

Advanced Power MOSFET

IRF610A

FEATURES

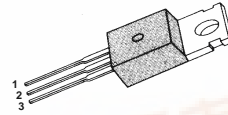
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current : 10 μ A (Max.) @ $V_{DS} = 200V$
- Low $R_{DS(ON)}$: 1.169 Ω (Typ.)

$$BV_{DSS} = 200 V$$

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

$$I_D = 3.3 A$$

TO-220



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 ($T_C=25^\circ C$) | 3.3 | A |
| | Continuous Drain Current ($T_C=100^\circ C$) | 2.1 | |
| I_{DM} | Drain Current-Pulsed ① | 10 | A |
| V_{GS} | Gate-to-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy ② | 44 | mJ |
| I_{AR} | Avalanche Current ① | 3.3 | A |
| E_{AR} | Repetitive Avalanche Energy ① | 3.8 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | 5.0 | V/ns |
| P_D | Total Power Dissipation ($T_C=25^\circ C$) | 38 | W |
| | Linear Derating Factor | 0.31 | |
| 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 | -- | 3.28 | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink | 0.5 | -- | |
| $R_{\theta JA}$ | Junction-to-Ambient | -- | 62.5 | |

Electrical Characteristics (T_C=25°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 =250μA |
| ΔBV/ΔT _J | Breakdown Voltage Temp. Coeff. | -- | 0.23 | -- | V/°C | I _D =250 μA See Fig 7 |
| V _{GS(th)} | Gate Threshold Voltage | 2.0 | -- | 4.0 | V | V _{DS} =5V, I _D =250 μA |
| 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} =200V |
| | | -- | -- | 100 | | V _{DS} =160V, T _C =125 °C |
| R _{DS(on)} | Static Drain-Source On-State Resistance | -- | -- | 1.5 | Ω | V _{GS} =10V, I _D =1.65A ④ |
| g _{fs} | Forward Transconductance | -- | 1.31 | -- | Ω | V _{DS} =40V, I _D =1.65A ④ |
| C _{iss} | Input Capacitance | -- | 160 | 210 | pF | V _{GS} =0V, V _{DS} =25V, f =1MHz See Fig 5 |
| C _{oss} | Output Capacitance | -- | 35 | 44 | | |
| C _{rss} | Reverse Transfer Capacitance | -- | 14 | 18 | | |
| t _{d(on)} | Turn-On Delay Time | -- | 10 | 30 | ns | V _{DD} =100V, I _D =3.3A, R _G =24Ω See Fig 13 ④ ⑤ |
| t _r | Rise Time | -- | 10 | 30 | | |
| t _{d(off)} | Turn-Off Delay Time | -- | 20 | 50 | | |
| t _f | Fall Time | -- | 12 | 35 | | |
| Q _g | Total Gate Charge | -- | 7 | 10 | nC | V _{DS} =160V, V _{GS} =10V, I _D =3.3A See Fig 6 & Fig 12 ④ ⑤ |
| Q _{gs} | Gate-Source Charge | -- | 1.5 | -- | | |
| Q _{gd} | Gate-Drain("Miller") Charge | -- | 3.5 | -- | | |

Source-Drain Diode Ratings and Characteristics

| Symbol | Characteristic | Min. | Typ. | Max. | Units | Test Condition |
|-----------------|---------------------------|------|------|------|-------|---|
| I _S | Continuous Source Current | -- | -- | 3.3 | A | Integral reverse pn-diode in the MOSFET |
| I _{SM} | Pulsed-Source Current ① | -- | -- | 10 | | |
| V _{SD} | Diode Forward Voltage ④ | -- | -- | 1.5 | V | T _J =25°C, I _S =3.3A, V _{GS} =0V |
| t _{rr} | Reverse Recovery Time | -- | 107 | -- | ns | T _J =25°C, I _F =3.3A |
| Q _{rr} | Reverse Recovery Charge | -- | 0.33 | -- | μC | di _F /dt=100A/μs ④ |

Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=6mH, I_{AS}=3.3A, V_{DD}=50V, R_G=27Ω, Starting T_J=25 °C
- ③ I_{SD} ≤ 3.3A, di/dt ≤ 140A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J=25 °C
- ④ Pulse Test : Pulse Width = 250 μs, Duty Cycle ≤ 2%
- ⑤ Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

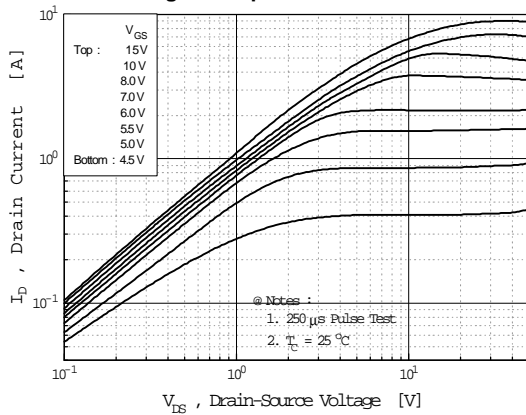


Fig 2. Transfer Characteristics

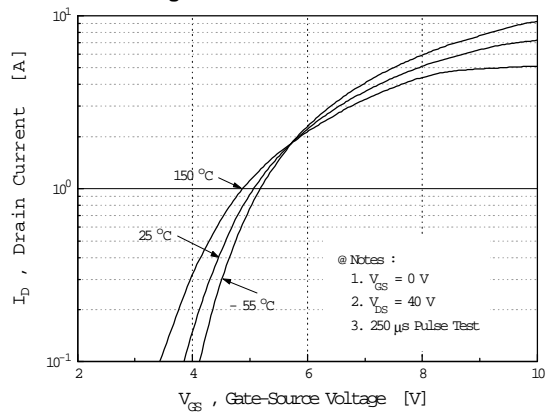


Fig 3. On-Resistance vs. Drain Current

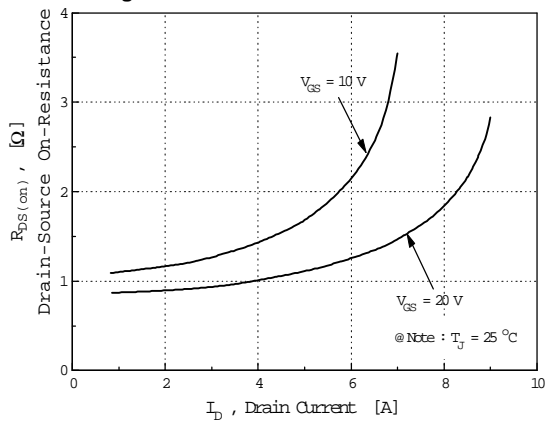


Fig 4. Source-Drain Diode Forward Voltage

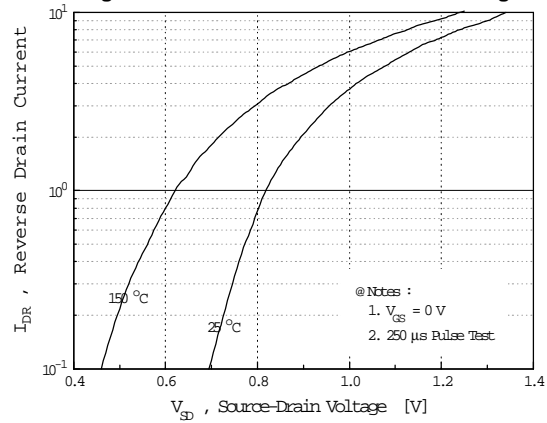


Fig 5. Capacitance vs. Drain-Source Voltage

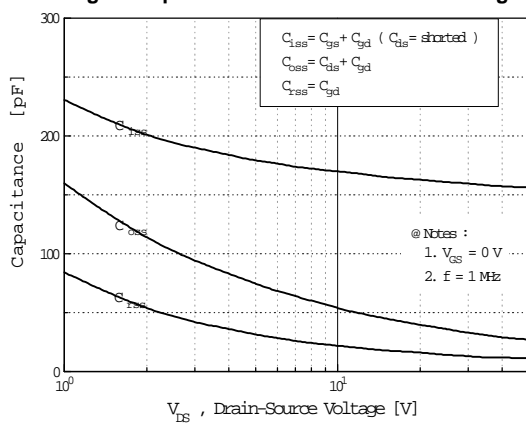
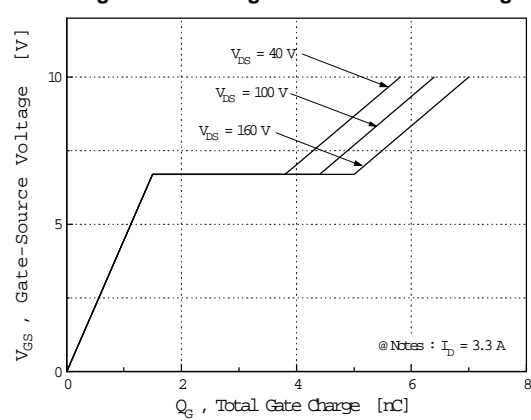


Fig 6. Gate Charge vs. Gate-Source Voltage



IRF610A

N-CHANNEL POWER MOSFET

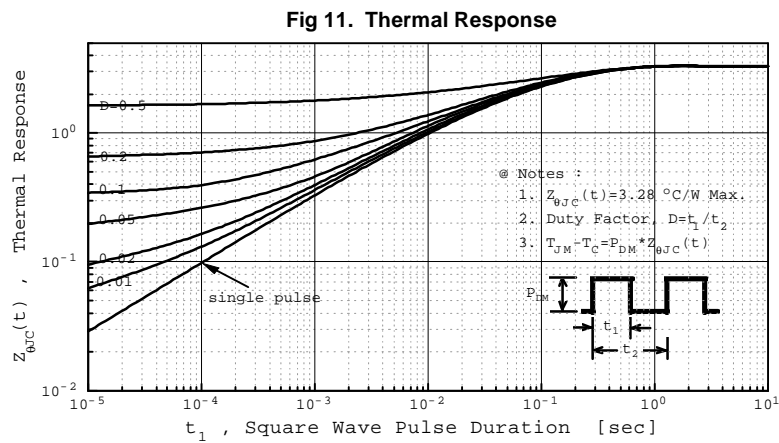
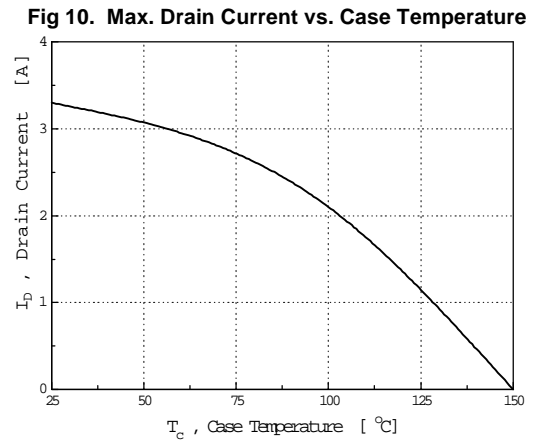
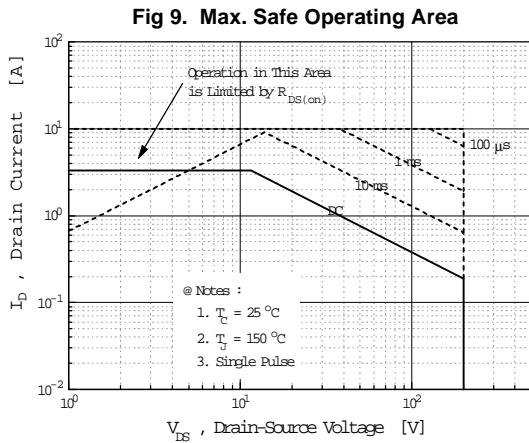
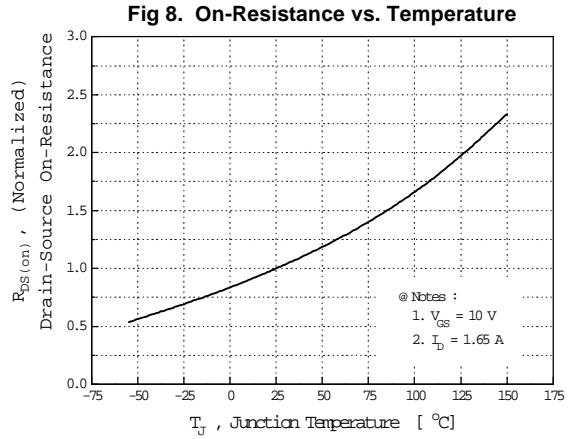
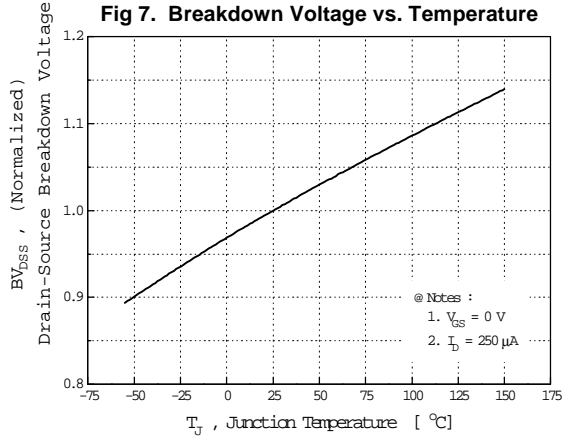


Fig 12. Gate Charge Test Circuit & Waveform

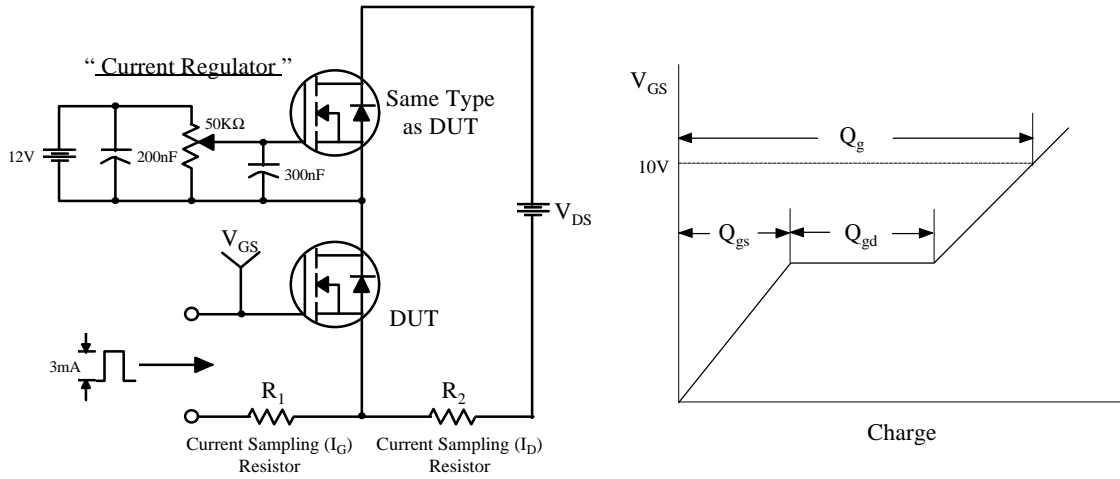


Fig 13. Resistive Switching Test Circuit & Waveforms

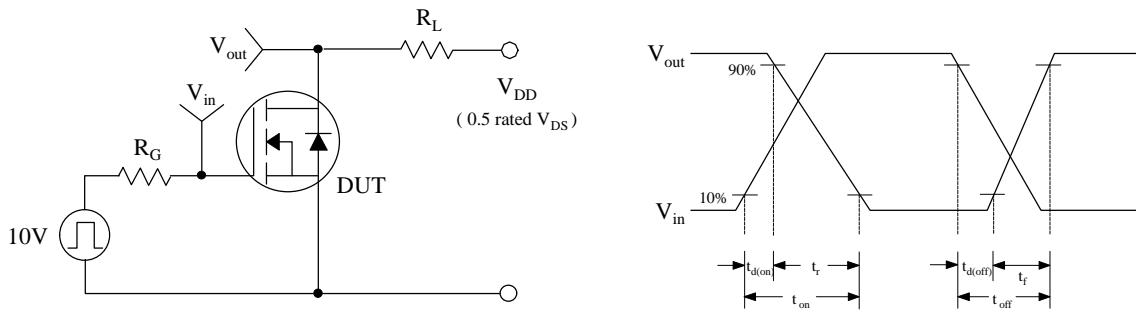


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

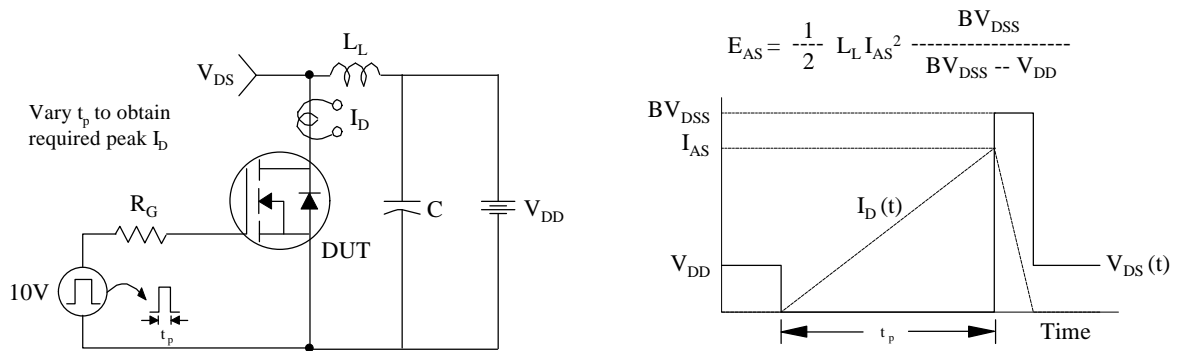
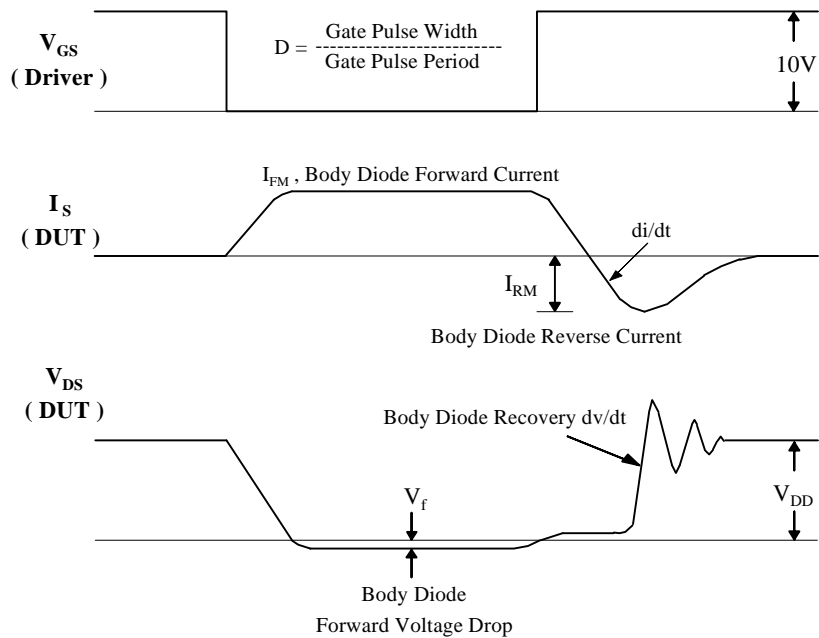
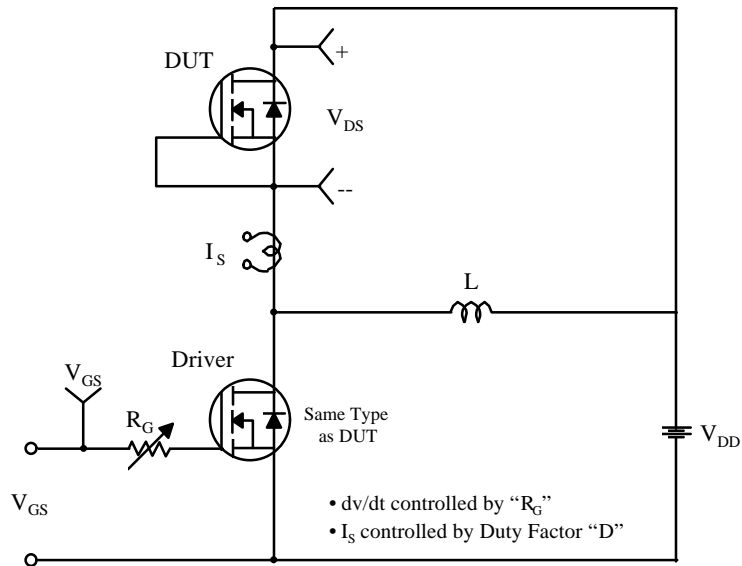


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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