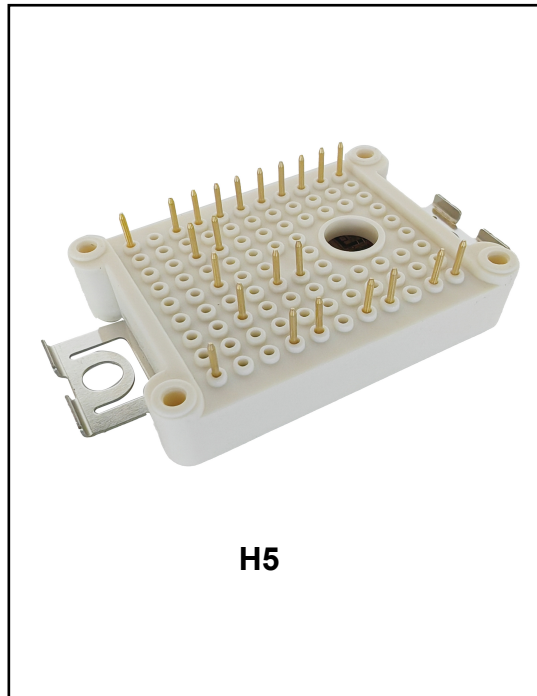


H5 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

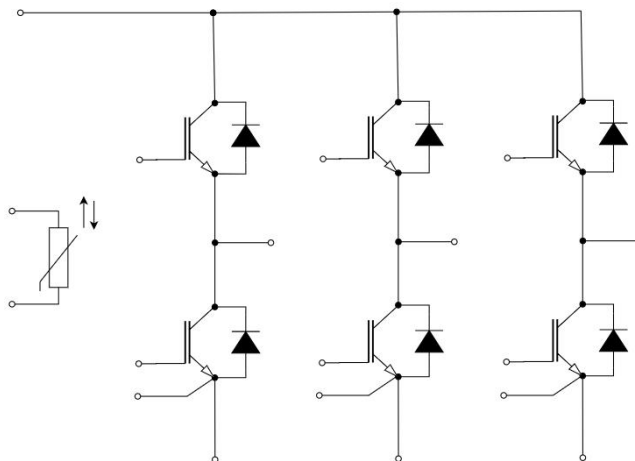
- Low $V_{CE(sat)}$ Trench IGBT technology
- 6 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Al₂O₃ substrate with low thermal resistance
- Solder Contact Technology
- Rugged mounting due to integrated mounting clamps



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_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	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray Inductance	LCE		--	25	--	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$		--	4.5	--	mΩ
Mounting force per clamp	F		40	--	80	N
Weight	G		--	24	--	g

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

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_c=25^\circ\text{C}$	67	A
	Collector Current @ $T_c=100^\circ\text{C}$	35	A
I_{CM}	Pulsed Collector Current, t_p limited by $T_{vj\max}$	70	A
$T_{j\max}$	Maximum Junction Temperature	175	$^\circ\text{C}$
P_D	Power Dissipation @ $T_c = 25^\circ\text{C}$	258	W
	Power Dissipation @ $T_c = 100^\circ\text{C}$	129	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	35	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	70	A

Module

Symbol	Description	Value	Unit
$T_{vj\text{ op}}$	Temperature under switching conditions	-40 to 150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to 125	$^\circ\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V

IGBT 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	$V_{GE} = 15\text{ V}, I_C = 35\text{ A}, T_{vj} = 25^\circ\text{C}$	--	1.60	2.10	V
		$V_{GE} = 15\text{ V}, I_C = 35\text{ A}, T_{vj} = 125^\circ\text{C}$	--	1.75	--	
		$V_{GE} = 15\text{ V}, I_C = 35\text{ A}, T_{vj} = 150^\circ\text{C}$	--	1.80	--	
$V_{GE(TH)}$	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	$f=1\text{MHz}$	--	1.34	--	Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$	--	4140	--	pF
C_{res}	Reverse Transfer		--	36.5	--	pF
Q_G	Gate Charge	$V_{GE}=15\text{V}, I_C=35\text{A}$	--	0.15	--	μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CE} = 600\text{ V}, I_C = 35\text{ A}, R_G = 10\Omega, V_{GE(on)} = 15\text{V}, V_{GE(off)} = -5\text{V}, T_{vj} = 25^\circ\text{C}$	--	90	--	ns
t_r	Rise Time		--	216	--	
$t_{d(off)}$	Turn-off Delay Time		--	176	--	
t_f	Fall Time		--	92	--	
E_{on}	Turn-On Switching Loss per Pulse		--	1.83	--	mJ
E_{off}	Turn Off Switching Loss per Pulse		--	2.55	--	
$t_{d(on)}$	Turn-On Delay Time	$V_{CE} = 600\text{ V}, I_C = 35\text{ A}, R_G = 10\Omega, V_{GE(on)} = 15\text{V}, V_{GE(off)} = -5\text{V}, T_{vj} = 150^\circ\text{C}$	--	95	--	ns
t_r	Rise Time		--	264	--	
$t_{d(off)}$	Turn-off Delay Time		--	212	--	
t_f	Fall Time		--	163	--	
E_{on}	Turn-on Switching Loss per Pulse		--	2.65	--	mJ

E _{off}	Turn Off Switching Loss per Pulse		--	3.68	--	
I _{sc}	Short circuit collector current	$t_p \leq 10\mu s, V_{GE} = 15V,$ $T_{vj} = 150^\circ C, V_{CC} \leq 800V,$	--	110	--	A
T _{sc}	Short circuit time	$V_{GE} = 16V,$ $T_{vj} = 150^\circ C, V_{CC} \leq 800V$	6			μs
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.58		K/W

Diode Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 35A, V _{GE} = 0V, T _{vj} = 25°C	--	1.60	2.60	V
		I _F = 35A, V _{GE} = 0V, T _{vj} = 125°C	--	1.55	--	
		I _F = 35A, V _{GE} = 0V, T _{vj} = 150°C	--	1.50	--	
Q _r	Recovered Charge	V _R = 600V, I _F = 35A, R _G = 10Ω, V _{GE(on)} = 15V, V _{GE(off)} = -5V, T _{vj} = 25°C	--	0.65	--	μC
IRM	Peak Reverse Recovery Current		--	38	--	A
T _{rr}	Reverse Recovery Time		--	25	--	ns
E _{rec}	Reverse Recovery Energy		--	0.7	--	mJ
Q _r	Recovered Charge	V _R = 600V, I _F = 35A, R _G = 10Ω, V _{GE(on)} = 15V, V _{GE(off)} = -5V, T _{vj} = 150°C	--	1.14	--	μC
IRM	Peak Reverse Recovery Current		--	39	--	A
T _{rr}	Reverse Recovery Time		--	40	--	ns
E _{rec}	Reverse Recovery Energy		--	1.55	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.81	--	K/W

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 R ₁₀₀	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

Figure1.output characteristic IGBT,Inverter(typical)
 $V_{GE}=15V$

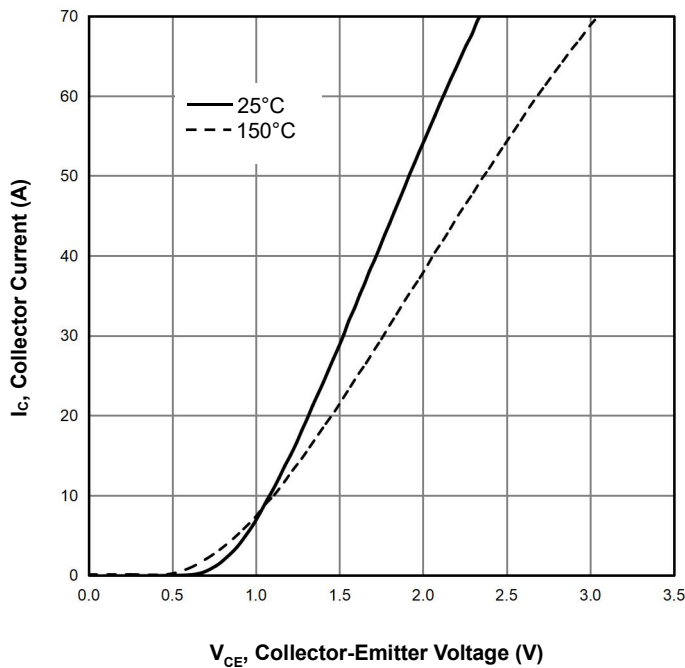


Figure2.output characteristic IGBT,Inverter(typical)
 $T_{vj}=150^{\circ}C$

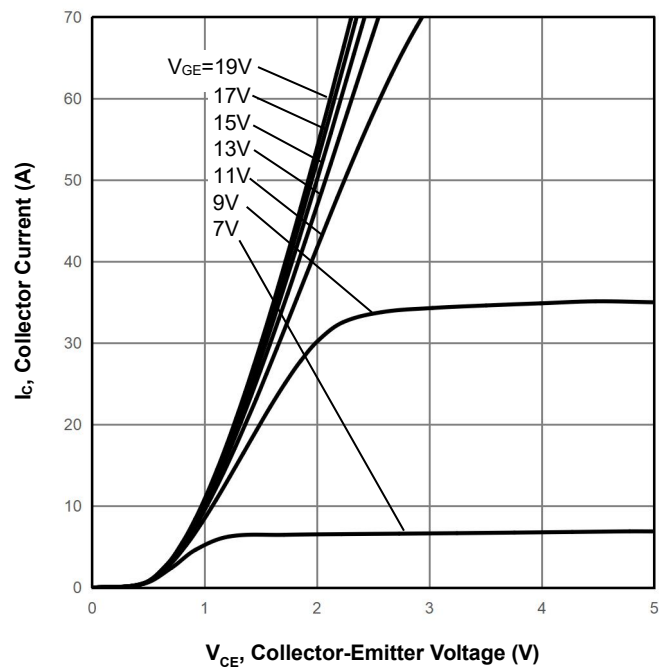


Figure3. $V_{CE(sat)}$ vs. Temperature

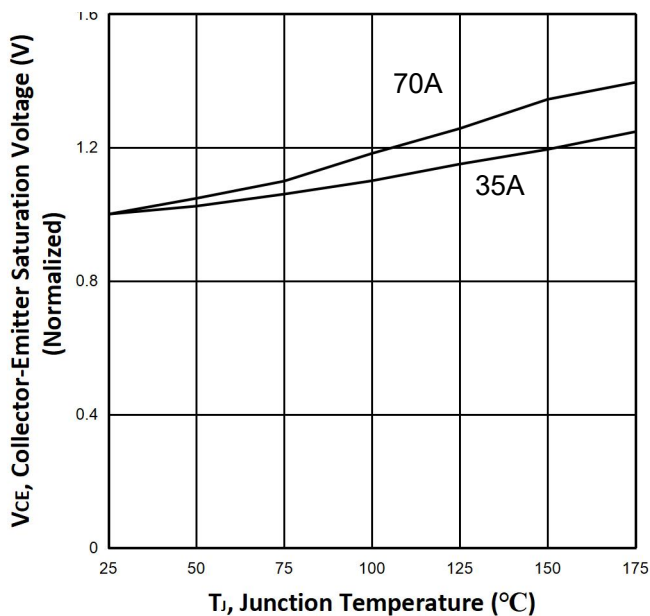


Figure4.transfer characteristic IGBT,Inverter(typical)
 $V_{CE}=20V$

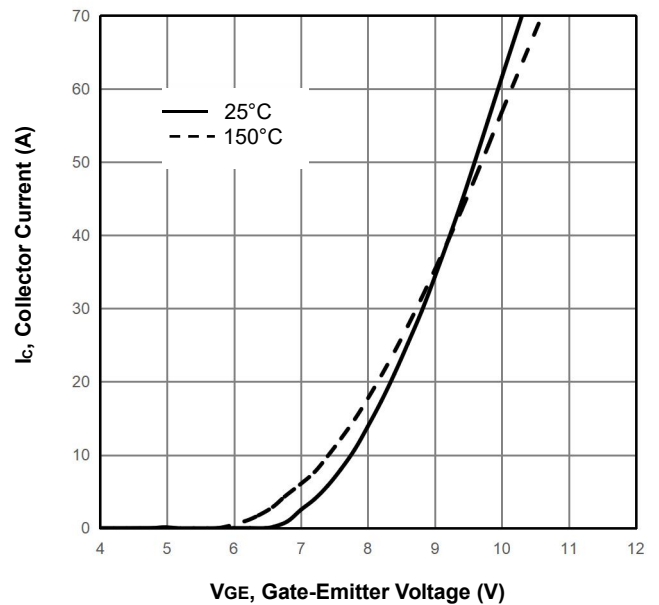


Figure5. V_{GE} vs. Temperature

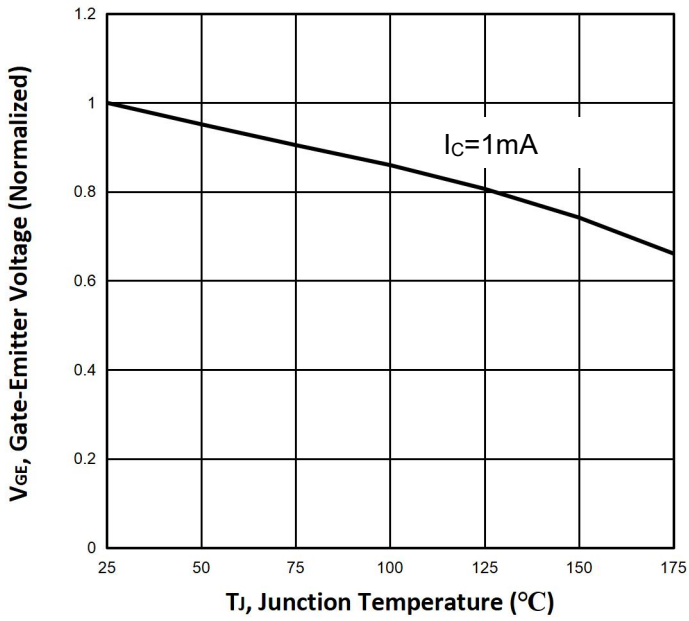


Figure6. Gate Charge Waveform

V_{CC}=600V

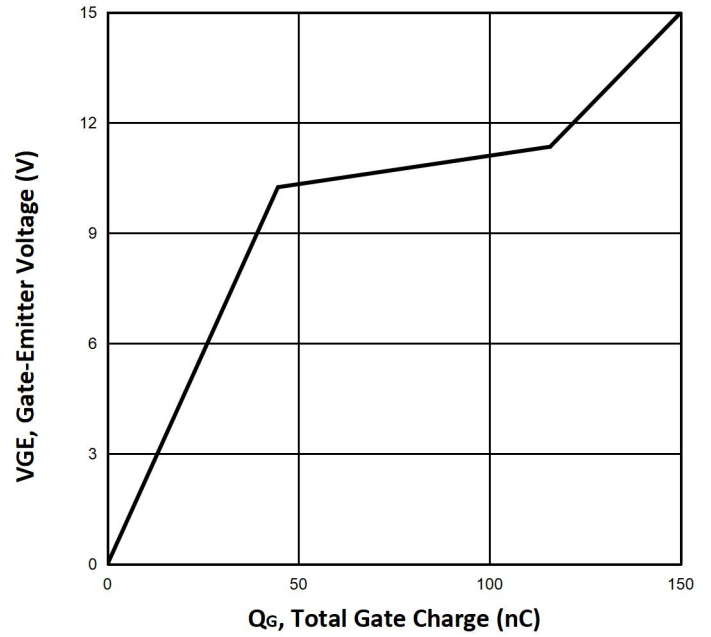


Figure7. Saturation Voltage vs. V_{GE}

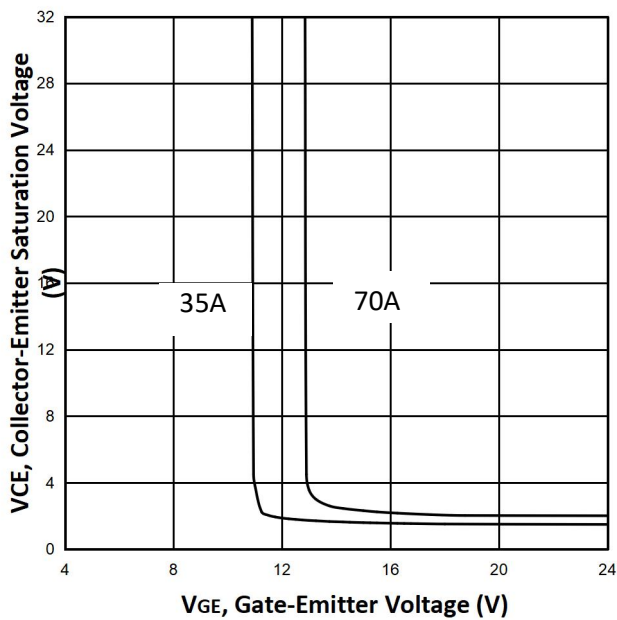


Figure8. P_{tot} vs. Case Temperature

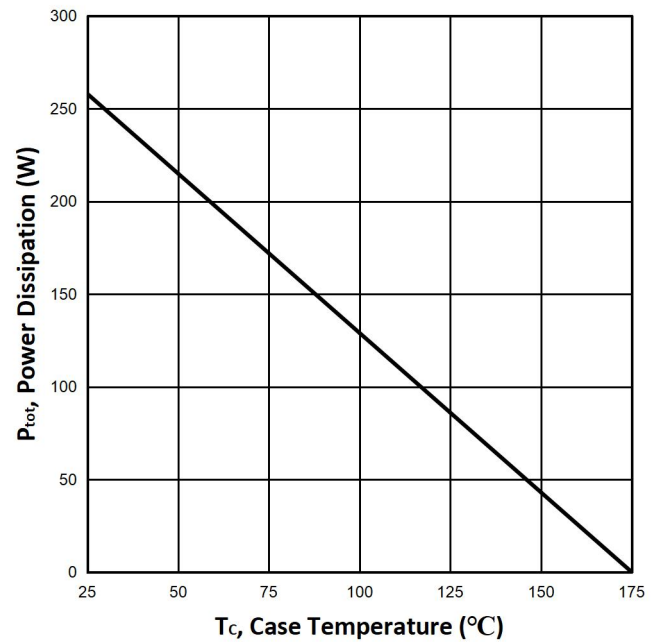


Figure9.switching losses IGBT,Inverter(typical)

$V_{GE(on)} = 15V, V_{GE(off)} = -5V, R_G = 15\Omega, V_{CE} = 600V$

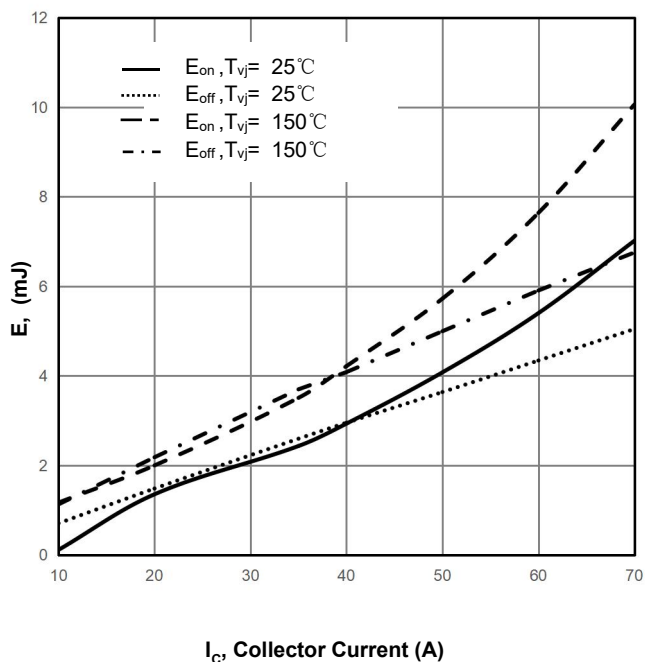


Figure10.switching losses IGBT,Inverter(typical)

$V_{GE(on)} = 15V, V_{GE(off)} = -5V, I_c = 35A, V_{CE} = 600V$

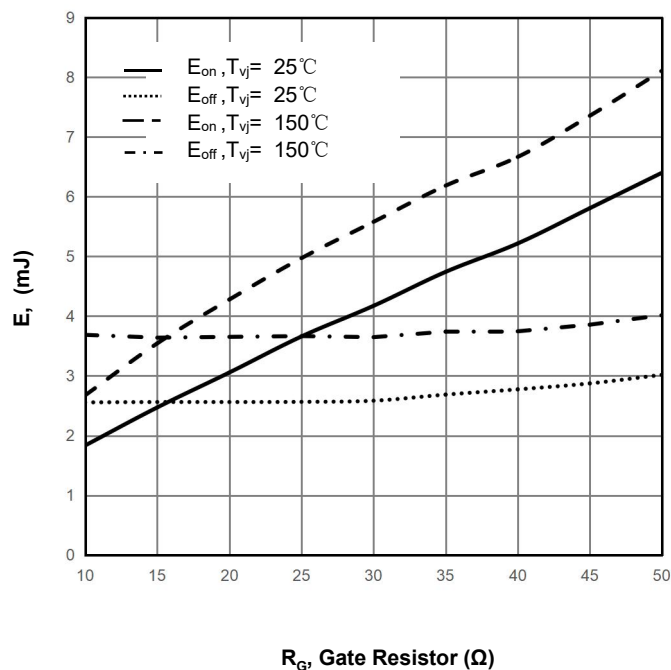


Figure11.reverse bias safe operating area IGBT ,Inverter

$V_{GE(on)} = 15V, V_{GE(off)} = -5V, R_G = 25\Omega, T_{vj} = 150^\circ C$

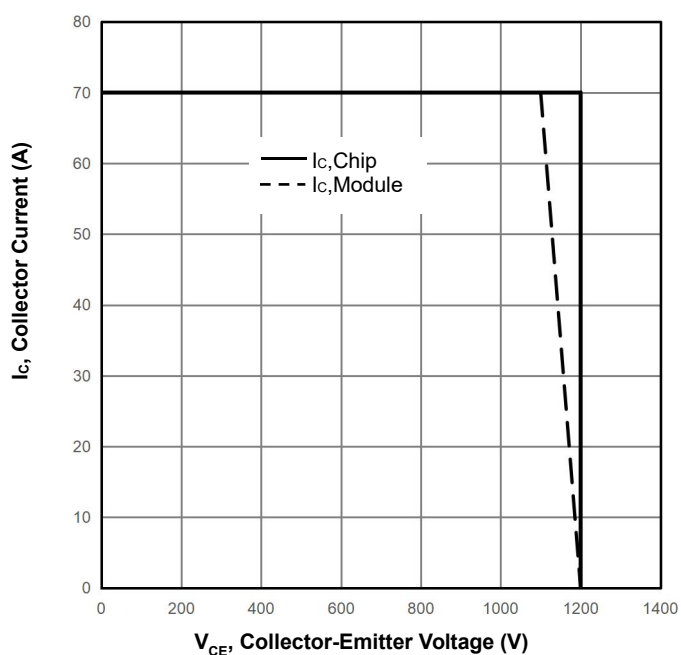


Figure12.transient thermal impedance IGBT,Inverter

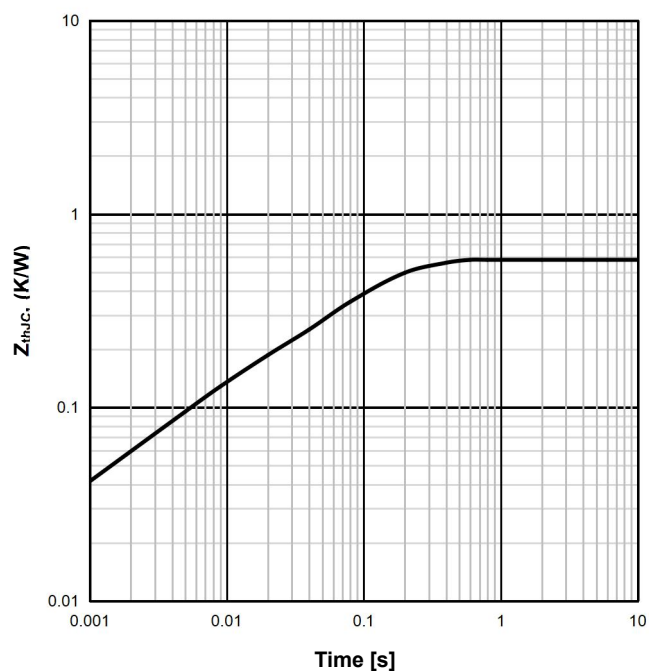


Figure13.forward characteristic of Diode,Inverter(typical)

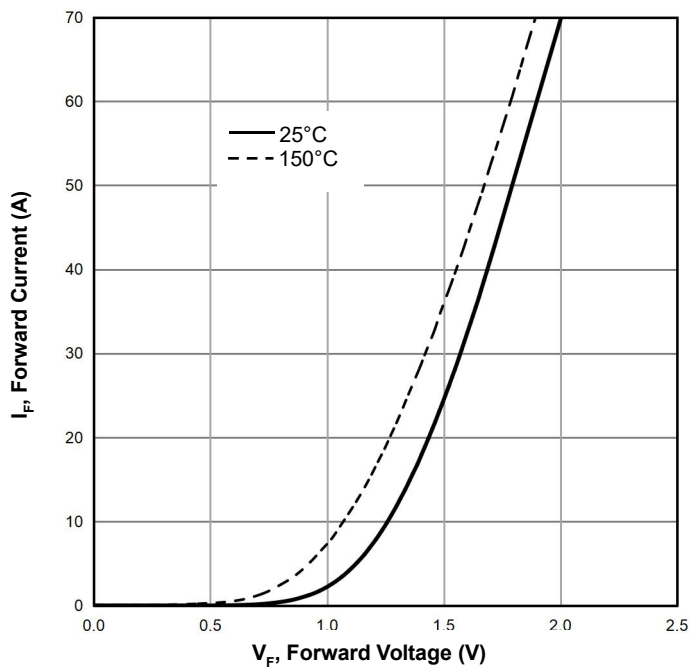


Figure14.reverse recovery current vs forward current (typical)

$V_{CC}=600V, V_{GE}=15V/-5V, R_{Gon}=10\Omega, R_{Goff}=25\Omega$

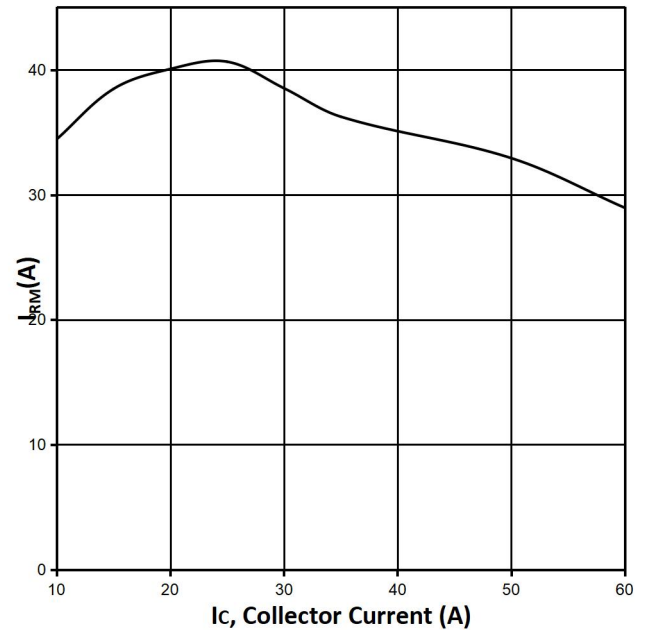


Figure15.switching losses Diode,Inverter(typical)

$R_{Gon}=15\Omega, V_{CE}=600V$

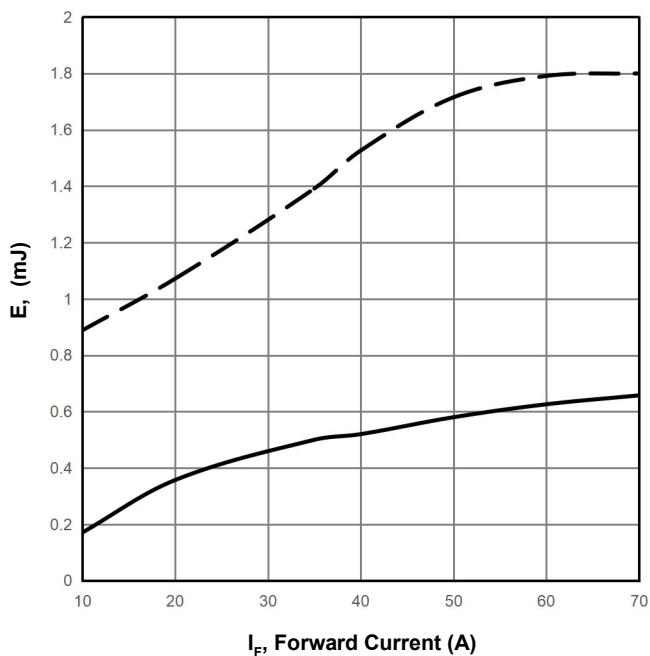


Figure16.switching losses Diode,Inverter(typical)

$I_F=35A, V_{CE}=600V$

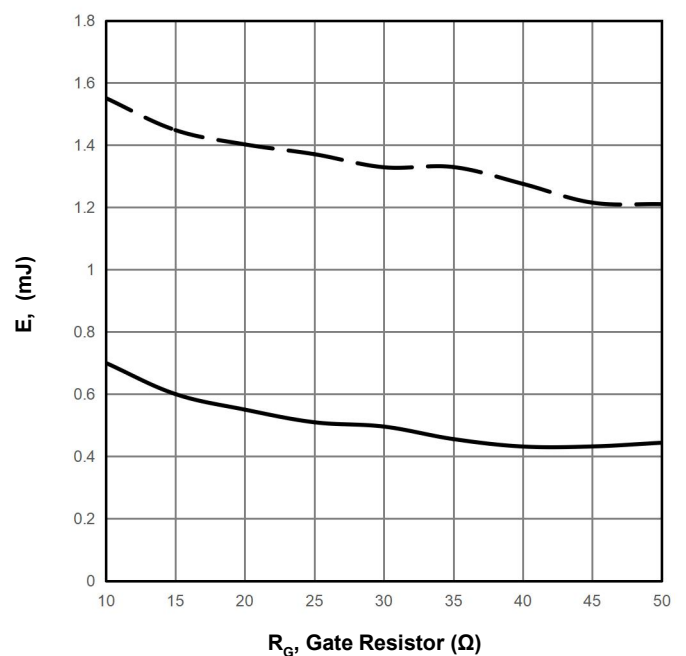


Figure17.transient thermal impedance Diode,Inverter

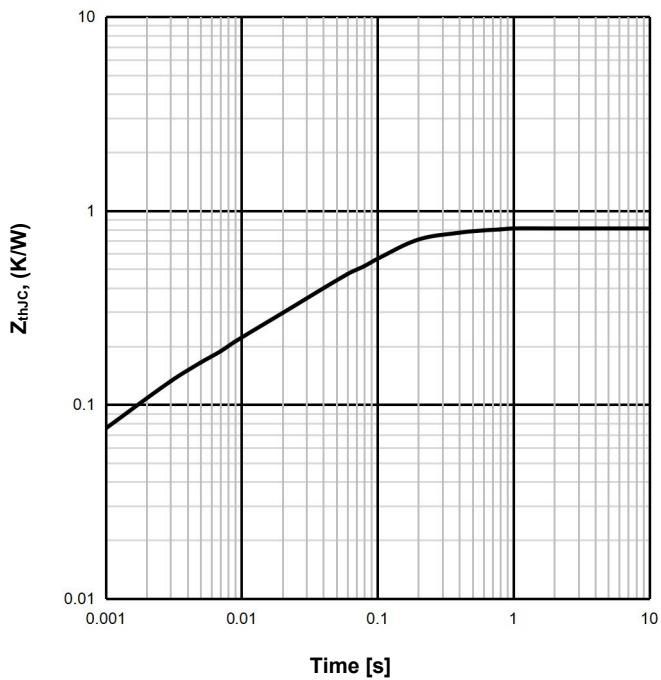


Figure18.NTC-Thermistor-temperature characteristic(typical)

