Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

International
IOR Rectifier

PD - 91688A

PRELIMINARY

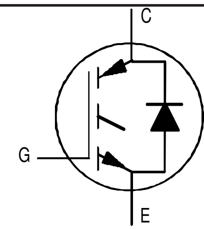
IRG4PSH71KD

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Short Circuit Rated
UltraFast IGBT

Features

- Hole-less clip/pressure mount package compatible with TO-247 and TO-264, with reinforced pins
- High short circuit rating IGBTs, optimized for motorcontrol
- Minimum switching losses combined with low conduction losses
- Tightest parameter distribution
- IGBT co-packaged with ultrafast soft recovery antiparallel diode
- Creepage distance increased to 5.35mm



n-channel

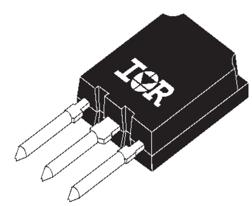
V_{CES} = 1200V

$V_{CE(on)}$ typ. = 2.97V

@V_{GE} = 15V, I_C = 42A

Benefits

- Highest current rating copack IGBT
- Maximum power density, twice the power handling of the TO-247, less space than TO-264
- HEXFRED™ diode optimized for operation with IGBT, to minimize EMI, noise and switching losses



SUPER - 247

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	78	A
I_C @ T_C = 100°C	Continuous Collector Current	42	
I_{CM}	Pulsed Collector Current ①	156	
I_{LM}	Clamped Inductive Load Current ②	156	
I_F @ T_C = 100°C	Diode Continuous Forward Current	42	
I_{FM}	Diode Maximum Forward Current	156	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	350	W
P_D @ T_C = 100°C	Maximum Power Dissipation	140	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal Resistance\ Mechanical

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	——	——	0.36	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	——	——	0.69	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	——	0.24	——	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	——	——	38	
	Recommended Clip Force	20.0(2.0)	——	——	N (kgf)
	Weight	——	6 (0.21)	——	g (oz)

5/11/99

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage③	1200	—	—	V	V_{GE} = 0V, I_C = 250µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.1	—	V/°C	V_{GE} = 0V, I_C = 10mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.97	3.9	V	I_C = 42A	V_{GE} = 15V
		—	3.44	—		I_C = 78A	See Fig. 2, 5
		—	2.60	—		I_C = 42A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		V_{CE} = V_{GE}, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-12	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.5mA	
g_{fe}	Forward Transconductance ④	25	38	—	S	V_{CE} = 50V, I_C = 42A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 1200V	
		—	—	10	mA	V_{GE} = 0V, V_{CE} = 1200V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	—	2.5	3.7	V	I_C = 42A	See Fig. 13
		—	2.4	—		I_C = 42A, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±20V	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions		
Q_g	Total Gate Charge (turn-on)	—	410	610	nC	I_C = 42A		
Q_{ge}	Gate - Emitter Charge (turn-on)	—	47	70		V_{CC} = 400V	See Fig.8	
Q_{gc}	Gate - Collector Charge (turn-on)	—	145	220		V_{GE} = 15V		
$t_{d(on)}$	Turn-On Delay Time	—	67	—	ns			
t_r	Rise Time	—	84	—		T_J = 25°C		
$t_{d(off)}$	Turn-Off Delay Time	—	230	350		I_C = 42A, V_{CC} = 800V		
t_f	Fall Time	—	130	190		V_{GE} = 15V, R_G = 5.0Ω		
E_{on}	Turn-On Switching Loss	—	5.68	—	mJ	Energy losses include "tail"		
E_{off}	Turn-Off Switching Loss	—	3.23	—		and diode reverse recovery		
E_{ts}	Total Switching Loss	—	8.90	11.6		See Fig. 9,10,18		
t_{sc}	Short Circuit Withstand Time	10	—	—	µs	V_{CC} = 720V, T_J = 125°C		
						V_{GE} = 15V, R_G = 5.0Ω		
$t_{d(on)}$	Turn-On Delay Time	—	65	—	ns	T_J = 150°C,	See Fig. 11,18	
t_r	Rise Time	—	87	—		I_C = 42A, V_{CC} = 800V		
$t_{d(off)}$	Turn-Off Delay Time	—	370	—		V_{GE} = 15V, R_G = 5.0Ω		
t_f	Fall Time	—	290	—		Energy losses include "tail"		
E_{ts}	Total Switching Loss	—	13.7	—	mJ	and diode reverse recovery		
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package		
C_{ies}	Input Capacitance	—	5770	—	pF	V_{GE} = 0V		
C_{oes}	Output Capacitance	—	400	—		V_{CC} = 30V	See Fig. 7	
C_{res}	Reverse Transfer Capacitance	—	100	—		f = 1.0MHz		
t_{rr}	Diode Reverse Recovery Time	—	107	160	ns	T_J = 25°C	See Fig.	
		—	160	240		T_J = 125°C	14	I_F = 42A
I_{rr}	Diode Peak Reverse Recovery Current	—	10	15	A	T_J = 25°C	See Fig.	
		—	16	24		T_J = 125°C	15	V_R = 200V
Q_{rr}	Diode Reverse Recovery Charge	—	680	1020	nC	T_J = 25°C	See Fig.	
		—	1400	2100		T_J = 125°C	16	di/dt = 200A/µs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	—	250	—	A/µs	T_J = 25°C	See Fig.	
	During t_b	—	320	—		T_J = 125°C	17	

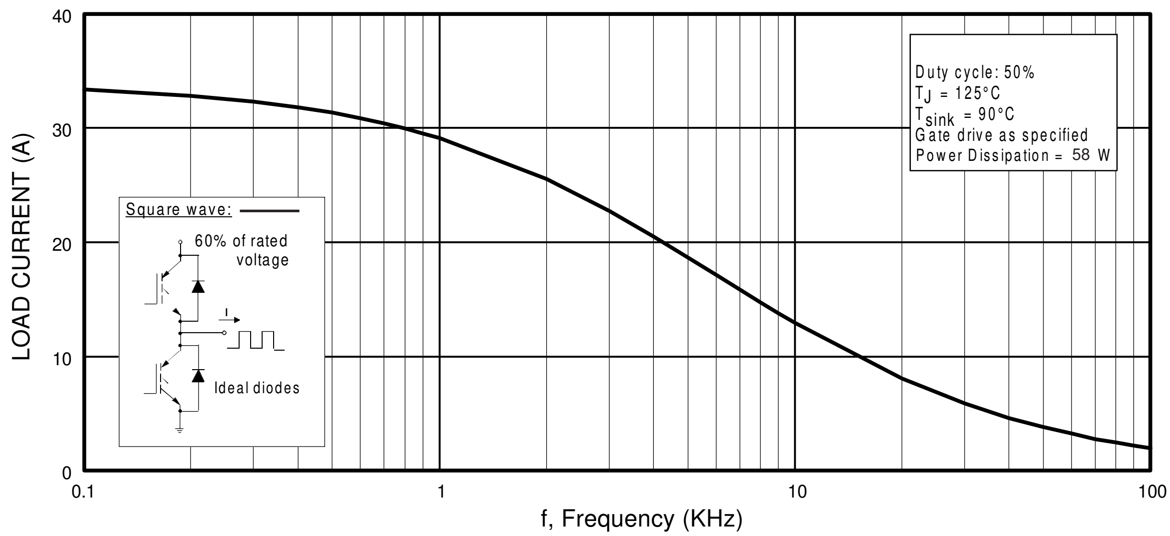


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

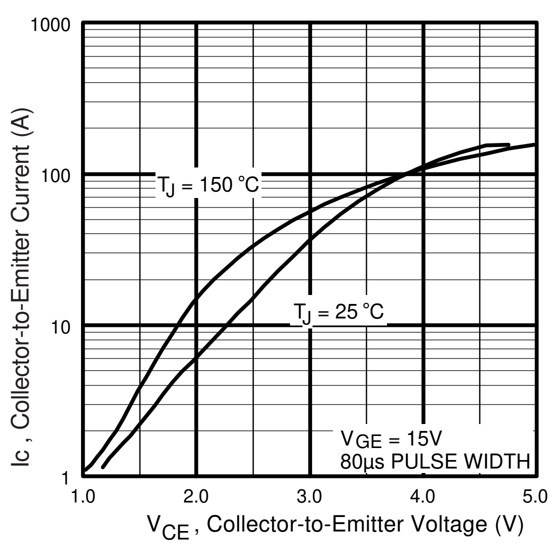


Fig. 2 - Typical Output Characteristics

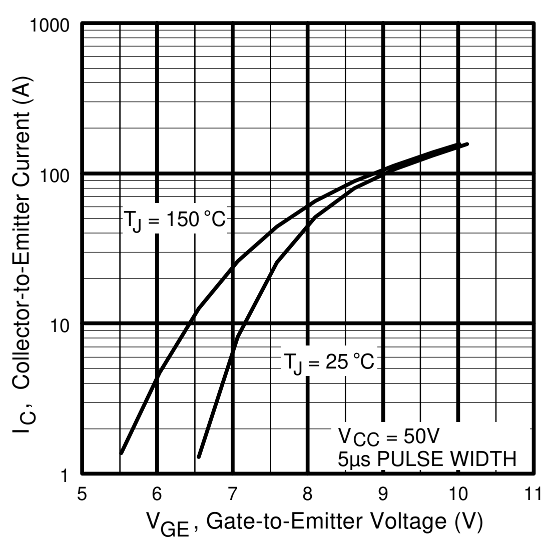


Fig. 3 - Typical Transfer Characteristics

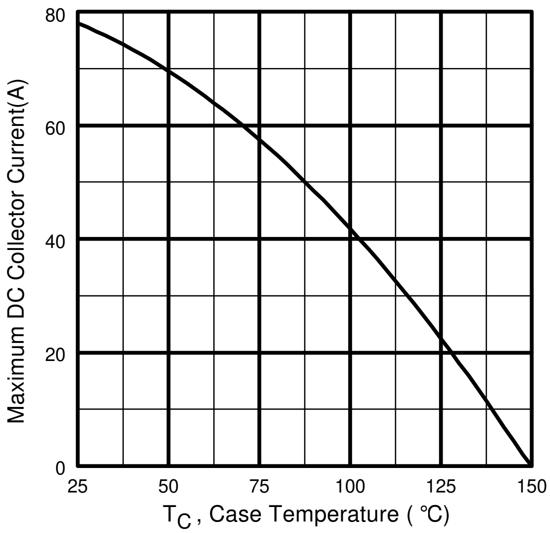


Fig. 4 - Maximum Collector Current vs. Case Temperature

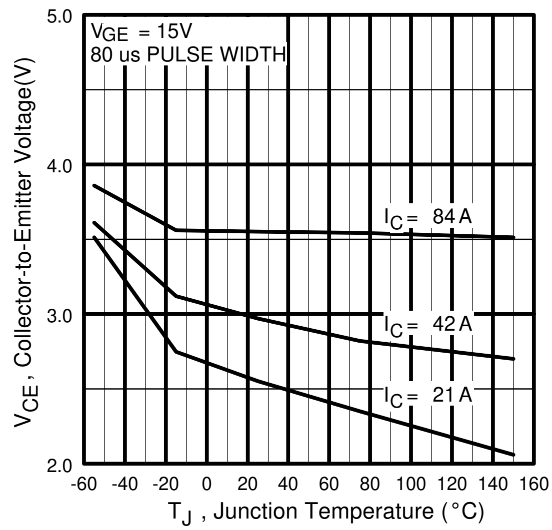


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

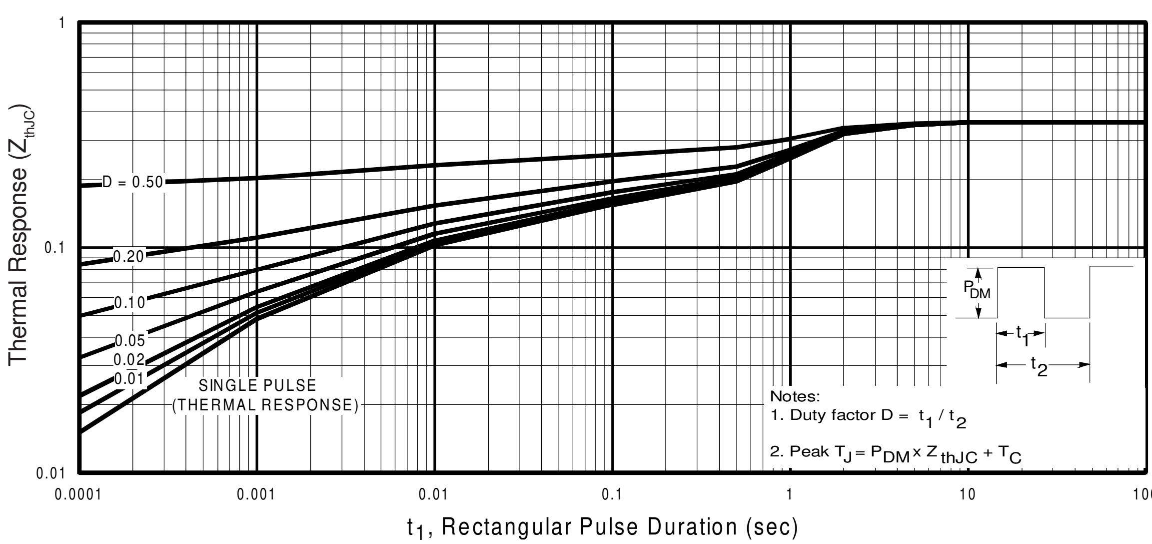


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

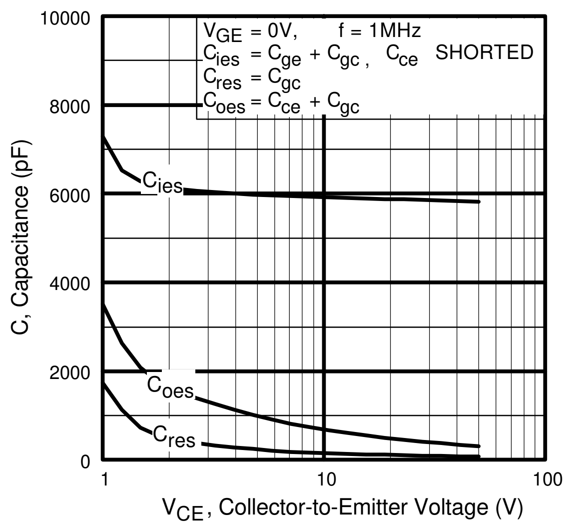


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

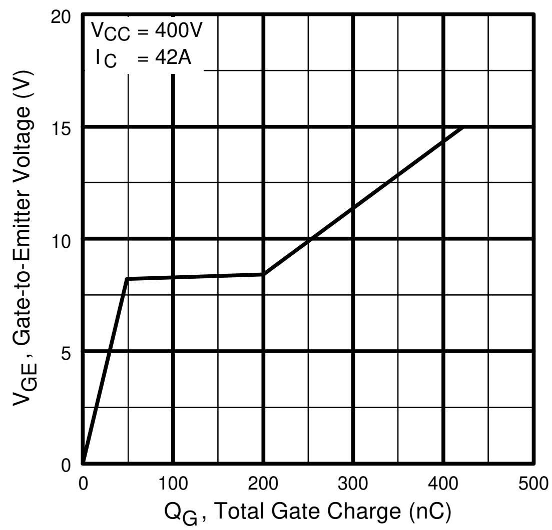


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

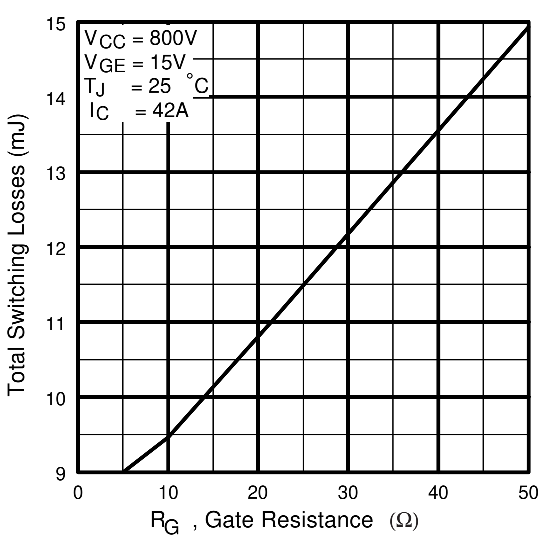


Fig. 9 - Typical Switching Losses vs. Gate Resistance

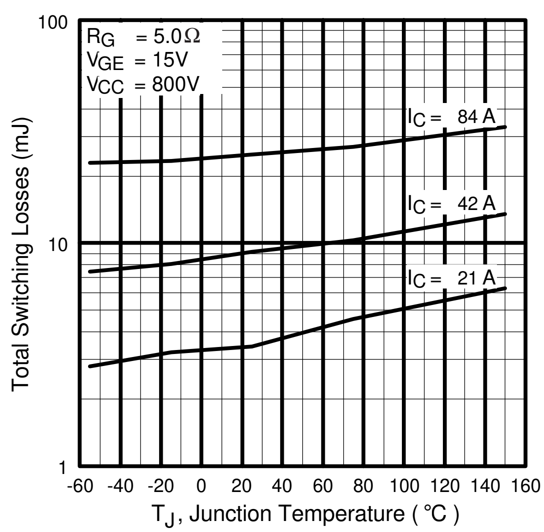
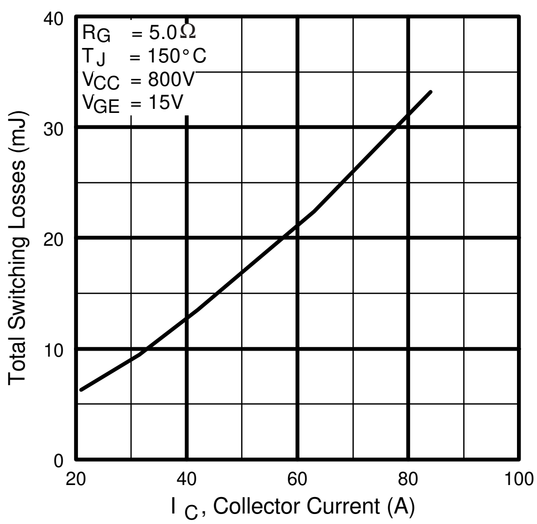
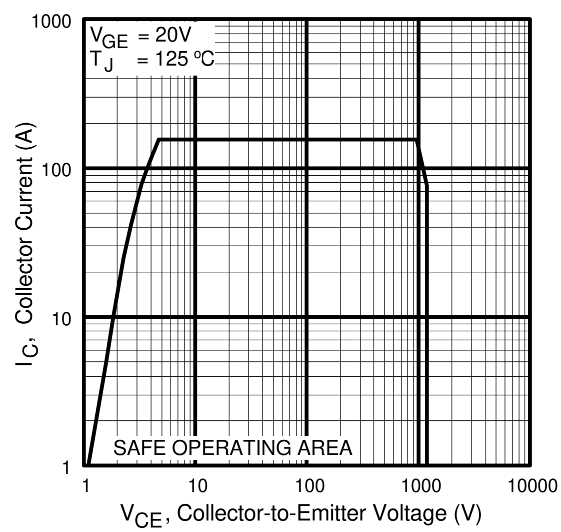


Fig. 10 - Typical Switching Losses vs. Junction Temperature

(Ω)





Collector-to-Emitter Current

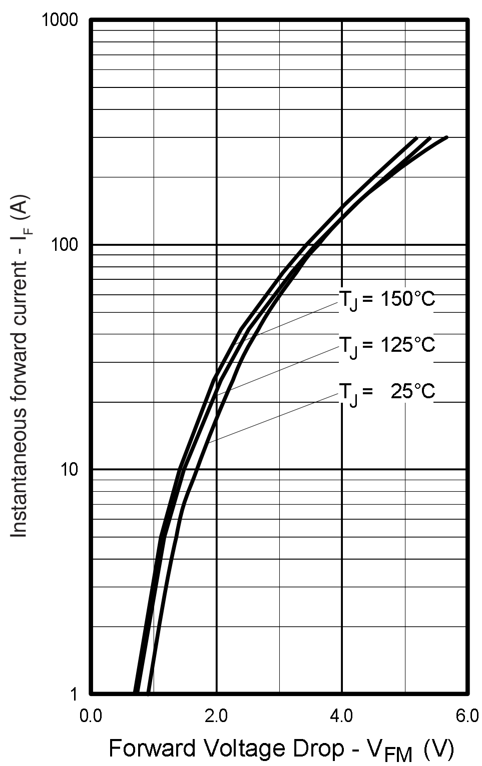


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

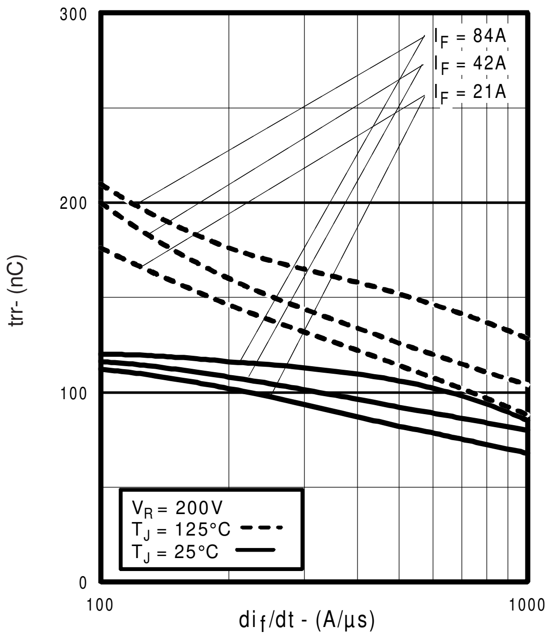


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

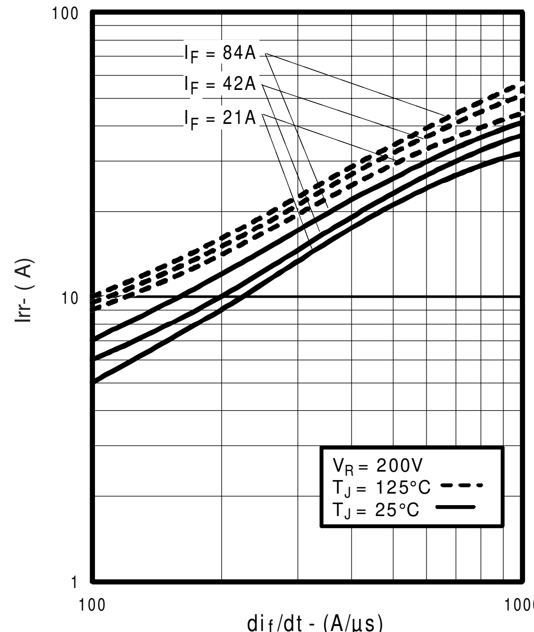


Fig. 15 - Typical Recovery Current vs. di_f/dt

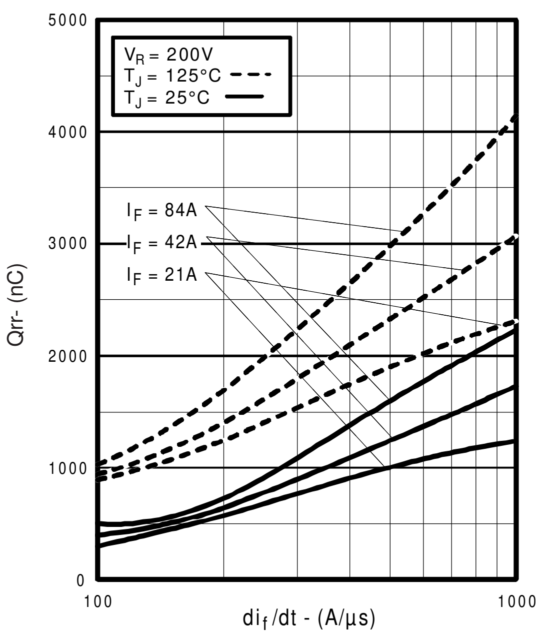


Fig. 16 - Typical Stored Charge vs. di_f/dt

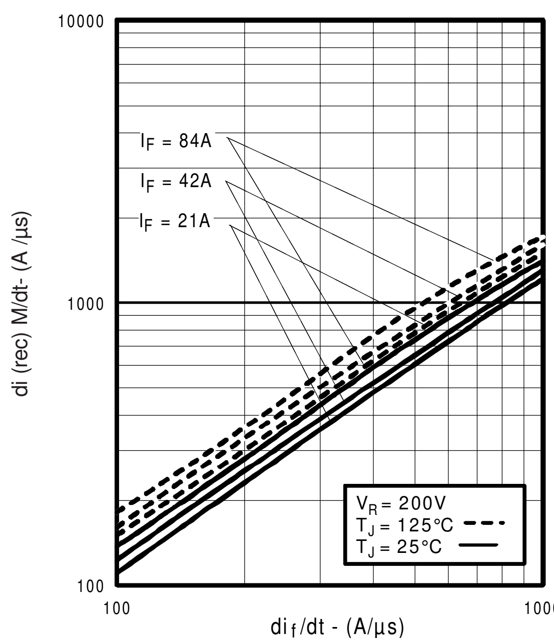


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

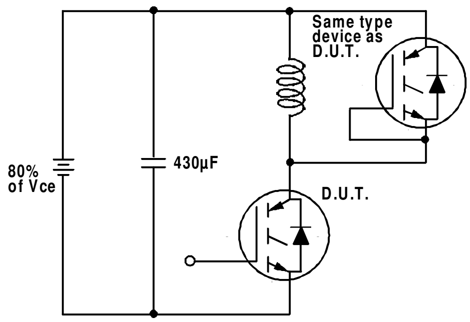


Fig. 18a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

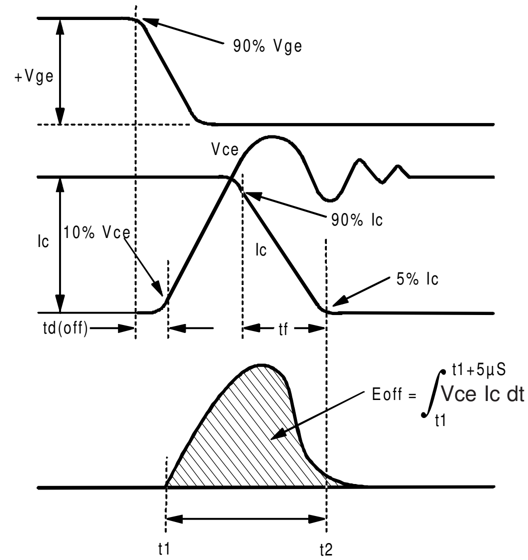


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

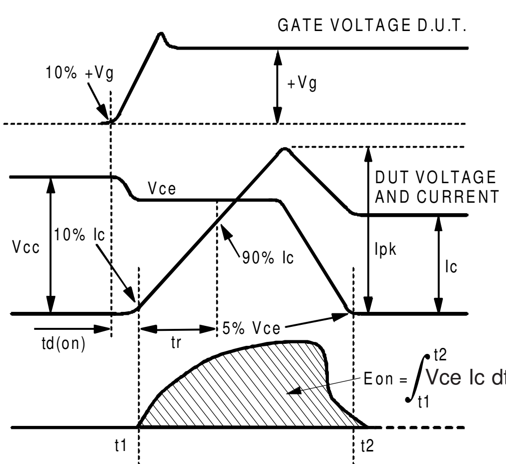


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

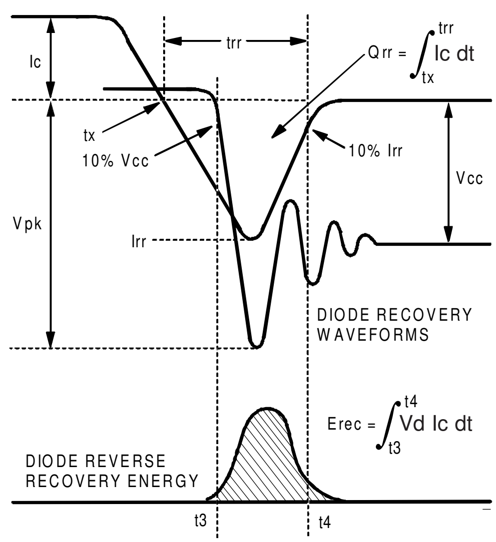


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

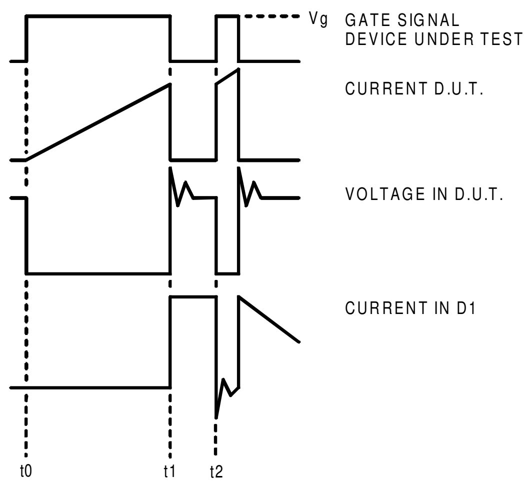


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

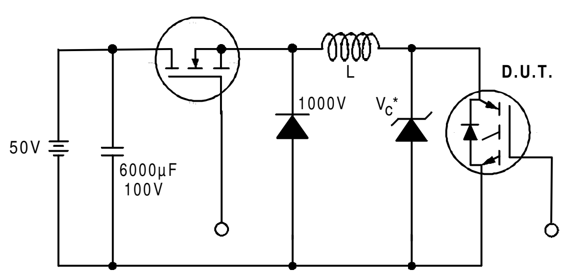


Figure 19. Clamped Inductive Load Test Circuit

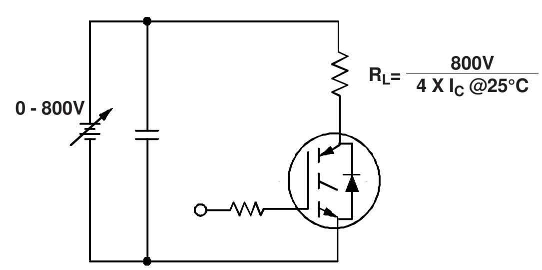


Figure 20. Pulsed Collector Current Test Circuit

Notes:

① Repetitive rating: V_{GE}=20V; pulse width limited by maximum junction temperature (figure 20)

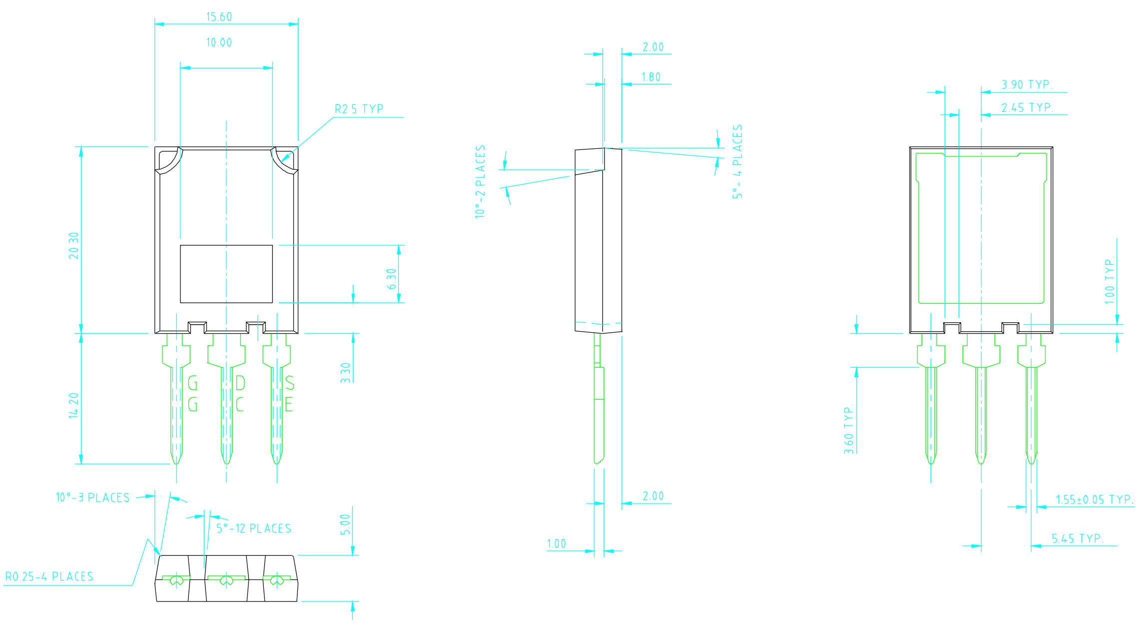
② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10µH, R_G= 5.0Ω (figure 19)

③ Pulse width ≤ 80µs; duty factor ≤ 0.1%

④ Pulse width 5.0µs, single shot

Case Outline and Dimensions — Super-247

Dimensions are shown in millimeters



International
IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
IR GREAT BRITAIN: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 838 4630
IR TAIWAN:16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan Tel: 886-2-2377-9936

http://www.irf.com/ Data and specifications subject to change without notice. 5/99