

# ELECTRO POWER

## NEP1661VC42 - Power Thyristor

4200 V<sub>DRM</sub>; 1661 A avg



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### HIGH POWER THYRISTOR PHASE CONTROL APPLICATIONS

#### Features:

- . All Diffused Structure
- . Spoke Amplifying Gate Configuration
- . Guaranteed Maximum Turn-Off Time
- . High dV/dt Capability
- . Pressure Assembled Device

### ELECTRICAL CHARACTERISTICS AND RATINGS

#### Blocking - Off State

| Device Type  | V <sub>RRM</sub> (1) | V <sub>DRM</sub> (1) | V <sub>RSM</sub> (1) |
|--------------|----------------------|----------------------|----------------------|
| NEP1611VC420 | 4200                 | 4200                 | 4200                 |

V<sub>RRM</sub> = Repetitive peak reverse voltage

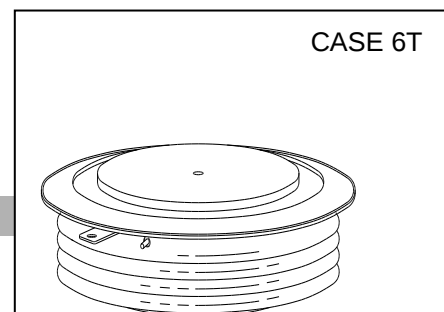
V<sub>DRM</sub> = Repetitive peak off state voltage

V<sub>RSM</sub> = Non repetitive peak reverse voltage (2)

|                                                       |                                     |                     |
|-------------------------------------------------------|-------------------------------------|---------------------|
| Repetitive peak reverse leakage and off state leakage | I <sub>RRM</sub> / I <sub>DRM</sub> | 10 Ma<br>150 mA (3) |
| Critical rate of voltage rise                         | dV/dt (4)                           | 500 V/μsec          |

#### Conducting - on state

| Parameter                                        | Symbol             | Min. | Max.                | Typ. | Units            | Conditions                                                                                                                                                            |
|--------------------------------------------------|--------------------|------|---------------------|------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Average value of on-state current                | I <sub>T(AV)</sub> |      | 1661                |      | A                | Sinewave, 180° conduction, T <sub>c</sub> =65°C                                                                                                                       |
| RMS value of on-state current                    | I <sub>TRMS</sub>  |      | 3259                |      | A                | Nominal value                                                                                                                                                         |
| Peak one cycle surge (non repetitive) current    | I <sub>TSM</sub>   |      | 25000<br>23000      |      | A<br>A           | 8.3 msec (60Hz), sinusoidal wave-shape, 180° conduction, T <sub>j</sub> = 125 °C<br>10.0 msec (50Hz), sinusoidal wave-shape, 180° conduction, T <sub>j</sub> = 125 °C |
| I square t                                       | I <sup>2</sup> t   |      | 2.6x10 <sup>6</sup> |      | A <sup>2</sup> s | 8.3 msec                                                                                                                                                              |
| Latching current                                 | I <sub>L</sub>     |      | 500                 |      | mA               | V <sub>D</sub> = 24 V; R <sub>L</sub> = 12 ohms                                                                                                                       |
| Holding current                                  | I <sub>H</sub>     |      | 500                 |      | mA               | V <sub>D</sub> = 24 V; I = 2.5 A                                                                                                                                      |
| Peak on-state voltage                            | V <sub>TM</sub>    |      | 2.17                |      | V                | I <sub>TM</sub> = 3220 A;                                                                                                                                             |
| Critical rate of rise of on-state current (5, 6) | di/dt              |      | 250                 |      | A/μs             | Switching from V <sub>DRM</sub> ≤ 1000 V, non-repetitive                                                                                                              |
| Critical rate of rise of on-state current (6)    | di/dt              |      | 150                 |      | A/μs             | Switching from V <sub>DRM</sub> ≤ 1000 V                                                                                                                              |



#### Notes:

All ratings are specified for T<sub>j</sub>=25 °C unless otherwise stated.

(1) All voltage ratings are specified for an applied 50Hz/60Hz sinusoidal waveform over the temperature range -40 to +125 °C.

(2) 10 msec. max. pulse width

(3) Maximum value for T<sub>j</sub> = 125 °C.

(4) Minimum value for linear and exponential waveshape to 80% rated V<sub>DRM</sub>. Gate open. T<sub>j</sub> = 125 °C.

(5) Non-repetitive value.

(6) The value of di/dt is established in accordance with EIA/NIMA Standard RS-397, Section 5-2-2-6. The value defined would be in addition to that obtained from a snubber circuit, comprising a 0.2 μF capacitor and 20 ohms resistance in parallel with the thristor under test.

## ELECTRICAL CHARACTERISTICS AND RATINGS (cont'd)

### Gating

| Parameter                                  | Symbol      | Min. | Max.              | Typ. | Units          | Conditions                                                                                                                                                                                   |
|--------------------------------------------|-------------|------|-------------------|------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peak gate power dissipation                | $P_{GM}$    |      | 200               |      | W              | $t_p = 40 \mu s$                                                                                                                                                                             |
| Average gate power dissipation             | $P_{G(AV)}$ |      | 5                 |      | W              |                                                                                                                                                                                              |
| Peak gate current                          | $I_{GM}$    |      | 20                |      | A              |                                                                                                                                                                                              |
| Gate current required to trigger all units | $I_{GT}$    |      | 300<br>200<br>125 |      | mA<br>mA<br>mA | $V_D = 6 V; R_L = 3 \text{ ohms}; T_j = -40^\circ C$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = +25^\circ C$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = +125^\circ C$                        |
| Gate voltage required to trigger all units | $V_{GT}$    | 0.30 | 5<br>4            |      | V<br>V<br>V    | $V_D = 6 V; R_L = 3 \text{ ohms}; T_j = -40^\circ C$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = 0-125^\circ C$<br>$V_D = \text{Rated } V_{DRM}; R_L = 1000 \text{ ohms}; T_j = +125^\circ C$ |
| Peak negative voltage                      | $V_{GRM}$   |      | 20                |      | V              |                                                                                                                                                                                              |

### Dynamic

| Parameter                           | Symbol   | Min. | Max. | Typ. | Units   | Conditions                                                                                                                                                                               |
|-------------------------------------|----------|------|------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delay time                          | $t_d$    |      | 2.0  |      | $\mu s$ | $I_{TM} = 50 A; V_D = 67\% V_{DRM}$<br>Gate pulse: $V_G = 30 V; R_G = 10 \text{ ohms}; t_r = 0.1 \mu s; t_p = 20 \mu s$                                                                  |
| Turn-off time (with $V_R = -50 V$ ) | $t_q$    |      | 550  |      | $\mu s$ | $I_{TM} > 2000 A; di/dt = 10 A/\mu s;$<br>$V_R \geq -50 V; \text{Re-applied } dV/dt = 20 V/\mu s \text{ linear to } 67\% V_{DRM};$<br>$T_j = 125^\circ C; \text{Duty cycle} \geq 0.01\%$ |
| Reverse recovery current            | $I_{rr}$ |      |      |      | A       | $I_{TM} > 2000 A; di/dt = 10 A/\mu s;$<br>$V_R \geq -50 V$                                                                                                                               |

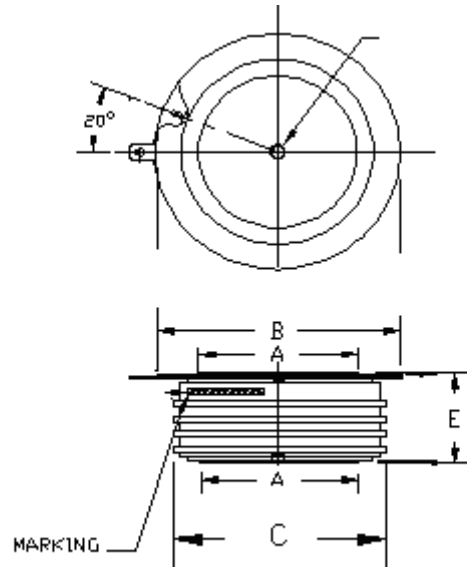
## THERMAL AND MECHANICAL CHARACTERISTICS AND RATINGS

| Parameter                             | Symbol            | Min.         | Max.          | Typ.       | Units        | Conditions            |
|---------------------------------------|-------------------|--------------|---------------|------------|--------------|-----------------------|
| Operating temperature                 | $T_j$             | -40          | +125          |            | $^\circ C$   |                       |
| Storage temperature                   | $T_{stg}$         | -40          | +150          |            | $^\circ C$   |                       |
| Thermal resistance - junction to case | $R_{\theta(j-c)}$ |              | 0.017         |            | $^\circ C/W$ | Double sided cooled   |
| Thermal resistance - case to sink     | $R_{\theta(c-s)}$ |              | 0.003         |            | $^\circ C/W$ | Double sided cooled * |
| Mounting force                        | P                 | 8000<br>35.5 | 10000<br>44.4 |            | lb.<br>kN    |                       |
| Weight                                | W                 |              |               | 2.1<br>953 | Lb.<br>g.    |                       |

\* Mounting surfaces smooth, flat and

greased

Note : for case outline and dimensions, see case outline drawing in page 3 of this Technical Data



A: 63 mm

B: 100 mm

C: 88 mm

E: 34 mm