74HC237

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

Rev. 7 — 29 January 2016

Product data sheet

General description 1.

The 74HC237 is a high-speed Si-gate CMOS device and is pin compatible with low-power Schottky TTL (LSTTL). The 74HC237 is specified in compliance with JEDEC standard no. 7A.

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 (LE = LOW), the 74HC237 acts as a 3-to-8 active LOW decoder. When the latch enable (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 LE remains HIGH. The output enable input (E1 and E2) controls the state of the outputs independent of the address inputs or latch operation. All outputs are HIGH unless E1 is LOW and E2 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.

Features and benefits 2.

- Combines 3-to-8 decoder with 3-bit latch
- Multiple input enable for easy expansion or independent controls
- Active HIGH mutually exclusive outputs
- Low-power dissipation
- ESD protection:
 - HBM JESD22-A114F exceeds 2 000 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

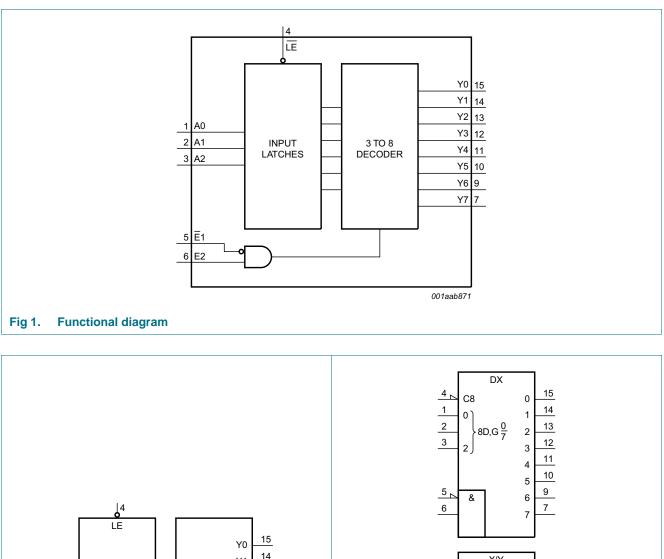
Ordering information 3.

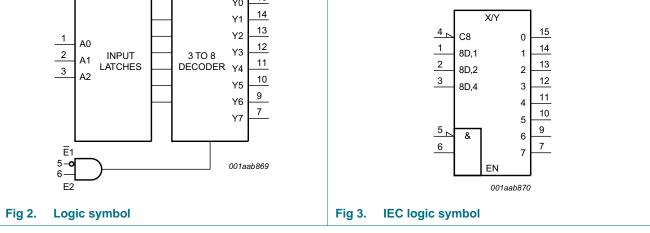
Table 1. **Ordering information**

Type number	Package								
	Temperature range	nge Name Description							
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					

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4. Functional diagram

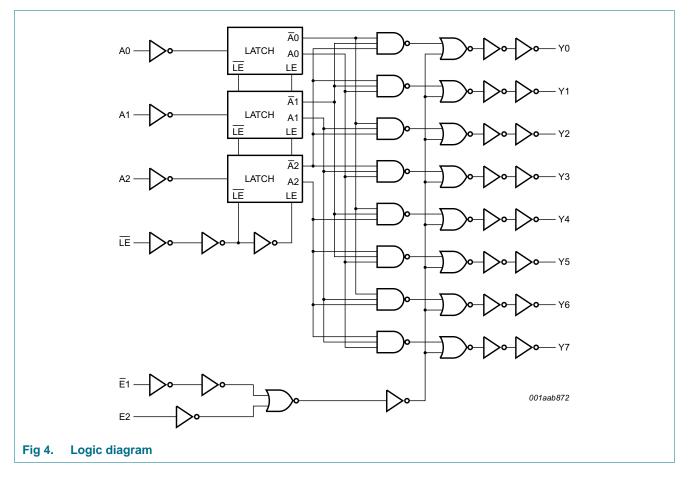




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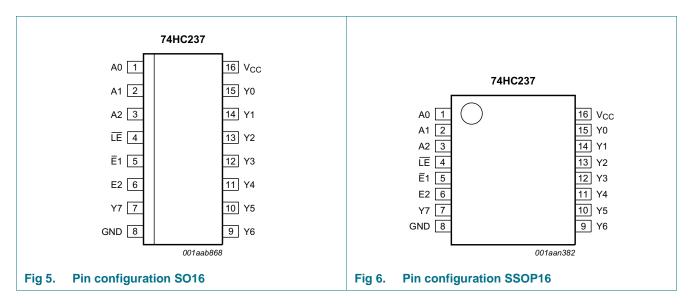
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3-to-8 line decoder, demultiplexer with address latches



5. Pinning information

5.1 Pinning



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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 _{CC}	16	supply voltage							

6. Functional description

Table	3. Fu	nction ta	able												
Enab	e		Input			Output									
LE	E1	E2	A0	A1	A2	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7		
Н	L	Н	Х	Х	Х	stable									
Х	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 H	Н	L	L	L	Н	L	L	L	L	L	L	L			
		-	Н	L	L	L	Н	L	L	L	L	L	L		
			L	Н	L	L	L	Н	L	L	L	L	L		
			Н	Н	L	L	L	L	Н	L	L	L	L		
			L	L	Н	L	L	L	L	Н	L	L	L		
			Н	L	Н	L	L	L	L	L	Н	L	L		
			L	Н	Н	L	L	L	L	L	L	Н	L		
			Н	Н	Н	L	L	L	L	L	L	L	Н		

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

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
lo	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	SO16 and SSOP16 packages	<u>[1]</u>	-	500	mW

For SO16 package: P_{tot} derates linearly with 8 mW/K above 70 °C.
 For SSOP16 package: P_{tot} derates linearly with 5.5 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	Min	Тур	Max	Unit
V _{CC}	supply voltage		2.0	5.0	6.0	V
VI	input voltage		0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-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	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 _{ai}	_{mb} = 25	°C	T _{amb} = +85		T _{amb} = −40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
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	$V_{I} = V_{IH} \text{ or } V_{IL}$									
	output voltage	$I_0 = -20 \ \mu A; \ V_{CC} = 2.0 \ V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_0 = -20 \ \mu A; \ V_{CC} = 4.5 \ V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_0 = -20 \ \mu A; \ V_{CC} = 6.0 \ V$	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	$V_{I} = V_{IH} \text{ or } V_{IL}$								
	output voltage	$I_0 = 20 \ \mu\text{A}; \ V_{CC} = 2.0 \ \text{V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 20 \ \mu\text{A}; \ V_{CC} = 4.5 \ \text{V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 20 \ \mu\text{A}; \ V_{CC} = 6.0 \ \text{V}$	-	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
		$I_0 = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
l _l	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 V$	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{CC}	supply current		-	-	8.0	-	80	-	160	μA
Cl	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 10.

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

Symbol	Parameter	Conditions	T _{amb} = 25 °C		T _{amb} = −40 °C to +85 °C		T _{amb} = -40 °C to +125 °C		Unit	
				Тур	Max	Min	Max	Min	Мах	
t _h hold time	hold time	An to LE; see Figure 9					-			
		V _{CC} = 2.0 V	30	3	-	40	-	45	-	ns
		V _{CC} = 4.5 V	6	1	-	8	-	9	-	ns
		V _{CC} = 6.0 V	5	1	-	7	-	8	-	ns
C _{PD}	power dissipation capacitance	$C_{L} = 50 \text{ pF; } f = 1 \text{ MHz;} \qquad [3]$ V _I = GND to V _{CC}	-	60	-	-	-	-	-	pF

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

[3] 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;

 $f_o = output frequency in MHz;$

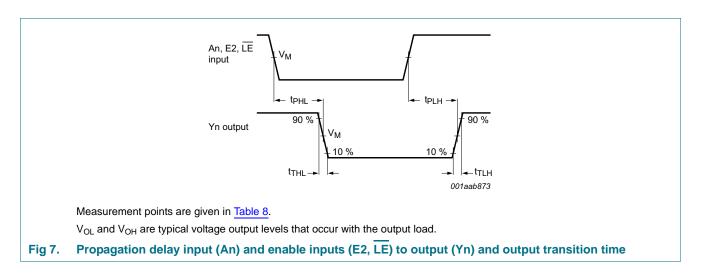
 C_L = output load capacitance in pF;

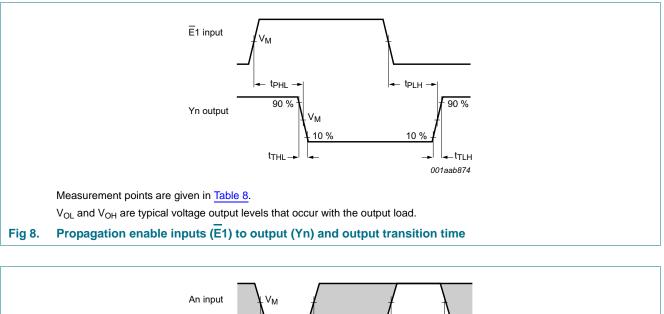
 V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11. Waveforms





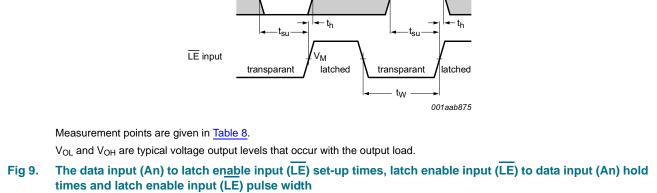


Table 8. Measurement points

Туре	Input	Output	
	V _M	V _M	
74HC237	0.5V _{CC}	0.5V _{CC}	

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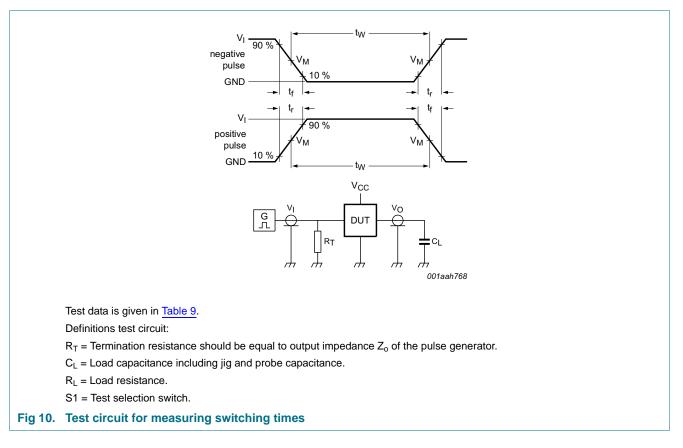
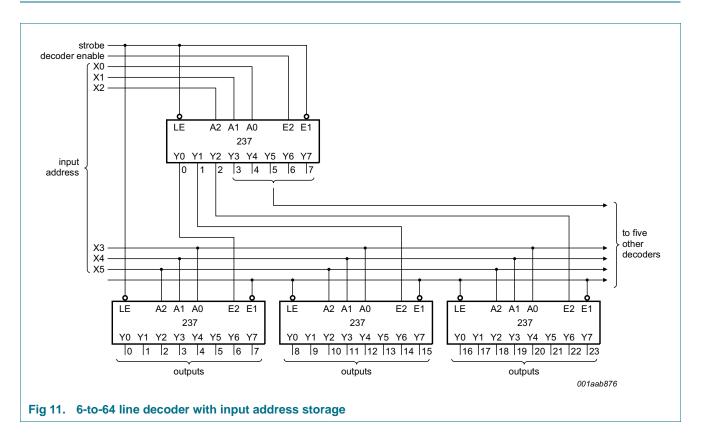


Table 9. Test data

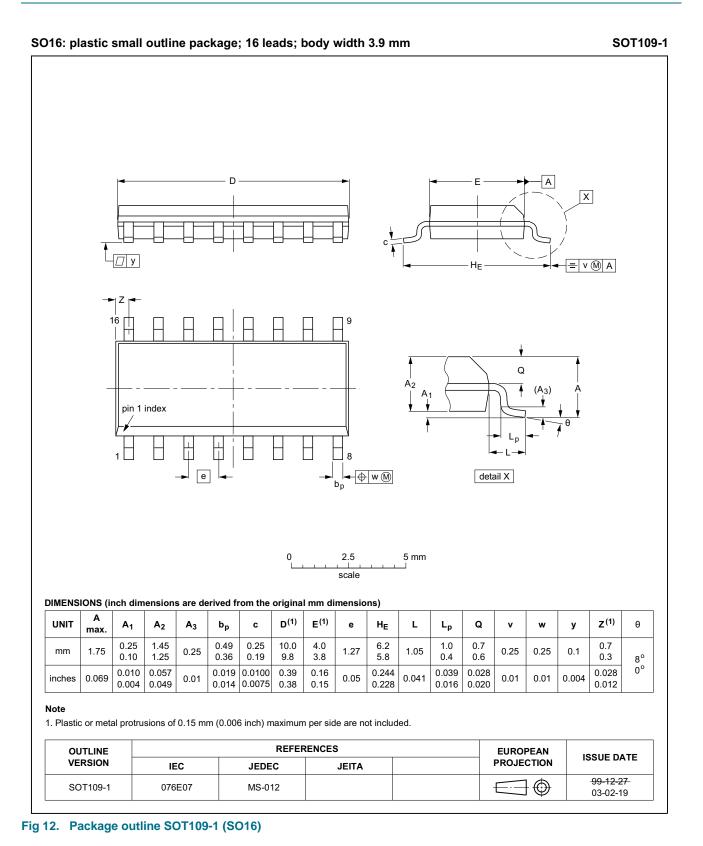
Туре	Input		Load	Test
	VI	t _r , t _f	CL	
74HC237	V _{CC}	6.0 ns	15 pF, 50 pF	t _{PLH} , t _{PHL}

12. Application information



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13. Package outline



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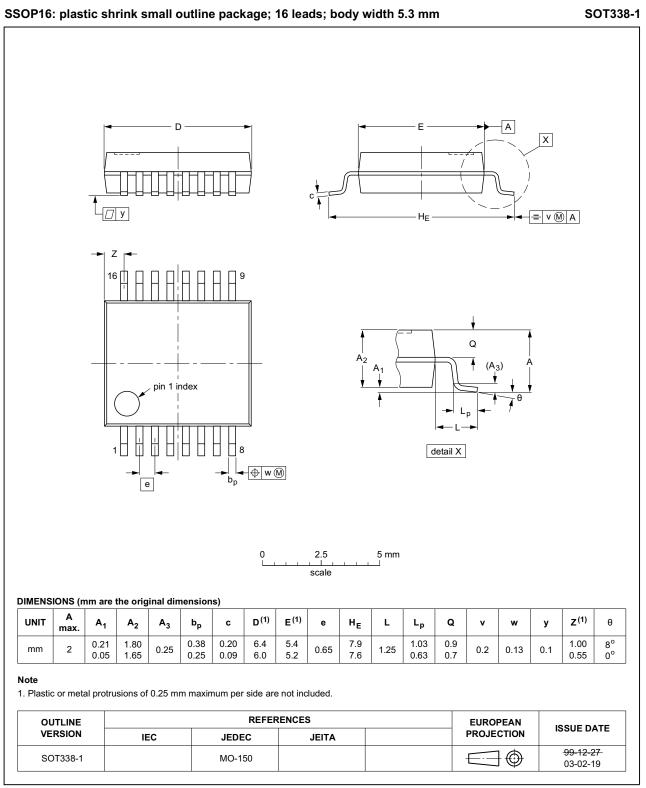


Fig 13. Package outline SOT338-1 (SSOP16)

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14. 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						

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes					
74HC237 v.7	20160129	Product data sheet	-	74HC237 v.6					
Modifications:	Type number	er 74HC237N removed.	·						
74HC237 v.6	20120823	Product data sheet	-	74HC237 v.5					
Modifications: • Measurement points added to Figure 7 and Figure 8 (errata).									
74HC237 v.5	20111209	Product data sheet	-	74HC237 v.4					
Modifications:	 Legal pages 	s 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	-	-					

16. Legal information

16.1 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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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