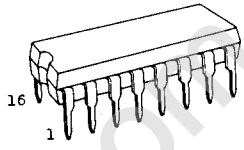
TC40104BP, TC40194BP

TC40104BP 4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTER WITH 3-STATE OUTPUTS

TC40194BP 4-BIT BIDIRECTIONAL UNIVERSAL SHIFT REGISTER WITH ASYNCHRONOUS MASTER RESET

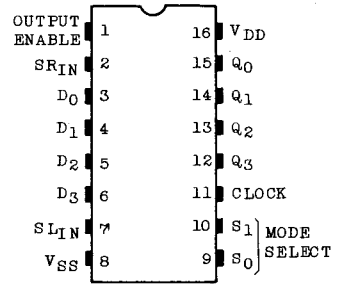
The TC40104BP and TC40194BP are 4-bit shift registers with parallel output, parallel input, shift right and shift left inputs.
To the TC40104BP is attached OUTPUT ENABLE input which can place output terminal into high impedance.
Also, to the TC40194BP is attached $\overline{\text{RESET}}$ input which can clear the contents of registers asynchronously.
In parallel data preset mode, data of $D_0 \sim D_3$ are not only preset in the internal register, but output to each Q output, at the rise of clock, Shift right and shift left inputs are inhibited during the time.
In shift right and shift left modes, data from shift right and shift left inputs are shifted to the right and to the left by 1 bit, respectively, synchronously with the rise of clock.
The TC40194BP is function and pin compatible with the 74194 of TTL.



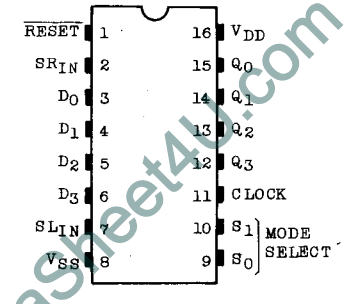
DIP 16(3D16A-P)

PIN ASSIGNMENT (TOP VIEW)

TC40104BP



TC40194BP



TRUTH TABLE

TC40104BP

CLOCK	MODE SELECT S_0	MODE SELECT S_1	OUTPUT ENABLE	OPERATION MODE
↑	L	L	H	RESET
↑	H	L	H	SHIFT RIGHT($Q_0 \rightarrow Q_1 \rightarrow Q_2 \rightarrow Q_3$)
↑	L	H	H	SHIFT LEFT ($Q_3 \rightarrow Q_2 \rightarrow Q_1 \rightarrow Q_0$)
↑	H	H	H	PARALLEL DATA PRESET
*	*	*	L	OUTPUT HIGH IMPEDANCE

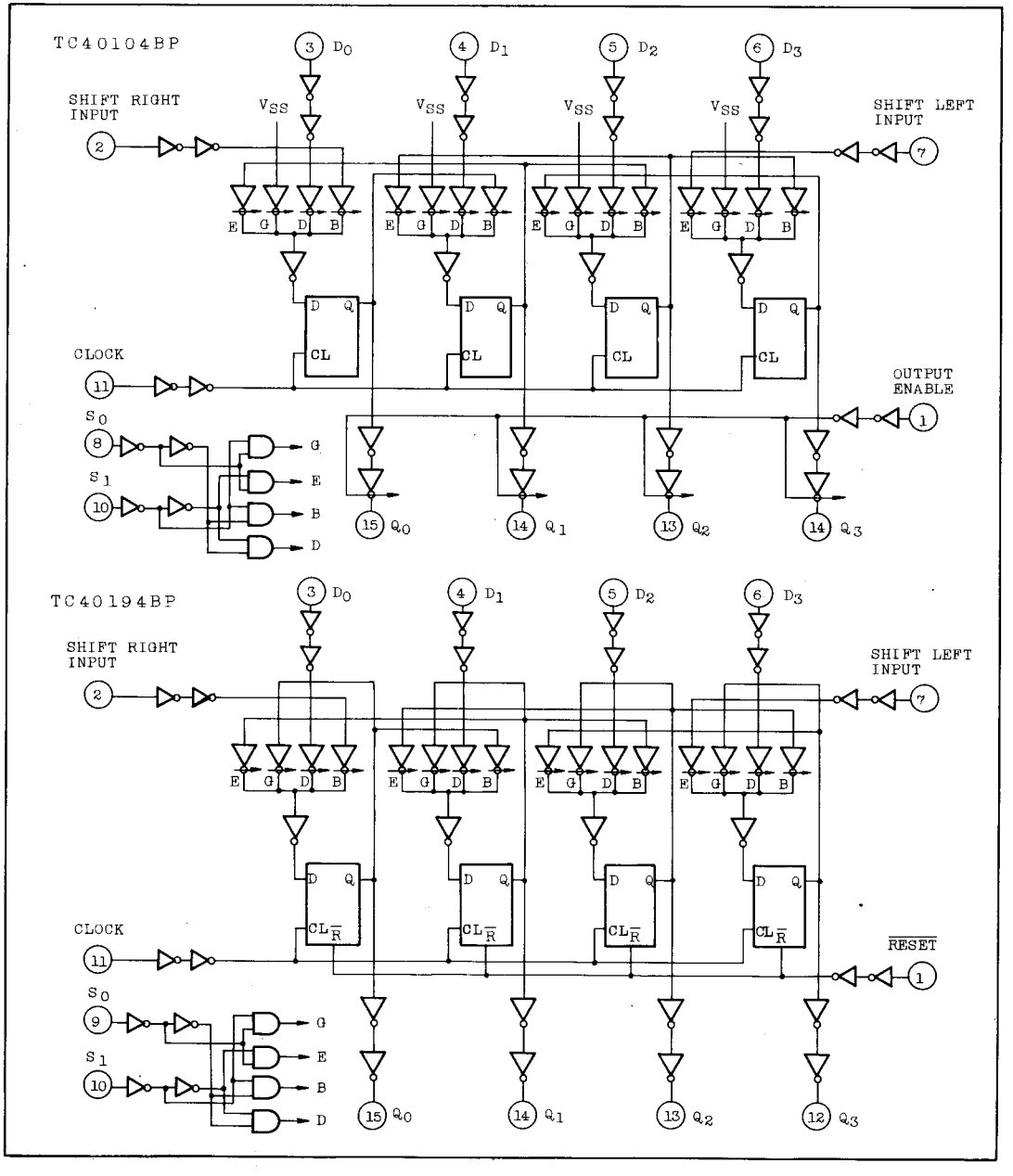
* : Don't care

TC40194BP

CLOCK	MODE SELECT S_0	MODE SELECT S_1	$\overline{\text{RESET}}$	OPERATION MODE
*	L	L	H	HOLD
↑	H	L	H	SHIFT RIGHT($Q_0 \rightarrow Q_1 \rightarrow Q_2 \rightarrow Q_3$)
↑	L	H	H	SHIFT LEFT ($Q_3 \rightarrow Q_2 \rightarrow Q_1 \rightarrow Q_0$)
↑	H	H	H	PARALLEL DATA PRESET
*	*	*	L	RESET

* : Don't care

LOGIC DIAGRAM



MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	V_{SS}-0.5 ~ V_{SS}+20	V
Input Voltage	V_{IN}	V_{SS}-0.5 ~ V_{DD}+0.5	V
Output Voltage	V_{OUT}	V_{SS}-0.5 ~ V_{DD}+0.5	V
DC Input Current	I_{IN}	±10	mA
Power Dissipation	P_D	300	mW
Operating Temperature Range	T_A	-40 ~ 85	°C
Storage Temperature Range	T_{stg}	-65 ~ 150	°C
Lead Temp./Time	T_{sol}	260°C · 10sec	

RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V_{DD}		3	-	18	V
Input Voltage	V_{IN}		0	-	V_{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD} (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Output Voltage	V_{OH}	$\|I_{OUT}\| < 1\mu A$ V_{IN}=V_{SS},V_{DD}	5	4.95	-	4.95	5.00	-	4.95	-	V
			10	9.95	-	9.95	10.00	-	9.95	-	
			15	14.95	-	14.95	15.00	-	14.95	-	
Low-Level Output Voltage	V_{OL}	$\|I_{OUT}\| < 1\mu A$ V_{IN}=V_{SS},V_{DD}	5	-	0.05	-	0.00	0.05	-	0.05	
			10	-	0.05	-	0.00	0.05	-	0.05	
			15	-	0.05	-	0.00	0.05	-	0.05	
Output High Current	I_{OH}	V_{OH}=4.6V	5	-0.61	-	-0.51	-1.0	-	-0.42	-	mA
		V_{OH}=2.5V	5	-2.5	-	-2.1	-4.0	-	-1.7	-	
		V_{OH}=9.5V	10	-1.5	-	-1.3	-2.2	-	-1.1	-	
		V_{OH}=13.5V	15	-4.0	-	-3.4	-9.0	-	-2.8	-	
		V_{IN}=V_{SS},V_{DD}									
Output Low Current	I_{OL}	V_{OL}=0.4V	5	0.61	-	0.51	1.5	-	0.42	-	
		V_{OL}=0.5V	10	1.5	-	1.3	3.8	-	1.1	-	
		V_{OL}=1.5V	15	4.0	-	3.4	15.0	-	2.8	-	
		V_{IN}=V_{SS},V_{DD}									

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V)

CHARACTERISTIC		SYMBOL	TEST CONDITION	V_{DD} (V)	-40°C MIN.	-40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNIT
Input High Voltage		V_{IH}	V_{OUT}=0.5V, 4.5V	5	3.5	-	3.5	2.75	-	3.5	-	V
			V_{OUT}=1.0V, 9.0V	10	7.0	-	7.0	5.5	-	7.0	-	
			V_{OUT}=1.5V,13.5V	15	11.0	-	11.0	8.25	-	11.0	-	
			$\|I_{OUT}\|$<1μA									
Input Low Voltage		V_{IL}	V_{OUT}=0.5V, 4.5V	5	-	1.5	-	2.25	1.5	-	1.5	
			V_{OUT}=1.0V, 9.0V	10	-	3.0	-	4.5	3.0	-	3.0	
			V_{OUT}=1.5V,13.5V	15	-	4.0	-	6.75	4.0	-	4.0	
			$\|I_{OUT}\|$<1μA									
Input Current	"H" Level	I_{IH}	V_{IH}=18V	18	-	0.1	-	10^{-5}	0.1	-	1.0	μA
	"L" Level	I_{IL}	V_{IL}=0V	18	-	-0.1	-	-10^{-5}	-0.1	-	-1.0	
3-State ◎ Output Leakage Current	"H" Level	I_{DH}	V_{DH}=18V	18	-	0.4	-	10^{-4}	0.4	-	12	μA
	"L" Level	I_{DL}	V_{DL}=0V	18	-	-0.4	-	-10^{-4}	-0.4	-	-12	
Quiescent Device Current		I_{DD}	V_{IN}=V_{SS},V_{DD} *	5	-	5	-	0.005	5	-	150	μA
				10	-	10	-	0.010	10	-	300	
				15	-	20	-	0.015	20	-	600	

◎ Only TC40104BP * All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, V_{SS}=0V, C_L=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Output Transition Time (High to Low)	t_{THL}		5	-	80	200	
			10	-	50	100	
			15	-	40	80	
Propagation Delay Time (CLOCK - Q)	t_{pLH} t_{pHL}		5	-	220	440	ns
			10	-	90	200	
			15	-	60	140	
Three State Disable Time (OUTPUT ENABLE - Q) ◎	t_{pZH} t_{pZL}	R_L=1kΩ	5	-	80	160	ns
			10	-	35	70	
			15	-	25	50	

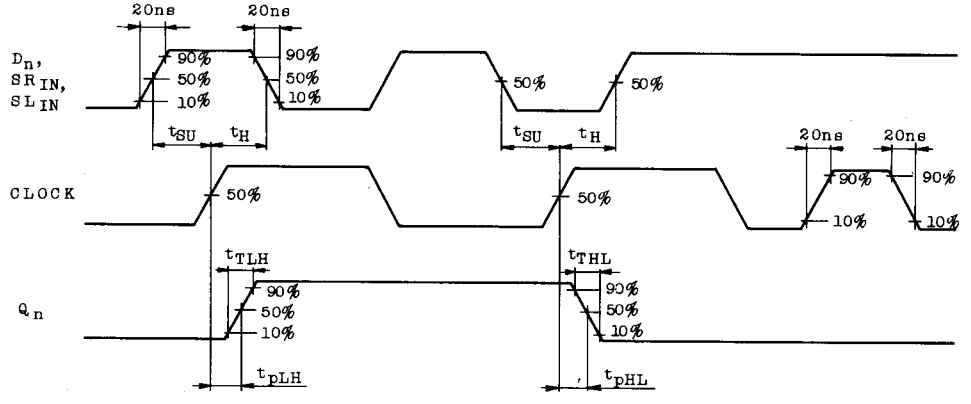
DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, V_{SS}=0V, C_L=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Three State Disable Time (OUTPUT ENABLE - Q) ◎	t_{pLZ} t_{pHZ}	R_L=1kΩ	5	-	55	110	ns
			10	-	30	60	
			15	-	25	50	
Propagation Delay Time ($\overline{RESET}$ - Q) *	t_{pHL}		5	-	160	460	ns
			10	-	65	180	
			15	-	50	130	
Min. Clock Pulse Width	t_w		5	-	70	180	ns
			10	-	40	80	
			15	-	25	50	
Min. Pulse Width ($\overline{RESET}$) *	t_{WL}		5	-	100	200	
			10	-	40	80	
			15	-	25	50	
Max. Clock Frequency	f_{CL}		5	1.5	3	-	MHz
			10	4	8	-	
			15	6	11	-	
Max. Clock Input Rise Time. Max. Clock Input Fall Time.	t_{rCL} t_{fCL}		5	20	-	-	μs
			10	2.5	-	-	
			15	1.0	-	-	
Min. Set-up Time ($D_0 \sim D_3$, SR_{IN}, SL_{IN}-CLOCK)	t_{SU}		5	-	160	320	ns
			10	-	65	170	
			15	-	40	80	
Min. Set-up Time (S_0, S_1 - CLOCK)	t_{SU}		5	-	200	400	
			10	-	80	160	
			15	-	60	120	
Min. Hold Time ($D_0 \sim D_3$, SR_{IN}, SL_{IN} - CLCOK)	t_H		5	-	-145	0	ns
			10	-	-55	0	
			15	-	-35	0	
Min. Hold Time (S_0, S_1 - CLOCK)	t_H		5	-	-185	0	
			10	-	-70	0	
			15	-	-55	0	
Input Capacitance	C_{IN}			-	5	7.5	pF

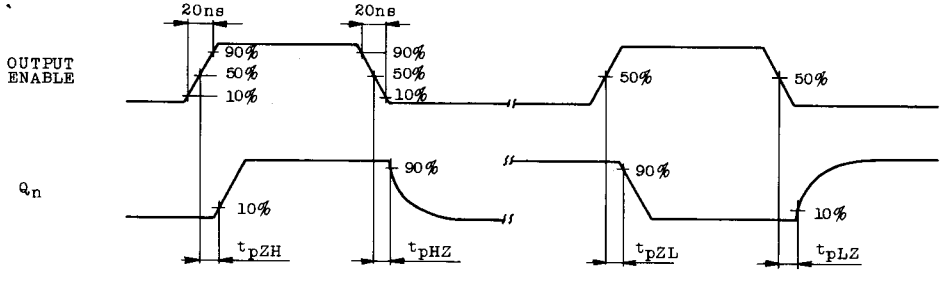
◎ Only TC40104BP * Only TC40194BP

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

WAVEFORM 1



WAVEFORM 2



WAVEFORM 3