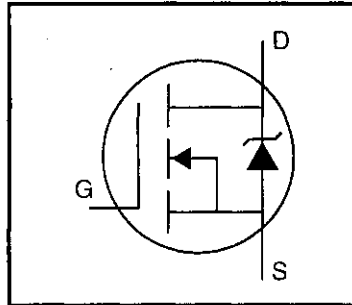


## HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Isolated Central Mounting Hole
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DS} = 60V$$

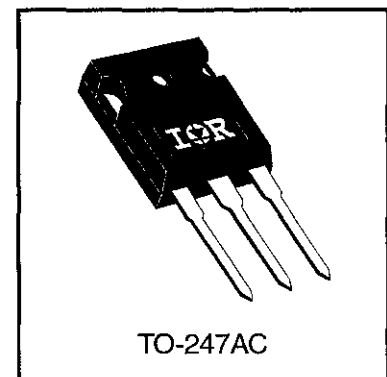
$$R_{DS(on)} = 0.028\Omega$$

$$I_D = 57A$$

## Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.



TO-247AC

DATA  
SHEETS

## Absolute Maximum Ratings

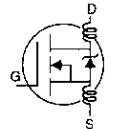
	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10 V	57	A
$I_D$ @ $T_C = 100^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10 V	40	
$I_{DM}$	Pulsed Drain Current ①	230	
$P_D$ @ $T_C = 25^\circ C$	Power Dissipation	180	W
	Linear Derating Factor	1.2	W/°C
$V_{GS}$	Gate-to-Source Voltage	±20	V
$E_{AS}$	Single Pulse Avalanche Energy ②	53	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1 N•m)	

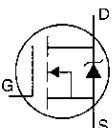
## Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.83	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V	$V_{GS}=0V$ , $I_D=250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.060	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.028	$\Omega$	$V_{GS}=10V$ , $I_D=34A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS}=V_{GS}$ , $I_D=250\mu A$
$g_{fs}$	Forward Transconductance	17	—	—	S	$V_{DS}=25V$ , $I_D=34A$ ④
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS}=60V$ , $V_{GS}=0V$
		—	—	250		$V_{DS}=48V$ , $V_{GS}=0V$ , $T_J=150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS}=20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS}=-20V$
$Q_g$	Total Gate Charge	—	—	95	nC	$I_D=52A$
$Q_{gs}$	Gate-to-Source Charge	—	—	27		$V_{DS}=48V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	46		$V_{GS}=10V$ See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	19	—	ns	$V_{DD}=30V$
$t_r$	Rise Time	—	120	—		$I_D=52A$
$t_{d(off)}$	Turn-Off Delay Time	—	55	—		$R_G=9.1\Omega$
$t_f$	Fall Time	—	86	—		$R_D=0.56\Omega$ See Figure 10 ④
$L_D$	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	13	—		
$C_{iss}$	Input Capacitance	—	2500	—	pF	$V_{GS}=0V$
$C_{oss}$	Output Capacitance	—	1200	—		$V_{DS}=25V$
$C_{rss}$	Reverse Transfer Capacitance	—	200	—		$f=1.0\text{MHz}$ See Figure 5


**Source-Drain Ratings and Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	57	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	230		
$V_{SD}$	Diode Forward Voltage	—	—	2.5	V	$T_J=25^\circ\text{C}$ , $I_S=57A$ , $V_{GS}=0V$ ④
$t_{rr}$	Reverse Recovery Time	—	140	300	ns	$T_J=25^\circ\text{C}$ , $I_F=52A$
$Q_{rr}$	Reverse Recovery Charge	—	1.2	2.8	$\mu C$	$di/dt=100A/\mu s$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ )				

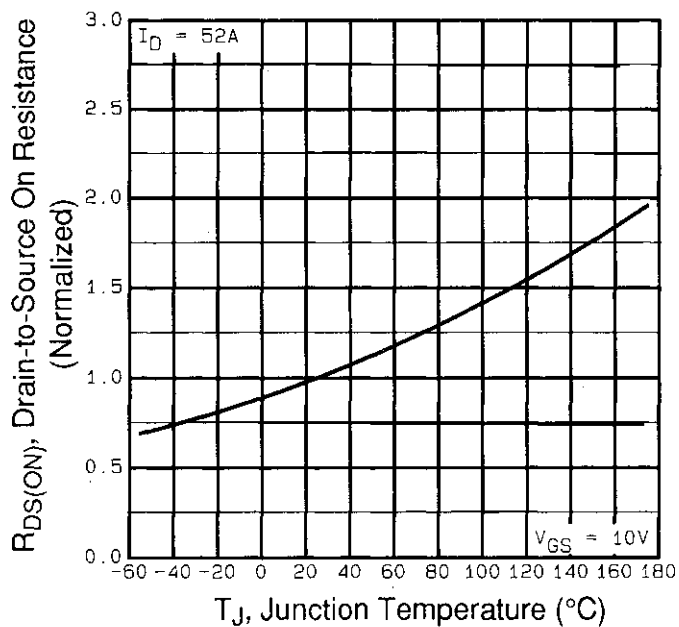
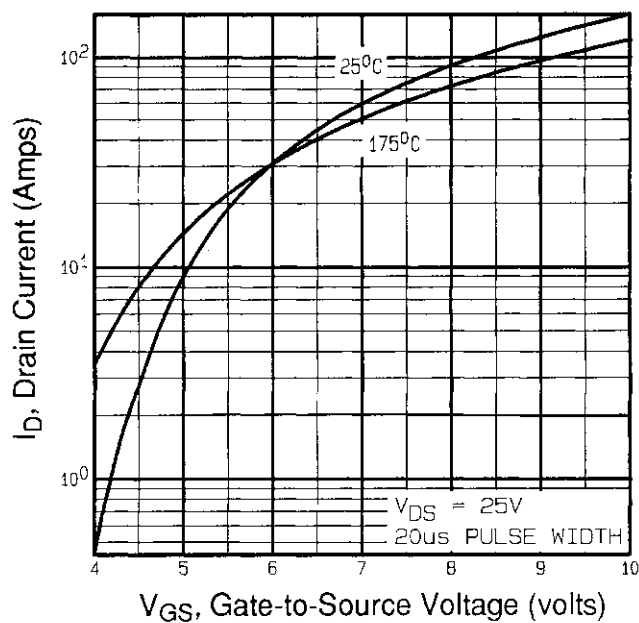
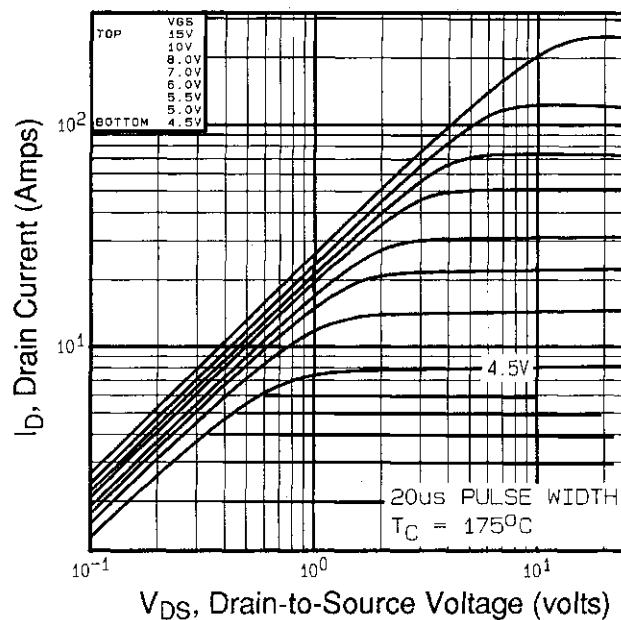
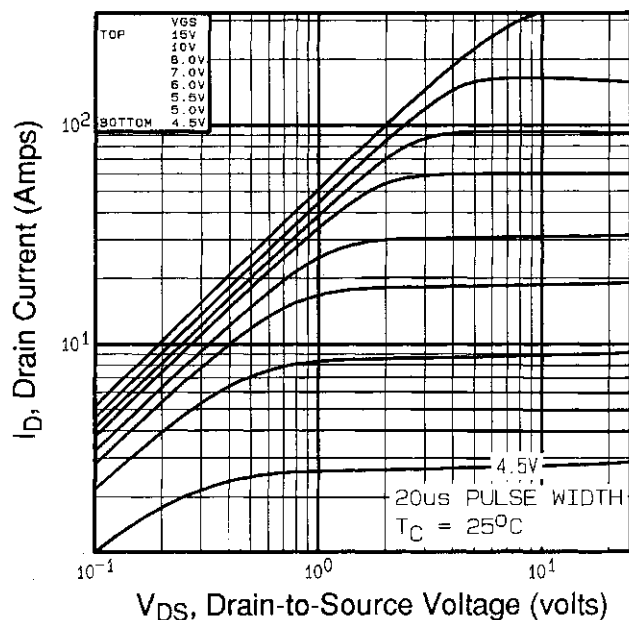
**Notes:**

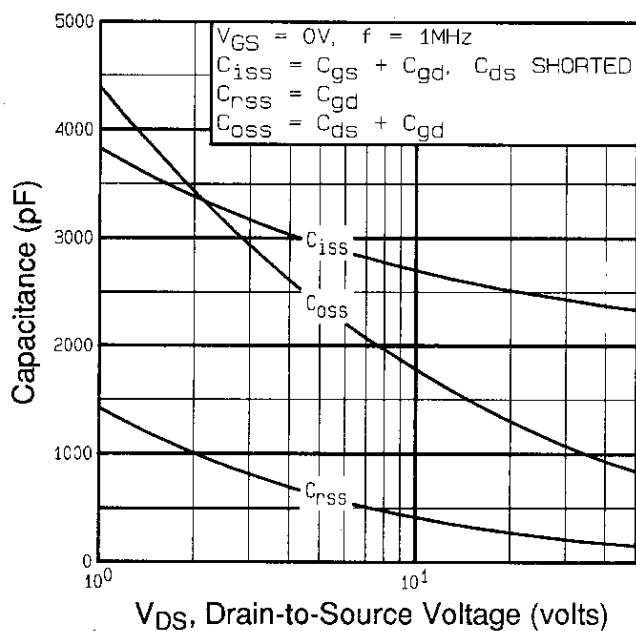
① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)

③  $I_{SD} \leq 52A$ ,  $di/dt \leq 250A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$

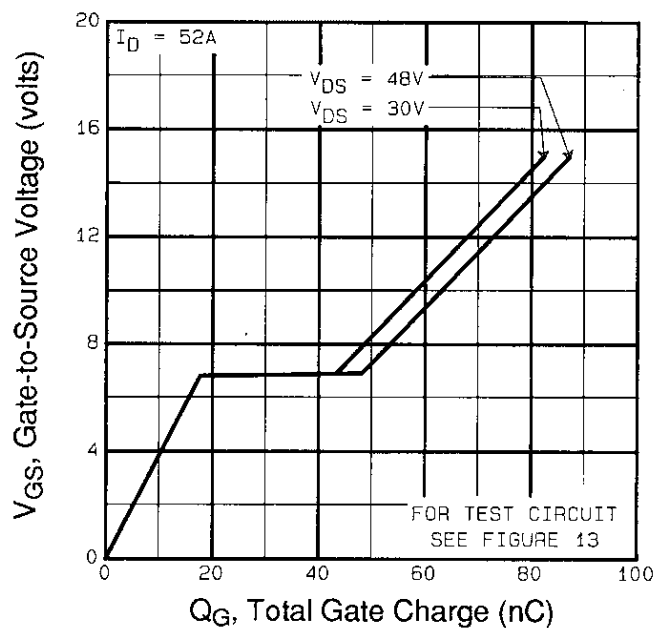
②  $V_{DD}=25V$ , starting  $T_J=25^\circ\text{C}$ ,  $L=19\mu H$ ,  $R_G=25\Omega$ ,  $I_{AS}=57A$  (See Figure 12)

④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

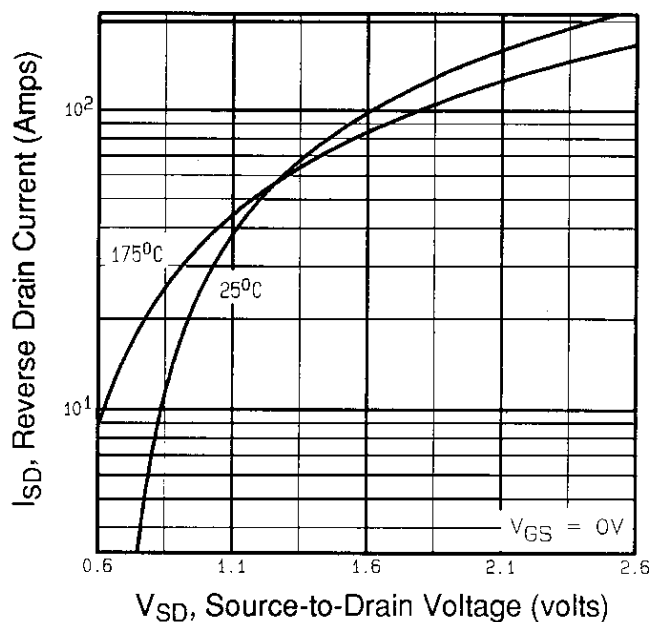




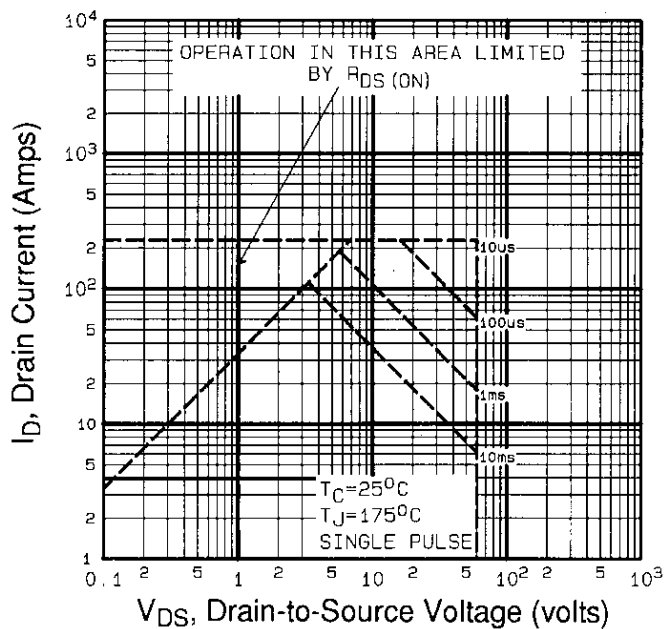
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



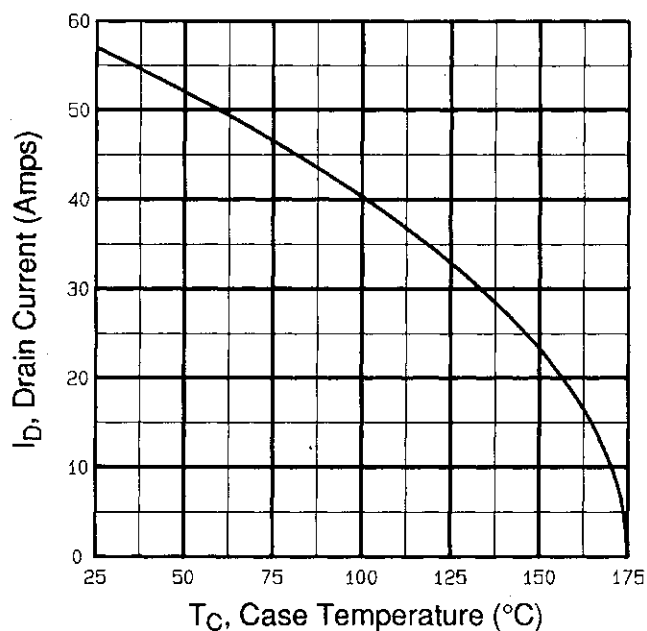
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



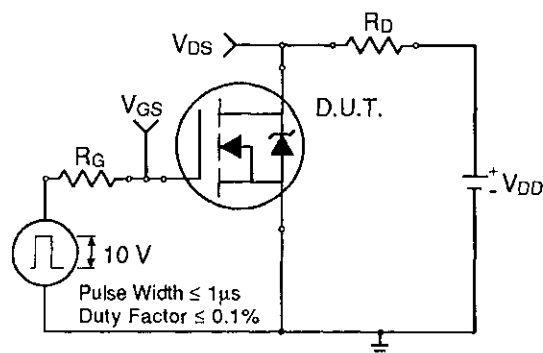
**Fig 7.** Typical Source-Drain Diode Forward Voltage



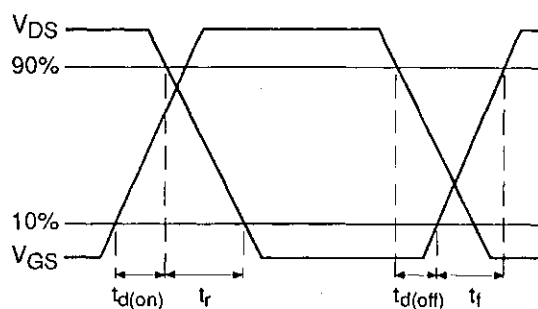
**Fig 8.** Maximum Safe Operating Area



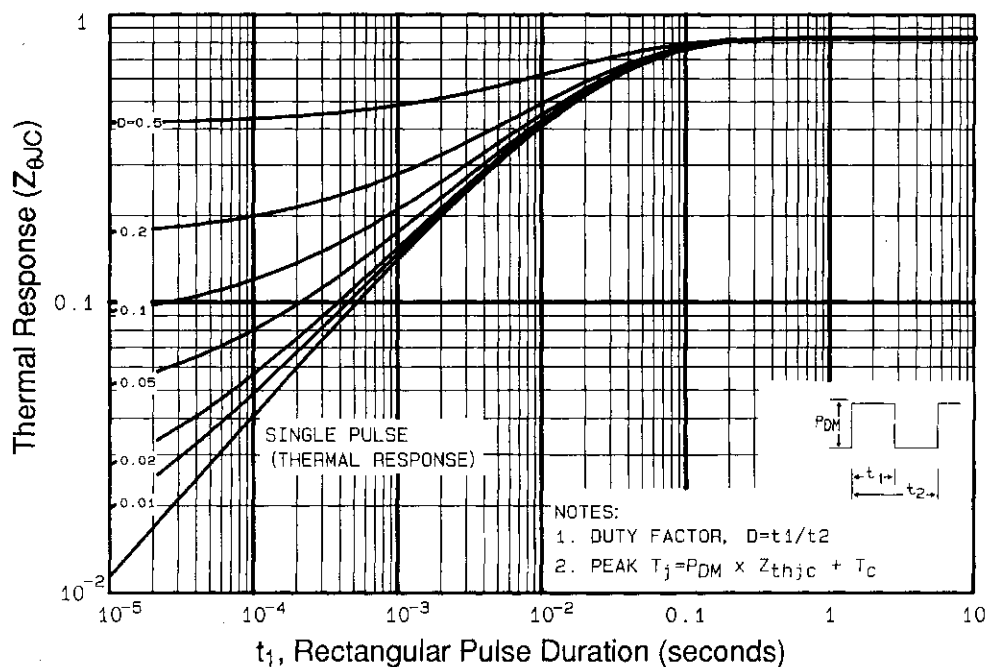
**Fig 9.** Maximum Drain Current Vs. Case Temperature



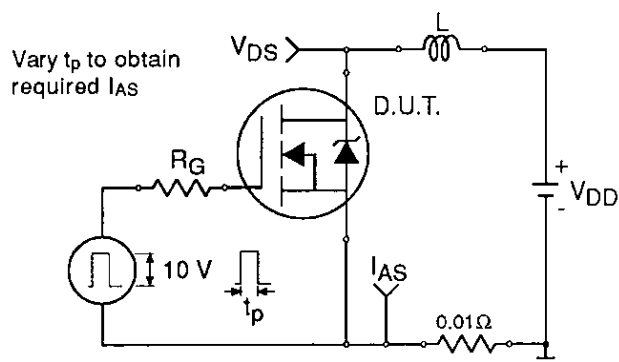
**Fig 10a.** Switching Time Test Circuit



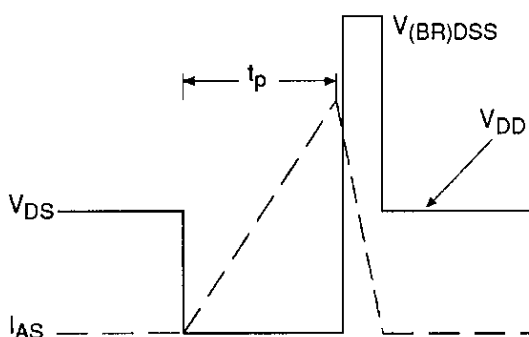
**Fig 10b.** Switching Time Waveforms



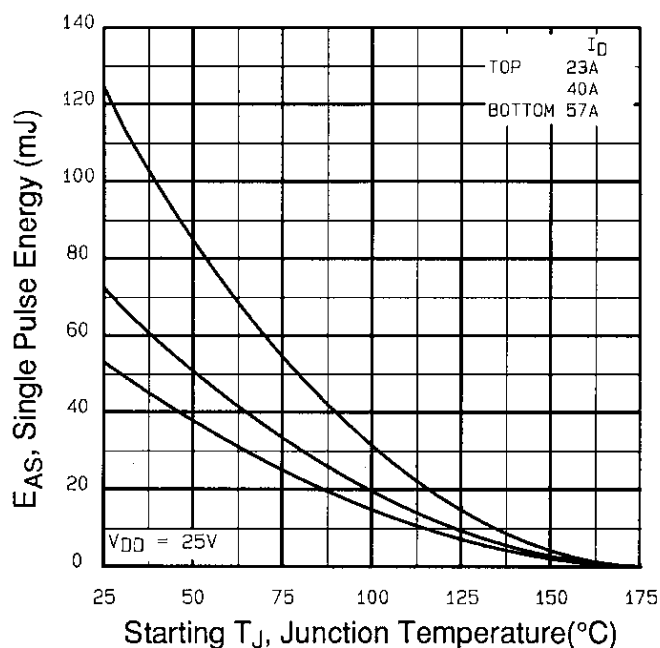
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



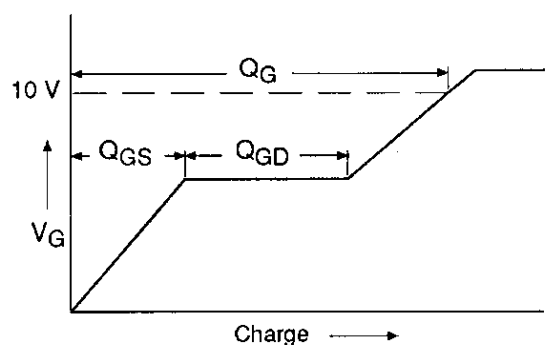
**Fig 12a.** Unclamped Inductive Test Circuit



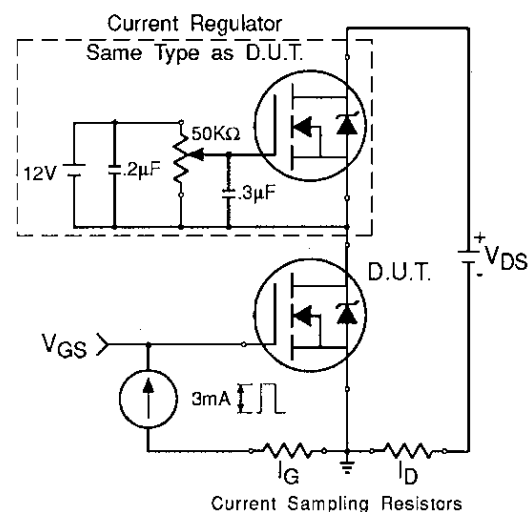
**Fig 12b.** Unclamped Inductive Waveforms



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



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



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

**Appendix A:** Figure 14, Peak Diode Recovery  $dv/dt$  Test Circuit – See page 1505

**Appendix B:** Package Outline Mechanical Drawing – See page 1511

**Appendix C:** Part Marking Information – See page 1517

**International**  
**IR Rectifier**