International
IOR Rectifier

PD - 50071C

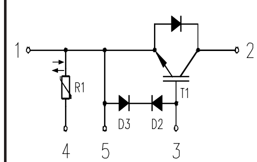
GA600GD25S

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



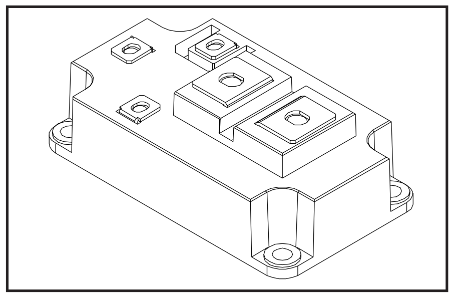
V_{CES} = 250V

$V_{CE(on)\ typ.}$ = 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	nC	V_{CC} = 200V, V_{GE} = 15V
Qge	Gate - Emitter Charge (turn-on)	—	555	832		I_C = 600A
Q_{gc}	Gate - Collector Charge (turn-on)	—	1262	1893		T_J = 25°C
$t_{d(on)}$	Turn-On Delay Time	—	1060	—	ns	R_{G1} = 15Ω, R_{G2} = 0Ω,
t_r	Rise Time	—	950	—		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	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	9754	—		V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	—	1913	—		ƒ = 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

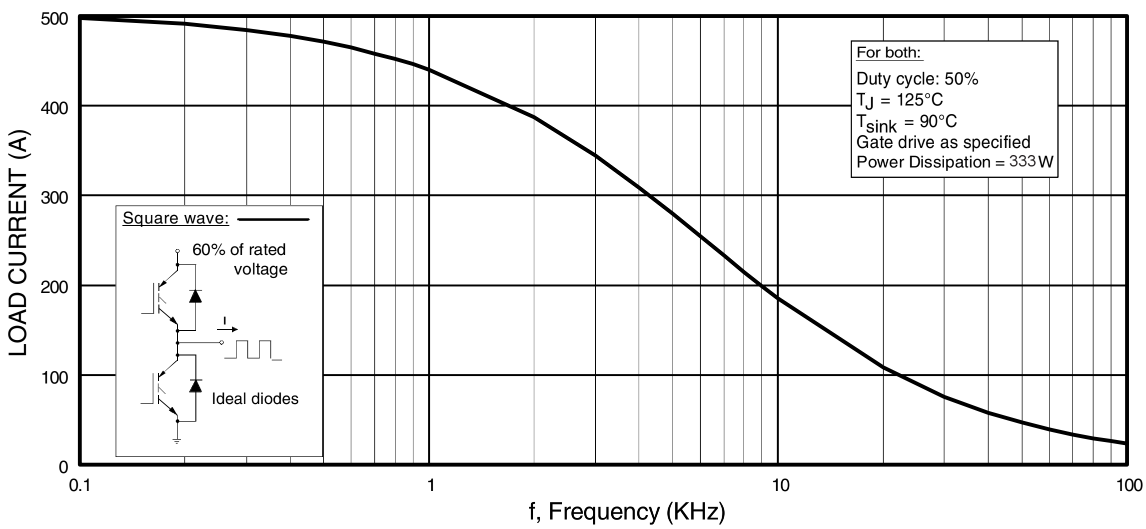


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

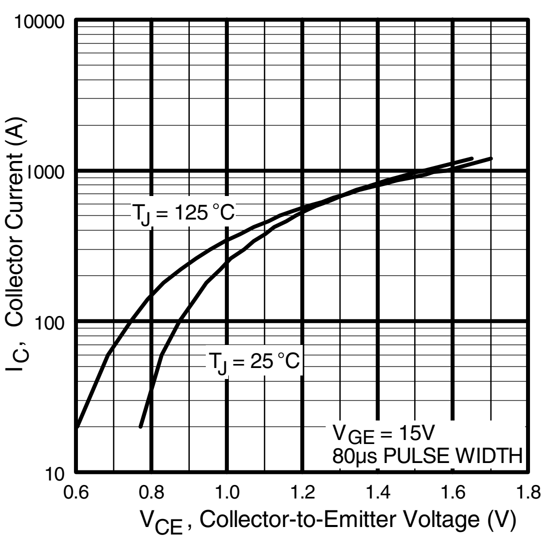


Fig. 2 - Typical Output Characteristics

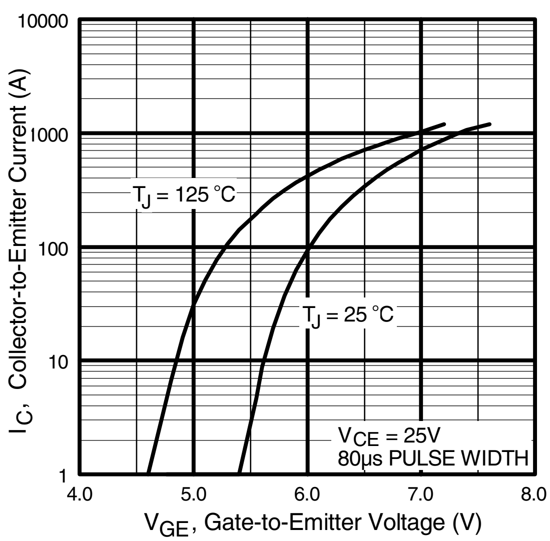


Fig. 3 - Typical Transfer Characteristics

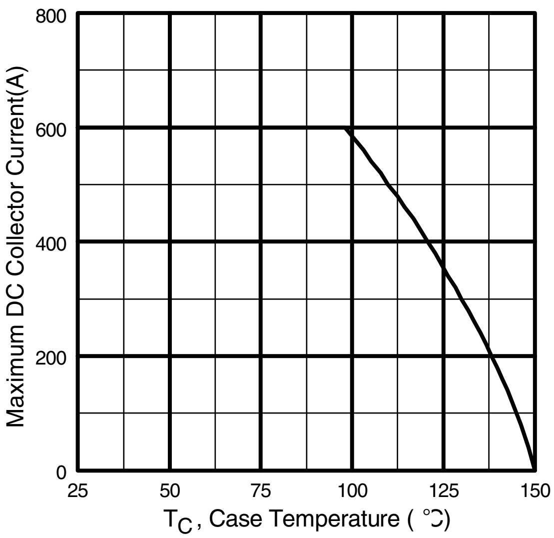


Fig. 4 - Maximum Collector Current vs. Case Temperature

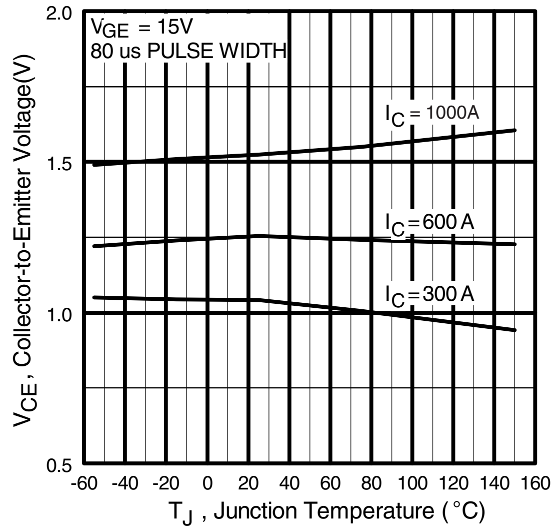


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

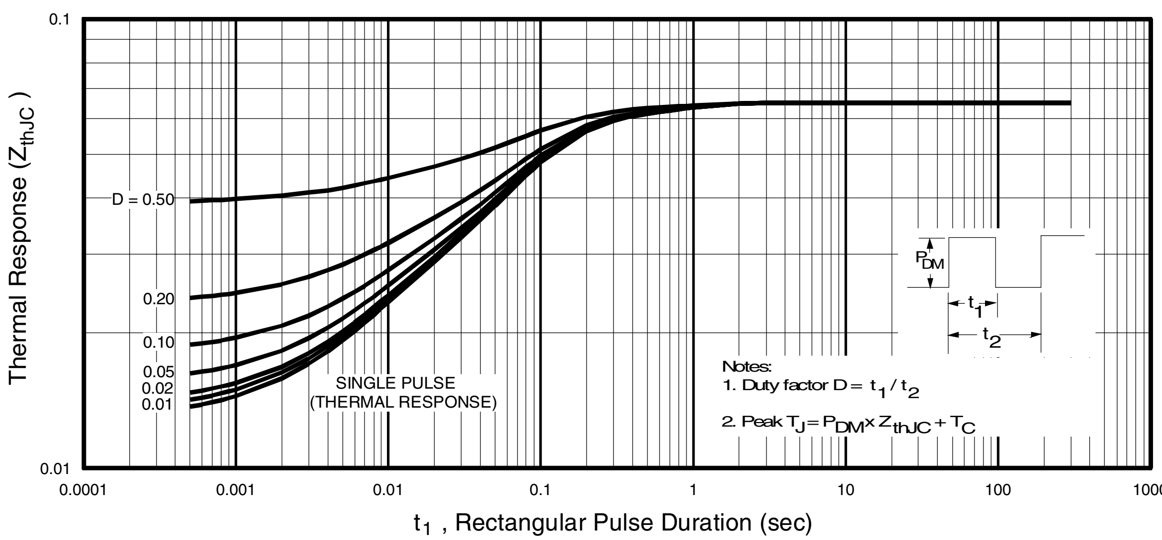


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

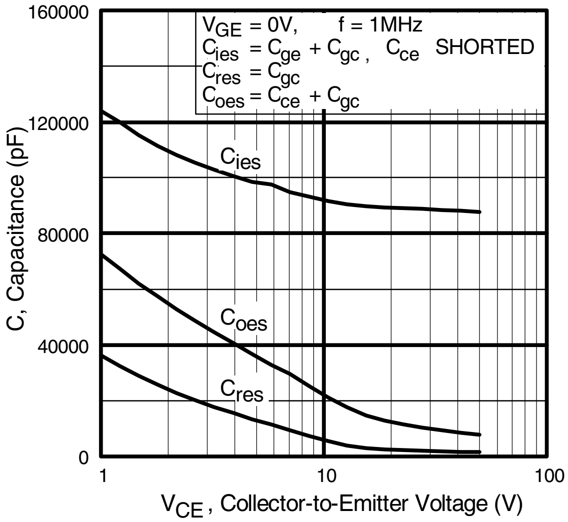


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

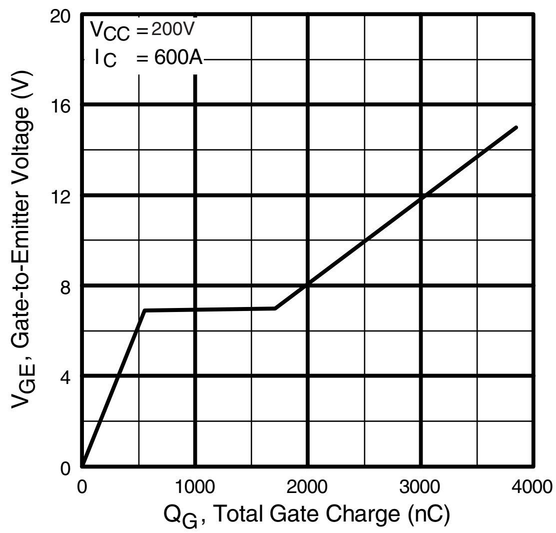


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

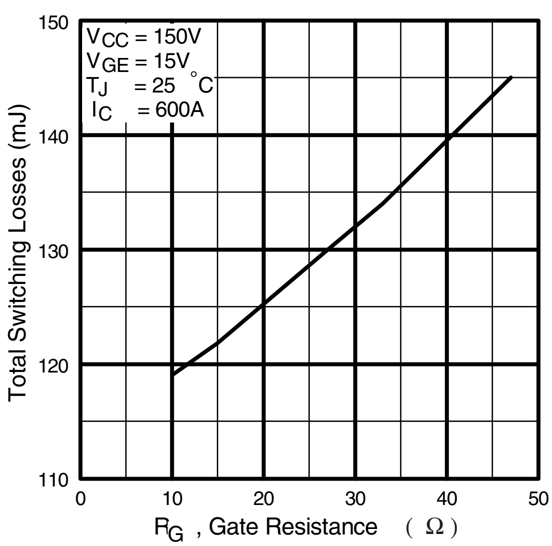


Fig. 9 - Typical Switching Losses vs. Gate Resistance

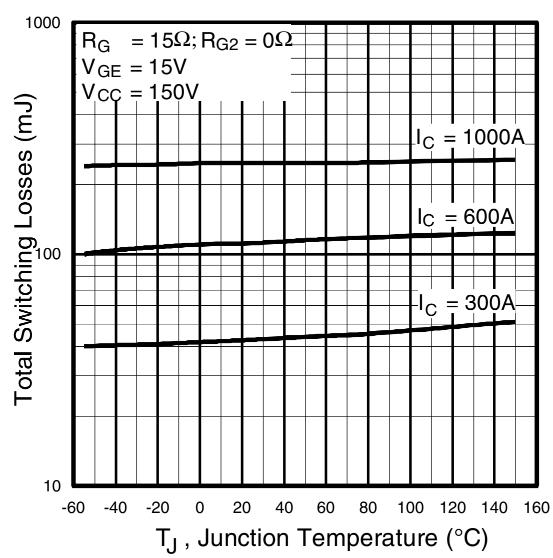


Fig. 10 - Typical Switching Losses vs. Junction Temperature

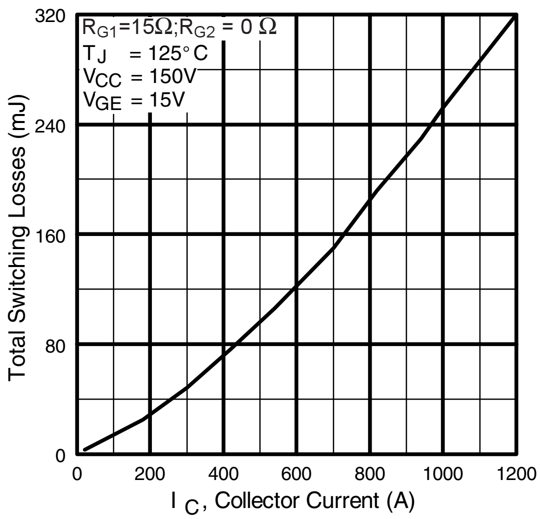


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

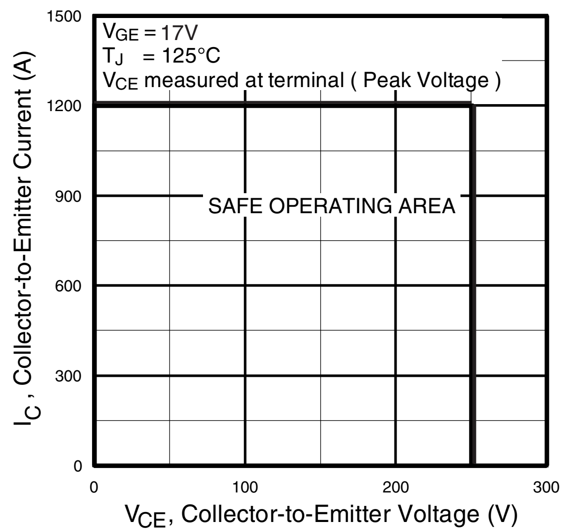


Fig. 12 - Reverse Bias SOA

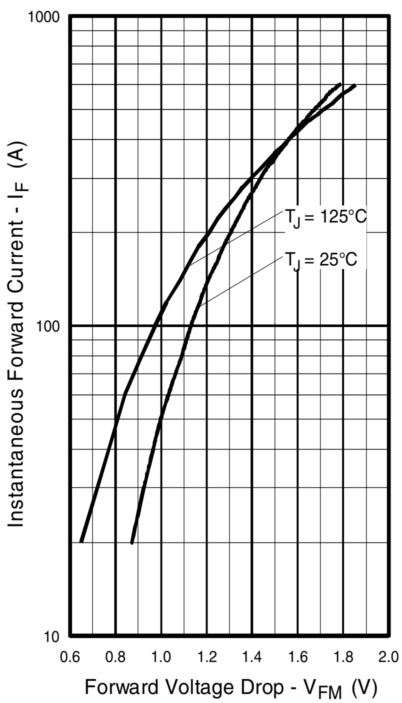


Fig. 13 - Typical Forward Voltage Drop vs. Instantaneous Forward Current

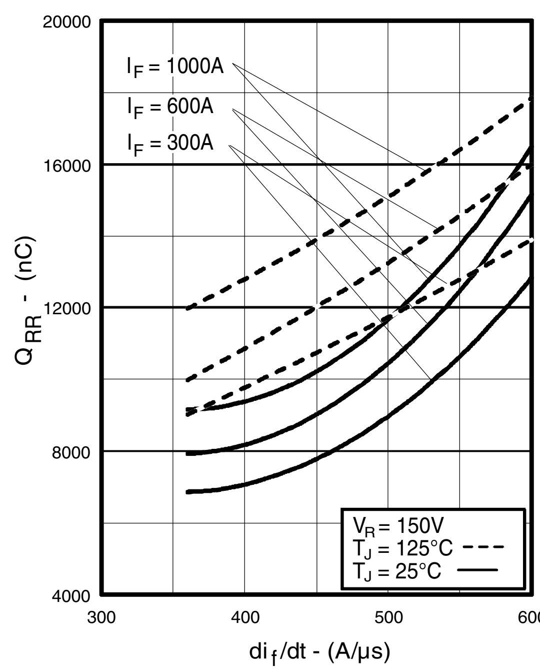


Fig. 14 - Typical Stored Charge vs. di_f/dt

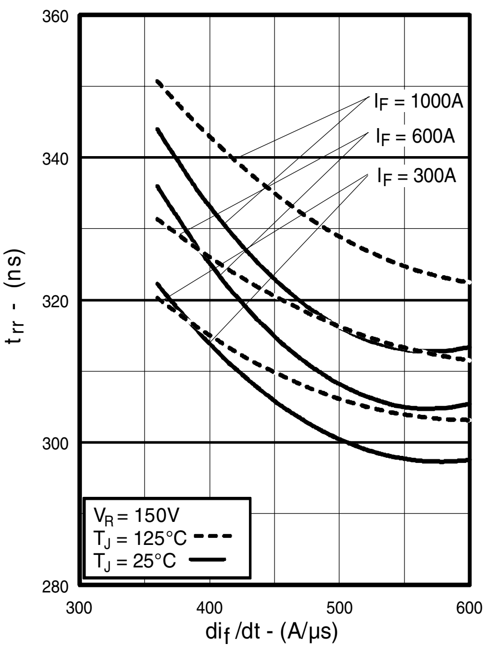


Fig. 15 - Typical Reverse Recovery vs. di_f/dt

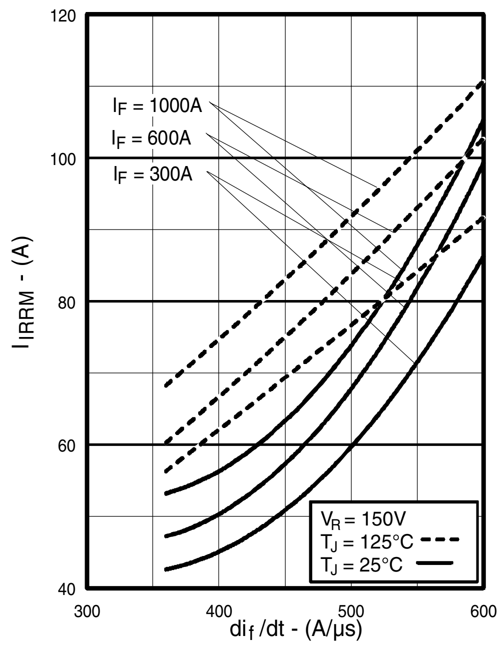


Fig. 16 - Typical Recovery Current vs. di_f/dt

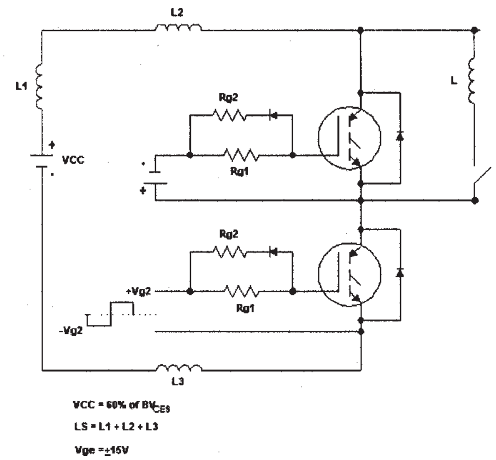


Fig. 17a - Test Circuit for Measurement of I_{LM}, E_{on}, $E_{off(diode)}$, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

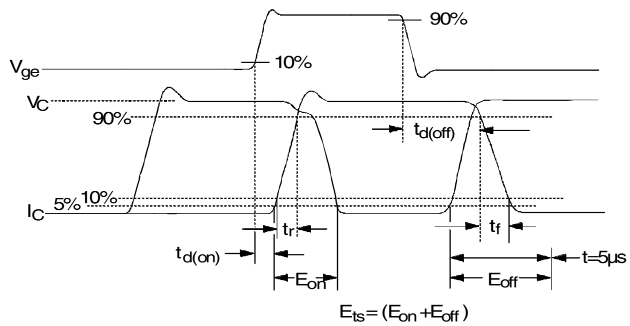


Fig. 17b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off}, $t_{d(off)}$, t_f

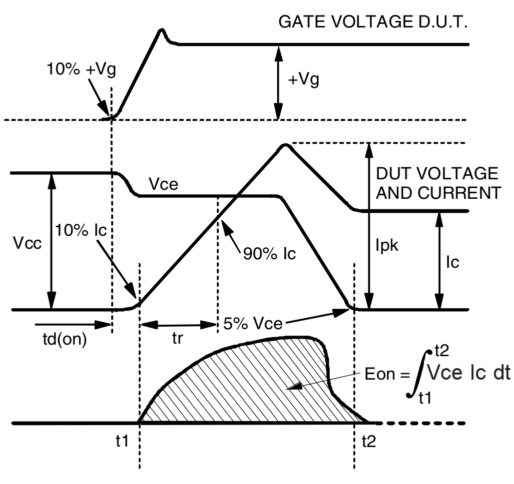


Fig. 17c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on}, $t_{d(on)}$, t_r

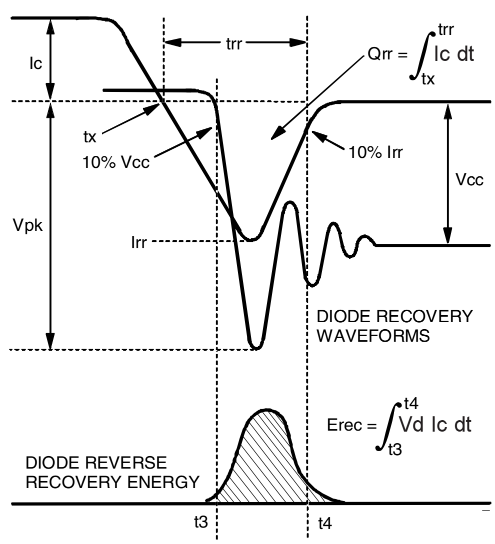


Fig. 17d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

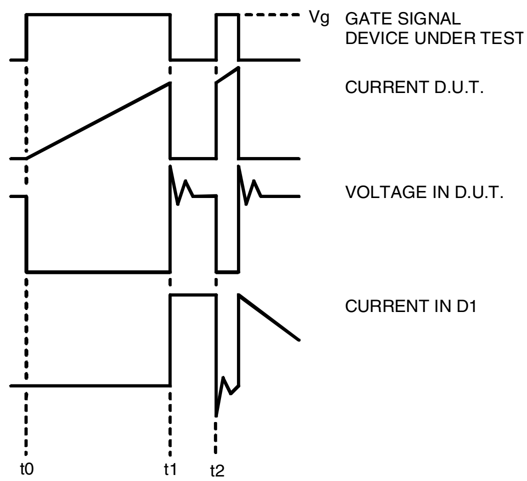


Figure 17e. Macro Waveforms for Figure 18a's Test Circuit

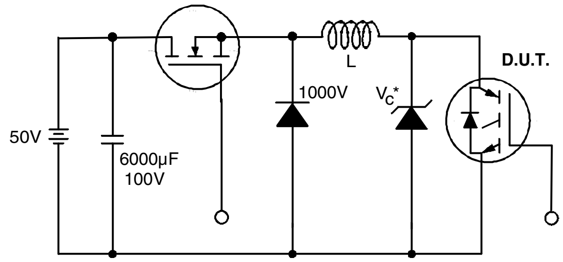


Figure 18. Clamped Inductive Load Test Circuit

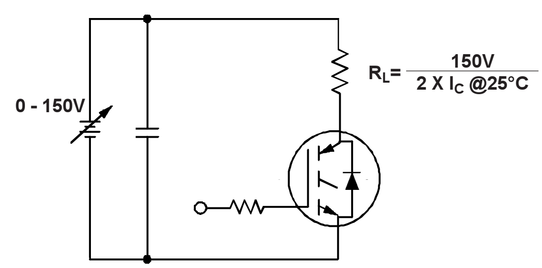


Figure 19. Pulsed Collector Current Test Circuit

Notes:

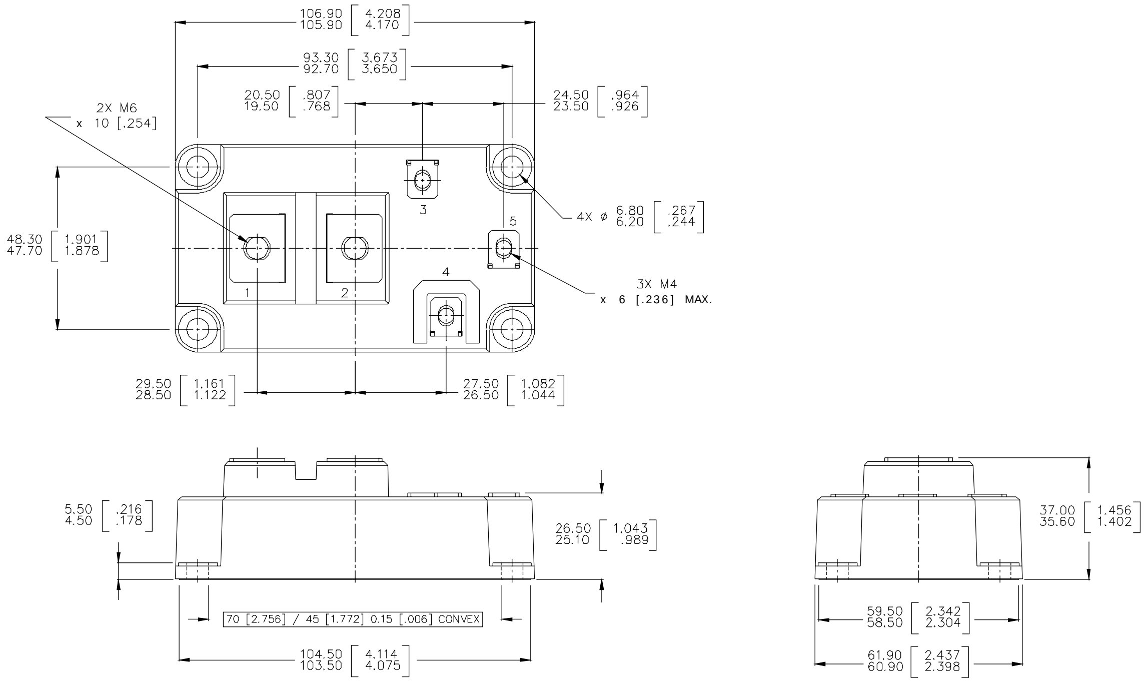
① Repetitive rating; V_{GE} = 17V, pulse width limited by max. junction temperature.

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.

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