LEGM50BE120E2HZ

IGBT Power Module

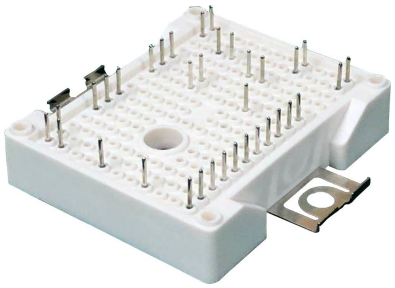
Features:

- V_{CE}=1200V I_C=50A
- 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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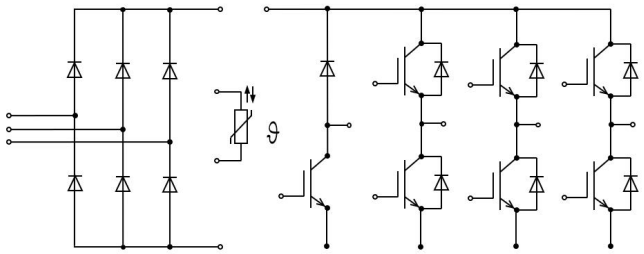


Internal Circuit

Maximum Rated Values (IGBT,Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	V_{EC}=0 V,I_C=1mA,T_{vj}=25 ℃	1200	V
I_C	Continuous Collector Current	T_C=80℃,T_{vjmax}=150 ℃	50	A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C	100	A
V_{GES}	Gate-Emitter Voltage	T_{vj}=25 ℃	±30	V
P_{tot}	Total Power Dissipation	T_C=25 ℃,T_{vjmax}=175 ℃	319	W

Characteristics 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 ℃		1.81		V
		I_C=50 A, V_{GE}=15 V, T_{vj}=150 ℃		2.07		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.5	5.9	7.0	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			4	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=15 V, T_{vj}=25 ℃			400	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHZ		4.85		nF
C_{res}	Reverse Transfer Capacitance			140		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_G=15 Ω T_{vj}=25 ℃		46		ns
t_r	Rise Time, Inductive Load			85		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			142		ns
t_f	Fall Time, Inductive Load			220		ns
E_{on}	Turn-on Energy Loss per Pulse			4.23		mJ
E_{off}	Energy Loss per Pulse			2.86		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=50 A,V_{CE}=600 V V_{GE}=±15 V R_G=15 Ω T_{vj}=150 ℃		45		ns
t_r	Rise Time, Inductive Load			92		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			156		ns
t_f	Fall Time, Inductive Load			327		ns
E_{on}	Turn-on Energy Loss per Pulse			9.17		mJ
E_{off}	Energy Loss per Pulse			4.22		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.47	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C
I_{SC}	SC data	V_{GE} ≤15 V, V_{CC} = 600 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt t_P ≤ 10 μs, T_{vj} = 150 ℃		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			35		A
I_{FRM}	Repetitive Peak Forward Current	t_P=1 ms		70		A

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=35 A, V_{CE}=0 V,T_{vj}= 25 ℃		1.9		V
		I_F=35 A, V_{CE}=0 V,T_{vj}=150 ℃		1.6		V
I_{rr}	Peak reverse recovery current	I_F=35 A,V_R=600 V -di/dt=1100A/us T_{vj}=25 ℃, V_{GE}=-15V		49		A
Q_r	Recovered Charge			3.56		uC
E_{rec}	Reverse Recovery Energy			1.21		mJ
I_{rr}	Peak reverse recovery current	I_F=35 A,V_R=600 V -di/dt=1100A/us T_{vj}=150 ℃ V_{GE}=-15V		76		A
Q_r	Recovered Charge			8.99		uC
E_{rec}	Reverse Recovery Energy			3.23		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.08	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}=150 ℃		360		A
I^2t	I^2t-value	t_p=10ms T_{vj}=150 ℃		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}=150 ℃ 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		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℃, $T_{vj\,max}$ = 175℃		35		A
I_{CRM}	Peak Collector Current	I_{CRM}=2I_C		70		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=35 A, V_{GE}=15 V, T_{vj}=25 ℃		1.9		V
		I_C=35 A, V_{GE}=15 V, T_{vj}=150 ℃		2.4		V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=6.0 mA,V_{CE}=V_{GE},T_{vj}= 25 ℃	5.8	6.3	6.8	V
I_{CES}	Collector-Emitter Cut-off Current	V_{CE}=1200 V, V_{GE}=0 V, T_{vj}=25 ℃			1.2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE}=0 V, V_{GE}=20V, T_{vj}=25 ℃			410	nA
C_{ies}	Input capacitance	f = 1 MHz, T_{vj}= 25°C, V_{CE} = 25 V, V_{GE}= 0 V		3459		pF
C_{res}	Reverse transfer capacitance			102		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=35 A,V_{CE}=600 V, V_{GE}=±15 V, R_G=15Ω, T_{vj}=25 ℃		20		ns
t_r	Rise Time, Inductive Load			30		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			215		ns
t_f	Fall Time, Inductive Load			169		ns
E_{on}	Turn-on Energy Loss per Pulse			1.25		mJ
E_{off}	Turn-off Energy Loss per Pulse			2.30		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	I_C=35 A,V_{CE}=600 V, V_{GE}=±15 V, R_G=15Ω, T_{vj}=150 ℃		34		ns
t_r	Rise Time, Inductive Load			26		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			280		ns
t_f	Fall Time, Inductive Load			277		ns
E_{on}	Turn-on Energy Loss per Pulse			2.74		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.82		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.69	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℃, $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		160		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
I_{rr}	Peak reverse recovery current	I_F=15 A,V_R=600 V -di/dt=300A/us T_{vj}=25 ℃		45		A
Q_r	Recovered Charge			0.17		μC
E_{rec}	Reverse Recovery Energy			1.06		mJ
I_{rr}	Peak reverse recovery current	I_F=15A,V_R=600 V -di/dt=300A/us T_{vj}=150 ℃		56		A
Q_r	Recovered Charge			0.69		μC
E_{rec}	Reverse Recovery Energy			2.64		mJ
R_{thJC}	Thermal resistance, junction to case	Per diode		2.1	2.28	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	℃

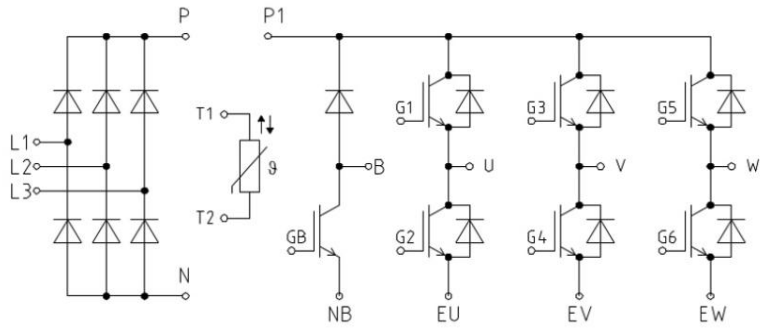
NTC-Thermistor (Characteristic Values)

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

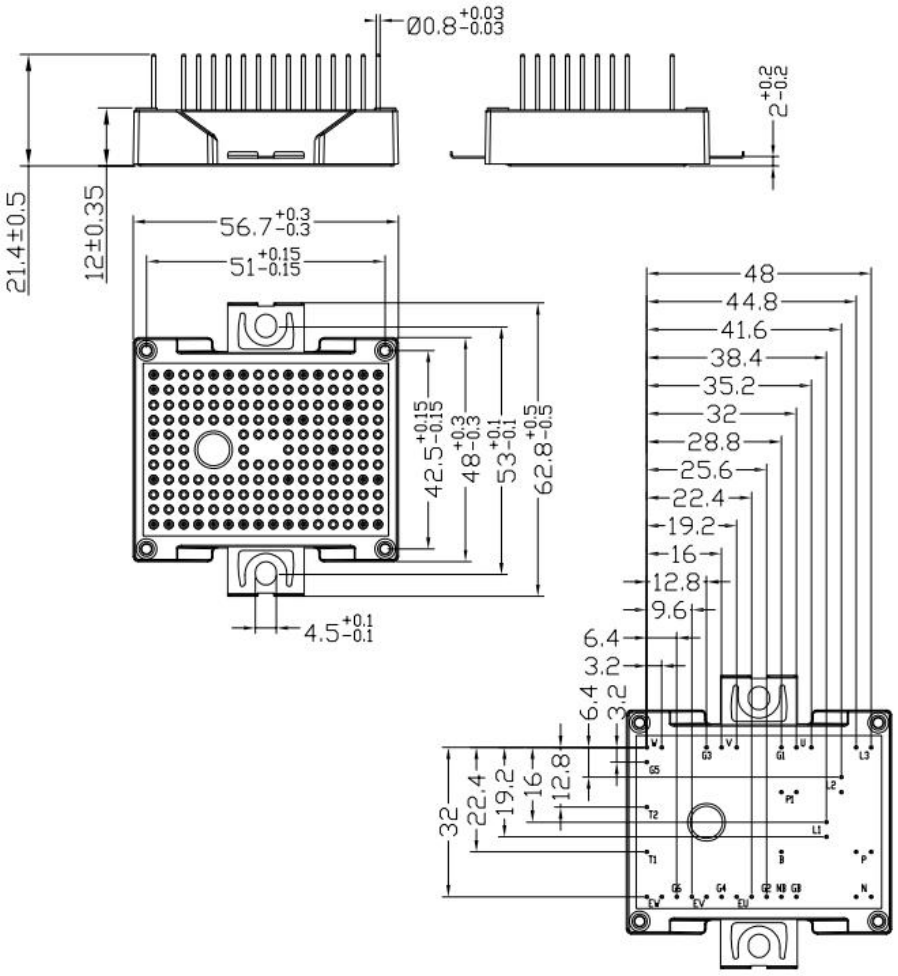
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{stg}	Storage Temperature		-40		125	℃
F	Mountig Force per Clamp		40		80	N
G	Weight of Module			44		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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