# Symmetrical Gate Turn-Off Thyristor Type SA20AP1200UR

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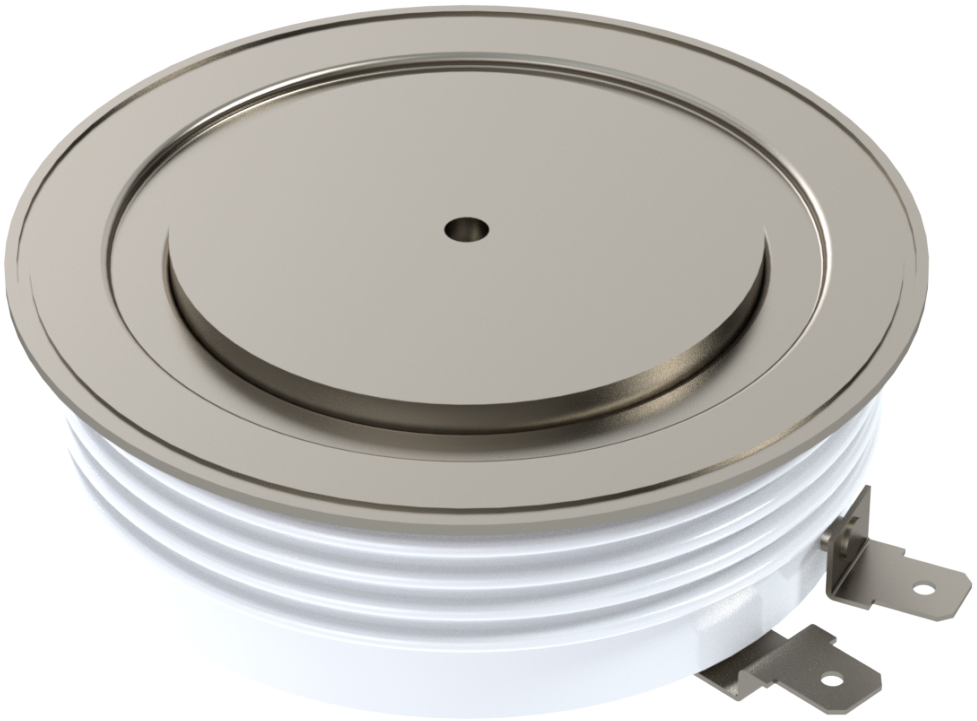
Data Sheet Issue: 1



| ORDERING INFORMATION | | | | | | (Please quote 12 to 15 digit code as below) |
|---|---|---|---|---|---|---|
| SA | 20 | AP | 1200 | U | R | |
| - | Voltage Code | Outline Code | Current code | Type code | Special code | Optional code |

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**Absolute Maximum Ratings**

| | VOLTAGE RATINGS | MAXIMUM LIMITS | UNITS |
|---|---|---|---|
| $V_{DRM}$ | Repetitive peak off-state voltage, (note 1) | 2000 | V |
| $V_{RSM}$ | Non-repetitive peak off-state voltage, (note 1) | 2100 | V |
| $V_{RRM}$ | Repetitive peak reverse voltage | 500 | V |
| $V_{RSM}$ | Non-repetitive peak reverse voltage | 500 | V |
| note 1) | $V_{GK}$ = –2V | | |

| | OTHER RATINGS | MAXIMUM LIMITS | UNITS |
|---|---|---|---|
| $I_{TGQ}$ | Peak turn-off current (note 1) | 1200 | A |
| $L_S$ | Snubber loop impedance, $I_{TM} = I_{TGQ}$ (note 1) | 0.3 | µH |
| $I_{T(AV)M}$ | Mean on-state current, $T_{sink}$ = 55°C, (note 2) | 670 | A |
| $I_{T(RMS)}$ | Nominal RMS on-state current, $T_{sink}$ = 25°C (note 2) | 1340 | A |
| $I_{TSM}$ | Peak non-repetitive surge current $t_p$ = 10ms | 10.5 | kA |
| $I_{TSM2}$ | Peak non-repetitive surge current (note 3) | 19 | kA |
| $I^2t$ | $I^2t$ capacity for fusing $t_p$ = 10ms | $550 \cdot 10^3$ | $A^2s$ |
| $(di/dt)_{cr}$ | Critical rate of rise of on-state current, (note 4) | 1000 | A/µs |
| $P_{FGM}$ | Peak forward gate power | 210 | W |
| $P_{RGM}$ | Peark reverse gate power | 8 | kW |
| $I_{FGM}$ | Peak forward gate current | 140 | A |
| $V_{RGM}$ | Peak reverse gate voltage (note 5) | 18 | V |
| $t_{off}$ | Minimum permissible off-time, $I_{TM} = I_{TGQ}$ (note 1) | 80 | µs |
| $t_{on}$ | Minimum permissible off-time | 20 | µs |
| $T_{jop}$ | Operating temperature range | -40 to +125 | °C |
| $T_{stg}$ | Storage temperature range | -40 to +150 | °C |
| note 1) | $T_j$ = 125°C, $V_D$ = 80%$V_{DM}$, $V_{DM} \leq V_{DRM}$, $di_{GQ}/dt$ = 20A/µs, $C_S$ = 3µF | | |
| note 2) | Double-side cooled, single phase, 50Hz, 180° half-sinewave. | | |
| note 3) | Half-sinewave, $t_p$ = 2ms | | |
| note 4) | For di/dt > 1000A/µs please consult factory. | | |
| note 5) | May exceed this value during turn-off avalanche period. | | |

## Characteristics

| | PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $V_{TM}$ | Maximum peak on-state voltage | $I_G$ = 2A, $I_T$ = 1200A | - | 3.0 | 3.3 | V |
| $I_L$ | Latching current | $T_j$ = 25°C | - | 15 | - | A |
| $I_H$ | Holding current | | - | 15 | - | A |
| $(dv/dt)_{cr}$ | Critical rate of rise of off-state voltage | $V_D$ = 80%$V_{DRM}$, $V_{GR}$ = –2V | 1000 | - | - | V/µs |
| $I_{DRM}$ | Peak off-state current | Rated $V_{DRM}$, $V_{GR}$ = –2V | - | - | 50 | mA |
| $I_{RRM}$ | Peak reverse current | Rated $V_{RRM}$ | - | - | 100 | mA |
| $I_{GKM}$ | Peak negative gate leakage current | $V_{GR}$ = –16V | - | - | 200 | mA |
| $V_{GT}$ | Gate trigger voltage | $T_j$ = –40°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 1.0 | - | V |
| | | $T_j$ = 25°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 0.9 | - | V |
| | | $T_j$ = 125°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 0.8 | - | V |
| $I_{GT}$ | Gate trigger current | $T_j$ = –40°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 3.0 | 8.0 | A |
| | | $T_j$ = 25°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 0.6 | 2.5 | A |
| | | $T_j$ = 125°C, $V_D$ = 25V, $R_L$ = 25mΩ | - | 60 | 500 | mA |
| $t_d$ | Delay time | (note 2) | - | 1.0 | - | µs |
| $t_{gt}$ | Turn-on time | Conditions as for $t_d$, (10%$I_{GM}$ to 10%$V_D$) | - | 3.0 | 7.0 | µs |
| $t_f$ | Fall time | (note 3) | - | 0.8 | - | µs |
| $t_{gq}$ | Turn-off time | Conditions as for $t_f$, (10%$I_{GQ}$ to 10%$I_{TGQ}$) | - | 12 | 13 | µs |
| $I_{GQ}$ | Turn-off gate current | Conditions as for $t_f$ | - | 250 | - | A |
| $Q_{GQ}$ | Turn-off gate charge | | - | 1600 | 2000 | mC |
| $t_{tail}$ | Tail time | Conditions as for $t_f$, (10%$I_{TGQ}$ to $I_{TGQ}$ < 1A) | - | 40 | 60 | µs |
| $t_{gw}$ | Gate off-time (note 4) | Conditions as for $t_f$ | 150 | - | - | µs |
| $R_{thJK}$ | Thermal resistance, junction to sink | Double side cooled | - | - | 0.027 | K/W |
| | | Cathode side cooled | - | - | 0.070 | K/W |
| | | Anode side cooled | - | - | 0.045 | K/W |
| F | Mounting force | (note 5) | 15 | - | 25 | kN |
| $W_t$ | Weight | | - | 480 | - | g |

note 1) Unless otherwise indicated $T_j$ = 125°C

note 2) $V_D$ = 50%$V_{DRM}$, $I_{TGQ}$ = 1200A, $I_{GM}$ = 40A, $di_G/dt$ = 20A/µs, $T_j$ = 25°C, di/dt = 300A/µs, (10%$I_{GM}$ to 90%$V_D$)

note 3) $V_D$ = 80%$V_{DRM}$, $I_{TGQ}$ = 1200A, $C_S$ = 3µF, $di_G/dt$ = 40A/µs, $V_{GR}$ = –16V, (90%$I_{TGQ}$ to 10%$V_D$)

note 4) The gate off-time is the period during which the gate circuit is required to remain low impedance to allow for the passage of tail current.

note 5) For other clamping forces, consult factory.

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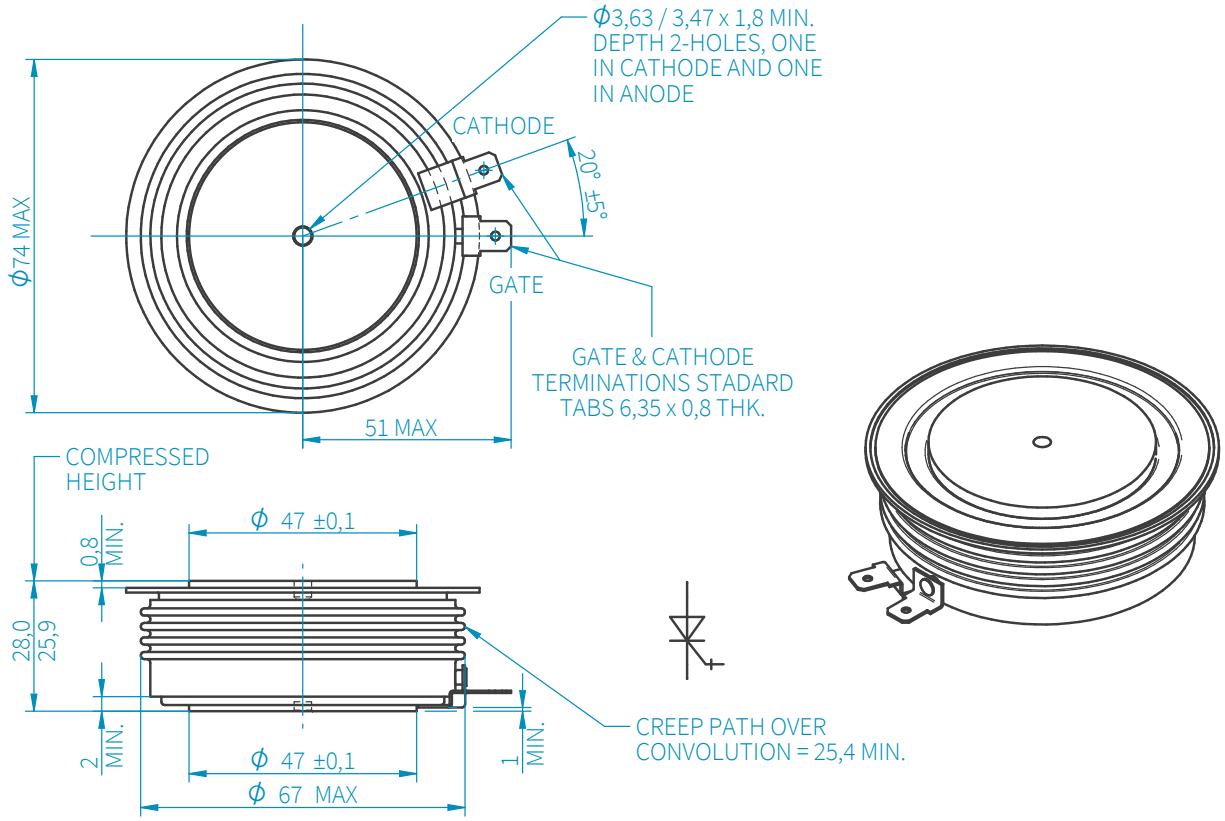
**Outline Drawing**

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