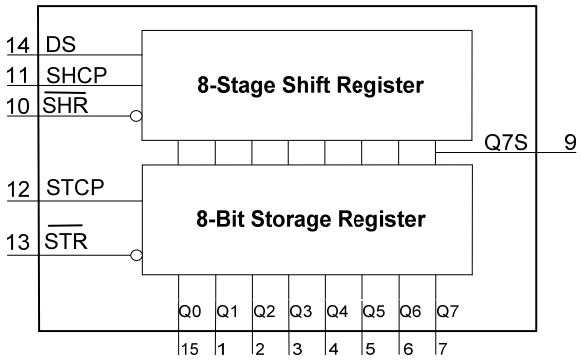
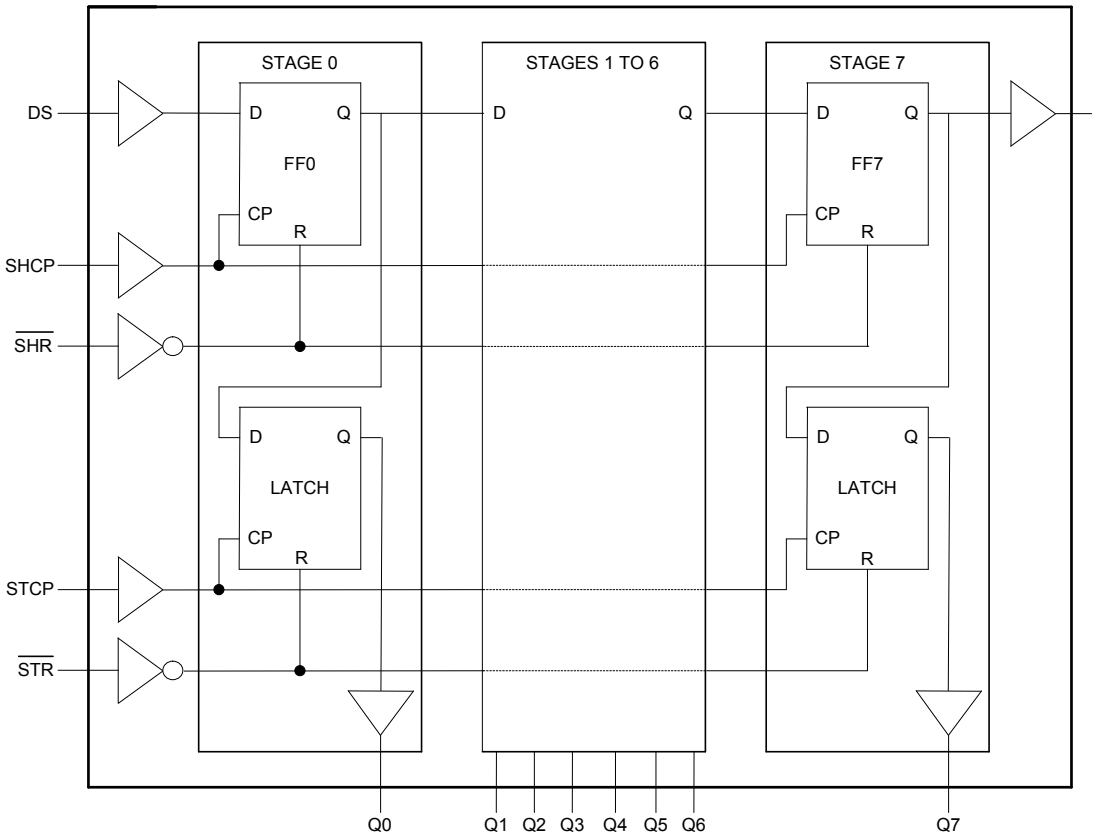
Pin Descriptions

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	$\overline{SHR}$	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



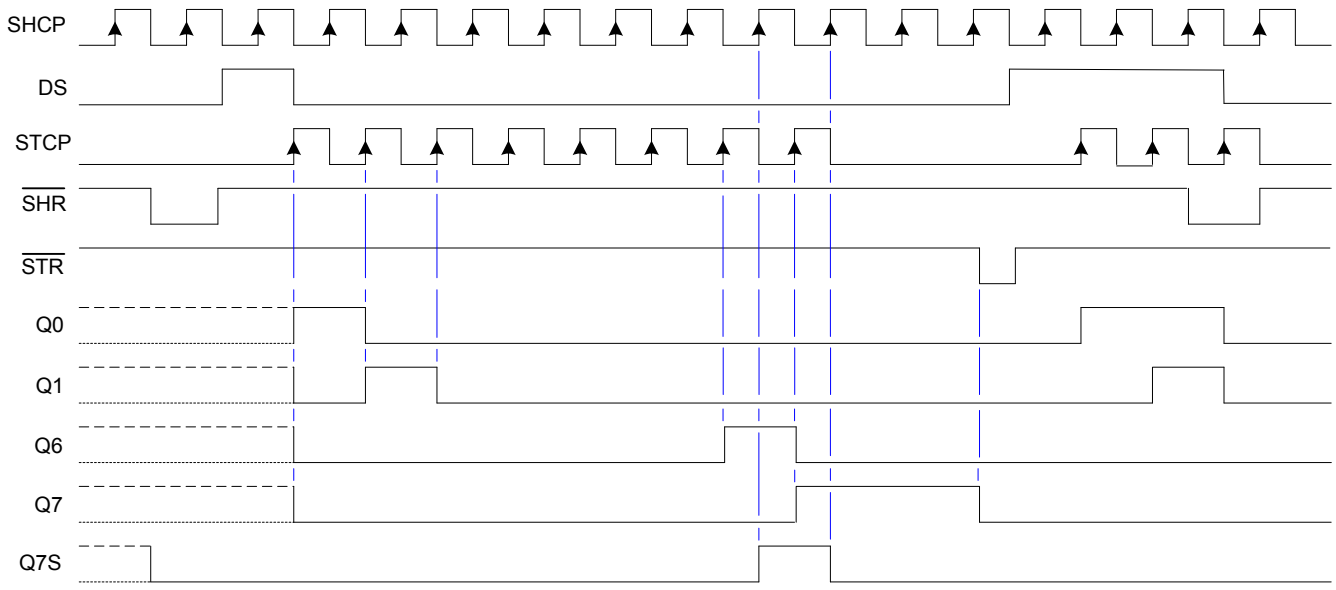
Logic Diagram



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	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 VI > 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	mA
		Qn bus driver outputs	+/- 35	mA
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

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	–	4.5	5.5	V
V_I	Input Voltage	–	0	5.5	V
V_O	Output Voltage	Active Mode	0	V_{CC}	V
$\Delta t/\Delta V$	Input transition rise or fall rate	V_{CC} = 4.5V to 5.5V	–	500	ns/V
T_A	Operating free-air temperature	–	-40	+125	°C

Notes: 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			-40°C to +85°C		-40°C to +125°C		Unit
					Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	High-level Input Voltage	–		4.5 V to 5.5 V	2.0	1.6	–	2.0	–	2.0	–	V
V_{IL}	Low-level input voltage	–		4.5 V to 5.5 V	–	–	0.8	–	0.8	–	0.8	V
V_{OH}	High Level Output Voltage	I_{OH} = -20µA All outputs		4.5 V	4.4	4.5	–	4.4	–	4.4	–	V
	Q7S output	I_{OH} = -4.0mA		4.5 V	3.98	4.32	–	3.85	–	3.7	–	
	Qn Bus Outputs	I_{OH} = -6.0 mA		4.5 V	3.98	4.32	–	3.85	–	3.7	–	–
V_{OL}	Low-level Output Voltage	I_{OL} = 20µA All outputs		4.5 V	–	0	0.1	–	0.1	–	0.1	V
	Q7S output	I_{OL} = 4.0mA		4.5 V	–	0.15	0.26	–	0.33	–	0.4	
	Qn Bus Outputs	I_{OL} = 6.0mA		4.5 V	–	0.16	0.26	–	0.33	–	0.4	–
I_I	Input Current	V_I =GND to 5.5 V		5.5 V	–	–	±0.1	–	± 1	–	± 1	µA
I_{CC}	Supply Current	V_I = GND or V_{CC} I_O=0		5.5 V	–	–	8.0	–	80	–	160	µA
ΔI_{CC}	Additional Supply Current	Test Per Pin V_I = V_{cc} -2.1 V Other	PINS SHCP SHST $\overline{SHR}$ $\overline{STR}$	4.5V to 5.5 V	–	100	240	–	300	–	300	µA
		V_I = Vcc or GND I_O=0	PIN DS	4.5V to 5.5 V	–	75	120	–	150	–	150	
C_i	Input Capacitance	V_i = V_{CC} or GND	5.5 V	–	3.5	10	–	–	10	–	10	pF

Operating Characteristics

Parameter		Test Conditions	V_{CC} = 5V	Unit
			TYP	
C_{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load V_I = GND TO V_{CC} – 1.5V	51	pF

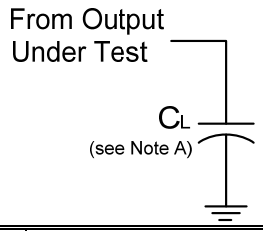
Switching Characteristics

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 C_L=15pF	5.0 V	30	92	–	24	–	20	–	MHz
t_W Pulse Width	SHCP HIGH or LOW	Figure 2 C_L=50pF	4.5 V	16	4	–	20	–	24	–	ns
	STCP HIGH or LOW	Figure 2 C_L=50pF	4.5 V	16	4	–	20	–	24	–	
	$\overline{SHR}$ and $\overline{STR}$ HIGH or LOW	Figure 2 C_L=50pF	4.5 V	16	6	–	20	–	24	–	
t_{SU} Set-up Time	DS to SHCP	Figure 2 C_L=50pF	4.5 V	20	4	–	25	–	30	–	ns
	$\overline{SHR}$ to STCP	Figure 2 C_L=50pF 2	4.5 V	20	6	–	25	–	30	–	
	SHCP to STCP	Figure 2 C_L=50pF	4.5 V	20	7	–	25	–	30	–	
t_{PD} Propagation Delay	SHCP to Q7S	Figure 2 C_L=50p	4.5 V	–	18	32	–	40	–	48	ns
		Figure 2 C_L=15pF	5.0 V	–	15	–	–	–	–	–	
	STCP to Qn	Figure 2 C_L=50p	4.5 V	–	18	32	–	40	–	48	
		Figure 2 C_L=15p	5.0 V	–	15	–	–	–	–	–	
t_H Hold Time	DS to SHCP	Figure 2	4.5 V	5	-3	–	6	–	7	–	ns
t_{REC} Recovery Time	$\overline{SHR}$ to SHCP and $\overline{STR}$ to STCP	Figure 2	4.5 V	10	-5	–	13	–	15	–	ns

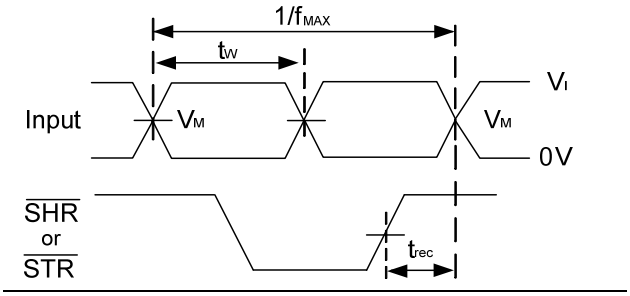
Switching Characteristics (cont.)

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	
t_{PHL} Propagation Delay	$\overline{SHR}$ to Q7S	Figure 2 C_L=50pF	4.5 V	–	17	30	–	38	–	45	ns
		Figure 2 C_L=15pF	5.0 V	–	14	–	–	–	–	–	
	$\overline{STR}$ to Qn	Figure 2 C_L=50pF	4.5 V	–	17	30	–	38	–	45	ns
		Figure 2 C_L=15pF	5.0 V	–	14	–	–	–	–	–	
t_{THL} t_{TLH} Transition Times	Serial data output Q7S	Figure 2 C_L=50pF	4.5 V	–	7	15	–	19	–	22	ns
	Parallel Data Outputs Q_N	Figure 2 C_L=50pF	4.5 V	–	5	12	–	15	–	18	ns

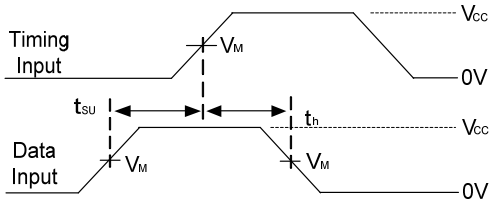
Parameter Measurement Information



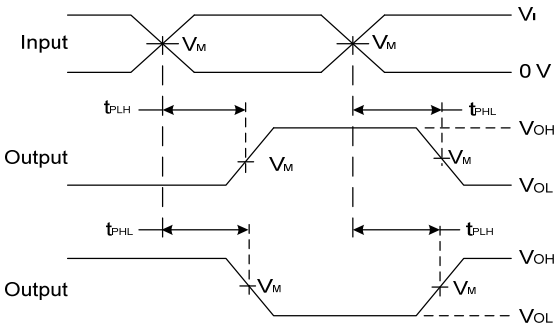
V_{CC}	Inputs		V_M
	V_I	t_r/t_f	
4.5V	V_{CC}	6ns	$V_{CC}/2$
5.0V	V_{CC}	6ns	$V_{CC}/2$



Voltage Waveform
Pulse Duration and Recovery Time



Voltage Waveform
Set-up and Hold Times

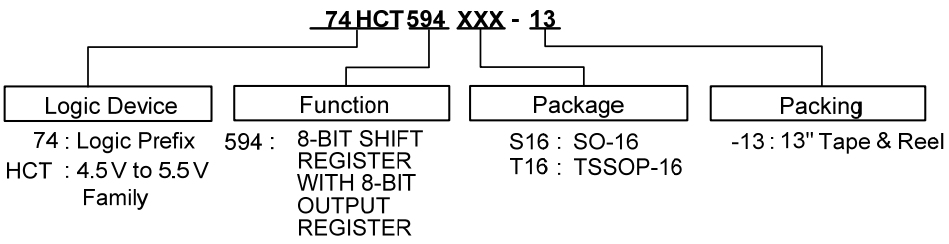


Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs

Notes: A . Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 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

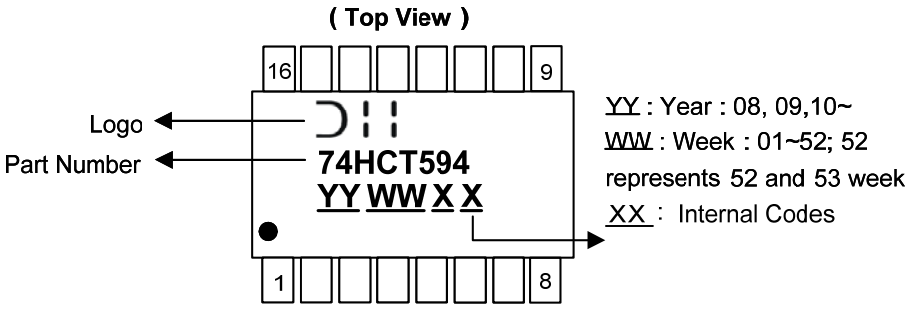


Device	Package Code	Packaging	7" Tape and Reel (Note 6)	
			Quantity	Part Number Suffix
74HCT594S16-13	S16	SO-16	2500/Tape & Reel	-13
74HCT594T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

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

Marking Information

(1) SO-16, TSSOP-16

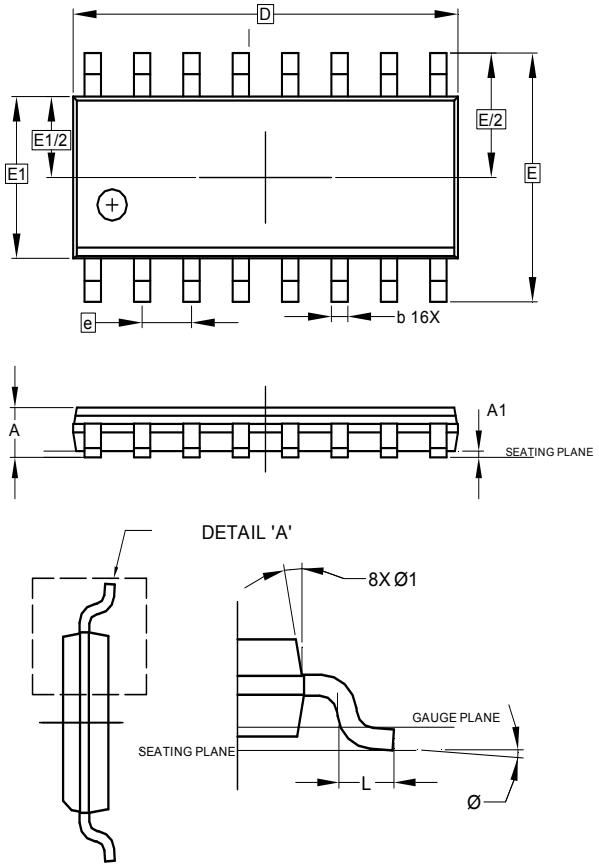


Part Number	Package
74HCT594S16	SO-16
74HCT594T16	TSSOP-16

Package Outline Dimensions (All Dimensions in mm.)

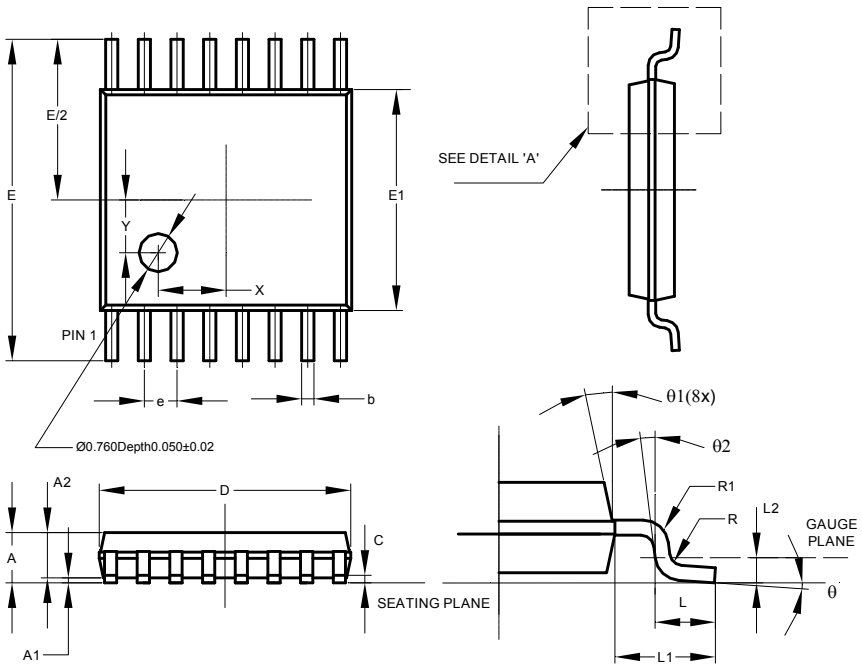
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(1) Package Type: SO-16



SOIC-16			
Dim	Min	Max	Typ
A	–	1.75	–
A1	0.10	0.25	–
b	0.31	0.51	–
c	0.10	0.25	–
D	9.80	10.00	–
E	5.80	6.20	–
E1	3.80	4.00	–
e	–	–	1.27
L	0.40	1.27	–
Ø	0°	8°	–
Ø1	5°	15°	–
All Dimensions in mm			

(2) Package Type: TSSOP-16

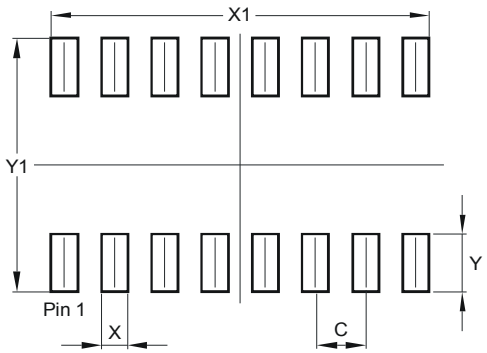


TSSOP-16			
Dim	Min	Max	Typ
A	–	1.08	–
A1	0.05	0.15	–
A2	0.80	0.93	–
b	0.19	0.30	–
c	0.09	0.20	–
D	4.90	5.10	–
E	6.40 BSC		
E1	4.30	4.50	–
e	0.65 BSC		
L	0.45	0.75	–
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	–	–
R1	0.09	–	–
X	–	–	1.350
Y	–	–	1.050
θ	0°	8°	–
θ1	5°	15°	–
θ2	0°	–	–
All Dimensions in mm			

Suggested Pad Layout

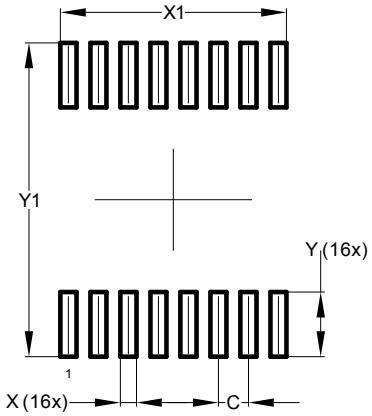
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

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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