# DFI900HF12I4ME7

## 1200V/900A Half Bridge IGBT Module

## Description

The DFI900HF12I4ME7 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power Switching Application and Motor control.

## Features

- Blocking voltage:1200V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- Thermistor inside

## Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Uninterrupted Power Supply

## Circuit diagram

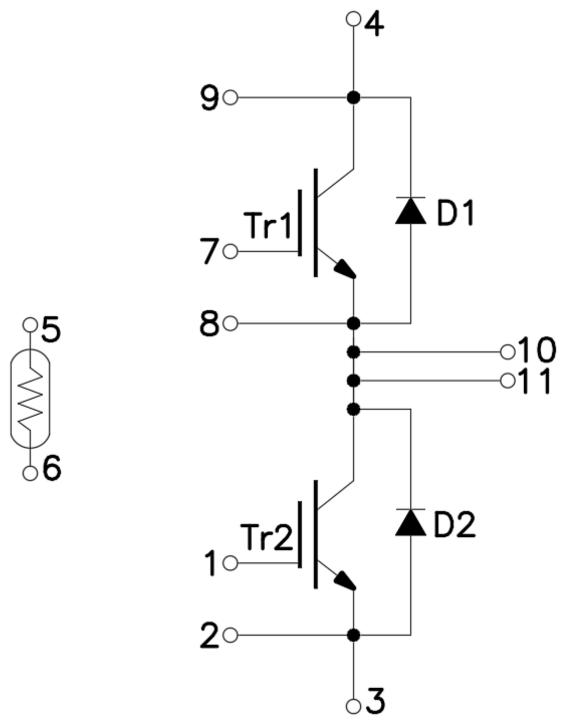



Figure 1. Out drawing & circuit diagram for DFI900HF12I4ME7

## Pin Configuration and Marking Information

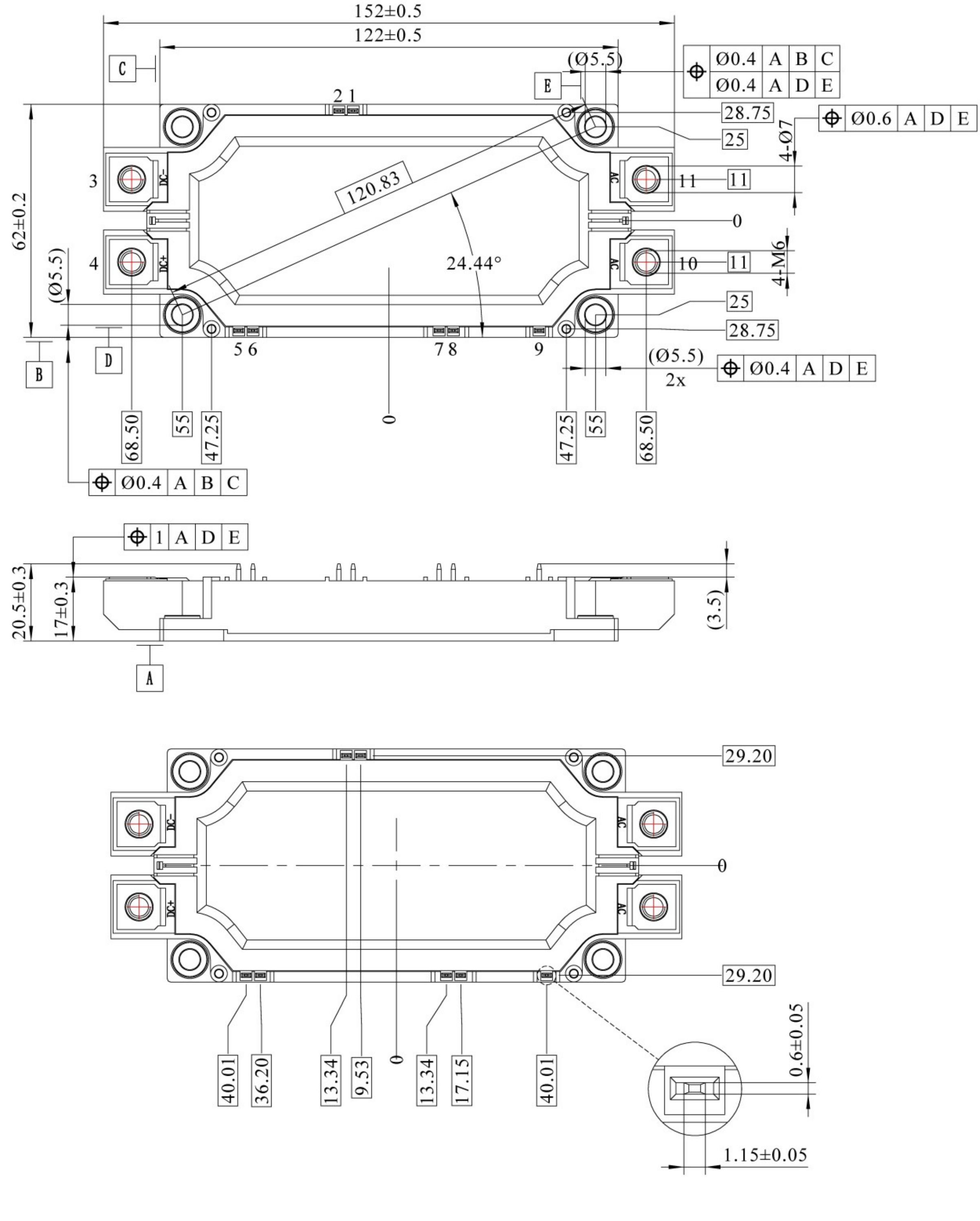



Figure 2. Pin configuration

## Module

| Parameter | Condition | Value | Unit |
|---|---|---|---|
| Isolation Voltage | RMS, f =50Hz, t =1min | 3.4 | 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 | - | >400 | - |
| Module lead resistance, terminals – chip | $T_C$ =25°C | 0.8 | mΩ |
| Mounting torque for module mounting | M5, M6 | 3 to 6 | Nm |
| Weight | - | 350 | g |

## Maximum Ratings ($T_j$ =25°C unless otherwise specified)

| Symbol | Parameter | Condition | Ratings | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | G-E Short | 1200 | V |
| $V_{GES}$ | Gate-Emitter Voltage | C-E Short | ±20 | V |
| $I_C$ | DC Continuous Collector Current | $T_C$ =75°C, $T_j$ =150°C | 900 | A |
| $I_{CM}$ | Pulse Collector Current | $t_p$ =1ms, Note1 | 1800 | A |
| $P_C$ | Maximum Power Dissipation | $T_C$ =25°C, $T_j$ =150°C(IGBT) | 3125 | W |
| $I_F$ | Diode Forward Current | - | 900 | A |
| $I_{FRM}$ | Repetitive peak forward Current | $t_p$ =1ms, Note1 | 1800 | A |
| $T_{vjop}$ | Operating junction temperature | Note2 | -40 to 175 | °C |
| $T_{stg}$ | Storage temperature | - | -40 to 125 | °C |

Note1: Pulse width limited by maximum junction temperature

Note2: $T_{vjop}$ >150°C is only allowed for operation at overload conditions

## NTC characteristics

| Symbol | Parameter | Condition | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $R_{25}$ | Resistance | $T_C$ =25°C | - | 5 | - | kΩ |
| ΔR/R | Deviation of R100 | $T_C$ =100°C, $R_{100}$ =493Ω | -5 | - | 5 | % |
| $P_{25}$ | Power dissipation | $T_C$ =25°C | - | - | 20 | mW |
| $B_{25/50}$ | B-value | R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))] | - | 3375 | - | K |
| $B_{25/80}$ | B-value | R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))] | - | 3411 | - | K |
| $B_{25/100}$ | B-value | R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))] | - | 3433 | - | K |

## IGBT Electrical characteristics ($T_j$ =25°C unless otherwise specified, chip)

| Symbol | Item | Condition | | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| $V_{CE(sat)}$ (Chip) | Collector-Emitter Saturation Voltage | $I_C$ =900A, $V_{GE}$ =15V | $T_j$ =25°C | - | 1.72 | 2.06 | V |
| | | | $T_j$ =125°C | - | 2.00 | - | |
| | | | $T_j$ =150°C | - | 2.10 | - | |
| | | | $T_j$ =175°C | - | 2.18 | - | |
| $V_{GE(th)}$ | Gate-Emitter threshold Voltage | $I_C$ =25mA, $V_{CE}$ =$V_{GE}$ | | 5.0 | - | 6.5 | V |
| $Q_G$ | Gate charge | $V_{GE}$ = -15V to +15V | | - | 7.6 | - | uC |
| $R_{Gint}$ | Internal gate resistor | - | $T_j$ =25°C | - | 0.5 | - | Ω |
| $C_{ies}$ | Input Capacitance | $V_{CE}$ =25V, $V_{GE}$ =0V, f =1MHz | $T_j$ =25°C | - | 133.8 | - | nF |
| $C_{oes}$ | Output Capacitance | | | - | 4.35 | - | nF |
| $C_{res}$ | Reverse transfer Capacitance | | | - | 1.18 | - | nF |
| $I_{CES}$ | Collector- Emitter Cut off Current | $V_{CE}$ =1200V, $V_{GE}$ =0V | $T_j$ =25°C | - | - | 1 | mA |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{GE}$ = 20V, $V_{CE}$ =0V | $T_j$ =25°C | - | - | 1.5 | uA |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}$ =600V, $I_C$ = 900A, $V_{GE}$ =+15V/-8V, $R_g$ =1.0Ω, Inductive load | $T_j$ =25°C | - | 289 | - | ns |
| | | | $T_j$ =150°C | - | 325 | - | |
| $t_r$ | Rise time | | $T_j$ =25°C | - | 110 | - | ns |
| | | | $T_j$ =150°C | - | 138 | - | |
| $t_{d(off)}$ | Turn-off delay time | | $T_j$ =25°C | - | 483 | - | ns |
| | | | $T_j$ =150°C | - | 548 | - | |
| $t_f$ | Fall time | | $T_j$ =25°C | - | 163 | - | ns |
| | | | $T_j$=150°C | - | 292 | - | |
| $E_{on}$ | Turn-on power dissipation | | $T_j$ =25°C | - | 64.24 | - | mJ |
| | | | $T_j$ =150°C | - | 92.36 | - | |
| $E_{off}$ | Turn-off power dissipation | | $T_j$ =25°C | - | 89.56 | - | mJ |
| | | | $T_j$ =150°C | - | 114.98 | - | |
| $R_{th(j-c)}$ | Thermal Resistance, Junction to Case (IGBT) | | | - | 0.040 | - | K/W |
| $R_{th(c-s)}$ | Thermal Resistance, Case to sink (Conductive Grease applied), Note1 | | | - | 0.015 | - | K/W |

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

## Freewheeling Diode Electrical characteristics ($T_j$=25°C unless otherwise specified, chip)

| Symbol | Item | Condition | | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| $V_F$ | Diode Forward Voltage | $I_F$ =900A<br>$V_{GE}$ =0V | $T_j$=25°C | - | 1.69 | 2. 03 | V |
| | | | $T_j$=125°C | - | 1.58 | - | |
| | | | $T_j$=150°C | - | 1.55 | - | |
| | | | $T_j$=175°C | - | 1.50 | - | |
| $T_{rr}$ | Reverse recovery time | $V_{CC}$=600V<br>$I_F$=900A<br>$V_{GE}$=+15/-8V<br>$R_g$=1.0Ω<br>Inductive load<br>switching operation | $T_j$=25°C | - | 685 | - | ns |
| | | | $T_j$=150°C | - | 864 | - | |
| $I_{RM}$ | Peak reverse recovery Current | | $T_j$=25°C | - | 565 | - | A |
| | | | $T_j$=150°C | - | 609 | - | |
| $Q_{rr}$ | Reverse recovery charge | | $T_j$=25°C | - | 0.161 | - | uC |
| | | | $T_j$=150°C | - | 0.242 | - | |
| $E_{rr}$ | Reverse recovered energy | | $T_j$=25°C | - | 75.50 | - | mJ |
| | | | $T_j$=150°C | - | 112.32 | - | |
| $R_{th(j-c)}$ | Thermal Resistance, Junction to Case (Diode) | | | - | 0.072 | - | K/W |
| $R_{th(c-s)}$ | Thermal Resistance, Case to sink (Conductive Grease applied), Note1 | | | - | 0.025 | - | K/W |

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

## Test Conditions

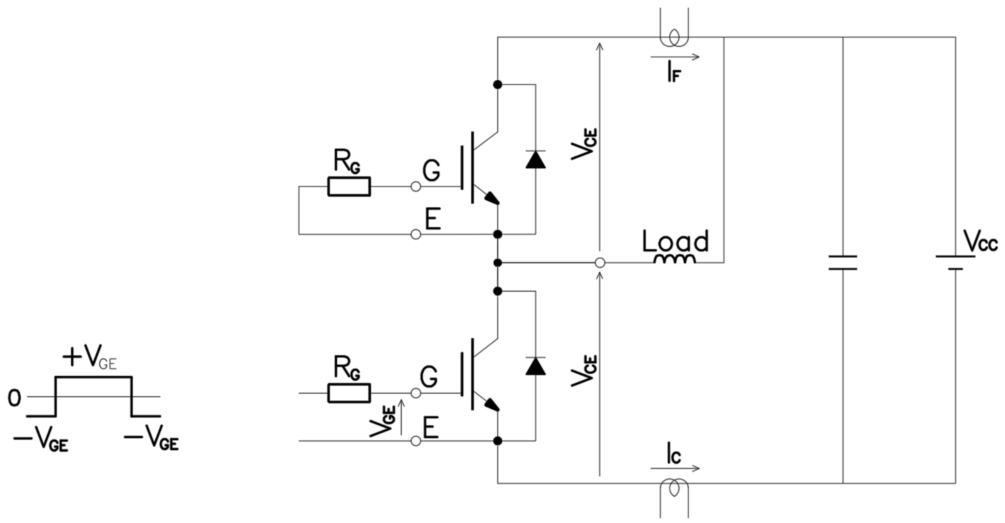



Figure 3. Switching time measure circuit

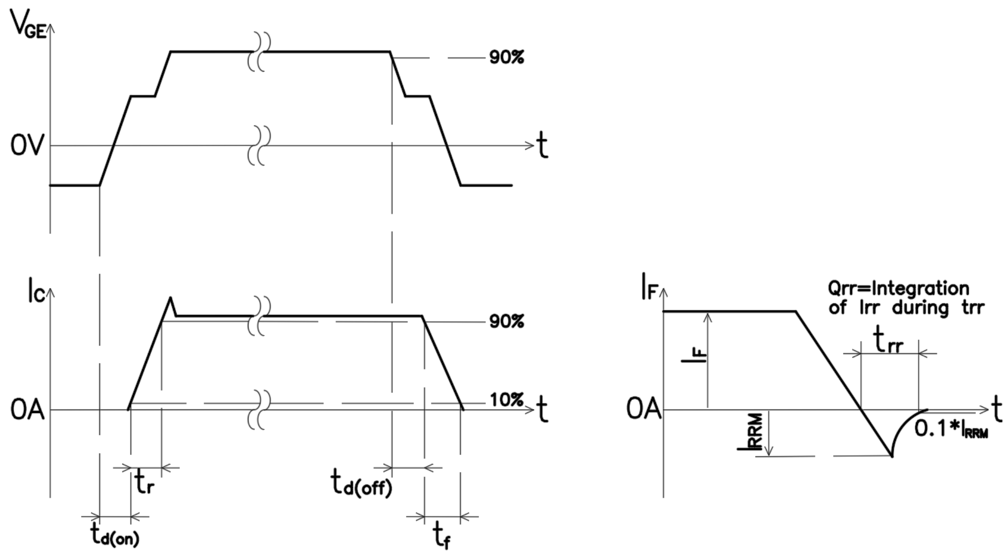



Figure 4. Switching time definition

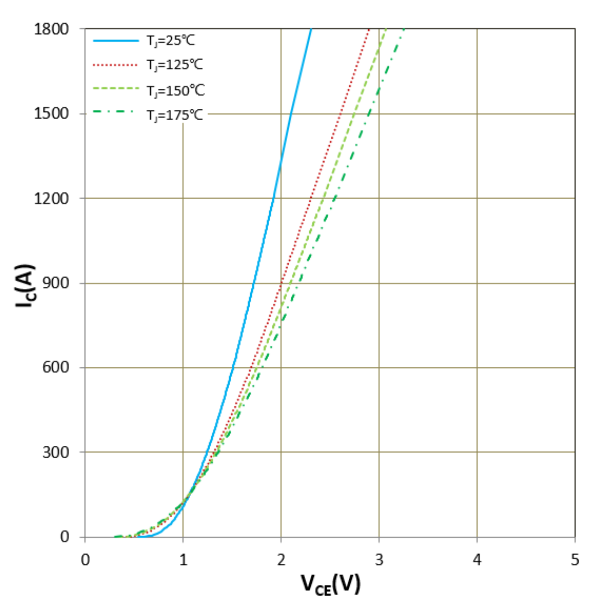



Figure 5. Ic vs $V_{CE}$

$V_{GE}$ =15V

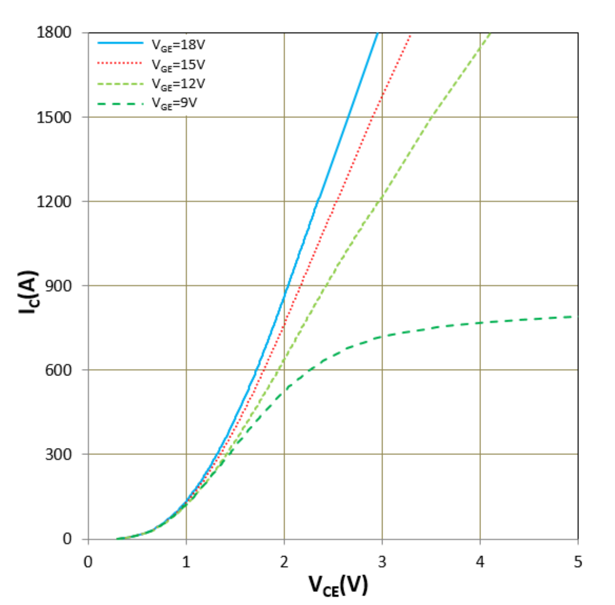



Figure 6. Ic vs $V_{CE}$

$T_j$ =175°C

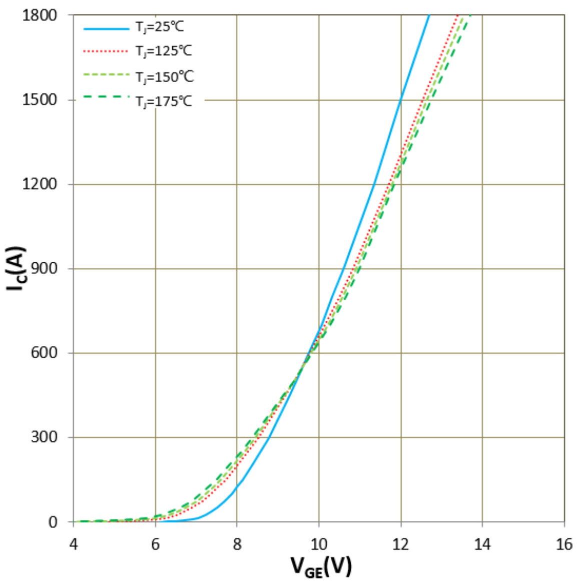



Figure 7. Ic vs $V_{GE}$

$V_{CE}$ =20V

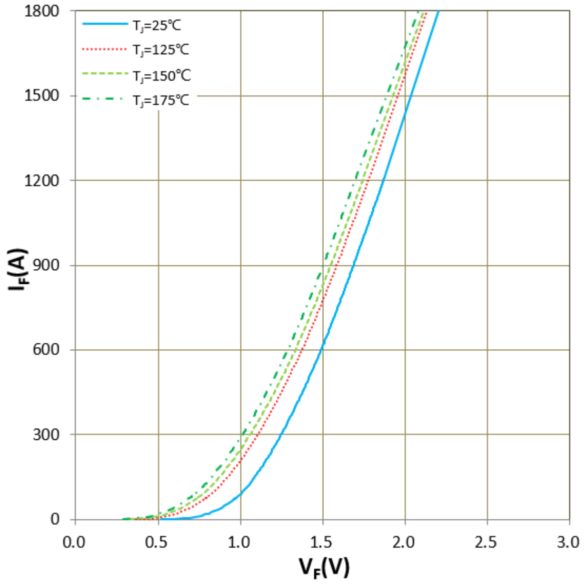



Figure 8. $I_F$ vs $V_F$

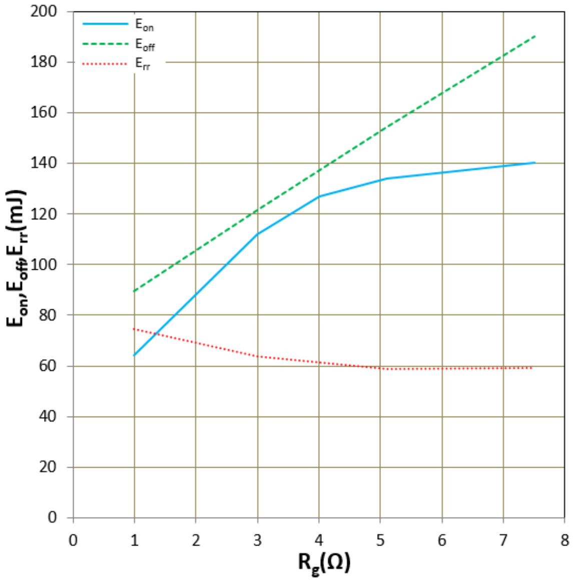



Figure 9. $E_{on}$, $E_{off}$, $E_{rr}$ vs $R_g$ (Typ)

$V_{CC}$ =600V, $V_{GE}$ =+15V/-8V, $I_C$ =900A, $T_j$ =25°C

Inductive Load

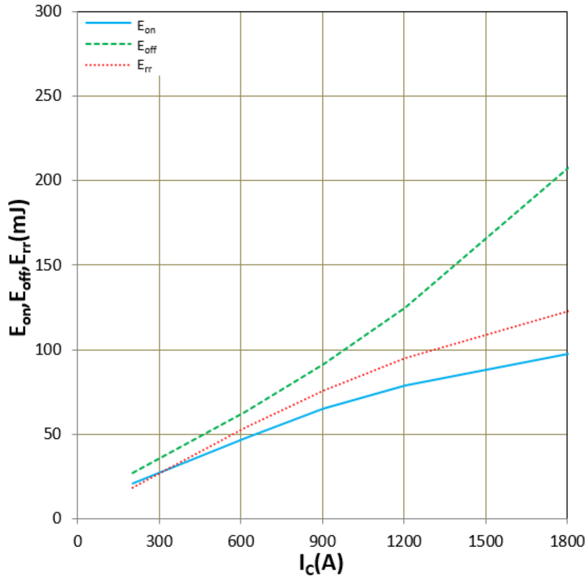



Figure 10. $E_{on}$, $E_{off}$, $E_{rr}$ vs Ic (Typ)

$V_{CC}$=600V, $V_{GE}$ =+15V/-8V, $R_g$ =1.0Ω, $T_j$ =25°C

Inductive Load

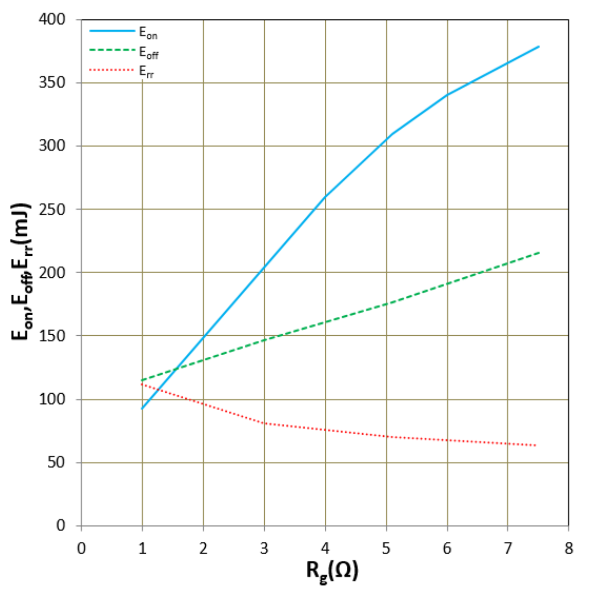



Figure 11. $E_{on}$, $E_{off}$, $E_{rr}$ vs $R_g$ (Typ)

$V_{CC}$ =600V, $V_{GE}$ =+15V/-8V, $I_C$ =900A, $T_j$ =150°C

Inductive Load

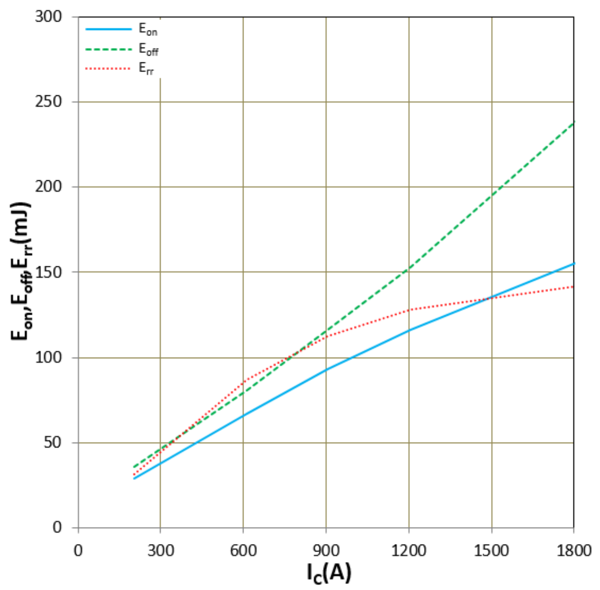



Figure 12. $E_{on}$, $E_{off}$, $E_{rr}$ vs Ic (Typ)

$V_{CC}$=600V, $V_{GE}$ =+15V/-8V, $R_g$ =1.0Ω, $T_j$ =150°C

Inductive Load

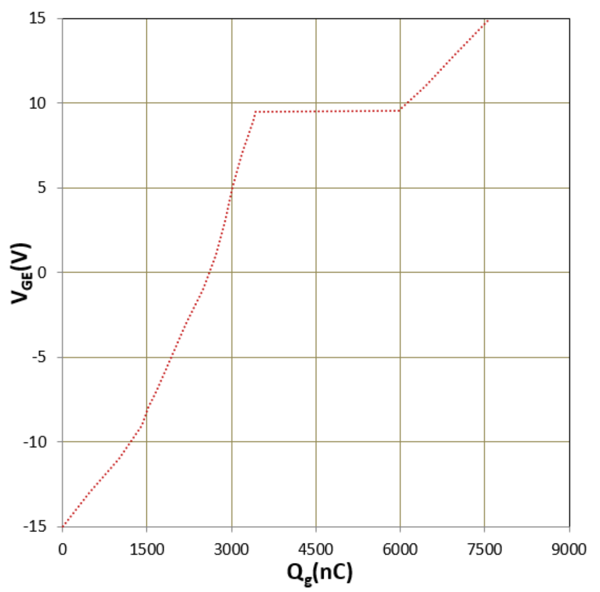



Figure 13. Gate charge

$V_{CC}$ =600V, $I_C$ =900A, $T_j$ =25°C

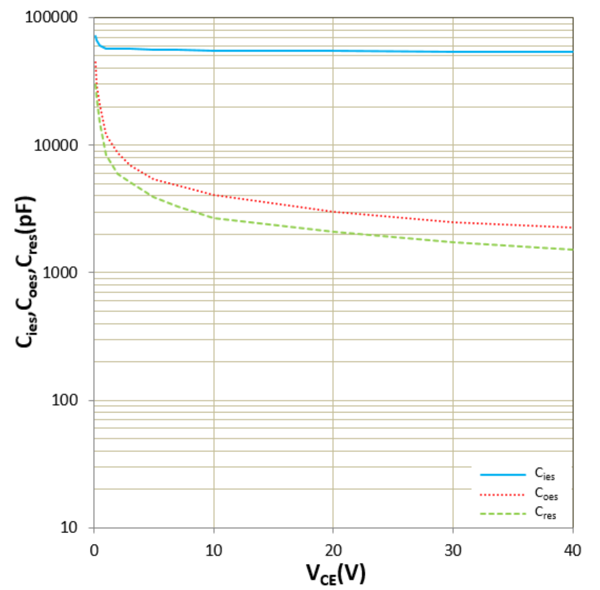
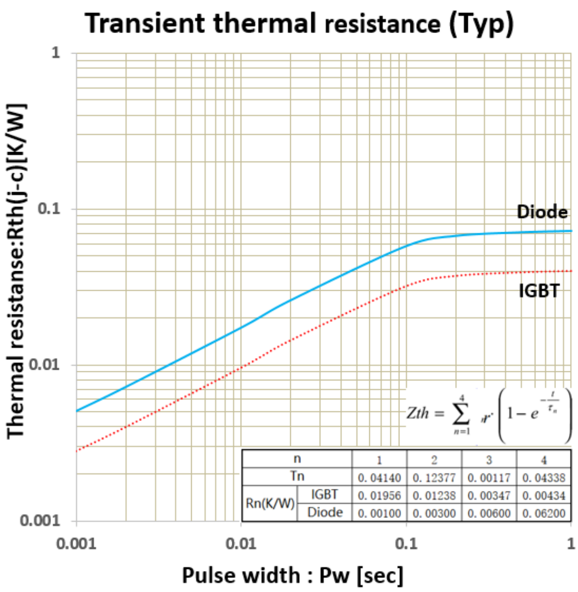



Figure 14. $C_{ies}$, $C_{oes}$, $C_{res}$ vs $V_{CE}$

$T_j$ =25°C, f =1MHz




| n | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Tn | | 0. 04140 | 0. 12377 | 0. 00117 | 0. 04338 |
| Rn(K/W) | IGBT | 0. 01956 | 0. 01238 | 0. 00347 | 0. 00434 |
| | Diode | 0. 00100 | 0. 00300 | 0. 00600 | 0. 06200 |

Figure 15. 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.