

INTERNATIONAL RECTIFIER



REPETITIVE AVALANCHE RATED AND dv/dt RATED

HEXFET® TRANSISTOR

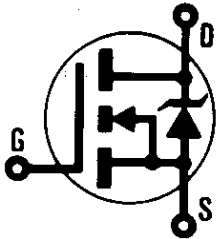
IRFM140

2N7218

JANTX2N7218

JANTXV2N7218

[REF: MIL-S-19500/596]



N-CHANNEL

100 Volt, 0.077 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry design achieves very low on-state resistance combined with high transconductance.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, very fast switching, ease of paralleling and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies and virtually any application where military and/or high reliability is required.

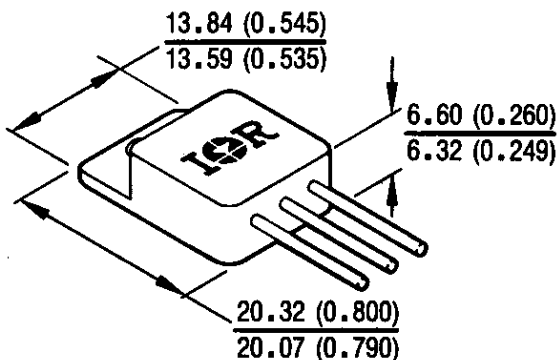
Product Summary

| Part Number | BV _{DSS} | R _{DS(on)} | I _D |
|-------------|-------------------|---------------------|----------------|
| IRFM140 | 100V | 0.077Ω | 28A |

FEATURES:

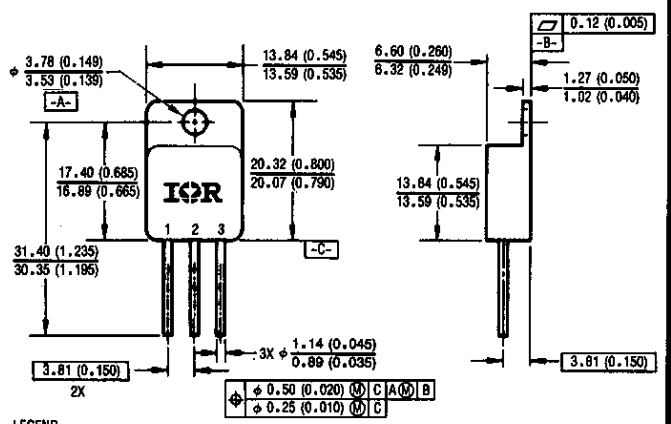
- Repetitive Avalanche Rating
- Isolated and Hermetically Sealed
- Alternative to TO-3 Package
- Simple Drive Requirements
- Ease of Paralleling
- Ceramic Eyelets

CASE STYLE AND DIMENSIONS



CAUTION

BERYLLIA WARNING PER MIL-S-19500
SEE PAGE I-300



LEGEND
1 DRAIN
2 SOURCE
3 GATE

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M - 1992.
2 ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).

Conforms to JEDEC Outline TO-254AA*
Dimensions in Millimeters and (Inches)

*For leadform configurations see page I-300, fig. 15

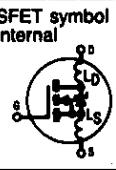


Absolute Maximum Ratings

| Parameter | IRFM140, JANTXV, JANTX-, 2N7218 | Units |
|--|--|-------|
| I_D @ $V_{GS} = 10V, T_C = 25^\circ C$ Continuous Drain Current | 28 | A |
| I_D @ $V_{GS} = 10V, T_C = 100^\circ C$ Continuous Drain Current | 20 | |
| I_{DM} Pulsed Drain Current ① | 112 | |
| P_D @ $T_C = 25^\circ C$ Max. Power Dissipation | 125 | W |
| Linear Derating Factor | 1.0 | W/K ⑤ |
| V_{GS} Gate-to-Source Voltage ² | ± 20 | V |
| E_{AS} Single Pulse Avalanche Energy ② | 250 (See Fig. 12) | mJ |
| I_{AR} Avalanche Current ① | 28 (See E_{AR}) | A |
| E_{AR} Repetitive Avalanche Energy ① | 12.5 (See Fig. 13) | mJ |
| dv/dt Peak Diode Recovery dv/dt ③ | 5.5 (See Fig. 13) | V/ns |
| T_J Operating Junction Temperature Range | -55 to 150 | °C |
| T_{STG} Storage Temperature Range | | |
| Lead Temperature | 300 (0.063 in. (1.6 mm) from case for 10s) | |
| Weight | 9.3 (typical) | g |


Electrical Characteristics @ $T_J = 25^\circ C$ (Unless Otherwise Specified)

| Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|------|------|-------|----------|--|
| BV_{DSS} Drain-to-Source Breakdown Voltage | 100 | — | — | V | $V_{GS} = 0V, I_D = 1.0 mA$ |
| $\Delta BV_{DSS}/\Delta T_J$ Temperature Coefficient of Breakdown Voltage | — | 0.13 | — | V/°C | Reference to 25°C, $I_D = 1.0 mA$ |
| $R_{DS(on)}$ Static Drain-to-Source On-State Resistance | — | — | 0.077 | Ω | $V_{GS} = 10V, I_D = 20A$ ④ |
| | — | — | 0.125 | | |
| $V_{GS(th)}$ Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS} = V_{GS}, I_D = 250 \mu A$ |
| g_{fs} Forward Transconductance | 9.1 | — | — | S (⑦) | $V_{DS} \geq 15V, I_{DS} = 20A$ ④ |
| I_{DSS} Zero Gate Voltage Drain Current | — | — | 25 | μA | $V_{DS} = 0.8 \times \text{Max. Rating}, V_{GS} = 0V$ |
| | — | — | 250 | | $V_{DS} = 0.8 \times \text{Max. Rating}$ $V_{GS} = 0V, T_J = 125^\circ C$ |
| I_{GSS} Gate-to-Source Leakage Forward | — | — | 100 | nA | $V_{GS} = 20V$ |
| I_{GSS} Gate-to-Source Leakage Reverse | — | — | -100 | nA | $V_{GS} = -20V$ |
| Q_g Total Gate Charge | 30 | — | 59 | nC | $V_{GS} = 10V, I_D = 28A$ $V_{DS} = 0.5 \times \text{Max. Rating}$ See Fig. 6 and 14 |
| Q_{gs} Gate-to-Source Charge | 2.4 | — | 12 | | |
| Q_{gd} Gate-to-Drain ("Miller") Charge | 12 | — | 30.7 | | |
| $t_{d(on)}$ Turn-On Delay Time | — | — | 21 | ns | $V_{DD} = 50V, I_D = 20A, R_G = 9.1\Omega$ See Fig. 11 |
| t_r Rise Time | — | — | 145 | | |
| $t_{d(off)}$ Turn-Off Delay Time | — | — | 64 | | |
| t_f Fall Time | — | — | 105 | | |
| L_D Internal Drain Inductance | — | 8.7 | — | nH | Measured from the drain lead, 6 mm (0.25 in.) from package to center of die. |
| L_S Internal Source Inductance | — | 8.7 | — | | Measured from the source lead, 6 mm (0.25 in.) from package to source bonding pad. |
| C_{iss} Input Capacitance | — | 1660 | — | pF | $V_{GS} = 0V, V_{DS} = 25V$ $f = 1.0 MHz$ See Fig. 5 |
| C_{oss} Output Capacitance | — | 550 | — | | |
| C_{rss} Reverse Transfer Capacitance | — | 120 | — | | |
| C_{DC} Drain-to-Case Capacitance | — | 12 | — | | |





Source-Drain Diode Ratings and Characteristics

| Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|--|------|------|---------------|---|
| I_S Continuous Source Current (Body Diode) | — | — | 28 | A | Modified MOSFET symbol showing the integral Reverse p-n junction rectifier.  |
| I_{SM} Pulsed Source Current (Body Diode) ① | — | — | 112 | | |
| V_{SD} Diode Forward Voltage | — | — | 1.5 | V | $T_J = 25^\circ\text{C}$, $I_S = 28\text{A}$, $V_{GS} = 0\text{V}$ ④ |
| t_{rr} Reverse Recovery Time | — | — | 400 | nS | $T_J = 25^\circ\text{C}$, $I_F = 28\text{A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$ ④ |
| Q_{RR} Reverse Recovery Charge | — | — | 2.9 | μC | $V_{DD} \leq 50\text{V}$ |
| t_{on} Forward Turn-On Time | Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$. | | | | |

Thermal Resistance

| Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|--------------------------------|------|------|------|-------|--|
| R_{thJC} Junction-to-Case | — | — | 1.0 | K/W ⑤ | |
| R_{thJS} Case-to-Sink | — | 0.21 | — | | Mounting surface flat, smooth, and greased |
| R_{thJA} Junction-to-Ambient | — | — | 48 | | Typical socket mount |

① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 9) Refer to current HEXFET reliability report

② @ $V_{DD} = 25\text{V}$, Starting $T_J = 25^\circ\text{C}$, $L \geq 470\ \mu\text{H}$, $R_G = 25\ \Omega$, Peak $I_L = 28\text{A}$

③ $I_{SD} \leq 28\text{A}$, $di/dt \leq 170\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J \leq 150^\circ\text{C}$ Suggested $R_G = 9.1\ \Omega$

④ Pulse width $\leq 300\ \mu\text{s}$; Duty Cycle $\leq 2\%$

⑤ $K/W = ^\circ\text{C}/\text{W}$
 $W/K = \text{W}/^\circ\text{C}$



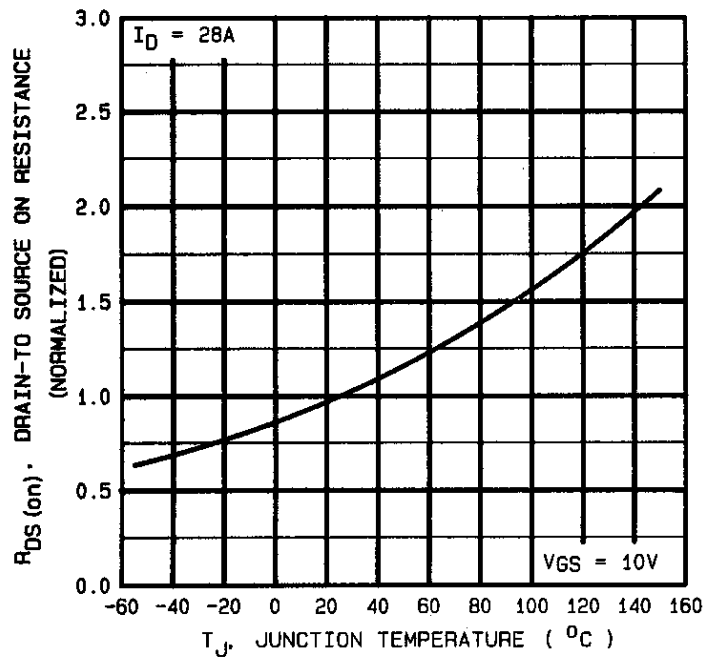
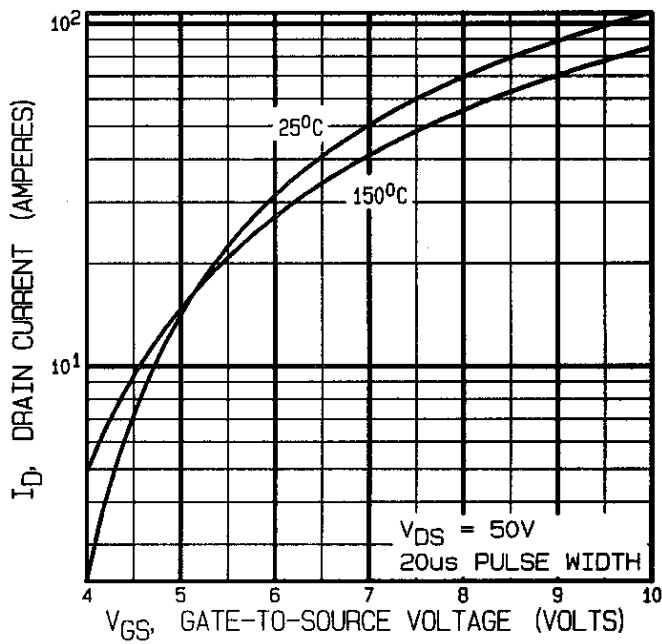
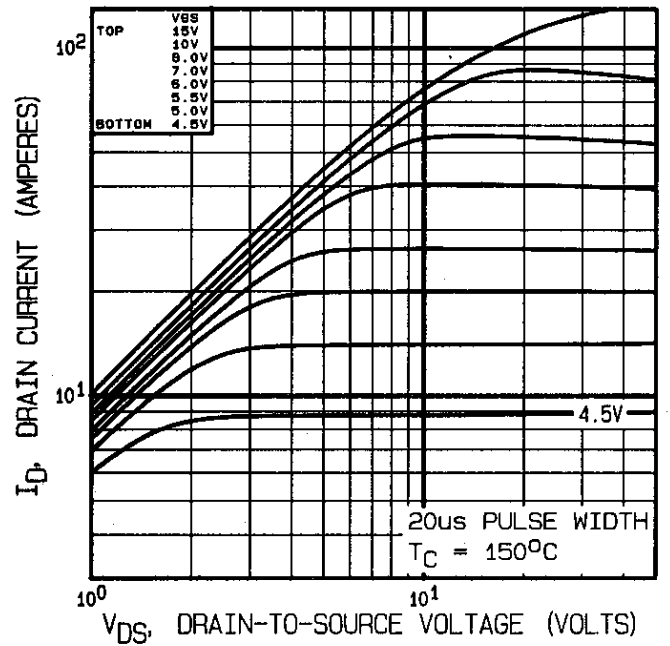
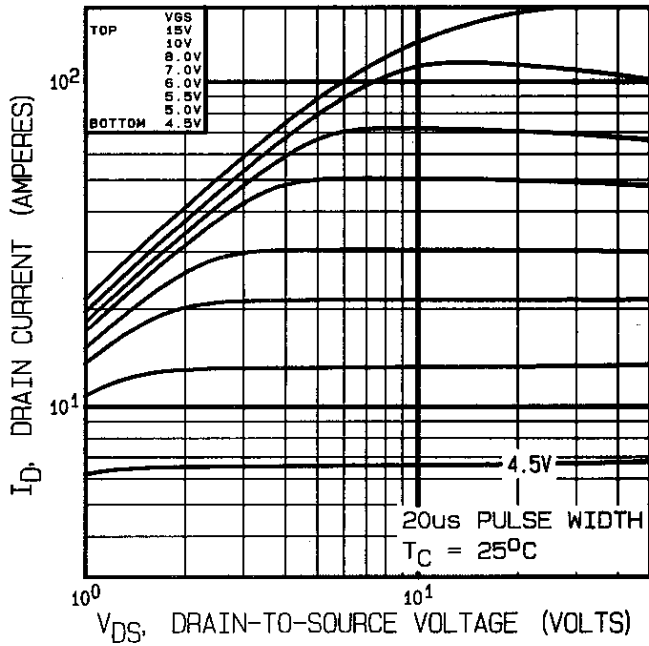


Fig. 3 — Typical Transfer Characteristics

Fig. 4 — Normalized On-Resistance Vs. Temperature

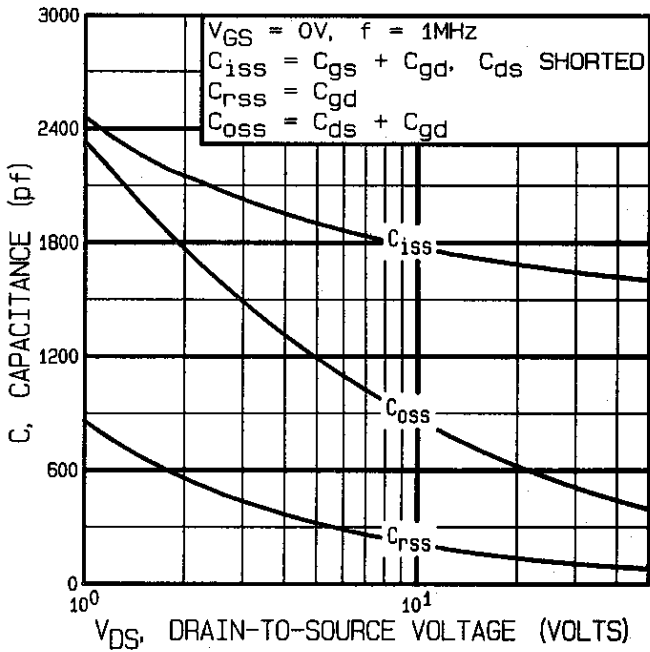


Fig. 5 — Typical Capacitance Vs. Drain-to-Source Voltage

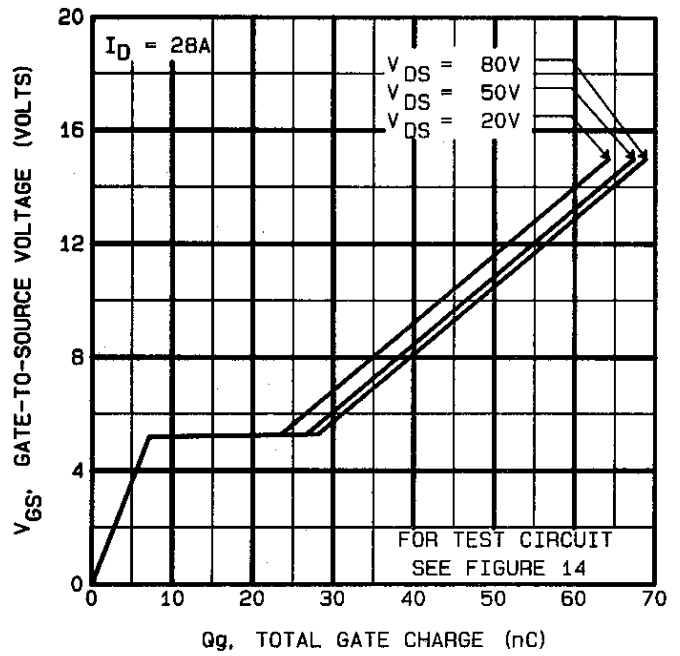


Fig. 6 — Typical Gate Charge Vs. Gate-to-Source Voltage

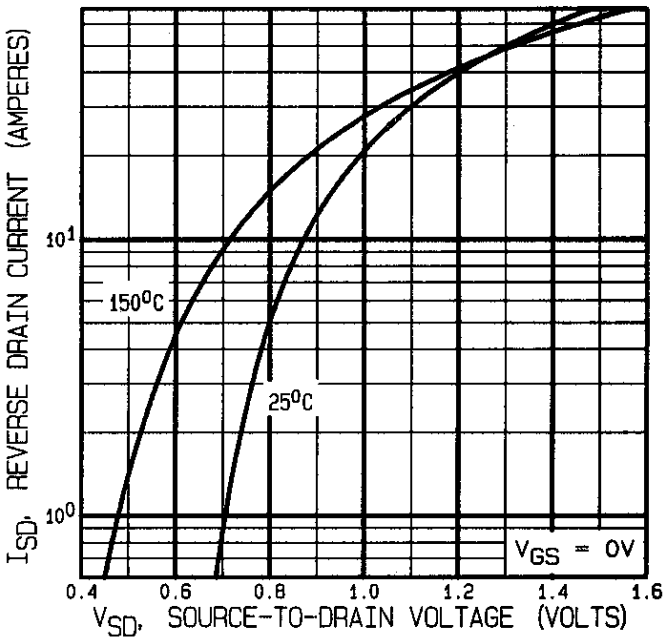


Fig. 7 — Typical Source-Drain Diode Forward Voltage

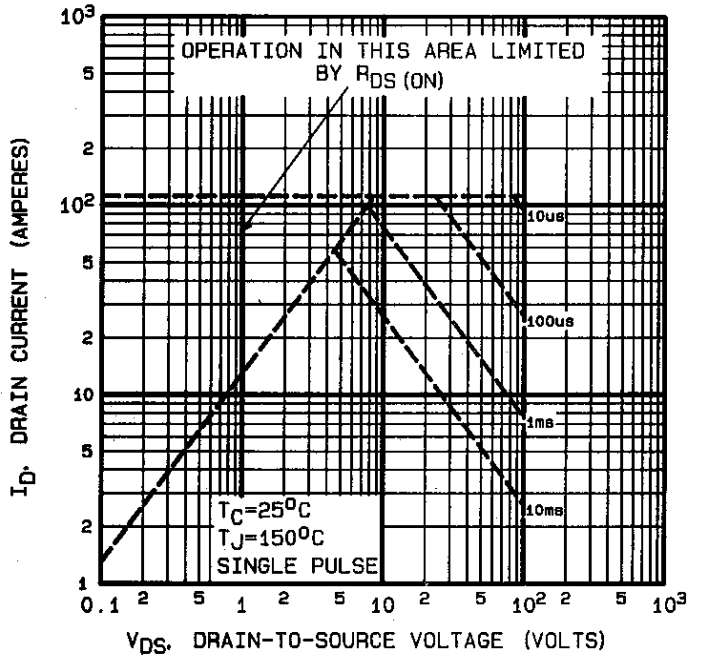


Fig. 8 — Maximum Safe Operating Area

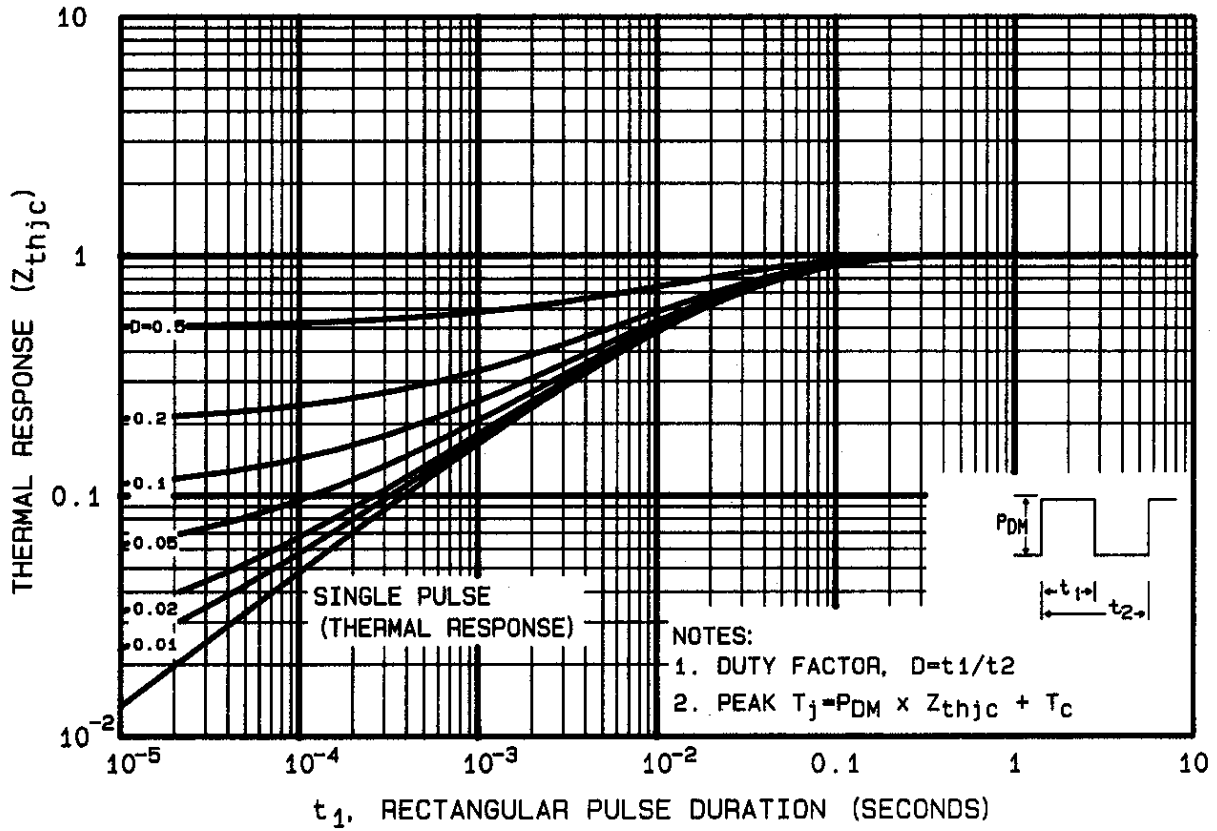


Fig. 9 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

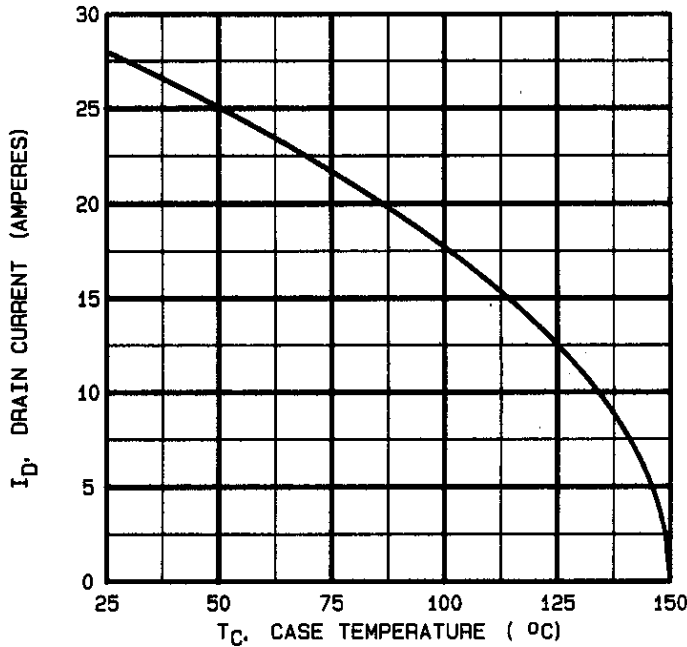


Fig. 10 — Maximum Drain Current Vs. Case Temperature

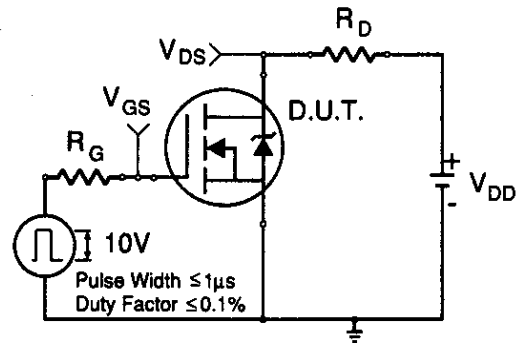


Fig. 11a — Switching Time Test Circuit

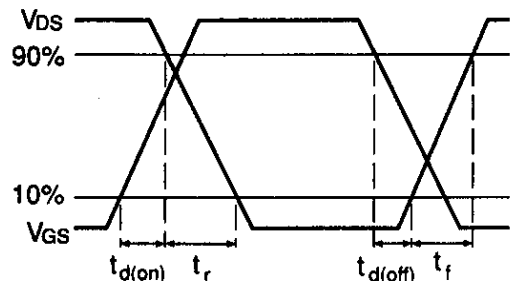


Fig. 11b — Switching Time Waveforms

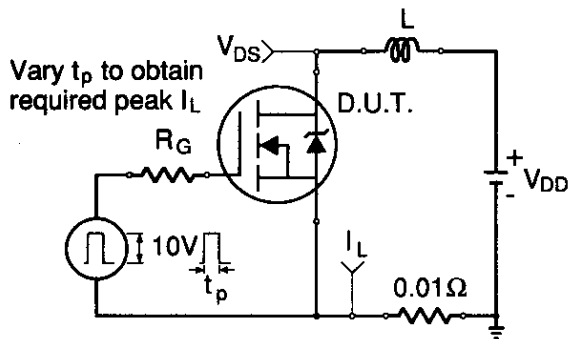


Fig. 12a — Unclamped Inductive Test Circuit

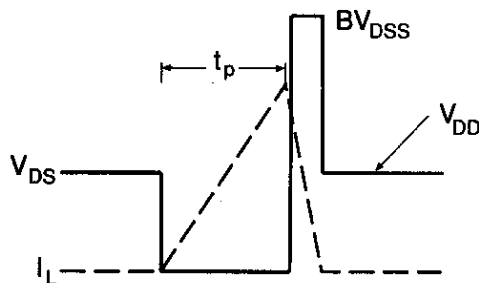


Fig. 12b — Unclamped Inductive Waveforms

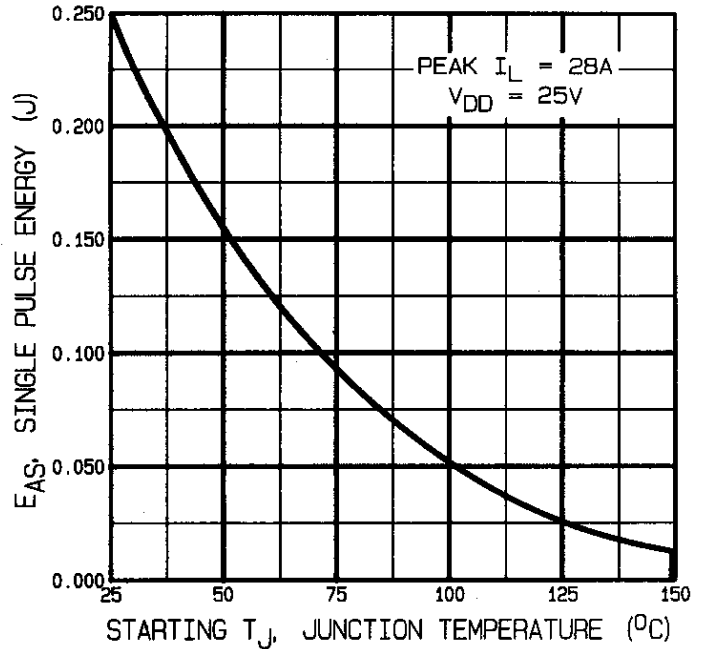


Fig. 12c — Maximum Avalanche Energy Vs. Starting Junction Temperature

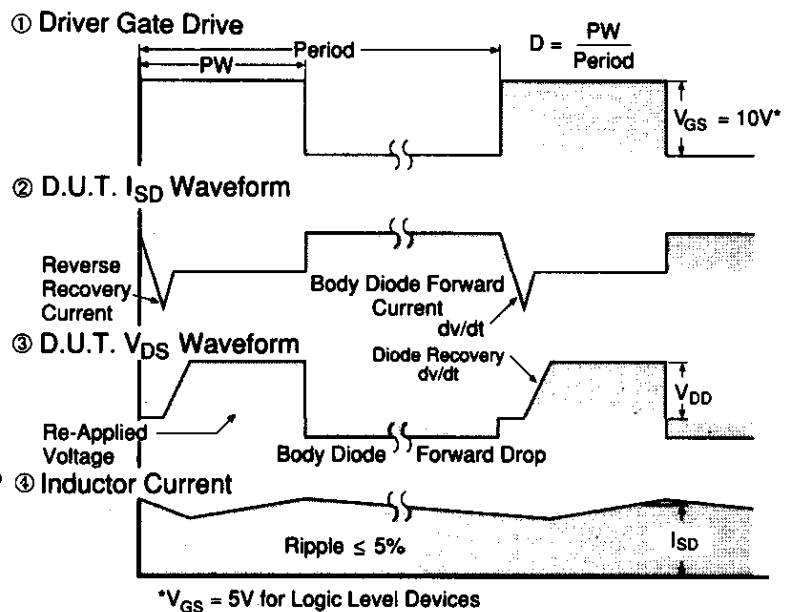
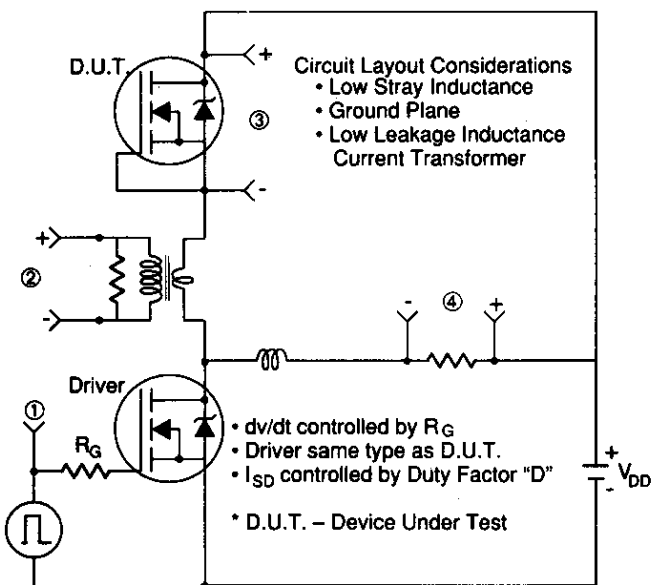


Fig. 13 — Peak Diode Recovery dv/dt Test Circuit

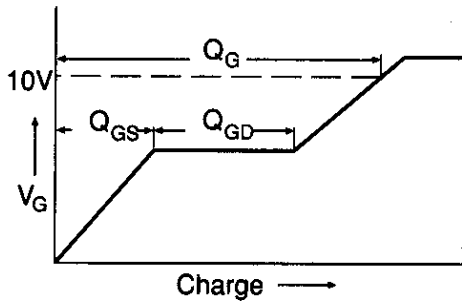


Fig. 14a — Basic Gate Charge Waveform

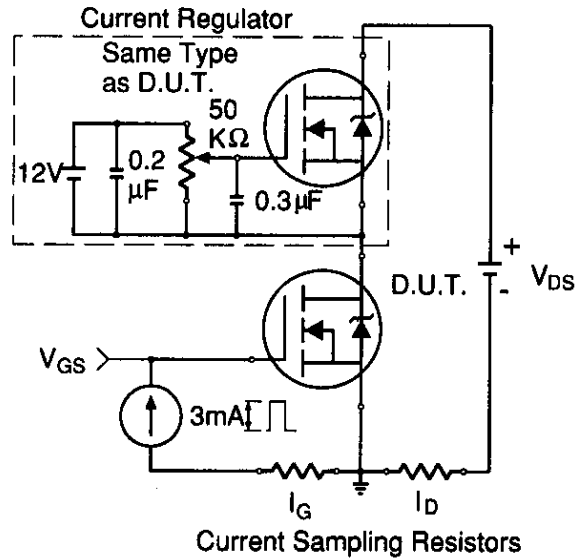


Fig. 14b — Gate Charge Test Circuit

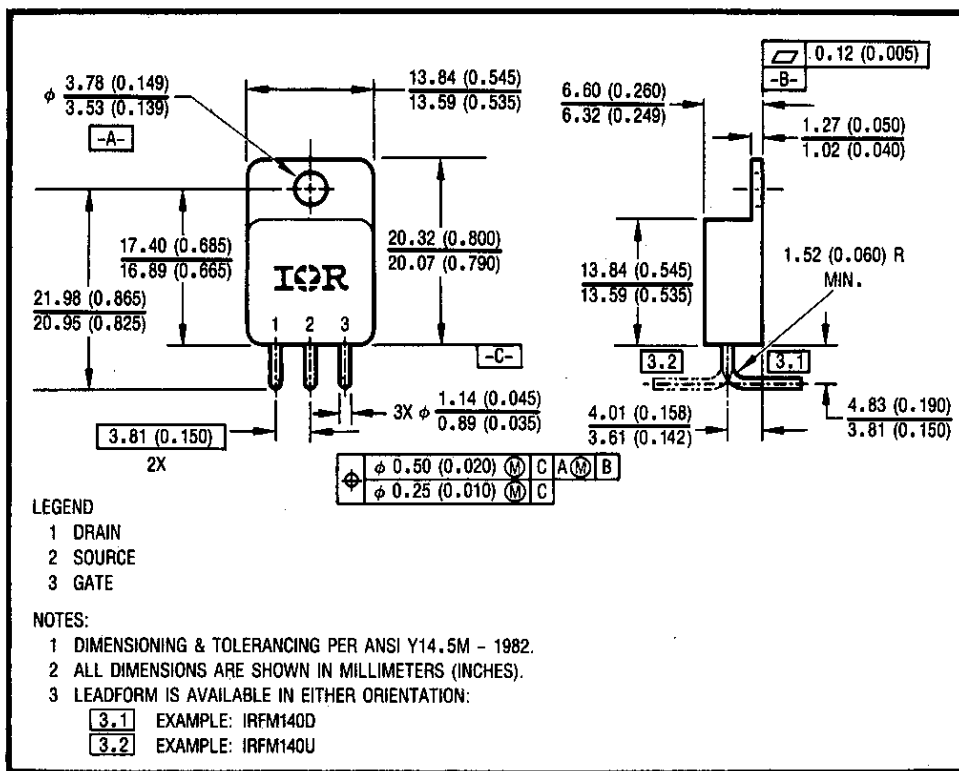


Fig. 15 — Optional Leadforms for Outline TO-254

BERYLLIA WARNING PER MIL-S-19500

Packages containing beryllia shall not be ground, sandblasted, machined, or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.