

STARPOWER

SEMICONDUCTOR

IGBT

GD30PJT60L2S

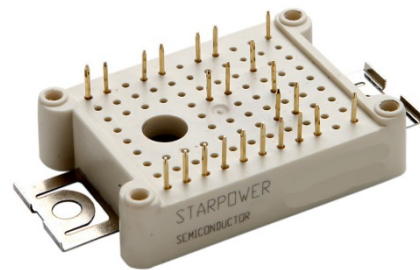
600V/30A PIM in one-package

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

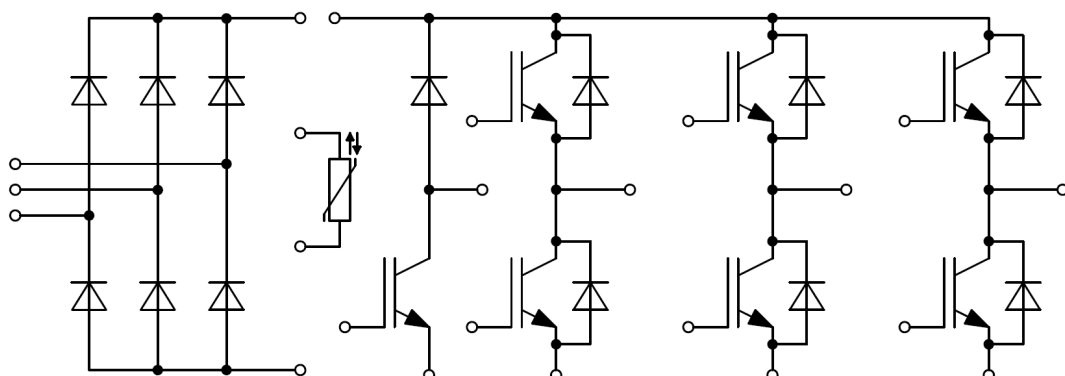
- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated heatsink using DBC technology



Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	47	A
	@ $T_C=100^{\circ}\text{C}$	30	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	60	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	137	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	60	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	30	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	270	A
I^2t	I^2t -value, $V_R=0\text{V}, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	360	A^2s

IGBT-brake

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	35	A
	@ $T_C=100^{\circ}\text{C}$	20	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	40	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	111	W

Diode-brake

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	20	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	40	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature(inverter,brake)	175	$^{\circ}\text{C}$
	Maximum Junction Temperature (rectifier)	150	
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	2500	V

IGBT-inverter Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=30\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.55	2.00	V
		$I_C=30\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		1.70		
		$I_C=30\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		1.80		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.43\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.0	5.8	6.5	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
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.63		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.30		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		20		ns
t_r	Rise Time			161		ns
$t_{d(off)}$	Turn-Off Delay Time			138		ns
t_f	Fall Time			44		ns
E_{on}	Turn-On Switching Loss			0.51		mJ
E_{off}	Turn-Off Switching Loss			0.59		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		21		ns
t_r	Rise Time			212		ns
$t_{d(off)}$	Turn-Off Delay Time			162		ns
t_f	Fall Time			60		ns
E_{on}	Turn-On Switching Loss			0.66		mJ
E_{off}	Turn-Off Switching Loss			0.74		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		22		ns
t_r	Rise Time			225		ns
$t_{d(off)}$	Turn-Off Delay Time			183		ns
t_f	Fall Time			64		ns
E_{on}	Turn-On Switching Loss			0.76		mJ
E_{off}	Turn-Off Switching Loss			0.79		mJ
I_{SC}	SC Data	$t_p \leq 6\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=360\text{V}, V_{CEM} \leq 600\text{V}$		150		A

Diode-inverter Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=30\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.60	2.05	V
		$I_F=30\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.55		
		$I_F=30\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.50		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=30\text{A},$ $-di/dt=2000\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^{\circ}\text{C}$		1.2		μC
I_{RM}	Peak Reverse Recovery Current			44		A
E_{rec}	Reverse Recovery Energy			0.34		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=30\text{A},$ $-di/dt=2000\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^{\circ}\text{C}$		2.2		μC
I_{RM}	Peak Reverse Recovery Current			49		A
E_{rec}	Reverse Recovery Energy			0.54		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=30\text{A},$ $-di/dt=2000\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^{\circ}\text{C}$		2.6		μC
I_{RM}	Peak Reverse Recovery Current			50		A
E_{rec}	Reverse Recovery Energy			0.65		mJ

Diode-rectifier Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=30\text{A}, T_j=150^{\circ}\text{C}$		1.18		V
I_R	Reverse Current	$T_j=150^{\circ}\text{C}, V_R=1600\text{V}$			1.0	mA

IGBT-brake Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=20\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.55	2.00	V
		$I_C=20\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		1.70		
		$I_C=20\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		1.80		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.29\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.0	5.8	6.5	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
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		1.10		nF
C_{res}	Reverse Transfer Capacitance			0.03		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.20		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		20		ns
t_r	Rise Time			131		ns
$t_{d(off)}$	Turn-Off Delay Time			118		ns
t_f	Fall Time			72		ns
E_{on}	Turn-On Switching Loss			0.33		mJ
E_{off}	Turn-Off Switching Loss			0.43		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		21		ns
t_r	Rise Time			162		ns
$t_{d(off)}$	Turn-Off Delay Time			142		ns
t_f	Fall Time			96		ns
E_{on}	Turn-On Switching Loss			0.43		mJ
E_{off}	Turn-Off Switching Loss			0.57		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=20\text{A}, R_G=18\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		22		ns
t_r	Rise Time			169		ns
$t_{d(off)}$	Turn-Off Delay Time			153		ns
t_f	Fall Time			102		ns
E_{on}	Turn-On Switching Loss			0.50		mJ
E_{off}	Turn-Off Switching Loss			0.58		mJ
I_{SC}	SC Data	$t_p \leq 6\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=360\text{V}, V_{CEM} \leq 600\text{V}$		100		A

Diode-brake Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=20\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.30	1.75	V
		$I_F=20\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.25		
		$I_F=20\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.25		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=20\text{A},$ $-di/dt=650\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^{\circ}\text{C}$		1.2		μC
I_{RM}	Peak Reverse Recovery Current			20		A
E_{rec}	Reverse Recovery Energy			0.29		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=20\text{A},$ $-di/dt=650\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^{\circ}\text{C}$		1.7		μC
I_{RM}	Peak Reverse Recovery Current			22		A
E_{rec}	Reverse Recovery Energy			0.39		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=20\text{A},$ $-di/dt=650\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^{\circ}\text{C}$		1.9		μC
I_{RM}	Peak Reverse Recovery Current			23		A
E_{rec}	Reverse Recovery Energy			0.45		mJ

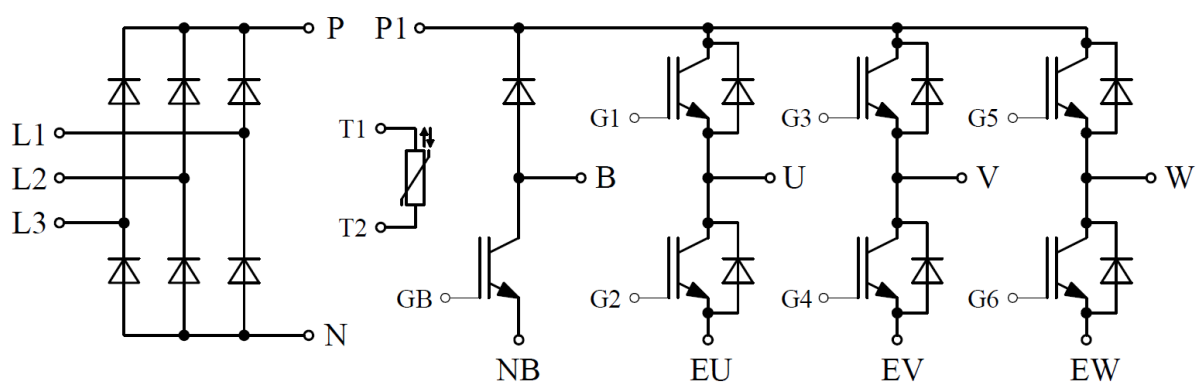
NTC Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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

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

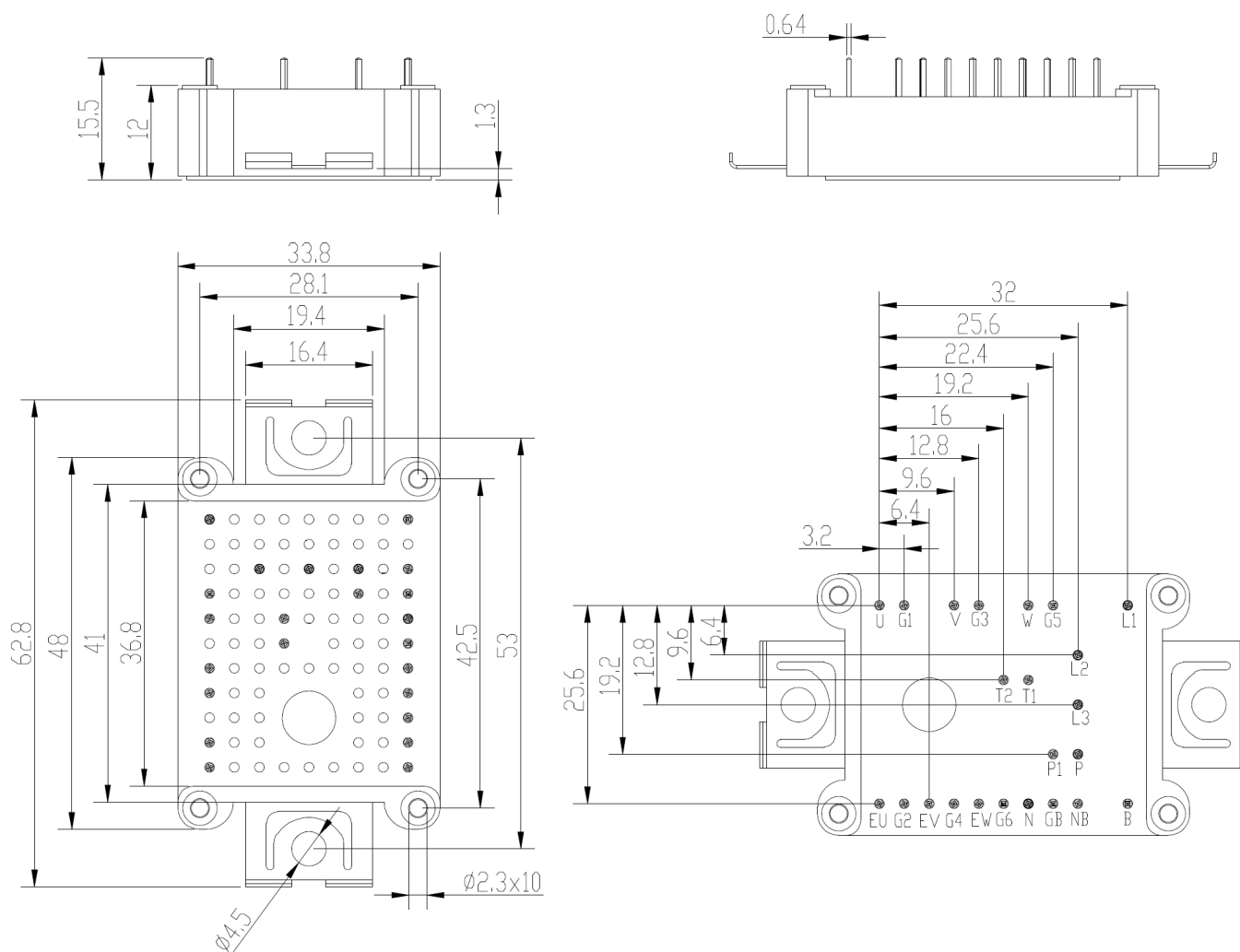
Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		30		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance, Terminal to Chip		8.00 6.00		m Ω
R_{thJC}	Junction-to-Case (per IGBT-inverter)		0.994	1.093	K/W
	Junction-to-Case (per Diode-inverter)		1.606	1.767	
	Junction-to-Case (per Diode-rectifier)		1.110	1.221	
	Junction-to-Case (per IGBT-brake)		1.218	1.340	
	Junction-to-Case (per Diode-brake)		1.925	2.117	
R_{thCH}	Case-to-Heatsink (per IGBT-inverter)		0.952		K/W
	Case-to-Heatsink (per Diode-inverter)		1.539		
	Case-to-Heatsink (per Diode-rectifier)		1.064		
	Case-to-Heatsink (per IGBT-brake)		1.167		
	Case-to-Heatsink (per Diode-brake)		1.844		
	Case-to-Sink (per Module)		0.058		
F	Mounting Force Per Clamp	20		50	N
G	Weight of Module		24		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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