

STARPOWER

SEMICONDUCTOR

IGBT

GD10FST60L4S

Molding Type Module**600V/10A 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 $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- 5 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD

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	GD10FST60L4S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	600	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	20 10	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	20	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	69	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	600			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V},$ $T_j=25^{\circ}\text{C}$			1.0	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	$I_C=500\mu\text{A}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	4.0		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=10\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.60	2.05	V
		$I_C=10\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.00		
		$I_C=10\text{A}, V_{GE}=15\text{V},$ $T_j=150^{\circ}\text{C}$		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=400V, I_C=10A,$ $R_G=47\Omega, V_{GE}=15V,$ $T_j=25^\circ C$		38		ns
t_r	Rise Time			19		ns
$t_{d(off)}$	Turn-Off Delay Time			119		ns
t_f	Fall Time			25		ns
E_{on}	Turn-On Switching Loss			0.09		mJ
E_{off}	Turn-Off Switching Loss			0.21		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=400V, I_C=10A,$ $R_G=47\Omega, V_{GE}=15V,$ $T_j=125^\circ C$		38		ns
t_r	Rise Time			23		ns
$t_{d(off)}$	Turn-Off Delay Time			135		ns
t_f	Fall Time			40		ns
E_{on}	Turn-On Switching Loss			0.15		mJ
E_{off}	Turn-Off Switching Loss			0.27		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=400V, I_C=10A,$ $R_G=47\Omega, V_{GE}=15V,$ $T_j=150^\circ C$		39		ns
t_r	Rise Time			24		ns
$t_{d(off)}$	Turn-Off Delay Time			140		ns
t_f	Fall Time			45		ns
E_{on}	Turn-On Switching Loss			0.17		mJ
E_{off}	Turn-Off Switching Loss			0.28		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		0.54		nF
C_{oes}	Output Capacitance			0.05		nF
C_{res}	Reverse Transfer Capacitance			0.02		nF
Q_G	Gate Charge	$V_{CC}=400V, I_C=10A,$ $V_{GE}=15V$		24		nC
I_{SC}	SC Data	$t_p \leq 5\mu s, V_{GE}=15V,$ $T_j=150^\circ C, V_{CC}=400V,$ $V_{CEM} \leq 600V$		80		A

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

Symbol	Description	GD10FST60L4S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^{\circ}\text{C}$	600	V
I_F	DC Forward Current	10	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	20	A

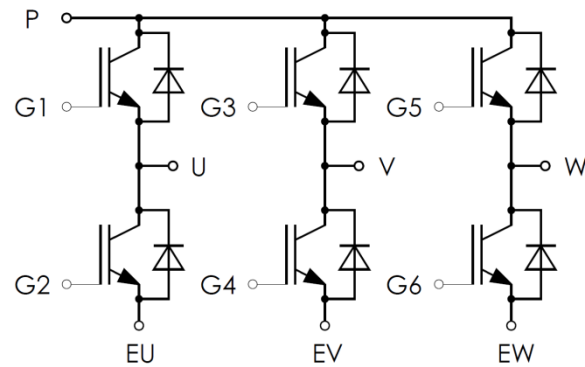
Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =10A, V _{GE} =0V	T _j =25℃		1.55	2.00	V
			T _j =125℃		1.55		
			T _j =150℃		1.55		
Q _r	Recovered Charge	I _F =10A, V _R =400V, R _G =47Ω, V _{GE} =-15V	T _j =25℃		0.6		μC
			T _j =125℃		1.1		
			T _j =150℃		1.3		
I _{RM}	Peak Reverse Recovery Current		T _j =25℃		15		A
			T _j =125℃		16		
			T _j =150℃		19		
E _{rec}	Reverse Recovery Energy		T _j =25℃		0.09		mJ
			T _j =125℃		0.18		
			T _j =150℃		0.20		

IGBT Module

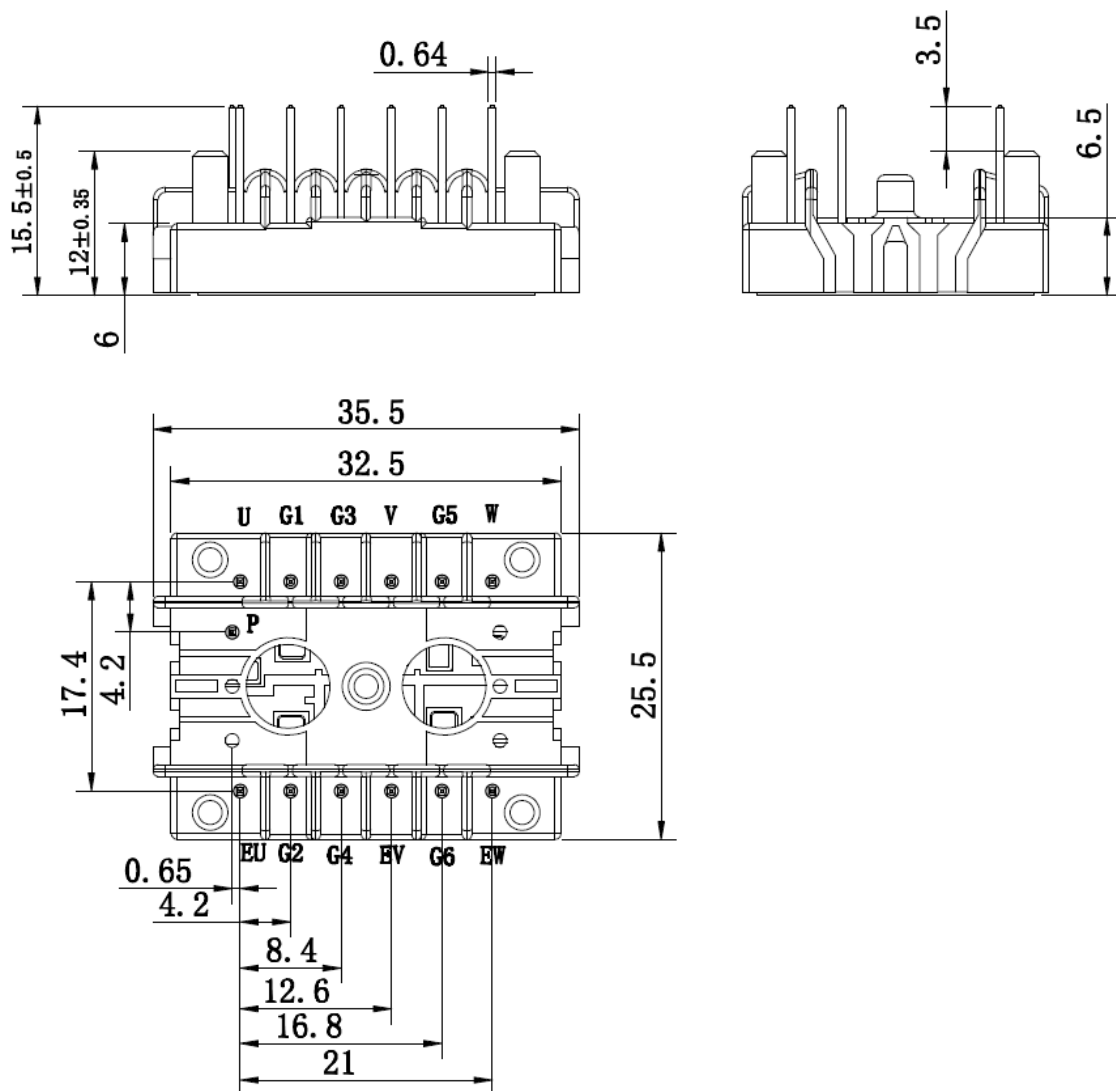
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000			V
L_{CE}	Stray Inductance		25		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^{\circ}\text{C}$		9.50		m Ω
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter)			2.183	K/W
	Junction-to-Case (per Diode-inverter)			3.349	
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.077		K/W
T_{jmax}	Maximum Junction Temperature			175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40		150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}\text{C}$
F	Mounting Force Per Clamp	30		50	N
G	Weight of Module		10		g

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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