# N-Channel Enhancement Mode Field Effect Transistor

## Product Summary

| | |
|---|---|
| $V_{DS}$ | 800V |
| $I_D$ | 22A |
| $R_{DS(ON)}$( at $V_{GS}$=10V) | 190m |
| 100% EAS Tested | |
| 100% $V_{DS}$ Tested | |

## General Description

Super Junction High Voltage MOSFET technology
Ultra Low Gate Charge Cause Lower Driving Requirement
Low On-resistance and Low Conduction Loss
Moisture Sensitivity Level 1
Epoxy Meets UL 94 V-0 Flammability Rating
Halogen Free

## Applications

Switching Mode Power Supplies (SMPS)
PWM Motor Controls
LED Lighting
Adapter

## Limiting Values

| Parameter | Conditions | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-source Voltage | | | $V_{DS}$ | - | 800 | V |
| Gate-source Voltage | | | $V_{GS}$ | -20 | 20 | |
| Continuous Drain Current (Note 1,2) | Steady-State | $T_A$=25 ,$V_{GS}$=10V | $I_D$ | - | 2.4 | A |
| | | $T_A$=100 | | | | |

## Electrical Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static Parameter** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250 A,Tj=25 | 800 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=800V,$V_{GS}$=0V,Tj=25 | - | - | 1 | |
| | | $V_{DS}$=800V,$V_{GS}$=0V,Tj=125 | - | - | 100 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V,Tj=25 | - | - | ±10 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250 A,Tj=25 | 3 | 3.8 | 4.6 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=12A,Tj=25 | - | 153 | 190 | |
| | | $V_{GS}$=10V,$I_D$=12A,Tj=150 | - | 405 | 503 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=22A,$V_{GS}$=0V,Tj=25 | - | 0.86 | 1.2 | V |
| Gate Resistance | $R_G$ | f=1MHz,Tj=25 | - | 4 | - | |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=400V,$V_{GS}$=0V,f=1MHz,Tj=25 | - | 2944 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 44.3 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 1.8 | - | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{DS}$= 0V,$V_{GS}$=0V,f=1MHz, Tj=25 | - | 72 | - | |
| Effective output capacitance, time related | $C_{o(tr)}$ | | - | 328 | - | |
| **Switching Parameters** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=10V,$V_{DS}$=400V,$I_D$=22A,Tj=25 | - | 62 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 16.7 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 23.5 | - | |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$=22A,di/dt=100A/ s,$V_{GS}$=0V, $V_R$=400V,Tj=25 | - | 8.1 | - | C |
| Reverse Recovery Time | $t_{rr}$ | | - | 418 | - | ns |
| Peak Reverse Recovery Current | $I_{rrm}$ | | - | 33.8 | - | A |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{GS}$=10V,$V_{DS}$=400V,$I_D$=22A,$R_{GEN}$=3 , Tj=25 | - | 84 | - | ns |
| Turn-on Rise Time | $t_r$ | | - | 37 | - | |
| Turn-off Delay Time | $t_{D(off)}$ | | - | 50 | - | |
| Turn-off Fall Time | $t_f$ | | - | 14 | - | |

Note

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of R is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 $in^2$ pad of 2oz. Copper, in the still air environment with $T_A$=25 .The maximum allowed junction temperature of 150 . The value in any given application depends on the user's specific board design.
3. Thermal resistance from junction to soldering point (on the exposed drain pad).

## Typical Electrical and Thermal Characteristics Diagrams

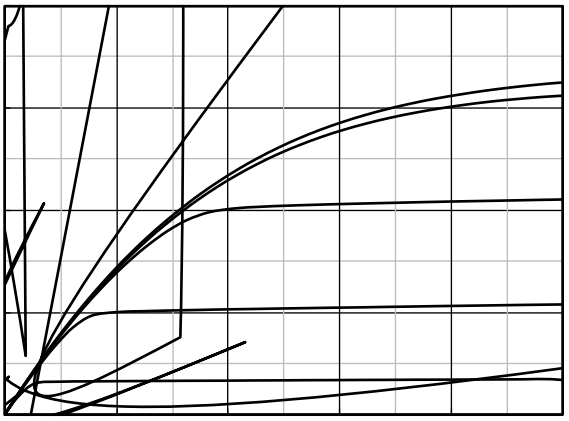


Figure 1. Output Characteristics; typical values

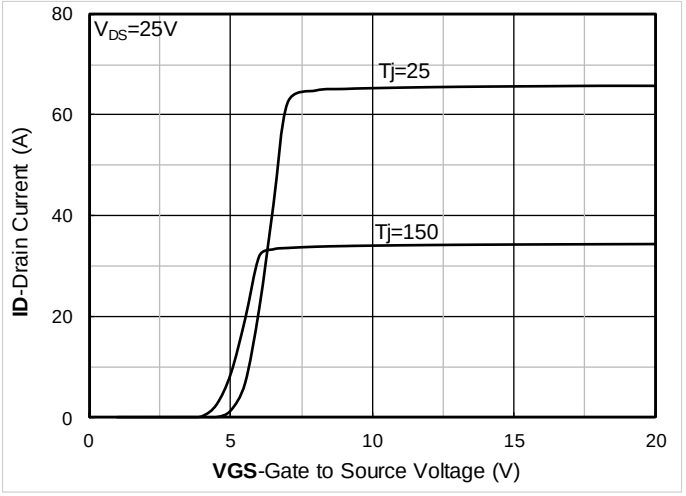



Figure 2. Transfer Characteristics; typical values

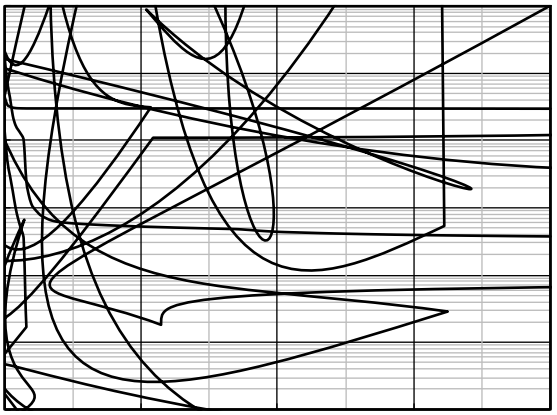


Figure 3. Capacitance Characteristics; typical values

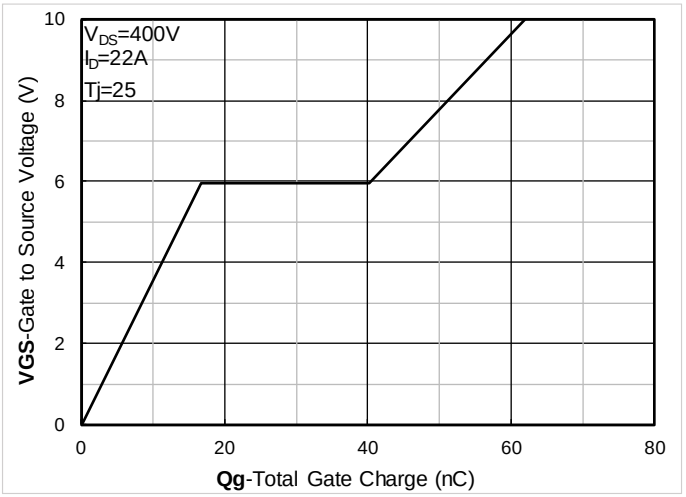



Figure 4. Gate Charge; typical values

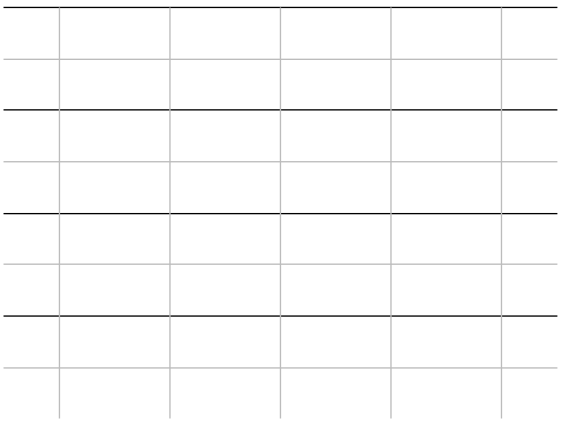


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

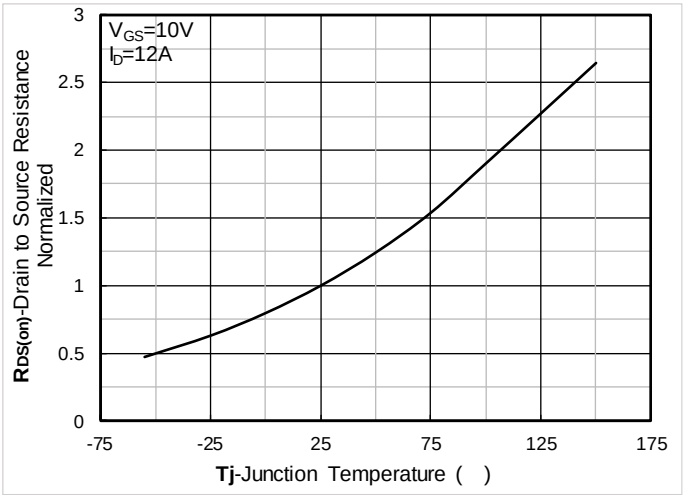



Figure 6. Normalized On-Resistance

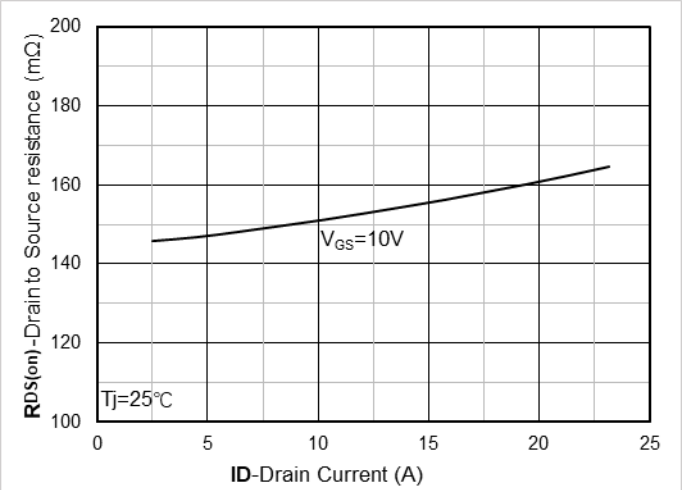



Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

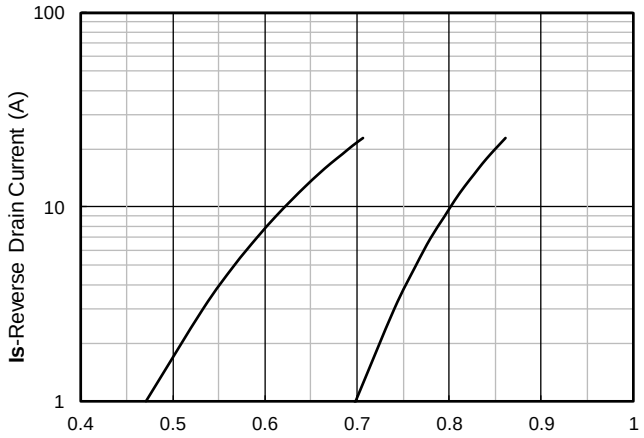



Figure 8. Forward characteristics of reverse diode; typical values

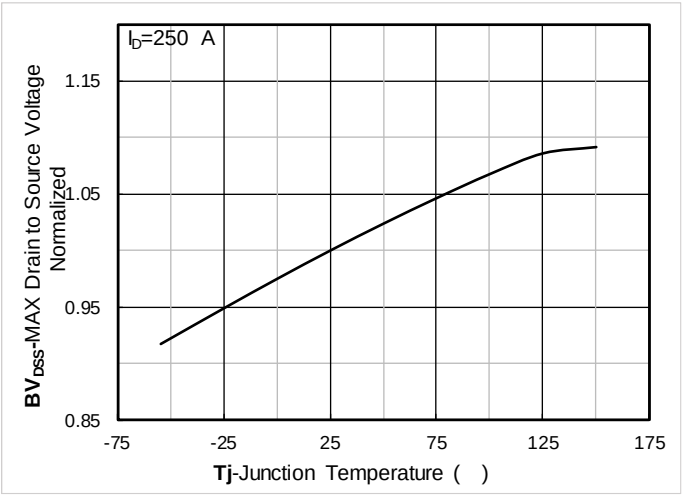



Figure 9. Normalized breakdown voltage

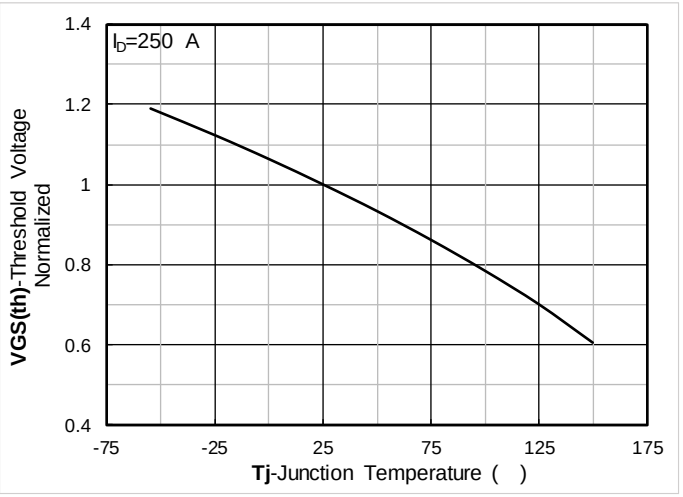



Figure 10. Normalized Threshold voltage

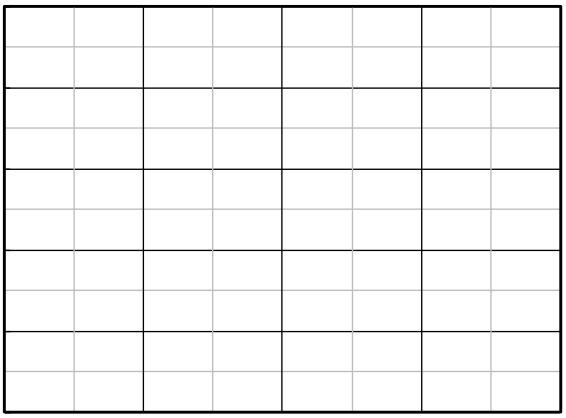


Figure 11. Current dissipation

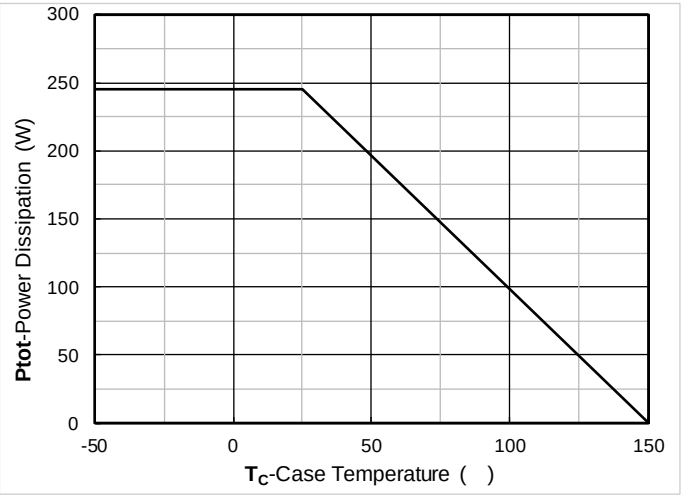



Figure 12. Power dissipation

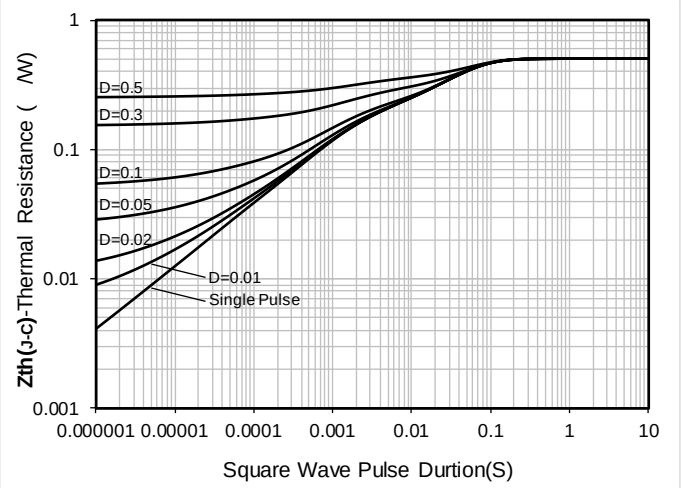



Figure 13. Maximum Transient Thermal Impedance

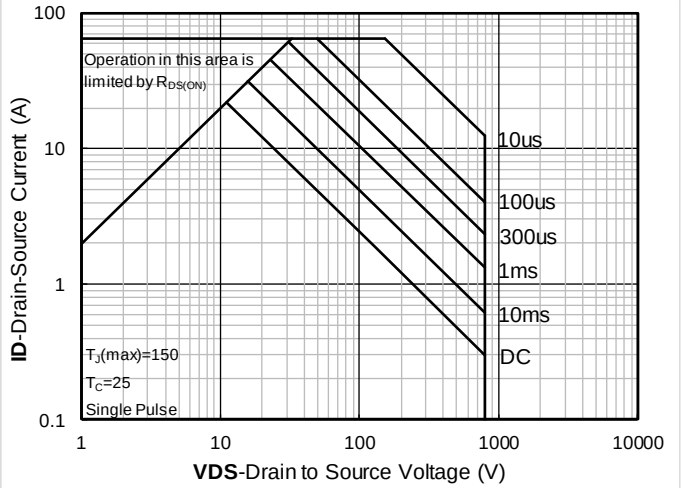



Figure 14. Safe Operation Area

## Test Circuits & Waveforms

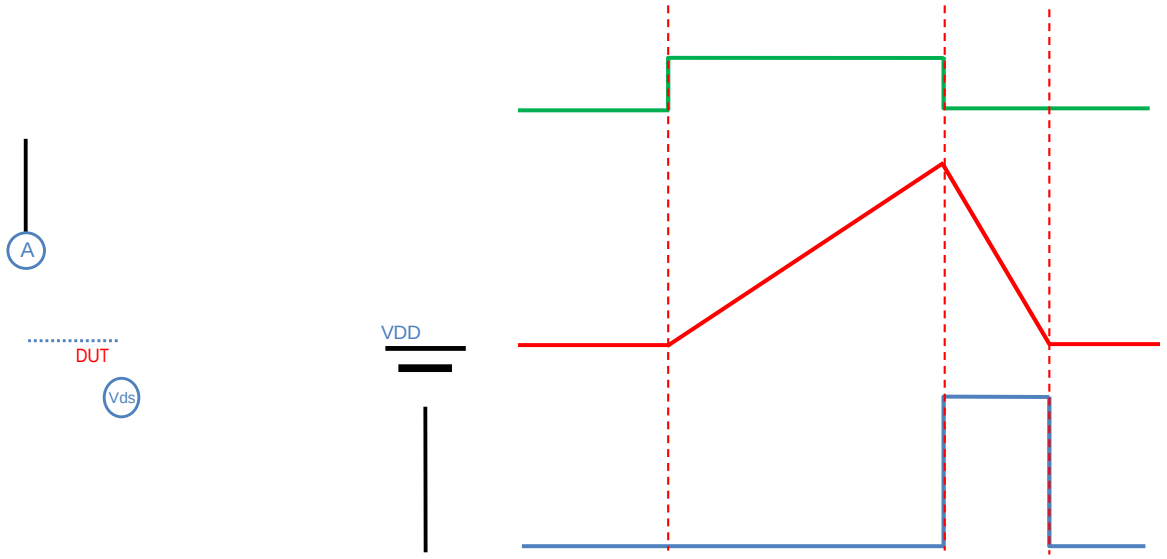



Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

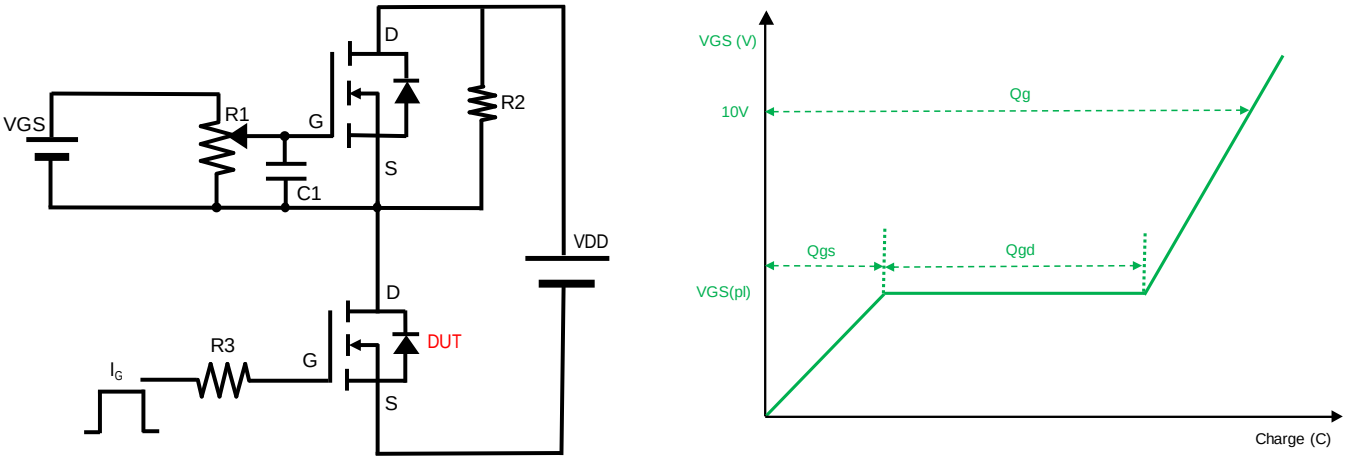



Figure B. Gate Charge Test Circuit & Waveform

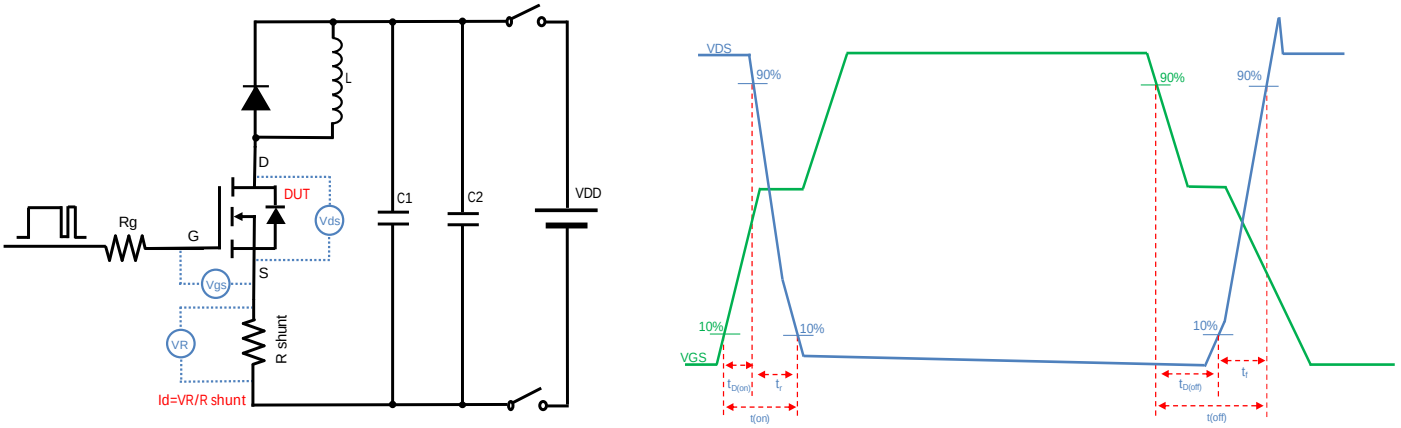



Figure C. Resistive Switching Test Circuit & Waveform

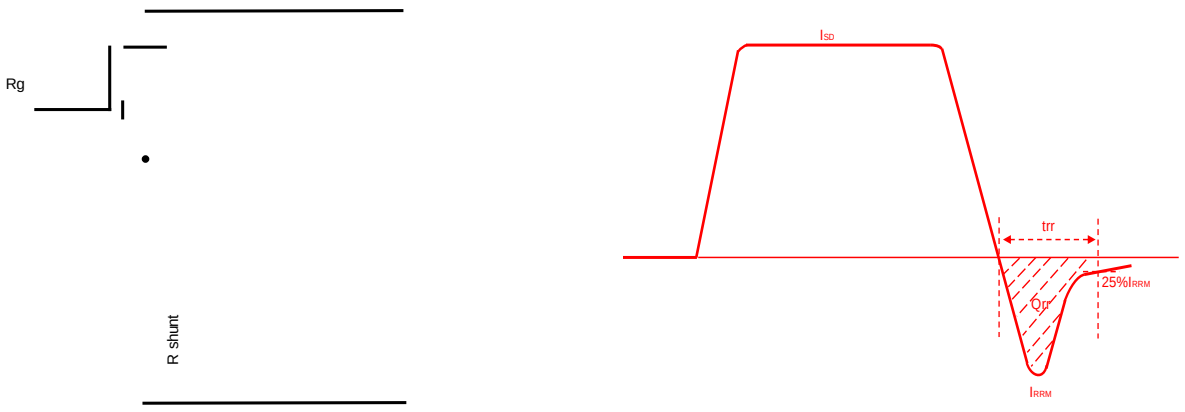
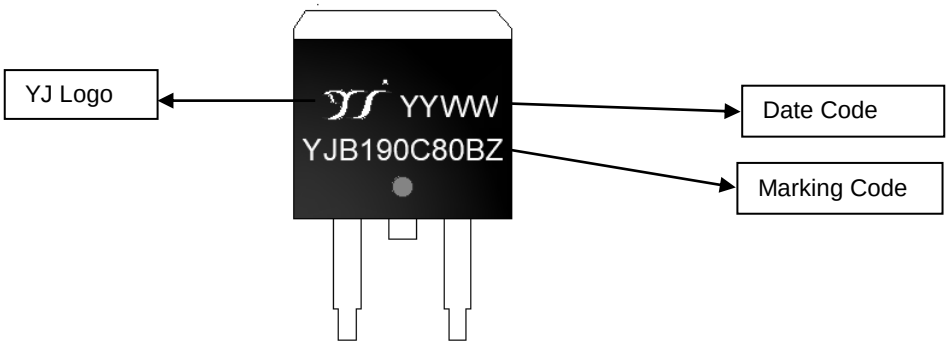



Figure D. Diode Recovery Test Circuit & Waveform

## Marking Information




Note
1. All marking is at middle of the product body
2. All marking is in laser printing
3. YJB190C80BZ is marking code, YYWW is date code,
4. Body color: Black

## Disclaimer

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