



# 74CBTLV1G125-Q100

Single bus switch

Rev. 2 — 24 June 2024

Product data sheet

## 1. General description

The 74CBTLV1G125-Q100 is a single high-speed line switch. The switch is disabled when the output enable ( $\overline{OE}$ ) input is high.

To ensure the high-impedance OFF-state during power-up or power-down, tie  $\overline{OE}$  to the  $V_{CC}$  through a pull-up resistor. The current-sinking capability of the driver determines the minimum value of the resistor.

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 potentially 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
- Overvoltage tolerant control inputs to 3.6 V
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
- 5  $\Omega$  switch connection between two ports
- Rail to rail switching on data I/O ports
- CMOS low power consumption
- Latch-up performance meets requirements of JESD78 Class I
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
<a href="#">74CBTLV1G125GW-Q100</a>	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	<a href="#">SOT353-1</a>
<a href="#">74CBTLV1G125GV-Q100</a>	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	<a href="#">SOT753</a>

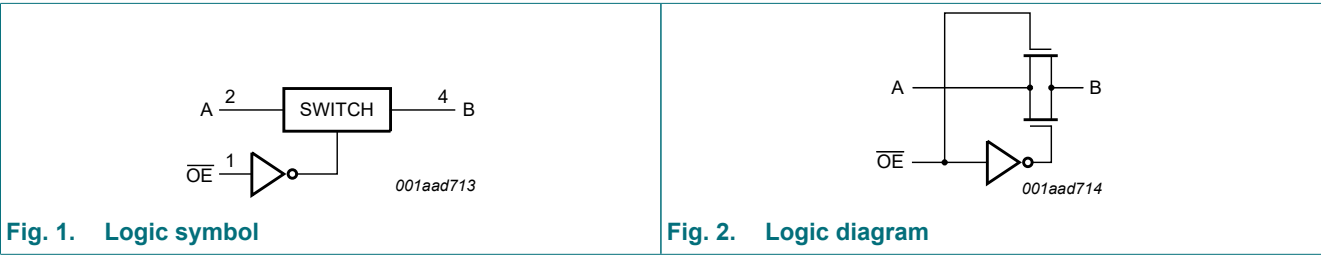
4. Marking

Table 2. Marking

Type number	Marking code [1]
74CBTLV1G125GW-Q100	bM
74CBTLV1G125GV-Q100	b25

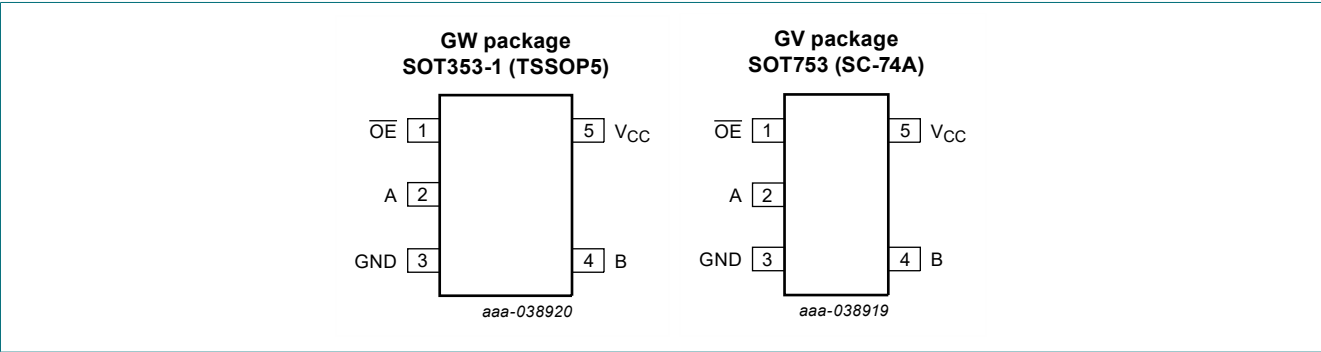
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT353-1 and SOT753	SOT886, SOT1115 and SOT1202	
OE	1	1	output enable input OE (active LOW)
A	2	2	data input or output A
GND	3	3	ground (0 V)
B	4	4	data input or output B
n.c.	-	5	not connected
VCC	5	6	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

Output enable input $\overline{OE}$	Function switch
L	ON-state
H	OFF-state

8. Limiting values

Table 5. 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
$V_{CC}$	supply voltage		-0.5	+4.6	V
$V_I$	input voltage	[1]	-0.5	+4.6	V
$V_{SW}$	switch voltage	enable and disable mode	-0.5	$V_{CC} + 0.5$	V
$I_{IK}$	input clamping current	$V_{IO} < -0.5\text{ V}$	-50	-	mA
$I_{SK}$	switch clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 50$	mA
$I_{SW}$	switch current	$V_{SW} = 0\text{ V}$ to $V_{CC}$	-	$\pm 128$	mA
$I_{CC}$	supply current		-	+50	mA
$I_{GND}$	ground current		-50	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [2]	-	250	mW

- [1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
[2] For SOT353-1 (TSSOP5) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.  
For SOT753 (SC-74A) package:  $P_{tot}$  derates linearly with 3.8 mW/K above 85 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	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]	0	-	20	ns/V

- [1] Applies to control signal levels.

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T <sub>amb</sub> = -40 °C to +85 °C						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.6 V	-	-	±1.0	µA
I <sub>S(OFF)</sub>	OFF-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> - GND; V <sub>CC</sub> = 3.6 V; see Fig. 3	-	±0.1	±5	µA
I <sub>S(ON)</sub>	ON-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 3.6 V; see Fig. 4	-	±0.1	±5	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±10	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.6 V	-	-	10	µA
ΔI <sub>CC</sub>	additional supply current	control input; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; V <sub>CC</sub> = 3.6 V [2]	-	-	300	µA
C <sub>I</sub>	input capacitance	control input; V <sub>I</sub> = 0 V or 3 V	-	2.5	-	pF
C <sub>sw</sub>	switch capacitance	OFF-state	-	7.0	-	pF
		ON-state	-	10.3	-	pF
T <sub>amb</sub> = -40 °C to +125 °C						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.6 V	-	-	±100	µA
I <sub>S(OFF)</sub>	OFF-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> - GND; V <sub>CC</sub> = 3.6 V; see Fig. 3	-	-	±200	µA
I <sub>S(ON)</sub>	ON-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 3.6 V; see Fig. 4	-	-	±200	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±10	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.6 V	-	-	200	µA
ΔI <sub>CC</sub>	additional supply current	control input; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; V <sub>CC</sub> = 3.6 V [2]	-	-	5000	µA

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and at V<sub>CC</sub> = 3.3 V.

[2] One input at 3 V, other inputs at V<sub>CC</sub> or GND.

Table 8. Resistance R<sub>ON</sub>

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see test circuit Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
R <sub>ON</sub>	ON resistance	V <sub>CC</sub> = 2.3 V; see Fig. 6 [2]						
		I <sub>SW</sub> = 64 mA; V <sub>I</sub> = 0 V	-	4.7	10	-	15.0	Ω
		I <sub>SW</sub> = 24 mA; V <sub>I</sub> = 0 V	-	4.5	10	-	15.0	Ω
		I <sub>SW</sub> = 15 mA; V <sub>I</sub> = 1.7 V	-	11	25	-	38.0	Ω
		V <sub>CC</sub> = 3.0 V; see Fig. 7						
		I <sub>SW</sub> = 64 mA; V <sub>I</sub> = 0 V	-	4.2	7	-	11.0	Ω
		I <sub>SW</sub> = 24 mA; V <sub>I</sub> = 0 V	-	4.1	7	-	11.0	Ω
		I <sub>SW</sub> = 15 mA; V <sub>I</sub> = 2.4 V	-	7.3	15	-	25.5	Ω

- [1] Typical values are measured at T<sub>amb</sub> = 25 °C.
- [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.

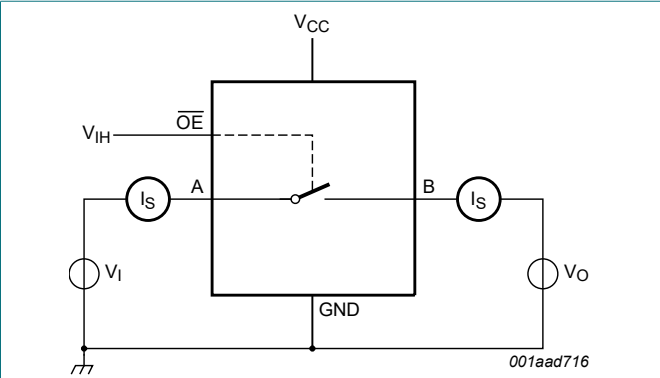


Fig. 3. Test circuit for measuring OFF-state leakage current

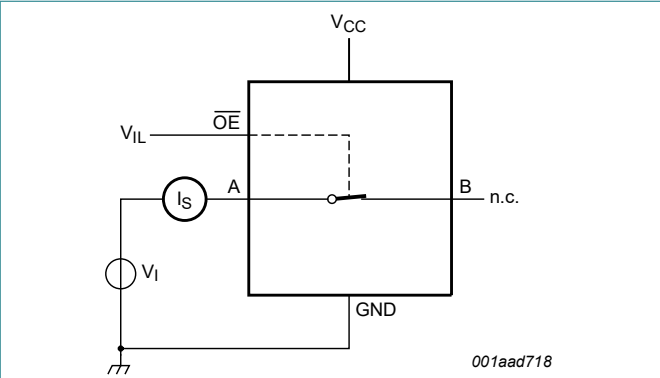
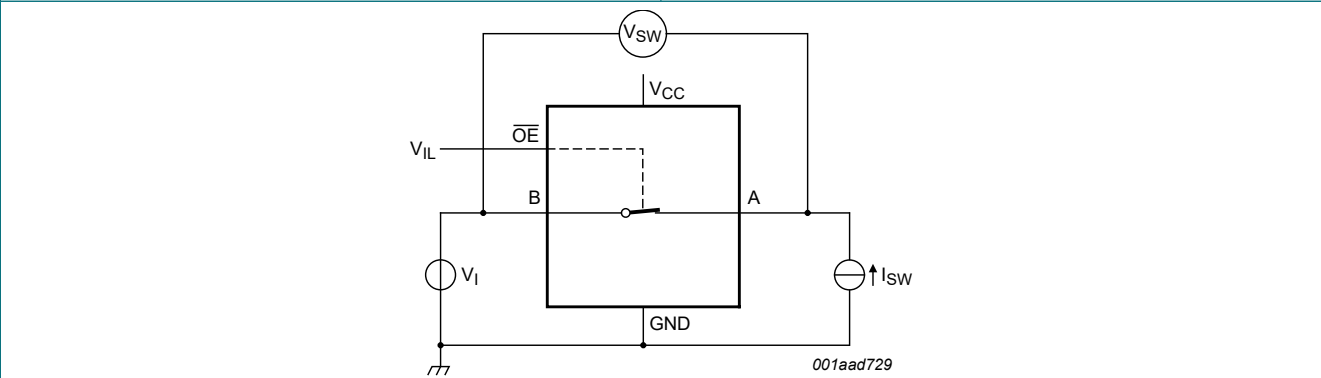
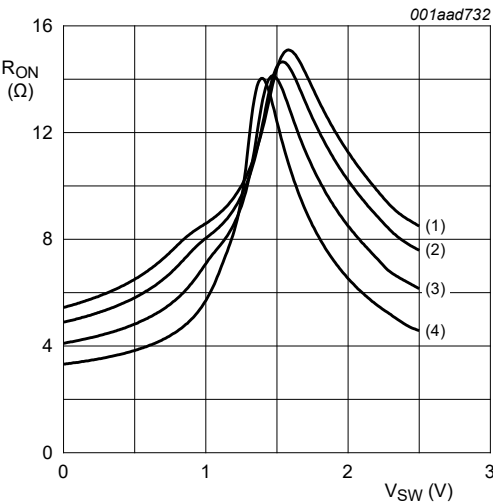


Fig. 4. Test circuit for measuring ON-state leakage current



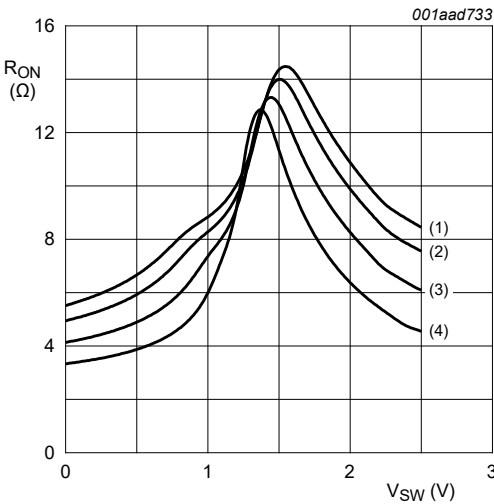
$R_{ON} = V_{SW} / I_{SW}$ .

Fig. 5. Test circuit for measuring ON-resistance



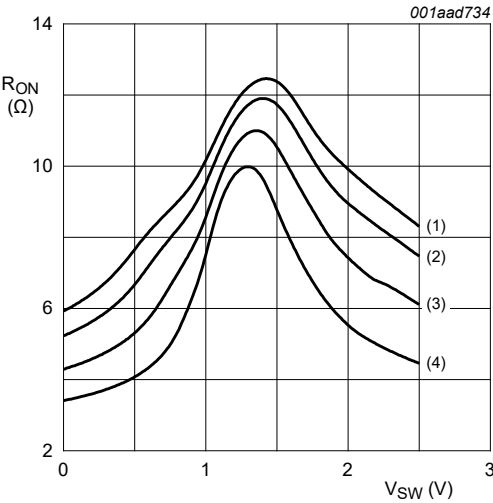
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

a.  $V_{CC} = 2.5\text{ V}$ ;  $I_{SW} = 15\text{ mA}$ ;  $V_{SW} = 1.7\text{ V}$



- (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)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

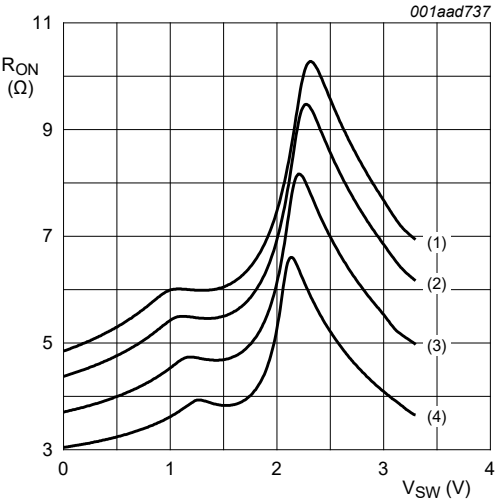
b.  $V_{CC} = 2.5\text{ V}$ ;  $I_{SW} = 24\text{ mA}$ ;  $V_{SW} = 0\text{ V}$



- (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)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

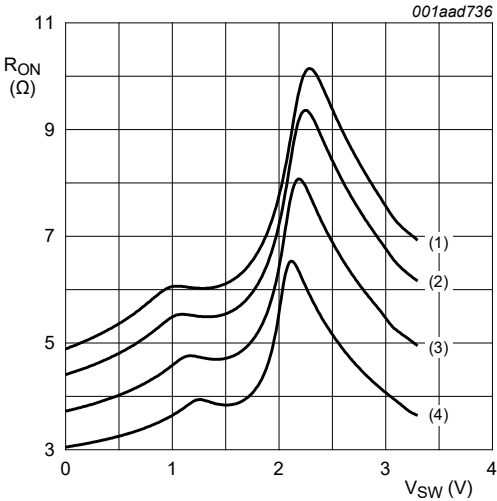
c.  $V_{CC} = 2.5\text{ V}$ ;  $I_{SW} = 64\text{ mA}$ ;  $V_{SW} = 0\text{ V}$

Fig. 6. Switch ON-resistance as a function of input voltage at  $V_{CC} = 2.5\text{ V}$



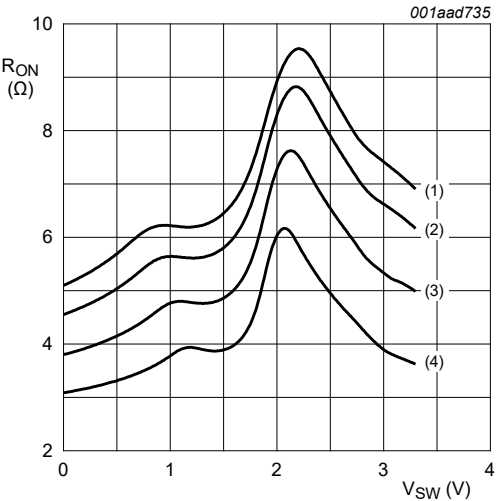
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

a.  $V_{CC} = 3.3\text{ V}$ ;  $I_{SW} = 15\text{ mA}$ ;  $V_{SW} = 2.4\text{ V}$



- (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)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

b.  $V_{CC} = 3.3\text{ V}$ ;  $I_{SW} = 24\text{ mA}$ ;  $V_{SW} = 0\text{ V}$



- (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)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

c.  $V_{CC} = 3.3\text{ V}$ ;  $I_{SW} = 64\text{ mA}$ ;  $V_{SW} = 0\text{ V}$

Fig. 7. Switch ON-resistance as a function of input voltage at  $V_{CC} = 3.3\text{ V}$

11. Dynamic characteristics

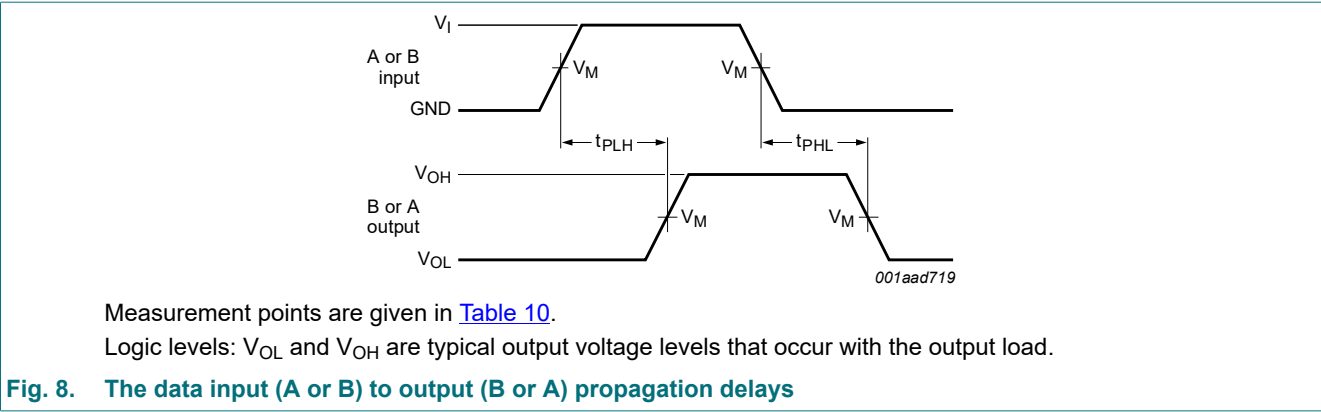
Table 9. Dynamic characteristics

GND = 0 V; see Fig. 10.

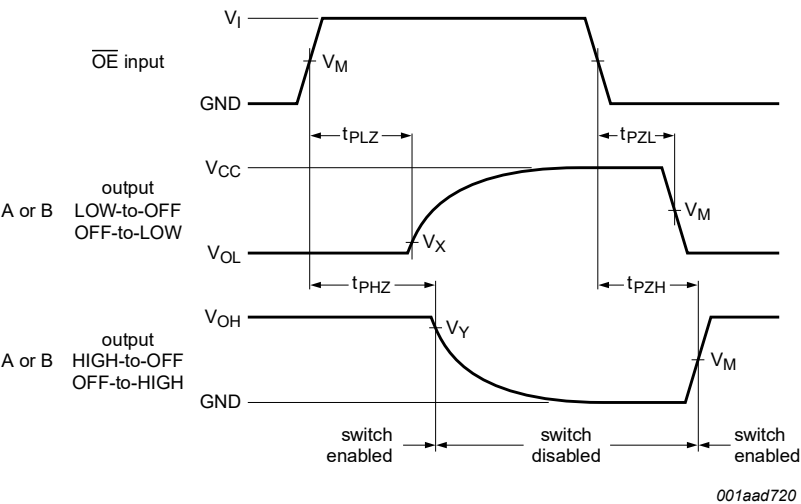
Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A to B or B to A; see Fig. 8; R <sub>L</sub> = ∞ Ω [2][3]						
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.21	-	0.32	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.16	0.25	-	0.39	ns
t <sub>en</sub>	enable time	OE to A or B; see Fig. 9; R <sub>L</sub> = 500 Ω [4]						
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.50	4.00	1.0	5.00	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.05	4.00	1.0	5.00	ns
t <sub>dis</sub>	disable time	OE to A or B; see Fig. 9; R <sub>L</sub> = 500 Ω [5]						
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.80	5.00	1.0	6.30	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	3.40	4.10	1.0	5.40	ns

- [1] All typical values are measured at T<sub>amb</sub> = 25 °C and at nominal V<sub>CC</sub>.
- [2] The propagation delay is the calculated RC time constant of the maximum on-state resistance of the switch and the load capacitance, when driven by an ideal voltage source (zero output impedance).
- [3] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [4] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.
- [5] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.

11.1. Waveforms and test circuit





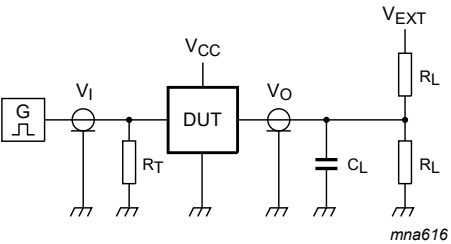


Measurement points are given in [Table 10](#).  
Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Fig. 9. Enable and disable times

Table 10. Measurement points

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



Test data is given in [Table 11](#).  
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;  
 $V_{EXT}$  = Test voltage for switching times.

Fig. 10. Test circuit for measuring switching times

Table 11. Test data

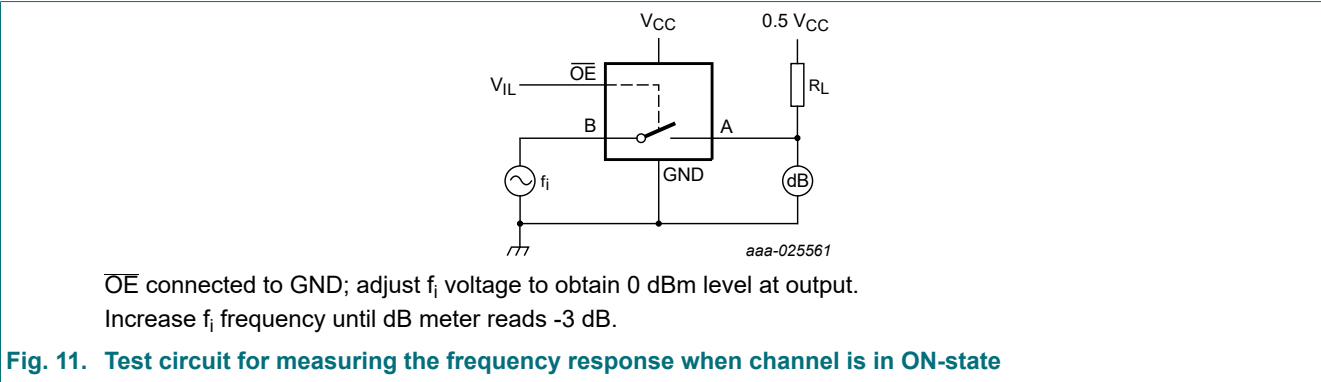
Supply voltage	Load	$V_{EXT}$		
$V_{CC}$	$C_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
2.3 V to 2.7 V	30 pF	open	GND	$2 \times V_{CC}$
3.0 V to 3.6 V	50 pF	open	GND	$2 \times V_{CC}$

## 12. Additional dynamic characteristics

**Table 12. Additional dynamic characteristics**  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  
 $V_I = \text{GND or } V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 2.5 \text{ ns}$ .

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. 11 [1]	-	263	-	MHz

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



13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm SOT353-1

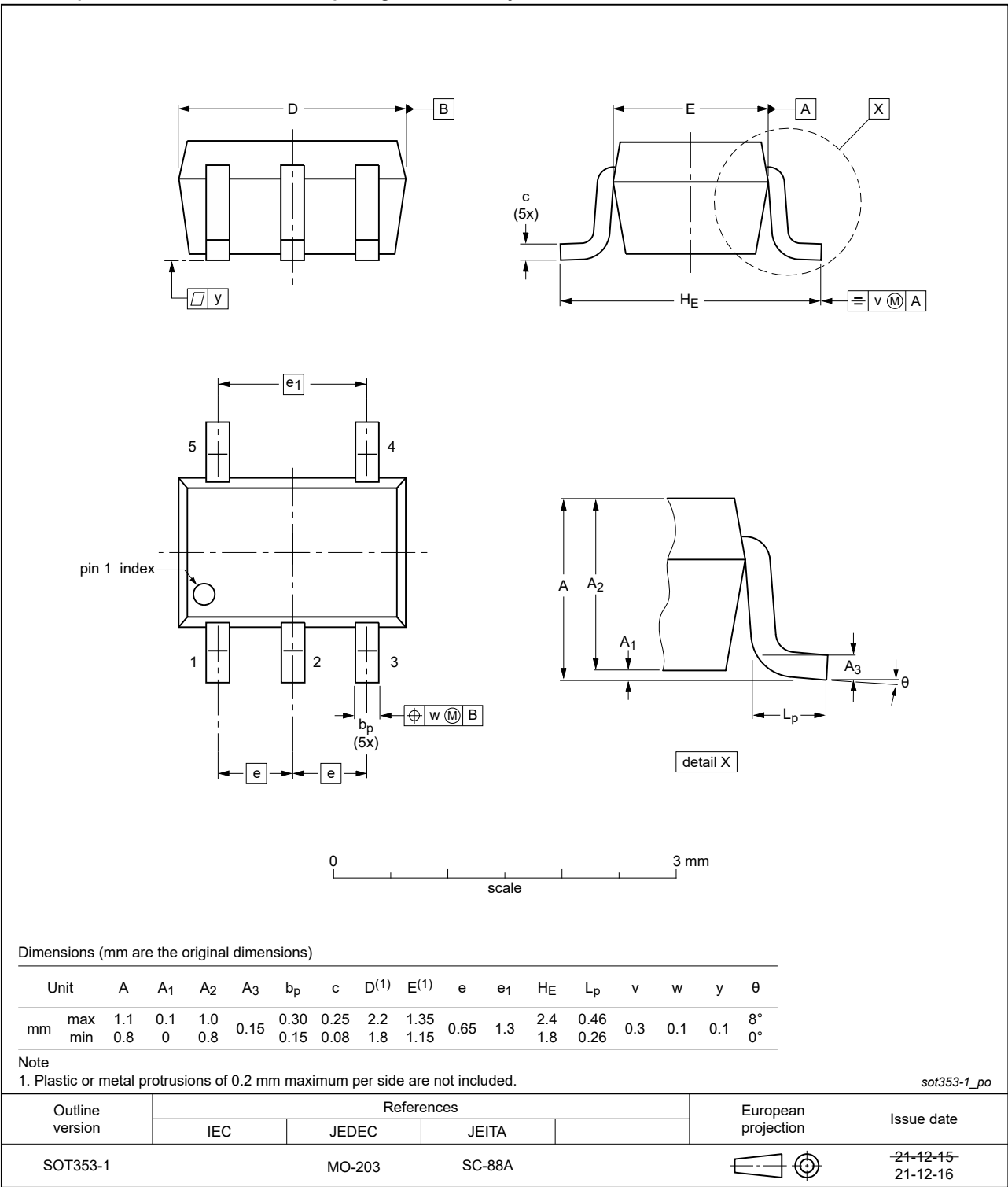


Fig. 12. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

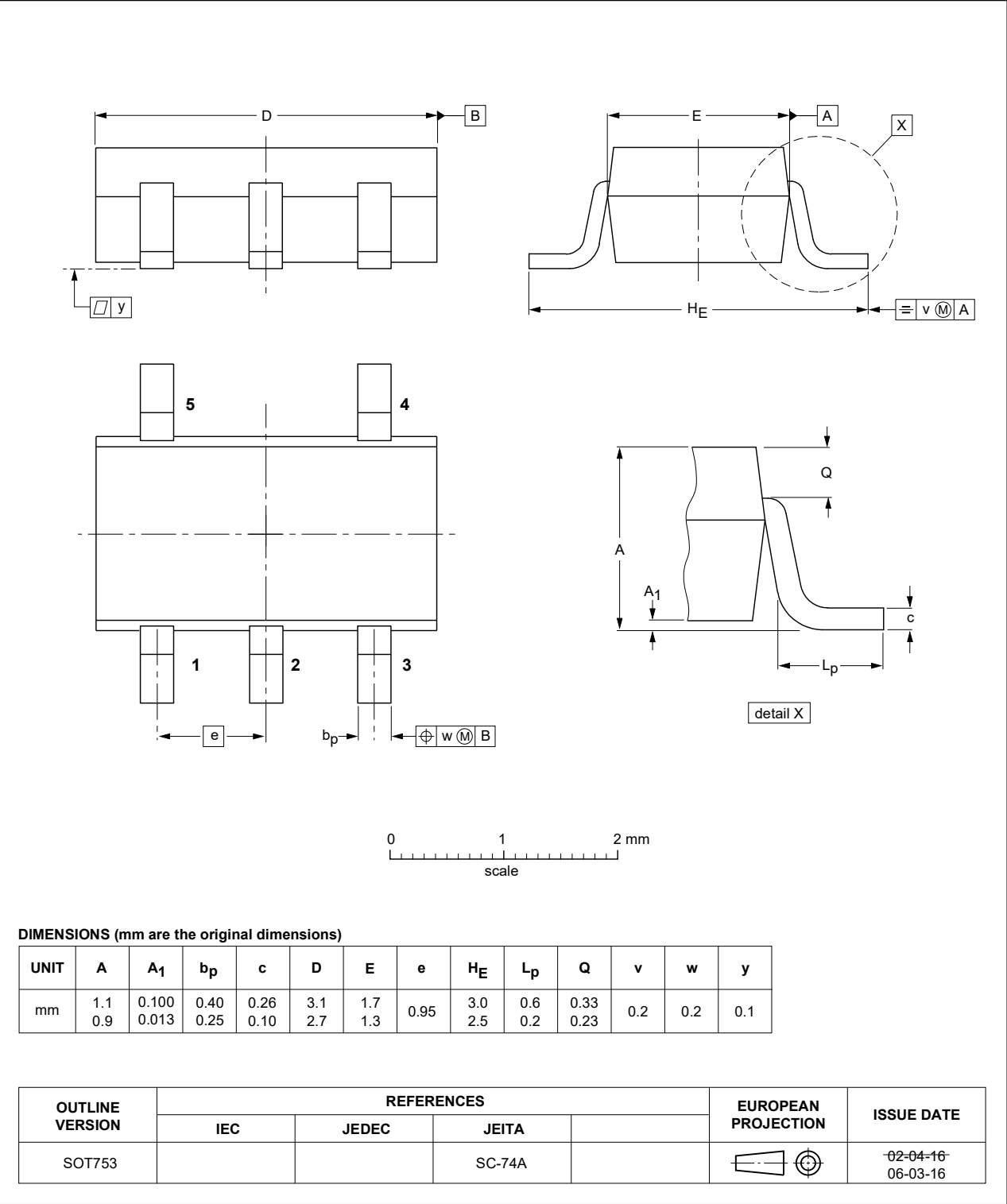


Fig. 13. Package outline SOT753 (SC-74A)

14. Abbreviations

Table 13. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CBTLV1G125_Q100 v.2	20240624	Product data sheet	-	74CBTLV1G125_Q100 v.1
Modifications:	• <a href="#">Section 2</a> : ESD specification updated according to the latest JEDEC standard.			
74CBTLV1G125_Q100 v.1	20240126	Product data sheet	-	-

## 16. 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.
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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