

74HC2G125; 74HCT2G125

Dual buffer/line driver; 3-state

Rev. 5 — 17 March 2014

Product data sheet

1. General description

The 74HC2G125; 74HCT2G125 are dual buffer/line drivers with 3-state outputs controlled by the output enable inputs ($\overline{\text{OE}}$). Inputs include clamp diodes which enable the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- Input levels:
 - ◆ For 74HC2G125: CMOS level
 - ◆ For 74HCT2G125: TTL level
- 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
74HC2G125DP	$-40\text{ }^{\circ}\text{C}$ 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
74HCT2G125DP				
74HC2G125DC	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74HCT2G125DC				
74HC2G125GD	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $3 \times 2 \times 0.5\text{ mm}$	SOT996-2
74HCT2G125GD				



4. Marking

Table 2. Marking codes

Type number	Marking code ^[1]
74HC2G125DP	H25
74HCT2G125DP	T25
74HC2G125DC	H25
74HCT2G125DC	T25
74HC2G125GD	H25
74HCT2G125GD	T25

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

5. Functional diagram

mce185

Fig 1. Logic symbol

mce186

Fig 2. IEC logic symbol

mna120

Fig 3. Logic diagram (one driver)

6. Pinning information

6.1 Pinning

001aae074

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

001aai333

Transparent top view

Fig 5. Pin configuration SOT996-2 (XSON8)

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
$\overline{1OE}, \overline{2OE}$	1, 7	output enable input (active LOW)
1A, 2A	2, 5	data input
GND	4	ground (0 V)
1Y, 2Y	6, 3	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table^[1]

Control	Input	Output
$\overline{nOE}$	nA	nY
L	L	L
L	H	H
H	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 _{CC}	supply voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -0.5 V or V _I > V _{CC} + 0.5 V ^[1]	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V ^[1]	-	±20	mA
I _O	output current	V _O = -0.5 V to (V _{CC} + 0.5 V) ^[1]	-	35	mA
I _{CC}	supply current		-	70	mA
I _{GND}	ground current		-70	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C ^[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_{tot} derates linearly with 2.5 mW/K.
 For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.
 For XSON8 package: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74HC2G125			74HCT2G125			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V _I	input voltage		0	-	V _{CC}	0	-	V _{CC}	V
V _O	output voltage		0	-	V _{CC}	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 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_{amb} = 25 °C.

Symbol	Parameter	Conditions	T _{amb} = −40 °C to +85 °C			T _{amb} = −40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HC2G125								
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	V
		V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	V
		V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = −20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	V
		I _O = −20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	V
		I _O = −20 μA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	V
		I _O = −6.0 mA; V _{CC} = 4.5 V	3.84	4.32	-	3.7	-	V
		I _O = −7.8 mA; V _{CC} = 6.0 V	5.34	5.81	-	5.2	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 20 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	0	0.1	-	0.1	V
		I _O = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
		I _O = 7.8 mA; V _{CC} = 6.0 V	-	0.16	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 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	μA
C_I	input capacitance		-	1.0	-	-	-	pF
C_O	output capacitance		-	1.5	-	-	-	pF
74HCT2G125								
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; $V_{CC} = 5.5\text{ V}$	-	-	± 1.0	-	± 1.0	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	± 5.0	-	± 10	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 5.5\text{ V}$	-	-	10	-	20	μA
ΔI_{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	μA
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 °C to +85 °C			T _{amb} = −40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
74HC2G125								
t _{pd}	propagation delay	nA to nY; see Figure 6 ^[2]						
		V _{CC} = 2.0 V	-	35	115	-	135	ns
		V _{CC} = 4.5 V	-	11	23	-	27	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	10	-	-	-	ns
		V _{CC} = 6.0 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 ^[1]	Max	Min	Max	
t _{en}	enable time	n $\overline{\text{OE}}$ to nY; see Figure 7 ^[2]						
		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	n $\overline{\text{OE}}$ to nY; see Figure 7 ^[2]						
		V _{CC} = 2.0 V	-	24	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	see Figure 6 ^[2]						
		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} ^[3]						
		output enabled	-	11	-	-	-	pF
		output disabled	-	1	-	-	-	pF
74HCT2G125								
t _{pd}	propagation delay	nA to nY; see Figure 6 ^[2]						
		V _{CC} = 4.5 V	-	15	31	-	38	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	12	-	-	-	ns
t _{en}	enable time	n $\overline{\text{OE}}$ to nY; see Figure 7 ; V _{CC} = 4.5 V ^[2]	-	15	35	-	42	ns
t _{dis}	disable time	n $\overline{\text{OE}}$ to nY; see Figure 7 ; V _{CC} = 4.5 V ^[2]	-	15	31	-	38	ns
t _t	transition time	see Figure 6 ; V _{CC} = 4.5 V ^[2]	-	6	15	-	18	ns
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} − 1.5 V ^[3]						
		output enabled	-	11	-	-	-	pF
		output disabled	-	1	-	-	-	pF

[1] All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.

[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 μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 and test circuit

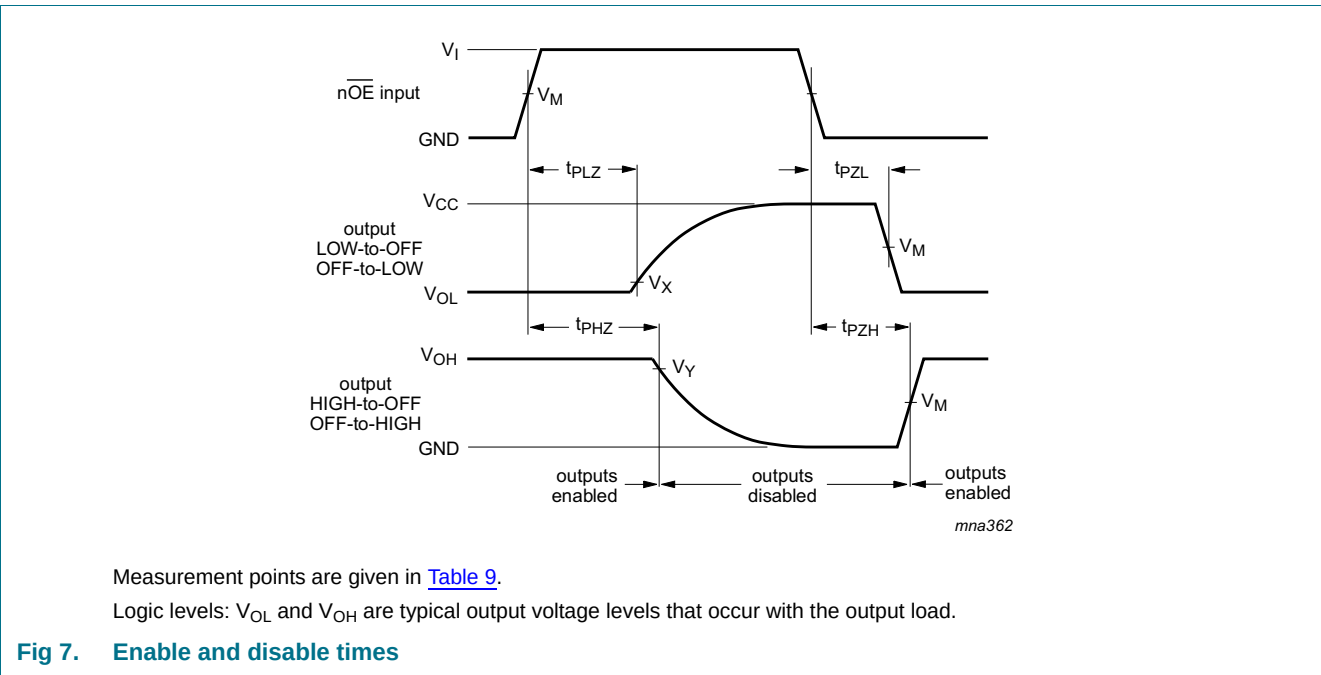
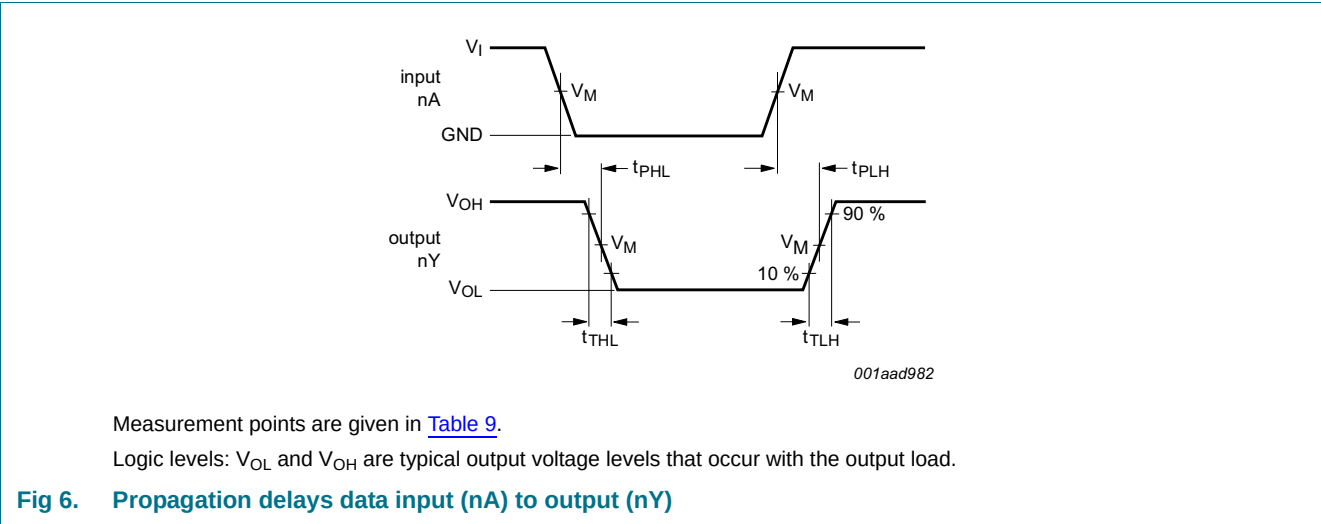


Table 9. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC2G125	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$
74HCT2G125	1.3 V	1.3 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$

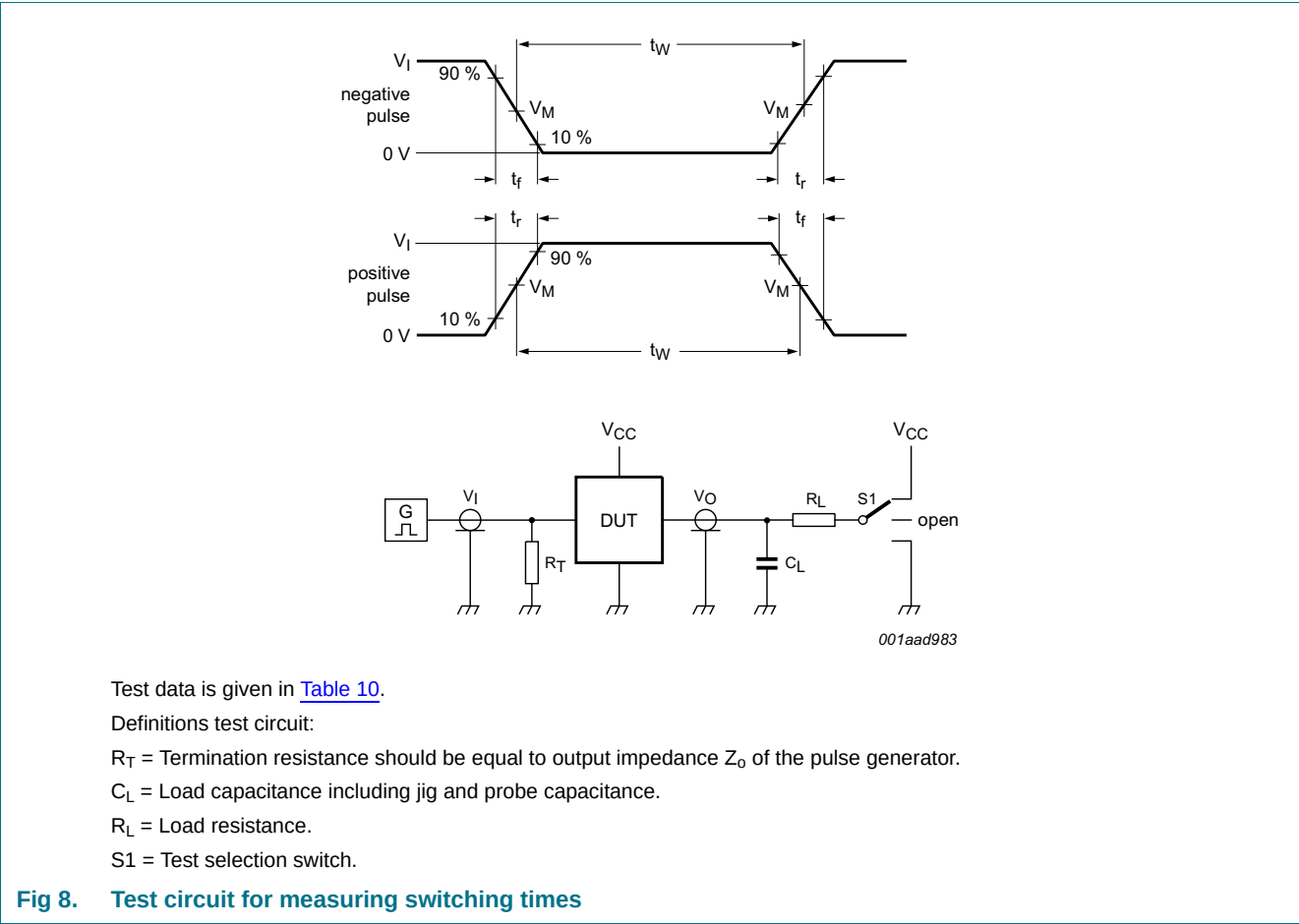


Table 10. Test data

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}
74HC2G125	V_{CC}	$\leq 6 \text{ ns}$	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}
74HCT2G125	3 V	$\leq 6 \text{ ns}$	15 pF, 50 pF	1 k Ω	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

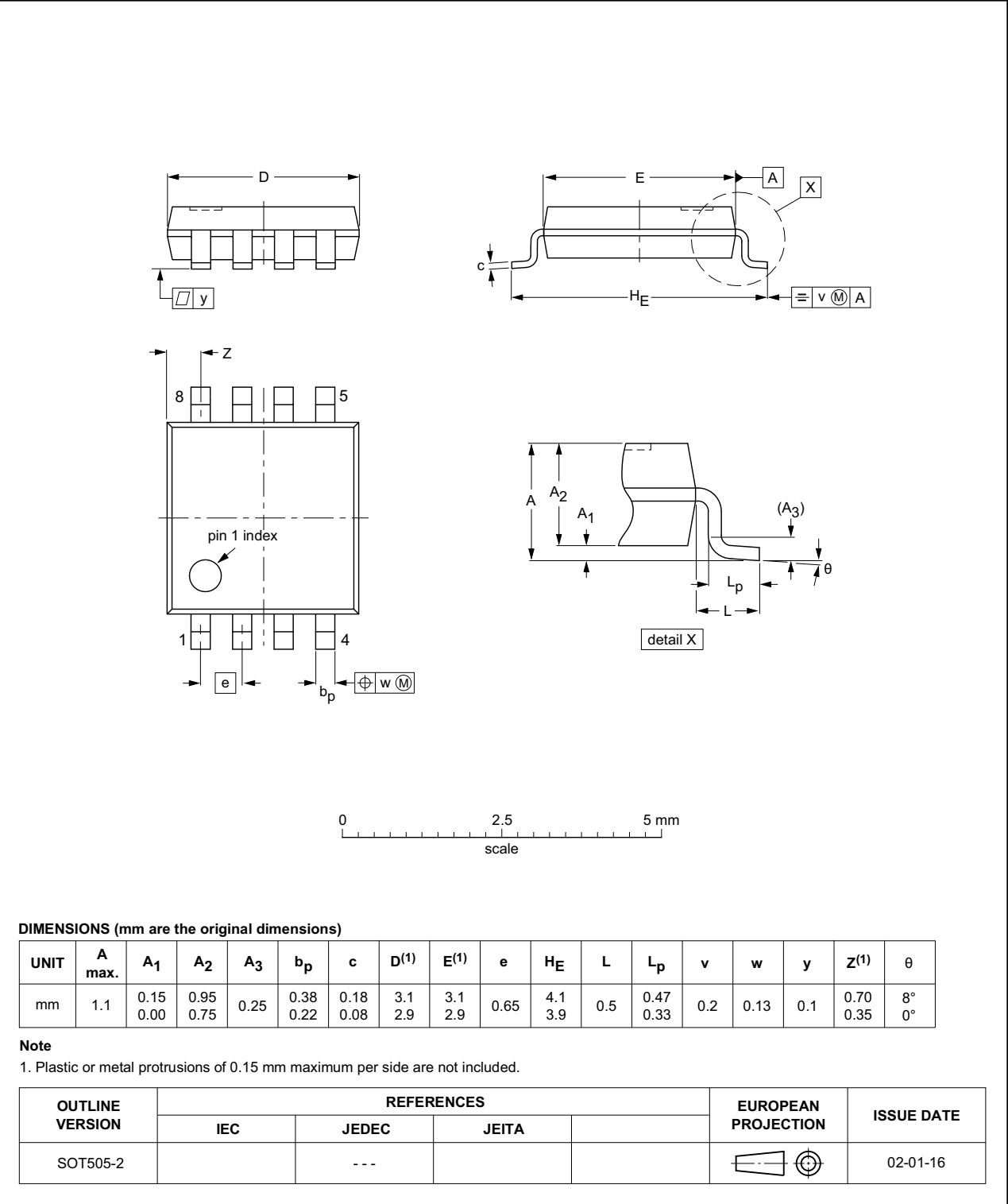


Fig 9. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

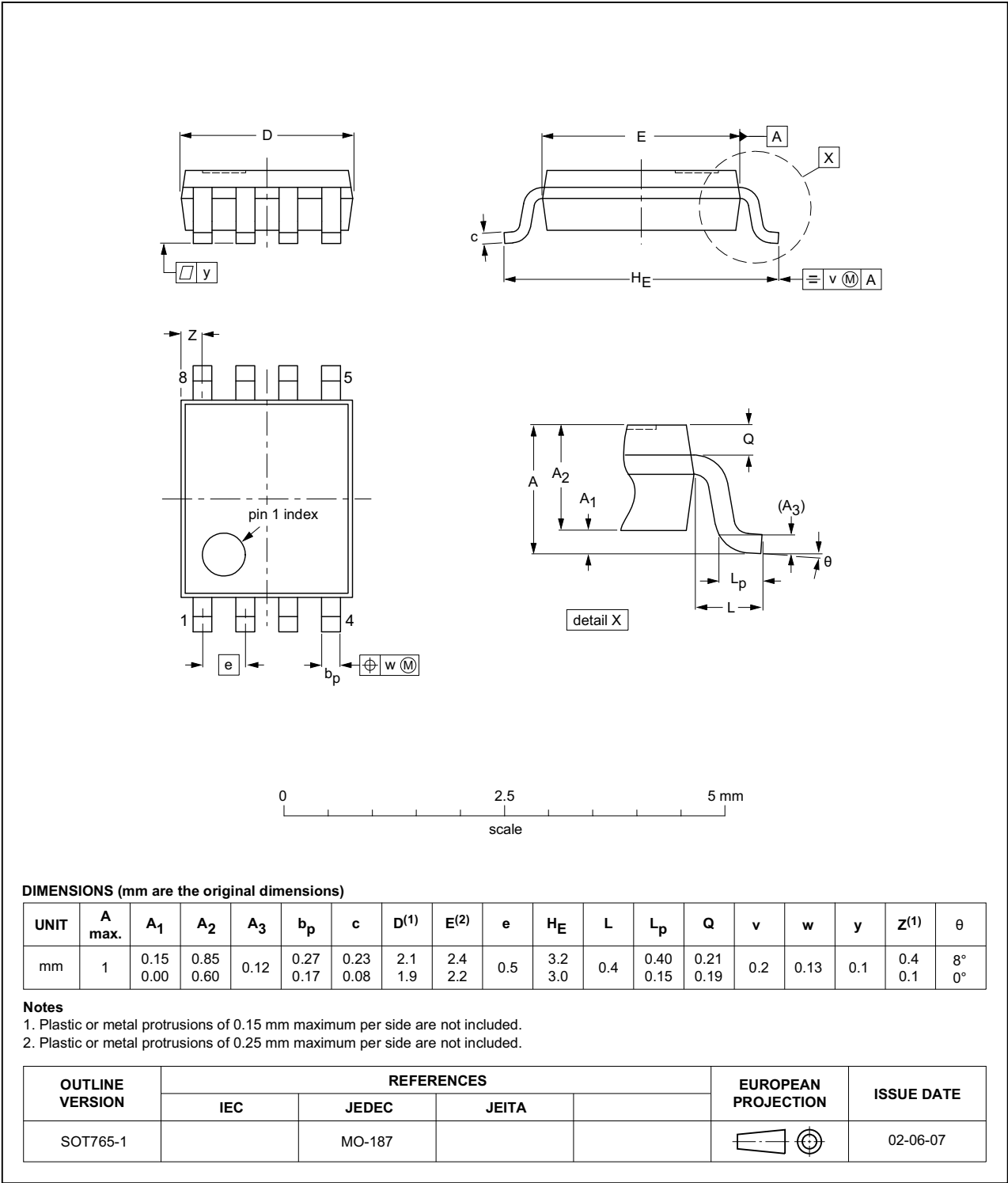


Fig 10. Package outline SOT765-1 (VSSOP8)

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

SOT996-2

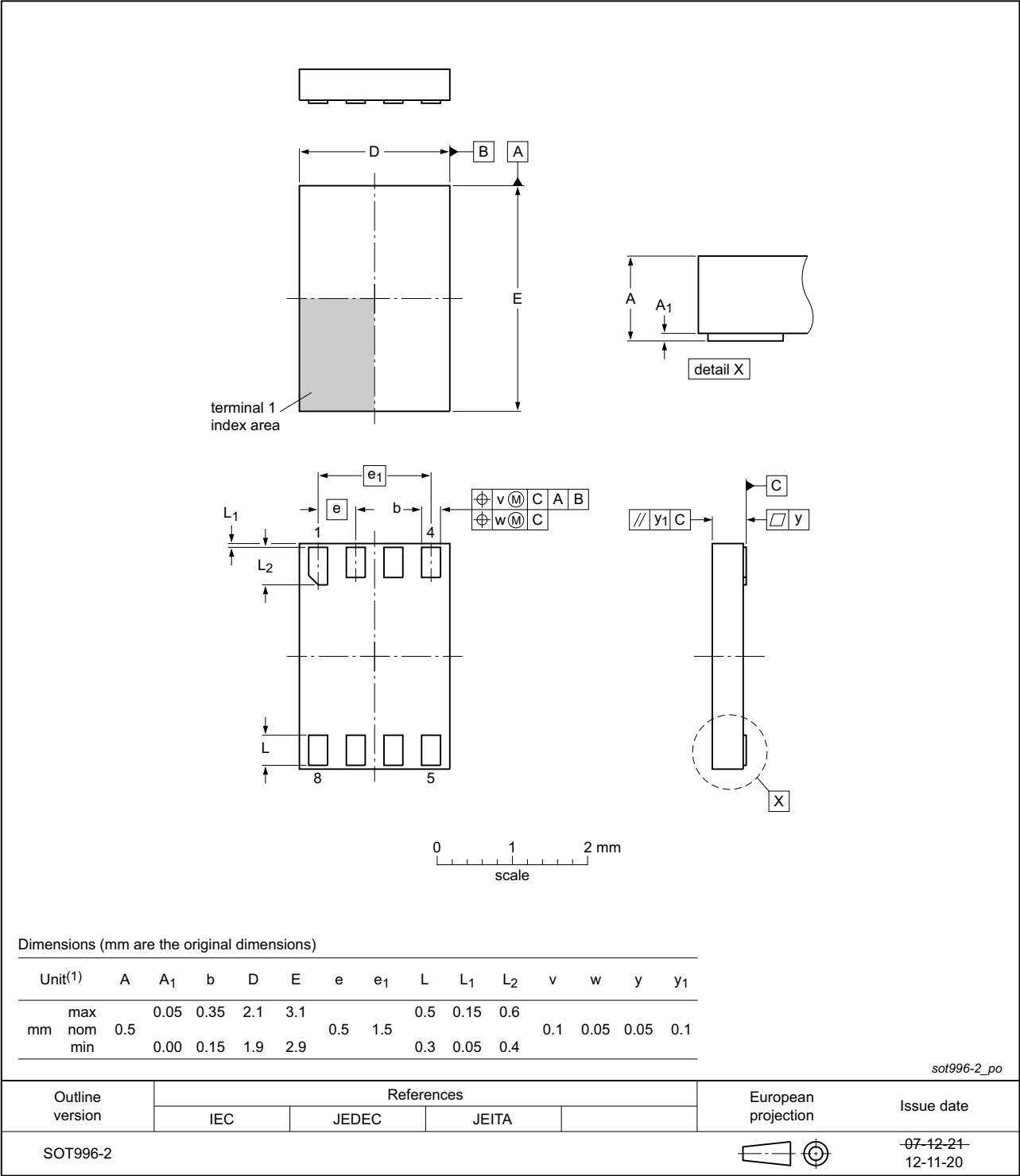


Fig 11. Package outline SOT996-2 (XSON8)

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
TTL	Transistor-Transistor Logic

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G125 v.5	20140317	Product data sheet	-	74HC_HCT2G125 v.4
Modifications:	• For type numbers 74HC2G125GD and 74HCT2G125GD XSON8U has changed to XSON8.			
74HC_HCT2G125 v.4	20080704	Product data sheet	-	74HC_HCT2G125 v.3
74HC_HCT2G125 v.3	20060102	Product data sheet	-	74HC_HCT2G125 v.2
74HC_HCT2G125 v.2	20030303	Product specification	-	74HC_HCT2G125 v.1
74HC_HCT2G125 v.1	20030131	Product specification	-	-

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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