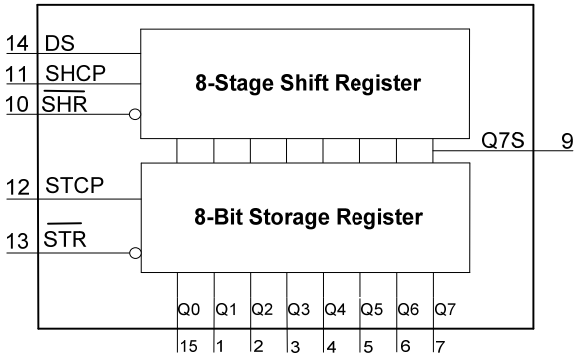
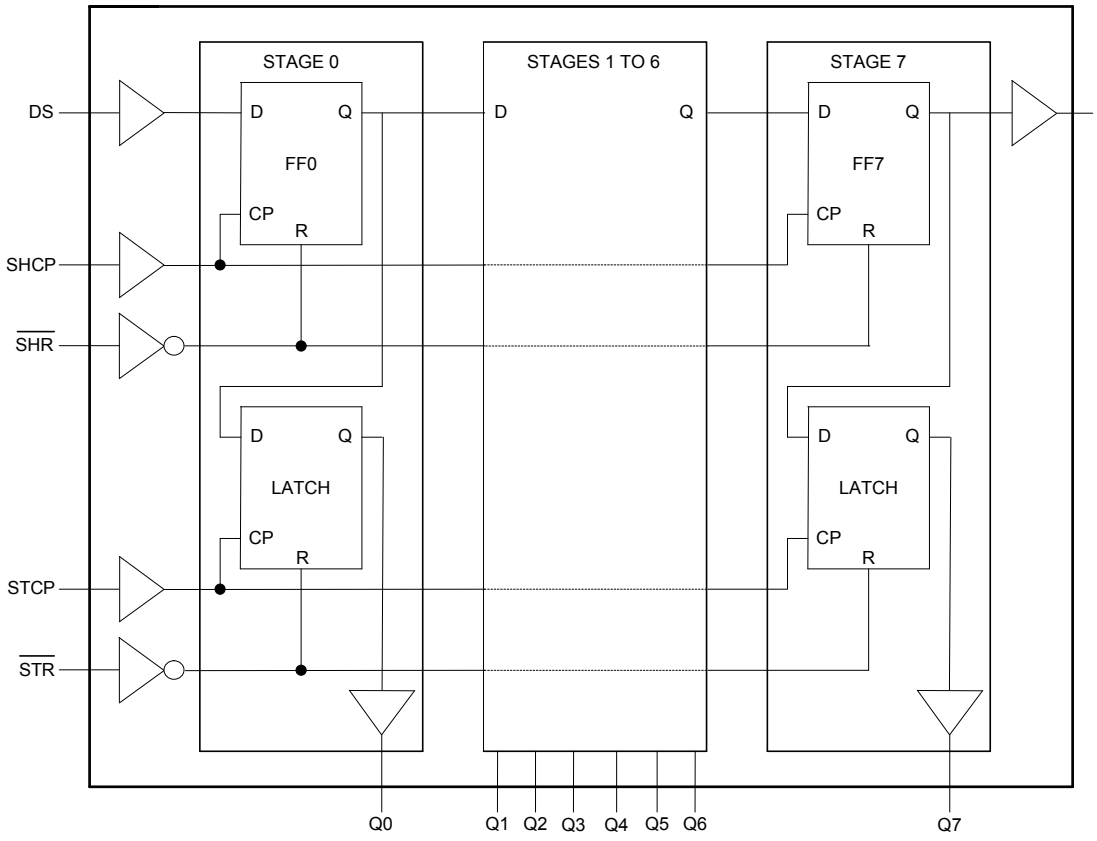
Pin Descriptions

Pin Number	Pin Name	Functions
1	Q1	Parallel Data Output 1
2	Q2	Parallel Data Output 2
3	Q3	Parallel Data Output 3
4	Q4	Parallel Data Output 4
5	Q5	Parallel Data Output 5
6	Q6	Parallel Data Output 6
7	Q7	Parallel Data Output 7
8	GND	Ground
9	Q7S	Serial Data Output
10	$\overline{SHR}$	Shift Register Reset active low
11	SHCP	Shift Register Clock Input
12	STCP	Storage Register Clock Input
13	$\overline{STR}$	Storage Register Reset active low
14	DS	Serial Data input
15	Q0	Parallel Data Output 0
16	Vcc	Supply Voltage

Functional Diagram



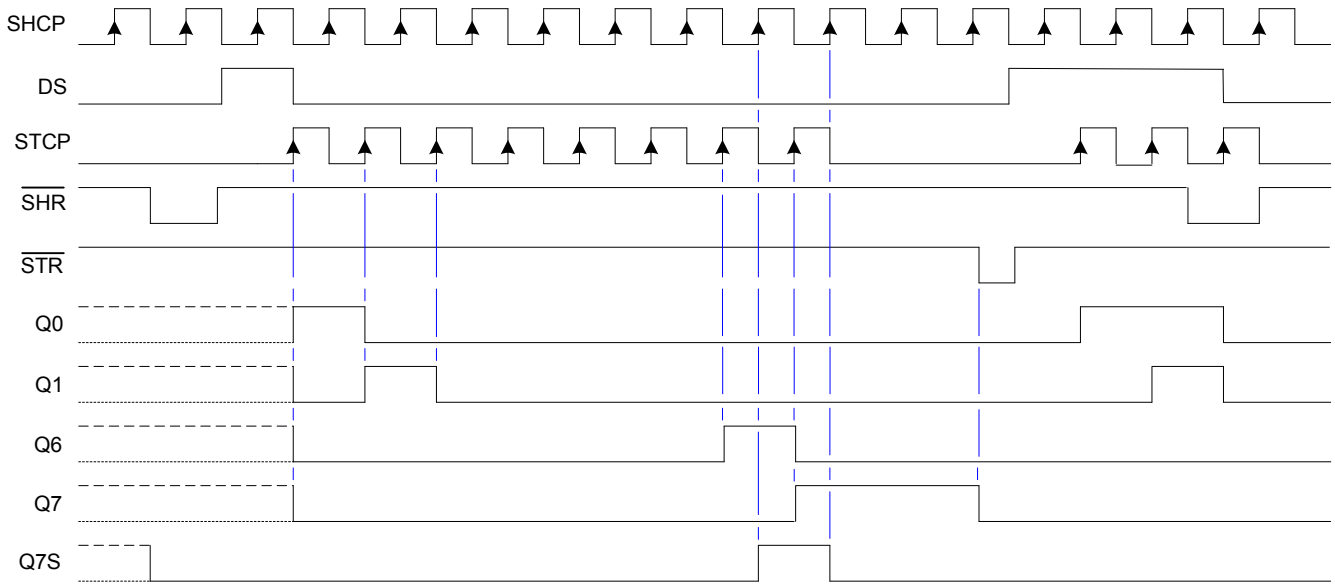
Logic Diagram



Functional Description and Timing Diagram

Control				Input	Output		Function
$\overline{SHR}$	$\overline{STR}$	SHCP	STCP	DS	Q7S	Qn	
L	X	X	X	X	L	NC	Clear Shift Register
X	L	X	X	X	NC	L	Clear Storage Register
H	X	↑	L	H or L	Q6S	NC	Loads DS into shift register stage 0. All Q_S shifted
H	H	X	↑	X	NC	Qs	Contents of shift register moved to starge register all Q_S -> Q_N
H	H	↑	↑	H or L	Q6S	QnS	Shift Register one pulse count ahead of storage register.

H=HIGH voltage state
L=LOW voltage state
↑=LOW to HIGH transition
X= don't care – high or low (not floating)
NC= No change



Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
V_{CC}	Supply Voltage Range	-0.5 to +7.0	V
V_I	Input Voltage Range	-0.5 to +7.0	V
V_o	Voltage applied to output in high or low state	-0.3 to V_{CC} +0.5	V
I_{IK}	Input Clamp Current V_I< -0.5V	-20	mA
I_{OK}	Output Clamp Current V_O<-0.5V	-20	mA
I_{OK}	Output Clamp Current V_O> V_{CC} +0.5V	20	mA
I_O	Continuous output current	±25	mA
I_{CC}	Continuous current through Vcc	75	mA
I_{GND}	Continuous current through GND	-75	mA
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C
P_{TOT}	Total Power Dissipation	500	mW

Notes: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions (Note 5) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage	–	2.0	5.5	V
V_I	Input Voltage	–	0	5.5	V
V_O	Output Voltage	–	0	V_{CC}	V
Δt/ΔV	Input transition Rise or Fall Rate	V_{CC} = 3.0V to 3.6V	–	100	ns/V
		V_{CC} = 4.5V to 5.5V	–	20	
T_A	Operating Free-Air Temperature	–	-40	+125	°C

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = +25°C			T_A = -40°C to +85°C		T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	High-Level Input Voltage	–	2.0V	1.5	–	–	1.5	–	1.5	–	V
		–	3.0V	2.1	–	–	2.1	–	2.1	–	
		–	5.5V	3.85	–	–	3.85	–	3.85	–	
V_{IL}	Low-Level Input Voltage	–	2.0V	–	–	0.5	–	0.5	–	0.5	V
		–	3.0V	–	–	0.9	–	0.9	–	0.9	
		–	5.5V	–	–	1.65	–	1.65	–	1.65	
V_{OH}	High-Level Output Voltage	I_{OH} = -50μA	2.0V	1.9	2.0	–	1.9	–	1.9	–	V
		I_{OH} = -50μA	3.0V	2.9	3.0	–	2.9	–	2.9	–	
		I_{OH} = -50μA	4.5V	4.4	4.5	–	4.4	–	4.4	–	
		I_{OH} = -4mA	3.0V	2.58	–	–	2.48	–	2.40	–	
		I_{OH} = -8mA	4.5V	3.94	–	–	3.80	–	3.70	–	
V_{OL}	Low-Level Output Voltage	I_{OL} = 50μA	2.0V	–	0	0.1	–	0.1	–	0.1	V
		I_{OL} = 50μA	3.0V	–	0	0.1	–	0.1	–	0.1	
		I_{OL} = 50μA	4.5V	–	0	0.1	–	0.1	–	0.1	
		I_{OL} = 4mA	3.0V	–	–	0.36	–	0.44	–	0.55	
		I_{OL} = 8mA	4.5V	–	–	0.36	–	0.44	–	0.55	
I_I	Input Current	V_I = GND or 5.5V	5.5V	–	0.01	± 0.1	–	± 1	–	± 2	μA
I_{CC}	Supply Current	V_I = GND or V_{CC} I_O = 0	5.5V	–	–	4	–	40	–	80	μA
C_i	Input Capacitance	V_i = V_{CC} or GND	5.5V	–	3.5	10	–	10	–	10	pF

Switching Characteristics

Symbol / Parameter	Pins	Test Conditions	V_{CC}	T_A = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
f_{MAX} Maximum Frequency	SHCP or STCP	Figure1	3.0V to 3.6V	80	125	–	70	–	65	–	MHz
			4.5V to 5.5V	90	70	–	80	–	70	–	
t_W Pulse Width	SHCP and STCP HIGH or LOW	Figure1	3.0V to 3.6V	6.0	–	–	6.5	–	7.0	–	ns
			4.5V to 5.5V	5.5	–	–	6.0	–	6.5	–	
	$\overline{SHR}$ and $\overline{STR}$ HIGH or LOW	Figure1	3.0V to 3.6V	5.0	–	–	5.0	–	5.5	–	
			4.5V to 5.5V	5.0	–	–	5.2	–	5.7	–	
t_{SU} Set-up Time	DS to SHCP	Figure1	3.0V to 3.6V	3.5	–	–	3.5	–	3.5	–	ns
			4.5V to 5.5V	3.0	–	–	3.0	–	3.0	–	
	$\overline{SHR}$ to STCP	Figure1	3.0V to 3.6V	8.0	–	–	9.0	–	9.5	–	
			4.5V to 5.5V	5.0	–	–	5.0	–	5.5	–	
	SHCP tp STCP	Figure1	3.0V to 3.6V	8.0	–	–	8.5	–	9.0	–	ns
			4.5V to 5.5V	5.0	–	–	5.0	–	5.5	–	
t_H Hold Time	DS to SHCP	Figure1	3.0V to 3.6V	1.5	–	–	1.5	–	1.5	–	ns
			4.5V to 5.5V	2.0	–	–	2.0	–	2.0	–	
t_{REC} Recovery Time	$\overline{SHR}$ to SHCP	Figure1	3.0V to 3.6V	4.2	–	–	4.8	–	5.3	–	ns
			4.5V to 5.5V	2.9	–	–	3.3	–	3.8	–	
	$\overline{SHR}$ to STCP	Figure1	3.0V to 3.6V	4.6	–	–	5.3	–	5.8	–	ns
			4.5V to 5.5V	3.2	–	–	3.7	–	4.3	–	
t_{PLH} LOW to HIGH Propagation Delay	SHCP toQ7S	Figure1 C_L = 15pF	3.0V to 3.6V	–	5.2	8.5	2.2	9.7	2.2	10.6	ns
			4.5V to 5.5V	–	3.8	6.3	1.7	7.2	1.7	7.8	
		Figure1 C_L = 50pF	3.0V to 3.6V	–	7.4	11.5	3.0	13.2	3.0	14.3	
			4.5V to 5.5V	–	4.8	8.0	2.4	9.1	2.4	10.0	
	STCP to Qn	Figure1 C_L = 15pF	3.0V to 3.6V	–	5.1	8.3	2.3	9.5	2.3	10.6	ns
			4.5V to 5.5V	–	3.5	5.7	1.8	6.5	1.8	7.1	
		Figure1 C_L = 50pF	3.0V to 3.6V	–	7.3	11.9	3.3	13.6	3.3	14.7	
			4.5V to 5.5V	–	4.8	7.8	2.6	9.0	2.6	9.8	

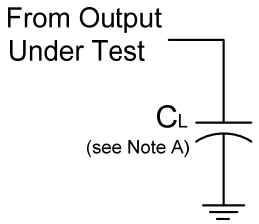
Switching Characteristics (cont.)

Symbol / Parameter	Pins	Test Conditions	V_{CC}	T_A = +25°C			-40°C°C to +85°C		-40°C°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{PHLH} HIGH to LOW Propagation Delay	SHCP toQ7S	Figure 1 C_L = 15pF	3.0V to 3.6V	–	5.5	8.9	2.3	10.2	2.3	11.0	ns
			4.5V to 5.5V	–	4.1	6.7	1.9	7.6	1.9	8.2	
		Figure 1 C_L = 50pF	3.0V to 3.6V	–	7.4	12.1	3.0	13.9	3.0	15.1	
			4.5V to 5.5V	–	5.4	8.8	2.5	10.1	2.5	11.0	
	STCP to Qn	Figure 1 C_L = 15pF	3.0V to 3.6V	–	5.5	9.1	2.4	10.4	2.4	11.3	ns
			4.5V to 5.5V	–	3.7	6.0	1.9	6.9	1.9	7.5	
		Figure 1 C_L = 50pF	3.0V to 3.6V	–	7.3	12.0	3.2	13.8	3.2	15.0	
			4.5V to 5.5V	–	5.2	8.5	2.6	9.7	2.6	10.5	
	$\overline{SHR}$ to Q7S	Figure 1 C_L = 15pF	3.0V to 3.6V	–	5.7	9.5	2.3	10.8	2.3	11.7	ns
			4.5V to 5.5V	–	4.1	6.7	2.0	7.6	2.0	8.2	
		Figure 1 C_L = 50pF	3.0V to 3.6V	–	7.5	12.2	3.6	14.0	3.6	15.2	
			4.5V to 5.5V	–	5.4	8.8	2.8	10.1	2.8	11.0	
	$\overline{STR}$ to Qn	Figure 1 C_L = 15pF	3.0V to 3.6V	–	4.1	7.2	2.2	8.2	2.2	8.9	ns
			4.5V to 5.5V	–	4.1	7.2	2.2	8.2	2.2	8.9	
		Figure 1 C_L = 50pF	3.0V to 3.6V	–	5.4	9.4	3.0	10.7	3.0	11.6	
			4.5V to 5.5V	–	5.4	9.4	3.0	10.7	3.0	11.6	
t_{PHL} Propagation Delay	$\overline{SHR}$ to Q7S	Figure 1	2.0V	–	39	150	–	185	–	225	ns
			4.5V	–	14	30	–	37	–	45	
			5.0V	–	11	–	–	–	–	–	
			6.0V	–	12	26	–	31	–	38	
	$\overline{STR}$ to Qn	Figure 1	2.0V	–	39	125	–	155	–	185	ns
			4.5V	–	14	25	–	31	–	37	
			5.0V	–	11	–	–	–	–	–	
			6.0V	–	12	21	–	26	–	31	
t_{THL} Transition Time	Serial data output Q7S	Figure 1	2.0V	–	19	75	–	95	–	110	ns
			4.5V	–	7	15	–	19	–	22	
			6.0V	–	6	13	–	16	–	19	
	Parallel Data Outputs Q_N	Figure 1	2.0V	–	14	60	–	75	–	90	ns
			4.5V	–	5	12	–	15	–	18	
			6.0V	–	4	10	–	13	–	15	

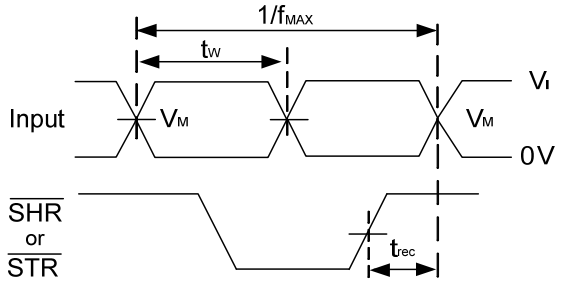
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V_{CC} = 5V	Unit
			Typ	
C_{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load	51	pF

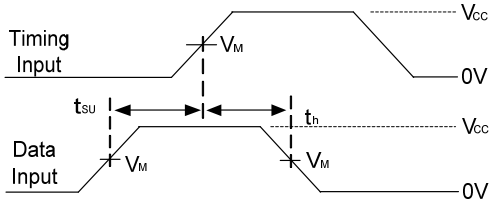
Parameter Measurement Information



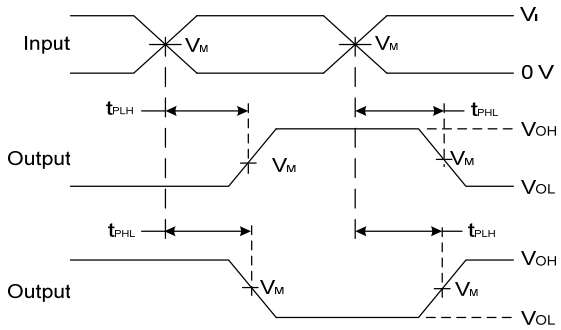
V_{CC}	Inputs		V_M
	V_I	t_r/t_f	
4.5V	V_{CC}	6ns	$V_{CC}/2$
5.0V	V_{CC}	6ns	$V_{CC}/2$



Voltage Waveform
Pulse Duration and Recovery Time



Voltage Waveform
Set-up and Hold Times

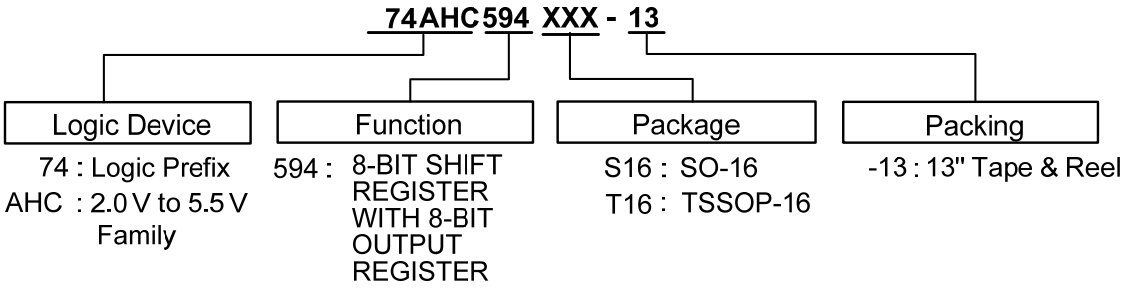


Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs

Notes:
A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 10MHz.
C. Inputs are measured separately one transition per measurement.
D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Figure 1 Load Circuit and Voltage Waveforms

Ordering Information

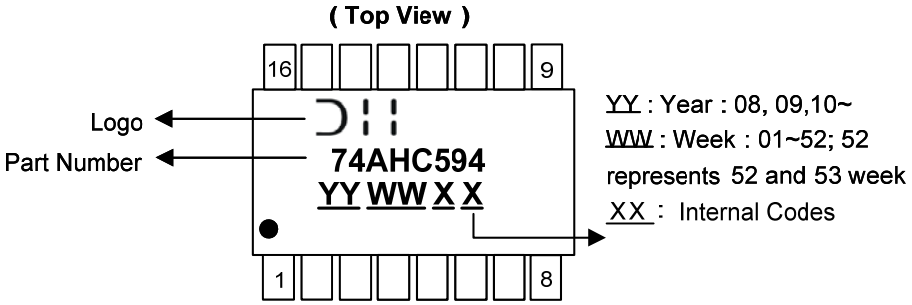


Part Number	Package Code	Packaging	7" Tape and Reel (Note 6)	
			Quantity	Part Number Suffix
74AHC594S16-13	S16	SO-16	2500/Tape & Reel	-13
74AHC594T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

Note: 6. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

(1) SO-16, TSSOP16

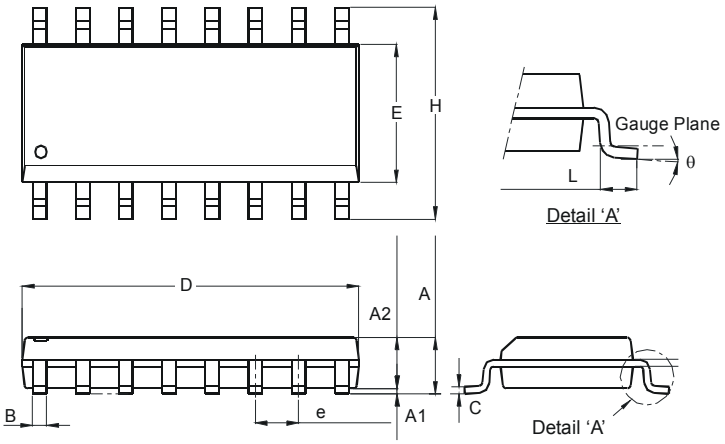


Part Number	Package
74AHC594S16	SO-16
74AHC594T16	TSSOP-16

Package Outline Dimensions (All dimensions in mm.)

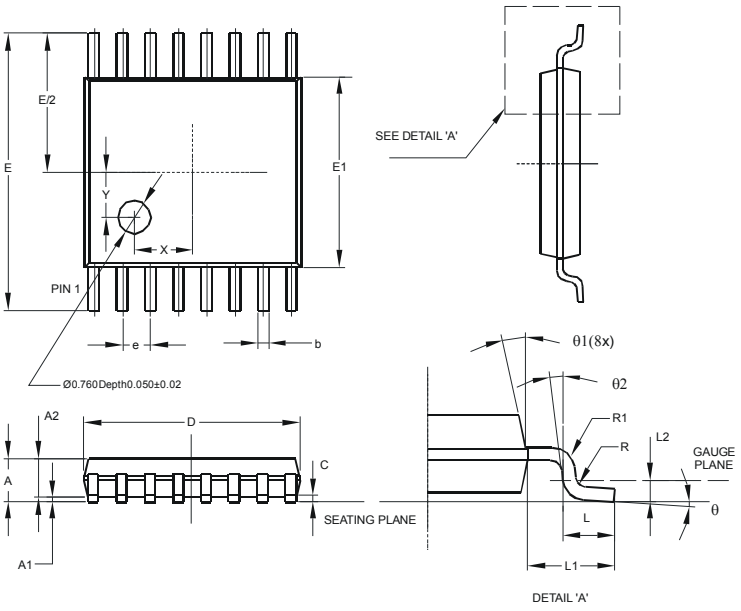
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

Package Type: SO-16



SO-16		
Dim	**Min**	**Max**
A	1.40	1.75
A1	0.10	0.25
A2	1.30	1.50
B	0.33	0.51
C	0.19	0.25
D	9.80	10.00
E	3.80	4.00
e	1.27 Typ	
H	5.80	6.20
L	0.38	1.27
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-16

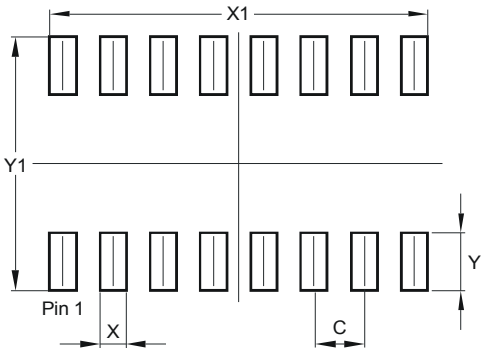


TSSOP-16			
Dim	**Min**	**Max**	**Typ**
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
θ1	5°	15°	-
θ2	0°	-	-
All Dimensions in mm			

Suggested Pad Layout

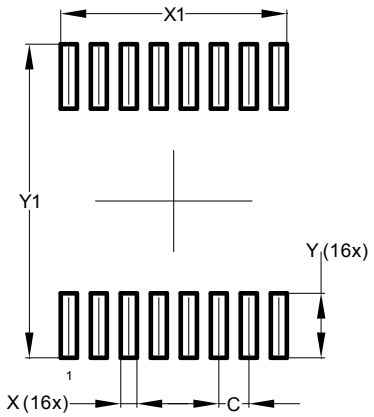
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

Package Type: SO-16



Dimensions	Value (in mm)
C	1.270
X	0.670
X1	9.560
Y	1.450
Y1	6.400

Package Type: TSSOP-16



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	4.900
Y	1.400
Y1	6.800

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