



# R A E

Jiangsu Runau Electronics Manufacturing Co.,Ltd

# YC450-Power Thyristor

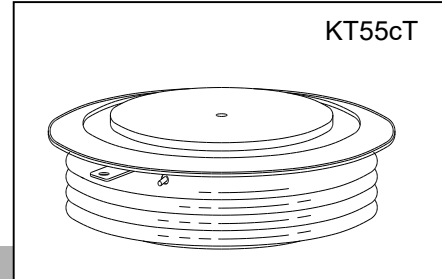
500-1600VDRM

\*\*\*\*\*

## HIGH POWER THYRISTOR FOR PHASE CONTROL APPLICATIONS

### Features:

- . All Diffused Structure
- . Interdigitated Amplifying Gate Configuration
- . Blocking capability up to 1600 volts
- . 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) |
|-------------|----------------------|----------------------|----------------------|
| YC450E      | 500                  | 500                  | 600                  |
| YC450M      | 600                  | 600                  | 720                  |
| YC450N      | 800                  | 800                  | 960                  |
| YC450P      | 1000                 | 1000                 | 1150                 |
| YC450PB     | 1200                 | 1200                 | 1300                 |
| YC450PD     | 1400                 | 1400                 | 1500                 |
| YC450PM     | 1600                 | 1600                 | 1700                 |

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)

### 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 thyristor under test.

|   |                                     |                    |
|---|-------------------------------------|--------------------|
| Repetitive peak reverse leakage and off state leakage | I <sub>RRM</sub> / I <sub>DRM</sub> | 15 mA<br>65 mA (3) |
| Critical rate of voltage rise                         | dV/dt (4)                           | 400 V/μsec         |

### Conducting - on state

| Parameter  | Symbol             | Min. | Max.                | Typ. | Units            | Conditions  |
|--|--------------------|------|---------------------|------|------------------|---|
| Average value of on-state current                | I <sub>T(AV)</sub> |      | 1640                |      | A                | Sinewave, 180° conduction, T <sub>c</sub> =65°C                                   |
| RMS value of on-state current                    | I <sub>TRMS</sub>  |      | 2575                |      | A                | Nominal value   |
| Peak one cycle surge (non repetitive) current    | I <sub>TSM</sub>   |      | 28500               |      | A                | 8.3 msec (60Hz), sinusoidal wave-shape, 180° conduction, T <sub>j</sub> = 125 °C  |
|  |                    |      | 26000               |      | A                | 10.0 msec (50Hz), sinusoidal wave-shape, 180° conduction, T <sub>j</sub> = 125 °C |
| I square t                                       | I <sup>2</sup> t   |      | 3.4x10 <sup>6</sup> |      | A <sup>2</sup> s | 8.3 msec  |
| Latching current                                 | I <sub>L</sub>     |      | 800                 |      | mA               | V <sub>D</sub> = 24 V; R <sub>L</sub> = 12 ohms                                   |
| Holding current                                  | I <sub>H</sub>     |      | 400                 |      | mA               | V <sub>D</sub> = 24 V; I = 2.5 A  |
| Peak on-state voltage                            | V <sub>TM</sub>    |      | 1.4                 |      | V                | I <sub>TM</sub> = 3000 A;   |
| Critical rate of rise of on-state current (5, 6) | di/dt              |      | 400                 |      | 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  |

**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                          | $I_{GM}$    |      | 10                |      | A              |   |
| Gate current required to trigger all units | $I_{GT}$    |      | 300<br>200<br>125 |      | mA<br>mA<br>mA | $V_D = 6 V; R_L = 3 \text{ ohms}; T_j = -40 \text{ }^\circ\text{C}$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = +25 \text{ }^\circ\text{C}$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = +125 \text{ }^\circ\text{C}$                        |
| Gate voltage required to trigger all units | $V_{GT}$    | 0.30 | 5<br>3            |      | V<br>V<br>V    | $V_D = 6 V; R_L = 3 \text{ ohms}; T_j = -40 \text{ }^\circ\text{C}$<br>$V_D = 6 V; R_L = 3 \text{ ohms}; T_j = 0-125 \text{ }^\circ\text{C}$<br>$V_D = \text{Rated } V_{DRM}; R_L = 1000 \text{ ohms}; T_j = +125 \text{ }^\circ\text{C}$ |
| Peak negative voltage                      | $V_{GRM}$   |      | 5                 |      | V              |   |

**Dynamic**

| Parameter                                  | Symbol   | Min. | Max. | Typ.       | Units   | Conditions   |
|--|----------|------|------|------------|---------|--|
| Delay time                                 | $t_d$    |      | 1.5  | 0.7        | $\mu s$ | $I_{TM} = 50 \text{ A}; V_D = 67\% V_{DRM}$<br>Gate pulse: $V_G = 30 \text{ V}; R_G = 10 \text{ ohms}; t_r = 0.1 \mu s; t_p = 20 \mu s$  |
| Turn-off time (with $V_R = -5 \text{ V}$ ) | $t_q$    |      | 250  | <b>150</b> | $\mu s$ | $I_{TM} > 1000 \text{ A}; di/dt = 25 \text{ A}/\mu s;$<br>$V_R \geq -5 \text{ V};$ Re-applied $dV/dt = 20 \text{ V}/\mu s$ linear to $67\% V_{DRM};$<br>$T_j = 125 \text{ }^\circ\text{C};$ Duty cycle $\geq 0.01\%$ |
| Reverse recovery charge                    | $I_{rr}$ |      |      |            | $\mu C$ | $I_{TM} > 1000 \text{ A}; di/dt = 25 \text{ A}/\mu s;$<br>$V_R \geq -50 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$   |

**THERMAL AND MECHANICAL CHARACTERISTICS AND RATINGS**

| Parameter                             | Symbol            | Min.         | Max.           | Typ.       | Units                     | Conditions                                   |
|---------------------------------------|-------------------|--------------|----------------|------------|---------------------------|--|
| Operating temperature                 | $T_j$             | -40          | +125           |            | $^\circ\text{C}$          |  |
| Storage temperature                   | $T_{stg}$         | -40          | +150           |            | $^\circ\text{C}$          |  |
| Thermal resistance - junction to case | $R_{\Theta(j-c)}$ |              | 0.025<br>0.050 |            | $^\circ\text{C}/\text{W}$ | Double sided cooled<br>Single sided cooled   |
| Thermal resistance - case to sink     | $R_{\Theta(c-s)}$ |              | 0.010<br>0.020 |            | $^\circ\text{C}/\text{W}$ | Double sided cooled *<br>Single sided cooled |
| Mounting force                        | P                 | 5000<br>24.5 | 6000<br>26.4   |            | lb.<br>kN                 |  |
| Weight                                | W                 |              |                | 16<br>0.46 | oz<br>Kg.                 |  |

\* Mounting surfaces smooth, flat and greased

