Jan.2021

LEGM10BE120E1H

IGBT Power Module

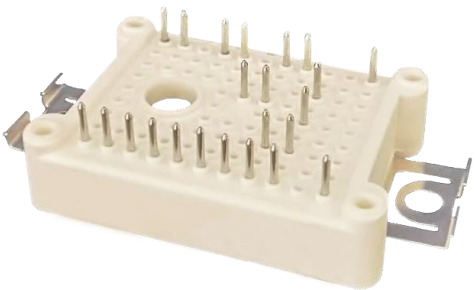
Features:

- V_{CE}=1200V I_C=10A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175℃
- Isolation Type Package

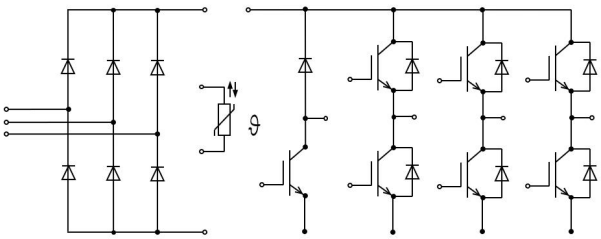
Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



E1



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 ℃	10	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	20	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25 ℃	±30	V
P_{tot}	Total Power Dissipation	T_C=25 ℃,T_{vjmax}=175 ℃	100	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=10 A, V_{GE}=15 V, T_{vj}=25 ℃		1.87		V
		I_C=10 A, V_{GE}=15 V, T_{vj}=150 ℃		2.34		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=10 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=50Ω T_{vj}=25 ℃		350		ns
t_r	Rise Time, Inductive Load			230		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			190		ns
t_f	Fall Time, Inductive Load			195		ns
E_{on}	Turn-on Energy Loss per Pulse			1.8		mJ
E_{off}	Energy Loss per Pulse			0.5		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=10 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=50Ω T_{vj}=150 ℃		280		ns
t_r	Rise Time, Inductive Load			250		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			330		ns
t_f	Fall Time, Inductive Load			220		ns
E_{on}	Turn-on Energy Loss per Pulse			2.2		mJ
E_{off}	Energy Loss per Pulse			0.8		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			1.47	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 ℃		50		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 ℃		10		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		20		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=10 A, V_{CE}=0 V, T_{vj}=25 ℃		1.74		V
		I_F=10 A, V_{CE}=0 V, T_{vj}=150 ℃		1.88		V
t_{rr}	Reverse Recovery time	I_F=10 A,V_R=600 V -di/dt=75A/us T_{vj}=25 ℃		370		ns
Q_r	Recovered Charge			7.4		uC
E_{rec}	Reverse Recovery Energy			0.2		mJ
t_{rr}	Reverse Recovery time	I_F=10A,V_R=600 V -di/dt=75A/us T_{vj}=150 ℃		400		ns
Q_r	Recovered Charge			13.3		uC
E_{rec}	Reverse Recovery Energy			0.3		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.99	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 ℃		20		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		20		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		120		A
I^2t	I^2t-value			90		A^2S
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=150 ℃		70		A
I^2t	I^2t-value			60		A^2S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_{vj}=150 ℃ I_F=10 A		0.94		V
I_R	Reverse current	T_{vj}=150 ℃ V_R=1800V		1.1		mA
R_{thjc}	Thermal resistance junction to case	per diode		1.25		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 ℃, $T_{vj\ max}$ = 175 ℃		10		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		20		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=10 A, V_{GE}=15 V, T_{vj}=25 ℃		1.87		V
		I_C=10 A, V_{GE}=15 V, T_{vj}=150 ℃		2.34		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=10 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=50 Ω T_{vj}=25 ℃		350		ns
t_r	Rise Time, Inductive Load			230		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			190		ns
t_f	Fall Time, Inductive Load			195		ns
E_{on}	Turn-on Energy Loss per Pulse			1.8		mJ
E_{off}	Energy Loss per Pulse			0.5		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=10 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=50Ω T_{vj}=150 ℃		280		ns
t_r	Rise Time, Inductive Load			250		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			330		ns
t_f	Fall Time, Inductive Load			220		ns
E_{on}	Turn-on Energy Loss per Pulse			2.2		mJ
E_{off}	Energy Loss per Pulse			0.8		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			1.47	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃

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 ℃		10		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		20		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=10 A, V_{CE}=0 V, T_{vj}=25 ℃		1.74		V
		I_F=10 A, V_{CE}=0 V, T_{vj}=150 ℃		1.88		V
t_{rr}	Reverse Recovery time	I_F=10 A,V_R=600 V -di/dt=50A/us T_{vj}=25 ℃		370		ns
Q_r	Recovered Charge			7.42		uC
E_{rec}	Reverse Recovery Energy			0.23		mJ
t_{rr}	Reverse Recovery time	I_F=10A,V_R=600 V -di/dt=50A/us T_{vj}=150 ℃		400		ns
Q_r	Recovered Charge			13.3		uC
E_{rec}	Reverse Recovery Energy			0.36		mJ
R_{thJC}	Thermal resistance, junction to case	pro Diode / per Diode			1.99	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C

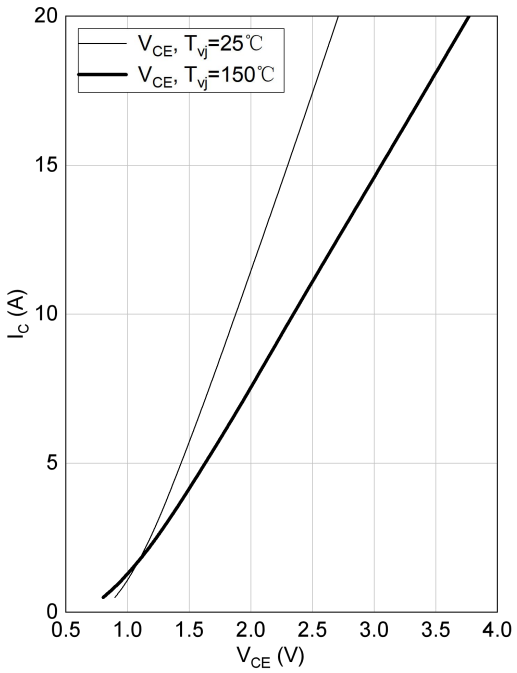
NTC-Thermistor (Characteristic Values)

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

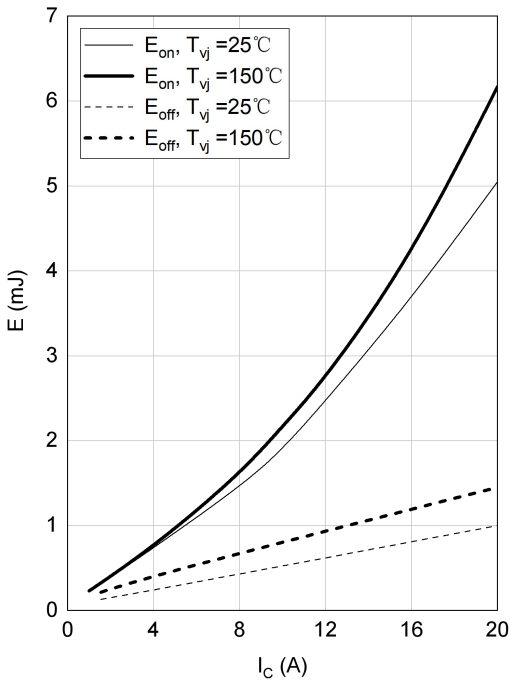
Module Characteristics

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

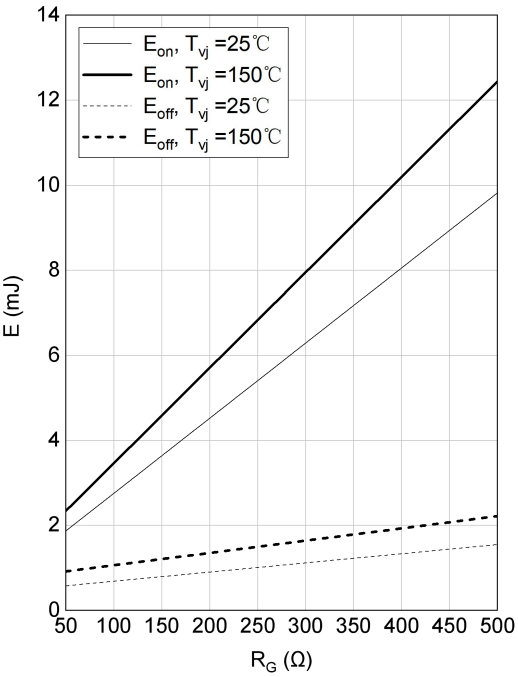
Output characteristic of IGBT,Inverter(typical)
$I_C = f(V_{CE})$
V_{GE} = 15V



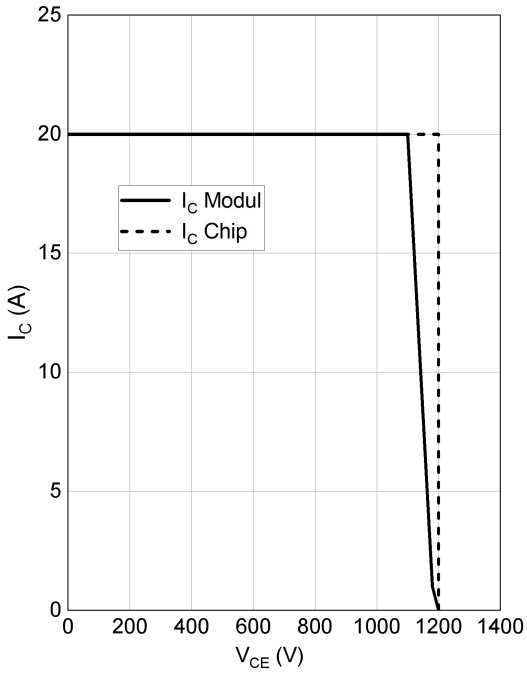
Switching losses IGBT,Inverter(typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE}= ±15V, R_G= 50Ω, V_{CE} = 600V



Switching losses IGBT,Inverter(typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15V, I_C = 10A , V_{CE} = 600V

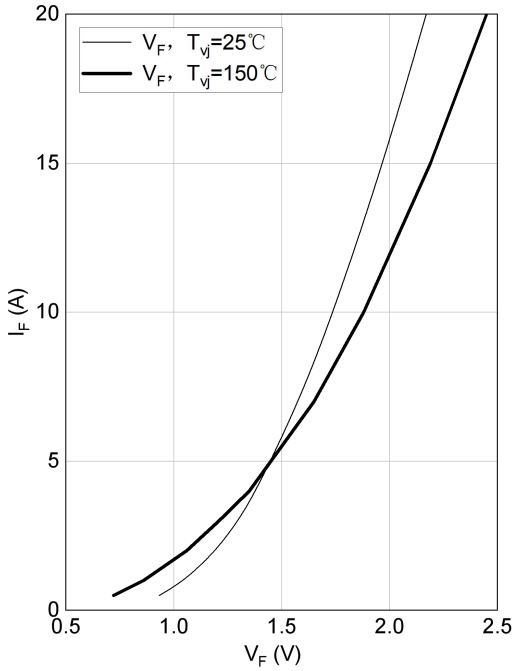


RBSOA IGBT,Inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = ±15V,R_{Goff} = 50Ω,T_{vj} = 150°C



Forward characteristic of Diode,Inverter (typical)

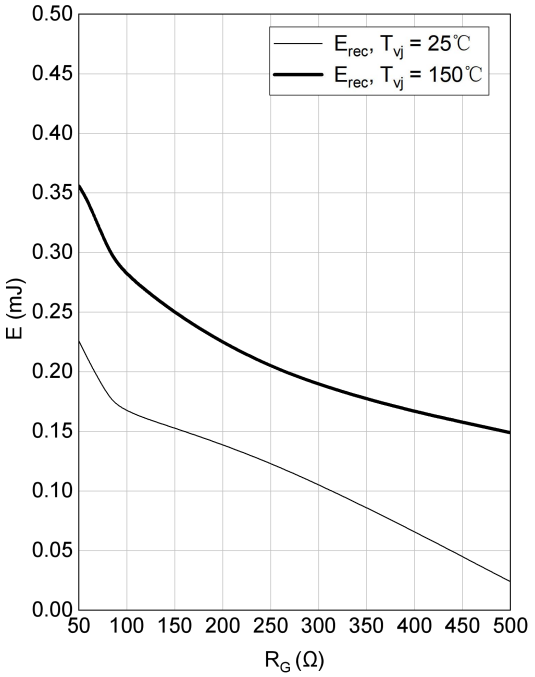
$I_F = f(V_F)$



Switching losses of Diode, Inverter (typical)

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

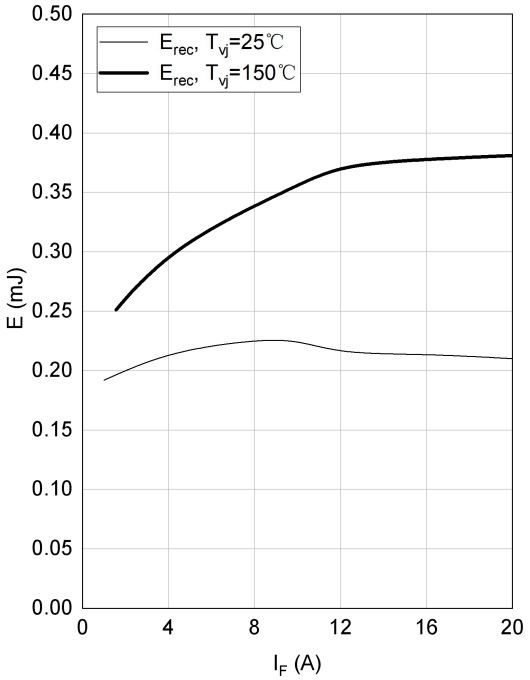
I_F =10A，V_{CE} = 600V



Switching losess of Diode, Inverter (typical)

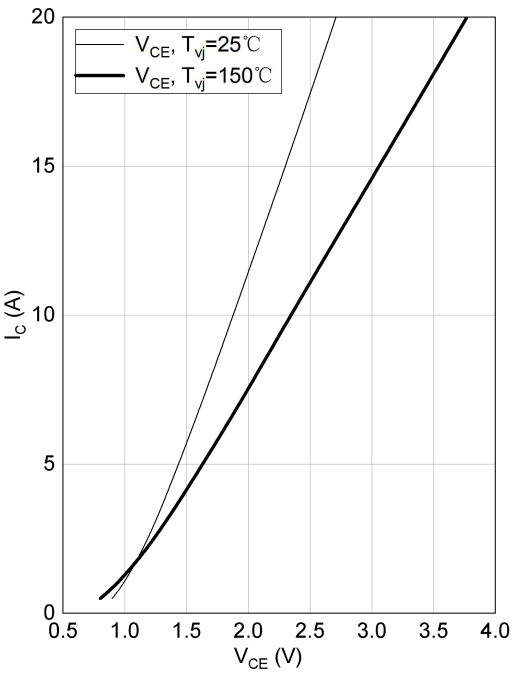
$E_{rec} = f(I_F)$,

R_G = 50Ω，V_{CE} = 600V



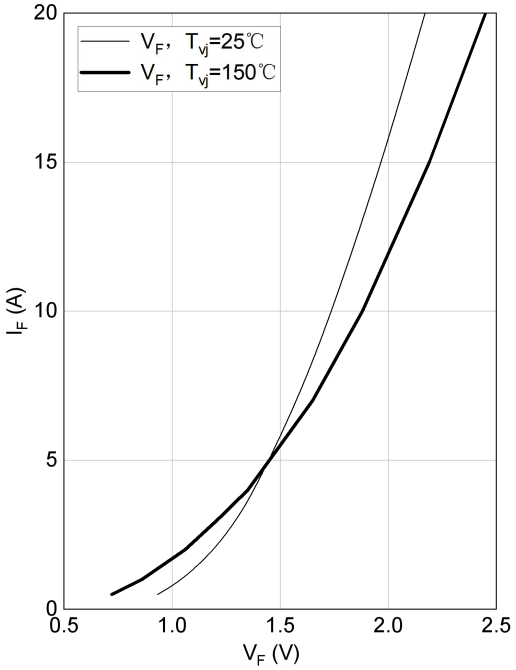
Output characteristic IGBT,Brake-Chopper (typical)

$I_C = f(V_{CE})$



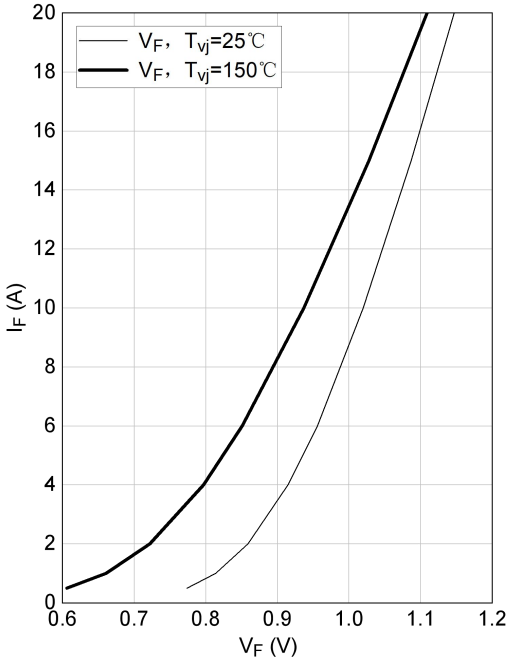
Forward characteristic of Diode,Brake-Chopper (typical)

$I_F = f(V_F)$



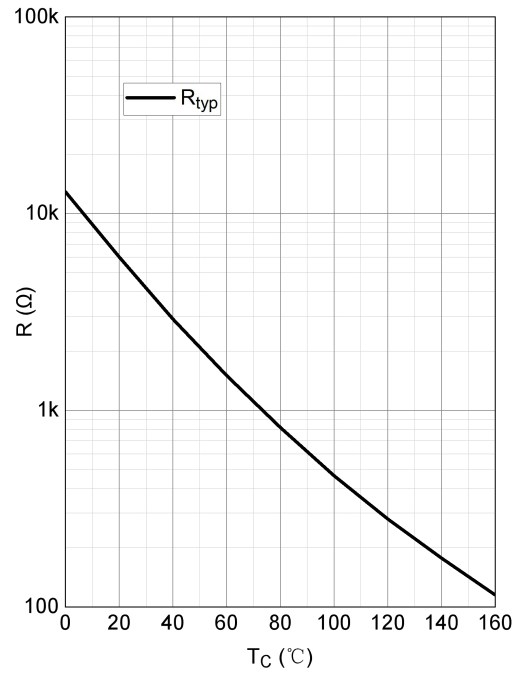
Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

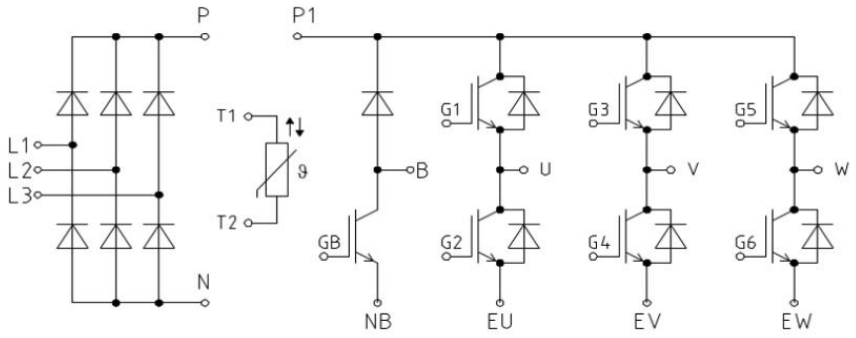


NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

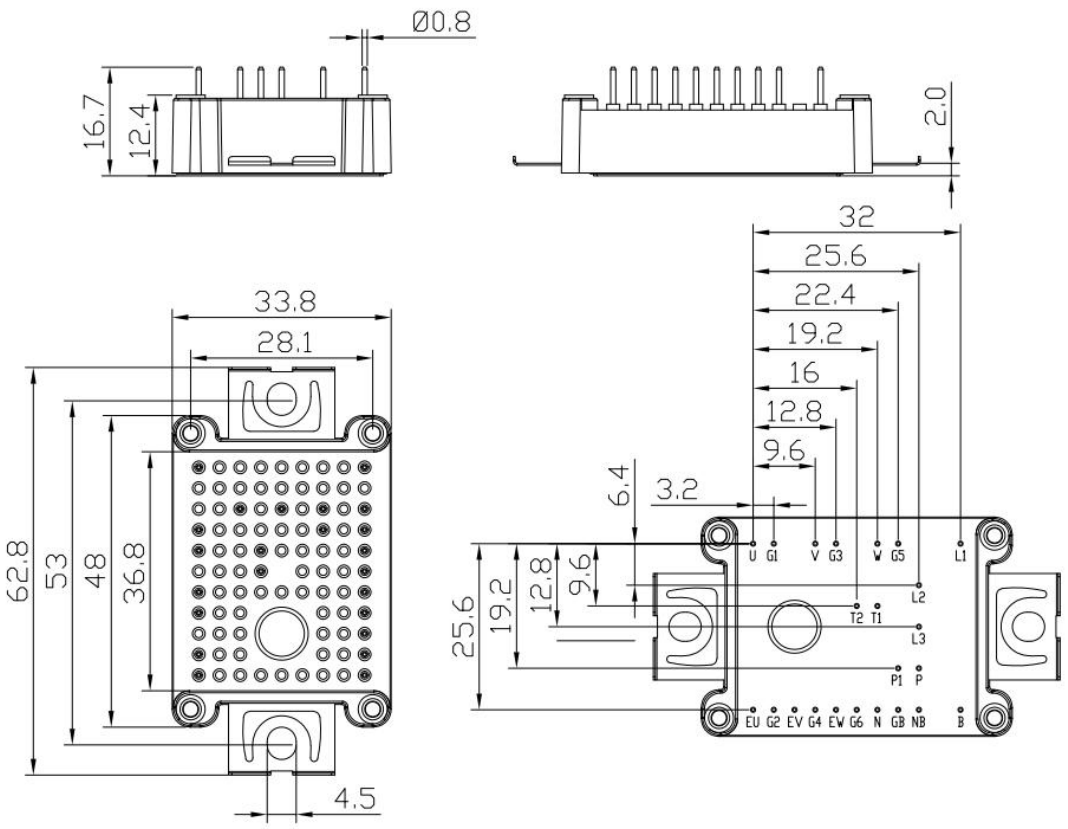


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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