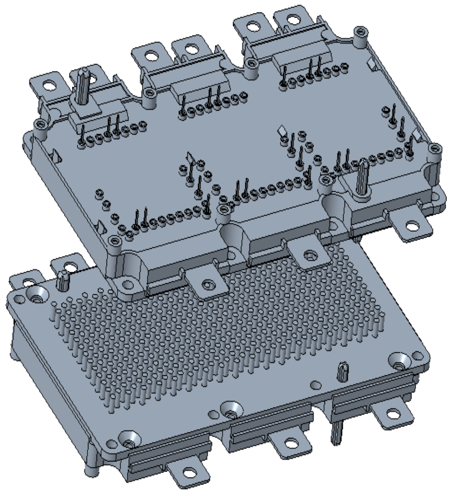
CHONGQING CLOUDCHILD TECHNOLOGY CO.,LTD

HPD IGBT POWER MODULE

CCGH950T75SD **Trench-FS IGBT power module**

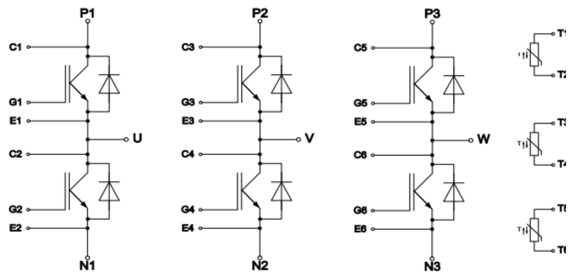
V_{CES}	V_{CEsat}		I_{CN}/I_{CRM}
750V	T_{vj}=25℃@520A	1.53V	950A/1900A
	T_{vj}=175℃@520A	1.68V	



DESCRIPTION

This IGBT power module adopts a very compact six-pack (750V/950A) optimized for hybrid and electric vehicles. Due to the high clearance and creepage distances, the module is also well suited for increased system working voltages and supports modular inverter approaches.

EQUIVALENT CIRCUIT



FEATURES

- Increased blocking voltage to 750V
- Increased DC link Voltage
- High short circuit capability
- Self-limiting short circuit current
- High surge current capability
- High current density
- Ultra low conduction and switching loss
- Ultra-fast & soft recovery anti-parallel FRD
- Trench-FS IGBT technology
- High Power Density
- Emitter Controlled Diode
- Integrated NTC temperature sensor
- High creepage and clearance distances
- Direct cooled PinFin base plate
- Guiding elements for PCB and cooler assembly
- AQG324 Qualified

APPLICATIONS

- Motor Drives
- Hybrid Electrical Vehicles(H)EV
- Commercial Agriculture Vehicles
- Automotive applications

CHARACTERISTICS VALUES

MAXIMUM RATED VALUES(IGBT)

Parameter	Symbol	Conditions	Values	Units
Collector-emitter voltage	V_{CES}	T_{vj}=25℃，V_{GE}=0V	750	V
Implemented collector current	I_{CN}		950	A
Continuous DC collector current	$I_{C\ nom}$	T_F=95℃, $T_{vj\ max}$=175℃	520[1)]	A
Repetitive peak collector current	I_{CRM}	t_p=1ms，T_{vj}=25℃	1900	A
Gate-emitter peak voltage	V_{GES}	T_{vj}=25℃	±30	V
SC data	I_{SC}	V_{GE}≤15V, V_{CC}=400V V_{CEmax}=V_{CES}-L_{sCE}*di/dt t_p≤5μs, T_{vj}=150℃	4500	A
Total power dissipation	P_{tot}	T_F=75℃, $T_{vj\ max}$=175℃	769[1)]	W

1）Verified by characterization / design not by test.

CHARACTERISTICS VALUES(IGBT)

Parameter	Symbol	Conditions		Values Min.	Values Typ.	Values Max.	Units
Collector-emitter saturation voltage	V_{CEsat}	I_C=520A, V_{GE}=15V, T_{vj}=25℃			1.53	1.85	V
		I_C=520A, V_{GE}=15V, T_{vj}=150℃			1.65	2.1	V
		I_C=520A, V_{GE}=15V, T_{vj}=175℃			1.68	2.2	V
Gate-emitter threshold voltage	V_{GEth}	V_{CE}=V_{GE}, I_C=10mA	T_{vj}=25℃	5.0	6.1	7.0	V
			T_{vj}=175℃		3.9		V
Gate charge	Q_G	V_{GE}=-8V...+15V，V_{CE} = 400V			4.3		uC
Integrated gate resistor	R_G	T_{vj}=25℃			1		Ω
Input capacitance	C_{ies}	T_{vj}=25℃,f=1MHz,V_{GE}=0V,V_{CE}=50V			37		nF
Output capacitance	C_{oes}	T_{vj}=25℃,f=1MHz,V_{GE}=0V,V_{CE}=50V			0.88		nF
Reverse transfer capacitance	C_{res}	T_{vj}=25℃,f=1MHz,V_{GE}=0V,V_{CE}=50V			0.25		nF
Collector-emitter cut-off current	I_{CES}	V_{CE}=750V, V_{GE}=0V	T_{vj}=25℃			1	mA
			T_{vj}=175℃		4		mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25℃				400	nA
Turn-on delay time, inductive load	$t_{d\ on}$	I_C=520A, V_{CE}=400V, V_{GE}=-8V/+15V, R_{Gon}=5Ω, R_{Goff}=5Ω	T_{vj}=25℃		292		ns
			T_{vj}=150℃		300		ns
			T_{vj}=175℃		308		ns
Rise time, inductive load	t_r		T_{vj}=25℃		78		ns
			T_{vj}=150℃		89		ns
			T_{vj}=175℃		92		ns
Turn-off delay time, inductive load	$t_{d\ off}$		T_{vj}=25℃		960		ns
			T_{vj}=150℃		1073		ns
			T_{vj}=175℃		1078		ns
Fall time, inductive load	t_f		T_{vj}=25℃		48		ns
			T_{vj}=150℃		58		ns
			T_{vj}=175℃		70		ns

Turn-on energy loss per pulse	E_{on}	I_C=520A, V_{CE}=400V, V_{GE}=-8V/+15V, R_{Gon}=5Ω, R_{Goff}=5Ω,L_s=20nH, di/dt(Tvj25°)=5500A/μs, di/dt(Tvj150°)=5000A/μs, dv/dt(Tvj25°)=3100V/μs， dv/dt(Tvj150°)=2500V/μs	T_{vj}=25℃		17.0		mJ
			T_{vj}=150℃		28.1		mJ
			T_{vj}=175℃		30.5		mJ
Turn-off energy loss per pulse	E_{off}		T_{vj}=25℃		33.2		mJ
			T_{vj}=150℃		37.5		mJ
			T_{vj}=175℃		38.2		mJ
IGBT, thermal resistance, junction to cooling fluid	$R_{thjF\ IGBT}$	Per IGBT, ∆V/∆t=10 dm³/min, T_F = 75°C				0.13	K/W

MAXIMUM RATED VALUES(Diode)

Parameter	Symbol	Conditions	Values	Units
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃	750	V
Implemented forward current	I_{FN}		950	A
Continuous DC forward current	I_F		520[1)]	A
Repetitive peak forward current	I_{FRM}	t_p=1ms	1900	A
I^2t-value	I^2t	V_R=0V, t_p=10ms, T_{vj}=150℃	18500	A^2s
		V_R=0V, t_p=10ms, T_{vj}=175℃	15700	A^2s

1) Verified by characterization / design not by test.

CHARACTERISTICS VALUES(Diode)

Parameter	Symbol	Conditions		Values			Units
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F=520A, V_{GE}=0V	T_{vj}=25℃		1.70	1.90	V
			T_{vj}=150℃		1.73		V
			T_{vj}=175℃		1.75		V
Peak reverse recovery current	I_{RM}	I_F=520A, V_R=400V, V_{GE}=-8V -di_F/dt=5000A/μs (T_{vj}=150℃)	T_{vj}=25℃		230		A
			T_{vj}=150℃		340		A
			T_{vj}=175℃		360		A
Recovered charge	Q_r		T_{vj}=25℃		19.4		μC
			T_{vj}=150℃		38.5		μC
			T_{vj}=175℃		43.6		μC
Reverse recovery energy	E_{rec}		T_{vj}=25℃		3.7		mJ
			T_{vj}=150℃		6.6		mJ
			T_{vj}=175℃		7.3		mJ
Diode, thermal resistance, junction to cooling fluid	$R_{thjF\ Diode}$	Per diode,∆V/∆t = 10 dm³/min, T_F = 75°C				0.17	K/W

NTC-THERMISTOR

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Rated resistance	R_{25}	T_C=25℃		5.0		KΩ
Deviation of R100	△R/R	T_C=100℃, R_{100}=493Ω	-3		3	%
Power dissipation	P_{25}	T_C=25℃			60	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K
B-value	$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
B-value	$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

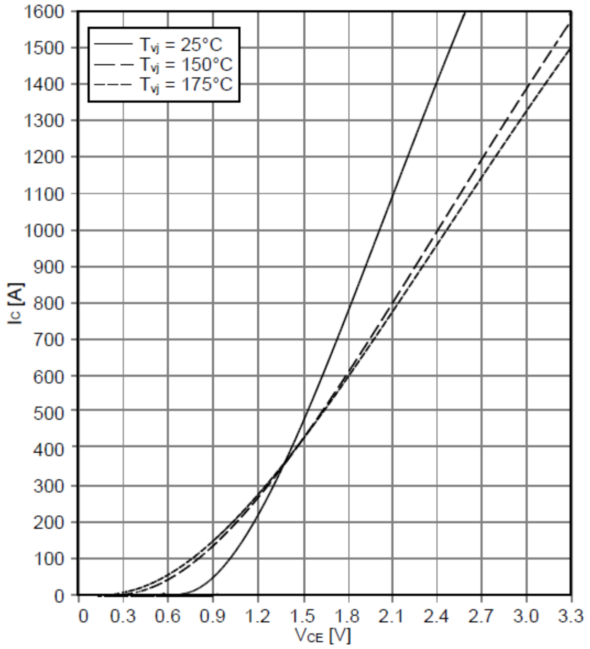
MODULE

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Maximum junction temperature	$T_{vj\ max}$				175	℃
Temperature under switching conditions	$T_{vj\ op}$		-40		175	℃
Storage temperature	T_{stg}		-40		150	℃
Stray inductance module	L_{sCE}			7		nH
Module lead resistance, terminals-chip	$R_{CC'+EE}$	T_{vj}=25℃, per switch		0.72		mΩ
Isolation test voltage	V_{isol}	AC, RMS, f=50Hz, t=1min		3.5		kV
Creepage distance	ds	Terminal to terminal		9.0		mm
		Terminal to base		9.0		mm
Clearance distance in air	da	Terminal to terminal		4.5		mm
		Terminal to base		4.5		mm
Comperative tracking index	CTI		>200			
Mounting torque for module mounting	M1	Screw M4 baseplate to heatsink	1.8	2.0	2.2	N·m
	M2	Screw M4 EJOT Delta PCB to frame	0.45	0.50	0.55	
Terminal connection torque	M3	Screw M5	3		6	
Internal isolation	-	Basic insulation (class1, IEC 61140)	AIN			-
Material of module baseplate	-		Cu+Ni			-
Dimensions	L x W x H		154.5x126.5x32			mm
Weight	G		720			g

CHARACTERISTICS DIAGRAMS

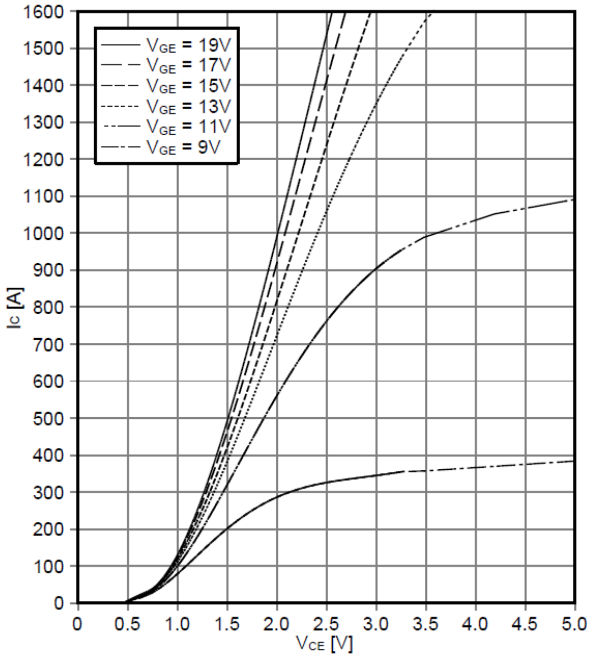
Output characteristic IGBT, Inverter(typical)

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



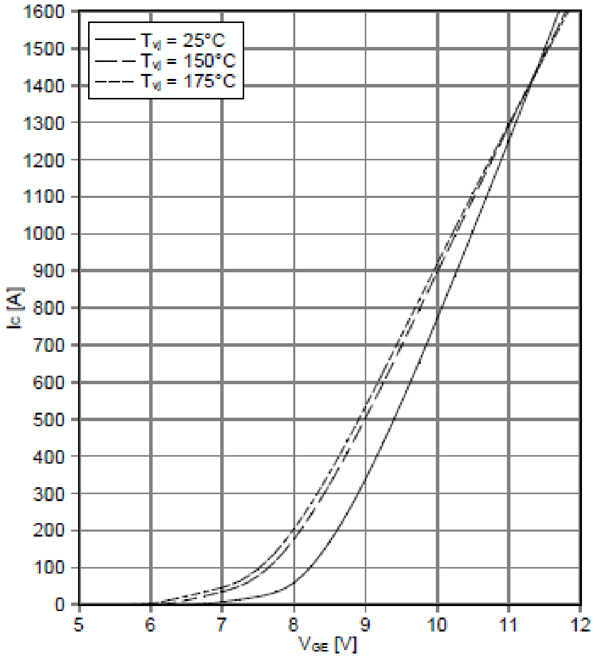
Output characteristic IGBT, Inverter(typical)

$I_C=f(V_{CE}), T_{vj}=150℃$



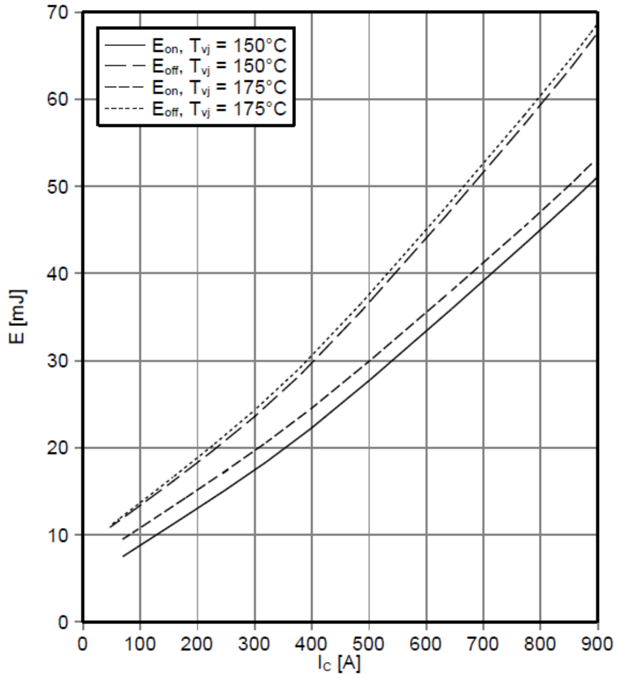
Transfer characteristic IGBT, Inverter(typical)

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



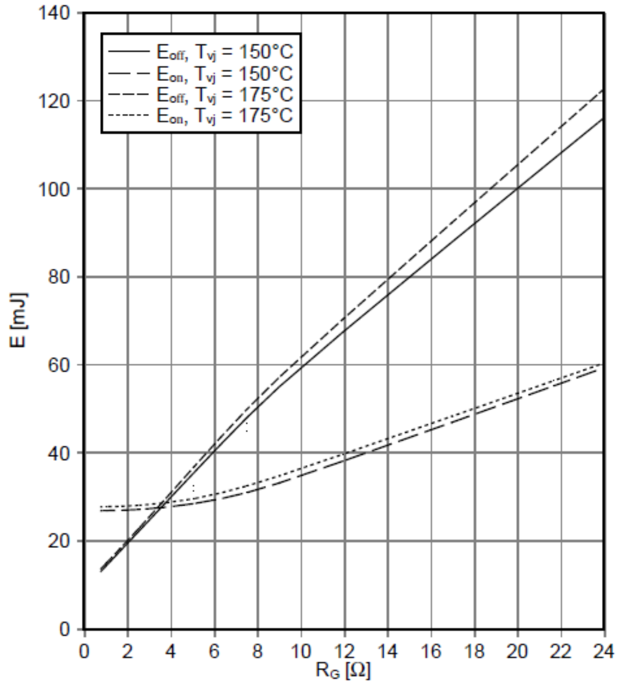
Switching losses IGBT, Inverter(typical)

$E_{on}=f(I_C)$, $E_{off}=f(I_C)$ $V_{GE}=-8V/+15V$, $R_{Gon}=5\Omega$, $R_{Goff}=5\Omega$, $V_{CE}=400V$



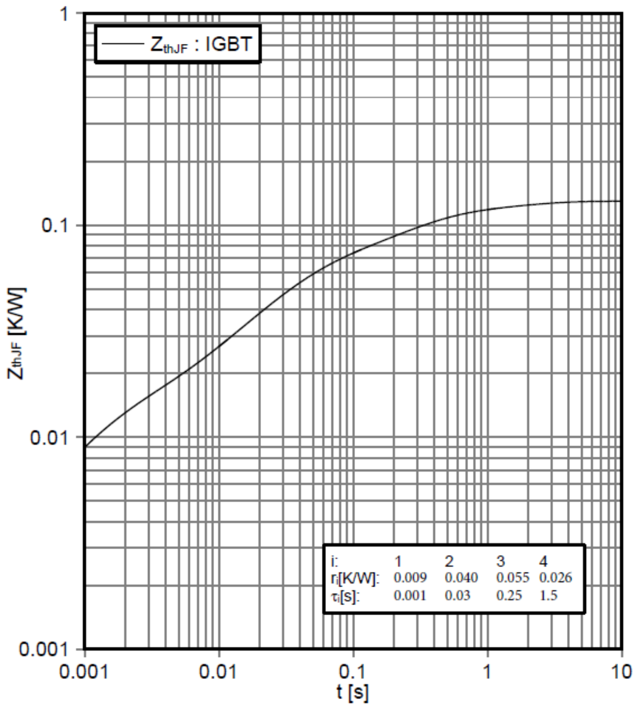
Switching losses IGBT, Inverter(typical)

$E_{on}=f(R_G)$, $E_{off}=f(R_G)$ V_{GE}=-8V/+15V, I_C=520A, V_{CE}=400V



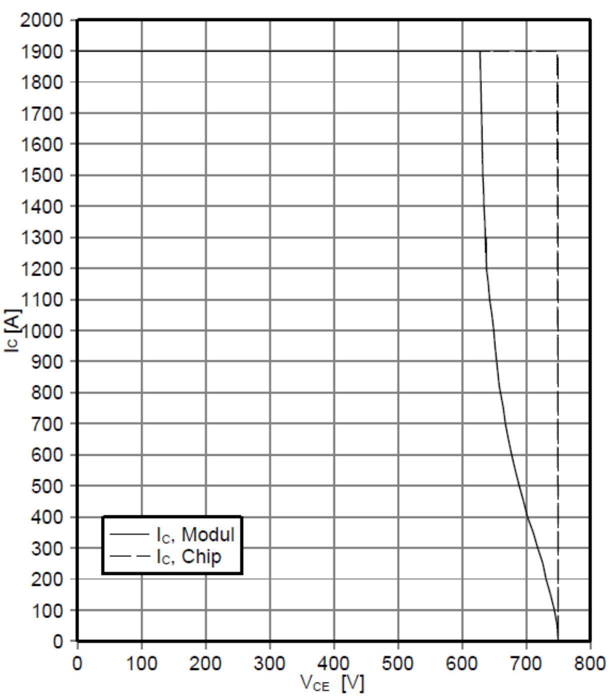
Transient thermal impedance IGBT, Inverter

$Z_{thJF}=f(t)$



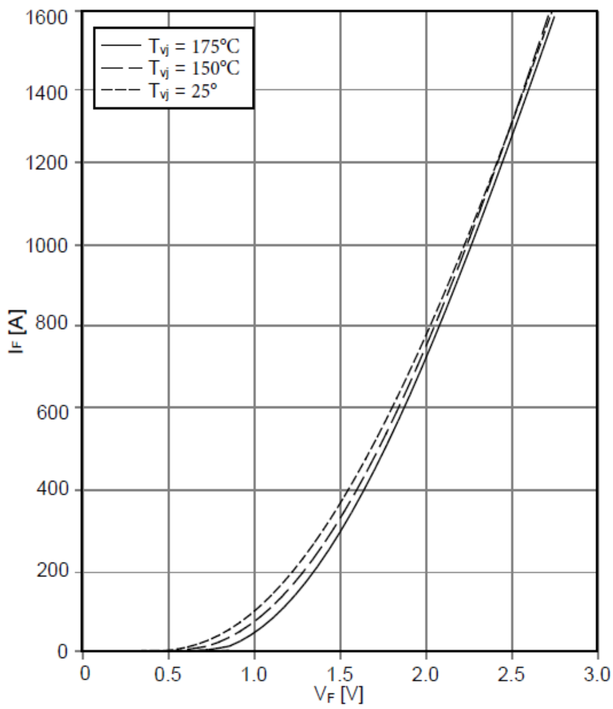
Reverse bias safe operating area IGBT, Inverter(RBSOA)

$I_C=f(V_{CE})$, V_{GE}=±15V, R_{Goff}=5Ω, T_{vj}=150℃

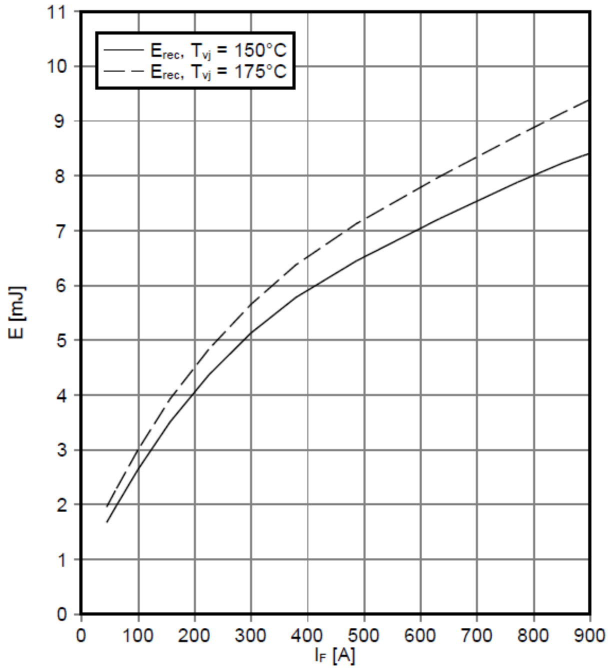


Forward characteristic of Diode, Inverter(typical)

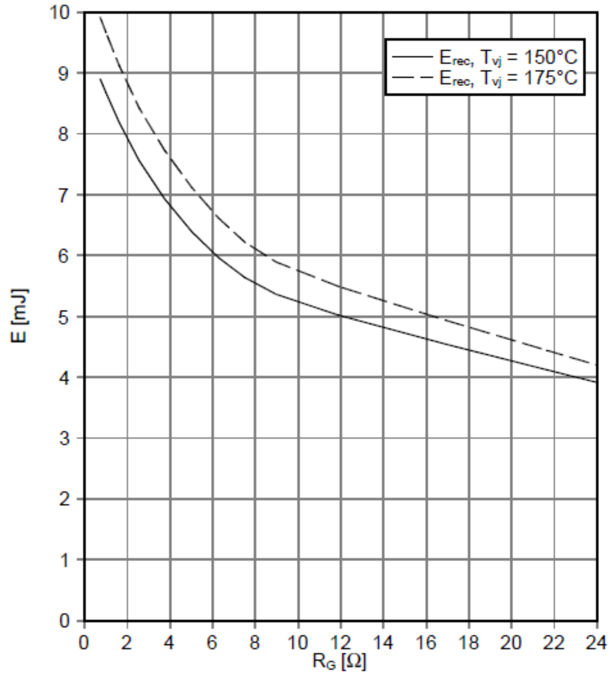
$I_F=f(V_F)$



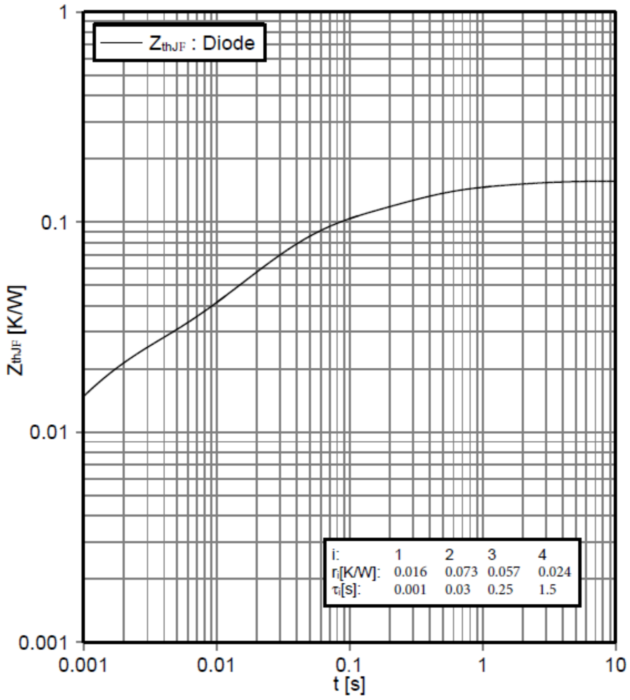
Switching losses Diode, Inverter(typical)
$E_{rec}=f(I_F)$, $R_{Gon}=5\Omega$, $V_{CE}=400V$



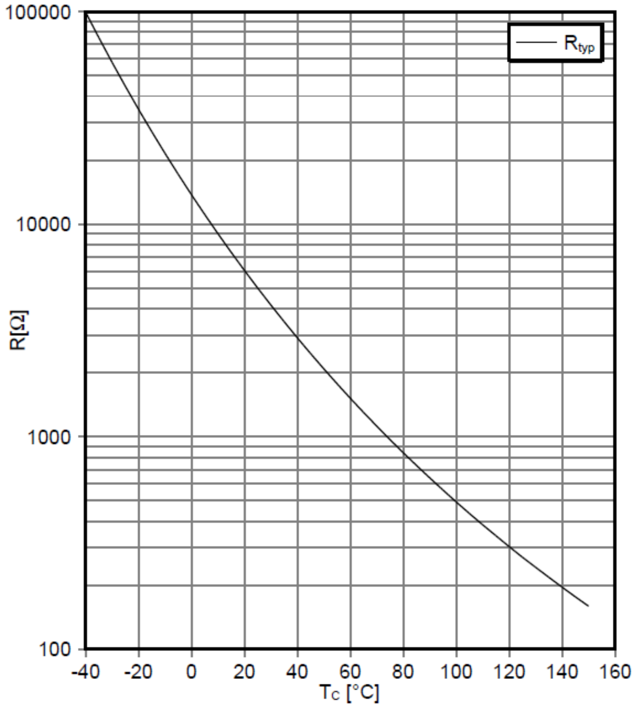
Switching losses Diode, Inverter(typical)
$E_{rec}=f(R_G)$, $I_F=450A$, $V_{CE}=400V$



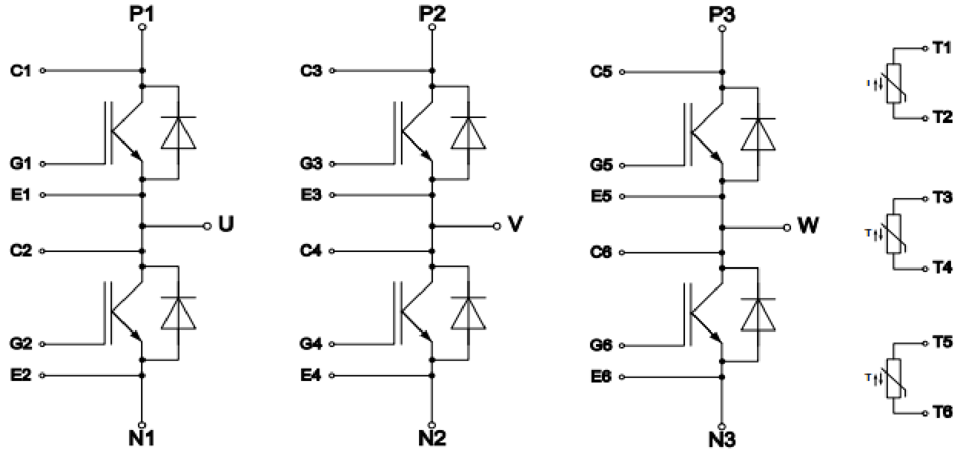
Transient thermal impedance Diode, Inverter
$Z_{thJF}=f(t)$



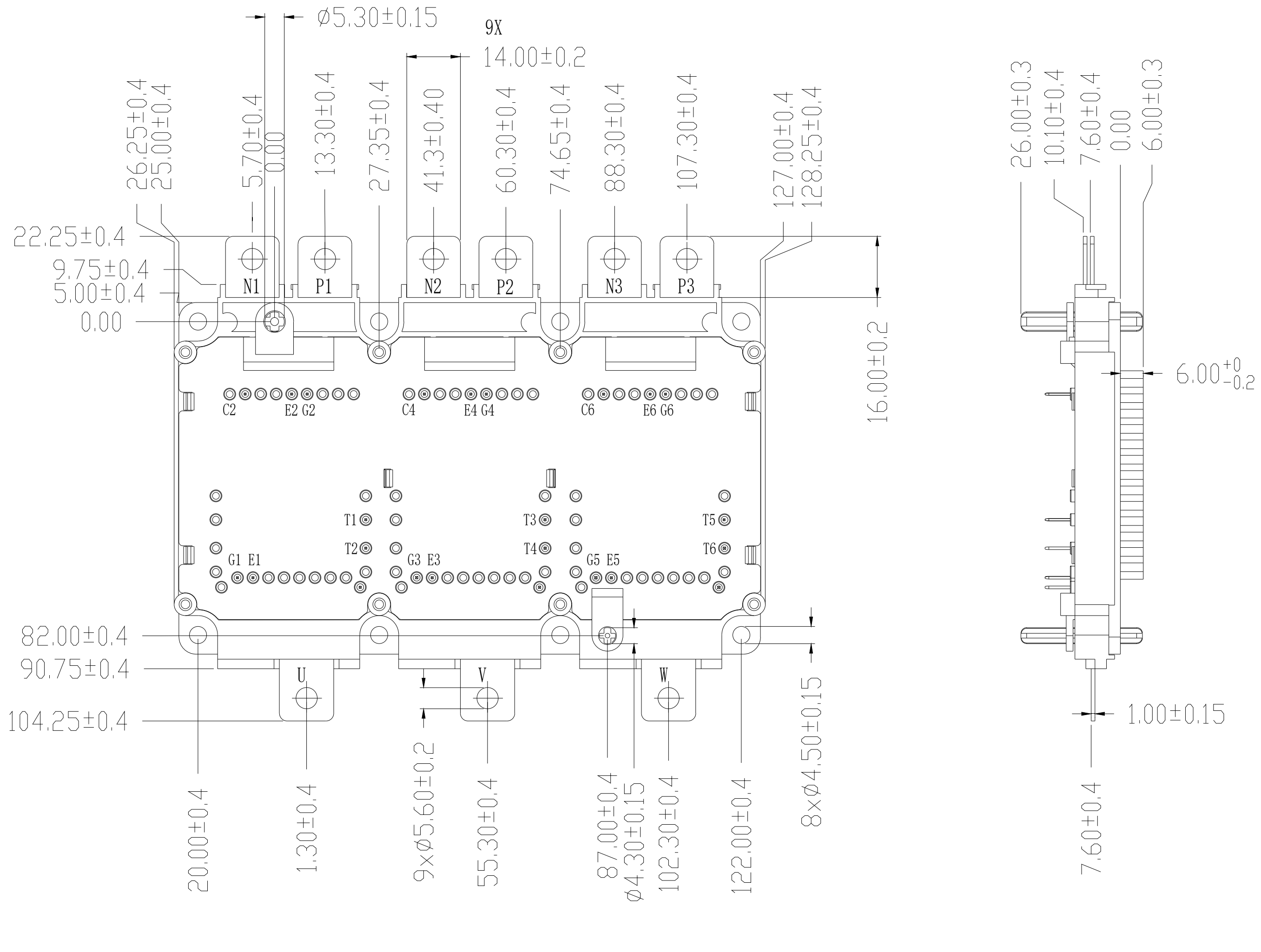
NTC-Thermistor-temperature, characteristic(typical)
R=f(T)

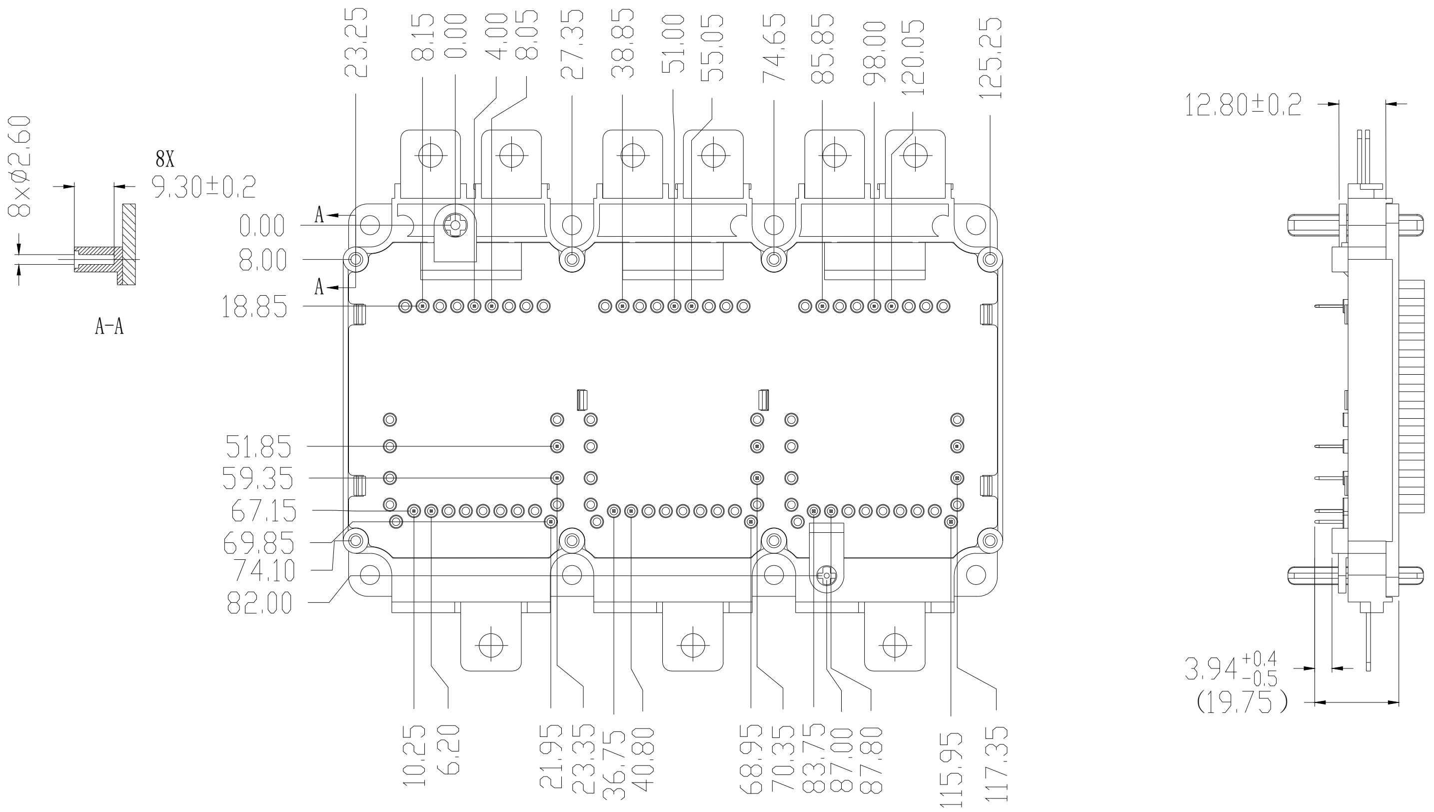


CIRCUIT DIAGRAM



PACKAGE OUTLINES




23.25
8.15
0.00
4.00
8.05
27.35
38.85
51.00
55.05
74.65
85.85
98.00
120.05
125.25
8×Ø2.60
8X
9.30±0.2
A-A
A
A
0.00
8.00
18.85
51.85
59.35
67.15
69.85
74.10
82.00
10.25
6.20
21.95
23.35
36.75
40.80
68.95
70.35
83.75
87.00
87.80
115.95
117.35
12.80±0.2
3.94 +0.4 -0.5
(19.75)

Date of change	Rev #	revise content
2023/04/21	A/0	Initial releases