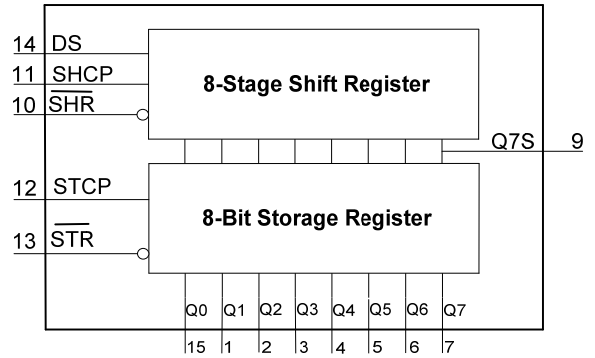


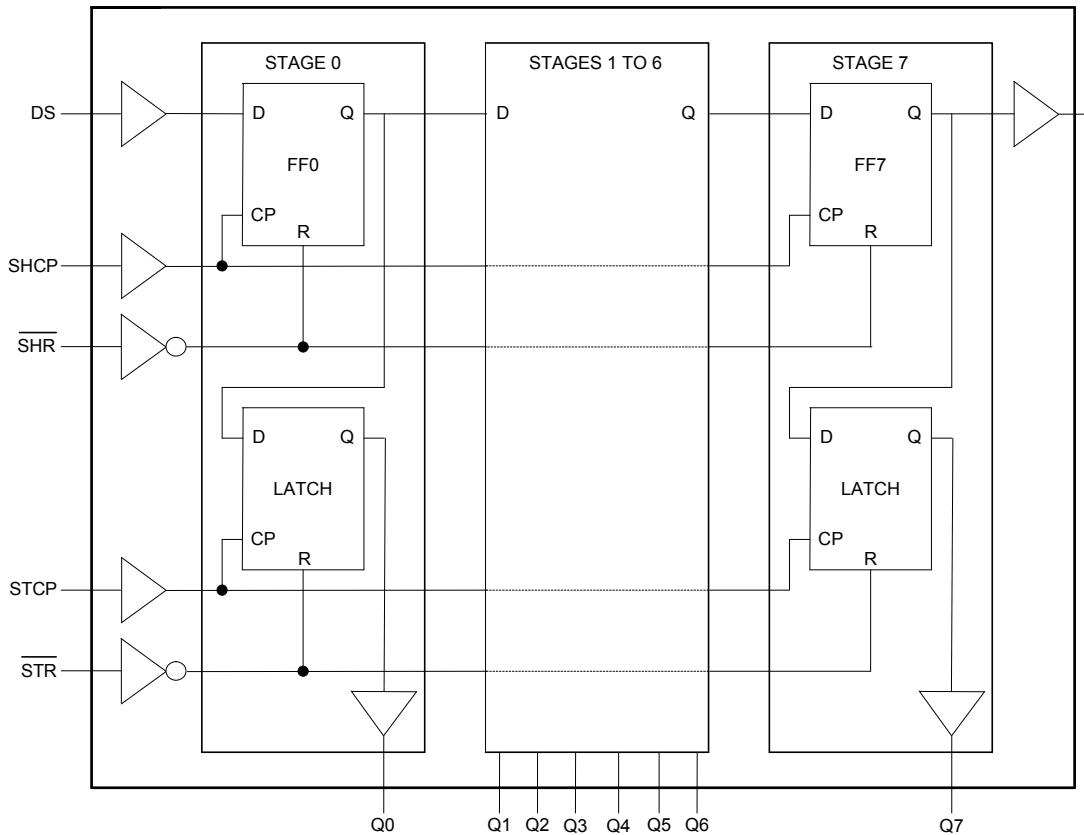
Pin Descriptions

Pin Number	Pin Name	Description
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	$\overline{\text{SHR}}$	Shift Register Reset active low
11	SHCP	Shift Register Clock Input
12	STCP	Storage Register Clock Input
13	$\overline{\text{STR}}$	Storage Register Reset active low
14	DS	Serial Data input
15	Q0	Parallel Data Output 0
16	V _{CC}	Supply Voltage

Functional Diagram



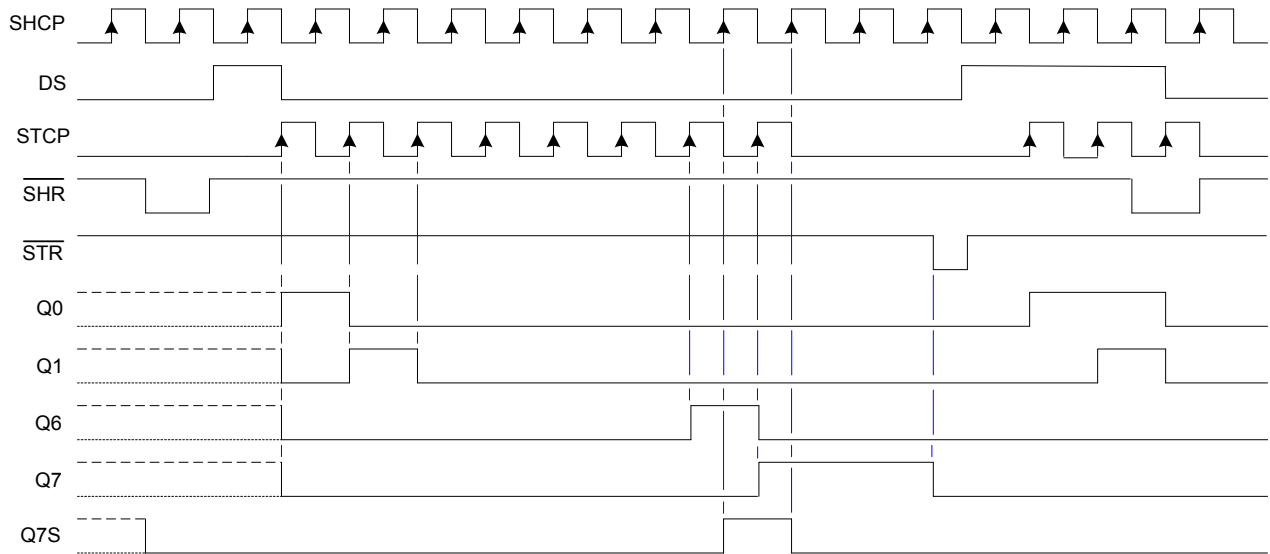
Logic Diagram



Functional Description and Timing Diagram

Control				Input	Output		Function
SHR	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	Q _S	Contents of shift register moved to starge register all Q _S -> Q _N
H	H	↑	↑	H or L	Q6S	Q _{nS}	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	Description	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 _{IK}	Input Clamp Current V _I > V _{CC} +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	Q7 standard output	±25
		Qn bus driver outputs	±35
I _{CC}	Continuous current through V _{CC}	70	mA
I _{GND}	Continuous current through GND	-70	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

Note: 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	6.0	V
V _I	Input Voltage	–	0	V _{CC}	V
V _O	Output Voltage	–	0	V _{CC}	V
Δt/ΔV	Input transition rise or fall rate	V _{CC} = 2.0V	–	1000	ns/V
		V _{CC} = 4.5V	–	500	
		V _{CC} = 6.0V	–	400	–
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	1.2	–	1.5	–	1.5	–	V
			4.5V	3.15	2.4	–	3.15	–	3.15	–	
			6.0V	4.2	3.2	–	4.2	–	4.2	–	
V _{IL}	Low-level input voltage	–	2.0V	–	0.8	0.5	–	0.5	–	0.5	V
			4.5V	–	2.1	1.35	–	1.35	–	1.35	
			6.0V	–	2.8	1.8	–	1.8	–	1.8	
V _{OH}	High Level Output Voltage	I _{OH} = -20μA All outputs	2.0V	1.9	2.0	–	1.9	–	1.9	–	V
			4.5V	4.4	4.5	–	4.4	–	4.4	–	
			6.0V	5.9	6.0	–	5.9	–	5.9	–	
	Q7S output	I _{OH} = -4mA	4.5V	3.98	4.32	–	3.84	–	3.7	–	
		I _{OH} = -5.2mA	6.0V	5.48	5.81	–	5.34	–	5.2	–	
	Qn Bus Outputs	I _{OH} = -6.0mA	4.5V	3.98	4.32	–	3.84	–	3.7	–	
I _{OH} = -7.8mA		6.0V	5.48	5.81	–	5.34	–	5.2	–		
V _{OL}	Low-level Output Voltage	I _{OL} = 20μA All outputs	2.0V	–	0	0.1	–	0.1	–	0.1	V
			4.5V	–	0	0.1	–	0.1	–	0.1	
			6.0V	–	0	0.1	–	0.1	–	0.1	
	Q7S output	I _{OL} = 4.0mA	4.5V	–	.15	0.26	–	0.33	–	0.4	
		I _{OL} = 5.2mA	6.0V	–	.16	0.26	–	0.33	–	0.4	
	Qn Bus Outputs	I _{OL} = 6.0mA	4.5V	–	.15	0.26	–	0.33	–	0.4	
I _{OL} = 7.8mA		6.0V	–	.16	0.26	–	0.33	–	0.4		
I _I	Input Current	V _I = GND to 5.5V	6.0V	–	–	±0.1	–	±1	–	±1	μA
I _{CC}	Supply Current	V _I = GND or V _{CC} I _O = 0	6.0V	–	–	8.0	–	80	–	160	μA
C _i	Input Capacitance	V _i = V _{CC} – or GND	6.0V	–	3.5	10	–	10	–	10	pF

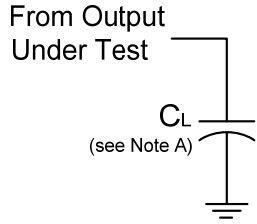
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

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

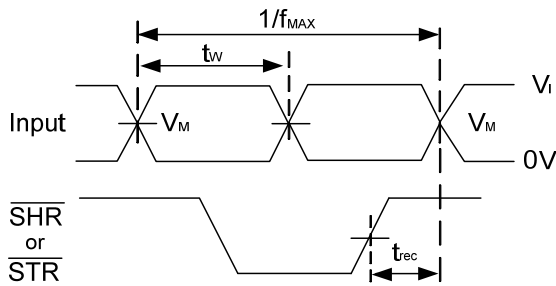
Switching Characteristics

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	Figure 2	2.0V	6	30	–	4.8	–	4	–	MHz
			4.5V	30	92	–	24	–	20	–	
			5.0V	–	100	–	–	–	–	–	
			6.0V	35	109	–	28	–	24	–	
t _w Pulse Width	SHCP HIGH or LOW	Figure 2	2.0V	80	10	–	100	–	120	–	ns
			4.5V	16	4	–	20	–	24	–	
			6.0V	14	3	–	17	–	20	–	
	STCP HIGH or LOW	Figure 2	2.0V	80	10	–	100	–	120	–	
			4.5V	16	4	–	20	–	24	–	
			6.0V	14	3	–	17	–	20	–	
	SHR and STR HIGH or LOW	Figure 2	2.0V	80	14	–	100	–	120	–	
			4.5V	16	5	–	20	–	24	–	
			6.0V	14	4	–	17	–	20	–	
t _{su} Set-up Time	DS to SHCP	Figure 2	2.0V	100	10	–	125	–	150	–	ns
			4.5V	20	4	–	25	–	30	–	
			6.0V	17	3	–	21	–	26	–	
	SHR to STCP	Figure 2	2.0V	100	14	–	125	–	150	–	ns
			4.5V	20	5	–	25	–	30	–	
			6.0V	17	4	–	21	–	26	–	
	SHCP to STCP	Figure 2	2.0V	100	17	–	125	–	150	–	ns
			4.5V	20	6	–	25	–	30	–	
			6.0V	17	5	–	21	–	26	–	
t _{PD} Propagation Delay	SHCP to Q7S	Figure 2	2.0V	–	44	150	–	185	–	225	ns
			4.5V	–	16	30	–	37	–	45	
			5.0V	–	13	–	–	–	–	–	
			6.0V	–	14	26	–	31	–	38	
	STCP to Qn	Figure 2	2.0V	–	44	150	–	185	–	225	ns
			4.5V	–	16	30	–	37	–	45	
			5.0V	–	13	–	–	–	–	–	
			6.0V	–	14	26	–	31	–	38	
t _H Hold Time	DS to SHCP	Figure 2	2.0V	25	-8	–	30	–	35	–	ns
			4.5V	5	-3	–	6	–	7	–	
			6.0V	4	-2	–	5	–	6	–	
t _{REC} Recovery Time	SHR to SHCP and STR to STCP	Figure 2	2.0V	50	-14	–	65	–	75	–	ns
			4.5V	10	-5	–	13	–	15	–	
			6.0V	9	-4	–	11	–	13	–	
t _{PHL} Propagation Delay	SHR to Q7S	Figure 2	2.0V	–	39	150	–	185	–	225	ns
			4.5V	–	14	30	–	37	–	45	
			5.0V	–	11	–	–	–	–	–	
			6.0V	–	12	26	–	31	–	38	
	STR to Qn	Figure 2	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 2	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 2	2.0V	–	14	60	–	75	–	90	ns
			4.5V	–	5	12	–	15	–	18	
			6.0V	–	4	10	–	13	–	15	

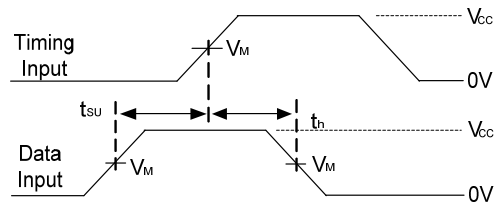
Parameter Measurement Information



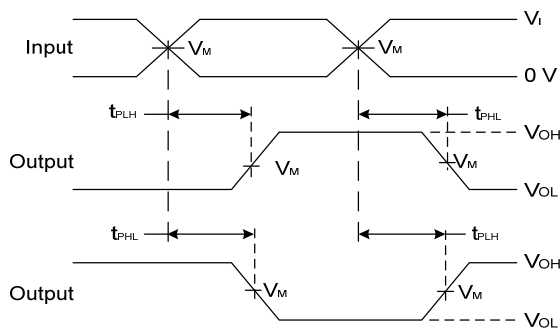
V_{CC}	Inputs		V_M	C_L
	V_I	t_r/t_f		
2.0V	V_{CC}	6ns	$V_{CC}/2$	50pF
4.5V	V_{CC}	6ns	$V_{CC}/2$	50pF
5.0V	V_{CC}	6ns	$V_{CC}/2$	15pF
6.0V	V_{CC}	6ns	$V_{CC}/2$	50pF



**Voltage Waveform
Pulse Duration and Recovery Time**



**Voltage Waveform
Set-up and Hold Times**

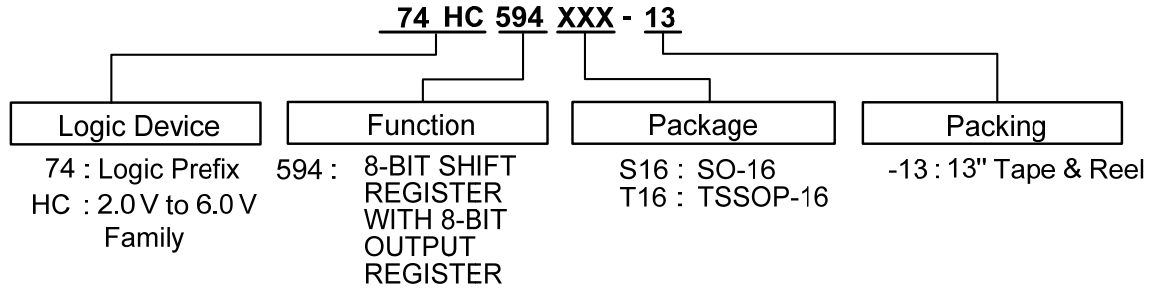


**Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs**

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

Figure 2 Load Circuit and Voltage Waveforms

Ordering Information

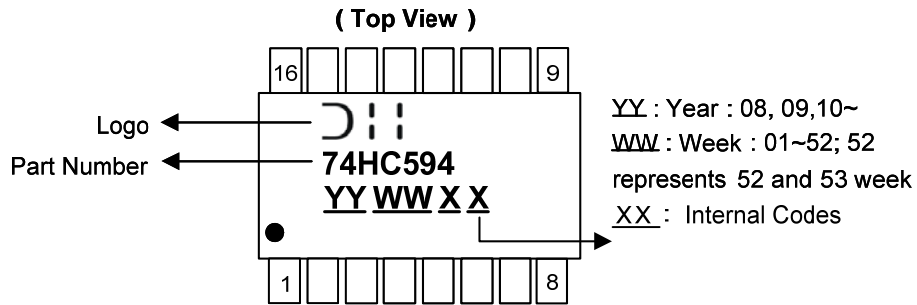


Part Number	Package Code	Packaging	7" Tape and Reel (Note 6)	
			Quantity	Part Number Suffix
74HC594S16-13	S16	SO-16	2500/Tape & Reel	-13
74HC594T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

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

Marking Information

(1) SO-16, TSSOP16

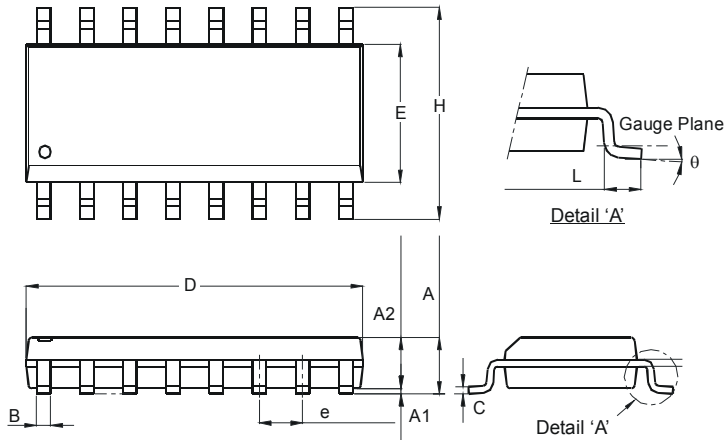


Part Number	Package
74HC594S16	SO-16
74HC594T16	TSSOP-16

Package Outline Dimensions (All dimensions in mm.)

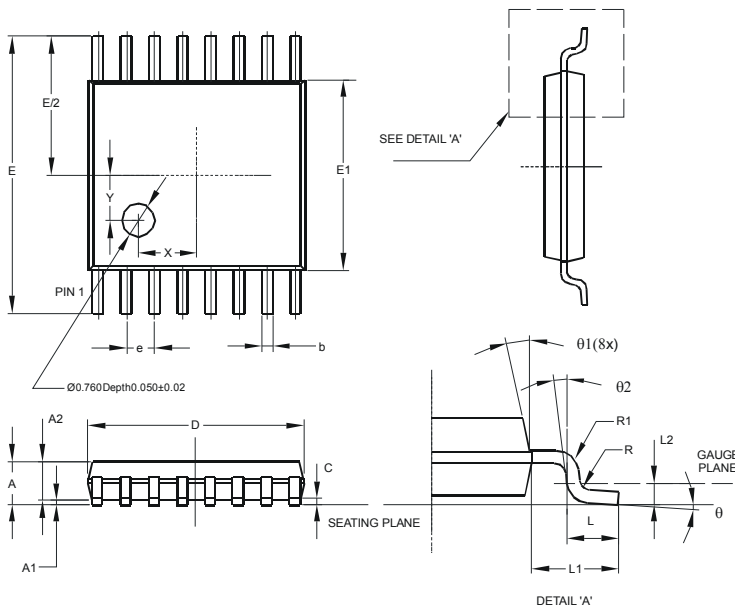
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

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

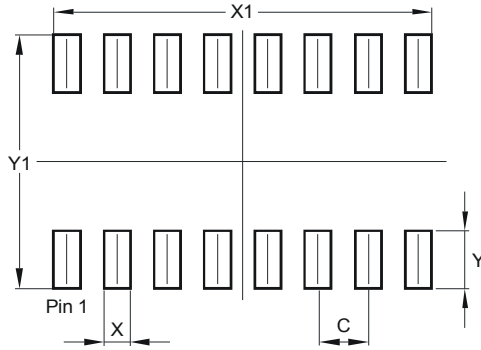


TSSOP-16			
Dim	Min	Max	Typ
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
θ1	5°	15°	-
θ2	0°	-	-
All Dimensions in mm			

Suggested Pad Layout

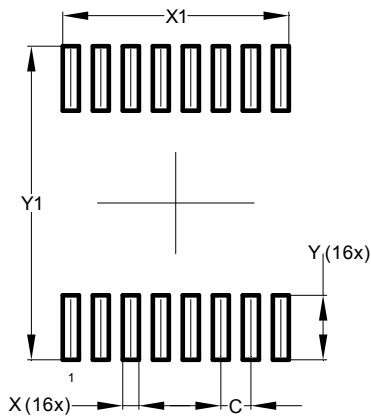
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

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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