DATA SHEET

74ALVC244
Octal buffer/line driver; 3-state

Product specification
Supersedes data of 2003 Aug 11

2003 Sep 08

Philips Semiconductors

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Octal buffer/line driver; 3-state 74ALVC244

FEATURES

- Wide supply voltage range from 1.65 to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standard:
  JESD8-7 (1.65 to 1.95 V)
  JESD8-5 (2.3 to 2.7 V)
  JESD8B/JESD36 (2.7 to 3.6 V)
- ESD protection:
  HBM EIA/JESD22-A114-A exceeds 2000 V
  MM EIA/JESD22-A115-A exceeds 200 V.

DESCRIPTION

The 74ALVC244 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay nAn to nYn	V_{CC} = 1.8 V; C_L = 30 pF; R_L = 1 kΩ	2.7	ns
		V_{CC} = 2.5 V; C_L = 30 pF; R_L = 500 Ω	2.0	ns
		V_{CC} = 2.7 V; C_L = 50 pF; R_L = 500 Ω	2.3	ns
		V_{CC} = 3.3 V; C_L = 50 pF; R_L = 500 Ω	2.2	ns
C_I	input capacitance		3.5	pF
C_{PD}	power dissipation capacitance per buffer	V_{CC} = 3.3 V; notes 1 and 2	20	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
   $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz;
   f_o = output frequency in MHz;
   C_L = output load capacitance in pF;
   V_{CC} = supply voltage in Volts;
   N = total load switching outputs;
   $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. The condition is V_I = GND to V_{CC}.

FUNCTION TABLE

See note 1.

INPUT		OUTPUT
$n\overline{OE}$	nAn	nYn
L	L	L
L	H	H
H	X	Z

Note

1. H = HIGH voltage level;
   L = LOW voltage level;
   X = don't care;
   Z = high-impedance OFF-state.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE				
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE
74ALVC244D	–40 to +85 °C	20	SO20	plastic	SOT163-1
74ALVC244PW	–40 to +85 °C	20	TSSOP20	plastic	SOT360-1
74ALVC244BQ	–40 to +85 °C	20	DHVQFN20	plastic	SOT764-1

PINNING

PIN	SYMBOL	DESCRIPTION
1	$1\overline{OE}$	output enable input (active LOW)
2	1A0	data input
3	2Y0	bus output
4	1A1	data input
5	2Y1	bus output
6	1A2	data input
7	2Y2	bus output
8	1A3	data input
9	2Y3	bus output
10	GND	ground (0 V)

PIN	SYMBOL	DESCRIPTION
11	2A3	data input
12	1Y3	bus output
13	2A2	data input
14	1Y2	bus output
15	2A1	data input
16	1Y1	bus output
17	2A0	data input
18	1Y0	bus output
19	$2\overline{OE}$	output enable input (active LOW)
20	V_{CC}	supply voltage

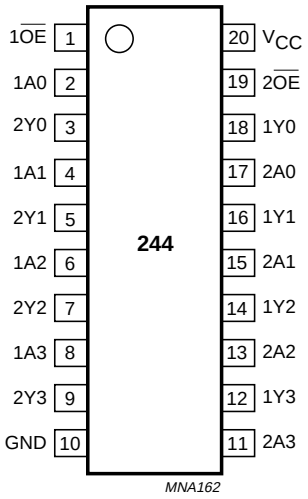
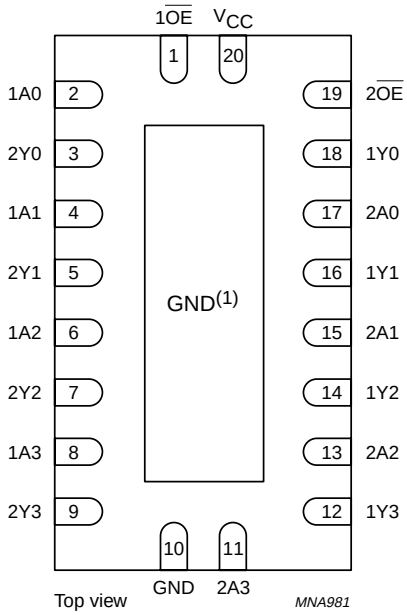


Fig.1 Pin configuration.



(1) The die substrate is attached to this pad using conductive die attach material. It can not be used as a supply pin or input.

Fig.2 Logic symbol.

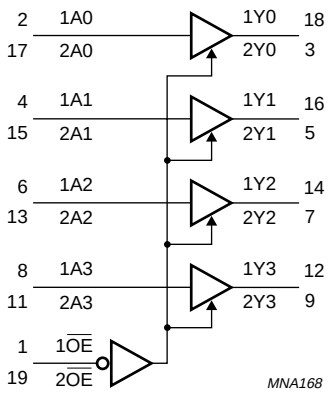


Fig.3 Logic symbol.

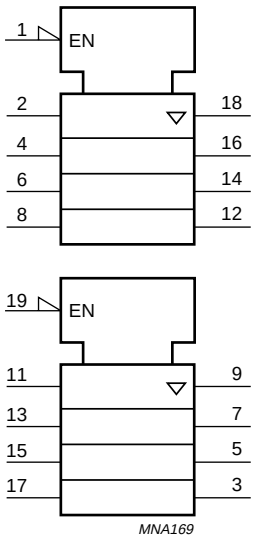


Fig.4 IEE/IEC logic symbol.

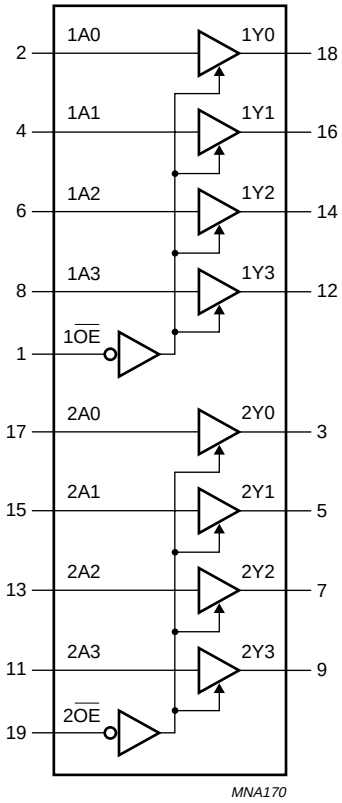


Fig.5 Logic diagram.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		1.65	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	V_{CC} = 1.65 to 3.6 V; enable mode	0	V_{CC}	V
		V_{CC} = 1.65 to 3.6 V; disable mode	0	3.6	V
		V_{CC} = 0 V; Power-down mode	0	3.6	V
T_{amb}	operating ambient temperature		–40	+85	°C
t_r, t_f	input rise and fall times	V_{CC} = 1.65 to 2.7 V	0	20	ns/V
		V_{CC} = 2.7 to 3.6 V	0	10	ns/V

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134); voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		–0.5	+4.6	V
I_{IK}	input diode current	V_I < 0	–	–50	mA
V_I	input voltage		–0.5	+4.6	V
I_{OK}	output diode current	V_O > V_{CC} or V_O < 0	–	±50	mA
V_O	output voltage	enable mode; notes 1 and 2	–0.5	V_{CC} + 0.5	V
		disable mode	–0.5	+4.6	V
		Power-down mode; note 2	–0.5	+4.6	V
I_O	output source or sink current	V_O = 0 to V_{CC}	–	±50	mA
I_{GND}, I_{CC}	V_{CC} or GND current		–	±100	mA
T_{stg}	storage temperature		–65	+150	°C
P_{tot}	power dissipation	T_{amb} = –40 to +85 °C; note 3	–	500	mW

Notes

1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. When V_{CC} = 0 V (Power-down mode), the output voltage can be 3.6 V in normal operation.
3. For SO20 packages: above 70 °C derate linearly with 8 mW/K.
   For TSSOP20 packages: above 60 °C derate linearly with 5.5 mW/K.
   For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

DC CHARACTERISTICS

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
		OTHER	V_{CC} (V)				
T_{amb} = −40 to +85 °C							
V_{IH}	HIGH-level input voltage		1.65 to 1.95	0.65 × V_{CC}	–	–	V
			2.3 to 2.7	1.7	–	–	V
			2.7 to 3.6	2	–	–	V
V_{IL}	LOW-level input voltage		1.65 to 1.95	–	–	0.35 × V_{CC}	V
			2.3 to 2.7	–	–	0.7	V
			2.7 to 3.6	–	–	0.8	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 100 μA	1.65 to 3.6	–	–	0.2	V
		I_O = 6 mA	1.65	–	–	0.3	V
		I_O = 12 mA	2.3	–	–	0.4	V
		I_O = 18 mA	2.3	–	–	0.6	V
		I_O = 12 mA	2.7	–	–	0.4	V
		I_O = 18 mA	3.0	–	–	0.4	V
		I_O = 24 mA	3.0	–	–	0.55	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = −100 μA	1.65 to 3.6	V_{CC} − 0.2	–	–	V
		I_O = −6 mA	1.65	1.25	–	–	V
		I_O = −12 mA	2.3	1.8	–	–	V
		I_O = −18 mA	2.3	1.7	–	–	V
		I_O = −12 mA	2.7	2.2	–	–	V
		I_O = −18 mA	3.0	2.4	–	–	V
		I_O = −24 mA	3.0	2.2	–	–	V
I_{LI}	input leakage current	V_I = 3.6 V or GND	3.6	–	±0.1	±5	μA
I_{OZ}	3-state output OFF-state current	V_I = V_{IH} or V_{IL}; V_O = 3.6 V or GND; note 2	3.6	–	0.1	±10	μA
I_{off}	power OFF leakage current	V_I or V_O = 3.6 V	0.0	–	±0.1	±10	μA
I_{CC}	quiescent supply current	V_I = V_{CC} or GND; I_O = 0	3.6	–	0.2	20	μA
ΔI_{CC}	additional quiescent supply current per input pin	V_I = V_{CC} − 0.6 V; I_O = 0	3.0 to 3.6	–	5	750	μA

Notes

1. All typical values are measured at T_{amb} = 25 °C.
2. For transceivers, the parameters I_{OZ} includes the input leakage current.

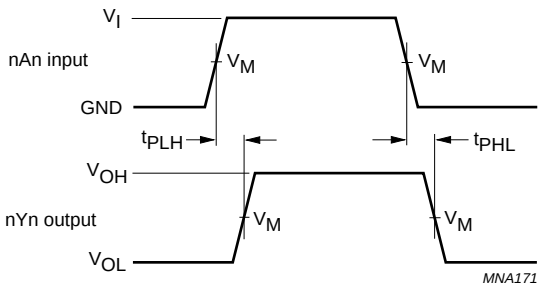
AC CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.(1)	MAX.	UNIT
		WAVEFORMS	V_{CC} (V)				
T_{amb} = −40 to +85 °C							
t_{PHL}/t_{PLH}	propagation delay nAn to nYn	see Figs 6 and 8	1.65 to 1.95	1.0	2.7	4.4	ns
			2.3 to 2.7	1.0	2.0	3.1	ns
			2.7	1.0	2.3	3.1	ns
			3.0 to 3.6	1.0	2.2	2.8	ns
t_{PZH}/t_{PZL}	3-state output enable time $n\overline{OE}$ to nYn	see Figs 7 and 8	1.65 to 1.95	1.0	3.4	6.9	ns
			2.3 to 2.7	1.0	2.6	5.4	ns
			2.7	1.0	3.2	5.3	ns
			3.0 to 3.6	1.0	2.5	4.5	ns
t_{PHZ}/t_{PLZ}	3-state output disable time $n\overline{OE}$ to nYn	see Figs 7 and 8	1.65 to 1.95	1.0	3.8	5.9	ns
			2.3 to 2.7	1.0	2.2	4.1	ns
			2.7	1.0	3.0	4.4	ns
			3.0 to 3.6	1.0	2.9	4.2	ns

Note

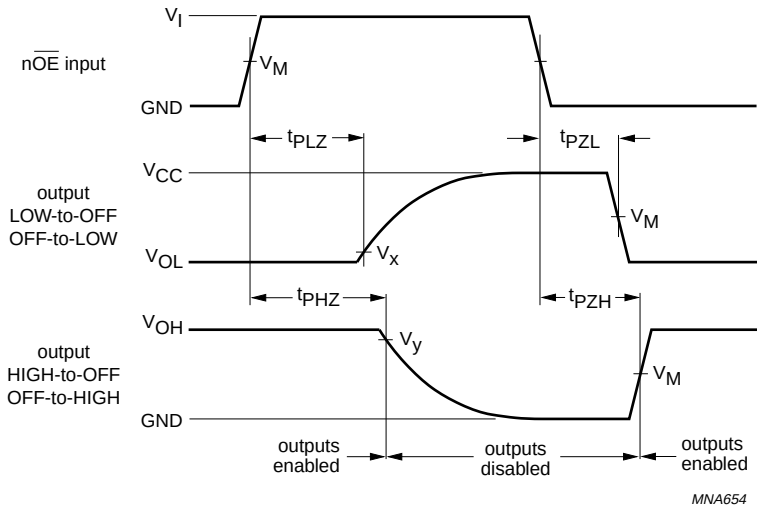
1. All typical values are measured at T_{amb} = 25 °C.

AC WAVEFORMS



V_{CC}	V_M	INPUT	
		V_I	$t_r = t_f$
1.65 to 1.95 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.3 to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns

Fig.6 Input nAn to output nYn propagation delay times.

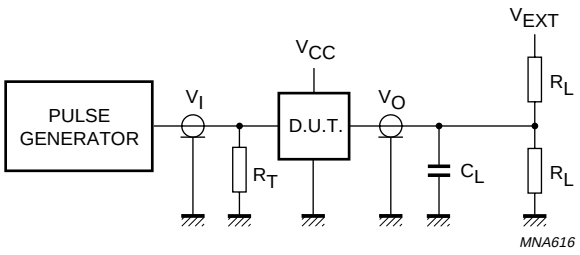


V_{CC}	V_M	INPUT	
		V_I	$t_r = t_f$
1.65 to 1.95 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.3 to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns

$V_X = V_{OL}$ + 0.3 V at $V_{CC} \geq$ 2.7 V;
$V_X = V_{OL}$ + 0.15 V at V_{CC} < 2.7 V;
$V_Y = V_{OH}$ – 0.3 V at $V_{CC} \geq$ 2.7 V;
$V_Y = V_{OH}$ – 0.15 V at V_{CC} < 2.7 V.

V_{OL} and V_{OH} are typical output voltage drop that occur with the output load.

Fig.7 3-state enable and disable times.



V_{CC}	V_I	C_L	R_L	V_{EXT}		
				t_{PLH}/t_{PHL}	t_{PZH}/t_{PHZ}	t_{PZL}/t_{PLZ}
1.65 to 1.95 V	V_{CC}	30 pF	1 kΩ	open	GND	$2 \times V_{CC}$
2.3 to 2.7 V	V_{CC}	30 pF	500 Ω	open	GND	$2 \times V_{CC}$
2.7 V	2.7 V	50 pF	500 Ω	open	GND	6 V
3.0 to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V

Definitions for test circuit:

R_L = Load resistor.

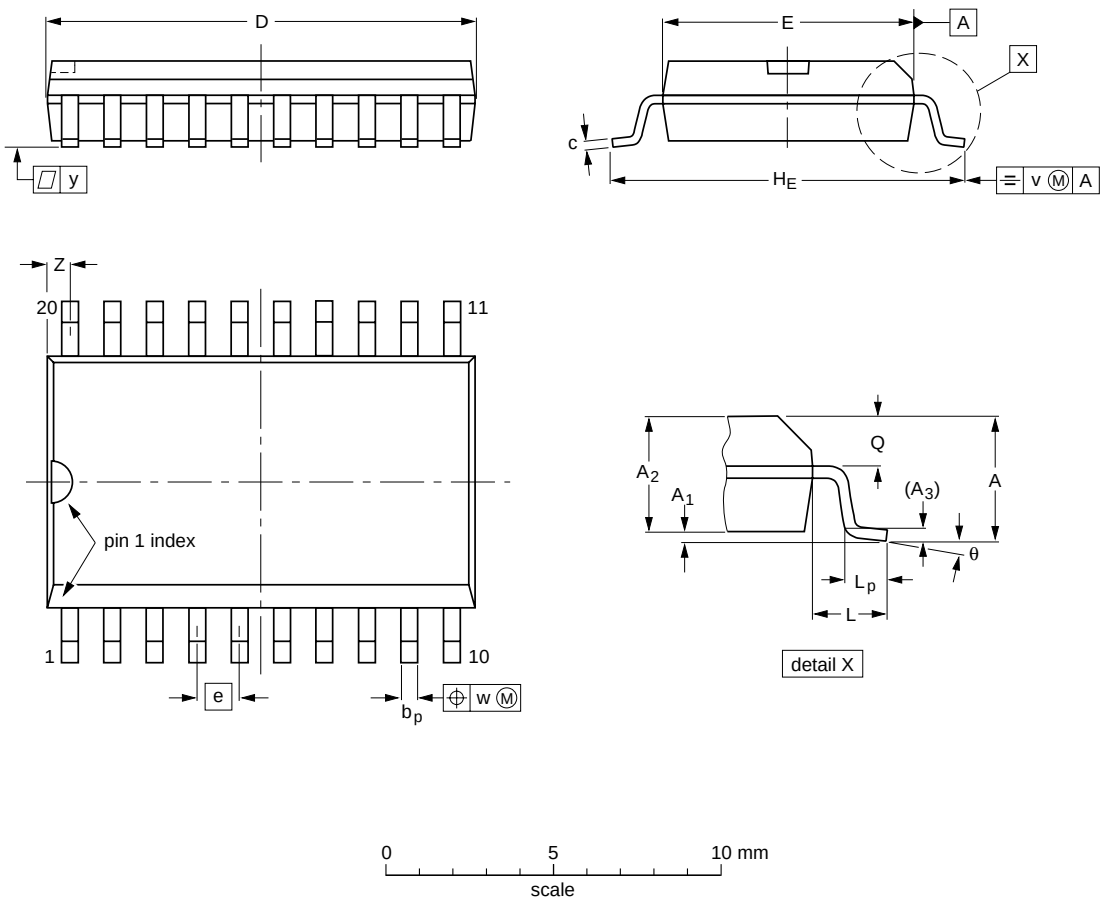
C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.

Fig.8 Load circuitry for switching times.

PACKAGE OUTLINES

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



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

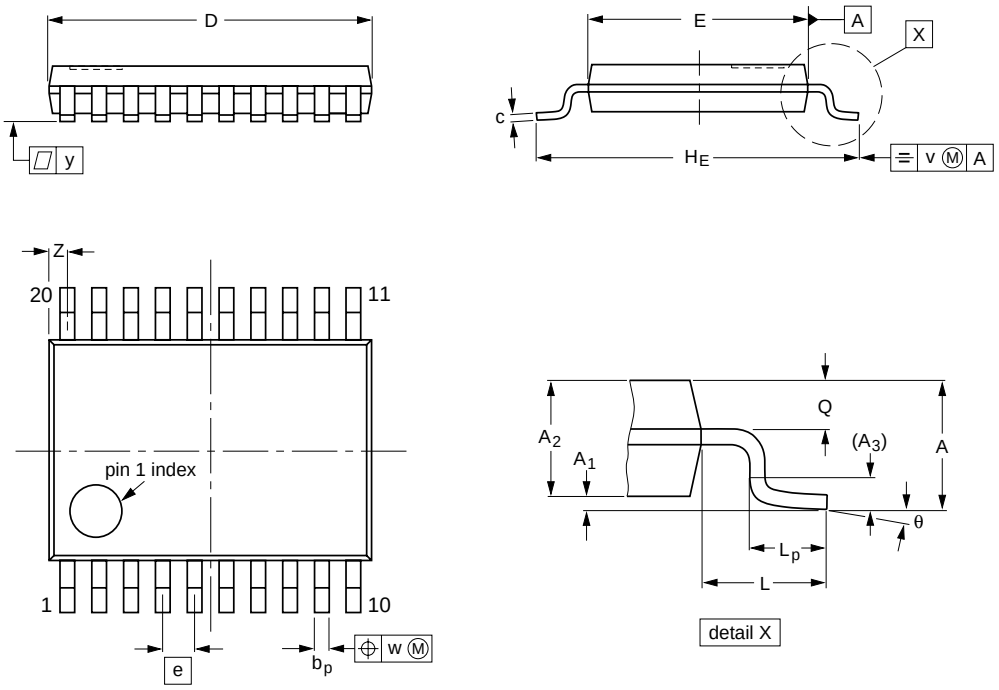
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

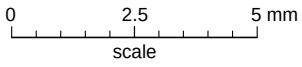
Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT163-1	075E04	MS-013				~~99-12-27~~ 03-02-19

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm **SOT360-1**





DIMENSIONS (mm are the original dimensions)

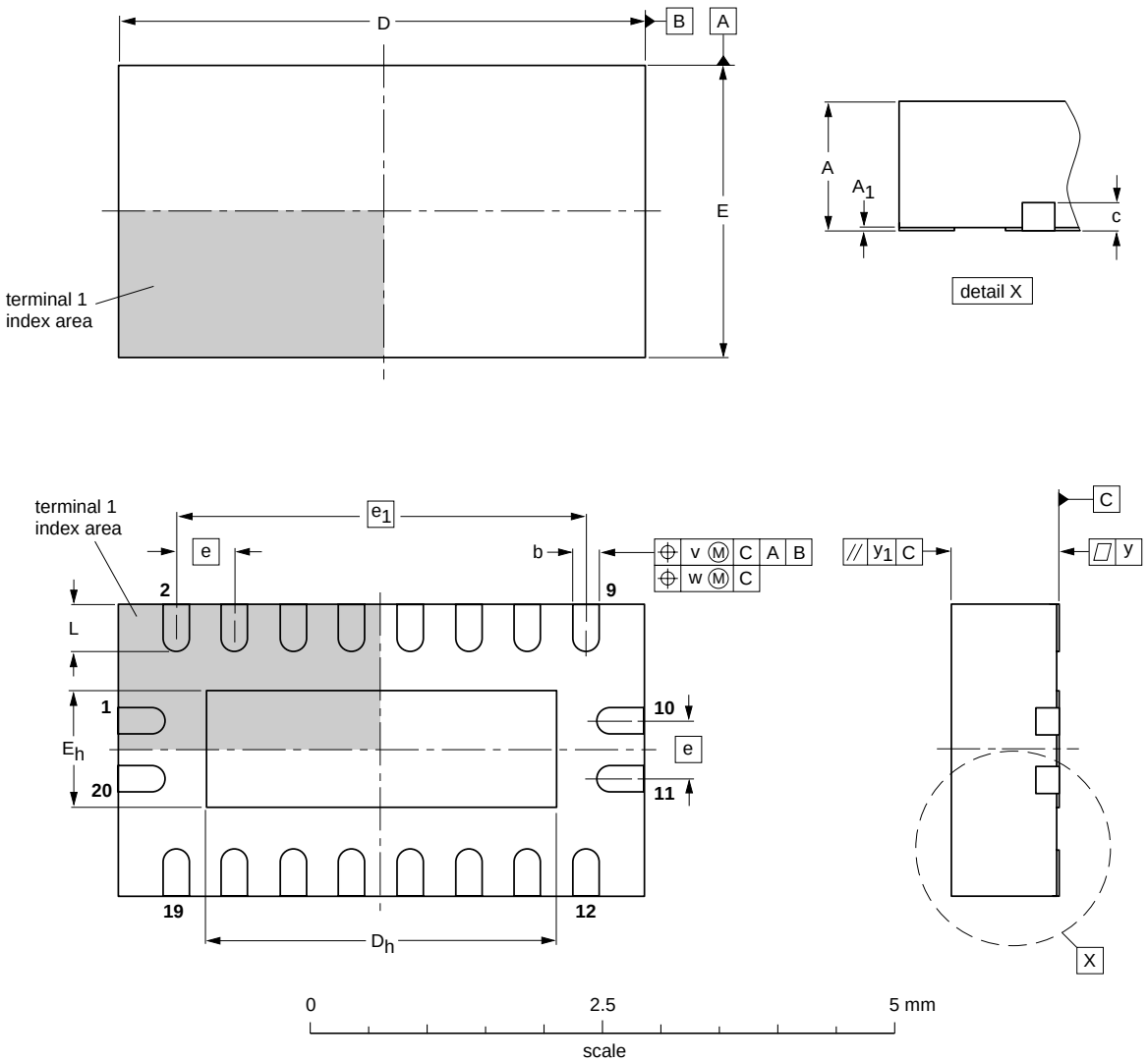
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8^o 0^o

Notes

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT360-1		MO-153				~~99-12-27~~ 03-02-19

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm **SOT764-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	4.6 4.4	3.15 2.85	2.6 2.4	1.15 0.85	0.5	3.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT764-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS[1]	PRODUCT STATUS[2][3]	DEFINITION
I	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.
II	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.
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Notes

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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.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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.

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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