

# 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)	$30\times 10^3$	$A^2s$
$I^2t$	$I^2t$ capacity for fusing $t_p=10ms$ , $V_{RM}\leq 10V$ , (note 5)	$36.3\times 10^3$	$A^2s$
$(di/dt)_{cr}$	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 $\mu s$ 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,  $180^{\circ}$  half-sinewave.
- 3) Single side cooled, single phase; 50Hz,  $180^{\circ}$  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

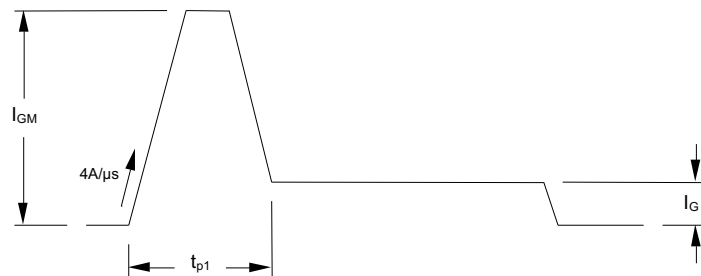
When selecting snubber components, care must be taken not to use excessively large values of snubber capacitor or excessively small values of snubber resistor. Such excessive component values may lead to device damage due to the large resultant values of snubber discharge current. If required, please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

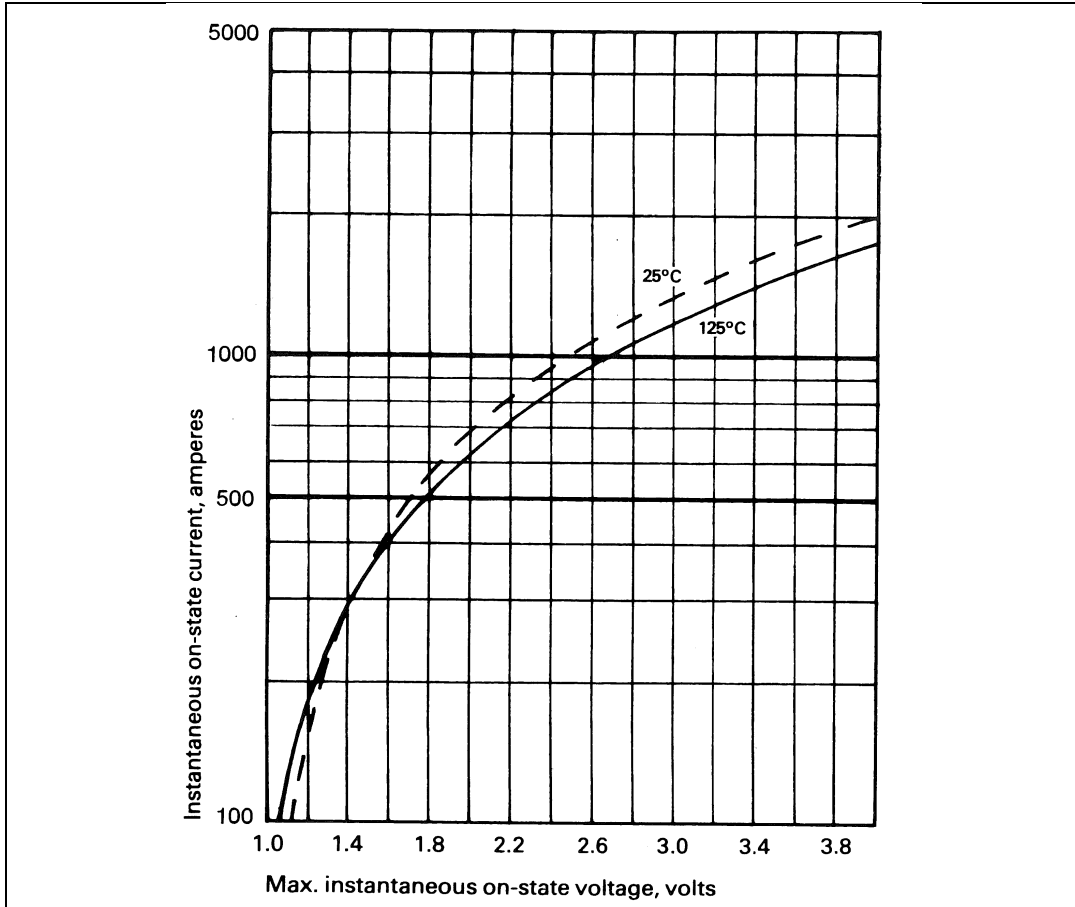


Figure 2 - Transient thermal impedance

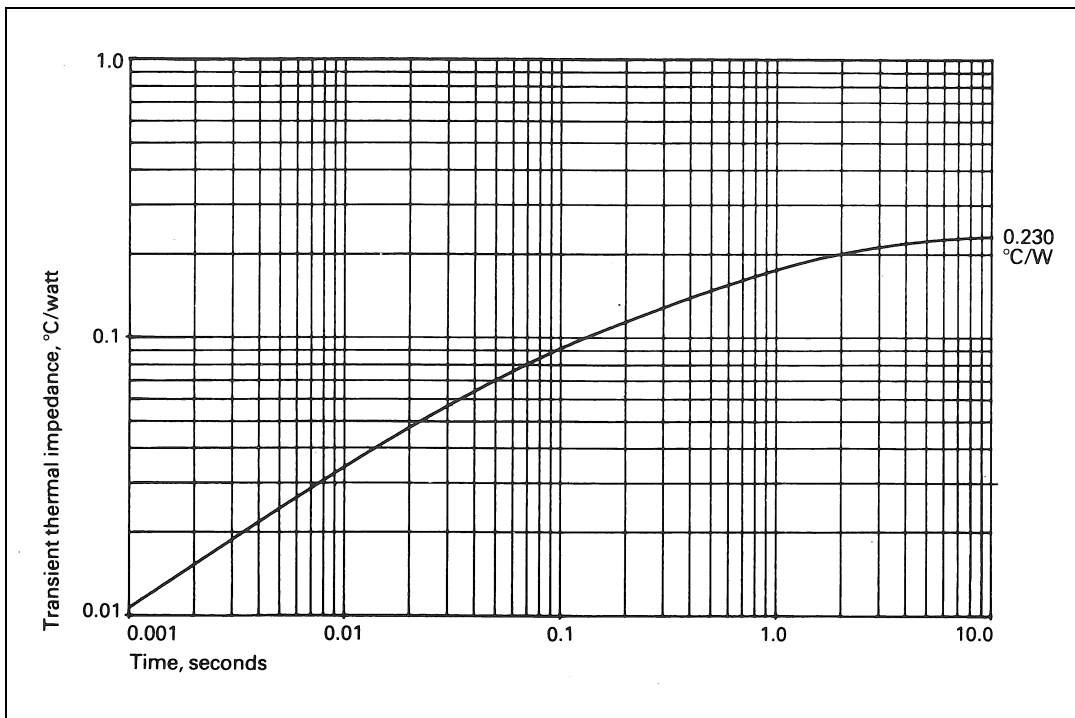


Figure 3 - Gate characteristics at 25°C junction temperature

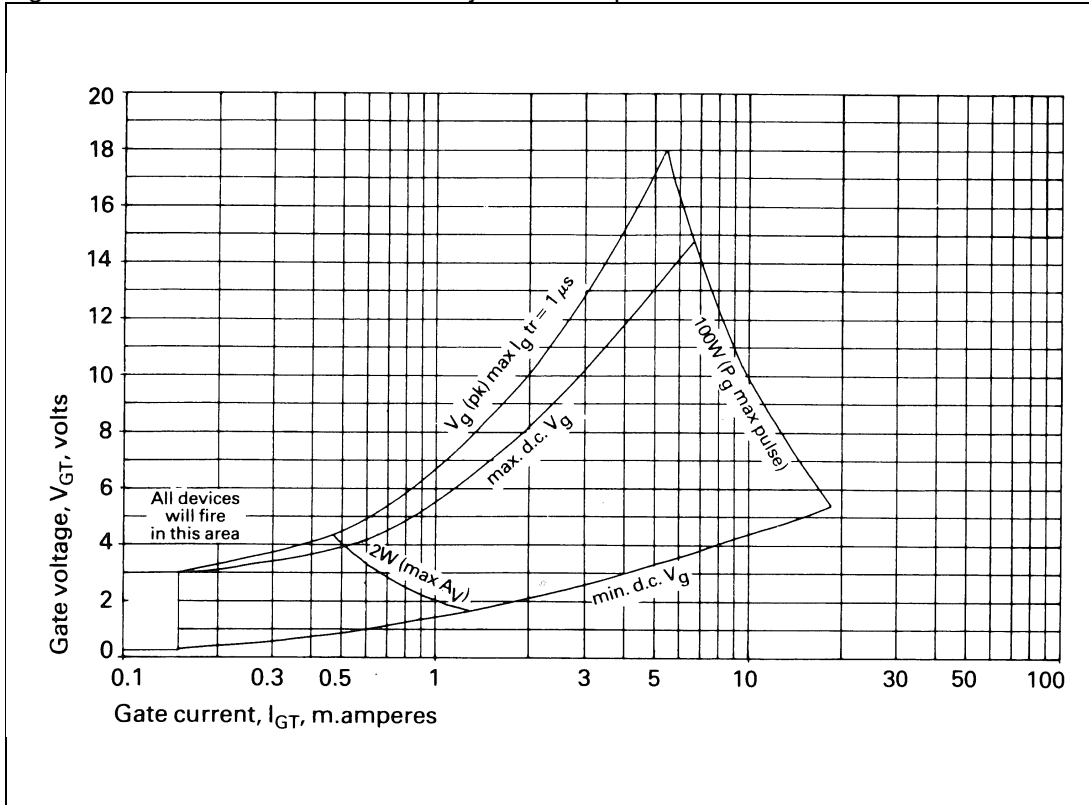


Figure 4 - Gate trigger characteristic

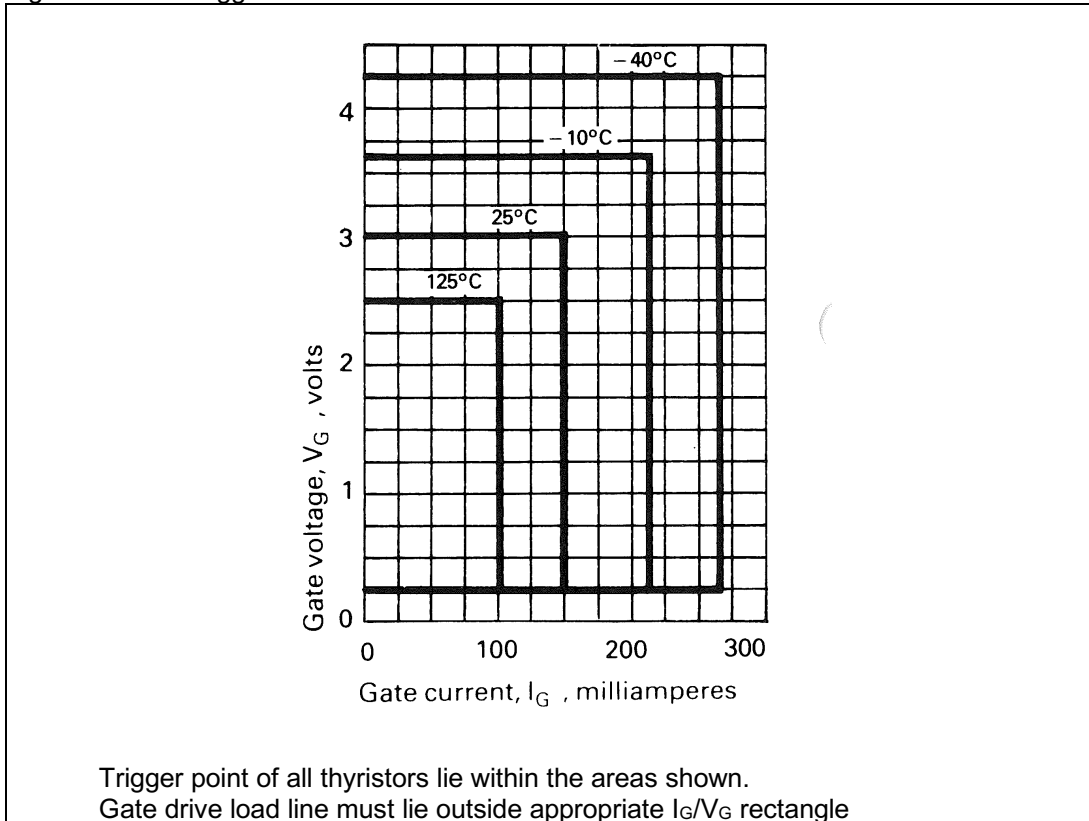


Figure 5 – On-state current vs. case temperature - (Sine wave)

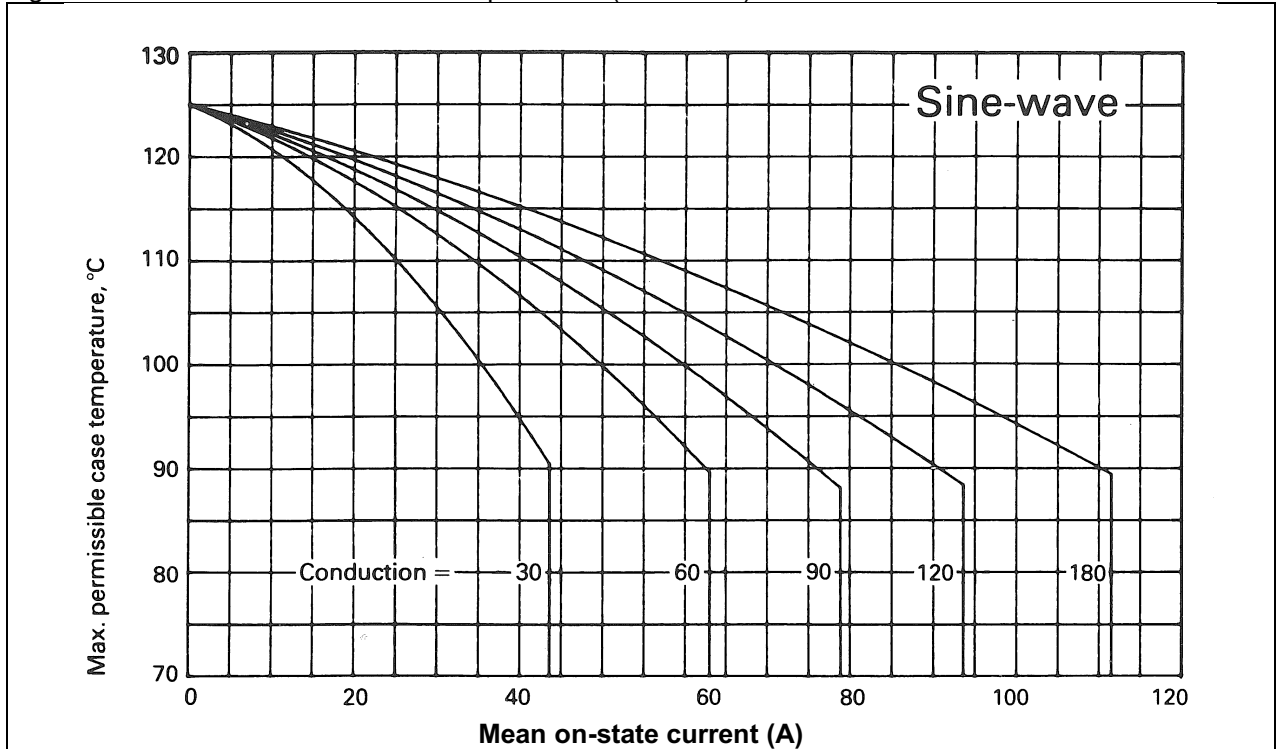


Figure 6 - On-state current vs. Power dissipation - (Sine wave)

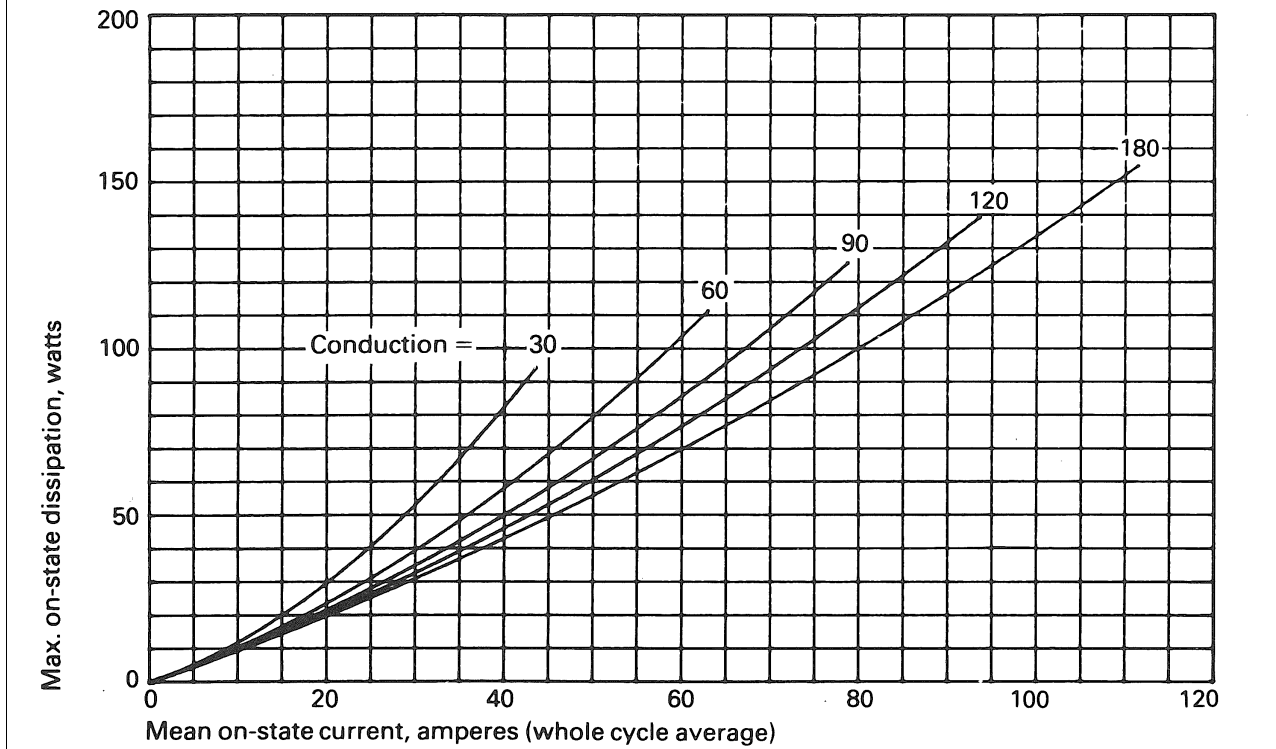


Figure 7 – On-state current vs. case temperature - (Square wave)

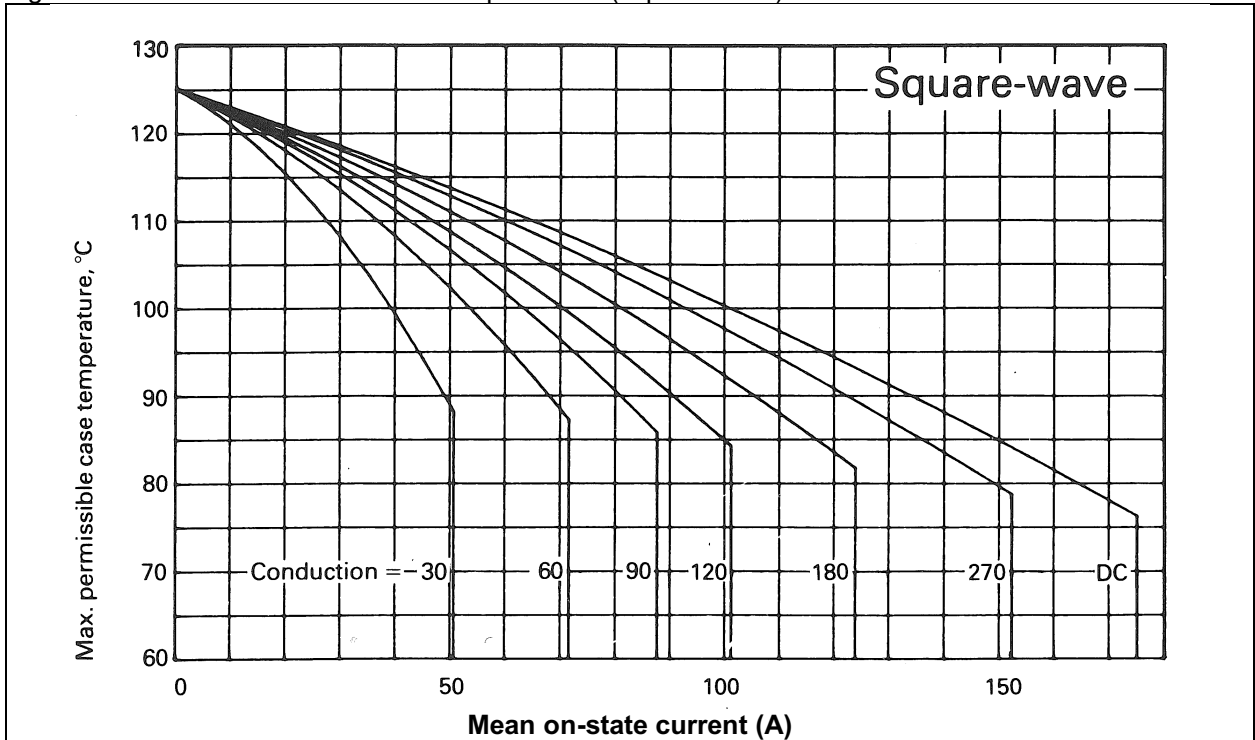


Figure 8 – On-state current vs. Power dissipation - (Square wave)

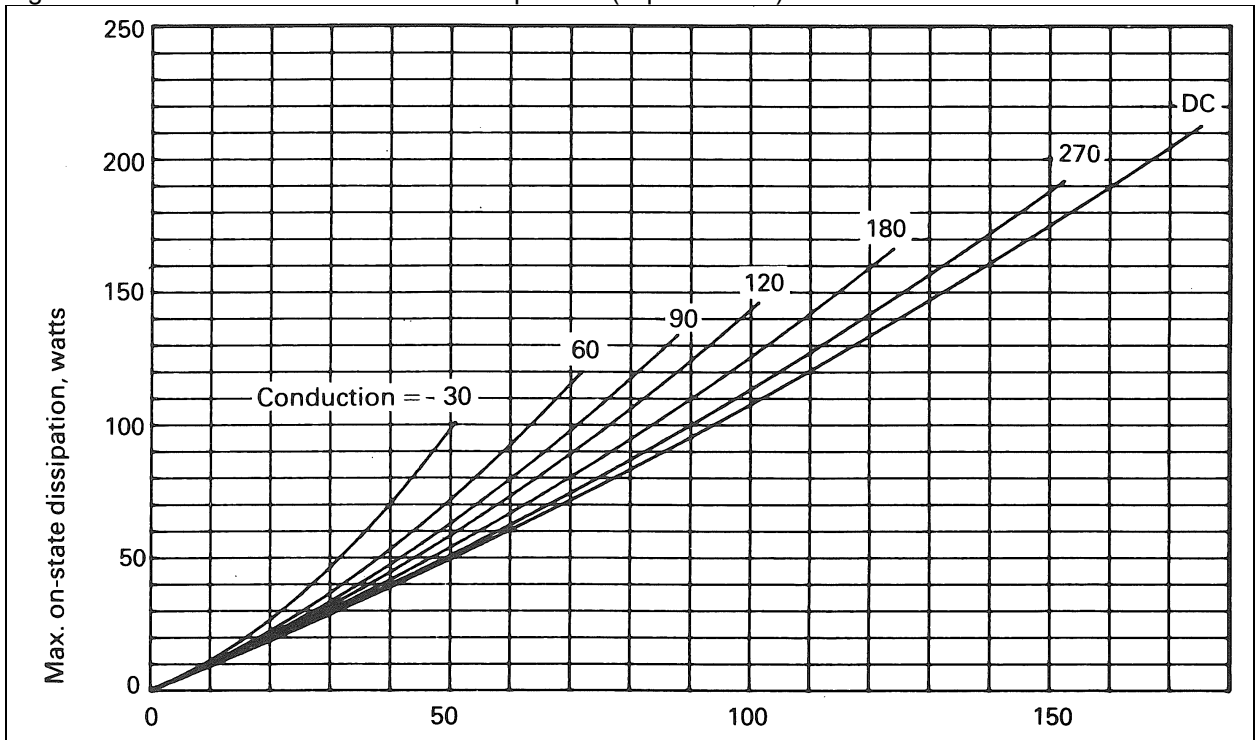
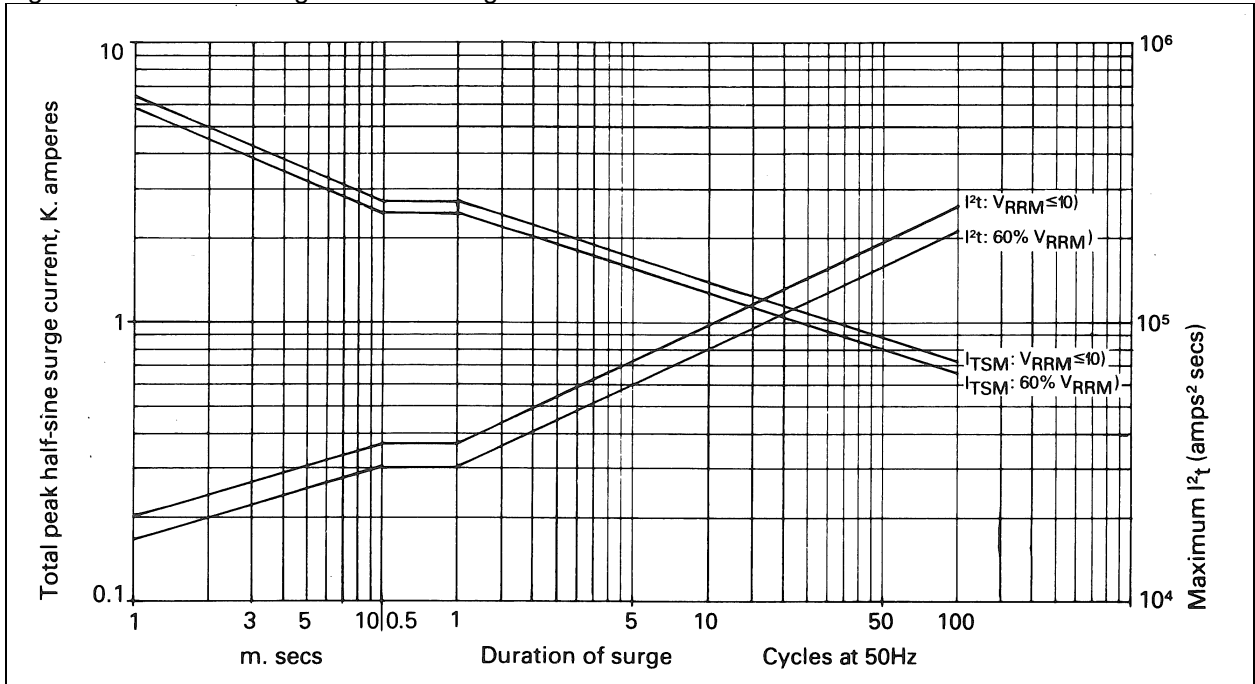
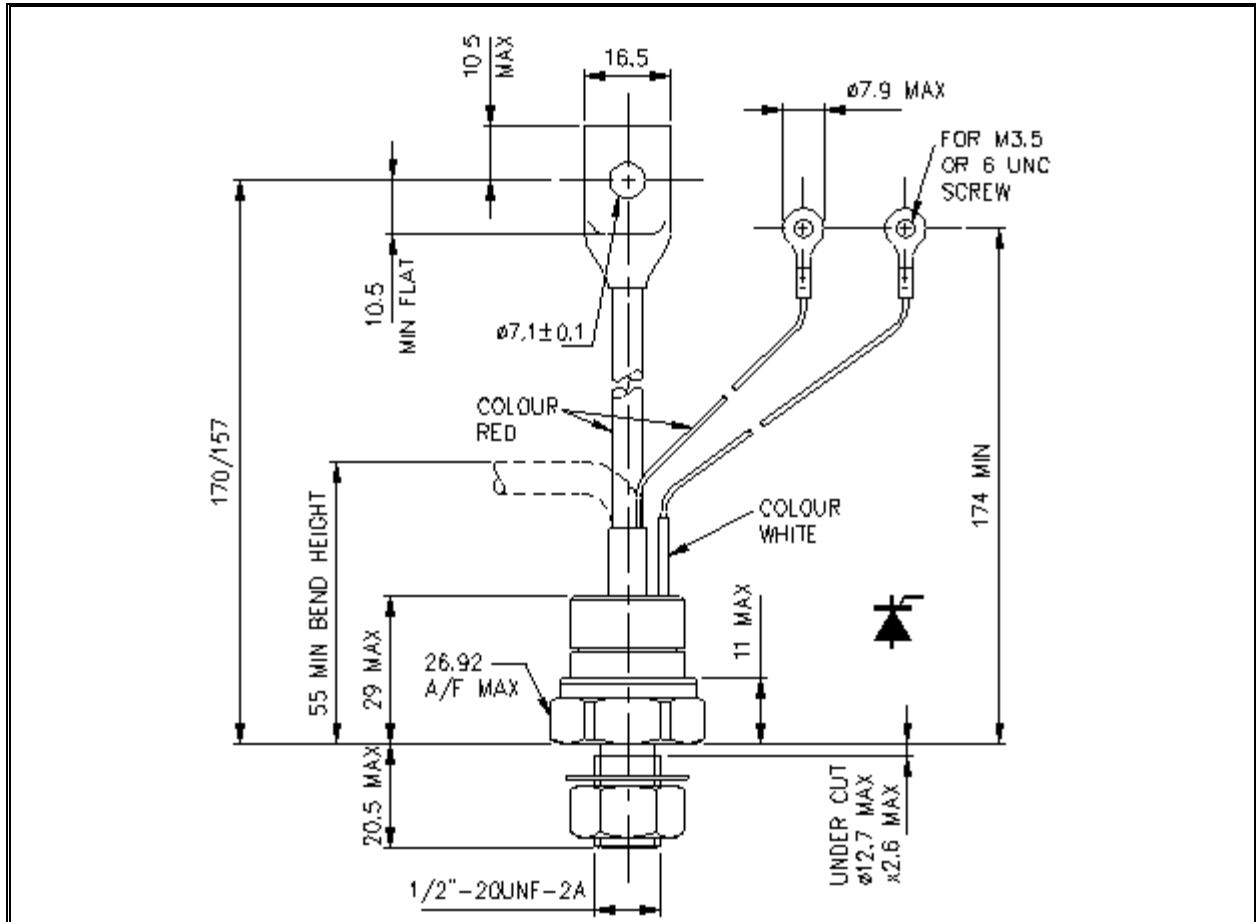


Figure 9 – Maximum surge and I2t Ratings





**Outline Drawing & Ordering Information**



101A231

**ORDERING INFORMATION**

(Please quote 10 digit code as below)

<b>N0180</b> Fixed Type Code	<b>SH</b> Fixed Outline Code	◆ ◆ Off-state Voltage Code $V_{DRM}/100$ 12-16	<b>0</b> Fixed Code
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Typical order code: N0180SH140 – 1400V  $V_{RRM}/V_{DRM}$

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