

International  
**IR** Rectifier

**SMPS MOSFET**

**IRF840A**

HEXFET® Power MOSFET

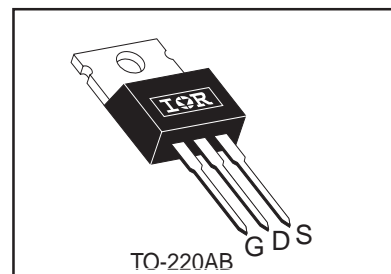
#### Applications

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

$V_{DSS}$	$R_{ds(on)}$ max	$I_D$
500V	0.85Ω	8.0A

#### 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
- Effective  $C_{oss}$  Specified (See AN1001)



#### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	8.0	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	5.1	
$I_{DM}$	Pulsed Drain Current ①	32	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 30	V
$dv/dt$	Peak Diode Recovery $dv/dt$ ③	5.0	V/ns
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

#### Typical SMPS Topologies:

- Two Transistor Forward
- Half Bridge
- Full Bridge

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.58	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.85	$\Omega$	$V_{GS} = 10V, I_D = 4.8A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25 250	$\mu A$	$V_{DS} = 500V, V_{GS} = 0V$ $V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	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)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$g_{fs}$	Forward Transconductance	3.7	—	—	S	$V_{DS} = 50V, I_D = 4.8A$
$Q_g$	Total Gate Charge	—	—	38	nC	$I_D = 8.0A$ $V_{DS} = 400V$ $V_{GS} = 10V$ , See Fig. 6 and 13 ④
$Q_{gs}$	Gate-to-Source Charge	—	—	9.0		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	18		
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{DD} = 250V$ $I_D = 8.0A$ $R_G = 9.1\Omega$ $R_D = 31\Omega$ , See Fig. 10 ④
$t_r$	Rise Time	—	23	—		
$t_{d(off)}$	Turn-Off Delay Time	—	26	—		
$t_f$	Fall Time	—	19	—		
$C_{iss}$	Input Capacitance	—	1018	—		
$C_{oss}$	Output Capacitance	—	155	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ , See Fig. 5 $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 400V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 0V$ to $400V$ ⑤
$C_{rss}$	Reverse Transfer Capacitance	—	8.0	—		
$C_{oss}$	Output Capacitance	—	1490	—		
$C_{oss}$	Output Capacitance	—	42	—		
$C_{oss\ eff.}$	Effective Output Capacitance	—	56	—		

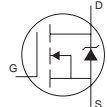
## Avalanche Characteristics

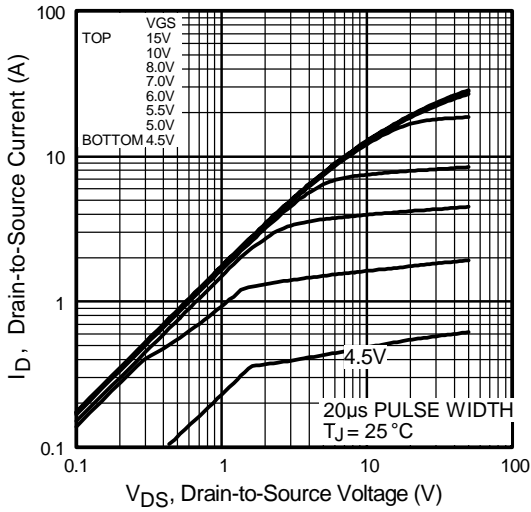
	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy②	—	510	mJ
$I_{AR}$	Avalanche Current①	—	8.0	A
$E_{AR}$	Repetitive Avalanche Energy①	—	13	mJ

## Thermal Resistance

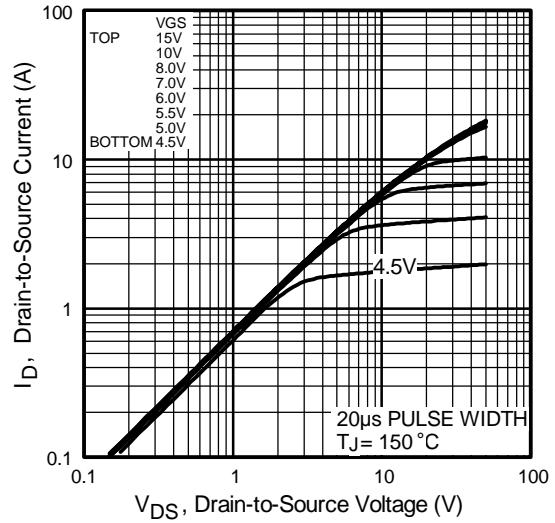
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.0	$^\circ\text{C/W}$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

## Diode Characteristics

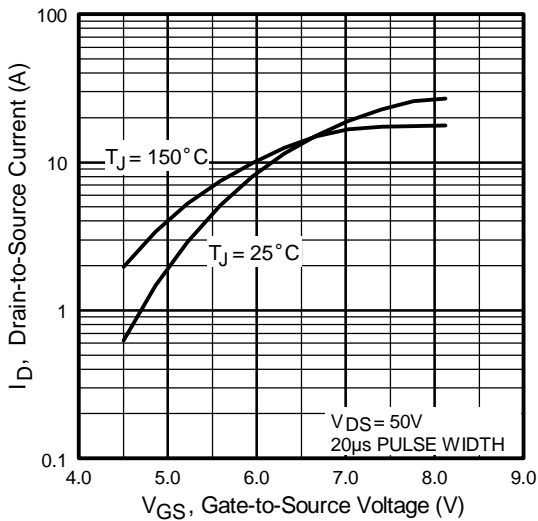
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	8.0	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	32		
$V_{SD}$	Diode Forward Voltage	—	—	2.0	V	$T_J = 25^\circ\text{C}, I_S = 8.0A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	422	633	ns	$T_J = 25^\circ\text{C}, I_F = 8.0A$
$Q_{rr}$	Reverse Recovery Charge	—	2.16	3.24	$\mu\text{C}$	$di/dt = 100A/\mu\text{s}$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				



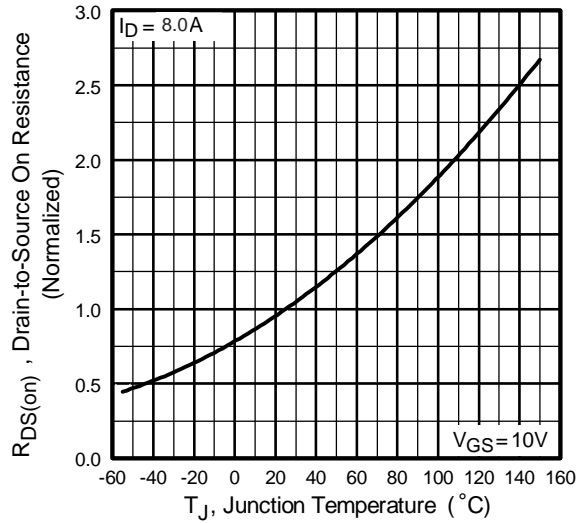
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

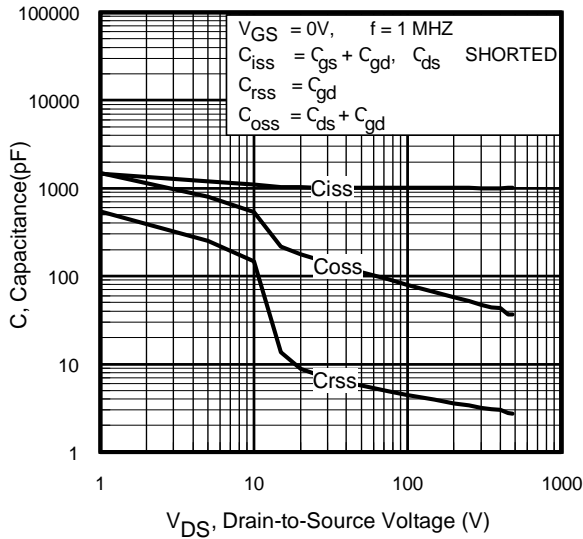


**Fig 3.** Typical Transfer Characteristics

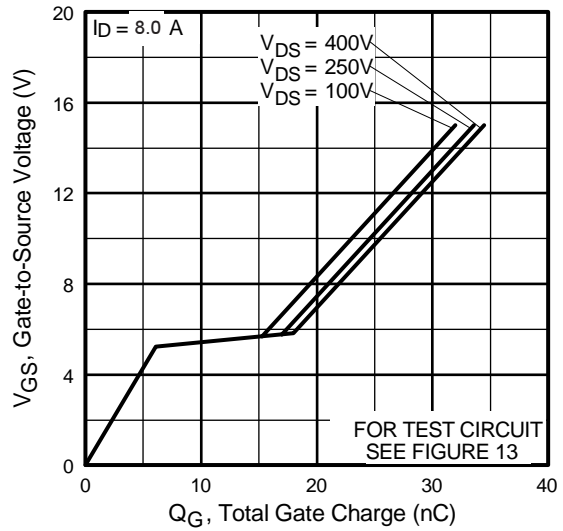


**Fig 4.** Normalized On-Resistance Vs. Temperature

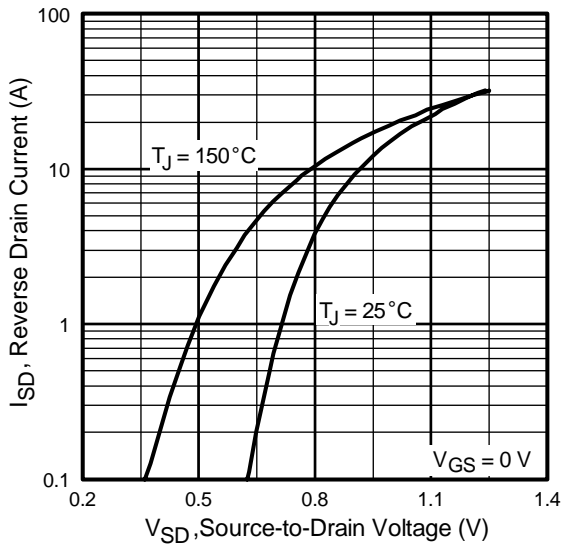
# IRF840A



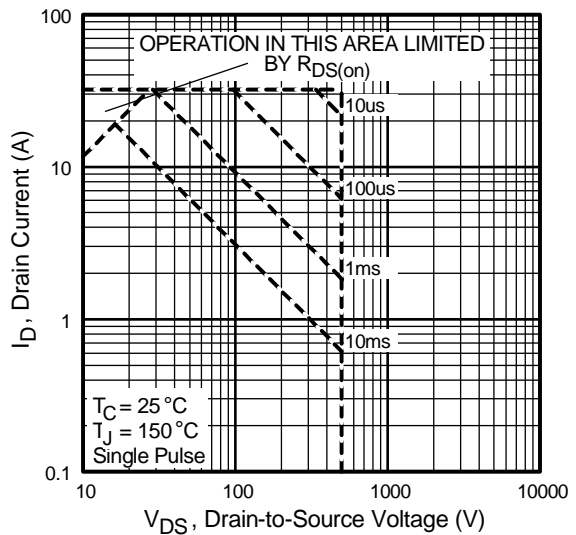
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



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



**Fig 8.** Maximum Safe Operating Area

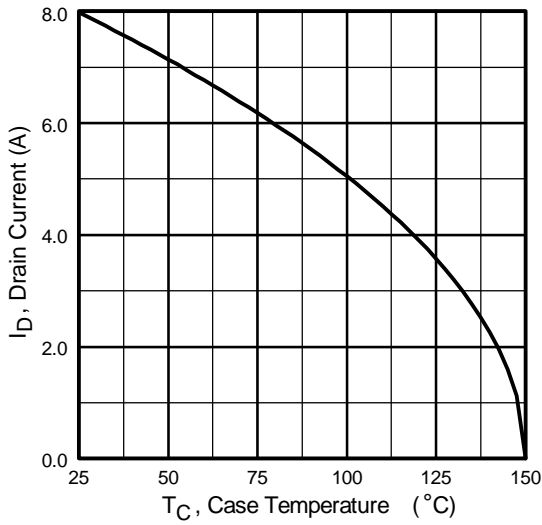


Fig 9. Maximum Drain Current Vs. Case Temperature

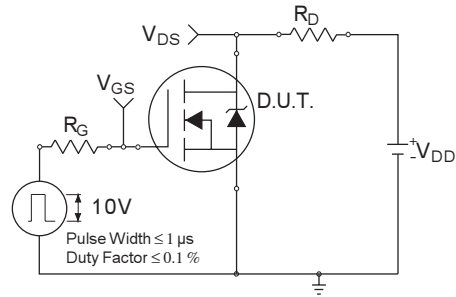


Fig 10a. Switching Time Test Circuit

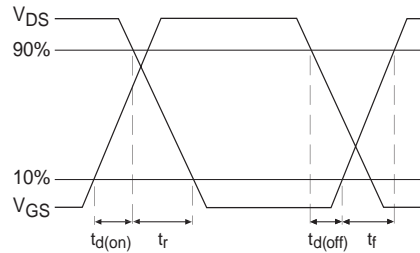


Fig 10b. Switching Time Waveforms

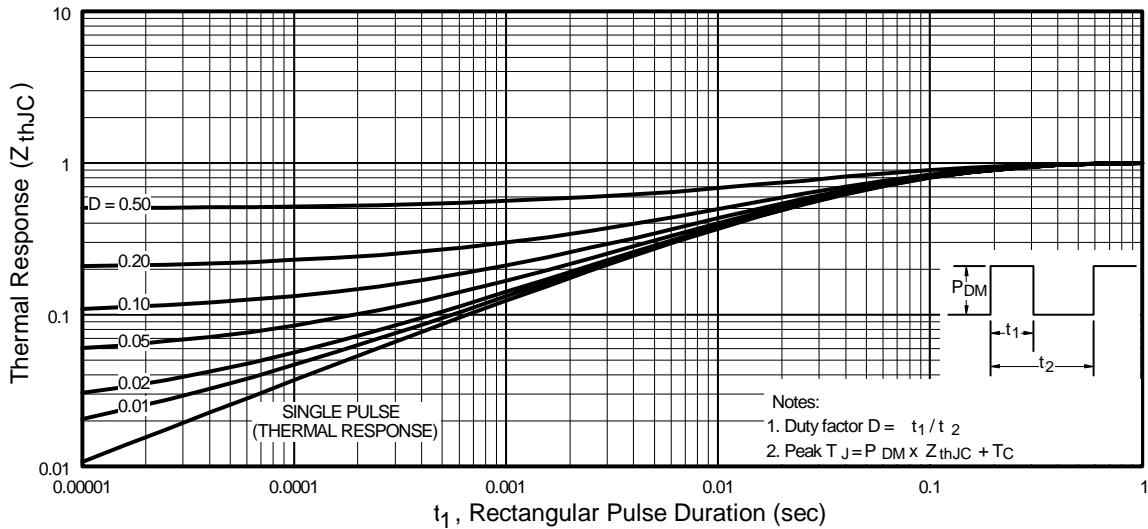
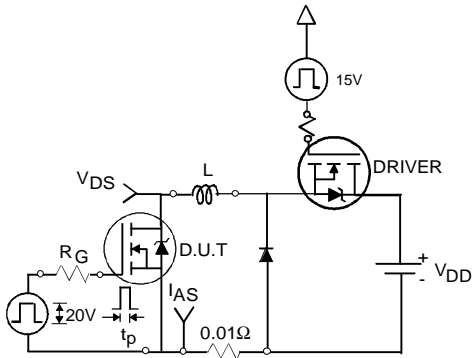
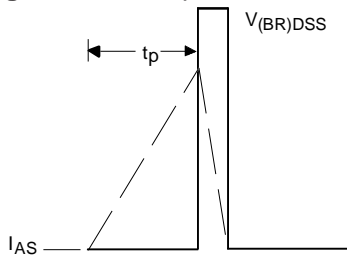


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

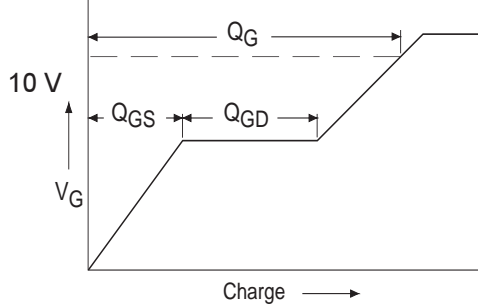
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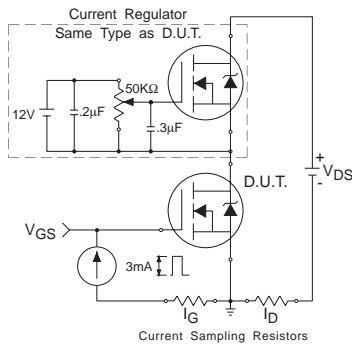
**Fig 12a.** Unclamped Inductive Test Circuit



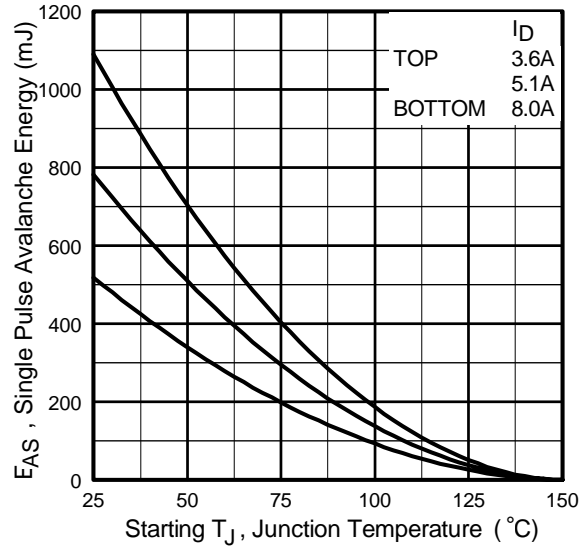
**Fig 12b.** Unclamped Inductive Waveforms



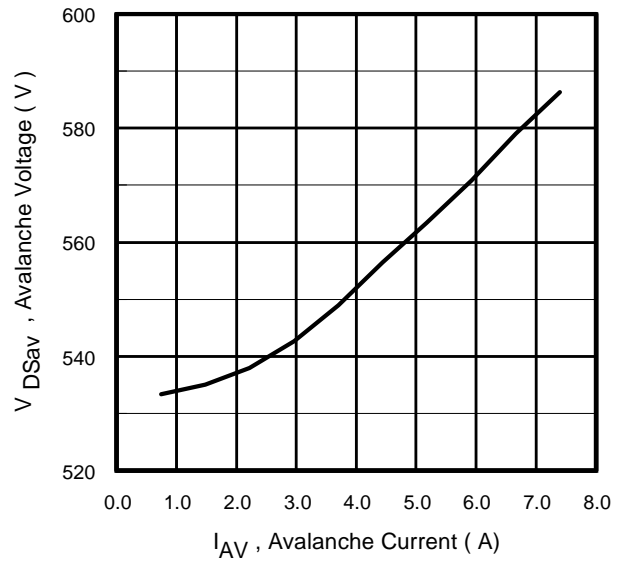
**Fig 13a.** Basic Gate Charge Waveform



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

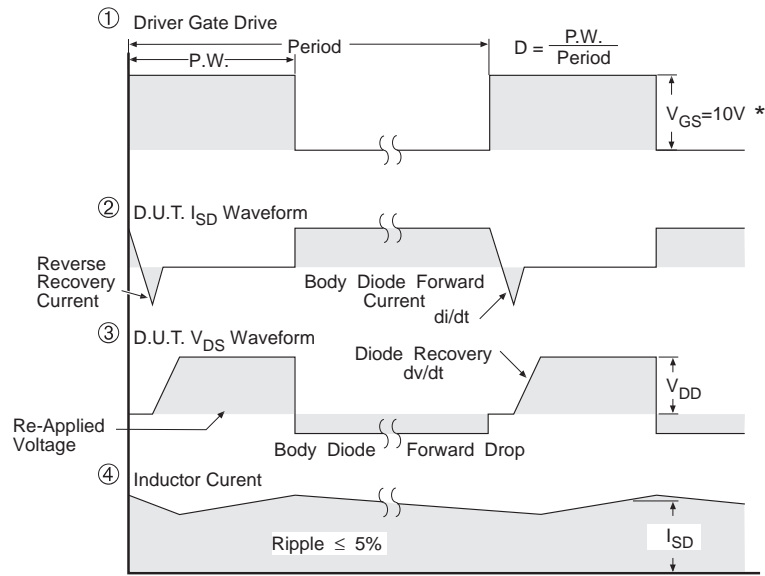
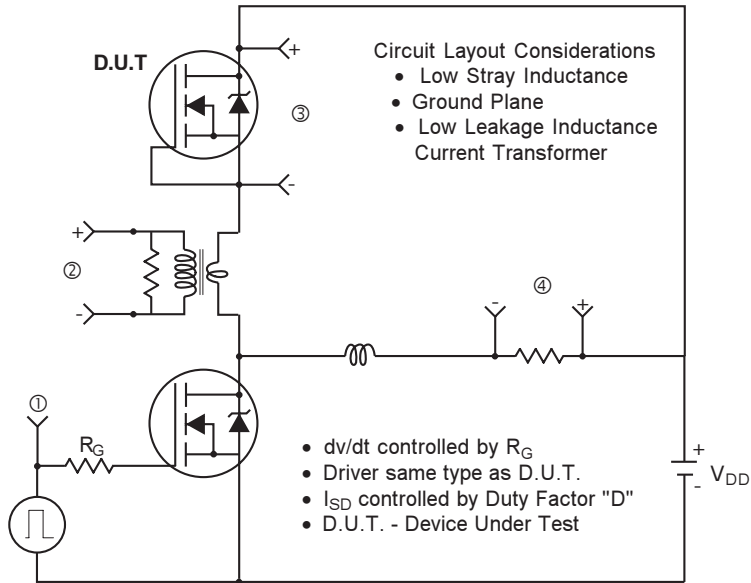


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**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**

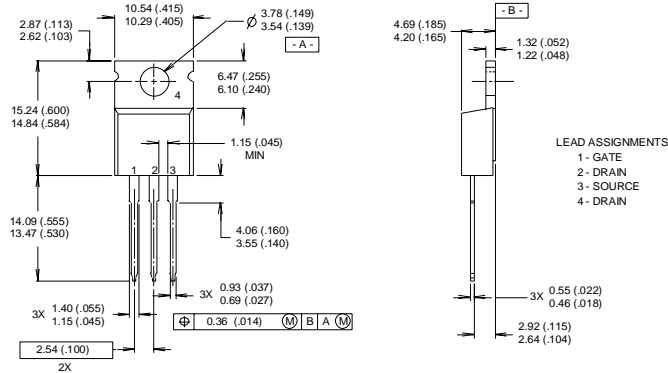
# IRF840A



## Package Outline

### TO-220AB Outline

Dimensions are shown in millimeters (inches)



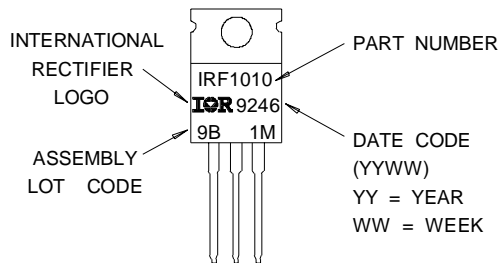
- NOTES:
- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
  - 2 CONTROLLING DIMENSION : INCH
  - 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
  - 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

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

## Part Marking Information

### TO-220AB

EXAMPLE : THIS IS AN IRF1010  
 WITH ASSEMBLY  
 LOT CODE 9B1M



#### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 16 \text{ mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 8.0\text{A}$ . (See Figure 12)
- ③  $I_{SD} \leq 8.0\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- 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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