

STARPOWER

SEMICONDUCTOR™

IGBT

GD450HTL120C7S

Preliminary

Molding Type Module**1200V/450A 6 in one-package**

General Description

STARPOWER IGBT power module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- Low switching losses
- 10 μ s short circuit capability
- Square RBSOA
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

IGBT-inverter $T_C=25^\circ\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD450HTL120C7S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^\circ\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=100^\circ\text{C}$	900	A
		450	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	900	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	3191	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V},$ $T_j=25^\circ\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V},$ $T_j=25^\circ\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=18.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^\circ\text{C}$	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=450\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		2.00	2.45	V
		$I_C=450\text{A}, V_{GE}=15\text{V},$ $T_j=125^\circ\text{C}$		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{GE}=-15\dots+15\text{V}$		4.6		μC
E_{on}	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=450\text{A},$ $R_G=2.3\Omega, V_{GE}=\pm 15\text{V},$ $T_j=25^\circ\text{C}$		48		mJ
E_{off}	Turn-Off Switching Loss			28		mJ
E_{tot}	Total Switching Loss			76		mJ
E_{on}	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=450\text{A},$ $R_G=2.3\Omega, V_{GE}=\pm 15\text{V},$ $T_j=125^\circ\text{C}$		66		mJ
E_{off}	Turn-Off Switching Loss			45		mJ
E_{tot}	Total Switching Loss			111		mJ

$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=450A,$ $R_G=2.3\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		205		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			465		ns
t_f	Fall Time			50		ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=450A,$ $R_G=2.3\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		225		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			520		ns
t_f	Fall Time			75		ns
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1Mhz,$ $V_{GE}=0V$		31.8		nF
C_{oes}	Output Capacitance			2.13		nF
C_{res}	Reverse Transfer Capacitance			1.41		nF
I_{SC}	SC Data	$t_{sc}\leq 10\mu s, V_{GE}\leq 15V,$ $T_j=125^\circ C, V_{CC}=600V,$ $V_{CEM}\leq 1200V$		2250		A
R_{Gint}	Internal Gate Resistance			0.7		Ω

DIODE-inverter $T_C=25^\circ C$ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD450HTL120C7S	Units
V_{RRM}	Collector-Emitter Voltage @ $T_j=25^\circ C$	1200	V
I_F	DC Forward Current @ $T_C=80^\circ C$	450	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	900	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
V_F	Diode Forward Voltage	$I_F=450A, V_{GE}=0V$	$T_j=25^\circ C$		1.80	2.20	V
			$T_j=125^\circ C$		1.90		
Q_r	Recovered Charge	$V_R=600V,$	$T_j=25^\circ C$		58		μC
			$T_j=125^\circ C$		99		
I_{RM}	Peak Reverse Recovery Current	$I_F=450A,$ $R_G=2.3\Omega,$	$T_j=25^\circ C$		372		A
			$T_j=125^\circ C$		492		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$		22		mJ
			$T_j=125^\circ C$		45		

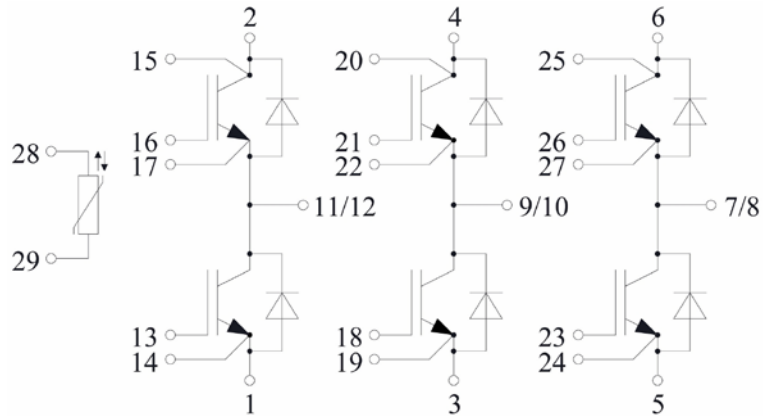
Electrical Characteristics of NTC $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

IGBT Module

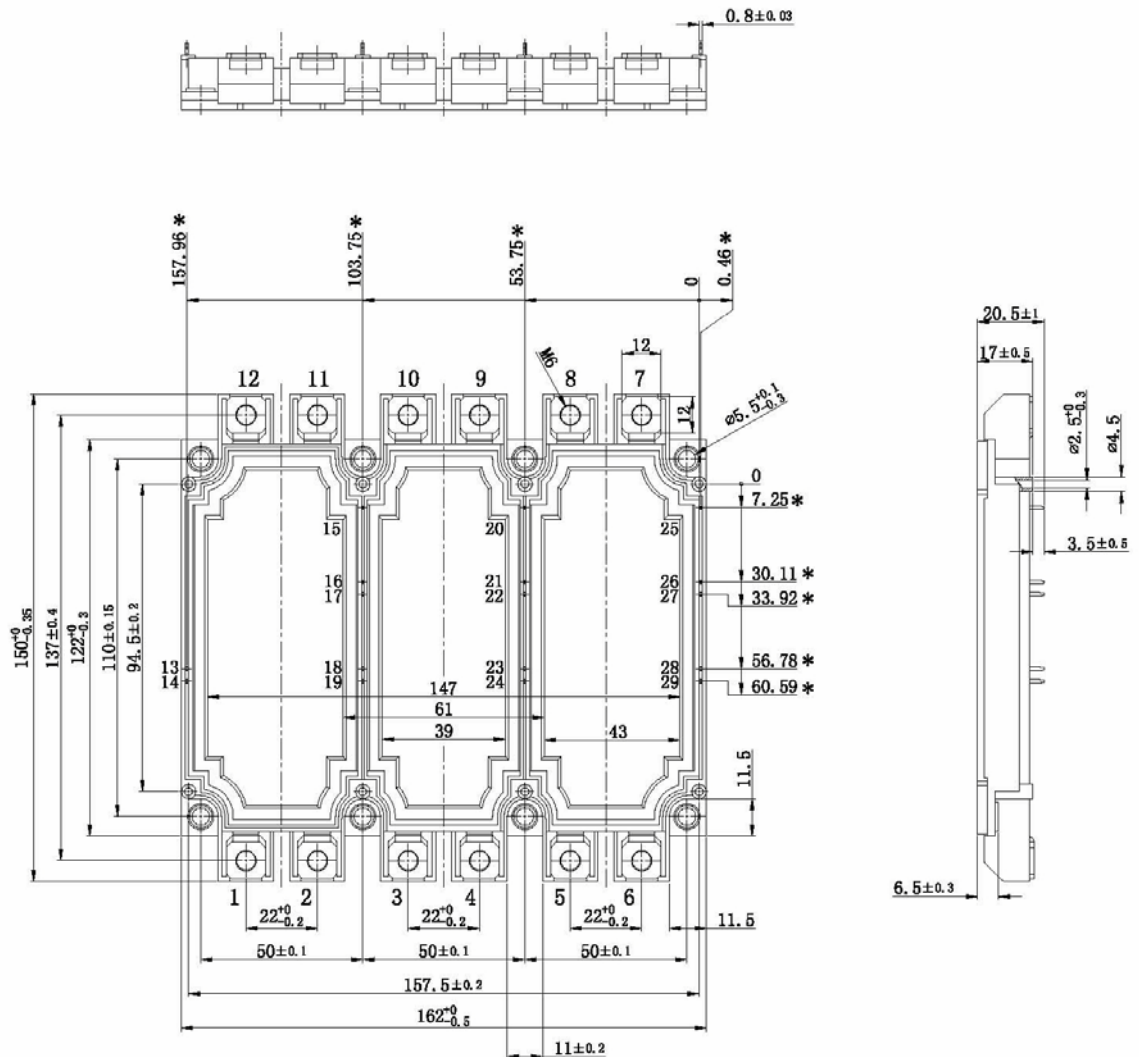
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$		2500		V
L_{CE}	Stray Inductance		20		nH
$R_{\text{CC'+EE'}}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^{\circ}\text{C}$		1.1		m Ω
$R_{\theta\text{JC}}$	Junction-to-Case (per IGBT) Junction-to-Case (per DIODE)			0.047 0.078	K/W
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		0.005		K/W
T_{jmax}	Maximum Junction Temperature			175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}\text{C}$
Mounting Torque	Power Terminal Screw:M5	3.0		6.0	N.m
	Mounting Screw:M6	3.0		6.0	N.m
Weight	Weight of Module		910		g

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters



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