

# DATA SHEET

## **74ALVCH16827**

20-bit buffer/line driver, non-inverting  
(3-State)

Product specification

1998 Jul 27

IC24 Data Handbook

## 20-bit buffer/line driver, non-inverting (3-State)

## 74ALVCH16827

## FEATURES

- Wide supply voltage range of 1.2V to 3.6V
- Complies with JEDEC standard no. 8-1A
- Wide supply voltage range of 1.2V to 3.6V
- CMOS low power consumption
- Direct interface with TTL levels
- Universal bus transceiver with D-type latches and D-type flip-flops capable of operating in transparent, latched, clocked or clocked-enabled mode.
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple  $V_{CC}$  and GND pins for minimum noise and ground bounce
- Current drive  $\pm 24$  mA at 3.0 V
- All inputs have bus hold circuitry
- Output drive capability 50Ω transmission lines @ 85°C
- 3-State non-inverting outputs for bus oriented applications

## DESCRIPTION

The 74ALVCH16827 is a 20-bit non-inverting buffer/driver with 3-State outputs for bus oriented applications.

The 74ALVCH16827 consists of two 10-bit sections with separate output enable signals. For either 10-bit buffer section, the two output enable ( $1\overline{OE}1$  and  $1\overline{OE}2$  or  $2\overline{OE}1$  and  $2\overline{OE}2$ ) inputs must both be active. If either output enable input is high, the outputs of that 10-bit buffer section are in high impedance state.

The 74ALVCH16827 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

## QUICK REFERENCE DATA

GND = 0V;  $T_{amb} = 25^\circ\text{C}$ ;  $t_r = t_f = 2.5\text{ns}$

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	Propagation delay CP to Qn	$V_{CC} = 2.5\text{V}$ , $C_L = 30\text{pF}$ $V_{CC} = 3.3\text{V}$ , $C_L = 50\text{pF}$	2.0 2.0	ns
$C_I$	Input capacitance		5	pF
$C_{PD}$	Power dissipation capacitance per latch	$V_I = \text{GND to } V_{CC}^1$	Output enabled 20 Output disabled 3	pF

## NOTES:

- $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  $C_L$  = output load capacity in pF;  
 $f_o$  = output frequency in MHz;  $V_{CC}$  = supply voltage in V;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
56-Pin Plastic TSSOP Type II	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	74ALVCH16827 DGG	ACH16827 DGG	SOT364-1

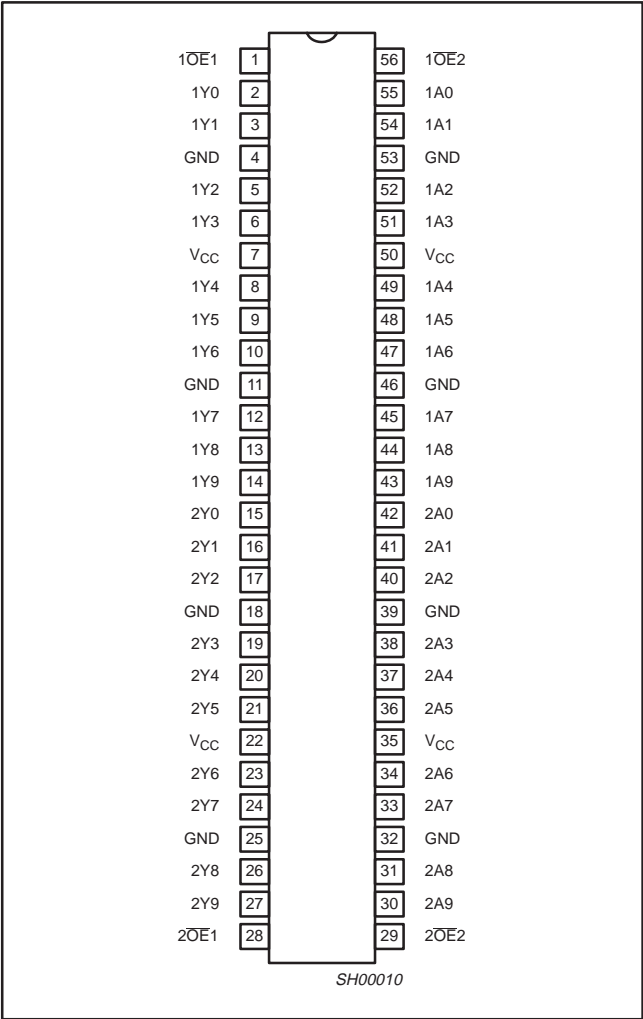
## PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
55, 54, 52, 51, 49, 48, 47, 45, 44, 43, 42, 41, 40, 38, 37, 36, 34, 33, 31, 30	1A0 - 1A9 2A0 - 2A9	Data inputs
2, 3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 26, 27	1Y0 - 1Y9 2Y0 - 2Y9	Data outputs
1, 56, 28, 29	$1\overline{OE}0$ , $1\overline{OE}1$ $2\overline{OE}0$ , $2\overline{OE}1$	Output enable inputs (active-Low)
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0V)
7, 22, 35, 50	$V_{CC}$	Positive supply voltage

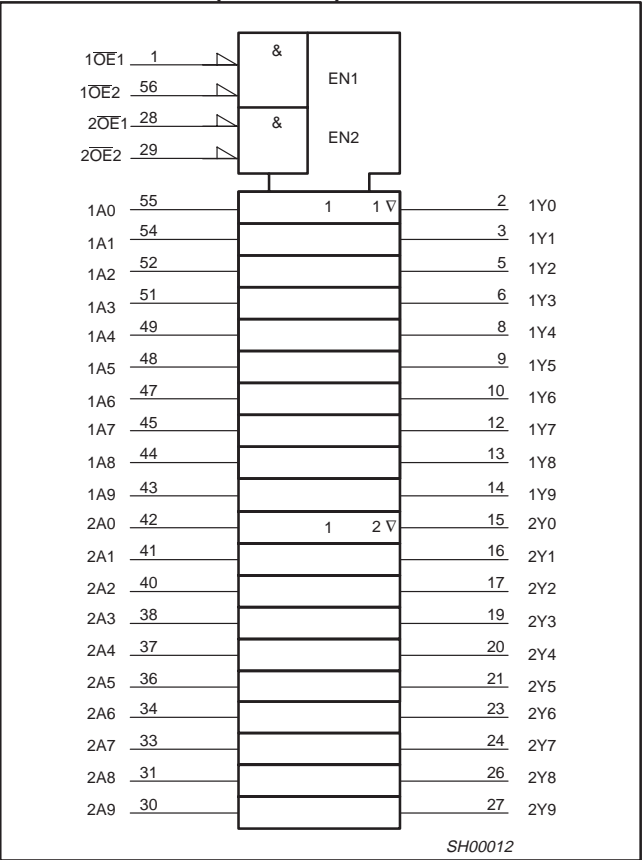
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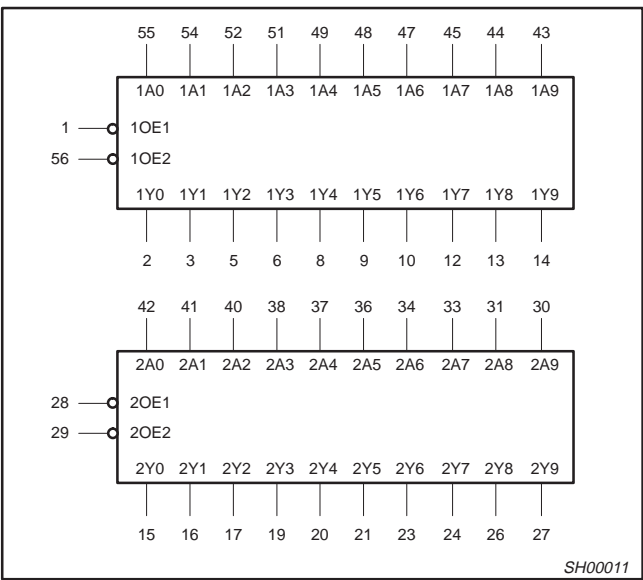
PIN CONFIGURATION



LOGIC SYMBOL (IEEE/IEC)



LOGIC SYMBOL



FUNCTION TABLE

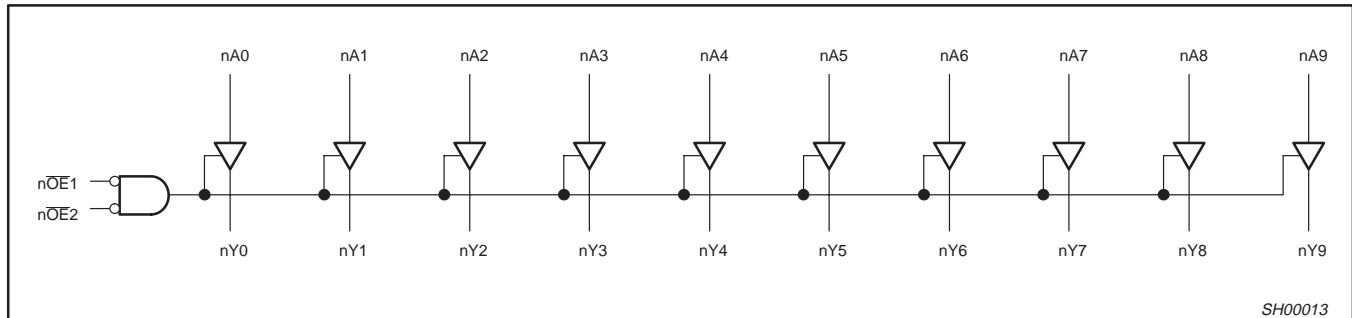
INPUTS			OUTPUTS
nOE1	nOE2	A	Y
L	L	L	L
L	L	H	H
H	H	X	Z
X	H	X	Z

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

## 20-bit buffer/line driver, non-inverting (3-State)

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## LOGIC DIAGRAM



## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
$V_{CC}$	DC supply voltage 2.5V range (for max. speed performance @ 30 pF output load)		2.3	2.7	V
	DC supply voltage 3.3V range (for max. speed performance @ 50 pF output load)		3.0	3.6	
$V_I$	DC Input voltage range		0	$V_{CC}$	V
$V_O$	DC output voltage range		0	$V_{CC}$	V
$T_{amb}$	Operating free-air temperature range		-40	+85	°C
$t_r, t_f$	Input rise and fall times	$V_{CC} = 2.3$ to $3.0$ V $V_{CC} = 3.0$ to $3.6$ V	0	20 10	ns/V

ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

In accordance with the Absolute Maximum Rating System (IEC 134)  
 Voltages are referenced to GND (ground = 0V)

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	For control pins <sup>2</sup>	-0.5 to +4.6	V
		For data inputs <sup>2</sup>	-0.5 to $V_{CC} + 0.5$	
$I_{OK}$	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	±50	mA
$V_O$	DC output voltage	Note 2	-0.5 to $V_{CC} + 0.5$	V
$I_O$	DC output source or sink current	$V_O = 0$ to $V_{CC}$	±50	mA
$I_{GND}, I_{CC}$	DC $V_{CC}$ or GND current		±100	mA
$T_{stg}$	Storage temperature range		-65 to +150	°C
$P_{TOT}$	Power dissipation per package -plastic medium-shrink (SSOP) -plastic thin-medium-shrink (TSSOP)	For temperature range: -40 to +125 °C above +55°C derate linearly with 11.3 mW/K above +55°C derate linearly with 8 mW/K	850 600	mW

## NOTE:

- 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 input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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**DC ELECTRICAL CHARACTERISTICS**

Over recommended operating conditions. Voltage are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>IH</sub>	HIGH level Input voltage	V <sub>CC</sub> = 2.3 to 2.7V	1.7	1.2		V
		V <sub>CC</sub> = 2.7 to 3.6V	2.0	1.5		
V <sub>IL</sub>	LOW level Input voltage	V <sub>CC</sub> = 2.3 to 2.7V		1.2	0.7	V
		V <sub>CC</sub> = 2.7 to 3.6V		1.5	0.8	
V <sub>OH</sub>	HIGH level output voltage	V <sub>CC</sub> = 2.3 to 3.6V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -100μA	V <sub>CC</sub> -0.2	V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -6mA	V <sub>CC</sub> -0.3	V <sub>CC</sub> -0.08		
		V <sub>CC</sub> = 2.3V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -12mA	V <sub>CC</sub> -0.6	V <sub>CC</sub> -0.26		
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -12mA	V <sub>CC</sub> -0.5	V <sub>CC</sub> -0.14		
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -12mA	V <sub>CC</sub> -0.6	V <sub>CC</sub> -0.09		
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -24mA	V <sub>CC</sub> -1.0	V <sub>CC</sub> -0.28		
V <sub>OL</sub>	LOW level output voltage	V <sub>CC</sub> = 2.3 to 3.6V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA		GND	0.20	V
		V <sub>CC</sub> = 2.3V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 6mA		0.07	0.40	V
		V <sub>CC</sub> = 2.3V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 12mA		0.15	0.70	V
		V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 12mA		0.14	0.40	
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 24mA		0.27	0.55	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 2.3 to 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND		0.1	5	μA
I <sub>OZ</sub>	3-State output OFF-state current	V <sub>CC</sub> = 2.3 to 3.6V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND		0.1	10	μA
I <sub>CC</sub>	Quiescent supply current	V <sub>CC</sub> = 2.3 to 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0		0.2	40	μA
ΔI <sub>CC</sub>	Additional quiescent supply current	V <sub>CC</sub> = 2.3V to 3.6V; V <sub>I</sub> = V <sub>CC</sub> - 0.6V; I <sub>O</sub> = 0		150	750	μA
I <sub>BHL</sub> <sup>2</sup>	Bus hold LOW sustaining current	V <sub>CC</sub> = 2.3V; V <sub>I</sub> = 0.7V	45	—		μA
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = 0.8V	75	150		
I <sub>BHH</sub> <sup>2</sup>	Bus hold HIGH sustaining current	V <sub>CC</sub> = 2.3V; V <sub>I</sub> = 1.7V	-45			μA
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = 2.0V	-75	-175		
I <sub>BHLO</sub> <sup>2</sup>	Bus hold LOW overdrive current	V <sub>CC</sub> = 3.6V	500			μA
I <sub>BHHO</sub> <sup>2</sup>	Bus hold HIGH overdrive current	V <sub>CC</sub> = 3.6V	-500			μA

**NOTES:**

1. All typical values are at  $T_{amb} = 25^{\circ}C$ .
2. Valid for data inputs of bus hold parts.

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**AC CHARACTERISTICS FOR  $V_{CC} = 2.3V$  TO  $2.7V$  RANGE**GND = 0V;  $t_r = t_f \leq 2.0ns$ ;  $C_L = 30pF$ 

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			V <sub>CC</sub> = 2.5 ± 0.2V			
			MIN	TYP <sup>1</sup>	MAX	
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay nAn to nYn	1, 3	1.0	2.0	4.1	ns
t <sub>PZH</sub> /t <sub>PZL</sub>	3-State output enable time n <sub>OE</sub> n to nYn	2, 3	1.0	2.9	6.0	ns
t <sub>PHZ</sub> /t <sub>PLZ</sub>	3-State output disable time n <sub>OE</sub> n to nYn	2,3	1.2	2.1	5.6	ns

**NOTE:**1. All typical values are at  $V_{CC} = 2.5V$  and  $T_{amb} = 25^\circ C$ .**AC CHARACTERISTICS FOR  $V_{CC} = 3.0V$  TO  $3.6V$  RANGE AND  $V_{CC} = 2.7V$** GND = 0V;  $t_r = t_f \leq 2.5ns$ ;  $C_L = 50pF$ 

SYMBOL	PARAMETER	WAVEFORM	LIMITS			LIMITS			UNIT
			V <sub>CC</sub> = 3.3 ± 0.3V			V <sub>CC</sub> = 2.7V			
			MIN	TYP <sup>1, 2</sup>	MAX	MIN	TYP <sup>1</sup>	MAX	
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay nAn to nYn	1, 3	1.0	2.0	3.4	1.0	2.1	3.9	ns
t <sub>PZH</sub> /t <sub>PZL</sub>	3-State output enable time nOE <sub>n</sub> to nYn	2, 3	1.0	2.5	4.7	1.0	3.0	5.7	ns
t <sub>PHZ</sub> /t <sub>PLZ</sub>	3-State output disable time nOE <sub>n</sub> to nYn	2, 3	1.3	2.8	4.5	1.3	3.1	4.9	ns

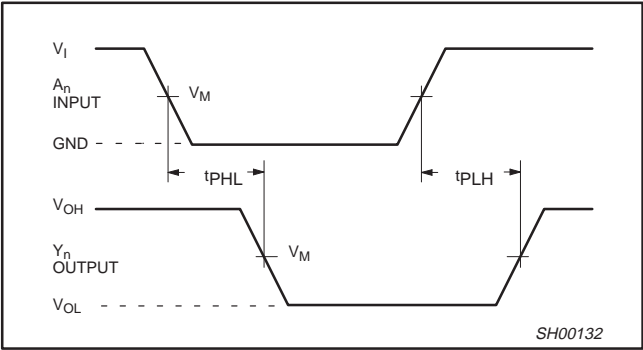
**NOTES:**1. All typical values are at  $V_{CC} T_{amb} = 25^\circ C$ .2. Typical value is measured at  $V_{CC} = 3.3V$ .

20-bit buffer/line driver, non-inverting (3-State)

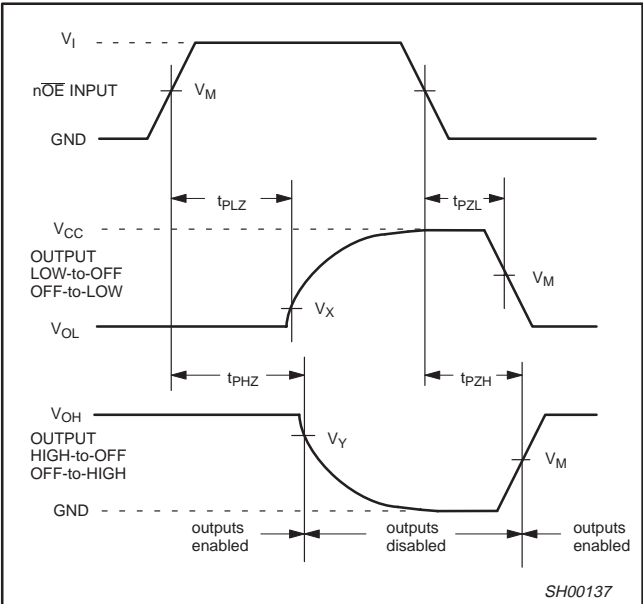
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**AC WAVEFORMS FOR  $V_{CC} = 2.3V$  TO  $2.7V$  AND  $V_{CC} < 2.3V$  RANGE**  
 $V_M = 0.5\text{ V}$   
 $V_X = V_{OL} + 0.15V$   
 $V_Y = V_{OH} - 0.15V$   
 $V_{OL}$  and  $V_{OH}$  are the typical output voltage drop that occur with the output load.

**AC WAVEFORMS FOR  $V_{CC} = 3.0V$  TO  $3.6V$  AND  $V_{CC} = 2.7V$  RANGE**  
 $V_M = 1.5\text{ V}$   
 $V_X = V_{OL} + 0.3V$   
 $V_Y = V_{OH} - 0.3V$   
 $V_{OL}$  and  $V_{OH}$  are the typical output voltage drop that occur with the output load.  
 $V_I = 2.7V$   
 $V_I = V_{CC}$



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



Waveform 2. The 3-State Output Enable and Disable Times

TEST CIRCUIT

**Test Circuit for switching times**

**DEFINITIONS**  
 $R_L$  = Load resistor  
 $C_L$  = Load capacitance includes jig and probe capacitance  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

**SWITCH POSITION**

TEST	$S_1$	$V_{CC}$	$V_I$
$t_{PLH}/t_{PHL}$	Open	$< 2.7V$	$V_{CC}$
$t_{PLZ}/t_{PZL}$	$2 * V_{CC}$	$2.7-3.6V$	$2.7V$
$t_{PHZ}/t_{PZH}$	GND		

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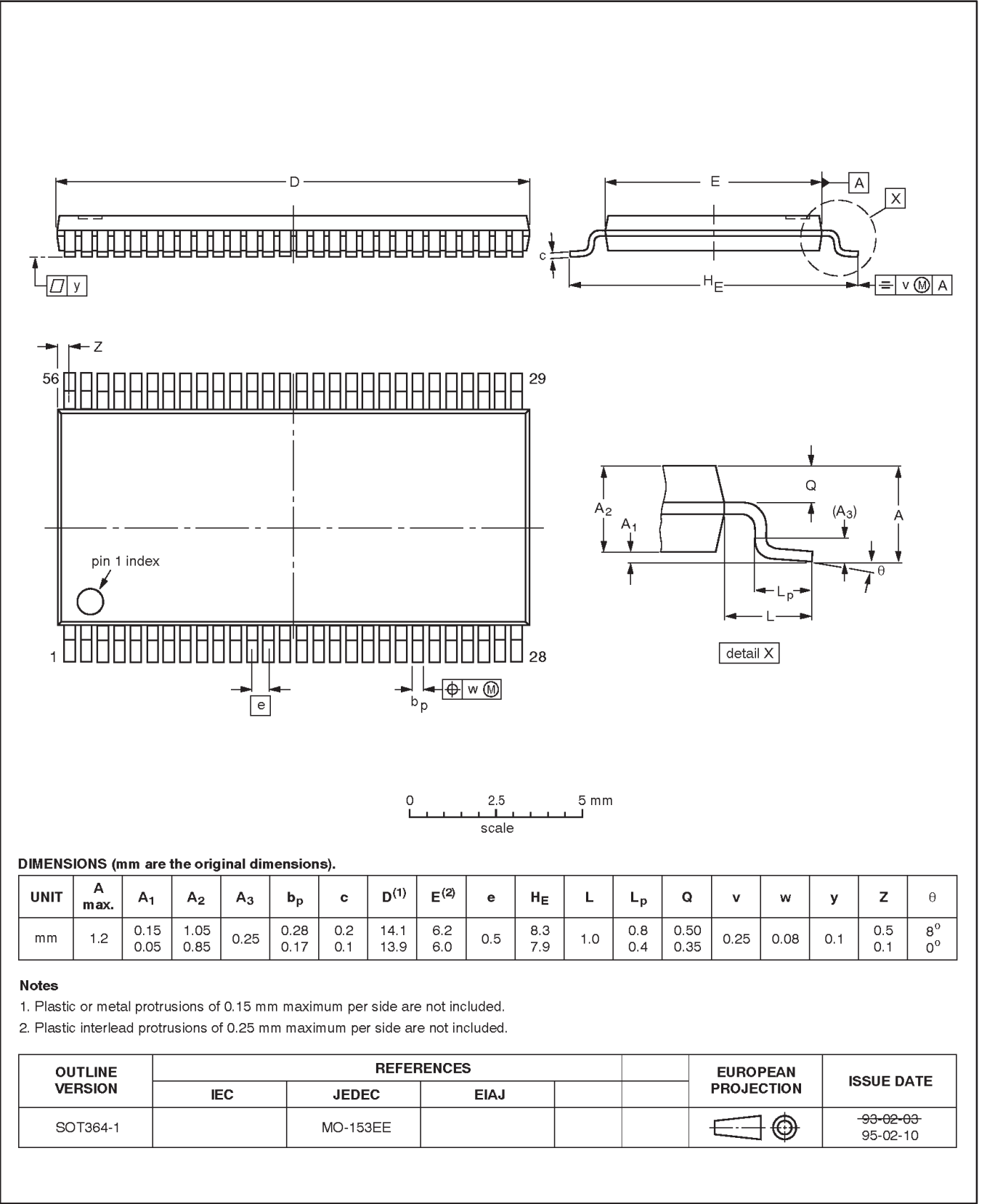
Waveform 3. Load circuitry for switching times

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

SOT364-1



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**NOTES**

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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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