

C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

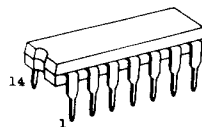
TC40H164P/F

TC40H164 3-BIT SHIFT REGISTER (SERIAL-IN PARALLEL-OUT)

The TC40H164 is a SERIAL-IN/PARALLEL-OUT shift register.

CLOCK input and $\overline{\text{CLEAR}}$ input are common to all D-type flip-flop, so that it can synchronously perform CLEAR operation from the outside at arbitrary time. In this case, when $\overline{\text{CLEAR}}$ input is set to "L" level, all the data inputs Q go to "L" level.

The flip-flop on each stage is triggered at the rising edge of CLOCK input.



DIP14(3D14A-P)

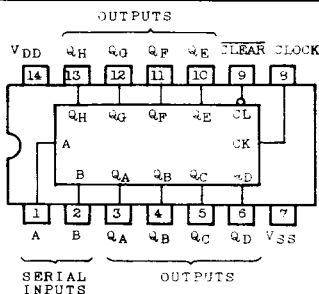


MFP14(F14QB-F)

MAXIMUM RATING

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VDD	VSS-0.5 ~ VSS+10	V
Input Voltage	VIN	VSS-0.5 ~ VDD+0.5	V
Output Voltage	VOUT	VSS-0.5 ~ VDD+0.5	V
Input Current	VIN	±10	mA
Power Dissipation	PD	300(DIP)/180(MFP)	mW
Storage Temperature	Tstg	-65 ~ 150	°C
Lead Temp./Time	Tsol	260°C • 10 sec	

PIN CONNECTION

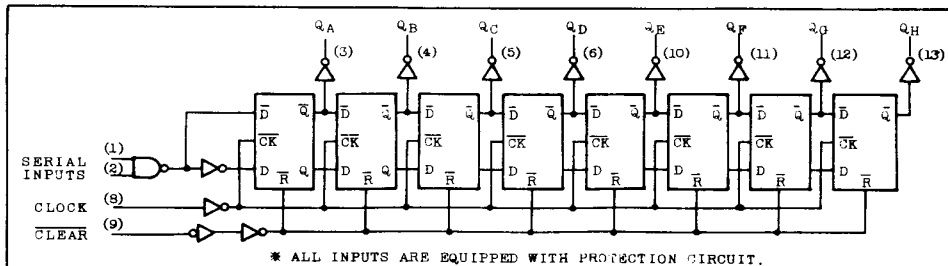


TRUTH TABLE

INPUTS				OUTPUTS							
$\overline{\text{CLEAR}}$	CLOCK	A	B	QA	QB	QC	QD	QE	QF	QG	QH
L	X	X	X	L	L	L	L	L	L	L	L
H	L	X	X	QAQ	QBQ	QCQ	QDQ	QEQ	QFQ	QGQ	QHQ
H	↑	H	H	H	H	H	H	H	H	H	H
H	↑	L	X	L	QAQ	QBQ	QCQ	QDQ	QEQ	QFQ	QHQ
H	↑	X	L	L	QAQ	QBQ	QCQ	QDQ	QEQ	QFQ	QHQ

X=Don't care

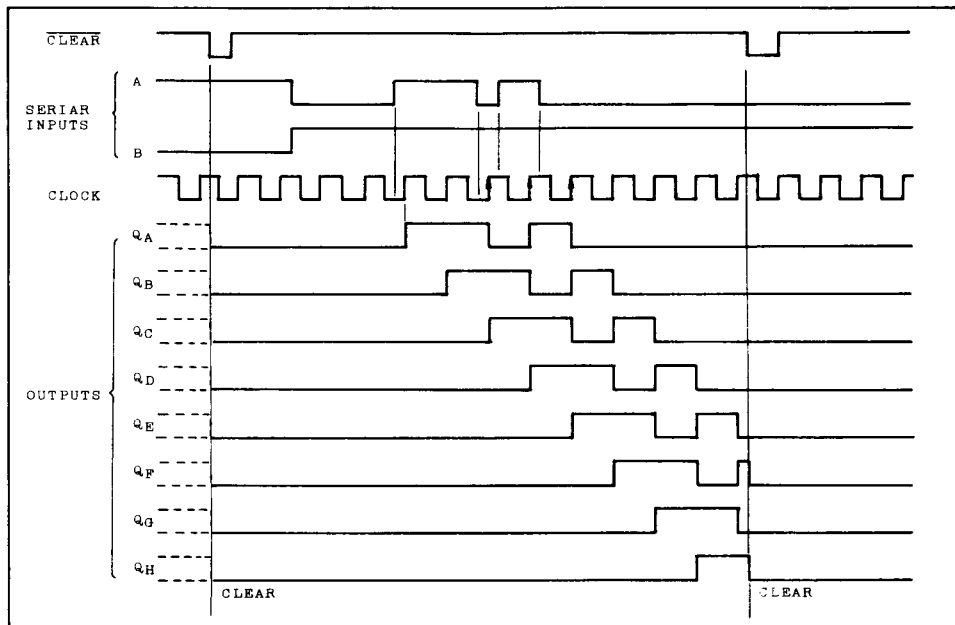
BLOCK DIAGRAM



* ALL INPUTS ARE EQUIPPED WITH PROTECTION CIRCUIT.

TC40H164P/F**RECOMMENDED OPERATING CONDITIONS ($V_{SS}=0.0V$)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	-	2.0	-	8.0	V
Input Voltage	V_{IN}	-	0	-	V_{DD}	V
Operating Temperature	T_{opr}	-	-40	-	85	°C

TIMING CHART**ELECTRICAL CHARACTERISTICS ($V_{SS}=0.0V$)**

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	5.0	-	4.95	-	V
Low Level Output Voltage	V_{OL}	$ I_{OUT} < 1\mu A$ $V_{IN}=V_{SS}, V_{DD}$	5	-	0.05	-	0.0	0.05	-	0.05	

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ELECTRICAL CHARACTERISTICS ($V_{SS}=0.0V$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	VDD (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High Level Output Current	I_{OH}	$V_{OH}=4.6V$ $V_{IN}=V_{SS}, V_{DD}$	5	-0.52	-	-0.44	-	-	-0.36	-	mA
Low Level Output Current	I_{OL}	$V_{OL}=0.4V$ $V_{IN}=V_{SS}, V_{DD}$	5	1.4	-	1.1	-	-	0.8	-	
High Level Input Voltage	V_{IH}	$ I_{OUT} < 1\mu A$ $V_{OUT}=0.5V$ $V_{OUT}=4.5V$	5	4.0	-	4.0	-	-	4.0	-	V
Low Level Input Voltage	V_{IL}		5	-	1.0	-	-	1.0	-	1.0	
Input Current	"H" Level	I_{IH}	8	-	0.3	-	10^{-5}	0.3	-	1.0	μA
	"L" Level	I_{IL}	8	-	-0.3	-	-10^{-5}	-0.3	-	-1.0	
Quiescent Supply Current	I_{DD}	$*V_{IN}=V_{SS}, V_{DD}$	5	-	12.5	-	10^{-3}	12.5	-	75	μA

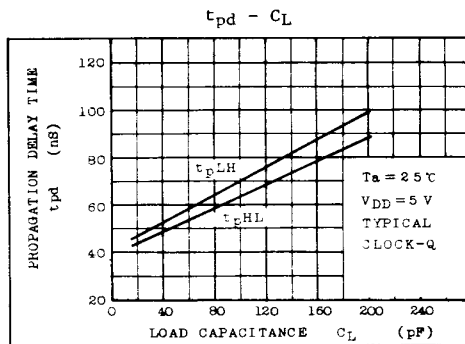
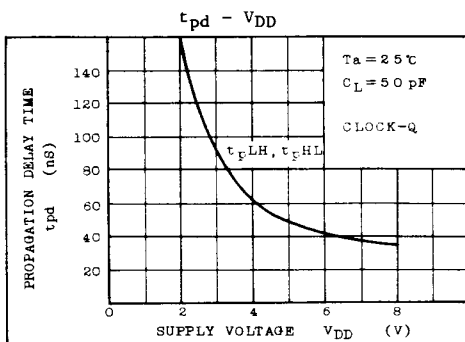
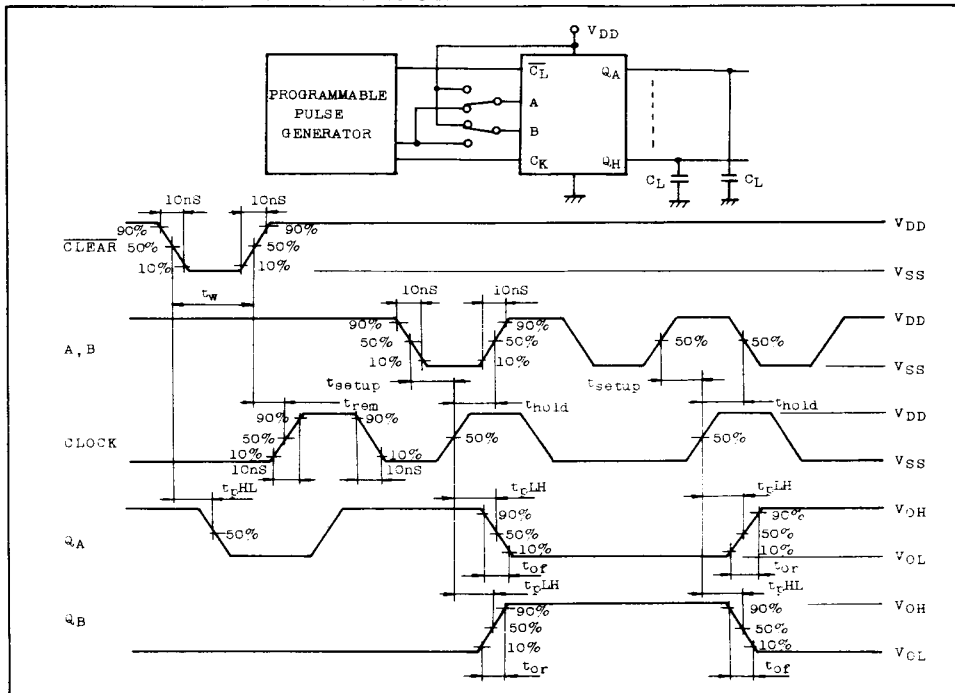
* All valid input combinations.

SWITCHING CHARACTERISTICS ($T_a=25^\circ C$, $V_{DD}=5V$, $C_L=15pF$)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Rise Time		t_{or}	CLOCK - Q	-	20	35	ns
Output Fall Time		t_{of}		-	16	30	
Propagation Delay Time	(Low-High)	t_{PLH}	CLOCK - Q	-	45	68	ns
	(High-Low)	t_{PHL}		-	43	65	
Propagation Delay Time	(High-Low)	t_{pHL}	CLEAR - Q	-	45	68	ns
Min. Data Setup Time		t_{set-up}		-	-	25	ns
Min. Clear Removal Time		t_{rem}		-	12	22	ns
Max. Clock Rise Time		t_{rd}			1.0	5.0	μs
Max. Clock Fall Time		t_{fd}					
Max. Clock Frequency		$f_{max\phi}$			10	24	MHz
Min. Width of Pulse		t_w	CLEAR	-	20	35	ns
Input Capacitance		C_{IN}		-	5	-	pF
Min. Dat Hold Time		t_{hold}		-	-	5	ns

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SWITCHING TIME TEST CIRCUIT AND WAVEFORM



TC40H164P/F

