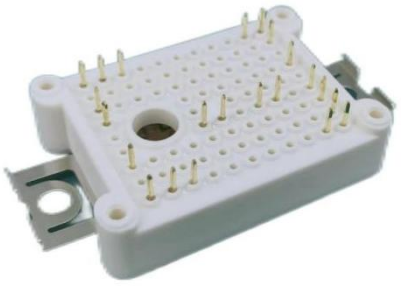
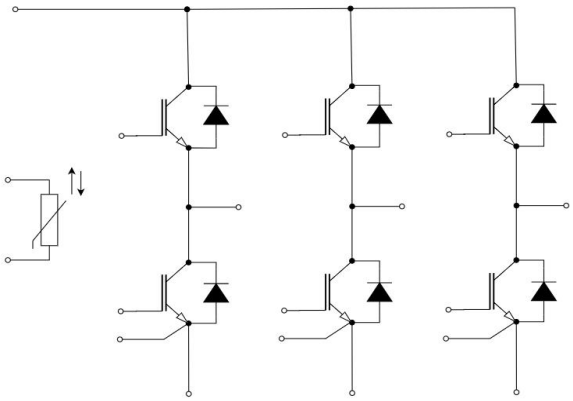
IGBT module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC



H1



Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Al_2O_3 substrate with low thermal resistance
- Solder Contact Technology
- Rugged mounting due to integrated mounting clamps

Typical Applications

- Air Conditioning
- Motor Drives
- Servo Drives
- UPS Systems
- Auxiliary inverters

Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS,f=50Hz,t=60s	2.5	kV
Internal isolation		basic insulation(class 1,IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{creep}	terminal to terminal	6.3	mm
Clearance	d_{clear}	terminal to heatsink	10	mm
Clearance	d_{clear}	terminal to terminal	5	mm
Comparative tracking index (electrical)	CTI		>200	
RTI Elec.	RTI	housing	140	℃

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{CE}			--	25	--	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$			--	4.5	--	mΩ
Mounting torque for module mounting	M	-Mounting according to valid application note	M5, Screw	40	--	80	Nm
Weight	G			--	24	--	g

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

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	67	A
	Collector Current @ T_C=100℃	35	A
I_{CM}	Pulsed Collector Current，t_p limited by $T_{vj\,max}$	70	A
T_{jmax}	Maximum Junction Temperature	175	℃
P_D	Power Dissipation @ T_C = 25°C	258	W
	Power Dissipation @T_C = 100 °C	129	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	35	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	70	A

Module

Symbol	Description	Value	Unit
$T_{vj\,op}$	Temperature under switching conditions	-40 to 150	℃
T_{STG}	Storage Temperature Range	-40 to 125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V

IGBT Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 35 A, T_{vj} = 25°C	--	1.40	1.80	V
		V_{GE} = 15 V, I_C = 35 A, T_{vj} = 125°C	--	1.65	--	
		V_{GE} = 15 V, I_C = 35 A, T_{vj} = 150°C	--	1.70	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C = 1.2mA,T_{vj} = 25°C	5.0	5.7	6.5	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} =V_{CES} ,T_{vj} = 25°C	--	--	200	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = V_{GES} , V_{CE} = 0 V， T_{vj} = 25°C	--	--	300	nA
R_{Gint}	Internal Gate Resistance		--	1.34	--	Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz,	--	4140	--	pF
C_{res}	Reverse Transfer	V_{GE}=0V	--	36.5	--	pF
Q_G	Gate Charge	V_{GE}= 15V	--	0.15	--	μC
$t_{d(on)}$	Turn−On Delay Time	V_{CE} = 600 V,I_C = 35 A, R_G = 10Ω,$V_{GE(on)}$ =15V,$V_{GE(off)}$ =−5V, T_{vj} = 25°C	--	90	--	ns
t_r	Rise Time		--	216	--	
$t_{d(off)}$	Turn−off Delay Time		--	176	--	
t_f	Fall Time		--	92	--	
E_{on}	Turn−On Switching Loss per Pulse		--	1.83	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	2.55	--	

$t_{d(on)}$	Turn−On Delay Time	V_{CE} = 600 V,I_C = 35 A, R_G = 10Ω,$V_{GE(on)}$ =15V,$V_{GE(off)}$ =−5V, T_{vj} = 150°C	--	95	--	ns
t_r	Rise Time		--	264	--	
$t_{d(off)}$	Turn−off Delay Time		--	212	--	
t_f	Fall Time		--	163	--	
E_{on}	Turn−on Switching Loss per Pulse		--	2.65	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	3.68	--	
I_{SC}	SC Data	t_P≤10μs,V_{GE} ≤15V, T_{vj} =150℃,V_{CC}=800V, V_{CEmax}=V_{CES} -L_{sCE}*di/dt	--	135	--	A
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.58		K/W

Diode Characteristics （Tc=25℃ unless otherwise noted）

V_F	Diode Forward Voltage	I_F =35A, V_{GE}=0V， T_{vj} = 25°C	--	2.60	3.2	V
		I_F = 35A, V_{GE}=0V， T_{vj} = 125°C	--	2.50	--	
		I_F = 35A, V_{GE}=0V， T_{vj} = 150°C	--	2.45	--	
Q_r	Recovered Charge	V_R=600V,I_F=35A, R_G = 10Ω,V_{GE}=-5V T_{vj} =25℃	--	0.65	--	μC
I_{RM}	Peak Reverse Recovery Current		--	38	--	A
T_{rr}	Reverse Recovery Time		--	25	--	ns
Erec	Reverse Recovery Energy		--	0.7	--	mJ
Q_r	Recovered Charge	V_R=600V,I_F=35A, R_G = 10Ω,V_{GE}=-5V T_{vj} =150℃	--	1.14	--	μC
I_{RM}	Peak Reverse Recovery Current		--	39	--	A
T_{rr}	Reverse Recovery Time		--	40	--	ns
Erec	Reverse Recovery Energy		--	1.55	--	mJ
R_{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.81	--	K/W

NTC Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R_{25}	Rated Resistance		--	5.0	--	kΩ
ΔR/R	Deviation of R100	Tc=100 ℃,R_{100}=493.3Ω	-5	--	5	%
P_{25}	Power Dissipation		--	--	20.0	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

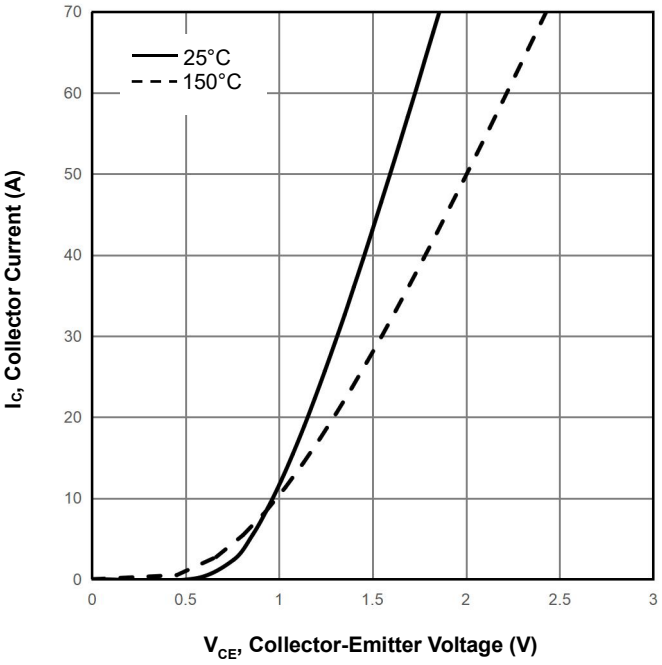


Figure2.output characteristic IGBT,Inverter(typical)
T_{vj}=150°C

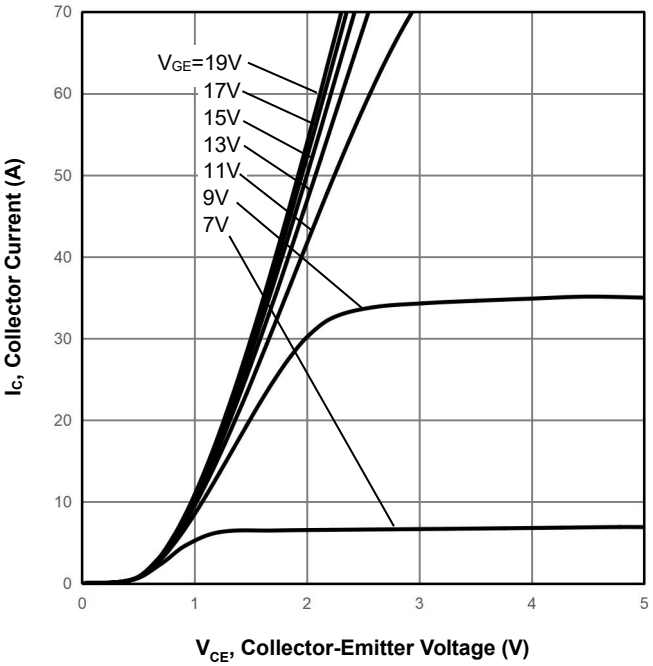


Figure3.transfer characteristic IGBT,Inverter(typical)
V_{CE}=20V

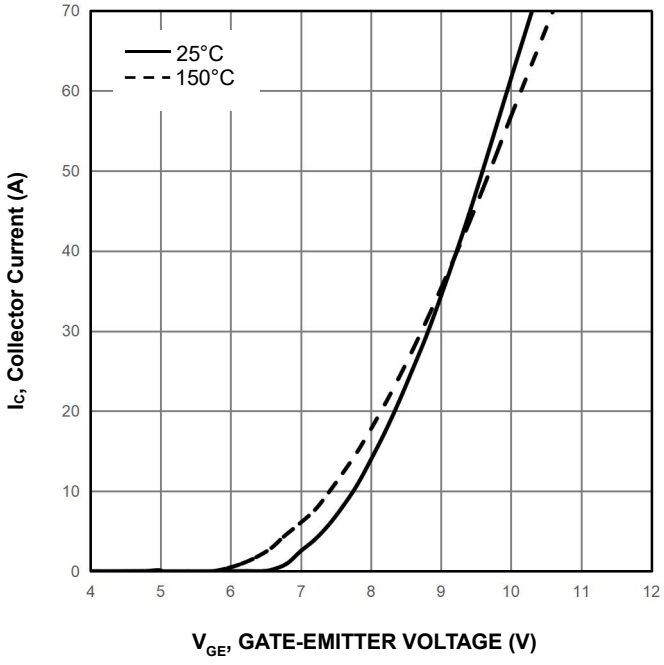


Figure4.switching losses IGBT,Inverter(typical)
$V_{GE(on)}$ =15V,$V_{GE(off)}$ =－5V,R_G=15Ω,V_{CE}=600V

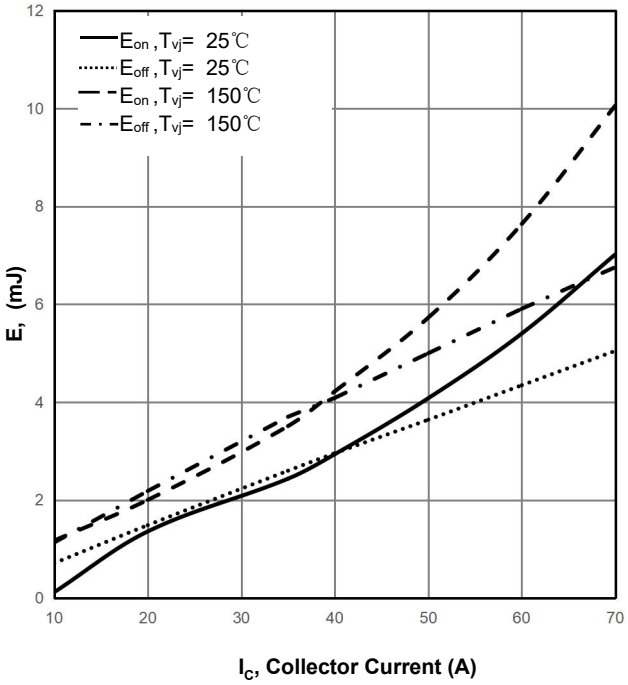


Figure5.switching losses IGBT,Inverter(typical)

$V_{GE(on)}$ =15V,$V_{GE(off)}$ =－5V,I_C=35A,V_{CE}=600V

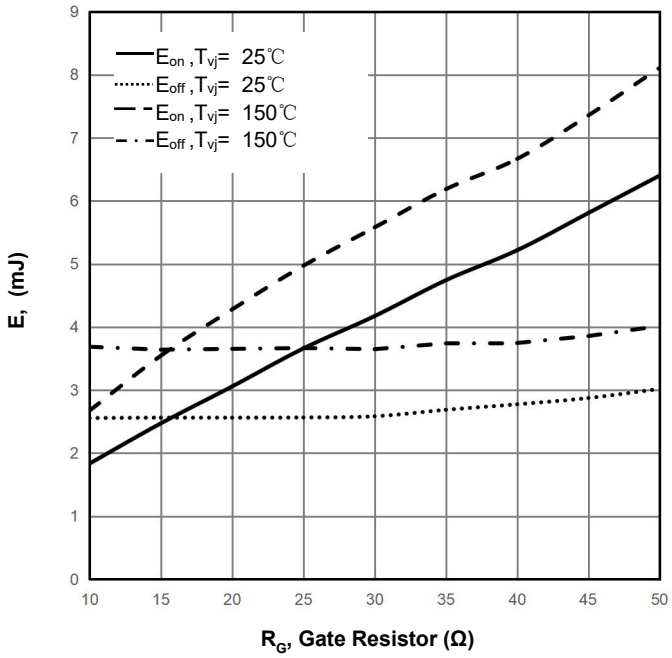


Figure6.transient thermal impedance IGBT,Inverter

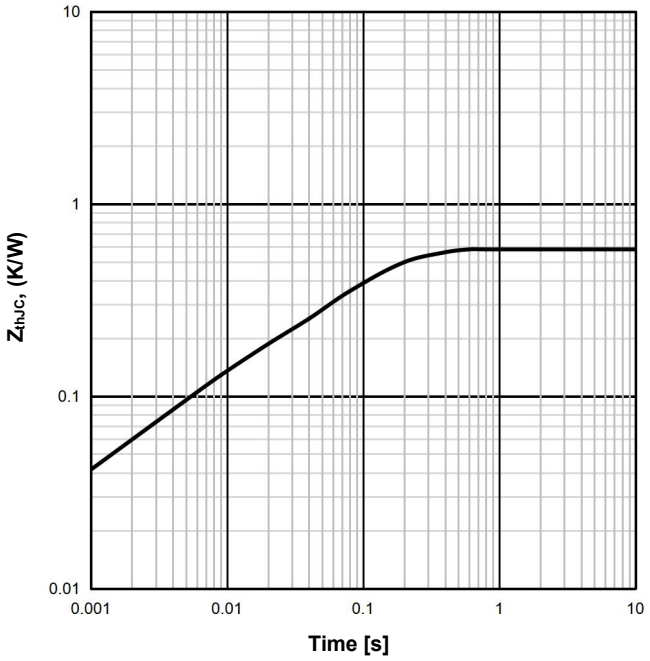


Figure7.reverse bias safe operating area IGBT ,Inverter

$V_{GE(on)}$ =15V,$V_{GE(off)}$ =－5V,R_G=25Ω,T_{vj}=150°C

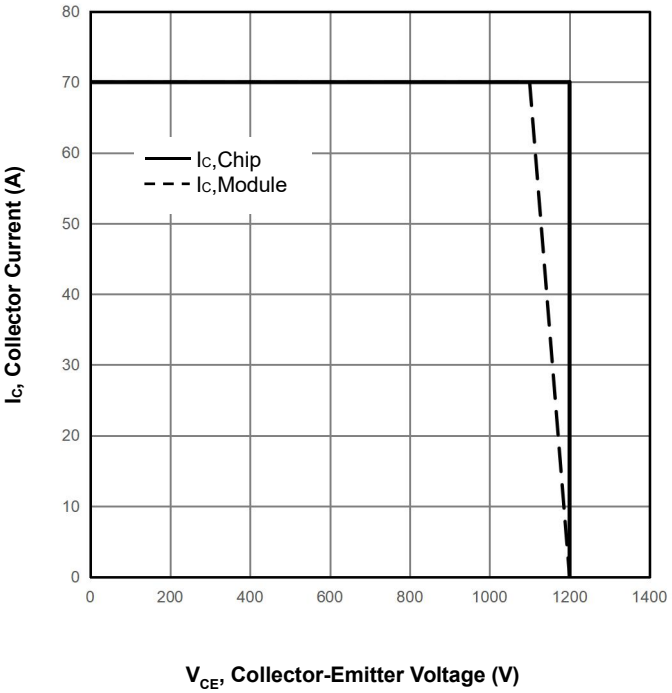


Figure8.forward characteristic of Diode,Inverter(typical)

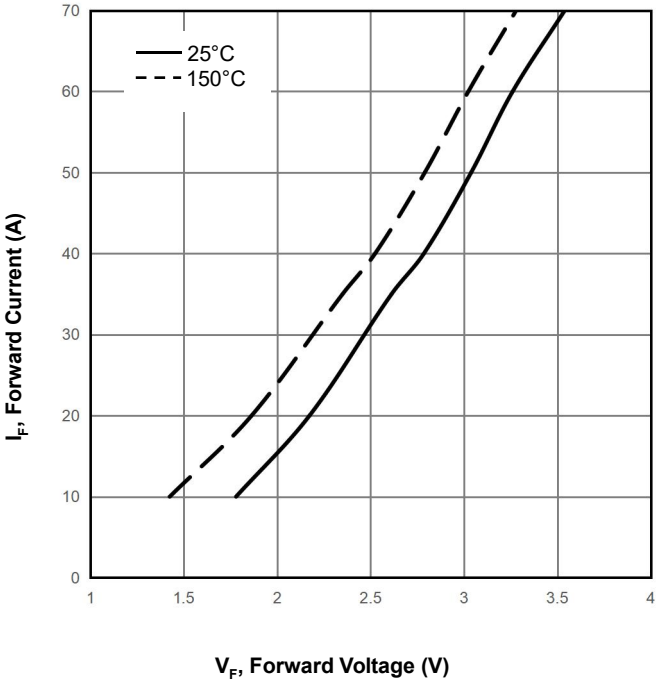


Figure9.switching losses Diode,Inverter(typical)
R_{Gon}=15Ω,V_{CE}=600V

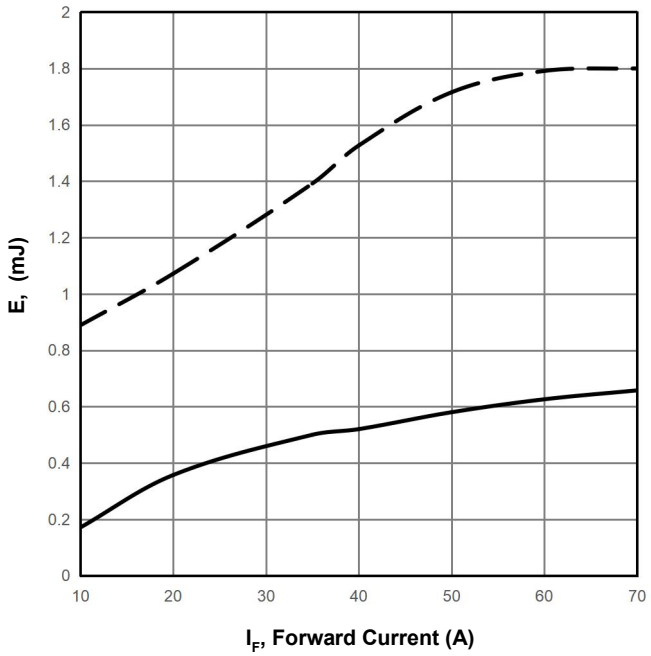


Figure10.switching losses Diode,Inverter(typical)
I_F=35A,V_{CE}=600V

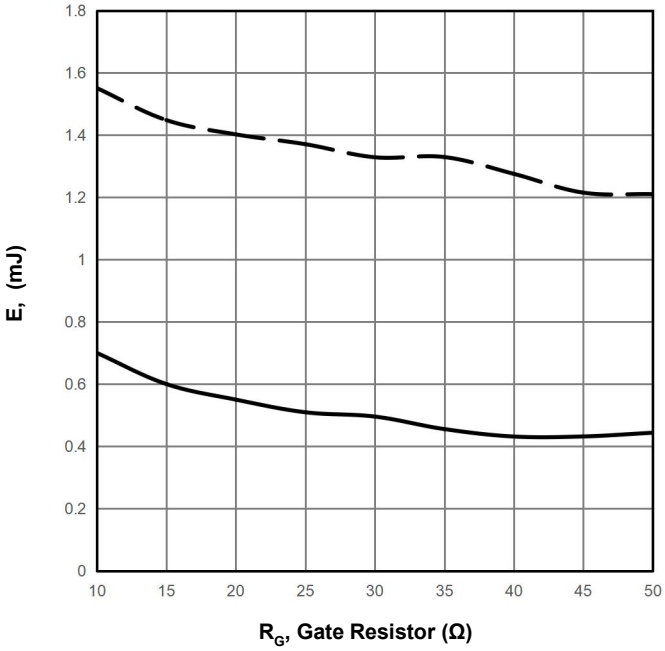


Figure11.transient thermal impedance Diode,Inverter

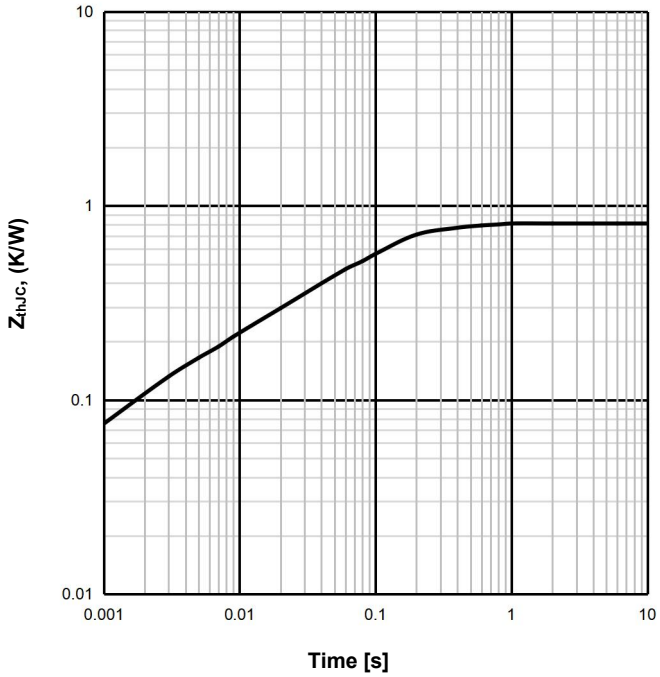
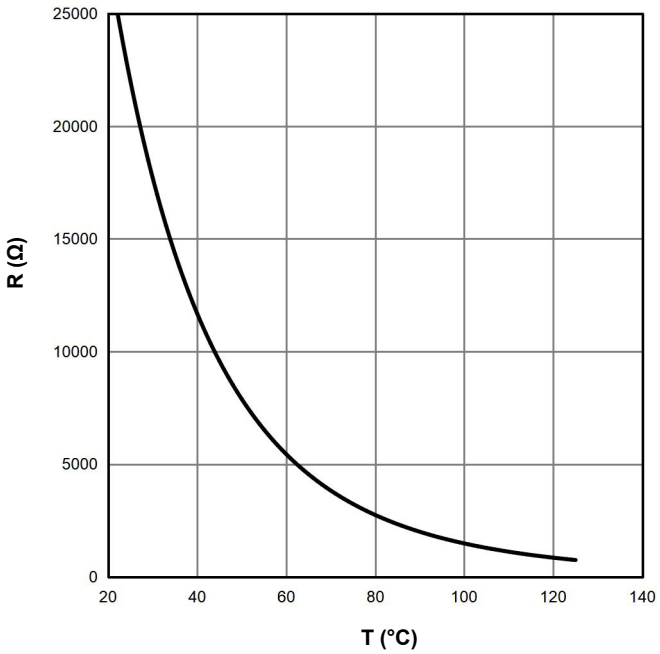
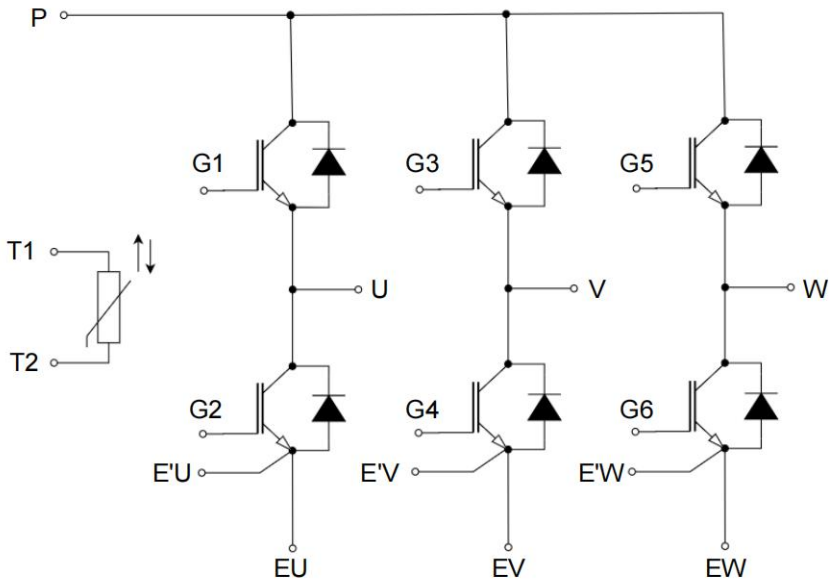


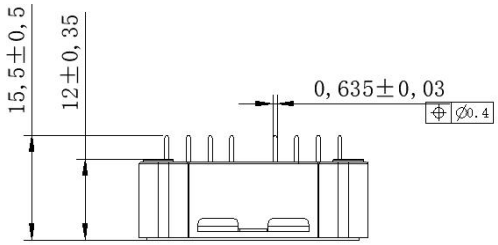
Figure12.NTC-Thermistor-temperature characteristic(typical)



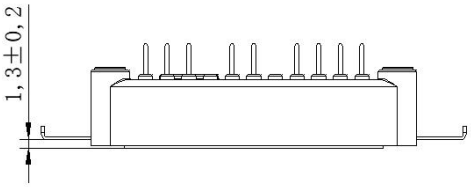
CIRCUIT DIAGRAM



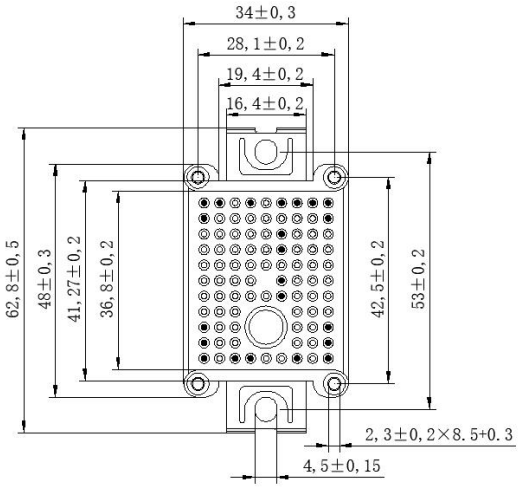
PACKAGE DIMENSION



SIDE VIEW



SIDE VIEW



TOP VIEW