LEGM50BE120L4H7

IGBT Power Module

Features:

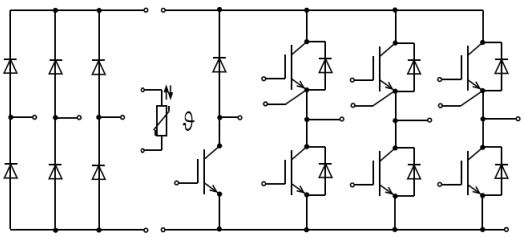
- V_{CE}=1200V I_C=50A
- Low $V_{CE(sat)}$
- TRENCHSTOP™ IGBT7
- V_{CEsat} with positive temperature coefficient
- Overload operation up to 175℃
- Isolation Type Package

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℃	50	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	100	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25℃	±20	V
P_{tot}	Total Power Dissipation	T_C=25 ℃,T_{vjmax}=175 ℃	259	W

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=50 A, V_{GE}=15 V, T_{vj}=25 ℃		1.45		V
		I_C=50 A, V_{GE}=15 V, T_{vj}=175 ℃		1.72		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=500 μA,V_{CE}=V_{GE},T_{vj}= 25 ℃	4.3	5.1	5.9	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 ℃			100	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 30 V, V_{GE}= 0 V		7790		nF
C_{ies}	Output capacitance			225		nF
C_{res}	Reverse transfer capacitance			56		nF
Q_G	Gate charge	V_{CC}=960V, I_C=50A,V_{GE}=15V		347		nC
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_G=7.5Ω T_{vj}=25 ℃		0.059		μs
t_r	Rise Time, Inductive Load			0.043		μs
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			0.290		μs
t_f	Fall Time, Inductive Load			0.110		μs
E_{on}	Turn-on Energy Loss per Pulse			5.07		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.37		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_G=7.5Ω T_{vj}=175 ℃		0.062		μs
t_r	Rise Time, Inductive Load			0.049		μs
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			0.42		μs
t_f	Fall Time, Inductive Load			0.27		μs
E_{on}	Turn-on Energy Loss per Pulse			7.72		mJ
E_{off}	Turn-off Energy Loss per Pulse			6.58		mJ
R_{thJC}	Thermal resistance, junction to case	Per IGBT			0.579	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	°C

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			50		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		100		A

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=50 A, V_{CE}=0 V,T_{vj}= 25 ℃		1.71		V
		I_F=50 A, V_{CE}=0 V,T_{vj}= 175 ℃		1.80		V
I_{rr}	Peak reverse recovery current	I_F=50 A,V_R=600 V -di/dt=530A/us T_{vj}=25 ℃		24		A
Q_r	Recovered Charge			5.41		uC
E_{rec}	Reverse Recovery Energy			2.17		mJ
I_{rr}	Peak reverse recovery current	I_F=50 A,V_R=600 V -di/dt=530A/us T_{vj}=175 ℃		33.6		A
Q_r	Recovered Charge			10.7		uC
E_{rec}	Reverse Recovery Energy			4.41		mJ
R_{thJC}	Thermal resistance, junction to case	Per Diode			0.90	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 ℃		1600		V
I_{FRMSM}	Maximum RMS forward current per chip	T_c=100 ℃		30		A
I_{RMSM}	Maximum RMS current at rectifier chip	T_c=100 ℃		30		A
I_{FSM}	Surge forward current	t_p=10ms T_{vj}=25 ℃		360		A

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	T_{vj}=150 ℃ I_F=10A		1.46		V
I_R	Reverse current	T_{vj}=150 ℃ V_R=1600V			5.0	uA
R_{thJH}	Junction-radiator thermal resistance	Per Diode		1.5		K/W
T_{vjop}	Temperature under switching conditions		-40		175	℃

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 ℃		1.60		V
		I_C=25 A, V_{GE}=15 V, T_{vj}=175 ℃		1.82		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=0.5 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.15	5.80	6.45	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			0.004	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=20V, T_{vj}=25 ℃			100	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		4.77		nF
C_{res}	Reverse transfer capacitance			0.017		nF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_G=9.1Ω T_{vj}=25 ℃		0.041		ns
t_r	Rise Time, Inductive Load			0.025		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			0.230		ns
t_f	Fall Time, Inductive Load			0.140		ns
E_{on}	Turn-on Energy Loss per Pulse			1.47		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.65		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=25 A,V_{CE}=600 V V_{GE}=±15 V R_G=9.1Ω T_{vj}=175 ℃		0.044		ns
t_r	Rise Time, Inductive Load			0.030		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			0.350		ns
t_f	Fall Time, Inductive Load			0.280		ns
E_{on}	Turn-on Energy Loss per Pulse			2.39		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.13		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	Per IGBT			0.697	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	℃
I_{sc}	SC	V_{GE}≤15V, V_{CE}=800V, t_p≤8μS, T_{vj}=150℃, $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		90		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			25		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		50		A

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=25 A, V_{CE}=0 V, T_{vj}=25 ℃		1.83		V
		I_F=25 A, V_{CE}=0 V, T_{vj}=175 ℃		1.63		V
I_{rr}	Peak reverse recovery current	I_F=25 A,V_R=600 V -di/dt=395A/us T_{vj}=25 ℃		18		A
Q_r	Recovered Charge			2.79		μC
E_{rec}	Reverse Recovery Energy			1.36		mJ
I_{rr}	Peak reverse recovery current	I_F=25A,V_R=600 V -di/dt=395A/us T_{vj}=150 ℃		29		A
Q_r	Recovered Charge			4.41		μC
E_{rec}	Reverse Recovery Energy			2.03		mJ
R_{thJC}	Thermal resistance, junction to case	Per Diode			1.43	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	℃

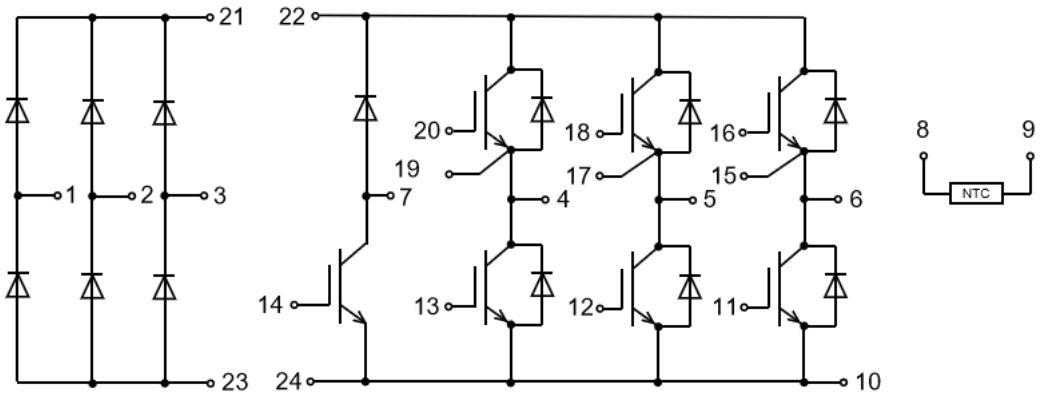
NTC-Thermistor (Characteristic Values)

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

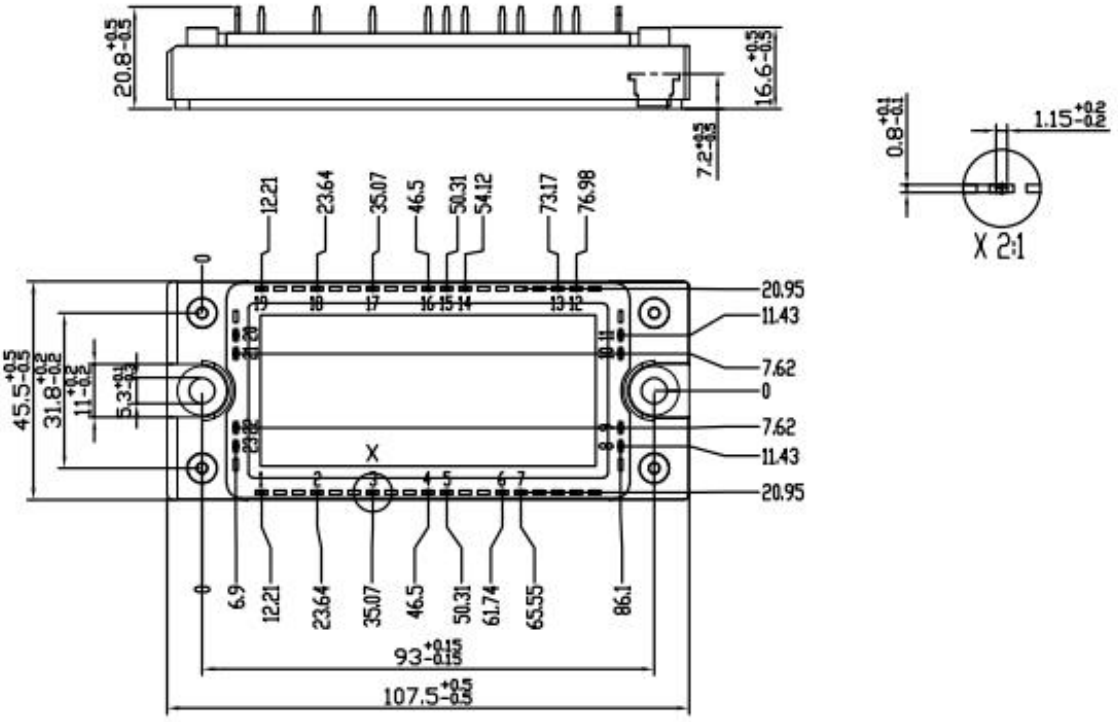
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		125	℃
F	Mountig Force per Clamp		20		50	N
G	Weight of Module			175		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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