

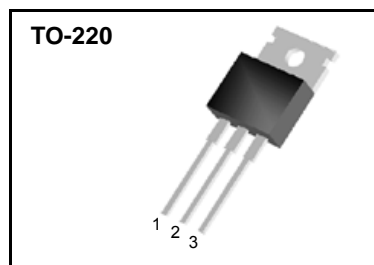
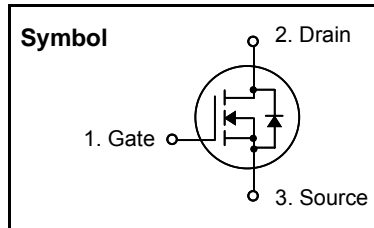
N-Channel MOSFET

Features

- **High ruggedness**
- $R_{DS(on)}$ (Max 0.85 Ω)@ $V_{GS}=10V$
- Gate Charge (Typical 48nC)
- Improved dv/dt Capability, High ruggedness
- 100% Avalanche Tested
- Maximum Junction Temperature Range (150°C)

General Description

This Power MOSFET is produced using SemiWell's advanced planar stripe, DMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. This devices is specially well suited for half bridge and full bridge resonant topolgy like a electronic lamp ballast.



Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|----------------|--|------------|-------|
| V_{DSS} | Drain to Source Voltage | 500 | V |
| I_D | Continuous Drain Current(@ $T_C = 25^\circ C$) | 8 | A |
| | Continuous Drain Current(@ $T_C = 100^\circ C$) | 5.1 | A |
| I_{DM} | Drain Current Pulsed (Note 1) | 32 | A |
| V_{GS} | Gate to Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 660 | mJ |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 12.5 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 5 | V/ns |
| P_D | Total Power Dissipation(@ $T_C = 25^\circ C$) | 125 | W |
| | Derating Factor above 25 °C | 1.0 | W/°C |
| T_{STG}, T_J | Operating Junction Temperature & Storage Temperature | - 55 ~ 150 | °C |
| T_L | Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds. | 300 | °C |

Thermal Characteristics

| Symbol | Parameter | Value | | | Units |
|-----------------|---|-------|------|------|-------|
| | | Min. | Typ. | Max. | |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | - | - | 1 | °C/W |
| $R_{\theta CS}$ | Thermal Resistance, Case to Sink | - | 0.5 | - | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | - | - | 62 | °C/W |

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Electrical Characteristics (T_C = 25 °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 = 250uA | 500 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature coefficient | I _D = 250uA, referenced to 25 °C | - | 0.6 | - | V/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} = 500V, V _{GS} = 0V | - | - | 1 | uA |
| | | V _{DS} = 400V, T _C = 125 °C | - | - | 10 | uA |
| 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 = 250uA | 2.0 | - | 4.0 | V |
| R _{DS(on)} | Static Drain-Source On-state Resistance | V _{GS} = 10 V, I _D = 4A | - | - | 0.85 | Ω |
| Dynamic Characteristics | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} = 0 V, V _{DS} = 25V, f = 1MHz | - | 1470 | - | pF |
| C _{oss} | Output Capacitance | | - | 170 | - | |
| C _{rss} | Reverse Transfer Capacitance | | - | 40 | - | |
| Dynamic Characteristics | | | | | | |
| t _{d(on)} | Turn-on Delay Time | V _{DD} = 250V, I _D = 8A, R _G = 50Ω * see fig. 13. (Note 4, 5) | - | 22 | - | ns |
| t _r | Rise Time | | - | 25 | - | |
| t _{d(off)} | Turn-off Delay Time | | - | 130 | - | |
| t _f | Fall Time | | - | 30 | - | |
| Q _g | Total Gate Charge | V _{DS} = 400V, V _{GS} = 10V, I _D = 8A * see fig. 12. (Note 4, 5) | - | 48 | 60 | nC |
| Q _{gs} | Gate-Source Charge | | - | 7 | - | |
| Q _{gd} | Gate-Drain Charge(Miller Charge) | | - | 20 | - | |

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 | - | - | 8 | A |
| I _{SM} | Pulsed Source Current | | - | - | 32 | |
| V _{SD} | Diode Forward Voltage | I _S = 8A, V _{GS} = 0V | - | - | 2.0 | V |
| t _{rr} | Reverse Recovery Time | I _S = 8A, V _{GS} = 0V, di _F /dt = 100A/us | - | 335 | - | ns |
| Q _{rr} | Reverse Recovery Charge | | - | 3.6 | - | uC |

* NOTES

1. Repeatability rating : pulse width limited by junction temperature
2. L = 18.5mH, I_{AS} = 8A, V_{DD} = 50V, R_G = 0Ω, Starting T_J = 25°C
3. I_{SD} ≤ 10A, di/dt ≤ 300A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature.



Fig 1. On-State Characteristics

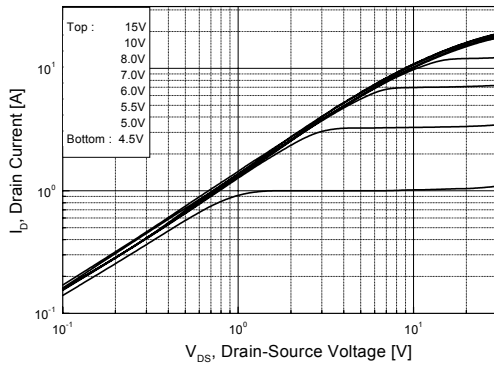


Fig 2. Transfer Characteristics

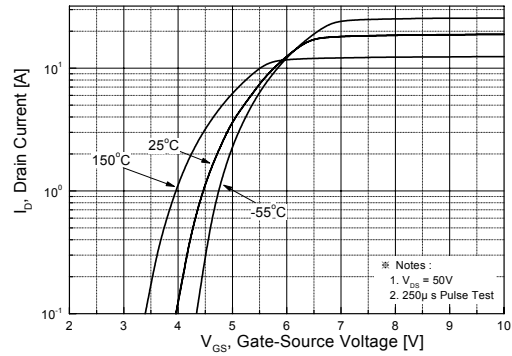


Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage

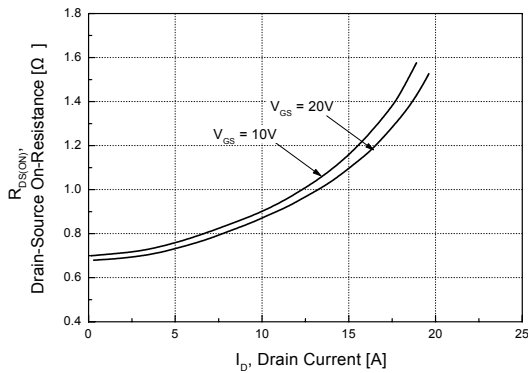


Fig 4. On State Current vs. Allowable Case Temperature

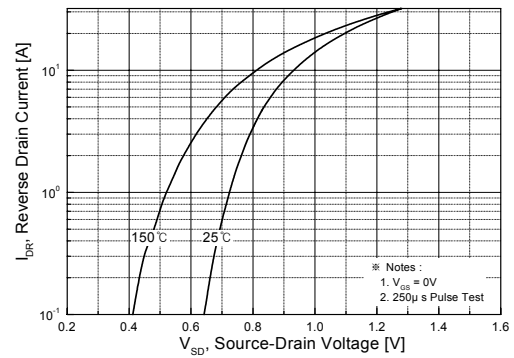


Fig 5. Capacitance Characteristics

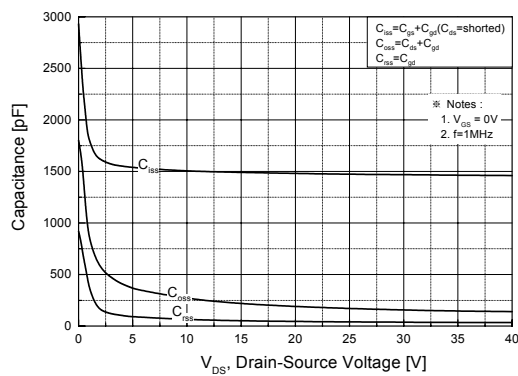
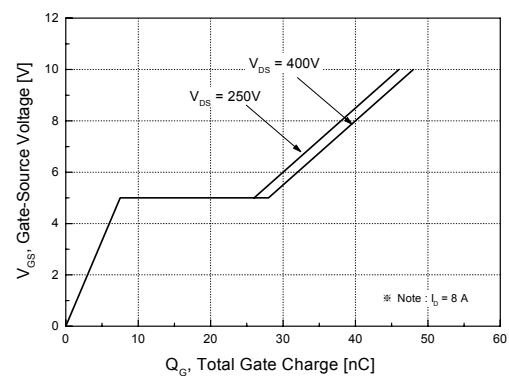


Fig 6. Gate Charge Characteristics



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Fig 7. Breakdown Voltage Variation

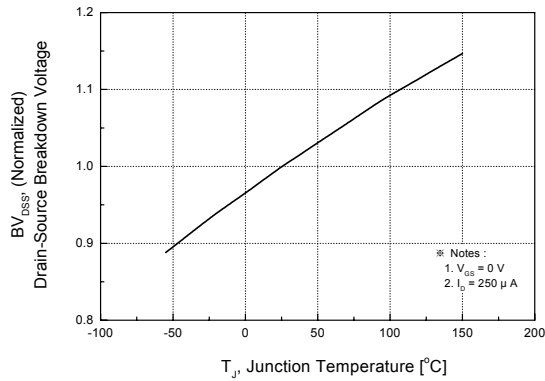


Fig 8. On-Resistance Variation

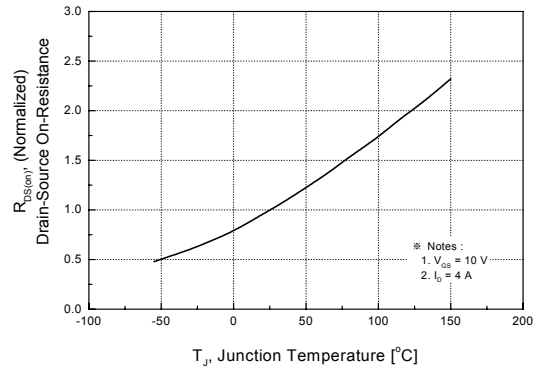


Fig 9. Maximum Safe Operating Area

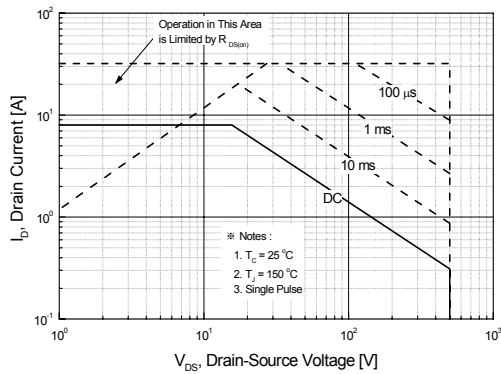


Fig 10. Maximum Drain Current vs. Case Temperature

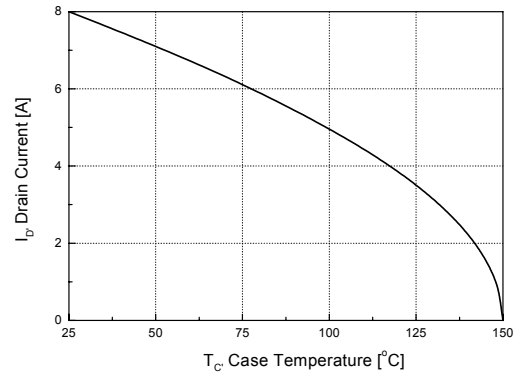


Fig 11. Transient Thermal Response Curve

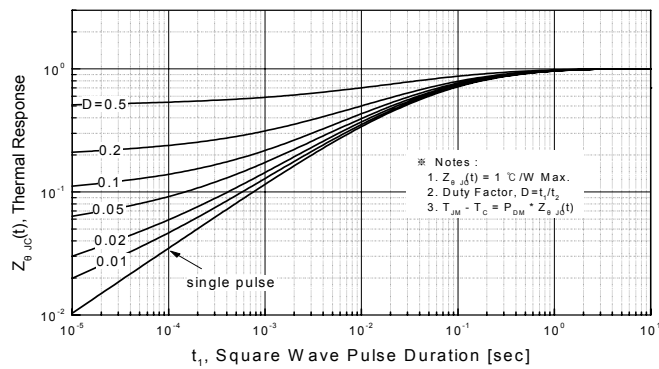


Fig. 12. Gate Charge Test Circuit & Waveforms

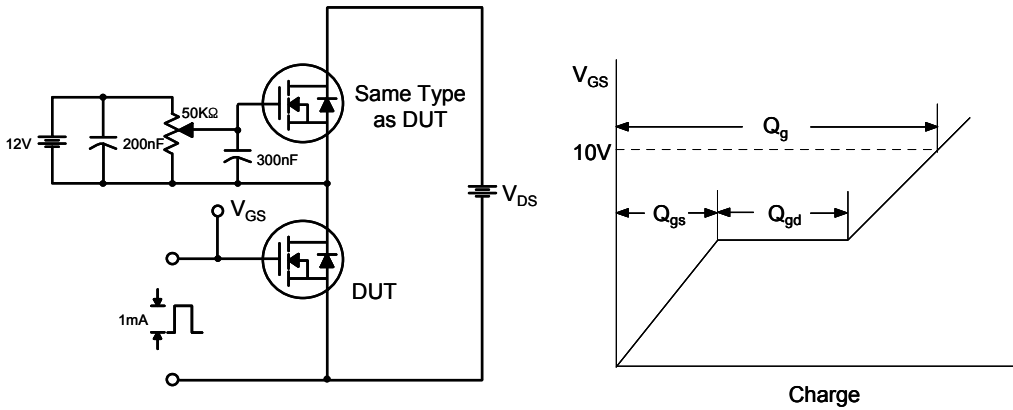


Fig 13. Switching Time Test Circuit & Waveforms

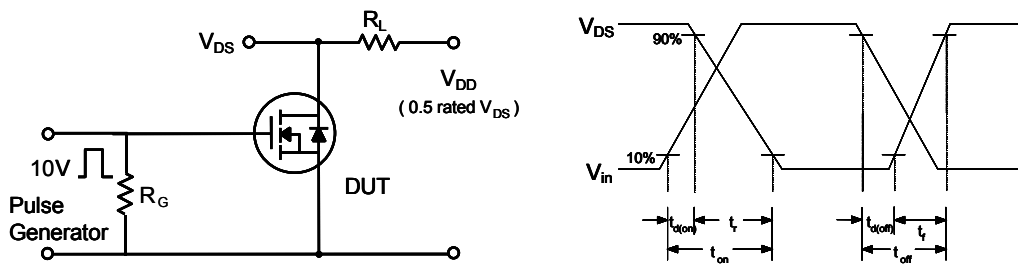
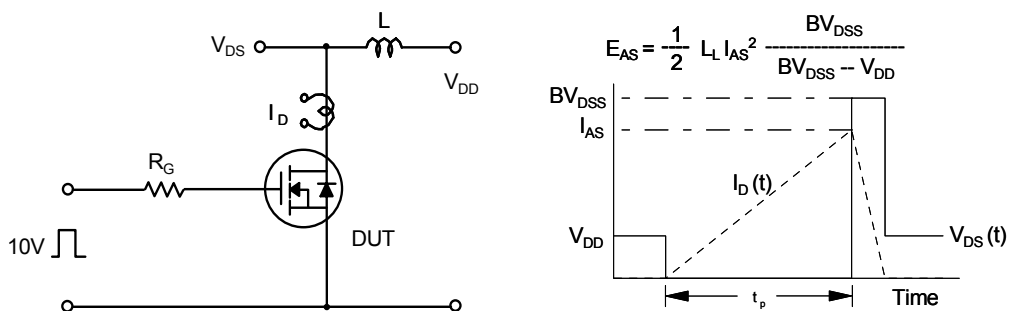
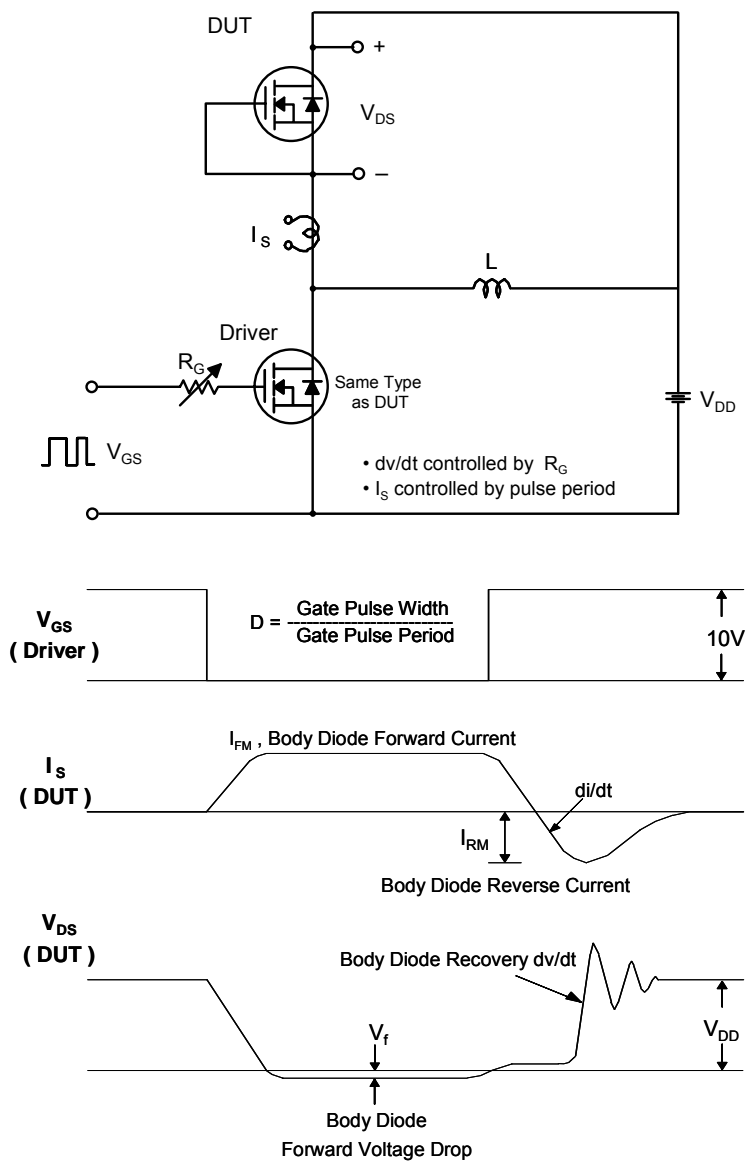


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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



TO-220 Package Dimension

| Dim. | mm | | | Inch | | |
|-------------|------|------|------|-------|-------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 9.7 | | 10.1 | 0.382 | | 0.398 |
| B | 6.3 | | 6.7 | 0.248 | | 0.264 |
| C | 9.0 | | 9.47 | 0.354 | | 0.373 |
| D | 12.8 | | 13.3 | 0.504 | | 0.524 |
| E | 1.2 | | 1.4 | 0.047 | | 0.055 |
| F | | 1.7 | | | 0.067 | |
| G | | 2.5 | | | 0.098 | |
| H | 3.0 | | 3.4 | 0.118 | | 0.134 |
| I | 1.25 | | 1.4 | 0.049 | | 0.055 |
| J | 2.4 | | 2.7 | 0.094 | | 0.106 |
| K | 5.0 | | 5.15 | 0.197 | | 0.203 |
| L | 2.2 | | 2.6 | 0.087 | | 0.102 |
| M | 1.25 | | 1.55 | 0.049 | | 0.061 |
| N | 0.45 | | 0.6 | 0.018 | | 0.024 |
| O | 0.6 | | 1.0 | 0.024 | | 0.039 |
| \emptyset | | 3.6 | | | 0.142 | |

