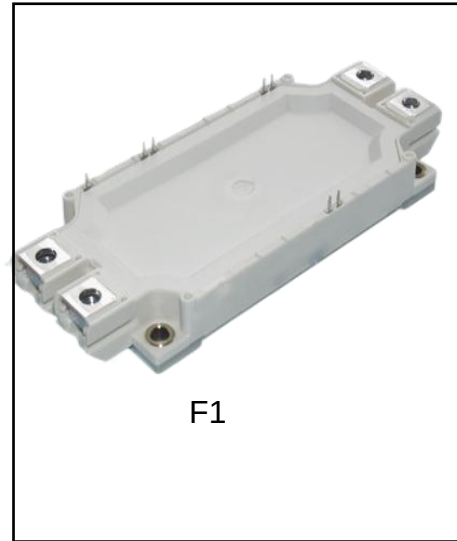


F1 module with Trench/Fieldstop IGBT and Emitter Controlled diode

Features

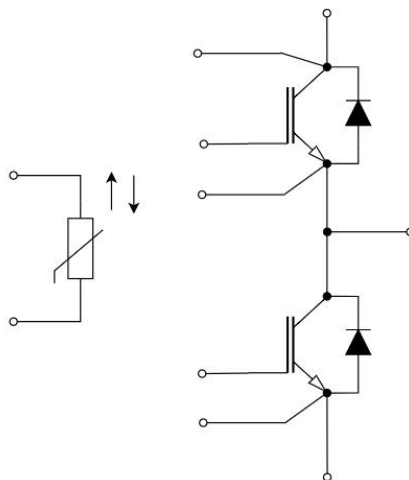
- Electrical features
 - Low V_{CEsat}
 - V_{CEsat} with positive Temperature Coefficient
- Mechanical features
 - High Power and Thermal Cycling Capability
 - High Power Density
 - Isolated Base Plate
 - PressFIT Contact Technology
 - Low Inductance Module structure



Typical Applications

- Construction, Commercial and Agriculture Vehicles
- High Power Converters
- Motor Drives
- Servo Drives

Description



Package Insulation coordination

Symbol	Description	Note or test condition	Values	Unit
V _{ISOL}	Isolation test voltage	RMS,f=50Hz,t=60s	3.4	kV
	Material of module baseplate		Cu	
	Internal isolation	basic insulation(class 1,IEC 61140)	Si ₃ N ₄	
d _{creep}	Creepage distance	terminal to heatsink	> 15	mm
d _{creep}	Creepage distance	terminal to terminal	12.1	mm
d _{clear}	Clearance	terminal to heatsink	> 12.5	mm
d _{clear}	Clearance	terminal to terminal	10.0	mm
CTI	Comparative tracking index (electrical)		>200	
RTI			140	°C

Package Characteristic values

Symbol	Description	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	LCE			--	20	--	nH
Module Lead Resistance, Terminal to Chip	RCC'+EE'			--	0.80	--	mΩ
Storage Temperature Range	T _{STG}			-40		125	°C
M	Mounting torque for module mounting	-Mounting according to valid application note	M5, Screw	3.0	--	6.0	Nm
M	Terminal connection torque	-Mounting according to valid application note	M6, Screw	3.0	--	6.0	Nm
G	Weight			--	345	--	g

IGBT

Absolute Maximum Ratings (T_c = 25°C unless otherwise noted)

Symbol	Description	Note or test condition	Value	Unit
V _{CES}	Collector-Emitter Voltage	T _{vj} = 25 °C	1200	V
I _{C nom}	Continuous DC collector current	T _C = 100 °C, T _{vj max} = 175 °C	800	A
I _{CRM}	Repetitive peak collector current	t _p = 1 ms	1200	A
V _{GES}	Gate-emitter peak voltage		±20	V

Characteristics (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 800 A, V _{GE} = 15 V	T _{vj} = 25 °C	--	1.55	1.80	V
			T _{vj} = 125 °C	--	1.85	--	
			T _{vj} = 150 °C	--	1.90	--	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	V _{GE} = V _{CE} , I _C = 12 mA, T _{vj} = 25 °C		5.5	--	6.8	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1200V, T _{vj} = 25 °C		--	--	200	μA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = 20V, V _{CE} = 0 V, T _{vj} = 25 °C		--	--	300	nA
R _{Gint}	Internal Gate Resistance	T _{vj} = 25 °C		--	1.59	--	Ω
C _{ies}	Input Capacitance	f = 100KHz, T _{vj} = 25 °C, V _{CE} = 25 V, V _{GE} = 0 V		--	100	--	nF
C _{oes}	Out Capacitance			--	2.59	--	nF
C _{res}	Reverse Transfer Capacitance			--	0.34	--	nF
Q _G	Gate Charge	V _{GE} = 15 V, V _{CE} = 600 V		--	2.92	--	μC
t _{d(on)}	Turn-On Delay Time	I _C = 800 A, V _{CE} = 600 V, V _{GE} = ±15 V, R _{gon} = 10Ω, R _{goff} = 10Ω	T _{vj} = 25 °C	--	1.05	--	μs
			T _{vj} = 150 °C	--	1.02	--	
t _r	Rise Time	I _C = 800 A, V _{CE} = 600 V, V _{GE} = ±15 V, R _{gon} = 10Ω, R _{goff} = 10Ω	T _{vj} = 25 °C	--	0.3	--	μs
			T _{vj} = 150 °C	--	0.47	--	
t _{d(off)}	Turn-off Delay Time	I _C = 800 A, V _{CE} = 600 V, V _{GE} = ±15 V, R _{gon} = 10Ω, R _{goff} = 10Ω	T _{vj} = 25 °C	--	1.93	--	μs
			T _{vj} = 150 °C	--	2.05	--	
t _f	Fall Time	I _C = 800 A, V _{CE} = 600 V, V _{GE} = ±15 V, R _{gon} = 10Ω, R _{goff} = 10Ω	T _{vj} = 25 °C	--	0.17	--	μs
			T _{vj} = 150 °C	--	0.2	--	

E _{on}	Turn-On Switching Loss per Pulse	I _C = 800 A, V _{CE} = 600 V, L _S = 50 nH, V _{GE} = ±15 V, R _{gon} =10Ω, R _{goff} =10Ω	T _{vj} = 25 °C	--	268	--	mJ
			T _{vj} = 150 °C	--	411	--	
E _{off}	Turn Off Switching Loss per Pulse	I _C = 800 A, V _{CE} = 600 V, L _S = 50 nH, V _{GE} = ±15 V, R _{gon} =10Ω, R _{goff} =10Ω	T _{vj} = 25 °C	--	132	--	mJ
			T _{vj} = 150 °C	--	162	--	
I _{SC}	SC Data	V _{GE} ≤ 15 V, V _{CC} = 800 V, V _{CEmax} =V _{CES} -L _S CE . di/dt	t _p ≤ 10 μs, T _{vj} = 25 °C	--	3370	--	A
			t _p ≤ 10 μs, T _{vj} = 150 °C	--	2700	--	
R _{thJC}	Thermal resistance, junction to case	per IGBT		--	0.036	--	K/W
T _{vj op}		Temperature under switching conditions		-40		175 ¹⁾	°C

¹⁾T_{vj op} > 150 °C is only allowed for operation at overload conditions.

Diode

Absolute Maximum Ratings (T_C = 25 °C unless otherwise noted)

Symbol	Description	Note or test condition	Value	Unit
V _{RRM}	Repetitive peak reverse voltage	T _{vj} = 25 °C	1200	V
I _F	Continuous DC forward current		800	A
I _{FRM}	Repetitive peak forward current	t _p = 1 ms	1600	A

Diode Characteristics (T_C = 25 °C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 800 A, V _{GE} = 0 V	T _{vj} = 25 °C	--	1.75	2.40	V
			T _{vj} = 125 °C	--	1.75	--	
			T _{vj} = 150 °C	--	1.75	--	
Q _r	Recovered Charge	V _R = 600 V, I _F = 800 A, V _{GE} = ±15 V, R _{gon} =10Ω,R _{goff} =10Ω	T _{vj} = 25 °C	--	69.4	--	μC
			T _{vj} = 150 °C	--	170.9	--	
I _{RRM}	Peak Reverse Recovery Current	V _R = 600 V, I _F = 800 A, V _{GE} = ±15 V, R _{gon} =10Ω,R _{goff} =10Ω	T _{vj} = 25 °C	--	146	--	A
			T _{vj} = 150 °C	--	224	--	

E_{rec}	Reverse recovery energy	$V_R = 600\text{ V},$ $I_F = 800\text{ A},$ $V_{GE} = \pm 15\text{ V},$ $R_{gon}=10\Omega, R_{goff}=10\Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$	--	20.1	--	mJ
			$T_{vj} = 150\text{ }^\circ\text{C}$	--	51.2	--	
R_{thJC}	Thermal resistance, junction to case	per diode		--	0.056	--	K/W
$T_{vj\text{ op}}$		Temperature under switching conditions		-40		175 ²⁾	$^\circ\text{C}$

²⁾ $T_{vj\text{ op}} > 150\text{ }^\circ\text{C}$ is only allowed for operation at overload conditions.

NTC Characteristics

Symbol	Parameter	Note or Test Condition	Value			Unit
			Min	Typ	Max	
R_{25}	Rated Resistance	$T_C = 25\text{ }^\circ\text{C}$	--	5	--	k Ω
$\Delta R/R$	Deviation of R100	$T_C=100\text{ }^\circ\text{C}, R_{100}=493\Omega$	-5	--	5	%
P_{25}	Power Dissipation	$T_C = 25\text{ }^\circ\text{C}$	--	--	20	mW
$B_{25/50}$	B-value	$R_2=R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15K))]$	--	3375	--	K
$B_{25/80}$	B-value	$R_2=R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15K))]$	--	3411	--	K
$B_{25/100}$	B-value	$R_2=R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15K))]$	--	3433	--	K

Figure1. Output characteristic IGBT(typical)

$T_{vj}=25^{\circ}\text{C}$

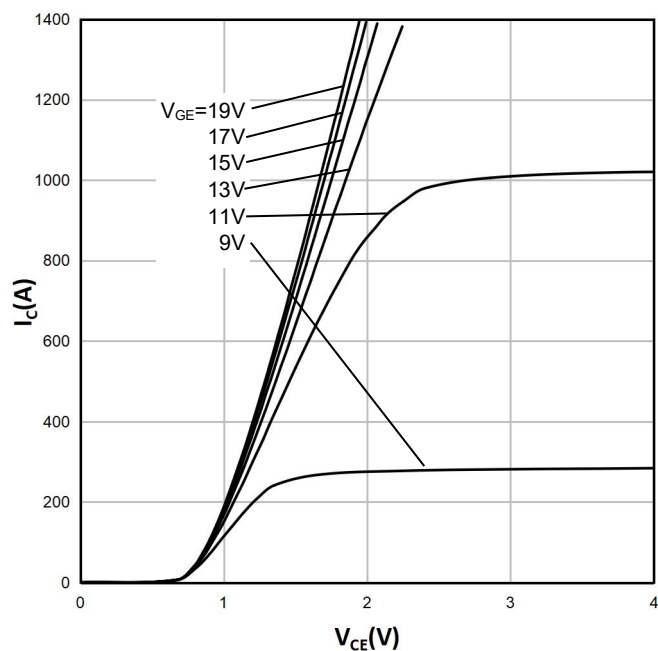


Figure2. Output characteristic IGBT(typical)

$T_{vj}=150^{\circ}\text{C}$

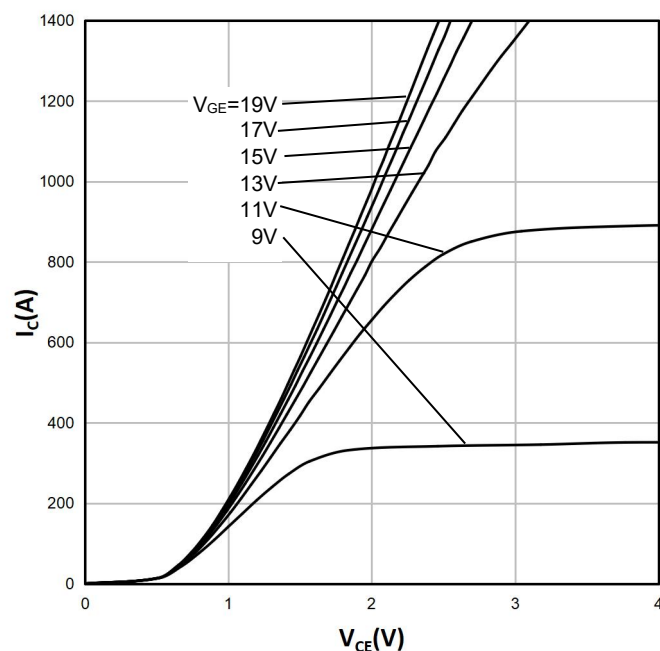


Figure3. $V_{CE(sat)}$ vs. Temperature

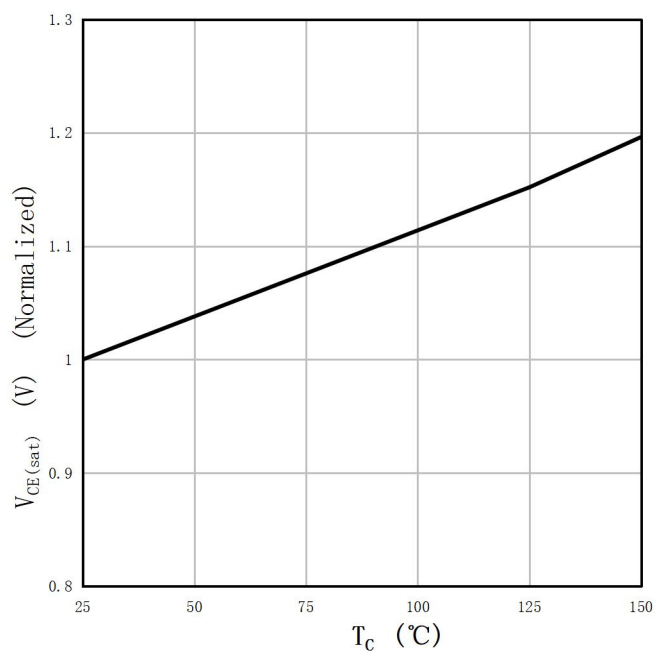


Figure4. transfer characteristic IGBT(typical)

$V_{CE}=20\text{V}$

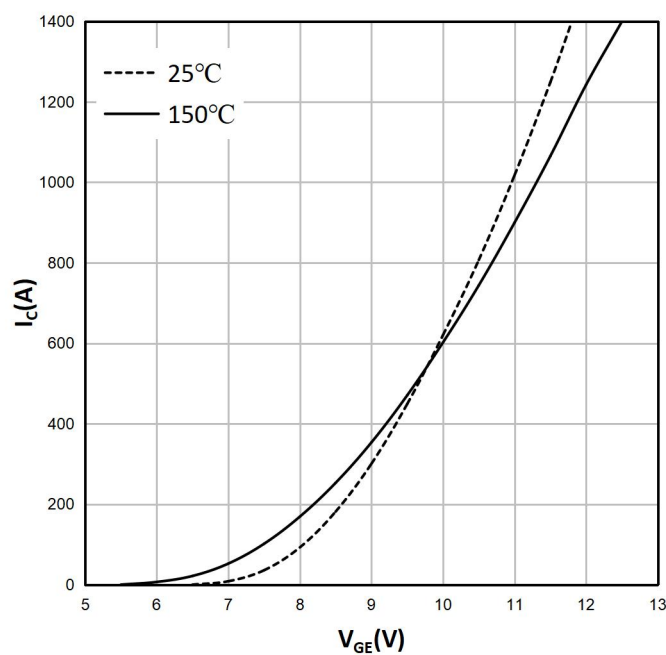


Figure5. V_{TH} vs. Temperature

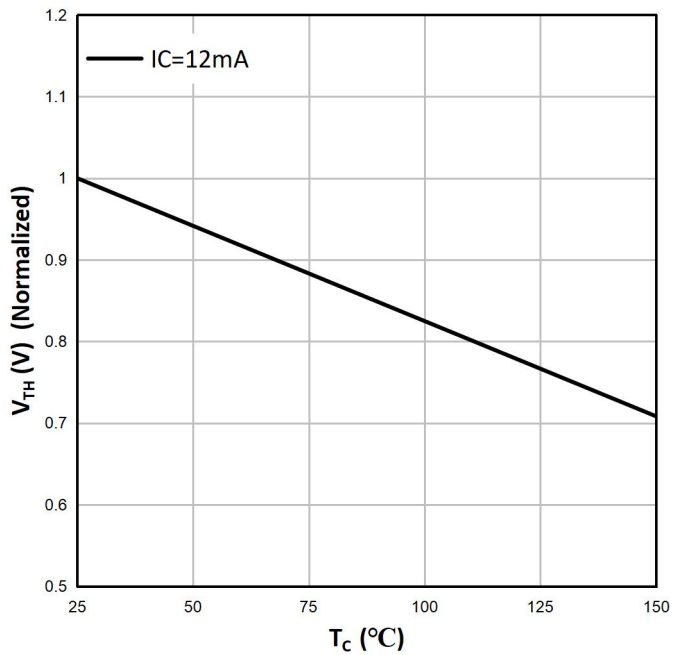


Figure6. Gate Charge Waveform

$V_{ce}=600V, V_{GE}=15V, T_{vj}=25^{\circ}C$

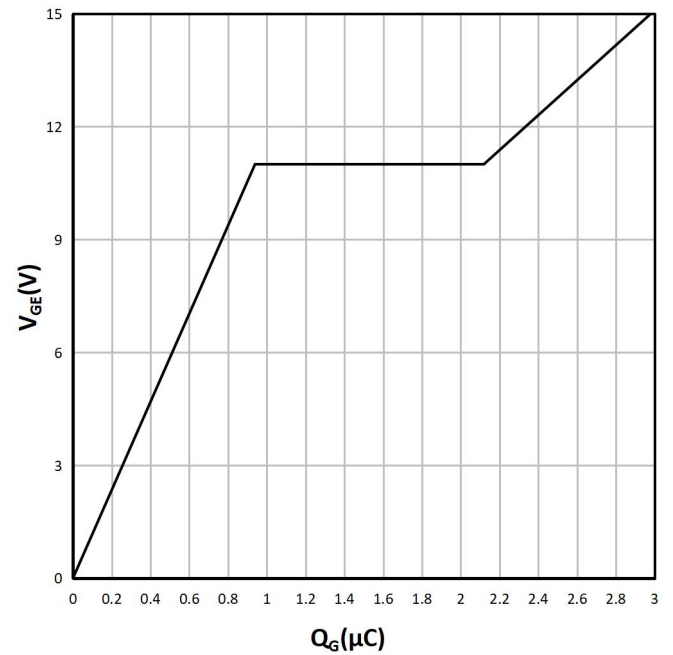


Figure7. P_{tot} vs. Case Temperature

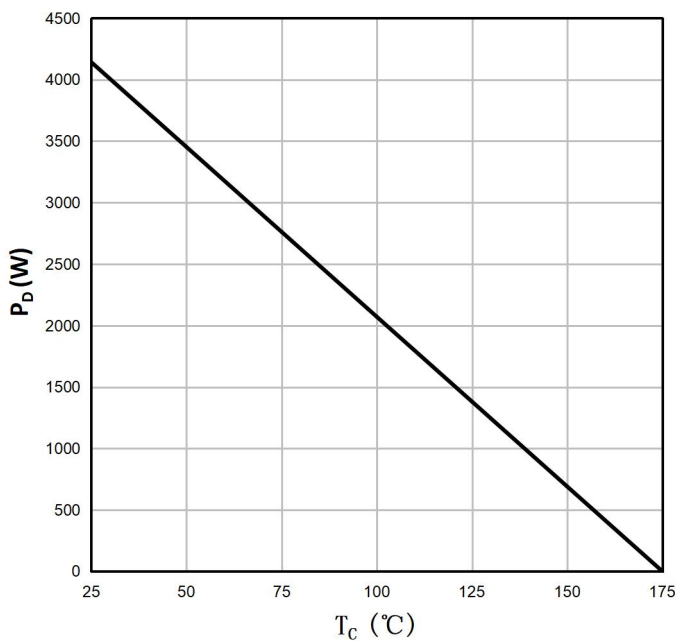


Figure8. FBSOA IGBT

$D=0, T_c=25^{\circ}C, T_{j}<=175^{\circ}C, V_{ge}=15V$

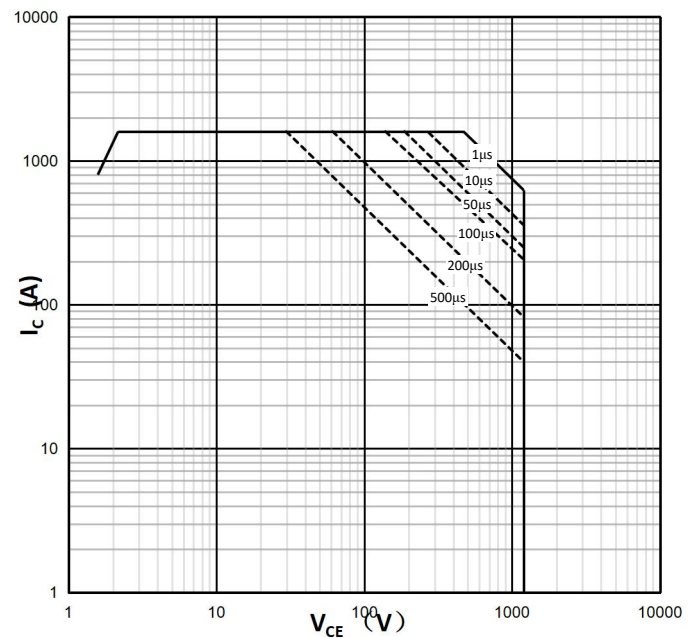


Figure9.switching losses IGBT(typical)

$V_{cc}=600V, R_{gon}=10\Omega, R_{goff}=10\Omega, V_{ge}= \pm 15V$

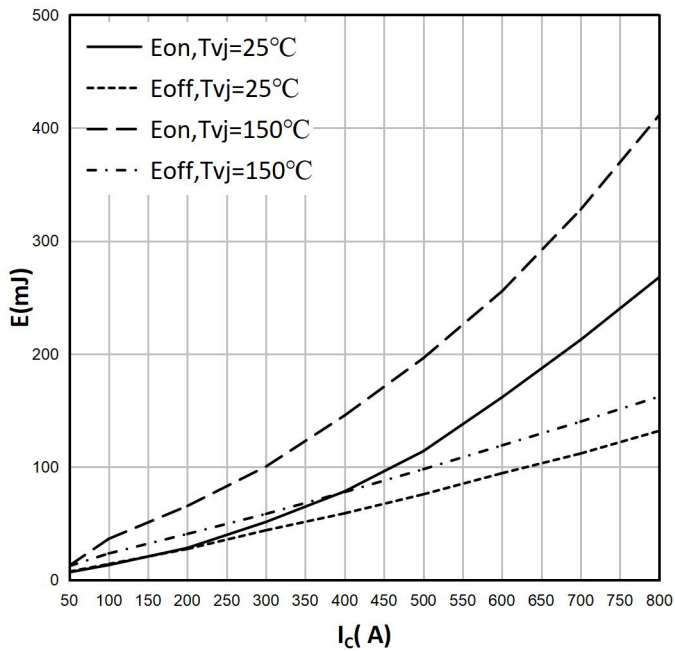


Figure10.switching losses IGBT(typical)

$V_{cc}=600V, I_C=800A, V_{ge}= \pm 15V$

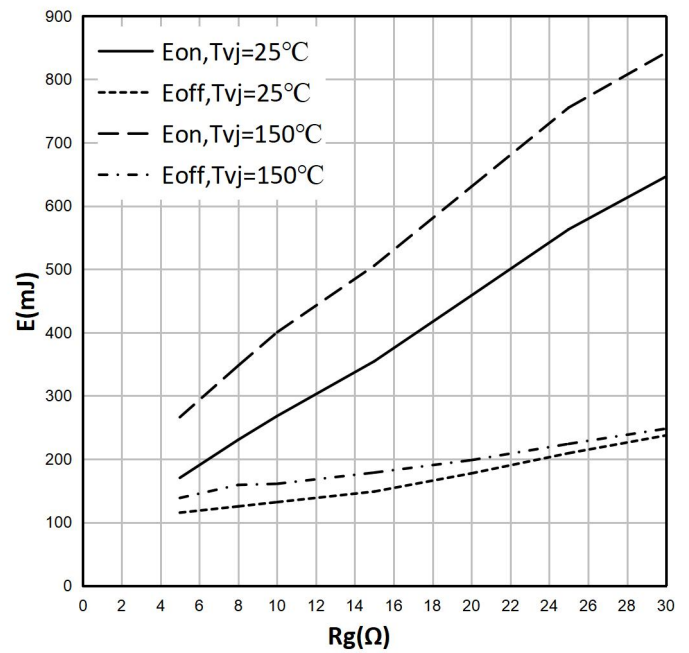


Figure11.transient thermal impedance,IGBT

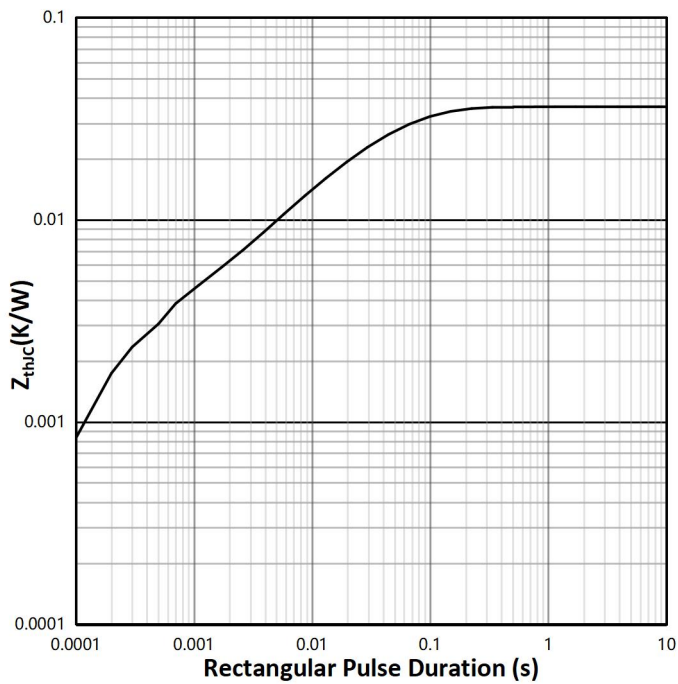


Figure12. forward characteristic of Diode(typical)

$V_{GE}=0V$

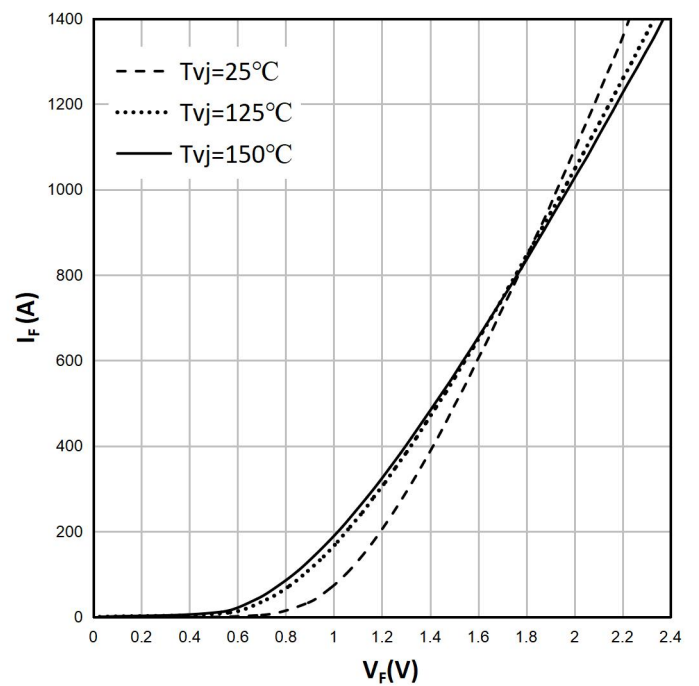


Figure 13.Reverse Recovery Energy Loss vs. IC
Vcc=600V,Rgon=10Ω,Rgoff=10Ω,Vge=±15V

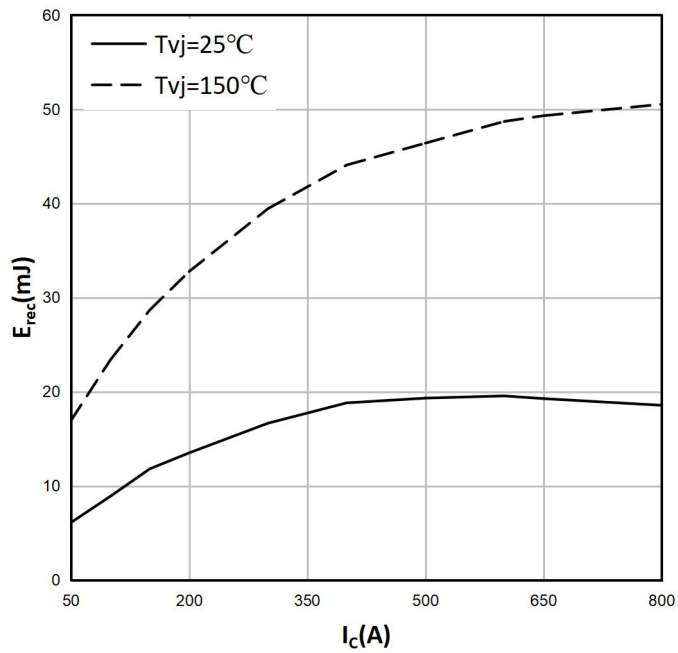


Figure 14.Reverse Recovery Energy Loss vs. RG
Vcc=600V, IC=800A, Vge=±15V

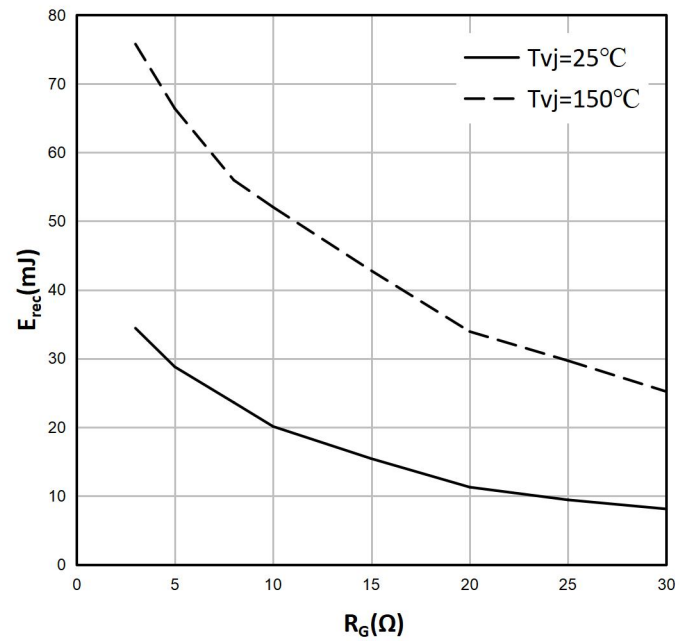
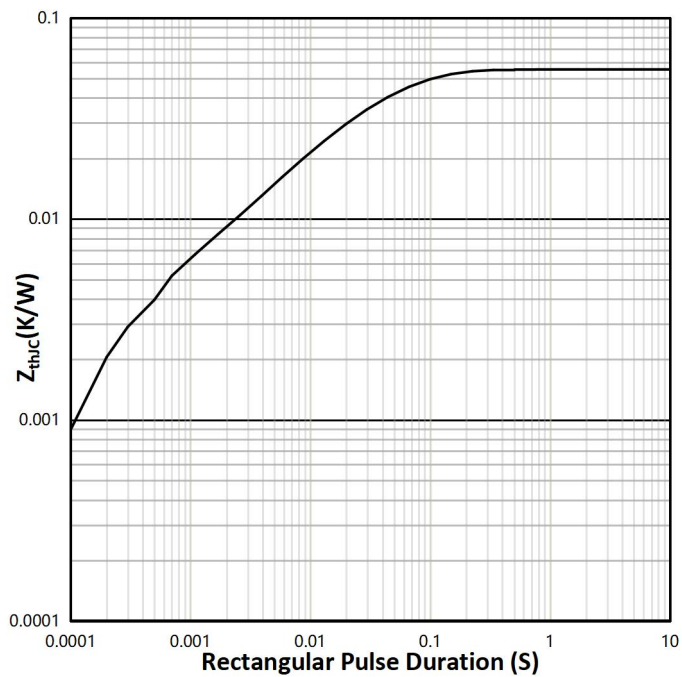
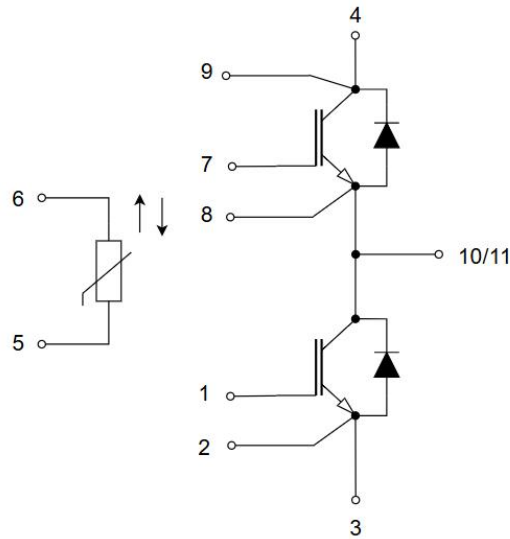


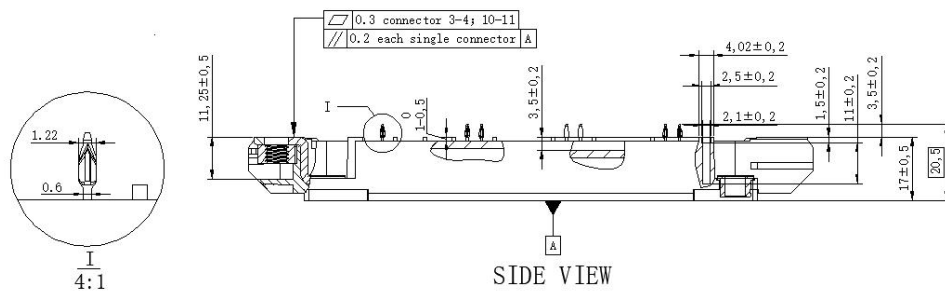
Figure 15.transient thermal impedance,Diode



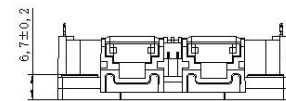
CIRCUIT DIAGRAM



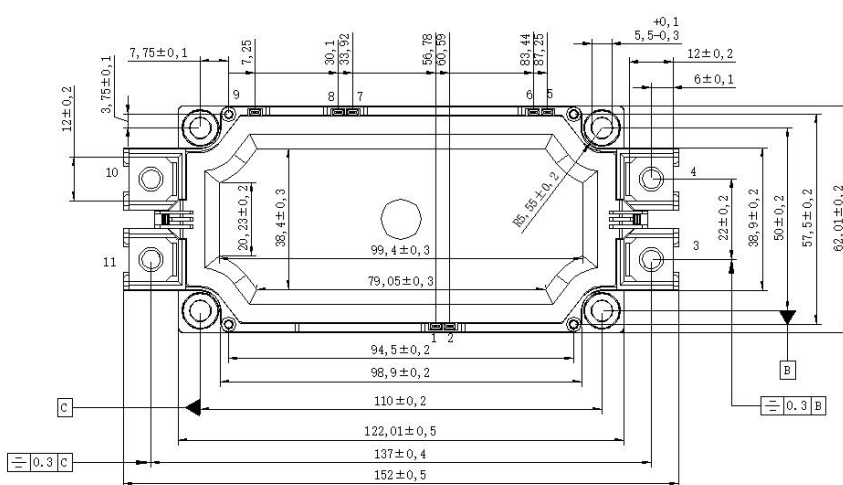
PACKAGE DIMENSION



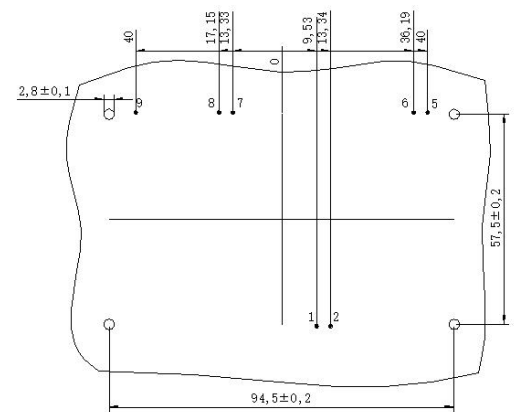
SIDE VIEW



SIDE VIEW



TOP VIEW



PCB孔位图