

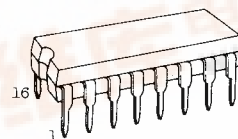
TC5036AP TC5048AP 17-STAGE HIGH SPEED FREQUENCY DIVIDER

TC5036AP and TC5048AP are 17-stage ripple carry binary counters equipped with inverters for crystal oscillators.

If ϕ input is opened (ϕ ="L"), the inverted output of 9th stage appears on FC terminal. If ϕ input is set to "H", 9 stages from 9th stage through 17th stage can be also independently used having FC terminal as the clock input.

Outputs can be derived arbitrarily from stages 4, 12, 13, 14, 15, 16 and 17 of TC5036AP and stages 4, 5, 6, 7, 14, 16 and 17 of TC5048AP.

Both devices are improved to have 50% duty Q4 output as same as others by changing the divider stage of TC5036P and TC5048P to static type counter.



DIP16(3D16A-P)

PIN ASSIGNMENT

ABSOLUTE MAXIMUM RATINGS

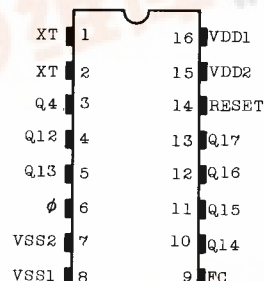
CHARACTERISTIC		SYMBOL	RATING	UNIT
DC Supply Voltage		V _{DD1}	V _{SS1} -0.5 ~ V _{SS1} +10	V
		V _{DD2}	V _{SS1} -0.5 ~ V _{DD1} +0.5	
Input Voltage	XT	V _{IN}	V _{SS1} -0.5 ~ V _{DD2} +0.5	V
	ϕ , FC	V _{IN}	V _{SS1} -0.5 ~ V _{DD1} +0.5	
Output Voltage		V _{OUT}	V _{SS1} -0.5 ~ V _{DD1} +0.5	V
DC Input Current		I _{IN}	±10	mA
Power Dissipation		P _D	300	mW
Storage Temperature Range		T _{stg}	-65 ~ 150	°C
Lead Temp./Time		T _{sol}	260°C • 10 sec	

TRUTH TABLE

INPUTS				FUNCTION (See Timing Chart)
RESET	XT	ϕ	FC	
H		OPEN	H	$f_{Q4} = f_{XT}/2^4$ Q5 ~ Q17="L" LEVEL
L		OPEN	$\overline{Q9}$	$f_{Qn} = f_{XT}/2^n$ n; 5 ~ 17
L		H		$f_{Qn} = f_{XT}/2^n$ n; 5 ~ 7 $f_{Qm} = f_{FC}/2^{(m-8)}$ m; 12 ~ 17

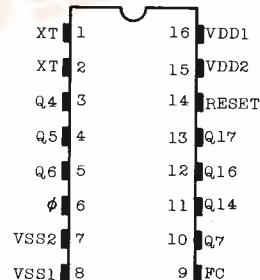
* Don't Care

TC5036AP



(TOP VIEW)

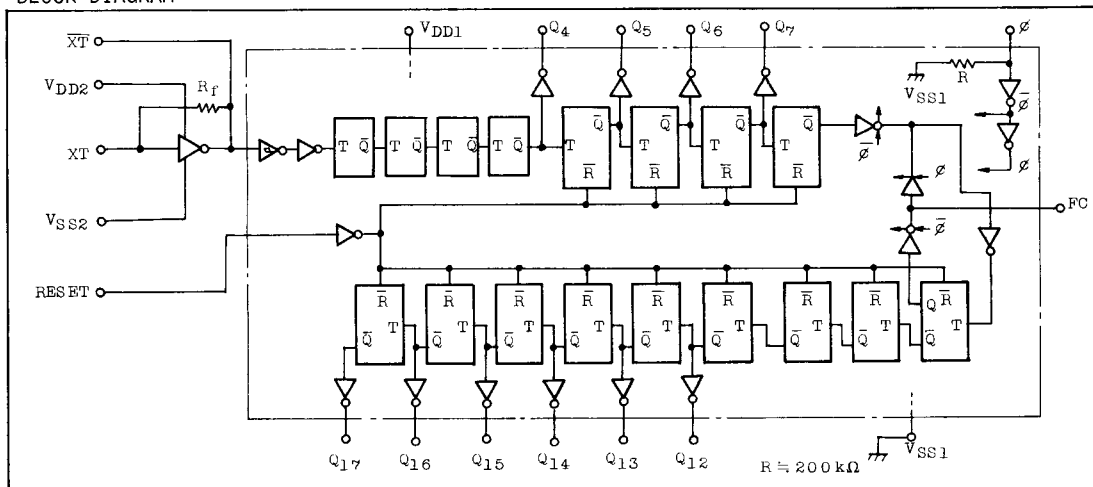
TC5048AP



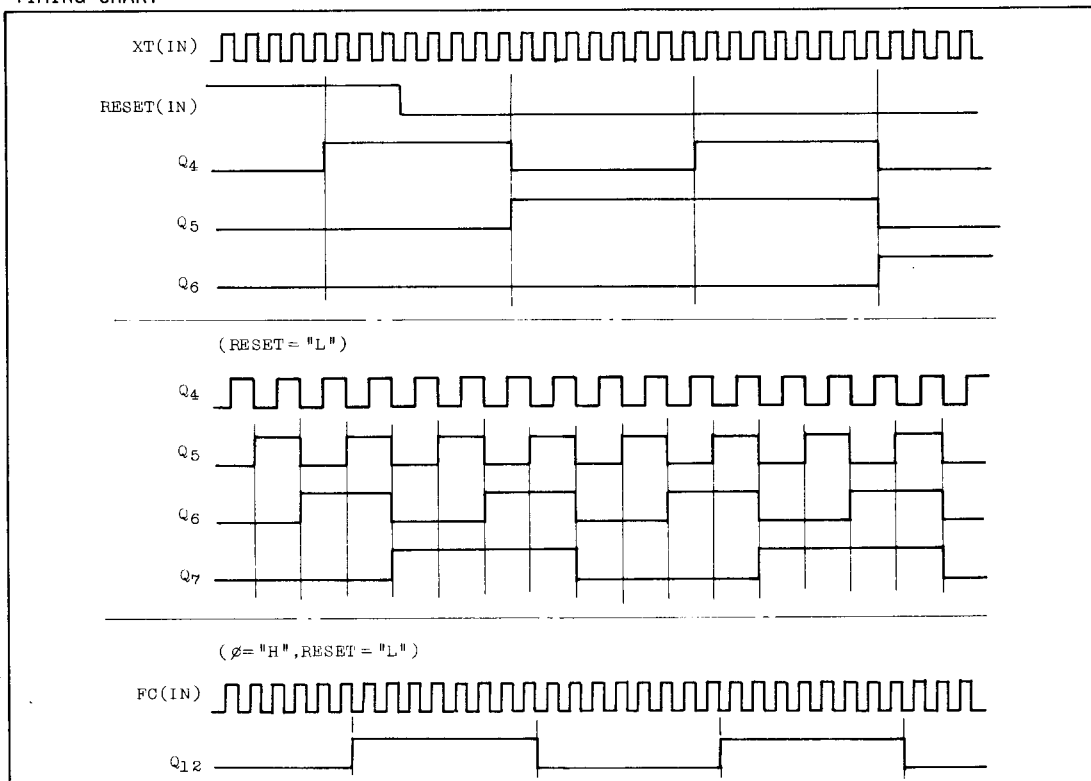
(TOP VIEW)

TC5036AP, TC5048AP

BLOCK DIAGRAM



TIMING CHART



TC5036AP, TC5048AP

RECOMMENDED OPERATING CONDITIONS ($V_{SS1}=V_{SS2}=0V$)

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD1}		3	—	8	V
	V_{DD2}		3	—	V_{DD1}	
Input Voltage	V_{IN}	Except XT	0	—	V_{DD1}	
Operating Temp.	T_{opr}		-40	—	85	°C

ELECTRICAL CHARACTERISTICS ($V_{SS1}=V_{SS2}=0V$, $V_{DD1}=V_{DD2}$)

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$ $V_{IN}=V_{DD}, V_{SS}$	5	4.95	—	4.95	5.00	—	4.95	—	V
Low Level Output Voltage		V_{OL}	$ I_{OUT} < 1\mu A$ $V_{IN}=V_{DD}, V_{SS}$	5	—	0.05	—	0.00	0.05	—	0.05	
High Level Output Current	Q	I_{OH}	$V_{OH}=4.6V$ $V_{IN}=V_{DD}, V_{SS}$	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA
	FC, $\overline{XT}$		$V_{OH}=4.6V$ $V_{IN}=V_{DD}, V_{SS}$	5	0.025	—	-0.02	-0.06	—	-0.015	—	
Low Level Output Current	Q	I_{OL}	$V_{OL}=0.4V$ $V_{IN}=V_{DD}, V_{SS}$	5	0.61	—	0.51	1.5	—	0.42	—	
	FC, $\overline{XT}$		$V_{OL}=0.4V$ $V_{IN}=V_{DD}, V_{SS}$	5	0.10	—	0.08	0.25	—	0.06	—	
High Level Input Voltage		V_{IH}	$V_{OUT}=0.5V, 4.5V$ $ I_{OUT} < 1\mu A$	5	3.5	—	3.5	2.75	—	3.5	—	V
Low Level Input Voltage		V_{IL}	$V_{OUT}=0.5V, 4.5V$ $ I_{OUT} < 1\mu A$	5	—	1.5	—	2.25	1.5	—	1.5	
High Level Input Current (except XT, ϕ)		I_{IH}	$V_{IH}=8V$	8	—	0.2	—	10^{-5}	0.2	—	1.0	μA
Low Level Input Current (except XT, ϕ)		I_{IL}	$V_{IL}=0V$	8	—	-0.2	—	-10^{-5}	-0.2	—	-1.0	
Quiescent Device Current		I_{DD1}	$V_{IN}=V_{DD}, V_{SS} *$	8	—	5	—	0.005	5	—	150	

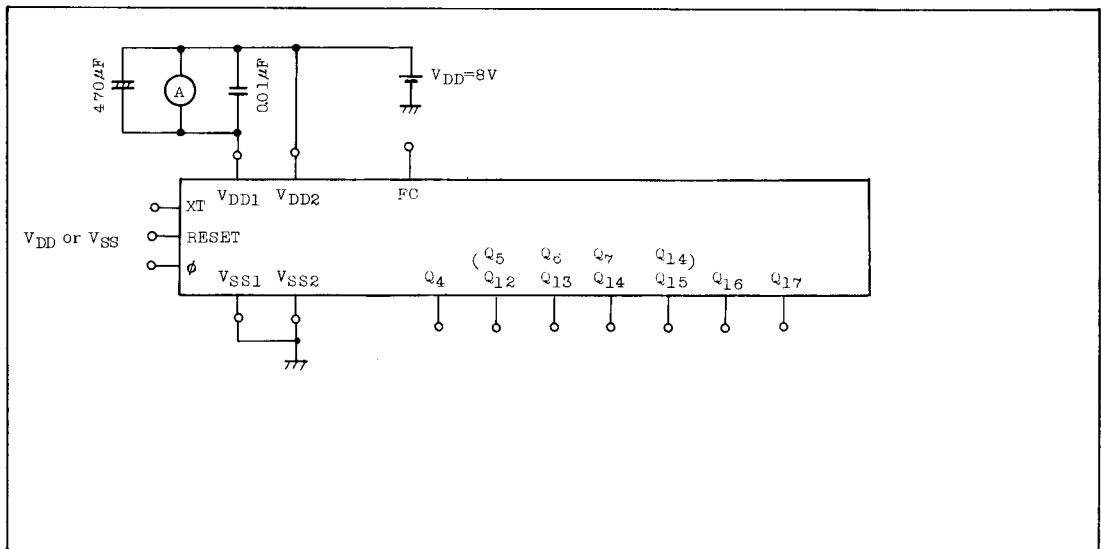
* All valid input combinations.

TC5036AP, TC5048AP

SWITCHING CHARACTERISTICS ($V_{DD1}=V_{DD2}$, $V_{SS1}=V_{SS2}=0V$, $T_a=25^\circ C$, $C_L=50pF$)

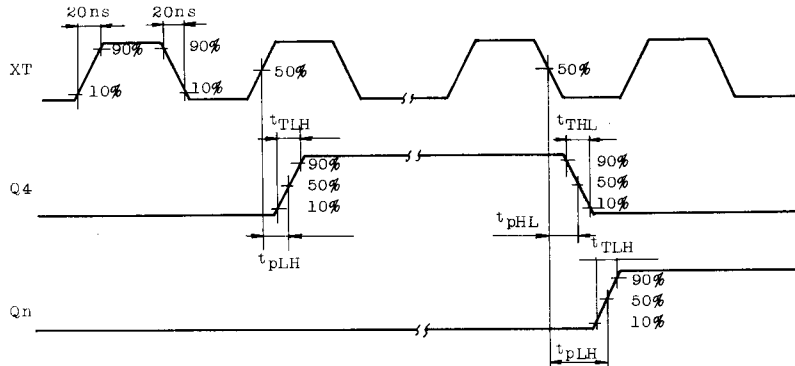
CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Rise Time (Q OUTPUT)	t _{TLH}		5	-	70	200	ns
Output Fall Time (Q OUTPUT)	t _{THL}						
Input Amp Vias Resistance	R _f		8	0.6	1.6	3.0	MΩ
Propagation Delay Time (XT-Q4)	t _{pLH} ,t _{pHL}		5	-	200	400	ns
Propagation Delay Time (XT-Q17)	t _{pLH} ,t _{pHL}		5	-	0.78	1.6	μs
Propagation Delay Time (FC-Q12)	t _{pLH} ,t _{pHL}		5	-	240	480	ns
Propagation Delay Time (FC-Q17)	t _{pLH} ,t _{pHL}		5	-	420	900	ns
Propagation Delay Time (RESET-Q)	t _{pHL} (RESET)		5	-	100	200	ns
Min. Pulse Width	t _w (RESET)		5	-	35	70	ns
Max. Clock Frequency	f _{CL} (XT)		5	10	20	-	MHz
Max. Clock Frequency	f _{CL} (FC)		5	8	16	-	
Max. Clock Rise Time	t _{rCL}	(XT)	5	No Limit			μs
Max. Clock Fall Time	t _{fCL}						
Max. Clock Rise Time	t _{rCL}	(FC)	5	20	-	-	
Max. Clock Fall Time	t _{fCL}						
Input Capacitance	C _{IN}	except FC		-	5	7.5	pF

I_{DD1} TEST CIRCUIT

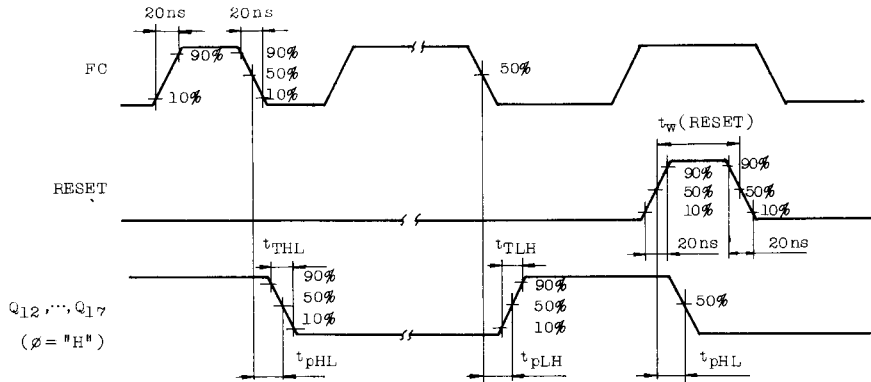


SWITCHING TIME TEST WAVEFORMS

1. $f_{CL}(XT)$, t_{TLH} , t_{THL} , t_{PLH} , t_{PHL}



2. $f_{CL}(FC)$, $t_w(\text{RESET})$, $t_{PHL}(\text{RESET})$



TYPICAL APPLICATION

