

# STARPOWER

SEMICONDUCTOR™

# IGBT

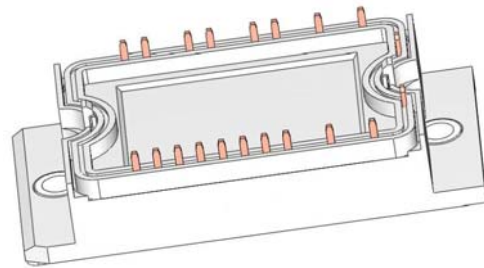
## GD10PIK120E1S

## Preliminary

**Molding Type Module****1200V/10A PIM in one-package**

### General Description

STARPOWER IGBT Power Module provides ultra low conduction and switching loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



### Features

- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Square RBSOA
- Latch-up free
- 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	GD10PIK120E1S	Units
$V_{CES}$	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$	20	A
	@ $T_C=80^{\circ}\text{C}$	10	
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	20	A
$P_{tot}$	Total Power Dissipation @ $T_j=150^{\circ}\text{C}$	108	W
$T_{SC}$	Short Circuit Withstand Time @ $T_j=150^{\circ}\text{C}$	10	$\mu\text{s}$

**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$			5.0	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	$I_C=125\mu\text{A}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	4.4	5.0	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=10\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		2.40	2.70	V
		$I_C=10\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		2.70		

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$E_{on}$	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=10\text{A}, R_G=22\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		0.96		mJ
$E_{off}$	Turn-Off Switching Loss			0.46		mJ
$E_{tot}$	Total Switching Loss				1.42	mJ
$E_{on}$	Turn-On Switching Loss	$V_{CC}=600\text{V}, I_C=10\text{A}, R_G=22\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		1.25		mJ
$E_{off}$	Turn-Off Switching Loss			0.69		mJ
$E_{tot}$	Total Switching Loss				1.94	mJ

$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=10A,$ $R_G=22\Omega, V_{GE} = \pm 15V,$ $T_J=125^\circ C$		86		ns
$t_r$	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			118		ns
$t_f$	Fall Time			274		ns
$C_{ies}$	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		750		pF
$C_{oes}$	Output Capacitance			190		pF
$C_{res}$	Reverse Transfer Capacitance			20		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	GD10PIK120E1S	Units
$V_{RRM}$	Collector-Emitter Voltage @ $T_J=25^\circ C$	1200	V
$I_F$	DC Forward Current @ $T_C=80^\circ C$	10	A
$I_{FRM}$	Repetitive Peak Forward Current $t_p=1ms$	20	A
$I^2t$	$I^2t$ -value, $V_R=0V, t_p=10ms, T_J=125^\circ C$	20	$A^2s$

#### Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=10A, V_{GE}=0V$	$T_J=25^\circ C$	1.85	2.20	V
			$T_J=125^\circ C$		2.00	
$Q_{rr}$	Recovered Charge	$I_F=10A,$	$T_J=25^\circ C$	0.82		$\mu C$
			$T_J=125^\circ C$		1.51	
$I_{RM}$	Peak Reverse Recovery Current	$V_R=600V,$ $di/dt=-400A/\mu s,$	$T_J=25^\circ C$	12		A
			$T_J=125^\circ C$		13	
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_J=25^\circ C$	0.31		mJ
			$T_J=125^\circ C$		0.55	

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

Symbol	Description	GD10PIK120E1S	Units
$V_{RRM}$	Collector-Emitter Voltage @ $T_j=25^\circ\text{C}$	1600	V
$I_{FRMSM}$	Forward Current RMS Maximum Per Diode @ $T_C=80^\circ\text{C}$	52	A
$I_{RMSM}$	Maximum RMS Current at Rectifier output @ $T_C=80^\circ\text{C}$	62	A
$I_{FSM}$	Surge Forward Current $V_R=0\text{V}$ , $t_p=10\text{ms}$ , $T_j=150^\circ\text{C}$	270	A
$I^2t$	$I^2t$ -value, $V_R=0\text{V}$ , $t_p=10\text{ms}$ , $T_j=150^\circ\text{C}$	380	$\text{A}^2\text{s}$

**Characteristics Values**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=50\text{A}$ , $T_j=125^\circ\text{C}$			1.37	V
$I_R$	Reverse Current	$T_j=150^\circ\text{C}$ , $V_R=1600\text{V}$			2.0	mA

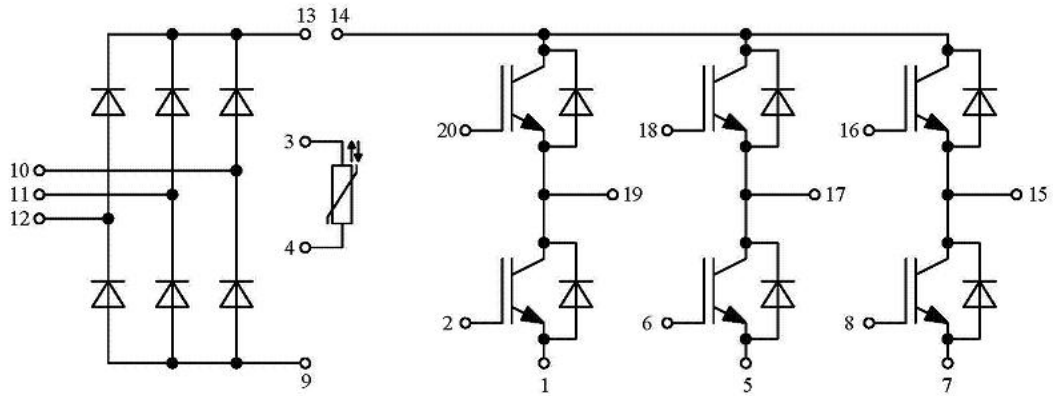
**Electrical Characteristics of NTC**  $T_C=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$R_{25}$	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of $R_{100}$	$T_C=100^\circ\text{C}$ , $R_{100}=493.3\Omega$	-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

**IGBT Module**

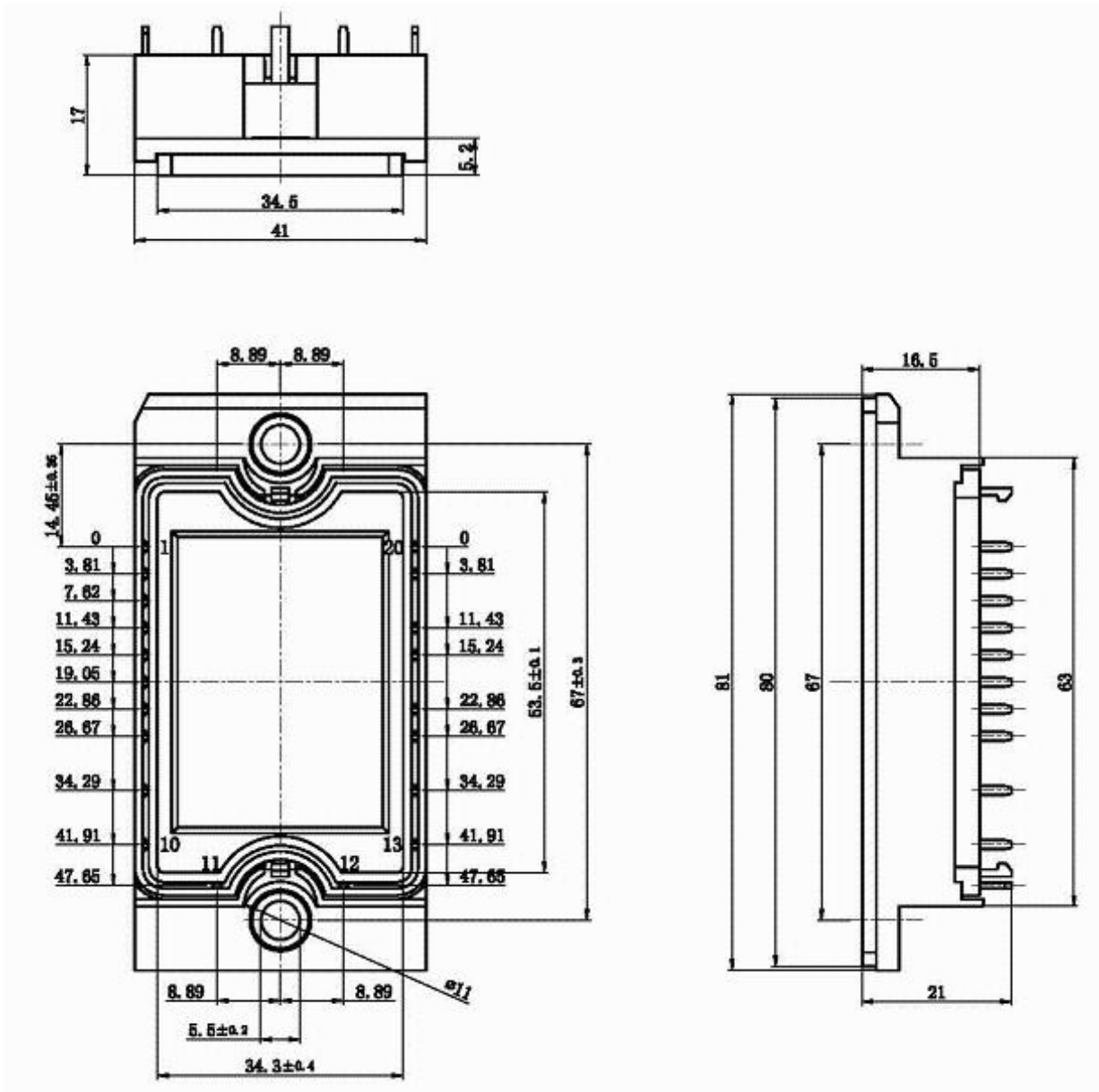
Symbol	Parameter	Min.	Typ.	Max.	Units
V <sub>ISO</sub>	Isolation Voltage RMS, f=50Hz, t=1min		2500		V
L <sub>CE</sub>	Stray Inductance		40		nH
R <sub>CC'+EE'</sub>	Module Lead Resistance, Terminal to Chip @ T <sub>C</sub> =25°C		10.0		mΩ
R <sub>θJC</sub>	Junction-to-Case (per IGBT-inverter)			1.16	K/W
	Junction-to-Case (per DIODE-inverter)			1.84	
	Junction-to-Case (per DIODE-rectifier)			1.23	
R <sub>θCS</sub>	Case-to-Sink (Conductive grease applied)		0.03		K/W
T <sub>j</sub>	Maximum Junction Temperature		150		°C
T <sub>STG</sub>	Storage Temperature Range	-40		125	°C
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		110		g

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters



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