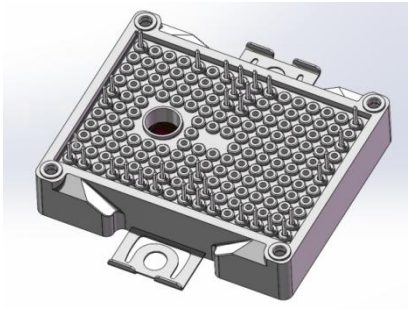
JL3I100V65SE2E7SN

3-Level NPC Inverter Module with 650V Trench Stop IGBTs

RoHS

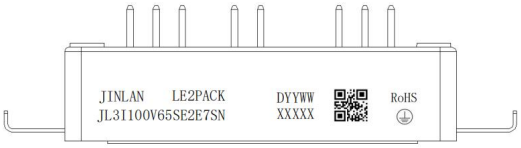
Features

- Electrical features
  - 650V Trench Stop IGBTs
  - Low Inductive Layout
  - Low Switching Losses
  - Thermistor



LE2 Pack

- Mechanical features
  - Compact Design
  - Solderable Pins
  - Al_2O_3 Substrate with Low Thermal Resistance
  - Rugged mounting due to integrated mounting clamps

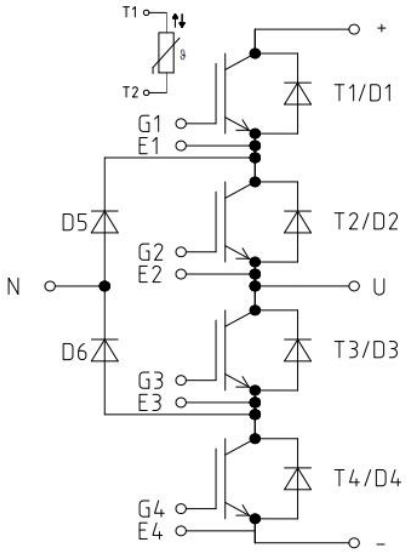


JINLAN	= Company Name
JL3I100V65SE2E7SN	= Specific Device Code
YYWW	= Year and Work Week Code
XXXXX	= Serial Number
QR code	= Custom Assembly Information

Typical Applications

- 3-Level-Applications
- Solar Applications
- UPS Systems

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS,f=50Hz,t=60s	2.5	kV
Internal isolation		basic insulation(class 1,IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	11.5	mm
Clearance	d_{clear}	terminal to heatsink	10	mm
Comparative tracking index (electrical)	CTI		>200	
RTI Elec.	RTI	housing	140	℃

Package Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray Inductance	L_{CE}		--	15	--	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$		--	2.00	--	mΩ
Storage Temperature Range	T_{STG}		-40		125	℃
Mounting torque for module mounting	M	-Mounting according to valid application note	40	--	80	N
Weight	G		--	39	--	g

IGBT （T1、T2、T3、T4）

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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	±30	V
I_{CDC}	Continuous Collector Current @ T_C = 80°C (T_{JMAX} = 175°C)	100	A
I_{CM}	Pulsed Collector Current，t_p limited by $T_{vj\,max}$	200	A
Tjmax	Maximum Junction Temperature	175	℃
P_D	Power Dissipation @ T_C = 25°C	430	W
	Power Dissipation @T_C = 100 °C	215	W

Characteristics （Tc=25℃ unless otherwise noted）

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	I_C =100A,V_{GE} = 15V	T_{vj} = 25 °C	--	1.25	1.70	V
			T_{vj} = 150 °C	--	1.45	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	I_C=1mA,V_{CE}=V_{GE}		4.0	5.0	6.0	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 650 V		--	--	200	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±30 V, V_{CE} = 0 V, T_{vj} = 25°C		--	--	±100	nA
RGint	Internal Gate Resistance	T_{vj} = 25°C		--	1.51	--	Ω
Cies	Input Capacitance	V_{CE}=25V,V_{GE}=0V, f=1MHz		--	6390	--	pF
Coes	Output capacitance			--	401	--	pF
Cres	Reverse Transfer			--	60.3	--	pF
Q_G	Gate Charge	V_{CE} = 480 V, I_C = 100 A V_{GE} = −5 V to +15 V		--	0.242	--	μC
td(on)	Turn−On Delay Time	V_{CE}=400V,I_C=100A, V_{GE}= −5 V to +15 V, Rgon=25Ω,Rgoff=50Ω, Inductive Load, Tvj=25°C		--	0.15	--	μs
tr	Rise Time			--	0.03	--	
td(off)	Turn−off Delay Time			--	0.86	--	
tf	Fall Time			--	0.11	--	
Eon	Turn−On Switching Loss per Pulse			--	1.9	--	mJ
Eoff	Turn Off Switching Loss per Pulse			--	6.8	--	
td(on)	Turn−On Delay Time	V_{CE}=400V,I_C=100A, V_{GE}= −5 V to +15 V, Rgon=25Ω,Rgoff=50Ω, Inductive Load, T_j=150°C		--	0.14	--	μs
tr	Rise Time			--	0.03	--	
td(off)	Turn−off Delay Time			--	0.91	--	
tf	Fall Time			--	0.08	--	
Eon	Turn−on Switching Loss per Pulse			--	5.7	--	mJ
Eoff	Turn Off Switching Loss per Pulse			--	6.9	--	
RthJC	Thermal resistance	Junction-to-Case (per IGBT)		--	0.35	--	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.

Diode（D1、D2、D3、D4）

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

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	200	A

Characteristics（Tc=25℃ unless otherwise noted）

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 100 A, T_J = 25°C	--	1.40	1.95	V
		I_F = 100 A, T_J = 150°C	--	1.20	--	
T_{rr}	Reverse Recovery Time	V_{CE}=400V,I_F=100A, V_{GE}= −5 V to +15 V, Rgon=25Ω,Rgoff=50Ω, Inductive Load, T_j=25°C	--	0.64	--	μs
I_{RRM}	Peak Reverse Recovery Current		--	100	--	A
Q_{rr}	Recovered Charge		--	3.6	--	μC
E_{rec}	Reverse Recovery Energy		--	1.4	--	mJ
T_{rr}	Reverse Recovery Time	V_{CE}=400V,I_F=100A, V_{GE}= −5 V to +15 V, Rgon=25Ω,Rgoff=50Ω, Inductive Load, T_j=150°C	--	0.164	--	μs
I_{RRM}	Peak Reverse Recovery Current		--	104.1	--	A
Q_{rr}	Recovered Charge		--	9.0	--	μC
E_{rec}	Reverse Recovery Energy		--	2.14	--	mJ
R_{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.40	--	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.

Diode（D5、D6）

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

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	200	A

Characteristics（Tc=25℃ unless otherwise noted）

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 100 A, T_J = 25°C	--	1.30	1.85	V
		I_F = 100 A, T_J = 150°C	--	1.35	--	
T_{rr}	Reverse Recovery Time	V_{CE}=400V V_{GE}= −5 V to +15 V I_F=100A,R_g=5Ω T_{vj}=25°C	--	0.13	--	μs
I_{RRM}	Peak Reverse Recovery Current		--	93.5	--	A
Q_{rr}	Recovered Charge		--	4.9	--	μC
Erec	Reverse Recovery Energy		--	1.45	--	mJ
T_{rr}	Reverse Recovery Time	V_{CE}=400V V_{GE}= −5 V to +15 V I_F=100A, R_g=5Ω, T_{vj}=150°C	--	0.3	--	μs
I_{RRM}	Peak Reverse Recovery Current		--	89.9	--	A
Q_{rr}	Recovered Charge		--	10.3	--	μC
Erec	Reverse Recovery Energy		--	2.64	--	mJ
R_{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.30	--	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.

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(typical)
T_{vj}=25°C

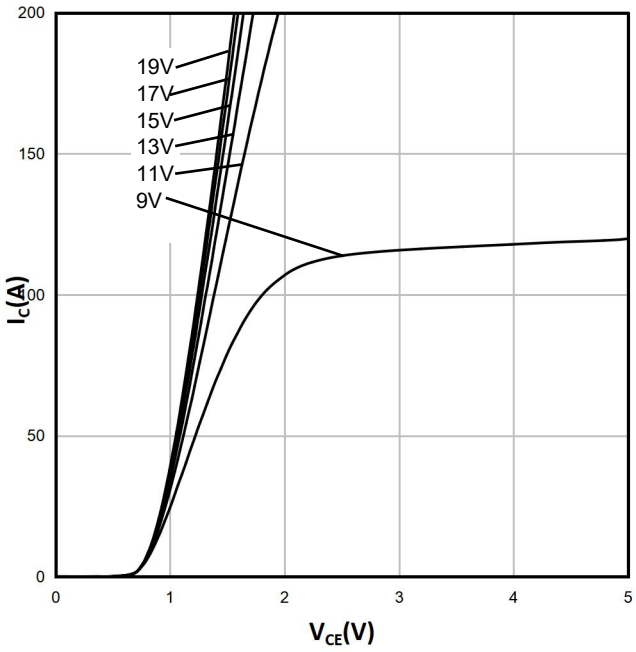


Figure2.output characteristic IGBT(typical)
T_{vj}=150°C

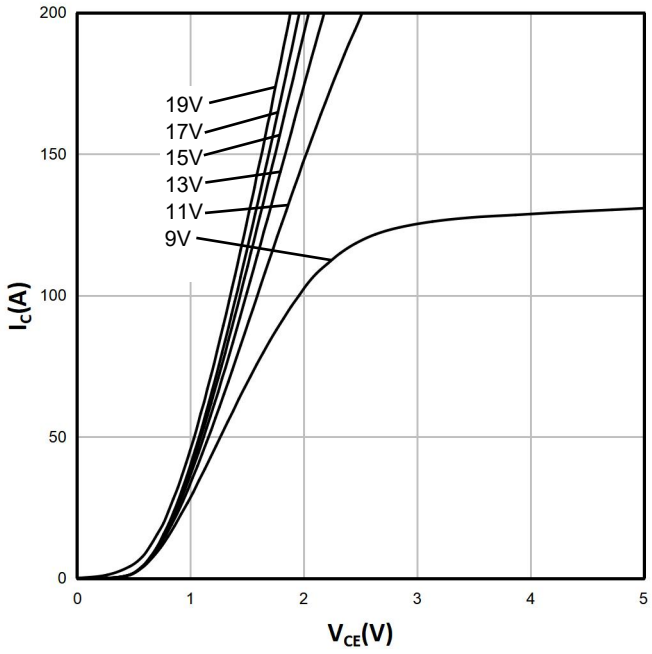


Figure3. $V_{CE(sat)}$ vs. Temperature

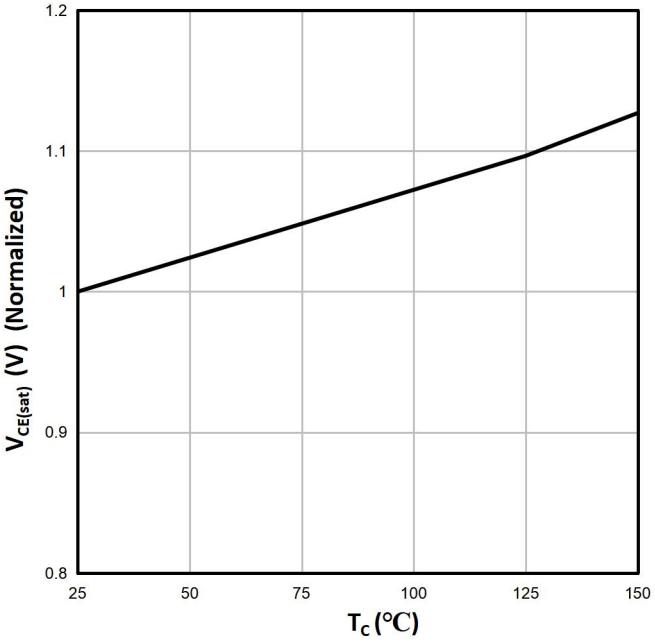


Figure4.transfer characteristic IGBT(typical)
V_{CE}=20V

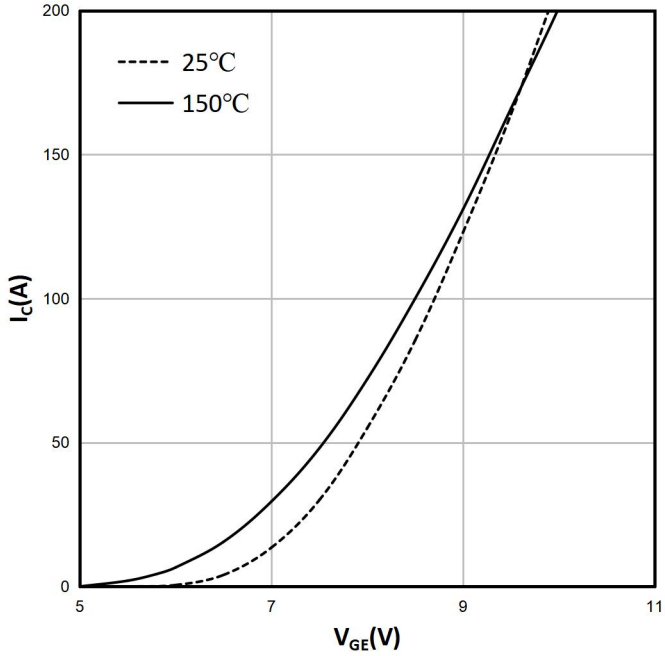


Figure5. V_{TH} vs. Temperature

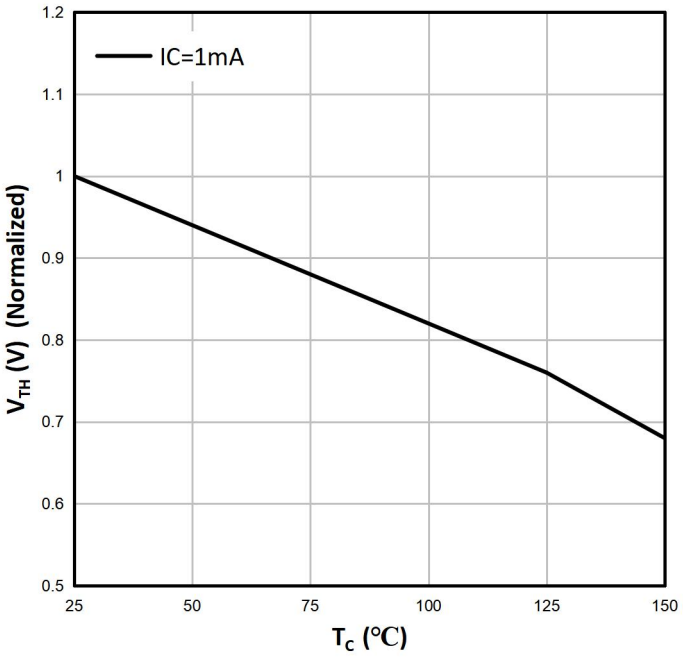


Figure6. Gate Charge Waveform

VCC=400V,IC=100A,VGE=15V

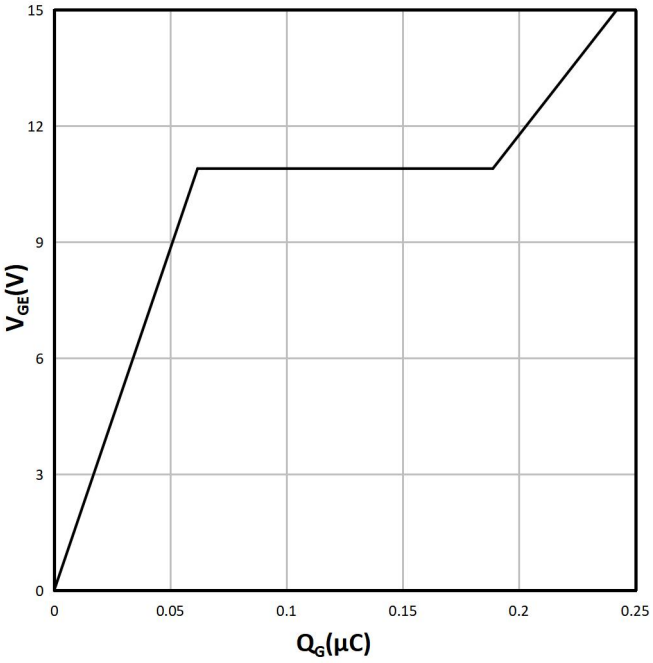


Figure7.switching losses IGBT(typical)（T1，T4）

Vcc=400V,Rgon=25Ω,Rgoff=50Ω,Vge=15V/-5V

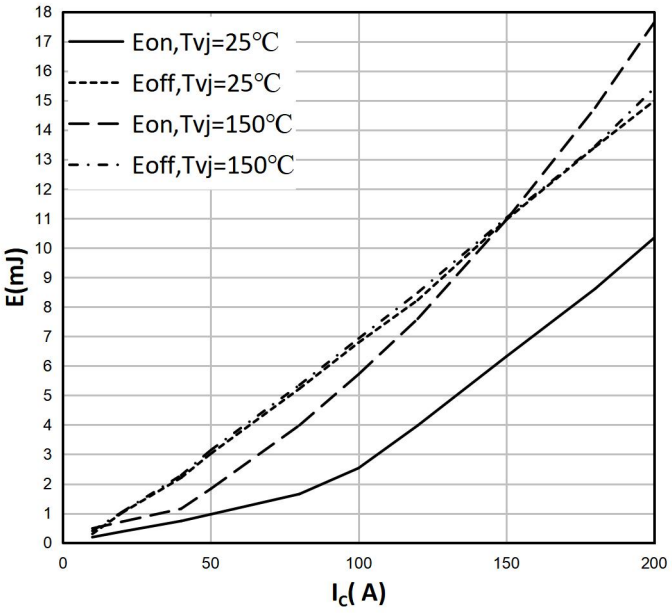


Figure8.switching losses IGBT(typical)（T1，T4）

Vcc=400V,IC=100A,Vge=15V/-5V

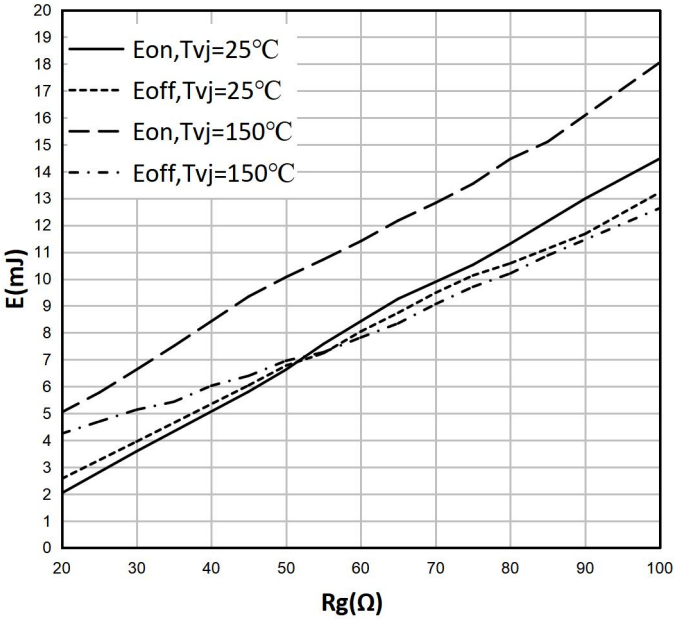


Figure9.switching losses IGBT(typical)（T2，T3）

Vcc=400V,Rgon=25Ω,Rgoff=50Ω,Vge=15V/-5V

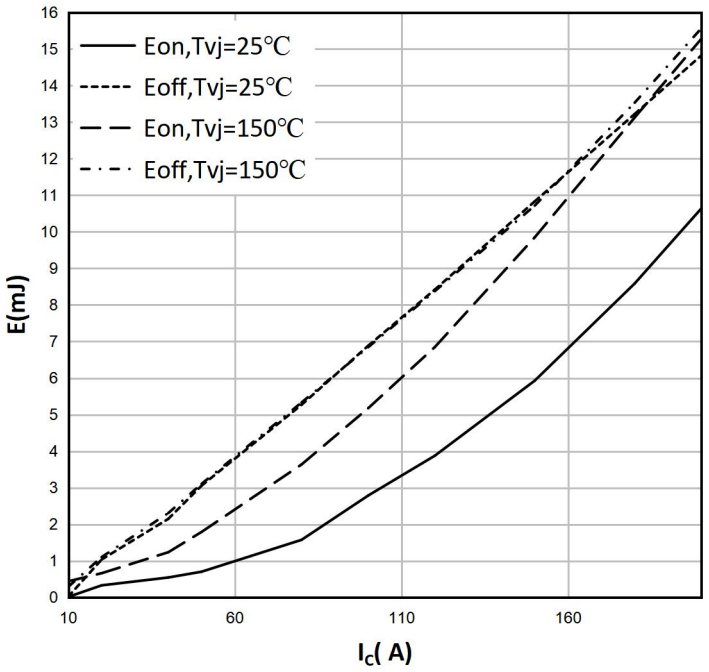


Figure10.switching losses IGBT(typical)（T2，T3）

Vcc=400V,IC=100A,Vge=15V/-5V

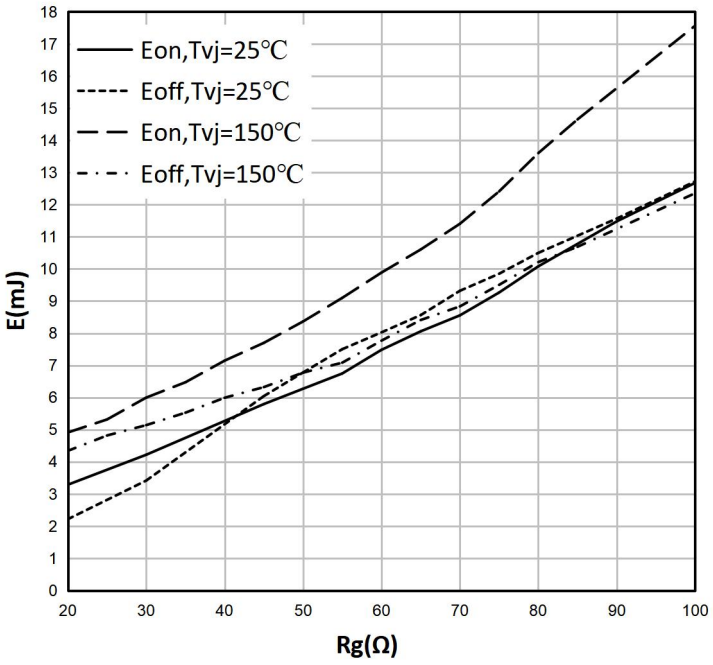


Figure11. FBSOA IGBT(typical)（T1，T2，T3，T4）

D=0, Tc=25℃,Tj<=175℃,Vge=15V

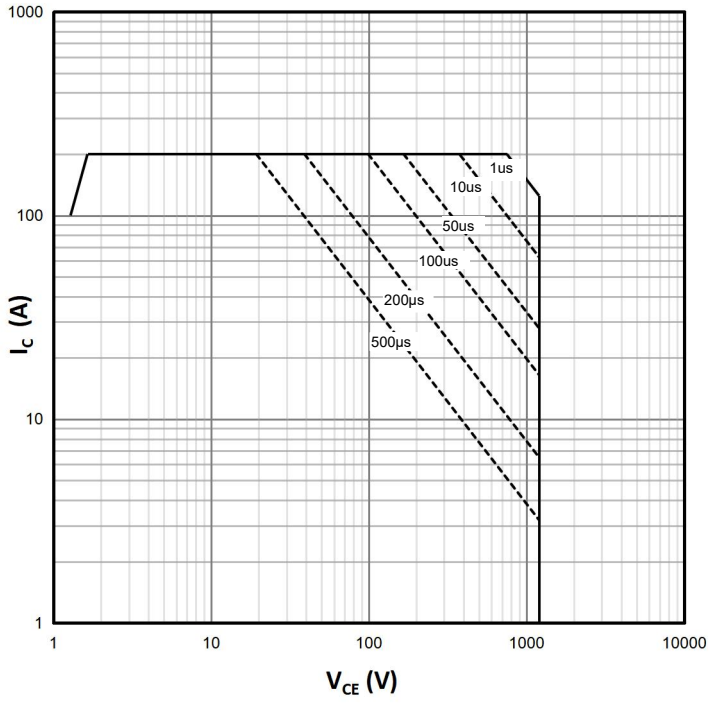


Figure12. transient thermal impedance IGBT(typical)（T1，T2，T3，T4）

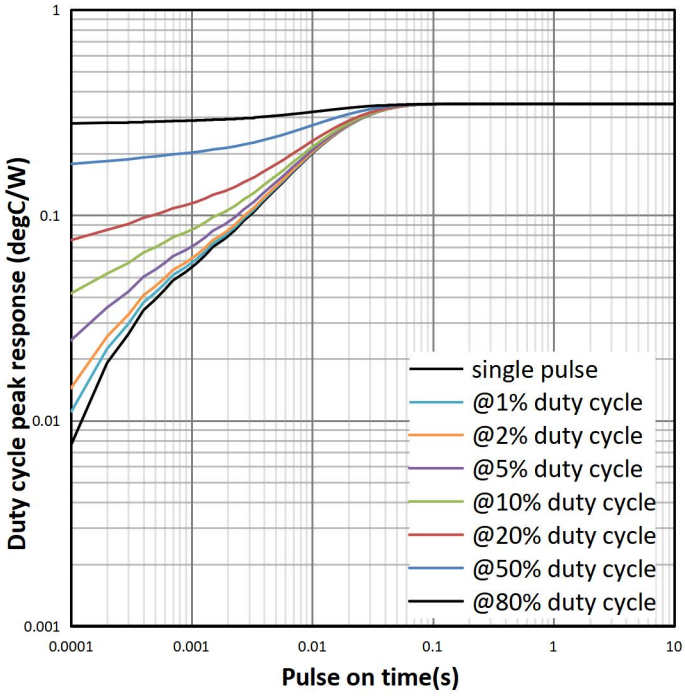


Figure13. forward characteristic of Diode (typical)
（D1，D2，D3，D4）

V_{GE}=0V

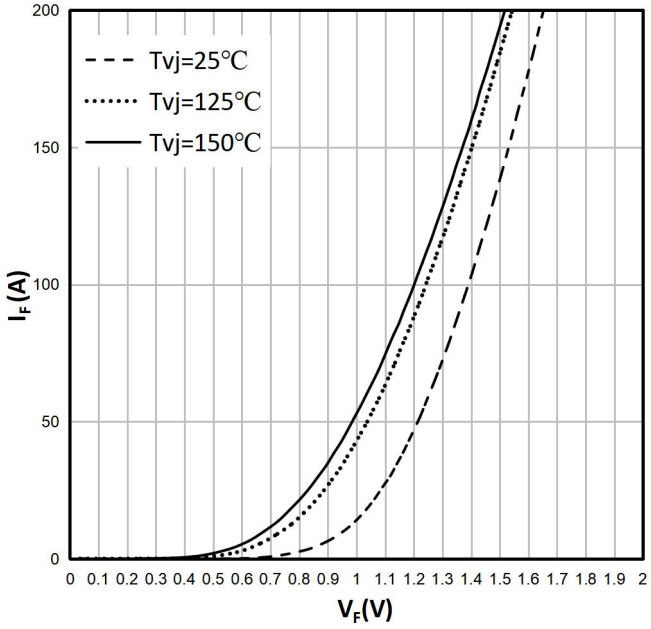


Figure14. forward characteristic of Diode (typical)
（D5，D6）

V_{GE}=0V

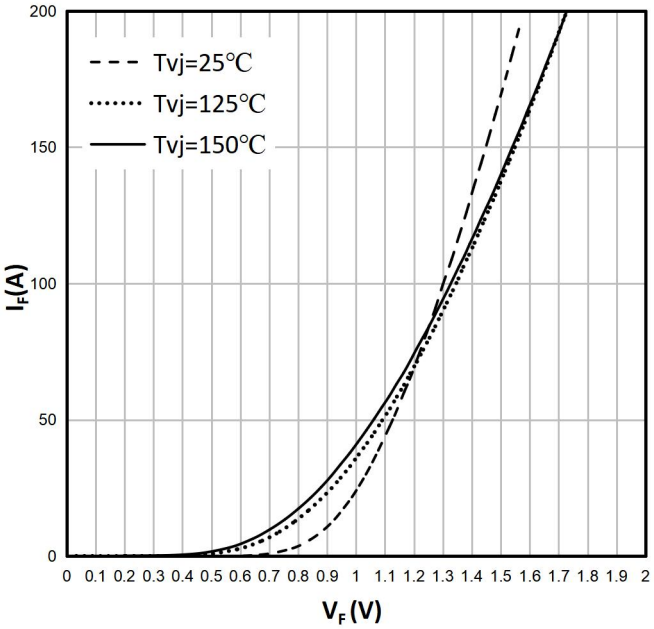


Figure15.Reverse Recovery Energy Loss vs.vs. RG
（D1，D4）

Vcc=400V,IC=100A,Vge=15V/-5V

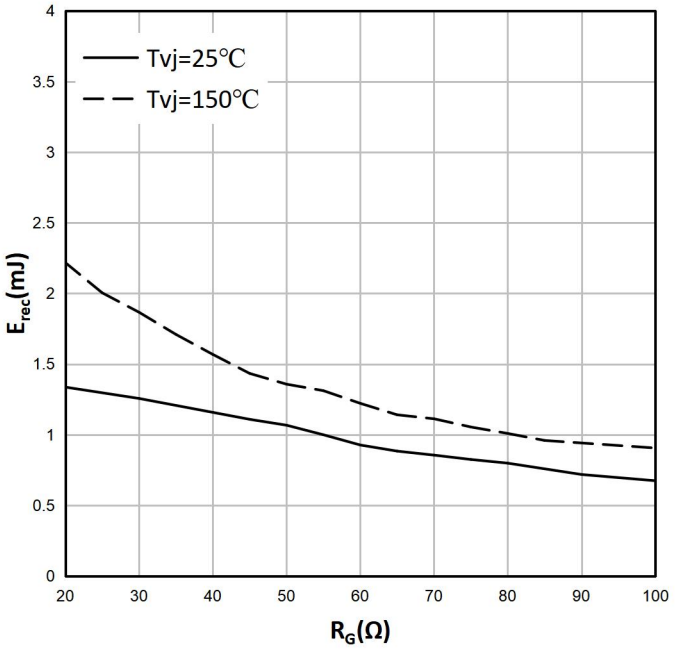


Figure16.Reverse Recovery Energy Loss vs. IC
（D1，D4）

Vcc=400V,Rg=25Ω,Vge=15V/-5V

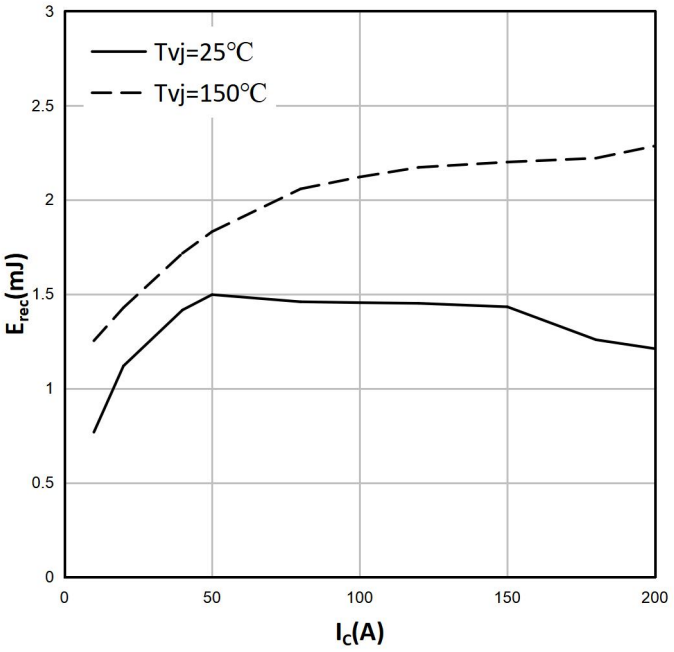


Figure17.Reverse Recovery Energy Loss vs.vs. RG（D2，D3）

Vcc=400V,IC=100A,Vge=15V/-5V

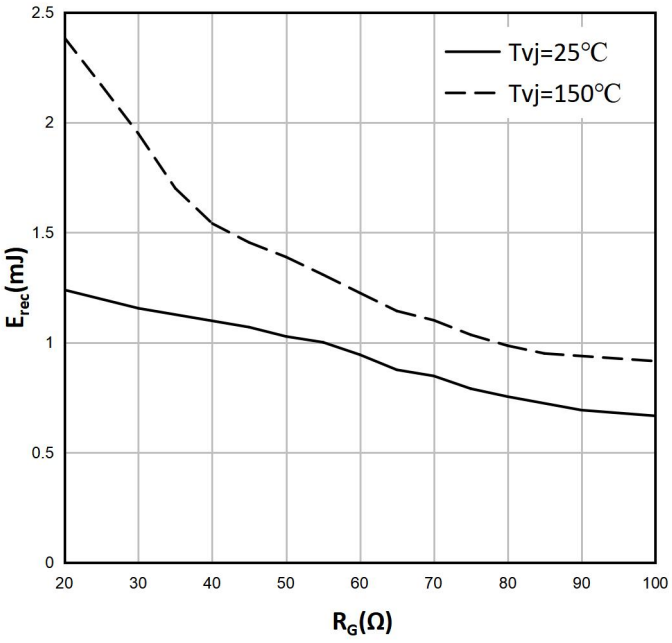


Figure18.Reverse Recovery Energy Loss vs. IC（D2，D3）

Vcc=400V,Rg=25Ω,Vge=15V/-5V

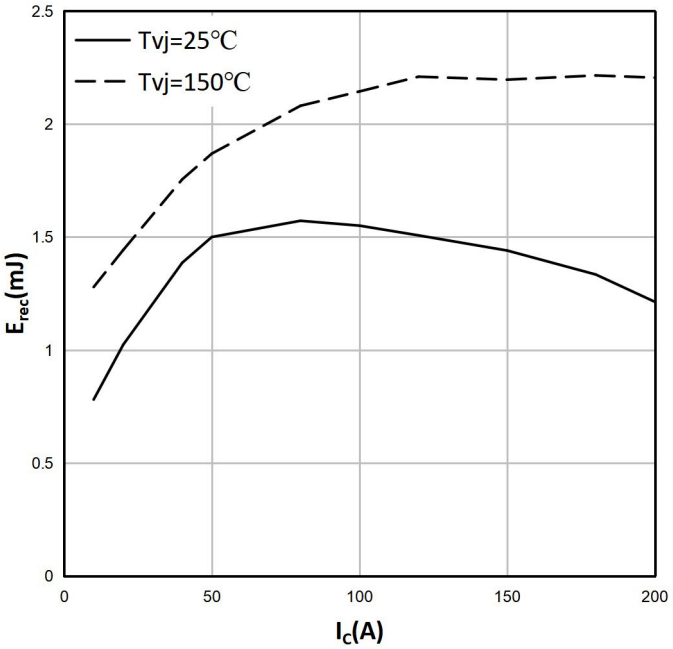


Figure19.Reverse Recovery Energy Loss vs.vs. RG（D5，D6）

Vcc=400V,IC=100A,Vge=15V/-5V

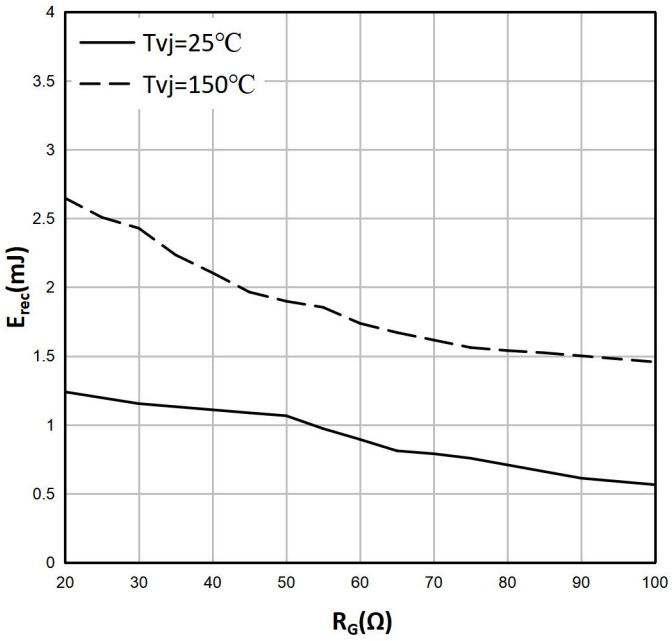


Figure20.Reverse Recovery Energy Loss vs.vs. RG（D5，D6）

Vcc=400V,IC=100A,Vge=15V/-5V

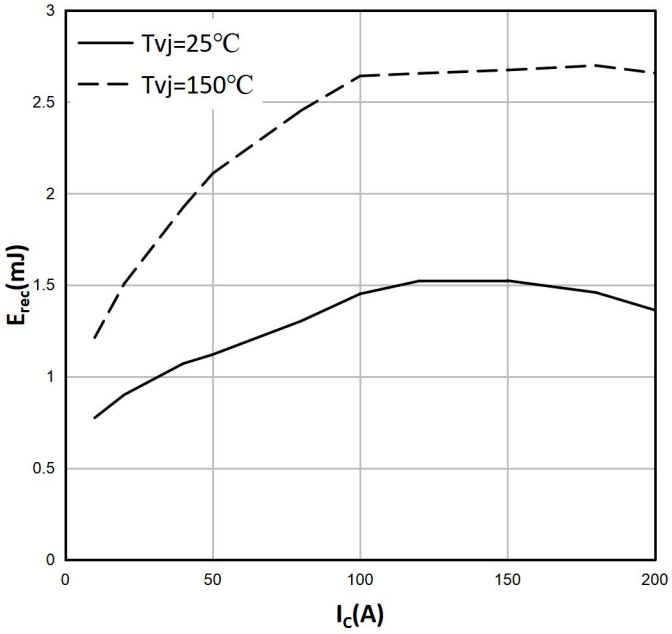


Figure21. transient thermal impedance FRD, (typical)（D1，D2，D3，D4）

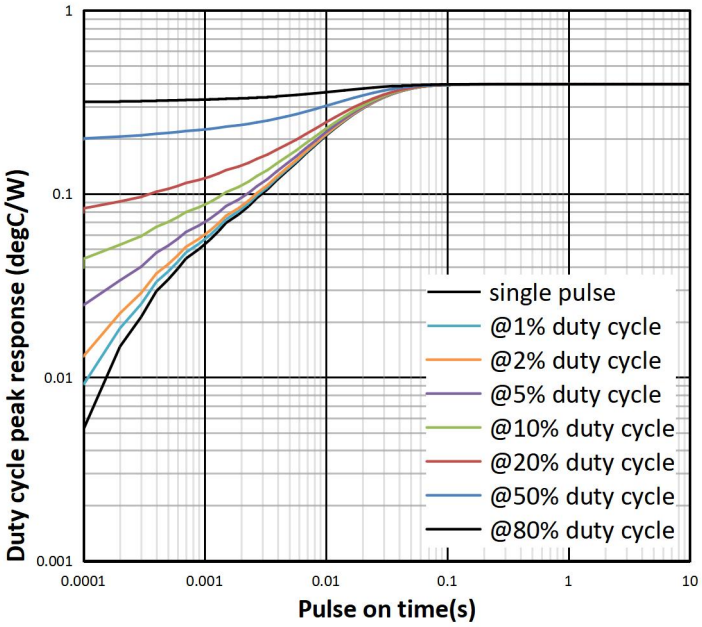
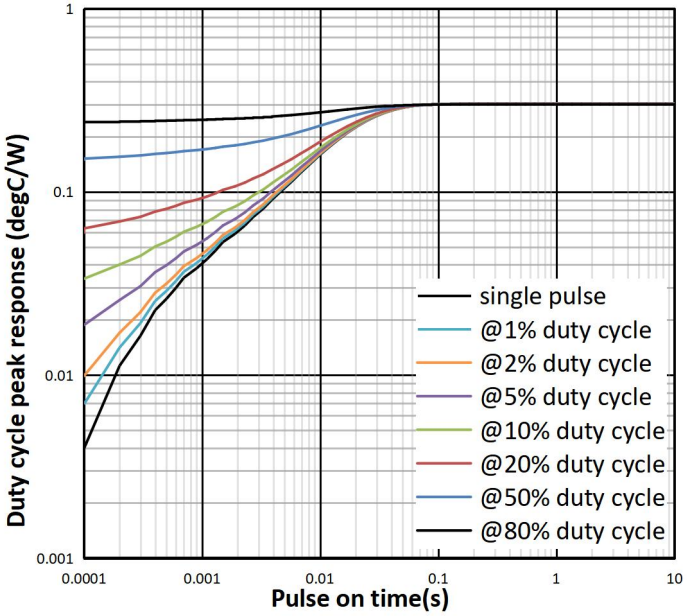
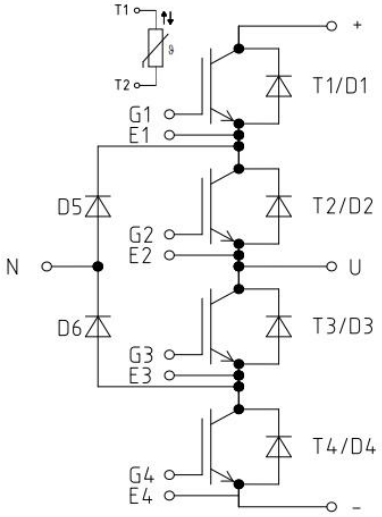


Figure22. transient thermal impedance FRD, (typical)（D5，D6）

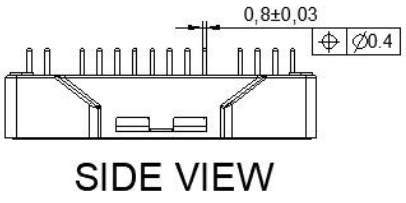


CIRCUIT DIAGRAM

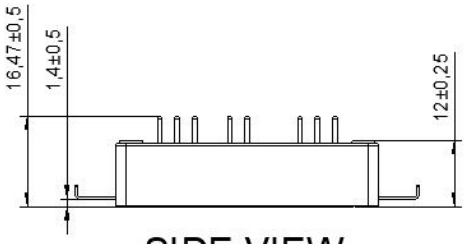


PACKAGE DIMENSION

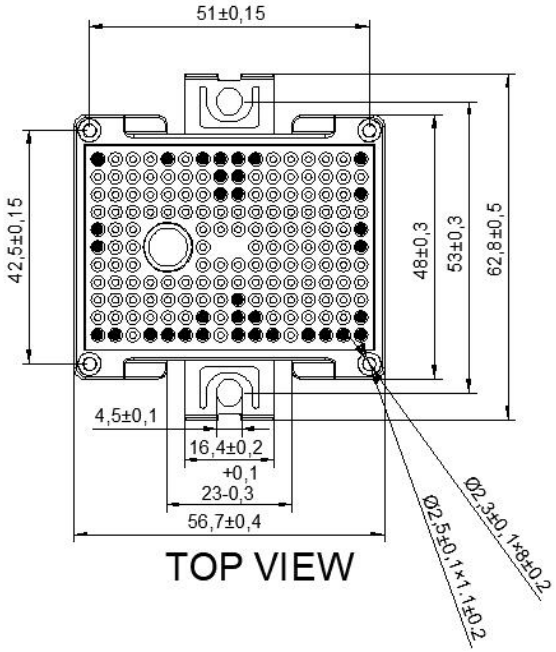
Dimensions in Millimeters



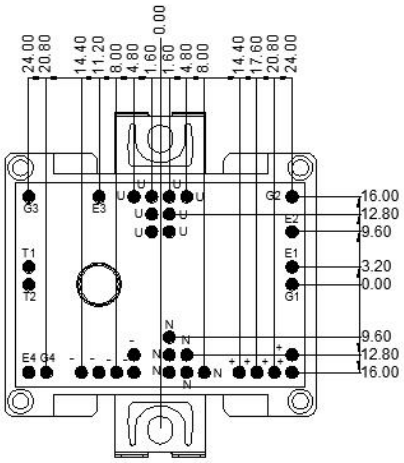
SIDE VIEW



SIDE VIEW



TOP VIEW



REVISION HISTORY

Document version	Date of release	Description of changes
Rev.00	2024-06-07	Preview

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