

# Wespack Phase Control Thyristor

## Types N3597ML020 to N3597ML060

Development Type No.: NX313ML020-060

### Absolute Maximum Ratings

|           | VOLTAGE RATINGS                                 | MAXIMUM LIMITS | UNITS |
|-----------|-------------------------------------------------|----------------|-------|
| $V_{DRM}$ | Repetitive peak off-state voltage, (note 1)     | 200-600        | V     |
| $V_{DSM}$ | Non-repetitive peak off-state voltage, (note 1) | 300-700        | V     |
| $V_{RRM}$ | Repetitive peak reverse voltage, (note 1)       | 200-600        | V     |
| $V_{RSM}$ | Non-repetitive peak reverse voltage, (note 1)   | 300-700        | V     |

|                | OTHER RATINGS                                                           | MAXIMUM LIMITS                                                    | UNITS             |
|----------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------|
| $I_{T(AV)M}$   | Maximum average on-state current, $T_{sink}=55^{\circ}C$ , (note 2)     | 3597                                                              | A                 |
| $I_{T(AV)M}$   | Maximum average on-state current, $T_{sink}=85^{\circ}C$ , (note 2)     | 2588                                                              | A                 |
| $I_{T(AV)M}$   | Maximum average on-state current, $T_{sink}=85^{\circ}C$ , (note 3)     | 1244                                                              | A                 |
| $I_{T(RMS)M}$  | Nominal RMS on-state current, $T_{sink}=25^{\circ}C$ , (note 2)         | 7030                                                              | A                 |
| $I_{T(d.c.)}$  | D.C. on-state current, $T_{sink}=25^{\circ}C$ , (note 4)                | 5616                                                              | A                 |
| $I_{TSM}$      | Peak non-repetitive surge $t_p=10ms$ , $V_{rm}=60\%V_{RRM}$ , (note 5)  | 45.4                                                              | kA                |
| $I_{TSM2}$     | Peak non-repetitive surge $t_p=10ms$ , $V_{rm}\leq 10V$ , (note 5)      | 50.0                                                              | kA                |
| $I^2t$         | $I^2t$ capacity for fusing $t_p=10ms$ , $V_{rm}=60\%V_{RRM}$ , (note 5) | $10.3\times 10^6$                                                 | $A^2s$            |
| $I^2t$         | $I^2t$ capacity for fusing $t_p=10ms$ , $V_{rm}\leq 10V$ , (note 5)     | $12.5\times 10^6$                                                 | $A^2s$            |
| $(di/dt)_{cr}$ | Critical rate of rise of on-state current (note 6)                      | (continuous, 50Hz)<br>(repetitive, 50Hz, 60s)<br>(non-repetitive) | 100<br>200<br>400 |
| $V_{RGM}$      | Peak reverse gate voltage                                               | 5                                                                 | V                 |
| $P_{G(AV)}$    | Mean forward gate power                                                 | 4                                                                 | W                 |
| $P_{GM}$       | Peak forward gate power                                                 | 30                                                                | W                 |
| $T_{j op}$     | Operating temperature range                                             | -40 to +140                                                       | $^{\circ}C$       |
| $T_{stg}$      | Storage temperature range                                               | -40 to +150                                                       | $^{\circ}C$       |

### Notes:-

- De-rating factor of 0.13% per  $^{\circ}C$  is applicable for  $T_j$  below  $25^{\circ}C$ .
- Double side cooled, single phase; 50Hz,  $180^{\circ}$  half-sinewave.
- Cathode side cooled, single phase; 50Hz,  $180^{\circ}$  half-sinewave.
- Double side cooled.
- Half-sinewave,  $140^{\circ}C$   $T_j$  initial.
- $V_D=67\% V_{DRM}$ ,  $I_{TM}=2000A$ ,  $I_{FG}=2A$ ,  $t_r\leq 0.5\mu s$ ,  $T_{case}=140^{\circ}C$ .

## Characteristics

|                       | PARAMETER                                  | MIN. | TYP. | MAX.  | TEST CONDITIONS (Note 1)                                                                                                                               | UNITS |
|-----------------------|--------------------------------------------|------|------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| V <sub>TM</sub>       | Maximum peak on-state voltage              | -    | -    | 1.05  | I <sub>TM</sub> =4000A                                                                                                                                 | V     |
| V <sub>TM</sub>       | Maximum peak on-state voltage              | -    | -    | 1.53  | I <sub>TM</sub> =13000A                                                                                                                                | V     |
| V <sub>T0</sub>       | Threshold voltage                          | -    | -    | 0.840 |                                                                                                                                                        | V     |
| r <sub>T</sub>        | Slope resistance                           | -    | -    | 0.053 |                                                                                                                                                        | mΩ    |
| (dv/dt) <sub>cr</sub> | Critical rate of rise of off-state voltage | 1000 | -    | -     | V <sub>D</sub> =80% V <sub>DRM</sub> , linear ramp, gate o/c                                                                                           | V/μs  |
| I <sub>DRM</sub>      | Peak off-state current                     | -    | -    | 100   | Rated V <sub>DRM</sub>                                                                                                                                 | mA    |
| I <sub>RRM</sub>      | Peak reverse current                       | -    | -    | 100   | Rated V <sub>RRM</sub>                                                                                                                                 | mA    |
| V <sub>GT</sub>       | Gate trigger voltage                       | -    | -    | 3.0   | T <sub>j</sub> =25°C V <sub>D</sub> =10V, I <sub>T</sub> =3A                                                                                           | V     |
| I <sub>GT</sub>       | Gate trigger current                       | -    | -    | 300   |                                                                                                                                                        | mA    |
| V <sub>GD</sub>       | Gate non-trigger voltage                   | -    | -    | 0.25  |                                                                                                                                                        | V     |
| I <sub>H</sub>        | Holding current                            | -    | -    | 1000  | T <sub>j</sub> =25°C                                                                                                                                   | mA    |
| t <sub>gd</sub>       | Gate-controlled turn-on delay time         | -    | 0.7  | 2.0   | V <sub>D</sub> =67% V <sub>DRM</sub> , I <sub>T</sub> =2000A, di/dt=10A/μs, I <sub>FG</sub> =2A, t <sub>r</sub> =0.5μs, T <sub>j</sub> =25°C           | μs    |
| t <sub>gt</sub>       | Turn-on time                               | -    | 1.3  | 3.0   |                                                                                                                                                        | μs    |
| Q <sub>rr</sub>       | Recovered charge                           | -    | 1300 | -     | I <sub>TM</sub> =1000A, t <sub>p</sub> =1000μs, di/dt=10A/μs, V <sub>r</sub> =50V                                                                      | μC    |
| Q <sub>ra</sub>       | Recovered charge, 50% Chord                | -    | 750  | 850   |                                                                                                                                                        | μC    |
| I <sub>rr</sub>       | Reverse recovery current                   | -    | 95   | -     |                                                                                                                                                        | A     |
| t <sub>rr</sub>       | Reverse recovery time                      | -    | 16   | -     |                                                                                                                                                        | μs    |
| t <sub>q</sub>        | Turn-off time                              | -    | 200  | -     | I <sub>TM</sub> =1000A, t <sub>p</sub> =1000μs, di/dt=10A/μs, V <sub>r</sub> =50V, V <sub>dr</sub> =80%V <sub>DRM</sub> , dV <sub>dr</sub> /dt=20V/μs  | μs    |
|                       |                                            | -    | 260  | -     | I <sub>TM</sub> =1000A, t <sub>p</sub> =1000μs, di/dt=10A/μs, V <sub>r</sub> =50V, V <sub>dr</sub> =80%V <sub>DRM</sub> , dV <sub>dr</sub> /dt=200V/μs |       |
| R <sub>thJK</sub>     | Thermal resistance, junction to heatsink   | -    | -    | 0.018 | Double side cooled                                                                                                                                     | K/W   |
|                       |                                            | -    | -    | 0.033 | Anode side cooled                                                                                                                                      | K/W   |
|                       |                                            | -    | -    | 0.044 | Cathode side cooled                                                                                                                                    | K/W   |
| F                     | Mounting force                             | 25   | -    | 31    | Note 2.                                                                                                                                                | kN    |
| W <sub>t</sub>        | Weight                                     | -    | 550  | -     |                                                                                                                                                        | g     |

Notes:-

- 1) Unless otherwise indicated T<sub>j</sub>=140°C.
- 2) For other clamp forces, please consult factory.

## Curves

Figure 1 – On-state characteristics of Limit device

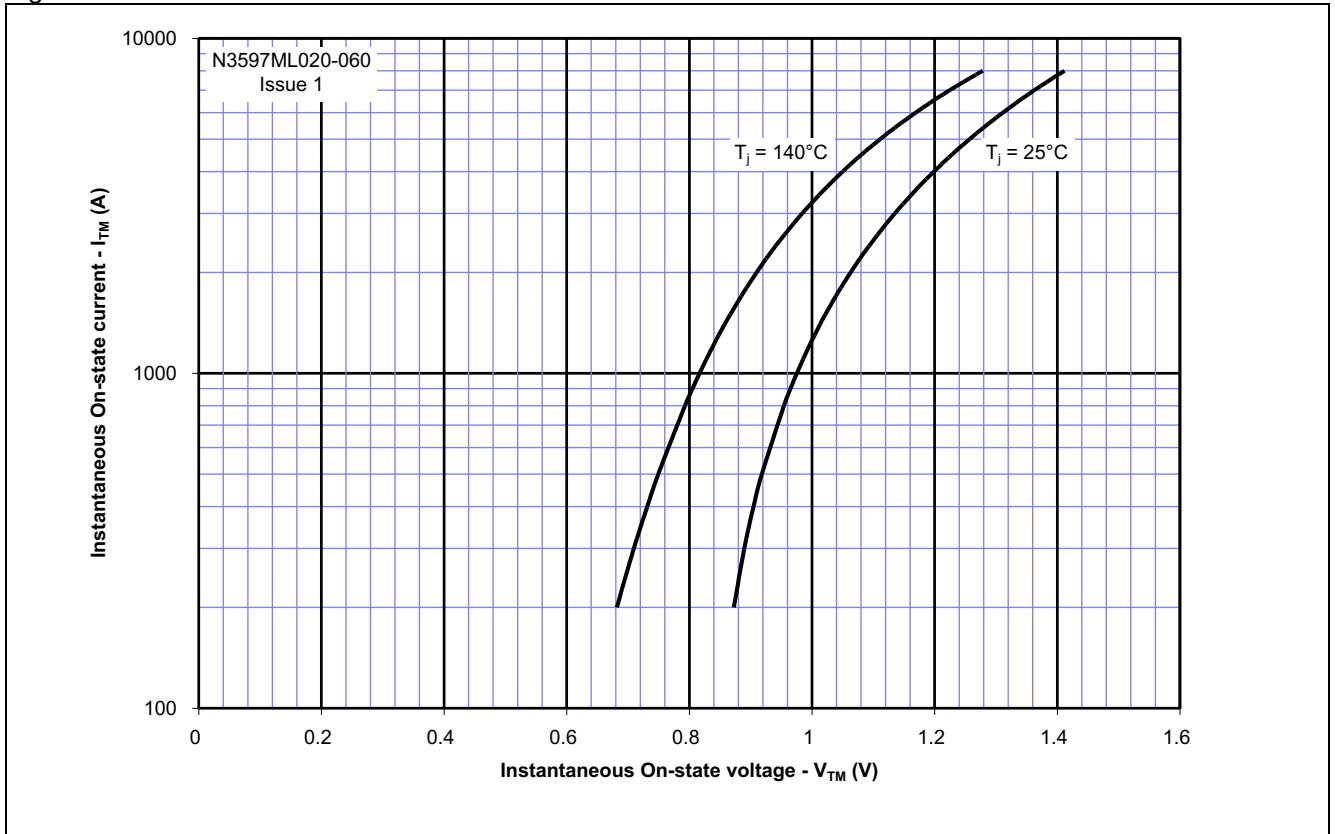


Figure 2 – Transient thermal impedance

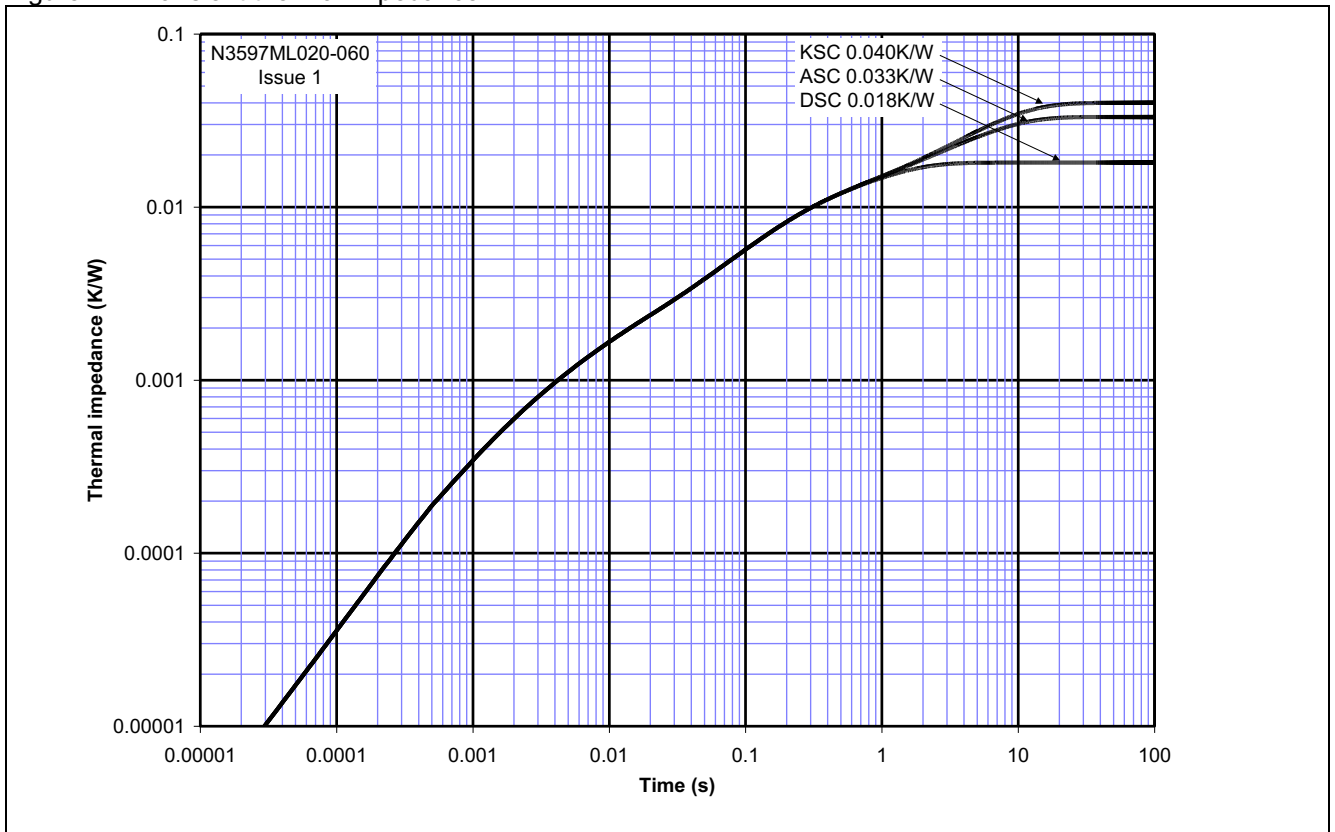
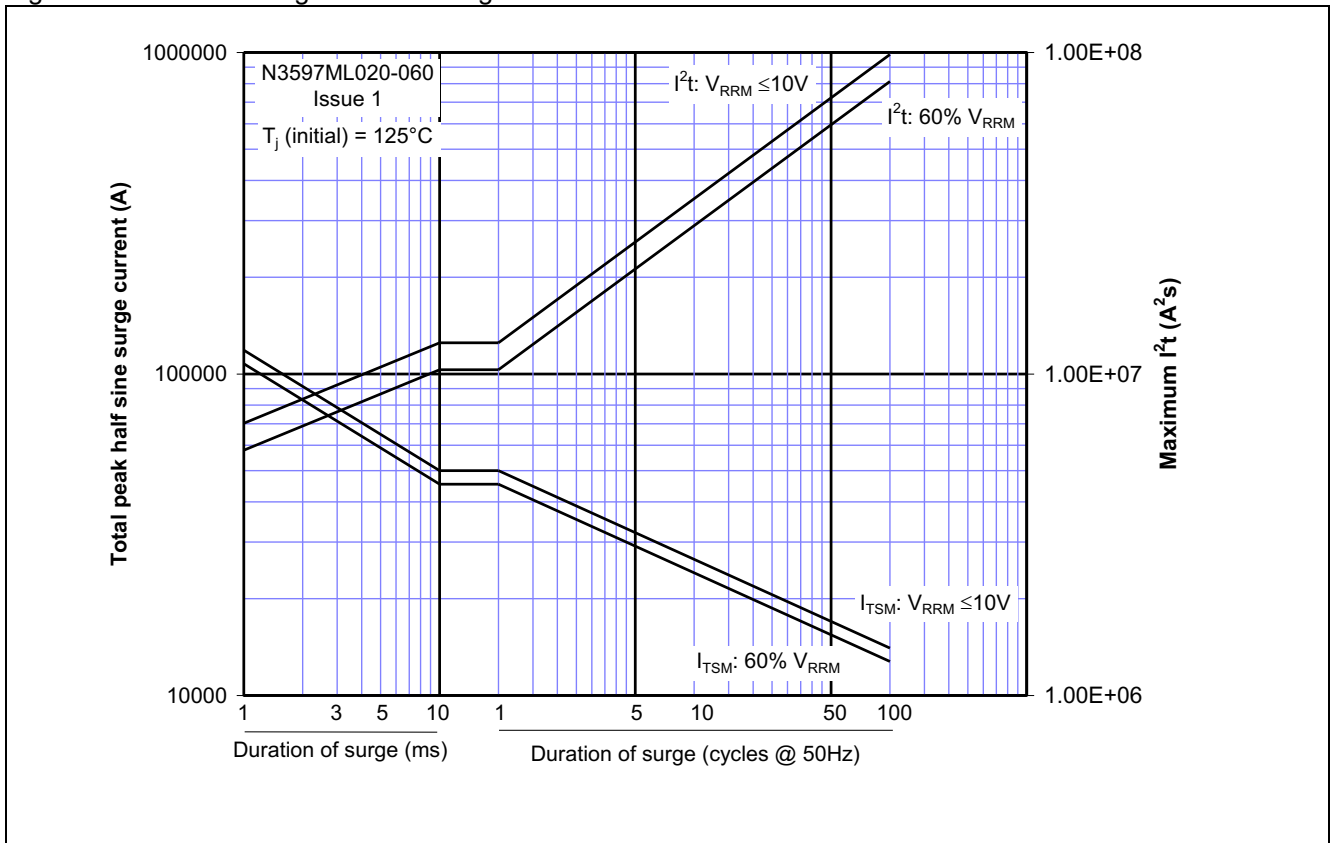
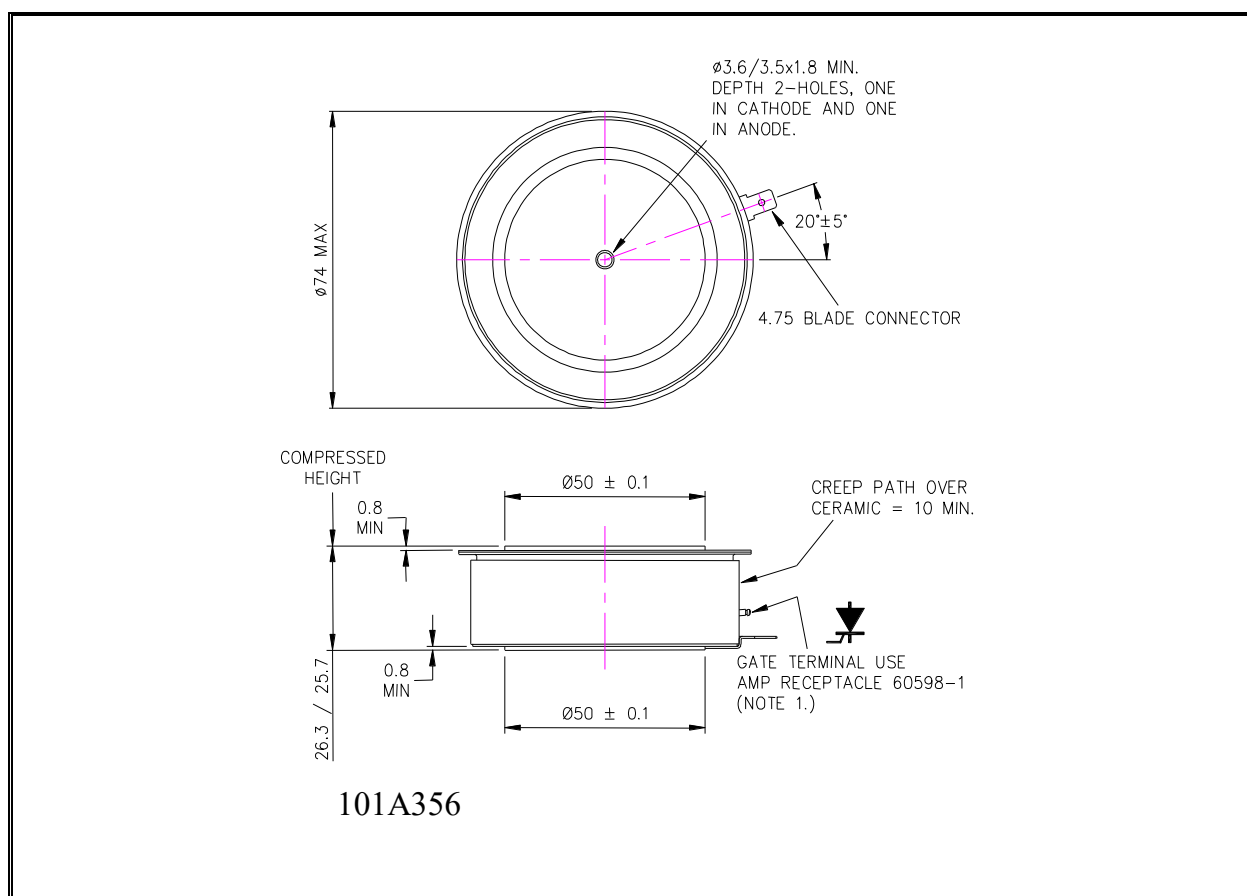


Figure 3 – Maximum surge and  $I^2t$  Ratings



## Outline Drawing & Ordering Information



### ORDERING INFORMATION

(Please quote 10 digit code as below)

| N3597           | ML                 | ◆◆                                     | 0                        |
|-----------------|--------------------|----------------------------------------|--------------------------|
| Fixed Type Code | Fixed outline code | Voltage code<br>$V_{DRM}/100$<br>16-18 | Fixed turn-off time code |

Order code: N3597ML060 – 600V  $V_{DRM}$ ,  $V_{RRM}$ , 26mm clamp height capsule.

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