

STARPOWER

SEMICONDUCTOR™

IGBT

GD600MPT170P1S

Molding Type Module**1700V/600A half of 3-level 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 3-level-application.



Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 10 μ s short circuit capability
- Low inductance case
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- High power and thermal cycling capability

Typical Applications

3-Level-Application.

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

Symbol	Description	GD600MPT170P1S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1700	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	1000 600	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	1200	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	3.83	kW

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	$I_C=24.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=600\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		2.00	2.45	V
		$I_C=600\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=600A,$ $R_G=2.0\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		285		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			820		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			131		mJ
E_{off}	Turn-Off Switching Loss			128		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=600A,$ $R_G=2.0\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		305		ns
t_r	Rise Time			86		ns
$t_{d(off)}$	Turn-Off Delay Time			1030		ns
t_f	Fall Time			300		ns
E_{on}	Turn-On Switching Loss			190		mJ
E_{off}	Turn-Off Switching Loss			188		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1Mhz,$ $V_{GE}=0V$		52.9		nF
C_{oes}	Output Capacitance			2.20		nF
C_{res}	Reverse Transfer Capacitance			1.75		nF
R_{Gint}	Internal Gate Resister			1.7		Ω
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM} \leq 1700V$		2400		A

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

Symbol	Description	GD600MPT170P1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^{\circ}\text{C}$	1700	V
I_F	DC Forward Current $T_C=100^{\circ}\text{C}$	600	A
I_{FM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	1200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =600A, V _{GE} =0V	T _j =25°C		1.80	2.20	V
			T _j =125°C		1.90		
Q _r	Recovered Charge	I _F =600A, V _R =900V, R _G =2.0Ω, V _{GE} =-15V	T _j =25°C		160		μC
			T _j =125°C		265		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		660		A
			T _j =125°C		720		
E _{rec}	Reverse Recovery Energy		T _j =25°C		81.0		mJ
			T _j =125°C		143		

DIODE-3-level $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD600MPT170P1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^{\circ}\text{C}$	1700	V
I_F	DC Forward Current $T_C=100^{\circ}\text{C}$	600	A
I_{FM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	1200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =600A, V _{GE} =0V	T _j =25°C		1.80	2.20	V
			T _j =125°C		1.90		
Q _r	Recovered Charge	I _F =600A, V _R =900V, R _G =2.0Ω, V _{GE} =-15V	T _j =25°C		160		μC
			T _j =125°C		265		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		660		A
			T _j =125°C		720		
E _{rec}	Reverse Recovery Energy	T _j =25°C		81.0		mJ	
		T _j =125°C		143			

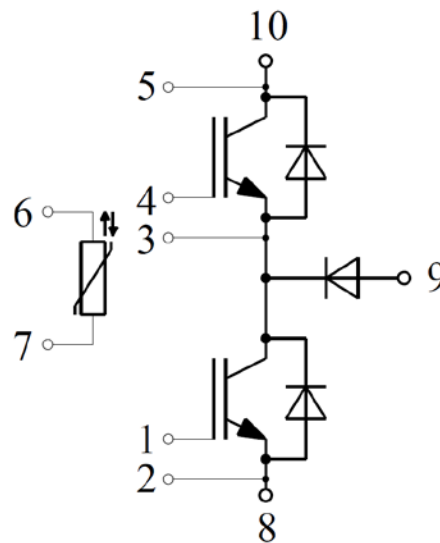
NTC $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	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

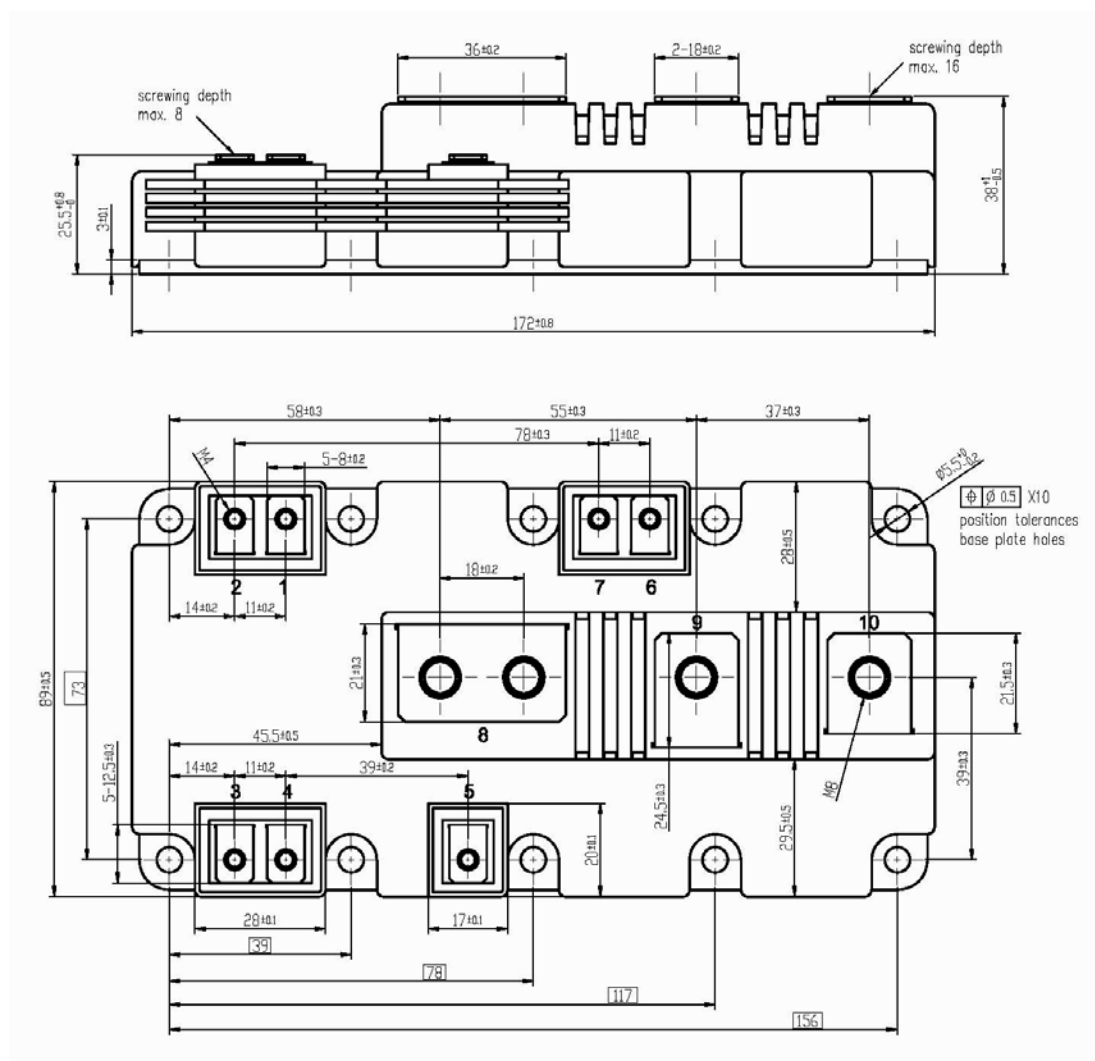
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000			V
L_{CE}	Stray Inductance		18		nH
$R_{\text{CC}'+\text{EE}'}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^{\circ}\text{C}$		0.30		$\text{m}\Omega$
$R_{\theta\text{JC}}$	Junction-to-Case (per inverter-IGBT) Junction-to-Case (per inverter-DIODE) Junction-to-Case (per DIODE-3-level)			39.2 75.3 75.3	K/kW
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		4.5		K/kW
T_{jmax}	Maximum Junction Temperature			175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}\text{C}$
Mounting Torque	Power Terminal Screw:M4	1.8		2.1	N.m
	Power Terminal Screw:M8	8.0		10	N.m
	Mounting Screw:M5	3.0		5.0	N.m
Weight	Weight of Module		825		g

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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