STARPOWER

SEMICONDUCTOR **IGBT**

GD30PIT60C5S

Molding Type Module

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
- 5μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

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

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PIT60C5S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	55 30	A
I_{CM}	Pulsed Collector Current t_p=1ms	60	A
P_{tot}	Total Power Dissipation @ T_j=175℃	157	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.0mA,V_{CE}=V_{GE}, T_j=25℃	4.0	4.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=30A,V_{GE}=15V, T_j=25℃		1.60	2.05	V
		I_C=30A,V_{GE}=15V, T_j=125℃		1.80		

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=15Ω,V_{GE}=±15V, T_j=25℃		77		ns
t_r	Rise Time			39		ns
$t_{d(off)}$	Turn-Off Delay Time			81		ns
t_f	Fall Time			101		ns
E_{on}	Turn-On Switching Loss			0.75		mJ
E_{off}	Turn-Off Switching Loss			0.29		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=30A, R_G=15Ω,V_{GE}=±15V, T_j=125℃		78		ns
t_r	Rise Time			39		ns
$t_{d(off)}$	Turn-Off Delay Time			84		ns
t_f	Fall Time			121		ns
E_{on}	Turn-On Switching Loss			0.86		mJ
E_{off}	Turn-Off Switching Loss			0.37		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		2.11		nF
C_{oes}	Output Capacitance			0.20		nF
C_{res}	Reverse Transfer Capacitance			0.07		nF
Q_G	Gate Charge	V_{CC}=400V,I_C=30A, V_{GE}=15V		59		nC
I_{SC}	SC Data	t_P≤5μs,V_{GE}=15V, T_j=125℃,V_{CC}=400V, V_{CEM}≤600V		315		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PIT60C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	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=30V_{GE}=0V	T_j=25℃		1.45	1.90	V
			T_j=125℃		1.43		
Q_r	Recovered Charge	I_F=30A, V_R=300V, R_G=15Ω, V_{GE}=-15V	T_j=25℃		1.6		μC
			T_j=125℃		2.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		29		A
			T_j=125℃		30		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.33		mJ
			T_j=125℃		0.40		

Diode-rectifier T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PIT60C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1600	V
$I_{F(AV)}$	Average On-state Current @ T_C=100℃	31	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ T_C=80℃	60	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=45℃	320	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=45℃	510	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=30A	T_j=150℃		1.05		V
I_R	Reverse Current	T_j=150℃,V_R=1600V				2.0	mA

IGBT-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PIT60C5S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	35 20	A
I_{CM}	Pulsed Collector Current t_p=1ms	40	A
P_{tot}	Total Power Dissipation @ T_j=150℃	128	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=250μA,V_{CE}=V_{GE}, T_j=25℃	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=20A,V_{GE}=15V, T_j=25℃		1.80	2.25	V
		I_C=20A,V_{GE}=15V, T_j=125℃		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=20A, R_G=16Ω,V_{GE}=±15V, T_j=25℃		70		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			113		ns
t_f	Fall Time			119		ns
E_{on}	Turn-On Switching Loss			0.34		mJ
E_{off}	Turn-Off Switching Loss			0.26		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=20A, R_G=16Ω,V_{GE}=±15V, T_j=125℃		84		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			113		ns
t_f	Fall Time			141		ns
E_{on}	Turn-On Switching Loss			0.47		mJ
E_{off}	Turn-Off Switching Loss			0.39		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		1240		pF
C_{oes}	Output Capacitance			124		pF
C_{res}	Reverse Transfer Capacitance			44		pF
Q_G	Gate Charge	V_{CC}=400V,I_C=20A, V_{GE}=15V		71		nC
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=400V, V_{CEM}≤600V		180		A

Diode-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD30PIT60C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current	20	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	40	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=20A,V_{GE}=0V	T_j=25℃		1.30	1.75	V
			T_j=125℃		1.25		
Q_r	Recovered Charge	I_F=20A, V_R=300V, R_G=16Ω, V_{GE}=-15V	T_j=25℃		1.1		μC
			T_j=125℃		1.7		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		32		A
			T_j=125℃		37		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.27		mJ
			T_j=125℃		0.43		

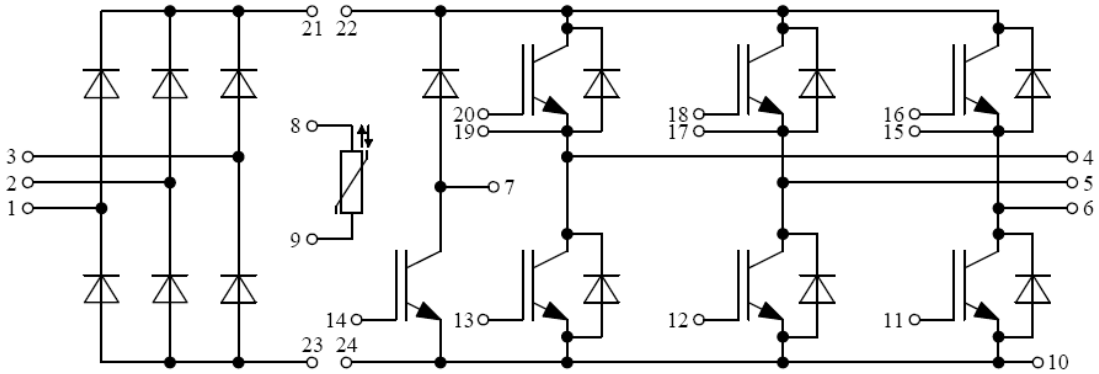
Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100℃,R_{100}=493.3Ω	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

IGBT Module

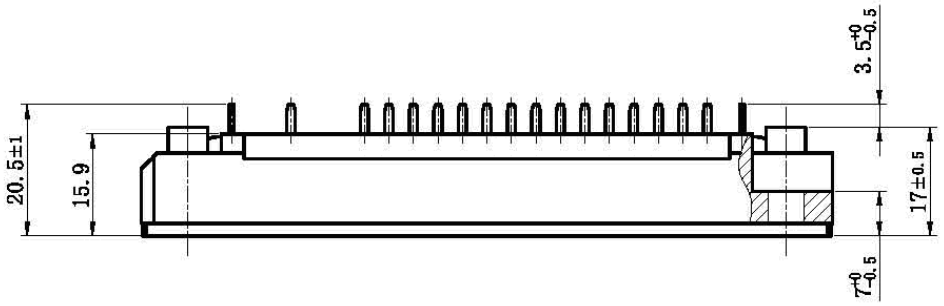
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500			V
L_{CE}	Stray Inductance		60		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		4.00 2.00		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake-chopper) Junction-to-Case (per Diode-brake-chopper)			0.958 1.679 1.138 0.980 2.332	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.02		K/W
T_j	Maximum Junction Temperature			175	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

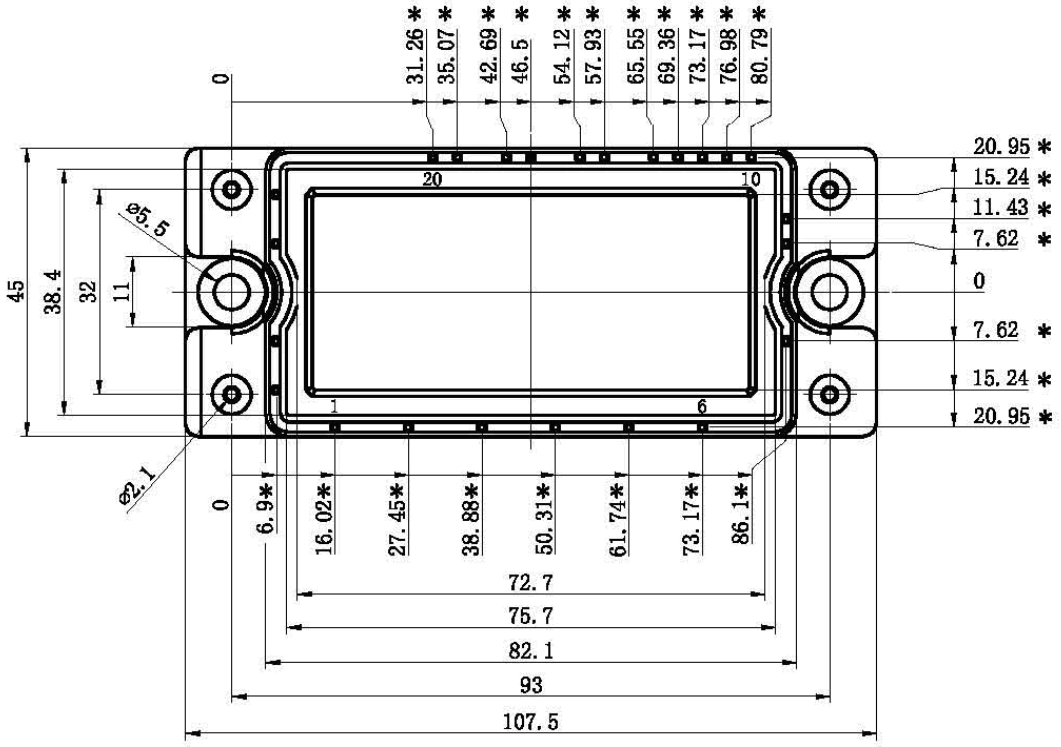
Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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