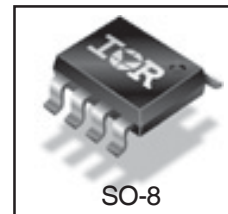
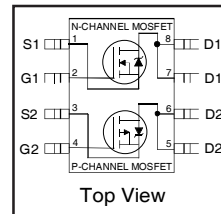


| | N-CH | P-CH | |
|--|------|------|------------|
| V_{DS} | 30 | -30 | V |
| $R_{DS(on) \max}$ | 27 | 64 | m Ω |
| Q_g (typical) | 6.8 | 8.1 | nC |
| I_D (@ $T_A = 25^\circ\text{C}$) | 6.8 | -4.6 | A |

HEXFET[®] Power MOSFET



Applications

- High and Low Side Switches for Inverter
- High and Low Side Switches for Generic Half-Bridge

Features

| |
|--|
| High and low-side MOSFETs in a single package |
| High-side P-Channel MOSFET |
| Industry-standard pinout |
| Compatible with existing surface mount techniques |
| RoHS compliant containing no Lead, no Bromide and no Halogen |
| MSL1, Consumer qualification |

results in
 \Rightarrow

Benefits

| |
|----------------------------|
| Increased power density |
| Easier drive circuitry |
| Multi-vendor compatibility |
| Easier manufacturing |
| Environmentally friendlier |
| Increased reliability |

| Base Part Number | Package Type | Standard Pack | | Orderable part number |
|------------------|--------------|---------------|----------|-----------------------|
| | | Form | Quantity | |
| IRF9389PbF | SO-8 | Tube/Bulk | 95 | IRF9389PbF |
| | | Tape and Reel | 4000 | IRF9389TRPbF |

Absolute Maximum Ratings

| | Parameter | Max. | | Units |
|--------------------------------|---|--------------|-----------|---------------------|
| | | N-Channel | P-Channel | |
| V_{GS} | Gate-to-Source Voltage | ± 20 | ± 20 | V |
| $I_D @ T_A = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 6.8 | -4.6 | A |
| $I_D @ T_A = 70^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 5.4 | -3.7 | |
| I_{DM} | Pulsed Drain Current ^① | 34 | -23 | |
| $P_D @ T_A = 25^\circ\text{C}$ | Power Dissipation | 2.0 | | W |
| $P_D @ T_A = 70^\circ\text{C}$ | Power Dissipation | 1.3 | | |
| | Linear Derating Factor | 0.016 | | W/ $^\circ\text{C}$ |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 150 | | $^\circ\text{C}$ |

Thermal Resistance

| | Parameter | Typ. | Max | Units |
|-----------------|-------------------------------------|------|------|---------------------------|
| $R_{\theta JL}$ | Junction-to-Drain Lead ^④ | — | 20 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient ^③ | — | 62.5 | |

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

| | Parameter | | Min. | Typ. | Max. | Units | Conditions |
|-------------------------------------|--------------------------------------|------|------|------|------|-------|---|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | N-Ch | 30 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| | | P-Ch | -30 | — | — | | V _{GS} = 0V, I _D = -250μA |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | N-Ch | — | 0.03 | — | V/°C | Reference to 25°C, I _D = 1mA |
| | | P-Ch | — | 0.02 | — | | Reference to 25°C, I _D = -1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | N-Ch | — | 22 | 27 | mΩ | V _{GS} = 10V, I _D = 6.8A ② |
| | | | — | 33 | 40 | | V _{GS} = 4.5V, I _D = 5.4A ② |
| | | P-Ch | — | 51 | 64 | mΩ | V _{GS} = -10V, I _D = -4.6A ② |
| | | | — | 82 | 103 | | V _{GS} = -4.5V, I _D = -3.7A ② |
| V _{GS(th)} | Gate Threshold Voltage | N-Ch | 1.3 | 1.8 | 2.3 | V | V _{DS} = V _{GS} , I _D = 10μA |
| | | P-Ch | -1.3 | -1.8 | -2.3 | | V _{DS} = V _{GS} , I _D = -10μA |
| I _{DSS} | Drain-to-Source Leakage Current | N-Ch | — | — | 1.0 | μA | V _{DS} = 24V, V _{GS} = 0V |
| | | P-Ch | — | — | -1.0 | | V _{DS} = -24V, V _{GS} = 0V |
| | | N-Ch | — | — | 150 | | V _{DS} = 24V, V _{GS} = 0V, T _J = 125°C |
| | | P-Ch | — | — | -150 | | V _{DS} = -24V, V _{GS} = 0V, T _J = 125°C |
| I _{GSS} | Gate-to-Source Forward Leakage | N-Ch | — | — | 100 | nA | V _{GS} = 20V |
| | | P-Ch | — | — | -100 | | V _{GS} = -20V |
| | Gate-to-Source Reverse Leakage | N-Ch | — | — | -100 | | V _{GS} = -20V |
| | | P-Ch | — | — | 100 | | V _{GS} = 20V |
| g _{fs} | Forward Transconductance | N-Ch | 8.2 | — | — | S | V _{DS} = 15V, I _D = 5.4A |
| | | P-Ch | 4.1 | — | — | | V _{DS} = -15V, I _D = -3.7A |
| Q _g | Total Gate Charge | N-Ch | — | 6.8 | 14 | nC | N-Channel V _{GS} = 10V, V _{DS} = 15V, I _D = 6.8A |
| | | P-Ch | — | 8.1 | 16 | | P-Channel V _{GS} = -10V, V _{DS} = -15V, I _D = -4.6A |
| Q _{gs} | Gate-to-Source Charge | N-Ch | — | 1.4 | — | | |
| | | P-Ch | — | 1.3 | — | | |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | N-Ch | — | 0.98 | — | | |
| | | P-Ch | — | 2.1 | — | | |
| R _G | Gate Resistance | N-Ch | — | 2.2 | 4.4 | Ω | |
| | | P-Ch | — | 9.4 | 19 | | |
| t _{d(on)} | Turn-On Delay Time | N-Ch | — | 5.1 | — | ns | N-Channel V _{DD} = 15V, V _{GS} = 4.5V ③ I _D = 1.0A, R _G = 6.2Ω |
| | | P-Ch | — | 8.0 | — | | |
| t _r | Rise Time | N-Ch | — | 4.8 | — | | |
| | | P-Ch | — | 14 | — | | |
| t _{d(off)} | Turn-Off Delay Time | N-Ch | — | 4.9 | — | | |
| | | P-Ch | — | 17 | — | | P-Channel V _{DD} = -15V, V _{GS} = -4.5V ③ I _D = -1.0A, R _G = 6.8Ω |
| t _f | Fall Time | N-Ch | — | 3.9 | — | | |
| | | P-Ch | — | 15 | — | | |
| C _{iss} | Input Capacitance | N-Ch | — | 398 | — | pF | N-Channel V _{GS} = 0V, V _{DS} = 15V, f = 1.0MHz |
| | | P-Ch | — | 383 | — | | |
| C _{oss} | Output Capacitance | N-Ch | — | 82 | — | | |
| | | P-Ch | — | 104 | — | | P-Channel V _{GS} = 0V, V _{DS} = -15V, f = 1.0KHz |
| C _{riss} | Reverse Transfer Capacitance | N-Ch | — | 36 | — | | |
| | | P-Ch | — | 64 | — | | |

Diode Characteristics

| | Parameter | | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|------|-------|---|
| I _S | Continuous Source Current (Body Diode) | N-Ch | — | — | 2.0 | A | |
| | | P-Ch | — | — | -2.0 | | |
| I _{SM} | Pulsed Source Current (Body Diode) | N-Ch | — | — | 34 | | |
| | | P-Ch | — | — | -23 | | |
| V _{SD} | Diode Forward Voltage | N-Ch | — | — | 1.2 | V | T _J = 25°C, I _S = 2.0A, V _{GS} = 0V ③ |
| | | P-Ch | — | — | -1.2 | | T _J = 25°C, I _S = -2.0A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | N-Ch | — | 8.4 | 13 | ns | N-Channel: T _J = 25°C, I _F = 2.0A, V _{DD} = 15V, di/dt = 102/μs ④ |
| | | P-Ch | — | 11 | 17 | | |
| Q _{rr} | Reverse Recovery Charge | N-Ch | — | 2.3 | 3.5 | nC | P-Channel: T _J = 25°C, I _F = -2.0A, V _{DD} = -15V, di/dt = 102/μs ④ |
| | | P-Ch | — | 4.8 | 7.2 | | |

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 16)
 ② Pulse width ≤ 400μs; duty cycle ≤ 2%.

- ③ Surface mounted on 1 in square Cu board
 ④ R_θ is measured at T_J approximately 90°C

N-Channel

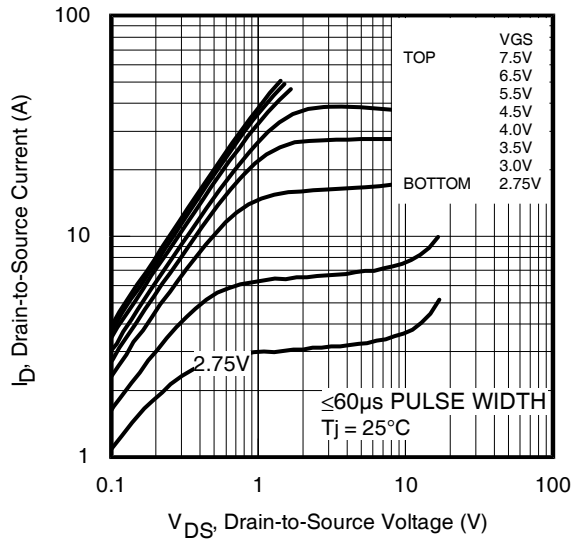


Fig 1. Typical Output Characteristics

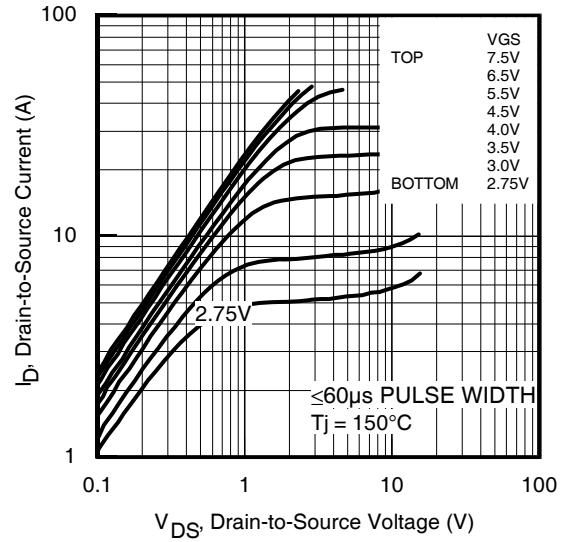


Fig 2. Typical Output Characteristics

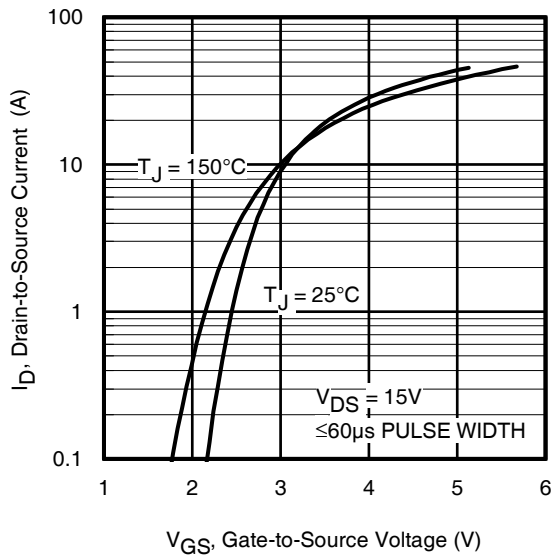


Fig 3. Typical Transfer Characteristics

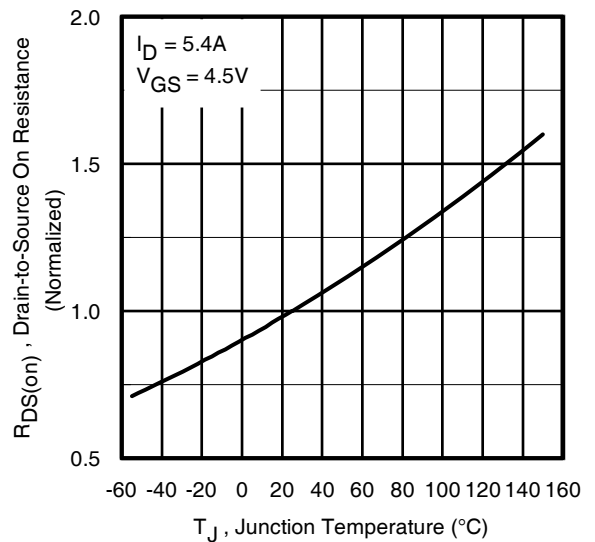
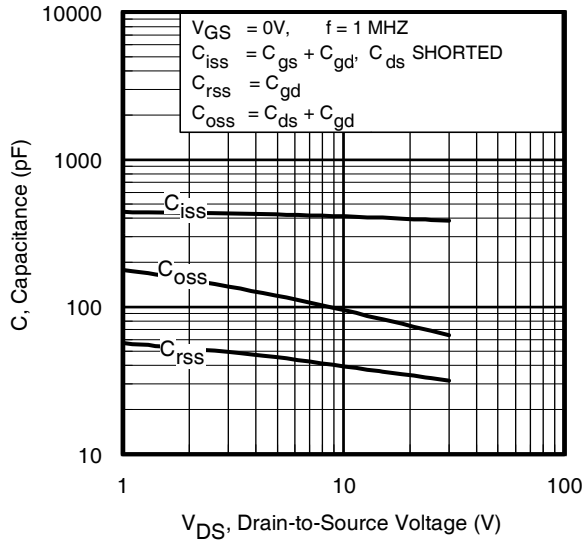
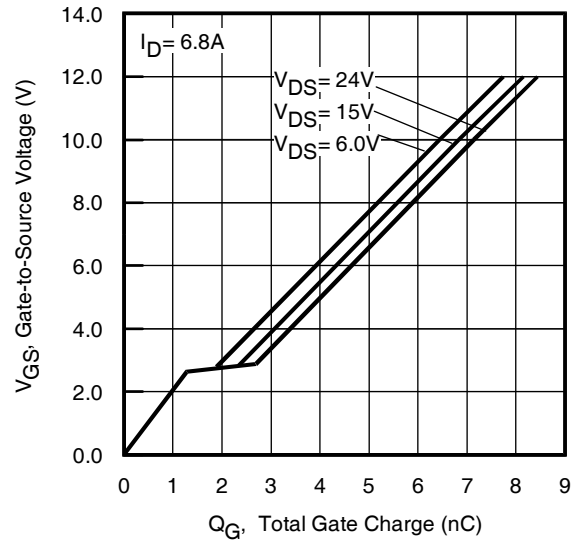
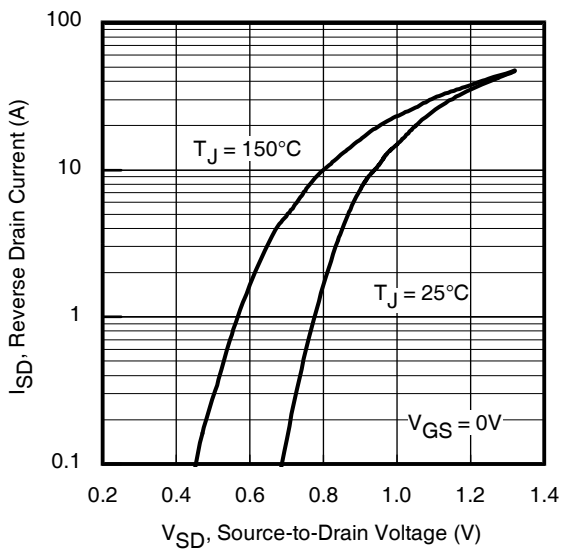
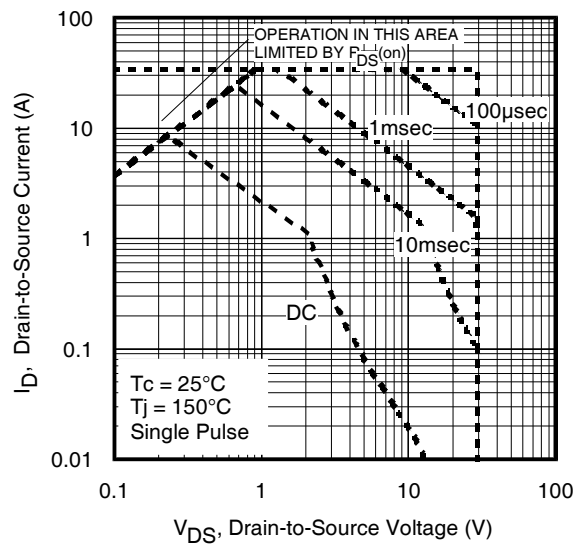
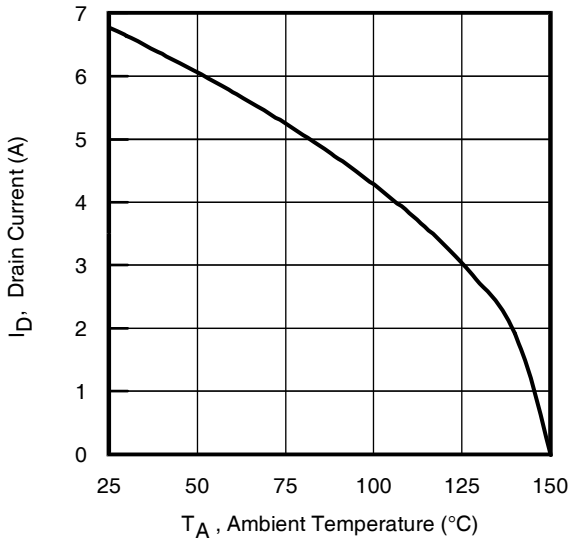
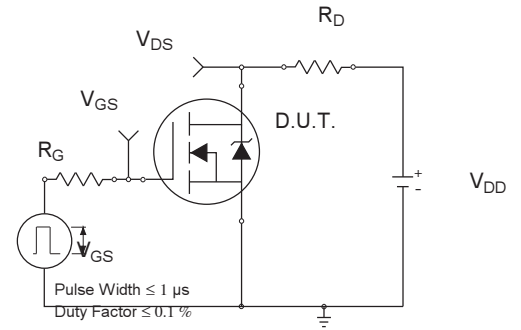
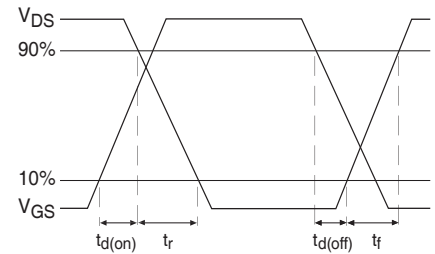
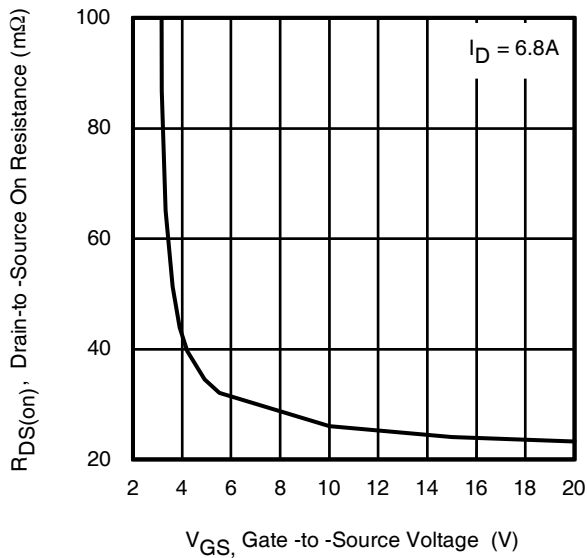
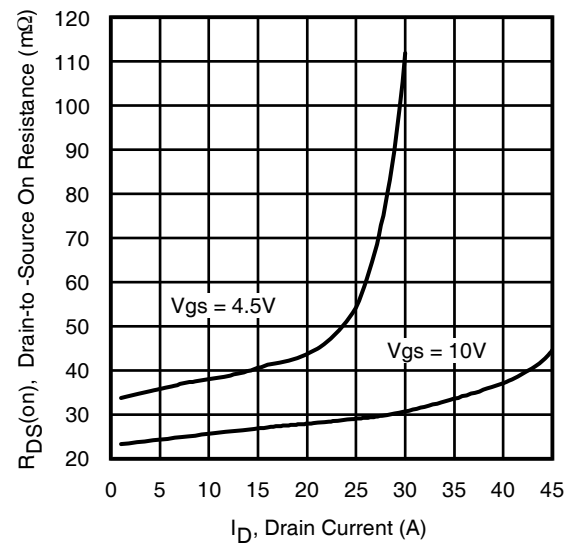


Fig 4. Normalized On-Resistance vs. Temperature

N-Channel

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

N-Channel

Fig 9. Maximum Drain Current vs. Ambient Temperature

Fig 10a. Switching Time Test Circuit

Fig 10b. Switching Time Waveforms

Fig 11. Typical On-Resistance vs. Gate Voltage

Fig 12. Typical On-Resistance vs. Drain Current

N-Channel

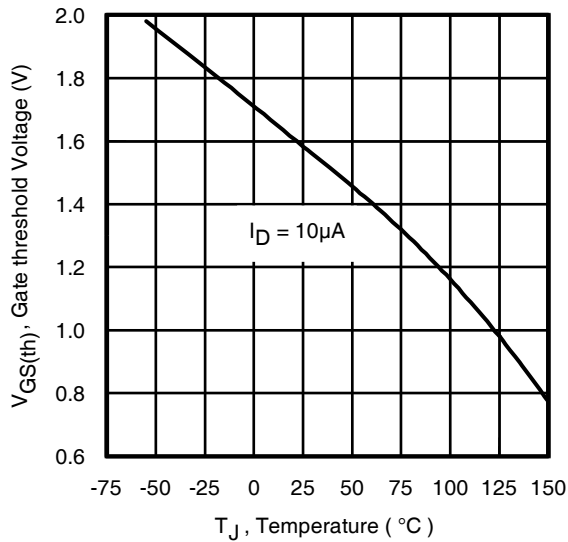


Fig 13. Threshold Voltage vs. Temperature

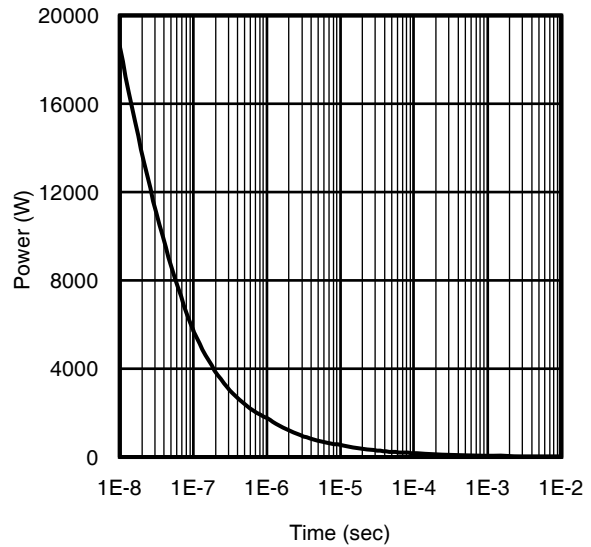


Fig 14. Typical Power vs. Time

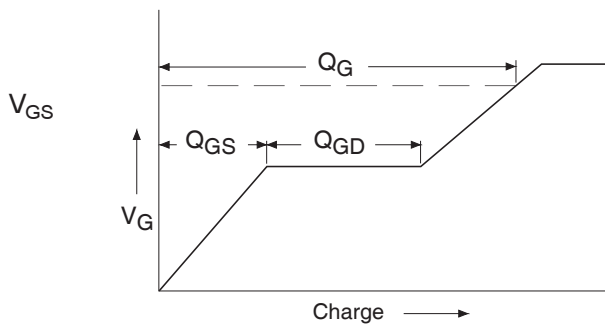


Fig 15a. Basic Gate Charge Waveform

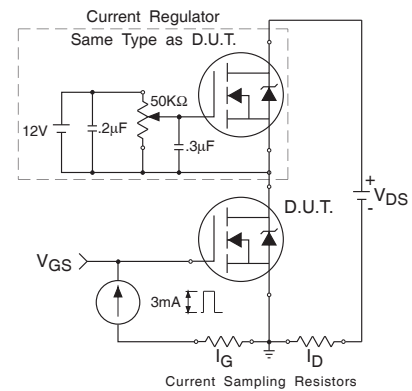


Fig 15b. Gate Charge Test Circuit

N and P-Channel

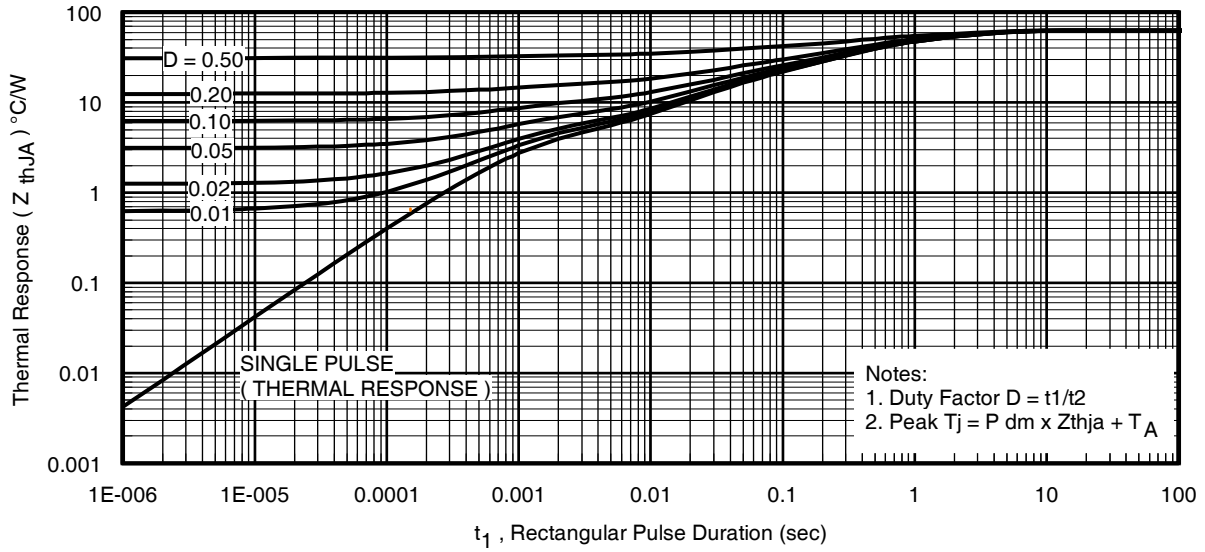


Fig 16. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

P-Channel

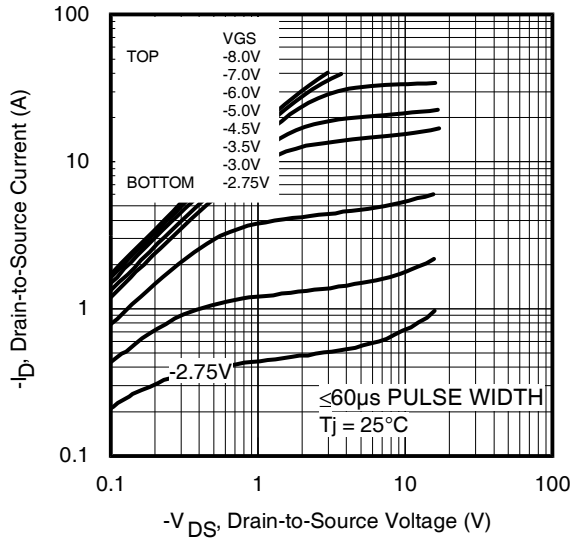


Fig 17. Typical Output Characteristics

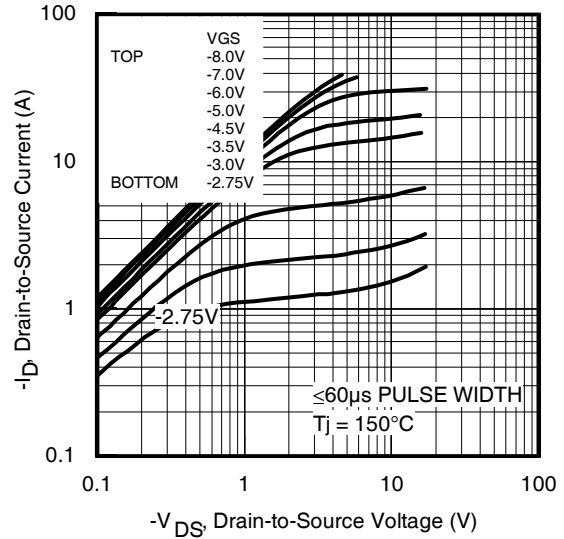


Fig 18. Typical Output Characteristics

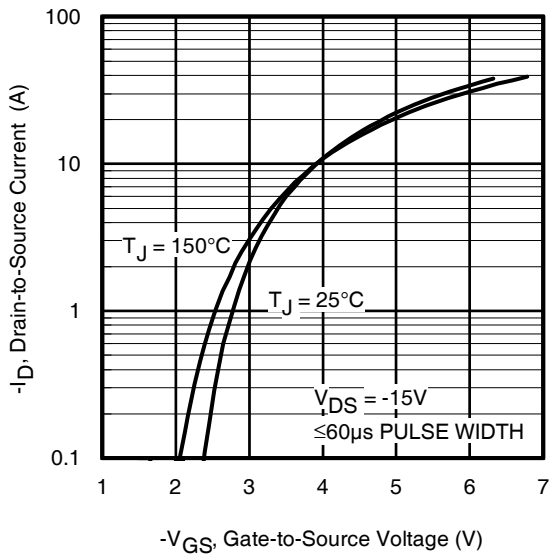


Fig 19. Typical Transfer Characteristics

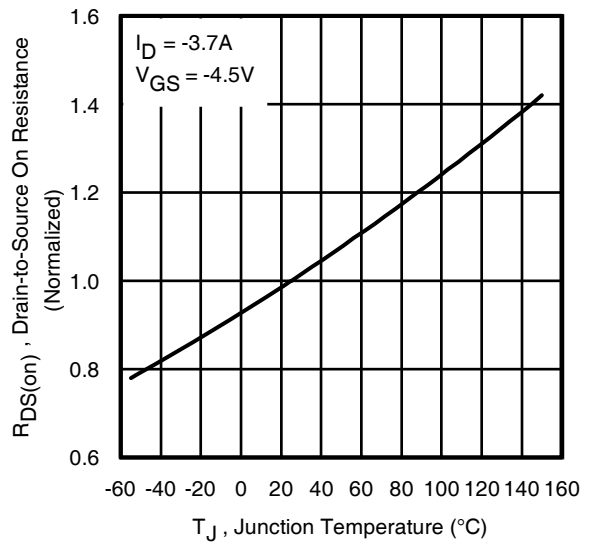


Fig 20. Normalized On-Resistance vs. Temperature

P-Channel

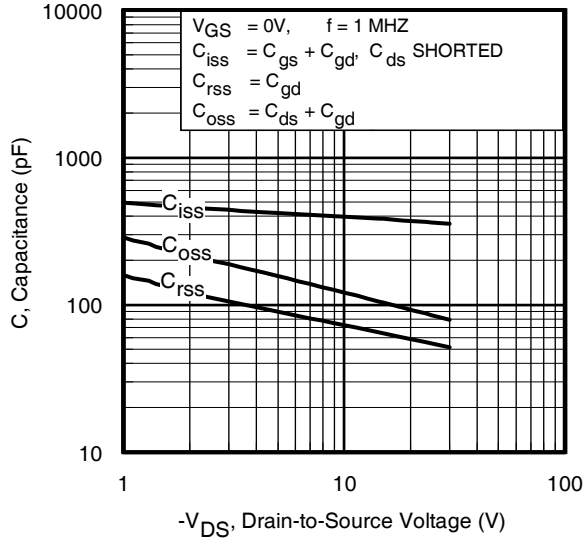


Fig 21. Typical Capacitance vs. Drain-to-Source Voltage

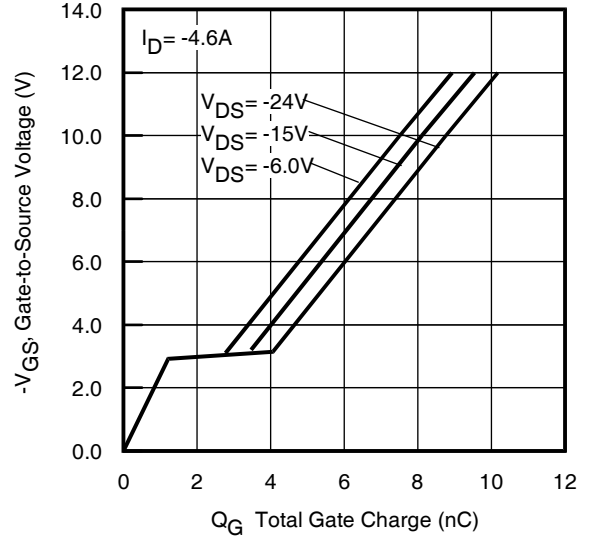


Fig 22. Typical Gate Charge vs. Gate-to-Source Voltage

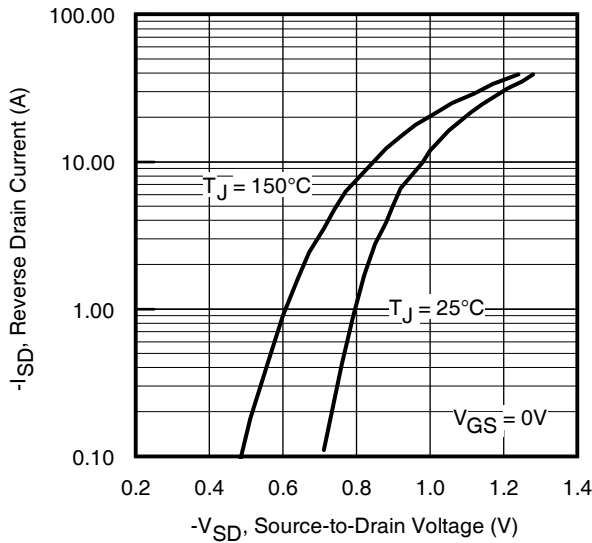


Fig 23. Typical Source-Drain Diode Forward Voltage

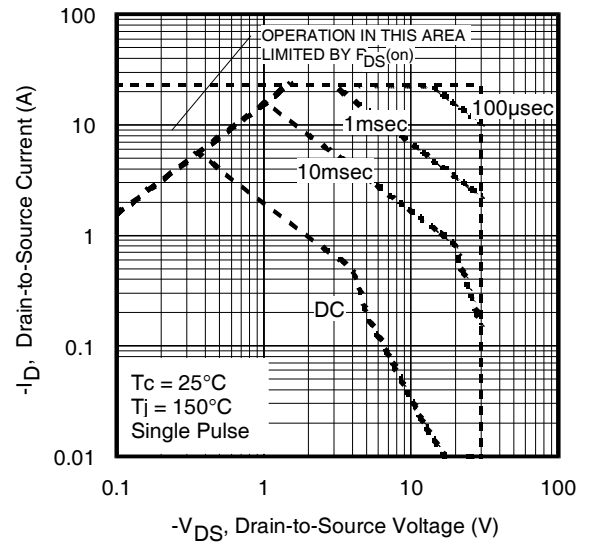
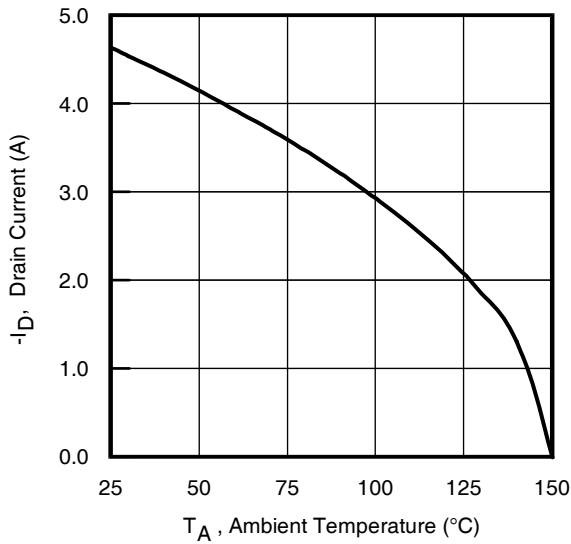
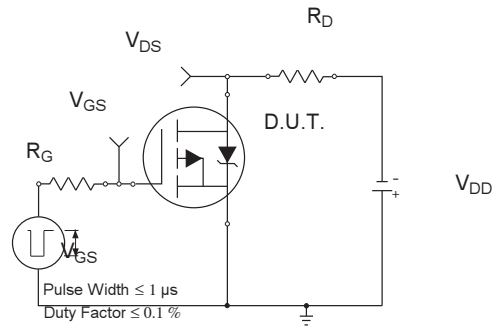
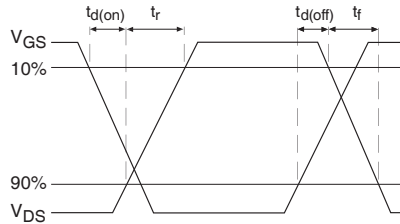
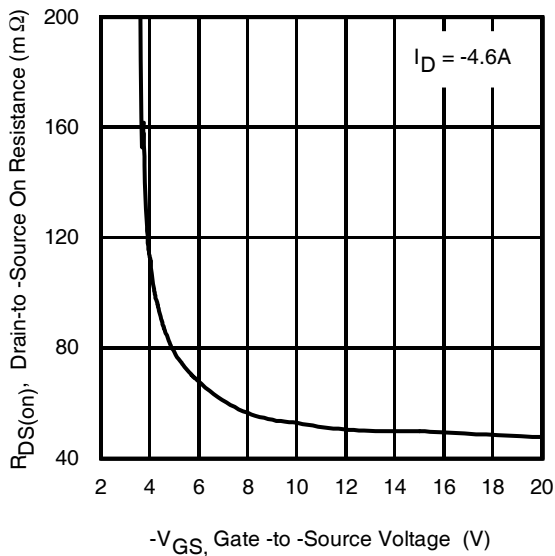
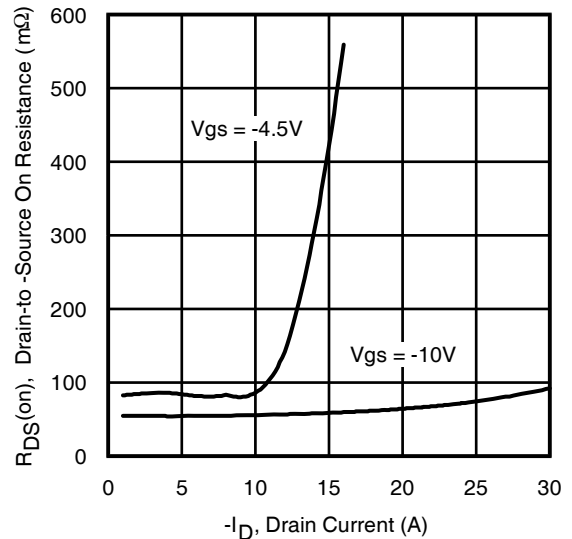


Fig 24. Maximum Safe Operating Area

P-Channel

Fig 25. Maximum Drain Current vs. Ambient Temperature

Fig 26a. Switching Time Test Circuit

Fig 26b. Switching Time Waveforms

Fig 27. Typical On-Resistance vs. Gate Voltage

Fig 28. Typical On-Resistance vs. Drain Current

P-Channel

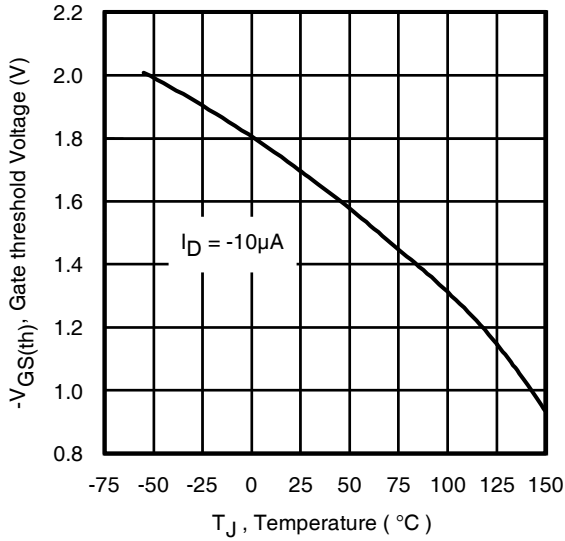


Fig 29. Threshold Voltage vs. Temperature

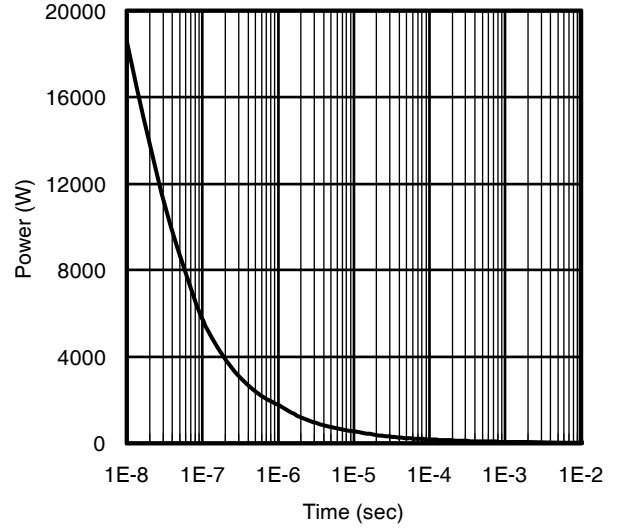


Fig 30. Typical Power vs. Time

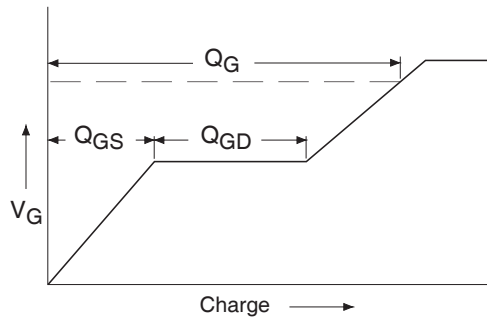


Fig 31a. Basic Gate Charge Waveform

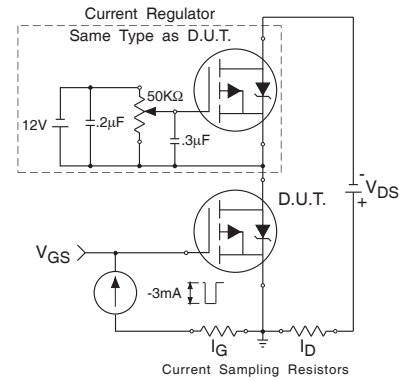
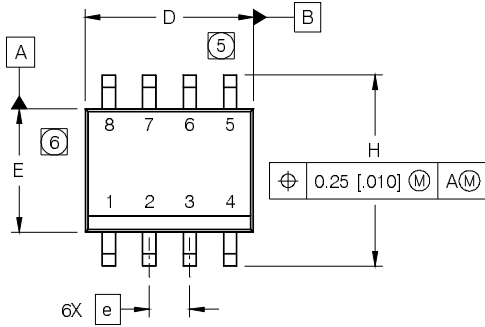
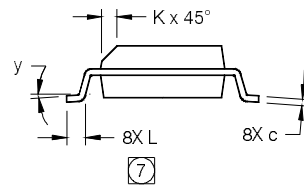
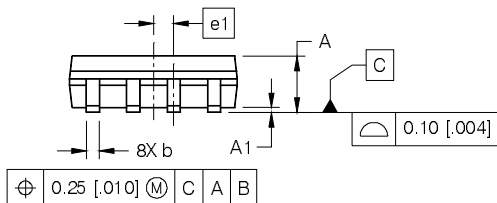


Fig 31b. Gate Charge Test Circuit

SO-8 Package Details

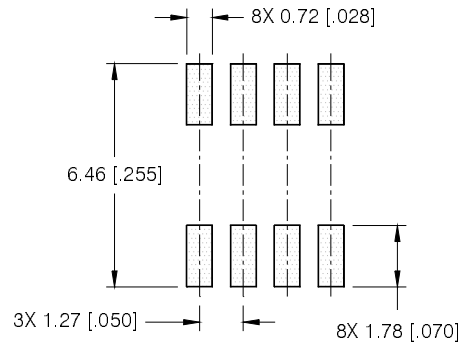


| DIM | INCHES | | MILLIMETERS | |
|-----|------------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | .0532 | .0688 | 1.35 | 1.75 |
| A1 | .0040 | .0098 | 0.10 | 0.25 |
| b | .013 | .020 | 0.33 | 0.51 |
| c | .0075 | .0098 | 0.19 | 0.25 |
| D | .189 | .1968 | 4.80 | 5.00 |
| E | .1497 | .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° |

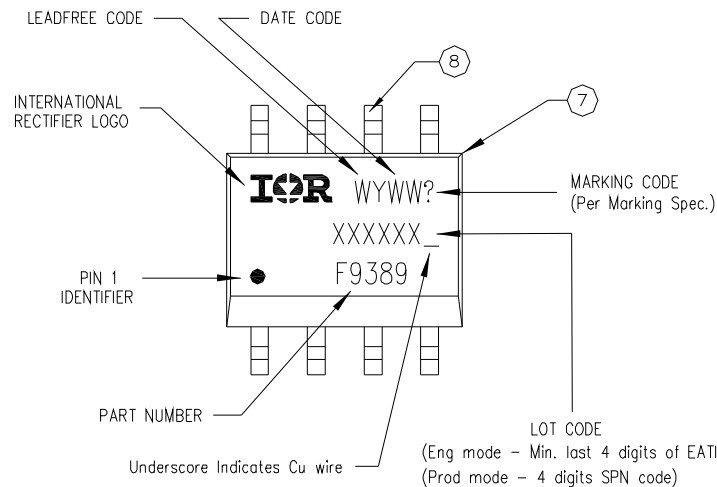


- NOTES:
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
 2. CONTROLLING DIMENSION: MILLIMETER
 3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
 5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
 6. DIMENSION 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

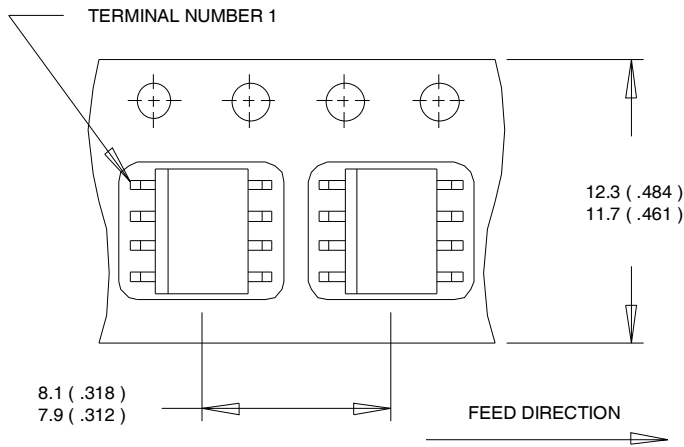


SO-8 Part Marking

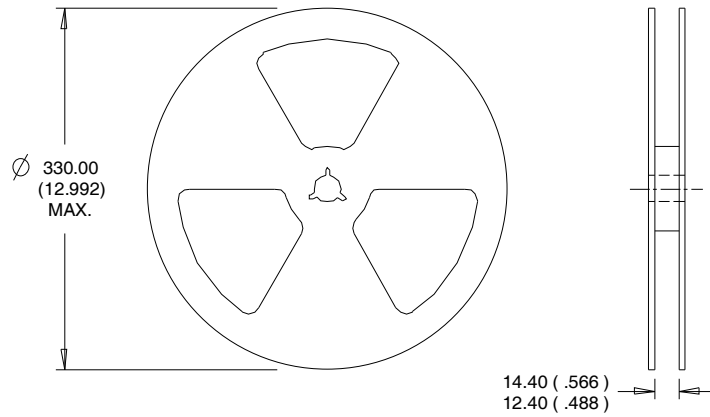


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

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.

Qualification information†

| | | |
|----------------------------|---|--|
| Qualification level | Consumer (per JEDEC JES D47F ^{††} guidelines) | |
| Moisture Sensitivity Level | SO-8 | MSL1 (per JEDEC J-S TD-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.