

# 74CBTLV3245-Q100

8-bit bus switch with output enable

Rev. 4 — 7 May 2020

Product data sheet

## 1. General description

The 74CBTLV3245-Q100 is an 8-pole, single-throw bus switch. The device features a single output enable input ( $\overline{OE}$ ) that controls eight switch channels. The switches are disabled when  $\overline{OE}$  is HIGH. Schmitt-trigger action at control inputs makes the circuit tolerant of slower input rise and fall times. This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

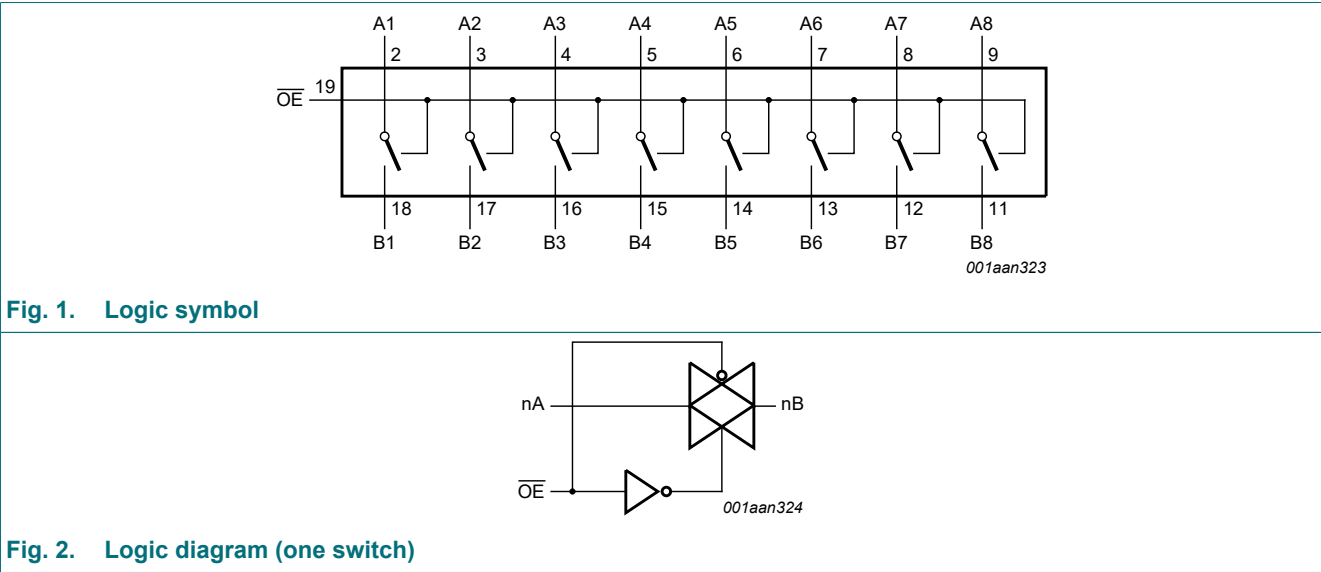
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Supply voltage range from 2.3 V to 3.6 V
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0  $\Omega$ )
- 5  $\Omega$  switch connection between two ports
- Rail to rail switching on data I/O ports
- CMOS low power consumption
- Latch-up performance exceeds 250 mA per JESD78B Class I level A
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

## 3. Ordering information

Table 1. Ordering information

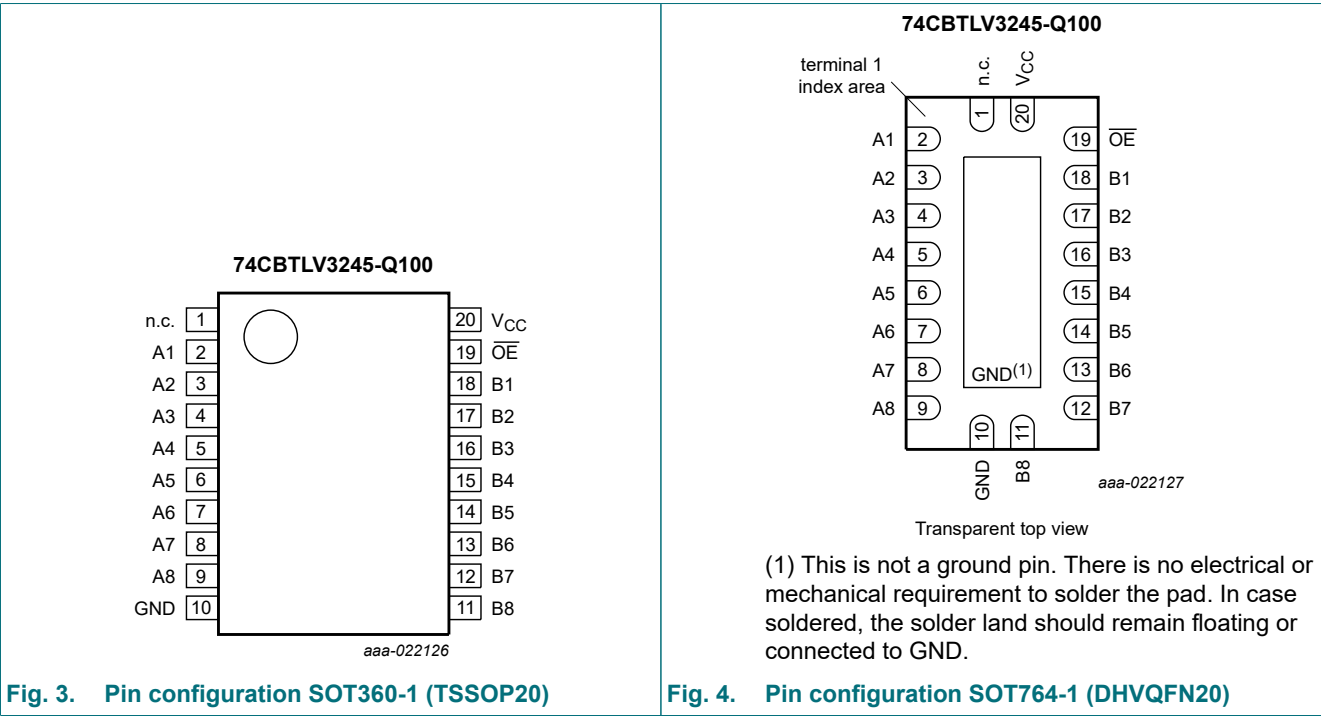
| Type number        | Package           |          |                                                                                                                                |          |
|--------------------|-------------------|----------|--------------------------------------------------------------------------------------------------------------------------------|----------|
|                    | Temperature range | Name     | Description                                                                                                                    | Version  |
| 74CBTLV3245PW-Q100 | -40 °C to +125 °C | TSSOP20  | plastic thin shrink small outline package; 20 leads; body width 4.4 mm                                                         | SOT360-1 |
| 74CBTLV3245BQ-Q100 | -40 °C to +125 °C | DHVQFN20 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm | SOT764-1 |

4. Functional diagram



5. Pinning information

5.1. Pinning



## 5.2. Pin description

Table 2. Pin description

| Symbol          | Pin                            | Description                      |
|-----------------|--------------------------------|----------------------------------|
| nc              | 1                              | not connected                    |
| A1 to A8        | 2, 3, 4, 5, 6, 7, 8, 9         | data input/output (A port)       |
| GND             | 10                             | ground (0 V)                     |
| B1 to B8        | 18, 17, 16, 15, 14, 13, 12, 11 | data input/output (B port)       |
| OE              | 19                             | output enable input (active LOW) |
| V <sub>CC</sub> | 20                             | positive supply voltage          |

## 6. Functional description

Table 3. Function selection

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

| Input | Input/output |
|-------|--------------|
| OE    | An, Bn       |
| L     | An = Bn      |
| H     | Z            |

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter               | Conditions                               | Min  | Max                   | Unit |
|------------------|-------------------------|------------------------------------------|------|-----------------------|------|
| V <sub>CC</sub>  | supply voltage          |                                          | -0.5 | +4.6                  | V    |
| V <sub>I</sub>   | input voltage           | [1]                                      | -0.5 | +4.6                  | V    |
| V <sub>SW</sub>  | switch voltage          | enable and disable mode [1]              | -0.5 | V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V                  | -50  | -                     | mA   |
| I <sub>SK</sub>  | switch clamping current | V <sub>I</sub> < -0.5 V                  | -50  | -                     | mA   |
| I <sub>SW</sub>  | switch current          | V <sub>SW</sub> = 0 V to V <sub>CC</sub> | -    | ±128                  | mA   |
| I <sub>CC</sub>  | supply current          |                                          | -    | +100                  | mA   |
| I <sub>GND</sub> | ground current          |                                          | -100 | -                     | mA   |
| T <sub>stg</sub> | storage temperature     |                                          | -65  | +150                  | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C [2] | -    | 500                   | mW   |

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For SOT360-1 (TSSOP20) package: P<sub>tot</sub> derates linearly with 10.0 mW/K above 100 °C.  
For SOT764-1 (DHVQFN20) package: P<sub>tot</sub> derates linearly with 12.9 mW/K above 111 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions                                  | Min | Max      | Unit |
|---------------------|-------------------------------------|---------------------------------------------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                                             | 2.3 | 3.6      | V    |
| $V_I$               | input voltage                       |                                             | 0   | 3.6      | V    |
| $V_{SW}$            | switch voltage                      | enable and disable mode                     | 0   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                                             | -40 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.3\text{ V to }3.6\text{ V}$ [1] | -   | 200      | ns/V |

[1] Applies to control signal levels.

## 9. Static characteristics

**Table 6. Static characteristics**

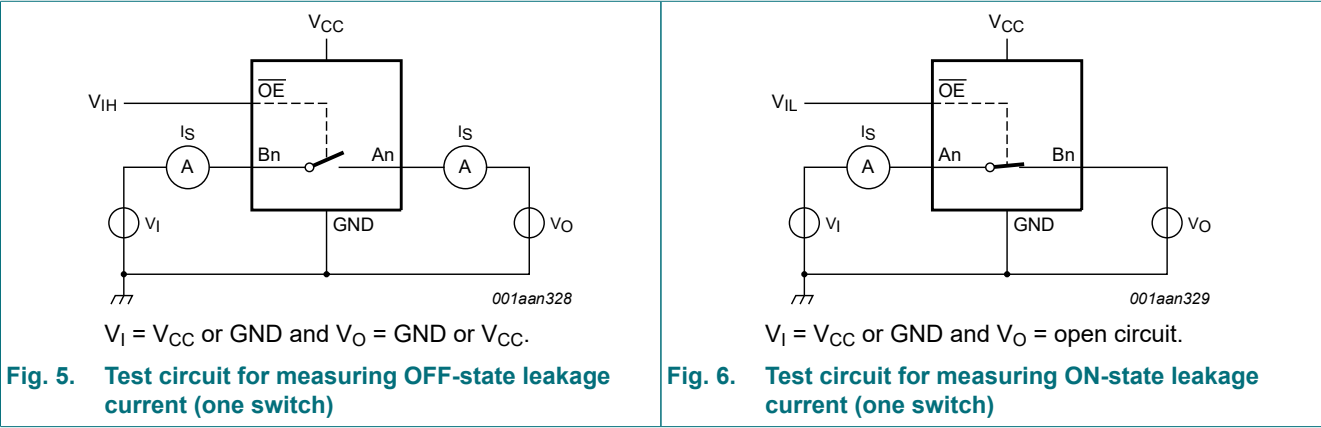
At recommended operating conditions voltages are referenced to GND (ground = 0 V).

| Symbol          | Parameter                 | Conditions                                                                                                          | $T_{amb} = -40\text{ °C to }+85\text{ °C}$ |         |          | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |          | Unit          |
|-----------------|---------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------|----------|---------------------------------------------|----------|---------------|
|                 |                           |                                                                                                                     | Min                                        | Typ [1] | Max      | Min                                         | Max      |               |
| $V_{IH}$        | HIGH-level input voltage  | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                                             | 1.7                                        | -       | -        | 1.7                                         | -        | V             |
|                 |                           | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                                                                             | 2.0                                        | -       | -        | 2.0                                         | -        | V             |
| $V_{IL}$        | LOW-level input voltage   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                                             | -                                          | -       | 0.7      | -                                           | 0.7      | V             |
|                 |                           | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                                                                             | -                                          | -       | 0.9      | -                                           | 0.9      | V             |
| $I_I$           | input leakage current     | pin $\overline{OE}$ ; $V_I = \text{GND to }V_{CC}$ ; $V_{CC} = 3.6\text{ V}$                                        | -                                          | -       | $\pm 1$  | -                                           | $\pm 20$ | $\mu\text{A}$ |
| $I_{S(OFF)}$    | OFF-state leakage current | $V_{CC} = 3.6\text{ V}$ ; see Fig. 5                                                                                | -                                          | -       | $\pm 1$  | -                                           | $\pm 20$ | $\mu\text{A}$ |
| $I_{S(ON)}$     | ON-state leakage current  | $V_{CC} = 3.6\text{ V}$ ; see Fig. 6                                                                                | -                                          | -       | $\pm 1$  | -                                           | $\pm 20$ | $\mu\text{A}$ |
| $I_{OFF}$       | power-off leakage current | $V_I$ or $V_O = 0\text{ V to }3.6\text{ V}$ ; $V_{CC} = 0\text{ V}$                                                 | -                                          | -       | $\pm 10$ | -                                           | $\pm 50$ | $\mu\text{A}$ |
| $I_{CC}$        | supply current            | $V_I = \text{GND or }V_{CC}$ ; $I_O = 0\text{ A}$ ; $V_{SW} = \text{GND or }V_{CC}$ ; $V_{CC} = 3.6\text{ V}$       | -                                          | -       | 10       | -                                           | 50       | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current | pin $\overline{OE}$ ; $V_I = V_{CC} - 0.6\text{ V}$ ; $V_{SW} = \text{GND or }V_{CC}$ ; $V_{CC} = 3.6\text{ V}$ [2] | -                                          | -       | 300      | -                                           | 2000     | $\mu\text{A}$ |
| $C_I$           | input capacitance         | pin $\overline{OE}$ ; $V_{CC} = 3.3\text{ V}$ ; $V_I = 0\text{ V to }3.3\text{ V}$                                  | -                                          | 0.9     | -        | -                                           | -        | pF            |
| $C_{S(OFF)}$    | OFF-state capacitance     | $V_{CC} = 3.3\text{ V}$ ; $V_I = 0\text{ V to }3.3\text{ V}$                                                        | -                                          | 5.2     | -        | -                                           | -        | pF            |
| $C_{S(ON)}$     | ON-state capacitance      | $V_{CC} = 3.3\text{ V}$ ; $V_I = 0\text{ V to }3.3\text{ V}$                                                        | -                                          | 14.3    | -        | -                                           | -        | pF            |

[1] All typical values are measured at  $T_{amb} = 25\text{ °C}$ .

[2] One input at 3 V, other inputs at  $V_{CC}$  or GND.

9.1. Test circuits



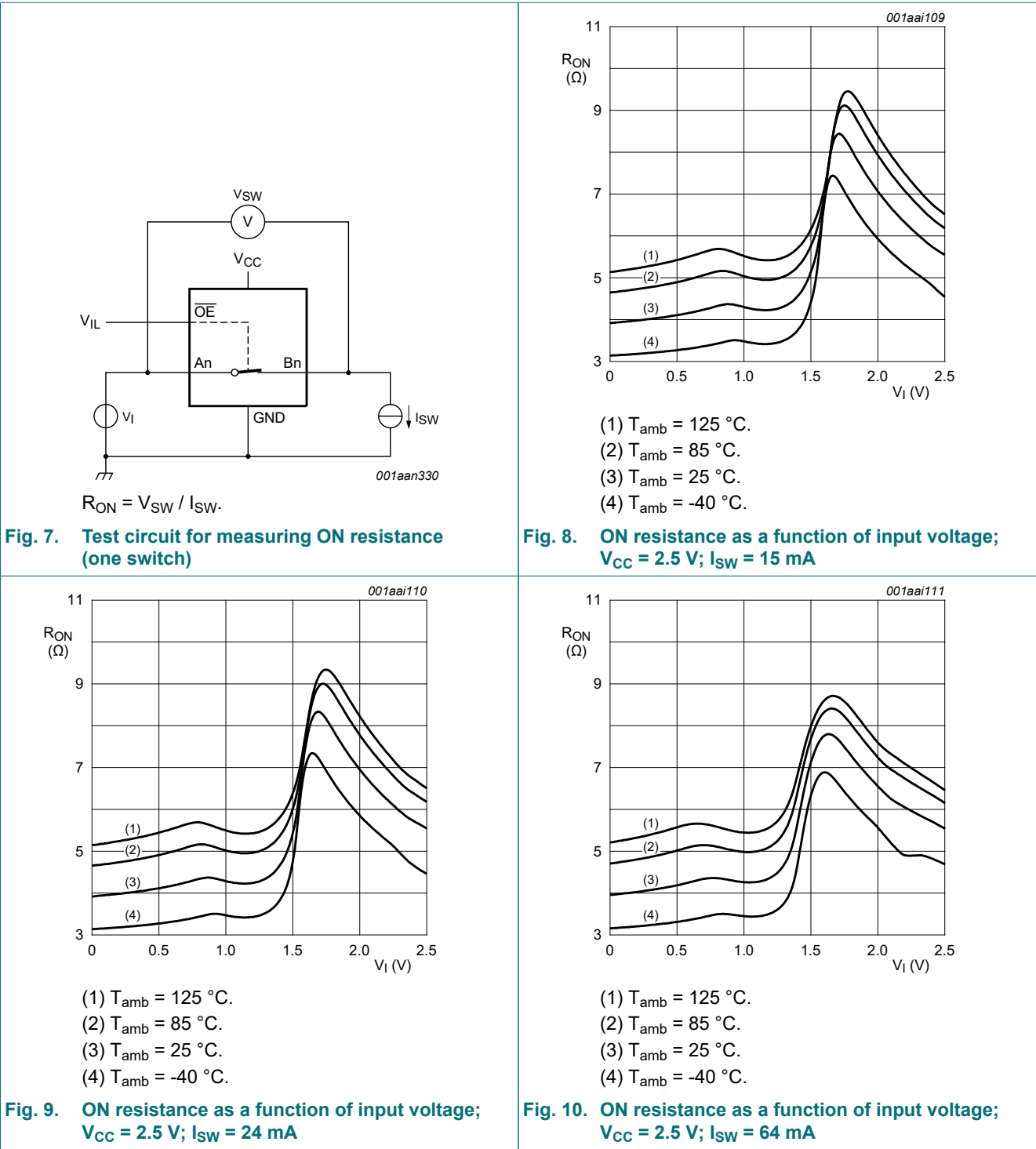
9.2. ON resistance

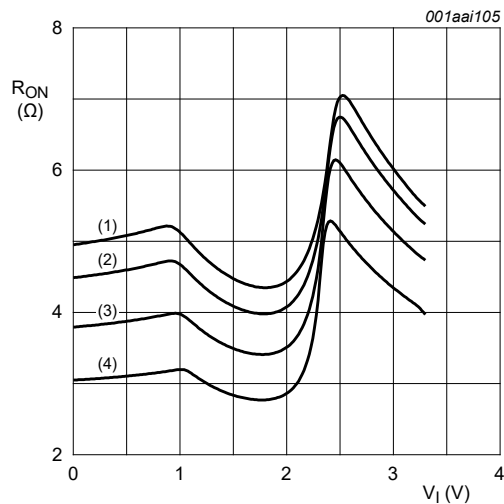
**Table 7. Resistance  $R_{ON}$**   
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

| Symbol   | Parameter     | Conditions                                                            | $T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$ |         |     | $T_{amb} = -40\text{ }^{\circ}\text{C to }+125\text{ }^{\circ}\text{C}$ |      | Unit     |
|----------|---------------|-----------------------------------------------------------------------|------------------------------------------------------------------------|---------|-----|-------------------------------------------------------------------------|------|----------|
|          |               |                                                                       | Min                                                                    | Typ [1] | Max | Min                                                                     | Max  |          |
| $R_{ON}$ | ON resistance | $V_{CC} = 2.3\text{ V to }2.7\text{ V};$<br>see Fig. 8 to Fig. 10 [2] |                                                                        |         |     |                                                                         |      |          |
|          |               | $I_{SW} = 64\text{ mA}; V_I = 0\text{ V}$                             | -                                                                      | 4.2     | 8.0 | -                                                                       | 15.0 | $\Omega$ |
|          |               | $I_{SW} = 24\text{ mA}; V_I = 0\text{ V}$                             | -                                                                      | 4.2     | 8.0 | -                                                                       | 15.0 | $\Omega$ |
|          |               | $I_{SW} = 15\text{ mA}; V_I = 1.7\text{ V}$                           | -                                                                      | 8.4     | 40  | -                                                                       | 60.0 | $\Omega$ |
|          |               | $V_{CC} = 3.0\text{ V to }3.6\text{ V};$<br>see Fig. 11 to Fig. 13    |                                                                        |         |     |                                                                         |      |          |
|          |               | $I_{SW} = 64\text{ mA}; V_I = 0\text{ V}$                             | -                                                                      | 4.0     | 7.0 | -                                                                       | 11.0 | $\Omega$ |
|          |               | $I_{SW} = 24\text{ mA}; V_I = 0\text{ V}$                             | -                                                                      | 4.0     | 7.0 | -                                                                       | 11.0 | $\Omega$ |
|          |               | $I_{SW} = 15\text{ mA}; V_I = 2.4\text{ V}$                           | -                                                                      | 6.2     | 15  | -                                                                       | 25.5 | $\Omega$ |

[1] Typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$  and nominal  $V_{CC}$ .  
[2] Measured by the voltage drop between the A and B terminals at the indicated current through the switch. ON-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

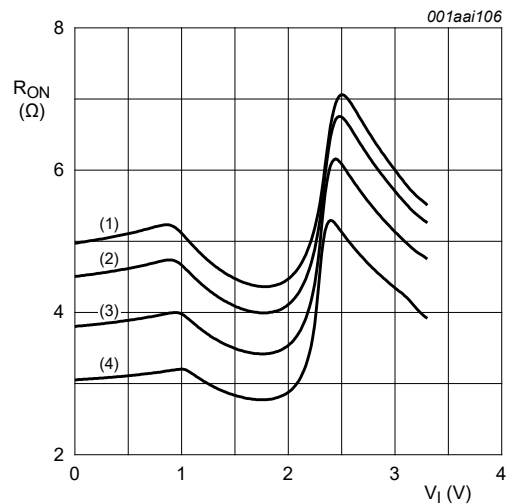
9.3. ON resistance test circuit and graphs





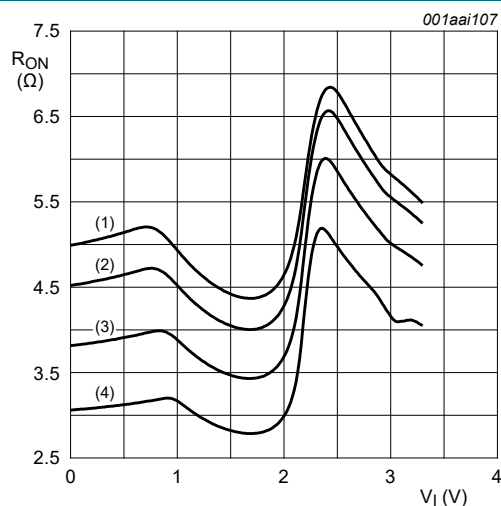
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig. 11. ON resistance as a function of input voltage;**  
 $V_{CC} = 3.3\text{ V}; I_{SW} = 15\text{ mA}$



- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig. 12. ON resistance as a function of input voltage;**  
 $V_{CC} = 3.3\text{ V}; I_{SW} = 24\text{ mA}$



- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig. 13. ON resistance as a function of input voltage;**  $V_{CC} = 3.3\text{ V}; I_{SW} = 64\text{ mA}$

## 10. Dynamic characteristics

**Table 8. Dynamic characteristics**

$GND = 0\text{ V}$ ; for test circuit see [Fig. 16](#)

| Symbol    | Parameter         | Conditions                                               | $T_{amb} = -40\text{ °C to }+85\text{ °C}$ |         |      | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |      | Unit |
|-----------|-------------------|----------------------------------------------------------|--------------------------------------------|---------|------|---------------------------------------------|------|------|
|           |                   |                                                          | Min                                        | Typ [1] | Max  | Min                                         | Max  |      |
| $t_{pd}$  | propagation delay | An to Bn or Bn to An; see <a href="#">Fig. 14</a> [2][3] |                                            |         |      |                                             |      |      |
|           |                   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                  | -                                          | -       | 0.13 | -                                           | 0.20 | ns   |
|           |                   | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                  | -                                          | -       | 0.20 | -                                           | 0.31 | ns   |
| $t_{en}$  | enable time       | OE to An or Bn; see <a href="#">Fig. 15</a> [4]          |                                            |         |      |                                             |      |      |
|           |                   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                  | 1.0                                        | 3.4     | 5.5  | 1.0                                         | 8.0  | ns   |
|           |                   | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                  | 1.0                                        | 3.0     | 4.9  | 1.0                                         | 7.0  | ns   |
| $t_{dis}$ | disable time      | OE to An or Bn; see <a href="#">Fig. 15</a> [5]          |                                            |         |      |                                             |      |      |
|           |                   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                  | 1.0                                        | 3.0     | 5.5  | 1.0                                         | 8.0  | ns   |
|           |                   | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                  | 1.0                                        | 3.4     | 5.8  | 1.0                                         | 8.5  | ns   |

[1] All typical values are measured at  $T_{amb} = 25\text{ °C}$  and at nominal  $V_{CC}$ .

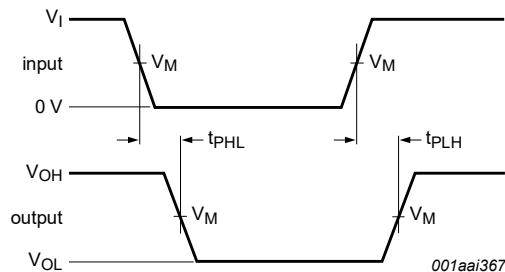
[2] The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the load capacitance, when driven by an ideal voltage source (zero output impedance).

[3]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[4]  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[5]  $t_{dis}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

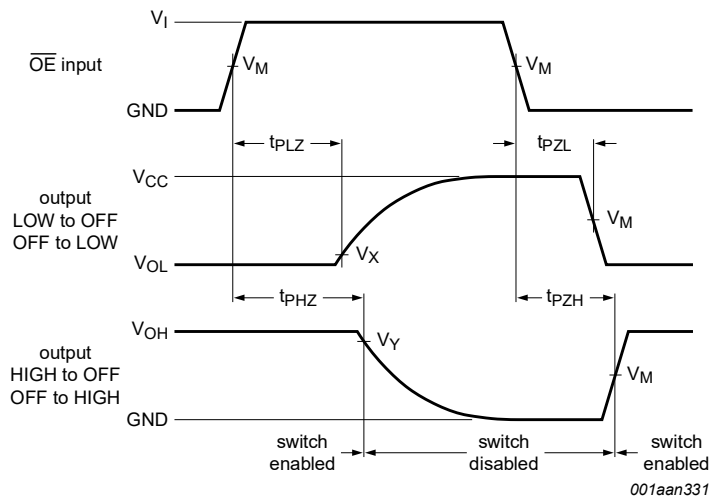
### 10.1. Waveforms and test circuit



Measurement points are given in [Table 9](#).

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig. 14. The data input (An, Bn) to output (Bn, An) propagation delay times**

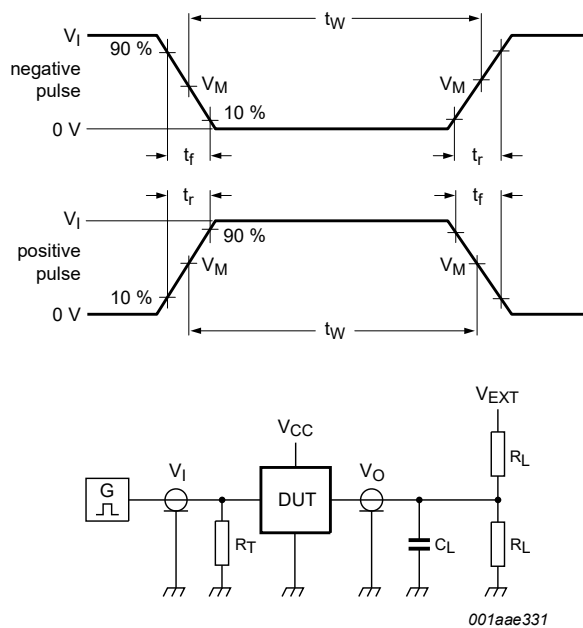


Measurement points are given in [Table 9](#).  
Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Fig. 15. Enable and disable times

Table 9. Measurement points

| Supply voltage | Input       |          |               | Output      |                   |                   |
|----------------|-------------|----------|---------------|-------------|-------------------|-------------------|
| $V_{CC}$       | $V_M$       | $V_I$    | $t_r = t_f$   | $V_M$       | $V_X$             | $V_Y$             |
| 2.3 V to 2.7 V | $0.5V_{CC}$ | $V_{CC}$ | $\leq 2.0$ ns | $0.5V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 3.0 V to 3.6 V | $0.5V_{CC}$ | $V_{CC}$ | $\leq 2.0$ ns | $0.5V_{CC}$ | $V_{OL} + 0.3$ V  | $V_{OH} - 0.3$ V  |



Test data is given in [Table 10](#).  
Definitions for test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

Fig. 16. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage  |                | Load           |                                     | V <sub>EXT</sub>                    |                                     |
|-----------------|----------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|
| V <sub>CC</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLH</sub> , t <sub>PHL</sub> | t <sub>PZH</sub> , t <sub>PHZ</sub> | t <sub>PZL</sub> , t <sub>PLZ</sub> |
| 2.3 V to 2.7 V  | 30 pF          | 500 Ω          | open                                | GND                                 | 2V <sub>CC</sub>                    |
| 3.0 V to 3.6 V  | 50 pF          | 500 Ω          | open                                | GND                                 | 2V <sub>CC</sub>                    |

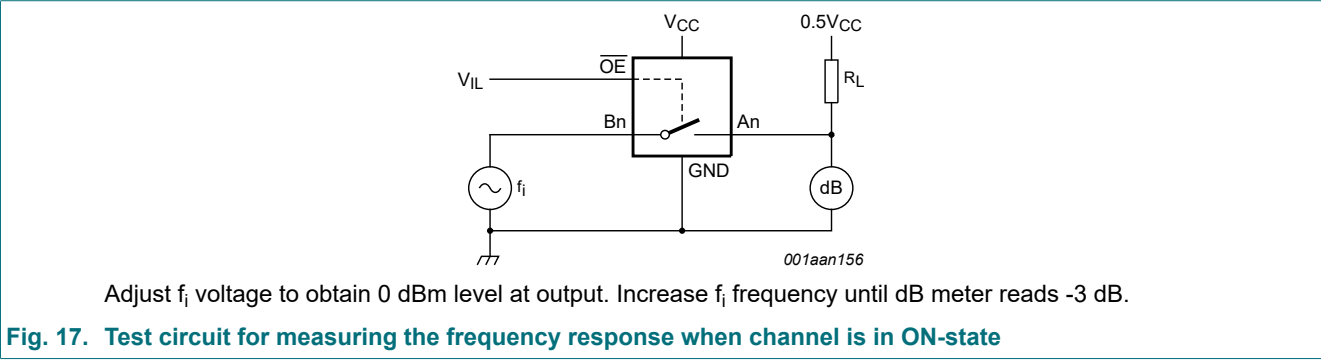
10.2. Additional dynamic characteristics

Table 11. Additional dynamic characteristics

GND = 0 V.

| Symbol              | Parameter                | Conditions                                                      | T <sub>amb</sub> = 25 °C |     |     | Unit |
|---------------------|--------------------------|-----------------------------------------------------------------|--------------------------|-----|-----|------|
|                     |                          |                                                                 | Min                      | Typ | Max |      |
| f <sub>(-3dB)</sub> | -3 dB frequency response | V <sub>CC</sub> = 3.3 V; R <sub>L</sub> = 50 Ω; see Fig. 17 [1] | -                        | 406 | -   | MHz  |

[1] f<sub>i</sub> is biased at 0.5V<sub>CC</sub>.



11. Package outline

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

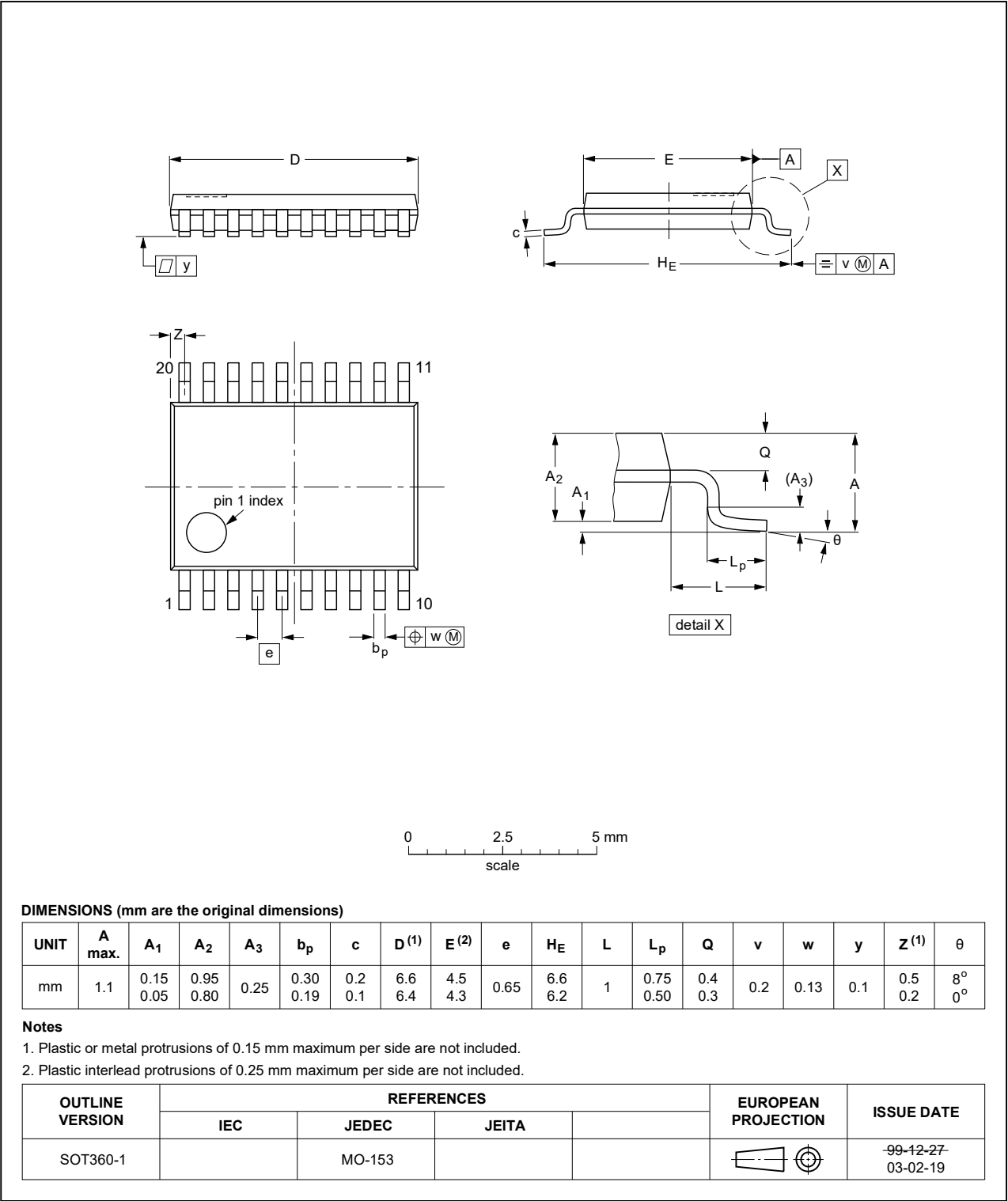


Fig. 18. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads;  
20 terminals; body 2.5 x 4.5 x 0.85 mm

SOT764-1



Fig. 19. Package outline SOT764-1 (DHVQFN20)

## 12. Abbreviations

Table 12. Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                       |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| MIL     | Military                                |
| MM      | Machine Model                           |

## 13. Revision history

Table 13. Revision history

| Document ID          | Release date                                                                                                                                                                                                                                  | Data sheet status  | Change notice | Supersedes           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|----------------------|
| 74CBTLV3245_Q100 v.4 | 20200507                                                                                                                                                                                                                                      | Product data sheet | -             | 74CBTLV3245_Q100 v.3 |
| Modifications:       | <ul style="list-style-type: none"> <li>• <a href="#">Section 2</a> updated.</li> <li>• <a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>                                          |                    |               |                      |
| 74CBTLV3245_Q100 v.3 | 20190412                                                                                                                                                                                                                                      | Product data sheet | -             | 74CBTLV3245_Q100 v.2 |
| Modifications:       | <ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                    |               |                      |
| 74CBTLV3245_Q100 v.2 | 20161110                                                                                                                                                                                                                                      | Product data sheet | -             | 74CBTLV3245_Q100 v.1 |
| Modifications:       | <ul style="list-style-type: none"> <li>• <a href="#">Additional dynamic characteristics</a> added.</li> </ul>                                                                                                                                 |                    |               |                      |
| 74CBTLV3245_Q100 v.1 | 20160414                                                                                                                                                                                                                                      | Product data sheet | -             | -                    |

## 14. Legal information

### Data sheet status

| Document status<br>[1][2]      | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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