

STARPOWER

SEMICONDUCTOR

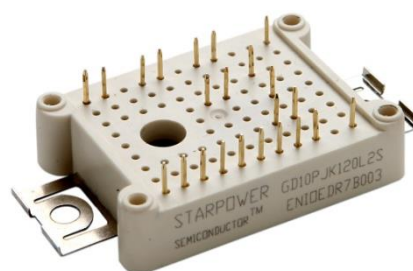
IGBT

GD15FBT120L2S

Molding Type Module**1200V/15A 6 plus brake 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

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- 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	GD15FBT120L2S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	26	A
	@ $T_C=80^{\circ}\text{C}$	15	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	30	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	142	W

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	$I_C=720\mu\text{A}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.0	5.8	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=15\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.90	2.35	V
		$I_C=15\text{A}, V_{GE}=15\text{V},$ $T_j=175^{\circ}\text{C}$		2.50		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{CC}=600\text{V}, I_C=15\text{A},$ $V_{GE}=15\text{V}$		80		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=15\text{A},$ $R_G=10\Omega, V_{GE}=\pm 15\text{V},$ $T_j=25^{\circ}\text{C}$		28		ns
t_r	Rise Time			27		ns
$t_{d(off)}$	Turn-Off Delay Time			125		ns
t_f	Fall Time			105		ns
E_{on}	Turn-On Switching Loss			1.22		mJ
E_{off}	Turn-Off Switching Loss			0.58		mJ

$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=15A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		26		ns
t_r	Rise Time			26		ns
$t_{d(off)}$	Turn-Off Delay Time			154		ns
t_f	Fall Time			272		ns
E_{on}	Turn-On Switching Loss			2.18		mJ
E_{off}	Turn-Off Switching Loss			0.99		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		1.95		nF
C_{oes}	Output Capacitance			0.08		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		130		A

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

Maximum Rated Values

Symbol	Description	GD15FBT120L2S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^\circ C$	1200	V
I_F	DC Forward Current @ $T_C=80^\circ C$	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	$I_F=15A, V_{GE}=0V$	$T_J=25^\circ C$		2.05	2.45	V
			$T_J=125^\circ C$		2.15		
Q_r	Recovered Charge	$I_F=15A,$ $V_R=600V,$ $di/dt=-245A/\mu s,$	$T_J=25^\circ C$		0.62		μC
			$T_J=125^\circ C$		2.08		
I_{RM}	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_J=25^\circ C$		10		A
			$T_J=125^\circ C$		12		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_J=25^\circ C$		0.47		mJ
			$T_J=125^\circ C$		0.86		

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

Symbol	Description	GD15FBT120L2S	Units
V_{CES}	Collector-Emitter Voltage @ $T_J=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_J=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	18	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 @ $T_J=150^{\circ}\text{C}$	97	W

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	$I_C=10\text{A}, V_{GE}=15\text{V},$ $T_J=25^{\circ}\text{C}$		2.45	2.90	V
		$I_C=10\text{A}, V_{GE}=15\text{V},$ $T_J=125^{\circ}\text{C}$		2.75		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{CC}=600\text{V}, I_C=10\text{A},$ $V_{GE}=15\text{V}$		48		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=10\text{A},$ $R_G=22\Omega, V_{GE}=\pm 15\text{V},$ $T_J=25^{\circ}\text{C}$		85		ns
t_r	Rise Time			21		ns
$t_{d(off)}$	Turn-Off Delay Time			110		ns
t_f	Fall Time			220		ns
E_{on}	Turn-On Switching Loss			0.96		mJ
E_{off}	Turn-Off Switching Loss			0.46		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
E_{on}	Turn-On Switching Loss			1.25		mJ
E_{off}	Turn-Off Switching Loss			0.69		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		0.75		nF
C_{oes}	Output Capacitance			0.19		nF
C_{res}	Reverse Transfer Capacitance			0.02		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		80		A

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

Maximum Rated Values

Symbol	Description	GD15FBT120L2S	Units
V_{RRM}	Repetitive Peak Reverse 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

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =10A,V _{GE} =0V	T _j =25°C		1.85	2.30	V
			T _j =125°C		2.00		
Q _r	Recovered Charge	I _F =10A, V _R =600V, di/dt=-400A/μs, V _{GE} =-15V	T _j =25°C		0.82		μC
			T _j =125°C		1.51		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		12		A
			T _j =125°C		13		
E _{rec}	Reverse Recovery Energy		T _j =25°C		0.31		mJ
			T _j =125°C		0.51		

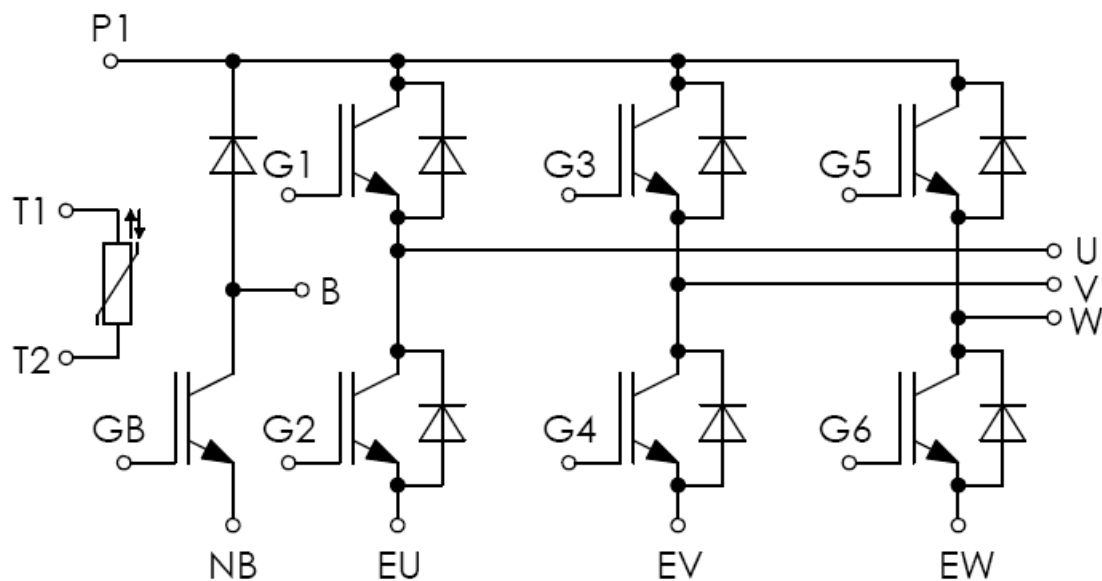
Electrical Characteristics of NTC $T_C=25^{\circ}\text{C}$ unless otherwise noted

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

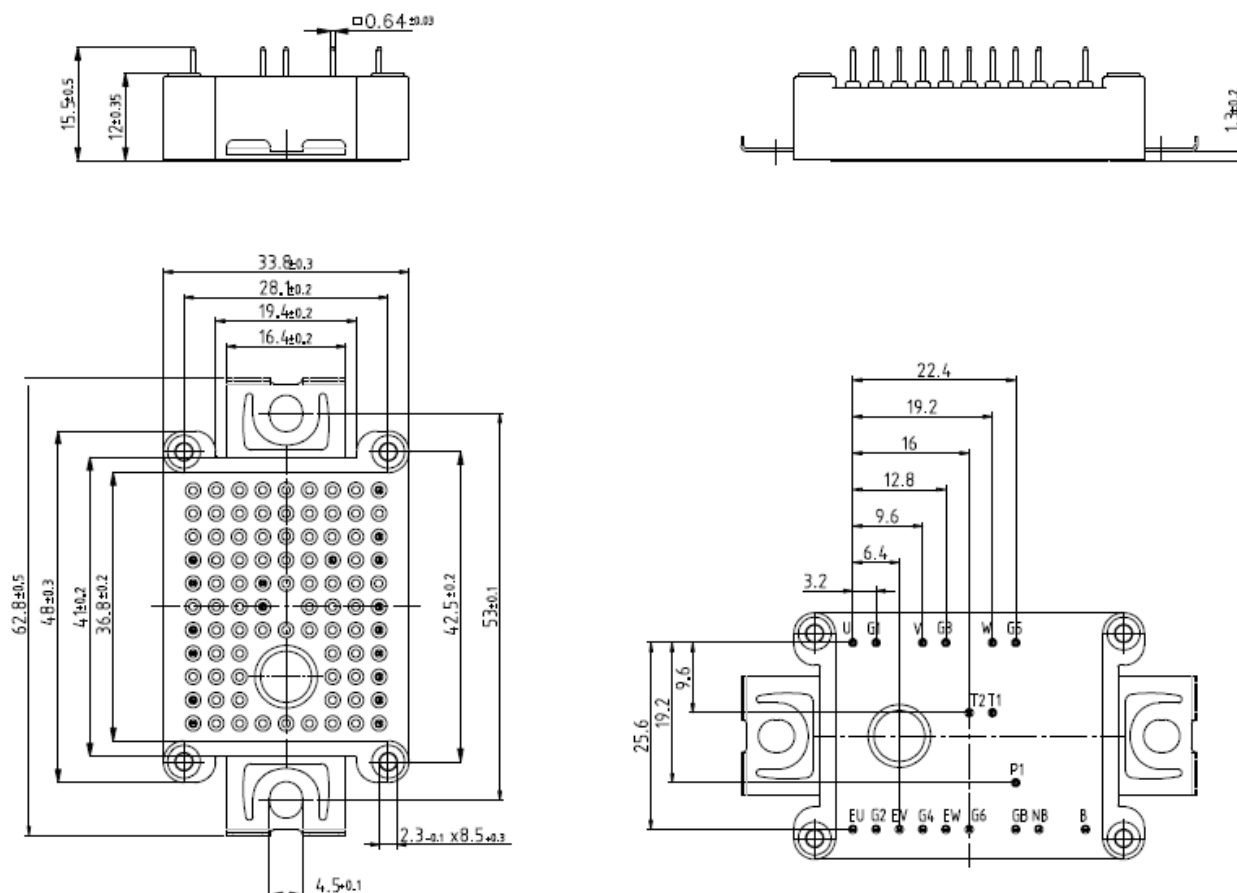
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	2500			V
L_{CE}	Stray Inductance		30		nH
$R_{\text{CC}'+\text{EE}'}$	Module Lead Resistance, Terminal to Chip @ $T_C=25^{\circ}\text{C}$		8.0		$\text{m}\Omega$
$R_{\theta\text{JC}}$	Junction-to-Case (per IGBT-inverter)			1.05	K/W
	Junction-to-Case (per DIODE-inverter)			1.85	
	Junction-to-Case (per IGBT-brake-chopper)			1.29	
	Junction-to-Case (per DIODE-brake-chopper)			2.03	
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		0.08		K/W
T_j	Maximum Junction Temperature			175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}\text{C}$
F	Mounting Force Per Clamp	20		50	N
G	Weight of Module		24		g

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters



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