

Applications

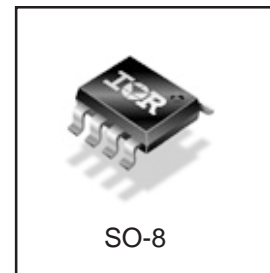
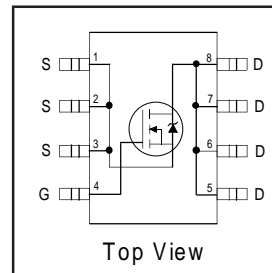
- High Frequency DC-DC Converters with Synchronous Rectification

HEXFET® Power MOSFET

| V_{DSS} | $R_{DS(on) \max}$ | I_D |
|-----------|-------------------|-------|
| 40V | 13mΩ | 10A |

Benefits

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



Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|--------------------------|--|--------------|-------|
| V_{DS} | Drain-Source Voltage | 40 | V |
| V_{GS} | Gate-to-Source Voltage | ± 12 | V |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 10 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 8.5 | |
| I_{DM} | Pulsed Drain Current ^① | 85 | |
| $P_D @ T_A = 25^\circ C$ | Maximum Power Dissipation ^③ | 2.5 | W |
| $P_D @ T_A = 70^\circ C$ | Maximum Power Dissipation ^③ | 1.6 | W |
| | Linear Derating Factor | 0.02 | mW/°C |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to + 150 | °C |

Thermal Resistance

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|----------------------------------|------|------|-------|
| $R_{\theta JL}$ | Junction-to-Drain Lead | — | 20 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ^④ | — | 50 | |

Notes ^① through ^④ are on page 8
www.irf.com

IRF7470

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 | 40 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.04 | — | V/ $^\circ\text{C}$ | Reference to 25°C , $I_D = 1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 9.0 | 13 | m Ω | $V_{GS} = 10V, I_D = 10A$ ④ |
| | | — | 10 | 15 | | $V_{GS} = 4.5V, I_D = 8.0A$ ④ |
| | | — | 14.5 | 30 | | $V_{GS} = 2.8V, I_D = 5.0A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 0.8 | — | 2.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 20 | μA | $V_{DS} = 32V, V_{GS} = 0V$ |
| | | — | — | 100 | | $V_{DS} = 32V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 200 | nA | $V_{GS} = 12V$ |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | $V_{GS} = -12V$ |

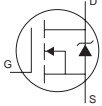
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--------------|---------------------------------|------|------|------|-------|-----------------------------|
| g_{fs} | Forward Transconductance | 27 | — | — | S | $V_{DS} = 20V, I_D = 8.0A$ |
| Q_g | Total Gate Charge | — | 29 | 44 | nC | $I_D = 8.0A$ |
| Q_{gs} | Gate-to-Source Charge | — | 7.9 | 12 | | $V_{DS} = 20V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | 8.0 | 12 | | $V_{GS} = 4.5V$ ③ |
| Q_{oss} | Output Gate Charge | — | 23 | 35 | | $V_{GS} = 0V, V_{DS} = 16V$ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 10 | — | ns | $V_{DD} = 20V$ |
| t_r | Rise Time | — | 1.9 | — | | $I_D = 8.0A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 21 | — | | $R_G = 1.8\Omega$ |
| t_f | Fall Time | — | 3.2 | — | | $V_{GS} = 4.5V$ ③ |
| C_{iss} | Input Capacitance | — | 3430 | — | | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 690 | — | pF | $V_{DS} = 20V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 41 | — | | $f = 1.0\text{MHz}$ |

Avalanche Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| E_{AS} | Single Pulse Avalanche Energy② | — | 300 | mJ |
| I_{AR} | Avalanche Current① | — | 8.0 | A |

Diode Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|------|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 2.3 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 85 | | |
| V_{SD} | Diode Forward Voltage | — | 0.80 | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 8.0A, V_{GS} = 0V$ ③ |
| | | — | 0.65 | — | | $T_J = 125^\circ\text{C}, I_S = 8.0A, V_{GS} = 0V$ |
| t_{rr} | Reverse Recovery Time | — | 72 | 110 | ns | $T_J = 25^\circ\text{C}, I_F = 8.0A, V_R = 20V$ |
| Q_{rr} | Reverse Recovery Charge | — | 130 | 200 | nC | $di/dt = 100A/\mu s$ ③ |
| t_{rr} | Reverse Recovery Time | — | 76 | 110 | ns | $T_J = 125^\circ\text{C}, I_F = 8.0A, V_R = 20V$ |
| Q_{rr} | Reverse Recovery Charge | — | 150 | 230 | nC | $di/dt = 100A/\mu s$ ③ |

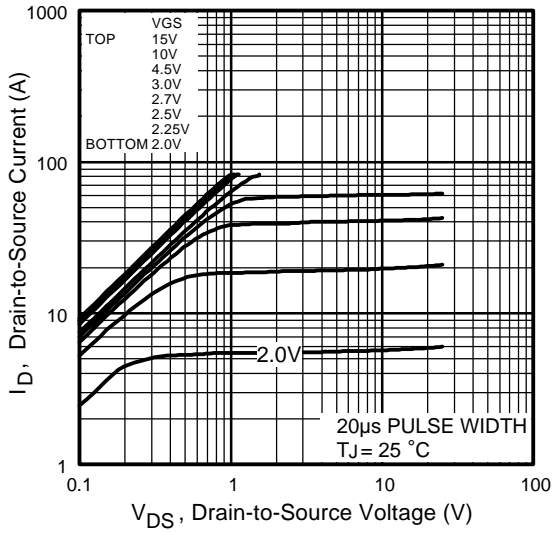


Fig 1. Typical Output Characteristics

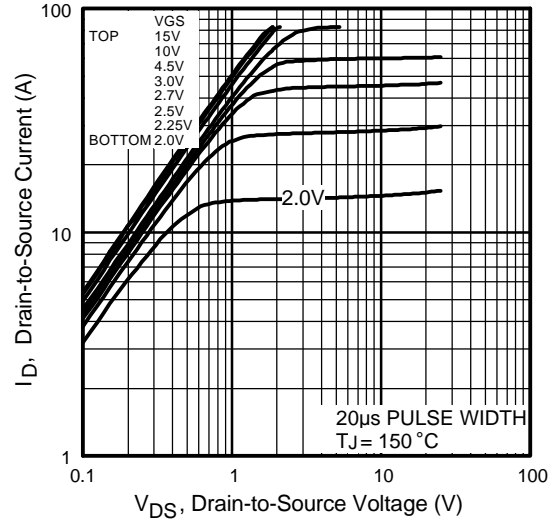


Fig 2. Typical Output Characteristics

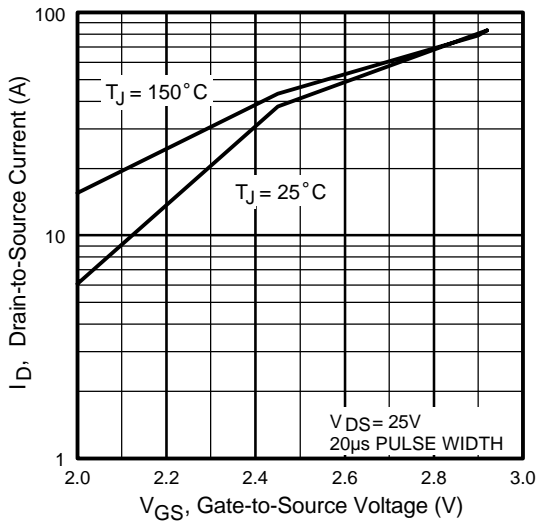


Fig 3. Typical Transfer Characteristics

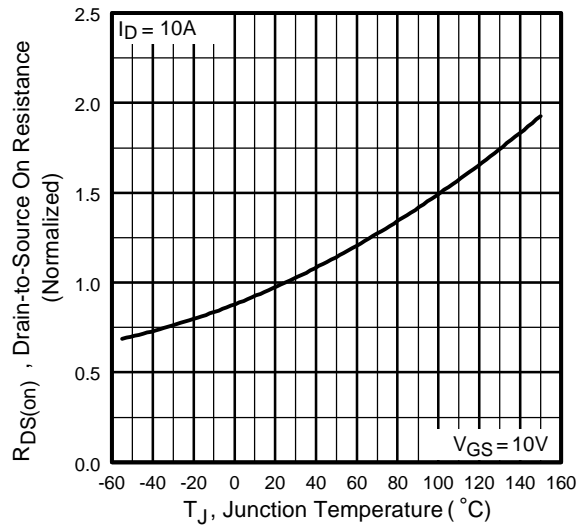


Fig 4. Normalized On-Resistance Vs. Temperature

IRF7470

International
IR Rectifier

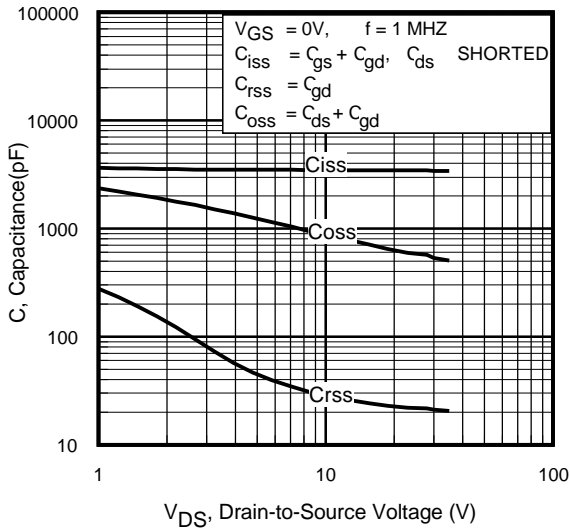


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

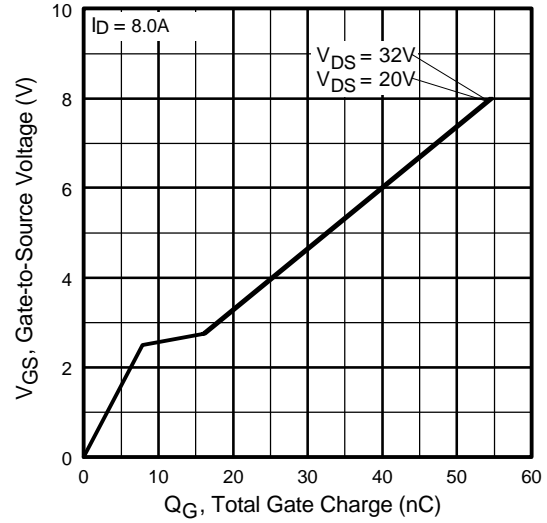


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

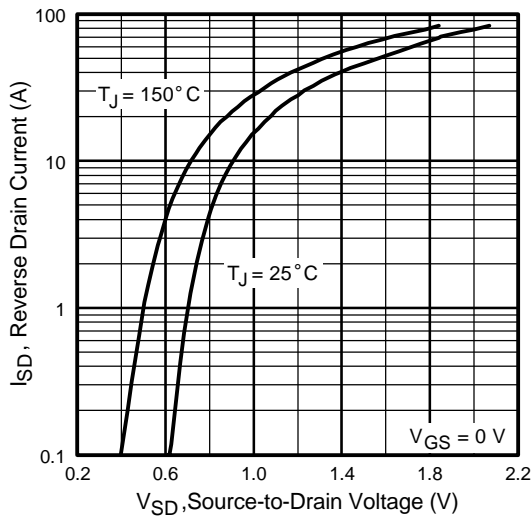


Fig 7. Typical Source-Drain Diode Forward Voltage

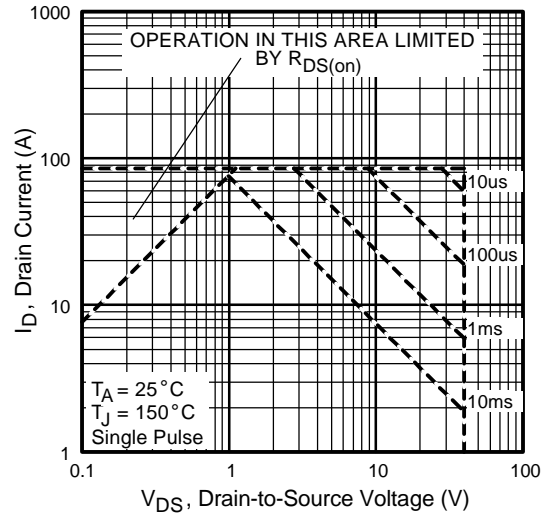


Fig 8. Maximum Safe Operating Area

Fig 6. On-Resistance Vs. Drain Current

International
IR Rectifier

IRF7470

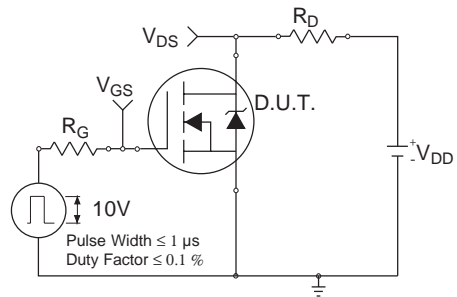
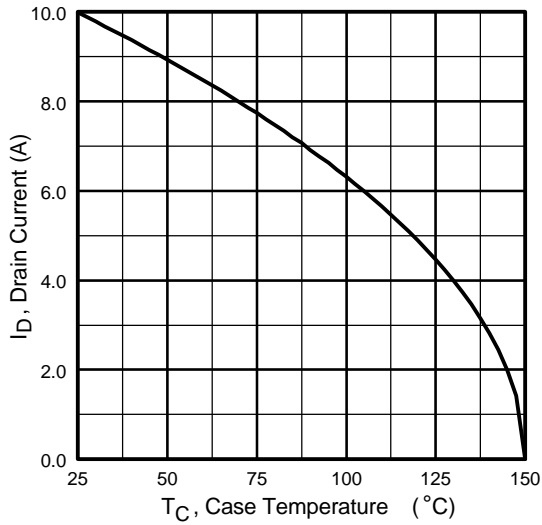


Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

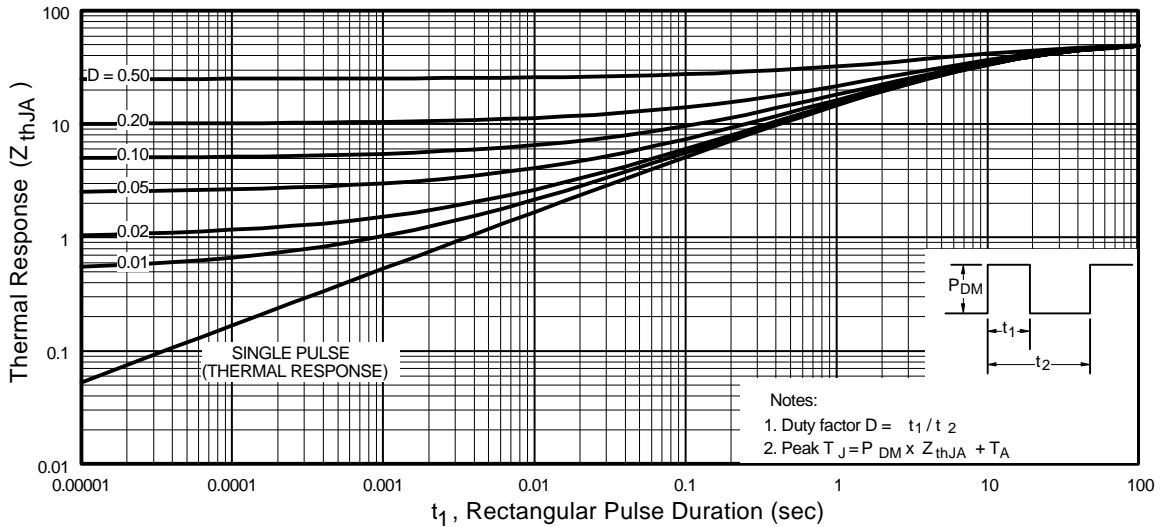


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

IRF7470

International
IR Rectifier

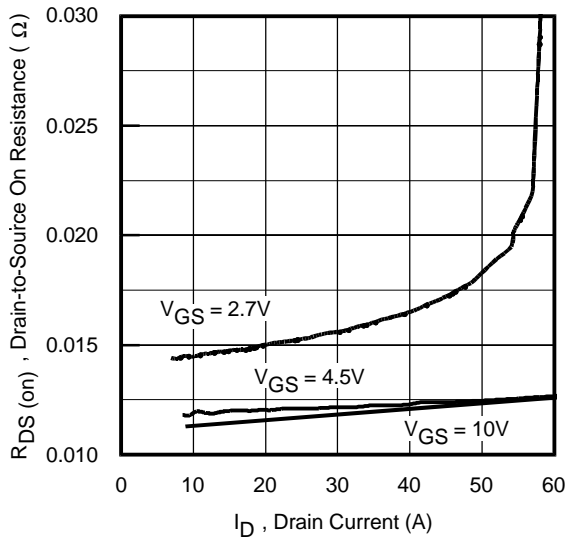


Fig 12. On-Resistance Vs. Drain Current

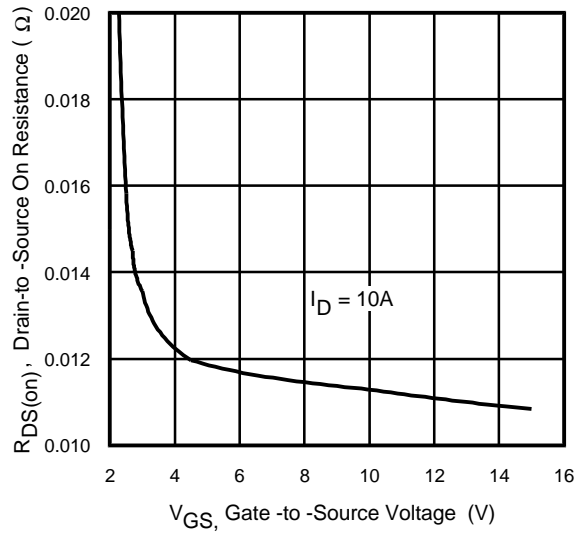


Fig 13. On-Resistance Vs. Gate Voltage

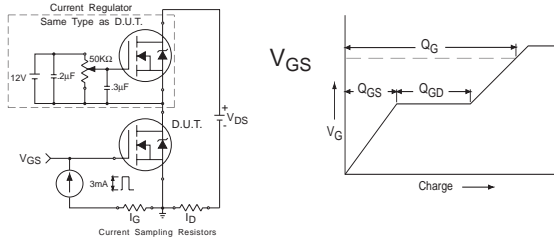


Fig 13a&b. Basic Gate Charge Test Circuit and Waveform

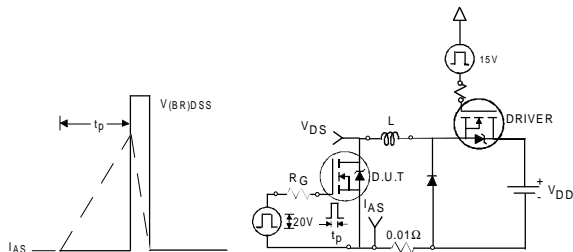


Fig 14a&b. Unclamped Inductive Test circuit and Waveforms

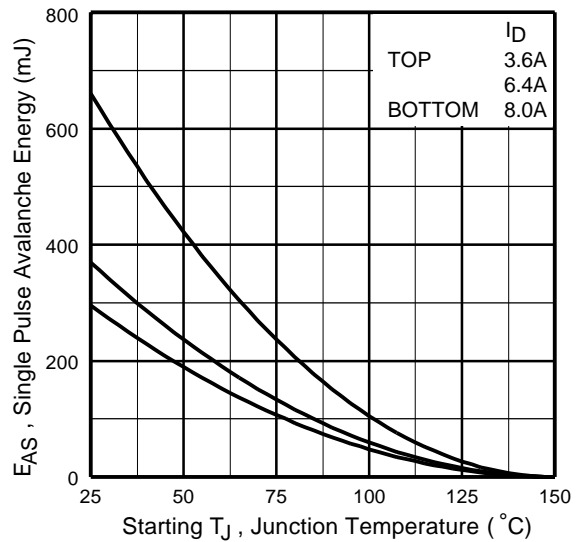


Fig 14c. Maximum Avalanche Energy Vs. Drain Current

SO-8 Package Details



| DIM | INCHES | | MILLIMETERS | |
|-----|------------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| B | .014 | .018 | 0.36 | 0.46 |
| C | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .196 | 4.80 | 4.98 |
| E | .150 | .157 | 3.81 | 3.99 |
| e | .050 BASIC | | 1.27 BASIC | |
| e1 | .025 BASIC | | 0.635 BASIC | |
| H | .2284 | .2440 | 5.80 | 6.20 |
| K | .011 | .019 | 0.28 | 0.48 |
| L | 0.16 | .050 | 0.41 | 1.27 |
| θ | 0° | 8° | 0° | 8° |

RECOMMENDED FOOTPRINT



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION : INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS
MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.006).
- ⑥ DIMENSIONS IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE..

SO-8 Part Marking

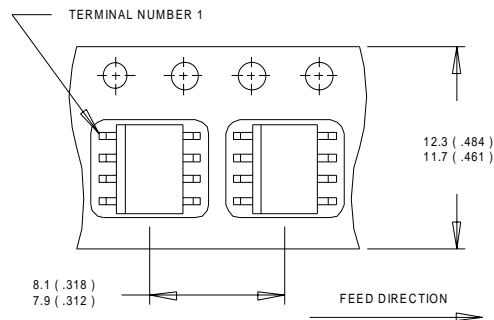
EXAMPLE: THIS IS AN IRF7101



IRF7470

International
IR Rectifier

SO-8 Tape and Reel



- NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
 2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
 3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



- NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
 2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 9.4\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 8.0\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ When mounted on 1 inch square copper board, $t < 10$ sec

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. 3/01

www.irf.com