

8-bit serial input and output shift register

- AND-Gated (Enable/Disable) Serial Inputs
- Fully Buffered Clock and Serial Inputs
- Direct Clear
- Package Options Include Plastic
 - Small-Outline (D) and Ceramic Flat (W)
 - Packages, Ceramic Chip Carriers (FK), and
 - Standard Plastic (N) and Ceramic (J)
 - 300-mil DIPS

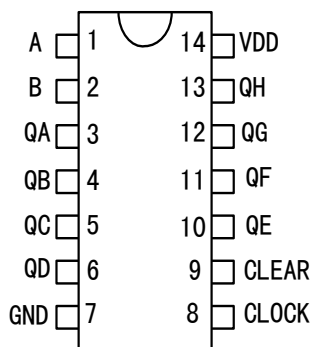
DESCRIPTION

These 8-bit shift registers feature AND-gated serial inputs and an asynchronous clear (CLR) input. The gated serial (A and B) inputs permit complete control over incoming data; a low at either input inhibits entry of the new data and resets the first flip-flop to the low level at the next clock (CLK) pulse. A high-level input enables the other input, which then determines the state of the first flip-flop. Data at the serial inputs can be changed while CLK is high or low, provided the minimum setup time requirements are met. Clocking occurs on the low-to-high-level transition of CLK.

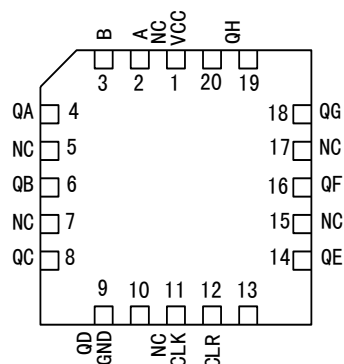
The 54HC164 is characterized for operation over the full military temperature range of -55°C to 125°C . The 74HC164 is characterized for operation from -40°C to 85°C .

54HC164...J OR W PACKAGE

74HC164...D OR N PACKAGE



54HC164...FK PACKAGE (TOP VIEW)



NC=NO internal connection

FUNCTION TABLE

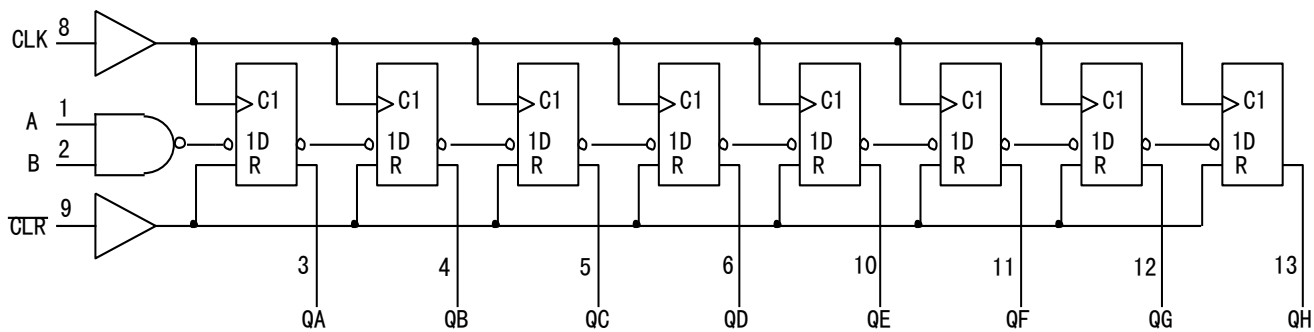
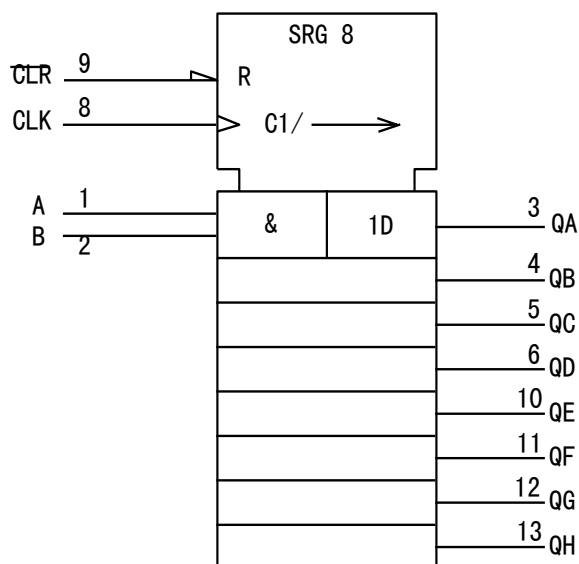
INPUTS				OUTPUTS		
CLR	CLK	A	B	QA	QB...QH	
L	X	X	X	L	L	L
H	L	X	X	QA0	QB0	QH0
H	↑	H	H	H	QAn	QGn
H	↑	L	X	L	QAn	QGn
H	↑	X	L	L	QAn	QGn

QA0, QB0, QH0=the level of QA, QB, or QH, respectively, before the indicated steady-state input conditions were established

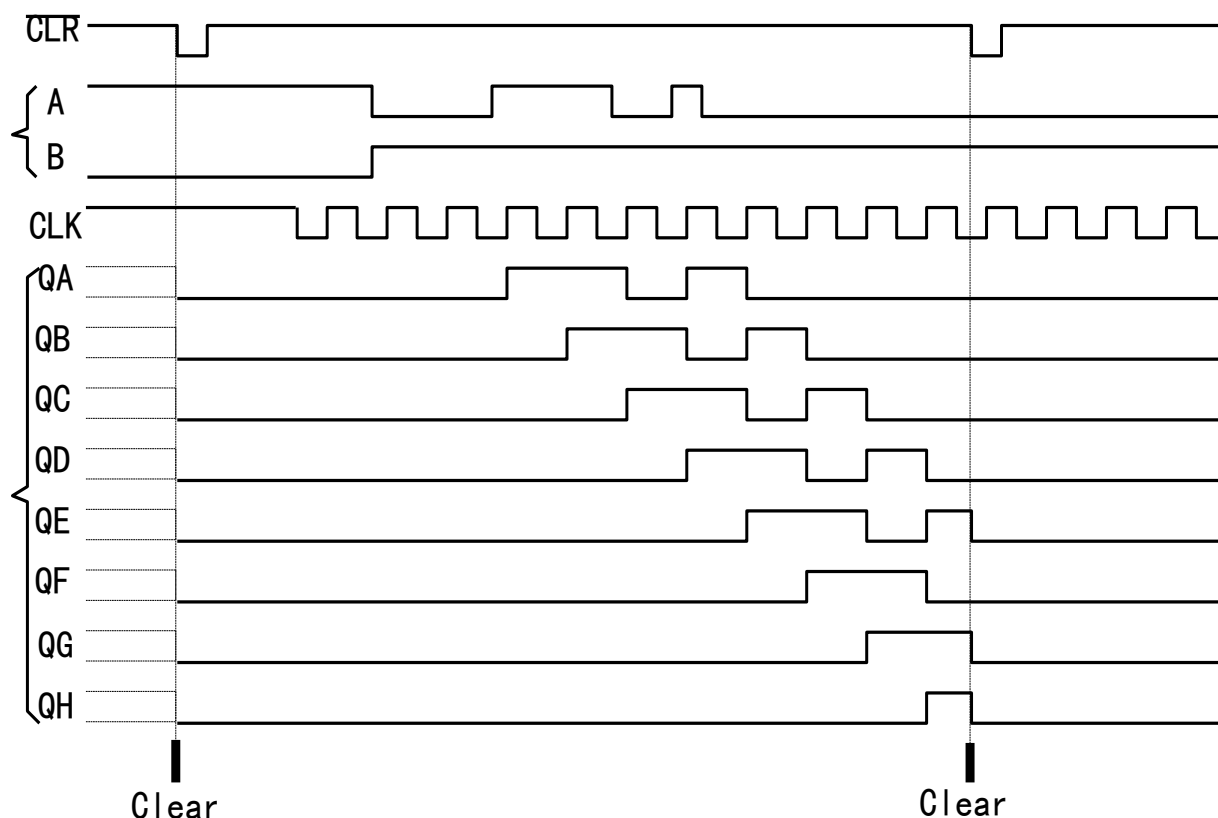
QAn, QGn=the level of QA or QG before

the most recent ↑ transition of

CLK: indicates a 1-bit shift



TYPICAL CLEAR, SHIFT, AND CLEAR SEQUENCE



Absolute maximum ratings over operating free-air temperature rangeT

Supply voltage range, Vcc.....	-0.5V to 7V
Input clamp current, I _{IK} (V _I <0 or V _I >Vcc)(see Note 1).....	± 20mA
Output clamp current, I _{OK} (V _O <) or V _O >Vcc)(see Note 1).....	± 20mA
Continuous output current, I _O (V _O =0 to Vcc).....	± 25mA
Continuous current through Vcc or GND.....	± 50mA
Packaged thermal impedance, θ_{JA} (see Note 2): D packaged.....	127°C/W
N package.....	78°C/W

Storage temperature range, T_{stg}.....-65°C to 150°C

T Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

RECOMMENDED OPERATING CONDITIONS

		54HC164			74HC164			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage		2	5	6	2	5	6	
V _{IH} High-level input voltage	V _{CC} =2V	1.5	-	-	1.5	-		
	V _{CC} =4.5V	3.15	-	-	3.15	-		
	V _{CC} =6V	4.2	-	-	4.2	-		
V _{IL} Low-level input voltage	V _{CC} =2V	0	-	0.5	0	-	0.5	
	V _{CC} =4.5V	0	-	1.35	0	-	1.35	
	V _{CC} =6V	0	-	1.8	0	-	1.8	
V _I Input voltage		0	-	V _{CC}		0	V _{CC}	V
V _O Output voltage		0	-	V _{CC}		0	V _{CC}	V
t _{IT} Input transition (rise and fall) time	V _{CC} =2V	0	-	1000	0	-	1000	ns
	V _{CC} =4.5V	0	-	500	0	-	500	
	V _{CC} =6V	0	-	400	0	-	400	
T _A Operating free-air temperature		-55	-	125	-40	-	85	°C

T If this device is used in the threshold region (from V_{IL} max=0.5V to V_{IH} min=1.5V), there is a potential to go into the wrong state from induced grounding, causing double clocking. Operating with the inputs at tt=1000ns and V_{CC}=2V does not damage the device; however, functionally, the CLK inputs are not ensured while in the shift, count, or toggle operating modes.

Electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		VCC	T _A =25°C			54HC164		74HC164		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I =V _{IH} or V _{IL}	I _{OH} =-20uA	2V	1.9	1.998	-	1.9	-	1.9	-	V
			4.5V	4.4	4.499	-	4.4	-	4.4	-	
			6V	5.9	5.999	-	5.9	-	5.9	-	
		I _{OH} =-4mA	4.5V	3.98	4.3	-	3.7	-	3.84	-	
		I _{OH} =-5.2mA	6V	5.48	5.8	-	5.2	-	5.34	-	
V _{OL}	V _I =V _{IH} or V _{IL}	I _{OL} =20uA	2V	-	0.002	0.1	-	0.1	-	0.1	V
			4.5V	-	0.001	0.1	-	0.1	-	0.1	
			6V	-	0.001	0.1	-	0.1	-	0.1	
		I _{OL} =4mA	4.5V	-	0.17	0.26	-	0.4	-	0.33	
		I _{OL} =5.2mA	6V	-	0.15	0.26	-	0.4	-	0.33	
I _I	V _I =V _{CC} or 0		6V	-	±0.1	±100	-	±1000	-	±1000	nA
I _{CC}	V _I =V _{CC} or 0, I _O =0		6V	-	-	8	-	160	-	80	uA
C _I			2V to 6V	-	3	10	-	10	-	10	pF

Timing requirements over recommended operating free-air temperature range (unless otherwise noted)

		VCC	T _A =25℃		54HC164		74HC164		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock} Clock frequency		2V	0	6	0	4.2	0	5	MHz
		4.5V	0	31	0	21	0	25	
		6V	0	36	0	25	0	28	
t _w Pulse duration	$\overline{\text{CLR}}$ low	2V	100	-	150	-	125	-	ns
		4.5V	20	-	30	-	25	-	
		6V	17	-	25	-	21	-	
	CLK high or low	2V	80	-	120	-	100	-	
		4.5V	16	-	24	-	20	-	
		6V	14	-	20	-	18	-	
t _{su} Setup time before CLK ↑	Data	2V	100	-	150	-	125	-	ns
		4.5V	20	-	30	-	25	-	
		6V	17	-	25	-	21	-	
	CLR inactive	2V	100	-	150	-	125	-	
		4.5V	20	-	30	-	25	-	
		6V	17	-	25	-	21	-	
t _h Hold time, data after CLK ↑		2V	5	-	5	-	5	-	ns
		4.5V	5	-	5	-	5	-	
		6V	5	-	5	-	5	-	

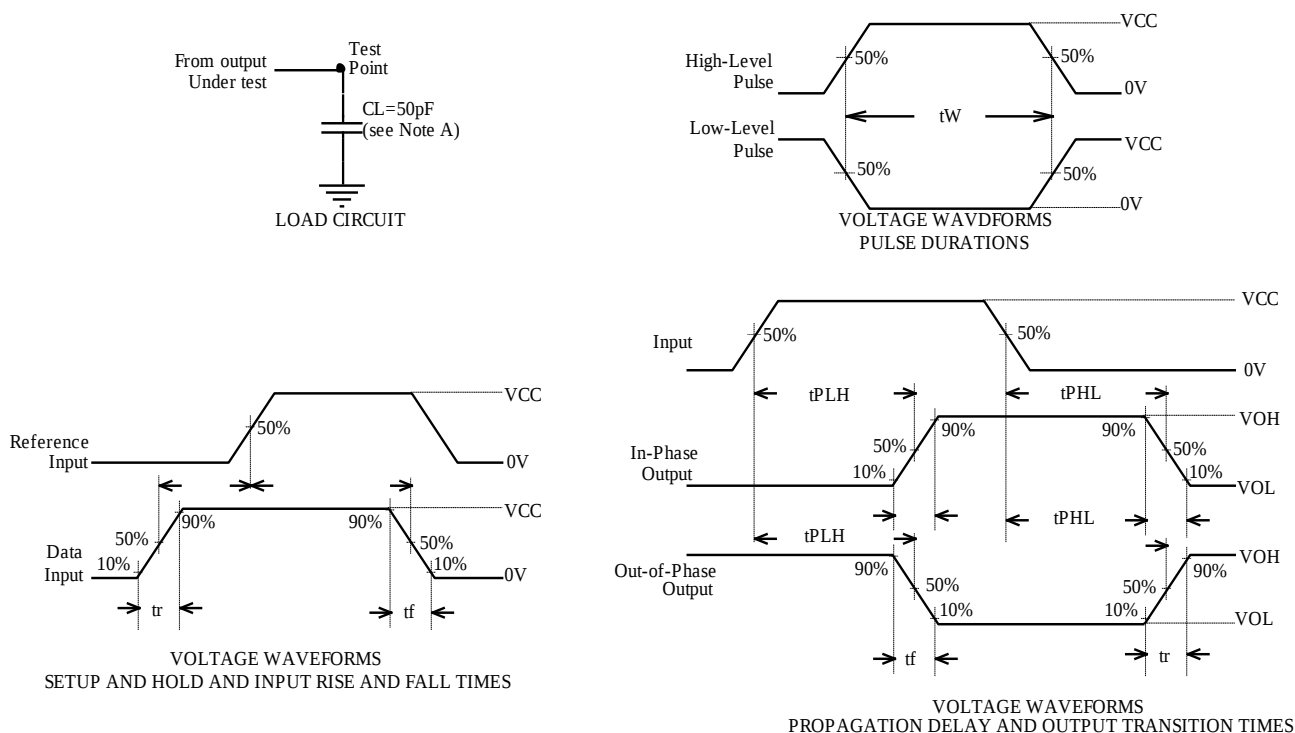
Switching characteristics over recommended operating free-air temperature rang, C_L=50pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	VCC	T _A =25°C			54HC164		74HC164		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			2V	6	10	-	4.2	-	5	-	MHz
			4.5V	31	54	-	21	-	25	-	
			6V	36	62	-	25	-	28	-	
t _{PHL}	CLR	Any Q	2V	-	140	205	-	295	-	255	ns
			4.5V	-	28	41	-	59	-	51	
			6V	-	24	35	-	51	-	46	
t _{pd}	CLK	Any Q	2V	-	115	175	-	265	-	220	
			4.5V	-	23	35	-	53	-	44	
			6V	-	20	30	-	45	-	38	
t _t			2V	-	38	75	-	110	-	95	ns
			4.5V	-	8	15	-	22	-	19	
			6V	-	6	13	-	19	-	16	

Operating characteristics, $T_A=25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
Cpd Power dissipation capacitance	No load	135	pF

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and test-fixture capacitance.

B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{MHz}$, $Z_O = 50\ \Omega$, $t_r = 6\text{ns}$, $t_f = 6\text{ns}$.

C. For clock inputs, f_{max} is measured when the input duty cycle is 50%

D. The outputs are measured one at a time with one input transition per measurement.

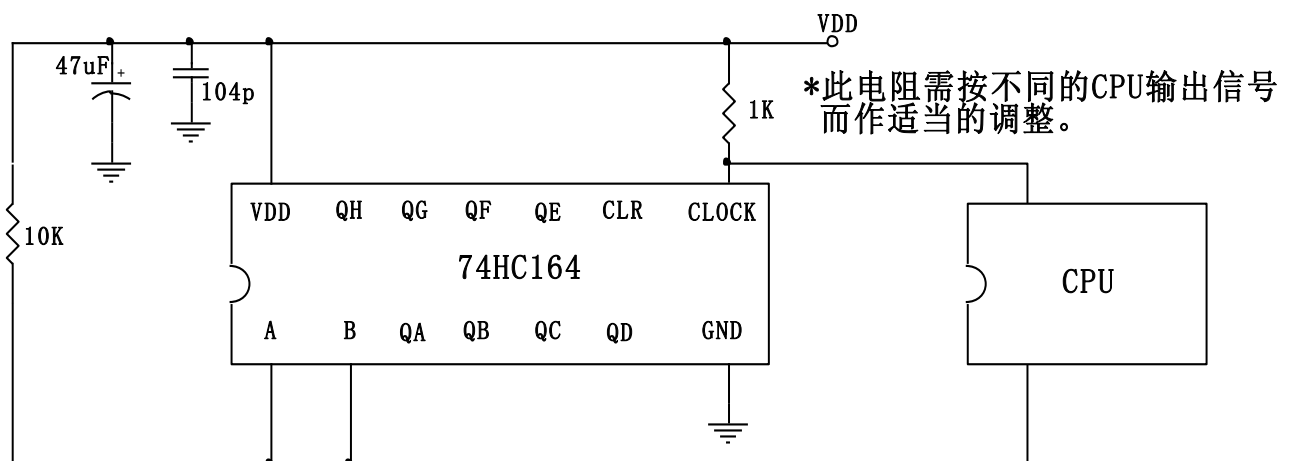
E. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

PAD ASSIGNMENT

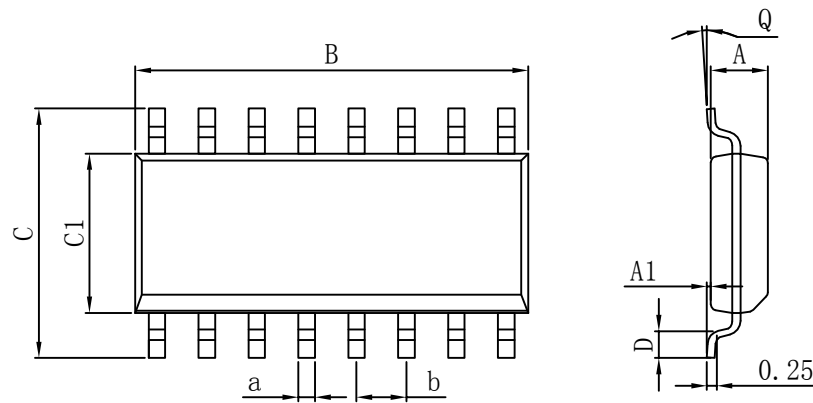
Pad No	Pad Name	X	Y
1	A	-242.00	-53.50
2	B	-250.00	252.00
3	QA	-135.00	-188.50
4	QB	0.00	-188.50
5	QC	115.00	-188.50
6	QD	252.00	-188.50
7	GND	252.00	-73.50
8	CLOCK	241.85	41.50
9	CLEAR	252.00	180.50
10	QE	137.00	190.50
11	QF	2.00	190.50
12	QG	-113.00	190.50
13	QH	-250.00	190.50
14	VDD	-250.00	61.50

附图:



封装外形

SOP14



Dimensions In Millimeters					
Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	4.520	4.620	D	0.400	0.950
A1	0.100	0.250	Q	0°	8°
B	8.500	9.000	a	0.420TYP	
C	5.800	6.250	b	1.270 TYP	
C1	3.800	4.000			