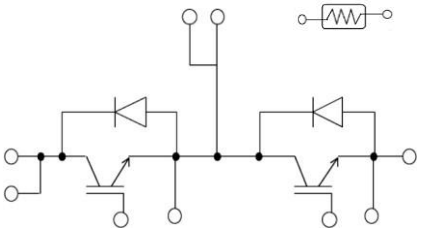
Trench-Field Stop IGBT Module

V_{CES}= 1200V, I_C= 200A, $V_{CE(sat)}$= 1.85V



FEATURES

- Increased Blocking Voltage Capability To 1200V,Tvjop = 150°C
- High Short Circuit Capability, Self Limiting Short Circuit Current
- High Surge Current Capability and Density
- High Power Density,Increased Dc Ink Voltage
- Integrated NTC temperature sensor
- Standard Housing

APPLICATIONS

- Commercial Agriculture Vehicles
- Motor Drives
- Solar Applications
- UPS Systems

CHARACTERISTICS VALUES
MAXIMUM RATED VALUES(IGBT)

Parameter	Symbol	Conditions	Values	Units
Collector-emitter voltage	VCES	Tvj=25°C, VGE=0V	1200	V
Continuous collector current	ICN	TC= 100° C, Tvj max= 175°C	200	A
Repetitive peak collector current	ICRM	tP= 1ms, Tvj=25°C	400	A
Gate-emitter peak voltage	VGES	Tvj=25°C	±30	V
SC data	ISC	VGE≤15V, VCC=800V VCEmax=VCES-LSce*di/dt, tP≤10μs, Tvj= 150°C	800	A
Total power dissipation	Ptot	TC=25°C, Tvj max= 175°C	955[1)]	W

1) Verified by characterization / design not by test.

CHARACTERISTICS VALUES(IGBT)

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	VCEsat	IC=200A, VGE=15V	Tvj=25°C		1.85	2.1	V
			Tvj=125°C		2.1		V
			Tvj=150°C		2.2		V
Gate-emitter threshold voltage	VGEth	IC=6.4mA, VCE=VGE	Tvj=25°C	5	6	6.5	V
			Tvj=150°C		4.6		V

Gate charge	QG	VGE=-8V/+15V		2.3		μC
Integrated gate resistor	RG	Tvj=25°C		5		Ω
Input capacitance	Cies	Tvj=25°C f= 1MHz, VCE=25V, VGE=0V		23.8		nF
Output capacitance	Coes	Tvj=25°C f= 1MHz, VCE=25V, VGE=0V		1.1		nF
Reverse transfer capacitance	Cres	Tvj=25°C, f= 1MHz, VGE=0V, VCE=25V		0.22		nF
Collector-emitter cut-off current	ICES	VCE=1200V, VGE=0V	Tvj=25°C		1	mA
			Tvj=150°C		4	mA
Gate-emitter leakage current	IGES	VCE=0V, VGE=20V, Tvj=25°C			400	nA
Turn-on delay time	td on	IC=200A, VCE=600V, VGE=-8V/+15V, RGon=0.22Ω, RGoff=6. 1Ω, Inductive Load	Tvj=25°C	0.26		μs
			Tvj=125°C	0.27		μs
			Tvj=150°C	0.27		μs
Rise time	tr		Tvj=25°C	0.04		μs
			Tvj=125°C	0.05		μs
			Tvj=150°C	0.06		μs
Turn-off delay time	td off		Tvj=25°C	0.95		μs
			Tvj=125°C	1.08		μs
			Tvj=150°C	1.12		μs
Fall time	tf		Tvj=25°C	0.06		μs
			Tvj=125°C	0.18		μs
			Tvj=150°C	0.22		μs
Turn-on energy loss per pulse	Eon	IC=200A, VCE=600V, VGE=-8V/+15V, RGon=0.22Ω, RGoff=6.1Ω, Ls=35nH, di/dt=3600A/μs (Tvj= 150°C) du/dt=4700V/μs (Tvj= 150°C)	Tvj=25°C	11.7		mJ
			Tvj=125°C	16.9		mJ
			Tvj=150°C	18.6		mJ
Turn-off energy loss per pulse	Eoff		Tvj=25°C	24.8		mJ
			Tvj=125°C	27.8		mJ
			Tvj=150°C	29.2		mJ
Thermal resistance, junction to case	RthJC	per IGBT			0.157	K/W

MAXIMUM RATED VALUES(FRD)

Parameter	Symbol	Conditions		Values	Units
Repetitive peak reverse voltage	VRRM	Tvj=25°C		1200	V
Continuous forward current	IFN	TC= 100°C, Tvj max= 175°C		200	A
Maximum repetitive forward current	IFRM	tP= 1ms		400	A
I^2t-value	I^2t	VR=0V, tP= 10ms	Tvj=125°C	9000	A^2s
			Tvj=150°C	7200	

CHARACTERISTICS VALUES(FRD)

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	VF	IF=200A, VGE=0V	Tvj=25°C		1.8		V
			Tvj=125°C		1.87		V
			Tvj=150°C		1.9		V
Peak reverse recovery current	IRM	IF=200A, VR=600V, VGE=-8V, diF/dt=3600A/μs (Tvj=150°C)	Tvj=25°C		172		A
			Tvj=125°C		183		A
			Tvj=150°C		200		A
Recovered charge	Qr		Tvj=25°C		11.3		μC
			Tvj=125°C		21.1		μC
			Tvj=150°C		28.3		μC
Reverse recovery energy	Erec		Tvj=25°C		5		mJ
			Tvj=125°C		8.5		mJ
			Tvj=150°C		11.6		mJ
Thermal resistance, junction to case	RthJC	per FRD				0.22	K/W

NTC-THERMISTOR

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Rated resistance	R25	TC=25°C		5.0		kΩ
Deviation of R100	△R/R	TC= 100°C, R100=493Ω	-3		3	%
Power dissipation	P25	TC=25°C			60	mW
B-value	B25/50	R2=R25 exp[B25/50(1/T2-1/(298.15K))]		3375		K
B-value	B25/80	R2=R25 exp[B25/80(1/T2-1/(298.15K))]		3411		K
B-value	B25/100	R2=R25 exp[B25/100(1/T2-1/(298.15K))]		3433		K

CHARACTERISTICS VALUES(MODULE)

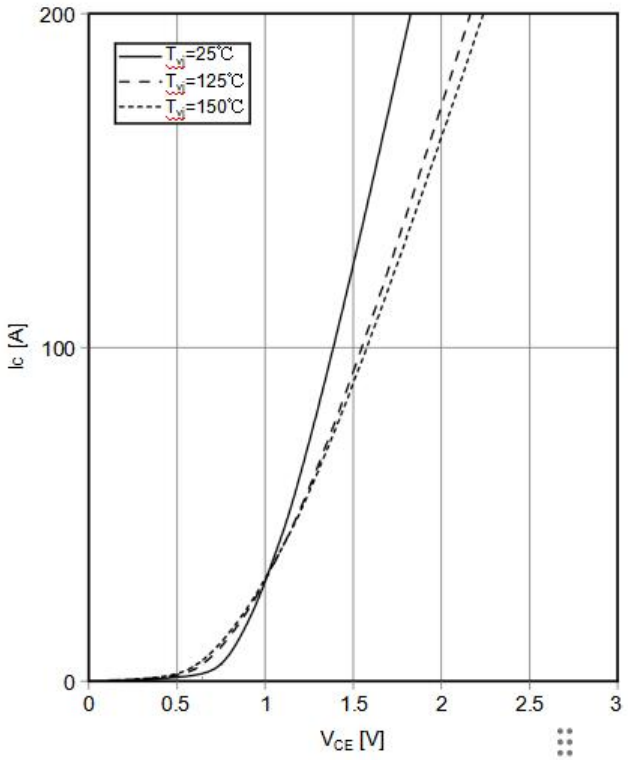
Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Maximum junction temperature	Tvj max	-			175	°C
Temperature under switching conditions	Tvj op	-	-40		150	°C
Storage temperature	Tstg	-	-40		125	°C
Stray inductance module	LsCE	-		21		nH
Module lead resistance, terminals-chip	RCC'+EE'	Tvj=25°C, per switch		1.2		mΩ
Isolation test voltage	VISOL	RMS, f=50Hz, t= 1min		2.5		kV

Creepage distance	ds	Terminal to heatsink		14.5		mm
		Terminal to terminal		13		mm
Clearance distance	da	Terminal to heatsink		12.5		mm
		Terminal to terminal		10		mm
Comperative tracking index	CTI	-		>200		-
Mounting torque for module mounting	M1	Screw M5	3	-	6	N·m
Terminal connection torque	M2	Screw M6	3	-	6	N·m
Internal isolation	-	Basic insulation (class1, IEC 61140)		Al2O3		-
Material of module baseplate	-	-		Cu+Ni		-
Dimensions	LxWxH	-		152.1x62x20.8		mm
Weight	G	-		338		g

CHARACTERISTICS DIAGRAMS

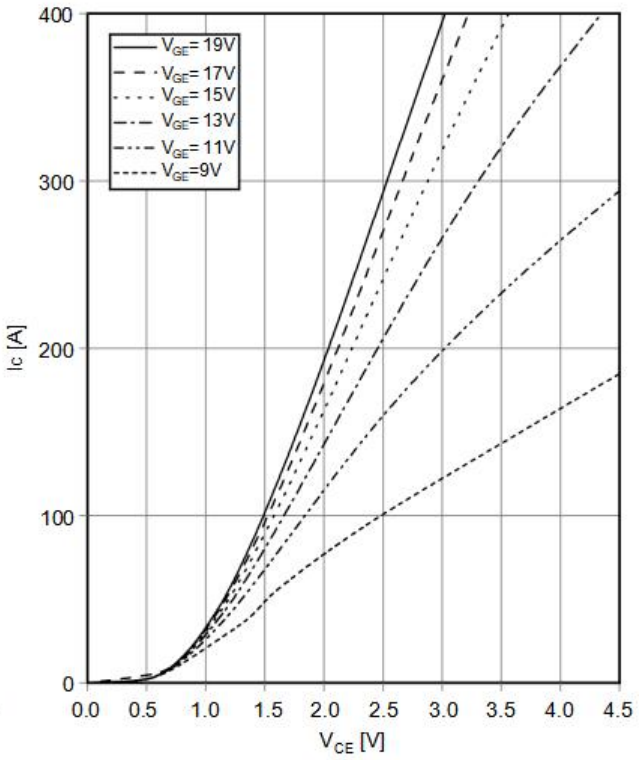
Output characteristic IGBT, Inverter(typical)

$I_C=f(V_{CE})$, $V_{GE}=15V$



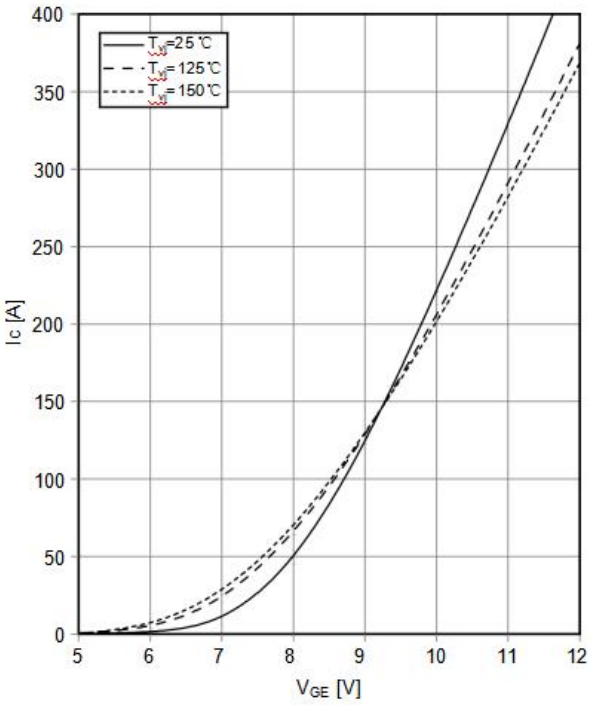
Output characteristic IGBT, Inverter(typical)

$I_C=f(V_{CE})$, $T_{vj}=150°C$



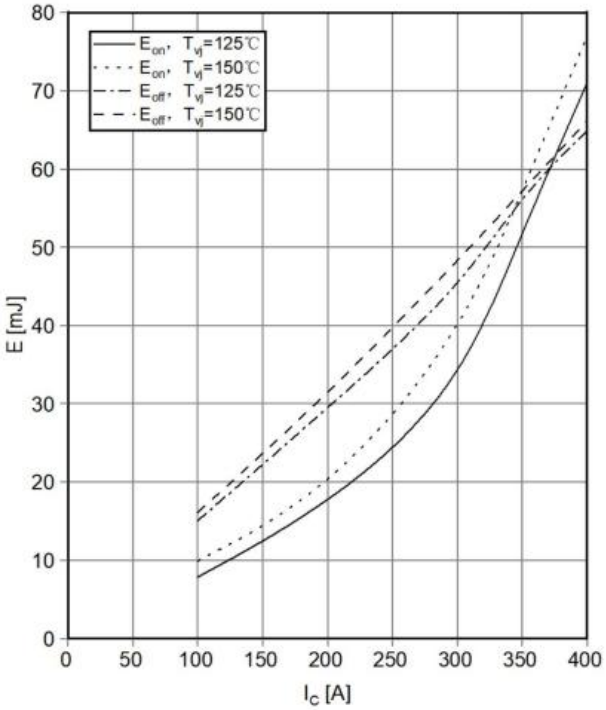
Transfer characteristic IGBT, Inverter(typical)

$I_C=f(V_{GE})$, $V_{CE}=20V$



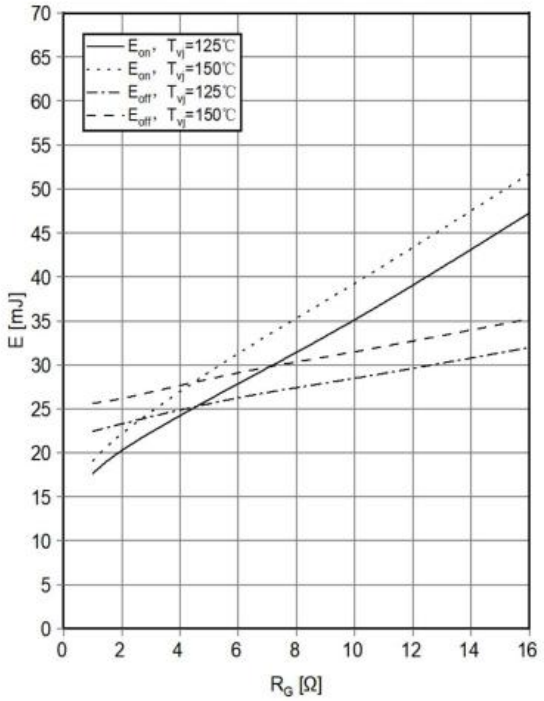
Switching losses IGBT, Inverter(typical)

$E_{on}=f(I_C)$, $E_{off}=f(I_C)$, V_{GE}=-8V/+15V, R_{Gon}=0.22Ω, R_{Goff}=6.1Ω, V_{CE}=600V



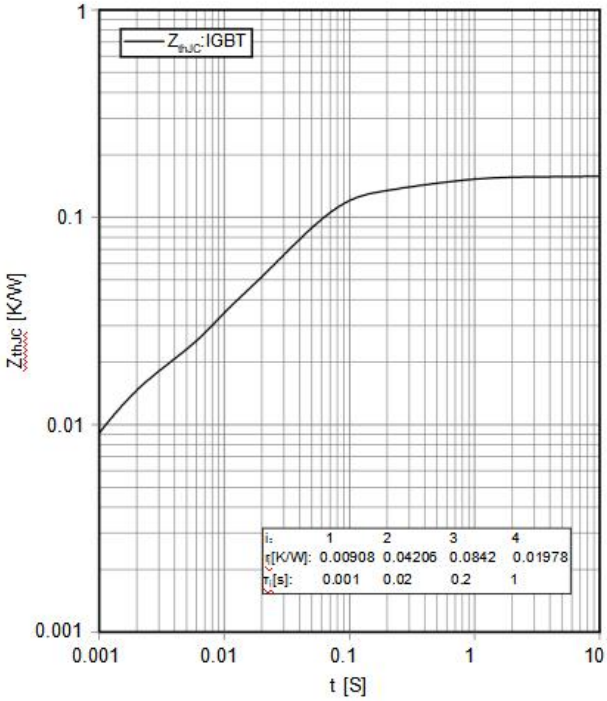
Switching losses IGBT, Inverter(typical)

$E_{on}=f(R_G)$, $E_{off}=f(R_G)$, V_{GE}=-8/+15V, I_C=200A, V_{CE}=600V



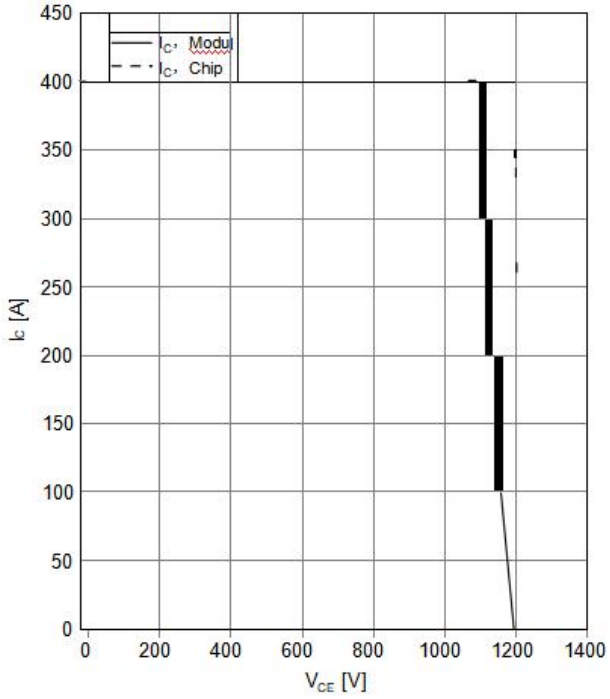
Transient thermal impedance IGBT, Inverter

$Z_{thJC}=f(t)$



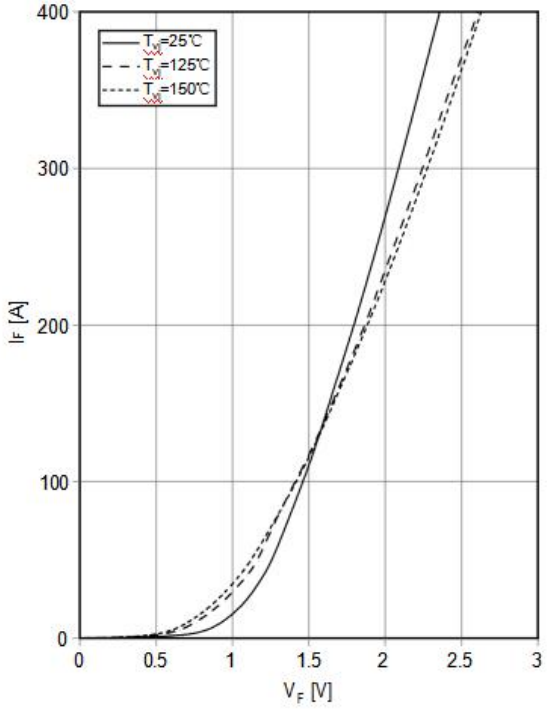
Everse bias safe operating area IGBT, Inverter(RBSOA)

$I_C=f(V_{CE})$, V_{GE}= 15V, R_{Goff}=0.22Ω, T_{vj}=150°C



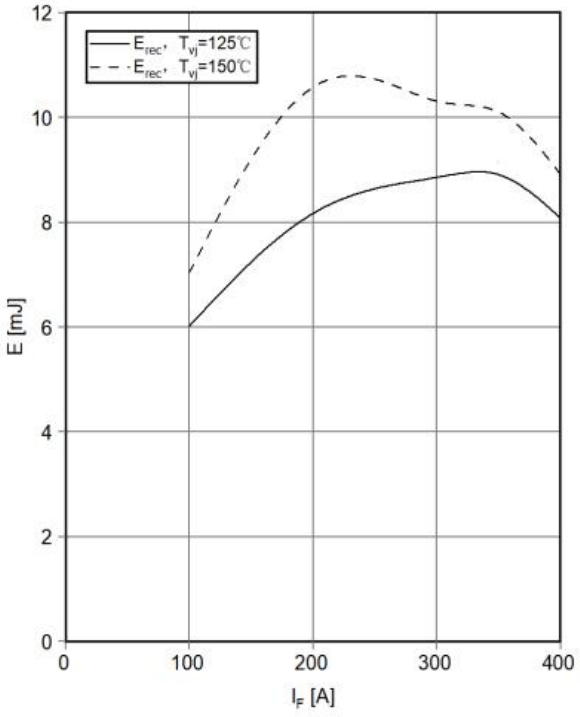
Forward characteristic of FRD, Inverter(typical)

$I_F=f(V_F)$



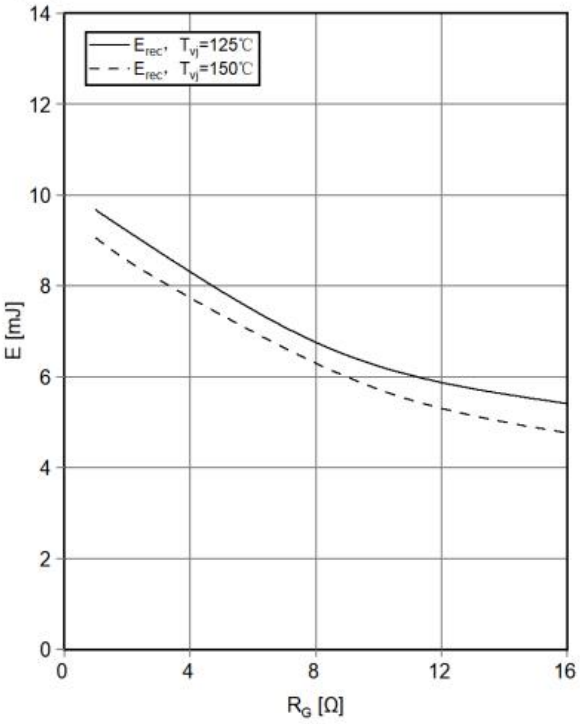
Switching losses FRD, Inverter(typical)

$E_{rec}=f(I_F)$, R_{Gon}=0.22Ω, V_{CE}=600V



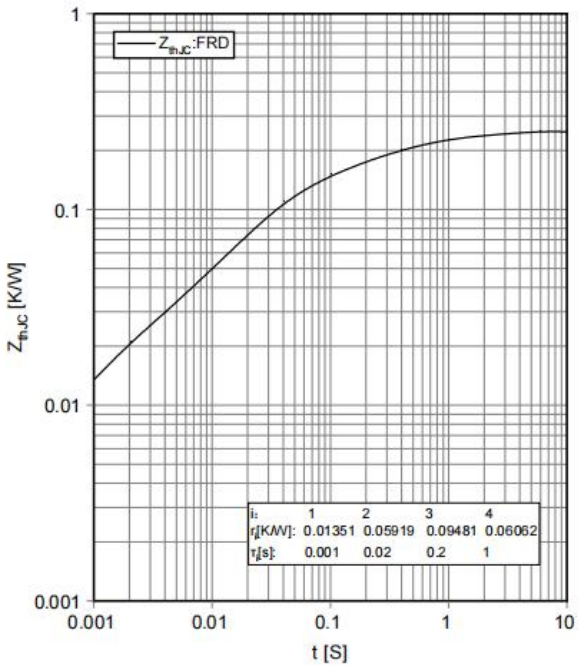
Switching losses FRD, Inverter(typical)

$E_{rec}=f(R_G)$, I_F=200A, V_{CE}=600V



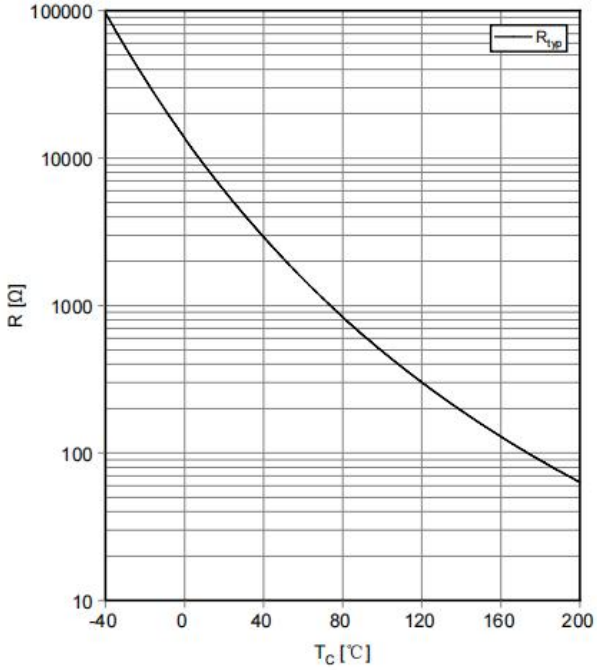
Transient thermal impedance FRD, Inverter

$Z_{thJC}=f(t)$

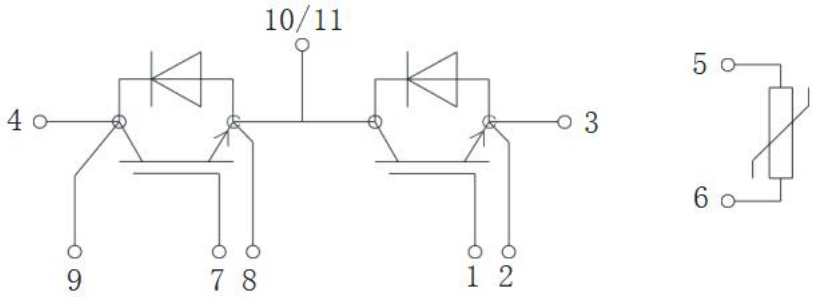


NTC-Thermistor-temperature characteristic(typical)

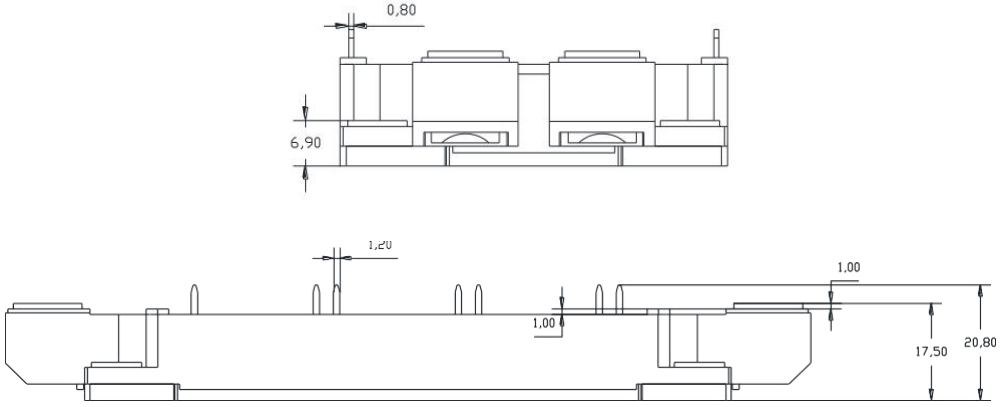
R=f(T)

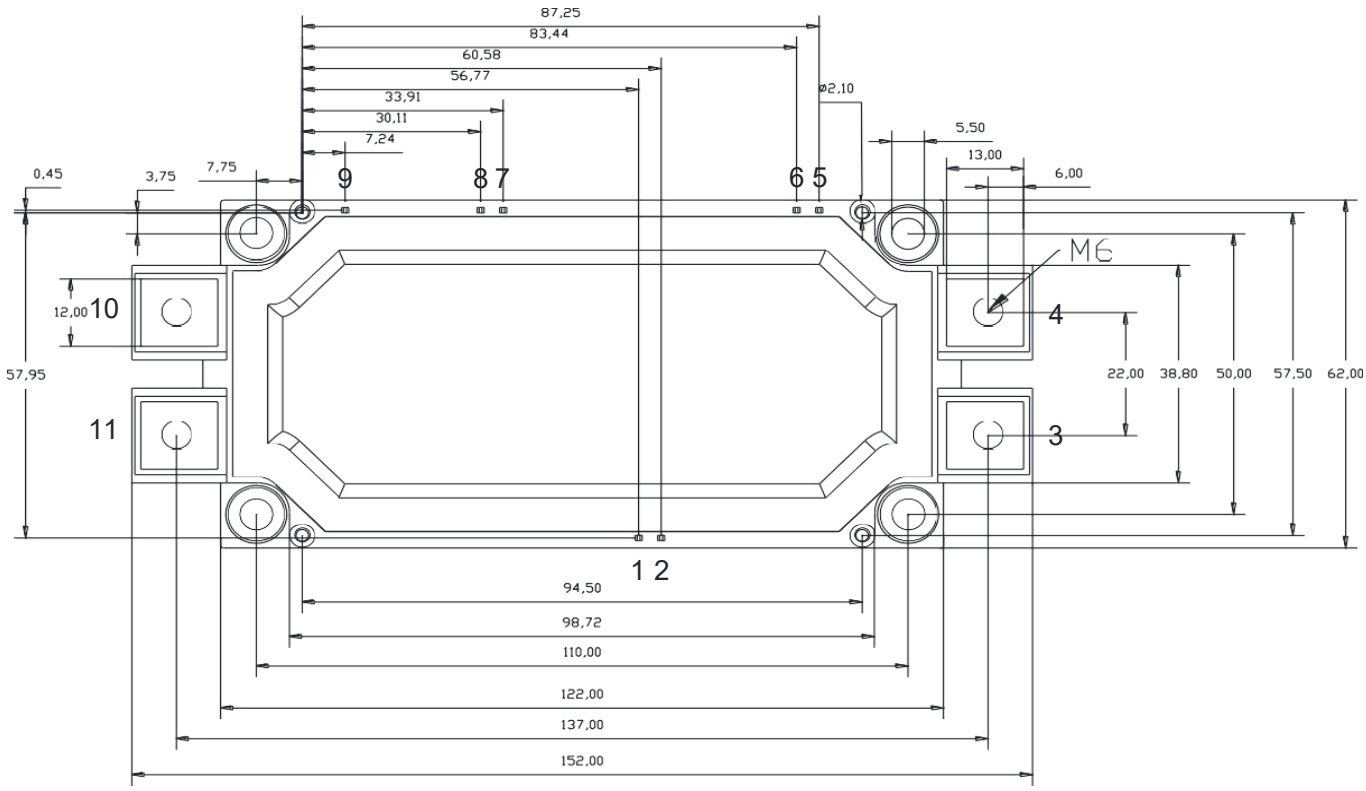


CIRCUIT DIAGRAM



PACKAGE OUTLINES





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