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Kind regards,

Team Nexperia

74HC240; 74HCT240

Octal buffer/line driver; 3-state; inverting
Rev. 4 — 25 February 2016

Product data sheet

1. **General description**

The 74HC240; 74HCT240 is an 8-bit inverting buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables (10E and 20E), each controlling four of the 3-state outputs. A HIGH on nOE 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**

- Complies with JEDEC standard JESD7A
- Input levels:
 - ◆ For 74HC240: CMOS level
 - ◆ For 74HCT240: TTL level
- Inverting 3-state outputs
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

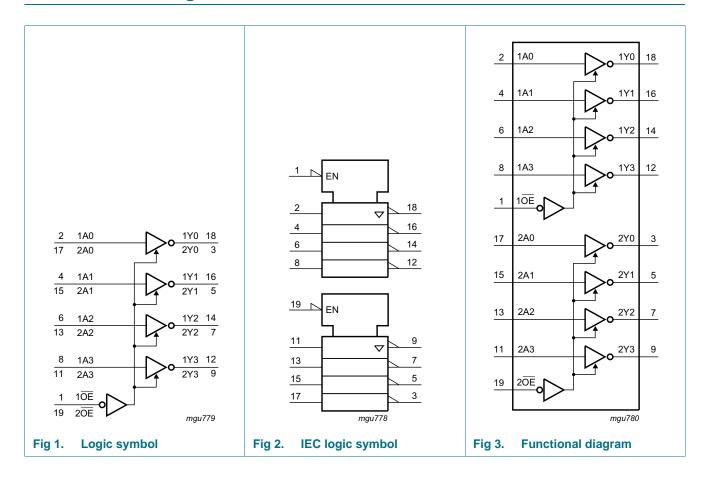
Ordering information 3.

Table 1. **Ordering information**

Type number	Package				
	Temperature range	Name	Description	Version	
74HC240D	−40 °C to +125 °C	SO20	plastic small outline package; 20 leads;	SOT163-1	
74HCT240D	-		body width 7.5 mm		
74HC240DB	−40 °C to +125 °C	SSOP20	plastic shrink small outline package; 20 leads; body	SOT339-1	
74HCT240DB	-		width 5.3 mm		
74HC240PW	−40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads;	SOT360-1	
74HCT240PW	-		body width 4.4 mm		
74HC240BQ	-40 °C to +125 °C	DHVQFN20	plastic dual-in-line compatible thermal enhanced very	SOT764-1	
74HCT240BQ			thin quad flat package; no leads; 20 terminals; body $2.5 \times 4.5 \times 0.85$ mm		

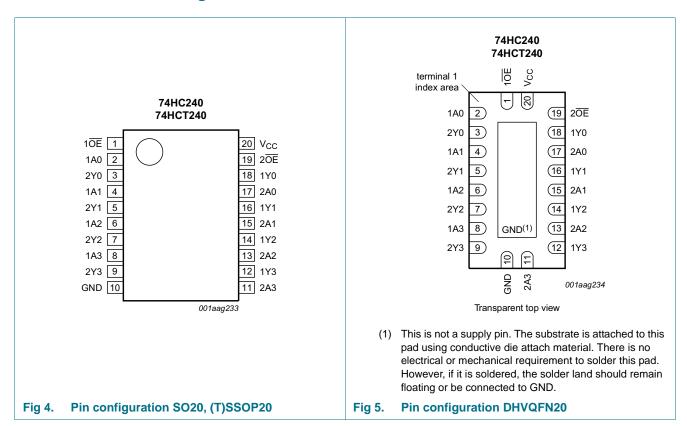


4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1 OE , 2 OE	1, 19	output enable input (active LOW)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	bus output
GND	10	ground (0 V)
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	bus output
Vcc	20	supply voltage

6. Functional description

Table 3. Function table[1]

Input nOE	Output	
nOE	nAn	nYn
L	L	Н
L	Н	L
Н	X	Z

^[1] H = HIGH voltage level;

L = LOW voltage level;

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	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$		-	±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	SO20, SSOP20, TSSOP20 and DHVQFN20 packages	<u>[1]</u>	-	500	mW	

^[1] For SO20 packages: above 70 °C, P_{tot} derates linearly with 8 mW/K.
For SSOP20 and TSSOP20 packages: above 60 °C, P_{tot} derates linearly with 5.5 mW/K.
For DHVQFN20 packages: above 60 °C, P_{tot} derates linearly with 4.5 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	7	74HC240			74HCT240		
			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
Δt/ΔV	input transition rise and	V _{CC} = 2.0 V	-	-	625	-	-	-	ns/V
	fall rate	V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 6.0 V	-	-	83	-	-	-	ns/V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C

74HC_HCT240

X = don't care;

Z = high-impedance OFF-state.

9. 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	
74HC240	0									
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	-	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	$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	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
		$I_{O} = -6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	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
		$I_O = 20 \mu A; V_{CC} = 6.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	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	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 6.0$ V; $V_O = V_{CC}$ or GND	-	-	±0.5	-	±5.0	-	±10	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
Cı	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT2	40									
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} ; $V_{CC} = 4.5 \text{ V}$								
U	output voltage	$I_{O} = -20 \mu\text{A}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -6 \text{ mA}$	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
OL.	output voltage	$I_O = 20 \mu\text{A}$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O} = 6.0 \text{ mA}$	_	0.16	0.26	-	0.33	-	0.4	V

 Table 6.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions		25 °C		–40 °C to	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
II	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 5.5$ V; $V_O = V_{CC}$ or GND	-	-	±0.5	-	±5.0	-	±10	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$; $I_O = 0 \text{ A}$	-	-	8.0	-	80	-	160	μΑ
Δl _{CC}	additional supply current	per input pin; $V_1 = V_{CC} - 2.1 \text{ V};$ other inputs at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V; $I_0 = 0 \text{ A}$								
		nAn or inputs	-	150	540	-	675	-	735	μΑ
		nOE input	-	70	252	-	315	-	343	μΑ
Cı	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

GND = 0 V; for test circuit see Figure 8.

Symbol	Parameter	Conditions			25 °C		-40 °C to	+125 °C	Unit
				Min	Тур	Max	Max (85 °C)	Max (125 °C)	
74HC240)								
t _{pd}	propagation delay	nAn to nYn; see Figure 6	<u>[1]</u>						
		V _{CC} = 2.0 V		-	30	100	125	150	ns
		V _{CC} = 4.5 V		-	11	20	25	30	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	9	-	-	-	ns
		V _{CC} = 6.0 V		-	9	17	21	26	ns
t _{en}	enable time	nOE to nYn; see Figure 7	[2]						
		V _{CC} = 2.0 V		-	39	150	190	225	ns
		V _{CC} = 4.5 V		-	14	30	38	45	ns
		V _{CC} = 6.0 V		-	11	26	33	38	ns
t _{dis}	disable time	nOE to nYn or see Figure 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 time	see Figure 6	[4]						
		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

 Table 7.
 Dynamic characteristics ...continued

GND = 0 V; for test circuit see Figure 8.

Symbol	Parameter	Conditions		25 °C			-40 °C to	+125 °C	Unit
				Min	Тур	Max	Max (85 °C)	Max (125 °C)	
C _{PD}	power dissipation capacitance	per transceiver; V _I = GND to V _{CC}	•		30	-	-	-	pF
74HCT24	40								
t _{pd} propagation delay	nAn to nYn; see Figure 6	<u>[1]</u>							
		V _{CC} = 4.5 V		-	11	20	25	30	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	9	-	-	-	ns
t _{en}	enable time	nOE to nYn; V _{CC} = 4.5 V; see Figure 7	\overline{OE} to nYn; $V_{CC} = 4.5 \text{ V}$; [2]		13	30	38	45	ns
t _{dis}	disable time	nOE to nYn; V _{CC} = 4.5 V; see Figure 7	<u>[3]</u>	-	13	25	31	38	ns
t _t	transition time	V _{CC} = 4.5 V; see Figure 6	[4]	-	5	12	15	18	ns
C _{PD}	power dissipation capacitance	per transceiver; V _I = GND to V _{CC} - 1.5 V	<u>[5]</u>	-	30	-	-	-	pF

- [1] t_{pd} is the same as t_{PHL} and t_{PLH} .
- [2] t_{en} is the same as t_{PZH} and t_{PZL} .
- [3] t_{dis} is the same as t_{PHZ} and t_{PLZ} .
- [4] t_t is the same as t_{THL} and t_{TLH} .
- [5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

 f_i = input frequency in MHz;

 $f_o = output frequency in MHz;$

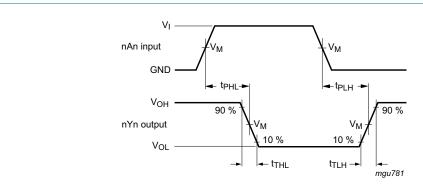
C_L = output load capacitance in pF;

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 drop that occur with the output load.

Fig 6. Input (nAn) to output (nYn) propagation delays and output transition times

74HC_HCT240

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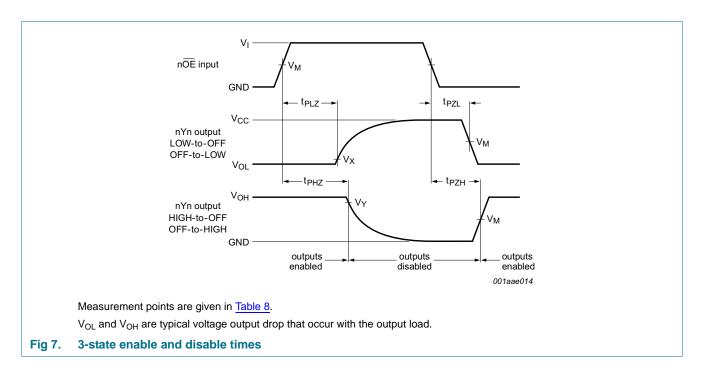
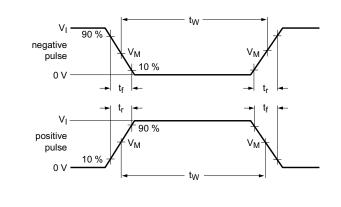
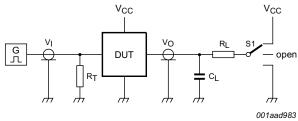


Table 8. Measurement points

Туре	Input	Output					
	V _M	V _M	V _X	V _Y			
74HC240	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$			
74HCT240	1.3 V	1.3 V	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$			





Test data is given in Table 9.

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 resistance.

S1 = Test selection switch.

Fig 8. Test circuit for measuring switching times

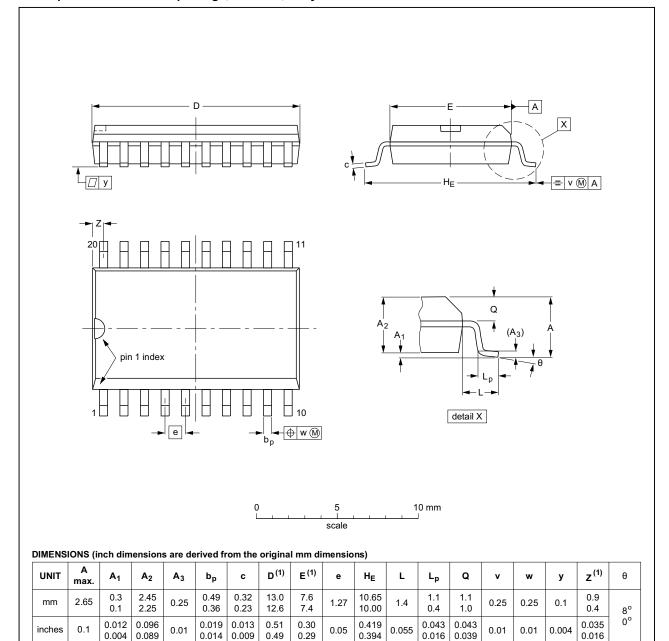
Table 9. Test data

Туре	Input		Load		S1 position		
	VI	t _r , t _f	CL	R _L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
74HC240	V _{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}
74HCT240	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}

12. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



Note

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

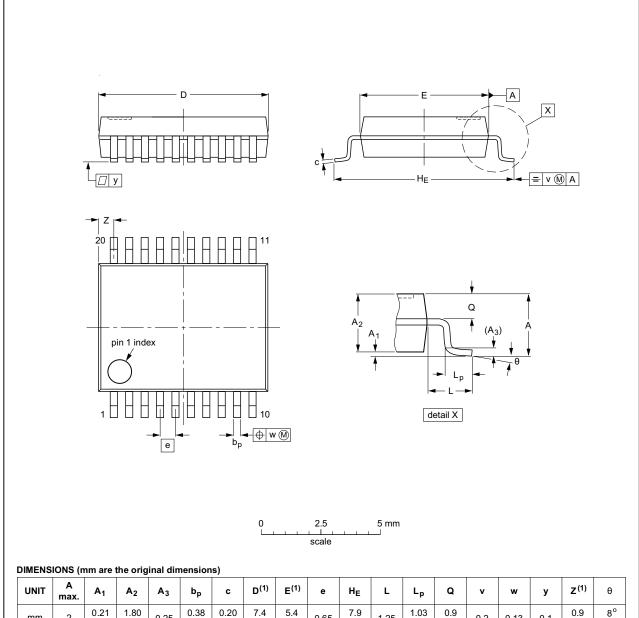
OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT163-1	075E04	MS-013				99-12-27 03-02-19

Fig 9. Package outline SOT163-1 (SO20)

74HC_HCT240

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	ø	v	¥	у	Z ⁽¹⁾	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	7.4 7.0	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	0.9 0.5	8° 0°

Note

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT339-1		MO-150				99-12-27 03-02-19	

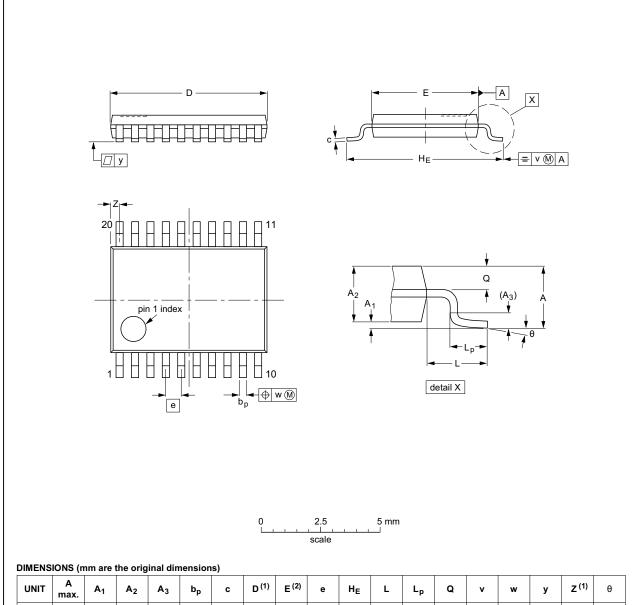
Fig 10. Package outline SOT339-1 (SSOP20)

74HC_HCT240

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TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E (2)	е	HE	L	Lp	Q	٧	w	у	Z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	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	0.5 0.2	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.

		EUROPEAN	ISSUE DATE			
IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
	MO-153				99-12-27 03-02-19	
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Fig 11. Package outline SOT360-1 (TSSOP20)

74HC_HCT240

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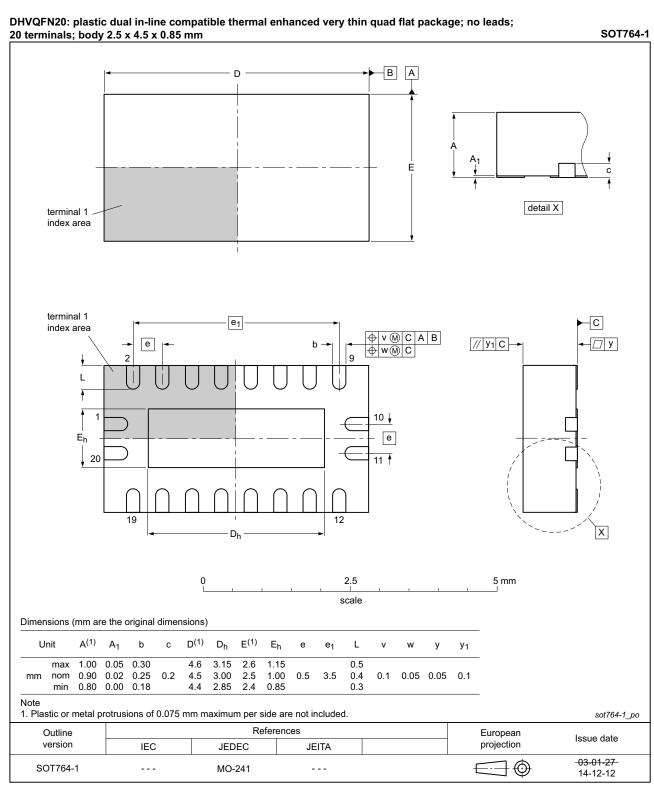


Fig 12. Package outline SOT764-1 (DHVQFN20)

74HC_HCT240

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13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	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_HCT240 v.4	20160225	20160225 Product data sheet -		74HC_HCT240 v.3				
Modifications:	Type numbe	rs 74HC240N and 74HCT2	240N (SOT146-1)	removed.				
74HC_HCT240 v.3	20070802	Product data sheet	-	74HC_HCT240_CNV v.2				
Modifications:		of this data sheet has been f NXP Semiconductors.	redesigned to cor	nply with the new identity				
	 Legal texts h 	nave been adapted to the n	ew company nam	e where appropriate.				
	 Added type number 74HC240BQ and 74HCT240BQ (DHVQFN20 package) 							
74HC_HCT240_CNV v.2	19970828	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.nxp.com.

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74HC_HCT240

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74HC240; 74HCT240

Octal buffer/line driver; 3-state; inverting

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