DATA SHEET

74F5302
Fiber optic dual LED/clock driver

Product specification

1990 Jul 24

IC15 Data Handbook

Philips
Semiconductors

PHILIPS

Fiber optic dual LED/clock driver 74F5302

FEATURES

- TTL inputs
- Output enable control
- High current source and sink capability
- Matched propagation delay times (t_{PLH}, t_{PHL})
- Symmetrical rise and fall times
- ESD protection greater than 2000 volts
- Single +5V supply
- Surface mount package

APPLICATIONS

- High speed serial data communication
- Fiber optic data links
- Local area and metropolitan area networks
- Digital Television
- PBX systems

ASSOCIATED PRODUCTS

- NE5210/11/12 transimpedance amplifiers
- NE5214/5217 postamplifiers with link status indicator
- 74F5300 fiber optic LED driver

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT(TOTAL)
74F5302	2.5ns	8mA

ORDERING INFORMATION

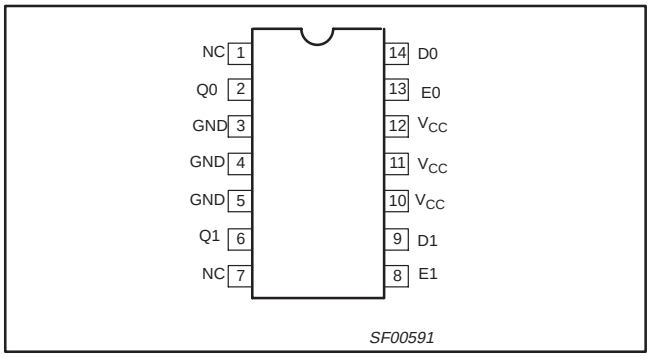
DESCRIPTION	ORDER CODE	PKG DWG #
	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C	
14–pin plastic DIP	N74F5302N	SOT27-1
14–pin plastic SO	N74F5302D	SOT108-1

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

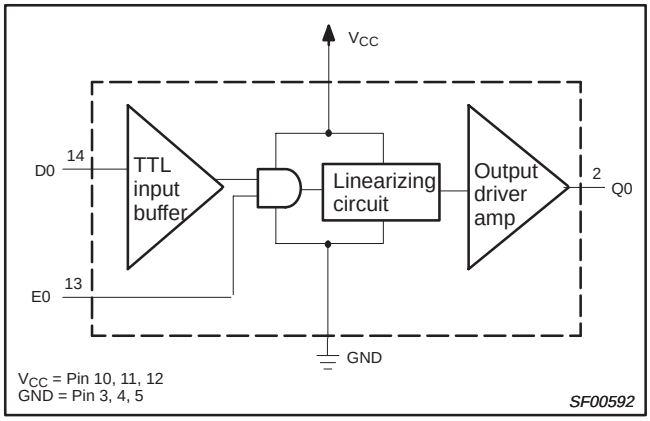
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Dn	Data inputs	1.0/1.0	20µA/0.6mA
En	Enable inputs	1.0/1.0	20µA/0.6mA
Qn	Current driver output	8000/266.6	160mA/160mA

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

PIN CONFIGURATION



LOGIC DIAGRAM (ONE DRIVER)



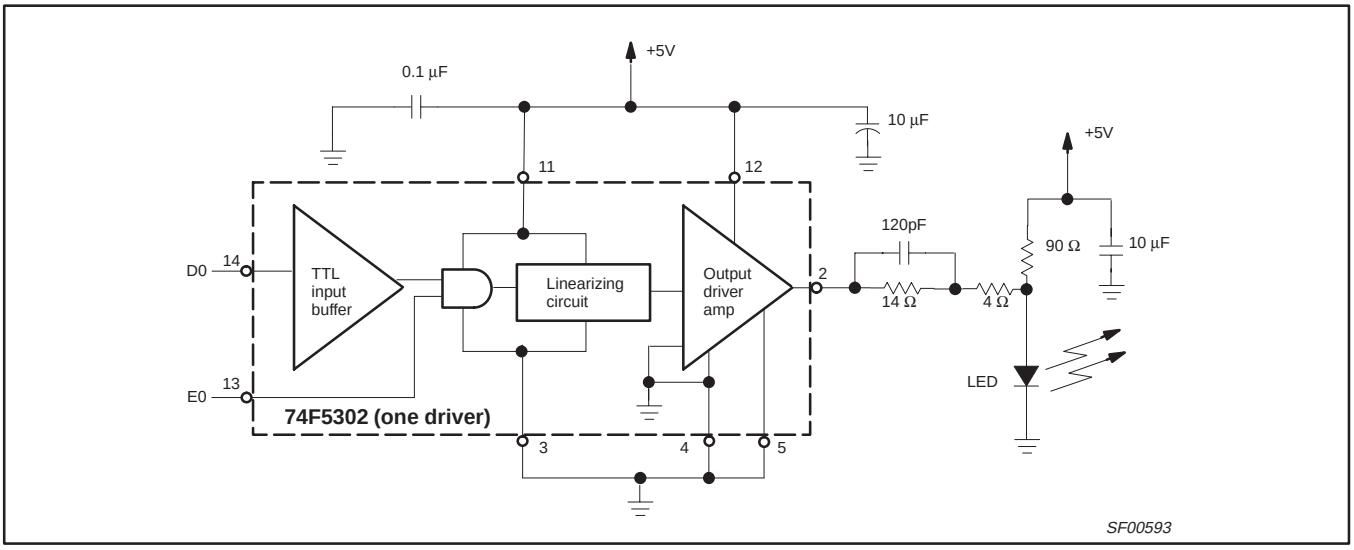
DESCRIPTION

The 74F5302 is a dual LED/clock driver designed for use in fiber optic links. The 74F5302 is ideally suited for use in high speed optical high transmitter systems. It is also ideal for use as a clock driver.

The TTL input buffer accepts TTL data. The linearizing circuits ensures a constant propagation delay for t_{PLH} and t_{PHL}, and controls the rise and fall times. The output driver amplifier is capable of sourcing more than 160mA and sinking more than 160mA at low impedances. The high current output driver has been designed to deal with transmission line effects of high speed switching systems with fast rising and falling edges. The performance of the system can be enhanced by matching impedance at the output for proper termination. It exhibits closely matched propagation delays (t_{PLH} and t_{PHL}) and symmetrical rise and fall times. The resulting optical waveform has minimal duty cycle distortion (DCD). When used with the external pre–bias and pre–charging circuits, the response can be tailored to a specific LED to eliminate any overshoot and to minimize the long fall response.

Additionally, this part can be used as the transmitter in a complete fiber optic system when combined with any of the NE5210/5211/5212 preamplifiers and NE5214/5217 postamplifiers for the optical receiver. Please refer to applications note AN1121 in the Philips Semiconductors Fiber Optic Communication Data Book for more specific applications information.

APPLICATION FOR 50Mb/s OPTICAL TRANSMITTER



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	240	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			T_A = –40 to +85°C
		MIN	NOM	MAX	UNIT
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			–160	mA
I_{OL}	Low–level output current			160	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, V_{IH} = MIN	I_{OH} = –80mA	±10%V_{CC}	2.5			V
					±5%V_{CC}	2.8	3.3	3.9	V
					V_{CC} = 5V	3.0	3.3	3.6	V
				I_{OH} = –160mA	±10%V_{CC}	2.0			V
V_{OL}	Low-level output voltage		V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OL} = 100mA	±10%V_{CC}		0.42	0.55	V
				I_{OL} = 120mA	±10%V_{CC}		0.45	0.60	V
				I_{OL} = 160mA	±10%V_{CC}		0.55	0.80	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		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_{CC}	Supply current (total)	I_{CCH}	V_{CC} = MAX				5.0	12	mA
		I_{CCL}	V_{CC} = MAX				18	25	mA

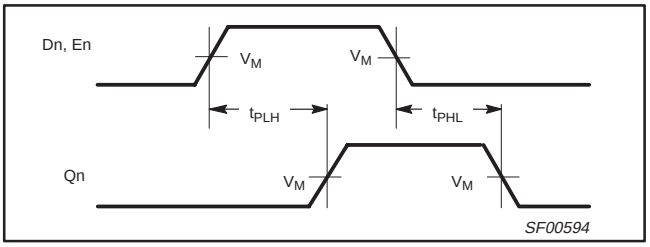
NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3. The device is not short circuit protected.

AC ELECTRICAL CHARACTERISTICS

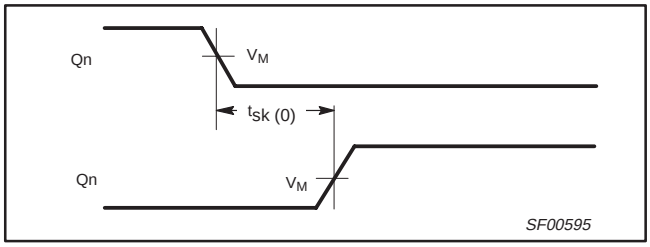
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			T_{amb} = +25°C, V_{CC} = +5.0V, C_L = 50pF, R_L = 100Ω			T_{amb} = 0°C to +70°C, V_{CC} = +5.0V ± 10%, C_L = 50pF, R_L = 100Ω		
			MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay Dn, En, to Qn	Waveform 1	1.0 1.0	2.0 2.5	4.5 5.0	1.0 1.0	4.5 5.0	ns
D_{tpw}	Pulse width distortion[1]	Frequency = 10MHz		0.8	1.2		1.8	ns
t_{RFS}	Rise and fall time skew[3, 4]			0.3	1.5		2.0	ns
$t_{sk\ (0)}$	Output skew[2, 4]	Waveform 2		0.9	1.3		1.6	ns
t_{THL} t_{TLH}	Fall time 90% to 10% Rise time 10% to 90%	Test circuits and Waveforms	1.0 1.0	1.5 1.8	3.0 3.0	0.5 0.5	4.0 4.5	ns

NOTES:
1. D_{tpw} is defined as the difference between input pulse width and output pulse width (0 to 3 volt swing and 50% duty cycle).
2. | t_{PN} actual – t_{PM} actual| for any output compared to any other output where N and M are either LH or HL.
3. | t_{TLH} actual – t_{THL} actual|.
4. Skew times are valid only under same test conditions (temperature, V_{CC}, loading, etc.,).

AC WAVEFORMS



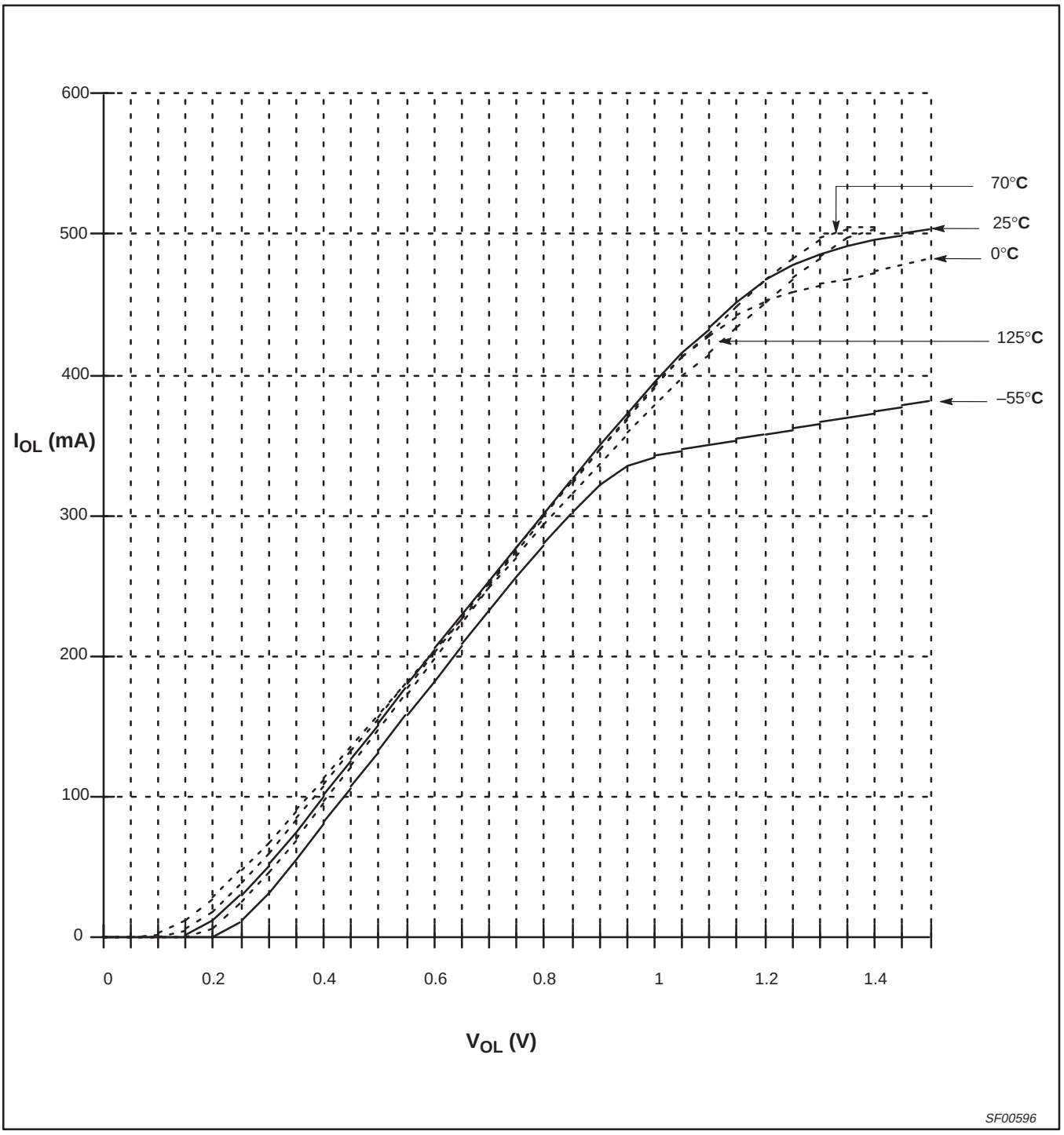
Waveform 1. Propagation delay for input to output



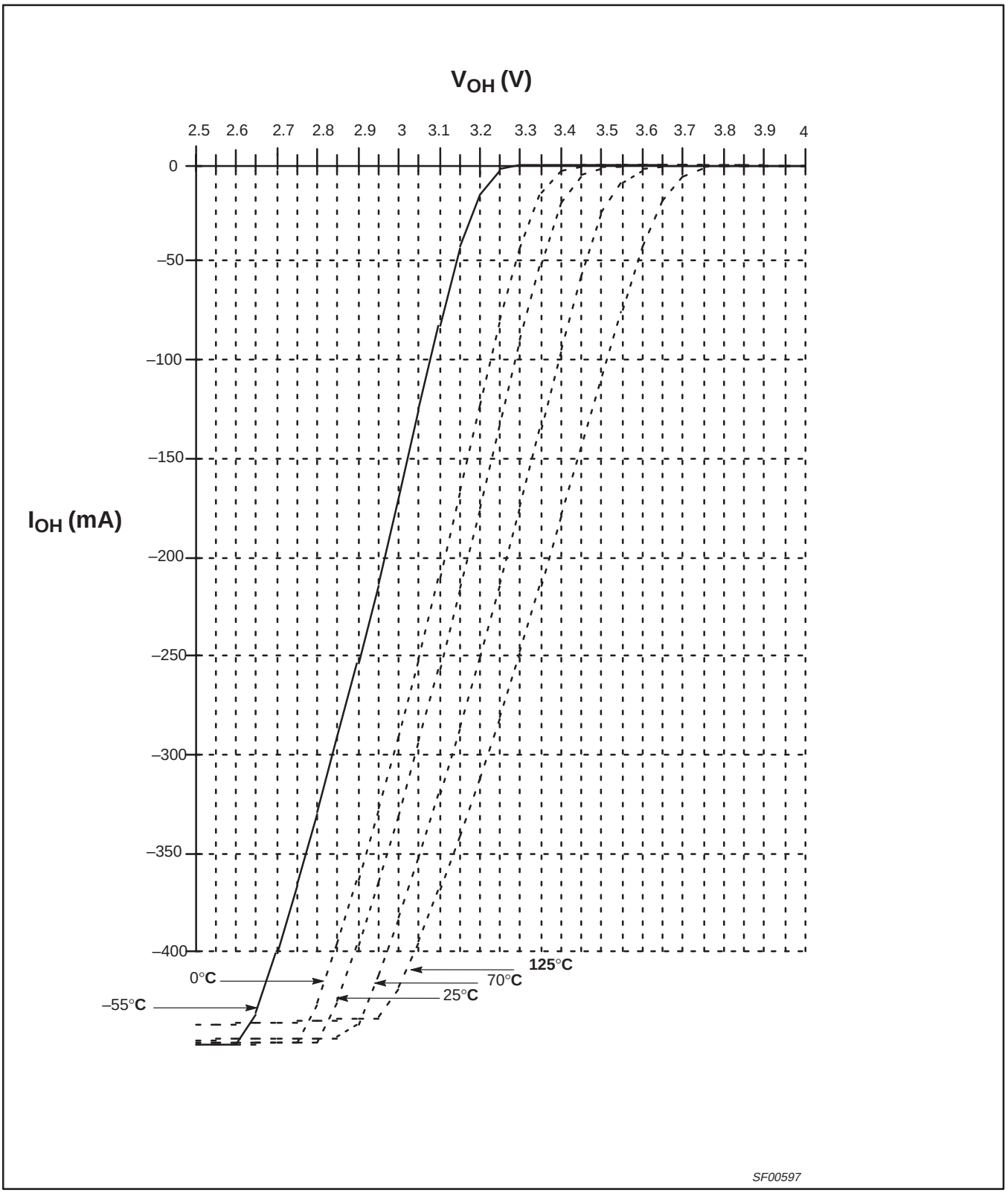
Waveform 2. Output skew

NOTE: For all waveforms, V_M = 1.5V.

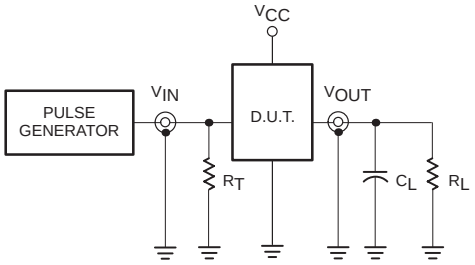
TYPICAL (V_{CC} = 5.0V) V_{OL} VERSUS I_{OL} FOR VARIOUS TEMPERATURES



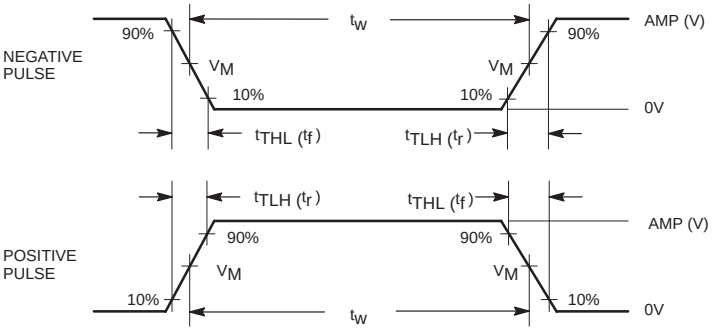
TYPICAL (V_{CC} = 5.0V) V_{OH} VERSUS I_{OH} FOR VARIOUS TEMPERATURES



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.

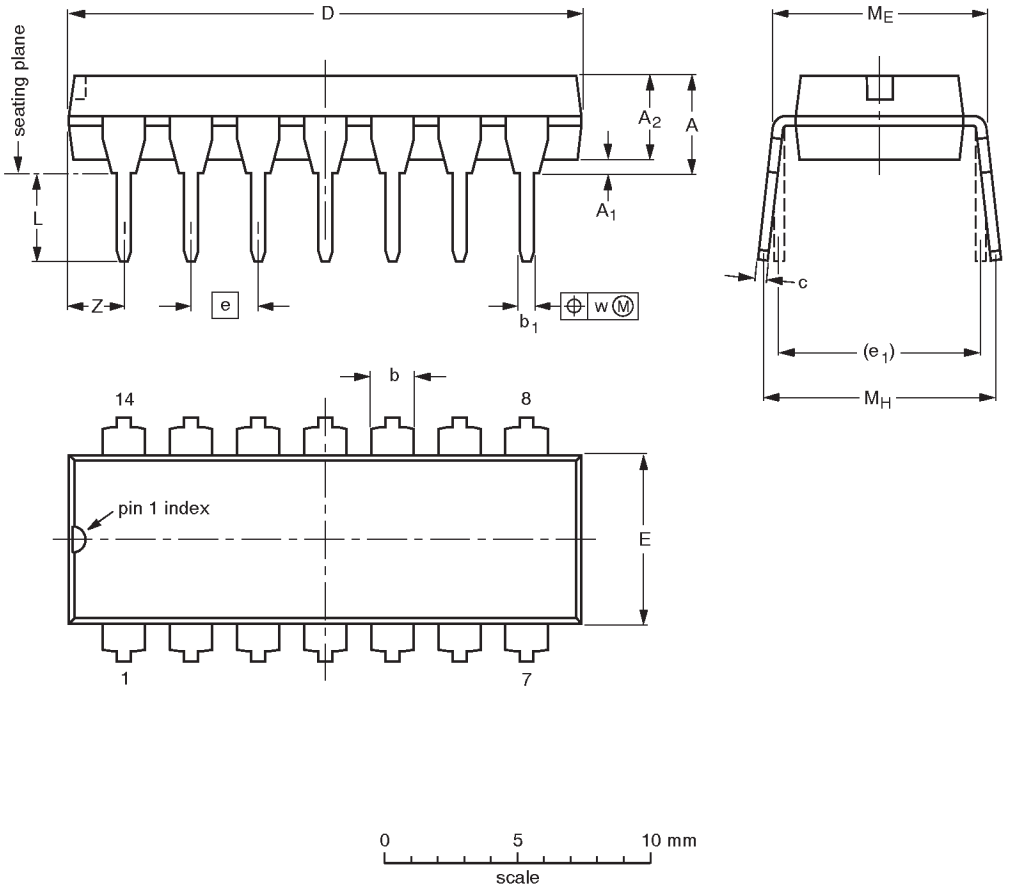
R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

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

SF00006

DIP14: plastic dual in-line package; 14 leads (300 mil) **SOT27-1**



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

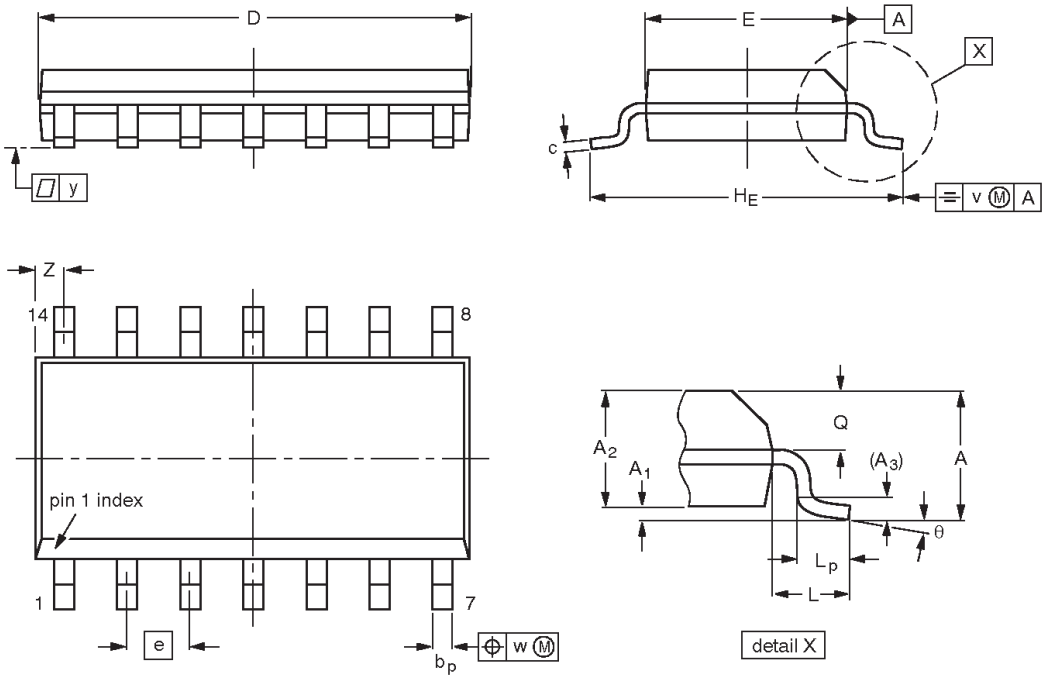
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

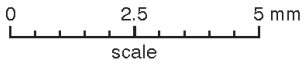
Note

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			
SOT27-1	050G04	MO-001AA				~~92-11-17~~ 95-03-11

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**





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	8.75 8.55	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^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	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			
SOT108-1	076E06S	MS-012AB				~~95-01-23~~ 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.
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.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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print code Date of release: 10-98

Document order number: 9397-750-05209

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