

LEGM10BE120E1HZ

IGBT Power Module

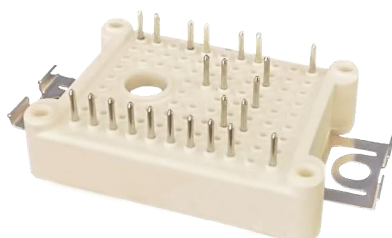
Features:

- $V_{CE}=1200V$ $I_C=10A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature $175^{\circ}C$
- Isolation Type Package

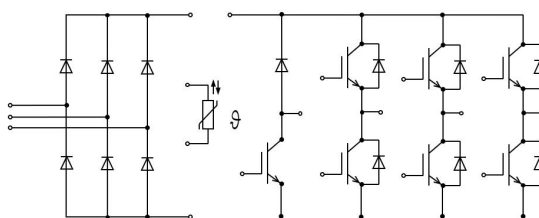
Applications:

- The inverter
- Motor control and drives

Package Type & Internal Circuit



E1



Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	$V_{EC}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
I_C	Continuous Collector Current	$T_C=100^{\circ}C$	10	A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$	20	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	105	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=10\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$		2.2	2.8	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=1.0\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25\text{ }^{\circ}\text{C}$	4.8		6.6	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0\text{ V}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			410	nA
C_{ies}	Input capacitance	$f = 1\text{ MHz}, T_{vj}=25\text{ }^{\circ}\text{C}, V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$		1213		pF
C_{res}	Reverse transfer capacitance			29		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=10\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=47\text{ }\Omega$ $T_{vj}=25\text{ }^{\circ}\text{C}$		45		ns
t_r	Rise Time, Inductive Load			44		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			180		ns
t_f	Fall Time, Inductive Load			165		ns
E_{on}	Turn-on Energy Loss per Pulse			0.9		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.55		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=10\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=47\text{ }\Omega$ $T_{vj}=150\text{ }^{\circ}\text{C}$		45		ns
t_r	Rise Time, Inductive Load			63		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			275		ns
t_f	Fall Time, Inductive Load			225		ns
E_{on}	Turn-on Energy Loss per Pulse			1.55		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.87		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT		1.25	1.4	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$
I_{sc}	SC	$V_{GE}\leq 15\text{ V}, V_{CE}=600\text{ V}, t_p\leq 10\mu\text{s}, T_{vj}=150\text{ }^{\circ}\text{C}, V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		50		A

Maximum Rated Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj}=25\text{ }^{\circ}\text{C}$		1200		V
I_F	Continuous DC Forward Current	$T_C=100\text{ }^{\circ}\text{C}$		10		A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ ms}$		20		A
I^2t	I^2t Value	$V_R=0\text{ V}$, $t_p=10\text{ ms}$, $T_{vj}=150\text{ }^{\circ}\text{C}$		14		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=10\text{ A}$, $V_{CE}=0\text{ V}$, $T_{vj}=25\text{ }^{\circ}\text{C}$		2.1		V
I_{rr}	Peak reverse recovery current	$I_F=10\text{ A}$, $V_R=600\text{ V}$ $-di/dt=500\text{ A/us}$ $T_{vj}=25\text{ }^{\circ}\text{C}$ $V_{GE}=-15\text{ V}$		12		ns
Q_r	Recovered Charge			0.9		μC
E_{rec}	Reverse Recovery Energy			0.24		mJ
I_{rr}	Peak reverse recovery current	$I_F=10\text{ A}$, $V_R=600\text{ V}$ $-di/dt=500\text{ A/us}$ $T_{vj}=150\text{ }^{\circ}\text{C}$ $V_{GE}=-15\text{ V}$		8		ns
Q_r	Recovered Charge			1.9		μC
E_{rec}	Reverse Recovery Energy			0.59		mJ
R_{thJC}	Thermal resistance, junction to case	Per Diode		1.75	1.9	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$

Maximum Rated Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25\text{ }^{\circ}\text{C}$		1800		V
I_{FRMSM}	Maximum RMS forward current per chip	$T_c=80\text{ }^{\circ}\text{C}$		30		A
I_{RMSM}	Maximum RMS current at rectifier chip	$T_c=80\text{ }^{\circ}\text{C}$		30		A
I_{FSM}	Surge forward current	$t_p=10\text{ms}$ $T_{vj}=25\text{ }^{\circ}\text{C}$		190		A
I^2t	I^2t -value			180		A ² S
I_{FSM}	Surge forward current	$t_p=10\text{ms}$ $T_{vj}=125\text{ }^{\circ}\text{C}$		160		A
I^2t	I^2t -value			130		A ² S

Characteristic Values (Diode Rectifier)

V_F	Forward voltage	$T_{vj}=125\text{ }^{\circ}\text{C}$ $I_F=15\text{A}$		0.98		V
I_R	Reverse current	$T_{vj}=125\text{ }^{\circ}\text{C}$ $V_R=1800\text{V}$		1.1		mA
R_{thjc}	Thermal resistance junction to case	per diode			1.18	K/W
T_{vjop}	Temperature under switching conditions		-40		125	$^{\circ}\text{C}$

Maximum Rated Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$		1200		V
I_C	Continuous Collector Current	$T_C = 100^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$		10		A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$		20		A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}\text{C}$	-20		20	V

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=10\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25^{\circ}\text{C}$		2.2	2.8	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=1.0\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	4.8		6.6	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25^{\circ}\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0\text{ V}, V_{GE}=15\text{ V}, T_{vj}=25^{\circ}\text{C}$			410	nA
C_{ies}	Input capacitance	$f = 1\text{ MHz}, T_{vj}=25^{\circ}\text{C}, V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$		1213		pF
C_{res}	Reverse transfer capacitance			29		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=10\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=47\ \Omega$ $T_{vj}=25^{\circ}\text{C}$		45		ns
t_r	Rise Time, Inductive Load			44		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			180		ns
t_f	Fall Time, Inductive Load			165		ns
E_{on}	Turn-on Energy Loss per Pulse			0.9		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.55		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=10\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=47\ \Omega$ $T_{vj}=150^{\circ}\text{C}$		45		ns
t_r	Rise Time, Inductive Load			63		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			275		ns
t_f	Fall Time, Inductive Load			225		ns
E_{on}	Turn-on Energy Loss per Pulse			1.55		mJ
E_{off}	Turn-off Energy Loss per Pulse			0.87		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT		1.25	1.4	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$
I_{sc}	SC	$V_{GE}\leq 15\text{ V}, V_{CE}=600\text{ V}, t_p\leq 10\mu\text{s}, T_{vj}=150^{\circ}\text{C}, V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		50		A

Maximum Rated Values (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1200		V
I_F	Continuous DC Forward Current			10		A
I_{FRM}	Repetitive Peak Forward Current	$t_p = 1\text{ ms}$		20		A

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F = 10\text{ A}$, $V_{CE} = 0\text{ V}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$		2.1		V
t_{rr}	Reverse Recovery time	$I_F = 10\text{ A}$, $V_R = 600\text{ V}$ $-di/dt = 500\text{ A/us}$ $T_{vj} = 25\text{ }^{\circ}\text{C}$ $V_{GE} = -15\text{ V}$		12		ns
Q_r	Recovered Charge			0.9		μC
E_{rec}	Reverse Recovery Energy			0.24		mJ
t_{rr}	Reverse Recovery time	$I_F = 10\text{ A}$, $V_R = 600\text{ V}$ $-di/dt = 500\text{ A/us}$ $T_{vj} = 150\text{ }^{\circ}\text{C}$ $V_{GE} = -15\text{ V}$		8		ns
Q_r	Recovered Charge			1.9		μC
E_{rec}	Reverse Recovery Energy			0.59		mJ
R_{thJC}	Thermal resistance, junction to case	Per Diode		1.75	1.9	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$

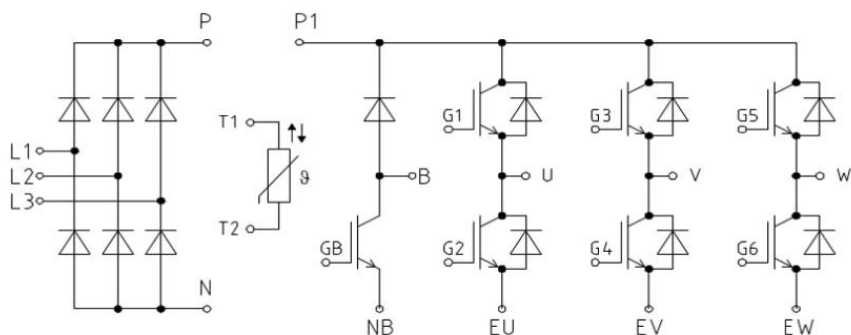
NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R ₂₅	Rated resistance	T _c =25 °C		5		KΩ
ΔR/R	Deviation of R100	T _c =100 °C	-5		5	%
P ₂₅	Power dissipation	T _c =25 °C		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

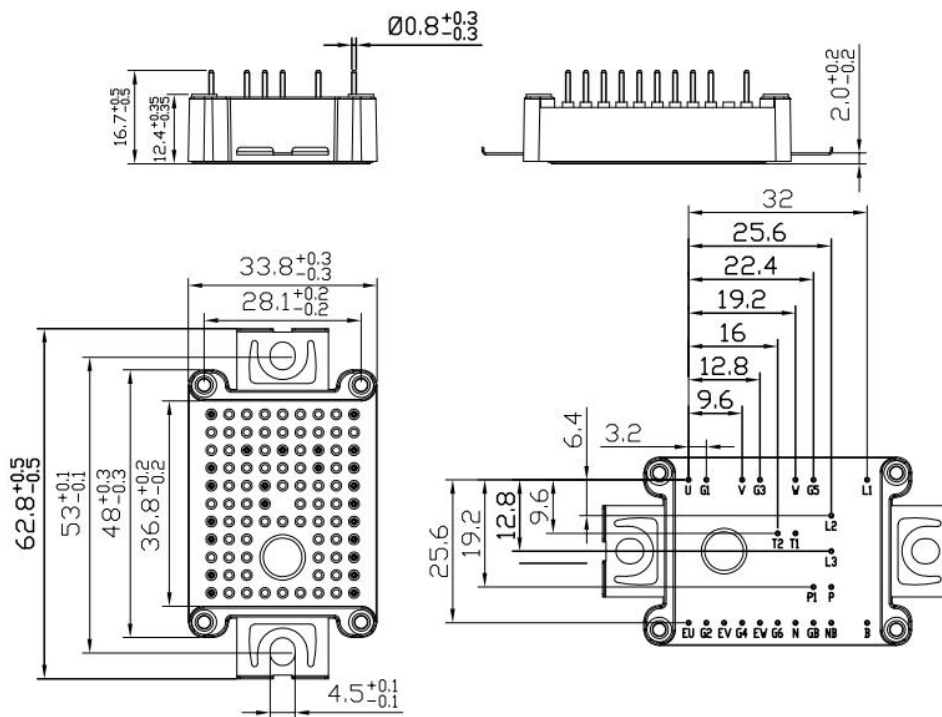
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T _{stg}	Storage Temperature		-40		125	°C
F	Mounting Force per Clamp		20		50	N
G	Weight of Module			25		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



DISCLAIMER

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