## *flow* PFC 0 — 600 V/ 2 x 20 A / 35 kHz

### Features

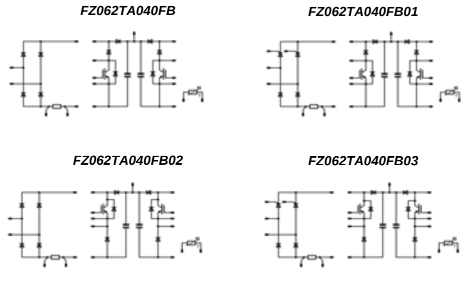
- Vincotech clip-in housing
- Compact and low inductance design
- Suitable for Interleaved topology
- Suitable for curent sensing in collector or in emitter
- Ultrafast boost IGBT and FRED

### *flow* 0 housing

### Target Applications

- PFC for welding
- PFC for SMPS
- PFC for motor drives
- PFC for UPS
- PFC for battery charger

### Schematic




### Types

- FZ062TA040FB; without SCR, current sense in collector
- FZ062TA040FB01; with SCR, current sense in collector
- FZ062TA040FB02; without SCR, current sense in emitter
- FZ062TA040FB03; with SCR, current sense in emitter

## Maximum Ratings

$T_j$=25°C, unless otherwise specified

| Parameter | Symbol | Condition | | Value | Unit |
|---|---|---|---|---|---|
| **Input Rectifier Diode** | | | | | |
| Repetitive peak reverse voltage | $V_{RRM}$ | | | 1600 | V |
| DC forward current | $I_F$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 35 | A |
| Surge forward current | $I_{FSM}$ | $t_p$=10ms | $T_j$=25°C | 250 | A |
| I2t-value | $I^2t$ | | | 310 | $A^2s$ |
| Power dissipation per Diode | $P_{tot}$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 40 | W |
| Maximum Junction Temperature | $T_j$max | | | 150 | °C |
| **Input Rectifier Thyristor** | | | | | |
| Repetitive peak reverse voltage | $V_{RRM}$ | | | 800 | V |
| DC forward current | $I_F$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 34 | A |
| Surge forward current | $I_{FSM}$ | $t_p$=10ms | $T_j$=25°C | 250 | A |
| I2t-value | $I^2t$ | | | 310 | $A^2s$ |
| Power dissipation per Thyristor | $P_{tot}$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 44 | W |
| Maximum Junction Temperature | $T_j$max | | | 150 | °C |

# Maximum Ratings

$T_j$=25°C, unless otherwise specified

| Parameter | Symbol | Condition | | Value | Unit |
|---|---|---|---|---|---|
| **PFC IGBT** | | | | | |
| Collector-emitter break down voltage | $V_{CE}$ | | | 600 | V |
| DC collector current | $I_C$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 27 | A |
| Repetitive peak collector current | $I_{Cpulse}$ | $t_p$ limited by $T_j$max | | 150 | A |
| Power dissipation per IGBT | $P_{tot}$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 71 | W |
| Gate-emitter peak voltage | $V_{GE}$ | | | +/- 20 | V |
| Short circuit ratings | $t_{SC}$<br>$V_{CC}$ | $T_j$≤150°C<br>$V_{GE}$=15V | | 10<br>600 | μs<br>V |
| Maximum Junction Temperature | $T_j$max | | | 150 | °C |
| **C.T. Inverse diode** | | | | | |
| Peak Repetitive Reverse Voltage | $V_{RRM}$ | $T_j$=25°C | | 600 | V |
| DC forward current | $I_F$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 8 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_p$ limited by $T_j$max | | 16 | A |
| Power dissipation per Diode | $P_{tot}$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 14 | W |
| Maximum Junction Temperature | $T_j$max | | | 175 | °C |
| **PFC Diode** | | | | | |
| Peak Repetitive Reverse Voltage | $V_{RRM}$ | $T_j$=25°C | | 600 | V |
| DC forward current | $I_F$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 25 | A |
| Repetitive peak forward current | $I_{FRM}$ | $t_p$ limited by $T_j$max | | 50 | A |
| Power dissipation | $P_{tot}$ | $T_j=T_j$max | $T_h$=80°C<br>$T_c$=80°C | 37 | W |
| Maximum Junction Temperature | $T_j$max | | | 600 | °C |
| **PFC Shunt** | | | | | |
| DC forward current | $I_F$ | | $T_c$=25°C | 44.7 | A |
| Power dissipation per Shunt | $P_{tot}$ | | $T_c$=25°C | 10 | W |
| **DC link Capacitor** | | | | | |
| Max.DC voltage | $V_{MAX}$ | | $T_c$=25°C | 500 | V |
| **Thermal Properties** | | | | | |
| Storage temperature | $T_{stg}$ | | | -40…+125 | °C |
| Operation temperature under switching condition | $T_{op}$ | | | -40…+(Tjmax - 25) | °C |
| **Insulation Properties** | | | | | |
| Insulation voltage | $V_{is}$ | t=2s | DC voltage | 4000 | V |
| Creepage distance | | | | min 12,7 | mm |
| Clearance | | | | min 12,7 | mm |

## Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{GE}$ [V] or<br>$V_{GS}$ [V] | $V_r$ [V] or<br>$V_{CE}$ [V] or<br>$V_{DS}$ [V] | $I_C$ [A] or<br>$I_F$ [A] or<br>$I_D$ [A] | $T_j$ | Min | Typ | Max | |
| **Input Rectifier Diode** | | | | | | | | | | |
| Forward voltage | $V_F$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 1.16<br>1.11 | 1.4 | V |
| Threshold voltage (for power loss calc. only) | $V_{to}$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 0.9<br>0.77 | | V |
| Slope resistance (for power loss calc. only) | $r_t$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 9<br>12 | | mΩ |
| Reverse current | $I_r$ | | | 1500 | | Tj=25°C<br>Tj=150°C | | | 0.02<br>2 | mA |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ =1 W/mK | | | | | | 1.72 | | K/W |
| **Input Rectifier Thyristor** | | | | | | | | | | |
| Forward voltage | $V_F$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 1.25<br>1.22 | 1.6 | V |
| Threshold voltage (for power loss calc. only) | $V_{to}$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 0.93<br>0.82 | | V |
| Slope resistance (for power loss calc. only) | $r_t$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 0.011<br>0.014 | | mΩ |
| Reverse current | $I_r$ | | | 800 | | Tj=25°C<br>Tj=125°C | | | 0.05<br>2 | mA |
| Gate controlled delay time | $t_{GD}$ | Ig=0,5A<br>dig/dt=0,5A/us | | VD=1/2Vdrm | | Tj=25°C | | | 2 | µs |
| Gate controlled rise time | $t_{GR}$ | Ig=0,2A<br>dig/dt=0,2A/us | | | | Tj=25°C | | <1 | | µs |
| Critical rate of rise of off-state voltage | (dv/dt)cr | | | VD=2/3Vdrm | | Tj=125°C | | | 500 | V/µs |
| Critical rate of rise of on-state current | (di/dt)cr | Ig=0,2A<br>f=50Hz | | VD=2/3Vdrm | 40 | Tj=125°C | | | 150 | A/µs |
| Circuit commutated turn-off time | $t_q$ | VD=2/3Vdrm<br>tp=200us | | 100 | 26 | Tj=125°C | | 150 | | µs |
| Holding current | $I_H$ | VD=6V | | | | Tj=25°C | | | 50 | mA |
| Latching current | $I_L$ | tp=10us<br>Ig=0,2A | | | | Tj=25°C | | | 90 | mA |
| Gate trigger voltage | $V_{GT}$ | VD=6V | | | | Tj=25°C<br>Tj=-40°C | | | 1.3<br>1.6 | V |
| Gate trigger current | $I_{GT}$ | VD=6V | | | | Tj=25°C<br>Tj=-40°C | 11 | | 28<br>50 | mA |
| Gate non-trigger voltage | $V_{GD}$ | | | VD=1/2Vdrm | | Tj=125°C | | | 0.2 | V |
| Gate non-trigger current | $I_{GD}$ | | | VD=1/2Vdrm | | Tj=125°C | | | 1 | mA |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 1 W/mK | | | | | | 1.57 | | K/W |
| **PFC IGBT** | | | | | | | | | | |
| Gate emitter threshold voltage | $V_{GE(th)}$ | | Vce | | 0.002 | Tj=25°C<br>Tj=125°C | 3 | 4 | 5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | | | 50 | Tj=25°C<br>Tj=125°C | | 2.74<br>3.25 | 3.3 | V |
| Collector-emitter cut-off | $I_{CES}$ | | 0 | 600 | | Tj=25°C<br>Tj=125°C | | 3.25 | 40 | uA |
| Gate-emitter leakage current | $I_{GES}$ | | 20 | 0 | | Tj=25°C<br>Tj=125°C | | | 0.2 | uA |
| Integrated Gate resistor | $R_{gint}$ | | | | | | | n.a. | | Ω |
| Turn-on delay time | $t_{d(on)}$ | Rgoff=8Ω<br>Rgon=8Ω | 15 | 400 | 30 | Tj=25°C<br>Tj=125°C | | 22<br>22.6 | | ns |
| Rise time | $t_r$ | | | | | Tj=25°C<br>Tj=125°C | | 14<br>14.6 | | |
| Turn-off delay time | $t_{d(off)}$ | | | | | Tj=25°C<br>Tj=125°C | | 327.6<br>354.2 | | |
| Fall time | $t_f$ | | | | | Tj=25°C<br>Tj=125°C | | 9.4<br>11.1 | | |
| Turn-on energy loss per pulse | $E_{on}$ | | | | | Tj=25°C<br>Tj=125°C | | 0.5052<br>0.7837 | | mWs |
| Turn-off energy loss per pulse | $E_{off}$ | | | | | Tj=25°C<br>Tj=125°C | | 0.7981<br>0.968 | | |
| Input capacitance | $C_{ies}$ | f=1MHz | 0 | 25 | | Tj=25°C | | 2572 | | pF |
| Output capacitance | $C_{oss}$ | | | | | | | 245 | | |
| Reverse transfer capacitance | $C_{rss}$ | | | | | | | 158 | | |
| Gate charge | $Q_{Gate}$ | | 15 | 480 | 50 | Tj=25°C | | 158 | | nC |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 1 W/mK | | | | | | 0.99 | | K/W |

## Characteristic Values

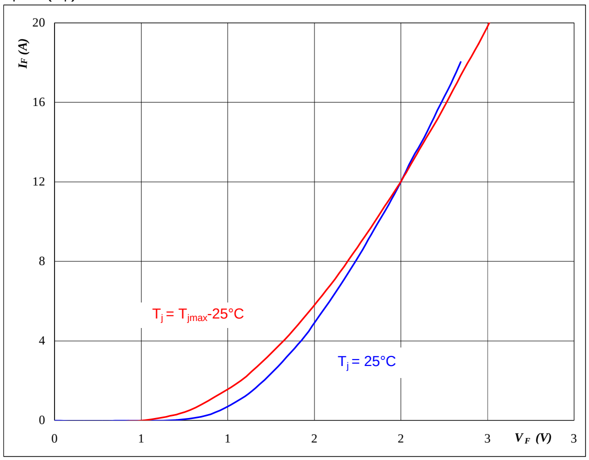
| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{GE}$ [V] or $V_{GS}$ [V] | $V_r$ [V] or $V_{CE}$ [V] or $V_{DS}$ [V] | $I_C$ [A] or $I_F$ [A] or $I_D$ [A] | $T_j$ | Min | Typ | Max | |
| **C.T. Inverse diode** | | | | | | | | | | |
| Diode forward voltage | $V_F$ | | | | | Tj=25°C<br>Tj=125°C | | 1.66<br>1.61 | | V |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 1 W/mK | | | | | | 5.12 | | K/W |
| **PFC Diode** | | | | | | | | | | |
| Forward voltage | $V_F$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 2.52<br>1.81 | 2.8 | V |
| Reverse leakage current | $I_{rm}$ | | | 600 | | Tj=25°C<br>Tj=125°C | | | 100 | μA |
| Peak recovery current | $I_{RRM}$ | Rgoff=8Ω | 15 | 400 | 30 | Tj=25°C<br>Tj=125°C | | 37.632<br>59.961 | | A |
| Reverse recovery time | $t_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 12.6<br>23 | | ns |
| Reverse recovery charge | $Q_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 0.2238<br>0.7628 | | μC |
| Reverse recovered energy | $E_{rec}$ | | | | | Tj=25°C<br>Tj=125°C | | 0.0115<br>0.1151 | | mWs |
| Peak rate of fall of recovery current | di(rec)max /dt | | | | | Tj=25°C<br>Tj=125°C | | 16814<br>11387 | | A/μs |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 1 W/mK | | | | | | 1.88 | | K/W |
| **PFC Shunt** | | | | | | | | | | |
| R1 value | R | | | | | | 4.7 | 5 | 5.3 | mΩ |
| Temperature coeficient | $t_c$ | 20°C to 60°C | | | | | | < 50 | | ppm/K |
| Internal heat resistance | $R_{thi}$ | | | | | | | < 6.5 | | K/W |
| Inductance | L | | | | | | | < 3 | | nH |
| **DC link Capacitor** | | | | | | | | | | |
| C value | C | | | | | | 480 | 540 | 600 | nF |
| **Thermistor** | | | | | | | | | | |
| Rated resistance | R | | | | | Tj=25°C | | 22 | | kΩ |
| Deviation of R100 | ΔR/R | R25=22 KΩ | | | | Tj=100°C | -5 | | 5 | % |
| Power dissipation | P | | | | | Tj=25°C | | | 210 | mW |
| Power dissipation constant | | | | | | Tj=25°C | | 3.5 | | mW/K |
| B-value | $B_{(25/50)}$ | Tol. ±3% | | | | Tj=25°C | | 3940 | | K |
| B-value | $B_{(25/100)}$ | Tol. ±3% | | | | Tj=25°C | | 4000 | | K |

# PFC Switch & C.T. Inverse Diode

**Figure 1** Inverse diode

**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$

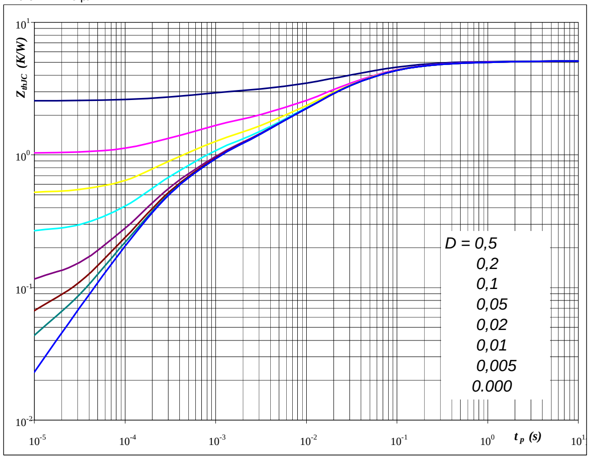



$t_p$ = 250 µs

**Figure 2** Inverse diode

**Diode transient thermal impedance as a function of pulse width**

$Z_{thJH} = f(t_p)$



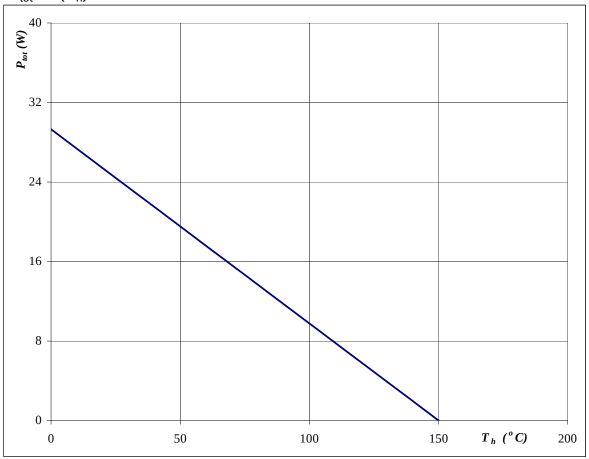

D = tp / T

$R_{thJH}$ = 5.12 K/W

**Figure 3** Inverse diode

**Power dissipation as a function of heatsink temperature**

$P_{tot} = f(T_h)$

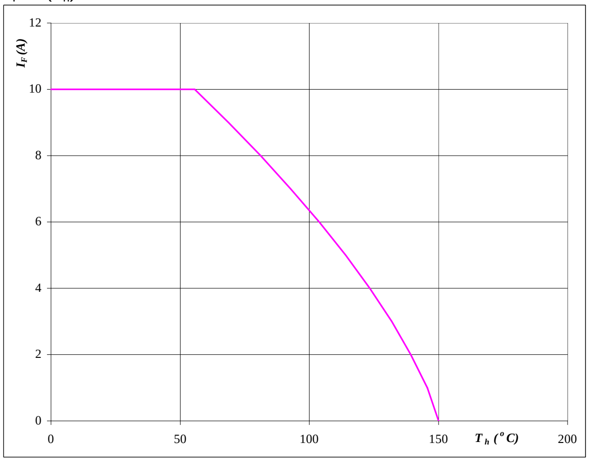



$T_j$ = 150 ºC

**Figure 4** Inverse diode

**Forward current as a function of heatsink temperature**

$I_F = f(T_h)$



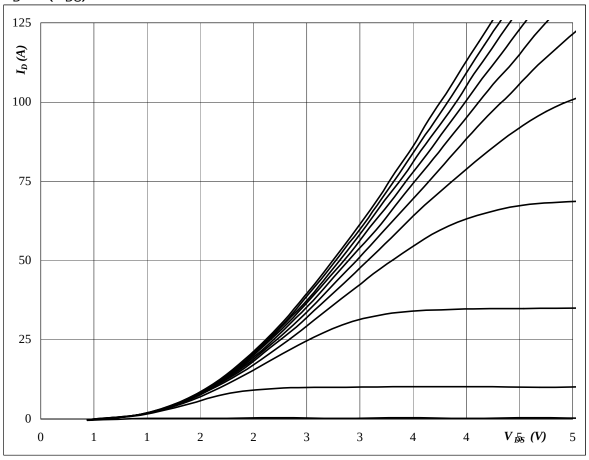

$T_j$ = 150 ºC

# PFC

**Figure 1** PFC SWITCH

**Typical output characteristics**

$I_D = f(V_{DS})$

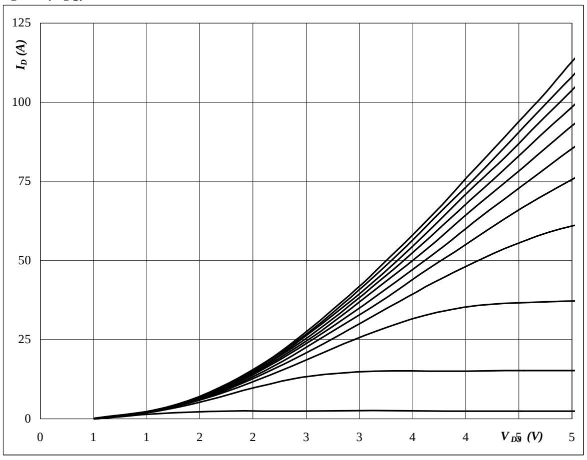



| | | |
|---|---|---|
| $t_p$ = | 250 | μs |
| $T_j$ = | 25 | °C |
| $V_{GS}$ from | 5 V to 15 V in steps of 1 V | |

**Figure 2** PFC SWITCH

**Typical output characteristics**

$I_D = f(V_{DS})$

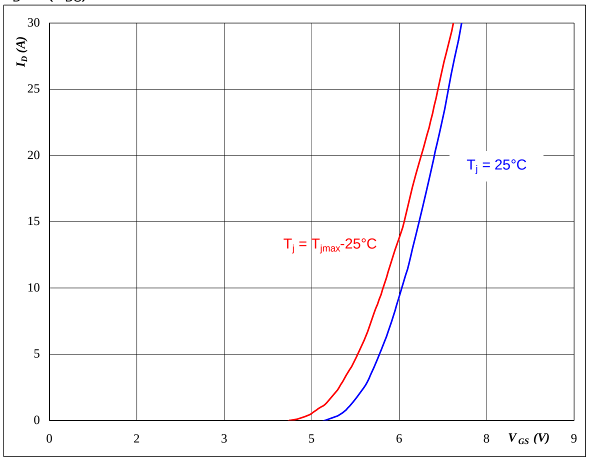



| | | |
|---|---|---|
| $t_p$ = | 250 | μs |
| $T_j$ = | 125 | °C |
| $V_{GS}$ from | 5 V to 15 V in steps of 1 V | |

**Figure 3** PFC SWITCH

**Typical transfer characteristics**

$I_D = f(V_{DS})$

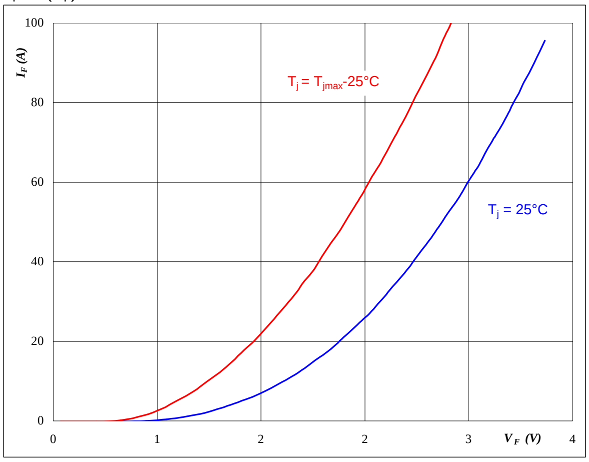



| | | |
|---|---|---|
| $t_p$ = | 250 | μs |
| $V_{DS}$ = | 10 | V |

**Figure 4** PFC FRED

**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$

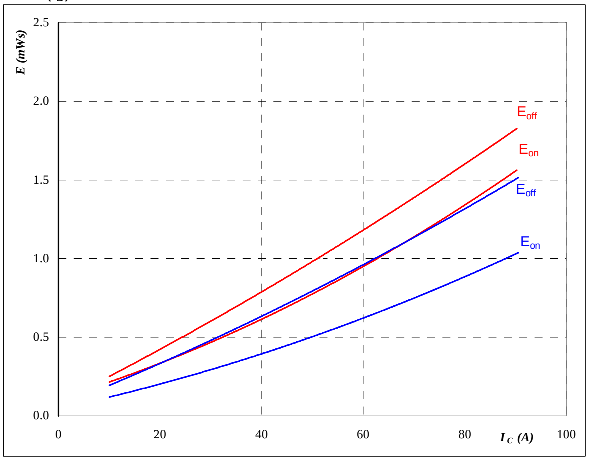



| | | |
|---|---|---|
| $t_p$ = | 250 | μs |

# PFC

**Figure 5** PFC SWITCH

**Typical switching energy losses**
**as a function of collector current**
$E = f(I_D)$

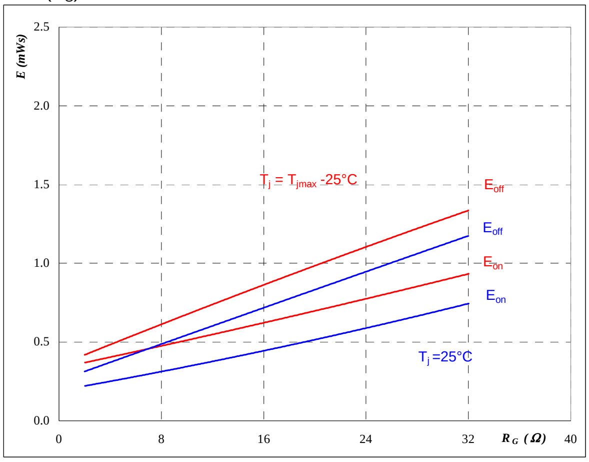



inductive load

| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |
| $R_{goff}$ = | 8 | Ω |

**Figure 6** PFC SWITCH

**Typical switching energy losses**
**as a function of gate resistor**
$E = f(R_G)$

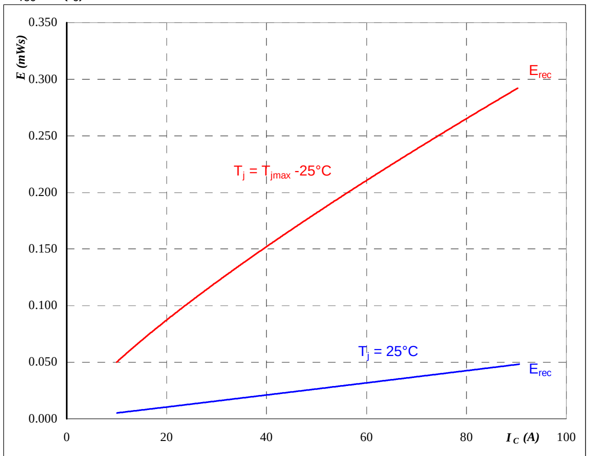



inductive load

| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $I_D$ = | 30 | A |

**Figure 7** PFC SWITCH

**Typical reverse recovery energy loss**
**as a function of collector (drain) current**
$E_{rec} = f(I_c)$

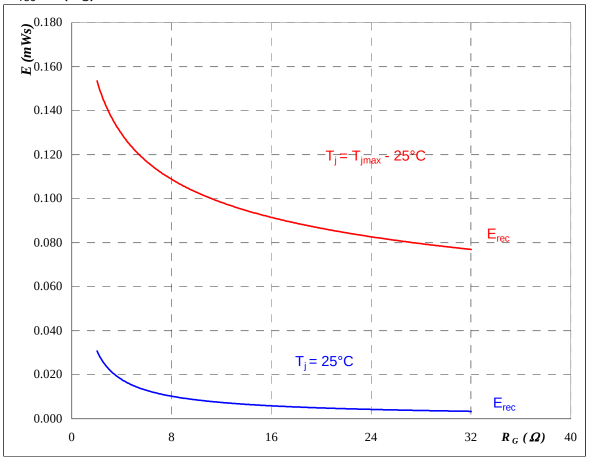



inductive load

| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |
| $R_{goff}$ = | 8 | Ω |

**Figure 8** PFC SWITCH

**Typical reverse recovery energy loss**
**as a function of gate resistor**
$E_{rec} = f(R_G)$




inductive load

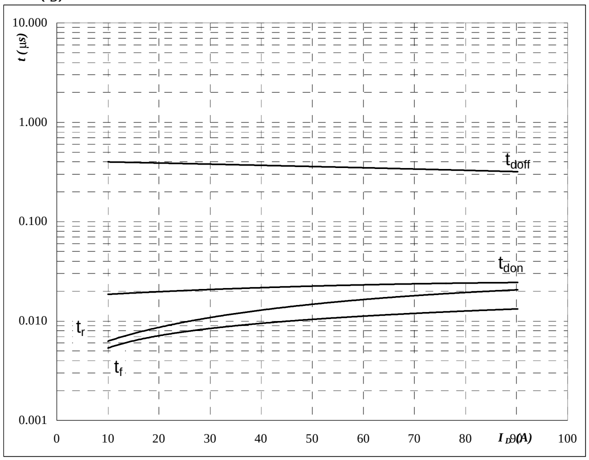
| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $I_D$ = | 30 | A |

# PFC

**Figure 9** PFC SWITCH

**Typical switching times as a function of collector current**

t = f($I_D$)



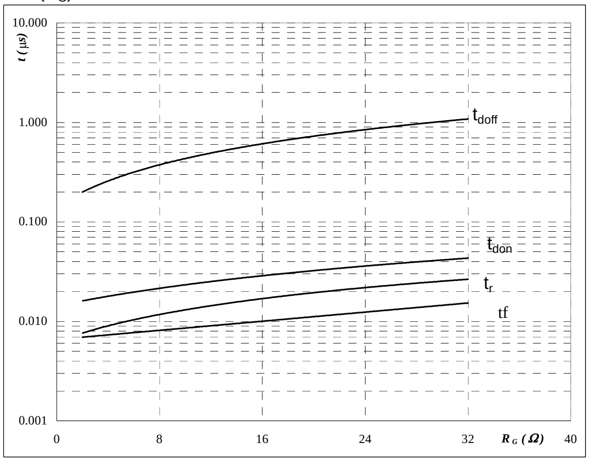

inductive load

| | | |
|---|---|---|
| $T_j$ = | 125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |
| $R_{goff}$ = | 8 | Ω |

**Figure 10** PFC SWITCH

**Typical switching times as a function of gate resistor**

t = f($R_G$)



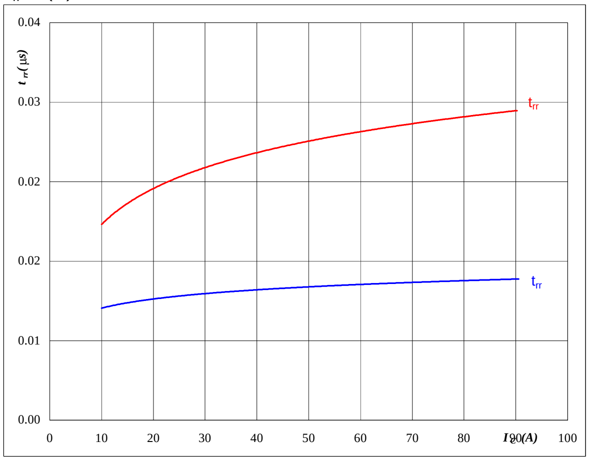

inductive load

| | | |
|---|---|---|
| $T_j$ = | 125 | °C |
| $V_{DS}$ = | 400 | V |
| $V_{GS}$ = | 15 | V |
| $I_C$ = | 30 | A |

**Figure 11** PFC FRED

**Typical reverse recovery time as a function of collector current**

$t_{rr}$ = f(Ic)

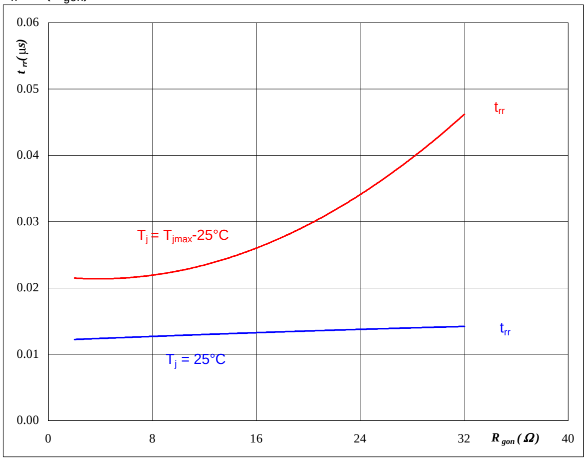



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{CE}$ = | 400 | V |
| $V_{GE}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |

**Figure 12** PFC FRED

**Typical reverse recovery time as a function of IGBT turn on gate resistor**

$t_{rr}$ = f($R_{gon}$)



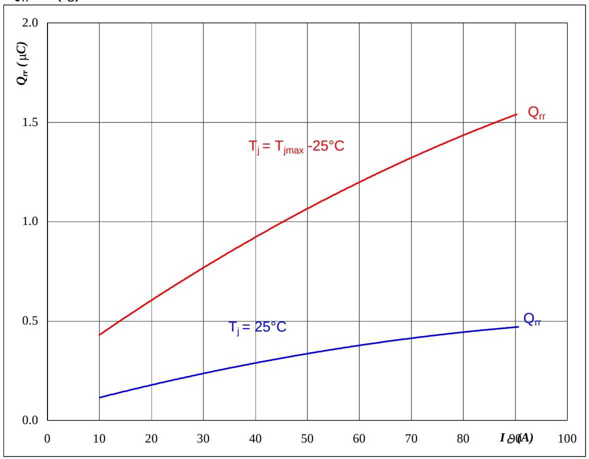

| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_R$ = | 400 | V |
| $I_F$ = | 30 | A |
| $V_{GS}$ = | 15 | V |

# PFC

**Figure 13** PFC FRED

**Typical reverse recovery charge as a function of collector current**

$Q_{rr} = f(I_C)$

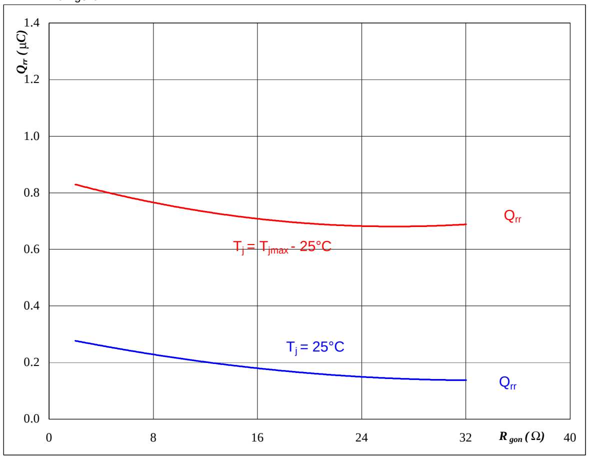



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{CE}$ = | 400 | V |
| $V_{GE}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |

**Figure 14** PFC FRED

**Typical reverse recovery charge as a function of IGBT turn on gate resistor**

$Q_{rr} = f(R_{gon})$

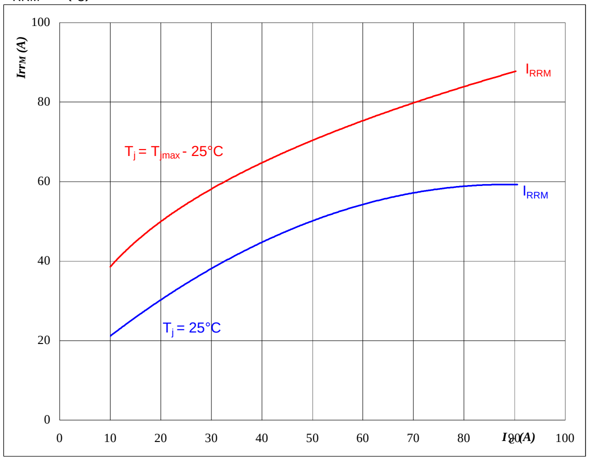



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_R$ = | 400 | V |
| $I_F$ = | 30 | A |
| $V_{GS}$ = | 15 | V |

**Figure 15** PFC FRED

**Typical reverse recovery current as a function of collector current**

$I_{RRM} = f(I_C)$

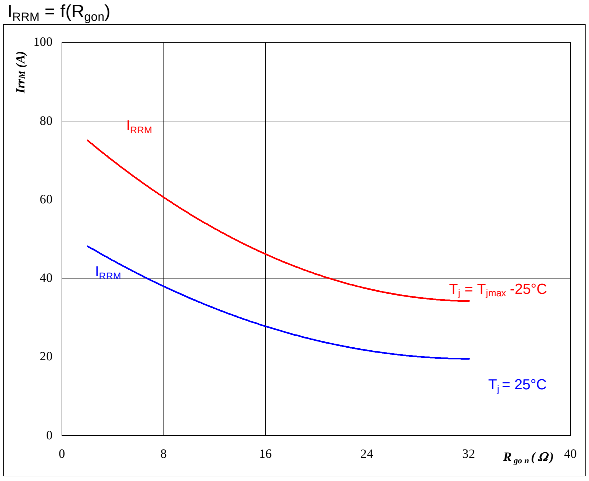



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{CE}$ = | 400 | V |
| $V_{GE}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |

**Figure 16** PFC FRED

**Typical reverse recovery current as a function of IGBT turn on gate resistor**

$I_{RRM} = f(R_{gon})$



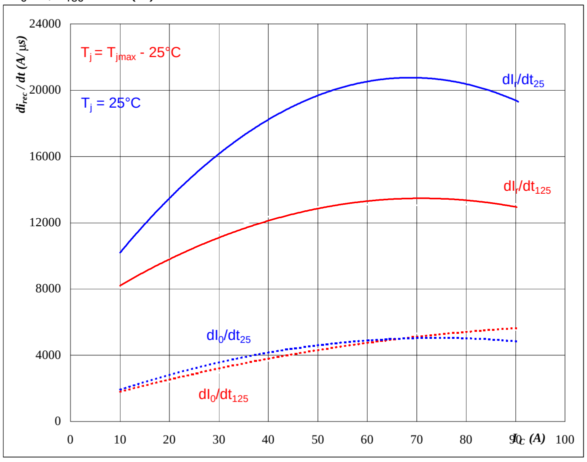

| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_R$ = | 400 | V |
| $I_F$ = | 30 | A |
| $V_{GS}$ = | 15 | V |

# PFC

**Figure 17** PFC FRED

**Typical rate of fall of forward and reverse recovery current as a function of collector current**

$dI_0/dt, dI_{rec}/dt = f(Ic)$

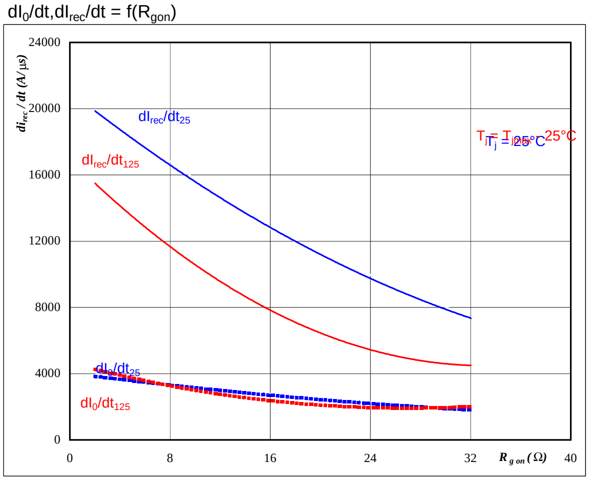



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_{CE}$ = | 400 | V |
| $V_{GE}$ = | 15 | V |
| $R_{gon}$ = | 8 | Ω |

**Figure 18** PFC FRED

**Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor**

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$

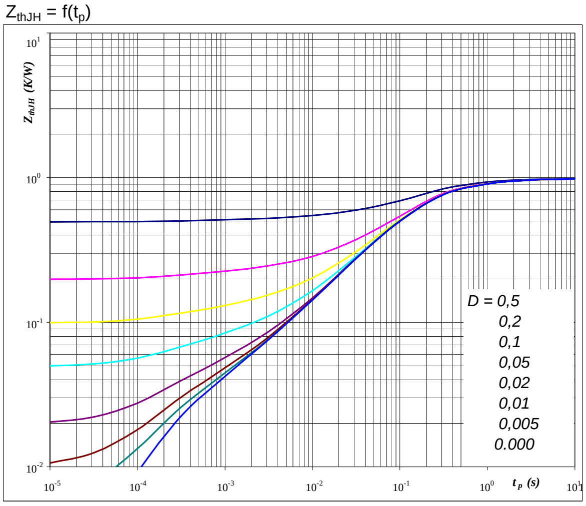



| | | |
|---|---|---|
| $T_j$ = | 25/125 | °C |
| $V_R$ = | 400 | V |
| $I_F$ = | 30 | A |
| $V_{GS}$ = | 15 | V |

**Figure 19** PFC SWITCH

**IGBT/MOSFET transient thermal impedance as a function of pulse width**

$Z_{thJH} = f(t_p)$




| | | |
|---|---|---|
| D = | $t_p$ / T | |
| $R_{thJH}$ = | 0.99 | K/W |

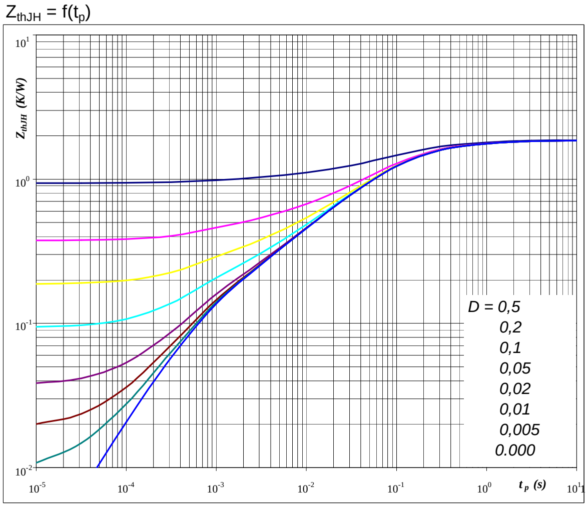
IGBT thermal model values

| R (C/W) | Tau (s) |
|---|---|
| 0.049 | 4.52E+00 |
| 0.198 | 6.47E-01 |
| 0.559 | 1.37E-01 |
| 0.129 | 2.16E-02 |
| 0.030 | 2.42E-03 |
| 0.022 | 2.71E-04 |

**Figure 20** PFC FRED

**FRED transient thermal impedance as a function of pulse width**

$Z_{thJH} = f(t_p)$




| | | |
|---|---|---|
| D = | $t_p$ / T | |
| $R_{thJH}$ = | 1.87 | K/W |

FRED thermal model values

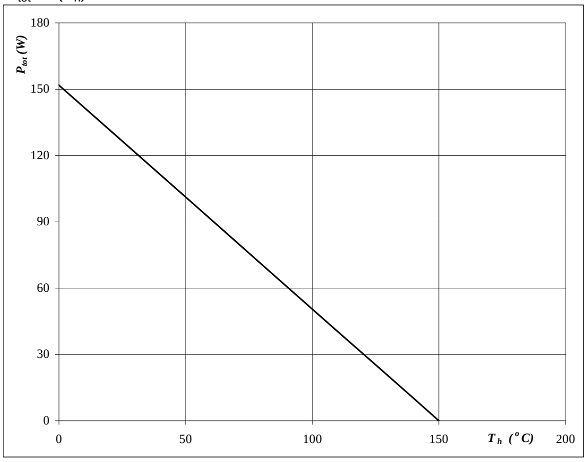
| R (C/W) | Tau (s) |
|---|---|
| 0.04 | 1.03E+01 |
| 0.21 | 9.26E-01 |
| 0.76 | 1.43E-01 |
| 0.57 | 3.47E-02 |
| 0.18 | 4.85E-03 |
| 0.11 | 6.60E-04 |

# PFC

**Figure 21** PFC SWITCH

**Power dissipation as a function of heatsink temperature**

$P_{tot} = f(T_h)$

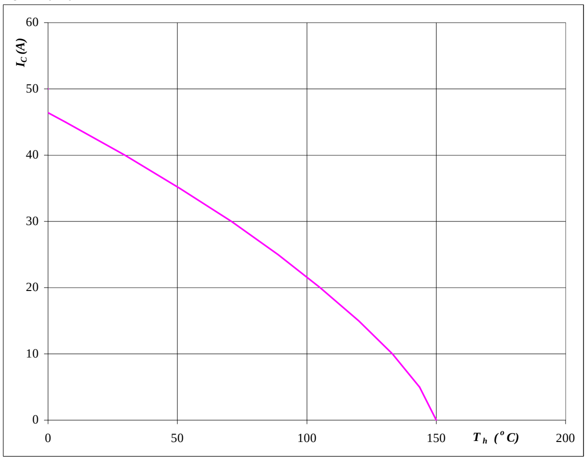



$T_j$ = 150 ºC

**Figure 22** PFC SWITCH

**Collector/Drain current as a function of heatsink temperature**

$I_C = f(T_h)$

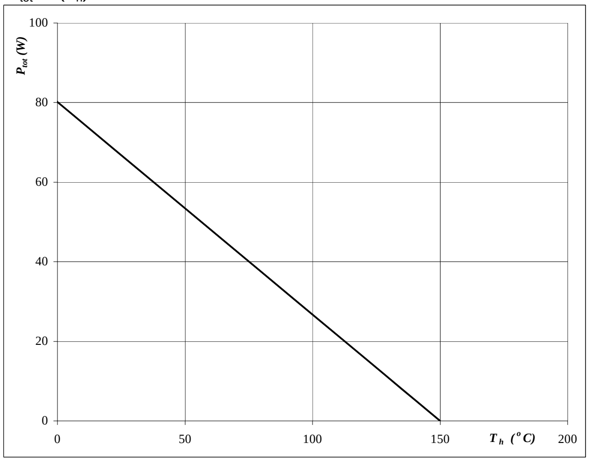



$T_j$ = 150 ºC
$V_{GS}$ = 15 V

**Figure 23** PFC FRED

**Power dissipation as a function of heatsink temperature**

$P_{tot} = f(T_h)$

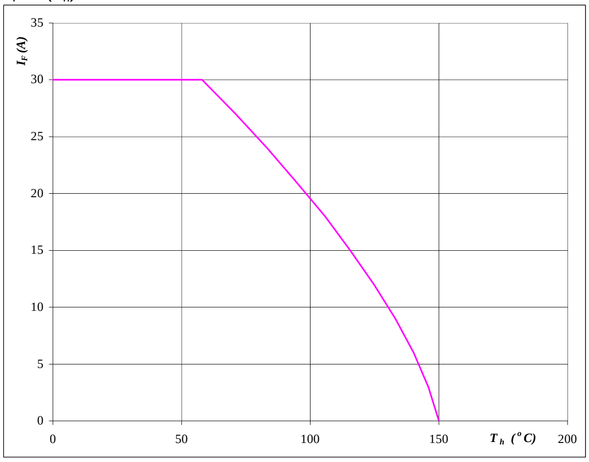



$T_j$ = 150 ºC

**Figure 24** PFC FRED

**Forward current as a function of heatsink temperature**

$I_F = f(T_h)$



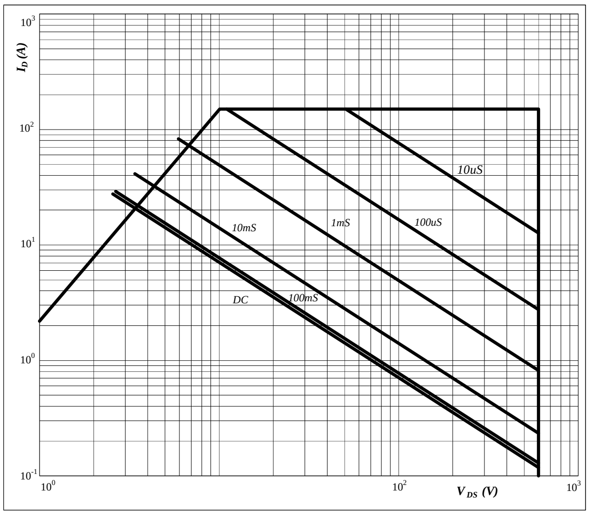

$T_j$ = 150 ºC

# PFC

| **Figure 25** | PFC SWITCH |
|---|---|

**Safe operating area as a function of drain-source voltage**

$I_D = f(V_{DS})$

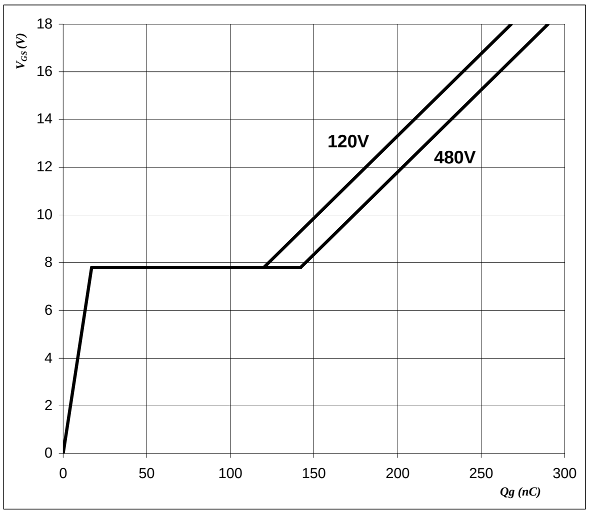



| | | |
|---|---|---|
| D = | single pulse | |
| $T_h$ = | 80 | ºC |
| $V_{GS}$ = | 15 | V |
| $T_j$ = | $T_{jmax}$ | ºC |

| **Figure 26** | PFC SWITCH |
|---|---|

**Gate voltage vs Gate charge**

$V_{GS} = f(Qg)$



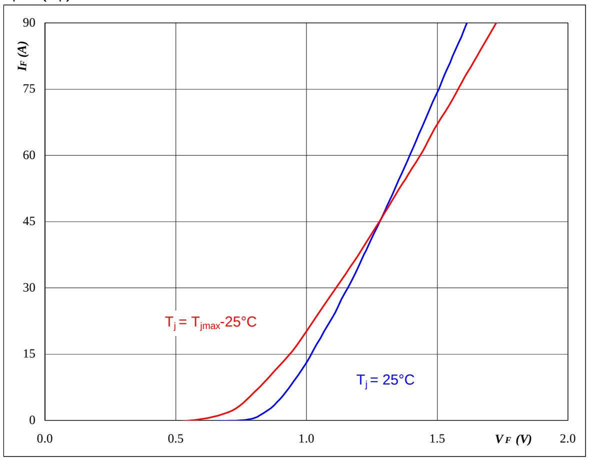

| | | |
|---|---|---|
| $I_D$ = | 50 | A |

# Input Rectifier Bridge

**Figure 1** Rectifier diode

**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$

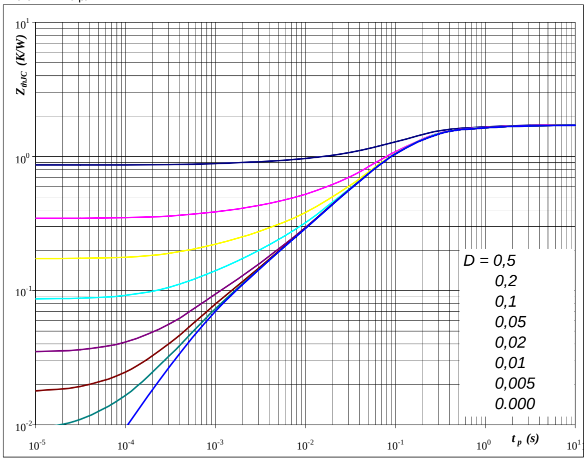



$t_p$ = 250 μs

**Figure 2** Rectifier diode

**Diode transient thermal impedance as a function of pulse width**

$Z_{thJH} = f(t_p)$



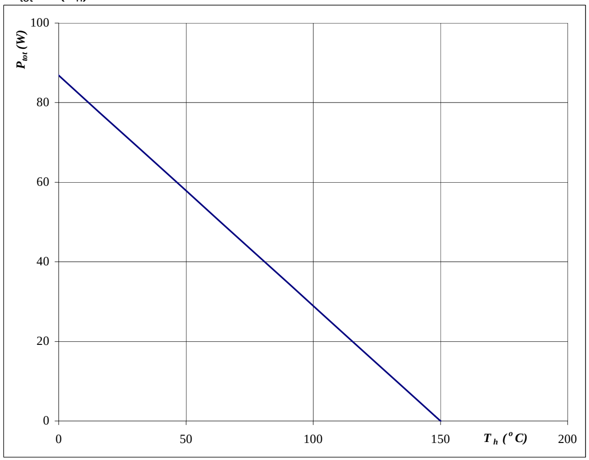

D = $t_p$ / T

$R_{thJH}$ = 1.728 K/W

**Figure 3** Rectifier diode

**Power dissipation as a function of heatsink temperature**

$P_{tot} = f(T_h)$

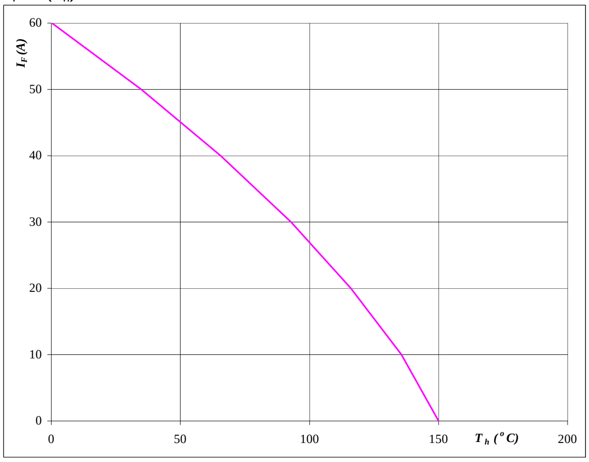



$T_j$ = 150 ºC

**Figure 4** Rectifier diode

**Forward current as a function of heatsink temperature**

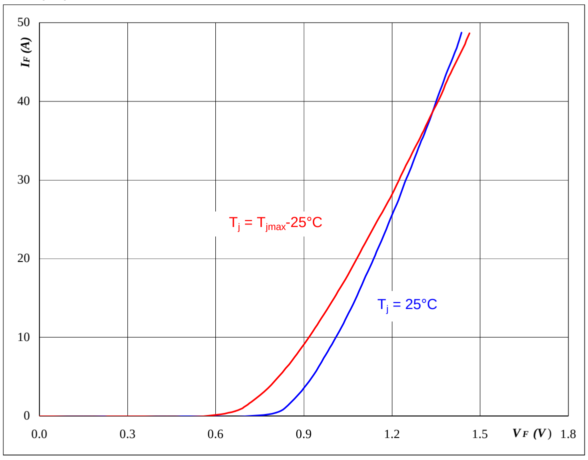
$I_F = f(T_h)$




$T_j$ = 150 ºC

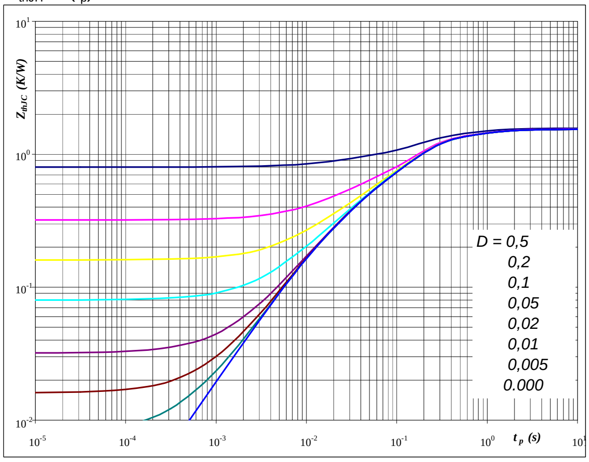
# Thyristor

**Figure 1** Thyristor
**Typical thyristor forward current as a function of forward voltage**
$I_F = f(V_F)$



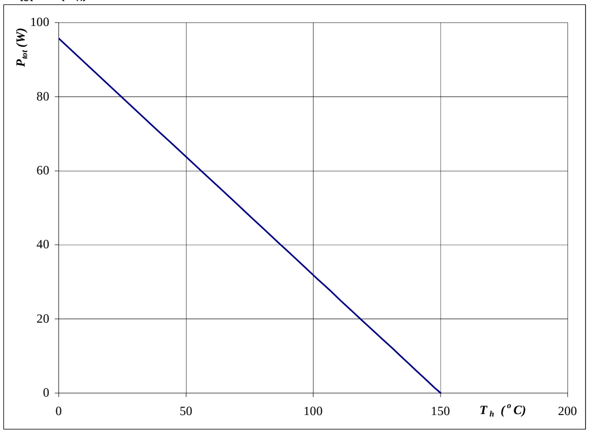

$t_p$ = 250 µs

**Figure 2** Thyristor
**Thyristor transient thermal impedance as a function of pulse width**
$Z_{thJH} = f(t_p)$



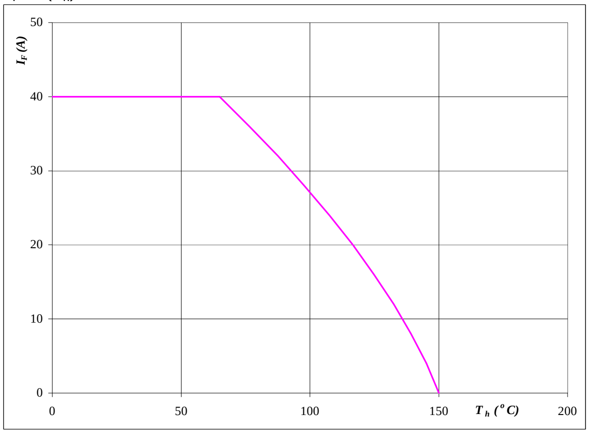

D = $t_p$ / T
$R_{thJH}$ = 1.57 K/W

**Figure 3** Thyristor
**Power dissipation as a function of heatsink temperature**
$P_{tot} = f(T_h)$




$T_j$ = 150 ºC

**Figure 4** Thyristor
**Forward current as a function of heatsink temperature**
$I_F = f(T_h)$

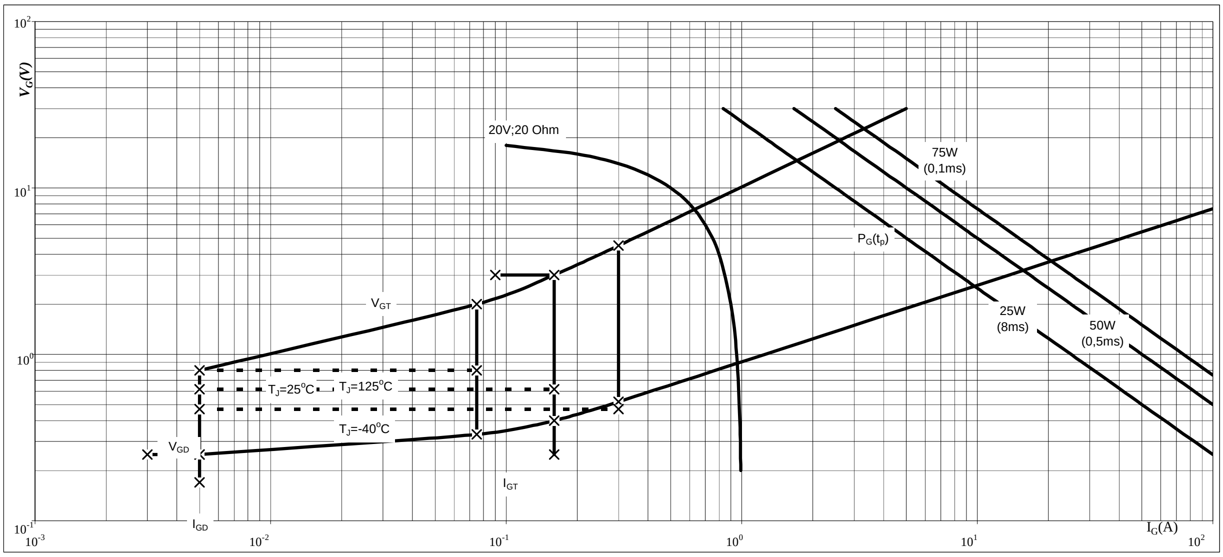



$T_j$ = 150 ºC

# Thyristor

**Figure 5** Thyristor

**Gate trigger characteristics**

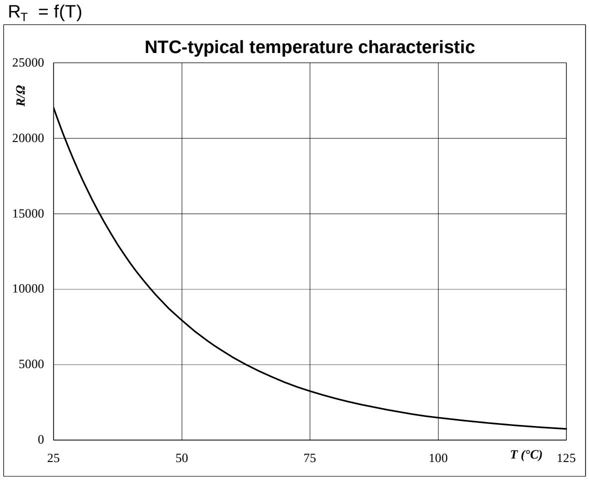



# Thermistor

**Figure 1** Thermistor

**Typical NTC characteristic**
**as a function of temperature**

$R_T$ = f(T)



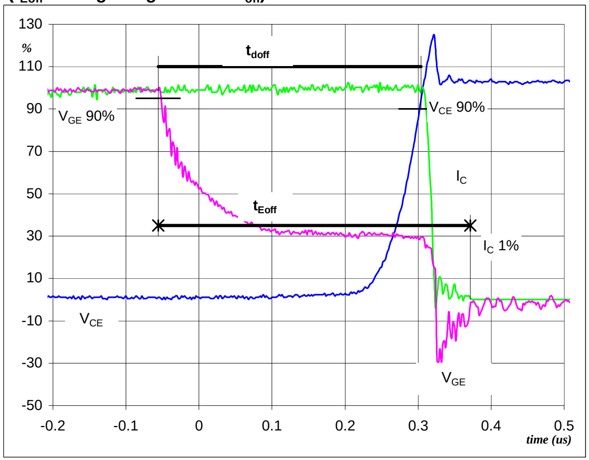
# Switching Definitions PFC

**General conditions**

| | | |
|---|---|---|
| $T_j$ | = | 125 °C |
| $R_{gon}$ | = | 8 Ω |
| $R_{goff}$ | = | 8 Ω |

**Figure 1** PFC SWITCH

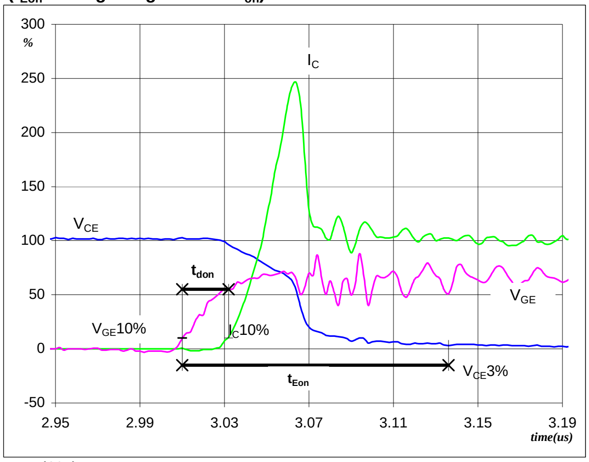
**Turn-off Switching Waveforms & definition of $t_{doff}$, $t_{Eoff}$**
**($t_{Eoff}$ = integrating time for $E_{off}$)**




| | | |
|---|---|---|
| $V_{GE}$ (0%) = | 0 | V |
| $V_{GE}$ (100%) = | 15 | V |
| $V_C$ (100%) = | 400 | V |
| $I_C$ (100%) = | 50 | A |
| $t_{doff}$ = | 0.35 | μs |
| $t_{Eoff}$ = | 0.43 | μs |

**Figure 2** PFC SWITCH

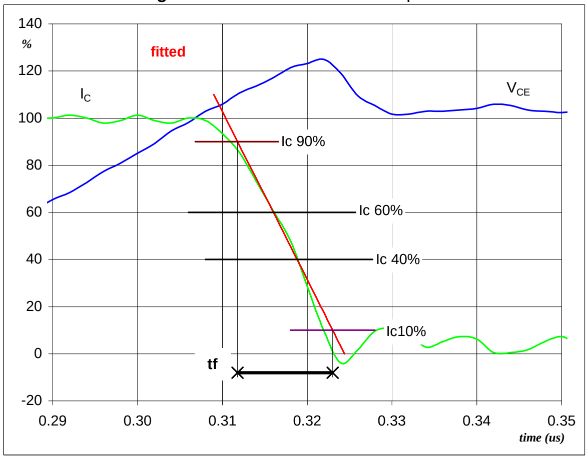
**Turn-on Switching Waveforms & definition of $t_{don}$, $t_{Eon}$**
**($t_{Eon}$ = integrating time for $E_{on}$)**




| | | |
|---|---|---|
| $V_{GE}$ (0%) = | 0 | V |
| $V_{GE}$ (100%) = | 15 | V |
| $V_C$ (100%) = | 400 | V |
| $I_C$ (100%) = | 50 | A |
| $t_{don}$ = | 0.02 | μs |
| $t_{Eon}$ = | 0.13 | μs |

**Figure 3** PFC SWITCH

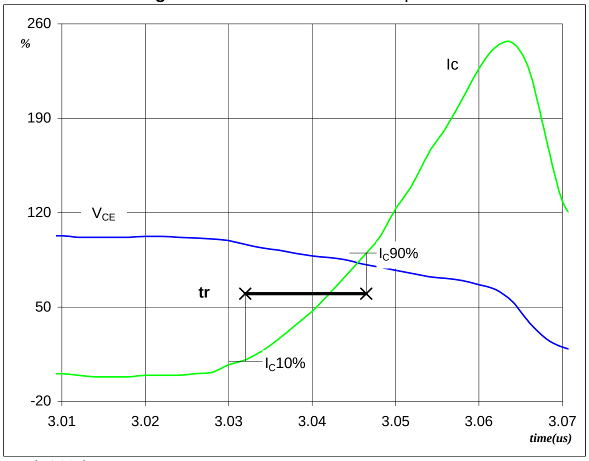
**Turn-off Switching Waveforms & definition of $t_f$**




| | | |
|---|---|---|
| $V_C$ (100%) = | 400 | V |
| $I_C$ (100%) = | 50 | A |
| $t_f$ = | 0.011 | μs |

**Figure 4** PFC SWITCH

**Turn-on Switching Waveforms & definition of $t_r$**

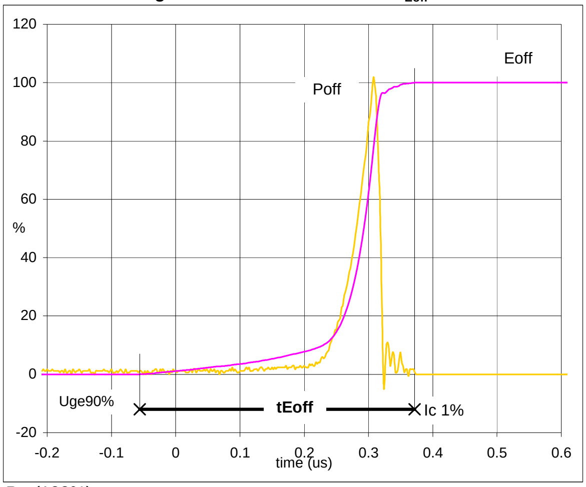



| | | |
|---|---|---|
| $V_C$ (100%) = | 400 | V |
| $I_C$ (100%) = | 50 | A |
| $t_r$ = | 0.015 | μs |

# Switching Definitions PFC

**Figure 5** PFC SWITCH

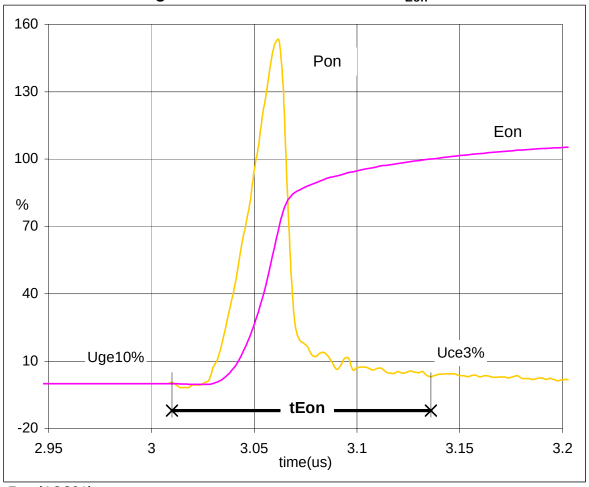
**Turn-off Switching Waveforms & definition of $t_{Eoff}$**




| | | |
|---|---|---|
| $P_{off}$ (100%) = | 20.08 | kW |
| $E_{off}$ (100%) = | 0.97 | mJ |
| $t_{Eoff}$ = | 0.43 | μs |

**Figure 6** PFC SWITCH

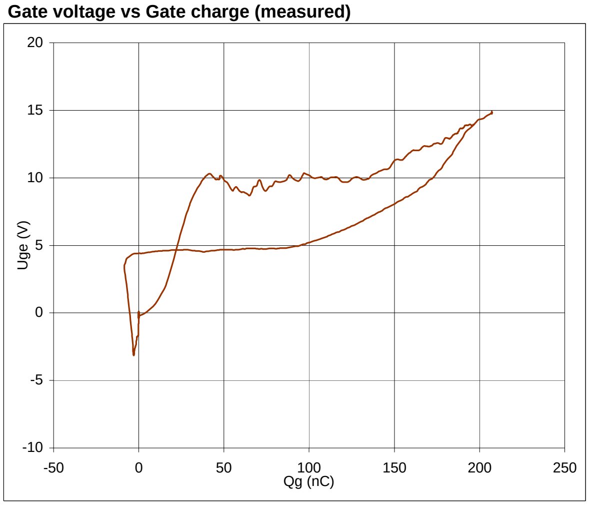
**Turn-on Switching Waveforms & definition of $t_{Eon}$**




| | | |
|---|---|---|
| $P_{on}$ (100%) = | 20.08 | kW |
| $E_{on}$ (100%) = | 0.78 | mJ |
| $t_{Eon}$ = | 0.126 | μs |

**Figure 7** PFC SWITCH

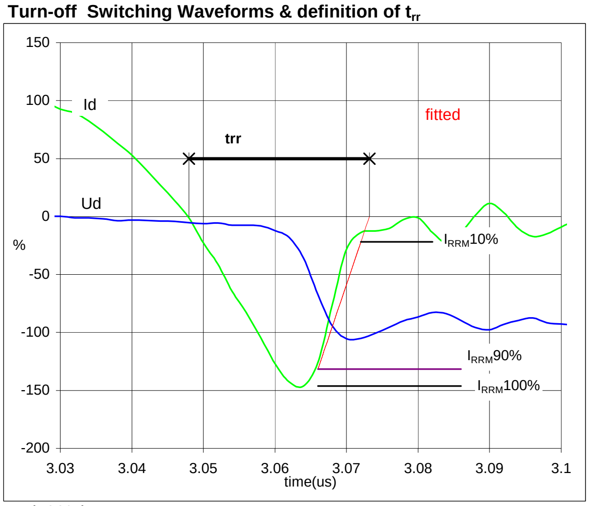
**Gate voltage vs Gate charge (measured)**




| | | |
|---|---|---|
| $V_{GEoff}$ = | 0 | V |
| $V_{GEon}$ = | 15 | V |
| $V_C$ (100%) = | 400 | V |
| $I_C$ (100%) = | 50 | A |
| $Q_g$ = | 207.14 | nC |

**Figure 8** PFC FRED

**Turn-off Switching Waveforms & definition of $t_{rr}$**

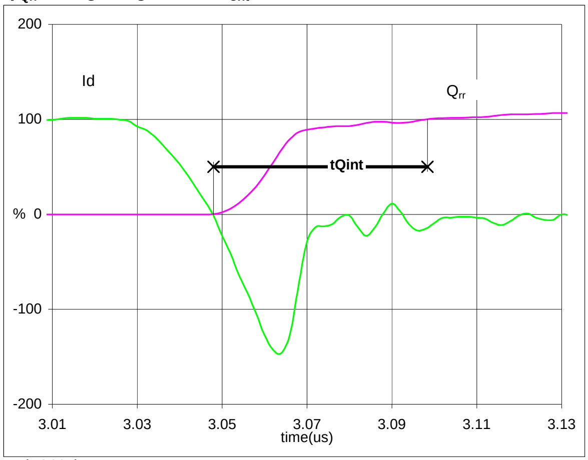



| | | |
|---|---|---|
| $V_d$ (100%) = | 400 | V |
| $I_d$ (100%) = | 50 | A |
| $I_{RRM}$ (100%) = | -73 | A |
| $t_{rr}$ = | 0.03 | μs |

# Switching Definitions PFC

**Figure 9** PFC FRED

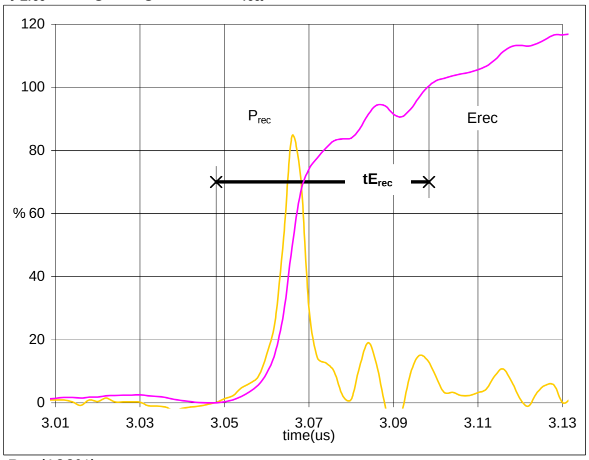
**Turn-on Switching Waveforms & definition of $t_{Qrr}$**
**($t_{Qrr}$= integrating time for $Q_{rr}$)**




| | | |
|---|---|---|
| $I_d$ (100%) = | 50 | A |
| $Q_{rr}$ (100%) = | 1.08 | μC |
| $t_{Qint}$ = | 0.05 | μs |

**Figure 10** PFC FRED

**Turn-on Switching Waveforms & definition of $t_{Erec}$**
**($t_{Erec}$= integrating time for $E_{rec}$)**




| | | |
|---|---|---|
| $P_{rec}$ (100%) = | 20.08 | kW |
| $E_{rec}$ (100%) = | 0.19 | mJ |
| $t_{Erec}$ = | 0.05 | μs |

# Ordering Code and Marking - Outline - Pinout

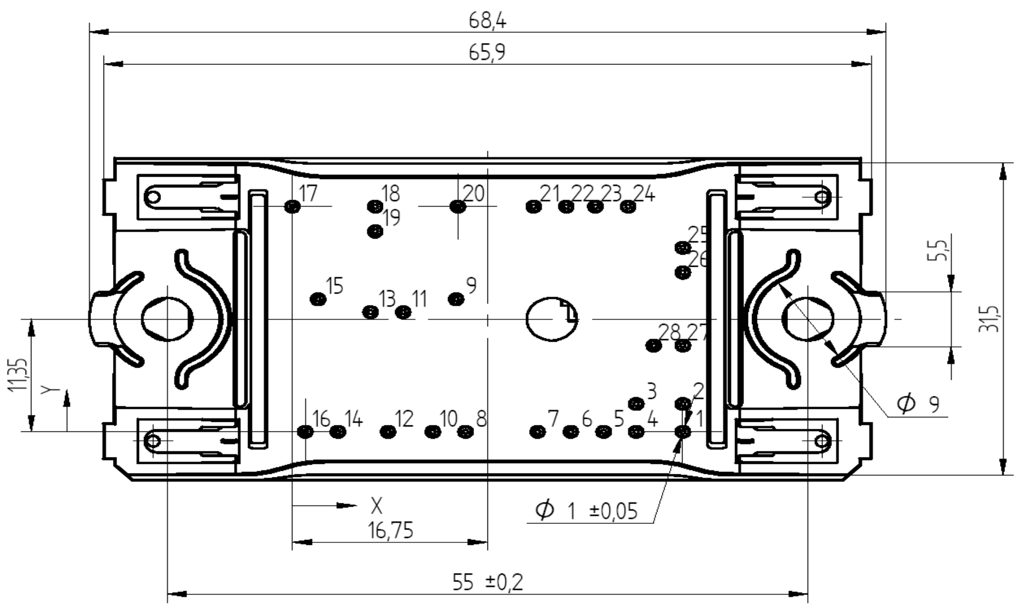
## Ordering Code & Marking

| Version | Ordering Code | in DataMatrix as | in packaging barcode as |
|---|---|---|---|
| without SCR, current sense in collector | 10-FZ062TA040FB-P984D18 | P984D18 | P984D18 |
| with SCR, current sense in collector | 10-FZ062TA040FB01-P984D28 | P984D28 | P984D28 |
| without SCR, current sense in emitter | 10-FZ062TA040FB02-P984D38 | P984D38 | P984D38 |
| with  SCR, current sense in emitter | 10-FZ062TA040FB03-P984D48 | P984D48 | P984D48 |

## Outline

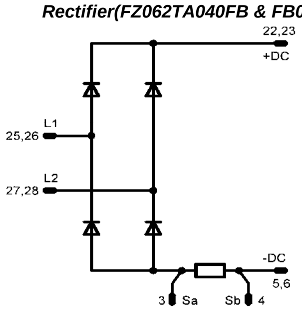
Pin table

| Pin | X | Y |
|---|---|---|
| 1 | 33,5 | 0 |
| 2 | 33,5 | 2,8 |
| 3 | 29,5 | 2,8 |
| 4 | 29,5 | 0 |
| 5 | 26,7 | 0 |
| 6 | 23,9 | 0 |
| 7 | 21,05 | 0 |
| 8 | 14,85 | 0 |
| 9 | 14,05 | 13,35 |
| 10 | 12,05 | 0 |
| 11 | 9,5 | 12,05 |
| 12 | 8,2 | 0 |
| 13 | 6,7 | 12,05 |
| 14 | 3,9 | 0 |
| 15 | 2,2 | 13,35 |
| 16 | 1,1 | 0 |
| 17 | 0 | 22,7 |
| 18 | 7,1 | 22,7 |
| 19 | 7,1 | 20,2 |
| 20 | 14,2 | 22,7 |
| 21 | 20,7 | 22,7 |
| 22 | 23,5 | 22,7 |
| 23 | 26 | 22,7 |
| 24 | 28,8 | 22,7 |
| 25 | 33,5 | 18,55 |
| 26 | 33,5 | 16,05 |
| 27 | 33,5 | 8,7 |
| 28 | 31 | 8,7 |



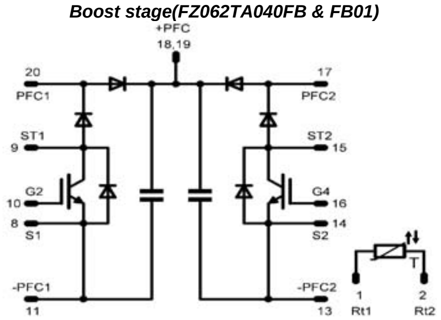

## Pinout

*Rectifier(FZ062TA040FB & FB02)*



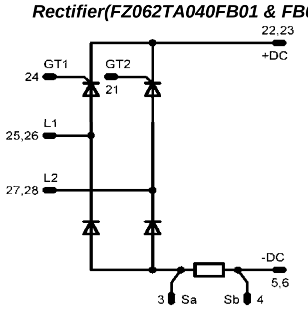

***Pin nr. 21 & 24 without electrical connection***

*Boost stage(FZ062TA040FB & FB01)*

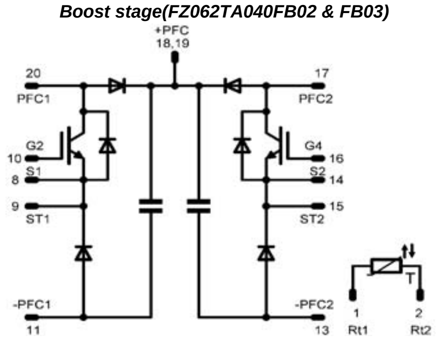



***Pin nr. 7 & 12 without electrical connection***

*Rectifier(FZ062TA040FB01 & FB03)*




*Boost stage(FZ062TA040FB02 & FB03)*




***Pin nr. 7 & 12 without electrical connection***

**PRODUCT STATUS DEFINITIONS**

| Datasheet Status | Product Status | Definition |
| --- | --- | --- |
| Target | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff. |
| Preliminary | First Production | This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff. |
| Final | Full Production | This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff. |

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**LIFE SUPPORT POLICY**

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.