Yongsen

YEGM150BE120L5H

IGBT Power Module

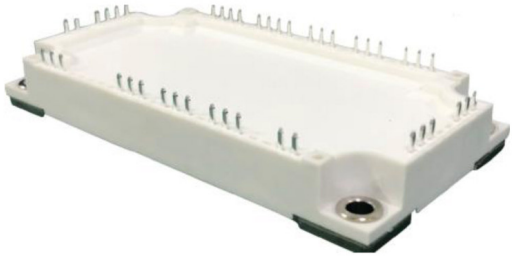
Features

- V_{CE}=1200V I_C=150A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175℃
- Isolation Type Package

Applications

- The inverter
- Motor control and drives

Package Type & Internal Circuit



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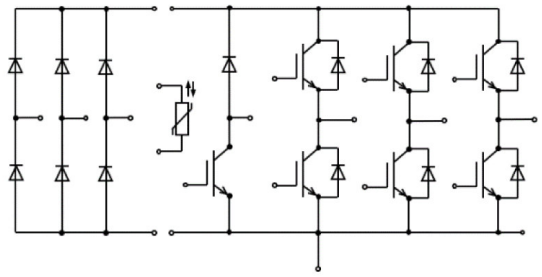


Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Maximum Power Dissipation	V_{EC}=0 V,I_C=1 mA,T_{vj}=25 ℃	1200	V
I_C	Continuous Collector Current	T_C=100 ℃	150	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	300	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25 ℃	±20	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=175℃	1050	W

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=150 A, V_{GE}=15 V, T_{vj}=25 ℃		1.75	2.3	V
		I_C=150 A, V_{GE}=15 V, T_{vj}=150 ℃		2.0		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=5.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.2	6.2	6.5	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 ℃			400	nA
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=150 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=1 Ω T_{vj}=25 ℃		120		ns
t_r	Rise Time, Inductive Load			55		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			370		ns
t_f	Fall Time, Inductive Load			105		ns
E_{on}	Turn-on Energy Loss per Pulse			3.1		mJ
E_{off}	Energy Loss per Pulse			12.4		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=150 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=1 Ω T_{vj}=150 ℃		140		ns
t_r	Rise Time, Inductive Load			60		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			400		ns
t_f	Fall Time, Inductive Load			115		ns
E_{on}	Turn-on Energy Loss per Pulse			3.8		mJ
E_{off}	Energy Loss per Pulse			15		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.17	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃
I_{SC}	SC data	V_{GE} ≤15 V, V_{CC} = 900 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt t_P ≤ 10 μs, T_{vj} = 150 ℃		650		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	T_C=100 ℃		150		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		300		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		4500		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=150 A, V_{CE}=0 V, T_{vj}=25 ℃		1.75		V
		I_F=150 A, V_{CE}=0 V, T_{vj}=150 ℃		1.85		V
t_{rr}	Reverse Recovery time	I_F=150 A,V_R=600 V -di/dt=3500 A/us T_{vj}=25 ℃		160		ns
Q_r	Recovered Charge			14.7		uC
E_{rec}	Reverse Recovery Energy			7.4		mJ
t_{rr}	Reverse Recovery time	I_F=150 A,V_R=600 V -di/dt=3500 A/us T_{vj}=150 ℃		190		ns
Q_r	Recovered Charge			21.8		uC
E_{rec}	Reverse Recovery Energy			11.3		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			0.28	K/W
$T_{vj\ op}$	Operating Junction Temperature		-40		125	℃

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℃		35		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		70		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=50 A, V_{GE}=15 V, T_{vj}=25 ℃		1.80	2.25	V
		I_C=50 A, V_{GE}=15 V, T_{vj}=150 ℃		2.05	2.7	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=2 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5	6	6.5	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			4.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			450	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHZ	-	5.19	-	nF
C_{oes}	Output Capacitance		-	225	-	pF
C_{res}	Reverse Transfer Capacitance		-	189	-	pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=15 Ω T_{vj}=25 ℃		76		ns
t_r	Rise Time, Inductive Load			62		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			278		ns
t_f	Fall Time, Inductive Load			196		ns
E_{on}	Turn-on Energy Loss per Pulse			5.2		mJ
E_{off}	Energy Loss per Pulse			3.1		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=15 Ω T_{vj}=150 ℃		80		ns
t_r	Rise Time, Inductive Load			64		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			326		ns
t_f	Fall Time, Inductive Load			284		ns
E_{on}	Turn-on Energy Loss per Pulse			5.4		mJ
E_{off}	Energy Loss per Pulse			4.5		mJ
R_{thJC}	Thermal resistance, junction to case	pro IGBT / per IGBT			0.47	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		125	°C
I_{SC}	SC data	V_{GE} ≤15 V, V_{CC} = 600 V, V_{CEmax} = V_{CES} - L_{sCE} ·di/dt, t_P ≤ 10 μs, T_{vj} = 150 ℃		250		A

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			35		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		70		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		220		A^2s

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=35 A, V_{CE}=0 V,T_{vj}= 25 ℃		1.9	2.5	V
		I_F=35 A, V_{CE}=0 V,T_{vj}=150 ℃		1.9		V
t_{rr}	Reverse Recovery time	I_F=35 A,V_R=600 V -di/dt=100A/us T_{vj}=25 ℃, V_{GE}=-15V		170		ns
Q_r	Recovered Charge			0.98		uC
E_{rec}	Reverse Recovery Energy			0.35		mJ
t_{rr}	Reverse Recovery time	I_F=35A,V_R=600 V -di/dt=100A/us T_{vj}=150 ℃ V_{GE}=-15V		205		ns
Q_r	Recovered Charge			1.09		uC
E_{rec}	Reverse Recovery Energy			0.36		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.0	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 ℃		110		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		110		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		1320		A
I^2t	I^2t-value	t_p=10ms T_{vj}=25 ℃		8712		A^2S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_c=25 ℃		1.2		V
I_R	Reverse current	T_{vj}=150 ℃ V_R=1600V		2		mA
R_{thjc}	Thermal resistance junction to case	T_c=25 ℃			0.86	K/W
T_{vjop}	Temperature under switching conditions		-40		150	℃

NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated resistance	T_c=25 ℃		5		KΩ
ΔR/R	Deviation of R100	T_c=100 ℃	-5		5	%
P_{25}	Power dissipation	T_c=25 ℃			20	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3380		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298,15K))]$		3450		K

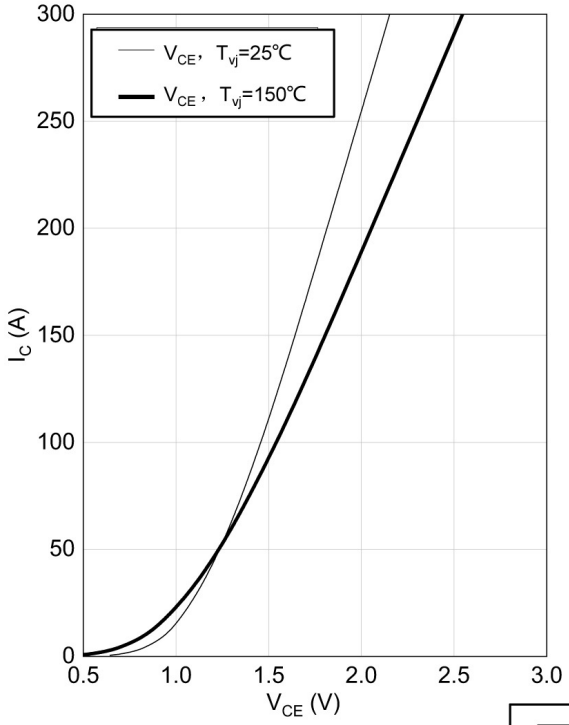
Module Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		150	℃
M_s	Module-to-Sink Torque	Recommended(M5)	3.0		6.0	N·m
G	Weight of Module			300		g

Output characteristic of IGBT,Inverter (typical)

$I_c = f(V_{CE})$

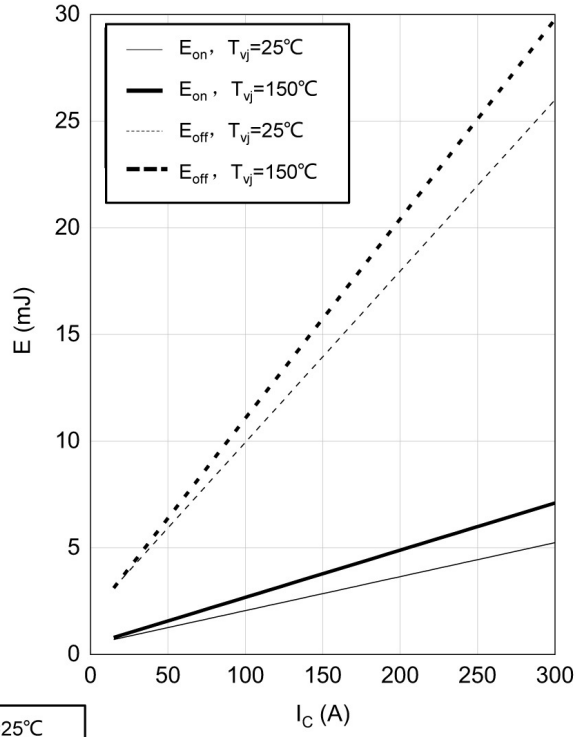
$V_{GE} = 15V$

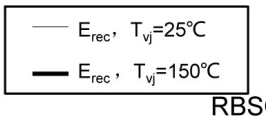


Switching losses of IGBT,Inverter (typical)

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

$V_{GE} = \pm 15V$, $R_G = 1\Omega$, $V_{CE} = 600V$

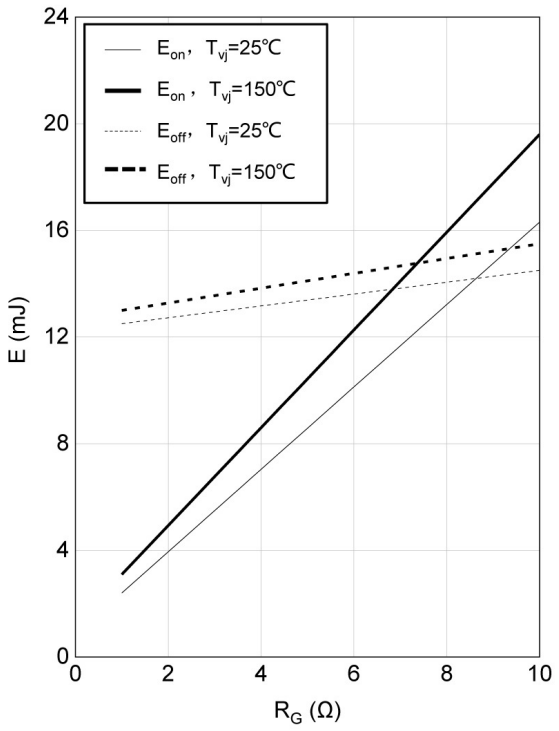




Switching losses of IGBT,Inverter (typical)

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

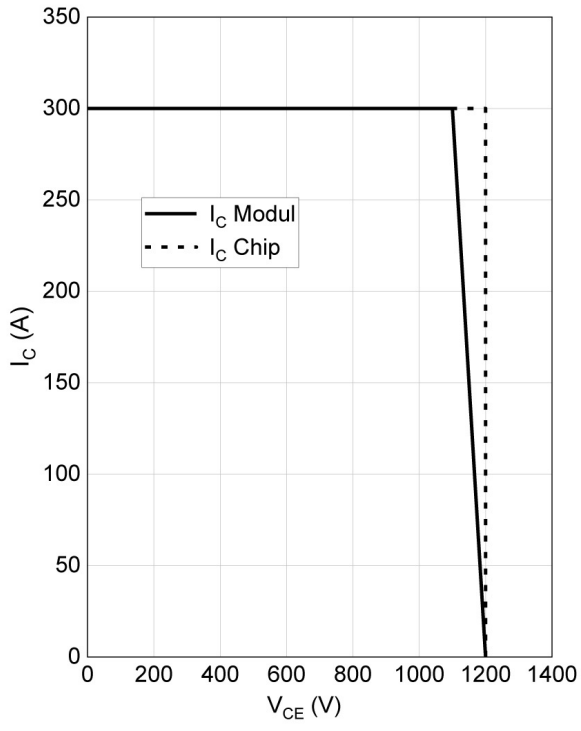
$V_{GE} = \pm 15V$, $I_C = 150A$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

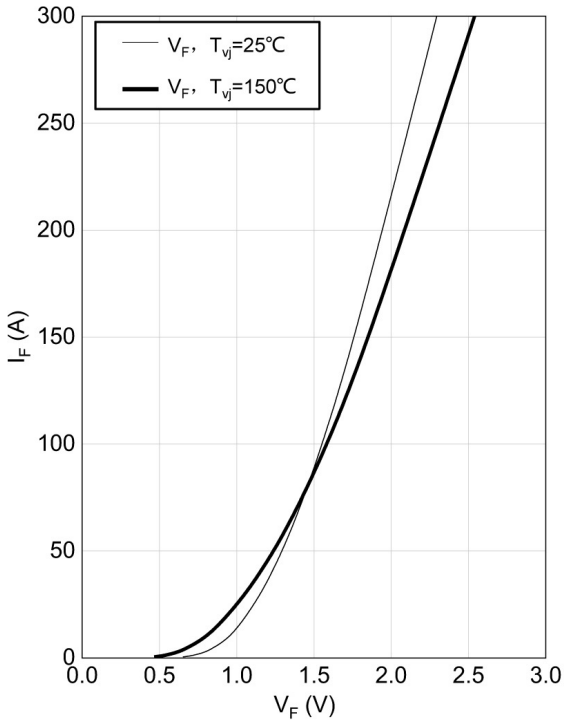
$I_C = f(V_{CE})$

$V_{GE} = \pm 15V$, $R_{Goff} = 1\Omega$, $T_{vj} = 150$ ℃



Forward characteristic of Diode,Inverter (typical)

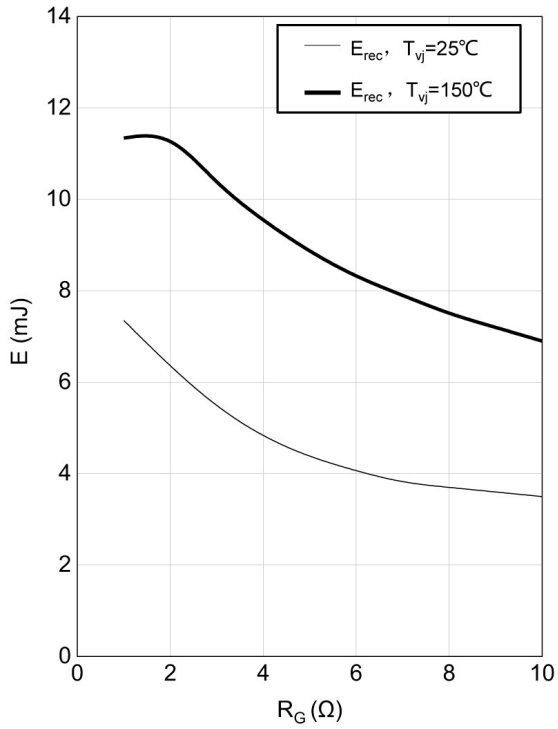
$I_F = f(V_F)$



Switching losses of Diode, Inverter (typical)

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

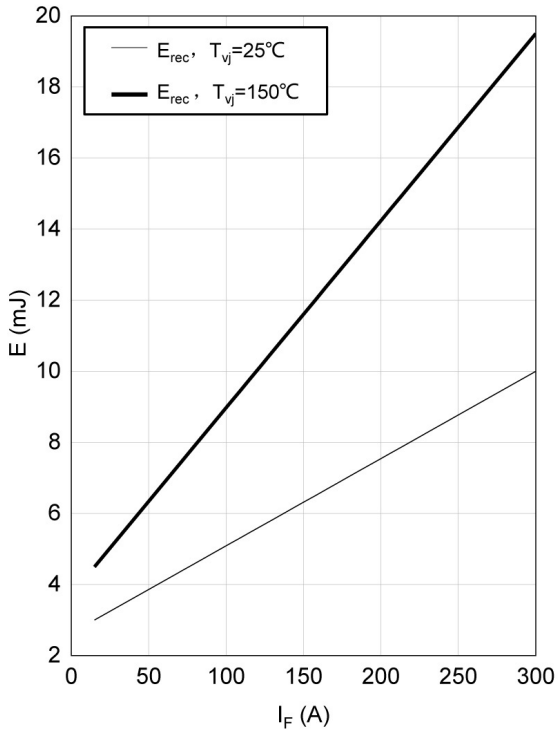
I_F = 150A，V_{CE} = 600V



Switching losess of Diode, Inverter (typical)

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

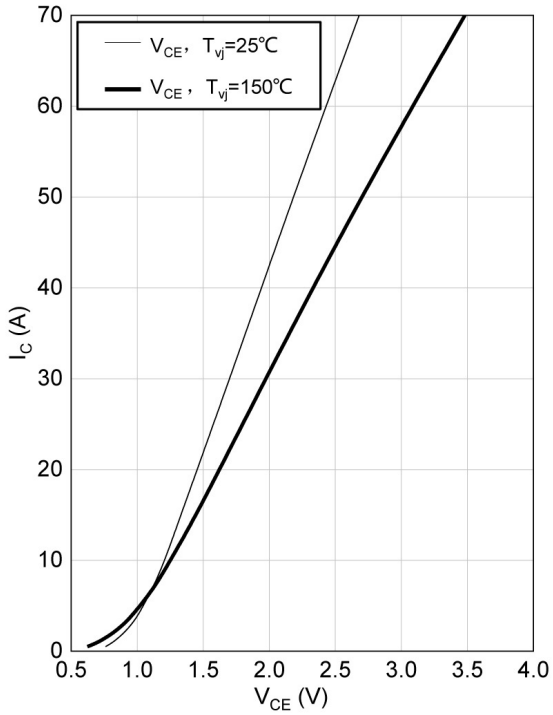
R_G = 1Ω，V_{CE} = 600V



Output characteristic IGBT,Brake-Chopper (typical)

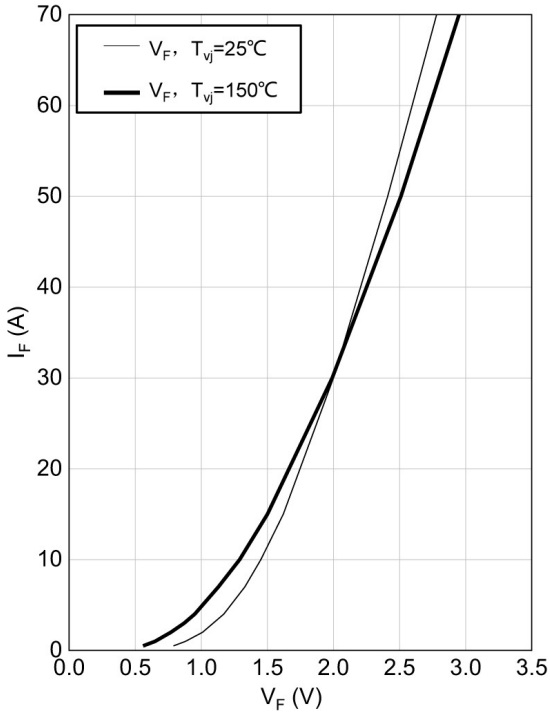
$I_C = f(V_{CE})$

V_{GE} = 15 V



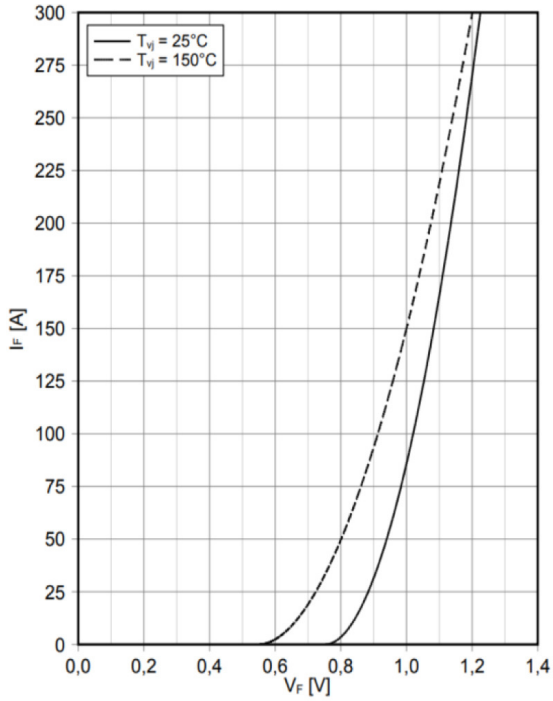
Forward characteristic of Diode,Brake-Chopper (typical)

$I_F = f(V_F)$



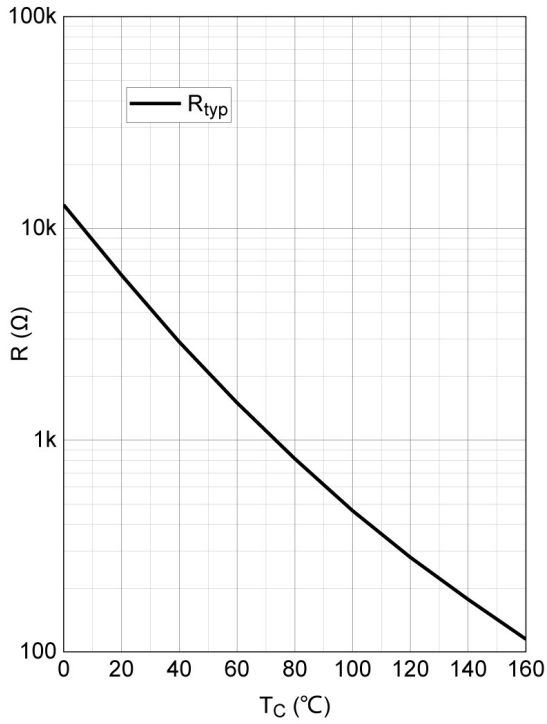
Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

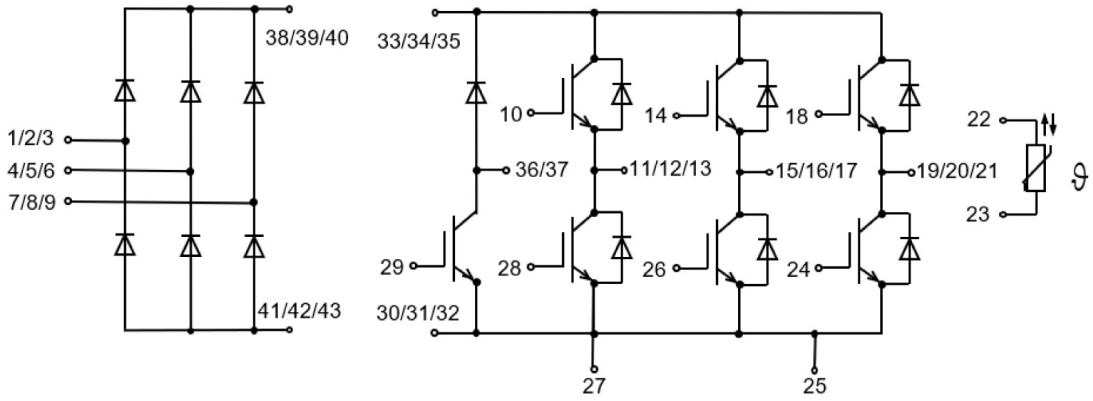


NTC-Thermistor-temperature characteristic (typical)

R = f (T)

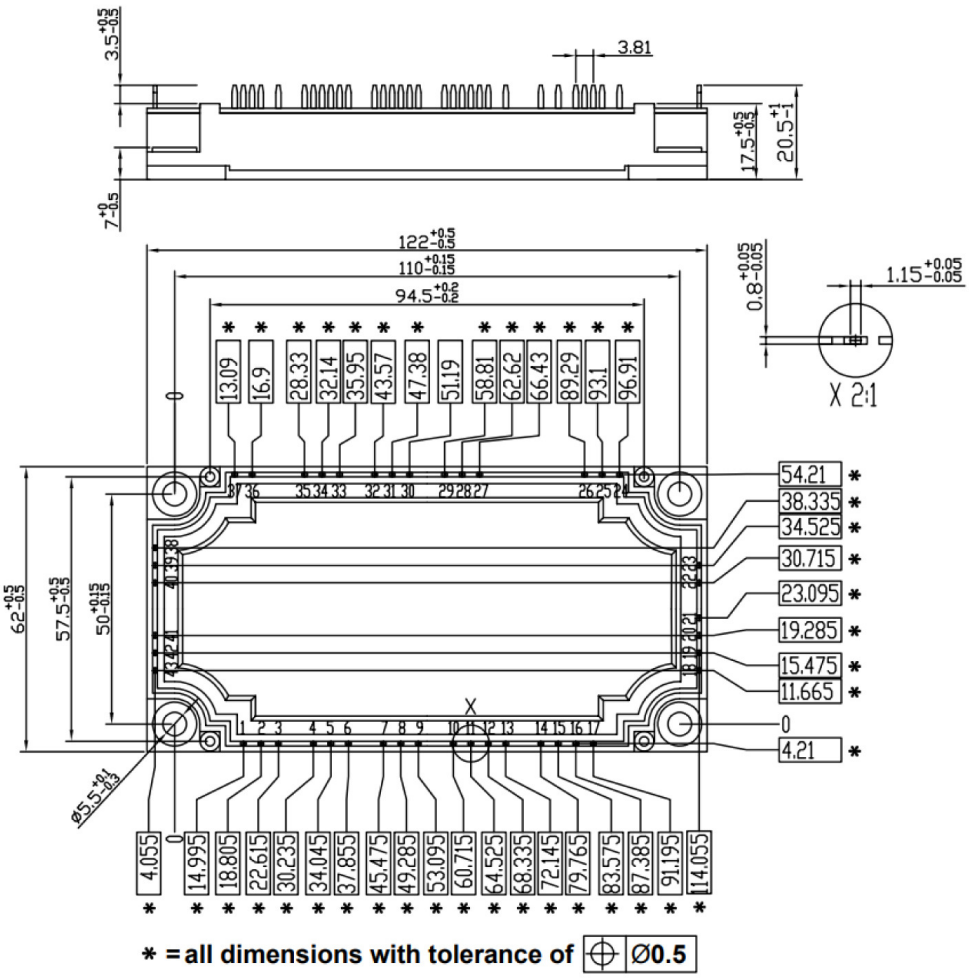


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



* = all dimensions with tolerance of Ø0.5