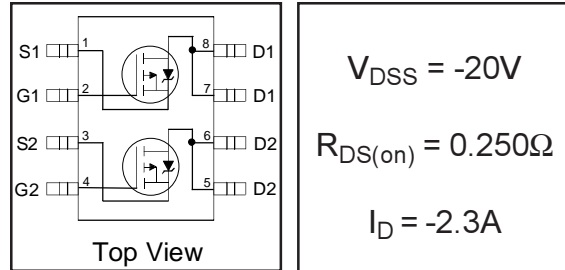


IRF7104PbF

HEXFET® Power MOSFET

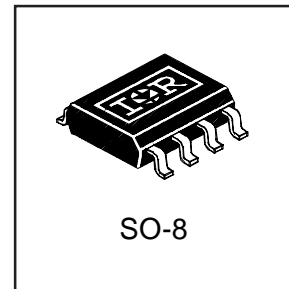
- Advanced Process Technology
- Ultra Low On-Resistance
- Dual P-Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Fast Switching
- Lead-Free



Description

Fourth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible 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 device for use in a wide variety of applications.

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and dual-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra red, or wave soldering techniques. Power dissipation of greater than 0.8W is possible in a typical PCB mount application.



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------|--|-------------|-------|
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | -2.3 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | -1.8 | |
| I_{DM} | Pulsed Drain Current ① | -10 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 2.0 | W |
| | Linear Derating Factor | 0.016 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 12 | V |
| dv/dt | Peak Diode Recovery dv/dt ② | -3.0 | V/nS |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to +150 | °C |

Thermal Resistance Ratings

| | Parameter | Min. | Typ. | Max. | Units |
|-----------------|-------------------------------|------|------|------|-------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient ④ | — | — | 62.5 | °C/W |

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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 | -20 | — | — | V | $V_{GS} = 0V, I_D = -250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | -0.015 | — | V/°C | Reference to $25^\circ\text{C}, I_D = -1\text{mA}$ |
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | — | 0.19 | 0.25 | Ω | $V_{GS} = -10V, I_D = -1.0A$ ③ |
| | | — | 0.30 | 0.40 | | $V_{GS} = -4.5V, I_D = -0.50A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | -1.0 | — | -3.0 | V | $V_{DS} = V_{GS}, I_D = -250\mu A$ |
| g_{fs} | Forward Transconductance | — | 2.5 | — | S | $V_{DS} = -15V, I_D = -2.3A$ ③ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | -2.0 | μA | $V_{DS} = -16V, V_{GS} = 0V$ |
| | | — | — | -25 | | $V_{DS} = -16V, V_{GS} = 0V, T_J = 55^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | -100 | nA | $V_{GS} = -12V$ |
| | Gate-to-Source Reverse Leakage | — | — | 100 | | $V_{GS} = 12V$ |
| Q_g | Total Gate Charge | — | 9.3 | 25 | nC | $I_D = -2.3A$ |
| Q_{gs} | Gate-to-Source Charge | — | 1.6 | — | | $V_{DS} = -10V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | 3.0 | — | | $V_{GS} = -10V$ ③ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 12 | 40 | ns | $V_{DD} = -10V$ |
| t_r | Rise Time | — | 16 | 40 | | $I_D = -1.0A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 42 | 90 | | $R_G = 6.0\Omega$ |
| t_f | Fall Time | — | 30 | 50 | | $R_D = 10\Omega$ ③ |
| L_D | Internal Drain Inductance | — | 4.0 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| L_S | Internal Source Inductance | — | 6.0 | — | | |
| C_{iss} | Input Capacitance | — | 290 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 210 | — | | $V_{DS} = -15V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 67 | — | | $f = 1.0\text{MHz}$ |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|---|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | -2.0 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | -9.2 | | |
| V_{SD} | Diode Forward Voltage | — | — | -1.2 | V | $T_J = 25^\circ\text{C}, I_S = -1.25A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | — | 69 | 100 | ns | $T_J = 25^\circ\text{C}, I_F = -1.25A$ |
| Q_{rr} | Reverse Recovery Charge | — | 90 | 140 | nC | $di/dt = 100A/\mu s$ ③ |
| 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.
- ② $I_{SD} \leq -2.3A, di/dt \leq 100A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
- ③ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.
- ④ Surface mounted on FR-4 board, $t \leq 10\text{sec}$.

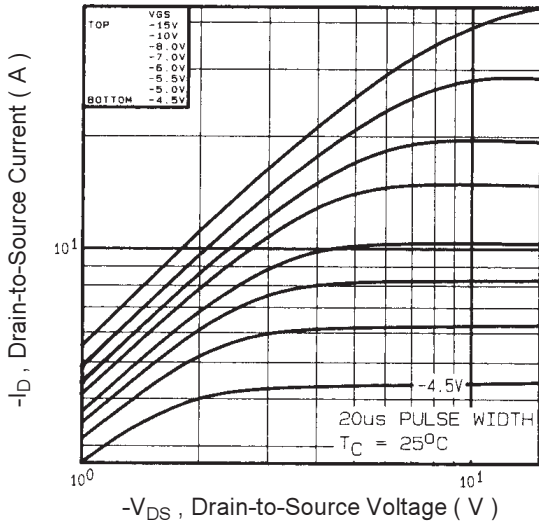


Fig 1. Typical Output Characteristics

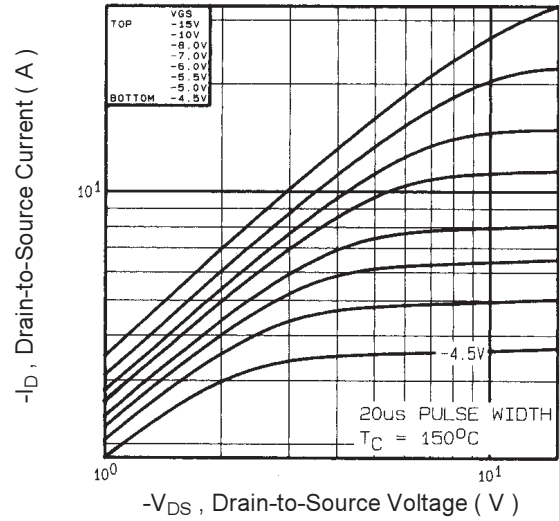


Fig 2. Typical Output Characteristics

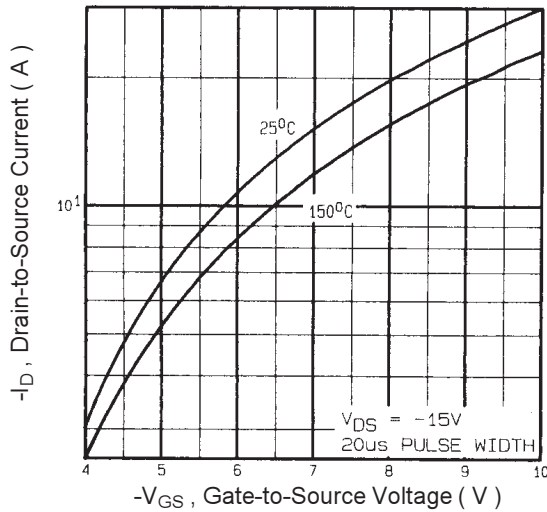


Fig 3. Typical Transfer Characteristics

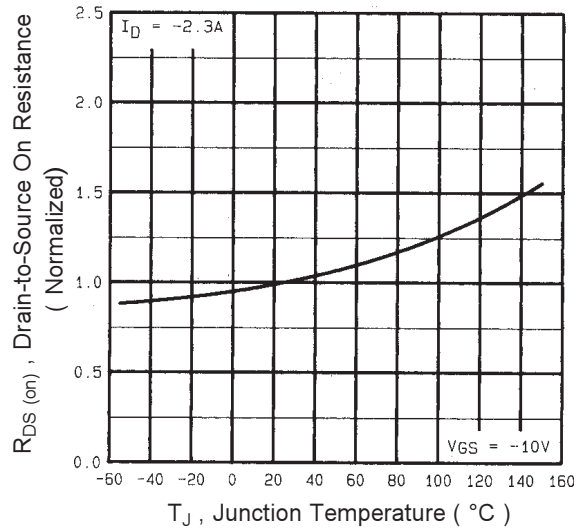


Fig 4. Normalized On-Resistance Vs. Temperature

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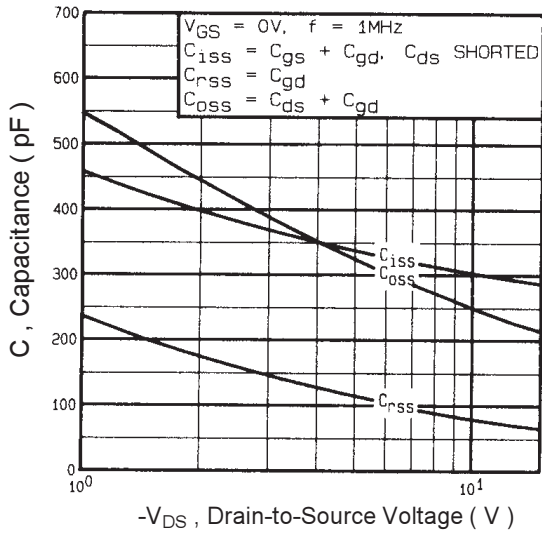


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

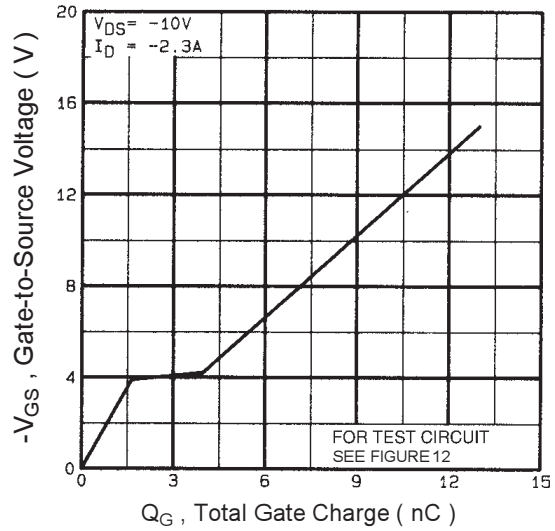


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

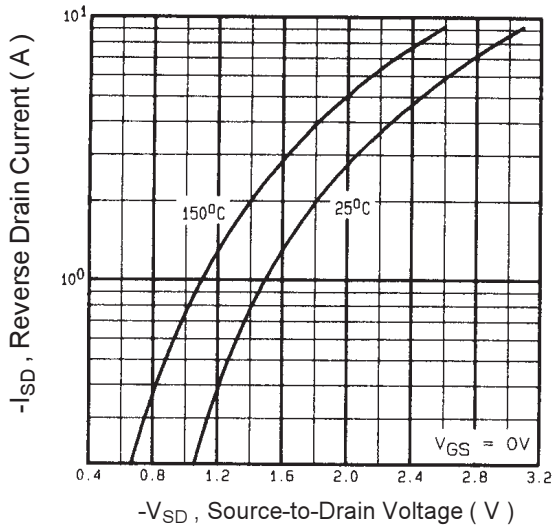


Fig 7. Typical Source-Drain Diode Forward Voltage

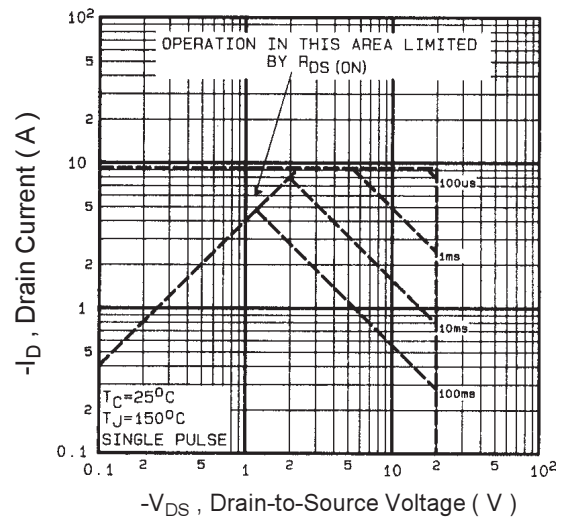


Fig 8. Maximum Safe Operating Area

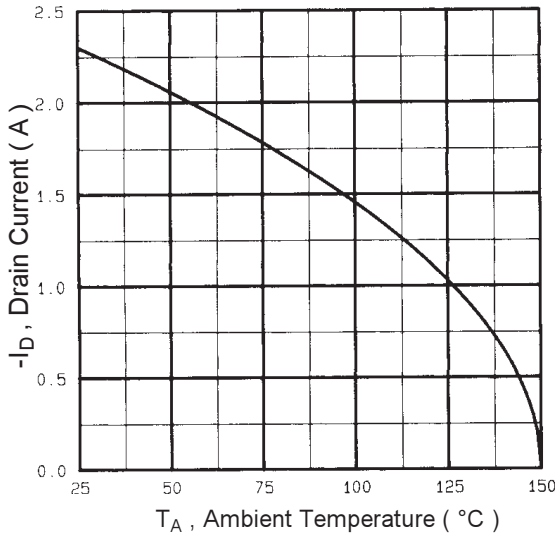


Fig 9. Maximum Drain Current Vs. Ambient Temperature

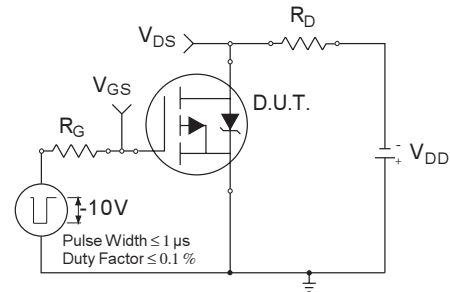


Fig 10a. Switching Time Test Circuit

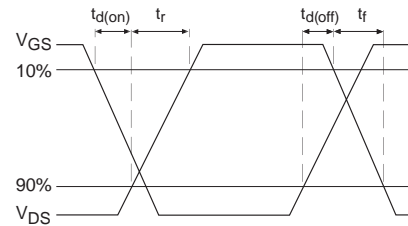


Fig 10b. Switching Time Waveforms

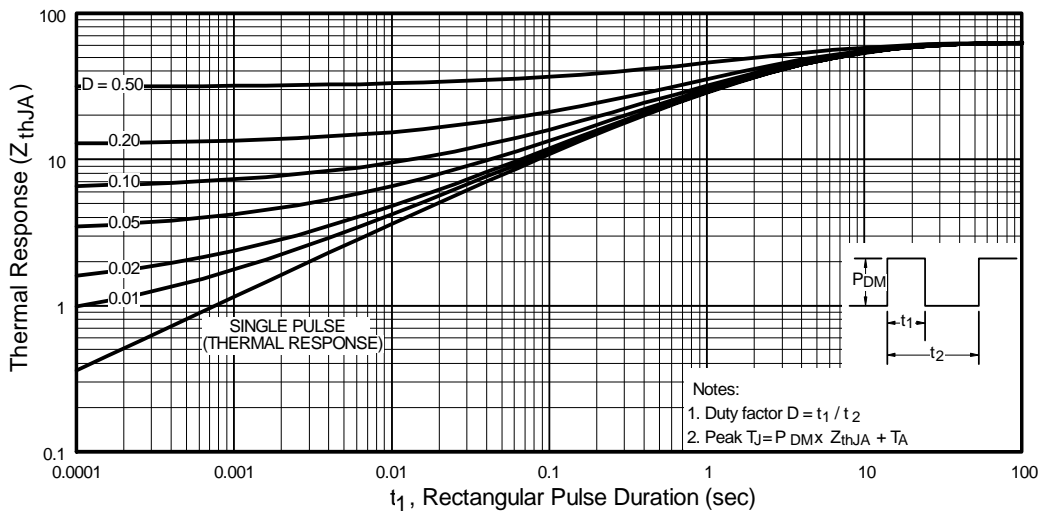


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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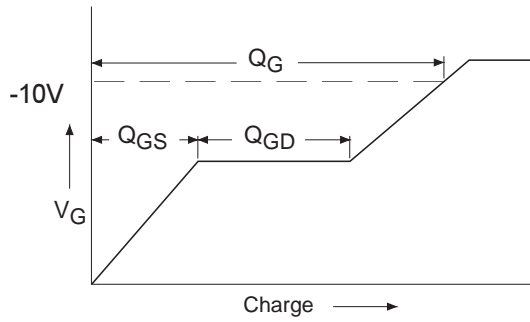


Fig 12a. Basic Gate Charge Waveform

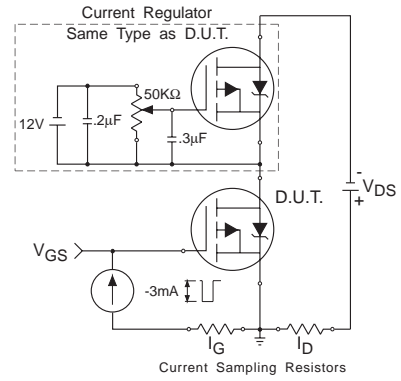
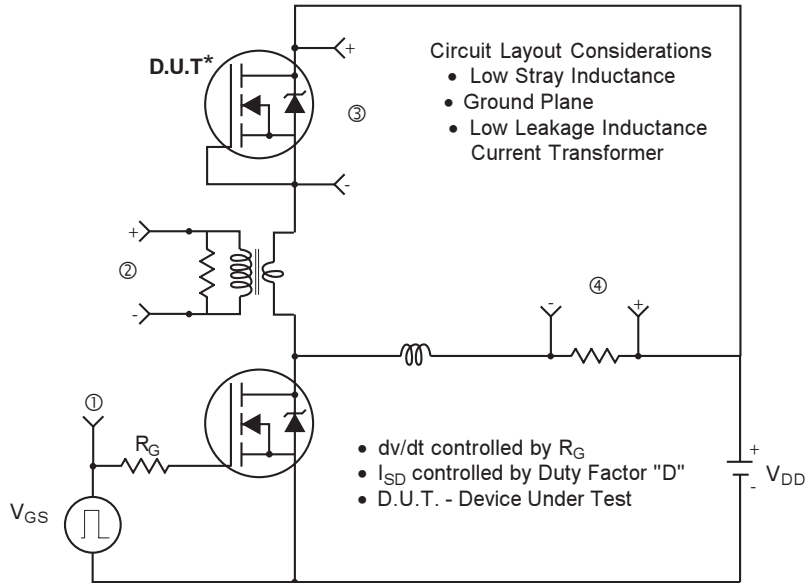
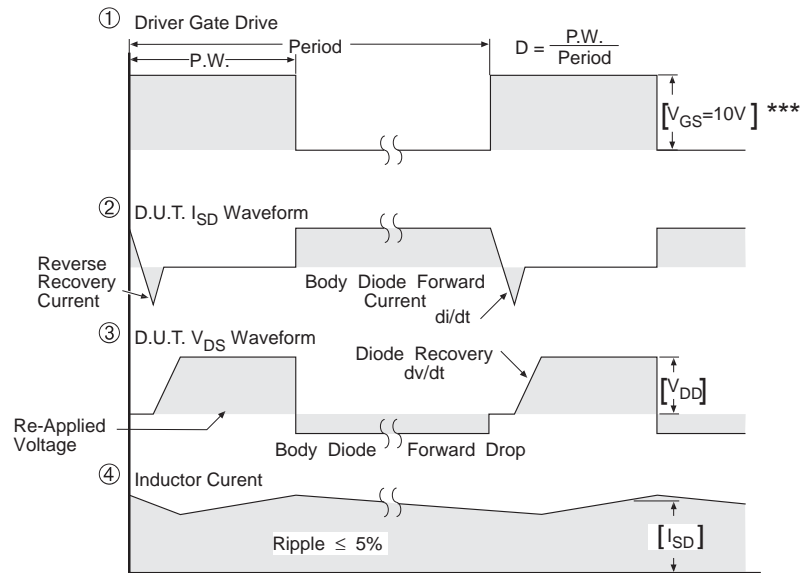


Fig 12b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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



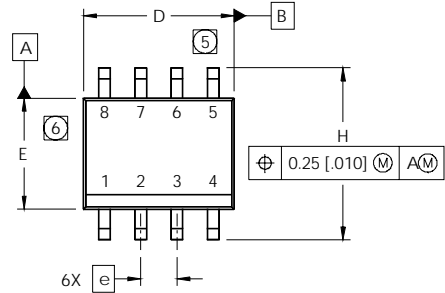
*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

Fig 13. For P-Channel HEXFETS

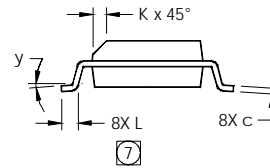
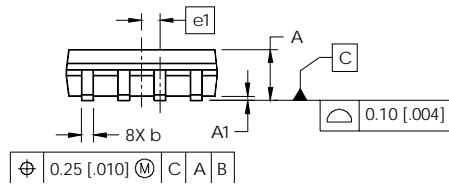
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SO-8 Package Outline

Dimensions are shown in millimeters (inches)



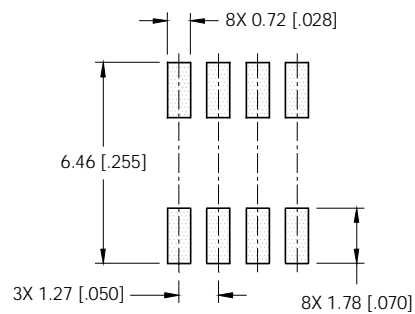
| DIM | INCHES | | MILLIMETERS | |
|-----|------------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
| e | .050 BASIC | | 1.27 BASIC | |
| e1 | .025 BASIC | | 0.635 BASIC | |
| H | 2.284 | 2.440 | 5.80 | 6.20 |
| K | .0099 | .0196 | 0.25 | 0.50 |
| L | .016 | .050 | 0.40 | 1.27 |
| y | 0° | 8° | 0° | 8° |



NOTES:

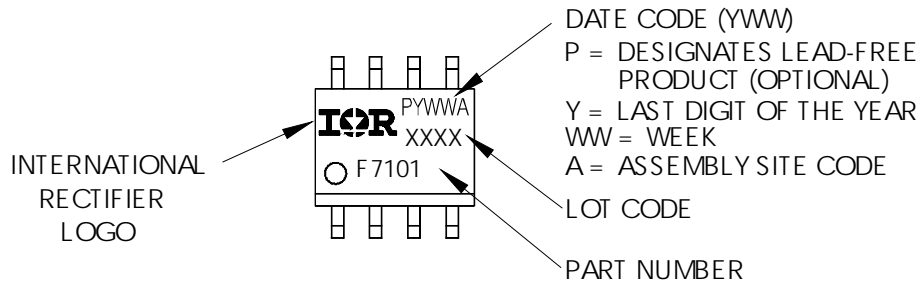
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [0.010].
- ⑦ DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT



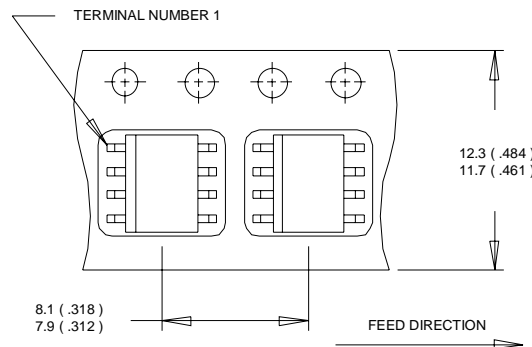
SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

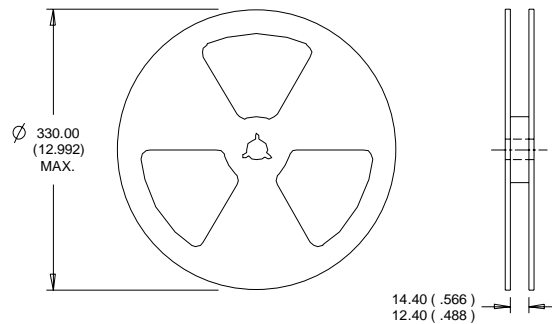


SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)



- 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.

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 Qualifications Standards can be found on IR's Web site.

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