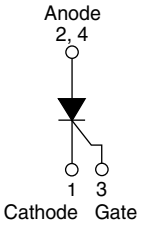
# Thyristor Surface Mount, Phase Control SCR, 16 A


D²PAK (TO-263AB)




## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see EKOWEISS Semiconductors

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

- Input rectification (soft start)
- Ekoweiss input diodes, switches and output rectifiers which are available in identical package outlines

## DESCRIPTION

The EKS-25TTS16S-M3 of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125 °C junction temperature.

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{T(AV)}$ | 16 A |
| $V_{DRM}/V_{RRM}$ | 1600 V |
| $V_{TM}$ | 1.25 V |
| $I_{GT}$ | 45 mA |
| $T_J$ | -40 to +125 °C |
| Package | D²PAK (TO-263AB) |
| Circuit configuration | Single SCR |

| 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. (140 µm) copper | 3.5 | 5.5 | A |
| Aluminum IMS, $R_{thCA}$ = 15 °C/W | 8.5 | 13.5 | |
| Aluminum IMS with heatsink, $R_{thCA}$ = 5 °C/W | 16.5 | 25.0 | |

**Note**

- $T_A$ = 55 °C, $T_J$ = 125 °C, footprint 300 mm²

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| PARAMETER | TEST CONDITIONS | VALUES | UNITS |
| $I_{T(AV)}$ | Sinusoidal waveform | 16 | A |
| $I_{RMS}$ | | 25 | |
| $V_{RRM}/V_{DRM}$ | | 1600 | V |
| $I_{TSM}$ | | 350 | A |
| $V_T$ | 16 A, $T_J$ = 25 °C | 1.25 | V |
| dV/dt | | 500 | V/µs |
| dI/dt | | 150 | A/µs |
| $T_J$ | | -40 to +125 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PART NUMBER | $V_{RRM}$, MAXIMUM PEAK REVERSE VOLTAGE V | $V_{DRM}$, MAXIMUM PEAK DIRECT VOLTAGE V | $I_{RRM}/I_{DRM}$, AT 125 °C mA |
| EKS-25TTS16S-M3 | 1600 | 1600 | 10 |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES TYP. | VALUES MAX. | UNITS |
|---|---|---|---|---|---|
| Maximum average on-state current | $I_{T(AV)}$ | $T_C$ = 93 °C, 180° conduction half sine wave | 16 | | A |
| Maximum RMS on-state current | $I_{RMS}$ | | 25 | | A |
| Maximum peak, one-cycle, non-repetitive surge current | $I_{TSM}$ | 10 ms sine pulse, rated $V_{RRM}$ applied | 300 | | A |
| | | 10 ms sine pulse, no voltage reapplied | 350 | | A |
| Maximum $I^2t$ for fusing | $I^2t$ | 10 ms sine pulse, rated $V_{RRM}$ applied | 450 | | $A^2s$ |
| | | 10 ms sine pulse, no voltage reapplied | 630 | | $A^2s$ |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | 6300 | | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop | $V_{TM}$ | 16 A, $T_J$ = 25 °C | 1.25 | | V |
| On-state slope resistance | $r_t$ | $T_J$ = 125 °C | 12.0 | | mΩ |
| Threshold voltage | $V_{T(TO)}$ | $T_J$ = 125 °C | 1.0 | | V |
| Maximum reverse and direct leakage current | $I_{RM}/I_{DM}$ | $T_J$ = 25 °C, $V_R$ = rated $V_{RRM}/V_{DRM}$ | 0.5 | | mA |
| | | $T_J$ = 125 °C, $V_R$ = rated $V_{RRM}/V_{DRM}$ | 10 | | mA |
| Holding current | $I_H$ | Anode supply = 6 V, resistive load, initial $I_T$ = 1 A, $T_J$ = 25 °C | - | 150 | mA |
| Maximum latching current | $I_L$ | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 200 | | mA |
| Maximum rate of rise of off-state voltage | dV/dt | $T_J$ = $T_J$ max., linear to 80 %, $V_{DRM}$ = $R_g$ - k = open | 500 | | V/µs |
| Maximum rate of rise of turned-on current | dI/dt | | 150 | | A/µs |

## 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 | W |
| 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 °C | 60 | mA |
| | | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 45 | mA |
| | | Anode supply = 6 V, resistive load, $T_J$ = 125 °C | 20 | mA |
| Maximum required DC gate voltage to trigger | $V_{GT}$ | Anode supply = 6 V, resistive load, $T_J$ = -10 °C | 2.5 | V |
| | | Anode supply = 6 V, resistive load, $T_J$ = 25 °C | 2.0 | V |
| | | Anode supply = 6 V, resistive load, $T_J$ = 125 °C | 1.0 | V |
| Maximum DC gate voltage not to trigger | $V_{GD}$ | $T_J$ = 125 °C, $V_{DRM}$ = rated value | 0.25 | V |
| Maximum DC gate current not to trigger | $I_{GD}$ | | 2.0 | mA |

## SWITCHING

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Typical turn-on time | $t_{gt}$ | $T_J$ = 25 °C | 0.9 | µs |
| Typical reverse recovery time | $t_{rr}$ | $T_J$ = 125 °C | 4 | µs |
| Typical turn-off time | $t_q$ | $T_J$ = 125 °C | 110 | µs |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **VALUES** | **UNITS** |
| Maximum junction and storage temperature range | $T_J$, $T_{Stg}$ | | -40 to +125 | °C |
| Maximum thermal resistance, junction to case | $R_{thJC}$ | DC operation | 1.1 | °C/W |
| Typical thermal resistance, junction to ambient (PCB mount) | $R_{thJA}$ (1) | | 40 | °C/W |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Marking device | | Case style $D^2PAK$ (TO-263AB) | 25TTS16S | |

**Note**

(1) When mounted on 1" square (650 $mm^2$) PCB of FR-4 or G-10 material 4 oz. (140 µm] copper 40 °C/W.
For recommended footprint and soldering techniques refer to application note #AN-994

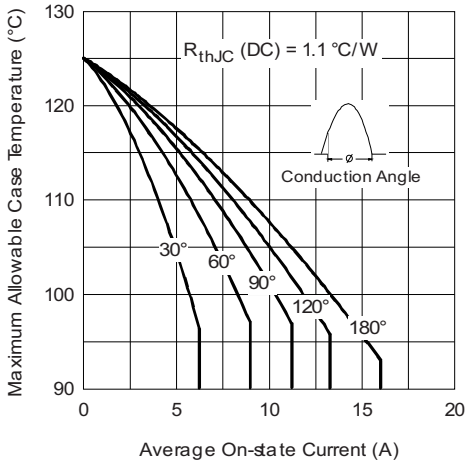



Fig. 1 - Current Rating Characteristics

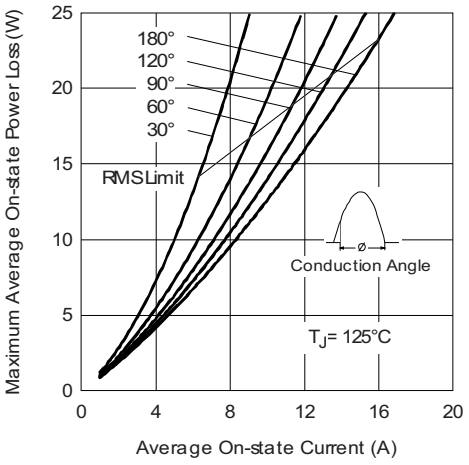



Fig. 3 - On-State Power Loss Characteristics

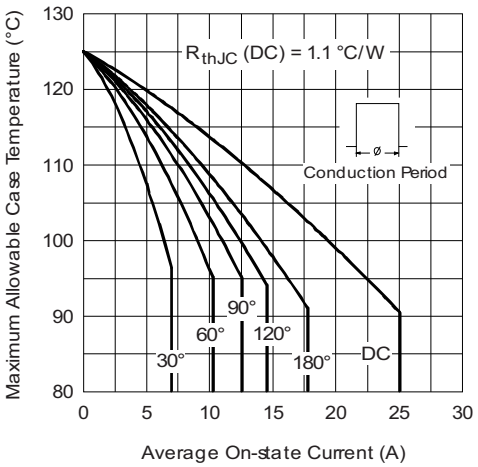



Fig. 2 - Current Rating Characteristics

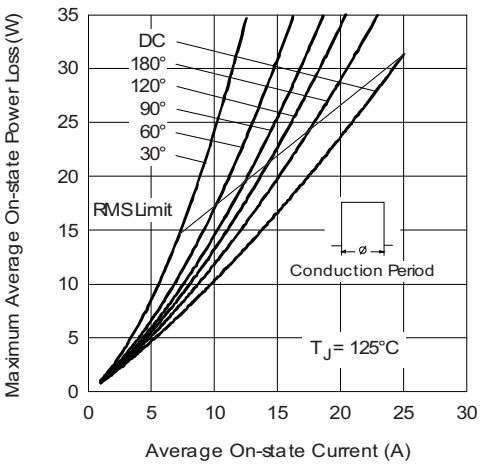



Fig. 4 - On-State Power Loss Characteristics

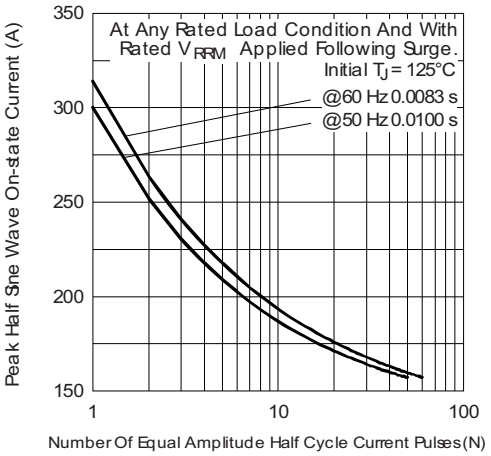



Fig. 5 - Maximum Non-Repetitive Surge Current

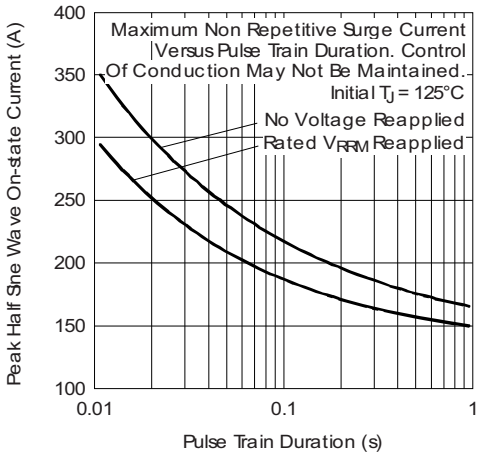



Fig. 6 - Maximum Non-Repetitive Surge Current

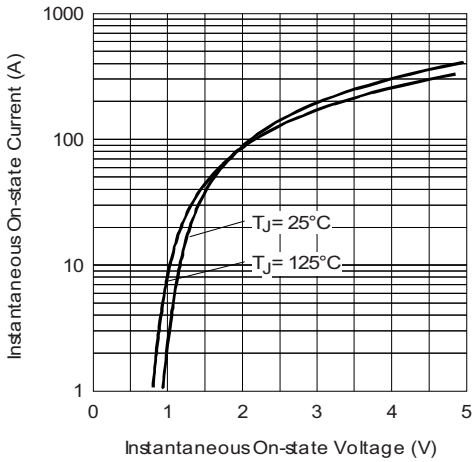



Fig. 7 - On-State Voltage Drop Characteristics

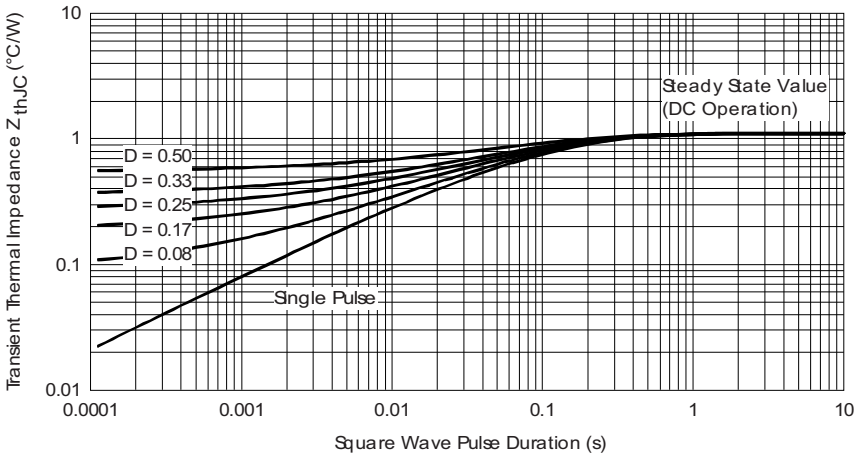



Fig. 8 - Gate Characteristics

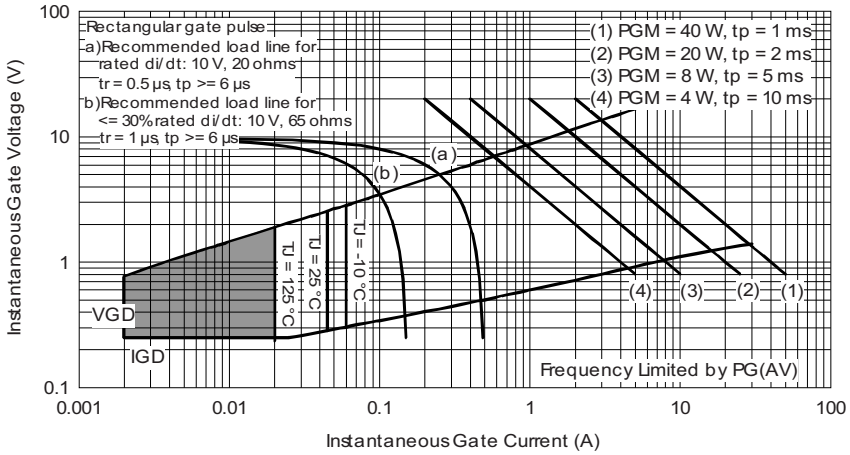



Fig. 9 - Thermal Impedance $Z_{thJC}$ Characteristics

## ORDERING INFORMATION TABLE

Device code

| EKS- | 25 | T | T | S | 16 | S | TRL | -M3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

1 - EKOWEISS Semiconductors product

2 - Current rating (25 = 25 A)

3 - Circuit configuration:
T = single thyristor

4 - Package:
T = $D^2PAK$ (TO-263AB)

5 - Type of silicon:
S = standard recovery rectifier

6 - Voltage rating: Voltage code x 100 = $V_{RRM}$ — 16 = 1600 V

7 - S = surface mountable

8 - • None = tube
• TRL = tape and reel (left oriented)
• TRR = tape and reel (right oriented)

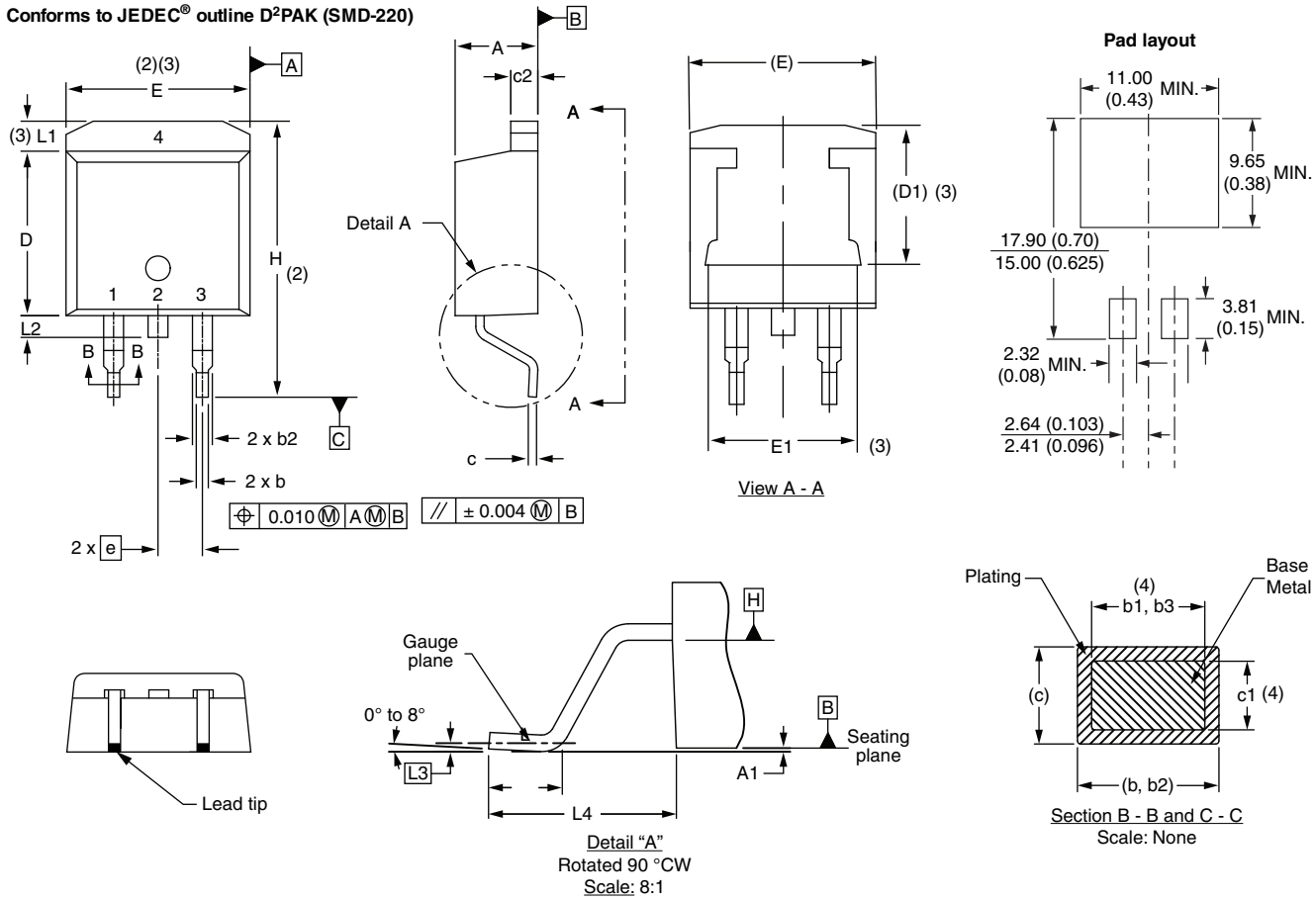
9 - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | |
|---|---|---|
| **PREFERRED P/N** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| EKS-25TTS16S-M3 | 50 | Antistatic plastic tubes |
| EKS-25TTS16STRL-M3 | 800 | 13" diameter plastic tape and reel |
| EKS-25TTS16STRR-M3 | 800 | 13" diameter plastic tape and reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | EKOWEISS Semiconductors |
| Part marking information | EKOWEISS Semiconductors |
| Packaging information | EKOWEISS Semiconductors |

# D²PAK

**DIMENSIONS** in millimeters and inches




| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 4.06 | 4.83 | 0.160 | 0.190 | |
| A1 | 0.00 | 0.254 | 0.000 | 0.010 | |
| b | 0.51 | 0.99 | 0.020 | 0.039 | |
| b1 | 0.51 | 0.89 | 0.020 | 0.035 | 4 |
| b2 | 1.14 | 1.78 | 0.045 | 0.070 | |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 |
| c | 0.38 | 0.74 | 0.015 | 0.029 | |
| c1 | 0.38 | 0.58 | 0.015 | 0.023 | 4 |
| c2 | 1.14 | 1.65 | 0.045 | 0.065 | |
| D | 8.51 | 9.65 | 0.335 | 0.380 | 2 |

| SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| D1 | 6.86 | 8.00 | 0.270 | 0.315 | 3 |
| E | 9.65 | 10.67 | 0.380 | 0.420 | 2, 3 |
| E1 | 7.90 | 8.80 | 0.311 | 0.346 | 3 |
| e | 2.54 BSC | | 0.100 BSC | | |
| H | 14.61 | 15.88 | 0.575 | 0.625 | |
| L | 1.78 | 2.79 | 0.070 | 0.110 | |
| L1 | - | 1.65 | - | 0.066 | 3 |
| L2 | 1.27 | 1.78 | 0.050 | 0.070 | |
| L3 | 0.25 BSC | | 0.010 BSC | | |
| L4 | 4.78 | 5.28 | 0.188 | 0.208 | |

**Notes**

(1) Dimensioning and tolerancing per ASME Y14.5 M-1994
(2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
(3) Thermal pad contour optional within dimension E, L1, D1 and E1
(4) Dimension b1 and c1 apply to base metal only
(5) Datum A and B to be determined at datum plane H
(6) Controlling dimension: inches
(7) Outline conforms to JEDEC® outline TO-263AB

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