

STARPOWER

SEMICONDUCTOR

IGBT

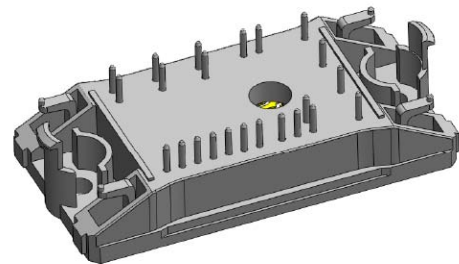
GD30PJT60F1S

Molding Type Module

600V/30A PIM in one-package

General Description

STARPOWER IGBT Power Module provides ultra low conduction 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
- 5 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- 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	GD30PJT60F1S	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 @ $T_C=25^\circ\text{C}$	50	A
	@ $T_C=80^\circ\text{C}$	30	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	60	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	125	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	$I_C=1.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	4.0		6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=30\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_C=30\text{A}, V_{GE}=15\text{V}, T_j=175^\circ\text{C}$		1.90		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=30A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		39		ns
t_r	Rise Time			28		ns
$t_{d(off)}$	Turn-Off Delay Time			90		ns
t_f	Fall Time			38		ns
E_{on}	Turn-On Switching Loss			0.33		mJ
E_{off}	Turn-Off Switching Loss			0.54		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=30A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_j=175^\circ C$		39		ns
t_r	Rise Time			30		ns
$t_{d(off)}$	Turn-Off Delay Time			109		ns
t_f	Fall Time			52		ns
E_{on}	Turn-On Switching Loss			0.87		mJ
E_{off}	Turn-Off Switching Loss			0.80		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		2113		pF
C_{oes}	Output Capacitance			197		pF
C_{res}	Reverse Transfer Capacitance			65		pF
Q_G	Gate Charge	$V_{CC}=400V, I_C=30A,$ $V_{GE}=15V$		59		nC
R_{Gint}	Internal Gate Resister			/		Ω
I_{SC}	SC Data	$t_p \leq 5\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=400V,$ $V_{CEM} \leq 600V$		315		A

Diode-inverter $T_C=25^\circ C$ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PJT60F1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	600	V
I_F	DC Forward Current	30	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	60	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=30A, V_{GE}=0V$	$T_j=25^\circ C$	1.30	1.75	V
			$T_j=125^\circ C$	1.25		
Q_r	Recovered Charge	$I_F=30A,$ $V_R=300V,$ $R_G=10\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	2.2		μC
			$T_j=125^\circ C$	4.6		
I_{RM}	Peak Reverse Recovery Current	$V_R=300V,$ $R_G=10\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	38		A
			$T_j=125^\circ C$	44		
E_{rec}	Reverse Recovery Energy	$V_R=300V,$ $R_G=10\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	0.41		mJ
			$T_j=125^\circ C$	0.92		

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

Symbol	Description	GD30PJT60F1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ\text{C}$	1600	V
$I_{F(AV)}$	Average On-state Current @ $T_C=100^\circ\text{C}$	20	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ $T_C=80^\circ\text{C}$	40	A
I_{FSM}	Surge Forward Current $V_R=0V, t_p=10\text{ms}, T_j=45^\circ\text{C}$	270	A
I^2t	I^2t -value, $V_R=0V, t_p=10\text{ms}, T_j=45^\circ\text{C}$	360	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=30\text{A}$ $T_j=150^\circ\text{C}$		1.26		V
I_R	Reverse Current	$T_j=150^\circ\text{C}, V_R=1600\text{V}$			1.0	mA

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

Symbol	Description	GD30PJT60F1S	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 @ $T_C=25^\circ\text{C}$ @ $T_C=80^\circ\text{C}$	30 15	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	30	A
P_{tot}	Total Power Dissipation @ $T_j=175^\circ\text{C}$	85	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	$V_{CE}=V_{CES}, V_{GE}=0V,$ $T_j=25^\circ\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0V,$ $T_j=25^\circ\text{C}$			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	$I_C=15\text{A}, V_{GE}=15\text{V},$ $T_j=25^\circ\text{C}$		1.50	1.95	V
		$I_C=15\text{A}, V_{GE}=15\text{V},$ $T_j=175^\circ\text{C}$		1.80		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=400V, I_C=15A,$ $R_G=22\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		33		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			88		ns
t_f	Fall Time			21		ns
E_{on}	Turn-On Switching Loss			0.15		mJ
E_{off}	Turn-Off Switching Loss			0.29		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=400V, I_C=15A,$ $R_G=22\Omega, V_{GE}=\pm 15V,$ $T_j=175^\circ C$		33		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			100		ns
t_f	Fall Time			33		ns
E_{on}	Turn-On Switching Loss			0.24		mJ
E_{off}	Turn-Off Switching Loss			0.48		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		1043		pF
C_{oes}	Output Capacitance			87		pF
C_{res}	Reverse Transfer Capacitance			32		pF
Q_G	Gate Charge	$V_{CC}=400V, I_C=15A,$ $V_{GE}=15V$		29		nC
R_{Gint}	Internal Gate Resister			/		Ω
I_{SC}	SC Data	$t_p \leq 5\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=400V,$ $V_{CEM} \leq 600V$		162		A

Diode-brake-chopper $T_C=25^\circ C$ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PJT60F1S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	600	V
I_F	DC Forward Current	15	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	30	A

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
V_F	Diode Forward Voltage	$I_F=15A, V_{GE}=0V$	$T_j=25^\circ C$		1.20	1.60	V
			$T_j=125^\circ C$		1.15		
Q_r	Recovered Charge	$I_F=15A,$ $V_R=300V,$ $R_G=16\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$		0.9		μC
			$T_j=125^\circ C$		1.4		
I_{RM}	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_j=25^\circ C$		27		A
			$T_j=125^\circ C$		31		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$		0.23		mJ
			$T_j=125^\circ C$		0.36		

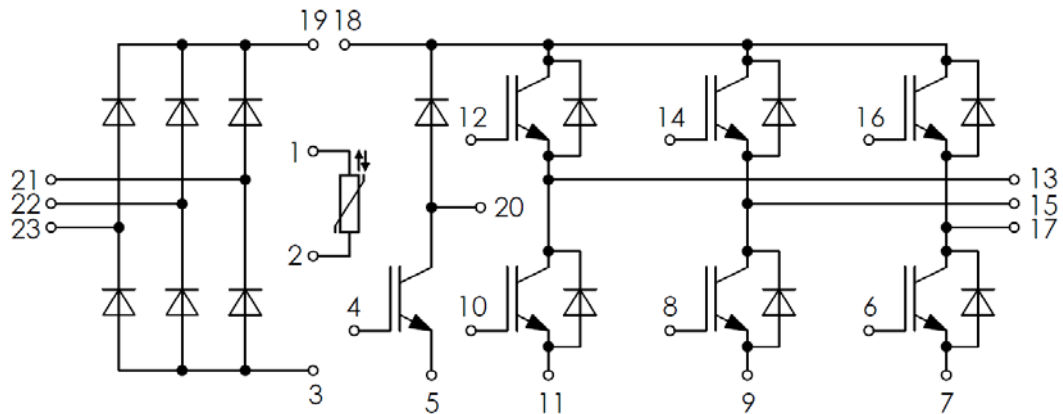
NTC $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			22.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=1486.1\Omega$	-5		5	%
P_{25}	Power Dissipation				200	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		4000		K

IGBT Module

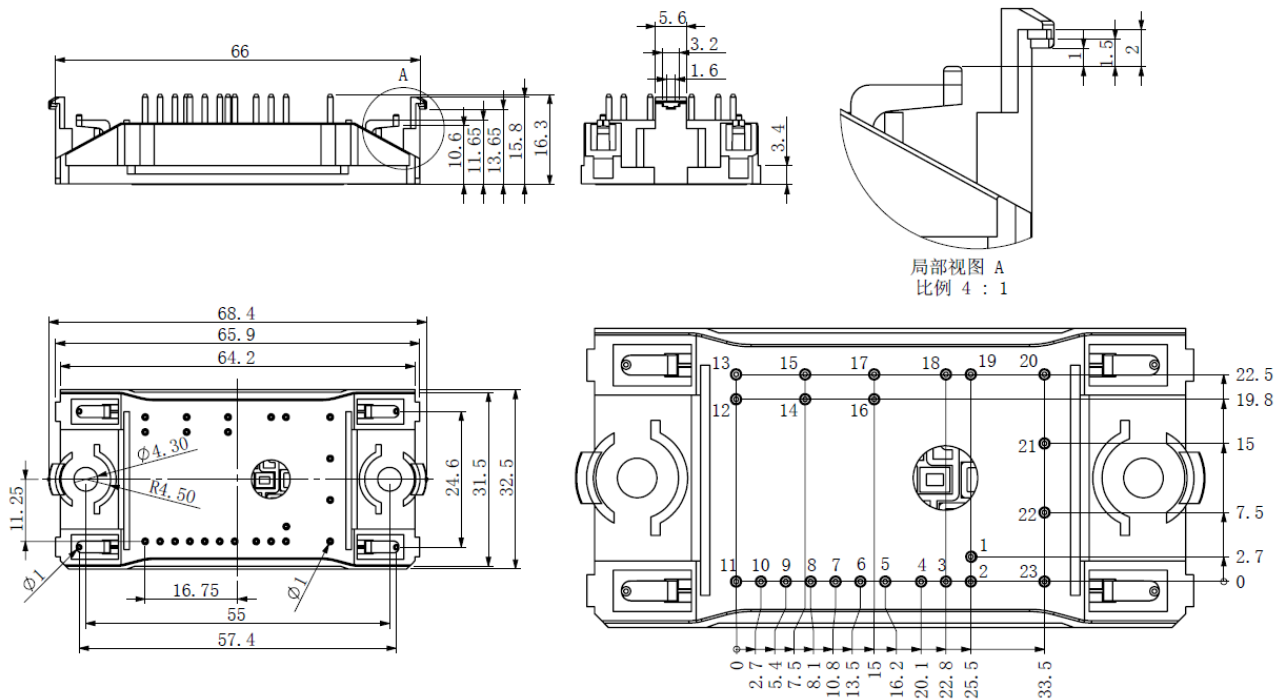
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000			V
$R_{\theta\text{JC}}$	Junction-to-Case (per IGBT-inverter)			1.204	K/W
	Junction-to-Case (per Diode-inverter)			1.983	
	Junction-to-Case (per Diode-rectifier)			1.623	
	Junction-to-Case (per IGBT-brake-chopper)			1.770	
	Junction-to-Case (per Diode-brake-chopper)			2.854	
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		0.036		K/W
T_{jmax}	Maximum Junction Temperature			150	$^\circ\text{C}$
T_{jop}	Operating Junction Temperature	-40		125	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^\circ\text{C}$

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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