

International IR Rectifier

PD-93864

IRF7534D1

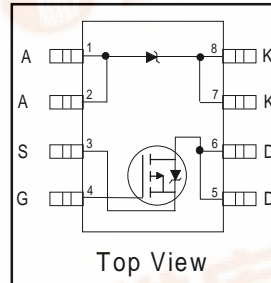
FETKY MOSFET & Schottky Diode

- Co-packaged HEXFET[®] power MOSFET and Schottky diode
- Ultra Low On-Resistance MOSFET
- Trench technology
- Micro8[™] Footprint
- Available in Tape & Reel

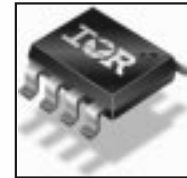
Description

The FETKY family of co-packaged MOSFETs and Schottky diodes offers the designer an innovative, board space saving solution for switching regulator and power management applications. International Rectifier utilizes advanced processing techniques to achieve extremely low on-resistance per silicon area. Combining this technology with International Rectifier's low forward drop Schottky rectifiers results in an extremely efficient device suitable for use in a wide variety of portable electronics applications, such as cell phones, PDAs, etc.

The Micro8[™] package makes an ideal device for applications where printed circuit board space is at a premium. The low profile (<1.1mm) of the Micro8[™] will allow it to fit easily into extremely thin application environments such as portable electronics



| |
|----------------------------|
| $V_{DS} = -20V$ |
| $R_{DS(on)} = 0.055\Omega$ |
| Schottky $V_f = 0.39V$ |



Micro8[™]

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------|--|--------------|-------|
| V_{DS} | Drain-Source Voltage | -20 | V |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V$ | -4.3 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V$ | -3.4 | |
| I_{DM} | Pulsed Drain Current ^① | -34 | |
| $P_D @ T_A = 25^\circ C$ | Maximum Power Dissipation ^④ | 1.25 | W |
| $P_D @ T_A = 70^\circ C$ | Maximum Power Dissipation ^④ | 0.8 | W |
| | Linear Derating Factor | 10 | mW/°C |
| V_{GS} | Gate-to-Source Voltage | ± 12 | V |
| dv/dt | Peak Diode Recovery dv/dt ^② | 1.1 | V/ns |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to + 150 | °C |

Thermal Resistance

| | Parameter | Max. | Units |
|-----------------|--|------|-------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient ^④ | 100 | °C/W |

Notes:

- ① Repetitive rating – pulse width limited by max. junction temperature (see Fig. 9)
- ② $I_{SD} \leq -1.2A$, $di/dt \leq 100A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ C$
- ③ Pulse width $\leq 300\mu s$ – duty cycle $\leq 2\%$
- ④ When mounted on 1 inch square copper board to approximate typical multi-layer PCB thermal resistance



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MOSFET 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 | $V_{GS} = 0V, I_D = -250\mu A$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.055 | Ω | $V_{GS} = -4.5V, I_D = -4.3A$ ③ |
| | | — | — | 0.105 | | $V_{GS} = -2.5V, I_D = -3.4A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | -0.6 | — | -1.2 | V | $V_{DS} = V_{GS}, I_D = -250\mu A$ |
| g_{fs} | Forward Transconductance | 2.5 | — | — | S | $V_{DS} = -10V, I_D = -0.8A$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | -1.0 | μA | $V_{DS} = -16V, V_{GS} = 0V$ |
| | | — | — | -25 | | $V_{DS} = -16V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| 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 | — | 10 | 15 | nC | $I_D = -3A$ |
| Q_{gs} | Gate-to-Source Charge | — | 2.1 | 3.1 | | $V_{DS} = -10V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | 2.5 | 3.7 | | $V_{GS} = -5V$ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 10 | — | ns | $V_{DD} = -10V$ |
| t_r | Rise Time | — | 46 | — | | $I_D = -2A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 60 | — | | $R_G = 6.0\Omega$ |
| t_f | Fall Time | — | 64 | — | | $R_D = 5\Omega, \text{ ③}$ |
| C_{iss} | Input Capacitance | — | 1066 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 402 | — | | $V_{DS} = -10V$ |
| C_{riss} | Reverse Transfer Capacitance | — | 125 | — | | $f = 1.0\text{MHz}$ |

MOSFET Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|------|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | -1.3 | A | |
| I_{SM} | Pulsed Source Current (Body Diode) | — | — | -34 | | |
| V_{SD} | Body Diode Forward Voltage | — | — | -1.2 | V | $T_J = 25^\circ\text{C}, I_S = -1.6A, V_{GS} = 0V$ |
| t_{rr} | Reverse Recovery Time (Body Diode) | — | 54 | 82 | ns | $T_J = 25^\circ\text{C}, I_F = -2.5A$ |
| Q_{rr} | Reverse Recovery Charge | — | 41 | 61 | nC | $di/dt = 100A/\mu s$ ③ |

Schottky Diode Maximum Ratings

| | Parameter | Max. | Units | Conditions |
|-------------|--|------|-------|--|
| $I_{F(av)}$ | Max. Average Forward Current | 1.9 | A | 50% Duty Cycle. Rectangular Wave, $T_A = 25^\circ\text{C}$ See Fig.13 $T_A = 70^\circ\text{C}$ |
| | | 1.4 | | |
| I_{SM} | Max. peak one cycle Non-repetitive Surge current | 120 | A | 5 μs sine or 3 μs Rect. pulse 10ms sine or 6ms Rect. pulse Following any rated load condition & with V_{RRM} applied |
| | | 11 | | |

Schottky Diode Electrical Specifications

| | Parameter | Max. | Units | Conditions |
|----------|------------------------------|------|------------|--|
| V_{FM} | Max. Forward voltage drop | 0.50 | V | $I_F = 1.0A, T_J = 25^\circ\text{C}$ |
| | | 0.62 | | $I_F = 2.0A, T_J = 25^\circ\text{C}$ |
| | | 0.39 | | $I_F = 1.0A, T_J = 125^\circ\text{C}$ |
| | | 0.57 | | $I_F = 2.0A, T_J = 125^\circ\text{C}$ |
| I_{RM} | Max. Reverse Leakage current | 0.02 | mA | $V_R = 20V, T_J = 25^\circ\text{C}$ |
| | | 8 | | $T_J = 125^\circ\text{C}$ |
| C_t | Max. Junction Capacitance | 92 | pF | $V_R = 5Vdc$ (100kHz to 1 MHz) 25°C |
| dv/dt | Max. Voltage Rate of Charge | 3600 | V/ μs | Rated V_R |

(HEXFET is the reg. TM for International Rectifier Power MOSFET's)

Power MOSFET Characteristics

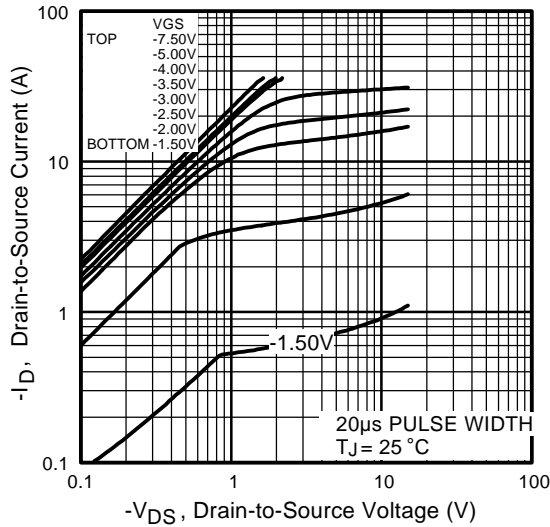


Fig 1. Typical Output Characteristics

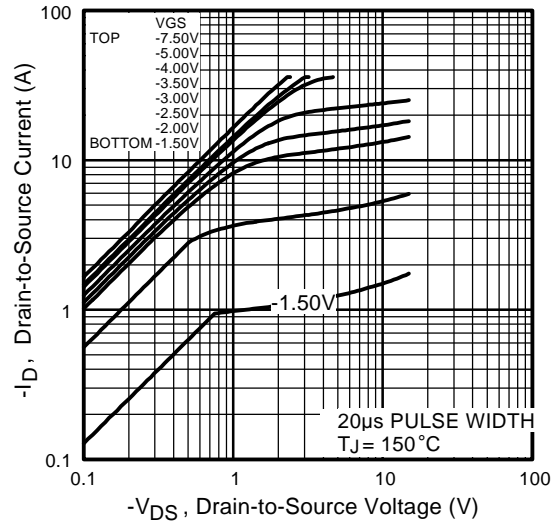


Fig 2. Typical Output Characteristics

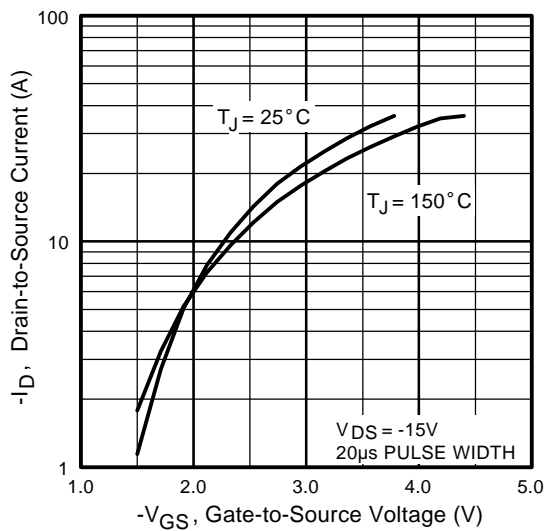


Fig 3. Typical Transfer Characteristics

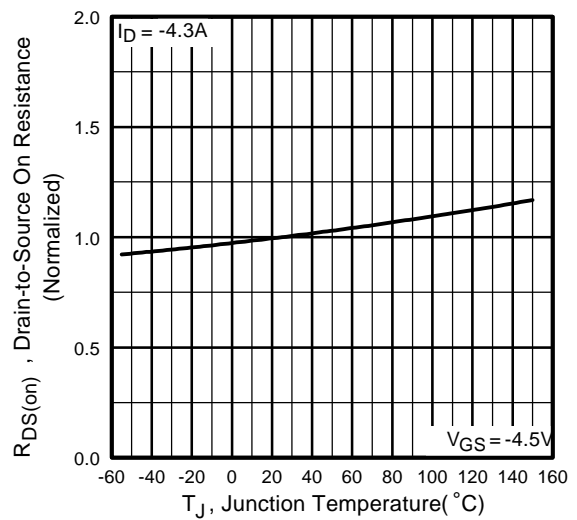


Fig 4. Normalized On-Resistance Vs. Temperature

Power MOSFET Characteristics

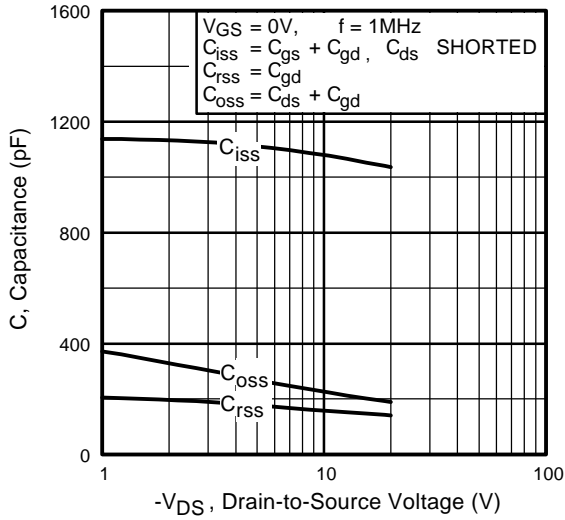


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

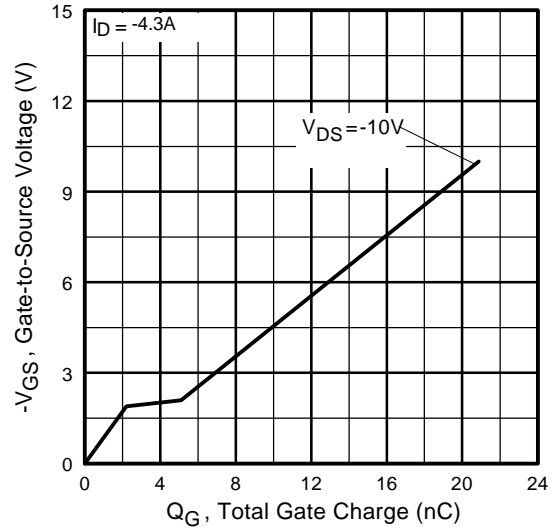


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

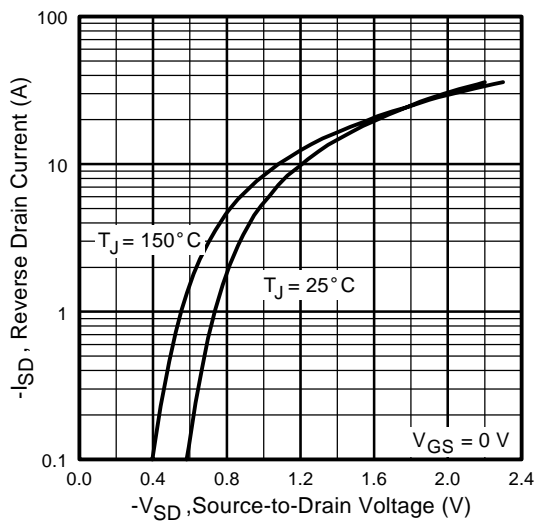


Fig 7. Typical Source-Drain Diode Forward Voltage

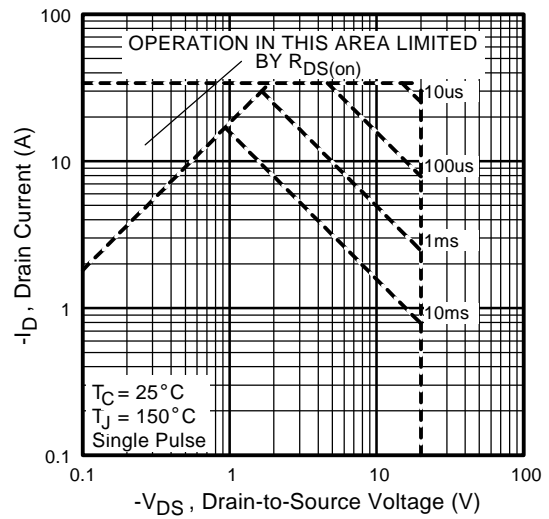


Fig 8. Maximum Safe Operating Area

Power MOSFET Characteristics

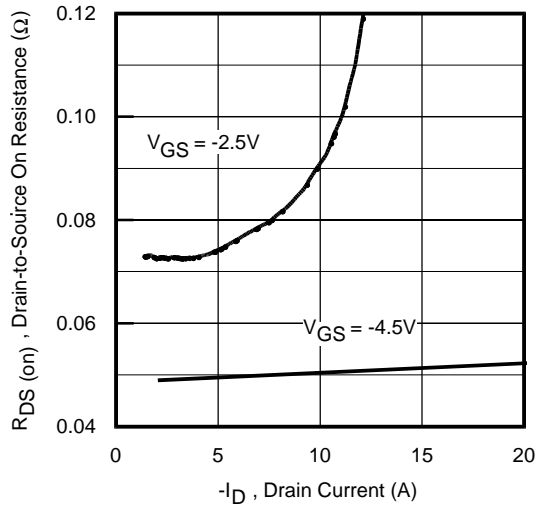


Fig 9. Typical On-Resistance Vs. Drain Current

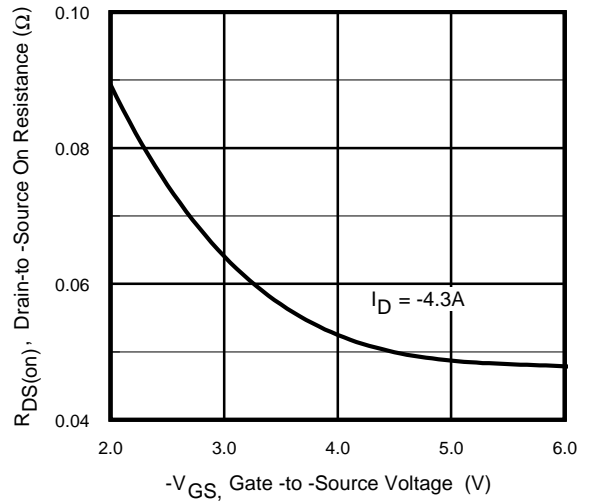


Fig 10. Typical On-Resistance Vs. Gate Voltage

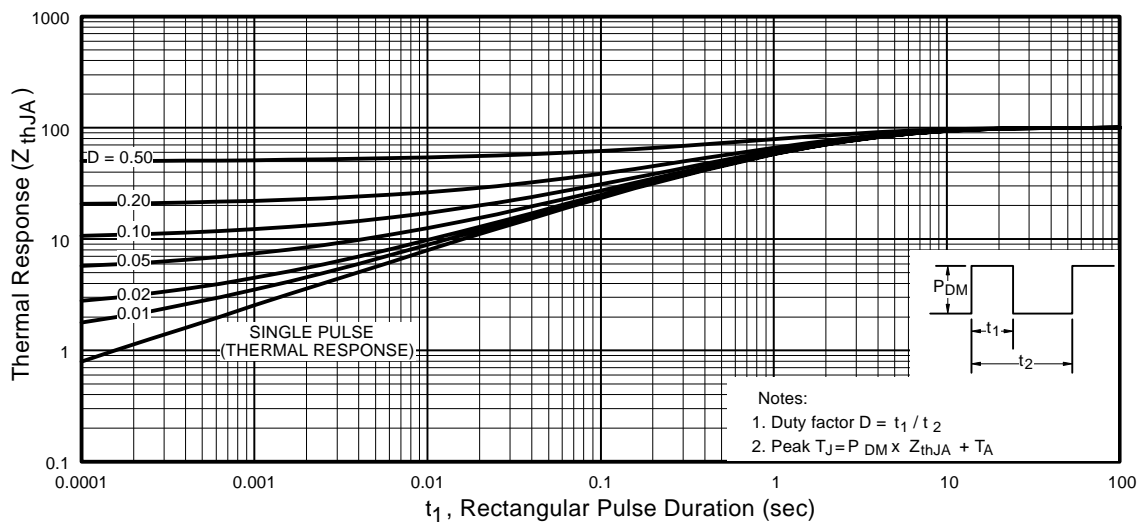


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

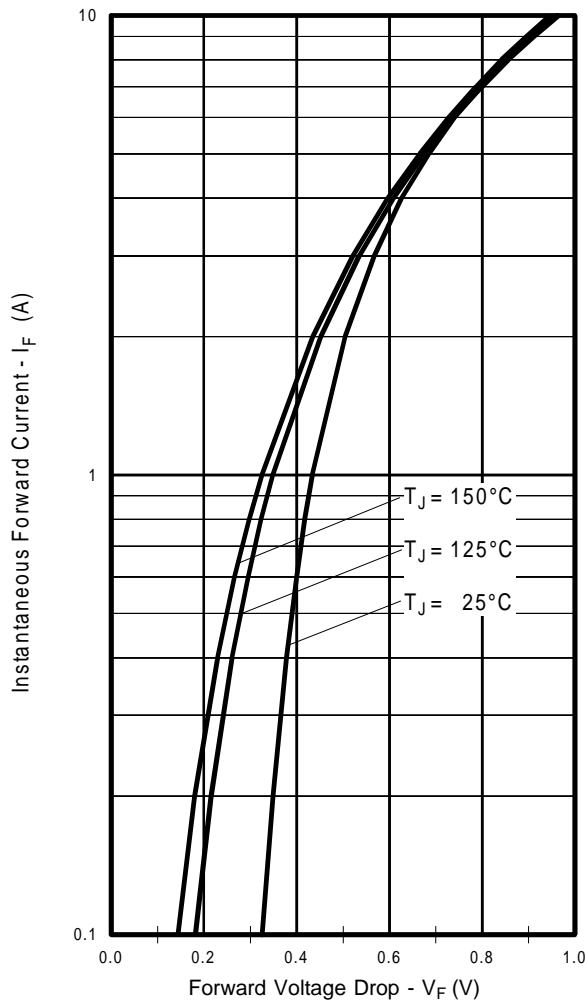


Fig. 12 - Typical Forward Voltage Drop Characteristics

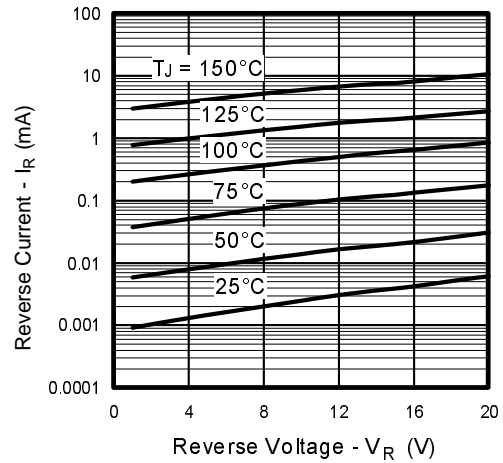


Fig. 13 - Typical Values of Reverse Current Vs. Reverse Voltage

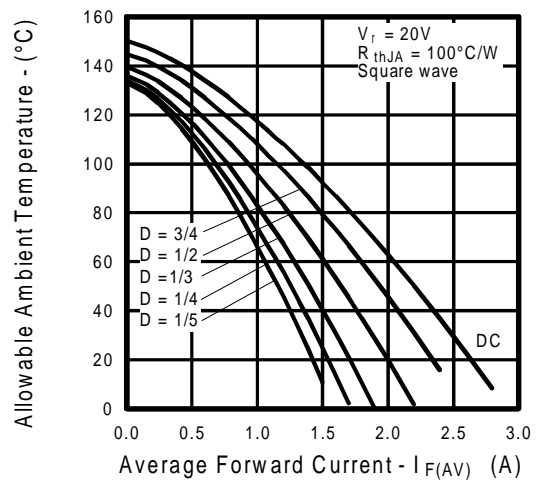
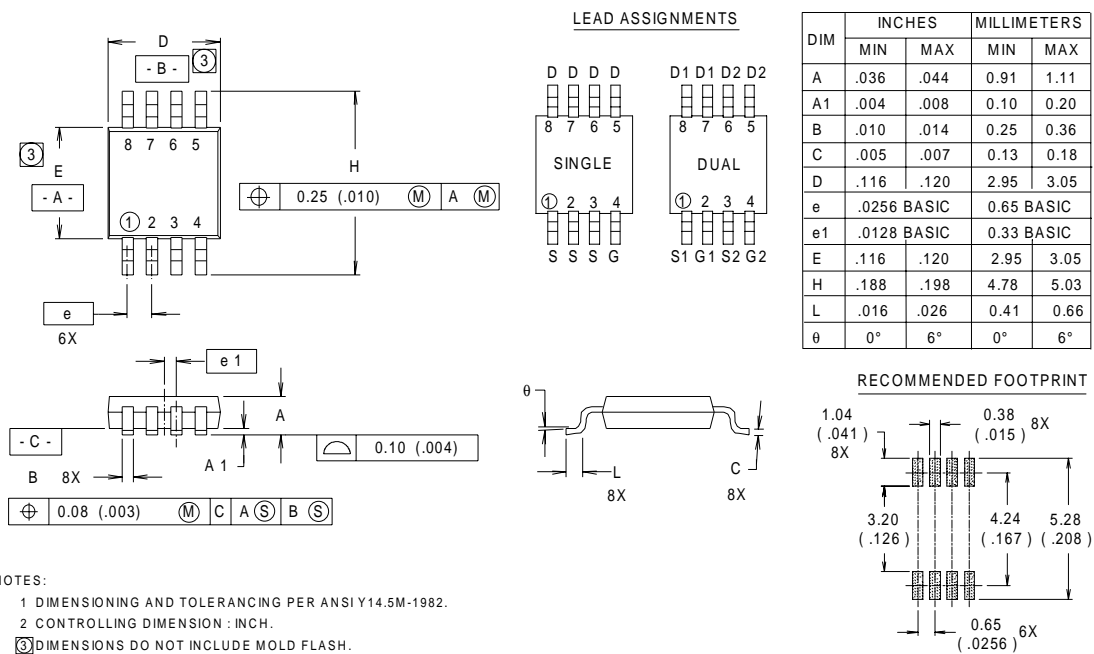


Fig. 14 - Maximum Allowable Ambient Temp. Vs. Forward Current

Package Outline

Micro8™ Outline

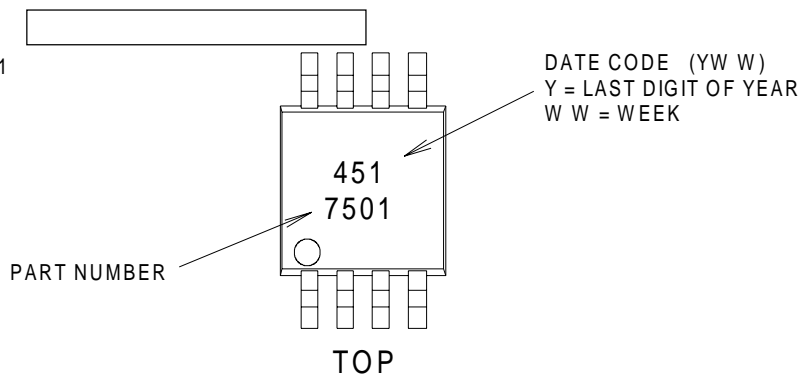
Dimensions are shown in millimeters (inches)



Part Marking Information

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EXAMPLE : THIS IS AN IRF7501



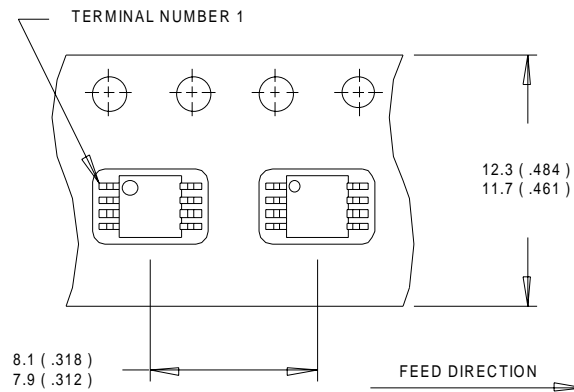
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Tape & Reel Information

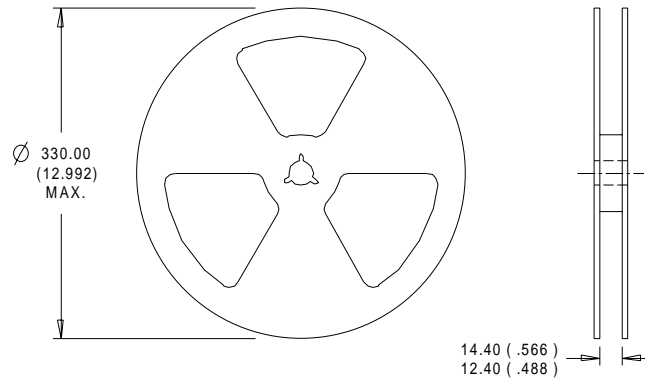
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Dimensions are shown in millimeters (inches)



NOTES:

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



NOTES:

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

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Data and specifications subject to change without notice. 2/2000