DATA SHEET

74ALVC245
Octal bus transceiver; 3-state

Product specification

2003 Jul 10

Philips Semiconductors

PHILIPS

Octal bus transceiver; 3-state 74ALVC245

FEATURES

- Wide supply voltage range from 1.65 to 3.6 V
- 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).
- 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
- ESD protection:
  HBM EIA/JESD22-A114-A exceeds 2000 V
  MM EIA/JESD22-A115-A exceeds 200 V.

DESCRIPTION

The 74ALVC245 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74ALVC245 features an output enable input ($\overline{OE}$) for easy cascading and send/receive input (DIR) for direction control. $\overline{OE}$ controls the outputs, so that the buses are effectively isolated.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay inputs An to Bn; Bn to An	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	2.1	ns
		V_{CC} = 2.7 V; C_L = 50 pF; R_L = 500 Ω	3.0	ns
		V_{CC} = 3.3 V; C_L = 50 pF; R_L = 500 Ω	2.3	ns
C_I	input capacitance		3.5	pF
$C_{I/O}$	input/output capacitance		3.5	pF
C_{PD}	power dissipation capacitance per buffer	V_{CC} = 3.3 V; notes 1 and 2		
		outputs enable	25	pF
		outputs disabled	1	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}.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE			
	PINS	PACKAGE	MATERIAL	CODE
74ALVC245D	20	SO20	plastic	SOT163-1
74ALVC245PW	20	TSSOP20	plastic	SOT360-1

FUNCTION TABLE

See note 1.

INPUT		INPUT/OUTPUT	
$\overline{OE}$	DIR	An	Bn
L	L	A = B	input
L	H	input	B = A
H	X	Z	Z

Note

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

PINNING

PIN	SYMBOL	DESCRIPTION
1	DIR	direction control
2	A0	data input/output
3	A1	data input/output
4	A2	data input/output
5	A3	data input/output
6	A4	data input/output
7	A5	data input/output
8	A6	data input/output
9	A7	data input/output
10	GND	ground (0 V)

PIN	SYMBOL	DESCRIPTION
11	B7	data input/output
12	B6	data input/output
13	B5	data input/output
14	B4	data input/output
15	B3	data input/output
16	B2	data input/output
17	B1	data input/output
18	B0	data input/output
19	$\overline{OE}$	output enable input (active LOW)
20	V_{CC}	supply voltage

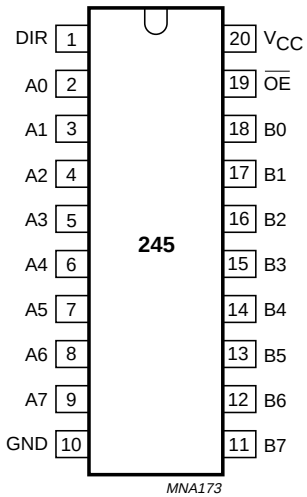


Fig.1 Pin configuration..

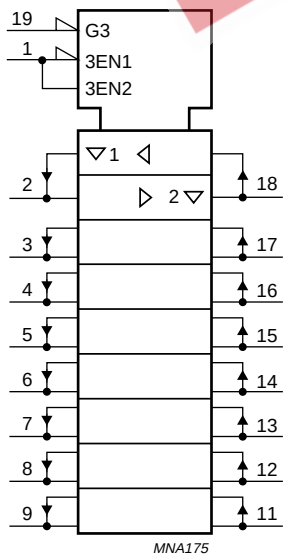


Fig.2 IEE/IEC logic symbol.

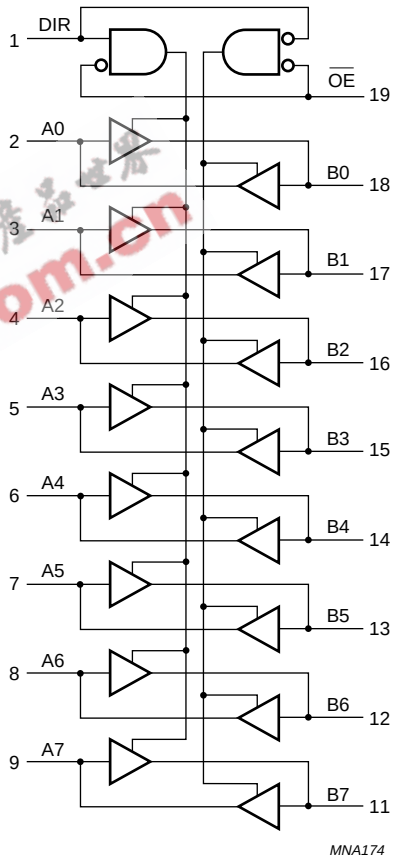


Fig.3 Logic symbol.

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				
	SO20 package	above 70 °C derate linearly with 8 mW/K	–	500	mW
	TSSOP20 package	above 60 °C derate linearly with 5.5 mW/K	–	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.

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	10	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 V_{CC} = 3.3 V and T_{amb} = 25 °C.
2. For transceivers, the parameters I_{OZ} includes the input leakage current.

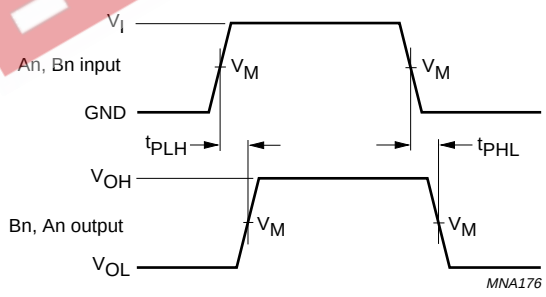
AC CHARACTERISTICS

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 An to Bn; Bn to An	see Figs 4 and 6	1.65 to 1.95	1.0	2.7	6.0	ns
			2.3 to 2.7	1.0	2.1	3.5	ns
			2.7	1.0	3.0	3.6	ns
			3.0 to 3.6	1.0	2.3	3.4	ns
t_{PZH}/t_{PZL}	3-state output enable time $\overline{OE}$ to An; $\overline{OE}$ to Bn	see Figs 5 and 6	1.65 to 1.95	1.0	4.0	8.6	ns
			2.3 to 2.7	1.0	3.0	6.0	ns
			2.7	1.0	2.6	6.3	ns
			3.0 to 3.6	1.0	2.9	5.5	ns
t_{PHZ}/t_{PLZ}	3-state output disable time $\overline{OE}$ to An; $\overline{OE}$ to Bn	see Figs 5 and 6	1.65 to 1.95	1.0	4.4	8.0	ns
			2.3 to 2.7	1.0	2.3	4.8	ns
			2.7	1.0	3.3	5.3	ns
			3.0 to 3.6	1.0	3.2	5.5	ns

Note

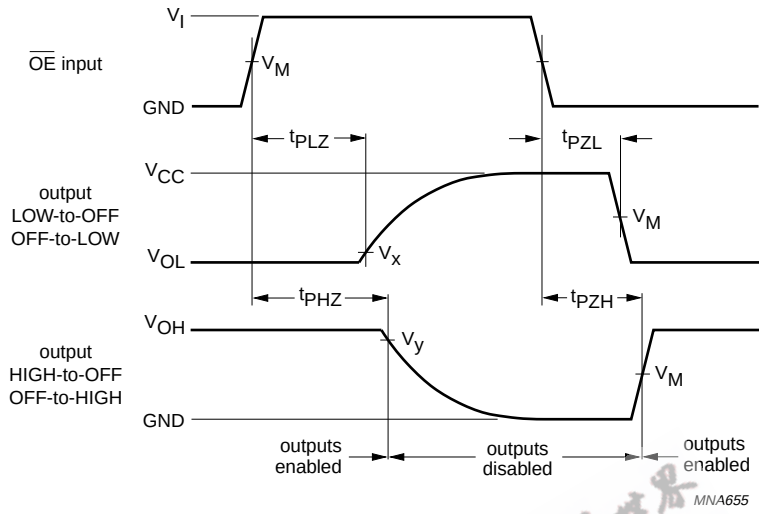
1. All typical values are measured at T_{amb} = 25 °C.

AC WAVEFORMS



V_{CC}	V_M	INPUT	
		V_I	$t_r = t_f$
1.65 to 1.95 V	0.5 × V_{CC}	V_{CC}	≤ 2.0 ns
2.3 to 2.7 V	0.5 × 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.4 Input (An, Bn) to output (Bn, An) propagation delay times.

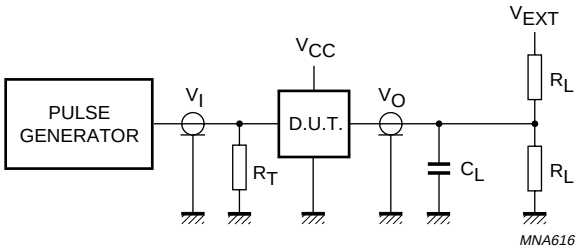


V_{CC}	V_M	INPUT	
		V_I	$t_r = t_f$
1.65 to 1.95 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.3 to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns

$V_X = V_{OL} + 0.3$ 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.5 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.

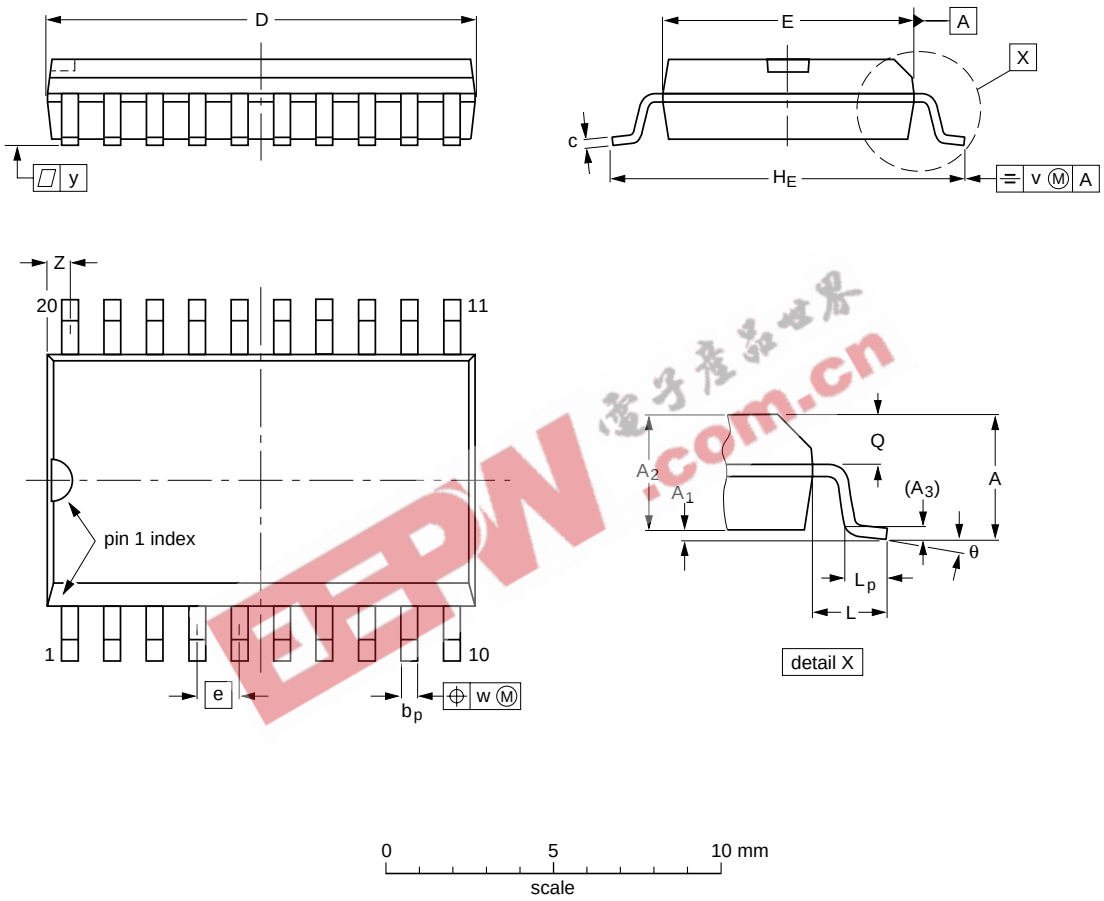
C_L = Load capacitance including jig and probe capacitance.

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

Fig.6 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)

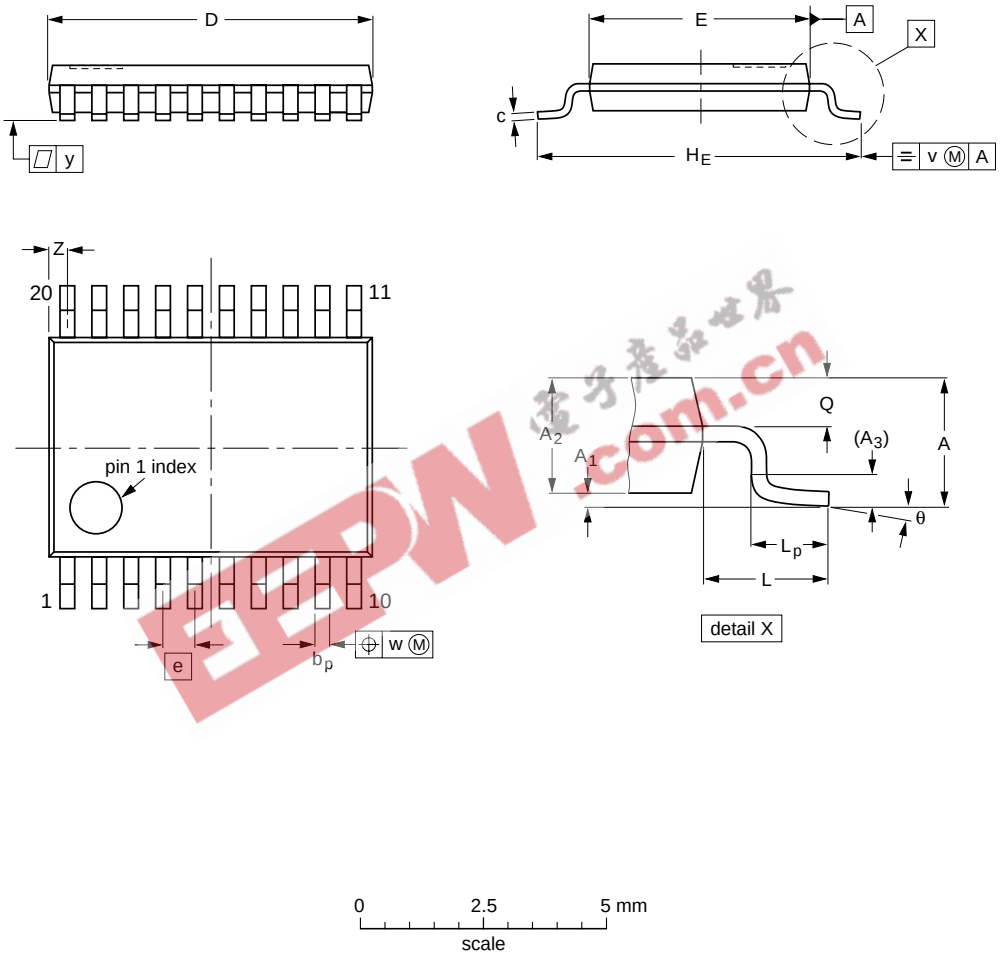
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419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

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LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
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DEFINITIONS

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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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SCA75

Printed in The Netherlands 613508/01/pp13 Date of release: 2003 Jul 10 Document order number: 9397 750 11647

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