PD - 50071C

International
IOR Rectifier

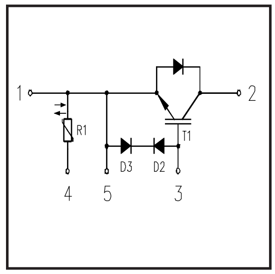
GA600GD25S

SINGLE SWITCH IGBT DUAL INT-A-PAK

Standard™ Speed IGBT

Features

- Standard speed, optimized for battery powered application
- Very low conduction losses
- HEXFRED™ antiparallel diodes with ultra-soft recovery
- Industry standard package
- UL recognition pending
- Internal thermistor



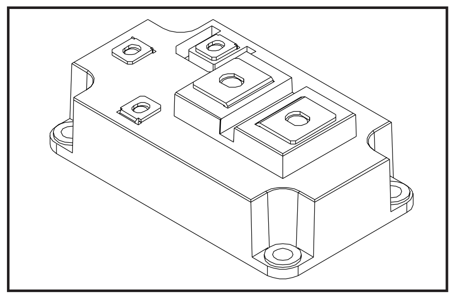
V_{CES} = 250V

$V_{CE(on)\ typ.}$ = 1.25V

@V_{GE} = 15V, I_C = 600A

Benefits

- Increased operating efficiency
- Direct mounting to heatsink
- Performance optimized for power conversion: UPS, SMPS, Welding
- Lower EMI, requires less snubbing



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	250	V
I_C @ T_C = 25°C	Continuous Collector Current	600	A
I_{CM}	Pulsed Collector Current①	1200	
I_{LM}	Peak Switching Current②	1200	
I_{FM}	Peak Diode Forward Current	1200	
V_{GE}	Gate-to-Emitter Voltage	±17	V
V_{ISOL}	RMS Isolation Voltage, Any Terminal To Case, t = 1 min	2500	
P_D @ T_C = 25°C	Maximum Power Dissipation	1920	W
P_D @ T_C = 85°C	Maximum Power Dissipation	1000	
T_J	Operating Junction Temperature Range	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	

Thermal / Mechanical Characteristics

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case - IGBT	—	0.065	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case - Diode	—	0.20	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink - Module	0.04	—	
	Mounting Torque, Case-to-Heatsink ③	—	6.0	N·m
	Mounting Torque, Case-to-Terminal 1, 2 ③	—	5.0	
	Mounting Torque, Case-to-Terminal 3,4,5,6	—	1.5	
	Weight of Module	365	—	g

08/27/02

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	250	—	—	V	V_{GE} = 0V, I_C = 1mA
$V_{CE(on)}$	Collector-to-Emitter Voltage	—	1.25	1.4		V_{GE} = 15V, I_C = 600A
		—	1.25	—		V_{GE} = 15V, I_C = 600A, T_J = 125°C
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		I_C = 5.0mA, V_{CE} = 6.0V
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-11	—	mV/°C	V_{CE} = 6.0V, I_C = 5.0mA,T_C= 25/125°C
g_{fe}	Forward Transconductance ③	—	720	—	S	V_{CE} = 25V, I_C = 600A
I_{CES}	Collector-to-Emitter Leaking Current	—	—	2.0	mA	V_{GE} = 0V, V_{CE} = 250V
		—	—	20		V_{GE} = 0V, V_{CE} = 250V, T_J = 125°C
V_{FM}	Diode Forward Voltage - Maximum	—	1.5	1.8	V	I_F = 300A, V_{GE} = 0V
		—	1.5	—		I_F = 300A, V_{GE} = 0V, T_J = 125°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	1.0	µA	V_{GE} = ±14V (18V zeners gate-emitter)
ΔT_{DP}	Pulse Diode Temp Rise	—	—	80	°C	I_C = 300A, t = 150msec, Tc =70°C
R-T_{25}	Thermistor, Positive Temp Coefficient	738	820	902	Ω	I = 100mA,P = 2.5mW/°C (see note 1)

Dynamic Characteristics - T_J = 125°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	3825	5738		V_{CC} = 200V, V_{GE} = 15V
Qge	Gate - Emitter Charge (turn-on)	—	555	832	nC	I_C = 600A
Q_{gc}	Gate - Collector Charge (turn-on)	—	1262	1893		T_J = 25°C
$t_{d(on)}$	Turn-On Delay Time	—	1060	—		R_{G1} = 15Ω, R_{G2} = 0Ω,
t_r	Rise Time	—	950	—	ns	I_C = 600A
$t_{d(off)}$	Turn-Off Delay Time	—	846	—		V_{CC} = 150V, Inductor load
t_f	Fall Time	—	934	—		V_{GE} = ±15V
E_{on}	Turn-On Switching Energy	—	17	—	mJ	See Fig. 17, 19
$E_{off\ (1)}$	Turn-Off Switching Energy	—	105	—		
$E_{ts\ (1)}$	Total Switching Energy	—	122	250		
C_{ies}	Input Capacitance	—	86063	—		V_{GE} = 0V
C_{oes}	Output Capacitance	—	9754	—	pF	V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	—	1913	—		f = 1 MHz
t_{rr}	Diode Reverse Recovery Time	—	314	—	ns	I_C = 600A
I_{rr}	Diode Peak ReverseCurrent	—	80	—	A	R_{G1} = 15Ω
Q_{rr}	Diode Recovery Charge	—	12513	—	µC	R_{G2} = 0Ω
$di_{(rec)}M/_{dt}$	Diode Peak Rate of Fall of Recovery During t_b	—	632	—	A/µs	V_{CC} = 150V di/dt = 500A/µs

Notes:

1. The thermistor has an average rate of change of 7Ω /°C between 20°C and 125°C.
   Consult U.S. Sensor data sheet for P821GS1K for details

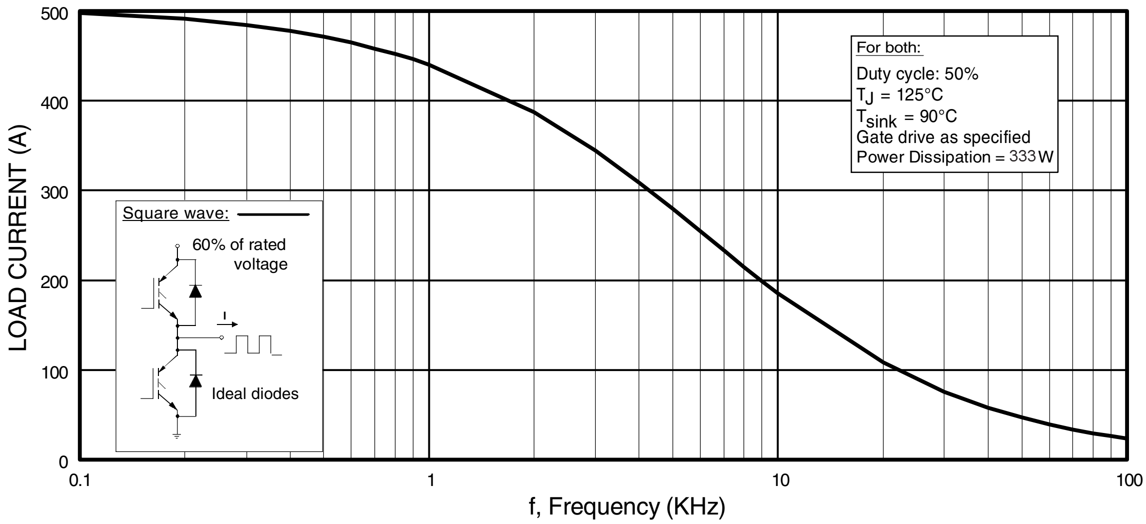


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

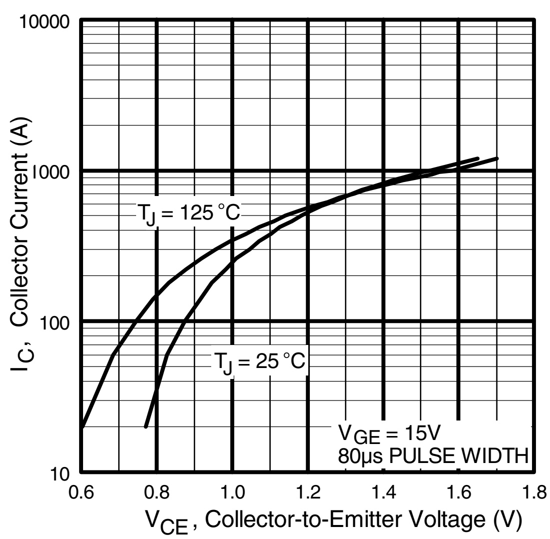


Fig. 2 - Typical Output Characteristics

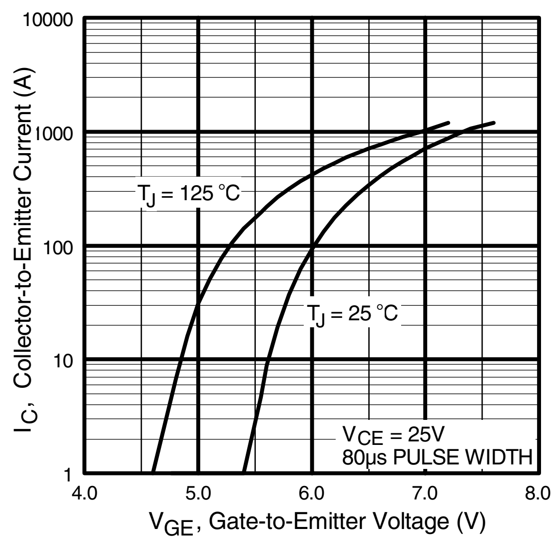


Fig. 3 - Typical Transfer Characteristics

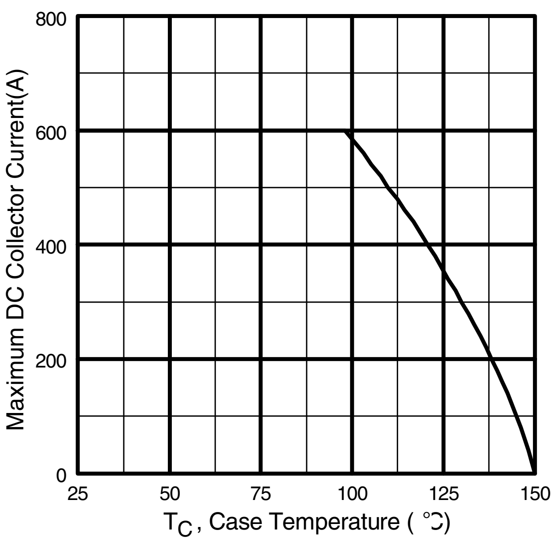


Fig. 4 - Maximum Collector Current vs. Case Temperature

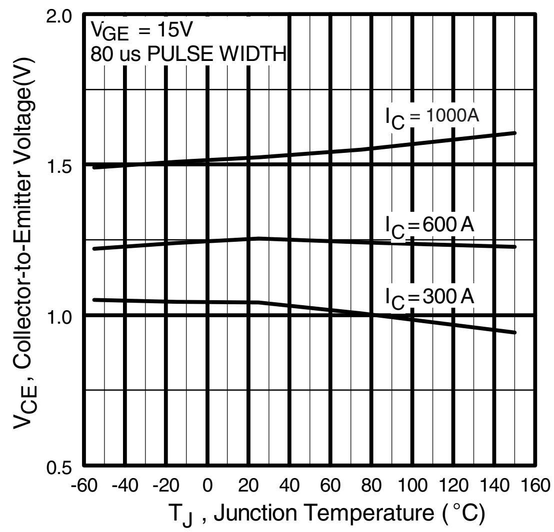


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

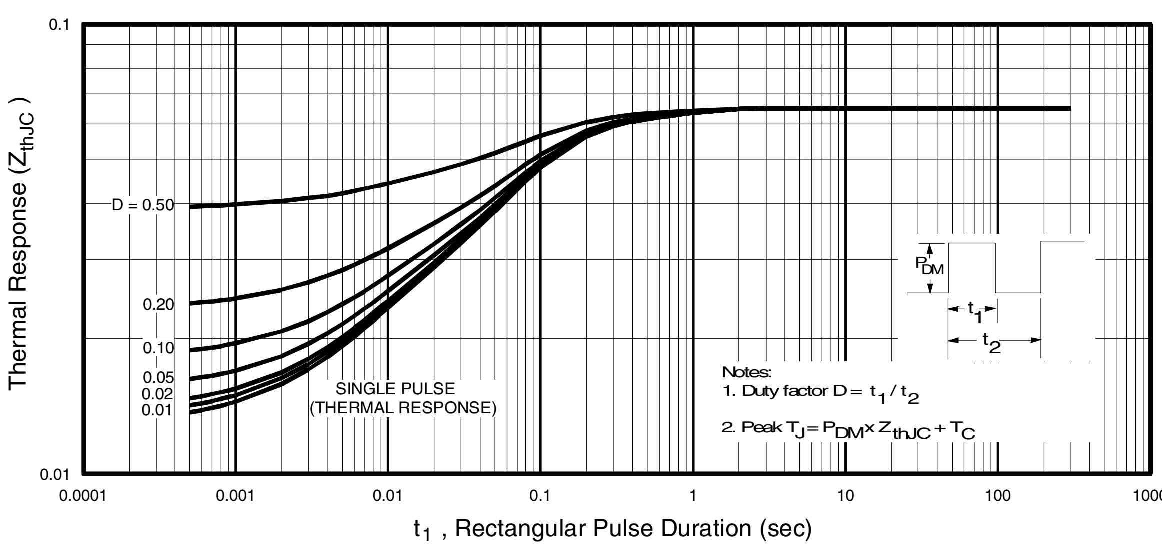


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

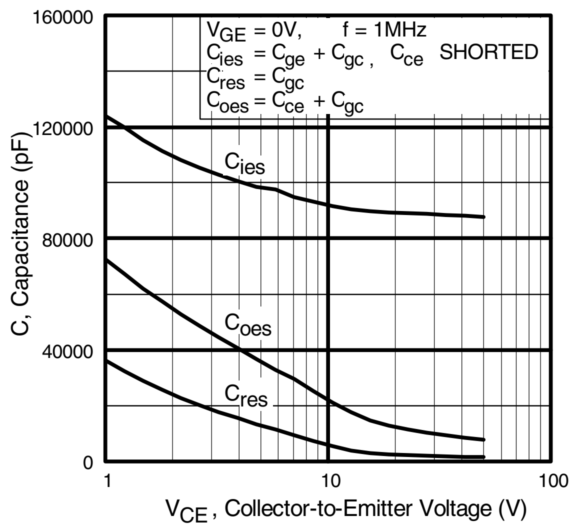


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

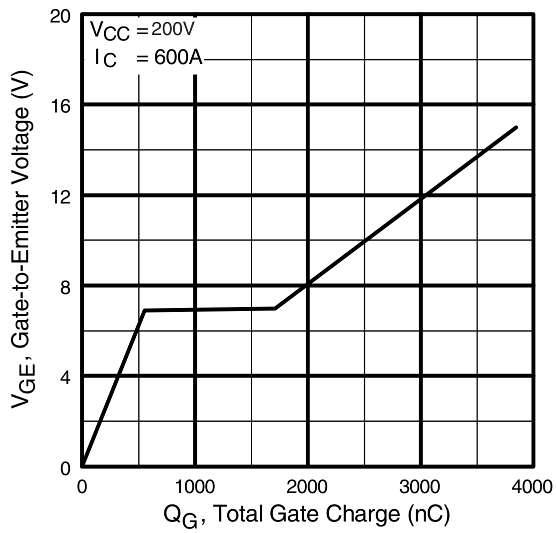


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

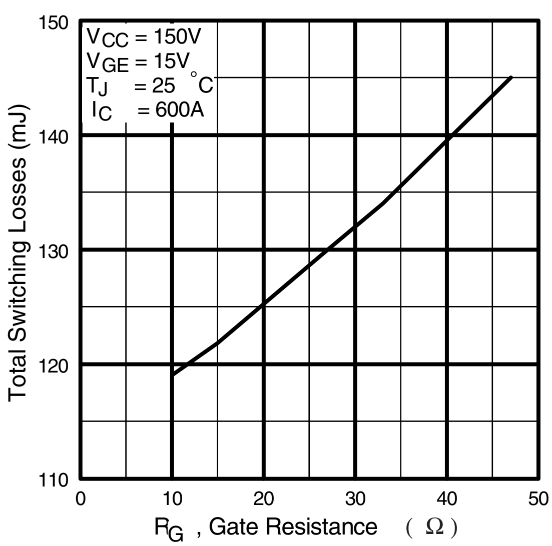


Fig. 9 - Typical Switching Losses vs. Gate Resistance

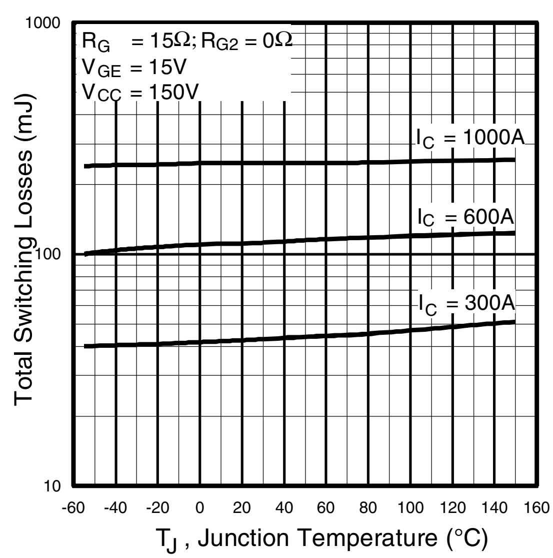


Fig. 10 - Typical Switching Losses vs. Junction Temperature

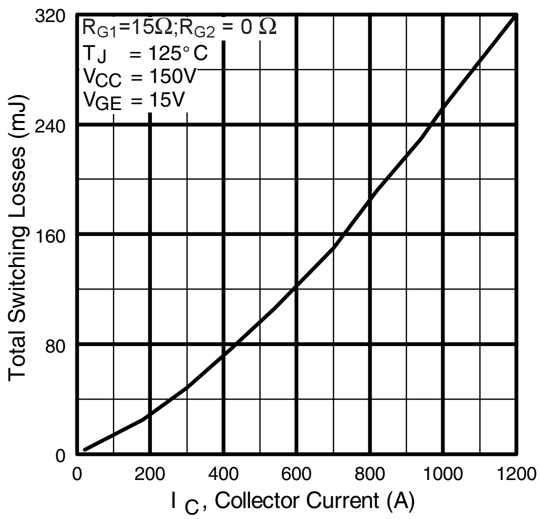


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

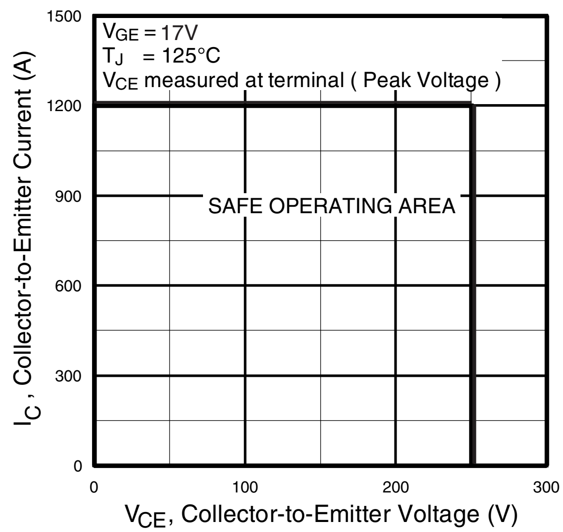


Fig. 12 - Reverse Bias SOA

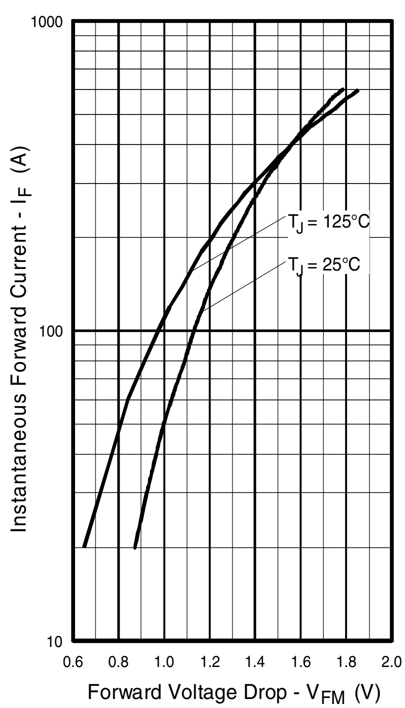


Fig. 13 - Typical Forward Voltage Drop vs. Instantaneous Forward Current

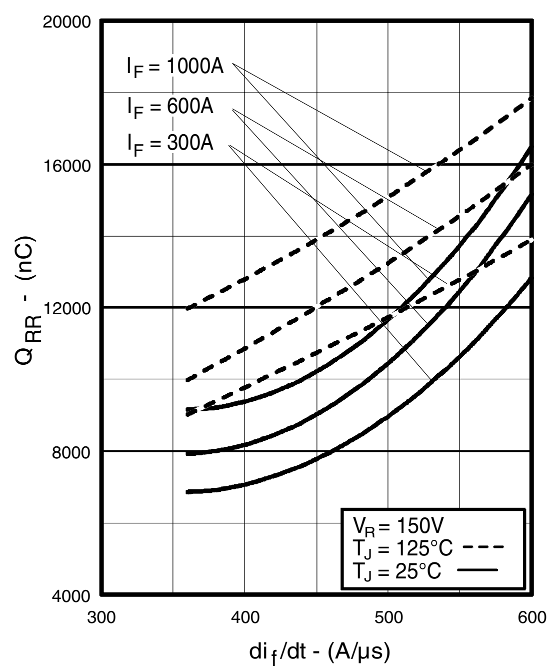


Fig. 14 - Typical Stored Charge vs. di_f/dt

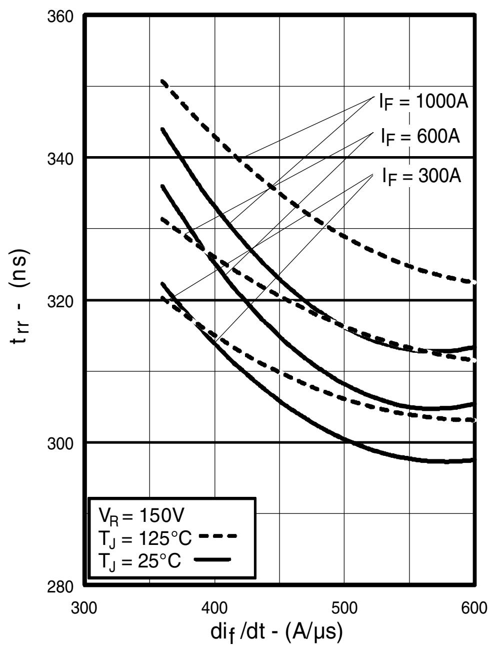


Fig. 15 - Typical Reverse Recovery vs. di_f/dt

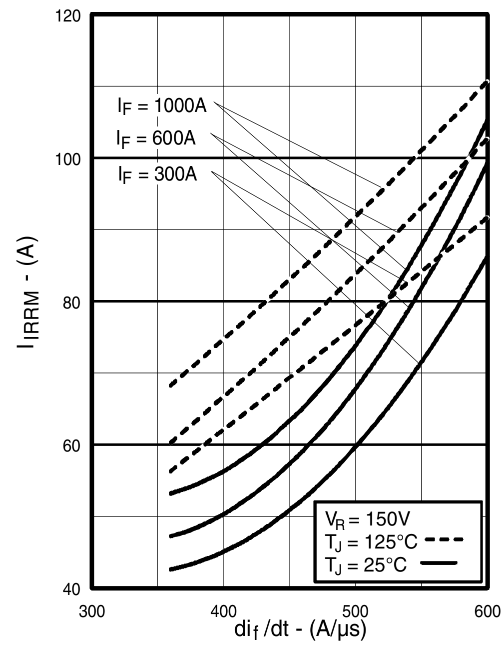


Fig. 16 - Typical Recovery Current vs. di_f/dt

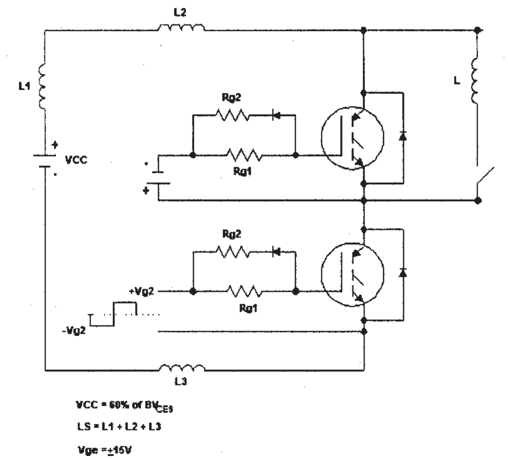


Fig. 17a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

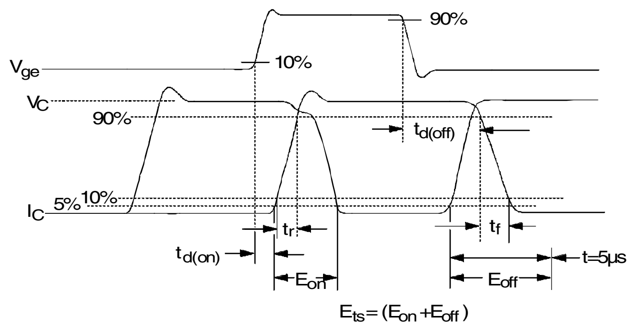


Fig. 17b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

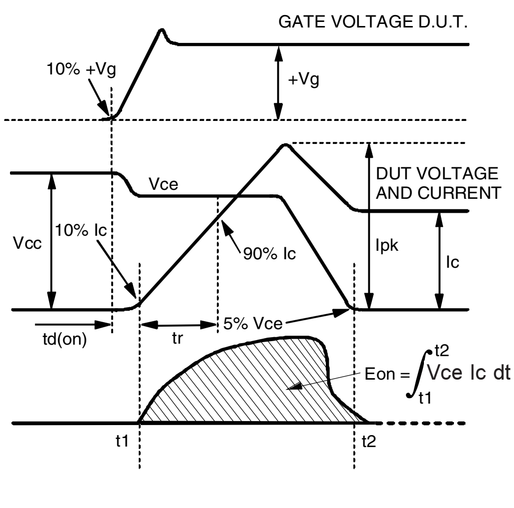


Fig. 17c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

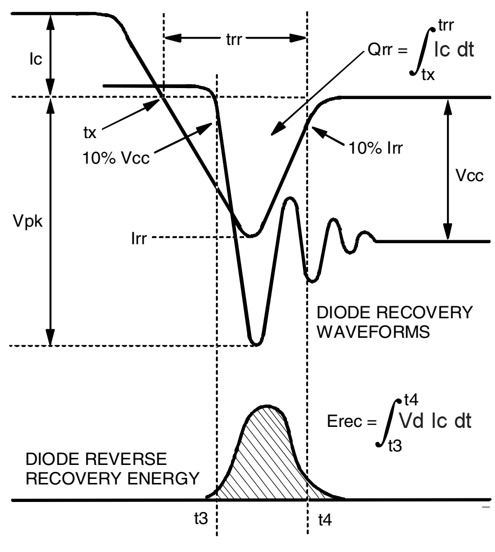


Fig. 17d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

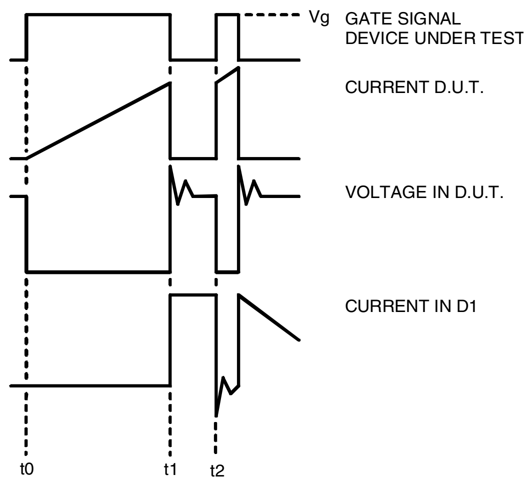


Figure 17e. Macro Waveforms for Figure 18a's Test Circuit

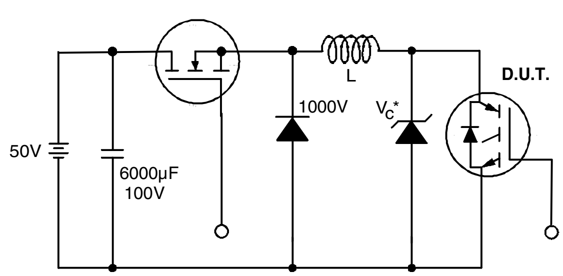


Figure 18. Clamped Inductive Load Test Circuit

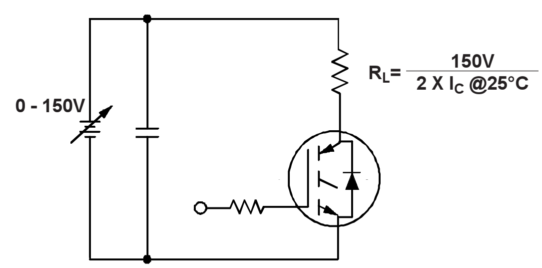


Figure 19. Pulsed Collector Current Test Circuit

Notes:

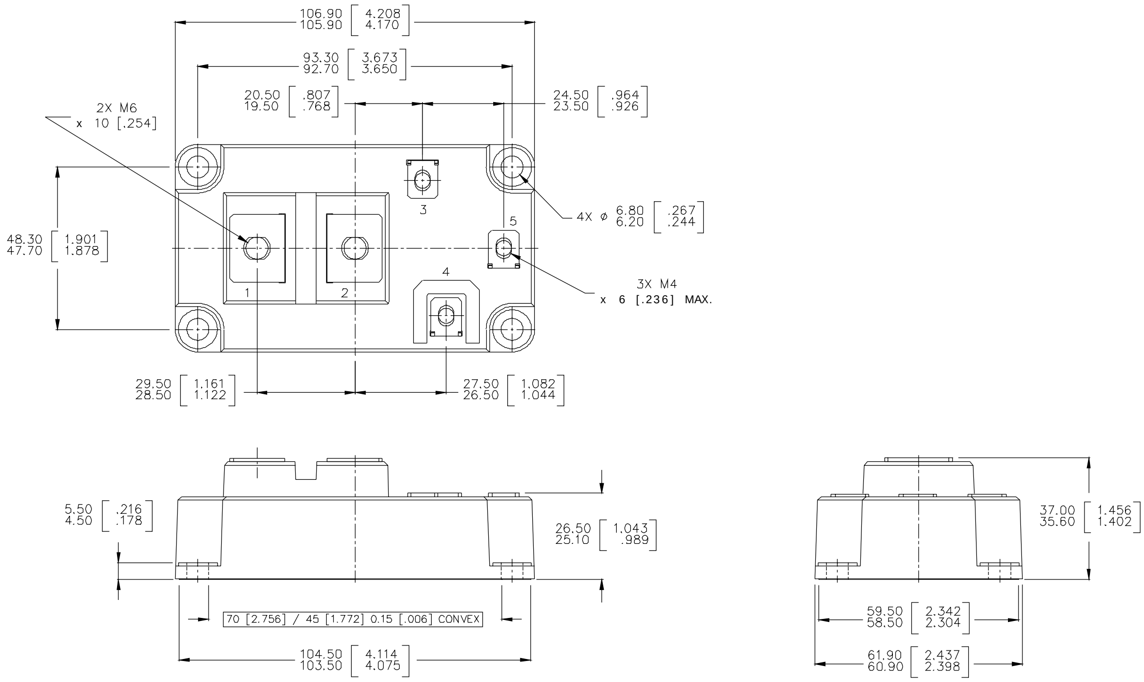
① Repetitive rating; V_{GE} = 17V, pulse width limited by max. junction temperature.

② See fig. 17

③ For screws M6.

④ Pulse width 50µs; single shot.

Case Outline — DUAL INT-A-PAK



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
IOR Rectifier

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.08/02