JL3I600V110SE3E7SS

3-Level INPC Inverter Module with 1100V Trench Stop IGBTs

RoHS

Features

• Electrical features

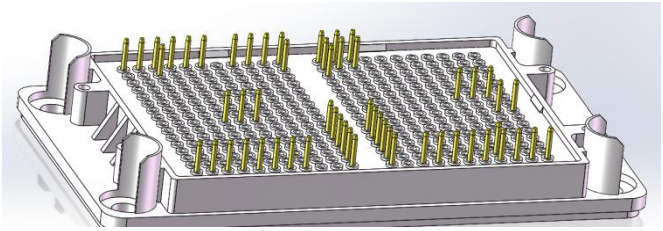
-Neutral Point Clamped Three−level Inverter Module

-1100V Low $V_{CE(sat)}$ Trench Stop IGBTs

-$V_{CE(sat)}$ with positive temperature coefficient

- Maximum junction temperature 175℃

- Low Inductive Layout



LE3 Pack

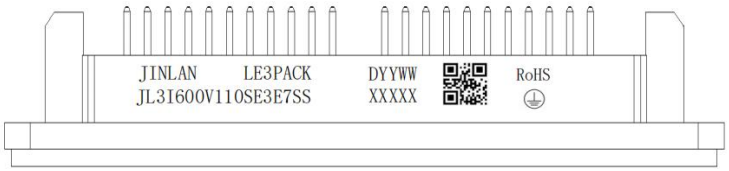
• Mechanical features

- Package with CTI >600

- Solderable Pins

- Isolated copper baseplate using AMB technology

MARKING DIAGRAM



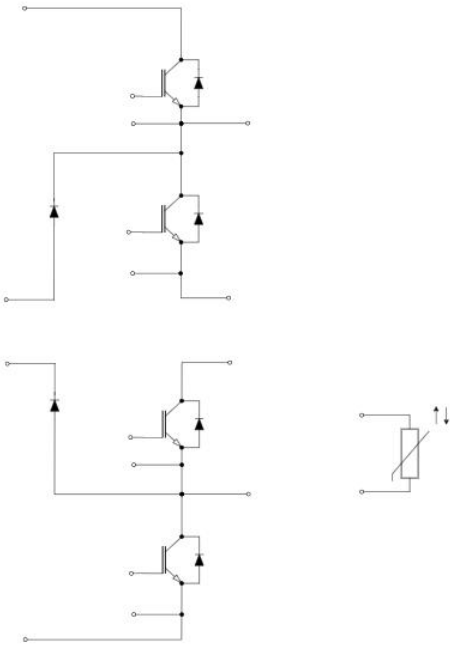
JINLAN	= Company Name
JL3I600V110SE3E7SS	= Specific Device Code
YYWW	= Year and Work Week Code
XXXXX	= Serial Number
QR code	= Custom Assembly Information

Typical Applications

• Solar Inverters

• Energy Storage System

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS,f=50Hz,t=60s	4.0	kV
Internal isolation		basic insulation(class 1,IEC 61140)	Si_3N_4	
Creepage distance	d_{creep}	terminal to heatsink	14.2	mm
Clearance	d_{clear}	terminal to heatsink	12.4	mm
Comparative tracking index (electrical)	CTI		＞600	

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{CE}			--	15	--	nH
Storage Temperature Range	T_{STG}			-40		125	℃
Mounting torque for module mounting	*M*	-Mounting according to valid application note	M5, Screw	3		5	Nm
Weight	*G*				250		g

IGBT (T1,T2,T3,T4)

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

Symbol	Description	Value	Unit
V_{CES}	Collector−Emitter Voltage	1100	V
V_{GE}	Gate− Emitter Voltage	±30	V
I_C	Continuous Collector Current @ Tc = 80°C, T_J = 175°C	600	A
$I_{C(RM)}$	T_p=1ms	1200	A

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	V_{GE} = 15V, I_C =600 A	T_J = 25°C	--	1.65	2.3	V
			T_J = 150°C	--	2.1	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C =15 mA		4.0	5.0	6.0	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} =1100V ,T_{vj}= 25°C		--	--	1	mA
I_{GES}	Gate Leakage Current	V_{GE} = ±20 V, V_{CE} = 0 V		--	--	400	nA
R_{Gint}	Internal Gate Resistance			--	1.46	--	Ω
C_{iss}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz		--	45.7	--	nF
C_{oss}	Output Capacitance			--	4.3	--	
C_{rss}	Reverse Transfer Capacitance			--	0.133	--	
Q_g	Total Gate Charge	V_{GE} = ± 15 V		--	1.44	--	μC
$t_{d(on)}$	Turn−On Delay Time	T_J = 25°C V_{CE} =600V, I_C =200A V_{GE} =±15 V, R_{Gon} =10Ω, R_{Goff} =10Ω		--	0.13	--	μs
t_r	Rise Time			--	0.1	--	
$t_{d(off)}$	Turn−off Delay Time			--	0.79	--	
t_f	Fall Time			--	0.04	--	
E_{on}	Turn−On Switching Loss per Pulse			--	5.25	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	7.64	--	
$t_{d(on)}$	Turn−On Delay Time	T_J = 150°C V_{CE} =600V, I_C =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	0.13	--	μs
t_r	Rise Time			--	0.09	--	
$t_{d(off)}$	Turn−off Delay Time			--	1.0	--	
t_f	Fall Time			--	0.05	--	
E_{on}	Turn−on Switching Loss per Pulse			--	11.67	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	9.76	--	
R_{thJC}	Thermal Resistance − Chip−to−Case			--	0.062	--	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.

SiC Diode(D5, D6)

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

Symbol	Description	Value	Unit
V_{RRM}	Peak Repetitive Reverse Voltage	1200	V
I_F	Continuous Forward Current @T_J = 150°C	200	A
I_{FRM}	Repetitive Peak Forward Current @T_J = 150°C	400	A

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 200A, V_{GE} = 0 V	T_J = 25°C	--	1.60	2.35	V
			T_J = 150°C	--	2.20	--	
Q_{rr}	Reverse Recovery Charge	T_J = 25°C V_R =600V, I_F =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	2.85	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	67.8	--	A
E_{REC}	Reverse Recovery Energy			--	0.44	--	mJ
Q_{rr}	Reverse Recovery Charge	T_J = 150°C V_R =600 V, I_F =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	1.48	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	55.9	--	A
E_{REC}	Reverse Recovery Energy			--	0.31	--	mJ
R_{thJC}	Thermal Resistance − Chip−to−Case				0.16		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.

SiC Diode(D1, D4)

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

Symbol	Description	Value	Unit
V_{RRM}	Peak Repetitive Reverse Voltage	1200	V
I_F	Continuous Forward Current @T_J = 150°C	300	A
I_{FRM}	Repetitive Peak Forward Current @T_J = 150°C	600	A

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 300A, V_{GE} = 0 V	T_J = 25°C	--	1.60	2.35	V
			T_J = 150°C	--	2.20	--	
Q_{rr}	Reverse Recovery Charge	T_J = 25°C V_R =600V, I_F =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	6.2	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	116.7	--	A
E_{REC}	Reverse Recovery Energy			--	1.13	--	mJ
Q_{rr}	Reverse Recovery Charge	T_J = 150°C V_R =600V, I_F =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	3.3	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	103.7	--	A
E_{REC}	Reverse Recovery Energy			--	0.86	--	mJ
R_{thJC}	Thermal Resistance − Chip−to−Case				0.102		K/W
$T_{vj\ op}$		Temperature under switching conditions		-40		175[3)]	℃

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

DIODE (D2, D3)

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

Symbol	Description	Value	Unit
V_{RRM}	Peak Repetitive Reverse Voltage	1100	V
I_F	Continuous Forward Current @T_J = 150°C	500	A
I_{FRM}	Repetitive Peak Forward Current @T_J = 150°C	1000	A

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 500A, V_{GE} = 0 V	T_J = 25°C	--	1.7	2.9	V
			T_J = 150°C	--	1.6	--	
Q_{rr}	Reverse Recovery Charge	T_J = 25°C V_R =600V, I_F =200A V_{GE} = ±15 V, R_{Gon} = 10Ω, R_{Goff} =10Ω		--	89.6	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	329.6	--	A
E_{REC}	Reverse Recovery Energy			--	9.16	--	mJ
Q_{rr}	Reverse Recovery Charge	T_J = 150°C V_R =600V, I_F =200A V_{GE} = ±15 V, R_{Gon} =10Ω, R_{Goff} =10Ω		--	115.6	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	362.7	--	A
E_{REC}	Reverse Recovery Energy			--	19.2	--	mJ
R_{thJC}	Thermal Resistance − Chip−to−Case				0.096		K/W
$T_{vj\,op}$		Temperature under switching conditions		-40		175[4)]	℃

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

THERMISTOR PROPERTIES

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R_{25}	Rated Resistance	T=25℃	-	5	-	KΩ
R_{100}	Rated Resistance	T=100℃	-	478.5	-	Ω
▲R/R	Deviation of R25		-1	-	1	%
P_{25}	Power Dissipation			210		mW
	Power Dissipation Constant			3.5		mW/K
$B_{25/85}$	B-value	B(25/80),tolerance ±1%	-	3480	-	K
$B_{25/50}$	B-value	B(25/50),tolerance ±1%	-	3473	-	K
$B_{25/100}$	B-value	B(25/100),tolerance ±1%	-	3481	-	K

Figure1.output characteristic IGBT(typical)
T_{vj}=25°C

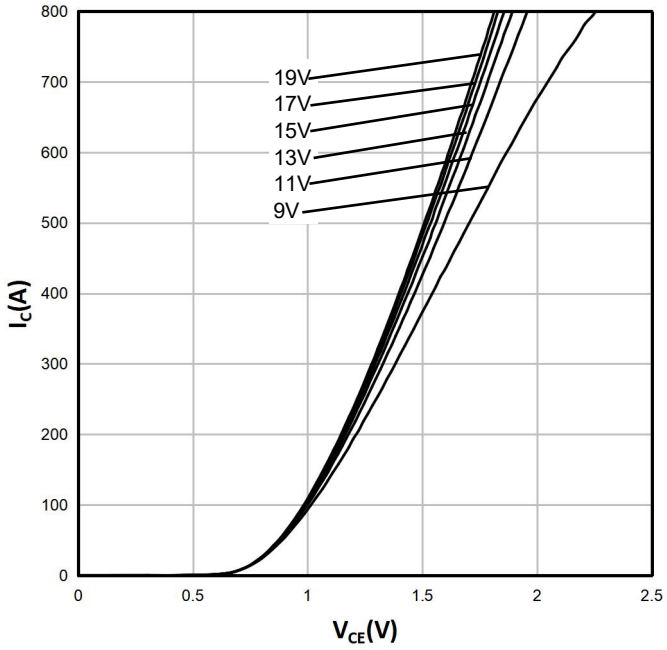


Figure2.output characteristic IGBT(typical)
T_{vj}=150°C

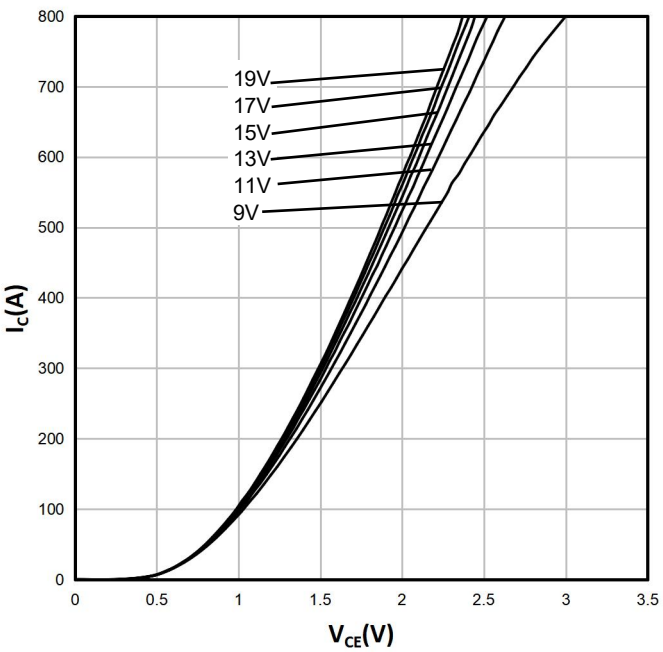


Figure3. $V_{CE(sat)}$ vs. Temperature

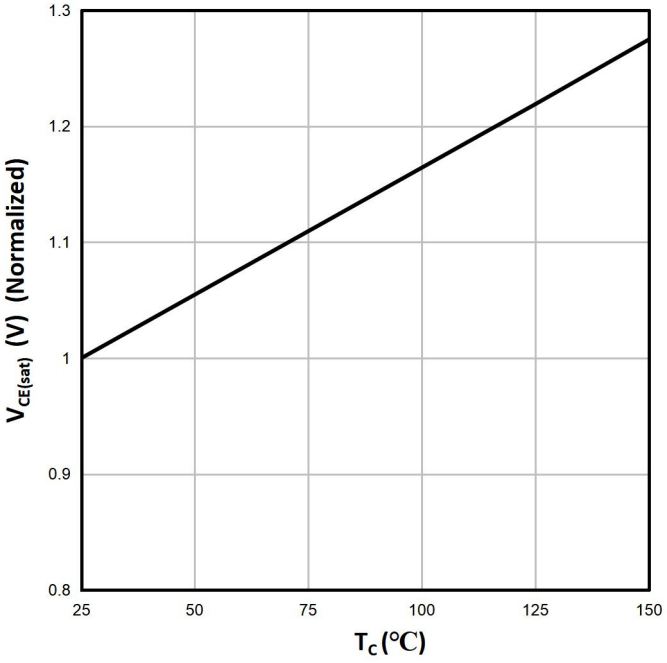


Figure4.transfer characteristic IGBT(typical)
V_{CE}=20V

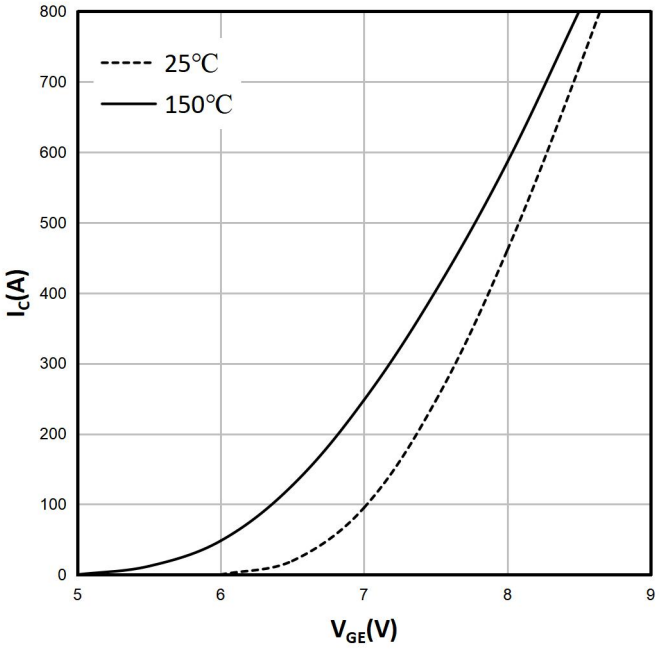


Figure5. FBSOA IGBT(typical)
D=0, Tc=25℃,Tj<=175℃,Vge=15V

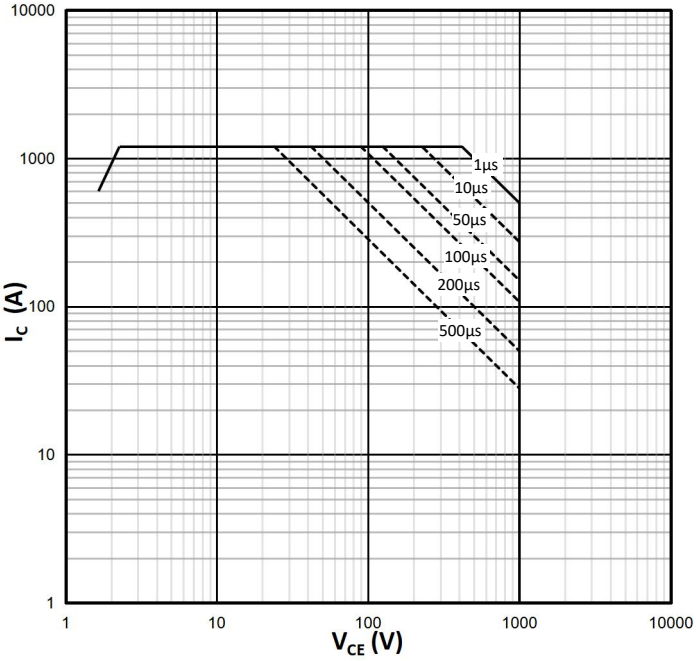


Figure6. Gate Charge Waveform
Vcc=600V

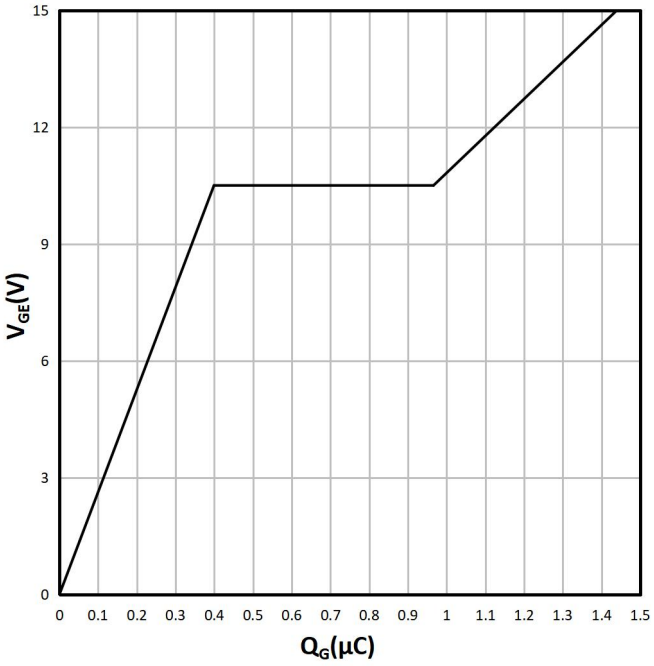


Figure7.switching losses IGBT(typical)
Vcc=600V,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

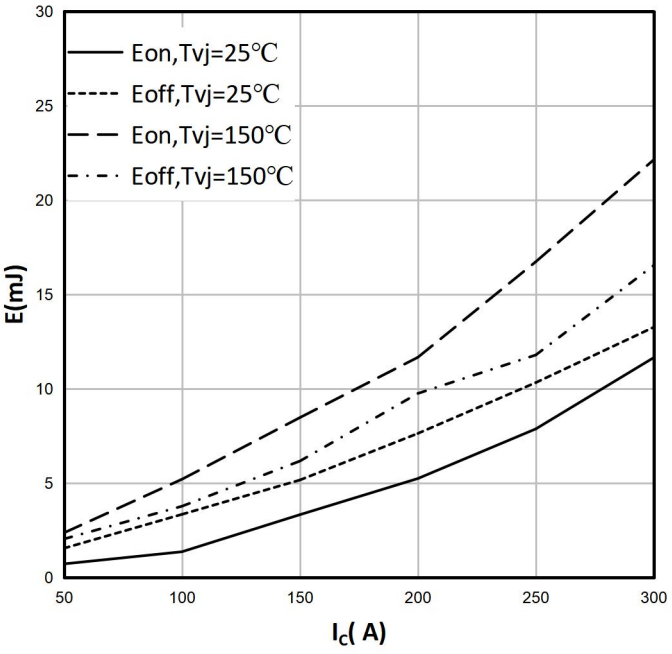


Figure 8.switching losses IGBT,Inverter(typical)
Vcc=600V,Ic=200A,Vge=±15V

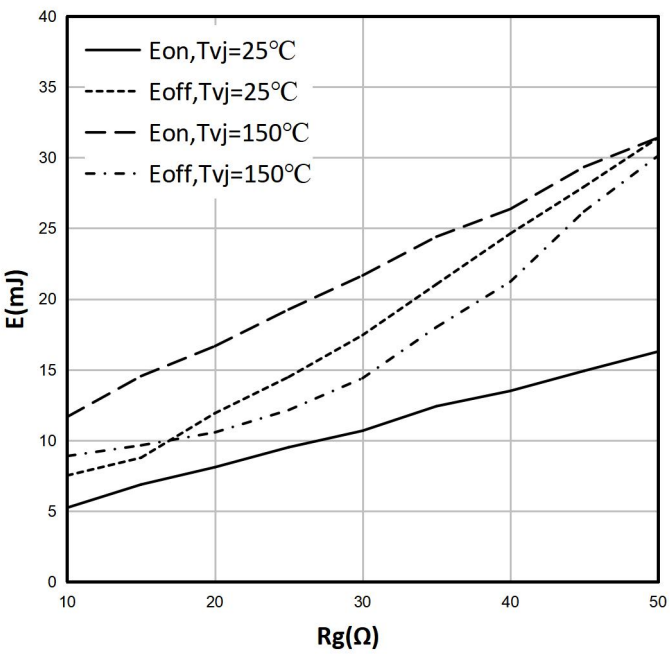


Figure9. transient thermal impedance IGBT（T1，T2，T3，T4）

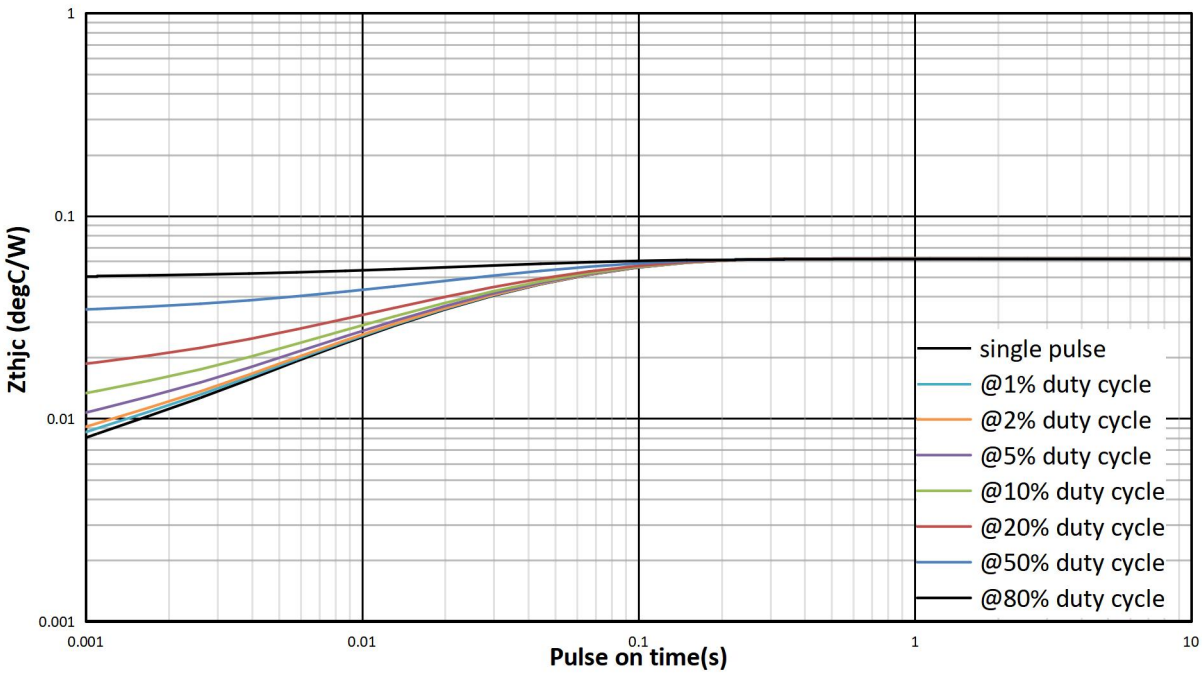


Figure10. forward characteristic of SiC Diode(typical)（D5，D6）

VGF=0V

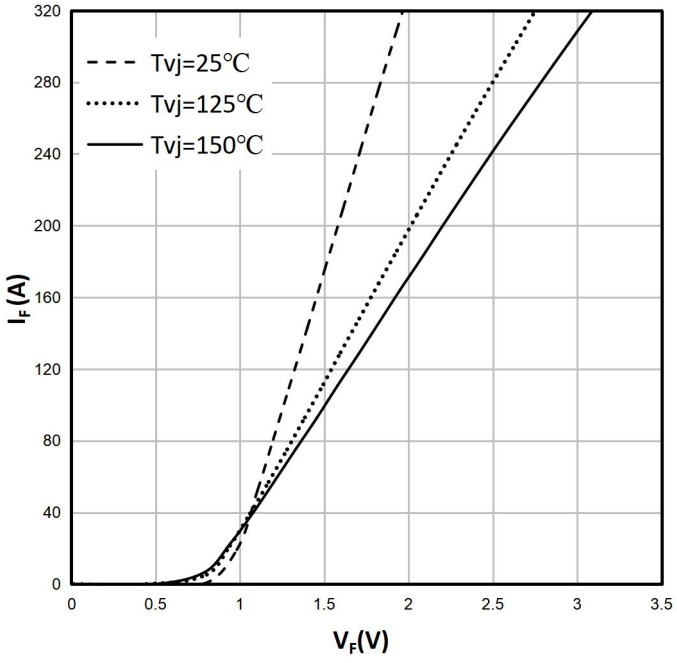


Figure11.Reverse Recovery Energy Loss vs. IC（D5，D6）

Vcc=600V,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

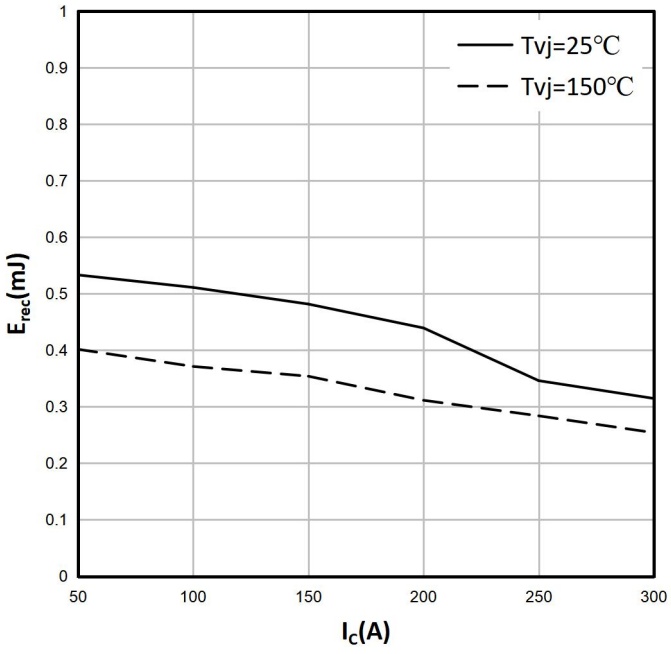


Figure12.Reverse Recovery Energy Loss vs.RG（D5，D6）

Vcc=600V,Ic=200A,Vge=±15V

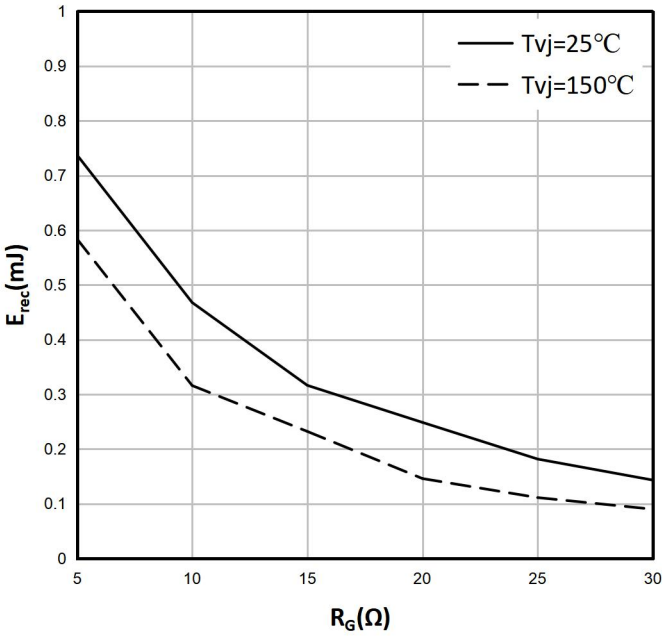


Figure13. forward characteristic of SiC Diode(typical)（D1，D4）

V_{GE}=0V

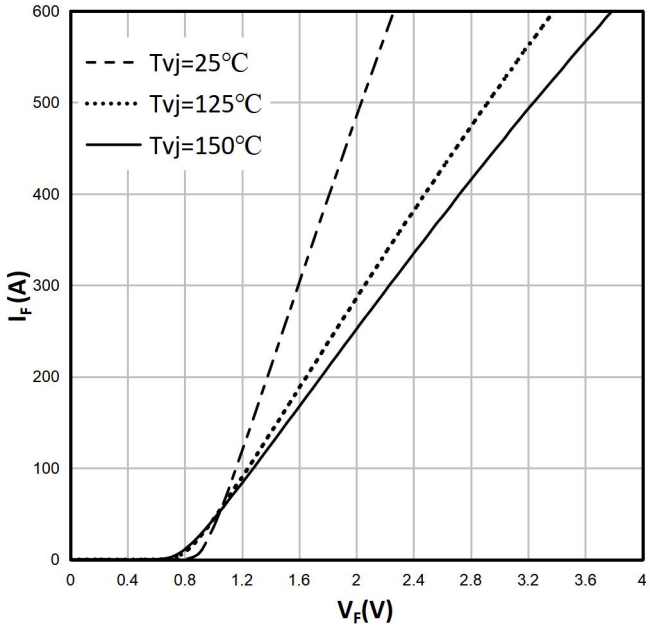


Figure14.Reverse Recovery Energy Loss vs. IC（D1，D4）

Vcc=600V,,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

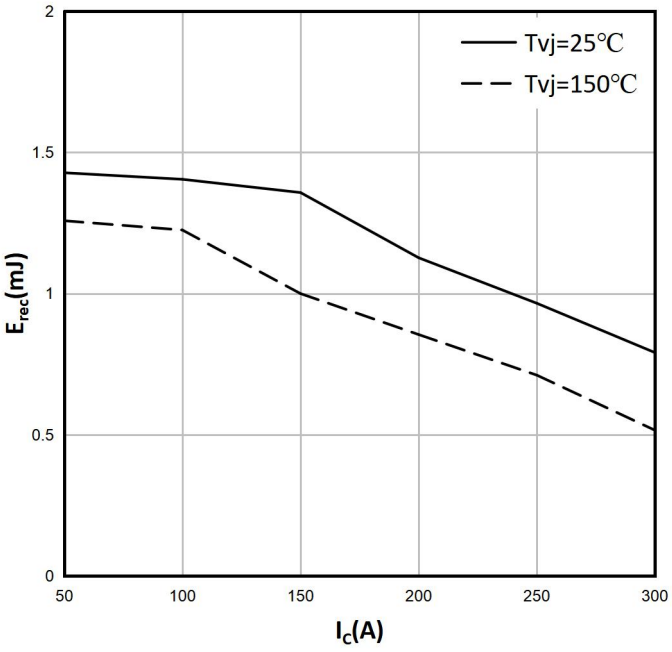


Figure15.Reverse Recovery Energy Loss vs.RG（D1，D4）

Vcc=600V,Ic=200A,Vge=±15V

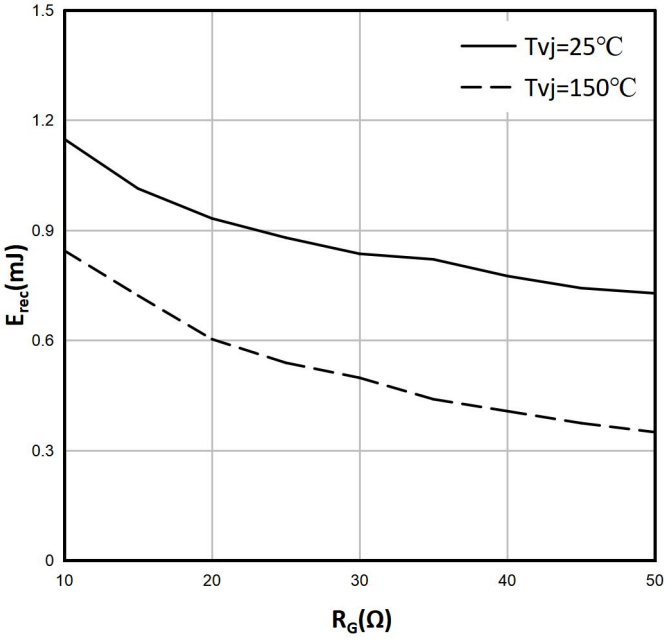


Figure16. forward characteristic of Diode(typical)
（D2，D3）

V_{GE}=0V

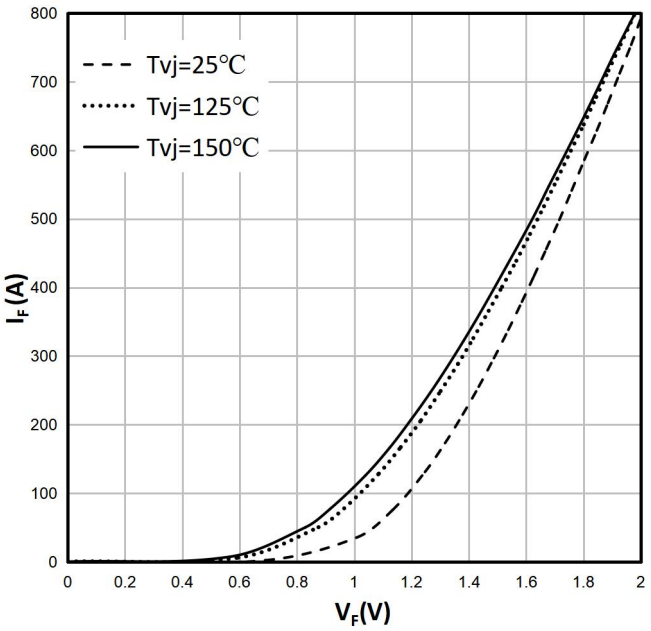


Figure17.Reverse Recovery Energy Loss vs. IC
（D2，D3）

Vcc=600V,,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

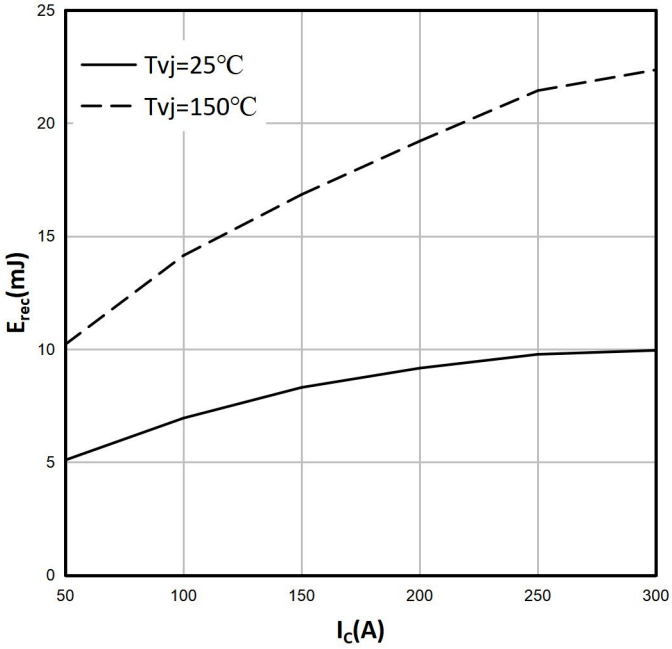


Figure18.Reverse Recovery Energy Loss vs.RG
（D2，D3）

Vcc=600V,Ic=200A,Vge=±15V

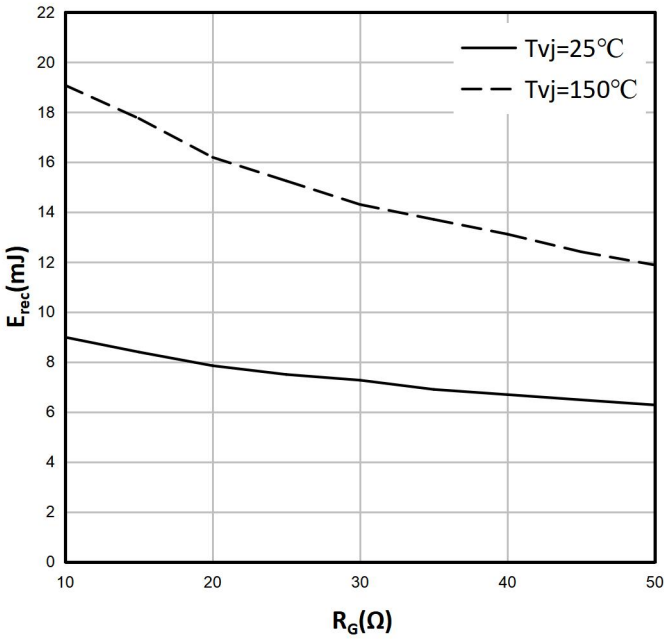


Figure19. transient thermal impedance Diode（D5，D6）

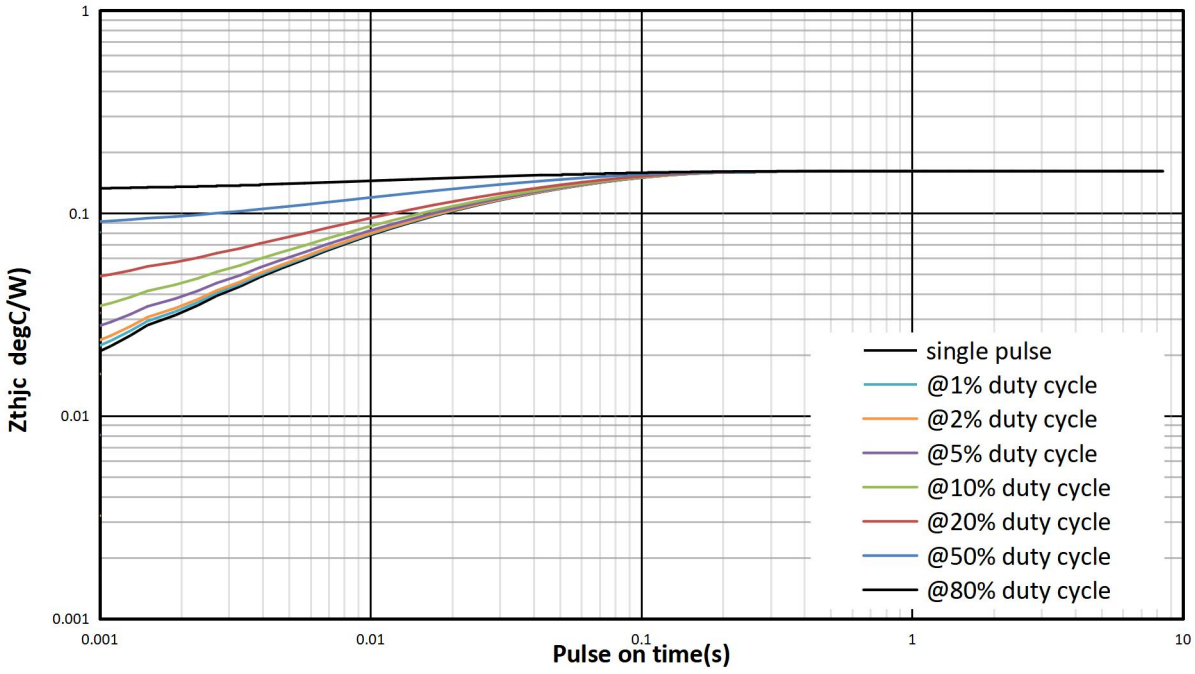


Figure20. transient thermal impedance Diode（D1，D4）

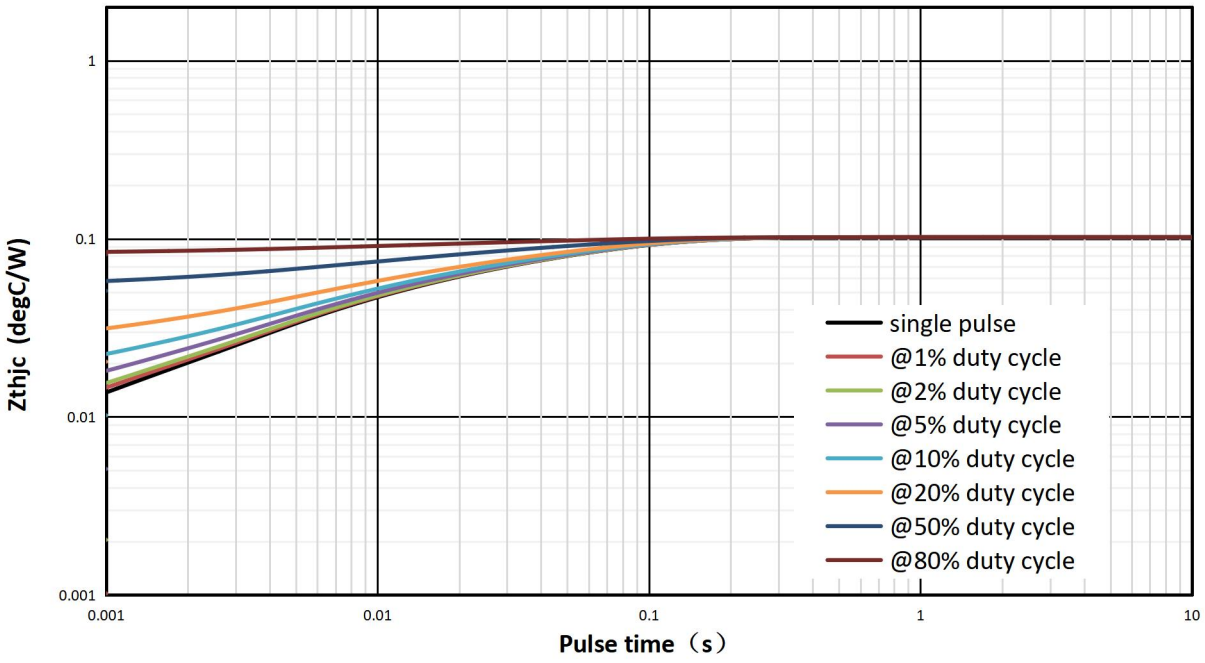
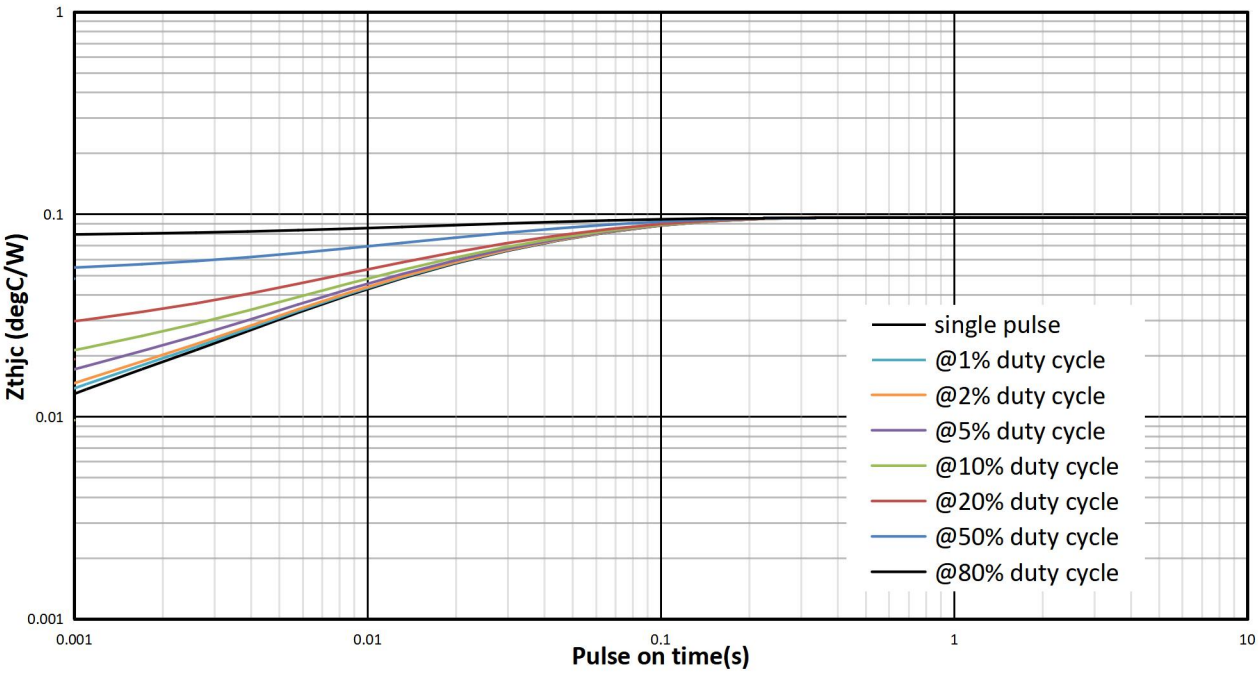
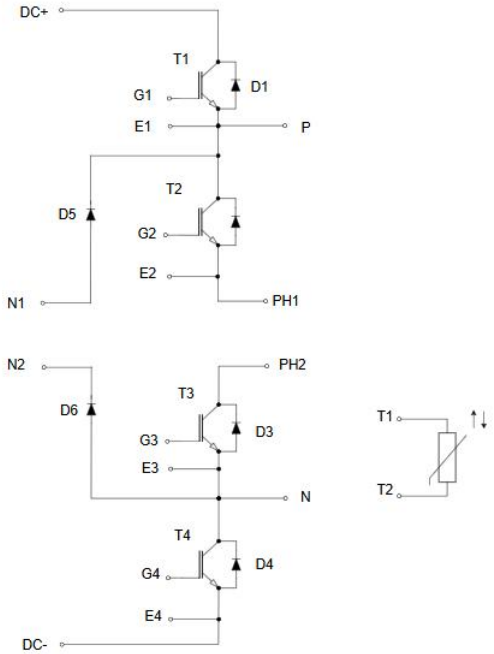


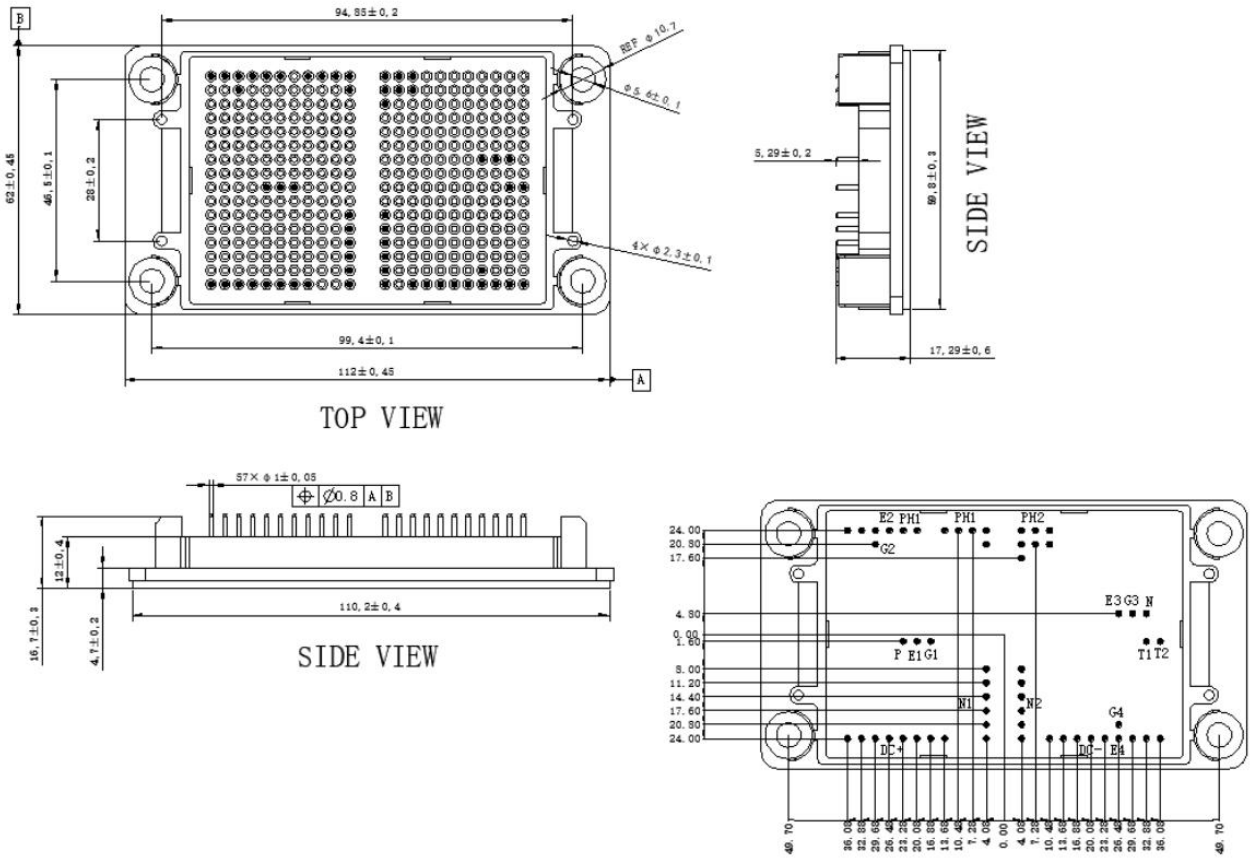
Figure21. transient thermal impedance Diode（D2，D3）



CIRCUIT DIAGRAM



PACKAGE DIMENSIONS



REVISION HISTORY

Document version	Date of release	Description of changes
Rev.00	2025-2-4	Preview
Rev.01	2025-4-21	Add charts
Rev.02	2025-6-11	Substrate optimized from ZTA to Si_3N_4, & R_{thJC} updated

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