



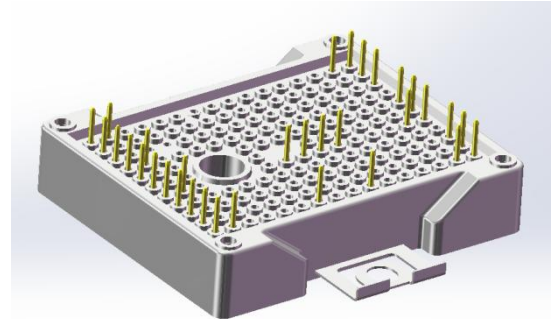
JLAFF50B120RE2E7SN

LE2 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC



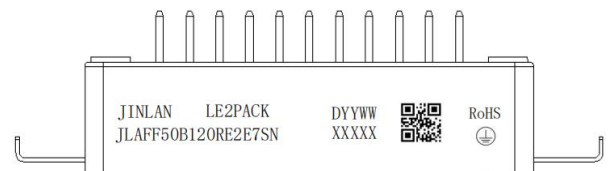
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Overload operation up to 175 $^{\circ}$ C
- Low inductance case
- Isolated heatsink using DBC technology
- High power density



LE2 Pack

MARKING DIAGRAM

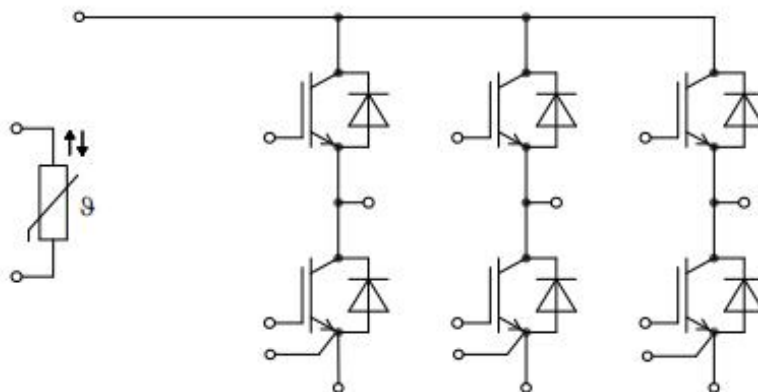


Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply
- Air Conditioning
- UPS Systems

JINLAN	= Company Name
JLAFF50B120RE2E7SN	= 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	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	mm
Clearance	d_{clear}	terminal to terminal	5	mm
Comparative tracking index (electrical)	CTI		>200	

Package Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray Inductance	LCE		--	40	--	nH
Module Lead Resistance, Terminal to Chip	RCC'+EE'		--	4.00	--	mΩ
Storage Temperature Range	T _{STG}		-40		125	°C
Mounting force per clamp	F		40	--	80	N
Weight	G			41.2		g

**IGBT****Absolute Maximum Ratings** ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 25	V
I_c	Collector Current @ $T_c=25^\circ\text{C}$	100	A
	Collector Current @ $T_c=100^\circ\text{C}$	50	A
I_{CM}	Pulsed Collector Current, t_p limited by $T_{vj\max}$	100	A
$T_{j\max}$	Maximum Junction Temperature	175	$^\circ\text{C}$
P_D	Power Dissipation @ $T_c = 25^\circ\text{C}$	270	W
	Power Dissipation @ $T_c = 100^\circ\text{C}$	108	W

Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}, I_c = 50\text{ A}, T_{vj} = 25^\circ\text{C}$	--	1.80	2.20	V
		$V_{GE} = 15\text{ V}, I_c = 50\text{ A}, T_{vj} = 125^\circ\text{C}$	--	1.95	--	
		$V_{GE} = 15\text{ V}, I_c = 50\text{ A}, T_{vj} = 150^\circ\text{C}$	--	2.00	--	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_c = 1\text{ mA}, T_{vj} = 25^\circ\text{C}$	5.0	6.0	7.0	V
I_{CES}	Collector-Emitter Cutoff Current	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}, T_{vj} = 25^\circ\text{C}$	--	--	200	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}, T_{vj} = 25^\circ\text{C}$	--	--	200	nA
R_{Gint}	Internal Gate Resistance		--	1.27	--	Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz},$ $V_{GE}=0\text{V}$	--	5.07	--	nF
C_{res}	Reverse Transfer		--	0.13	--	nF
Q_G	Gate Charge	$V_{GE}=15\text{V}, I_c=50\text{A}$	--	0.19	--	μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_c = 50\text{ A}$ $R_{Gon} = 10\Omega, R_{Goff} = 25\Omega$ $V_{GE} = \pm 15\text{ V}$ Inductive Load $T_{vj} = 25^\circ\text{C}$	--	110	--	ns
t_r	Rise Time		--	30	--	
$t_{d(off)}$	Turn-off Delay Time		--	180	--	
t_f	Fall Time		--	190	--	
E_{on}	Turn-On Switching Loss per Pulse		--	2.83	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	4.42	--	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_c = 50\text{ A}$ $R_{Gon} = 10\Omega, R_{Goff} = 25\Omega$ $V_{GE} = \pm 15\text{ V}$ Inductive Load $T_{vj} = 125^\circ\text{C}$	--	120	--	ns
t_r	Rise Time		--	30	--	
$t_{d(off)}$	Turn-off Delay Time		--	230	--	
t_f	Fall Time		--	340	--	
E_{on}	Turn-on Switching Loss per Pulse		--	4.16	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	5.24	--	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600\text{ V}, I_c = 50\text{ A}$ $R_{Gon} = 10\Omega, R_{Goff} = 25\Omega$ $V_{GE} = \pm 15\text{ V}$ Inductive Load $T_{vj} = 150^\circ\text{C}$	--	110	--	ns
t_r	Rise Time		--	40	--	
$t_{d(off)}$	Turn-off Delay Time		--	240	--	
t_f	Fall Time		--	330	--	
E_{on}	Turn-on Switching Loss per Pulse		--	4.87	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	5.49	--	
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE} \leq 15\text{V},$ $T_{vj} = 150^\circ\text{C}, V_{CC} = 800\text{V},$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	--	130	--	A
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.42	0.489	K/W
$T_{vj\text{ op}}$		Temperature under switching conditions	-40		175 ¹⁾	$^\circ\text{C}$

¹⁾ $T_{vj\text{ op}} > 175^\circ\text{C}$ is only allowed for operation at overload conditions.



Diode

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

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	1200	V
I _F	Diode Continuous Forward Current	50	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	100	A

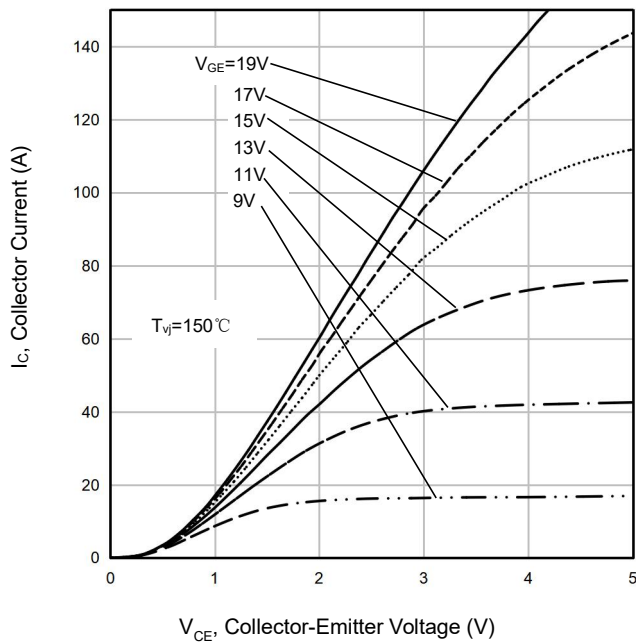
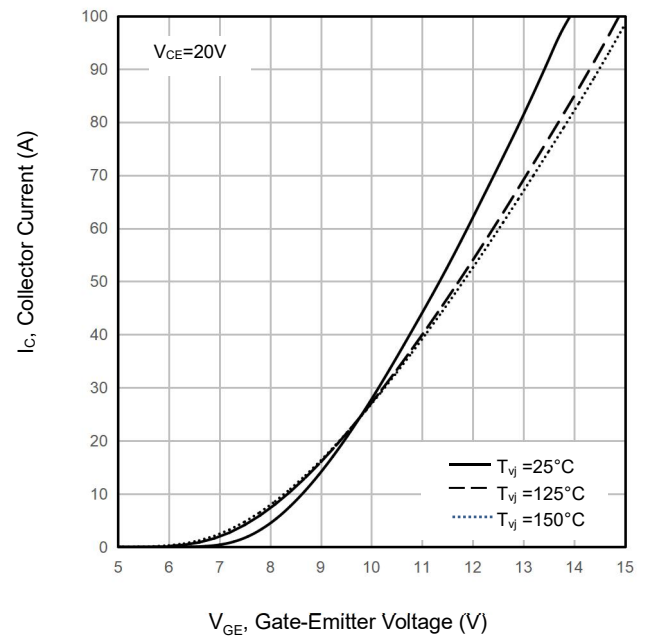
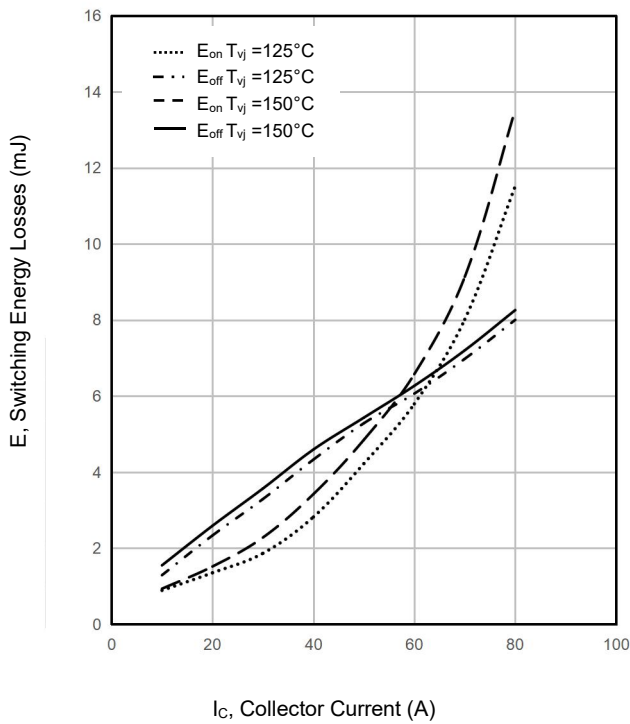
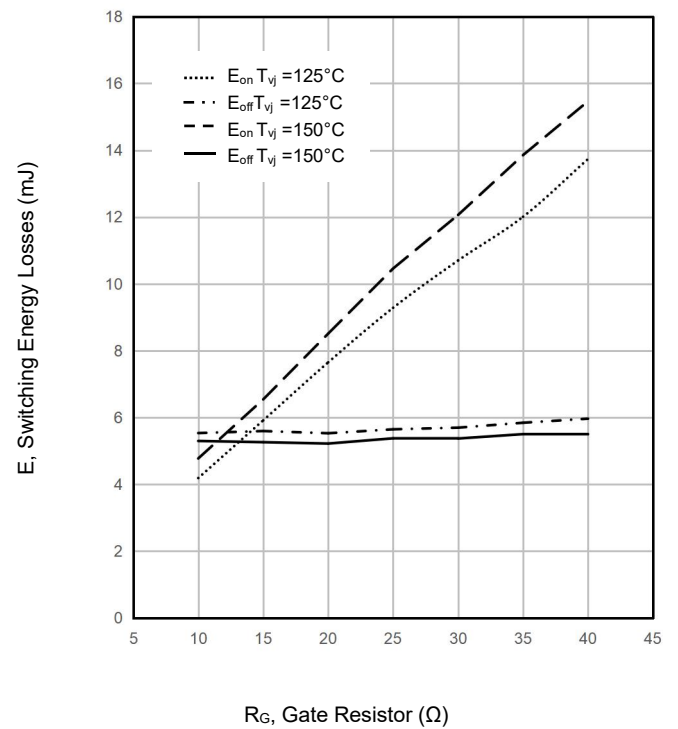
Characteristics (T_C=25°C unless otherwise noted)

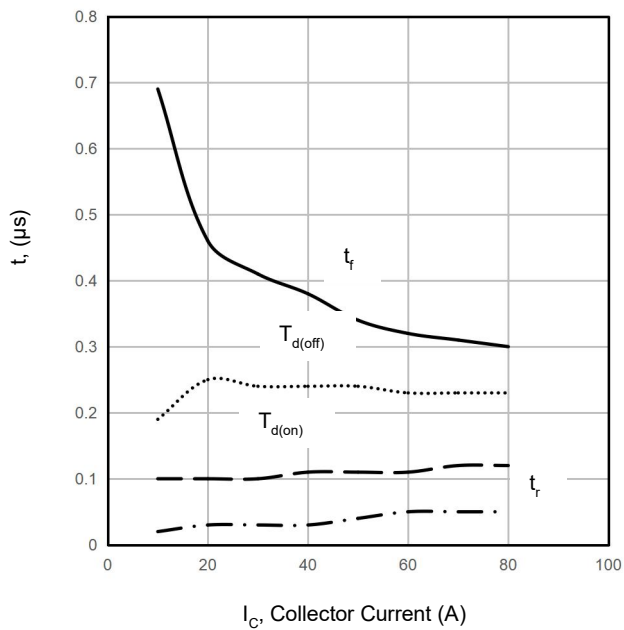
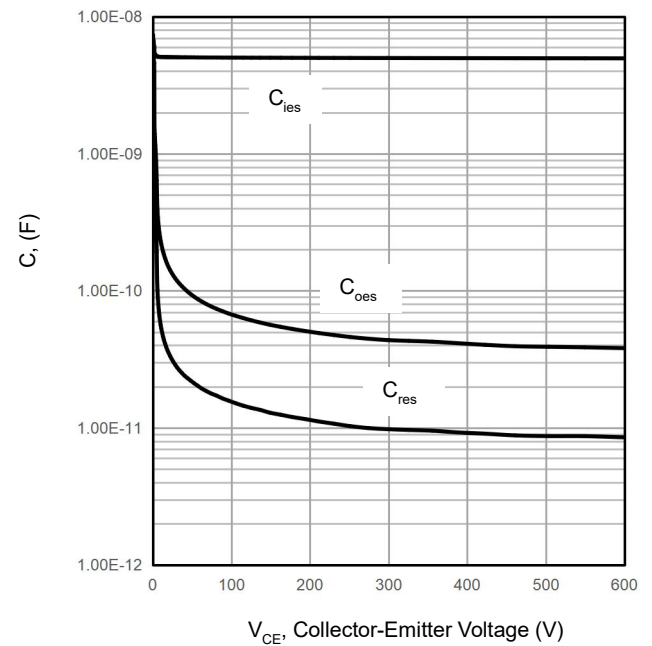
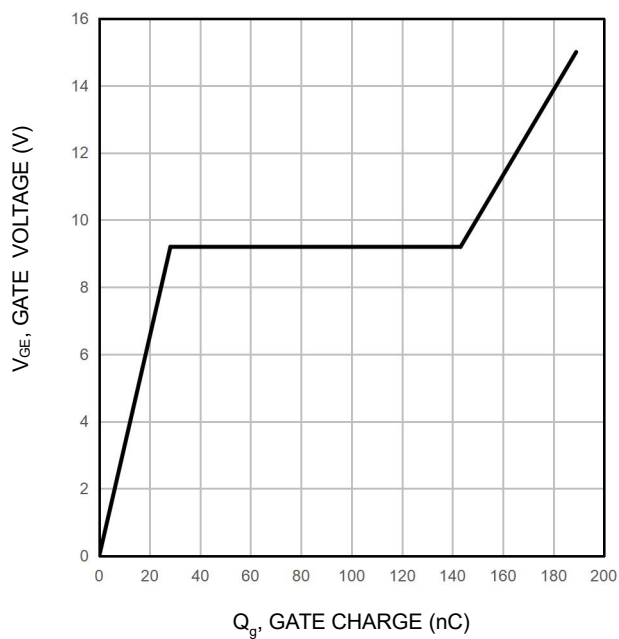
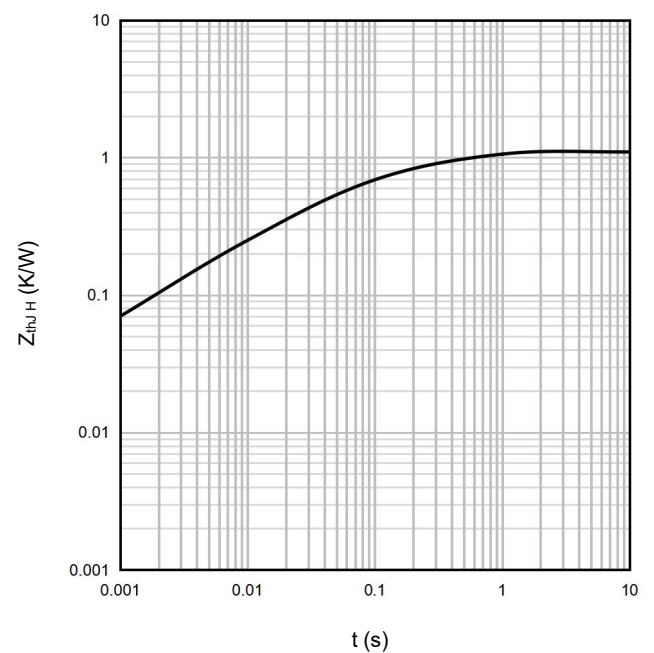
V _F	Diode Forward Voltage	I _F = 50A, V _{GE} =0V, T _{vj} = 25°C	--	1.80	2.80	V
		I _F = 50A, V _{GE} =0V, T _{vj} = 125°C	--	1.75	--	
		I _F = 50A, V _{GE} =0V, T _{vj} = 150°C	--	1.70	--	
Q _r	Recovered Charge	V _R =600V, I _F =50A, R _{Gon} = 10Ω, R _{Goff} = 25Ω, V _{GE} = ±15V , T _{vj} = 25°C	--	0.48	--	μC
IRM	Peak Reverse Recovery Current		--	40	--	A
T _{rr}	Reverse Recovery Time		--	16.5	--	ns
E _{rec}	Reverse Recovery Energy		--	0.65	--	mJ
Q _r	Recovered Charge	V _R =600V, I _F =50A, R _{Gon} = 10Ω, R _{Goff} = 25Ω, V _{GE} = ±15V , T _{vj} = 125°C	--	0.67	--	μC
IRM	Peak Reverse Recovery Current		--	25	--	A
T _{rr}	Reverse Recovery Time		--	36.5	--	ns
E _{rec}	Reverse Recovery Energy		--	0.96	--	mJ
Q _r	Recovered Charge	V _R =600V, I _F =50A, R _{Gon} = 10Ω, R _{Goff} = 25Ω, V _{GE} = ±15V , T _{vj} = 150°C	--	1.72	--	μC
IRM	Peak Reverse Recovery Current		--	27	--	A
T _{rr}	Reverse Recovery Time		--	42.9	--	ns
E _{rec}	Reverse Recovery Energy		--	1.01	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.68		K/W
T _{vj op}		Temperature under switching conditions	-40		175 ²⁾	°C

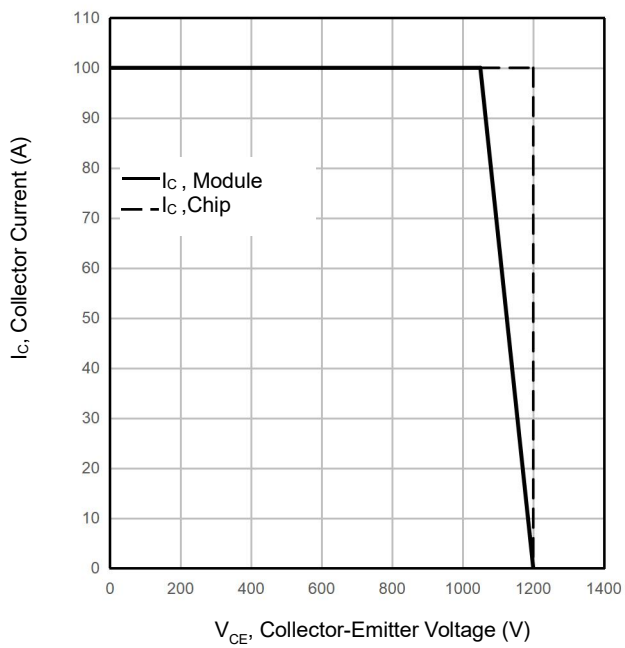
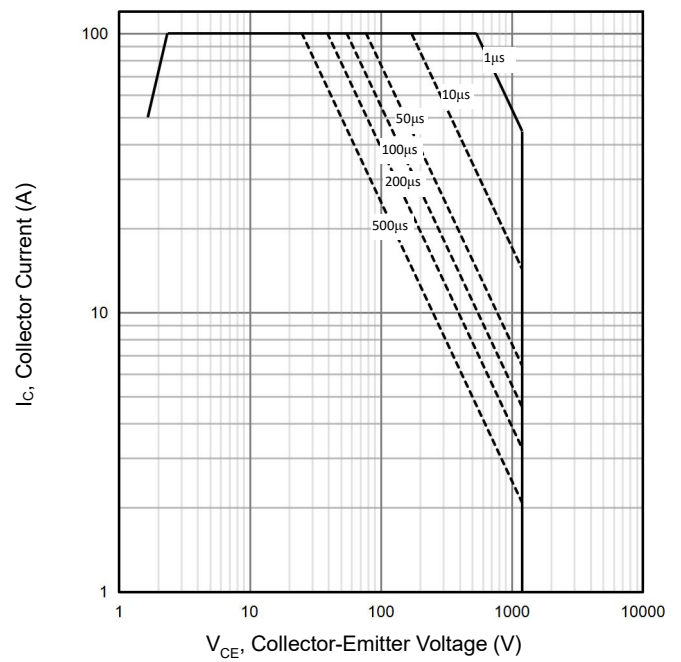
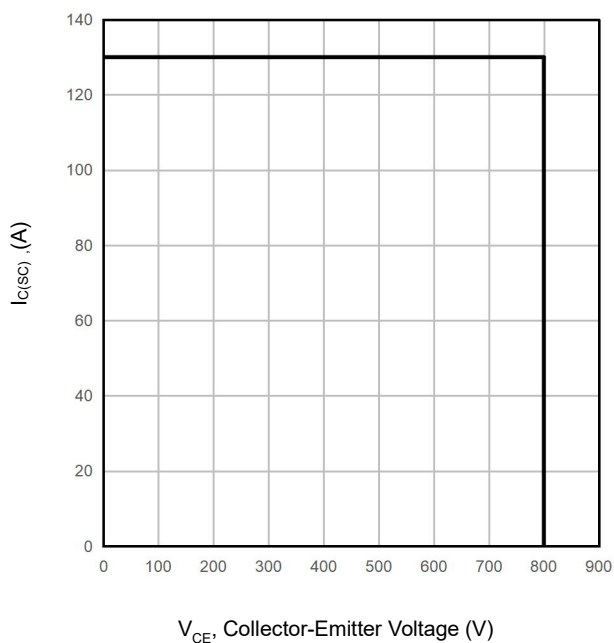
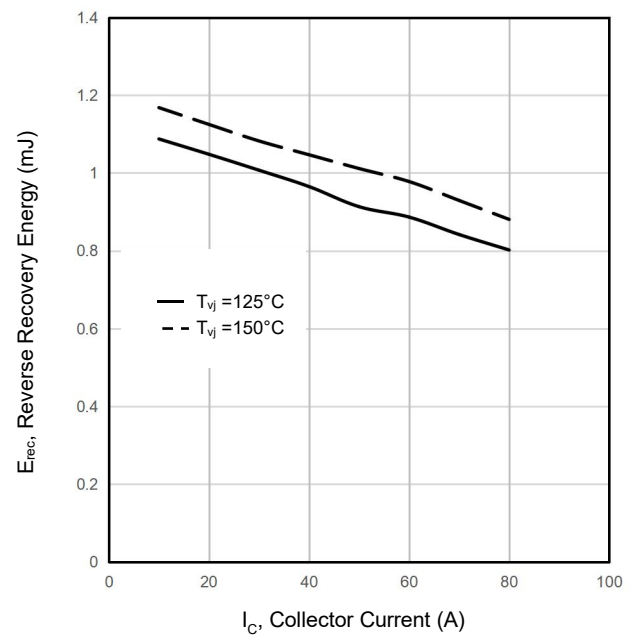
²⁾T_{vj op} > 175°C is only allowed for operation at overload conditions.

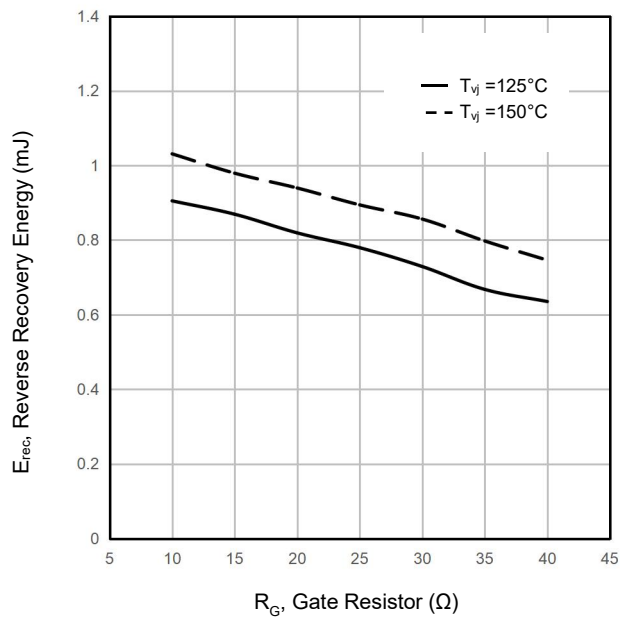
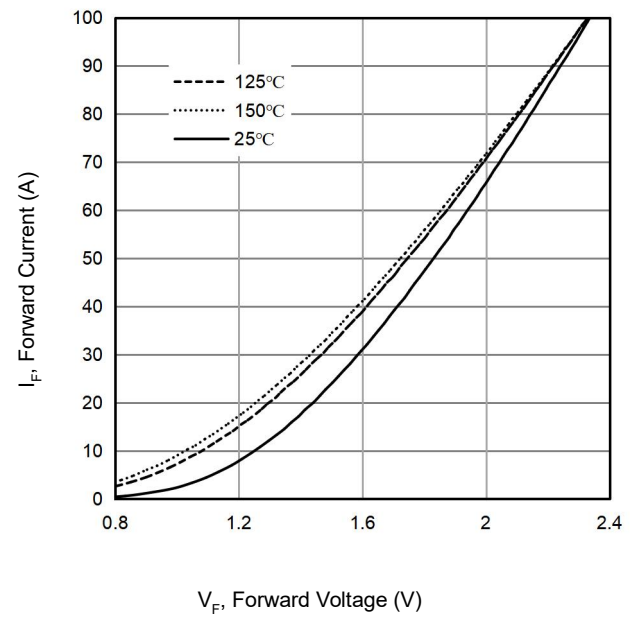
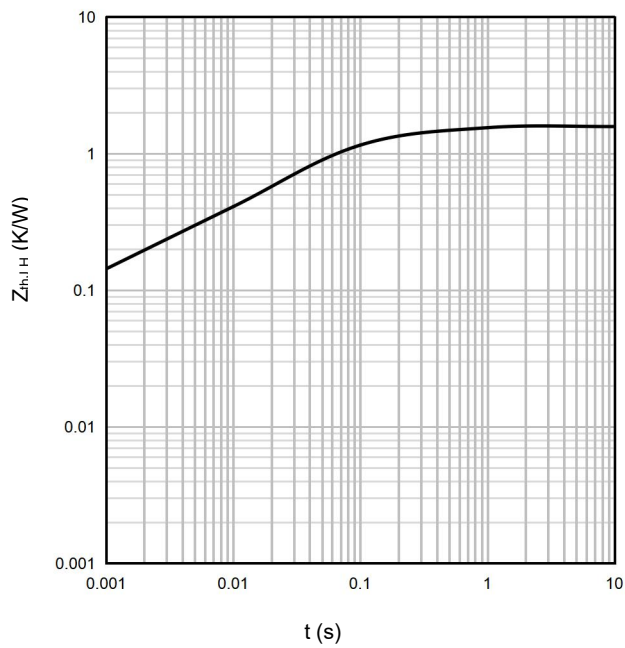
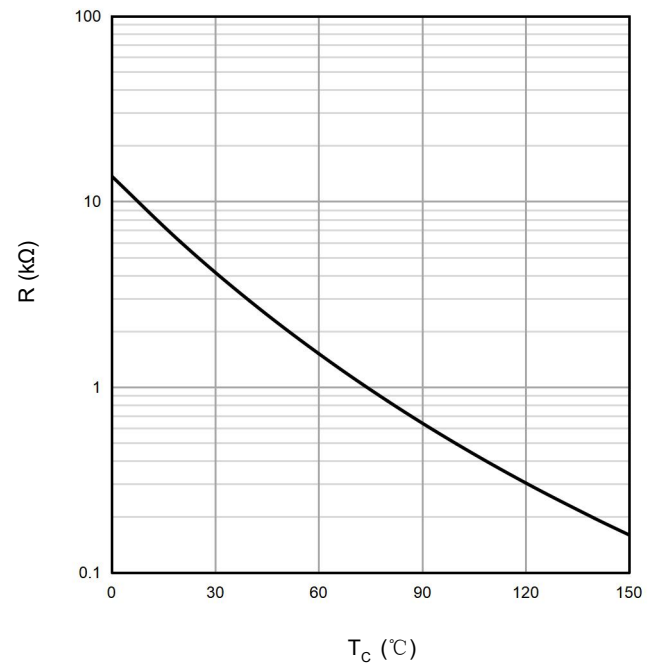
NTC Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R ₂₅	Rated Resistance		--	5.0	--	kΩ
ΔR/R	Deviation of R100	T _C =100 °C, 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

**Figure 1. Typical Output Characteristics****Figure 2. Typical Transfer Characteristics****Figure 3. Switching Loss vs. Collector Current** $V_{CE} = 600\text{V}, V_{GE} = \pm 15\text{V}, R_G = 10\Omega$ **Figure 4. Switching Loss vs. R_G** $V_{CE} = 600\text{V}, V_{GE} = \pm 15\text{V}, I_c = 50\text{A}$ 

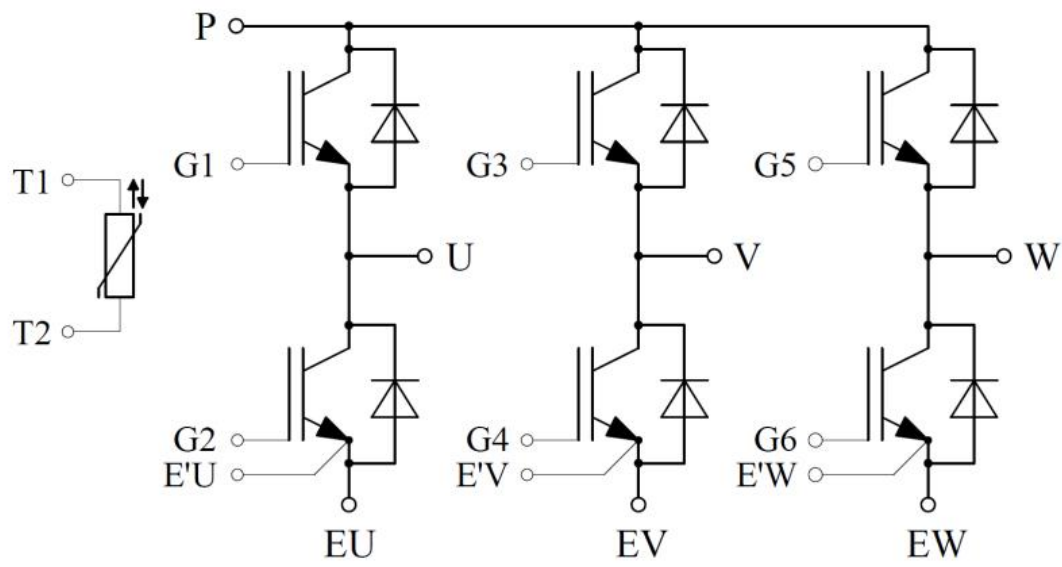
**Figure 5.Switching Time IGBT** $V_{CE}=600V, V_{GE}=\pm 15V, R_G=10\Omega, T_{vj}=150^\circ C$ **Figure 6.Capacitance IGBT** $f=100KHz, V_{GE}=0V$ **Figure 7.Gate Voltage** $V_{CE}=600V, V_{GE}=15V, I_C=50A$ **Figure 8.IGBT Transient Thermal Impedance**

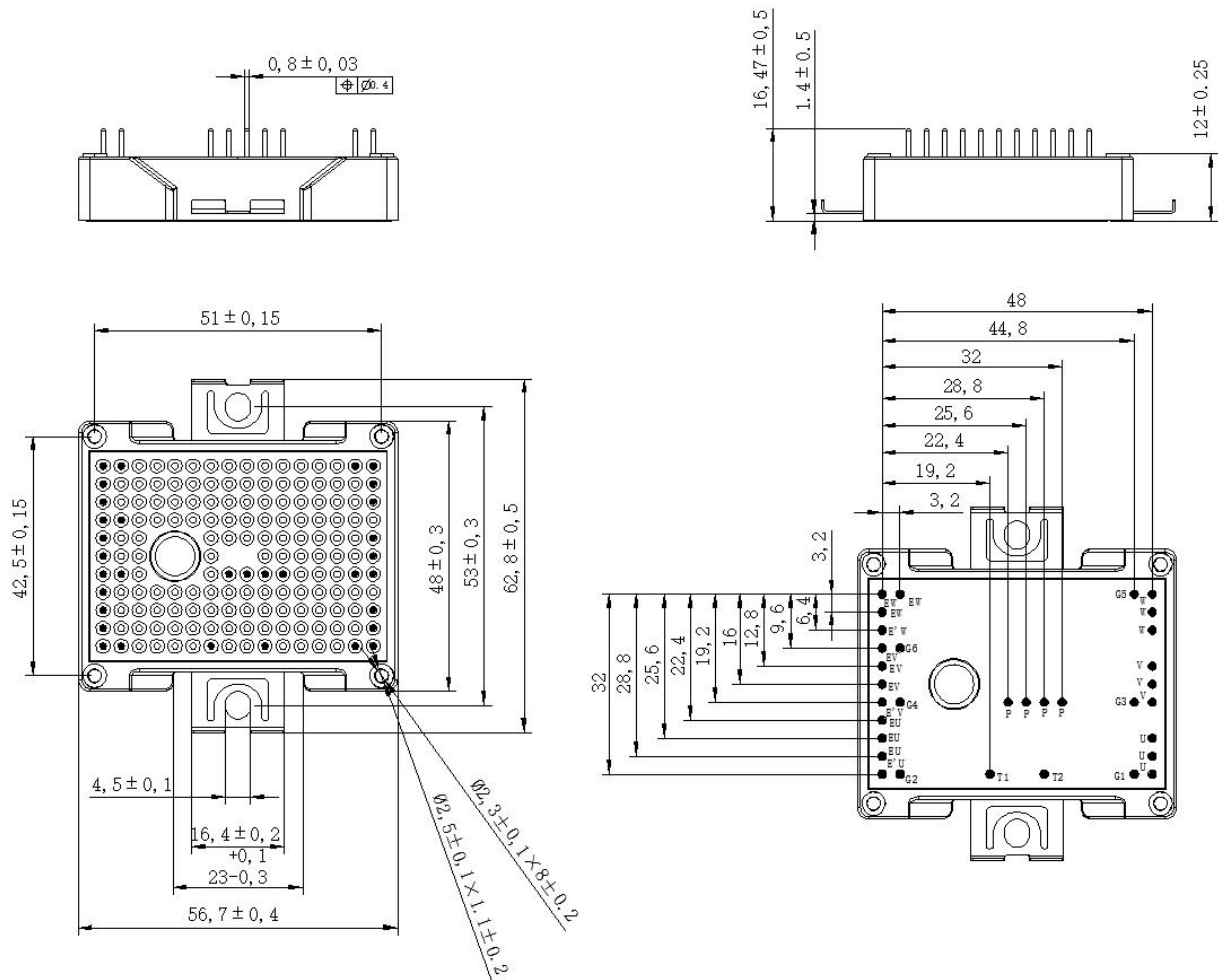
**Figure 9.RBSOA IGBT** $V_{GE} = \pm 15V, R_G = 10\Omega, T_{vj} = 150^\circ C$ **Figure 10.FBSOA IGBT** $D=0, T_c=25^\circ C, T_j \leq 175^\circ C, V_{ge}=15V$ **Figure 11.SCSOA IGBT** $V_{GE} = \pm 15V, R_G = 15\Omega, t_p \leq 10\mu s, T_{vj} = 150^\circ C$ **Figure 12.Reverse Recovery Energy Loss vs. IC**

**Figure 13.Reverse Recovery Energy Loss vs. R_G** $V_{CE}=600V, R_G=10\Omega$ **Figure 14.Diode Forward Characteristics** $V_{GE}=0V$ **Figure 15.Diode Transient Thermal Impedance****Figure 16.NTC Temperature Characteristic**



CIRCUIT DIAGRAM



**PACKAGE DIMENSION****NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME 7 14.5M,2009.
2. CONTROLLING DIMENSION:MILLIMETERS

**REVISION HISTORY**

Document version	Date of release	Description of changes
Rev.00	2023-09-19	Preview
Rev.01	2023-12-31	Add IGBT FBSOA curve, IGBT RBSOA curve, and IGBT SCSOA curve. Update the screw hole dimension tolerance.
Rev.02	2024-3-19	Change product name and product marking
Rev.03	2024-9-5	Update $V_{GE(TH)}$ range R_{thJC} optimized
Rev.04	2024-12-3	Update Typical Output Characteristics curve, FBSOA IGBT curve, and Diode Forward Characteristics curve.
Rev.05	2025-4-10	POD updated



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