

Description

The DFI450HF12DF1 offer lower losses and higher energy for soft switching application.



Features

- 1200V450 A, $V_{CE(sat)}(typ.) = 1.95V$
- Low inductive design
- Lower losses and higher energy
- Excellent short circuit ruggedness
- Field Stop IGBT Technology

Applications

- Motor drive
- Inverter
- Power supply

Circuit diagram

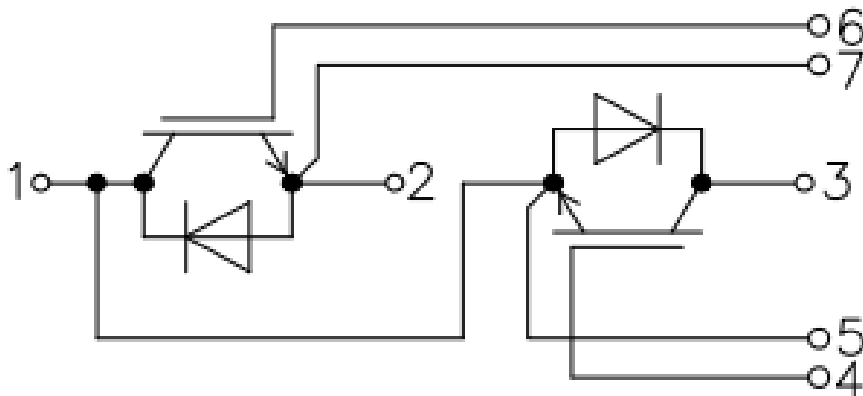


Figure 1. Out drawing & circuit diagram for DFI450HF12DF1

Pin Configuration and Marking Information

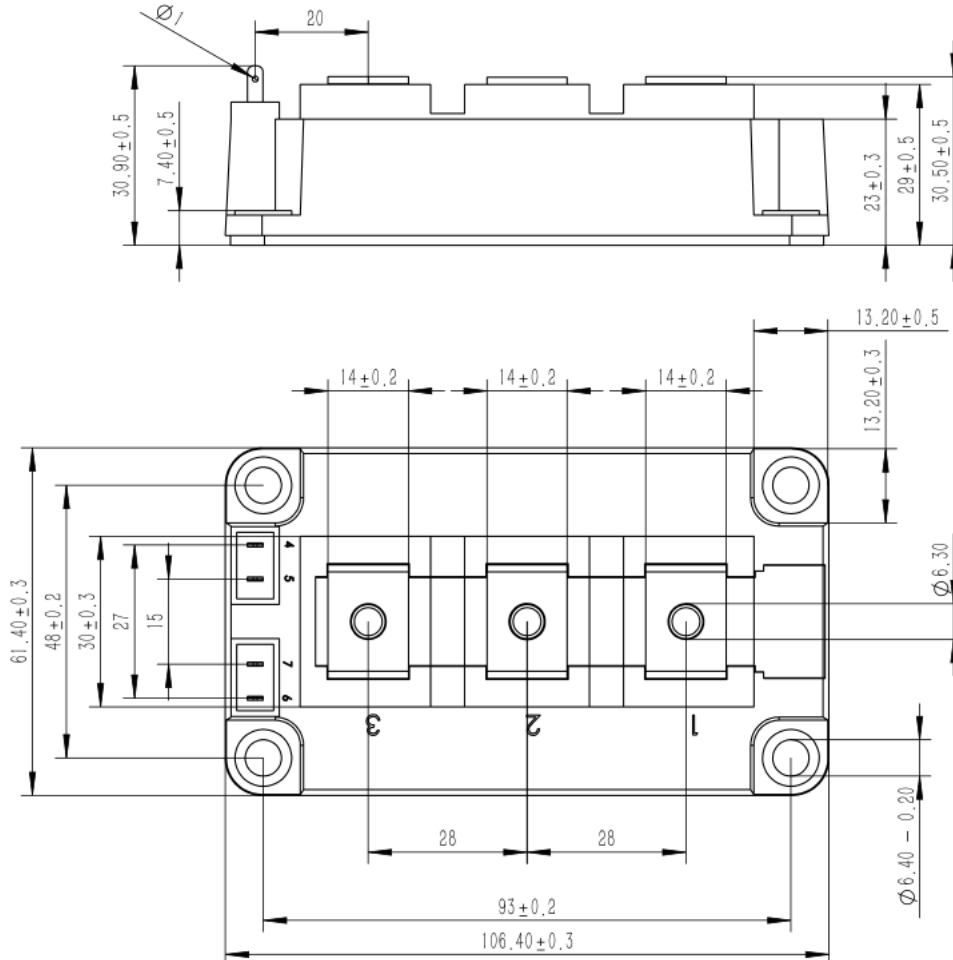


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t = 1min	4.0	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	-	>200	-
Module lead resistance, terminals – chip	T _C = 25°C	0.8	mΩ
Mounting torque for module mounting	M6	3 to 6	Nm
Weight	-	315	g

Maximum Ratings (IGBT, $T_j=25^{\circ}\text{C}$ 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	$\pm 30\text{V}$	V
I_C	DC Continuous Collector Current	$T_C=100^{\circ}\text{C}$	450	A
I_{CM}	Pulse Collector Current	$t_p=1\text{ms}$, Note1	900	A
P_C	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$, $T_j=150^{\circ}\text{C}$ (IGBT)	1420	W
T_j	junction temperature	-	-40 to 150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^{\circ}\text{C}$

Note1: Pulse width limited by maximum junction temperature

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

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Diode forward Current	- $T_j=150^{\circ}\text{C}$	450	A
I_{FRM}	Repetitive peak forward Current	$t_p=1\text{ms}$, Note1	900	A
T_j	junction temperature	-	-40 to 150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^{\circ}\text{C}$

Note1: Pulse width limited by maximum junction temperature

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	$I_C=450\text{A}$ $V_{GE}=15\text{V}$	$T_j=25^{\circ}\text{C}$	-	1.95	2.20	V
			$T_j=125^{\circ}\text{C}$	-	2.20	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	$I_C=15\text{mA}$, $V_{CE}=V_{GE}$	5.0	-	6.0	V	
Q_G	Gate charge	$V_{GE}=-15\text{V}$ to $+15\text{V}$	-	2.6	-	μC	
R_{Gint}	Internal gate resistor	$f=1\text{M}$, $V_{pp}=1\text{V}$	$T_j=25^{\circ}\text{C}$	-	3.9	-	Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$ $f=1\text{MHz}$	$T_j=25^{\circ}\text{C}$	-	38	-	nF
C_{oes}	Output Capacitance			-	3.3	-	nF
C_{res}	Reverse transfer Capacitance			-	1.7	-	nF
I_{CES}	Collector- Emitter Cut off Current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$	$T_j=25^{\circ}\text{C}$	-	-	3	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=30\text{V}$, $V_{CE}=0\text{V}$	$T_j=25^{\circ}\text{C}$	-	-	400	nA
$t_{d(on)}$	Turn-on delay time		$T_j=25^{\circ}\text{C}$	-	360	-	ns
			$T_j=125^{\circ}\text{C}$	-	395	-	
t_r	Rise time		$T_j=25^{\circ}\text{C}$	-	110	-	ns
			$T_j=125^{\circ}\text{C}$	-	118	-	
$t_{d(off)}$	Turn-off delay time		$T_j=25^{\circ}\text{C}$	-	750	-	ns
			$T_j=125^{\circ}\text{C}$	-	810	-	

t _f	Fall time	V _{CC} = 600V	T _j = 25°C	-	92	-	ns
			T _j = 125°C	-	101	-	
E _{on}	Turn-on power dissipation	I _C = 450A V _{GE} = +15V/-15V	T _j = 25°C	-	59	-	mJ
			T _j = 125°C	-	69	-	
E _{off}	Turn-off power dissipation	R _G = 3Ω Inductive load	T _j = 25°C	-	45	-	mJ
			T _j = 125°C	-	58	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)		-	-	0.088	-	°C/W

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
V _F	Diode Forward Voltage	I _F = 450A, V _{GE} = 0V	T _j = 25°C	-	2.0	2.2	V
			T _j = 125°C	-	2.1	-	
I _{rr}	Peak reverse recovery Current	I _F = 450A, di/dt = 5000A/μs, V _R = 600V, V _{GE} = -15V	T _j = 25°C	-	280	-	A
			T _j = 125°C	-	330	-	
Q _{rr}	Recovered charge	V _R = 600V, V _{GE} = -15V	T _j = 25°C	-	25	-	nC
			T _j = 125°C	-	44	-	
E _{rr}	Reverse recovered energy	V _R = 600V, V _{GE} = -15V	T _j = 25°C	-	11	-	mJ
			T _j = 125°C	-	18	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)		-	-	0.10	-	°C/W

Test Conditions

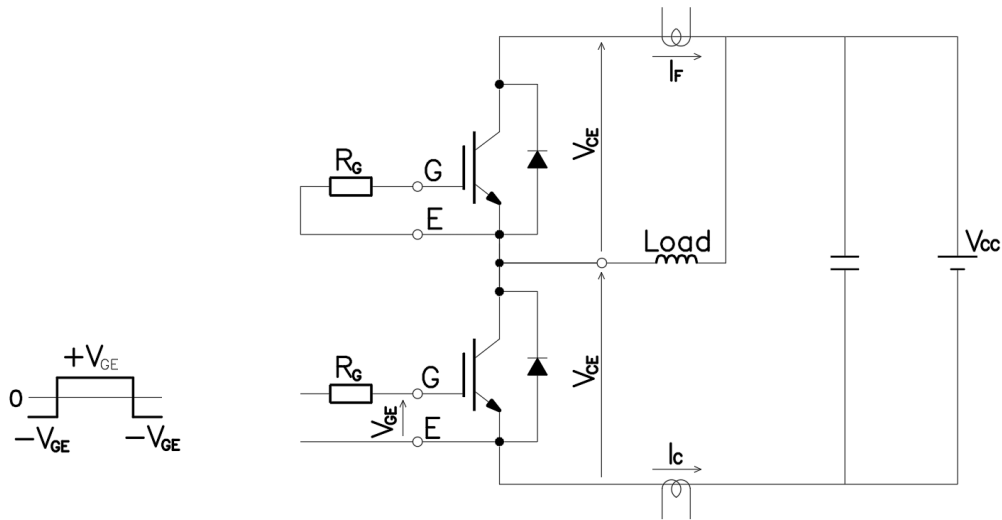


Figure 3. Switching time measure circuit

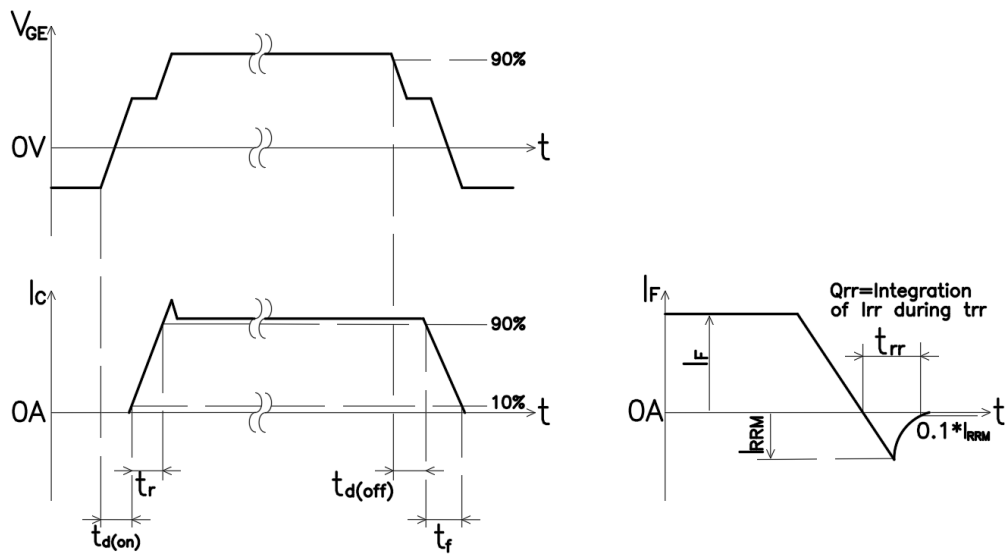


Figure 4. Switching time definition

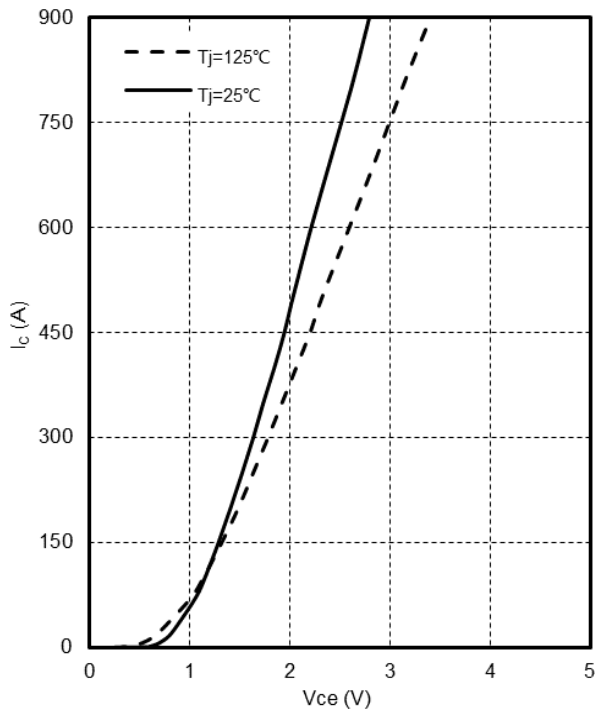


Figure 5. I_c vs V_{ce}
 $V_{GE}=15\text{V}$

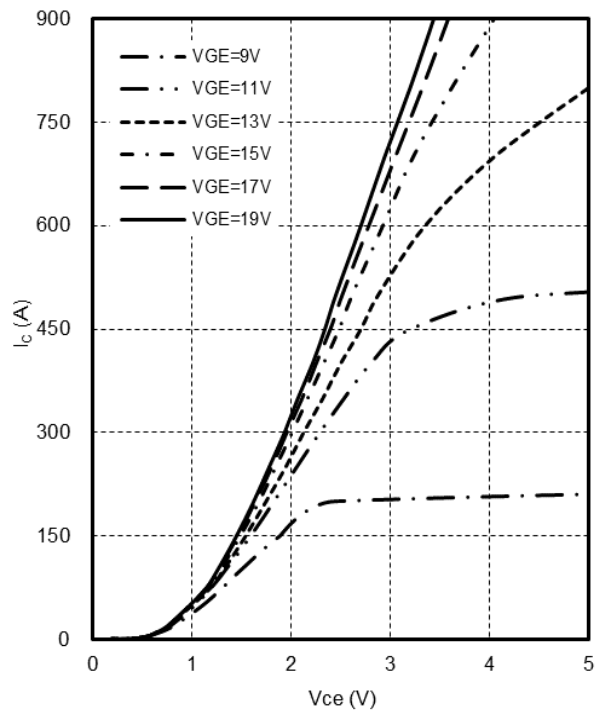


Figure 6. I_c vs V_{ce}
 $T_j=125^\circ\text{C}$

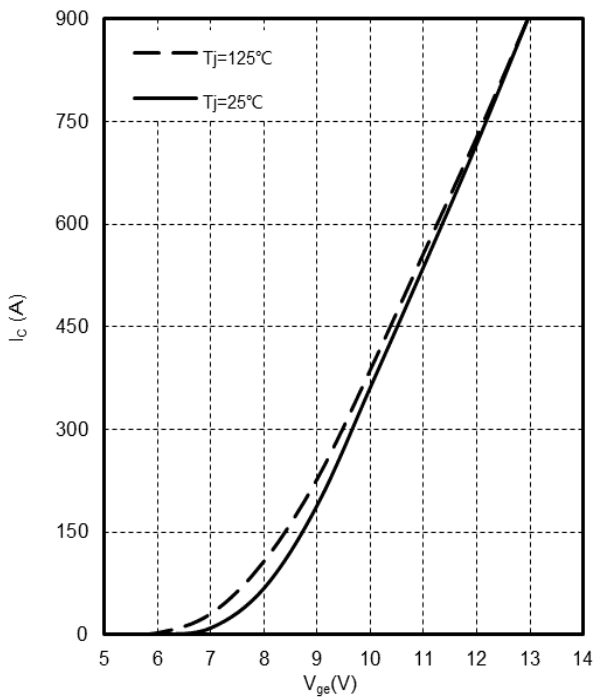


Figure 7. I_c vs V_{GE}
 $V_{CE}=20\text{V}$

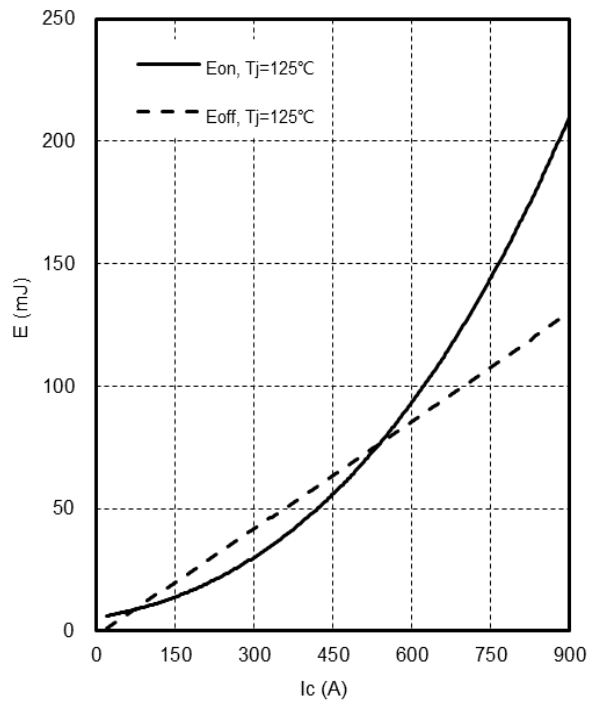


Figure 8. E_{on} , E_{off} vs I_c (Typ)
 $V_{CC}=600\text{V}$, $V_{GE}=+15\text{V}/-15\text{V}$, $R_G=3\Omega$
Inductive Load

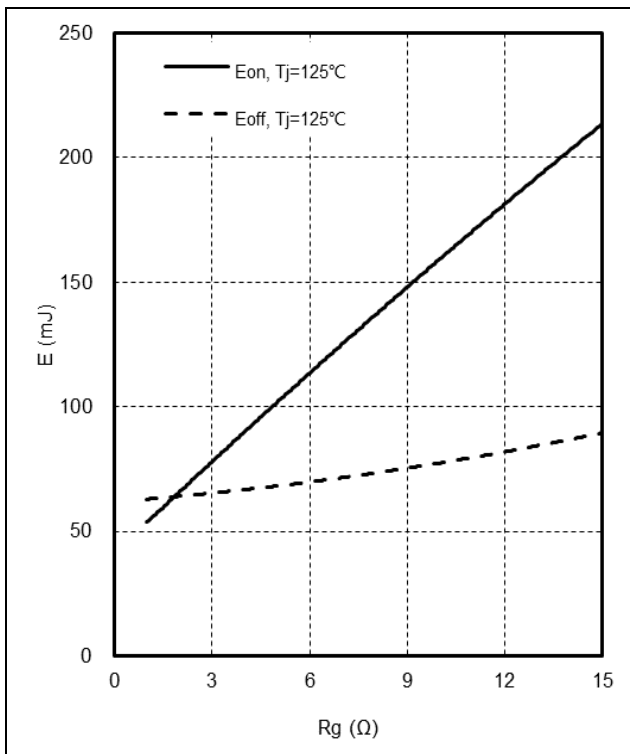


Figure 9. E_{on} , E_{off} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-15V$, $I_C=450A$
 Inductive Load

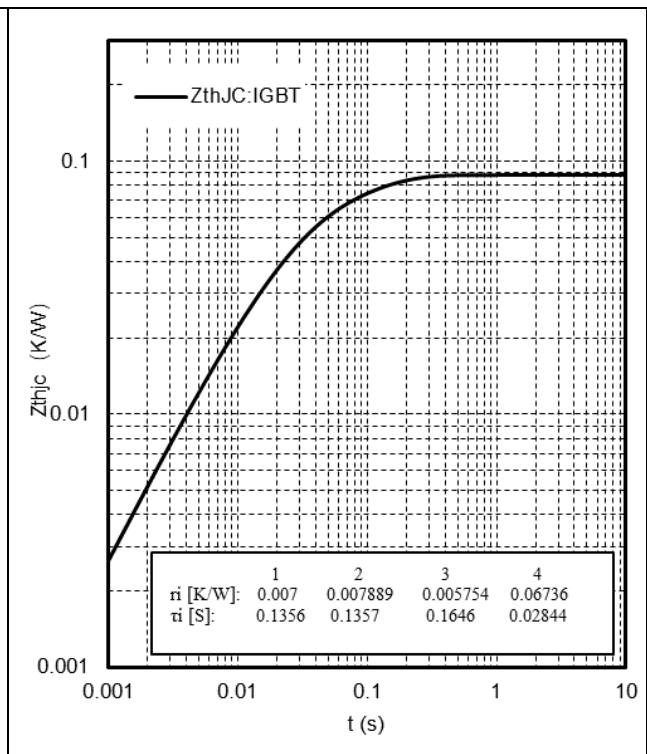


Figure 10. Transient thermal impedance IGBT ,
 $Z_{thjc}=f(t)$

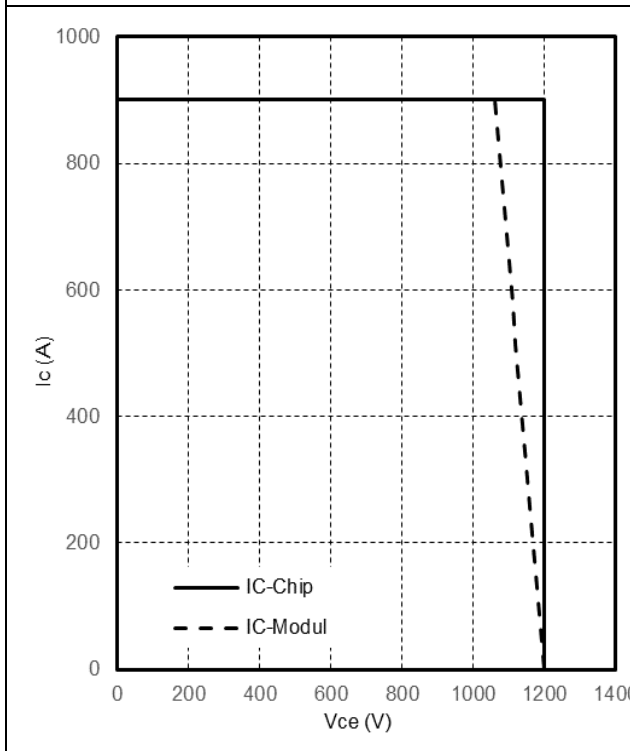


Figure 11. Reverse bias safe operating area IGBT,
 $I_C=f(V_{CE})$, $V_{GE}=\pm 15V$, $R_{Goff}=3\Omega$, $T_{vj}=125^\circ C$

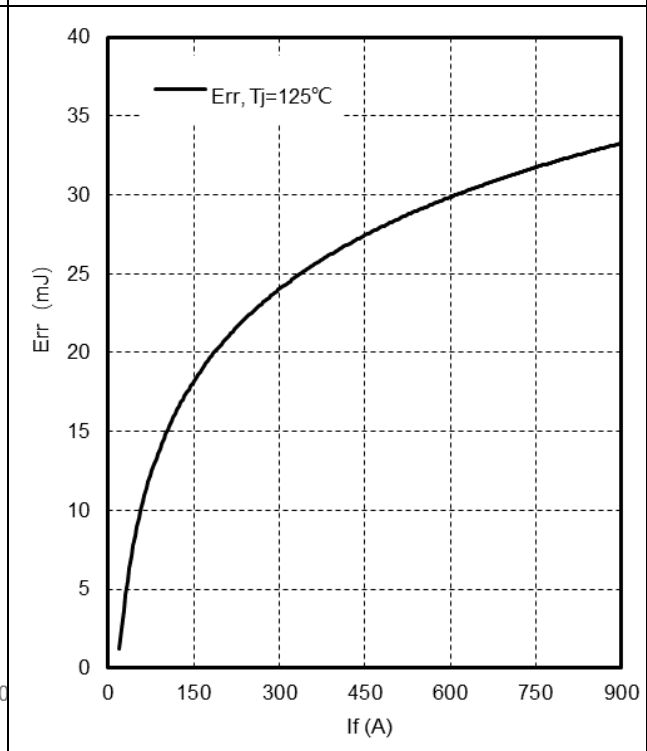


Figure 12. E_{rr} vs I_F (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-15V$, $R_G=3\Omega$
 Inductive Load

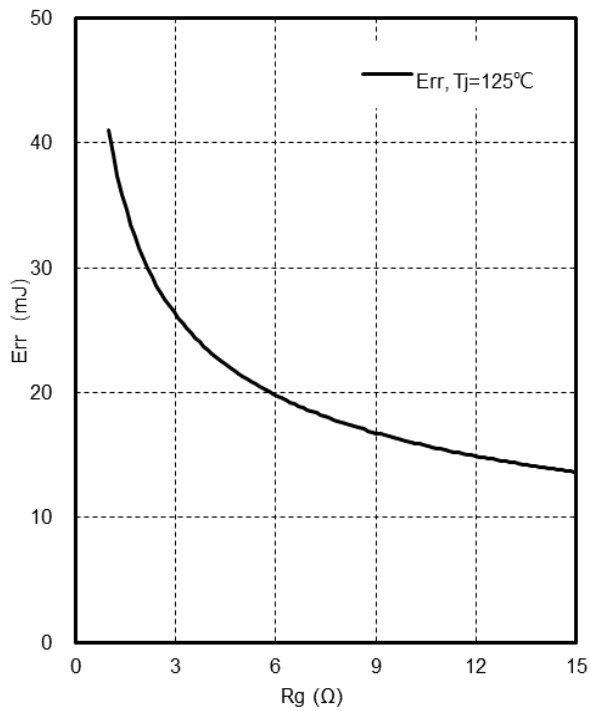


Figure 13. Err vs R_G (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-15V$, $I_F=450A$
 Inductive Load

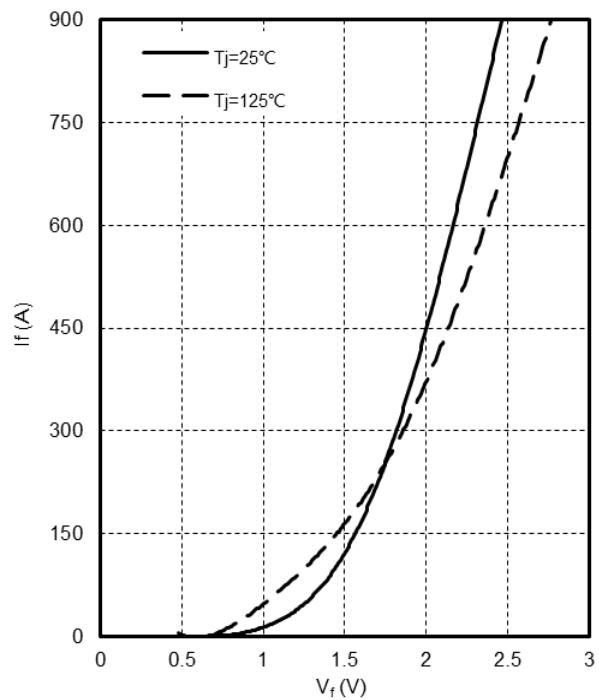


Figure 14. Forward characteristic of Diode ,
 $I_F=f(V_F)$

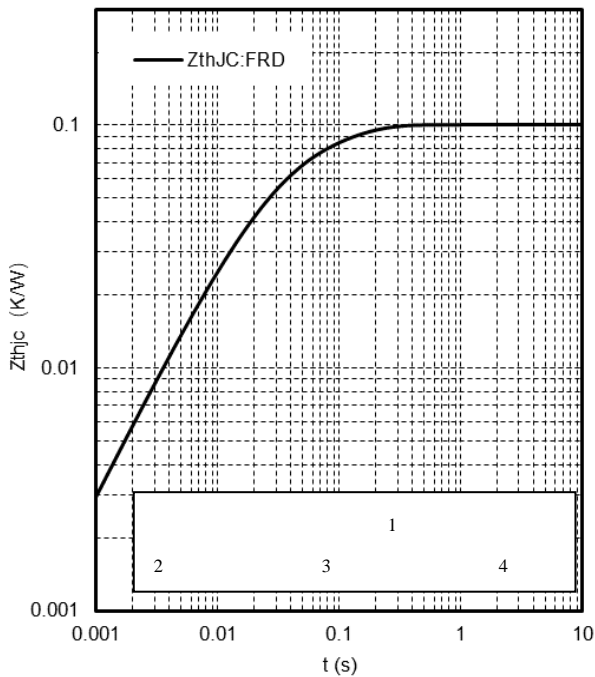


Figure 15. Transient thermal impedance Diode,
 $Z_{thjc}=f(t)$

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