

Features

- Trench/Fieldstop IGBT
- Low Switching Losses
- Standard package
- Copper Base Plate
- Solder Contact Technology
- Integrated NTC temperature sensor



Typical Applications

- Motor Drives
- Servo Drives

IGBT, Inverter

Maximum Rated Values							
Symbol	Item	Conditions		Rating		Unit	
IGBT							
V _{CES}	Collector-emitter voltage	T _{vj} =25°C		1200		V	
V _{GES}	Gate-emitter voltage	-		±20		V	
I _C	Collector current,DC	T _C =80°C,T _{vj} =175°C		25		A	
I _{CRM}	Repetitive peak collector current	t _p =1ms		50		A	
P _{tot}	Total power dissipation	T _C =25°C,T _{vj} =175°C		151		W	
Characteristics Values							
Symbol	Item	Conditions		Values			Unit
IGBT				Min.	Typ.	Max.	
I _{CES}	Collector-emitter cut-off current	V _{CE} =1200V,V _{GE} =0V,T _{vj} =25°C		-	-	1	mA
I _{GES}	Gate leakage current	V _{CE} =0V,V _{GE} =20V,T _{vj} =25°C		-	-	100	nA
V _{GE(th)}	Gate-emitter threshold voltage	I _C =0.8mA,V _{CE} =V _{GE} ,T _{vj} =25°C		5.2	5.61	6.6	V
V _{CESat}	Collector-emitter saturation voltage	I _C =25A V _{GE} =15V	T _{vj} =25°C	-	1.98	-	
			T _{vj} =125°C	-	2.26	-	
			T _{vj} =150°C	-	-	-	
C _{ies}	Input capacitance	V _{CE} =25V,V _{GE} =0V f=1MHz,T _{vj} =25°C		-	1.77	-	nF
C _{oes}	Output capacitance			-	0.17	-	
C _{res}	Reverse transfer capacitance			-	0.06	-	
Q _G	Gate charge	V _{CC} =600V, I _C =25A V _{GE} =-15...+15V,T _{vj} =25°C		-	0.171	-	μC
R _g	Internal gate resistance	T _{vj} =25°C		-	-	-	Ω

t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C =25A V _{GE} =±15V R _{G(on)} =33Ω R _{G(off)} =33Ω	T _{vj} =25°C	-	134	-	ns
			T _{vj} =125°C	-	110	-	
			T _{vj} =150°C	-	-	-	
t _r	Rise time		T _{vj} =25°C	-	62	-	
			T _{vj} =125°C	-	55	-	
			T _{vj} =150°C	-	-	-	
t _{d(off)}	Turn-off delay time		T _{vj} =25°C	-	213.6	-	
			T _{vj} =125°C	-	227.2	-	
			T _{vj} =150°C	-	-	-	
t _f	Fall time		T _{vj} =25°C	-	323.2	-	
			T _{vj} =125°C	-	387.2	-	
			T _{vj} =150°C	-	-	-	
E _{on}	Turn-on energy (per pulse)		T _{vj} =25°C	-	4.25	-	mJ
			T _{vj} =125°C	-	5.2	-	
			T _{vj} =150°C	-	-	-	
E _{off}	Turn-off energy (per pulse)		T _{vj} =25°C	-	1.64	-	
			T _{vj} =125°C	-	2.0	-	
			T _{vj} =150°C	-	-	-	
SC data	Short-circuit current	V _{CC} =600V,V _{GE} ≤15V,T _{vj} =125°C V _{CES} ≤1200V,t _p ≤10μs	-	90	-	A	
R _{thJC}	Thermal resistance,junction to case	Per IGBT	-	-	0.99	K/W	
T _{vjop}	Temperature under switching conditions		-40		150	°C	

Diode, Inverter**Maximum Rated Values**

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$	1200	V
I_F	Forward current, DC	$T_C=80^{\circ}C, T_{vj}=175^{\circ}C$	25	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	50	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	170	A^2s

Characteristic Values

V _F	Continuous forward voltage	I _F =25A V _{GE} =0V	T _{vj} =25°C	-	2.29	-	V
			T _{vj} =125°C	-	1.83	-	
			T _{vj} =150°C	-	-	-	
I _{RM}	Peak reverse recovery current	V _R =600V I _F =25A V _{GE} =-15V	T _{vj} =25°C	-	17	-	A
			T _{vj} =125°C	-	20	-	
			T _{vj} =150°C	-	-	-	
t _{rr}	Reverse recovery time		T _{vj} =25°C	-	237	-	ns
			T _{vj} =125°C	-	528	-	
			T _{vj} =150°C	-	-	-	
Q _r	Recovered charge		T _{vj} =25°C	-	0.71	-	μC
			T _{vj} =125°C	-	4.03	-	
			T _{vj} =150°C	-	-	-	

E_{rec}	Reverse recovery energy		$T_{vj}=25^{\circ}\text{C}$	-	0.03	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	1.07	-	
			$T_{vj}=150^{\circ}\text{C}$	-	-	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	-	1.35	K/W
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}\text{C}$

Diode, Rectifier**Maximum Rated Values**

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$	1800	V
I_{FRMSM}	Maximum RMS forward current per chip	$T_C=80^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	50	A
I_{FRM}	Repetitive peak forward current	$t_p=1\text{ms}$	80	A
I^2t	I^2t -value	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	340	A^2s

Characteristic Values

Characteristic Values							
Symbol	Item	Conditions		Values			Unit
				Min.	Typ.	Max.	
V _F	Continuous forward voltage	I _F =25A V _{GE} =0V	T _{vj} =25°C	-	1.1	-	V
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
I _R	Reverse current	V _R =1800V	T _{vj} =25°C	-	-	10	uA
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
R _{thJC}	Thermal resistance, junction to case	per diode		-	-	1	K/W
T _{vjop}	Temperature under switching conditions			-40		150	°C

IGBT, Brake-Chopper**Maximum Rated Values**

Symbol	Item	Conditions	Values	Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Collector current, DC	$T_C=80^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	15	A
I_{CRM}	Repetitive peak collector current	$t_p=1\text{ms}$	30	A
P_{tot}	Total power dissipation	$T_C=25^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	127	W

Characteristic Values

Symbol	Item	Conditions		Values			Unit
IGBT				Min.	Typ.	Max.	
I _{CES}	Collector-emitter cut-off current	V _{CE} =1200V,V _{GE} =0V,T _{vj} =25°C		-	-	1	mA
I _{GES}	Gate leakage current	V _{CE} =0V,V _{GE} =20V,T _{vj} =25°C		-	-	100	nA
V _{GE(th)}	Gate-emitter threshold voltage	I _C =0.5mA,V _{CE} =V _{GE} ,T _{vj} =25°C		5.2	5.83	6.6	V
V _{CEsat}	Collector-emitter saturation voltage	I _C =15A V _{GE} =15V	T _{vj} =25°C	-	1.97	2.25	
			T _{vj} =125°C	-	2.29	-	
			T _{vj} =150°C	-	-	-	
C _{ies}	Input capacitance	V _{CE} =25V,V _{GE} =0V		-	1.19	-	nF

C _{oes}	Output capacitance	f=1MHz,T _{vj} =25°C		-	0.08	-		
C _{res}	Reverse transfer capacitance			-	0.04	-		
Q _G	Gate charge	V _{CC} =600V,I _C =15A V _{GE} =-15...+15V,T _{vj} =25°C		-	0.094	-	μC	
R _g	Internal gate resistance	T _{vj} =25°C		-	-	-	Ω	
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C =15A V _{GE} =±15V R _{G(on)} =33Ω R _{G(off)} =33Ω	T _{vj} =25°C	-	114.4	-	ns	
			T _{vj} =125°C	-	91.2	-		
			T _{vj} =150°C	-	-	-		
t _r	Rise time		T _{vj} =25°C	-	35.2	-		
			T _{vj} =125°C	-	39.2	-		
			T _{vj} =150°C	-	-	-		
t _{d(off)}	Turn-off delay time		T _{vj} =25°C	-	184	-		
			T _{vj} =125°C	-	99.8	-		
			T _{vj} =150°C	-	-	-		
t _f	Fall time		T _{vj} =25°C	-	388	-	mJ	
			T _{vj} =125°C	-	412	-		
			T _{vj} =150°C	-	-	-		
E _{on}	Turn-on energy (per pulse)		T _{vj} =25°C	-	1.92	-		
			T _{vj} =125°C	-	2.69	-		
			T _{vj} =150°C	-	-	-		
E _{off}	Turn-off energy (per pulse)		T _{vj} =25°C	-	1.36	-		
			T _{vj} =125°C	-	1.2	-		
			T _{vj} =150°C	-	-	-		
SC data	Short-circuit current	V _{CC} =600V,V _{GE} ≤15V,T _{vj} =125°C V _{CES} ≤1200V,t _p ≤10μs		-	55	-	A	
R _{thJC}	Thermal resistance,junction to case	Per IGBT		-	-	1.18	K/W	
T _{vjop}	Temperature under switching conditions			-40		150	°C	

Diode, Brake-Chopper**Maximum Rated Values**

Symbol	Item	Conditions	Rating	Unit
V _{RRM}	Repetitive peak reverse voltage	T _{vj} =25°C	1200	V
I _F	Forward current, DC	T _C =80°C, T _{vj} =175°C	10	A
I _{FRM}	Repetitive peak forward current	t _p =1ms	20	A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =125°C	20	A ² s

Characteristic Values

V _F	Continuous forward voltage	I _F =10A V _{GE} =0V	T _{vj} =25°C	-	2.15	2.3	V
			T _{vj} =125°C	-	1.93	-	
			T _{vj} =150°C	-	-	-	
I _{RM}	Peak reverse recovery current	V _R =600V I _F =10A	T _{vj} =25°C	-	19	-	A
			T _{vj} =125°C	-	28	-	
			T _{vj} =150°C	-	-	-	
t _{rr}	Reverse recovery time	V _{GE} =-15V	T _{vj} =25°C	-	84.4	-	ns
			T _{vj} =125°C	-	292	-	

Q _r	Recovered charge		T _{vj} =25°C	-	0.72	-	μC
			T _{vj} =125°C	-	2.94	-	
E _{rec}	Reverse recovery energy		T _{vj} =25°C	-	0.07	-	mJ
			T _{vj} =125°C	-	0.78	-	
R _{thJC}	Thermal resistance, junction to case	per diode		-	-	2.3	K/W
T _{vjop}	Temperature under switching conditions			-40		150	°C

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R ₂₅	Rated resistance	T _C =25°C	-	5	-	kΩ
ΔR/R	Deviation of resistance	T _C =100°C, R ₁₀₀ =493Ω	-5	-	5	%
P ₂₅	Power dissipation	T _C =25°C	-	-	20	mW
B _{25/50}	B-constant	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15K))]$	-	3375	-	K
B _{25/80}	B-constant	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15K))]$	-	3411	-	
B _{25/100}	B-constant	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15K))]$	-	3433	-	

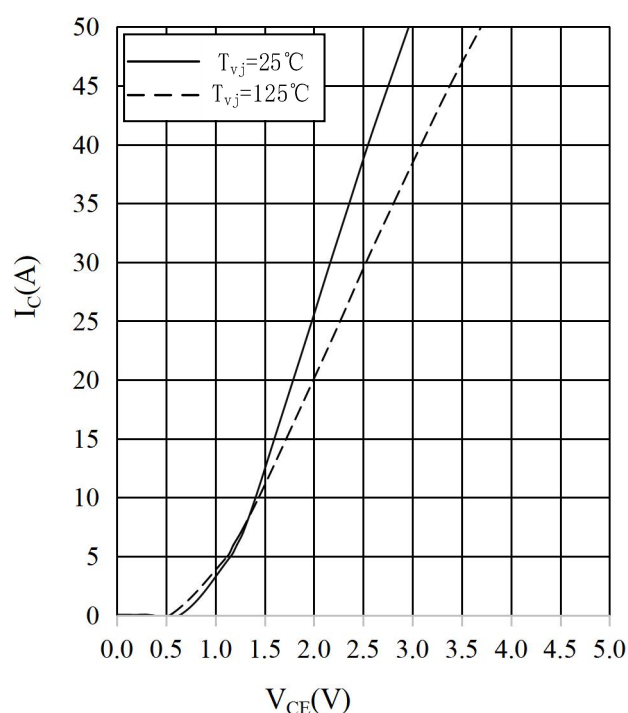
Module

Symbol	Item	Conditions	Rating			Unit
V _{ISOL}	Isolation voltage	Terminals to baseplate, RMS, f=50Hz, t=1min	2500			V
T _{vj max}	Maximum junction temperature	-	175			°C
T _{vj op}	Operating junction temperature	Continuous operations (under switching)	-40~150			°C
T _{stg}	Storage temperature	-	-40~125			°C
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
Ms	Mounting torque	Mounting to heat sink, M5 screw	3	-	6	Nm
ds	Creepage distance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	10	-	
da	Clearance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	7.5	-	
m	Weight	-	-	175	-	g

output characteristic IGBT,Inverter (typical)

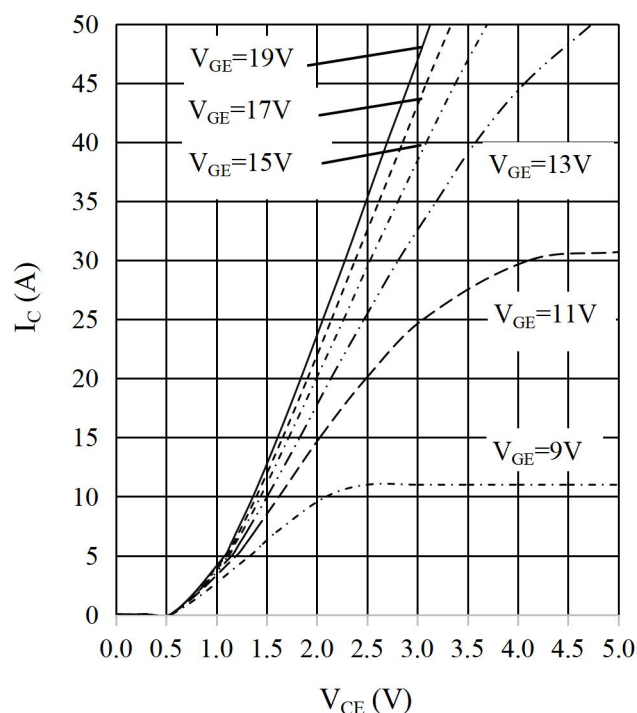
$$I_C = f(V_{CE})$$

$$V_{GE} = 15 \text{ V}$$


output characteristic IGBT,Inverter (typical)

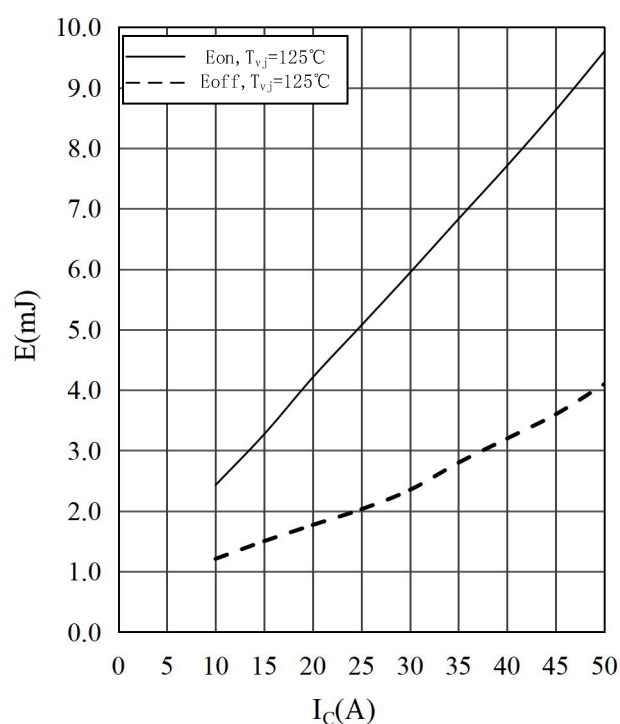
$$I_C = f(V_{CE})$$

$$T_{vj} = 125^\circ\text{C}$$


switching losses IGBT,Inverter (typical)

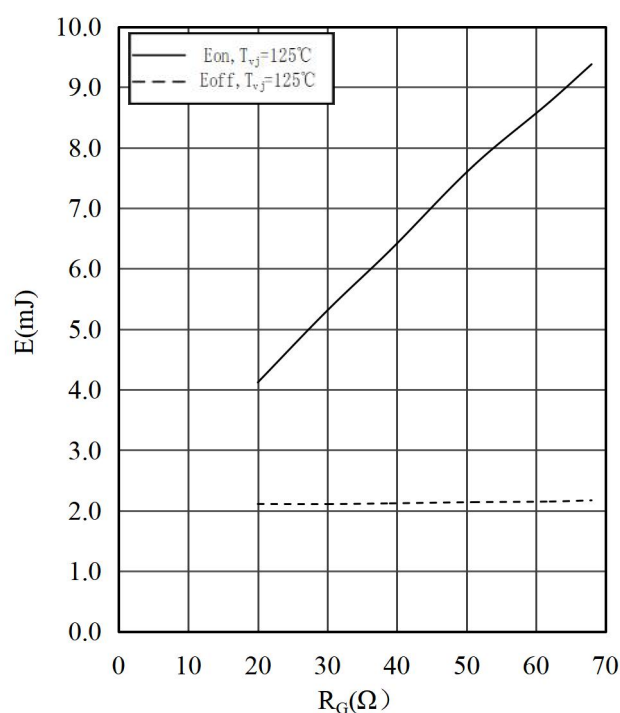
$$E_{on} = f(I_C), E_{off} = f(I_C)$$

$$V_{GE} = \pm 15 \text{ V}, R_{Gon} = 33 \Omega, R_{Goff} = 33 \Omega, V_{CE} = 600 \text{ V}$$


switching losses IGBT,Inverter (typical)

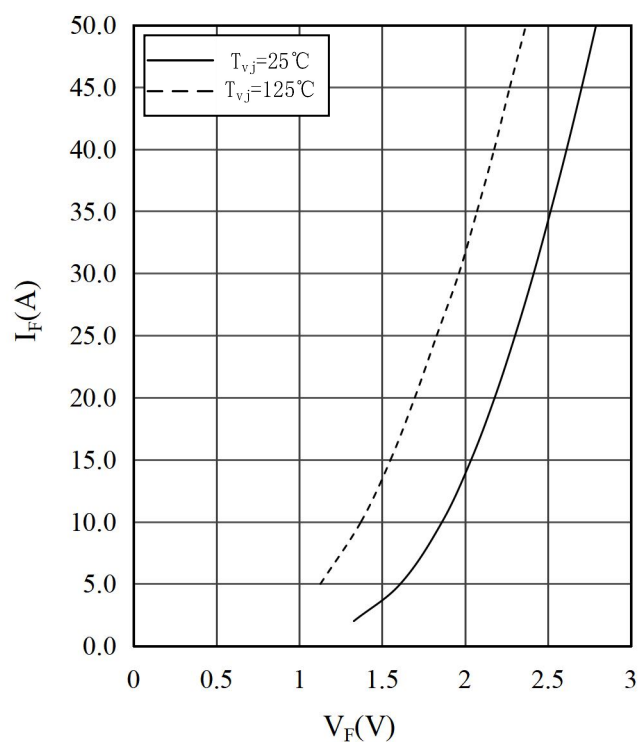
$$E_{on} = f(R_G), E_{off} = f(R_G)$$

$$V_{GE} = \pm 15 \text{ V}, I_C = 25 \text{ A}, V_{CE} = 600 \text{ V}$$



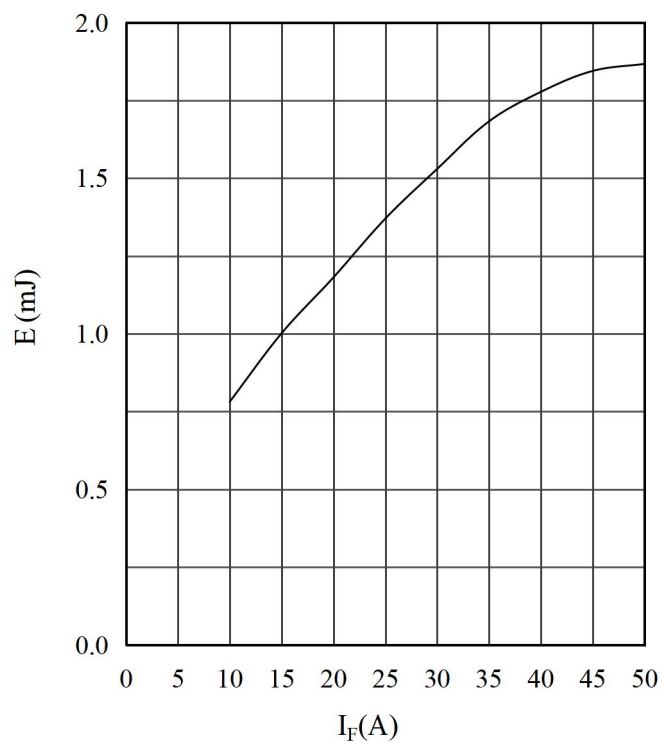
forward characteristic of Diode, Inverter (typical)

$$I_F = f(V_F)$$


switching losses Diode, Inverter (typical)

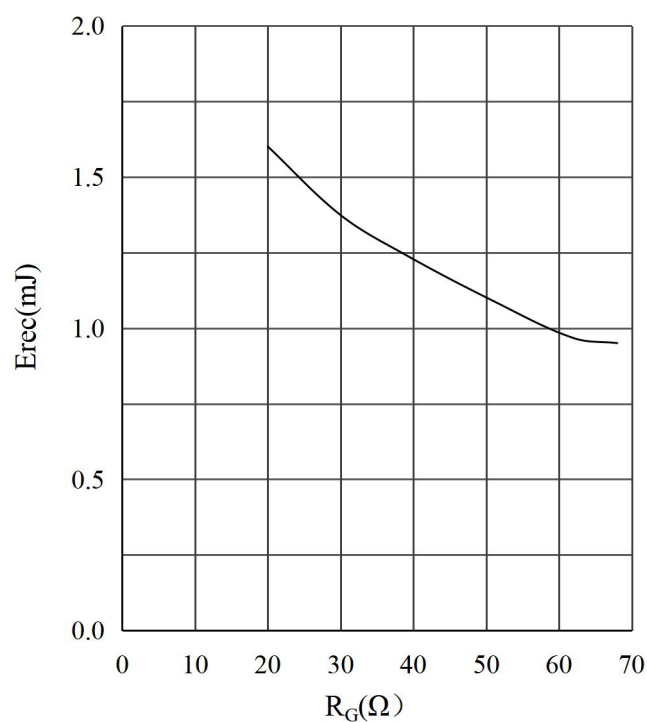
$$E_{rec} = f(I_F)$$

$$R_{Gon} = 33 \Omega, V_{CE} = 600 \text{ V}, T_{vj} = 125^\circ\text{C}$$


switching losses Diode, Inverter (typical)

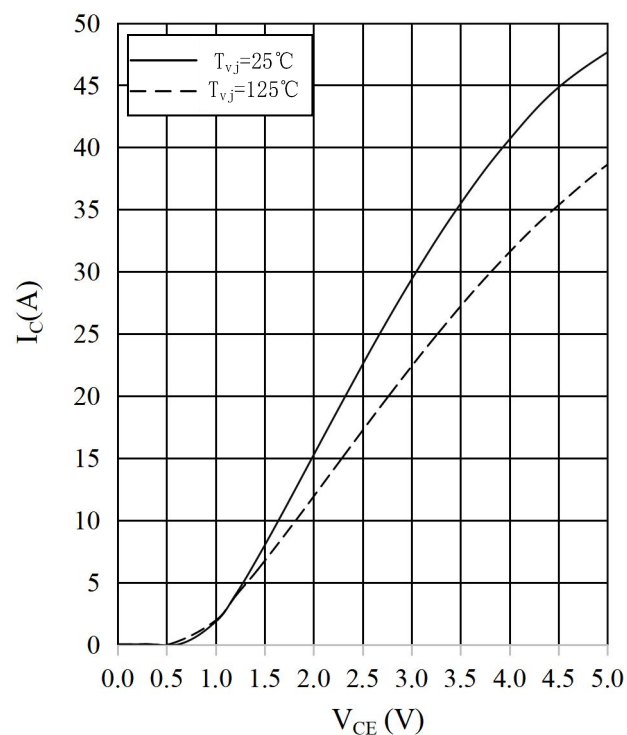
$$E_{rec} = f(R_G)$$

$$I_F = 25 \text{ A}, V_{CE} = 600 \text{ V}, T_{vj} = 125^\circ\text{C}$$


output characteristic IGBT, Brake-Chopper (typical)

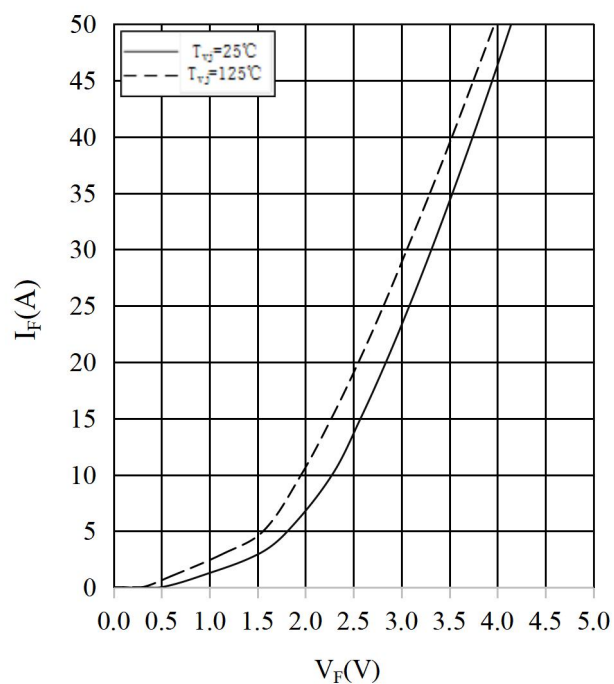
$$I_C = f(V_{CE})$$

$$V_{GE} = 15 \text{ V}$$



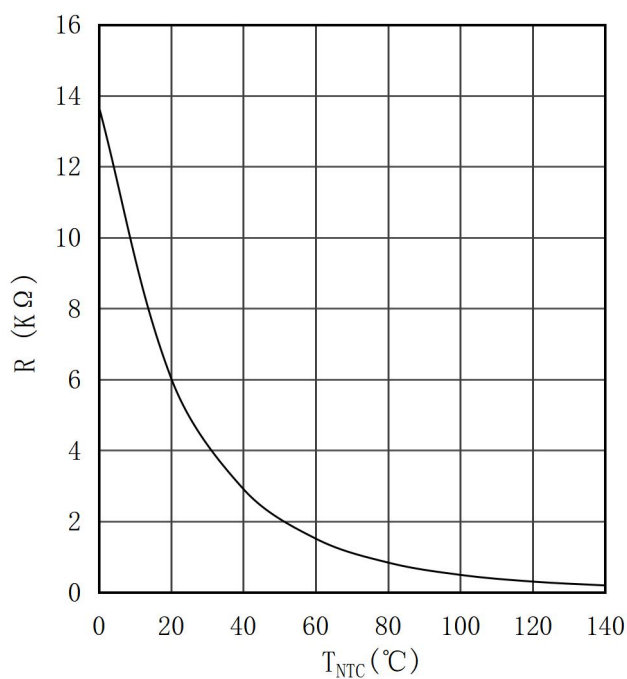
forward characteristic of Diode, Brake-Chopper (typical)

$$I_F = f(V_F)$$

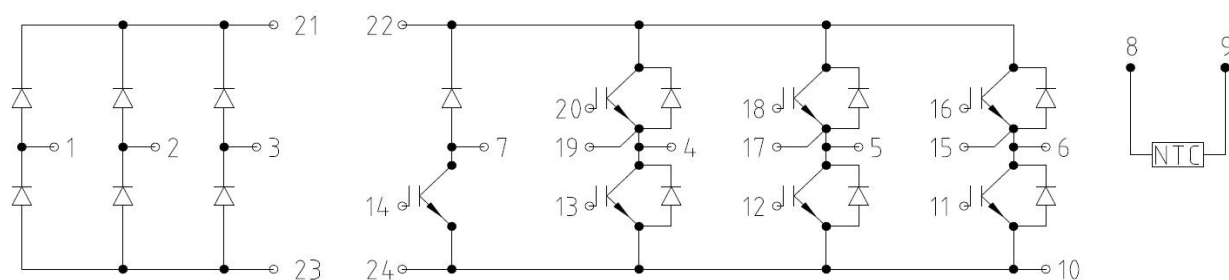


NTC-Thermistor-temperature characteristic(typical)

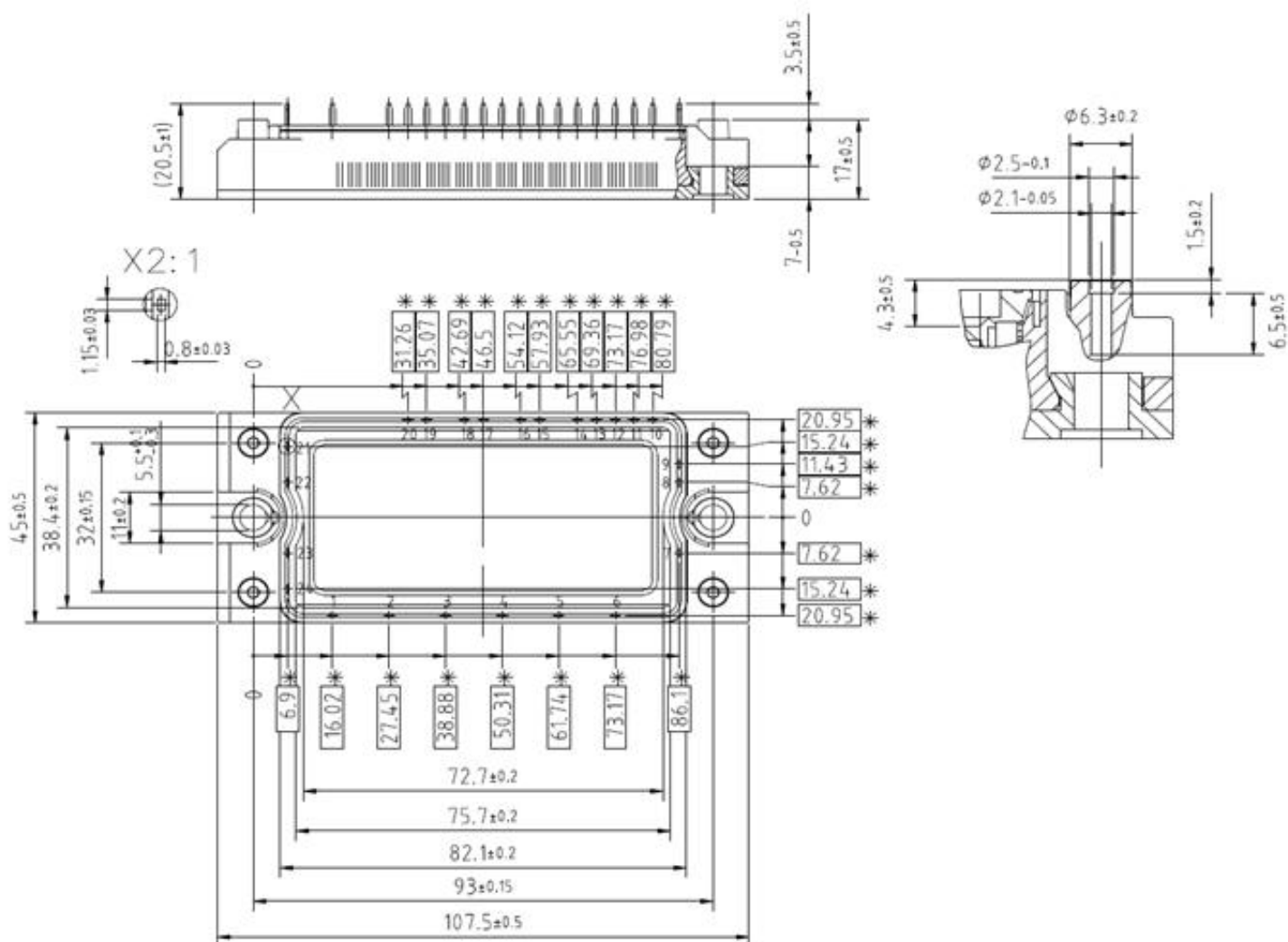
$$R = f(T)$$



Circuit Diagram



Package Outlines



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