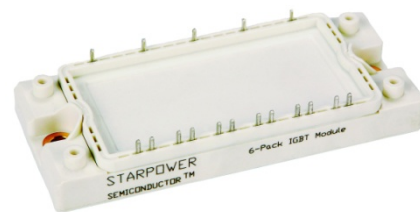


# IGBT

## GD50FFL120C5S

**Molding Type Module**

**1200V/50A 6 in one-package**



### Features

- Low  $V_{CE(sat)}$  SPT+ IGBT technology
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- 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

**Absolute Maximum Ratings**  $T_C=25^{\circ}\text{C}$  unless otherwise noted

| Symbol          | Description                                                                | GD50FFL120C5S | Units              |
|-----------------|----------------------------------------------------------------------------|---------------|--------------------|
| $V_{CES}$       | Collector-Emitter Voltage                                                  | 1200          | V                  |
| $V_{GES}$       | Gate-Emitter Voltage                                                       | $\pm 20$      | V                  |
| $I_C$           | Collector Current @ $T_C=25^{\circ}\text{C}$<br>@ $T_C=80^{\circ}\text{C}$ | 90<br>50      | A                  |
| $I_{CM(1)}$     | Pulsed Collector Current $t_p=1\text{ms}$                                  | 100           | A                  |
| $I_F$           | Diode Continuous Forward Current @ $T_C=80^{\circ}\text{C}$                | 50            | A                  |
| $I_{FM(1)}$     | Diode Maximum Forward Current $t_p=1\text{ms}$                             | 100           | A                  |
| $P_D$           | Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$                      | 379           | W                  |
| $T_{jmax}$      | Maximum Junction Temperature                                               | 150           | $^{\circ}\text{C}$ |
| $T_{STG}$       | Storage Temperature Range                                                  | -40 to +125   | $^{\circ}\text{C}$ |
| $V_{ISO}$       | Isolation Voltage RMS, $f=50\text{Hz}$ , $t=1\text{min}$                   | 2500          | V                  |
| Mounting Torque | Mounting Screw:M5                                                          | 3.0 to 6.0    | N.m                |

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

**Electrical Characteristics of IGBT**  $T_C=25^{\circ}\text{C}$  unless otherwise noted**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           | $V_{CE}=V_{CES}$ , $V_{GE}=0\text{V}$ ,<br>$T_j=25^{\circ}\text{C}$ |      |      | 5.0  | mA    |
| $I_{GES}$     | Gate-Emitter Leakage Current        | $V_{GE}=V_{GES}$ , $V_{CE}=0\text{V}$ ,<br>$T_j=25^{\circ}\text{C}$ |      |      | 400  | nA    |

**On Characteristics**

| Symbol        | Parameter                               | Test Conditions                                                       | Min. | Typ. | Max. | Units |
|---------------|-----------------------------------------|-----------------------------------------------------------------------|------|------|------|-------|
| $V_{GE(th)}$  | Gate-Emitter Threshold Voltage          | $I_C=2.0\text{mA}$ , $V_{CE}=V_{GE}$ ,<br>$T_j=25^{\circ}\text{C}$    | 5.0  | 6.2  | 7.0  | V     |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C=50\text{A}$ , $V_{GE}=15\text{V}$ ,<br>$T_j=25^{\circ}\text{C}$  |      | 1.85 | 2.30 | V     |
|               |                                         | $I_C=50\text{A}$ , $V_{GE}=15\text{V}$ ,<br>$T_j=125^{\circ}\text{C}$ |      | 2.00 |      |       |

**Switching Characteristics**

| Symbol        | Parameter                                | Test Conditions                                                                            | Min. | Typ. | Max. | Units      |
|---------------|------------------------------------------|--------------------------------------------------------------------------------------------|------|------|------|------------|
| $t_{d(on)}$   | Turn-On Delay Time                       | $V_{CC}=600V, I_C=50A,$<br>$R_G=15\Omega, V_{GE}=\pm 15V,$<br>$T_j=25^\circ C$             |      | 392  |      | ns         |
| $t_r$         | Rise Time                                |                                                                                            |      | 74   |      | ns         |
| $t_{d(off)}$  | Turn-Off Delay Time                      |                                                                                            |      | 374  |      | ns         |
| $t_f$         | Fall Time                                |                                                                                            |      | 380  |      | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                            |      | 6.28 |      | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                            |      | 3.22 |      | mJ         |
| $t_{d(on)}$   | Turn-On Delay Time                       | $V_{CC}=600V, I_C=50A,$<br>$R_G=15\Omega, V_{GE}=\pm 15V,$<br>$T_j=125^\circ C$            |      | 403  |      | ns         |
| $t_r$         | Rise Time                                |                                                                                            |      | 69   |      | ns         |
| $t_{d(off)}$  | Turn-Off Delay Time                      |                                                                                            |      | 408  |      | ns         |
| $t_f$         | Fall Time                                |                                                                                            |      | 381  |      | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                            |      | 7.30 |      | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                            |      | 5.22 |      | mJ         |
| $C_{ies}$     | Input Capacitance                        | $V_{CE}=30V, f=1MHz,$<br>$V_{GE}=0V$                                                       |      | 4.29 |      | nF         |
| $C_{oes}$     | Output Capacitance                       |                                                                                            |      | 0.30 |      | nF         |
| $C_{res}$     | Reverse Transfer Capacitance             |                                                                                            |      | 0.20 |      | nF         |
| $I_{SC}$      | SC Data                                  | $T_P \leq 10\mu s, V_{GE}=15V,$<br>$T_j=125^\circ C, V_{CC}=900V,$<br>$V_{CEM} \leq 1200V$ |      | 270  |      | A          |
| $L_{CE}$      | Stray Inductance                         |                                                                                            |      | 60   |      | nH         |
| $R_{CC'+EE'}$ | Module Lead Resistance, Terminal To Chip |                                                                                            |      | 4.4  |      | m $\Omega$ |

**Electrical Characteristics of DIODE**  $T_C=25^\circ C$  unless otherwise noted

| Symbol           | Parameter                     | Test Conditions                                                                                |                      | Min. | Typ. | Max. | Units |
|------------------|-------------------------------|------------------------------------------------------------------------------------------------|----------------------|------|------|------|-------|
| V <sub>F</sub>   | Diode Forward Voltage         | I <sub>F</sub> =50A                                                                            | T <sub>i</sub> =25℃  |      | 1.80 | 2.20 | V     |
|                  |                               |                                                                                                | T <sub>i</sub> =125℃ |      | 1.85 |      |       |
| Q <sub>r</sub>   | Recovered Charge              | I <sub>F</sub> =50A,<br>V <sub>R</sub> =600V,<br>R <sub>G</sub> =15Ω,<br>V <sub>GE</sub> =-15V | T <sub>i</sub> =25℃  |      | 3.3  |      | μC    |
|                  |                               |                                                                                                | T <sub>i</sub> =125℃ |      | 6.5  |      |       |
| I <sub>RM</sub>  | Peak Reverse Recovery Current |                                                                                                | T <sub>i</sub> =25℃  |      | 34   |      | A     |
|                  |                               |                                                                                                | T <sub>i</sub> =125℃ |      | 47   |      |       |
| E <sub>rec</sub> | Reverse Recovery Energy       |                                                                                                | T <sub>i</sub> =25℃  |      | 1.28 |      | mJ    |
|                  |                               |                                                                                                | T <sub>i</sub> =125℃ |      | 2.03 |      |       |

Thermal Characteristics

| Symbol          | Parameter                                | Typ. | Max. | Units |
|-----------------|------------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case (per IGBT)              |      | 0.33 | K/W   |
| $R_{\theta JC}$ | Junction-to-Case (per DIODE)             |      | 0.64 | K/W   |
| $R_{\theta CS}$ | Case-to-Sink (Conductive grease applied) | 0.02 |      | K/W   |
| Weight          | Weight of Module                         | 200  |      | g     |

