

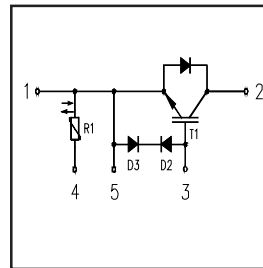
GA600HD25S

Standard™ Speed IGBT

SINGLE SWITCH IGBT DUAL INT-A-Pak

Features

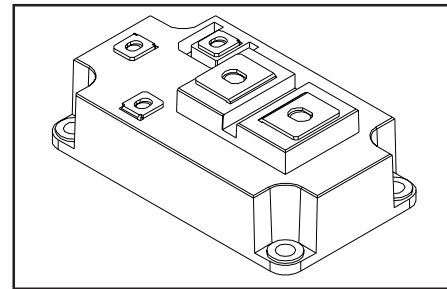
- Standard speed, optimized for battery powered application
- Very low conduction losses
- HEXFRED™ antiparallel diodes with ultra-soft recovery
- Industry standard package
- UL recognition pending
- Internal thermistor



$V_{CES} = 250V$
$V_{CE(on) typ.} = 1.20V$
@ $V_{GE} = 15V, I_C = 600A$

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
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	600	A
I_{CM}	Pulsed Collector Current ^①	1200	
I_{LM}	Peak Switching Current ^②	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, $t = 1 \text{ min}$	2500	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	1920	W
$P_D @ T_C = 85^\circ C$	Maximum Power Dissipation	1000	
T_J	Operating Junction Temperature Range	-40 to +150	$^\circ C$
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	$^\circ C/W$
$R_{\theta JC}$	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	—	2.0	
	Weight of Module	400	—	g

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	—	1.20	1.30		V _{GE} = 15V, I _C = 600A
		—	1.16	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
ΔV _{GE(th)/ΔT_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, T _c = 70°C
R-T ₂₅	Thermistor, Positive Temp Coefficient	779	820	861	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
Q _{ge}	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, I _C = 600A
t _r	Rise Time	—	950	—		Inductor load
t _{d(off)}	Turn-Off Delay Time	—	846	—		
t _f	Fall Time	—	934	—		V _{GE} = ±15V
E _{on}	Turn-On Switching Energy	—	17	—	mJ	See Fig. 18, 20
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	—		f = 1 MHz
t _{rr}	Diode Reverse Recovery Time	—	314	—	ns	I _C = 600A
I _{rr}	Diode Peak Reverse Current	—	80	—		A
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 Quality Thermistor Inc. data sheet QTI 0805-821J for details

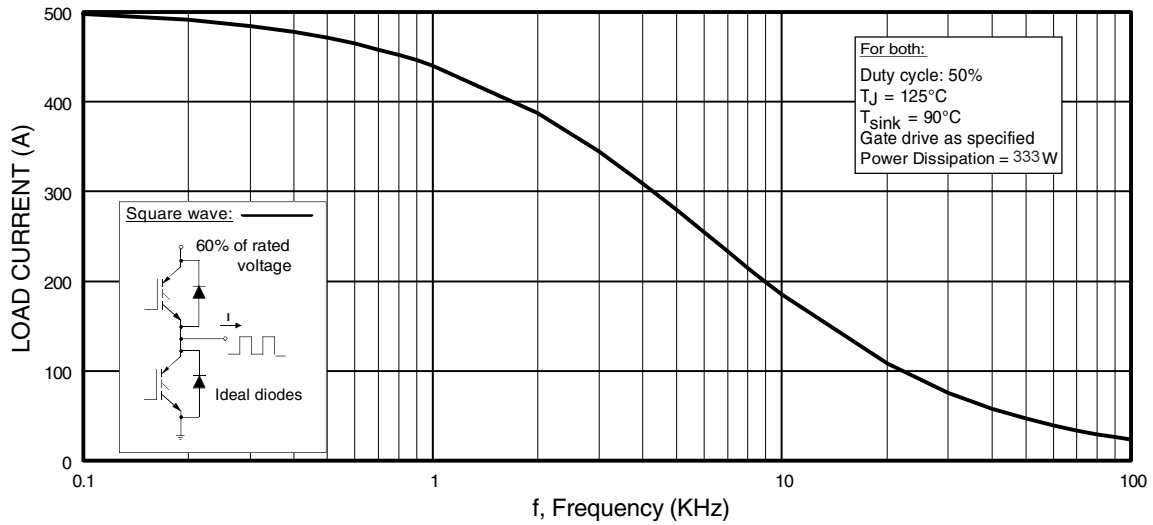


Fig. 1 - Typical Load Current vs. Frequency
 (Load Current = I_{RMS} of fundamental)

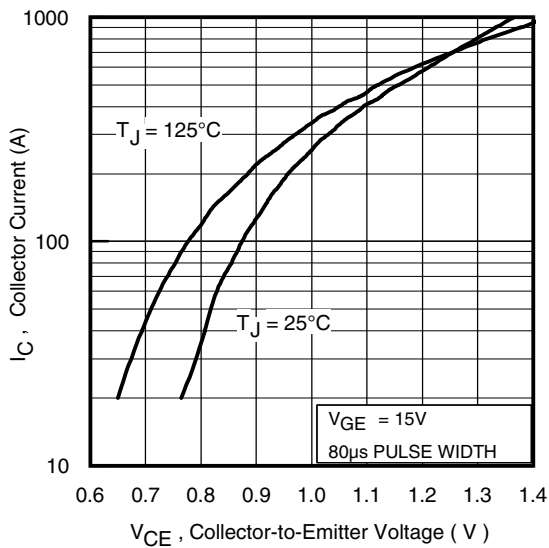


Fig. 2 - Typical Output Characteristics

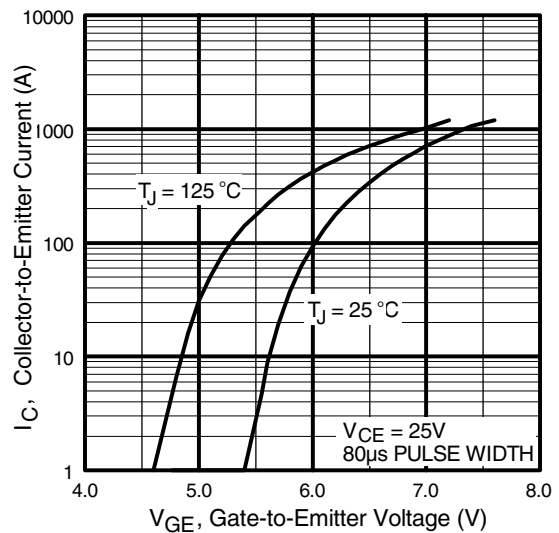


Fig. 3 - Typical Transfer Characteristics

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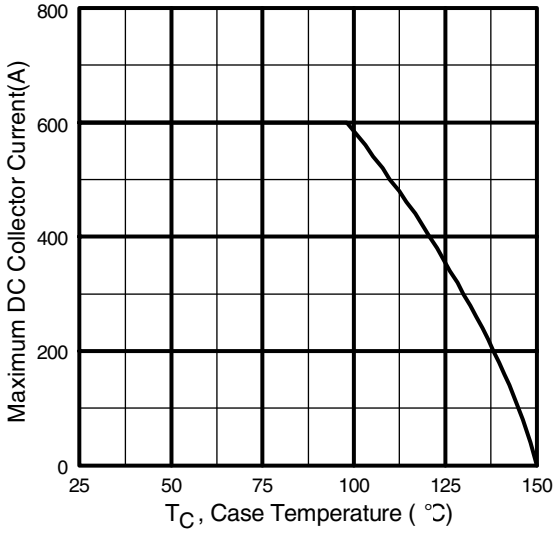


Fig. 4 - Maximum Collector Current vs. Case Temperature

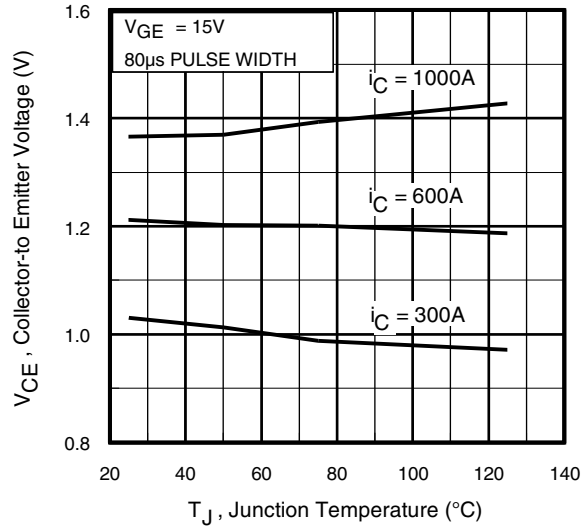


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

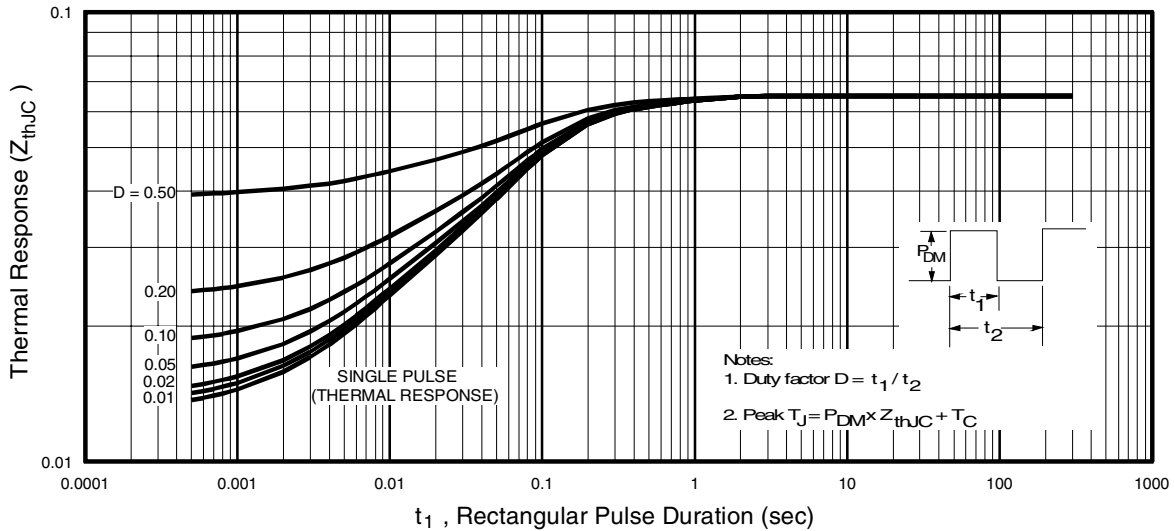


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

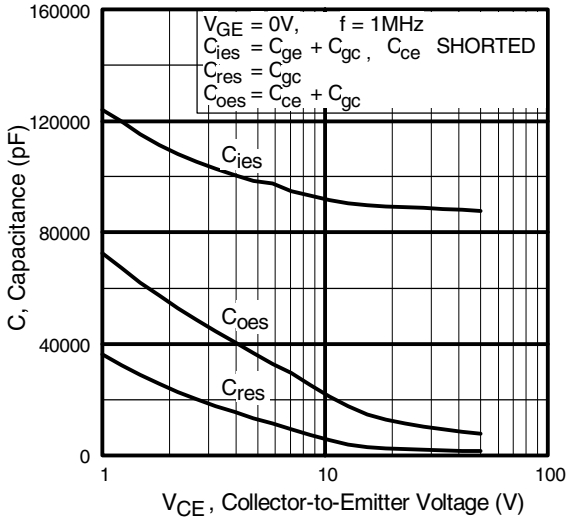


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

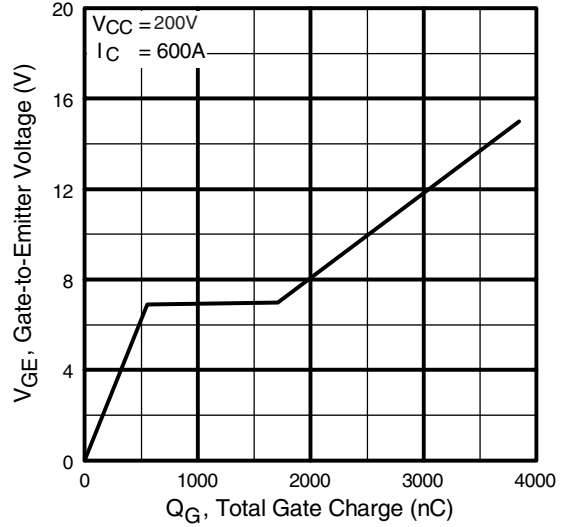


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

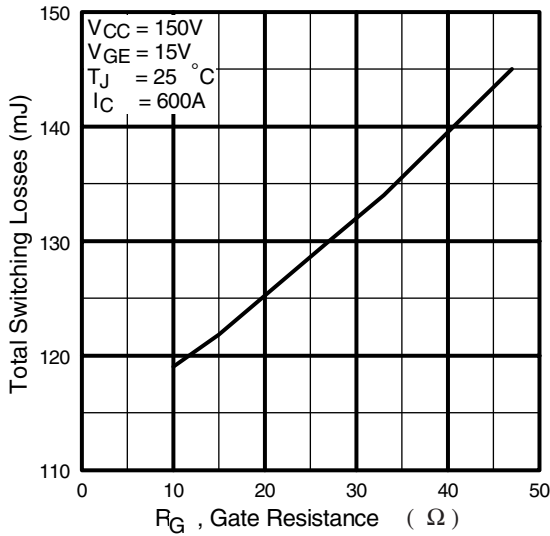


Fig. 9 - Typical Switching Losses vs. Gate Resistance

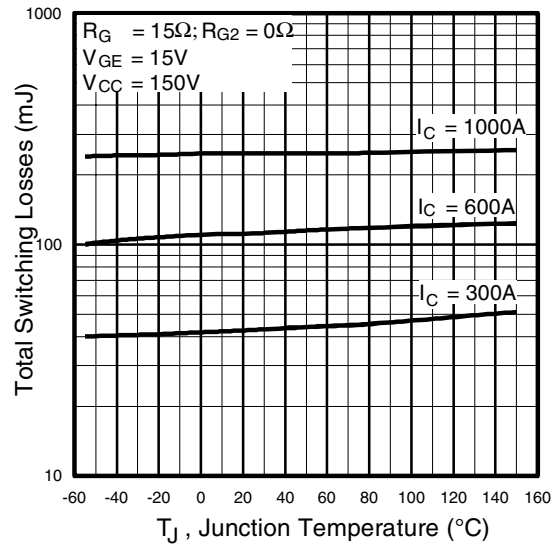


Fig. 10 - Typical Switching Losses vs. Junction Temperature

GA600HD25S

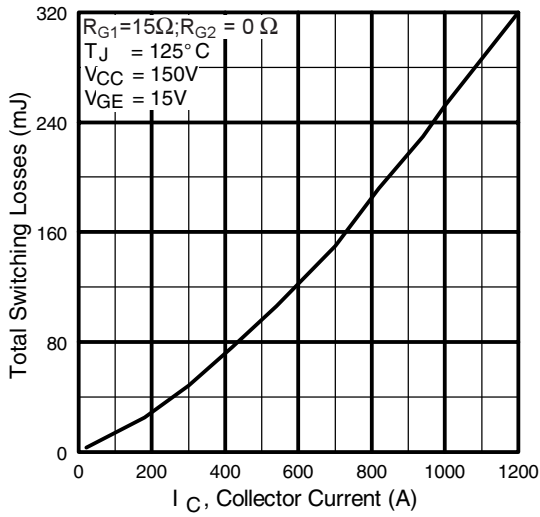


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

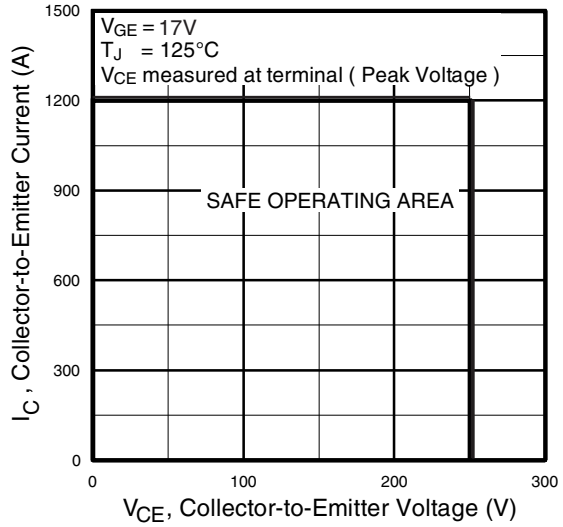


Fig. 12 - Reverse Bias SOA

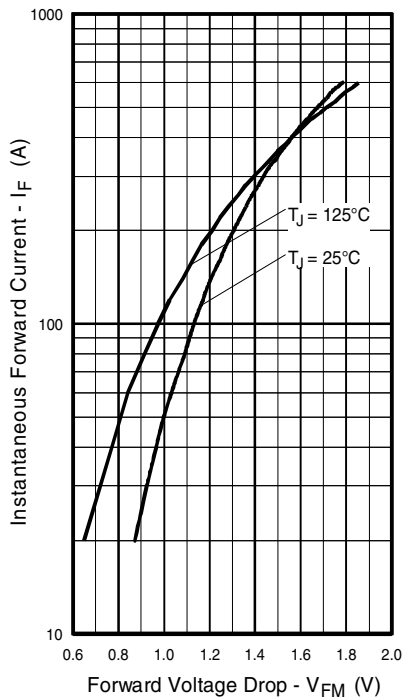


Fig. 13 - Typical Forward Voltage Drop vs. Instantaneous Forward Current

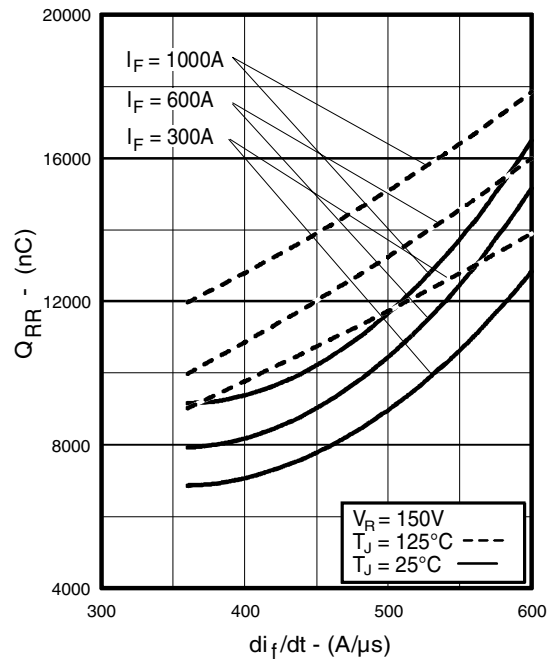


Fig. 14 - Typical Stored Charge vs. di_f/dt

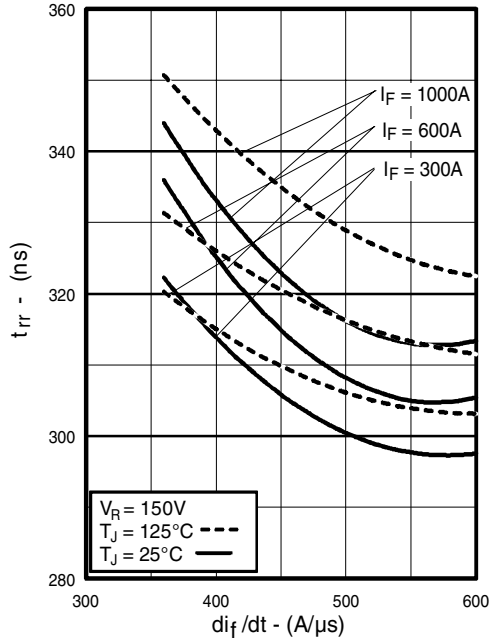


Fig. 15 - Typical Reverse Recovery vs. di_f/dt

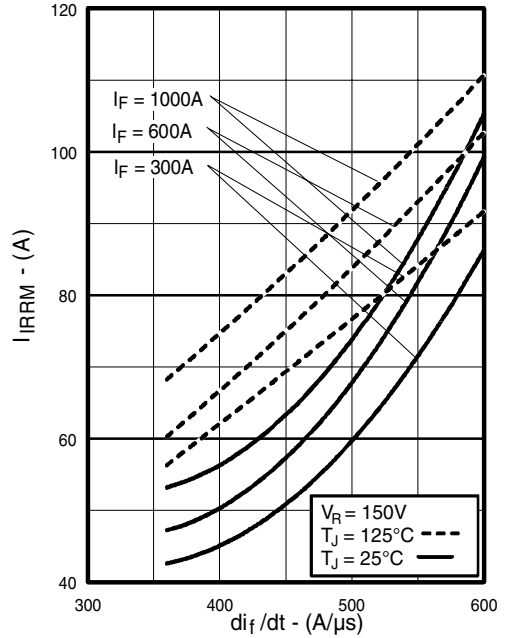


Fig. 16 - Typical Recovery Current vs. di_f/dt

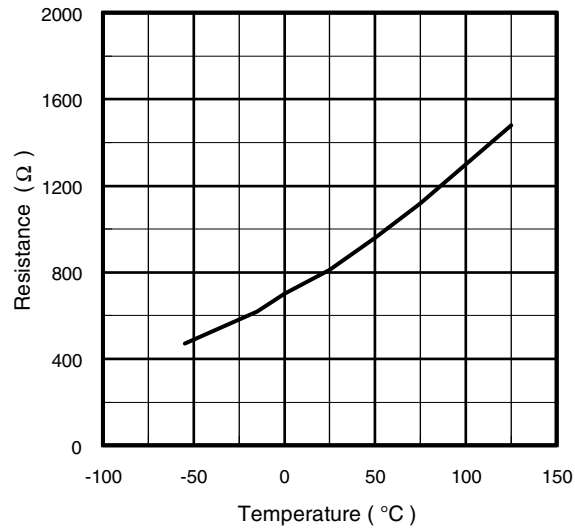


Fig. 17 - Typical Thermistor Characteristics
(See Note1 on page 2)

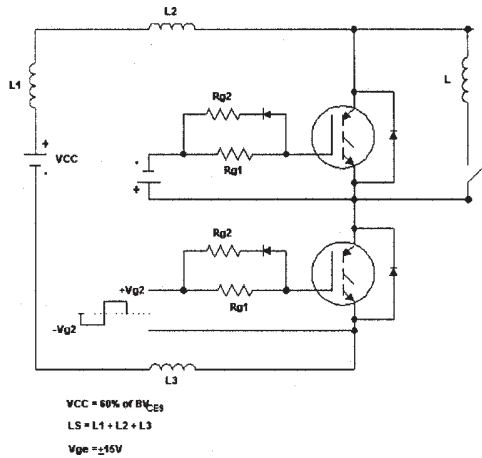


Fig. 18a - Test Circuit for Measurement of I_{LM} , E_{on} , $E_{off}(\text{diode})$, t_{rr} , Q_{rr} , I_{rr} , $t_{d(on)}$, t_r , $t_{d(off)}$, t_f

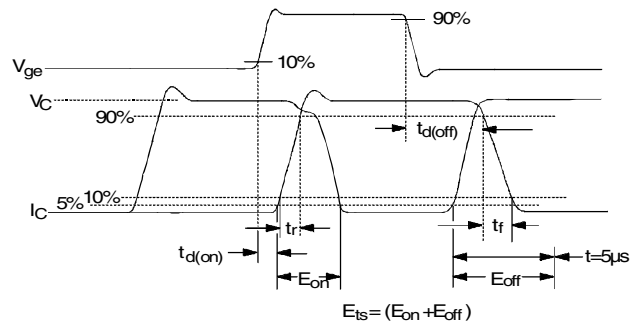


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off} , $t_{d(off)}$, t_f

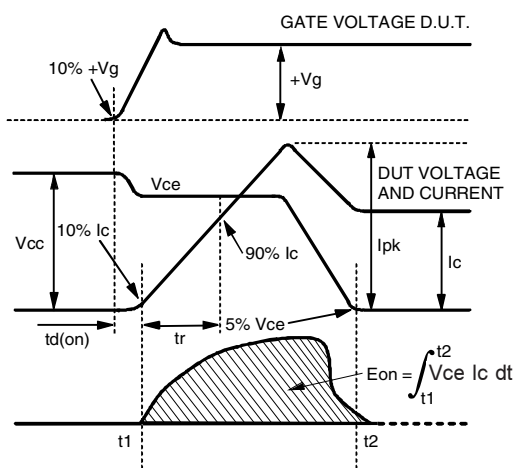


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on} , $t_{d(on)}$, t_r

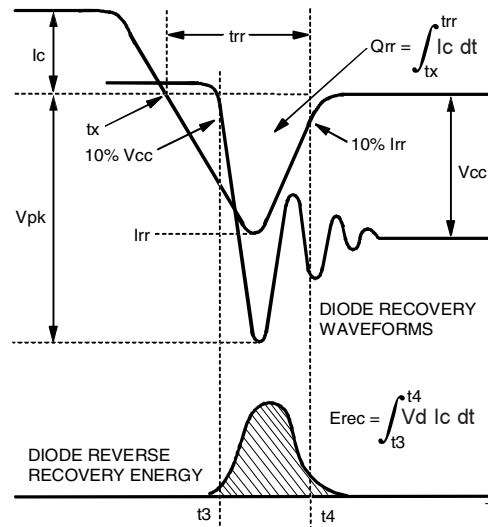


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec} , t_{rr} , Q_{rr} , I_{rr}

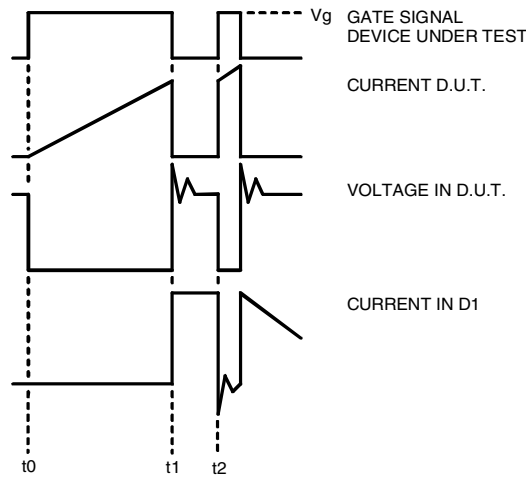


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

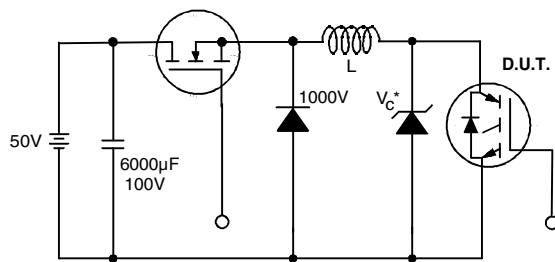


Figure 19. Clamped Inductive Load Test Circuit

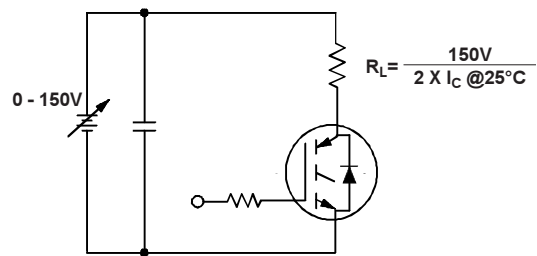


Figure 20. Pulsed Collector Current Test Circuit

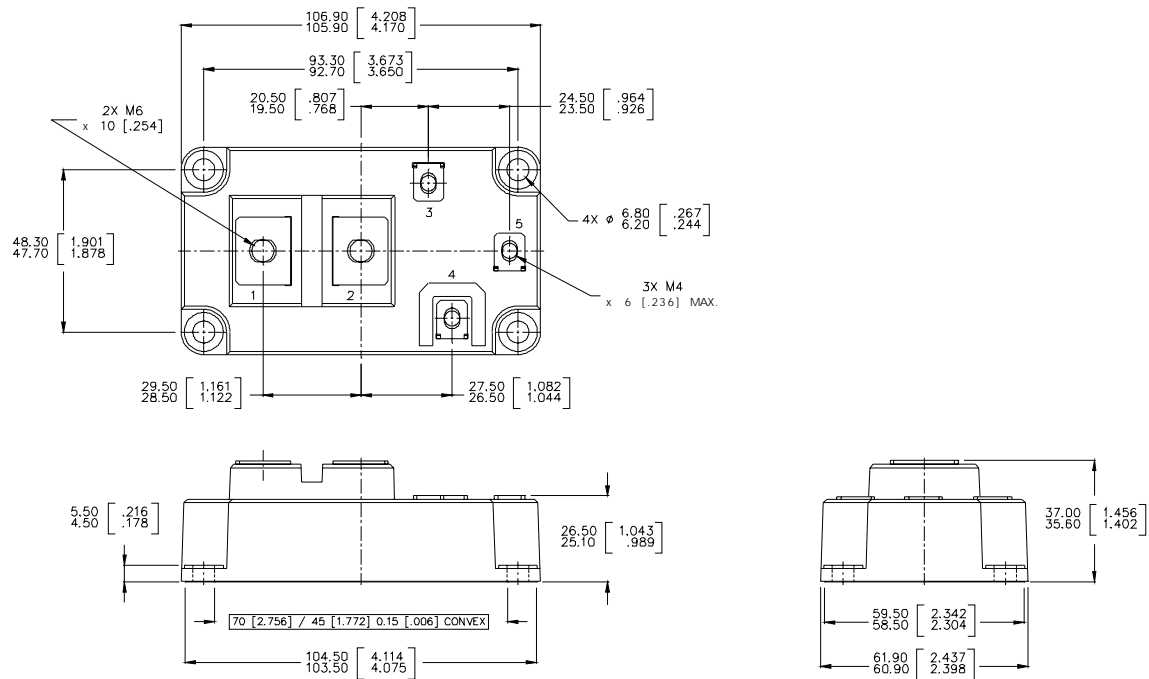
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Notes:

- ① Repetitive rating; $V_{GE} = 17V$, pulse width limited by max. junction temperature.
- ② See fig. 17
- ③ For screws M6.
- ④ Pulse width $50\mu s$; 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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