74CBTLV1G125

Single bus switch Rev. 2 — 29 July 2010

Product data sheet

General description 1.

The 74CBTLV1G125 provides a single high-speed line switch. The switch is disabled when the output enable (OE) input is high.

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

Schmitt trigger action at control input makes the circuit tolerant to slower input rise and fall times across the entire V_{CC} range from 2.3 V to 3.6 V.

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 JESD22-C101E 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 meets requirements of JESD78 Class I
- 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				
74CBTLV1G125GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74CBTLV1G125GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74CBTLV1G125GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886				
74CBTLV1G125GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1 \times 0.5 mm	SOT891				
74CBTLV1G125GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115				
74CBTLV1G125GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202				

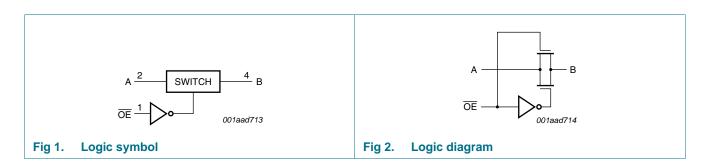
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74CBTLV1G125GW	bM
74CBTLV1G125GV	b25
74CBTLV1G125GM	bM
74CBTLV1G125GF	bM
74CBTLV1G125GN	bM
74CBTLV1G125GS	bM

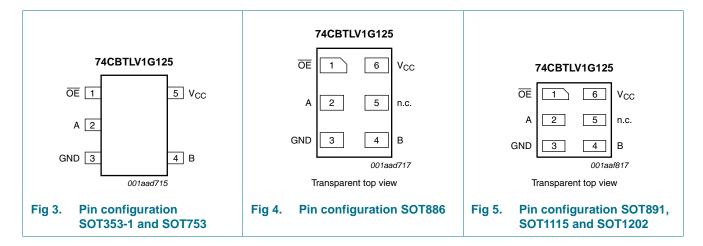
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description	
	SOT353-1, SOT753	SOT886, SOT891, 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)	
В	4	4	data input or output B	
n.c.	-	5	not connected	
V _{CC}	5	6	supply voltage	

7. Functional description

7.1 Function table

Table 4. Function table[1]

Output enable input OE	Function switch
L	ON-state
Н	OFF-state

[1] H = HIGH voltage level; L = LOW voltage level.

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
Cyllibol	i arameter	Oonanons	141111	IVIGA	Oint
V_{CC}	supply voltage		-0.5	+4.6	V
VI	input voltage		<u>[1]</u> –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	$V_{I/O} < -0.5 \text{ V}$	-50	-	mA
I _{SK}	switch clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	-	±50	mA
I _{SW}	switch current	$V_{SW} = 0 V \text{ to } V_{CC}$	-	±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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[2] -	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		2.3	-	3.6	V
VI	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	$V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$	<u>[1]</u> 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 _{amb} = -	40 °C to +85 °C					
V_{IH}	HIGH-level input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
I	input leakage current	$V_I = GND$ to V_{CC} ; $V_{CC} = 3.6 \text{ V}$	-	-	±1.0	μΑ
I _{S(OFF)}	OFF-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC} - GND$; $V_{CC} = 3.6$ V; see <u>Figure 6</u>	-	±0.1	±5	μΑ
I _{S(ON)}	ON-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 3.6$ V; see Figure 7	-	±0.1	±5	μΑ
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^[2] For TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

 Table 7.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V	-	-	±10	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A}; V_{CC} = 3.6 \text{ V}$	-	-	10	μΑ
ΔI_{CC}	additional supply current	control input; $V_I = V_{CC} - 0.6 \text{ V}$; $V_{CC} = 3.6 \text{ V}$	[2] _	-	300	μΑ
Cı	input capacitance	control input; $V_I = 0 \text{ V or } 3 \text{ V}$	-	2.5	-	pF
C_{sw}	switch capacitance	OFF-state	-	7.0	-	pF
		ON-state	-	10.3	-	pF
T _{amb} = -	40 °C to +125 °C					
V _{IH}	HIGH-level input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
I	input leakage current	$V_I = GND$ to V_{CC} ; $V_{CC} = 3.6 \text{ V}$	-	-	±100	μΑ
I _{S(OFF)}	OFF-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC} - GND$; $V_{CC} = 3.6$ V; see <u>Figure 6</u>	-	-	±200	μΑ
I _{S(ON)}	ON-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 3.6$ V; see Figure 7	-	-	±200	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±10	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A}; V_{CC} = 3.6 \text{ V}$	-	-	200	μΑ
ΔI_{CC}	additional supply current	control input; $V_I = V_{CC} - 0.6 \text{ V}$; $V_{CC} = 3.6 \text{ V}$	[2] _	-	5000	μΑ

^[1] Typical values are measured at T_{amb} = 25 °C and at V_{CC} = 3.3 V.

Table 8. Resistance R_{ON}

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

	•								
Symbol	Parameter	ameter Conditions	–40 °C to +85 °C		-40 °C to +125 °C		Unit		
				Min	Typ[1]	Max	Min	Max	
R_{ON}	ON resistance	V _{CC} = 2.3 V; see <u>Figure 9</u>	[2]						
		$I_{SW} = 64 \text{ mA}; V_I = 0 \text{ V}$		-	4.7	10	-	15.0	Ω
		$I_{SW} = 24 \text{ mA}; V_I = 0 \text{ V}$		-	4.5	10	-	15.0	Ω
		$I_{SW} = 15 \text{ mA}; V_I = 1.7 \text{ V}$		-	11	25	-	38.0	Ω
		V _{CC} = 3.0 V; see <u>Figure 10</u>							
		$I_{SW} = 64 \text{ mA}; V_I = 0 \text{ V}$		-	4.2	7	-	11.0	Ω
		$I_{SW} = 24 \text{ mA}; V_I = 0 \text{ V}$		-	4.1	7	-	11.0	Ω
		$I_{SW} = 15 \text{ mA}; V_I = 2.4 \text{ V}$		-	7.3	15	-	25.5	Ω

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

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

^[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.

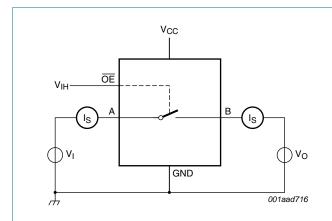


Fig 6. Test circuit for measuring OFF-state leakage current

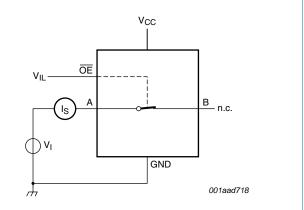
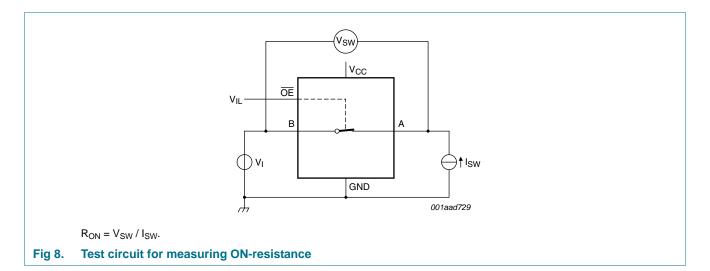
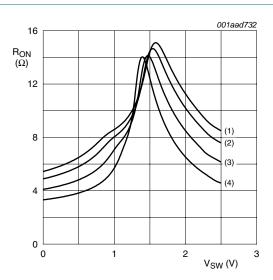


Fig 7. Test circuit for measuring ON-state leakage current





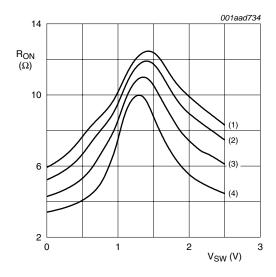


(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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



(1)
$$T_{amb} = 125 \, ^{\circ}C$$

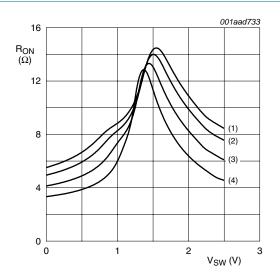
(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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

Fig 9. Switch ON-resistance as a function of input voltage at $V_{CC} = 2.5 \text{ V}$



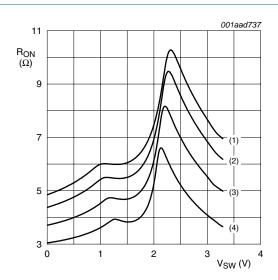
(1)
$$T_{amb} = 125 \, ^{\circ}C$$

(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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



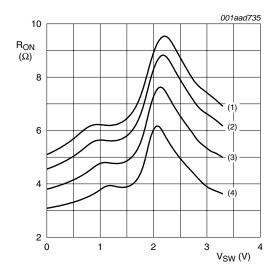


(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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



(1)
$$T_{amb} = 125 \, ^{\circ}C$$

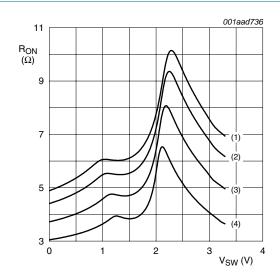
(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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

Fig 10. Switch ON-resistance as a function of input voltage at V_{CC} = 3.3 V



(1)
$$T_{amb} = 125 \, ^{\circ}C$$

(2)
$$T_{amb} = 85 \, ^{\circ}C$$

(3)
$$T_{amb} = 25 \, ^{\circ}C$$

(4)
$$T_{amb} = -40 \, ^{\circ}C$$

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

11. Dynamic characteristics

Table 9. Dynamic characteristics

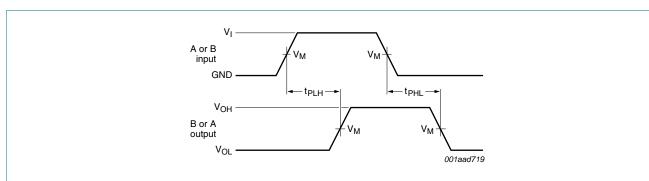
GND = 0 V: see Figure 13.

Symbol	Parameter	Conditions		–40 °C to +85 °C		–40 °C to	o +125 °C	Unit	
				Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	A to B or B to A; see <u>Figure 11</u> ; $R_L = \infty \Omega$	[2][3]						
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		-	-	0.21	-	0.32	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		-	0.16	0.25	-	0.39	ns
t _{en}	enable time	$\overline{\text{OE}}$ to A or B; see Figure 12; R _L = 500 Ω	<u>[4]</u>						
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.0	2.50	4.00	1.0	5.00	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		1.0	2.05	4.00	1.0	5.00	ns
t _{dis}	disable time	$\overline{\text{OE}}$ to A or B; see Figure 12; R _L = 500 Ω	<u>[5]</u>						
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.0	2.80	5.00	1.0	6.30	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		1.0	3.40	4.10	1.0	5.40	ns

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

- [3] tpd is the same as tplH and tpHL.
- [4] t_{en} is the same as t_{PZH} and t_{PZL} .
- [5] t_{dis} is the same as t_{PHZ} and t_{PLZ} .

12. Waveforms



Measurement points are given in Table 10.

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

Fig 11. The data input (A or B) to output (B or A) propagation delays

Table 10. Measurement points

Supply voltage	Output	Inputs				
V _{CC}	V _M	V _M	V _I	$t_r = t_f$		
2.3 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{CC}	≤ 2.0 ns		

74CBTLV1G125

^[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).

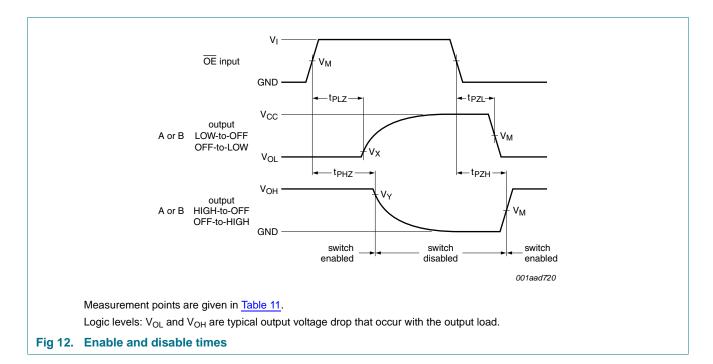
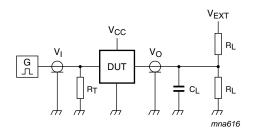


Table 11. Measurement points

Supply voltage	Input	Output				
V _{CC}	V _M	V _M	V _X	V _Y		
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.15 V	V _{OH} – 0.15 V		
3.0 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.3 V	$V_{OH} - 0.3 V$		

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Test data is given in Table 12.

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} = Test voltage for switching times.

Fig 13. Test circuit for measuring switching times

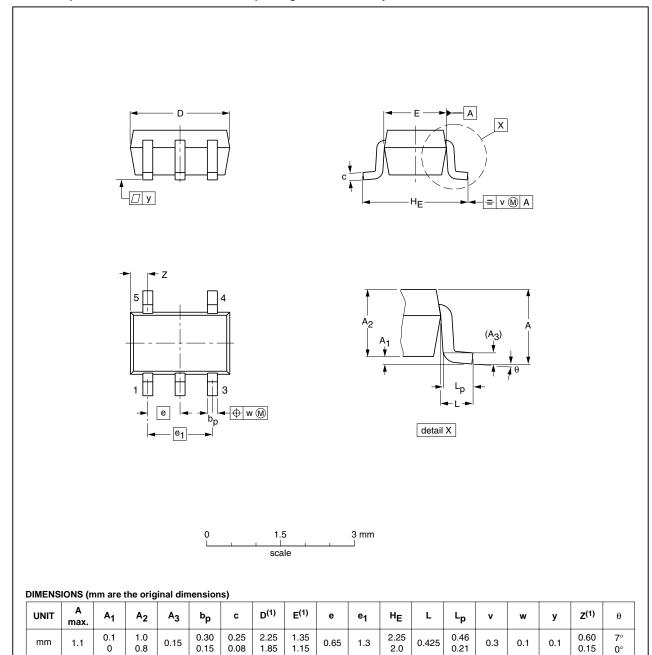
Table 12. Test data

Supply voltage	Load	V _{EXT}		
V _{CC}	CL	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	$2 \times V_{CC}$

13. Package outline

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

SOT353-1



Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE		REFERENCES			EUROPEAN	ISSUE DATE	
	VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
	SOT353-1		MO-203	SC-88A			-00-09-01 03-02-19

Fig 14. Package outline SOT353-1 (TSSOP5)

74CBTLV1G125

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Plastic surface-mounted package; 5 leads

SOT753

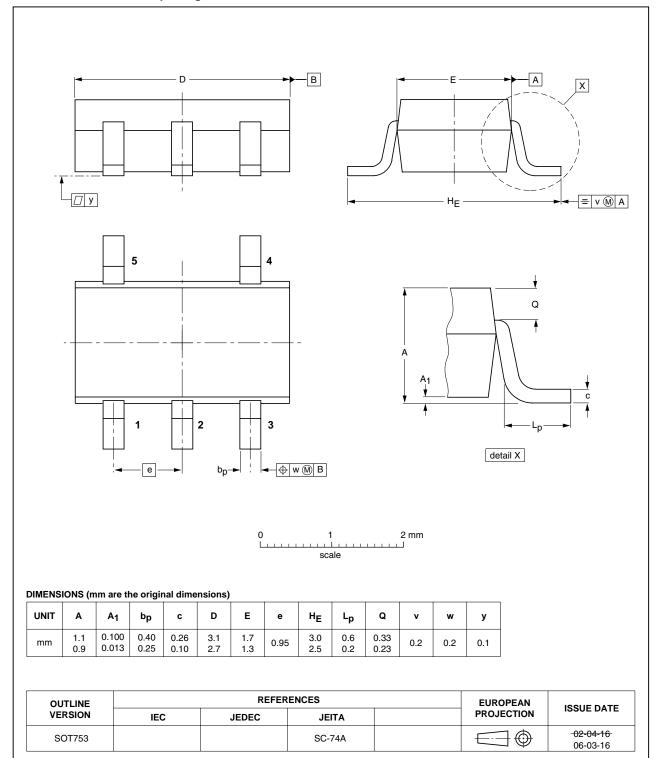


Fig 15. Package outline SOT753

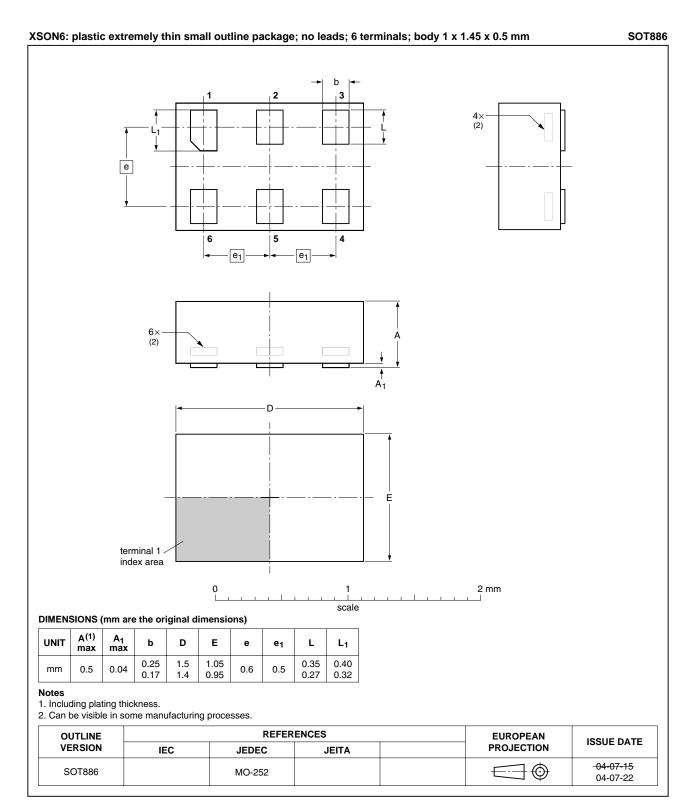


Fig 16. Package outline SOT886 (XSON6)

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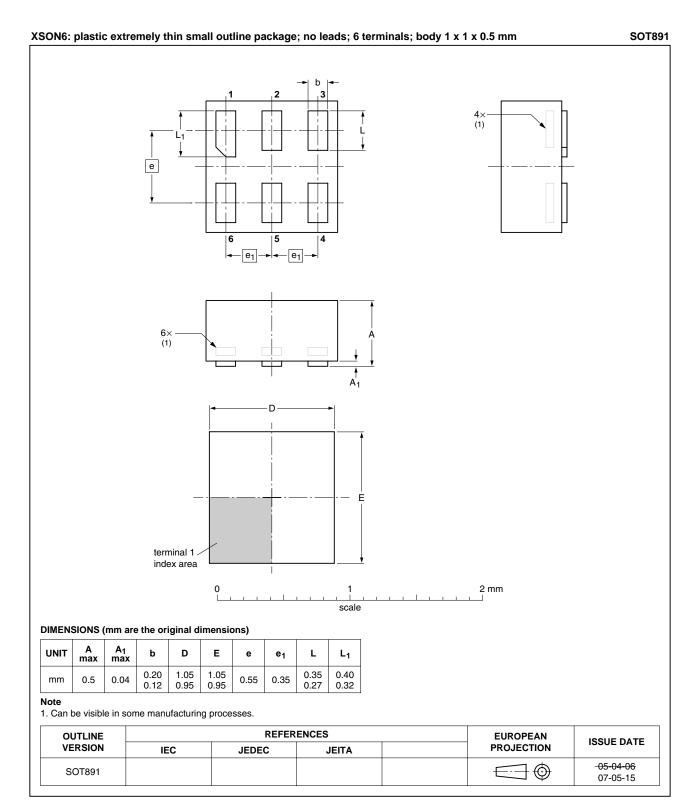


Fig 17. Package outline SOT891 (XSON6)

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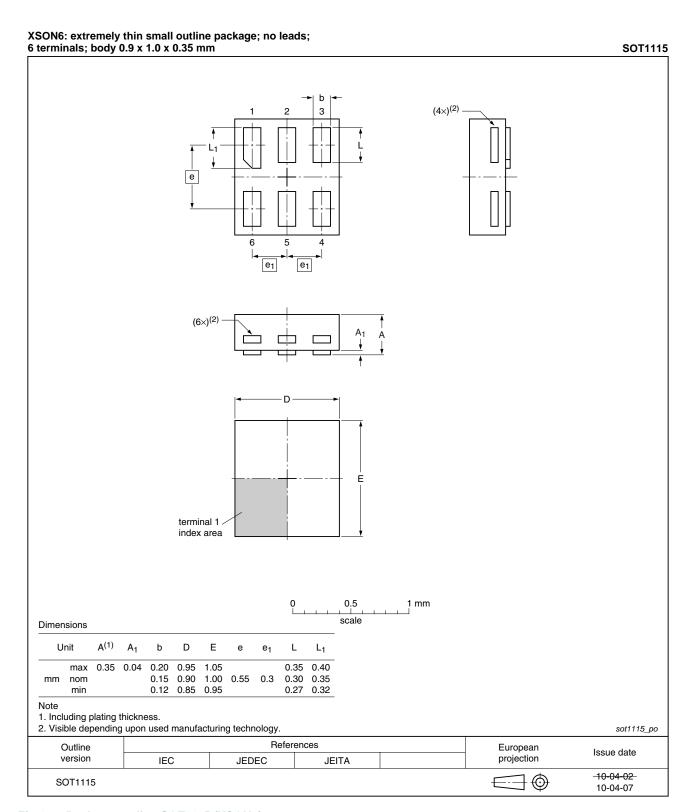


Fig 18. Package outline SOT1115 (XSON6)

74CBTLV1G125

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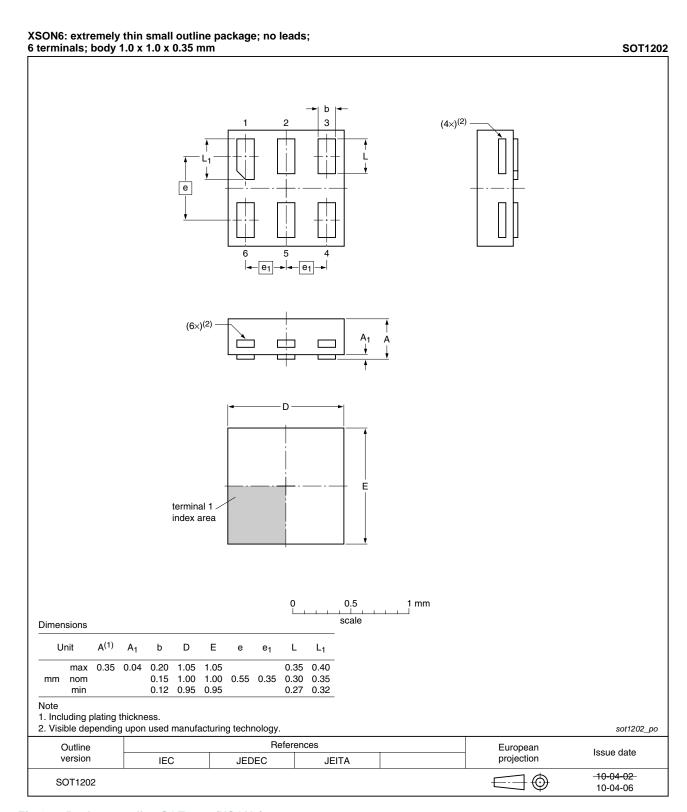


Fig 19. Package outline SOT1202 (XSON6)

74CBTLV1G125

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14. Abbreviations

Table 13. 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

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CBTLV1G125 v.2	20100729	Product data sheet	-	74CBTLV1G125 v.1
Modifications:	 Added type number 74CBTLV1G125GN (SOT1116/XSON8 package). 			
 Added type number 74CBTLV1G125GS (SOT1203/XSON8 package). 				
74CBTLV1G125 v.1	20070223	Product data sheet	-	-

16. Legal information

16.1 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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