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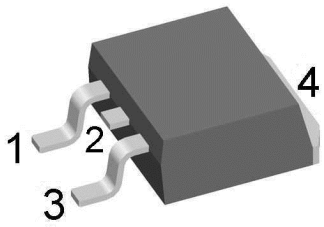
# High Efficiency Thyristor

| | | |
|---|---|---|
| $V_{RRM}$ | = | 1200 V |
| $I_{TAV}$ | = | 30 A |
| $V_T$ | = | 1.27 V |

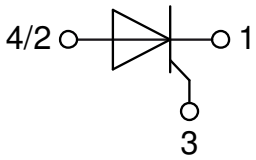
Single Thyristor

**Part number**

**CLA30E1200PC**




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

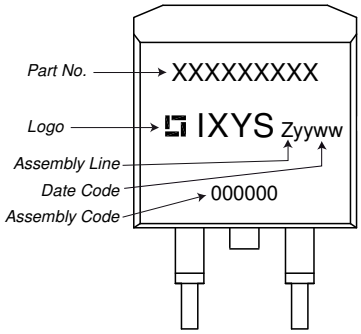
**Package:** TO-263 (D2Pak)

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

| Thyristor | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| $V_{RSM/DSM}$ | *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 | | | 10 | µA |
| | | $V_{R/D}$ = 1200 V | $T_{VJ}$ = 125°C | | | 2 | mA |
| $V_T$ | *forward voltage drop* | $I_T$ = 30 A | $T_{VJ}$ = 25°C | | | 1.30 | V |
| | | $I_T$ = 60 A | | | | 1.59 | V |
| | | $I_T$ = 30 A | $T_{VJ}$ = 125°C | | | 1.27 | V |
| | | $I_T$ = 60 A | | | | 1.65 | V |
| $I_{TAV}$ | *average forward current* | $T_C$ = 115°C | $T_{VJ}$ = 150°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°C | | | 0.86 | V |
| $r_T$ | *slope resistance* } | | | | | 13.2 | mΩ |
| $R_{thJC}$ | *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°C | | | 250 | W |
| $I_{TSM}$ | *max. forward surge current* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 300 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 325 | A |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 255 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 275 | A |
| $I^2t$ | *value for fusing* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 450 | $A^2s$ |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 440 | $A^2s$ |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 325 | $A^2s$ |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 315 | $A^2s$ |
| $C_J$ | *junction capacitance* | $V_R$ = 400 V f = 1 MHz | $T_{VJ}$ = 25°C | | 13 | | 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, $I_T$ = 90 A | | | 150 | A/µs |
| | | $t_P$ = 200 µs; $di_G/dt$ = 0.3 A/µs; | | | | | |
| | | $I_G$ = 0.3 A; V = ⅔ $V_{DRM}$ | non-repet., $I_T$ = 30 A | | | 500 | A/µs |
| $(dv/dt)_{cr}$ | *critical rate of rise of voltage* | V = ⅔ $V_{DRM}$ | $T_{VJ}$ = 150°C | | | 500 | V/µs |
| | | $R_{GK}$ = ∞; method 1 (linear voltage rise) | | | | | |
| $V_{GT}$ | *gate trigger voltage* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 1.3 | V |
| | | | $T_{VJ}$ = -40°C | | | 1.6 | V |
| $I_{GT}$ | *gate trigger current* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 30 | mA |
| | | | $T_{VJ}$ = -40°C | | | 50 | 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* | | | | | 1 | mA |
| $I_L$ | *latching current* | $t_p$ = 10 µs | $T_{VJ}$ = 25°C | | | 90 | mA |
| | | $I_G$ = 0.3 A; $di_G/dt$ = 0.3 A/µs | | | | | |
| $I_H$ | *holding current* | $V_D$ = 6 V $R_{GK}$ = ∞ | $T_{VJ}$ = 25°C | | | 60 | mA |
| $t_{gd}$ | *gate controlled delay time* | $V_D$ = ½ $V_{DRM}$ | $T_{VJ}$ = 25°C | | | 2 | µs |
| | | $I_G$ = 0.3 A; $di_G/dt$ = 0.3 A/µs | | | | | |
| $t_q$ | *turn-off time* | $V_R$ = 100 V; $I_T$ = 30 A; V = ⅔ $V_{DRM}$ | $T_{VJ}$ = 125 °C | | 150 | | µs |
| | | di/dt = 10 A/µs dv/dt = 20 V/µs $t_p$ = 200 µs | | | | | |

| Package TO-263 (D2Pak) | | | 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** | | | | 2 | | g |
| $F_C$ | *mounting force with clip* | | 20 | | 60 | N |

## Product Marking




## Part description

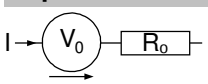
C = Thyristor (SCR)
L = High Efficiency Thyristor
A = (up to 1200V)
30 = Current Rating [A]
E = Single Thyristor
1200 = Reverse Voltage [V]
PC = TO-263AB (D2Pak) (2)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | CLA30E1200PC | CLA30E1200PC | Tape & Reel | 800 | 508235 |

| Similar Part | Package | Voltage class |
|---|---|---|
| CLA30E1200PB | TO-220AB (3) | 1200 |
| CLA30E1200HB | TO-247AD (3) | 1200 |
| CS22-12io1M | TO-220ABFP (3) | 1200 |
| CS22-08io1M | TO-220ABFP (3) | 800 |
| CMA30E1600PN | TO-220ABFP (3) | 1600 |
| CMA30E1600PB | TO-220AB (3) | 1600 |
| CMA30E1600PZ | TO-263AB (D2Pak) (2HV) | 1600 |

## Equivalent Circuits for Simulation

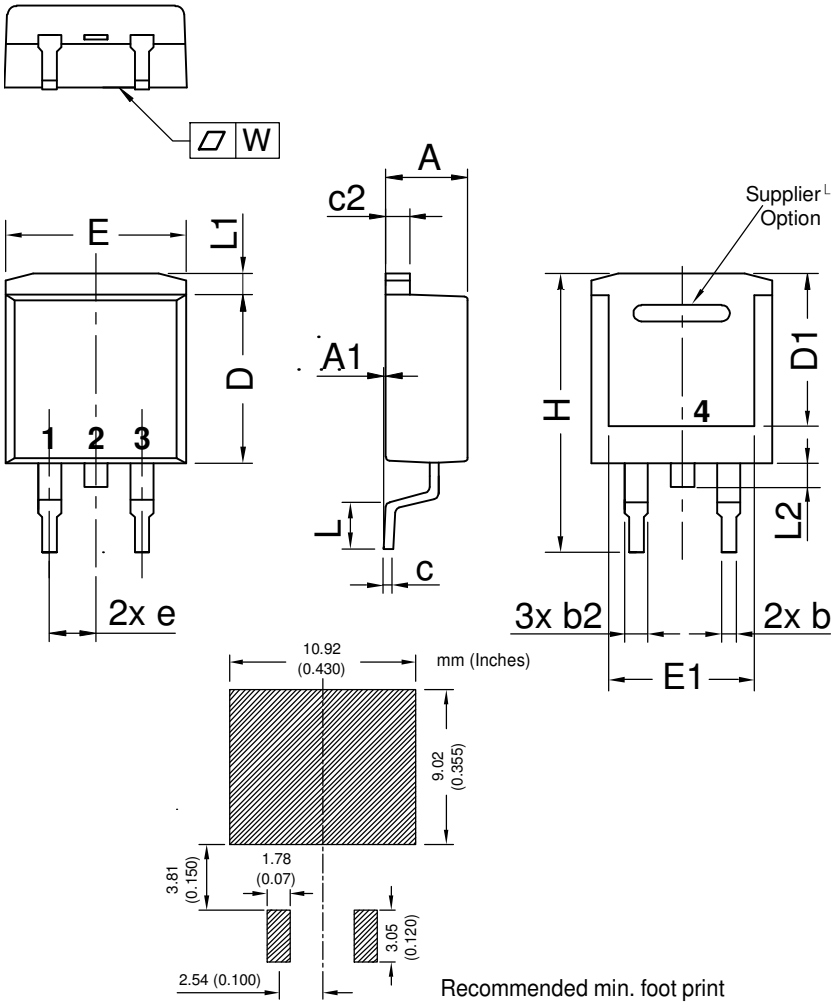
** on die level* $T_{VJ}$ = 150 °C




**Thyristor**

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

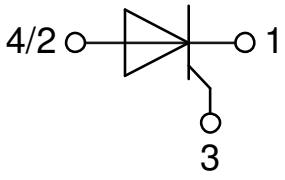
## Outlines TO-263 (D2Pak)




Recommended min. foot print

| 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 | 2.5 | | 0.098 | |
| 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

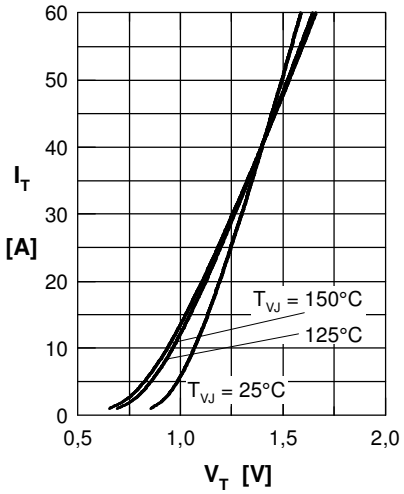



Fig. 1 Forward characteristics

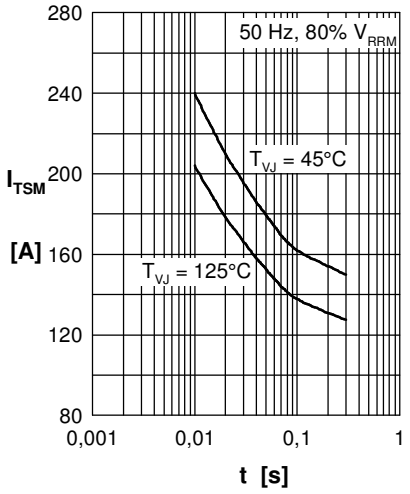



Fig. 2 Surge overload current
$I_{TSM}$: crest value, t: duration

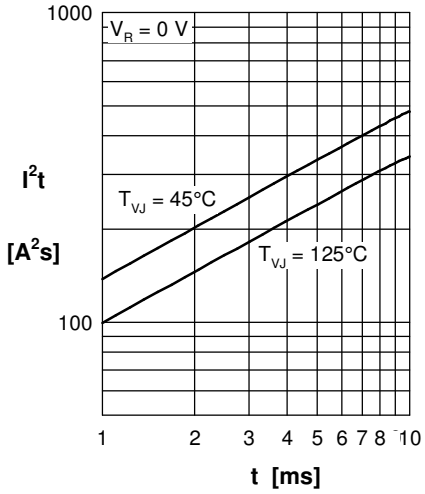



Fig. 3 $I^2t$ versus time (1-10 s)

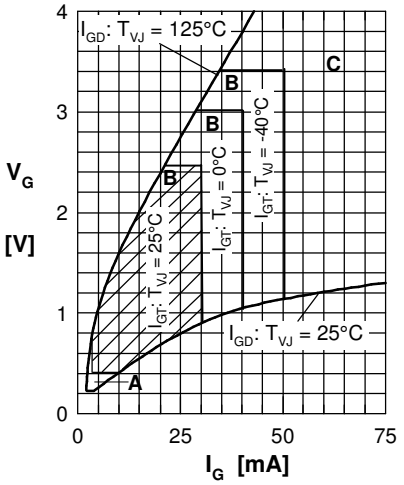



Fig. 4 Gate voltage & gate current
Triggering: A = no; B = possible; C = safe

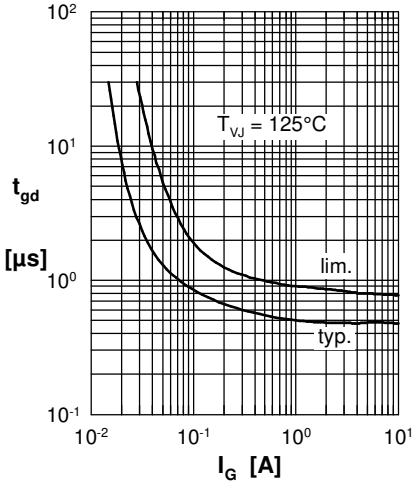



Fig. 5 Gate controlled delay time $t_{gd}$

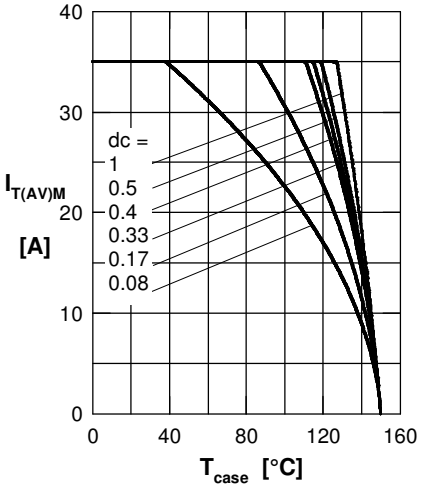



Fig. 6 Max. forward current at case temperature

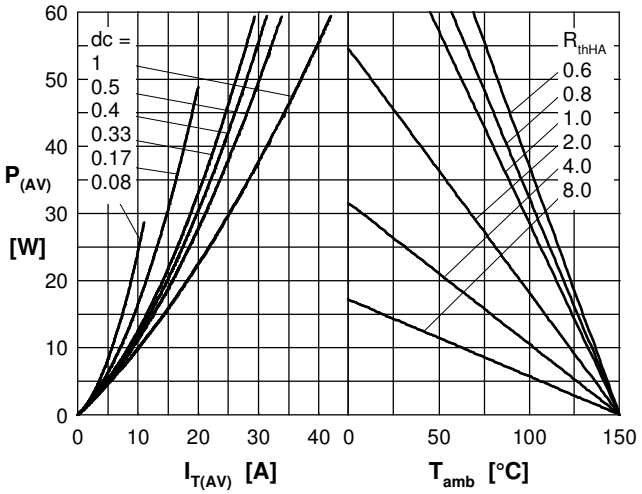
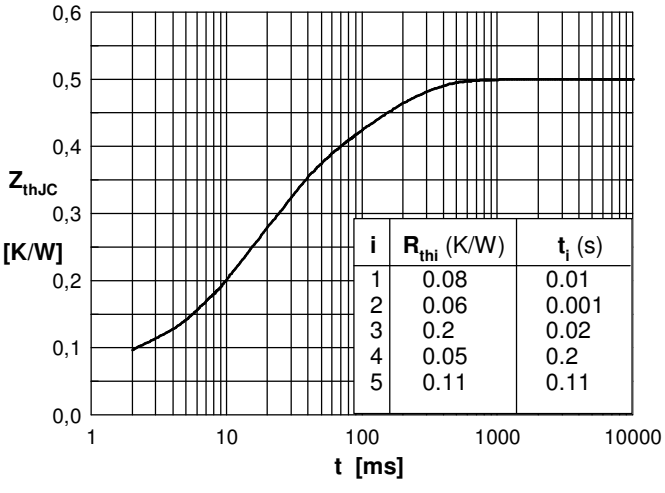



Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature




| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|---|---|
| 1 | 0.08 | 0.01 |
| 2 | 0.06 | 0.001 |
| 3 | 0.2 | 0.02 |
| 4 | 0.05 | 0.2 |
| 5 | 0.11 | 0.11 |

Fig. 7 Transient thermal impedance junction to case