74HC2G125; 74HCT2G125

Dual buffer/line driver; 3-state
Rev. 6 — 1 November 2018

Product data sheet

1. General description

The 74HC2G125; 74HC2G125 are dual buffer/line drivers with 3-state outputs controlled by the output enable inputs ($n\overline{OE}$). 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 2 000 V
 - MM JESD22-A115-A exceeds 200 V
- · 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					
74HC2G125DP	-40 °C to +125 °C TSSOP8		plastic thin shrink small outline package; 8 leads;	SOT505-2					
74HCT2G125DP			body width 3 mm; lead length 0.5 mm						
74HC2G125DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads;	SOT765-1					
74HCT2G125DC			body width 2.3 mm						

4. Marking

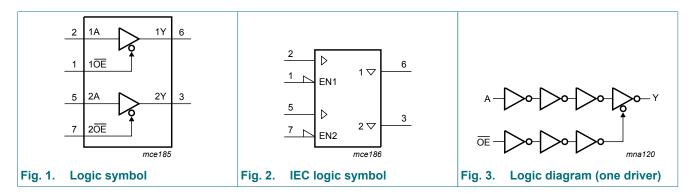
Table 2. Marking codes

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

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

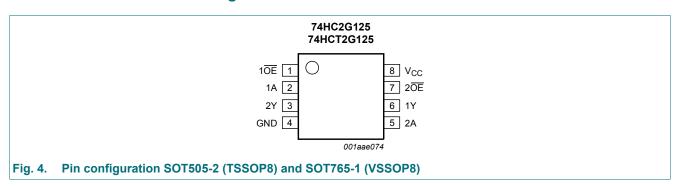


5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1 OE , 2 OE	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

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

Control	Input	Output
nŌĒ	nA	nY
L	L	L
L	Н	Н
Н	X	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	+7.0	V
I _{IK}	input clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
I _{OK}	output clamping current	V_{O} < -0.5 V or V_{O} > V_{CC} + 0.5 V	[1]	-	±20	mA
Io	output current	$V_{O} = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	[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.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74HC2G125			74HCT2G125			Unit
			Min	Тур	Max	Min	Тур	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
VI	input voltage		0	-	V _{CC}	0	-	V _{CC}	V
Vo	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

^[2] For TSSOP8 package: above 55 $^{\circ}$ C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 $^{\circ}$ C the value of P_{tot} derates linearly with 8 mW/K.

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	Тур	Max	Min	Max	
74HC2G1	25							
V _{IH}	HIGH-level input	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	V
	voltage	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	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	V
	voltage	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	V _I = V _{IH} or V _{IL}						
	voltage	I_{O} = -20 μ A; 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 μ A; 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
		$I_{\rm O}$ = -7.8 mA; $V_{\rm CC}$ = 6.0 V	5.34	5.81	-	5.2	-	V
V _{OL}	LOW-level output	V _I = V _{IH} or V _{IL}						
	voltage	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; $V_{CC} = 6.0 \text{ V}$	-	-	±1.0	-	±1.0	μA
l _{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	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	10	-	20	μΑ
Cı	input capacitance		-	1.0	-	-	-	pF
Co	output capacitance		-	1.5	-	-	-	pF
74HCT2G	125							
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	V
V _{OH}		$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$						
	voltage	I _O = -20 μA	4.4	4.5	-	4.4	-	V
		I _O = -6.0 mA	3.84	4.32	-	3.7	-	V
V _{OL}		$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$						
	voltage	Ι _Ο = 20 μΑ	-	0	0.1	-	0.1	V
		I _O = 6.0 mA	-	0.16	0.33	-	0.4	V
l _l	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±1.0	-	±1.0	μA

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Symbol	Parameter	Conditions	T _{amb} =	-40 °C to	+85 °C	T _{amb} = -40 °	C to +125 °C	Unit
			Min	Тур	Max	Min	Max	
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	±5.0	-	±10	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	10	-	20	μΑ
ΔI _{CC}	additional supply current	per input; V _{CC} = 4.5 V to 5.5 V; V _I = V _{CC} - 2.1 V; I _O = 0 A	-	-	375	-	410	μA
Cı	input capacitance		-	1.0	-	-	-	pF
Co	output capacitance		-	1.5	-	-	-	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Fig. 7.

Symbol	Parameter	Conditions	T _{amb} :	= -40 °C to	+85 °C	T _{amb} = -40 °	Unit	
				Typ [1]	Max	Min	Max	
74HC2G	125		•					•
t _{pd}	propagation	nA to nY; see Fig. 5 [2]						
	delay	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
t _{en}	enable time	nOE to nY; see Fig. 6 [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	nOE to nY; see Fig. 6 [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	see <u>Fig. 5</u> [2]						
	time	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	per buffer; $V_I = GND$ to V_{CC} [3]						
	dissipation	output enabled	-	11	-	-	-	pF
	capacitance	output disabled	-	1	-	-	-	pF

Symbol	Parameter	Conditions		T_{amb} = -40 °C to +85 °C			T _{amb} = -40 °	Unit	
				Min	Typ [1]	Max	Min	Max	
74HCT2	G125								
t _{pd}	propagation	nA to nY; see Fig. 5	2]						
	delay	V _{CC} = 4.5 V		-	15	31	-	38	ns
		V _{CC} = 5.0 V; C _L = 15 pF		-	12	-	-	-	ns
t _{en}	enable time	nOE to nY; see Fig. 6;V _{CC} = 4.5 V	2]	-	15	35	-	42	ns
t _{dis}	disable time	nOE to nY; see Fig. 6;V _{CC} = 4.5 V	2]	-	15	31	-	38	ns
t _t	transition time	see <u>Fig. 5</u> ; V _{CC} = 4.5 V	2]	-	6	15	-	18	ns
	power dissipation	per buffer; V _I = GND to V _{CC} - 1.5 V	3]						
	capacitance	output enabled		-	11	-	-	-	pF
		output disabled		-	1	-	-	-	pF

- All typical values are measured at T_{amb} = 25 °C.
- 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 $t_{\text{PHZ}}.$

 t_t is the same as t_{THL} and t_{TLH} . 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;

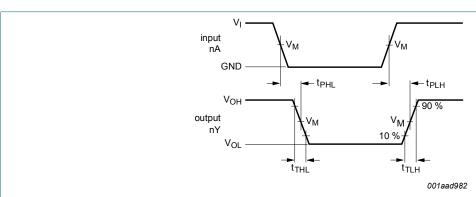
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs.}$

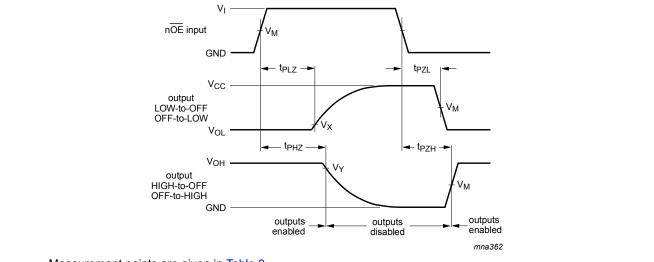
11.1. Waveforms and test circuit



Measurement points are given in Table 9.

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

Propagation delays data input (nA) to output (nY) Fig. 5.



Measurement points are given in Table 9.

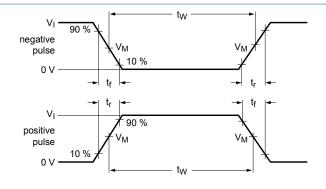
Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

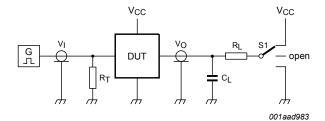
Fig. 6. Enable and disable times

Table 9. Measurement points

Туре	Input	Output					
	V _M	V _M	V _X	V _Y			
74HC2G125	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V			
74HCT2G125	1.3 V	1.3 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V			

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Test data is given in Table 10.

Definitions test circuit:

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator.

 C_L = Load capacitance including jig and probe capacitance.

 R_L = Load resistance.

S1 = Test selection switch.

Fig. 7. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position		
	V _I	t _r , t _f	CL	R _L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
74HC2G125	V _{CC}	≤ 6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}
74HCT2G125	3 V	≤ 6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}

12. Package outline

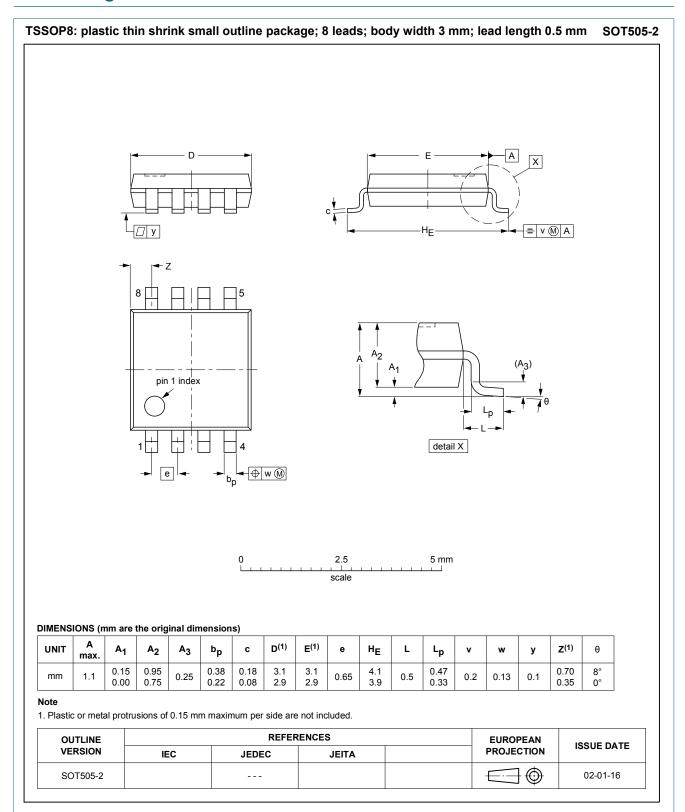


Fig. 8. Package outline SOT505-2 (TSSOP8)

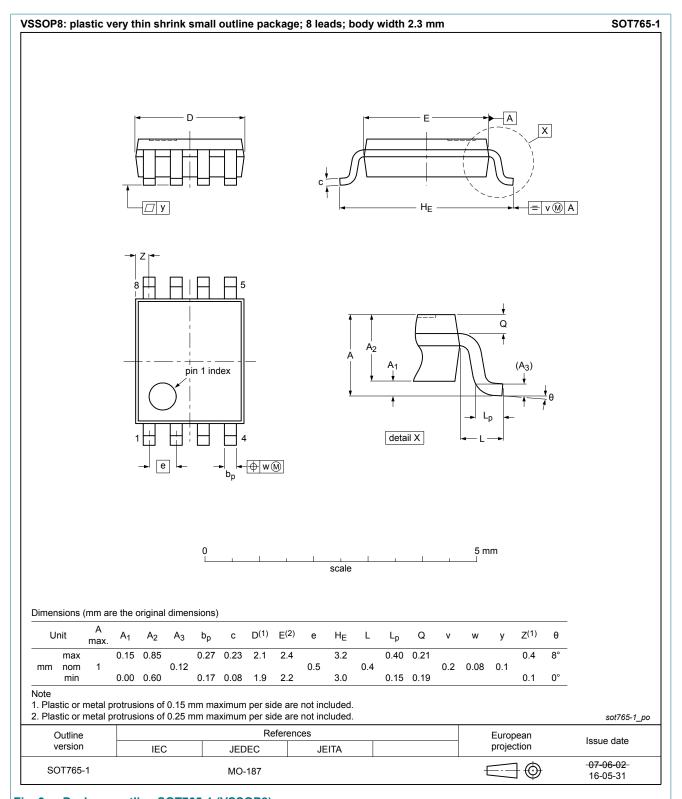


Fig. 9. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 11. Abbreviations

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

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74HC_HCT2G125 v.6	20181101	Product data sheet	-	74HC_HCT2G125 v.5	
Modifications:	 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. Type numbers 74HC2G125GD and 74HCT2G125GD (SOT996-2/XSON8) removed. 				
74HC_HCT2G125 v.5	20140317	Product data sheet	-	74HC_HCT2G125 v.4	
Modifications:	For type numb	ers 74HC2G125GD and 74H	ICT2G125GD 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	-	-	

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.
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