

IGBT

GD50PIT120C6S

Preliminary

Molding Type Module

1200V/50A PIM in one-package

Features

- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Square RBSOA
- 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 $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD50PIT120C6S	Units
V_{CES}	Collector-Emitter Voltage @ $T_J=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	75	A
	@ $T_C=80^{\circ}\text{C}$	50	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
P_{tot}	Total Power Dissipation @ $T_J=175^{\circ}\text{C}$	357	W
T_{SC}	Short Circuit Withstand Time @ $T_J=150^{\circ}\text{C}$	10	μs

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	$T_J=25^{\circ}\text{C}$	1200			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	$I_C=2.4\text{mA}, V_{CE}=V_{GE},$ $T_J=25^{\circ}\text{C}$	5.0	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_J=25^{\circ}\text{C}$		2.05		V
		$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_J=125^{\circ}\text{C}$		2.35		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
E_{on}	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=50\text{A},$ $R_G=5.0\Omega, V_{GE}=\pm 15\text{V},$ $T_J=25^{\circ}\text{C}$		4.0		mJ
E_{off}	Turn-Off Switching Loss			2.8		mJ
E_{tot}	Total Switching Loss			6.8		mJ
E_{on}	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=50\text{A},$ $R_G=5.0\Omega, V_{GE}=\pm 15\text{V},$ $T_J=125^{\circ}\text{C}$		5.0		mJ
E_{off}	Turn-Off Switching Loss			4.8		mJ
E_{tot}	Total Switching Loss			9.8		mJ

GD50PIT120C6S**IGBT Module**

$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=5.0\Omega, V_{GE} = \pm 15V,$ $T_J=25^\circ C$		75		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			305		ns
t_f	Fall Time			55		ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=5.0\Omega, V_{GE} = \pm 15V,$ $T_J=125^\circ C$		73		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			335		ns
t_f	Fall Time			125		ns
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		6240		pF
C_{oes}	Output Capacitance			230		pF
C_{res}	Reverse Transfer Capacitance			150		pF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		TBD		A

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

Symbol	Description	GD50PIT120C6S	Units
V_{RRM}	Collector-Emitter Voltage @ $T_J=25^\circ C$	1200	V
I_F	DC Forward Current @ $T_C=25^\circ C$	80	A
	@ $T_C=80^\circ C$	50	
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	100	A
I^2t	I^2t -value, $V_R=0V, t_p=10ms, T_J=125^\circ C$	690	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =50A,V _{GE} =0V	T _j =25°C		1.90		V
			T _j =125°C		2.00		
t _{rr}	Diode Reverse Recovery time	I _F =50A, V _R =600V, di/dt=-1000A/μs, V _{GE} =-15V	T _j =25°C		250		ns
			T _j =125°C		360		
I _{RM}	Diode Peak Reverse Recovery Current		T _j =25°C		45		A
			T _j =125°C		55		
E _{rec}	Reverse Recovery Energy		T _j =25°C		2.4		mJ
			T _j =125°C		5.0		

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

Symbol	Description	GD50PIT120C6S	Units
V_{RRM}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1600	V
$I_{F(AV)}$	DC Forward Current @ $T_C=80^{\circ}\text{C}$	59	A
$I_{F\text{ RMSM}}$	Forward Current RMS Maximum Per Diode @ $T_C=80^{\circ}\text{C}$	110	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}$, $t_p=10\text{ms}$, $T_j=45^{\circ}\text{C}$	850	A
I^2t	I^2t -value, $V_R=0\text{V}$, $t_p=10\text{ms}$, $T_j=45^{\circ}\text{C}$	3610	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=50\text{A}$	$T_j=25^{\circ}\text{C}$	1.52		V
			$T_j=125^{\circ}\text{C}$	1.46		
I_R	Reverse Current	$T_j=25^{\circ}\text{C}$, $V_R=1600\text{V}$			1.5	mA

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

Symbol	Description	GD50PIT120C6S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	40	A
		25	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	50	A
P_{tot}	Total Power Dissipation @ $T_j=150^{\circ}\text{C}$	227	W
T_{SC}	Short Circuit Withstand Time @ $T_j=150^{\circ}\text{C}$	10	μs

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			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	$I_C=250\mu A, V_{CE}=V_{GE},$ $T_J=25^\circ C$	4.0	5.0	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=25A, V_{GE}=15V,$ $T_J=25^\circ C$		2.60		V
		$I_C=25A, V_{GE}=15V,$ $T_J=125^\circ C$		2.90		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
E_{on}	Turn-On Switching Loss	$V_{CC}=600V, I_C=25A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_J=25^\circ C$		2.2		mJ
E_{off}	Turn-Off Switching Loss			1.9		mJ
E_{tot}	Total Switching Loss			4.1		mJ
E_{on}	Turn-On Switching Loss	$V_{CC}=600V, I_C=25A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		3.2		mJ
E_{off}	Turn-Off Switching Loss			2.7		mJ
E_{tot}	Total Switching Loss			5.9		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=25A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		60		ns
t_r	Rise Time			30		ns
$t_{d(off)}$	Turn-Off Delay Time			450		ns
t_f	Fall Time			200		ns
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		2370		pF
C_{oes}	Output Capacitance			455		pF
C_{res}	Reverse Transfer Capacitance			60		pF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		TBD		A

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

Symbol	Description	GD50PIT120C6S	Units
V_{RRM}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
I_F	DC Forward Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	40 25	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	50	A
I^2t	I^2t -value, $V_R=0\text{V}$, $t_p=10\text{ms}$, $T_j=125^{\circ}\text{C}$	170	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=25\text{A}$, $V_{GE}=0\text{V}$	$T_j=25^{\circ}\text{C}$	2.05		V
			$T_j=125^{\circ}\text{C}$	2.35		
Q_r	Diode Reverse Recovered charge	$I_F=25\text{A}$, $V_R=600\text{V}$, $di/dt=-700\text{A}/\mu\text{s}$, $V_{GE}=-15\text{V}$	$T_j=25^{\circ}\text{C}$	2.80		μC
			$T_j=125^{\circ}\text{C}$	5.00		
I_{RM}	Diode Peak Reverse Recovery Current		$T_j=25^{\circ}\text{C}$	26.0		A
			$T_j=125^{\circ}\text{C}$	24.0		
E_{rec}	Reverse Recovery Energy		$T_j=25^{\circ}\text{C}$	0.90		mJ
			$T_j=125^{\circ}\text{C}$	1.80		

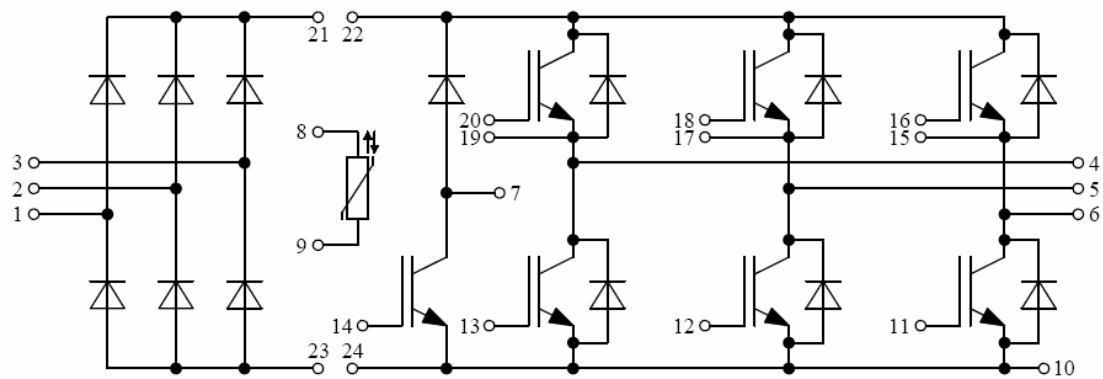
Electrical Characteristics of NTC $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$R_{100}=493.3\Omega$	-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		Typ.	Max.	Units
V _{ISO}	Isolation Voltage RMS, f=50Hz, t=1min		2500		V
L _{CE}	Stray Inductance		60		nH
R _{CC'+EE'}	Module Lead Resistance, Terminal to Chip @ T _C =25°C		4.00		m Ω
R _{θJC}	Junction-to-Case (per IGBT-inverter)		0.42		K/W
	Junction-to-Case (per DIODE-inverter)		0.59		
	Junction-to-Case (per DIODE-rectifier)		0.62		
	Junction-to-Case (per IGBT-brake-chopper)		0.55		
	Junction-to-Case (per DIODE-brake-chopper)		0.70		
R _{θCS}	Case-to-Sink (Conductive grease applied)		0.009		K/W
T _j	Maximum Junction Temperature			175	°C
T _{STG}	Storage Temperature Range	-40		125	°C
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters

