

LEGM200TD120L5H

IGBT Power Module

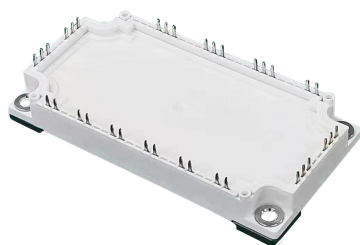
Features

- $V_{CE}=1200V$ $I_C=200A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient
- Maximum junction temperature $175^{\circ}C$
- Isolation Type Package

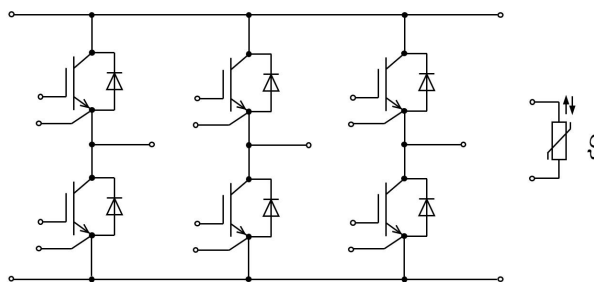
Applications

- Motor control and drives

Package Type & Internal Circuit



L5



Internal Circuit

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Maximum Power Dissipation	$V_{EC}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
I_C	Continuous Collector Current	$T_C=100^{\circ}C$	200	A
I_{CRM}	Peak Collector Current	$I_{CRM}=2I_C$	400	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 30	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=150^{\circ}C$	950	W

Maximum Rated Values (IGBT Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=200\text{ A}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$		1.8		V
		$I_C=200\text{ A}, V_{GE}=15\text{ V}, T_{vj}=150\text{ }^{\circ}\text{C}$		2.2		V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=5.0\text{ mA}, V_{CE}=V_{GE}, T_{vj}=25\text{ }^{\circ}\text{C}$	5.7	6.2	6.8	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			20	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0\text{ V}, V_{GE}=15\text{ V}, T_{vj}=25\text{ }^{\circ}\text{C}$			200	nA
R_{Gint}	Internal gate resistor			1.78		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{ V}, V_{GE}=0\text{ V},$ $f=1\text{ MHz}$		14.2		nF
C_{oes}	Output Capacitance			0.52		nF
C_{res}	Reverse Transfer Capacitance			0.69		nF
Q_g	Gate charge	$V_{CE}=600\text{ V}, I_C=200\text{ A}, V_{GE}=15\text{ V}$		1.9		μC
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=200\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=4\text{ }\Omega$ $T_{vj}=25\text{ }^{\circ}\text{C}$		99		ns
t_r	Rise Time, Inductive Load			74		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			413		ns
t_f	Fall Time, Inductive Load			117		ns
E_{on}	Turn-on Energy Loss per Pulse			14.9		mJ
E_{off}	Energy Loss per Pulse			17.4		mJ
$t_{d(on)}$	Turn-on Delay Time, Inductive Load	$I_C=200\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}$ $R_G=4\text{ }\Omega$ $T_{vj}=150\text{ }^{\circ}\text{C}$		107		ns
t_r	Rise Time, Inductive Load			79		ns
$t_{d(off)}$	Turn-off Delay Time, Inductive Load			474		ns
t_f	Fall Time, Inductive Load			251		ns
E_{on}	Turn-on Energy Loss per Pulse			23.7		mJ
E_{off}	Energy Loss per Pulse			24.35		mJ
R_{thJC}	Thermal resistance, junction to case	per IGBT			0.13	K/W
$T_{vj\text{ op}}$	Temperature under switching conditions		-40		150	$^{\circ}\text{C}$
I_{sc}	SC	$V_{GE}\leq 15\text{ V}, V_{CE}=900\text{ V},$ $t_p\leq 10\mu\text{s}, T_{vj}=150\text{ }^{\circ}\text{C},$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$		800		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	$T_C = 100\text{ }^{\circ}\text{C}$		200		A
I_{FRM}	Repetitive Peak Forward Current	$t_P = 1\text{ ms}$		400		A
I^2t	I^2t Value	$V_R = 0\text{ V}$, $t_P = 10\text{ ms}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		7500		A^2s

Characteristic Values (Diode Inverter)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F = 200\text{ A}$, $V_{CE} = 0\text{ V}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$		1.9		V
		$I_F = 200\text{ A}$, $V_{CE} = 0\text{ V}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		1.9		V
I_{rr}	Peak reverse recovery current	$I_F = 200\text{ A}$, $V_R = 600\text{ V}$ -di/dt=2420 A/us $T_{vj} = 25\text{ }^{\circ}\text{C}$		166		A
Q_r	Recovered Charge			24		μC
E_{rec}	Reverse Recovery Energy			10.9		mJ
I_{rr}	Peak reverse recovery current	$I_F = 200\text{ A}$, $V_R = 600\text{ V}$ -di/dt=2420 A/us $T_{vj} = 150\text{ }^{\circ}\text{C}$		186		A
Q_r	Recovered Charge			22		μC
E_{rec}	Reverse Recovery Energy			20.8		mJ
R_{thJC}	Thermal resistance, junction to case	per Diode			0.19	K/W
$T_{vj\text{ op}}$	Operating Junction Temperature		-40		150	$^{\circ}\text{C}$

NTC-Thermistor (Characteristic Values)

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

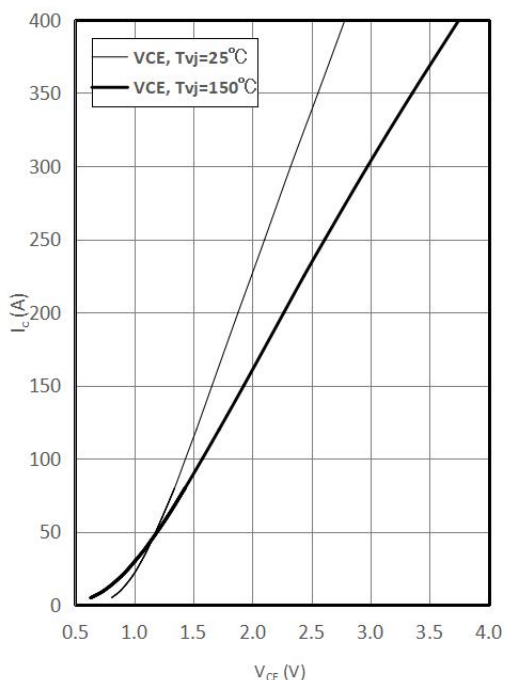
Module Characteristics

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	$^{\circ}\text{C}$
M_s	Module-to-Sink Torque	Recommended(M5)	3.0		6.0	N·m
G	Weight of Module			314		g

Output characteristic of IGBT, Inverter (typical)

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

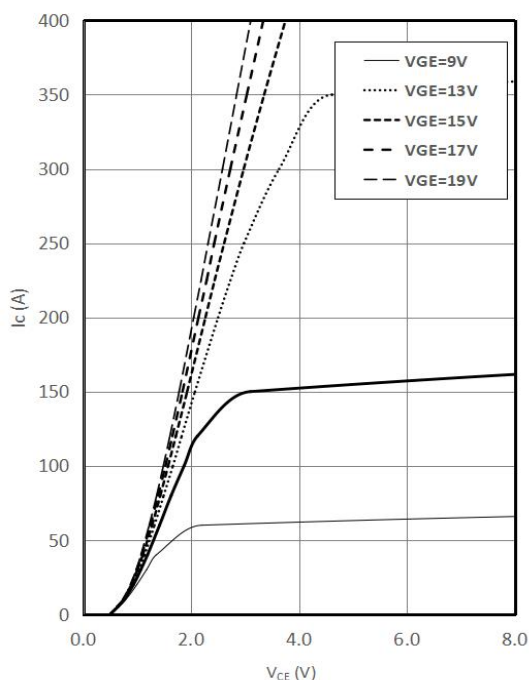
$$V_{GE} = 15V$$



Output characteristic of IGBT, Inverter (typical)

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

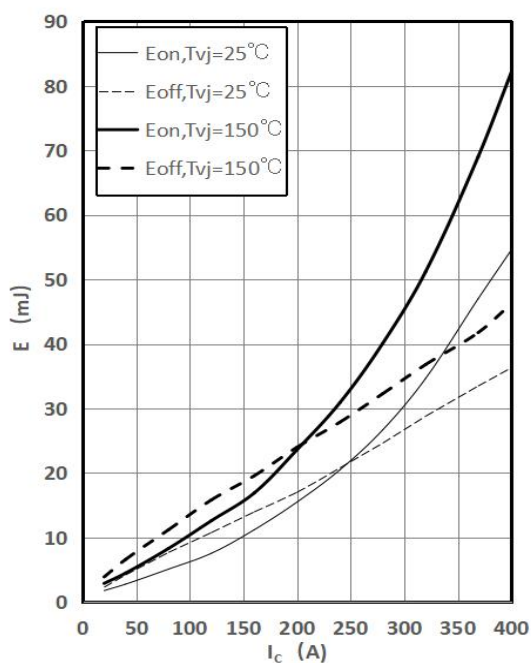
$$T_{vj}=150^\circ C$$



Switching losses of IGBT, Inverter (typical)

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

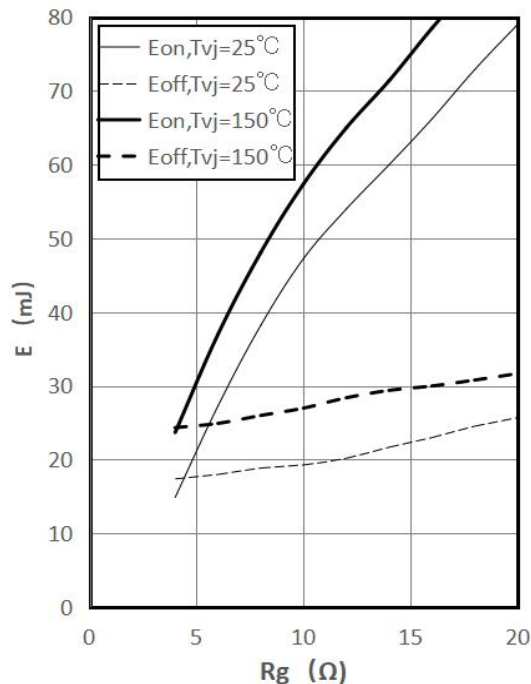
$$V_{GE} = \pm 15V, R_G = 4\Omega, V_{CE} = 600V$$



Switching losses of IGBT, Inverter (typical)

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

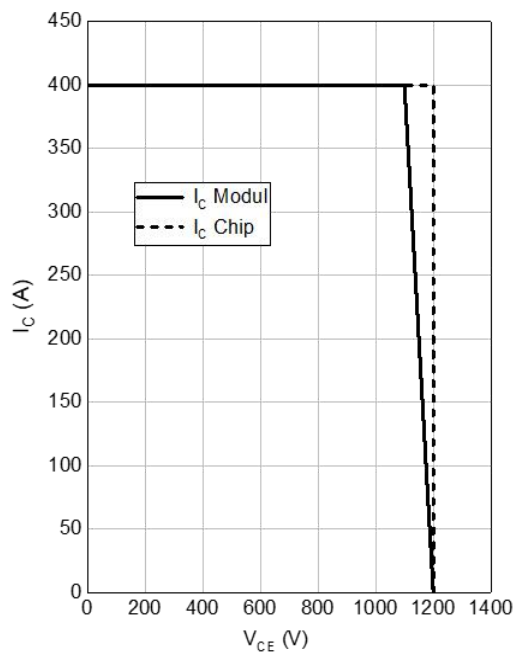
$$V_{GE} = \pm 15V, I_c = 200A, V_{CE} = 600V$$



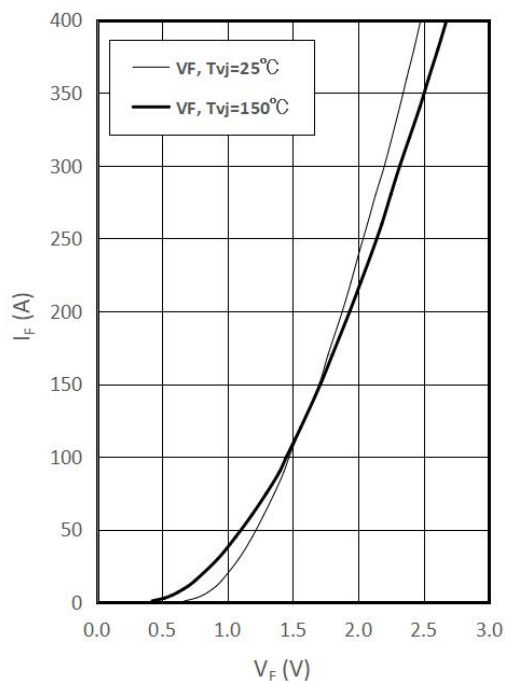
RBSOA IGBT, Inverter (typical)

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

$$V_{GE} = \pm 15V, T_{vj} = 150^\circ C$$

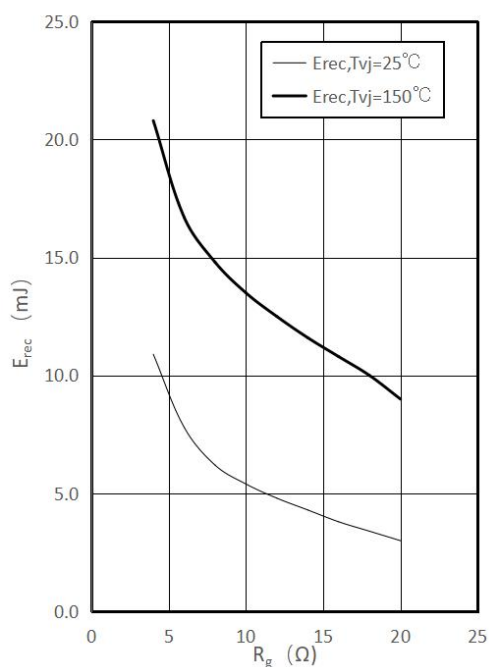

Forward characteristic of Diode, Inverter (typical)

$$I_F = f(V_F)$$


Switching losses of Diode, Inverter (typical)

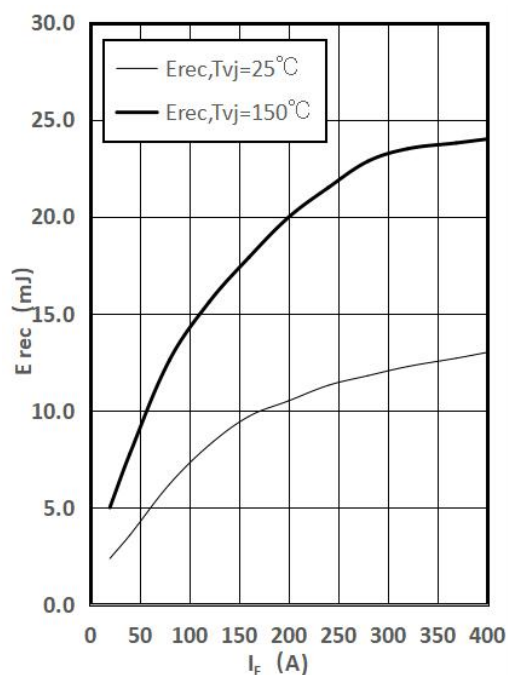
$$E_{rec} = f(R_G)$$

$$I_F = 200A, V_{CE} = 600V$$


Switching losses of Diode, Inverter (typical)

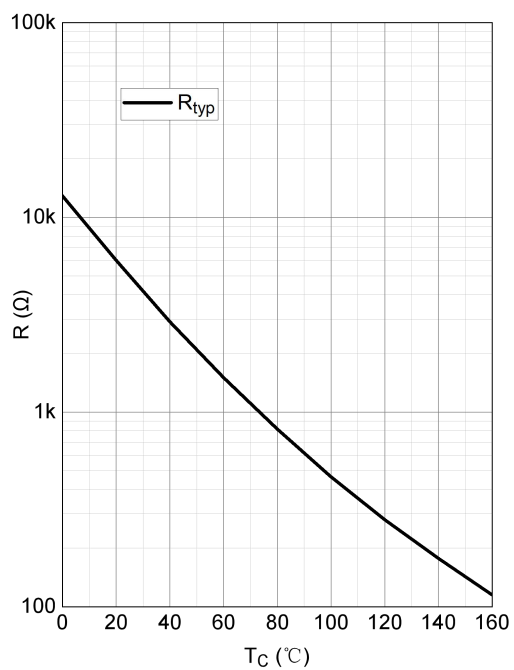
$$E_{rec} = f(I_F)$$

$$R_G = 4\Omega, V_{CE} = 600V$$

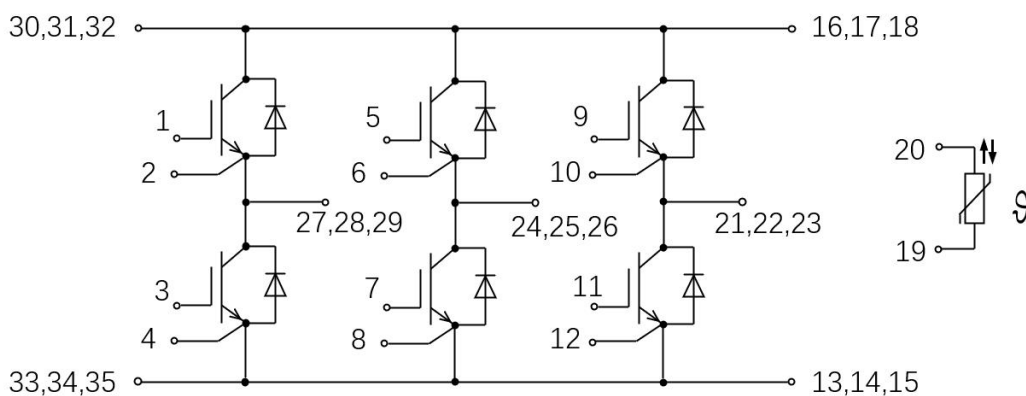


NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

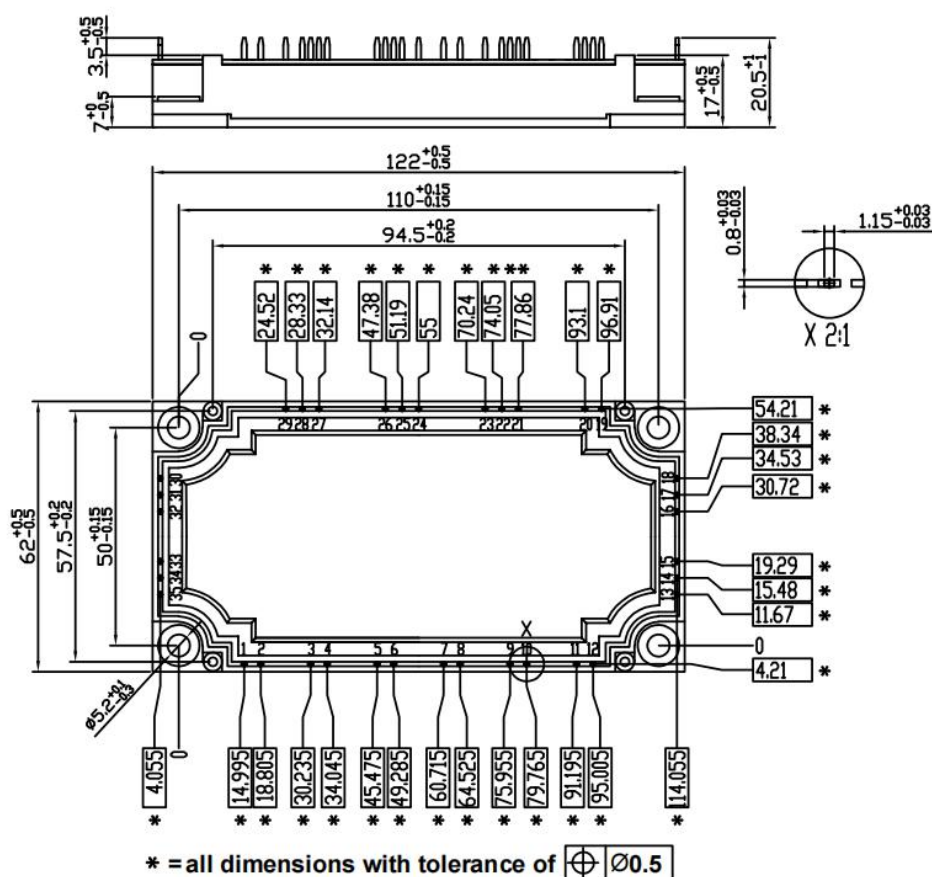


Circuit Diagram



Package Dimensions

(Dimensions in Millimeters)



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