Hex buffer/line driver (3-State)

"74LV367DB-T"

74LV367

FEATURES

- Optimized for Low Voltage applications: 1.0 to 3.6V

- Accepts TTL input levels between $V_{CC} = 2.7V$ and $V_{CC} = 3.6V$

- Typical V_{OLP} (output ground bounce) $< 0.8V$ @ $V_{CC} = 3.3V$, $T_{amb} = 25°C$

- Typical V_{OHV} (output V_{OH} undershoot) $> 2V$ @ $V_{CC} = 3.3V$, $T_{amb} = 25°C$

- Non-inverting outputs

- Output capability: bus driver

- I_{CC} category: MSI

DESCRIPTION

The 74LV367 is a low-voltage CMOS device and is pin and function compatible 74HC/HCT367.

The 74LV367 is a hex non-inverting buffer/line driver with 3-State outputs. The 3-State outputs (nY) are controlled by the output enable inputs ($1\overline{OE}$, $2\overline{OE}$).

A HIGH on $n\overline{OE}$, causes the outputs to assume a high impedance OFF-state.

QUICK REFERENCE DATA

GND = 0V; $T_{amb} = 25°C$; $t_r = t_f \leq 2.5$ ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay nA to nY	$C_L = 15pF$ $V_{CC} = 3.3V$	8	ns
C_I	Input capacitance		3.5	pF
C_{PD}	Power dissipation capacitance per buffer	Notes 1 and 2	30	pF

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

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
16-Pin Plastic DIL	−40°C to +125°C	74LV367 N	74LV367 N	SOT38-4
16-Pin Plastic SO	−40°C to +125°C	74LV367 D	74LV367 D	SOT109-1
16-Pin Plastic SSOP Type II	−40°C to +125°C	74LV367 DB	74LV367 DB	SOT338-1
16-Pin Plastic TSSOP Type I	−40°C to +125°C	74LV367 PW	74LV367PW DH	SOT403-1

PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1, 15	$1\overline{OE}$, $2\overline{OE}$	Output enable inputs (active-LOW)
2, 4, 6, 10, 12, 14	1A to 6A	Data inputs
3, 5, 7, 9, 11, 13	1Y to 6Y	Data outputs
8	GND	Ground (0V)
16	V_{CC}	Positive supply voltage

FUNCTION TABLE

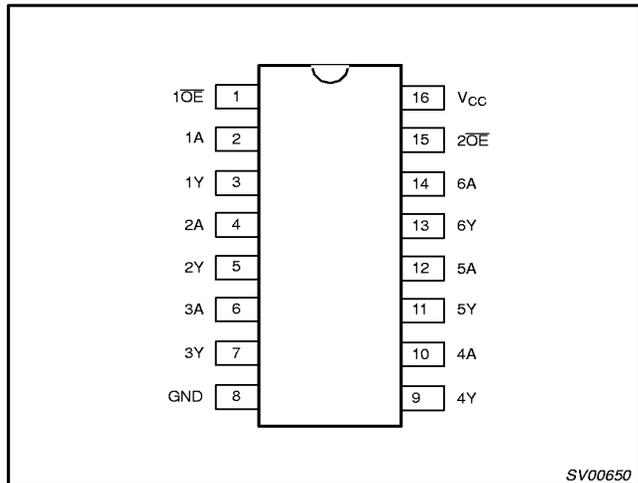| INPUTS		OUTPUT
$n\overline{OE}$	nA	nY
L	L	L
L	H	H
H	X	Z

H = HIGH voltage level
L = LOW voltage level
X = Don't care
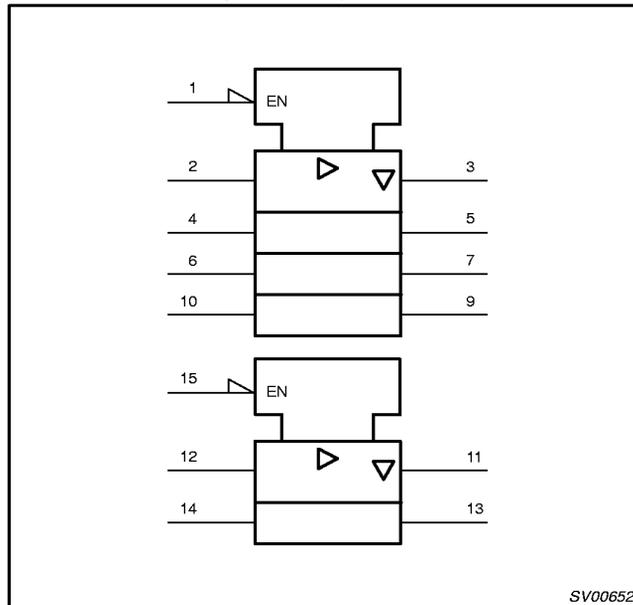Z = High impedance OFF-state

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"74LV367DB-T"

74LV367

PIN CONFIGURATION
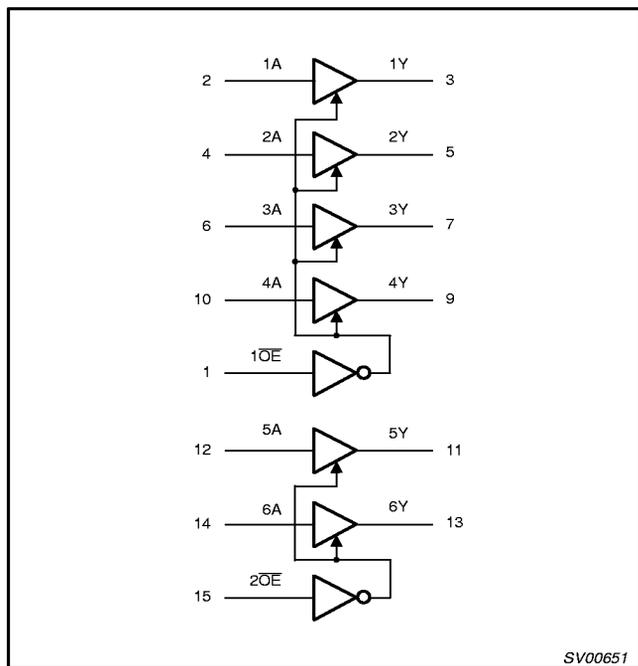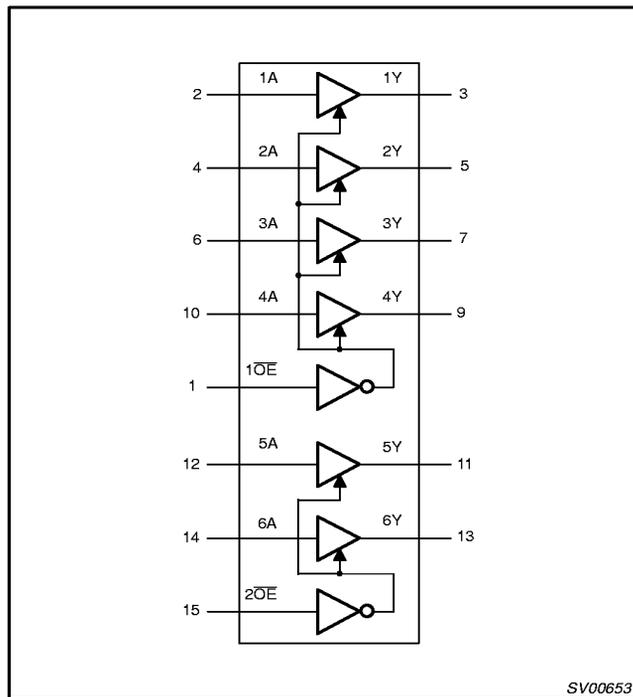
1OE	1	16	VCC
1A	2	15	2OE
1Y	3	14	6A
2A	4	13	6Y
2Y	5	12	5A
3A	6	11	5Y
3Y	7	10	4A
GND	8	9	4Y

SV00650

LOGIC SYMBOL

SV00651

LOGIC SYMBOL (IEEE/IEC)

SV00652

FUNCTIONAL DIAGRAM

SV00653

"74LV367DB-T"

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
V_{CC}	DC supply voltage	See Note 1	1.0	3.3	3.6	V
V_I	Input voltage		0	–	V_{CC}	V
V_O	Output voltage		0	–	V_{CC}	V
T_{amb}	Operating ambient temperature range in free air	See DC and AC characteristics	−40 −40		+85 +125	°C
t_r, t_f	Input rise and fall times	V_{CC} = 1.0V to 2.0V V_{CC} = 2.0V to 2.7V V_{CC} = 2.7V to 3.6V	– – –	– – –	500 200 100	ns/V

NOTE:

1. The LV is guaranteed to function down to V_{CC} = 1.0V (input levels GND or V_{CC}); DC characteristics are guaranteed from V_{CC} = 1.2V to V_{CC} = 3.6V.

ABSOLUTE MAXIMUM RATINGS[1, 2]

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
$\pm I_{IK}$	DC input diode current	V_I < −0.5 or V_I > V_{CC} + 0.5V	20	mA
$\pm I_{OK}$	DC output diode current	V_O < −0.5 or V_O > V_{CC} + 0.5V	50	mA
$\pm I_O$	DC output source or sink current – bus driver outputs	−0.5V < V_O < V_{CC} + 0.5V	35	mA
$\pm I_{GND}$, $\pm I_{CC}$	DC V_{CC} or GND current for types with –bus driver outputs		70	mA
T_{stg}	Storage temperature range		−65 to +150	°C
P_{tot}	Power dissipation per package –plastic DIL –plastic mini-pack (SO) –plastic shrink mini-pack (SSOP and TSSOP)	for temperature range: −40 to +125°C above +70°C derate linearly with 12mW/K above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	750 500 400	mW

NOTES:

1. 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.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Hex buffer/line driver (3-State)

"74LV367DB-T"

74LV367

DC CHARACTERISTICS FOR THE LV FAMILY

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

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP[1]	MAX	MIN	MAX	
V_{IH}	HIGH level Input voltage	V_{CC} = 1.2V	0.9			0.9		V
		V_{CC} = 2.0V	1.4			1.4		
		V_{CC} = 2.7 to 3.6V	2.0			2.0		
V_{IL}	LOW level Input voltage	V_{CC} = 1.2V			0.3		0.3	V
		V_{CC} = 2.0V			0.6		0.6	
		V_{CC} = 2.7 to 3.6V			0.8		0.8	
V_{OH}	HIGH level output voltage; all outputs	V_{CC} = 1.2V; V_I = V_{IH} or V_{IL}; $-I_O$ = 100μA		1.2				V
		V_{CC} = 2.0V; V_I = V_{IH} or V_{IL}; $-I_O$ = 100μA	1.8	2.0		1.8		
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; $-I_O$ = 100μA	2.5	2.7		2.5		
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; $-I_O$ = 100μA	2.8	3.0		2.8		
V_{OH}	HIGH level output voltage; BUS driver outputs	V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; $-I_O$ = 8mA	2.40	2.82		2.20		V
V_{OL}	LOW level output voltage; all outputs	V_{CC} = 1.2V; V_I = V_{IH} or V_{IL}; I_O = 100μA		0				V
		V_{CC} = 2.0V; V_I = V_{IH} or V_{IL}; I_O = 100μA		0	0.2		0.2	
		V_{CC} = 2.7V; V_I = V_{IH} or V_{IL}; I_O = 100μA		0	0.2		0.2	
		V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 100μA		0	0.2		0.2	
V_{OL}	LOW level output voltage; BUS driver outputs	V_{CC} = 3.0V; V_I = V_{IH} or V_{IL}; I_O = 8mA		0.20	0.40		0.50	V
I_I	Input leakage current	V_{CC} = 3.6V; V_I = V_{CC} or GND			1.0		1.0	μA
I_{OZ}	3-State output OFF-state current	V_{CC} = 3.6V; V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND			5		10	μA
I_{CC}	Quiescent supply current; MSI	V_{CC} = 3.6V; V_I = V_{CC} or GND; I_O = 0			20.0		160	μA
ΔI_{CC}	Additional quiescent supply current per input	V_{CC} = 2.7V to 3.6V; V_I = V_{CC} − 0.6V			500		850	μA

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

Hex buffer/line driver (3-State)

74LV367

"74LV367DB-T"

AC CHARACTERISTICS

GND = 0V; $t_r = t_f \leq 2.5$ns; $C_L = 50$pF; $R_L = 1$KΩ

SYMBOL	PARAMETER	WAVEFORM	CONDITION	LIMITS					UNIT
				−40 to +85 °C			−40 to +125 °C		
			V_{CC}(V)	MIN	TYP[1]	MAX	MIN	MAX	
t_{PHL}/t_{PLH}	Propagation delay nA to nY	Figure 1	1.2	–	50	–	–	–	ns
			2.0	–	17	32	–	39	
			2.7	–	13	24	–	29	
			3.0 to 3.6	–	10[2]	19	–	23	
t_{PZH}/t_{PZL}	3-State output enable time n$\overline{OE}$ to nY	Figure 2	1.2	–	80	–	–	–	ns
			2.0	–	27	51	–	60	
			2.7	–	20	38	–	44	
			3.0 to 3.6	–	15[2]	30	–	36	
t_{PHZ}/t_{PLZ}	3-State output disable time n$\overline{OE}$ to nY	Figure 2	1.2	–	90	–	–	–	ns
			2.0	–	32	59	–	70	
			2.7	–	24	44	–	52	
			3.0 to 3.6	–	19[2]	36	–	42	

NOTES:
1. All typical values are measured at $T_{amb} = 25°C$
2. Typical values are measured at $V_{CC} = 3.3V$

AC WAVEFORMS

$V_M = 1.5V$ at $V_{CC} \geq 2.7V$
$V_M = 0.5V * V_{CC}$ at $V_{CC} < 2.7V$
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
$V_X = V_{OL} + 0.3V$ at $V_{CC} \geq 2.7V$
$V_X = V_{OL}$ $0.1V_{CC}$ at $V_{CC} < 2.7V$
$V_Y = V_{OH} - 0.3V$ at $V_{CC} \geq 2.7V$
$V_Y = V_{OH} - 0.1V_{CC}$ at $V_{CC} < 2.7V$

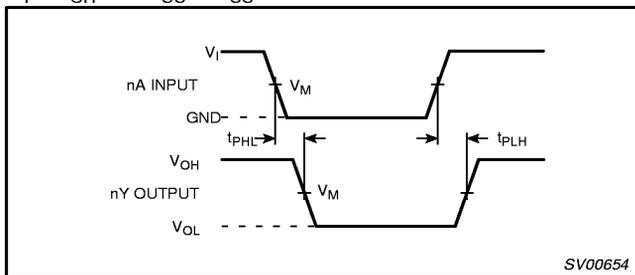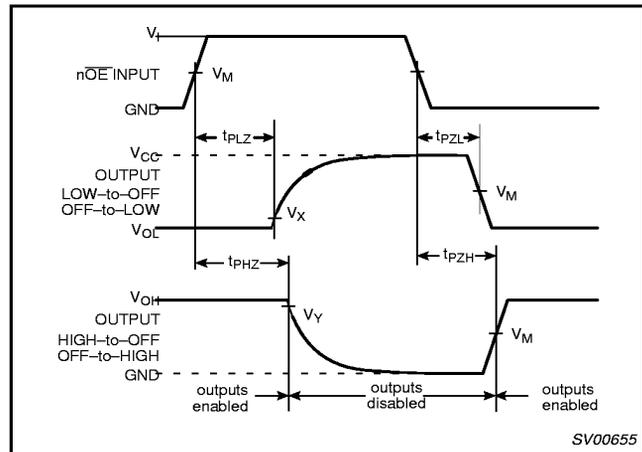**Figure 1. Input (nA) to output (nY) propagation delays.**

Figure 2. 3-State 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
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 * V_{CC}
t_{PHZ}/t_{PZH}	GND

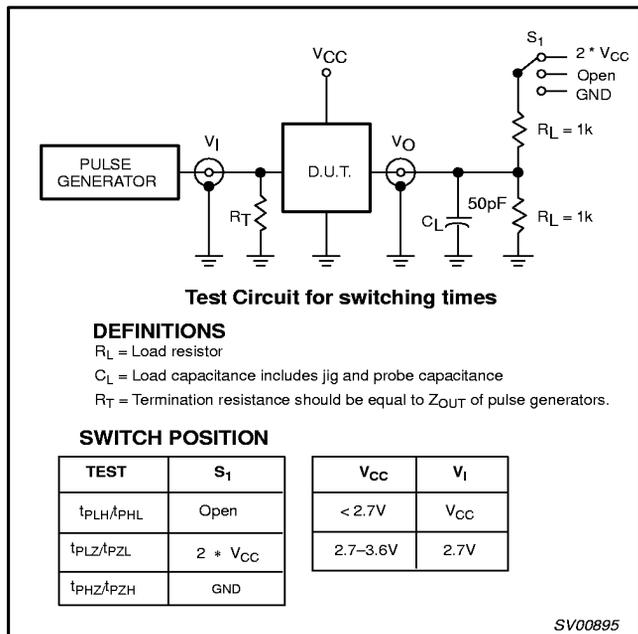| V_{CC}	V_I
< 2.7V	V_{CC}
2.7–3.6V	2.7V

SV00895

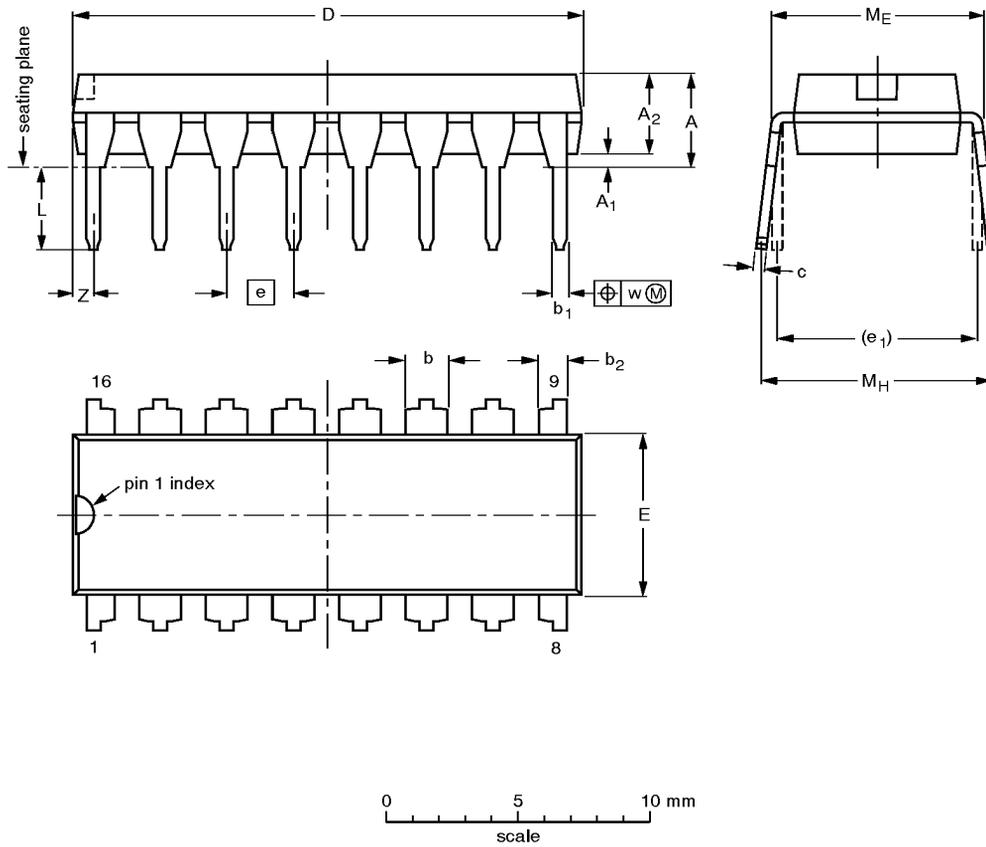**Figure 3. Load circuitry for switching times.**

Hex buffer/line driver (3-State)

74LV367

"74LV367DB-T"

DIP16:   plastic dual in-line package; 16 leads (300 mil)

SOT38-4

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

UNIT	A max.	A$_1$ min.	A$_2$ max.	b	b$_1$	b$_2$	c	D$^{(1)}$	E$^{(1)}$	e	e$_1$	L	M$_E$	M$_H$	w	Z$^{(1)}$ max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

Note

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

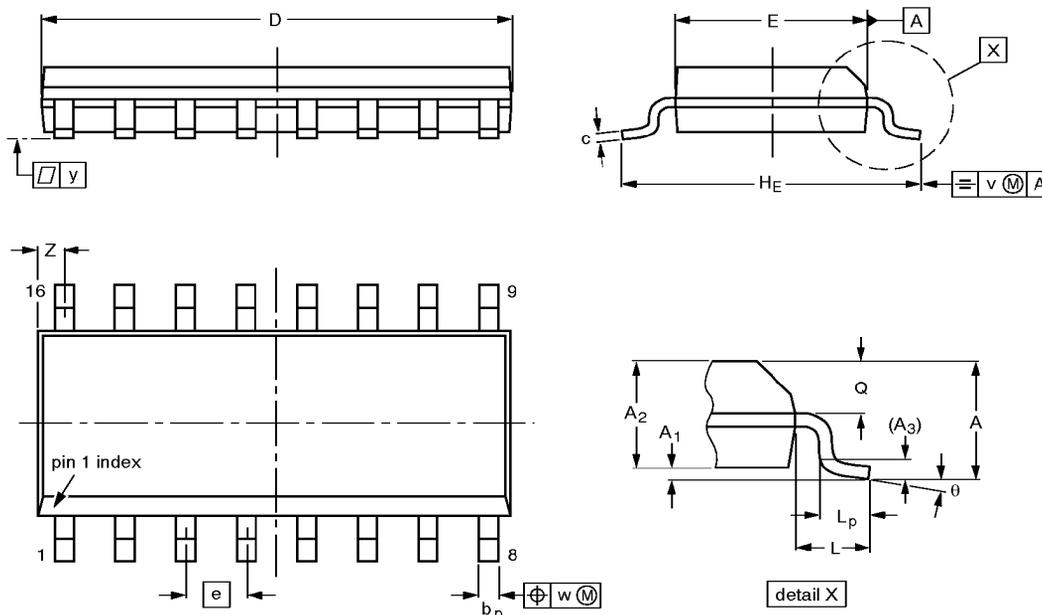| OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

Hex buffer/line driver (3-State)

"74LV367DB-T"

74LV367

SO16:   plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1


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0        2.5        5 mm
|__|__|__|__|__|__|__|__|__|__|
             scale
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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	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.39 0.38	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				91-08-13 95-01-23

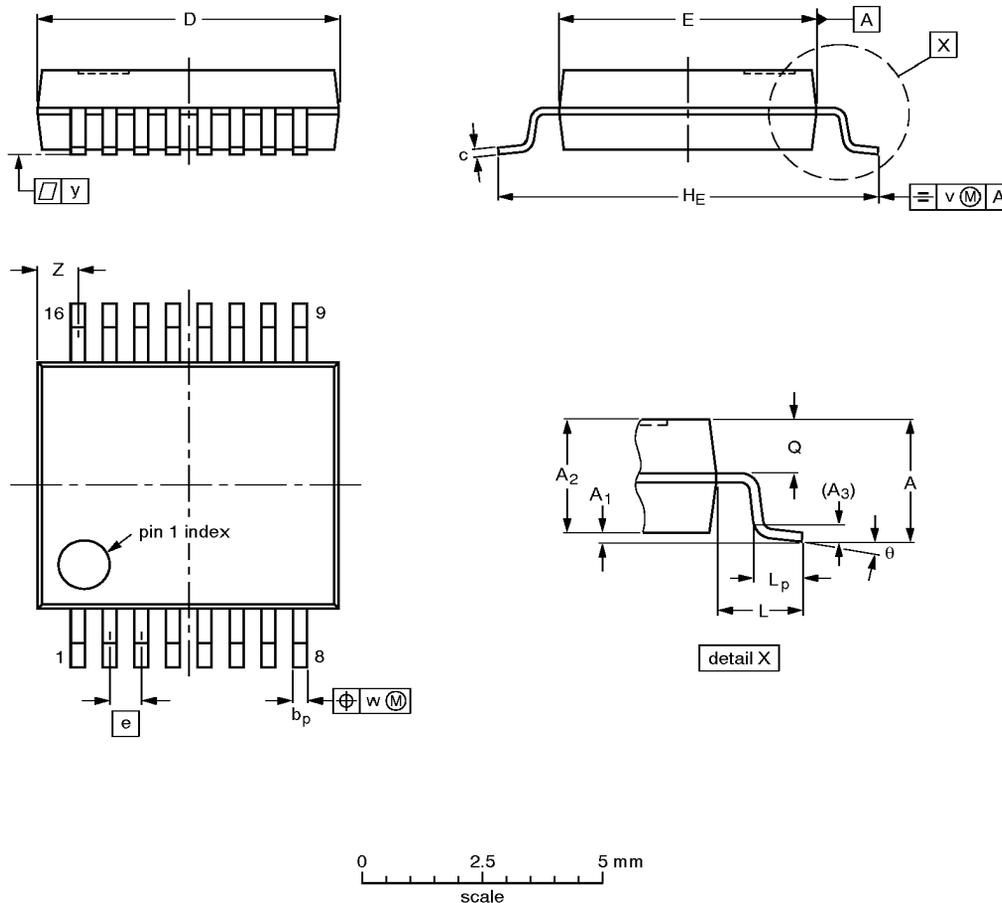Hex buffer/line driver (3-State)

74LV367

"74LV367DB-T"

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm   **SOT338-1**

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	b_p	c	D [1]	E [1]	e	H_E	L	L_p	Q	v	w	y	Z [1]	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8° 0°

Note

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

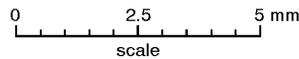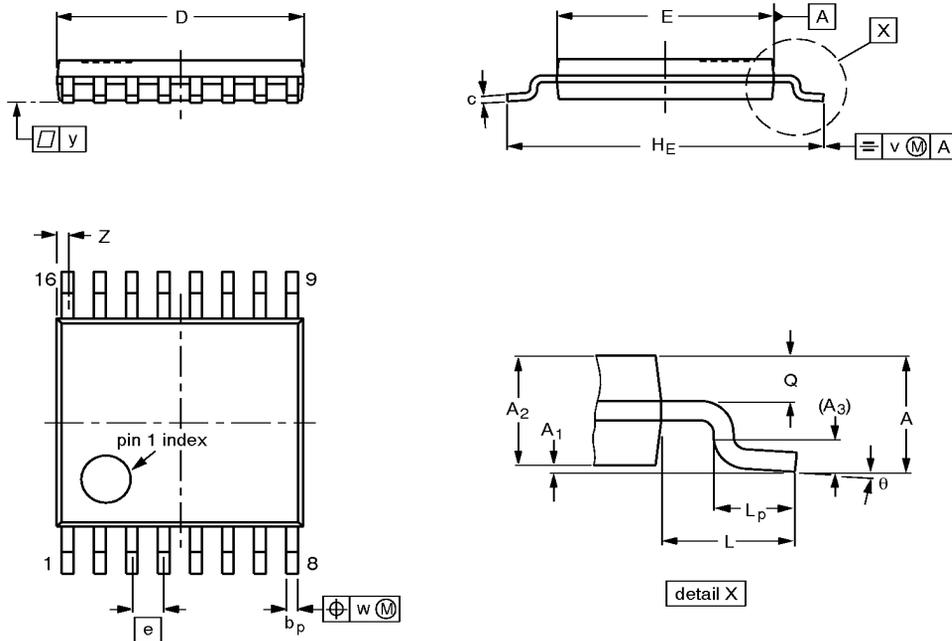| OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT338-1		MO-150AC				~~94-01-14~~ 95-02-04

Hex buffer/line driver (3-State)

74LV367

"74LV367DB-T"

TSSOP16:   plastic thin shrink small outline package; 16 leads; body width 4.4 mm   SOT403-1

pin 1 index

detail X

0   2.5   5 mm

scale

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D [1]	E [2]	e	Hₑ	L	Lₚ	Q	v	w	y	Z [1]	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

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	EIAJ			
SOT403-1		MO-153				~~94-07-12~~ 95-04-04