

Electrical Features

- Trench/ Fieldstop IGBT
- V_{CEsat} with positive Temperature Coefficient
- Low V_{CEsat}

Typical Applications

- Auxiliary inverters
- Motor drives
- Servo drives



Mechanical Features

- High power density
- Integrated NTC temperature sensor
- Copper base plate
- Solder contact technology
- Standard housing

IGBT , Inverter

Maximum Rated Values							
Symbol	Item	Conditions	Rating			Unit	
IGBT							
V_{CES}	Collector- emitter voltage	$T_{vj}=25^{\circ}C$	1200			V	
V_{GES}	Gate- emitter voltage	-	± 20			V	
I_C	Collector current,DC	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$	150			A	
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	300			A	
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	872			W	
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
IGBT			Min.	Typ.	Max.		
I_{CES}	Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$	-	-	1	mA	
I_{GES}	Gate leakage current	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$	-	-	500	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=5.7mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.71	6.2	V	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=150A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.9	-	V
			$T_{vj}=125^{\circ}C$	-	2.1	-	
			$T_{vj}=150^{\circ}C$	-	2.2	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	10.6	-	nF	
C_{oes}	Output capacitance		-	0.69	-		
C_{res}	Reverse transfer capacitance		-	0.36	-		
Q_G	Gate charge	$V_{CC}=600V, I_C=150A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	939	-	nC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	1.2	-	Ω	

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=150A$ $V_{GE}=\pm 15V$ $R_{G(on)}=10\Omega$ $R_{G(off)}=10\Omega$	$T_{vj}=25^\circ C$	-	133.0	-	ns	
			$T_{vj}=125^\circ C$	-	101.2	-		
			$T_{vj}=150^\circ C$	-	98.5	-		
t_r	Rise time		$T_{vj}=25^\circ C$	-	99.4	-		
			$T_{vj}=125^\circ C$	-	112.3	-		
			$T_{vj}=150^\circ C$	-	125.8	-		
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	480.2	-		
			$T_{vj}=125^\circ C$	-	539.2	-		
			$T_{vj}=150^\circ C$	-	550.4	-		
t_f	Fall time		$T_{vj}=25^\circ C$	-	116.5	-		
			$T_{vj}=125^\circ C$	-	126.4	-		
			$T_{vj}=150^\circ C$	-	126.3	-		
E_{on}	Turn-on energy (per pulse)		$T_{vj}=25^\circ C$	-	21.24	-		mJ
			$T_{vj}=125^\circ C$	-	26.83	-		
			$T_{vj}=150^\circ C$	-	31.79	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	11.0	-			
		$T_{vj}=125^\circ C$	-	16.99	-			
		$T_{vj}=150^\circ C$	-	20.76	-			
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	473	-	A		
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.172	K/W		
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.0785	-	K/W		
T_{vjop}	Temperature under switching conditions		-40		150	$^\circ C$		
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			150		A		
I_{FRM}	Repetitive peak forward current	$t_p=1ms$		300		A		
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$		2950		A^2s		
Characteristic Values								
V_F	Continuous forward voltage	$I_F=150A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	1.36	-	V	
			$T_{vj}=125^\circ C$	-	1.62	-		
			$T_{vj}=150^\circ C$	-	1.67	-		
I_{RM}	Peak reverse recovery current		$T_{vj}=25^\circ C$	-	51.0	-	A	
			$T_{vj}=125^\circ C$	-	72.8	-		
			$T_{vj}=150^\circ C$	-	77.0	-		
t_{rr}	Reverse recovery time	$V_R=600V$ $I_F=150A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	112	-	ns	
			$T_{vj}=125^\circ C$	-	902	-		
			$T_{vj}=150^\circ C$	-	976	-		
Q_r	Recovered charge		$T_{vj}=25^\circ C$	-	6.29	-	μC	
			$T_{vj}=125^\circ C$	-	17.81	-		
			$T_{vj}=150^\circ C$	-	18.13	-		

E _{rec}	Reverse recovery energy		T _{vj} =25°C	-	1.54	-	mJ
			T _{vj} =125°C	-	4.81	-	
			T _{vj} =150°C	-	5.66	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	0.299	K/W	
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m·K)	-	0.105	-	K/W	
T _{vjop}	Temperature under switching conditions		-40		150	°C	

Diode, Rectifier
Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
V _{RRM}	Repetitive peak reverse voltage	T _{vj} =25°C	1600	V
I _{FRMSM}	Maximum RMS forward current per chip	T _C =100°C, T _{vj} =175°C	150	A
I _{RMSM}	Maximum RMS current at rectifier output	T _C =100°C	150	A
I _{FSM}	Surge forward current	t _p =10 ms, T _{vj} =25°C	1320	A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =150°C	9800	A ² s

Characteristic Values

Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V _F	Continuous forward voltage	I _F =150A V _{GE} =0V	T _{vj} =25°C	-	1.1	-	V
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
I _R	Reverse current	V _R =1600V	T _{vj} =25°C	-	-	10	uA
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	0.284	K/W	
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m·K)	-	0.0887	-	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°C	1200	V
V _{GES}	Gate-emitter voltage	-	±20	V
I _C	Collector current, DC	T _C =100°C, T _{vj} =175°C	100	A
I _{CRM}	Repetitive peak collector current	t _p =1ms	200	A
P _{tot}	Total power dissipation	T _C =25°C, T _{vj} =175°C	652	W

Characteristic Values

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
IGBT						
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	-	-	500	nA
V _{GE(th)}	Gate-emitter threshold voltage	I _C =3.8mA, V _{CE} =V _{GE} , T _{vj} =25°C	5.2	5.56	6.2	V

V_{CEsat}	Collector-emitter saturation voltage	$I_C=100A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.83	-	
			$T_{vj}=125^{\circ}C$	-	2.11	-	
			$T_{vj}=150^{\circ}C$	-	2.22	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	7.07	-	nF	
C_{oes}	Output capacitance		-	0.46	-		
C_{res}	Reverse transfer capacitance		-	0.24	-		
Q_G	Gate charge	$V_{CC}=600V, I_C=100A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	640	-	nC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	1.8	-	Ω	
$t_{d(on)}$	Turn-on delay time		$T_{vj}=25^{\circ}C$	-	105	-	ns
			$T_{vj}=125^{\circ}C$	-	115	-	
			$T_{vj}=150^{\circ}C$	-	114	-	
t_r	Rise time		$T_{vj}=25^{\circ}C$	-	59.2	-	
			$T_{vj}=125^{\circ}C$	-	67.8	-	
			$T_{vj}=150^{\circ}C$	-	72.0	-	
$t_{d(off)}$	Turn-off delay time	$V_{CC}=600V$ $I_C=100A$ $V_{GE}=\pm 15V$	$T_{vj}=25^{\circ}C$	-	471.2	-	
			$T_{vj}=125^{\circ}C$	-	676.2	-	
			$T_{vj}=150^{\circ}C$	-	708.8	-	
t_f	Fall time	$R_{G(on)}=10\Omega$ $R_{G(off)}=10\Omega$	$T_{vj}=25^{\circ}C$	-	161	-	
			$T_{vj}=125^{\circ}C$	-	210	-	
			$T_{vj}=150^{\circ}C$	-	268	-	
E_{on}	Turn-on energy (per pulse)		$T_{vj}=25^{\circ}C$	-	10.01	-	mJ
			$T_{vj}=125^{\circ}C$	-	18.93	-	
			$T_{vj}=150^{\circ}C$	-	21.59	-	
E_{off}	Turn-off energy (per pulse)		$T_{vj}=25^{\circ}C$	-	8.03	-	
			$T_{vj}=125^{\circ}C$	-	10.21	-	
			$T_{vj}=150^{\circ}C$	-	10.94	-	
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^{\circ}C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	244	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.23	K/W	
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.0941	-	K/W	
T_{vjop}	Temperature under switching conditions		-40		150	$^{\circ}C$	
Diode , Brake- Chopper							
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			50		A	
I_{FRM}	Repetitive peak forward current	$t_p=1ms$		100		A	
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$		560		A^2s	
Characteristic Values							
V_F	Continuous forward voltage	$I_F=50A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	1.52	-	V
			$T_{vj}=125^{\circ}C$	-	1.43	-	
			$T_{vj}=150^{\circ}C$	-	1.35	-	

I _{RM}	Peak reverse recovery current	V _R =600V I _F =50A V _{GE} =-15V	T _{vj} =25°C	-	83.12	-	A
			T _{vj} =125°C	-	108.37	-	
			T _{vj} =150°C	-	121.12	-	
t _{rr}	Reverse recovery time	V _R =600V I _F =50A V _{GE} =-15V	T _{vj} =25°C	-	59.2	-	ns
			T _{vj} =125°C	-	63.8	-	
Q _r	Recovered charge	V _R =600V I _F =50A V _{GE} =-15V	T _{vj} =25°C	-	7.03	-	μC
			T _{vj} =125°C	-	9.5	-	
E _{rec}	Reverse recovery energy	V _R =600V I _F =50A V _{GE} =-15V	T _{vj} =25°C	-	1.87	-	mJ
			T _{vj} =125°C	-	4.9291	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	0.682	-	K/W
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m·K)	-	0.123	-	-	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

Module

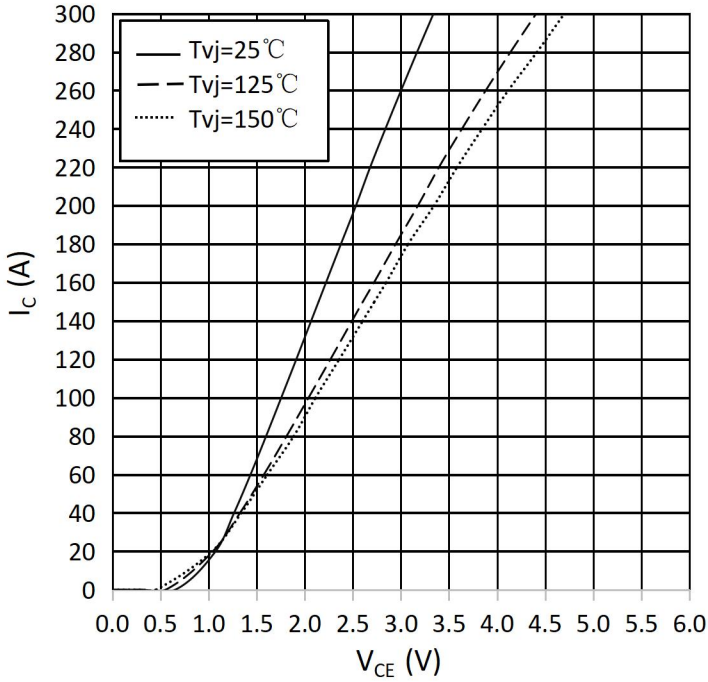
Symbol	Item	Conditions	Rating			Unit
V _{ISOL}	Isolation voltage	Terminals to baseplate, RMS, f=50Hz, t=1min	2500			V
T _{vj max}	Maximum junction temperature	-	175			°C
T _{vj op}	Operating junction temperature	Continuous operation (underswitching)	-40~150			°C
T _{stg}	Storage temperature	-	-40~125			°C
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M	Mounting torque for module mounting	-	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	-	-	290	-	g

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	-	

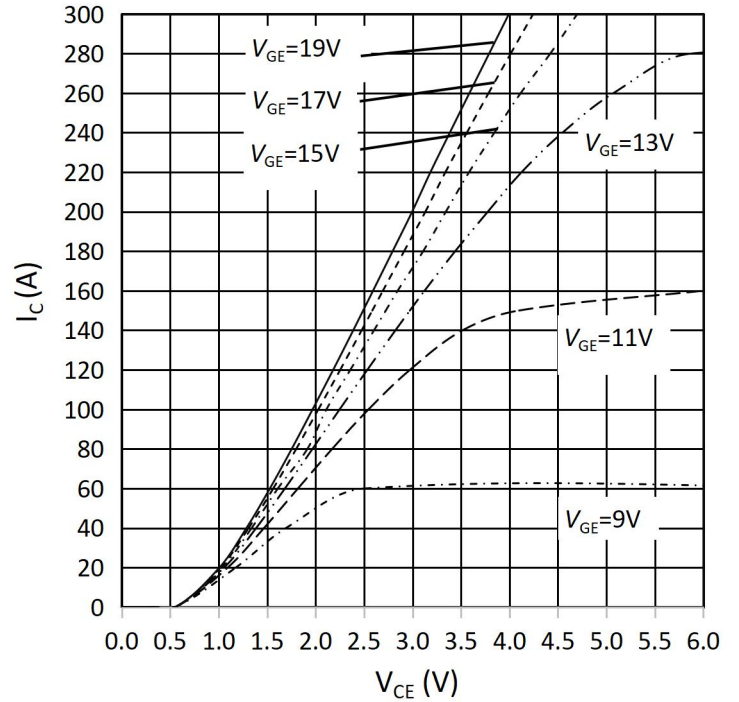
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15V$



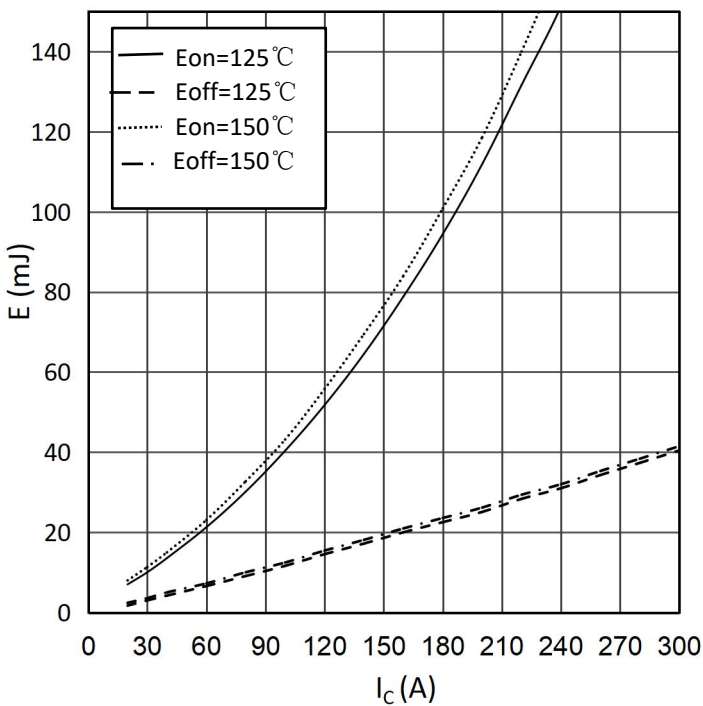
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 150^\circ C$



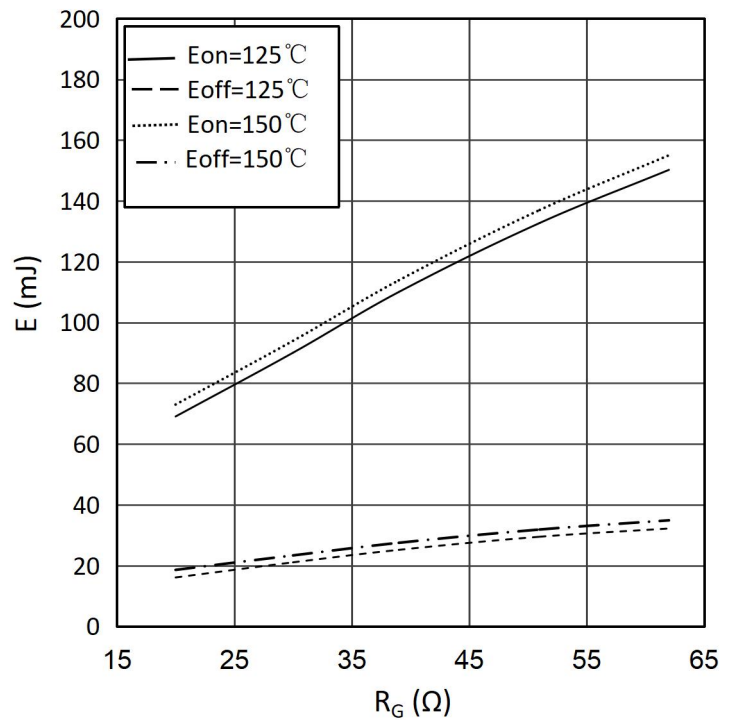
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15V, R_{Gon} = 30\Omega, R_{Goff} = 30\Omega, V_{CE} = 600V$



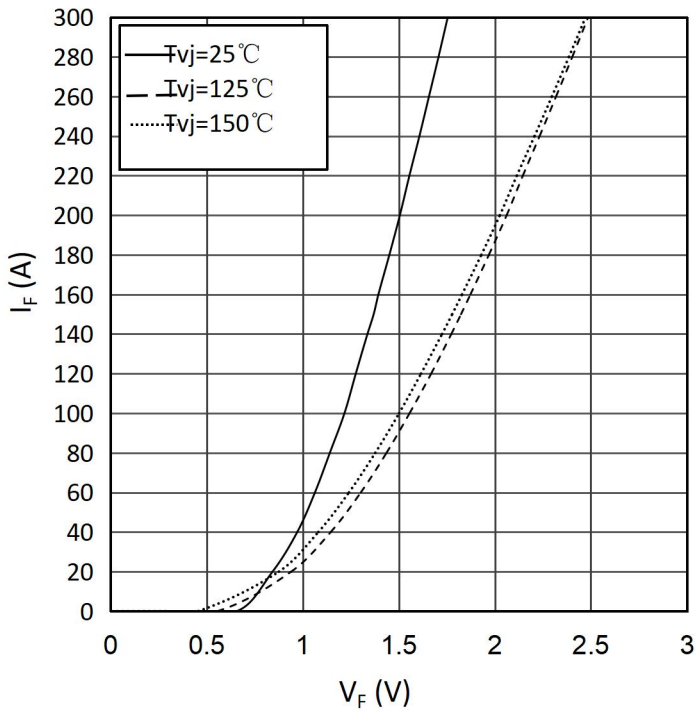
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15V, I_C = 150A, V_{CE} = 600V$



forward characteristic of Diode, Inverter (typical)

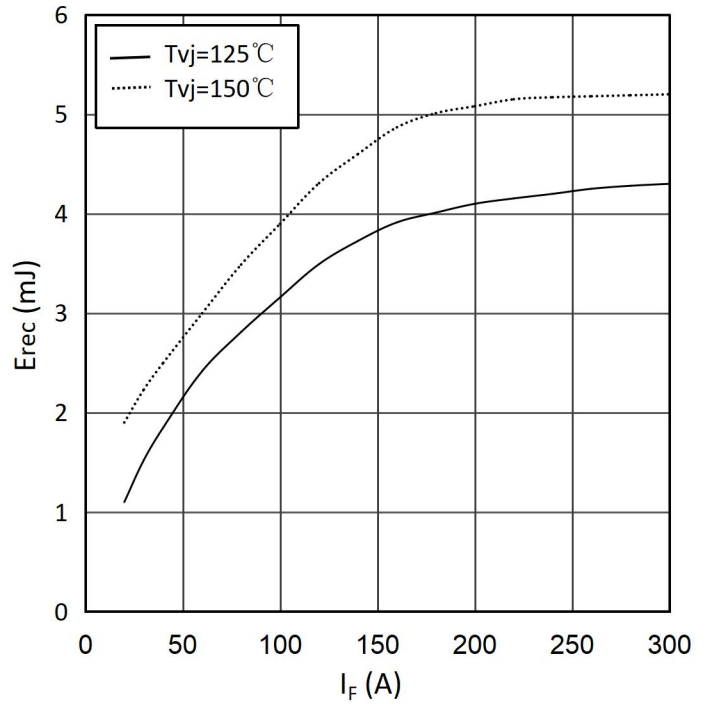
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

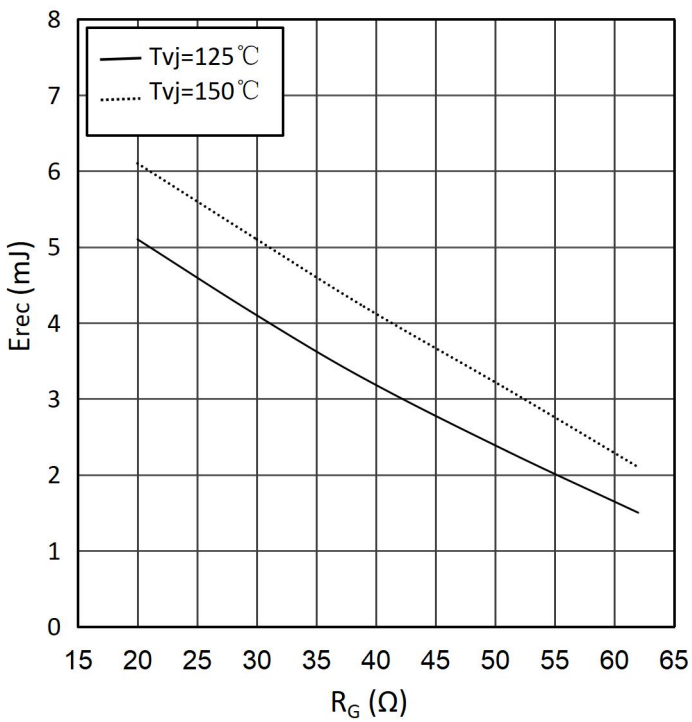
$R_{GS} = 30\Omega \quad V_{CE} = 600\text{V}$



switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

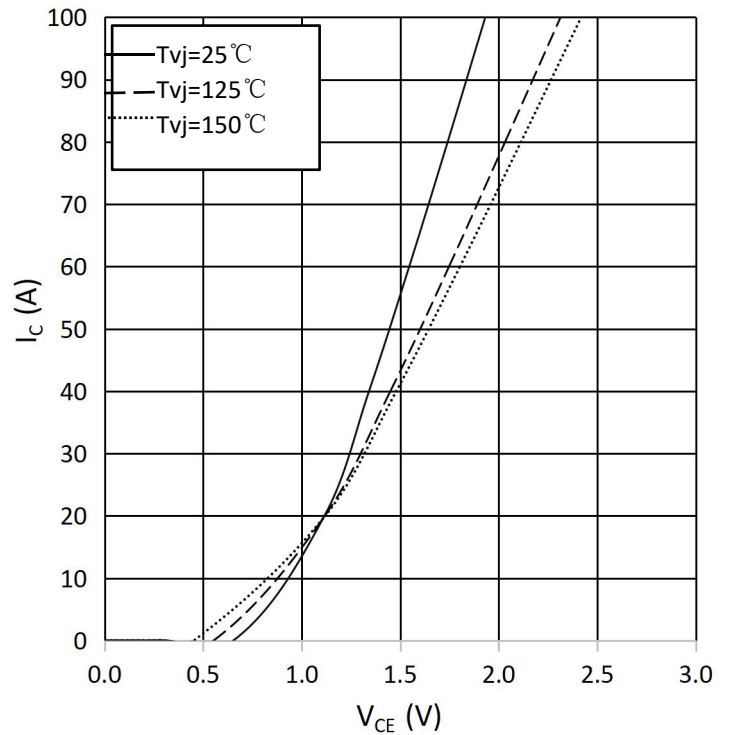
$I_F = 150\text{A}, V_{CE} = 600\text{V}$



output characteristic IGBT, Brake-Chopper (typical)

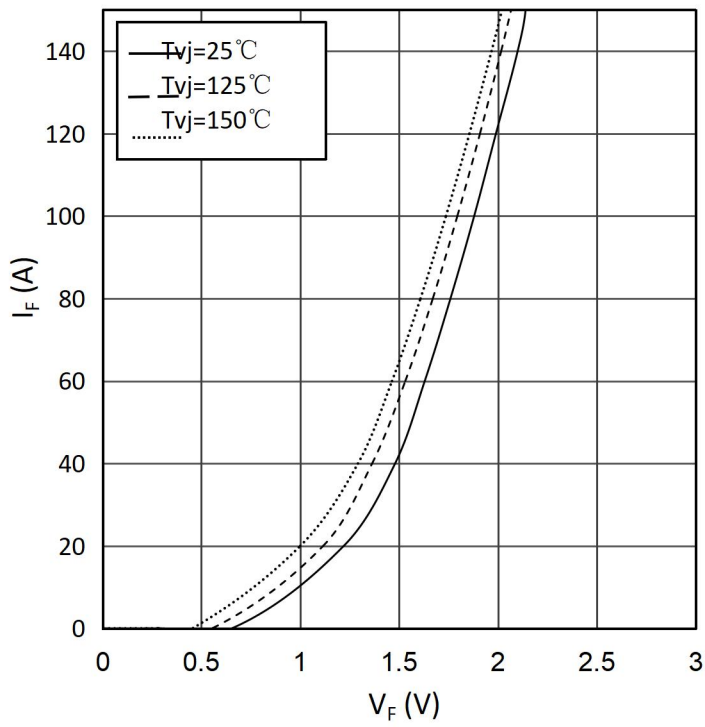
$I_C = f(V_{CE})$

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



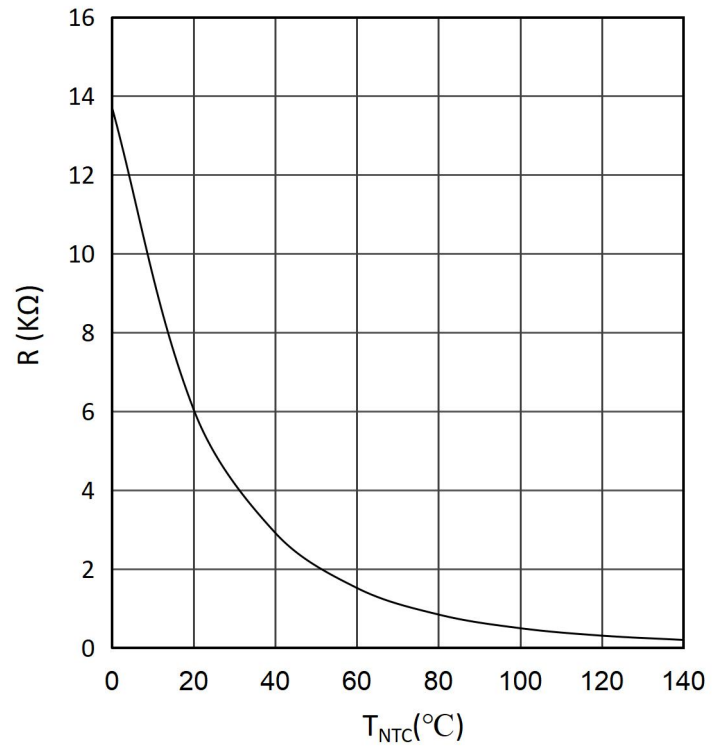
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$

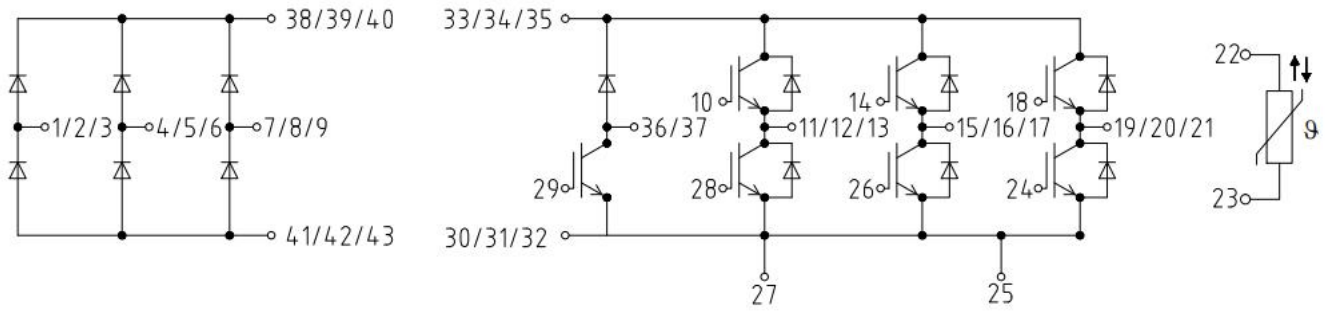


NTC- Thermistor- temperature characteristic(typical)

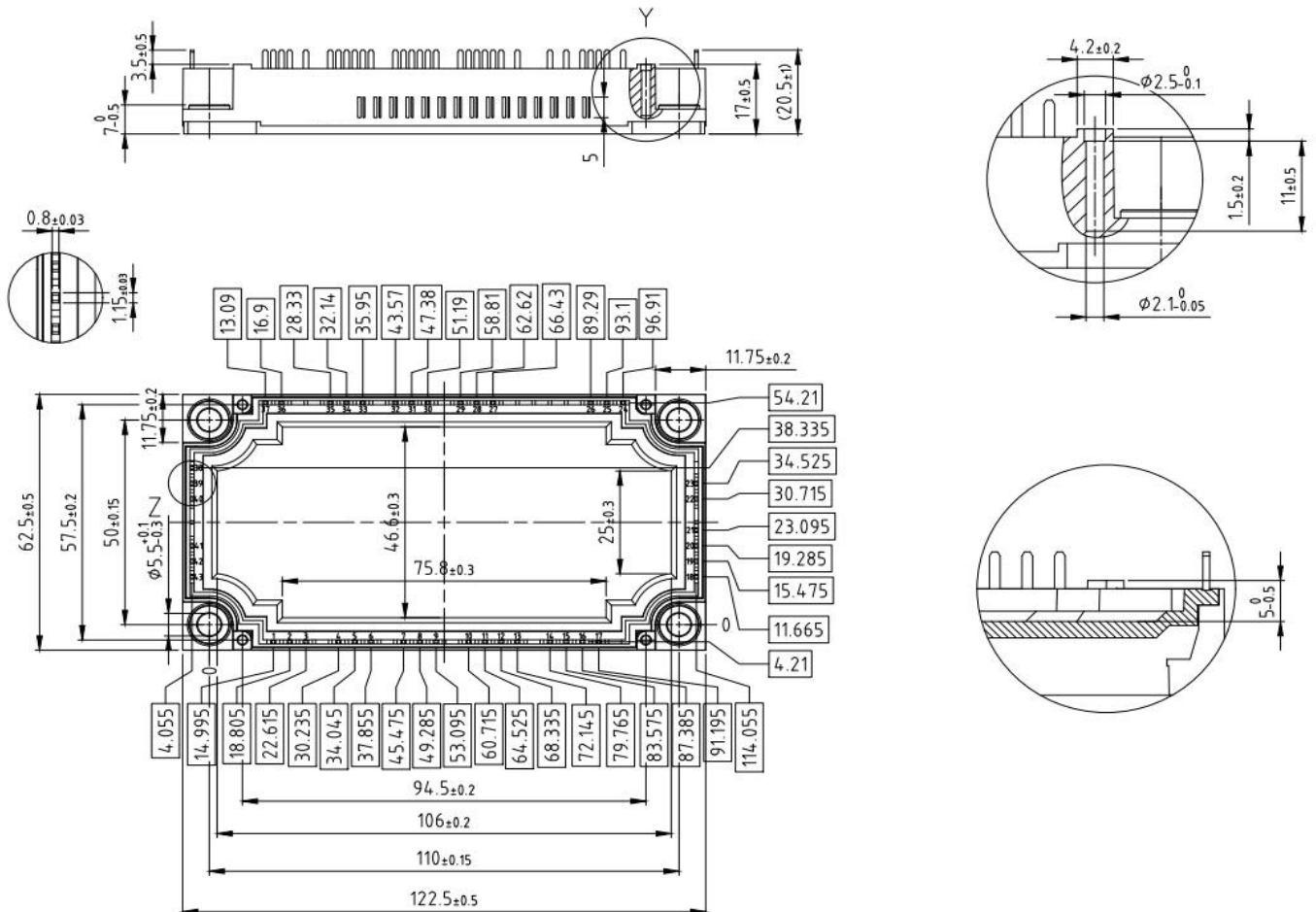
$R=f(T)$



Circuit Diagram



Package Outlines



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