LEGM150BE120L5H

IGBT Power Module

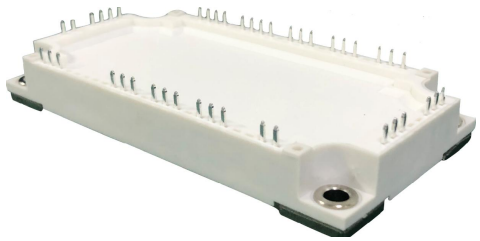
Features

- 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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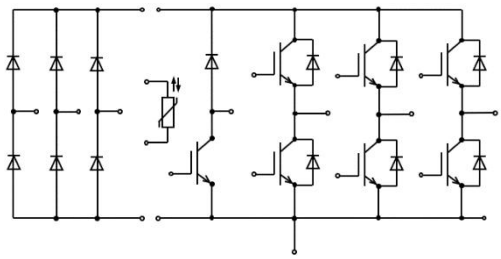


Internal Circuit

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=6.0 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
R_{Gint}	Internal gate resistor			1.28		Ω
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHZ		19.0		nF
C_{oes}	Output Capacitance			0.71		nF
C_{res}	Reverse Transfer Capacitance			0.92		nF
Q_g	Gate charge	V_{CE}=600V,I_C=150A,V_{GE}=15V		1.4		uC
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=150 A,V_{CE}=600 V V_{GE}=±15 V R_G=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_G=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 ℃		1.9		V
		I_F=150 A, V_{CE}=0 V, T_{vj}=150 ℃		2.0		V
I_{rr}	Peak reverse recovery current	I_F=150 A,V_R=600 V -di/dt=2300 A/us T_{vj}=25 ℃		132		A
Q_r	Recovered Charge			10		uC
E_{rec}	Reverse Recovery Energy			3.9		mJ
I_{rr}	Peak reverse recovery current	I_F=150 A,V_R=600 V -di/dt=2300 A/us T_{vj}=150 ℃		152		A
Q_r	Recovered Charge			22		uC
E_{rec}	Reverse Recovery Energy			8.8		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			0.28	K/W
$T_{vj\ op}$	Operating Junction Temperature		-40		150	℃

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℃, $T_{vj\ max}$ = 175℃		100		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		200		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=100 A, V_{GE}=15 V, T_{vj}=25 ℃		1.7		V
		I_C=100 A, V_{GE}=15 V, T_{vj}=150 ℃		2.1		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=6.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.5	6.2	6.8	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			400	nA
R_{Gint}	Internal gate resistor			4.16		Ω
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHZ		6950		nF
C_{oes}	Output Capacitance			328		nF
C_{res}	Reverse Transfer Capacitance			492		nF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=100 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=25 Ω T_{vj}=25 ℃		203		ns
t_r	Rise Time, Inductive Load			117		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			694		ns
t_f	Fall Time, Inductive Load			130		ns
E_{on}	Turn-on Energy Loss per Pulse			21		mJ
E_{off}	Energy Loss per Pulse			8.86		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=100 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=25 Ω T_{vj}=150 ℃		194		ns
t_r	Rise Time, Inductive Load			129		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			764		ns
t_f	Fall Time, Inductive Load			264		ns
E_{on}	Turn-on Energy Loss per Pulse			26.5		mJ
E_{off}	Energy Loss per Pulse			11.8		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.54	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃
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 ℃		500		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			60		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		120		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=60 A, V_{CE}=0 V,T_{vj}= 25 ℃		1.9		V
		I_F=60A, V_{CE}=0 V,T_{vj}=150 ℃		1.6		V
t_{rr}	Reverse Recovery time	I_F=60 A,V_R=600 V -di/dt=660A/us T_{vj}=25 ℃, V_{GE}=-15V		501		ns
Q_r	Recovered Charge			2.95		uC
E_{rec}	Reverse Recovery Energy			0.61		mJ
t_{rr}	Reverse Recovery time	I_F=60A,V_R=600 V -di/dt=660A/us T_{vj}=150 ℃ V_{GE}=-15V		809		ns
Q_r	Recovered Charge			8.32		uC
E_{rec}	Reverse Recovery Energy			1.61		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.0	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃

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 ℃		1.0	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

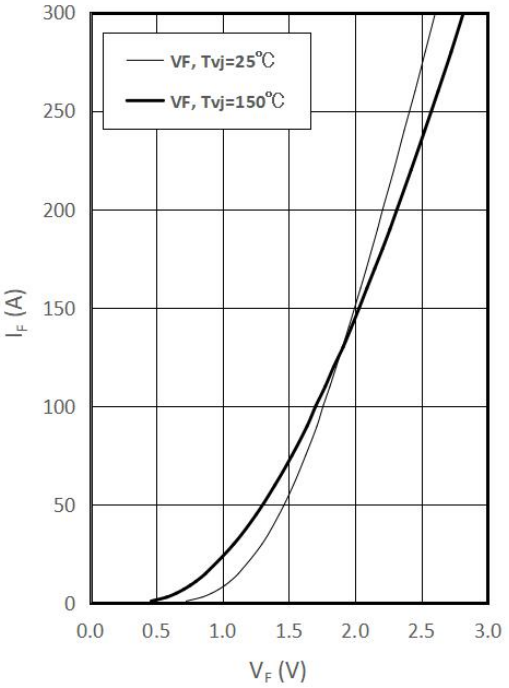
Module Characteristics

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			315		g

Output characteristic of IGBT,Inverter (typical)

$I_c = f(V_{CE})$

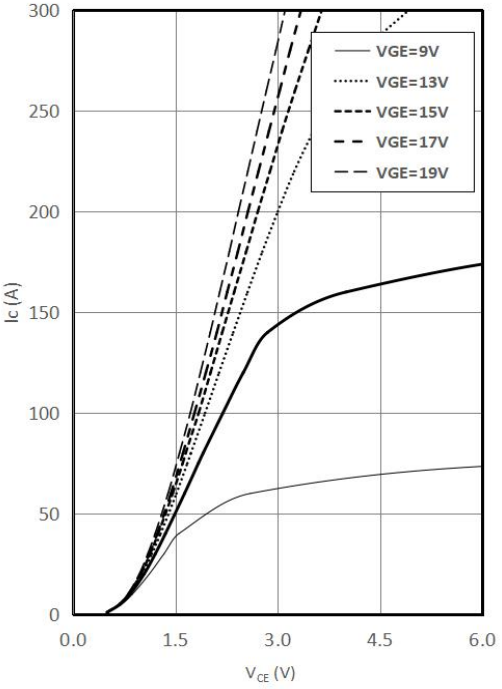
$V_{GE} = 15V$



Output characteristic of IGBT,Inverter (typical)

$I_c = f(V_{CE})$

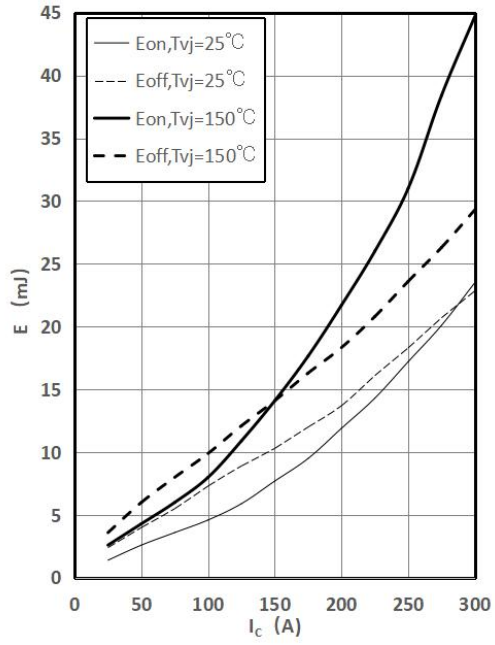
$T_{vj}=150℃$



Switching losses of IGBT,Inverter (typical)

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

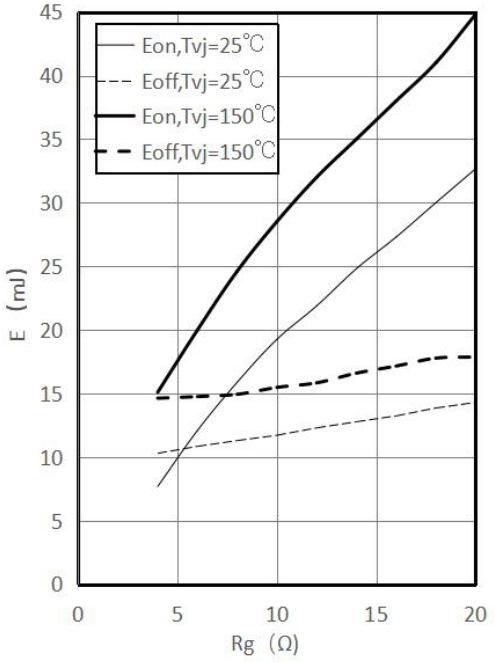
$V_{GE} = \pm 15V$, $R_G = 4\Omega$, $V_{CE} = 600V$



Switching losses of IGBT,Inverter (typical)

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

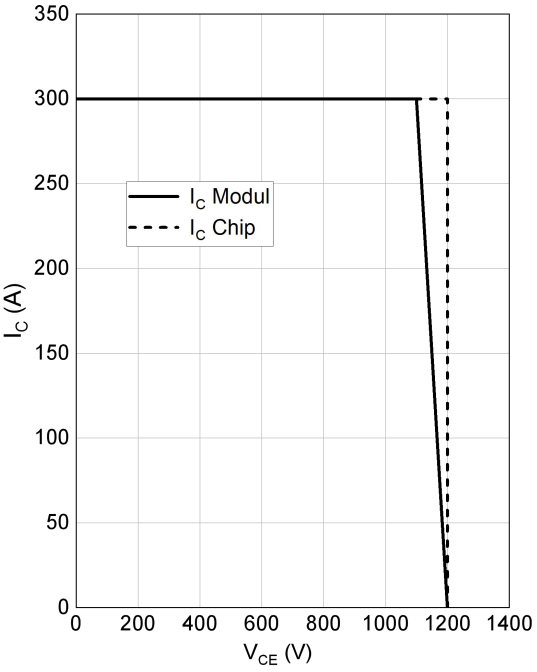
$V_{GE} = \pm 15V$, $I_C = 150A$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

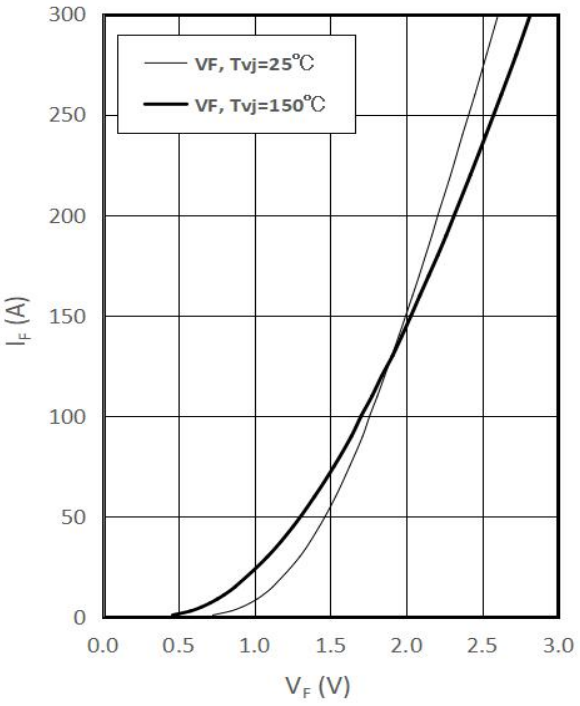
I_C= f (V_{CE})

V_{GE} = ±15V, R_G = 1Ω, T_{vj} =125 ℃



Forward characteristic of Diodе,Inverter (typical)

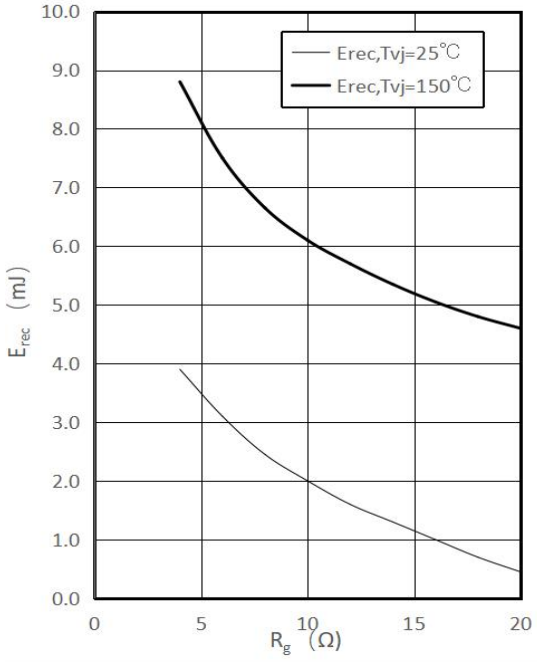
I_F = f (V_F)



Switching losses of Diode, Inverter (typical)

E_{rec} = f (R_G),

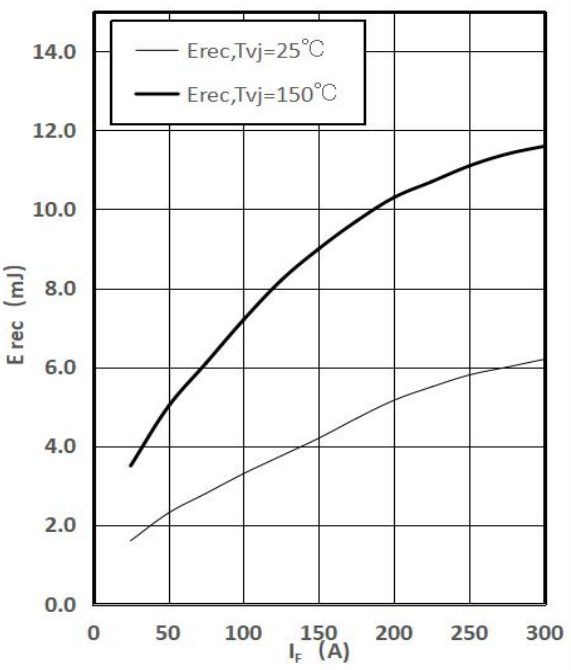
I_F = 150A，V_{CE} = 600V



Switching losses of Diode, Inverter (typical)

E_{rec} = f(I_F),

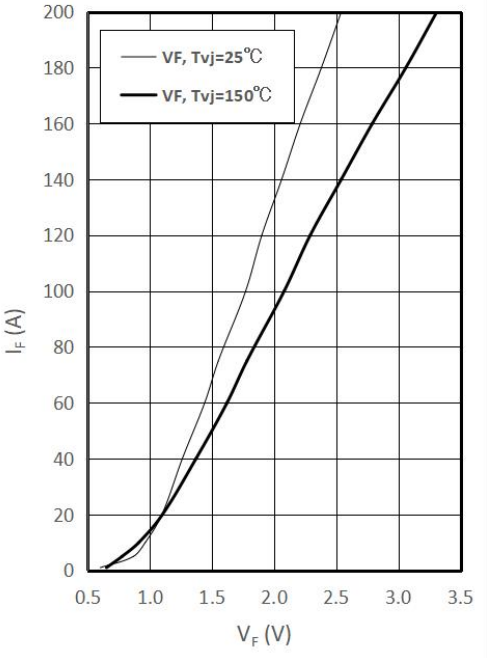
R_G = 4Ω，V_{CE} = 600V



Output characteristic IGBT,Brake-Chopper (typical)

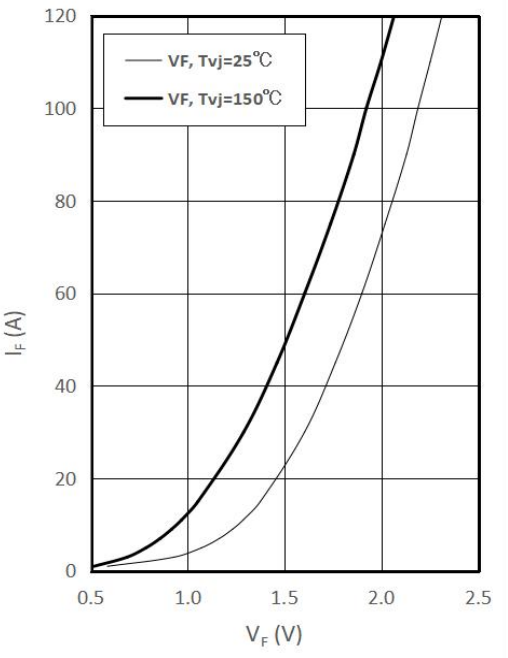
$I_C = f(V_{CE})$

V_{GE} = 15 V



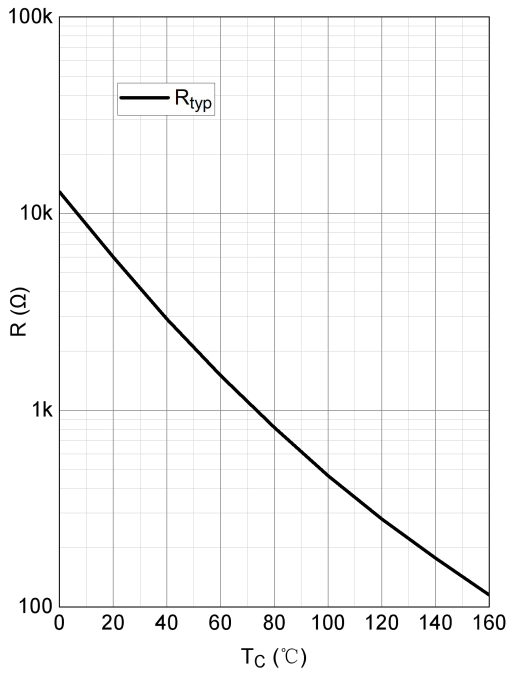
Forward characteristic of Diode,Brake-Chopper (typical)

$I_F = f(V_F)$



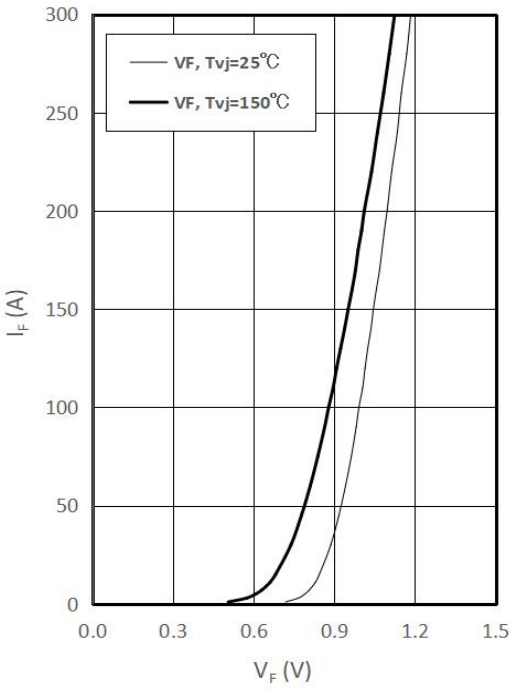
NTC-Thermistor-temperature characteristic (typical)

R = f (T)

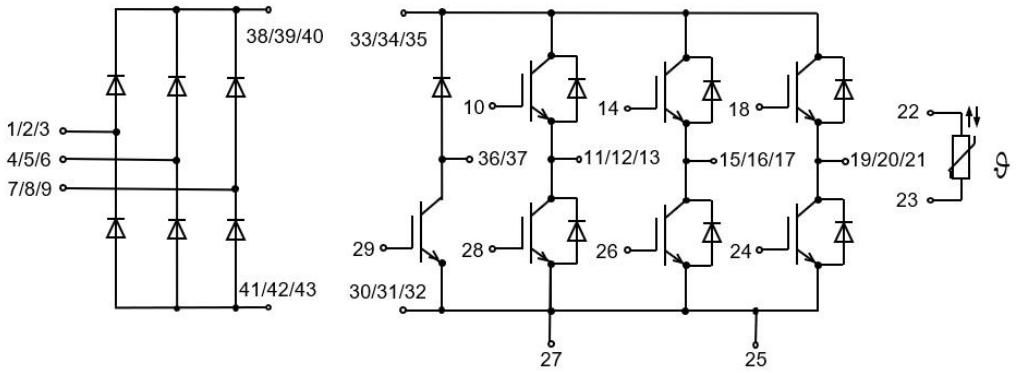


Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

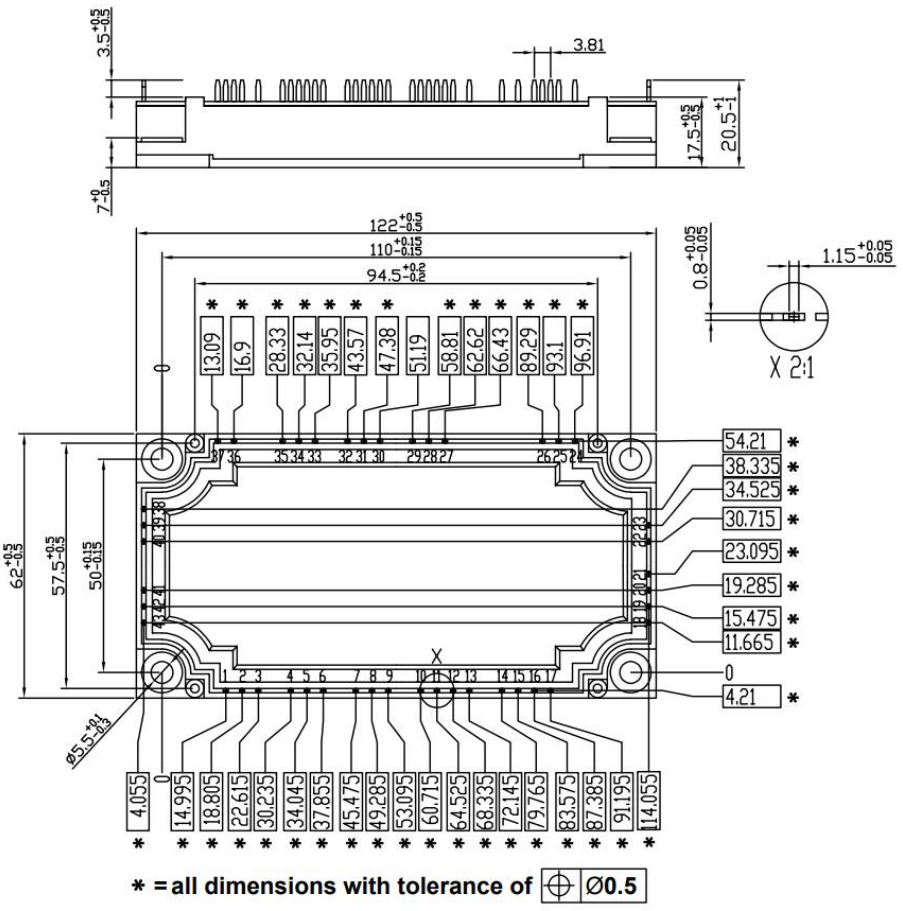


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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