

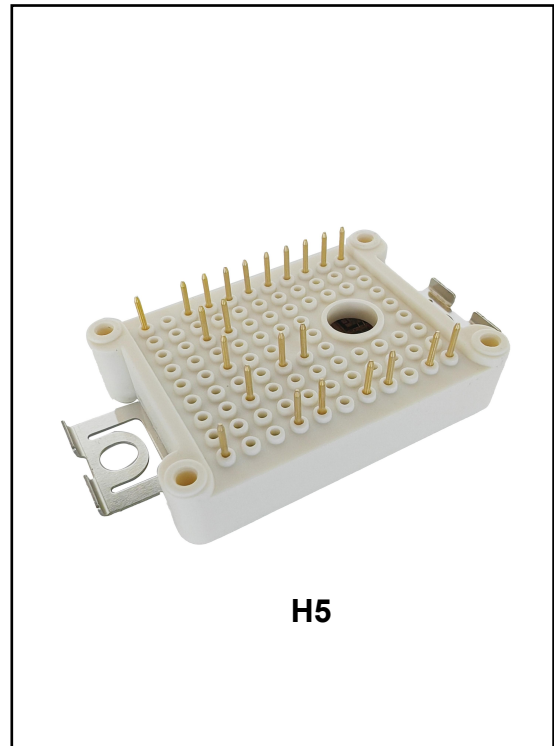
H5 PACK module with Trench/Fieldstop IGBT and Emitter Control lled diode and NTC

Features

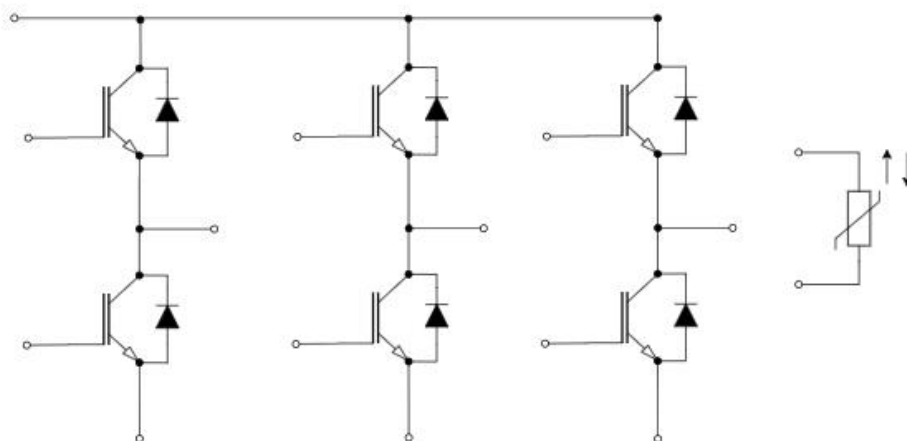
- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Al_2O_3 substrate with low thermal resistance
- Solder Contact Technology

Typical Applications

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



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 ₂ O 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		--	30	--	nH
Storage Temperature Range	T _{STG}		-40		125	°C
Mounting force per clamp	F		40	--	80	N
Weight	G			24		g

IGBT

Absolute Maximum Ratings (T_c = 25°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°C	100	A
	Collector Current @ T _C =100°C	50	A
I _{CM}	Pulsed Collector Current, t _p limited by T _{vj max}	100	A
T _{Jmax}	Maximum Junction Temperature	175	°C
P _D	Power Dissipation @ T _C = 25°C	270	W
	Power Dissipation @ T _C = 100 °C	108	W

Characteristics (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15 V, I _C = 50 A, T _{vj} = 25°C	--	1.80	2.20	V
		V _{GE} = 15 V, I _C = 50 A, T _{vj} = 125°C	--	1.95	--	
		V _{GE} = 15 V, I _C = 50 A, T _{vj} = 150°C	--	2.00	--	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	V _{GE} = V _{CE} , I _C = 1 mA, T _{vj} = 25°C	5.0	6.0	7.0	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = V _{CES} , T _{vj} = 25°C	--	--	200	µA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = V _{GES} , V _{CE} = 0 V, T _{vj} = 25°C	--	--	200	nA
R _{Gint}	Internal Gate Resistance		--	1.27	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, f=1MHz, V _{GE} =0V	--	5.07	--	nF
C _{res}	Reverse Transfer		--	0.13	--	nF
Q _G	Gate Charge	V _{GE} =15V, I _C =50A	--	0.19	--	µC
t _{d(on)}	Turn-On Delay Time	V _{CC} = 600 V, I _C = 50 A R _{Gon} = 10Ω, R _{Goff} = 25Ω , V _{GE} = ±15V Inductive Load T _{vj} = 25°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 V, I _C = 50 A R _{Gon} = 10Ω, R _{Goff} = 25Ω , V _{GE} = ±15V Inductive Load T _{vj} = 125°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 V, I _C = 50 A R _{Gon} = 10Ω, R _{Goff} = 25Ω , V _{GE} = ±15V Inductive Load T _{vj} = 150°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 ≤10µs, V _{GE} ≤15V, T _{vj} = 150°C, V _{CC} =800V, V _{CEmax} =V _{CES} - L _{sCE} ·di/dt	--	130	--	A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.45	--	K/W
T _{vj op}		Temperature under switching conditions	-40		175 ¹⁾	°C

¹⁾T_{vj op} > 175°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

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)	--	0.77	--	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. For detailed specifications please refer to AN 2018-14.

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

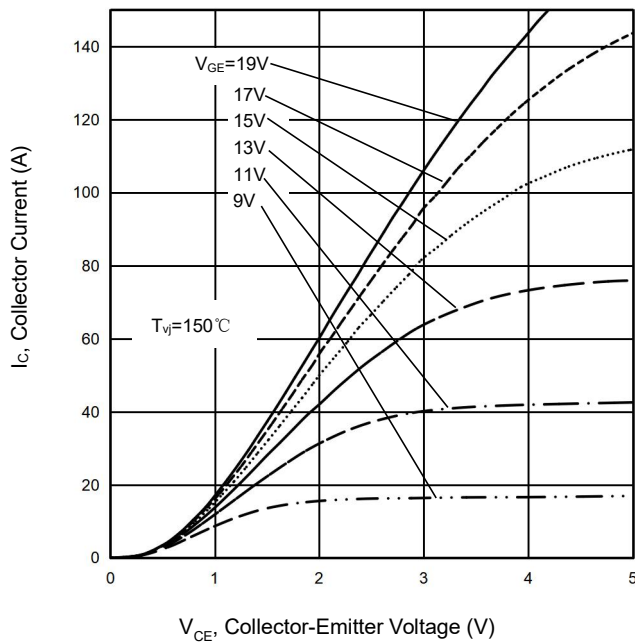


Figure 2. Typical Transfer Characteristics

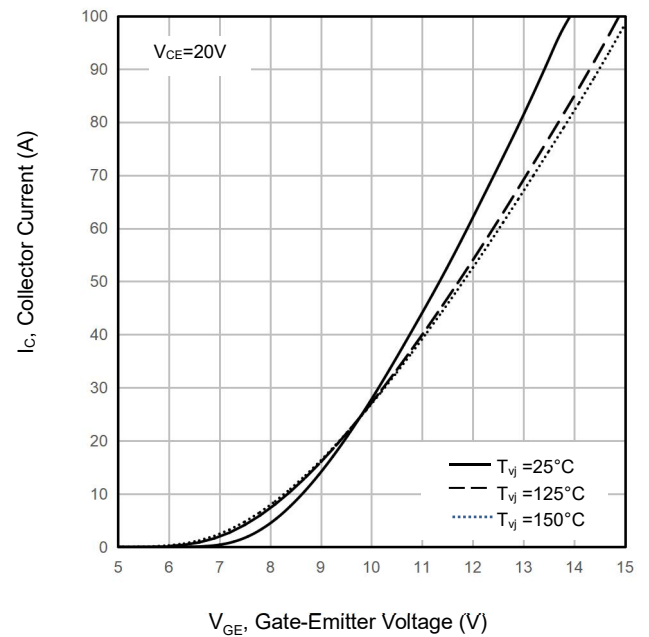


Figure 3. Switching Loss vs. Collector Current

$V_{ce} = 600\text{V}$, $V_{ge} = \pm 15\text{V}$, $R_g = 10\Omega$

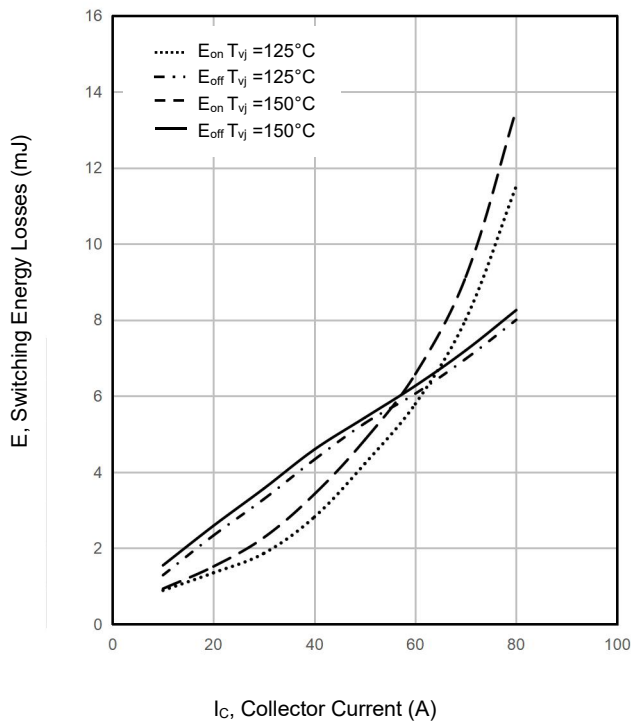


Figure 4. Switching Loss vs. R_g

$V_{ce} = 600\text{V}$, $V_{ge} = \pm 15\text{V}$, $I_c = 50\text{A}$

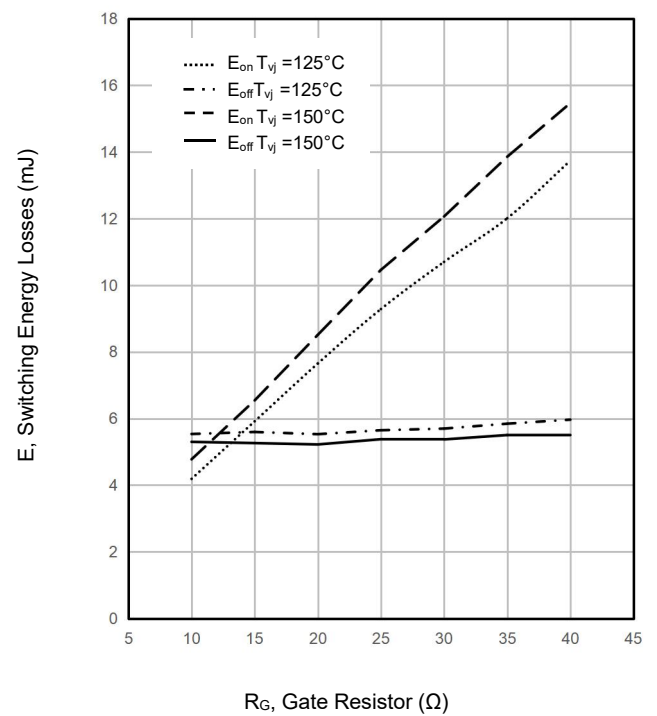


Figure 5.Switching Time IGBT

$V_{CE}=600V, V_{GE}=\pm 15V, R_G=10\Omega, T_{vj}=150^\circ C$

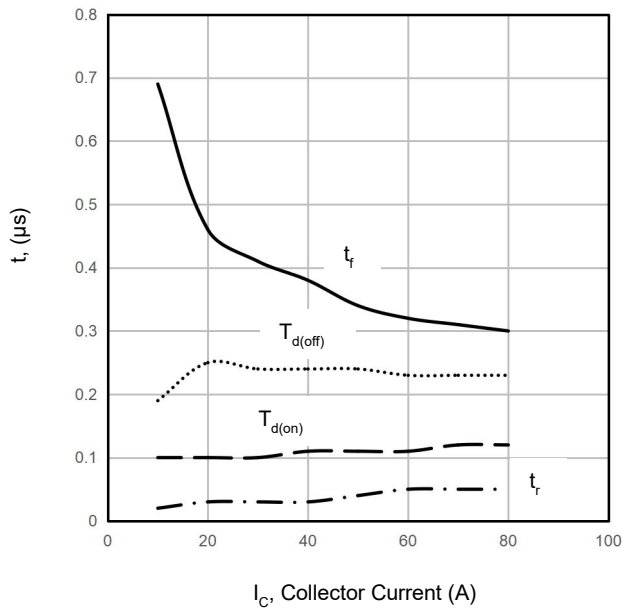


Figure 6.Capacitance IGBT

$f=100KHz, V_{GE}=0V$

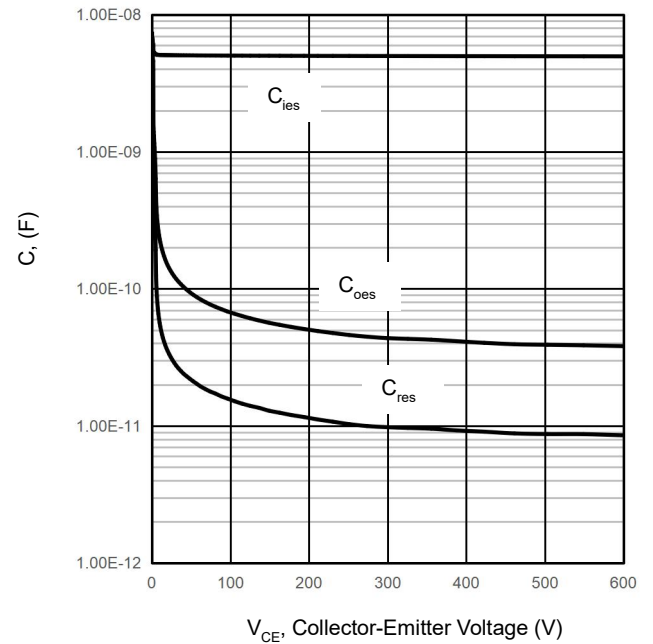


Figure 7.Gate Voltage

$V_{CE}=600V, V_{GE}=15V, I_C=50A$

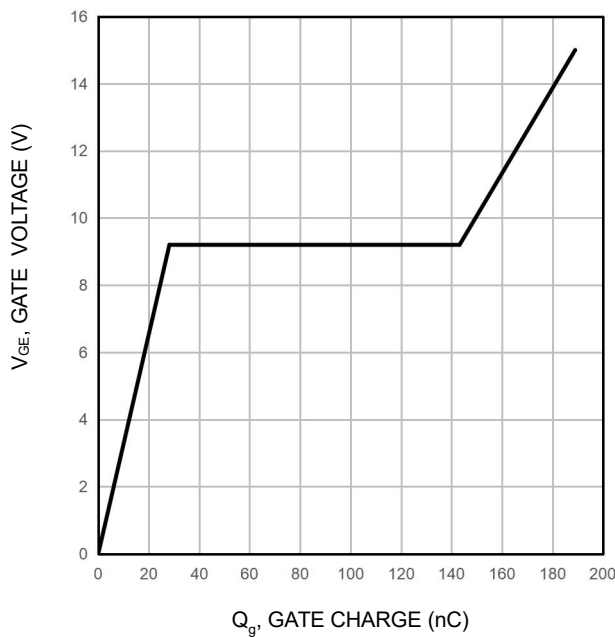


Figure 8.IGBT Transient Thermal Impedance

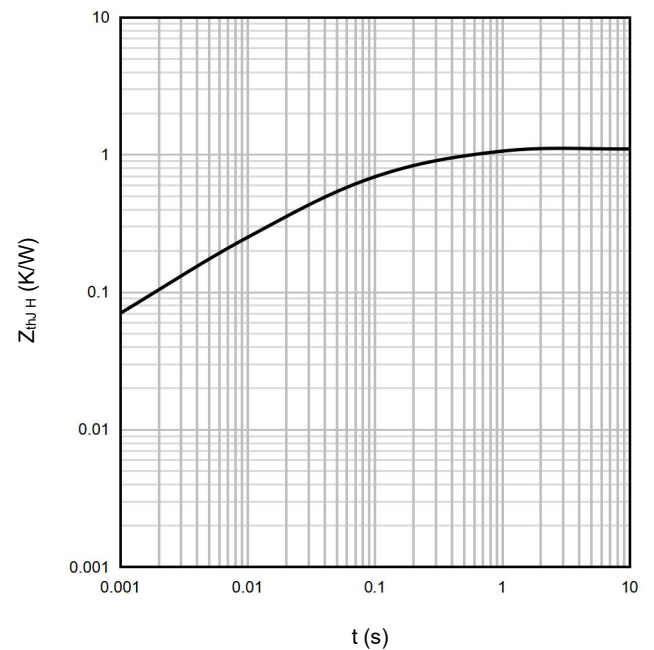


Figure 9.RBSOA IGBT

$V_{GE} = \pm 15V, R_G = 10\Omega, T_{vj} = 150^\circ C$

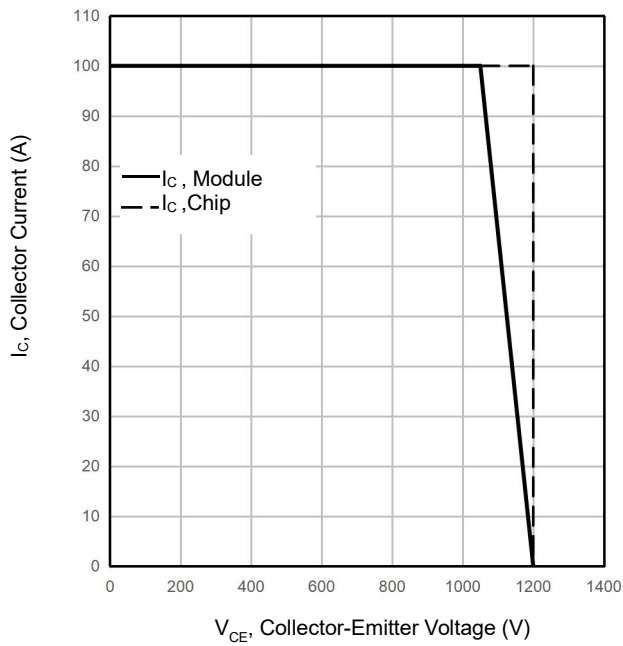


Figure 10.FBSOA IGBT

$D=0, T_c=25^\circ C, T_j \leq 175^\circ C, V_{ge}=15V$

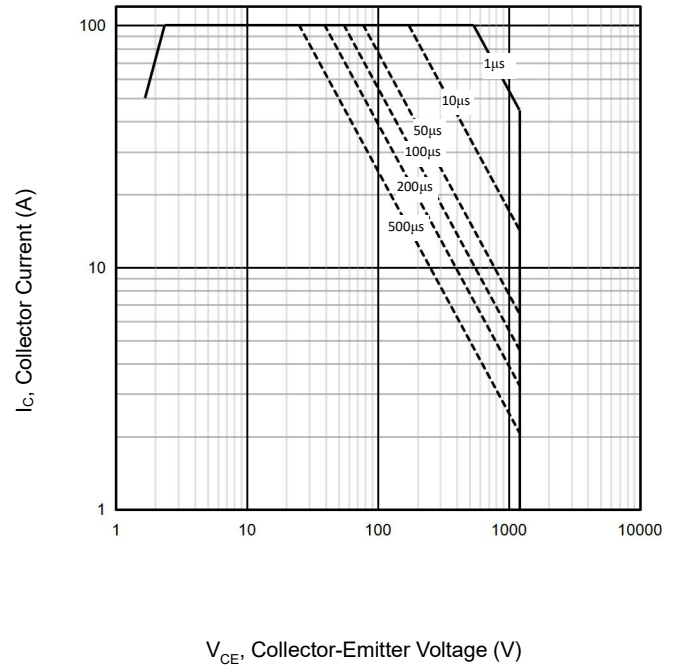


Figure 11.SCSOA IGBT

$V_{GE} = \pm 15V, R_G = 15\Omega, t_p \leq 10\mu s, T_{vj} = 150^\circ C$

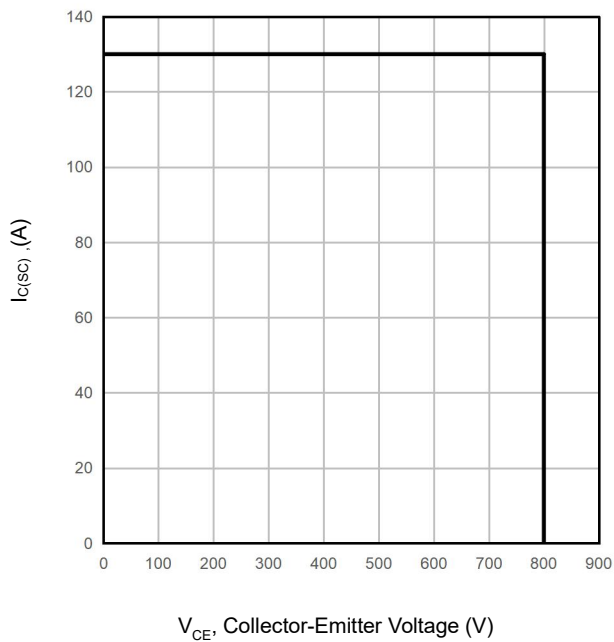


Figure 12.Reverse Recovery Energy Loss vs. IC

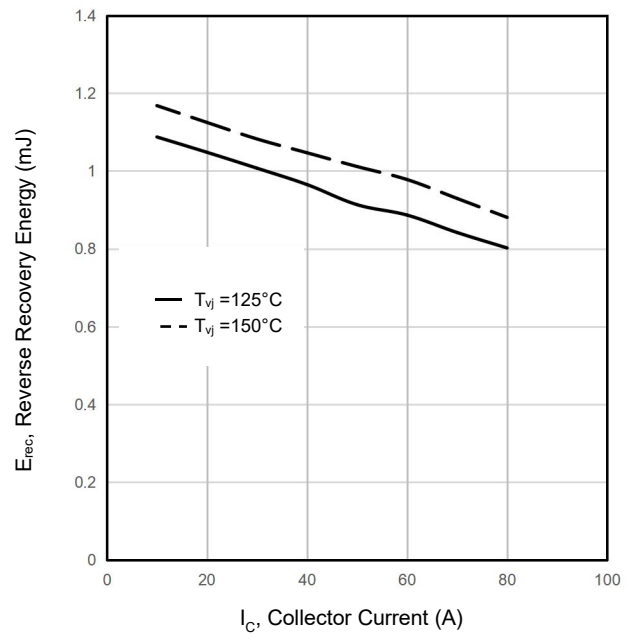


Figure 13. Reverse Recovery Energy Loss vs. R_G
 $V_{CE}=600V, R_G=10\Omega$

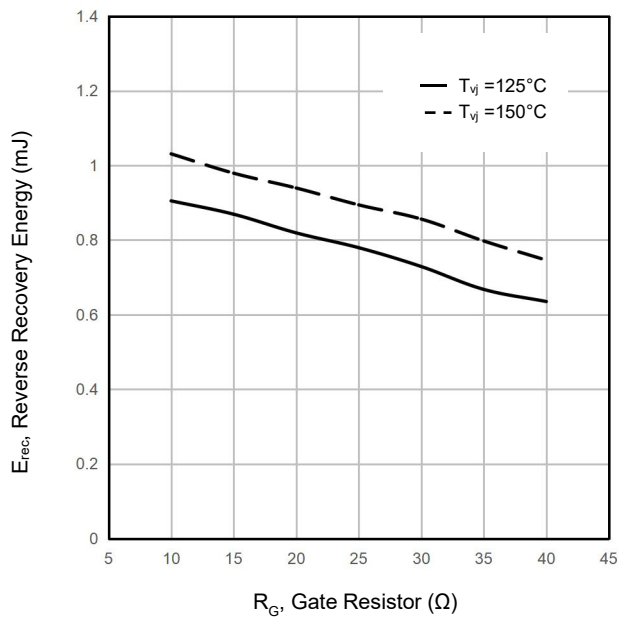


Figure 14. Diode Forward Characteristics
 $V_{GE}=0V$

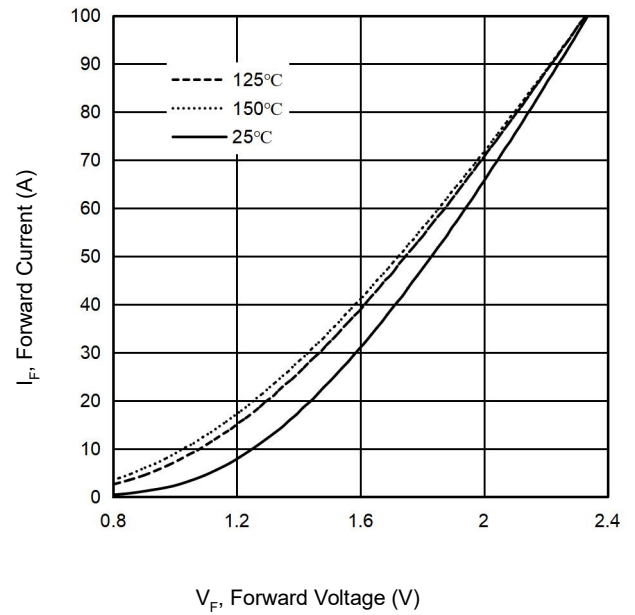


Figure 15. Diode Transient Thermal Impedance

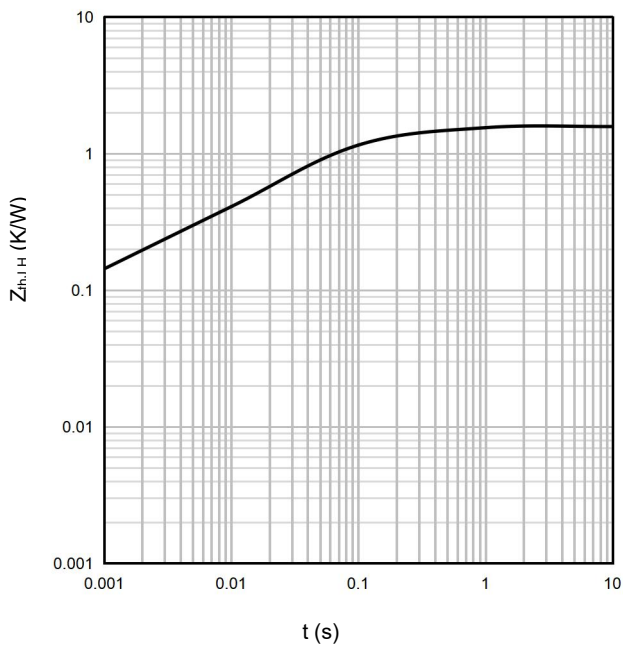
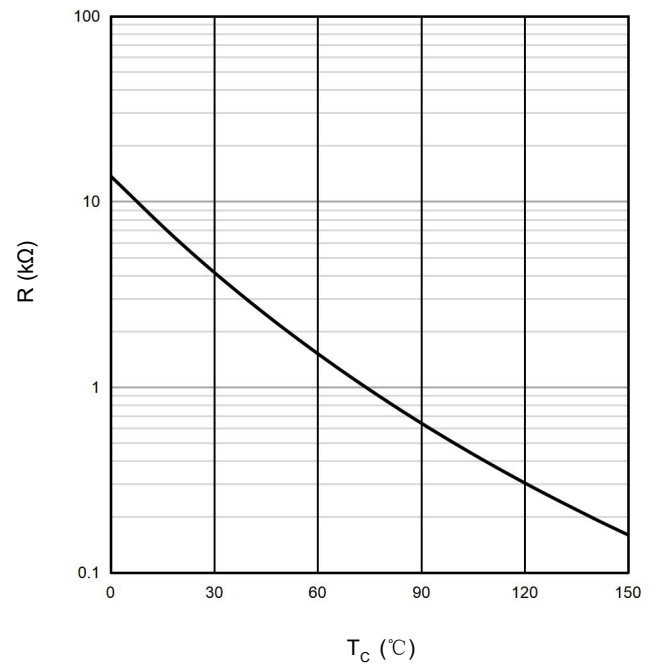
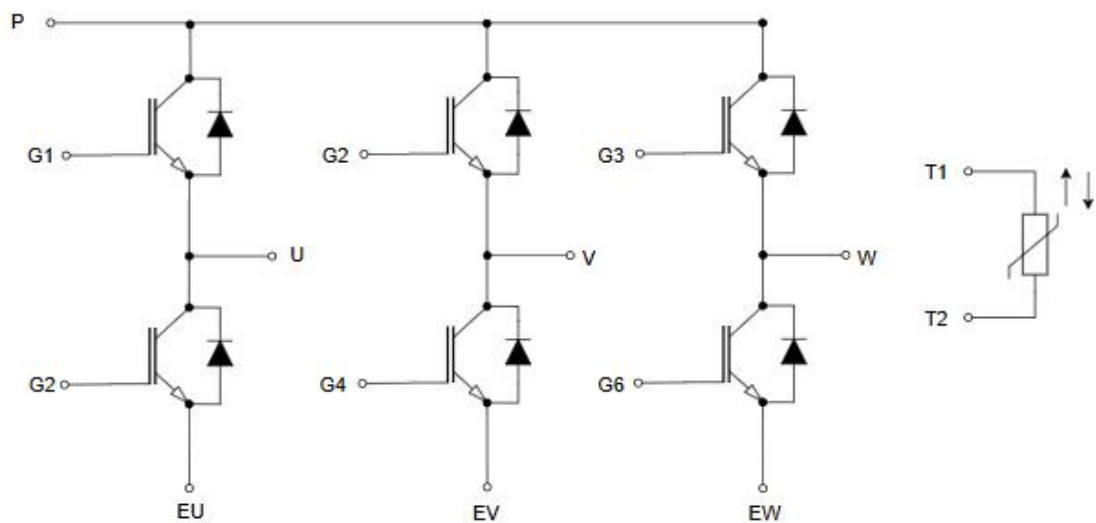


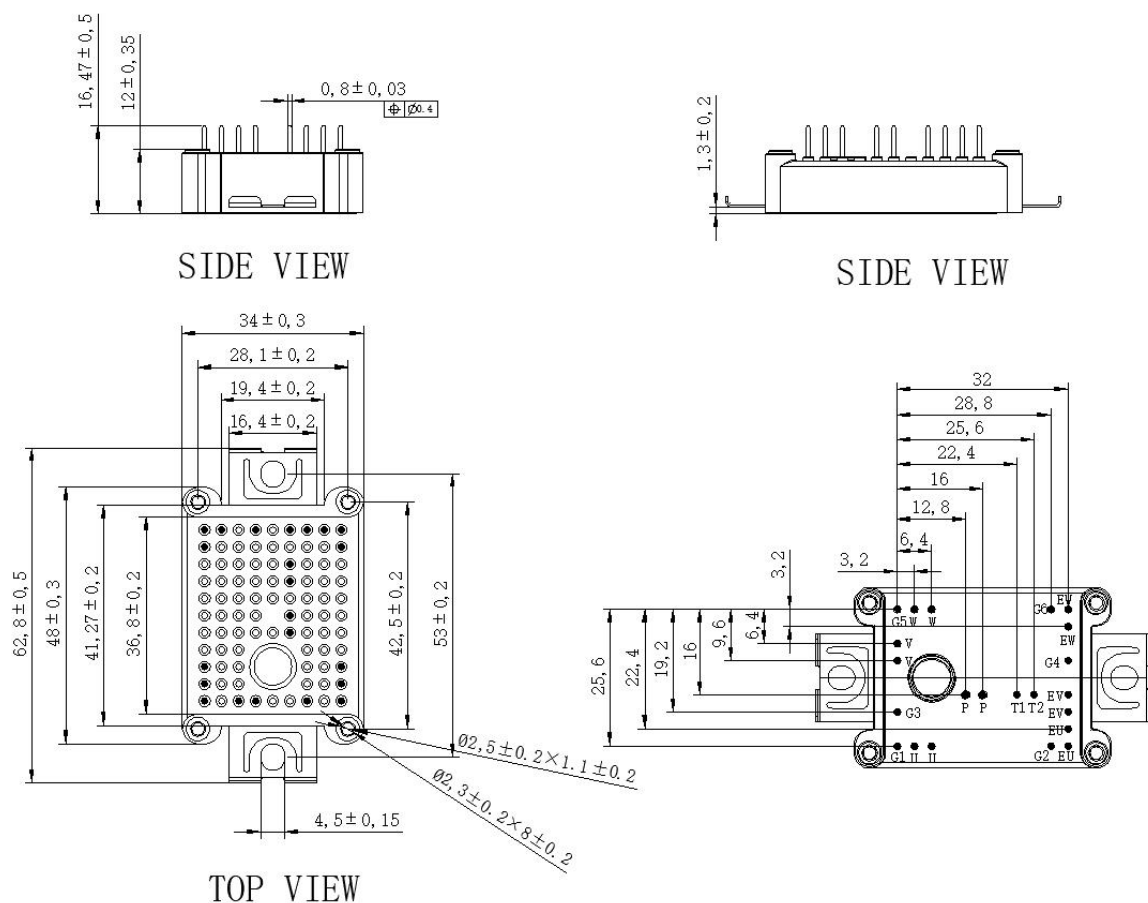
Figure 16. NTC Temperature Characteristic



CIRCUIT DIAGRAM



PACKAGE DIMENSION



NOTES:

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