

LEGM35BE120E2H7

IGBT Power Module

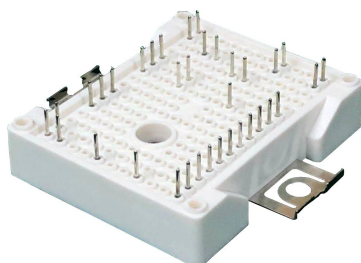
Features:

- $V_{CE}=1200V$ $I_C=35A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Overload operation up to 175°C
- Isolation Type Package

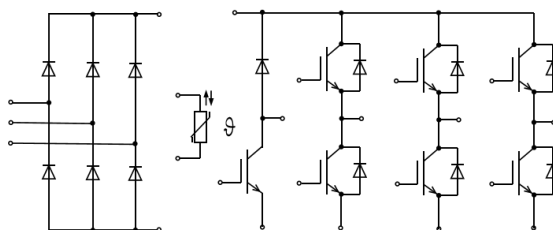
Applications:

- 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	$V_{EC}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
I_C	Continuous Collector Current	$T_C=100^{\circ}C$	35	A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$	70	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	259	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$		1.58		V
		$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=175\text{ }^{\circ}\text{C}$		1.93		V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=1.5\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25\text{ }^{\circ}\text{C}$	5.5	6.1	7.0	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	$V_{CE}=0\text{ V}, V_{GE}=20\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			500	nA
C_{ies}	Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25\text{ }^{\circ}\text{C},$ $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		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	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=20\text{ }\Omega$ $T_{vj}=25\text{ }^{\circ}\text{C}$		59		ns
t_r	Rise Time, Inductive Load			36		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			324		ns
t_f	Fall Time, Inductive Load			179		ns
E_{on}	Turn-on Energy Loss per Pulse			1.91		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.22		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=20\text{ }\Omega$ $T_{vj}=175\text{ }^{\circ}\text{C}$		46		ns
t_r	Rise Time, Inductive Load			37		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			352		ns
t_f	Fall Time, Inductive Load			337		ns
E_{on}	Turn-on Energy Loss per Pulse			3.37		mJ
E_{off}	Turn-off Energy Loss per Pulse			4.49		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.58	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		175	$^{\circ}\text{C}$
I_{sc}	SC	$V_{GE}\leq 15\text{ V}, V_{CE}\leq 600\text{ V}, t_p\leq 10\mu\text{s},$ $T_{vj}=25\text{ }^{\circ}\text{C}, V_{CES}\leq 1200\text{ V}$		174		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	$T_C=100\text{ }^{\circ}\text{C}$		35		A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ ms}$		70		A

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=35\text{ A}, V_{CE}=0\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$		2.25		V
		$I_F=35\text{ A}, V_{CE}=0\text{ V}, T_{vj}=175\text{ }^{\circ}\text{C}$		1.65		V
I_{rr}	Peak reverse recovery current	$I_F=35\text{ A}, V_R=600\text{ V}$ $-di/dt=893\text{ A/us}$ $T_{vj}=25\text{ }^{\circ}\text{C}$		28		A
Q_r	Recovered Charge			0.88		μC
E_{rec}	Reverse Recovery Energy			0.09		mJ
I_{rr}	Peak reverse recovery current	$I_F=35\text{ A}, V_R=600\text{ V}$ $-di/dt=893\text{ A/us}$ $T_{vj}=175\text{ }^{\circ}\text{C}$		42		A
Q_r	Recovered Charge			4.75		μC
E_{rec}	Reverse Recovery Energy			1.49		mJ
R_{thJC}	Thermal resistance, junction to case				0.9	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		175	$^{\circ}\text{C}$

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	$T_c=80\text{ }^{\circ}\text{C}$		60		A
I_{RMSM}	Maximum RMS current at rectifier chip	$T_c=80\text{ }^{\circ}\text{C}$		60		A
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	$T_{vj}=25\text{ }^{\circ}\text{C}$ $I_F=35\text{A}$		1.57		V
I_R	Reverse current	$T_{vj}=25\text{ }^{\circ}\text{C}$ $V_R=1800\text{V}$			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	$^{\circ}\text{C}$

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	$T_C = 100^{\circ}\text{C}$		35		A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$		70		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	$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25^{\circ}\text{C}$		1.58		V
		$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=175^{\circ}\text{C}$		1.93		V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=1.5\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.5	6.1	7.0	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	$V_{CE}=0\text{ V}, V_{GE}=20\text{ V}, T_{vj}=25^{\circ}\text{C}$			500	nA
C_{ies}	Input capacitance	$f = 1\text{ MHz}, T_{vj}=25^{\circ}\text{C},$ $V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$		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	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=15\ \Omega$ $T_{vj}=25^{\circ}\text{C}$		37		ns
t_r	Rise Time, Inductive Load			28		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			286		ns
t_f	Fall Time, Inductive Load			168		ns
E_{on}	Turn-on Energy Loss per Pulse			1.56		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.22		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=15\ \Omega$ $T_{vj}=175^{\circ}\text{C}$		35		ns
t_r	Rise Time, Inductive Load			29		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			325		ns
t_f	Fall Time, Inductive Load			334		ns
E_{on}	Turn-on Energy Loss per Pulse			2.41		mJ
E_{off}	Turn-off Energy Loss per Pulse			4.61		mJ

Characteristic Values (IGBT Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.58	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		175	°C
I_{sc}	SC	$V_{GE} \leq 15V, V_{CE} = 600V, t_p \leq 10\mu s,$ $T_{vj} = 125^\circ C, V_{CES} \leq 1200V$		160		A

Maximum Rated Values (Diode Brake-Chopper)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj} = 25^\circ C$		1200		V
I_F	Continuous DC Forward Current	$T_C = 100^\circ C$		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	$I_F = 10\ A, V_{CE} = 0\ V, T_{vj} = 25^\circ C$		1.83		V
		$I_F = 10\ A, V_{CE} = 0\ V, T_{vj} = 175^\circ C$		1.51		V
I_{rr}	Peak reverse recovery current	$I_F = 10\ A, V_R = 600\ V$ $-di/dt = 937\ A/\mu s$ $T_{vj} = 25^\circ C$		23.4		A
Q_r	Recovered Charge			0.87		μC
E_{rec}	Reverse Recovery Energy			0.21		mJ
I_{rr}	Peak reverse recovery current	$I_F = 10\ A, V_R = 600\ V$ $-di/dt = 937\ A/\mu s$ $T_{vj} = 175^\circ C$		30.8		A
Q_r	Recovered Charge			2.45		μC
E_{rec}	Reverse Recovery Energy			0.89		mJ
R_{thJC}	Thermal resistance, junction to case				3.03	K/W
$T_{vj\ op}$	Temperature under switching conditions		-40		150	°C

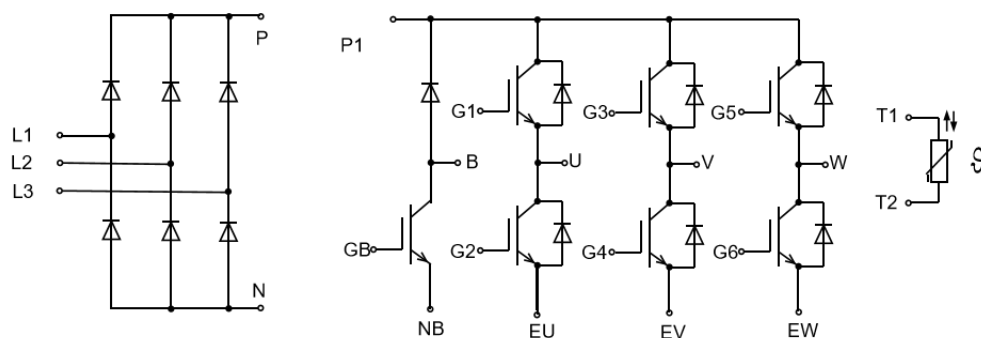
NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R ₂₅	Rated resistance	T _c =25 °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

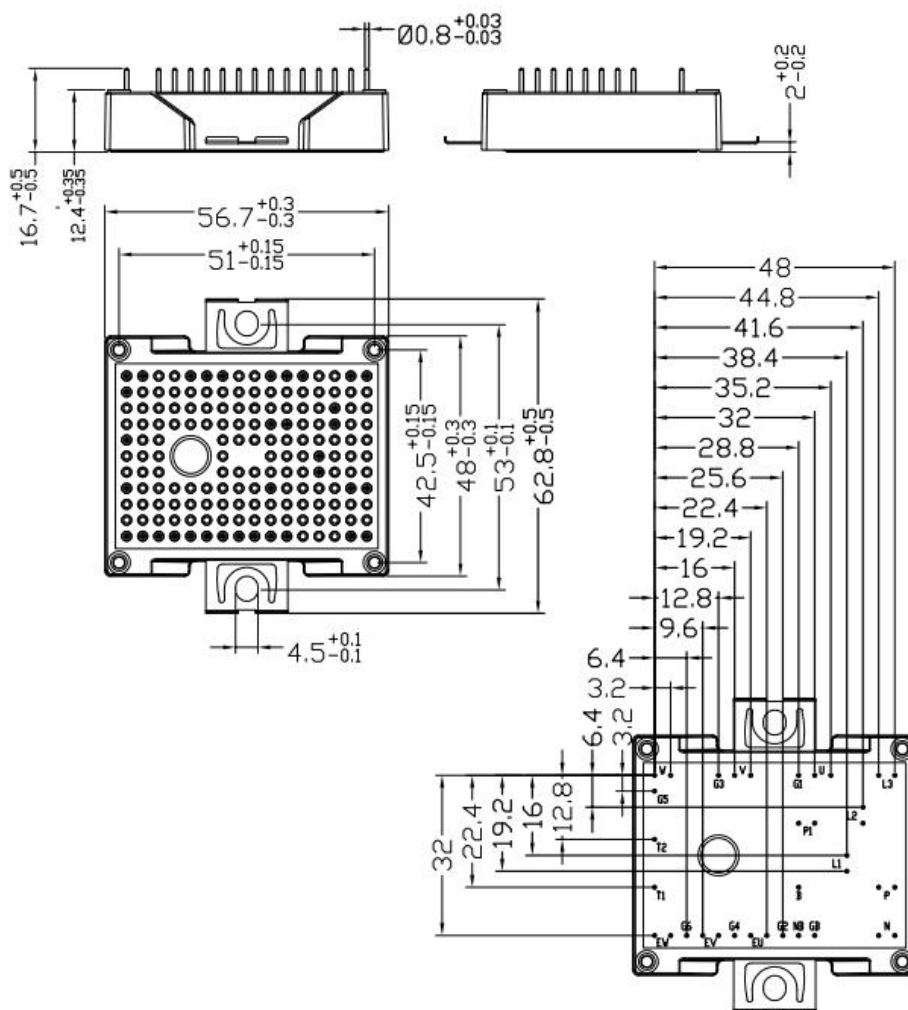
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T _{stg}	Storage Temperature		-40		125	°C
F	Mounting Force per Clamp		20		50	N
G	Weight of Module			44		g

Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



DISCLAIMER

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2. Operating conditions may differ from simulation assumptions in several aspects like level of DC-link voltage, applied gate-voltage and gate-resistor, case and junction temperatures as well as the power circuit stray-inductance. Therefore, deviations of parameters and assumptions used for the simulation and the real application may exist.
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