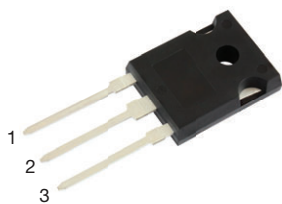
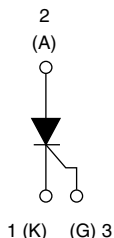


# Thyristor High Voltage, Phase Control SCR, 30 A



TO-247AD 3L



## FEATURES

- Designed and qualified according to JEDEC® - JESD 47
- Flexible solution for reliable AC power rectification
- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Typical usage is in input rectification crowbar (soft start) and AC switch in motor control, UPS, welding and battery charge

## DESCRIPTION

The VS-30TPS12L-M3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. AEC-Q101 qualified P/N available (VS-30TPS12LHM3).

## PRIMARY CHARACTERISTICS

|                       |                   |
|-----------------------|-------------------|
| $I_{T(AV)}$           | 20 A              |
| $V_{DRM}/V_{RRM}$     | 1200 V            |
| $V_{TM}$              | 1.3 V             |
| $I_{GT}$              | 45 mA             |
| $T_J$                 | -40 °C to +125 °C |
| Package               | TO-247AD 3L       |
| Circuit configuration | Single SCR        |

## MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER         | TEST CONDITIONS            | VALUES      | UNITS |
|-------------------|----------------------------|-------------|-------|
| $I_{T(AV)}$       | Sinusoidal waveform        | 20          | A     |
| $I_{RMS}$         |                            | 30          |       |
| $V_{RRM}/V_{DRM}$ |                            | 1200        | V     |
| $I_{TSM}$         |                            | 300         | A     |
| $V_T$             | 20 A, $T_J = 25\text{ °C}$ | 1.3         | V     |
| dv/dt             |                            | 500         | V/μs  |
| di/dt             |                            | 150         | A/μs  |
| $T_J$             |                            | -40 to +125 | °C    |

## VOLTAGE RATINGS

| PART NUMBER    | $V_{RRM}/V_{DRM}$ , MAXIMUM<br>REPETITIVE PEAK AND<br>OFF-STATE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM<br>NON-REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | $I_{RRM}/I_{DRM}$<br>AT 125 °C<br>mA |
|----------------|------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------|
| VS-30TPS12L-M3 | 1200                                                                         | 1300                                                               | 10                                   |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                                            | SYMBOL          | TEST CONDITIONS                                                                                     | VALUES     | UNITS         |
|------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|------------|---------------|
| Maximum average on-state current                     | $I_{T(AV)}$     | $T_C = 95\text{ }^{\circ}\text{C}$ , 180° conduction half sine wave                                 | 20         | A             |
| Maximum RMS on-state current                         | $I_{RMS}$       |                                                                                                     | 30         |               |
| Maximum peak, one-cycle non-repetitive surge current | $I_{TSM}$       | 10 ms sine pulse, rated $V_{RRM}$ applied<br>10 ms sine pulse, no voltage reapplied                 | 250<br>300 |               |
| Maximum $I^2t$ for fusing                            | $I^2t$          | 10 ms sine pulse, rated $V_{RRM}$ applied<br>10 ms sine pulse, no voltage reapplied                 | 310<br>442 | $A^2s$        |
| Maximum $I^2\sqrt{t}$ for fusing                     | $I^2\sqrt{t}$   | $t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied                                          | 4420       | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop                        | $V_{TM}$        | 20 A, $T_J = 25\text{ }^{\circ}\text{C}$                                                            | 1.3        | V             |
| On-state slope resistance                            | $r_t$           | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 | 12         | $m\Omega$     |
| Threshold voltage                                    | $V_{T(TO)}$     |                                                                                                     | 1.0        | V             |
| Maximum reverse and direct leakage current           | $I_{RM}/I_{DM}$ | $T_J = 25\text{ }^{\circ}\text{C}$<br>$T_J = 125\text{ }^{\circ}\text{C}$                           | 0.5<br>10  | mA            |
| Maximum holding current                              | $I_H$           | Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$ | 150        |               |
| Maximum latching current                             | $I_L$           | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$                              | 200        |               |
| Maximum rate of rise of off-state voltage            | $dv/dt$         | $T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_g\text{-k} = \text{open}$                        | 500        | V/ $\mu s$    |
| Maximum rate of rise of turned-on current            | $di/dt$         |                                                                                                     | 150        | A/ $\mu s$    |

**TRIGGERING**

| PARAMETER                                   | SYMBOL      | TEST CONDITIONS                                                                                                                                                                                                              | VALUES            | UNITS |
|---------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------|
| Maximum peak gate power                     | $P_{GM}$    |                                                                                                                                                                                                                              | 8.0               | W     |
| Maximum average gate power                  | $P_{G(AV)}$ |                                                                                                                                                                                                                              | 2.0               |       |
| Maximum peak positive gate current          | $+I_{GM}$   |                                                                                                                                                                                                                              | 1.5               | A     |
| Maximum peak negative gate voltage          | $-V_{GM}$   |                                                                                                                                                                                                                              | 10                | V     |
| Maximum required DC gate current to trigger | $I_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$<br>Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$<br>Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 60<br>45<br>20    | mA    |
| Maximum required DC gate voltage to trigger | $V_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$<br>Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$<br>Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 2.5<br>2.0<br>1.0 |       |
| Maximum DC gate voltage not to trigger      | $V_{GD}$    | $T_J = 125\text{ }^{\circ}\text{C}$ , $V_{DRM} = \text{rated value}$                                                                                                                                                         | 0.25              | mA    |
| Maximum DC gate current not to trigger      | $I_{GD}$    |                                                                                                                                                                                                                              | 2.0               |       |

**SWITCHING**

| PARAMETER                     | SYMBOL   | TEST CONDITIONS                     | VALUES | UNITS   |
|-------------------------------|----------|-------------------------------------|--------|---------|
| Typical turn-on time          | $t_{gt}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.9    | $\mu s$ |
| Typical reverse recovery time | $t_{rr}$ | $T_J = 125\text{ }^{\circ}\text{C}$ | 4      |         |
| Typical turn-off time         | $t_q$    |                                     | 110    |         |



| THERMAL AND MECHANICAL SPECIFICATIONS           |                                   |                                      |            |                        |
|-------------------------------------------------|-----------------------------------|--------------------------------------|------------|------------------------|
| PARAMETER                                       | SYMBOL                            | TEST CONDITIONS                      | VALUES     | UNITS                  |
| Maximum junction and storage temperature range  | T <sub>J</sub> , T <sub>Stg</sub> |                                      | -40 to 125 | °C                     |
| Maximum thermal resistance, junction to case    | R <sub>thJC</sub>                 | DC operation                         | 0.8        | °C/W                   |
| Maximum thermal resistance, junction to ambient | R <sub>thJA</sub>                 |                                      | 40         |                        |
| Maximum thermal resistance, case to heatsink    | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.25       |                        |
| Approximate weight                              |                                   |                                      | 6          | g                      |
|                                                 |                                   |                                      | 0.21       | oz.                    |
| Mounting torque                                 | minimum                           |                                      | 6 (5)      | kgf · cm<br>(lbf · in) |
|                                                 | maximum                           |                                      | 12 (10)    |                        |
| Marking device                                  |                                   | Case style TO-247AD 3L               | 30TPS12L   |                        |

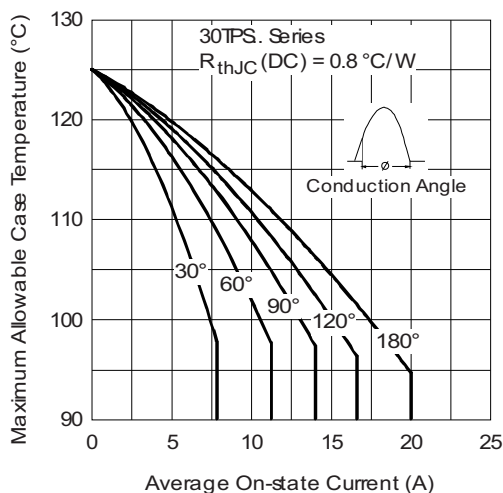


Fig. 1 - Current Rating Characteristics

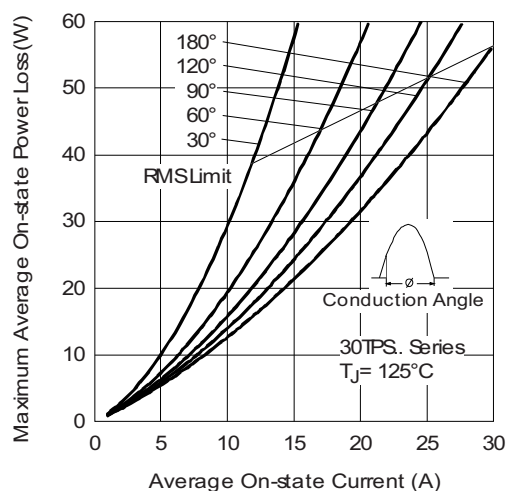


Fig. 3 - On-State Power Loss Characteristics

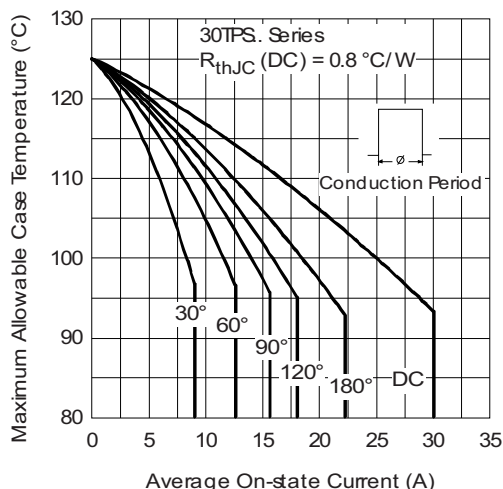


Fig. 2 - Current Rating Characteristics

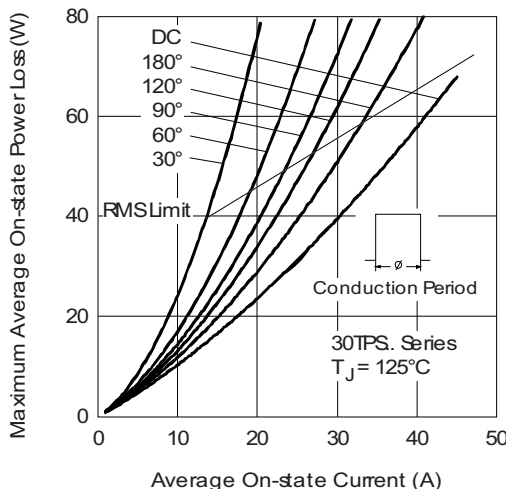


Fig. 4 - On-State Power Loss Characteristics

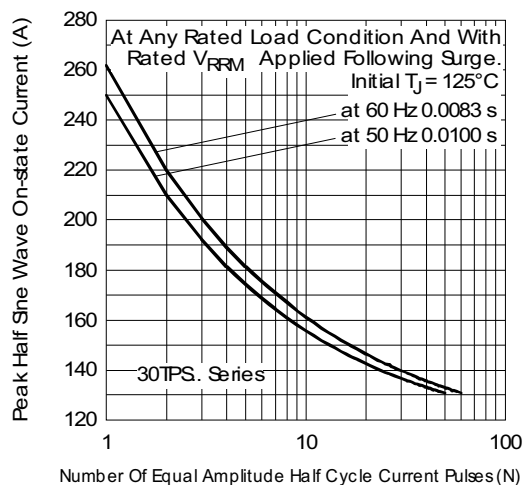


Fig. 5 - Maximum Non-Repetitive Surge Current

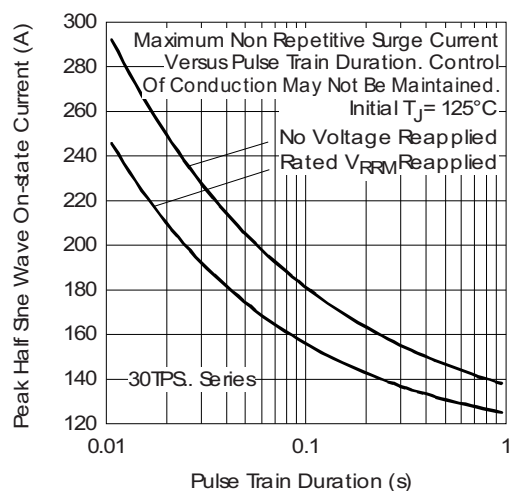


Fig. 6 - Maximum Non-Repetitive Surge Current

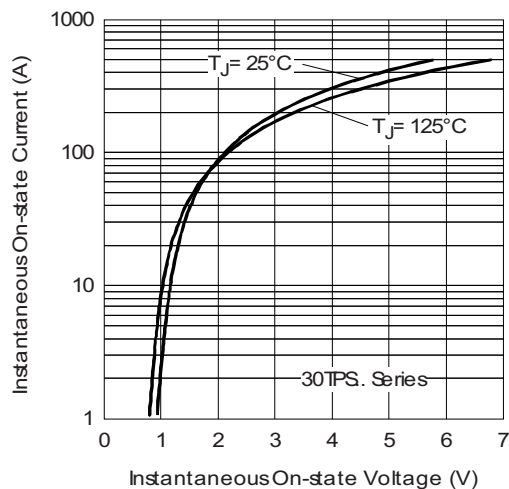
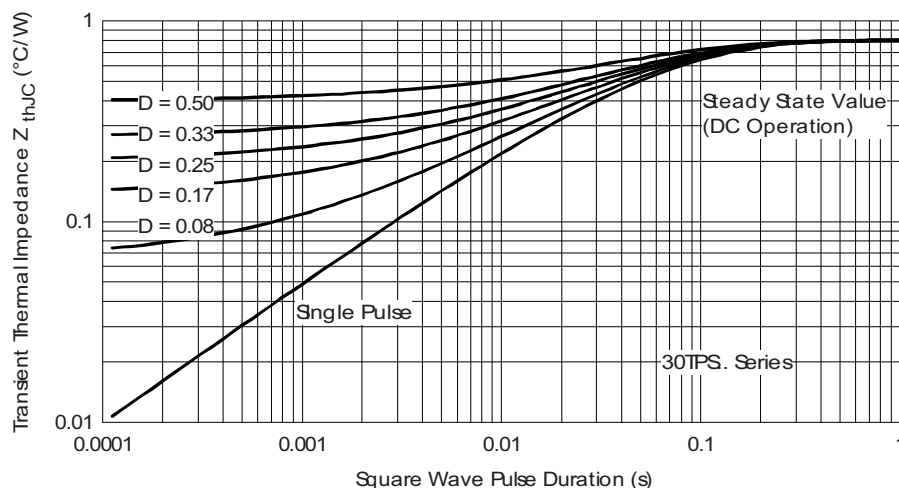


Fig. 7 - On-State Voltage Drop Characteristics


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

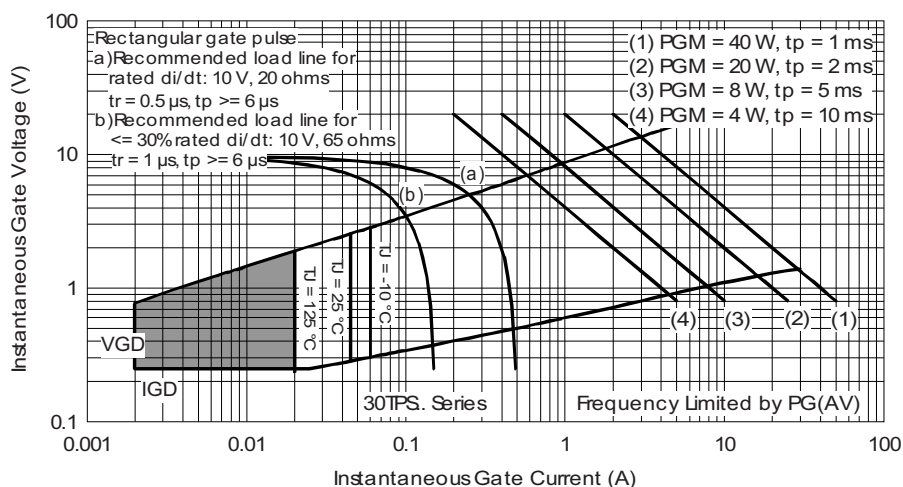


Fig. 9 - Gate Characteristics

## ORDERING INFORMATION TABLE

| Device code | VS-                                                                                         | 30 | T | P | S | 12 | L | -M3 |
|-------------|---------------------------------------------------------------------------------------------|----|---|---|---|----|---|-----|
|             | 1                                                                                           | 2  | 3 | 4 | 5 | 6  | 7 | 8   |
| 1           | Vishay Semiconductors product                                                               |    |   |   |   |    |   |     |
| 2           | Current rating (30 = 30 A)                                                                  |    |   |   |   |    |   |     |
| 3           | Circuit configuration:<br>T = Thyristor                                                     |    |   |   |   |    |   |     |
| 4           | P = TO-247 package                                                                          |    |   |   |   |    |   |     |
| 5           | Type of silicon:<br>S = Standard recovery rectifier                                         |    |   |   |   |    |   |     |
| 6           | Voltage code x 100 = $V_{RRM}$ ——— 12 = 1200 V                                              |    |   |   |   |    |   |     |
| 7           | Package L = long lead                                                                       |    |   |   |   |    |   |     |
| 8           | Environmental digit:<br>-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free |    |   |   |   |    |   |     |

| ORDERING INFORMATION (Example) |                   |                        |                          |
|--------------------------------|-------------------|------------------------|--------------------------|
| PREFERRED P/N                  | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-30TPS12L-M3                 | 25                | 500                    | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |             |                                                                        |
|----------------------------|-------------|------------------------------------------------------------------------|
| Dimensions                 | TO-247AD 3L | <a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a> |
| Part marking information   | TO-247AD 3L | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |



### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.34  | 0.065  | 0.092 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |

| SYMBOL    | MILLIMETERS |       | INCHES    |       | NOTES |
|-----------|-------------|-------|-----------|-------|-------|
|           | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D2        | 0.51        | 1.30  | 0.020     | 0.051 |       |
| E         | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1        | 13.46       | -     | 0.53      | -     |       |
| e         | 5.46 BSC    |       | 0.215 BSC |       |       |
| $\Phi K$  | 0.254       |       | 0.010     |       |       |
| L         | 19.81       | 20.32 | 0.780     | 0.800 |       |
| L1        | 3.71        | 4.29  | 0.146     | 0.169 |       |
| $\Phi P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\Phi P1$ | -           | 6.98  | -         | 0.275 |       |
| Q         | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R         | 4.52        | 5.49  | 0.178     | 0.216 |       |
| S         | 5.51 BSC    |       | 0.217 BSC |       |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\Phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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