| $V_{DRM}$ | = | 4200 V |
| $I_{T(AV)M}$ | = | 1150 A |
| $I_{T(RMS)}$ | = | 1800 A |
| $I_{TSM}$ | = | $17.3 \cdot 10^3$ A |
| $V_{T0}$ | = | 0.95 V |
| $r_T$ | = | 0.575 m$\Omega$ |

# Phase Control Thyristor

# 5STP 12F4200

- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Designed for traction, energy and industrial applications**
- **Optimum power handling capability**

## Blocking
*Maximum rated values [1]*

| Parameter | Symbol | Conditions | 5STP 12F4200 | Unit |
|---|---|---|---|---|
| Max repetitive peak forward and reverse blocking voltage | $V_{DRM}$, $V_{RRM}$ | f = 50 Hz, $t_p$ = 10 ms, $T_{vj}$ = 5…125 °C, Note 1 <br> $V_{AK}$ $V_{DRM}$,$V_{RRM}$ $t_p$ t | 4200 | V |
| Critical rate of rise of commutating voltage | dv/dt$_{crit}$ | Exp. to 0.67·$V_{DRM}$, $T_{vj}$ = 125 °C | 1000 | V/µs |
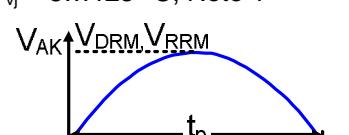
*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Forward leakage current | $I_{DRM}$ | $V_{DRM}$, $T_{vj}$ = 125 °C | | | 200 | mA |
| Reverse leakage current | $I_{RRM}$ | $V_{RRM}$, $T_{vj}$ = 125 °C | | | 200 | mA |

Note 1: Voltage de-rating factor of 0.11% per °C is applicable for $T_{vj}$ below +5 °C.

## Mechanical data
*Maximum rated values [1]*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Mounting force | $F_M$ | | 14 | 22 | 24 | kN |
| Acceleration | a | Device unclamped | | | 50 | m/s$^2$ |
| Acceleration | a | Device clamped | | | 100 | m/s$^2$ |

*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Weight | m | | | | 0.6 | kg |
| Housing thickness | H | $F_M$ = 22 kN, $T_a$ = 25 °C | 26.1 | | 26.5 | mm |
| Surface creepage distance | $D_S$ | | 25 | | | mm |
| Air strike distance | $D_a$ | | 14 | | | mm |

1) Maximum rated values indicate limits beyond which damage to the device may occur

**ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.**

## On-state

*Maximum rated values [1])*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Average on-state current | $I_{T(AV)M}$ | Half sine wave, Tc = 70 °C | | | 1150 | A |
| RMS on-state current | $I_{T(RMS)}$ | | | | 1800 | A |
| Peak non-repetitive surge current | $I_{TSM}$ | $t_p$ = 10 ms, $T_{vj}$ = 125 °C, sine half wave, | | | $17.3 \cdot 10^3$ | A |
| Limiting load integral | $I^2t$ | $V_D = V_R$= 0 V, after surge | | | $1.5 \cdot 10^6$ | $A^2s$ |
| Peak non-repetitive surge current | $I_{TSM}$ | $t_p$ = 10 ms, $T_{vj}$ = 125 °C, sine half wave, | | | $12 \cdot 10^3$ | A |
| Limiting load integral | $I^2t$ | $V_R = 0.6 \cdot V_{RRM}$, after surge | | | $720 \cdot 10^3$ | $A^2s$ |

*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| On-state voltage | $V_T$ | $I_T$ = 2000 A, $T_{vj}$ = 125 °C | | | 2.1 | V |
| Threshold voltage | $V_{(T0)}$ | $I_T$ = 600 A - 1800 A, $T_{vj}$ = 125 °C | | | 0.95 | V |
| Slope resistance | $r_T$ | | | | 0.575 | mΩ |
| Holding current | $I_H$ | Tvj = 25 °C | | | 80 | mA |
| | | Tvj = 125 °C | | | 60 | mA |
| Latching current | $I_L$ | Tvj = 25 °C | | | 500 | mA |
| | | Tvj = 125 °C | | | 200 | mA |

## Switching

*Maximum rated values [1])*

| Parameter | Symbol | Conditions | | min | typ | max | Unit |
|---|---|---|---|---|---|---|---|
| Critical rate of rise of on-state current | $di/dt_{crit}$ | $T_{vj}$ = 125 °C, $I_{TRM}$ = 2000 A, $V_D \le 0.67 \cdot V_{DRM}$, $I_{FG}$ = 2 A, $t_r$ = 0.5 µs | Cont. f = 50 Hz | | | 100 | A/µs |
| | | | Cont. f = 1 Hz | | | 1000 | A/µs |
| Circuit-commutated turn-off time | $t_q$ | $T_{vj}$ = 125 °C, $I_{TRM}$ = 2000 A, $V_R$ = 200 V, $di_T/dt$ = -1.5 A/µs, $V_D \le 0.67 \cdot V_{DRM}$, $dv_D/dt$ = 20 V/µs | | | | 900 | µs |

*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Reverse recovery charge | $Q_{rr}$ | $T_{vj}$ = 125 °C, $I_{TRM}$ = 2000 A, $V_R$ = 200 V, $di_T/dt$ = -1.5 A/µs | 1400 | | 2400 | µAs |
| Reverse recovery current | $I_{RM}$ | | 40 | | 54 | A |
| Gate turn-on delay time | $t_{gd}$ | $T_{vj}$ = 25 °C, $V_D = 0.4 \cdot V_{RM}$, $I_{FG}$ = 2 A, $t_r$ = 0.5 µs | | | 2 | µs |

# Triggering

*Maximum rated values [1])*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Peak forward gate voltage | $V_{FGM}$ | | | | 12 | V |
| Peak forward gate current | $I_{FGM}$ | | | | 10 | A |
| Peak reverse gate voltage | $V_{RGM}$ | | | | 10 | V |
| Average gate power loss | $P_{G(AV)}$ | | | see Fig. 7 | | W |

*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Gate-trigger voltage | $V_{GT}$ | Tvj = 25 °C | | | 2.6 | V |
| Gate-trigger current | $I_{GT}$ | Tvj = 25 °C | | | 400 | mA |
| Gate non-trigger voltage | $V_{GD}$ | $V_D = 0.4 \cdot V_{DRM}$, $T_{vjmax}$ = 125 °C | | | 0.3 | V |
| Gate non-trigger current | $I_{GD}$ | $V_D = 0.4 \cdot V_{DRM}$, $T_{vjmax}$ = 125 °C | | | 10 | mA |

# Thermal

*Maximum rated values [1])*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Operating junction temperature range | $T_{vj}$ | | | | 125 | °C |
| Storage temperature range | $T_{stg}$ | | -40 | | 140 | °C |

*Characteristic values*

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Thermal resistance junction to case, | $R_{th(j-c)}$ | Double-side cooled $F_m$ = 14... 24 kN | | | 17 | K/kW |
| | $R_{th(j-c)A}$ | Anode-side cooled $F_m$ = 14... 24 kN | | | 33 | K/kW |
| | $R_{th(j-c)C}$ | Cathode-side cooled $F_m$ = 14... 24 kN | | | 35 | K/kW |
| Thermal resistance case to heatsink, | $R_{th(c-h)}$ | Double-side cooled $F_m$ = 14... 24 kN | | | 4 | K/kW |
| | $R_{th(c-h)}$ | Single-side cooled $F_m$ = 14... 24 kN | | | 8 | K/kW |

**Analytical function for transient thermal impedance:**

$$Z_{th(j-c)}(t) = \sum_{i=1}^{n} R_i \left(1 - e^{-t/\tau_i}\right)$$

| i | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $R_i$(K/kW) | 10.350 | 3.760 | 2.290 | 0.670 |
| $\tau_i$(s) | 0.3723 | 0.0525 | 0.0057 | 0.0023 |



$Z_{thJC}$ [K/kW]

$F_m$ = 14 - 24 kN
Double side cooled

180° sine:        add 1.5 K/kW
180° rectangular: add 2 K/kW
120° rectangular: add 3 K/kW
60° rectangular:  add 5 K/kW

5STP 12F4200 Jan. 02
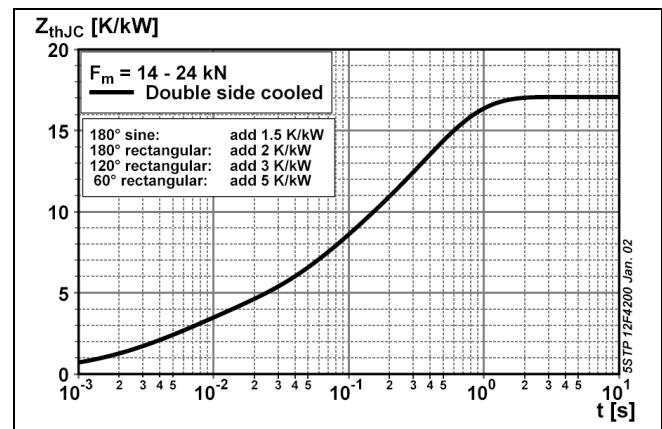
**Fig. 1** Transient thermal impedance (junction-to-case) vs. time
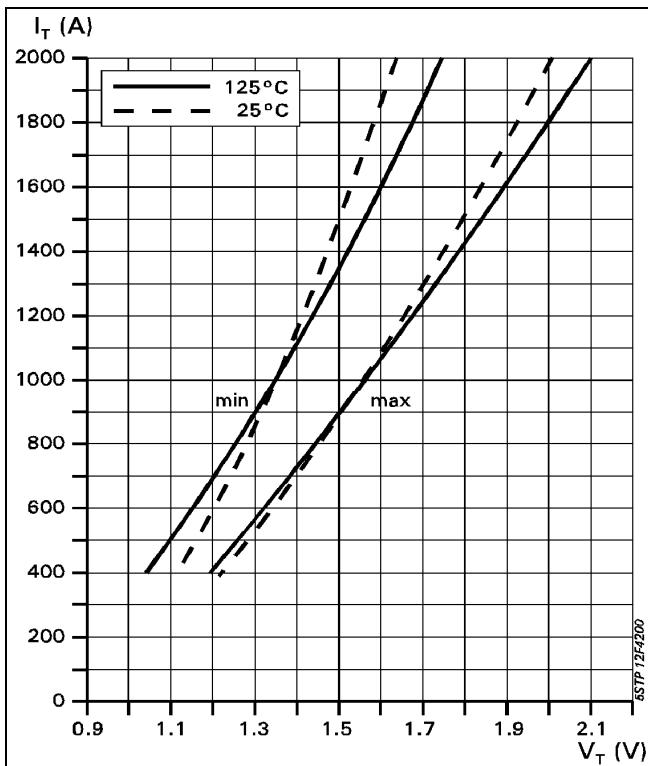
**Fig. 2** On-state voltage characteristics
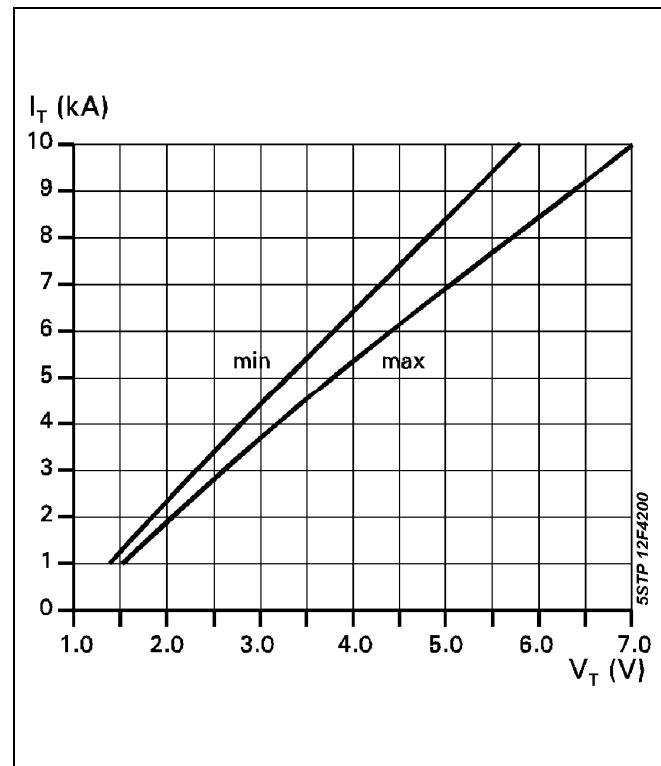


**Fig. 3** On-state voltage characteristics
$T_{vj}$ = 125 °C, 10 ms half sine
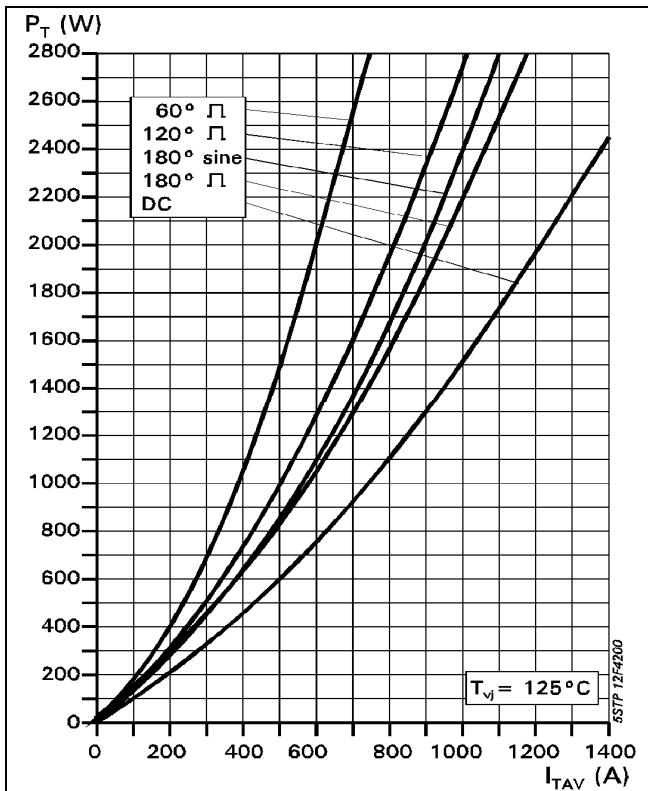


**Fig. 4** On-state power dissipation vs. mean on-state current, turn-on losses excluded
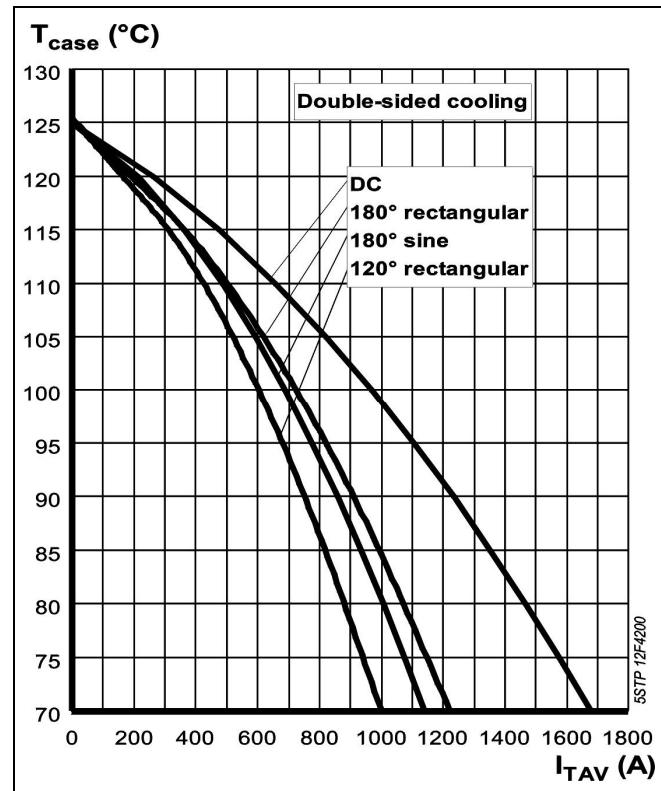


**Fig. 5** Max. permissible case temperature vs. mean on-state current, switching losses ignored

---

**ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.**
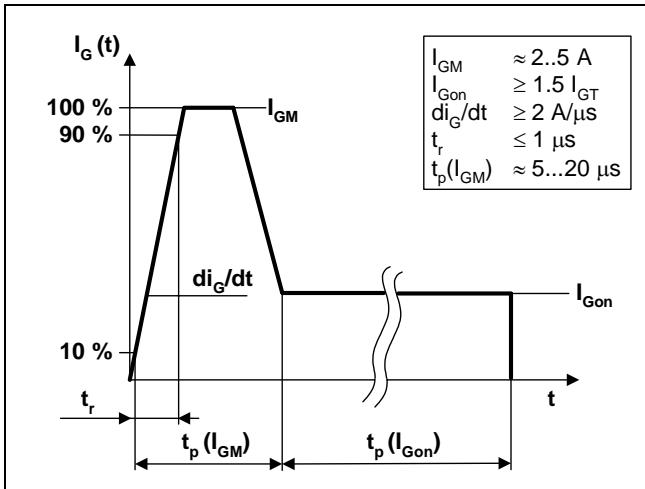
**Fig. 6** Recommended gate current waveform
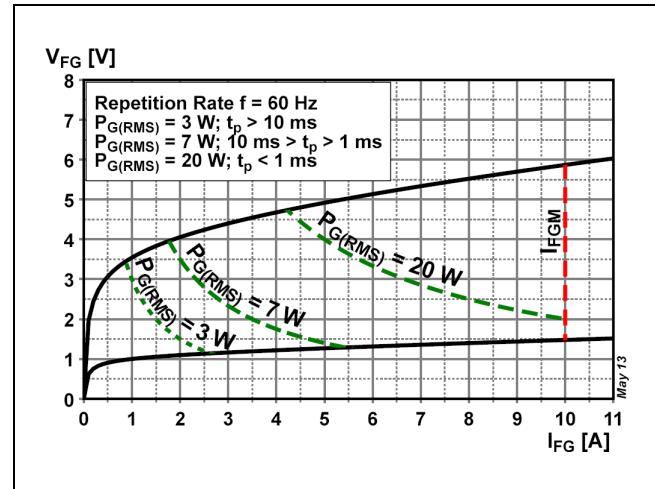


**Fig. 7** Max. peak gate power loss
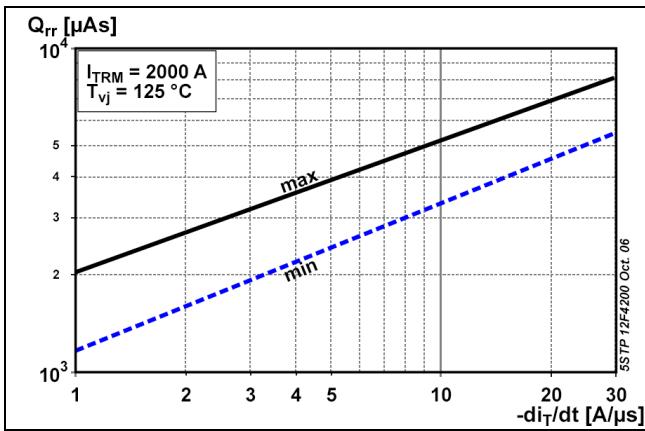


**Fig. 8** Reverse recovery charge vs. decay rate of on-state current
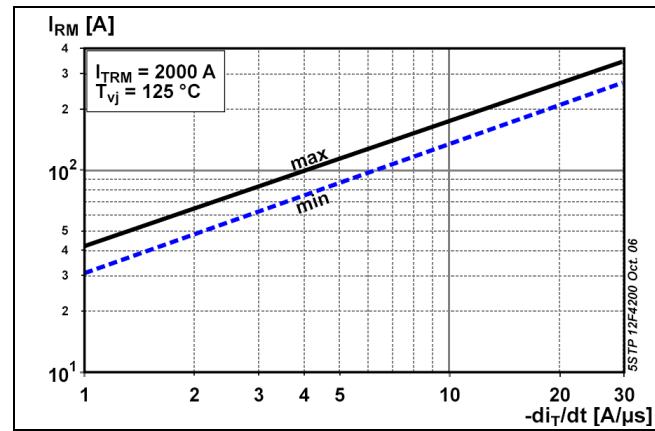


**Fig. 9** Peak reverse recovery current vs. decay rate of on-state current

**ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.**

# Turn-on and Turn-off losses
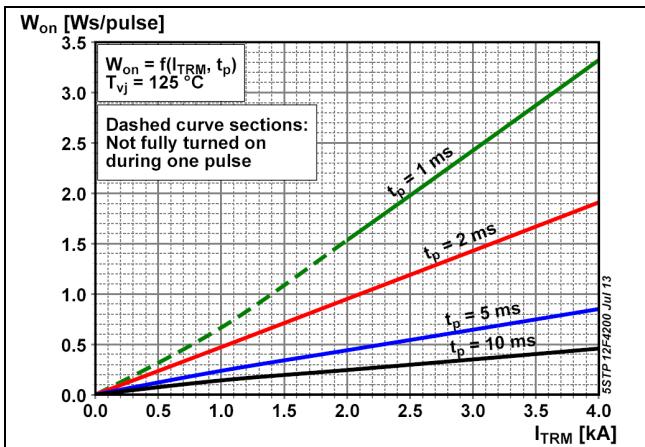


**Fig. 10** Turn-on energy, half sinusoidal waves
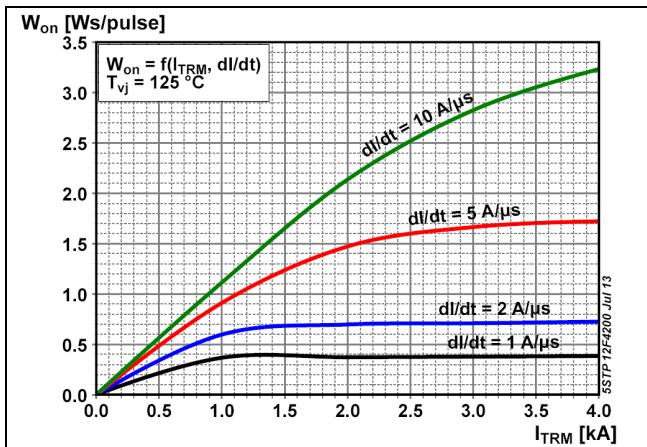


**Fig. 11** Turn-on energy, rectangular waves
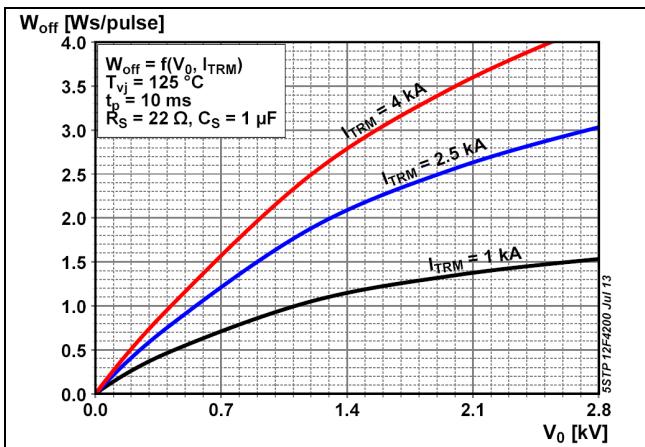


**Fig. 12** Turn-off energy, half sinusoidal waves
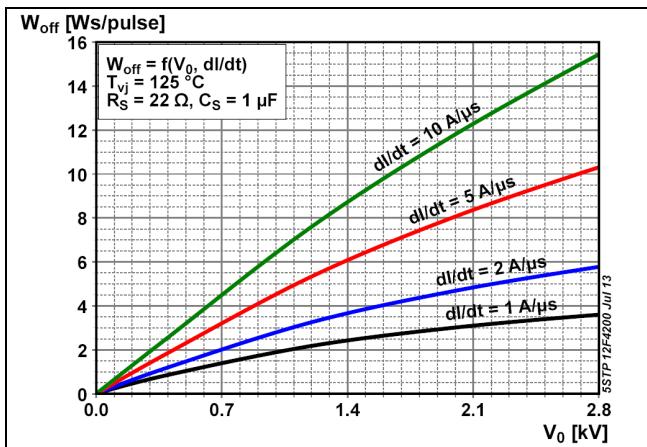


**Fig. 13** Turn-off energy, rectangular waves
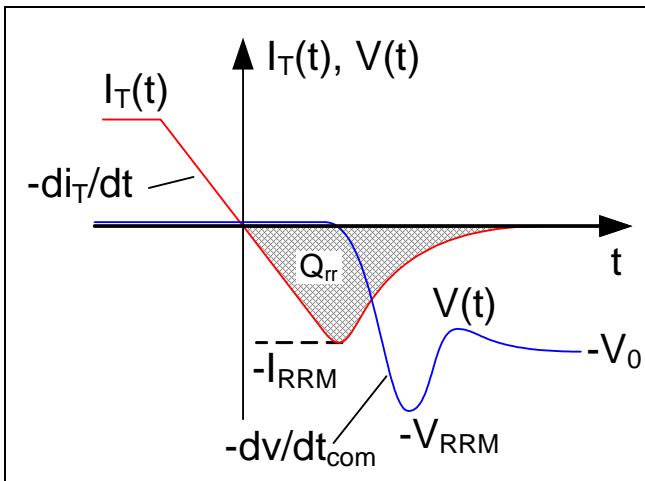


**Fig. 14** Current and voltage waveforms at turn-off

**Total power loss for repetitive waveforms:**

$$P_{TOT} = P_T + W_{on} \cdot f + W_{off} \cdot f$$

where

$$P_T = \frac{1}{T} \int_0^T I_T \cdot V_T(I_T) \; dt$$

**Fig. 15** Relationships for power loss

**ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.**
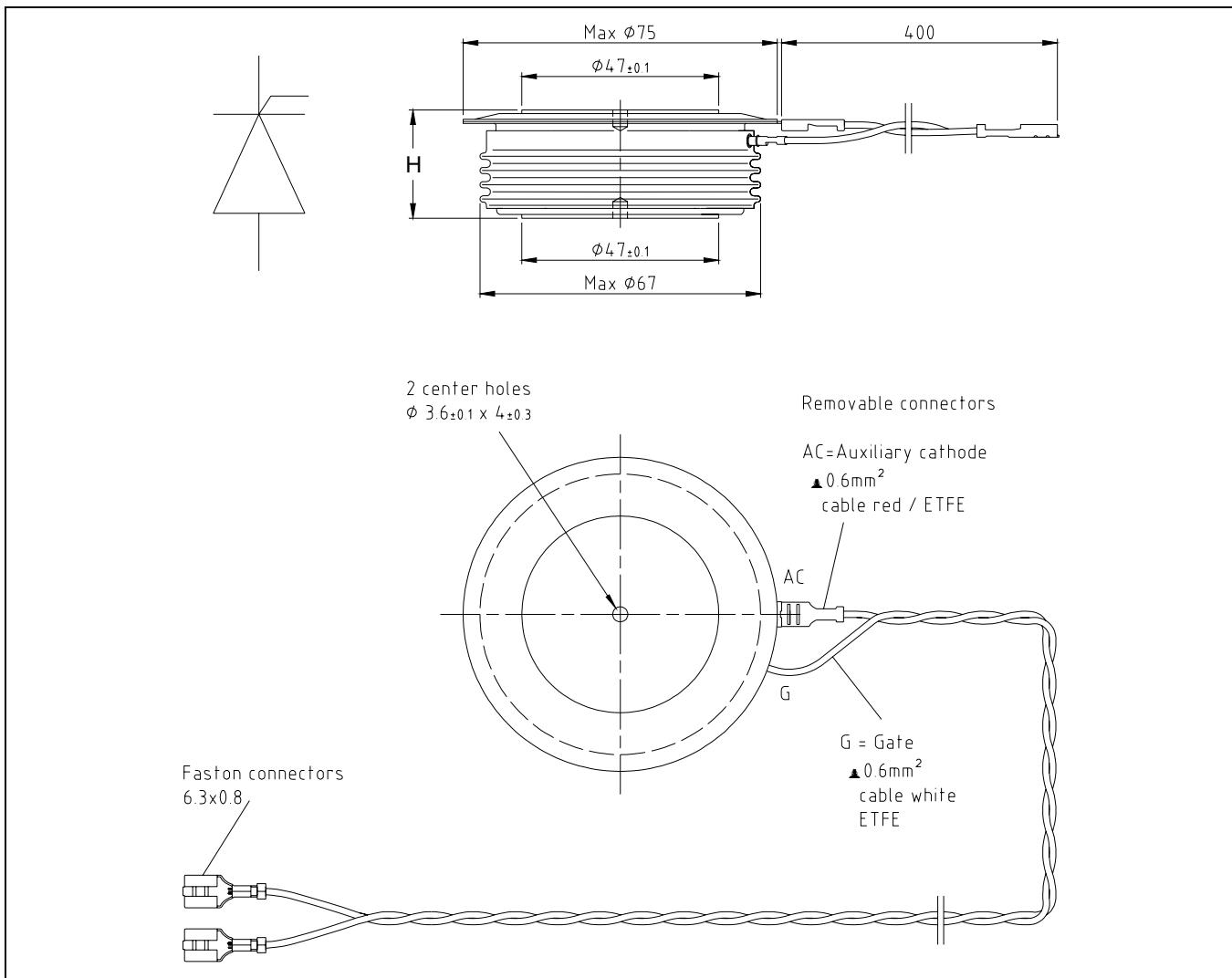
**Fig. 16** Device Outline Drawing

## Related documents:

| | |
|---|---|
| 5SYA 2020 | Design of RC-Snubber for Phase Control Applications |
| 5SYA 2049 | Voltage definitions for phase control thyristors and diodes |
| 5SYA 2051 | Voltage ratings of high power semiconductors |
| 5SYA 2034 | Gate-Drive Recommendations for PCT's |
| 5SYA 2036 | Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors |
| 5SZK 9104 | Specification of environmental class for pressure contact diodes, PCTs and GTO, STORAGE available on request, please contact factory |
| 5SZK 9105 | Specification of environmental class for pressure contact diodes, PCTs and GTO, TRANSPORTATION available on request, please contact factory |

Please refer to http://www.abb.com/semiconductors for current version of documents.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for* SCRs *category:*

*Click to view products by* ABB *manufacturer:*

Other Similar products are found below :

NTE5428  NTE5448  NTE5457  NTE5511  T1500N16TOF VT  T720N18TOF  T880N14TOF  T880N16TOF  TS110-7UF  TT104N12KOF-A  TT104N12KOF-K  TT162N16KOF-A  TT162N16KOF-K  TT330N16AOF  VS-16RIA100  VS-22RIA20  VS-2N5206  VS-2N685  VS-40TPS08A-M3  VS-ST230S12P1VPBF  057219R  CLB30I1200HB  T1190N16TOF VT  T1220N22TOF VT  T201N70TOH  T830N18TOF  TD92N16KOF-A  TT250N12KOF-K  VS-2N692  VS-2N689  VS-25RIA40  VS-16RIA120  VS-10RIA120  VS-30TPS08PBF  NTE5427  NTE5442  VS-2N690  VS-ST300S20P0PBF  TT251N16KOF-K  VS-22RIA100  VS-16RIA40  CR02AM-8#F00  VS-ST110S12P0VPBF  TD250N16KOF-A  VS-ST110S16P0  VS-10RIA10  VS-16TTS08-M3  TS110-7A1-AP  T930N36TOF VT  T2160N24TOF VT