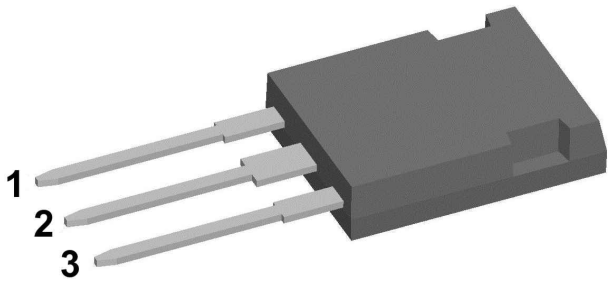
# High Efficiency Thyristor

| | | |
|---|---|---|
| $V_{RRM}$ | = | 1200 V |
| $I_{TAV}$ | = | 80 A |
| $V_T$ | = | 1,38 V |

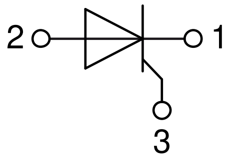
## Single Thyristor

**Part number**

**CLA80E1200HF**




Backside: anode




**Features / Advantages:**

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability

**Applications:**

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

**Package:** PLUS247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

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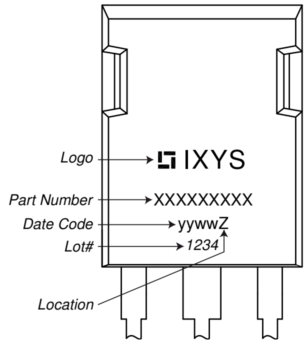
## Thyristor

| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Ratings | | | |
| $V_{RSM/DSM}$ | *max. non-repetitive reverse/forward blocking voltage* | | $T_{VJ}$ = 25°C | | | 1300 | V |
| $V_{RRM/DRM}$ | *max. repetitive reverse/forward blocking voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $I_{R/D}$ | *reverse current, drain current* | $V_{R/D}$ = 1200 V | $T_{VJ}$ = 25°C | | | 50 | µA |
| | | $V_{R/D}$ = 1200 V | $T_{VJ}$ = 125°C | | | 5 | mA |
| $V_T$ | *forward voltage drop* | $I_T$ = 80 A | $T_{VJ}$ = 25°C | | | 1,40 | V |
| | | $I_T$ = 160 A | | | | 1,77 | V |
| | | $I_T$ = 80 A | $T_{VJ}$ = 125°C | | | 1,38 | V |
| | | $I_T$ = 160 A | | | | 1,87 | V |
| $I_{TAV}$ | *average forward current* | $T_C$ = 115°C | $T_{VJ}$ = 150°C | | | 80 | A |
| $I_{T(RMS)}$ | *RMS forward current* | 180° sine | | | | 126 | A |
| $V_{T0}$ | *threshold voltage* | *for power loss calculation only* | $T_{VJ}$ = 150°C | | | 0,88 | V |
| $r_T$ | *slope resistance* | | | | | 6,3 | mΩ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0,2 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0,25 | | K/W |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 620 | W |
| $I_{TSM}$ | *max. forward surge current* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 900 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 970 | A |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 765 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 825 | A |
| $I^2t$ | *value for fusing* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 4,05 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 3,92 | kA²s |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 2,93 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 2,83 | kA²s |
| $C_J$ | *junction capacitance* | $V_R$ = 400V f = 1 MHz | $T_{VJ}$ = 25°C | | 36 | | pF |
| $P_{GM}$ | *max. gate power dissipation* | $t_P$ = 30 µs | $T_C$ = 150°C | | | 10 | W |
| | | $t_P$ = 300 µs | | | | 5 | W |
| $P_{GAV}$ | *average gate power dissipation* | | | | | 0,5 | W |
| $(di/dt)_{cr}$ | *critical rate of rise of current* | $T_{VJ}$ = 150°C; f = 50 Hz | repetitive, $I_T$ = 240 A | | | 150 | A/µs |
| | | $t_P$ = 200 µs; $di_G/dt$ = 0,3 A/µs; | | | | | |
| | | $I_G$ = 0,3A; $V_D$ = ⅔ $V_{DRM}$ | non-repet., $I_T$ = 80 A | | | 500 | A/µs |
| $(dv/dt)_{cr}$ | *critical rate of rise of voltage* | $V_D$ = ⅔ $V_{DRM}$ | $T_{VJ}$ = 150°C | | | 1000 | V/µs |
| | | $R_{GK}$ = ∞; method 1 (linear voltage rise) | | | | | |
| $V_{GT}$ | *gate trigger voltage* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 1,5 | V |
| | | | $T_{VJ}$ = -40°C | | | 1,6 | V |
| $I_{GT}$ | *gate trigger current* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 50 | mA |
| | | | $T_{VJ}$ = -40°C | | | 80 | mA |
| $V_{GD}$ | *gate non-trigger voltage* | $V_D$ = ⅔ $V_{DRM}$ | $T_{VJ}$ = 150°C | | | 0,2 | V |
| $I_{GD}$ | *gate non-trigger current* | | | | | 5 | mA |
| $I_L$ | *latching current* | $t_p$ = 10 µs | $T_{VJ}$ = 25°C | | | 150 | mA |
| | | $I_G$ = 0,3A; $di_G/dt$ = 0,3 A/µs | | | | | |
| $I_H$ | *holding current* | $V_D$ = 6 V $R_{GK}$ = ∞ | $T_{VJ}$ = 25°C | | | 100 | mA |
| $t_{gd}$ | *gate controlled delay time* | $V_D$ = ½ $V_{DRM}$ | $T_{VJ}$ = 25°C | | | 2 | µs |
| | | $I_G$ = 0,3A; $di_G/dt$ = 0,3 A/µs | | | | | |
| $t_q$ | *turn-off time* | $V_R$ = 100 V; $I_T$ = 80A; $V_D$ = ⅔ $V_{DRM}$ | $T_{VJ}$ =125 °C | | 150 | | µs |
| | | di/dt = 20 A/µs; dv/dt = 20 V/µs; $t_p$ = 200 µs | | | | | |

## Package PLUS247

| Symbol | Definition | Conditions | | Ratings min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{RMS}$ | *RMS current* | per terminal | | | | 70 | A |
| $T_{VJ}$ | *virtual junction temperature* | | | -40 | | 150 | °C |
| $T_{op}$ | *operation temperature* | | | -40 | | 125 | °C |
| $T_{stg}$ | *storage temperature* | | | -40 | | 150 | °C |
| **Weight** | | | | | 6 | | g |
| $F_C$ | *mounting force with clip* | | | 20 | | 120 | N |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | | *terminal to terminal* | 5,5 | | | mm |
| $d_{Spb/Apb}$ | | | *terminal to backside* | 5,5 | | | mm |

Product Marking



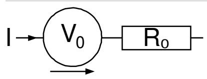

### Part description

C = Thyristor (SCR)
L = High Efficiency Thyristor
A = (up to 1200V)
80 = Current Rating [A]
E = Single Thyristor
1200 = Reverse Voltage [V]
HF = PLUS247 (3)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | CLA80E1200HF | CLA80E1200HF | Tube | 30 | 508680 |

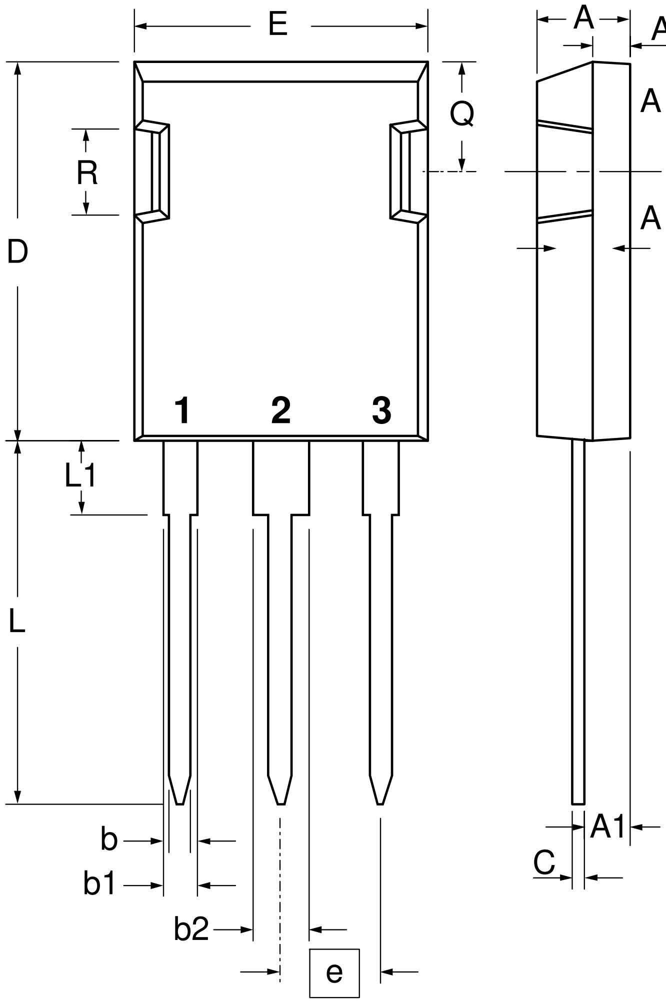
## Equivalent Circuits for Simulation

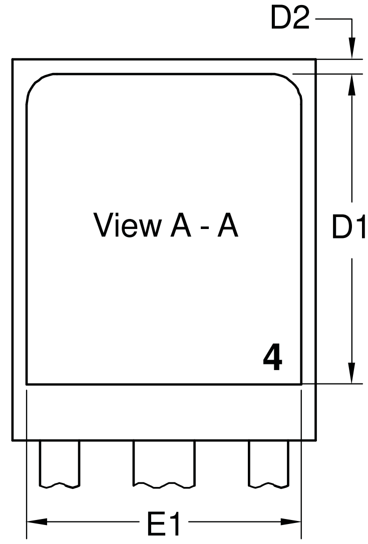
* on die level $T_{VJ} = 150°C$



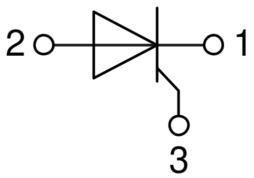

| | | Thyristor | |
|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 0,88 | V |
| $R_{0\,max}$ | *slope resistance ** | 3,8 | mΩ |

## Outlines PLUS247




| Sym. | Inches | | Millimeter | |
|---|---|---|---|---|
| | min. | max. | min. | max. |
| A | 0.190 | 0.205 | 4.83 | 5.21 |
| A1 | 0.090 | 0.100 | 2.29 | 2.54 |
| A2 | 0.075 | 0.085 | 1.91 | 2.16 |
| b | 0.045 | 0.055 | 1.14 | 1.40 |
| b1 | 0.075 | 0.084 | 1.91 | 2.13 |
| b2 | 0.115 | 0.123 | 2.92 | 3.12 |
| C | 0.024 | 0.031 | 0.61 | 0.80 |
| D | 0.819 | 0.840 | 20.80 | 21.34 |
| D1 | 0.515 | - | 13.07 | - |
| D2 | 0.010 | 0.053 | 0.51 | 1.35 |
| E | 0.620 | 0.635 | 15.75 | 16.13 |
| E1 | 0.530 | - | 13.45 | - |
| e | 0.215 BSC | | 5.45 BSC | |
| L | 0.780 | 0.800 | 19.81 | 20.32 |
| L1 | 0.150 | 0.170 | 3.81 | 4.32 |
| Q | 0.220 | 0.244 | 5.59 | 6.20 |
| R | 0.170 | 0.190 | 4.32 | 4.83 |



## Thyristor

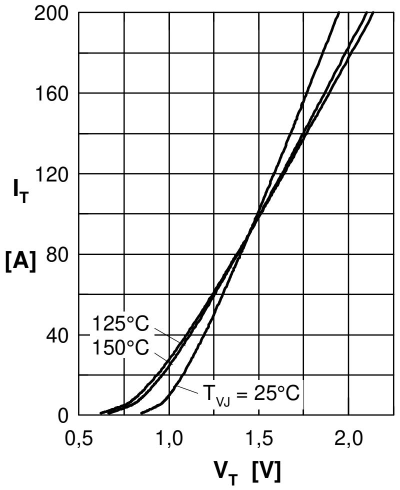



Fig. 1 Forward characteristics

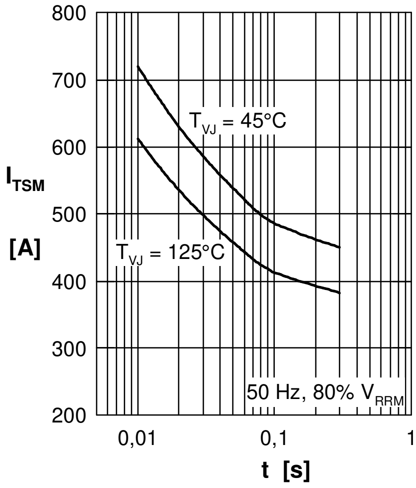



Fig. 2 Surge overload current

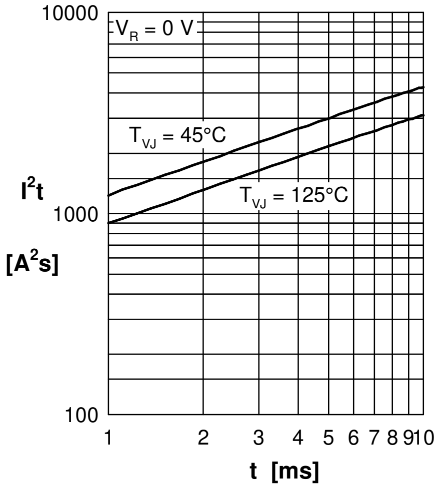



Fig. 3 $I^2t$ versus time (1-10 ms)

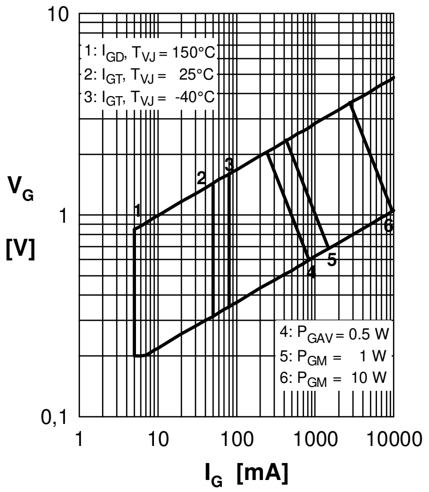



Fig. 4 Gate trigger characteristics

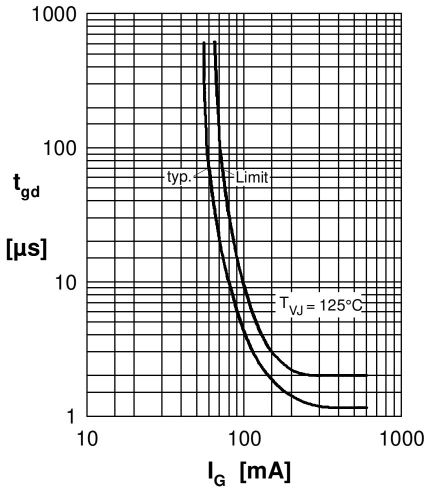



Fig. 5 Gate controlled delay time

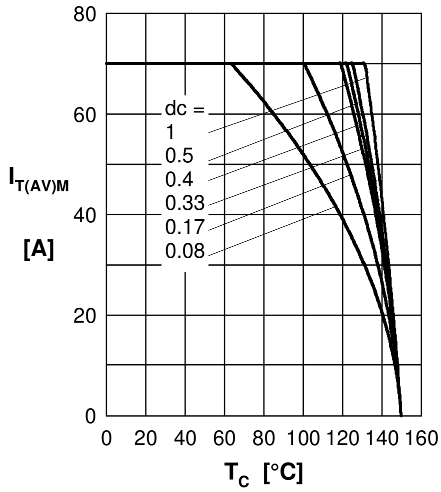



Fig. 6 Max. forward current
at case temperature

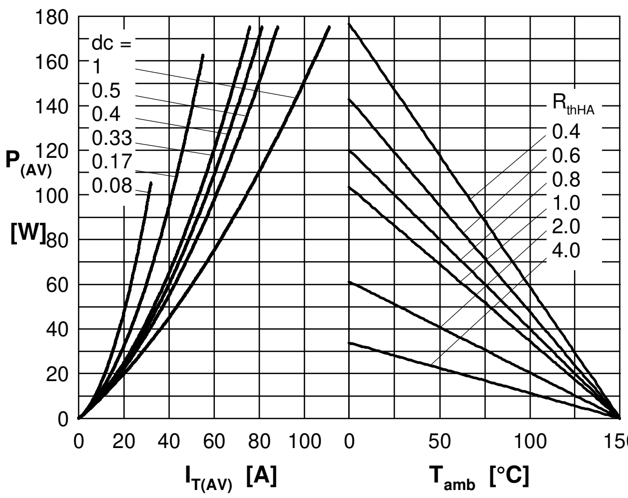



Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

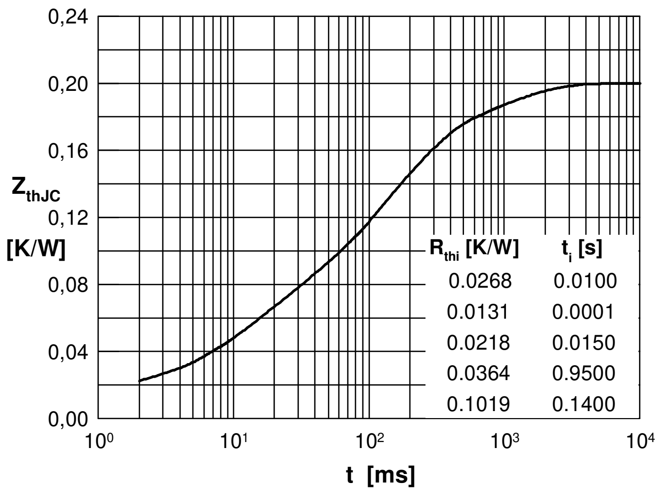



Fig. 8 Transient thermal impedance