

3-Level IGBT Module

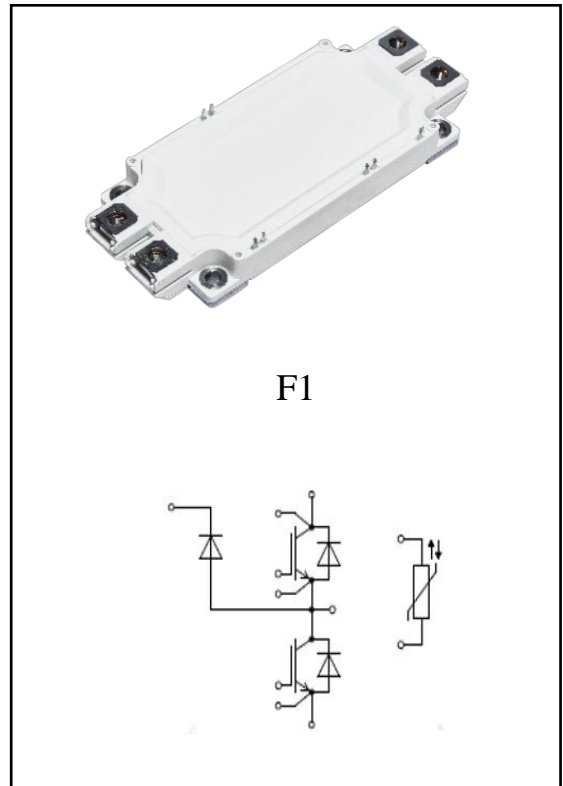
$V_{CES} = 1200V$, $I_{C\text{nom}} = 450A / I_{CRM} = 900A$

Electrical characteristics :

- 1200V Trench /Field Stop process
- Low switching losses
- V_{cesat} has a 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	$T_{vj} = 25^{\circ}C$	V_{CES}	1200	V
Continuous DC collector current	$T_C = 100^{\circ}C$, $T_{vj\text{max}} = 175^{\circ}C$	$I_{C\text{nom}}$	450	A
Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	900	A
Total power dissipation	$T_C = 25^{\circ}C$, $T_{vj\text{max}} = 175^{\circ}C$	P_{tot}	1250	W
Gate emitter voltage	$t_p \leq 0.5\mu s, D < 0.001$	V_{GE}	± 20 30	V

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter saturation voltage	$V_{GE}=15V, I_C=450A$ $T_{vj}=25^{\circ}C$ $V_{GE}=15V, I_C=450A$ $T_{vj}=125^{\circ}C$ $V_{GE}=15V, I_C=450A$ $T_{vj}=150^{\circ}C$	$V_{CE\ sat}$		1.61 1.89 1.96	2.1	V
Gate-Emitter threshold voltage	$I_C=17mA, V_{GE}=V_{CE}$ $T_{vj}=25^{\circ}C$	V_{GEth}	5.3	5.8	6.5	
Gate charge	$V_{GE}=-15V...+15V$	Q_G		3.12		μC
Internal gate resistor	$T_{vj}=25^{\circ}C$	R_{Gint}		1.9		Ω
Input capacitance	$f=100kHz, V_{CE}=25V,$ $V_{GE}=0V$ $T_{vj}=25^{\circ}C$	C_{ies}		34.9		nF
Reverse transfer capacitance		C_{res}		1.4		
Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V$ $T_{vj}=25^{\circ}C$	I_{CES}			2	mA
Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V$ $T_{vj}=25^{\circ}C$	I_{GES}			200	nA
Turn-on delay time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2.0\Omega$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{d\ on}$		195 234 237		ns
Rise time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2.0\Omega$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_r		100 106 108		
Turn-off delay time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2.0\Omega$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{d\ off}$		458 515 536		
Fall time	$I_C=450A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2.0\Omega$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_f		97 172 186		
Turn-on energy loss per pulse	$I_C=450A, V_{CE}=600V,$ $V_{GE}=\pm 15V, R_G=2.0\Omega,$ $di/dt=3300A/us(T_{vj}=150^{\circ}C)$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{on}		28.45 45.72 49.56		mJ
Turn-off energy loss per pulse	$I_C=450A, V_{CE}=600V,$ $V_{GE}=\pm 15V, R_G=2.0\Omega,$ $du/dt=3700V/us(T_{vj}=150^{\circ}C)$ (inductive load) $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{off}		36.89 47.46 49.37		mJ
SC data	$V_{GE}\leq 15V, V_{cc}=800V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 10us, T_{vj}=150^{\circ}C$	I_{sc}		1700		A
Thermal resistance, junction to case	per IGBT	R_{thJC}			0.12	K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	$^{\circ}C$

Diode, Inverter&3-Level

Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$	V_{RRM}	1200	V
Continuous DC forward current		I_F	450	A
Repetitive peak forward current	$t_p=1\text{ms}$	I_{FRM}	900	A
I2t-value	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	I2t	33000	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max.	
Forward voltage	$I_F=450\text{A}, V_{GE}=0\text{V}$ $T_{vj}=25^{\circ}\text{C}$	V_F		1.99	2.50	V
	$I_F=450\text{A}, V_{GE}=0\text{V}$ $T_{vj}=125^{\circ}\text{C}$			1.81		
	$I_F=450\text{A}, V_{GE}=0\text{V}$ $T_{vj}=150^{\circ}\text{C}$			1.76		
Peak reverse recovery current	$I_F=450\text{A}, V_R=600\text{V},$ $V_{GE}=-15\text{V}, R_G=2.0\Omega,$ $T_{vj}=25^{\circ}\text{C}$	I_{RM}		220		A
	$T_{vj}=125^{\circ}\text{C}$			365		
	$-diF/dt=3300\text{A/us}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=150^{\circ}\text{C}$			394		
Recovered charge	$I_F=450\text{A}, V_R=600\text{V},$ $V_{GE}=-15\text{V}, R_G=2.0\Omega,$ $T_{vj}=25^{\circ}\text{C}$	Q_r		35.60		μC
	$T_{vj}=125^{\circ}\text{C}$			86.25		
	$-diF/dt=3300\text{A/us}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=150^{\circ}\text{C}$			101.30		
Reverse recovered energy	$I_F=450\text{A}, V_R=600\text{V},$ $V_{GE}=-15\text{V}, R_G=2.0\Omega,$ $T_{vj}=25^{\circ}\text{C}$	E_{rec}		16.28		mJ
	$T_{vj}=125^{\circ}\text{C}$			39.16		
	$-diF/dt=3300\text{A/us}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=150^{\circ}\text{C}$			45.33		
Thermal resistance, junction to case	per diode	R_{thJC}			0.20	K/W
Temperature under switching conditions		$T_{vj\text{op}}$	-40		150	$^{\circ}\text{C}$

NTC-Thermistor

Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
Rated resistances	$T_c=25^{\circ}\text{C}, \pm 5\%$	R_{25}		5.0		$\text{K}\Omega$
B-value	$\pm 2\%$	$B_{25/50}$		3375		K

Module

Parameter	Conditions	Symbol	Value			Unit
Isolation test voltage	RMS, f=50Hz, t=1min	V _{ISOL}	2500			V
Internal isolation			Al ₂ O 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

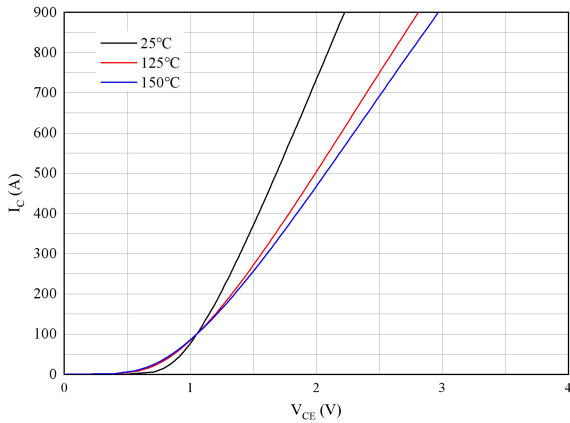


Fig 1. Typical output characteristics ($V_{GE}=15V$)

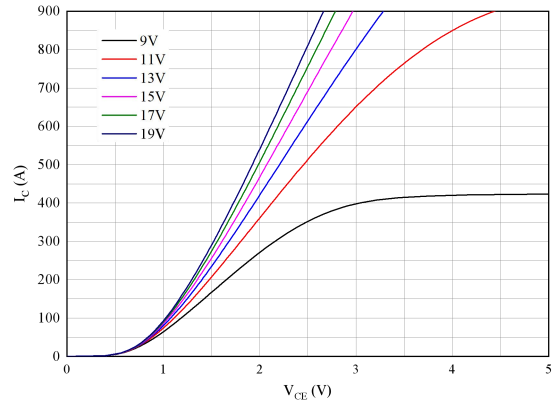


Fig 2. Typical output characteristics ($T_{vj}=150^{\circ}C$)

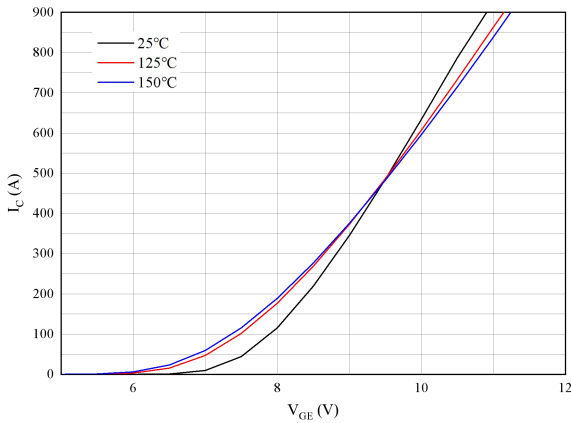


Fig 3. Typical transfer characteristic ($V_{CE}=20V$)

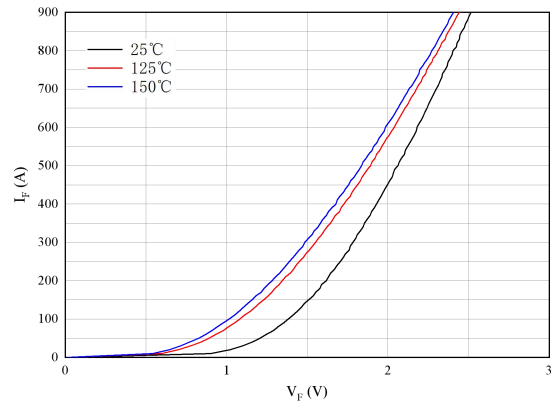


Fig 4. Forward characteristic of Diode

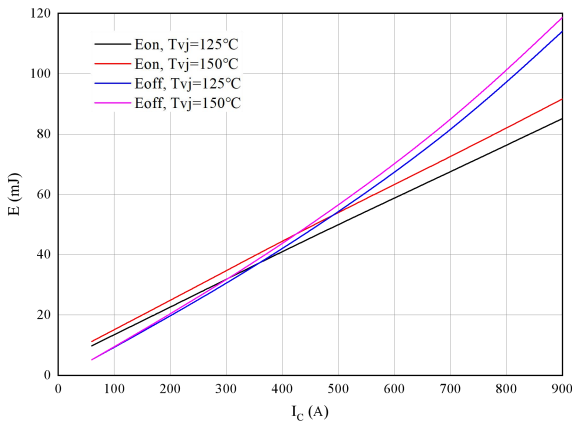


Fig 5. Switching losses of IGBT

$V_{GE}=\pm 15V$, $R_{Gon}=2.0\Omega$, $R_{Goff}=2.0\Omega$, $V_{CE}=600V$

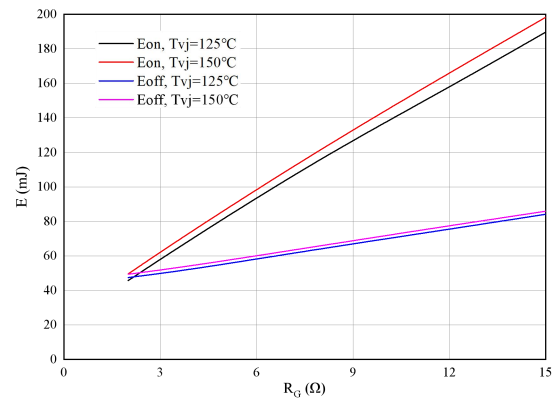


Fig 6. Switching losses of IGBT

$V_{GE}=\pm 15V$, $I_C=450A$, $V_{CE}=600V$

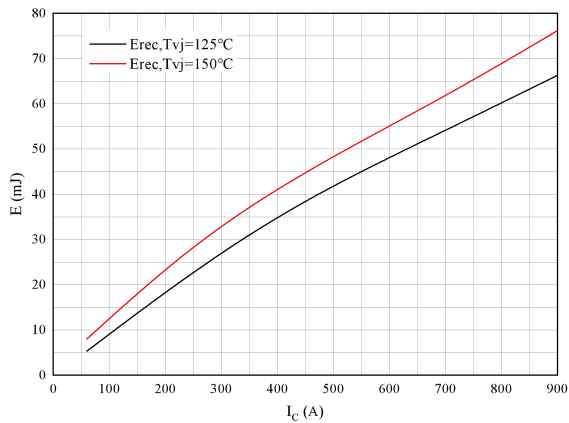


Fig 7. Switching losses of Diode
R_{Gon}=2.0Ω, V_{CE}=600V

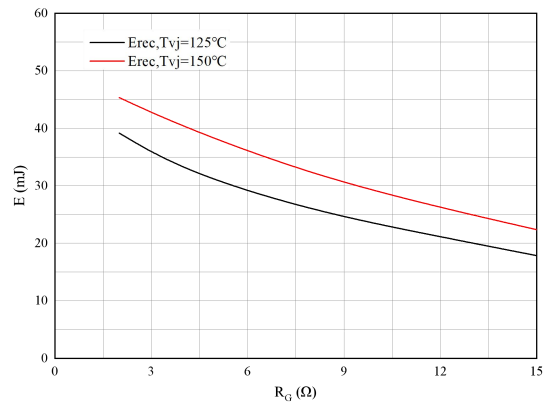


Fig 8. Switching losses of Diode
I_C=450A, V_{CE}=600V

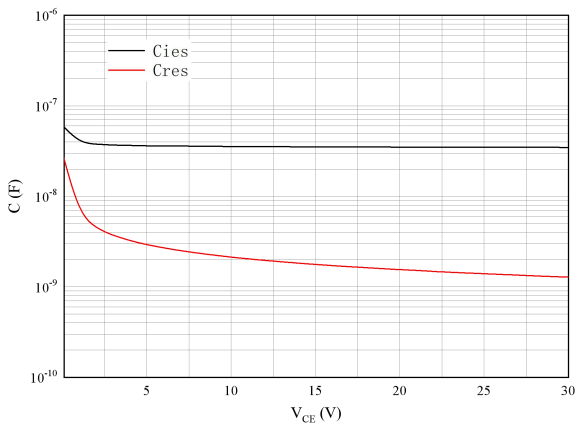


Fig 9. Capacitance characteristic

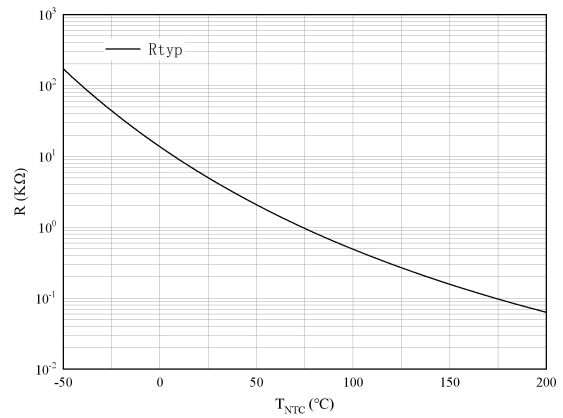


Fig 10. NTC-Thermistor-temperature characteristic

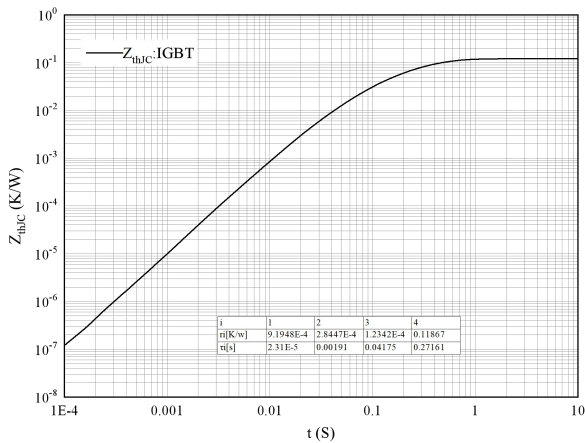


Fig 11. Transient thermal impedance IGBT, Inverter
Z_{thJC}=f(t)

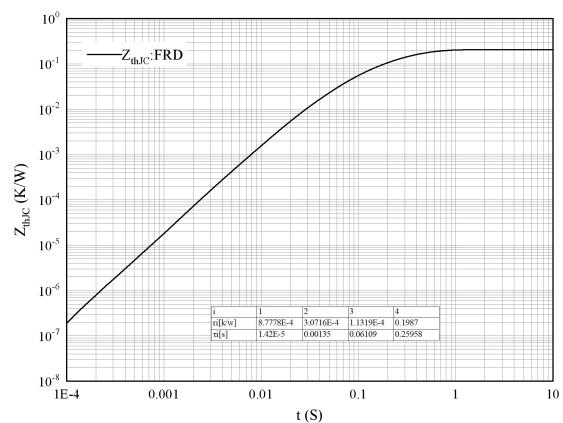
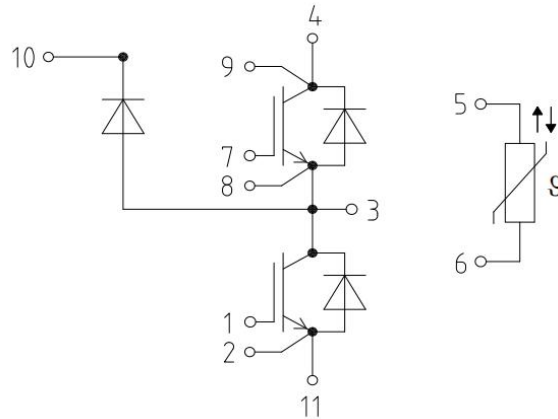


Fig 12. Transient thermal impedance FRD, Inverter
Z_{thJC}=f(t)

Circuit diagram



Package outlines

