# ACR400SE

## Fast Turn-off Asymmetric Thyristor

Replaces March 1998 version, DS4202-3.1

DS4202-4.0 January 2000

### APPLICATIONS

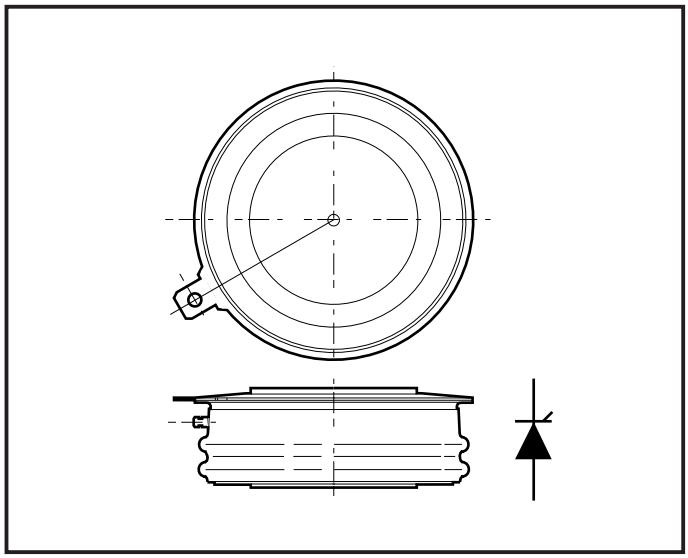
- High Frequency Applications
- Regulated Power Supplies
- Capacitor Discharge
- Ultrasonic Generators
- Induction Heating

### KEY PARAMETERS

| | |
|---|---|
| $V_{DRM}$ | 1800V |
| $I_{T(AV)}$ | 380A |
| $I_{TSM}$ | 6000A |
| dVdt | 1000V/µs |
| dI/dt | 500A/µs |
| $t_q$ | 10.0µs |

### FEATURES

- The ACR400SE is an asymmetric thyristor which has exceptionally fast turn-off capabilities combined with good turn-on characteristics.



**Outline type code: E.**
**See Package Details for further information.**

### VOLTAGE RATINGS

| Type Number | Repetitive Peak Off-state Voltage $V_{DRM}$ V | Repetitive Peak Reverse Voltage $V_{RRM}$ V |
|---|---|---|
| ACR400SE18 | 1800 | 10 |
| ACR400SE16 | 1600 | 10 |
| ACR400SE14 | 1400 | 10 |
| ACR400SE12 | 1200 | 10 |

**Lower voltage grades available.**

### CURRENT RATINGS

| Symbol | Parameter | Conditions | Max. | Units |
|---|---|---|---|---|
| **Double Side Cooled** | | | | |
| $I_{T(AV)}$ | Mean on-state current | Half wave resistive load, $T_{case}$ = 80°C | 380 | A |
| $I_{T(RMS)}$ | RMS value | $T_{case}$ = 80°C | 600 | A |
| $I_T$ | Continuous (direct) on-state current | $T_{case}$ = 80°C | 490 | A |
| **Single Side Cooled (Anode side)** | | | | |
| $I_{T(AV)}$ | Mean on-state current | Half wave resistive load, $T_{case}$ = 80°C | 240 | A |
| $I_{T(RMS)}$ | RMS value | $T_{case}$ = 80°C | 380 | A |
| $I_T$ | Continuous (direct) on-state current | $T_{case}$ = 80°C | 295 | A |

## SURGE RATINGS

| Symbol | Parameter | Conditions | Max. | Units |
|---|---|---|---|---|
| $I_{TSM}$ | Surge (non-repetitive) on-state current | 10ms half sine; $T_{case}$ = 125°C | 6.0 | kA |
| $I^2t$ | $I^2t$ for fusing | $V_R$ = 0 | 810 x $10^3$ | $A^2s$ |

## THERMAL AND MECHANICAL DATA

| Symbol | Parameter | Conditions | | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Thermal resistance - junction to case | Double side cooled | dc | - | 0.041 | °C/W |
| | | Single side cooled | Anode dc | - | 0.074 | °C/W |
| | | | Cathode dc | - | 0.092 | °C/W |
| $R_{th(c-h)}$ | Thermal resistance - case to heatsink | Clamping force 7.0kN with mounting compound | Double side | - | 0.018 | °C/W |
| | | | Single side | - | 0.036 | °C/W |
| $T_{vj}$ | Virtual junction temperature | On-state (conducting) | | - | 135 | °C |
| | | Reverse (blocking) | | - | 125 | °C |
| $T_{stg}$ | Storage temperature range | | | -55 | 125 | °C |
| - | Clamping force | | | 6.0 | 8.0 | kN |

## DYNAMIC CHARACTERISTICS

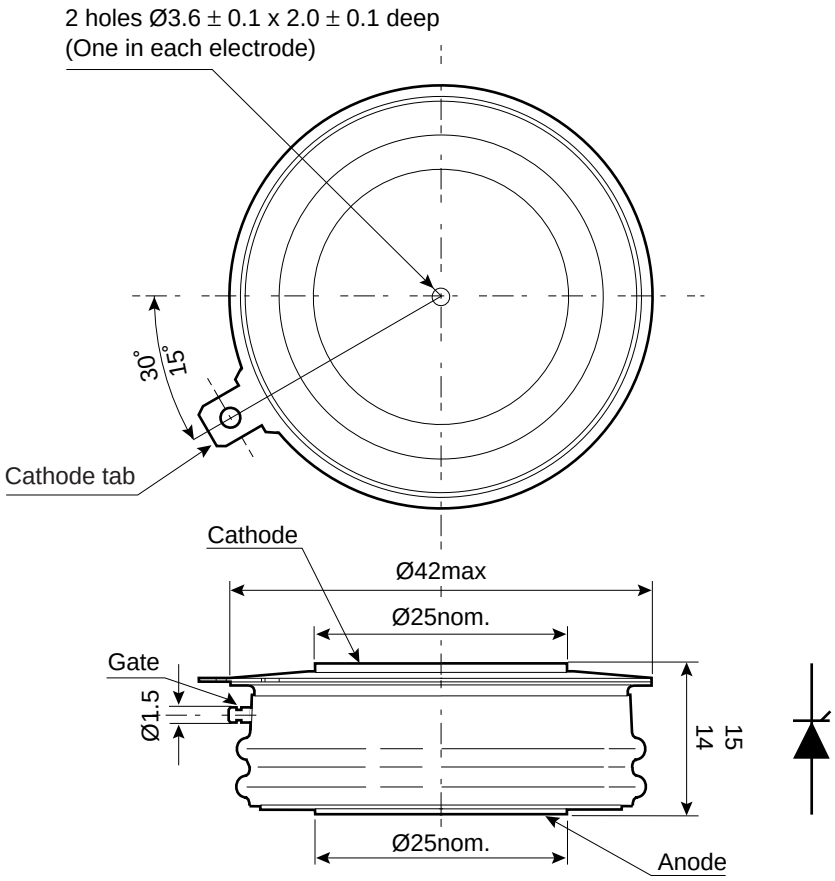
| Symbol | Parameter | Conditions | Min. | Max. | Units |
|---|---|---|---|---|---|
| $V_{TM}$ | Maximum on-state voltage | At 1500A peak, $T_{case}$ = 25°C | - | 3.25 | V |
| $I_{RRM}/I_{DRM}$ | Peak reverse and off-state current | At $V_{RRM}/V_{DRM}$, $T_{case}$ = 125°C | - | 60 | mA |
| dV/dt | Maximum linear rate of rise of off-state voltage | To $V_{DRM}$ $T_j$ = 125°C, Gate open circuit | - | 1000 | V/µs |
| dI/dt | Rate of rise of on-state current | From $V_{DRM}$ to 125A<br>Gate source 15V, 15Ω<br>$t_r$ = 50ns. | - | 500 | A/µs |
| $V_{T(TO)}$ | Threshold voltage | At $T_{vj}$ = 125°C | - | 1.8 | V |
| $r_T$ | On-state slope resistance | At $T_{vj}$ = 125°C | - | 0.9 | mΩ |
| $I_L$ | Latching current | - | 500 | - | mA |
| $I_H$ | Holding current | - | 100 | - | mA |
| $t_d$ | Delay time | $V_D$ = 300V, gate source = 15V, 15Ω | - | 800 | ns |
| $t_q$ | Turn-off time | $I_T$ = 500A, square wave 50µs pulse, $T_j$ = 120˚C, $dI_{RR}/dt$ = 50A/µs, dV/dt = 500V/µs to 75% $V_{DRM}$. | - | 10.0 | µs |

## GATE TRIGGER CHARACTERISTICS AND RATINGS

| Symbol | Parameter | Conditions | | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{GT}$ | Gate trigger voltage | $V_{DWM}$ = 12V, $R_L$ = 30Ω, $T_{case}$ = 25°C | | - | 5 | V |
| $I_{GT}$ | Gate trigger current | $V_{DWM}$ = 12V, $R_L$ = 30Ω, $T_{case}$ = 25°C | | - | 500 | mA |
| $V_{FGM}$ | Peak forward gate voltage | - | | - | 40 | V |
| $V_{RGM}$ | Peak reverse gate voltage | - | | - | 10 | V |
| $I_{FGM}$ | Peak forward gate current | - | | - | 10 | A |
| $P_{GM}$ | Peak gate power | - | | - | 40 | W |
| $P_{G(AV)}$ | Average gate power | Average time 10ms max | Forward | - | 10 | W |
| | | | Reverse | - | - | W |

## PACKAGE DETAILS

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.




Nominal weight: 82g
Clamping force: 8kN ±10%
Lead length: 420mm
Lead terminal connector: M4 ring

**Package outine type code: E**

## ASSOCIATED PUBLICATIONS

| Title | Application Note Number |
|---|---|
| Calculating the junction temperature or power semiconductors | AN4506 |
| Gate triggering and the use of gate characteristics | AN4840 |
| Recommendations for clamping power semiconductors | AN4839 |
| The effect of temperature on thyristor performance | AN4870 |
| Thyristor and diode measurement with a multi-meter | AN4853 |
| Turn-on performance of thyristors in parallel | AN4999 |
| Use of $V_{TO}$, $r_T$ on-state characteristic | AN5001 |

## POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the up to date CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete solution (PACs).

## DEVICE CLAMPS

Disc devices require the correct clamping force to ensure their safe operation. The PACs range offers a varied selection of pre-loaded clamps to suit all of our manufactured devices. This include cube clamps for single side cooling of 'T' 22mm

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

## HEATSINKS

Power Assembly has it's own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance or our semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest Sales Representative or the factory.

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