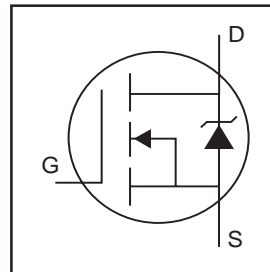


# IRFPS3815PbF

HEXFET® Power MOSFET

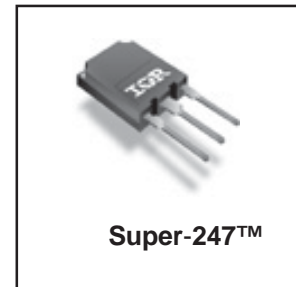
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



|                            |
|----------------------------|
| $V_{DSS} = 150V$           |
| $R_{DS(on)} = 0.015\Omega$ |
| $I_D = 105A$               |

## Description

The HEXFET® Power MOSFETs 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.



## Absolute Maximum Ratings

|                           | Parameter                                | Max.                  | Units |
|---------------------------|--|-----------------------|-------|
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ | 105                   | A     |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 74                    |       |
| $I_{DM}$                  | Pulsed Drain Current ①                   | 390                   |       |
| $P_D @ T_C = 25^\circ C$  | Power Dissipation                        | 441                   | W     |
|                           | Linear Derating Factor                   | 2.9                   | W/°C  |
| $V_{GS}$                  | Gate-to-Source Voltage                   | $\pm 30$              | V     |
| $E_{AS}$                  | Single Pulse Avalanche Energy ②          | 1610                  | mJ    |
| $I_{AR}$                  | Avalanche Current ③                      | 58                    | A     |
| $E_{AR}$                  | Repetitive Avalanche Energy ④            | 38                    | mJ    |
| dv/dt                     | Peak Diode Recovery dv/dt ⑤              | 3.0                   | V/ns  |
| $T_J$                     | Operating Junction and                   | -55 to + 175          |       |
| $T_{STG}$                 | Storage Temperature Range                |                       |       |
|                           | Soldering Temperature, for 10 seconds    | 300 (1.6mm from case) |       |

## Thermal Resistance

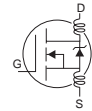
|                 | Parameter                           | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case                    | —    | 0.34 | °C/W  |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.24 | —    |       |
| $R_{\theta JA}$ | Junction-to-Ambient                 | —    | 40   |       |

# IRFPS3815PbF

International  
IR Rectifier

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

|                                 | Parameter                            | Min. | Typ. | Max.  | Units    | Conditions   |
|---------------------------------|--------------------------------------|------|------|-------|----------|--|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 150  | —    | —     | V        | $V_{GS} = 0V, I_D = 250\mu A$                                      |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.18 | —     | V/°C     | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$                  |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —    | 0.015 | $\Omega$ | $V_{GS} = 10V, I_D = 63A$ ③  |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 3.0  | —    | 5.0   | V        | $V_{DS} = 10V, I_D = 250\mu A$                                     |
| $g_{fs}$                        | Forward Transconductance             | 47   | —    | —     | S        | $V_{DS} = 50V, I_D = 58A$  |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 25    | $\mu A$  | $V_{DS} = 100V, V_{GS} = 0V$                                       |
|                                 |                                      | —    | —    | 250   |          | $V_{DS} = 80V, V_{GS} = 0V, T_J = 150^\circ\text{C}$               |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100   | nA       | $V_{GS} = 30V$   |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100  |          | $V_{GS} = -30V$  |
| $Q_g$                           | Total Gate Charge                    | —    | 260  | 390   | nC       | $I_D = 58A$  |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | 53   | 80    |          | $V_{DS} = 120V$  |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | 150  | 230   |          | $V_{GS} = 10V$ ④   |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 22   | —     |          | $V_{DD} = 75V$   |
| $t_r$                           | Rise Time                            | —    | 130  | —     | ns       | $I_D = 58A$  |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 51   | —     |          | $R_G = 1.03\Omega$   |
| $t_f$                           | Fall Time                            | —    | 60   | —     |          | $V_{GS} = 10V$ ④   |
| $L_D$                           | Internal Drain Inductance            | —    | 5.0  | —     | nH       | Between lead, 6mm (0.25in.) from package and center of die contact |
| $L_S$                           | Internal Source Inductance           | —    | 13   | —     |          |  |
| $C_{iss}$                       | Input Capacitance                    | —    | 6810 | —     | pF       | $V_{GS} = 0V$  |
| $C_{oss}$                       | Output Capacitance                   | —    | 1570 | —     |          | $V_{DS} = 25V$   |
| $C_{riss}$                      | Reverse Transfer Capacitance         | —    | 480  | —     |          | $f = 1.0\text{MHz}$ , See Fig. 5                                   |
| $C_{oss}$                       | Output Capacitance                   | —    | 9820 | —     |          | $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$                    |
| $C_{oss}$                       | Output Capacitance                   | —    | 670  | —     |          | $V_{GS} = 0V, V_{DS} = 120V, f = 1.0\text{MHz}$                    |
| $C_{oss\ eff.}$                 | Effective Output Capacitance ⑤       | —    | 1270 | —     |          | $V_{GS} = 0V, V_{DS} = 0V \text{ to } 120V$                        |

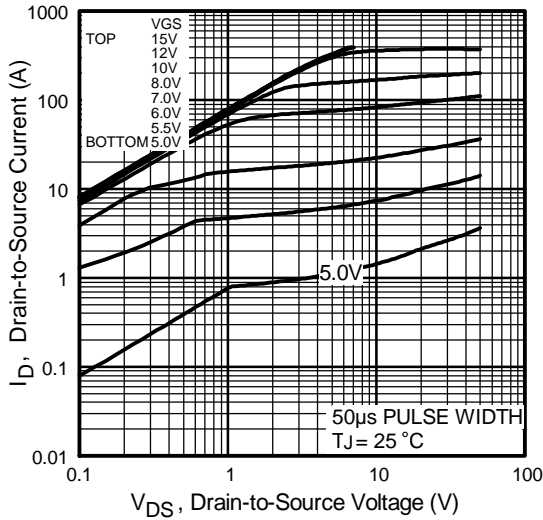


## Source-Drain Ratings and Characteristics

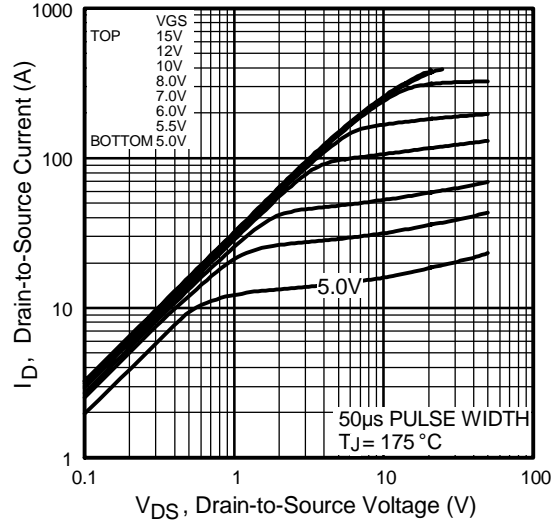
|          | Parameter                              | Min.  | Typ. | Max. | Units | Conditions   |
|----------|--|---|------|------|-------|--|
| $I_S$    | Continuous Source Current (Body Diode) | —   | —    | 105  | A     | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —   | —    | 390  |       |  |
| $V_{SD}$ | Diode Forward Voltage                  | —   | —    | 1.3  | V     | $T_J = 25^\circ\text{C}, I_S = 58A, V_{GS} = 0V$ ④             |
| $t_{rr}$ | Reverse Recovery Time                  | —   | 270  | 410  | ns    | $T_J = 25^\circ\text{C}, I_F = 58A$                            |
| $Q_{rr}$ | Reverse Recovery Charge                | —   | 2990 | 4490 | nC    | $di/dt = 100A/\mu s$ ④   |
| $t_{on}$ | Forward Turn-On Time                   | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ ) |      |      |       |  |

### Notes:

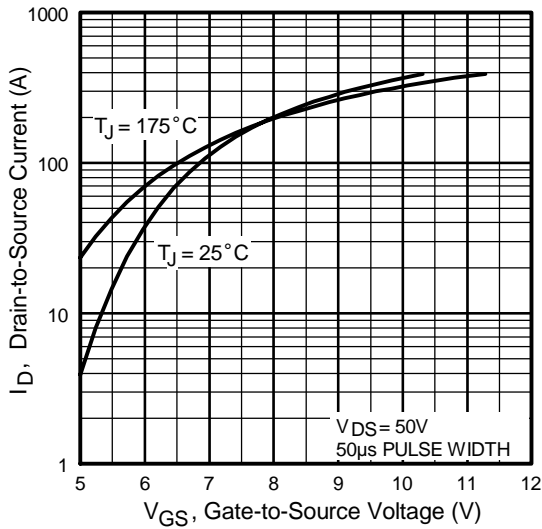
- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.96\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 58A$ . (See Figure 12)
- ③  $I_{SD} \leq 58A$ ,  $di/dt \leq 450A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤  $C_{oss\ eff.}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$



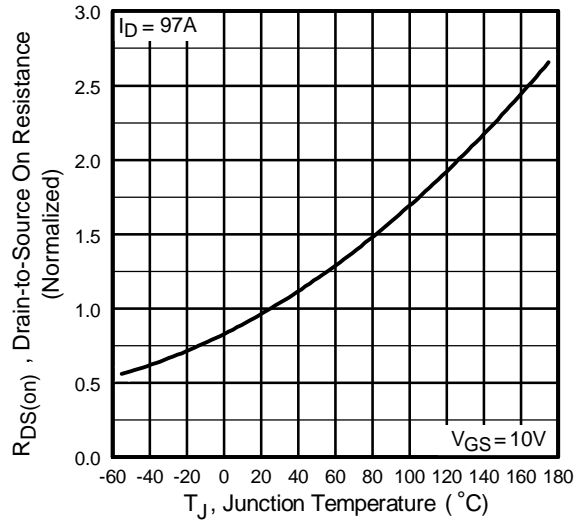
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



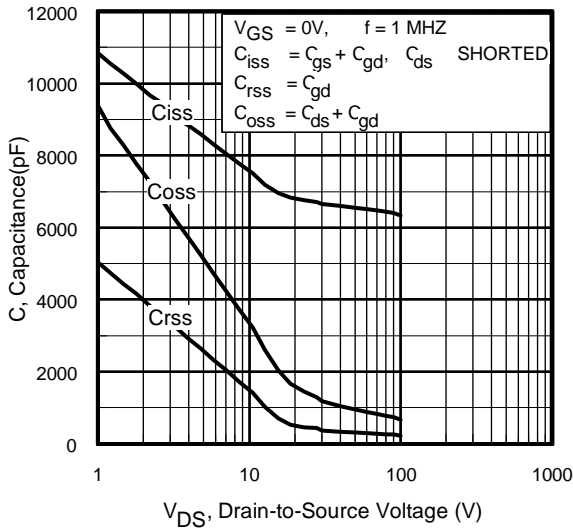
**Fig 3.** Typical Transfer Characteristics



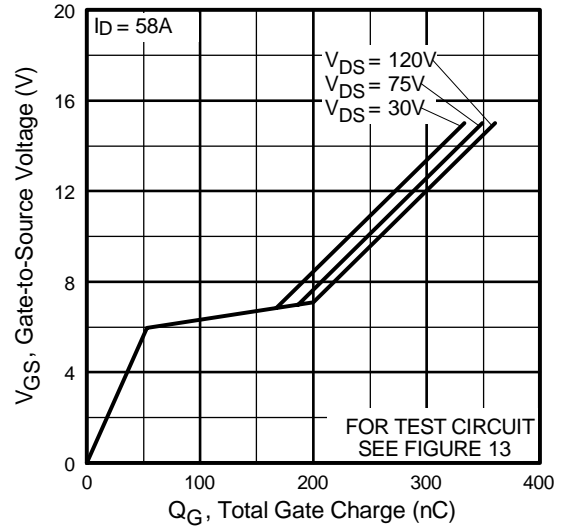
**Fig 4.** Normalized On-Resistance Vs. Temperature

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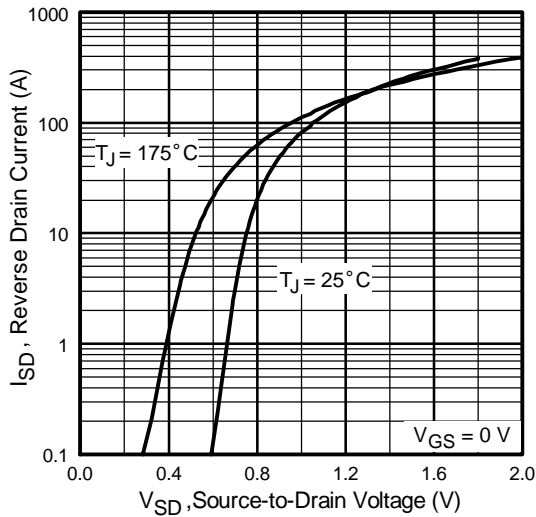
International  
**IR** Rectifier



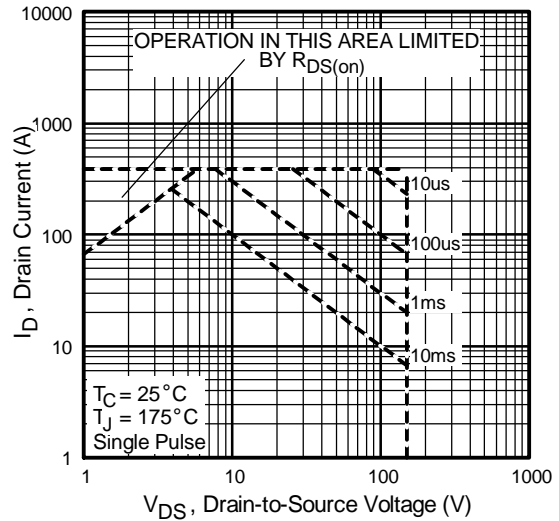
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



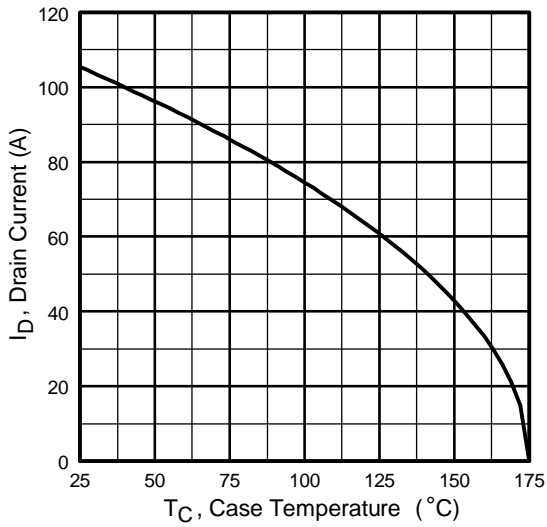
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



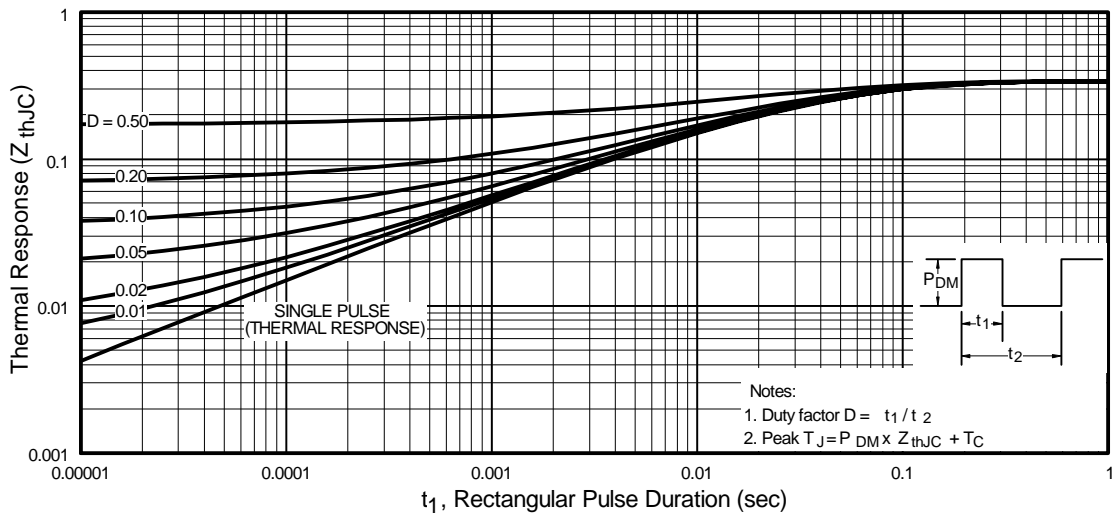
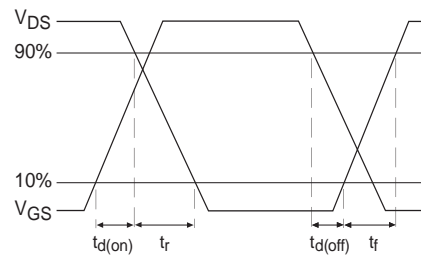
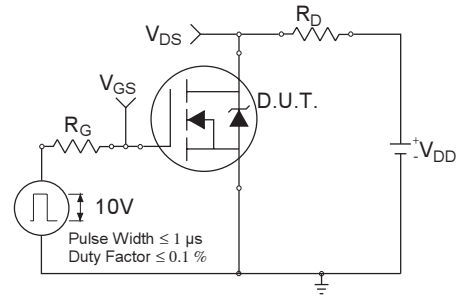
**Fig 7.** Typical Source-Drain Diode Forward Voltage



**Fig 8.** Maximum Safe Operating Area



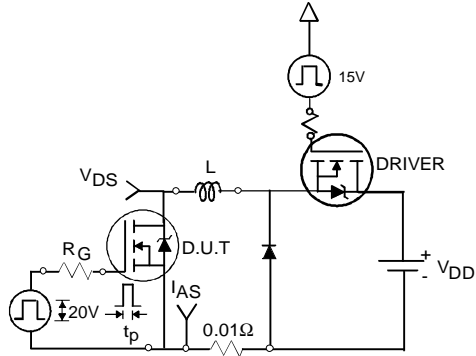
**Fig 9.** Maximum Drain Current Vs. Case Temperature



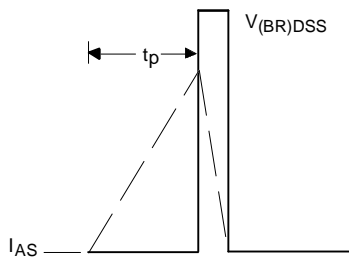
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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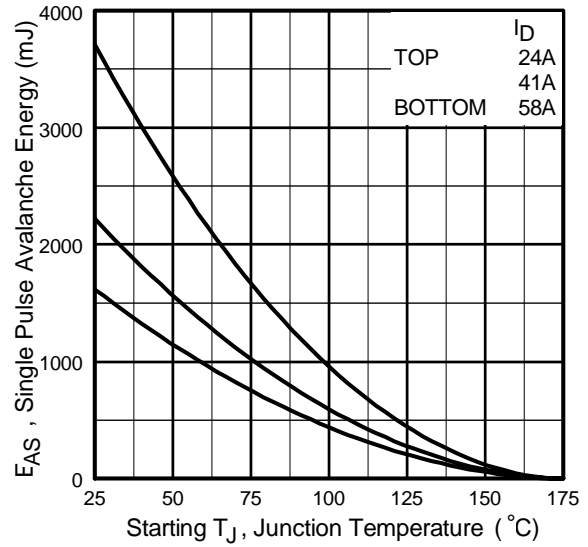
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**IRF** Rectifier



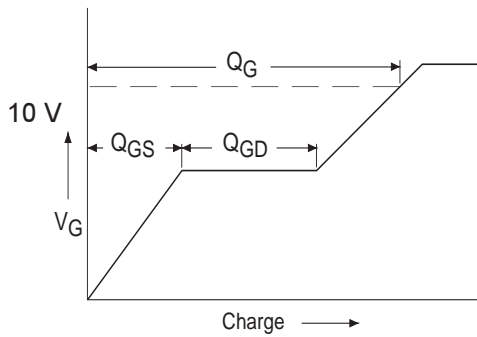
**Fig 12a.** Unclamped Inductive Test Circuit



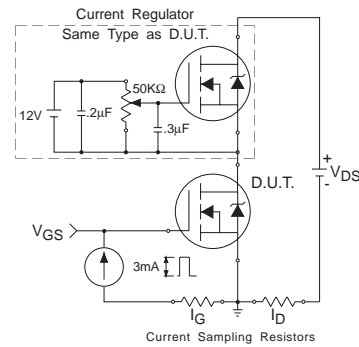
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current

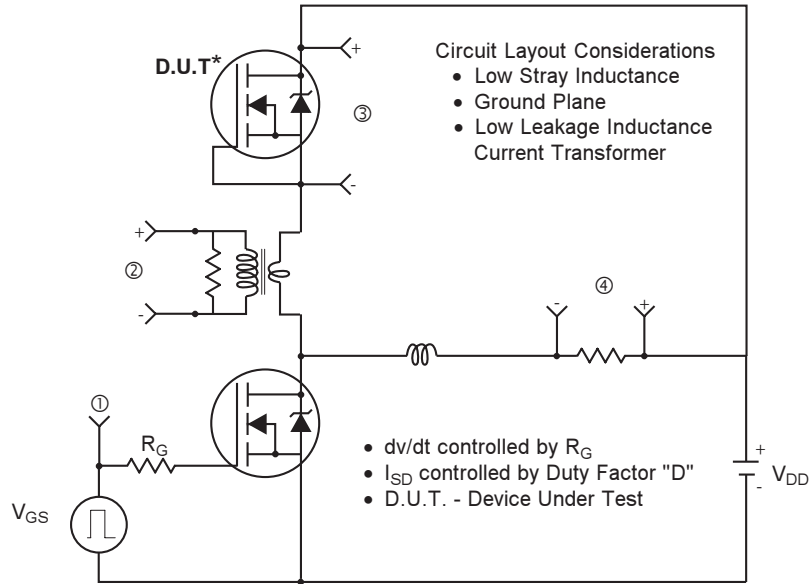


**Fig 13a.** Basic Gate Charge Waveform

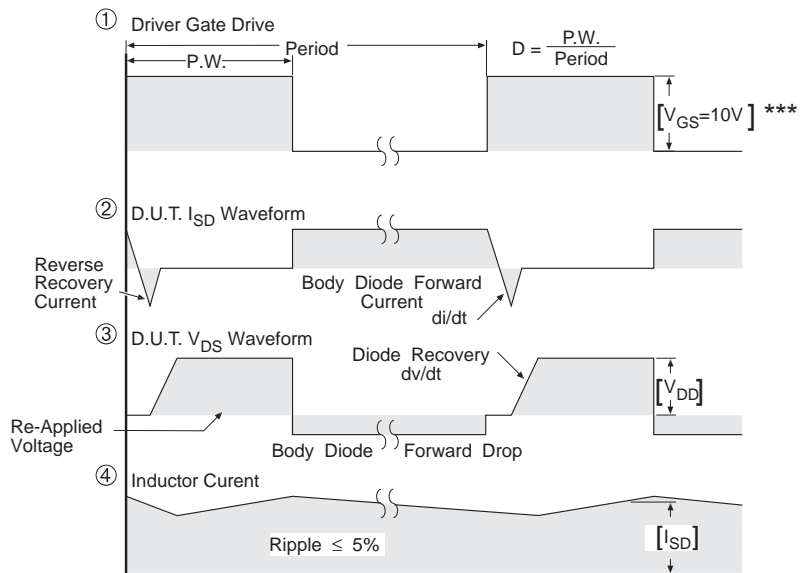


**Fig 13b.** Gate Charge Test Circuit

## Peak Diode Recovery dv/dt Test Circuit



\* Reverse Polarity of D.U.T for P-Channel



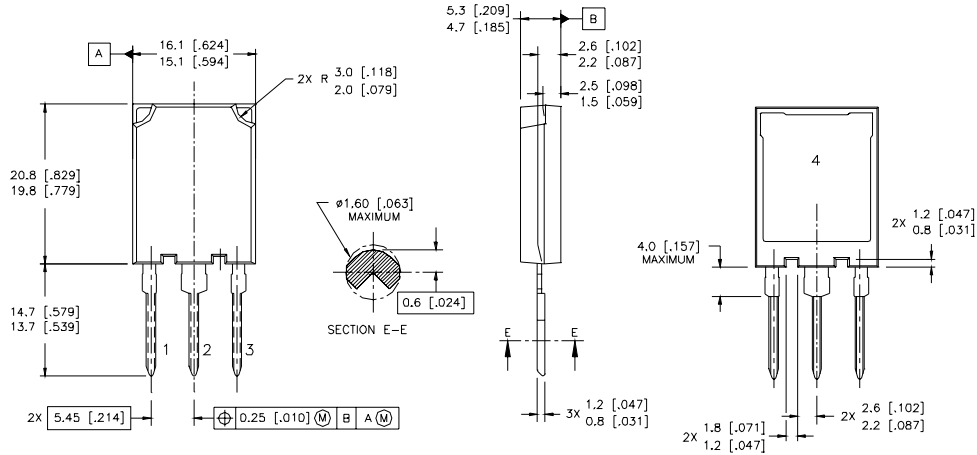
\*\*\*  $V_{GS} = 5.0V$  for Logic Level and 3V Drive Devices

**Fig 14.** For N-channel HEXFET® power MOSFETs

# IRFPS3815PbF

## Case Outline and Dimensions — Super-247

International  
**IR** Rectifier



**NOTES:**

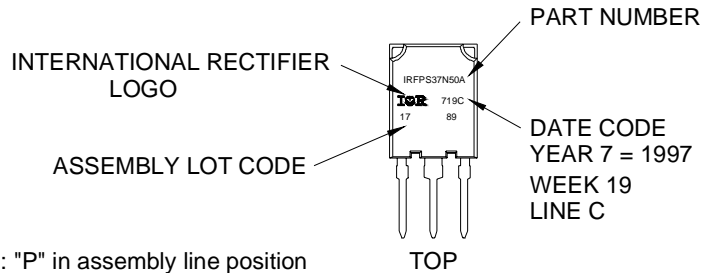
1. DIMENSIONS & TOLERANCING PER ASME Y14.5M-1994
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETRES [INCHES]

**LEAD ASSIGNMENTS**

| MOSFET     | IGBT          |
|------------|---------------|
| 1 - GATE   | 1 - GATE      |
| 2 - DRAIN  | 2 - COLLECTOR |
| 3 - SOURCE | 3 - EMITTER   |
| 4 - DRAIN  | 4 - COLLECTOR |

## Super-247 (TO-274AA) Part Marking Information

EXAMPLE: THIS IS AN IRFPS37N50A WITH  
ASSEMBLY LOT CODE 1789  
ASSEMBLED ON WW 19, 1997  
IN THE ASSEMBLY LINE "C"



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

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[RJK60S3DPP-E0#T2](#) [RJK60S5DPK-M0#T0](#) [APT5010JVFR](#) [APT12031JFLL](#) [APT12040JVR](#) [DMN3404LQ-7](#) [NTE6400](#) [JANTX2N6796U](#)  
[JANTX2N6784U](#) [JANTXV2N5416U4](#) [SQM110N05-06L-GE3](#) [SIHF35N60E-GE3](#) [2SK2614\(TE16L1,Q\)](#)