

LEGM35TD120E3HZ

IGBT Power Module

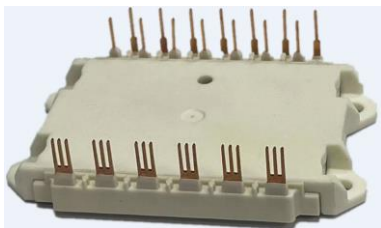
Features:

- $V_{CE}=1200V$ $I_C=35A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature $150^{\circ}C$
- Isolation Type Package

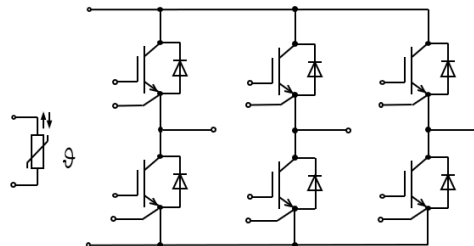
Applications:

- 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	$T_C=80^{\circ}C, T_{vjmax}=150^{\circ}C$	35	A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$	70	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 30	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=150^{\circ}C$	200	W

Characteristics Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$		1.85	2.5	V
		$I_C=35\text{ A}, V_{GE}=15\text{ V}, T_{vj}=125\text{ }^{\circ}\text{C}$		2.13	2.7	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=2\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25\text{ }^{\circ}\text{C}$	5.2	6.2	7.0	V
C_{ies}	Input capacitance	$f=1\text{ MHz}, T_{vj}=25\text{ }^{\circ}\text{C},$ $V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$			3.11	nF
C_{res}	Reverse transfer capacitance				103	pF
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			1.2	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0\text{ V}, V_{GE}=20\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			410	nA
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=15\Omega$ $T_{vj}=25\text{ }^{\circ}\text{C}$		50		ns
t_r	Rise Time, Inductive Load			48		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			200		ns
t_f	Fall Time, Inductive Load			156		ns
E_{on}	Turn-on Energy Loss per Pulse			2.64		mJ
E_{off}	Turn-off Energy Loss per Pulse			1.87		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=35\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=15\Omega$ $T_{vj}=125\text{ }^{\circ}\text{C}$		55		ns
t_r	Rise Time, Inductive Load			60		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			240		ns
t_f	Fall Time, Inductive Load			240		ns
E_{on}	Turn-on Energy Loss per Pulse			3.22		mJ
E_{off}	Turn-off Energy Loss per Pulse			3.01		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.65	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		125	$^{\circ}\text{C}$
I_{sc}	SC	$V_{GE}\leq 15\text{ V}, V_{CE}=600\text{ V},$ $t_p\leq 10\mu\text{S}, T_{vj}=125\text{ }^{\circ}\text{C},$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		160		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			35		A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ ms}$		70		A
I^2t	I^2t Value	$V_R=0\text{ V}$, $t_p=10\text{ ms}$, $T_{vj}=125\text{ }^{\circ}\text{C}$		220		A ² s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=35\text{ A}$, $V_{CE}=0\text{ V}$, $T_{vj}=25\text{ }^{\circ}\text{C}$		1.9	2.5	V
		$I_F=35\text{ A}$, $V_{CE}=0\text{ V}$, $T_{vj}=125\text{ }^{\circ}\text{C}$		1.9		V
t_{rr}	Reverse Recovery time	$I_F=35\text{ A}$, $V_R=600\text{ V}$ -di/dt=100A/us $T_{vj}=25\text{ }^{\circ}\text{C}$, $V_{GE}=-15\text{ V}$		170		ns
Q_r	Recovered Charge			0.98		uC
E_{rec}	Reverse Recovery Energy			0.35		mJ
t_{rr}	Reverse Recovery time	$I_F=35\text{ A}$, $V_R=600\text{ V}$ -di/dt=100A/us $T_{vj}=125\text{ }^{\circ}\text{C}$ $V_{GE}=-15\text{ V}$		205		ns
Q_r	Recovered Charge			1.09		uC
E_{rec}	Reverse Recovery Energy			0.36		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			1.0	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		125	$^{\circ}\text{C}$

NTC-Thermistor (Characteristic Values)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated resistance	$T_c = 25\text{ }^{\circ}\text{C}$		5		$K\Omega$
$\Delta R/R$	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

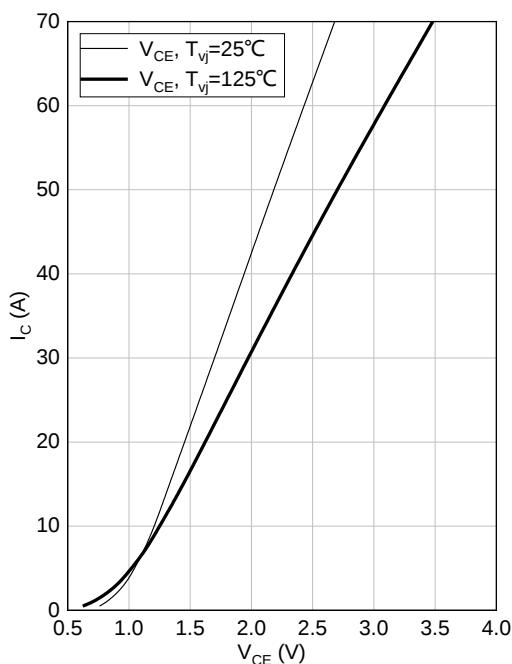
Module Characteristics

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		20		50	N
G	Weight of Module			25		g

Output characteristic of IGBT, Inverter (typical)

$$I_c = f(V_{CE})$$

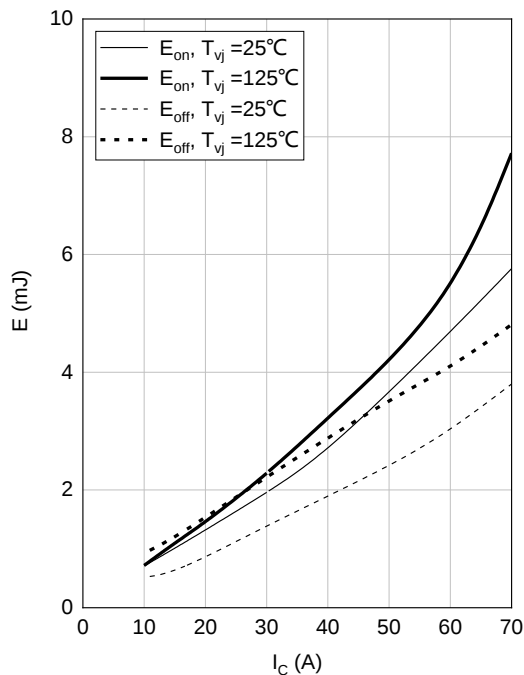
$$V_{GE} = 15V$$



Switching time of IGBT, Inverter (typical)

$$E_{on} = f(I_c), E_{off} = f(I_c)$$

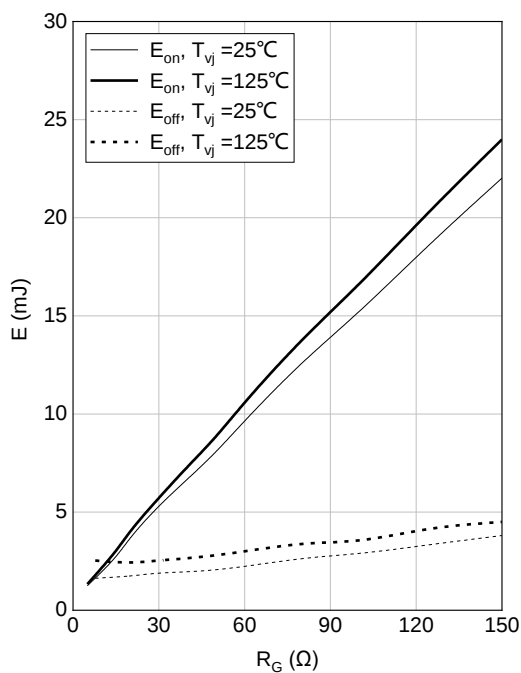
$$V_{GE} = \pm 15V, R_G = 15\Omega, V_{CE} = 600V$$



Switching loss of IGBT, Inverter (typical)

$$E_{on} = f(R_G), E_{off} = f(R_G)$$

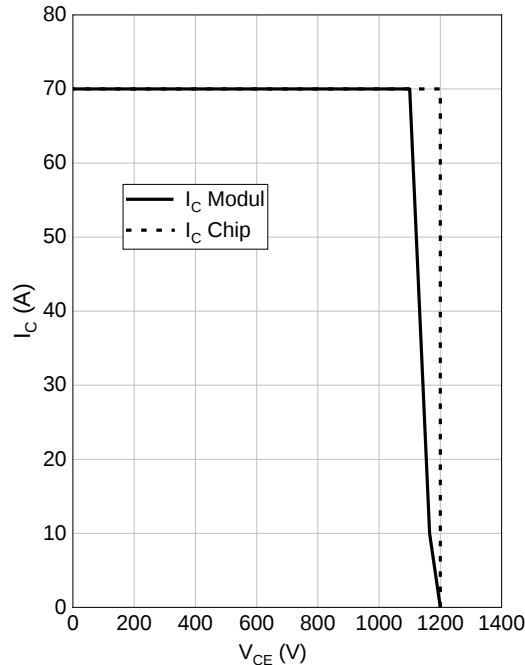
$$V_{GE} = \pm 15V, I_c = 35A, V_{CE} = 600V$$



RBSOA IGBT, Inverter (typical)

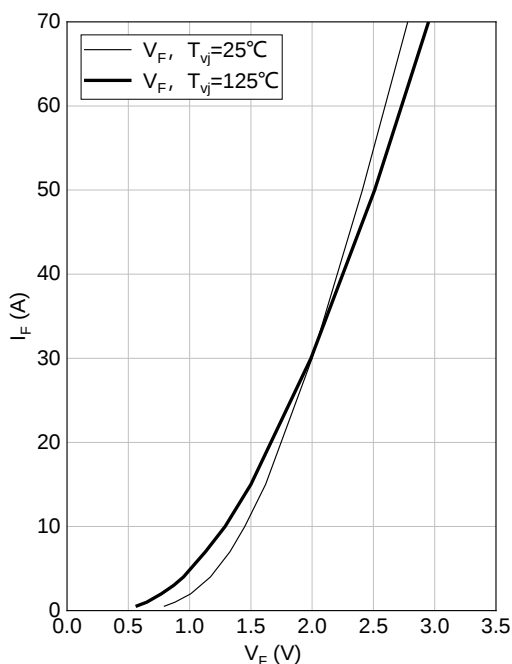
$$I_c = f(V_{CE})$$

$$V_{GE} = \pm 15V, R_{Goff} = 15\Omega, T_{vj}=125^\circ C$$



Forward characteristic of Diode, Inverter (typical)

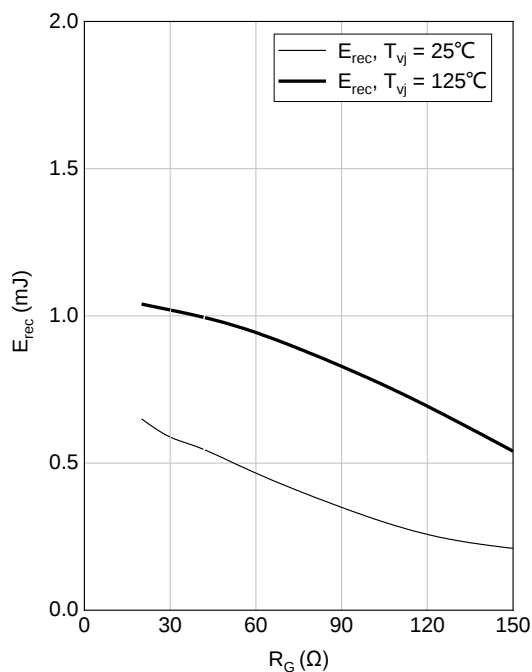
$$I_F = f(V_F)$$



Switching losses of Diode, Inverter (typical)

$$E_{rec} = f(R_G)$$

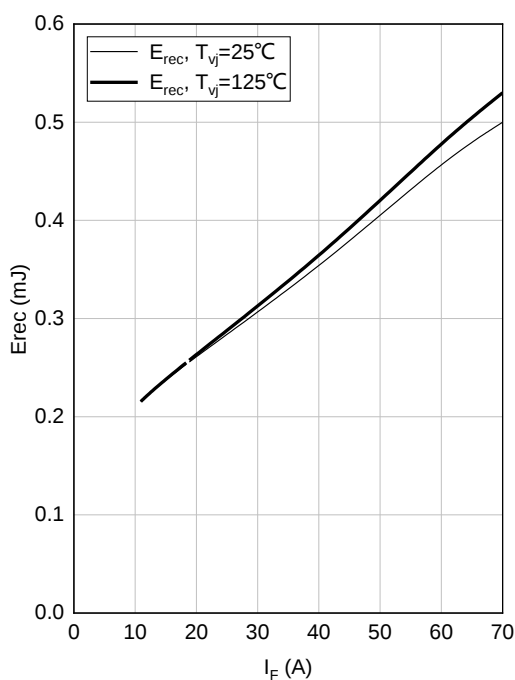
$$I_F = 35\text{A}, V_{CE} = 600\text{V}$$



Switching losses of Diode, Inverter (typical)

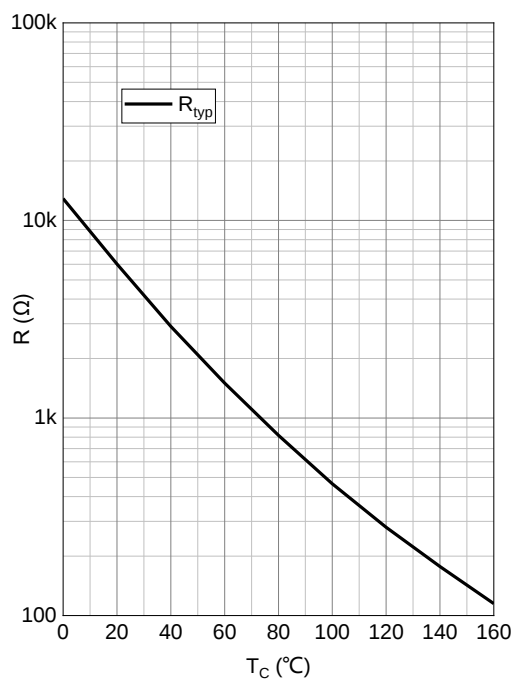
$$E_{rec} = f(I_F)$$

$$R_{Gon} = 15\Omega, V_{CE} = 600\text{V}$$

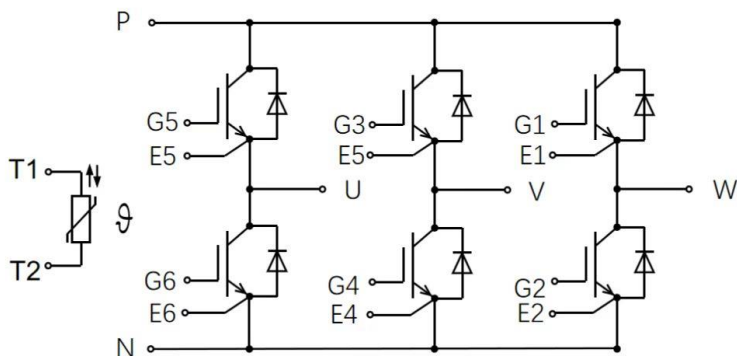


NTC-thermistor-temperature characteristic (typical)

$$R = f(T_{NTC})$$

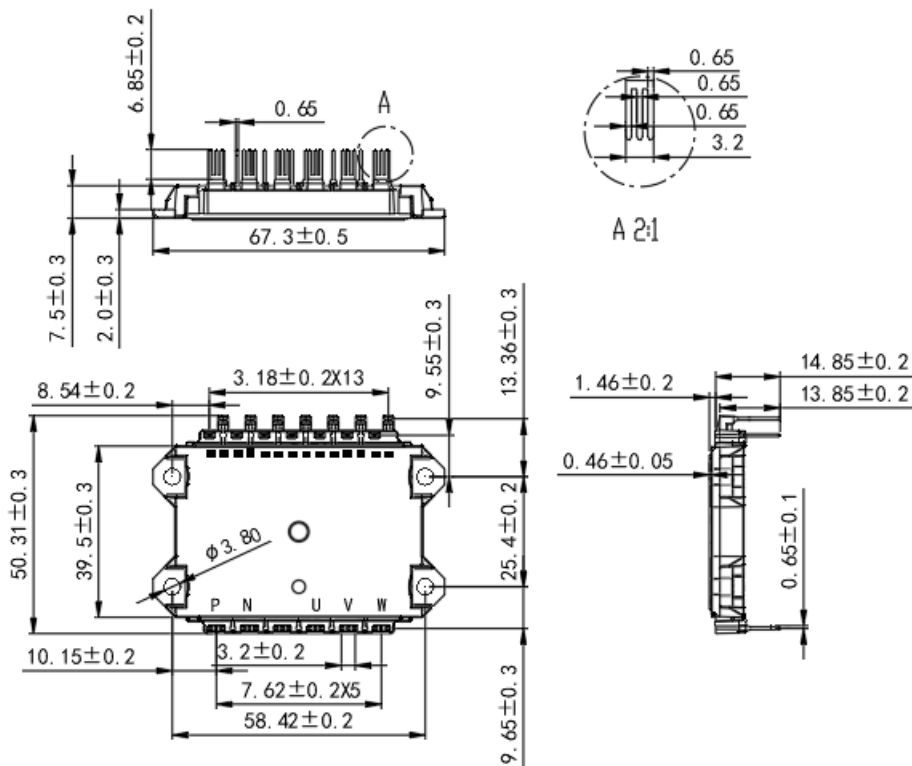


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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