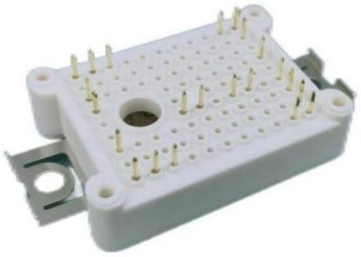
JLFF60B65RE1E7SN

LE1 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

RoHS

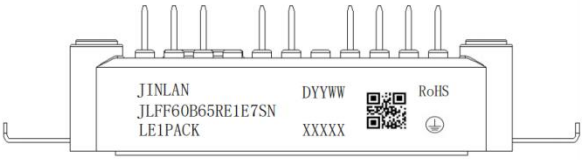
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- 5μs short circuit capability
- Al_2O_3 substrate with low thermal resistance
- Solder Contact Technology



LE1 Pack

MARKING DIAGRAM

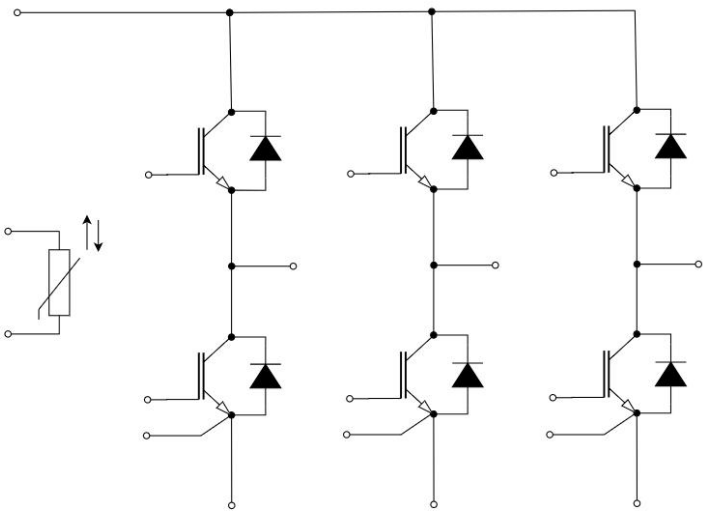


Typical Applications

- Air Conditioning
- Motor Drives
- Servo Drives
- UPS Systems

JINLAN	= Company Name
JLFF60B65RE1E7SN	= Specific Device Code
YYWW	= Year and Work Week Code
XXXXX	= Serial Number
QR code	= Custom Assembly

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS,f = 50 Hz,t = 60 s	2.5	kV
Internal isolation		basic insulation(class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{creep}	terminal to terminal	6.3	mm
Clearance	d_{clear}	terminal to heatsink	10.0	mm
Clearance	d_{clear}	terminal to terminal	5.0	mm
Comparative tracking index (electrical)	CTI		>200	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{CE}			--	25	--	nH
Storage temperature	T_{stg}			-40	--	125	°C
Mounting torque for module mounting	M	Mounting according to valid application note	M5, Screw	40	--	80	Nm
Weight	G			--	24	--	g

IGBT

Absolute Maximum Ratings (T_c = 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 @ Tc = 100 °C	60	A
I_{CM}	Pulsed Collector Current，t_p limited by $T_{vj\ max}$	120	A
P_{tot}	Total power dissipation, T_C = 25 °C, $T_{vj\ max}$ = 175 °C	227	W

Characteristics （T_c=25℃ unless otherwise noted）

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	I_C=60 A,V_{GE} = 15 V	T_{vj} = 25 °C	--	1.90	2.70	V
			T_{vj} = 150 °C	--	2.35	--	
$V_{GE(TH)}$	Gate−Emitter Threshold Voltage	I_C=1 mA,V_{CE}=V_{GE}		4	5.2	6	V
I_{CES}	Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 650 V		--	--	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±30 V, V_{CE} = 0 V, T_{vj} = 25 °C		--	--	400	nA
R_{Gint}	Internal Gate Resistance	f=1 MHz		--	1.29	--	Ω
C_{ies}	Input Capacitance	V_{CE}=25 V,V_{GE}=0 V, f=1 MHz		--	7.37	--	nF
C_{oes}	Output Capacitance			--	0.243	--	nF
C_{res}	Reverse Transfer			--	0.116	--	nF
Q_G	Gate Charge	V_{CC}=480V,I_C=60A,V_{GE}=15V		--	0.24	--	uC
$t_{d(on)}$	Turn−On Delay Time	V_{CC}=400V,I_C=60A, V_{GE}=±15V, R_g=10Ω, Inductive Load T_{vj} = 25 °C		--	44	--	ns
t_r	Rise Time			--	37	--	
$t_{d(off)}$	Turn−off Delay Time			--	201	--	
t_f	Fall Time			--	17	--	
E_{on}	Turn−On Switching Loss per Pulse			--	1.53	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	0.88	--	
$t_{d(on)}$	Turn−On Delay Time	V_{CC}=400V,I_C=60A, V_{GE}=±15V, R_g=10Ω, Inductive Load T_{vj} = 150 °C		--	40	--	ns
t_r	Rise Time			--	48	--	
$t_{d(off)}$	Turn−off Delay Time			--	252	--	
t_f	Fall Time			--	25	--	
E_{on}	Turn−on Switching Loss per Pulse			--	2.04	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	1.19	--	
$I_{C(SC)}$	Short circuit collector curren	V_{GE}=15V,V_{CC}=400V, t_{SC}≤5us,T_{vj} ≤150°C		--	221	--	A
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.596	--	K/W
$T_{vj\ op}$	Temperature under switching conditions			-40		175[1)]	°C

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

Diode

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	60	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	120	A

Characteristics （Tc=25℃ unless otherwise noted）

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 60 A, T_{vj} = 25 °C	--	1.80	2.60	V
		I_F =60 A, T_{vj} = 150 °C	--	1.55	--	
I_{RM}	Peak Reverse Recovery Current	I_F=60 A,R_G=10 Ω T_{vj} = 25 °C	--	44.8	--	A
Q_{rr}	Recovered Charge		--	3.75	--	μC
E_{rec}	Reverse Recovery Energy		--	1.56	--	mJ
I_{RM}	Peak Reverse Recovery Current	I_F=60 A,R_G=10 Ω T_{vj} = 150 °C	--	47.2	--	A
Q_{rr}	Recovered Charge		--	5.08	--	μC
E_{rec}	Reverse Recovery Energy		--	1.94	--	mJ
R_{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.688	--	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175[2)]	°C

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 R_{100}	T_C=100 ℃,R_{100}=493.3 Ω	-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)

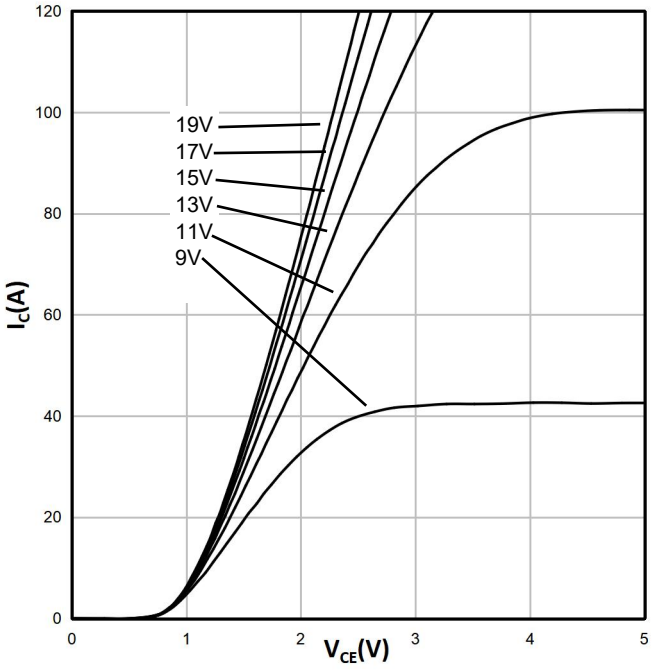


Figure2.output characteristic IGBT(typical)

T_{vj}=150°C

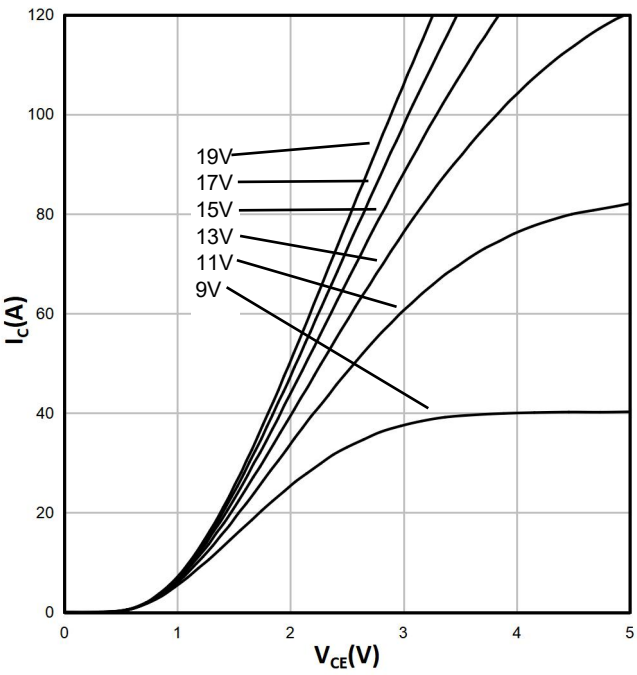


Figure3. $V_{CE(sat)}$ vs. Temperature

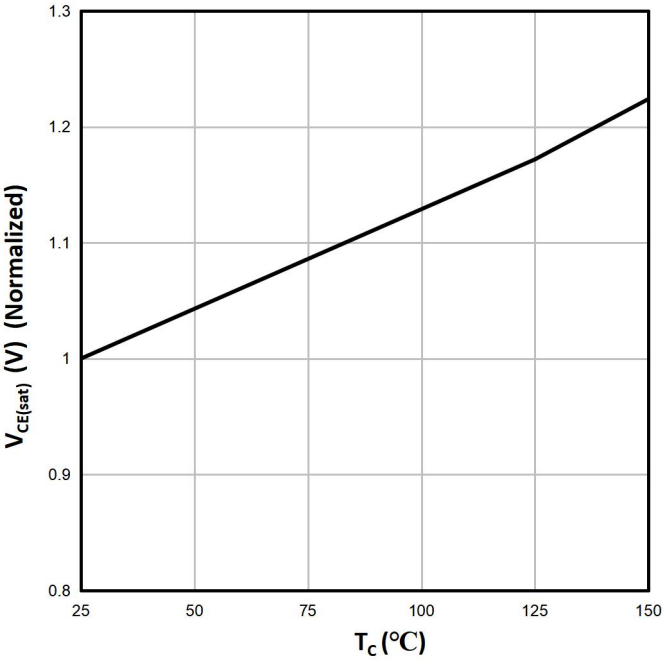


Figure4.transfer characteristic IGBT

V_{CE}=20V

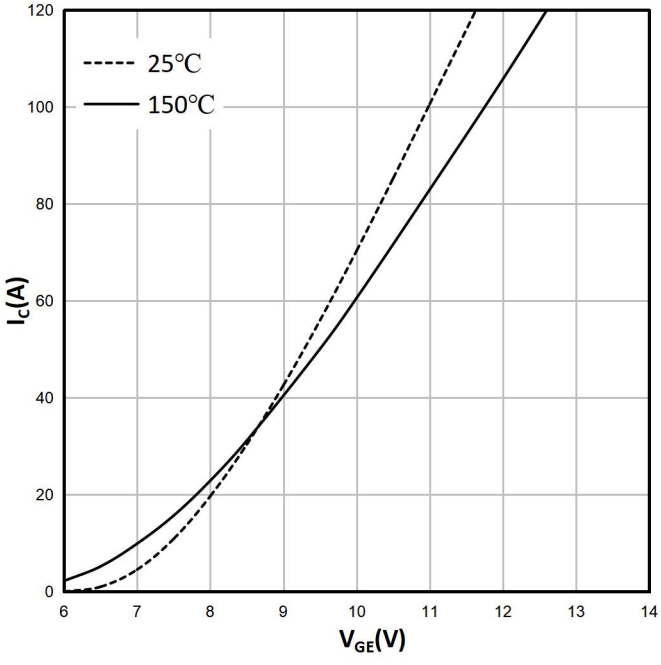


Figure5. FBSOA IGBT
D=0, Tc=25℃,Tj<=175℃,Vge=15V

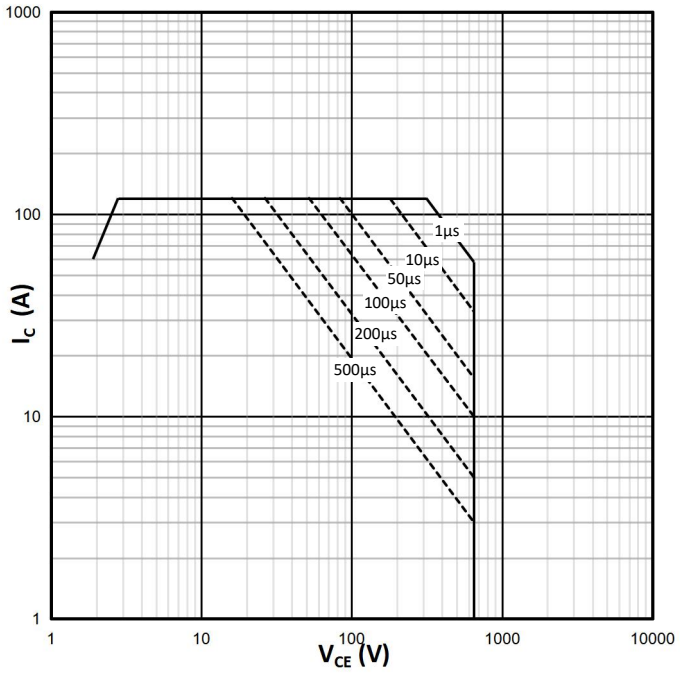


Figure6. Gate Charge Waveform
VCC=480V,IC=60A,VGE=15V

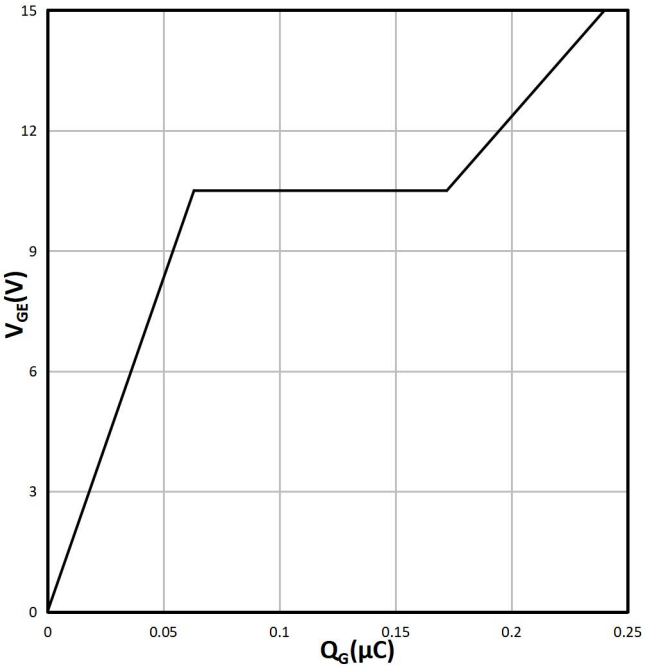


Figure7.switching losses IGBT(typical)
Vcc=400V,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

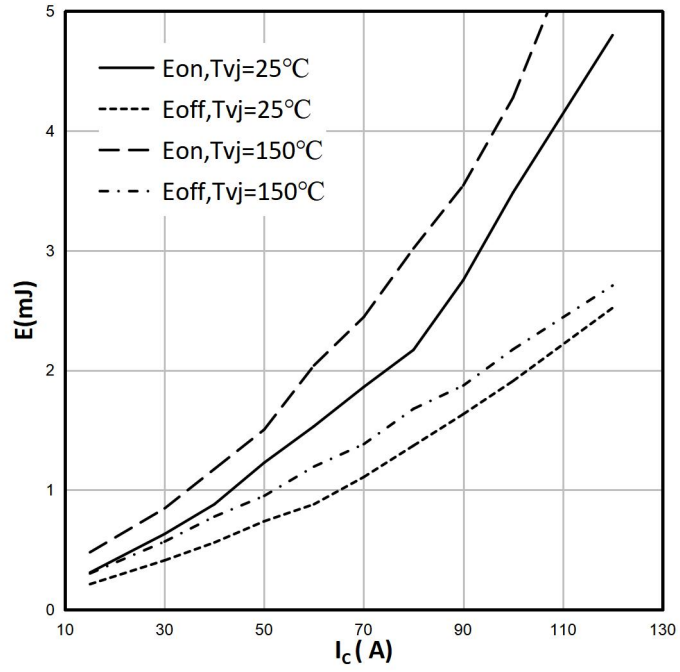


Figure 8.switching losses IGBT (typical)
Vcc=400V,Ic=60A,Vge=±15V

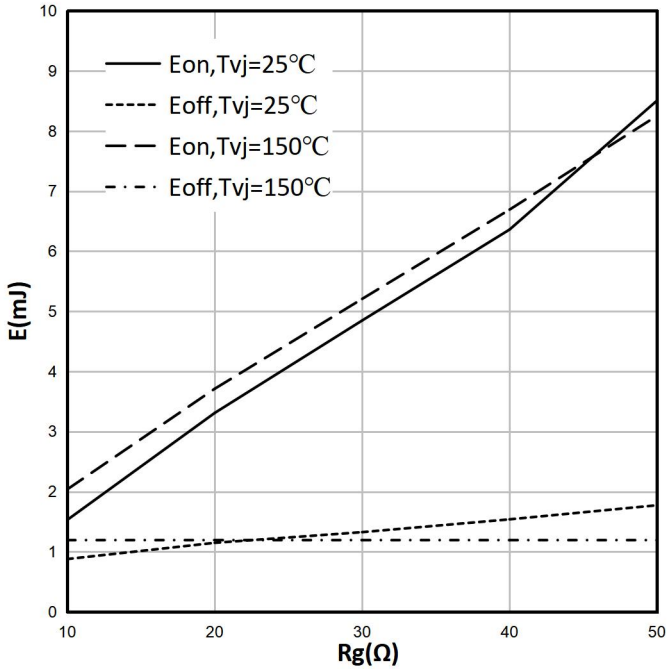


Figure9. transient thermal impedance

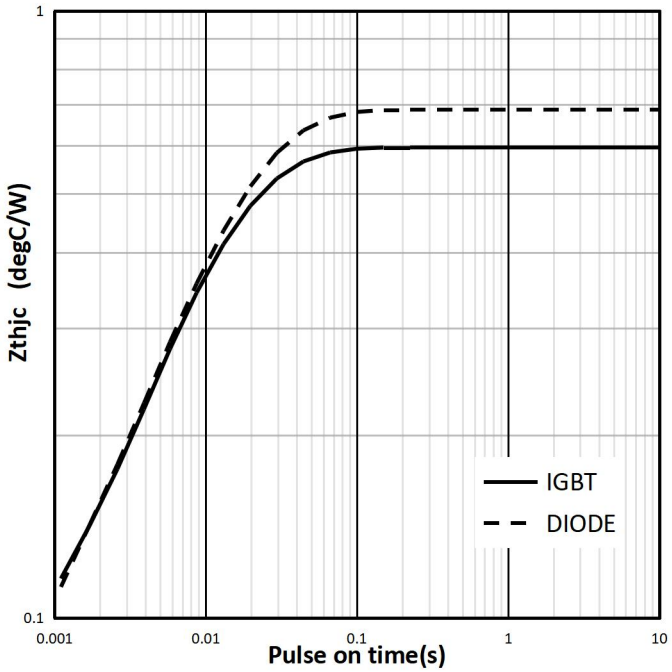


Figure10. forward characteristic of Diode(typical)

VGE=0V

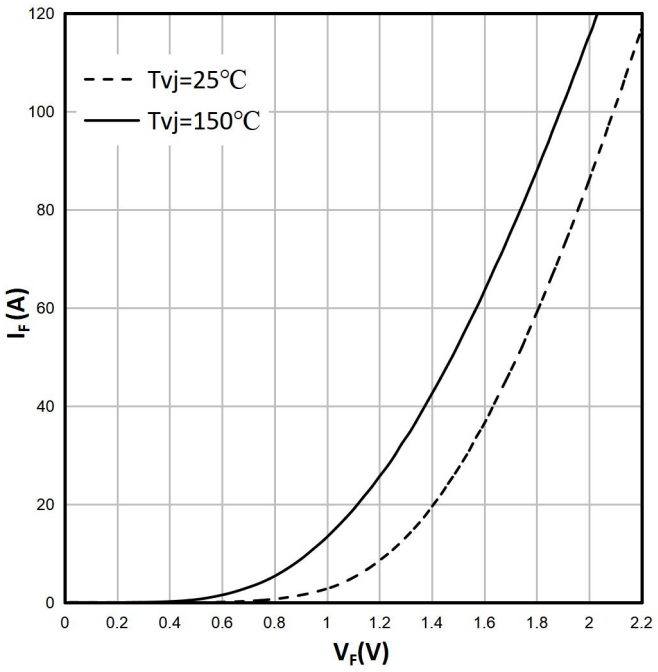


Figure11.Reverse Recovery Energy Loss vs. IC

Vcc=400V,R_{Gon} =10Ω, R_{Goff} =10Ω,Vge=±15V

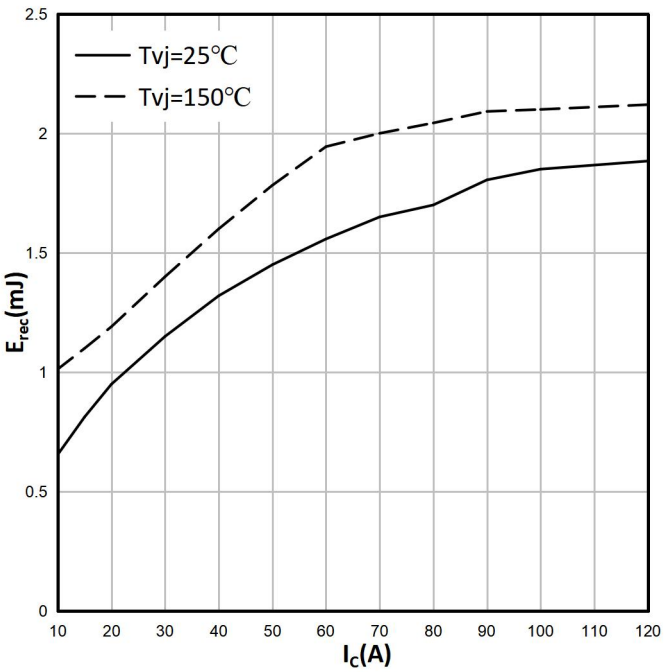
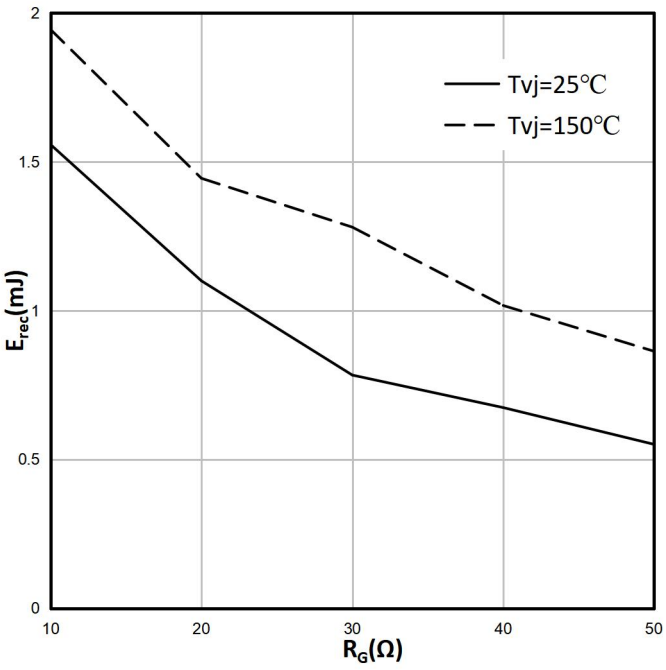
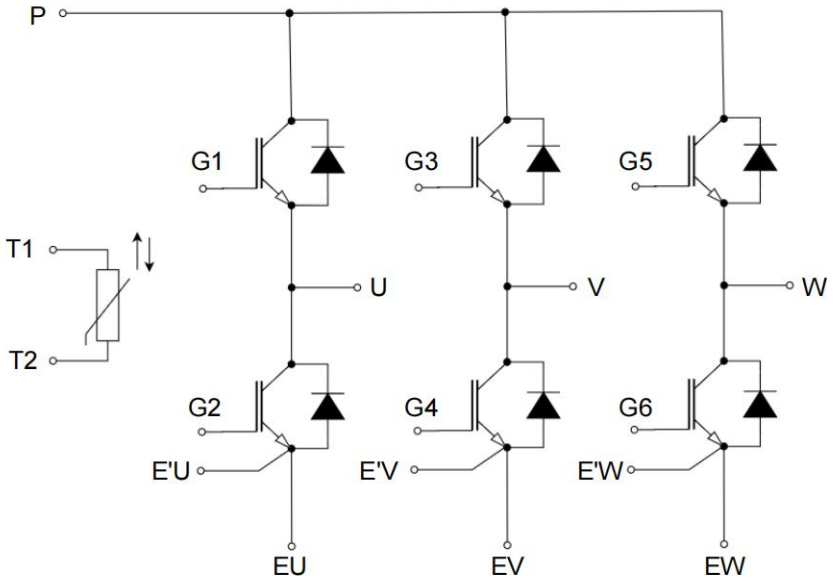


Figure12.Reverse Recovery Energy Loss vs.RG

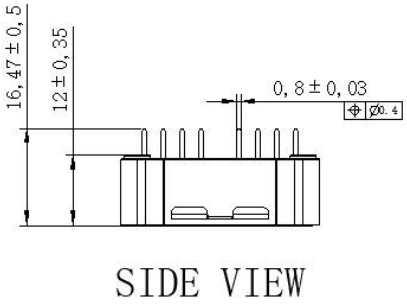
Vcc=400V,Ic=60A,,Vge=±15V

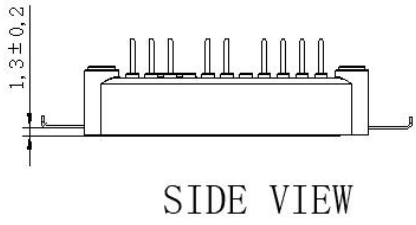


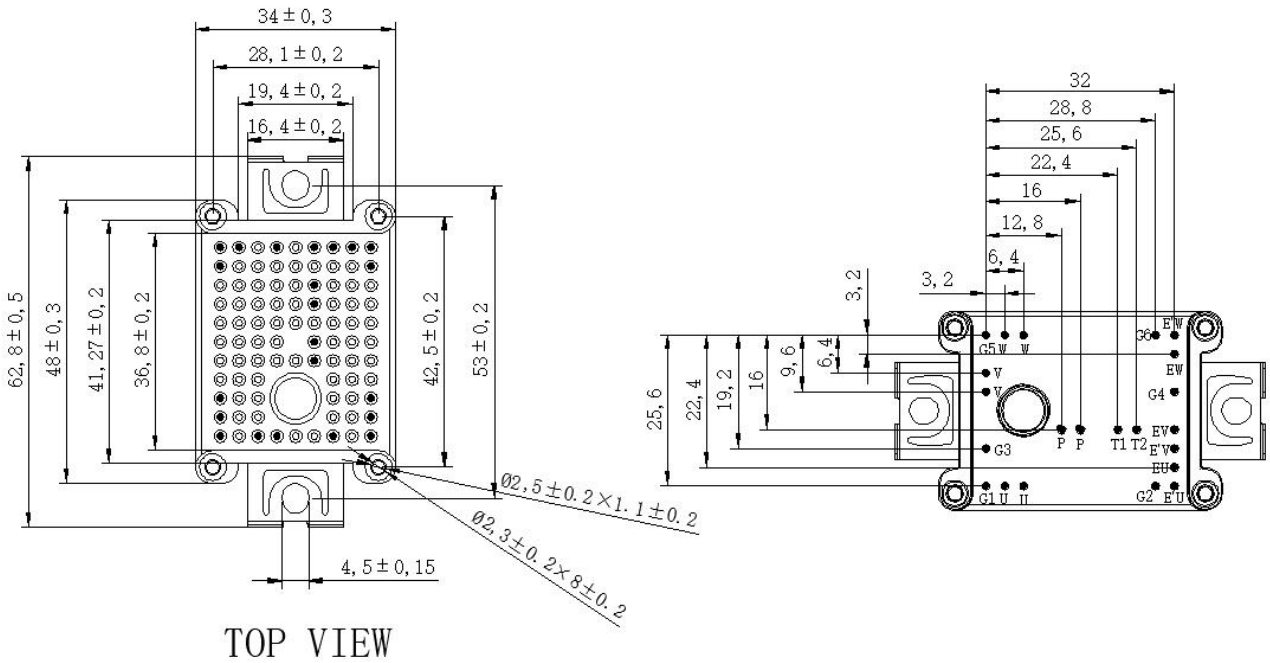
CIRCUIT DIAGRAM



PACKAGE DIMENSION







REVISION HISTORY

Document version	Date of release	Description of changes
Rev.00	2024-10-18	Preview
Rev.01	2025-05-12	Add Charts

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