Yongsen

YEGM15BE120E4HZ

IGBT Power Module

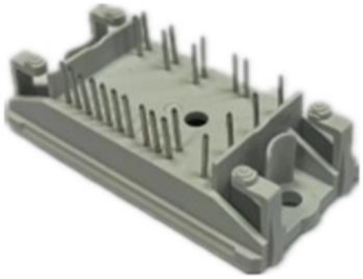
Features:

- V_{CE}=1200V I_C=15A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 150℃
- Isolation Type Package

Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



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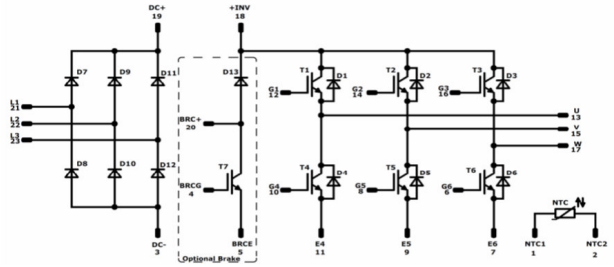


Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	V_{EC}=0V,I_C=1mA,T_{vj}=25℃	1200	V
I_C	Continuous Collector Current	T_C=100℃	15	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	30	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±30	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=150℃	130	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15 A, V_{GE}=15 V, T_{vj}=25 ℃		1.85	2.5	V
		I_C=15 A, V_{GE}=15 V, T_{vj}=125 ℃		2.0	2.7	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=5.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5	5.6	7	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			410	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		1.29		nF
C_{res}	Reverse transfer capacitance			41		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=15 A,V_{CE}=600 V V_{GE}=±15 V R_G=35Ω T_{vj}=25 ℃		94		ns
t_r	Rise Time, Inductive Load			52		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			243		ns
t_f	Fall Time, Inductive Load			190		ns
E_{on}	Turn-on Energy Loss per Pulse			1.95		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.81		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=15 A,V_{CE}=600 V V_{GE}=±15 V R_G=35Ω Tvj=125 ℃		85		ns
t_r	Rise Time, Inductive Load			114		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			202		ns
t_f	Fall Time, Inductive Load			312		ns
E_{on}	Turn-on Energy Loss per Pulse			2.1		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.2		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			1.15	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		125	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}=600V, t_p≤10μs, T_{vj}=125℃, V_{CEmax}=V_{CES}-L_{sCE} ·di/dt		60		A

Maximum Rated Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CES}	Collector-emitter voltage	T_{vj}=25℃		1200		V
I_C	Continuous Collector Current	T_C = 100℃, $T_{vj\,max}$ = 150℃		15		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		30		A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	-20		20	V

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15 A, V_{GE}=15 V, T_{vj}=25 ℃		1.85	2.5	V
		I_C=15 A, V_{GE}=15 V, T_{vj}=125 ℃		2.0	2.7	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=5.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5	5.6	7	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			410	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		1.29		nF
C_{res}	Reverse transfer capacitance			41		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=15 A,V_{CE}=600 V V_{GE}=±15 V R_G=35Ω T_{vj}=25 ℃		94		ns
t_r	Rise Time, Inductive Load			52		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			243		ns
t_f	Fall Time, Inductive Load			190		ns
E_{on}	Turn-on Energy Loss per Pulse			1.95		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.81		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=15 A,V_{CE}=600 V V_{GE}=±15 V R_G=35Ω Tvj=125 ℃		85		ns
t_r	Rise Time, Inductive Load			114		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			202		ns
t_f	Fall Time, Inductive Load			312		ns
E_{on}	Turn-on Energy Loss per Pulse			2.1		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.2		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			1.15	K/W
$T_{vj\,op}$	Temperature under switching conditions		-40		125	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}=600V, t_p≤10μs, T_{vj}=125℃, V_{CEmax}=V_{CES}-L_{sCE} ·di/dt		60		A

Maximum Rated Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	T_{vj}= 25 ℃		1200		V
I_F	Continuous DC Forward Current			15		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		30		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		15		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=15 A, V_{CE}=0 V, T_{vj}=25 ℃		1.9	2.5	V
		I_F=15 A, V_{CE}=0 V, T_{vj}=125 ℃		1.90		V
t_{rr}	Reverse Recovery time	I_F=15 A,V_R=600 V -di/dt=300A/us T_{vj}=25 ℃		220		ns
Q_r	Recovered Charge			0.8		μC
E_{rec}	Reverse Recovery Energy			0.2		mJ
t_{rr}	Reverse Recovery time	I_F=15A,V_R=600 V -di/dt=300A/us T_{vj}=125 ℃		370		ns
Q_r	Recovered Charge			1.4		μC
E_{rec}	Reverse Recovery Energy			0.4		mJ
R_{thJC}	Thermal resistance, junction to case				1.75	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		125	℃

Maximum Rated Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive peak reverse voltage	T_{vj}=25 ℃		1800		V
I_{FRMSM}	Maximum RMS forward current per chip	T_c=80 ℃		30		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		30		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		190		A
I^2t	I^2t-value			180		A^2S
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=125 ℃		160		A
I^2t	I^2t-value			130		A^2S

Characteristic Values (Diode Rectifier)

V_F	Forward voltage	T_{vj}=125 ℃ I_F=15A		0.98		V
I_R	Reverse current	T_{vj}=125 ℃ V_R=1800V		1.1		mA
R_{thjc}	Thermal resistance junction to case	per diode			1.18	K/W
T_{vjop}	Temperature under switching conditions		-40		125	℃

Maximum Rated Values (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	T_{vj}= 25 ℃		1200		V
I_F	Continuous DC Forward Current	T_C=100 ℃		15		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		30		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		15		A^2s

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=15 A, V_{CE}=0 V, T_{vj}=25 ℃		1.9	2.3	V
		I_F=15 A, V_{CE}=0 V, T_{vj}=125 ℃		1.90		V
t_{rr}	Reverse Recovery time	I_F=15 A,V_R=600 V -di/dt=300A/us T_{vj}=25 ℃		220		ns
Q_r	Recovered Charge			0.8		μC
E_{rec}	Reverse Recovery Energy			0.2		mJ
t_{rr}	Reverse Recovery time	I_F=15A,V_R=600 V -di/dt=300A/us T_{vj}=125 ℃		370		ns
Q_r	Recovered Charge			1.4		μC
E_{rec}	Reverse Recovery Energy			0.4		mJ
R_{thJC}	Thermal resistance, junction to case				1.75	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		125	℃

NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated resistance	T_c=25 ℃		22		KΩ
ΔR/R	Deviation of R100	T_c=100 ℃	-5		5	%
P_{25}	Power dissipation	T_c=25 ℃		210		mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3950		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298,15K))]$		3998		K

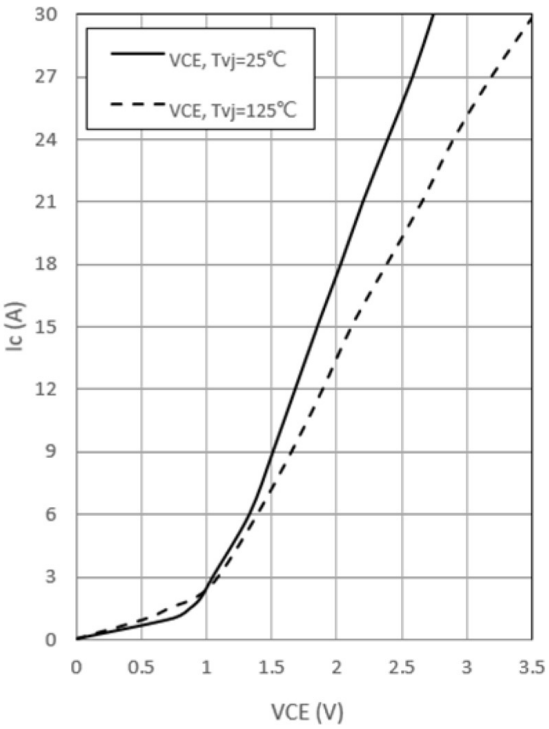
Module Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		125	℃
F	Mountig Force per Clamp		20		50	N
G	Weight of Module			25		g

Output characteristic of IGBT,Inverter (typical)

$I_c = f(V_{CE})$

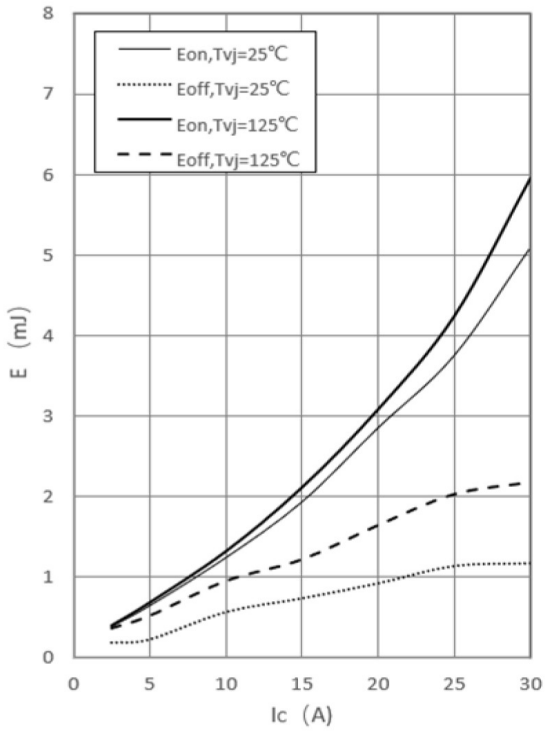
$V_{GE} = 15V$



Switching time of IGBT,Inverter (typical)

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

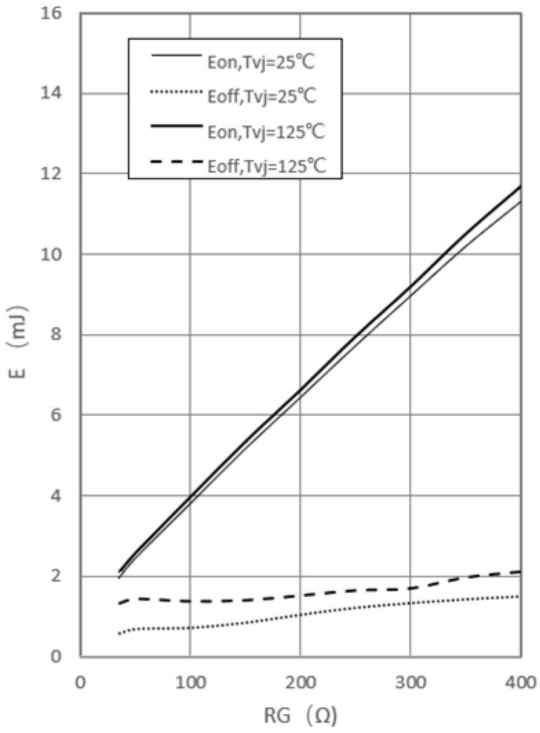
$V_{GE} = \pm 15V$, RG =35Ω, $V_{CE} = 600V$



Switching losess of IGBT,Inverter (typical)

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

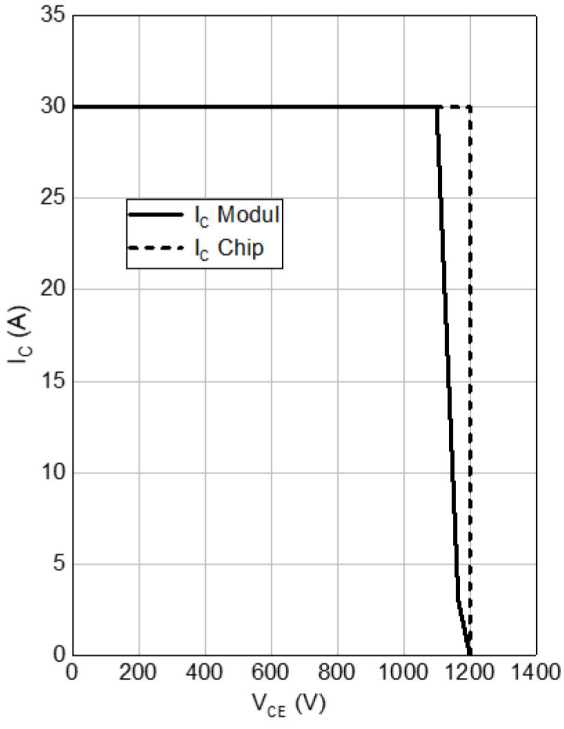
$V_{GE} = \pm 15V$, $I_C = 15A$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

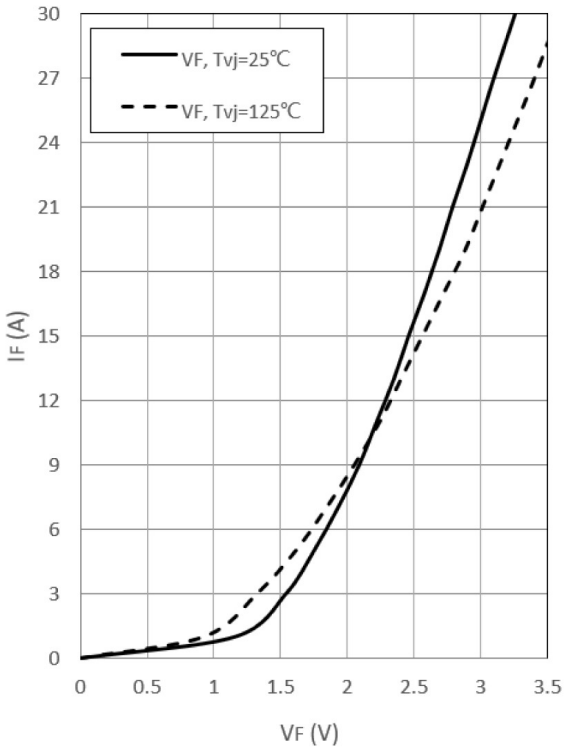
$I_C = f(V_{CE})$

$V_{GE} = \pm 15V$, $R_{Goff} = 35Ω$, $T_{vj} = 125℃$



Forward characteristic of Diode,Inverter (typical)

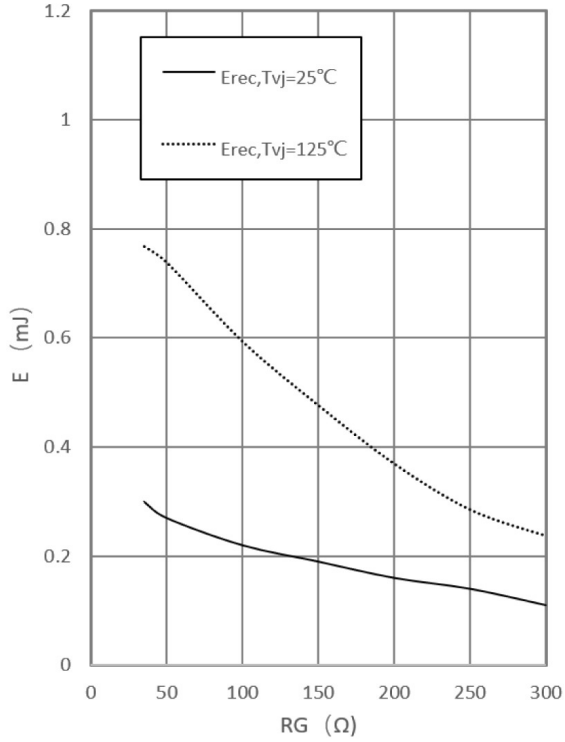
$I_F = f(V_F)$



Switching losses of Diode, Inverter (typical)

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

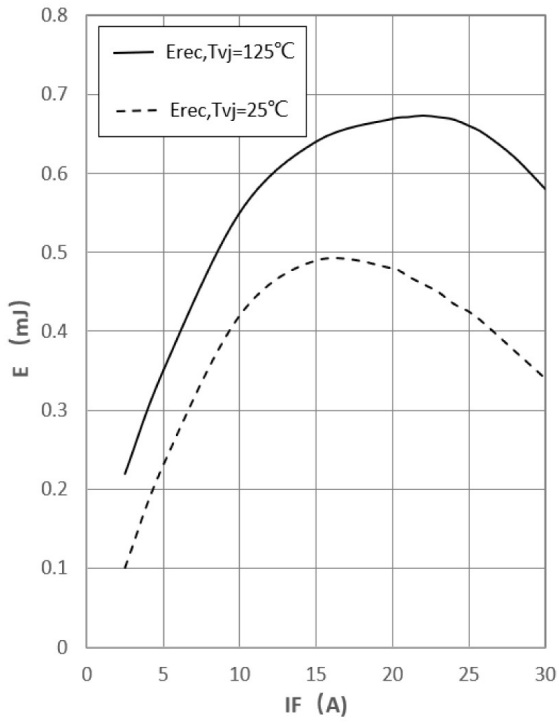
$I_F = 15A$, $V_{CE} = 600V$



Switching losses of Diode, Inverter (typical)

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

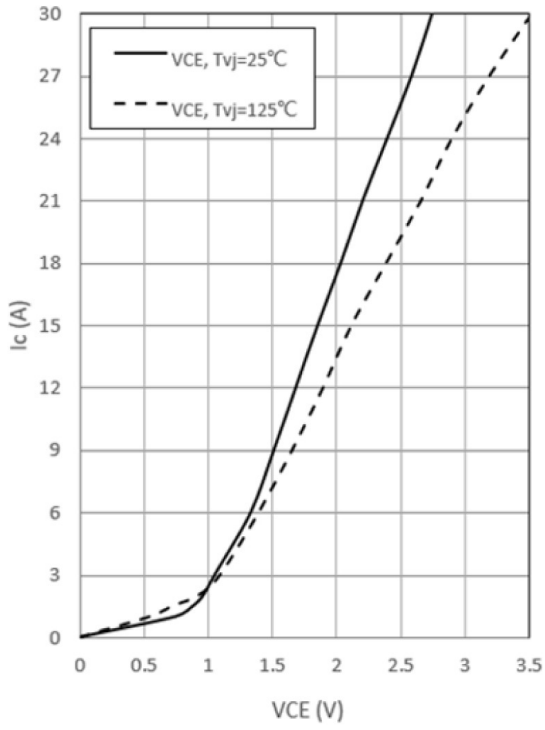
$R_G = 35\Omega$, $V_{CE} = 600V$



Output characteristic of IGBT,Brake-Chopper, (typical)

$I_c = f(V_{CE})$

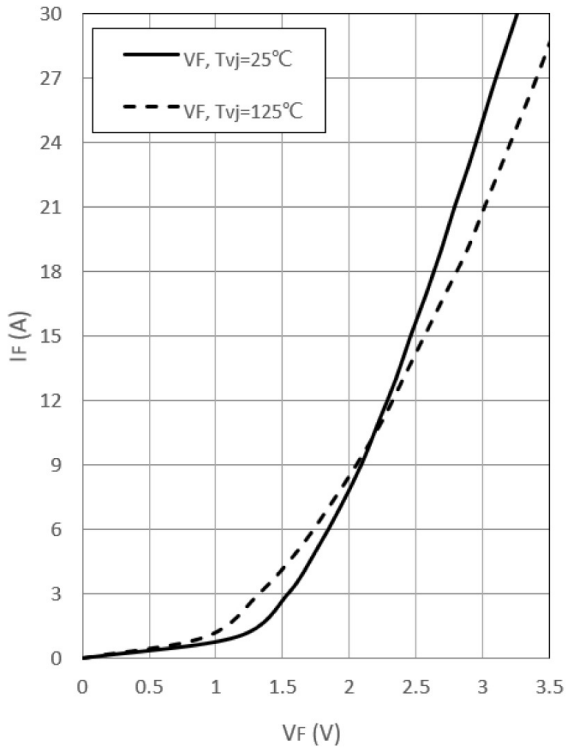
$V_{GE} = 15V$



Output characteristic of IGBT,Brake-Chopper, (typical)

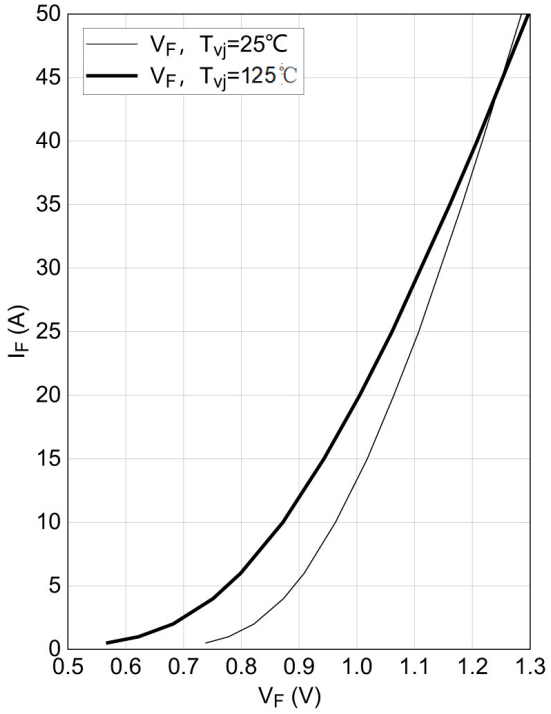
$I_c = f(V_{CE})$

$V_{GE} = 15V$



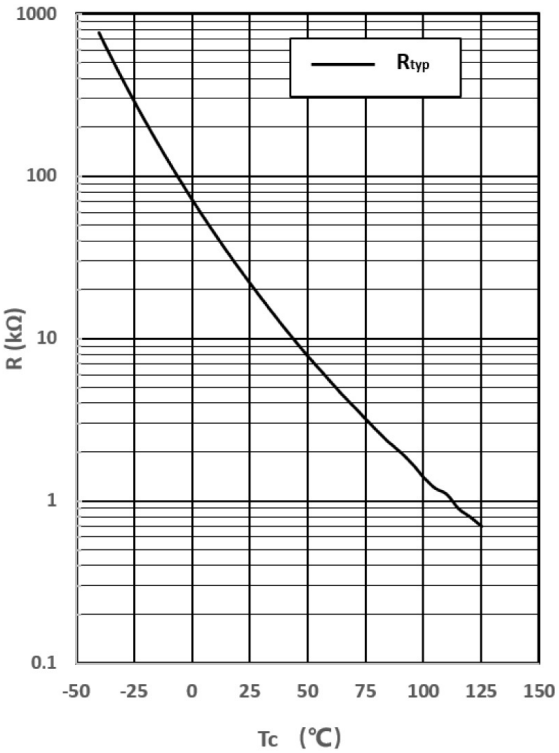
Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

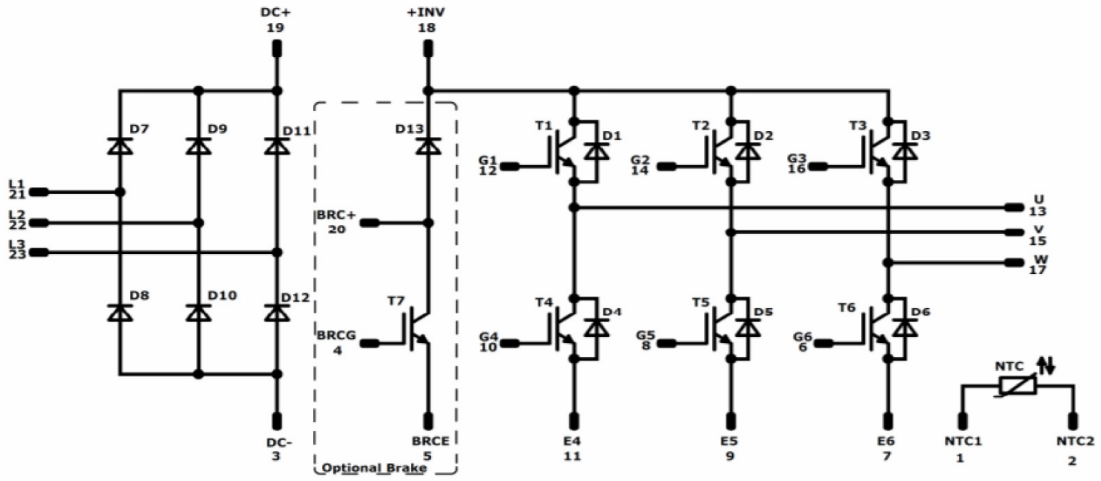


NTC-thermistor-temperature characteristic (typical)

$R = f(T_{NTC})$,



Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)

	Pin table			Pinout variation	
Pin	X	Y		Modul subtype	Not assembled pins
1	25,5	2,7	NTC1	P540-A01	-
2	25,5	0	NTC2	P540-C01	4,5,20
3	22,8	0	-DC		
4	20,1	0	BRCG		
5	16,2	0	BRCE		
6	13,5	0	G6		
7	10,8	0	E6		
8	8,1	0	G5		
9	5,4	0	E5		
10	2,7	0	G4		
11	0	0	E4		
12	0	19,8	G1		
13	0	22,5	U		
14	7,5	19,8	G2		
15	7,5	22,5	V		
16	15	19,8	G3		
17	15	22,5	W		
18	22,8	22,5	+INV		
19	25,5	22,5	+DC		
20	33,5	22,5	BRC+		
21	33,5	15	L1		
22	33,5	7,5	L2		
23	33,5	0	L3