DATA SHEET

74F240
Octal inverter buffer (3-State)
74F241/74F241A
Octal buffer (3-State)

Product data
Supersedes data of 1991 Jan 02

2002 Mar 18

Philips
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FEATURES

- Octal bus interface
- 3-State buffer outputs sink 64 mA
- 15 mA source current
- Guaranteed output skew less than 2.0 ns (74F241A)
- Reduced ground bounce (74F241A)
- Reduced I_{CC} (74F241A only)
- Reduced loading (74F241A I_{IL} = 40 μA)

DESCRIPTION

The 74F240 and 74F241 are octal buffers that are ideal for driving bus lines of buffer memory address registers. The outputs are all capable of sinking 64 mA and sourcing up to 15 mA. The device features two output enables, each controlling four of the 3-state outputs.

The 74F241A is functionally equivalent to its non-A counterpart. It has been designed to reduce effects of ground noise. Other advantages are noted in the features.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F240	4.3 ns	37 mA
74F241	5.0 ns	53 mA
74F241A	4.5 ns	32 mA

ORDERING INFORMATION

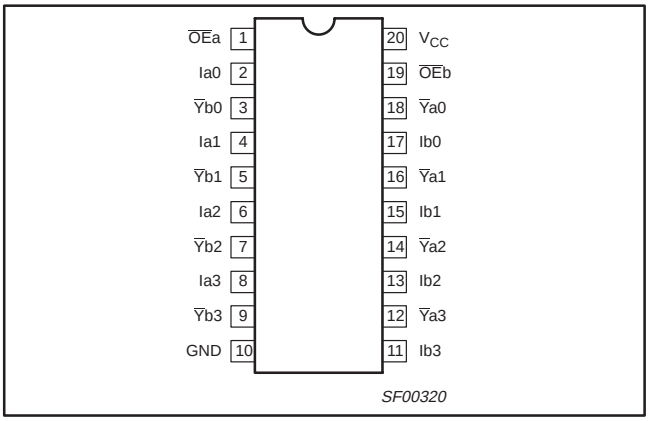
DESCRIPTION	ORDER CODE	PKG DWG #
	COMMERCIAL RANGE V_{CC} = 5 V ±10%, T_{amb} = 0 °C to +70 °C	
20-pin plastic DIP	N74F240N, N74F241N, N74F241AN	SOT146-1
20-pin plastic SOL	N74F240D, N74F241D, N74F241AD	SOT163-1
20-pin plastic SSOP II	N74F240DB	SOT339-1

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

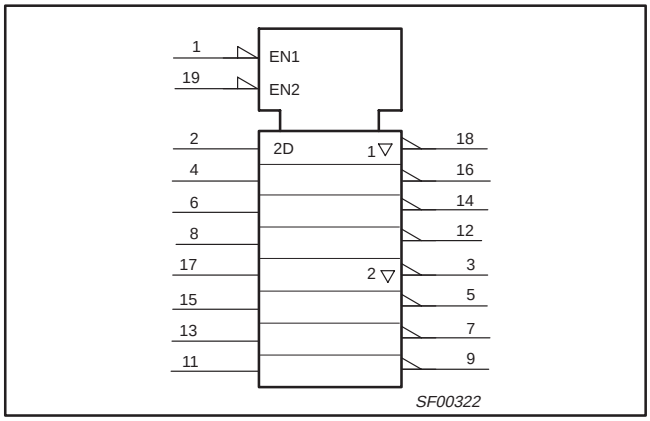
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Ian, Ibn	Data inputs (74F240)	1.0/1.67	20 μA/1.0 mA
	Data inputs (74F241)	1.0/2.67	20 μA/1.6 mA
	Data inputs (74F241A)	1.0/0.067	20 μA/40 μA
$\overline{OE}$a, $\overline{OE}$b	Output enable inputs (Active-LOW) (74F240)	1.0/0.33	20 μA/0.2 mA
$\overline{OE}$a, OEb	Output enable input (74F241)	1.0/1.67	20 μA/1.0 mA
	Output enable input (74F241A)	1.0/0.067	20 μA/40 μA
Yan, Ybn	Data outputs (74F241, 74F241A)	750/106.7	15 mA/64 mA
$\overline{Y}$an, $\overline{Y}$bn	Data outputs (74F240)	750/106.7	15 mA/64 mA

Note to input and output loading and fan out table
One (1.0) FAST unit load is defined as: 20 μA in the HIGH state and 0.6 mA in the LOW state.

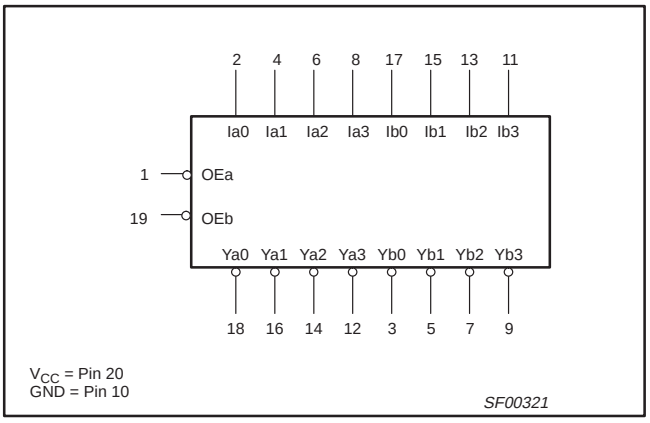
PIN CONFIGURATION FOR 74F240



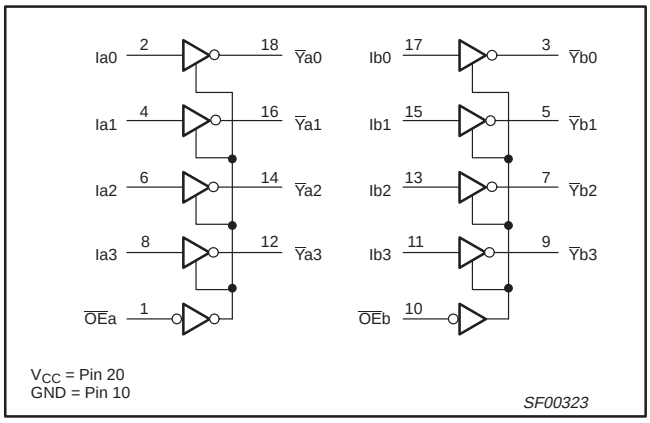
IEC/IEEE SYMBOL FOR 74F240



LOGIC SYMBOL FOR 74F240



LOGIC DIAGRAM FOR 74F240

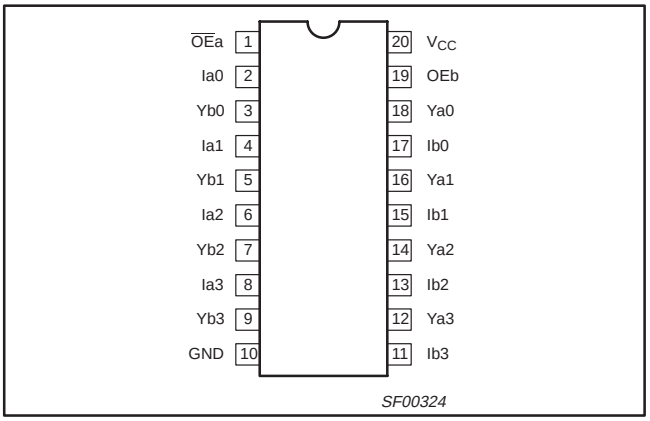


FUNCTION TABLE FOR 74F240

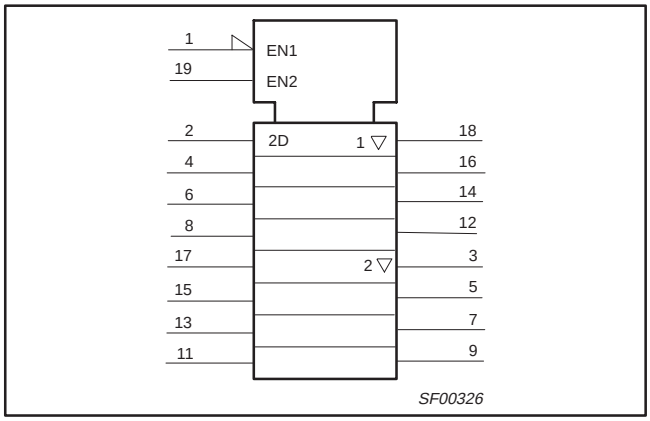
INPUTS				OUTPUTS	
$\overline{OE}$a	Ia	$\overline{OE}$b	Ib	$\overline{Y}$a	$\overline{Y}$b
L	L	L	L	H	H
L	H	L	H	L	L
H	X	H	X	Z	Z

NOTES:
H = High voltage level
L = Low voltage level
X = Don't care
Z = High impedance "off" state

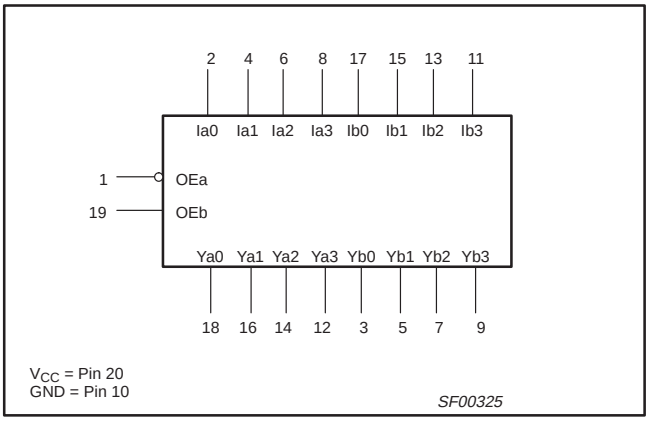
PIN CONFIGURATION FOR 74F241/74F241A



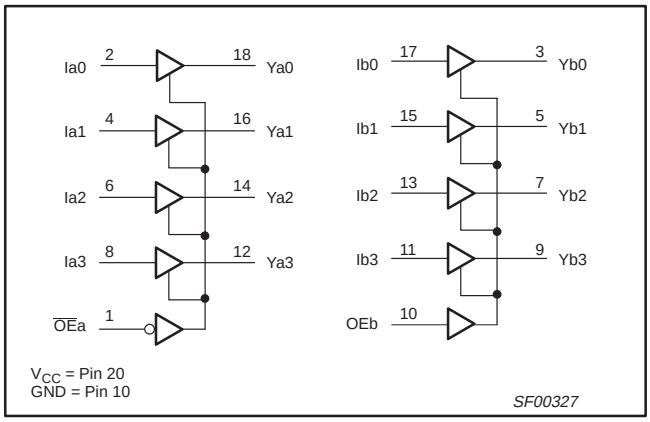
IEC/IEEE SYMBOL FOR 74F241/74F241A



LOGIC SYMBOL FOR 74F241/74F241A



LOGIC DIAGRAM FOR 74F241/74F241A



FUNCTION TABLE FOR 74F241/74F241A

INPUTS				OUTPUTS	
$\overline{OE}$a	Ia	OEb	Ib	Ya	Yb
L	L	H	L	L	L
L	H	H	H	H	H
H	X	L	X	Z	Z

NOTES:
H = High voltage level
L = Low voltage level
X = Don't care
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	128	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			–15	mA
I_{OL}	Low-level output current			64	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} = –3 mA	±10%V_{CC}	2.4			V
						±5%V_{CC}	2.7	3.4		V
					I_{OH} = –15 mA	±10%V_{CC}	2.0			V
						±5%V_{CC}	2.0			V
V_{OL}	Low-level output voltage			V_{CC} = MIN; V_{IL} = MAX; V_{IH} = MIN	I_{OL} = MAX	±10%V_{CC}			0.50	V
						±5%V_{CC}		0.42	0.50	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 = 7.0 V					100	µA
I_{IH}	High-level input current			V_{CC} = MAX; V_I = 2.7 V					20	µA
I_{IL}	Low-level input current	74F240 all inputs		V_{CC} = MAX; V_I = 0.5 V					–1.0	mA
		74F241 $\overline{OE}$a, OEb							–1.0	mA
		74F241 Ian, Ibn							–1.6	mA
		74F241A all inputs							–40	µA
I_{OZH}	Off-state output current, high-level voltage applied			V_{CC} = MAX, V_O = 2.7 V					50	µA
I_{OZL}	Off-state output current, low-level voltage applied			V_{CC} = MAX, V_O = 0.5 V					–50	µA
I_{OS}	Short-circuit output current[3]			V_{CC} = MAX			–100		–225	mA
I_{CC}	Supply current (total)	74F240	I_{CCH}	V_{CC} = MAX				12	18	mA
			I_{CCL}					50	70	mA
			I_{CCZ}					35	45	mA
		74F241	I_{CCH}					40	60	mA
			I_{CCL}					60	90	mA
			I_{CCZ}					65	90	mA
		74F241A	I_{CCH}					20	30	mA
			I_{CCL}					49	65	mA
			I_{CCZ}					26	40	mA

NOTES:

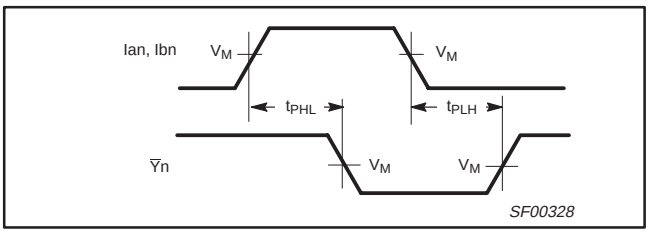
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5 V, T_{amb} = 25 °C.
3. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test 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

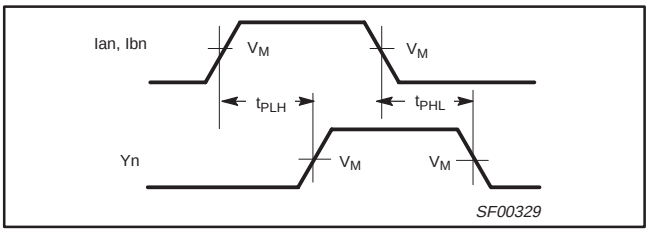
SYMBOL	PARAMETER		TEST CONDITION	LIMITS					UNIT
				T_{amb} = +25 °C V_{CC} = +5.0 V C_L = 50 pF; R_L = 500 Ω			T_{amb} = 0 °C to +70 °C V_{CC} = +5.0 V ± 10% C_L = 50 pF; R_L = 500 Ω		
				MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to $\overline{Y}$n	74F240	Waveform 1	3.0 2.0	4.5 3.0	6.5 4.5	3.0 2.0	7.5 5.0	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	3.0 4.5	5.0 6.5	7.5 8.5	3.0 4.0	9.0 10.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	3.0 3.0	5.5 5.0	7.0 7.0	3.0 3.0	7.5 7.5	ns
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F241	Waveform 2	2.5 2.5	4.0 4.0	5.2 5.2	2.5 2.5	6.2 6.5	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	2.0 2.0	4.0 5.0	5.7 7.0	2.0 2.0	6.7 8.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	2.0 2.0	4.0 4.0	6.0 6.0	2.0 2.0	7.0 7.0	ns
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F241A	Waveform 2	2.5 2.5	4.5 4.5	5.8 5.8	2.5 2.5	6.5 6.5	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	2.5 3.5	4.5 5.0	6.0 7.0	2.0 3.0	6.7 8.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	2.0 1.5	4.0 3.5	6.0 5.5	1.5 1.0	6.5 6.0	ns
$t_{sk(0)}$	Output skew[1, 2]		Waveform 5			1.5		2.0	ns

NOTES:
1. $|t_{PN}$ actual – t_{PM} actual| for any output compared to any other output where N and M are either LH or HL.
2. Skew times are valid only under same test conditions (temperature, V_{CC}, loading, etc.).

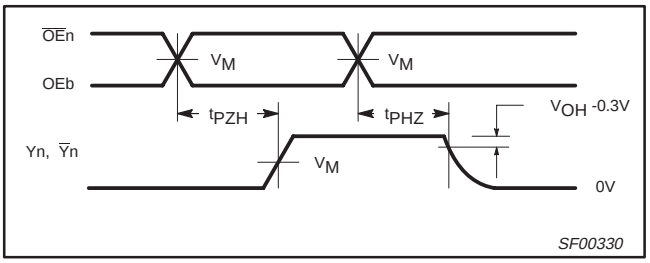
AC WAVEFORMS



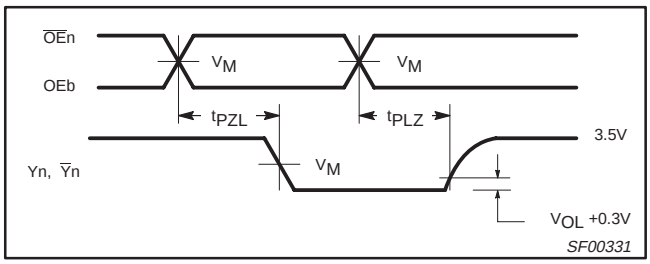
Waveform 1. Propagation delay for inverting outputs



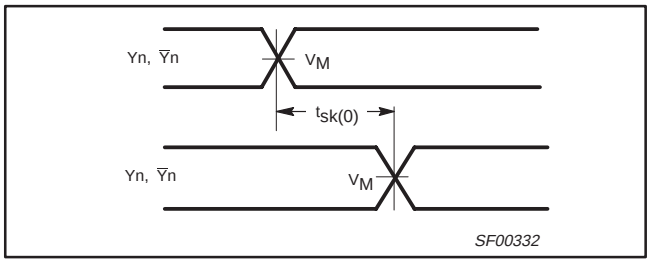
Waveform 2. Propagation delay for non-invertlng outputs



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

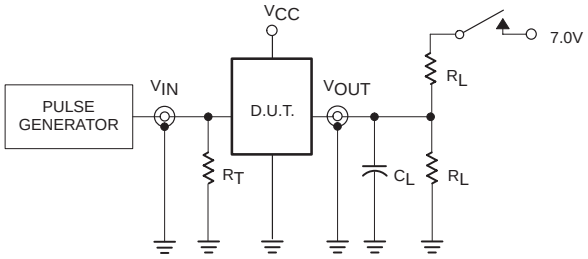


Waveform 5. Output skew

Notes to AC waveforms

1. For all waveforms, V_M = 1.5 V.
2. The shaded areas indicate when the input is permitted to change for predictable output performance.

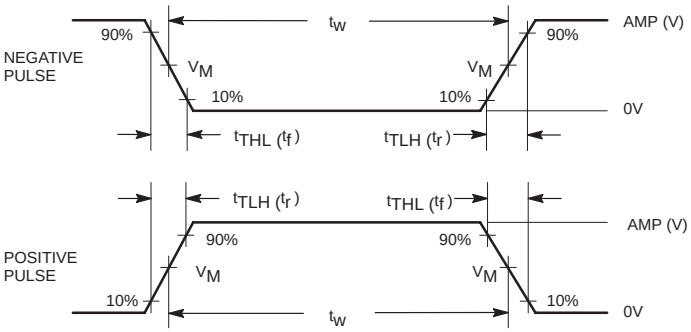
TEST CIRCUIT AND WAVEFORMS



Test Circuit for Open Collector Outputs

SWITCH POSITION

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



Input Pulse Definition

DEFINITIONS:

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

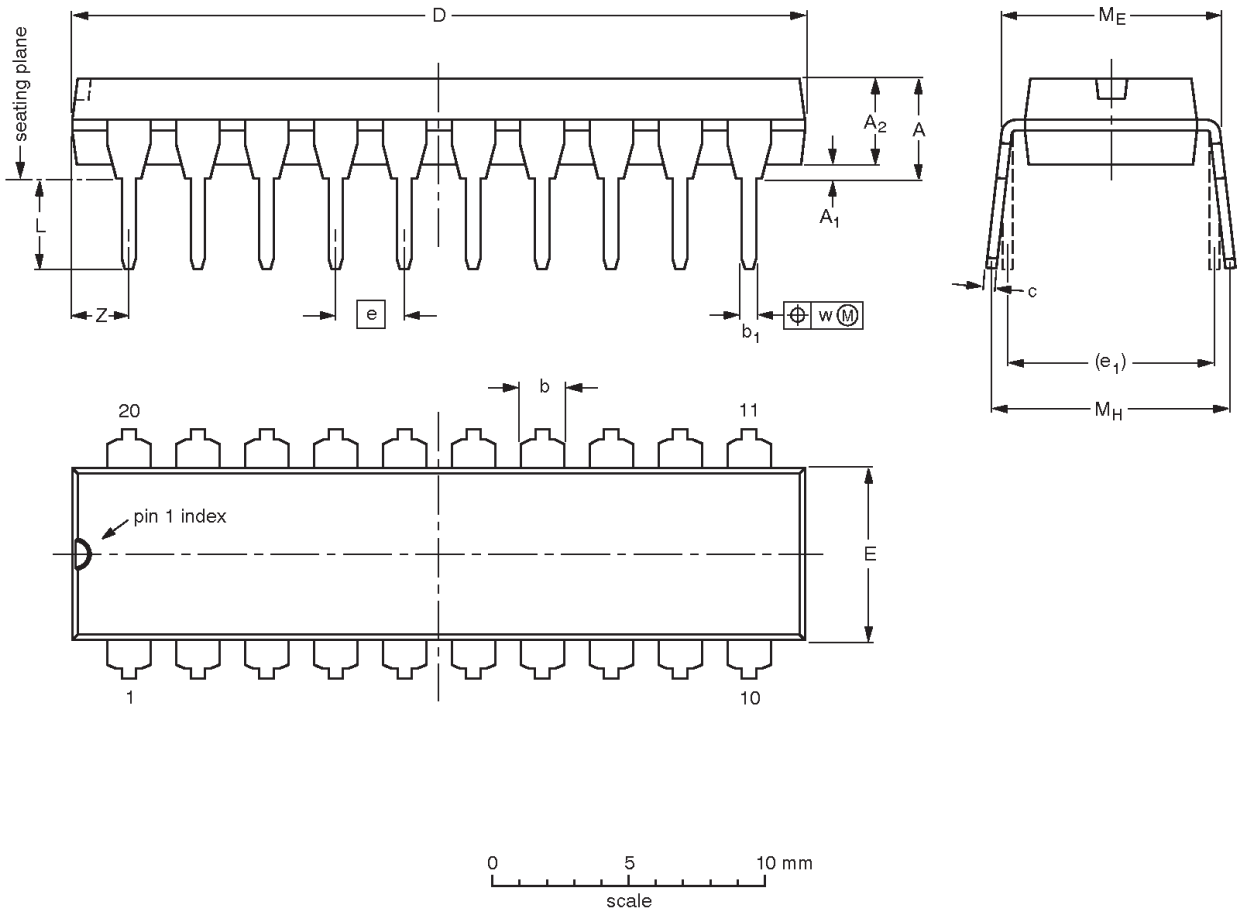
C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.

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}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00128

DIP20: plastic dual in-line package; 20 leads (300 mil) **SOT146-1**



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

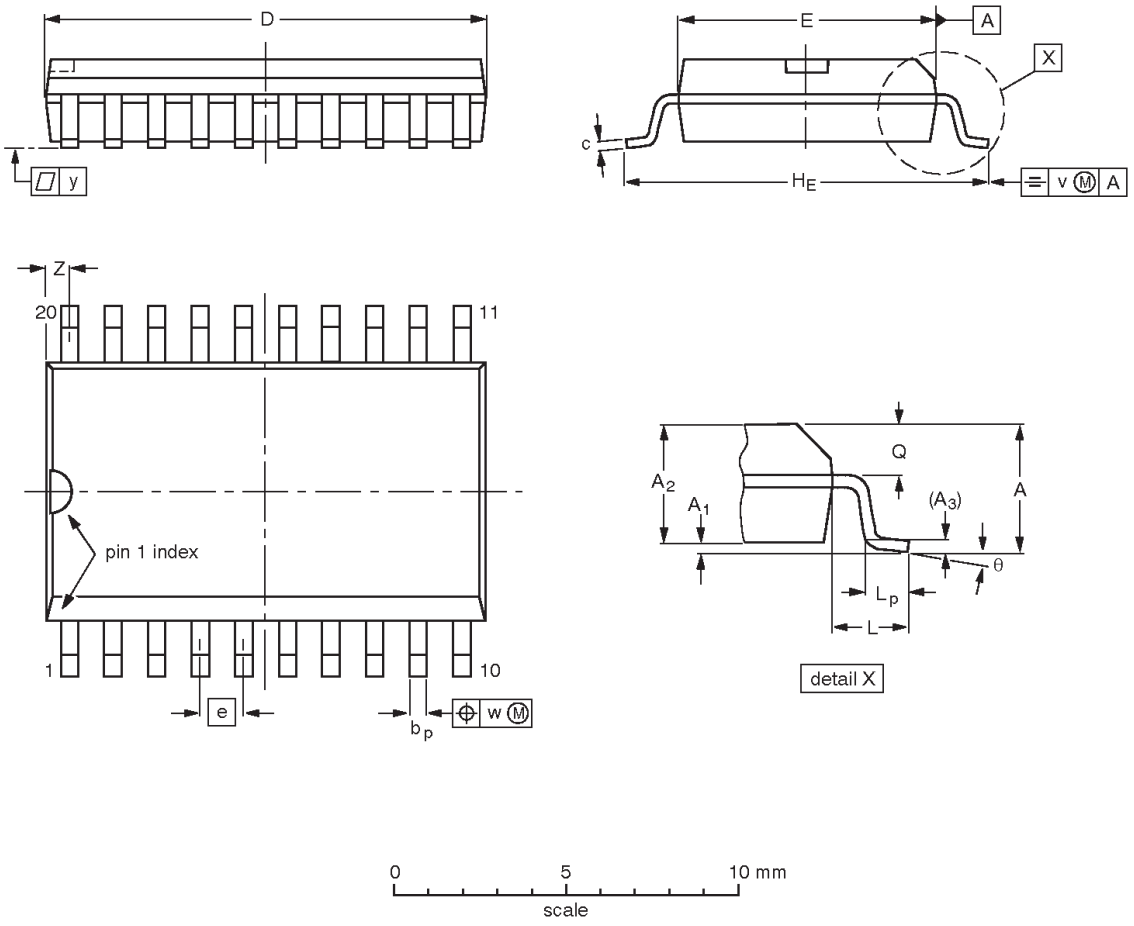
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.0
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

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			
SOT146-1		MS-001	SC-603			~~95-05-24~~ 99-12-27

SO20: plastic small outline package; 20 leads; body width 7.5 mm **SOT163-1**



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

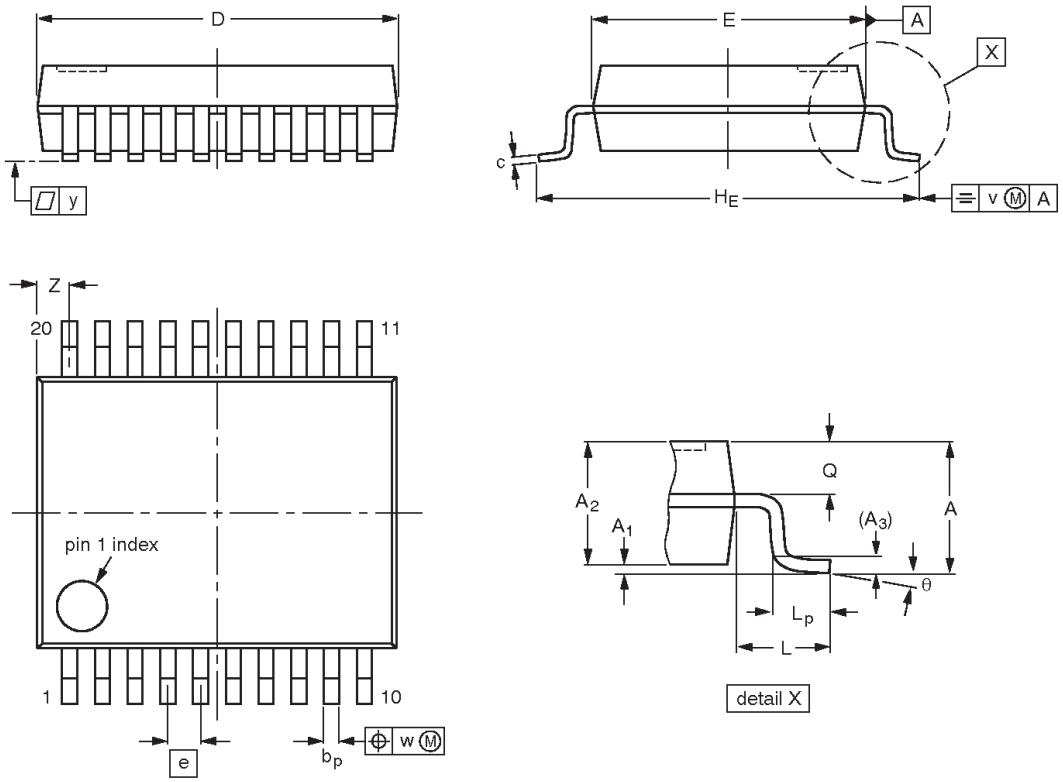
UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	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	

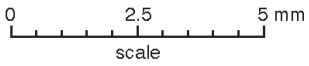
Note

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			
SOT163-1	075E04	MS-013				~~97-05-22~~ 99-12-27

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm **SOT339-1**





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	7.4 7.0	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	0.9 0.5	8^o 0^o

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			
SOT339-1		MO-150				~~95-02-04~~ 99-12-27

NOTES

Data sheet status

Data sheet status [1]	Product status [2]	Definitions
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

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

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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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