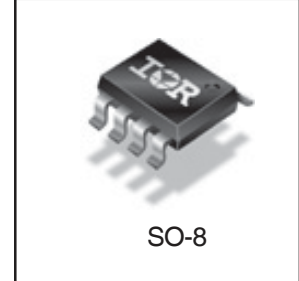
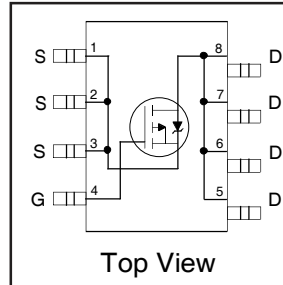


HEXFET® Power MOSFET

| | | |
|--|--------------|----------------------------|
| V_{DS} | -30 | V |
| $R_{DS(on) max}$ (@ $V_{GS} = -10V$) | 0.020 | Ω |
| Q_g (typical) | 61 | nC |
| I_b (@ $T_A = 25^\circ C$) | -10 | A |



Features

| |
|---|
| Industry-standard pinout SO-8 Package |
| Compatible with Existing Surface Mount Techniques |
| RoHS Compliant, Halogen-Free |
| MSL1, Industrial qualification |



Benefits

| |
|----------------------------|
| Multi-Vendor Compatibility |
| Easier Manufacturing |
| Environmentally Friendlier |
| Increased Reliability |

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|--------------|---------------|----------|-----------------------|
| | | Form | Quantity | |
| IRF7416PbF-1 | SO-8 | Tube/Bulk | 95 | IRF7416PbF-1 |
| | | Tape and Reel | 4000 | IRF7416TRPbF-1 |

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------|---|--------------|-------|
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -10 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -7.1 | |
| I_{DM} | Pulsed Drain Current ① | -45 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation | 2.5 | W |
| | Linear Derating Factor | 0.02 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulse Avalanche Energy ② | 370 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | -5.0 | V/ns |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 150 | °C |

Thermal Resistance

| | Parameter | Max. | Units |
|-----------------|-----------------------|------|-------|
| $R_{\theta JA}$ | Junction-to-Ambient ⑤ | 50 | °C/W |

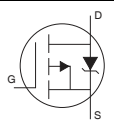
Static Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--|--------------------------------------|------|--------|-------|-------|--|
| V _{(BR)DSS} | Drain-to-Source Breakdown Voltage | -30 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| ΔV _{(BR)DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | -0.024 | — | V/°C | Reference to 25°C, I _D = -1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | — | 0.020 | Ω | V _{GS} = -10V, I _D = -5.6A ④ |
| | | — | — | 0.035 | | V _{GS} = -4.5V, I _D = -2.8A ④ |
| V _{GS(th)} | Gate Threshold Voltage | -1.0 | — | -2.04 | V | V _{DS} = V _{GS} , I _D = -250μA |
| g _{fs} | Forward Transconductance | 5.6 | — | — | S | V _{DS} = -10V, I _D = -2.8A |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | -1.0 | μA | V _{DS} = -24V, V _{GS} = 0V |
| | | — | — | -25 | | V _{DS} = -24V, V _{GS} = 0V, T _J = 125°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | -100 | nA | V _{GS} = -20V |
| | Gate-to-Source Reverse Leakage | — | — | 100 | | V _{GS} = 20V |

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

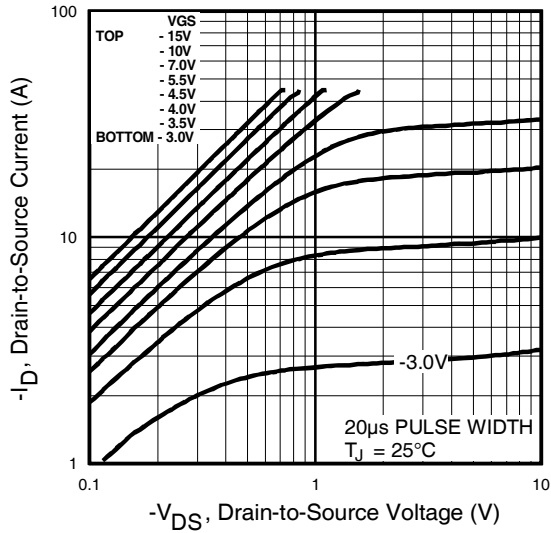
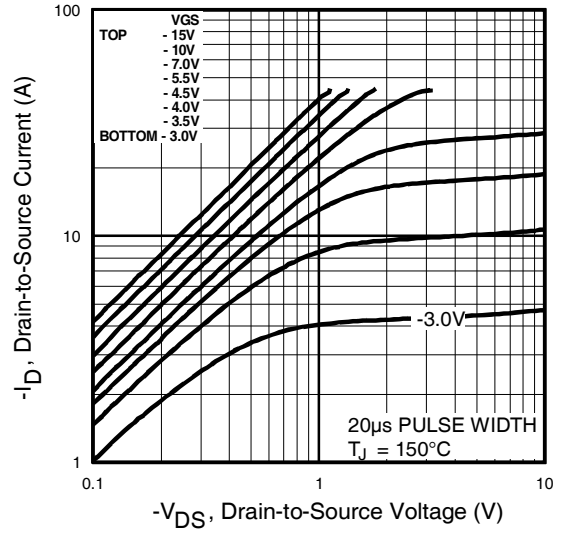
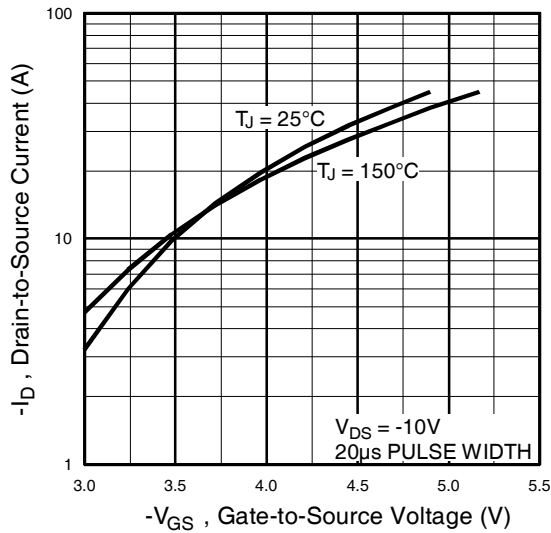
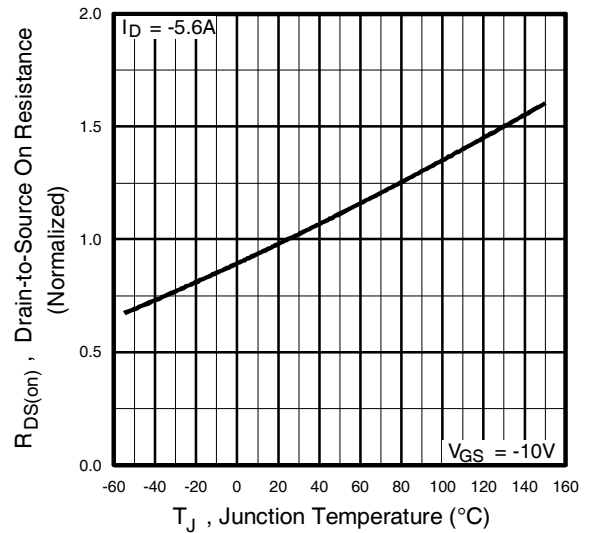
| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------|---------------------------------|------|------|------|-------|--|
| Q _g | Total Gate Charge | — | 61 | 92 | nC | I _D = -5.6A |
| Q _{gs} | Gate-to-Source Charge | — | 8.0 | 12 | | V _{DS} = -24V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | 22 | 32 | | V _{GS} = -10V, See Fig. 6 & 9 ④ |
| t _{d(on)} | Turn-On Delay Time | — | 18 | — | ns | V _{DD} = -15V |
| t _r | Rise Time | — | 49 | — | | I _D = -5.6A |
| t _{d(off)} | Turn-Off Delay Time | — | 59 | — | | R _G = 6.2Ω |
| t _f | Fall Time | — | 60 | — | | R _D = 2.7Ω, See Fig. 10 ④ |
| C _{iss} | Input Capacitance | — | 1700 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 890 | — | | V _{DS} = -25V |
| C _{rss} | Reverse Transfer Capacitance | — | 410 | — | | f = 1.0MHz, See Fig. 5 |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | -3.1 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | -45 | | |
| V _{SD} | Diode Forward Voltage | — | — | -1.0 | V | T _J = 25°C, I _S = -5.6A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 56 | 85 | ns | T _J = 25°C, I _F = -5.6A |
| Q _{rr} | Reverse Recovery Charge | — | 99 | 150 | nC | di/dt = 100A/μs ③ |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting T_J = 25°C, L = 25mH
R_G = 25Ω, I_{AS} = -5.6A. (See Figure 12)
- ③ I_{SD} ≤ -5.6A, di/dt ≤ 100A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 150°C
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.
- ⑤ Surface mounted on FR-4 board, t ≤ 10sec.


Fig 1. Typical Output Characteristics

Fig 2. Typical Output Characteristics

Fig 3. Typical Transfer Characteristics

Fig 4. Normalized On-Resistance Vs. Temperature

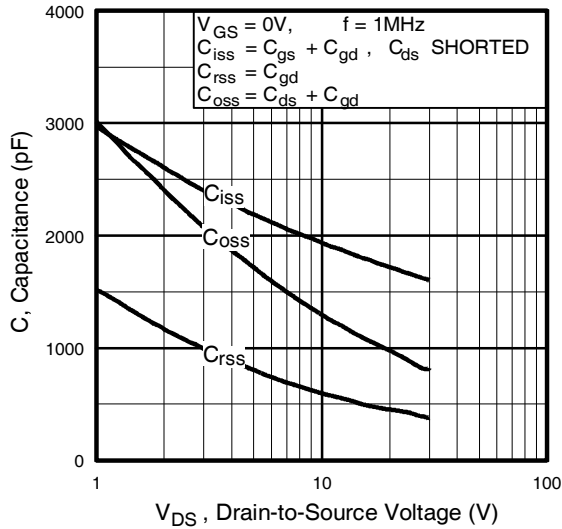


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

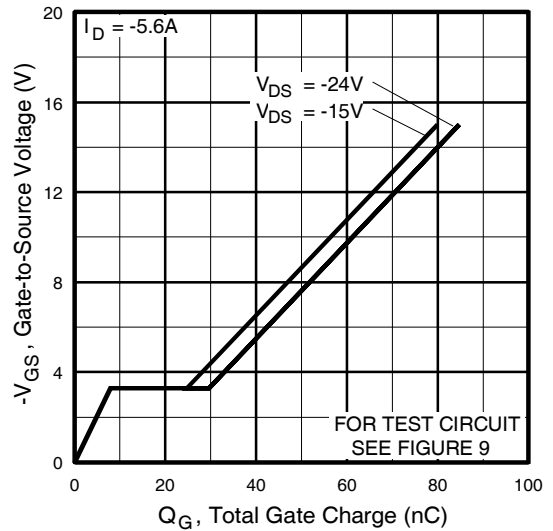


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

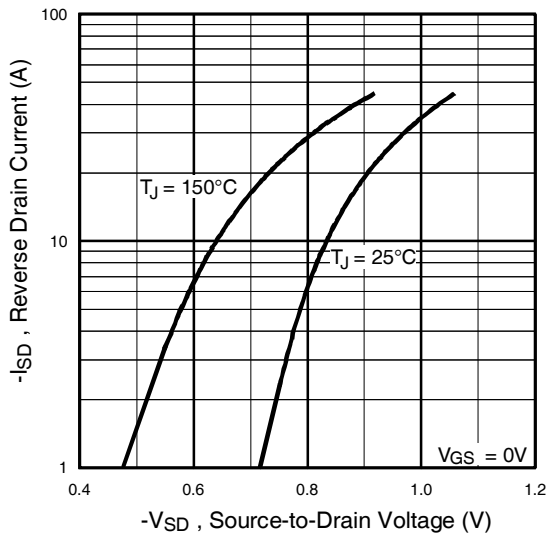


Fig 7. Typical Source-Drain Diode Forward Voltage

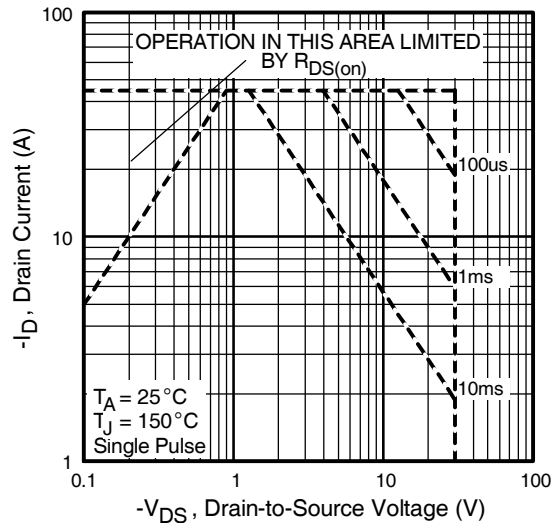
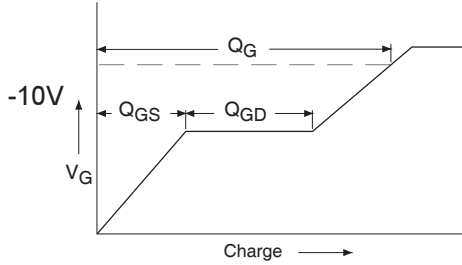
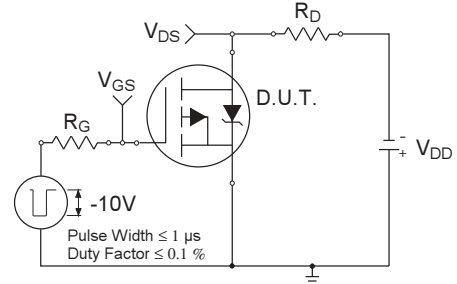
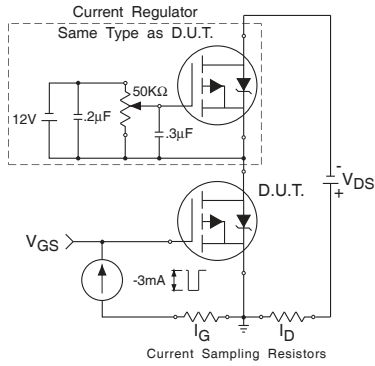
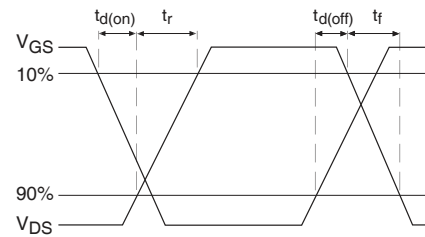
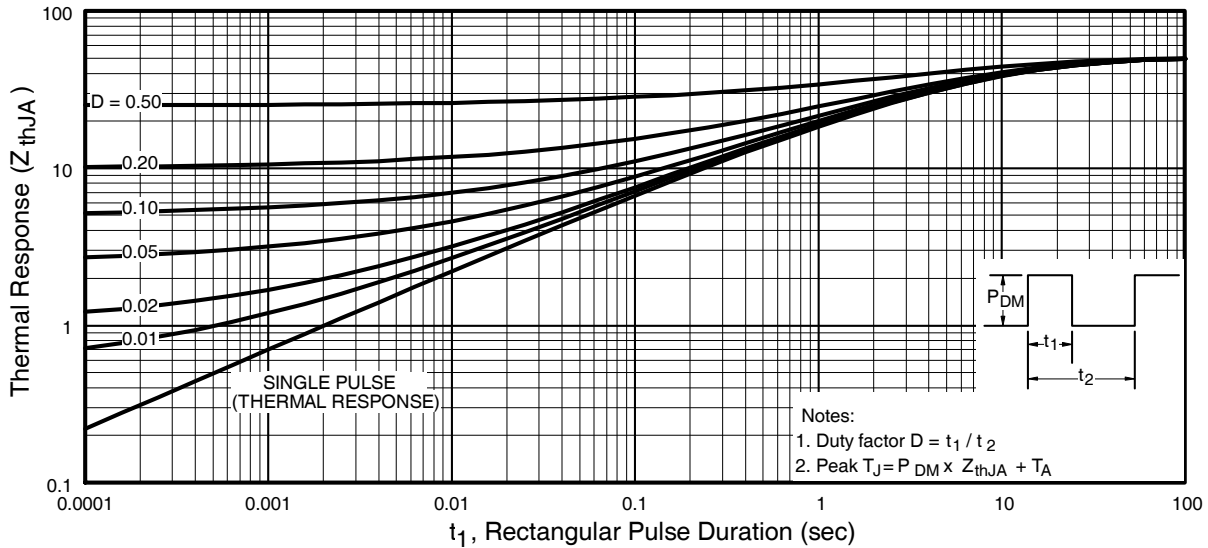


Fig 8. Maximum Safe Operating Area


Fig 9a. Basic Gate Charge Waveform

Fig 10a. Switching Time Test Circuit

Fig 9b. Gate Charge Test Circuit

Fig 10b. Switching Time Waveforms

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

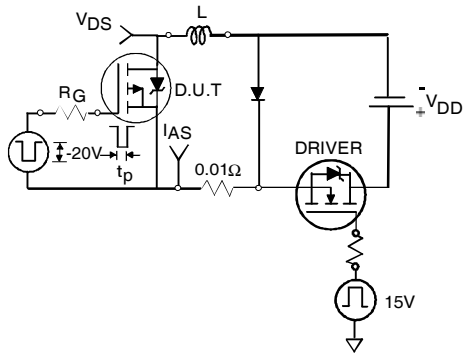


Fig 12a. Unclamped Inductive Test Circuit

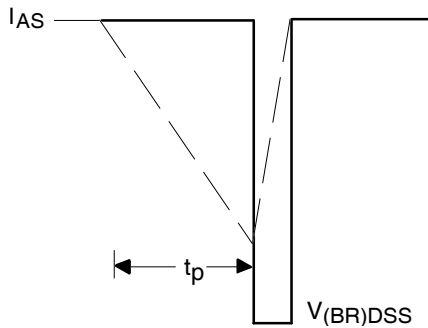


Fig 12b. Unclamped Inductive Waveforms

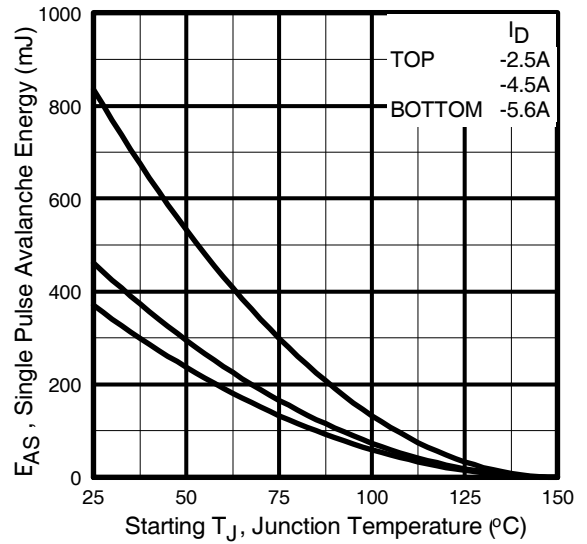
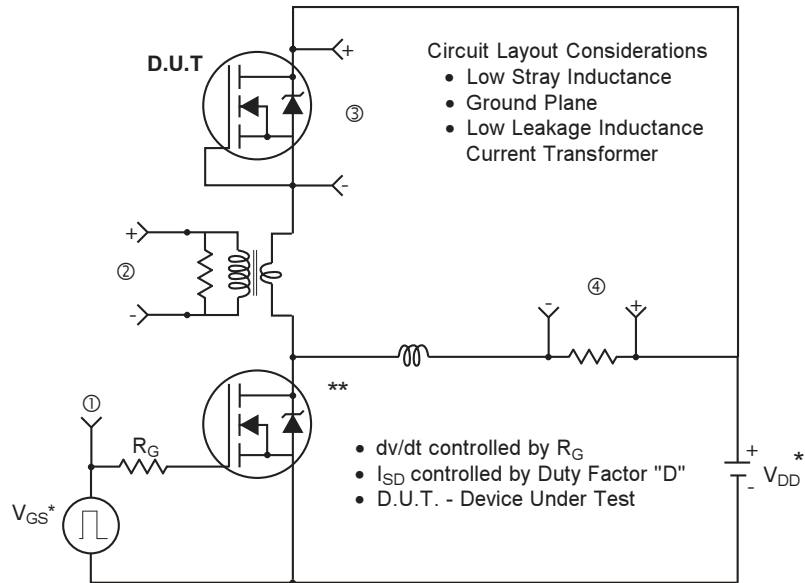


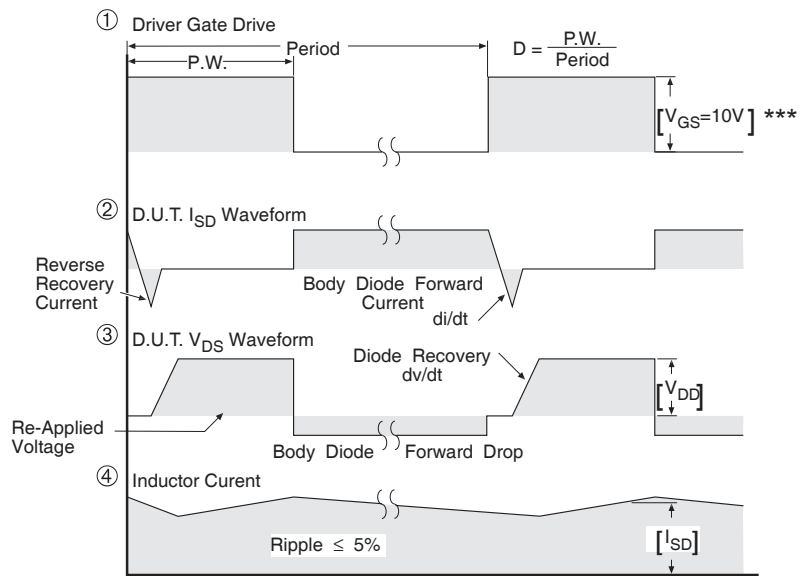
Fig 12c. Maximum Avalanche Energy Vs. Drain Current

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel

** Use P-Channel Driver for P-Channel Measurements

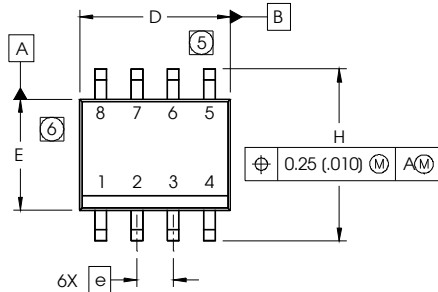


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

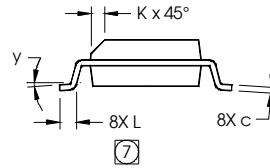
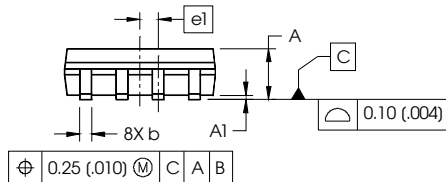
Fig 13. For P-Channel HEXFETS

SO-8 Package Outline

Dimensions are shown in millimeters (inches)



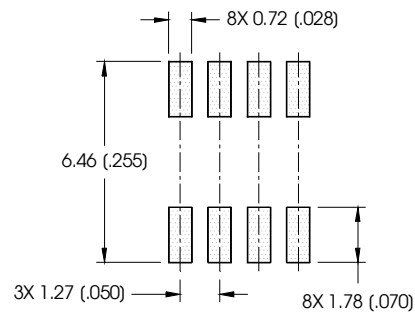
| DIM | INCHES | | MILLIMETERS | |
|-----|------------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .1574 | 3.80 | 4.00 |
| e | .050 BASIC | | 1.27 BASIC | |
| e1 | .025 BASIC | | 0.635 BASIC | |
| H | .2284 | .2440 | 5.80 | 6.20 |
| K | .0099 | .0196 | 0.25 | 0.50 |
| L | .016 | .050 | 0.40 | 1.27 |
| y | 0° | 8° | 0° | 8° |



NOTES:

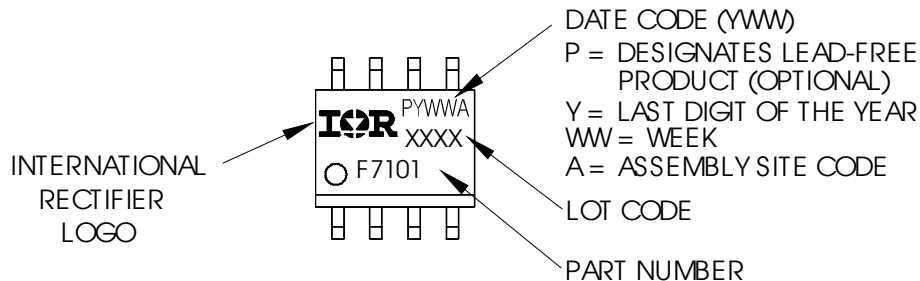
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
- ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).
- ⑦ DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT



SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

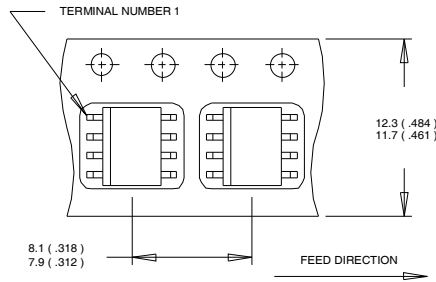


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

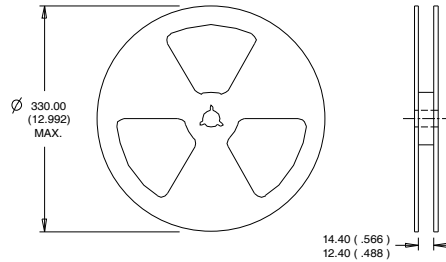


IRF7416PbF-1

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.

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

Qualification information[†]

| | | |
|----------------------------|--|---|
| Qualification level | Industriid (per JEDEC JESD47F ^{††} guidelines) | |
| Moisture Sensitivity Level | SO-8 | M5L1 (per JEDEC J-STD-020D ^{††}) |
| RoHS compliant | Yes | |

[†] Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability>

^{††} Applicable version of JEDEC standard at the time of product release

International
IR Rectifier

IR WORLD HEADQUARTERS: 101 N. Sepulveda Blvd., El Segundo, California 90245, USA

To contact International Rectifier, please visit <http://www.irf.com/whoto-call/>