

# 74HC2G126; 74HCT2G126

Dual buffer/line driver; 3-state

Rev. 5 — 18 December 2013

Product data sheet

## 1. General description

The 74HC2G126; 74HCT2G126 is a dual buffer/line driver with 3-state outputs controlled by the output enable inputs (nOE). Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## 2. Features and benefits

- Wide operating voltage from 2.0 V to 6.0 V
- Input levels:
  - ◆ For 74HC2G126: CMOS level
  - ◆ For 74HCT2G126: TTL level
- Complies with JEDEC standard no. 7A
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC2G126DP 74HCT2G126DP	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74HC2G126DC 74HCT2G126DC	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74HC2G126GD 74HCT2G126GD	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $3 \times 2 \times 0.5$ mm	SOT996-2



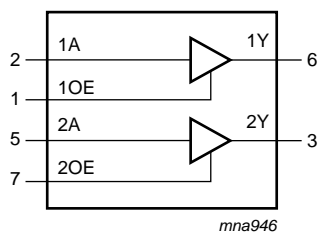
## 4. Marking

Table 2. Marking codes<sup>[1]</sup>

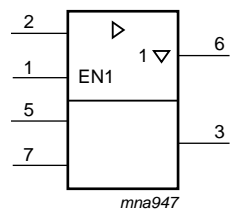
Type number	Marking code
74HC2G126DP	H26
74HCT2G126DP	T26
74HC2G126DC	H26
74HCT2G126DC	T26
74HC2G126GD	H26
74HCT2G126GD	T26

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

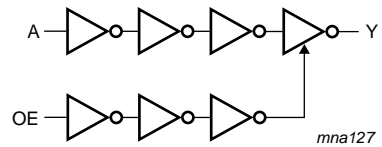
## 5. Functional diagram



*mna946*



*mna947*



*mna127*

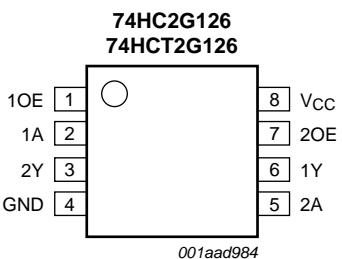
**Fig 1. Logic symbol**

**Fig 2. IEC logic symbol**

**Fig 3. Logic diagram (one driver)**

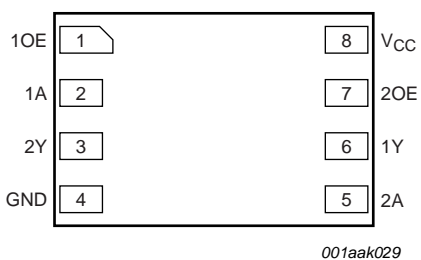
## 6. Pinning information

### 6.1 Pinning



*001aad984*

**74HC2G126**  
**74HCT2G126**



*001aak029*

Transparent top view

**Fig 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)**

**Fig 5. Pin configuration SOT996-2 (XSON8)**

## 6.2 Pin description

**Table 3.** Pin description

Symbol	Pin	Description
1OE, 2OE	1, 7	output enable input
1A, 2A	2, 5	data input
1Y, 2Y	6, 3	data output
GND	4	ground (0 V)
V <sub>CC</sub>	8	supply voltage

## 7. Functional description

**Table 4.** Function table<sup>[1]</sup>

Input		Output
nOE	nA	nY
H	L	L
H	H	H
L	X	Z

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance 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 <sub>CC</sub>	supply voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V	[1] -	±20	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V	[1] -	±20	mA
I <sub>O</sub>	output current	V <sub>O</sub> = -0.5 V to (V <sub>CC</sub> + 0.5 V)	[1] -	±35	mA
I <sub>CC</sub>	supply current		-	70	mA
I <sub>GND</sub>	ground current		-70	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation		[2] -	300	mW

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

[2] For TSSOP8 package: above 55 °C the value of P<sub>tot</sub> derates linearly with 2.5 mW/K.  
 For VSSOP8 package: above 110 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.  
 For XSON8 package: above 118 °C the value of P<sub>tot</sub> derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74HC2G126			74HCT2G126			Unit
			Min	Typ	Max	Min	Typ	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	-	-	-	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	-	-	-	ns/V

## 10. Static characteristics

**Table 7. Static characteristics**

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T<sub>amb</sub> = 25 °C.

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
<b>74HC2G126</b>								
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.84	4.32	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	I <sub>O</sub> = -7.8 mA; V <sub>CC</sub> = 6.0 V	5.34	5.81	-	5.2	-	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	V
I <sub>I</sub>	input leakage current	I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.33	-	0.4	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.33	-	0.4	V
		V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±5.0	-	±10	μA

**Table 7. Static characteristics ...continued**

Voltages are referenced to GND (ground = 0 V). All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

Symbol	Parameter	Conditions	$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$			$T_{amb} = -40\text{ }^{\circ}\text{C to } +125\text{ }^{\circ}\text{C}$		Unit
			Min	Typ	Max	Min	Max	
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$ ; $V_{CC} = 6.0\text{ V}$	-	-	10	-	20	$\mu\text{A}$
$C_I$	input capacitance		-	1.0	-	-	-	pF
$C_O$	output capacitance		-	1.5	-	-	-	pF

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$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	2.0	1.6	-	2.0	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	-	1.2	0.8	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5\text{ V}$						
		$I_O = -20\text{ }\mu\text{A}$	4.4	4.5	-	4.4	-	V
		$I_O = -6.0\text{ mA}$	3.84	4.32	-	3.7	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5\text{ V}$						
		$I_O = 20\text{ }\mu\text{A}$	-	0	0.1	-	0.1	V
		$I_O = 6.0\text{ mA}$	-	0.16	0.33	-	0.4	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	$\pm 1.0$	-	$\pm 1.0$	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	$\pm 5.0$	-	$\pm 10$	
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$ ; $V_{CC} = 5.5\text{ V}$	-	-	10	-	20	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input; $V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ; $V_I = V_{CC} - 2.1\text{ V}$ ; $I_O = 0\text{ A}$	-	-	375	-	410	$\mu\text{A}$
$C_I$	input capacitance		-	1.0	-	-	-	pF
$C_O$	output capacitance		-	1.5	-	-	-	pF

**11. Dynamic characteristics**

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50\text{ pF}$  unless otherwise specified; for test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$			$T_{amb} = -40\text{ }^{\circ}\text{C to } +125\text{ }^{\circ}\text{C}$		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
<b>74HC2G126</b>								
$t_{pd}$	propagation delay	nA to nY; see <a href="#">Figure 6</a>						
		$V_{CC} = 2.0\text{ V}$	-	35	115	-	135	ns
		$V_{CC} = 4.5\text{ V}$	-	11	23	-	27	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	10	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	-	8	20	-	23	ns

**Table 8. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit see [Figure 8](#).

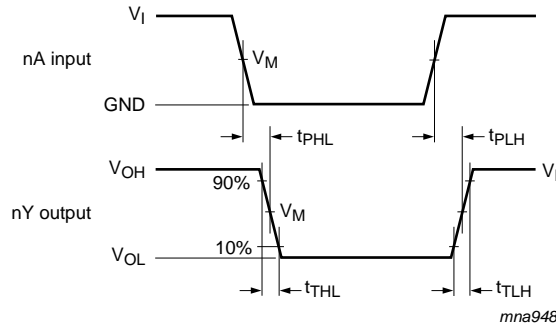
Symbol	Parameter	Conditions	$T_{amb} = -40$ °C to $+85$ °C			$T_{amb} = -40$ °C to $+125$ °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$t_{en}$	enable time	nOE to nY; see <a href="#">Figure 7</a>	<a href="#">[2]</a>					
		$V_{CC} = 2.0$ V	-	40	115	-	135	ns
		$V_{CC} = 4.5$ V	-	11	23	-	27	ns
		$V_{CC} = 6.0$ V	-	8	20	-	23	ns
$t_{dis}$	disable time	nOE to nY; see <a href="#">Figure 7</a>	<a href="#">[2]</a>					
		$V_{CC} = 2.0$ V	-	25	125	-	150	ns
		$V_{CC} = 4.5$ V	-	12	25	-	30	ns
		$V_{CC} = 6.0$ V	-	10	21	-	26	ns
$t_t$	transition time	nY; see <a href="#">Figure 6</a>	<a href="#">[2]</a>					
		$V_{CC} = 2.0$ V	-	18	75	-	90	ns
		$V_{CC} = 4.5$ V	-	6	15	-	18	ns
		$V_{CC} = 6.0$ V	-	5	13	-	15	ns
$C_{PD}$	power dissipation capacitance	per buffer; $V_I = GND$ to $V_{CC}$	<a href="#">[3]</a>					
		output enabled	-	11	-	-	-	pF
		output disabled	-	1	-	-	-	pF

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$t_{pd}$	propagation delay	nA to nY; see <a href="#">Figure 6</a>	<a href="#">[2]</a>						
		$V_{CC} = 4.5$ V	-	15	30	-	36	ns	
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	12	-	-	-	ns	
$t_{en}$	enable time	nOE to nY; see <a href="#">Figure 7</a> ; $V_{CC} = 4.5$ V	<a href="#">[2]</a>	-	11	31	-	38	ns
$t_{dis}$	disable time	nOE to nY; see <a href="#">Figure 7</a> ; $V_{CC} = 4.5$ V	<a href="#">[2]</a>	-	11	35	-	42	ns
$t_t$	transition time	nY; see <a href="#">Figure 6</a> ; $V_{CC} = 4.5$ V	<a href="#">[2]</a>	-	6	15	-	18	ns
$C_{PD}$	power dissipation capacitance	per buffer; $V_I = GND$ to $V_{CC} - 1.5$ V	<a href="#">[3]</a>						
		output enabled	-	11	-	-	-	pF	
		output disabled	-	1	-	-	-	pF	

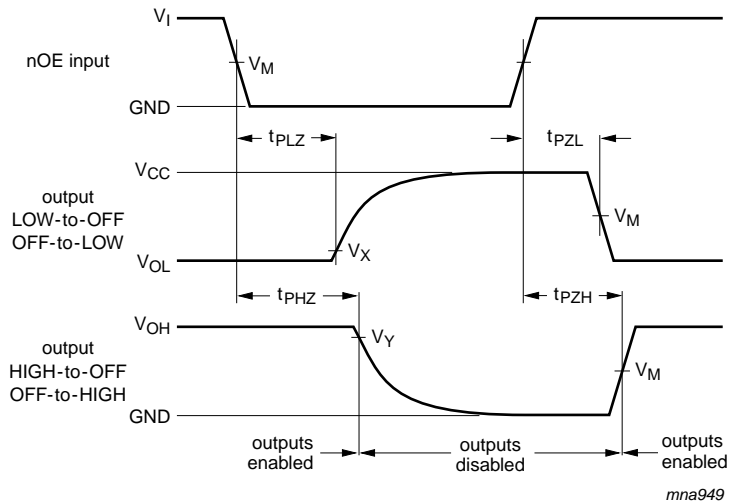
- [1] All typical values are measured at  $T_{amb} = 25$  °C.
- [2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .  
 $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .  
 $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .  
 $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .
- [3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{CC}$  = supply voltage in V;  
 $N$  = number of inputs switching;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

12. Waveforms



Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 6. Propagation delay input (nA) to output (nY) and transition time output (nY)**



Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 7. Enable and disable times**

**Table 9. Measurement points**

Type	Input	Output		
	$V_M$	$V_M$	$V_X$	$V_Y$
74HC2G126	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$
74HCT2G126	1.3 V	1.3 V	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$

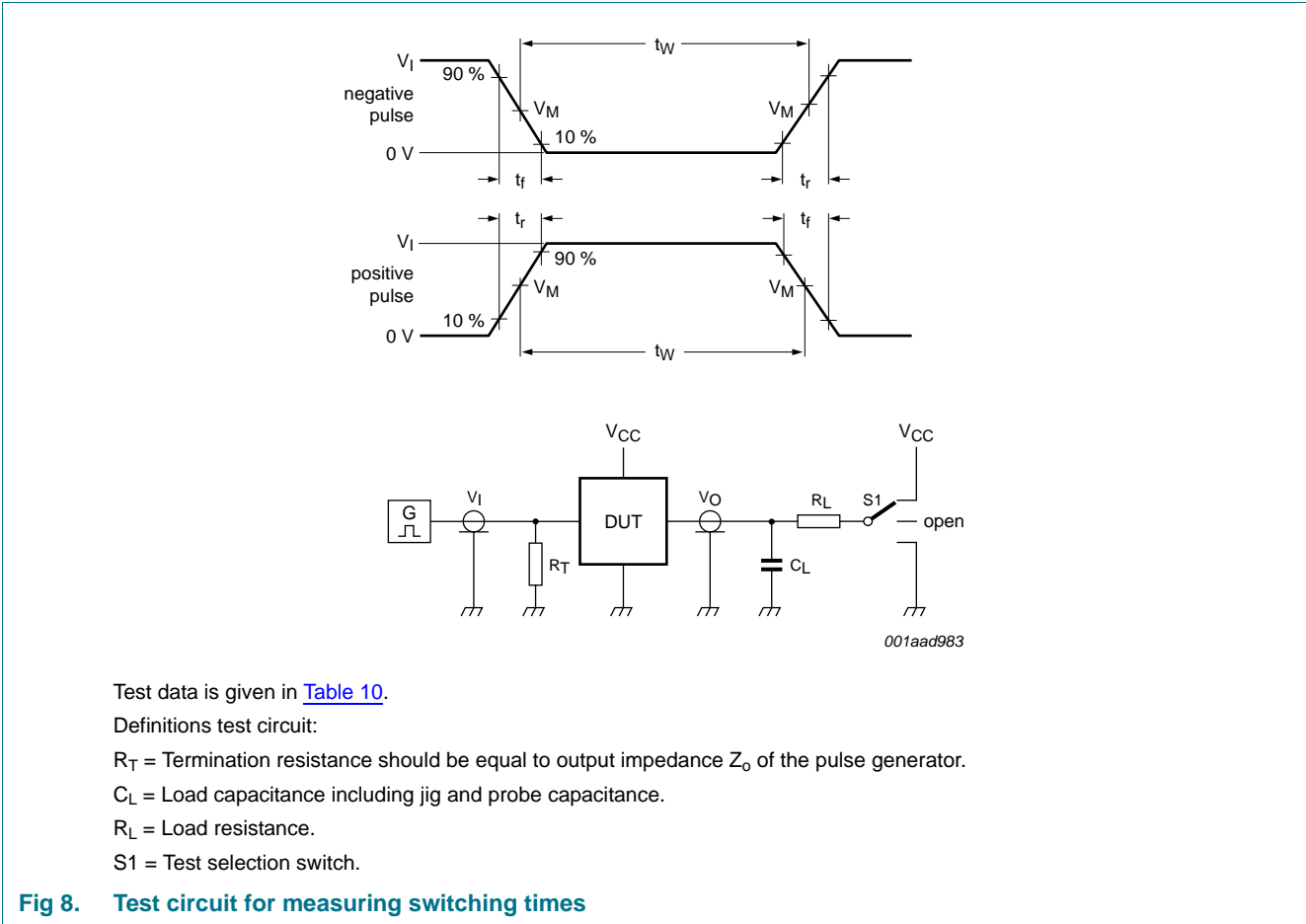


Table 10. Test data

Type	Input		Load		S1 position		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
74HC2G126	GND to $V_{CC}$	$\leq 6$ ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$
74HCT2G126	GND to 3 V	$\leq 6$ ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$



13. Package outline

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

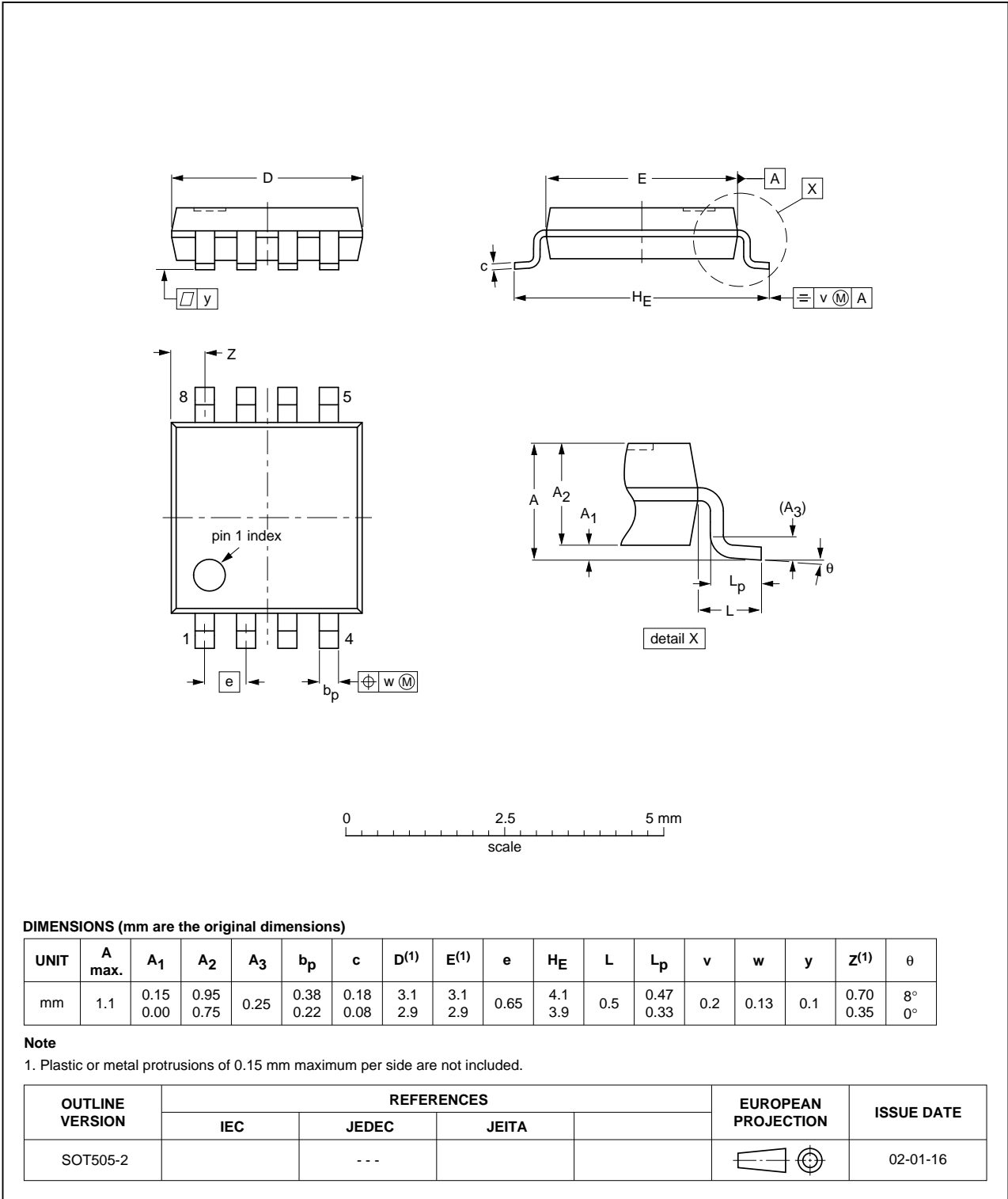


Fig 9. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

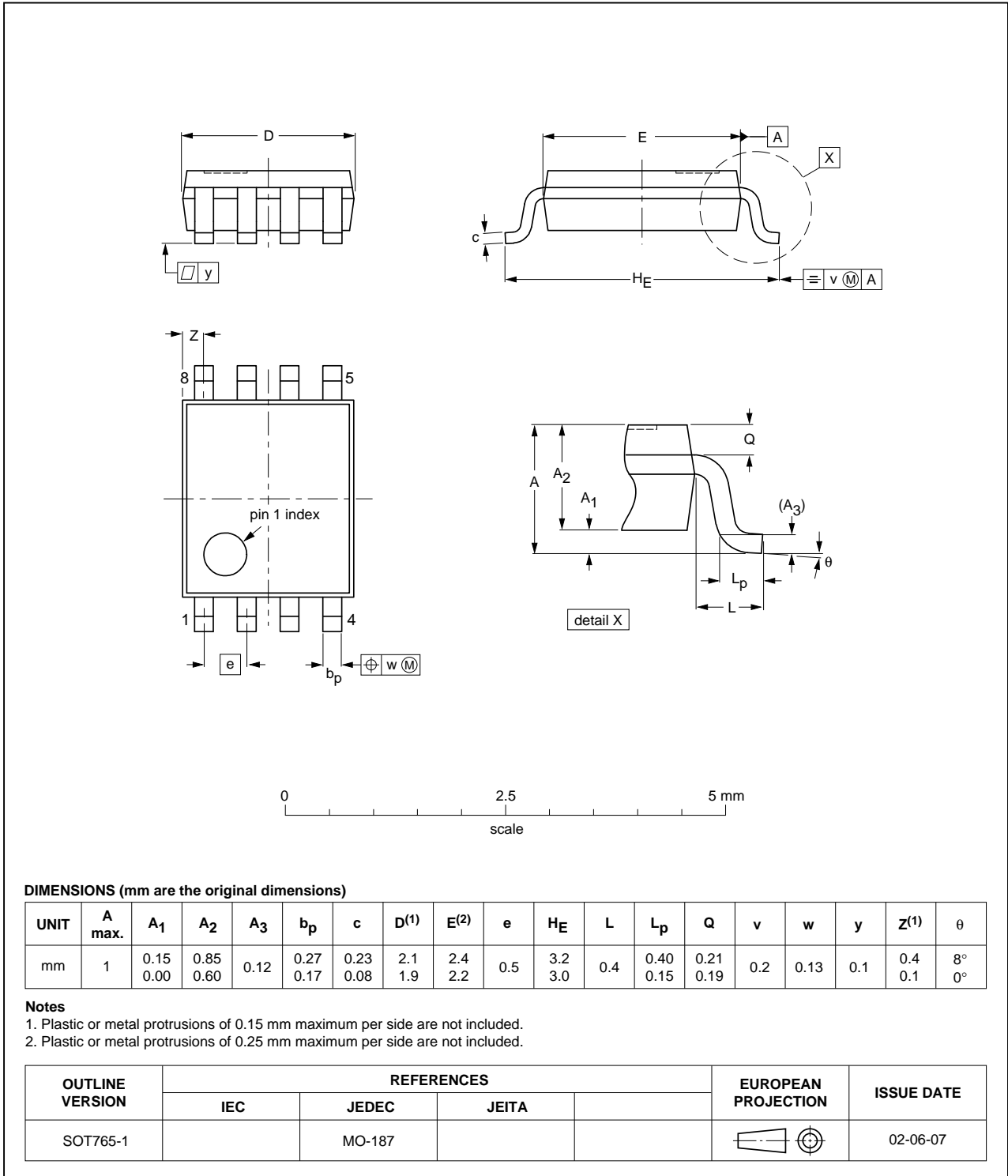


Fig 10. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads;  
8 terminals; body 3 x 2 x 0.5 mm

SOT996-2

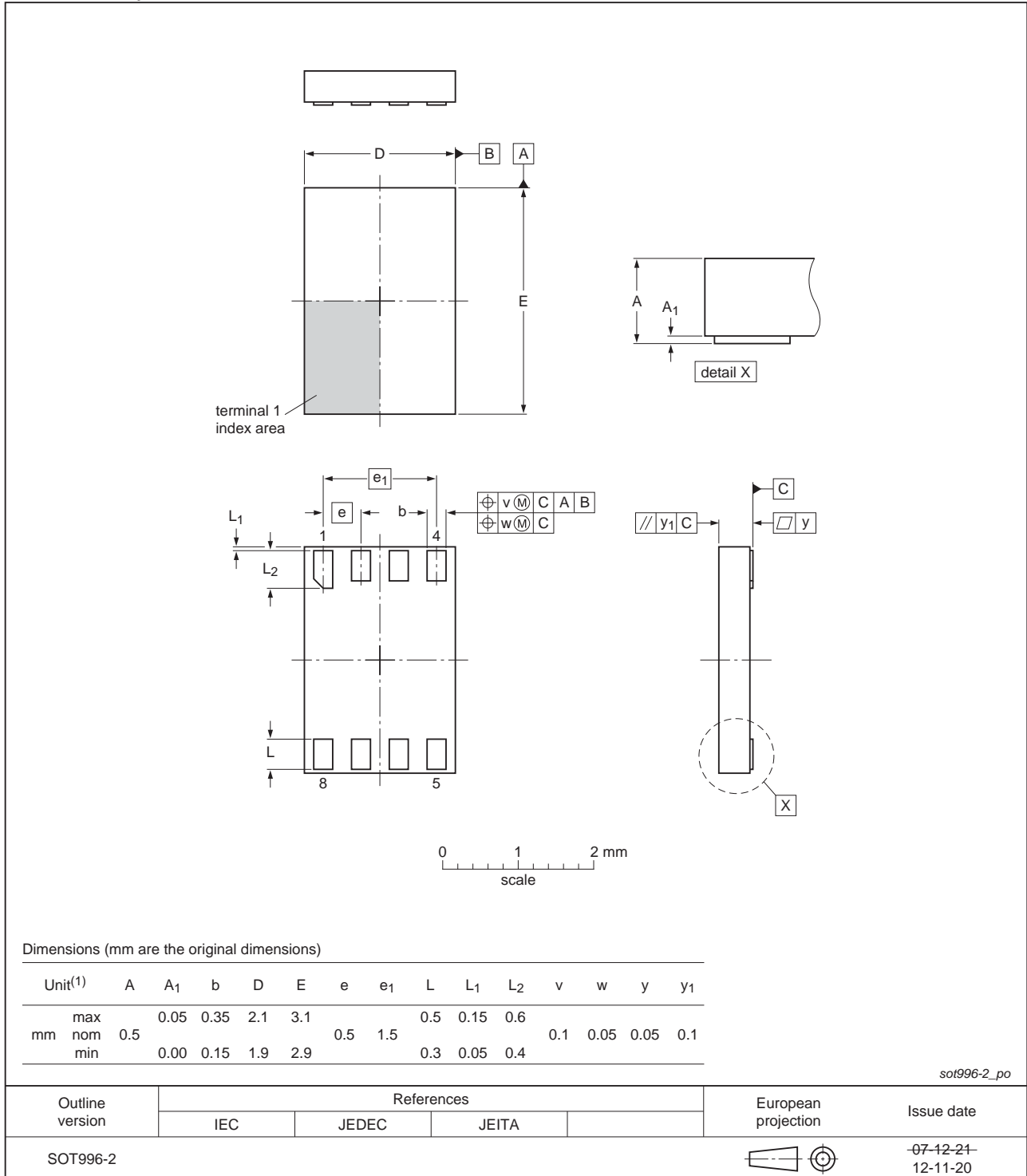


Fig 11. Package outline SOT996-2 (XSON8)

## 14. Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G126 v.5	20131218	Product data sheet	-	74HC_HCT2G126 v.4
Modifications:	<ul style="list-style-type: none"> <li>For type numbers 74HC2G126GD and 74HCT2G126GD XSON8U has changed to XSON8.</li> </ul>			
74HC_HCT2G126 v.4	20090924	Product data sheet	-	74HC_HCT2G126 v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Table 2</a>: Marking codes table added.</li> </ul>			
74HC_HCT2G126 v.3	20090507	Product data sheet	-	74HC_HCT2G126 v.2
74HC_HCT2G126 v.2	20051215	Product data sheet	-	74HC_HCT2G126 v.1
74HC_HCT2G126 v.1	20030303	Product data sheet	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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