

IRLB3813PbF

Applications

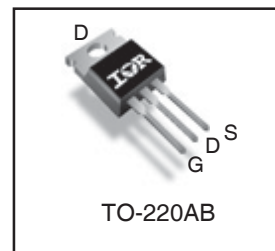
- Optimized for UPS/Inverter Applications
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- Power Tools

Benefits

- Very Low $R_{DS(on)}$ at 4.5V V_{GS}
- Ultra-Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current
- Lead-Free

HEXFET® Power MOSFET

| V_{DSS} | $R_{DS(on)}$ max | Qg (typ.) |
|-----------|---------------------------------|-----------|
| 30V | 1.95m Ω @ $V_{GS} = 10V$ | 57nC |



| G | D | S |
|------|-------|--------|
| Gate | Drain | Source |

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---------------------------|--|-----------------------|---------------|
| V_{DS} | Drain-to-Source Voltage | 30 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 260 [Ⓒ] | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 190 [Ⓒ] | |
| I_{DM} | Pulsed Drain Current [Ⓓ] | 1050 | |
| $P_D @ T_C = 25^\circ C$ | Maximum Power Dissipation [Ⓔ] | 230 | W |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation [Ⓔ] | 120 | |
| | Linear Derating Factor | 1.6 | W/ $^\circ C$ |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 175 | $^\circ C$ |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | Mounting torque, 6-32 or M3 screw | 10lb·in (1.1N·m) | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|------------------------------------|------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case [Ⓔ] | — | 0.64 | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink, Flat Greased Surface | 0.50 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient [Ⓔ] | — | 62 | |

Notes [Ⓓ] through [Ⓔ] are on page 9

www.irf.com

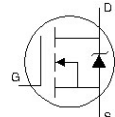
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--------------------------------|--------------------------------------|------|------|------|------------|--|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | 30 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 11 | — | mV/°C | Reference to $25^\circ\text{C}, I_D = 1.0\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 1.60 | 1.95 | m Ω | $V_{GS} = 10V, I_D = 60A$ ③ |
| | | — | 2.00 | 2.60 | | $V_{GS} = 4.5V, I_D = 48A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.35 | 1.90 | 2.35 | V | $V_{DS} = V_{GS}, I_D = 150\mu A$ |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Coefficient | — | -7.8 | — | mV/°C | |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1.0 | μA | $V_{DS} = 24V, V_{GS} = 0V$ |
| | | — | — | 100 | | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 20V$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS} = -20V$ |
| g_{fs} | Forward Transconductance | 140 | — | — | S | $V_{DS} = 15V, I_D = 48A$ |
| Q_g | Total Gate Charge | — | 57 | 86 | nC | $V_{DS} = 15V$ $V_{GS} = 4.5V$ $I_D = 48A$ See Fig. 16 |
| Q_{gs1} | Pre-Vth Gate-to-Source Charge | — | 16 | — | | |
| Q_{gs2} | Post-Vth Gate-to-Source Charge | — | 6.7 | — | | |
| Q_{gd} | Gate-to-Drain Charge | — | 19 | — | | |
| Q_{godr} | Gate Charge Overdrive | — | 15 | — | | |
| Q_{sw} | Switch Charge ($Q_{gs2} + Q_{gd}$) | — | 25.7 | — | | |
| Q_{oss} | Output Charge | — | 35 | — | nC | $V_{DS} = 16V, V_{GS} = 0V$ |
| R_G | Gate Resistance | — | 0.87 | 1.3 | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 36 | — | ns | $V_{DD} = 15V, V_{GS} = 4.5V$ ③ $I_D = 48A$ $R_G = 1.8\Omega$ See Fig. 14 |
| t_r | Rise Time | — | 170 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 33 | — | | |
| t_f | Fall Time | — | 60 | — | | |
| C_{iss} | Input Capacitance | — | 8420 | — | pF | $V_{GS} = 0V$ $V_{DS} = 15V$ $f = 1.0\text{MHz}$ |
| C_{oss} | Output Capacitance | — | 1620 | — | | |
| C_{riss} | Reverse Transfer Capacitance | — | 650 | — | | |

Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| E_{AS} | Single Pulse Avalanche Energy ② | — | 520 | mJ |
| I_{AR} | Avalanche Current ① | — | 48 | A |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|------|------|-------|-------|---|
| I_S | Continuous Source Current (Body Diode) | — | — | 260 ⑥ | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 1050 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.0 | V | $T_J = 25^\circ\text{C}, I_S = 48A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | — | 24 | 36 | ns | $T_J = 25^\circ\text{C}, I_F = 48A, V_{DD} = 15V$ |
| Q_{rr} | Reverse Recovery Charge | — | 22 | 33 | nC | $di/dt = 244A/\mu s$ ③ |

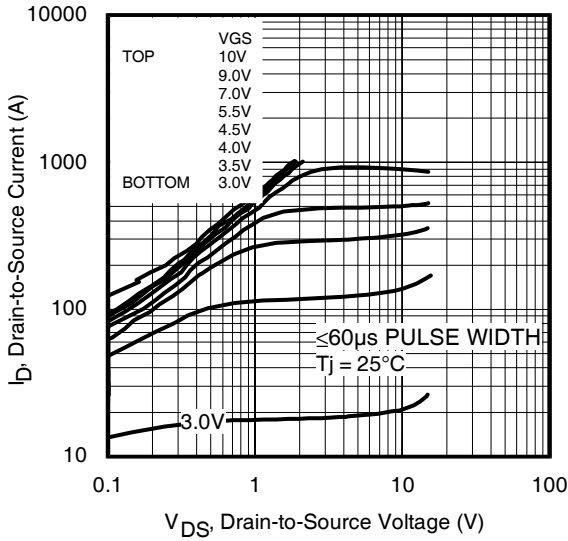


Fig 1. Typical Output Characteristics

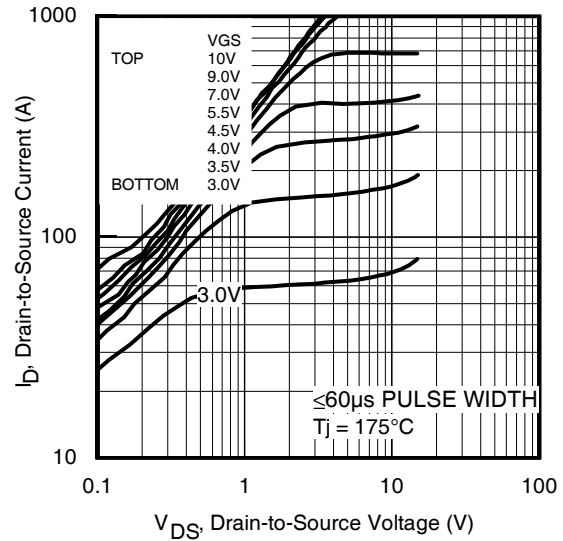


Fig 2. Typical Output Characteristics

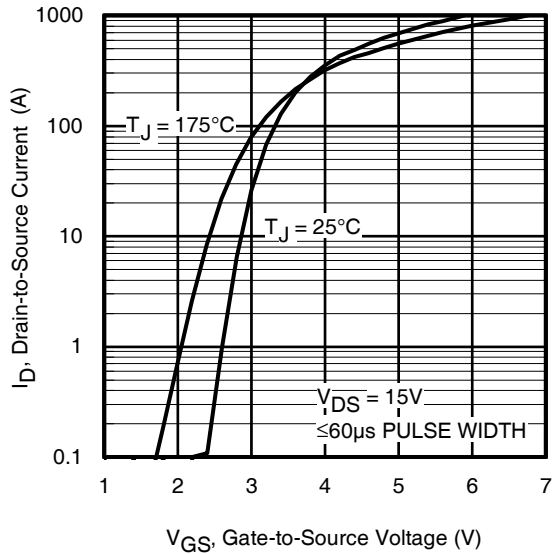


Fig 3. Typical Transfer Characteristics

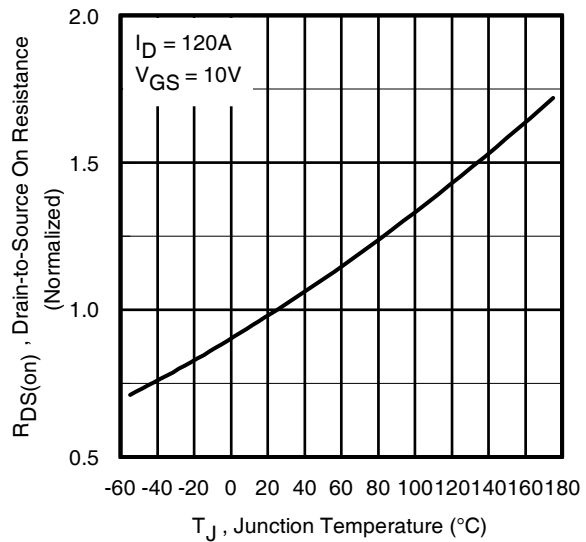


Fig 4. Normalized On-Resistance vs. Temperature

IRLB3813PbF

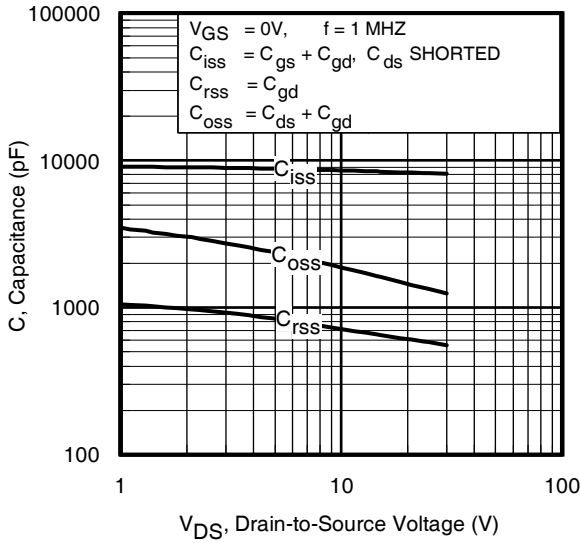


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

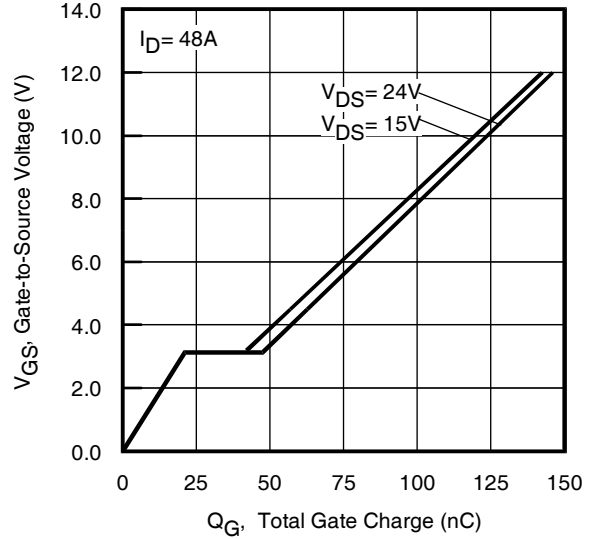


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

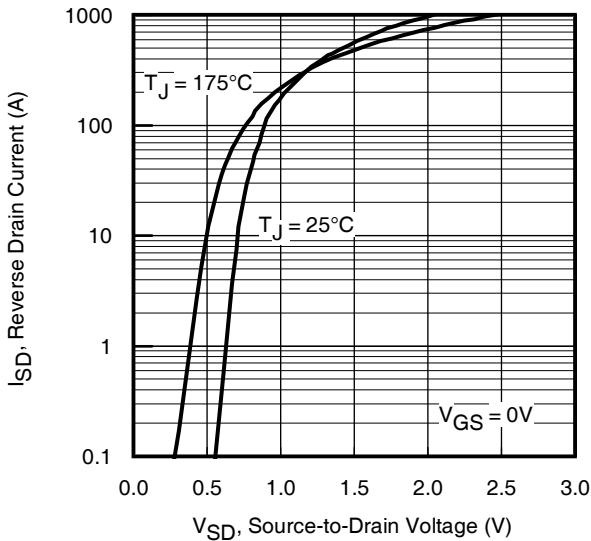


Fig 7. Typical Source-Drain Diode Forward Voltage

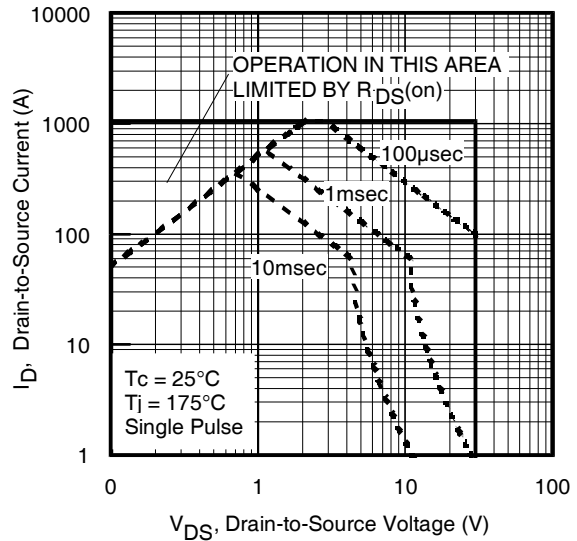


Fig 8. Maximum Safe Operating Area

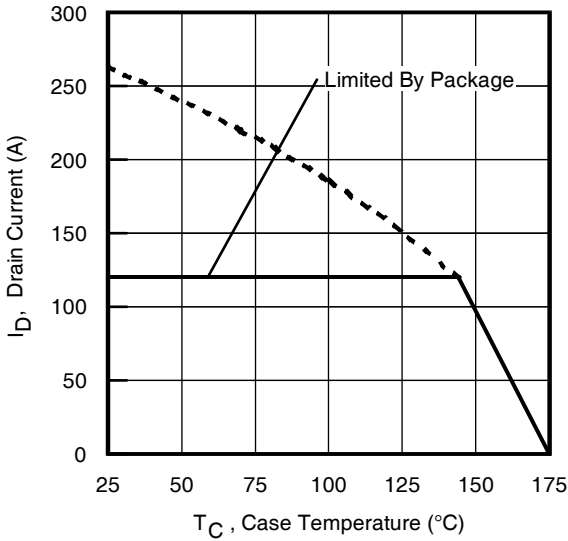


Fig 9. Maximum Drain Current vs. Case Temperature

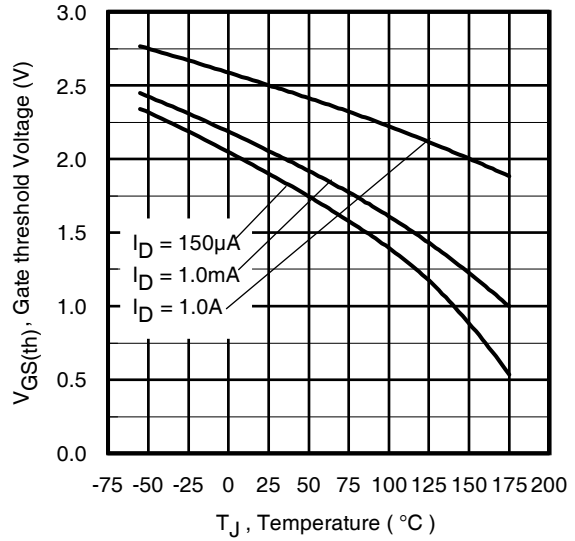


Fig 10. Threshold Voltage vs. Temperature

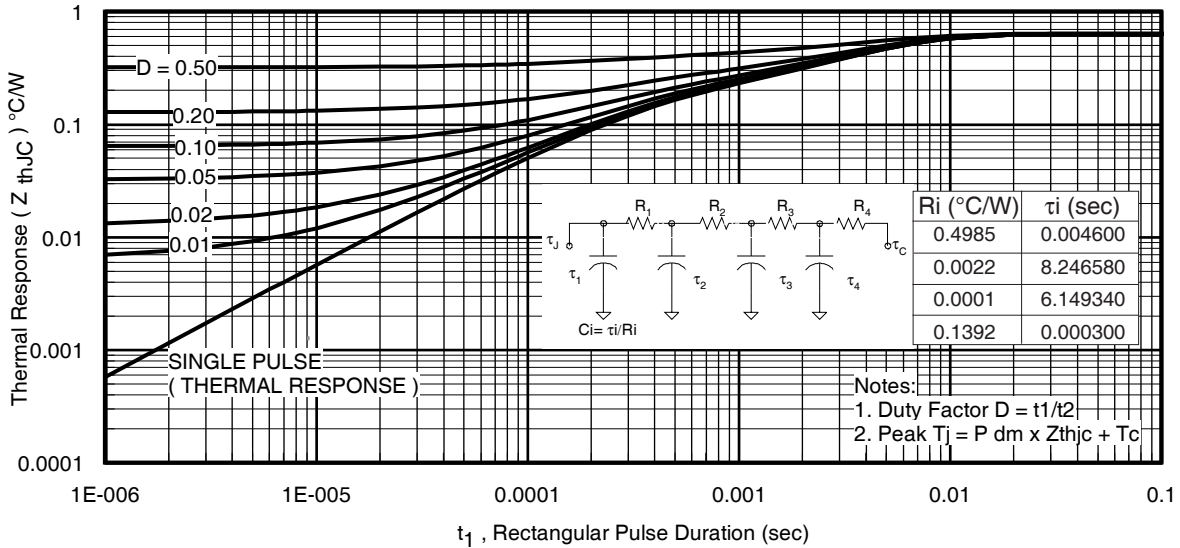


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRLB3813PbF

International
IR Rectifier

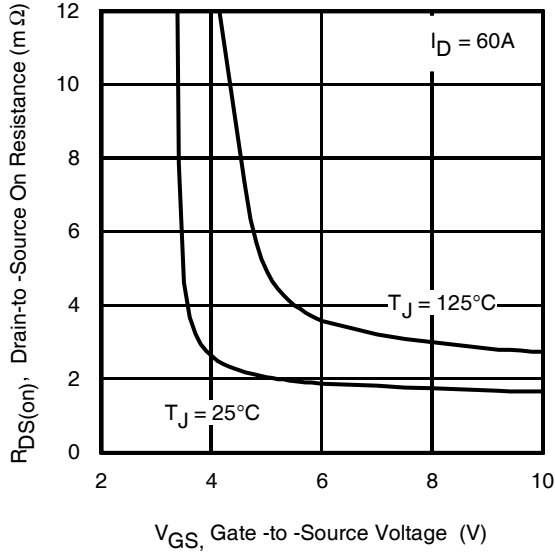


Fig 12. On-Resistance vs. Gate Voltage

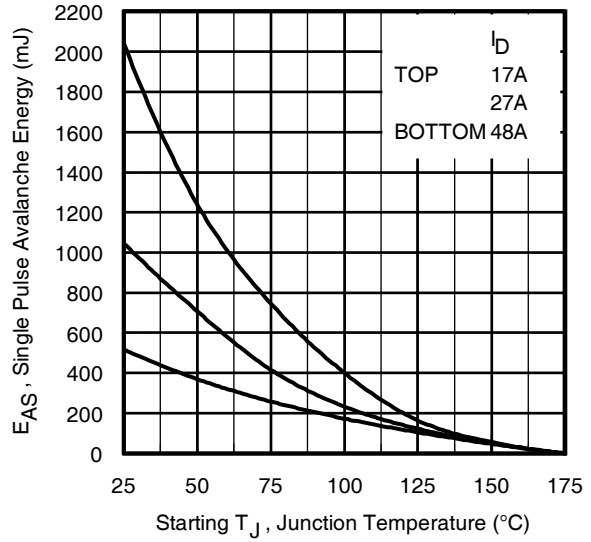


Fig 13a. Maximum Avalanche Energy vs. Drain Current

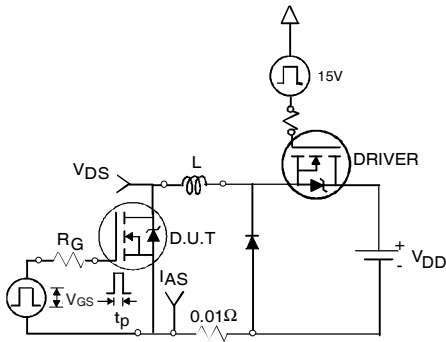


Fig 13b. Unclamped Inductive Test Circuit

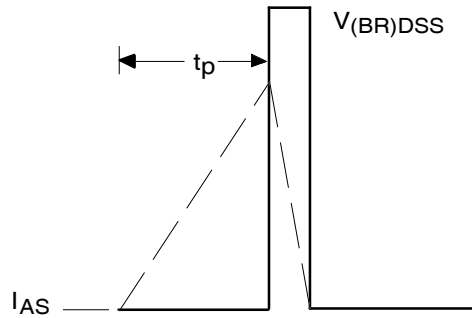


Fig 13c. Unclamped Inductive Waveforms

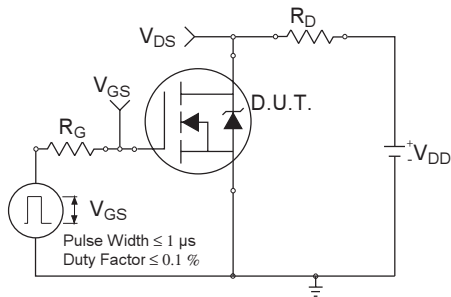


Fig 14a. Switching Time Test Circuit

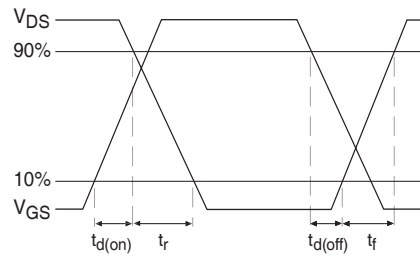
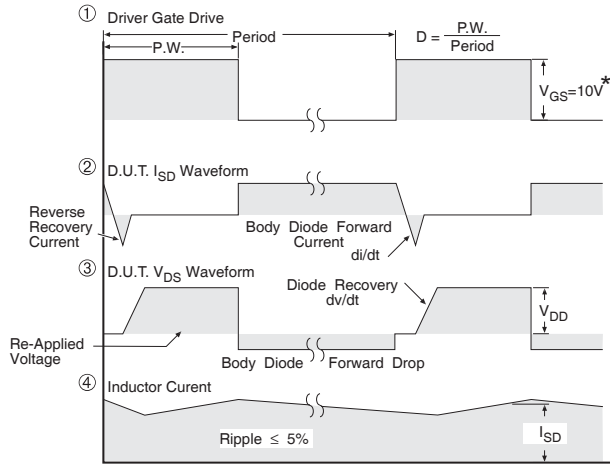
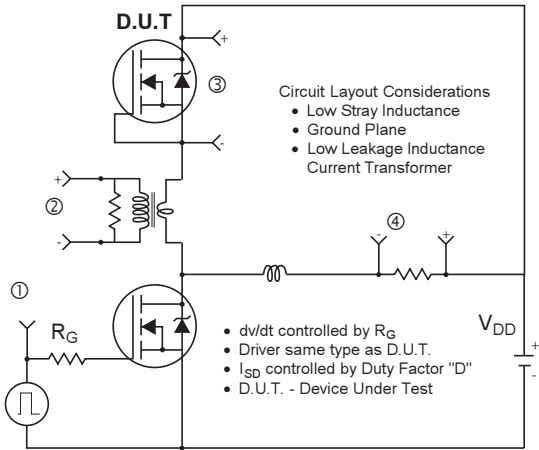


Fig 14b. Switching Time Waveforms



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

Fig 15. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

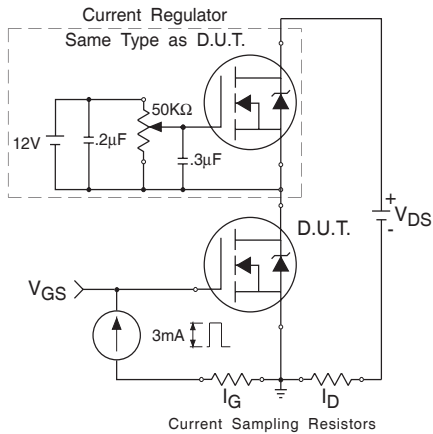


Fig 16a. Gate Charge Test Circuit

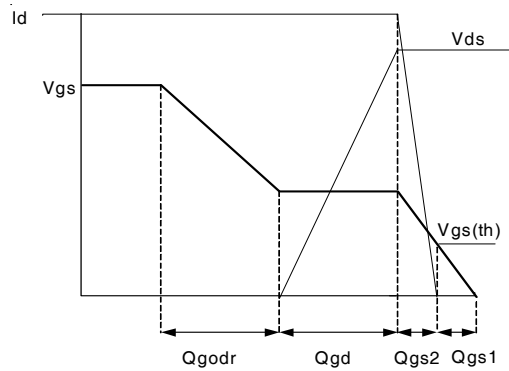
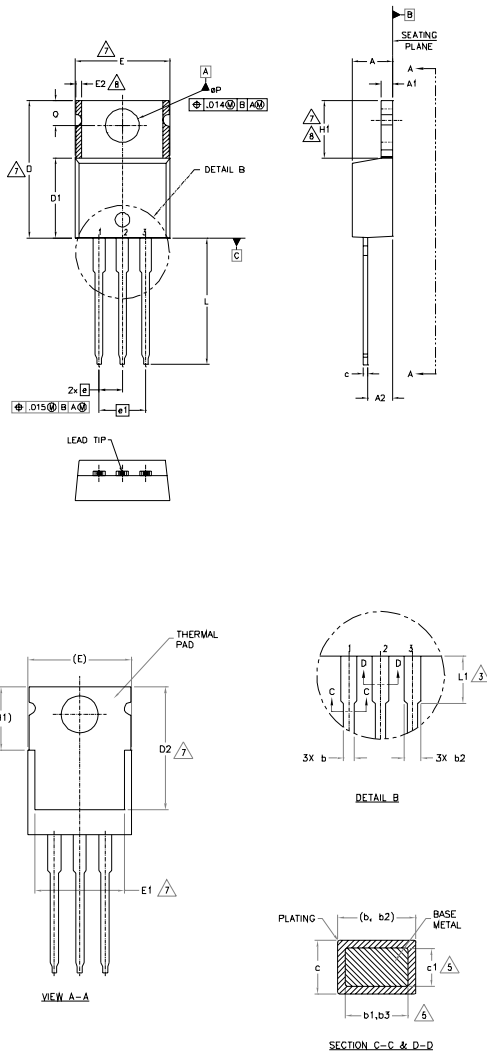


Fig 16b. Gate Charge Waveform

IRLB3813PbF

International
IR Rectifier

TO-220AB Package Outline (Dimensions are shown in millimeters (inches))



- NOTES:
- 1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
 - 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
 - 3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
 - 4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 - 5.- DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
 - 6.- CONTROLLING DIMENSION : INCHES.
 - 7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
 - 8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
 - 9.- OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

| SYMBOL | DIMENSIONS | | | | NOTES |
|--------|-------------|-------|----------|------|-------|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | 3.56 | 4.83 | .140 | .190 | |
| A1 | 0.51 | 1.40 | .020 | .055 | |
| A2 | 2.03 | 2.92 | .080 | .115 | |
| b | 0.38 | 1.01 | .015 | .040 | |
| b1 | 0.38 | 0.97 | .015 | .038 | 5 |
| b2 | 1.14 | 1.78 | .045 | .070 | |
| b3 | 1.14 | 1.73 | .045 | .068 | 5 |
| c | 0.36 | 0.61 | .014 | .024 | |
| c1 | 0.36 | 0.56 | .014 | .022 | 5 |
| D | 14.22 | 16.51 | .560 | .650 | 4 |
| D1 | 8.38 | 9.02 | .330 | .356 | |
| D2 | 11.68 | 12.88 | .460 | .507 | 7 |
| E | 9.65 | 10.67 | .380 | .420 | 4,7 |
| E1 | 6.86 | 8.89 | .270 | .350 | 7 |
| E2 | - | 0.76 | - | .030 | 8 |
| e | 2.54 BSC | | .100 BSC | | |
| e1 | 5.08 BSC | | .200 BSC | | |
| H1 | 5.84 | 6.86 | .230 | .270 | 7,8 |
| L | 12.70 | 14.73 | .500 | .580 | |
| L1 | 3.56 | 4.06 | .140 | .160 | 3 |
| ØP | 3.54 | 4.08 | .139 | .161 | |
| Q | 2.54 | 3.42 | .100 | .135 | |

LEAD ASSIGNMENTS

HEFET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE

IGBTs, G2PACK

- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER

DIODES

- 1.- ANODE
- 2.- CATHODE
- 3.- ANODE

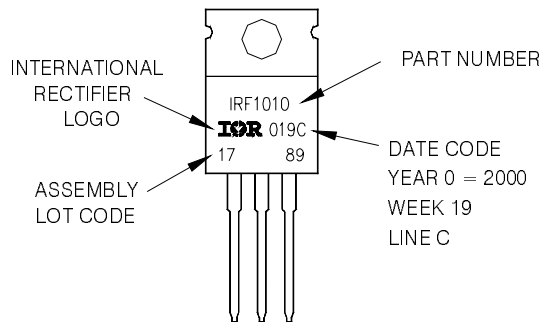
TO-220AB packages are not recommended for Surface Mount Application.

Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 2000
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position
indicates "Lead - Free"



Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.45\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 48\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑤ R_θ is measured at T_J approximately 90°C .
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

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

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information.07/2009

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View IRLB3813PBF on WIN SOURCE](#)

 [Infineon Technologies](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management