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74HC157-Q100; 74HCT157-Q100

Quad 2-input multiplexer Rev. 2 — 21 January 2015

Product data sheet

General description

The 74HC157-Q100; 74HCT157-Q100 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-Q100 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-Q100. 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-Q100 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:

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

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

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

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

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

Features and benefits 2.

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Low-power dissipation
- Non-inverting data path
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- Multiple package options

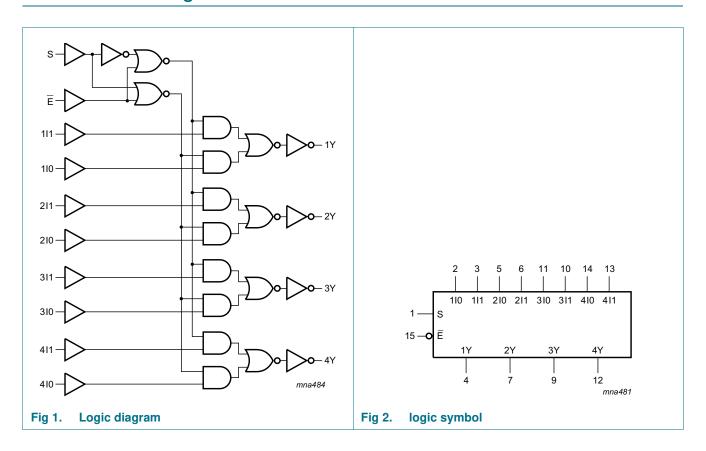


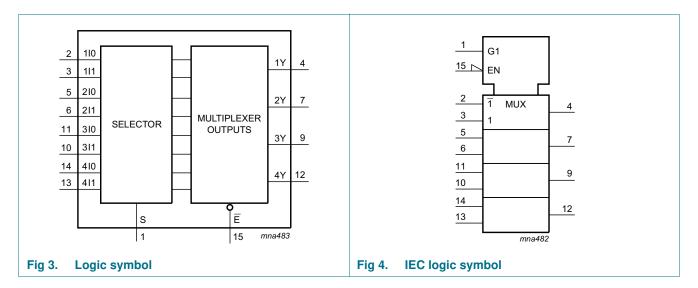
3. Ordering information

Table 1. Ordering information

Type number	Package									
	Temperature range	Name	Description	Version						
74HC157D-Q100	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width	SOT109-1						
74HCT157D-Q100			3.9 mm							
74HC157PW-Q100	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads;	SOT403-1						
74HCT157PW-Q100			body width 4.4 mm							
74HC157BQ-Q100	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced	SOT763-1						
74HCT157BQ-Q100			very thin quad flat package; no leads; 16 terminals; body $2.5 \times 3.5 \times 0.85$ mm							

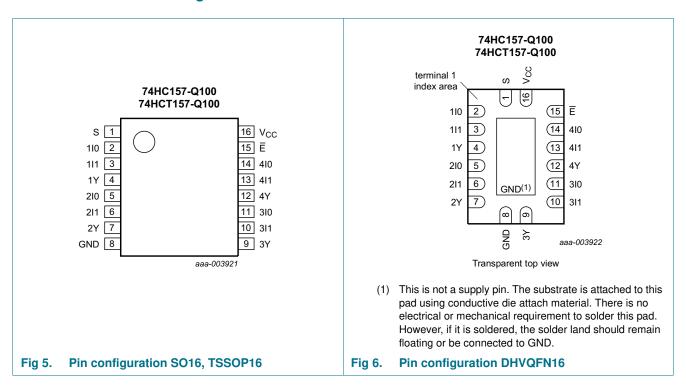
4. Functional diagram





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
Ē	S	nI0	nl1	nY
Н	X	X	X	L
L	L	L	X	L
L	L	Н	X	Н
L	Н	Х	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	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$					
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	[1]	-	500	mW	
		TSSOP16 package	[2]	-	500	mW	
		DHVQFN16 package	[3]	-	500	mW	

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

74HC_HCT157_Q100

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^[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	ditions 74HC157-Q100				74HCT157-Q100			
			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	
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0 \text{ V}$	-	-	625	-	-	-	ns/V	
		$V_{CC} = 4.5 \text{ V}$	-	1.67	139	-	1.67	139	ns/V	
		$V_{CC} = 6.0 \text{ V}$	-	-	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 _{ar}	_{nb} = 25	°C		–40 °C 35 °C	T _{amb} = -40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC15	7-Q100									
V_{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	٧
	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	-	٧
V_{IL}	LOW-level	V _{CC} = 2.0 V	-	8.0	0.5	-	0.5	-	0.5	٧
	input voltage	V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	٧
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	٧
V _{OH}	HIGH-level	$V_I = V_{IH}$ 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
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	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	$I_O = 20 \mu A; V_{CC} = 2.0 \text{ V}$	-	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 mA; V _{CC} = 4.5 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	٧
lį	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	μΑ

 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 25 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
Cı	input capacitance		-	3.5	-					pF
74HCT1	57-Q100									
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	output voltage	$I_{O} = -20 \mu A$	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	٧
		$I_O = 4.0 \text{ mA}$	-	0.15	0.26	-	0.33	-	0.4	٧
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; $I_O = 0 \text{ A}$								
		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); $C_L = 50$ pF unless otherwise specified; for test circuit see Figure 9.

Symbol	Parameter	Conditions	1	_{amb} = 25	°C		= –40 °C -85 °C		= –40 °C 125 °C	Unit
			Mir	Тур	Max	Min	Max	Min	Max	
74HC15	7-Q100		'							
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 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	2]							
	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	$C_L = 50 \text{ pF}; f = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	-	70	-	-	-	-	-	pF
74HCT1	57-Q100		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 V; C _L = 15 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	Symbol Parameter Conditions			T _{an}	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	
t _t	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 pF; f = 1 MHz; V _I = GND to V _{CC} - 1.5 V	[3]	-	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;

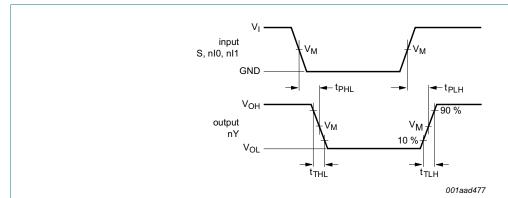
C_L = output load capacitance in pF;

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 Table 8.

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)

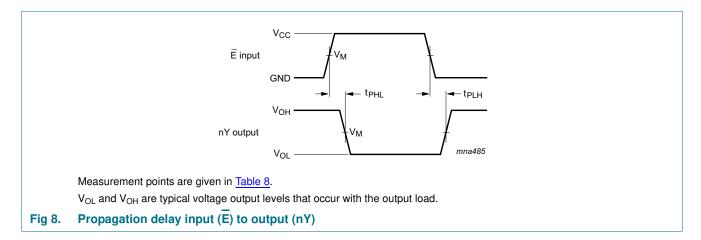
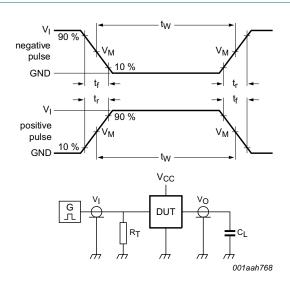


Table 8. Measurement points

Туре	Input	Output		
	V _M	V _M		
74HC157-Q100	0.5V _{CC}	0.5V _{CC}		
74HCT157-Q100	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.

 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

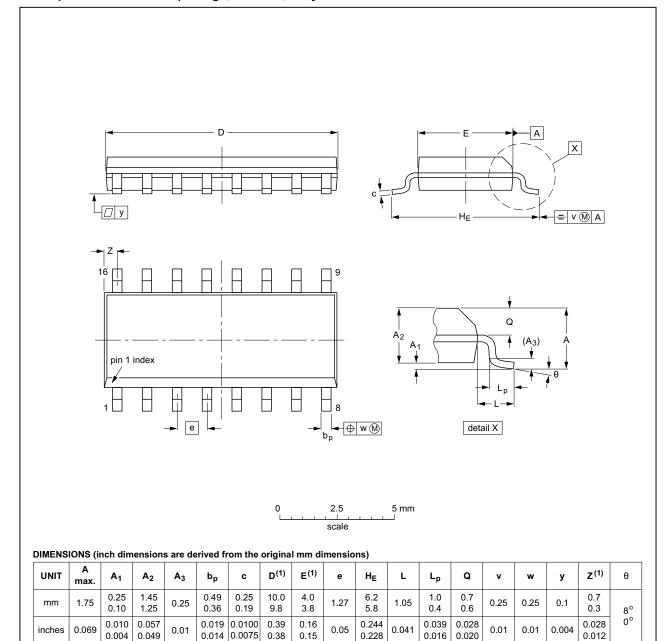
Table 9. Test data

Туре	Input		Load	Test
	VI	t _r , t _f	CL	
74HC157-Q100	V _{CC}	6.0 ns	15 pF, 50 pF	t _{PLH} , t _{PHL}
74HCT157-Q100	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.

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

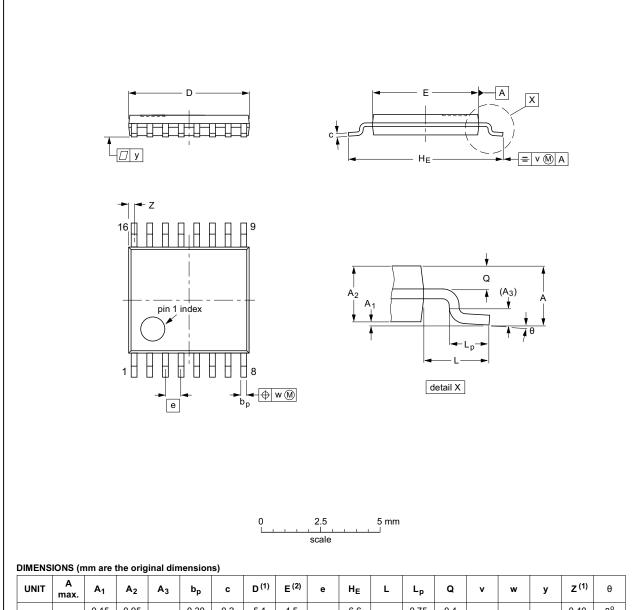
Fig 10. Package outline SOT109-1 (SO16)

74HC_HCT157_Q100

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

SOT403-1



UNI	IT	A max.	A ₁	A ₂	A ₃	b _p	С	D ⁽¹⁾	E (2)	е	HE	L	Lp	Q	٧	w	у	Z ⁽¹⁾	θ
mn	n	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.

			REFERENCES					
IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE			
	MO-153				-99-12-27 03-02-18			
_	ILO							

Fig 11. Package outline SOT403-1 (TSSOP16)

74HC_HCT157_Q100

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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

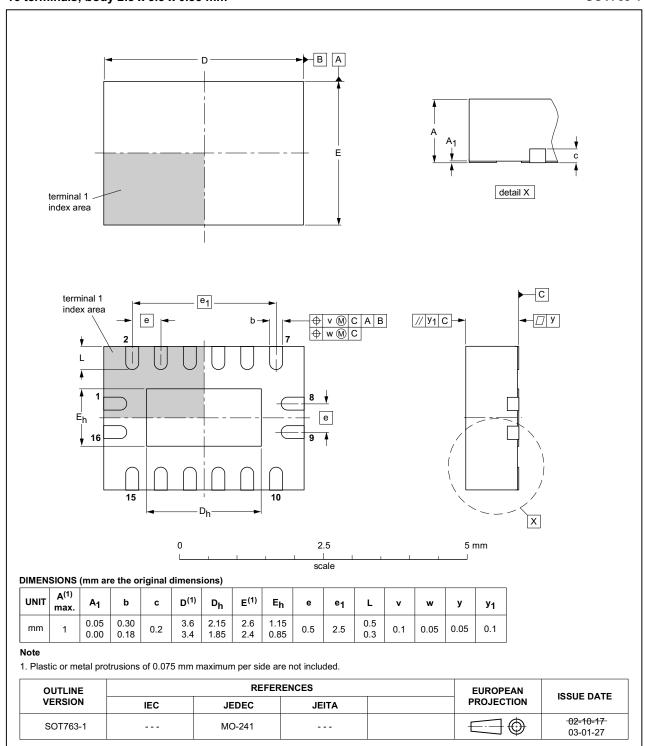


Fig 12. Package outline SOT763-1 (DHVQFN16)

74HC_HCT157_Q100

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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
MIL	Military

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT157_Q100 v.2	20150121 Product data sheet		-	74HC_HCT157_Q100 v.1
Modifications:	• <u>Table 7</u> : Pov	ver dissipation capacitance	e condition for 74HCT	157-Q100 is corrected.
74HC_HCT157_Q100 v.1	20120802	Product data sheet	-	-

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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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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