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

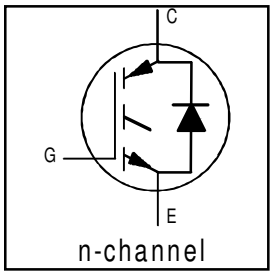
Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

International
IOR Rectifier

IRG4RC10UD

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

UltraFast CoPack IGBT



V_{CES} = 600V

$V_{CE(on)\ typ.}$ = 2.15V

@V_{GE} = 15V, I_C = 5.0A

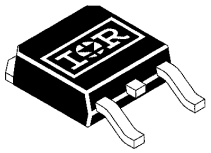
t_f (typ.) = 140ns

Features

- UltraFast: Optimized for medium operating frequencies (8-40 kHz in hard switching, >200 kHz in resonant mode).
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than previous generation
- IGBT co-packaged with HEXFRED™ ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-252AA package

Benefits

- Generation 4 IGBT's offer highest efficiencies available
- IGBT's optimized for specific application conditions
- HEXFRED diodes optimized for performance with IGBT's . Minimized recovery characteristics require less/no snubbing
- Lower losses than MOSFET's conduction and Diode losses



D-PAK
TO-252AA

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	8.5	A
I_C @ T_C = 100°C	Continuous Collector Current	5.0	
I_{CM}	Pulsed Collector Current ①	34	
I_{LM}	Clamped Inductive Load Current ②	34	
I_F @ T_C = 100°C	Diode Continuous Forward Current	4.0	
I_{FM}	Diode Maximum Forward Current	16	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	38	W
P_D @ T_C = 100°C	Maximum Power Dissipation	15	
T_J	Operating Junction and	-55 to +150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (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 - IGBT	—	—	3.3	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	7.0	
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*	—	—	50	
Wt	Weight	—	0.3 (0.01)	—	g (oz)

Details of note ① through ④ are on the last page

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage③	600	—	—	V	V_{GE} = 0V, I_C = 250µA
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.54	—	V/°C	V_{GE} = 0V, I_C = 1.0mA
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.15	2.6	V	I_C = 5.0A V_{GE} = 15V
		—	2.61	—		I_C = 8.5A See Fig. 2, 5
		—	2.30	—		I_C = 5.0A, 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	—	-8.7	—	mV/°C	V_{CE} = V_{GE}, I_C = 250µA
g_{fe}	Forward Transconductance ④	2.8	4.2	—	S	V_{CE} = 100V, I_C = 5.0A
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 600V
		—	—	1000		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C
V_{FM}	Diode Forward Voltage Drop	—	1.5	1.8	V	I_C = 4.0A See Fig. 13
		—	1.4	1.7		I_C = 4.0A, T_J = 125°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)	—	15	22	nC	I_C = 5.0A
Qge	Gate - Emitter Charge (turn-on)	—	2.6	4.0		V_{CC} = 400V See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	—	5.8	8.7		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	40	—	ns	T_J = 25°C
t_r	Rise Time	—	16	—		I_C = 5.0A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	87	130		V_{GE} = 15V, R_G = 100Ω
t_f	Fall Time	—	140	210		Energy losses include "tail" and
E_{on}	Turn-On Switching Loss	—	0.14	—	mJ	diode reverse recovery.
E_{off}	Turn-Off Switching Loss	—	0.12	—		See Fig. 9, 10, 18
E_{ts}	Total Switching Loss	—	0.26	0.33		
$t_{d(on)}$	Turn-On Delay Time	—	38	—	ns	T_J = 150°C, See Fig. 11, 18
t_r	Rise Time	—	18	—		I_C = 5.0A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	95	—		V_{GE} = 15V, R_G = 100Ω
t_f	Fall Time	—	250	—		Energy losses include "tail" and
E_{ts}	Total Switching Loss	—	0.45	—	mJ	diode reverse recovery.
L_E	Internal Emitter Inductance	—	7.5	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	270	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	21	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	3.5	—		f = 1.0MHz
t_{rr}	Diode Reverse Recovery Time	—	28	42	ns	T_J = 25°C See Fig.
		—	38	57		T_J = 125°C 14 I_F = 4.0A
I_{rr}	Diode Peak Reverse Recovery Current	—	2.9	5.2	A	T_J = 25°C See Fig.
		—	3.7	6.7		T_J = 125°C 15 V_R = 200V
Q_{rr}	Diode Reverse Recovery Charge	—	40	60	nC	T_J = 25°C See Fig.
		—	70	105		T_J = 125°C 16 di/dt = 200A/µs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	—	280	—	A/µs	T_J = 25°C See Fig.
	During t_b	—	235	—		T_J = 125°C 17

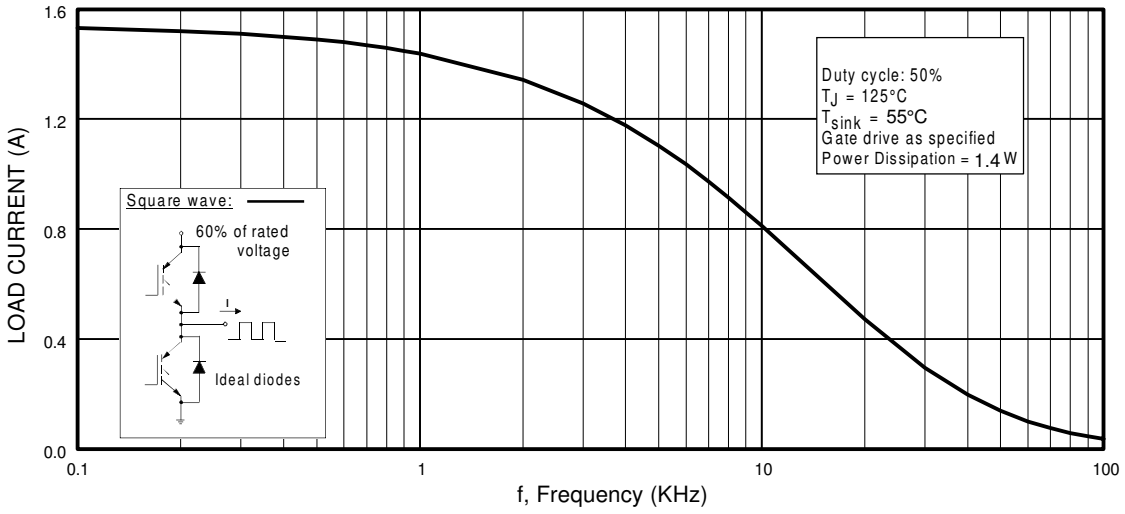


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

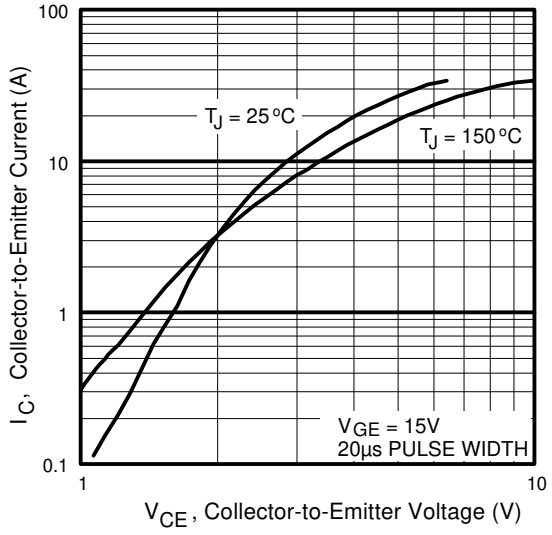


Fig. 2 - Typical Output Characteristics

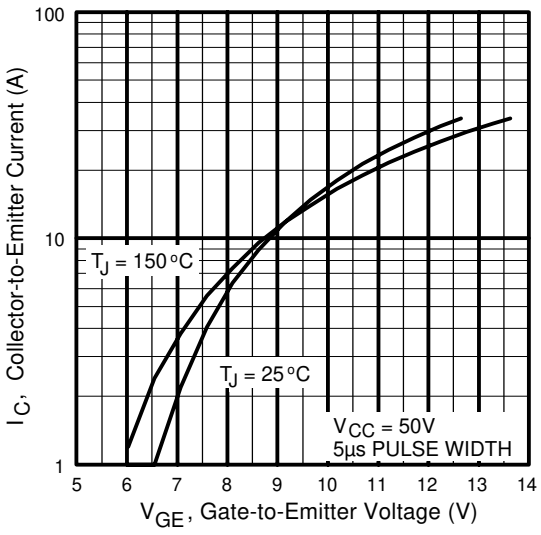


Fig. 3 - Typical Transfer Characteristics

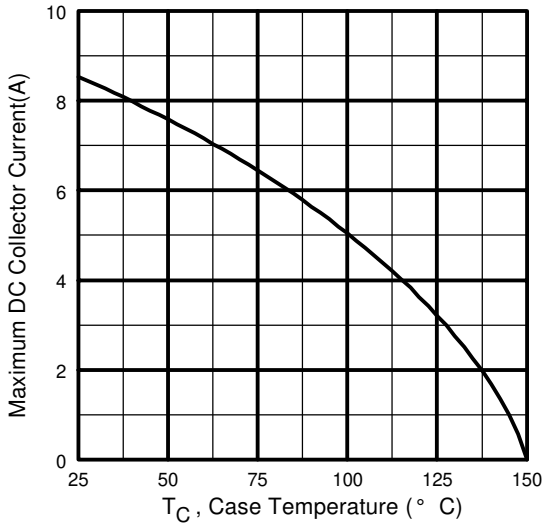


Fig. 4 - Maximum Collector Current vs. Case Temperature

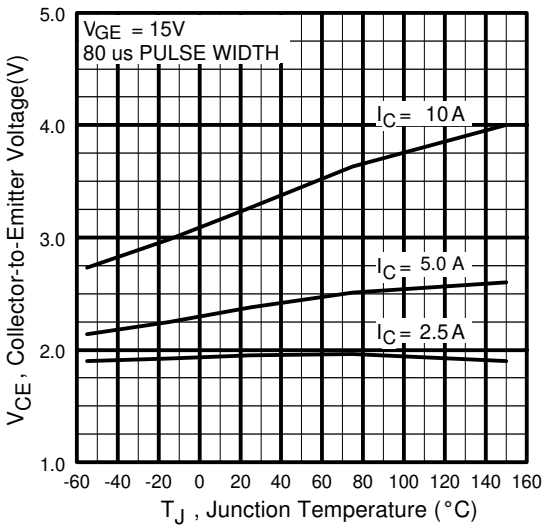


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

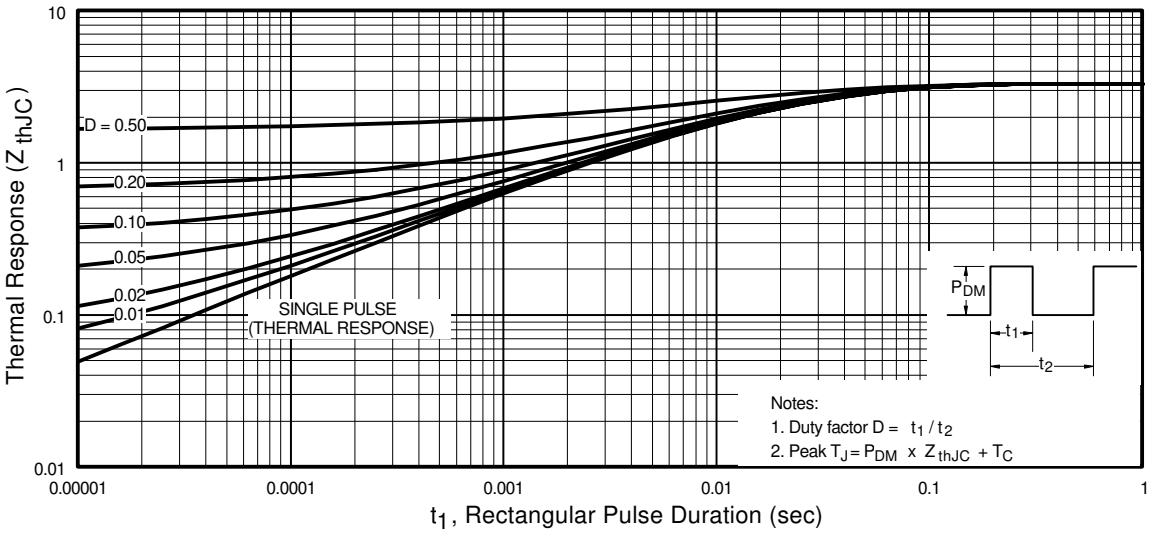


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

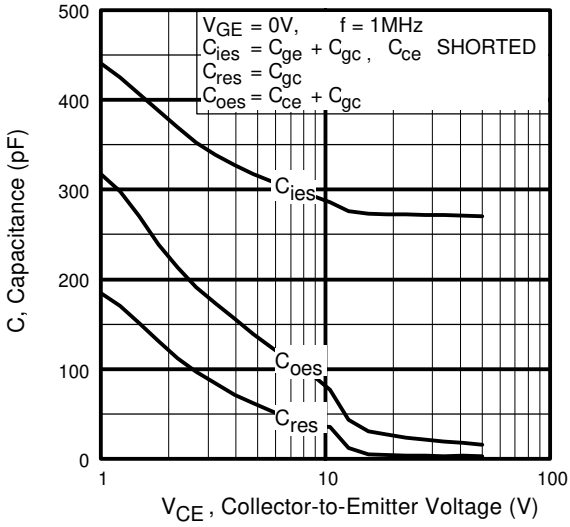


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

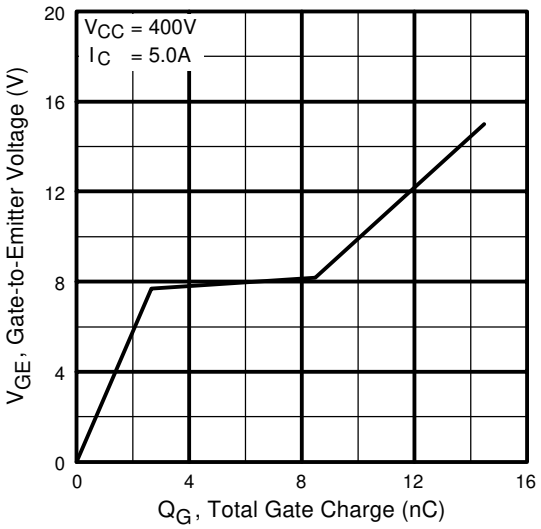


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

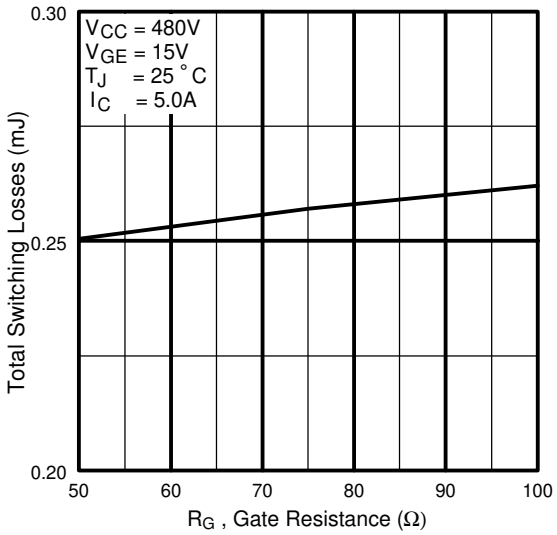


Fig. 9 - Typical Switching Losses vs. Gate Resistance

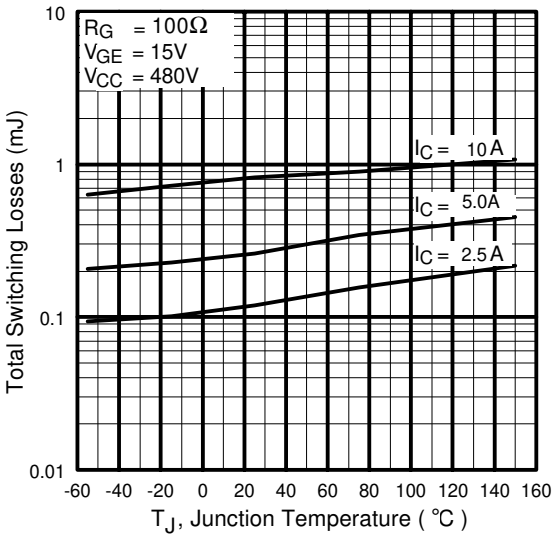


Fig. 10 - Typical Switching Losses vs. Junction Temperature

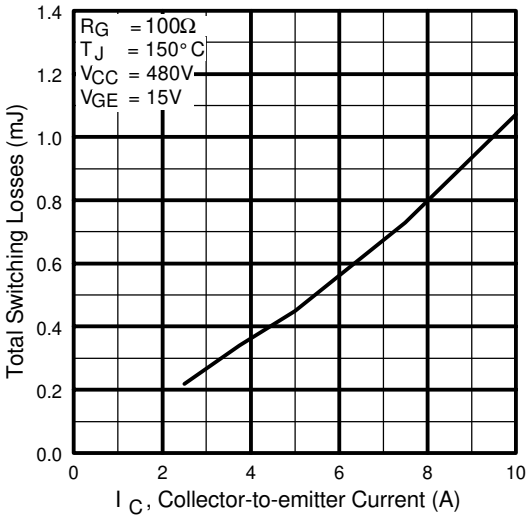


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

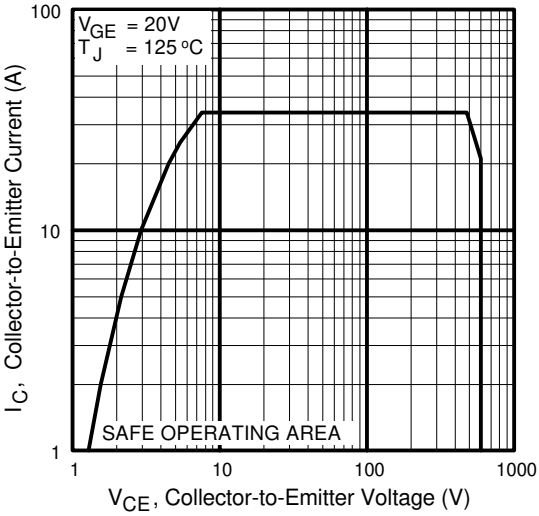


Fig. 12 - Turn-Off SOA

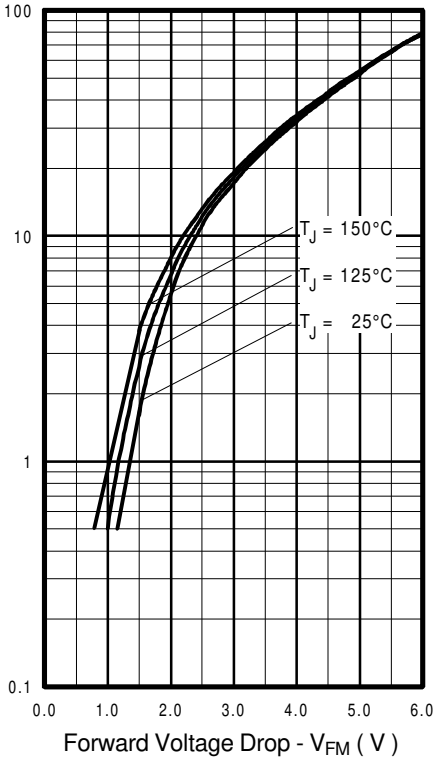


Fig. 13 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

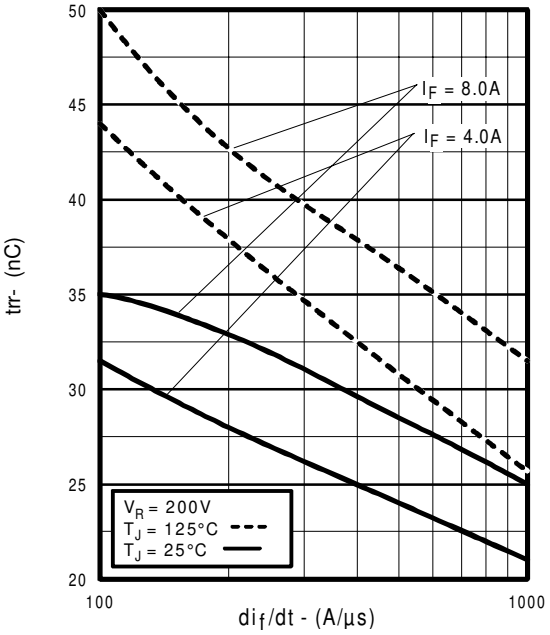


Fig. 14 - Typical Reverse Recovery vs. di_f/dt

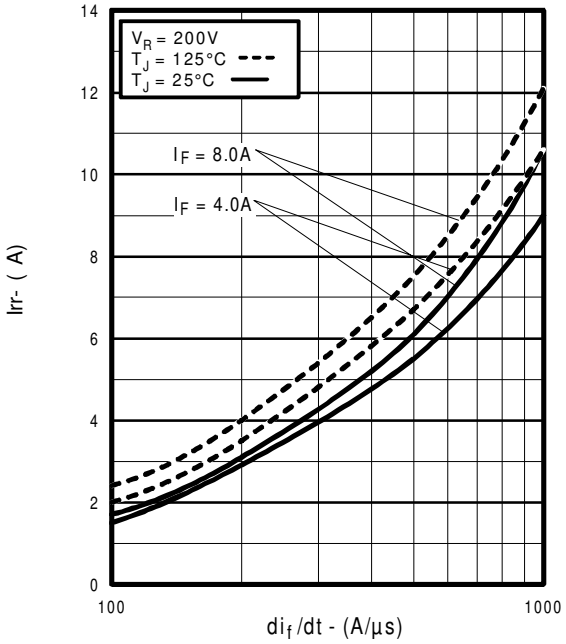


Fig. 15 - Typical Recovery Current vs. di_f/dt

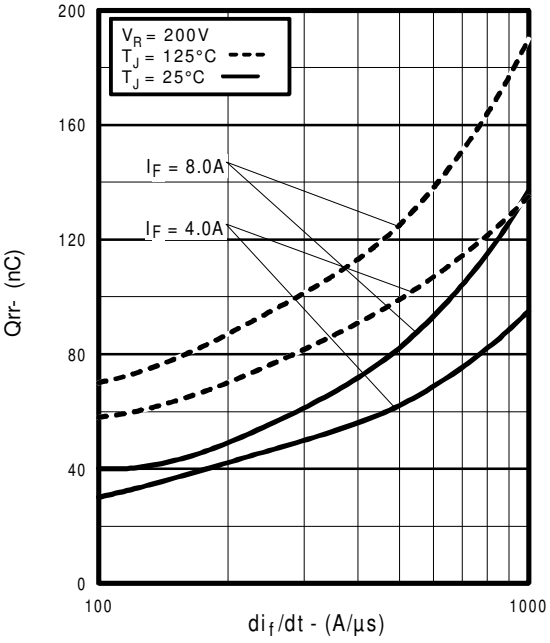


Fig. 16 - Typical Stored Charge vs. di_f/dt

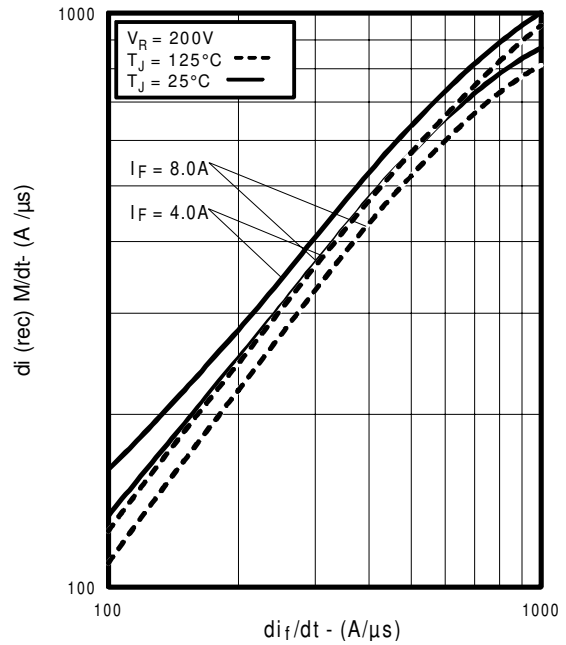


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di_f/dt,

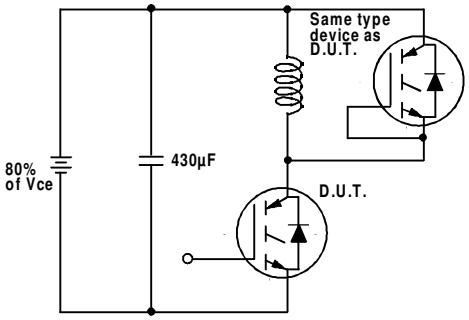


Fig. 18a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

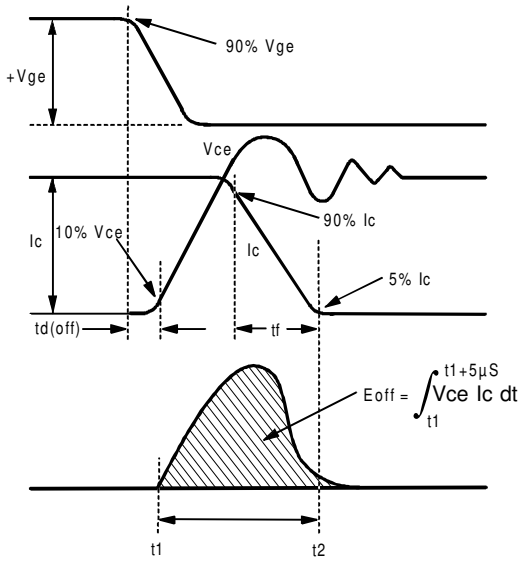


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

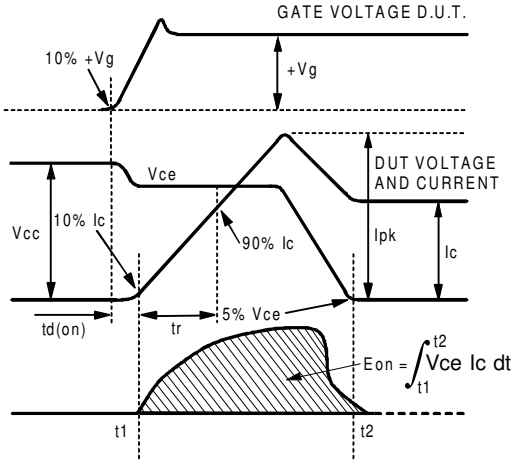


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

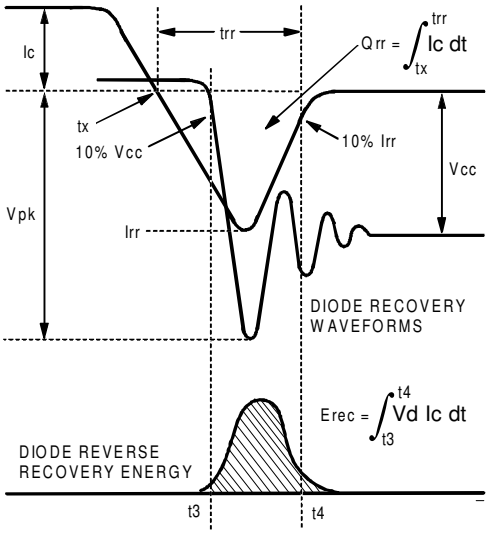


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

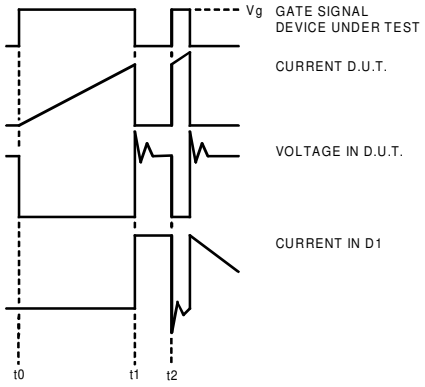


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

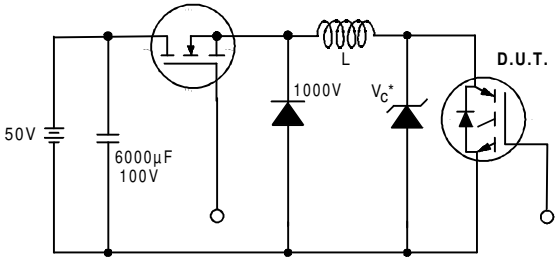


Figure 19. Clamped Inductive Load Test Circuit

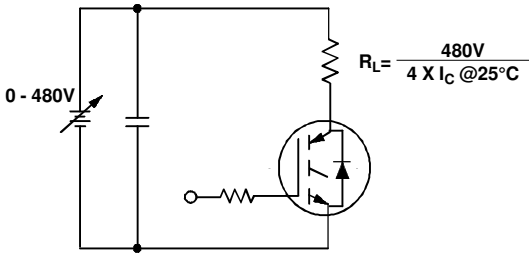
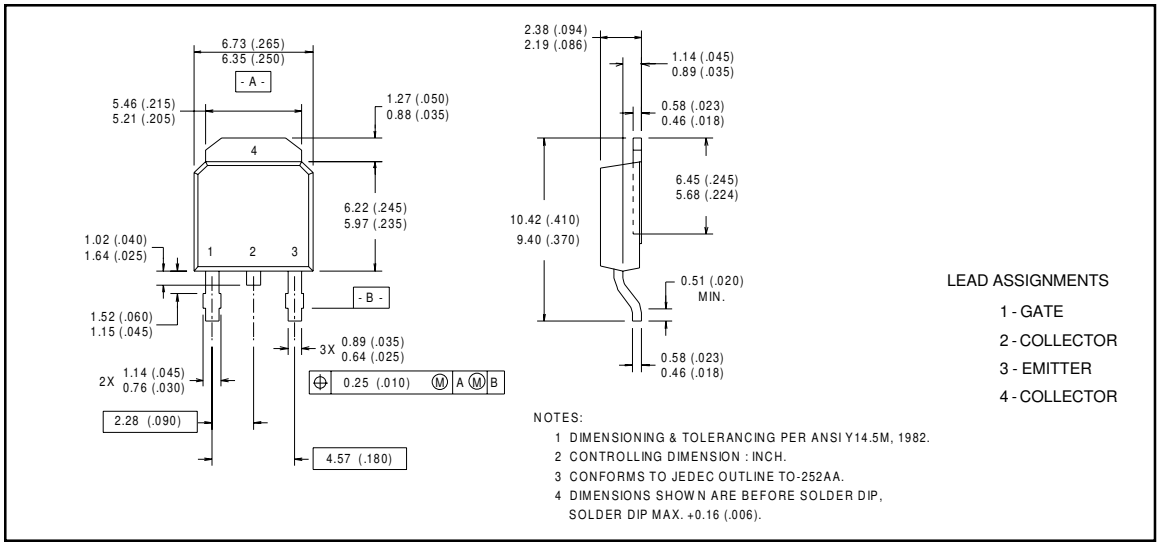


Figure 20. Pulsed Collector Current Test Circuit

Package Outline

TO-252AA Outline

Dimensions are shown in millimeters (inches)



Notes:

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

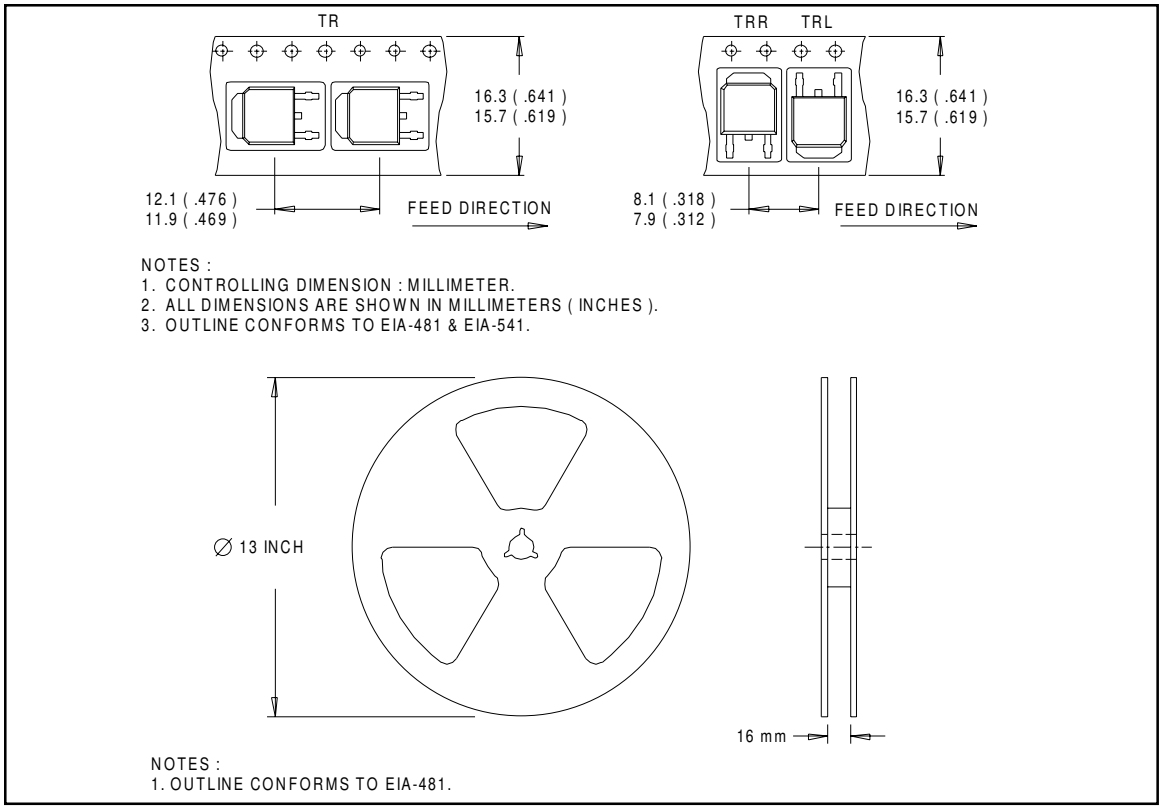
② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10µH, R_G = 100Ω (figure 19)

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

④ Pulse width 5.0µs, single shot.

Tape & Reel Information

TO-252AA



IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.

Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/