

Phase Control Thyristor

Types N0180SH120 to N0180SH160

Absolute Maximum Ratings

| | VOLTAGE RATINGS | MAXIMUM LIMITS | UNITS |
|-----------|---|-----------------------|--------------|
| V_{DRM} | Repetitive peak off-state voltage, (note 1) | 1200-1600 | V |
| V_{DSM} | Non-repetitive peak off-state voltage, (note 1) | 1200-1600 | V |
| V_{RRM} | Repetitive peak reverse voltage, (note 1) | 1200-1600 | V |
| V_{RSM} | Non-repetitive peak reverse voltage, (note 1) | 1300-1700 | V |

| | OTHER RATINGS | MAXIMUM LIMITS | UNITS |
|----------------|--|-----------------------|--------------|
| $I_{T(AV)}$ | Mean on-state current, $T_{sink}=55^{\circ}C$, (note 2) | 180 | A |
| $I_{T(AV)}$ | Mean on-state current, $T_{sink}=85^{\circ}C$, (note 2) | 110 | A |
| $I_{T(RMS)}$ | Nominal RMS on-state current, $T_{sink}=25^{\circ}C$, (note 2) | 175 | A |
| $I_{T(d.c.)}$ | D.C. on-state current, $T_{sink}=25^{\circ}C$, (note 4) | 175 | A |
| I_{TSM} | Peak non-repetitive surge $t_p=10ms$, $V_{RM}=0.6V_{RRM}$, (note 5) | 2450 | A |
| I_{TSM2} | Peak non-repetitive surge $t_p=10ms$, $V_{RM}\leq 10V$, (note 5) | 2695 | A |
| I^2t | I^2t capacity for fusing $t_p=10ms$, $V_{RM}=0.6V_{RRM}$, (note 5) | 30×10^3 | A^2s |
| I^2t | I^2t capacity for fusing $t_p=10ms$, $V_{RM}\leq 10V$, (note 5) | 36.3×10^3 | A^2s |
| $(di/dt)_{cr}$ | Maximum rate of rise of on-state current (repetitive), (Note 6) | 500 | $A/\mu s$ |
| | Maximum rate of rise of on-state current (non-repetitive), (Note 6) | 1000 | $A/\mu s$ |
| V_{FGM} | Peak forward gate voltage | 12 | V |
| I_{FGM} | Peak forward gate current | 19 | A |
| V_{RGM} | Peak reverse gate voltage | 5 | V |
| $P_{G(AV)}$ | Mean forward gate power | 2 | W |
| P_{GM} | Peak forward gate power (100 μs pulse width) | 100 | W |
| V_{GD} | Non-trigger gate voltage, (Note 7) | 0.25 | V |
| T_{HS} | Operating temperature range | -40 to +125 | $^{\circ}C$ |
| T_{stg} | Storage temperature range | -40 to +150 | $^{\circ}C$ |

Notes:-

- 1) De-rating factor of 0.13% per $^{\circ}C$ is applicable for T_j below $25^{\circ}C$.
- 2) Double side cooled, single phase; 50Hz, 180° half-sinewave.
- 3) Single side cooled, single phase; 50Hz, 180° half-sinewave.
- 4) Double side cooled.
- 5) Half-sinewave, $125^{\circ}C$ T_j initial.
- 6) $V_D=80\% V_{DRM}$, $I_{FG}=1A$, $t_r\leq 1\mu s$, $T_{case}=125^{\circ}C$.
- 7) Rated V_{DRM} .

Characteristics

| | PARAMETER | MIN. | TYP. | MAX. | TEST CONDITIONS (Note 1) | UNITS |
|----------------|--|------|------|------|-----------------------------------|-------|
| V_{TM} | Maximum peak on-state voltage | - | - | 1.57 | $I_{TM}=715A$ | V |
| V_{T0} | Threshold voltage | - | - | 0.9 | | V |
| r_T | Slope resistance | - | - | 1.79 | | mΩ |
| $(dv/dt)_{cr}$ | Critical rate of rise of off-state voltage | 1000 | - | - | $V_D=80\% V_{DRM}$ | V/μs |
| I_{DRM} | Peak off-state current | - | - | 20 | Rated V_{DRM} | mA |
| I_{RRM} | Peak reverse current | - | - | 20 | Rated V_{RRM} | mA |
| V_{GT} | Gate trigger voltage | - | - | 3.0 | $T_j=25^\circ C$ | V |
| I_{GT} | Gate trigger current | - | - | 150 | $T_j=25^\circ C$ $V_D=6V, I_T=1A$ | mA |
| I_H | Holding current | - | - | 600 | $T_j=25^\circ C$ | mA |
| R_{thJC} | Thermal resistance, junction to case | - | - | 0.23 | Double side cooled | K/W |
| F | Mounting torque | - | - | 14 | | Nm |
| W_t | Weight | - | 130 | - | | g |

Notes:-

- 1) Unless otherwise indicated $T_j=125^\circ C$.

Notes on Ratings and Characteristics

1.0 Voltage Grade Table

| Voltage Grade | V_{DRM} V_{DSM} V_{RRM} V | V_{RSM} V | V_D V_R DC V |
|---------------|------------------------------------|----------------|---------------------|
| 12 | 1200 | 1300 | 810 |
| 14 | 1400 | 1500 | 930 |
| 16 | 1600 | 1700 | 1040 |

2.0 Extension of Voltage Grades

This report is applicable to other voltage grades when supply has been agreed by Sales/Production.

3.0 De-rating Factor

A blocking voltage de-rating factor of 0.13%/°C is applicable to this device for T_j below 25°C.

4.0 Repetitive dv/dt

Standard dv/dt is 1000V/μs.

5.0 Snubber Components

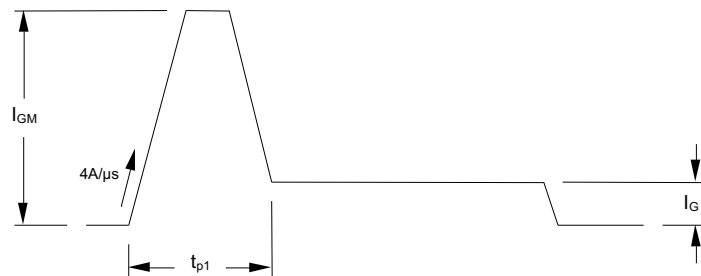
When selecting snubber components, care must be taken not to use excessively large values of snubber capacitor or excessively small values of snubber resistor. Such excessive component values may lead to device damage due to the large resultant values of snubber discharge current. If required, please consult the factory for assistance.

6.0 Rate of rise of on-state current

The maximum un-primed rate of rise of on-state current must not exceed 1000A/μs at any time during turn-on on a non-repetitive basis. For repetitive performance, the on-state rate of rise of current must not exceed 500A/μs at any time during turn-on. Note that these values of rate of rise of current apply to the total device current including that from any local snubber network.

7.0 Gate Drive

The nominal requirement for a typical gate drive is illustrated below. An open circuit voltage of at least 30V is assumed. This gate drive must be applied when using the full di/dt capability of the device.



The magnitude of I_{GM} should be between five and ten times I_{GT} , which is shown on page 2. Its duration (t_{p1}) should be 20μs or sufficient to allow the anode current to reach ten times I_L , whichever is greater. Otherwise, an increase in pulse current could be needed to supply the necessary charge to trigger. The 'back-porch' current I_G should remain flowing for the same duration as the anode current and have a magnitude in the order of 1.5 times I_{GT} .

Curves

Figure 1 - On-state characteristics of Limit device

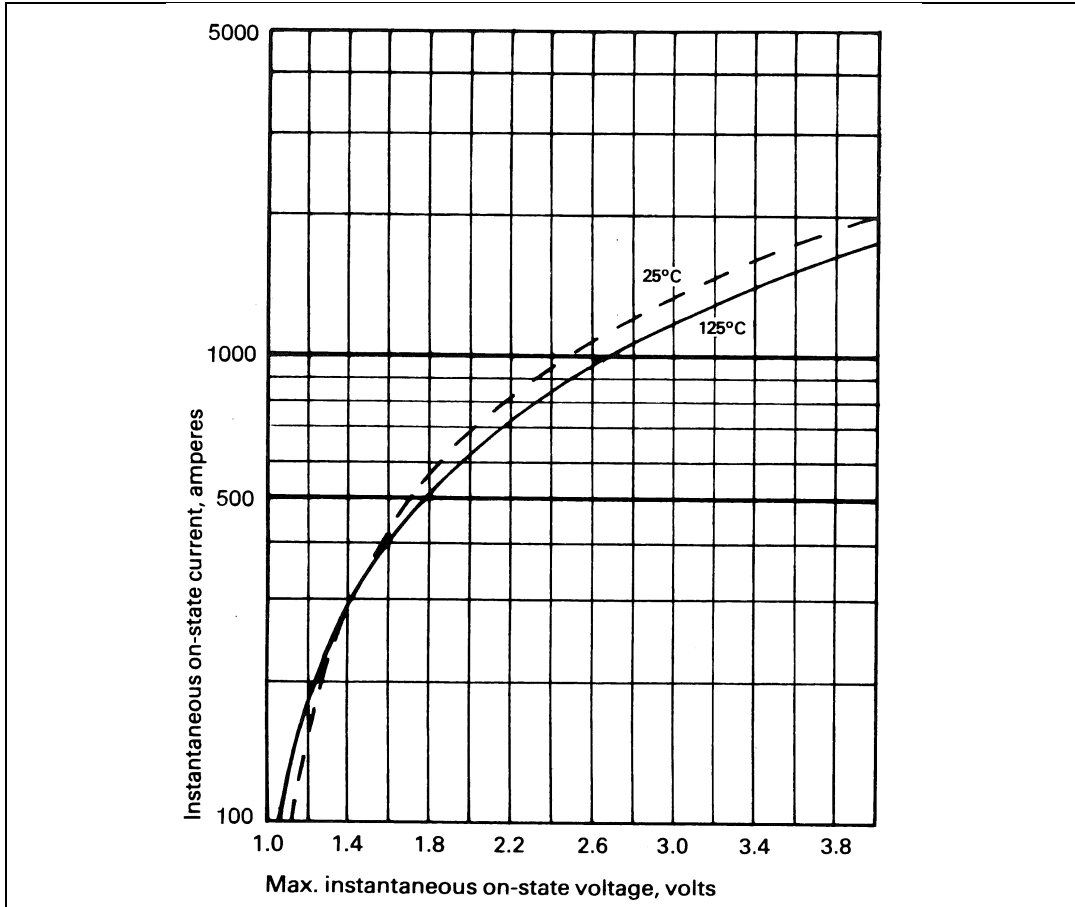


Figure 2 - Transient thermal impedance

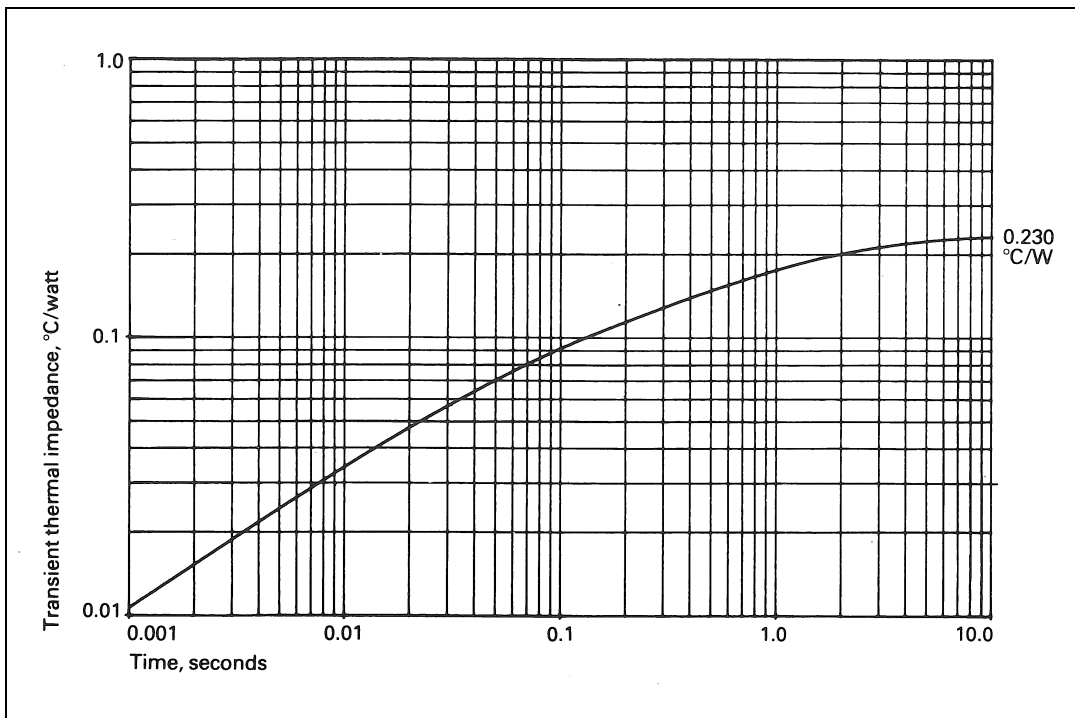


Figure 3 - Gate characteristics at 25°C junction temperature

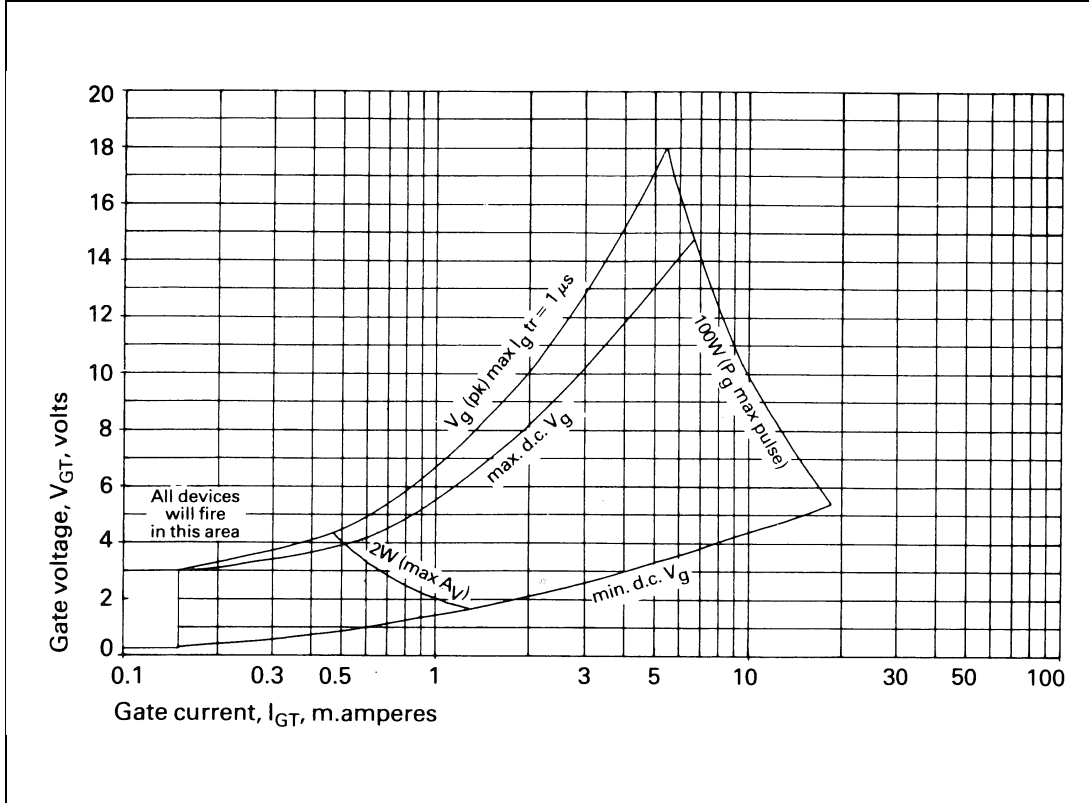


Figure 4 - Gate trigger characteristic

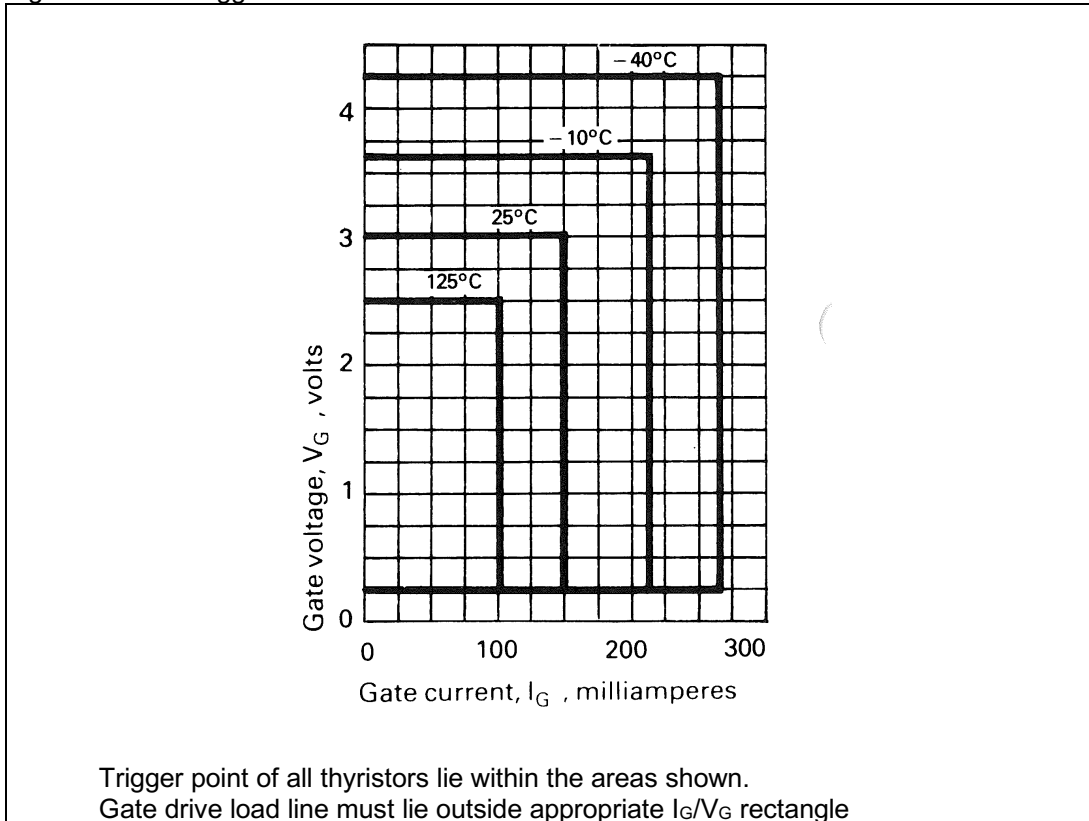


Figure 5 – On-state current vs. case temperature - (Sine wave)

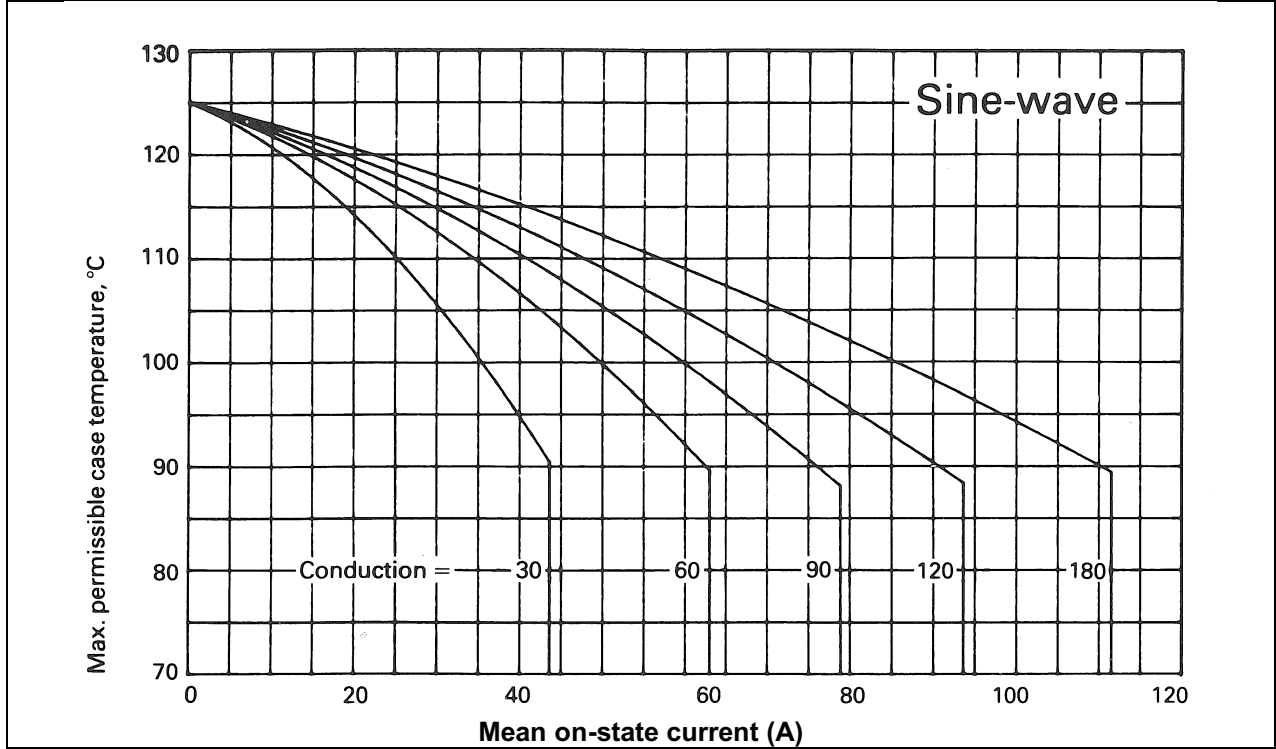


Figure 6 - On-state current vs. Power dissipation - (Sine wave)

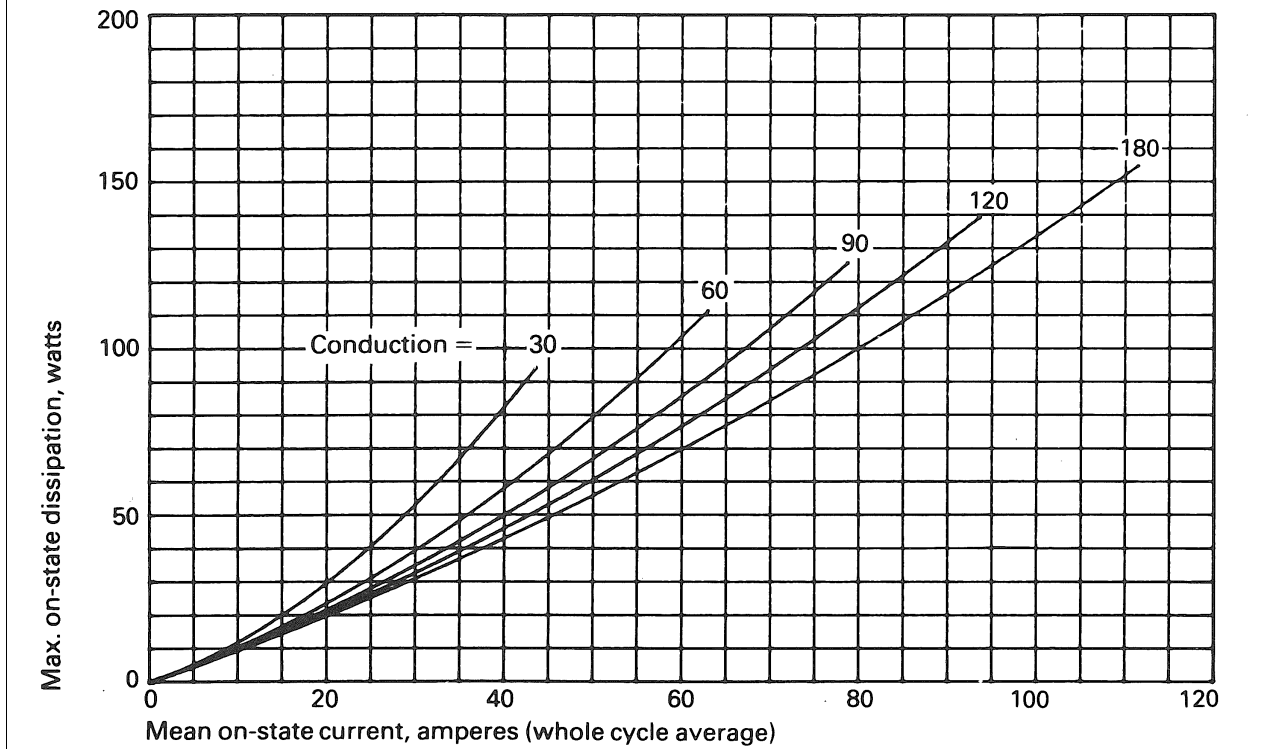


Figure 7 – On-state current vs. case temperature - (Square wave)

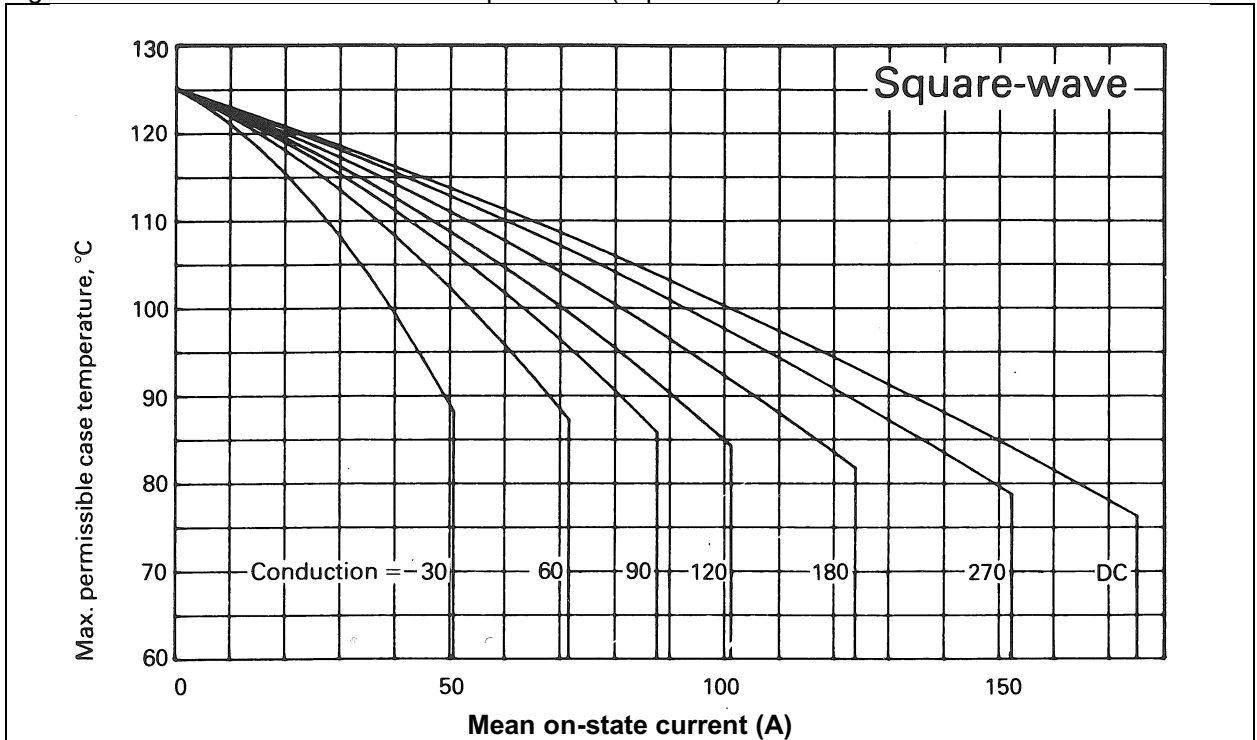


Figure 8 – On-state current vs. Power dissipation - (Square wave)

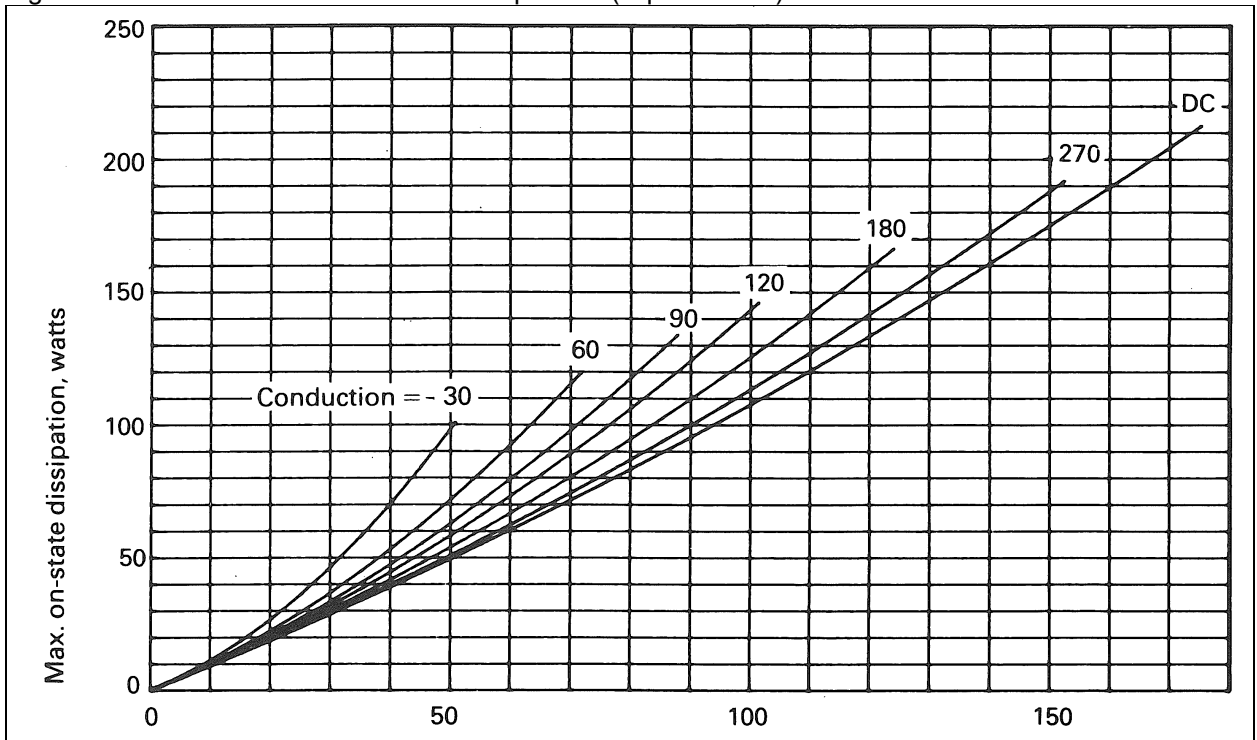
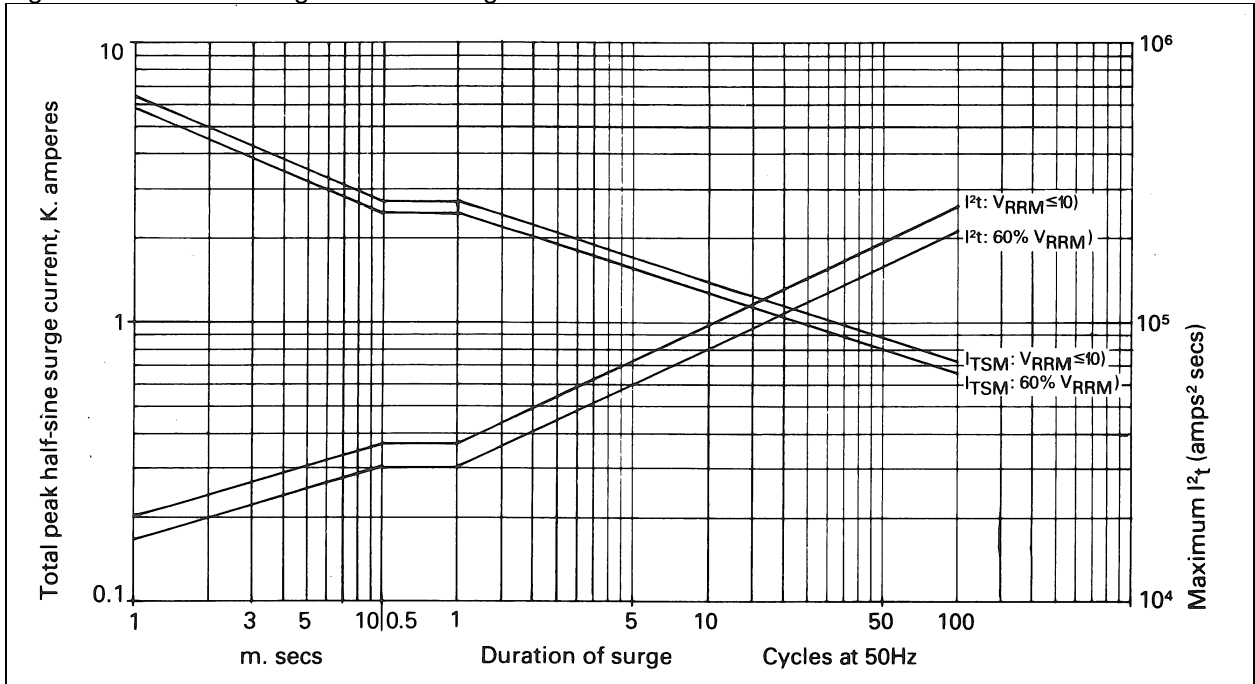
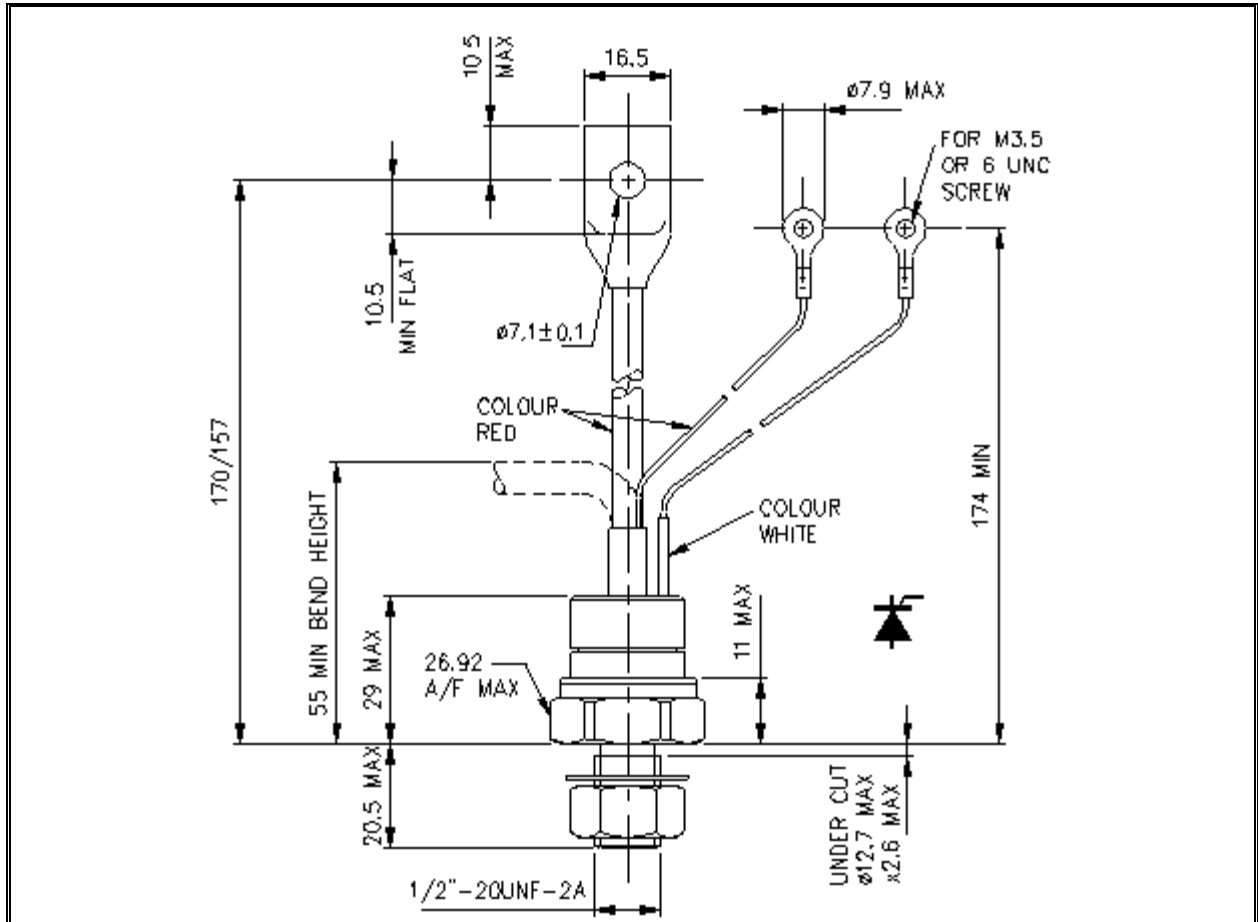


Figure 9 – Maximum surge and I2t Ratings



Outline Drawing & Ordering Information



101A231

ORDERING INFORMATION

(Please quote 10 digit code as below)

| | | | |
|------------------------------------|------------------------------------|---|------------------------|
| N0180 Fixed Type Code | SH Fixed Outline Code | ◆ ◆ Off-state Voltage Code $V_{DRM}/100$ 12-16 | 0 Fixed Code |
|------------------------------------|------------------------------------|---|------------------------|

Typical order code: N0180SH140 – 1400V V_{RRM}/V_{DRM}

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