

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	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$	100	A			
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	200	A			
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	517	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
			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	$I_C=3.8mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.48	6.2	V	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=100A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.93	-	V
			$T_{vj}=125^{\circ}C$	-	2.41	-	
			$T_{vj}=150^{\circ}C$	-	2.50	-	
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	$V_{CC}=600V, I_C=100A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.64	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	1.8	-	Ω	

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=100A$ $V_{GE}=\pm 15V$ $R_{G(on)}=30\Omega$ $R_{G(off)}=30\Omega$	$T_{vj}=25^\circ C$	-	240	-	ns
			$T_{vj}=125^\circ C$	-	211	-	
			$T_{vj}=150^\circ C$	-	203	-	
t_r	Rise time		$T_{vj}=25^\circ C$	-	103	-	
			$T_{vj}=125^\circ C$	-	134	-	
			$T_{vj}=150^\circ C$	-	139	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	782	-	
			$T_{vj}=125^\circ C$	-	830	-	
			$T_{vj}=150^\circ C$	-	742	-	
t_f	Fall time		$T_{vj}=25^\circ C$	-	140	-	
			$T_{vj}=125^\circ C$	-	244	-	
			$T_{vj}=150^\circ C$	-	345	-	
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^\circ C$	-	26.2	-	mJ	
		$T_{vj}=125^\circ C$	-	39.0	-		
		$T_{vj}=150^\circ C$	-	41.6	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	8.1	-		
		$T_{vj}=125^\circ C$	-	10.6	-		
		$T_{vj}=150^\circ C$	-	10.9	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	273	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.29	K/W	
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.13	-	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		100	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	200	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$	1500	A^2s

Characteristic Values

V_F	Continuous forward voltage	$I_F=100A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	1.96	-	V
			$T_{vj}=125^\circ C$	-	1.77	-	
			$T_{vj}=150^\circ C$	-	1.72	-	
I_{RM}	Peak reverse recovery current		$T_{vj}=25^\circ C$	-	49.3	-	A
			$T_{vj}=125^\circ C$	-	68.8	-	
			$T_{vj}=150^\circ C$	-	72.7	-	
t_{rr}	Reverse recovery time	$V_R=600V$ $I_F=100A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	113.6	-	ns
			$T_{vj}=125^\circ C$	-	800	-	
			$T_{vj}=150^\circ C$	-	952	-	
Q_r	Recovered charge		$T_{vj}=25^\circ C$	-	4.01	-	μC
			$T_{vj}=125^\circ C$	-	15.57	-	
			$T_{vj}=150^\circ C$	-	22.76	-	

E _{rec}	Reverse recovery energy		T _{vj} =25°C	-	0.6	-	mJ
			T _{vj} =125°C	-	3.4	-	
			T _{vj} =150°C	-	5.1	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	0.5	-	K/W
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m • K)	-	0.225	-	-	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		1800			V
I _{FRMSM}	Maximum RMS forward current per chip	T _C =80°C, T _{vj} =175°C		100			A
I _{RMSM}	Maximum RMS current at rectifier output	T _C = 80°C		150			A
I _{FSM}	Surge forward current	tp = 10 ms, T _{vj} = 150°C		880			A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =150°C		3850			A ² s

Characteristic Values

Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V _F	Continuous forward voltage	I _F =100A V _{GE} =0V	T _{vj} =25°C	-	1.24	-	V
			T _{vj} =125°C	-	1.36	-	
			T _{vj} =150°C	-	1.37	-	
I _R	Reverse current	V _R =1800V	T _{vj} =25°C	-	-	10	uA
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
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		50			A
I _{CRM}	Repetitive peak collector current	t _p =1ms		100			A
P _{tot}	Total power dissipation	T _C =25°C, T _{vj} =175°C		280			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	5.66	6.2	V
V _{CEsat}	Collector-emitter saturation voltage	I _C =50A V _{GE} =15V	T _{vj} =25°C	-	2.2	-	
			T _{vj} =125°C	-	2.7	-	
			T _{vj} =150°C	-	2.8	-	

C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	3.15	-	nF	
C_{oes}	Output capacitance		-	0.18	-		
C_{res}	Reverse transfer capacitance		-	0.103	-		
Q_G	Gate charge	$V_{CC}=600V, I_C=50A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.316	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	-	-	Ω	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=50A$ $V_{GE}=\pm 15V$ $R_{G(on)}=30\Omega$ $R_{G(off)}=30\Omega$	$T_{vj}=25^{\circ}C$	-	198	-	ns
			$T_{vj}=125^{\circ}C$	-	153	-	
			$T_{vj}=150^{\circ}C$	-	141	-	
t_r	Rise time		$T_{vj}=25^{\circ}C$	-	32	-	
			$T_{vj}=125^{\circ}C$	-	44	-	
			$T_{vj}=150^{\circ}C$	-	49	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^{\circ}C$	-	768	-	
			$T_{vj}=125^{\circ}C$	-	628	-	
			$T_{vj}=150^{\circ}C$	-	612	-	
t_f	Fall time		$T_{vj}=25^{\circ}C$	-	131	-	
			$T_{vj}=125^{\circ}C$	-	319	-	
			$T_{vj}=150^{\circ}C$	-	369	-	
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^{\circ}C$	-	5.8	-	mJ	
		$T_{vj}=125^{\circ}C$	-	9.6	-		
		$T_{vj}=150^{\circ}C$	-	10.9	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^{\circ}C$	-	3.2	-		
		$T_{vj}=125^{\circ}C$	-	4.4	-		
		$T_{vj}=150^{\circ}C$	-	4.7	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^{\circ}C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	178	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.54	K/W	
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.245	-	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			25		A	
I_{FRM}	Repetitive peak forward current	$t_p=1ms$		50		A	
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$		90		A^2s	
Characteristic Values							
V_F	Continuous forward voltage	$I_F=25A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	2.08	-	V
			$T_{vj}=125^{\circ}C$	-	1.65	-	
			$T_{vj}=150^{\circ}C$	-	1.56	-	

I _{RM}	Peak reverse recovery current	V _R =600V I _F =25A V _{GE} =-15V	T _{vj} =25°C	-	48.8	-	A
			T _{vj} =125°C	-	53.9	-	
			T _{vj} =150°C	-	53.9	-	
t _{rr}	Reverse recovery time		T _{vj} =25°C	-	104.6	-	ns
			T _{vj} =125°C	-	288	-	
			T _{vj} =150°C	-	299	-	
Q _r	Recovered charge		T _{vj} =25°C	-	2.79	-	μC
			T _{vj} =125°C	-	7.69	-	
			T _{vj} =150°C	-	7.72	-	
E _{rec}	Reverse recovery energy	T _{vj} =25°C	-	0.34	-	mJ	
		T _{vj} =125°C	-	1.74	-		
		T _{vj} =150°C	-	1.81	-		
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	1.35	K/W	
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m • K)	-	0.61	-	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

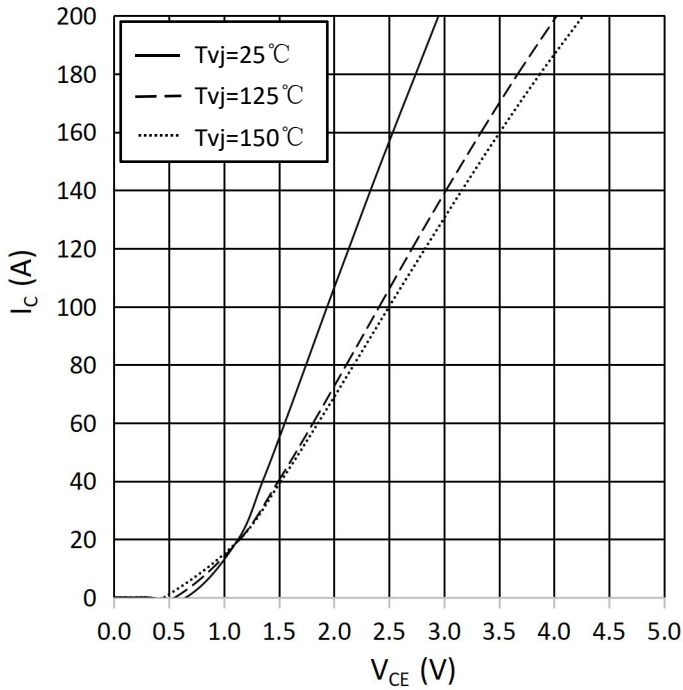
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R ₂₅	Rated resistance	T _C =25°C	-	5	-	kΩ
ΔR/R	Deviation of resistance	T _C =100°C, R ₁₀₀ =493Ω	-5	-	5	%
P ₂₅	Power dissipation	T _C =25°C	-	-	20	mW
B _{25/50}	B-constant	R ₂ =R ₂₅ exp[B _{25/50} (1/T ₂ -1/(298.15K))]	-	3375	-	K
B _{25/80}	B-constant	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 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

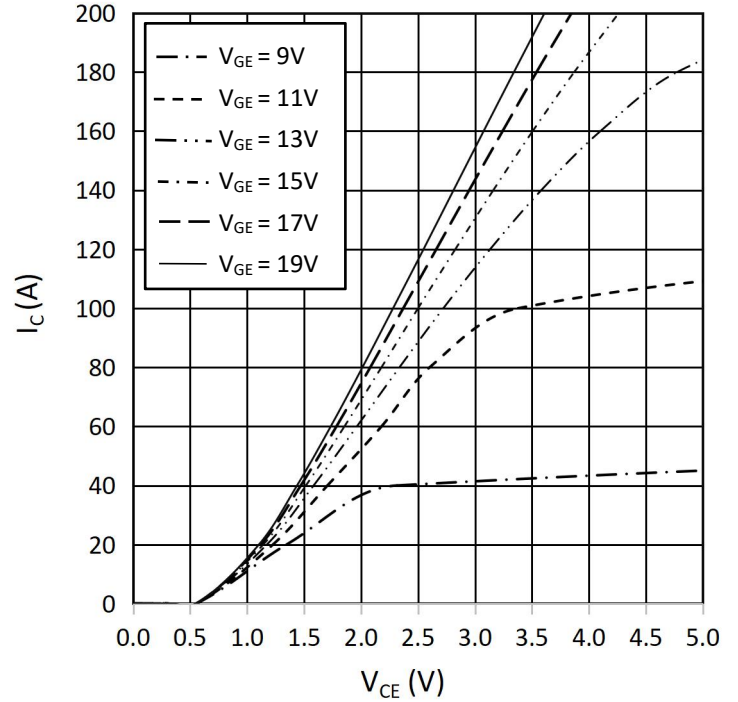
output characteristic IGBT,Inverter (typical)

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



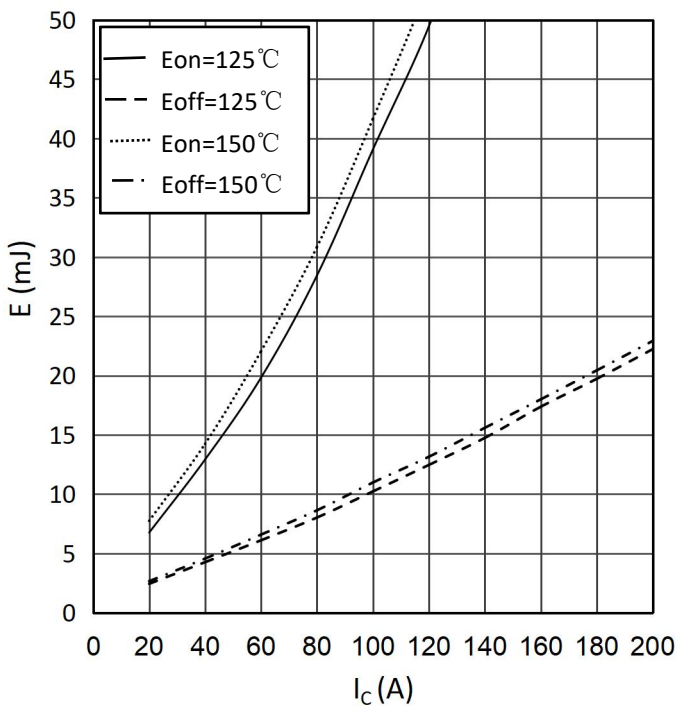
output characteristic IGBT,Inverter (typical)

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



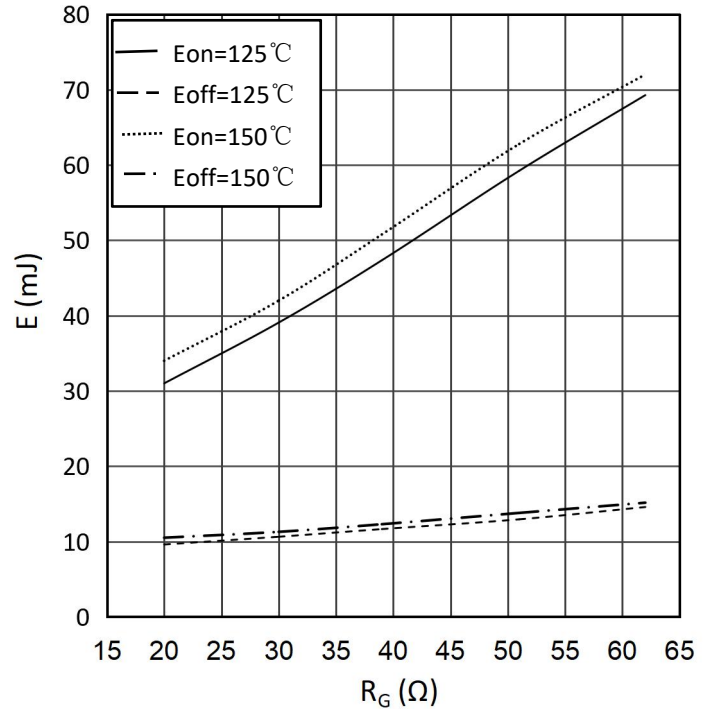
switching losses IGBT,Inverter (typical)

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



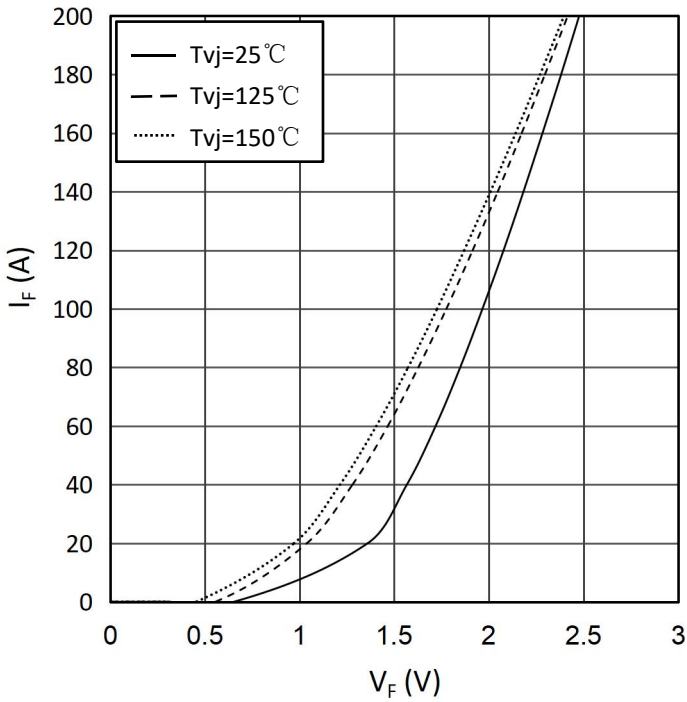
switching losses IGBT,Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15V$, $I_C = 100A$, $V_{CE} = 600V$



forward characteristic of Diode, Inverter (typical)

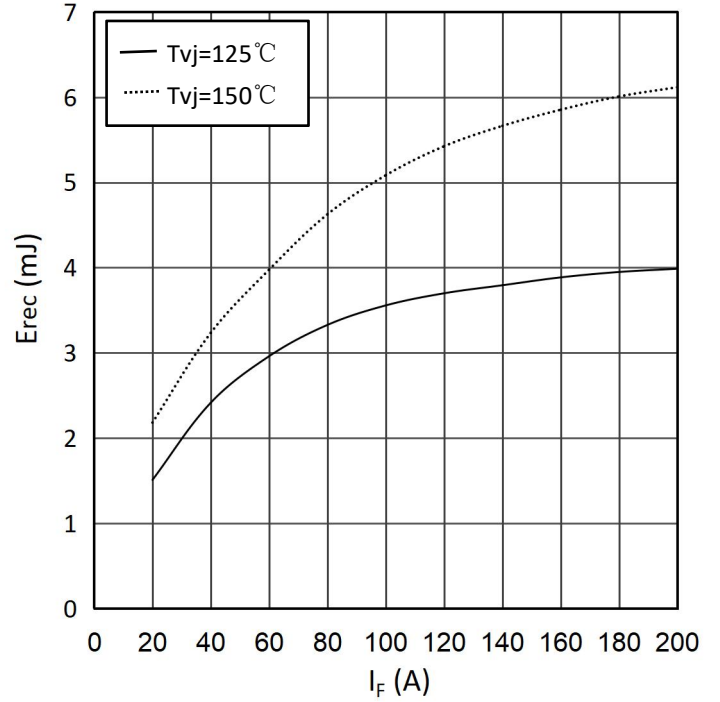
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

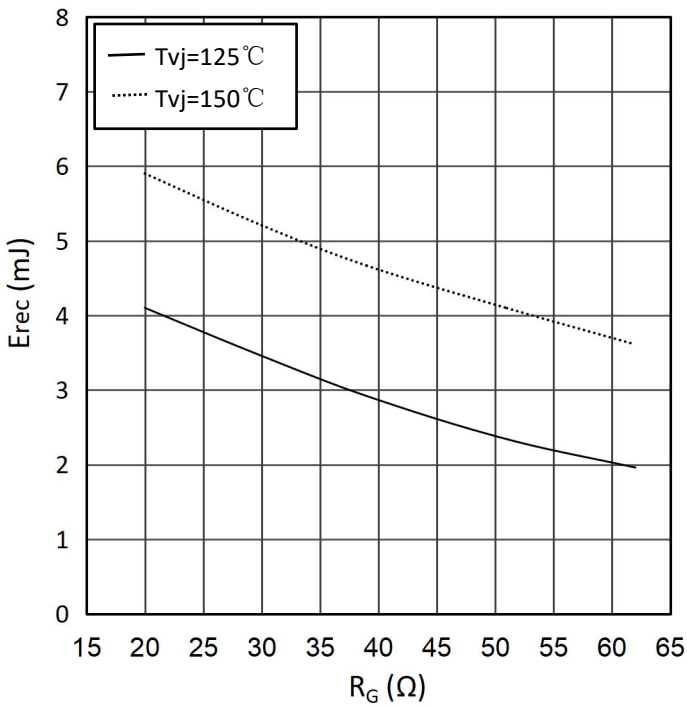
$R_{Gon} = 30\Omega, V_{CE} = 600\text{ V}$



switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

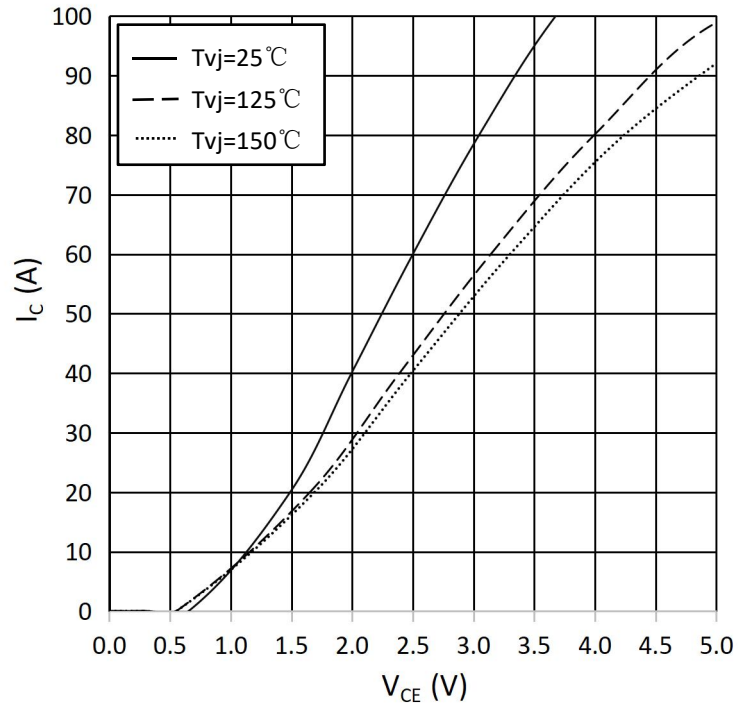
$I_F = 100\text{A}, V_{CE} = 600\text{V}$



output characteristic IGBT, Brake-Chopper (typical)

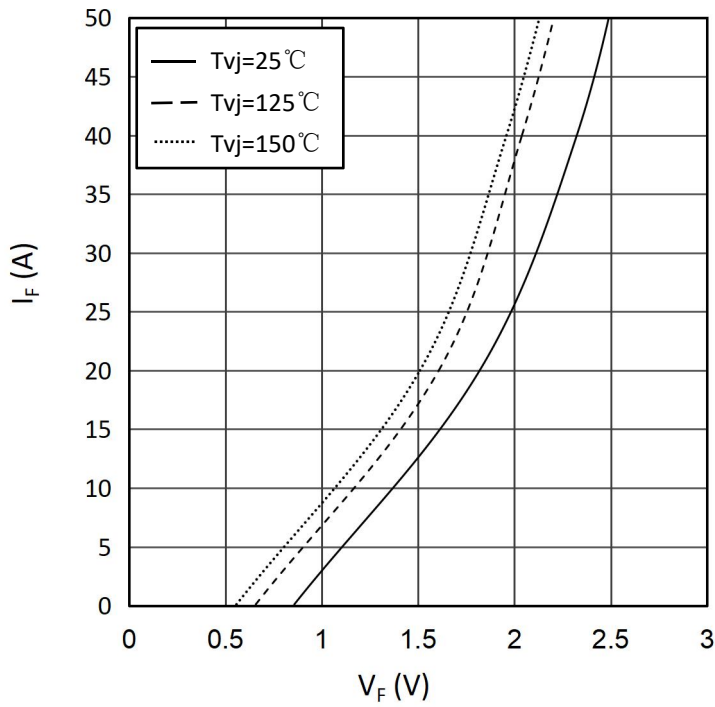
$I_C = f(V_{CE})$

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



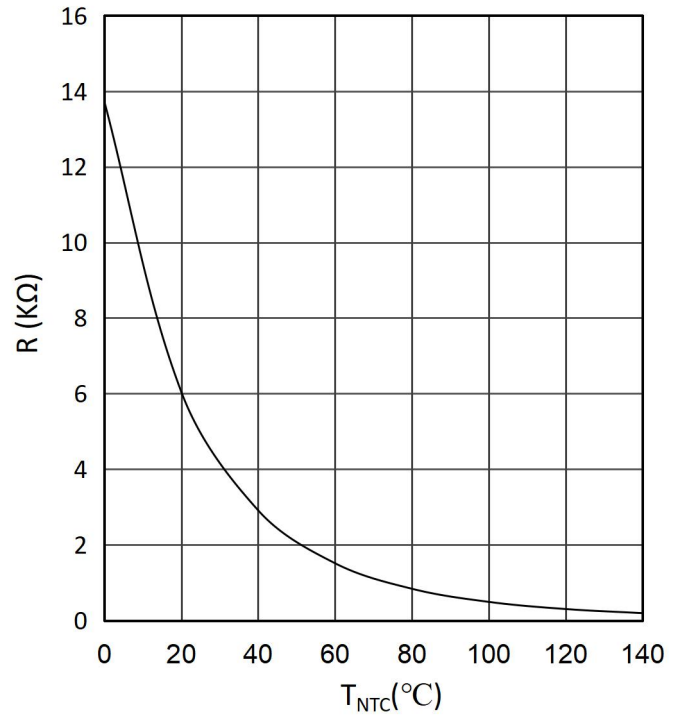
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$



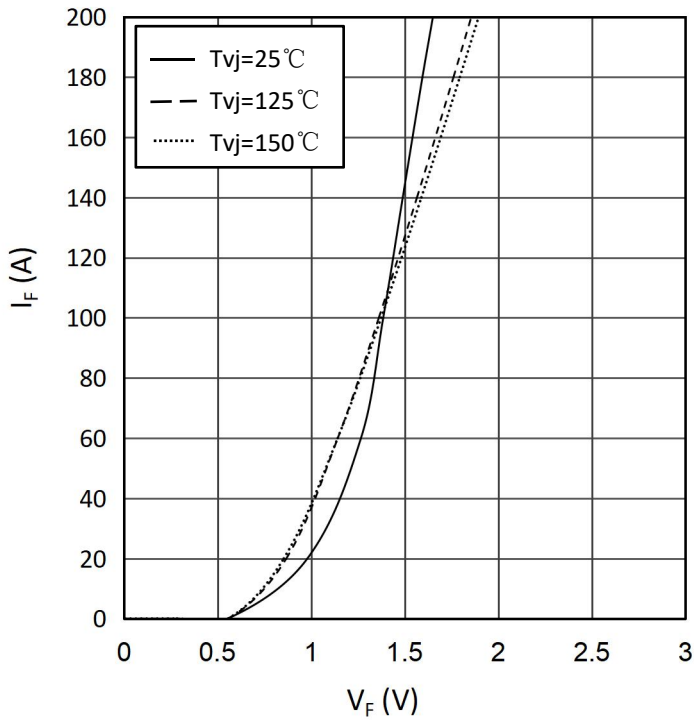
NTC-Thermistor-temperature characteristic(typical)

$R=f(T)$

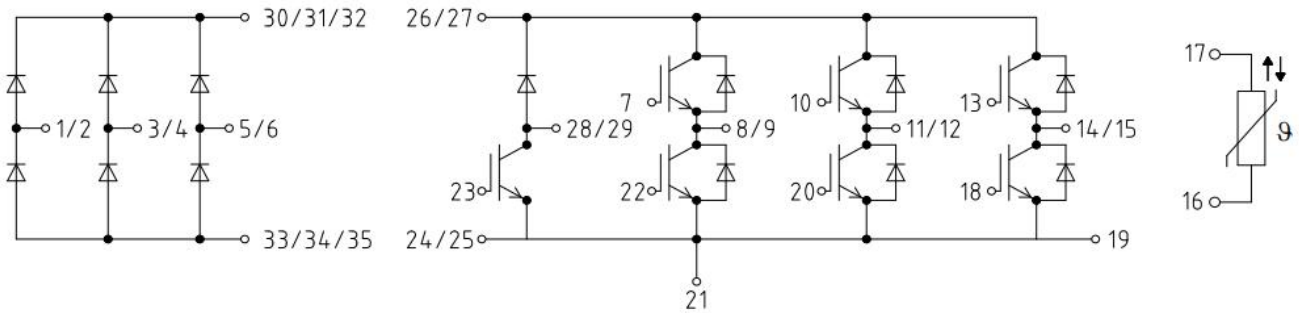


Forward characteristic of Diode, Rectifier(typical)

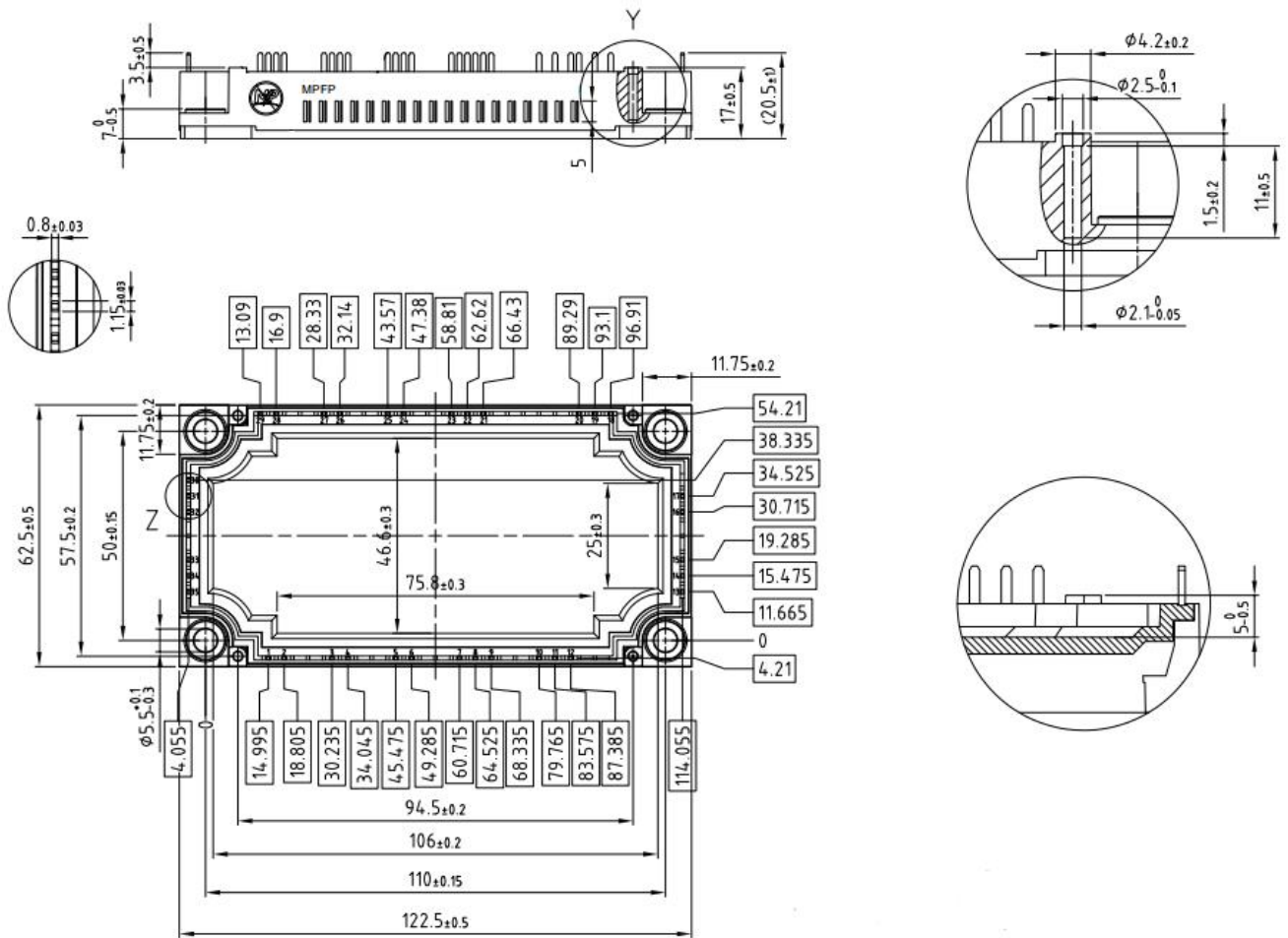
$I_F = f(V_F)$



Circuit Diagram



Package Outlines



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