

Electrical Features

- Trench/Fieldstop IGBT
- Half-bridge
- Low inductance
- Standard package
- High short circuit capability
- Including anti-parallel FWD



Typical Applications

- Motor Drives
- Servo Drives
- Auxiliary Inverters

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	$T_C=80^{\circ}C, T_{vj}=175^{\circ}C$	25			A
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	50			A
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	187			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	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$	-	-	100	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=0.8mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.61	6.6	V
V_{CESat}	Collector-emitter saturation voltage	$I_C=25A$ $V_{GE}=15V$ $T_{vj}=25^{\circ}C$	-	1.98	-	
		$T_{vj}=125^{\circ}C$	-	2.26	-	
		$T_{vj}=150^{\circ}C$	-	2.39	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	1.77	-	nF
C_{oes}	Output capacitance		-	0.17	-	
C_{res}	Reverse transfer capacitance		-	0.06	-	
Q_G	Gate charge	$V_{CC}=600V, I_C=25A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.171	-	nC
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	-	-	Ω

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=25A$ $V_{GE}=\pm 15V$ $R_{G(on)}=33\Omega$ $R_{G(off)}=33\Omega$	$T_{vj}=25^\circ C$	-	134	-	ns	
			$T_{vj}=125^\circ C$	-	110	-		
			$T_{vj}=150^\circ C$	-	96	-		
t_r	Rise time		$T_{vj}=25^\circ C$	-	62	-		
			$T_{vj}=125^\circ C$	-	55	-		
			$T_{vj}=150^\circ C$	-	48	-		
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	213.6	-		
			$T_{vj}=125^\circ C$	-	227.2	-		
			$T_{vj}=150^\circ C$	-	232.1	-		
t_f	Fall time		$T_{vj}=25^\circ C$	-	323.2	-		
			$T_{vj}=125^\circ C$	-	387.2	-		
			$T_{vj}=150^\circ C$	-	401.1	-		
E_{on}	Turn-on energy (per pulse)		$T_{vj}=25^\circ C$	-	2.25	-		mJ
			$T_{vj}=125^\circ C$	-	3.1	-		
			$T_{vj}=150^\circ C$	-	3.38	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	1.64	-			
		$T_{vj}=125^\circ C$	-	2.0	-			
		$T_{vj}=150^\circ C$	-	2.2	-			
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	90	-	A		
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.8	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	$T_C=80^\circ C, T_{vj}=175^\circ C$	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

			Min.	Typ.	Max.		
V_F	Continuous forward voltage	$I_F=25A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	2.29	-	V
			$T_{vj}=125^\circ C$	-	1.83	-	
			$T_{vj}=150^\circ C$	-	1.72	-	
I_{RM}	Peak reverse recovery current	$V_R=600V$ $I_F=25A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	17	-	A
			$T_{vj}=125^\circ C$	-	20	-	
			$T_{vj}=150^\circ C$	-	21	-	
t_{rr}	Reverse recovery time		$T_{vj}=25^\circ C$	-	237	-	ns
			$T_{vj}=125^\circ C$	-	528	-	
			$T_{vj}=150^\circ C$	-	601	-	
Q_r	Recovered charge		$T_{vj}=25^\circ C$	-	0.71	-	μC
			$T_{vj}=125^\circ C$	-	4.03	-	
			$T_{vj}=150^\circ C$	-	4.6	-	

E_{rec}	Reverse recovery energy		$T_{vj}=25^{\circ}C$	-	0.03	-	mJ
			$T_{vj}=125^{\circ}C$	-	1.07	-	
			$T_{vj}=150^{\circ}C$	-	2.4	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	-	1.35	K/W
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}C$

Diode, Rectifier

Maximum Rated Values							
Symbol	Item	Conditions	Rating			Unit	
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$	1800			V	
I_{FRMSM}	Maximum RMS forward current per chip	$T_C=80^{\circ}C, T_{vj}=175^{\circ}C$	50			A	
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	60			A	
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=150^{\circ}C$	340			A^2s	
Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V_F	Continuous forward voltage	$I_F=25A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	1.1	-	V
			$T_{vj}=125^{\circ}C$	-	1.52	-	
			$T_{vj}=150^{\circ}C$	-	1.40	-	
I_R	Reverse current	$V_R=1600V$	$T_{vj}=25^{\circ}C$	-	-	10	uA
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	-	1	K/W
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}C$

IGBT , Brake-Chopper

Maximum Rated Values							
Symbol	Item	Conditions	Values			Unit	
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}C$	1200			V	
V_{GES}	Gate-emitter voltage	-	± 20			V	
I_C	Collector current,DC	$T_C=80^{\circ}C, T_{vj}=175^{\circ}C$	15			A	
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	30			A	
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	125			W	
Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
IGBT							
I_{CES}	Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$	-	-	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	$I_C=0.5mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.83	6.6	V	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=15A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.97		2.25
			$T_{vj}=125^{\circ}C$	-	2.29		-
			$T_{vj}=150^{\circ}C$	-	2.39	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$	-	1.19	-	nF	

C_{oes}	Output capacitance	$f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}$	-	0.08	-		
C_{res}	Reverse transfer capacitance		-	0.04	-		
Q_G	Gate charge	$V_{CC}=600\text{V}, I_C=15\text{A}$ $V_{GE}=-15\dots+15\text{V}, T_{vj}=25^{\circ}\text{C}$	-	0.094	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}\text{C}$	-	-	-	Ω	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600\text{V}$ $I_C=15\text{A}$ $V_{GE}=\pm 15\text{V}$ $R_{G(on)}=33\Omega$ $R_{G(off)}=33\Omega$	$T_{vj}=25^{\circ}\text{C}$	-	114.4	-	ns
			$T_{vj}=125^{\circ}\text{C}$	-	91.2	-	
			$T_{vj}=150^{\circ}\text{C}$	-	81.1	-	
t_r	Rise time		$T_{vj}=25^{\circ}\text{C}$	-	35.2	-	
			$T_{vj}=125^{\circ}\text{C}$	-	39.2	-	
			$T_{vj}=150^{\circ}\text{C}$	-	46.4	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^{\circ}\text{C}$	-	184	-	
			$T_{vj}=125^{\circ}\text{C}$	-	99.8	-	
			$T_{vj}=150^{\circ}\text{C}$	-	88.0	-	
t_f	Fall time	$T_{vj}=25^{\circ}\text{C}$	-	388	-		
		$T_{vj}=125^{\circ}\text{C}$	-	412	-		
		$T_{vj}=150^{\circ}\text{C}$	-	502	-		
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^{\circ}\text{C}$	-	0.92	-	mJ	
		$T_{vj}=125^{\circ}\text{C}$	-	1.69	-		
		$T_{vj}=150^{\circ}\text{C}$	-	1.99	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^{\circ}\text{C}$	-	1.36	-		
		$T_{vj}=125^{\circ}\text{C}$	-	1.2	-		
		$T_{vj}=150^{\circ}\text{C}$	-	0.74	-		
SC data	Short-circuit current	$V_{CC}=600\text{V}, V_{GE}\leq 15\text{V}, T_{vj}=125^{\circ}\text{C}$ $V_{CES}\leq 1200\text{V}, t_p\leq 10\mu\text{s}$	-	55	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	1.2	K/W	
T_{vjop}	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$	
Diode , Brake-Chopper							
Maximum Rated Values							
Symbol	Item	Conditions	Rating		Unit		
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$	1200		V		
I_F	Forward current, DC	$T_C=80^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	10		A		
I_{FRM}	Repetitive peak forward current	$t_p=1\text{ms}$	20		A		
I^2t	I^2t -value	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	20		A^2s		
Characteristic Values							
V_F	Continuous forward voltage	$I_F=10\text{A}$ $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	2.15	2.3	V
			$T_{vj}=125^{\circ}\text{C}$	-	1.99	-	
			$T_{vj}=150^{\circ}\text{C}$	-	1.92	-	
I_{RM}	Peak reverse recovery current		$T_{vj}=25^{\circ}\text{C}$	-	15	-	A
			$T_{vj}=125^{\circ}\text{C}$	-	13	-	
			$T_{vj}=150^{\circ}\text{C}$	-	13	-	
t_{rr}	Reverse recovery time	$T_{vj}=25^{\circ}\text{C}$	-	84.4	-	ns	
		$T_{vj}=125^{\circ}\text{C}$	-	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

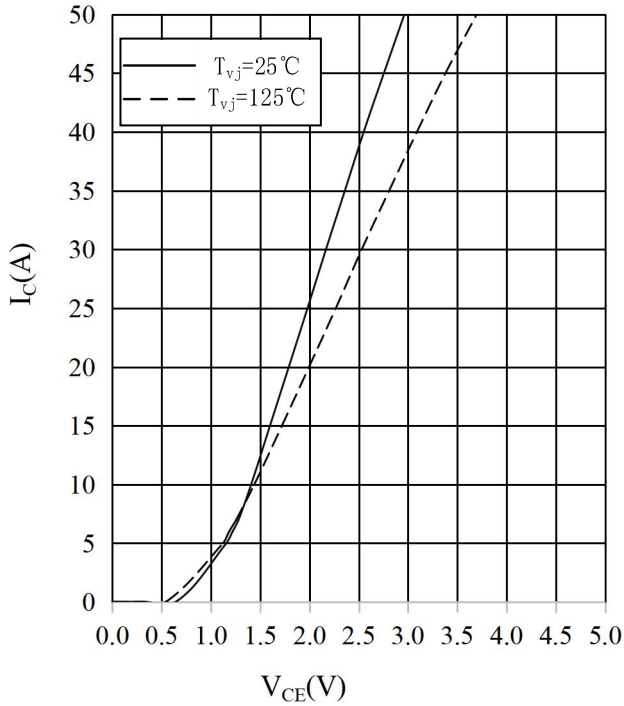
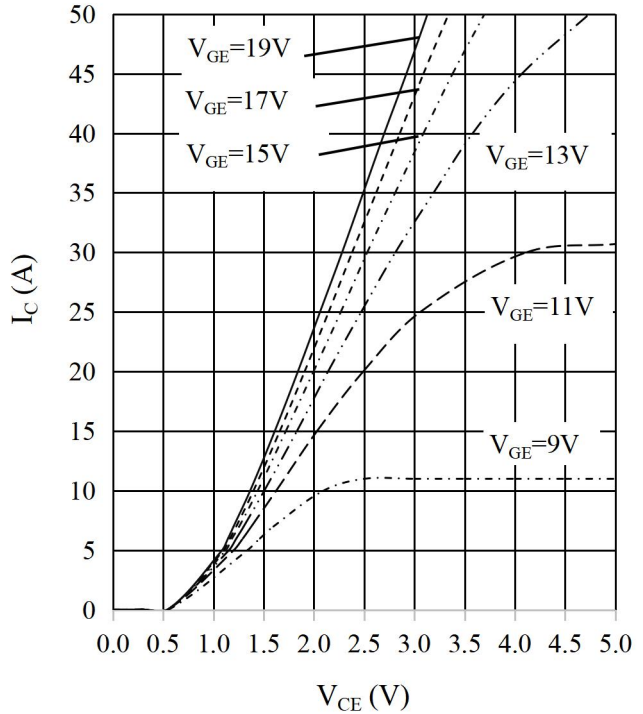
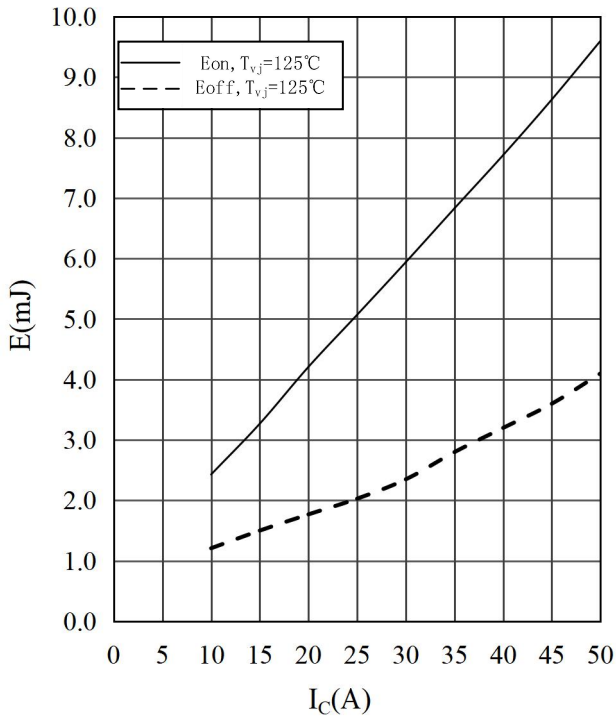
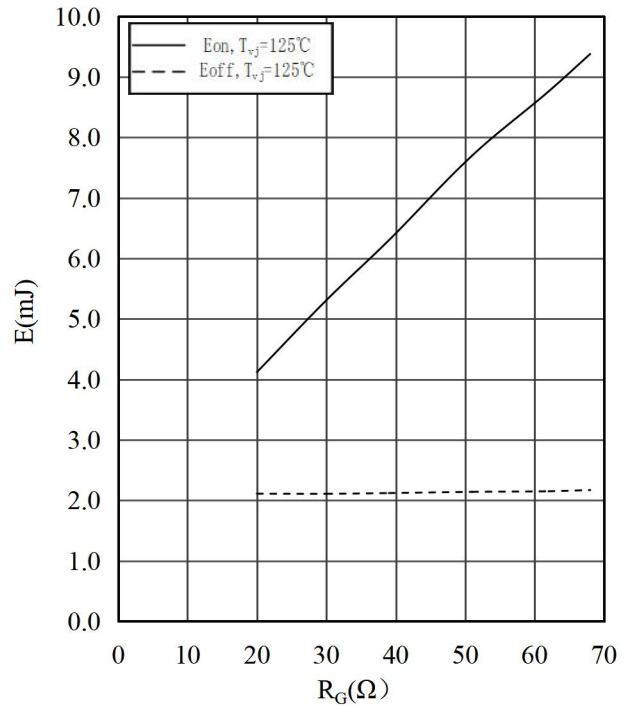
Diode electrical characteristics according to IEC 60747 – 2

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(under switching)	-40~ 150			°C
T _{stg}	Storage temperature	-	-40~ 125			°C
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M _s	Mounting torque	Mounting to heat sink,M5 screw	3	-	6	Nm
d _s	Creepage distance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	10	-	
d _a	Clearance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	7.5	-	
m	Weight	-	-	175	-	g

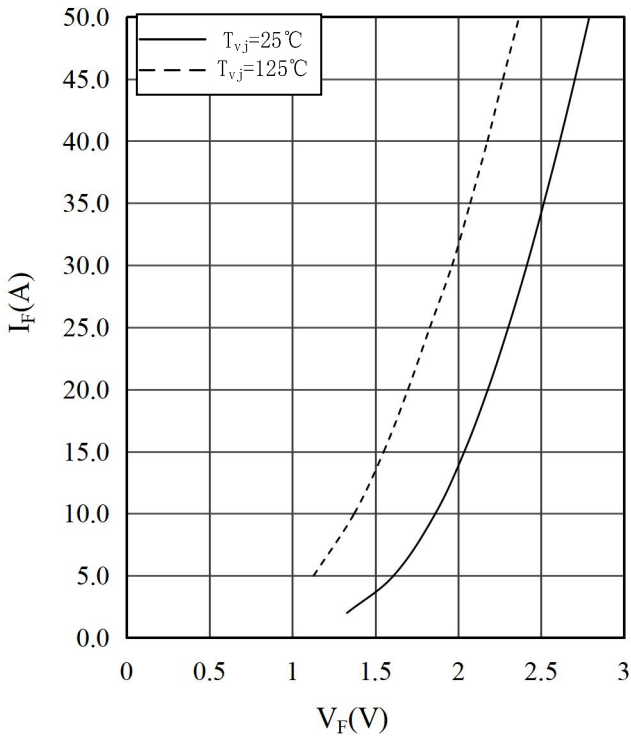
NTC Thermistor Characteristics

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

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)

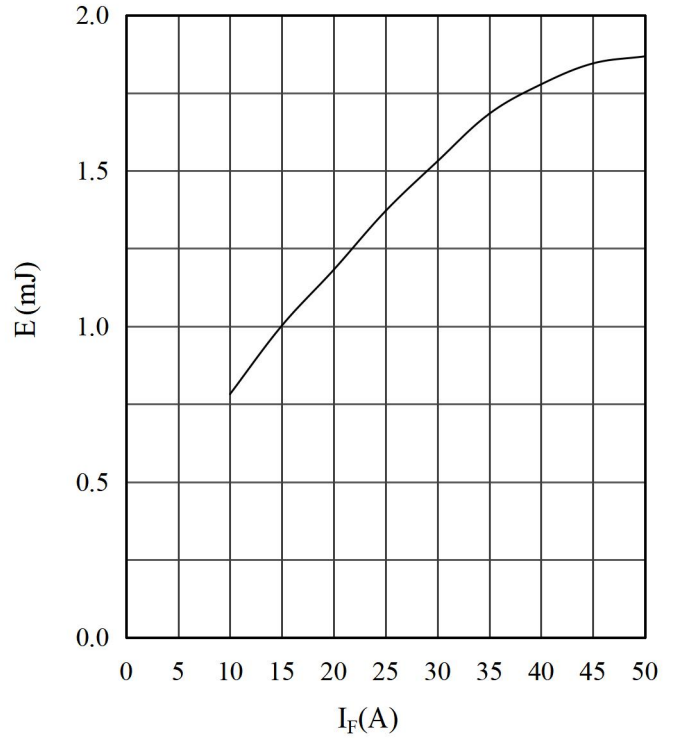
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

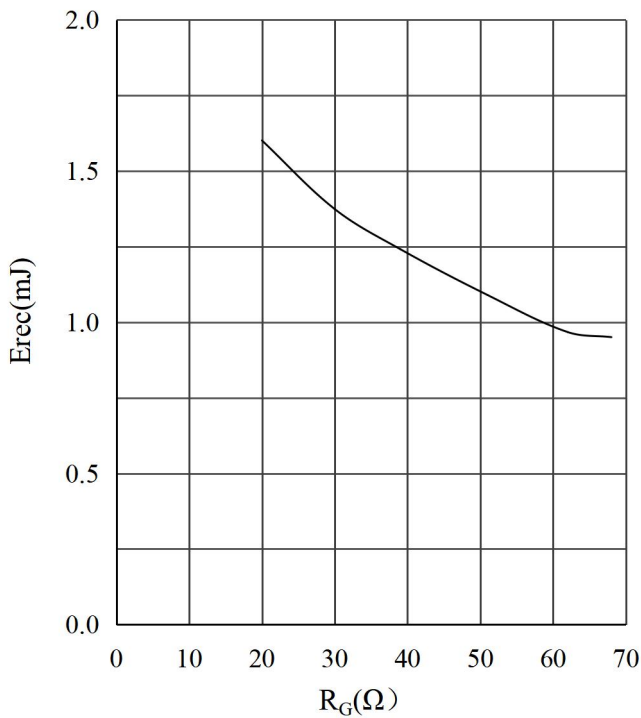
$R_{Gon} = 33\Omega$, $V_{CE} = 600\text{ V}$, $T_{vj} = 125^\circ\text{C}$



switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

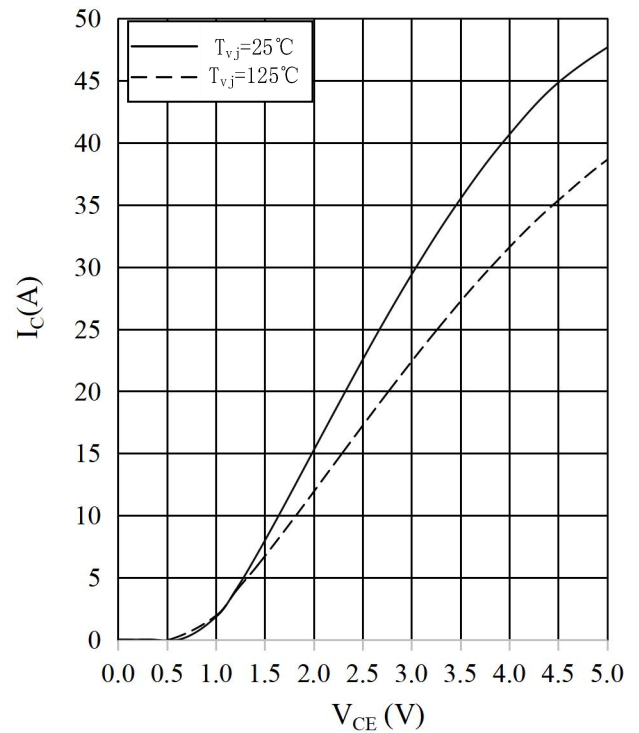
$I_F = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 125^\circ\text{C}$



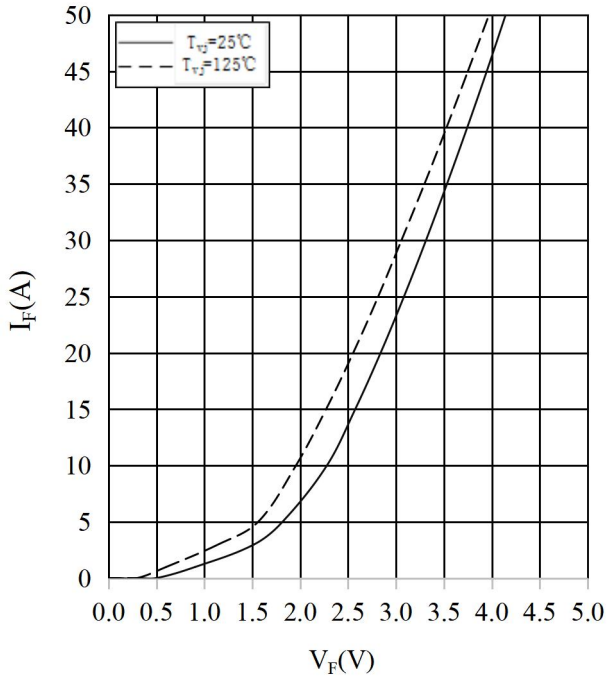
output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

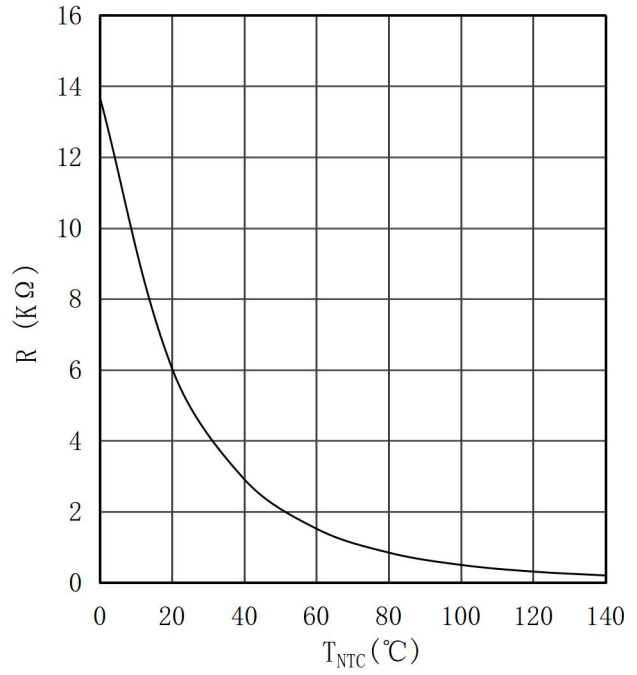
$V_{GE} = 15\text{ V}$



forward characteristic of Diode, Brake-Chopper (typical)
 $I_F = f(V_F)$



NTC-Thermistor-temperature characteristic(typical)
 $R=f(T)$



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