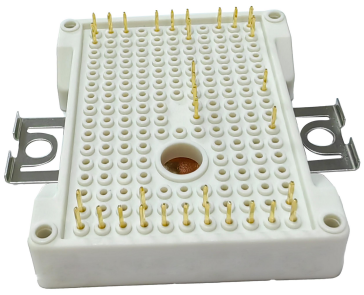
H6 PACK module with Gen.7 Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Overload operation up to 175℃
- Low inductance case
- Isolated heatsink using DBC technology

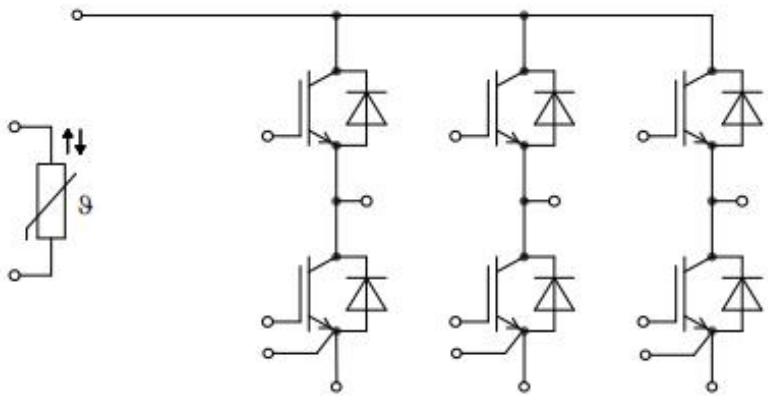


H6

Typical Applications

- Servo drives
- UPS systems
- Motor drives
- Air conditioning
- 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	℃

Package Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray Inductance	L_{CE}		--	40	--	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$		--	4.00	--	mΩ
Storage Temperature Range	T_{STG}		-40		125	℃
Mountig force per clamp	F		40		80	N
Weight	G			41		g

IGBT

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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±30	V
I_C	Collector Current @ T_C=25℃	150	A
	Collector Current @ T_C=80℃	75	A
I_{CM}	Pulsed Collector Current，t_p=1S	225	A
P_{tot}	Total power dissipation,T_C = 25°C, $T_{vj\ max}$ = 150°C	357	W

Characteristics (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage	I_C=75A，V_{GE}=15V	T_{vj}=25°C	--	1.65	2.5	V
			T_{vj}= 150°C	--	2.0	--	
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1mA,V_{CE}=V_{GE}		5.0	--	7.0	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V,V_{CE}=1200V		--	--	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=30V,V_{CE}=0V		--	--	100	nA
R_{Gint}	Internal Gate Resistance	f=1MHz		--	1.41	--	Ω
C_{ies}	Input Capacitance	V_{CE}=25V,V_{GE}=0V, f=1MHz		--	7.41	--	nF
C_{oes}	Out Capacitance			--	0.284	--	nF
C_{res}	Reverse Transfer			--	0.048	--	nF
Q_G	Gate Charge	V_{GE} = ± 15 V		--	0.237	--	μC
$t_{d(on)}$	Turn−On Delay Time	T_J = 25°C V_{CE} =600V, I_C =75A V_{GE} =±15V, R_{Gon} =10Ω, R_{Goff} =25Ω		--	0.044	--	μs
t_r	Rise Time			--	0.028	--	
$t_{d(off)}$	Turn−off Delay Time			--	0.525	--	
t_f	Fall Time			--	0.095	--	
E_{on}	Turn−On Switching Loss per Pulse			--	8.72	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	3.1	--	
$t_{d(on)}$	Turn−On Delay Time	T_J = 150°C V_{CE} =600V, I_C =75A V_{GE} =±15V, R_{Gon} =10Ω, R_{Goff} =25Ω		--	0.084	--	μs
t_r	Rise Time			--	0.032	--	
$t_{d(off)}$	Turn−off Delay Time			--	0.53	--	
t_f	Fall Time			--	0.165	--	
E_{on}	Turn−on Switching Loss per Pulse			--	13.4	--	mJ
E_{off}	Turn Off Switching Loss per Pulse			--	7.14	--	
I_{SC}	SC Data	V_{GE}=15V,V_{CC}≤800V, t_{SC}≤10us,T_j≤150°C		--	230	--	A
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)			0.314		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

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

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	75	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	225	A

Caracteristics （Tc=25℃ unless otherwise noted）

Symbol	Parameter	Note or Test Condition		Min	Typ	Max	Unit
V_F	Diode Forward Voltage	I_F = 75A, V_{GE} = 0 V	T_J = 25°C	--	1.70	2.50	V
			T_J = 150°C	--	1.60	--	
Q_{rr}	Reverse Recovery Charge	T_J = 25°C V_{CE} =600V, I_C =75A V_{GE} =±15V, R_{Gon} =10Ω, R_{Goff} =25Ω		--	10.2	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	40.8	--	A
E_{REC}	Reverse Recovery Energy			--	4.3	--	mJ
Q_{rr}	Reverse Recovery Charge	T_J = 150°C V_R =600 V, I_C =75A V_{GE} = ±15V, R_{Gon} =10Ω, R_{Goff} = 10Ω		--	26	--	μC
I_{RRM}	Peak Reverse Recovery Current			--	46.1	--	A
E_{REC}	Reverse Recovery Energy			--	9.8	--	mJ
R_{thJC}	Thermal Resistance − Chip−to−Case				0.551		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.

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

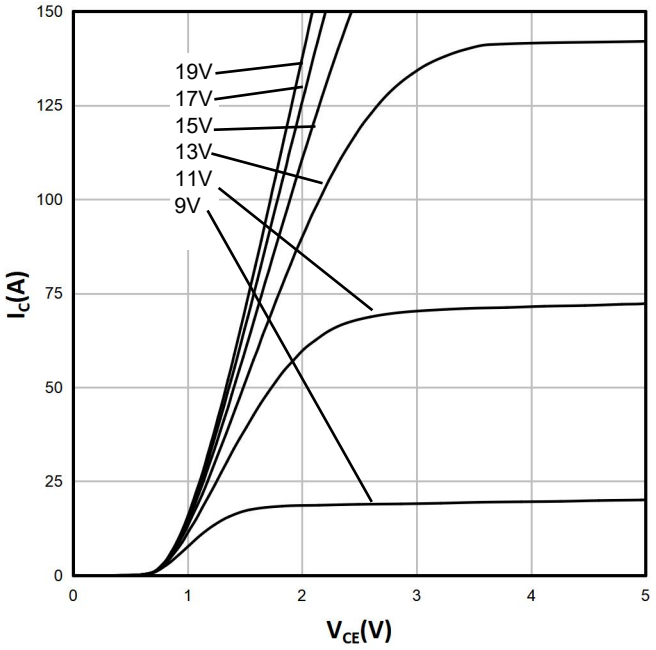


Figure2.output characteristic IGBT(typical)
T_{vj}=150°C

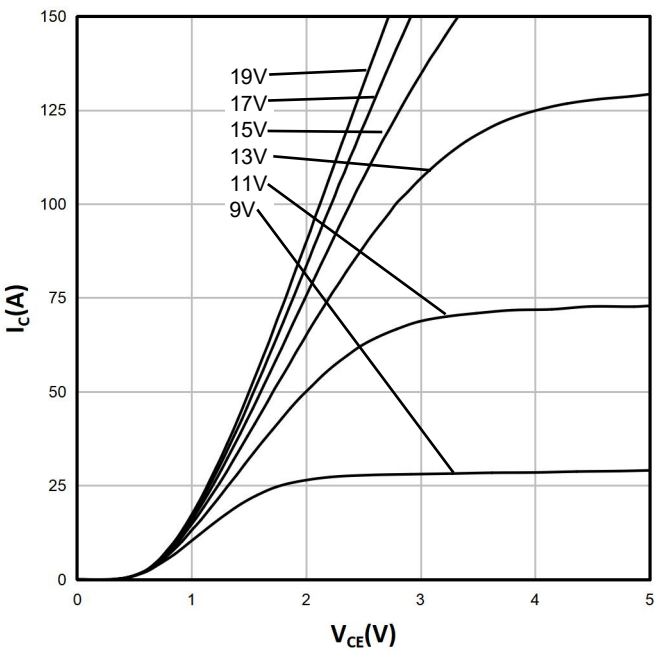


Figure3. $V_{CE(sat)}$ vs. Temperature

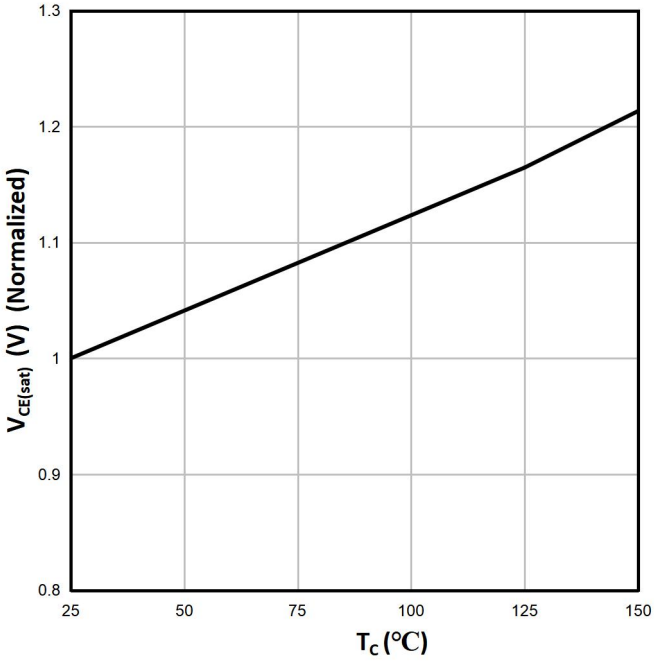


Figure4.transfer characteristic IGBT
V_{CE}=20V

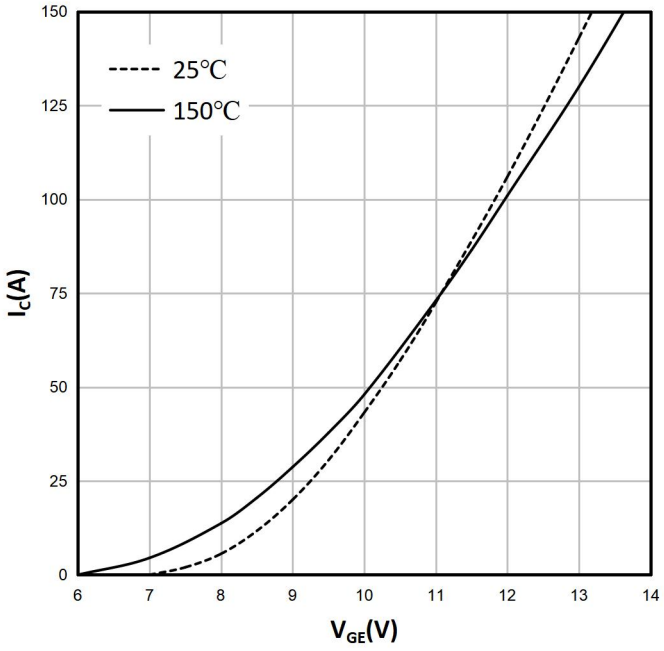


Figure5. FBSOA IGBT
D=0, Tc=25℃,Tj<=175℃,Vge=15V

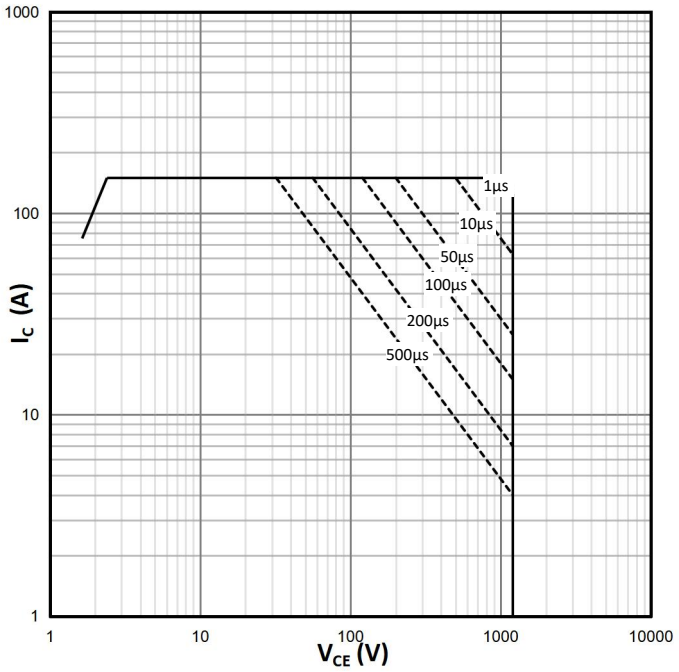


Figure6. Gate Charge Waveform
Vcc=600V,IC=75A,VGE=15V

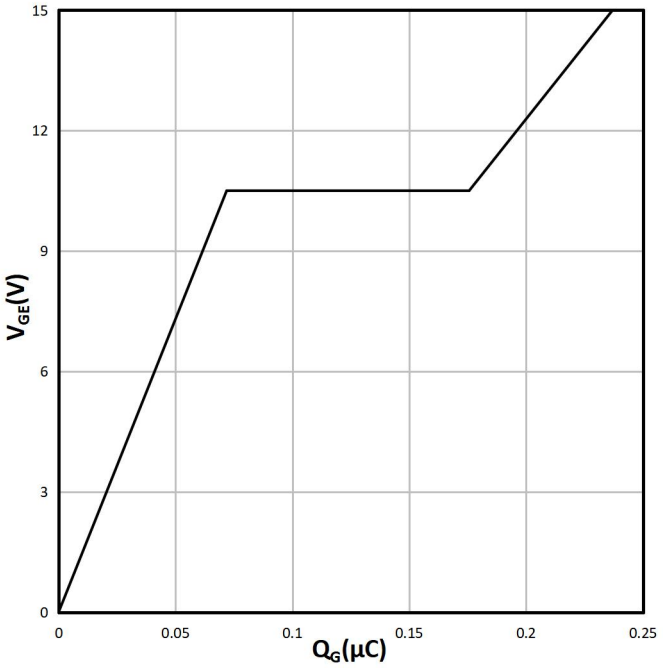


Figure7.switching losses IGBT(typical)
Vcc=600V,R_{Gon} =10Ω, R_{Goff} =25Ω,Vge=±15V

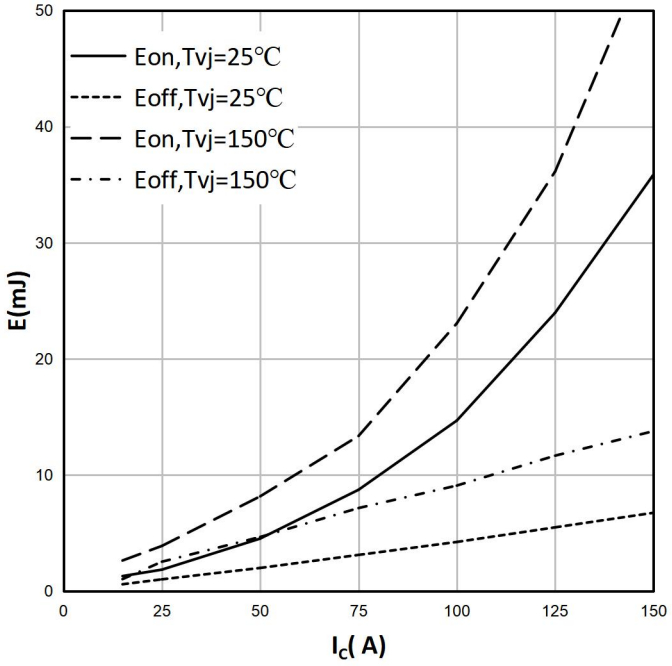


Figure 8.switching losses IGBT (typical)
Vcc=600V,Ic=75A,Vge=±15V

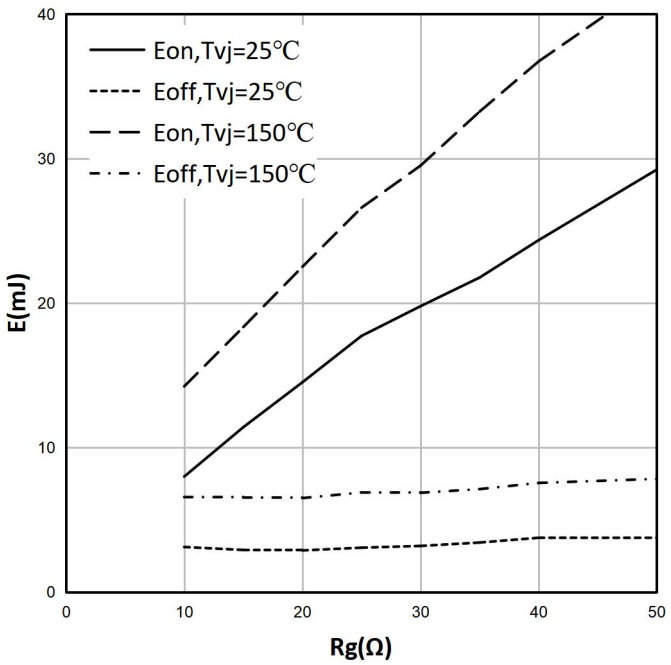


Figure9. transient thermal impedance

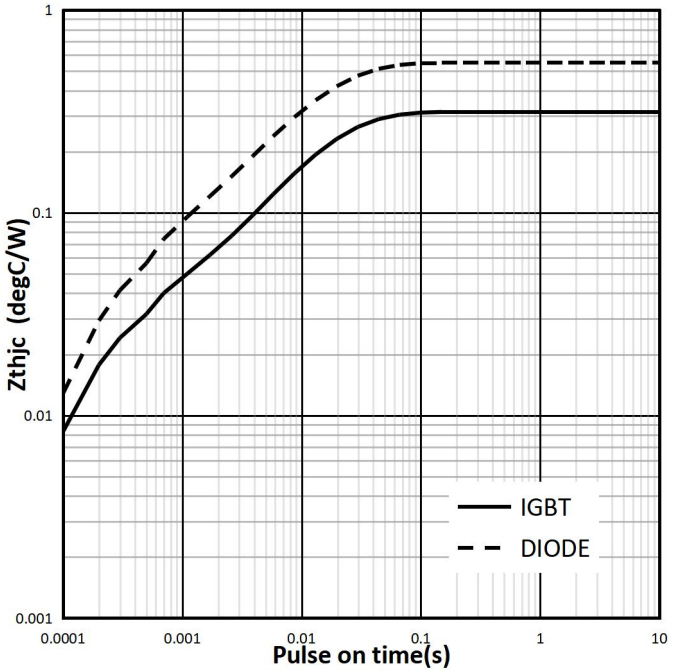


Figure10. forward characteristic of Diode(typical)
VGE=0V

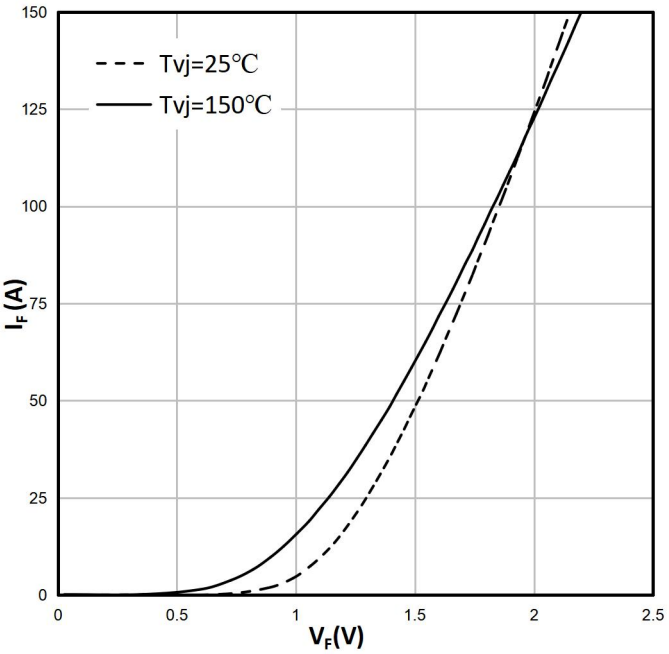


Figure11.Reverse Recovery Energy Loss vs. IC
Vcc=600V,R_{Gon} =10Ω, R_{Goff} =25Ω,Vge=±15V

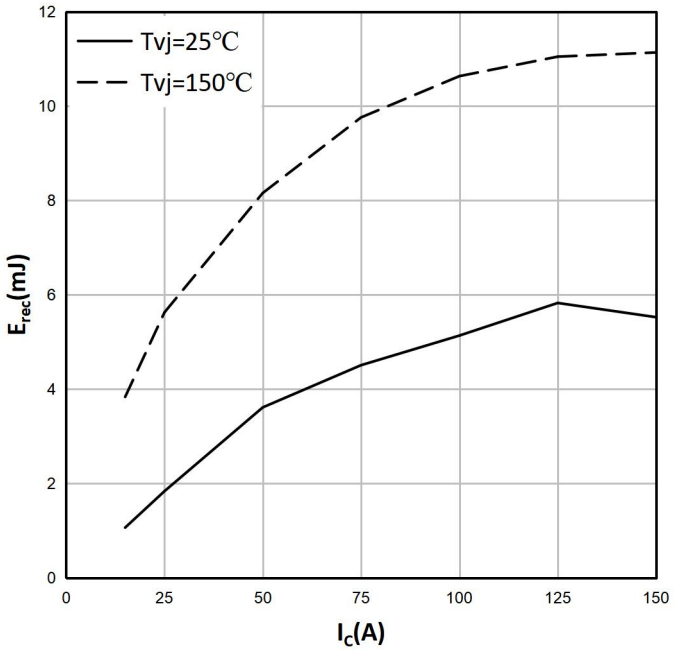
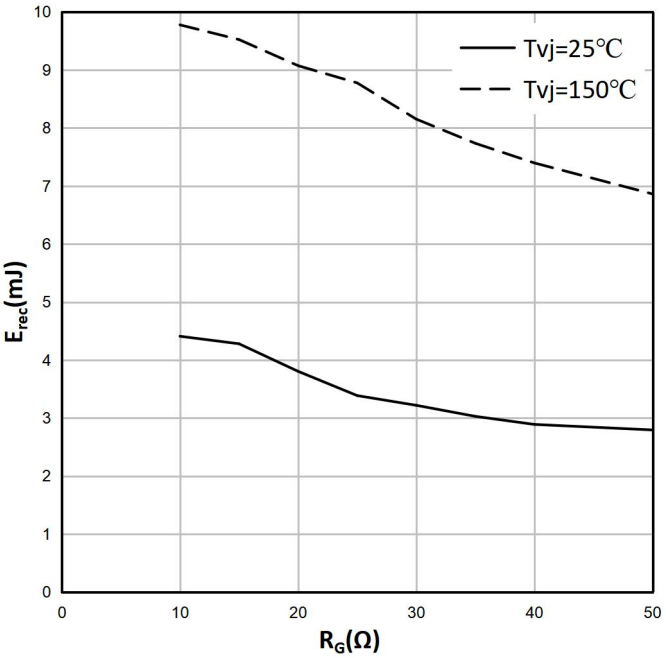
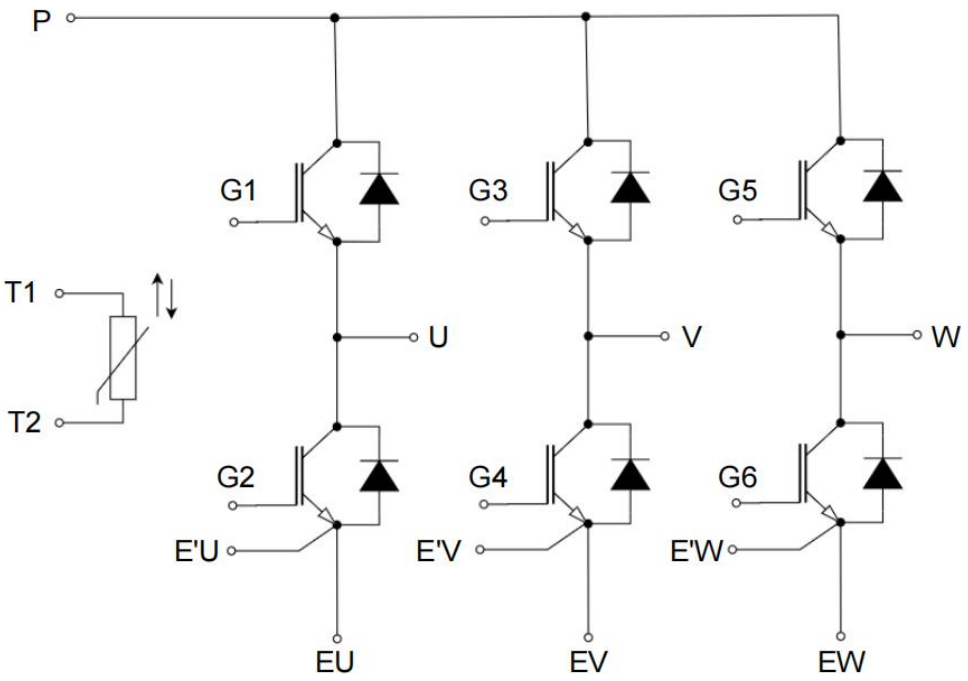


Figure12.Reverse Recovery Energy Loss vs.RG
Vcc=600V,Ic=75A,,Vge=±15V



CIRCUIT DIAGRAM



PACKAGE DIMENSION