

# IGBT

## GD150HFL120C2S

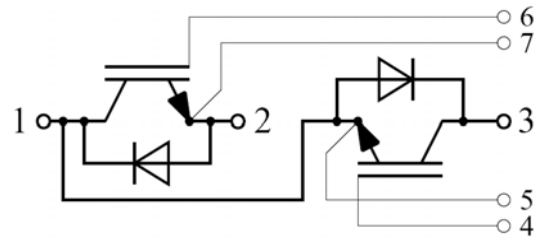
**Molding Type Module**

**1200V/150A 2 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



Equivalent Circuit Schematic

### 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                                                                | GD150HFL120C2S | 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>@ $T_C=80^{\circ}\text{C}$ | 300            | A                  |
|             |                                                                            | 150            |                    |
| $I_{CM(1)}$ | Pulsed Collector Current $t_p=1\text{ms}$                                  | 300            | A                  |
| $I_F$       | Diode Continuous Forward Current                                           | 150            | A                  |
| $I_{FM}$    | Diode Maximum Forward Current $t_p=1\text{ms}$                             | 300            | A                  |
| $P_D$       | Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$                      | 1008           | W                  |
| $T_j$       | 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    | Power Terminal Screw:M6                                                    | 2.5 to 5.0     | N.m                |
| Torque      | Mounting Screw:M6                                                          | 3.0 to 5.0     | 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          | $I_C=6.0\text{mA}$ , $V_{CE}=V_{GE}$ ,<br>$T_j=25^{\circ}\text{C}$     | 5.0  | 6.2  | 7.0  | V     |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C=150\text{A}$ , $V_{GE}=15\text{V}$ ,<br>$T_j=25^{\circ}\text{C}$  |      | 1.90 | 2.35 | V     |
|               |                                         | $I_C=150\text{A}$ , $V_{GE}=15\text{V}$ ,<br>$T_j=125^{\circ}\text{C}$ |      | 2.10 |      |       |

## Switching Characteristics

| Symbol        | Parameter                                | Test Conditions                                                                             | Min. | Typ. | Max. | Units      |
|---------------|------------------------------------------|---------------------------------------------------------------------------------------------|------|------|------|------------|
| $t_{d(on)}$   | Turn-On Delay Time                       | $V_{CC}=600V, I_C=150A,$<br>$R_G=4.7\Omega, V_{GE}=\pm 15V,$<br>$T_J=25^\circ C$            |      | 336  |      | ns         |
| $t_r$         | Rise Time                                |                                                                                             |      | 75   |      | ns         |
| $t_{d(off)}$  | Turn-Off Delay Time                      |                                                                                             |      | 346  |      | ns         |
| $t_f$         | Fall Time                                |                                                                                             |      | 182  |      | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                             |      | 7.25 |      | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                             |      | 9.30 |      | mJ         |
| $t_{d(on)}$   | Turn-On Delay Time                       | $V_{CC}=600V, I_C=150A,$<br>$R_G=4.7\Omega, V_{GE}=\pm 15V,$<br>$T_J=125^\circ C$           |      | 346  |      | ns         |
| $t_r$         | Rise Time                                |                                                                                             |      | 77   |      | ns         |
| $t_{d(off)}$  | Turn-Off Delay Time                      |                                                                                             |      | 389  |      | ns         |
| $t_f$         | Fall Time                                |                                                                                             |      | 322  |      | ns         |
| $E_{on}$      | Turn-On Switching Loss                   |                                                                                             |      | 9.95 |      | mJ         |
| $E_{off}$     | Turn-Off Switching Loss                  |                                                                                             |      | 16.0 |      | mJ         |
| $C_{ies}$     | Input Capacitance                        | $V_{CE}=25V, f=1MHz,$<br>$V_{GE}=0V$                                                        |      | 11.0 |      | nF         |
| $C_{oes}$     | Output Capacitance                       |                                                                                             |      | 0.80 |      | nF         |
| $C_{res}$     | Reverse Transfer Capacitance             |                                                                                             |      | 0.52 |      | nF         |
| $I_{SC}$      | SC Data                                  | $t_{SC}\leq 10\mu s, V_{GE}=15V,$<br>$T_J=125^\circ C, V_{CC}=900V,$<br>$V_{CEM}\leq 1200V$ |      | 890  |      | A          |
| $R_{Gint}$    | Internal Gate Resistance                 |                                                                                             |      | 1.5  |      | $\Omega$   |
| $L_{CE}$      | Stray Inductance                         |                                                                                             |      |      | 20   | nH         |
| $R_{CC'+EE'}$ | Module Lead Resistance, Terminal to Chip | $T_C=25^\circ C$                                                                            |      | 0.35 |      | 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> =150A                                                                        | T <sub>j</sub> =25℃  |      | 1.80 | 2.20 | V     |
|                  |                               |                                                                                             | T <sub>j</sub> =125℃ |      | 1.85 |      |       |
| Q <sub>r</sub>   | Recovered Charge              | I <sub>F</sub> =150A,<br>V <sub>R</sub> =600V,<br>di/dt=-2360A/μs,<br>V <sub>GE</sub> =-15V | T <sub>j</sub> =25℃  |      | 16.2 |      | μC    |
|                  |                               |                                                                                             | T <sub>j</sub> =125℃ |      | 26.6 |      |       |
| I <sub>RM</sub>  | Peak Reverse Recovery Current |                                                                                             | T <sub>j</sub> =25℃  |      | 138  |      | A     |
|                  |                               |                                                                                             | T <sub>j</sub> =125℃ |      | 166  |      |       |
| E <sub>rec</sub> | Reverse Recovery Energy       |                                                                                             | T <sub>j</sub> =25℃  |      | 7.48 |      | mJ    |
|                  |                               |                                                                                             | T <sub>i</sub> =125℃ |      | 13.4 |      |       |

Thermal Characteristics

| Symbol          | Parameter                                | Typ.  | Max.  | Units |
|-----------------|------------------------------------------|-------|-------|-------|
| $R_{\theta JC}$ | Junction-to-Case (per IGBT)              |       | 0.124 | K/W   |
| $R_{\theta JC}$ | Junction-to-Case (per DIODE)             |       | 0.174 | K/W   |
| $R_{\theta CS}$ | Case-to-Sink (Conductive grease applied) | 0.035 |       | K/W   |
| Weight          | Weight of Module                         | 300   |       | g     |

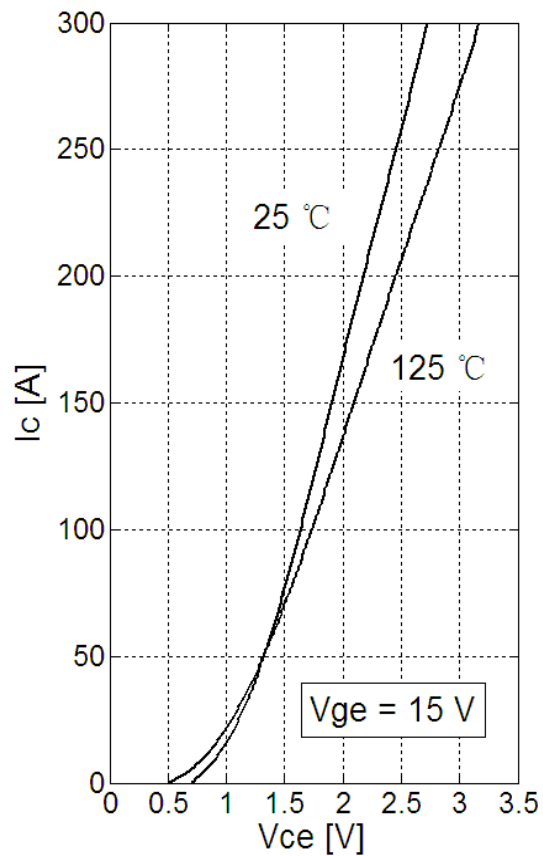


Fig 1. IGBT Typical Output Characteristics

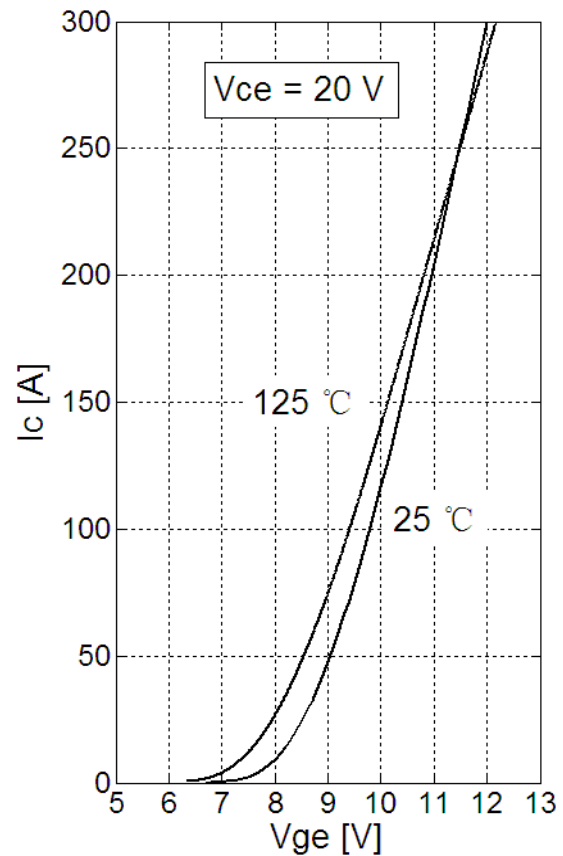
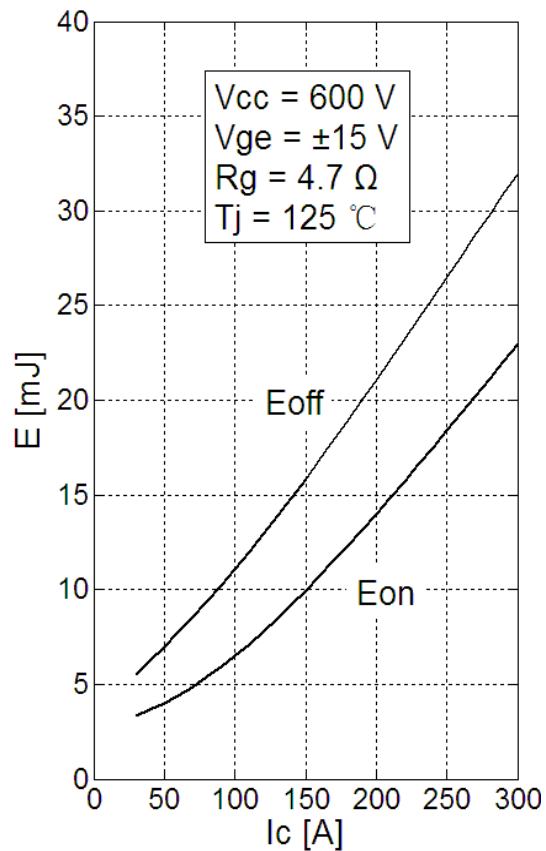
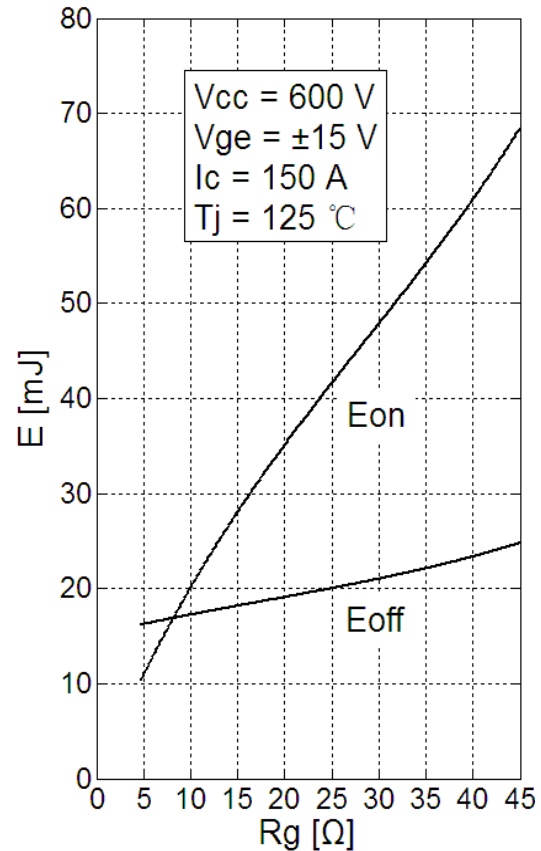


Fig 2. IGBT Typical Transfer Characteristics

Fig 3. IGBT Switching Loss vs.  $I_c$ Fig 4. IGBT Switching Loss vs.  $R_g$

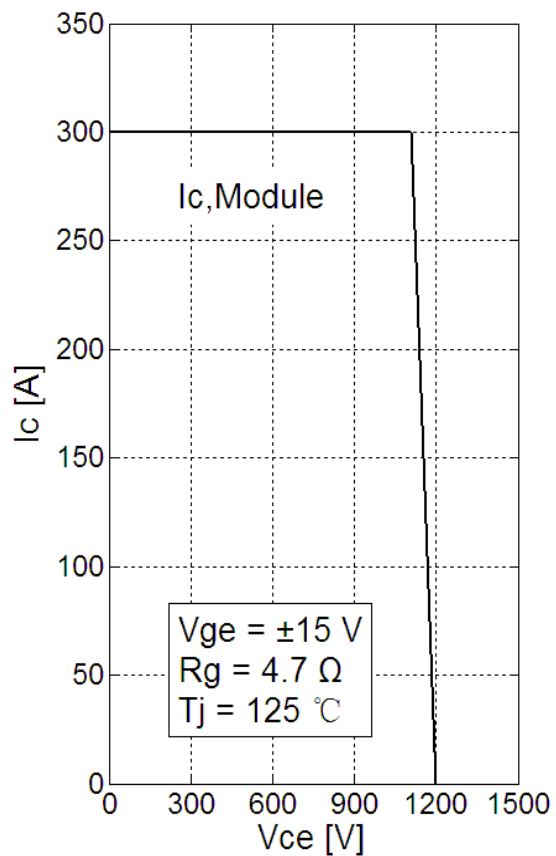


Fig 5. RBSOA

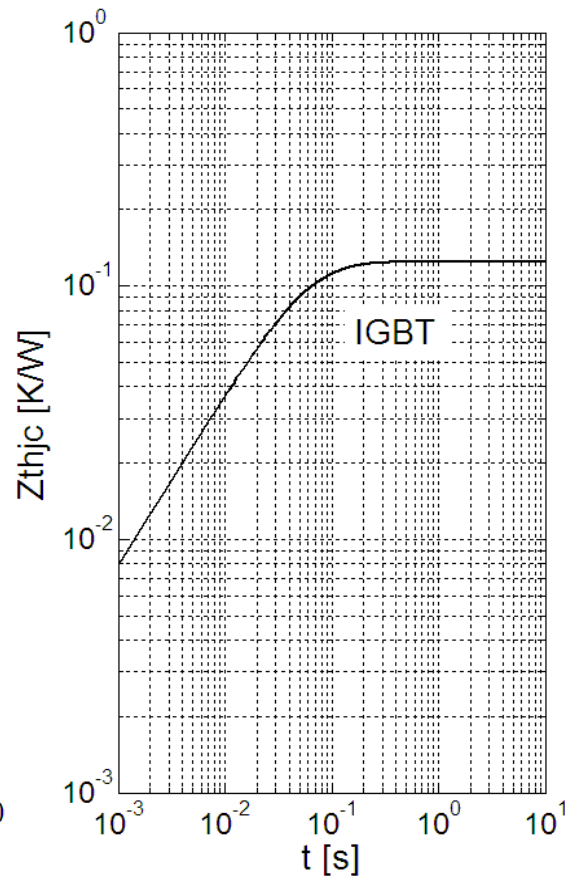


Fig 6. IGBT Transient Thermal Impedance

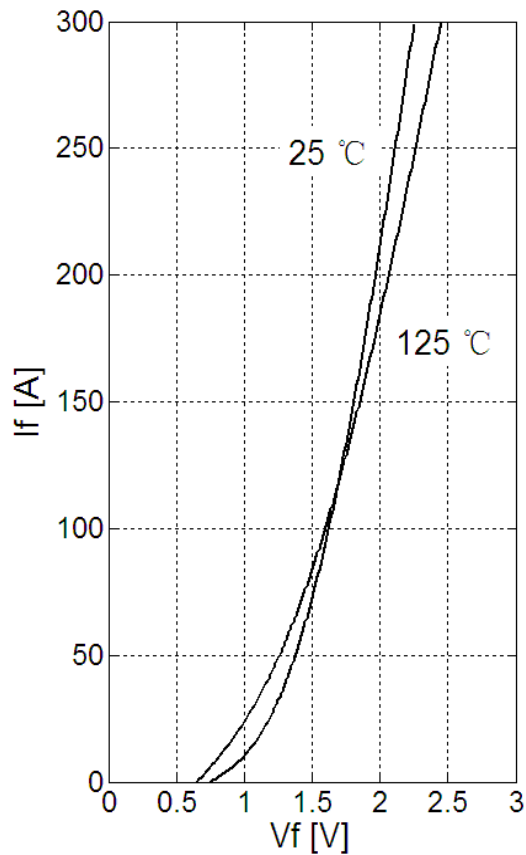
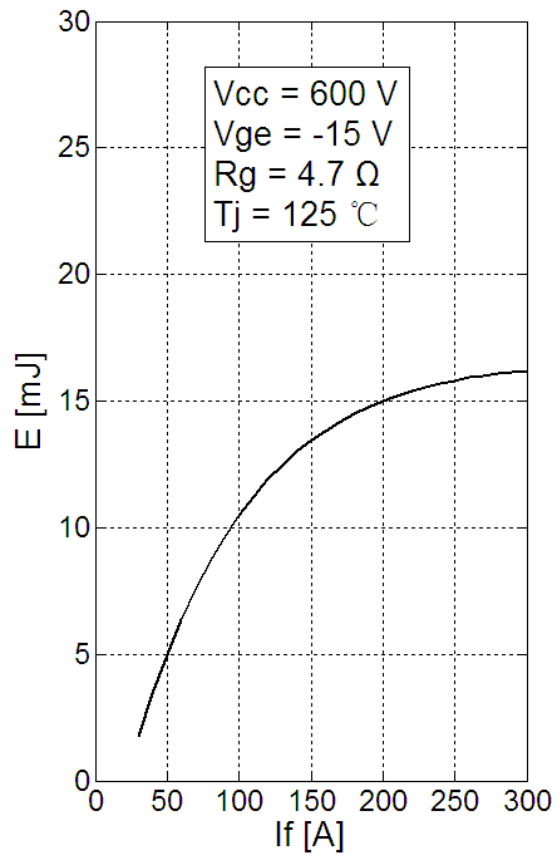


Fig 7. Diode Typical Forward Characteristics

Fig 8. Diode Switching Loss vs.  $I_f$

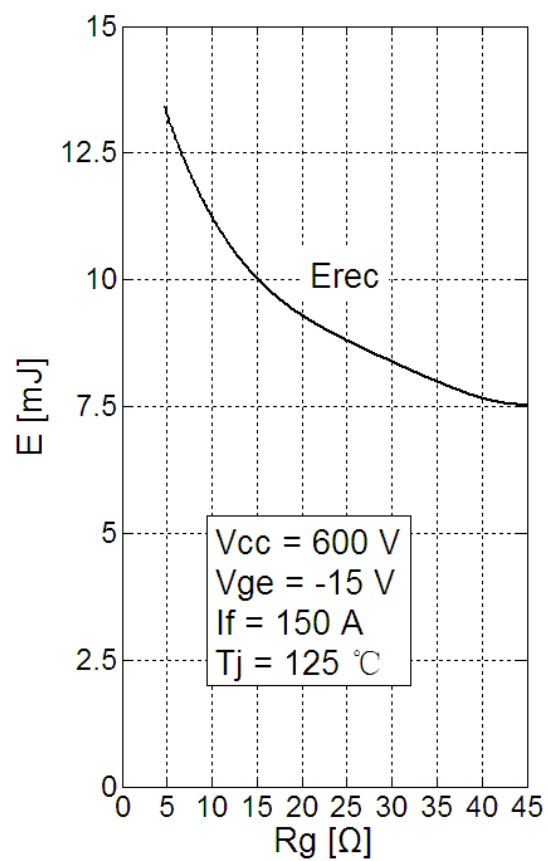
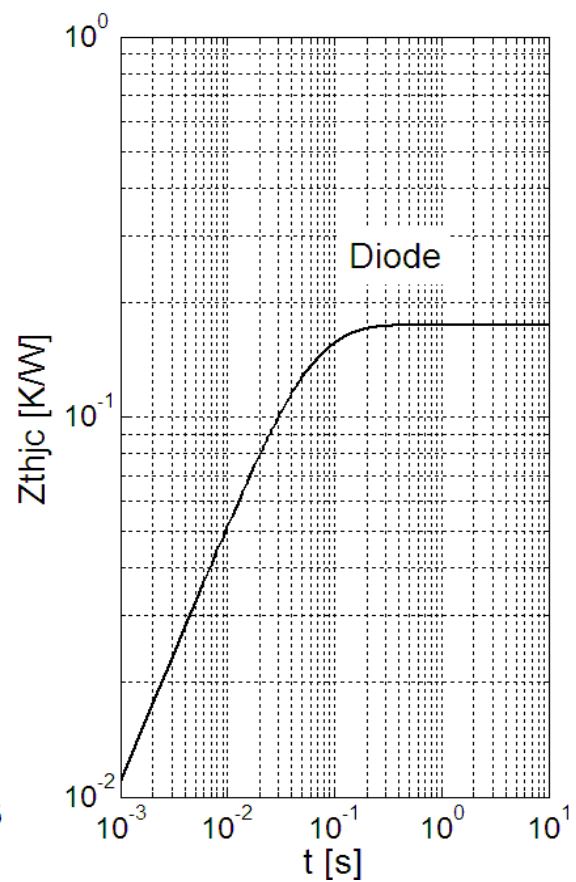
Fig 9. Diode Switching Loss vs.  $R_g$ 

Fig 10. Diode Transient Thermal Impedance

## Package Dimension

Dimensions in Millimeters

