

DATA SHEET

74ALVT16240

16-bit inverting buffer/driver (3-State)

Product specification
Replaces data sheet of 1997 May 02
IC23 Data Handbook

1998 Feb 13

2.5V/3.3V 16-bit inverting buffer/driver (3-State)

74ALVT16240

FEATURES

- 16-bit 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 3-State
- No bus current loading when output is tied to 5V bus
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

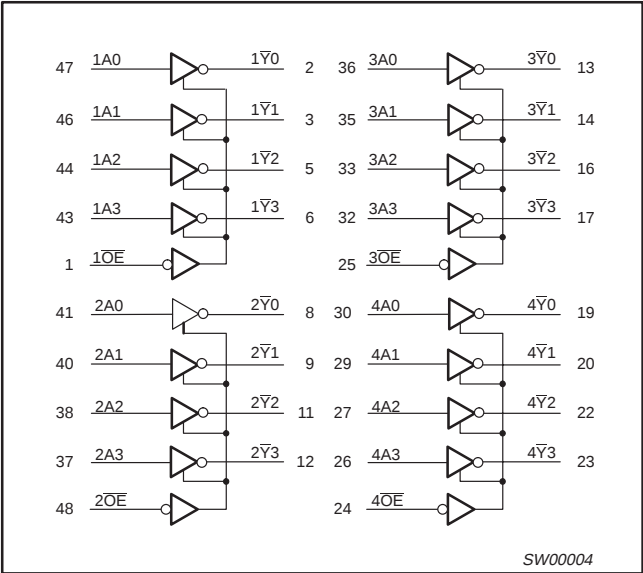
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}C$	TYPICAL		UNIT
			2.5V	3.3V	
t_{PLH} t_{PHL}	Propagation delay nAx to nYx	$C_L = 50pF$	2.5 1.9	1.7 1.7	ns
C_{IN}	Input capacitance nOE	$V_I = 0V$ or V_{CC}	3	3	pF
C_O	Output pin capacitance	$V_{I/O} = 0V$ or V_{CC}	9	9	pF
I_{CCZ}	Total supply current	Outputs disabled	40	60	μA

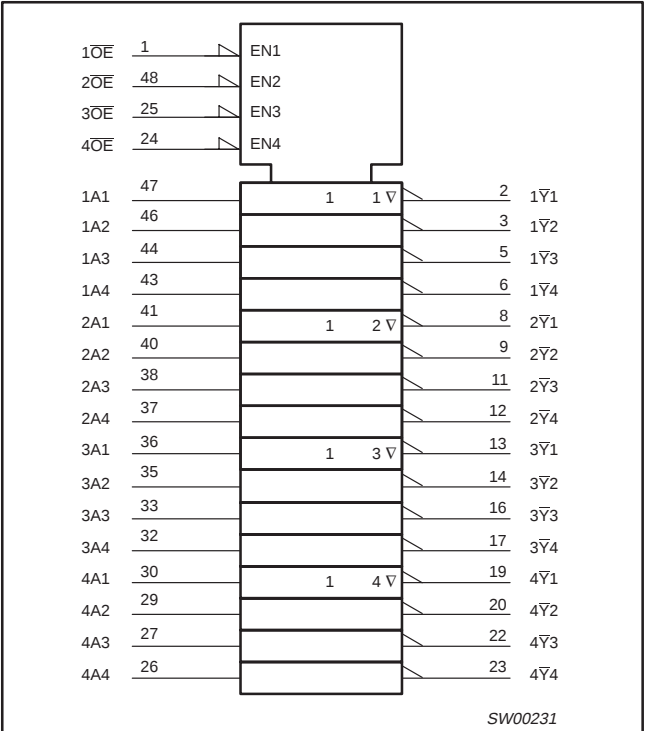
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	-40°C to +85°C	74ALVT16240 DL	AV16240 DL	SOT370-1
48-Pin Plastic TSSOP Type II	-40°C to +85°C	74ALVT16240 DGG	AV16240 DGG	SOT362-1

LOGIC SYMBOL



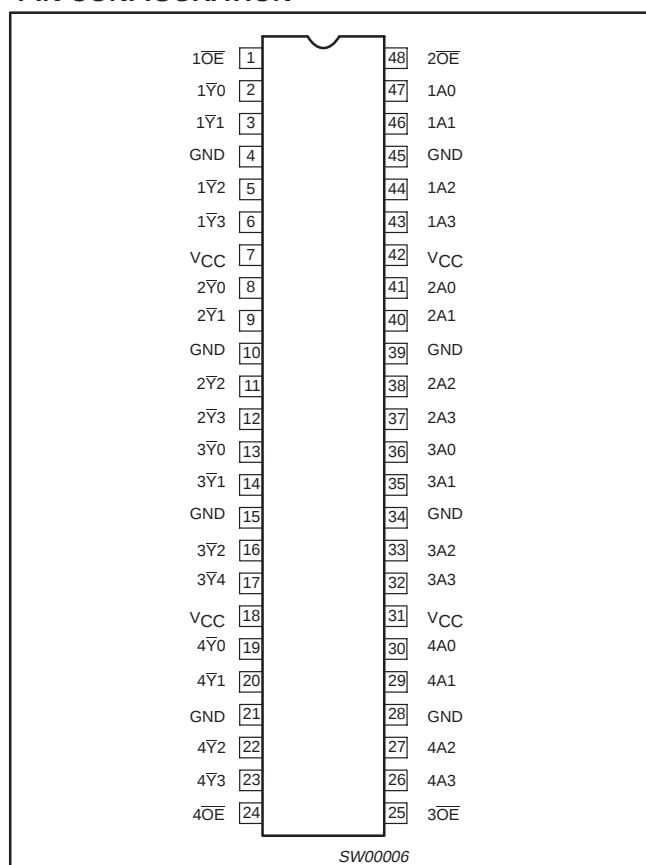
LOGIC SYMBOL (IEEE/IEC)



2.5V/3.3V 16-bit inverting buffer/driver (3-State)

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PIN CONFIGURATION



PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26	1A0-1A3 2A0-2A3 3A0-3A3 4A0-4A3	Data inputs
2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23	1Y0-1Y3 2Y0-2Y3 3Y0-3Y3 4Y0-4Y3	Data outputs
1, 48, 25, 24	1OE, 2OE, 3OE, 4OE	Output enables
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V _{CC}	Positive supply voltage

FUNCTION TABLE

Inputs		Outputs
nOE	nAx	nYx
L	L	H
L	H	L
H	X	Z

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

ABSOLUTE MAXIMUM RATINGS^{1, 2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		-0.5 to +4.6	V
I _{IK}	DC input diode current	V _I < 0	-50	mA
V _I	DC input voltage ³		-0.5 to +7.0	V
I _{OK}	DC output diode current	V _O < 0	-50	mA
V _{OUT}	DC output voltage ³	Output in Off or High state	-0.5 to +7.0	V
I _{OUT}	DC output current	Output in Low state	128	mA
		Output in High state	-64	
T _{stg}	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 16-bit inverting buffer/driver (3-State)

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	2.5V RANGE LIMITS		3.3V RANGE LIMITS		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	DC supply voltage	2.3	2.7	3.0	3.6	V
V_I	Input voltage	0	5.5	0	5.5	V
V_{IH}	High-level input voltage	1.7		2.0		V
V_{IL}	Input voltage		0.7		0.8	V
I_{OH}	High-level output current		-8		-32	mA
I_{OL}	Low-level output current		8		32	mA
	Low-level output current; current duty cycle $\leq 50\%$; $f \geq 1$ kHz		24		64	
$\Delta t/\Delta v$	Input transition rise or fall rate; Outputs enabled		10		10	ns/V
T_{amb}	Operating free-air temperature range	-40	+85	-40	+85	°C

DC ELECTRICAL CHARACTERISTICS (3.3V $\pm$ 0.3V RANGE)

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS			UNIT	
				Temp = -40°C to +85°C				
				MIN	TYP ¹	MAX		
V _{IK}	Input clamp voltage	V _{CC} = 3.0V; I _{IK} = −18mA			−0.85	−1.2	V	
V _{OH}	High-level output voltage	V _{CC} = 3.0 to 3.6V; I _{OH} = −100μA		V _{CC} −0.2	V _{CC}		V	
		V _{CC} = 3.0V; I _{OH} = −32mA		2.0	2.3			
V _{OL}	Low-level output voltage	V _{CC} = 3.0V; I _{OL} = 100μA			0.07	0.2	V	
		V _{CC} = 3.0V; I _{OL} = 16mA			0.25	0.4		
		V _{CC} = 3.0V; I _{OL} = 32mA			0.3	0.5		
		V _{CC} = 3.0V; I _{OL} = 64mA			0.4	0.55		
I _I	Input leakage current	V _{CC} = 3.6V; V _I = V _{CC} or GND	Control pins		0.1	±1	μA	
		V _{CC} = 0 or 3.6V; V _I = 5.5V			0.1	10		
		V _{CC} = 3.6V; V _I = V _{CC}	Data pins ⁴		0.5	1		
		V _{CC} = 3.6V; V _I = 0V			0.1	−5		
I _{OFF}	Off current	V _{CC} = 0V; V _I or V _O = 0 to 4.5V			0.1	±100	μA	
I _{HOLD}	Bus Hold current Data inputs ⁶	V _{CC} = 3V; V _I = 0.8V		75	130		μA	
		V _{CC} = 3V; V _I = 2.0V		−75	−140			
		V _{CC} = 0V to 3.6V; V _{CC} = 3.6V		±500				
I _{PU/PD}	Power up/down 3-State output current ³	V _{CC} ≤ 1.2V; V _O = 0.5V to V _{CC} ; V _I = GND or V _{CC} OE/OE = Don't care			1	±100	μA	
I _{OZH}	3-State output High current	V _{CC} = 3.6V; V _O = 3.0V; V _I = V _{IL} or V _{IH}			0.5	5	μA	
I _{OZL}	3-State output Low current	V _{CC} = 3.6V; V _O = 0.5V; V _I = V _{IL} or V _{IH}			0.5	−5	μA	
I _{CCH}	Quiescent supply current	V _{CC} = 3.6V; Outputs High, V _I = GND or V _{CC} , I _O = 0			0.05	0.1	mA	
I _{CCL}		V _{CC} = 3.6V; Outputs Low, V _I = GND or V _{CC} , I _O = 0			3.9	5.5		
I _{CCZ}		V _{CC} = 3.6V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵			0.06	0.1		
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 3V to 3.6V; One input at V _{CC} −0.6V, Other inputs at V _{CC} or GND				0.04	0.4	mA

NOTES:

1. All typical values are at $V_{CC} = 3.3V$ and $T_{amb} = 25^\circ C$.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
3. This parameter is valid for any V_{CC} between $0V$ and $1.2V$ with a transition time of up to $10msec$. From $V_{CC} = 1.2V$ to $V_{CC} = 3.3V \pm 0.3V$ a transition time of $100\mu sec$ is permitted. This parameter is valid for $T_{amb} = 25^\circ C$ only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled up to V_{CC} or pulled down to ground.
6. This is the bus hold overdrive current required to force the input to the opposite logic state.

2.5V/3.3V 16-bit inverting buffer/driver (3-State)

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AC CHARACTERISTICS (3.3V $\pm$ 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 ± 0.3V			
			MIN	TYP ¹	MAX	
t _{PLH} t _{PHL}	Propagation delay nAx to nYx	1	0.5 0.5	1.7 1.7	3.0 2.6	ns
t _{PZH} t _{PZL}	Output enable time to High and Low level	2	1.0 1.0	1.9 1.9	3.0 3.1	ns
t _{PHZ} t _{PLZ}	Output disable time from High and Low Level	2	1.5 1.5	2.8 2.3	4.1 3.4	ns

NOTE:1. All typical values are at $V_{CC} = 3.3\text{V}$ and $T_{\text{amb}} = 25^\circ\text{C}$.**DC ELECTRICAL CHARACTERISTICS (2.5V $\pm$ 0.2V RANGE)**

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS			UNIT
				Temp = -40°C to +85°C			
				MIN	TYP ¹	MAX	
V _{IK}	Input clamp voltage	V _{CC} = 2.3V; I _{IK} = -18mA			-0.85	-1.2	V
V _{OH}	High-level output voltage	V _{CC} = 2.3 to 3.6V; I _{OH} = -100μA		V _{CC} -0.2	V _{CC}		V
		V _{CC} = 2.3V; I _{OH} = -8mA		1.8	2.5		
V _{OL}	Low-level output voltage	V _{CC} = 2.3V; I _{OL} = 100μA			0.07	0.2	V
		V _{CC} = 2.3V; I _{OL} = 24mA			0.3	0.5	
		V _{CC} = 2.3V; I _{OL} = 8mA				0.4	
I _I	Input leakage current	V _{CC} = 2.7V; V _I = V _{CC} or GND	Control pins		0.1	±1	μA
		V _{CC} = 0 or 2.7V; V _I = 5.5V			0.1	10	
		V _{CC} = 2.7V; V _I = V _{CC}	Data pins ⁴		0.1	1	
		V _{CC} = 2.7V; V _I = 0			0.1	-5	
I _{OFF}	Off current	V _{CC} = 0V; V _I or V _O = 0 to 4.5V			0.1	±100	μA
I _{HOLD}	Bus Hold current	V _{CC} = 2.3V; V _I = 0.7V			90		μA
	Data inputs ⁶	V _{CC} = 2.3V; V _I = 1.7V			-10		
I _{EX}	Current into an output in the High state when V _O > V _{CC}	V _O = 5.5V; V _{CC} = 2.3V			10	125	μA
I _{PU/PD}	Power up/down 3-State output current ³	V _{CC} ≤ 1.2V; V _O = 0.5V to V _{CC} ; V _I = GND or V _{CC} ; OE/OE = Don't care			1	±100	μA
I _{OZH}	3-State output High current	V _{CC} = 2.7V; V _O = 2.3V; V _I = V _{IL} or V _{IH}			0.5	5	μA
I _{OZL}	3-State output Low current	V _{CC} = 2.7V; V _O = 0.5V; V _I = V _{IL} or V _{IH}			0.5	-5	μA
I _{CCH}	Quiescent supply current	V _{CC} = 2.7V; Outputs High, V _I = GND or V _{CC} , I _O = 0			0.04	0.1	mA
I _{CCL}		V _{CC} = 2.7V; Outputs Low, V _I = GND or V _{CC} , I _O = 0			2.7	4.5	
I _{CCZ}		V _{CC} = 2.7V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵			0.04	0.1	
ΔI _{CC}	Additional supply current per input pin ²	V _{CC} = 2.3V to 2.7V; One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND			0.04	0.4	mA

NOTES:

1. All typical values are at $V_{CC} = 2.5\text{V}$ and $T_{\text{amb}} = 25^\circ\text{C}$.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
3. This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From $V_{CC} = 1.2\text{V}$ to $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$ a transition time of 100 μsec is permitted. This parameter is valid for $T_{\text{amb}} = 25^\circ\text{C}$ only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled up to V_{CC} or pulled down to ground.
6. Not guaranteed.

2.5V/3.3V 16-bit inverting buffer/driver (3-State)

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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 $+85^{\circ}\text{C}$.

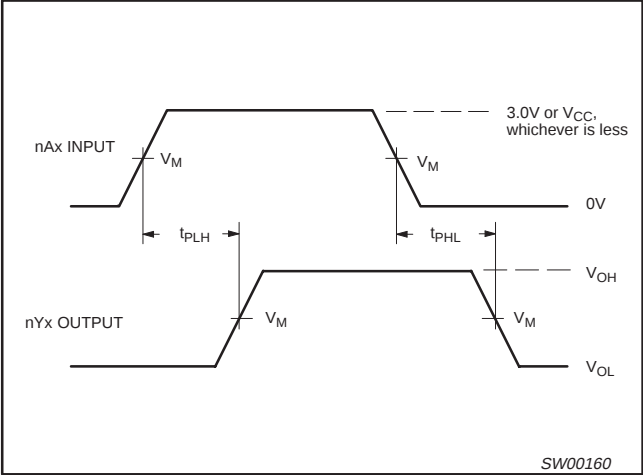
SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			V _{CC} = 2.5V ±0.2V			
			MIN	TYP ¹	MAX	
t _{PLH} t _{PHL}	Propagation delay nAx to nȲx	1	1.0 1.0	2.5 1.9	3.7 2.9	ns
t _{PZH} t _{PZL}	Output enable time to High and Low level	2	1.0 1.0	3.3 2.6	5.3 4.2	ns
t _{PHZ} t _{PLZ}	Output disable time from High and Low Level	2	1.0 1.0	2.5 1.8	4.0 3.0	ns

NOTE:

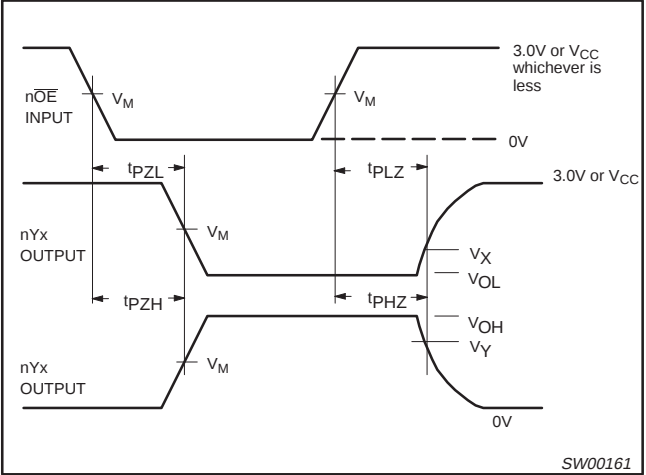
1. All typical values are at $V_{CC} = 2.5\text{V}$ and $T_{\text{amb}} = 25^{\circ}\text{C}$.

AC WAVEFORMS

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



Waveform 1. Input (nAx) to Output (nYx) Propagation Delays

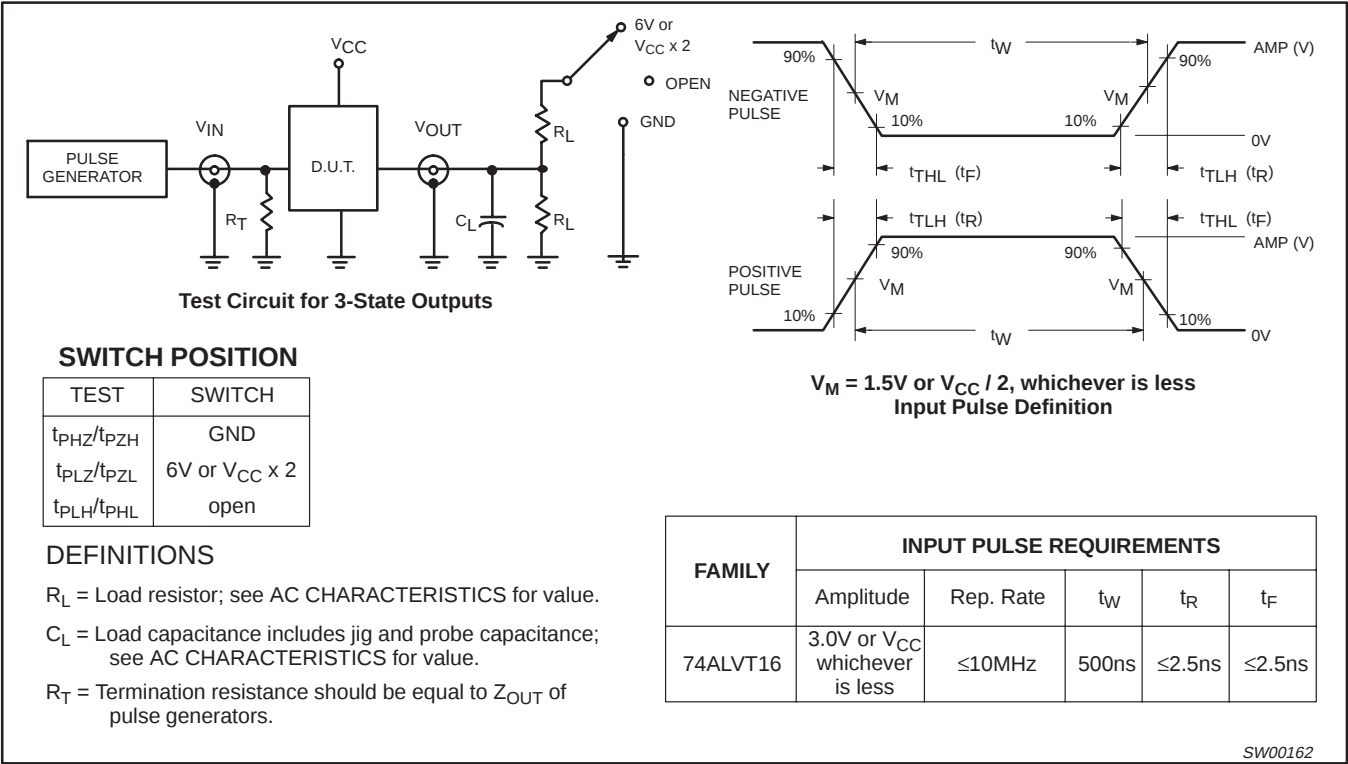


Waveform 2. 3-State Output Enable and Disable Times

2.5V/3.3V 16-bit inverting buffer/driver (3-State)

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TEST CIRCUIT AND WAVEFORMS

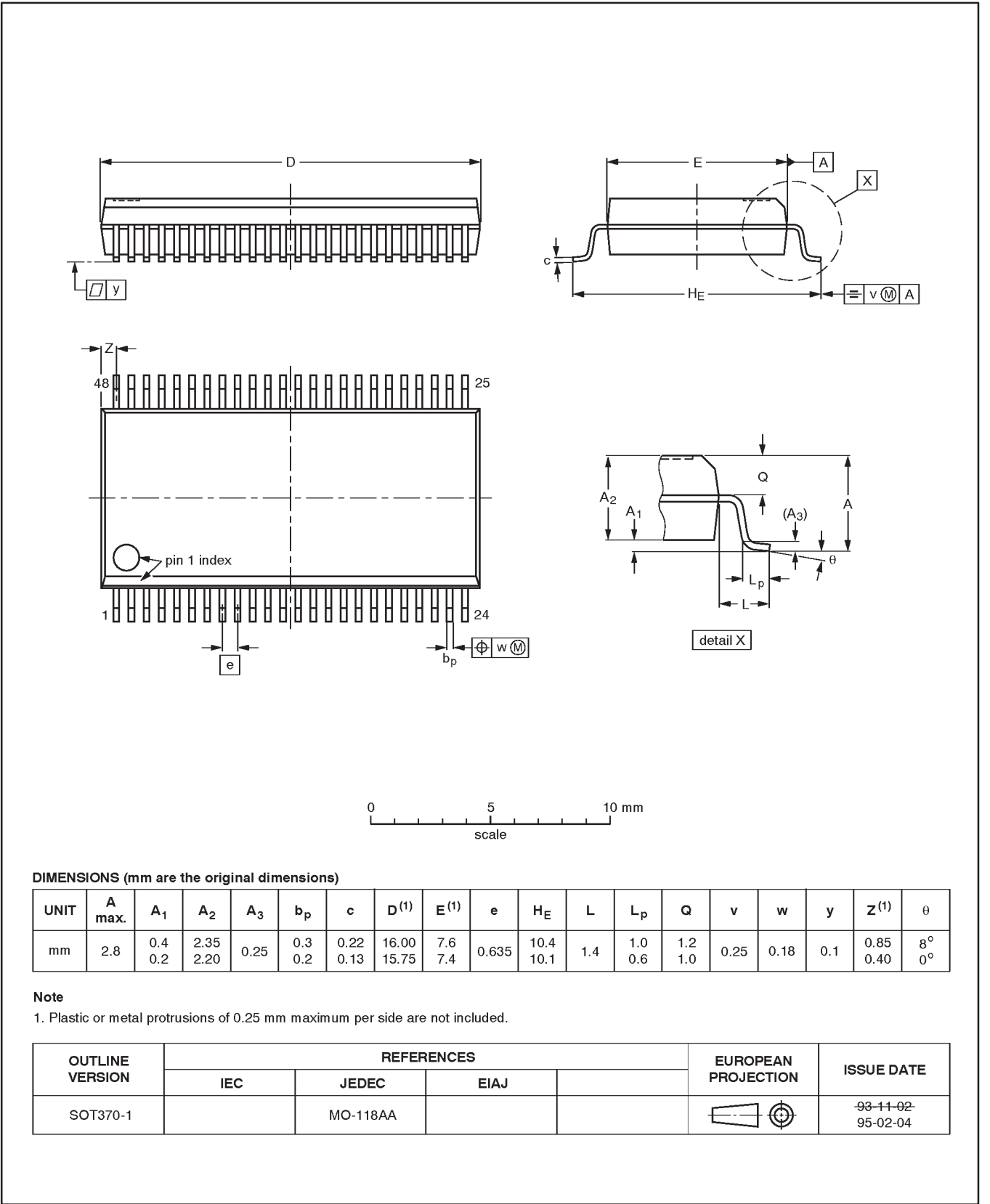


16-bit inverting buffer/driver; (3-State)

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SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1

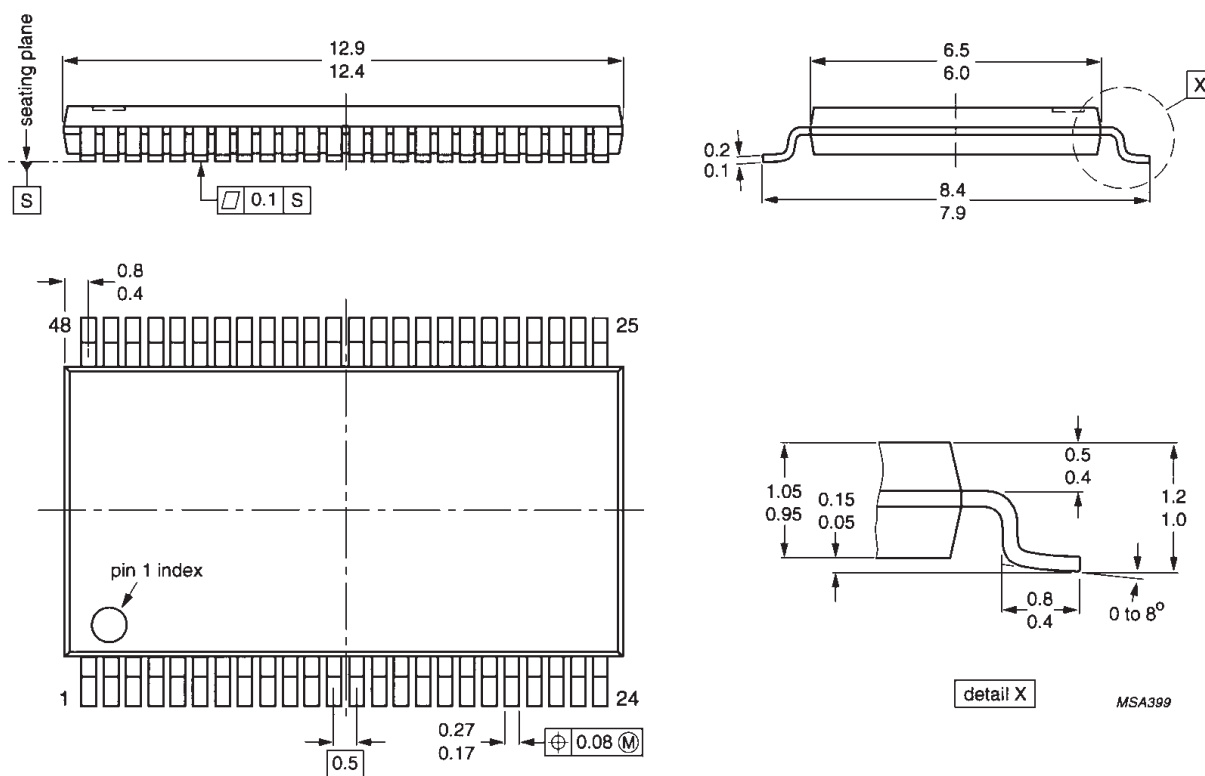


16-bit inverting buffer/driver; (3-State)

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TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1mm

SOT362-1



Dimensions in mm.

16-bit inverting buffer/driver (3-State)

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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.
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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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