

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptable Power Supply
- High Speed Power Switching

| | | |
|------------------------|-------------------------------|----------------------|
| V_{DSS} | R_{DS(on)} max | I_D |
| 500V | 0.13Ω | 36A |

Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective Coss Specified (See AN 1001)



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|------------------------|--------------|
| I _D @ T _C = 25°C | Continuous Drain Current, V _{GS} @ 10V | 36 | A |
| I _D @ T _C = 100°C | Continuous Drain Current, V _{GS} @ 10V | 23 | |
| I _{DM} | Pulsed Drain Current ① | 144 | |
| P _D @ T _C = 25°C | Power Dissipation | 446 | W |
| | Linear Derating Factor | 3.6 | W/°C |
| V _{GS} | Gate-to-Source Voltage | ± 30 | V |
| dv/dt | Peak Diode Recovery dv/dt ③ | 3.5 | V/ns |
| T _J | Operating Junction and | -55 to + 150 | °C |
| T _{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |

Typical SMPS Topologies

- Full Bridge Converters
- Power Factor Correction Boost

Notes ① through ⑤ are on page 8
www.irf.com

IRFPS37N50A

International
IR Rectifier

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------|--------------------------------------|------|------|------|----------|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 500 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.13 | Ω | $V_{GS} = 10V, I_D = 22A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | $V_{DS} = 500V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 400V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 30V$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS} = -30V$ |

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|---------------------------------|------|------|------|-------|---|
| g_{fs} | Forward Transconductance | 20 | — | — | S | $V_{DS} = 50V, I_D = 22A$ |
| Q_g | Total Gate Charge | — | — | 180 | nC | $I_D = 36A$ $V_{DS} = 400V$ $V_{GS} = 10V$, See Fig. 6 and 13 ④ |
| Q_{gs} | Gate-to-Source Charge | — | — | 46 | | |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 71 | | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 23 | — | ns | $V_{DD} = 250V$ $I_D = 36A$ $R_G = 2.15\Omega$ $R_D = 7.0\Omega$, See Fig. 10 ④ |
| t_r | Rise Time | — | 98 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 52 | — | | |
| t_f | Fall Time | — | 80 | — | | |
| C_{iss} | Input Capacitance | — | 5579 | — | pF | $V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$, See Fig. 5 |
| C_{oss} | Output Capacitance | — | 810 | — | | |
| C_{rss} | Reverse Transfer Capacitance | — | 36 | — | | |
| C_{oss} | Output Capacitance | — | 7905 | — | | |
| C_{oss} | Output Capacitance | — | 221 | — | | |
| $C_{oss\ eff.}$ | Effective Output Capacitance | — | 400 | — | | |
| | | | | | | $V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V$ ⑤ |

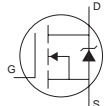
Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| E_{AS} | Single Pulse Avalanche Energy② | — | 1260 | mJ |
| I_{AR} | Avalanche Current① | — | 36 | A |
| E_{AR} | Repetitive Avalanche Energy① | — | 44 | mJ |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|--------------------|
| $R_{\theta JC}$ | Junction-to-Case | — | 0.28 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.24 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 40 | |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|---|------|------|---------------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 36 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 144 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.5 | V | $T_J = 25^\circ\text{C}, I_S = 36A, V_{GS} = 0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 570 | 860 | ns | $T_J = 25^\circ\text{C}, I_F = 36A$ |
| Q_{rr} | Reverse Recovery Charge | — | 8.6 | 13 | μC | $di/dt = 100A/\mu\text{s}$ ④ |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$) | | | | |

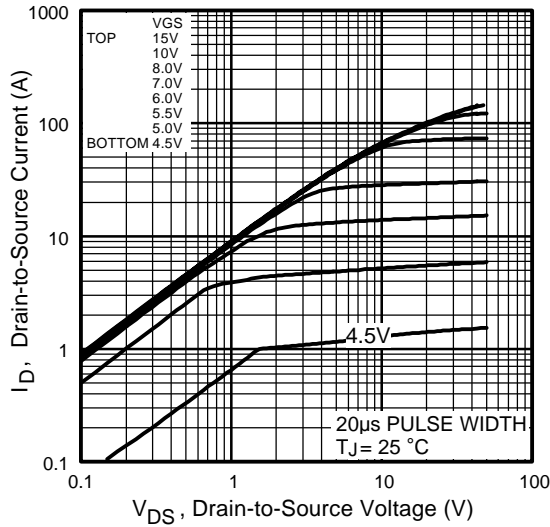


Fig 1. Typical Output Characteristics

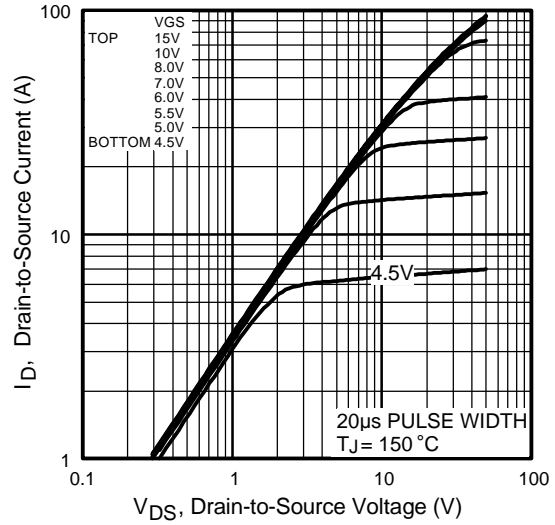


Fig 2. Typical Output Characteristics

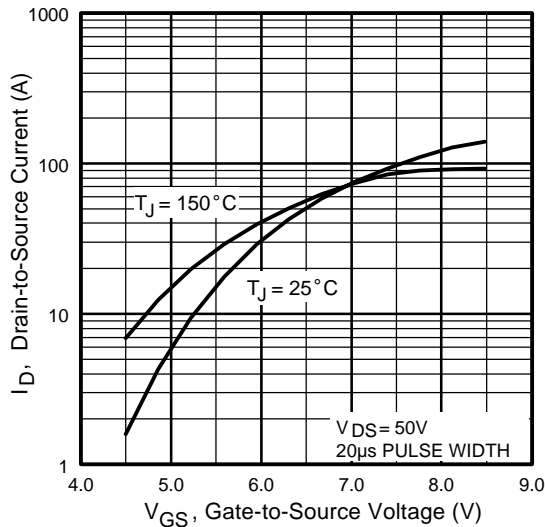


Fig 3. Typical Transfer Characteristics

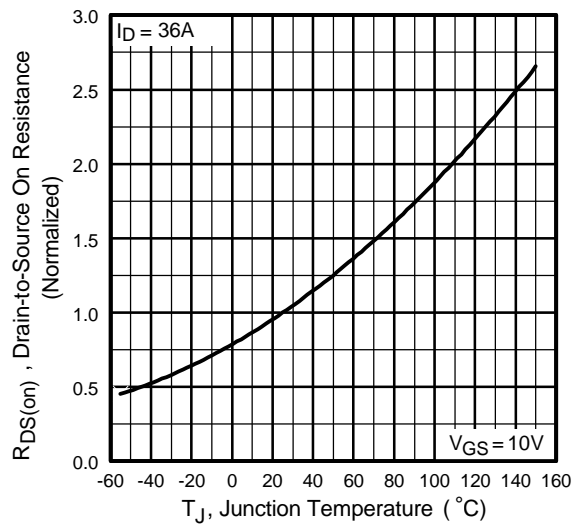


Fig 4. Normalized On-Resistance Vs. Temperature

IRFPS37N50A

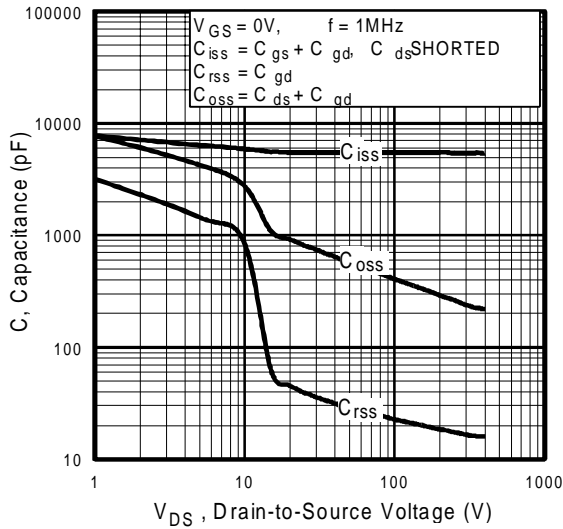


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

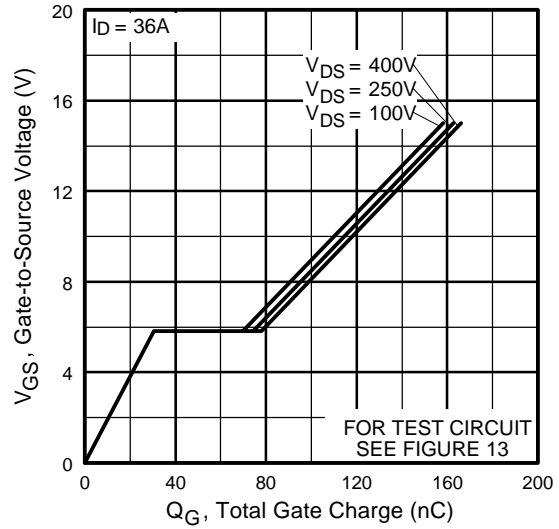


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

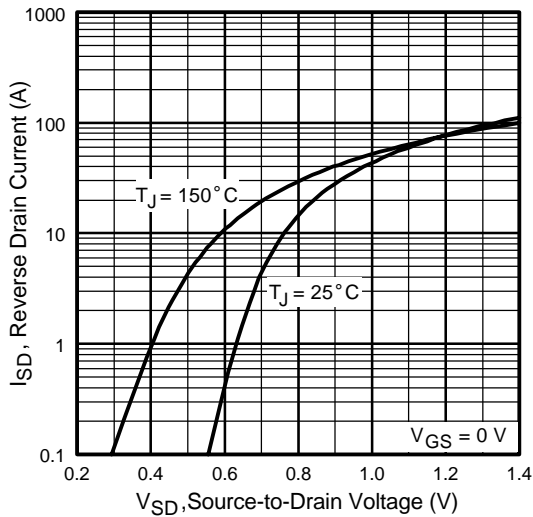


Fig 7. Typical Source-Drain Diode Forward Voltage

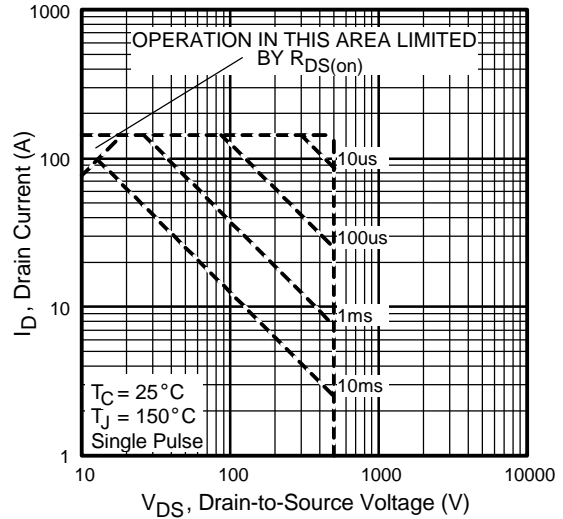


Fig 8. Maximum Safe Operating Area

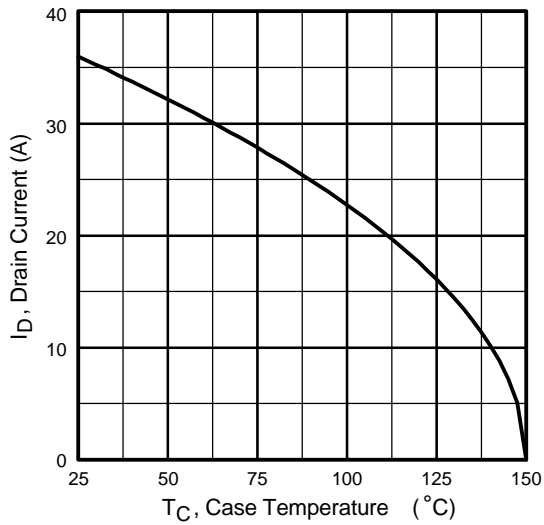


Fig 9. Maximum Drain Current Vs. Case Temperature

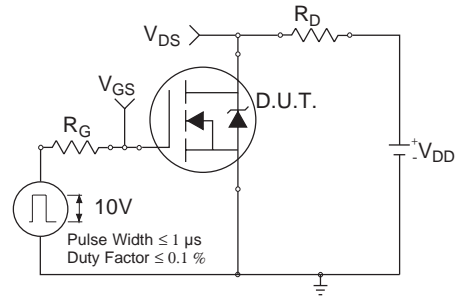


Fig 10a. Switching Time Test Circuit

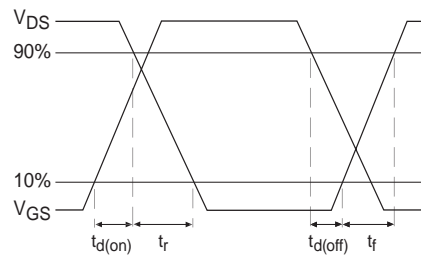


Fig 10b. Switching Time Waveforms

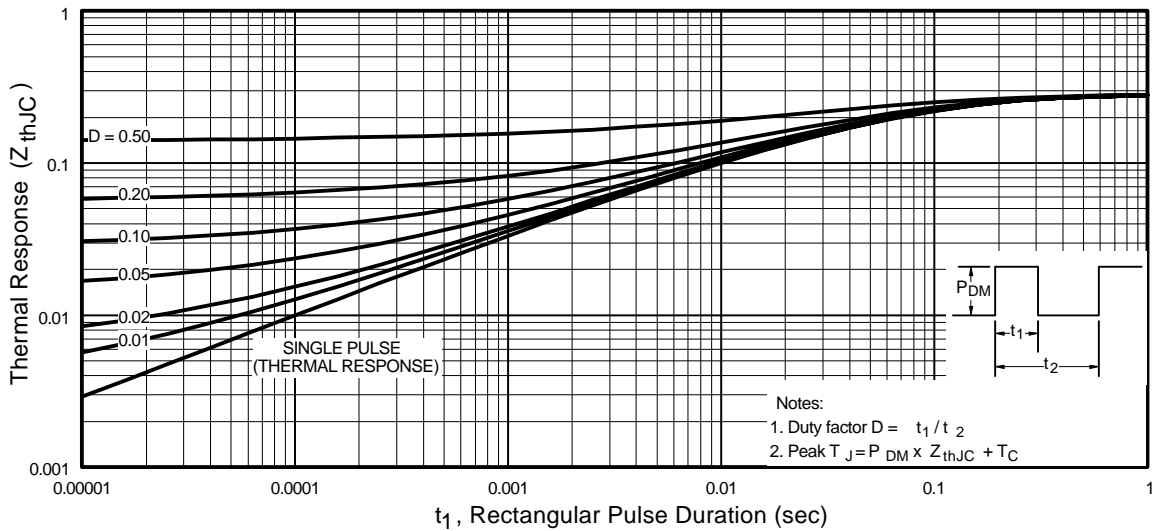


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFPS37N50A

International
IR Rectifier



Fig 12a. Unclamped Inductive Test Circuit

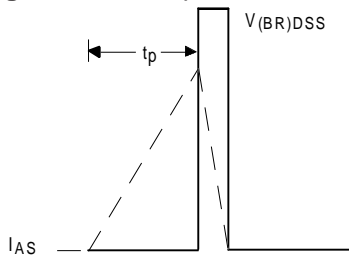


Fig 12b. Unclamped Inductive Waveforms

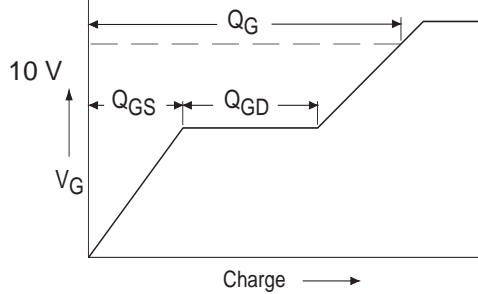


Fig 13a. Basic Gate Charge Waveform

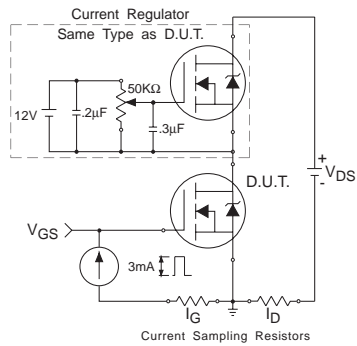


Fig 13b. Gate Charge Test Circuit

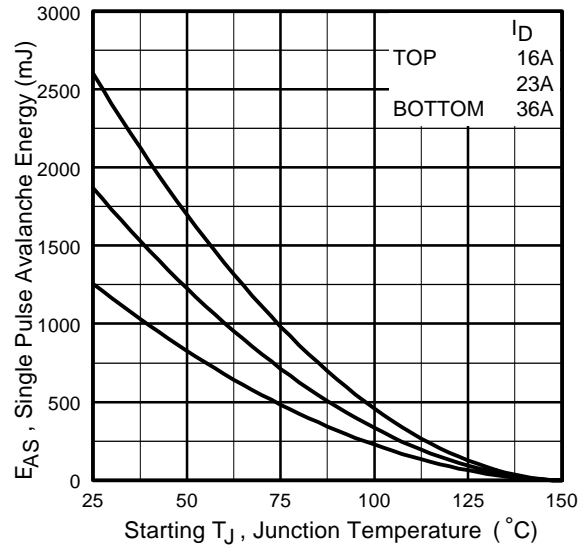


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

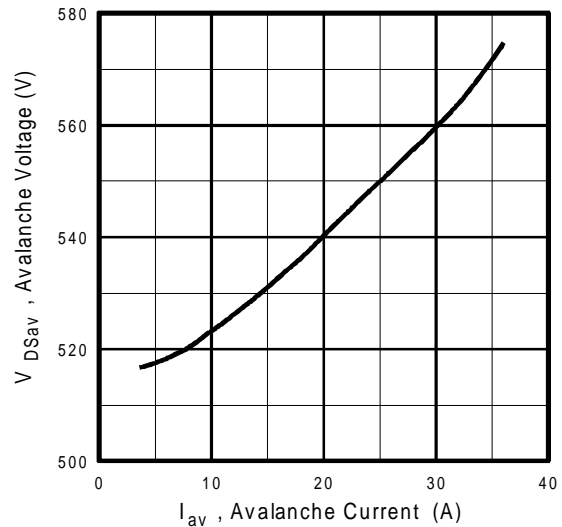
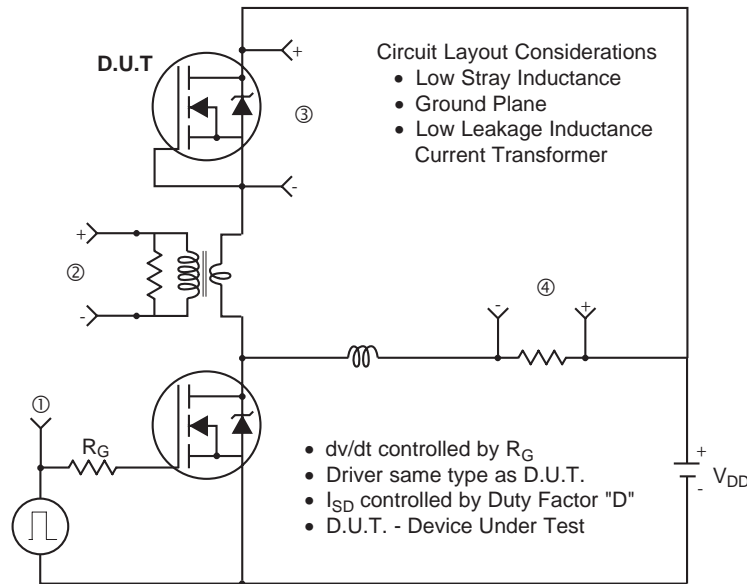


Fig 12d. Typical Drain-to-Source Voltage Vs. Avalanche Current

Peak Diode Recovery dv/dt Test Circuit



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

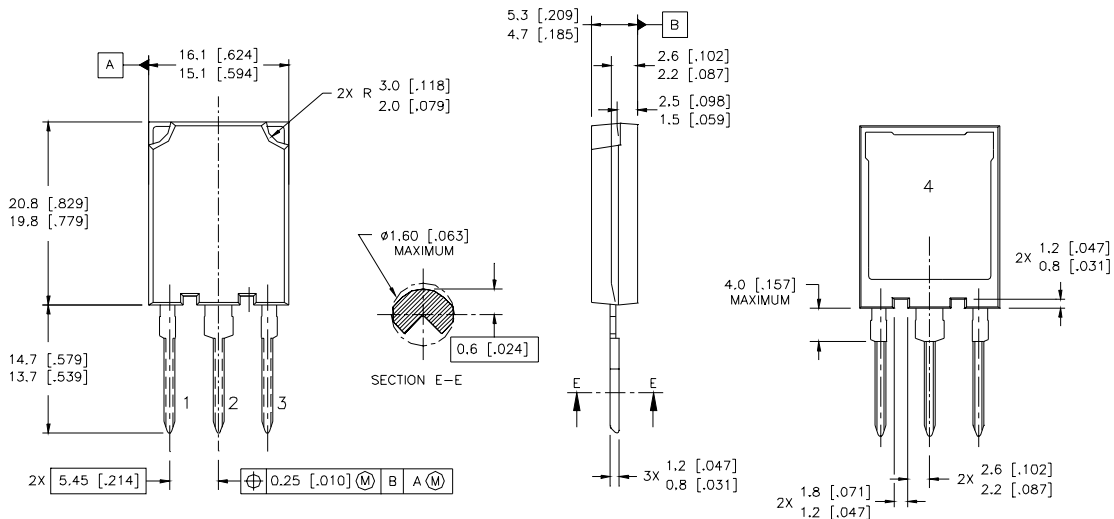
Fig 14. For N-channel HEXFET® Power MOSFETs

IRFPS37N50A

International
IR Rectifier

Case Outline and Dimensions — Super-247

Dimensions are shown in millimeters



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 |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
 - ② Starting $T_J = 25^\circ\text{C}$, $L = 1.94\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 36\text{A}$. (See Figure 12)
 - ③ $I_{SD} \leq 36\text{A}$, $di/dt \leq 145\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$
 - ④ Pulse width $\leq 300\mu\text{s}$; 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}
- ** When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

International
IR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 252-7105

IR GREAT BRITAIN: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200

IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086

IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 838 4630

IR TAIWAN: 16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan Tel: 886-2-2377-9936

Data and specifications subject to change without notice. 12/99

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Infineon:](#)

[IRFPS37N50APBF](#)