

Electrical Features

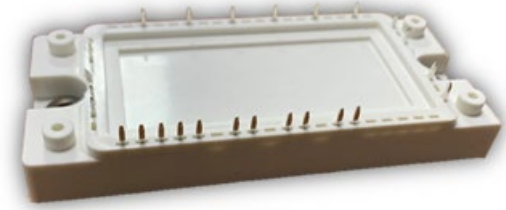
- Trench/Fieldstop IGBT
- V_{CEsat} with positive Temperature Coefficient
- High short circuit capability

Typical Applications

- Motor Drives
- Servo Drives
- Auxiliary Inverters

Mechanical Features

- 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	$T_{vj}=25^{\circ}C$	650	V			
V_{GES}	Gate-emitter voltage	-	± 20	V			
I_C	Collector current,DC	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$	50	A			
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	100	A			
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	188	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
IGBT			Min.	Typ.	Max.		
I_{CES}	Collector-emitter cut-off current	$V_{CE}=650V, V_{GE}=0V, T_{vj}=25^{\circ}C$	-	-	1	mA	
I_{GES}	Gate leakage current	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$	-	-	100	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=0.8mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.62	6.6	V	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=50A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.64		-
			$T_{vj}=125^{\circ}C$	-	1.81		-
			$T_{vj}=150^{\circ}C$	-	1.84	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$	-	5.052	-	nF	
C_{res}	Reverse transfer capacitance	$f=1MHz, T_{vj}=25^{\circ}C$	-	0.068	-		
Q_G	Gate charge	$V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.209	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	0	-	Ω	

t _{d(on)}	Turn-on delay time	V _{CC} =300V I _C =50A V _{GE} =±15V R _{G(on)} =51Ω R _{G(off)} =51Ω	T _{vj} =25°C	-	207.4	-	ns	
			T _{vj} =125°C	-	261.0	-		
			T _{vj} =150°C	-	268.0	-		
t _r	Rise time		T _{vj} =25°C	-	189.2	-		
			T _{vj} =125°C	-	211.1	-		
			T _{vj} =150°C	-	229.3	-		
t _{d(off)}	Turn-off delay time		T _{vj} =25°C	-	270.8	-		
			T _{vj} =125°C	-	342.5	-		
			T _{vj} =150°C	-	368.2	-		
t _f	Fall time		T _{vj} =25°C	-	151.6	-		
			T _{vj} =125°C	-	169.0	-		
			T _{vj} =150°C	-	280.0	-		
E _{on}	Turn-on energy (per pulse)	V _{CC} =300V, I _C =50A V _{GE} =±15V, R _{G(on)} =51Ω di/dt=1500A/μs(T _{vj} =125°C)	T _{vj} =25°C	-	3.44	-	mJ	
			T _{vj} =125°C	-	4.57	-		
			T _{vj} =150°C	-	6.04	-		
E _{off}	Turn-off energy (per pulse)		V _{CC} =300V, I _C =50A V _{GE} =±15V, R _{G(off)} =51Ω du/dt=6300V/μs(T _{vj} =125°C)	T _{vj} =25°C	-	0.78		-
				T _{vj} =125°C	-	1.00		-
				T _{vj} =150°C	-	1.02		-
SC data	Short-circuit current	V _{CC} =360V, V _{GE} ≤15V, T _{vj} =25°C, t _p ≤10μs		-	259	-	A	
R _{thJC}	Thermal resistance, junction to case	Per IGBT		-	-	0.8	K/W	
R _{thCH}	Thermal resistance, case to heatsink	Per IGBT, λ _{grease} =1W/(m·K)		-	0.335	-	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°C	650	V
I _F	Forward current, DC		50	A
I _{FRM}	Repetitive peak forward current	t _p =1ms	100	A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =125°C	330	A ² s

Characteristic Values

			Min.	Typ.	Max.		
V _F	Continuous forward voltage	I _F =50A V _{GE} =0V	T _{vj} =25°C	-	1.47	-	V
			T _{vj} =125°C	-	1.29	-	
			T _{vj} =150°C	-	1.25	-	
I _{RM}	Peak reverse recovery current	V _R =300V I _F =50A V _{GE} =-15V -di _F /dt=1400A/μs (T _{vj} =125°C)	T _{vj} =25°C	-	13.2	-	A
			T _{vj} =125°C	-	20.8	-	
			T _{vj} =150°C	-	24.9	-	
t _{rr}	Reverse recovery time		T _{vj} =25°C	-	158.3	-	ns
			T _{vj} =125°C	-	290.4	-	
			T _{vj} =150°C	-	358.4	-	
Q _r	Recovered charge	T _{vj} =25°C	-	0.98	-	μC	
		T _{vj} =125°C	-	2.90	-		
		T _{vj} =150°C	-	4.74	-		

E _{rec}	Reverse recovery energy		T _{vj} =25°C	-	0.16	-	mJ
			T _{vj} =125°C	-	0.34	-	
			T _{vj} =150°C	-	0.58	-	
R _{thJC}	Thermal resistance, junction to case	Per diode	-	-	1.2		K/W
R _{thCH}	Thermal resistance, case to heatsink	Per diode, λ _{grease} =1W/(m·K)	-	0.562	-		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 _F	Forward current, DC	T _C =100°C	50	A
I _{FRM}	Repetitive peak forward current	t _p =1ms	100	A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =150°C	685	A ² s

Characteristic Values

Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V _F	Continuous forward voltage	I _F =50A V _{GE} =0V	T _{vj} =25°C	-	1.88	-	V
			T _{vj} =125°C	-	1.80	-	
			T _{vj} =150°C	-	1.93	-	
I _R	Reverse current	V _R =1800V	T _{vj} =25°C	-	-	10	uA
			T _{vj} =125°C	-	-	200	
			T _{vj} =150°C	-	-	200	
R _{thJC}	Thermal resistance, junction to case	Per diode	-	-	0.85		K/W
R _{thCH}	Thermal resistance, case to heatsink	Per diode, λ _{grease} =1W/(m·K)	-	0.355	-		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	650	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	188	W

Characteristic Values

Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
IGBT							
I _{CES}	Collector-emitter cut-off current	V _{CE} =650V, 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	5.62	6.6	V	
V _{CESat}	Collector-emitter saturation voltage	I _C =50A V _{GE} =15V	T _{vj} =25°C	-	1.87		-
			T _{vj} =125°C	-	2.04		-
			T _{vj} =150°C	-	2.08	-	

C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$	-	5.052	-	nF	
C_{res}	Reverse transfer capacitance	$f=1MHz, T_{vj}=25^{\circ}C$	-	0.068	-		
Q_G	Gate charge	$V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.209	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	0	-	Ω	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=300V$ $I_C=50A$ $V_{GE}=\pm 15V$ $R_{G(on)}=51\Omega$ $R_{G(off)}=51\Omega$	$T_{vj}=25^{\circ}C$	-	227.2	-	
			$T_{vj}=125^{\circ}C$	-	268.8	-	
			$T_{vj}=150^{\circ}C$	-	204.0	-	
t_r	Rise time		$T_{vj}=25^{\circ}C$	-	175.2	-	
			$T_{vj}=125^{\circ}C$	-	204.8	-	
			$T_{vj}=150^{\circ}C$	-	204.0	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^{\circ}C$	-	226.0	-	
			$T_{vj}=125^{\circ}C$	-	274.8	-	
			$T_{vj}=150^{\circ}C$	-	392.0	-	
t_f	Fall time	$T_{vj}=25^{\circ}C$	-	202.0	-		
		$T_{vj}=125^{\circ}C$	-	227.6	-		
		$T_{vj}=150^{\circ}C$	-	108.0	-		
E_{on}	Turn-on energy (per pulse)	$V_{CC}=300V, I_C=50A$ $V_{GE}=\pm 15V, R_{G(on)}=51\Omega$ $di/dt=1300A/\mu s(T_{vj}=125^{\circ}C)$	$T_{vj}=25^{\circ}C$	-	2.83	-	
			$T_{vj}=125^{\circ}C$	-	3.82	-	
			$T_{vj}=150^{\circ}C$	-	4.06	-	
E_{off}	Turn-off energy (per pulse)		$T_{vj}=25^{\circ}C$	-	0.76	-	
			$T_{vj}=125^{\circ}C$	-	0.84	-	
			$T_{vj}=150^{\circ}C$	-	0.85	-	
SC data	Short-circuit current		$V_{CC}=360V, V_{GE}\leq 15V, T_{vj}=25^{\circ}C, t_p\leq 10\mu s$	-	251	-	A
R_{thJC}	Thermal resistance, junction to case		Per IGBT	-	-	0.8	K/W
R_{thCH}	Thermal resistance, case to heatsink		Per IGBT, $\lambda_{grease}=1W/(m\cdot K)$	-	0.335	-	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	$T_{vj}=25^{\circ}C$	650	V
I_F	Forward current, DC		20	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	40	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	45	A^2s

Characteristic Values

			Min.	Typ.	Max.	
V_F	Continuous forward voltage	$I_F=20A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	1.71	-
			$T_{vj}=125^{\circ}C$	-	1.48	-
			$T_{vj}=150^{\circ}C$	-	1.45	-
I_{RM}	Peak reverse recovery current	$V_R=300V$ $I_F=50A$ $V_{GE}=-15V$	$T_{vj}=25^{\circ}C$	-	14.1	-
			$T_{vj}=125^{\circ}C$	-	20.2	-
			$T_{vj}=150^{\circ}C$	-	22.6	-

trr	Reverse recovery time	V _R =300V	T _{vj} =25°C	-	146.1	-	ns
			T _{vj} =125°C	-	317.5	-	
			T _{vj} =150°C	-	361.0	-	
Q _r	Recovered charge	I _F =50A V _{GE} =-15V -di _F /dt=1400A/μs	T _{vj} =25°C	-	0.79	-	μC
			T _{vj} =125°C	-	2.54	-	
			T _{vj} =150°C	-	3.46	-	
E _{rec}	Reverse recovery energy	(T _{vj} =125°C)	T _{vj} =25°C	-	0.13	-	mJ
			T _{vj} =125°C	-	0.35	-	
			T _{vj} =150°C	-	0.47	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	2.3	K/W	
R _{thCH}	Thermal resistance, case to heatsink	Per diode, λ _{grease} =1W/(m·K)	-	0.96	-	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

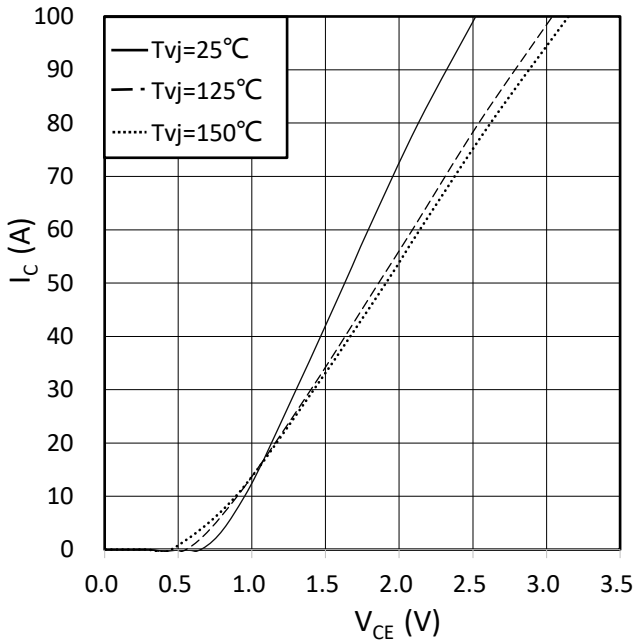
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R ₂₅	Rated resistance	T _C =25°C	-	5	-	kΩ
ΔR/R	Deviation of resistance	T _C =100°C, R ₁₀₀ =493Ω	-5	-	5	%
P ₂₅	Power dissipation	T _C =25°C	-	-	20	mW
B _{25/50}	B-constant	R ₂ =R ₂₅ exp[B _{25/50} (1/T ₂ -1/(298.15K))]	-	3375	-	K
B _{25/80}	B-constant	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
			Min.	Typ.	Max.	
V _{ISOL}	Isolation voltage	Terminals to baseplate, RMS, f=50Hz, t=1 min	2500			V
T _{vj max}	Maximum junction temperature	-	175			°C
T _{vj op}	Operating junction temperature	Continuous operation (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

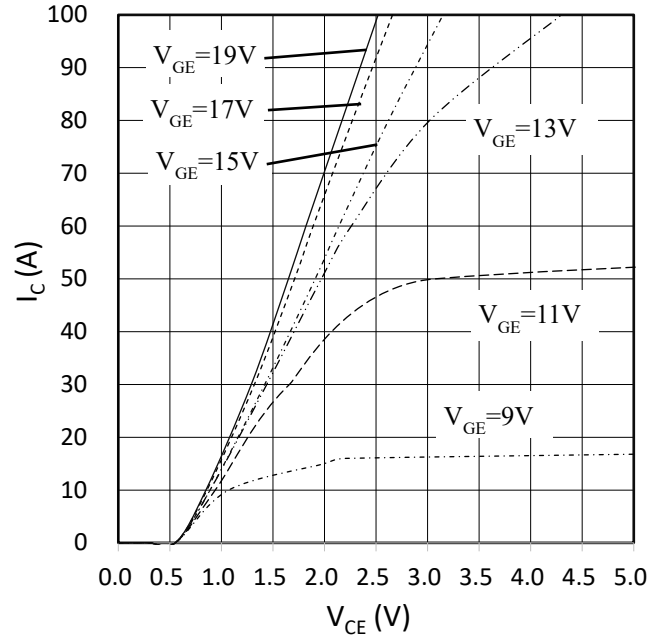
output characteristic IGBT,Inverter (typical)

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



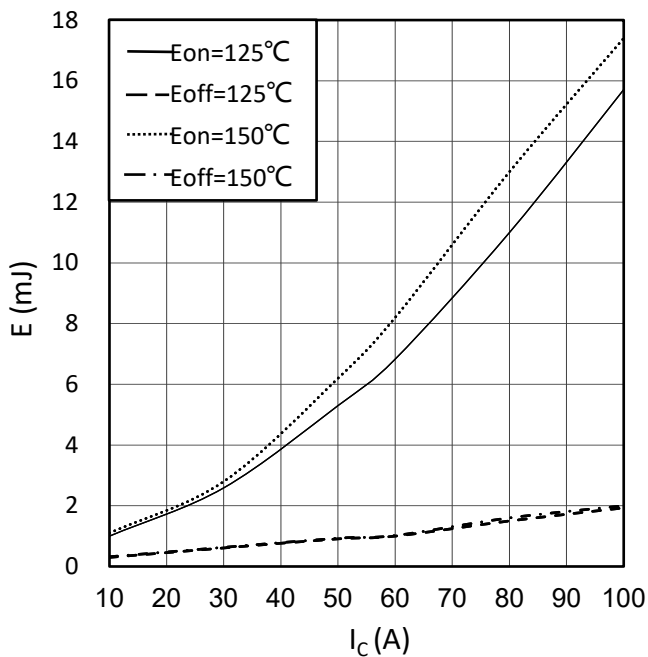
output characteristic IGBT,Inverter (typical)

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



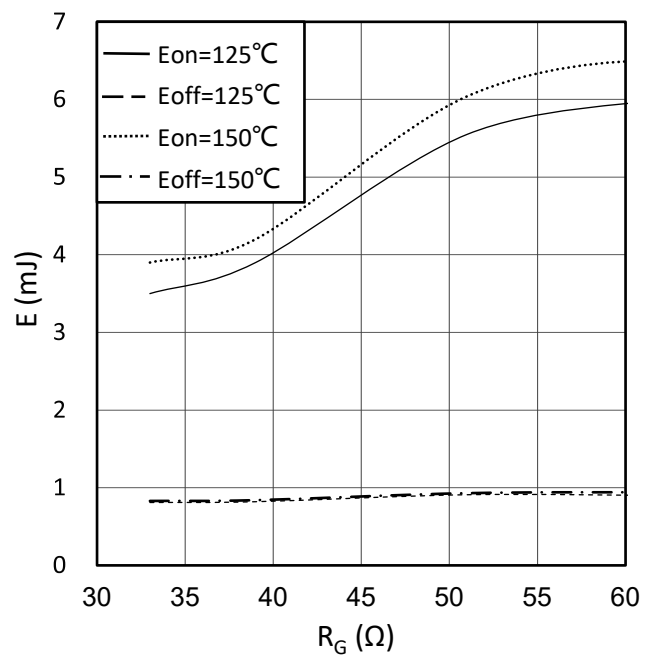
switching losses IGBT,Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{V}$, $R_{Gon} = 51\ \Omega$, $R_{Goff} = 51\ \Omega$, $V_{CE} = 300\text{ V}$



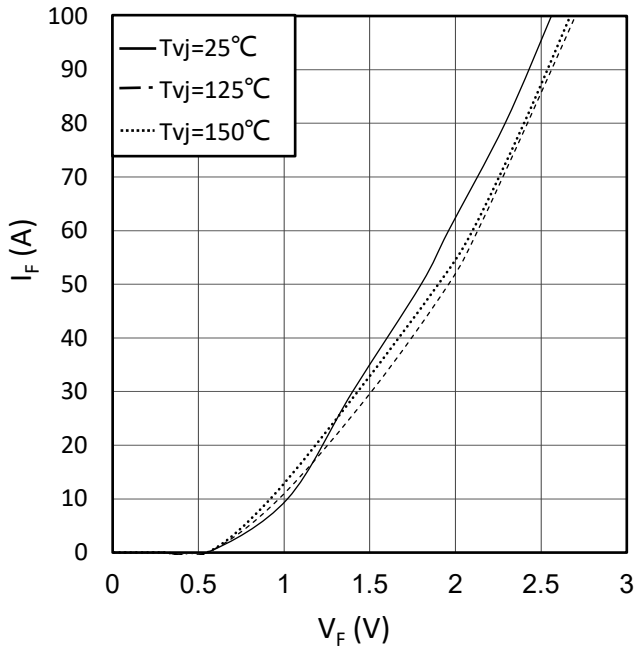
switching losses IGBT,Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{V}$, $I_C = 50\text{ A}$, $V_{CE} = 300\text{ V}$



forward characteristic of Diode, Inverter (typical)

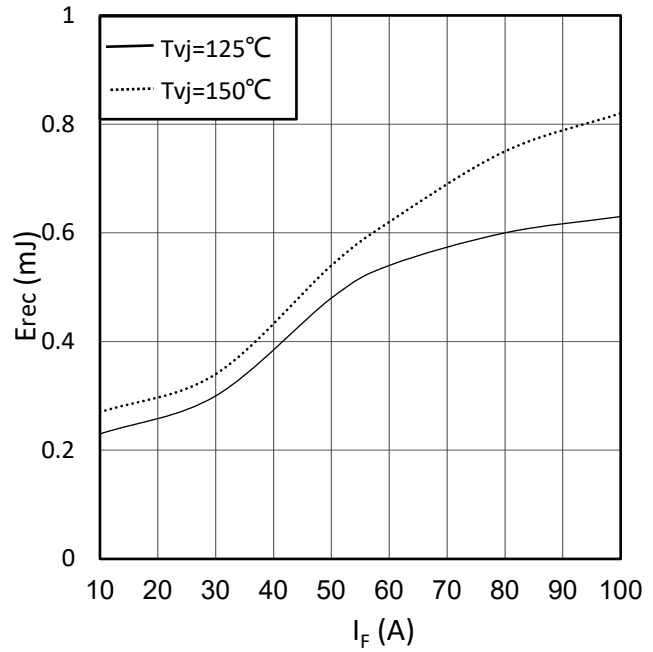
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

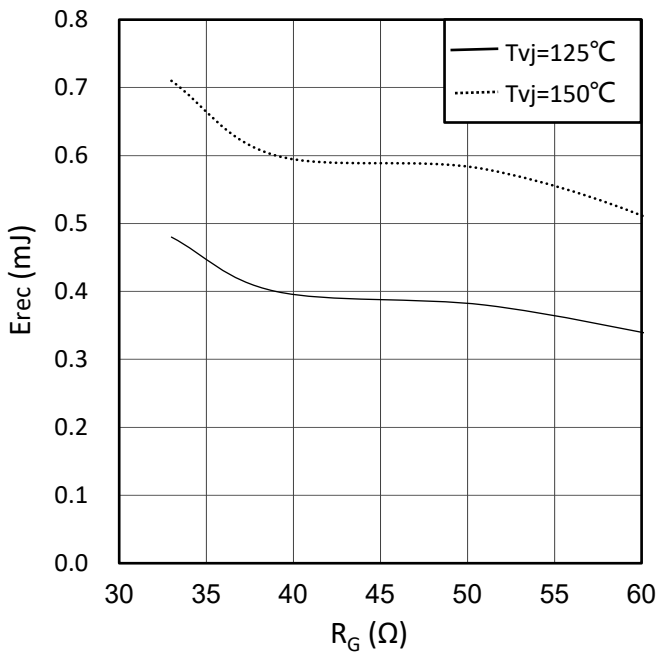
$R_{Gon} = 51 \Omega, V_{CE} = 300 \text{ V}$



switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

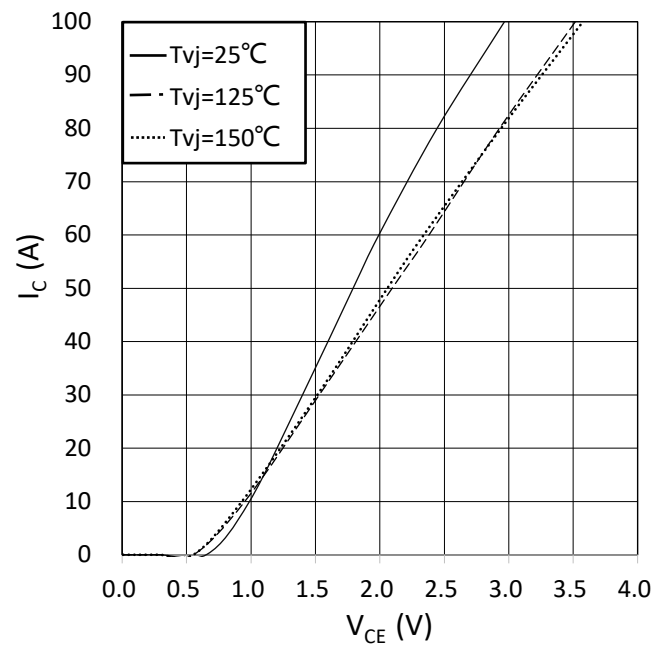
$I_F = 50 \text{ A}, V_{CE} = 300 \text{ V}$



output characteristic IGBT, Brake-Chopper (typical)

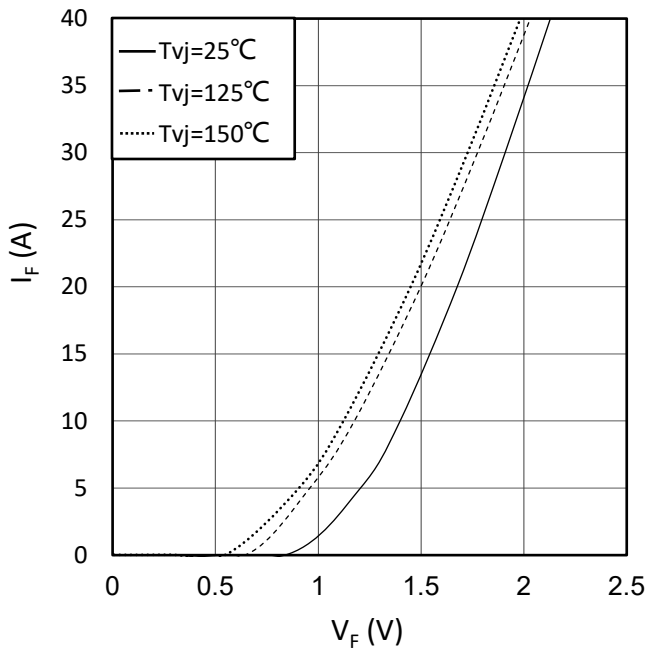
$I_C = f(V_{CE})$

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



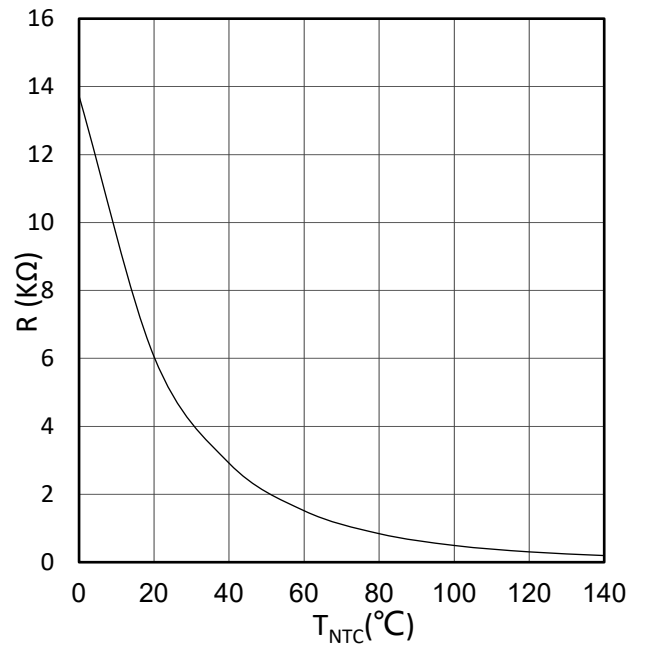
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$

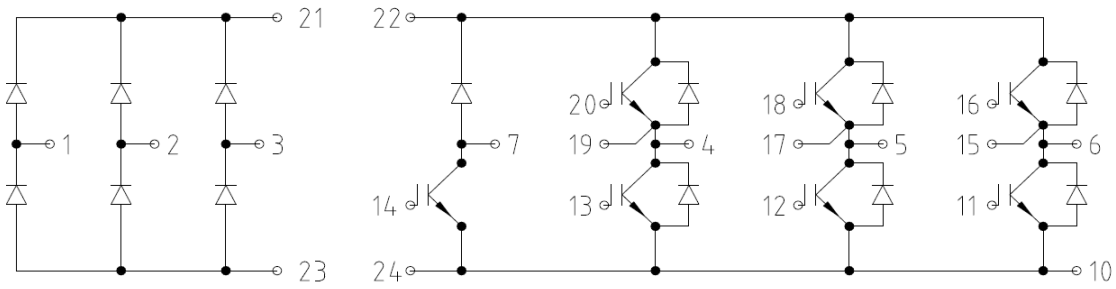


NTC-Thermistor-temperature characteristic(typical)

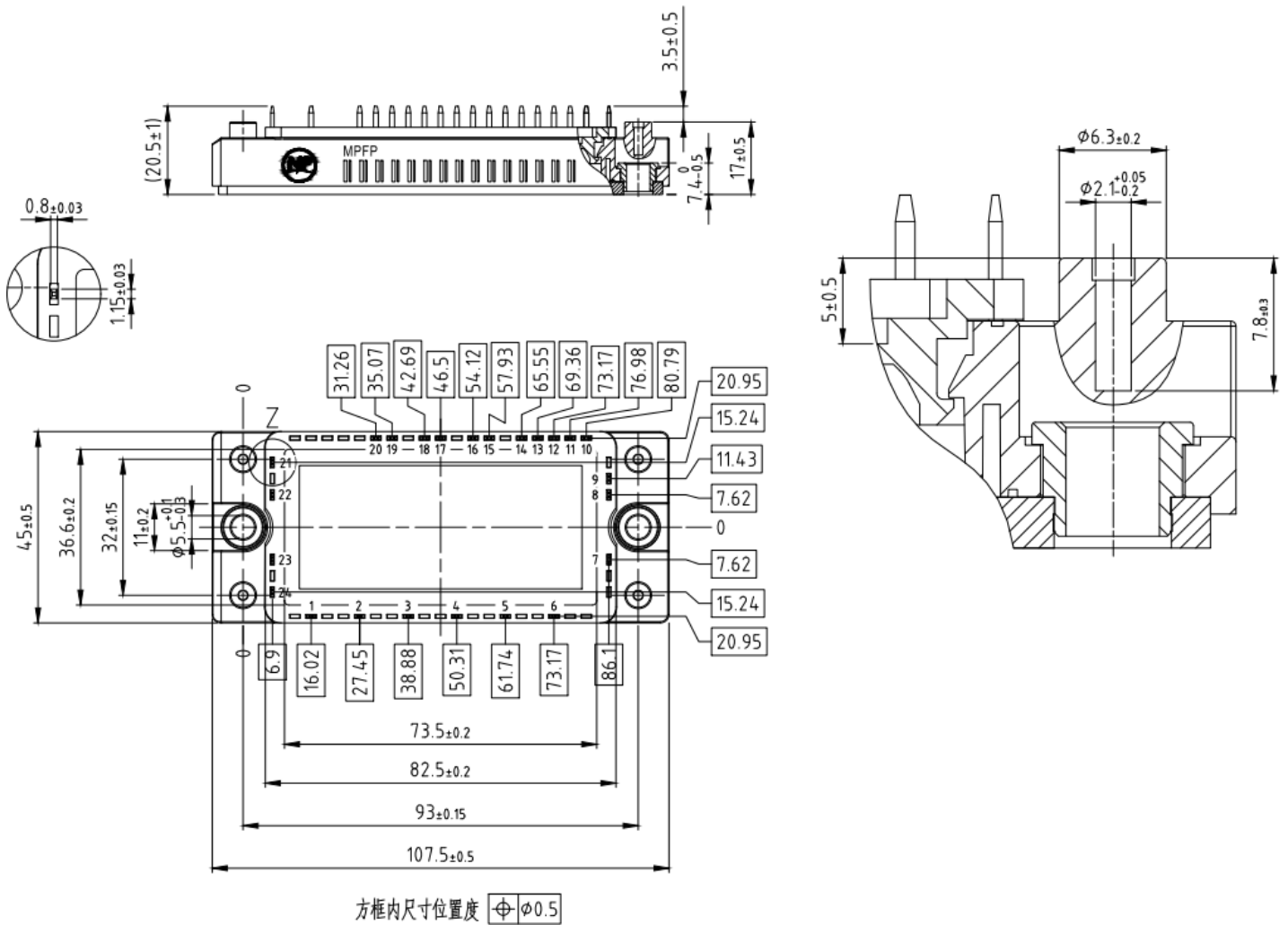
$R=f(T)$



Circuit Diagram



Package Outlines



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序号 Item	日期 Date	变更记录及描述 Change History Description	版本序号 Rev. item	经办人 Responsibility
1	22/5/1	初版规格书发布，版本为 V1.0	2022 5 Ver1.0	马慧明
2	22/11/7	更新 150℃数据。	2022 11 Ver1.1	梁华文