

# STARPOWER

SEMICONDUCTOR™

# IGBT

## GD1600SGL170C3S

## Preliminary

**Molding Type Module****1700V/1600A 1 in one-package**

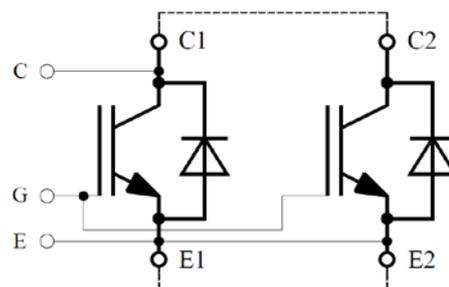
### General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as high power converters.



### Features

- Low  $V_{CE(sat)}$  SPT+ IGBT technology
- 10 $\mu$ 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



external connection to be done  
Equivalent Circuit Schematic

### Typical Applications

- AC Inverter Drives
- Uninterruptible Power Supply
- Wind Turbines

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

Symbol	Description	GD1600SGL170C3S	Units
$V_{CES}$	Collector-Emitter Voltage	1700	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=100^\circ\text{C}$	3000	A
		1600	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	3200	A
$I_F$	Diode Continuous Forward Current	1600	A
$I_{FM}$	Diode Maximum Forward Current	3200	A
$P_D$	Maximum power Dissipation @ $T_j=175^\circ\text{C}$	13.6	kW
$T_{jmax}$	Maximum Junction Temperature	175	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
$V_{ISO}$	Isolation Voltage RMS, $f=50\text{Hz}$ , $t=1\text{min}$	3400	V
Mounting Torque	Signal Terminal Screw:M4	1.8 to 2.1	N.m
	Power Terminal Screw:M8	8.0 to 10	
	Mounting Screw:M6	4.25 to 5.75	

**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
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1700			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	$I_C=64\text{mA}$ , $V_{CE}=V_{GE}$ , $T_j=25^\circ\text{C}$	4.5		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=1600\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^\circ\text{C}$		2.30	2.75	V
		$I_C=1600\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$		2.60		

## Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$Q_G$	Gate charge	$V_{GE}=-15\dots+15V$		14.1		$\mu C$
$R_{Gint}$	Internal Gate Resistor	$T_j=25^\circ C$		1.5		$\Omega$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V,$ $I_C=1600A,$ $R_{Gon}=0.82\Omega,$ $V_{GE}=\pm 15V,$ $T_j=25^\circ C$		289		ns
$t_r$	Rise Time			301		ns
$t_{d(off)}$	Turn-Off Delay Time			176		ns
$t_f$	Fall Time			189		ns
$E_{on}$	Turn-On Switching Loss			380		mJ
$E_{off}$	Turn-Off Switching Loss			525		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V,$ $I_C=1600A,$ $R_G=0.82\Omega,$ $V_{GE}=\pm 15V,$ $T_j=125^\circ C$		1055		ns
$t_r$	Rise Time			1135		ns
$t_{d(off)}$	Turn-Off Delay Time			150		ns
$t_f$	Fall Time			169		ns
$E_{on}$	Turn-On Switching Loss			460		mJ
$E_{off}$	Turn-Off Switching Loss			595		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		152		nF
$C_{oes}$	Output Capacitance			10.2		nF
$C_{res}$	Reverse Transfer Capacitance			6.4		nF
$I_{SC}$	SC Data	$t_{sc}\leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1200V,$ $V_{CEM}\leq 1700V$		7200		A
$L_{CE}$	Stray Inductance			12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.19		m $\Omega$

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	$I_F=1600A$	$T_j=25^\circ C$		1.75	2.05	V
			$T_j=125^\circ C$		1.80		
$Q_r$	Recovered Charge	$I_F=1600A,$	$T_j=25^\circ C$		350		$\mu C$
			$T_j=125^\circ C$		660		
$I_{RM}$	Reverse Recovery Current	$V_R=900V,$ $R_{Gon}=0.82\Omega,$	$T_j=25^\circ C$		900		A
			$T_j=125^\circ C$		1300		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$		280		mJ
			$T_j=125^\circ C$		450		

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		11	K/kW
$R_{\theta JC}$	Junction-to-Case (per Diode)		22	K/kW
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied, per Module)	6		K/kW
Weight	Weight of Module	1500		g



## Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see [www.powersemi.cc](http://www.powersemi.cc)), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.  
Changes of this product data sheet are reserved.