DATA SHEET

74F657

Octal transceiver with 8-bit parit generator/checker

Process specification

1990 Jul 30

IC15 Data Handbook

Philips
Semiconductors

PHILIPS

Octal transceiver with 8-bit parity generator/checker 74F657

FEATURES

- Combines 74F245 and 74F280A functions in one package
- High impedance base input for reduced loading (70µA in high and low states)
- Ideal in applications where high output drive and light bus loading are required (I_{IL} is 70µA vs FAST std of 600µA)
- 3–state buffer outputs sink 64mA and source 15mA
- Input diodes for termination effects
- 24–pin plastic slim DIP (300mil) package
- Industrial temperature range available (–40°C to +85°C)

DESCRIPTION

The 74F657 is an octal transceiver featuring non–inverting buffers with 3–state outputs and an 8–bit parity generator/checker, and is intended for bus–oriented applications. The buffers have a guaranteed current sinking capability of 24mA at the A ports and 64mA at the B ports. The transmit/receive (T/$\overline{R}$) input determines the direction of the data flow through the bidirectional transceivers. Transmit (active high) enables data from A ports to B ports; receive (active low) enables data from B ports to A ports. The output enable ($\overline{OE}$) input disables both the A and B ports by placing them in a high impedance condition when the $\overline{OE}$ input is high.

The parity select (ODD/$\overline{EVEN}$) input gives the user the option of odd or even parity systems.

The parity (PARITY) pin is an output from the generator/checker when transmitting from the port A to B (T/$\overline{R}$ = high) and an input when receiving from port B to A port (T/$\overline{R}$ = low).

When transmitting (T/$\overline{R}$ = high) the parity select (ODD/$\overline{EVEN}$) input is set, then the A port data is polled to determined the number of high bits. The parity (PARITY) output then goes to the logic state determined by the parity select (ODD/$\overline{EVEN}$) setting and by the number of high bits on port A.

For example, if the parity select (ODD/$\overline{EVEN}$) is set low (even parity), and the number of high bits on port A is odd, then the parity (PARITY) output will be high, transmitting even parity. If the number of high bits on port A is even, then the parity (PARITY) output will be low, keeping even parity.

When in receive mode (T/$\overline{R}$ = low) the B port is polled to determine the number of high bits. If parity select (ODD/$\overline{EVEN}$) is low (even parity) and the number of highs on port B is:

(1) odd and the parity (PARITY) input is high, then $\overline{ERROR}$ will be high, significantly no error.

(2) even and the parity (PARITY) input is high, then $\overline{ERROR}$ will be asserted low, indicating an error.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT(TOTAL)
74F657	8.0ns	100mA

ORDERING INFORMATION

DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C	INDUSTRIAL RANGE V_{CC} = 5V ±10%, T_{amb} = –40°C to +85°C	
24–pin plastic slim DIP (300mil)	N74F657N	I74F657N	SOT222-1
24–pin plastic SOL	N74F657D	I74F657D	SOT137-1
24–pin plastic SSOP	N74F657DB	I74F657DB	SOT340-1

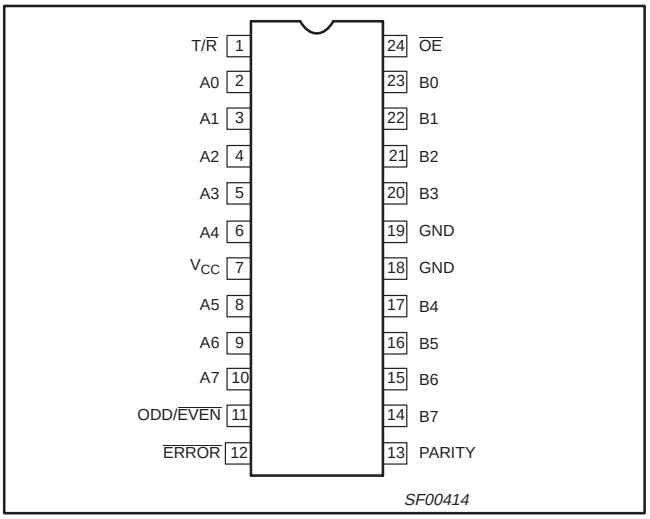
INPUT AND OUTPUT LOADING AND FAN OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
A0 – A7	A ports 3–state inputs	3.5/0.117	70µA/70µA
B0 – B7	B ports 3–state inputs	3.5/0.117	70µA/70µA
PARITY	Parity input	3.5/0.117	70µA/70µA
T/$\overline{R}$	Transmit/receive input	2.0/0.066	40µA/40µA
ODD/$\overline{EVEN}$	Parity select input	1.0/0.033	20µA/20µA
$\overline{OE}$	Output enable input (active low)	2.0/0.066	40µA/40µA
A0 – A7	A ports 3–state outputs	150/40	3.0mA/24mA
B0 – B7	B ports 3–state outputs	750/106.7	15mA/64mA
PARITY	Parity output	750/106.7	15mA/64mA
$\overline{ERROR}$	Error output	750/106.7	15mA/64mA

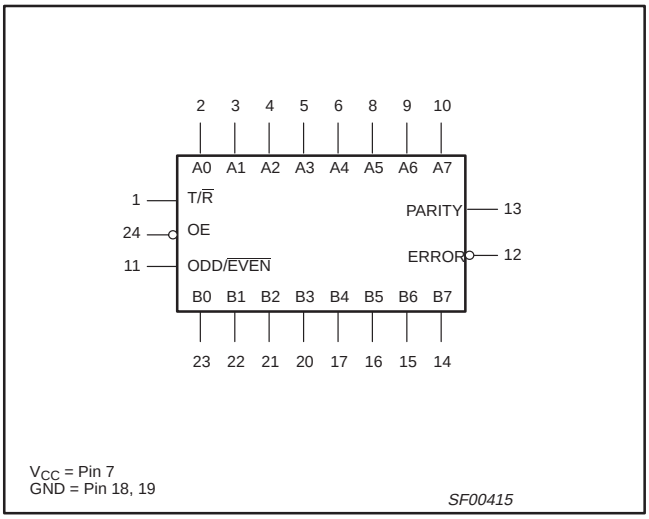
Note to input and output loading and fan out table

1. One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.

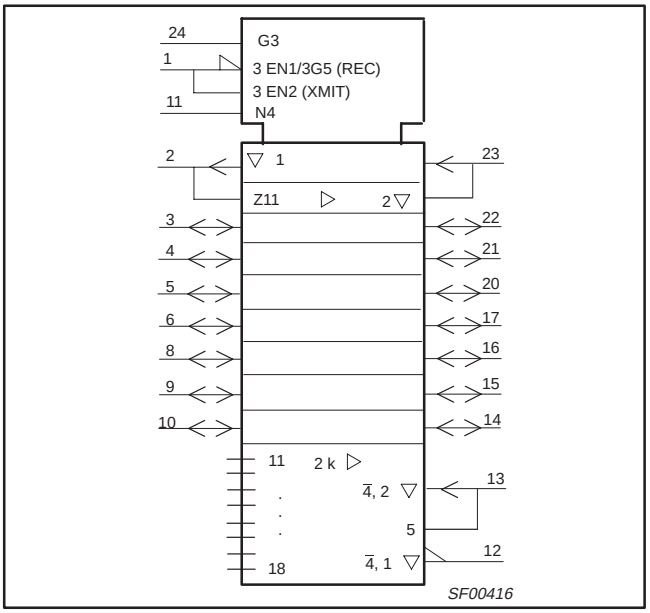
PIN CONFIGURATION



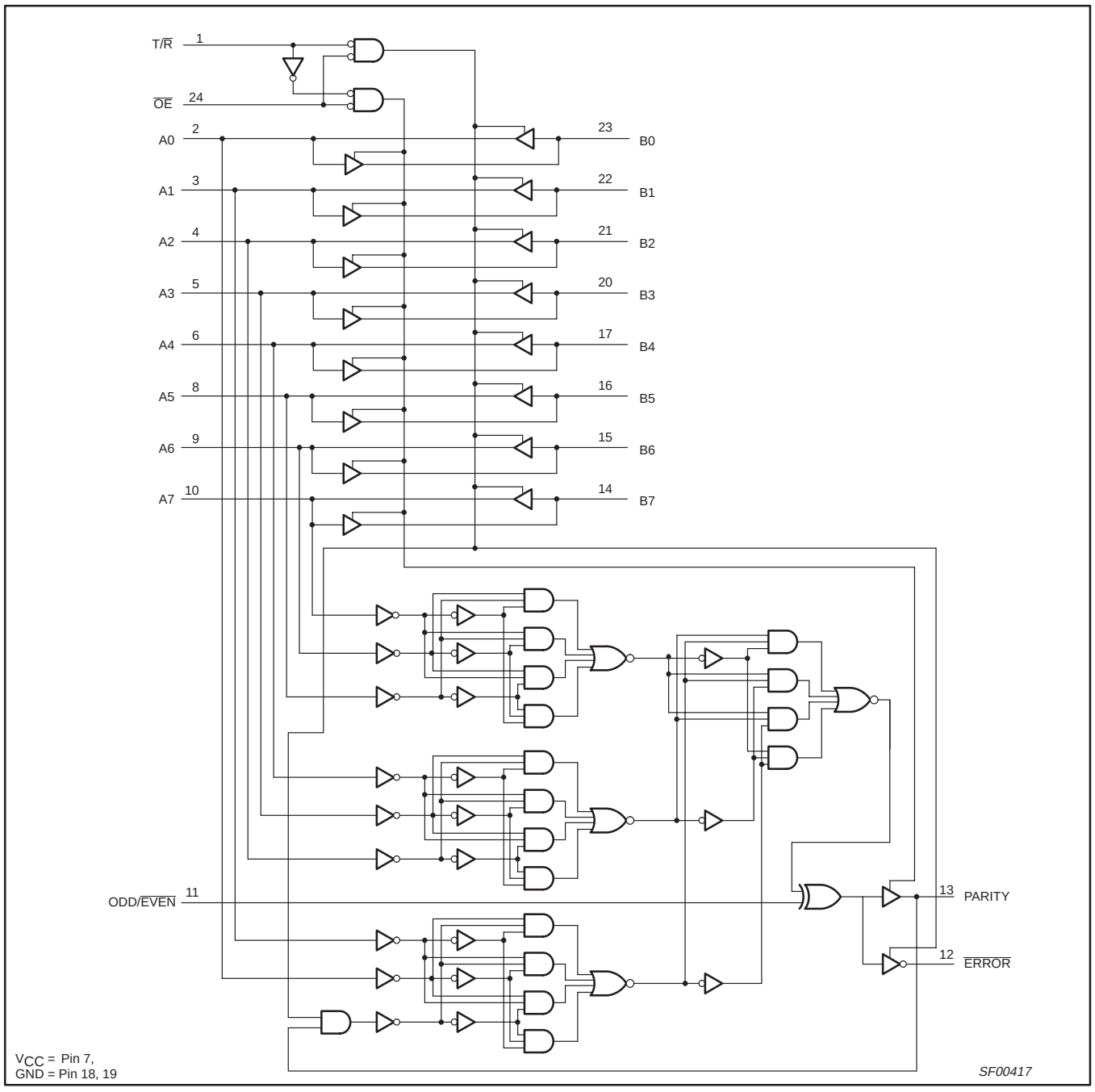
LOGIC SYMBOL



IEC/IEEE SYMBOL



LOGIC DIAGRAM



FUNCTION TABLE

NUMBER OF INPUTS THAT ARE HIGH	INPUTS			INPUT/OUTPUT	OUTPUTS	
	$\overline{OE}$	T/$\overline{R}$	ODD/$\overline{EVEN}$	PARITY	$\overline{ERROR}$	OUTPUTS MODE
0, 2, 4, 6, 8	L	H	H	H	Z	Transmit
	L	H	L	L	Z	Transmit
	L	L	H	H	H	Receive
	L	L	H	L	L	Receive
	L	L	L	H	L	Receive
	L	L	L	L	H	Receive
1, 3, 5, 7	L	H	H	L	Z	Transmit
	L	H	L	H	Z	Transmit
	L	L	H	H	L	Receive
	L	L	H	L	H	Receive
	L	L	L	H	H	Receive
	L	L	L	L	L	Receive
Don't care	H	X	X	Z	Z	Z

Notes to function table
1. H = High voltage level
2. L = Low voltage level
3. X = Don't care
4. Z = High impedance "'off" state

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	A0 – A7	48	mA
		B0 – B7, PARITY, $\overline{ERROR}$	128	mA
T_{amb}	Operating free air temperature range	Commercial range	0 to +70	°C
		Industrial range	–40 to +85	°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	A0 – A7			–3	mA
		B0 – B7, PARITY, $\overline{ERROR}$			–15	mA
I_{OL}	Low–level output current	A0 – A7			24	mA
		B0 – B7, PARITY, $\overline{ERROR}$			64	mA
T_{amb}	Operating free air temperature range	Commercial range	0		+70	°C
		Industrial range	–40		+85	°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	All outputs	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OH} = –3mA[4,5]	±10%V_{CC}	2.4			V
					±5%V_{CC}	2.7			V
		B0 – B7, PARITY, $\overline{ERROR}$		I_{OH} = –12mA[5]	±10%V_{CC}	2.0			V
					±5%V_{CC}	2.0			V
				I_{OH} = –15mA[4]	±10%V_{CC}	2.0			V
					±5%V_{CC}	2.0			V
V_{OL}	Low-level output voltage	A0 – A7	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OL} = 24mA[4,5]	±10%V_{CC}		0.35	0.50	V
					±5%V_{CC}		0.35	0.50	V
		B0 – B7, PARITY, $\overline{ERROR}$		I_{OL} = 48mA[4]	±10%V_{CC}		0.38	0.55	V
				I_{OL} = 48mA[5]	±5%V_{CC}		0.42	0.55	V
				I_{OL} = 64mA[4]	±5%V_{CC}		0.42	0.55	V
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	$\overline{OE}$, T/$\overline{R}$, ODD/$\overline{EVEN}$	V_{CC} = 0.0V, V_I = 7.0V					100	µA
		A0 – A7	V_{CC} = 5.5V, V_I = 5.5V					2	mA
		B0 – B7						1	mA
I_{IH}	High–level input current	OOD/$\overline{EVEN}$	V_{CC} = MAX, V_I = 2.7V					20[4]	µA
								40[5]	µA
		$\overline{OE}$, T/$\overline{R}$						40[4]	µA
								80[5]	µA
I_{IL}	Low–level input current	OOD/$\overline{EVEN}$	V_{CC} = MAX, V_I = 0.5V					–20	µA
		$\overline{OE}$, T/$\overline{R}$						–40	µA
I_{OZH} + I_{IH}	Off–state output current, high–level voltage applied	A0 – A7, B0 – B7, PARITY	V_{CC} = MAX, V_O = 2.7V					70	µA
I_{OZL} + I_{IL}	Off–state output current, low–level voltage applied		V_{CC} = MAX, V_O = 0.5V					–70	µA
I_{OZH}	Off–state output current, High–level voltage applied	$\overline{ERROR}$	V_{CC} = MAX, V_O = 2.7V					50	µA
I_{OZL}	Off–state output current, low–level voltage applied		V_{CC} = MAX, V_O = 0.5V					–50	µA
I_{OS}	Short circuit output current[3]	A0 – A7	V_{CC} = MAX			-60		-150	mA
		B0 – B7				-100		-225	mA
I_{CC}	Supply current (total)	I_{CCH}	V_{CC} = MAX				90	125[4]	mA
							90	135[5]	mA
		I_{CCL}					106	150[4]	mA
							106	160[5]	mA
		I_{CCZ}					98	145	mA

Notes to DC electrical characteristics

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.
4. For commercial range.
5. For industrial range.

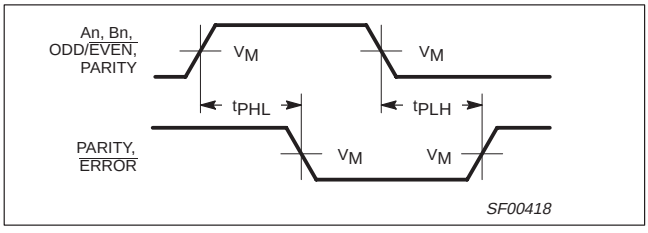
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS							UNIT
			T_{amb} = +25°C V_{CC} = +5.0V C_L = 50pF, R_L = 500Ω			T_{amb} = 0°C to +70°C V_{CC} = +5.0V ± 10% C_L = 50pF, R_L = 500Ω		T_{amb} = –40°C to +85°C V_{CC} = +5.0V ± 10% C_L = 50pF, R_L = 500Ω		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay An to Bn or Bn to An	Waveform 2	2.5 3.0	5.5 6.0	7.5 7.5	2.5 3.0	8.0 8.0	2.0 2.5	9.0 9.0	ns
t_{PLH} t_{PHL}	Propagation delay An to PARITY	Waveform 1, 2	7.0 7.0	10.0 10.0	14.0 15.0	7.0 7.0	16.0 16.0	5.5 6.5	16.5 19.0	ns
t_{PLH} t_{PHL}	Propagation delay ODD/$\overline{EVEN}$ to PARITY, $\overline{ERROR}$	Waveform 1, 2	4.5 4.5	7.5 8.0	11.0 11.5	4.5 4.5	12.0 12.5	3.5 4.0	13.0 15.5	ns
t_{PLH} t_{PHL}	Propagation delay Bn to $\overline{ERROR}$	Waveform 1, 2	8.0 8.0	14.0 14.0	20.5 20.5	7.5 7.5	22.5 22.5	7.5 7.5	24.5 25.0	ns
t_{PLH} t_{PHL}	Propagation delay PARITY to $\overline{ERROR}$	Waveform 1, 2	8.0 8.0	11.5 12.0	15.5 15.5	7.5 8.0	16.5 17.0	6.5 6.5	18.5 20.0	ns
t_{PZH} t_{PZL}	Output enable time[1] to high or low level	Waveform 3, 4	3.0 4.0	5.5 7.0	8.0 9.5	3.0 4.0	9.0 11.0	2.0 4.0	9.0 13.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level	Waveform 3, 4	2.0 2.0	4.5 4.0	7.5 6.0	2.0 2.0	8.0 6.5	1.0 1.0	8.0 7.5	ns

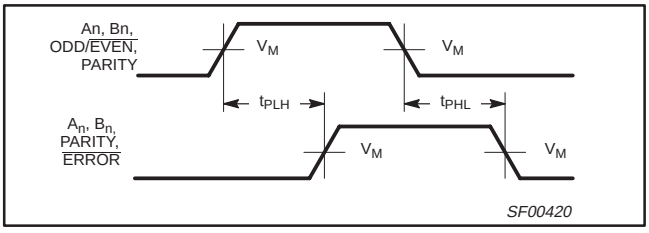
Note to AC electrical characteristics

1. These delay times reflect the 3-state recovery time only and not the signal through the buffers or the parity check circuitry. To assure VALID information at the $\overline{ERROR}$ pin, time must be allowed for the signal to propagate through the drivers (B to A), through the parity check circuitry (same as A to PARITY), and to the $\overline{ERROR}$ output. VALID data at the $\overline{ERROR}$ pin ≥ (B to A) + (A to PARITY).

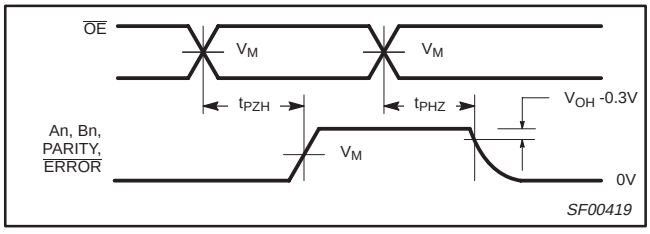
AC WAVEFORMS



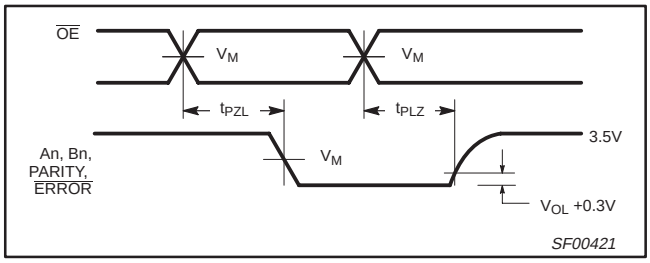
Waveform 1. Propagation delay for inverting outputs



Waveform 2. Propagation delay for non-Inverting outputs



Waveform 3. 3-state output enable time to high level and output disable time from high level

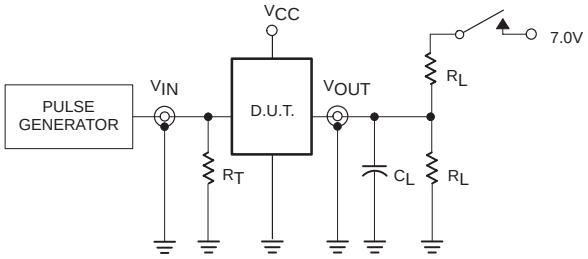


Waveform 4. 3-state output enable time to low level and output disable time from low level

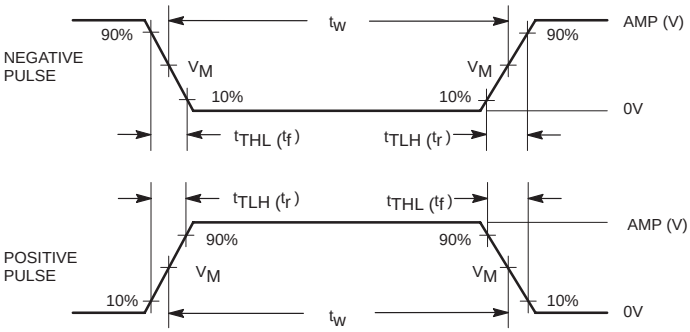
Note to AC waveforms

1. For all waveforms, V_M = 1.5V.

TEST CIRCUIT AND WAVEFORMS



Test Circuit for Open Collector Outputs



Input Pulse Definition

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

DEFINITIONS:

R_L = Load resistor; see AC electrical characteristics for value.

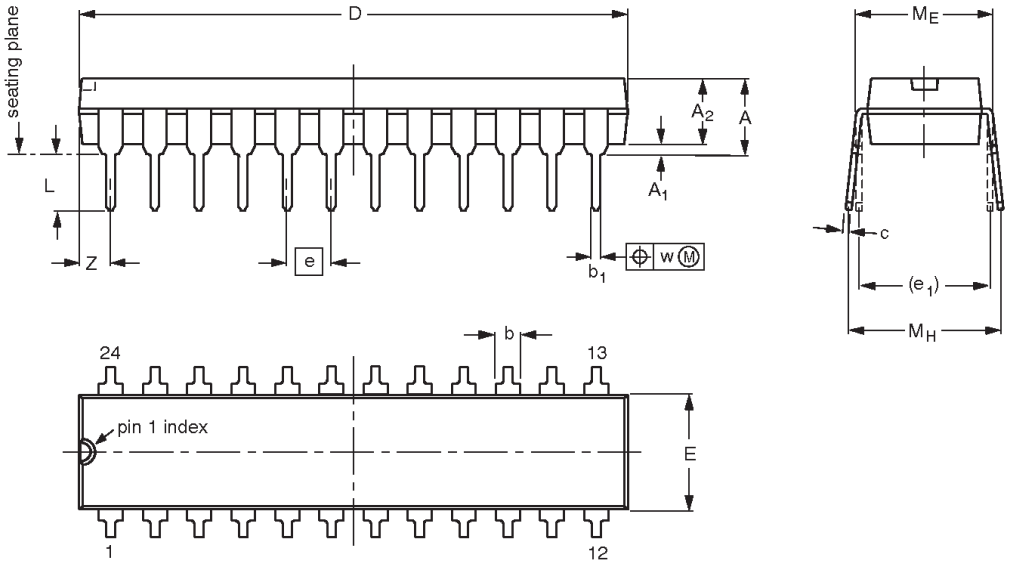
C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.

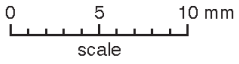
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

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

SF00128

DIP24: plastic dual in-line package; 24 leads (300 mil) **SOT222-1**





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

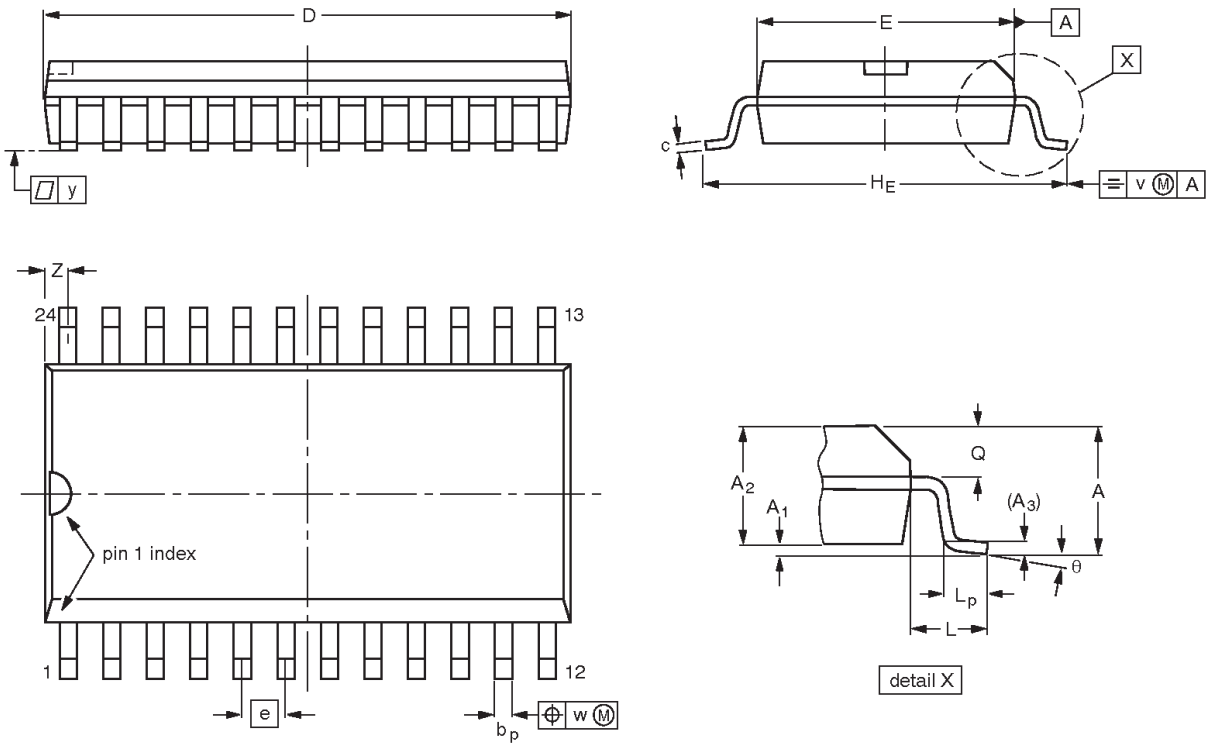
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.70	0.38	3.94	1.63 1.14	0.56 0.43	0.36 0.25	31.9 31.5	6.73 6.48	2.54	7.62	3.51 3.05	8.13 7.62	10.03 7.62	0.25	2.05
inches	0.185	0.015	0.155	0.064 0.045	0.022 0.017	0.014 0.010	1.256 1.240	0.265 0.255	0.100	0.300	0.138 0.120	0.32 0.30	0.395 0.300	0.01	0.081

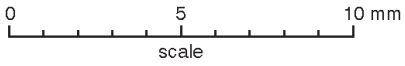
Note

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

SO24: plastic small outline package; 24 leads; body width 7.5 mm **SOT137-1**





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

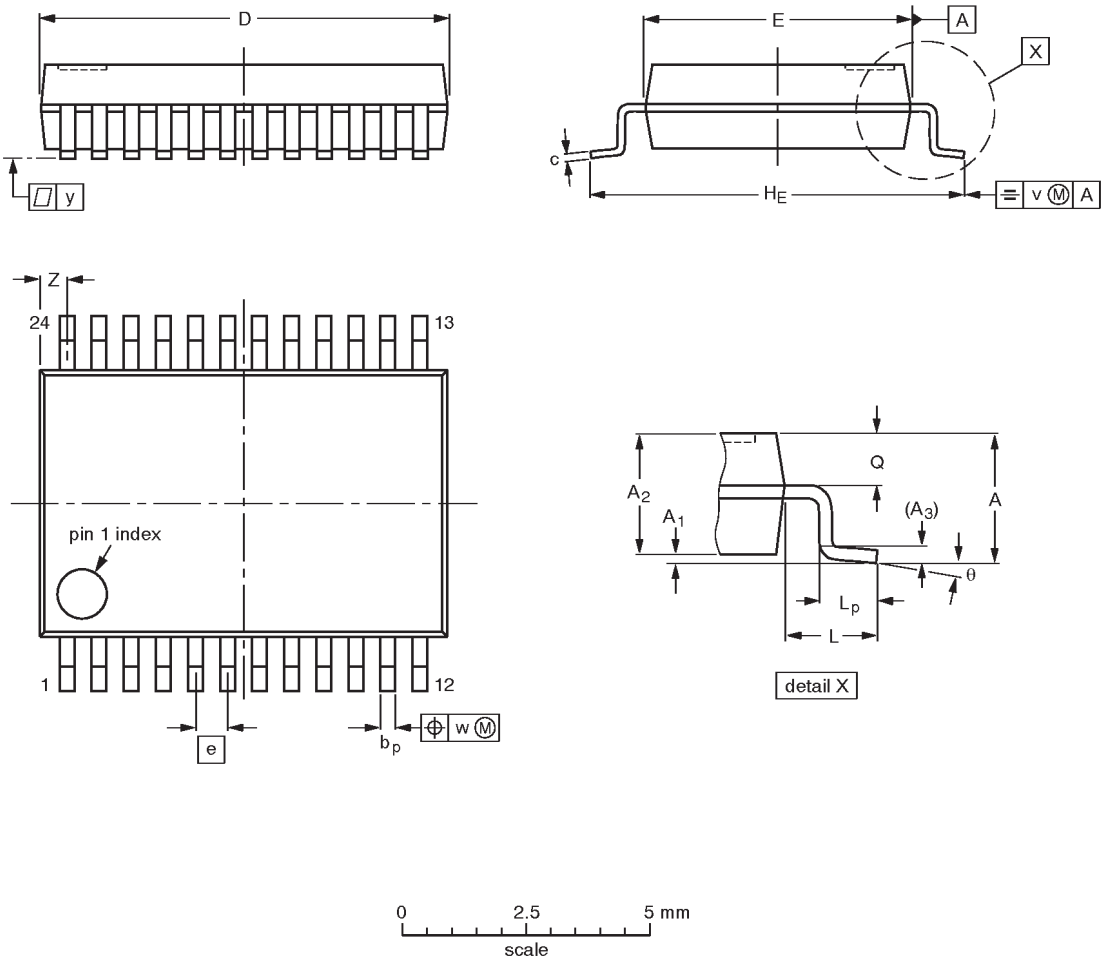
UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	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

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm **SOT340-1**



DIMENSIONS (mm are the original 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	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	8.4 8.0	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	0.8 0.4	8° 0°

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT340-1		MO-150AG				~~93-09-08~~ 95-02-04

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.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make chages at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088–3409
Telephone 800-234-7381

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