## 74HC237

# 3-to-8 line decoder, demultiplexer with address latches Rev. 8 — 26 October 2021 Product data sheet

### 1. General description

The 74HC237 is a 3-to-8 line decoder, demultiplexer with latches at the three address inputs (An). The 74HC237 essentially combines the 3-to-8 decoder function with a 3-bit storage latch. When the latch is enabled ( $\overline{\text{LE}}$  = LOW), the 74HC237 acts as a 3-to-8 active LOW decoder. When the latch enable ( $\overline{\text{LE}}$ ) goes from LOW-to-HIGH, the last data present at the inputs before this transition, is stored in the latches. Further address changes are ignored as long as  $\overline{\text{LE}}$  remains HIGH. The output enable input ( $\overline{\text{E}}$ 1 and  $\overline{\text{E}}$ 2) controls the state of the outputs independent of the address inputs or latch operation. All outputs are HIGH unless  $\overline{\text{E}}$ 1 is LOW and  $\overline{\text{E}}$ 2 is HIGH. The 74HC237 is ideally suited for implementing non-overlapping decoders in 3-state systems and strobes (stored address) applications in bus-oriented systems.

### 2. Features and benefits

- Combines 3-to-8 decoder with 3-bit latch
- · Multiple input enable for easy expansion or independent controls
- · Active HIGH mutually exclusive outputs
- Wide supply voltage range from 2.0 V to 6.0 V
- · 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
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

### 3. Ordering information

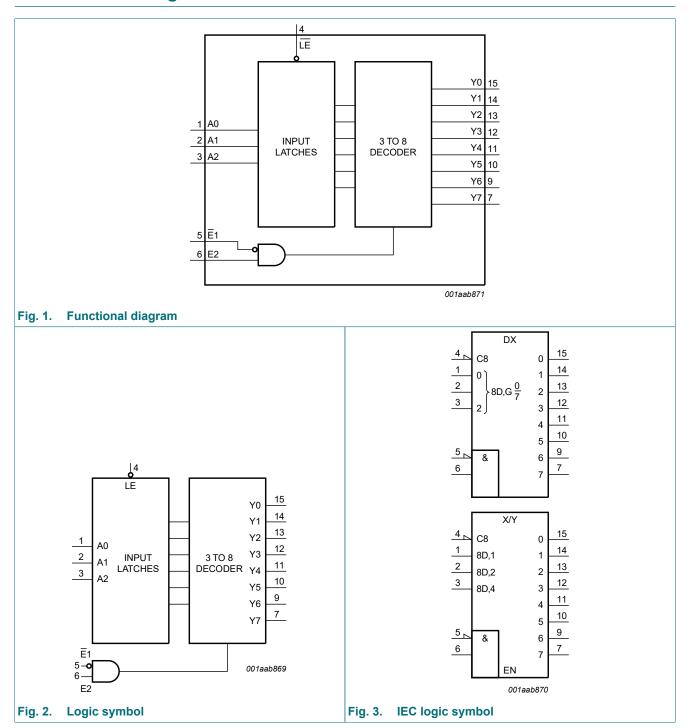
**Table 1. Ordering information** 

Type number	Package	Package										
	Temperature range	Name	Description	Version								
74HC237D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1								
74HC237DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1								
74HC237PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1								



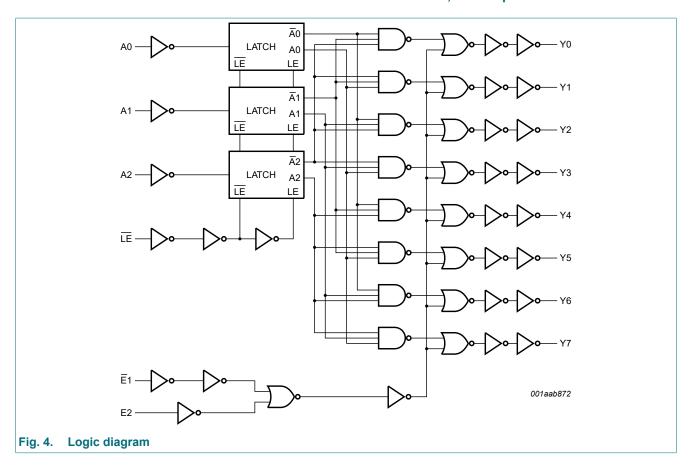
### 3-to-8 line decoder, demultiplexer with address latches

### 4. Functional diagram



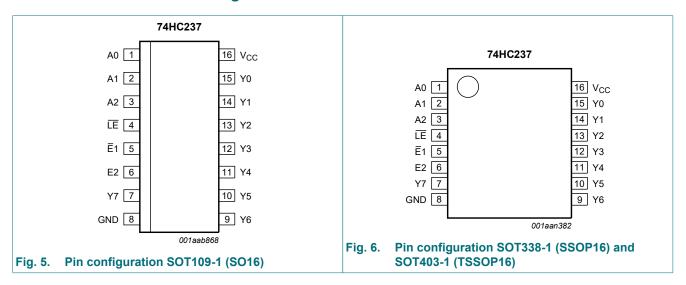
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### 3-to-8 line decoder, demultiplexer with address latches



### 5. Pinning information

### 5.1. Pinning



### 3-to-8 line decoder, demultiplexer with address latches

### 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
A0 to A2	1, 2, 3	data input
LE	4	latch enable input (active LOW)
Ē1	5	data enable input 1 (active LOW)
E2	6	data enable input 2 (active HIGH)
Y0 to Y7	15, 14, 13, 12, 11, 10, 9,	, 7 output
GND	8	ground (0 V)
V <sub>CC</sub>	16	supply voltage

### 6. Functional description

#### Table 3. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level; \ X = don't \ care.$ 

Enabl	е		Input			Output							
LE	E1	E2	A0	A1	A2	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Н	L	Н	Х	Х	Х	stable							
Χ	Н	Х	Х	Х	Х	L	L	L	L	L	L	L	L
Х	Х	L	Х	Х	Х	L	L	L	L	L	L	L	L
L	L	Н	L	L	L	Н	L	L	L	L	L	L	L
L	L	Н	Н	L	L	L	Н	L	L	L	L	L	L
L	L	Н	L	Н	L	L	L	Н	L	L	L	L	L
L	L	Н	Н	Н	L	L	L	L	Н	L	L	L	L
L	L	Н	L	L	Н	L	L	L	L	Н	L	L	L
L	L	Н	Н	L	Н	L	L	L	L	L	Н	L	L
L	L	Н	L	Н	Н	L	L	L	L	L	L	Н	L
L	L	Н	Н	Н	Н	L	L	L	L	L	L	L	Н

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### 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 <sub>CC</sub>	supply voltage		-0.5	+7	V
I <sub>IK</sub>	input clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I <sub>OK</sub>	output clamping current	$V_{O} < -0.5 \text{ V or } V_{O} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
lo	output current	$V_{O} = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	-	±25	mA
I <sub>CC</sub>	supply current		-	+50	mA
I <sub>GND</sub>	ground current		-	-50	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	[1	] -	500	mW

<sup>[1]</sup> For SOT109-1 (SO16) package: P<sub>tot</sub> derates linearly with 12.4 mW/K above 110 °C. For SOT338-1 (SSOP16) package: P<sub>tot</sub> derates linearly with 8.5 mW/K above 91 °C. For SOT403-1 (TSSOP16) package: P<sub>tot</sub> derates linearly with 8.5 mW/K above 91 °C.

### 8. Recommended operating conditions

### Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	V
VI	input voltage		0	-	V <sub>CC</sub>	V
Vo	output voltage		0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	ns/V

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### 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 to	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
V <sub>IH</sub>	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	voltage	V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 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 mA; $V_{CC}$ = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V <sub>OL</sub>	LOW-level	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
	output voltage	$I_{O}$ = 20 $\mu$ A; $V_{CC}$ = 2.0 $V$	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 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
		$I_O = 4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.26	-	0.33	-	0.4	V
		$I_{O}$ = 5.2 mA; $V_{CC}$ = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
lı	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	-	160	μΑ
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF

### 3-to-8 line decoder, demultiplexer with address latches

### 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 Fig. 10.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
t <sub>pd</sub>	propagation	An to Yn; see Fig. 7	[1]								
	delay	V <sub>CC</sub> = 2.0 V		-	52	160	-	200	-	240	ns
		V <sub>CC</sub> = 4.5 V		-	19	32	-	40	-	48	ns
		V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF		-	16	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V		-	15	27	-	34	-	41	ns
		LE to Yn; see Fig. 7	[1]								
		V <sub>CC</sub> = 2.0 V		-	61	190	-	240	-	285	ns
		V <sub>CC</sub> = 4.5 V		-	22	38	-	48	-	57	ns
		V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF		-	19	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V		-	18	32	-	41	-	48	ns
		E1to Yn; see Fig. 8	[1]								
		V <sub>CC</sub> = 2.0 V		-	47	145	-	180	-	220	ns
		V <sub>CC</sub> = 4.5 V		-	17	29	-	36	-	44	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$		-	14	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V		-	14	25	-	31	-	38	ns
		E2 to Yn; see Fig. 7	[1]								
		V <sub>CC</sub> = 2.0 V		-	47	145	-	180	-	220	ns
		V <sub>CC</sub> = 4.5 V		-	17	29	-	36	-	44	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$		-	14	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V		-	14	25	-	31	-	38	ns
t <sub>t</sub>	transition time	Yn; see <u>Fig. 7</u> and <u>Fig. 8</u>	[2]								
		V <sub>CC</sub> = 2.0 V		-	19	75	-	95	-	110	ns
		V <sub>CC</sub> = 4.5 V		-	7	15	-	19	-	22	ns
		V <sub>CC</sub> = 6.0 V		-	6	13	-	16	-	19	ns
t <sub>W</sub>	pulse width	LE HIGH; see Fig. 9									
		V <sub>CC</sub> = 2.0 V		50	11	-	65	-	75	-	ns
		V <sub>CC</sub> = 4.5 V		10	4	-	13	-	15	-	ns
		V <sub>CC</sub> = 6.0 V		9	3	-	11	-	13	-	ns
t <sub>su</sub>	set-up time	An to LE; see Fig. 9									
		V <sub>CC</sub> = 2.0 V		50	6	-	65	-	75	-	ns
		V <sub>CC</sub> = 4.5 V		10	2	-	13	-	15	-	ns
		V <sub>CC</sub> = 6.0 V		9	2	-	11	-	13	-	ns

#### 3-to-8 line decoder, demultiplexer with address latches

Symbol	Parameter	Conditions	25 °C			-40 °C t	o +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
t <sub>h</sub>	hold time	An to LE; see Fig. 9					-			
		V <sub>CC</sub> = 2.0 V	30	3	-	40	-	45	-	ns
		V <sub>CC</sub> = 4.5 V	6	1	-	8	-	9	-	ns
		V <sub>CC</sub> = 6.0 V	5	1	-	7	-	8	-	ns
C <sub>PD</sub>	power dissipation capacitance	$C_L$ = 50 pF; f = 1 MHz; [3] $V_I$ = GND to $V_{CC}$	-	60	-	-	-	-	-	pF

- $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .
- $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

 $f_i$  = input frequency in MHz;

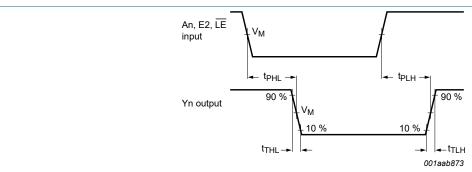
fo = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

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

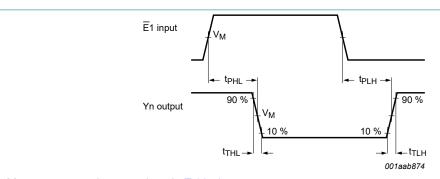
### 10.1. Waveforms and test circuit



Measurement points are given in Table 8.

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

Propagation delay input (An) and enable inputs (E2, LE) to output (Yn) and output transition time Fig. 7.



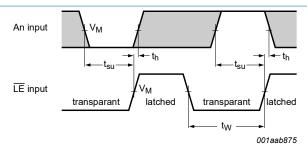
Measurement points are given in <u>Table 8</u>.

V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

Propagation enable inputs (E1) to output (Yn) and output transition time

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#### 3-to-8 line decoder, demultiplexer with address latches



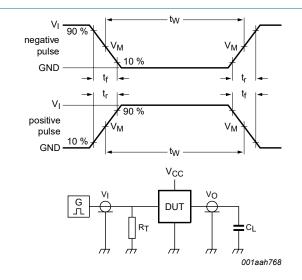
Measurement points are given in Table 8.

V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

Fig. 9. The data input (An) to latch enable input (\overline{LE}) set-up times, latch enable input (\overline{LE}) to data input (An) hold times and latch enable input (\overline{LE}) pulse width

**Table 8. Measurement points** 

Input	Output
$V_{M}$	V <sub>M</sub>
0.5V <sub>CC</sub>	0.5V <sub>CC</sub>



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<sub>L</sub> = Load capacitance including jig and probe capacitance.

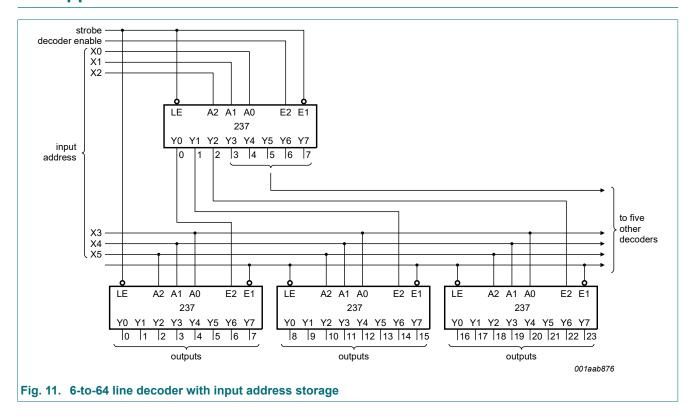
Fig. 10. Test circuit for measuring switching times

Table 9. Test data

Input		Load	Test
V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	CL	
V <sub>CC</sub>	6.0 ns	15 pF, 50 pF	t <sub>PLH</sub> , t <sub>PHL</sub>

### 3-to-8 line decoder, demultiplexer with address latches

### 11. Application information

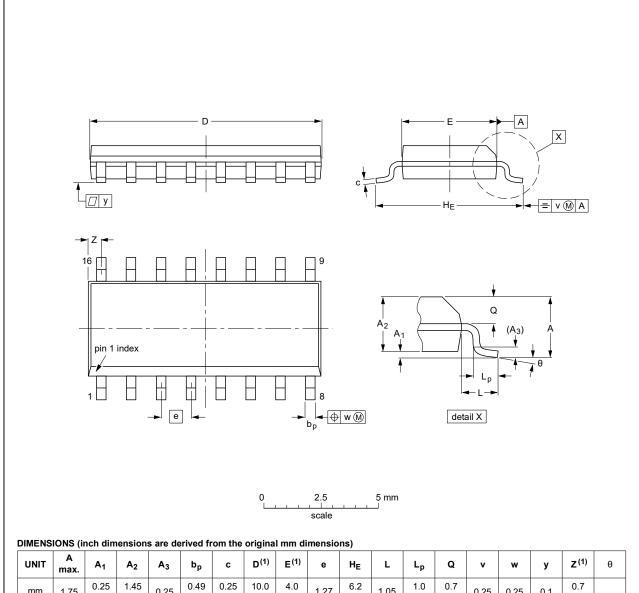


### 3-to-8 line decoder, demultiplexer with address latches

### 12. Package outline

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

SOT109-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	v	w	у	Z <sup>(1)</sup>	θ
mm	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°
inches	0.069	0.010 0.004	0.057 0.049	0.01		0.0100 0.0075		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°

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

OUTLINE		REFER	RENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	1330E DATE
SOT109-1	076E07	MS-012			<del>99-12-27</del> 03-02-19

Fig. 12. Package outline SOT109-1 (SO16)

### 3-to-8 line decoder, demultiplexer with address latches

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

SOT338-1

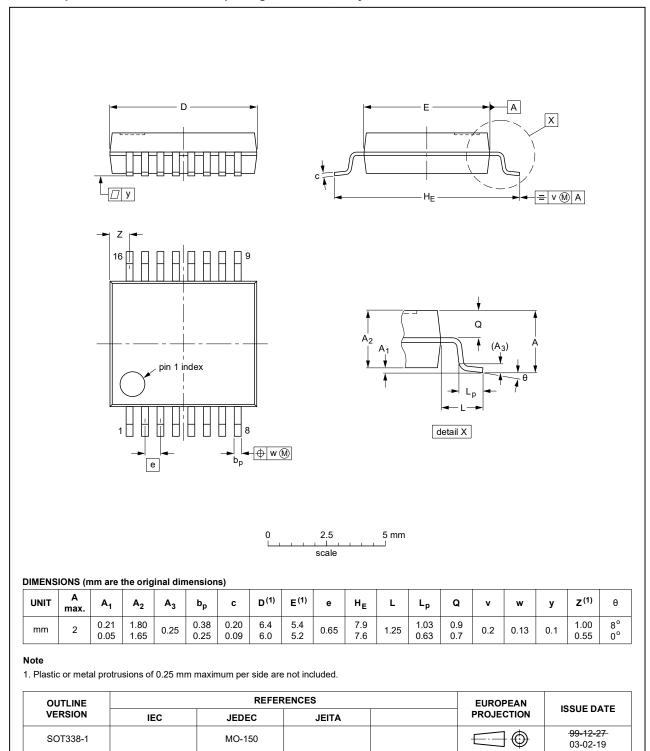
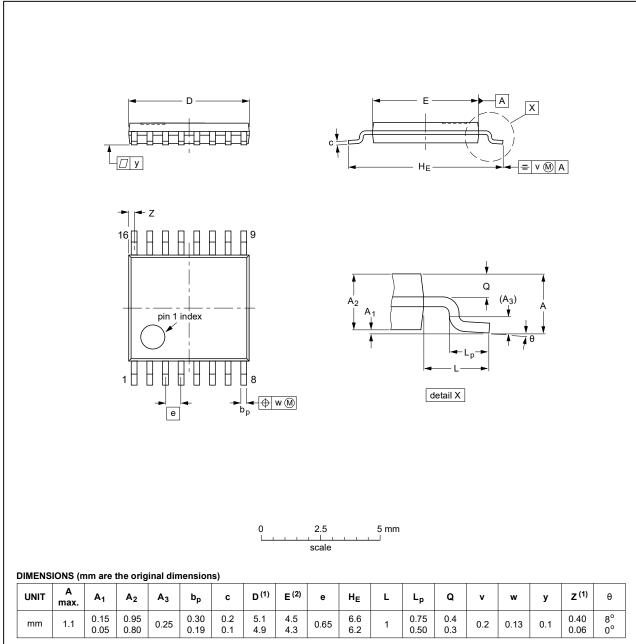


Fig. 13. Package outline SOT338-1 (SSOP16)

### 3-to-8 line decoder, demultiplexer with address latches

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				<del>99-12-27</del> 03-02-18

Fig. 14. Package outline SOT403-1 (TSSOP16)

### 3-to-8 line decoder, demultiplexer with address latches

### 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		
74HC237 v.8	20211026	Product data sheet	-	74HC237 v.7		
Modifications:	guidelines of Legal texts Type number Section 1 ar	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type number 74HC237PW (SOT403-1/TSSOP16) added.</li> <li>Section 1 and Section 2 updated.</li> <li>Section 7: Derating values for Ptot total power dissipation updated.</li> </ul>				
74HC237 v.7	20160129	Product data sheet	-	74HC237 v.6		
Modifications:	Type number					
74HC237 v.6	20120823	Product data sheet	-	74HC237 v.5		
Modifications:	Measurement points added to Fig. 7 and Fig. 8 (errata).					
74HC237 v.5	20111209	Product data sheet	-	74HC237 v.4		
Modifications:	Legal pages updated.					
74HC237 v.4	20110110	Product data sheet	-	74HC237 v.3		
74HC237 v.3	20041112	Product data sheet	-	74HC_HCT237_CNV v.2		
74HC_HCT237_CNV v.2	19970828	Product specification	-	74HC_HCT237 v.1		
74HC_HCT237 v.1	19901201	Product specification	-	-		

### 3-to-8 line decoder, demultiplexer with address latches

### 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".
- 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 <a href="https://www.nexperia.com">https://www.nexperia.com</a>.

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### 3-to-8 line decoder, demultiplexer with address latches

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