

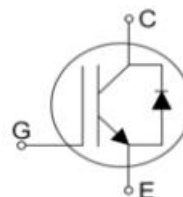
# LEGP50N120FHF

## IGBT Discrete

### Features:

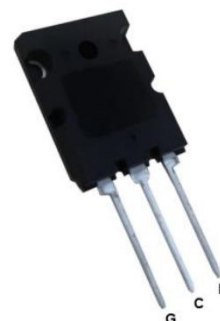
- 1200V/50A Trench Field Stop IGBT
- High breakdown voltage up to 1200V for improved reliability
- Trench-Stop Technology offering :
  - Low  $V_{CE(sat)}$
  - Very tight parameter distribution
  - Short circuit withstand time – 10 $\mu$ s
  - High ruggedness, temperature stable
  - Easy parallel switching capability due to positive temperature coefficient in  $V_{CE(sat)}$
- Enhanced avalanche capability

|                           |      |   |
|---------------------------|------|---|
| $V_{CE}$                  | 1200 | V |
| $I_C$                     | 50   | A |
| $V_{CE(sat)}$ @ $I_C=50A$ | 1.7  | V |



### Applications:

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



TO-264-3L

## Maximum Rated Values

| Symbol      | Parameter                      | Conditions                                              | Ratings    | Unit               |
|-------------|--------------------------------|---------------------------------------------------------|------------|--------------------|
| $V_{CES}$   | Collector-emitter voltage      |                                                         | 1200       | V                  |
| $I_C$       | Continuous Collector Current   | $T_C=25^{\circ}\text{C}$                                | 100        | A                  |
|             |                                | $T_C=100^{\circ}\text{C}$                               | 50         | A                  |
| $I_F$       | Diode Forward current          | $T_C=25^{\circ}\text{C}$                                | 100        | A                  |
|             |                                | $T_C=100^{\circ}\text{C}$                               | 50         | A                  |
| $V_{GE}$    | Gate-Emitter Voltage           |                                                         | $\pm 20$   | V                  |
| $V_{GE}$    | Transient Gate-Emitter Voltage |                                                         | $\pm 30$   | V                  |
| $I_{CRM}$   | Peak Collector Current         | $I_{CRM}=2I_C$                                          | 200        | A                  |
| $I_{Fplus}$ | Diode Pulsed Current           | Diode Pulsed Current                                    | 200        | A                  |
| $T_{sc}$    | Short Circuit Withstand Time   | Short Circuit Withstand Time                            | 10         | us                 |
| $P_{tot}$   | Total Power Dissipation        | $T_C=25^{\circ}\text{C}, T_{vjmax}=175^{\circ}\text{C}$ | 500        | W                  |
| $T_{vj}$    | Operating Junction Temperature | Operating Junction Temperature                          | -40...+175 | $^{\circ}\text{C}$ |
| $T_{stg}$   | Storage Temperature            | Storage Temperature                                     | -55...+150 | $^{\circ}\text{C}$ |
|             | Soldering temperature          | wave soldering<br>1.6mm (0.063in.) from case for 10s    | 260        | $^{\circ}\text{C}$ |

## Thermal Resistance

| Symbol            | Parameter                                 | Ratings | Unit |
|-------------------|-------------------------------------------|---------|------|
| $R_{\theta(j-c)}$ | IGBT thermal resistance, junction - case  | 0.30    | K/W  |
| $R_{\theta(j-c)}$ | Diode thermal resistance, junction - case | 0.65    | K/W  |
| $R_{\theta(j-a)}$ | Thermal resistance, junction - ambient    | 40      | K/W  |

**Characteristics Values of the IGBT** ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

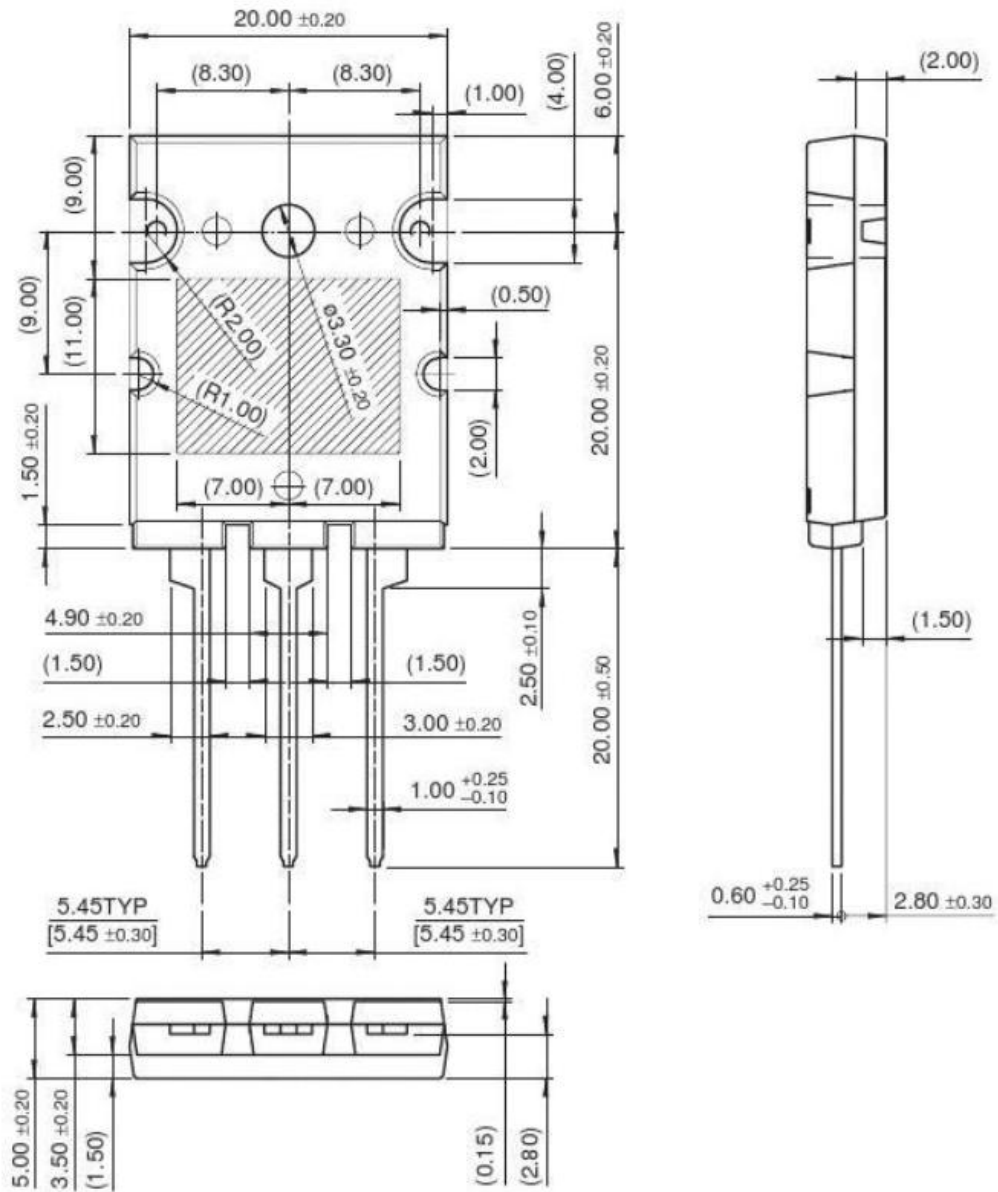
| Symbol        | Parameter                            | Conditions                                                                                                                                              | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $BV_{CES}$    | Collector-Emitter Breakdown Voltage  | $V_{GE} = 0\text{V}, I_C = 250\mu\text{A}$                                                                                                              | 1200 |      |      | V    |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$                                                                                          |      | 1.7  | 2.25 | V    |
|               |                                      | $I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$                                                                                         |      | 2.3  | 2.7  | V    |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $I_C=5.0\text{mA}, V_{CE}=V_{GE}$                                                                                                                       | 5.2  | 6.0  | 6.5  | V    |
| $I_{CES}$     | Collector-Emitter Cut-off Current    | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$                                                                                      |      |      | 20   | mA   |
| $I_{GES}$     | Gate-Emitter Leakage Current         | $V_{CE}=0\text{V}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$                                                                                        |      |      | 200  | nA   |
| $C_{ies}$     | Input Capacitance                    | $f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C},$<br>$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$                                                            |      |      | 3.11 | nF   |
| $C_{res}$     | Reverse Transfer Capacitance         |                                                                                                                                                         |      |      | 103  | pF   |
| $t_{d(on)}$   | Turn-on Delay Time                   | $I_C=50\text{A}, V_{CE}=600\text{V}$<br>$V_{GE}=\pm 15\text{V}$<br>$R_G=15\Omega$<br>$T_{vj}=25^{\circ}\text{C}$                                        |      | 71.5 |      | ns   |
| $t_r$         | Rise Time, Inductive Load            |                                                                                                                                                         |      | 68.6 |      | ns   |
| $t_{d(off)}$  | Turn-off Delay Time, Inductive Load  |                                                                                                                                                         |      | 286  |      | ns   |
| $t_f$         | Fall Time, Inductive Load            |                                                                                                                                                         |      | 223  |      | ns   |
| $E_{on}$      | Turn-on Energy Loss per Pulse        |                                                                                                                                                         |      | 3.76 |      | mJ   |
| $E_{off}$     | Turn-off Energy Loss                 |                                                                                                                                                         |      | 2.67 |      | mJ   |
| $t_{d(on)}$   | Turn-on Delay Time                   | $I_C=50\text{A}, V_{CE}=600\text{V}$<br>$V_{GE}=\pm 15\text{V}$<br>$R_G=15\Omega$<br>$T_{vj}=150^{\circ}\text{C}$                                       |      | 78.7 |      | ns   |
| $t_r$         | Rise Time, Inductive Load            |                                                                                                                                                         |      | 85.8 |      | ns   |
| $t_{d(off)}$  | Turn-off Delay Time, Inductive Load  |                                                                                                                                                         |      | 343  |      | ns   |
| $t_f$         | Fall Time, Inductive Load            |                                                                                                                                                         |      | 343  |      | ns   |
| $E_{on}$      | Turn-on Energy Loss per Pulse        |                                                                                                                                                         |      | 4.6  |      | mJ   |
| $E_{off}$     | Turn-off Energy Loss                 |                                                                                                                                                         |      | 4.3  |      | mJ   |
| $I_{SC}$      | Short Circuit Collector Current      | $V_{GE} \leq 15\text{V}, V_{CC} = 600\text{V}$<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$<br>$t_p \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ |      | 250  |      | A    |

**Characteristics Values of the Diode** ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

| Symbol    | Parameter               | Conditions                                                                                                                        | Min. | Typ. | Max. | Unit          |
|-----------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_F$     | Forward Voltage         | $I_F=50\text{ A}, T_{vj}=25^{\circ}\text{C}$                                                                                      |      | 1.7  |      | V             |
|           |                         | $I_F=50\text{ A}, T_{vj}=150^{\circ}\text{C}$                                                                                     |      | 2.5  |      | V             |
| $t_{rr}$  | Reverse Recovery time   | $I_F=50\text{ A}, V_R=600\text{ V}$<br>$-di/dt=100\text{ A}/\mu\text{s}$<br>$T_{vj}=25^{\circ}\text{C}$<br>$V_{GE}=-15\text{ V}$  |      | 243  |      | ns            |
| $Q_r$     | Recovered Charge        |                                                                                                                                   |      | 1.4  |      | $\mu\text{C}$ |
| $E_{rec}$ | Reverse Recovery Energy |                                                                                                                                   |      | 0.5  |      | mJ            |
| $t_{rr}$  | Reverse Recovery time   | $I_F=50\text{ A}, V_R=600\text{ V}$<br>$-di/dt=100\text{ A}/\mu\text{s}$<br>$T_{vj}=150^{\circ}\text{C}$<br>$V_{GE}=-15\text{ V}$ |      | 293  |      | ns            |
| $Q_r$     | Recovered Charge        |                                                                                                                                   |      | 1.56 |      | $\mu\text{C}$ |
| $E_{rec}$ | Reverse Recovery Energy |                                                                                                                                   |      | 0.51 |      | mJ            |

## Package Dimensions

### TO-264-3L



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TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE