JLHF450B120RD3E7DN

LD3 module with NCE Gen.7 Trench/Fieldstop IGBT and Emitter Controlled diode and PressFIT/NTC

Features

RoHS

• Electrical features

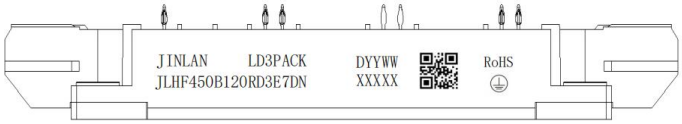
- Low V_{CEsat}
- $V_{CE(sat)}$ with positive temperature coefficient
- 10μs short circuit capability
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD

LD3

• Mechanical features

- Isolated Base Plate
- PressFIT Contact Technology

MARKING DIAGRAM

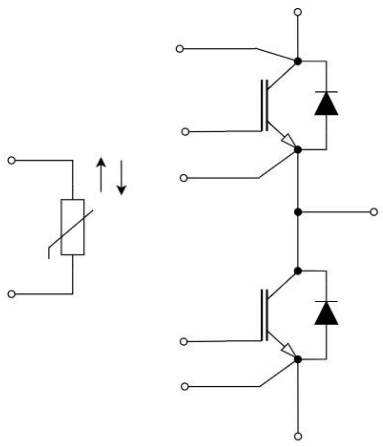


Typical Applications

- Hybrid and electric vehicle
- Inverter for motor drive
- Uninterruptible power supply

JINLAN	= Company Name
JLHF450B120RD3E7DN	= Specific Device Code
YYWW	= Year and Work Week Code
XXXXX	= Serial Number
QR code	= Custom Assembly Information

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS,f=50Hz,t=60s	3.4	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation(class 1,IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	14.5	mm
Creepage distance	d_{creep}	terminal to terminal	13.0	mm
Clearance	d_{clear}	terminal to heatsink	12.5	mm
Clearance	d_{clear}	terminal to terminal	10.0	mm
Comparative tracking index (electrical)	*CTI*		>500	
RTI Elec.	RTI	housing	140	℃

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{sCE}				20		nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	TC = 25 °C, per switch			1.1		mΩ
Storage Temperature Range	T_{STG}			-40		125	℃
M	M	-Mounting according to valid application note	M5, Screw	3.0	--	6.0	Nm
M	M	-Mounting according to valid application note	M6, Screw	3.0	--	6.0	Nm
Weight	G			--	345	--	g

IGBT

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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±30	V
I_{CDC}	Continuous Collector Current @ T_C = 80°C (T_{JMAX} = 175°C)	450	A
I_{CM}	Pulsed Collector Current， t_p limited by $T_{vj\ max}$	900	A
Tjmax	Maximum Junction Temperature	175	℃

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	I_C =450A, V_{GE} = 15 V	T_{vj} = 25 °C	--	1.50	2.3	V
			T_{vj} = 150 °C	--	1.70	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 5 mA, T_{vj} = 25°C		5.0	6.0	7.0	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} =1200V, T_{vj}= 25°C		--	--	2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±30 V, V_{CE} = 0 V, T_{vj} = 25°C		--	--	±200	nA
R_{Gint}	Internal Gate Resistance	T_{vj} = 25 °C		--	0.67	--	Ω
C_{ies}	Input Capacitance	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V		--	51	--	nF
C_{oes}	Out Capacitance			--	1.87	--	nF
C_{res}	Reverse Transfer			--	0.22	--	nF
Q_G	Gate Charge	V_{GE} = ±15 V, V_{CC} = 960 V		--	2.2	--	μC
$t_{d(on)}$	Turn−On Delay Time	I_C = 450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_G = 1.0 Ω	T_{vj} = 25 °C	--	0.137	--	μS
			T_{vj} = 150 °C	--	0.156	--	
			T_{vj} = 175 °C	--	0.158	--	
t_r	Rise Time	I_C =450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_G = 1.0 Ω	T_{vj} = 25 °C	--	0.044	--	μS
			T_{vj} = 150 °C	--	0.053	--	
			T_{vj} = 175 °C	--	0.055	--	
$t_{d(off)}$	Turn−off Delay Time	I_C = 450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_{Goff} = 1.0 Ω	T_{vj} = 25 °C	--	0.254	--	μS
			T_{vj} = 150 °C	--	0.290	--	
			T_{vj} = 175 °C	--	0.296	--	
t_f	Fall Time	I_C = 450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_G = 1.0 Ω	T_{vj} = 25 °C	--	0.028	--	μS
			T_{vj} = 150 °C	--	0.063	--	
			T_{vj} = 175 °C	--	0.064	--	
E_{on}	Turn−On Switching Loss per Pulse	I_C =450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_G = 1.0 Ω ($T_{vj\ max}$= 175 °C)	T_{vj} = 25 °C	--	19.32	--	mJ
			T_{vj} = 150 °C	--	38.52	--	
			T_{vj} = 175 °C	--	42.87	--	
E_{off}	Turn Off Switching Loss per Pulse	I_C = 450A, V_{CC} = 600 V, V_{GE} = 15 /-5V, R_G = 1.0 Ω ($T_{vj\ max}$= 175 °C)	T_{vj} = 25 °C	--	58.40	--	mJ
			T_{vj} = 150 °C	--	77.78	--	
			T_{vj} = 175 °C	--	80.59	--	

I_{SC}	SC Data	$V_{GE} \leq 15$ V, V_{CC} = 600 V, $V_{CEmax}=V_{CES}-L_{sCE}.di/dt$	$t_P \leq 10$ μs, T_{vj}=150 °C	--	1800	--	A
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.079		K/W
$T_{vj\ op}$		Temperature under switching conditions		-40		175[1)]	℃

[1)] $T_{vj\ op}$ > 150℃ is only allowed for operation at overload conditions.

Diodes

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

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ T_C=80℃	450	A
I_{FRM}	Diode Maximum Forward Current t_p=1ms	900	A

Characteristics （Tc=25℃ unless otherwise noted）

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 450 A	T_vj = 25 °C	--	1.60	2.60	V
			T_{vj} = 150 °C	--	1.50	--	
Q_r	Recovered Charge	I_F = 450 A, V_R = 600 V, R_G = 1.0 Ω ($T_{vj\ max}$= 175 °C)	T_vj = 25 °C	--	7.58	--	μC
			T_{vj} = 150 °C	--	24.97	--	
I_{RM}	Peak Reverse Recovery Current	I_F = 450 A, V_R = 600 V, R_G = 1.0 Ω ($T_{vj\ max}$= 175 °C)	T_vj = 25 °C	--	259	--	A
			T_{vj} = 150 °C	--	325	--	
E_{rec}	Reverse recovery energy	I_F = 450 A, V_R = 600 V, R_G = 1.0 Ω ($T_{vj\ max}$= 175 °C)	T_vj = 25 °C	--	8.14	--	mJ
			T_{vj} = 150 °C	--	22.22	--	
R_{thJC}	Thermal resistance, junction to case	per diode		--	0.098	--	K/W
$T_{vj\ op}$		Temperature under switching conditions		-40		175[2)]	℃

[2)] $T_{vj\ op}$ >150℃ is only allowed for operation at overload conditions.

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)
T_{vj}=25°C

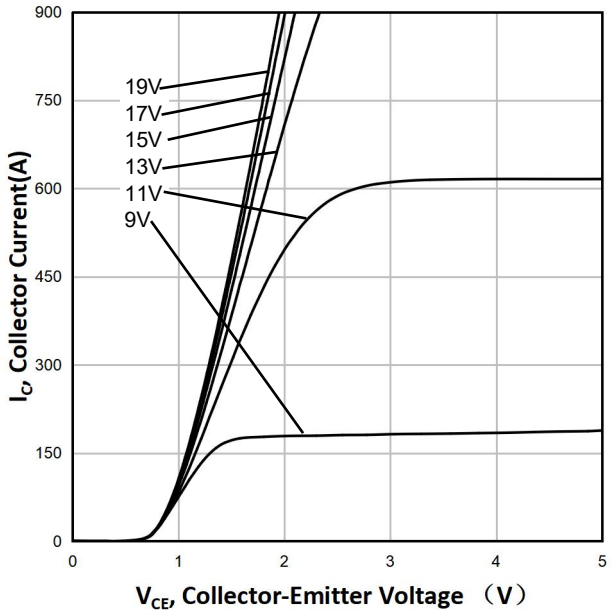


Figure2.output characteristic IGBT,Inverter(typical)
T_{vj}=150°C

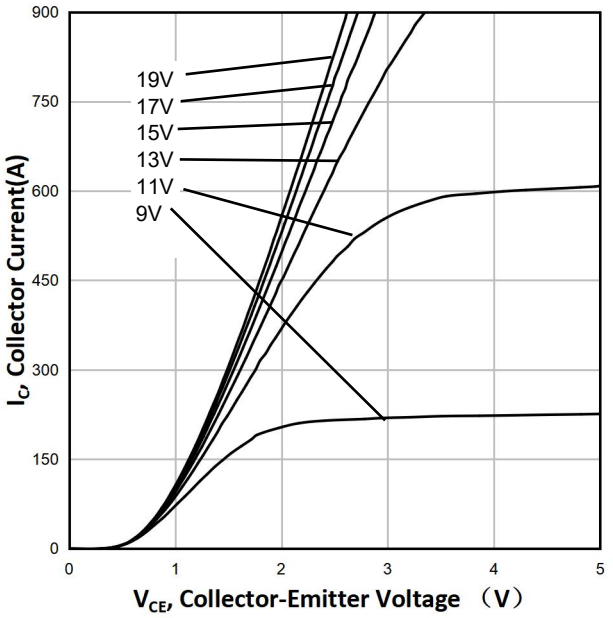


Figure3. $V_{CE(sat)}$ vs. Temperature

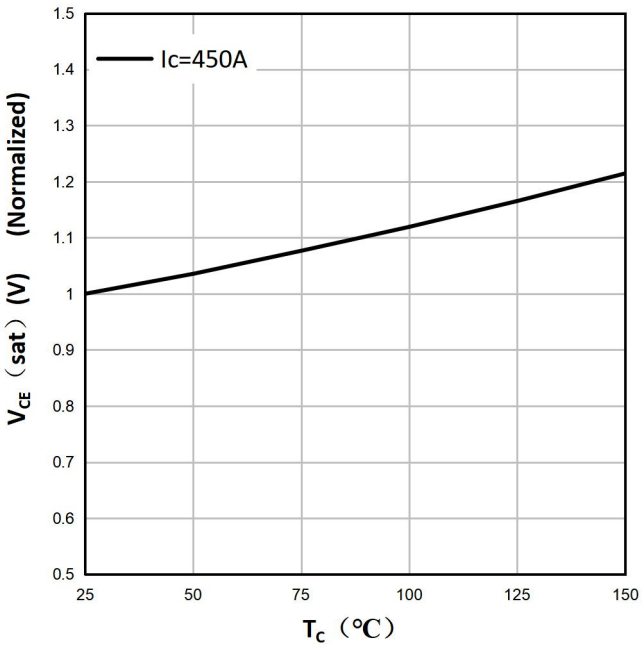


Figure4.transfer characteristic IGBT,Inverter(typical)
V_{CE}=20V

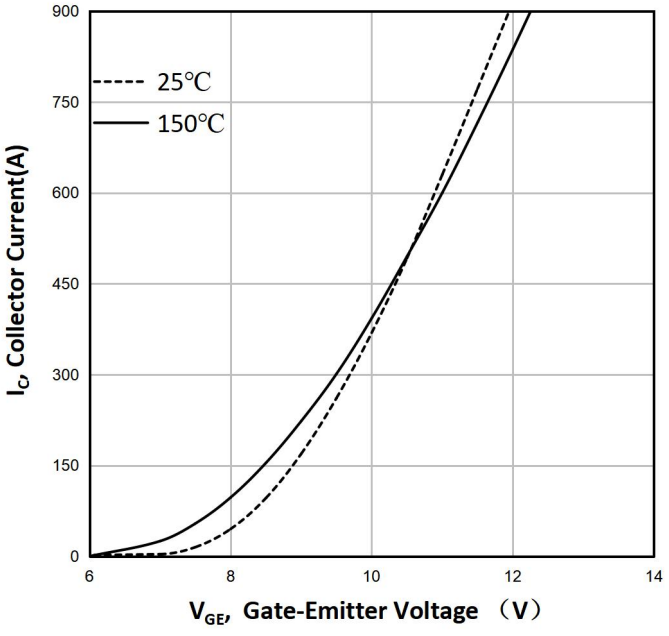


Figure5. V_{TH} vs. Temperature

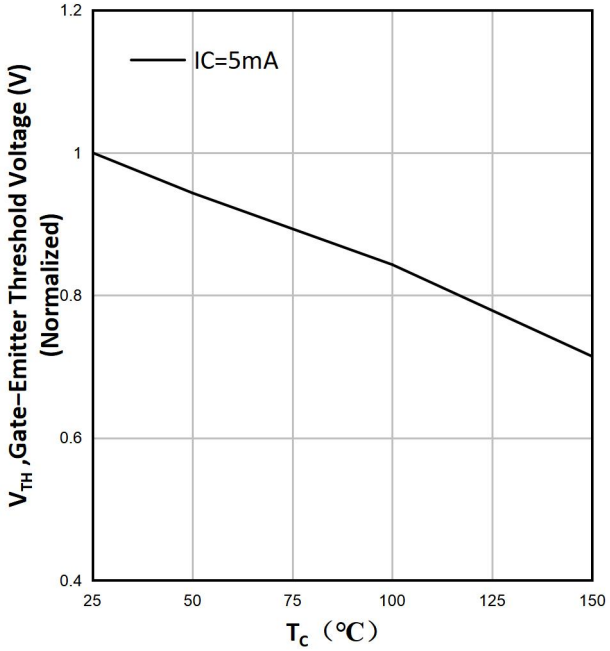


Figure6. Gate Charge Waveform

Vcc=960V,I_C=450A,T_{vj}=25°C

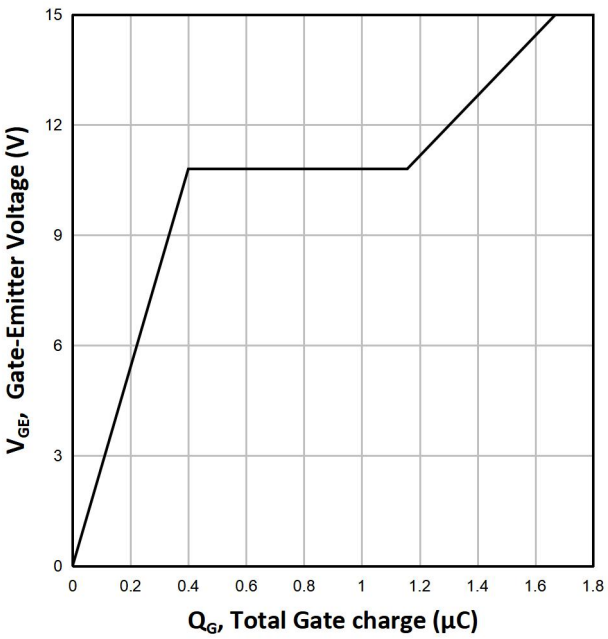


Figure7. Saturation Voltage vs. V_{GE}

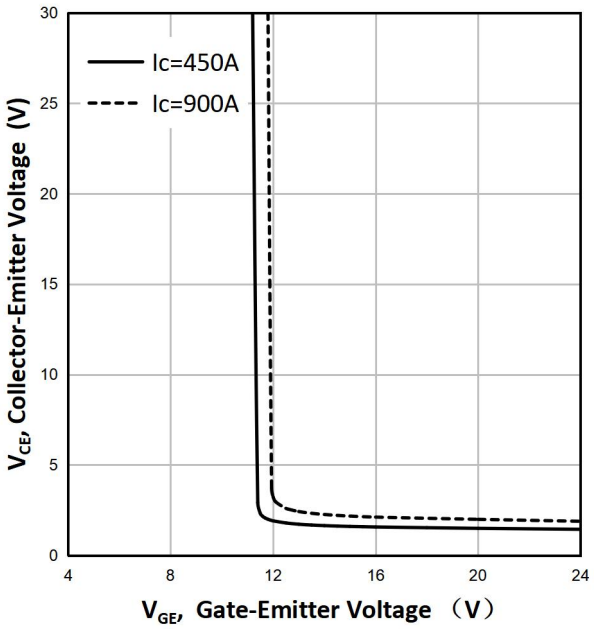


Figure8. Ptot vs. Case Temperature

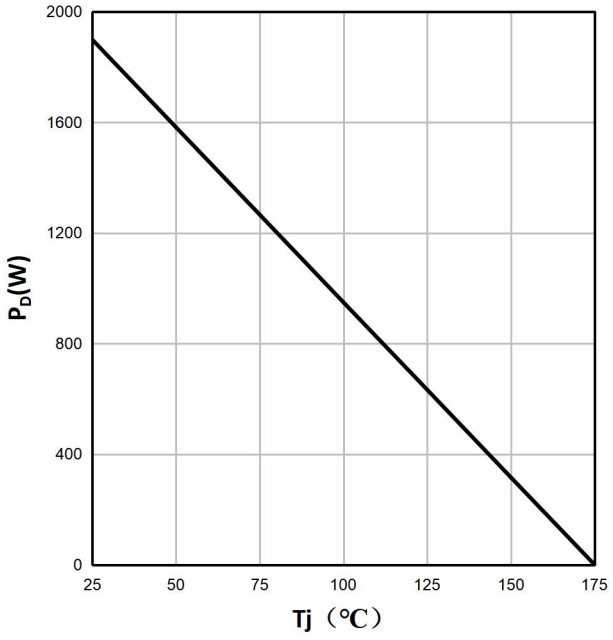


Figure9.switching losses IGBT,Inverter(typical)
Vcc=600V,Rgon=10Ω,Rgoff=10Ω,Vge=15V/-5V

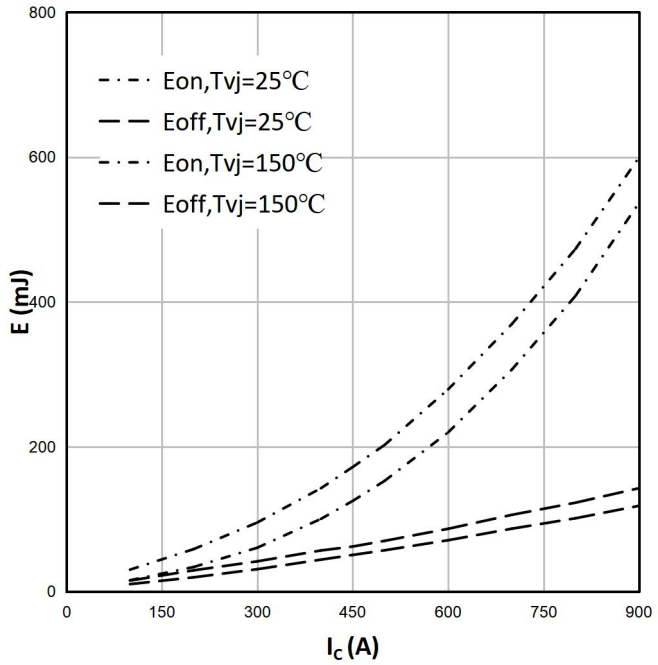


Figure10.switching losses IGBT,Inverter(typical)
Vcc=600V,IC=450A，Vge=15V/-5V

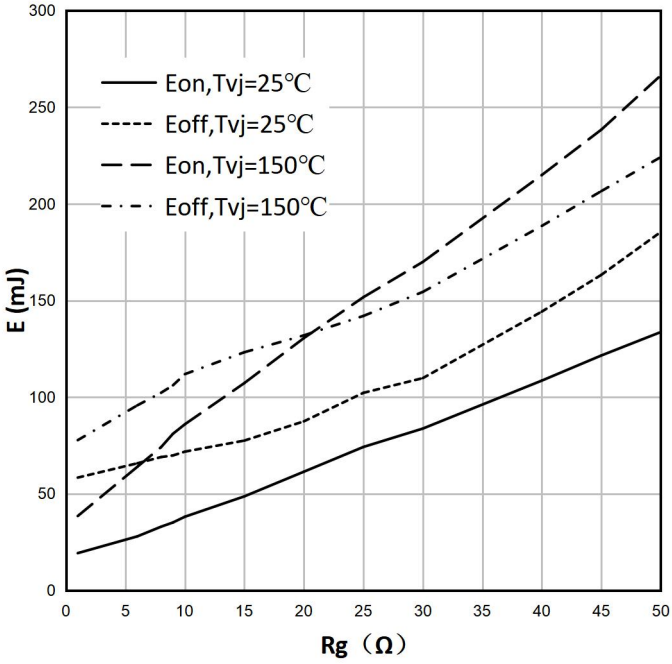


Figure11.FBSOA IGBT
D=0, Tc=25℃,Tj<=175℃,Vge=15V

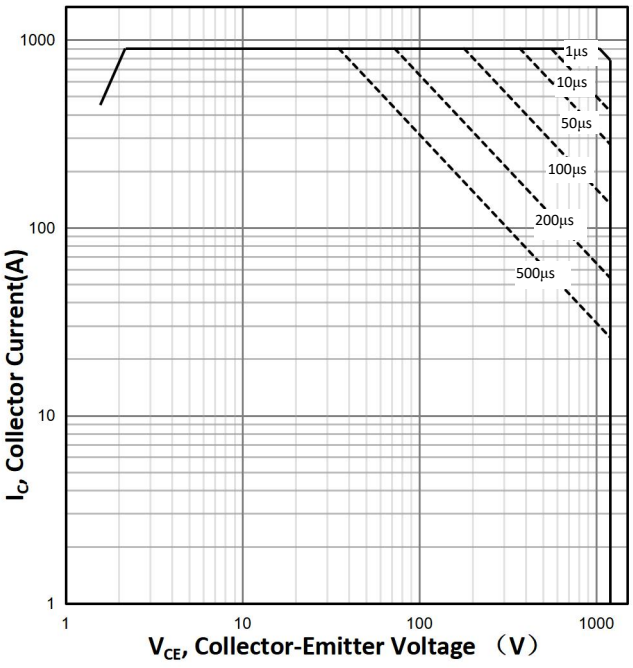


Figure12.transient thermal impedance

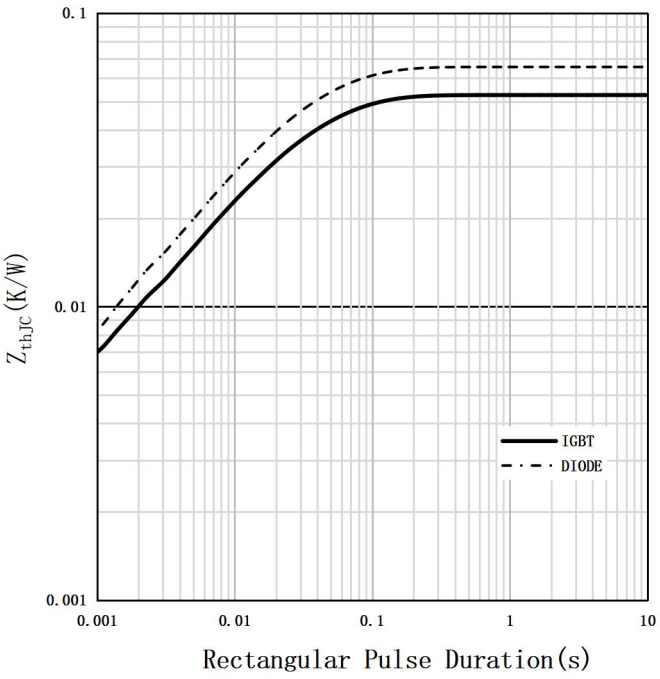


Figure13. forward characteristic of Diode,Inverter(typical)
V_{GE}=0V

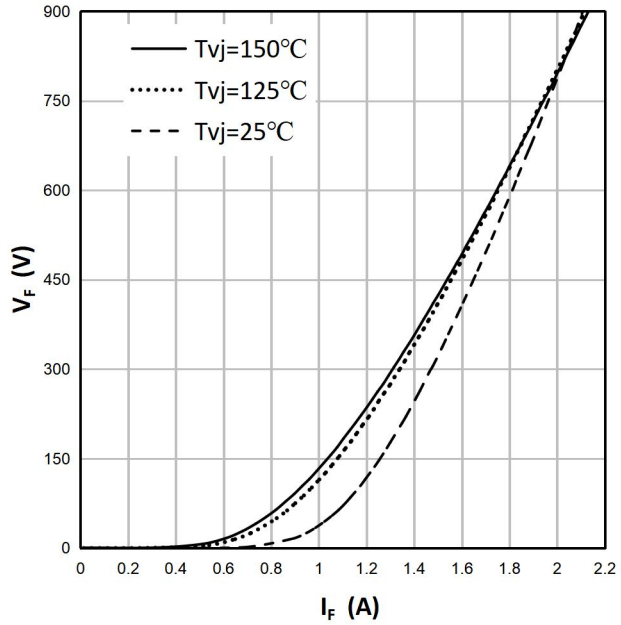


Figure 14.Reverse Recovery Energy Loss vs. IC
Vcc=600V,Rgon=10Ω,Rgoff=10Ω,Vge=15V/-5V

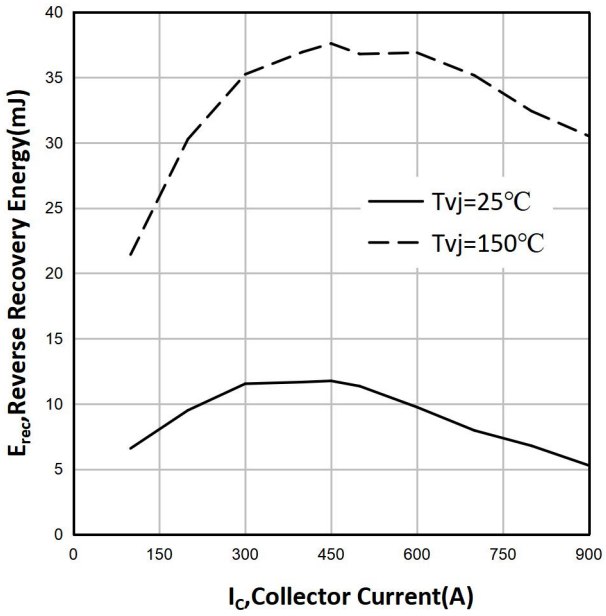


Figure 15.Reverse Recovery Energy Loss vs. RG
Vcc=600V, IC=450A, Vge=15V/-5V

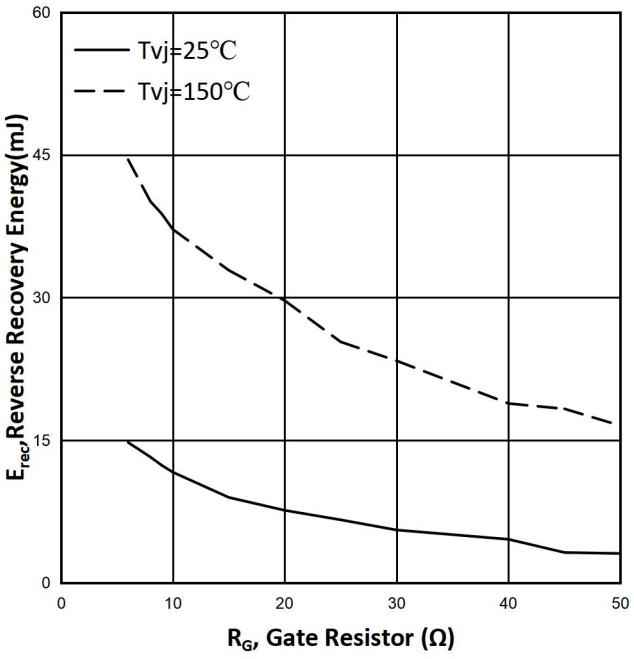
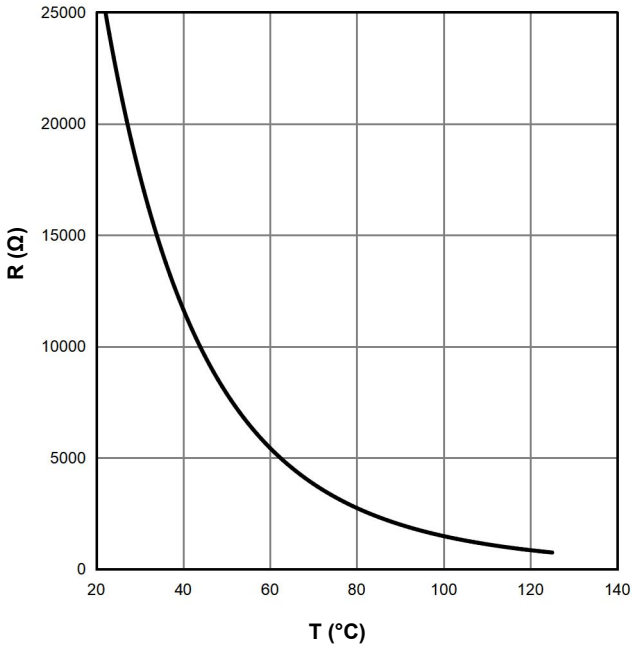
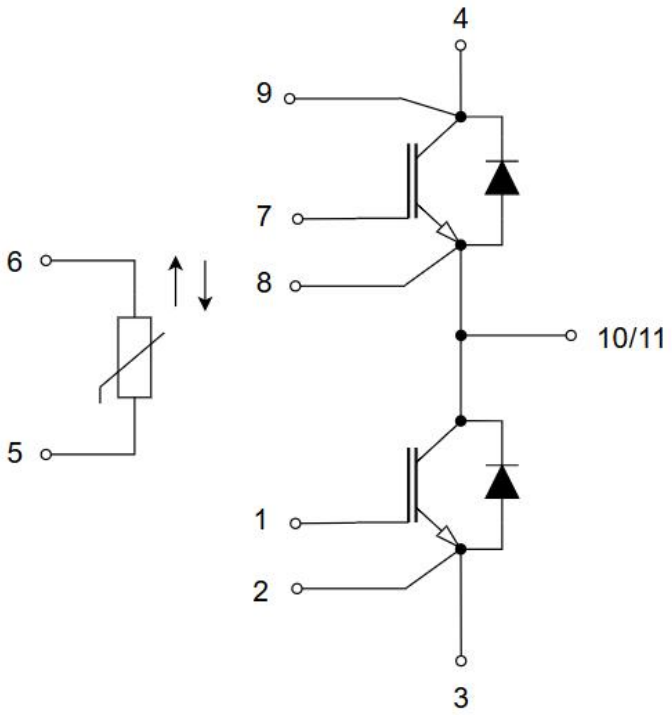


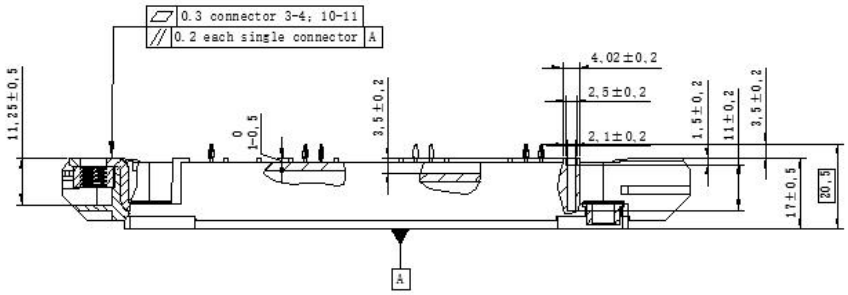
Figure16.NTC-Thermistor-temperature characteristic(typical)



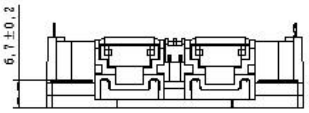
CIRCUIT DIAGRAM



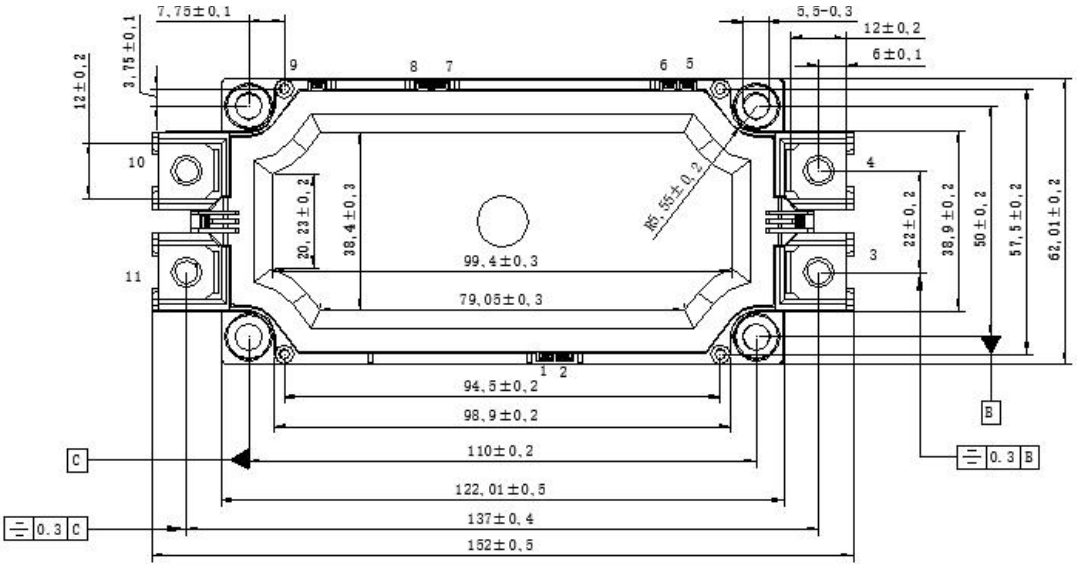
PACKAGE DIMENSION



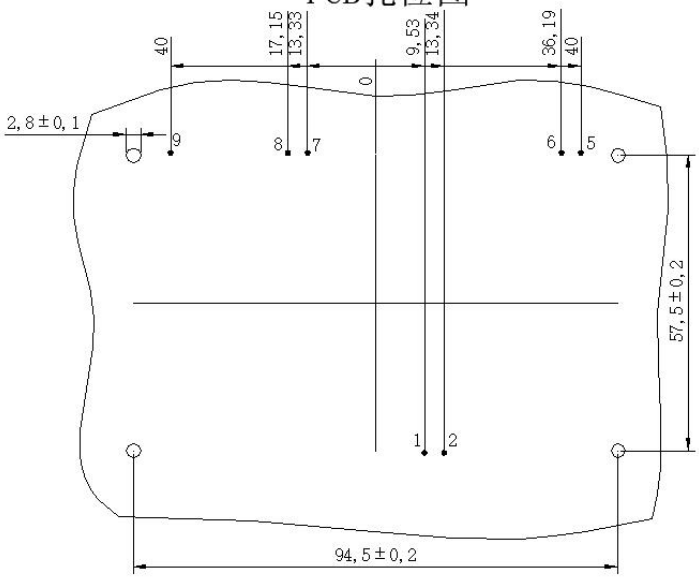
SIDE VIEW



SIDE VIEW



PCB孔位图



REVISION HISTORY

Document version	Date of release	Description of changes
Rev.00	2024-8-8	Preview
Rev.01	2024-12-31	Add chart

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