

# DATA SHEET

## **BTA216 series D, E and F** Three quadrant triacs guaranteed commutation

Product specification

September 2018

# Three quadrant triacs guaranteed commutation

# BTA216 series D, E and F

## GENERAL DESCRIPTION

Passivated guaranteed commutation triacs in a plastic envelope intended for use in motor control circuits or with other highly inductive loads. These devices balance the requirements of commutation performance and gate sensitivity. The "sensitive gate" E series and "logic level" D series are intended for interfacing with low power drivers, including micro controllers.

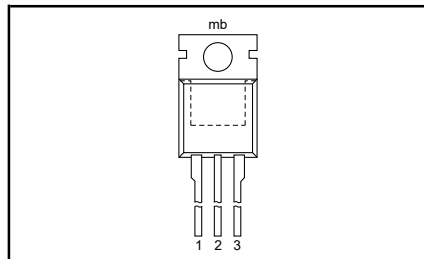
## QUICK REFERENCE DATA

| SYMBOL       | PARAMETER                            | MAX.   | UNIT |
|--------------|--------------------------------------|--|------|
| $V_{DRM}$    | Repetitive peak off-state voltages   | <b>600D</b><br><b>600E</b><br><b>600F</b><br>600 | V    |
| $I_{T(RMS)}$ | RMS on-state current                 | 16   | A    |
| $I_{TSM}$    | Non-repetitive peak on-state current | 140  | A    |

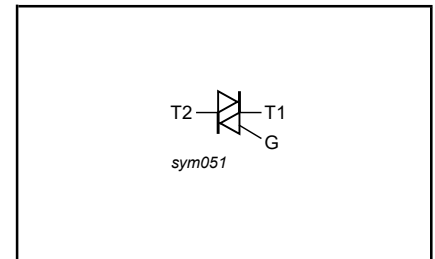
## PINNING - TO220AB

| PIN | DESCRIPTION     |
|-----|-----------------|
| 1   | main terminal 1 |
| 2   | main terminal 2 |
| 3   | gate            |
| tab | main terminal 2 |

## PIN CONFIGURATION



## SYMBOL



## LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

| SYMBOL       | PARAMETER  | CONDITIONS  | MIN. | MAX.             | UNIT               |
|--------------|--|---|------|------------------|--------------------|
| $V_{DRM}$    | Repetitive peak off-state voltages                           |   | -    | 600 <sup>1</sup> | V                  |
| $I_{T(RMS)}$ | RMS on-state current   | full sine wave;<br>$T_{mb} \leq 99\text{ }^{\circ}\text{C}$   | -    | 16               | A                  |
| $I_{TSM}$    | Non-repetitive peak on-state current                         | full sine wave;<br>$T_j = 25\text{ }^{\circ}\text{C}$ prior to surge<br>$t = 20\text{ ms}$                | -    | 140              | A                  |
| $I^2t$       | $I^2t$ for fusing  | $t = 16.7\text{ ms}$  | -    | 150              | A                  |
| $di_T/dt$    | Repetitive rate of rise of on-state current after triggering | $t = 10\text{ ms}$<br>$I_{TM} = 20\text{ A}; I_G = 0.2\text{ A};$<br>$di_G/dt = 0.2\text{ A}/\mu\text{s}$ | -    | 98               | A <sup>2</sup> s   |
| $I_{GM}$     | Peak gate current  |   | -    | 2                | A                  |
| $P_{GM}$     | Peak gate power  |   | -    | 5                | W                  |
| $P_{G(AV)}$  | Average gate power   | over any 20 ms period   | -    | 0.5              | W                  |
| $T_{stg}$    | Storage temperature  |   | -40  | 150              | $^{\circ}\text{C}$ |
| $T_j$        | Operating junction temperature                               |   | -    | 125              | $^{\circ}\text{C}$ |

<sup>1</sup> Although not recommended, off-state voltages up to 800V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu$ s.

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### THERMAL RESISTANCES

| SYMBOL         | PARAMETER                                       | CONDITIONS                | MIN. | TYP. | MAX. | UNIT |
|----------------|---|---------------------------|------|------|------|------|
| $R_{th\ j-mb}$ | Thermal resistance<br>junction to mounting base | full cycle                | -    | -    | 1.2  | K/W  |
| $R_{th\ j-a}$  | Thermal resistance<br>junction to ambient       | half cycle<br>in free air | -    | -    | 1.7  | K/W  |
|                |   |                           | -    | 60   | -    | K/W  |

### STATIC CHARACTERISTICS

$T_j = 25\text{ °C}$  unless otherwise stated

| SYMBOL   | PARAMETER                         | CONDITIONS  | MIN. | MAX.        |             |             | UNIT |
|----------|-----------------------------------|---|------|-------------|-------------|-------------|------|
|          |                                   | <b>BTA216-</b>  |      | <b>...D</b> | <b>...E</b> | <b>...F</b> |      |
| $I_{GT}$ | Gate trigger current <sup>2</sup> | $V_D = 12\text{ V}; I_T = 0.1\text{ A}$<br>T2+ G+<br>T2+ G-<br>T2- G-   | -    | 5           | 10          | 25          | mA   |
| $I_L$    | Latching current                  | $V_D = 12\text{ V}; I_{GT} = 0.1\text{ A}$<br>T2+ G+<br>T2+ G-<br>T2- G-                                      | -    | 15          | 25          | 30          | mA   |
| $I_H$    | Holding current                   | $V_D = 12\text{ V}; I_{GT} = 0.1\text{ A}$  | -    | 15          | 25          | 30          | mA   |
| $V_T$    | On-state voltage                  | $I_T = 20\text{ A}$   | -    | 1.5         |             |             | V    |
| $V_{GT}$ | Gate trigger voltage              | $V_D = 12\text{ V}; I_T = 0.1\text{ A}$<br>$V_D = 400\text{ V}; I_T = 0.1\text{ A};$<br>$T_j = 125\text{ °C}$ | 0.25 | 1.5         |             |             | V    |
| $I_D$    | Off-state leakage current         | $V_D = V_{DRM(max)}; T_j = 125\text{ °C}$   | -    | 0.5         |             |             | mA   |

### DYNAMIC CHARACTERISTICS

$T_j = 25\text{ °C}$  unless otherwise stated

| SYMBOL        | PARAMETER   | CONDITIONS   | MIN.        |             |             | MAX. | UNIT       |
|---------------|---|--|-------------|-------------|-------------|------|------------|
|               |   | <b>BTA216-</b>   | <b>...D</b> | <b>...E</b> | <b>...F</b> |      |            |
| $dV_D/dt$     | Critical rate of rise of<br>off-state voltage     | $V_{DM} = 67\% V_{DRM(max)};$<br>$T_j = 110\text{ °C};$ exponential<br>waveform; gate open<br>circuit  | 30          | 60          | 70          | -    | V/ $\mu$ s |
| $dI_{com}/dt$ | Critical rate of change of<br>commutating current | $V_{DM} = 400\text{ V}; T_j = 125\text{ °C};$<br>$I_{T(RMS)} = 16\text{ A};$<br>$dV_{com}/dt = 10\text{ V}/\mu\text{s};$ gate<br>open circuit  | 2.5         | 6.2         | 18          | -    | A/ms       |
| $dI_{com}/dt$ | Critical rate of change of<br>commutating current | $V_{DM} = 400\text{ V}; T_j = 125\text{ °C};$<br>$I_{T(RMS)} = 16\text{ A};$<br>$dV_{com}/dt = 0.1\text{ V}/\mu\text{s};$ gate<br>open circuit | 12          | 20          | 50          | -    | A/ms       |

<sup>2</sup> Device does not trigger in the T2-, G+ quadrant.

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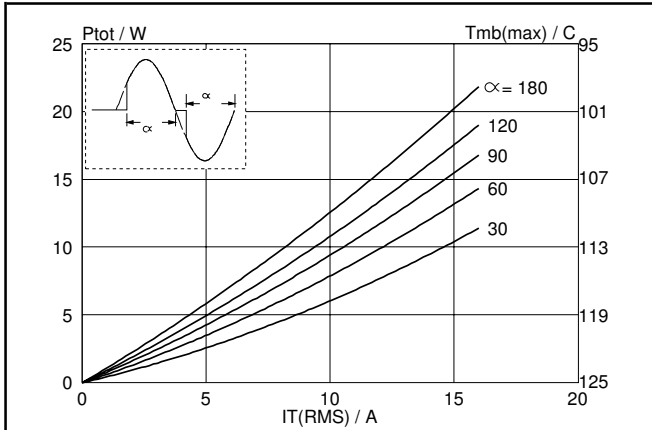


Fig.1. Maximum on-state dissipation,  $P_{tot}$ , versus rms on-state current,  $I_{T(RMS)}$ , where  $\alpha$  = conduction angle.

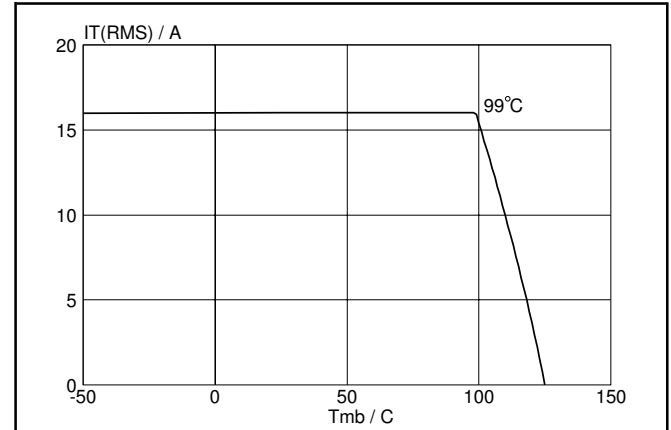


Fig.4. Maximum permissible rms current  $I_{T(RMS)}$ , versus mounting base temperature  $T_{mb}$ .

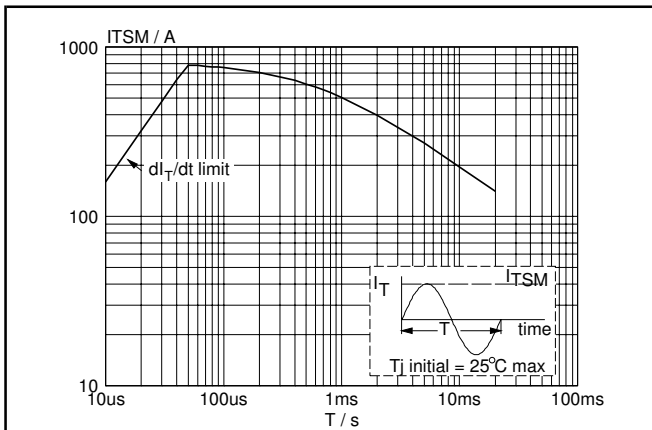


Fig.2. Maximum permissible non-repetitive peak on-state current  $I_{TSM}$ , versus pulse width  $t_p$ , for sinusoidal currents,  $t_p \leq 20ms$ .

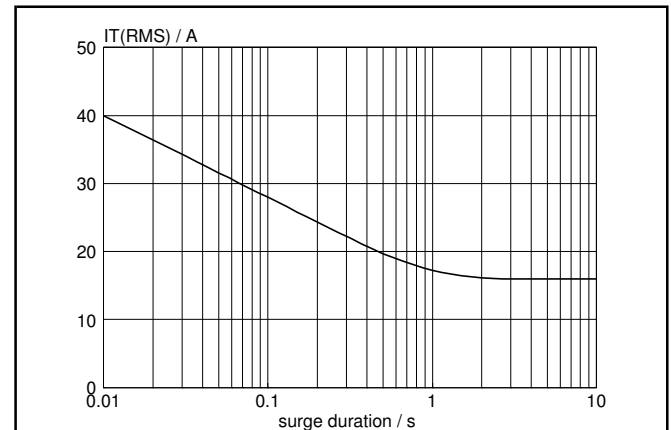


Fig.5. Maximum permissible repetitive rms on-state current  $I_{T(RMS)}$ , versus surge duration, for sinusoidal currents,  $f = 50 Hz$ ;  $T_{mb} \leq 99^\circ C$ .

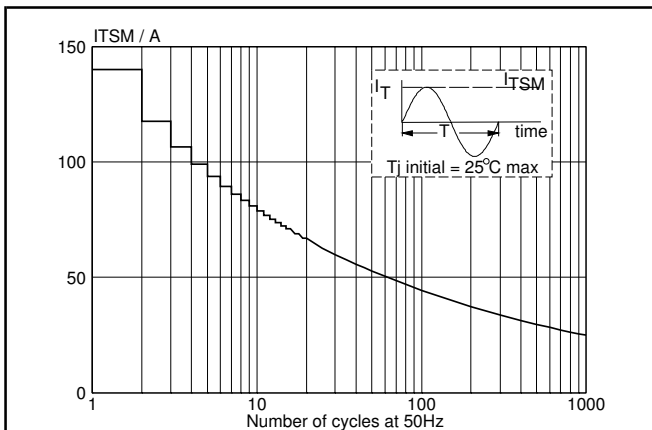


Fig.3. Maximum permissible non-repetitive peak on-state current  $I_{TSM}$ , versus number of cycles, for sinusoidal currents,  $f = 50 Hz$ .

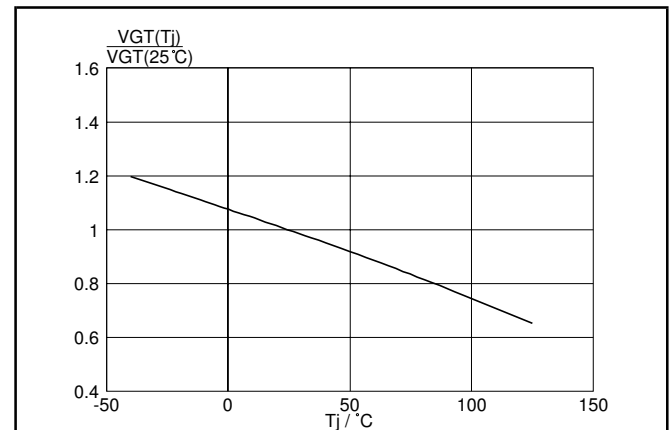
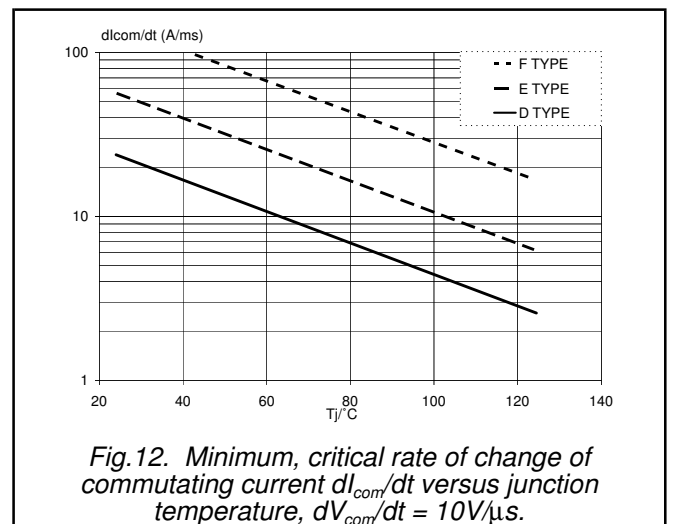
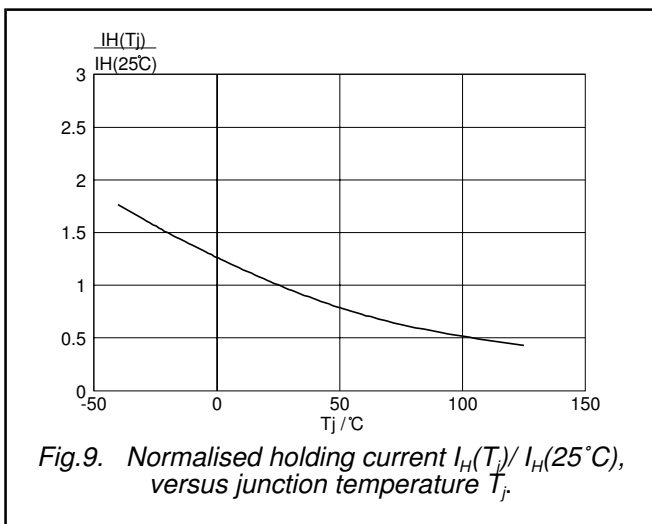
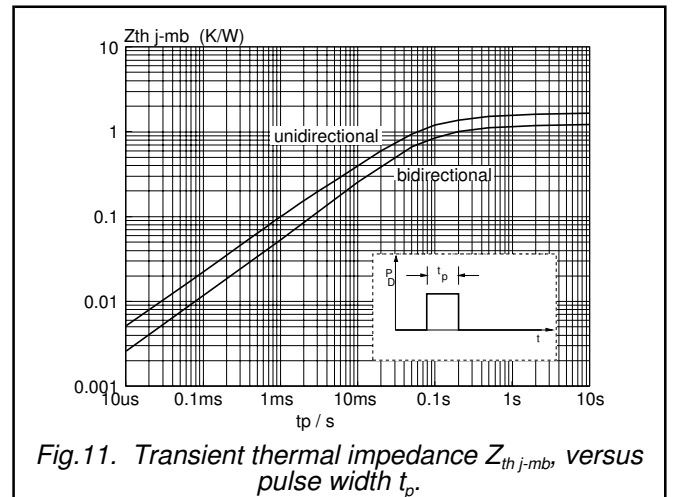
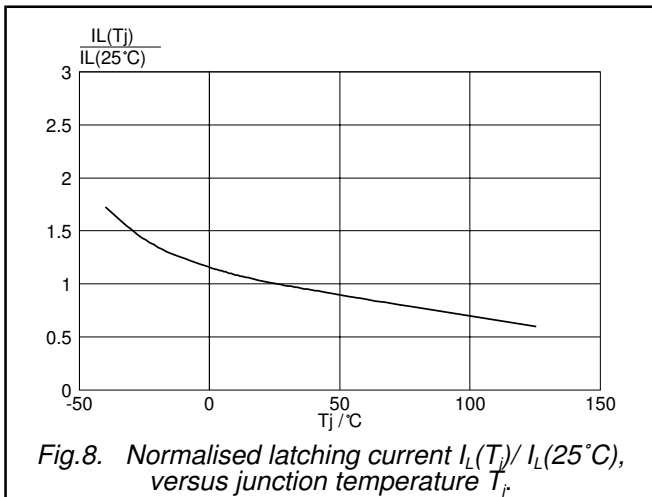
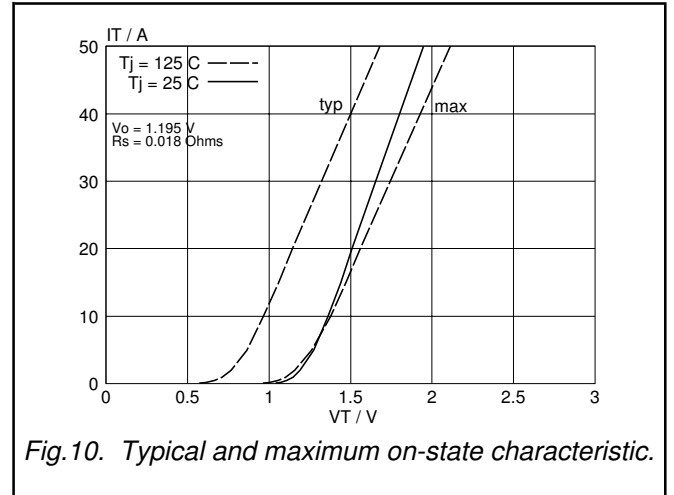
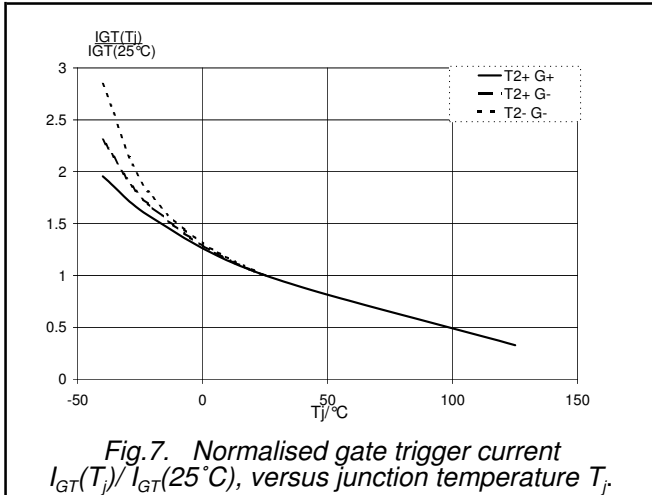


Fig.6. Normalised gate trigger voltage  $V_{GT}(T_j) / V_{GT}(25^\circ C)$ , versus junction temperature  $T_j$ .

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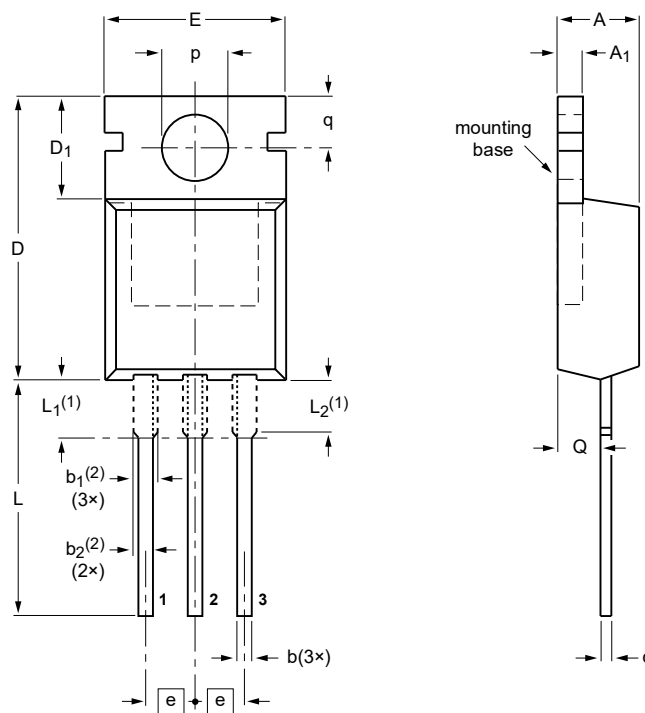
Three quadrant triacs  
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BTA216 series D, E and F

**MECHANICAL DATA**

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



**DIMENSIONS** (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub> | b          | b <sub>1</sub> ( <sup>2</sup> ) | b <sub>2</sub> ( <sup>2</sup> ) | c          | D            | D <sub>1</sub> | E           | e    | L            | L <sub>1</sub> ( <sup>1</sup> ) | L <sub>2</sub> ( <sup>1</sup> )<br>max. | p          | q          | Q          |
|------|------------|----------------|------------|---------------------------------|---------------------------------|------------|--------------|----------------|-------------|------|--------------|---------------------------------|---|------------|------------|------------|
| mm   | 4.7<br>4.1 | 1.40<br>1.25   | 0.9<br>0.6 | 1.6<br>1.0                      | 1.3<br>1.0                      | 0.7<br>0.4 | 16.0<br>15.2 | 6.6<br>5.9     | 10.3<br>9.7 | 2.54 | 15.0<br>12.8 | 3.30<br>2.79                    | 3.0                                     | 3.8<br>3.5 | 3.0<br>2.7 | 2.6<br>2.2 |

**Notes**

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

| OUTLINE<br>VERSION | REFERENCES |                 |       | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|-----------------|-------|------------------------|----------------------|
|                    | IEC        | JEDEC           | JEITA |                        |                      |
| SOT78              |            | 3-lead TO-220AB | SC-46 |                        | 08-04-23<br>08-06-13 |

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|--------------------------------|--------------------|---|
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| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

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