AOS SEMICONDUCTOR

产品规格说明书

Product Data Sheet

AOS74HC157D

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Logic Gates

Product Specification

AOS74HC157D

Data Sheet

Logic Gates

Quad 2-input Multiplexer

■ General Description

The 74HC157 are quad 2 input multiplexers which select 4 bits of data from two sources under the control of a common data select input(S).The enable input(E)is active LOW.When E is HIGH,all of the outputs (1Y to 4Y)are forced LOW regardless of all other input conditions.Moving the data from two groups of registerst of our common output buses is a common use of the SN74HC157. 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. The device is useful for implementing highly irregular logicby generating any four of the 16 different functions of two variables with one variable common. The 74HC157 is logic implementation of a 4-pole, 2-position switch, where theposition of the switch is determined by the logic levels applied to S.The logic equations are:

1Y=¬ E×(1I1×S+1I0×¬ S)
2Y=¬ E×(2I1×S+2I0×¬ S)
3Y=¬ E×(3I1×S+3I0×¬ S)
4Y=¬ E×(4I1×S+4I0×¬ S)

The 74HC157 is identical to the AOS74HC157 but has non-invert(true)outputs.

■ Features:

- Input levels:For AOS74HC157: CMOS level
- Low-power dissipation
- Non-inverting data path
- Specified from-40℃ to+125℃
- Packaging information: DIP16/SOP16/TSSOP16

■ Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AOS74HC157D	SOP16	HC157	2500 PCS/tube	5000 tube/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm

Note:If the physical information is inconsistent with the ordering information,please refer to the actual product.

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Block Diagram And Pin Description

Block Diagram

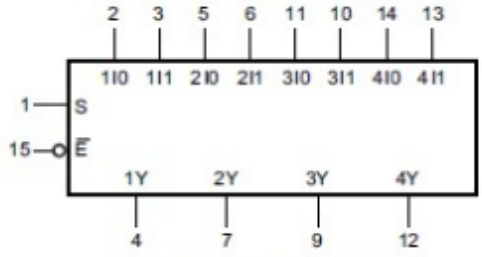

Figure 1. Logic symbol

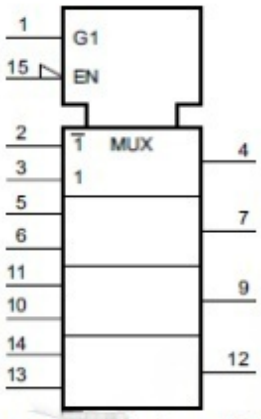

Figure 2. IEC logic symbol

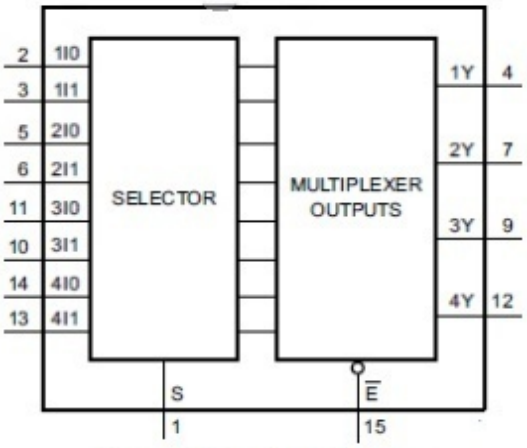

Figure 3. Functional diagram

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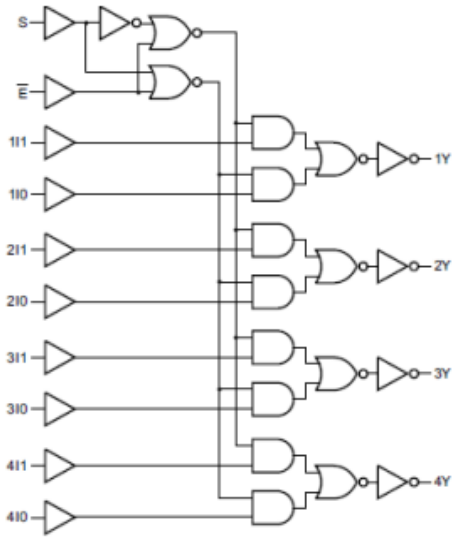
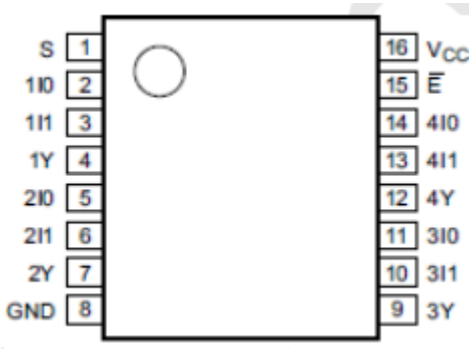


Figure 4. Logic diagram

■ Pin Configurations



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■ Pin Description

Pin No.	Pin Name	Description
1	S	common data select input
2	1I0	data input from source 0
3	1I1	data input from source 1
4	1Y	multiplexer output
5	2I0	data input from source 0
6	2I1	data input from source 1
7	2Y	multiplexer output
8	GND	ground (0V)
9	3Y	multiplexer output
10	3I1	data input from source 1
11	3I0	data input from source 0
12	4Y	multiplexer output
13	4I1	data input from source 1
14	4I0	data input from source 0
15	¬ E	enable input(active LOW)
16	V_{CC}	supply voltage

■ Function Table

Input				Output
¬ 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

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Electrical Parameter

Absolute Maximum Ratings

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

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}	-		-0.5	+7.0	V
input clamping current	I_{IK}	V_I< -0.5V or V_I>V_{CC}+0.5V		-	±20	mA
output clamping current	I_{OK}	V_O<-0.5V or V_O>V_{CC}+0.5V		-	±20	mA
output current	I_O	V_O=-0.5V to(V_{CC}+0.5V)		-	±25	mA
supply current	I_{CC}	-		-	+50	mA
ground current	I_{GND}	-		-50	-	mA
total power dissipation	P_{tot}	-		-	500	mW
storage temperature	T_{stg}	-		-65	+150	℃
soldering temperature	T_L	10s	DIP	245		℃
			SOP	250		℃

Note:

[1] For DIP16 packages:above 70℃ the value of Ptot derates linearly with 12mW/K.

[2] For SOP16 packages: above 70℃ the value of Ptot derates linearly with 8mW/K.

[3] For (T)SSOP16 packages:above 60℃ the value of Ptot derates linearly with 5.5mW/K.

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Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
AOS74HC157						
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
input transition rise and fall rate	$\Delta t/\Delta V$	V_{CC}=2.0V	-	-	625	ns/V
		V_{CC}=4.5V	-	1.67	139	ns/V
		V_{CC}=6.0V	-	-	83	ns/V
ambient temperature	T_{amb}	-	-40	-	+105	℃

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Electrical Characteristics

DC Characteristics 1

(Tamb=25℃,voltages are referenced to GND(ground=0V),unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
HIGH-level inputvoltage	V_{IH}	V_{CC}=2.0V		1.5	1.2	-	V
		V_{CC}=4.5V		3.15	2.4	-	V
		V_{CC}=6.0V		4.2	3.2	-	V
LOW-level inputvoltage	V_{IL}	V_{CC}=2.0V		-	0.8	0.5	V
		V_{CC}=4.5V		-	2.1	1.35	V
		V_{CC}=6.0V		-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA;V_{CC}=2.0V	1.9	2.0	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-20uA;V_{CC}=6.0V	5.9	6.0	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.98	4.32	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA;V_{CC}=2.0V	-	0	0.1	V
			I_O=20uA;V_{CC}=4.5V	-	0	0.1	V
			I_O=20uA;V_{CC}=6.0V	-	0	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	0.15	0.26	V
			I_O=5.2mA;V_{CC}=6.0V	-	0.16	0.26	V
input leakage current	I_I	V_I=V_{CC} or GND;V_{CC}=6.0V		-	-	±0.1	uA
supply current	I_{CC}	V_I=V_{CC} or GND;I_O=0A;V_{CC}=6.0V		-	-	8.0	uA
input capacitance	C_I	-		-	3.5	-	pF

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DC Characteristics 2

(Tamb=-40℃ to +85℃,voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
HIGH-level inputvoltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA;V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA;V_{CC}=6.0V	5.9	-	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.84	-	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.34	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA;V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA;V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA;V_{CC}=6.0V	-	-	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.33	V
			I_O=5.2mA;V_{CC}=6.0V	-	-	0.33	V
input leakage current	I_I	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
supply current	I_{CC}	V_I=V_{CC} or GND;I_O=0A; V_{CC}=6.0V		-	-	80	uA

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DC Characteristics 3

(Tamb=-40℃ to +105℃,voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	
		V_{CC}=6.0V		4.2	-	-	
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	
		V_{CC}=4.5V		-	-	1.35	
		V_{CC}=6.0V		-	-	1.8	
HIGH-level output voltage	V_{OH}	V_I=V_{IH}或V_{IL}	I_O=-20μA;V_{CC}=2.0V	1.9	-	-	
			I_O=-20μA;V_{CC}=4.5V	4.4	-	-	
			I_O=-20μA;V_{CC}=6.0V	5.9	-	-	
			I_O=-4.0mA;V_{CC}=4.5V	3.7	-	-	
			I_O=-5.2mA;V_{CC}=6.0V	5.2	-	-	
LOW-level output voltage	V_{OL}	V_I=V_{IH}或V_{IL}	I_O=20μA;V_{CC}=2.0V	-	-	0.1	
			I_O=20μA;V_{CC}=4.5V	-	-	0.1	
			I_O=20μA;V_{CC}=6.0V	-	-	0.1	
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.4	
			I_O=5.2mA;V_{CC}=6.0V	-	-	0.4	
input leakage current	I_I	V_I=V_{CC}或GND;V_{CC}=6.0V		-	-	±1.0	μA
supply current	I_{CC}	V_I=V_{CC}或GND;I_O=0A,V_{CC}=6.0V		-	-	160	

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AC Characteristics 1

(Tamb=25℃,GND=0V,C_L=50pF,unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
propagation delay	t_{pd}	nI0, nI1 to nY; see Figure 6[1]	V_{CC}=2.0V	-	36	125	ns
			V_{CC}=4.5V	-	13	25	ns
			V_{CC}=5.0V;C_L=50pF	-	11	-	ns
			V_{CC}=6.0V	-	10	21	ns
		S to nY; see Figure 6[1]	V_{CC}=2.0V	-	41	125	ns
			V_{CC}=4.5V	-	15	25	ns
			V_{CC}=5.0V;C_L=50pF	-	12	-	ns
			V_{CC}=6.0V	-	12	21	ns
		¬ E to nY; see Figure 7[1]	V_{CC}=2.0V	-	39	115	ns
			V_{CC}=4.5V	-	14	23	ns
			V_{CC}=5.0V;C_L=50pF	-	11	-	ns
			V_{CC}=6.0V	-	11	20	ns
transition time	t_t	nY; see Figure 6[2]	V_{CC}=2.0V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	ns
			V_{CC}=6.0V	-	6	13	ns
power dissipation capacitance	C_{PD}	C_L=50pF;f=1MHz;V_I=GND to V_{CC}[3]		-	70	-	pF

Note:

[1]t_{pd} is the sameas t_{PLH} and t_{PHL}.

[2]t_t is the same as t_{THL} and t_{TLH}.

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

$P_D=C_{PD}\times V_{CC}^2\times f_i\times N+(C_L\times V_{CC}^2\times f_o)$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;

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

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AC Characteristics 2

(T_{amb}=-40℃ to +85℃,GND=0V,C_L=50pF,unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
propagation delay	t_{pd}	nI0, nI1 to nY; see Figure 6[1]	V_{CC}=2.0V	-	-	155	ns
			V_{CC}=4.5V	-	-	31	ns
			V_{CC}=6.0V	-	-	26	ns
		S to nY; see Figure 6[1]	V_{CC}=2.0V	-	-	155	ns
			V_{CC}=4.5V	-	-	31	ns
			V_{CC}=6.0V	-	-	26	ns
		¬ E to nY; see Figure 7[1]	V_{CC}=2.0V	-	-	145	ns
			V_{CC}=4.5V	-	-	29	ns
			V_{CC}=6.0V	-	-	25	ns
transition time	t_t	nY; see Figure 6[2]	V_{CC}=2.0V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	ns
			V_{CC}=6.0V	-	-	16	ns

Note:

[1] t_{pd} is the sameas t_{PLH} and t_{PHL}.

[2] t_t is the same as t_{THL} and t_{TLH}.

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AC Characteristics 3

(T_{amb}=-40℃ to +105℃,GND=0V,C_L=50pF,unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
AOS74HC157							
propagation delay	t_{pd}	nI0, nI1 to nY; see Figure 6[1]	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	32	ns
		S to nY; see Figure 6[1]	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	32	ns
		¬ E to nY; see Figure 7[1]	V_{CC}=2.0V	-	-	175	ns
			V_{CC}=4.5V	-	-	35	ns
			V_{CC}=6.0V	-	-	30	ns
transition time	t_t	nY; see Figure 6[2]	V_{CC}=2.0V	-	-	110	ns
			V_{CC}=4.5V	-	-	22	ns
			V_{CC}=6.0V	-	-	19	ns

Note:

[1] t_{pd} is the sameas t_{PLH} and t_{PHL}.

[2] t_t is the same as t_{THL} and t_{TLH}.

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Testing Circuit
AC Testing Circuit

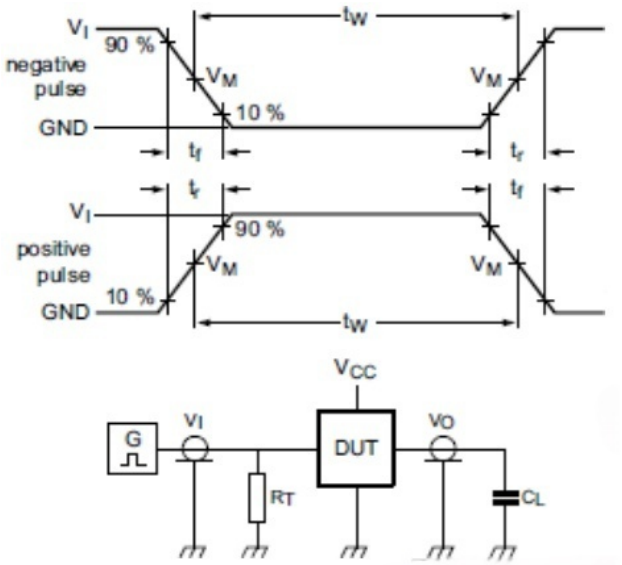

Figure 5. Test circuit for measuring switching times

Definitions for test circuit:
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.

AC Testing Waveforms

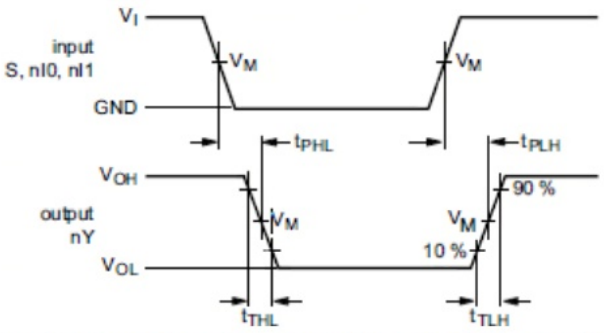

Figure 6. Propagation delay input (nI0, nI1, S) to output (nYn)

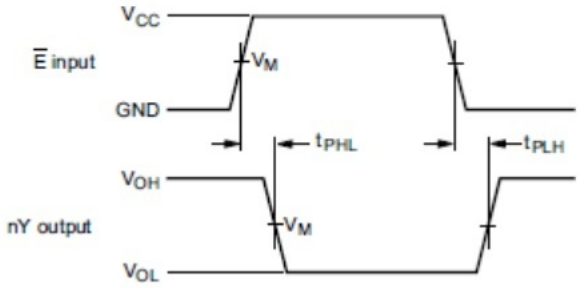

Figure 7. Propagation delay input ($\overline{E}$) to output (nY)

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Measurement Points

Type	Input	Output
	V_M	V_M
AOS74HC157	0.5xV_{CC}	0.5xV_{CC}

Test Data

Type	Input		Load	Test
	V_M	t_r, t_f	C_L	
AOS74HC157	V_{CC}	6ns	15pF, 50pF	t_{PHL}, t_{PLH}

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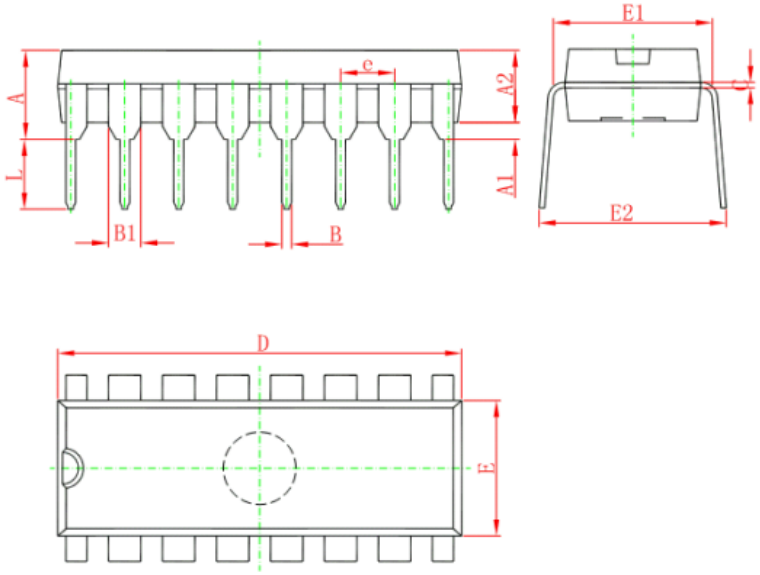
Package Information
DIP16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	6.60	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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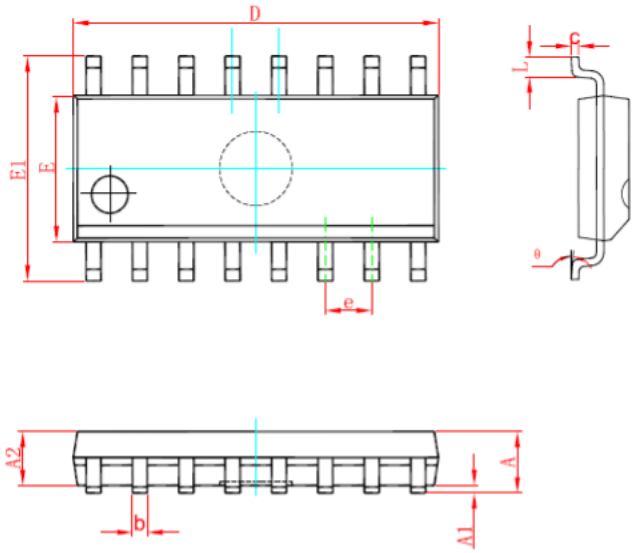
SOP16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0 °	8 °	0 °	8 °