

# High Efficiency Thyristor

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

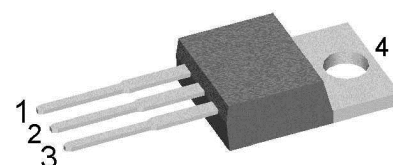
$$I_{TAV} = 30 \text{ A}$$

$$V_T = 1.32 \text{ V}$$

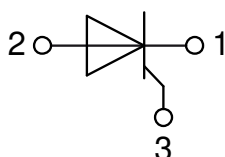
SemiFast  
Single Thyristor

Part number

**CLE30E1200PB**



Backside: Anode



## Features / Advantages:

- Thyristor for line and moderate frequencies
- Short turn-off time
- Planar passivated chip
- Long-term stability

## Applications:

- Softstart AC motor control
- Power converter
- AC power control
- Lighting and temperature control

## Package: TO-220

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

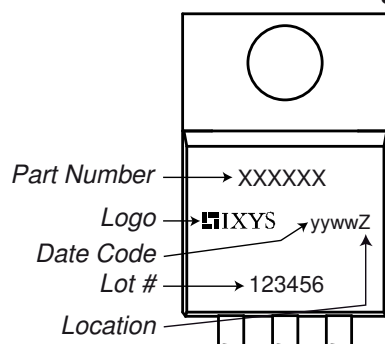
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| Thyristor             |                                                      |                                                                                                                                                           |                         | Ratings |      |      |                  |
|-----------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------|------|------|------------------|
| Symbol                | Definition                                           | Conditions                                                                                                                                                |                         | min.    | typ. | max. | Unit             |
| V <sub>RSM/DSM</sub>  | max. non-repetitive reverse/forward blocking voltage | T <sub>VJ</sub> = 25°C                                                                                                                                    |                         |         |      | 1200 | V                |
| V <sub>RRM/DRM</sub>  | max. repetitive reverse/forward blocking voltage     | T <sub>VJ</sub> = 25°C                                                                                                                                    |                         |         |      | 1200 | V                |
| I <sub>R/D</sub>      | reverse current, drain current                       | V <sub>R/D</sub> = 1200 V                                                                                                                                 | T <sub>VJ</sub> = 25°C  |         |      | 10   | μA               |
|                       |                                                      | V <sub>R/D</sub> = 1200 V                                                                                                                                 | T <sub>VJ</sub> = 125°C |         |      | 2    | mA               |
| V <sub>T</sub>        | forward voltage drop                                 | I <sub>T</sub> = 30 A                                                                                                                                     | T <sub>VJ</sub> = 25°C  |         |      | 1.34 | V                |
|                       |                                                      | I <sub>T</sub> = 60 A                                                                                                                                     |                         |         |      | 1.65 | V                |
|                       |                                                      | I <sub>T</sub> = 30 A                                                                                                                                     | T <sub>VJ</sub> = 125°C |         |      | 1.32 | V                |
|                       |                                                      | I <sub>T</sub> = 60 A                                                                                                                                     |                         |         |      | 1.70 | V                |
| I <sub>TAV</sub>      | average forward current                              | T <sub>C</sub> = 85°C<br>180° sine                                                                                                                        | T <sub>VJ</sub> = 150°C |         |      | 30   | A                |
| V <sub>T0</sub>       | threshold voltage                                    | for power loss calculation only                                                                                                                           |                         |         |      | 0.92 | V                |
| r <sub>T</sub>        | slope resistance                                     |                                                                                                                                                           |                         |         |      | 14   | mΩ               |
| R <sub>thJC</sub>     | thermal resistance junction to case                  |                                                                                                                                                           |                         |         |      | 0.5  | K/W              |
| R <sub>thCH</sub>     | thermal resistance case to heatsink                  |                                                                                                                                                           |                         |         | 0.5  |      | K/W              |
| P <sub>tot</sub>      | total power dissipation                              | T <sub>C</sub> = 25°C                                                                                                                                     |                         |         |      | 250  | W                |
| I <sub>TSM</sub>      | max. forward surge current                           | t = 10 ms; (50 Hz), sine                                                                                                                                  | T <sub>VJ</sub> = 45°C  |         |      | 350  | A                |
|                       |                                                      | t = 8,3 ms; (60 Hz), sine                                                                                                                                 | V <sub>R</sub> = 0 V    |         |      | 380  | A                |
|                       |                                                      | t = 10 ms; (50 Hz), sine                                                                                                                                  | T <sub>VJ</sub> = 150°C |         |      | 300  | A                |
|                       |                                                      | t = 8,3 ms; (60 Hz), sine                                                                                                                                 | V <sub>R</sub> = 0 V    |         |      | 320  | A                |
| I <sup>2</sup> t      | value for fusing                                     | t = 10 ms; (50 Hz), sine                                                                                                                                  | T <sub>VJ</sub> = 45°C  |         |      | 615  | A <sup>2</sup> s |
|                       |                                                      | t = 8,3 ms; (60 Hz), sine                                                                                                                                 | V <sub>R</sub> = 0 V    |         |      | 600  | A <sup>2</sup> s |
|                       |                                                      | t = 10 ms; (50 Hz), sine                                                                                                                                  | T <sub>VJ</sub> = 150°C |         |      | 450  | A <sup>2</sup> s |
|                       |                                                      | t = 8,3 ms; (60 Hz), sine                                                                                                                                 | V <sub>R</sub> = 0 V    |         |      | 425  | A <sup>2</sup> s |
| C <sub>J</sub>        | junction capacitance                                 | V <sub>R</sub> = 400 V f = 1 MHz                                                                                                                          | T <sub>VJ</sub> = 25°C  |         | 2    |      | pF               |
| P <sub>GM</sub>       | max. gate power dissipation                          | t <sub>p</sub> = 30 μs                                                                                                                                    | T <sub>C</sub> = 150°C  |         |      | 10   | W                |
|                       |                                                      | t <sub>p</sub> = 300 μs                                                                                                                                   |                         |         |      | 5    | W                |
| P <sub>GAV</sub>      | average gate power dissipation                       |                                                                                                                                                           |                         |         |      | 0.5  | W                |
| (di/dt) <sub>cr</sub> | critical rate of rise of current                     | T <sub>VJ</sub> = 150°C; f = 50 Hz repetitive, I <sub>T</sub> = 90 A                                                                                      |                         |         |      | 150  | A/μs             |
|                       |                                                      | t <sub>p</sub> = 200 μs; di <sub>G</sub> /dt = 0.3 A/μs; I <sub>G</sub> = 0.3 A; V = ⅔ V <sub>DRM</sub> non-repet., I <sub>T</sub> = 30 A                 |                         |         |      | 500  | A/μs             |
| (dv/dt) <sub>cr</sub> | critical rate of rise of voltage                     | V = ⅔ V <sub>DRM</sub> T <sub>VJ</sub> = 150°C                                                                                                            |                         |         |      | 500  | V/μs             |
|                       |                                                      | R <sub>GK</sub> = ∞; method 1 (linear voltage rise)                                                                                                       |                         |         |      |      |                  |
| V <sub>GT</sub>       | gate trigger voltage                                 | V <sub>D</sub> = 6 V                                                                                                                                      | T <sub>VJ</sub> = 25°C  |         |      | 1.4  | V                |
|                       |                                                      |                                                                                                                                                           | T <sub>VJ</sub> = -40°C |         |      | 1.7  | V                |
| I <sub>GT</sub>       | gate trigger current                                 | V <sub>D</sub> = 6 V                                                                                                                                      | T <sub>VJ</sub> = 25°C  |         |      | 30   | mA               |
|                       |                                                      |                                                                                                                                                           | T <sub>VJ</sub> = -40°C |         |      | 50   | mA               |
| V <sub>GD</sub>       | gate non-trigger voltage                             | V <sub>D</sub> = ⅔ V <sub>DRM</sub>                                                                                                                       | T <sub>VJ</sub> = 150°C |         |      | 0.2  | V                |
| I <sub>GD</sub>       | gate non-trigger current                             |                                                                                                                                                           |                         |         |      | 1    | mA               |
| I <sub>L</sub>        | latching current                                     | t <sub>p</sub> = 10 μs                                                                                                                                    | T <sub>VJ</sub> = 25°C  |         |      | 90   | mA               |
|                       |                                                      | I <sub>G</sub> = 0.3 A; di <sub>G</sub> /dt = 0.3 A/μs                                                                                                    |                         |         |      |      |                  |
| I <sub>H</sub>        | holding current                                      | V <sub>D</sub> = 6 V R <sub>GK</sub> = ∞                                                                                                                  | T <sub>VJ</sub> = 25°C  |         |      | 60   | mA               |
| t <sub>gd</sub>       | gate controlled delay time                           | V <sub>D</sub> = ½ V <sub>DRM</sub>                                                                                                                       | T <sub>VJ</sub> = 25°C  |         |      | 2    | μs               |
|                       |                                                      | I <sub>G</sub> = 0.3 A; di <sub>G</sub> /dt = 0.3 A/μs                                                                                                    |                         |         |      |      |                  |
| t <sub>q</sub>        | turn-off time                                        | V <sub>R</sub> = 100 V; I <sub>T</sub> = 30 A; V = ⅔ V <sub>DRM</sub> T <sub>VJ</sub> = 125 °C<br>di/dt = 10 A/μs dv/dt = 20 V/μs t <sub>p</sub> = 200 μs |                         |         | 50   |      | μs               |

| Package TO-220 |                              |              | Ratings |      |      |      |
|----------------|------------------------------|--------------|---------|------|------|------|
| Symbol         | Definition                   | Conditions   | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                  | per terminal |         |      | 35   | A    |
| $T_{VJ}$       | virtual junction temperature |              | -55     |      | 150  | °C   |
| $T_{op}$       | operation temperature        |              | -55     |      | 125  | °C   |
| $T_{stg}$      | storage temperature          |              | -55     |      | 150  | °C   |
| Weight         |                              |              |         | 2    |      | g    |
| $M_D$          | mounting torque              |              | 0.4     |      | 0.6  | Nm   |
| $F_C$          | mounting force with clip     |              | 20      |      | 60   | N    |

### Product Marking



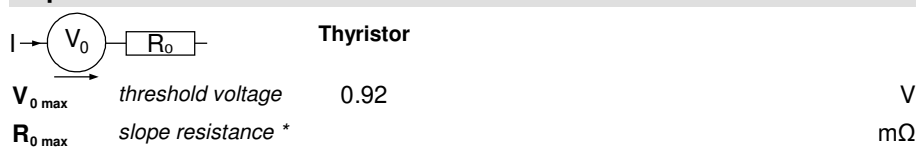
### Part description

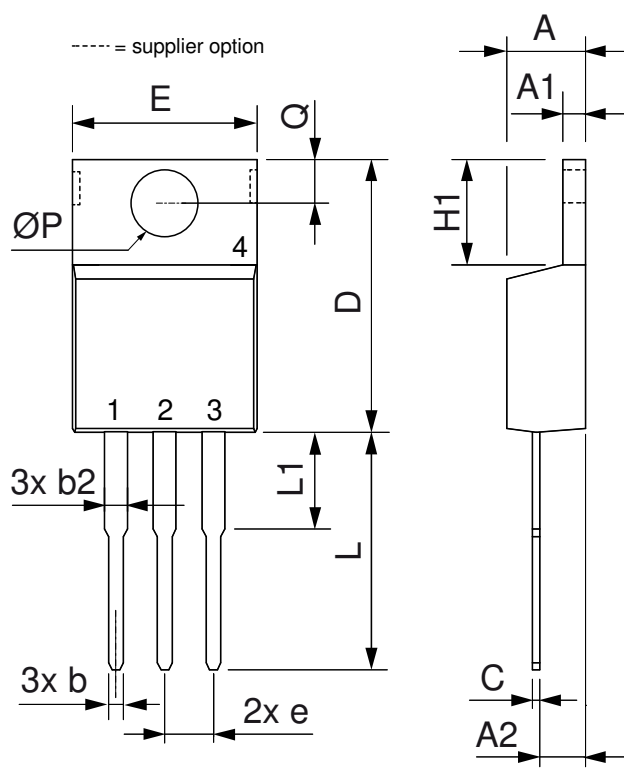
C = Thyristor (SCR)  
 L = High Efficiency Thyristor  
 E = Semifast (up to 1200V)  
 30 = Current Rating [A]  
 E = Single Thyristor  
 1200 = Reverse Voltage [V]  
 PB = TO-220AB (3)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | CLE30E1200PB    | CLE30E1200PB       | Tube          | 50       | 516162   |

### Equivalent Circuits for Simulation

\* on die level

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


**Outlines TO-220**


| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 4.32       | 4.82  | 0.170  | 0.190 |
| A1   | 1.14       | 1.39  | 0.045  | 0.055 |
| A2   | 2.29       | 2.79  | 0.090  | 0.110 |
| b    | 0.64       | 1.01  | 0.025  | 0.040 |
| b2   | 1.15       | 1.65  | 0.045  | 0.065 |
| C    | 0.35       | 0.56  | 0.014  | 0.022 |
| D    | 14.73      | 16.00 | 0.580  | 0.630 |
| E    | 9.91       | 10.66 | 0.390  | 0.420 |
| e    | 2.54       | BSC   | 0.100  | BSC   |
| H1   | 5.85       | 6.85  | 0.230  | 0.270 |
| L    | 12.70      | 13.97 | 0.500  | 0.550 |
| L1   | 2.79       | 5.84  | 0.110  | 0.230 |
| ØP   | 3.54       | 4.08  | 0.139  | 0.161 |
| Q    | 2.54       | 3.18  | 0.100  | 0.125 |

