

# DATA SHEET

## **74HC1G125; 74HCT1G125** **Bus buffer/line drivers; 3-state**

Product specification  
Supersedes data of 2002 May 17

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## Bus buffer/line drivers; 3-state

## 74HC1G125; 74HCT1G125

## FEATURES

- Wide supply voltage range from 2.0 to 6.0 V
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- Very small 5 pins package
- Output capability: bus driver.

## DESCRIPTION

The 74HC1G/HCT1G125 is a high-speed Si-gate CMOS device.

The 74HC1G/HCT1G125 provides one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input pin ( $\overline{OE}$ ). A HIGH at pin  $\overline{OE}$  causes the output as assume a high-impedance OFF-state.

The bus driver output currents are equal compared to the 74HC/HCT125.

## QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f \leq 6.0\text{ ns}$ .

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC1G	HCT1G	
$t_{PHL}/t_{PLH}$	propagation delay A to Y	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	9	10	ns
$C_I$	input capacitance		1.5	1.5	pF
$C_{PD}$	power dissipation capacitance	notes 1 and 2	30	27	pF

## Notes

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in Volts;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

2. For HC1G the condition is  $V_I = \text{GND to } V_{CC}$ .

For HCT1G the condition is  $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ .

## FUNCTION TABLE

See note 1.

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	L	L
L	H	H
H	X	Z

## Note

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

Bus buffer/line drivers; 3-state

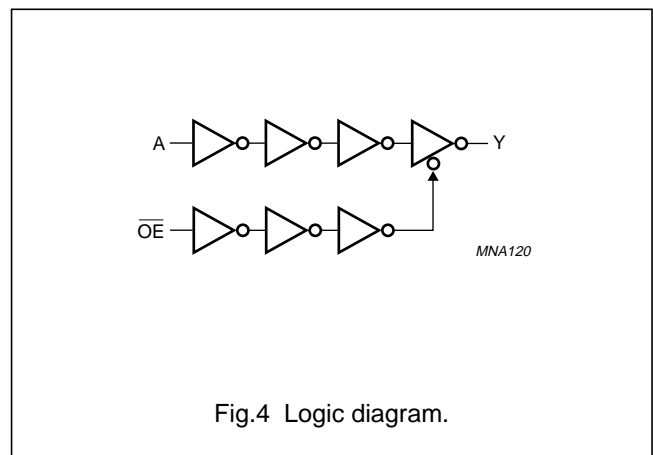
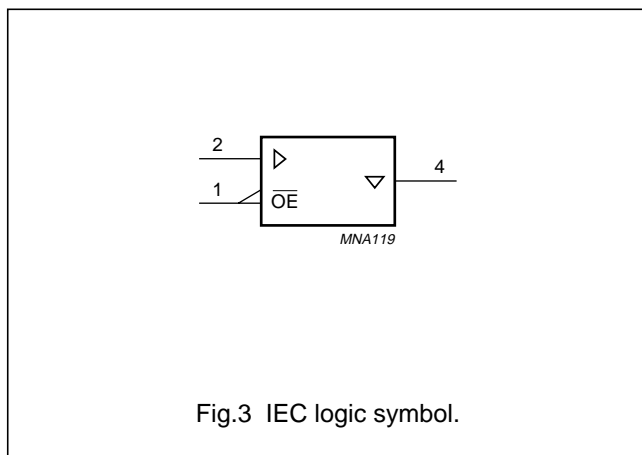
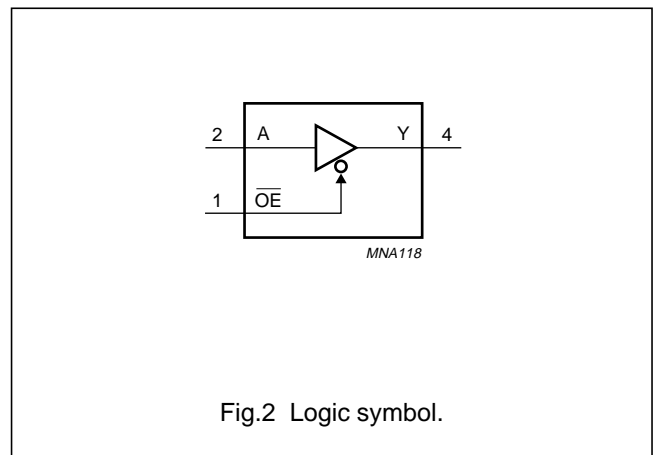
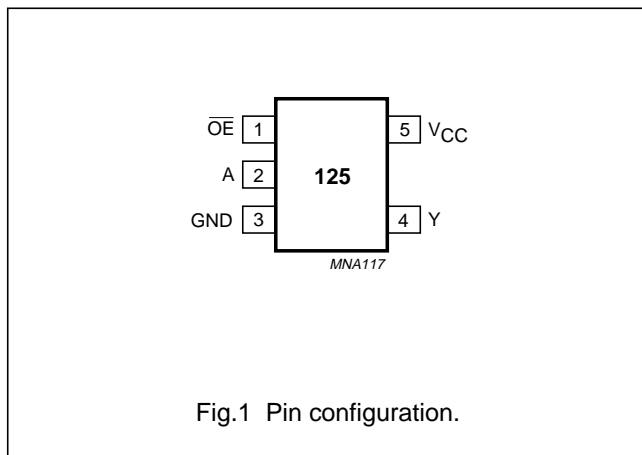
74HC1G125; 74HCT1G125

ORDERING INFORMATION

TYPE NUMBER	PACKAGE					
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE	MARKING
74HC1G125GW	-40 to +125 °C	5	SC-88A	plastic	SOT353	HM
74HCT1G125GW	-40 to +125 °C	5	SC-88A	plastic	SOT353	TM
74HC1G125GV	-40 to +125 °C	5	SC-74A	plastic	SOT753	H25
74HCT1G125GV	-40 to +125 °C	5	SC-74A	plastic	SOT753	T25

PINNING

PIN	SYMBOL	DESCRIPTION
1	$\overline{OE}$	output enable input
2	A	data input A
3	GND	ground (0 V)
4	Y	data output Y
5	V <sub>CC</sub>	supply voltage



## Bus buffer/line drivers; 3-state

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## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	74HC1G125			74HCT1G125			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
$T_{amb}$	operating ambient temperature	see DC and AC characteristics per device	–40	+25	+125	–40	+25	+125	°C
$t_r, t_f$	input rise and fall times	$V_{CC} = 2.0$ V	–	–	1000	–	–	–	ns
		$V_{CC} = 4.5$ V	–	–	500	–	–	500	ns
		$V_{CC} = 6.0$ V	–	–	400	–	–	–	ns

## 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 diode current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V; note 1	–	±20	mA
$I_{OK}$	output diode current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V; note 1	–	±20	mA
$I_O$	output source or sink current	$-0.5$ V < $V_O < V_{CC} + 0.5$ V; note 1	–	±12.5	mA
$I_{CC}$	$V_{CC}$ or GND current	note 1	–	±25	mA
$T_{stg}$	storage temperature		–65	+150	°C
$P_D$	power dissipation per package	for temperature range from –40 to +125 °C; note 2	–	200	mW

## Notes

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. Above 55 °C the value of  $P_D$  derates linearly with 2.5 mW/K.

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## DC CHARACTERISTICS

## Family 74HC1G

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

SYMBOL	PARAMETER	TEST CONDITIONS		$T_{amb}$ (°C)					UNIT
		OTHER	$V_{CC}$ (V)	-40 to +85			-40 to +125		
				MIN.	TYP. <sup>(1)</sup>	MAX.	MIN.	MAX.	
$V_{IH}$	HIGH-level input voltage		2.0	1.5	1.2	–	1.5	–	V
			4.5	3.15	2.4	–	3.15	–	V
			6.0	4.2	3.2	–	4.2	–	V
$V_{IL}$	LOW-level input voltage		2.0	–	0.8	0.5	–	0.5	V
			4.5	–	2.1	1.35	–	1.35	V
			6.0	–	2.8	1.8	–	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -20 \mu A$	2.0	1.9	2.0	–	1.9	–	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -20 \mu A$	4.5	4.4	4.5	–	4.4	–	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -20 \mu A$	6.0	5.9	6.0	–	5.9	–	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -2.0 \text{ mA}$	4.5	4.13	4.32	–	3.7	–	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -2.6 \text{ mA}$	6.0	5.63	5.81	–	5.2	–	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = 20 \mu A$	2.0	–	0	0.1	–	0.1	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = 20 \mu A$	4.5	–	0	0.1	–	0.1	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = 20 \mu A$	6.0	–	0	0.1	–	0.1	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = 2.0 \text{ mA}$	4.5	–	0.15	0.33	–	0.4	V
		$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = 2.6 \text{ mA}$	6.0	–	0.16	0.33	–	0.4	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND	6.0	–	–	1.0	–	1.0	$\mu A$
$I_{OZ}$	3-state output current OFF-state	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND	6.0	–	–	5	–	10	$\mu A$
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$	6.0	–	–	10	–	20	$\mu A$

## Note

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

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## Family 74HCT1G

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

SYMBOL	PARAMETER	TEST CONDITIONS		T <sub>amb</sub> (°C)					UNIT
		OTHER	V <sub>CC</sub> (V)	-40 to +85			-40 to +125		
				MIN.	TYP. <sup>(1)</sup>	MAX.	MIN.	MAX.	
V <sub>IH</sub>	HIGH-level input voltage		4.5 to 5.5	2.0	1.6	–	2.0	–	V
V <sub>IL</sub>	LOW-level input voltage		4.5 to 5.5	–	1.2	0.8	–	0.8	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	4.5	4.4	4.5	–	4.4	–	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = –2.0 mA	4.5	4.13	4.32	–	3.7	–	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 20 µA	4.5	–	0	0.1	–	0.1	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 2.0 mA	4.5	–	0.15	0.33	–	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5	–	–	1.0	–	1.0	µA
I <sub>OZ</sub>	3-state output current OFF-state	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND	5.5	–	–	5	–	10	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0	5.5	–	–	10	–	20	µA
ΔI <sub>CC</sub>	additional supply current per input	V <sub>I</sub> = V <sub>CC</sub> – 2.1 V; I <sub>O</sub> = 0	4.5 to 5.5	–	–	500	–	850	µA

## Note

1. All typical values are measured at T<sub>amb</sub> = 25 °C.

## Bus buffer/line drivers; 3-state

## 74HC1G125; 74HCT1G125

## AC CHARACTERISTICS

## Type 74HC1G125

GND = 0 V;  $t_r = t_f \leq 6.0$  ns;  $C_L = 50$  pF.

SYMBOL	PARAMETER	TEST CONDITIONS		$T_{amb}$ (°C)					UNIT
		WAVEFORMS	$V_{CC}$ (V)	-40 to +85			-40 to +125		
				MIN.	TYP. <sup>(1)</sup>	MAX.	MIN.	MAX.	
$t_{PHL}/t_{PLH}$	propagation delay A to Y	see Figs 5 and 7	2.0	–	24	125	–	150	ns
			4.5	–	10	25	–	30	ns
			6.0	–	8	21	–	26	ns
$t_{PZH}/t_{PZL}$	3-state output enable time $\overline{OE}$ to Y	see Figs 6 and 7	2.0	–	19	155	–	190	ns
			4.5	–	9	31	–	38	ns
			6.0	–	7	26	–	32	ns
$t_{PHZ}/t_{PLZ}$	3-state output disable time $\overline{OE}$ to Y	see Figs 6 and 7	2.0	–	18	155	–	190	ns
			4.5	–	12	31	–	38	ns
			6.0	–	11	26	–	32	ns

## Note

1. All typical values are measured at  $T_{amb} = 25$  °C.

## Type 74HCT1G125

GND = 0 V;  $t_r = t_f \leq 6.0$  ns;  $C_L = 50$  pF.

SYMBOL	PARAMETER	TEST CONDITIONS		$T_{amb}$ (°C)					UNIT
		WAVEFORMS	$V_{CC}$ (V)	-40 to +85			-40 to +125		
				MIN.	TYP. <sup>(1)</sup>	MAX.	MIN.	MAX.	
$t_{PHL}/t_{PLH}$	propagation delay A to Y	see Figs 5 and 7	4.5	–	11	30	–	36	ns
$t_{PZH}/t_{PZL}$	3-state output enable time $\overline{OE}$ to Y	see Figs 6 and 7	4.5	–	10	35	–	42	ns
$t_{PHZ}/t_{PLZ}$	3-state output disable time $\overline{OE}$ to Y	see Figs 6 and 7	4.5	–	11	31	–	38	ns

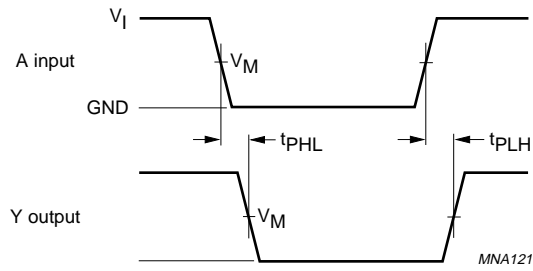
## Note

1. All typical values are measured at  $T_{amb} = 25$  °C.

Bus buffer/line drivers; 3-state

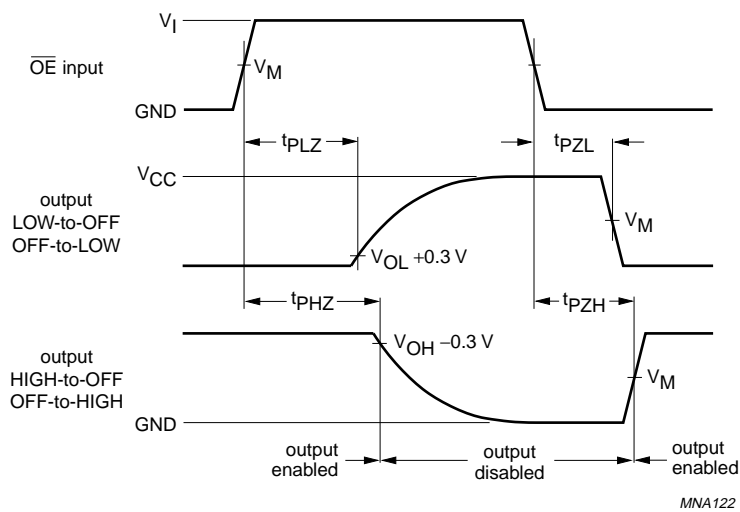
74HC1G125; 74HCT1G125

AC WAVEFORMS



For HC1G:  $V_M = 50\%$ ;  $V_I = \text{GND to } V_{CC}$ .  
 For HCT1G:  $V_M = 1.3 \text{ V}$ ;  $V_I = \text{GND to } 3.0 \text{ V}$ .

Fig.5 The input (A) to output (Y) propagation delays.

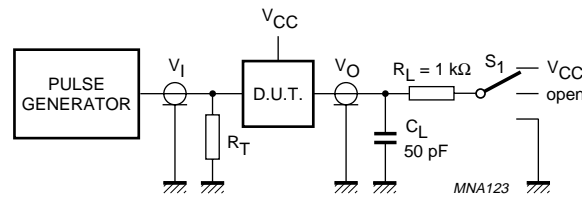


For HC1G:  $V_M = 50\%$ ;  $V_I = \text{GND to } V_{CC}$ .  
 For HCT1G:  $V_M = 1.3 \text{ V}$ ;  $V_I = \text{GND to } 3.0 \text{ V}$ .

Fig.6 The 3-state enable and disable times.

Bus buffer/line drivers; 3-state

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TEST	S <sub>1</sub>
t <sub>PLH</sub> /t <sub>PHL</sub>	open
t <sub>PLZ</sub> /t <sub>PZL</sub>	V <sub>CC</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND

Definitions for test circuit:

C<sub>L</sub> = load capacitance including jig and probe capacitance (see "AC characteristics").

R<sub>T</sub> = termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator.

Fig.7 Load circuitry for switching times.

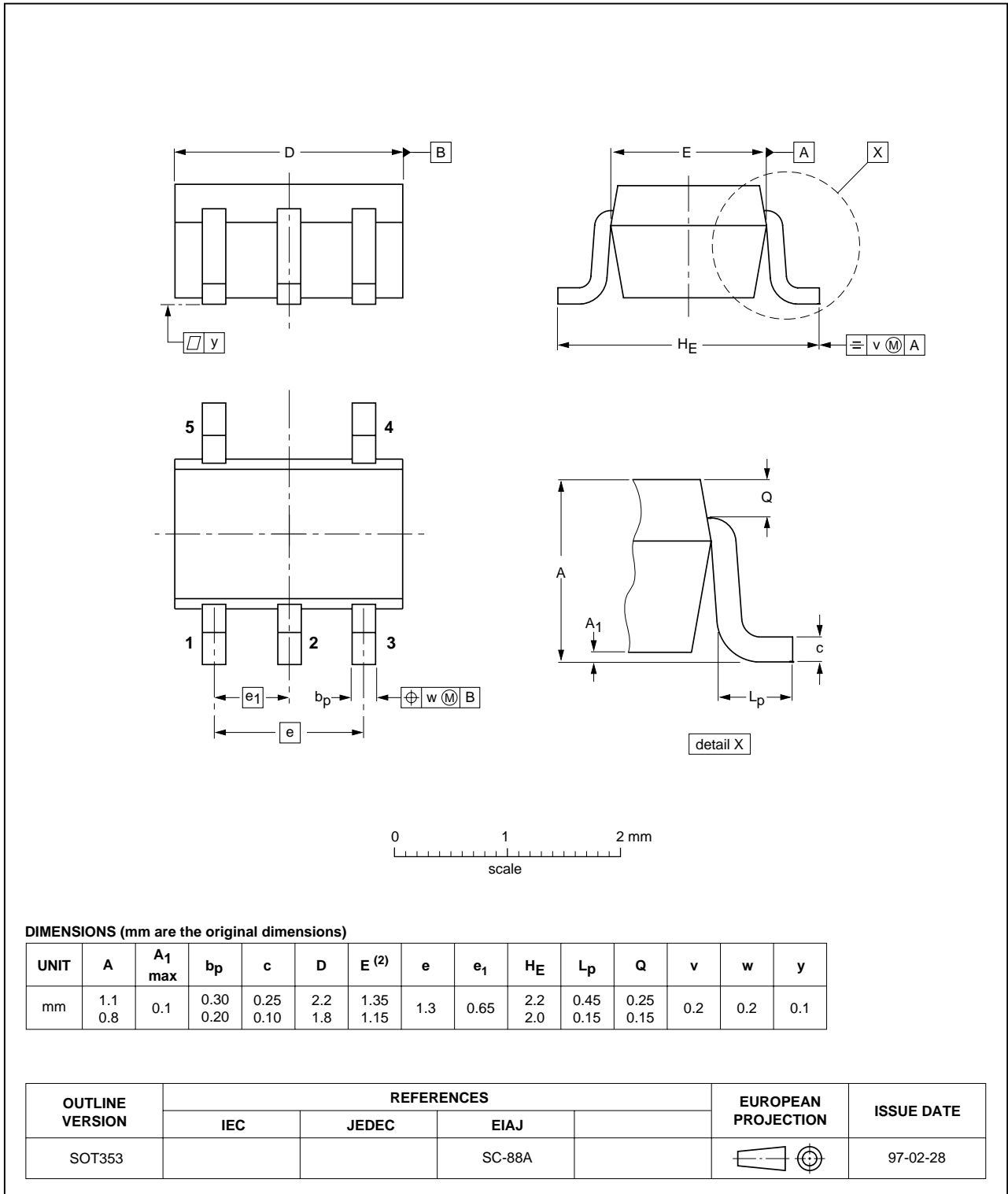
Bus buffer/line drivers; 3-state

74HC1G125; 74HCT1G125

PACKAGE OUTLINES

Plastic surface mounted package; 5 leads

SOT353

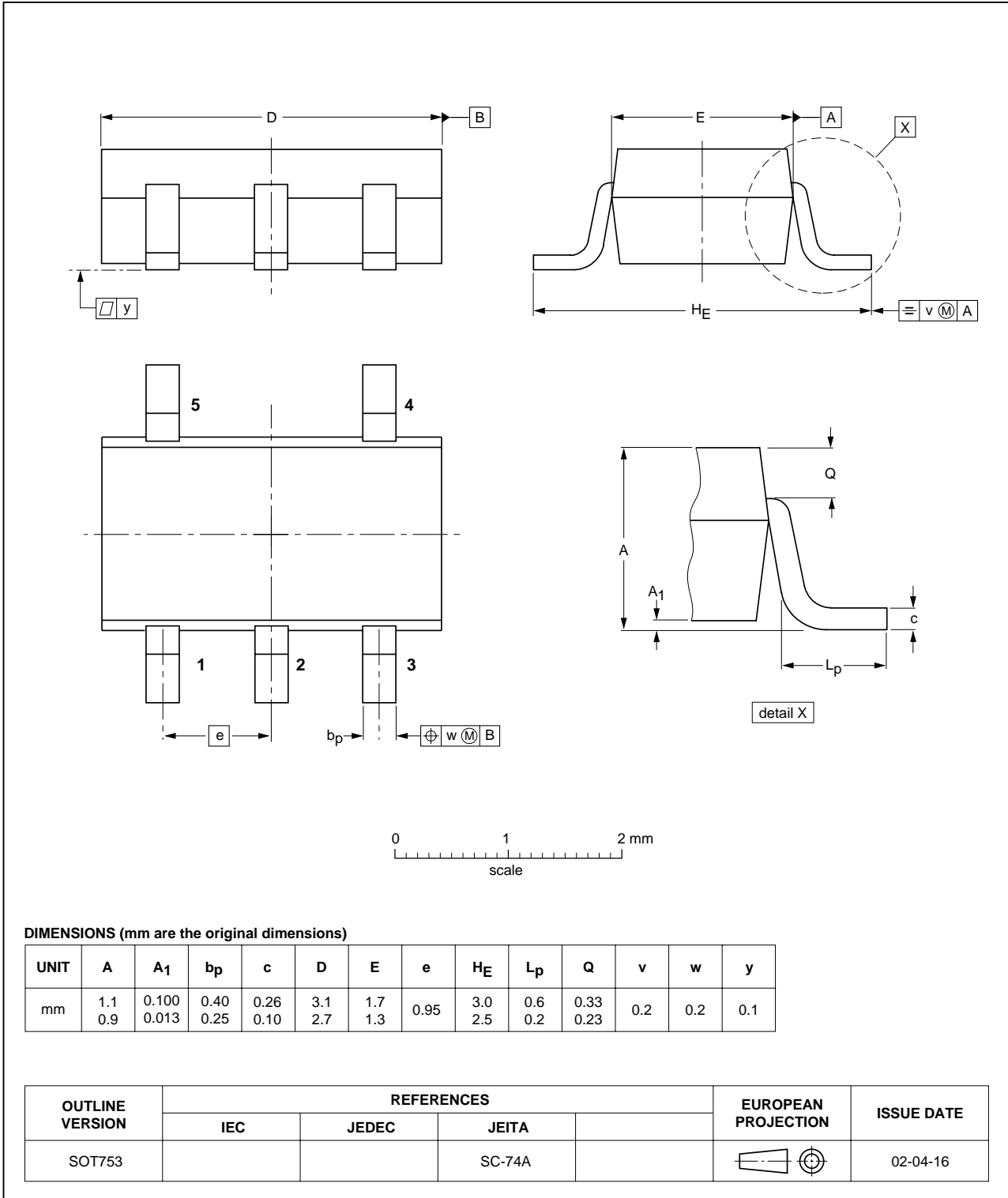


Bus buffer/line drivers; 3-state

74HC1G125; 74HCT1G125

Plastic surface mounted package; 5 leads

SOT753



## Bus buffer/line drivers; 3-state

## 74HC1G125; 74HCT1G125

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