DFI450HF12I4ME7

1200V/450A Half Bridge IGBT Module

Description

The DFI450HF12I4ME7 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power Switching supply and Motor control.

Features

- Blocking voltage:1200V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Uninterrupted Power Supply

Circuit diagram

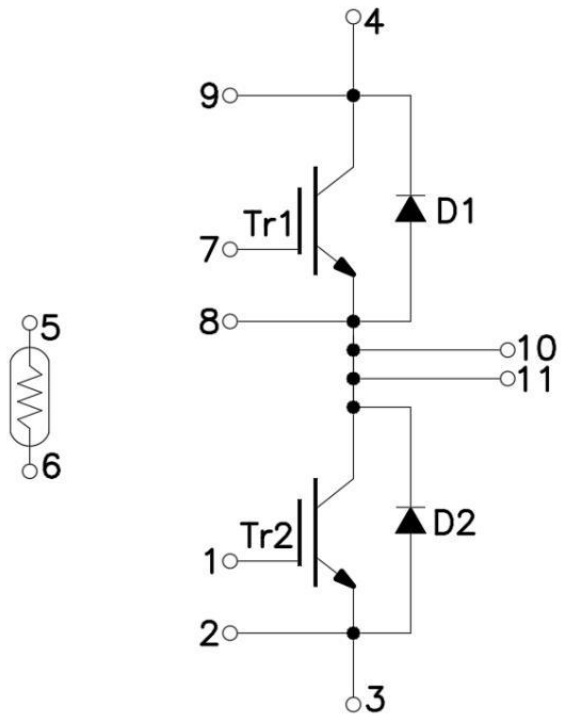

Figure 1. Out drawing & circuit diagram for DFI450HF12I4ME7

Pin Configuration and Marking Information

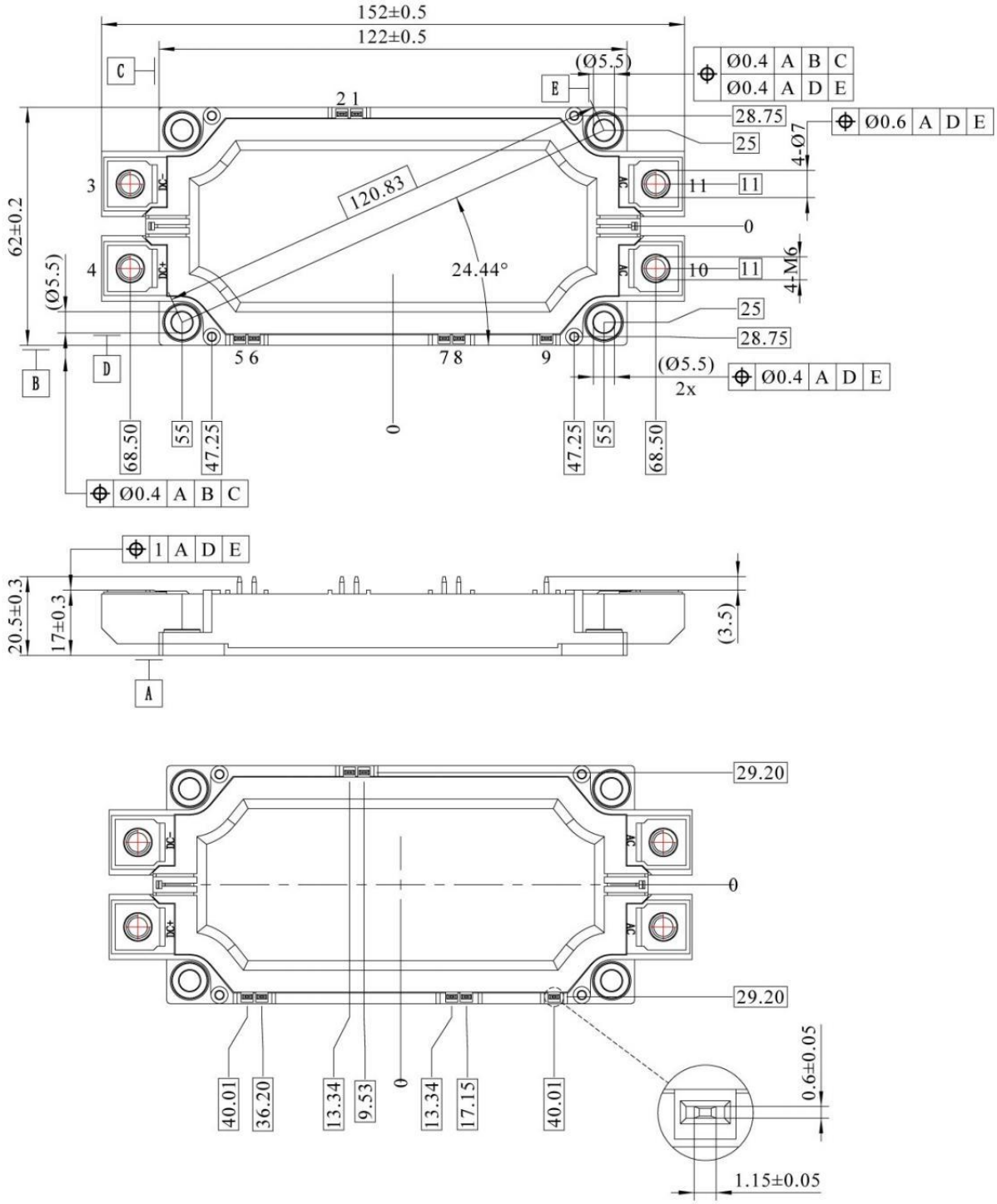

Figure 2. Pin configuration

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f= 50Hz, t =1min	3.4	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	600	-
Module lead resistance, terminals - chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	350	g

Maximum Ratings (T_j =25°C unless otherwise specified)

Symbol	Parameter	Condition	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I_C	DC Continuous Collector Current	T_C =95°C	450	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	900	A
P_C	Maximum Power Dissipation	T_C =25°C, IGBT	2239	W
I_F	Diode Forward Current	-	450	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	900	A
T_{vjop}	Operating junction temperature	Note2	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Note2: T_{vjop} > 150°C is only allowed for operation at overload conditions

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C=25°C	-	5	-	kΩ
ΔR/R	Deviation of R_{100}	T_C=100°C, R_{100} =493Ω	-5	-	5	%
P_{25}	Power dissipation	T_C=25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

IGBT Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C =450A V_{GE} =15V	T_j =25°C	-	1.60	1.92	V
			T_j =125°C	-	1.73	-	
			T_j =150°C	-	1.80	-	
			T_j =175°C	-	1.85	-	
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =17mA, V_{CE} =V_{GE}		5.0	5.8	6.5	V
Q_G	Gate charge	V_{GE} = -15V to +15V		-	5.2	-	uC
R_{Gint}	Internal gate resistor	-	T_j =25°C	-	0.7	-	Ω
C_{ies}	Input Capacitance	V_{CE} =25V V_{GE} =0V f=1MHz	T_j =25°C	-	64.8	-	nF
C_{oes}	Output Capacitance			-	1.76	-	nF
C_{res}	Reverse transfer Capacitance			-	0.50	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE} =1200V, V_{GE} =0V	T_j =25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = 20V, V_{CE} =0V	T_j =25°C	-	-	1	uA
$t_{d(on)}$	Turn-on delay time	V_{CC} =600V I_C =450A V_{GE} =+15V/-8V R_G =1.0Ω Inductive load	T_j =25°C	-	254	-	ns
			T_j =125°C	-	262	-	
			T_j =150°C	-	264	-	
t_r	Rise time		T_j =25°C	-	61	-	ns
			T_j =125°C	-	82	-	
			T_j =150°C	-	87	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	455	-	ns
			T_j =125°C	-	494	-	
			T_j =150°C	-	504	-	
t_f	Fall time		T_j =25°C	-	194	-	ns
			T_j=125°C	-	292	-	
			T_j =150°C	-	317	-	
			T_j =25°C	-	40.6	-	

E_{on}	Turn-on power dissipation		T_j=125°C	-	60.8	-	mJ
			T_j=150°C	-	65.8	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	37.5	-	mJ
			T_j=125°C	-	48.8	-	
			T_j=150°C	-	51.6	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.067	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.020	-	°C/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m ・ K and thickness is 50um

Freewheeling Diode Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V_F (Chip)	Diode Forward Voltage	I_F =450A, V_{GE} =0V	T_j =25°C	-	1.64	1.97	V
			T_j =125°C	-	1.48	-	
			T_j =150°C	-	1.49	-	
			T_j =175°C	-	1.44	-	
t_{rr}	Reverse recovery time	(Switch side) V_{CC} =600V I_C =450A V_{GE} =+15V/-8V R_G =1.0Ω (FRD side) V_{rr} =600V I_F =450A V_{GE} =-8V Inductive load switching operation	T_j =25°C	-	0.620	-	us
			T_j =125°C	-	0.673	-	
			T_j =150°C	-	0.687	-	
I_{RM}	Peak reverse recovery Current		T_j =25°C	-	353	-	A
			T_j =125°C	-	383	-	
			T_j =150°C	-	390	-	
Q_{rr}	Recovered charge		T_j=25°C	-	89.9	-	uC
			T_j =125°C	-	135.5	-	
			T_j =150°C	-	147.0	-	
E_{rr}	Reverse recovered energy		T_j =25°C	-	40.3	-	mJ
			T_j =125°C	-	58.9	-	
			T_j =150°C	-	63.5	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.093	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.025	-	°C/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m ・ K and thickness is 50um

Test Conditions

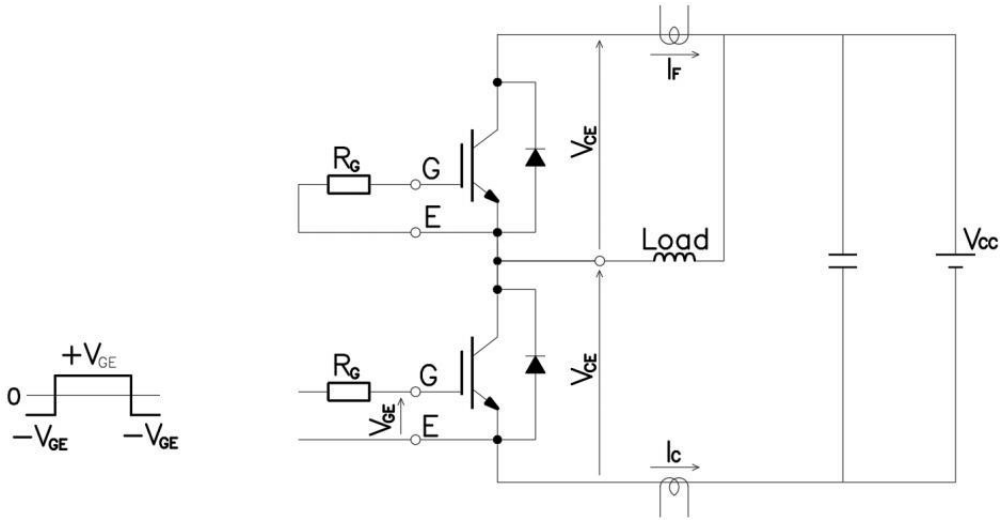

Figure 3. Switching time measure circuit

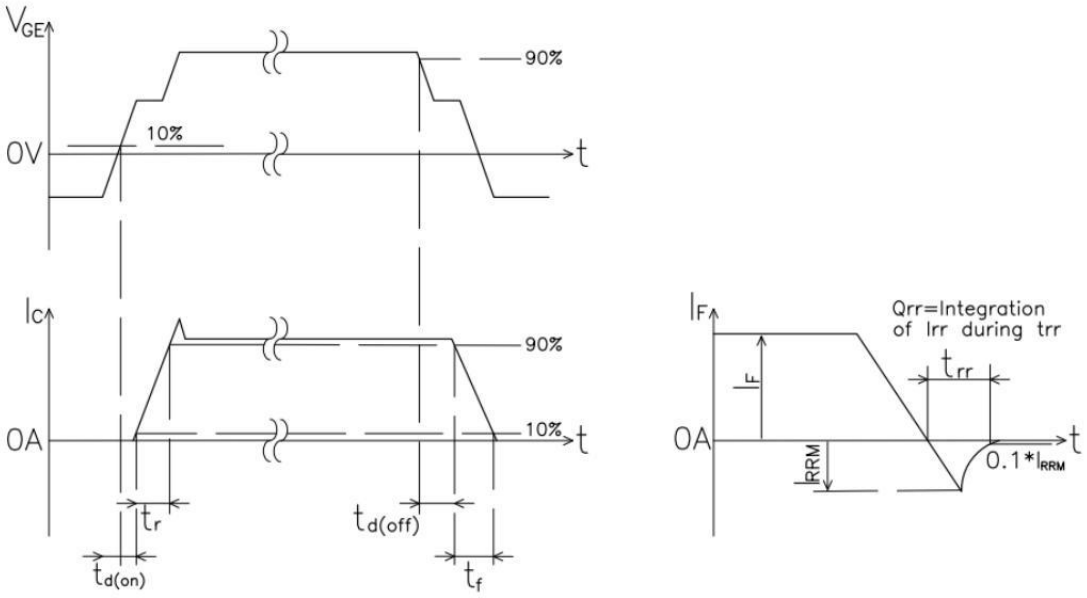

Figure 4. Switching time definition

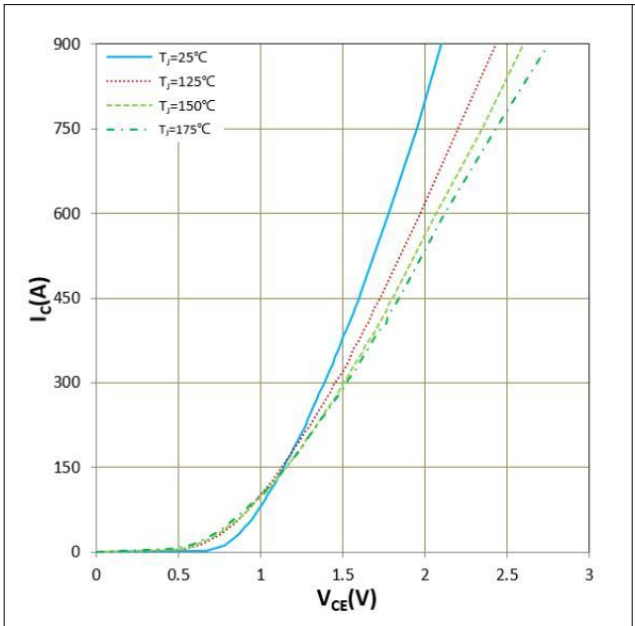

Figure 5. Ic vs V_{CE}

V_{GE} =15V

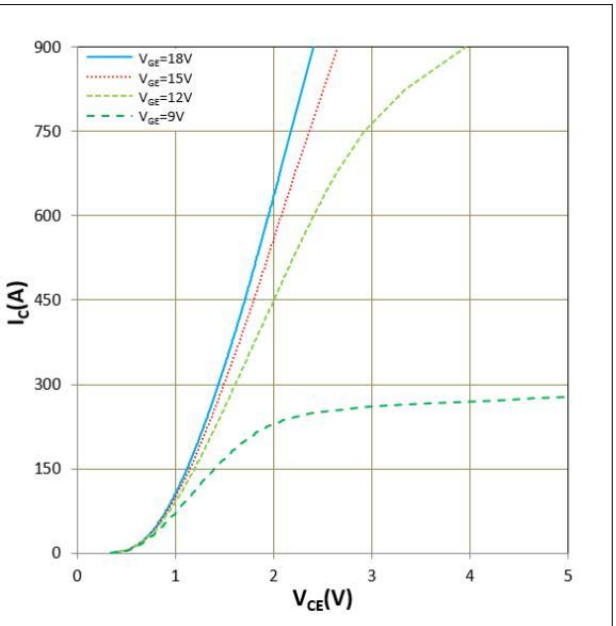

Figure 6. Ic vs V_{CE}

T_j =150°C

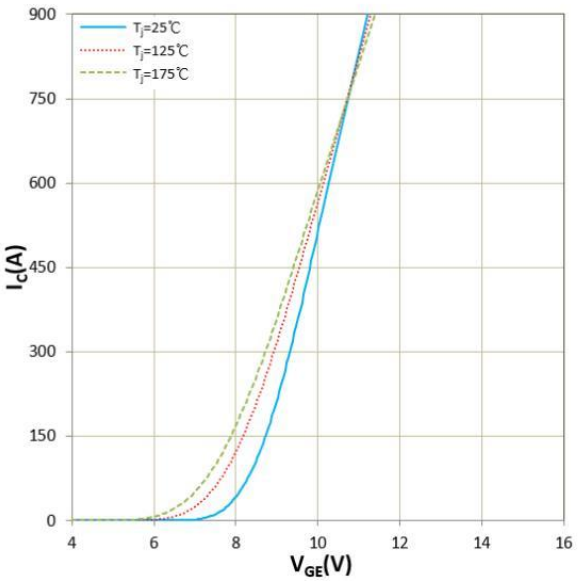

Figure 7. Ic vs V_{GE}

V_{CE} =20V

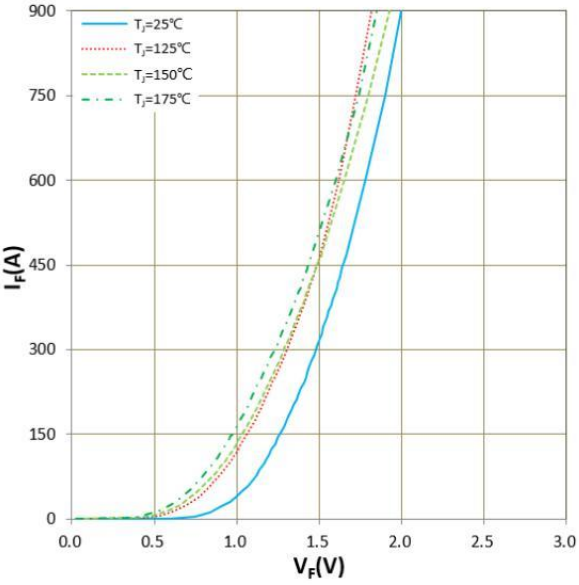

Figure 8. I_F vs V_F

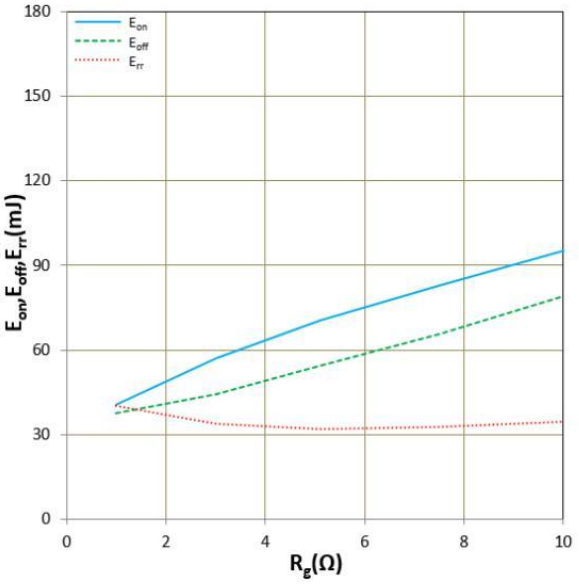

Figure 9. E_{on}, E_{off}, E_{rr} vs R_g(Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, I_C =450A, T_j =25°C

Inductive Load

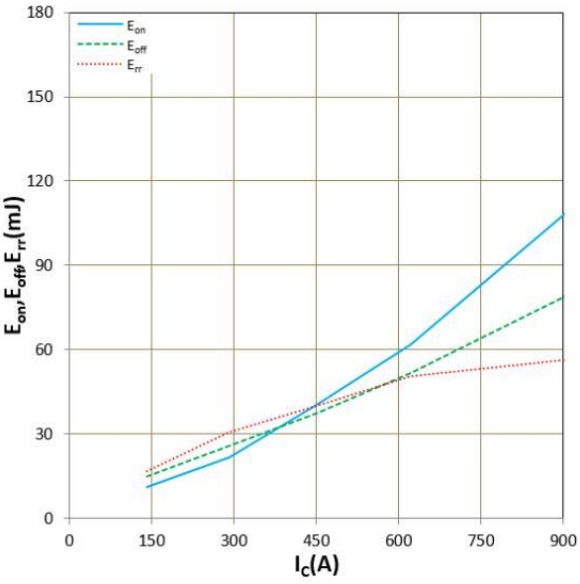

Figure 10. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =25°C

Inductive Load

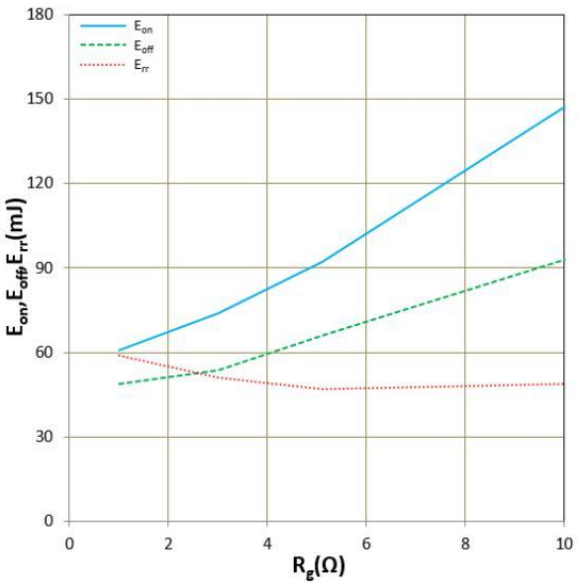

Figure 11. E_{on}, E_{off}, E_{rr} vs R_g(Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, I_C =450A, T_j =125°C

Inductive Load

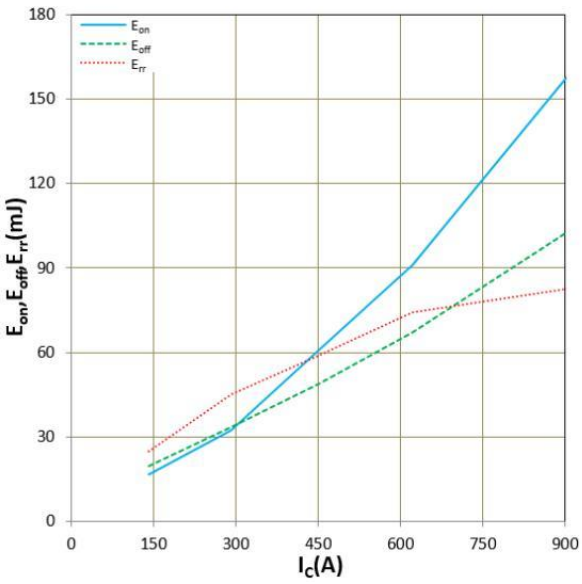

Figure 12. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, R_g=1.0Ω, T_j =125°C

Inductive Load

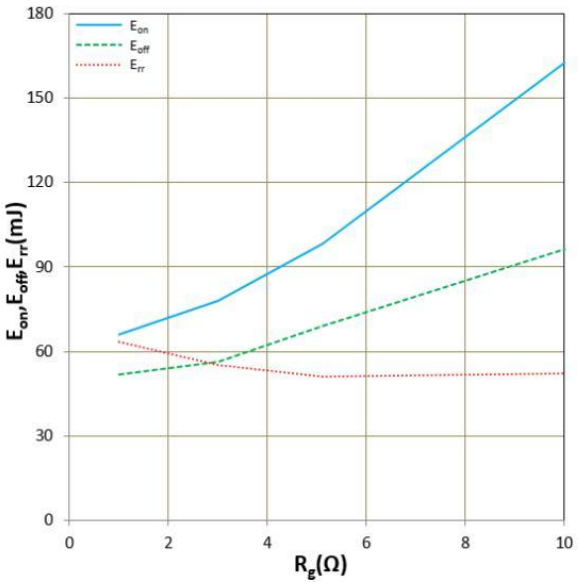

Figure 13. E_{on}, E_{off}, E_{rr} vs R_g(Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, I_C =450A, T_j =150°C

Inductive Load

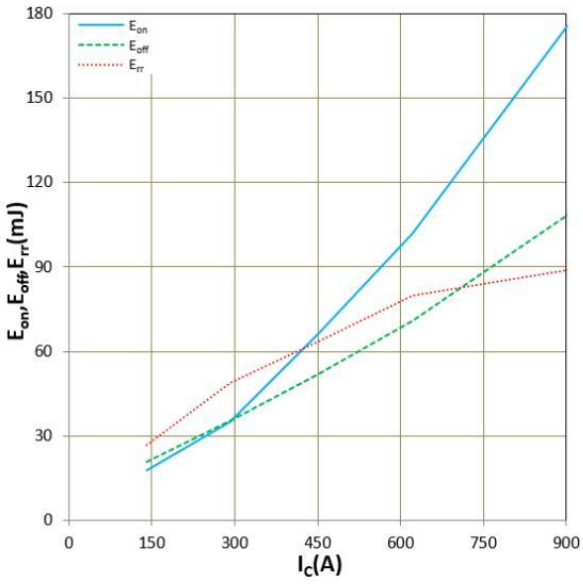

Figure 14. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC}=600V, V_{GE}=+15V/-8V, R_g=1.0Ω, T_j =150°C

Inductive Load

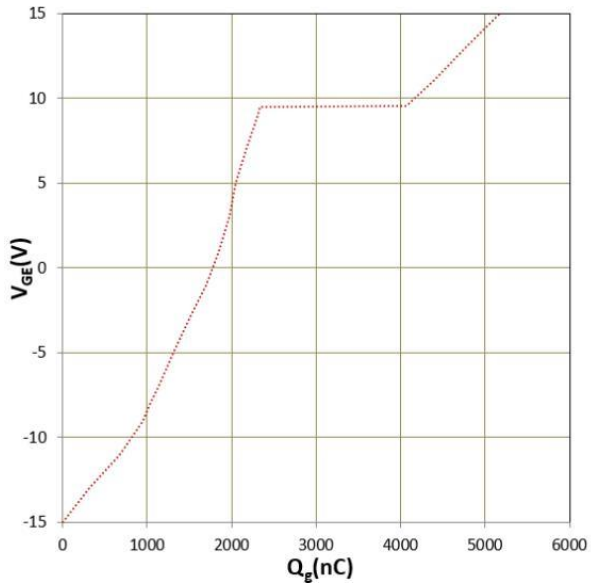

Figure 15. Gate charge

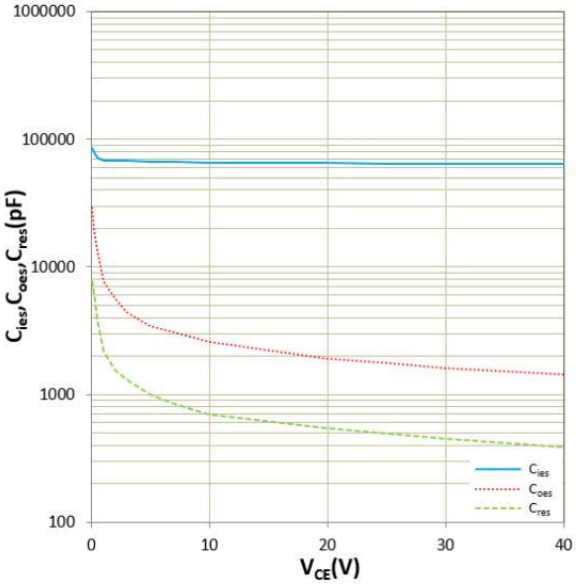

Figure 16. C_{ies}, C_{oes}, C_{res} vs V_{CE}

T_j=25°C, f=1MHz

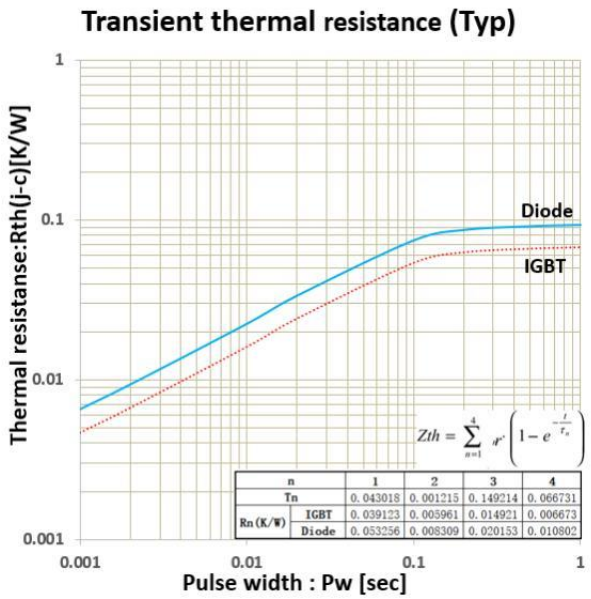

Figure 17. transient thermal impedance IGBT/Diode

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The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

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