# EVLYS LTD. - POWER SEMICONDUCTORS DEVICES - Wholesale and Retail.

# Fast Thyristor Type FDT80-1600-28

Low switching losses / Low reverse recovery charge

Distributed amplified gate for high $di_T/dt$

| | | | | | |
|---|---|---|---|---|---|
| Mean on-state current | | | $I_{TAV}$ | 1600 A | |
| Repetitive peak off-state voltage | | | $V_{DRM}$ | 2000...2800 V | |
| Repetitive peak reverse voltage | | | $V_{RRM}$ | | |
| Turn-off time | | | $t_q$ | 50.0, 63.0 µs | |
| $V_{DRM}$, $V_{RRM}$, V | 2000 | 2200 | 2400 | 2600 | 2800 |
| Voltage code | 20 | 22 | 24 | 26 | 28 |
| $T_j$, °C | –60...+125 | | | | |

## MAXIMUM ALLOWABLE RATINGS

| Symbols and parameters | | Units | Values | Test conditions | |
|---|---|---|---|---|---|
| **ON-STATE** | | | | | |
| $I_{TAV}$ | Mean on-state current | A | 1600<br>1833<br>2715 | $T_c$=91 °C; Double side cooled;<br>$T_c$=85 °C; Double side cooled;<br>$T_c$=55 °C; Double side cooled;<br>180° half-sine wave; 50 Hz | |
| $I_{TRMS}$ | RMS on-state current | A | 2512 | $T_c$=91 °C; Double side cooled;<br>180° half-sine wave; 50 Hz | |
| $I_{TSM}$ | Surge on-state current | kA | 40.0<br>46.0 | $T_j$=$T_{j\,max}$<br>$T_j$=25 °C | 180° half-sine wave;<br>$t_p$=10 ms; single pulse;<br>$V_D$=$V_R$=0 V;<br>Gate pulse:$I_G$=$I_{FGM}$; $V_G$=20 V;<br>$t_{GP}$=50 µs; $di_G/dt$=2 A/µs |
| | | | 42.0<br>48.0 | $T_j$=$T_{j\,max}$<br>$T_j$=25 °C | 180° half-sine wave;<br>$t_p$=8.3 ms; single pulse;<br>$V_D$=$V_R$=0 V;<br>Gate pulse:$I_G$=$I_{FGM}$; $V_G$=20 V;<br>$t_{GP}$=50 µs; $di_G/dt$=2 A/µs |
| $I^2t$ | Safety factor | $A^2s\cdot10^3$ | 8000<br>10500 | $T_j$=$T_{j\,max}$<br>$T_j$=25 °C | 180° half-sine wave;<br>$t_p$=10 ms; single pulse;<br>$V_D$=$V_R$=0 V;<br>Gate pulse:$I_G$=$I_{FGM}$; $V_G$=20 V;<br>$t_{GP}$=50 µs; $di_G/dt$=2 A/µs |
| | | | 7300<br>9500 | $T_j$=$T_{j\,max}$<br>$T_j$=25 °C | 180° half-sine wave;<br>$t_p$=8.3 ms; single pulse;<br>$V_D$=$V_R$=0 V;<br>Gate pulse:$I_G$=$I_{FGM}$; $V_G$=20 V;<br>$t_{GP}$=50 µs; $di_G/dt$=2 A/µs |
| **BLOCKING** | | | | | |
| $V_{DRM}$, $V_{RRM}$ | Repetitive peak off-state and Repetitive peak reverse voltages | V | 2000...2800 | $T_{j\,min}$< $T_j$ <$T_{j\,max}$;<br>180° half-sine wave; 50 Hz;<br>Gate open | |
| $V_{DSM}$, $V_{RSM}$ | Non-repetitive peak off-state and Non-repetitive peak reverse voltages | V | 2100...2900 | $T_{j\,min}$< $T_j$ <$T_{j\,max}$;<br>180° half-sine wave; single pulse; Gate open | |
| $V_D$, $V_R$ | Direct off-state and Direct reverse voltages | V | 0.6·$V_{DRM}$<br>0.6·$V_{RRM}$ | $T_j$=$T_{j\,max}$;<br>Gate open | |

| | | | | |
|---|---|---|---|---|
| **TRIGGERING** | | | | |
| $I_{FGM}$ | Peak forward gate current | A | 10 | $T_j=T_{j\,max}$ |
| $V_{RGM}$ | Peak reverse gate voltage | V | 5 | |
| $P_G$ | Gate power dissipation | W | 8 | $T_j=T_{j\,max}$ for DC gate current |
| **SWITCHING** | | | | |
| $(di_T/dt)_{crit}$ | Critical rate of rise of on-state current non-repetitive (f=1 Hz) | A/µs | 2500 | $T_j=T_{j\,max}$; $V_D=0.67\cdot V_{DRM}$; $I_{TM}=5800$ A; Gate pulse: $I_G=2$ A; $V_G=20$ V; $t_{GP}=50$ µs; $di_G/dt=2$ A/µs |
| **THERMAL** | | | | |
| $T_{stg}$ | Storage temperature | °C | –60...+50 | |
| $T_j$ | Operating junction temperature | °C | –60...+125 | |
| **MECHANICAL** | | | | |
| F | Mounting force | kN | 40.0...50.0 | |
| a | Acceleration | m/s$^2$ | 50 | Device clamped |

## CHARACTERISTICS

| Symbols and parameters | | Units | Values | Conditions | |
|---|---|---|---|---|---|
| **ON-STATE** | | | | | |
| $V_{TM}$ | Peak on-state voltage, max | V | 2.26 | $T_j=25$ °C; $I_{TM}=5024$ A | |
| $V_{T(TO)}$ | On-state threshold voltage, max | V | 1.360 | $T_j=T_{j\,max}$; $0.5\,\pi\,I_{TAV} < I_T < 1.5\,\pi\,I_{TAV}$ | |
| $r_T$ | On-state slope resistance, max | mΩ | 0.183 | | |
| $I_H$ | Holding current, max | mA | 1000 | $T_j=25$ °C; $V_D=12$ V; Gate open | |
| **BLOCKING** | | | | | |
| $I_{DRM}$, $I_{RRM}$ | Repetitive peak off-state and Repetitive peak reverse currents, max | mA | 300 | $T_j=T_{j\,max}$; $V_D=V_{DRM}$; $V_R=V_{RRM}$ | |
| $(dv_D/dt)_{crit}$ | Critical rate of rise of off-state voltage[1], min | V/µs | 200, 320, 500, 1000, 1600, 2000, 2500 | $T_j=T_{j\,max}$; $V_D=0.67\cdot V_{DRM}$; Gate open | |
| **TRIGGERING** | | | | | |
| $V_{GT}$ | Gate trigger direct voltage, max | V | 3.00<br>3.00<br>1.50 | $T_j=T_{j\,min}$<br>$T_j=25$ °C<br>$T_j=T_{j\,max}$ | $V_D=12$ V; $I_D=3$ A; Direct gate current |
| $I_{GT}$ | Gate trigger direct current, max | mA | 500<br>300<br>150 | $T_j=T_{j\,min}$<br>$T_j=25$ °C<br>$T_j=T_{j\,max}$ | |
| $V_{GD}$ | Gate non-trigger direct voltage, min | V | 0.35 | $T_j=T_{j\,max}$; $V_D=0.67\cdot V_{DRM}$; Direct gate current | |
| $I_{GD}$ | Gate non-trigger direct current, min | mA | 70.00 | | |
| **SWITCHING** | | | | | |
| $t_{gd}$ | Delay time, max | µs | 1.05 | $T_j=25$ °C; $V_D=1500$ V; $I_{TM}=I_{TAV}$; $di/dt=200$ A/µs; Gate pulse: $I_G=2$ A; $V_G=20$ V; $t_{GP}=50$ µs; $di_G/dt=2$ A/µs | |
| $t_{gt}$ | Turn-on time[2], max | µs | 2.50, 3.20, 4.00, 6.30 | | |
| $t_q$ | Turn-off time[3], max | µs | 50.0, 63.0 | $dv_D/dt=50$ V/µs; | $T_j=T_{j\,max}$; $I_{TM}=I_{TAV}$; $di_R/dt=-10$ A/µs; $V_R=100$V; $V_D=0.67\,V_{DRM}$ |
| | | | 63.0, 80.0 | $dv_D/dt=200$ V/µs; | |
| $Q_{rr}$ | Total recovered charge(linear), max | µC | 1250 | $T_j=T_{j\,max}$; $I_{TM}=2000$ A; $di_R/dt=-50$ A/µs; $V_R=100$ V | |
| $t_{rr}$ | Reverse recovery time, max | µs | 9.0 | | |
| $I_{rrM}$ | Peak reverse recovery current, max | A | 280 | | |

| | | | | | |
|---|---|---|---|---|---|
| **THERMAL** | | | | | |
| $R_{thjc}$ | Thermal resistance, junction to case, max | °C/W | 0.0100 | Direct current | Double side cooled |
| $R_{thjc-A}$ | | | 0.0220 | | Anode side cooled |
| $R_{thjc-K}$ | | | 0.0180 | | Cathode side cooled |
| $R_{thck}$ | Thermal resistance, case to heatsink, max | °C/W | 0.0020 | Direct current | |
| **MECHANICAL** | | | | | |
| w | Weight, max | g | 1600 | | |
| $D_s$ | Surface creepage distance | mm (inch) | 55.13 (2.170) | | |
| $D_a$ | Air strike distance | mm (inch) | 25.10 (0.988) | | |

## PART NUMBERING GUIDE

| FDT | 80 | 1600 | 28 | 7 | 2 | 4 | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |

1. FDT — Fast Inverter Disc Thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code
5. Critical rate of rise of off-state voltage
6. Group of turn-off time ($dv_D/dt$=50 V/μs)
7. Group of turn-on time

## NOTES

[1] Critical rate of rise of off-state voltage

| Symbol of Group | 4 | 5 | 6 | 7 | 8 | 8,5 | 9 |
|---|---|---|---|---|---|---|---|
| $(dv_D/dt)_{crit}$, V/μs | 200 | 320 | 500 | 1000 | 1600 | 2000 | 2500 |

[2] Turn-on time

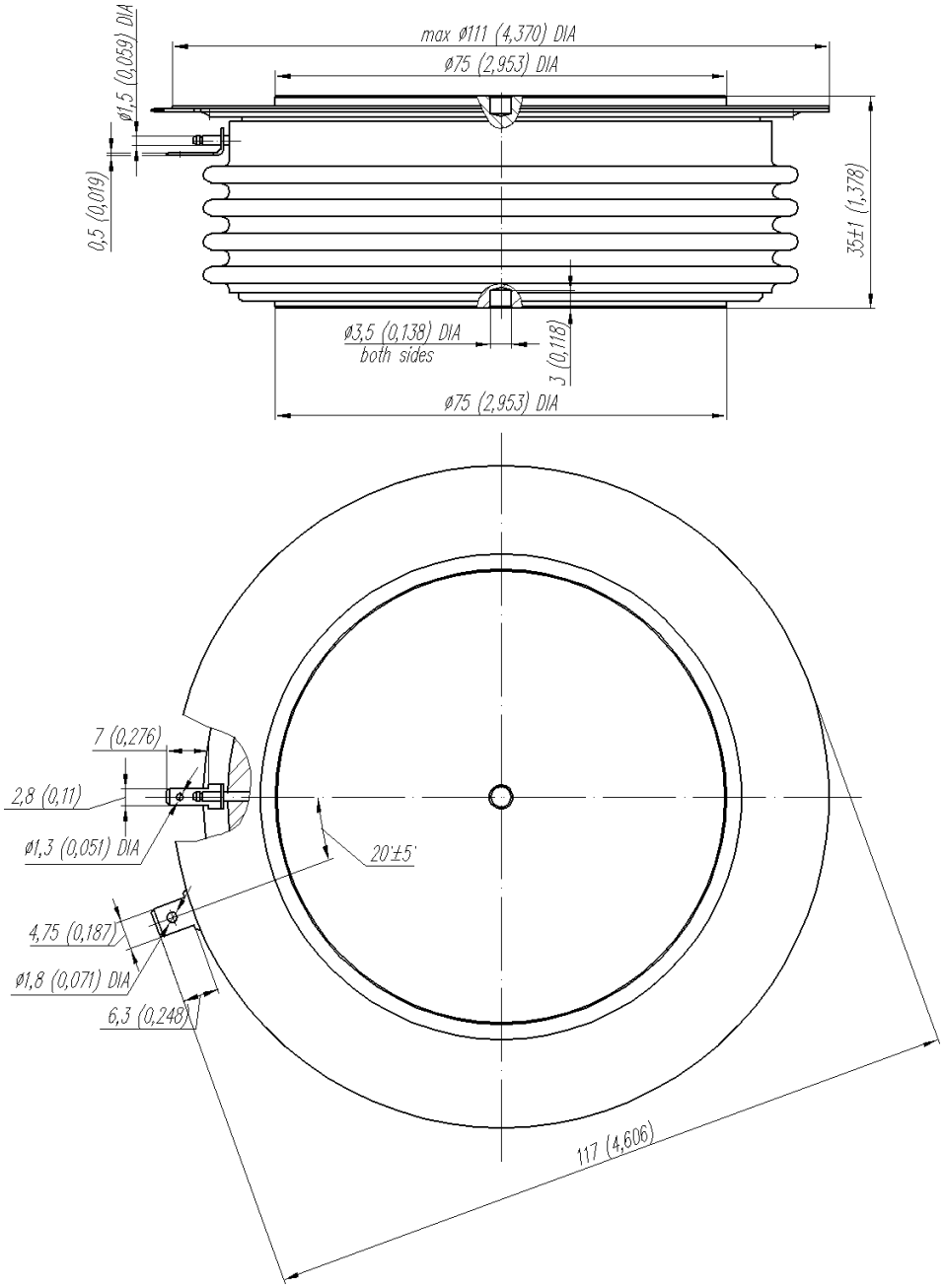
| Symbol of group | 4 | 3 | 2 | |
|---|---|---|---|---|
| $t_{gt}$, μs | 2.50 | 3.20 | 4.00 | 6.30 |

[3] Turn-off time ($dv_D/dt$=50 V/μs)

| Symbol of group | 2 | 1 |
|---|---|---|
| $t_q$, μs | 50.0 | 63.0 |

## OVERALL DIMENSIONS

**Package type: T.F5**




All dimensions in millimeters (inches)