

Pin Descriptions

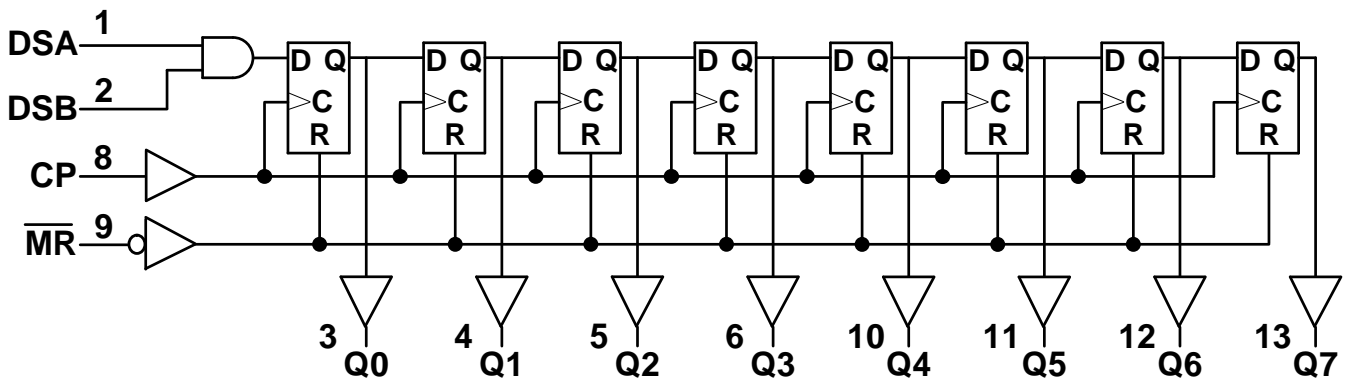
Pin Number	Pin Name	Function
1	DSA	Serial Data Input
2	DSB	Serial Data Input
3	Q0	Data Output
4	Q1	Data Output
5	Q2	Data Output
6	Q3	Data Output
7	GND	Ground
8	CP	Clock Pulse –Positive Edge Triggered
9	$\overline{\text{MR}}$	Master Reset - Asynchronous
10	Q4	Data Output
11	Q5	Data Output
12	Q6	Data Output
13	Q7	Data Output
14	Vcc	Supply Voltage

Function Table (Note 4)

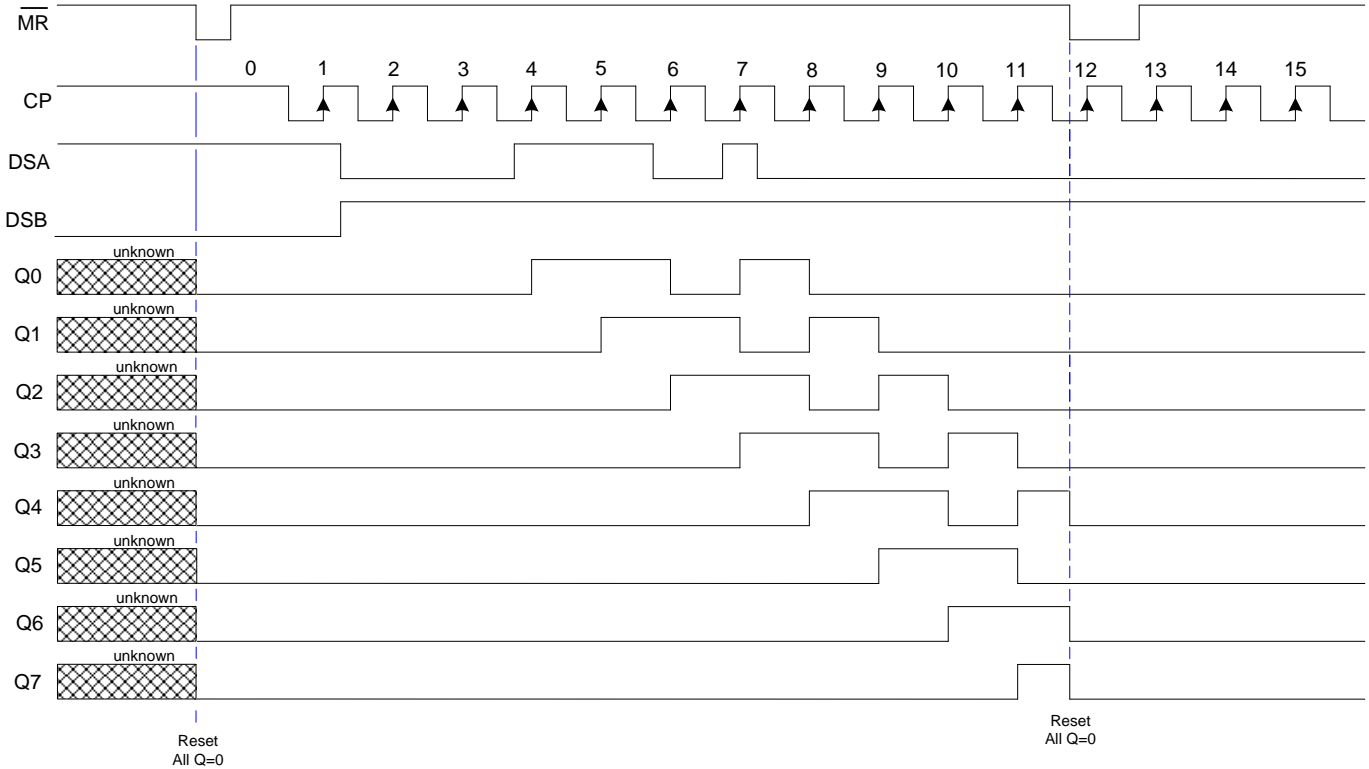
Mode	Input				Output	
	$\overline{\text{MR}}$	CP	DSA	DSB	Q0	Q1-Q7
Reset	L	X	X	X	L	L
Shift	H	↑	L	X	L	$Q_n \leftarrow Q_{n-1}$ (n= 1 to7)
	H	↑	X	L	L	$Q_n \leftarrow Q_{n-1}$ (n= 1 to7)
	H	↑	H	H	H	$Q_n \leftarrow Q_{n-1}$ (n= 1 to7)

Note: 4. Signals asserted on DSA and DSB must be in place longer than Tsu (set-up time) before CP occurs and remain in place Thold (hold time) after CP.

Logic Diagram



Timing Diagram



- Notes:
- 5. All Q values are reset to LOW when \overline{MR} goes low. \overline{MR} is asynchronous and overrides all other signals.
 - 6. Serial data supplied at DSA and DSB is ANDED and transferred to Q0 on positive edge of CP.

Absolute Maximum Ratings (Note 7) ($T_A = +25^\circ\text{C}$, 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 (Note 8)	-0.5 to +7.0	V
I_{IK}	Input Clamp Current $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	± 20	mA
I_{OK}	Output Clamp Current $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	± 20	mA
I_O	Continuous Output Current $-0.5V < V_O < V_{CC} + 0.5V$	+/- 25	mA
I_{CC}	Continuous Current through Vcc	50	mA
I_{GND}	Continuous Current through GND	-50	mA
T_J	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-65 to +150	$^\circ\text{C}$
P_{TOT}	Total Power Dissipation	500	mW

- Notes:
- 7. 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.
 - 8. Input Voltage cannot exceed V_{CC} to the extent the maximum clamp current is exceeded.

Recommended Operating Conditions (Note 9) ($T_A = +25^\circ\text{C}$, 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
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 2.0\text{V}$	—	625	ns/V
		$V_{CC} = 4.5\text{V}$	—	140	
		$V_{CC} = 6.0\text{V}$	—	85	
T_A	Operating Free-Air Temperature	—	-40	+125	$^\circ\text{C}$

Note: 9. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics ($T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		$T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$		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	$I_{OH} = -20\mu\text{A}$	2.0V	1.9	2.0	—	1.9	—	1.9	—	V
		$I_{OH} = -20\mu\text{A}$	4.5V	4.4	4.5	—	4.4	—	4.4	—	
		$I_{OH} = -20\mu\text{A}$	6.0V	5.9	6.0	—	5.9	—	5.9	—	
		$I_{OH} = -4.0\text{mA}$	4.5V	3.98	4.32	—	3.84	—	3.7	—	
		$I_{OH} = -5.2\text{mA}$	6.0V	5.48	5.81	—	5.34	—	5.2	—	
V_{OL}	Low-level Output Voltage	$I_{OL} = 20\mu\text{A}$	2.0V	—	0	0.1	—	0.1	—	0.1	V
		$I_{OL} = 20\mu\text{A}$	4.5V	—	0	0.1	—	0.1	—	0.1	
		$I_{OL} = 20\mu\text{A}$	6.0V	—	0	0.1	—	0.1	—	0.1	
		$I_{OL} = 4\text{mA}$	4.5V	—	0.15	0.26	—	0.33	—	0.4	
		$I_{OL} = 5.2\text{mA}$	6.0V	—	0.15	0.26	—	0.33	—	0.4	
I_I	Input Current	$V_I = \text{GND}$ or V_{CC}	6.0V	—	—	± 0.1	—	± 1	—	± 1	μA
I_{CC}	Supply Current	$V_I = \text{GND}$ or V_{CC} , $I_O = 0\text{A}$	6.0V	—	—	8.0	—	80	—	160	μA

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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	CP	Figure 1	2.0 V	6	23	—	5	—	4	—	MHz
			4.5 V	30	71	—	24	—	20	—	
			5.0 V	—	78	—	—	—	—	—	
			6.0 V	35	85	—	28	—	24	—	
t _w Pulse Width	CP HIGH or LOW	Figure 1	2.0 V	80	14	—	100	—	120	—	ns
			4.5 V	16	5	—	20	—	24	—	
			6.0 V	14	4	—	17	—	20	—	
	MR LOW	Figure 1	2.0 V	60	17	—	75	—	90	—	ns
			4.5 V	12	6	—	15	—	18	—	
			6.0 V	10	5	—	13	—	15	—	
t _{SU} Set-up Time	DSA or DSB to CP	Figure 1	2.0 V	60	8	—	75	—	90	—	ns
			4.5 V	12	3	—	15	—	18	—	
			6.0 V	10	2	—	13	—	15	—	
t _H Hold Time	DSA or DSB to CP	Figure 1	2.0 V	4	-6	—	4	—	4	—	ns
			4.5 V	4	-2	—	4	—	4	—	
			6.0 V	4	-2	—	4	—	4	—	
t _{PD} Propagation Delay	CP to Qn	Figure 1	2.0 V	—	41	170	—	215	—	255	ns
			4.5 V	—	15	34	—	43	—	51	
			5.0 V	—	12	—	—	—	—	—	
			6.0 V	—	12	29	—	37	—	43	
t _{rec} Recovery Time	MR to CP	Figure 1	2.0 V	60	17	—	75	—	90	—	ns
			4.5 V	12	6	—	15	—	18	—	
			6.0 V	10	5	—	13	—	15	—	
t _{PHL} HIGH to LOW Propagation Delay	MR to Qn	Figure 1	2.0 V	—	39	140	—	175	—	210	ns
			4.5 V	—	14	28	—	35	—	42	
			5.0 V	—	11	—	—	—	—	—	
			6.0 V	—	11	24	—	30	—	36	
t _r Transition Time	All signals	Figure 1	2.0 V	—	19	75	—	95	—	110	ns
			4.5 V	—	7	15	—	19	—	22	
			6.0 V	—	6	13	—	16	—	19	

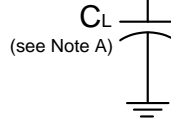
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V _{CC} = 6V	Unit
			Typ	
C _{pd}	Power Dissipation Capacitance per Gate	f = 1 MHz	40	pF
C _I	Input Capacitance	V _I = V _{CC} – or GND	3.5	pF

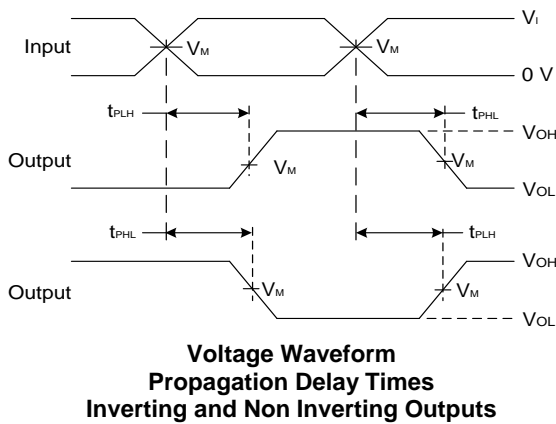
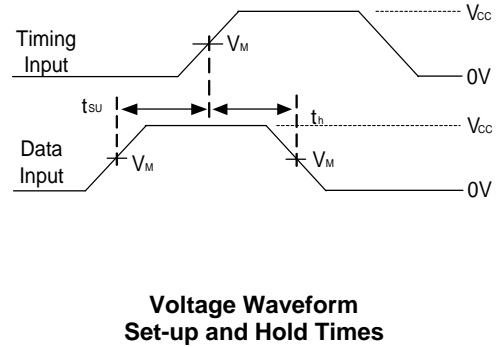
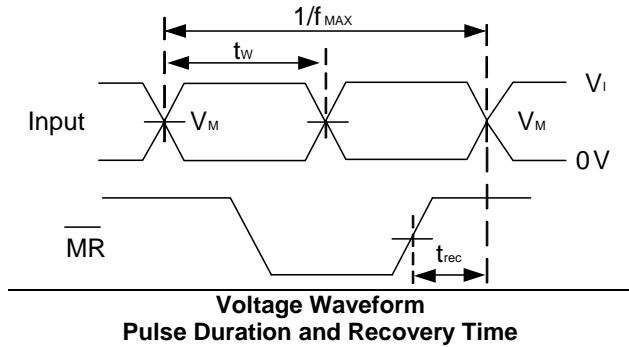
Parameter Measurement Information

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From Output Under Test



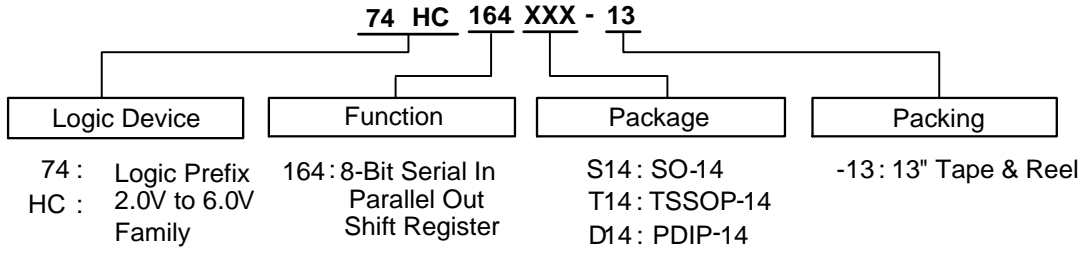
V _{CC}	Inputs		V _M	C _L
	V _I	t _r /t _f		
2.0V	V _{CC}	6ns	V _{CC} /2	50pF
4.5V	V _{CC}	6ns	V _{CC} /2	50pF
5.0V	V _{CC}	6ns	V _{CC} /2	15pF
6.0V	V _{CC}	6ns	V _{CC} /2	50pF



- 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}.
 - E. Transition times t_r, t_{th}, t_{fh} are measured from the 10% to 90% or 90% to 10% of the appropriate waveform.

Figure 1 Load Circuit and Voltage Waveforms

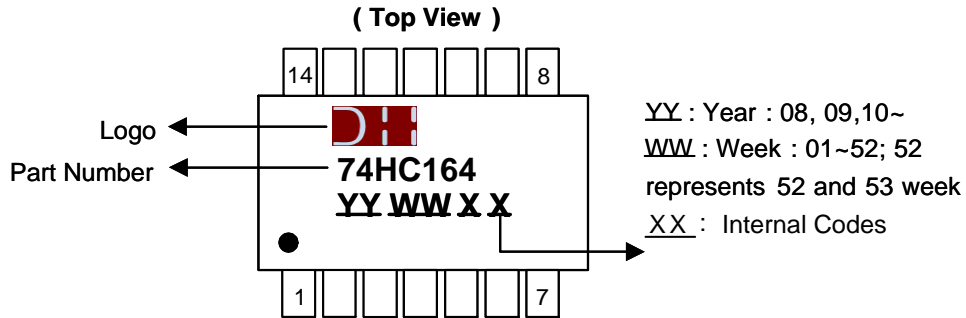
Ordering Information



Device	Package Code	Packaging	Packing	
			Quantity	Part Number Suffix
74HC164S14-13	S14	SO-14	2,500/Tape & Reel	-13
74HC164T14-13	T14	TSSOP-14	2,500/Tape & Reel	-13
74HC164D14	D14	PDIP-14	TUBE	No Suffix

Marking Information

(1) SO-14, TSSOP-14, PDIP-14

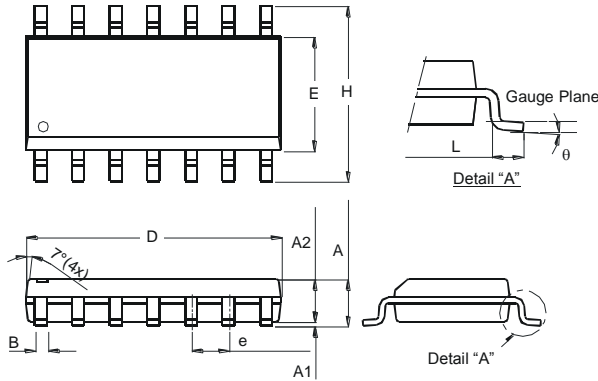


Part Number	Package
74HC164S14-13	SO-14
74HC164T14-13	TSSOP-14
74HC164D14	PDIP-14

Package Outline Dimensions (All dimensions in mm.)

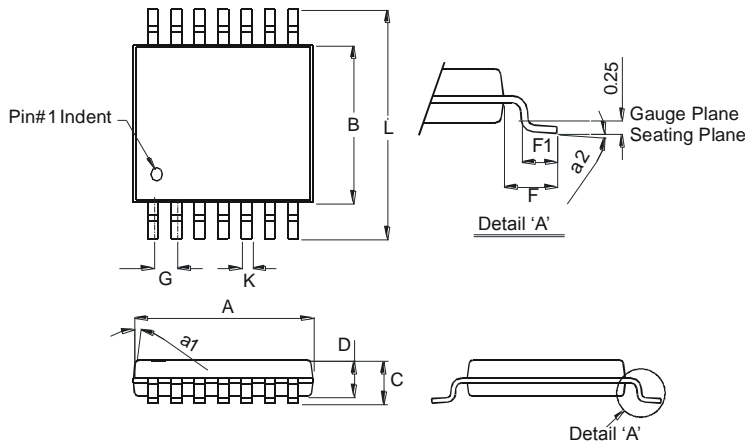
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

Package Type: SO-14



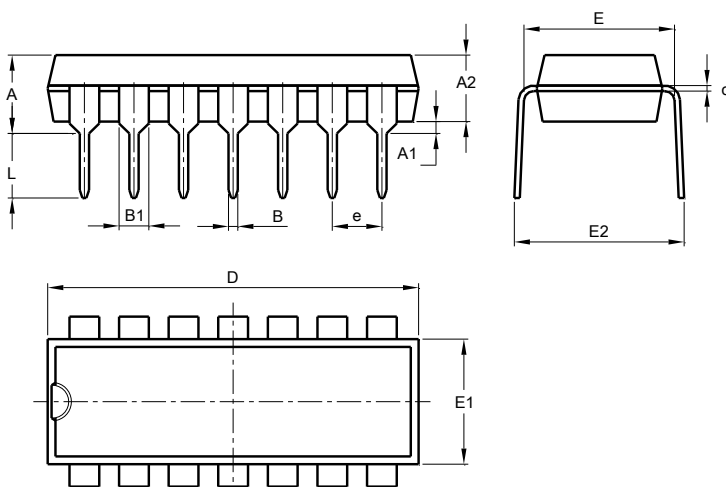
SO-14		
Dim	Min	Max
A	1.47	1.73
A1	0.10	0.25
A2	1.45 Typ	
B	0.33	0.51
D	8.53	8.74
E	3.80	3.99
e	1.27 Typ	
H	5.80	6.20
L	0.38	1.27
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-14



TSSOP-14		
Dim	Min	Max
a1	7° (4X)	
a2	0°	8°
A	4.9	5.10
B	4.30	4.50
C	—	1.2
D	0.8	1.05
F	1.00 Typ	
F1	0.45	0.75
G	0.65 Typ	
K	0.19	0.30
L	6.40 Typ	
All Dimensions in mm		

Package Type: PDIP-14

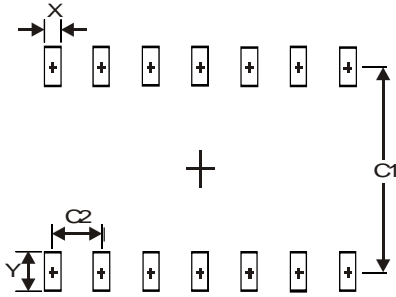


PDIP-14		
Dim	Min	Max
A	3.710	4.310
A1	0.510	-
A2	3.200	3.600
B	0.380	0.570
B1	1.524 (BSC)	
c	0.204	0.360
D	18.800	19.200
E	6.200	6.600
E1	7.320	7.920
E2	8.400	9.000
e	2.540 (BSC)	
L	3.000	3.600
All Dimensions in mm		

Suggested Pad Layout

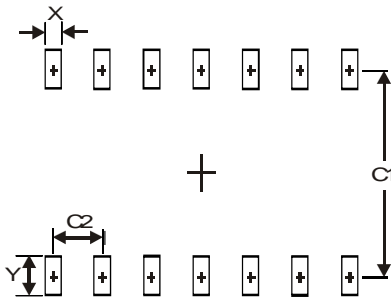
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

Package Type: SO-14



Dimensions	Value (in mm)
X	0.60
Y	1.50
C1	5.4
C2	1.27

Package Type: TSSOP-14



Dimensions	Value (in mm)
X	0.45
Y	1.45
C1	5.9
C2	0.65

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