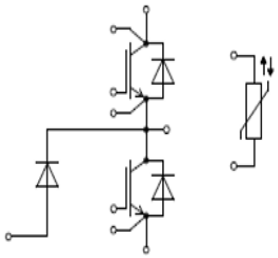
3-Level IGBT Module

V_{CES} =1200V， $I_{C\ nom}$ =450A / I_{CRM} =900A

F1



Equivalent Circuit

Features：

- 1200V Trench / Field Stop process
- Low switching losses
- Low Vcesat with positive temperature coefficient

Applications:

- 3-Level-Applications
- Energy storage inverter
- Annual Performance Factor
- UPS Systems

IGBT, Inverter

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	450	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	900	A
Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	1250	W
Gate emitter voltage	t_P =≤0.5us,D＜0.001	V_{GE}	±20 30	V

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter saturation voltage	V_{GE}=15V, I_C=450A T_{vj}=25°C V_{GE}=15V, I_C=450A T_{vj}=125°C V_{GE}=15V, I_C=450A T_{vj}=150°C	$V_{CE\ sat}$		1.61 1.89 1.96	2.1	V
Gate-Emitter threshold voltage	I_C=17mA, V_{GE}= V_{CE} T_{vj}=25°C	V_{GEth}	5.3	5.8	6.5	
Gate charge	V_{GE}=-15V…+15V	Q_G		3.12		µC
Internal gate resistor	T_{vj}=25°C	R_{Gint}		1.9		Ω
Input capacitance	f=100kHz, V_{CE}=25V, V_{GE}=0 V T_{vj}=25°C	C_{ies}		34.9		nF
Reverse transfer capacitance		C_{res}		1.4		
Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V T_{vj}=25°C	I_{CES}			2	mA
Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V T_{vj}=25°C	I_{GES}			200	nA
Turn-on delay time	I_C=450 A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=2.0Ω T_{vj}=125°C (inductive load) T_{vj}=150°C	$t_{d\ on}$		166 220 250		ns
Rise time	I_C=450 A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=2.0Ω T_{vj}=125°C (inductive load) T_{vj}=150°C	t_r		91 100 101		
Turn-off delay time	I_C=450 A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=2.0Ω T_{vj}=125°C (inductive load) T_{vj}=150°C	$t_{d\ off}$		425 484 500		
Fall time	I_C=450 A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=2.0Ω T_{vj}=125°C (inductive load) T_{vj}=150°C	t_f		88 156 176		
Turn-on energy loss per pulse	I_C=450A,V_{CE}=600V, V_{GE}=±15V, R_G=2.0Ω, T_{vj}=25°C di/dt=3500A/us(Tvj =150℃) T_{vj}=125°C ((inductive load) T_{vj}=150°C	E_{on}		23.28 31.04 35.09		mJ
Turn-off energy loss per pulse	I_C=450A,V_{CE}=600V, V_{GE}=±15V, R_G=2.0Ω, T_{vj}=25°C du/dt=4100V/us(Tvj =150℃) T_{vj}=125°C (inductive load) T_{vj}=150°C	E_{off}		35.19 44.73 47.14		mJ
SC data	V_{GE}≤15V, Vcc=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt t_P≤10us, T_{vj}=150°C	I_{SC}		1700		A
Thermal resistance, junction to case	per IGBT	R_{thJC}			0.12	K/W
Temperature under switching conditions		Tvj op	-40		150	°C

Diode, Inverter&3-Level

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	T_{vj}=25ºC	V_{RRM}	1200	V
Continuous DC forward current		I_F	450	A
Repetitive peak forward current	t_p=1ms	I_{FRM}	900	A
I2t-value	V_R =0V, tp=10ms, Tvj=125°C	I2t	34000	A^2s

Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F=450A, V_{GE}=0V I_F=450A, V_{GE}=0V I_F=450A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		2.35 2.55 2.45	3.0	V
Peak reverse recovery current	I_F=450A,V_R=600V, V_{GE}=-15V, R_G=2.0Ω, -diF/dt=3500 A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		210 296 313		A
Recovered charge	I_F=450A,V_R=600V, V_{GE}=-15V, R_G=2.0Ω, -diF/dt=3500A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		18.04 42.74 51.26		μC
Reverse recovered energy	I_F=450A,V_R=600V, V_{GE}=-15V, R_G=2.0Ω, -diF/dt=3500A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		7.19 18.12 22.18		mJ
Thermal resistance, junction to case	per diode		R_{thJC}			0.20	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

NTC-Thermistor

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Rated resistances	T_c=25°C，±5%	R_{25}		5.0		KΩ
B-value	±2%	$B_{25/50}$		3375		K

Module

Parameter	Conditions	Symbol	Value			Unit
Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}	2500			V
Internal isolation			Al_2O_3			
Storage temperature		T_{stg}	-40		125	°C
Mounting torque for modul mounting		M	3.0		6.0	Nm
Terminal connection torque		M	3.0		6.0	Nm
Weight		W		340		g

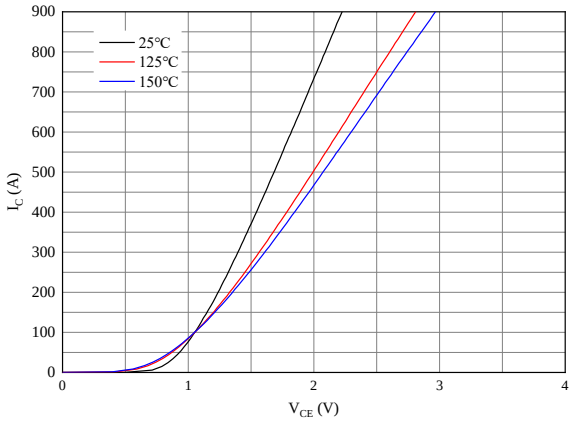


Fig 1. Typical output characteristics (V_{GE}=15V)

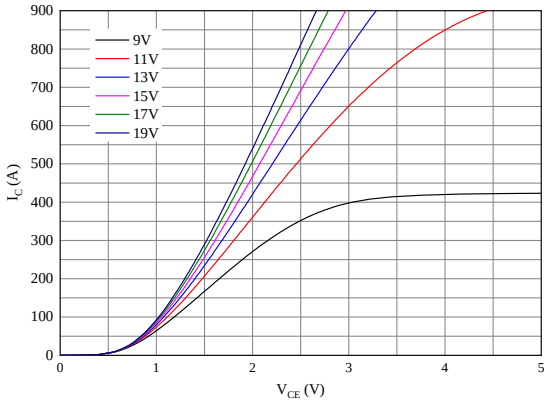


Fig 2. Typical output characteristics (T_{vj}=150℃)

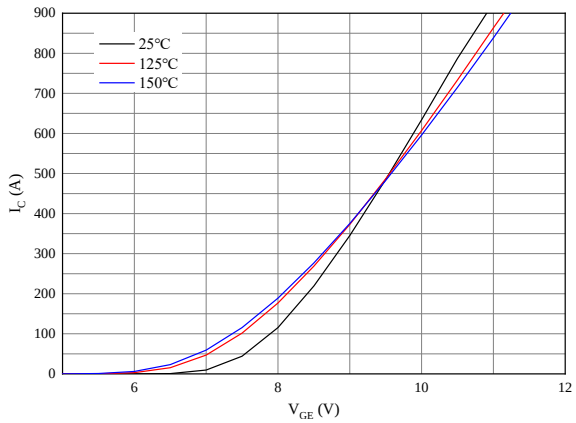


Fig 3. Typical transfer characteristic(V_{CE}=20V)

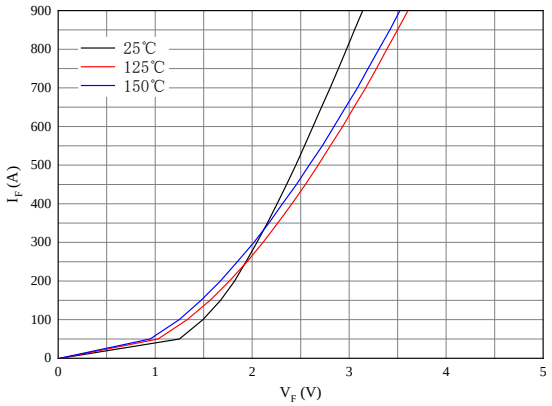


Fig 4. Forward characteristic of Diode

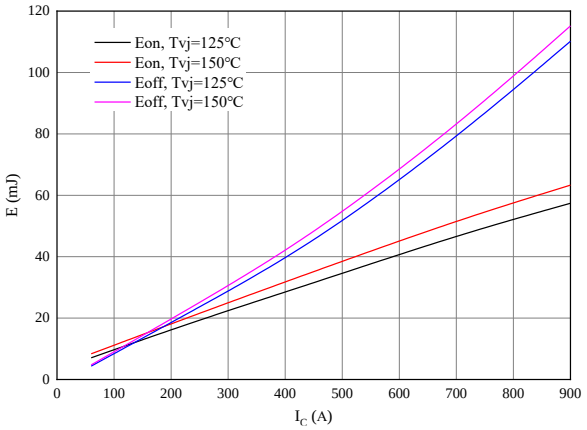


Fig 5. Switching losses of IGBT

V_{GE}=±15V, RGon=2.0Ω, RGoff=2.0Ω, V_{CE}=600V

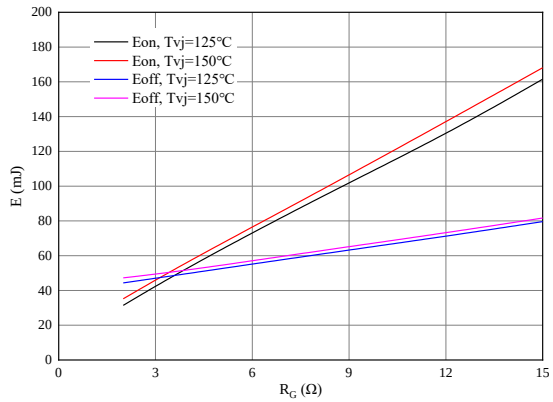


Fig 6. Switching losses of IGBT

V_{GE}=±15V, I_C=450A , V_{CE}=600V

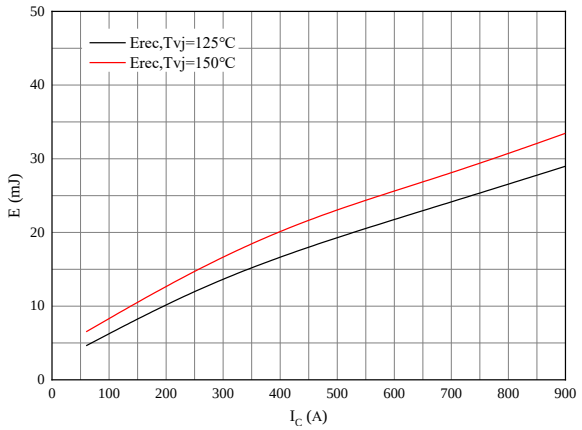


Fig 7. Switching losses of Diode

RGon=2.0Ω, V_{CE}=600V

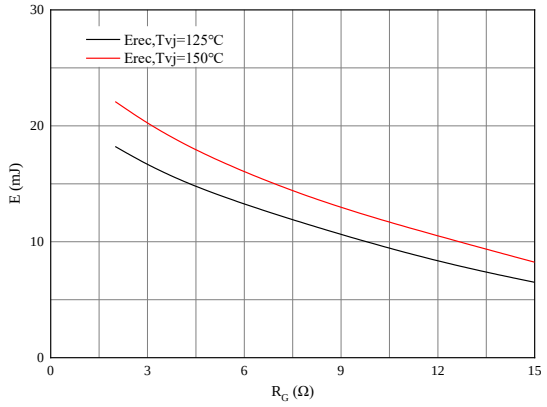


Fig 8. Switching losses of Diode

I_C=450A, V_{CE}=600V

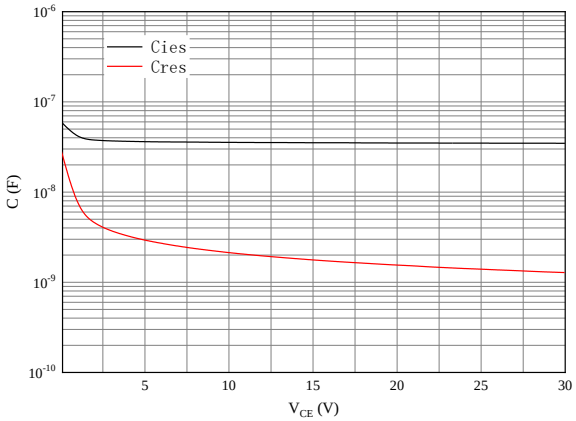


Fig 9. Capacitance characteristic

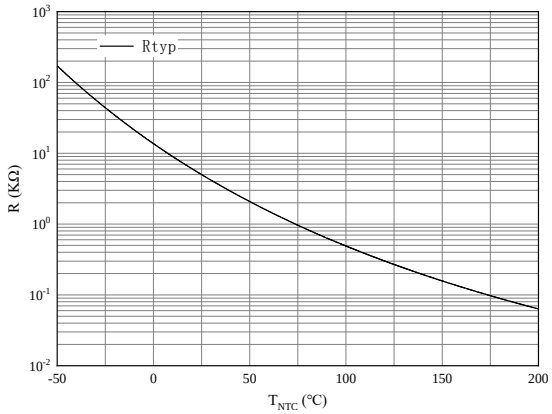


Fig 10. NTC-Thermistor-temperaturecharacteristic

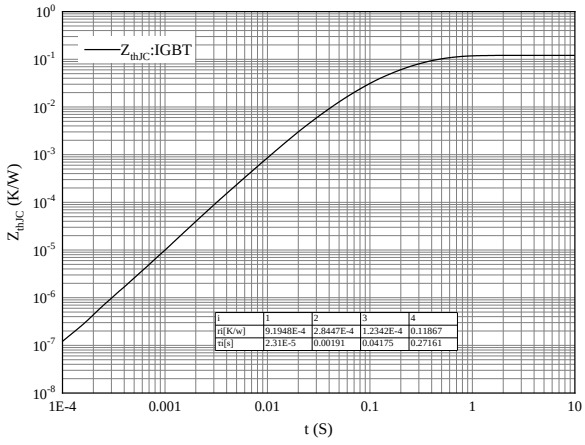


Fig11. Transient thermal impedance IGBT,Inverter

Z_{thJC}=f(t)

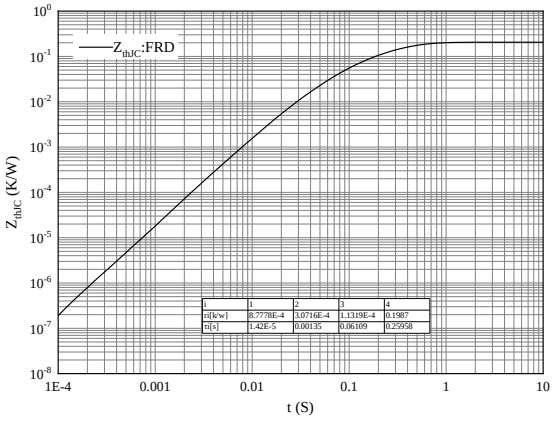
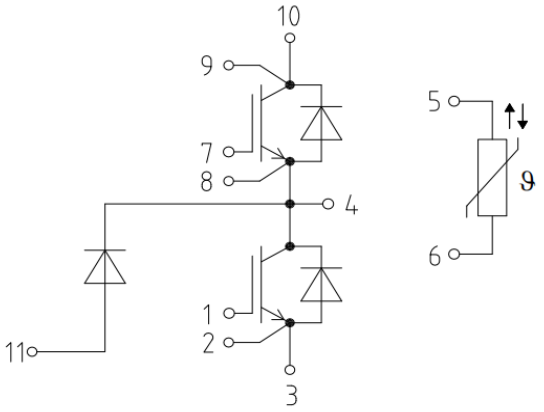


Fig12. Transient thermal impedance FRD ,Inverter

Z_{thJC}=f(t)

Circuit diagram



Package outlines