

# DATA SHEET

**74F5300**

Fiber optic LED driver

Product specification

1989 Dec 13

IC15 Data Handbook

# Fiber optic LED driver

# 74F5300

## 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)
74F5300	2.5ns	8mA

## ORDERING INFORMATION

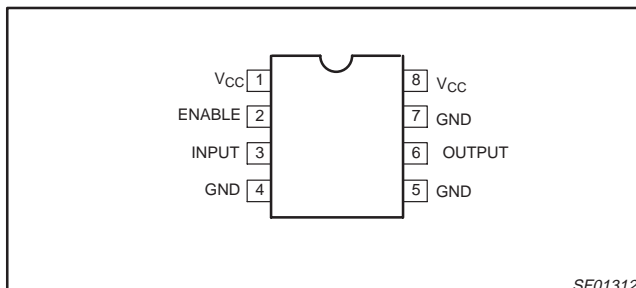
DESCRIPTION	ORDER CODE	DWG. PKG. #
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$	
8-pin plastic DIP	N74F5300N	SOT97-1
8-pin plastic SO	N74F5300D	SOT96-1

## INPUT AND OUTPUT LOADING AND FAN OUT TABLE

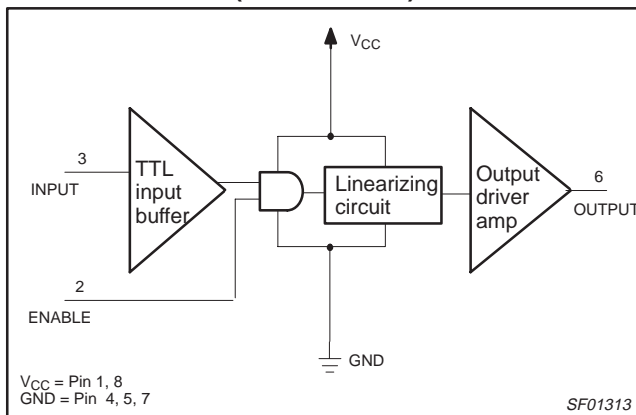
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Input	Data input	1.0/1.0	20 $\mu$ A/0.6mA
Enable	Enable input	1.0/1.0	20 $\mu$ A/0.6mA
Output	Current driver output	8000/266.6	160mA/160m

**NOTE:** One (1.0) FAST unit load is defined as: 20 $\mu$ A in the high state and 0.6mA in the low state.

## PIN CONFIGURATION



## LOGIC DIAGRAM (ONE DRIVER)



## DESCRIPTION

The 74F5300 is a LED driver designed for use in fiber optic links. The 74F5300 is ideally suited for use in high speed optical high transmitter systems.

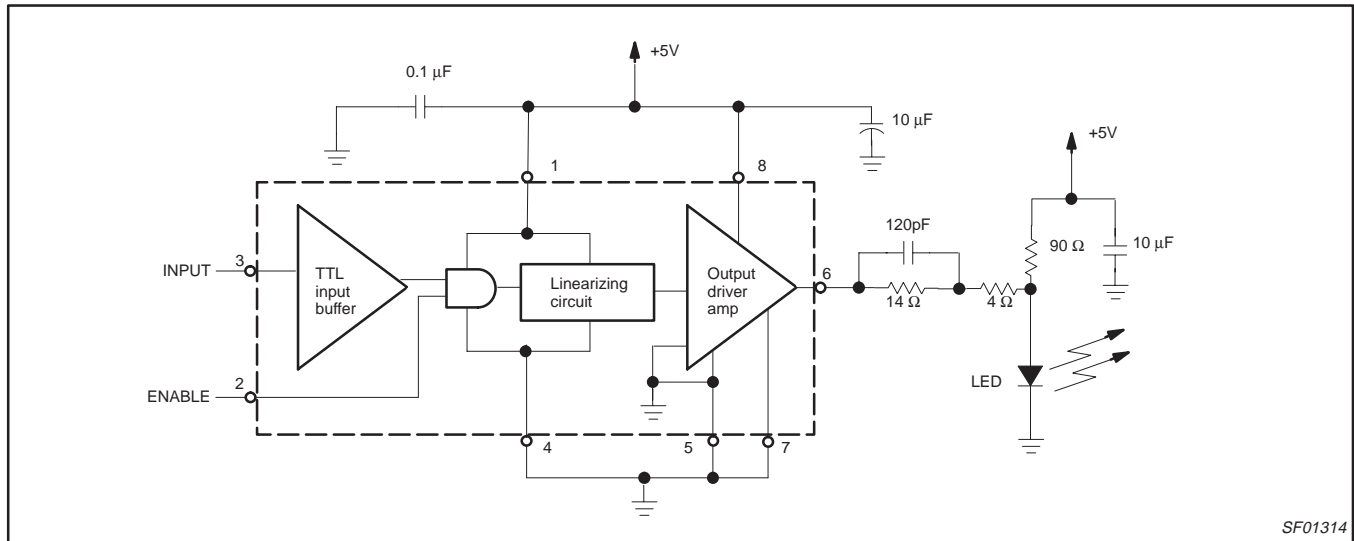
The TTL input buffer accepts TTL data. A logic high on the enable pin enables the buffer to drive the output driver amplifier. The linearizing circuits ensures a constant propagation delay for  $t_{PLH}$  and  $t_{PHL}$ , and controls the rise and fall times. The output driver amplifier is capable of 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.

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## 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 <sub>CC</sub>	Supply voltage	-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in high output state	-0.5 to V <sub>CC</sub>	V
I <sub>OUT</sub>	Current applied to output in low output state	240	mA
T <sub>amb</sub>	Operating free air temperature range	0 to +70	°C
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			T <sub>A</sub> = -40 to +85°C
		MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>Ik</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	High-level output current			-160	mA
I <sub>OL</sub>	Low-level output current			160	mA
T <sub>amb</sub>	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 <sup>1</sup>			LIMITS			UNIT	
					MIN	TYP <sup>2</sup>	MAX		
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>IH</sub> = MIN	I <sub>OH</sub> = -80mA	±10%V <sub>CC</sub>	2.5			V	
				±5%V <sub>CC</sub>	2.8	3.3	3.9	V	
				V <sub>CC</sub> = 5V	3.0	3.3	3.6	V	
			I <sub>OH</sub> = -160mA	±10%V <sub>CC</sub>	2.0			V	
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>IH</sub> = MIN	I <sub>OL</sub> = 100mA	±10%V <sub>CC</sub>		0.42	0.55	V	
			I <sub>OL</sub> = 120mA	±10%V <sub>CC</sub>		0.45	0.60	V	
			I <sub>OL</sub> = 160mA	±10%V <sub>CC</sub>		0.55	0.80	V	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>				-0.73	-1.2	V	
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V					100	μA	
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V					20	μA	
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V					-0.6	mA	
I <sub>CC</sub>	Supply current (total)	I <sub>CCH</sub>	V <sub>CC</sub> = MAX				4.0	12	mA
		I <sub>CCL</sub>	V <sub>CC</sub> = MAX				10.5	22	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<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
3. The device is not short circuit protected.

## AC ELECTRICAL CHARACTERISTICS

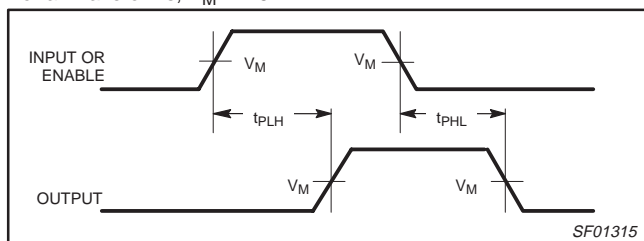
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			T <sub>amb</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50pF, R <sub>L</sub> = 100Ω			T <sub>amb</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 100Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Input or Enable to Output	Waveform 1	1.0 1.0	2.5 2.5	5.0 5.0	1.0 1.0	5.0 5.0	ns
D <sub>tpw</sub>	Pulse width distortion <sup>1</sup>	Frequency = 10MHz		0.8	1.2		1.8	ns
t <sub>PS</sub>	Propagation delay skew <sup>2, 4</sup>	Waveform 2		0.7	1.2		1.3	ns
t <sub>RFS</sub>	Rise and fall time skew <sup>3, 4</sup>			0.6	1.5		1.5	ns
t <sub>THL</sub> t <sub>TLH</sub>	Fall time 90% to 10% Rise time 10% to 90%	Test circuits and Waveforms	0.5 1.0	1.4 2.0	3.5 4.0	0.5 1.0	4.0 4.5	ns

**NOTES:**

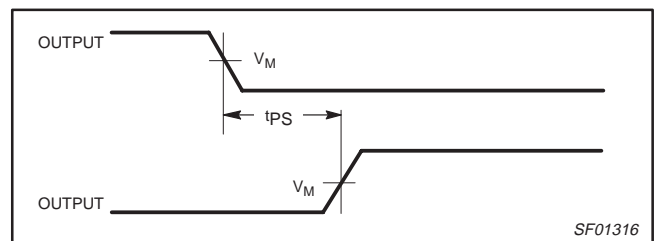
1. D<sub>tpw</sub> is defined as the difference between input pulse width and output pulse width (0 to 3 volt swing and 50% duty cycle).
2. |t<sub>PLH</sub> actual - t<sub>PHL</sub> actual|.
3. |t<sub>TLH</sub> actual - t<sub>THL</sub> actual|.
4. Skew times are valid only under same test conditions (temperature, V<sub>CC</sub>, loading, etc.).

## AC WAVEFORMS

For all waveforms, V<sub>M</sub> = 1.5V.



Waveform 1. Propagation delay for input to output

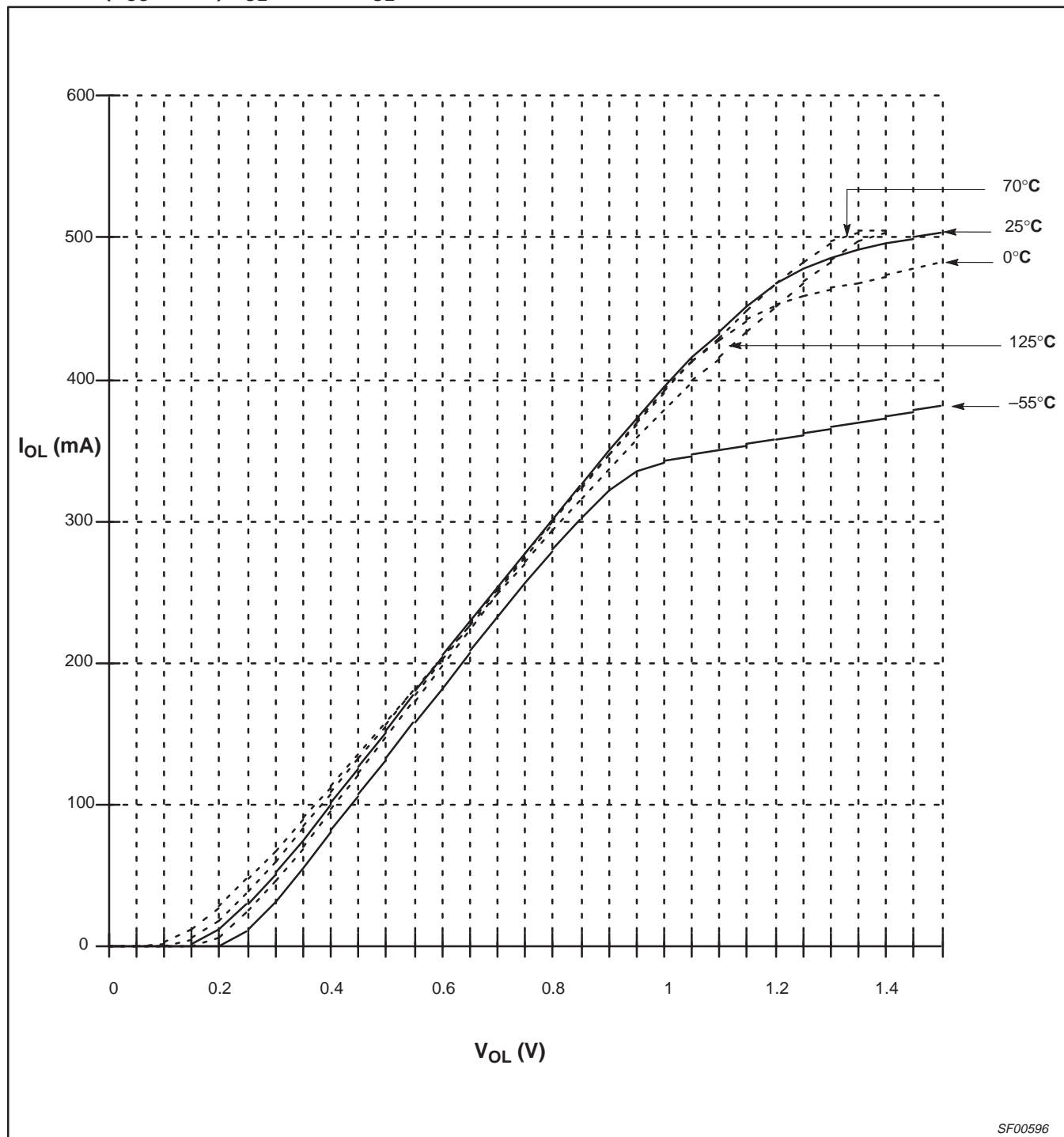


Waveform 2. Propagation delay skew

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

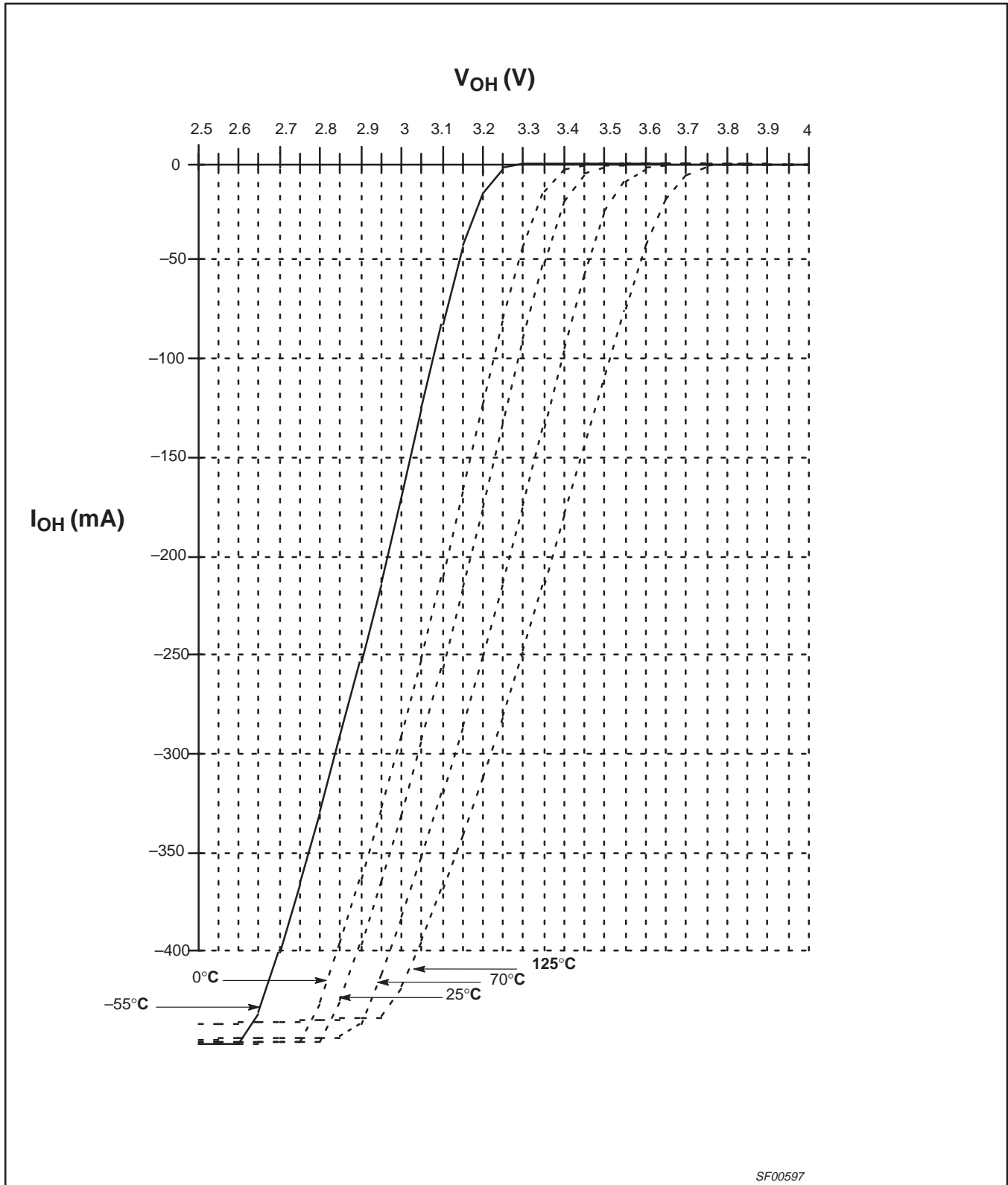


SF00596

# Fiber optic LED driver

# 74F5300

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

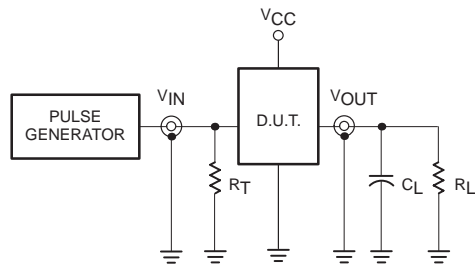


SF00597

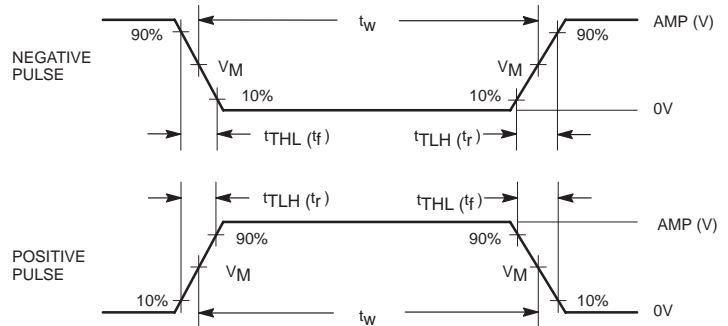
# Fiber optic LED driver

# 74F5300

## 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	rep. rate	$t_w$	$t_{TLH}$	$t_{THL}$
74F	3.0V	1MHz	500ns	2.5ns	2.5ns

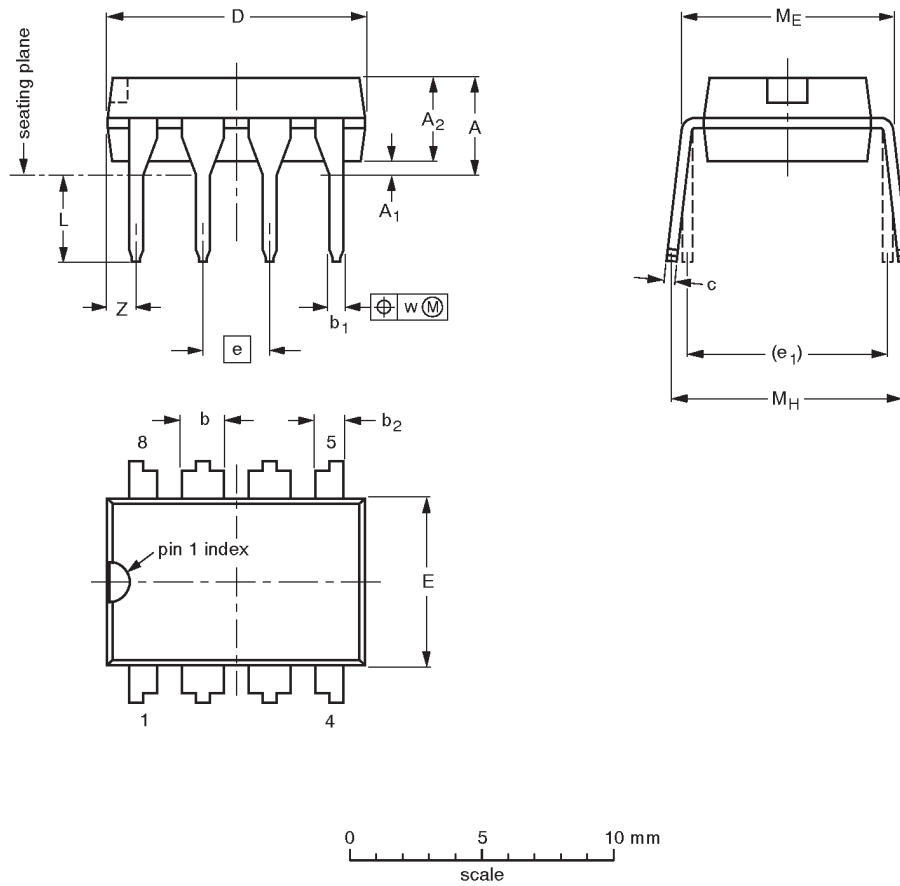
SF01317

# Fiber optic LED driver

## 74F5300

**DIP8: plastic dual in-line package; 8 leads (300 mil)**

**SOT97-1**



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

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.14	0.53 0.38	1.07 0.89	0.36 0.23	9.8 9.2	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	1.15
inches	0.17	0.020	0.13	0.068 0.045	0.021 0.015	0.042 0.035	0.014 0.009	0.39 0.36	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.045

**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		
SOT97-1	050G01	MO-001AN			92-11-17 95-02-04

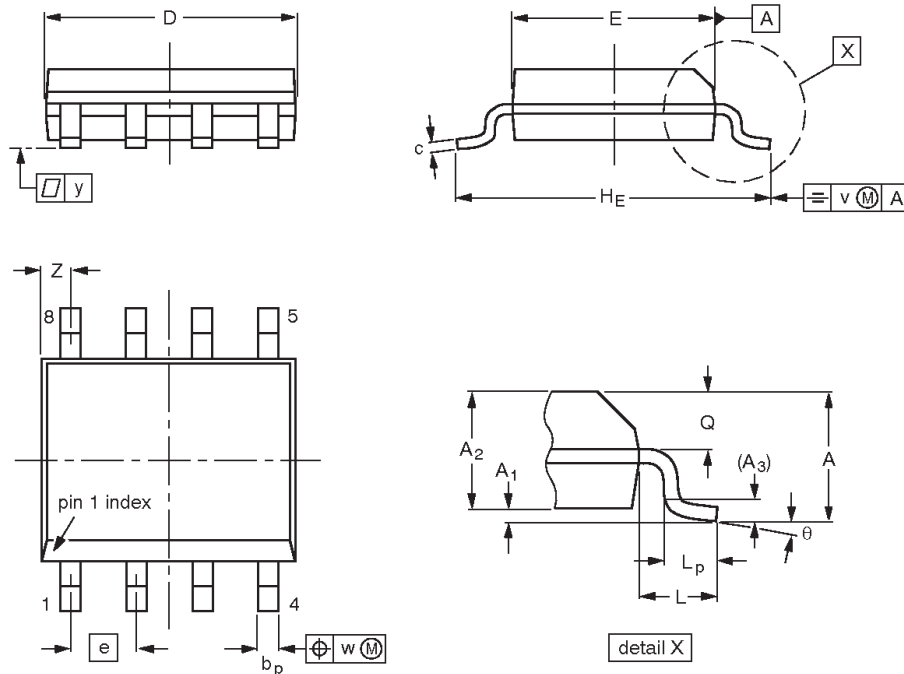


# Fiber optic LED driver

## 74F5300

**SO8: plastic small outline package; 8 leads; body width 3.9mm**

**SOT96-1**



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

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	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	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	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	

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				95-02-04 97-05-22

## Fiber optic LED driver

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## 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 changes at any time without notice in order to improve design and supply the best possible product.
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[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:

9397-750-05208

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