA |
| | Gate-source Leakage, Reverse | $V_{GS} = -30V, V_{DS} = 0V$ | - | - | -100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.0 | - | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-state Resistance | $V_{GS} = 10V, I_D = 1.0A$ | - | - | 4.0 (Note4) | Ω |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$ | - | 570 | 720 | pF |
| C_{oss} | Output Capacitance | | - | 150 | 215 | |
| C_{rss} | Reverse Transfer Capacitance | | - | 310 | 450 | |
| Dynamic Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 300V, I_D = 2.0A, R_G = 25$ see fig. 13. (Note 4, 5) | - | 15 | 35 | ns |
| t_r | Rise Time | | - | 75 | 140 | |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 30 | 60 | |
| t_f | Fall Time | | - | 35 | 60 | |
| Q_g | Total Gate Charge | $V_{DS} = 480V, V_{GS} = 10V, I_D = 2.0A$ see fig. 12. (Note 4, 5) | - | 15 | 20 | nC |
| Q_{gs} | Gate-Source Charge | | - | 1.6 | - | |
| Q_{gd} | Gate-Drain Charge(Miller Charge) | | - | 6 | - | |

Source-Drain Diode Ratings and Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit. |
|----------|---------------------------|---|------|------|------|---------|
| I_S | Continuous Source Current | Integral Reverse p-n Junction Diode in the MOSFET | - | - | 2.0 | A |
| I_{SM} | Pulsed Source Current | | - | - | 8.0 | |
| V_{SD} | Diode Forward Voltage | $I_S = 1.5A, V_{GS} = 0V$ | - | - | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_S = 2.0A, V_{GS} = 0V, di/dt = 100A/\mu s$ | - | 600 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 1.1 | - | μC |

*** NOTES**

1. Repeativity rating : pulse width limited by junction temperature
2. $L = 14.2mH, I_{AS} = 10.3A, V_{DD} = 50V, R_G = 50\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 10.3A, di/dt \leq 300A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
5. Essentially independent of operating temperature.

Fig 1. On-State Characteristics

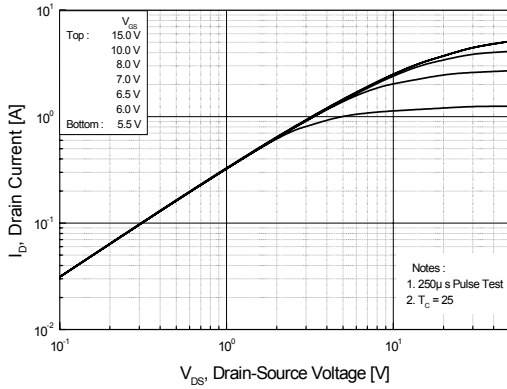


Fig 2. Transfer Characteristics

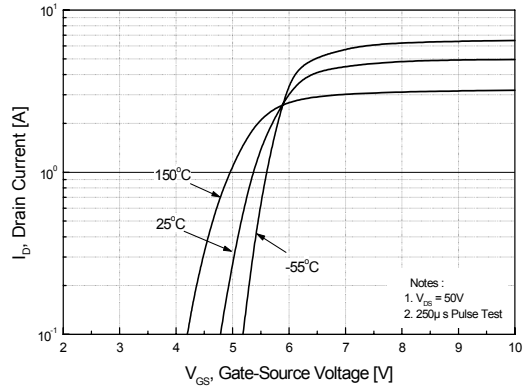


Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage

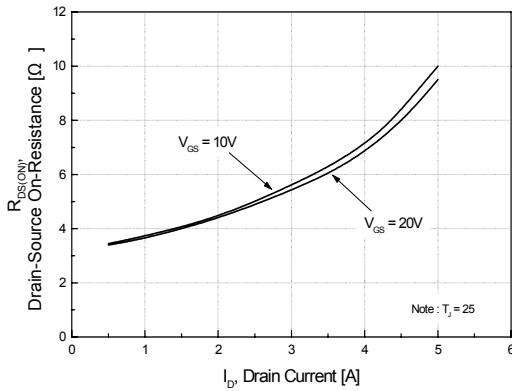


Fig 4. On State Current vs. Allowable Case Temperature

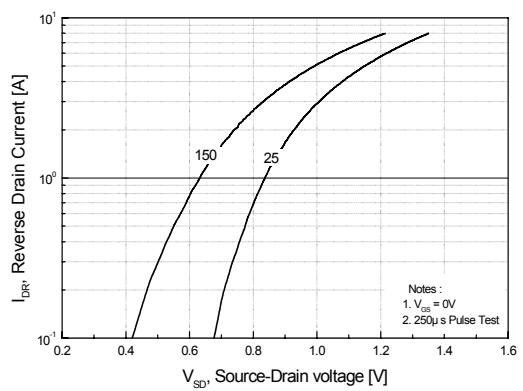


Fig 5. Capacitance Characteristics (Non-Repetitive)

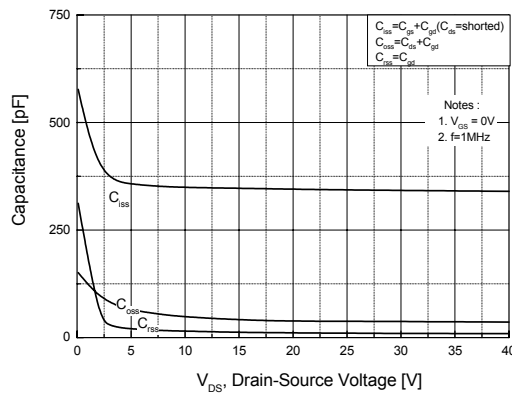


Fig 6. Gate Charge Characteristics

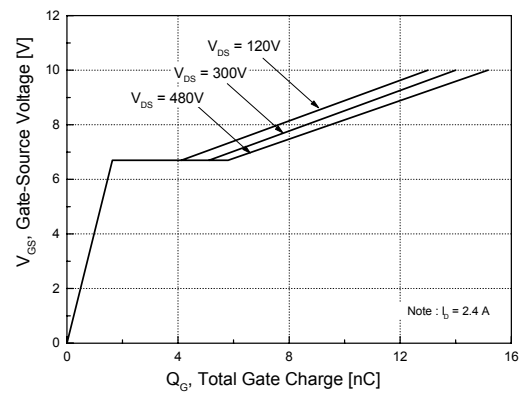


Fig 7. Breakdown Voltage Variation vs. Junction Temperature

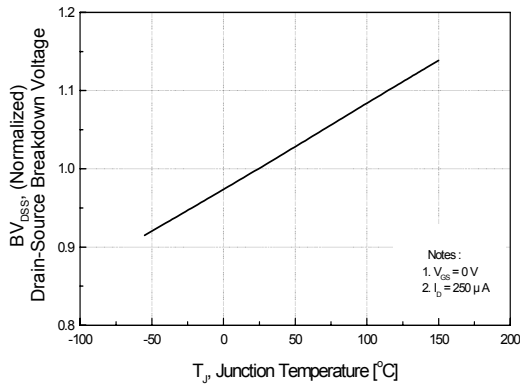


Fig 8. On-Resistance Variation vs. Junction Temperature

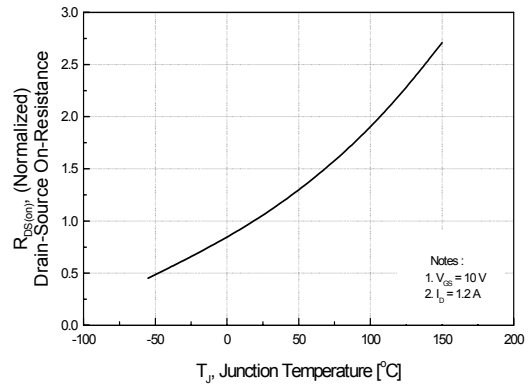


Fig 9. Maximum Safe Operating Area

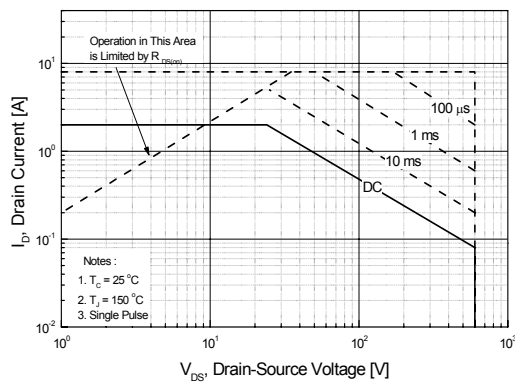


Fig 10. Maximum Drain Current

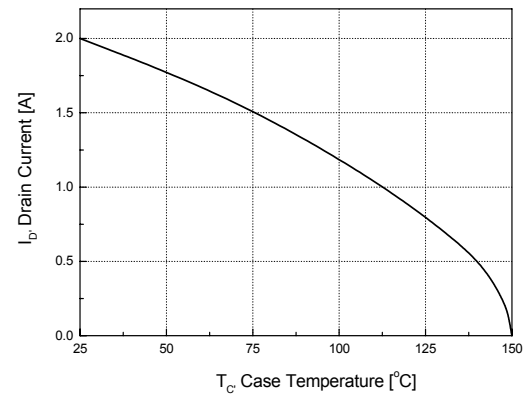


Fig 11. Transient Thermal Response Curve

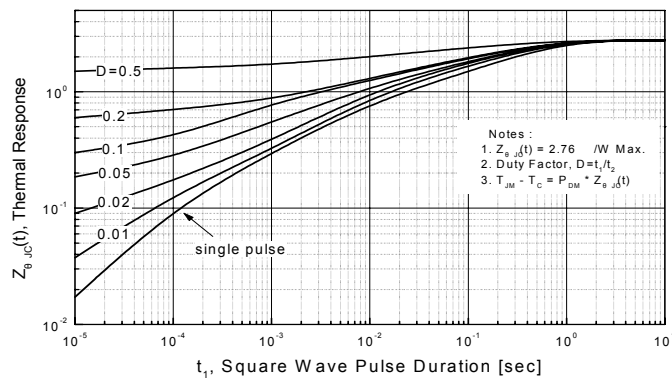


Fig. 12. Gate Charge Test Circuit & Waveforms

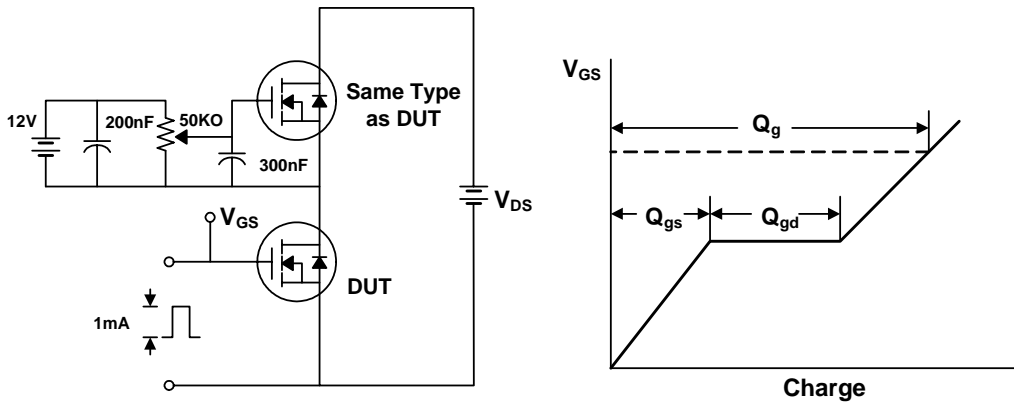


Fig 13. Switching Time Test Circuit & Waveforms

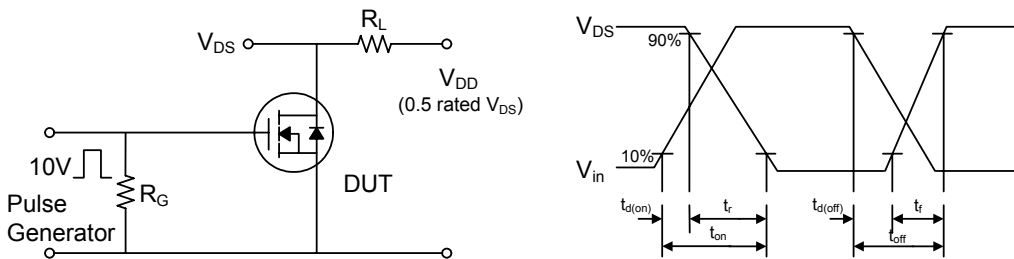


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

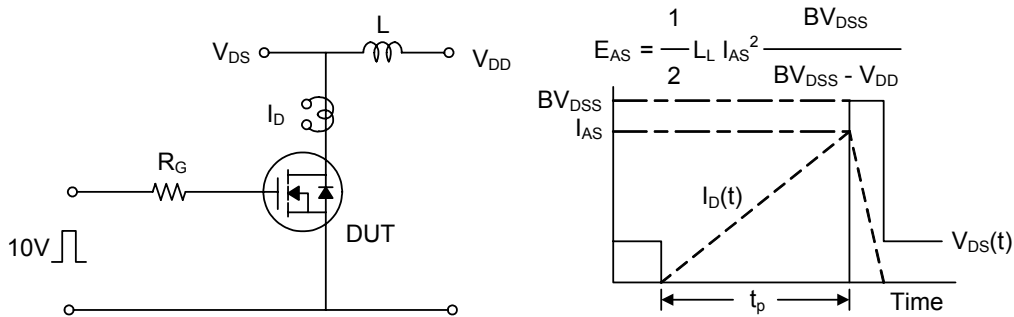
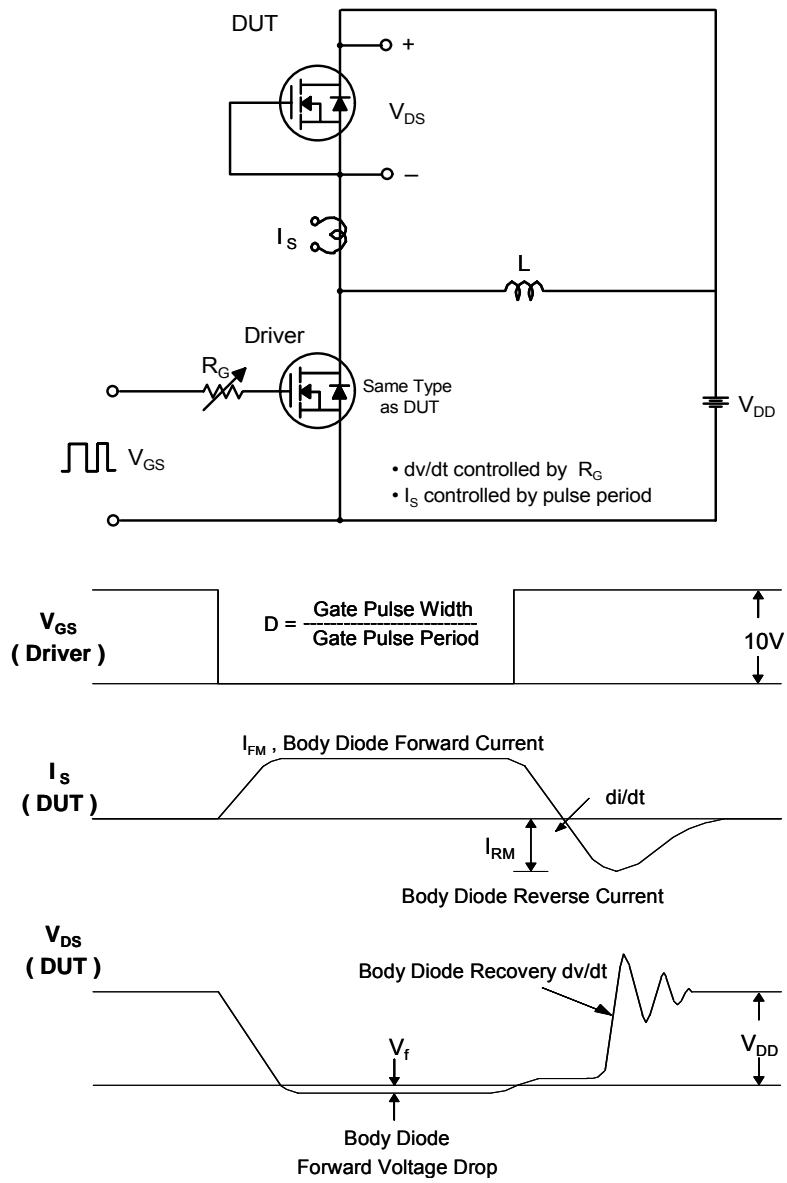


Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



TO-252(D-PAK) Package Dimension

| Dim. | mm | | | Inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 6.48 | 6.604 | 6.73 | 0.255 | 0.26 | 0.265 |
| B | 5.0 | 5.08 | 5.21 | 0.197 | 0.2 | 0.205 |
| C | 7.42 | 7.8 | 8.18 | 0.292 | 0.307 | 0.322 |
| D | 2.184 | 2.286 | 2.388 | 0.086 | 0.09 | 0.094 |
| E | 0.762 | 0.813 | 0.864 | 0.03 | 0.032 | 0.034 |
| F | 1.016 | 1.067 | 1.118 | 0.04 | 0.042 | 0.044 |
| G | | 2.286 | | | 0.09 | |
| H | | 2.286 | | | 0.09 | |
| I | 0.534 | 0.61 | 0.686 | 0.021 | 0.024 | 0.027 |
| J | 1.016 | 1.067 | 1.118 | 0.04 | 0.042 | 0.044 |
| K | | 0.508 | | | 0.02 | |
| L | | 0.762 | | | 0.03 | |
| | | 1.57 | | | 0.06 | |

