

High Efficiency Thyristor

$$V_{RRM} = 1200 \text{ V}$$

$$I_{TAV} = 30 \text{ A}$$

$$V_T = 1.27 \text{ V}$$

Two Quadrants Operation QI & QII
 Single Thyristor with two gate polarities

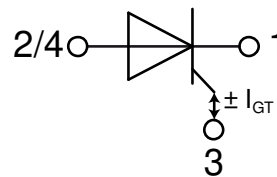
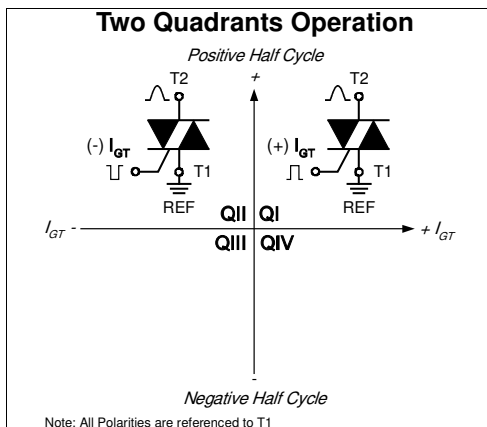
Part number

CLA30E1200NPZ

Marking on Product: CLA30E1200NPZ



Backside: anode



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Two gate current polarities usable
 - positive -> quadrant I
 - negative -> quadrant II
- Thyristor can be used as Triac
 - anti-parallel combination with AGT
 - Anode-Gated-Thyristor covers quadrant III
 - AGT-counterpart: CLB30I1200PZ

Applications:

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

Package: TO-263 (D2Pak-HV)

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

Disclaimer Notice

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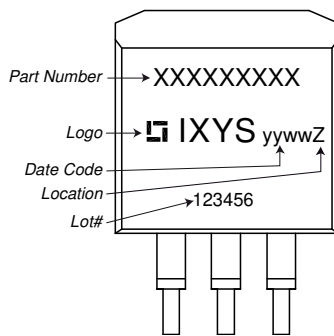


| Thyristor | | | Ratings | | | |
|----------------|--|---|--------------------------|------|----------|------------------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| $V_{RSM/DSM}$ | max. non-repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}C$ | | | 1300 | V |
| $V_{RRM/DRM}$ | max. repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}C$ | | | 1200 | V |
| I_{RD} | reverse current, drain current | $V_{R/D} = 1200 V$ | $T_{VJ} = 25^{\circ}C$ | | 10 | μA |
| | | $V_{R/D} = 1200 V$ | $T_{VJ} = 125^{\circ}C$ | | 2 | mA |
| V_T | forward voltage drop | $I_T = 30 A$ | $T_{VJ} = 25^{\circ}C$ | | 1.30 | V |
| | | $I_T = 60 A$ | | | 1.59 | V |
| | | $I_T = 30 A$ | $T_{VJ} = 125^{\circ}C$ | | 1.27 | V |
| | | $I_T = 60 A$ | | | 1.65 | V |
| I_{TAV} | average forward current | $T_C = 115^{\circ}C$ | $T_{VJ} = 150^{\circ}C$ | | 30 | A |
| $I_{T(RMS)}$ | RMS forward current | 180° sine | | | 47 | A |
| V_{T0} | threshold voltage | } for power loss calculation only | $T_{VJ} = 150^{\circ}C$ | | 0.86 | V |
| r_T | slope resistance | | | | 13.2 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | 0.5 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | 0.25 | | K/W |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}C$ | | 250 | W |
| I_{TSM} | max. forward surge current | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}C$ | | 300 | A |
| | | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$ | $V_R = 0 V$ | | 325 | A |
| | | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$ | $T_{VJ} = 150^{\circ}C$ | | 255 | A |
| | | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$ | $V_R = 0 V$ | | 275 | A |
| I^2t | value for fusing | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}C$ | | 450 | A ² s |
| | | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$ | $V_R = 0 V$ | | 440 | A ² s |
| | | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$ | $T_{VJ} = 150^{\circ}C$ | | 325 | A ² s |
| | | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$ | $V_R = 0 V$ | | 315 | A ² s |
| C_J | junction capacitance | $V_R = 400 V \quad f = 1 \text{ MHz}$ | $T_{VJ} = 25^{\circ}C$ | | 13 | pF |
| P_{GM} | max. gate power dissipation | $t_p = 30 \mu s$ | $T_C = 150^{\circ}C$ | | 10 | W |
| | | $t_p = 300 \mu s$ | | | 5 | W |
| P_{GAV} | average gate power dissipation | | | | 0.5 | W |
| $(di/dt)_{cr}$ | critical rate of rise of current | $T_{VJ} = 150^{\circ}C; f = 50 \text{ Hz}$ | repetitive, $I_T = 90 A$ | | 150 | A/ μs |
| | | $t_p = 200 \mu s; di_G/dt = 0.3 A/\mu s;$ | non-repet., $I_T = 30 A$ | | 500 | A/ μs |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage | $V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 150^{\circ}C$ | | 500 | V/ μs |
| | | $R_{GK} = \infty; \text{method 1 (linear voltage rise)}$ | | | | |
| V_{GT} | gate trigger voltage | $V_D = 6 V$ | $T_{VJ} = 25^{\circ}C$ | | 1.3 | V |
| | | | $T_{VJ} = -40^{\circ}C$ | | 1.6 | V |
| I_{GT} | gate trigger current | $V_D = 6 V$ | $T_{VJ} = 25^{\circ}C$ | | ± 30 | mA |
| | | | $T_{VJ} = -40^{\circ}C$ | | ± 50 | mA |
| V_{GD} | gate non-trigger voltage | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 150^{\circ}C$ | | 0.2 | V |
| I_{GD} | gate non-trigger current | | | | ± 1 | mA |
| I_L | latching current | $t_p = 10 \mu s$ | $T_{VJ} = 25^{\circ}C$ | | 90 | mA |
| | | $I_G = 0.3 A; di_G/dt = 0.3 A/\mu s$ | | | | |
| I_H | holding current | $V_D = 6 V \quad R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}C$ | | 60 | mA |
| t_{gd} | gate controlled delay time | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ} = 25^{\circ}C$ | | 2 | μs |
| | | $I_G = 0.3 A; di_G/dt = 0.3 A/\mu s$ | | | | |
| t_q | turn-off time | $V_R = 100 V; I_T = 30 A; V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 125^{\circ}C$ | | 150 | μs |
| | | $di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$ | | | | |



| Package TO-263 (D2Pak-HV) | | Ratings | | | | |
|---------------------------|--|----------------------|------|------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | 35 | A |
| T_{VJ} | virtual junction temperature | | -40 | | 150 | °C |
| T_{op} | operation temperature | | -40 | | 125 | °C |
| T_{stg} | storage temperature | | -40 | | 150 | °C |
| Weight | | | | 1.5 | | g |
| F_C | mounting force with clip | | 20 | | 60 | N |
| $d_{Spp/ App}$ | creepage distance on surface striking distance through air | terminal to terminal | 4.2 | | | mm |
| $d_{Spb/ Apb}$ | | terminal to backside | 4.7 | | | mm |

Product Marking



Part description

- C = Thyristor (SCR)
- L = High Efficiency Thyristor
- A = (up to 1200V)
- 30 = Current Rating [A]
- E = Single Thyristor with two gate polarities
- 1200 = Reverse Voltage [V]
- N = Three Quadrants operation: QI - QIII
- PZ = TO-263AB (D2Pak) (2HV)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|-------------------|--------------------|---------------|----------|----------|
| Standard | CLA30E1200NPZ-TRL | CLA30E1200NPZ | Tape & Reel | 800 | 516330 |
| Alternative | CLA30E1200NPZ-TUB | CLA30E1200NPZ | Tube | 50 | 525248 |

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 150^{\circ}C$



Thyristor

| | | | |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage | 0.86 | V |
| $R_{0\ max}$ | slope resistance * | 10 | mΩ |

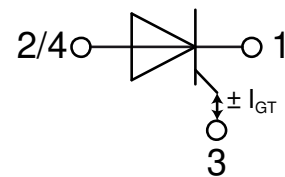


Outlines TO-263 (D2Pak-HV)



| Dim. | Millimeter | | Inches | |
|------|------------|-------|-------------|-------|
| | min | max | min | max |
| A | 4.06 | 4.83 | 0.160 | 0.190 |
| A1 | typ. 0.10 | | typ. 0.004 | |
| A2 | 2.41 | | 0.095 | |
| b | 0.51 | 0.99 | 0.020 | 0.039 |
| b2 | 1.14 | 1.40 | 0.045 | 0.055 |
| c | 0.40 | 0.74 | 0.016 | 0.029 |
| c2 | 1.14 | 1.40 | 0.045 | 0.055 |
| D | 8.38 | 9.40 | 0.330 | 0.370 |
| D1 | 8.00 | 8.89 | 0.315 | 0.350 |
| D2 | 2.3 | | 0.091 | |
| E | 9.65 | 10.41 | 0.380 | 0.410 |
| E1 | 6.22 | 8.50 | 0.245 | 0.335 |
| e | 2,54 BSC | | 0,100 BSC | |
| e1 | 4.28 | | 0.169 | |
| H | 14.61 | 15.88 | 0.575 | 0.625 |
| L | 1.78 | 2.79 | 0.070 | 0.110 |
| L1 | 1.02 | 1.68 | 0.040 | 0.066 |
| W | typ. 0.02 | 0.040 | typ. 0.0008 | 0.002 |

All dimensions conform with and/or within JEDEC standard.



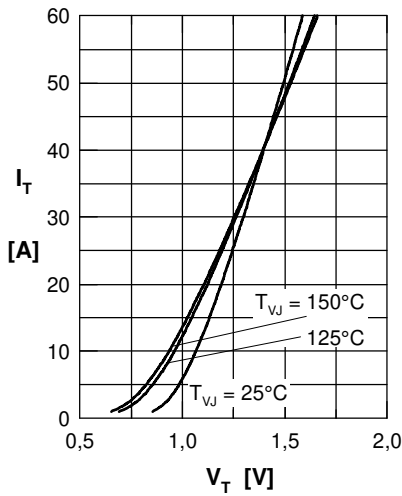
Thyristor


Fig. 1 Forward characteristics

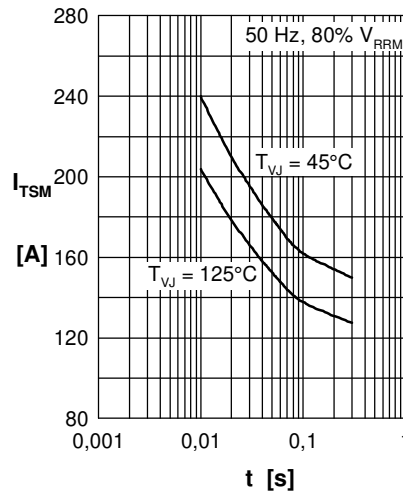
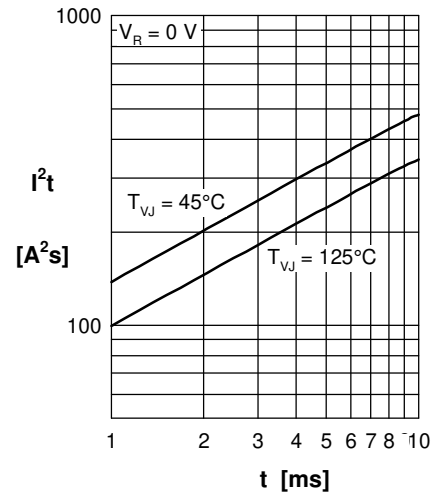

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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

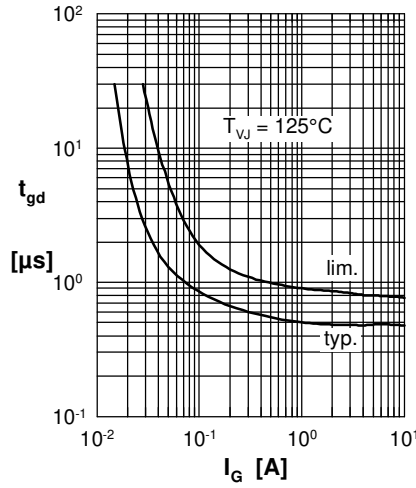
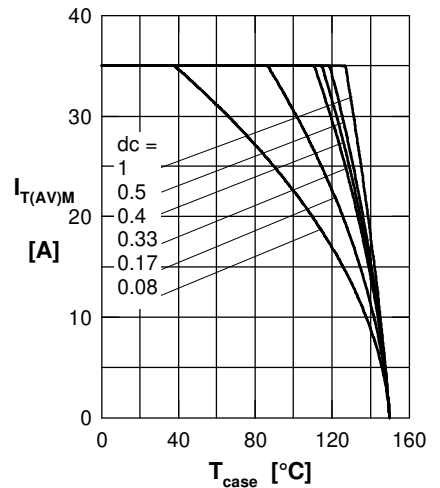
 Fig. 4 Gate voltage & gate current
 Triggering: A = no; B = possible; C = safe

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

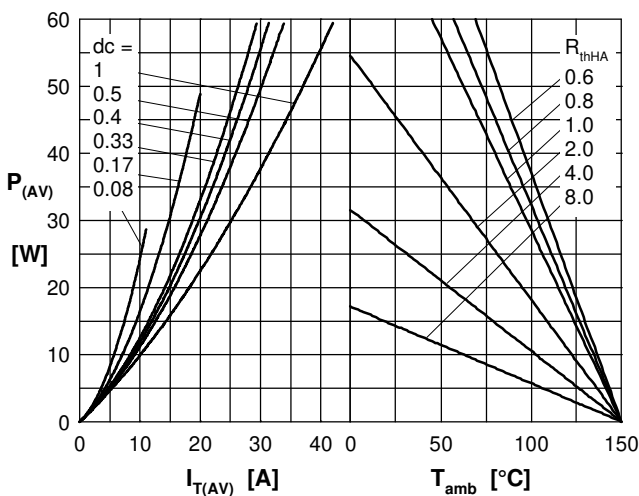
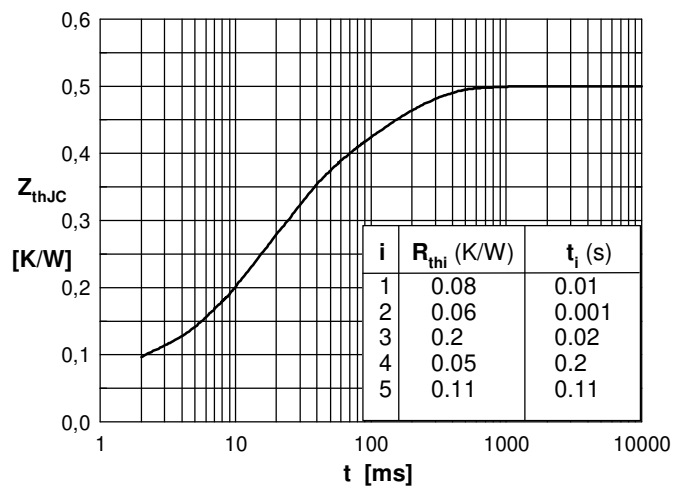

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 7 Transient thermal impedance junction to case