LEGM40BF120L5H

IGBT Power Module

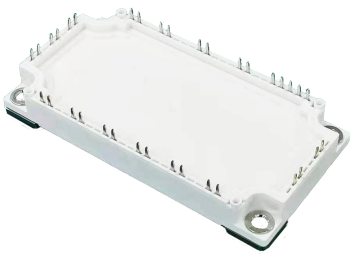
Features:

- V_{CE}=1200V I_C=40A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175℃
- Isolation Type Package

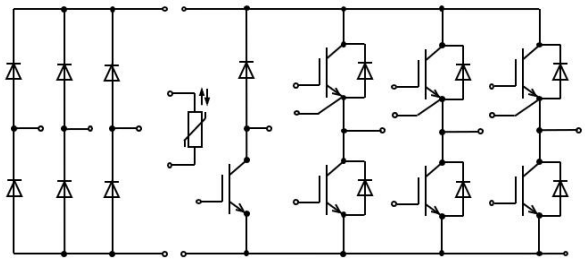
Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



L5



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℃	40	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	80	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±30	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=175℃	190	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40 A, V_{GE}=15 V, T_{vj}=25 ℃		2.69		V
		I_C=40 A, V_{GE}=15 V, T_{vj}=150 ℃		3.55		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=5.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃		5.8		V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			5.2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			410	nA
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=25Ω T_{vj}=25 ℃		220		ns
t_r	Rise Time, Inductive Load			160		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			310		ns
t_f	Fall Time, Inductive Load			100		ns
E_{on}	Turn-on Energy Loss per Pulse			6.2		mJ
E_{off}	Energy Loss per Pulse			2.5		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=25Ω T_{vj}=150 ℃		170		ns
t_r	Rise Time, Inductive Load			180		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			350		ns
t_f	Fall Time, Inductive Load			180		ns
E_{on}	Turn-on Energy Loss per Pulse			6.7		mJ
E_{off}	Energy Loss per Pulse			3.1		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.75	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C
I_{sc}	SC	V_{GE}≤15V, V_{CE}=600V, tp≤10μS, T_{vj}=150℃, VCE_{max}=V_{CES}-L_{sCE} ·di/dt		170		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 ℃		40		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		80		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		330		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=40 A, V_{CE}=0 V, T_{vj}=25 ℃		2.38		V
		I_F=40 A, V_{CE}=0 V, T_{vj}=150 ℃		2.7		V
t_{rr}	Reverse Recovery time	I_F=40 A,V_R=600 V -di/dt=500A/us T_{vj}=25 ℃		75		ns
Q_r	Recovered Charge			4.7		uC
E_{rec}	Reverse Recovery Energy			1.6		mJ
t_{rr}	Reverse Recovery time	I_F=40A,V_R=600 V -di/dt=500A/us T_{vj}=150 ℃		220		ns
Q_r	Recovered Charge			8.5		uC
E_{rec}	Reverse Recovery Energy			3.2		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			0.95	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C

Maximum Rated Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive peak reverse voltage	T_{vj}=25 ℃	1600			V
I_{FRMSM}	Maximum RMS forward current per chip	T_c=80 ℃		50		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		60		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		330		A
I^2t	I^2t-value	t_p=10ms T_{vj}=150 ℃		550		A^2S
I_{FSM}	Surge forward current	T_{vj}=25 ℃		270		A
I^2t	I^2t-value	T_c=80 ℃		360		A^2S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_c=25 ℃		1.1		V
I_R	Reverse current	T_c=100 ℃		2.1		mA
R_{thjc}	Thermal resistance junction to case	T_c=25 ℃			0.75	K/W
T_{vjop}	Temperature under switching conditions		-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° C, $T_{vj\,max}$ = 175° C		25		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		50		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=25 A, V_{GE}=15 V, T_{vj}=25 ℃		1.92		V
		I_C=25 A, V_{GE}=15 V, T_{vj}=150 ℃		2.31		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=5.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃		5.8		V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			1.2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			410	nA
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=20Ω T_{vj}=25 ℃		170		ns
t_r	Rise Time, Inductive Load			160		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			170		ns
t_f	Fall Time, Inductive Load			150		ns
E_{on}	Turn-on Energy Loss per Pulse			3.7		mJ
E_{off}	Energy Loss per Pulse			1.4		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=20Ω T_{vj}=150 ℃		130		ns
t_r	Rise Time, Inductive Load			180		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			250		ns
t_f	Fall Time, Inductive Load			180		ns
E_{on}	Turn-on Energy Loss per Pulse			3.9		mJ
E_{off}	Energy Loss per Pulse			1.8		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.89	K/W
$T_{vj\,op}$	Temperature under switching conditions		-40		150	°C

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 ℃		25		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		52		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		80		A^2s

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=25A, V_{CE}=0 V, T_{vj}=25 ℃		1.98		V
		I_F=25 A, V_{CE}=0 V, T_{vj}=150 ℃		1.90		V
t_{rr}	Reverse Recovery time	I_F=25 A,V_R=600 V -di/dt=250A/us T_{vj}=25 ℃		220		ns
Q_r	Recovered Charge			0.8		uC
E_{rec}	Reverse Recovery Energy			0.2		mJ
t_{rr}	Reverse Recovery time	I_F=25A,V_R=600 V -di/dt=250A/us T_{vj}=150 ℃		340		ns
Q_r	Recovered Charge			1.6		uC
E_{rec}	Reverse Recovery Energy			0.5		mJ
R_{thJC}	Thermal resistance, junction to case	I_F=25 A, V_{CE}=0 V, T_{vj}=25 ℃			1.24	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C

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

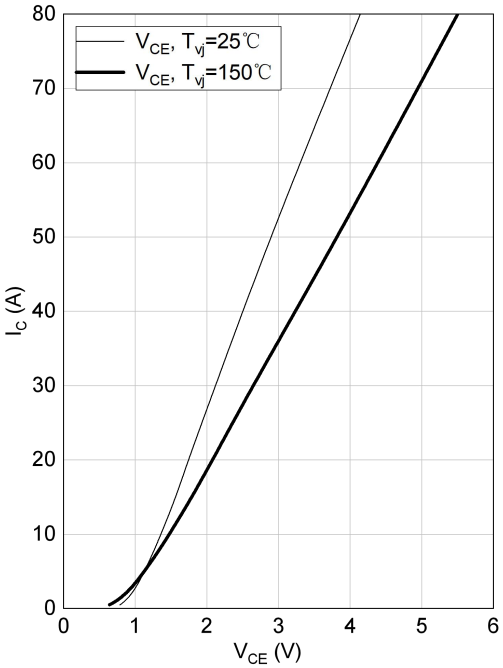
Module Characteristics

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			180		g

output characteristic of IGBT,Inverter (typical)

$I_c = f(V_{CE})$

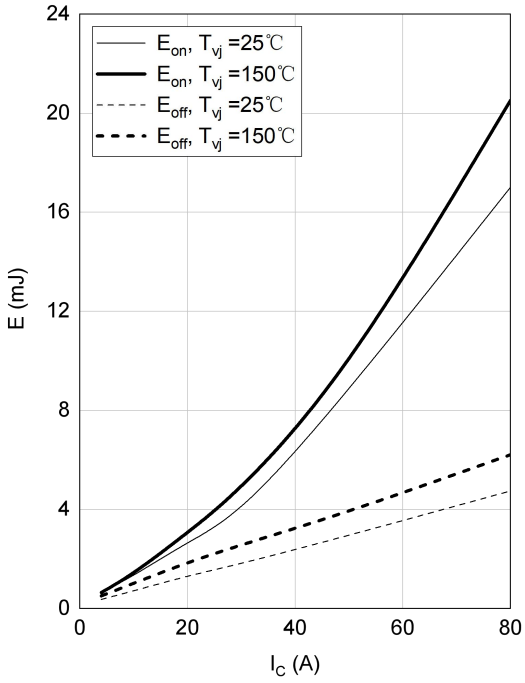
$V_{GE} = 15V$



switching time of IGBT,Inverter (typical)

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

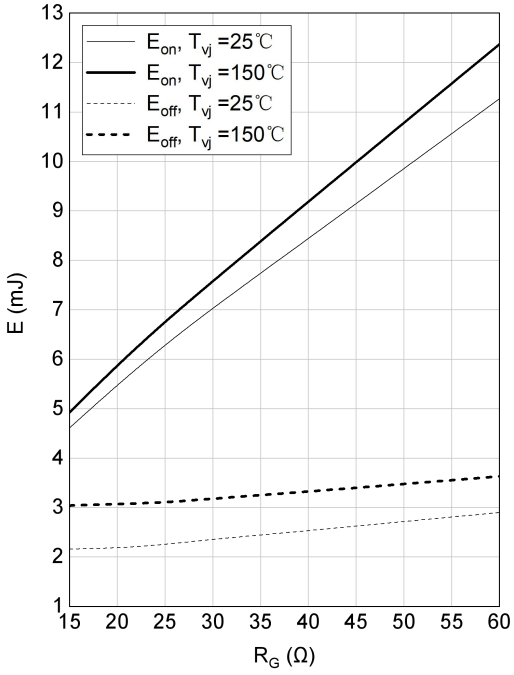
$V_{GE} = 15V$, $R_{Gon} = 15\Omega$, $V_{CE} = 600V$



switching losess of IGBT,Inverter (typical)

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

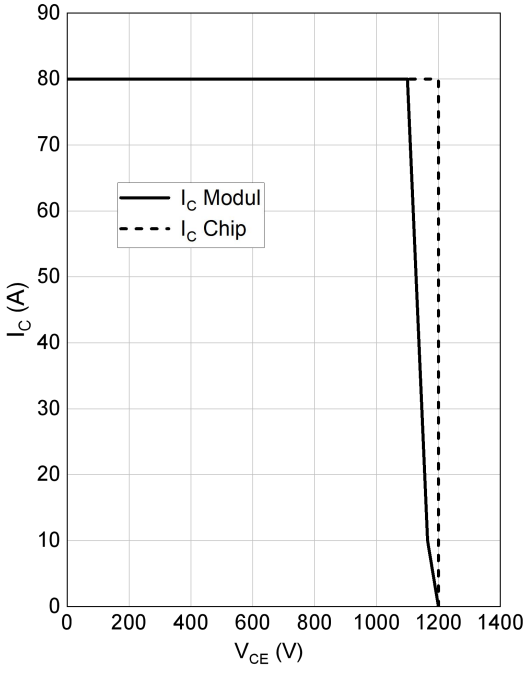
$V_{GE} = \pm 15V$, $I_C = 40A$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

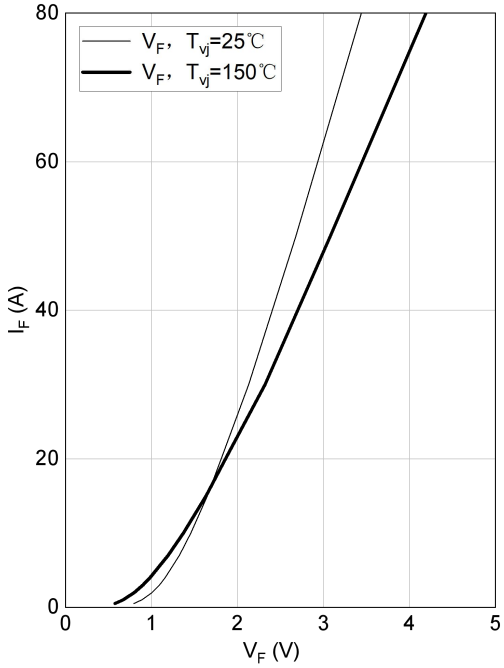
$I_C = f(V_{CE})$

$V_{GE} = 15V$, $R_{Goff} = 50\Omega$, $T_{vj} = 150$ ℃



forward characteristic of Diode,Inverter (typical)

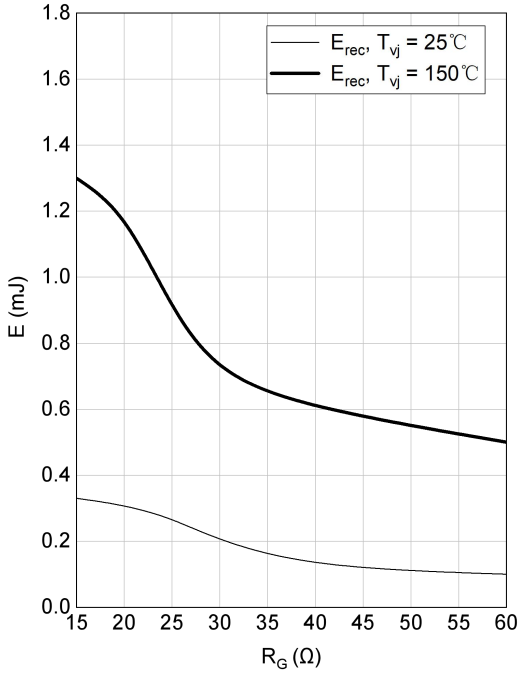
$I_F = f(V_F)$



switching losses of Diode, Inverter (typical)

Erec = $f(R_G)$,

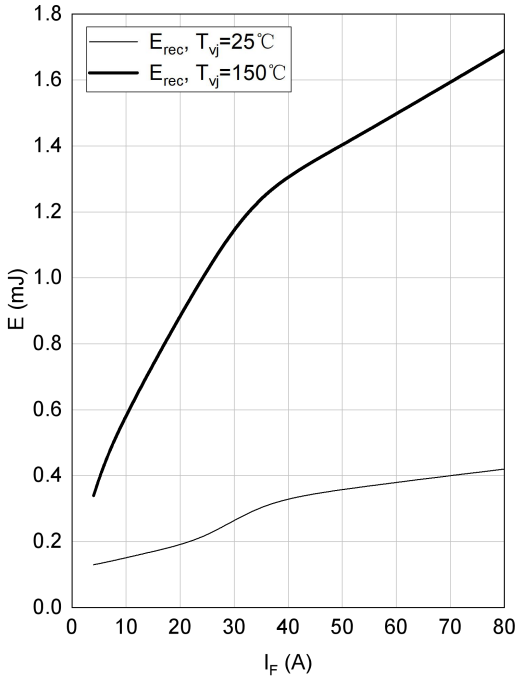
I_F = 40A，V_{CE} = 600V



switching losses of Diode, Inverter (typical)

Erec = $f(I_F)$,

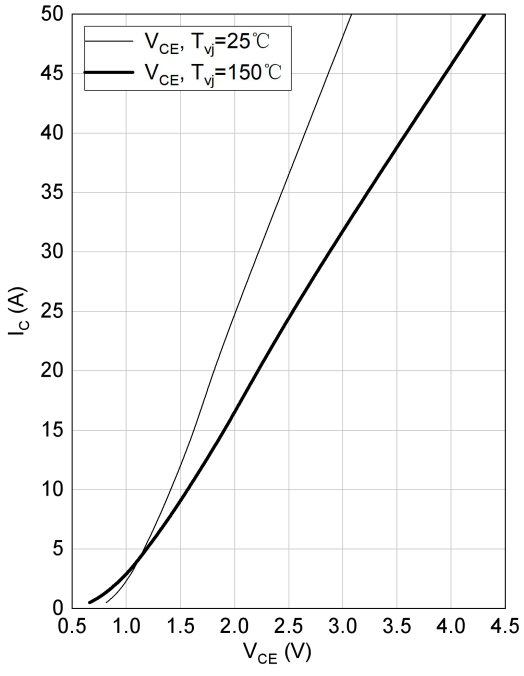
R_{Gon} = 15Ω，V_{CE} = 600V



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

$I_c = f(V_{CE})$

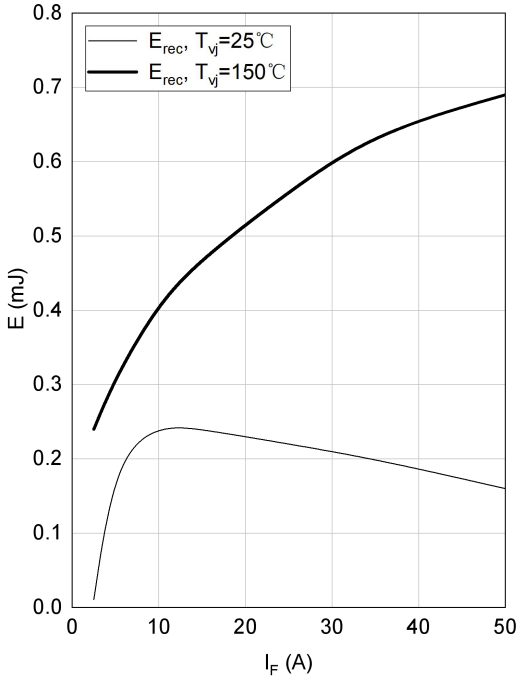
V_{GE} = 15V



forward characteristic of Diode,Brake-Chopper (typical)

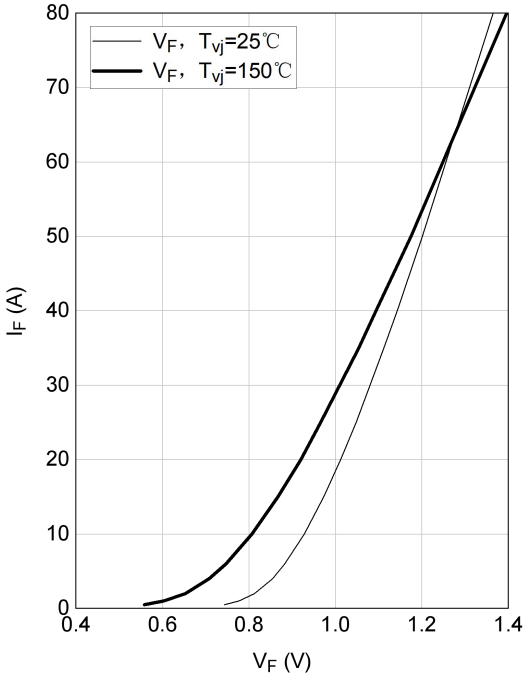
$I_F = f(V_F)$

$V_{GE} = \pm 15V$



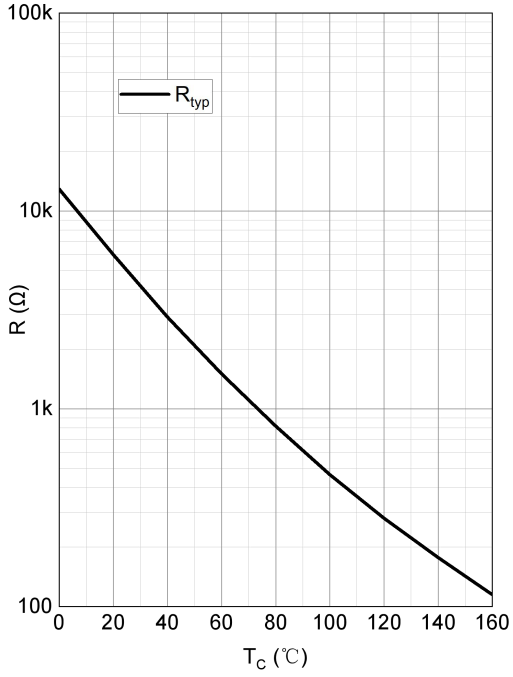
forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

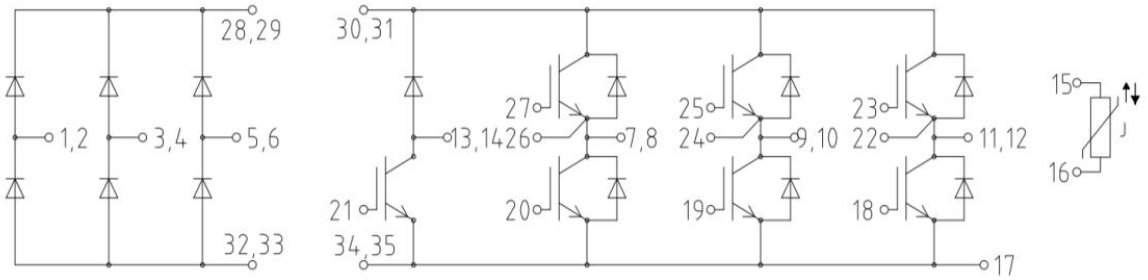


NTC-thermistor-temperature characteristic (typical)

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

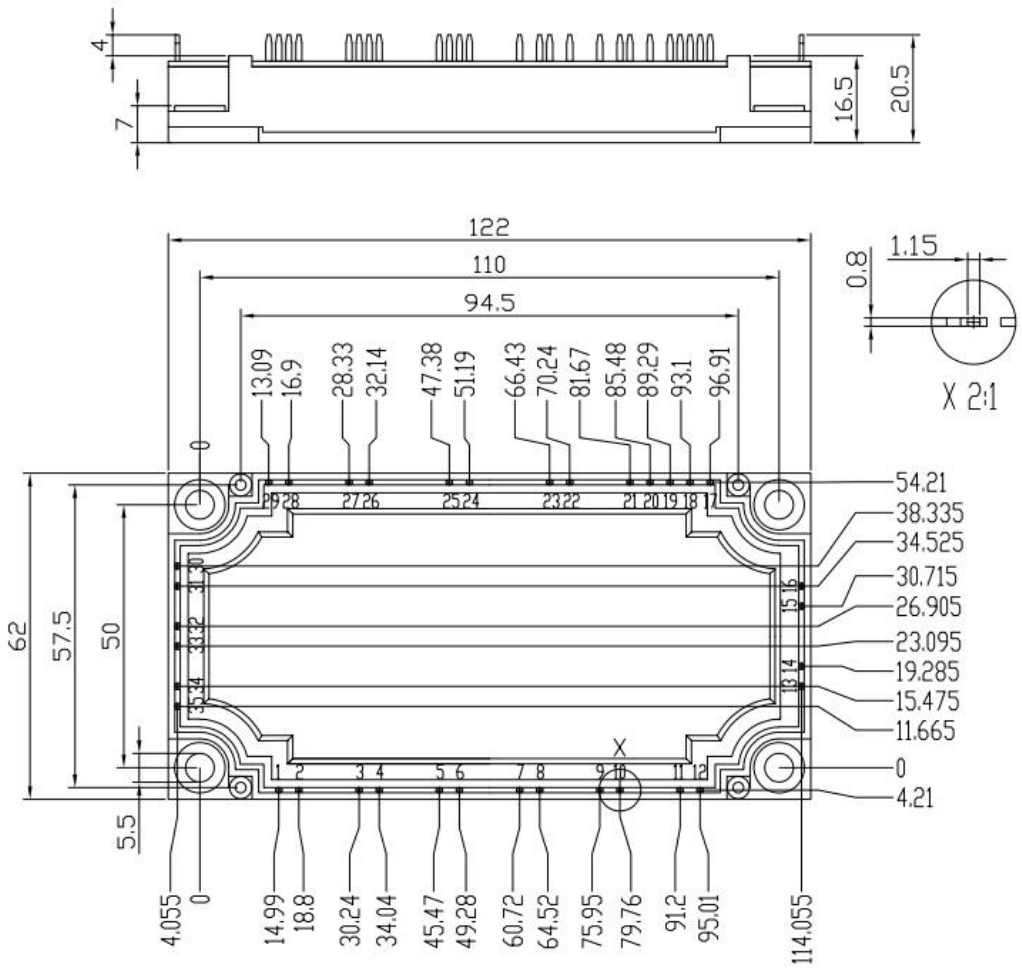


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



DISCLAIMER

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABITILY, FUNCTION OR DESIGN OR OTHERWISE