



High power cycling capability
Low on-state and switching losses
Designed for traction and industrial applications

Phase Control Thyristor Type T133-500-10

| | | | | | | | | |
|-----------------------------------|-----------|-----|-----|-----------|---|-----|------|--|
| Mean on-state current | | | | I_{TAV} | 500 A | | | |
| Repetitive peak off-state voltage | | | | V_{DRM} | 1000 V | | | |
| Repetitive peak reverse voltage | | | | V_{RRM} | | | | |
| Turn-off time | | | | t_q | 125, 160, 200, 250, 320, 400, 500 μ s | | | |
| V_{DRM}, V_{RRM}, V | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | |
| Voltage code | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| $T_j, ^\circ C$ | -60 ÷ 150 | | | | | | | |

MAXIMUM ALLOWABLE RATINGS

| Symbols and parameters | | Units | Values | Test conditions | |
|------------------------|--|-------------------|------------------------------------|---|--|
| ON-STATE | | | | | |
| I_{TAV} | Mean on-state current | A | 500 875 | $T_c=120^\circ C$, Double side cooled $T_c=85^\circ C$, Double side cooled 180° half-sine wave; 50 Hz | |
| I_{TRMS} | RMS on-state current | A | 785 | $T_c=120^\circ C$, Double side cooled 180° half-sine wave; 50 Hz | |
| I_{TSM} | Surge on-state current | kA | 10.0 12.0 | $T_j=T_{j\ max}$ $T_j=25^\circ C$ | 180° half-sine wave; 50 Hz ($t_p=10$ ms); single pulse; $V_D=V_R=0$ V; Gate pulse: $I_G=2$ A; $t_{GP}=50$ μ s; $di_G/dt \geq 1$ A/ μ s |
| | | | 11.0 13.0 | $T_j=T_{j\ max}$ $T_j=25^\circ C$ | 180° half-sine wave; 60 Hz ($t_p=8.3$ ms); single pulse; $V_D=V_R=0$ V; Gate pulse: $I_G=2$ A; $t_{GP}=50$ μ s; $di_G/dt \geq 1$ A/ μ s |
| I^2t | Safety factor | $A^2s \cdot 10^3$ | 500 720 | $T_j=T_{j\ max}$ $T_j=25^\circ C$ | 180° half-sine wave; 50 Hz ($t_p=10$ ms); single pulse; $V_D=V_R=0$ V; Gate pulse: $I_G=2$ A; $t_{GP}=50$ μ s; $di_G/dt \geq 1$ A/ μ s |
| | | | 500 700 | $T_j=T_{j\ max}$ $T_j=25^\circ C$ | 180° half-sine wave; 60 Hz ($t_p=8.3$ ms); single pulse; $V_D=V_R=0$ V; Gate pulse: $I_G=2$ A; $t_{GP}=50$ μ s; $di_G/dt \geq 1$ A/ μ s |
| BLOCKING | | | | | |
| V_{DRM}, V_{RRM} | Repetitive peak off-state and Repetitive peak reverse voltages | V | 400 ÷ 1000 | $T_{j\ min} < T_j < T_{j\ max}$; 180° half-sine wave; 50 Hz; Gate open | |
| V_{DSM}, V_{RSM} | Non-repetitive peak off-state and Non-repetitive peak reverse voltages | V | 500 ÷ 1100 | $T_{j\ min} < T_j < T_{j\ max}$; 180° half-sine wave; 50 Hz; single pulse; Gate open | |
| V_D, V_R | Direct off-state and Direct reverse voltages | V | 0.75· V_{DRM} 0.75· V_{RRM} | $T_j=T_{j\ max}$; Gate open | |

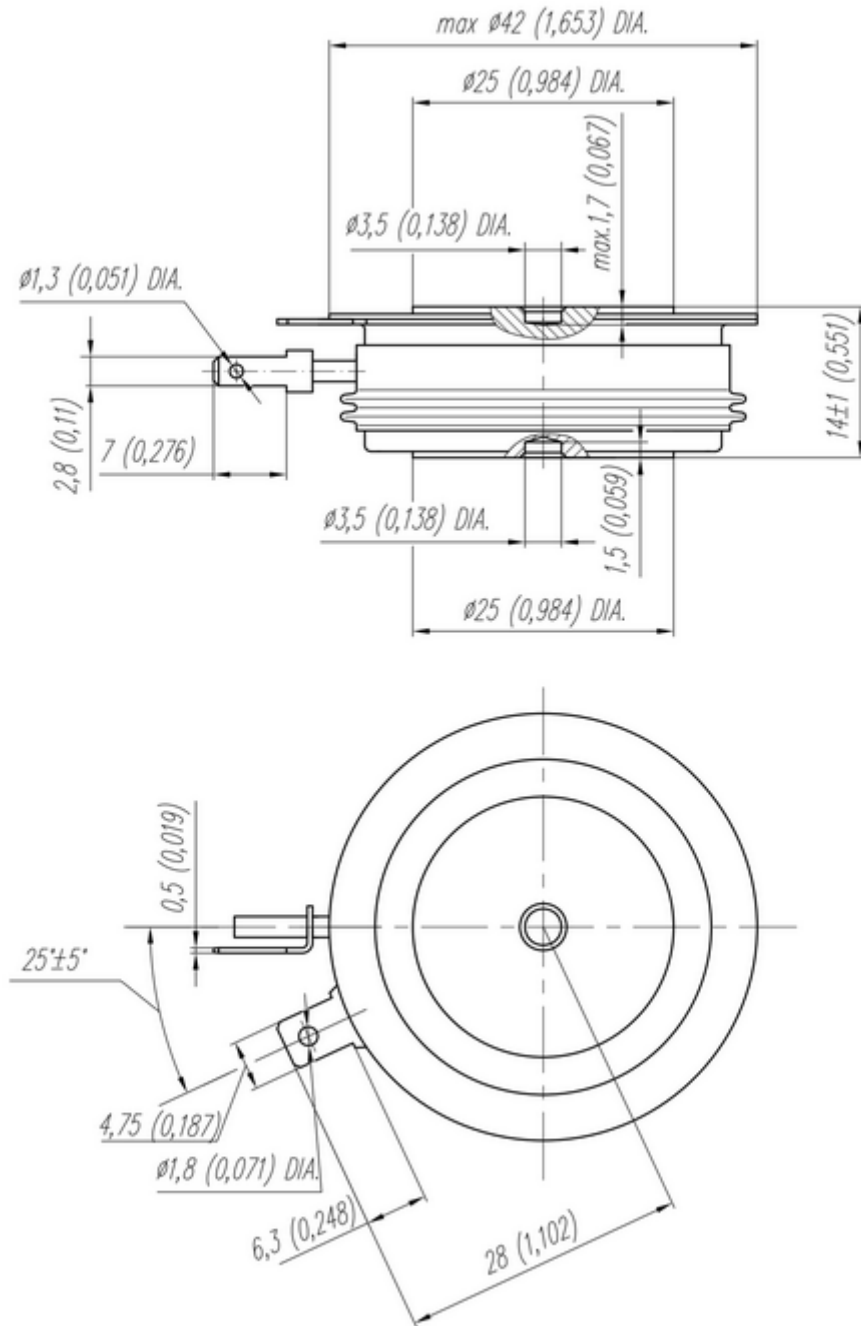
| TRIGGERING | | | | |
|--------------------|---|------------------|-----------|---|
| I_{FGM} | Peak forward gate current | A | 6 | $T_j = T_{j\ max}$ |
| V_{RGM} | Peak reverse gate voltage | V | 5 | |
| P_G | Gate power dissipation | W | 3 | $T_j = T_{j\ max}$ for DC gate current |
| SWITCHING | | | | |
| $(di_T/dt)_{crit}$ | Critical rate of rise of on-state current non-repetitive (f=1 Hz) | A/ μ s | 320 | $T_j = T_{j\ max}; V_D = 0.67 \cdot V_{DRM}; I_{TM} = 2 I_{TAV};$ Gate pulse: $I_G = 2$ A; $t_{GP} = 50 \mu$ s; $di_G/dt \geq 1$ A/ μ s |
| THERMAL | | | | |
| T_{stg} | Storage temperature | $^{\circ}$ C | -60÷50 | |
| T_j | Operating junction temperature | $^{\circ}$ C | -60÷150 | |
| MECHANICAL | | | | |
| F | Mounting force | kN | 9.0÷11.0 | |
| a | Acceleration | m/s ² | 50 100 | Device unclamped Device clamped |

CHARACTERISTICS

| Symbols and parameters | | Units | Values | Conditions | |
|------------------------|---|------------|--|---|---------------------|
| ON-STATE | | | | | |
| V_{TM} | Peak on-state voltage, max | V | 1.50 | $T_j = 25 \text{ }^{\circ}\text{C}; I_{TM} = 1570$ A | |
| $V_{T(TO)}$ | On-state threshold voltage, max | V | 0.95 | $T_j = T_{j\ max};$ | |
| r_T | On-state slope resistance, max | m Ω | 0.420 | $0.5 \pi I_{TAV} < I_T < 1.5 \pi I_{TAV}$ | |
| I_L | Latching current, max | mA | 700 | $T_j = 25 \text{ }^{\circ}\text{C}; V_D = 12$ V; Gate pulse: $I_G = 2$ A; $t_{GP} = 50 \mu$ s; $di_G/dt \geq 1$ A/ μ s | |
| I_H | Holding current, max | mA | 300 | $T_j = 25 \text{ }^{\circ}\text{C};$ $V_D = 12$ V; Gate open | |
| BLOCKING | | | | | |
| I_{DRM}, I_{RRM} | Repetitive peak off-state and Repetitive peak reverse currents, max | mA | 70 | $T_j = T_{j\ max};$ $V_D = V_{DRM}; V_R = V_{RRM}$ | |
| $(dv_D/dt)_{crit}$ | Critical rate of rise of off-state voltage ¹⁾ , min | V/ μ s | 200, 320, 500, 1000 | $T_j = T_{j\ max};$ $V_D = 0.67 \cdot V_{DRM};$ Gate open | |
| TRIGGERING | | | | | |
| V_{GT} | Gate trigger direct voltage, max | V | 4.00 | $T_j = T_{j\ min}$ $T_j = 25 \text{ }^{\circ}\text{C}$ $T_j = T_{j\ max}$ | Direct gate current |
| | | | 2.50 | | |
| | | | 2.00 | | |
| I_{GT} | Gate trigger direct current, max | mA | 400 | $T_j = T_{j\ min}$ $T_j = 25 \text{ }^{\circ}\text{C}$ $T_j = T_{j\ max}$ | |
| | | | 250 | | |
| | | | 200 | | |
| V_{GD} | Gate non-trigger direct voltage, min | V | 0.25 | $T_j = T_{j\ max};$ $V_D = 0.67 \cdot V_{DRM};$ | |
| I_{GD} | Gate non-trigger direct current, min | mA | 10.00 | Direct gate current | |
| SWITCHING | | | | | |
| t_{gd} | Delay time | μ s | 2.00 | $T_j = 25 \text{ }^{\circ}\text{C}; V_D = 0.4 \cdot V_{DRM}; I_{TM} = I_{TAV};$ Gate pulse: $I_G = 2$ A; $t_{GP} = 50 \mu$ s; $di_G/dt \geq 1$ A/ μ s | |
| t_q | Turn-off time ²⁾ , max | μ s | 125, 160, 200, 250, 320, 400, 500 | $dv_D/dt = 50$ V/ μ s; $T_j = T_{j\ max}; I_{TM} = I_{TAV};$ $di_R/dt = -10$ A/ μ s; $V_R = 100$ V; $V_D = 0.67 \cdot V_{DRM}$ | |

| THERMAL | | | | | |
|--------------|---|--------------|------------------|----------------|---------------------|
| R_{thjc} | Thermal resistance, junction to case, max | °C/W | 0.040 | Direct current | Double side cooled |
| R_{thjc-A} | | | 0.088 | | Anode side cooled |
| R_{thjc-K} | | | 0.072 | | Cathode side cooled |
| R_{thck} | Thermal resistance, case to heatsink, max | °C/W | 0.008 | Direct current | |
| MECHANICAL | | | | | |
| w | Weight, typ | g | 110 | | |
| D_s | Surface creepage distance | mm (inch) | 10.30 (0.405) | | |
| D_a | Air strike distance | mm (inch) | 6.30 (0.248) | | |

| PART NUMBERING GUIDE | | | | | | | NOTES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-----|-----|-----|------|-----|-----|---|--|--|--|--|-----------------|----|----|----|----|-----------------------------|-----|-----|-----|------|-----------------|----|----|----|----|----|----|----|--------------|-----|-----|-----|-----|-----|-----|-----|
| T | 133 | 500 | 10 | A2 | X2 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Phase Control Thyristor 2. Design version 3. Mean on-state current, A 4. Voltage code 5. Critical rate of rise of on-state current non-repetitive, V/μs 6. Turn-off time ($dv_D/dt=50$ V/μs) 7. Ambient conditions: N – normal; T – tropical | | | | | | | 1) Critical rate of rise of on-state current non-repetitive <table border="1"> <thead> <tr> <th>Symbol of Group</th> <th>P2</th> <th>K2</th> <th>E2</th> <th>A2</th> </tr> </thead> <tbody> <tr> <td>$(dv_D/dt)_{crit}, V/\mu s$</td> <td>200</td> <td>320</td> <td>500</td> <td>1000</td> </tr> </tbody> </table> 2) Turn-off time ($dv_D/dt=50$ V/μs) <table border="1"> <thead> <tr> <th>Symbol of Group</th> <th>X2</th> <th>T2</th> <th>P2</th> <th>M2</th> <th>K2</th> <th>H2</th> <th>E2</th> </tr> </thead> <tbody> <tr> <td>$t_q, \mu s$</td> <td>125</td> <td>160</td> <td>200</td> <td>250</td> <td>320</td> <td>400</td> <td>500</td> </tr> </tbody> </table> | | | | | Symbol of Group | P2 | K2 | E2 | A2 | $(dv_D/dt)_{crit}, V/\mu s$ | 200 | 320 | 500 | 1000 | Symbol of Group | X2 | T2 | P2 | M2 | K2 | H2 | E2 | $t_q, \mu s$ | 125 | 160 | 200 | 250 | 320 | 400 | 500 |
| Symbol of Group | P2 | K2 | E2 | A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $(dv_D/dt)_{crit}, V/\mu s$ | 200 | 320 | 500 | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Symbol of Group | X2 | T2 | P2 | M2 | K2 | H2 | E2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $t_q, \mu s$ | 125 | 160 | 200 | 250 | 320 | 400 | 500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



All dimensions in millimeters (inches)