

International  
**IR** Rectifier

## SAFEIR Series 25TTS..S

### SURFACE MOUNTABLE PHASE CONTROL SCR

#### Description/Features

The 25TTS..S **SAFEIR** series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125° C junction temperature.

Typical applications are in input rectification (soft start) and these products are designed to be used with International Rectifier input diodes, switches and output rectifiers which are available in identical package outlines.

|                                                                                   |           |               |
|-----------------------------------------------------------------------------------|-----------|---------------|
|  | $V_T$     | < 1.25V @ 16A |
|                                                                                   | $I_{TSM}$ | = 300A        |
|                                                                                   | $V_{RRM}$ | 800 to 1600V  |

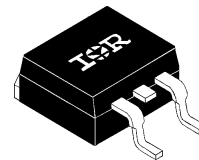
#### Output Current in Typical Applications

| Applications                                                       | Single-phase Bridge | Three-phase Bridge | Units |
|--------------------------------------------------------------------|---------------------|--------------------|-------|
| NEMA FR-4 or G10 glass fabric-based epoxy with 4 oz (140µm) copper | 3.5                 | 5.5                | A     |
| Aluminum IMS, $R_{thCA} = 15^\circ\text{C/W}$                      | 8.5                 | 13.5               |       |
| Aluminum IMS with heatsink, $R_{thCA} = 5^\circ\text{C/W}$         | 16.5                | 25.0               |       |

$T_A = 55^\circ\text{C}$ ,  $T_J = 125^\circ\text{C}$ , footprint 300mm<sup>2</sup>

#### Major Ratings and Characteristics

| Characteristics                        | 25TTS..S   | Units |
|----------------------------------------|------------|-------|
| $I_{T(AV)}$ Sinusoidal waveform        | 16         | A     |
| $I_{RMS}$                              | 25         | A     |
| $V_{RRM}/V_{DRM}$                      | up to 1600 | V     |
| $I_{TSM}$                              | 300        | A     |
| $V_T$ @ 16 A, $T_J = 25^\circ\text{C}$ | 1.25       | V     |
| dv/dt                                  | 500        | V/µs  |
| di/dt                                  | 150        | A/µs  |
| $T_J$                                  | -40 to 125 | °C    |



**D<sup>2</sup> PAK (SMD-220)**

## Voltage Ratings

| Part Number | $V_{RRM}$ , maximum<br>peak reverse voltage<br>V | $V_{DRM}$ , maximum<br>peak direct voltage<br>V | $I_{RRM}/I_{DRM}$<br>125°C<br>mA |
|-------------|--------------------------------------------------|-------------------------------------------------|----------------------------------|
| 25TTS08S    | 800                                              | 800                                             | 10                               |
| 25TTS12S    | 1200                                             | 1200                                            |                                  |
| 25TTS16S    | 1600                                             | 1600                                            |                                  |

## Absolute Maximum Ratings

| Parameters                       |                                        | 25TTS..S |      | Units             | Conditions                                                    |                                                           |
|----------------------------------|----------------------------------------|----------|------|-------------------|---------------------------------------------------------------|-----------------------------------------------------------|
| I <sub>T(AV)</sub>               | Max. Average On-state Current          | 16       |      | A                 | @ T <sub>C</sub> = 93° C, 180° conduction half sine wave      |                                                           |
| I <sub>RMS</sub>                 | Max. RMS On-state Current              | 25       |      |                   |                                                               |                                                           |
| I <sub>TSM</sub>                 | Max. Peak One Cycle Non-Repetitive     | 300      |      |                   | 10ms Sine pulse, rated V <sub>RRM</sub> applied               |                                                           |
|                                  | Surge Current                          | 350      |      |                   | 10ms Sine pulse, no voltage reapplied                         |                                                           |
| I <sup>2</sup> t                 | Max. I <sup>2</sup> t for fusing       | 450      |      | A <sup>2</sup> s  | 10ms Sine pulse, rated V <sub>RRM</sub> applied               |                                                           |
|                                  |                                        | 630      |      |                   | 10ms Sine pulse, no voltage reapplied                         |                                                           |
| I <sup>2</sup> √t                | Max. I <sup>2</sup> √t for fusing      | 6300     |      | A <sup>2</sup> √s | t = 0.1 to 10ms, no voltage reapplied                         |                                                           |
| V <sub>TM</sub>                  | Max. On-state Voltage Drop             | 1.25     |      | V                 | @ 16A, T <sub>J</sub> = 25° C                                 |                                                           |
| r <sub>t</sub>                   | On-state slope resistance              | 12.0     |      | mΩ                | T <sub>J</sub> = 125° C                                       |                                                           |
| V <sub>T(TO)</sub>               | Threshold Voltage                      | 1.0      |      | V                 |                                                               |                                                           |
| I <sub>RM</sub> /I <sub>DM</sub> | Max.Reverse and Direct                 | 0.5      |      | mA                | T <sub>J</sub> = 25° C                                        | V <sub>R</sub> = rated V <sub>RRM</sub> /V <sub>DRM</sub> |
|                                  | Leakage Current                        | 10       |      |                   | T <sub>J</sub> = 125° C                                       |                                                           |
| I <sub>H</sub>                   | Holding Current                        | Typ.     | Max. | mA                | Anode Supply = 6V, Resistive load, Initial I <sub>T</sub> =1A |                                                           |
|                                  |                                        | --       | 100  |                   | 25TTS08S, 25TTS12S                                            |                                                           |
|                                  |                                        | 100      | 150  |                   | 25TTS16S                                                      |                                                           |
| I <sub>L</sub>                   | Max. Latching Current                  | 200      |      | mA                | Anode Supply = 6V, Resistive load                             |                                                           |
| dv/dt                            | Max. Rate of Rise of off-state Voltage | 500      |      | V/μs              |                                                               |                                                           |
| di/dt                            | Max. Rate of Rise of turned-on Current | 150      |      | A/μs              |                                                               |                                                           |

### Triggering

| Parameters                                        | 25TTS..S | Units | Conditions                                                   |
|---------------------------------------------------|----------|-------|--------------------------------------------------------------|
| $P_{GM}$ Max. peak Gate Power                     | 8.0      | W     |                                                              |
| $P_{G(AV)}$ Max. average Gate Power               | 2.0      |       |                                                              |
| $+I_{GM}$ Max. peak positive Gate Current         | 1.5      | A     |                                                              |
| $-V_{GM}$ Max. peak negative Gate Voltage         | 10       | V     |                                                              |
| $I_{GT}$ Max. required DC Gate Current to trigger | 60       | mA    | Anode supply = 6V, resistive load, $T_J = -10^\circ\text{C}$ |
|                                                   | 45       |       | Anode supply = 6V, resistive load, $T_J = 25^\circ\text{C}$  |
|                                                   | 20       |       | Anode supply = 6V, resistive load, $T_J = 125^\circ\text{C}$ |
| $V_{GT}$ Max. required DC Gate Voltage to trigger | 2.5      | V     | Anode supply = 6V, resistive load, $T_J = -10^\circ\text{C}$ |
|                                                   | 2.0      |       | Anode supply = 6V, resistive load, $T_J = 25^\circ\text{C}$  |
|                                                   | 1.0      |       | Anode supply = 6V, resistive load, $T_J = 125^\circ\text{C}$ |
| $V_{GD}$ Max. DC Gate Voltage not to trigger      | 0.25     |       | $T_J = 125^\circ\text{C}$ , $V_{DRM}$ = rated value          |
| $I_{GD}$ Max. DC Gate Current not to trigger      | 2.0      | mA    | $T_J = 125^\circ\text{C}$ , $V_{DRM}$ = rated value          |

### Switching

| Parameters                             | 25TTS..S | Units         | Conditions                |
|----------------------------------------|----------|---------------|---------------------------|
| $t_{gt}$ Typical turn-on time          | 0.9      | $\mu\text{s}$ | $T_J = 25^\circ\text{C}$  |
| $t_{rr}$ Typical reverse recovery time | 4        |               | $T_J = 125^\circ\text{C}$ |
| $t_q$ Typical turn-off time            | 110      |               |                           |

### Thermal-Mechanical Specifications

| Parameters                                                           | 25TTS..S                     | Units              | Conditions                       |
|----------------------------------------------------------------------|------------------------------|--------------------|----------------------------------|
| $T_J$ Max. Junction Temperature Range                                | -40 to 125                   | $^\circ\text{C}$   |                                  |
| $T_{stg}$ Max. Storage Temperature Range                             | -40 to 125                   | $^\circ\text{C}$   |                                  |
| Soldering Temperature                                                | 240                          | $^\circ\text{C}$   | for 10 seconds (1.6mm from case) |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case                  | 1.1                          | $^\circ\text{C/W}$ | DC operation                     |
| $R_{thJA}$ Typ. Thermal Resistance Junction to Ambient (PCB Mount)** | 40                           | $^\circ\text{C/W}$ |                                  |
| wt Approximate Weight                                                | 2 (0.07)                     | g (oz.)            |                                  |
| T Case Style                                                         | D <sup>2</sup> Pak (SMD-220) |                    |                                  |

\*\*When mounted on 1" square (650mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz (140 $\mu\text{m}$ ) copper 40 $^\circ\text{C/W}$   
For recommended footprint and soldering techniques refer to application note #AN-994

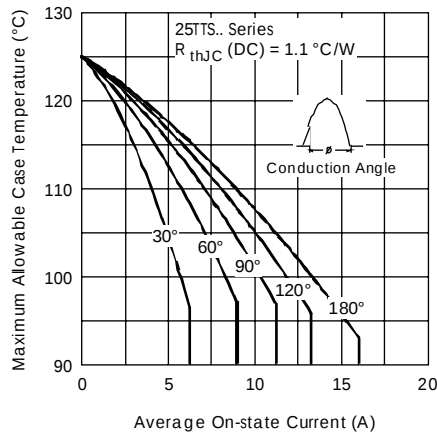


Fig. 1 - Current Rating Characteristics

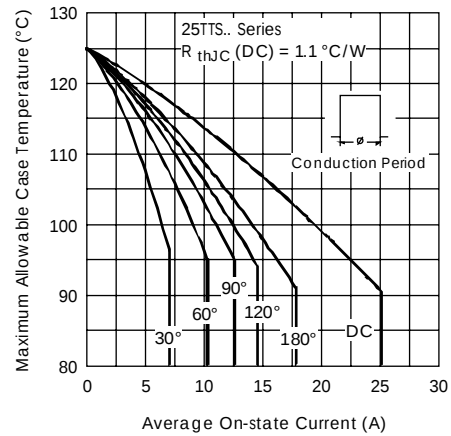


Fig. 2 - Current Rating Characteristics

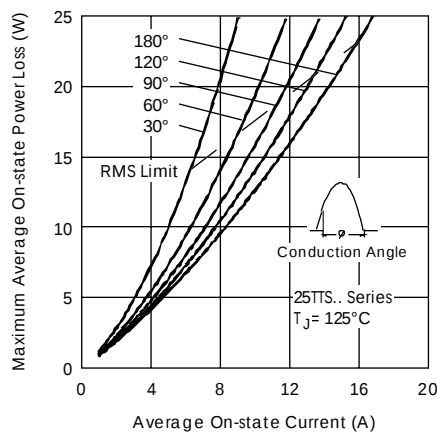


Fig. 3 - On-state Power Loss Characteristics

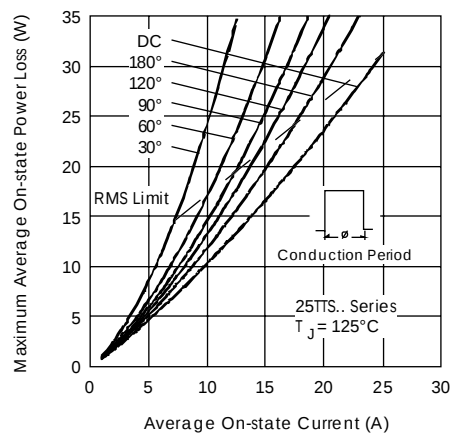


Fig. 4 - On-state Power Loss Characteristics

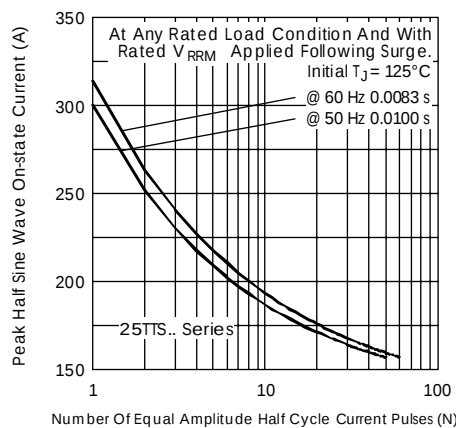


Fig. 5 - Maximum Non-Repetitive Surge Current

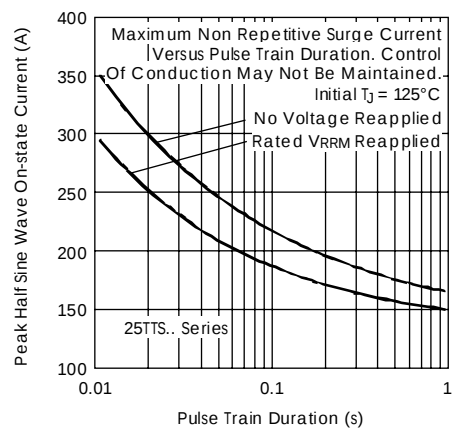


Fig. 6 - Maximum Non-Repetitive Surge Current

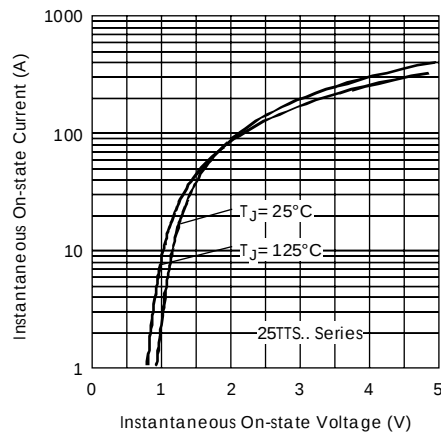


Fig. 7 - On-state Voltage Drop Characteristics

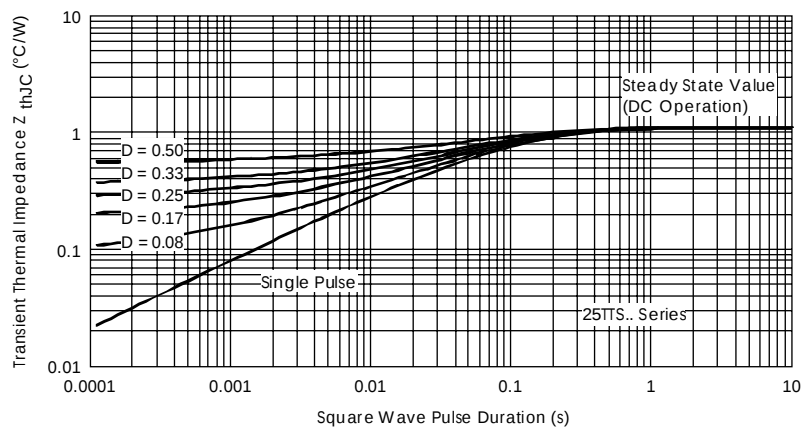


Fig. 8 - Gate Characteristics

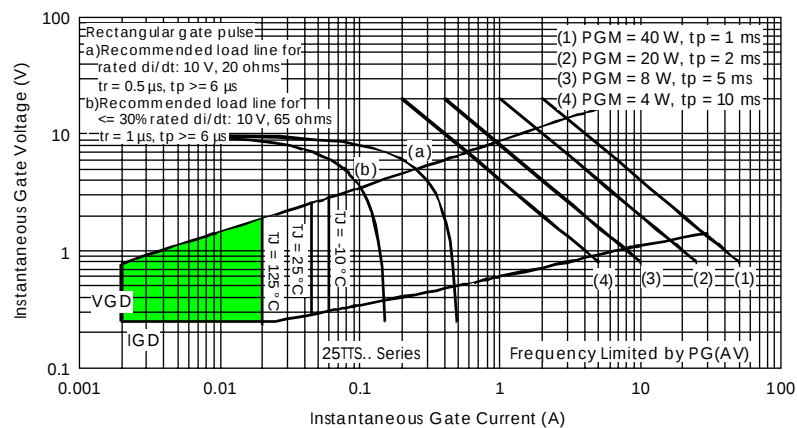


Fig. 9 - Thermal Impedance  $Z_{thJC}$  Characteristics

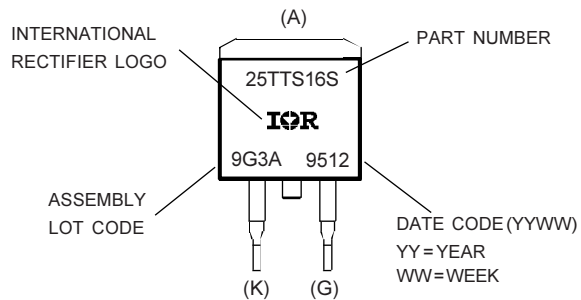
## 25TTS..S *SAFEIR* Series

Bulletin I2117 rev. D 12/98

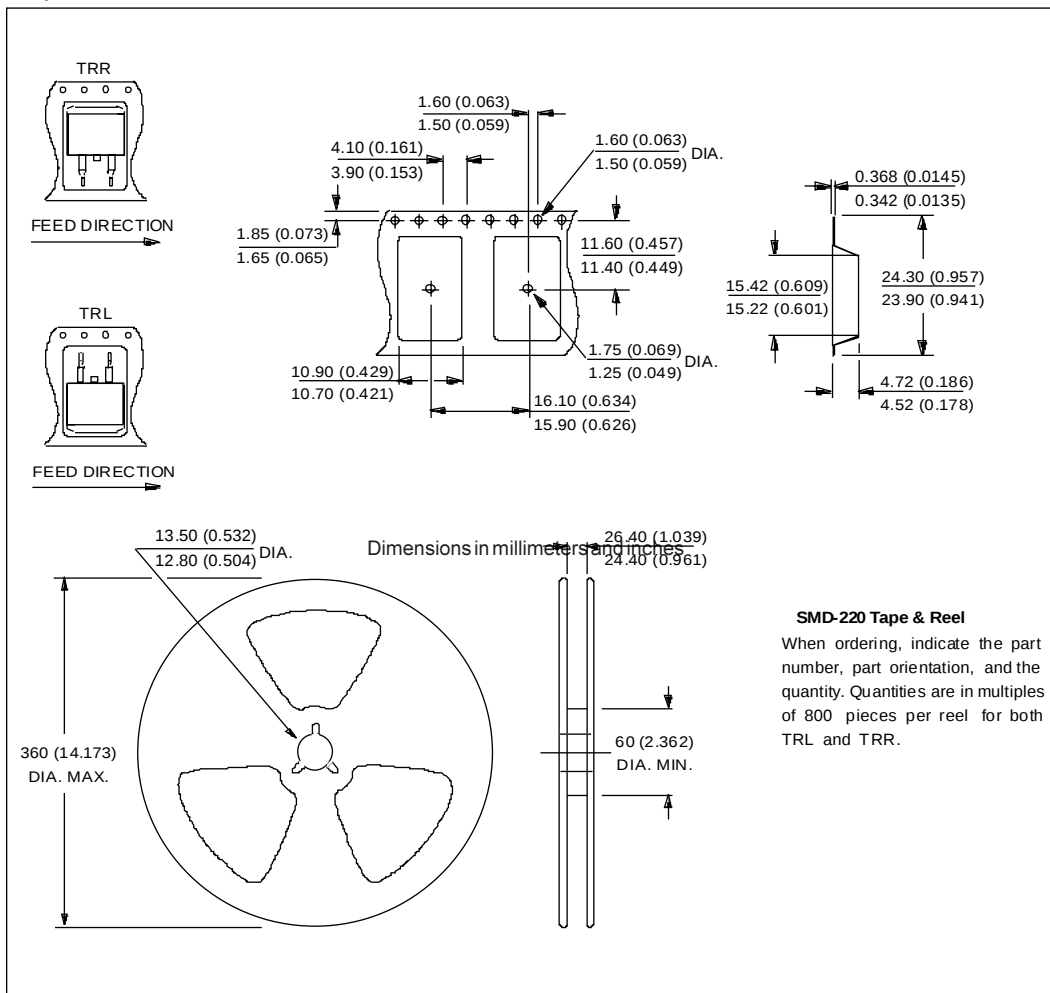
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### Marking Information

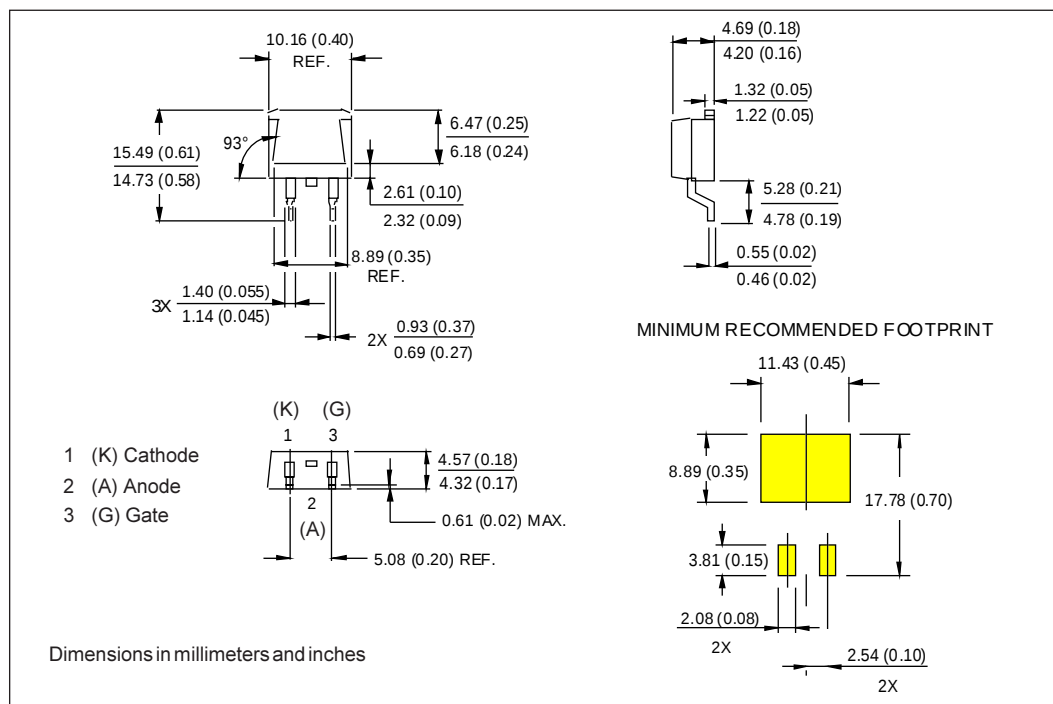
EXAMPLE: THIS IS AN 25TTS16S



### Tape & Reel Information



## Outline Table



## Ordering Information Table

| Device Code |                                                   |   |   |    |   |     |
|-------------|---------------------------------------------------|---|---|----|---|-----|
| 25          | T                                                 | T | S | 16 | S | TRL |
| ①           | ②                                                 | ③ | ④ | ⑤  | ⑥ | ⑦   |
| 1           | - Current Rating, RMS value                       |   |   |    |   |     |
| 2           | - Circuit Configuration                           |   |   |    |   |     |
|             | T = Single Thyristor                              |   |   |    |   |     |
| 3           | - Package                                         |   |   |    |   |     |
|             | T = TO-220AC                                      |   |   |    |   |     |
| 4           | - Type of Silicon                                 |   |   |    |   |     |
|             | S = Converter Grade                               |   |   |    |   |     |
| 5           | - Voltage code: Code x 100 = $V_{RRM}$            |   |   |    |   |     |
| 6           | - S = TO-220 D <sup>2</sup> Pak (SMD 220) Version |   |   |    |   |     |
| 7           | - Tape and Reel Option                            |   |   |    |   |     |
|             | TRL = Left Reel                                   |   |   |    |   |     |
|             | TRR = Right Orientation Reel                      |   |   |    |   |     |

|    |         |
|----|---------|
| 08 | = 800V  |
| 12 | = 1200V |
| 16 | = 1600V |

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