

Description

The DFH50FB12P3H1 offer lower losses and higher energy for application such as motor drive、inverter and soft switching applications.



Features

- 1200V50 A, $V_{CE(sat)}(typ.)=1.6V$
- Lower losses and higher energy
- Excellent short-circuit capability

Applications

- Motor drive
- Inverter
- Welding machines
- UPS

Circuit diagram

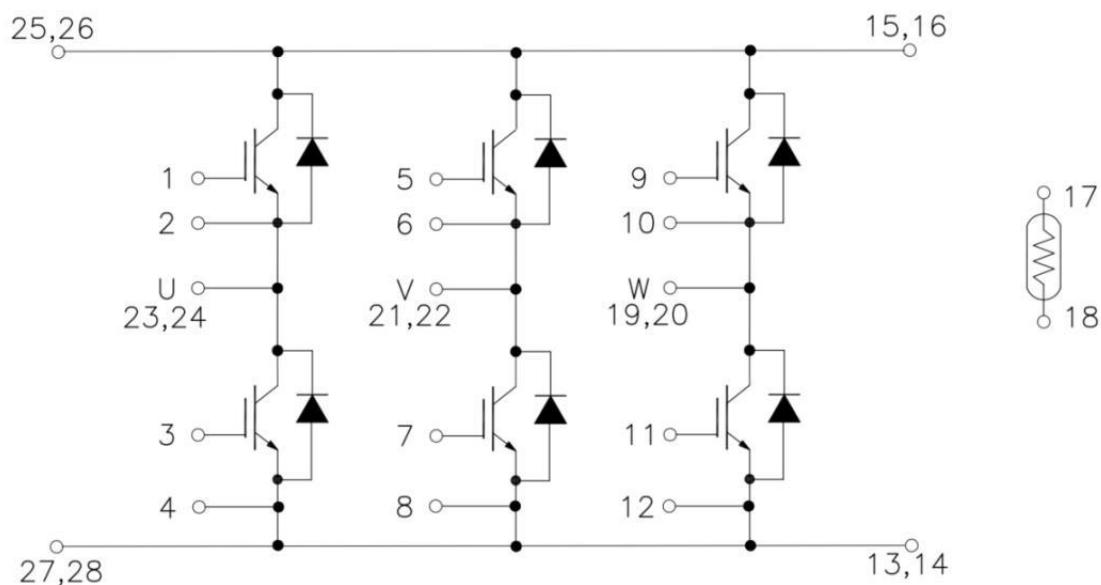


Figure 1. Out drawing & circuit diagram for DFH50FB12P3H1

Pin Configuration and Marking Information

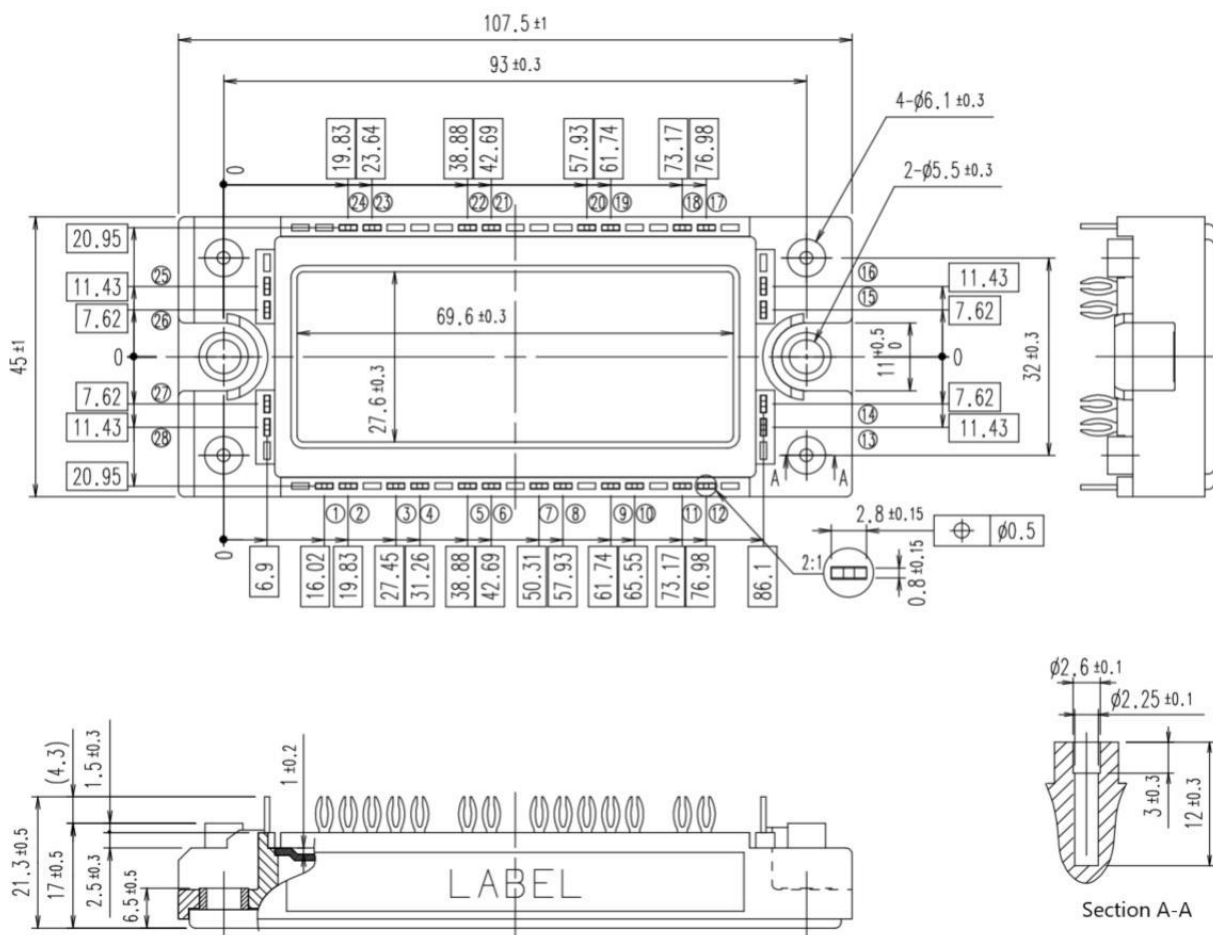


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f= 50Hz, t =1min	2.5	kV
CTI	-	>200	-
Module lead resistance, terminals - chip	T _c =25°C	0.8	mΩ
Mounting torque for module mounting	M5	3.5	Nm

Weight	-	155	g
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Maximum Ratings (T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V _{GES}	Gate-Emitter Voltage	C-E Short	±20V	V
I _C	DC Continuous Collector Current	T _C =115°C, T _{vjop} =150°C(IGBT)	50	A
I _{CM}	Pulse Collector Current	t _p =1ms, Note1	100	A
P _C	Maximum Power Dissipation	T _C =25°C, T _{vjop} =150°C(IGBT)	160	W
I _F	Diode forward Current	-	50	A
I _{FRM}	Repetitive peak forward Current	t _p =1ms, Note1	100	A
t _{sc}	Short Circuit Withstand Time	V _{GE} =15V, V _{CE} =600V	10	μs
T _{jmax}	Max junction temperature	-	175	°C
T _{vjop}	Operating junction temperature	-	-40 to 150	°C
T _{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

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	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3375	-	K
B _{25/80}	B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3411	-	K
B _{25/100}	B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3433	-	K

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =50A V _{GE} =15V	T _j =25°C	-	1.40	-	V
			T _j =125°C	-	1.60	-	V
			T _j =150°C	-	1.65	-	V
			T _j =175°C	-	1.95	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =5.7mA, V _{CE} =V _{GE}		5.0	5.8	6.5	V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	864	-	nC
R _{Gint}	Internal gate resistor	-	T _j =25°C	-	1.1	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f=1MHz	T _j =25°C	-	10.8	-	nF
C _{oes}	Output Capacitance			-	0.3	-	nF
C _{res}	Reverse transfer Capacitance			-	0.1	-	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	μA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C =50A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =4Ω Inductive load	T _j =25°C	-	235	-	ns
			T _j =125°C	-	271	-	
			T _j =150°C	-	278	-	
t _r	Rise time		T _j =25°C	-	69	-	ns
			T _j =125°C	-	94	-	
			T _j =150°C	-	96	-	
t _{d(off)}	Turn-off delay time		T _j =25°C	-	281	-	ns
			T _j =125°C	-	314	-	
			T _j =150°C	-	328	-	
t _f	Fall time		T _j =25°C	-	154	-	ns
			T _j =125°C	-	190	-	
			T _j =150°C	-	196	-	
				T _j =25°C	-	1.72	-

E _{on}	Turn-on power dissipation		T _j =125°C	-	2.3	-	mJ
			T _j =150°C	-	2.7	-	
E _{off}	Turn-off power dissipation		T _j =25°C	-	5.52	-	mJ
			T _j =125°C	-	6.1	-	
			T _j =150°C	-	6.4	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.20	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.05	-	K/W

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _F	Diode Forward Voltage	I _F =50A, V _{GE} =0V	T _J =25°C	-	1.65	-	V
			T _J =125°C	-	2.15	-	
			T _J =150°C	-	2.35	-	
			T _J =175°C	-	2.55	-	
t _{rr}	Diode Reverse Recovery Time	(Switch side) V _{CC} =600V, I _C =50A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =4Ω	T _J =25°C		27	-	ns
			T _J =125°C	-	49	-	
			T _J =150°C		54		
Q _{rr}	Recovered charge	(SiC SBD side) V _{rr} =600V, I _F =50A V _{GE} =-8V Inductive load	T _J =25°C	-	0.73	-	μC
			T _J =125°C	-	0.82	-	
			T _J =150°C	-	0.86	-	
E _{rr}	Reverse recovered energy	switching operation	T _J =25°C	-	0.10	-	mJ
			T _J =125°C	-	0.16	-	
			T _J =150°C	-	0.18	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (SiC SBD)			-	0.45	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.05	-	K/W

Test Conditions

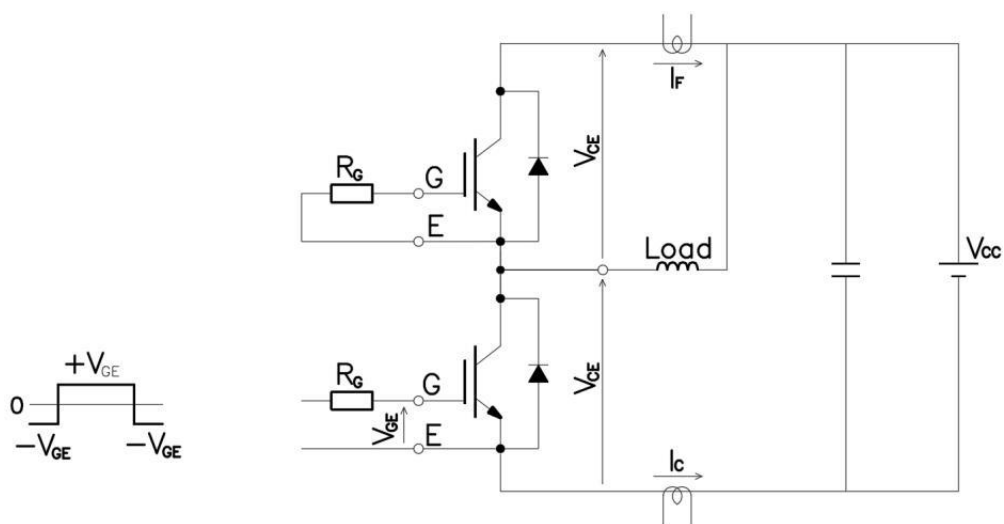


Figure 3. Switching time measure circuit

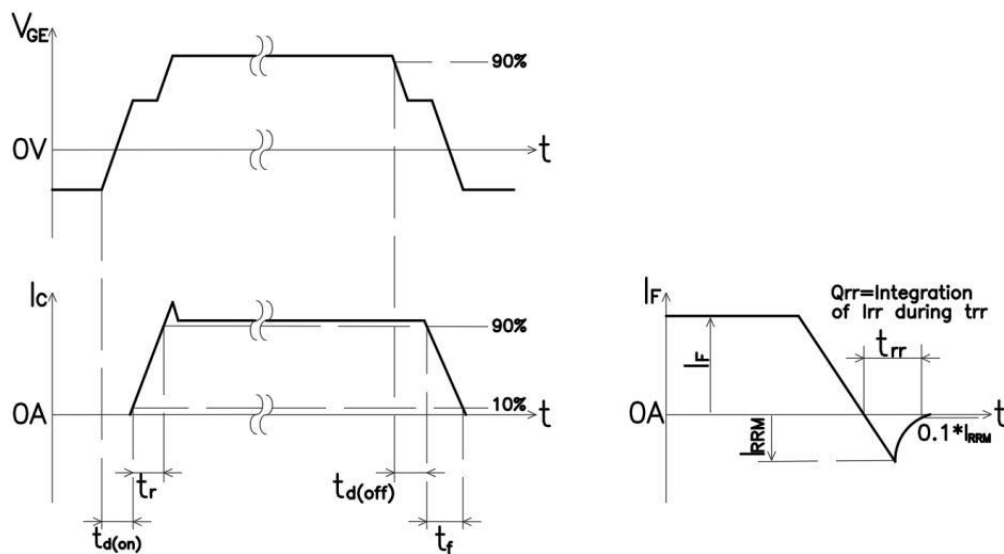


Figure 4. Switching time definition

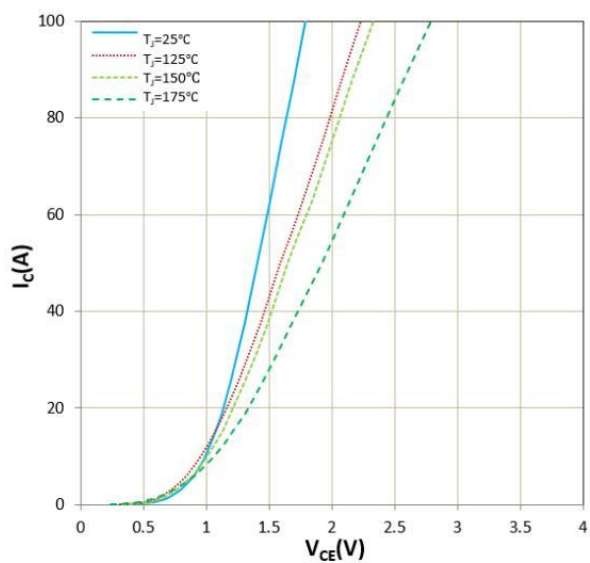


Figure 5. I_c vs V_{CE}

$V_{GE} = 15\text{V}$

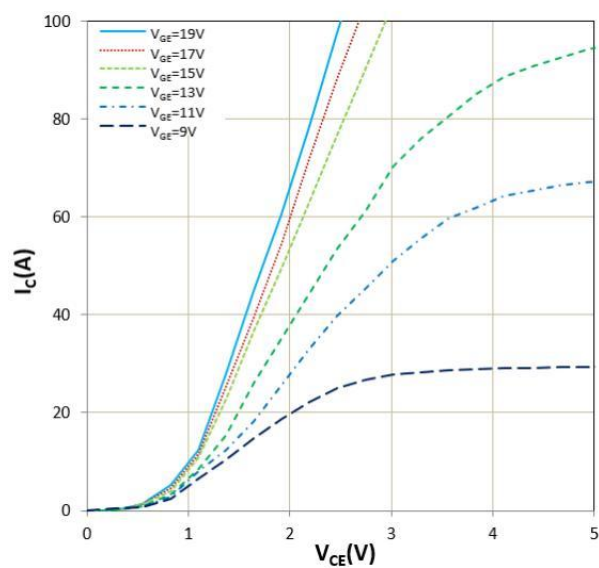


Figure 6. I_c vs V_{CE}

$T_j = 175^\circ\text{C}$

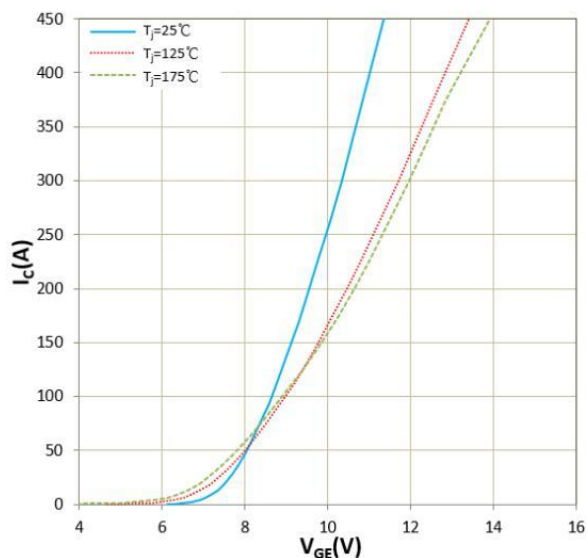


Figure 7. I_c vs V_{GE}

$V_{CE}=20V$

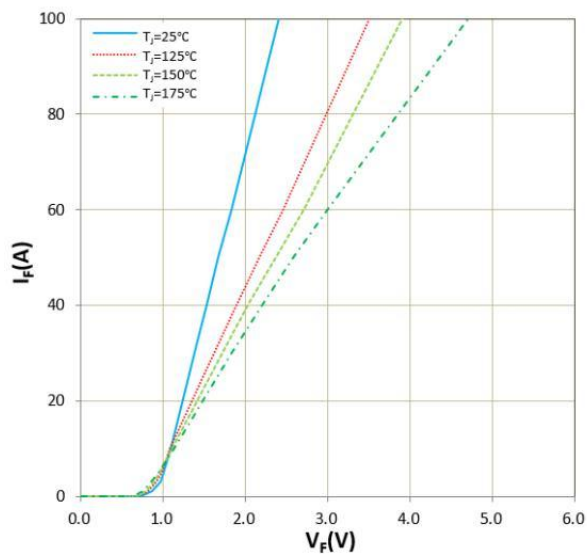


Figure 8. I_F vs V_F

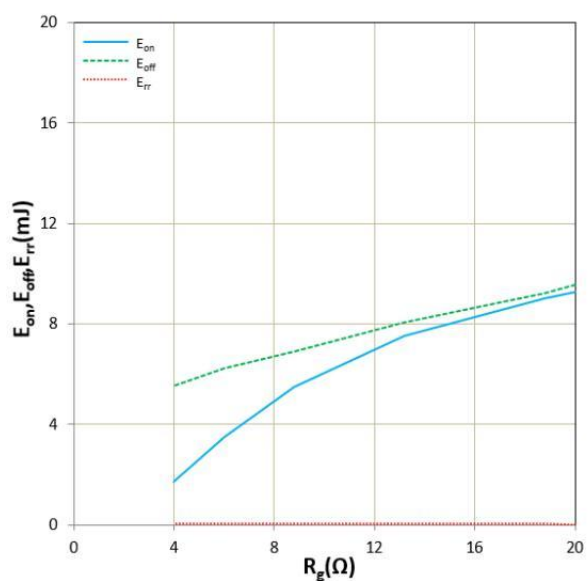


Figure 9. E_{on} , E_{off} , E_{tr} vs R_g (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_c=50A$, $T_j=25^\circ C$

Inductive Load

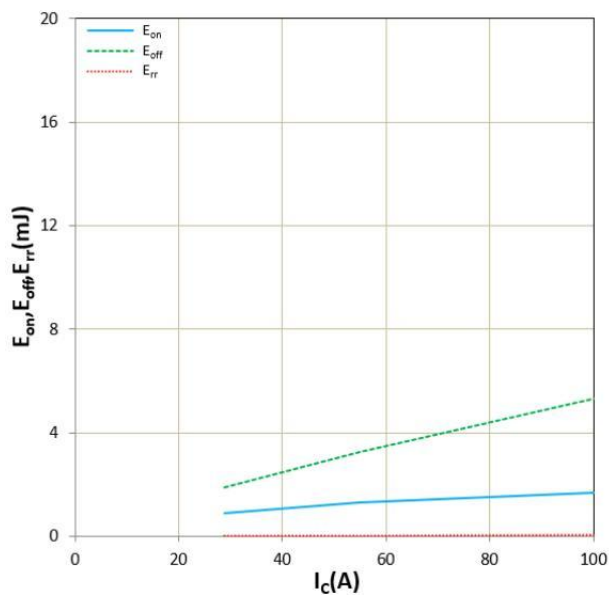


Figure 10. E_{on} , E_{off} , E_{tr} vs I_c (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=4\Omega$, $T_j=25^\circ C$

Inductive Load

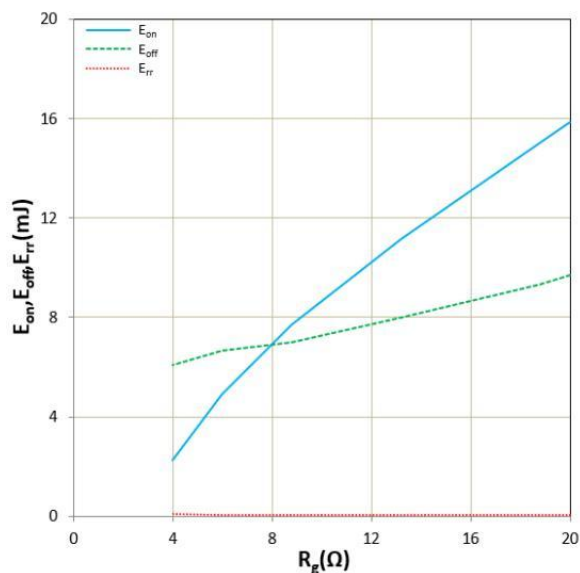


Figure 11. E_{on} , E_{off} , E_{rr} vs R_g (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=50A$, $T_j=125^\circ C$

Inductive Load

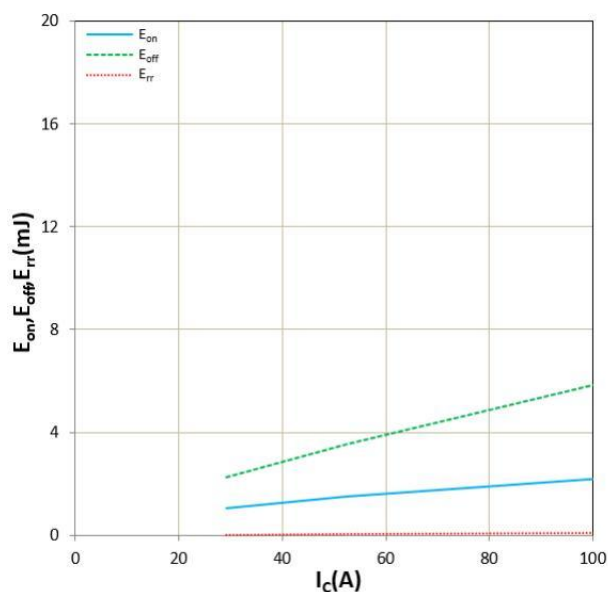


Figure 12. E_{on} , E_{off} , E_{rr} vs I_c (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=4\Omega$, $T_j=125^\circ C$

Inductive Load

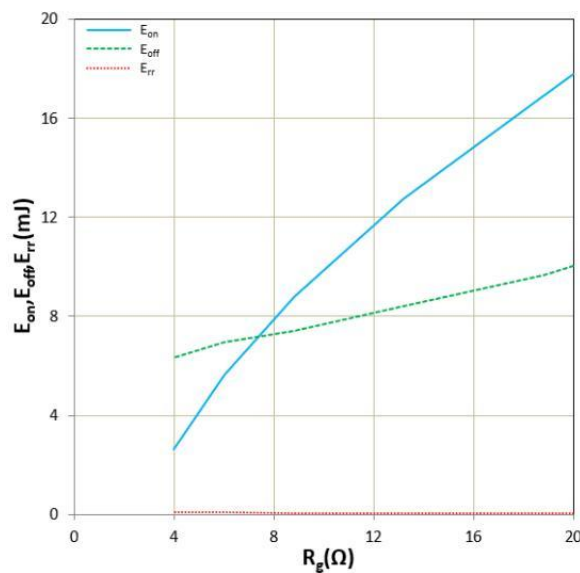


Figure 13. E_{on} , E_{off} , E_{rr} vs R_g (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=50A$, $T_j=150^\circ C$

Inductive Load

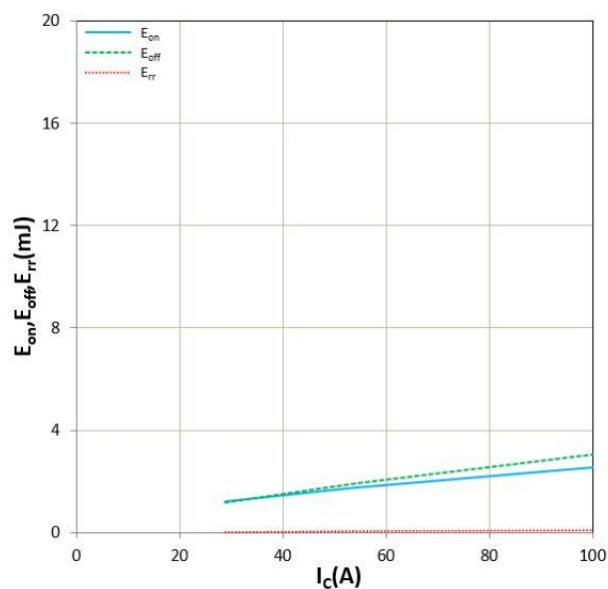


Figure 14. E_{on} , E_{off} , E_{rr} vs I_c (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=4\Omega$, $T_j=150^\circ C$

Inductive Load

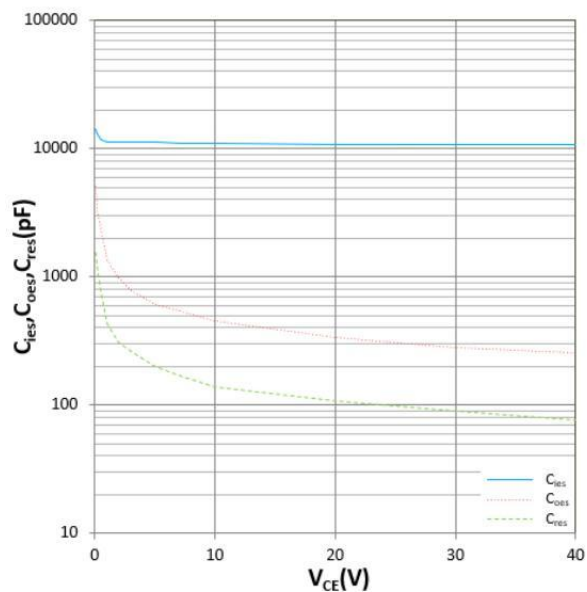


Figure 15. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j=25^{\circ}\text{C}$, $f=1\text{MHz}$

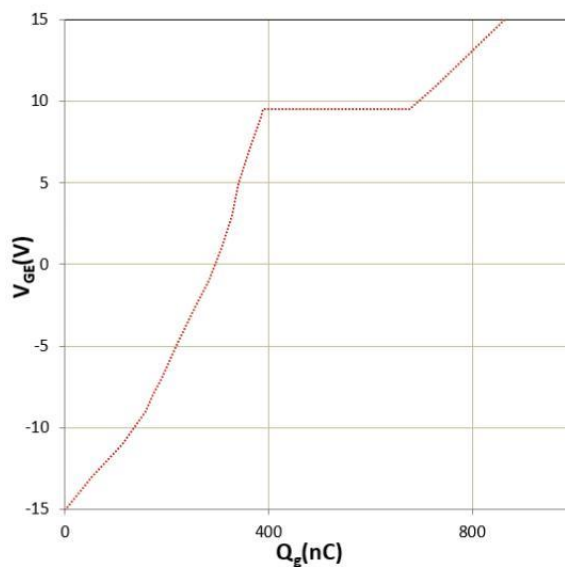


Figure 16. Gate charge
 $T_j=25^{\circ}\text{C}$

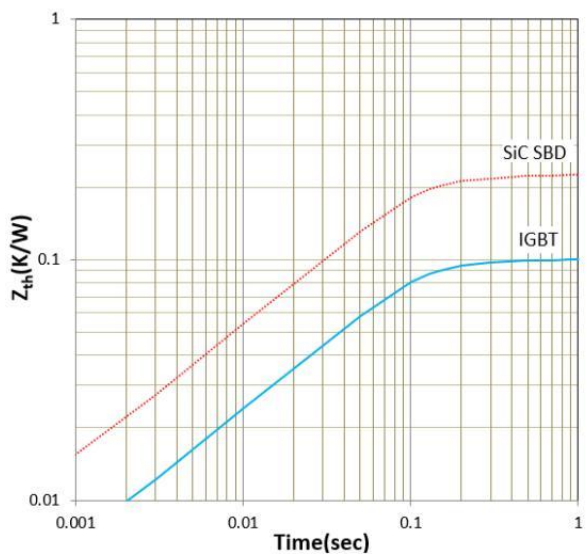


Figure 17. Transient thermal resistance

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