

## 1. General description

Silicon Carbide Schottky diode in a TO220-2L plastic package, designed for high frequency switched-mode power supplies.



## 2. Features and benefits

- New 6th Generation Technology
- Low Forward Voltage Drop
- Low Reverse Leakage Current
- High Forward Surge Capability  $I_{FSM}$
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

## 3. Applications

- Power factor correction
- Telecom / Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED / OLED TV
- Motor Drives

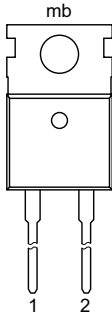
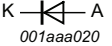
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions  | Notes | Values     |      |      | Unit |
|--------------------------------|---------------------------------|---|-------|------------|------|------|------|
| <b>Absolute maximum rating</b> |                                 |   |       |            |      |      |      |
| $V_{RRM}$                      | repetitive peak reverse voltage |   |       | 650        |      |      | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 150$ °C;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> |       | 10         |      |      | A    |
| $T_j$                          | junction temperature            |   |       | -55 to 175 |      |      | °C   |
| Symbol                         | Parameter                       | Conditions  | Notes | Min        | Typ  | Max  | Unit |
| <b>Static characteristics</b>  |                                 |   |       |            |      |      |      |
| $V_F$                          | forward voltage                 | $I_F = 10$ A; $T_j = 25$ °C; <a href="#">Fig. 5</a>   |       | -          | 1.29 | 1.45 | V    |
|                                |                                 | $I_F = 10$ A; $T_j = 150$ °C; <a href="#">Fig. 5</a>  |       | -          | 1.45 | 1.65 | V    |
|                                |                                 | $I_F = 10$ A; $T_j = 175$ °C; <a href="#">Fig. 5</a>  |       | -          | 1.50 | 1.70 | V    |
| <b>Dynamic characteristics</b> |                                 |   |       |            |      |      |      |
| $Q_r$                          | recovered charge                | $I_F = 10$ A; $di_F/dt = 500$ A/ $\mu$ s; $V_R = 400$ V;<br>$T_j = 25$ °C; <a href="#">Fig. 7</a>                                     |       | -          | 24   | -    | nC   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline  | Graphic symbol  |
|-----|--------|-------------------------------------|---|---|
| 1   | K      | cathode                             |  |  |
| 2   | A      | anode                               |   |   |
| mb  | mb     | mounting base; connected to cathode |   |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WN6D10650   | TO220-2L     | WN6D106506Q           | Tube           | 50                     | SOD59A          | 30-Mar-2015        |

## 7. Marking

Table 4. Marking codes

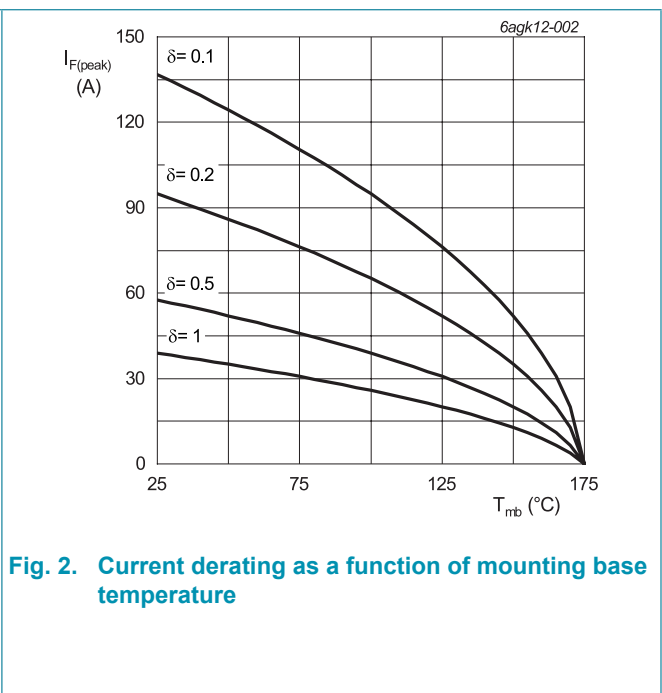
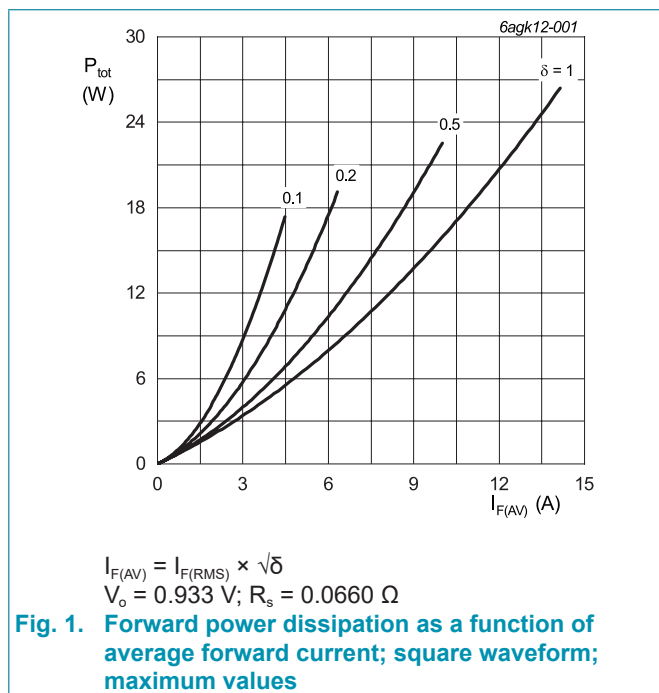
| Type number | Marking codes |
|-------------|---------------|
| WN6D10650   | WN6D<br>10650 |

### 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol      | Parameter                           | Conditions   | Notes | Values     | Unit                 |
|-------------|-------------------------------------|--|-------|------------|----------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |  |       | 650        | V                    |
| $V_{RWM}$   | crest working reverse voltage       |  |       | 650        | V                    |
| $V_R$       | reverse voltage                     | DC   |       | 650        | V                    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 150\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> |       | 10         | A                    |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 150\text{ }^\circ\text{C}$ ; square-wave pulse   |       | 20         | A                    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse   |       | 85         | A                    |
|             |                                     | $t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; square-wave pulse  |       | 800        | A                    |
| $I^2t$      | $I^2t$ for fusing                   | sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 10\text{ ms}$  |       | 36         | $\text{A}^2\text{s}$ |
| $T_{stg}$   | storage temperature                 |  |       | -55 to 175 | $^\circ\text{C}$     |
| $T_j$       | junction temperature                |  |       | -55 to 175 | $^\circ\text{C}$     |



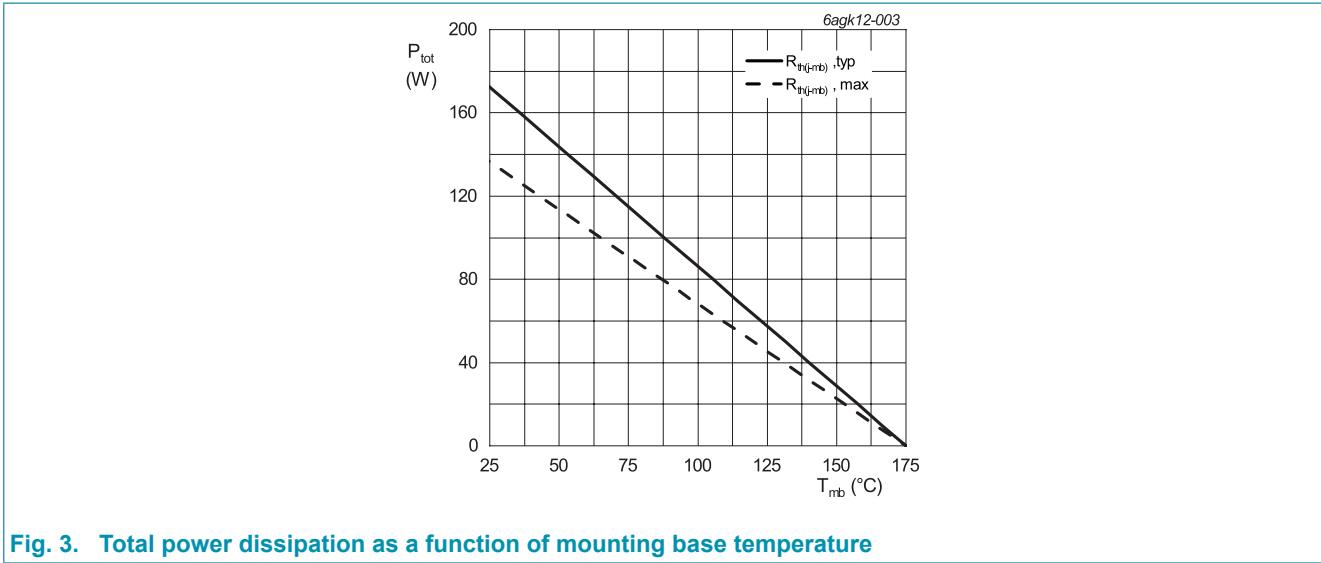


Fig. 3. Total power dissipation as a function of mounting base temperature

### 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter  | Conditions             | Notes | Min | Typ  | Max | Unit |
|----------------|--|------------------------|-------|-----|------|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | <a href="#">Fig. 4</a> |       | -   | 0.87 | 1.1 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air            |       | -   | 60   | -   | K/W  |

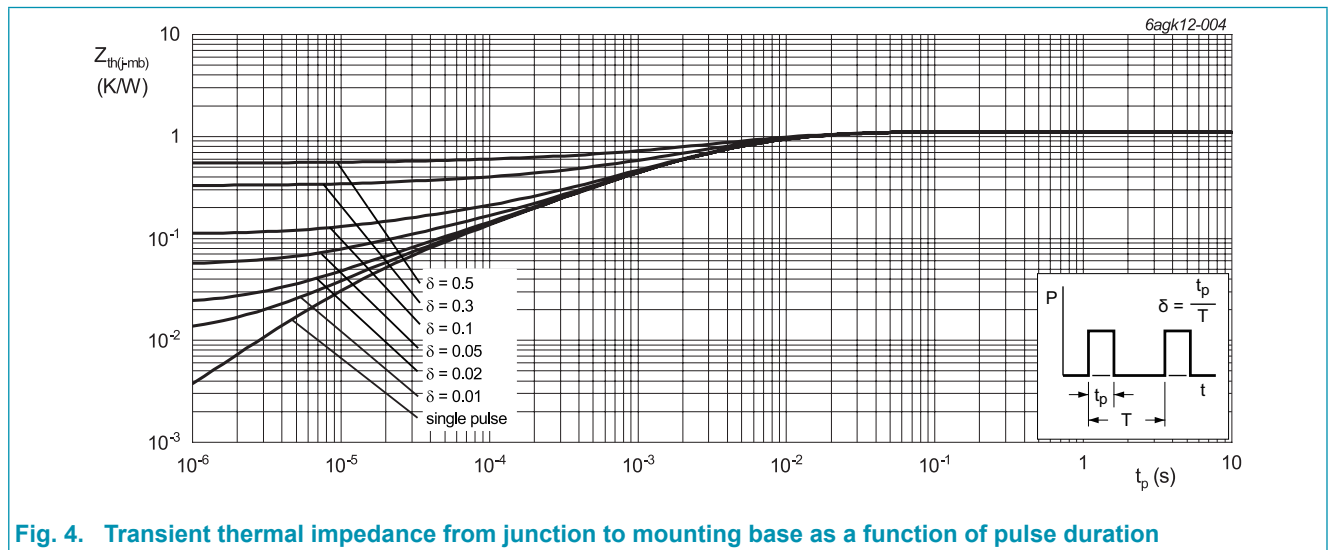
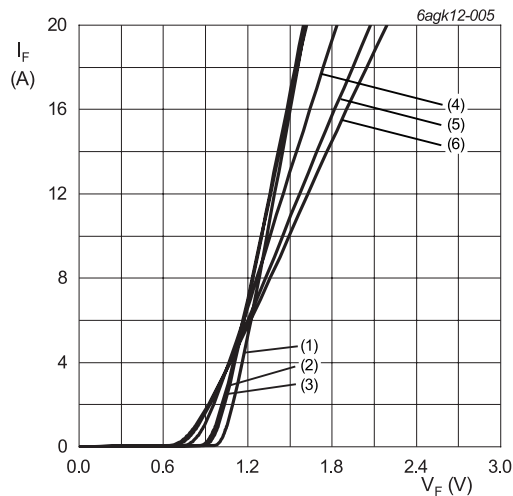


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

### 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                       | Conditions  | Notes | Min | Typ  | Max  | Unit          |
|--------------------------------|---------------------------------|---|-------|-----|------|------|---------------|
| <b>Static characteristics</b>  |                                 |   |       |     |      |      |               |
| $I_F$                          | forward current                 | $I_F = 10 \text{ A}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}$   |       | -   | 1.29 | 1.45 | V             |
|                                |                                 | $I_F = 10 \text{ A}; T_J = 150 \text{ }^\circ\text{C}; \text{ Fig. 5}$  |       | -   | 1.45 | 1.65 | V             |
|                                |                                 | $I_F = 10 \text{ A}; T_J = 175 \text{ }^\circ\text{C}; \text{ Fig. 5}$  |       | -   | 1.50 | 1.70 | V             |
| $I_R$                          | reverse current                 | $V_R = 650 \text{ V}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$  |       | -   | 1    | 50   | $\mu\text{A}$ |
|                                |                                 | $V_R = 650 \text{ V}; T_J = 175 \text{ }^\circ\text{C}; \text{ Fig. 6}$   |       | -   | 15   | 200  | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                                 |   |       |     |      |      |               |
| $Q_r$                          | recovered charge                | $I_F = 10 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$ |       | -   | 24   | -    | nC            |
| $C_d$                          | diode capacitance               | $f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$   |       | -   | 500  | -    | pF            |
|                                |                                 | $f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$   |       | -   | 58   | -    | pF            |
|                                |                                 | $f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$   |       | -   | 52   | -    | pF            |
| $E_{as}$                       | non-repetitive avalanche energy | $I_R = 5 \text{ A}; L = 5 \text{ mH}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$   |       | 60  | -    | -    | mJ            |



$V_o = 0.933 \text{ V}; R_s = 0.0660 \text{ } \Omega$   
 (1)  $T_J = -55 \text{ }^\circ\text{C};$  typical values  
 (2)  $T_J = 0 \text{ }^\circ\text{C};$  typical values  
 (3)  $T_J = 25 \text{ }^\circ\text{C};$  typical values  
 (4)  $T_J = 100 \text{ }^\circ\text{C};$  typical values  
 (5)  $T_J = 150 \text{ }^\circ\text{C};$  typical values  
 (6)  $T_J = 175 \text{ }^\circ\text{C};$  typical values

Fig. 5. Forward current as a function of forward voltage; typical values

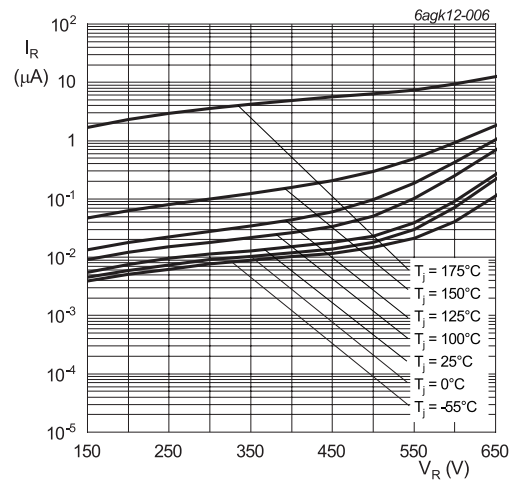


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

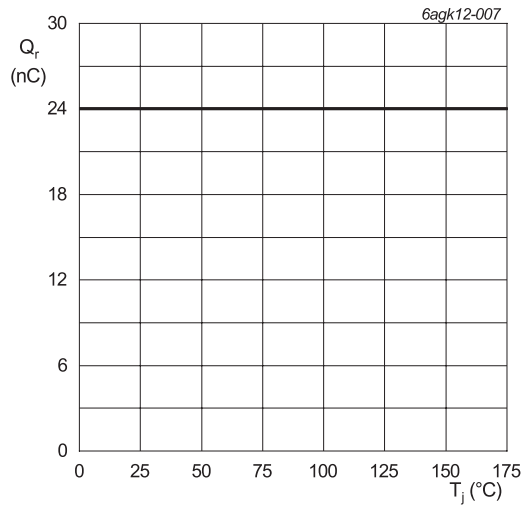
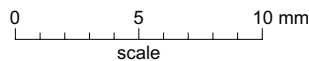
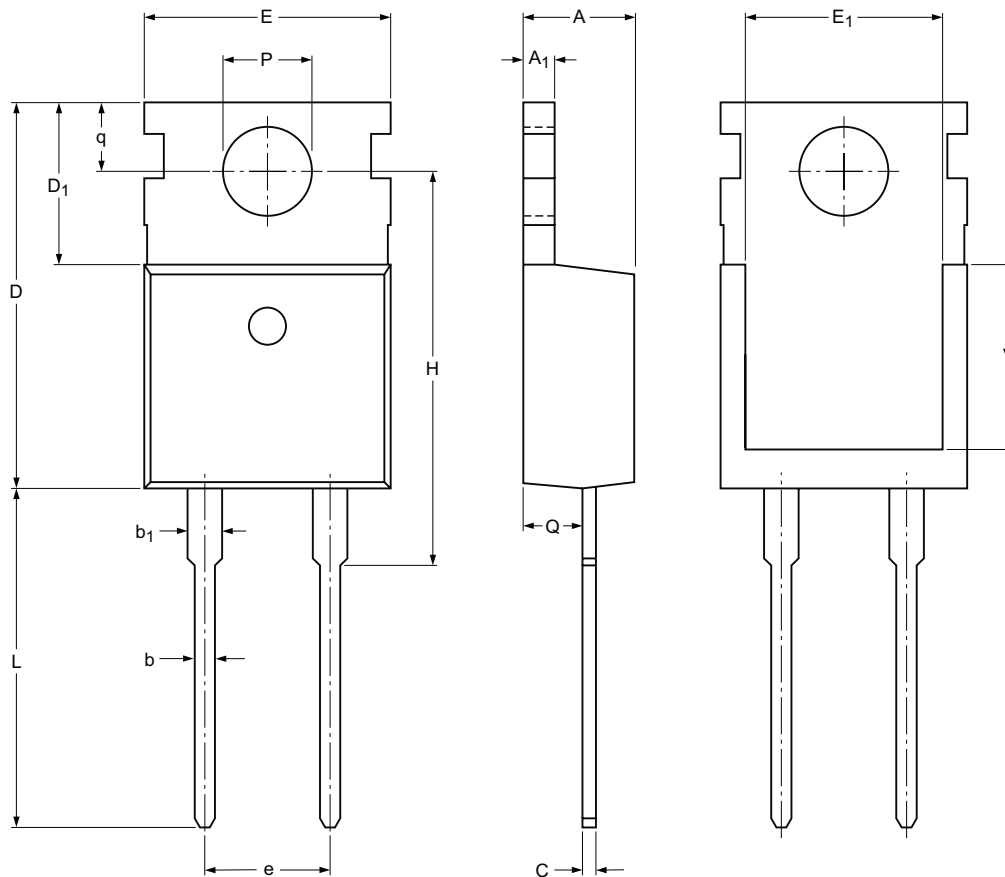


Fig. 7. Recovered charge as a function of junction temperature

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59A



Dimensions: (mm are the original dimensions)

| Unit | A   | A <sub>1</sub> | b    | b <sub>1</sub> ( <sup>1</sup> ) | c    | D    | D <sub>1</sub> | E     | e     | H     | L    | P    | Q   | q    | E <sub>1</sub> | V     |
|------|-----|----------------|------|---------------------------------|------|------|----------------|-------|-------|-------|------|------|-----|------|----------------|-------|
| max  | 4.7 | 1.40           | 0.95 | 1.70                            | 0.65 | 15.8 | 6.8            | 10.30 | 5.08  | 16.25 | 15.0 | 3.80 | 2.6 | 2.95 | 8.1            | 6.9   |
| nom  |     |                |      |                                 |      |      |                |       | (REF) |       |      |      |     |      |                | (REF) |
| min  | 4.3 | 1.15           | 0.70 | 1.17                            | 0.45 | 15.6 | 6.4            | 9.65  |       | 15.70 | 12.5 | 3.53 | 2.2 | 2.65 | 7.9            |       |

Note

1. Protruded dambar are included in the dimension.

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| Outline version | References        |       |       | European projection | Issue date             |
|-----------------|-------------------|-------|-------|---------------------|------------------------|
|                 | IEC               | JEDEC | JEITA |                     |                        |
| SOD59A          | TO-220AC (2-lead) |       |       |                     | -15-03-24-<br>15-03-30 |



## 12. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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### 13. Contents

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|                                  |    |
|----------------------------------|----|
| 1. General description.....      | 1  |
| 2. Features and benefits .....   | 1  |
| 3. Applications .....            | 1  |
| 4. Quick reference data.....     | 1  |
| 5. Pinning information.....      | 2  |
| 6. Ordering information.....     | 2  |
| 7. Marking.....                  | 2  |
| 8. Limiting values .....         | 3  |
| 9. Thermal characteristics ..... | 5  |
| 10. Characteristics.....         | 6  |
| 11. Package outline .....        | 8  |
| 12. Legal information .....      | 9  |
| 13. Contents .....               | 11 |

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