PD- 94820

International
IOR Rectifier

**SMPS MOSFET**

# IRF830APbF

HEXFET® Power MOSFET

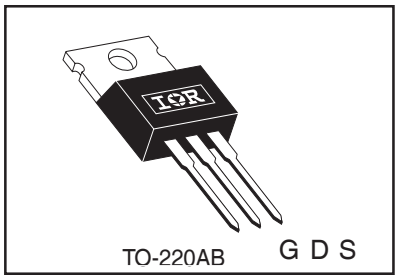
| $V_{DSS}$ | Rds(on) max | $I_D$ |
|---|---|---|
| 500V | 1.40Ω | 5.0A |

### Applications

- Switch Mode Power Supply ( SMPS )
- Uninterruptable Power Supply
- High speed power switching
- Lead-Free

### Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective Coss specified ( See AN 1001)




### Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 5.0 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V | 3.2 | |
| $I_{DM}$ | Pulsed Drain Current ① | 20 | |
| $P_D$ @$T_C$ = 25°C | Power Dissipation | 74 | W |
| | Linear Derating Factor | 0.59 | W/°C |
| $V_{GS}$ | Gate-to-Source Voltage | ± 30 | V |
| dv/dt | Peak Diode Recovery dv/dt ③ | 5.3 | V/ns |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | °C |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case ) | |
| | Mounting torqe, 6-32 or M3 screw | 10 lbf•in (1.1N•m) | |

### Typical SMPS Topologies:

- Two transistor Forward
- Half Bridge and Full Bridge

Notes ① through ⑤ are on page 8

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 500 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.60 | — | | V/°C Reference to 25°C, $I_D$ = 1mA |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 1.4 | Ω | $V_{GS}$ = 10V, $I_D$ = 3.0A ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 25 | µA | $V_{DS}$ = 500V, $V_{GS}$ = 0V |
| | | — | — | 250 | | $V_{DS}$ = 400V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS}$ = 30V |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS}$ = -30V |

## Dynamic @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $g_{fs}$ | Forward Transconductance | 2.8 | — | — | S | $V_{DS}$ = 50V, $I_D$ = 3.0A |
| $Q_g$ | Total Gate Charge | — | — | 24 | nC | $I_D$ = 5.0A |
| $Q_{gs}$ | Gate-to-Source Charge | — | — | 6.3 | | $V_{DS}$ = 400V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | — | — | 11 | | $V_{GS}$ = 10V, See Fig. 6 and 13 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 10 | — | ns | $V_{DD}$ = 250V |
| $t_r$ | Rise Time | — | 21 | — | | $I_D$ = 5.0A |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 21 | — | | $R_G$ = 14Ω |
| $t_f$ | Fall Time | — | 15 | — | | $R_D$ = 49Ω,See Fig. 10 ④ |
| $C_{iss}$ | Input Capacitance | — | 620 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | — | 93 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 4.3 | — | | $f$ = 1.0MHz, See Fig. 5 |
| $C_{oss}$ | Output Capacitance | — | 886 | — | | $V_{GS}$ = 0V, $V_{DS}$ = 1.0V, $f$ = 1.0MHz |
| $C_{oss}$ | Output Capacitance | — | 27 | — | | $V_{GS}$ = 0V, $V_{DS}$ = 400V, $f$ = 1.0MHz |
| $C_{oss}$ eff. | Effective Output Capacitance | — | 39 | — | | $V_{GS}$ = 0V, $V_{DS}$ = 0V to 400V ⑤ |

## Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $E_{AS}$ | Single Pulse Avalanche Energy② | — | 230 | mJ |
| $I_{AR}$ | Avalanche Current① | — | 5.0 | A |
| $E_{AR}$ | Repetitive Avalanche Energy① | — | 7.4 | mJ |

## Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case | — | 1.7 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.50 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 62 | |

## Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 5.0 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 20 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.5 | V | $T_J$ = 25°C, $I_S$ = 5.0A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | — | 430 | 650 | ns | $T_J$ = 25°C, $I_F$ = 5.0A |
| $Q_{rr}$ | Reverse RecoveryCharge | — | 1.62 | 2.4 | µC | di/dt = 100A/µs ④ |
| $t_{on}$ | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |

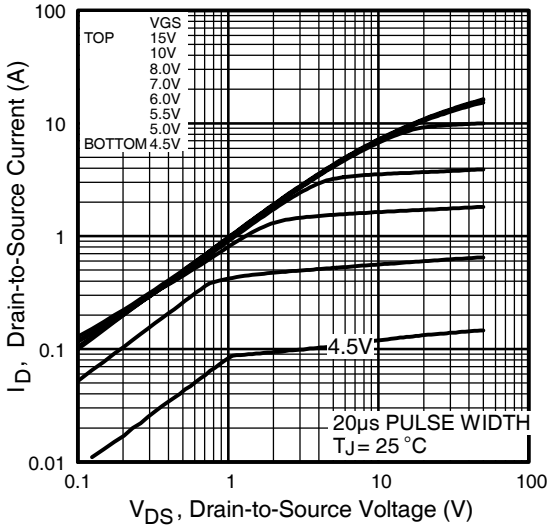



**Fig 1.** Typical Output Characteristics

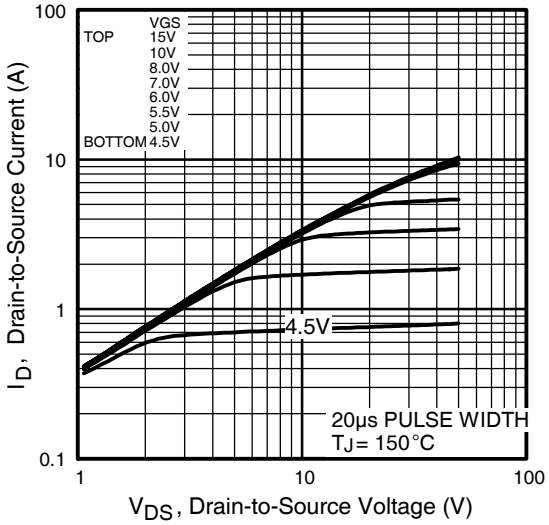



**Fig 2.** Typical Output Characteristics

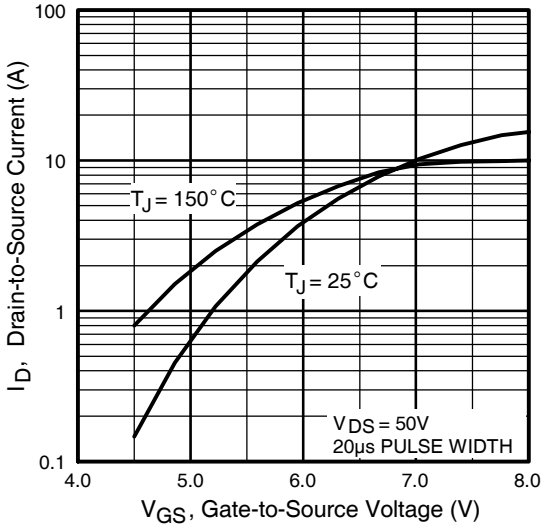



**Fig 3.** Typical Transfer Characteristics

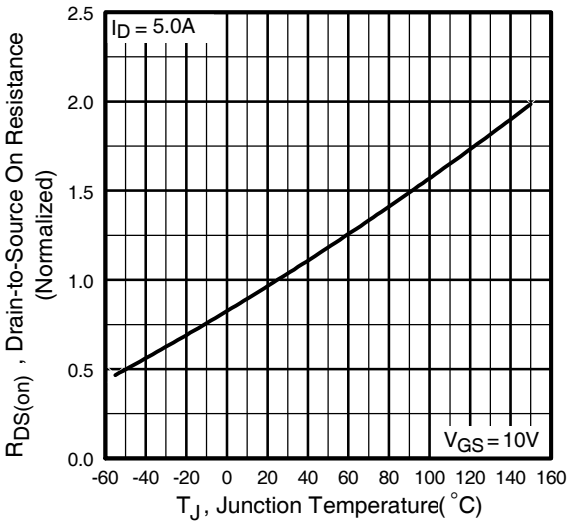



**Fig 4.** Normalized On-Resistance
Vs. Temperature

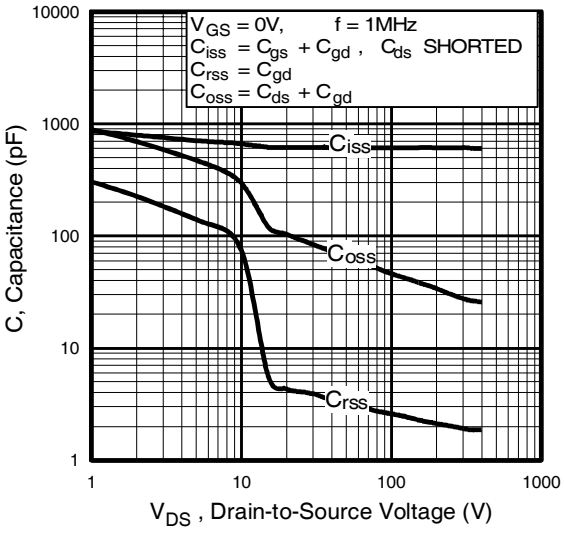



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

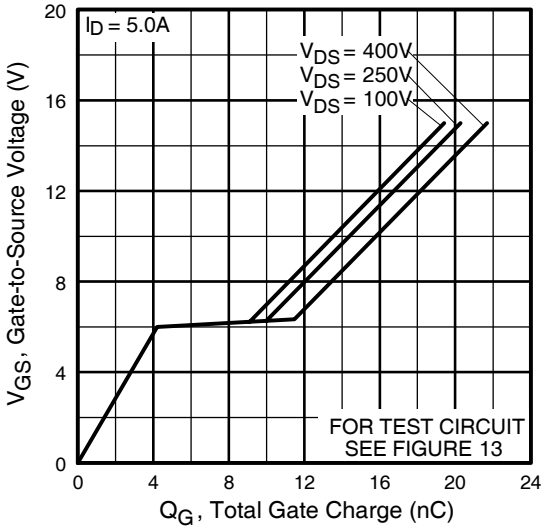



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

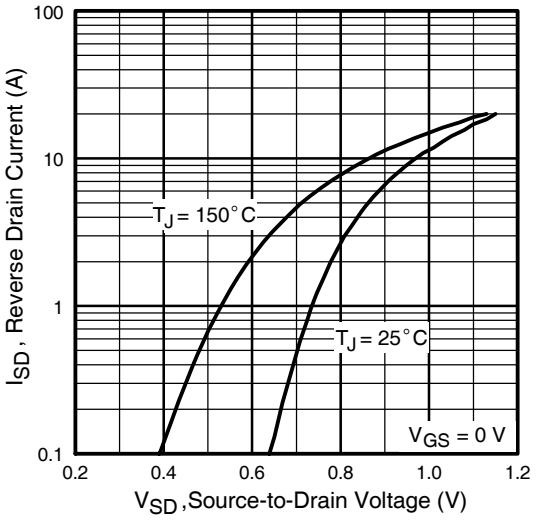



**Fig 7.** Typical Source-Drain Diode Forward Voltage

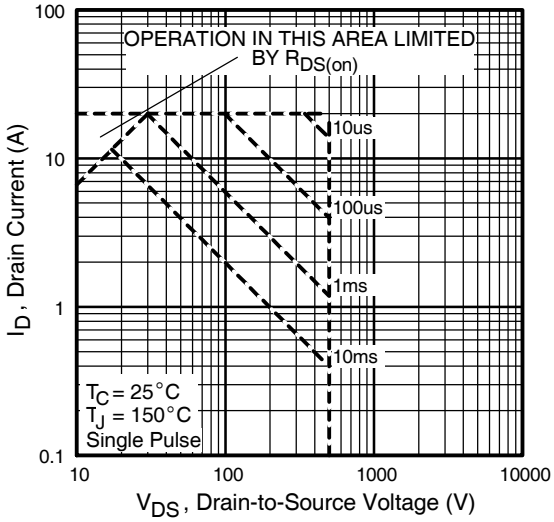



**Fig 8.** Maximum Safe Operating Area

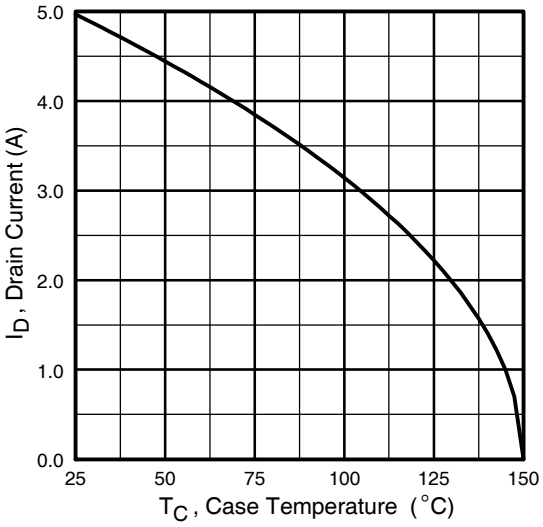



**Fig 9.** Maximum Drain Current Vs. Case Temperature

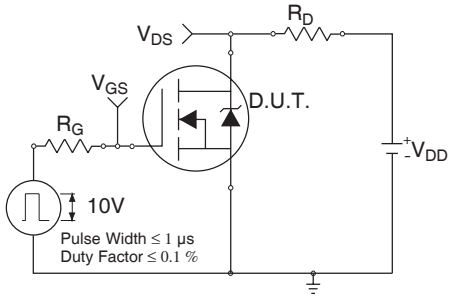



**Fig 10a.** Switching Time Test Circuit

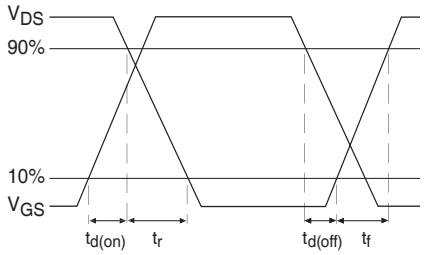



**Fig 10b.** Switching Time Waveforms

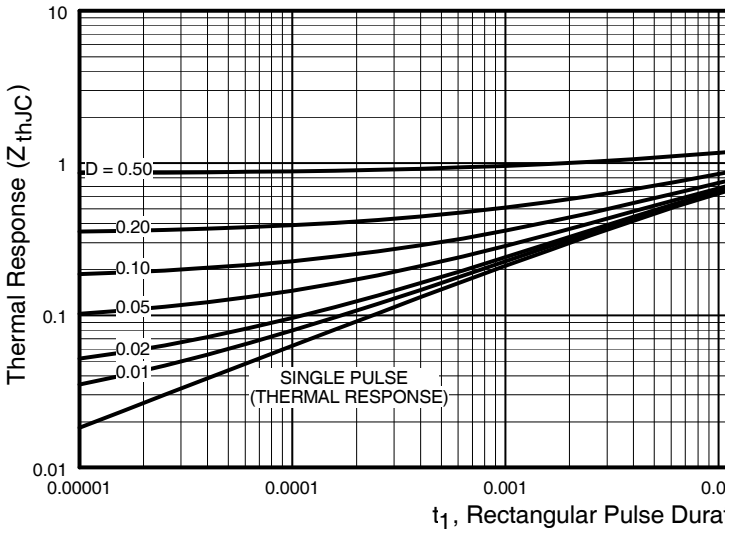



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

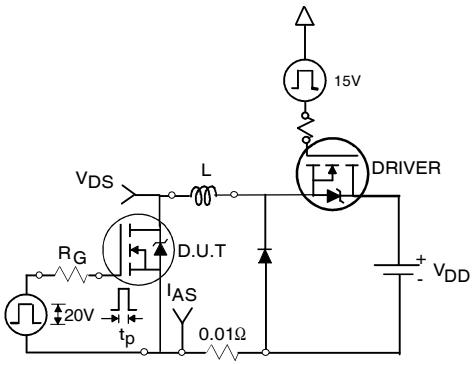



**Fig 12a.** Unclamped Inductive Test Circuit

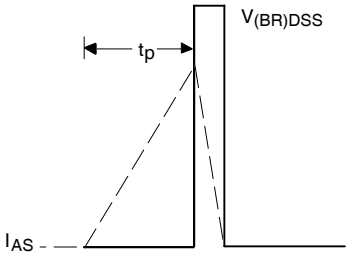



**Fig 12b.** Unclamped Inductive Waveforms

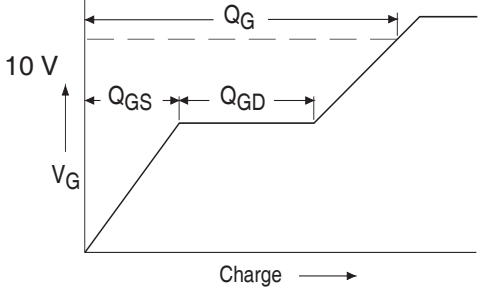



**Fig 13a.** Basic Gate Charge Waveform

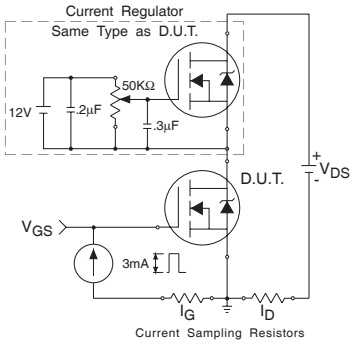



**Fig 13b.** Gate Charge Test Circuit

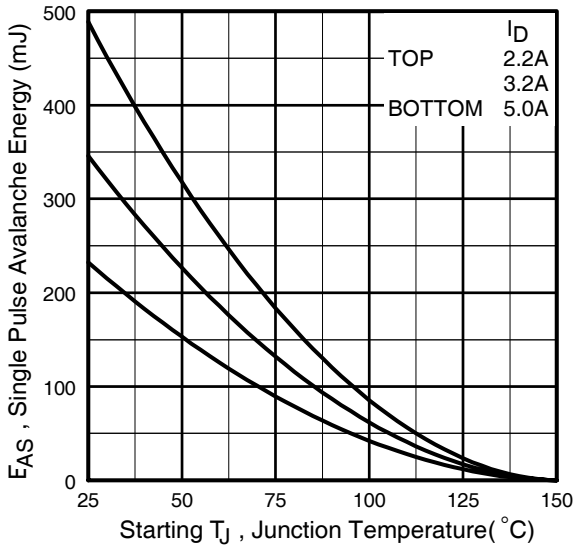



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current

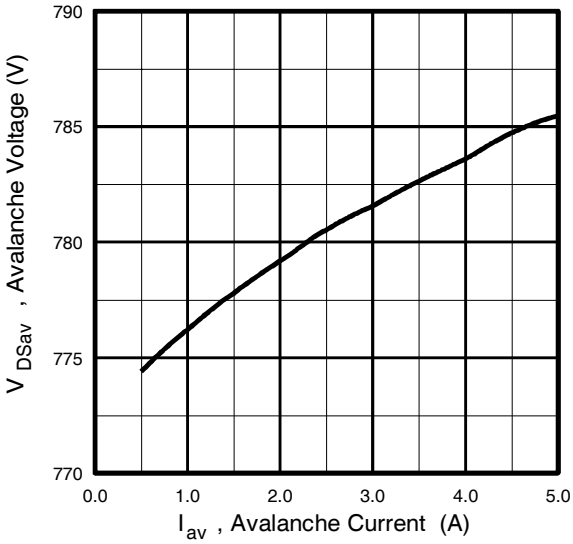
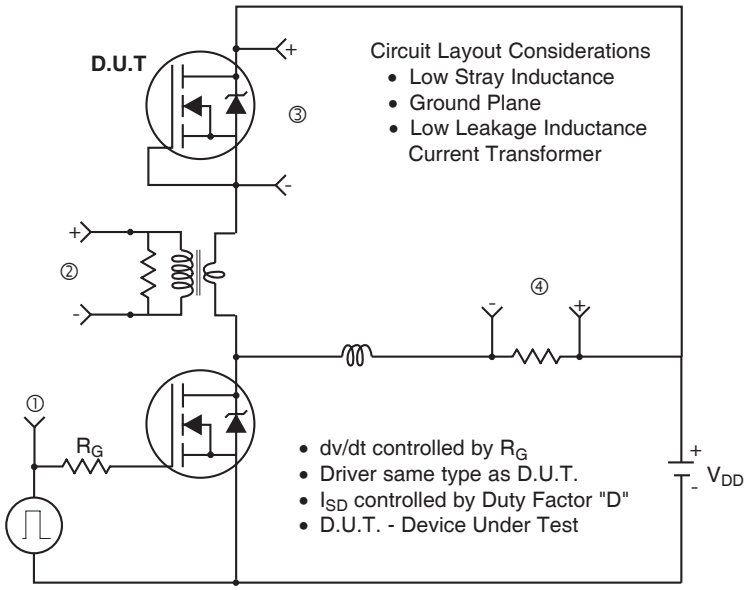
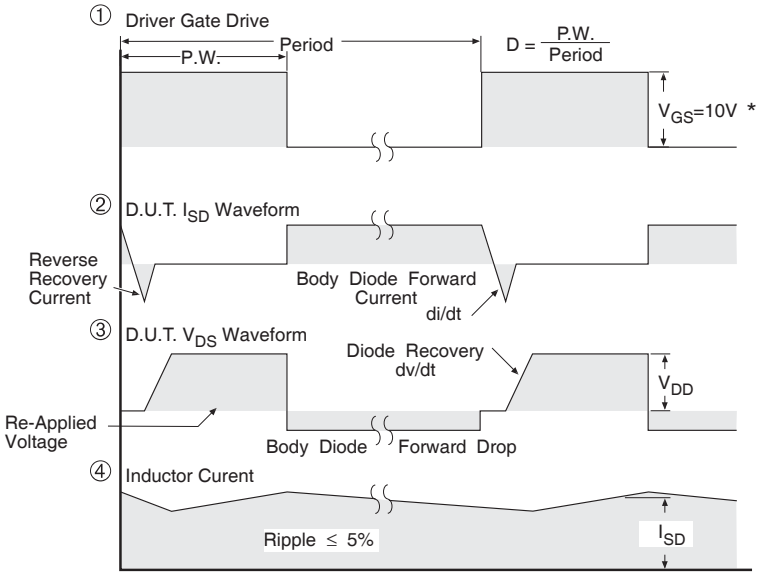



**Fig 12d.** Typical Drain-to-Source Voltage Vs. Avalanche Current

## Peak Diode Recovery dv/dt Test Circuit

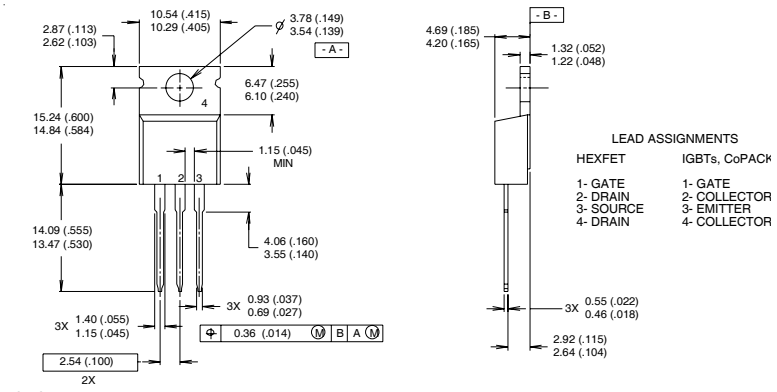



* $V_{GS}$ = 5V for Logic Level Devices

**Fig 14.** For N-Channel HEXFETS

## TO-220AB Package Outline

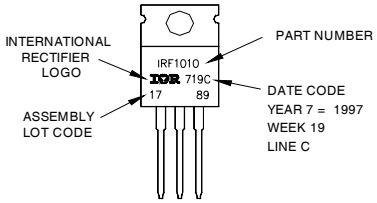



NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

## TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

**Note:** "P" in assembly line position indicates "Lead-Free"




**Notes:**

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )

② Starting $T_J$ = 25°C, L = 18mH
$R_G$ = 25Ω, $I_{AS}$ = 5.0A. (See Figure 12)

③ $I_{SD} \leq$ 5.0A, di/dt ≤ 370A/μs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

⑤ $C_{oss}$ eff. is a fixed capacitance that gives the same charging time as $C_{oss}$ while $V_{DS}$ is rising from 0 to 80% $V_{DSS}$

Data and specifications subject to change without notice.

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