LEGM25BE120L4HZ

IGBT Power Module

Features:

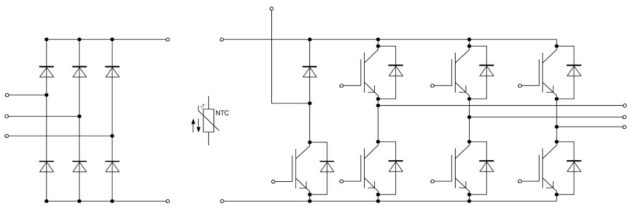
- V_{CE}=1200V I_C=25A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175℃
- Isolation Type Package

Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit

L4



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℃	25	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	50	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±30	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=175℃	178	W

Maximum Rated Values (IGBT Inverter)

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 ℃		1.8		V
		I_C=25 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 ℃	6.0	6.5	7.0	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			20	uA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			200	nA
R_{Gint}	Internal gate resistor	T_{vj}=25 °C		1.47		Ω
C_{ies}	Input Capacitance	f= 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		2146		pF
C_{oes}	Output Capacitance			72.5		pF
C_{res}	Reverse Transfer Capacitance			101.5		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_{Gon}=20Ω T_{vj}=25 ℃		29		ns
t_r	Rise Time, Inductive Load			14.2		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			213		ns
t_f	Fall Time, Inductive Load			214		ns
E_{on}	Turn-on Energy Loss per Pulse			1.14		mJ
E_{off}	Energy Loss per Pulse			1.81		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 ℃		29.2		ns
t_r	Rise Time, Inductive Load			16		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			277		ns
t_f	Fall Time, Inductive Load			340		ns
E_{on}	Turn-on Energy Loss per Pulse			2.33		mJ
E_{off}	Energy Loss per Pulse			2.77		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.84	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		100		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 ℃		25		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		50		A
I^2t	I^2t Value	V_R=0 V, t_P=10 ms, T_{vj}=150 ℃		220		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=25 A, V_{CE}=0 V,T_{vj}= 25 ℃		1.9		V
		I_F=25 A, V_{CE}=0 V,T_{vj}=150 ℃		1.6		V
t_{rr}	Reverse Recovery time	I_F=25 A,V_R=600 V -di/dt=1200A/us T_{vj}=25 ℃		86.3		ns
Q_r	Recovered Charge			2.1		uC
E_{rec}	Reverse Recovery Energy			0.6		mJ
t_{rr}	Reverse Recovery time	I_F=25A,V_R=600 V -di/dt=1200A/us T_{vj}=150 ℃		346		ns
Q_r	Recovered Charge			4.68		uC
E_{rec}	Reverse Recovery Energy			1.51		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.62	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 ℃		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 ℃		50		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		300		A
I^2t	I^2t-value			450		A^2S
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=125 ℃		230		A
I^2t	I^2t-value			310		A^2S

Characteristic Values (Diode Rectifier)

V_F	Forward voltage	T_{vj}=125 ℃ I_F=25A		1.1		V
I_R	Reverse current	T_{vj}=125 ℃ V_R=1600V		1.1		mA
R_{thjc}	Thermal resistance junction to case	per diode			1.1	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℃		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	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		30.8		nF
C_{res}	Reverse transfer capacitance			6.4		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 ℃		248		ns
t_r	Rise Time, Inductive Load			100		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			0.57		ns
t_f	Fall Time, Inductive Load			0.8		ns
E_{on}	Turn-on Energy Loss per Pulse			28.6		mJ
E_{off}	Turn-off Energy Loss per Pulse			7.4		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 Tvj=150 ℃		340		ns
t_r	Rise Time, Inductive Load			238		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			1.03		ns
t_f	Fall Time, Inductive Load			1.35		ns
E_{on}	Turn-on Energy Loss per Pulse			30.8		mJ
E_{off}	Turn-off Energy Loss per Pulse			6.4		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			1.26	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	T_C=100 ℃		15		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		30		A

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=15 A,T_{vj}=25 ℃		2.1		V
		I_F=15 A,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=15 A,V_R=600V -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	per Diode			1.575	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

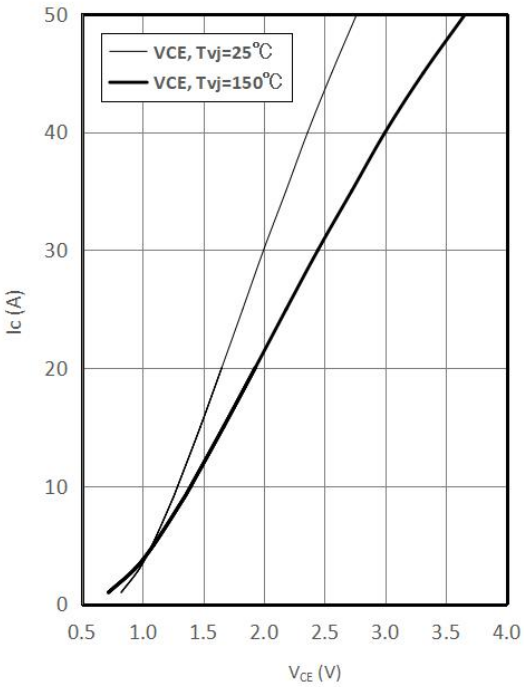
Module Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		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,Brake-Chopper, (typical)

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

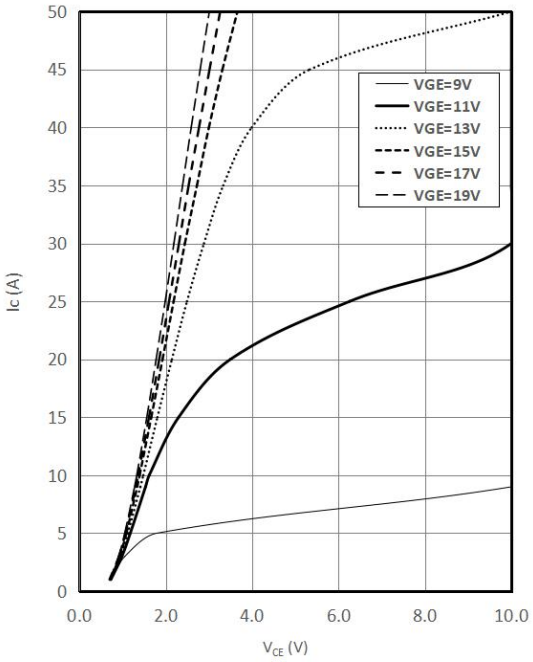
$V_{GE} = \pm 15V$, $R_G = 20\ \Omega$, $V_{CE} = 600V$



Output characteristic IGBT , Inverter (typical)

$I_C = f(V_{CE})$

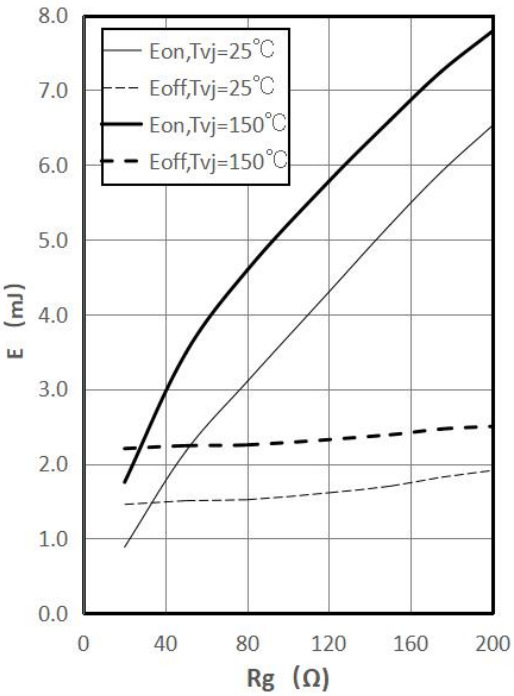
T_{vj}=150°C



Switching losses IGBT,Inverter(typical)

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

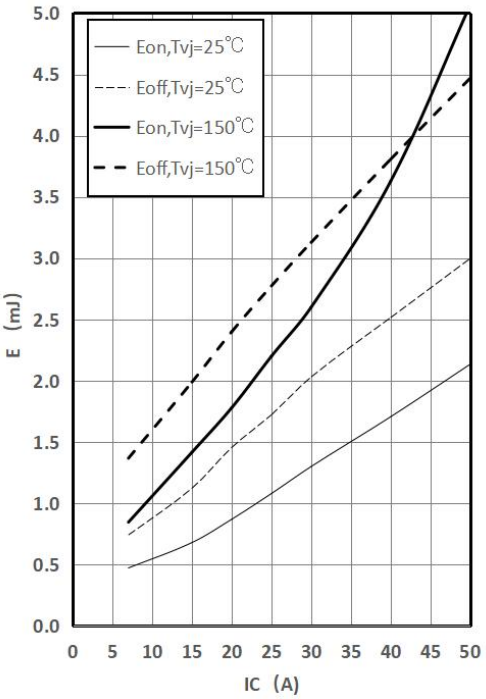
$V_{GE} = \pm 15V$, $I_C = 25\ A$, $V_{CE} = 600V$



Switching losses IGBT,Inverter(typical)

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

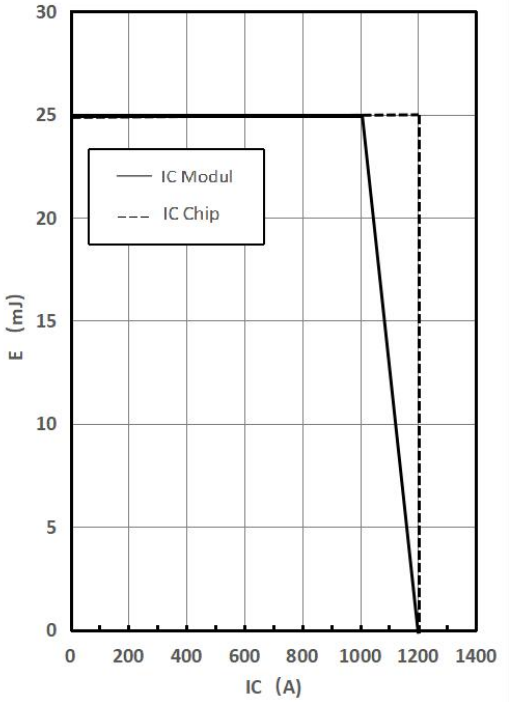
$V_{GE} = \pm 15V$, $R_G = 20\ \Omega$, $V_{CE} = 600V$



RBSOA IGBT,Inverter (typical)

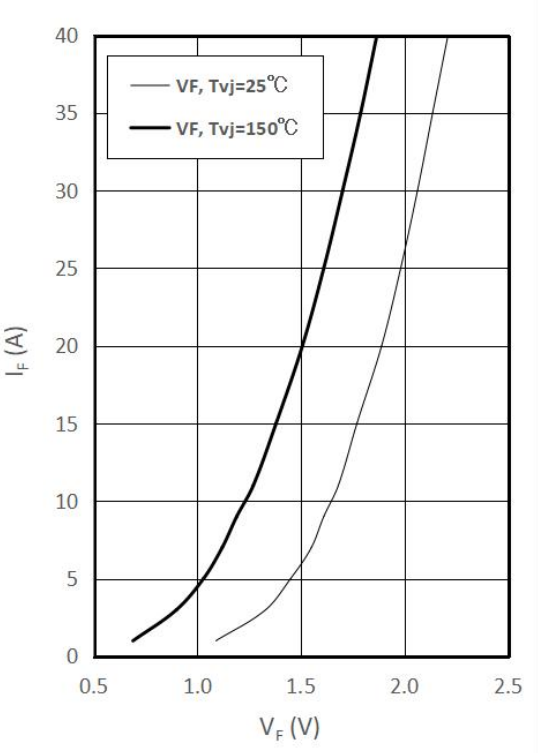
$I_C = f(V_{CE})$

$V_{GE} = \pm 15V$, $R_G = 20\ \Omega$, $T_{vj} = 150\ ℃$



Forward characteristic of Diode, Inverter (typical)

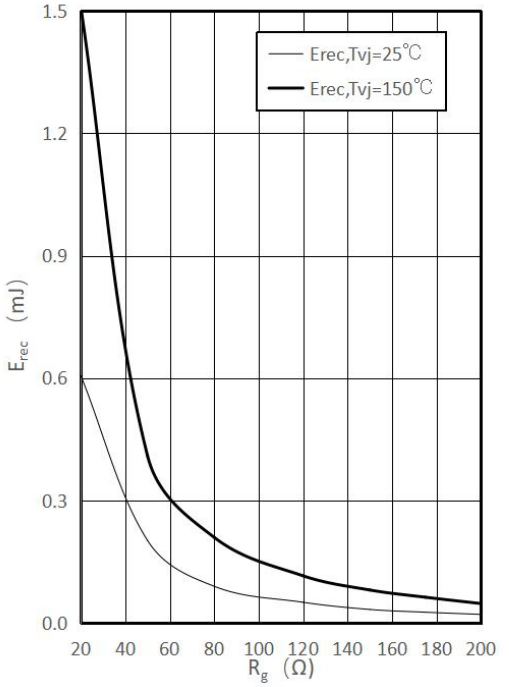
$I_F = f(V_F)$



Switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

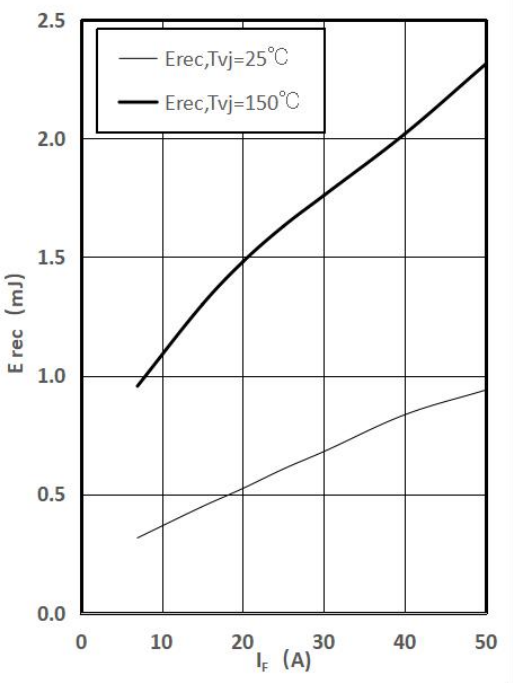
$I_F = 25\ A$, $V_{CE} = 600\ V$



Switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

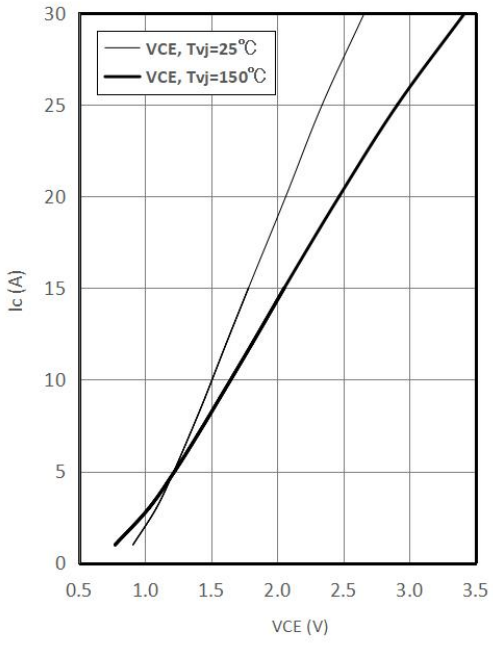
$R_G = 20\ \Omega$, $V_{CE} = 600\ V$



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

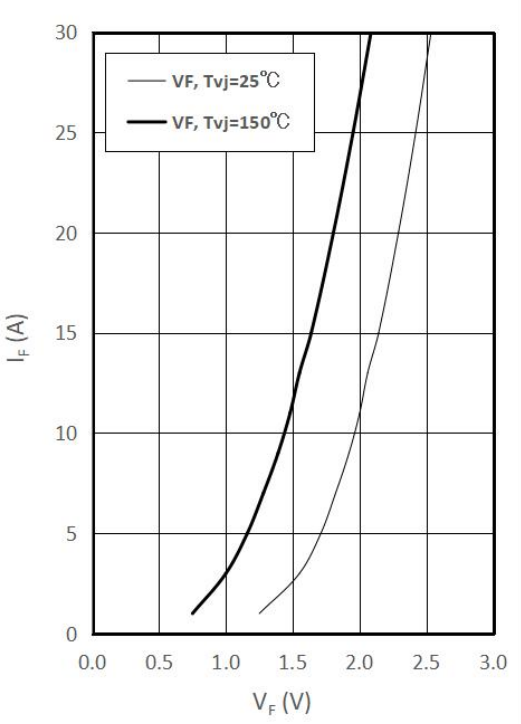
$I_c = f(V_{CE})$

$V_{GE} = 15V$



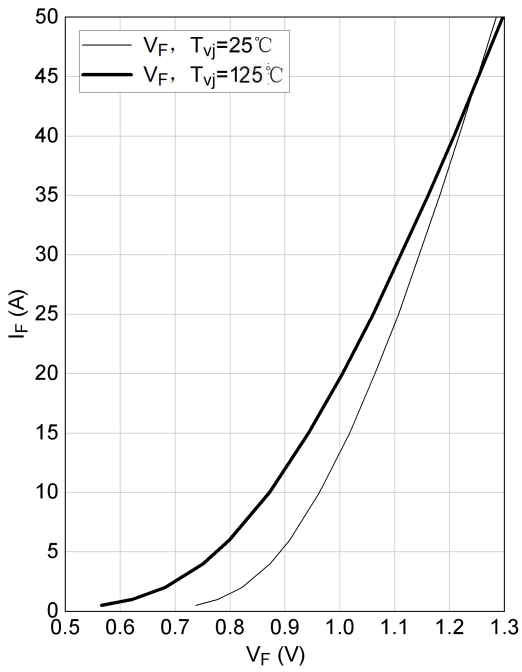
Forward characteristic of Diode,Brake-Chopper (typical)

$I_F = f(V_F)$



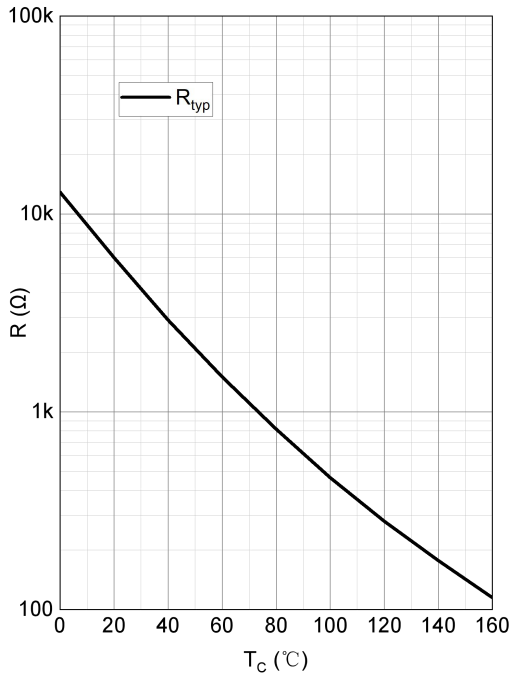
Forward characteristic of Diode, Rectifier(typical)

$I_F = f(V_F)$

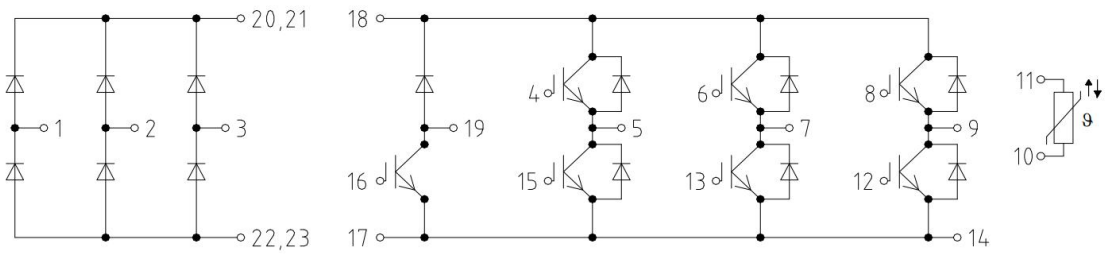


NTC-thermistor-temperature characteristic (typical)

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

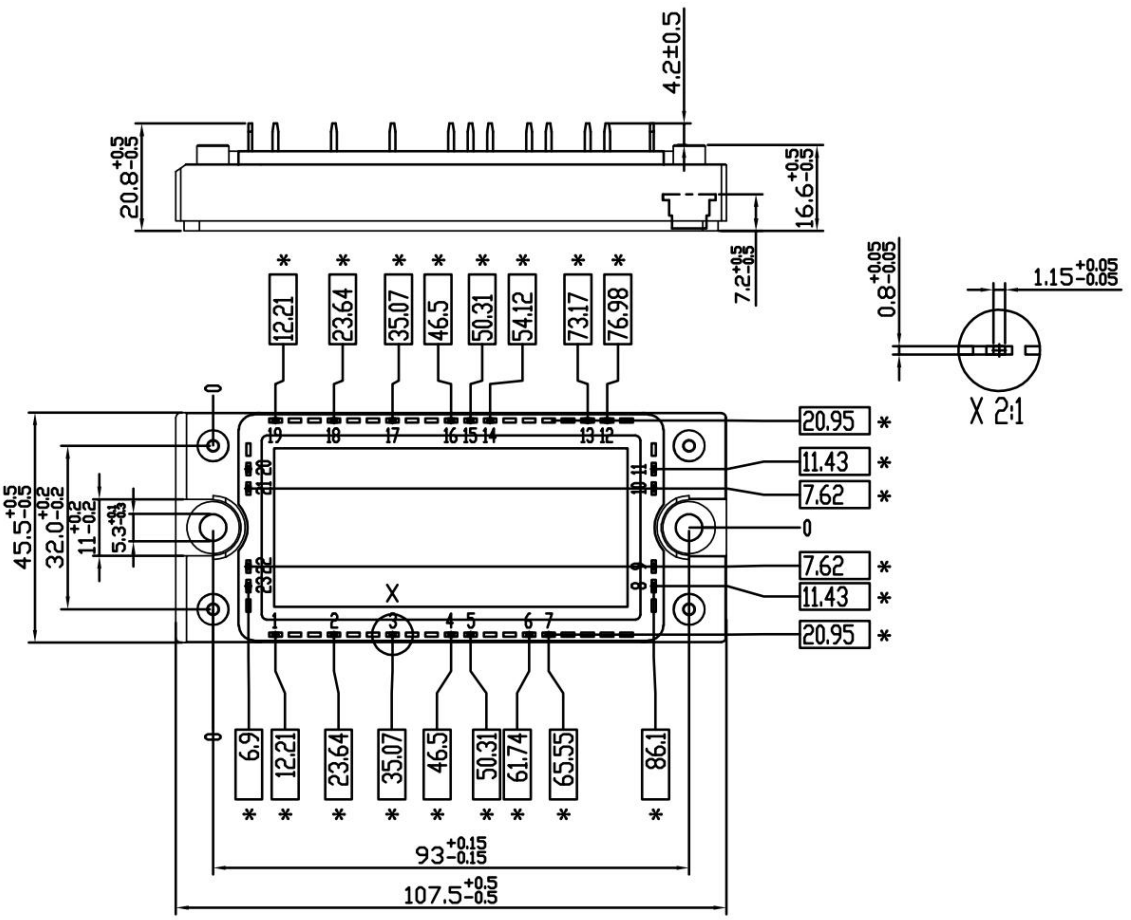


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



* = all dimensions with tolerance of ⌖ Ø0.5

DISCLAIMER

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