TN1605H-8x RTM
800 V High Temperature SCRs

Product Marketing SCR-Triac
Discrete & Filter Division
Automotive & Discrete Group
Why 800 V 150 °C SCR?

Controlling inrush power at start-up with reliable solution

The high temperature SCR drives bigger power in AC/DC portion thanks to its 800 V rated now at 150°C junction operations

- No more Electro-mechanical parts
- Meet IEC61000-4-x for Inrush limitation
- Converter efficiency improvement
- Low stand-by losses
- Easier-to-design drive circuit
- Strong immunity to external disturbances
Where to use 800 V 150 °C SCR?

**Consumer**
- TV SMPS
- Vacuum Cleaner
- Personal device charger
- E-bike chargers
- LED Light dimmer
- Smart plug

**Smart Appliances**
- Air Conditioning
- Induction heating
- Washing Machine
- Fridge
- Dish Washer

**Industrial**
- Server PS unit
- 5G repeater
- LED lighting
- AC Motor control
- Voltage regulator

**Renewable energy**
- Solar inverter
- UPS
- EV chargers
Topology trend for ICL in AC/DC converter

Migrate from electromechanical Relay to STMicroelectronics SCR

Application Benefits
- Power efficiency
- Power density
- Lifetime
- Acoustic noise
- Robustness to EMI
Performance comparison vs electromechanical relay

- **Power efficiency**
  - Relay 16 A: 97.72%
  - SCR: 98%
  - *based on efficiency measurement on a 1 kW AC/DC converter*

- **Power density**
  - Relay 16 A: 29 x 12.4 x 32.8 mm³
  - TO-220AB (I): 10 x 15.2 x 4.4 mm³
  - D²PAK: 4.3 x 10 x 8.95 mm³

- **EMI**
  - Relay 16 A: 50 k cycles
  - SCR: Billions of cycles

- **Acoustic noise**
  - Relay 16 A: 20-40 dB
  - SCR: 0 dB

- **Lifetime**
  - Relay 16 A: Contact ageing
  - SCR: Billions of cycles

- **Relay**
  - Relay 16 A: Slow turn-on with bounces
  - SCR: Fast turn-on

- **SCR**

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5 cm³

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11.8 cm³

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6.7 cm³

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3.8 cm³
High Temp. SCR in Digital Inrush Current Limiters

A reliable proposal to build any AC / DC rectifier bridge

By-pass parallel High-side SCRs
< 3.6 kW

Mixed Bridge
< 15 kW

Totem Pole Boost
< 8 kW

Standard input full bridge rectifier

Bridgeless - Totem pole PFC

Inrush current resistor used

Voltage control

No need of MCU

MCU driving
**KEY FEATURES**

- **Low side BYPASS or SMART Inrush Control**
  - Input AC voltage: 90-265 VAC, 50/60 Hz
  - Power range: from 50 W up to 1000 W
  - Robust and Immune: IEC 61000-4-5 surge: 2 kV
    
  IEC 61000-4-4 EFT burst: 4 kV min
  
  Low EMI Noise (EN 55014)

**KEY PRODUCTS**

- **TN1605H-8T** ➔ High TJ SCR in TO-220
- **Z0110MN** ➔ 1 A SMD TRIAC
- **STTH110A** ➔ 1 A Ultrafast Diode
**NTC bypass with High Temperature SCR**

**Example for a 1 kW / 230 V SMPS**

Improve your system overall efficiency by 0.4 to 0.6 %

- No acoustic noise
- High reliability
- No switch aging

![Circuit Diagram](chart)

**Efficiency of 1 kW PFC vs. output power load**

<table>
<thead>
<tr>
<th>Load (%)</th>
<th>RELAY Efficiency</th>
<th>SCR Efficiency</th>
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<tbody>
<tr>
<td>10%</td>
<td>96.35%</td>
<td>96.92%</td>
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<tr>
<td>20%</td>
<td>97.12%</td>
<td>97.50%</td>
</tr>
<tr>
<td>50%</td>
<td>97.50%</td>
<td>97.72%</td>
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<tr>
<td>100%</td>
<td>97.66%</td>
<td>97.75%</td>
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## TN1605H-8x Product offer tentative

**16 A 800 V High Temperature Silicon Controlled Rectifier**

<table>
<thead>
<tr>
<th>Package</th>
<th>Part Number</th>
<th>Samples availability</th>
<th>Release</th>
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<tbody>
<tr>
<td>DPAK</td>
<td>TN1605H-8B</td>
<td>Now</td>
<td>May 2023</td>
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<tr>
<td>D2PAK</td>
<td>TN1605H-8G</td>
<td>Now</td>
<td></td>
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<tr>
<td>TO-220AB</td>
<td>TN1605H-8T</td>
<td>Now</td>
<td>In MP</td>
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<tr>
<td>TO-220I</td>
<td>TN1605H-8I</td>
<td>Now</td>
<td></td>
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</tbody>
</table>
TN1605H-8 High Temperature SCR Features

800 V High Temperature SCR for robust and immune converters

**Rated for AC/DC converters**
- 800 V Repetitive off-state voltage for large range of application
- 150 °C fully rated for thermal vs compactness optimized designs
- 16 A rated controlled rectifier for up to 1 kW SMPS

**Optimized switching features**
- Tight triggering gate current 2 – 8 mA for accurate and easy control circuit
- 100 A/us turn-on dI/dt to manage high inrush current

**Immune to EMI disturbances**
- Extra 900 V on 10 ms off-state voltage for overvoltage surge management
- High dV/dt immunity up to 500 V/µs

**Package flexibility**
- Through-hole TO-220AB & TO-220AB-I for heatsink mounting
- SMD options with low thermal resistance DPAK & D2PAK
- Insulated TO-220AB is insulated package rated at RMS 2.5 kV UL1557
The TN1605H-8x challenge in 1 kW conversion

**ENGINEERING CHALLENGE** | **THYRISTOR SOLUTION** | **SYSTEM BENEFITS**
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Improve Immunity & Robustness | $V_{DSM} = 900 \text{ V;} \quad \frac{dV}{dt} = 500 \text{ V/µs}$ | Ease IEC 61000-4-x EMI std compliance

Provide reliability | 800 V 150°C reliable Thyristor With strong ITSM | Application inrush current management

Remove mechanical switch | AC/DC rectification with SCR | Compliance with RoHS

no EMI noise generation | No contact bouncing of a mechanical switch | Fit sensitive industrial electronics

No switch aging | Solid-State silicon switch | Lifetime savings
The TN1605H-8x of STMicroelectronics is a 16 ARMS 800 V SCR thyristor housed in SMD D2PAK and thermally efficient through-hole TO-220AB and TO-220I packages.

The ST Silicon Controlled Rectifier offers a reliable and efficient solution for controlling the inrush current of rectifier bridges and bridgeless PFC circuits in industrial environments. Dedicated to application up to 1 kW, this 16 Amps SCR is designed to meet the high-power requirements of modern industry, while maintaining high efficiency and minimizing energy waste.

With its high voltage and noise immunity of 500 V/μs, a turn-on current rise of 100 A/μs and a gate triggering current of 8 mA, it is easy to design a robust and compact control circuit in AC/DC converters for inrush current limiting circuits and industrial drives, such as overvoltage crowbar protection, motor control circuits and power tools.
Our technology starts with You

Find out more at www.st.com