

**SMPS MOSFET**

# IRFB18N50K

HEXFET® Power MOSFET

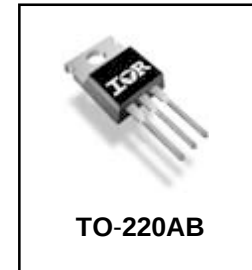
## Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

| $V_{DSS}$ | $R_{DS(on)}$ typ. | $I_D$ |
|-----------|-------------------|-------|
| 500V      | 0.26 $\Omega$     | 17A   |

## Benefits

- Low Gate Charge  $Q_g$  results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic  $dv/dt$  Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Low  $R_{DS(on)}$



## Absolute Maximum Ratings

|                                   | Parameter                                                   | Max.        | Units               |
|-----------------------------------|-------------------------------------------------------------|-------------|---------------------|
| $I_D$ @ $T_C = 25^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V                    | 17          | A                   |
| $I_D$ @ $T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V                    | 11          |                     |
| $I_{DM}$                          | Pulsed Drain Current ①                                      | 68          |                     |
| $P_D$ @ $T_C = 25^\circ\text{C}$  | Power Dissipation                                           | 220         | W                   |
|                                   | Linear Derating Factor                                      | 1.8         | W/ $^\circ\text{C}$ |
| $V_{GS}$                          | Gate-to-Source Voltage                                      | $\pm 30$    | V                   |
| $dv/dt$                           | Peak Diode Recovery $dv/dt$ ③                               | 11          | V/ns                |
| $T_J$<br>$T_{STG}$                | Operating Junction and<br>Storage Temperature Range         | -55 to +150 | $^\circ\text{C}$    |
|                                   | Soldering Temperature, for 10 seconds<br>(1.6mm from case ) | 300         |                     |
|                                   | Mounting Torque, 6-32 or M3 screw                           | 10          |                     |

## Avalanche Characteristics

| Symbol   | Parameter                      | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy② | —    | 370  | mJ    |
| $I_{AR}$ | Avalanche Current①             | —    | 17   | A     |
| $E_{AR}$ | Repetitive Avalanche Energy①   | —    | 22   | mJ    |

## Thermal Resistance

| Symbol          | Parameter                           | Typ. | Max. | Units              |
|-----------------|-------------------------------------|------|------|--------------------|
| $R_{\theta JC}$ | Junction-to-Case                    | —    | 0.56 | $^\circ\text{C/W}$ |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.50 | —    |                    |
| $R_{\theta JA}$ | Junction-to-Ambient                 | —    | 58   |                    |

# IRFB18N50K

International  
IR Rectifier

## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| Symbol                          | Parameter                            | Min. | Typ. | Max. | Units    | Conditions                                            |
|---------------------------------|--------------------------------------|------|------|------|----------|-------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 500  | —    | —    | V        | $V_{GS} = 0V, I_D = 250\mu A$                         |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.59 | —    | V/°C     | Reference to $25^\circ\text{C}, I_D = 1mA$            |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | 0.26 | 0.29 | $\Omega$ | $V_{GS} = 10V, I_D = 10A$ ④                           |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 3.0  | —    | 5.0  | V        | $V_{DS} = V_{GS}, I_D = 250\mu A$                     |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 50   | $\mu A$  | $V_{DS} = 500V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —    | 250  | $\mu A$  | $V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA       | $V_{GS} = 30V$                                        |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100 |          | $V_{GS} = -30V$                                       |

## Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

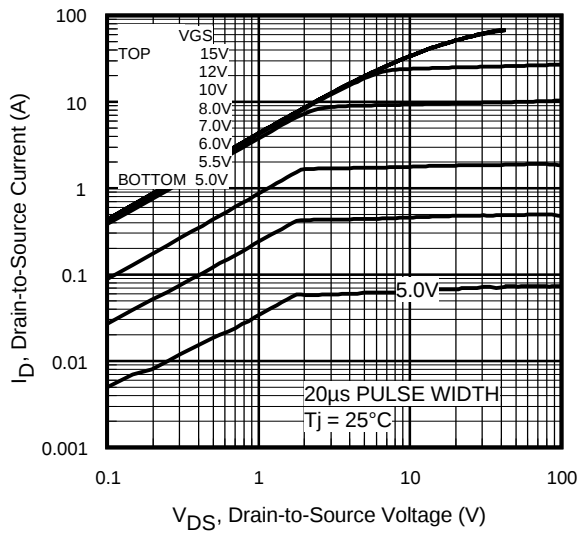
| Symbol                 | Parameter                       | Min. | Typ. | Max. | Units | Conditions                                    |
|------------------------|---------------------------------|------|------|------|-------|-----------------------------------------------|
| $g_{fs}$               | Forward Transconductance        | 6.4  | —    | —    | S     | $V_{DS} = 50V, I_D = 10A$                     |
| $Q_g$                  | Total Gate Charge               | —    | —    | 120  | nC    | $I_D = 17A$                                   |
| $Q_{gs}$               | Gate-to-Source Charge           | —    | —    | 34   |       | $V_{DS} = 400V$                               |
| $Q_{gd}$               | Gate-to-Drain ("Miller") Charge | —    | —    | 54   |       | $V_{GS} = 10V$ , See Fig. 6 and 13 ④          |
| $t_{d(on)}$            | Turn-On Delay Time              | —    | 22   | —    | ns    | $V_{DD} = 250V$                               |
| $t_r$                  | Rise Time                       | —    | 60   | —    |       | $I_D = 17A$                                   |
| $t_{d(off)}$           | Turn-Off Delay Time             | —    | 45   | —    |       | $R_G = 7.5\Omega$                             |
| $t_f$                  | Fall Time                       | —    | 30   | —    |       | $V_{GS} = 10V$ , See Fig. 10 ④                |
| $C_{iss}$              | Input Capacitance               | —    | 2830 | —    | pF    | $V_{GS} = 0V$                                 |
| $C_{oss}$              | Output Capacitance              | —    | 330  | —    |       | $V_{DS} = 25V$                                |
| $C_{rss}$              | Reverse Transfer Capacitance    | —    | 38   | —    |       | $f = 1.0MHz$ , See Fig. 5                     |
| $C_{oss}$              | Output Capacitance              | —    | 3310 | —    |       | $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz$      |
| $C_{oss}$              | Output Capacitance              | —    | 93   | —    |       | $V_{GS} = 0V, V_{DS} = 400V, f = 1.0MHz$      |
| $C_{oss \text{ eff.}}$ | Effective Output Capacitance    | —    | 155  | —    |       | $V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V$ ⑤ |

## Diode Characteristics

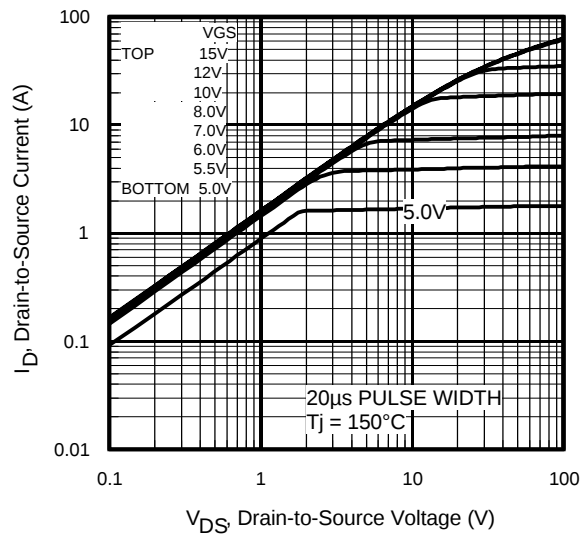
| Symbol   | Parameter                                 | Min.                                                                        | Typ. | Max. | Units   | Conditions                                                              |
|----------|-------------------------------------------|-----------------------------------------------------------------------------|------|------|---------|-------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                                                           | —    | 17   | A       | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                                                           | —    | 68   |         |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                     | —                                                                           | —    | 1.5  | V       | $T_J = 25^\circ\text{C}, I_S = 17A, V_{GS} = 0V$ ④                      |
| $t_{rr}$ | Reverse Recovery Time                     | —                                                                           | 520  | 780  | ns      | $T_J = 25^\circ\text{C}, I_F = 17A$                                     |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                                                           | 5.3  | 8.0  | $\mu C$ | $di/dt = 100A/\mu s$ ④                                                  |
| $t_{on}$ | Forward Turn-On Time                      | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ ) |      |      |         |                                                                         |

### Notes:

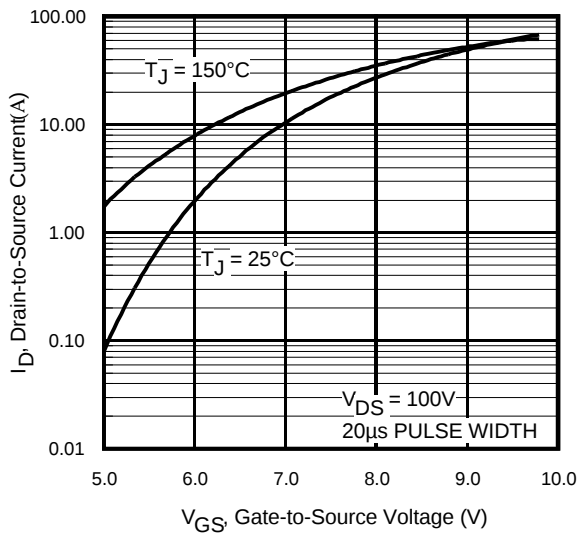
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 2.5mH$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 17A$ ,
- ③  $I_{SD} \leq 17A$ ,  $di/dt \leq 149A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .



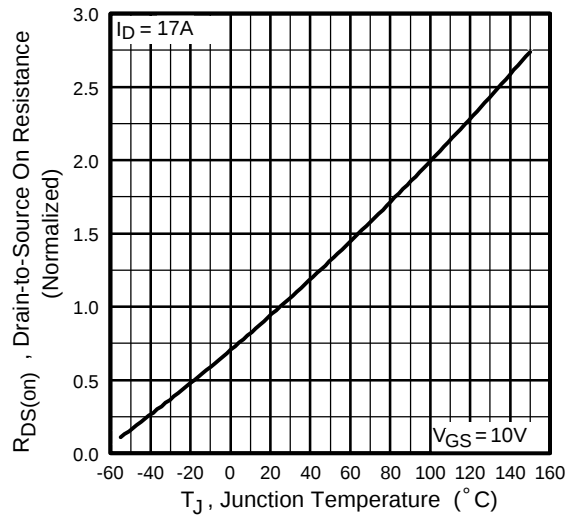
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



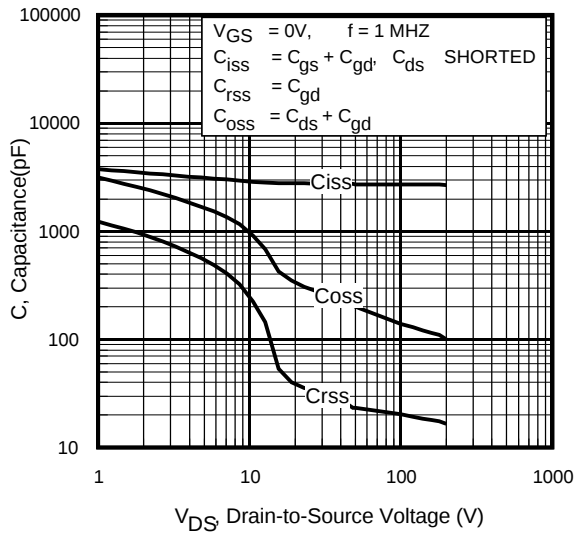
**Fig 3.** Typical Transfer Characteristics



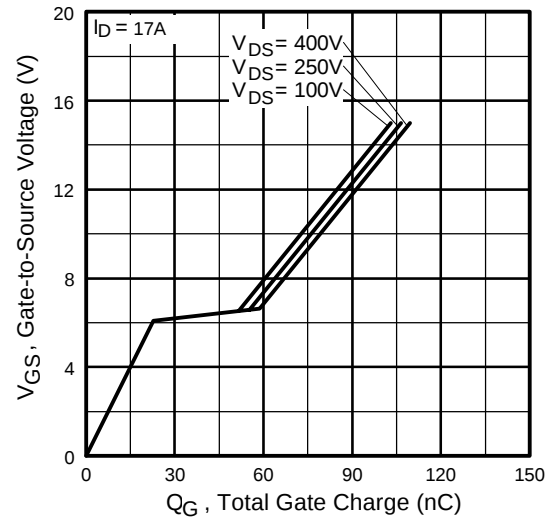
**Fig 4.** Normalized On-Resistance Vs. Temperature

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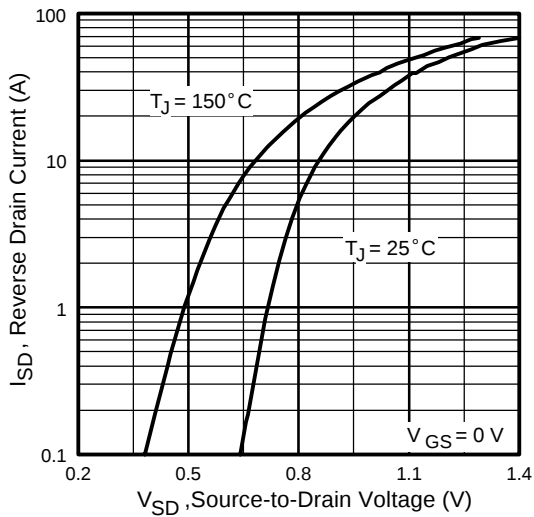
International  
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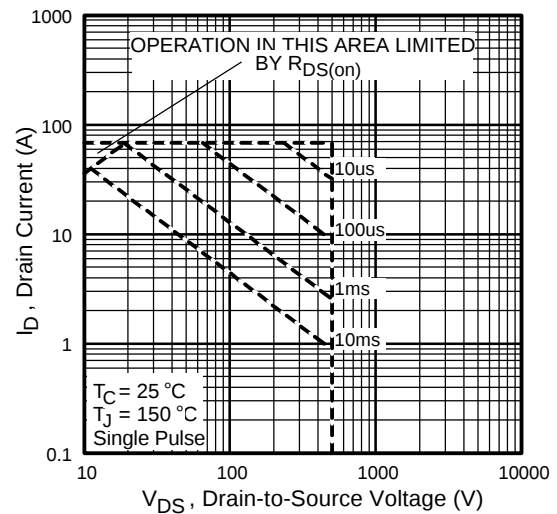
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



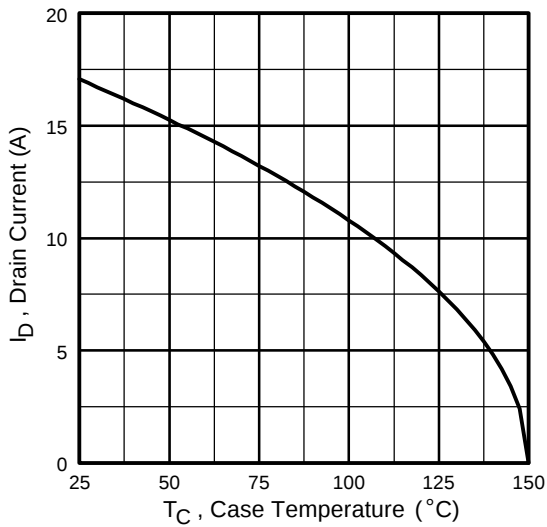
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



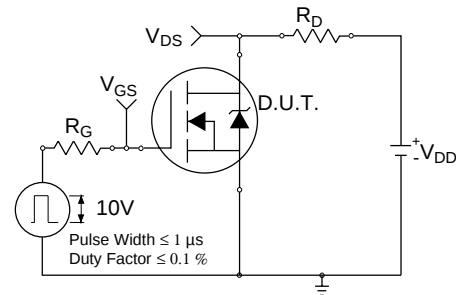
**Fig 7.** Typical Source-Drain Diode Forward Voltage



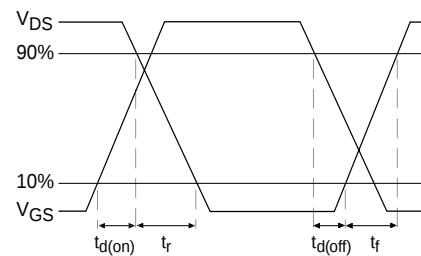
**Fig 8.** Maximum Safe Operating Area



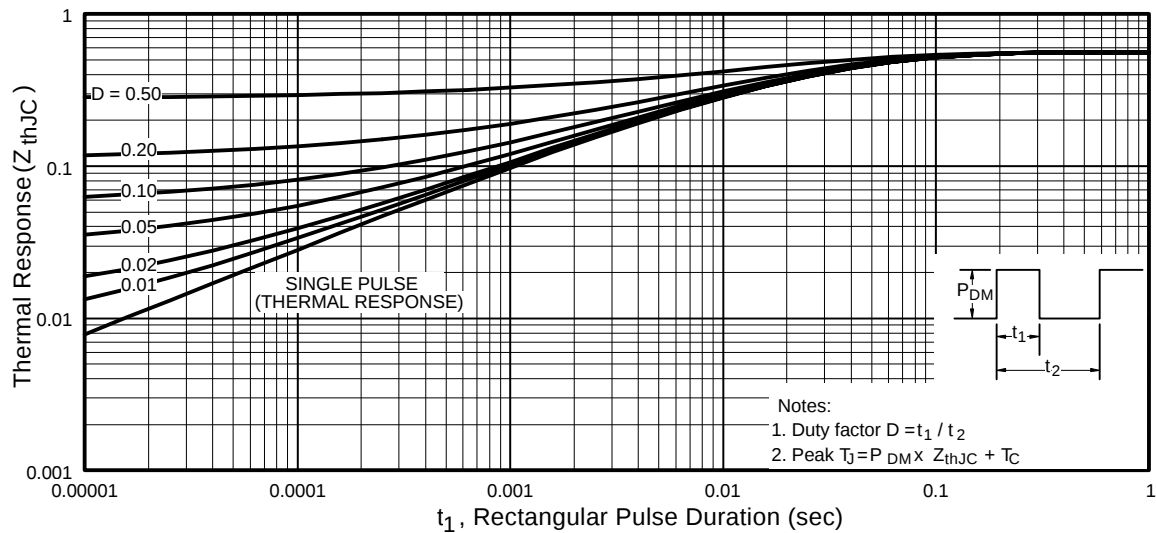
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



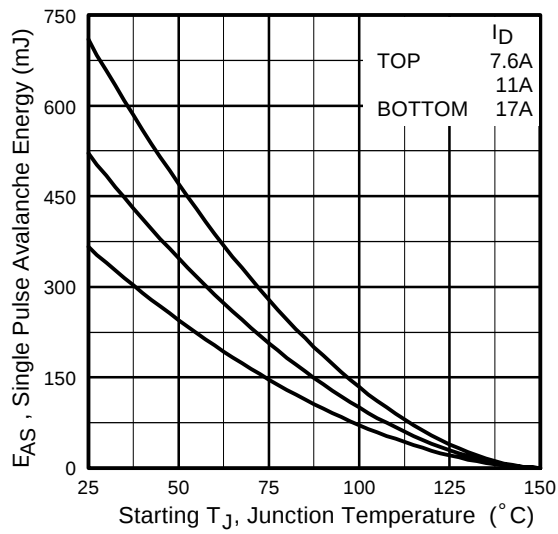
**Fig 10b.** Switching Time Waveforms



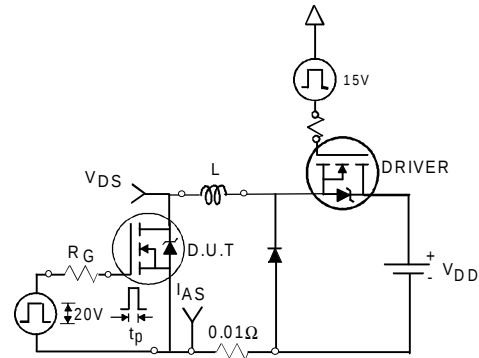
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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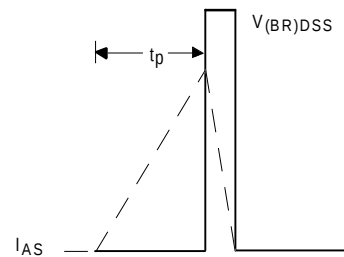
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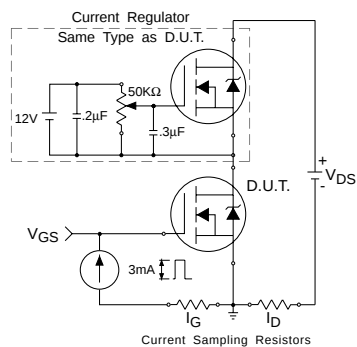
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



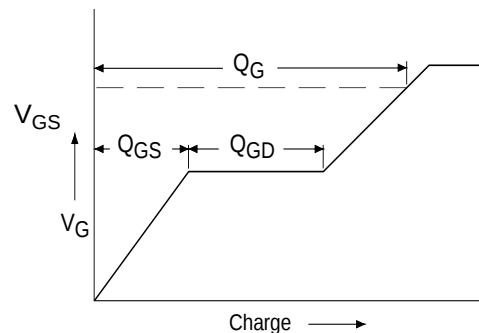
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

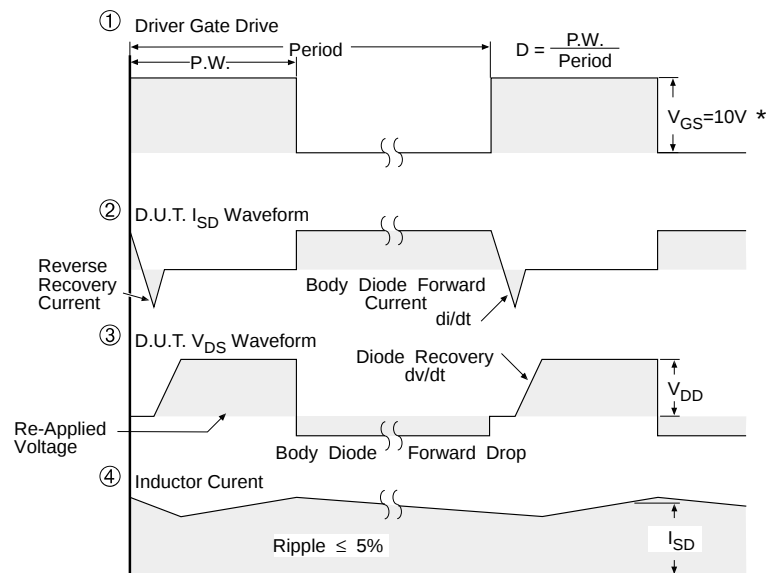
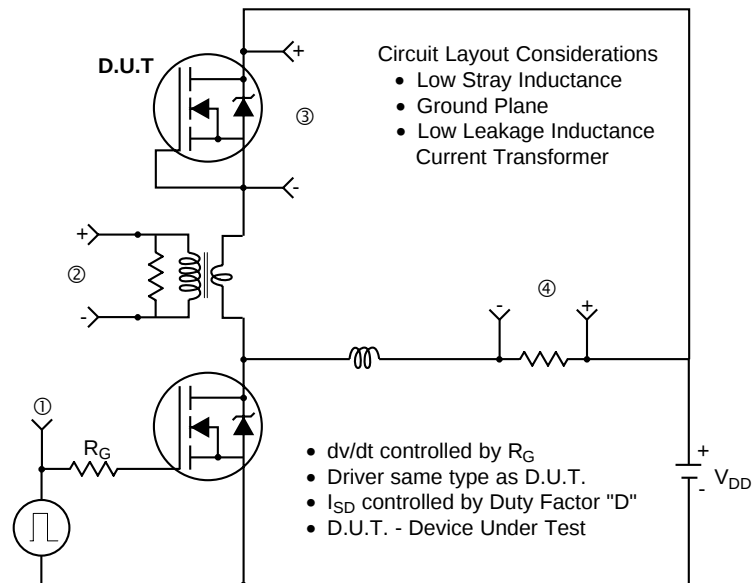


**Fig 13a.** Gate Charge Test Circuit



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

## Peak Diode Recovery dv/dt Test Circuit



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

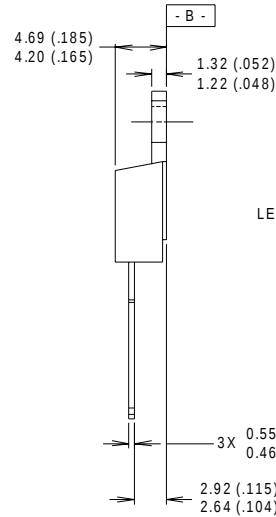
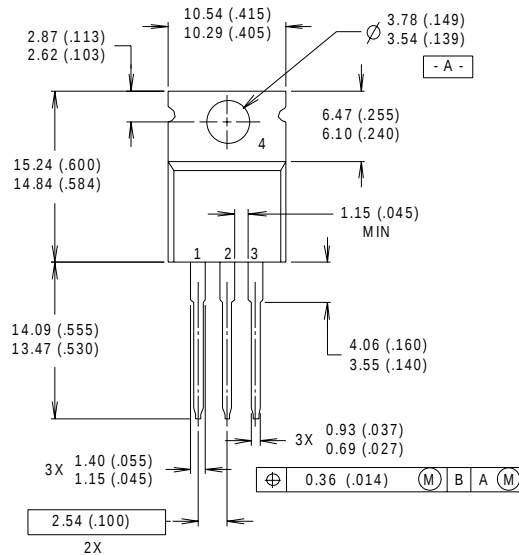
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

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## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS  
1 - GATE  
2 - DRAIN  
3 - SOURCE  
4 - DRAIN

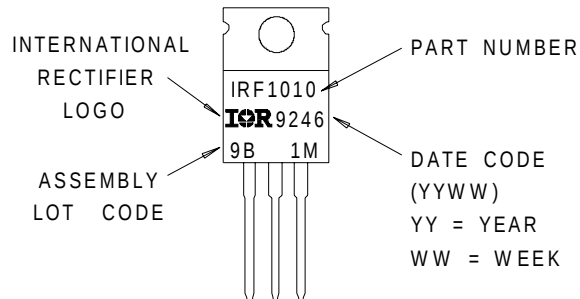
### NOTES:

- 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  
WITH ASSEMBLY  
LOT CODE 9B1M



Data and specifications subject to change without notice.  
This product has been designed and qualified for the industrial market.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

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