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:

 $1Y = \overline{E} \times (1I1 \times S + 1I0 \times \overline{S})$ $2Y = \overline{E} \times (2I1 \times S + 2I0 \times \overline{S})$ $3Y = \overline{E} \times (3I1 \times S + 3I0 \times \overline{S})$ $4Y = \overline{E} \times (4I1 \times S + 4I0 \times \overline{S})$

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 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

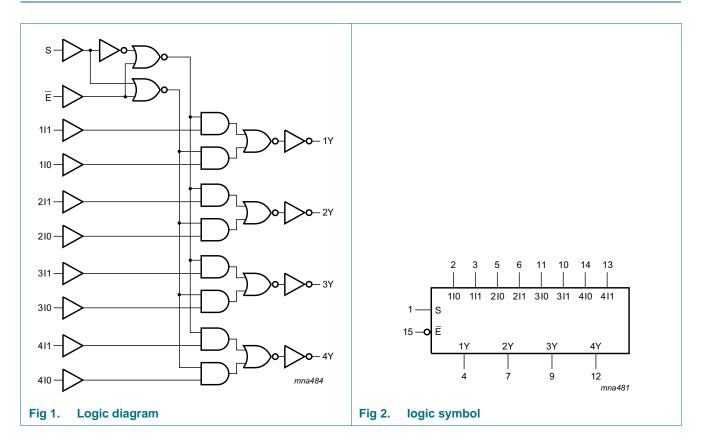
nexperia

3. Ordering information

Table 1. Ordering information

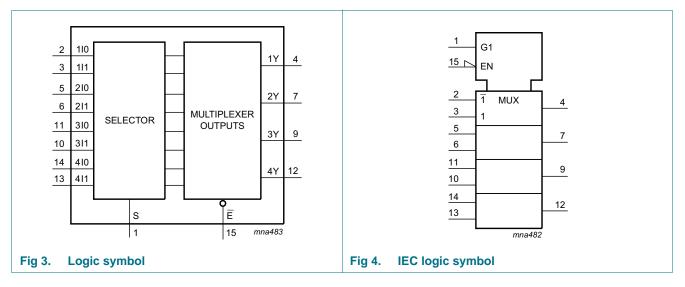
Type number	Package									
	Temperature range	Name	Description	Version						
74HC157D	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width	SOT109-1						
74HCT157D			3.9 mm							
74HC157DB	–40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads;	SOT338-1						
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

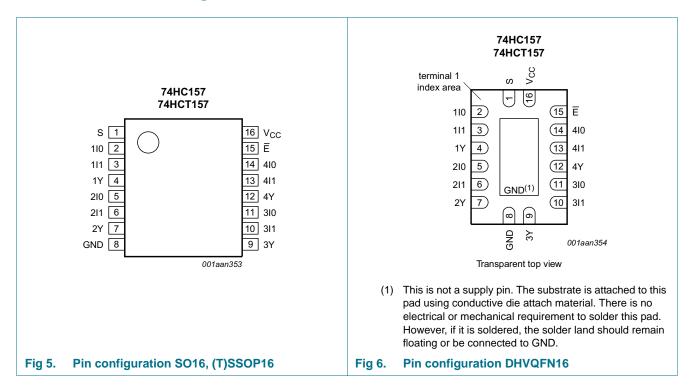


74HC157; 74HCT157

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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			
Ē	S	nl0	nl1	nY
Н	Х	Х	Х	L
L	L	L	Х	L
L	L	Н	Х	Н
L	Н	Х	L	L
L	Н	Х	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	$V_{I} < -0.5$ V or $V_{I} > V_{CC}$ + 0.5 V		-	±20	mA
I _{OK}	output clamping current	V_{O} < -0.5 V or V_{O} > V_{CC} + 0.5 V		-	±20	mA
I _O	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	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$				
		SO16 package	<u>[1]</u>	-	500	mW
		(T)SSOP16 package	[2]	-	500	mW
		DHVQFN16 package	<u>[3]</u>	-	500	mW

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

[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		
			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		_{nb} = 25	°C	T _{amb} = -40 °C to +85 °C		T _{amb} = -40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74HC157	7	1								
VIH	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
· 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	$V_{I} = V_{IH} \text{ or } V_{IL}$								
		$I_{O} = -20 \ \mu A; V_{CC} = 2.0 \ V$	1.9	2.0	-	1.9	-	1.9	-	V
		I_{O} = -20 μ A; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -20 \ \mu A; \ V_{CC} = 6.0 \ V$	5.9	6.0	-	5.9	-	5.9	-	V
		I_{O} = -4.0 mA; V_{CC} = 4.5 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	$V_{I} = V_{IH} \text{ or } V_{IL}$								
	output voltage	$I_0 = 20 \ \mu A; \ V_{CC} = 2.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 20 \ \mu A; \ V_{CC} = 4.5 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 20 \ \mu A; \ V_{CC} = 6.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		I_{O} = 4.0 mA; V_{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		$I_0 = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
I	input leakage current	$V_{I} = V_{CC}$ or GND; $V_{CC} = 6.0 V$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0$ V	-	-	8.0	-	80	-	160	μΑ

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Table 6.	Static characteristics	continued
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At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T _{ar}	_{nb} = 25	°C		–40 °C 35 °C	T _{amb} = −40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
CI	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT1	57									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	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	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 output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
		I _O = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
I	input leakage current	$V_{I} = V_{CC}$ or GND; $V_{CC} = 5.5 V$	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{CC}	supply current		-	-	8.0	-	80	-	160	μA
Δl _{CC}	additional supply current	$\label{eq:VI} \begin{array}{l} V_{I} = V_{CC} - 2.1 \; V;\\ \text{other inputs at } V_{CC} \; \text{or GND};\\ V_{CC} = 4.5 \; V \; \text{to 5.5 } V; \; I_{O} = 0 \; A \end{array}$								
		per input pin; nI0, nI1 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
CI	input capacitance		-	3.5	-	-	-	-	-	pF

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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 <u>Figure 9</u>.

Symbol	Parameter	Conditions	T,	T _{amb} = 25 °C			T _{amb} = −40 °C to +85 °C		T _{amb} = -40 °C to +125 °C	
				Тур	Max	Min	Max	Min	Max	
74HC157	7					1				
t _{pd}	propagation	nI0, nI1 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 V; C _L = 15 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 V; C _L = 15 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 V; C _L = 15 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	$C_L = 50 \text{ pF}; f = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	<u>1</u> -	70	-	-	-	-	-	pF
74HCT1	57									
t _{pd}	propagation	nI0, nI1 to nY; see Figure 7	1							
	delay	V _{CC} = 4.5 V	-	16	27	-	34	-	41	ns
		V _{CC} = 5 V; C _L = 15 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 V; C _L = 15 pF	-	12	-	-	-	-	-	ns

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Voltages	are referenced	I to GND (ground = 0 V); $C_L = 50 \mu$	oF unle	ss other	wise s	pecified;	for test circ	cuit see <mark>F</mark>	igure 9.	
Symbol	mbol Parameter Conditions		Parameter Conditions T _{amb} = 25 °C		°C		= –40 °C 85 °C	T _{amb} = −40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Мах	Min	Max	
t _t tra	transition	nY; see Figure 7 [2]								
	time	$V_{CC} = 4.5 V$	-	7	15	-	19	-	22	ns
C _{PD}	power dissipation capacitance	$C_L = 50 \text{ pF}; \text{ f} = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC} - 1.5 \text{ V}$	-	70	-	-	-	-	-	pF

Dynamic characteristics ... continued Table 7.

[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).

 $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \sum (C_{L} \times V_{CC}^{2} \times f_{o}) \text{ where:}$

 f_i = input frequency in MHz;

 $f_o = output frequency in MHz;$

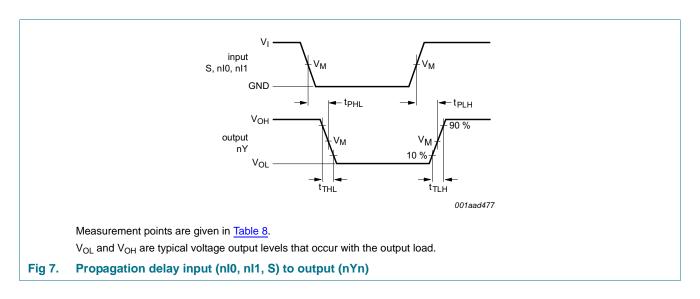
 C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11. Waveforms



74HC157; 74HCT157

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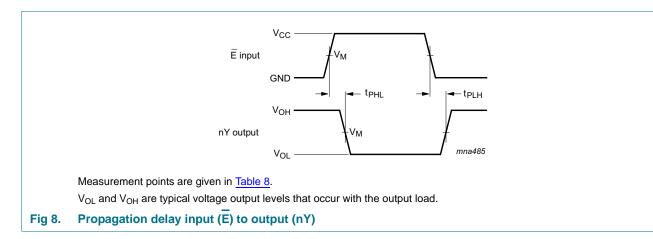


Table 8. Measurement points

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

74HC157; 74HCT157

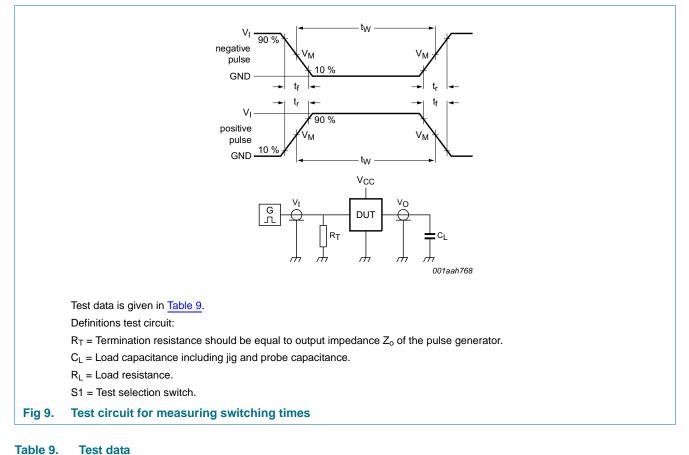
Test

15 pF, 50 pF

t_{PLH}, t_{PHL}

t_{PLH}, t_{PHL}

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Input Load Туре VI CL t_r, t_f 74HC157 6.0 ns 15 pF, 50 pF

6.0 ns

 V_{CC}

3.0 V

74HCT157

Quad 2-input multiplexer

12. Package outline

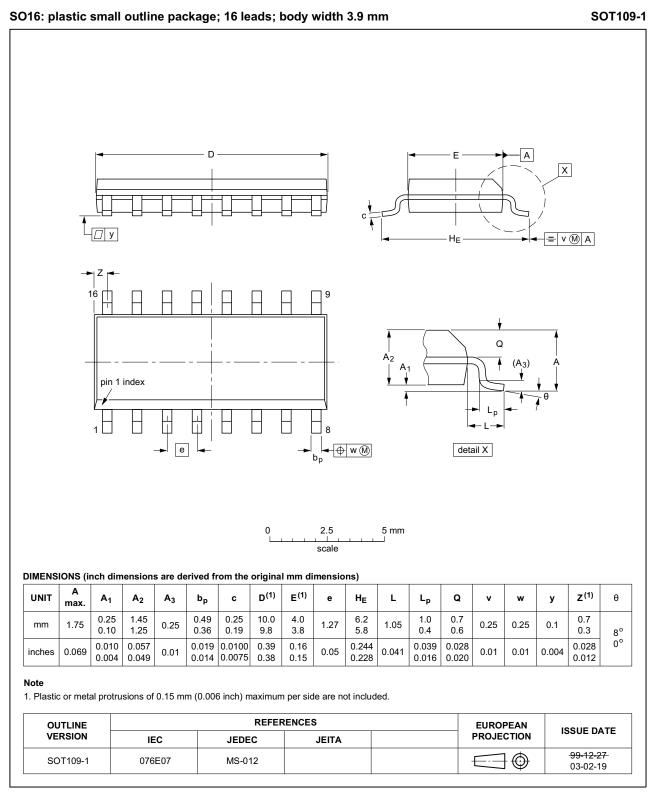


Fig 10. Package outline SOT109-1 (SO16)

Quad 2-input multiplexer

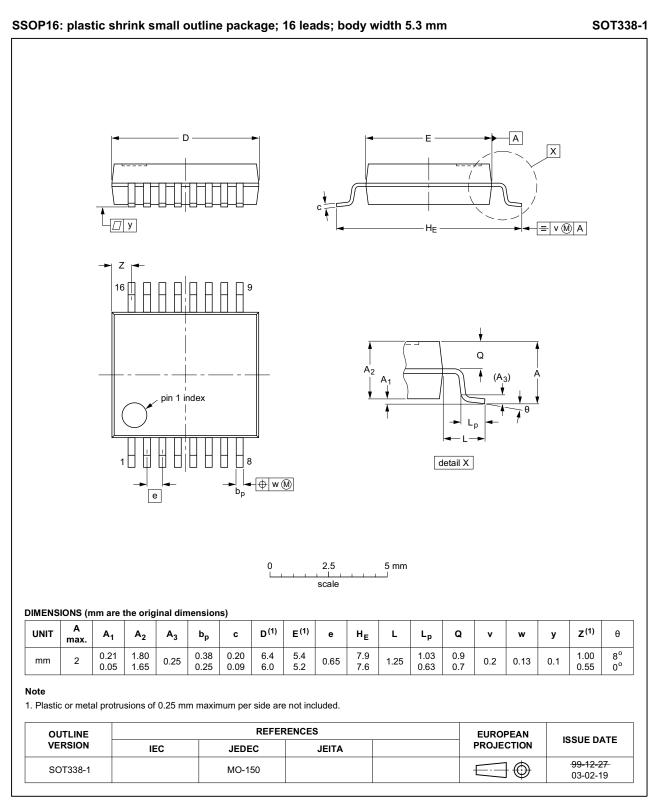


Fig 11. Package outline SOT338-1 (SSOP16)

Quad 2-input multiplexer

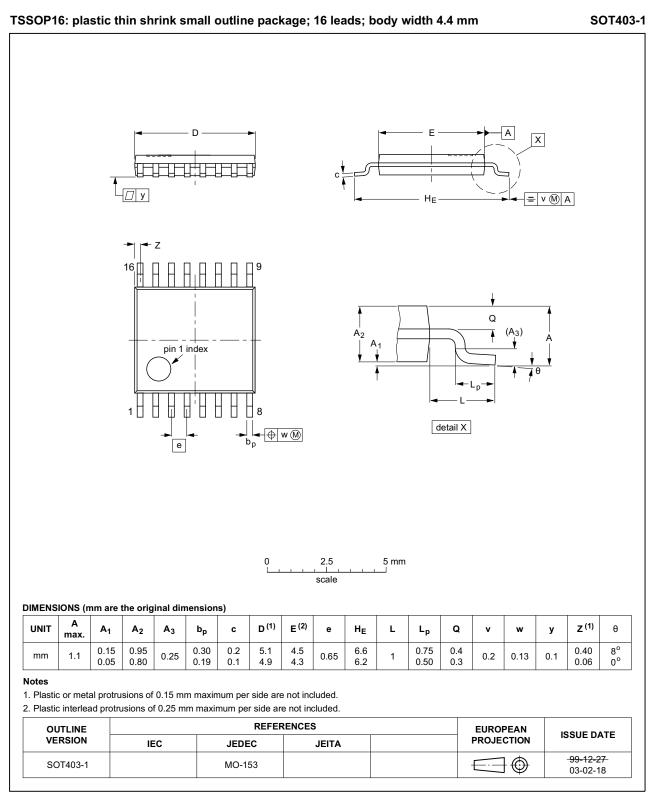
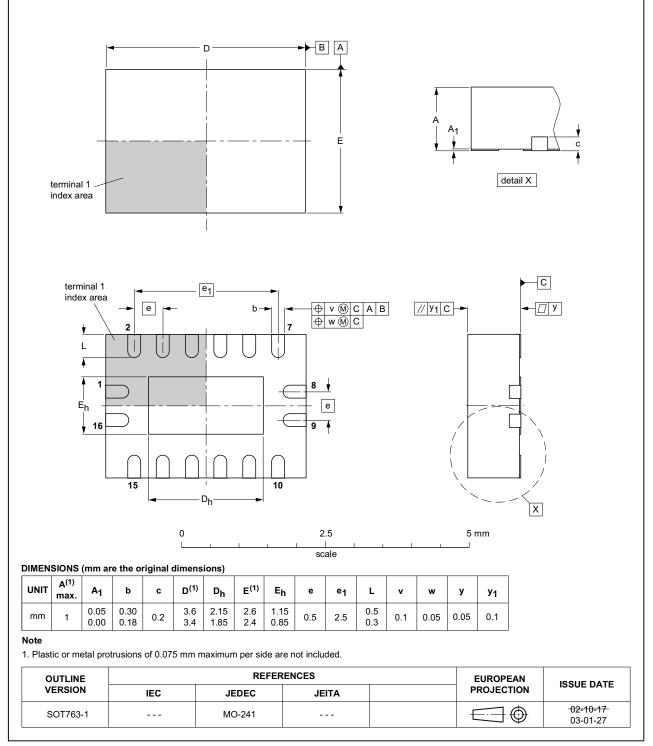


Fig 12. Package outline SOT403-1 (TSSOP16)

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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)

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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 number	ers 74HC157N and 74HCT	157N (SOT38-4) rer	noved.
74HC_HCT157 v.7	20150121	Product data sheet	-	74HC_HCT157 v.6
Modifications:	• <u>Table 7</u> : Power dissipation capacitance condition for 74HCT157 is corrected.			T157 is corrected.
74HC_HCT157 v.6	20120827	Product data sheet	-	74HC_HCT157 v.5
Modifications:	 Package ou 	Itline drawing DIP16 addec	J.	
74HC_HCT157 v.5	20120425	Product data sheet	-	74HC_HCT157 v.4
Modifications:	Figure 7 updated 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

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.nexperia.com.

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Product data sheet

74HC157; 74HCT157

Quad 2-input multiplexer

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