DESCRIPTION

The AL74LS138 decodes three binary-weighted address inputs (A0, A1, and A2) into eight mutually exclusive outputs (Y0 to Y7).

The device has three enable inputs (G1, G2A, and G2B). All outputs are high unless G1 is high and both G2A and G2B are low. The multiple enable inputs allow easy parallel expansion to a 1-of-32 decoder using only one inverter and four AL74LS138 devices.

The AL74LS138 can also be used as an 8-output demultiplexer by using one of the active-low enable inputs as the data input and the remaining enable inputs as strobe controls.

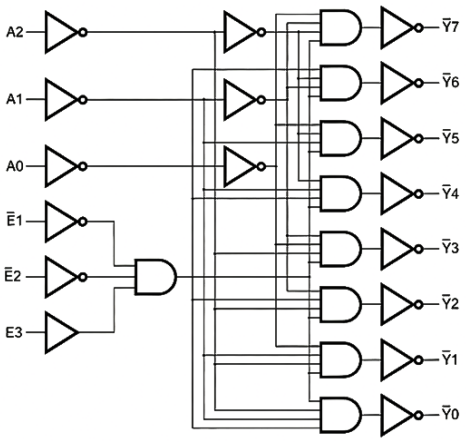
The inputs include clamp diodes, allowing the inputs to be interfaced with current-limiting resistors

The AL74SL08 is available in DIP16, SOP16 and TSSOP16 packages.

FEATURES

- Demultiplexing capability
- Multiple enable inputs for easy expansion
- Ideal for memory chip-select decoding
- Active-low, mutually exclusive outputs
- Operating ambient temperature range: -40°C to +125°C
- Available in DIP16, SOP16 and TSSOP16 Packages

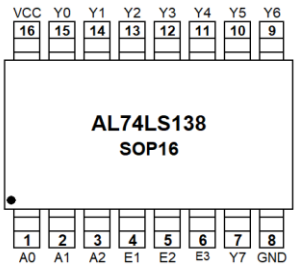
FUNCTION DIAGRAM



ORDERING INFORMATION

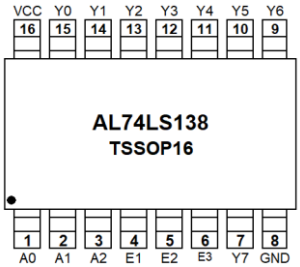
Package Type	Part Number	
DIP16 SPQ: 40pcs/Tube	P16	AL74SL08P16R
SOP16 SPQ: 200pcs/Tube	M16	AL74SL08M16R
TSSOP16 SPQ:200pcs/Tube	TMX16	AL74SL08TMX16R
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

PIN DESCRIPTION



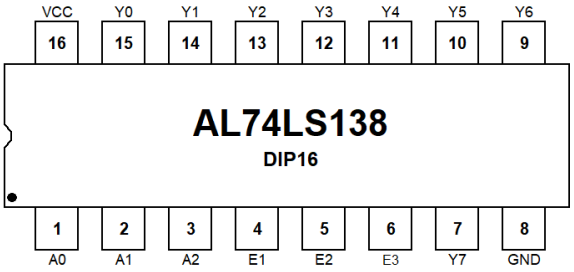
SOP16, M16

Top View



TSSOP16, TMX16

Top View



DIP16, P16

Top View

PIN#			Symbol	Function
SOP16	TSSOP16	DIP16		
1	1	1	A0	Address input
2	2	2	A1	Address input
3	3	3	A2	Address input
4	4	4	$\overline{E}1$	Enable input (active Low)
5	5	5	$\overline{E}2$	Enable input (active Low)
6	6	6	E 3	Enable input (active High)
7	7	7	$\overline{Y}7$	Output
8	8	8	GND	Ground
9	9	9	$\overline{Y}6$	Output
10	10	10	$\overline{Y}5$	Output
11	11	11	$\overline{Y}4$	Output
12	12	12	$\overline{Y}3$	Output
13	13	13	$\overline{Y}2$	Output
14	14	14	$\overline{Y}1$	Output
15	15	15	$\overline{Y}0$	Output
16	16	16	VCC	Power supply

FUNCTION TABLE

INPUTS						OUTPUT							
$\overline{E}1$	$\overline{E}2$	E 3	**A2**	**A1**	**A0**	$\overline{Y}7$	$\overline{Y}6$	$\overline{Y}5$	$\overline{Y}4$	$\overline{Y}3$	$\overline{Y}2$	$\overline{Y}1$	$\overline{Y}0$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	H	H	H	H	H	H	L
L	L	H	L	L	H	H	H	H	H	H	H	L	H
L	L	H	L	H	L	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	L	H	H	H
L	L	H	H	L	L	H	H	H	L	H	H	H	H
L	L	H	H	L	H	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	L	H	H	H	H	H	H
L	L	H	H	H	H	L	H	H	H	H	H	H	H

H=High Voltage Level L=Low Voltage Level, X=Don't care

ABSOLUTE MAXIMUM RATINGS

T_{amb}=25℃, GND=0V (unless otherwise noted)

V_{CC}, Supply Voltage Range		-0.5V ~ +7V
I_{IK}, Input Clamp Current	V_I<-0.5V or V_I>V_{CC}+0.5V	±20mA
I_{OK}, Output Clamp Current	V_O<-0.5V or V_O>V_{CC}+0.5V	±20mA
I_O, Continuous Output Current	-0.5V<V_O<V_{CC}+0.5V	±25mA
I_{CC}, Supply Current		50mA
I_{GND}, Ground Current		-50mA
P_{tot}, Total Power Dissipation		500mW
T_L, Soldering Temperature	DIP16	245℃
	SOP16, TSSOP16	260℃
T_{STG}, Storage Temperature		-65℃ ~ +150℃

Stresses above 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 in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	-	2	5	6	V
Input Voltage Range	V_I	-	0	-	V_{CC}	V
Output Voltage	V_O	-	0	-	V_{CC}	V
Input Rising/Falling Slew Rate	$\Delta t/\Delta V$	V_{CC}=2V	-	-	625	ns/V
		V_{CC}=4.5V	-	1.67	139	
		V_{CC}=6V	-	-	83	
Operating Environment	T_{amb}	-	-40	-	+125	℃

ELECTRICAL CHARACTERISTICS

T_A=25°C, GND=0V, unless otherwise noted.

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High level input voltage	V_{IH}	V_{CC}=2V		1.50	1.20	-	V
		V_{CC}=4.5V		3.15	2.40	-	
		V_{CC}=6V		4.20	3.20	-	
Low level input voltage	V_{IL}	V_{CC}=2V		-	0.80	0.50	V
		V_{CC}=4.5V		-	2.10	1.35	
		V_{CC}=6V		-	2.80	1.80	
High level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O= -20uA, V_{CC}=2.0V	1.90	2	-	V
			I_O= -20uA, V_{CC}=4.5V	4.40	4.50	-	
			I_O= -20uA, V_{CC}=6.0V	5.90	6	-	
			I_O= -4.0mA, V_{CC}=4.5V	3.98	4.32	-	
			I_O= -5.2mA, V_{CC}=6.0V	5.48	5.81	-	
Low level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA, V_{CC}=2.0V	-	0	0.10	V
			I_O=20uA, V_{CC}=4.5V	-	0	0.10	
			I_O=20uA, V_{CC}=6.0V	-	0	0.10	
			I_O=4.0mA, V_{CC}=4.5V	-	0.15	0.26	
			I_O=5.2mA, VCC=6.0V	-	0.16	0.26	
Input leak current	I_I	V_I= V_{CC} or GND, V_{CC}=6.0V		-	-	±1	uA
Quiescent current	I_{CC}	V_I= V_{CC} or GND, I_O=0A, V_{CC}=6.0V		-	-	8	uA
Input capacitance	C_I	-		-	3.50	-	pF

T_A= 40℃ ~ +85℃, GND=0V

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High level input voltage	V_{IH}	V_{CC}=2V		1.50	-	-	V
		V_{CC}=4.5V		3.15	-	-	
		V_{CC}=6V		4.20	-	-	
Low level input voltage	V_{IL}	V_{CC}=2V		-	-	0.50	V
		V_{CC}=4.5V		-	-	1.35	
		V_{CC}=6V		-	-	1.80	
High level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O= -20uA, V_{CC}=2.0V	1.90	-	-	V
			I_O= -20uA, V_{CC}=4.5V	4.40	-	-	
			I_O= -20uA, V_{CC}=6.0V	5.90	-	-	
			I_O= -4.0mA, V_{CC}=4.5V	3.84	-	-	
			I_O= -5.2mA, V_{CC}=6.0V	5.34	-	-	
Low level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA, V_{CC}=2.0V	-	-	0.10	V
			I_O=20uA, V_{CC}=4.5V	-	-	0.10	
			I_O=20uA, V_{CC}=6.0V	-	-	0.10	
			I_O=4.0mA, V_{CC}=4.5V	-	-	0.33	
			I_O=5.2mA, VCC=6.0V	-	-	0.33	
Input leak current	I_I	V_I= V_{CC} or GND, V_{CC}=6.0V		-	-	±1	uA
Quiescent current	I_{CC}	V_I= V_{CC} or GND, I_O=0A, V_{CC}=6.0V		-	-	80	uA

T_A= 40℃ ~ +125℃, GND=0V

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High level input voltage	V_{IH}	V_{CC}=2V		1.50	-	-	V
		V_{CC}=4.5V		3.15	-	-	
		V_{CC}=6V		4.20	-	-	
Low level input voltage	V_{IL}	V_{CC}=2V		-	-	0.50	V
		V_{CC}=4.5V		-	-	1.35	
		V_{CC}=6V		-	-	1.80	
High level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O= -20uA, V_{CC}=2.0V	1.90	-	-	V
			I_O= -20uA, V_{CC}=4.5V	4.40	-	-	
			I_O= -20uA, V_{CC}=6.0V	5.90	-	-	
			I_O= -4.0mA, V_{CC}=4.5V	3.70	-	-	
			I_O= -5.2mA, V_{CC}=6.0V	5.20	-	-	
Low level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA, V_{CC}=2.0V	-	-	0.10	V
			I_O=20uA, V_{CC}=4.5V	-	-	0.10	
			I_O=20uA, V_{CC}=6.0V	-	-	0.10	
			I_O=4.0mA, V_{CC}=4.5V	-	-	0.40	
			I_O=5.2mA, VCC=6.0V	-	-	0.40	
Input leak current	I_I	V_I= V_{CC} or GND, V_{CC}=6.0V		-	-	±1	uA
Quiescent current	I_{CC}	V_I= V_{CC} or GND, I_O=0A, V_{CC}=6.0V		-	-	160	uA

AC CHARACTERISTICS

T_A=25°C, GND=0V

Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Propagation delay from An to Yn	t_{pd}	Fig.2	V_{CC}=2V	-	41	150	ns
			V_{CC}=4.5V	-	15	30	
			VCC=5.0V, CL=15pF	-	12	-	
			V_{CC}=6V	-	12	26	
Propagation Delay from E3 to Yn		Fig.2	V_{CC}=2V	-	47	150	ns
			V_{CC}=4.5V	-	17	20	
			VCC=5.0V, CL=15pF	-	14	-	
			V_{CC}=6V	-	14	26	
Propagation Delay from En to Yn		Fig.3	V_{CC}=2V	-	47	150	
			V_{CC}=4.5V	-	17	20	
			VCC=5.0V, CL=15pF	-	14	-	
			V_{CC}=6V	-	14	26	
Transition Time	t_t	Fig.2	V_{CC}=2V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	
			V_{CC}=6V	-	6	13	
Power Dissipation Capacitance	C_{pd}	Each package, VI=GND ~ V_{CC} (1)		-	67	-	pF

1. C_{PD} is used to calculate the dynamic power dissipation (P_D), expressed in μW , $P_D=(C_{PD}\times V_{CC}^2\times f_i\times N)+\sum(C_L\times V_{CC}^2\times f_o)$, fi=Input frequency (MHz) ; fo= Output frequency (MHz) ; C_L=Output load capacitance(pF) ; V_{CC}=supply Voltage (V) ; N=Switching frequency ; $\sum(C_L\times V_{CC}^2\times f_o)$=Total output amount。.

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T_A= 40℃ ~ +85℃, GND=0V

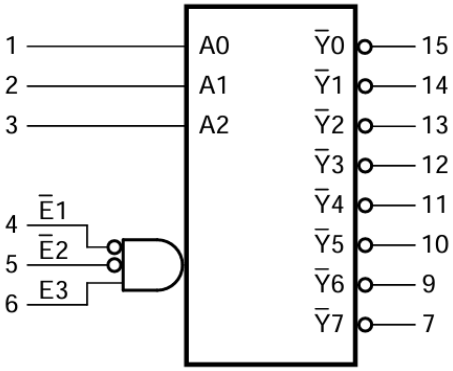
Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Propagation delay from An to Yn	t_{pd}	Fig.2	V_{CC}=2V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	
			V_{CC}=6V	-	-	33	
Propagation Delay from E3 to Yn		Fig.2	V_{CC}=2V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	
			V_{CC}=6V	-	-	33	
Propagation Delay from En to Yn		Fig.3	V_{CC}=2V	-	-	190	
			V_{CC}=4.5V	-	-	38	
			V_{CC}=6V	-	-	33	
Transition Time	t_t	Fig.2	V_{CC}=2V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	
			V_{CC}=6V	-	-	16	

T_A= 40℃ ~ +125℃, GND=0V

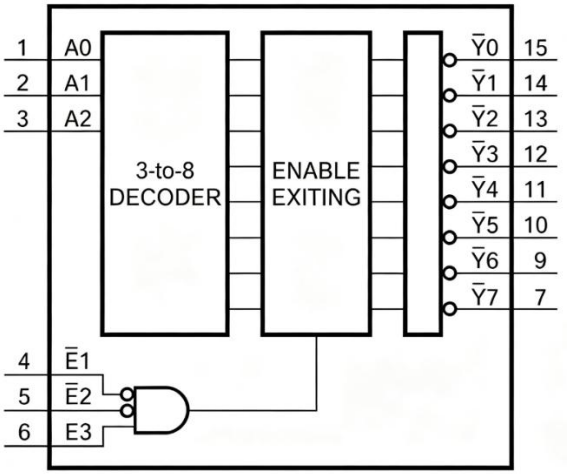
Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Propagation delay from An to Yn	t_{pd}	Fig.2	V_{CC}=2V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	
			V_{CC}=6V	-	-	38	
Propagation Delay from E3 to Yn		Fig.2	V_{CC}=2V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	
			V_{CC}=6V	-	-	38	
Propagation Delay from En to Yn		Fig.3	V_{CC}=2V	-	-	225	
			V_{CC}=4.5V	-	-	45	
			V_{CC}=6V	-	-	38	
Transition Time	t_t	Fig.2	V_{CC}=2V	-	-	110	ns
			V_{CC}=4.5V	-	-	22	
			V_{CC}=6V	-	-	19	

BLOCK DIAGRAM

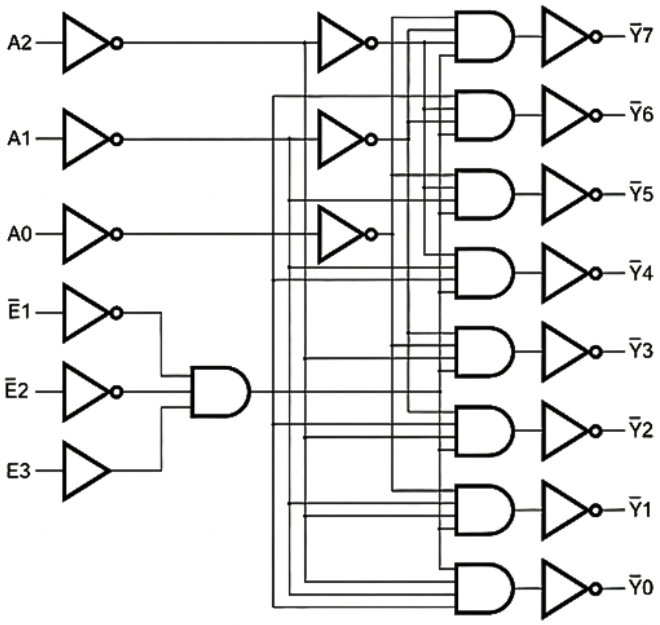
a. Logic Symbol



b. Function Diagram



c. Logic Diagram



PARAMETER MEASUREMENT INFORMATION

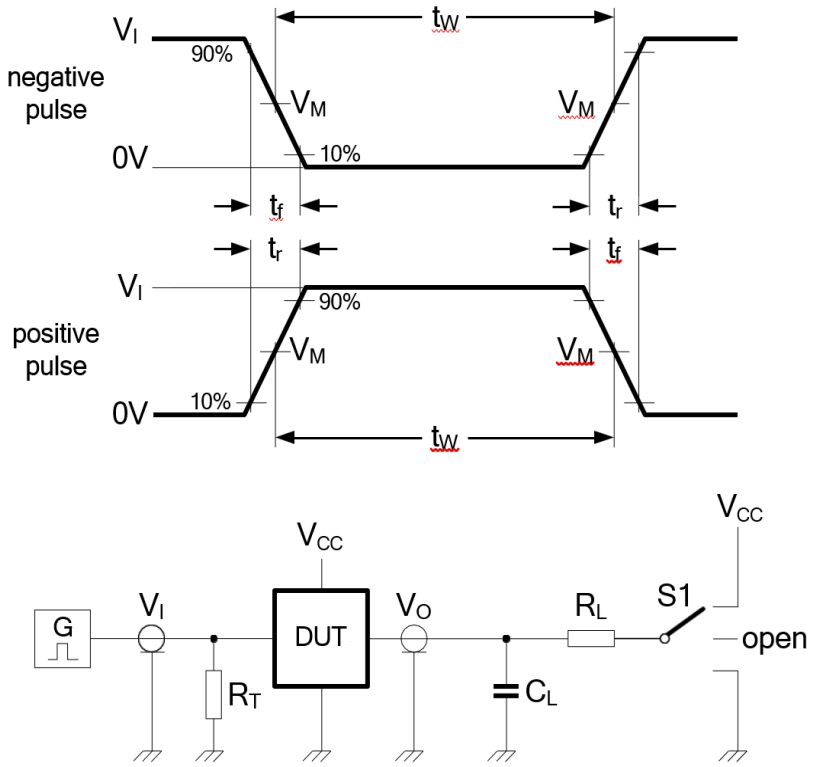


Fig 1. Switching Time Test Circuit

Note:

C_L: Load capacitance, including the capacitance of the probe and clips.

R_T: The termination resistor should match the signal generator's output impedance (Zo).

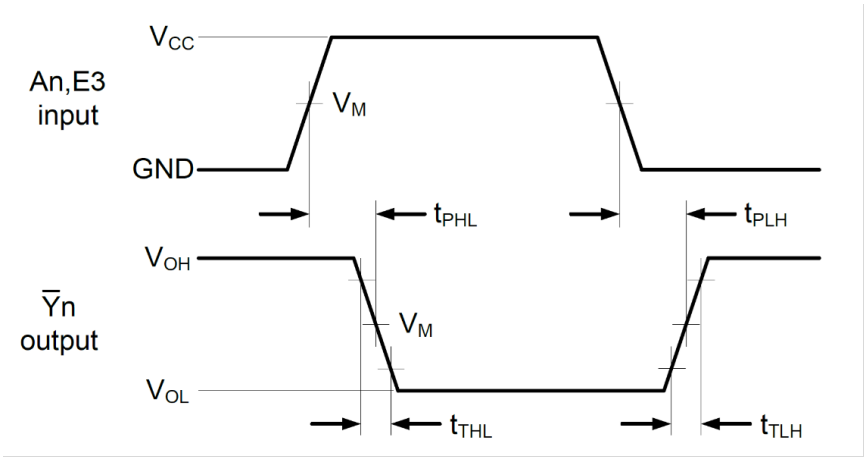


Fig 2. An/E3-to-Yn Propagation Delay and Yn Output Transition Time

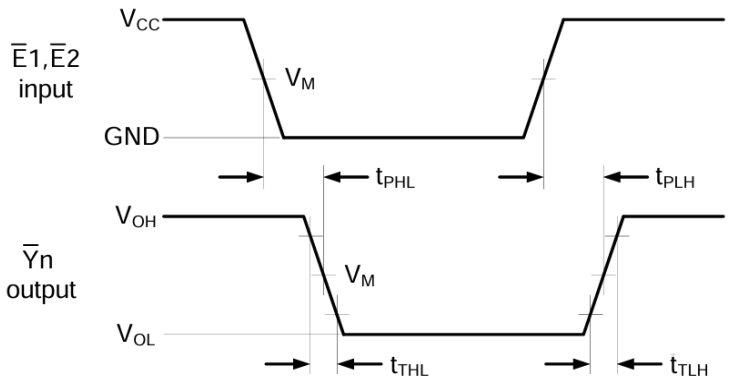


Fig 3. Enable Input (En) to Output (Yn) Propagation Delay and Transition Time

TEST POINT

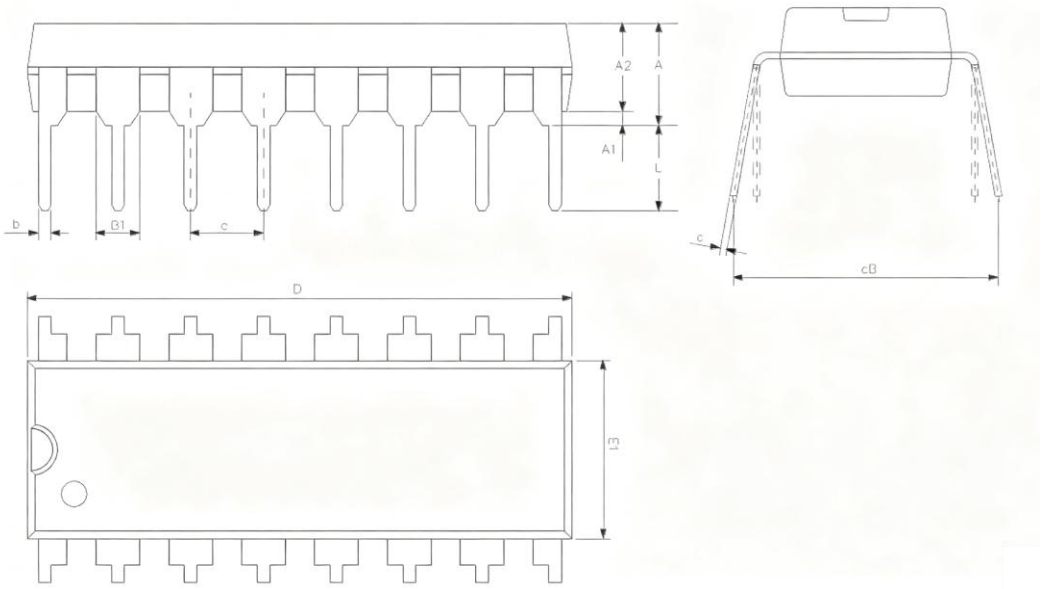
INPUTS	OUTPUT
V_M	V_M
0.5×VCC	0.5×VCC

TEST DATA

INPUTS		Load		S1 Position		
V_I	t_r , t_f	C_L	RL	t_{PLH}, t_{PHL}	t_{PZH} , t_{PHZ}	t_{PZL} , t_{PLZ}
VCC	6ns	15pF, 50Pf	1kΩ	open	GND	VCC

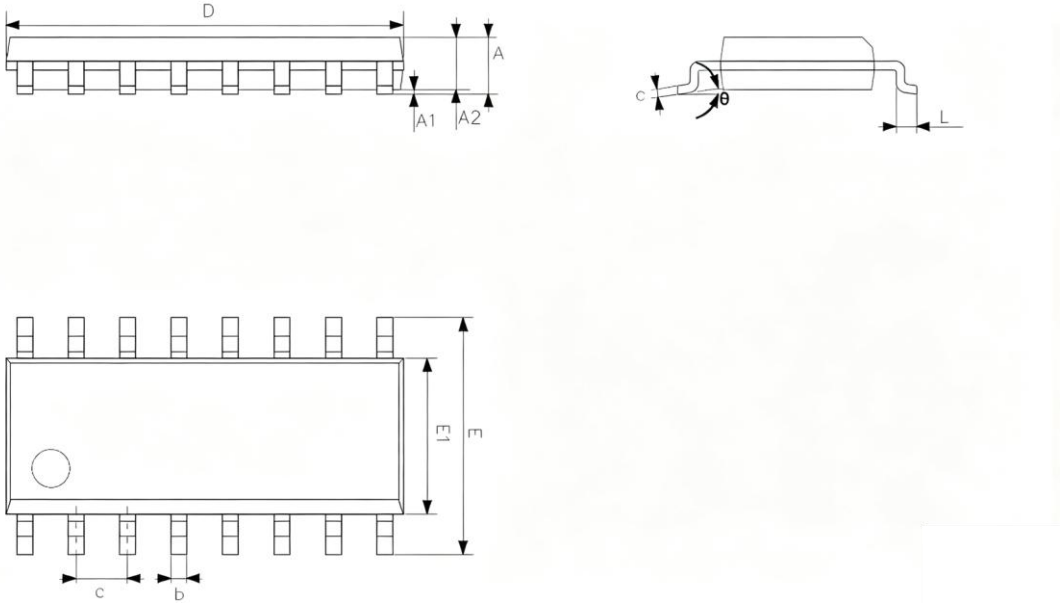
PACKAGE INFORMATION

Dimension in DIP16 (Unit: mm)



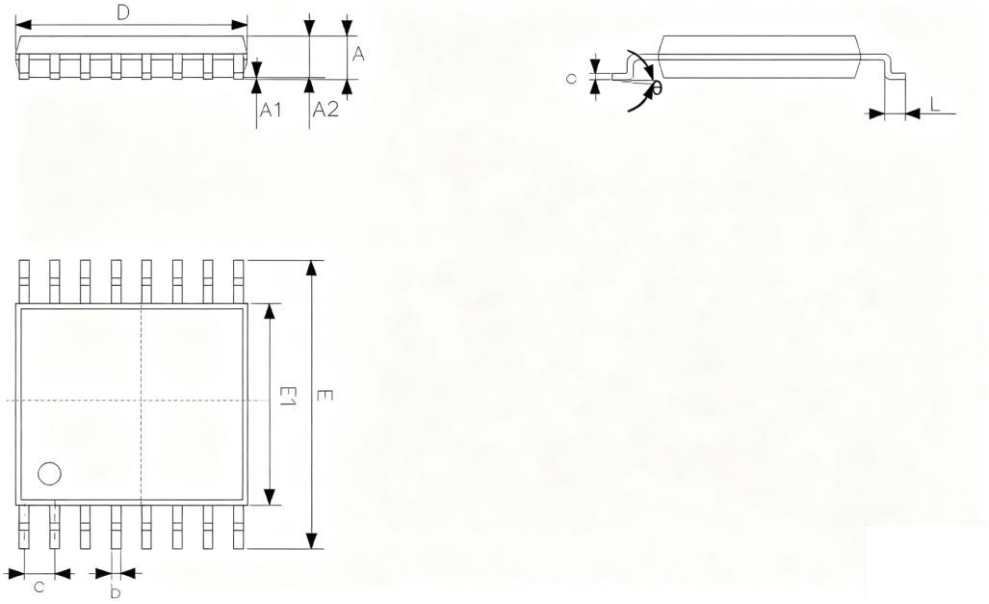
Symbol	Min.	Max.
A	3.600	5.330
A1	0.510	-
A2	3.200	3.600
B1	1.520	
b	0.360	0.560
c	0.200	0.360
D	18.800	19.940
E1	6.200	6.600
e	2.540	
eB	7.620	9.300
L	3.000	3.600

Dimension in SOP16 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	1.350	1.800
A1	0.100	0.250
A2	1.250	1.550
b	0.330	0.510
c	0.190	0.250
D	9.500	10.100
e	1.270 BSC	
E	5.800	6.300
E1	3.700	4.100
L	0.350	0.890
θ	0°	8°

Dimension in TSSOP16 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.050	0.150
A2	0.800	1.050
b	0.190	0.300
c	0.090	0.200
D	4.900	5.100
E	6.200	6.600
E1	4.300	4.500
e	0.650 BSC	
L	0.450	0.750
θ	0°	8°

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