LEGM40BE120L4H7

IGBT Power Module

Features:

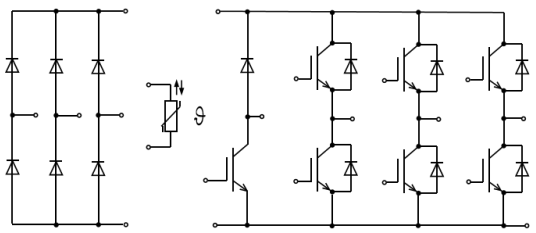
- V_{CE}=1200V I_C=40A
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Overload operation up to 175℃
- Isolation Type Package

Applications:

- Auxiliary Inverters
- Air Conditioning
- Motor 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℃	40	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	80	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±20	V
P_{tot}	Total Power Dissipation	T_C=25℃,T_{vjmax}=175℃	259	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 ℃		1.68		V
		I_C=40 A, V_{GE}=15 V, T_{vj}=175 ℃		2.08		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1.5 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.5	6.1	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}=20 V, T_{vj}=25 ℃			500	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		3.13		nF
C_{oes}	Output capacitance			0.17		nF
C_{res}	Reverse transfer capacitance			0.09		nF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V, V_{GE}=±15 V, R_G=20 Ω, T_{vj}=25 ℃		57.8		ns
t_r	Rise Time, Inductive Load			41.8		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			307		ns
t_f	Fall Time, Inductive Load			178		ns
E_{on}	Turn-on Energy Loss per Pulse			2.33		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.54		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=40 A,V_{CE}=600 V, V_{GE}=±15 V, R_G=20 Ω, T_{vj}=175 ℃		49		ns
t_r	Rise Time, Inductive Load			42		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			335		ns
t_f	Fall Time, Inductive Load			359		ns
E_{on}	Turn-on Energy Loss per Pulse			3.93		mJ
E_{off}	Turn-off Energy Loss per Pulse			4.91		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.58	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}≤600V,t_p≤10μs, T_{vj}=25℃,V_{CES}≤1200V		174		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

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 ℃		2.31		V
		I_F=40 A, V_{CE}=0 V, T_{vj}=175 ℃		1.74		V
I_{rr}	Peak reverse recovery current	I_F=40 A,V_R=600 V -di/dt=893 A/us T_{vj}=25 ℃		13.6		A
Q_r	Recovered Charge			0.89		μC
E_{rec}	Reverse Recovery Energy			0.09		mJ
I_{rr}	Peak reverse recovery current	I_F=40 A,V_R=600 V -di/dt=893 A/us T_{vj}=175 ℃		40.8		A
Q_r	Recovered Charge			5.02		μC
E_{rec}	Reverse Recovery Energy			1.57		mJ
R_{thJC}	Thermal resistance, junction to case				0.9	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	℃

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 ℃		60		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=80 ℃		60		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=150 ℃		370		A
I^2t	I^2t-value			685		A^2S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_{vj}=25 ℃ I_F=35A		1.57		V
I_R	Reverse current	T_{vj}=25 ℃ V_R=1800V			10	μA
R_{thjc}	Thermal resistance junction to case	per diode		1.05	1.15	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℃		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 ℃		1.85		V
		I_C=25 A, V_{GE}=15 V, T_{vj}=175 ℃		2.31		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=0.8 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.0	5.7	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}=20 V, T_{vj}=25 ℃			100	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		1.77		nF
C_{oes}	Output capacitance			0.17		nF
C_{res}	Reverse transfer capacitance			0.06		nF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_G=15 Ω T_{vj}=25 ℃		36		ns
t_r	Rise Time, Inductive Load			27		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			140		ns
t_f	Fall Time, Inductive Load			194		ns
E_{on}	Turn-on Energy Loss per Pulse			1.22		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.89		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_G=15 Ω T_{vj}=175 ℃		34		ns
t_r	Rise Time, Inductive Load			28		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			231		ns
t_f	Fall Time, Inductive Load			232		ns
E_{on}	Turn-on Energy Loss per Pulse			1.77		mJ
E_{off}	Turn-off Energy Loss per Pulse			2.47		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.84	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	℃
I_{sc}	SC	V_{GE}≤15V,V_{CE}=600V,t_p≤10μs, T_{vj}=25℃,V_{CES}≤1200V		144		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 ℃		10		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		20		A

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 ℃		1.83		V
		I_F=10 A, V_{CE}=0 V, T_{vj}=175 ℃		1.51		V
I_{rr}	Peak reverse recovery current	I_F=10 A,V_R=600 V -di/dt=750 A/us T_{vj}=25 ℃		19.6		A
Q_r	Recovered Charge			0.95		μC
E_{rec}	Reverse Recovery Energy			0.29		mJ
I_{rr}	Peak reverse recovery current	I_F=10 A,V_R=600 V -di/dt=750 A/us T_{vj}=175 ℃		29.2		A
Q_r	Recovered Charge			2.37		μC
E_{rec}	Reverse Recovery Energy			0.84		mJ
R_{thJC}	Thermal resistance, junction to case				3.03	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃

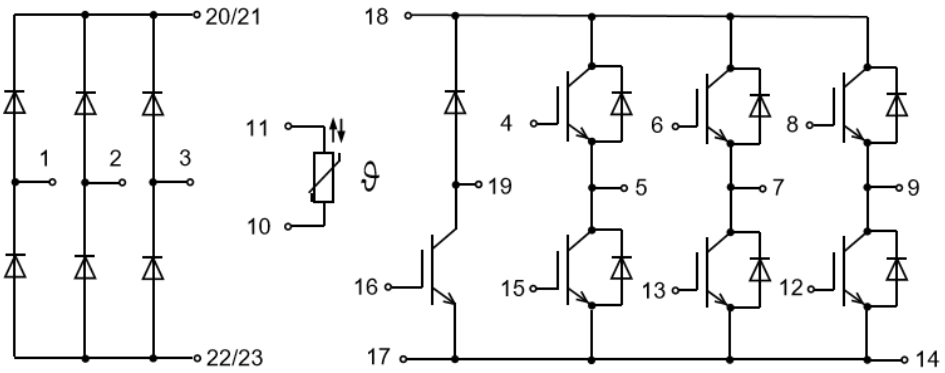
NTC-Thermistor (Characteristic Values)

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

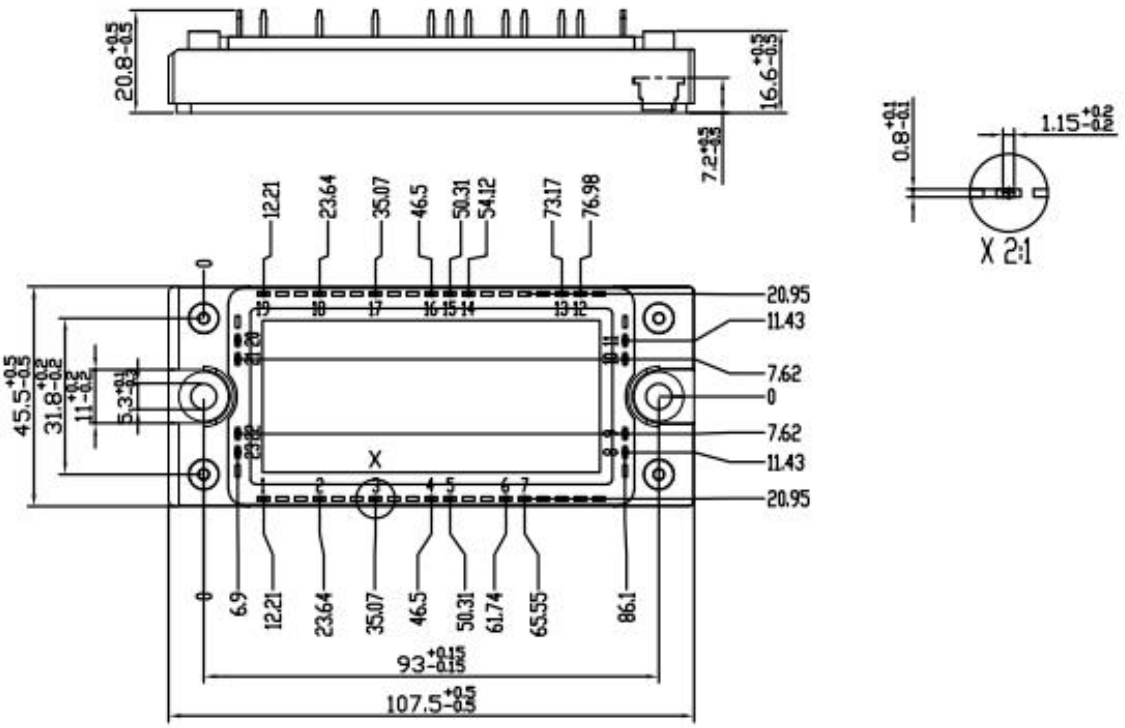
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		125	℃
M	Mounting torque for modul mounting	Recommended(M5)	3.0		6.0	N·m
G	Weight of Module			175		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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