

### Description

The DFI800HF17I4RE1 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power supply and Motor control.



### Features

- Blocking voltage:1700V
- Enhanced FRD
- Low saturation voltage  $V_{CE(sat)}$
- Low Switching Losses
- 175°C maximum junction temperature
- Thermistor inside

### Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Wind Turbines

### Circuit diagram

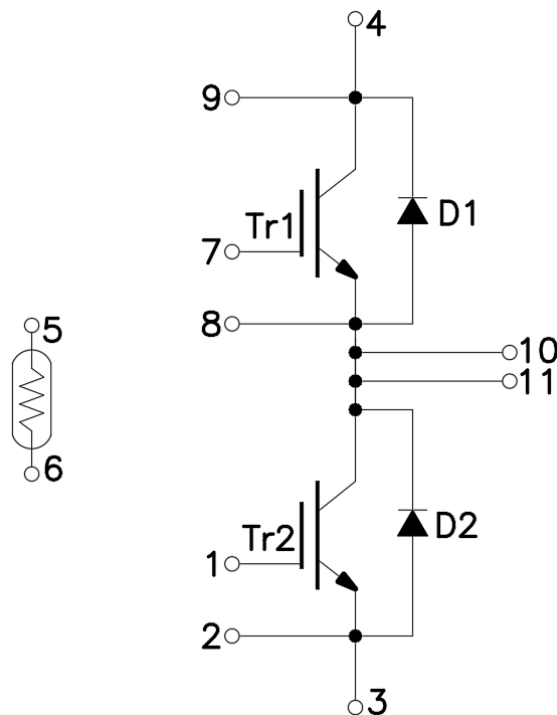


Figure 1. Out drawing & circuit diagram for DFI800HF17I4RE1

**Pin Configuration and Marking Information**

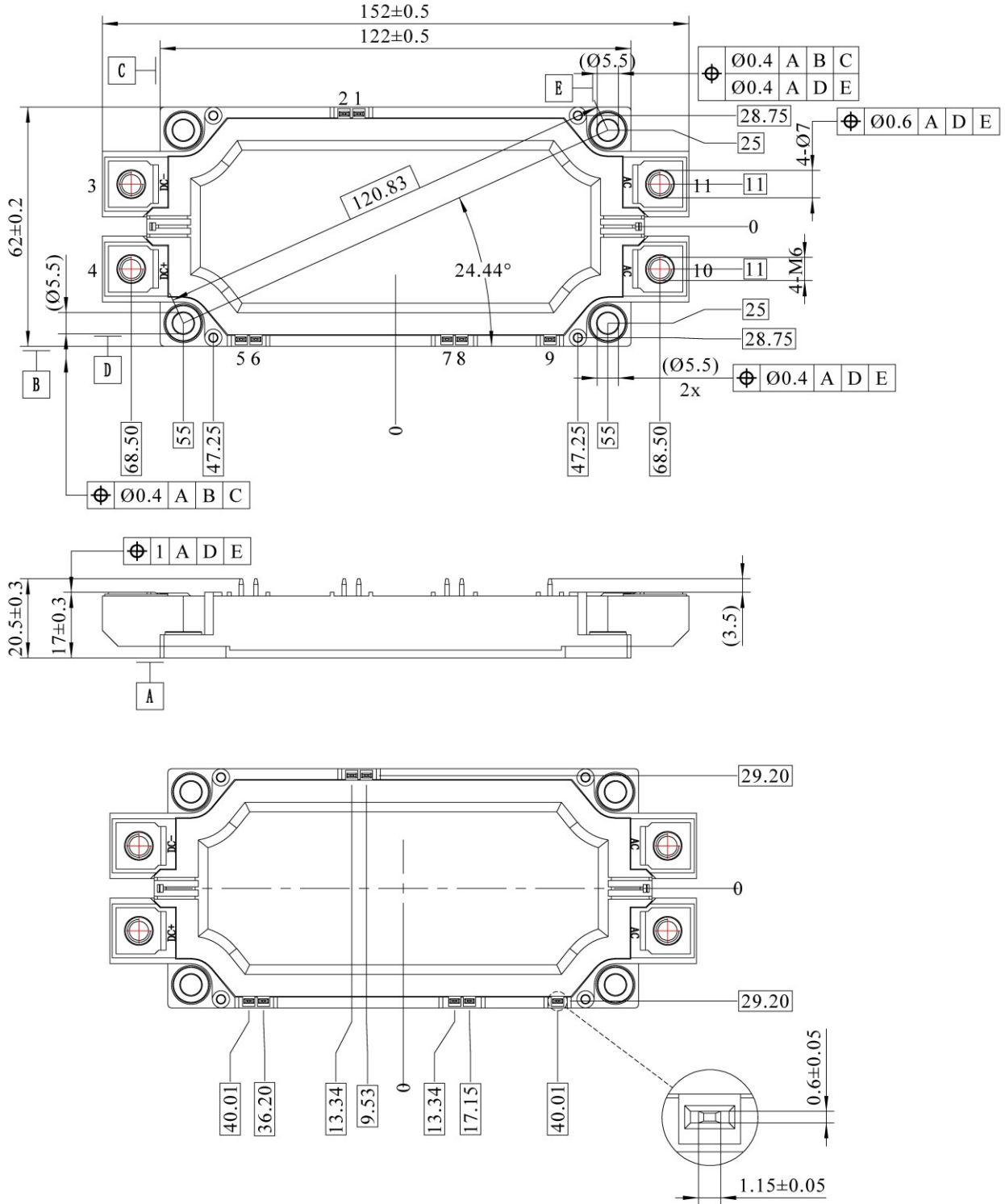


Figure 2. Pin configuration

### Module

| Parameter                              | Conditions                                   | Value      | Unit |
|--|--|------------|------|
| Isolation Voltage                      | RMS, f=50Hz, t=1min                          | 4.0        | KV   |
| Material of module baseplate           | -  | Cu         | -    |
| Creepage distance                      | terminal to heatsink<br>terminal to terminal | 14.5<br>13 | mm   |
| Clearance                              | terminal to heatsink<br>terminal to terminal | 12.5<br>10 | mm   |
| CTI                                    | -  | 600        | -    |
| Module lead resistance, terminals–chip | T <sub>C</sub> =25°C                         | 0.8        | mΩ   |
| Mounting torque for module mounting    | M5, M6                                       | 3 to 6     | Nm   |
| Weight                                 | -  | 350        | g    |

### Maximum Ratings (T<sub>j</sub>=25°C unless otherwise specified)

| Symbol           | Parameter                       | Conditions  | Ratings    | Unit             |
|------------------|---------------------------------|---|------------|------------------|
| V <sub>CES</sub> | Collector-Emitter Voltage       | G-E Short   | 1700       | V                |
| V <sub>GES</sub> | Gate-Emitter Voltage            | C-E Short   | ±30        | V                |
| I <sub>C</sub>   | DC Continuous Collector Current | T <sub>C</sub> =115°C   | 800        | A                |
| I <sub>CM</sub>  | Pulse Collector Current         | t <sub>p</sub> =1ms, Note1  | 1600       | A                |
| P <sub>C</sub>   | Maximum Power Dissipation       | T <sub>C</sub> =25°C, T <sub>j</sub> =175°C(IGBT)                       | 4545       | W                |
| I <sub>F</sub>   | Diode Forward Current           | -   | 800        | A                |
| I <sub>FRM</sub> | Repetitive peak forward Current | t <sub>p</sub> =1ms, Note1  | 1600       | A                |
| I <sup>2</sup> t | I <sup>2</sup> t-value          | V <sub>R</sub> =0V, t <sub>p</sub> =10ms, T <sub>j</sub> =125°C (Diode) | 36000      | A <sup>2</sup> s |
| T <sub>j</sub>   | junction temperature            | -   | -40 to 175 | °C               |
| T <sub>stg</sub> | Storage temperature             | -   | -40 to 125 | °C               |

Note1: Pulse width limited by maximum junction temperature

### NTC characteristics

| Symbol              | Parameter         | Condition  | Value |      |      | Unit |
|---------------------|-------------------|--|-------|------|------|------|
|                     |                   |  | Min.  | Typ. | Max. |      |
| R <sub>25</sub>     | Resistance        | T <sub>C</sub> =25°C   | -     | 5    | -    | kΩ   |
| ΔR/R                | Deviation of R100 | T <sub>C</sub> =100°C, R <sub>100</sub> =493Ω  | -5    | -    | 5    | %    |
| P <sub>25</sub>     | Power dissipation | T <sub>C</sub> =25°C   | -     | -    | 20   | mW   |
| B <sub>25/50</sub>  | B-value           | R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/50</sub> (1/T <sub>2</sub> - 1/(298,15 K))]  | -     | 3375 | -    | K    |
| B <sub>25/80</sub>  | B-value           | R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/80</sub> (1/T <sub>2</sub> - 1/(298,15 K))]  | -     | 3411 | -    | K    |
| B <sub>25/100</sub> | B-value           | R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/100</sub> (1/T <sub>2</sub> - 1/(298,15 K))] | -     | 3433 | -    | K    |

### IGBT Electrical characteristics (T<sub>j</sub>=25°C unless otherwise specified, chip)

| Symbol                         | Item   | Condition   | Value   |       |       | Unit  |     |
|--------------------------------|--|---|---|-------|-------|-------|-----|
|                                |  |   | Min.  | Typ.  | Max.  |       |     |
| V <sub>CE(sat)</sub><br>(Chip) | Collector-Emitter Saturation Voltage                                 | I <sub>C</sub> =800A<br>V <sub>GE</sub> =15V  | T <sub>j</sub> =25°C                          | -     | 1.78  | 2.14  | V   |
|                                |  |   | T <sub>j</sub> =125°C                         | -     | 2.09  | -     | V   |
|                                |  |   | T <sub>j</sub> =150°C                         | -     | 2.16  | -     | V   |
|                                |  |   | T <sub>j</sub> =175°C                         | -     | 2.24  | -     | V   |
| V <sub>GE(th)</sub>            | Gate-Emitter threshold Voltage                                       | I <sub>C</sub> =24mA, V <sub>CE</sub> =V <sub>GE</sub>  | T <sub>j</sub> =25°C                          | 5.0   | 5.8   | 6.5   | V   |
| I <sub>CES</sub>               | Collector- Emitter Cut off Current                                   | V <sub>CE</sub> =1700V, V <sub>GE</sub> =0V   | T <sub>j</sub> =25°C                          | -     | -     | 1     | mA  |
| I <sub>GES</sub>               | Gate-Emitter Leakage Current   | V <sub>GE</sub> =±30V, V <sub>CE</sub> =0V  | T <sub>j</sub> =25°C                          | -     | -     | 1.8   | uA  |
| C <sub>ies</sub>               | Input Capacitance  | V <sub>CE</sub> =25V<br>V <sub>GE</sub> =0V<br>f=1MHz   | T <sub>j</sub> =25°C                          | -     | 49.5  | -     | nF  |
| C <sub>oes</sub>               | Output Capacitance   |   | T <sub>j</sub> =25°C                          | -     | 1.8   | -     | nF  |
| C <sub>res</sub>               | Reverse transfer Capacitance   |   | T <sub>j</sub> =25°C                          | -     | 0.75  | -     | nF  |
| Q <sub>G</sub>                 | Gate charge  | V <sub>GE</sub> = -15V to +15V  | T <sub>j</sub> =25°C                          | -     | 6.2   | -     | uC  |
| R <sub>Gint</sub>              | Internal gate resistor   | -   | T <sub>j</sub> =25°C                          | -     | 1.7   | -     | Ω   |
| t <sub>d(on)</sub>             | Turn-on delay time   | V <sub>CC</sub> =900V<br>I <sub>C</sub> = 800A<br>V <sub>GE</sub> =+15V/-8V<br>R <sub>G</sub> =1.0Ω<br>Inductive load | T <sub>j</sub> =25°C                          | -     | 232   | -     | ns  |
|                                |  |   | T <sub>j</sub> =125°C                         | -     | 232   | -     |     |
|                                |  |   | T <sub>j</sub> =150°C                         | -     | 233   | -     |     |
| t <sub>r</sub>                 | Rise time  |   | T <sub>j</sub> =25°C                          | -     | 106   | -     | ns  |
|                                |  |   | T <sub>j</sub> =125°C                         | -     | 136   | -     |     |
|                                |  |   | T <sub>j</sub> =150°C                         | -     | 144   | -     |     |
| t <sub>d(off)</sub>            | Turn-off delay time  |   | T <sub>j</sub> =25°C                          | -     | 563   | -     | ns  |
|                                |  |   | T <sub>j</sub> =125°C                         | -     | 644   | -     |     |
|                                |  |   | T <sub>j</sub> =150°C                         | -     | 664   | -     |     |
| t <sub>f</sub>                 | Fall time  |   | T <sub>j</sub> =25°C                          | -     | 363   | -     | ns  |
|                                |  | T <sub>j</sub> =125°C   | -   | 505   | -     |       |     |
|                                |  | T <sub>j</sub> =150°C   | -   | 542   | -     |       |     |
| E <sub>on</sub>                | Turn-on power dissipation  | T <sub>j</sub> =25°C  | -   | 201.8 | -     | mJ    |     |
|                                |  | T <sub>j</sub> =125°C   | -   | 325.3 | -     |       |     |
|                                |  | T <sub>j</sub> =150°C   | -   | 345.2 | -     |       |     |
| E <sub>off</sub>               | Turn-off power dissipation   | T <sub>j</sub> =25°C  | -   | 157.3 | -     | mJ    |     |
|                                |  | T <sub>j</sub> =125°C   | -   | 195.8 | -     |       |     |
|                                |  | T <sub>j</sub> =150°C   | -   | 205.5 | -     |       |     |
| I <sub>SC</sub>                | SC data  | V <sub>GE</sub> ≤ 15V, V <sub>CC</sub> =900V  | t <sub>p</sub> <10us<br>T <sub>j</sub> =150°C | -     | 3000  | -     | A   |
| R <sub>th(j-c)</sub>           | Thermal Resistance, Junction to Case (IGBT)                          |   |   | -     | -     | 0.033 | K/W |
| R <sub>th(c-s)</sub>           | Thermal Resistance, Case to sink (Conductive Grease applied) , Note1 |   |   | -     | 0.015 | -     | K/W |

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m · K and thickness is 50um

### Freewheeling Diode Electrical characteristics (T<sub>j</sub>=25°C unless otherwise specified, chip)

| Symbol               | Item  | Condition  | Value                 |       |       | Unit |    |
|----------------------|---|--|-----------------------|-------|-------|------|----|
|                      |   |  | Min.                  | Typ.  | Max.  |      |    |
| V <sub>F</sub>       | Diode Forward Voltage   | I <sub>F</sub> =800A<br>V <sub>GE</sub> =0V  | T <sub>j</sub> =25°C  | -     | 1.93  | 2.32 | V  |
|                      |   |  | T <sub>j</sub> =125°C | -     | 1.95  | -    |    |
|                      |   |  | T <sub>j</sub> =150°C | -     | 1.95  | -    |    |
|                      |   |  | T <sub>j</sub> =175°C | -     | 1.80  | -    |    |
| t <sub>rr</sub>      | Reverse recovery time   | (Switch side)  | T <sub>j</sub> =25°C  | -     | 50.7  | -    | us |
|                      |   |  | T <sub>j</sub> =125°C | -     | 50.8  | -    |    |
|                      |   |  | T <sub>j</sub> =150°C | -     | 50.8  | -    |    |
| I <sub>RM</sub>      | Peak reverse recovery Current                                       | V <sub>CC</sub> =900V, I <sub>C</sub> =800A<br>V <sub>GE</sub> =+15V/-8V<br>R <sub>G</sub> =1.0Ω         | T <sub>j</sub> =25°C  | -     | 1012  | -    | A  |
|                      |   |  | T <sub>j</sub> =125°C | -     | 1051  | -    |    |
|                      |   |  | T <sub>j</sub> =150°C | -     | 1069  | -    |    |
| Q <sub>rr</sub>      | Recovered charge  | (FRD side)<br>V <sub>rr</sub> =900V, I <sub>F</sub> =800A<br>V <sub>GE</sub> =+15V/-8V<br>Inductive load | T <sub>j</sub> =25°C  | -     | 861   | -    | uC |
|                      |   |  | T <sub>j</sub> =125°C | -     | 923   | -    |    |
|                      |   |  | T <sub>j</sub> =150°C | -     | 942   | -    |    |
| E <sub>rr</sub>      | Reverse recovered energy  | switching operation  | T <sub>j</sub> =25°C  | -     | 414.8 | -    | mJ |
|                      |   |  | T <sub>j</sub> =125°C | -     | 348.3 | -    |    |
|                      |   |  | T <sub>j</sub> =150°C | -     | 332.7 | -    |    |
| R <sub>th(j-c)</sub> | Thermal Resistance, Junction to Case (Diode)                        |  | -                     | -     | 0.035 | °C/W |    |
| R <sub>th(c-s)</sub> | Thermal Resistance, Case to sink (Conductive Grease applied), Note1 |  | -                     | 0.015 | -     | °C/W |    |

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m · K and thickness is 50um

### Test Conditions

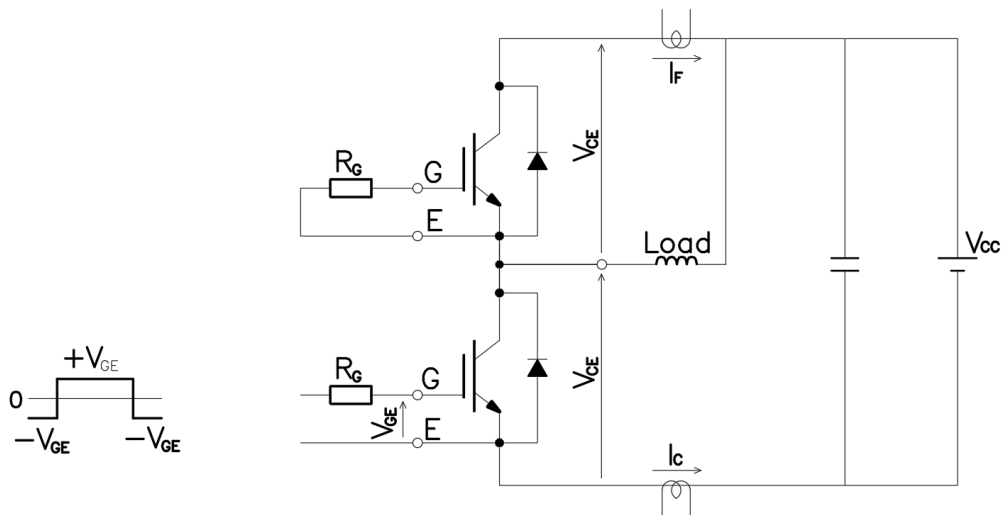


Figure 3. Switching time measure circuit

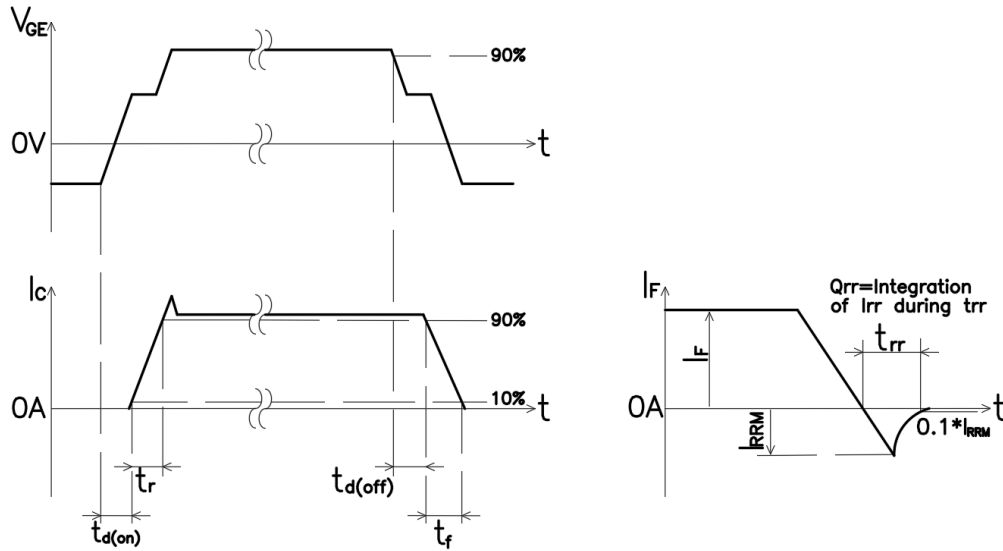


Figure 4. Switching time definition

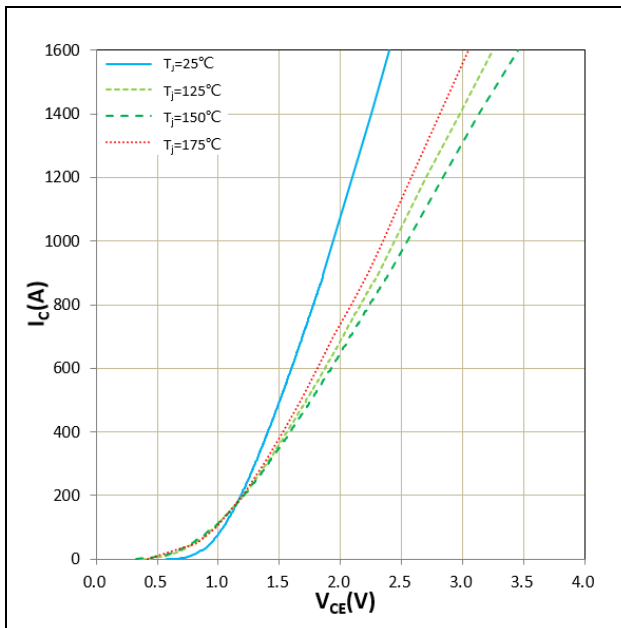


Figure 5.  $I_c$  vs  $V_{CE}$   
 $V_{GE} = 15V$

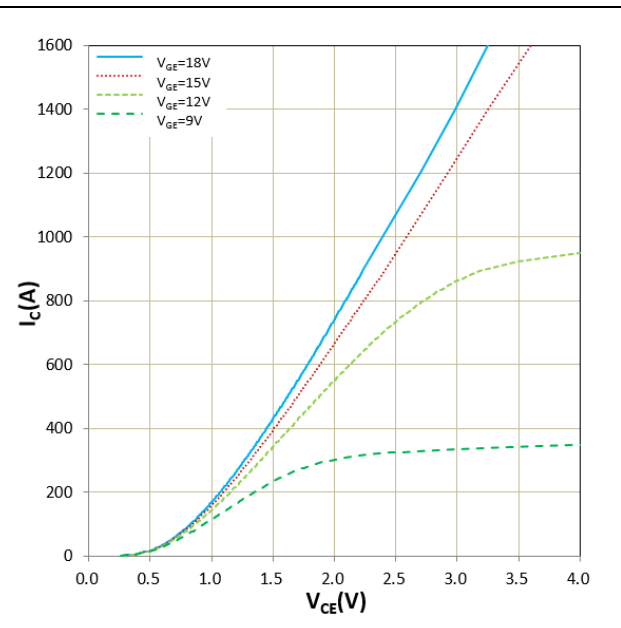


Figure 6.  $I_c$  vs  $V_{CE}$   
 $T_j = 175^\circ C$

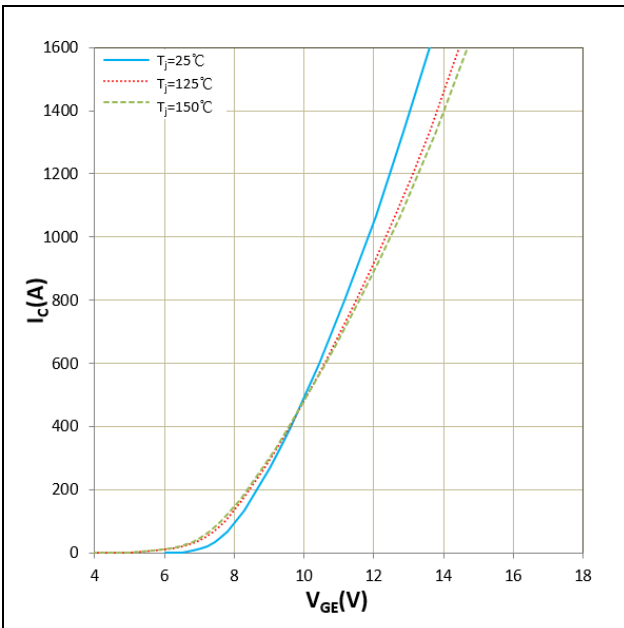


Figure 7.  $I_c$  vs  $V_{GE}$   
 $V_{CE}=20V$

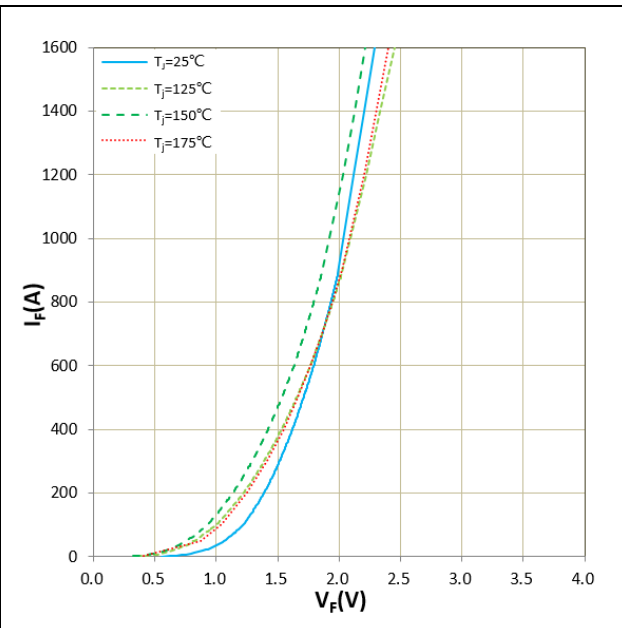


Figure 8.  $I_F$  vs  $V_F$

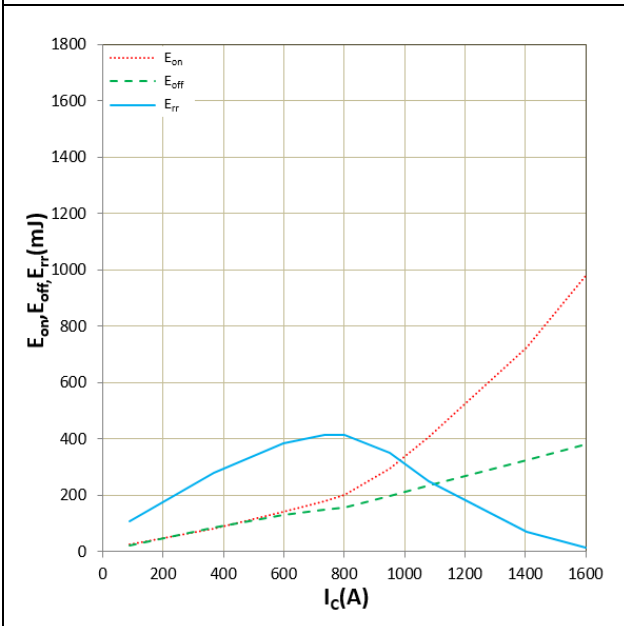


Figure 9.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_c$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $R_G=1.0\Omega$   
 $T_j=25^\circ C$ , Inductive Load

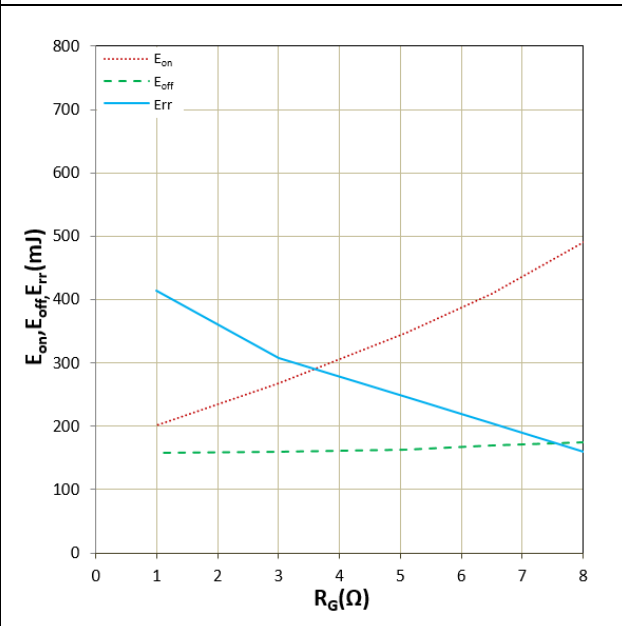


Figure 10.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_G$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $I_c=800A$   
 $T_j=25^\circ C$ , Inductive Load

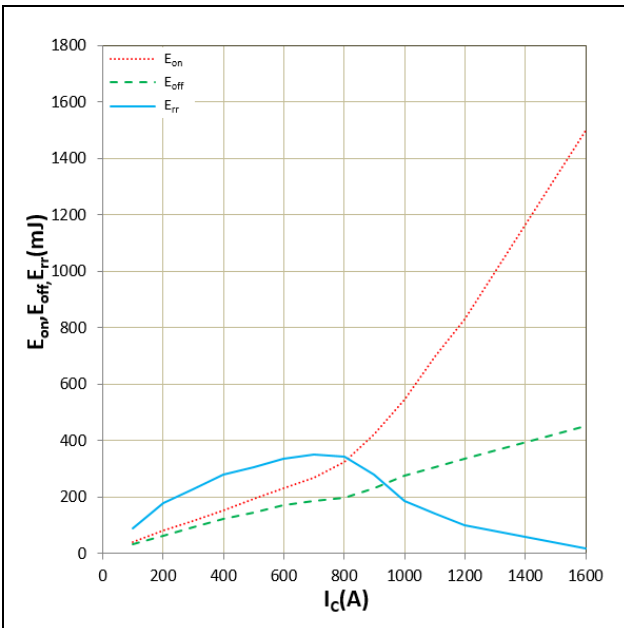


Figure 11.  $E_{on}$ ,  $E_{off}$  vs  $I_c$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $R_G=1.0\Omega$   
 $T_j=125^\circ C$ , inductive Load

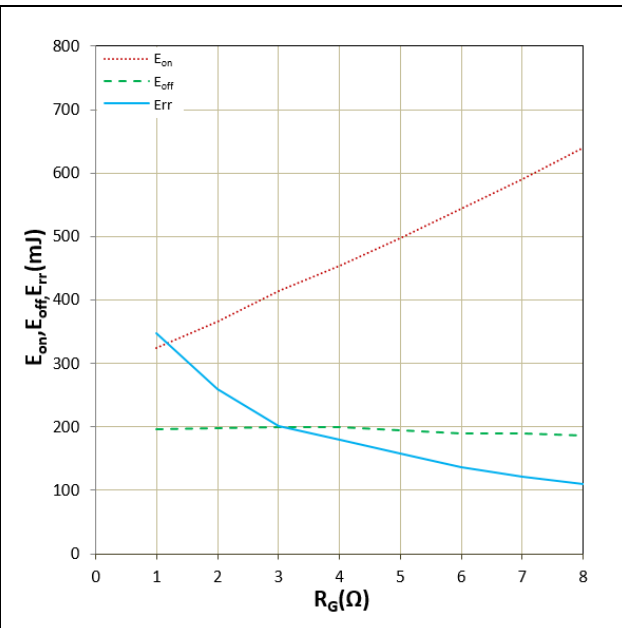


Figure 12.  $E_{on}$ ,  $E_{off}$ ,  $Err$  vs  $R_G$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $I_c=800A$   
 $T_j=125^\circ C$ , Inductive Load

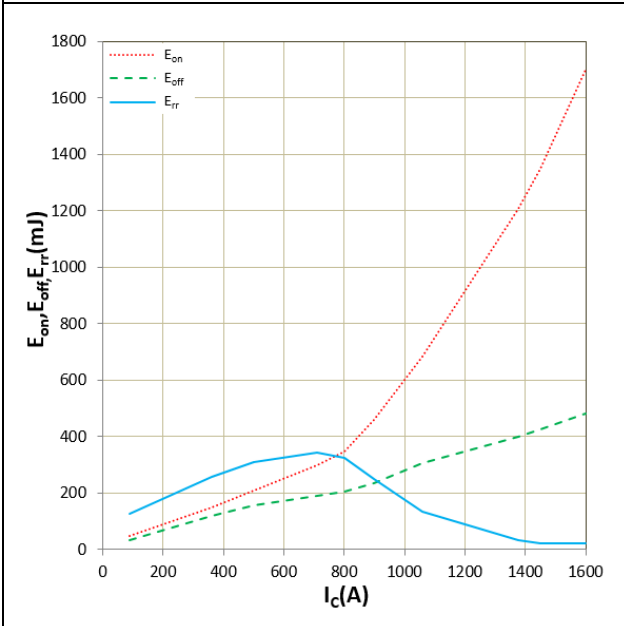


Figure 13.  $E_{on}$ ,  $E_{off}$  vs  $I_c$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $R_G=1.0\Omega$   
 $T_j=150^\circ C$ , inductive Load

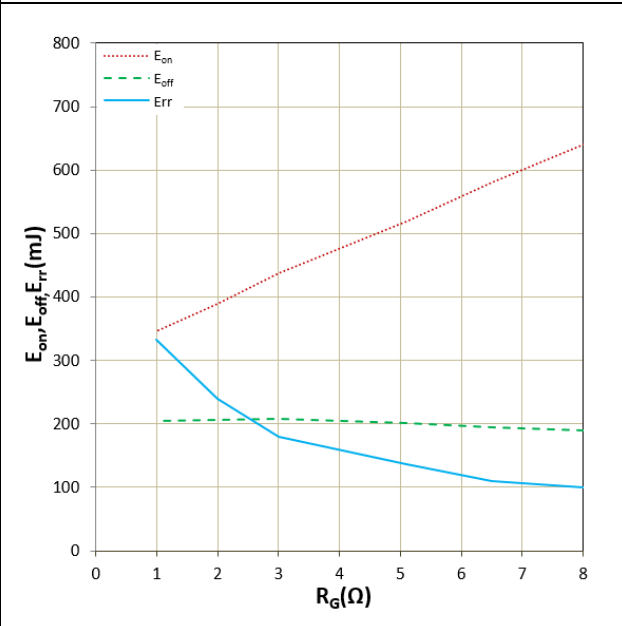


Figure 14.  $E_{on}$ ,  $E_{off}$ ,  $Err$  vs  $R_G$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $I_c=800A$   
 $T_j=150^\circ C$ , Inductive Load



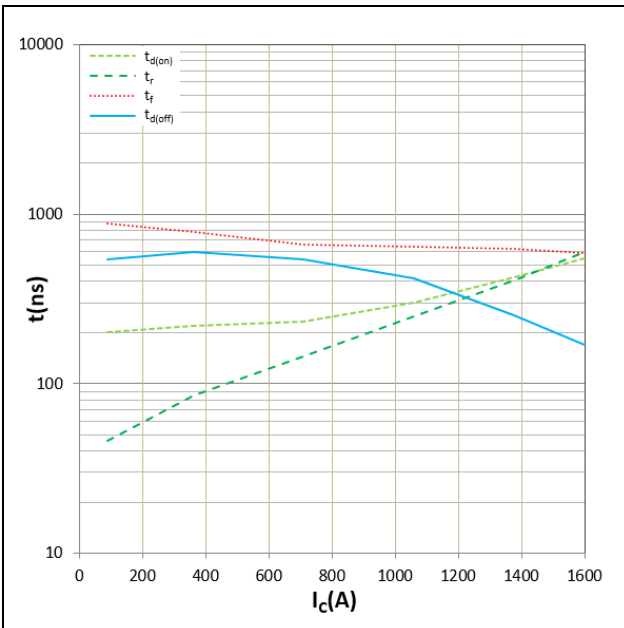


Figure 13. Switching time vs  $I_c$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $R_G=1.0\Omega$   
 $T_j=150^\circ C$ , Inductive Load

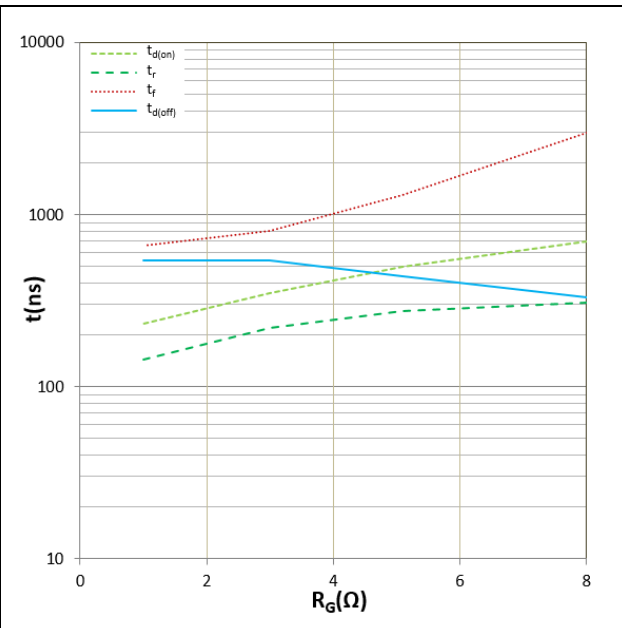


Figure 14. Switching time vs  $R_G$ (Typ)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $I_c=800A$   
 $T_j=150^\circ C$ , Inductive Load

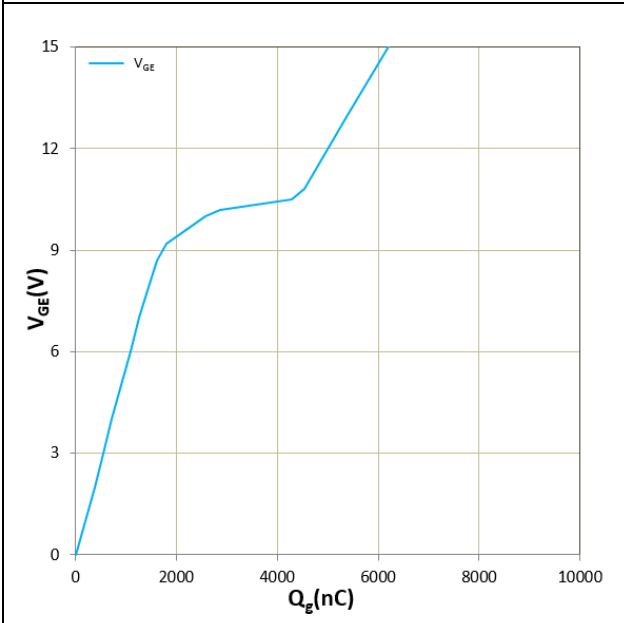


Figure 15. Gate charge

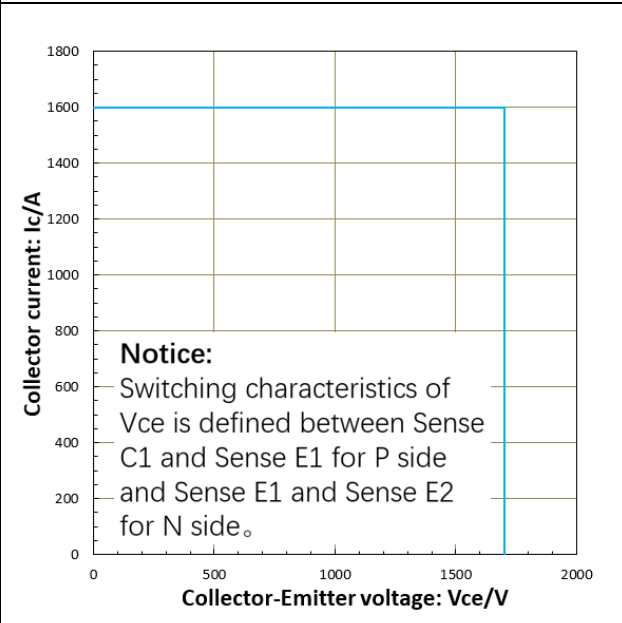


Figure 16. Reverse bias safe operating area(max.)  
 $V_{CC}=900V$ ,  $V_{GE}=+15V/-8V$ ,  $R_G=1.0\Omega$ ,  $T_j=175^\circ C$

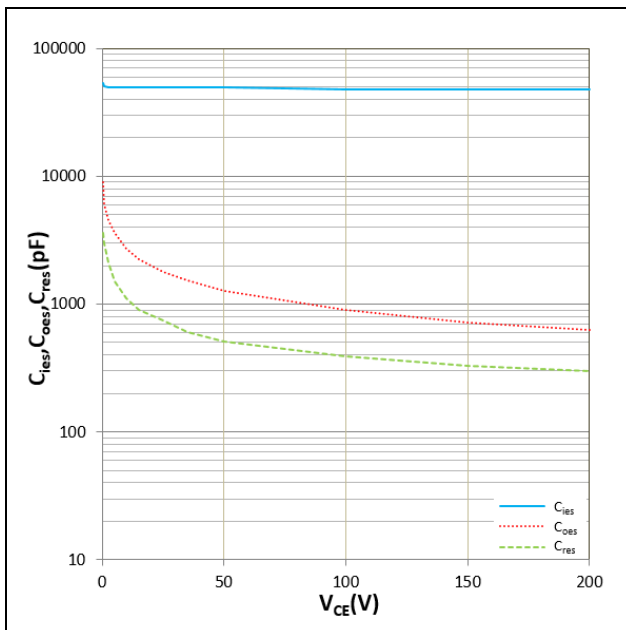


Figure 17.  $C_{ies}$ ,  $C_{oes}$ ,  $C_{res}$  vs  $V_{CE}$   
 $T_j = 25^\circ\text{C}$ ,  $f = 1\text{MHz}$

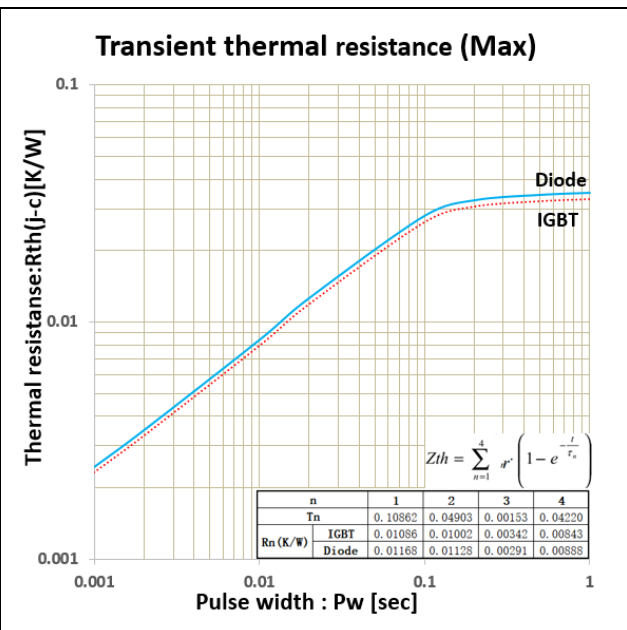


Figure 18. transient thermal impedance  
 IGBT/Diode

### IMPORTANT NOTICE:

This product data sheet describes the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively under the terms and conditions of the supply agreement. There will be no guarantee or of any kind for the product and its characteristics.

The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

Due to technical requirements, our product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

Changes to this product data sheet are reserved.

Please contact the sales staff (Sales@leapers-power.com) for further information on the product, technology, delivery terms, conditions and prices.