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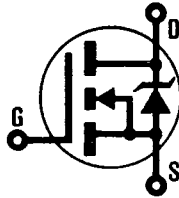
REPETITIVE AVALANCHE AND dv/dt RATED

HEXFET® TRANSISTORS

IRFPC40

IRFPC42

N-CHANNEL
POWER MOSFETs
TO-247AC PACKAGE



TO-3P

600 Volt, 1.2 Ohm HEXFET
TO-247AC (TO-3P) Plastic Package

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of this latest "State of the Art" design achieves: very low on-state resistance combined with high transconductance; superior reverse energy and diode recovery dv/dt capability.

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, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits.

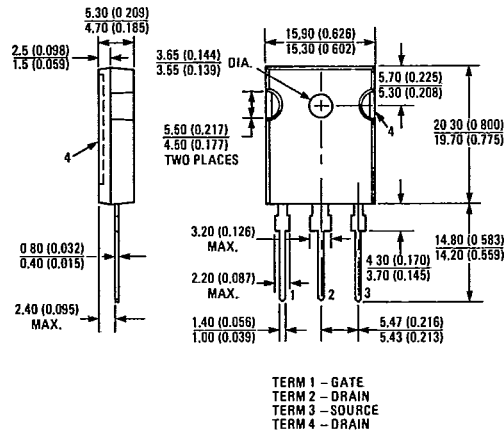
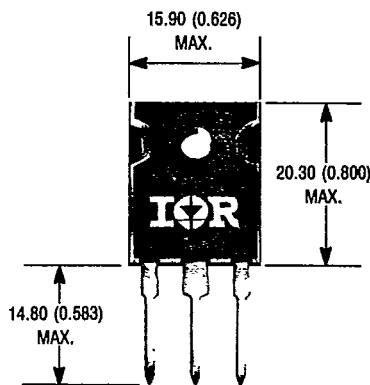
Product Summary

| Part Number | V _{DS} | R _{DS(on)} | I _D |
|-------------|-----------------|---------------------|----------------|
| IRFPC40 | 600V | 1.2Ω | 6.8A |
| IRFPC42 | 600V | 1.6Ω | 5.9A |

Features:

- Isolated Central Mounting Hole
- Repetitive Avalanche Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling

CASE STYLE AND DIMENSIONS



Conforms to JEDEC Outline TO-247AC (TO-3P)
Dimensions in Millimeters and (Inches)


Absolute Maximum Ratings

| Parameter | IRFPC40 | IRFPC42 | Units |
|--|---|---------|------------------|
| $I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current | 6.8 | 5.9 | A |
| $I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current | 4.3 | 3.7 | A |
| I_{DM} Pulsed Drain Current ① | 27 | 24 | A |
| $P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation | 150 | | W |
| Linear Derating Factor | 1.2 | | W/K ② |
| V_{GS} Gate-to-Source Voltage | ± 20 | | V |
| E_{AS} Single Pulse Avalanche Energy ③ | 410 (See Fig. 14) | | mJ |
| I_{AR} Avalanche Current ④ (Repetitive or Non-Repetitive) | 6.8 (See E_{AR}) | | A |
| E_{AR} Repetitive Avalanche Energy ④ | 15 (See I_{AR}) | | mJ |
| dv/dt Peak Diode Recovery dv/dt ⑤ | 3.0 (See Fig. 17) | | V/ns |
| T_J Operating Junction Temperature Range | -55 to 150 | | $^\circ\text{C}$ |
| T_{STG} Storage Temperature Range | -55 to 150 | | $^\circ\text{C}$ |
| Lead Temperature | 300 (0.063 in. (1.6mm) from case for 10s) | | $^\circ\text{C}$ |

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

| Parameter | Type | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------|------|------|------|---------------|--|
| BV_{DSS} Drain-to-Source Breakdown Voltage | ALL | 600 | — | — | V | $V_{GS} = 0V, I_D = 250 \mu\text{A}$ |
| $R_{DS(on)}$ Static Drain-to-Source On-State Resistance ⑥ | IRFPC40 | — | 0.97 | 1.2 | Ω | $V_{GS} = 10V, I_D = 3.7A$ |
| | IRFPC42 | — | 1.2 | 1.6 | | |
| $I_{D(on)}$ On-State Drain Current ⑥ | IRFPC40 | 6.8 | — | — | A | $V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max. $V_{GS} = 10V$ |
| | IRFPC42 | 5.9 | — | — | | |
| $V_{GS(th)}$ Gate Threshold Voltage | ALL | 2.0 | — | 4.0 | V | $V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$ |
| g_{fs} Forward Transconductance ⑥ | ALL | 4.9 | 7.3 | — | S (Ω) | $V_{DS} \geq 100V, I_{DS} = 3.7A$ |
| I_{DSS} Zero Gate Voltage Drain Current | ALL | — | — | 250 | μA | $V_{DS} = \text{Max. Rating}, V_{GS} = 0V$ |
| | | — | — | 1000 | | $V_{DS} = 0.8 \times \text{Max. Rating}$ $V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| I_{GSS} Gate-to-Source Leakage Forward | ALL | — | — | 500 | nA | $V_{GS} = 20V$ |
| I_{GSS} Gate-to-Source Leakage Reverse | ALL | — | — | -500 | nA | $V_{GS} = -20V$ |
| Q_g Total Gate Charge | ALL | — | 40 | 60 | nC | $V_{DS} = 10V, I_D = 6.2A$ |
| Q_{gs} Gate-to-Source Charge | ALL | — | 5.5 | 8.3 | nC | $V_{DS} = 0.6 \times \text{Max. Rating}$ See Fig. 16 |
| Q_{gd} Gate-to-Drain ("Miller") Charge | ALL | — | 20 | 30 | nC | (Independent of operating temperature) |
| $t_{d(on)}$ Turn-On Delay Time | ALL | — | 13 | 20 | ns | $V_{DD} = 200V, I_D = 6.2A, R_G = 9.1\Omega$ |
| t_r Rise Time | ALL | — | 18 | 27 | ns | $R_D = 47\Omega$ |
| $t_{d(off)}$ Turn-Off Delay Time | ALL | — | 55 | 83 | ns | See Fig. 15 |
| t_f Fall Time | ALL | — | 20 | 30 | ns | (Independent of operating temperature) |
| L_D Internal Drain Inductance | ALL | — | 4.5 | — | nH | Measured from the drain lead, 6mm (0.25 in.) from package to center of die |
| | | | | | | Modified MOSFET symbol showing the internal inductances |
| L_S Internal Source Inductance | ALL | — | 7.5 | — | nH | Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad |
| C_{iss} Input Capacitance | ALL | — | 1300 | — | pF | $V_{GS} = 0V, V_{DS} = 25V$ |
| C_{oss} Output Capacitance | ALL | — | 160 | — | pF | $f = 1.0 \text{ MHz}$ |
| C_{rss} Reverse Transfer Capacitance | ALL | — | 45 | — | pF | See Fig. 10 |

Source-Drain Diode Ratings and Characteristics

| Parameter | Type | Min. | Typ. | Max. | Units | Test Conditions |
|---|------|--|------|------|---------------|--|
| I_S Continuous Source Current (Body Diode) | ALL | — | — | 6.8 | A | Modified MOSFET symbol showing the integral Reverse p-n Junction rectifier  |
| I_{SM} Pulsed Source Current (Body Diode) ① | ALL | — | — | 27 | A | |
| V_{SD} Diode Forward Voltage ② | ALL | — | — | 1.5 | V | $T_J = 25^\circ\text{C}$, $I_S = 6.2\text{A}$, $V_{GS} = 0\text{V}$ |
| t_{rr} Reverse Recovery Time | ALL | 200 | 450 | 940 | ns | $T_J = 25^\circ\text{C}$, $I_F = 6.2\text{A}$, $di/dt = 100\text{ A}/\mu\text{s}$ |
| Q_{RR} Reverse Recovery Charge | ALL | 1.8 | 3.8 | 7.9 | μC | |
| t_{on} Forward Turn-On Time | ALL | Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$ | | | | |

Thermal Resistance

| | | | | | | |
|--------------------------------|-----|---|------|------|------------|--|
| R_{thJC} Junction-to-Case | ALL | — | — | 0.83 | K/W ③ | |
| R_{thCS} Case-to-Sink | ALL | — | 0.24 | — | K/W ③ | Mounting surface flat, smooth, and greased |
| R_{thJA} Junction-to-Ambient | ALL | — | — | 40 | K/W ③ | Typical socket mount |
| Mounting Torque | ALL | — | — | 10 | in. • lbs. | Standard 6-32 screw |

① Repetitive Rating: Pulse width limited by maximum junction temperature (see figure 5) Refer to current HEXFET reliability report

② @ $V_{DD} = 50\text{V}$, Starting $T_J = 25^\circ\text{C}$, $L = 16\text{ mH}$, $R_G = 25\Omega$, Peak $I_L = 6.8\text{A}$

③ $I_{SD} \leq 6.8\text{A}$, $di/dt \leq 80\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J \leq 150^\circ\text{C}$
Suggested $R_G = 9.1\Omega$

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

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

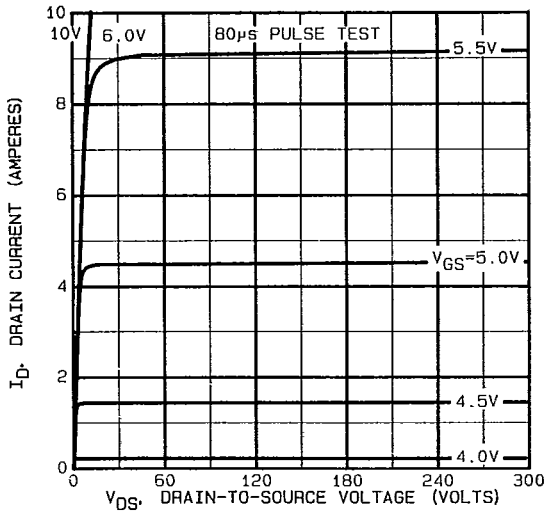


Fig. 1 — Typical Output Characteristics

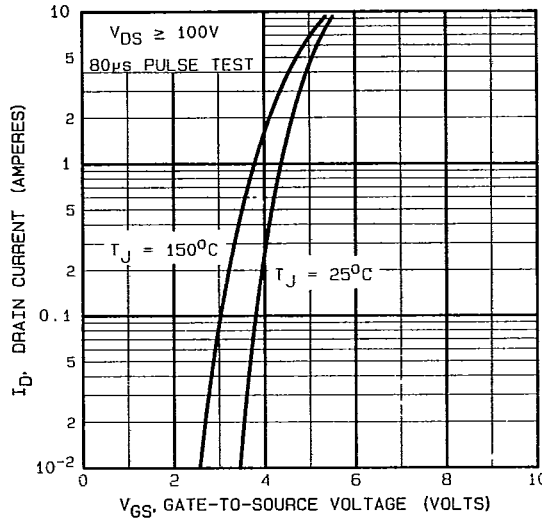


Fig. 2 — Typical Transfer Characteristics

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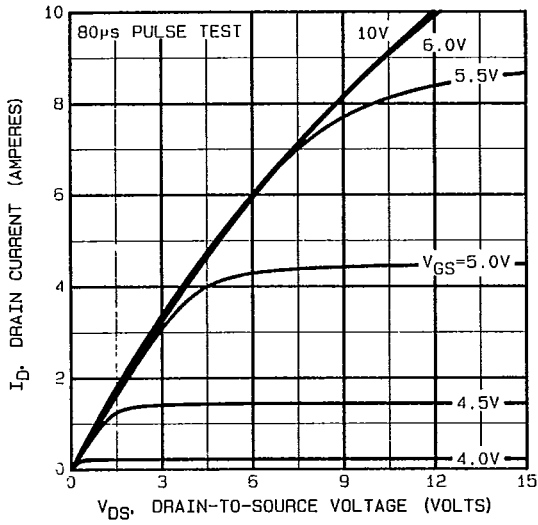


Fig. 3 — Typical Saturation Characteristics

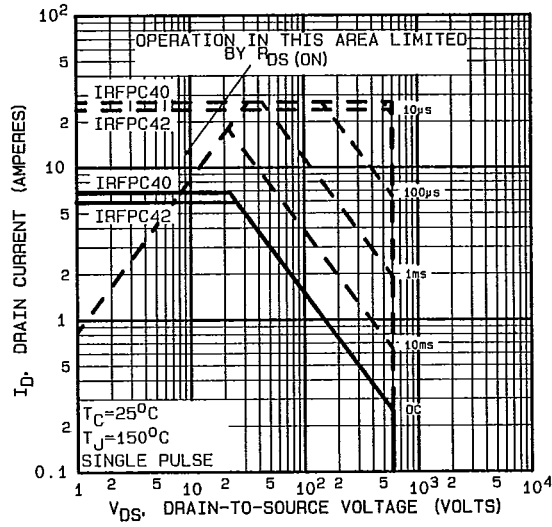


Fig. 4 — Maximum Safe Operating Area

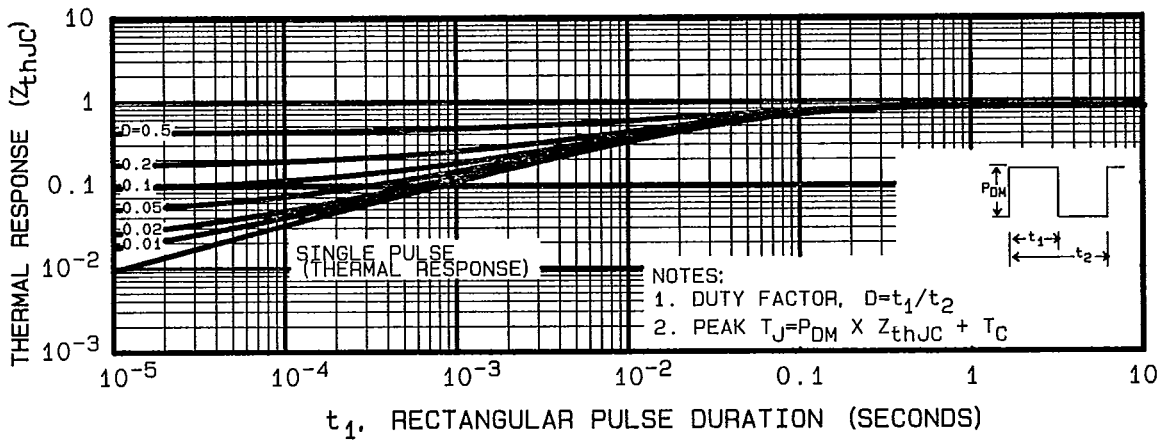


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

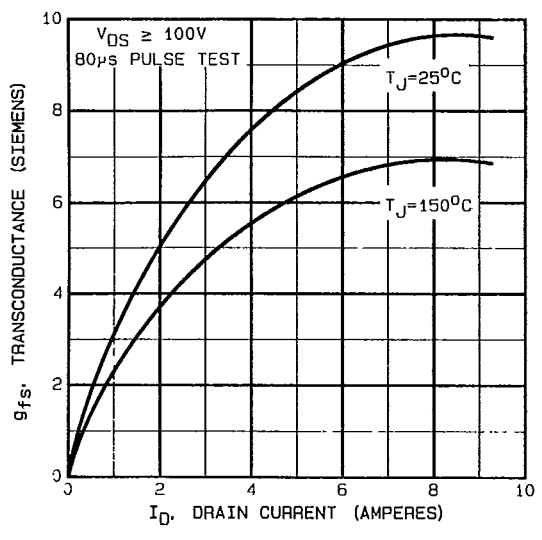


Fig. 6 — Typical Transconductance Vs. Drain Current

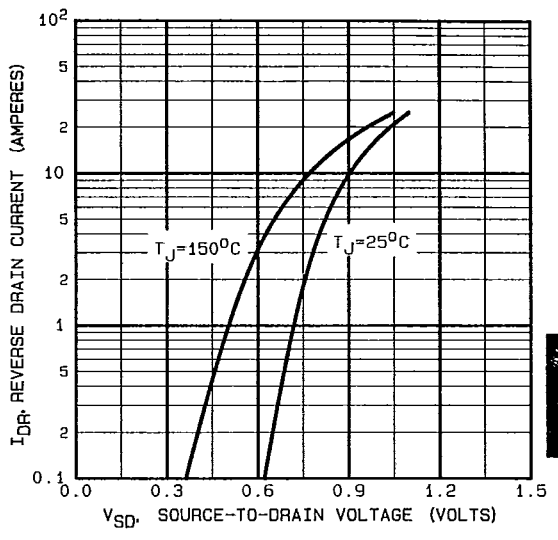


Fig. 7 — Typical Source-Drain Diode Forward Voltage

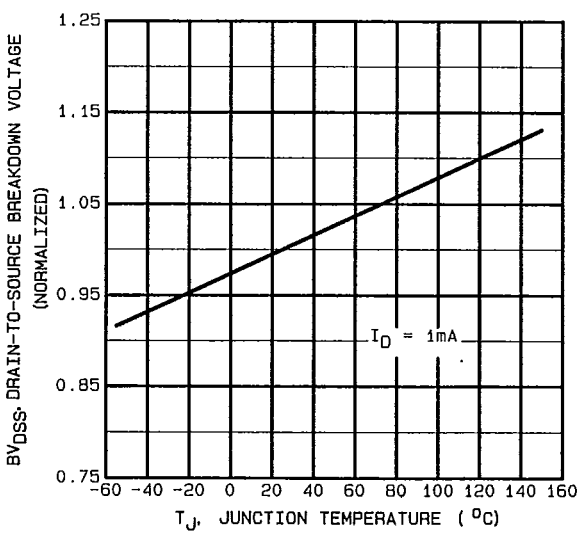


Fig. 8 — Breakdown Voltage Vs. Temperature

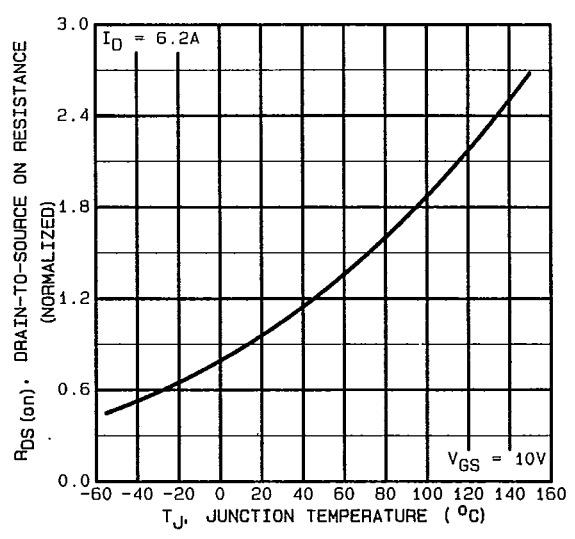


Fig. 9 — Normalized On-Resistance Vs. Temperature

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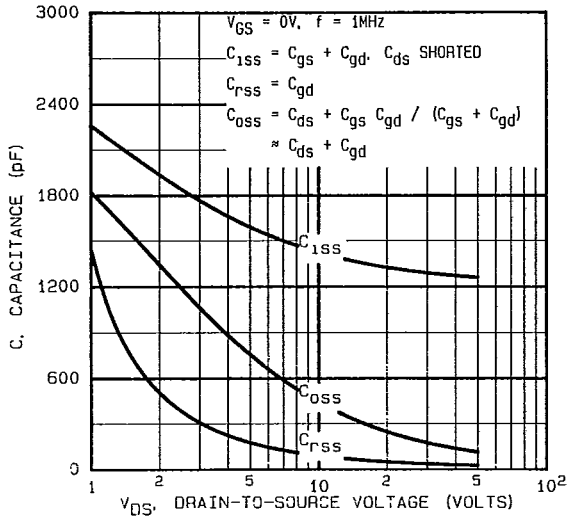


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

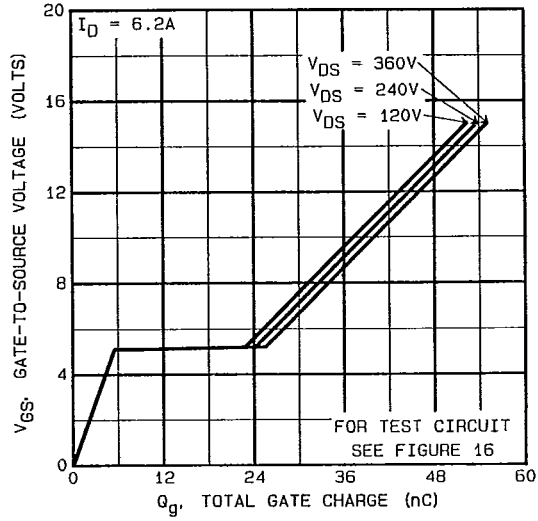


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

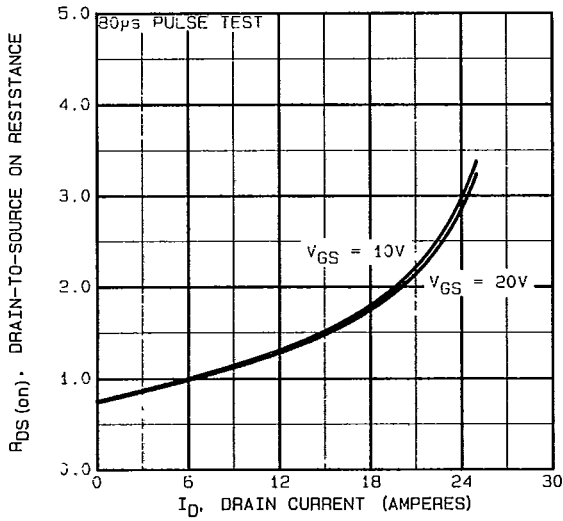


Fig. 12 — Typical On-Resistance Vs. Drain Current

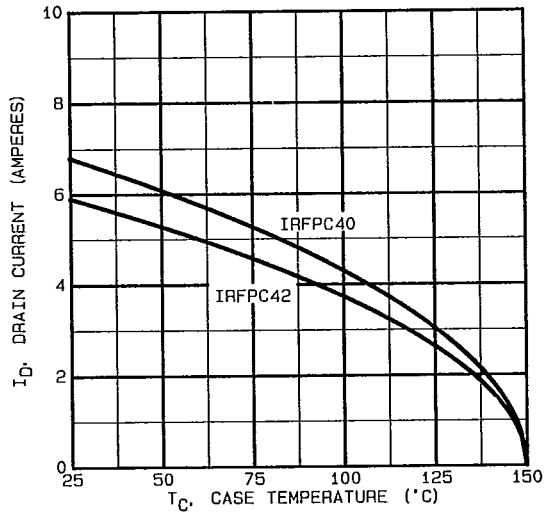


Fig. 13 — Maximum Drain Current Vs. Case Temperature

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IRFPC40, IRFPC42 Devices

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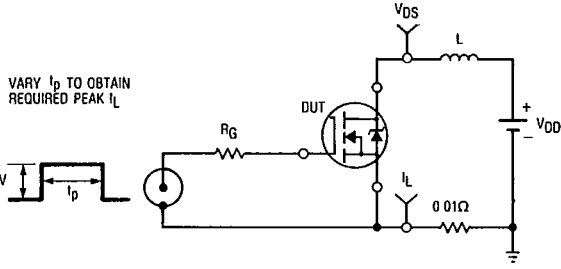


Fig. 14a — Unclamped Inductive Test Circuit

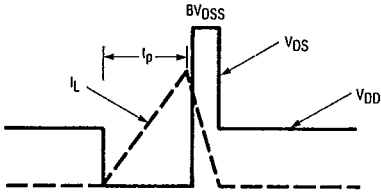


Fig. 14b — Unclamped Inductive Waveforms

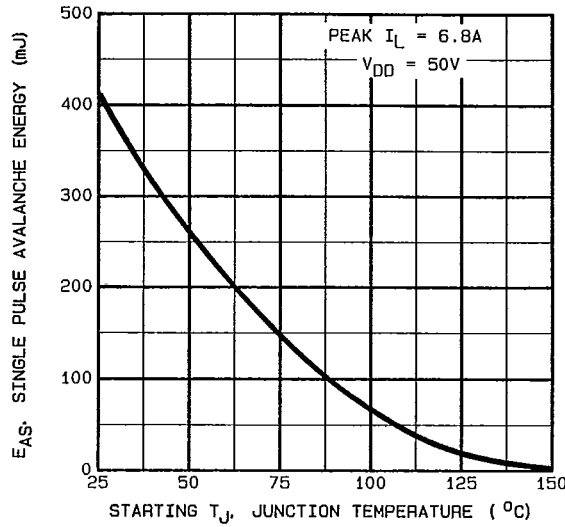


Fig. 14c — Maximum Avalanche Energy Vs. Starting Junction Temperature

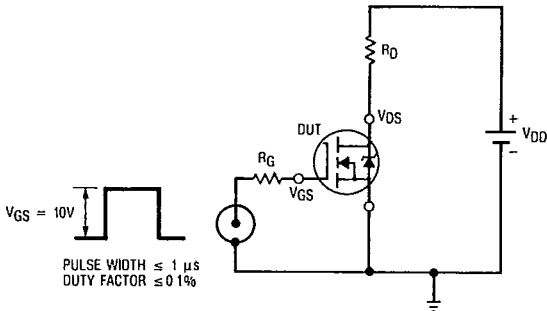


Fig. 15a — Switching Time Test Circuit

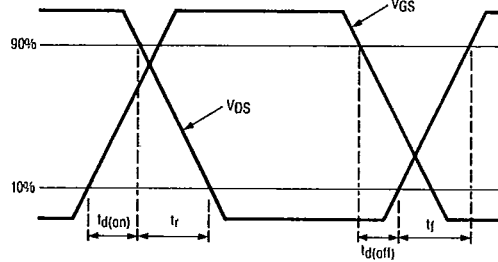


Fig. 15b — Switching Time Waveforms

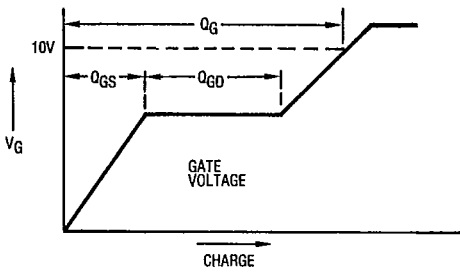


Fig. 16a — Basic Gate Charge Waveform

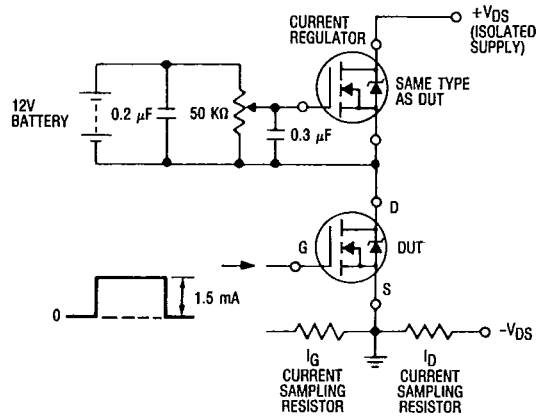


Fig. 16b — Gate Charge Test Circuit

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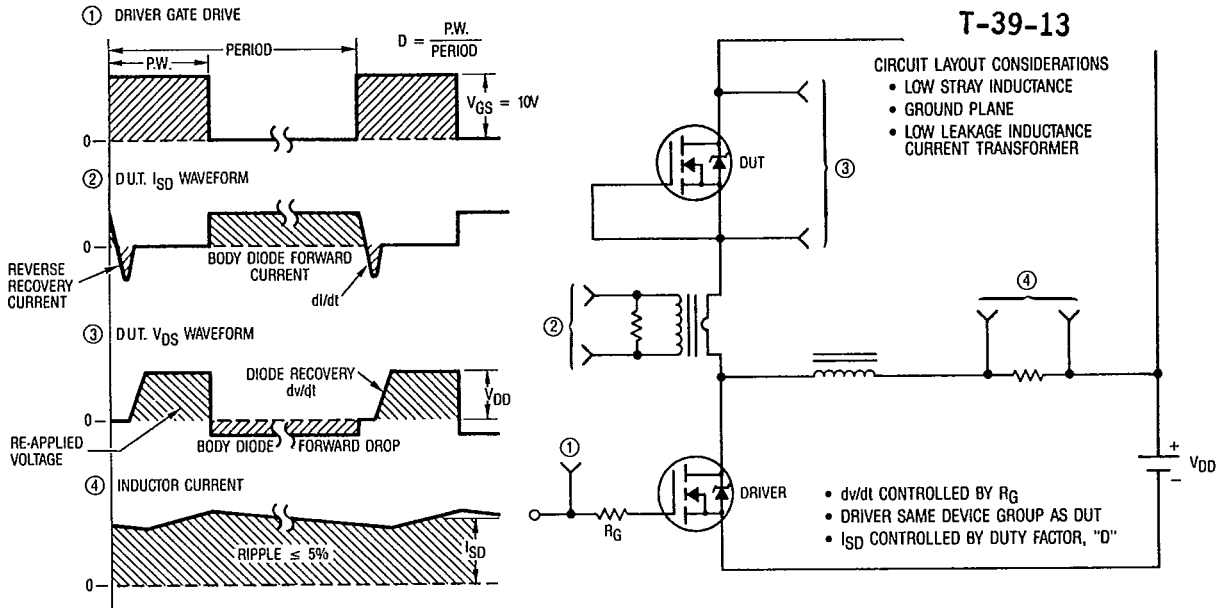


Fig. 17 — Peak Diode Recovery dv/dt Test Circuit