74HC157; 74HCT157

Quad 2-input multiplexer Rev. 8 — 28 December 2015

Product data sheet

General description 1.

The 74HC157; 74HCT157 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL. It is specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT157 are quad 2-input multiplexers which select 4 bits of data from two sources under the control of a common data select input (S). The enable input (E) is active LOW. When E is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all other input conditions.

Moving the data from two groups of registers to four common output buses is a common use of the 74HC/HCT157. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator. The device is useful for implementing highly irregular logic by generating any four of the 16 different functions of two variables with one variable common. The 74HC/HCT157 is logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to S.

The logic equations are:

$$1Y = \overline{E} \times (111 \times S + 110 \times \overline{S})$$

$$2Y = \overline{E} \times (211 \times S + 210 \times \overline{S})$$

$$3Y = \overline{E} \times (311 \times S + 310 \times \overline{S})$$

$$4Y = \overline{E} \times (411 \times S + 410 \times \overline{S})$$

The 74HC/HCT157 is identical to the 74HC158 but has non-inverting (true) outputs.

Features and benefits 2.

- Low-power dissipation
- Complies with JEDEC standard no. 7A
- Input levels:
 - ◆ For 74HC157: CMOS level
 - For 74HCT157: TTL level
- Non-inverting data path
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2 000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

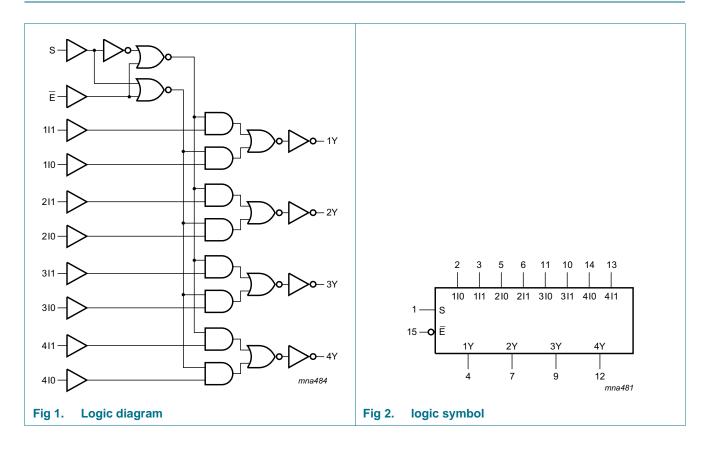


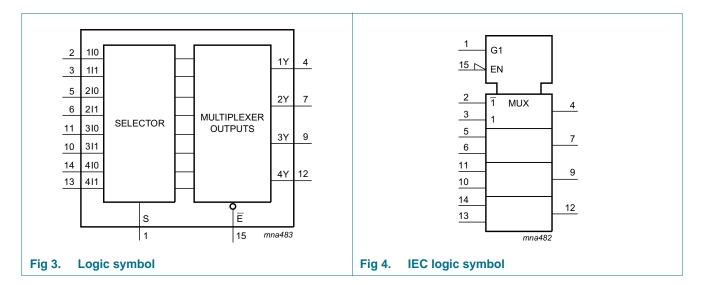
3. Ordering information

Table 1. Ordering information

Type number	Package									
	Temperature range	Name	Description	Version						
74HC157D	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width	SOT109-1						
74HCT157D			3.9 mm							
74HC157DB	−40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads;	SOT338-1						
74HCT157DB			body width 5.3 mm							
74HC157PW	–40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads;	SOT403-1						
74HCT157PW			body width 4.4 mm							
74HC157BQ	–40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very	SOT763-1						
74HCT157BQ			thin quad flat package; no leads; 16 terminals; body $2.5 \times 3.5 \times 0.85$ mm							

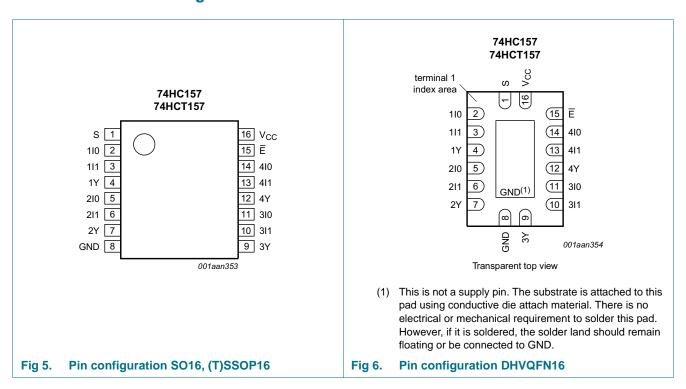
4. Functional diagram





5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	common data select input
1I0 to 4I0	2, 5, 11, 14	data inputs from source 0
1I1 to 4I1	3, 6, 10, 13	data inputs from source 1
1Y to 4Y	4, 7, 9, 12	multiplexer outputs
GND	8	ground (0 V)
Ē	15	enable input (active LOW)
V _{CC}	16	supply voltage

6. Functional description

Table 3. Function table[1]

Input				Output
E	S	nI0	nl1	nY
Н	X	X	X	L
L	L	L	X	L
L	L	Н	X	Н
L	Н	X	L	L
L	Н	X	Н	Н

^[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

7. 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	V
I _{IK}	input clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I _{OK}	output clamping current	$V_{O} < -0.5 \text{ V or } V_{O} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
Io	output current	$V_O = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	-	±25	mA
I _{CC}	supply current		-	+50	mA
I _{GND}	ground current		-50	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$			
		SO16 package	-	500	mW
		(T)SSOP16 package [2]	-	500	mW
		DHVQFN16 package	-	500	mW

^[1] P_{tot} derates linearly with 8 mW/K above 70 °C.

74HC_HCT157

^[2] P_{tot} derates linearly with 5.5 mW/K above 60 °C.

^[3] P_{tot} derates linearly with 4.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC157		74HCT157			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

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	T _{amb} = 25 °C			T _{amb} = -40 °C to +85 °C		T _{amb} = -40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC15	7									
V_{IH}	HIGH-level	V _{CC} = 2.0 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 output voltage	$V_I = V_{IH}$ or V_{IL}									
	output voltage	$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_{O} = -20 \mu A$; $V_{CC} = 4.5 V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -20 \mu A$; $V_{CC} = 6.0 \text{ V}$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_{O} = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	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
		$I_O = 20 \mu A; V_{CC} = 6.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O} = 4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.26	-	0.33	-	0.4	V
		$I_{O} = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	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
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	-	160	μА

 Table 6.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions	Tar	_{nb} = 25	°C		–40 °C 35 °C		-40 °C to 5 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
Cı	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT1	57		1	1	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 $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ input voltage		-	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	-	V
		$I_O = -4 \text{ mA}$	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}$	-	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	μА
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	8.0	-	80	-	160	μА
Δl _{CC}	additional supply current	$V_1 = V_{CC} - 2.1 \text{ V};$ other inputs at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V; $I_0 = 0 \text{ A}$								
		per input pin; nl0, nl1 inputs	-	100	360	-	450	-	490	μΑ
		per input pin; E input	-	60	216	-	270	-	294	μΑ
		per input pin; S input	-	100	360	-	450	-	490	μΑ
Cı	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50 \text{ pF}$ unless otherwise specified; for test circuit see Figure 9.

Symbol	Parameter	Conditions	Ta	_{mb} = 25	°C		= –40 °C -85 °C		= –40 °C 125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC15	7									_
t _{pd}	propagation	nl0, nl1 to nY; see Figure 7	1							
	delay	V _{CC} = 2.0 V	-	36	125	-	155	-	190	ns
		V _{CC} = 4.5 V	-	13	25	-	31	-	38	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	11	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	10	21	-	26	-	32	ns
		S to nY; see Figure 7	1							
		V _{CC} = 2.0 V	-	41	125	-	155	-	190	ns
		V _{CC} = 4.5 V	-	15	25	-	31	-	38	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	12	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	12	21	-	26	-	32	ns
		E to nY; see Figure 8	1							
		V _{CC} = 2.0 V	-	39	115	-	145	-	175	ns
		V _{CC} = 4.5 V	-	14	23	-	29	-	35	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	11	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	11	20	-	25	-	30	ns
t _t	transition	nY; see Figure 7	1							
	time	V _{CC} = 2.0 V	-	19	75	-	95	-	110	ns
		V _{CC} = 4.5 V	-	7	15	-	19	-	22	ns
		V _{CC} = 6.0 V	-	6	13	-	16	-	19	ns
C _{PD}	power dissipation capacitance	$C_L = 50 \text{ pF}; f = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	1 -	70	-	-	-	-	-	pF
74HCT1	57			1			1			_
t _{pd}	propagation	nl0, nl1 to nY; see Figure 7	1							
	delay	V _{CC} = 4.5 V	-	16	27	-	34	-	41	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	13	-	-	-	-	-	ns
		S to nY; see Figure 7	1							
		V _{CC} = 4.5 V	-	22	37	-	46	-	56	ns
		V _{CC} = 5 V; C _L = 15 pF	-	19	-	-	-	-	-	ns
		E to nY; see Figure 8	1							
		V _{CC} = 4.5 V	-	15	26	-	33	-	39	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	12	-	-	-	-	-	ns

 Table 7.
 Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); $C_L = 50 \text{ pF}$ unless otherwise specified; for test circuit see Figure 9.

Symbol	Parameter	Conditions		T _{amb} = 25 °C		T _{amb} = -40 °C to +85 °C		T _{amb} = -40 °C to +125 °C		Unit	
			М	in	Тур	Max	Min	Max	Min	Max	
t _t	transition	nY; see Figure 7	<u>!]</u>								
	time	V _{CC} = 4.5 V		-	7	15	-	19	-	22	ns
C _{PD}	power dissipation capacitance	C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC} – 1.5 V	-	-	70	-	-	-	-	-	pF

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] 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).

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

 f_i = input frequency in MHz;

f_o = output frequency in MHz;

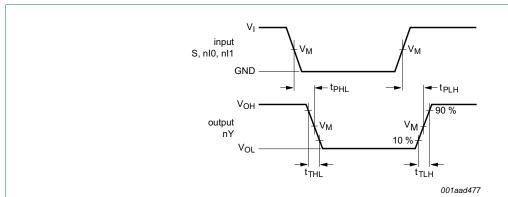
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11. Waveforms



Measurement points are given in <u>Table 8</u>.

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

Fig 7. Propagation delay input (nl0, nl1, S) to output (nYn)

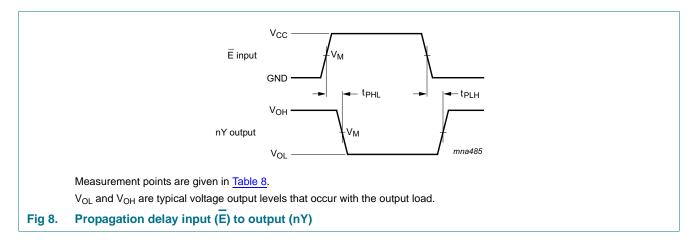
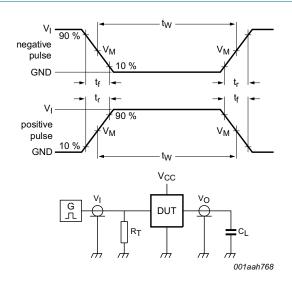


Table 8. Measurement points

Туре	Input	Output
	V _M	V _M
74HC157	0.5V _{CC}	0.5V _{CC}
74HCT157	1.3 V	1.3 V



Test data is given in Table 9.

Definitions test circuit:

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

 $\ensuremath{C_L}$ = Load capacitance including jig and probe capacitance.

 R_L = Load resistance.

S1 = Test selection switch.

Fig 9. Test circuit for measuring switching times

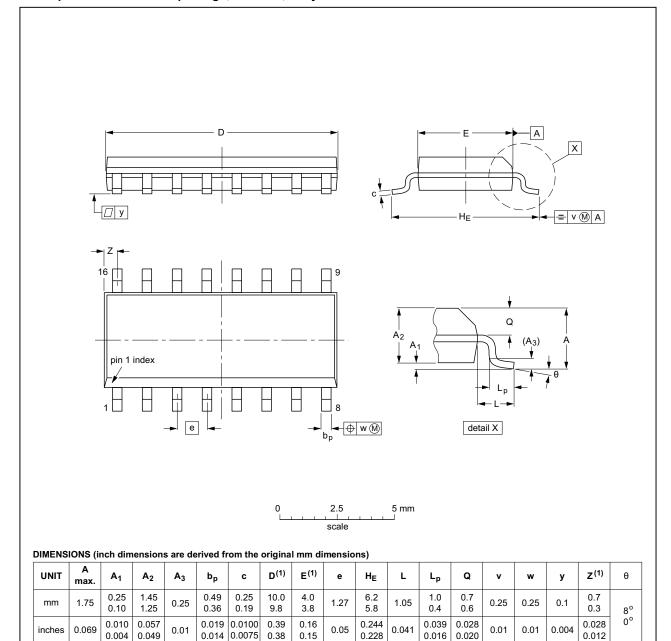
Table 9. Test data

Туре	Input I		Load	Test
	VI	t _r , t _f	CL	
74HC157	V _{CC}	6.0 ns	15 pF, 50 pF	t _{PLH} , t _{PHL}
74HCT157	3.0 V	6.0 ns	15 pF, 50 pF	t _{PLH} , t _{PHL}

12. Package outline

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

SOT109-1



Note

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

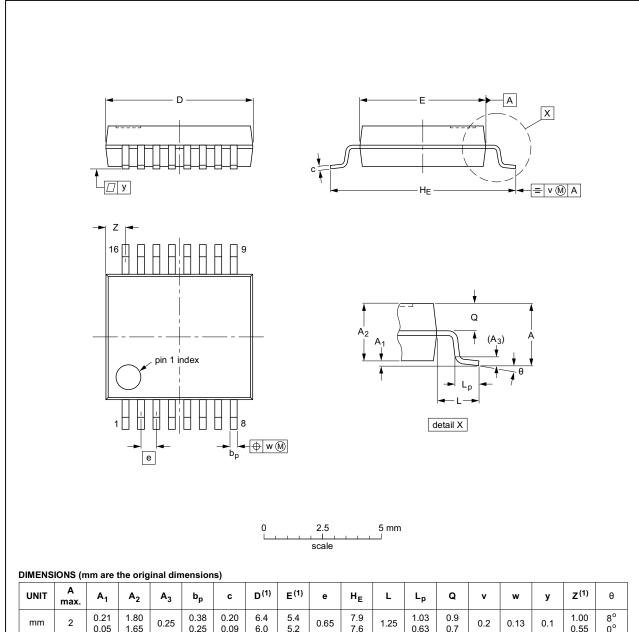
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SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig 10. Package outline SOT109-1 (SO16)

74HC_HCT157

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1



UNIT	A max.	A ₁	A ₂	A ₃	b _p	C	D ⁽¹⁾	E ⁽¹⁾	e	HE	L	Lp	Q	٧	w	у	Z ⁽¹⁾	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

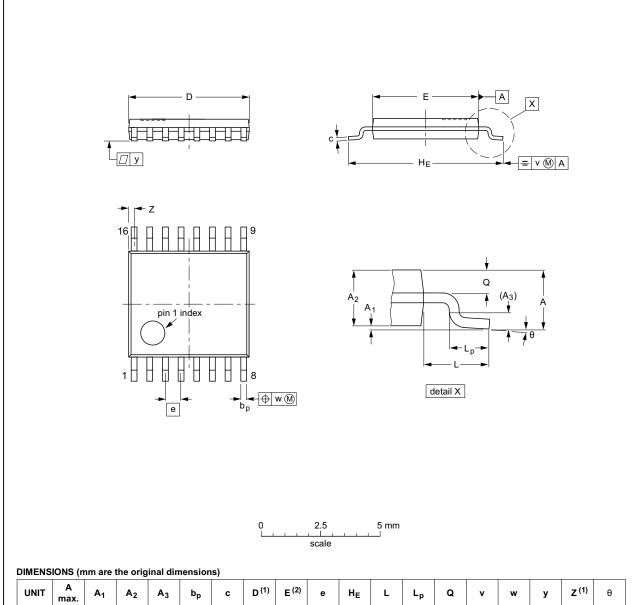
OUTLINE		REFER	ENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT338-1		MO-150			99-12-27 03-02-19

Fig 11. Package outline SOT338-1 (SSOP16)

74HC_HCT157

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

SOT403-1



	Α `						D (1)	E (2)									- (1)	_
UNIT	max.	A ₁	A ₂	А3	р	С	ייע	E (-)	е	HE	L	Lp	Q	٧	w	У	2(')	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

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.

PROJECTION	ISSUE DATE
	99-12-27 03-02-18

Fig 12. Package outline SOT403-1 (TSSOP16)

74HC_HCT157

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm SOT763-1

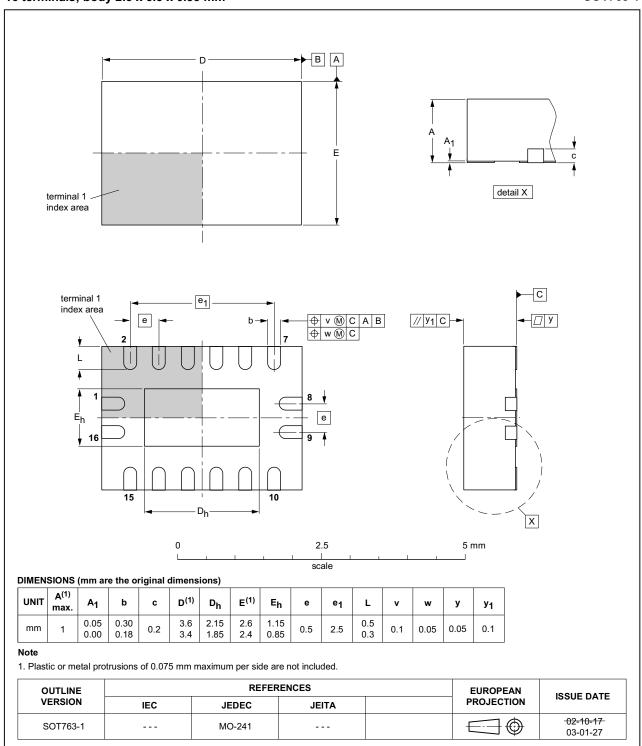


Fig 13. Package outline SOT763-1 (DHVQFN16)

74HC_HCT157

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_HCT157 v.8	20151228	Product data sheet	-	74HC_HCT157 v.7
Modifications:	Type numb	ers 74HC157N and 74HCT	157N (SOT38-4) rem	oved.
74HC_HCT157 v.7	20150121	Product data sheet	-	74HC_HCT157 v.6
Modifications:	• <u>Table 7</u> : Po	wer dissipation capacitance	e condition for 74HCT	157 is corrected.
74HC_HCT157 v.6	20120827	Product data sheet	-	74HC_HCT157 v.5
Modifications:	Package out	utline drawing DIP16 added	d.	
74HC_HCT157 v.5	20120425	Product data sheet	-	74HC_HCT157 v.4
Modifications:	• Figure 7 up	dated with transition times.		
74HC_HCT157 v.4	20111219	Product data sheet	-	74HC_HCT157 v.3
74HC_HCT157 v.3	20101231	Product data sheet	-	74HC_HCT157_CNV v.2
74HC_HCT157_CNV v.2	19970827	Product specification	-	-

15. Legal information

15.1 Data sheet status

Product status[3] 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.nexperia.com.

15.2 Definitions

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16. Contact information

For more information, please visit: http://www.nexperia.com

For sales office addresses, please send an email to: salesaddresses@nexperia.com

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