

STARPOWER

SEMICONDUCTOR™

IGBT

GD1200HFT120C3S

Preliminary

Molding Type Module**1200V/1200A 2 in one-package**

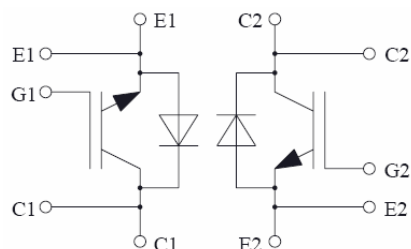
General Description

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

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



Equivalent Circuit Schematic

Typical Applications

- AC inverter drives
- Switching mode power supplies
- Electronic welders

Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Description	GD1200HFT120C3S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=70^{\circ}\text{C}$	1600	A
		1200	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	2400	A
I_F	Diode Continuous Forward Current	1200	A
I_{FM}	Diode Maximum Forward Current	2400	A
P_D	Maximum power Dissipation @ $T_J=150^{\circ}\text{C}$	5208	W
T_{SC}	Short Circuit Withstand Time @ $T_J=125^{\circ}\text{C}$	10	μs
T_J	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
I^2t -value, Diode	$V_R=0\text{V}$, $t=10\text{ms}$, $T_J=125^{\circ}\text{C}$	300	kA^2s
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	V
Mounting Torque	Power Terminal Screw:M4	1.7 to 2.3	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{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	$I_C=48\text{mA}$, $V_{CE}=V_{GE}$, $T_J=25^{\circ}\text{C}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1200\text{A}$, $V_{GE}=15\text{V}$, $T_J=25^{\circ}\text{C}$		1.7		V
		$I_C=1200\text{A}$, $V_{GE}=15\text{V}$, $T_J=125^{\circ}\text{C}$		2.0		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_{ge}	Gate charge	$I_C=1200A, V_{CE}=600V,$ $V_{GE}=-15 \dots +15V$		11.5		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=1200A,$ $R_{Gon}=2.4\Omega,$ $R_{Goff}=0.82\Omega,$ $V_{GE} = \pm 15V, T_j=25^\circ C$		600		ns
t_r	Rise Time			230		ns
$t_{d(off)}$	Turn-Off Delay Time			820		ns
t_f	Fall Time			150		ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=1200A,$ $R_{Gon}=2.4\Omega,$ $R_{Goff}=0.82\Omega,$ $V_{GE} = \pm 15V, T_j=125^\circ C$		660		ns
t_r	Rise Time			220		ns
$t_{d(off)}$	Turn-Off Delay Time			960		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss	$V_{GE} = \pm 15V, T_j=125^\circ C$		245		mJ
E_{off}	Turn-Off Switching Loss			190		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		86		nF
C_{oes}	Output Capacitance			5		nF
C_{res}	Reverse Transfer Capacitance			4		nF
I_{SC}	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		4800		A
L_{CE}	Stray Inductance			20		nH
$R_{CC'+EE'}$	Module lead resistance, terminal to chip	$T_C=25^\circ C$		0.18		m Ω

Electrical Characteristics of DIODE $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =1200A	T _j =25℃		2.2	2.8	V
			T _j =125℃		2.0		
Q _r	Diode Reverse Recovery Charge	I _F =1200A, V _R =600V, di/dt=-5400A/μs, V _{GE} =-15V	T _j =25℃		57		μC
			T _j =125℃		135		
I _{RM}	Diode Peak Reverse Recovery Current		T _j =25℃		340		A
			T _j =125℃		530		
E _{rec}	Reverse Recovery Energy		T _j =25℃		18		mJ
			T _i =125℃		35		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.024	K/W
$R_{\theta JC}$	Junction-to-Case (Diode Part, per 1/2 Module)		0.043	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	0.006		K/W
Weight	Weight of Module	1500		g

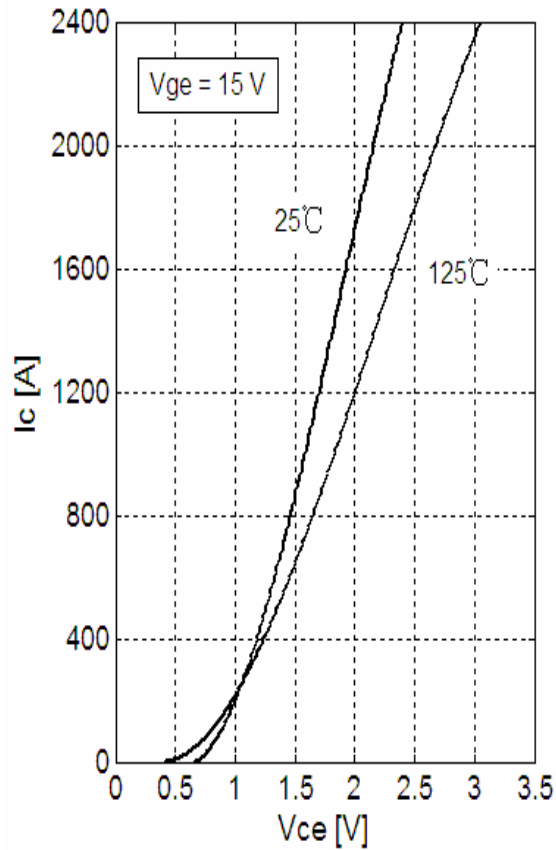


Fig 1. Typical IGBT Output Characteristics

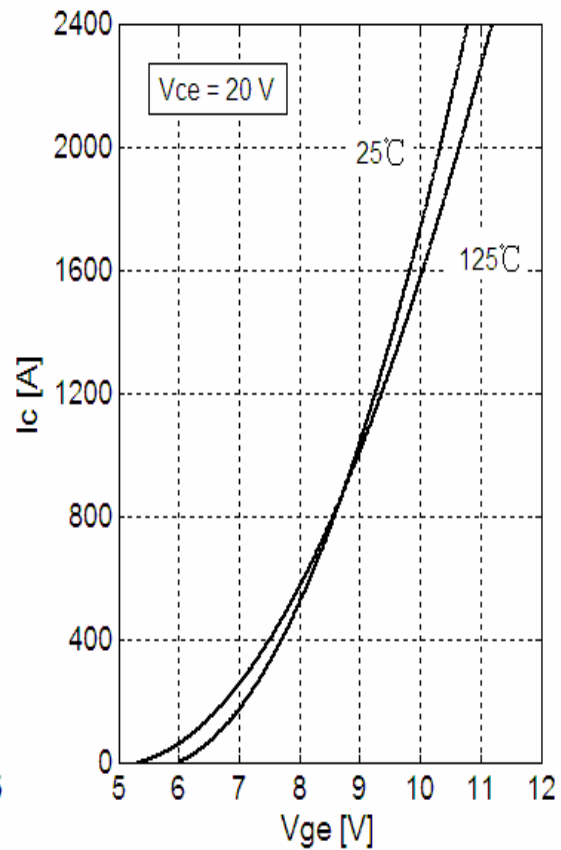


Fig 2. Typical IGBT Transfer Characteristics

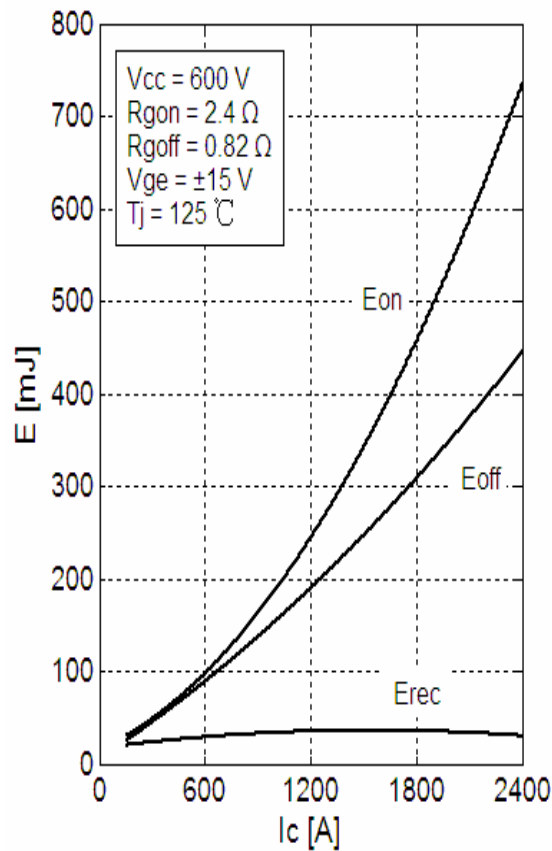


Fig 3. IGBT Switching Loss vs Collector Current

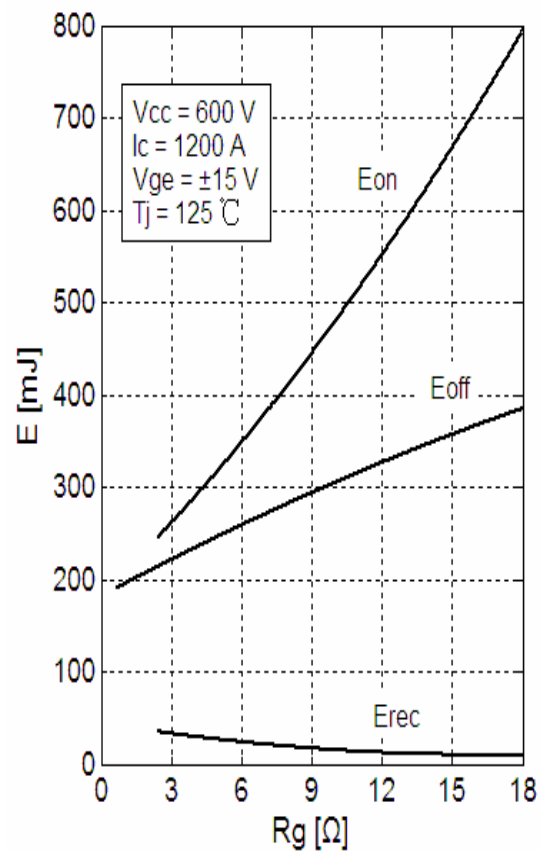


Fig 4. IGBT Switching Loss vs Gate Resistor

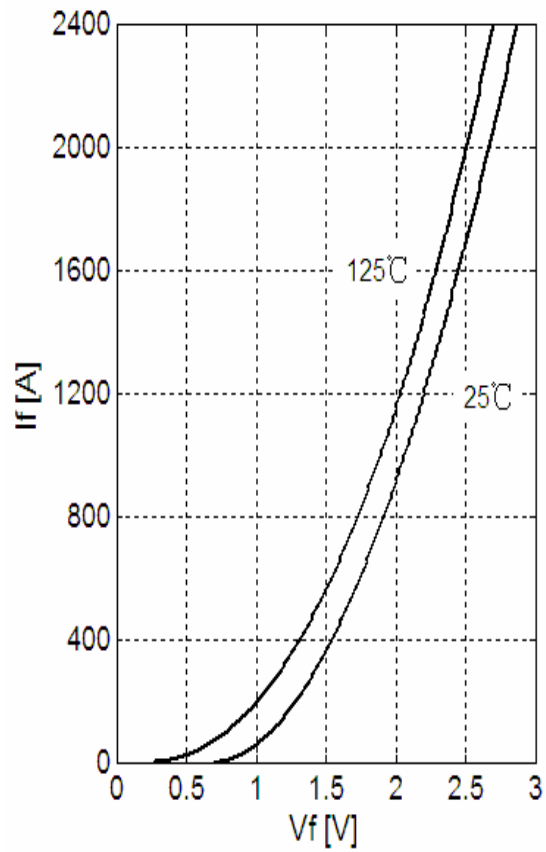


Fig 7. Typical Diode Forward Characteristics

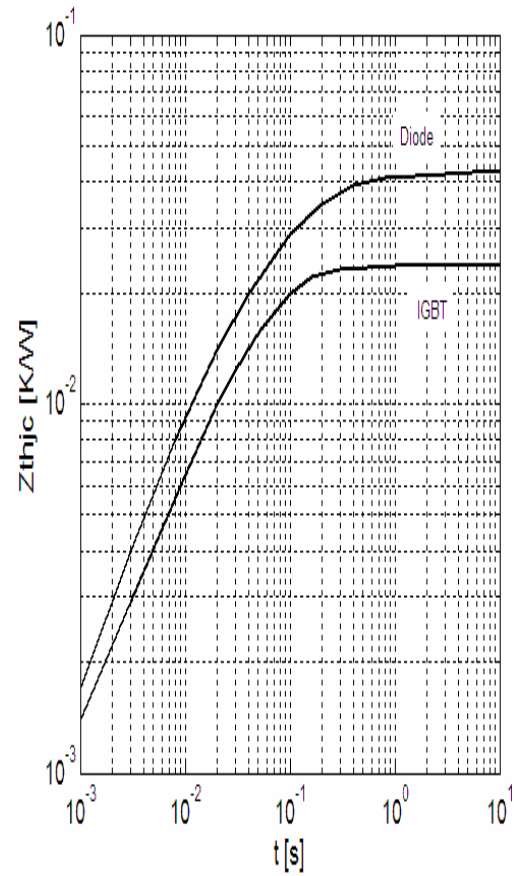
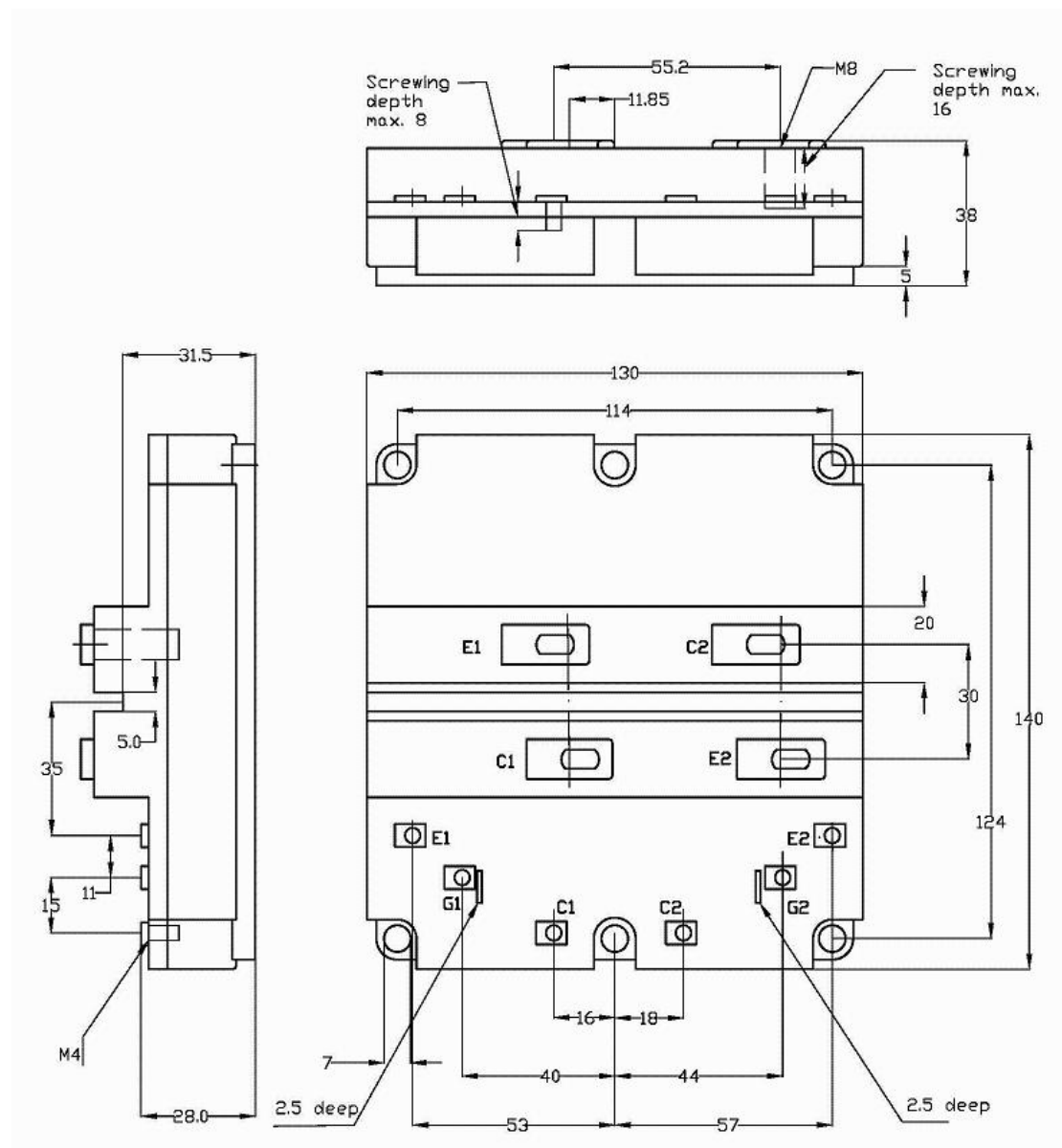


Fig 8. Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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