

Description

The DFI450FB08D6RE1 is a 3 Phase IGBT Power Module with a high power density. It integrates 750V IGBT chips designed for xEV or motor drives application.



Features

- Blocking voltage 750V
- Low saturation voltage $V_{CE(sat)}$
- 175°C maximum junction temperature
- Thermistor inside
- Press FIT Contact Technology

Applications

- xEV Applications
- Motor Drives
- Commercial Agriculture Vehicles

Circuit diagram

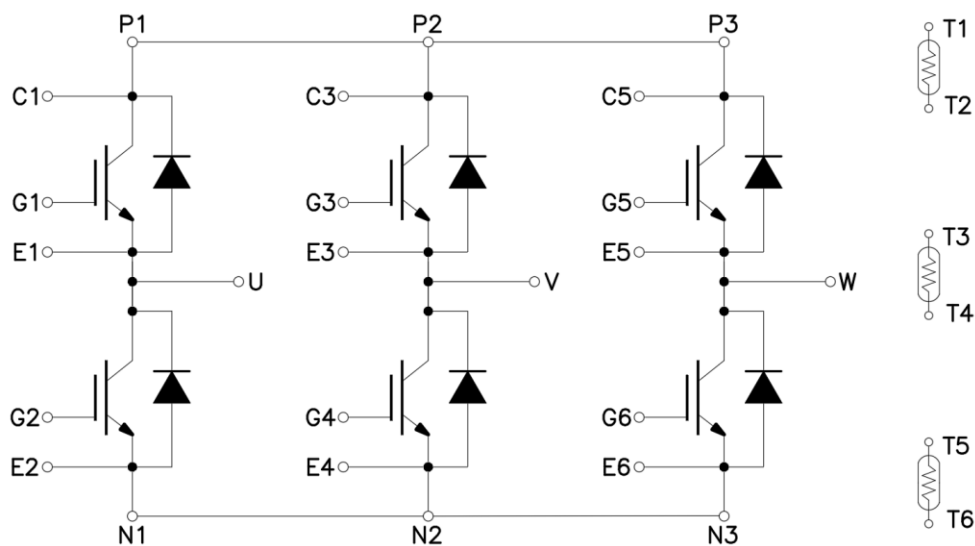


Figure 1. Out drawing & circuit diagram for DFI450FB08D6RE1

Physical Dimensions

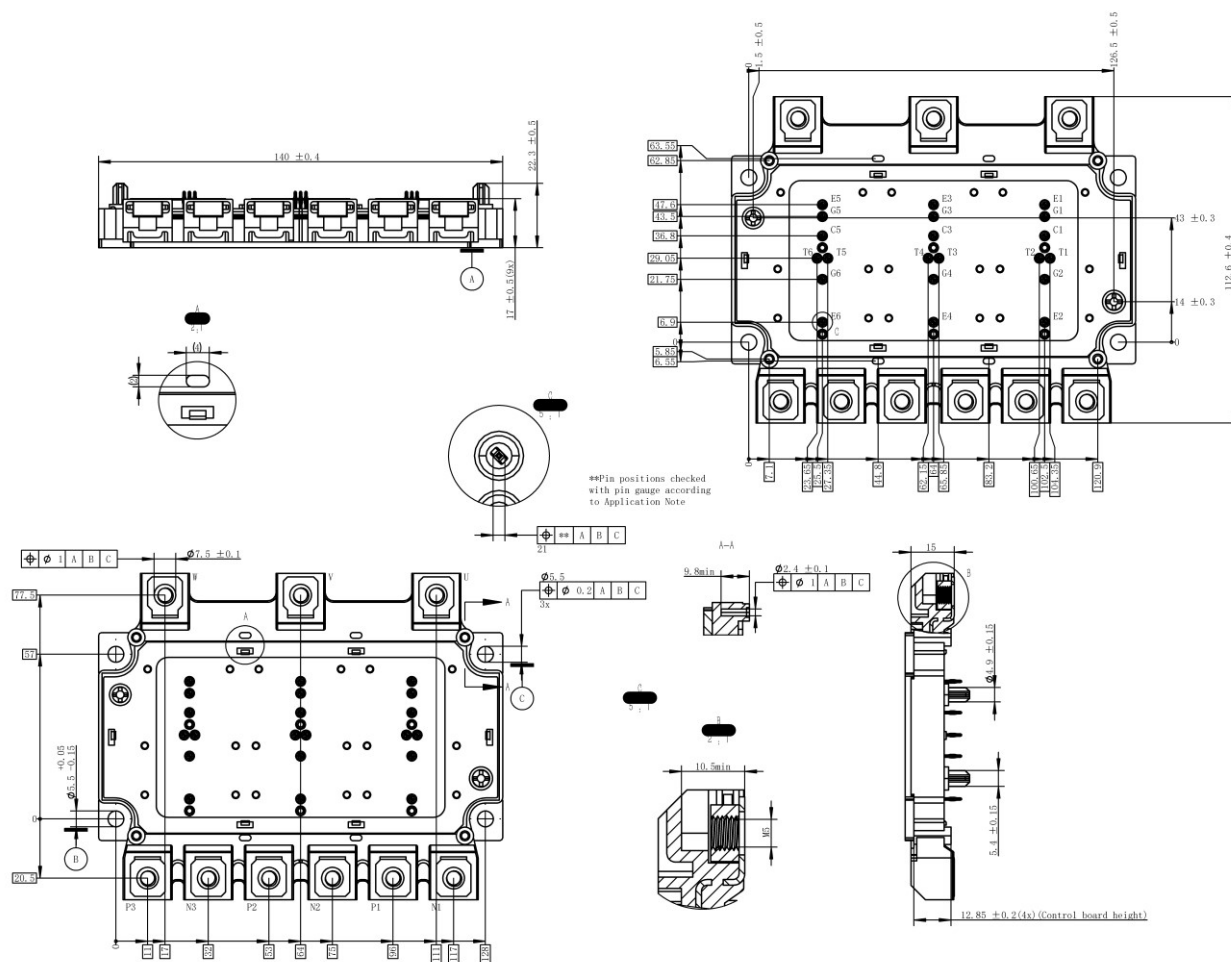


Figure2. Physical Dimensions

Maximum Ratings ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	750	V
V_{GES}	Gate-Emitter Voltage	C-E Short	± 20	V
I_{CN}	Implemented collector current	-	450	A
I_{Cnom}	Continuous DC collector current	$T_F = 65^\circ\text{C}$	330	A
I_{CM}	Pulse Collector Current	$t_p = 1\text{ms}$, Note1	900	A
I_{FN}	Implemented forward current	-	450	A
I_{FRM}	Repetitive peak forward Current	$t_p = 1\text{ms}$, Note2	900	A
T_j	junction temperature	-	-40 to 175	$^\circ\text{C}$

Note1: Recommended Operating Value: -8V/+15V, -15V/+15V

Note2: Pulse width limited by maximum junction temperature

Module

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
V _{ISOL}	Isolation voltage	RMS, f=50Hz, t=1min	2.5			KV
-	Material of module baseplate	-	Cu+Ni+Al			-
-	Creepage distance	terminal to heatsink	18.2			mm
		terminal to terminal	8.2			mm
-	Clearance	terminal to heatsink	18.2			mm
		terminal to terminal	5.9			mm
-	Weight	-	490			g
-	Mounting torque for module mounting	Screw M5 baseplate to heatsink	3.0	-	6.0	Nm
-	Terminal connection torque	Screw M5	3.0	-	6.0	Nm
ΔP	Pressure in cooling circuit	ΔV/Δt = 10dm ³ /min, T _F = 75°C	-	90	-	mbar
P	Maximum pressure in cooling circuit	T _{baseplate} < 40°C	-	-	2.5	bar
		T _{baseplate} ≥ 40°C	-	-	2.0	
L _{SCE}	Stray inductance module	-	-	15	-	nH
T _{stg}	Storage temperature	-	-40	-	+125	°C
CTI	Comperative	-	200	-	-	-

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R ₂₅	Resistance	T _c = 25°C	-	5	-	kΩ
ΔR/R	Deviation of R100	T _c = 100°C, R ₁₀₀ = 493Ω	5	-	5	%
P ₂₅	Power dissipation	T _c = 25°C	-	-	20	mW
B _{25/50}	B-value	R ₂ = R ₂₅ exp [B _{25/50} (1/T ₂ - 1/(298,15 K))]	-	3375	-	K
B _{25/80}	B-value	R ₂ = R ₂₅ exp [B _{25/80} (1/T ₂ - 1/(298,15 K))]	-	3411	-	K
B _{25/100}	B-value	R ₂ = R ₂₅ exp [B _{25/100} (1/T ₂ - 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 =300A	T _J =25°C	-	1.32	-	V
		V _{GE} =15V	T _J =175°C	-	1.50	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =19mA, V _{CE} =V _{GE}		5.0	5.5	6.0	V
Q _G	Gate charge	V _{GE} =-8V to +15V		-	583	-	nC
R _{Gint}	Internal gate resistor	-	T _J =25°C	-	3.3	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V	T _J =25°C	-	12	-	nF
C _{res}	Output capacitance	f =500KHz		-	0.22	-	
C _{res}	Reverse transfer Capacitance			-	0.06	-	nF
I _{CES}	Collector- Emitter Cut off Current	V _{CE} =750V, V _{GE} =0V	T _J =25°C	-	-	1.0	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =20V, V _{CE} =0V	T _J =25°C	-	-	2.0	uA
t _{d(on)}	Turn-on delay time	V _{CC} =400V I _C = 300A V _{GE} =+15V/-8V R _{Gon} =3.9Ω R _{Goff} =2.2Ω Inductive load	T _J =25°C	-	250	-	ns
			T _J =175°C	-	303	-	
t _r	Rise time		T _J =25°C	-	60	-	ns
			T _J =175°C	-	75	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	810	-	ns
			T _J =175°C	-	930	-	
t _f	Fall time		T _J =25°C	-	50	-	ns
			T _J =175°C	-	64	-	
E _{on}	Turn-on power dissipation		T _J =25°C	-	8.3	-	mJ
			T _J =175°C	-	10.4	-	
E _{off}	Turn-off power dissipation		T _J =25°C	-	13.3	-	mJ
			T _J =175°C	-	18.6	-	
R _{th(j-f)}	Thermal Resistance, Junction to cooling fluid (IGBT)			-	0.21	-	°C/W

Freewheeling Diode Electrical characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit	
				Min.	Typ.	Max		
V _{BR}	Rewerse Breakdown Voltage	I _R =200uA	-	750	-	-	V	
V _F	Diode Forward Voltage	I _F =300A, V _{GE} =0V	T _j =25°C	-	1.27	-	V	
			T _j =175°C	-	1.36	-		
I _R	Reverse Leakage Current	V _R =750V	T _j =25°C	-	-	100	uA	
t _{rr}	Reverse recovery time	(Switch side) V _{CC} =400V, I _C =300A	T _j =25°C	-	299	-	ns	
			T _j =175°C	-	573	-		
I _{RR}	Reverse recovery Current		V _{GE} =+15V/-8V R _{Gon} =3.9Ω, R _{Goff} =2.2Ω	T _j =25°C	-	199	-	A
				T _j =175°C	-	338	-	
Q _{rr}	Recovered charge	(FRD side) V _{rr} =400V, I _F =300A		T _j =25°C	-	22	-	uC
				T _j =175°C	-	47	-	
E _{rr}	Reverse recovered energy		V _{GE} =-8V , Inductive load switching operation	T _j =25°C	-	3.9	-	mJ
				T _j =175°C	-	10.0	-	
R _{th(j-f)}	Thermal Resistance, Junction to cooling fluid(Diode)			-	0.24	-	°C/W	

Test Conditions

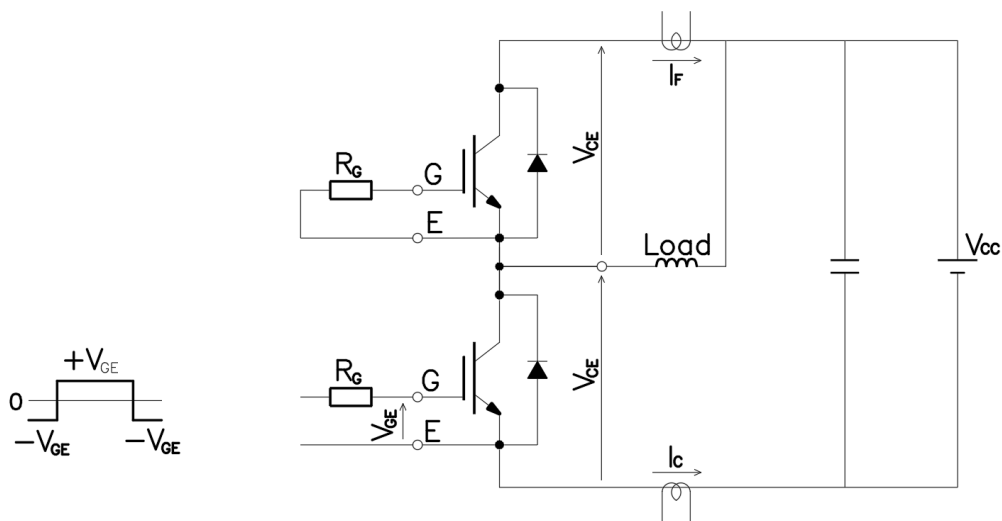


Figure 3. Switching time measure circuit

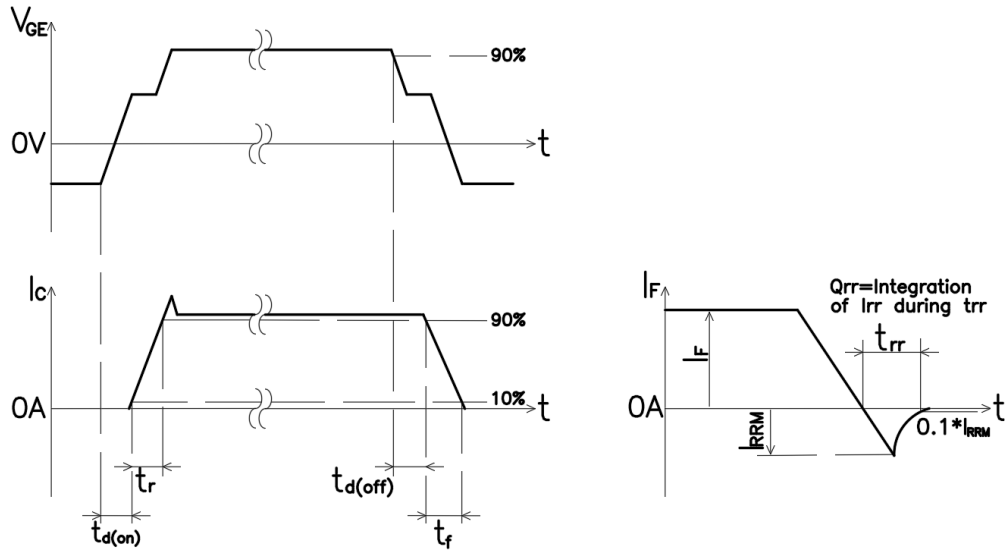


Figure 4. Switching time definition

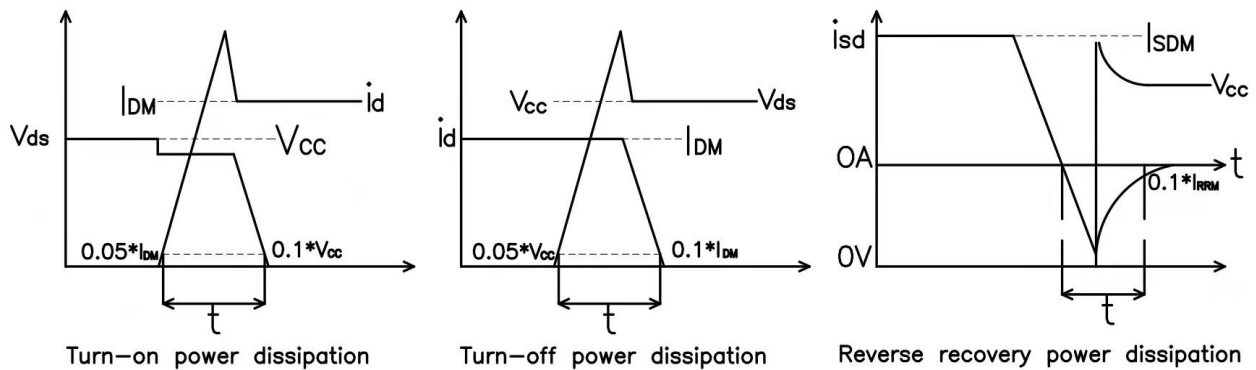


Figure 5. Switching power dissipation definition

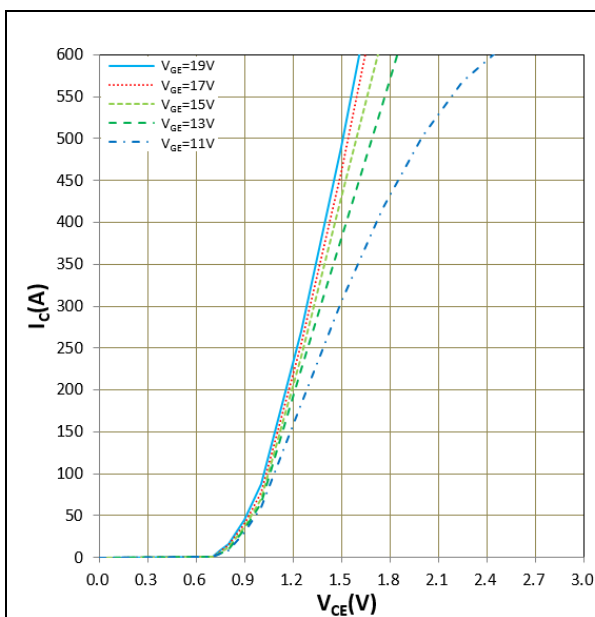


Figure 6. I_C vs V_{CE}

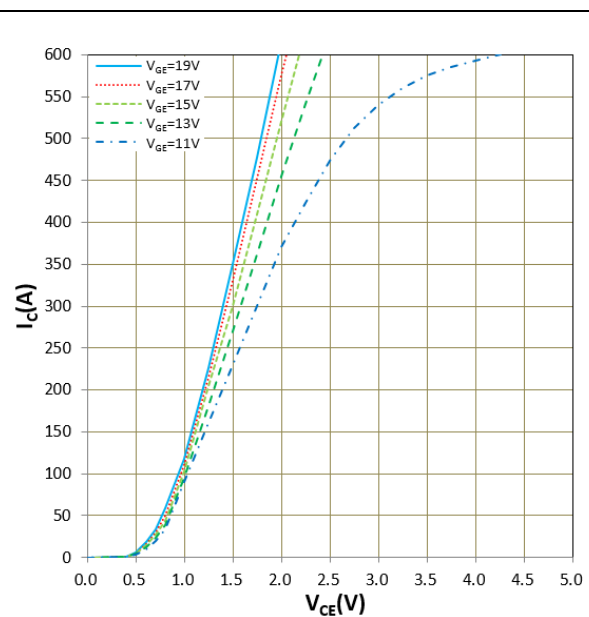
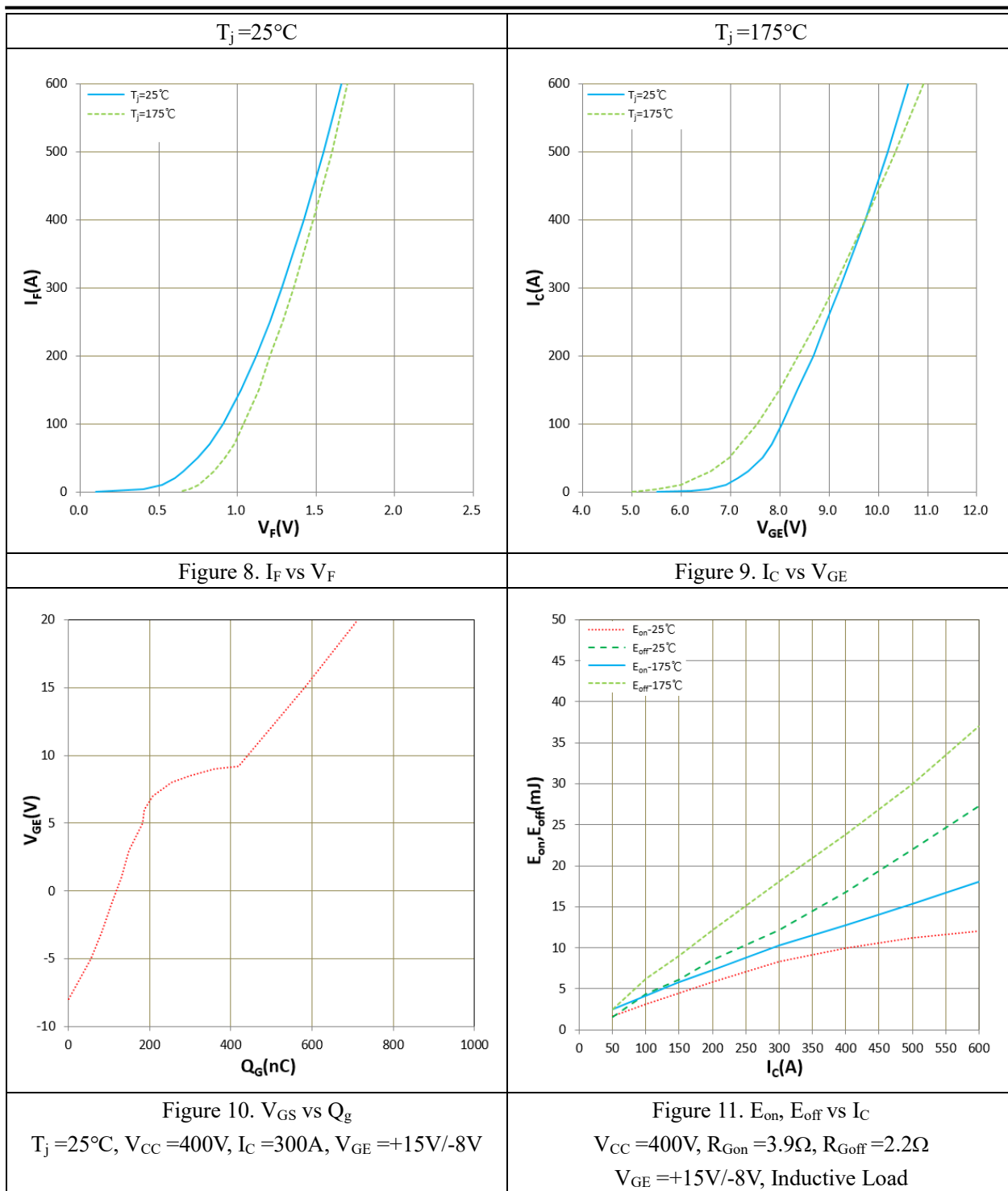


Figure 7. I_C vs V_{CE}



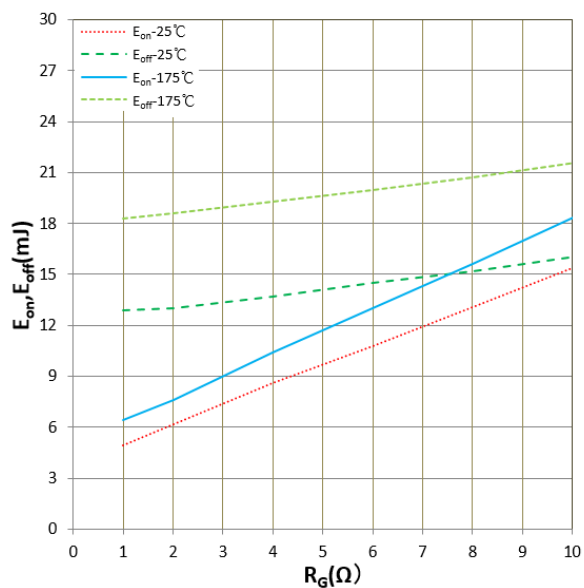


Figure 12. E_{on} , E_{off} vs R_G
 $V_{CC}=400V$, $I_D=300A$, $V_{GE}=+15V/-8V$
 Inductive Load

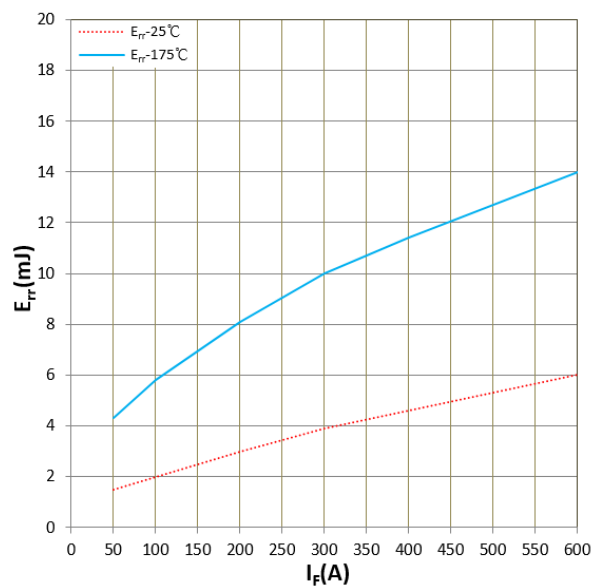


Figure 13. E_{tr} vs I_C
 $V_{CC}=400V$, $R_{Gon}=3.9\Omega$, $R_{Goff}=2.2\Omega$
 $V_{GE}=+15V/-8V$, Inductive Load

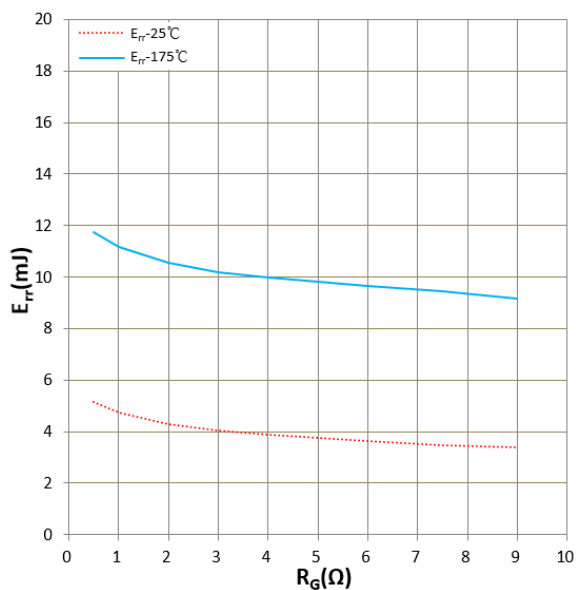


Figure 14. E_{tr} vs R_G
 $V_{CC}=400V$, $I_F=300A$, $V_{GE}=+15V/-8V$
 Inductive Load

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