

DATA SHEET

74ALVCH16841

20-bit bus interface D-type latch (3-State)

Product specification

1998 Jul 27

IC24 Data Handbook

20-bit bus interface D-type latch (3-State)

74ALVCH16841

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
- MULTIBYTE™ flow-through standard pin-out architecture
- Low inductance multiple V_{CC} and GND pins for minimum noise and ground bounce
- Current drive ±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

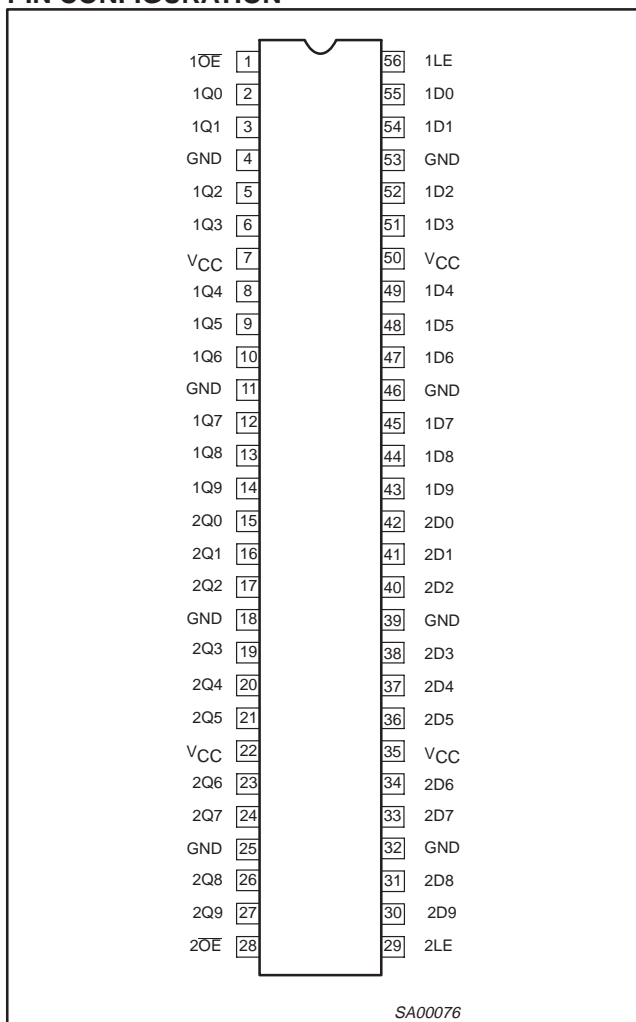
DESCRIPTION

The 74ALVCH16841 has two 10-bit D-type latch featuring separate D-type inputs for each latch and 3-State outputs for bus oriented applications. The two sections of each register are controlled independently by the latch enable (nLE) and output enable (nOE) control gates.

When nOE is LOW, the data in the registers appears at the outputs. When nOE is High the outputs are in High-impedance OFF state. Operation of the nOE input does not affect the state of the flip-flops.

The 74ALVCH16841 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.

PIN CONFIGURATION



QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT	
t _{PHL} /t _{PLH}	Propagation delay nD _n to nQ _n	V _{CC} = 2.5V, C _L = 30pF V _{CC} = 3.3V, C _L = 50pF	2.5 2.4	ns	
t _{PHL} /t _{PLH}	Propagation delay nLE to nQ _n	V _{CC} = 2.5V, C _L = 30pF V _{CC} = 3.3V, C _L = 50pF	2.5 2.4	ns	
C _I	Input capacitance		5.0	pF	
C _{PD}	Power dissipation capacitance per buffer	V _I = GND to V _{CC} ¹	Outputs enabled	19	pF
			Outputs disabled	3	

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; Σ (C_L × V_{CC}² × f_o) = sum of outputs.

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
56-Pin Plastic TSSOP Type II	-40°C to +85°C	74ALVCH16841 DGG	ACH16841 DGG	SOT364-1

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PIN DESCRIPTION

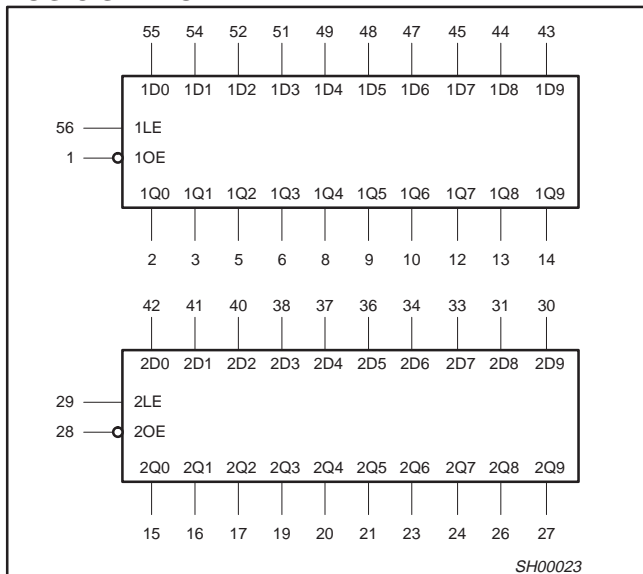
PIN NUMBER	SYMBOL	FUNCTION
1	1 \overline{OE}	Output enable inputs (active-LOW)
56	1LE	Latch enable inputs (active HIGH)
55, 54, 52, 51, 49, 48, 47, 45, 44, 43	1D0 – 1D9	Data inputs
2, 3, 5, 6, 8, 9, 10, 12, 13, 14	1Q0 – 1Q9	Data outputs
4, 11, 18, 25, 32, 39, 46, 53	GND	Ground (0V)
7, 22, 35, 50	V _{CC}	Positive supply voltage
28	2 \overline{OE}	Output enable inputs (active-LOW)
29	2LE	Latch enable inputs (active HIGH)
42, 41, 40, 38, 37, 36, 34, 33, 31, 30	2D0 – 2D9	Data inputs
15, 16, 17, 19, 20, 21, 23, 24, 26, 27	2Q0 – 2Q9	Data outputs

FUNCTION TABLE

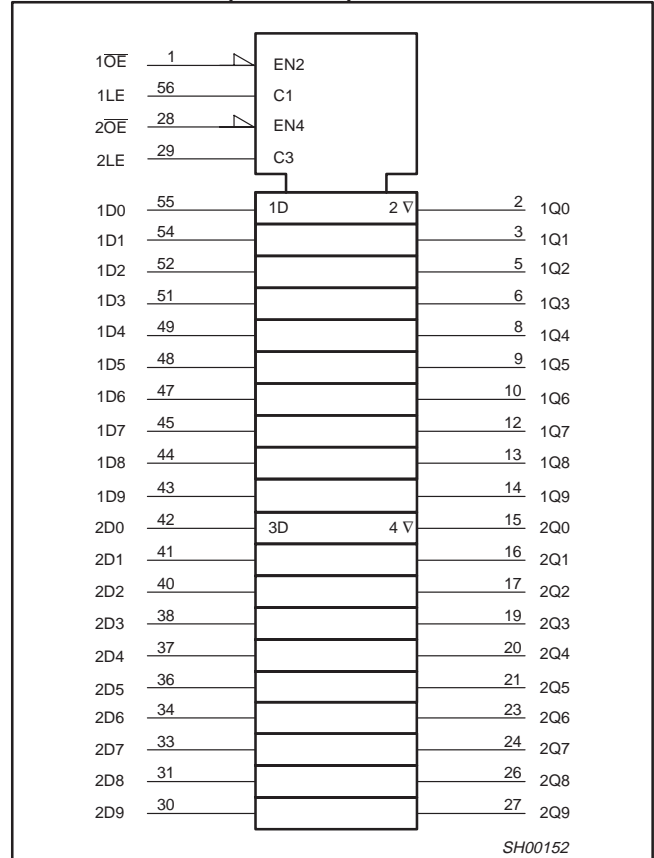
INPUTS			OUTPUT
n \overline{OE}	LE	Dx	Q
L	H	L	L
L	H	H	H
L	L	X	Q ₀
H	X	X	Z

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

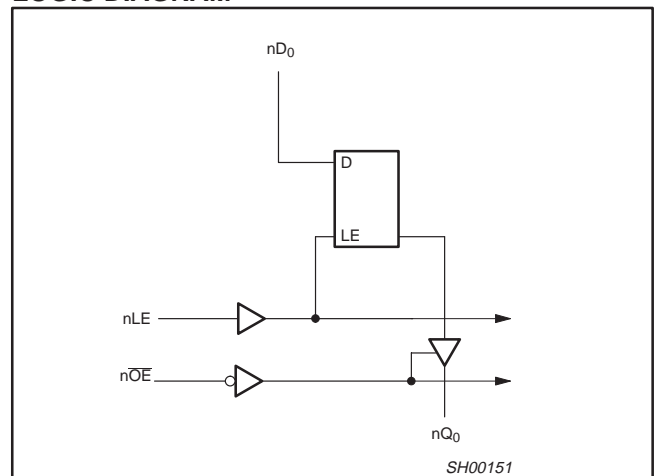
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



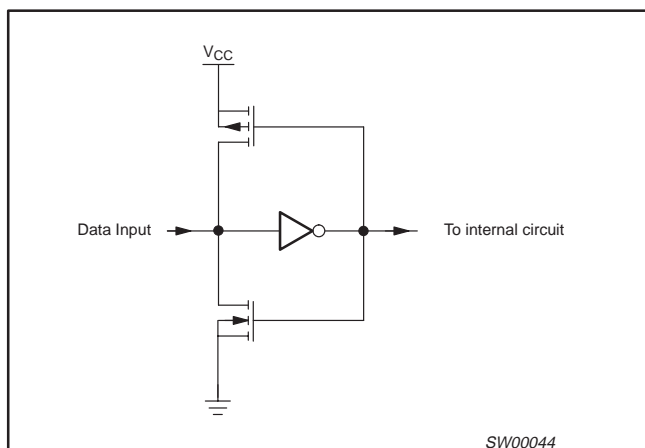
LOGIC DIAGRAM



20-bit bus interface D-type latch (3-State)

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BUS HOLD CIRCUIT



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 $3.0V$	0	20	ns/V
		$V_{CC} = 3.0$ to $3.6V$	0	10	

ABSOLUTE MAXIMUM RATINGS

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 ¹	-0.5 to +4.6	V
		For data inputs ¹	-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 1	-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	850 600	mW
		above +55°C derate linearly with 11.3 mW/K above +55°C derate linearly with 8 mW/K		

NOTE:

- 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 ¹	MAX	
V _{IH}	HIGH level Input voltage	V _{CC} = 2.3 to 2.7V	1.7	1.2		V
		V _{CC} = 2.7 to 3.6V	2.0	1.5		
V _{IL}	LOW level Input voltage	V _{CC} = 2.3 to 2.7V		1.2	0.7	V
		V _{CC} = 2.7 to 3.6V		1.5	0.8	
V _{OH}	HIGH level output voltage	V _{CC} = 2.3 to 3.6V; V _I = V _{IH} or V _{IL} ; I _O = -100μA	V _{CC} - 0.2	V _{CC}		V
		V _{CC} = 2.3V; V _I = V _{IH} or V _{IL} ; I _O = -6mA	V _{CC} - 0.3	V _{CC} - 0.08		
		V _{CC} = 2.3V; V _I = V _{IH} or V _{IL} ; I _O = -12mA	V _{CC} - 0.6	V _{CC} - 0.26		
		V _{CC} = 2.7V; V _I = V _{IH} or V _{IL} ; I _O = -12mA	V _{CC} - 0.5	V _{CC} - 0.14		
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -12mA	V _{CC} - 0.6	V _{CC} - 0.09		
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -24mA	V _{CC} - 1.0	V _{CC} - 0.28		
V _{OL}	LOW level output voltage	V _{CC} = 2.3 to 3.6V; V _I = V _{IH} or V _{IL} ; I _O = 100μA		GND	0.20	V
		V _{CC} = 2.3V; V _I = V _{IH} or V _{IL} ; I _O = 6mA		0.07	0.40	V
		V _{CC} = 2.3V; V _I = V _{IH} or V _{IL} ; I _O = 12mA		0.15	0.70	V
		V _{CC} = 2.7V; V _I = V _{IH} or V _{IL} ; I _O = 12mA		0.14	0.40	
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = 24mA		0.27	0.55	
I _I	Input leakage current	V _{CC} = 2.3 to 3.6V; V _I = V _{CC} or GND		0.1	5	μA
I _{OZ}	3-State output OFF-state current	V _{CC} = 2.3 to 3.6V; V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND		0.1	10	μA
I _{CC}	Quiescent supply current	V _{CC} = 2.3 to 3.6V; V _I = V _{CC} or GND; I _O = 0		0.2	40	μA
ΔI _{CC}	Additional quiescent supply current	V _{CC} = 2.3V to 3.6V; V _I = V _{CC} - 0.6V; I _O = 0		150	750	μA
I _{BHL} ²	Bus hold LOW sustaining current	V _{CC} = 2.3V; V _I = 0.7V	45	-		μA
		V _{CC} = 3.0V; V _I = 0.8V	75	150		
I _{BHH} ²	Bus hold HIGH sustaining current	V _{CC} = 2.3V; V _I = 1.7V	-45			μA
		V _{CC} = 3.0V; V _I = 2.0V	-75	-175		
I _{BHLO} ²	Bus hold LOW overdrive current	V _{CC} = 3.6V	500			μA
I _{BHHO} ²	Bus hold HIGH overdrive current	V _{CC} = 3.6V	-500			μA

NOTES:

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

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

SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$V_{CC} = 2.3$ to $2.7V$			
			MIN	TYP ¹	MAX	
t_{PLH}/t_{PHL}	Propagation delay nD _n to nQ _n	1, 5	1.0	2.5	5.0	ns
t_{PLH}/t_{PHL}	Propagation delay nLE to nQ _n	2, 5	1.0	2.5	5.6	ns
t_{PZH}/t_{PZL}	3-State output enable time nOE _n to nQ _n	4, 5	1.0	2.7	6.2	ns
t_{PHZ}/t_{PLZ}	3-State output disable time nOE _n to nQ _n	4, 5	1.1	2.2	5.3	ns
t_W	nLE pulse width HIGH	2, 5	3.3	1.5	–	ns
t_{SU}	Set up time nD _n to nLE	3, 5	1.3	0.1	–	ns
T_h	Hold time nD _n to nLE	3, 5	1.4	0.3	–	ns

NOTE:1. All typical values are at $V_{CC} = 3.3V$ 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
			$V_{CC} = 3.3 \pm 0.3V$			$V_{CC} = 2.7V$			
			MIN	TYP ^{1, 2}	MAX	MIN	TYP ¹	MAX	
t_{PLH}/t_{PHL}	Propagation delay nD _n to nQ _n	1, 5	1.0	2.4	3.9	1.0	2.6	4.7	ns
t_{PLH}/t_{PHL}	Propagation delay nLE to nQ _n	2, 5	1.0	2.4	4.3	1.0	2.6	5.1	ns
t_{PZH}/t_{PZL}	3-State output enable time nOE _n to nQ _n	4, 5	1.0	2.3	4.9	1.0	3.1	6.0	ns
t_{PHZ}/t_{PLZ}	3-State output disable time nOE _n to nQ _n	4, 5	1.3	2.9	4.1	1.3	3.1	4.3	ns
t_W	nLE pulse width HIGH	2, 5	3.3	1.5	–	3.3	1.5	–	ns
t_{SU}	Set up time nD _n to nLE	3, 5	1.0	0.6	–	1.1	0.1	–	ns
t_h	Hold time nD _n to nLE	3, 5	1.4	0.2	–	1.7	0.2	–	ns

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

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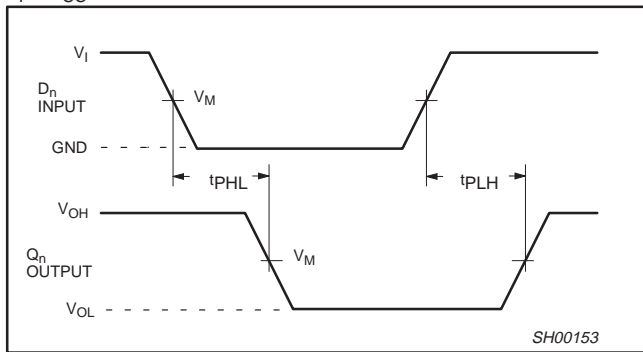
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AC WAVEFORMS FOR $V_{CC} = 2.3V$ TO $2.7V$ AND $V_{CC} < 2.3V$ RANGE

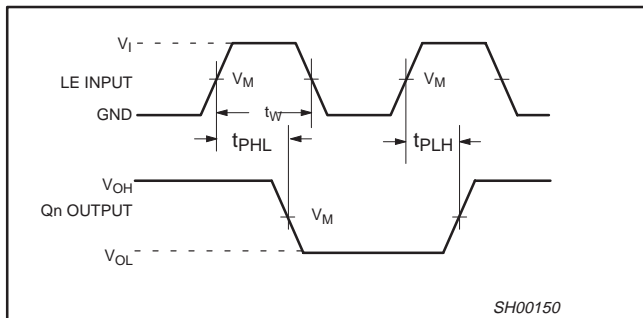
$V_M = 0.5 V_{CC}$
 $V_X = V_{OL} + 0.15V$
 $V_Y = V_{OH} - 0.15V$
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

AC WAVEFORMS FOR $V_{CC} = 3.0V$ TO $3.6V$ AND $V_{CC} = 2.7V$ RANGE

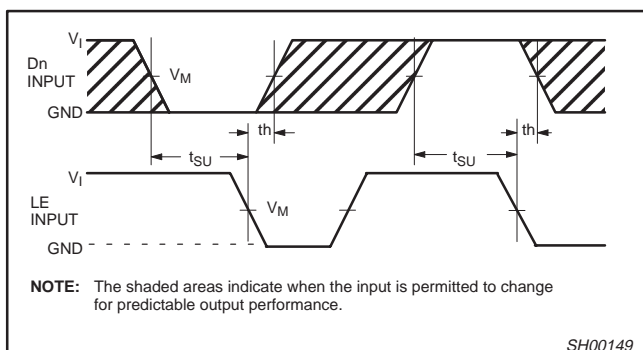
$V_M = 1.5 V$
 $V_X = V_{OL} + 0.3V$
 $V_Y = V_{OH} - 0.3V$
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.
 $V_I = 2.7V$
 $V_I = V_{CC}$



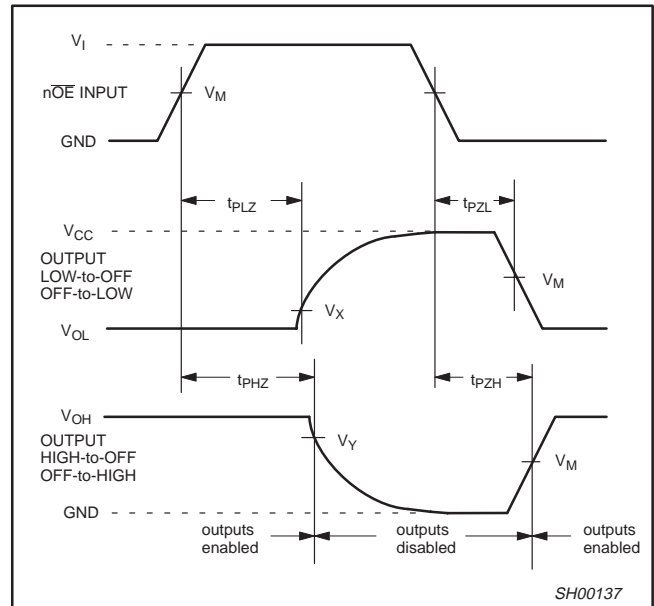
Waveform 1. The input (D_n) to output (Q_n) propagation delay



Waveform 2. The latch enable (LE) pulse width, the latch enable input to output (Q_n) propagation delay

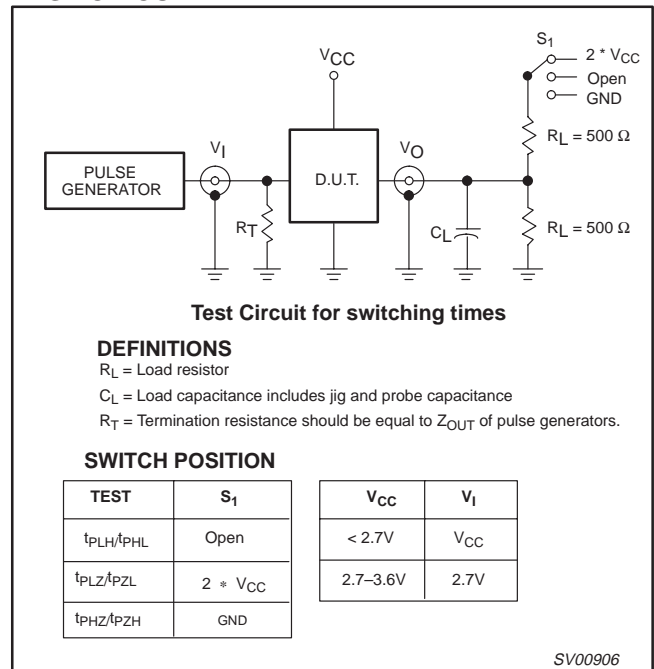


Waveform 3. The data set up and hold times for the D_n input to the LE input



Waveform 4. 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	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		

SV00906

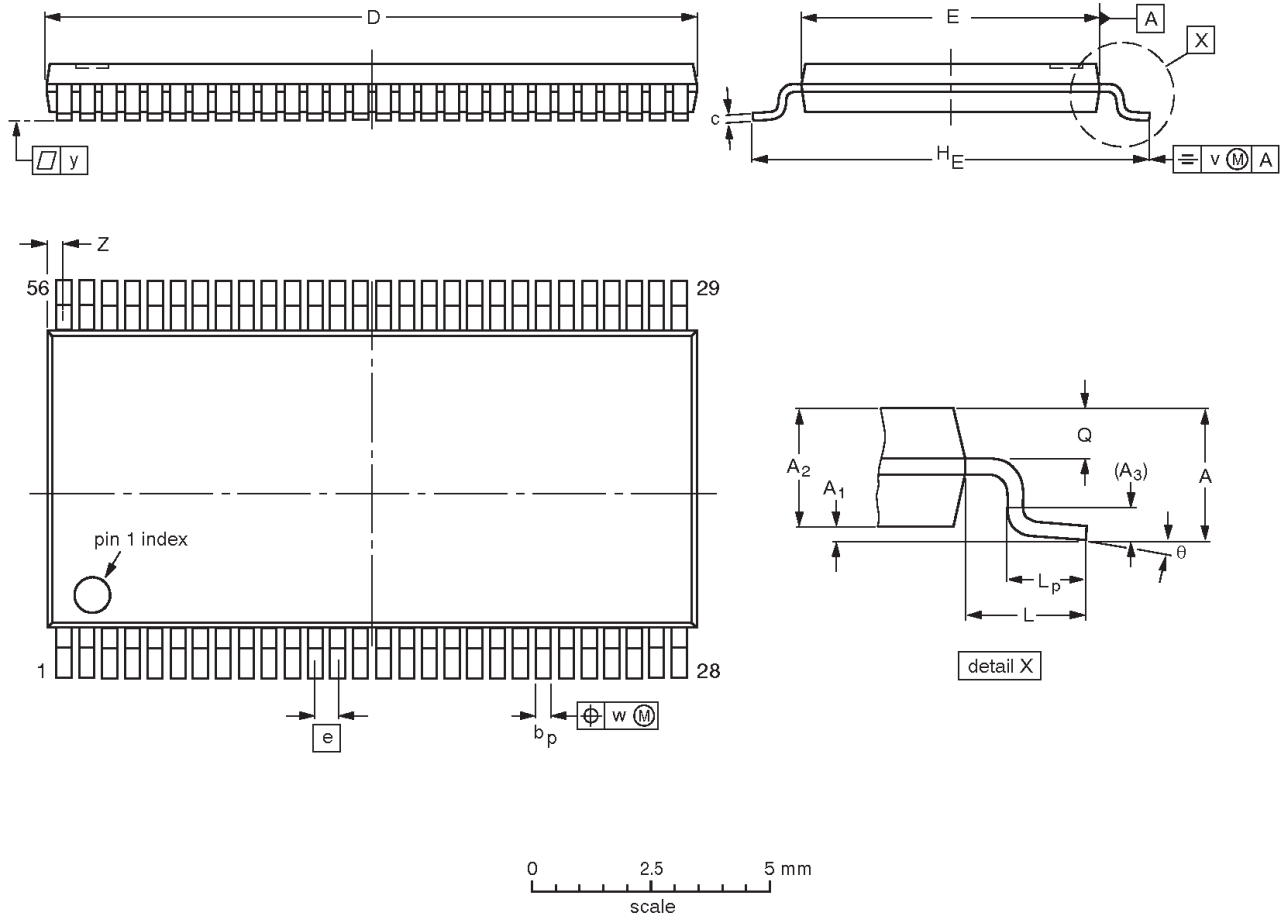
Waveform 5. Load circuitry for switching times

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

SOT364-1



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	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	14.1 13.9	6.2 6.0	0.5	8.3 7.9	1.0	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.5 0.1	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			
SOT364-1		MO-153EE				93-02-03 95-02-10

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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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