

IGBT

GD100HFK60C1S

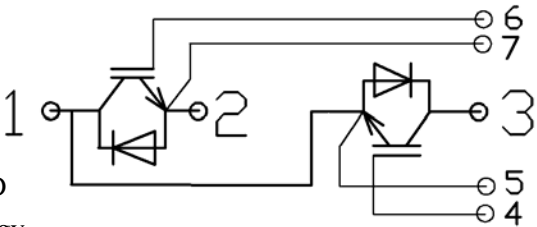
Molding Type Module

600V/100A 2 in one-package



Features

- High short circuit capability, self limiting to 6\*I<sub>C</sub>
- 10μs short circuit capability
- V<sub>CE(sat)</sub> with positive temperature coefficient
- Latch-up free
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DCB technology



Equivalent Circuit Schematic

Typical Applications

- UPS
- Switching mode power supplies
- Electronic welders at f<sub>sw</sub> up to 25kHz

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

| Symbol           | Description               | GD100HFK60C1S | Units |
|------------------|---------------------------|---------------|-------|
| V <sub>CES</sub> | Collector-Emitter Voltage | 600           | V     |

| Symbol                  | Description                                                | GD100HFK60C1S | Units      |
|-------------------------|------------------------------------------------------------|---------------|------------|
| $V_{GES}$               | Gate-Emitter Voltage                                       | $\pm 20V$     | V          |
| $I_C$                   | Collector Current @ $T_C=25^\circ C$<br>@ $T_C=80^\circ C$ | 130           | A          |
|                         |                                                            | 100           |            |
| $I_{CM(1)}$             | Pulsed Collector Current @ $T_C=80^\circ C$                | 200           | A          |
| $I_F$                   | Diode Continuous Forward Current                           | 100           | A          |
| $I_{FM}$                | Diode Maximum Forward Current                              | 200           | A          |
| $P_D$                   | Maximum power Dissipation @ $T_j=150^\circ C$              | 450           | W          |
| $T_{SC}$                | Short Circuit Withstand Time @ $T_j=125^\circ C$           | 10            | $\mu s$    |
| $T_J$                   | Operating Junction Temperature                             | -40 to +150   | $^\circ C$ |
| $T_{STG}$               | Storage Temperature Range                                  | -40 to +125   | $^\circ C$ |
| $I^2t$ -value,<br>Diode | $V_R=0V, t=10ms, T_j=125^\circ C$                          | 1250          | $A^2s$     |
| $V_{ISO}$               | Isolation Voltage RMS, $f=50Hz, t=1min$                    | 2500          | V          |
| Mounting                | Power Terminal Screw:M5                                    | 2.5 to 5.0    | N.m        |
| Torque                  | Mounting Screw:M6                                          | 3.0 to 6.0    | N.m        |

**Notes:**

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

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

| Symbol     | Parameter                           | Test Conditions                                  | Min. | Typ. | Max. | Units |
|------------|-------------------------------------|--------------------------------------------------|------|------|------|-------|
| $BV_{CES}$ | Collector-Emitter Breakdown Voltage | $T_j=25^\circ C$                                 | 600  |      |      | V     |
| $I_{CES}$  | Collector Cut-Off Current           | $V_{CE}=V_{CES}, V_{GE}=0V,$<br>$T_j=25^\circ C$ |      |      | 5.0  | mA    |
| $I_{GES}$  | Gate-Emitter Leakage Current        | $V_{GE}=V_{GES}, V_{CE}=0V,$<br>$T_j=25^\circ C$ |      |      | 400  | nA    |

**On Characteristics**

| Symbol        | Parameter                               | Test Conditions                                 | Min. | Typ. | Max. | Units |
|---------------|-----------------------------------------|-------------------------------------------------|------|------|------|-------|
| $V_{GE(th)}$  | Gate-Emitter Threshold Voltage          | $I_C=1.5mA, V_{CE}=V_{GE},$<br>$T_j=25^\circ C$ | 3.5  | 4.5  | 5.5  | V     |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C=100A, V_{GE}=15V, T_j=25^\circ C$          |      | 1.9  |      | V     |
|               |                                         | $I_C=100A, V_{GE}=15V,$<br>$T_j=125^\circ C$    |      | 2.3  |      |       |

**Switching Characteristics**

| Symbol       | Parameter           | Test Conditions                                                                  | Min. | Typ. | Max. | Units |
|--------------|---------------------|----------------------------------------------------------------------------------|------|------|------|-------|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{CC}=300V, I_C=100A,$<br>$R_G=2.2\Omega, V_{GE}=\pm 15V,$<br>$T_j=25^\circ C$ |      | 28   |      | ns    |
| $t_r$        | Rise Time           |                                                                                  |      | 12   |      | ns    |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                  |      | 130  |      | ns    |

**GD100HFK60C1S****IGBT Module**

|               |                                          |                                                                                           |  |      |  |            |
|---------------|------------------------------------------|-------------------------------------------------------------------------------------------|--|------|--|------------|
| $t_f$         | Fall Time                                | $V_{CC}=300V, I_C=100A,$<br>$R_G=2.2\Omega, V_{GE} = \pm 15V,$<br>$T_J=25^\circ C$        |  | 20   |  | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                           |  | 0.8  |  | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                           |  | 2.4  |  | mJ         |
| $t_{d(on)}$   | Turn-On Delay Time                       | $V_{CC}=300V, I_C=100A,$<br>$R_G=2.2\Omega, V_{GE} = \pm 15V,$<br>$T_J=125^\circ C$       |  | 50   |  | ns         |
| $t_r$         | Rise Time                                |                                                                                           |  | 15   |  | ns         |
| $t_{d(off)}$  | Turn-Off Delay Time                      |                                                                                           |  | 150  |  | ns         |
| $t_f$         | Fall Time                                |                                                                                           |  | 30   |  | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                           |  | 1.0  |  | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                           |  | 2.9  |  | mJ         |
| $C_{ies}$     | Input Capacitance                        | $V_{CE} = 25V, f=1MHz,$<br>$V_{GE} = 0V$                                                  |  | 12.8 |  | nF         |
| $C_{oes}$     | Output Capacitance                       |                                                                                           |  | 0.82 |  | nF         |
| $C_{res}$     | Reverse Transfer Capacitance             |                                                                                           |  | 0.18 |  | nF         |
| $I_{SC}$      | SC Data                                  | $T_P \leq 10\mu s, V_{GE}=15V,$<br>$T_J=125^\circ C, V_{CC}=300V,$<br>$V_{CEM} \leq 600V$ |  | 450  |  | A          |
| $L_{CE}$      | Stray inductance                         |                                                                                           |  | 30   |  | nH         |
| $R_{CC'+EE'}$ | Module lead resistance, terminal to chip | $T_C=25^\circ C$                                                                          |  | 0.75 |  | m $\Omega$ |

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

| Symbol           | Parameter                           | Test Conditions                                                                             |                       | Min. | Typ. | Max. | Units |
|------------------|-------------------------------------|---------------------------------------------------------------------------------------------|-----------------------|------|------|------|-------|
| V <sub>FM</sub>  | Diode Forward Voltage               | I <sub>F</sub> =100A                                                                        | T <sub>J</sub> =25°C  |      | 1.4  | 1.6  | V     |
|                  |                                     |                                                                                             | T <sub>J</sub> =125°C |      | 1.6  | 1.8  |       |
| Q <sub>rr</sub>  | Diode Reverse Recovery Charge       | I <sub>F</sub> =100A,<br>V <sub>R</sub> =300V,<br>di/dt=-4400A/us,<br>V <sub>GE</sub> =-15V | T <sub>J</sub> =25°C  |      | 8    |      | μC    |
|                  |                                     |                                                                                             | T <sub>J</sub> =125°C |      | 14   |      |       |
| I <sub>rr</sub>  | Diode Peak Reverse Recovery Current |                                                                                             | T <sub>J</sub> =25°C  |      | 150  |      | A     |
|                  |                                     |                                                                                             | T <sub>J</sub> =125°C |      | 170  |      |       |
| E <sub>rec</sub> | Reverse Recovery Energy             |                                                                                             | T <sub>J</sub> =25°C  |      | 2.2  |      | mJ    |
|                  |                                     |                                                                                             | T <sub>J</sub> =125°C |      | 3.2  |      |       |

**Thermal Characteristics**

| Symbol          | Parameter                                     | Typ. | Max. | Units        |
|-----------------|-----------------------------------------------|------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case (IGBT Part, per 1/2 Module)  |      | 0.17 | $^\circ C/W$ |
| $R_{\theta JC}$ | Junction-to-Case (DIODE Part, per 1/2 Module) |      | 0.48 | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink (Conductive grease applied)      | 0.05 |      | $^\circ C/W$ |
| Weight          | Weight of Module                              | 180  |      | g            |

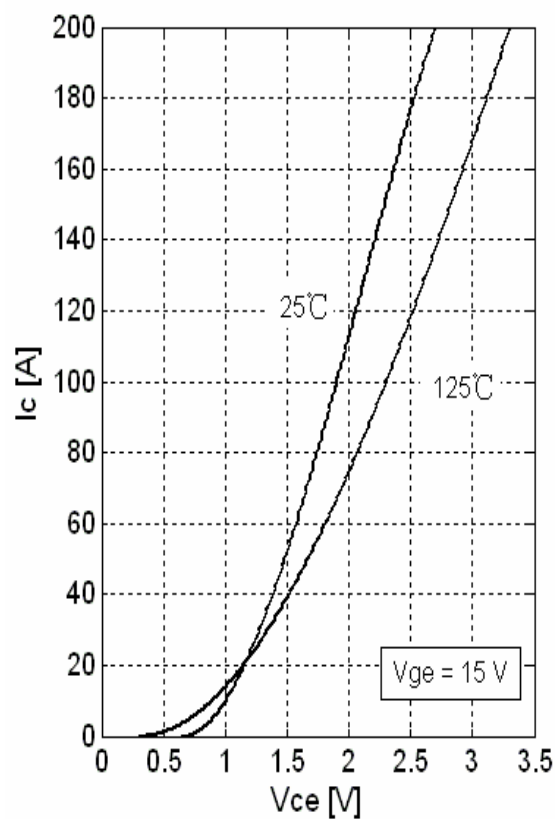


Fig 1. Typical Output Characteristics

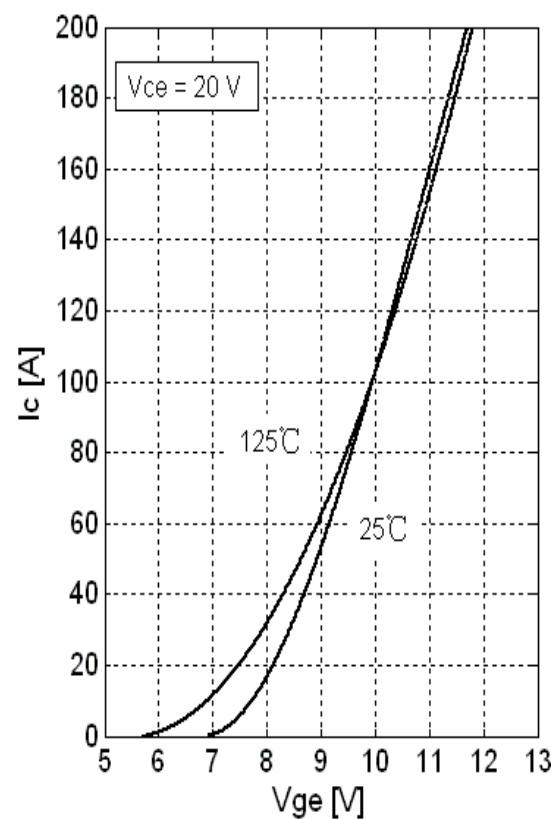


Fig 2. Typical Transfer Characteristics

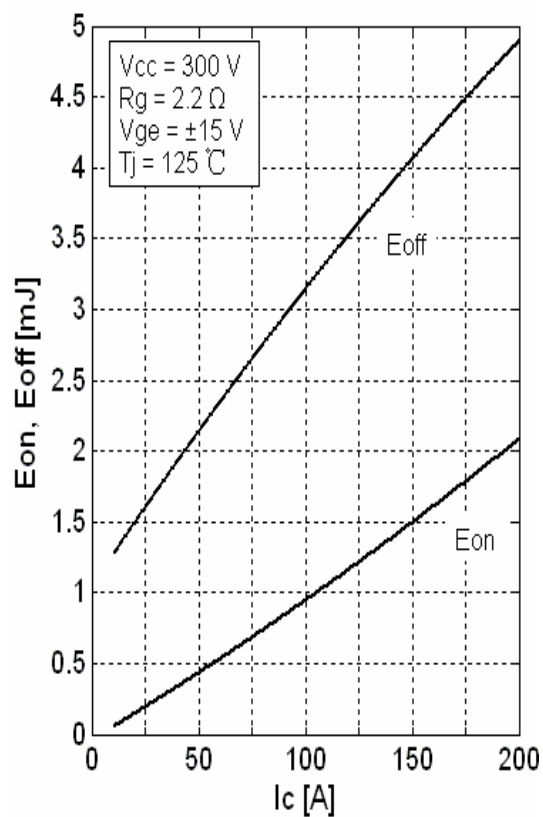


Fig 3. Switching Loss vs Collector Current

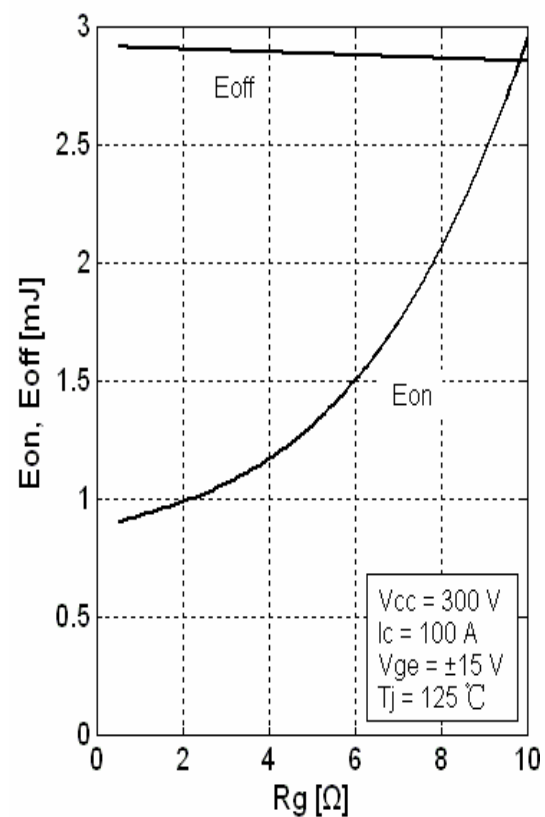


Fig 4. Switching Loss vs Gate Resistor

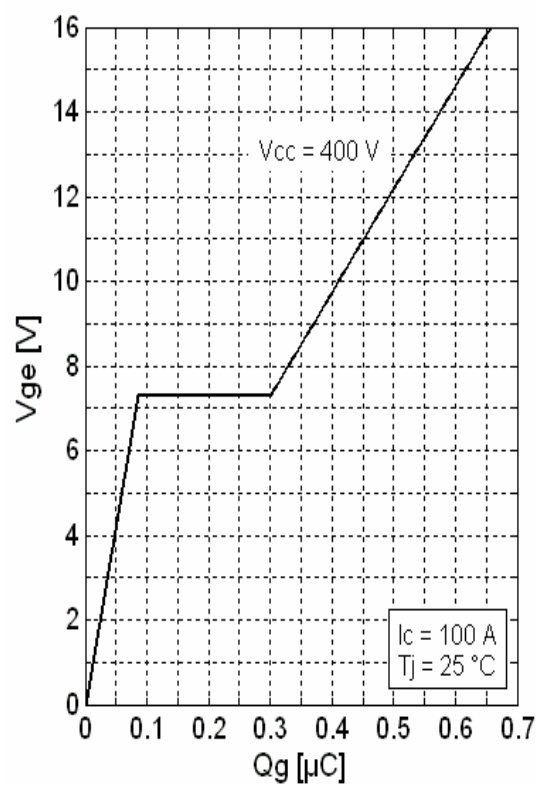
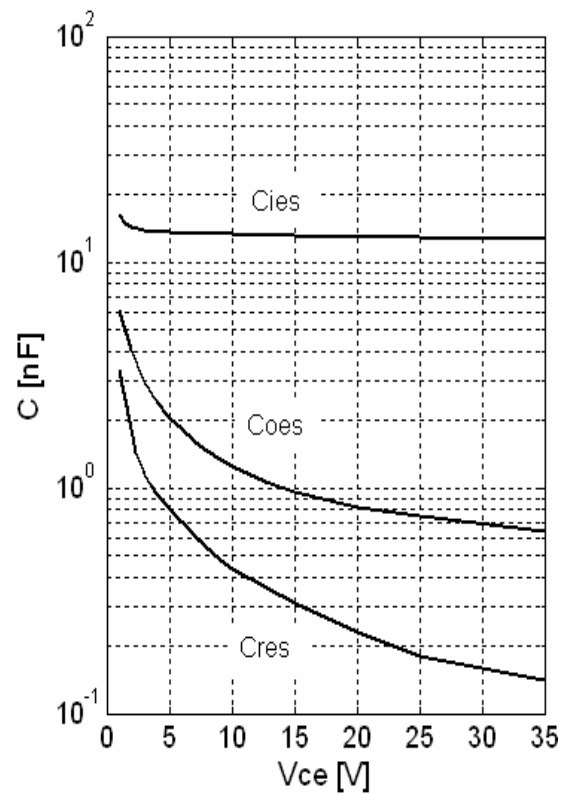
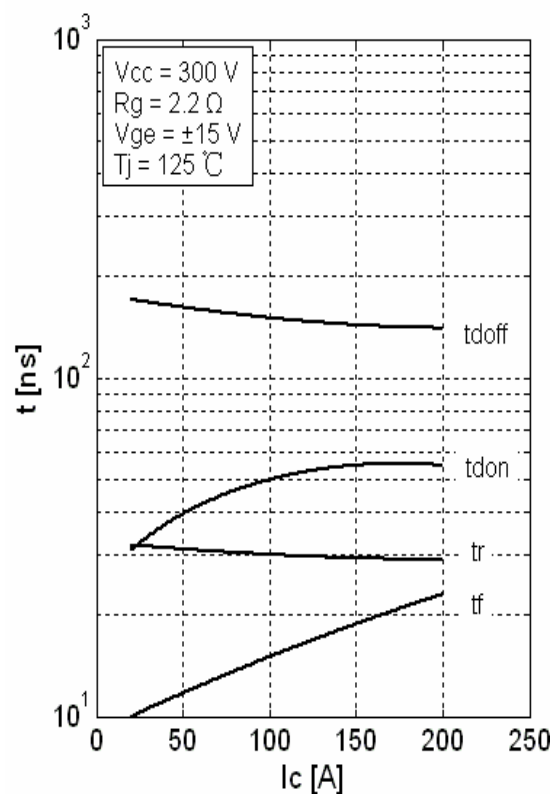
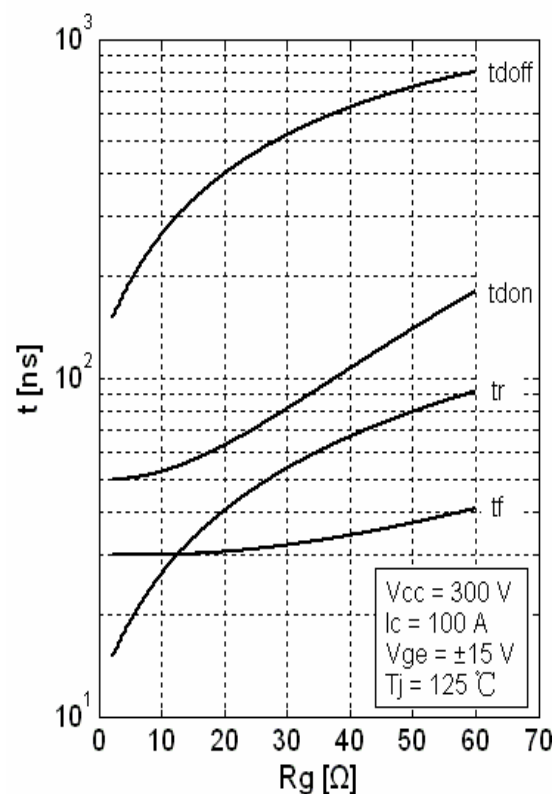


Fig 5. Gate Charge Characteristics.

Fig 6. Typical Capacitance vs  
Collector-Emitter VoltageFig 7. Typical Switching Times vs  $I_c$ Fig 8. Typical Switching Times vs  
Gate Resistance  $R_g$

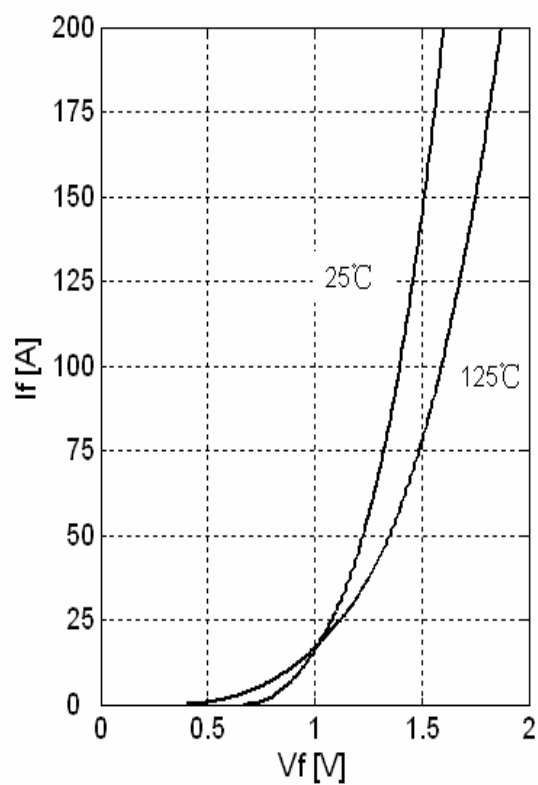


Fig 9. Typical Forward Characteristics (diode)

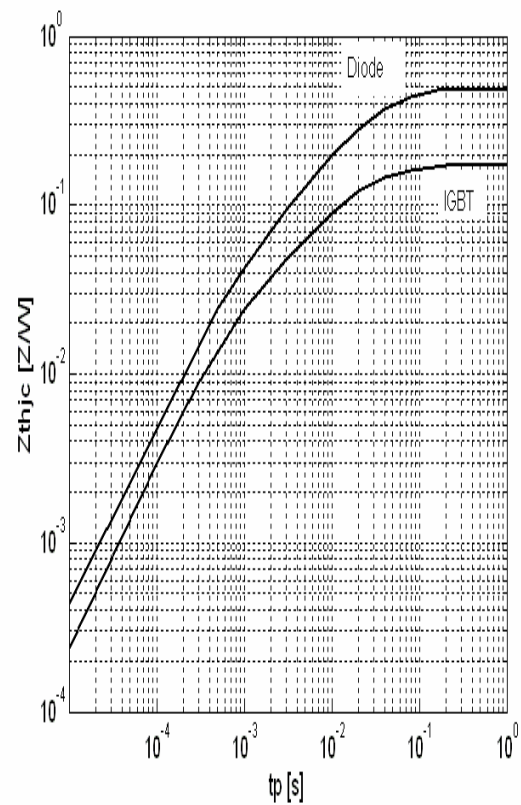


Fig 10. Transient thermal impedance

## Package Dimension

Dimensions in Millimeters

