LEGM15BE120E1HZ

IGBT Power Module

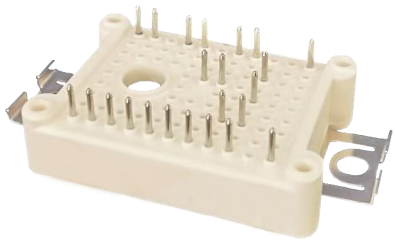
Features:

- V_{CE}=1200V I_C=15A
- 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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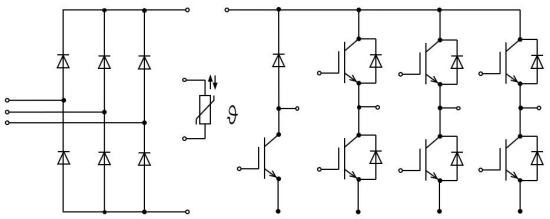


Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	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}=175℃	135	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 ℃		1.8		V
		I_C=15 A, V_{GE}=15 V, T_{vj}=150 ℃		2.0		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=0.6 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	6.1	6.5	7.0	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		1294		pF
C_{res}	Reverse transfer capacitance			41.6		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 ℃		30.8		ns
t_r	Rise Time, Inductive Load			6.4		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			248		ns
t_f	Fall Time, Inductive Load			100		ns
E_{on}	Turn-on Energy Loss per Pulse			0.57		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.8		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 T_{vj}=150 ℃		28.6		ns
t_r	Rise Time, Inductive Load			7.4		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			340		ns
t_f	Fall Time, Inductive Load			238		ns
E_{on}	Turn-on Energy Loss per Pulse			1.03		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.35		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT		1.102		K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}=600V, t_p≤10μs, T_{vj}=150℃, 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	T_C=100 ℃		15		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		30		A

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 ℃		2.1		V
		I_F=15 A, V_{CE}=0 V, T_{vj}=150 ℃		1.6		V
t_{rr}	Reverse Recovery time	I_F=15 A,V_R=600 V -di/dt=790A/us T_{vj}=25 ℃ V_{GE}=-15 V		40.3		ns
Q_r	Recovered Charge			0.66		μC
E_{rec}	Reverse Recovery Energy			0.08		mJ
t_{rr}	Reverse Recovery time	I_F=15A,V_R=600 V -di/dt=790A/us T_{vj}=150 ℃ V_{GE}=-15 V		385		ns
Q_r	Recovered Charge			1.83		μC
E_{rec}	Reverse Recovery Energy			0.33		mJ
R_{thJC}	Thermal resistance, junction to case			2.1		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 ℃		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 (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 ℃		1.8		V
		I_C=15 A, V_{GE}=15 V, T_{vj}=150 ℃		2.0		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=0.6 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	6.1	6.5	7.0	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
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		1294		pF
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 ℃		30.8		ns
t_r	Rise Time, Inductive Load			6.4		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			248		ns
t_f	Fall Time, Inductive Load			100		ns
E_{on}	Turn-on Energy Loss per Pulse			0.57		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.8		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 T_{vj}=150 ℃		28.6		ns
t_r	Rise Time, Inductive Load			7.4		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			340		ns
t_f	Fall Time, Inductive Load			238		ns
E_{on}	Turn-on Energy Loss per Pulse			1.03		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.35		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT		1.102		K/W
$T_{vj\,op}$	Temperature under switching conditions		-40		150	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}=600V, t_p≤10μs, T_{vj}=150℃, V_{CEmax}=V_{CES}-L_{sCE} ·di/dt		60		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			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 ℃		2.1		V
		I_F=15 A, V_{CE}=0 V, T_{vj}=150 ℃		1.6		V
t_{rr}	Reverse Recovery time	I_F=15 A,V_R=600 V -di/dt=790A/us T_{vj}=25 ℃		40.3		ns
Q_r	Recovered Charge			0.66		μC
E_{rec}	Reverse Recovery Energy			0.08		mJ
t_{rr}	Reverse Recovery time	I_F=15A,V_R=600 V -di/dt=790A/us T_{vj}=150 ℃		385		ns
Q_r	Recovered Charge			1.83		μC
E_{rec}	Reverse Recovery Energy			0.33		mJ
R_{thJC}	Thermal resistance, junction to case			2.1		K/W
$T_{vj\ op}$	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

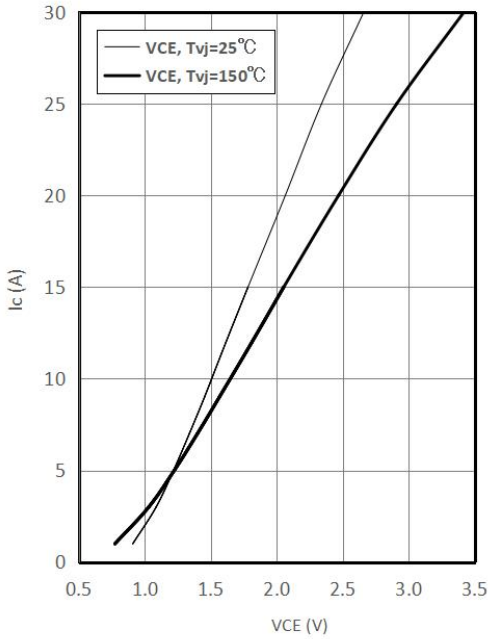
Module Characteristics

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

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

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

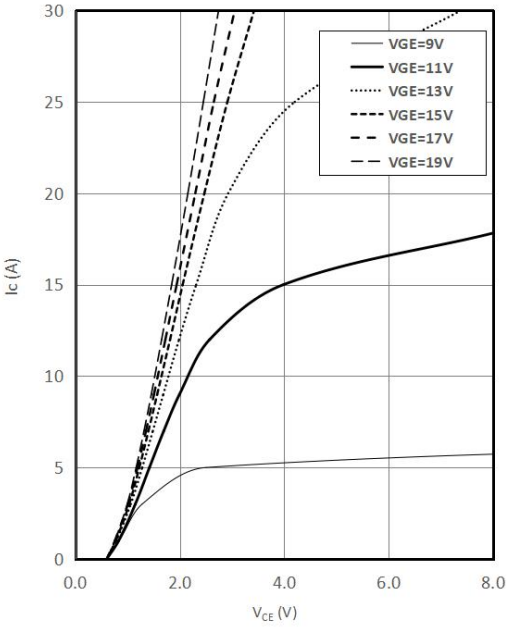
$V_{GE} = \pm 15V$, $R_G = 35\ \Omega$, $V_{CE} = 600V$



Output characteristic IGBT , Inverter (typical)

$I_C = f(V_{CE})$

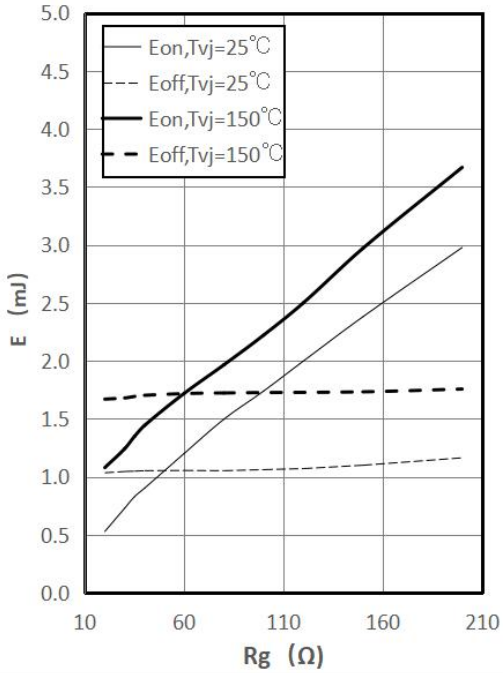
T_{vj}=150°C



Switching losses IGBT,Inverter(typical)

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

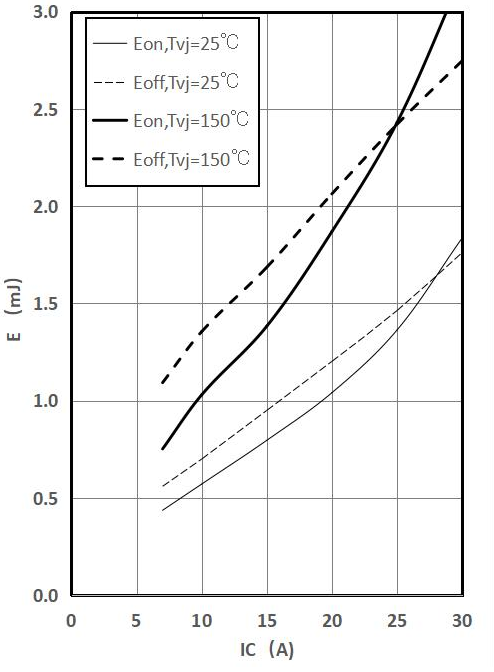
$V_{GE} = \pm 15V$, $I_C = 15\ A$, $V_{CE} = 600V$



Switching losses IGBT,Inverter(typical)

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

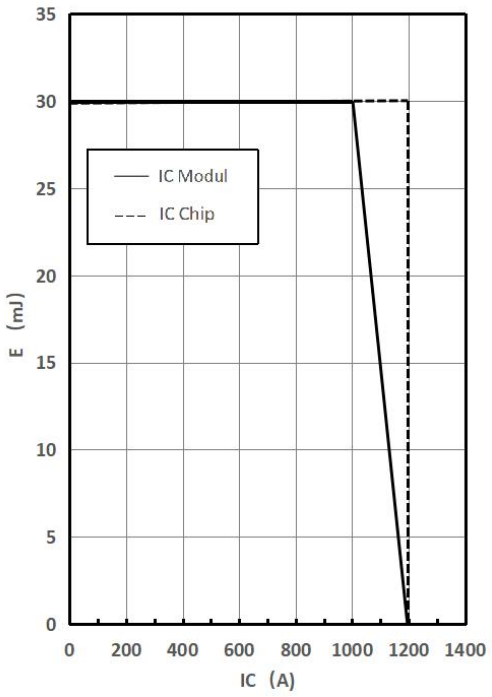
$V_{GE} = \pm 15V$, $R_G = 35\ \Omega$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

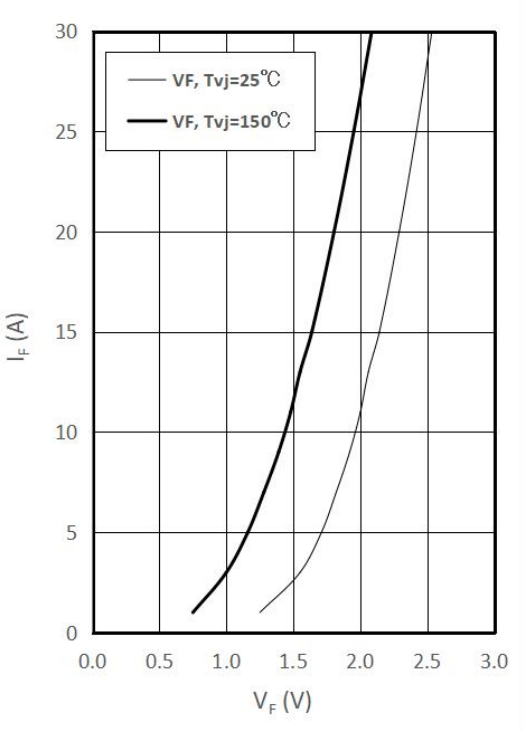
I_C= f (V_{CE})

V_{GE} = ±15V, R_G = 35 Ω, T_{vj} =150 ℃



Forward characteristic of Diode, Inverter (typical)

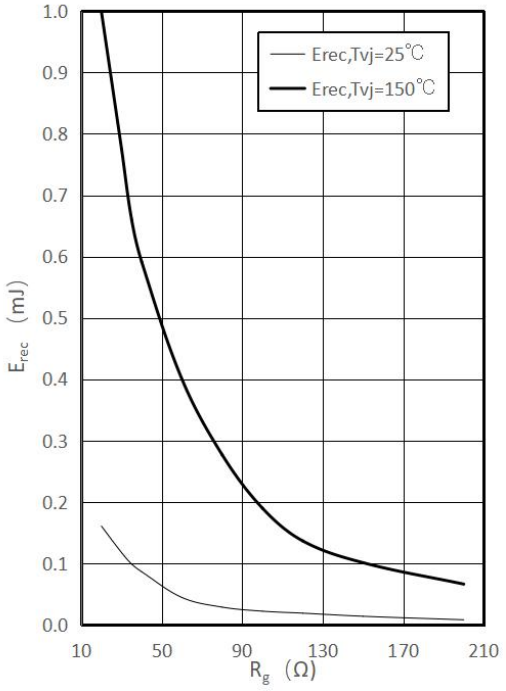
I_F = f (V_F)



Switching losses Diode, Inverter (typical)

E_{rec} = f (R_G)

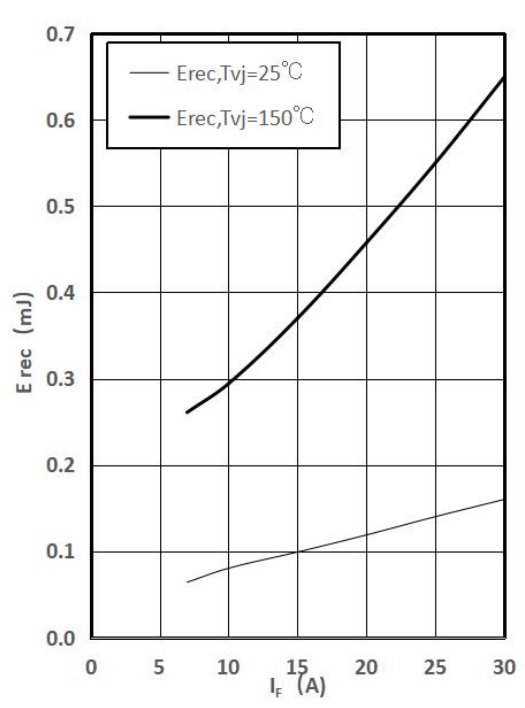
I_F = 15 A, V_{CE} = 600 V



Switching losses Diode, Inverter (typical)

E_{rec} = f (I_F)

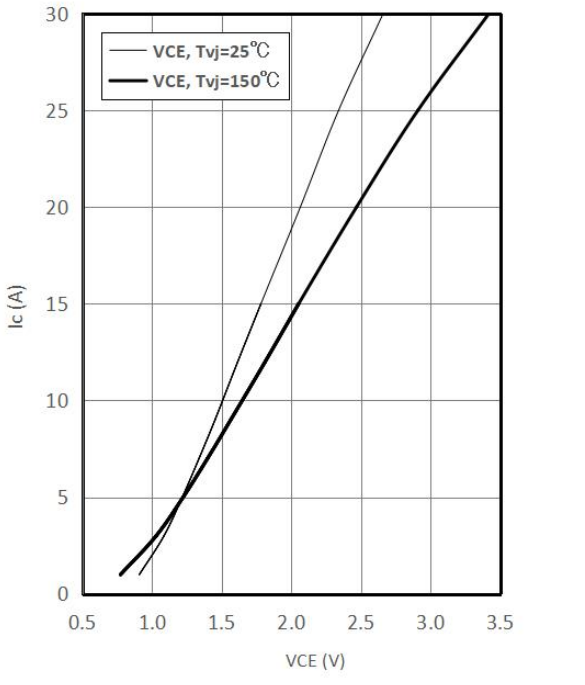
R_G = 35 Ω, V_{CE} = 600 V



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

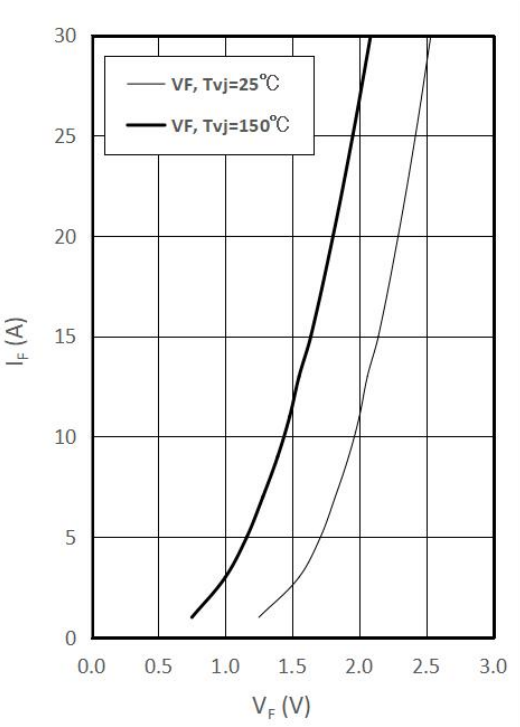
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$

$V_{GE} = \pm 15V$, $R_G = 35\ \Omega$, $V_{CE} = 600V$



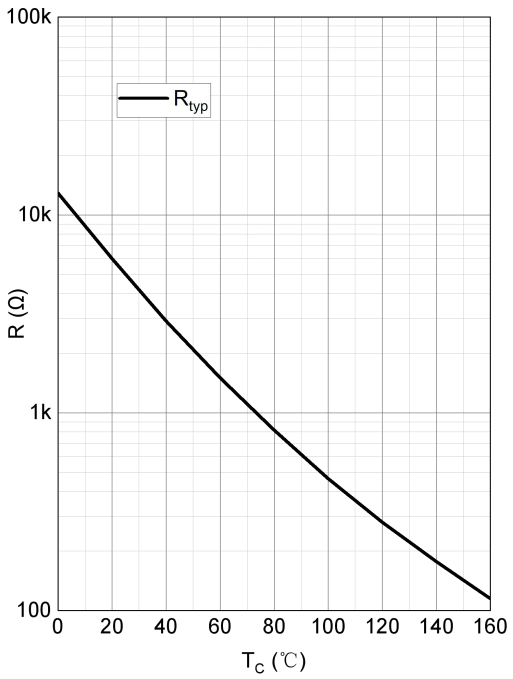
Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

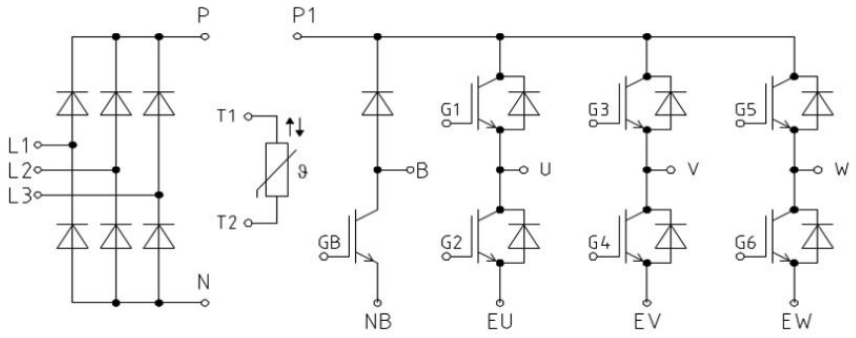


NTC-thermistor-temperature characteristic (typical)

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

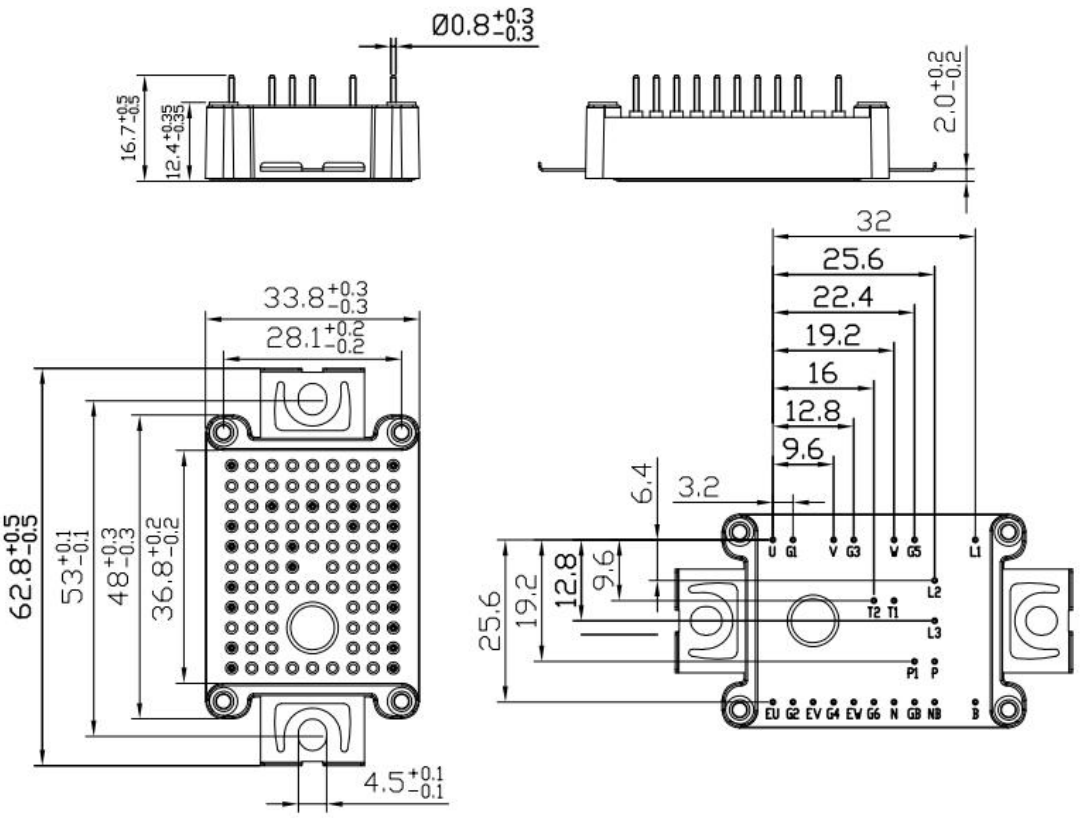


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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