

DATA SHEET

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74ALS139

Dual 1-of-4 decoder/demultiplexer

Product specification

1991 Feb 08

IC05 Data Handbook

Dual 1-of-4 decoder/demultiplexer

74ALS139

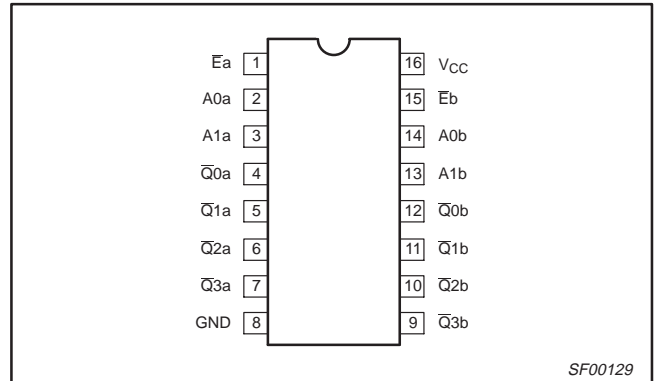
FEATURES

- Demultiplexing capability
- Two independent 1-of-4 decoders
- Multi-function capability

DESCRIPTION

The 74ALS139 is a dual 1-of-4 decoder/demultiplexer. This device has two independent decoders, each accepting two binary weighted inputs (A_{0n} , A_{1n}) and providing four mutually exclusive active-Low outputs (\bar{Q}_{0n} – \bar{Q}_{3n}). Each decoder has an active-Low enable (\bar{E}). When \bar{E} is High, every output is forced High. The enable can be used as the data input for a 1-of-4 demultiplexer application.

PIN CONFIGURATION



TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS139	6.0ns	4mA

ORDERING INFORMATION

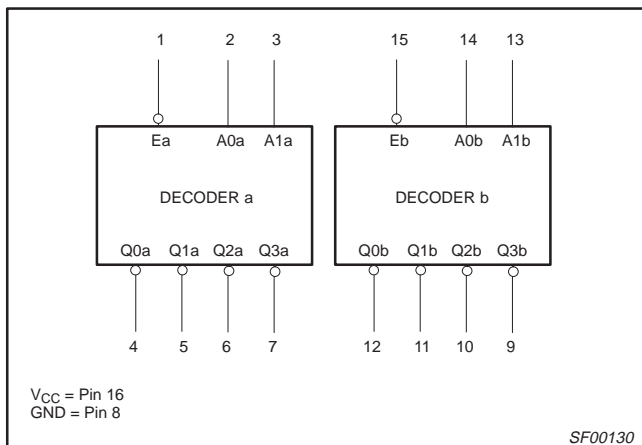
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	
16-pin plastic DIP	74ALS139N	SOT38-4
16-pin plastic SO	74ALS139D	SOT109-1

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

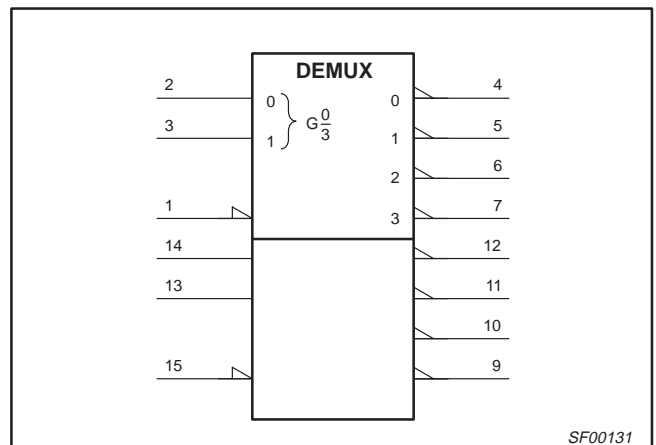
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
A_{0n} , A_{1n}	Address inputs	1.0/1.0	20 μ A/0.1mA
\bar{E}_a , \bar{E}_b	Enable inputs (active-Low)	1.0/1.0	20 μ A/0.1mA
\bar{Q}_{0n} , \bar{Q}_{1n}	Data outputs	20/80	0.4mA/8mA

NOTE: One (1.0) ALS unit load is defined as: 20 μ A in the High state and 0.1mA in the Low state.

LOGIC SYMBOL



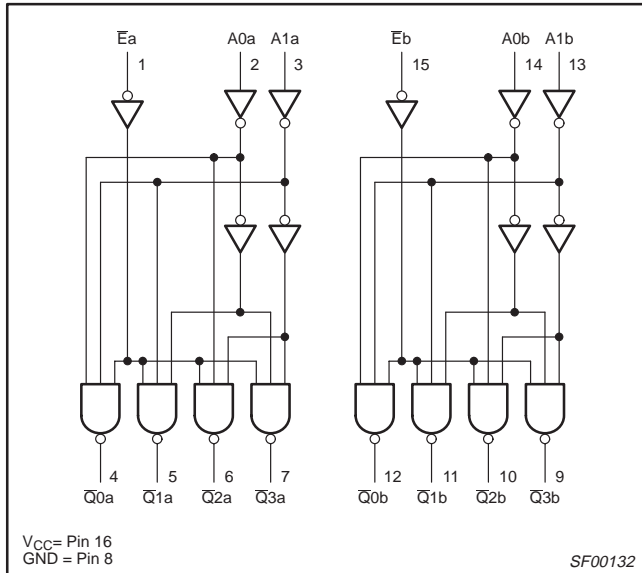
IEC/IEEE SYMBOL



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LOGIC DIAGRAM



FUNCTION TABLE

INPUTS			OUTPUTS			
\bar{E}	A0	A1	$\bar{Q}0$	$\bar{Q}1$	$\bar{Q}2$	$\bar{Q}3$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H = High voltage level
 L = Low voltage level
 X = Don't care

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	-0.5 to +7.0	V
V_{IN}	Input voltage	-0.5 to +7.0	V
I_{IN}	Input current	-30 to +5	mA
V_{OUT}	Voltage applied to output in High output state	-0.5 to V_{CC}	V
I_{OUT}	Current applied to output in Low output state	16	mA
T_{amb}	Operating free-air temperature range	0 to +70	°C
T_{stg}	Storage temperature range	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5.0	5.5	V
V_{IH}	High-level input voltage	2.0			V
V_{IL}	Low-level input voltage			0.8	V
I_{Ik}	Input clamp current			-18	mA
I_{OH}	High-level output current			-0.4	mA
I_{OL}	Low-level output current			8	mA
T_{amb}	Operating free-air temperature range	0		+70	°C

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DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS ¹	LIMITS			UNIT
			MIN	TYP ²	MAX	
V _{OH}	High-level output voltage	V _{CC} ±10%, V _{IL} = MAX, V _{IH} = MIN, I _{OH} = -0.4mA	V _{CC} - 2			V
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN	I _{OL} = 4mA	0.25	0.40	V
			I _{OL} = 8mA	0.35	0.50	V
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = I _{IK}		-0.73	-1.5	V
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 7.0V			0.1	mA
I _{IH}	High-level input current	V _{CC} = MAX, V _I = 2.7V			20	µA
I _{IL}	Low-level input current	V _{CC} = MAX, V _I = 0.5V			-0.1	mA
I _O	Output current ³	V _{CC} = MAX, V _O = 2.25V	-30		-112	mA
I _{CC}	Supply current (total)	V _{CC} = MAX		4.0	7.0	mA

NOTES:

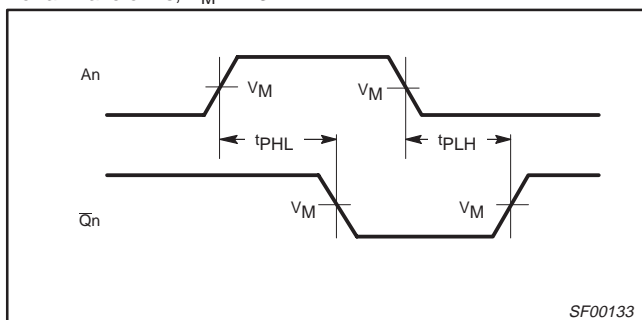
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3. The output conditions have been chosen to produce a current that closely approximate one half of the true short-circuit output current, I_{OS}.

AC ELECTRICAL CHARACTERISTICS

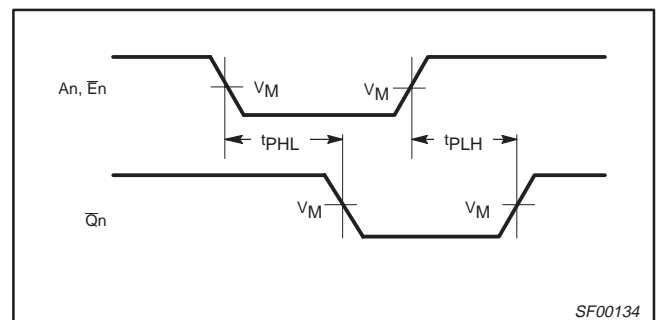
SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω		
			MIN	MAX	
t _{PLH} t _{PHL}	Propagation delay An to Q _n	Waveform 1, 2	3.0 3.0	10.0 12.0	ns
t _{PLH} t _{PHL}	Propagation delay E _n to Q _n	Waveform 2	3.0 3.0	8.0 8.0	ns

AC WAVEFORMS

For all waveforms, V_M = 1.3V.



Waveform 1. Propagation Delay for Inverting Outputs

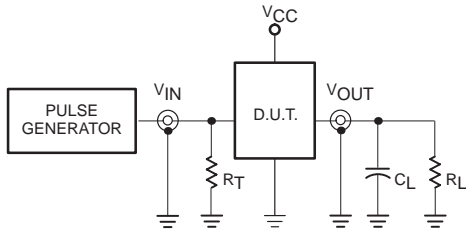


Waveform 2. Propagation Delay for Non-inverting Outputs

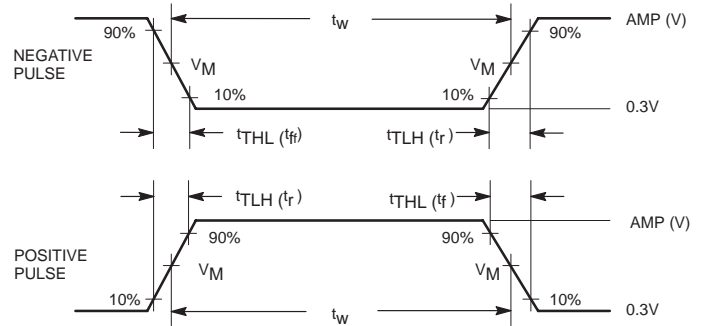
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TEST CIRCUIT AND WAVEFORMS



Test Circuit for Totem-pole Outputs



Input Pulse Definition

DEFINITIONS:

- R_L = Load resistor; see AC electrical characteristics for value.
- C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
- R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Family	INPUT PULSE REQUIREMENTS					
	Amplitude	V_M	Rep.Rate	t_w	t_{TLH}	t_{THL}
74ALS	3.5V	1.3V	1MHz	500ns	2.0ns	2.0ns

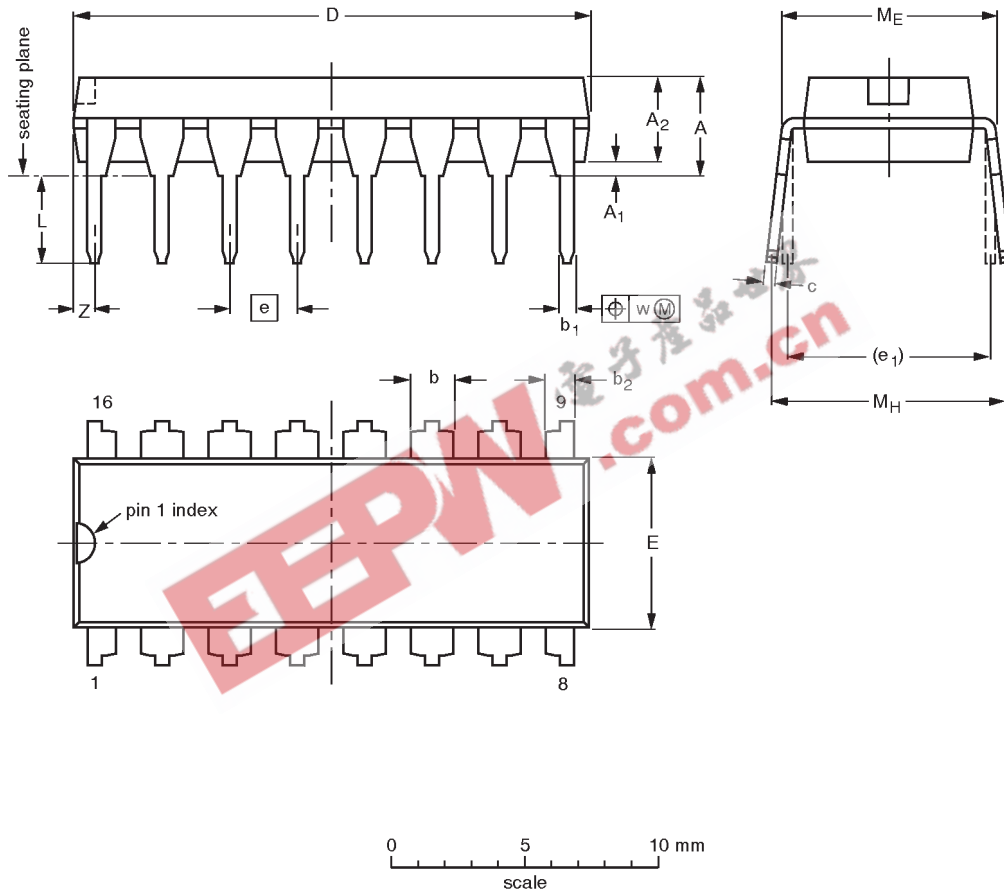
SC00005

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DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	b ₂	c	D ⁽¹⁾	E ⁽¹⁾	e	e ₁	L	M _E	M _H	w	z ⁽¹⁾ max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

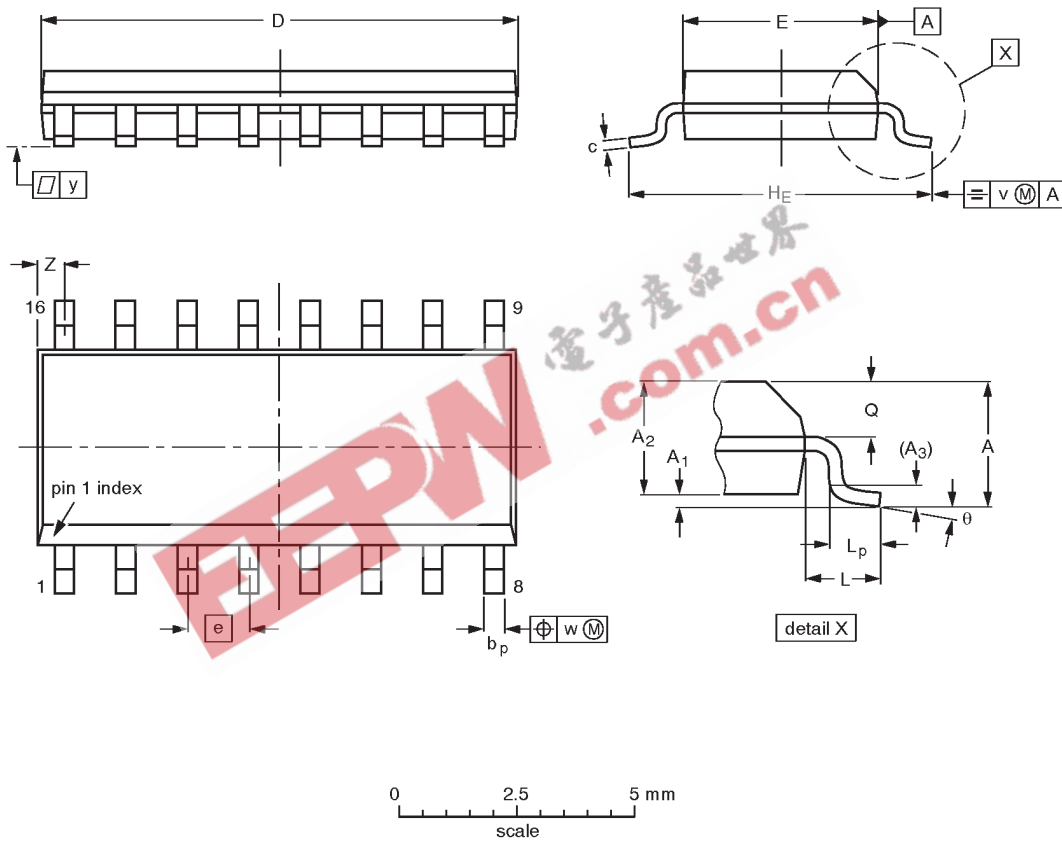
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

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

SOT109-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	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° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.39 0.38	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				91-08-13 95-01-23

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DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
<i>Preliminary Specification</i>	Preproduction Product	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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