

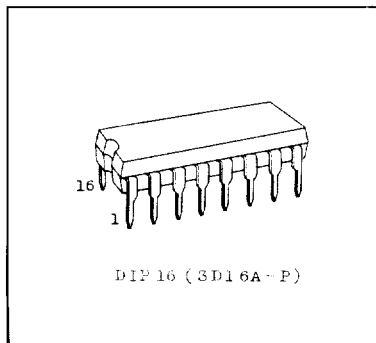
TC5036P, TC5048P 17-STAGE HIGH SPEED FREQUENCY DIVIDER

TC5036P and TC5048P are 17-stage ripple carry binary counters equipped with inverters for crystal oscillators.

As the first stage through the fourth stage are dynamic type counter, the high speed operation can be obtained but the operation starting from DC is not possible, so that these should be used in the range of $f_{MIN} \sim f_{MAX}$.

If ϕ input is opened ($\phi = "L"$), 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 TC5036P and stages 4, 5, 6, 7, 14, 16 and 17 of TC5048P.



ABSOLUTE MAXIMUM RATINGS

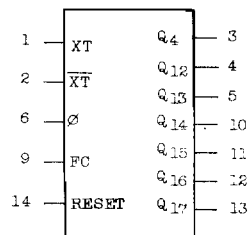
CHARACTERISTIC	SYMBOL	RATING	UNIT	
DC Supply Voltage	VDD1	VSS1-0.5 ~ VSS1+10	V	
	VDD2	VSS1-0.5 ~ VDD1+0.5		
Input Voltage	XT	VIN	VSS1-0.5 ~ VDD1+0.5	V
	ϕ, FC	VIN	VSS1-0.5 ~ VDD1+0.5	
Output Voltage	VOUT	VSS1-0.5 ~ VDD1+0.5	V	
DC Input Current	IIN	± 10	mA	
Power Dissipation	PD	300	mW	
Storage Temperature Range	Tstg	-65 ~ 150	°C	
Lead Temp./Time	Tsol	260°C · 10sec		

TRUTH TABLE

INPUTS				FUNCTION (See Timing Chart)
RESET	XT	ϕ	FC	
H		OPEN H	H *	$f_{Q4} = f_{XT} / 2^4$ $Q_5 \sim Q_{17} = "L" \text{ LEVEL}$
L		OPEN	$\overline{Q_9}$	$f_{Qn} = f_{XT} / 2^n$ $n; 5 \sim 17$
L		H		$f_{Qn} = f_{XT} / 2^n$ $n; 5 \sim 7$ $f_{Qm} = f_{FC} / 2^{(m-8)}$ $m; 12 \sim 17$
* Don't Care				

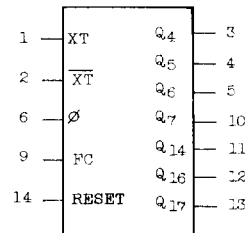
PIN ASSIGNMENT

TC5036P



VDD1 : 16 VSS1 : 8
VDD2 : 15 VSS2 : 7

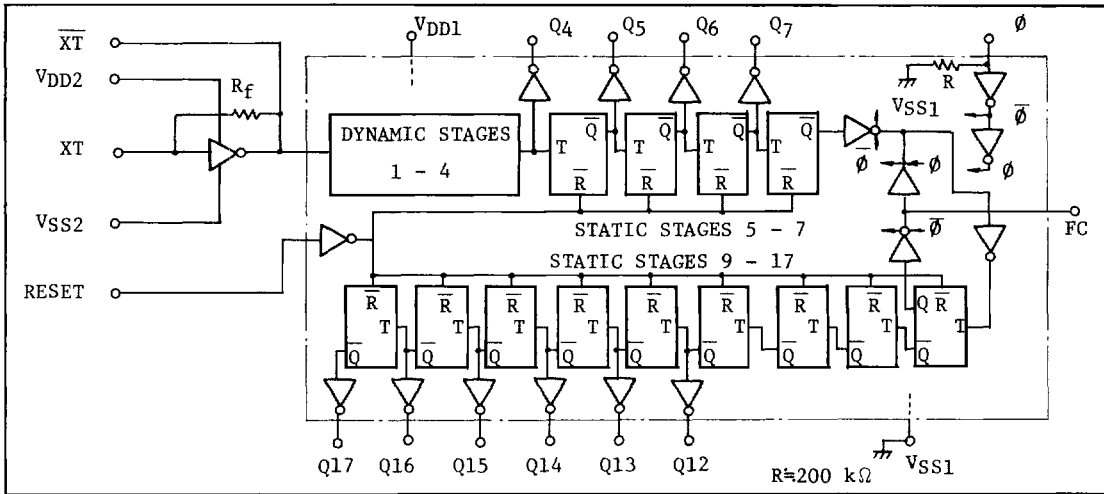
TC5048P



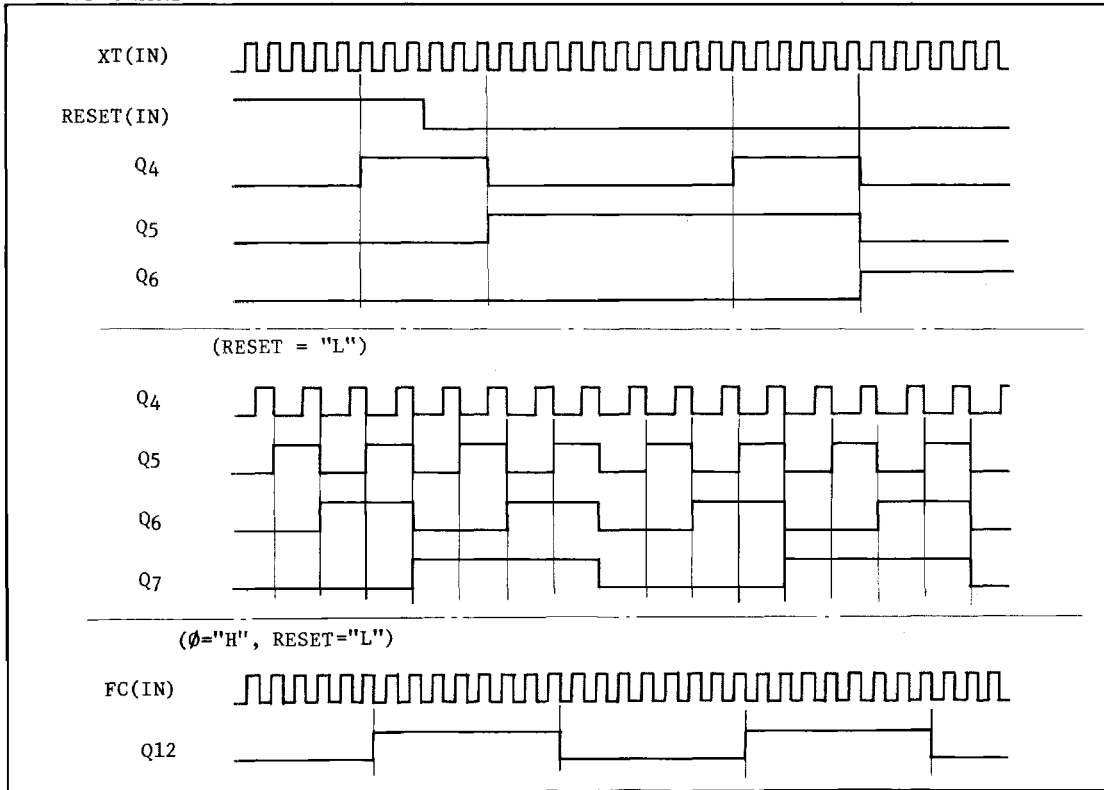
VDD1 : 16 VSS1 : 8
VDD2 : 15 VSS2 : 7

TC5036P, TC5048P

BLOCK DIAGRAM



TIMING CHART



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

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

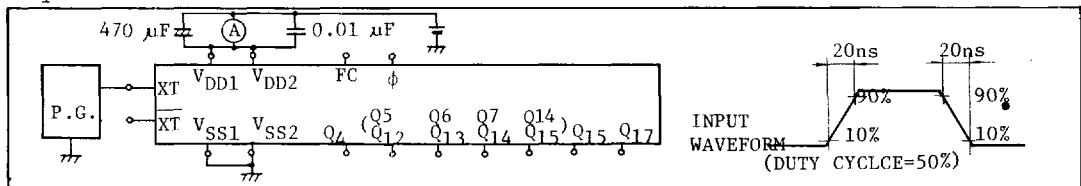
ELECTRICAL CHARACTERISTICS ($V_{SS1}=V_{SS2}=0V$, $V_{DD1}=V_{DD2}$)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	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	V	
High Level Output Current	Q Output FC XT	I_{OH}	5	$V_{OH}=4.6V$ $V_{IN}=V_{SS}, V_{DD}$		-0.2	-	-0.16	-0.8	-	-0.12	-
				$V_{OH}=4.6V$ $V_{IN}=V_{SS}, V_{DD}$		0.025	-	-0.02	-0.06	-	-0.015	-
Low Level Output Current	Q Output FC XT	I_{OL}	5	$V_{OL}=0.4V$ $V_{IN}=V_{DD}, V_{SS}$		0.52	-	0.44	1.5	-	0.36	-
				$V_{OL}=0.4V$ $V_{IN}=V_{DD}, V_{SS}$		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	V	
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	μA	
Operating Current Consumption (TC5048BP)	I_T	$f_{XT}=1MHz$	5	-	-	-	100	500	-	-	μA	

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	-	130	250	ns
Output Fall Time (Q OUTPUT)	t_{THL}		5	-	130	250	ns
Input Amp Vias Resistance	R_f		8	0.6	-	3.0	$M\Omega$
Propagation Delay Time (XT-Q ₄)	t_{pLH}, t_{pHL}		5	-	250	600	ns
Propagation Delay Time (XT-Q ₁₇)	t_{pLH}, t_{pHL}		5	-	-	8.0	μs
Prop. Delay Time (RESET-Q)	t_{pHL} (RESET)		5	-	-	2000	ns
Min. Clear Pulse Width	t_w (RESET)		5	-	-	1000	ns
Max. Clock Frequency	f_{MAX} (XT)		5	8	14	-	MHz
Min. Clock Frequency	f_{MIN} (XT)		8	-	-	20	kHz
Max. Clock Frequency	f_{MAX} (FC)		5	1.0	-	-	MHz
Max. Clock Rise Time	t_{rCL}	(XT, FC)	5	20	-	-	μs
Max. Clock Fall Time	t_{fCL}	(XT, FC)	5	20	-	-	μs
Input Capacitance	C_{IN}	except FC	-	-	5	7.5	pF

I_T TEST CIRCUIT

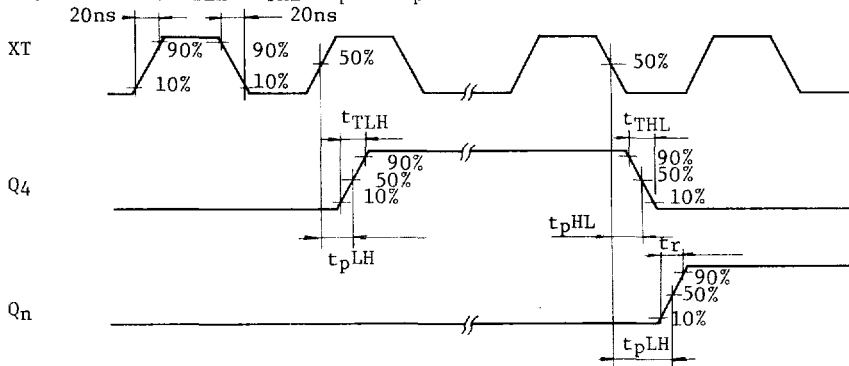


TC5036P, TC5048P

SWITCHING TIME TEST WAVEFORMS

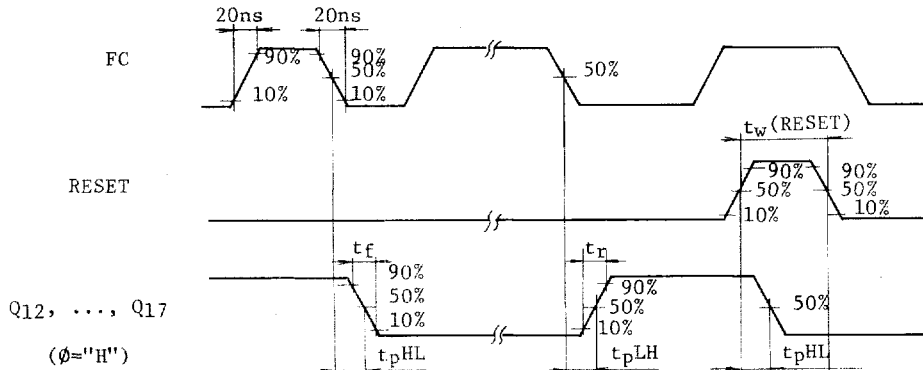
WAVEFORM 1.

1. $f_{MAX}(XT)$, $f_{MIN}(XT)$, t_{TLH} , t_{THL} , t_{pLH} , t_{pHL}



WAVEFORM 2.

2. $f_{MAX}(FC)$, $t_w(\text{RESET})$, $t_{pHL}(\text{RESET})$



TYPICAL APPLICATION

