

LEGM50BE70E2HZ

IGBT Power Module

Features:

- $V_{CE}=700V$ $I_C=50A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature 175°C
- Isolation Type Package

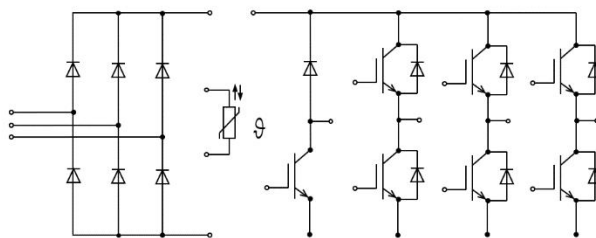
Applications:

- Auxiliary Inverters
- Air Conditioning
- Motor Drives

Package Type & Internal Circuit



E2



Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	$V_{EC}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	700	V
I_C	Continuous Collector Current	$T_C=100^{\circ}C$	50	A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$	100	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	175	W

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50A, V_{GE}=15V, T_{vj}=25^\circ C$		1.5		V
		$I_C=50A, V_{GE}=15V, T_{vj}=150^\circ C$		1.7		V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=0.8mA, V_{CE}=V_{GE}, T_{vj}=25^\circ C$	5.0	5.5	6.1	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=700V, V_{GE}=0V, T_{vj}=25^\circ C$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0V, V_{GE}=15V, T_{vj}=25^\circ C$			400	nA
$R_{g(int)}$	Internal gate resistor	$V_{GE}=0V, f=1MHz$		4.29		Ω
C_{ies}	Input capacitance	$f=1MHz, T_{vj}=25^\circ C,$ $V_{CE}=25V, V_{GE}=0V$		2732		nF
C_{res}	Reverse transfer capacitance			136.1		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=50A, V_{CE}=300V$ $V_{GE}=\pm 15V$ $R_G=10\Omega$ $T_{vj}=25^\circ C$		40		ns
t_r	Rise Time, Inductive Load			25.6		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			148		ns
t_f	Fall Time, Inductive Load			88		ns
E_{on}	Turn-on Energy Loss per Pulse			0.10		mJ
E_{off}	Energy Loss per Pulse			1.26		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=50A, V_{CE}=300V$ $V_{GE}=\pm 15V$ $R_G=10\Omega$ $T_{vj}=150^\circ C$		37		ns
t_r	Rise Time, Inductive Load			28		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			160		ns
t_f	Fall Time, Inductive Load			78		ns
E_{on}	Turn-on Energy Loss per Pulse			0.19		mJ
E_{off}	Energy Loss per Pulse			1.21		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.73	K/W
$T_{vj op}$	Temperature under switching conditions		-40		150	$^\circ C$
I_{sc}	SC	$V_{GE} \leq 15V, V_{CC} = 360V$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ $t_p \leq 10\mu s, T_{vj} = 150^\circ C$		250		A

Maximum Rated Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		700		V
I_F	Continuous DC Forward Current	$T_C = 100\text{ }^{\circ}\text{C}$		50		A
I_{FRM}	Repetitive Peak Forward Current	$t_p = 1\text{ ms}$		100		A

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F = 50\text{ A}, V_{CE} = 0\text{ V}, T_{vj} = 25\text{ }^{\circ}\text{C}$		1.45		V
		$I_F = 50\text{ A}, V_{CE} = 0\text{ V}, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.55		V
t_{rr}	Reverse Recovery time	$I_F = 50\text{ A}, V_R = 300\text{ V}$ $-di/dt = 100\text{ A/us}$ $T_{vj} = 25\text{ }^{\circ}\text{C}$		66		ns
Q_r	Recovered Charge			1.21		uC
E_{rec}	Reverse Recovery Energy			0.56		mJ
t_{rr}	Reverse Recovery time	$I_F = 50\text{ A}, V_R = 300\text{ V}$ $-di/dt = 100\text{ A/us}$ $T_{vj} = 150\text{ }^{\circ}\text{C}$		143		ns
Q_r	Recovered Charge			2.6		uC
E_{rec}	Reverse Recovery Energy			0.92		mJ
$T_{vj\text{ op}}$	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	$T_{vj}=25\text{ }^{\circ}\text{C}$		1600		V
I_{FRMSM}	Maximum RMS forward current per chip	$T_c=100\text{ }^{\circ}\text{C}$		60		A
I_{RMSM}	Maximum RMS current at rectifier chip	$T_c=100\text{ }^{\circ}\text{C}$		60		A
I_{FSM}	Surge forward current	$t_p=10\text{ms}, T_{vj}=25\text{ }^{\circ}\text{C}$		450		A
I^2t	I^2t -value			1000		A ² S
I_{FSM}	Surge forward current	$t_p=10\text{ms}, T_{vj}=150\text{ }^{\circ}\text{C}$		370		A
I^2t	I^2t -value			685		A ² S

Characteristic Values (Diode Rectifier)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward voltage	$T_{vj}=150\text{ }^{\circ}\text{C}, I_F=50\text{A}$		1.05		V
I_R	Reverse current	$T_{vj}=150\text{ }^{\circ}\text{C}, V_R=1600\text{V}$		1.0		mA
R_{thjc}	Thermal resistance junction to case	per diode			1.15	K/W

Maximum Rated Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$		700		V
I_C	Continuous Collector Current	$T_C = 100^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$		50		A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$		100		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	$I_C=50\text{A}, V_{GE}=15\text{ V}, T_{vj}=25^{\circ}\text{C}$		1.5		V
		$I_C=50\text{A}, V_{GE}=15\text{ V}, T_{vj}=150^{\circ}\text{C}$		1.7		V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=0.8\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.0	5.5	6.1	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=700\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25^{\circ}\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0\text{ V}, V_{GE}=15\text{ V}, T_{vj}=25^{\circ}\text{C}$			400	nA
$R_{g(int)}$	Internal gate resistor	$V_{GE}=0\text{ V}, f=1\text{ MHz}$		4.29		Ω
C_{ies}	Input capacitance	$f = 1\text{ MHz}, T_{vj}=25^{\circ}\text{C},$ $V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$		2732		nF
C_{res}	Reverse transfer capacitance			136.1		pF
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=50\text{ A}, V_{CE}=300\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=10\ \Omega$ $T_{vj}=25^{\circ}\text{C}$		40.4		ns
t_r	Rise Time, Inductive Load			25.6		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			148		ns
t_f	Fall Time, Inductive Load			88		ns
E_{on}	Turn-on Energy Loss per Pulse			0.10		mJ
E_{off}	Energy Loss per Pulse			1.26		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=50\text{ A}, V_{CE}=300\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=10\ \Omega$ $T_{vj}=150^{\circ}\text{C}$		37		ns
t_r	Rise Time, Inductive Load			28		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			160		ns
t_f	Fall Time, Inductive Load			78		ns
E_{on}	Turn-on Energy Loss per Pulse			0.19		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.73	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C
I_{sc}	SC	$V_{GE} \leq 15\ V$, $V_{CC} = 360\ V$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ $t_p \leq 10\ \mu s$, $T_{vj} = 150\ ^\circ C$		250		A

Maximum Rated Values (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj} = 25\ ^\circ C$		700		V
I_F	Continuous DC Forward Current			15		A
I_{FRM}	Repetitive Peak Forward Current	$t_p = 1\ ms$		30		A
I^2t	I^2t Value	$V_R = 0\ V$, $t_p = 10\ ms$, $T_{vj} = 150\ ^\circ C$		20.5		A ² s

Characteristics (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F = 15\ A$, $V_{CE} = 0\ V$, $T_{vj} = 25\ ^\circ C$		1.6		V
		$I_F = 15\ A$, $V_{CE} = 0\ V$, $T_{vj} = 150\ ^\circ C$		1.5		V
I_{rr}	Peak reverse recovery current	$I_F = 15\ A$, $V_R = 300\ V$ $-di/dt = 1600\ A/\mu s$ $T_{vj} = 25\ ^\circ C$		23		A
Q_r	Recovered Charge			0.8		μC
E_{rec}	Reverse Recovery Energy			0.16		mJ
I_{rr}	Peak reverse recovery current	$I_F = 15\ A$, $V_R = 300\ V$ $-di/dt = 1600\ A/\mu s$ $T_{vj} = 150\ ^\circ C$		26		A
Q_r	Recovered Charge			1.7		μC
E_{rec}	Reverse Recovery Energy			0.37		mJ
R_{thJC}	Thermal resistance, junction to case	Per Diode			2.5	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C

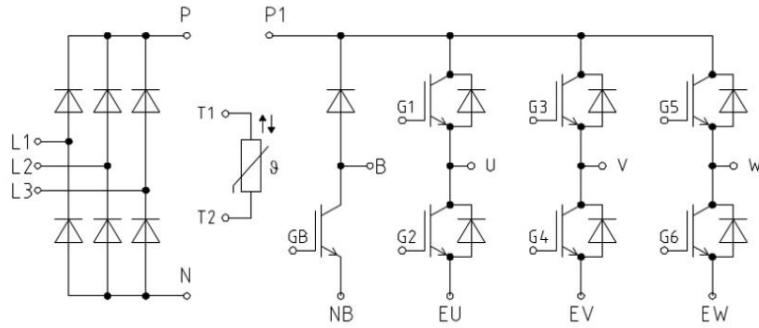
NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated resistance	$T_c=25\text{ }^{\circ}\text{C}$		5		K Ω
$\Delta R/R$	Deviation of R100	$T_c=100\text{ }^{\circ}\text{C}$	-5		5	%
P_{25}	Power dissipation	$T_c=25\text{ }^{\circ}\text{C}$		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

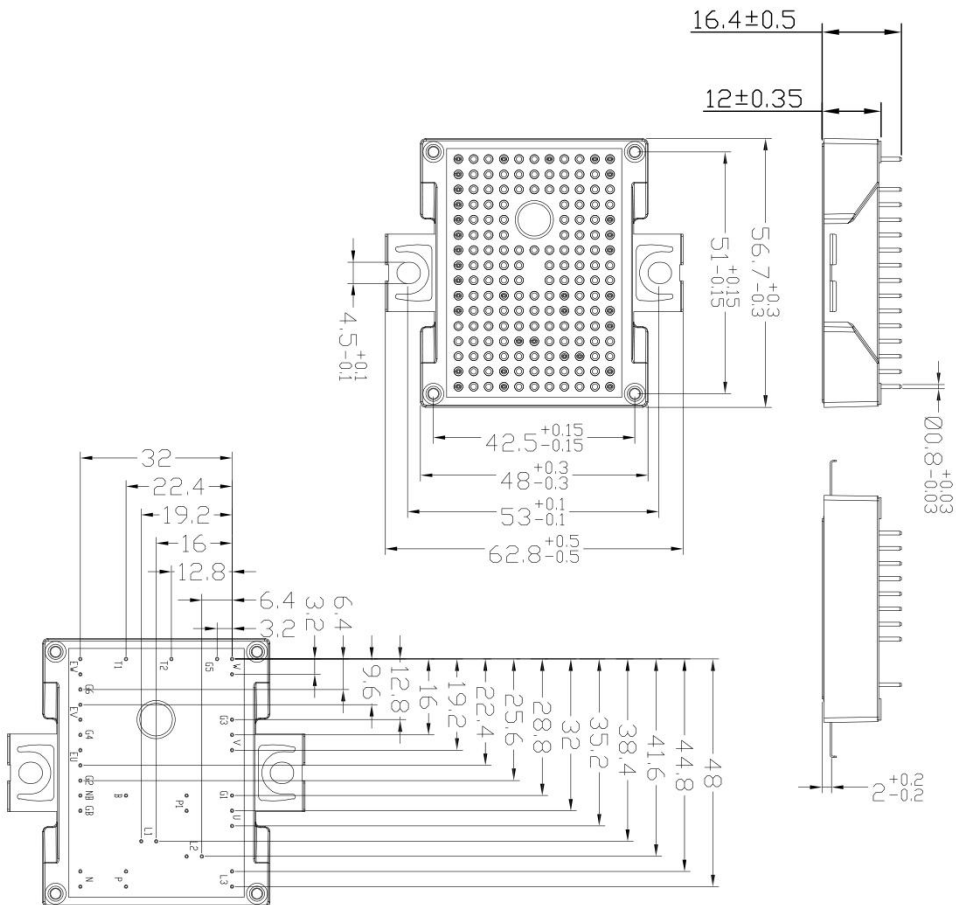
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{isol}	Isolation voltage	$t=1\text{ min}, f=50\text{ Hz}$	2500			V
T_{stg}	Storage Temperature		-40		150	$^{\circ}\text{C}$
F	Mounting Force per Clamp		40		80	N
G	Weight of Module			44		g

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