

| | | |
|------------|---|------------------|
| V_{DSM} | = | 2800 V |
| I_{TAVM} | = | 1400 A |
| I_{TRMS} | = | 2210 A |
| I_{TSM} | = | 18000 A |
| V_{T0} | = | 0.82 V |
| r_T | = | 0.370 m Ω |

Phase Control Thyristor

5STP 16F2800

Doc. No. 5SYA1022-03 Sep. 01

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

Blocking

| Part Number | 5STP 16F2800 | 5STP 16F2600 | 5STP 16F2200 | Conditions |
|---------------------|-----------------|--------------|--------------|---|
| V_{DRM} V_{RRM} | 2800 V | 2600 V | 2200 V | $f = 50$ Hz, $t_p = 10$ ms |
| V_{RSM1} | 3000 V | 2800 V | 2400 V | $t_p = 5$ ms, single pulse |
| I_{DRM} | ≤ 200 mA | | | V_{DRM} |
| I_{RRM} | ≤ 200 mA | | | V_{RRM} |
| dV/dt_{crit} | 1000 V/ μ s | | | Exp. to $0.67 \times V_{DRM}$, $T_j = 125^\circ$ C |

Mechanical data

| | | | |
|-------|---------------------------|------|----------------------|
| F_M | Mounting force | nom. | 22 kN |
| | | min. | 14 kN |
| | | max. | 24 kN |
| a | Acceleration | | |
| | Device unclamped | | 50 m/s ² |
| | Device clamped | | 100 m/s ² |
| m | Weight | | 0.6 kg |
| D_S | Surface creepage distance | | 25 mm |
| D_a | Air strike distance | | 14 mm |

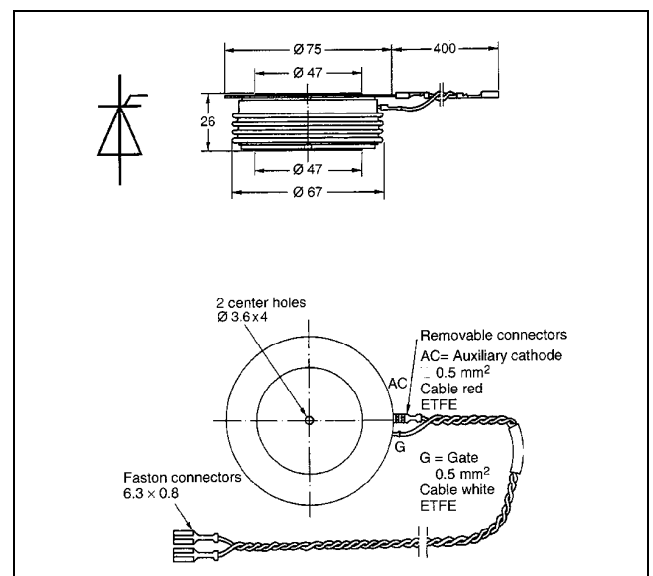


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On-state

| | | | | |
|------------|-------------------------------|----------------------------|--|---------------------------|
| I_{TAVM} | Max. average on-state current | 1400 A | Half sine wave, $T_C = 70^\circ\text{C}$ | |
| I_{TRMS} | Max. RMS on-state current | 2210 A | | |
| I_{TSM} | Max. peak non-repetitive | 18000 A | $t_p = 10\text{ ms}$ | $T_j = 125^\circ\text{C}$ |
| | surge current | 19000 A | $t_p = 8.3\text{ ms}$ | After surge: |
| I^2t | Limiting load integral | 1620 kA^2s | $t_p = 10\text{ ms}$ | $V_D = V_R = 0\text{V}$ |
| | | 1498 kA^2s | $t_p = 8.3\text{ ms}$ | |
| V_T | On-state voltage | 1.55 V | $I_T = 2000\text{ A}$ | $T_j = 125^\circ\text{C}$ |
| V_{T0} | Threshold voltage | 0.82 V | $I_T = 800 - 2400\text{ A}$ | |
| r_T | Slope resistance | 0.370 $\text{m}\Omega$ | | |
| I_H | Holding current | 25-75 mA | $T_j = 25^\circ\text{C}$ | |
| | | 15-60 mA | $T_j = 125^\circ\text{C}$ | |
| I_L | Latching current | 100- mA | $T_j = 25^\circ\text{C}$ | |
| | | 50-200 mA | $T_j = 125^\circ\text{C}$ | |

Switching

| | | | | |
|----------------|---|----------------------------|---|--|
| di/dt_{crit} | Critical rate of rise of on-state current | 150 $\text{A}/\mu\text{s}$ | Cont. $f = 50\text{ Hz}$ | $V_D \leq 0.67 \cdot V_{DRM}$, $T_j = 125^\circ\text{C}$ $I_{TRM} = 2000\text{ A}$ $I_{FG} = 2\text{ A}$, $t_r = 0.5\ \mu\text{s}$ |
| | | 300 $\text{A}/\mu\text{s}$ | 60 sec. $f = 50\text{ Hz}$ | |
| t_d | Delay time | $\leq 3.0\ \mu\text{s}$ | $V_D = 0.4 \cdot V_{DRM}$ | $I_{FG} = 2\text{ A}$, $t_r = 0.5\ \mu\text{s}$ |
| t_q | Turn-off time | $\leq 400\ \mu\text{s}$ | $V_D \leq 0.67 \cdot V_{DRM}$ $dv_D/dt = 20\text{V}/\mu\text{s}$ | $I_{TRM} = 2000\text{ A}$, $T_j = 125^\circ\text{C}$ $V_R > 200\text{ V}$, $di_T/dt = -20\text{ A}/\mu\text{s}$ |
| Q_{rr} | Recovery charge | min | 3000 μAs | |
| | | max | 6000 μAs | |

Triggering

| | | | |
|-----------|---------------------------|--------|----------------------------|
| V_{GT} | Gate trigger voltage | 2.6 V | $T_j = 25^\circ$ |
| I_{GT} | Gate trigger current | 400 mA | $T_j = 25^\circ$ |
| V_{GD} | Gate non-trigger voltage | 0.3 V | $V_D = 0.4 \times V_{DRM}$ |
| I_{GD} | Gate non-trigger current | 10 mA | $V_D = 0.4 \times V_{DRM}$ |
| V_{FGM} | Peak forward gate voltage | 12 V | |
| I_{FGM} | Peak forward gate current | 10 A | |
| V_{RGM} | Peak reverse gate voltage | 10 V | |
| P_G | Gate power loss | 3 W | |

Thermal

| | | | |
|------------|---|--------------|---------------------|
| T_{jmax} | Max. operating junction temperature range | 125 °C | |
| T_{stg} | Storage temperature range | -40...140 °C | |
| R_{thJC} | Thermal resistance junction to case | 33 K/kW | Anode side cooled |
| | | 35 K/kW | Cathode side cooled |
| | | 17 K/kW | Double side cooled |
| R_{thCH} | Thermal resistance case to heat sink | 8 K/kW | Single side cooled |
| | | 4 K/kW | Double side cooled |

Analytical function for transient thermal impedance:

$$Z_{thJC}(t) = \sum_{i=1}^n R_i(1 - e^{-t/\tau_i})$$

| | | | | |
|-------------|--------|--------|--------|--------|
| i | 1 | 2 | 3 | 4 |
| $R_i(K/kW)$ | 10.35 | 3.76 | 2.29 | 0.67 |
| $\tau_i(s)$ | 0.3723 | 0.0525 | 0.0057 | 0.0023 |

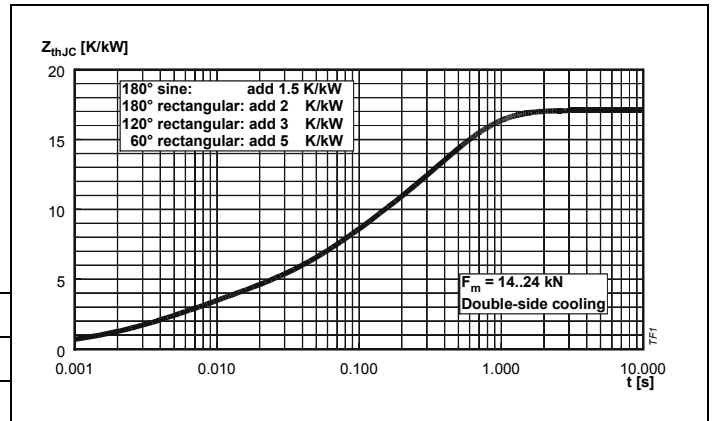


Fig. 1 Transient thermal impedance junction to case.

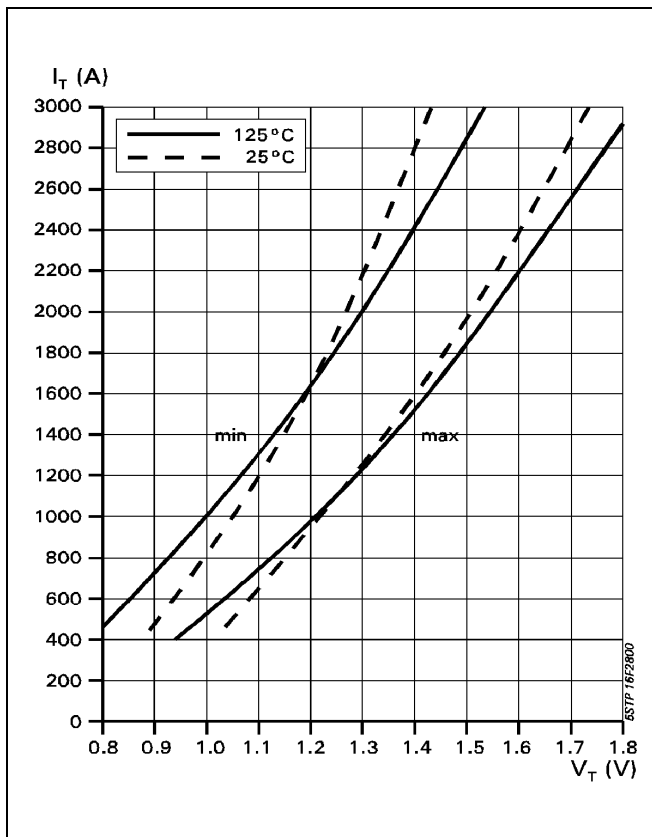


Fig. 2 On-state characteristics.

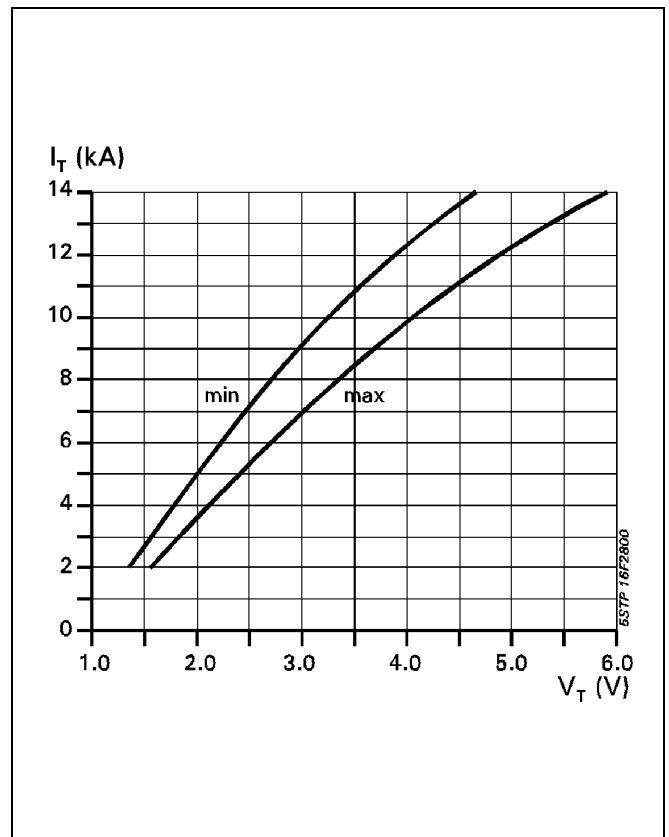


Fig. 3 On-state characteristics. $T_j=125^\circ\text{C}$, 10ms half sine