# DFI200HF17DF1

**1700V/200A Half Bridge IGBT Module**

## Description

The DFI200HF17DF1 offer lower losses and higher energy for soft switching applications.

.

## Features

- 1700V200 A, VCE (sat)(typ.) = 2.50V
- Lower losses and higher energy
- Excellent short-circuit capability
- 62mm half bridge module

## Applications

- Motor drive
- Inverter
- Power supply
- Wind Turbines

## Circuit diagram

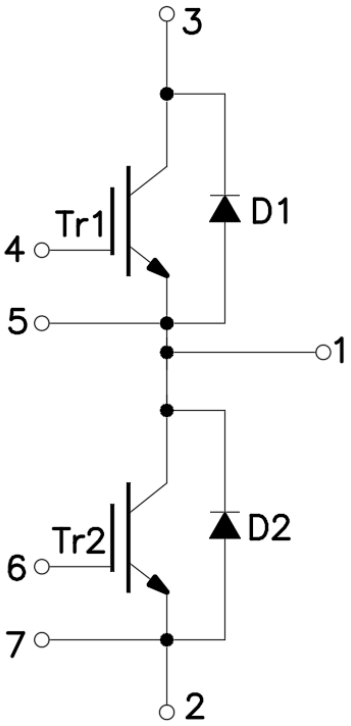


Figure 1. Out drawing & circuit diagram for DFI200HF17DF1

## Pin Configuration and Marking Information

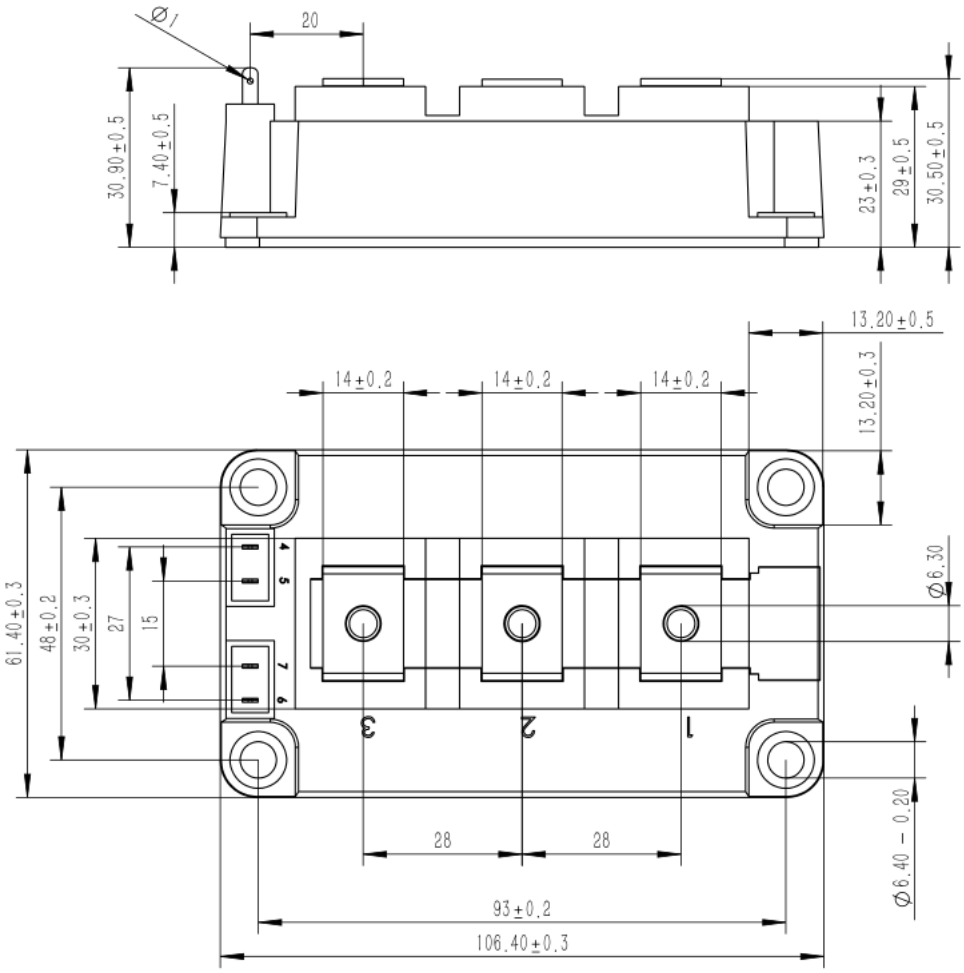


Figure 2. Pin configuration

## 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 | 47<br>26 | mm |
| Clearance | terminal to heatsink<br>terminal to terminal | 29<br>14 | mm |
| CTI | - | >200 | - |
| Module lead resistance, terminals – chip | $T_C$ =25°C | 0.8 | mΩ |
| Mounting torque for module mounting | M6 | 3 to 6 | Nm |
| Weight | - | 315 | g |

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

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | G-E Short | 1700 | V |
| $V_{GES}$ | Gate-Emitter Voltage | C-E Short | ±30V | V |
| $I_C$ | DC Continuous Collector Current | $T_C$ =100°C | 200 | A |
| $I_{CM}$ | Pulse Collector Current | $t_p$ =1ms, Note1 | 400 | A |
| $P_C$ | Maximum Power Dissipation | $T_C$ =25°C, $T_j$ =150°C(IGBT) | 890 | W |
| $T_{jop}$ | junction temperature | - | -40 to 150 | °C |
| $T_{stg}$ | Storage temperature | - | -40 to 125 | °C |

Note1: Pulse width limited by maximum junction temperature

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

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Peak Repetitive Revers Voltage | - | 1700 | V |
| $I_F$ | Diode forward Current | - Tc =100°C | 200 | A |
| $I_{FRM}$ | Repetitive peak forward Current | $t_p$ =1ms, Note1 | 400 | A |
| $T_{jop}$ | junction temperature | - | -40 to 150 | °C |
| $T_{stg}$ | Storage temperature | - | -40 to 125 | °C |

Note1: Pulse width limited by maximum junction temperature

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

| Symbol | Item | Condition | | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$ =200A, $V_{GE}$ =15V | $T_j$ =25°C | - | 2.50 | 2.70 | V |
| | | | $T_j$ =125°C | - | 2.80 | 3.0 | V |
| $V_{GE(th)}$ | Gate-Emitter threshold Voltage | $I_C$ =1mA, $V_{CE}$ =$V_{GE}$ | | 4.5 | - | 5.7 | V |
| $Q_G$ | Gate charge | $V_{GE}$ = -15V to +15V | | - | 2100 | - | nC |
| $R_{Gint}$ | Internal gate resistor | f=1M, Vpp=1V | $T_j$ =25°C | - | 2.75 | - | Ω |
| $C_{ies}$ | Input Capacitance | $V_{CE}$ =25V, $V_{GE}$ =0V, f =1MHz | $T_j$ =25°C | - | 18 | - | nF |
| $C_{oes}$ | Output Capacitance | | | - | 2.4. | - | nF |
| $C_{res}$ | Reverse transfer Capacitance | | | - | 1.3 | - | nF |
| $I_{CES}$ | Collector- Emitter Cut off Current | $V_{CE}$ =1700V, $V_{GE}$ =0V | $T_j$ =25°C | - | - | 5 | mA |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{GE}$ = ±30V, $V_{CE}$ =0V | $T_j$ =25°C | - | - | 400 | nA |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}$ = 900V, $I_C$ = 200A, $R_G$ = 5.1Ω, $V_{GE}$ = ±15V, Inductive Load | $T_j$ =25°C | - | 305 | - | ns |
| | | | $T_j$ =125°C | - | 115 | - | |
| $t_r$ | Rise time | | $T_j$ =25°C | - | 72 | - | ns |
| | | | $T_j$ =125°C | - | 70 | - | |
| $t_{d(off)}$ | Turn-off delay time | | $T_j$ =25°C | - | 600 | - | ns |
| | | | $T_j$ =125°C | - | 670 | - | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $t_f$ | Fall time | $V_{CC}$ = 900V<br>$I_C$ = 200A<br>$R_G$ = 5.1Ω<br>$V_{GE}$ = ±15V<br>Inductive Load | $T_j$ =25°C | - | 300 | - | ns |
| | | | $T_j$=125°C | - | 510 | - | |
| $E_{on}$ | Turn-on power dissipation | | $T_j$ =25°C | - | 27 | - | mJ |
| | | | $T_j$ =125°C | - | 40 | - | |
| $E_{off}$ | Turn-off power dissipation | | $T_j$ =25°C | - | 40 | - | mJ |
| | | | $T_j$ =125°C | - | 55 | - | |
| $R_{th(j-c)}$ | Thermal Resistance, Junction to Case (IGBT) | | | - | | 0.140 | °C/W |

## 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 | $I_F$ =200A, $V_{GE}$ =0V | $T_j$ =25°C | - | 2. 5 | 2.7 | V |
| | | | $T_j$ =125°C | - | 2. 4 | - | |
| $t_{rr}$ | Diode Reverse Recovery Time | $I_F$=200A,<br>di/dt= 4000A/μs,<br>$V_R$=900V,<br>$V_{GE}$ = -15V | $T_j$ =25°C | | 105 | | nS |
| | | | $T_j$ =125°C | | 180 | | |
| $I_{rr}$ | Peak reverse recovery Current | | $T_j$ =25°C | - | 185 | - | A |
| | | | $T_j$ =125°C | - | 220 | - | |
| $Q_{rr}$ | Recovered charge | | $T_j$=25°C | - | 11 | - | uC |
| | | | $T_j$ =125°C | - | 25 | - | |
| $E_{rr}$ | Reverse recovered energy | | $T_j$ =25°C | - | 5.65 | - | mJ |
| | | | $T_j$ =125°C | - | 12.8 | - | |
| $R_{th(j-c)}$ | Thermal Resistance, Junction to Case (Diode) | | | - | | 0.160 | °C/W |

## Test Conditions

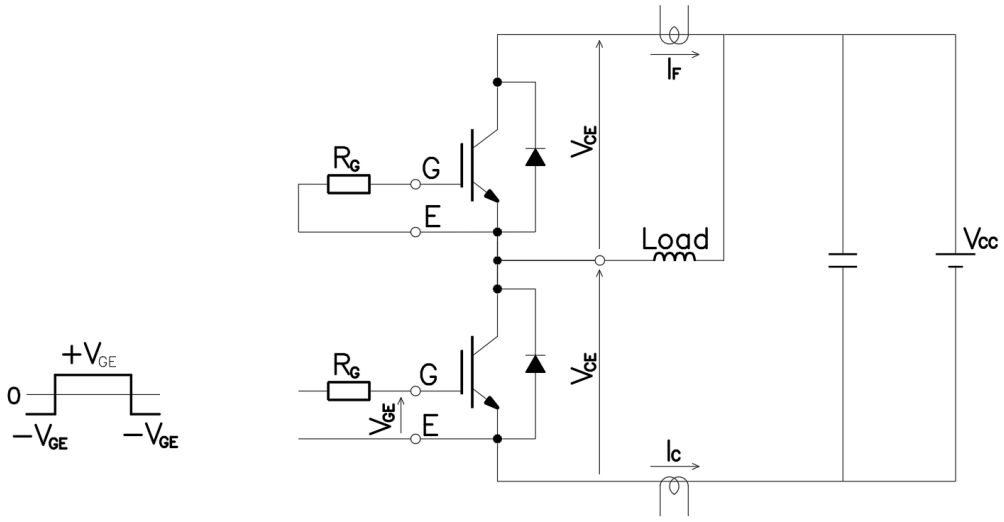


Figure 3. Switching time measure circuit

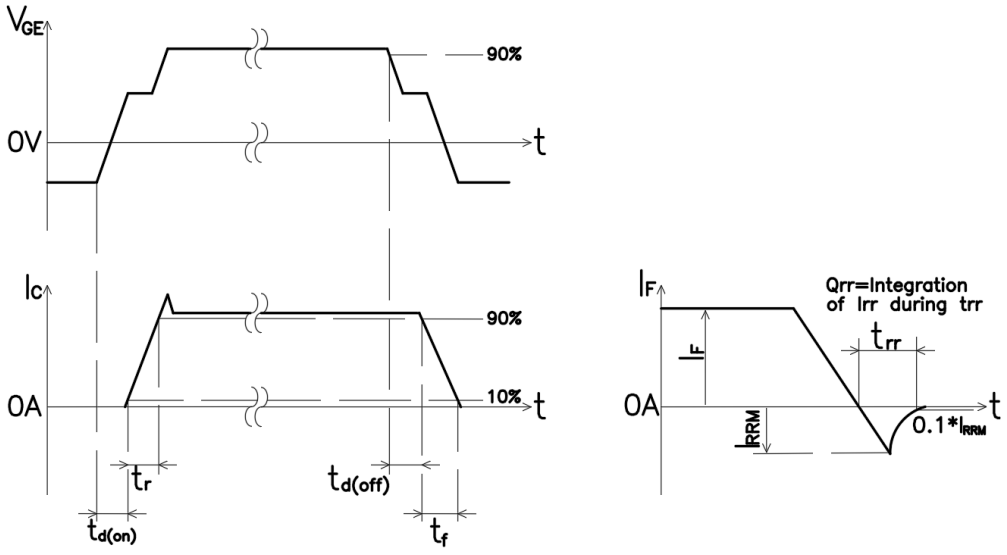


Figure 4. Switching time definition

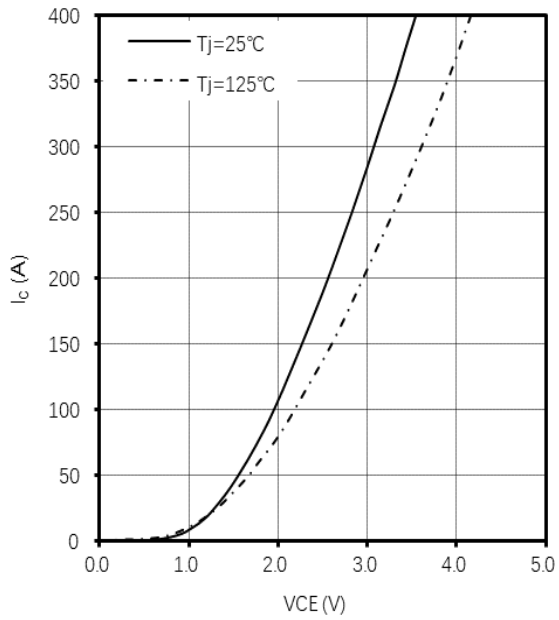


Figure 5. Ic vs $V_{CE}$
$V_{GE}$ =15V

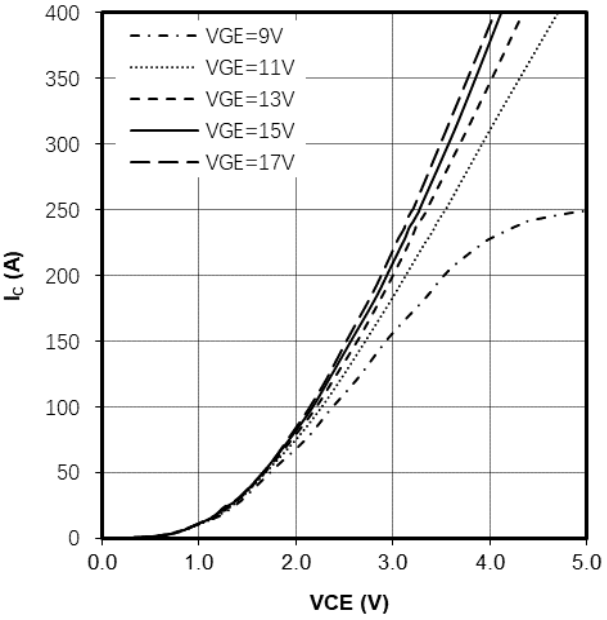


Figure 6. Ic vs $V_{CE}$
$T_j$ =125°C

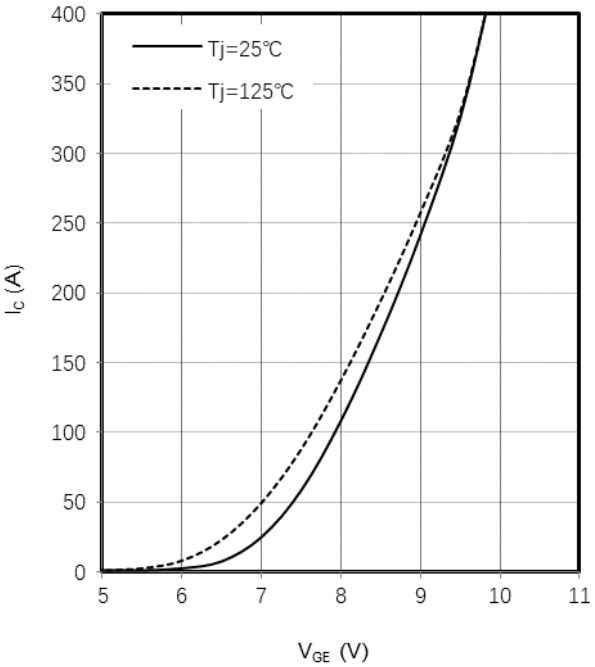


Figure 7. Ic vs $V_{GE}$
$V_{CE}$ =20V

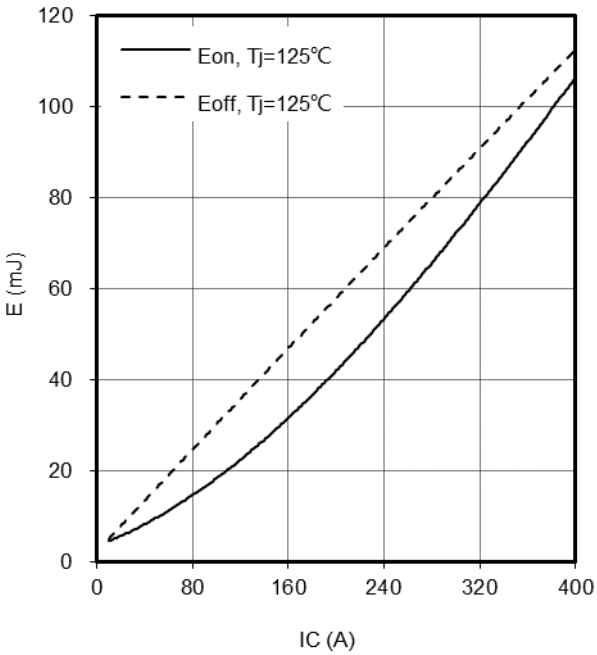


Figure8. $E_{on}$, $E_{off}$ vs Ic(Typ)
$V_{CC}$=900V, $V_{GE}$ =+15V/-15V, $R_G$ =5.1Ω

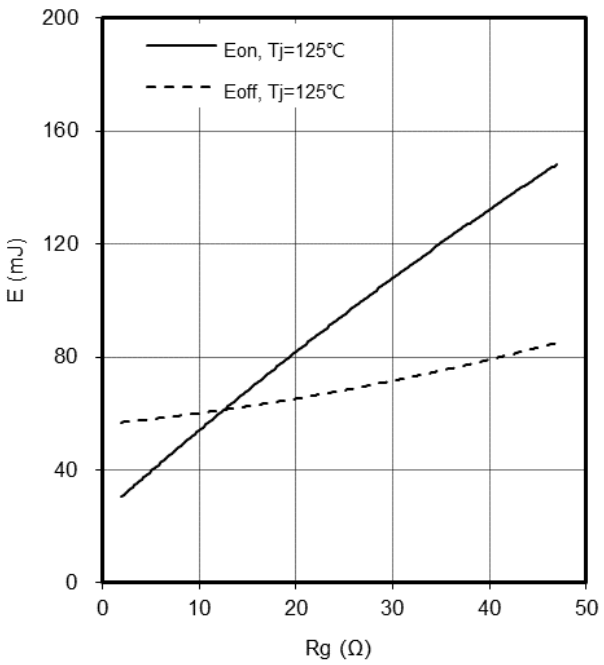


Figure 9. $E_{on}$, $E_{off}$ vs $R_g$(Typ)
$V_{CC}$=900V, $V_{GE}$=+15V/-15V, $I_C$=200A

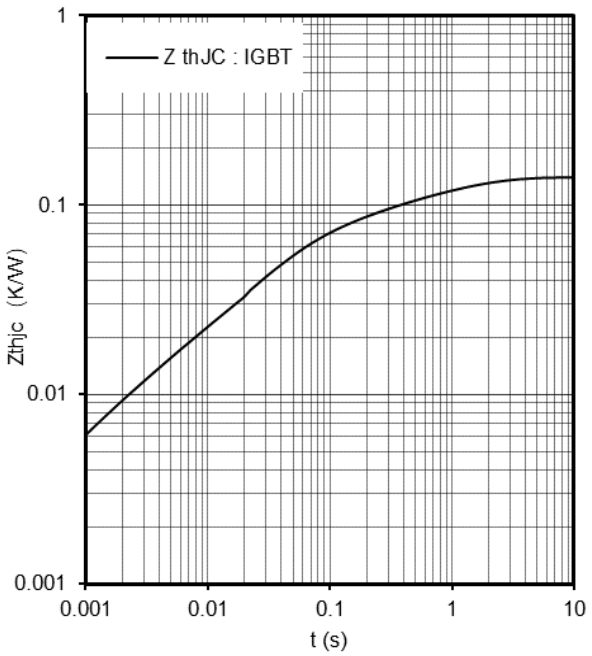


Figure 10. Transient thermal impedance IGBT , Zthjc=f(t)

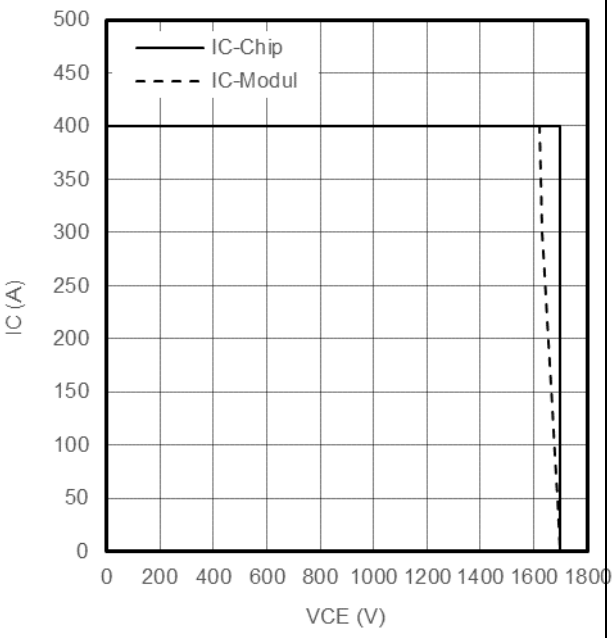


Figure 11. Reverse bias safe operating area IGBT, $I_C$=f($V_{CE}$),$V_{GE}$=±15V,$R_{Goff}$=5.1Ω，Tvj=125℃

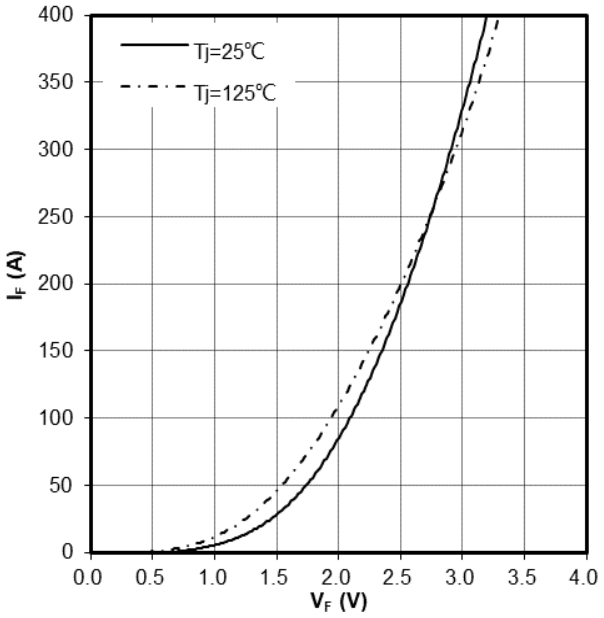


Figure 12. Forward characteristic of Diode ， $I_F$=f($V_F$)

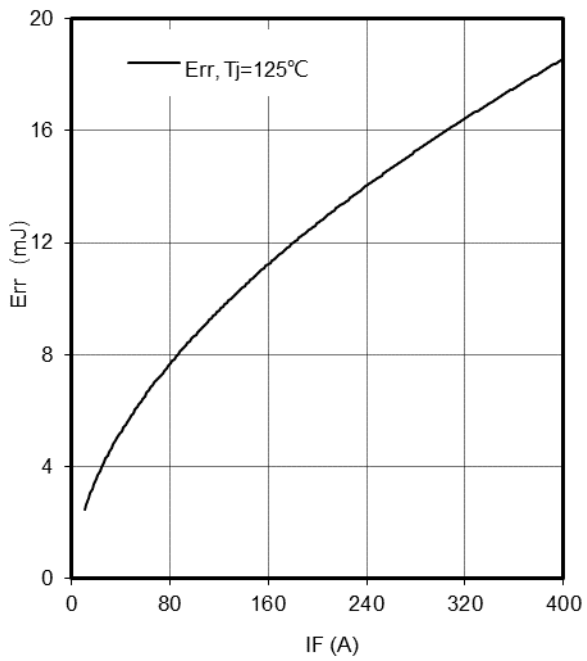


Figure 13. Switching losses Diode, $E_{rr}=f(I_F)$,,$R_{Gon}=5.1\Omega$,$V_{CE}=900V$

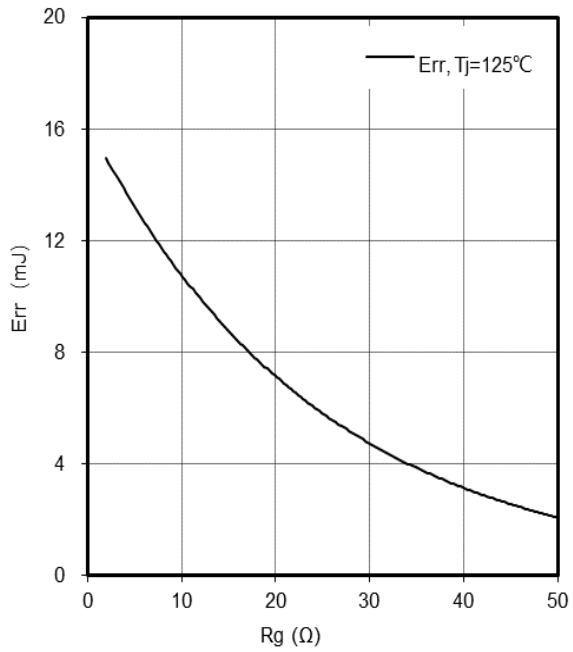


Figure 14. Switching losses Diode, $E_{rr}=f(R_G)$,$I_F=200A$,$V_{CE}=900V$

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