74HC253; 74HCT253

Dual 4-input multiplexer; 3-state

Rev. 8 — 18 October 2021

Product data sheet

1. General description

The 74HC253; 74HCT253 is a dual 4-bit multiplexer, each with four binary inputs (nl0 to nl3), an output enable input ($n\overline{OE}$) and shared select inputs (S0 and S1). One of the four binary inputs is selected by the select inputs and routed to the output nY. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. 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

- Non-inverting data path
- · 3-state outputs interface directly with system bus
- Common select inputs
- · Separate output enable inputs
- Wide supply voltage range from 2.0 V to 6.0 V
- Input levels:
 - For 74HC253: CMOS level
 - For 74HCT253: TTL level
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- · Complies with JEDEC standards
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Applications

- Data selectors
- · Data multiplexers

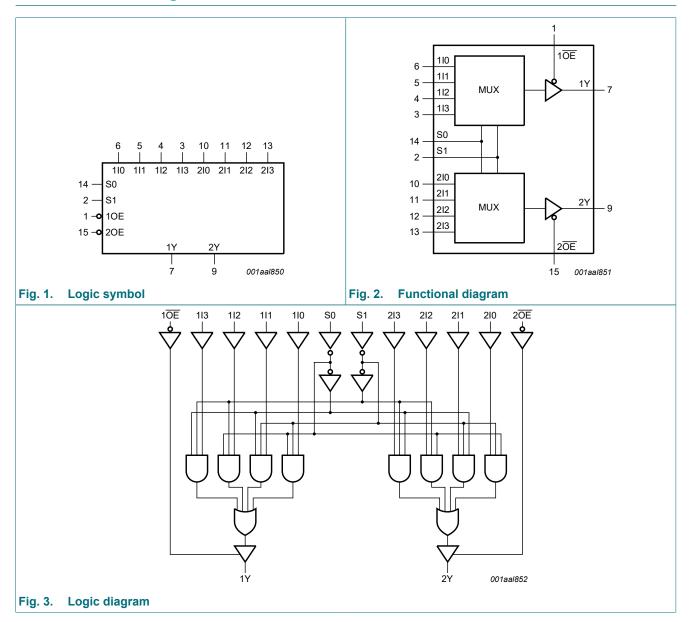
4. Ordering information

Table 1. Ordering information

Type number	Package	Package											
	Temperature range	Name	Description	Version									
74HC253D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads;	SOT109-1									
74HCT253D	-		body width 3.9 mm										
74HC253PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads;	SOT403-1									
74HCT253PW	-		body width 4.4 mm										

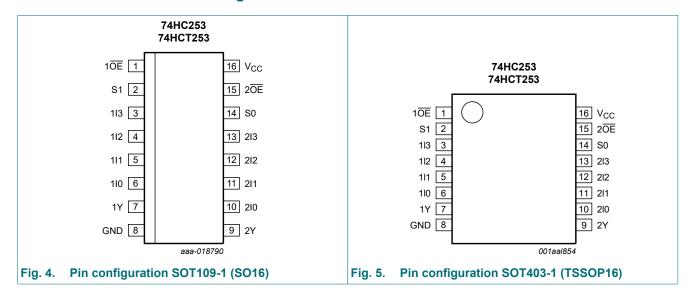


5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1 OE , 2 OE	1, 15	output enable inputs (active LOW)
S0, S1	14, 2	data select inputs
110, 111, 112, 113	6, 5, 4, 3	data inputs source 1
1Y	7	multiplexer output source 1
GND	8	ground (0 V)
2Y	9	multiplexer output source 2
210, 211, 212, 213	10, 11, 12, 13	data inputs source 2
V _{CC}	16	supply voltage

7. Functional description

Table 3. Function table

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

select Inputs		data inputs				output enable	output
S0	S1	nI0	nl1	nl2	nl3	nOE	nY
Χ	Х	Х	Х	X	Х	Н	Z
L	L	L	Х	X	X	L	L
L	L	Н	Х	Χ	Х	L	Н
Н	L	X	L	X	X	L	L
Н	L	Х	Н	Χ	X	L	Н
L	Н	X	X	L	X	L	L
L	Н	Х	Х	Н	Х	L	Н
Н	Н	X	X	Χ	L	L	L
Н	Н	X	X	X	Н	L	Н

8. Limiting values

Table 4. 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	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$ [1]	-	±50	mA
Io	output current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±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	$T_{amb} = -40 ^{\circ}\text{C to } +125 ^{\circ}\text{C}$ [2]	-	500	mW

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

^[2] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C. For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions		74HC253	3	7	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	-	+125	-40	-	+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 6. Static characteristics

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

Symbol Parameter		Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC25	3			l						
V _{IH}	HIGH-level input voltage $V_{CC} = 2.0 \text{ V}$		1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V _{IL}	LOW-level	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
	V _{CC} = 6.0 V		-	2.8	1.8	-	1.8	-	1.8	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = -20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		$I_O = -6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_O = -7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}								
	output voltage	$I_O = 20 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 6.0 V$	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		$I_O = 7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
l _l	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
l _{oz}	OFF-state output current	$V_I = V_{IH} \text{ or } V_{IL};$ $V_O = V_{CC} \text{ or GND};$ $V_{CC} = 6.0 \text{ V}$		-	±0.5	-	±5.0	-	±10.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	-	160	μΑ

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
Cı	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT2	53								1	
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	٧
		I _O = -6 mA	3.98	4.32	-	3.84	-	3.7	-	٧
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
	output voltage	Ι _Ο = 20 μΑ	-	0	0.1	-	0.1	-	0.1	٧
		I _O = 6.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
l _l	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.5	-	±5.0	-	±10	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	8.0	-	80	-	160	μΑ
Δl _{CC}	additional supply current	$V_I = V_{CC} - 2.1 \text{ V};$ other inputs at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V; $I_O = 0 \text{ A}$								
		per input pin; 1In, 2In inputs	-	40	144	-	180	-	196	μΑ
		per input pin; nOE input	-	110	396	-	495	-	539	μΑ
		per input pin; Sn input	-	110	396	-	495	-	539	μΑ
Cı	input capacitance		-	3.5	-	-	-	-	-	pF

11. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); For test circuit see Fig. 8.

Symbol	Parameter	Conditions	25	°C	-40 °C to +85 °C	-40 °C to +125 °C	Unit
			Тур	Max	Max	Max	1
74HC25	3						
t _{pd}	propagation	1In to 1Y or 2In to 2Y; see Fig. 6 [1]					
	delay	V _{CC} = 2.0 V	55	175	220	265	ns
		V _{CC} = 4.5 V	20	35	44	53	ns
		V _{CC} = 5.0 V; C _L = 15 pF	17	-	-	-	ns
		V _{CC} = 6.0 V	16	30	37	45	ns
		Sn to nY; see Fig. 6					
		V _{CC} = 2.0 V	58	175	220	265	ns
		V _{CC} = 4.5 V	21	35	44	53	ns
		V _{CC} = 5.0 V; C _L = 15 pF	18	-	-	-	ns
		V _{CC} = 6.0 V	17	30	37	45	ns
t _{en}	enable time	nOE to nY; see Fig. 7 [2]					
		V _{CC} = 2.0 V	30	100	125	150	ns
		V _{CC} = 4.5 V	11	20	25	30	ns
		V _{CC} = 6.0 V	9	17	21	26	ns
t _{dis}	disable time	nOE to nY; see Fig. 7 [3]					
		V _{CC} = 2.0 V	41	150	190	225	ns
		V _{CC} = 4.5 V	15	30	38	45	ns
		V _{CC} = 6.0 V	12	26	33	38	ns
t _t	transition	see <u>Fig. 6</u> [4]					
	time	V _{CC} = 2.0 V	14	60	75	90	ns
		V _{CC} = 4.5 V	5	12	15	18	ns
		V _{CC} = 6.0 V	4	10	13	15	ns
C _{PD}	power dissipation capacitance	per multiplexer; [5] $V_I = GND$ to V_{CC}	55	-	-	-	pF

Symbol	Parameter	Conditions	25	°C	-40 °C to +85 °C	-40 °C to +125 °C	Unit
			Тур	Max	Max	Max	
74HCT2	53						
t _{pd}	propagation	1In to 1Y or 2In to 2Y; see Fig. 6 [1]					
	delay	V _{CC} = 4.5 V	20	38	48	57	ns
		V _{CC} = 5.0 V; C _L = 15 pF	17	-	-	-	ns
		Sn to nY; see Fig. 6					
		V _{CC} = 4.5 V	22	40	50	60	ns
		V _{CC} = 5.0 V; C _L = 15 pF	19	-	-	-	ns
t _{en}	enable time	\overline{OE} to nY; V _{CC} = 4.5 V; [2] see Fig. 7	14	30	38	45	ns
t _{dis}	disable time	\overline{OE} to nY; V _{CC} = 4.5 V; [3] see Fig. 7	13	30	38	45	ns
t _t	transition time	V _{CC} = 4.5 V; see <u>Fig. 6</u>	5	12	15	18	ns
C _{PD}	power dissipation capacitance	per multiplexer; [5] $V_I = GND \text{ to } V_{CC} - 1.5 \text{ V}$	55	-	-	-	pF

- [1] t_{pd} is the same as t_{PHL} , t_{PLH} .
- [2] t_{en} is the same as t_{PZH}, t_{PZL}.
- [3] t_{dis} is the same as t_{PHZ} , t_{PLZ} .
- t_{dis} is the same as t_{THL}, t_{TLL}.
 t_t is the same as t_{THL}, t_{TLL}.
 C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 P_D = C_{PD} × V_{CC}² × f_i × N + ∑(C_L × V_{CC}² × f_o) where:

 f_i = input frequency in MHz;

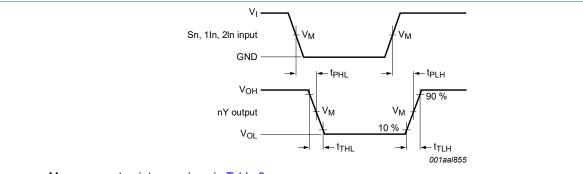
f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching; $\sum (C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs}.$

11.1. Waveforms and test circuit



Measurement points are given in Table 8.

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

Fig. 6. Propagation delays input (Sn, 1ln, 2ln) to output (nY) and output (nY) transition times

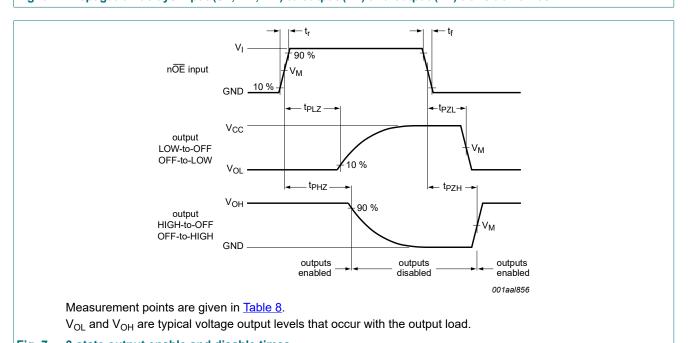
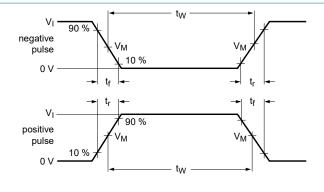
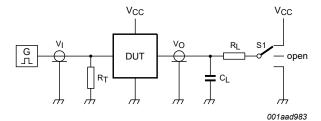


Fig. 7. 3-state output enable and disable times

Table 8. Measurement points

Туре	Input	Output
	V _M	V _M
74HC253	0.5V _{CC}	0.5V _{CC}
74HCT253	1.3 V	1.3 V





Measurement points are given in <u>Table 8</u> and test data is given in <u>Table 9</u>.

Definitions test circuit:

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

 C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistor.

Fig. 8. Test circuit for measuring switching times

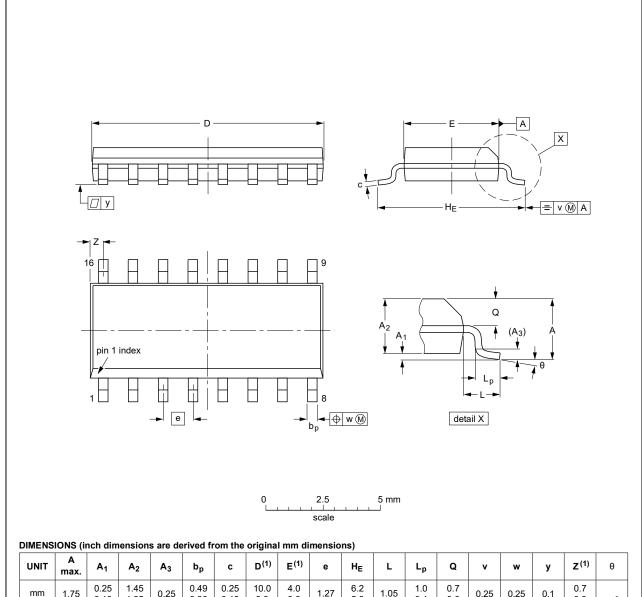
Table 9. Test data

Туре	Input		Load		Switch position				
	VI	$t_{\rm r}, t_{\rm f}$		R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}		
74HC253	V _{CC}	6 ns	50 pF	1 kΩ	open	GND	V _{CC}		
74HCT253	3 V	6 ns	50 pF 1 kΩ		open	GND	V _{CC}		

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



UNI	T A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	٧	w	у	Z ⁽¹⁾	θ
mn	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8°
inch	es 0.069	0.010 0.004	0.057 0.049	0.01	l	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	0°

Note

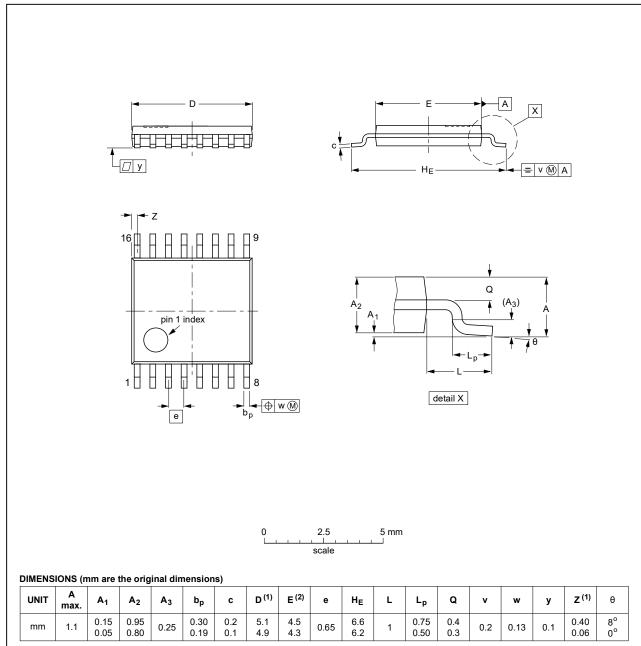
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN	ISSUE DATE	
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig. 9. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN	ISSUE DATE	
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT403-1		MO-153				99-12-27 03-02-18

Fig. 10. Package outline SOT403-1 (TSSOP16)

13. Abbreviations

Table 10. 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 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74HC_HCT253 v.8	20211018	Product data sheet	-	74HC_HCT253 v.7	
Modifications:	Type number 74HCT253PW (SOT403-1/TSSOP16) added.				
74HC_HCT253 v.7	20210816 Product data sheet - 74HC_HCT253 v.6				
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 74HC253DB and 74HCT253DB (SOT338-1/SSOP16) removed. Type number 74HC253PW (SOT403-1/TSSOP16) added. Section 2 updated. Section 8: Derating values for Ptot total power dissipation updated. 				
74HC_HCT253 v.6	20160201 Product data sheet - 74HC_HCT253 v.5				
Modifications:	Type numbers 74HC253N and 74HCT253N (SOT38-4) removed.				
74HC_HCT253 v.5	20150121	Product data sheet	-	74HC_HCT253 v.4	
Modifications:	<u>Table 7</u> : Power dissipation capacitance condition for 74HCT253 is corrected.				
74HC_HCT253 v.4	20111212	Product data sheet	-	74HC_HCT253 v.3	
Modifications:	Legal pages updated.				
74HC_HCT253 v.3	20100422	Product data sheet	-	74HC_HCT253_CNV v.2	
74HC_HCT253_CNV v.2	970828	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.
Product [short] data sheet	Production	This document contains the product specification.

- Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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