74CBTLV1G125

Single bus switch

Rev. 01 — 2 February 2007 Product data sheet

1. General description

The 74CBTLV1G125 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

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.

The 74CBTLV1G125 provides 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, $\overline{OE}$ should be tied to the V_{CC} through a pullup resistor. The minimum value of the resistor is determined by the current-sinking capability of the driver.

2. Features

- 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-A114-D exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101-C exceeds 1000 V
- 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 × 1.45 × 0.5 mm	SOT886
74CBTLV1G125GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891

4. Marking

Table 2. Marking

Type number	Marking code
74CBTLV1G125GW	bM
74CBTLV1G125GV	b25
74CBTLV1G125GM	bM
74CBTLV1G125GF	bM

5. Functional diagram

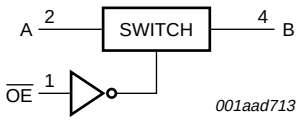


Fig 1. Logic symbol

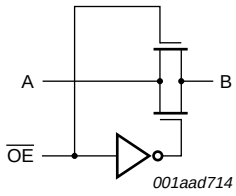


Fig 2. Logic diagram

6. Pinning information

6.1 Pinning

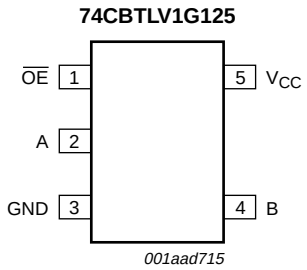


Fig 3. Pin configuration SOT353-1 and SOT753

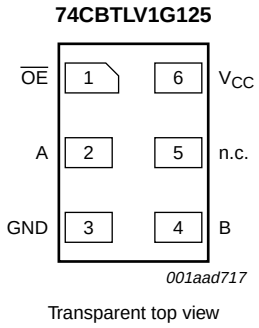


Fig 4. Pin configuration SOT886

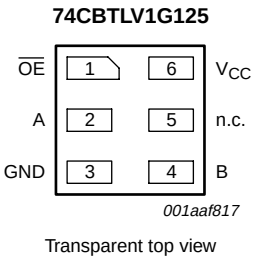


Fig 5. Pin configuration SOT891

6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT353-1/SOT753	SOT886/SOT891	
$\overline{OE}$	1	1	output enable input $\overline{OE}$ (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
V_{CC}	5	6	supply voltage

7. Functional description

7.1 Function table

Table 4. Function table[1]

Output enable input $\overline{OE}$	Function switch
L	ON-state
H	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
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	$V_{I/O}$ < –0.5 V		-	–50	mA
I_{SK}	switch clamping current	V_I < –0.5 V or V_I > V_{CC} + 0.5 V		-	±50	mA
I_{SW}	switch current	V_{SW} = 0 V 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 °C to +125 °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 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 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

9. Recommended operating conditions

Table 6. 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 V to 3.6 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_{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 V to 2.7 V	-	-	0.7	V
		V_{CC} = 2.7 V to 3.6 V	-	-	0.8	V
I_I	input leakage current	V_I = GND to V_{CC}; V_{CC} = 3.6 V	-	-	±1.0	µA
$I_{S(OFF)}$	OFF-state leakage current	V_I = V_{IH} or V_{IL}; V_O = V_{CC} – GND; V_{CC} = 3.6 V; see Figure 6	-	±0.1	±5	µA
$I_{S(ON)}$	ON-state leakage current	V_I = V_{IH} or V_{IL}; V_{CC} = 3.6 V; see Figure 7	-	±0.1	±5	µA

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	µA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 3.6 V		-	-	10	µA
ΔI_{CC}	additional supply current	control input; $V_I = V_{CC} - 0.6$ V; V_{CC} = 3.6 V	[2]	-	-	300	µA
C_I	input capacitance	control input; V_I = 0 V or 3 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_I	input leakage current	V_I = GND to V_{CC}; V_{CC} = 3.6 V		-	-	±100	µA
$I_{S(OFF)}$	OFF-state leakage current	$V_I = V_{IH}$ or V_{IL}; $V_O = V_{CC}$ − GND; V_{CC} = 3.6 V; see Figure 6		-	-	±200	µA
$I_{S(ON)}$	ON-state leakage current	$V_I = V_{IH}$ or V_{IL}; V_{CC} = 3.6 V; see Figure 7		-	-	±200	µA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±10	µA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 3.6 V		-	-	200	µA
ΔI_{CC}	additional supply current	control input; $V_I = V_{CC} - 0.6$ V; V_{CC} = 3.6 V	[2]	-	-	5000	µA

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

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

Table 8. Resistance R_{ON}

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

Symbol	Parameter	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 Figure 9	[2]						
		I_{SW} = 64 mA; V_I = 0 V		-	4.7	10	-	15.0	Ω
		I_{SW} = 24 mA; V_I = 0 V		-	4.5	10	-	15.0	Ω
		I_{SW} = 15 mA; V_I = 1.7 V		-	11	25	-	38.0	Ω
		V_{CC} = 3.0 V; see Figure 10							
		I_{SW} = 64 mA; V_I = 0 V		-	4.2	7	-	11.0	Ω
		I_{SW} = 24 mA; V_I = 0 V		-	4.1	7	-	11.0	Ω
		I_{SW} = 15 mA; V_I = 2.4 V		-	7.3	15	-	25.5	Ω

[1] Typical values are measured at T_{amb} = 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

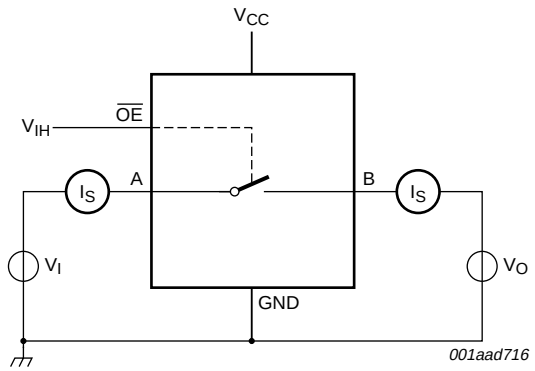


Fig 6. Test circuit for measuring OFF-state leakage current

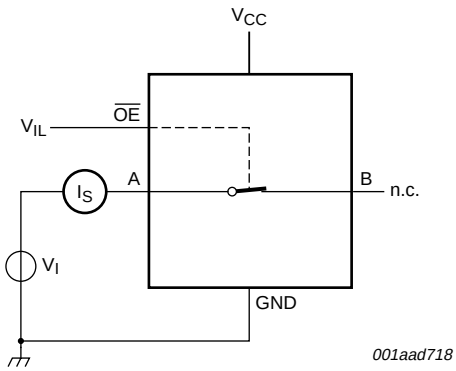
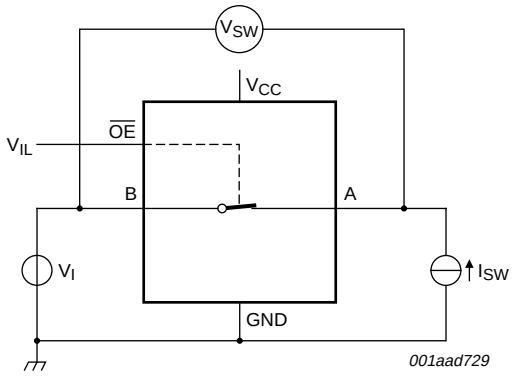
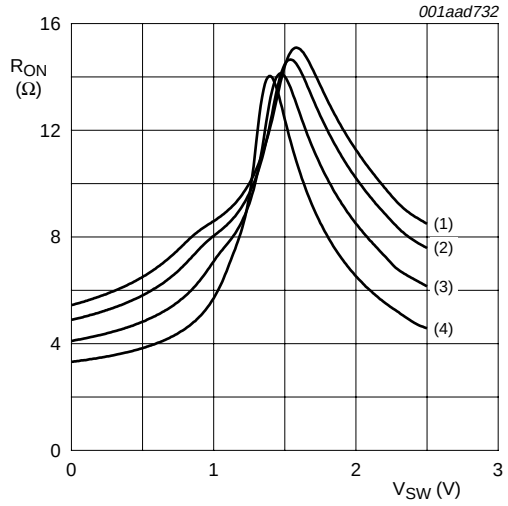


Fig 7. Test circuit for measuring ON-state leakage current



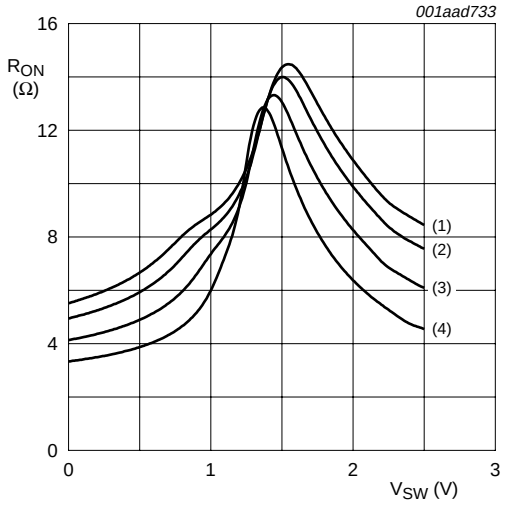
$R_{ON} = V_{SW} / I_{SW}$.

Fig 8. Test circuit for measuring ON-resistance



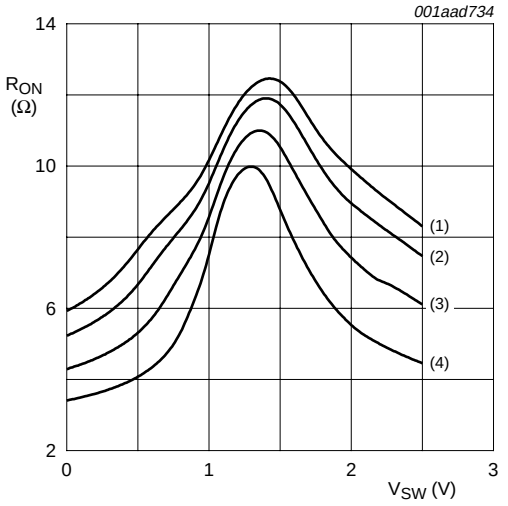
(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

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



(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

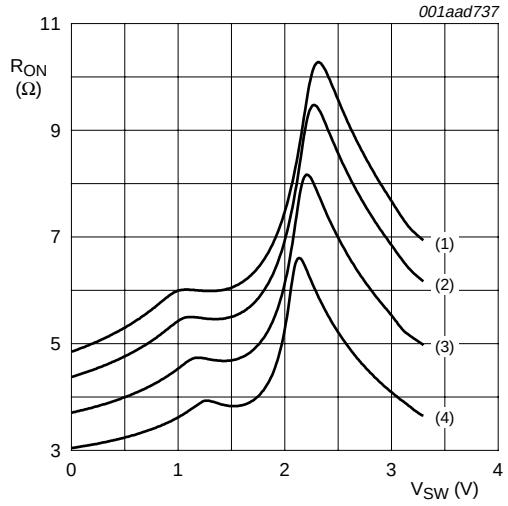
b. V_{CC} = 2.5 V; I_{SW} = 24 mA; V_{SW} = 0 V



(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

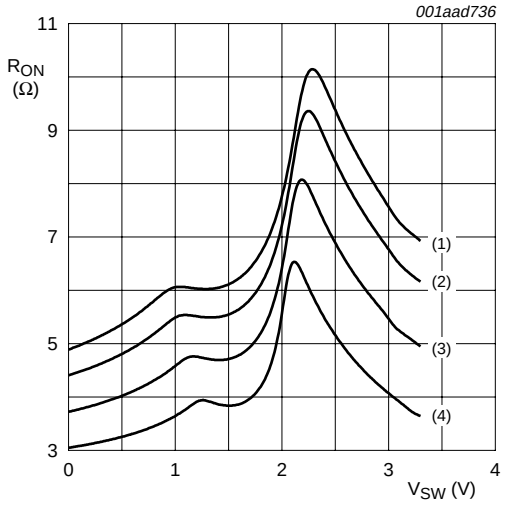
c. V_{CC} = 2.5 V; I_{SW} = 64 mA; V_{SW} = 0 V

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



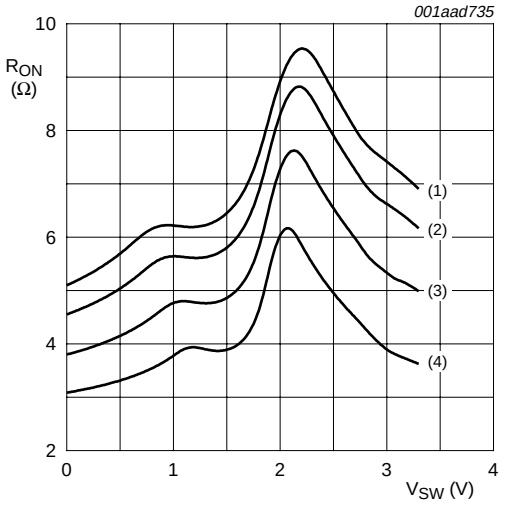
(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

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



(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

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



(1) T_{amb} = 125 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = –40 °C

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

Fig 10. Switch ON-resistance as a function of input voltage at V_{CC} = 3.3 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 +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	A to B or B to A; see Figure 11; $R_L = \infty$ [2][3]						
		V_{CC} = 2.3 V to 2.7 V	-	-	0.21	-	0.32	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.16	0.25	-	0.39	ns
t_{en}	enable time	$\overline{OE}$ to A or B; see Figure 12; R_L = 500 Ω [4]						
		V_{CC} = 2.3 V to 2.7 V	1.0	2.50	4.00	1.0	5.00	ns
		V_{CC} = 3.0 V to 3.6 V	1.0	2.05	4.00	1.0	5.00	ns
t_{dis}	disable time	$\overline{OE}$ to A or B; see Figure 12; R_L = 500 Ω [5]						
		V_{CC} = 2.3 V to 2.7 V	1.0	2.80	5.00	1.0	6.30	ns
		V_{CC} = 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_{amb} = 25 °C and at nominal V_{CC}.

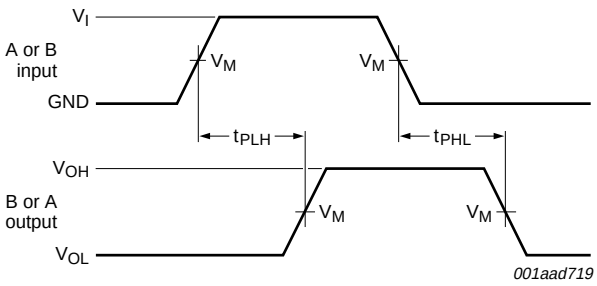
[2] The propagation delay is the calculated RC time constant of the maximum on-state resistance of the switch and the load capacitance, when driven by an ideal voltage source (zero output impedance).

[3] t_{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}.

12. Waveforms



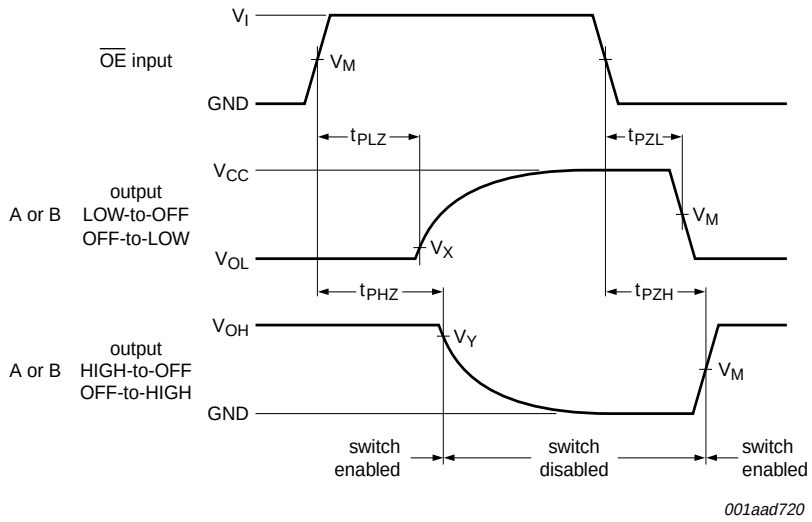
Measurement points are given in Table 10.

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 × V_{CC}	0.5 × V_{CC}	V_{CC}	≤ 2.0 ns



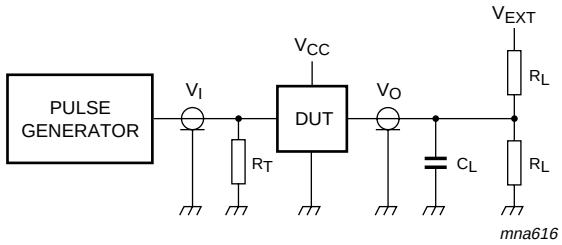
Measurement points are given in Table 11.

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

Fig 12. enable and disable times

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	$0.5V_{CC}$	$0.5V_{CC}$	V_{OL} + 0.15 V	V_{OH} − 0.15 V
3.0 V to 3.6 V	$0.5V_{CC}$	$0.5V_{CC}$	V_{OL} + 0.3 V	V_{OH} − 0.3 V



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_o of the pulse generator.

V_{EXT} = Test voltage for switching times.

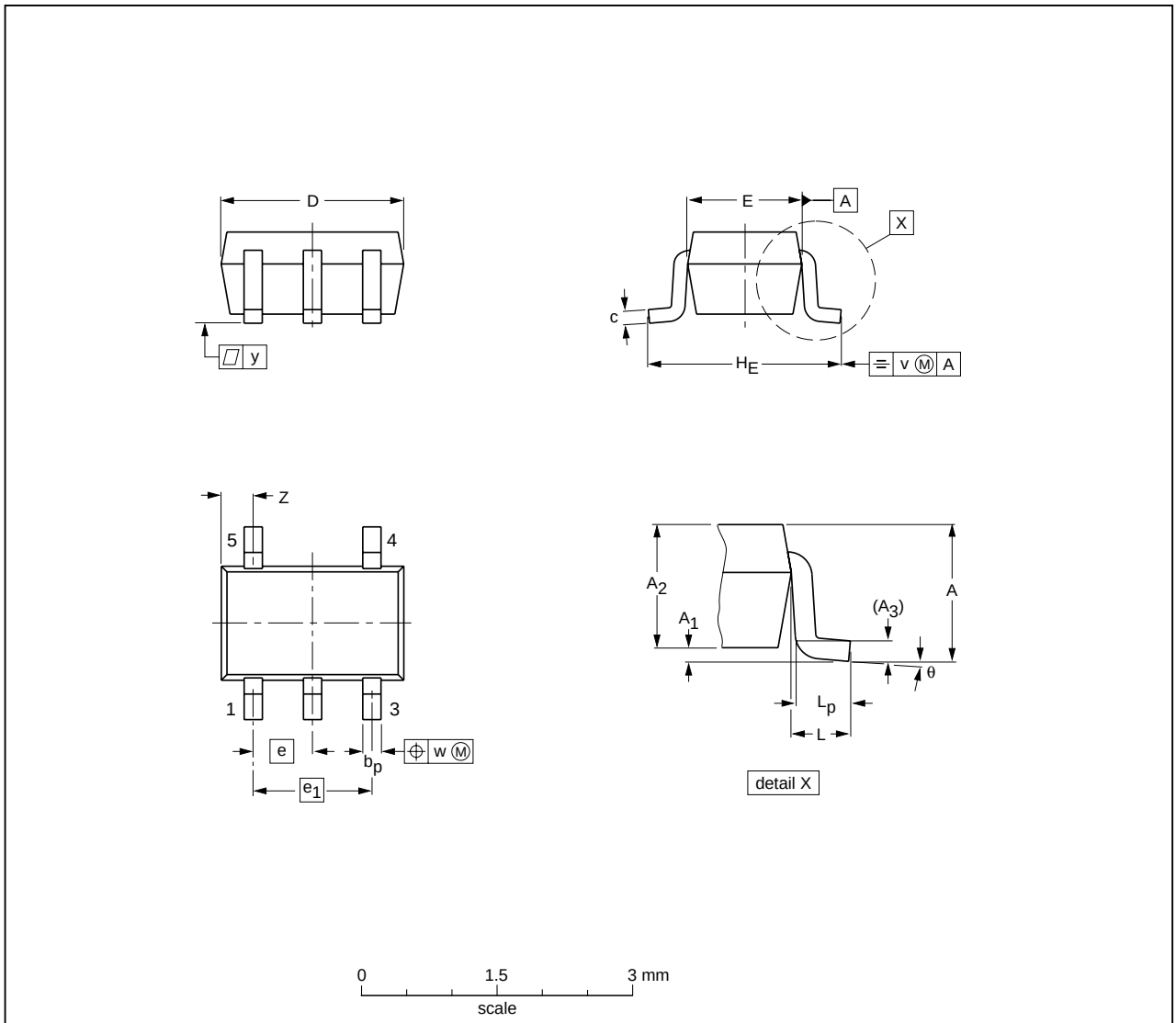
Fig 13. Load circuitry for switching times

Table 12. 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	$2 \times V_{CC}$

13. Package outline

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



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

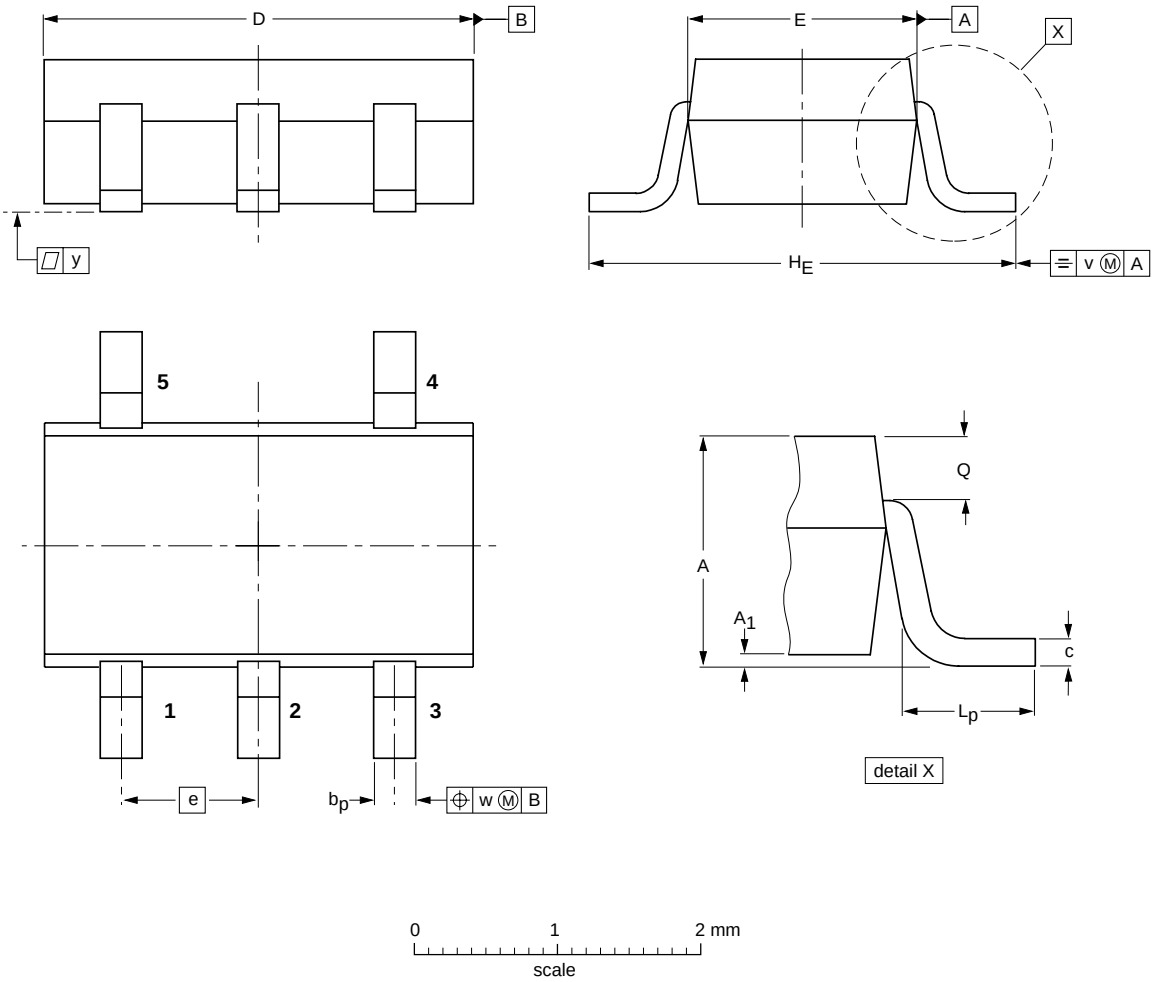
Note

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

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

Fig 14. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads **SOT753**



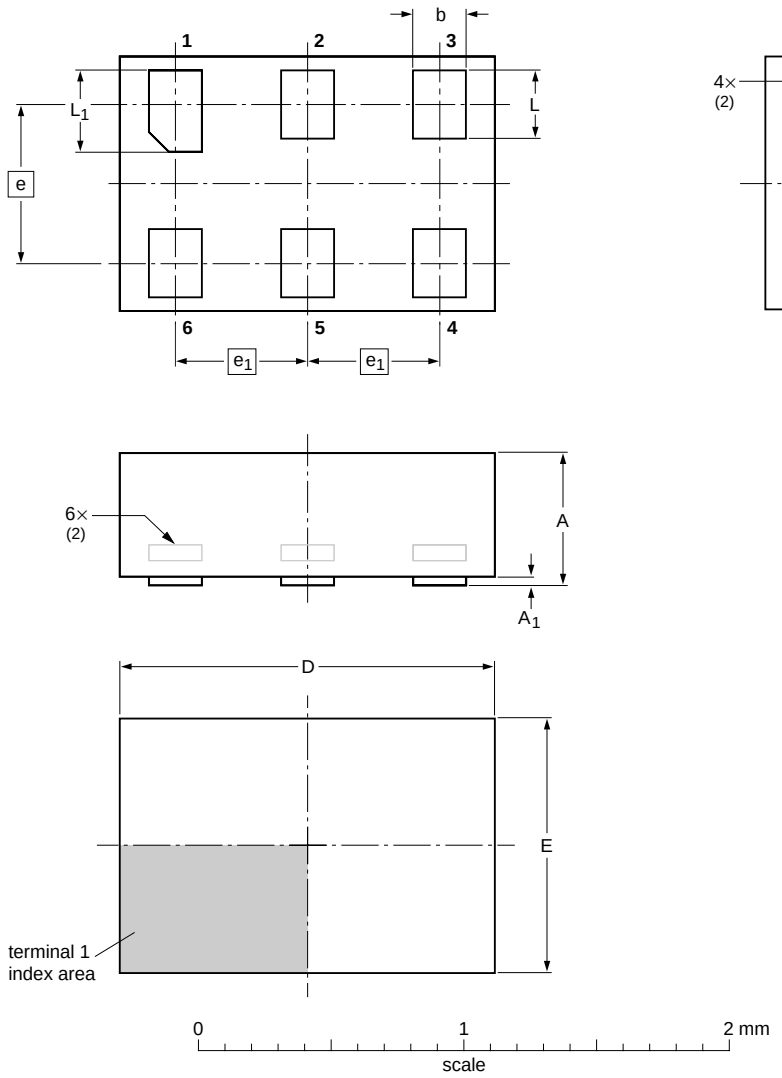
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			~~02-04-16~~ 06-03-16

Fig 15. Package outline SOT753

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm **SOT886**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max	A1 max	b	D	E	e	e1	L	L1
mm	0.5	0.04	0.25 0.17	1.5 1.4	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

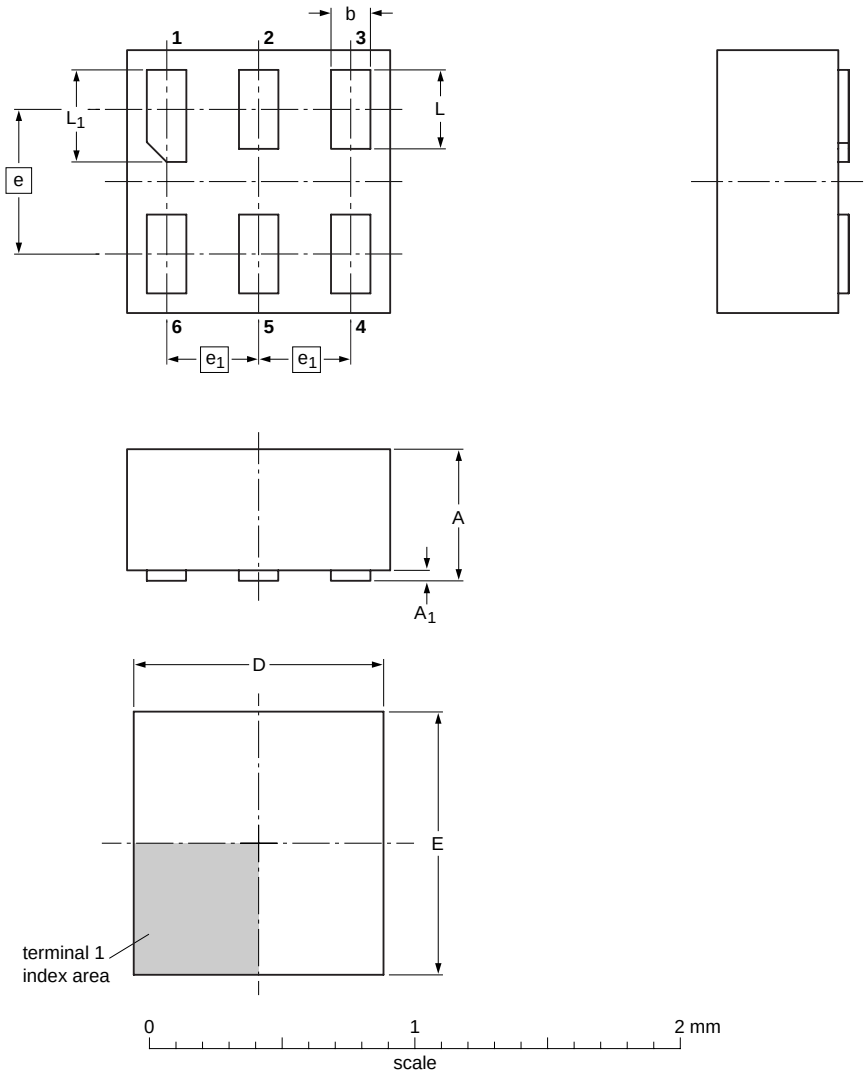
Notes

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT886		MO-252				~~04-07-15~~ 04-07-22

Fig 16. Package outline SOT886 (XSON6)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm **SOT891**



DIMENSIONS (mm are the original dimensions)

UNIT	A max	A_1 max	b	D	E	e	e_1	L	L_1
mm	0.5	0.04	0.20 0.12	1.05 0.95	1.05 0.95	0.55	0.35	0.35 0.27	0.40 0.32

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT891						~~05-03-11~~ 05-04-06

Fig 17. Package outline SOT891 (XSON6)

14. Abbreviations

Table 13: Abbreviations

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

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CBTLV1G125_1	20070202	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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18. Contents

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