

74LVC2G53

2-channel analog multiplexer/demultiplexer

Rev. 14 — 22 April 2021

Product data sheet

1. General description

The 74LVC2G53 is a single-pole double-throw analog switch with a digital select input (S), two independent inputs/outputs (Y0 and Y1), a common input/output (Z) and a digital enable input (E). When E is HIGH, the switch is turned off. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt trigger action at the select and enable inputs makes the circuit tolerant of slower input rise and fall times across the entire V_{CC} range from 1.65 V to 5.5 V.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- Very low ON resistance:
 - 7.5 Ω (typical) at $V_{CC} = 2.7$ V
 - 6.5 Ω (typical) at $V_{CC} = 3.3$ V
 - 6 Ω (typical) at $V_{CC} = 5$ V
- Switch current capability of 32 mA
- High noise immunity
- CMOS low-power consumption
- Overvoltage tolerant inputs to 5.5 V
- TTL interface compatibility at 3.3 V
- Latch-up performance meets requirements of JESD 78 Class I
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G53DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC2G53DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC2G53GT	-40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1
74LVC2G53GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74LVC2G53GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

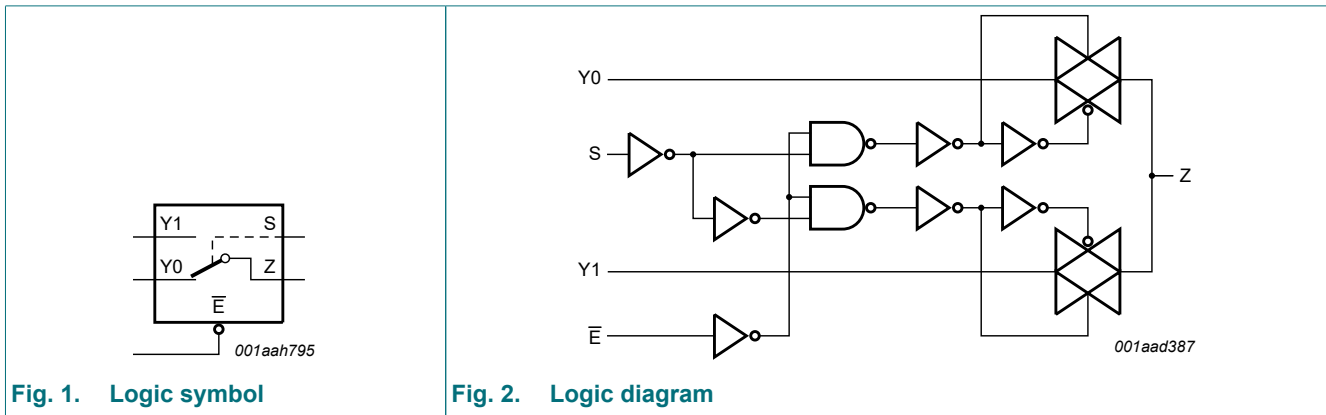
4. Marking

Table 2. Marking codes

Type number	Marking code[1]
74LVC2G53DP	V53
74LVC2G53DC	V53
74LVC2G53GT	V53
74LVC2G53GN	V3
74LVC2G53GS	V3

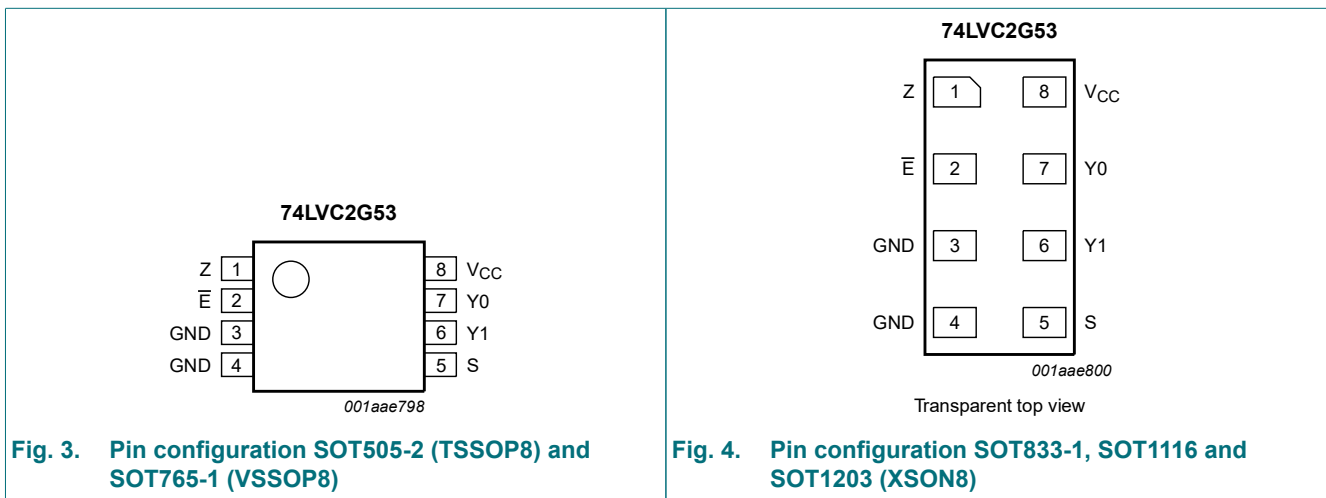
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
Z	1	common output or input
\bar{E}	2	enable input (active LOW)
GND	3	ground (0 V)
GND	4	ground (0 V)
S	5	select input
Y1	6	independent input or output
Y0	7	independent input or output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Input		Channel on
S	\bar{E}	
L	L	Y0 to Z or Z to Y0
H	L	Y1 to Z or Z to Y1
X	H	Z

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	+6.5	V
V _I	input voltage	[1]	-0.5	+6.5	V
I _{IK}	input clamping current	V _I < -0.5 V or V _I > V _{CC} + 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
V _{SW}	switch voltage	enable and disable mode [2]	-0.5	V _{CC} + 0.5	V
I _{SW}	switch current	V _{SW} > -0.5 V or V _{SW} < V _{CC} + 0.5 V	-	±50	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 [3]	-	250	mW

[1] The minimum input voltage rating may be exceeded if the input current rating is observed.

[2] The minimum and maximum switch voltage ratings may be exceeded if the switch clamping current rating is observed.

[3] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.

For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.

For SOT833-1 (XSON8) package: P_{tot} derates linearly with 3.1 mW/K above 68 °C.

For SOT1116 (XSON8) package: P_{tot} derates linearly with 4.2 mW/K above 90 °C.

For SOT1203 (XSON8) package: P_{tot} derates linearly with 3.6 mW/K above 81 °C.

9. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.65	5.5	V
V_I	input voltage		0	5.5	V
V_{SW}	switch voltage	enable and disable mode [1]	0	V_{CC}	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65\text{ V to }2.7\text{ V}$ [2]	-	20	ns/V
		$V_{CC} = 2.7\text{ V to }5.5\text{ V}$ [2]	-	10	ns/V

- [1] To avoid sinking GND current from terminal Z when switch current flows in terminal Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no GND current will flow from terminal Yn. In this case, there is no limit for the voltage drop across the switch.
- [2] Applies to control signal levels.

10. Static characteristics

Table 7. Static characteristics

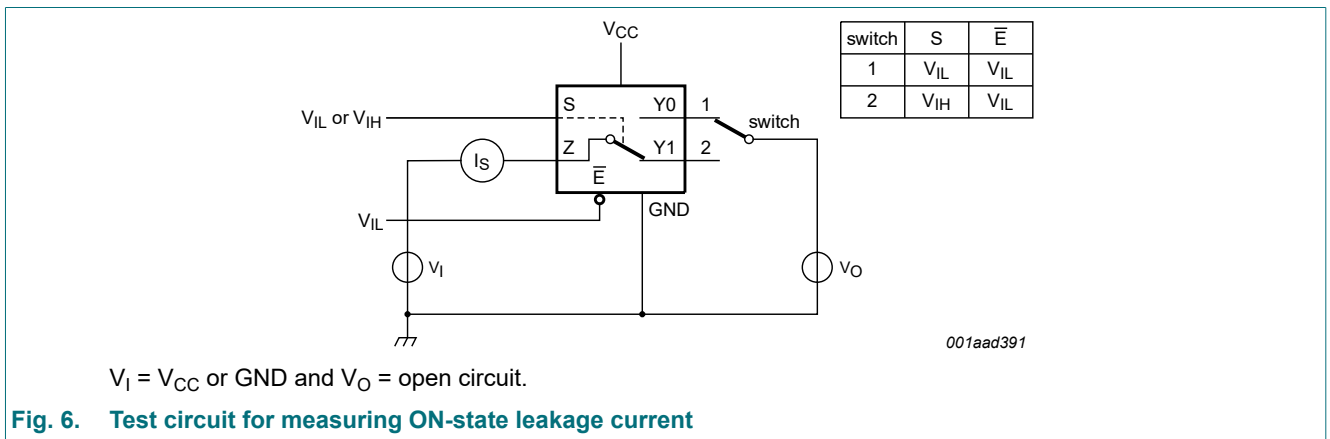
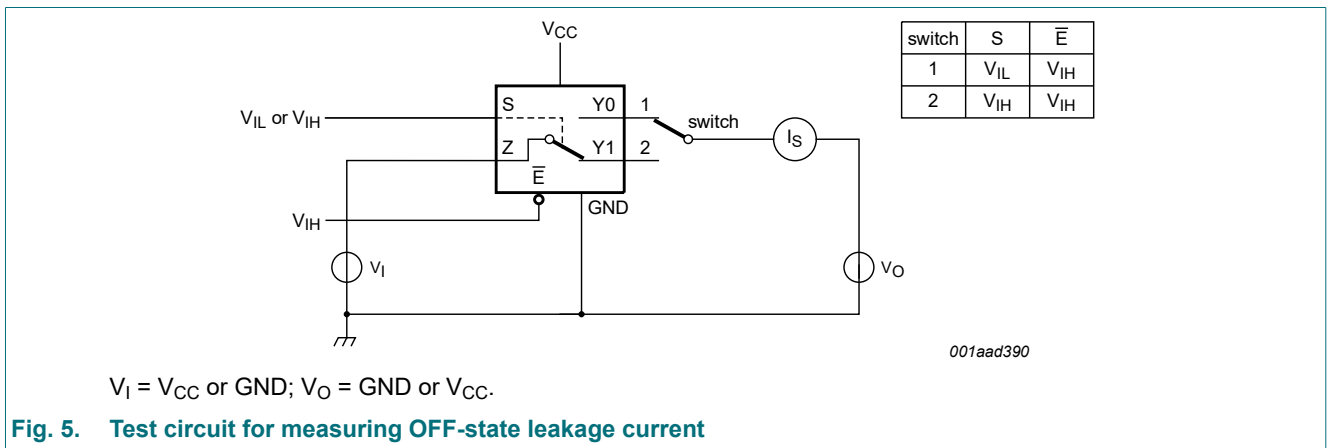
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.65V_{CC}$	-	-	$0.65V_{CC}$	-	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	-	-	1.7	-	V
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	2.0	-	-	2.0	-	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-	-	0.7	-	0.7	V
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	-	-	0.8	-	0.8	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
I_I	input leakage current	pin S and pin E; $V_I = 5.5\text{ V or GND}$; $V_{CC} = 0\text{ V to }5.5\text{ V}$ [2]	-	± 0.1	± 1	-	± 1	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5\text{ V}$; see Fig. 5 [2]	-	± 0.1	± 0.2	-	± 0.5	μA
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 5.5\text{ V}$; see Fig. 6 [2]	-	± 0.1	± 1	-	± 2	μA
I_{CC}	supply current	$V_I = 5.5\text{ V or GND}$; $V_{SW} = \text{GND or }V_{CC}$; $V_{CC} = 1.65\text{ V to }5.5\text{ V}$ [2]	-	0.1	4	-	4	μA
ΔI_{CC}	additional supply current	pin S and pin E; $V_I = V_{CC} - 0.6\text{ V}$; $V_{SW} = \text{GND or }V_{CC}$; $V_{CC} = 5.5\text{ V}$ [2]	-	5	500	-	500	μA

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
C_I	input capacitance		-	2.5	-	-	-	pF
$C_{S(OFF)}$	OFF-state capacitance		-	6.0	-	-	-	pF
$C_{S(ON)}$	ON-state capacitance		-	18	-	-	-	pF

- [1] Typical values are measured at $T_{amb} = 25\text{ °C}$.
- [2] These typical values are measured at $V_{CC} = 3.3\text{ V}$.

10.1. Test circuits



10.2. ON resistance

Table 8. ON resistance

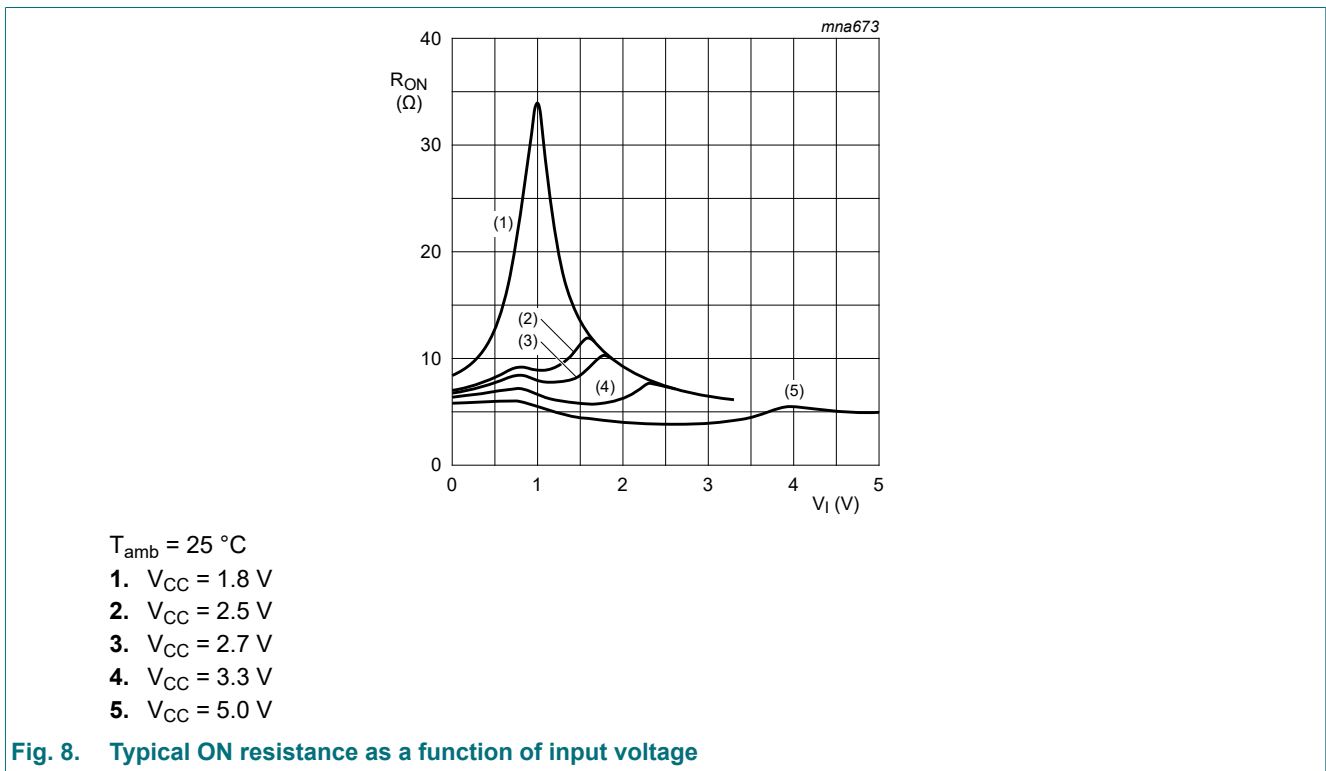
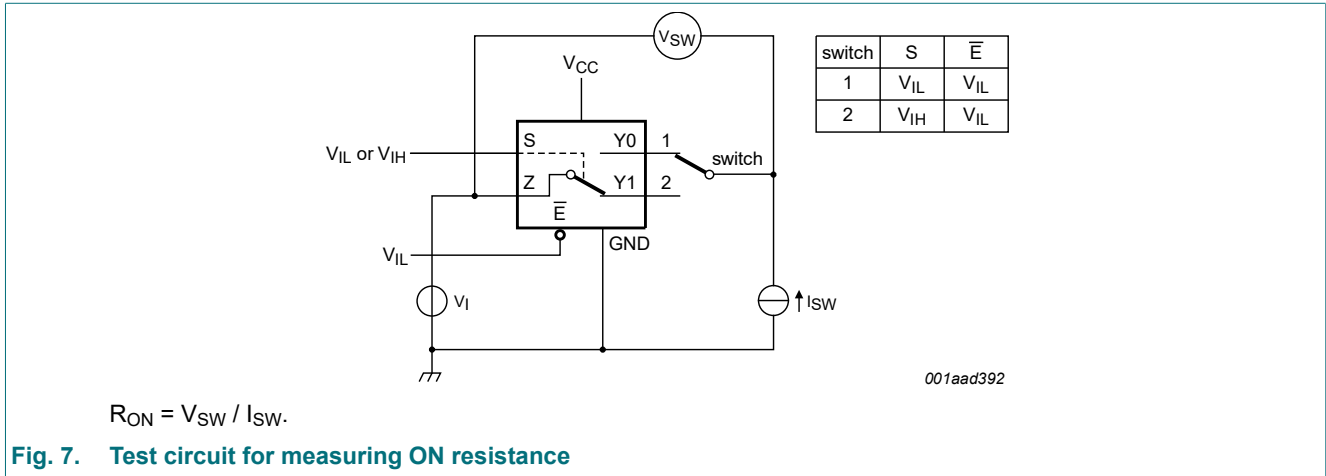
At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see [Fig. 8](#) to [Fig. 13](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
R _{ON(peak)}	ON resistance (peak)	V _I = GND to V _{CC} ; see Fig. 7						
		I _{SW} = 4 mA; V _{CC} = 1.65 V to 1.95 V	-	34.0	130	-	195	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	12.0	30	-	45	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	10.4	25	-	38	Ω
		I _{SW} = 24 mA; V _{CC} = 3 V to 3.6 V	-	7.8	20	-	30	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	6.2	15	-	23	Ω
R _{ON(rail)}	ON resistance (rail)	V _I = GND; see Fig. 7						
		I _{SW} = 4 mA; V _{CC} = 1.65 V to 1.95 V	-	8.2	18	-	27	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	7.1	16	-	24	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	6.9	14	-	21	Ω
		I _{SW} = 24 mA; V _{CC} = 3 V to 3.6 V	-	6.5	12	-	18	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	5.8	10	-	15	Ω
		V _I = V _{CC} ; see Fig. 7						
		I _{SW} = 4 mA; V _{CC} = 1.65 V to 1.95 V	-	10.4	30	-	45	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	7.6	20	-	30	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	7.0	18	-	27	Ω
		I _{SW} = 24 mA; V _{CC} = 3 V to 3.6 V	-	6.1	15	-	23	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	4.9	10	-	15	Ω
R _{ON(flat)}	ON resistance (flatness)	V _I = GND to V _{CC} [2]						
		I _{SW} = 4 mA; V _{CC} = 1.65 V to 1.95 V	-	26.0	-	-	-	Ω
		I _{SW} = 8 mA; V _{CC} = 2.3 V to 2.7 V	-	5.0	-	-	-	Ω
		I _{SW} = 12 mA; V _{CC} = 2.7 V	-	3.5	-	-	-	Ω
		I _{SW} = 24 mA; V _{CC} = 3 V to 3.6 V	-	2.0	-	-	-	Ω
		I _{SW} = 32 mA; V _{CC} = 4.5 V to 5.5 V	-	1.5	-	-	-	Ω

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

[2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V_{CC} and temperature.

10.3. ON resistance test circuit and graphs



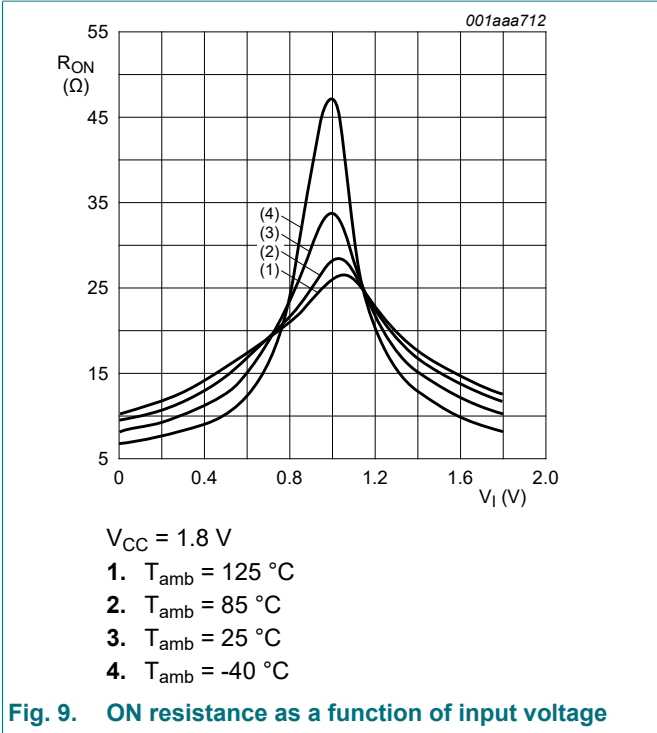


Fig. 9. ON resistance as a function of input voltage

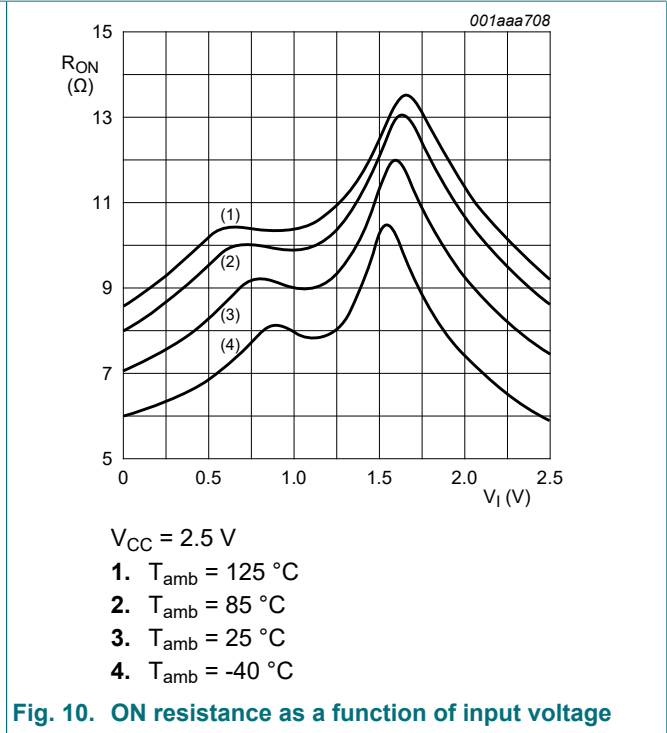


Fig. 10. ON resistance as a function of input voltage

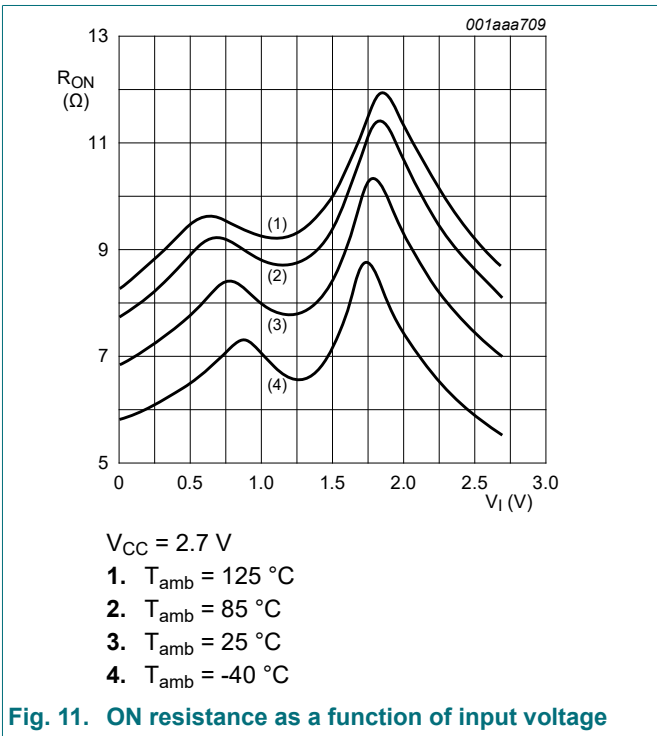


Fig. 11. ON resistance as a function of input voltage

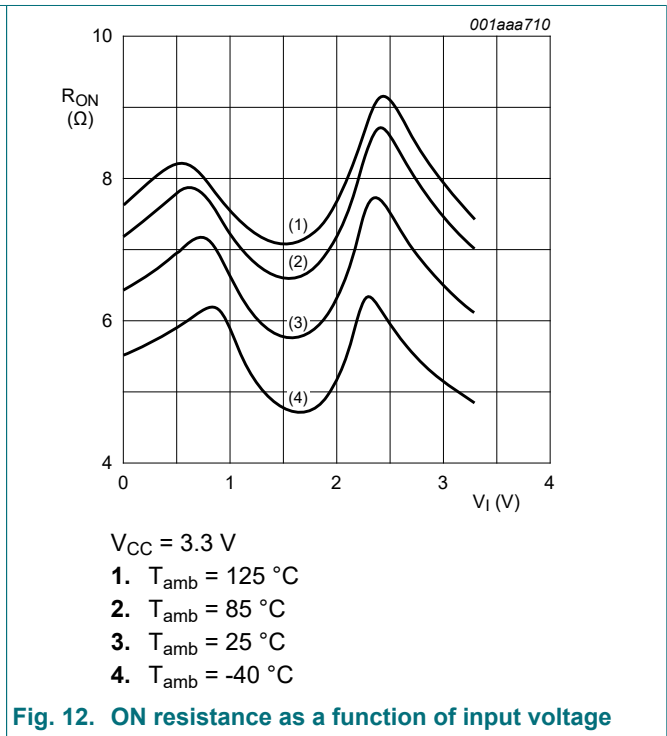
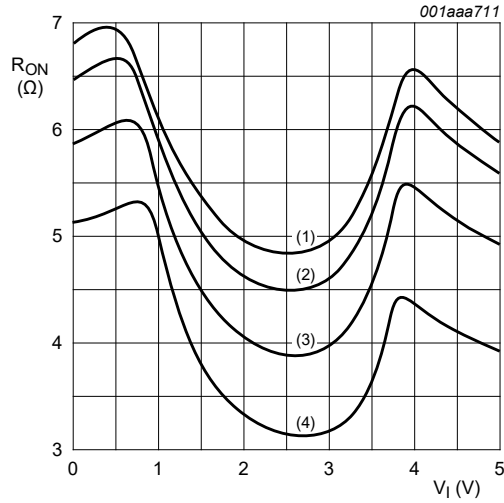


Fig. 12. ON resistance as a function of input voltage



$V_{CC} = 5.0 \text{ V}$

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

Fig. 13. ON resistance as a function of input voltage

11. Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 16.

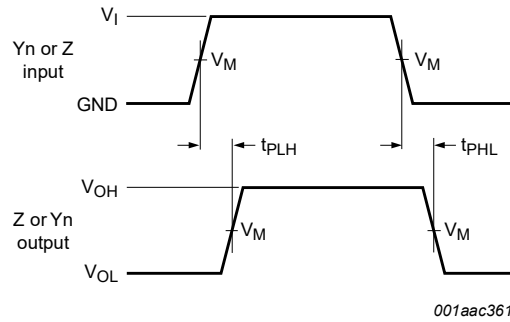
Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	Z to Y _n or Y _n to Z; see Fig. 14 [2] [3]						
		V _{CC} = 1.65 V to 1.95 V	-	-	2	-	2.5	ns
		V _{CC} = 2.3 V to 2.7 V	-	-	1.2	-	1.5	ns
		V _{CC} = 2.7 V	-	-	1.0	-	1.25	ns
		V _{CC} = 3.0 V to 3.6 V	-	-	0.8	-	1.0	ns
		V _{CC} = 4.5 V to 5.5 V	-	-	0.6	-	0.8	ns
t _{en}	enable time	S to Z or Y _n ; see Fig. 15 [2]						
		V _{CC} = 1.65 V to 1.95 V	2.6	6.7	10.3	2.6	12.9	ns
		V _{CC} = 2.3 V to 2.7 V	1.9	4.1	6.4	1.9	8.0	ns
		V _{CC} = 2.7 V	1.9	4.0	5.5	1.8	7.0	ns
		V _{CC} = 3.0 V to 3.6 V	1.8	3.4	5.0	1.8	6.3	ns
		V _{CC} = 4.5 V to 5.5 V	1.3	2.6	3.8	1.3	4.8	ns
		\bar{E} to Z or Y _n ; see Fig. 15 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.9	4.0	7.3	1.9	9.2	ns
		V _{CC} = 2.3 V to 2.7 V	1.4	2.5	4.4	1.4	5.5	ns
		V _{CC} = 2.7 V	1.1	2.6	3.9	1.1	4.9	ns
		V _{CC} = 3.0 V to 3.6 V	1.2	2.2	3.8	1.2	4.8	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	1.7	2.6	1.0	3.3	ns
t _{dis}	disable time	S to Z or Y _n ; see Fig. 15 [2]						
		V _{CC} = 1.65 V to 1.95 V	2.1	6.8	10.0	2.1	12.5	ns
		V _{CC} = 2.3 V to 2.7 V	1.4	3.7	6.1	1.4	7.7	ns
		V _{CC} = 2.7 V	1.4	4.9	6.2	1.4	7.8	ns
		V _{CC} = 3.0 V to 3.6 V	1.1	4.0	5.4	1.1	6.8	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	2.9	3.8	1.0	4.8	ns
		\bar{E} to Z or Y _n ; see Fig. 15 [2]						
		V _{CC} = 1.65 V to 1.95 V	2.3	5.6	8.6	2.3	11.0	ns
		V _{CC} = 2.3 V to 2.7 V	1.2	3.2	4.8	1.2	6.0	ns
		V _{CC} = 2.7 V	1.4	4.0	5.2	1.4	6.5	ns
		V _{CC} = 3.0 V to 3.6 V	2.0	3.7	5.0	2.0	6.3	ns
		V _{CC} = 4.5 V to 5.5 V	1.3	2.9	3.8	1.3	4.8	ns

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

[2] t_{pd} is the same as t_{PLH} and t_{PHL}; t_{en} is the same as t_{PZH} and t_{PZL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}

[3] Propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).

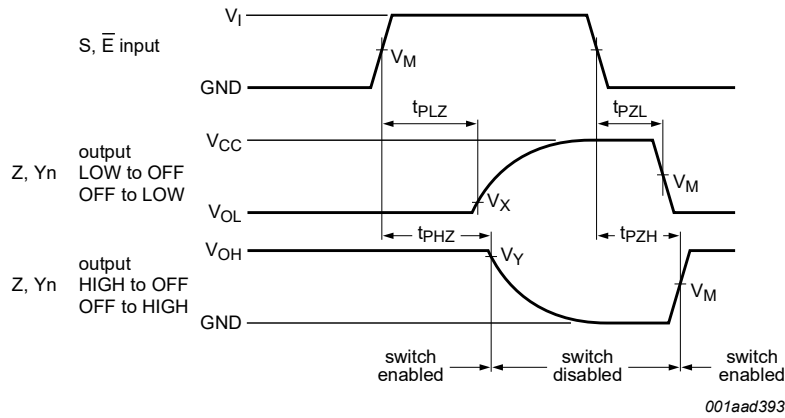
11.1. Waveforms and test circuits



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. 14. Input (Yn or Z) to output (Z or Yn) propagation delays



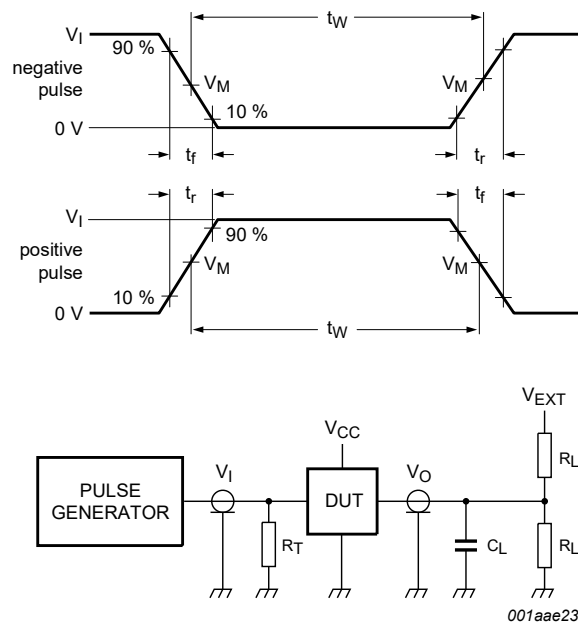
Measurement points are given in [Table 10](#).

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

Fig. 15. Enable and disable times

Table 10. Measurement points

Supply voltage	Input	Output		
V_{CC}	V_M	V_M	V_X	V_Y
1.65 V to 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
2.7 V to 5.5 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$



Test data is given in [Table 11](#).

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

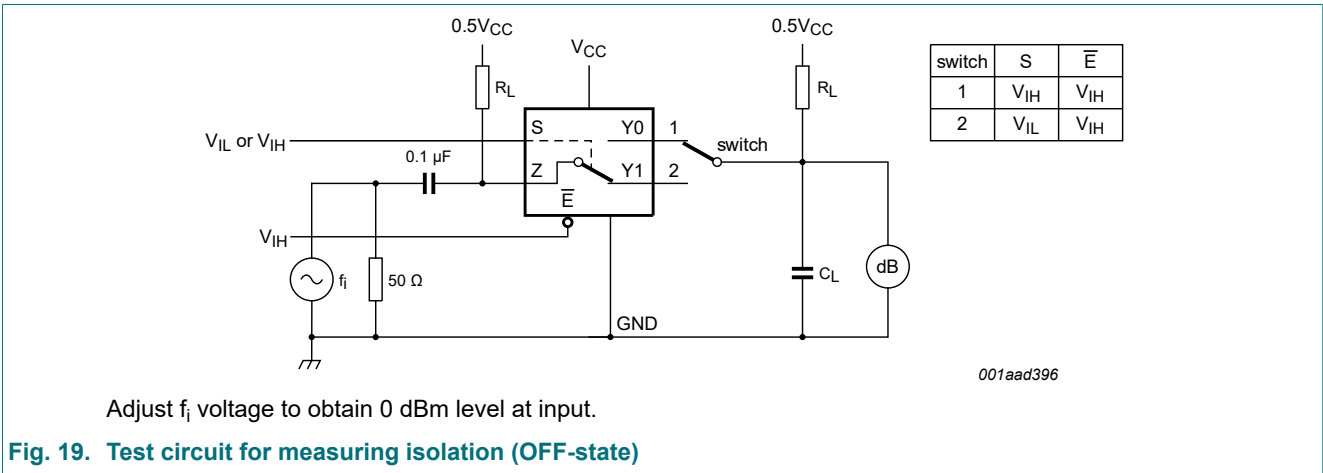
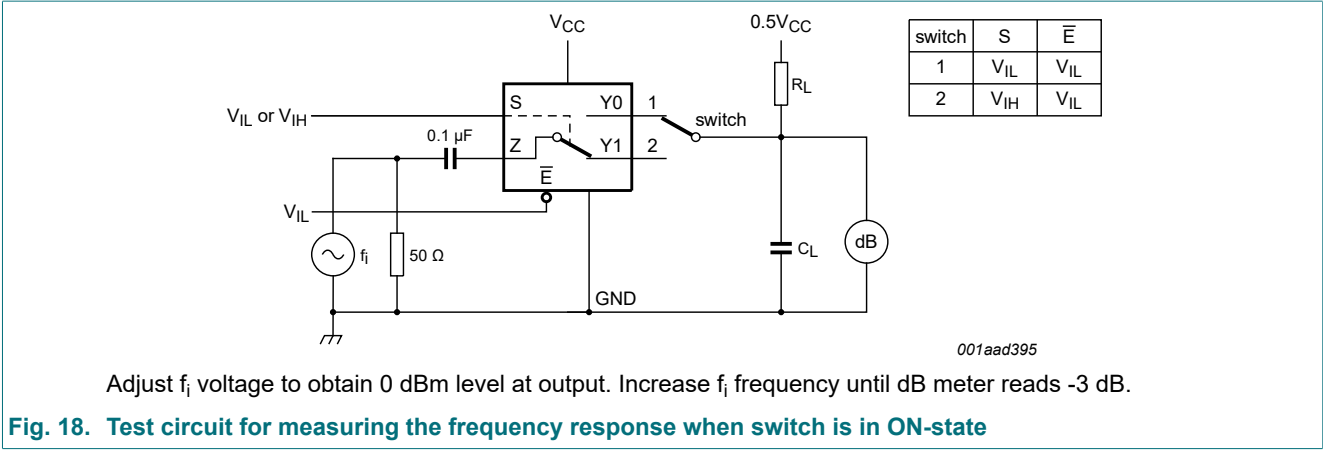
R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

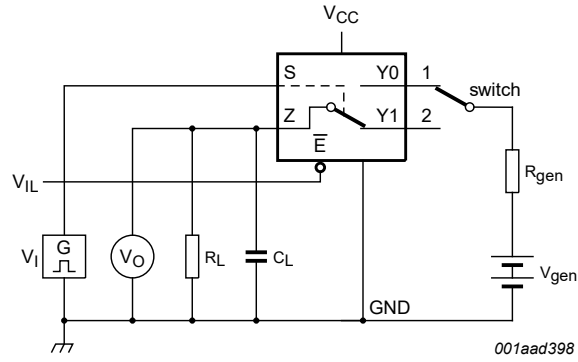
V_{EXT} = Test voltage for switching times.

Fig. 16. Test circuit for measuring switching times

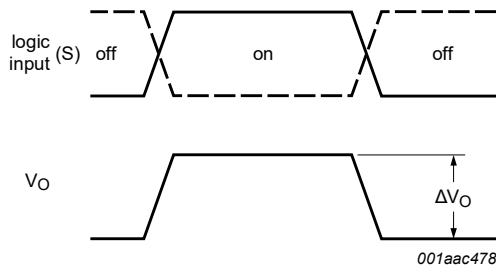
Table 11. Test data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	30 pF	1 k Ω	open	GND	$2V_{CC}$
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	GND	$2V_{CC}$
2.7 V	V_{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	$2V_{CC}$
3 V to 3.6 V	V_{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	$2V_{CC}$
4.5 V to 5.5 V	V_{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	$2V_{CC}$





a. Test circuit



b. Input and output pulse definitions

$$Q_{inj} = \Delta V_O \times C_L$$

ΔV_O = output voltage variation.

R_{gen} = generator resistance.

V_{gen} = generator voltage.

Fig. 20. Test circuit for measuring charge injection

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

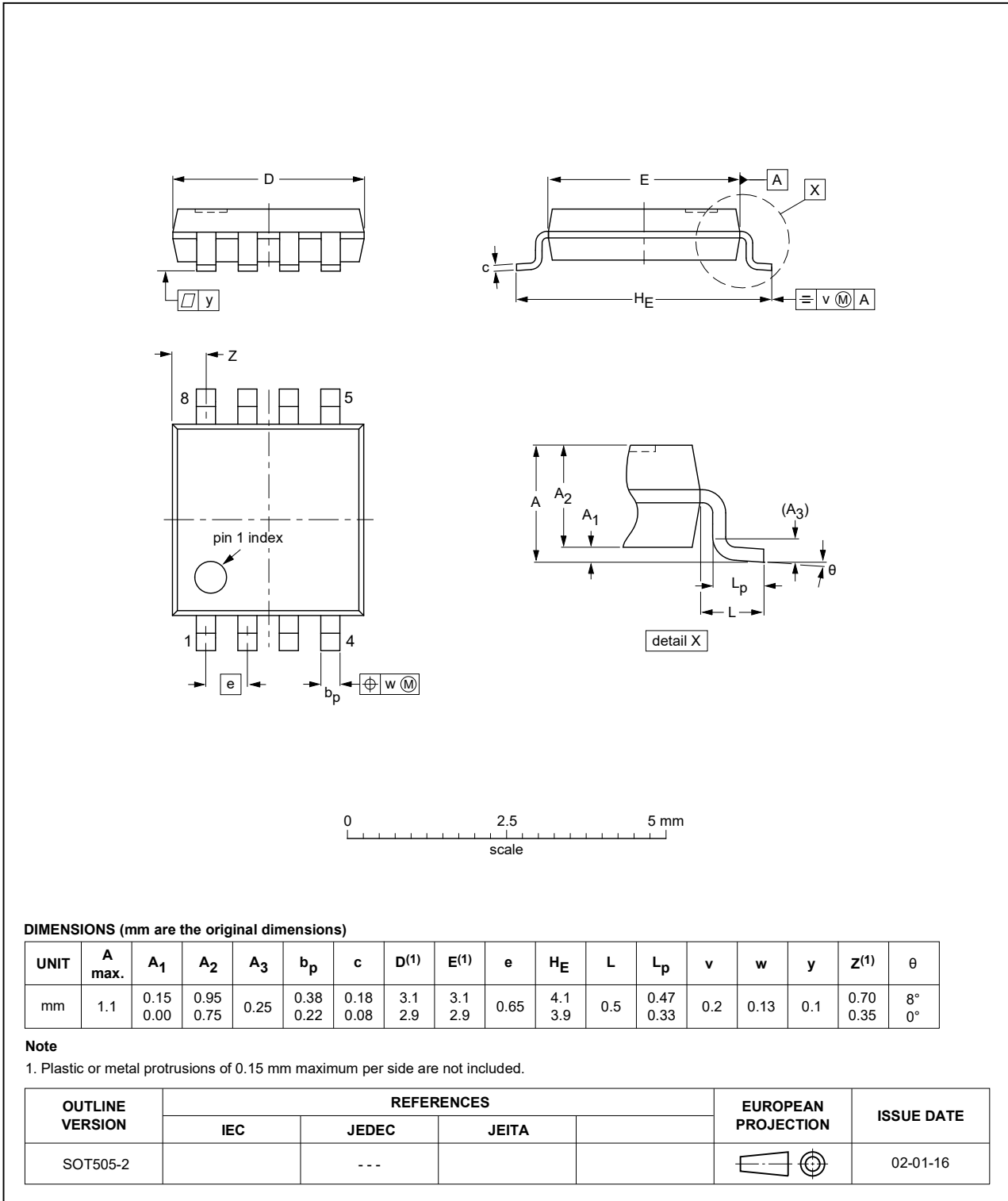


Fig. 21. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

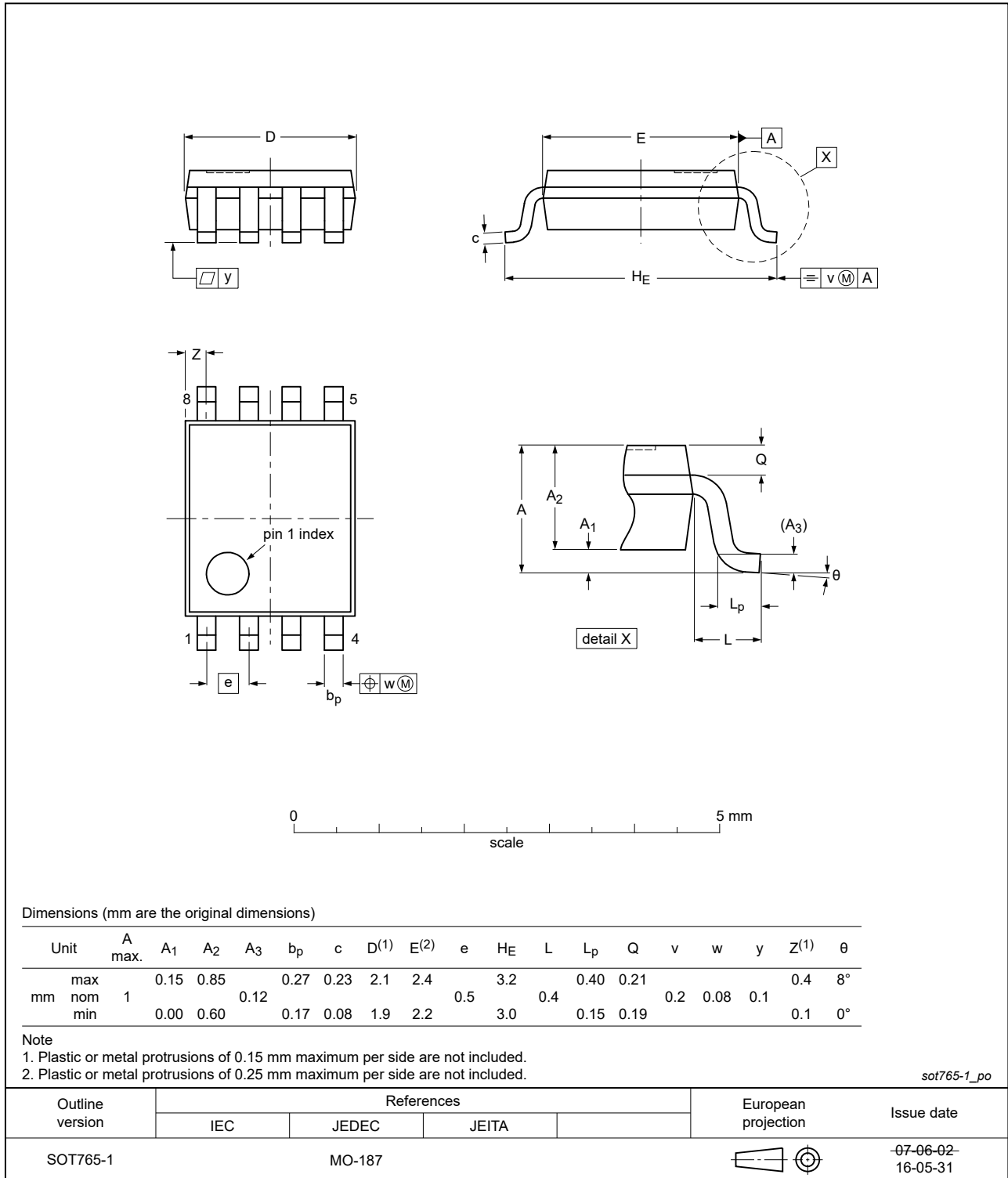


Fig. 22. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

SOT833-1

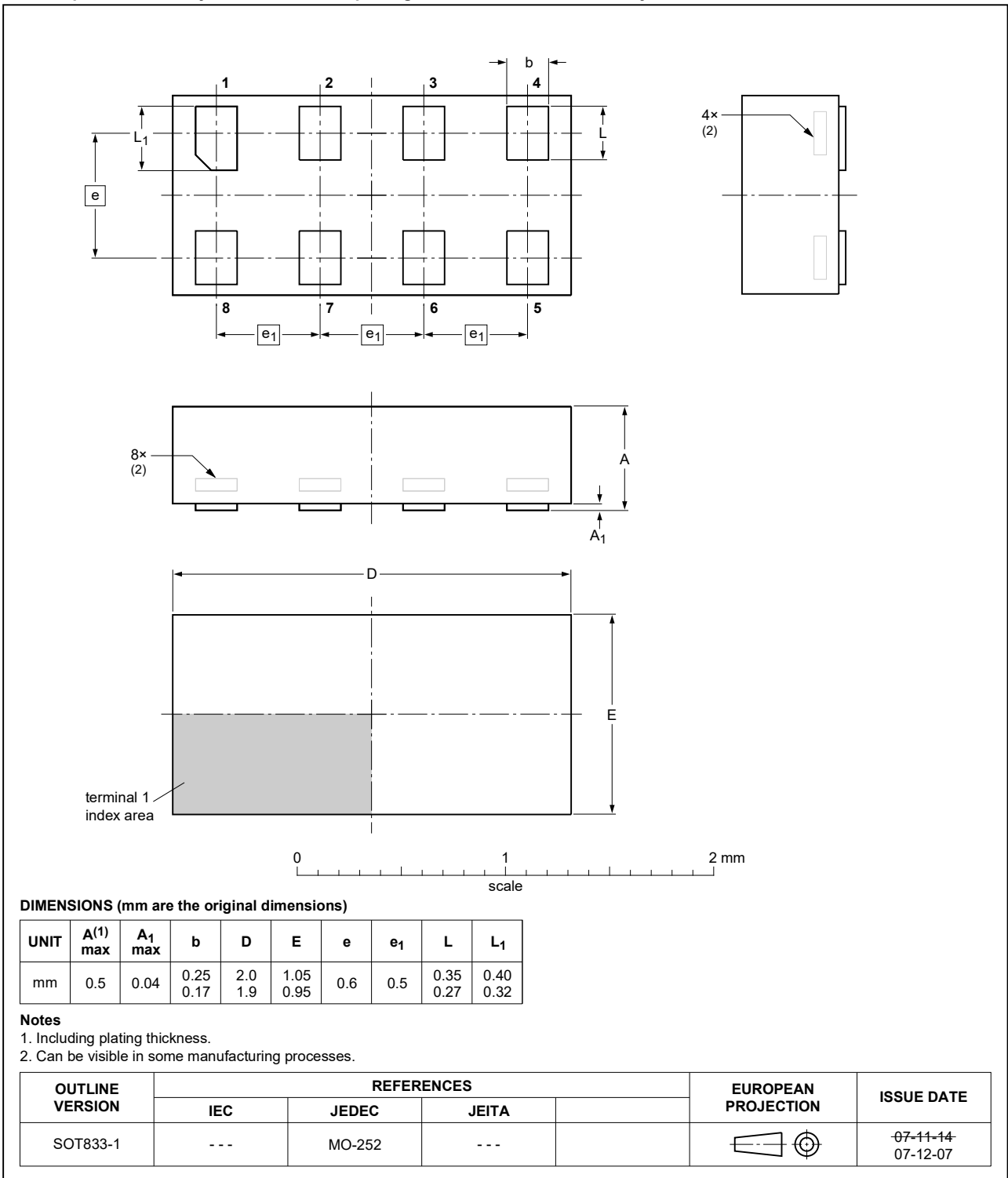


Fig. 23. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116

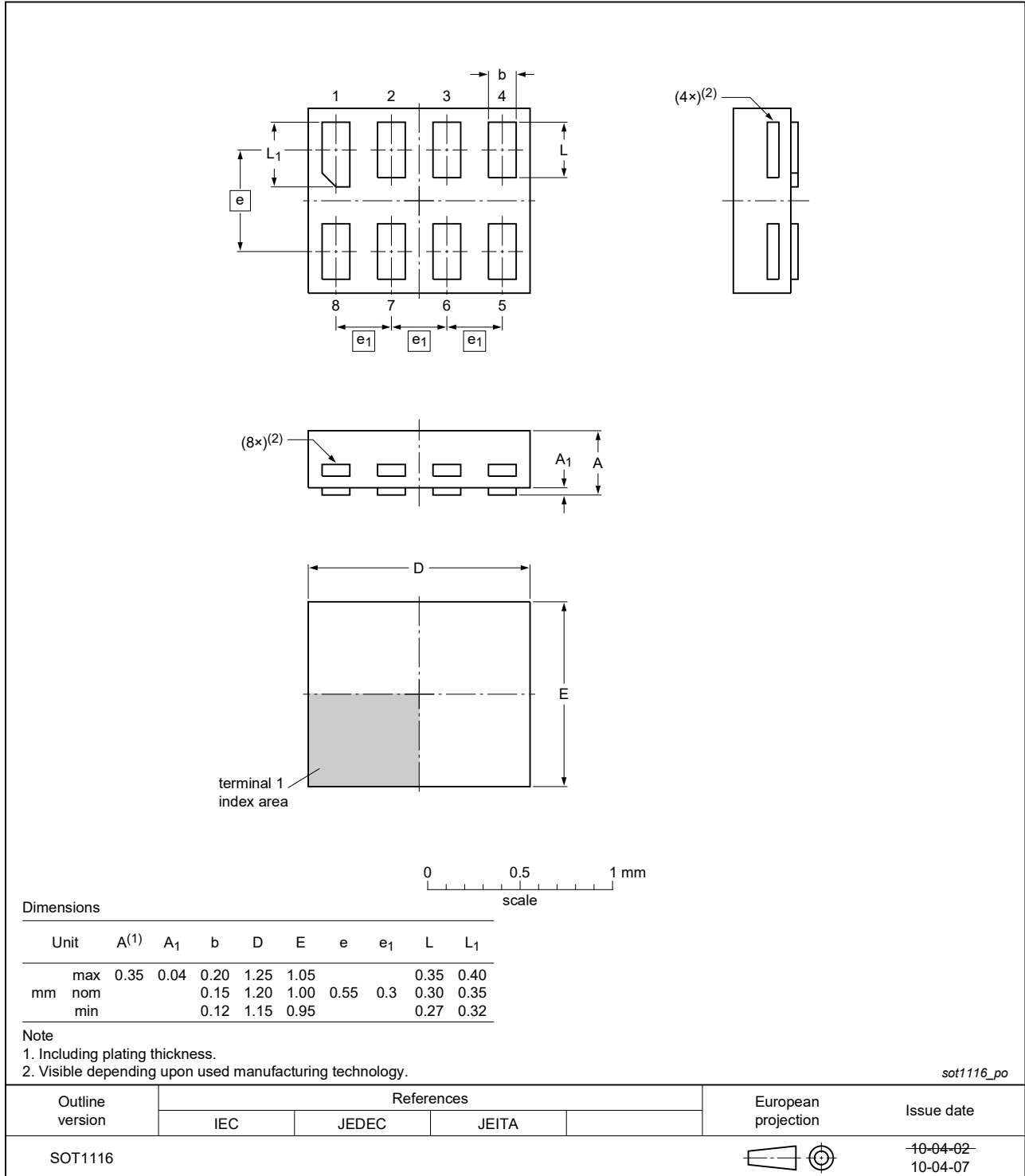


Fig. 24. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203

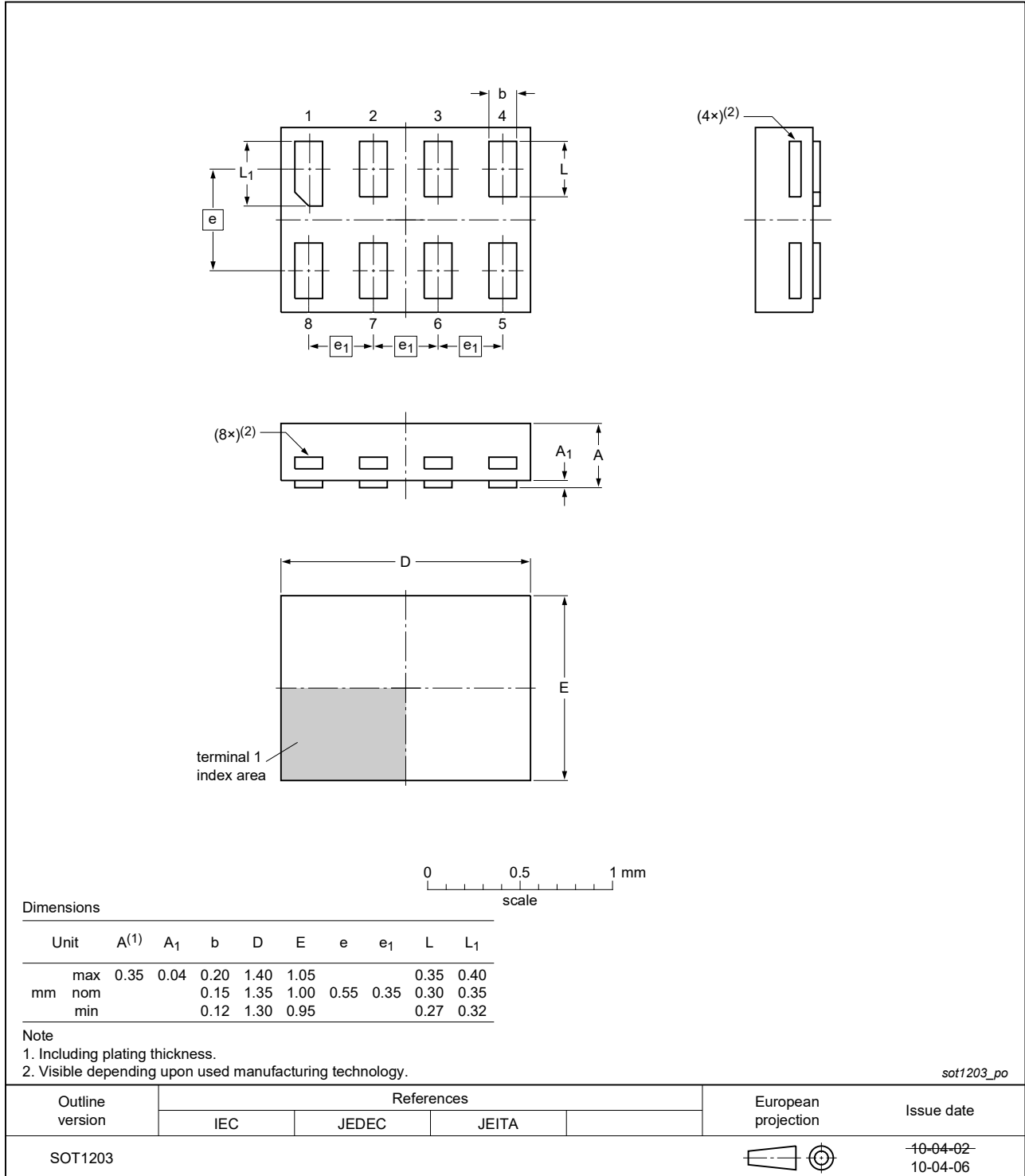


Fig. 25. Package outline SOT1203 (XSON8)

13. 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

14. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G53 v.14	20210422	Product data sheet	-	74LVC2G53 v.13
Modifications:	<ul style="list-style-type: none"> • Section 1 and Section 2 updated. • Type number 74LVC2G53GF (SOT1089 / XSON8) removed. 			
74LVC2G53 v.13	20190731	Product data sheet	-	74LVC2G53 v.12
Modifications:	<ul style="list-style-type: none"> • Type number 74LVC2G53GM (SOT902-2/XQFN8) removed. • Table 5: Derating values for P_{tot} total power dissipation updated. 			
74LVC2G53 v.12	20181116	Product data sheet	-	74LVC2G53 v.11
Modifications:	<ul style="list-style-type: none"> • Type number 74LVC2G53GD (SOT996-2/XSON8) removed. 			
74LVC2G53 v.11	20170821	Product data sheet	-	74LVC2G53 v.10
Modifications:	<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. 			
74LVC2G53 v.10	20161215	Product data sheet	-	74LVC2G53 v.9
Modifications:	<ul style="list-style-type: none"> • Table 7: The maximum limits for leakage current and supply current have changed. 			
74LVC2G53 v.9	20130405	Product data sheet	-	74LVC2G53 v.8
Modifications:	<ul style="list-style-type: none"> • For type number 74LVC2G53GD XSON8U has changed to XSON8. 			
74LVC2G53 v.8	20120622	Product data sheet	-	74LVC2G53 v.7
Modifications:	<ul style="list-style-type: none"> • For type number 74LVC2G53GM the SOT code has changed to SOT902-2. 			
74LVC2G53 v.7	20111125	Product data sheet	-	74LVC2G53 v.6
Modifications:	<ul style="list-style-type: none"> • Legal pages updated. 			
74LVC2G53 v.6	20100927	Product data sheet	-	74LVC2G53 v.5
74LVC2G53 v.5	20080618	Product data sheet	-	74LVC2G53 v.4
74LVC2G53 v.4	20080228	Product data sheet	-	74LVC2G53 v.3
74LVC2G53 v.3	20070828	Product data sheet	-	74LVC2G53 v.2
74LVC2G53 v.2	20060331	Product data sheet	-	74LVC2G53 v.1
74LVC2G53 v.1	20060110	Product data sheet	-	-

15. 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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