74CBTLV3245

8-bit bus switch with output enable Rev. 2 — 15 December 2011

Product data sheet

1. **General description**

The 74CBTLV3245 is an 8-pole, single-throw bus switch. The device features a single output enable input (OE) that controls eight switch channels. The switches are disabled when 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.

2. **Features and benefits**

- 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:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM AEC-Q100-011 revision B exceeds 1000 V
- \blacksquare 5 Ω 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
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C



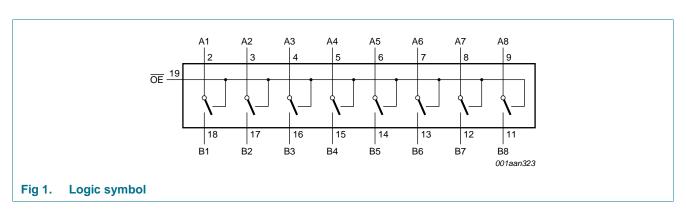
3. Ordering information

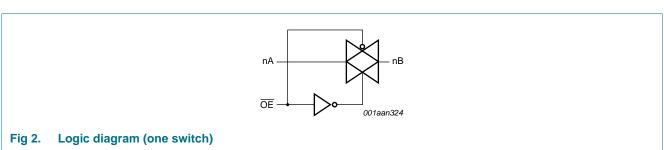
Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74CBTLV3245DS	-40 °C to +125 °C	SSOP20[1]	plastic shrink small outline package; 20 leads; body width 3.9 mm; lead pitch 0.635 mm	SOT724-1
74CBTLV3245PW	–40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74CBTLV3245BQ	–40 °C to +125 °C	DHVQFN20	plastic dual-in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body $2.5 \times 4.5 \times 0.85$ mm	SOT764-1

^[1] Also known as QSOP20 package

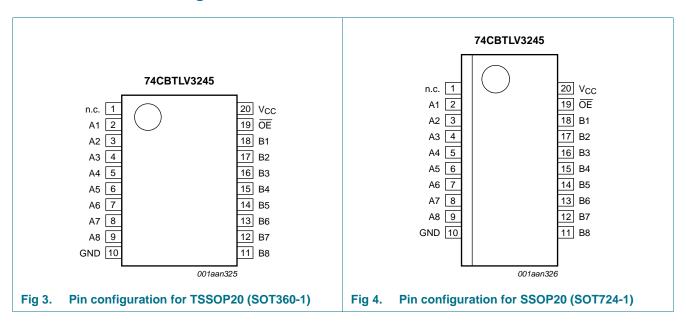
4. Functional diagram

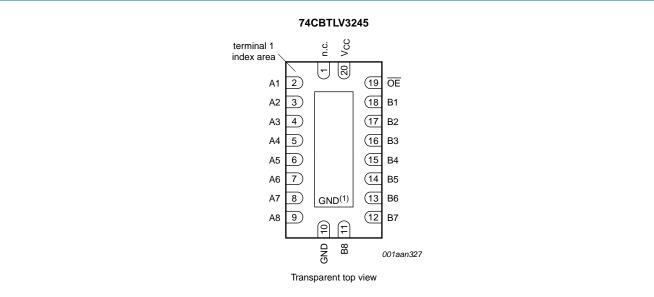




5. Pinning information

5.1 Pinning





(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig 5. Pin configuration for DHVQFN20 (SOT764-1)

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 _{CC}	20	positive supply voltage

6. Functional description

Table 3. Function selection[1]

Input OE	Input/output
OE	An, Bn
L	An = Bn
H	Ζ

^[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

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_{CC}	supply voltage		-0.5	+4.6	V
V_{I}	input voltage		<u>[1]</u> –0.5	+4.6	V
V_{SW}	switch voltage	enable and disable mode	<u>[1]</u> –0.5	$V_{CC} + 0.5$	V
I _{IK}	input clamping current	$V_1 < -0.5 \text{ V}$	-50	•	mA
I _{SK}	switch clamping current	$V_{I} < -0.5 \text{ V}$	-50	•	mA
I _{SW}	switch current	$V_{SW} = 0 V to V_{CC}$	-	±128	mA
I _{CC}	supply current		-	+100	mA
I_{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	T_{amb} = -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 SSOP20 and TSSOP20 packages: above 60 $^{\circ}$ C the value of P_{tot} derates linearly at 5.5 mW/K. For DHVQFN20 packages: above 60 $^{\circ}$ C the value of P_{tot} derates linearly at 4.5 mW/K.

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
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.3 V to 3.6 V	<u>[1]</u> _	200	ns/V

^[1] Applies to control signal levels.

9. Static characteristics

Table 6. Static characteristics

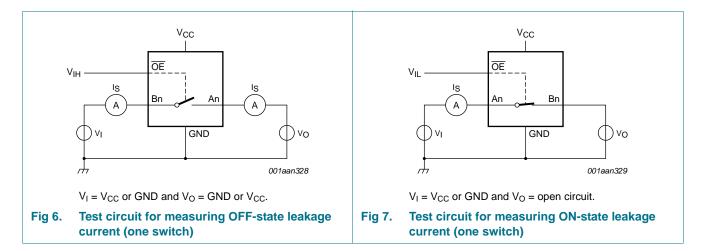
At recommended operating conditions voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Т	amb =	–40 °C to	+85 °C	T _{amb} = -40 °	C to +125 °C	Unit
				Min	Typ[1]	Max	Min	Max	
V_{IH}	HIGH-level	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.7	-	-	1.7	-	V
	input voltage	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		2.0	-	-	2.0	-	V
V_{IL}		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		-	-	0.7	-	0.7	V
	voltage	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		-	-	0.9	-	0.9	V
I	input leakage current	pin \overline{OE} ; $V_I = GND$ to V_{CC} ; $V_{CC} = 3.6 \text{ V}$		-	-	±1	-	±20	μΑ
I _{S(OFF)}	OFF-state leakage current	$V_{CC} = 3.6 \text{ V}$; see Figure 6		-	-	±1	-	±20	μΑ
I _{S(ON)}	ON-state leakage current	$V_{CC} = 3.6 \text{ V}$; see Figure 7		-	-	±1	-	±20	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V		-	-	±10	-	±50	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{SW} = GND \text{ or } V_{CC};$ $V_{CC} = 3.6 \text{ V}$		-	-	10	-	50	μА
ΔI_{CC}	additional supply current	pin $\overline{\text{OE}}$; $V_{I} = V_{CC} - 0.6 \text{ V}$; $V_{SW} = \text{GND or } V_{CC}$; $V_{CC} = 3.6 \text{ V}$	[2]	-	-	300	-	2000	μА
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 $T_{amb} = 25$ °C.

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

9.1 Test circuits



9.2 ON resistance

Table 7. Resistance R_{ON}

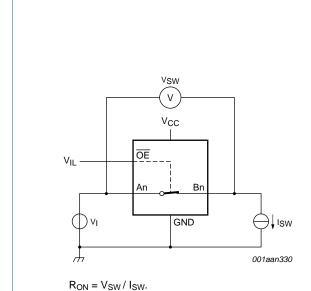
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions	T _{amb} =	-40 °C to	+85 °C	T _{amb} = -40 °	C to +125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V};$ see <u>Figure 9</u> to <u>Figure 11</u>	1						
	$I_{SW} = 64 \text{ mA}; V_I = 0 \text{ V}$	-	4.2	8.0	-	15.0	Ω	
	$I_{SW} = 24 \text{ mA}; V_I = 0 \text{ V}$	-	4.2	8.0	-	15.0	Ω	
		$I_{SW} = 15 \text{ mA}; V_I = 1.7 \text{ V}$	-	8.4	40	-	60.0	Ω
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V};$ see <u>Figure 12</u> to <u>Figure 14</u>						
		$I_{SW} = 64 \text{ mA}; V_I = 0 \text{ V}$	-	4.0	7.0	-	11.0	Ω
		$I_{SW} = 24 \text{ mA}; V_I = 0 \text{ V}$	-	4.0	7.0	-	11.0	Ω
		$I_{SW} = 15 \text{ mA}; V_I = 2.4 \text{ V}$	-	6.2	15	-	25.5	Ω

^[1] Typical values are measured at T_{amb} = 25 °C and nominal V_{CC} .

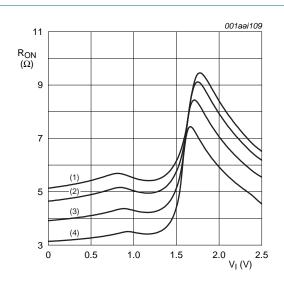
^[2] Measured by the voltage drop between the A and B terminals at the indicated current through the switch. ON-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

9.3 ON resistance test circuit and graphs



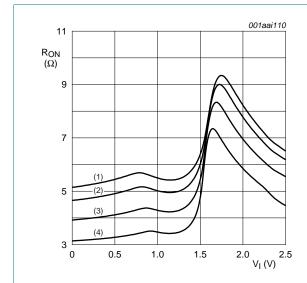
11ON - 1200 1200

Fig 8. Test circuit for measuring ON resistance (one switch)



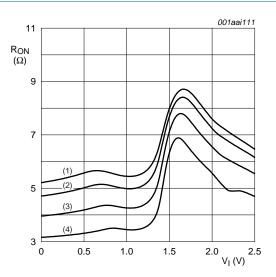
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 9. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V}$; $I_{SW} = 15 \text{ mA}$



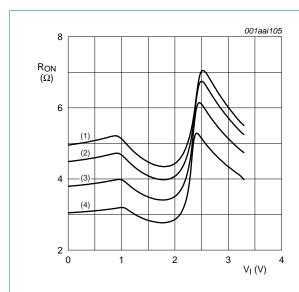
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 10. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V}; I_{SW} = 24 \text{ mA}$



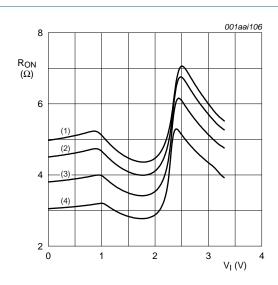
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 11. ON resistance as a function of input voltage; $V_{CC} = 2.5 \text{ V}$; $I_{SW} = 64 \text{ mA}$



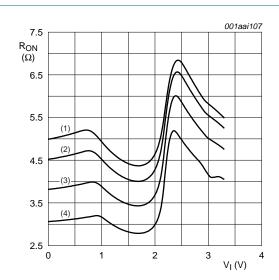
- (1) $T_{amb} = 125 \, ^{\circ}C$.
- (2) $T_{amb} = 85 \, ^{\circ}C$.
- (3) $T_{amb} = 25 \, ^{\circ}C$.
- (4) $T_{amb} = -40 \, ^{\circ}C$.

Fig 12. ON resistance as a function of input voltage; $V_{CC} = 3.3 \text{ V}; I_{SW} = 15 \text{ mA}$



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

Fig 13. ON resistance as a function of input voltage; $V_{CC} = 3.3 \text{ V}; I_{SW} = 24 \text{ mA}$



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

Fig 14. 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

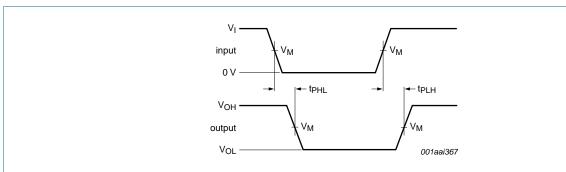
GND = 0 V; for test circuit see Figure 17

Symbol	Parameter	Conditions		T _{amb} =	–40 °C to	+85 °C	$T_{amb} = -40$ °	C to +125 °C	Unit
			Min	Typ[1]	Max	Min	Max		
t _{pd}	propagation delay	An to Bn or Bn to An; see Figure 15	[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 Figure 16	[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 Figure 16	<u>[5]</u>						
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		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 °C and at nominal V_{CC} .

- [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} .

11. Waveforms



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

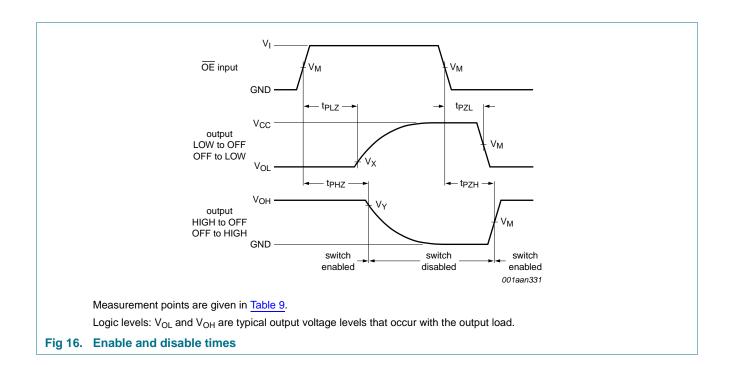
Table 9. Measurement points

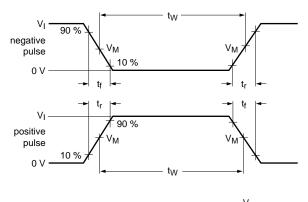
Supply voltage	Input			Output			
V _{CC}	V _M	V _I	$t_r = t_f$	V _M	V _X	V _Y	
2.3 V to 2.7 V	0.5V _{CC}	V_{CC}	\leq 2.0 ns	0.5V _{CC}	V _{OL} + 0.15 V	$V_{OH}-0.15\ V$	
3.0 V to 3.6 V	0.5V _{CC}	V_{CC}	≤ 2.0 ns	0.5V _{CC}	V_{OL} + 0.3 V	$V_{OH} - 0.3 V$	

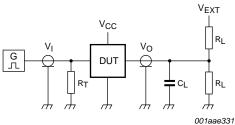
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^[2] The propagation delay is the calculated RC time constant of the on-state resistance of the switch and the load capacitance, when driven by an ideal voltage source (zero output impedance).







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_0 of the pulse generator.

 V_{EXT} = External voltage for measuring switching times.

Fig 17. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Load		V _{EXT}			
V _{CC}	C _L	R _L	t _{PLH} , t _{PHL}	t _{PZL} , t _{PLZ}		
2.3 V to 2.7 V	30 pF	500 Ω	open	GND	2V _{CC}	
3.0 V to 3.6 V	50 pF	500 Ω	open	GND	2V _{CC}	

12. Package outline

SSOP20: plastic shrink small outline package; 20 leads; body width 3.9 mm; lead pitch 0.635 mm SOT724-1

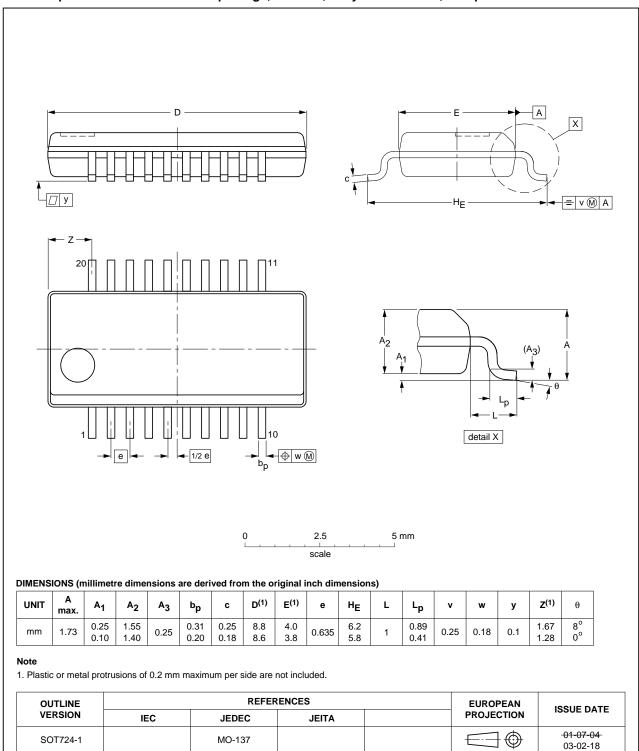


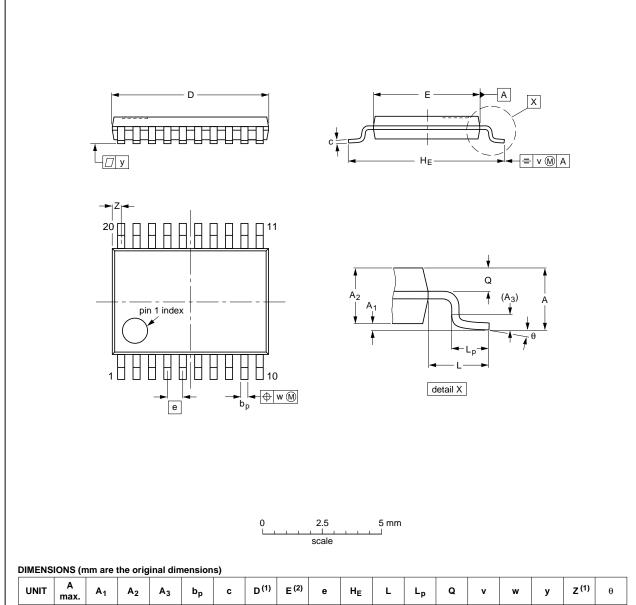
Fig 18. Package outline SOT724-1 (SSOP20)

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

SOT360-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E (2)	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE		EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE	
SOT360-1		MO-153			99-12-27 03-02-19	

Fig 19. Package outline SOT360-1 (TSSOP20)

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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

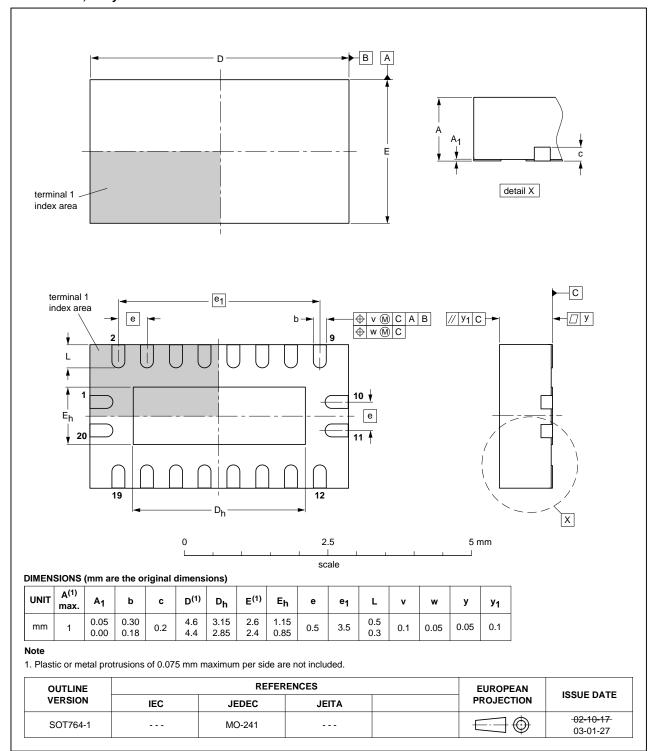


Fig 20. Package outline SOT764-1 (DHVQFN20)

74CBTLV3245

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13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MM	Machine Model

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CBTLV3245 v.2	20111215	Product data sheet	-	74CBTLV3245 v.1
Modifications:	 Legal pages 	s updated.		
74CBTLV3245 v.1	20101230	Product data sheet	-	-

15. Legal information

15.1 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 URL http://www.nxp.com.

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