Quad 2-input Multiplexer

CJ74LVC157 Logic

1 Introduction

The CJ74LVC157 is a quad 2-input multiplexer which select four bits of data from two sources under the control of a common select input (S). The four outputs present the selected data in the true (non-inverted) form. The enable input (/E) is active LOW. When pin /E is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all the other input conditions. Moving the data from two groups of registers to four common output buses is a common use of the CJ74LVC157. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator.

It is useful for implementing highly irregular logic by generating any 4 of the 16 different functions of two variables with one variable common.

The device is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to pin S.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3V and 5V applications.

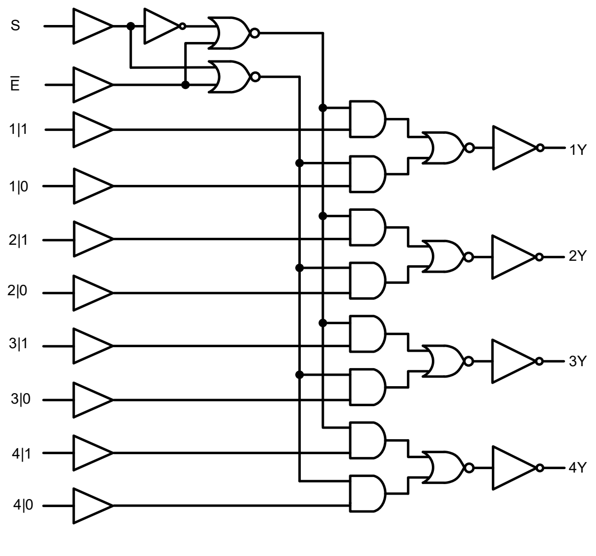
2 Available Packages

PART NUMBER	PACKAGE
CJ74LVC157	SOP16
	TSSOP16
	QFN3.5x2.5-16L

Note: For all available packages, please refer to the part Orderable Information.

3 Features

- Wide supply voltage range from 1.2V to 3.6V
- 5V tolerant inputs for interfacing with 5V logic
- CMOS low power consumption
- Direct interface with TTL levels
- Specified from -40°C to +125°C



Logic diagram

4 Orderable Information

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74LVC157AEN	SOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units / Reel	Active
CJ74LVC157BEN	TSSOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 5000 Units / Reel	Active
CJ74LVC157QEN	QFN3.5x2.5-16L	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 3000 Units / Reel	Active

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:
Active: Recommended for new products;
Customized: Products manufactured to meet the specific needs of customers;
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;
NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;
Obsolete: The device has been discontinued.

5 Pin Configuration and Marking Information

5.1 Pin Configuration

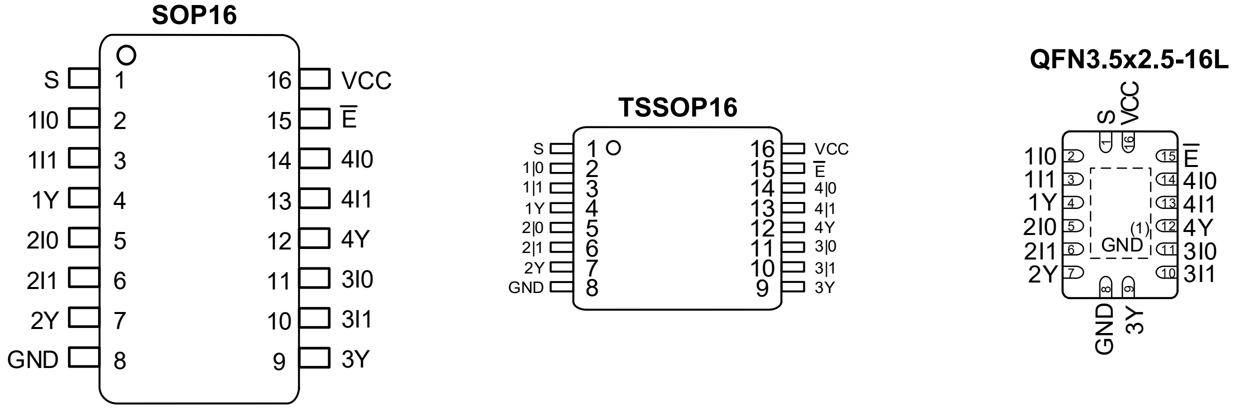


Figure 5-1 Pin configuration

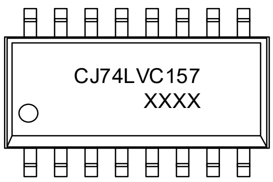
5.2 Pin Function

PIN		I/O(1)	DESCRIPTION
No.	NAME		
1	S	I	Common data select input
2	1I0	I	Data input from source 0
3	1I1	I	Data input from source 1
4	1Y	O	Multiplexer output
5	2I0	I	Data input from source 0
6	2I1	I	Data input from source 1
7	2Y	O	Multiplexer output
8	GND	G	Ground (0V)
9	3Y	O	Multiplexer output
10	3I1	I	Data input from source 1
11	3I0	I	Data input from source 0
12	4Y	O	Multiplexer output
13	4I1	I	Data input from source 1
14	4I0	I	Data input from source 0
15	$\overline{E}$	I	Enable input (active LOW)
16	VCC	P	Supply voltage

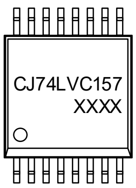
(1) I-Input, O-Output, P-Power, G-Ground

5.3 Marking Information

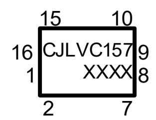
SOP16



TSSOP16



QFN3.5x2.5-16L



XXXX: Code, indicates weekly record information.

6 Specifications

6.1 Absolute Maximum Ratings

Voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	MAX.	UNIT
V_{CC}	Supply voltage	-		-0.5	+6.5	V
I_{IK}	Input clamping current	V_I < 0V		-50	-	mA
V_I	Input voltage	-		-0.5	+6.5	V
I_{OK}	Output clamping current	$V_O > V_{CC}$ or V_O < 0V		-	±50	mA
V_O	Output voltage	-		-0.5	V_{CC}+0.5	V
I_O	Output current	V_O=0V to V_{CC}		-	±50	mA
I_{CC}	Supply current	-		-	100	mA
I_{GND}	Ground current	-		-100	-	mA
P_{tot}	Total power dissipation	-		-	500	mW
T_{stg}	Storage temperature	-		-65	+150	°C
T_L	Soldering temperature	10s	SOP/TSSOP	-	260	°C

Note: Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

6.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	Supply voltage	-	1.65	-	3.6	V
		Functional	1.2	-	-	V
V_I	Input voltage	-	0	-	5.5	V
V_O	Output voltage	-	0	-	V_{CC}	V
T_{amb}	Ambient temperature	-	-40	-	+125	°C
Δt/ΔV	Input transition rise and fall rate	V_{CC}=1.65V to 2.7V	0	-	20	ns/V
		V_{CC}=2.7V to 3.6V	0	-	10	ns/V

6.3 Electrical Characteristics

6.3.1 DC Characteristics 1

T_{amb}=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{IH}	HIGH-level input voltage	V_{CC}=1.2V		1.08	-	-	V
		V_{CC}=1.65V to 1.95V		0.65xV_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.7	-	-	V
		V_{CC}=2.7V to 3.6V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=1.2V		-	-	0.12	V
		V_{CC}=1.65V to 1.95V		-	-	0.35xV_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=2.7V to 3.6V		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}	I_O=-100uA; V_{CC}=1.65V to 3.6V	V_{CC}-0.2	-	-	V
			I_O=-4mA; V_{CC}=1.65V	1.2	-	-	V
			I_O=-8mA; V_{CC}=2.3V	1.8	-	-	V
			I_O=-12mA; V_{CC}=2.7V	2.2	-	-	V
			I_O=-18mA; V_{CC}=3.0V	2.4	-	-	V
			I_O=-24mA; V_{CC}=3.0V	2.2	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}	I_O=100uA; V_{CC}=1.65V to 3.6V	-	-	0.2	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.45	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.6	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.4	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.55	V
I_I	Input leakage current	V_I=5.5V or GND; V_{CC}=3.6V		-	-	±5	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=3.6V		-	-	15	uA
ΔI_{CC}	Additional supply current	Per input pin; V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.7V to 3.6V		-	-	500	uA
C_I	Input capacitance	V_{CC}=0V to 3.6V; V_I= GND to V_{CC}		-	5.0	-	pF

Note: All typical values are measured at V_{CC}=3.3V (unless stated otherwise) and T_{amb}=25°C.

6.3.2 DC Characteristics 2

T_{amb}=-40°C to +125°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{IH}	HIGH-level input voltage	V_{CC}=1.2V		1.08	-	-	V
		V_{CC}=1.65V to 1.95V		0.65xV_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.7	-	-	V
		V_{CC}=2.7V to 3.6V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=1.2V		-	-	0.12	V
		V_{CC}=1.65V to 1.95V		-	-	0.35xV_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=2.7V to 3.6V		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}	I_O=-100uA; V_{CC}=1.65V to 3.6V	V_{CC}-0.3	-	-	V
			I_O=-4mA; V_{CC}=1.65V	1.05	-	-	V
			I_O=-8mA; V_{CC}=2.3V	1.65	-	-	V
			I_O=-12mA; V_{CC}=2.7V	2.05	-	-	V
			I_O=-18mA; V_{CC}=3.0V	2.25	-	-	V
			I_O=-24mA; V_{CC}=3.0V	2.0	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}	I_O=100uA; V_{CC}=1.65V to 3.6V	-	-	0.3	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.65	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.8	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.6	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.8	V
I_I	Input leakage current	V_I=5.5V or GND; V_{CC}=3.6V		-	-	±20	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=3.6V		-	-	200	uA
ΔI_{CC}	Additional supply current	Per input pin; V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.7V to 3.6V		-	-	5000	uA

Note: All typical values are measured at V_{CC}=3.3V (unless stated otherwise) and T_{amb}=25°C.

6.3.3 AC Characteristics 1

T_{amb}=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
t_{pd}	Propagation delay	nI0, nI1 to nY; See Figure 7-6	V_{CC}=1.2V	-	16	-	ns
			V_{CC}=1.65V to 1.95V	1.0	4.8	10.2	ns
			V_{CC}=2.3V to 2.7V	1.5	2.8	5.8	ns
			V_{CC}=2.7V	1.0	2.9	5.9	ns
			V_{CC}=3.0V to 3.6V	1.0	2.5	5.2	ns
		$\overline{E}$ to nY; See Figure 7-7	V_{CC}=1.2V	-	17	-	ns
			V_{CC}=1.65V to 1.95V	0.5	4.8	12.8	ns
			V_{CC}=2.3V to 2.7V	1.5	2.8	7.2	ns
			V_{CC}=2.7V	1.0	2.9	7.8	ns
			V_{CC}=3.0V to 3.6V	1.0	2.6	6.5	ns
		S to nY; See Figure 7-6	V_{CC}=1.2V	-	16	-	ns
			V_{CC}=1.65V to 1.95V	1.0	5.1	12.4	ns
			V_{CC}=2.3V to 2.7V	1.5	3.0	7.0	ns
			V_{CC}=2.7V	1.0	3.1	7.3	ns
			V_{CC}=3.0V to 3.6V	1.0	2.7	6.3	ns
$t_{sk(o)}$	Output skew time	V_{CC}=3.0V to 3.6V		-	-	1.0	ns
C_{PD}	Power dissipation capacitance	Per input; V_I=GND to V_{CC}	V_{CC}=1.65V to 1.95V	-	9.4	-	pF
			V_{CC}=2.3V to 2.7V	-	12.8	-	pF
			V_{CC}=3.0V to 3.6V	-	15.9	-	pF

Note:

(1) Typical values are measured at T_{amb}=25°C and V_{CC}=1.8V, 2.5V, 2.7V and 3.3V respectively.

(2) t_{pd} is the same as t_{PLH} and t_{PHL}.

(3) Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

(4) C_{PD} is used to determine the dynamic power dissipation (P_D in uW).

$P_D = C_{PD} x V_{CC}^2 x f_i x N + \sum(C_L x V_{CC}^2 x f_o)$ where:

f_i=input frequency in MHz;

f_o=output frequency in MHz;

C_L=output load capacitance in pF;

V_{CC}=supply voltage in V;

N=number of inputs switching;

$\sum(C_L x V_{CC}^2 x f_o)$=sum of outputs.

6.3.4 AC Characteristics 2

T_{amb}=-40°C to +125°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
t_{pd}	Propagation delay	nI0, nI1 to nY; See Figure 7-6	V_{CC}=1.65V to 1.95V	1.0	-	11.8	ns
			V_{CC}=2.3V to 2.7V	1.5	-	6.7	ns
			V_{CC}=2.7V	1.0	-	7.5	ns
			V_{CC}=3.0V to 3.6V	1.0	-	6.5	ns
		$\overline{E}$ to nY; See Figure 7-7	V_{CC}=1.65V to 1.95V	0.5	-	14.7	ns
			V_{CC}=2.3V to 2.7V	1.5	-	8.3	ns
			V_{CC}=2.7V	1.0	-	10.0	ns
			V_{CC}=3.0V to 3.6V	1.0	-	8.5	ns
		S to nY; See Figure 7-6	V_{CC}=1.65V to 1.95V	1.0	-	14.3	ns
			V_{CC}=2.3V to 2.7V	1.5	-	8.1	ns
			V_{CC}=2.7V	1.0	-	9.5	ns
			V_{CC}=3.0V to 3.6V	1.0	-	8.0	ns
$t_{sk(o)}$	Output skew time	V_{CC}=3.0V to 3.6V		-	-	1.5	ns

Note:

(1) Typical values are measured at T_{amb}=25°C and V_{CC}=1.8V, 2.5V, 2.7V and 3.3V respectively.

(2) t_{pd} is the same as t_{PLH} and t_{PHL}.

(3) Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

7 Detailed Description

7.1 Overview

The CJ74LVC157 is a quad 2-input multiplexer which select four bits of data from two sources under the control of a common select input (S). The four outputs present the selected data in the true (non-inverted) form. The enable input (/E) is active LOW. When pin /E is HIGH, all of the outputs (1Y to 4Y) are forced LOW regardless of all the other input conditions. Moving the data from two groups of registers to four common output buses is a common use of the CJ74LVC157. The state of the common data select input (S) determines the particular register from which the data comes. It can also be used as function generator.

It is useful for implementing highly irregular logic by generating any 4 of the 16 different functions of two variables with one variable common.

The device is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to pin S.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3V and 5V applications.

7.2 Functional Block Diagram

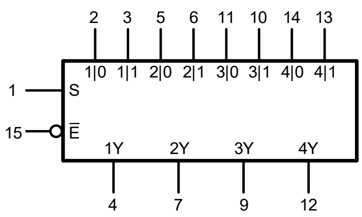


Figure 7-1 Logic symbol

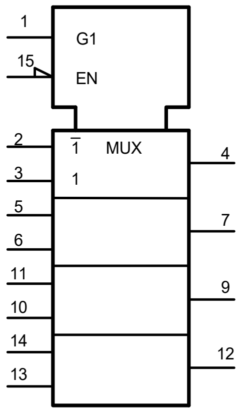


Figure 7-2 IEC logic symbol

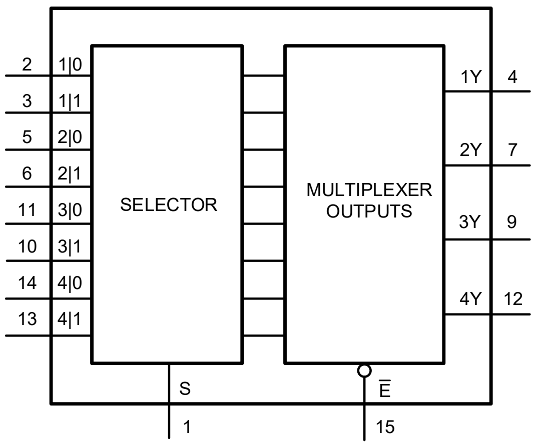


Figure 7-3 Functional diagram

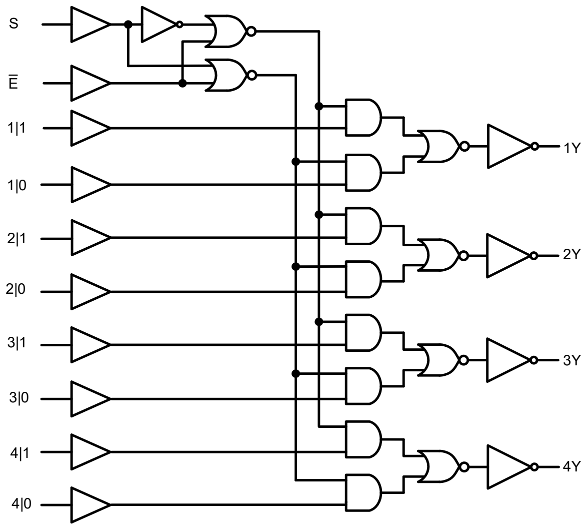


Figure 7-4 Logic diagram

7.3 Function Table

INPUT				OUTPUT
$\overline{E}$	S	nI0	nI1	nY
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care.

7.4 Testing Circuit

7.4.1 AC Testing Circuit

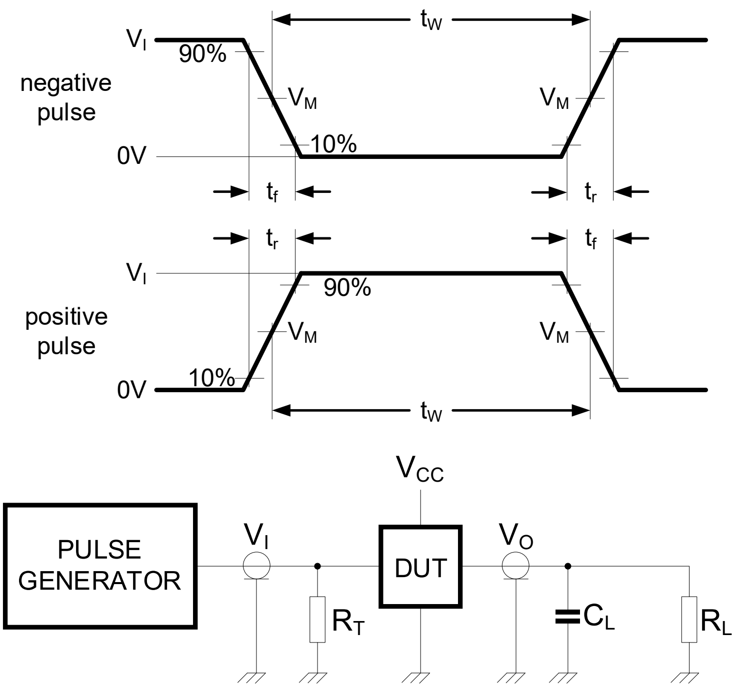


Figure 7-5 Test circuit for measuring switching times

Definitions for test circuit:

R_L=Load resistance.

C_L=Load capacitance including jig and probe capacitance.

R_T=Termination resistance should be equal to the output impedance Z_o of the pulse generator.

7.4.2 AC Testing Waveforms

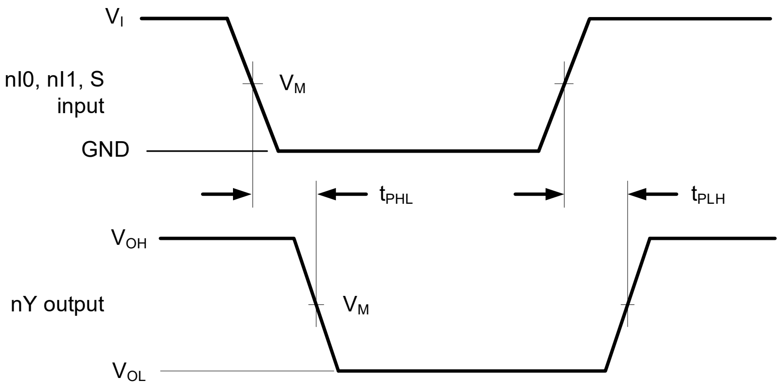


Figure 7-6 Data inputs (nI0, nI1) and common data select input (S) to output (nY) propagation delays

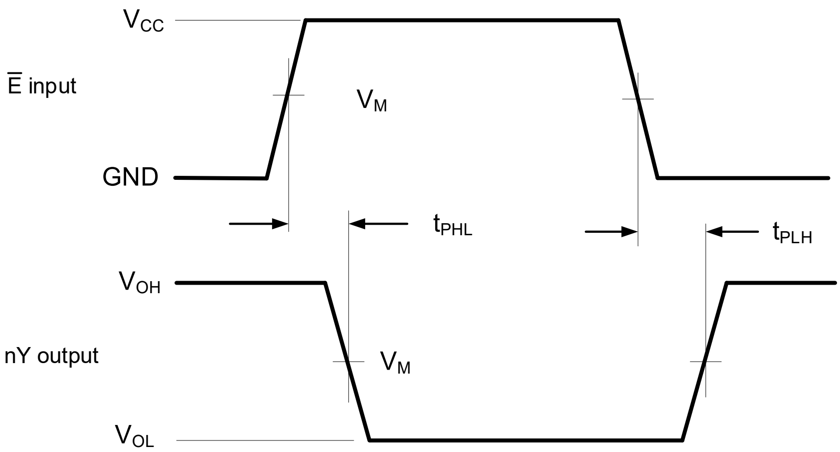


Figure 7-7 Enable input ($\overline{E}$) to output (nY) propagation delays

7.4.3 Measurement Points

SUPPLY VOLTAGE	INPUT	OUTPUT
V_{CC}	**V_M**	**V_M**
< 2.7V	0.5xV_{CC}	0.5xV_{CC}
≥ 2.7V	1.5V	1.5V

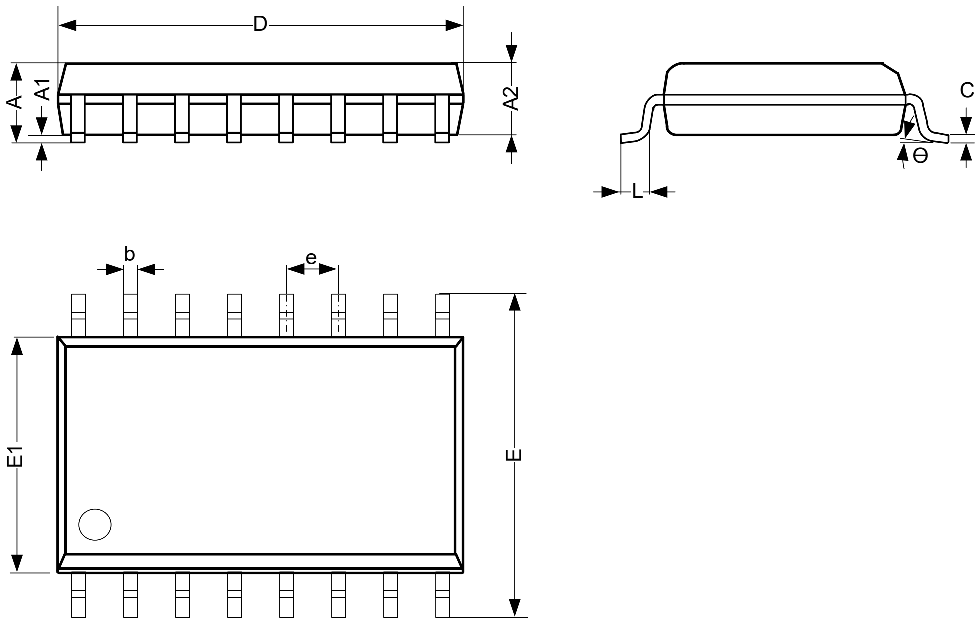
7.4.4 Test Data

SUPPLY VOLTAGE	INPUT		LOAD	
V_{CC}	**V_I**	**t_r , t_f**	**C_L**	**R_L**
1.2V	V_{CC}	≤ 2.0ns	30pF	1kΩ
1.65V to 1.95V	V_{CC}	≤ 2.0ns	30pF	1kΩ
2.3V to 2.7V	V_{CC}	≤ 2.0ns	30pF	500Ω
2.7V	2.7V	≤ 2.5ns	50pF	500Ω
3.0V to 3.6V	2.7V	≤ 2.5ns	50pF	500Ω

8 Mechanical Information

8.1 SOP16 Mechanical Information

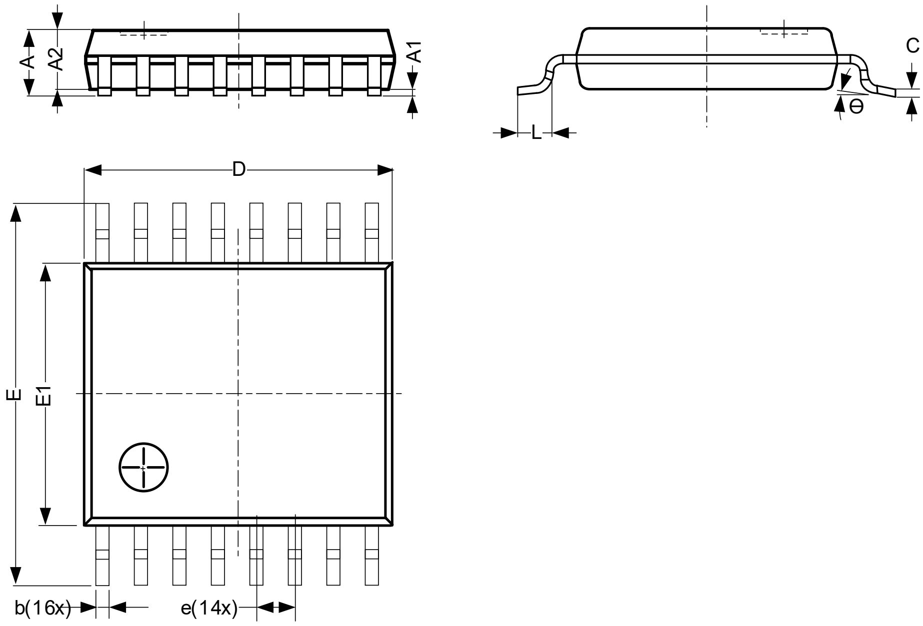
8.1.1 SOP16 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	**Typ.**	**Max.**
A	1.35	-	1.80
A1	0.10	-	0.25
A2	1.25	-	1.55
b	0.33	-	0.51
c	0.19	-	0.25
D	9.50	-	10.10
E	5.80	-	6.30
E1	3.70	-	4.10
e	1.27 BSC		
L	0.35	-	0.89
Θ	0°	-	8°
Unit: mm			

8.2 TSSOP16 Mechanical Information

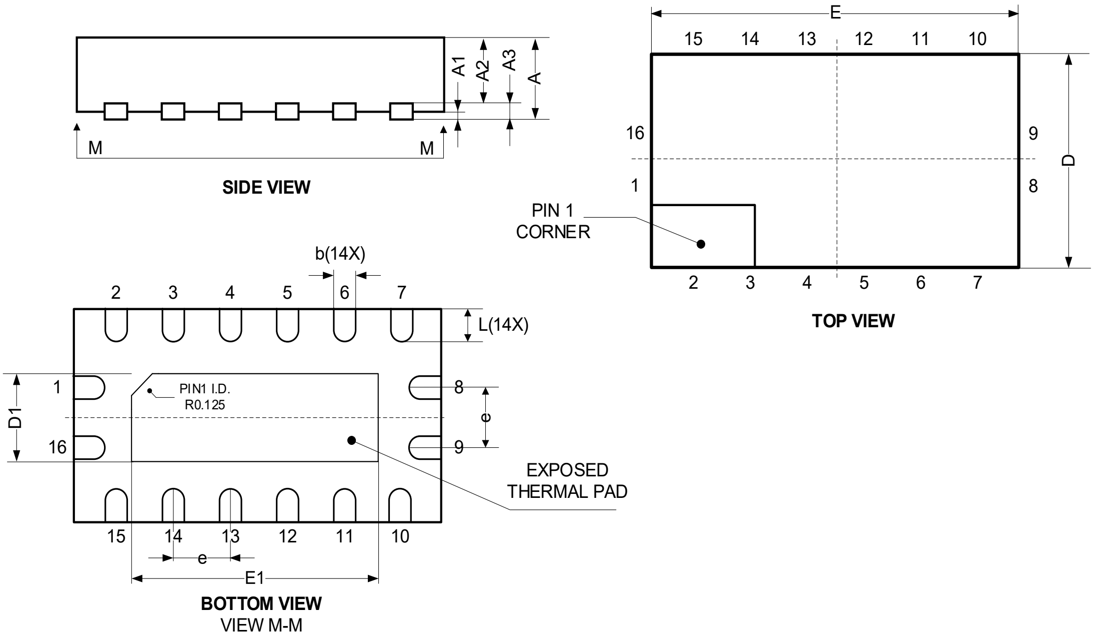
8.2.1 TSSOP16 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	-	-	1.20
A1	0.05	-	0.15
A2	0.80	-	1.05
b	0.19	-	0.30
c	0.09	-	0.20
D	4.90	-	5.10
E	6.20	-	6.60
E1	4.30	-	4.50
e	0.65 BSC		
L	0.45	-	0.75
Θ	0°	-	8°
Unit: mm			

8.3 QFN3.5x2.5-16L Mechanical Information

8.3.1 QFN3.5x2.5-16L Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	0.80	-	1.00
A1	0.00	-	0.05
A2	0.60	-	0.70
A3	-	0.20	-
D	2.40	-	2.60
E	3.40	-	3.60
e	0.50 BSC		
b	0.18	-	0.30
L	0.30	-	0.50
D1	0.85		1.15
E1	1.85		2.15
Unit: mm			

9 Notes and Revision History

9.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- ***https:www.jscj-elec.com*** for more details.

9.2 Notes

Electrostatic Discharge Caution

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

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