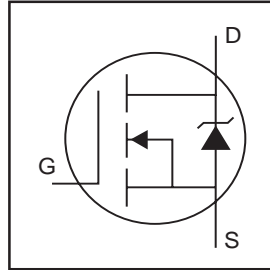


IRLBA3803

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Purchase IRLBA3803/P for solder plated option.

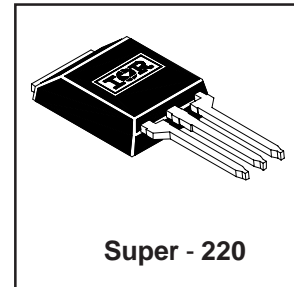


$V_{DSS} = 30V$
 $R_{DS(on)} = 0.005\Omega$
 $I_D = 179A^{\text{⑥}}$

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The Super-220 is a package that has been designed to have the same mechanical outline and pinout as the industry standard TO-220 but can house a considerably larger silicon die. It has increased current handling capability over both the TO-220 and the much larger TO-247 package. This makes it ideal to reduce component count in multiparalleled TO-220 applications, reduce system power dissipation, upgrade existing designs or have TO-247 performance in a TO-220 outline.



This package has also been designed to meet automotive qualification standard Q101.

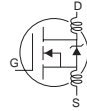
Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---------------------------|--|------------------------|---------------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 179 ^⑥ | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 126 ^⑥ | |
| I_{DM} | Pulsed Drain Current ^① | 720 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 270 | W |
| | Linear Derating Factor | 1.8 | W/ $^\circ C$ |
| V_{GS} | Gate-to-Source Voltage | ± 16 | V |
| E_{AS} | Single Pulse Avalanche Energy ^{② ⑤} | 610 | mJ |
| I_{AR} | Avalanche Current ^{① ⑤} | 71 | A |
| E_{AR} | Repetitive Avalanche Energy ^① | 27 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ^{③ ⑤} | 5.0 | V/ns |
| T_J | Operating Junction and | -55 to + 175 | $^\circ C$ |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | Recommended clip force | 20 | N |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case | — | 0.55 | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.5 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 58 | |

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--------------------------------------|--------------------------------------|------|-------|-------|-------|--|
| V _{(BR)DSS} | Drain-to-Source Breakdown Voltage | 30 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| ΔV _{(BR)DSS/ΔT_J} | Breakdown Voltage Temp. Coefficient | — | 0.052 | — | V/°C | Reference to 25°C, I _D = 1mA ^⑤ |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | — | 0.005 | Ω | V _{GS} = 10V, I _D = 71A ^④ |
| | | — | — | 0.009 | | V _{GS} = 4.5V, I _D = 59A ^④ |
| V _{GS(th)} | Gate Threshold Voltage | 1.0 | — | — | V | V _{DS} = V _{GS} , I _D = 250μA |
| g _{fs} | Forward Transconductance | 55 | — | — | S | V _{DS} = 25V, I _D = 71A ^⑤ |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | V _{DS} = 30V, V _{GS} = 0V |
| | | — | — | 250 | | V _{DS} = 24V, V _{GS} = 0V, T _J = 150°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | V _{GS} = 16V |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | V _{GS} = -16V |
| Q _g | Total Gate Charge | — | — | 140 | nC | I _D = 71A |
| Q _{gs} | Gate-to-Source Charge | — | — | 41 | | V _{DS} = 24V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | — | 78 | | V _{GS} = 4.5V, See Fig. 6 and 13 ^{④⑤} |
| t _{d(on)} | Turn-On Delay Time | — | 14 | — | nH | V _{DD} = 15V |
| t _r | Rise Time | — | 230 | — | | I _D = 71A |
| t _{d(off)} | Turn-Off Delay Time | — | 29 | — | | R _G = 1.3Ω |
| t _f | Fall Time | — | 35 | — | | R _D = 0.20Ω, See Fig. 10 ^{④⑤} |
| L _D | Internal Drain Inductance | — | 2.0 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| L _S | Internal Source Inductance | — | 5.0 | — | |  |
| C _{iss} | Input Capacitance | — | 5000 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 1800 | — | | V _{DS} = 25V |
| C _{rss} | Reverse Transfer Capacitance | — | 880 | — | | f = 1.0MHz, See Fig. 5 ^⑤ |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|--|------|------------------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 179 ^⑥ | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I _{SM} | Pulsed Source Current (Body Diode) ^① | — | — | 720 | | |
| V _{SD} | Diode Forward Voltage | — | — | 1.3 | V | T _J = 25°C, I _S = 71A, V _{GS} = 0V ^④ |
| t _{rr} | Reverse Recovery Time | — | 120 | 180 | ns | T _J = 25°C, I _F = 71A |
| Q _{rr} | Reverse Recovery Charge | — | 450 | 680 | nC | di/dt = 100A/μs ^{④⑤} |
| t _{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by L _S +L _D) | | | | |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② V_{DD} = 15V, starting T_J = 25°C, L = 180μH
R_G = 25Ω, I_{AS} = 71A. (See Figure 12)
- ③ I_{SD} ≤ 71A, di/dt ≤ 130A/μs, V_{DD} ≤ V_{(BR)DSS},
T_J ≤ 175°C

- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

- ⑤ Uses IRL3803 data and test conditions.

- ⑥ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

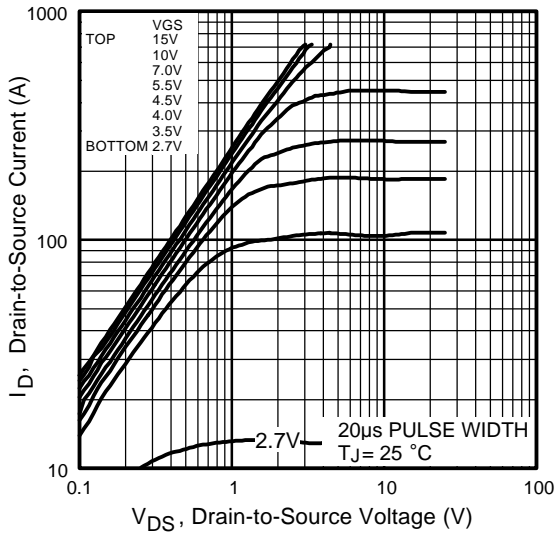


Fig 1. Typical Output Characteristics

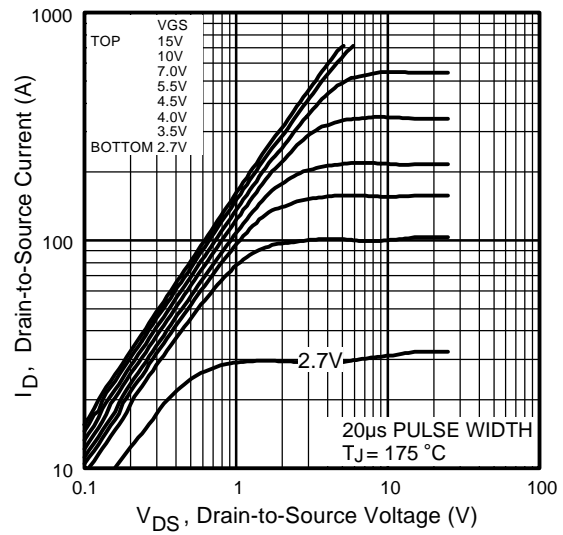


Fig 2. Typical Output Characteristics

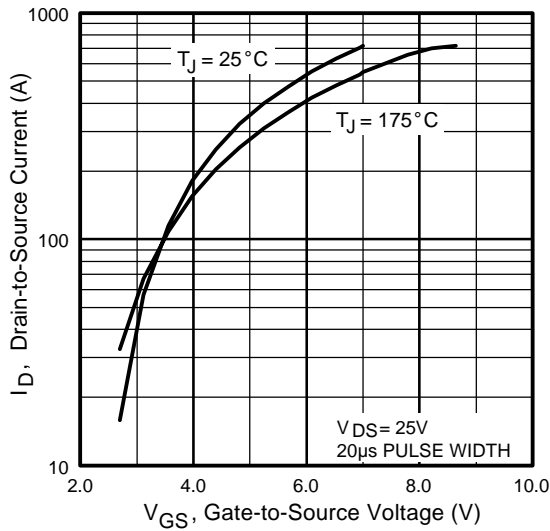


Fig 3. Typical Transfer Characteristics

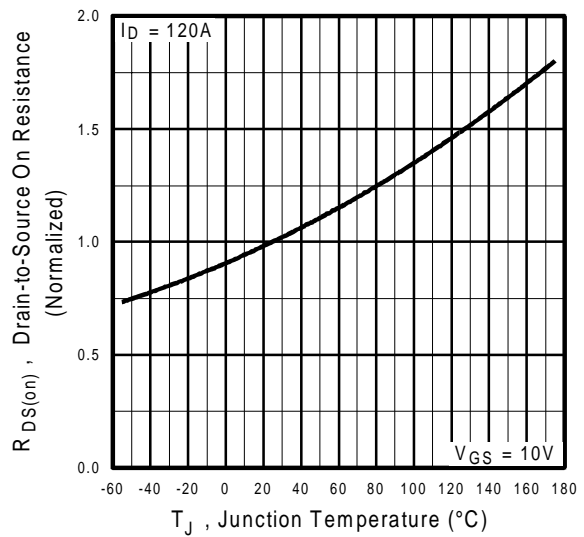


Fig 4. Normalized On-Resistance Vs. Temperature

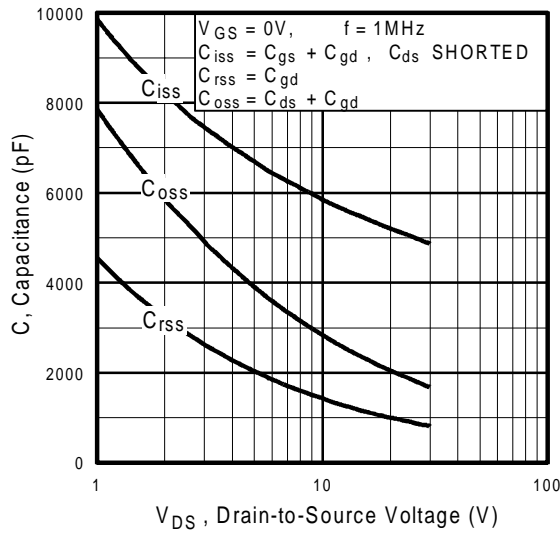


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

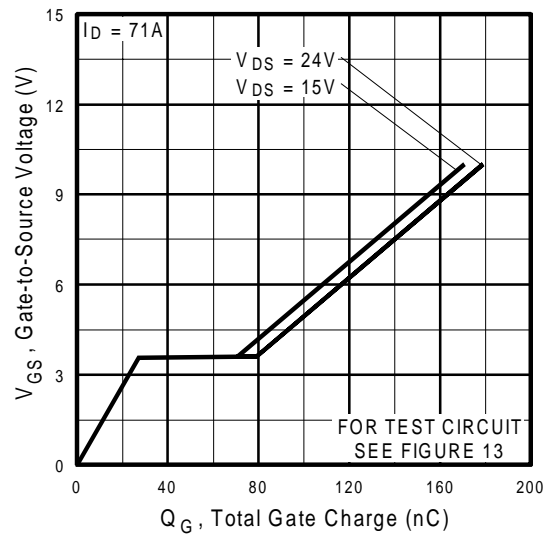


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

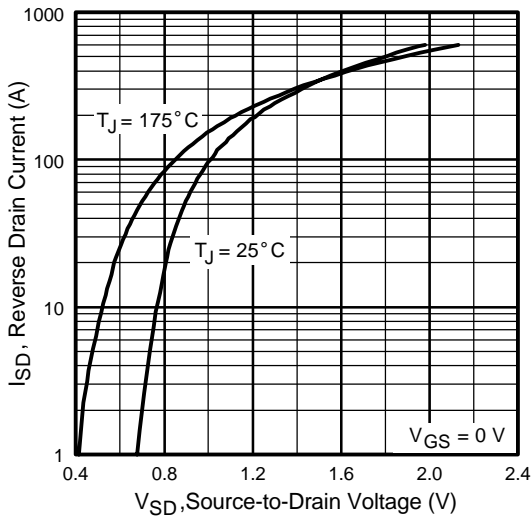


Fig 7. Typical Source-Drain Diode Forward Voltage

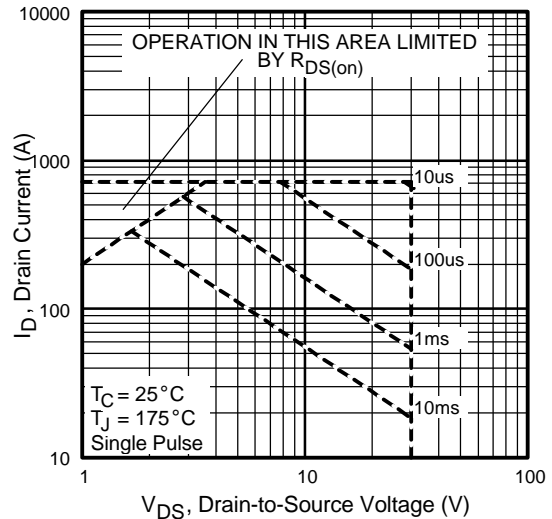


Fig 8. Maximum Safe Operating Area

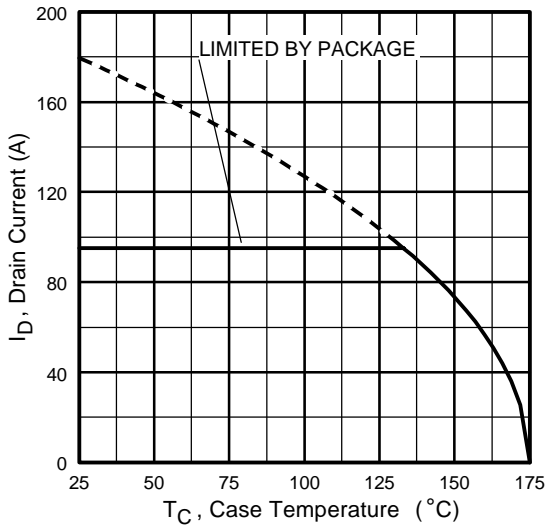


Fig 9. Maximum Drain Current Vs. Case Temperature

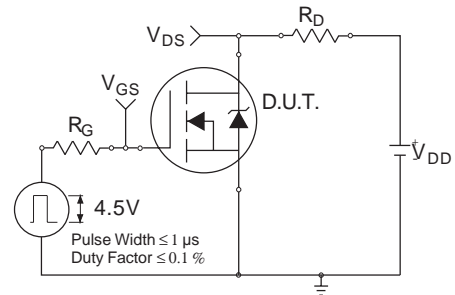


Fig 10a. Switching Time Test Circuit

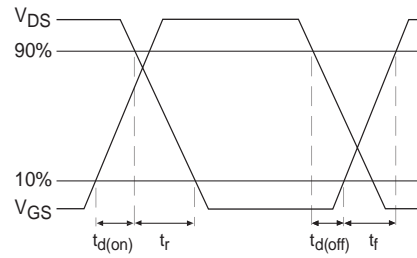


Fig 10b. Switching Time Waveforms

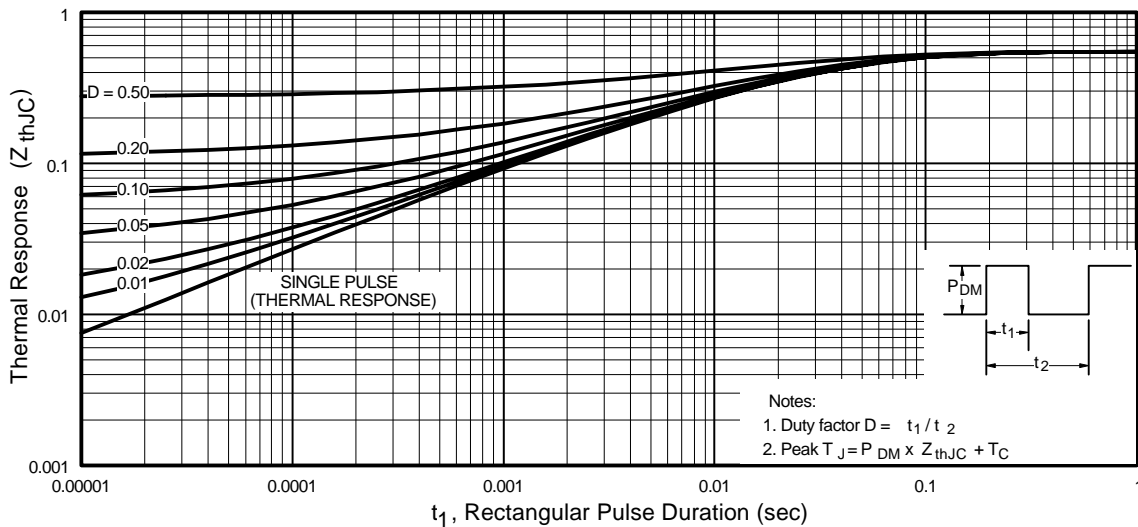


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

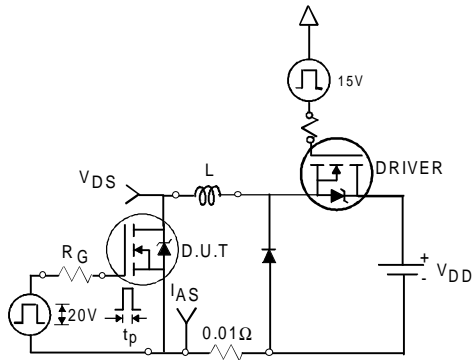


Fig 12a. Unclamped Inductive Test Circuit

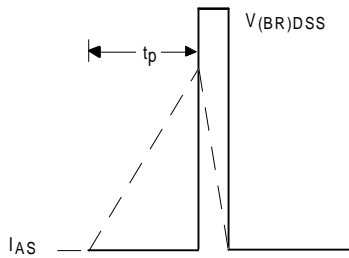


Fig 12b. Unclamped Inductive Waveforms

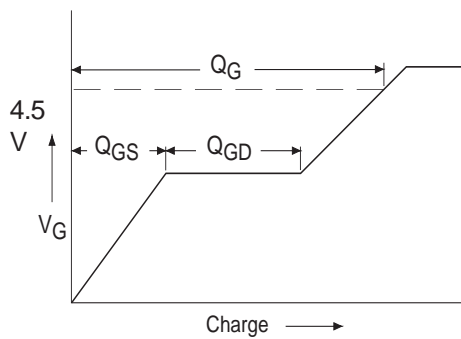


Fig 13a. Basic Gate Charge Waveform

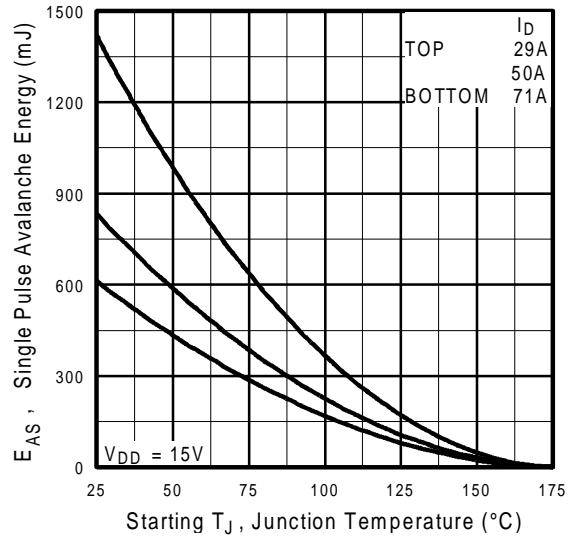


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

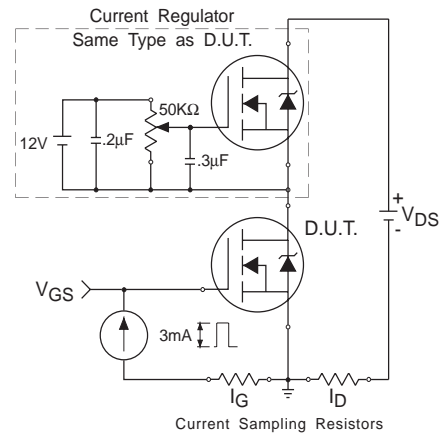
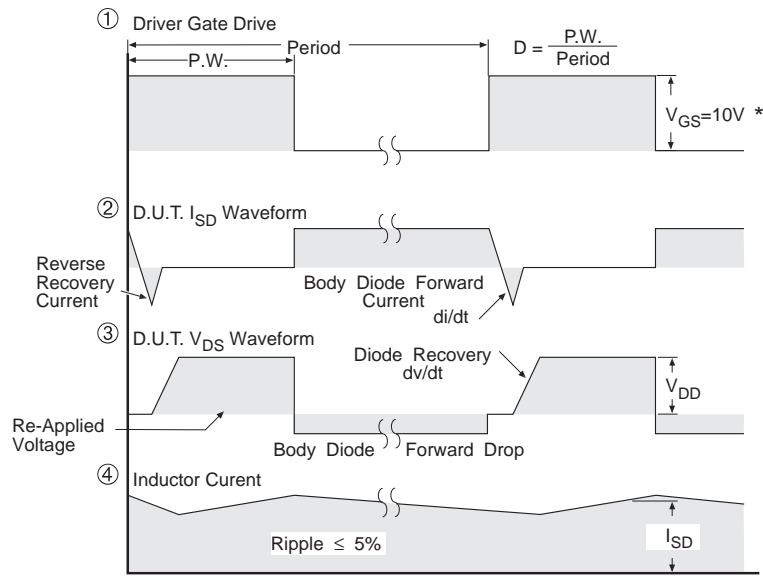
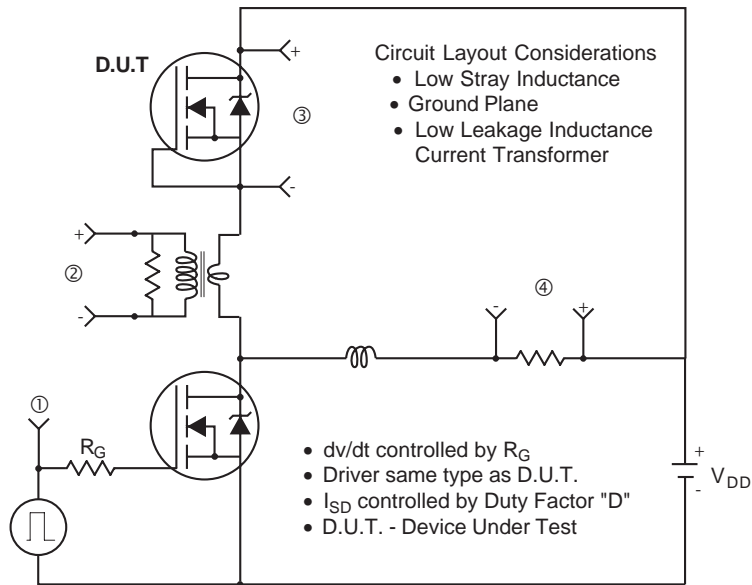


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



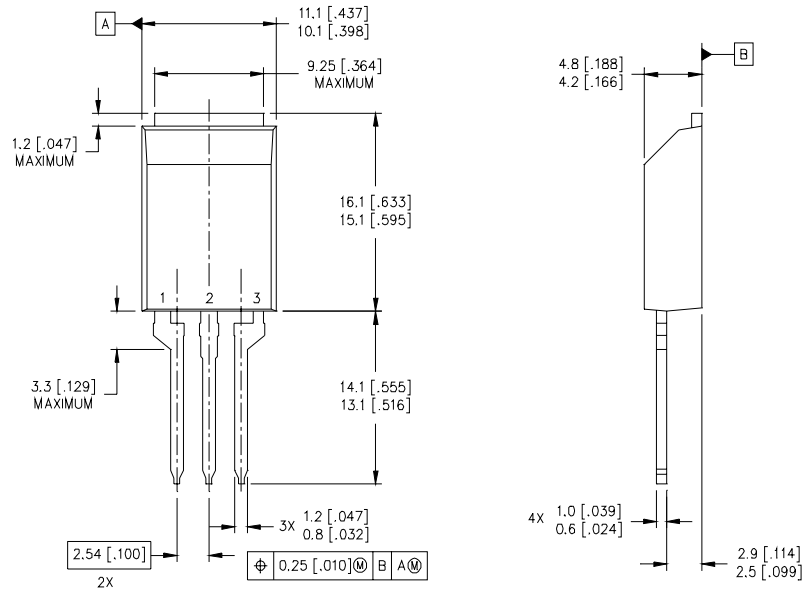
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

IRLBA3803

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Super-220 Package Outline



Super-220 package is not recommended for Surface Mount Application.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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