DATA SHEET

74F154

1-of-16 decoder/demultiplexer

Product specification

1990 Jan 08

IC15 Data Handbook

Philips
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Decoder/demultiplexer

74F154

FEATURES

- 16-line demultiplexing capability
- Mutually exclusive outputs
- 2-input enable gate for strobing or expansion

DESCRIPTION

The 74F154 decoder accepts four active High binary address inputs and provides 16 mutually exclusive active Low outputs. The 2-input Enable ($\overline{E}0$, $\overline{E}1$) gate can be used to strobe the decoder to eliminate the normal decoding "glitches" on the outputs, or it can be used for expansion of the decoder. The enable gate has two AND'ed inputs which must be Low to enable the outputs.
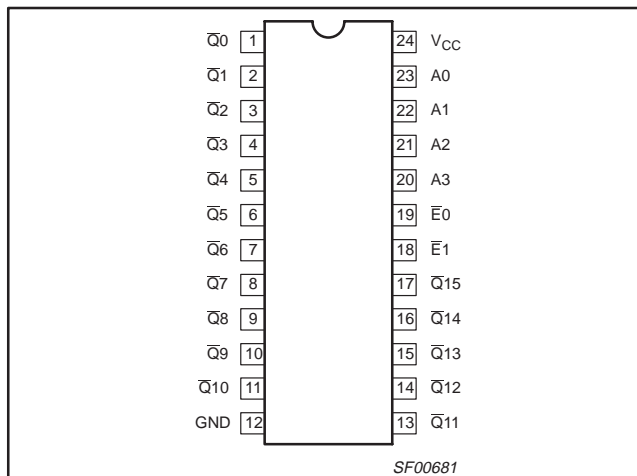
The 74F154 can be used as 1-of-16 demultiplexer by using one of the Enable inputs as the multiplexed data input. When the other Enable is Low, the addressed output will follow the state of the applied data.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F154	5.5 ns	26mA

ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C	PKG DWG #
24-pin plastic Slim DIP (300mil)	N74F154N	SOT222-1
24-pin plastic SOL	N74F154D	SOT137-1

PIN CONFIGURATION

$\overline{Q}0$	1	24	V_{CC}
$\overline{Q}1$	2	23	A0
$\overline{Q}2$	3	22	A1
$\overline{Q}3$	4	21	A2
$\overline{Q}4$	5	20	A3
$\overline{Q}5$	6	19	$\overline{E}0$
$\overline{Q}6$	7	18	$\overline{E}1$
$\overline{Q}7$	8	17	$\overline{Q}15$
$\overline{Q}8$	9	16	$\overline{Q}14$
$\overline{Q}9$	10	15	$\overline{Q}13$
$\overline{Q}10$	11	14	$\overline{Q}12$
GND	12	13	$\overline{Q}11$

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INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
A0 – A3	Data inputs	1.0/1.0	20µA/0.6mA
$\overline{E}0$, $\overline{E}1$	Enable inputs	1.0/1.0	20µA/0.6mA
$\overline{Q}0$ – $\overline{Q}15$	Data outputs	50/33	1.0mA/20mA

NOTE: One (1.0) FAST unit load is defined as: 20µA in the High state and 0.6mA in the Low state.
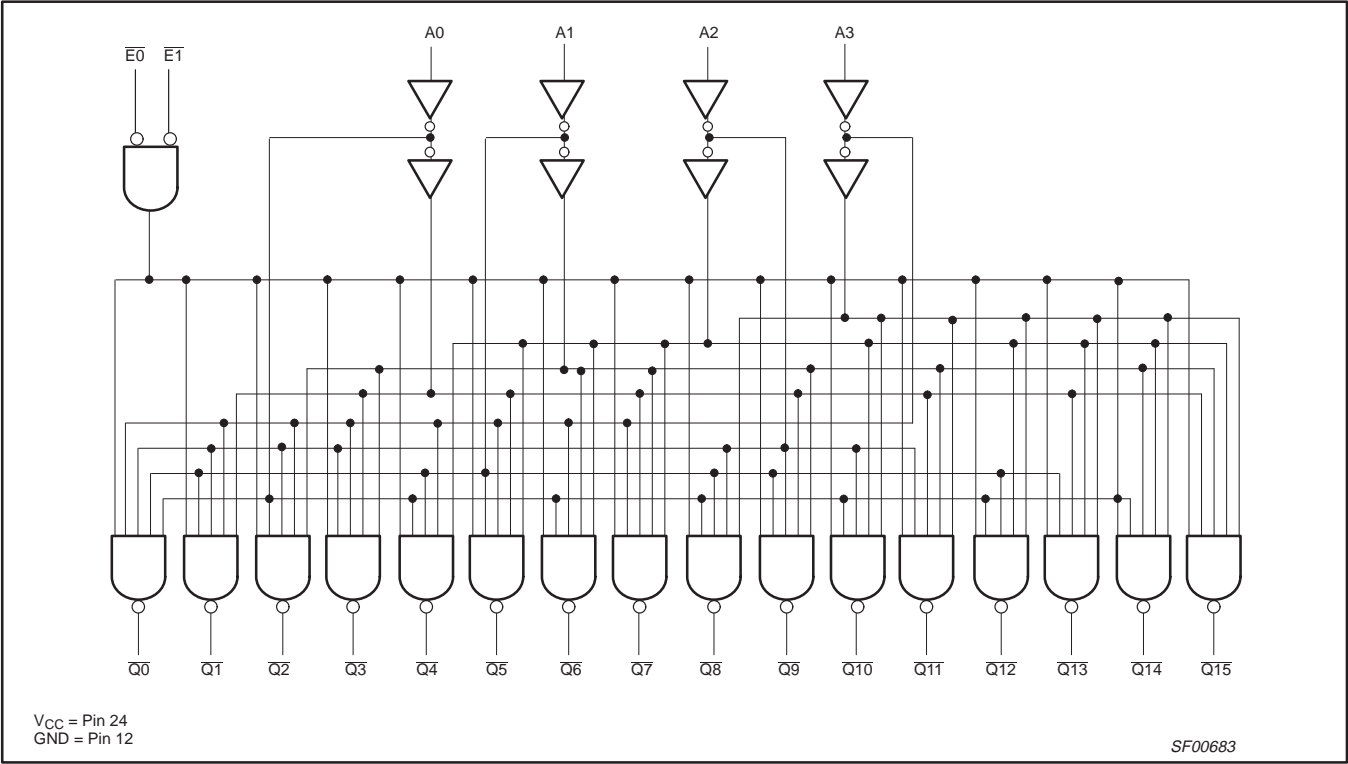
LOGIC SYMBOL

23 A0	Q0 1
22 A1	Q1 2
21 A2	Q2 3
20 A3	Q3 4
	Q4 5
	Q5 6
	Q6 7
	Q7 8
	Q8 9
	Q9 10
	Q10 11
	Q11 13
	Q12 14
	Q13 15
18 E1	Q14 16
19 E0	Q15 17

V_{CC}=Pin 24
GND=Pin 12

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LOGIC SYMBOL (IEEE/IEC)

DX

23 0	1
22	2
21 G $\frac{0}{16}$	3
20 3	4
	5
	6
	7
	8
	9
	10
	11
	13
	14
	15
18	16
19	17

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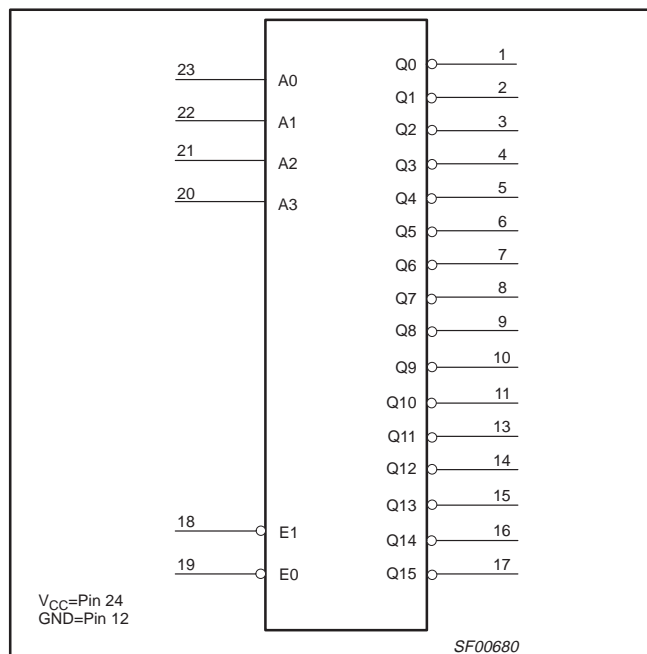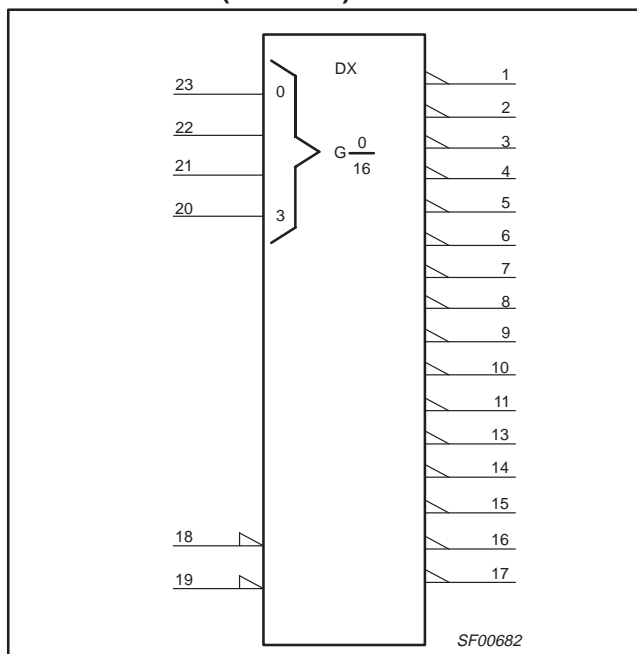
Decoder/demultiplexer

74F154

LOGIC DIAGRAM

V_{CC} = Pin 24
GND = Pin 12

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FUNCTION TABLE

INPUTS						OUTPUTS									OUTPUTS						
$\overline{E0}$	$\overline{E1}$	A0	A1	A2	A3	$\overline{Q0}$	$\overline{Q1}$	$\overline{Q2}$	$\overline{Q3}$	$\overline{Q4}$	$\overline{Q5}$	$\overline{Q6}$	$\overline{Q7}$	$\overline{Q8}$	$\overline{Q9}$	$\overline{Q10}$	$\overline{Q11}$	$\overline{Q12}$	$\overline{Q13}$	$\overline{Q14}$	$\overline{Q15}$
L	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	H	L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	L	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	L	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L

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

Decoder/demultiplexer

74F154

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits 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	40	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			−1	mA
I_{OL}	Low-level output current			20	mA
T_{amb}	Operating free-air temperature range	0		+70	°C

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} = MIN, V_{IL} = MAX	±10%V_{CC}	2.5			V
		V_{IH} = MIN, I_{OH} = MAX	±5%V_{CC}	2.7	3.4		
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = MAX	±10%V_{CC}		0.35	0.50	V
		V_{IH} = MIN, I_{OL} = MAX	±5%V_{CC}		0.35	0.50	
V_{IK}	Input clamp voltage	V_{CC} = MIN, I_I = I_{IK}			−0.73	−1.2	V
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 7.0V				100	μA
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				−0.6	mA
I_{OS}	Short-circuit output current[3]	V_{CC} = MAX		−60		−150	mA
I_{CC}	Supply current (total)	I_{CCH}	V_{CC} = MAX		26	40	mA
		I_{CCL}	V_{CC} = MAX		35	45	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. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.
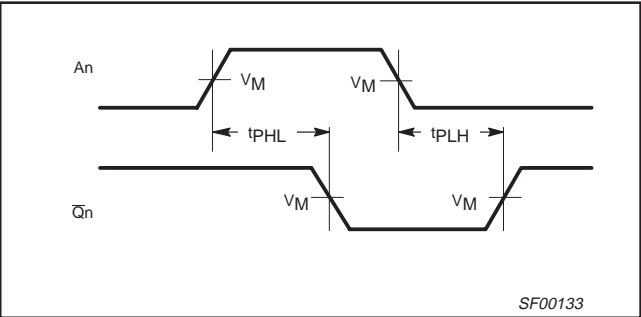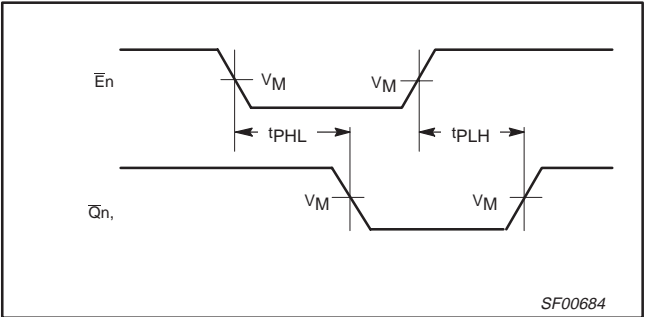
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	V_{CC} = +5.0V T_{amb} = +25°C C_L = 50pF, R_L = 500Ω			V_{CC} = +5.0V $\pm$ 10% T_{amb} = 0°C to +70°C C_L = 50pF, R_L = 500Ω		UNIT
			MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay An to $\overline{Q}$n	Waveform 1	2.0 3.5	5.0 6.5	9.5 10.0	1.5 3.0	10.5 10.5	ns
t_{PLH} t_{PHL}	Propagation delay $\overline{E}$n to Qn	Waveform 2	2.0 4.0	4.0 6.0	7.5 9.0	1.5 3.5	8.0 9.5	ns

AC WAVEFORMS

For all waveforms, V_M = 1.5V.
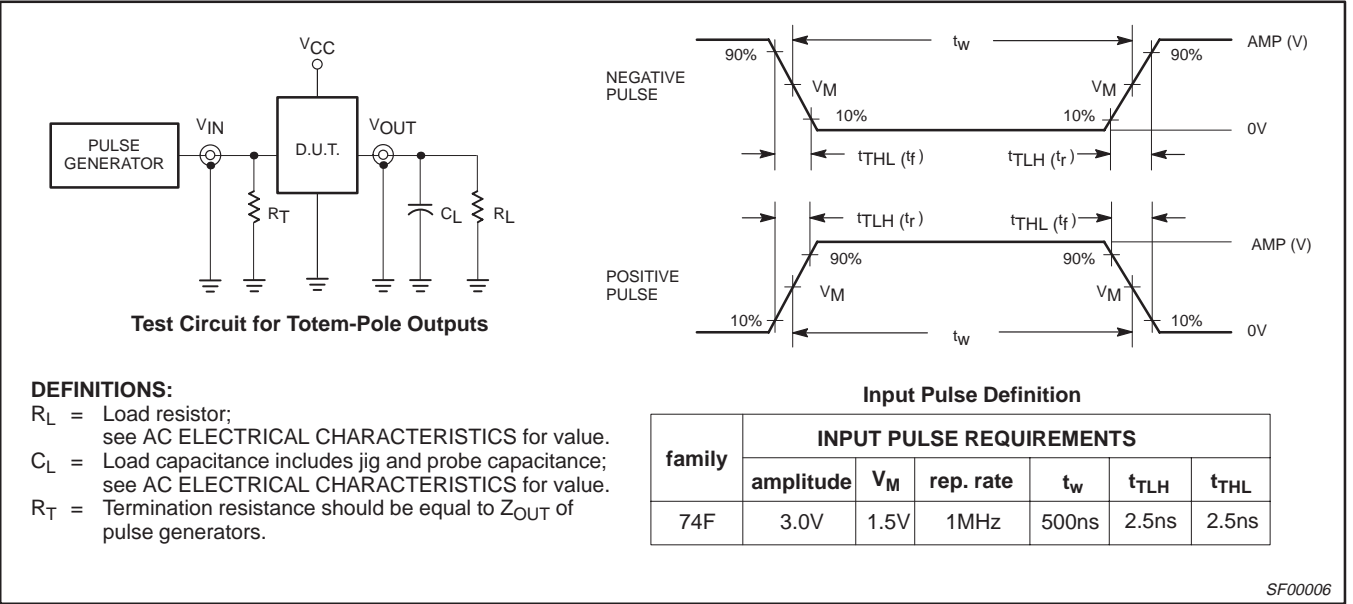
Waveform 1.   Propagation Delay for Address to Output

Waveform 2.   Propagation Delay for Enable to Output
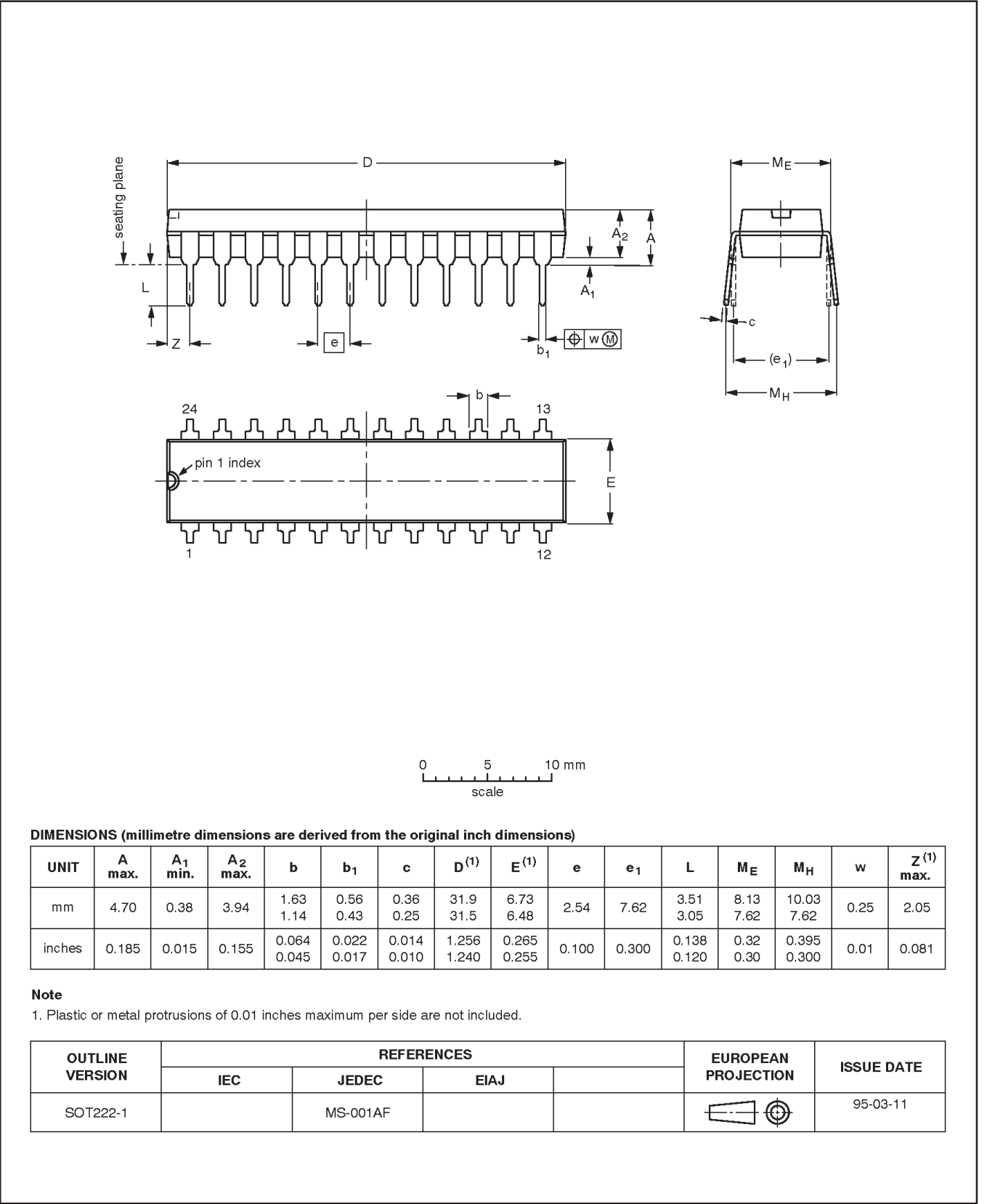
TEST CIRCUIT AND WAVEFORMS

Test Circuit for Totem-Pole Outputs

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.

Input Pulse Definition

family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

1-of-16 decoder/demultiplexer

74F153

DIP24:   plastic dual in-line package; 24 leads (300 mil)

SOT222-1

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

UNIT	A max.	A₁ min.	A₂ max.	b	b₁	c	D[1]	E[1]	e	e₁	L	M_E	M_H	w	Z[1] max.
mm	4.70	0.38	3.94	1.63 1.14	0.56 0.43	0.36 0.25	31.9 31.5	6.73 6.48	2.54	7.62	3.51 3.05	8.13 7.62	10.03 7.62	0.25	2.05
inches	0.185	0.015	0.155	0.064 0.045	0.022 0.017	0.014 0.010	1.256 1.240	0.265 0.255	0.100	0.300	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.081

Note

1. Plastic or metal protrusions of 0.01 inches maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT222-1		MS-001AF				95-03-11

1-of-16 decoder/demultiplexer

74F153

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1
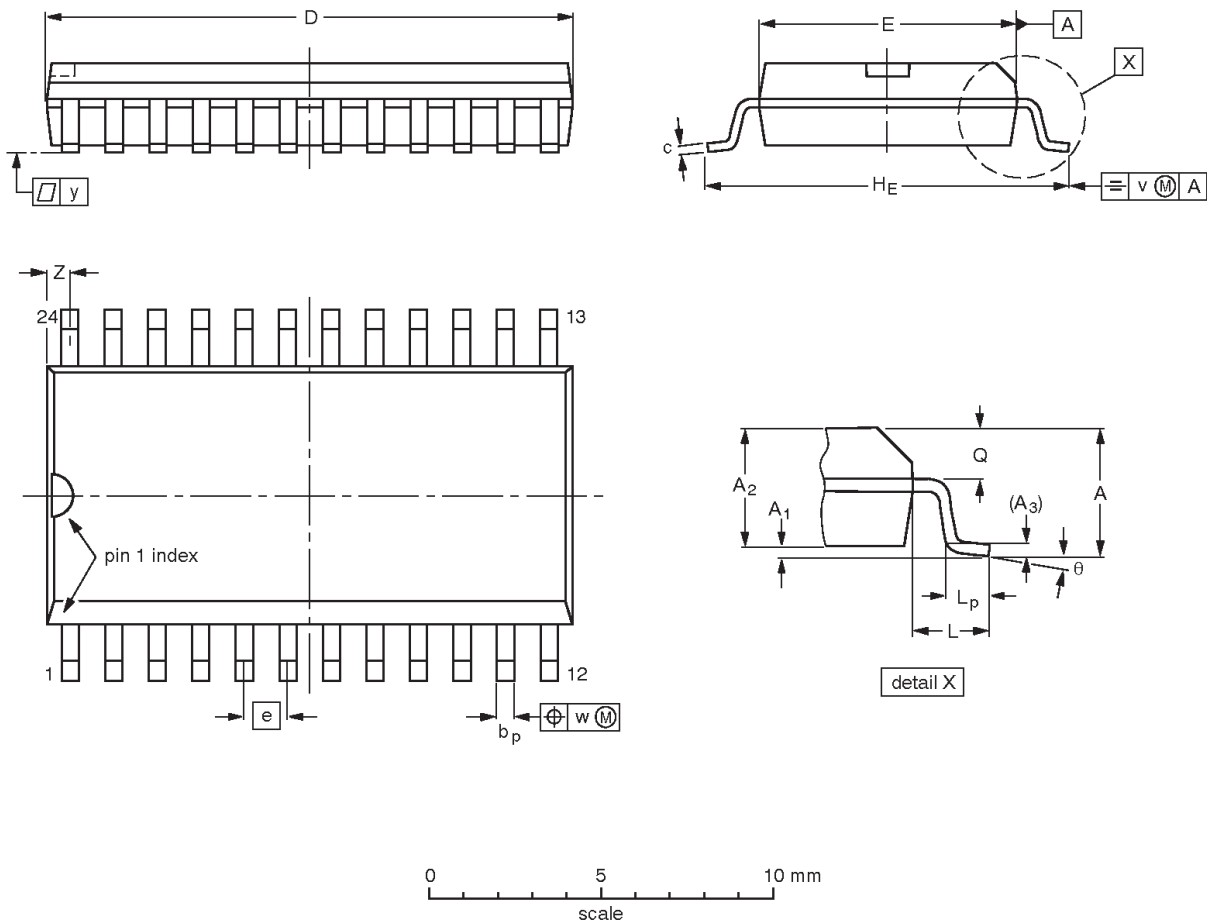
DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D(1)	E(1)	e	H_E	L	Lₚ	Q	v	w	y	Z(1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

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			
SOT137-1	075E05	MS-013AD				~~95-01-24~~ 97-05-22

Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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