



# High Efficiency Thyristor

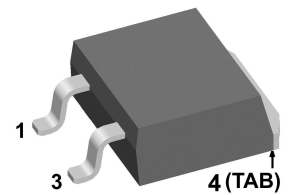
$V_{RRM} = 1200\text{ V}$   
 $I_{TAV} = 40\text{ A}$   
 $V_T = 1.26\text{ V}$

## Single Anode Gated Thyristor

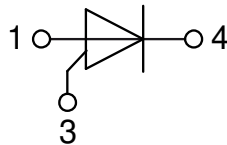
**Part number**

**CLB40I1200PZ**

Marking on Product: CLB40I1200PZ



Backside: cathode



### Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Thyristor can be used as Triac
  - anti-parallel combination with CGT
  - Cathode-Gated-Thyristor covers quadrants I & II
  - CGT-counterpart: CLA40E1200NPZ

### 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   | $\mu A$           |
|                |  | $V_{R/D} = 1200 V$  | $T_{VJ} = 125^{\circ}C$   |      | 2    | mA                |
| $V_T$          | forward voltage drop                                 | $I_T = 40 A$  | $T_{VJ} = 25^{\circ}C$    |      | 1.30 | V                 |
|                |  | $I_T = 80 A$  |                           |      | 1.59 | V                 |
|                |  | $I_T = 40 A$  | $T_{VJ} = 125^{\circ}C$   |      | 1.26 | V                 |
|                |  | $I_T = 80 A$  |                           |      | 1.64 | V                 |
| $I_{TAV}$      | average forward current                              | $T_C = 125^{\circ}C$  | $T_{VJ} = 150^{\circ}C$   |      | 40   | A                 |
| $I_{T(RMS)}$   | RMS forward current                                  | 180° sine   |                           |      | 63   | A                 |
| $V_{T0}$       | threshold voltage                                    | } for power loss calculation only   | $T_{VJ} = 150^{\circ}C$   |      | 0.85 | V                 |
| $r_T$          | slope resistance                                     |   |                           |      | 9.9  | m $\Omega$        |
| $R_{thJC}$     | thermal resistance junction to case                  |   |                           |      | 0.4  | K/W               |
| $R_{thCH}$     | thermal resistance case to heatsink                  |   |                           | 0.25 |      | K/W               |
| $P_{tot}$      | total power dissipation                              |   | $T_C = 25^{\circ}C$       |      | 310  | W                 |
| $I_{TSM}$      | max. forward surge current                           | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}C$    |      | 520  | A                 |
|                |  | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$   | $V_R = 0 V$               |      | 560  | A                 |
|                |  | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}C$   |      | 440  | A                 |
|                |  | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$   | $V_R = 0 V$               |      | 475  | A                 |
| $I^2t$         | value for fusing                                     | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$  | $T_{VJ} = 45^{\circ}C$    |      | 1.35 | kA <sup>2</sup> s |
|                |  | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$   | $V_R = 0 V$               |      | 1.31 | kA <sup>2</sup> s |
|                |  | $t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$  | $T_{VJ} = 150^{\circ}C$   |      | 970  | A <sup>2</sup> s  |
|                |  | $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$   | $V_R = 0 V$               |      | 940  | A <sup>2</sup> s  |
| $C_J$          | junction capacitance                                 | $V_R = 400 V \quad f = 1 \text{ MHz}$   | $T_{VJ} = 25^{\circ}C$    |      | 22   | 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, $I_T = 120 A$ |      | 150  | A/ $\mu s$        |
|                |  | $t_p = 200 \mu s; di_G/dt = 0.3 A/\mu s;$<br>$I_G = 0.3 A; V = \frac{2}{3} V_{DRM}$                                       | non-repet., $I_T = 40 A$  |      | 500  | A/ $\mu s$        |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage                     | $V = \frac{2}{3} V_{DRM}$<br>$R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$                                    | $T_{VJ} = 150^{\circ}C$   |      | 500  | V/ $\mu s$        |
| $V_{GT}$       | gate trigger voltage                                 | $V_D = 6 V$   | $T_{VJ} = 25^{\circ}C$    |      | 1.7  | V                 |
|                |  |   | $T_{VJ} = -40^{\circ}C$   |      | 1.9  | 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                                     | $t_p = 10 \mu s$  | $T_{VJ} = 25^{\circ}C$    |      | 100  | mA                |
|                |  | $I_G = 0.3 A; di_G/dt = 0.3 A/\mu s$  |                           |      |      |                   |
| $I_H$          | holding current                                      | $V_D = 6 V \quad R_{GK} = \infty$   | $T_{VJ} = 25^{\circ}C$    |      | 70   | mA                |
| $t_{gd}$       | gate controlled delay time                           | $V_D = \frac{1}{2} V_{DRM}$   | $T_{VJ} = 25^{\circ}C$    |      | 2    | $\mu s$           |
|                |  | $I_G = 0.3 A; di_G/dt = 0.3 A/\mu s$  |                           |      |      |                   |
| $t_q$          | turn-off time  | $V_R = 100 V; I_T = 40 A; V = \frac{2}{3} V_{DRM}$<br>$di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$ | $T_{VJ} = 125^{\circ}C$   |      | 150  | $\mu s$           |



| 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   |
| <b>Weight</b>             |  |                      |         | 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
- B = Anode gated (up to 1200V)
- 40 = Current Rating [A]
- I = Single Anode Gated Thyristor
- 1200 = Reverse Voltage [V]
- PZ = TO-263AB (D2Pak) (2HV)

| Ordering    | Ordering Number  | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|------------------|--------------------|---------------|----------|----------|
| Standard    | CLB40I1200PZ-TRL | CLB40I1200PZ       | Tape & Reel   | 800      | 518476   |
| Alternative | CLB40I1200PZ-TUB | CLB40I1200PZ       | Tube          | 50       | 525290   |

**Equivalent Circuits for Simulation**

\* on die level

$T_{VJ} = 150\text{ °C}$



**Thyristor**

|              |                    |      |    |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage  | 0.85 | V  |
| $R_{0\ max}$ | slope resistance * | 7.4  | 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.*

