LEGM40BF120L4HZ

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

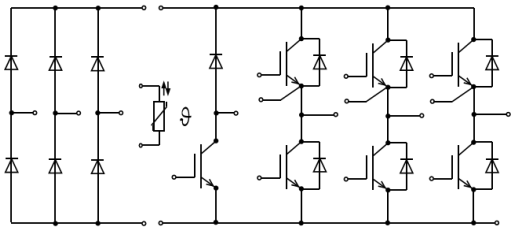
Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



L4



Internal Circuit

Maximum Rated Values (IGBT,Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	V_{EC}=0 V,I_C=1mA,T_{vj}=25 ℃	1200	V
I_C	Continuous Collector Current	T_C=80℃	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 ℃	240	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 ℃		1.77	2.00	V
		I_C=40 A, V_{GE}=15 V, T_{vj}=150 ℃		2.13		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=0.25 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.0	5.75	6.5	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}=20V, T_{vj}=25 ℃			100	nA
R_{Gint}	Internal gate resistor	V_{GE}=0 V, f=1 MHz		1.6		Ω
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		3459		pF
C_{oes}	Output capacitance			191		pF
C_{res}	Reverse transfer capacitance			102		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V V_{GE}=±15 V R_G=25 Ω T_{vj}=25 ℃		49		ns
t_r	Rise Time, Inductive Load			45		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			270		ns
t_f	Fall Time, Inductive Load			199		ns
E_{on}	Turn-on Energy Loss per Pulse			3.57		mJ
E_{off}	Turn-off Energy Loss per Pulse			2.70		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V V_{GE}=±15 V R_G=25 Ω T_{vj}=150 ℃		46		ns
t_r	Rise Time, Inductive Load			46		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			306		ns
t_f	Fall Time, Inductive Load			321		ns
E_{on}	Turn-on Energy Loss per Pulse			5.34		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.94		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.623	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		200		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			40		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		80		A

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 ℃		1.98		V
		I_F=40 A, V_{CE}=0 V,T_{vj}=150 ℃		1.65		V
I_{rr}	Peak reverse recovery current	I_F=40 A,V_R=600 V -di/dt=1000A/us T_{vj}=25 ℃, V_{GE}=-15V		48		A
Q_r	Recovered Charge			3.62		uC
E_{rec}	Reverse Recovery Energy			1.15		mJ
I_{rr}	Peak reverse recovery current	I_F=40 A,V_R=600 V -di/dt=1000A/us T_{vj}=150 ℃ V_{GE}=-15V		64		A
Q_r	Recovered Charge			7.36		uC
E_{rec}	Reverse Recovery Energy			2.12		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.2	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 ℃		70		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		70		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		420		A
I^2t	I^2t-value	t_p=10ms T_{vj}=25 ℃		880		A^2S
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=125 ℃		360		A
I^2t	I^2t-value	t_p=10ms T_{vj}=125 ℃		600		A^2S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_c=25 ℃		0.9		V
I_R	Reverse current	T_{vj}=125 ℃ V_R=1800V		1.1		mA
R_{thjc}	Thermal resistance junction to case	T_c=25 ℃			1.5	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℃, $T_{vj\,max}$ = 175℃		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 ℃		1.8		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
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		2.15		nF
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_G=20Ω T_{vj}=25 ℃		29.8		ns
t_r	Rise Time, Inductive Load			15.2		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			223		ns
t_f	Fall Time, Inductive Load			192		ns
E_{on}	Turn-on Energy Loss per Pulse			0.92		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.73		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_G=20Ω T_{vj}=150 ℃		30		ns
t_r	Rise Time, Inductive Load			16		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			279		ns
t_f	Fall Time, Inductive Load			344		ns
E_{on}	Turn-on Energy Loss per Pulse			1.71		mJ
E_{off}	Turn-off Energy Loss per Pulse			2.71		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.997	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 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

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=300A/us T_{vj}=25 ℃		42.2		ns
Q_r	Recovered Charge			0.88		μC
E_{rec}	Reverse Recovery Energy			0.09		mJ
t_{rr}	Reverse Recovery time	I_F=15A,V_R=600 V -di/dt=300A/us T_{vj}=150 ℃		270		ns
Q_r	Recovered Charge			2.06		μC
E_{rec}	Reverse Recovery Energy			0.43		mJ
R_{thJC}	Thermal resistance, junction to case	Per diode			1.62	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃

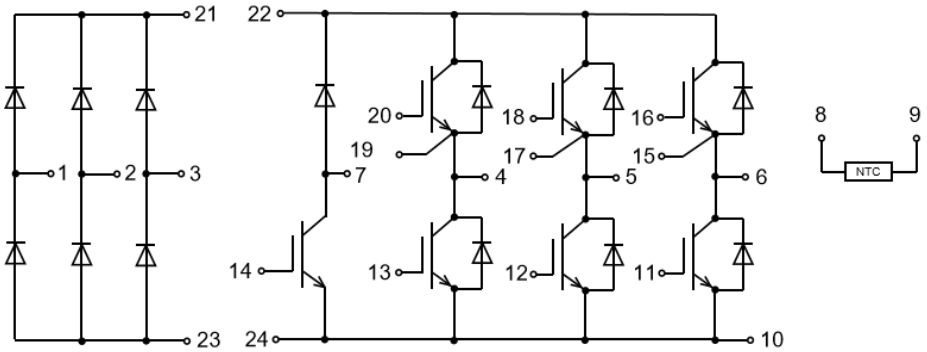
NTC-Thermistor (Characteristic Values)

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

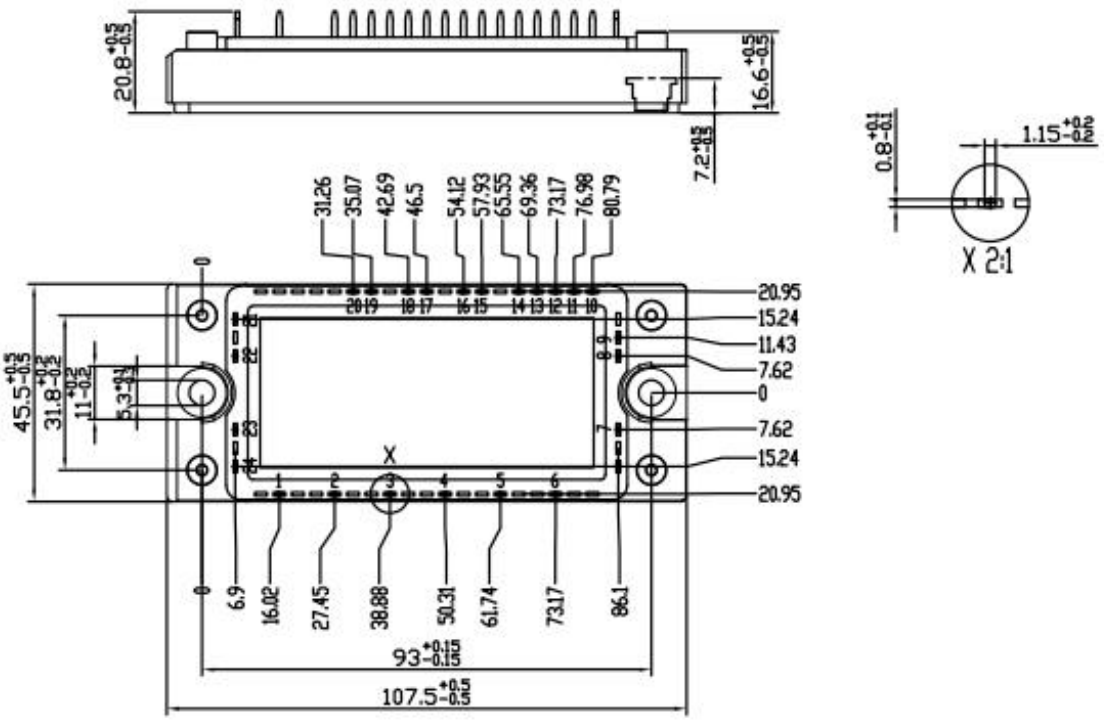
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		125	℃
F	Mountig Force per Clamp		40		80	N
G	Weight of Module			175		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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2. Operating conditions may differ from simulation assumptions in several aspects like level of DC-link voltage, applied gate-voltage and gate-resistor, case and junction temperatures as well as the power circuit stray-inductance. Therefore, deviations of parameters and assumptions used for the simulation and the real application may exist.
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