IGBT module with NCE Gen.7 Trench/
Fieldstop IGBT and Emitter Controlled diode and PressFIT/NTC

Features

• Electrical features

Low V_{CEsat}

T_{vjop}=150°C

V_{CEsat} with positive Temperature Coefficient

• Mechanical features

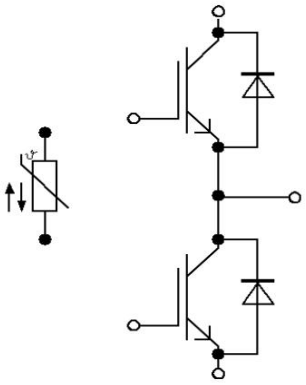
High Power and Thermal Cycling Capability

High Power Density

Isolated Base Plate

PressFIT Contact Technology

F1



Equivalent Circuit

Typical Applications

• Construction, Commercial and Agriculture Vehicles

• High Power Converters

• Motor Drives

• Servo Drives

Product validation

• Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

Package Insulation coordination

Symbol	Description	Note or test condition	Values	Unit
V_{ISOL}	Isolation test voltage	RMS,f=50Hz,t=60s	2.5	kV
	Material of module baseplate		Cu	
	Internal isolation	basic insulation(class 1,IEC 61140)	Al_2O_3	
d_{creep}	Creepage distance	terminal to heatsink	14.5	mm
d_{creep}	Creepage distance	terminal to terminal	13.0	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	

Package Characteristic values

Symbol	Description	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
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

Absolute Maximum Ratings

IGBT

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	600	A
I_C		T_C =25 °C,$T_{vj\ max}$ = 175 °C	950	A
I_{CRM}	Repetitive peak collector current	t_p =1 ms	1200	A
P_{tot}	Totalpowerdissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	2830	W
V_{GES}	Gate-emitter peak voltage		±20	V

Diode

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			600	A
I_{FRM}	Repetitive peak forward current	t_P = 1 ms		1200	A
I^2t	I^2t - value	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	30200	A^2s
			T_{vj} = 150 °C	27700	

IGBT Characteristics

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	I_C = 600 A, V_{GE} = 15 V	T_{vj} = 25 °C	--	1.55	1.80	V
			T_{vj}=125 °C	--	1.81	--	
			T_{vj} =150 °C	--	1.89	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C = 12 mA,T_{vj} = 25°C		5.6	6.2	6.8	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} =1200V ,T_{vj}= 25°C		--	--	35	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = 20V , V_{CE} = 0 V， T_{vj}= 25°C		--	--	200	nA
R_{Gint}	Internal Gate Resistance	T_{vj} = 25 °C		--	1.34	--	Ω
C_{ies}	Input Capacitance	f = 100KHz, T_{vj}= 25 °C, V_{CE} = 25 V, V_{GE} = 0 V		--	96.34	--	nF
C_{res}	Reverse Transfer Capacitance			--	0.48	--	nF
Q_G	Gate Charge	V_{GE} = 15 V， VCE = 600 V		--	3.32	--	μC
$t_{d(on)}$	Turn−On Delay Time	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2 Ω	T_{vj} = 25 °C	--	0.39	--	μs
			T_{vj} = 125 °C	--	0.42	--	
			T_{vj} = 150 °C	--	0.43	--	
t_r	Rise Time	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2 Ω	Tvj = 25 °C	--	0.09	--	μs
			T_{vj} = 125 °C	--	0.13	--	
			T_{vj} = 150 °C	--	0.14	--	
$t_{d(off)}$	Turn−off Delay Time	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 2 Ω	T_{vj} = 25 °C	--	0.54	--	μs
			T_{vj} = 125 °C	--	0.65	--	
			T_{vj} = 150 °C	--	0.66	--	
t_f	Fall Time	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0 Ω	T_{vj} = 25 °C	--	0.08	--	μs
			T_{vj} = 125 °C	--	0.17	--	
			T_{vj} = 150 °C	--	0.19	--	
E_{on}	Turn−On Switching Loss per Pulse	I_C = 600 A, V_{CE} = 600 V, L_S = 50 nH, V_{GE} = ±15 V, R_{Gon} = 2 Ω,	T_{vj} = 25 °C	--	39.06	--	mJ

		($T_{vj\ max}$ = 175 °C)	T_{vj} = 125 °C	--	69.32	--	
			T_{vj} = 150 °C	--	78.38	--	
E_{off}	Turn Off Switching Loss per Pulse	I_C = 600 A, V_{CE} = 600 V, L_S = 50 nH, V_{GE} = ±15 V, R_{Goff} = 2 Ω, ($T_{vj\ max}$ = 175 °C)	T_{vj} = 25 °C	--	52.71	--	mJ
			T_{vj} = 125 °C	--	80.38	--	
			T_{vj} = 150 °C	--	85.21	--	
I_{SC}	SC Data	V_{GE} ≤ 15 V, V_{CC} = 800 V, V_{CEmax}=V_{CES}-L_{sCE} . di/dt	t_P ≤ 10 µs, T_{vj} = 25°C	--	2200	--	A
			t_P ≤ 10 µs, T_{vj} = 150°C	--	2100	--	
R_{thJC}	Thermal resistance, junction to case	per IGBT		--	--	0.0531	K/W
R_{thCH}	Thermal resistance, case to heat sink	per IGBT λ_{Paste}=1W/(m·K)/λ_{grease}=1W/(m·K)		--	0.0217	--	K/W

Diode Characteristics

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 600 A, V_{GE} = 0 V	T_{vj} = 25 °C	--	2.35	2.65	V
			T_{vj} = 125 °C	--	2.30	--	
			T_{vj} = 150 °C	--	2.25	--	
Q_r	Recovered Charge	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di_F /dt = 3100 A/µs ($T_{vj\ max}$ = 175 °C)	T_{vj} = 25 °C	--	10.66	--	µC
			T_{vj} = 125 °C	--	22.31	--	
			T_{vj} = 150 °C	--	33.15	--	
I_{RM}	Peak Reverse Recovery Current	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di_F /dt = 3100 A/µs ($T_{vj\ max}$ = 175 °C)	T_{vj} = 25 °C	--	139	--	A
			T_{vj} = 125 °C	--	191	--	
			T_{vj} = 150 °C	--	199	--	
E_{rec}	Reverse recovery energy	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di_F /dt = 3100 A/µs ($T_{vj\ max}$ = 175 °C)	T_{vj} = 25 °C	--	9.85	--	mJ
			T_{vj} = 125 °C	--	20.23	--	
			T_{vj} = 150 °C	--	24.38	--	
R_{thJC}	Thermal resistance, junction to case	per diode		--	--	0.099	K/W
R_{thCH}	Thermal resistance, case to heat sink	per diode λ_{Paste}=1W/(m·K)/λ_{grease}=1W/(m·K)		--	0.021	--	K/W

THERMAL PROPERTIES

T_{stg}	Storage Temperature Range	−40 to 125	°C
$T_{vj\,op}$	Temperature under switching condition	−40 to 150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING RANGES

Symbol	Rating	Min	Max	Unit
T_J	Module Operating Junction Temperature	-40	175	℃

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

NTC Characteristics

Symbol	Parameter	Note or Test Condition	Value			Unit
			Min	Typ	Max	
R_{25}	Rated Resistance	T_C = 25°C	--	5	--	kΩ
ΔR/R	Deviation of R100	T_C=100 ℃,R_{100}=493Ω	-5	--	5	%
P_{25}	Power Dissipation	T_C = 25°C	--	--	20	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2- 1/(298.15K))]$	--	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,Inverter(typical)
V_{GE}=15V

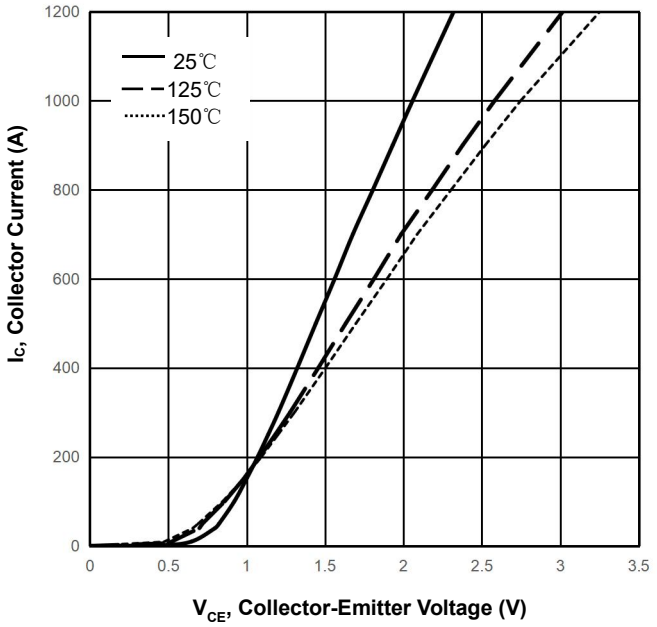


Figure2.Output characteristic IGBT,Inverter(typical)
T_{vj}=150℃

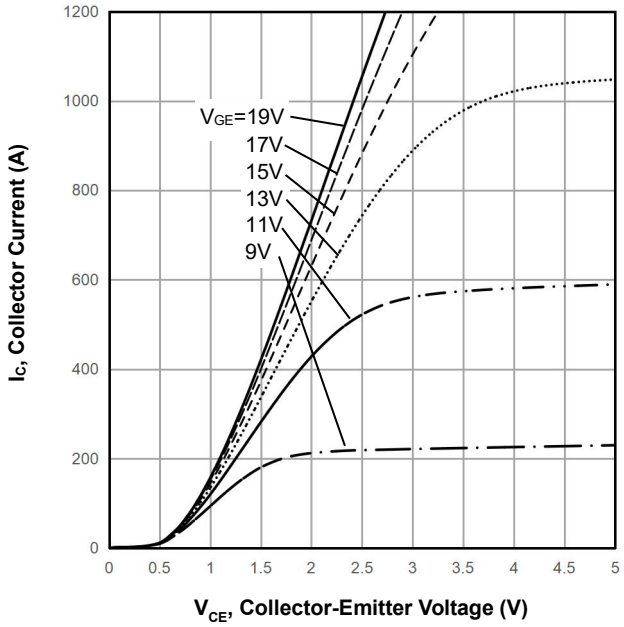


Figure3.transfer characteristic IGBT,Inverter (typical)
V_{CE}=60V

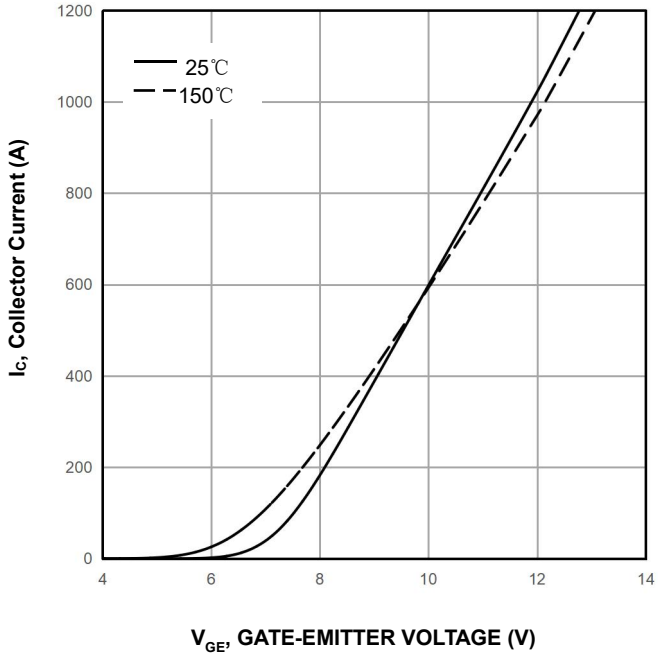


Figure4.switching losses IGBT,Inverter(typical)
V_{CE}=600V,V_{GE}=±15V,R_G=2Ω

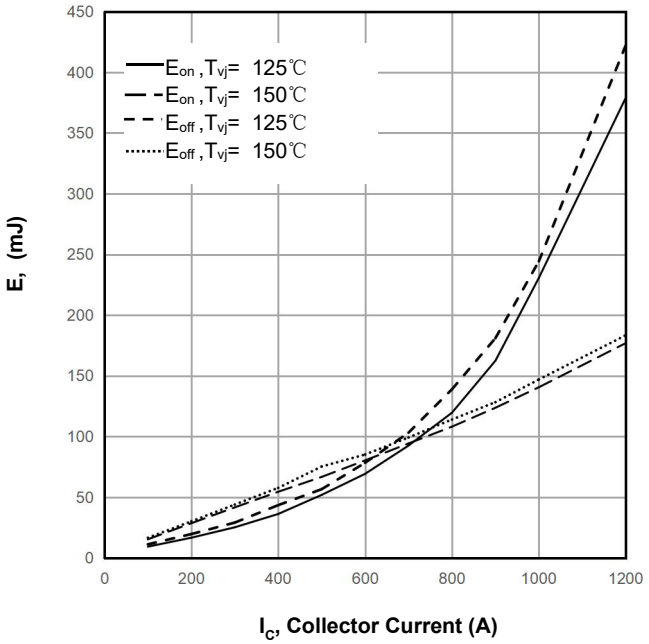


Figure5.switching losses IGBT,Inverter(typical)
V_{CE}=600V,V_{GE}=±15V,I_C=600A

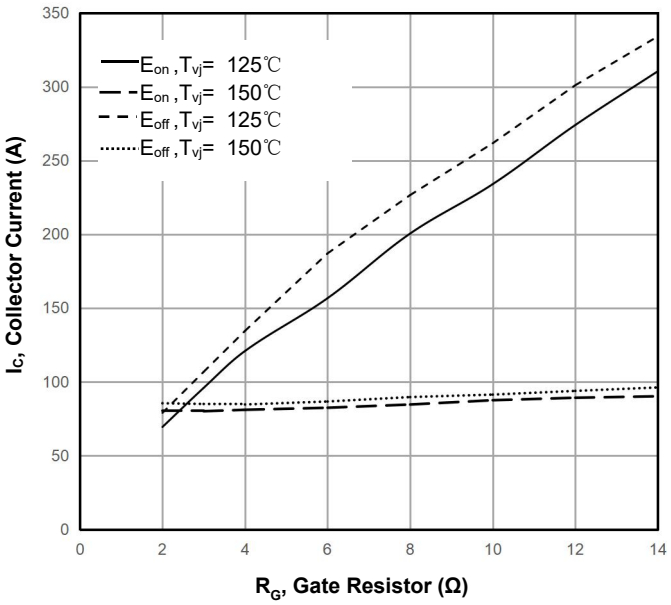


Figure6.Transient thermal impedance IGBT,Inverter

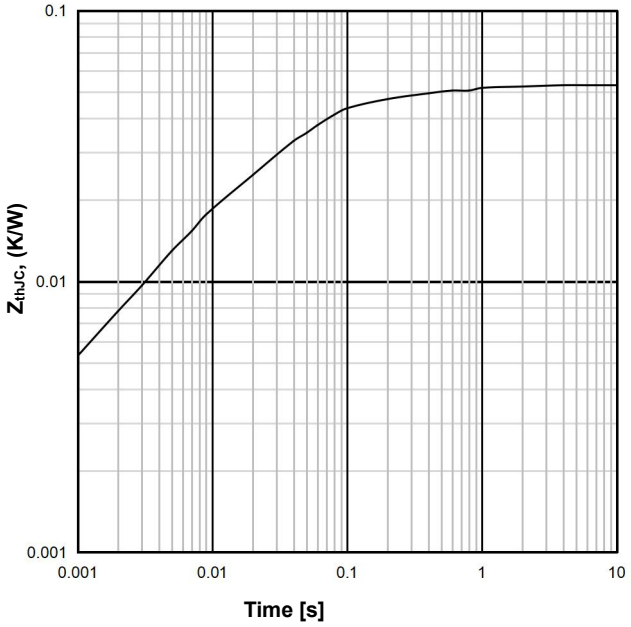


Figure7.RBSOA IGBT,Inverter (typical)
V_{GE}=±15V,R_{Goff}=2Ω,T_{vj}= 150℃

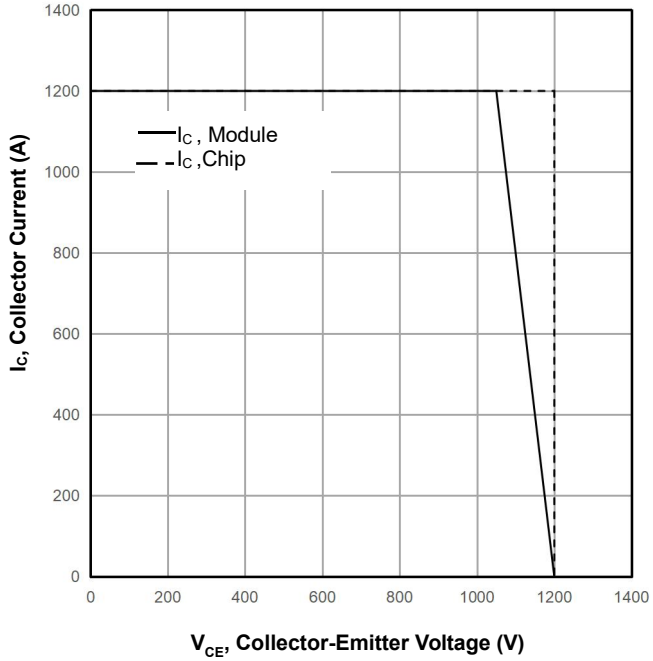


Figure 8 .switching Time IGBT,Inverter(typical)
V_{CE}=600V,V_{GE}=±15V,R_G=2Ω,T_{vj}= 150℃

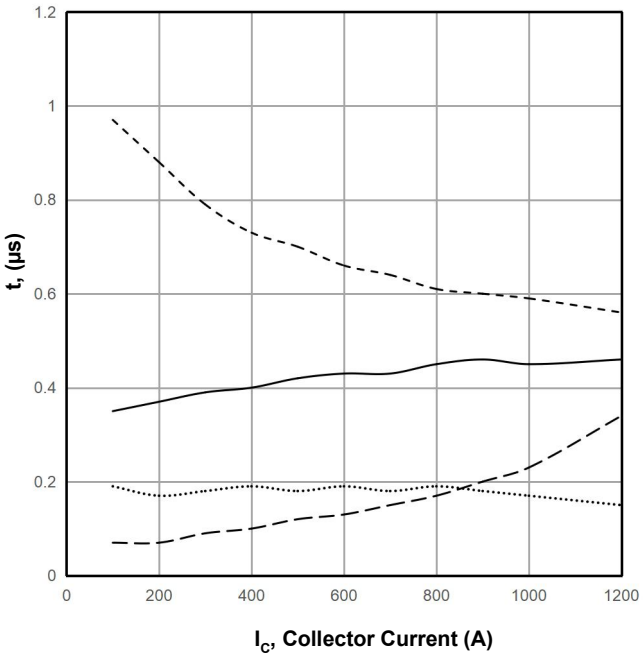


Figure 9 .Capacitance IGBT,Inverter(typical)
f=100KHz,V_{GE}=0V,T_{vj}= 25℃

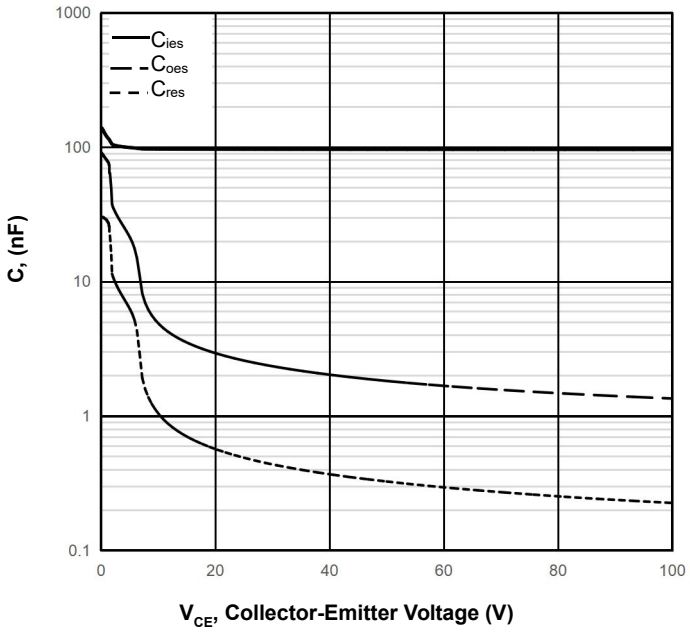


Figure10.Gate Voltage(typical)
V_{CE}=600V,I_C=600V,T_{vj}= 25℃

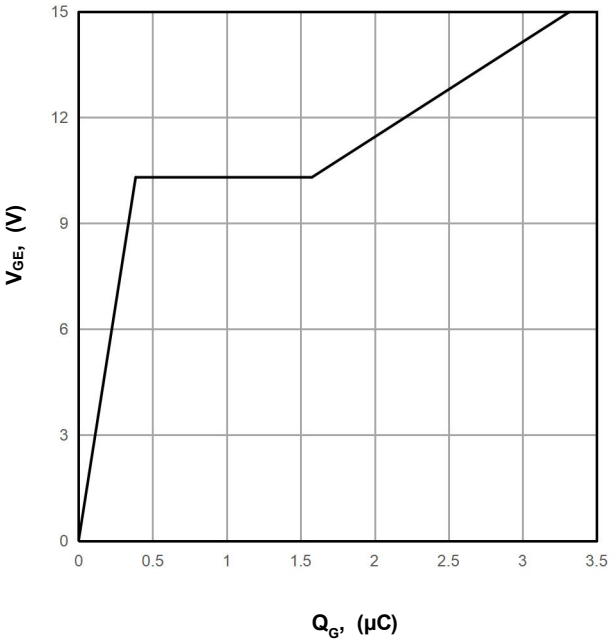


Figure11.Forward Characteristic of Diode(typical)

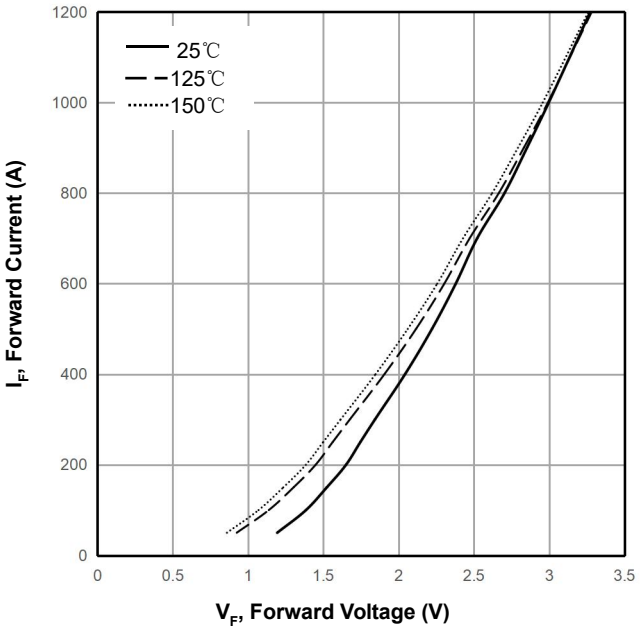


Figure12.Switching losses Diode,Inverter(typical)
V_{CE}=600V,R_G=2Ω

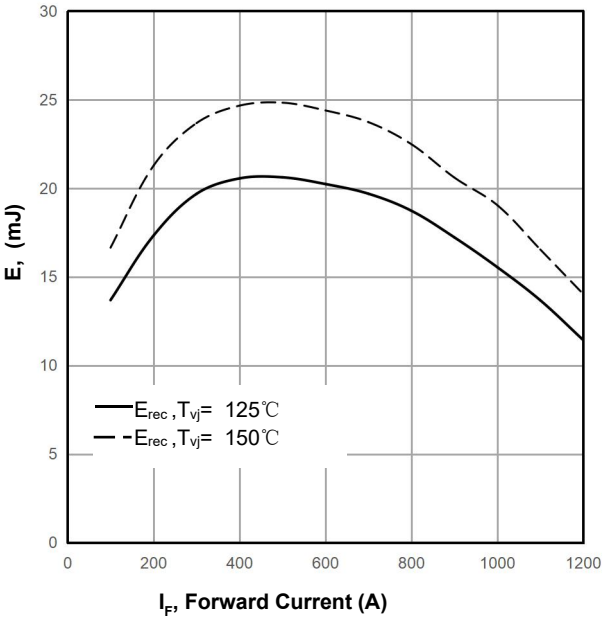


Figure13.Switching losses Diode,Inverter(typical)
V_{CE}=600V,I_F=600A

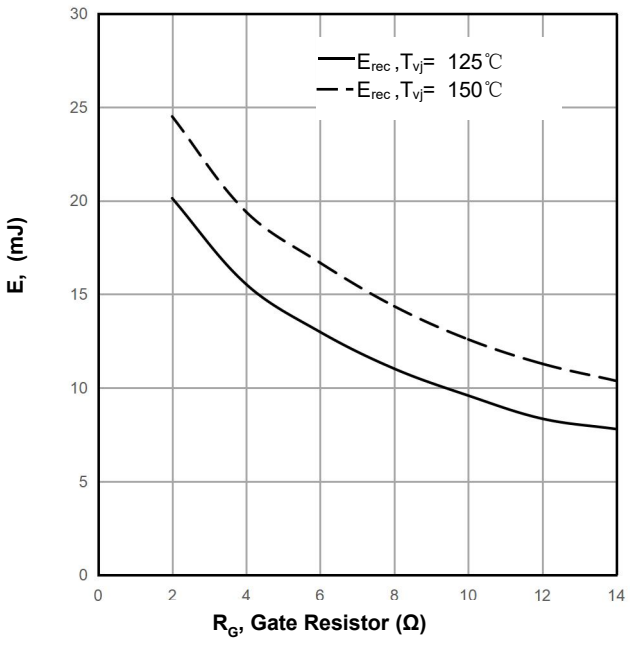
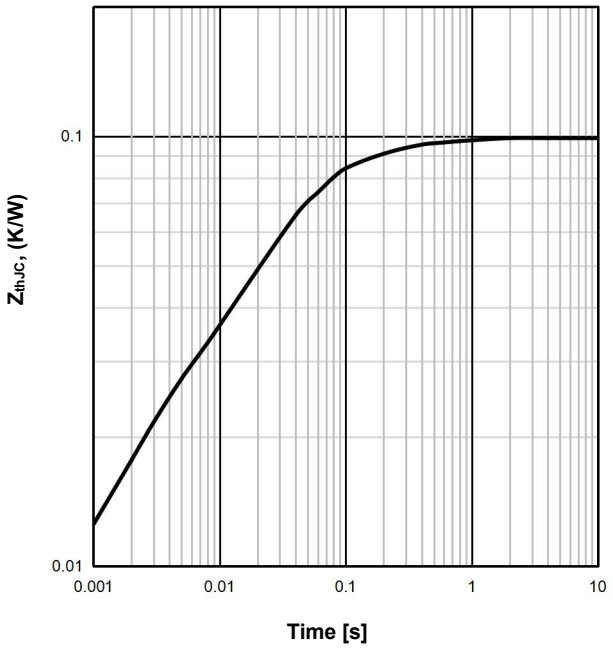
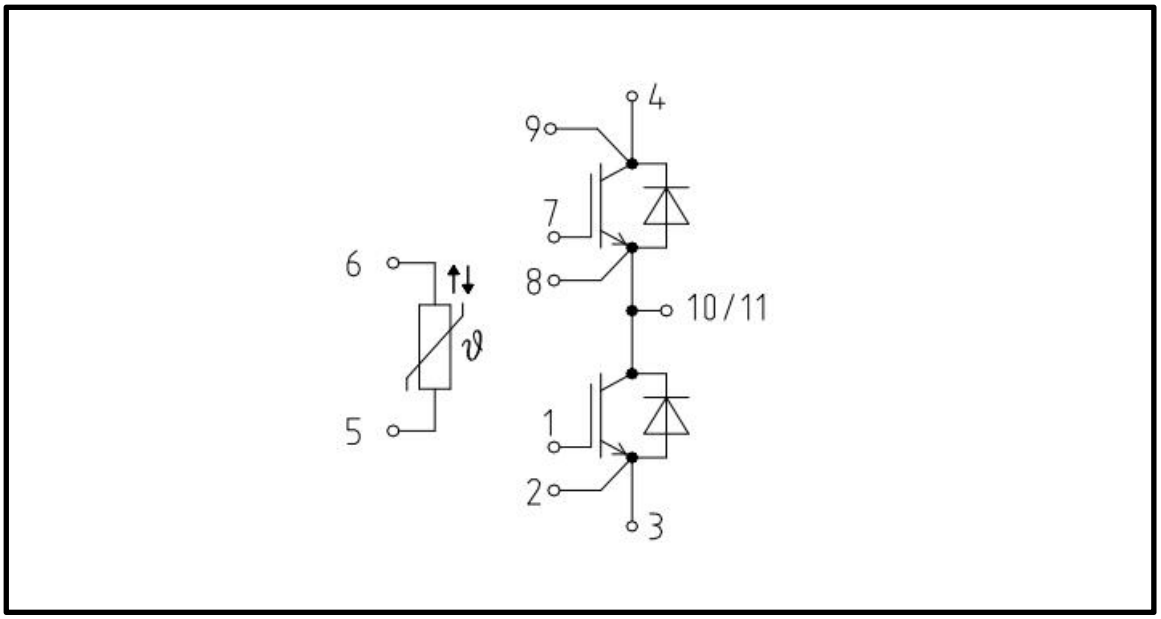


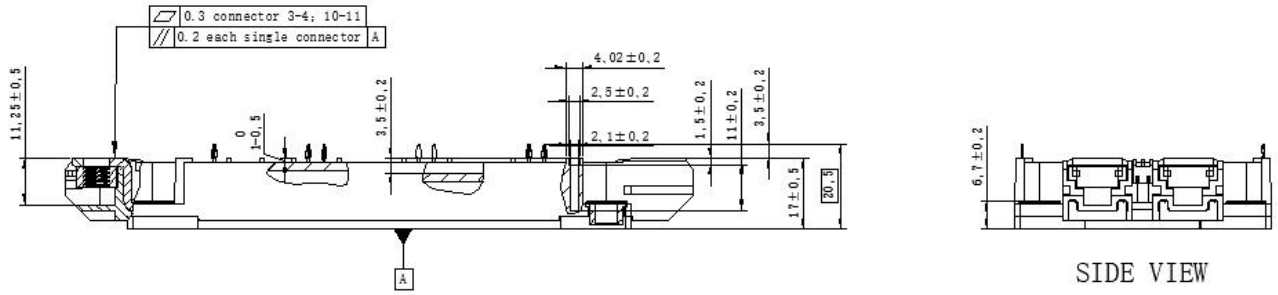
Figure14.Transient thermal impedance Diode,Inverter

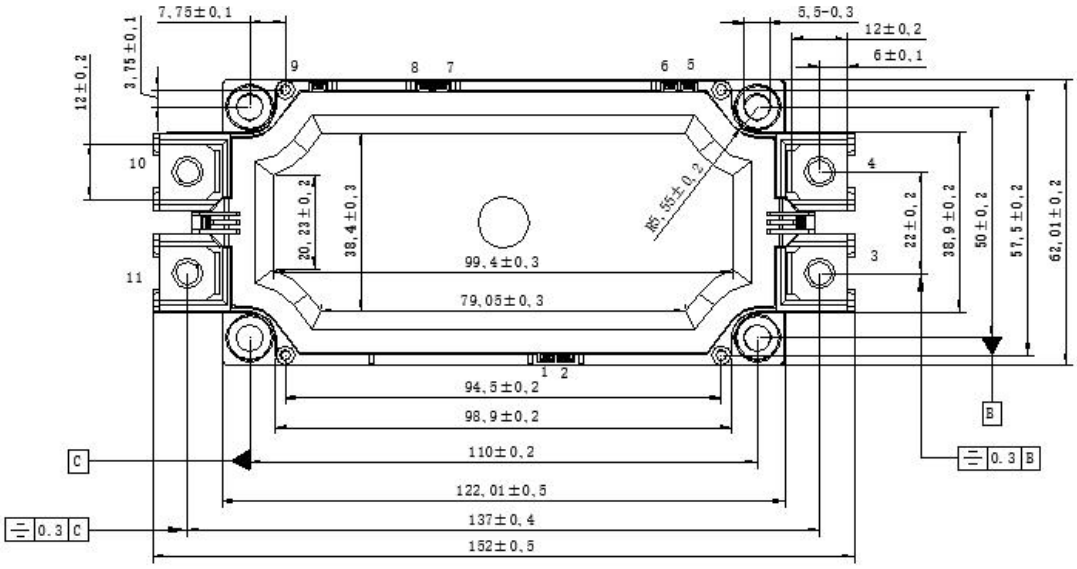


CIRCUIT DIAGRAM



PACKAGE DIMENSION





PCB孔位图