

# DATA SHEET

## **74ALVT16600**

**2.5V/3.3V 18-bit universal bus  
transceiver (3-State)**

Product specification  
Replaces data of 1997 May 12  
IC23 Data Handbook

1998 Feb 13

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

## 74ALVT16600

## FEATURES

- 18-bit bidirectional bus interface
- 5V I/O Compatible
- 3-State buffers
- Output capability: +64mA/-32mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power-up reset
- Power-up 3-State
- No bus current loading when output is tied to 5V bus
- Negative edge-triggered clock inputs
- Latch-up protection exceeds 500mA per JEDEC JC40.2 Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

## DESCRIPTION

The 74ALVT16600 is a high-performance BiCMOS product designed for  $V_{CC}$  operation at 2.5V and 3.3V with I/O compatibility up to 5V.

This device is an 18-bit universal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. Data flow in each direction is controlled by output enable ( $\overline{OEAB}$  and  $\overline{OEBA}$ ), latch enable (LEAB and LEBA), and clock ( $\overline{CPAB}$  and  $\overline{CPBA}$ ) inputs. For A-to-B data flow, the device operates in the transparent mode when LEAB is High. When LEAB is Low, the A data is latched if  $\overline{CPAB}$  is held at a High or Low logic level. If LEAB is Low, the A-bus data is stored in the latch/flip-flop on the High-to-Low transition of  $\overline{CPAB}$ . When  $\overline{OEAB}$  is Low, the outputs are active. When  $\overline{OEAB}$  is High, the outputs are in the high-impedance state. The High clock can be controlled with the clock-enable inputs ( $\overline{CEBA}/\overline{CEAB}$ ).

Data flow for B-to-A is similar to that of A-to-B but uses  $\overline{OEBA}$ , LEBA and  $\overline{CPBA}$ .

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}\text{C}$	TYPICAL		UNIT
			2.5V	3.3V	
$t_{PLH}$ $t_{PHL}$	Propagation delay An to Bn or Bn to An	$C_L = 50\text{pF}$	1.9 2.5	1.6 1.9	ns
$C_{IN}$	Input capacitance DIR, $\overline{OE}$	$V_I = 0\text{V}$ or $V_{CC}$	4	4	pF
$C_{I/O}$	I/O pin capacitance	Outputs disabled; $V_{I/O} = 0\text{V}$ or $V_{CC}$	8	8	pF
$I_{CCZ}$	Total supply current	Outputs disabled	40	70	$\mu\text{A}$

## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
56-Pin Plastic SSOP Type III	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	74ALVT16600 DL	AV16600 DL	SOT371-1
56-Pin Plastic TSSOP Type II	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	74ALVT16600 DGG	AV16600 DGG	SOT364-1

## PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 27	$\overline{OEAB}/\overline{OEBA}$	A-to-B Output enable input (active Low)
29, 56	$\overline{CEBA}/\overline{CEAB}$	B-to-A / A-to-B clock enable (active Low)
2, 28	LEAB/LEBA	A-to-B/B-to-A Latch enable input
55,30	$\overline{CPAB}/\overline{CPBA}$	A-to-B/B-to-A Clock input (active falling edge)
3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 26	A0-A17	Data inputs/outputs (A side)
54, 52, 51, 49, 48, 47, 45, 44, 43, 42, 41, 40, 38, 37, 36, 34, 33, 31	B0-B17	Data inputs/outputs (B side)
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0V)
7, 22, 35, 50	$V_{CC}$	Positive supply voltage

# 2.5V/3.3V 18-bit universal bus transceiver (3-State)

# 74ALVT16600

## FUNCTION TABLE

INPUTS					OUTPUT
CEAB	OEAB	LEAB	CPAB	A	B
X	H	X	X	X	Z
X	L	H	X	L	L
X	L	H	X	H	H
H	L	L	X	X	$B_0^{\pm}$
L	L	L	↓	L	L
L	L	L	↓	H	H
L	L	L	H	X	$B_0^{\pm}$
L	L	L	L	X	$B_0^{\S}$

X =Don't care

H =High voltage level

L =Low voltage level

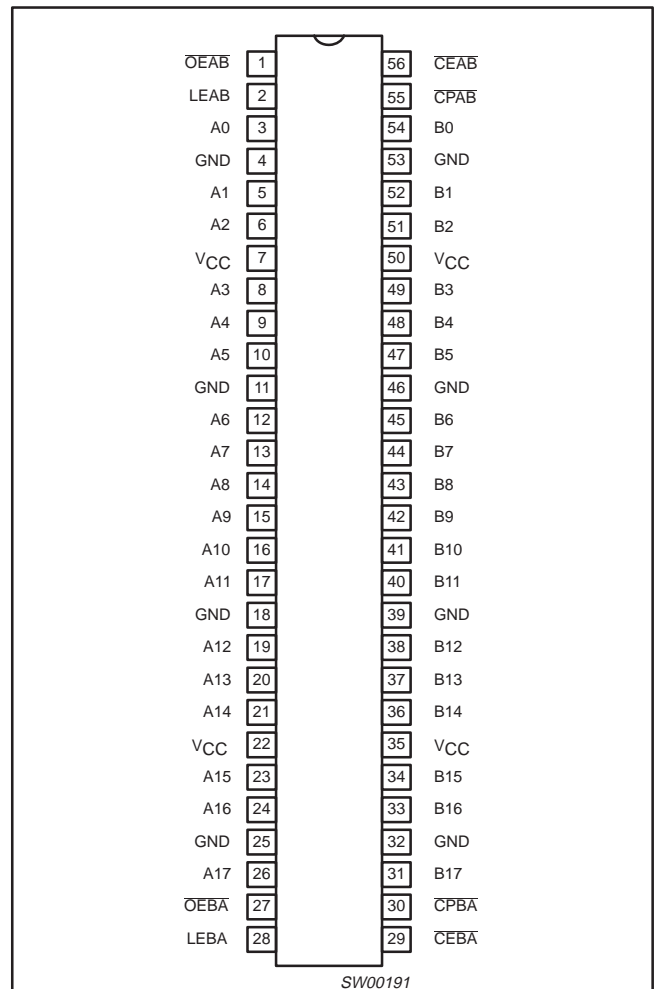
↓ =High-to-Low clock transition

† A-to-B data flow is shown: B-to-A flow is similar but uses  $\overline{OEBA}$ , LEBA, CPBA, and CEBA.

± Output level before the indicated steady-state input conditions were established.

§ Output level before the indicated steady-state input conditions were established, provided that CLKAB was Low before LEAB went Low.

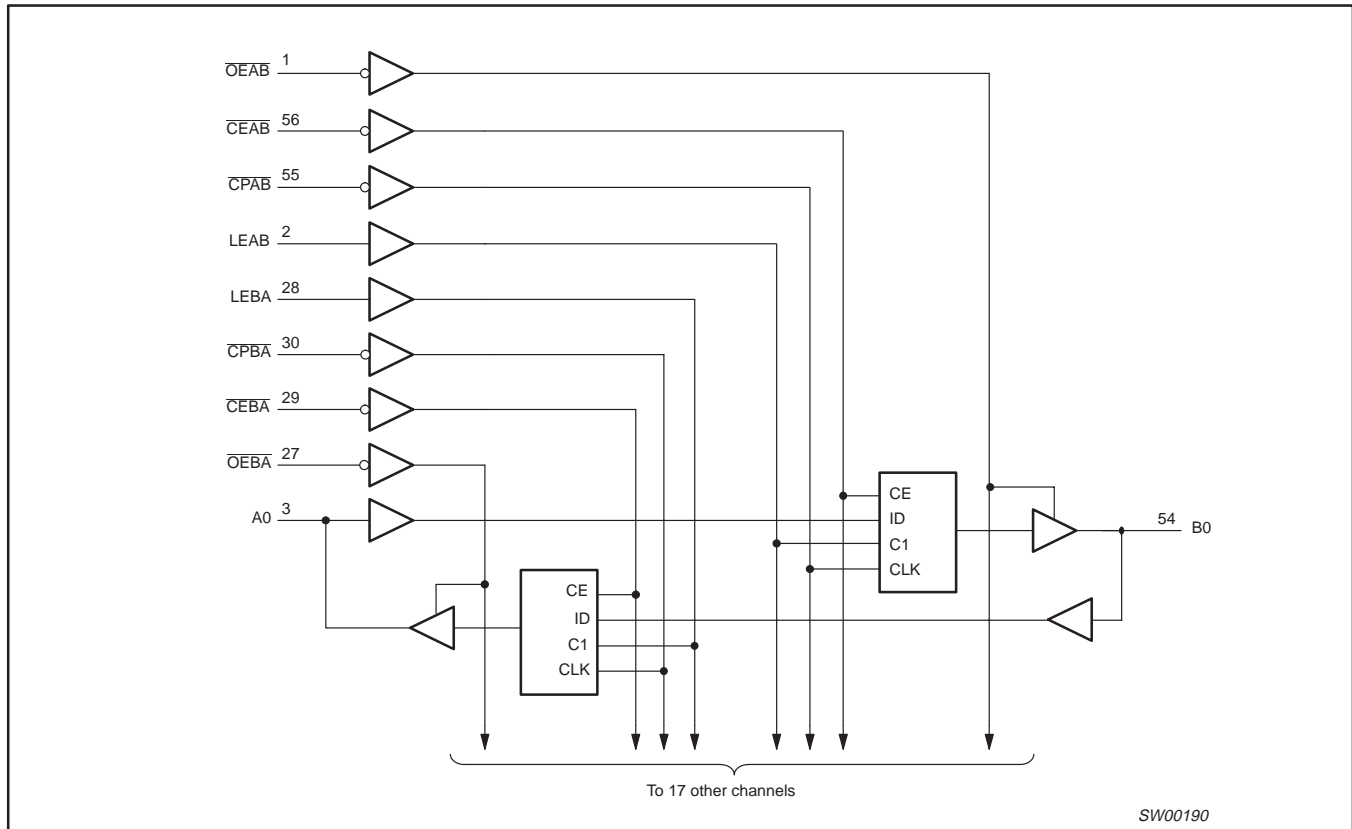
## PIN CONFIGURATION



2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

LOGIC DIAGRAM (Positive Logic)



ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +4.6	V
I <sub>IK</sub>	DC input diode current	V <sub>I</sub> < 0	-50	mA
V <sub>I</sub>	DC input voltage <sup>3</sup>		-0.5 to +7.0	V
I <sub>OK</sub>	DC output diode current	V <sub>O</sub> < 0	-50	mA
V <sub>OUT</sub>	DC output voltage <sup>3</sup>	Output in Off or High state	-0.5 to +7.0	V
I <sub>OUT</sub>	DC output current	Output in Low state	128	mA
		Output in High state	-64	
T <sub>stg</sub>	Storage temperature range		-65 to +150	°C

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	2.5V RANGE LIMITS		3.3V RANGE LIMITS		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	DC supply voltage	2.3	2.7	3.0	3.6	V
V <sub>I</sub>	Input voltage	0	5.5	0	5.5	V
V <sub>IH</sub>	High-level input voltage	1.7		2.0		V
V <sub>IL</sub>	Input voltage		0.7		0.8	V
I <sub>OH</sub>	High-level output current		-8		-32	mA
I <sub>OL</sub>	Low-level output current		8		32	mA
	Low-level output current; current duty cycle ≤ 50%; f ≥ 1 kHz		24		64	
Δt/Δv	Input transition rise or fall rate; Outputs enabled		10		10	ns/V
T <sub>amb</sub>	Operating free-air temperature range	-40	+85	-40	+85	°C

## DC ELECTRICAL CHARACTERISTICS (3.3V ± 0.3V RANGE)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 3.0V; I <sub>IK</sub> = -18mA		-0.85	-1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 3.0 to 3.6V; I <sub>OH</sub> = -100μA	V <sub>CC</sub> -0.2	V <sub>CC</sub>		V
		V <sub>CC</sub> = 3.0V; I <sub>OH</sub> = -32mA	2.0	2.3		
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 100μA		0.07	0.2	V
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 16mA		0.25	0.4	
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 32mA		0.3	0.5	
		V <sub>CC</sub> = 3.0V; I <sub>OL</sub> = 64mA		0.4	0.55	
V <sub>RST</sub>	Power-up output low voltage <sup>6</sup>	V <sub>CC</sub> = 3.6V; I <sub>O</sub> = 1mA; V <sub>I</sub> = V <sub>CC</sub> or GND			0.55	V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND	Control pins	0.1	±1	μA
		V <sub>CC</sub> = 0 or 3.6V; V <sub>I</sub> = 5.5V		0.1	10	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 5.5V	Data pins <sup>4</sup>	0.1	20	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub>		0.5	10	
		V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 0V		0.1	-5	
I <sub>OFF</sub>	Off current	V <sub>CC</sub> = 0V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5V		0.1	±100	μA
I <sub>HOLD</sub>	Bus Hold current Data inputs <sup>7</sup>	V <sub>CC</sub> = 3V; V <sub>I</sub> = 0.8V		75	130	μA
		V <sub>CC</sub> = 3V; V <sub>I</sub> = 2.0V		-75	-140	
		V <sub>CC</sub> = 0V to 3.6V; V <sub>CC</sub> = 3.6V		±500		
I <sub>EX</sub>	Current into an output in the High state when V <sub>O</sub> > V <sub>CC</sub>	V <sub>O</sub> = 5.5V; V <sub>CC</sub> = 3.0V		10	125	μA
I <sub>PU/PD</sub>	Power up/down 3-State output current <sup>3</sup>	V <sub>CC</sub> ≤ 1.2V; V <sub>O</sub> = 0.5V to V <sub>CC</sub> ; V <sub>I</sub> = GND or V <sub>CC</sub> OE = Don't care		1.0	±100	μA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 3.6V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		0.06	0.1	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 3.6V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		4.0	5	
I <sub>CCZ</sub>		V <sub>CC</sub> = 3.6V; Outputs Disabled; V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0 <sup>5</sup>		0.06	0.1	
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 3V to 3.6V; One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND		0.04	0.4	mA

## NOTES:

- All typical values are at V<sub>CC</sub> = 3.3V and T<sub>amb</sub> = 25°C.
- This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND
- This parameter is valid for any V<sub>CC</sub> between 0V and 1.2V with a transition time of up to 10msec. From V<sub>CC</sub> = 1.2V to V<sub>CC</sub> = 3.3V ± 0.3V a transition time of 100μsec is permitted. This parameter is valid for T<sub>amb</sub> = 25°C only.
- Unused pins at V<sub>CC</sub> or GND.
- I<sub>CCZ</sub> is measured with outputs pulled up to V<sub>CC</sub> or pulled down to ground.
- For valid test results, data must not be loaded into the flip-flops (or latches) after applying power.
- This is the bus hold overdrive current required to force the input to the opposite logic state.

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

**AC CHARACTERISTICS (3.3V ± 0.3V RANGE)**GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$ ;  $T_{\text{amb}} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ .

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$V_{CC} = 3.3V \pm 0.3V$			
			MIN	TYP <sup>1</sup>	MAX	
$f_{\text{MAX}}$	Maximum clock frequency	1		300		MHz
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay An to Bn or Bn to An	2	1.0 1.0	1.6 1.9	2.3 2.8	ns
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay Clock Low or High LEAB to Bn or LEBA to An	3	1.5 1.5	2.2 2.5	3.3 4.2	ns
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay $\overline{\text{CPAB}}$ to Bn or $\overline{\text{CPBA}}$ to An	1	1.5 1.5	2.6 3.2	4.2 4.8	ns
$t_{\text{PZH}}$ $t_{\text{PZL}}$	Output enable time to High and Low level	5 6	1.5 1.0	2.2 1.6	3.4 2.6	ns
$t_{\text{PHZ}}$ $t_{\text{PLZ}}$	Output disable time from High and Low Level	5 6	1.5 1.5	2.6 2.3	3.8 3.5	ns

**NOTE:**1. All typical values are at  $V_{CC} = 3.3V$  and  $T_{\text{amb}} = 25^\circ\text{C}$ .**AC SETUP REQUIREMENTS (3.3V ± 0.3V RANGE)**GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$ ;  $T_{\text{amb}} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ .

SYMBOL	PARAMETER	WAVEFORM	LIMITS		UNIT
			$V_{CC} = 3.3V \pm 0.3V$		
			MIN	TYP <sup>1</sup>	
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time, High or Low An to $\overline{\text{CPAB}}$ or Bn to $\overline{\text{CPBA}}$	4	2.0 2.0	0.8 0.9	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time, High or Low An to $\overline{\text{CPAB}}$ or Bn to $\overline{\text{CPBA}}$	4	0.0 0.0	-0.9 -0.7	ns
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time, High or Low Clock Low An to LEAB or Bn to $\overline{\text{CPBA}}$	4	1.0 1.0	-0.4 -0.1	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time, High or Low Clock High An to LEAB or Bn to LEBA	4	1.0 1.0	0.1 0.4	ns
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time $\overline{\text{CEAB}}$ before $\overline{\text{CPAB}}$ or $\overline{\text{CEBA}}$ before $\overline{\text{CPBA}}$	4	1.5 1.0	0.3 -0.6	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time $\overline{\text{CEAB}}$ after $\overline{\text{CPAB}}$ or $\overline{\text{CEBA}}$ after $\overline{\text{CPBA}}$	4	1.5 1.0	0.7 -0.2	ns
$t_{\text{w(H)}}$ $t_{\text{w(L)}}$	Pulse width, High or Low $\overline{\text{CPAB}}$ or $\overline{\text{CPBA}}$	1	1.5 1.5		ns
$t_{\text{w(H)}}$	LEAB or LEBA pulse width, High	3	1.5		ns

**NOTE:**1. All typical values are at  $V_{CC} = 3.3V$  and  $T_{\text{amb}} = 25^\circ\text{C}$ .

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

## DC ELECTRICAL CHARACTERISTICS (2.5V ± 0.2V RANGE)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = 2.3V; I <sub>IK</sub> = -18mA		-0.85	-1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 2.3 to 3.6V; I <sub>OH</sub> = -100μA	V <sub>CC</sub> -0.2			V
		V <sub>CC</sub> = 2.3V; I <sub>OH</sub> = -8mA	1.8			
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 2.3V; I <sub>OL</sub> = 100μA		0.07	0.2	V
		V <sub>CC</sub> = 2.3V; I <sub>OL</sub> = 24mA		0.3	0.5	
		V <sub>CC</sub> = 2.3V; I <sub>OL</sub> = 8mA			0.4	
V <sub>RST</sub>	Power-up output low voltage <sup>7</sup>	V <sub>CC</sub> = 2.7V; I <sub>O</sub> = 1mA; V <sub>I</sub> = V <sub>CC</sub> or GND			0.55	V
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>CC</sub> or GND	Control pins	0.1	±1	μA
		V <sub>CC</sub> = 0 or 2.7V; V <sub>I</sub> = 5.5V		0.1	10	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = 5.5V		0.1	20	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>CC</sub>	Data pins <sup>4</sup>	0.1	1	
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = 0		0.1	-5	
I <sub>OFF</sub>	Off current	V <sub>CC</sub> = 0V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5V		0.1	±100	μA
I <sub>HOLD</sub>	Bus Hold current	V <sub>CC</sub> = 2.3V; V <sub>I</sub> = 0.7V		90		μA
	Data inputs <sup>6</sup>	V <sub>CC</sub> = 2.3V; V <sub>I</sub> = 1.7V		-75		
I <sub>EX</sub>	Current into an output in the High state when V <sub>O</sub> > V <sub>CC</sub>	V <sub>O</sub> = 5.5V; V <sub>CC</sub> = 2.3V		10	125	μA
I <sub>PU/PD</sub>	Power up/down 3-State output current <sup>3</sup>	V <sub>CC</sub> ≤ 1.2V; V <sub>O</sub> = 0.5V to V <sub>CC</sub> ; V <sub>I</sub> = GND or V <sub>CC</sub> ; OE = Don't care		1	100	μA
I <sub>CCH</sub>	Quiescent supply current	V <sub>CC</sub> = 2.7V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		0.04	0.1	mA
I <sub>CCL</sub>		V <sub>CC</sub> = 2.7V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0		3.0	4.5	
I <sub>CCZ</sub>		V <sub>CC</sub> = 2.7V; Outputs Disabled; V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0 <sup>5</sup>		0.04	0.1	
ΔI <sub>CC</sub>	Additional supply current per input pin <sup>2</sup>	V <sub>CC</sub> = 2.3V to 2.7V; One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND		0.01	0.4	mA

## NOTES:

- All typical values are at V<sub>CC</sub> = 2.5V and T<sub>amb</sub> = 25°C.
- This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND.
- This parameter is valid for any V<sub>CC</sub> between 0V and 1.2V with a transition time of up to 10msec. From V<sub>CC</sub> = 1.2V to V<sub>CC</sub> = 2.5V ± 0.2V a transition time of 100μsec is permitted. This parameter is valid for T<sub>amb</sub> = 25°C only.
- Unused pins at V<sub>CC</sub> or GND.
- I<sub>CCZ</sub> is measured with outputs pulled up to V<sub>CC</sub> or pulled down to ground.
- Not guaranteed.
- For valid test results, data must not be loaded into the flip-flops (or latches) after applying power.

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

**AC CHARACTERISTICS (2.5V ± 0.2V RANGE)**GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$ ;  $T_{\text{amb}} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ .

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$V_{CC} = 2.5V \pm 0.2V$			
			MIN	TYP <sup>1</sup>	MAX	
$f_{\text{MAX}}$	Maximum clock frequency	1		250		MHz
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay An to Bn or Bn to An	2	1.0 1.5	1.9 2.5	3.0 3.6	ns
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay Clock Low or High LEAB to Bn or LEBA to An	3	2.0 2.5	3.0 3.3	4.5 5.1	ns
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation delay $\overline{\text{CPAB}}$ to Bn or $\overline{\text{CPBA}}$ to An	1	2.5 2.5	3.8 4.5	5.6 6.7	ns
$t_{\text{PZH}}$ $t_{\text{PZL}}$	Output enable time to High and Low level	5 6	2.0 1.0	3.1 2.0	4.4 3.0	ns
$t_{\text{PHZ}}$ $t_{\text{PLZ}}$	Output disable time from High and Low Level	5 6	1.5 1.5	2.5 2.3	4.1 3.6	ns

**NOTE:**1. All typical values are at  $V_{CC} = 3.3V$  and  $T_{\text{amb}} = 25^\circ\text{C}$ .**AC SETUP REQUIREMENTS (2.5V ± 0.2V RANGE)**GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$ ;  $T_{\text{amb}} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ .

SYMBOL	PARAMETER	WAVEFORM	LIMITS		UNIT
			$V_{CC} = 2.5V \pm 0.2V$		
			MIN	TYP <sup>1</sup>	
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time, High or Low An to $\overline{\text{CPAB}}$ or Bn to $\overline{\text{CPBA}}$	4	1.5 2.0	0.5 1.1	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time, High or Low An to $\overline{\text{CPAB}}$ or Bn to $\overline{\text{CPBA}}$	4	0.0 1.0	-1.1 -0.4	ns
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time, High or Low Clock Low An to LEAB or Bn to $\overline{\text{CPBA}}$	4	0.0 1.5	-0.8 0.4	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time, High or Low Clock High An to LEAB or Bn to LEBA	4	1.0 1.5	-0.4 0.9	ns
$t_{\text{s(H)}}$ $t_{\text{s(L)}}$	Setup time $\overline{\text{CEAB}}$ before $\overline{\text{CPAB}}$ or $\overline{\text{CEBA}}$ before $\overline{\text{CPBA}}$	4	1.0 1.0	-0.3 -0.5	ns
$t_{\text{h(H)}}$ $t_{\text{h(L)}}$	Hold time $\overline{\text{CEAB}}$ after $\overline{\text{CPAB}}$ or $\overline{\text{CEBA}}$ after $\overline{\text{CPBA}}$	4	1.5 1.5	0.8 0.5	ns
$t_{\text{w(H)}}$ $t_{\text{w(L)}}$	Pulse width, High or Low $\overline{\text{CPAB}}$ or $\overline{\text{CPBA}}$	1	2.5 2.5		ns
$t_{\text{w(H)}}$	LEAB or LEBA pulse width, High	3	1.5		ns

**NOTE:**1. All typical values are at  $V_{CC} = 2.5V$  and  $T_{\text{amb}} = 25^\circ\text{C}$ .



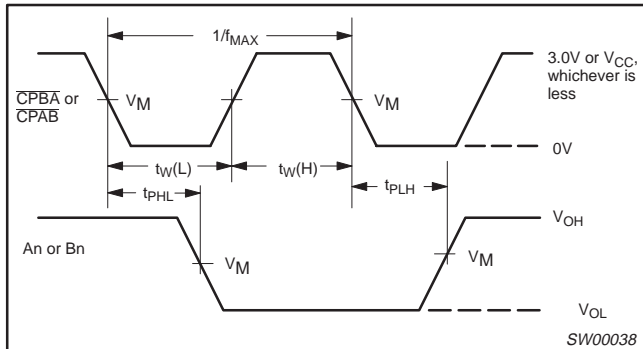
# 2.5V/3.3V 18-bit universal bus transceiver (3-State)

# 74ALVT16600

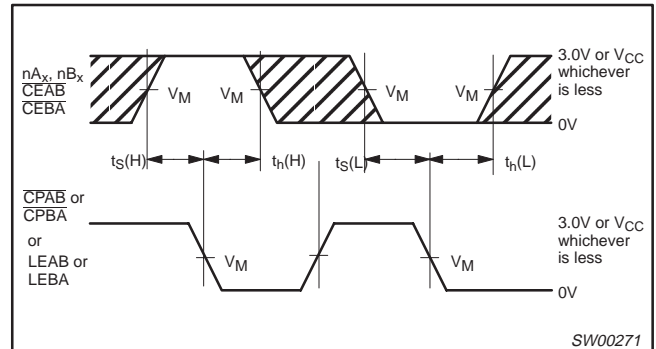
## AC WAVEFORMS

### NOTES:

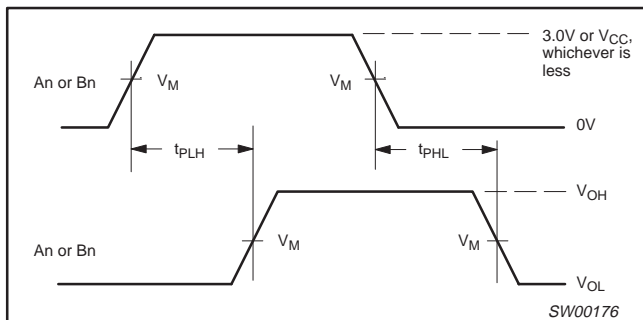
- $V_M = 1.5V$  at  $V_{CC} \geq 3.0V$ ,  $V_M = V_{CC}/2$  at  $V_{CC} \leq 2.7V$
- $V_X = V_{OL} + 0.3V$  at  $V_{CC} \geq 3.0V$ ,  $V_X = V_{OL} + 0.15V$  at  $V_{CC} \leq 2.7V$
- $V_Y = V_{OH} - 0.3V$  at  $V_{CC} \geq 3.0V$ ,  $V_Y = V_{OH} - 0.15V$  at  $V_{CC} \leq 2.7V$



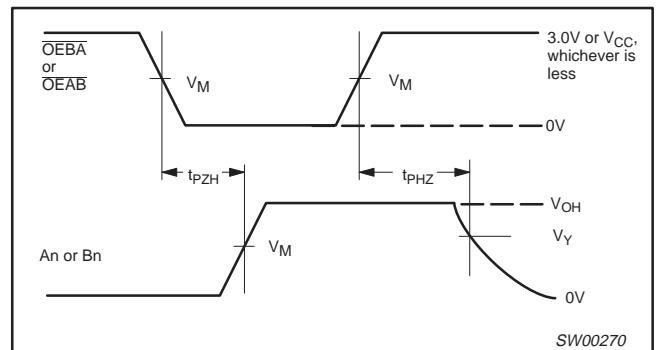
Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width, and Maximum Clock Frequency



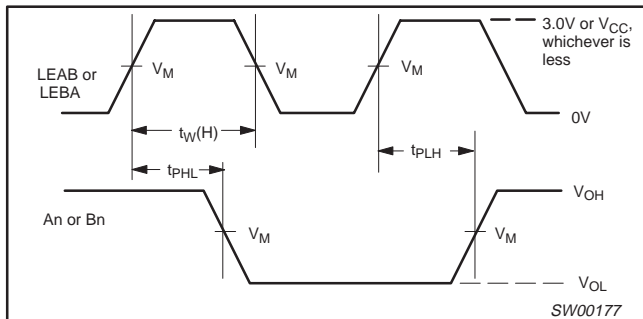
Waveform 4. Data Setup and Hold Times



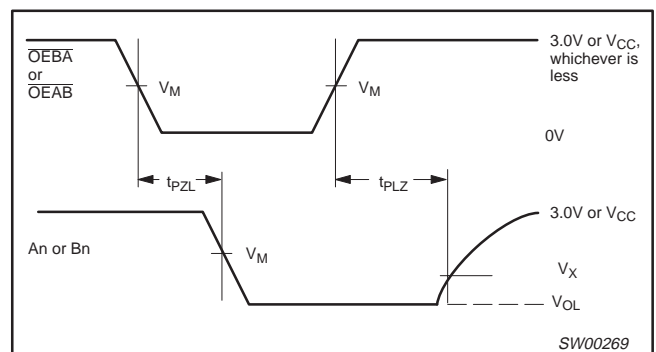
Waveform 2. Propagation Delay, Transparent Mode



Waveform 5. 3-State Output Enable Time to High Level and Output Disable Time from High Level



Waveform 3. Propagation Delay, Enable to Output, and Enable Pulse Width

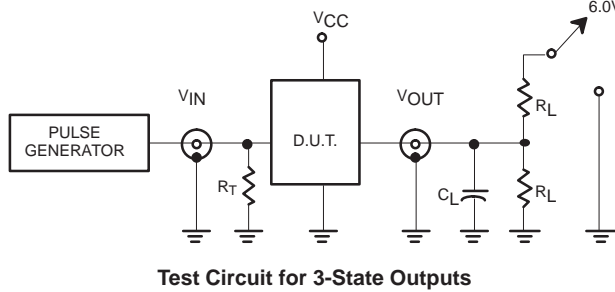


Waveform 6. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

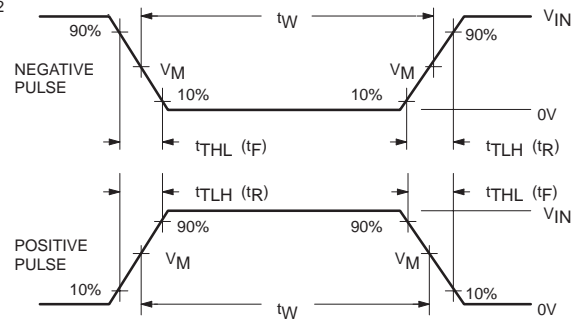
# 2.5V/3.3V 18-bit universal bus transceiver (3-State)

# 74ALVT16600

## TEST CIRCUIT AND WAVEFORMS



Test Circuit for 3-State Outputs



### SWITCH POSITION

TEST	SWITCH
$t_{PLZ}/t_{PZL}$	6V or $V_{CC} \times 2$
$t_{PLH}/t_{PHL}$	Open
$t_{PHZ}/t_{PZH}$	GND

### DEFINITIONS

$R_L$  = Load resistor; see AC CHARACTERISTICS for value.

$C_L$  = Load capacitance includes jig and probe capacitance: See AC CHARACTERISTICS for value.

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

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	$t_W$	$t_R$	$t_F$
74ALVT16	3.0V or $V_{CC}$ whichever is less	$\leq 10\text{MHz}$	500ns	$\leq 2.5\text{ns}$	$\leq 2.5\text{ns}$

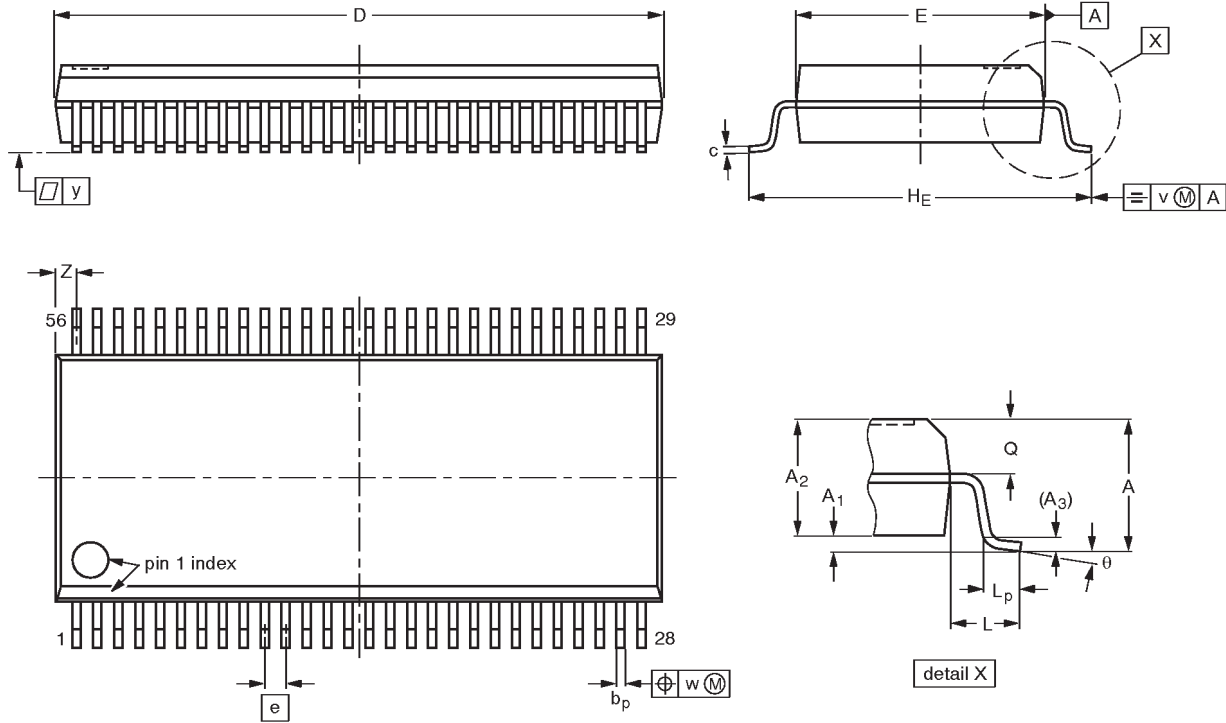
SW00025

2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

SSOP56: plastic shrink small outline package; 56 leads; body width 7.5 mm

SOT371-1



**DIMENSIONS (mm are the original 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>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.8	0.4 0.2	2.35 2.20	0.25	0.3 0.2	0.22 0.13	18.55 18.30	7.6 7.4	0.635	10.4 10.1	1.4	1.0 0.6	1.2 1.0	0.25	0.18	0.1	0.85 0.40	8° 0°

**Note**

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

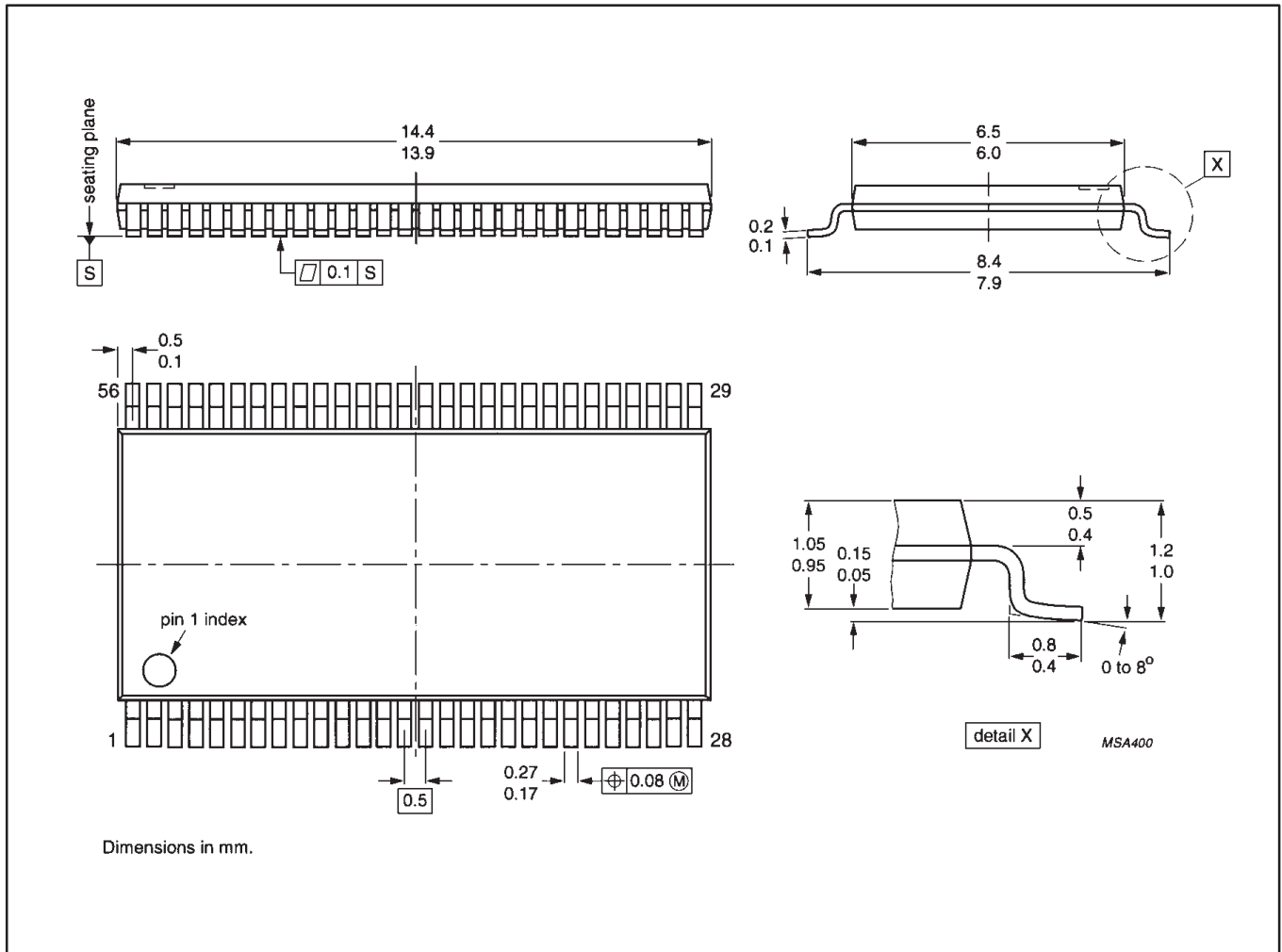
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT371-1		MO-118AB				93-11-02 95-02-04

# 2.5V/3.3V 18-bit universal bus transceiver (3-State)

## 74ALVT16600

**TSSOP56:** plastic thin shrink small outline package; 56 leads; body width 6.1mm

**SOT364-1**



---

2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

---

**NOTES**

## 2.5V/3.3V 18-bit universal bus transceiver (3-State)

74ALVT16600

**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.
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.

**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 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.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**Disclaimers**

**Life support** — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Philips Semiconductors  
811 East Arques Avenue  
P.O. Box 3409  
Sunnyvale, California 94088-3409  
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 1998  
All rights reserved. Printed in U.S.A.

print code

Date of release: 05-96

Document order number:

9397-750-03569

*Let's make things better.*