TCP4621AP

C2-MOS DIGITAL INTEGRATED CIRCUIT

SILICON MONOLITHIC

GENERAL DESCRIPTION

The TCP4621AP is a CMOS 4-bit single chip microcomputer most suitable for applications of driving fluorescent display tubess and of interfacing with high voltage circuits.

Output high breakdown voltage:

V_{DD} - 32V (Absolute max. rating V_{DD} - 35V)

'Output high breakdown voltage port:

14 ports (PO_{60} to PO_{67}, PO_{50} to PO_{54}, P_{10})

The TCP4621AP has adopted the P-channel Open Drain structure of some output ports of the TCP4620AP, resulting in high breakdown voltage. There are some difference between the TCP4620AP and the TCP4621AP in electrical characterisitcs, pin functions, and mask options, but the other functions, electrical characteristics, instructions, and pin connections of the TCP4621AP are compatible with those of the TCP4620AP. For the use and study of this device, use jointly with TCP4620AP Technical Data.

The following items are the points of difference in electrical characteristics.

1. Operating temperature and ambient temperature

   Topr = -20 to +70°C

   Ta = -20 to +70°C

2. Output high breakdown voltage port and output high level current

   IOH1 (PO_{60} to PO_{67}) = -1mA MIN. (V_{DD}=4.5V, V_{OH}=2.5V)

   IOH1 (PO_{50} to PO_{54}, P_{10}) = -7mA MIN. (V_{DD}=4.5V, V_{OH}=2.5V)

3. Mask option

   The contents only which are shown on the TCP4621AP mask option sheet can be designated. 400 KHz ceramic/IFT can be used as an oscillator.

PIN NAMES & PIN DESCRIPTION

Pin Name	Pin No.	Input/Output	Function
P_{03} to P_{00}	4	Input/Output	4-bit general purpose I/O port (I/O is changed over by a program.) This port can be used as a dedicated output. (I/O is designated by mask options.)
P_{13} to P_{10}	4	Output	4-bit general purpose output port * P_{10} only is a output high breakdown voltage port
P_{23} to P_{20}	4	Input or Output	4-bit general purpos Input/Output port
P_{43} to P_{40}	4	Input or Output	Input/Output is designated by mask options.
PO_{54} to PO_{50}	5	Output	* 5-digit Output high breakdown voltage port for display. (Can be used as the general purpose output port.)
PO_{67} to PO_{60}	8	Output	* 8-segment output high breakdown port for display [Can be used as the general purpose 8-bit output port (4 × 2 bits).]
PI_{53} to PI_{50}	4	Input	4-bit general purpose input port
PI_{60}	1	Input	1-bit general purpose input port (with an internal Schmitt circuit)
$\overline{RESET}$	1	Input	Reset input terminal (with an internal Schmitt circuit)
$\overline{INT}$	1	Input	Interrupt request input terminal (with an internal Schmitt circuit)
X_{IN}	1	Input	Oscillator connecting terminal
X_{OUT}	1	Output	Oscillator connecting terminal
C K	1	Output	External timing output
TEST	1	Input	Used by connecting to GND at all times
V_{DD}	1		Power supply
GND	1		GND

Note) The asterisk(*) indicates the points of difference between the TCP4620AP and this device.

Output high breakdown voltage ports are of P-channel open drain structure.

TCP4621AP MASK OPTIONS

Oscillation frequency			OSC	TYP021 050 400K ceramic IFT	TYP022 050 400K ceramic IFT				
Dividing ratio for internal clock			CP	02	02				
External timing output			CK	CP	PD2				
Counter	Divider 1 Input		PD	CP	CP				
	Divider 3 Input	COUNTER	PDR	PD2	PD2				
	Reset timing		PDR	N	/12500/				
Counter Buffer	Buffer 0 Input		CO	PI60	PI60				
	Buffer 1 Input	COUNTER	C1	RD7	RDB				
	Buffer 2 Input	BUFFER	C2	RDA	RDC				
	Buffer 3 Input		C3	RDD	RDD				
H flag			HOLD	0	H				
Restart condition			RSTH	0	C3				
Input/Output port	Port 0		STD	D(PROG)	1 (OUT)				
I/O Port	Port 2		P2	/F/(OUT)	/F/(OUT)	/0/(IN)	/0/(IN)	/0/(IN)	
	Port 4		P4	/F/(OUT)	/3/(IN/OUT)	/F/(OUT)	/3/(IN/OUT)	/0/(IN)	
Input resistance (Input port 5)			P15	0 (UP)	1 (DOWN)				
Decode matrix (PO5)	Line 0	DECODER	DEC0	/ /					
	Line 1		DEC1	/ /					
	Line 2		DEC2	/ /					
	Line 3		DEC3	/ /					
	Line 4		DEC4	/ /					
Output port	6/7		PO6	1(P6/P7)	0 (P6)				
P L A (PO6)	Line 0	P L A	PLA0	/ 00 /	/ /				
	Line 1		PLA1	/ 11 /	/ /				
	Line 2		PLA2	/ 22 /	/ /				
	Line 3		PLA3	/ 33 /	/ /				
	Line 4		PLA4	/ 44 /	/ /				
	Line 5		PLA5	/ 55 /	/ /				
	Line 6		PLA6	/ 66 /	/ /				
	Line 7		PLA7	/ 77 /	/ /				
	Line 8		PLA8	/ 88 /	/ /				
	Line 9		PLA9	/ 99 /	/ /				
	Line A		PLAA	/ AA /	/ /				
	Line B		PLAB	/ BB /	/ /				
	Line C		PLAC	/ CC /	/ /				
	Line D		PLAD	/ DD /	/ /				
	Line E		PLAE	/ EE /	/ /				
	Line F		PLAF	/ FF /	/ /				

ABSOLUTE MAXIMUM RATINGS

SYMBOL	ITEM	RATING	UNIT
V_{DD}	Supply Voltage	-0.3 to +7.0	V
V_{IN}	Input Voltage	-0.3 to V_{DD}+0.3	V
V_{OUT1}	Output Voltage (except $P0_5$, $P0_6$, P_{10})	-0.3 to V_{DD}+0.3	V
V_{OUT2}	Output Voltage ($P0_5$, $P0_6$, P_{10})	V_{DD} - 35 to V_{DD}+0.3	V
P_D	Power Dissipation	600	mW
Tsol	Soldering Temperature·Time	260 (10 SEC)	°C
Tstg	Sotrage Temperature	-55 to +125	°C
Topr	Operating Temperature	-20 to +70	°C

ALLOWABLE OPERATING CONDITIONS

SYMBOL	ITEM	RATING	UNIT
		V_{DD} = 4 to 6V	
Ta	Ambient Temperature	- 20 to +70	°C
V_{OUT}	Output Voltage ($P0_6$, $P0_5$, P_{10})	Max. V_{DD} - 32	V
f_X	X'tal Operating Frequency	40 to 400	KHz
tcy	Cycle Time	10 to 100	μs

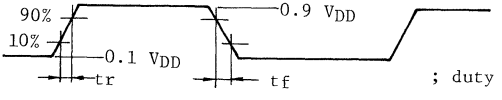
DC CHARACTERISTICS (Ta = -20°C to +70°C, V_{DD} = 4V to 6V)

SYMBOL	PARAMETER	TEST CONDITION	RATING MIN.	RATING TYP.	RATING MAX.	UNIT
V_{IH}	Input High Voltage		V_{DD}x0.7	V_{DD}x0.55	V_{DD}	V
V_{IHS}	Input High Voltage (Schmitt)		V_{DD}x0.85	V_{DD}x0.75	V_{DD}	
V_{IHC}	Input High Voltage (X_{IN} input)		V_{DD}x0.75	-	V_{DD}	
V_{IL}	Input Low Voltage		0	V_{DD}x0.45	V_{DD}x0.3	
V_{ILS}	Input Low Voltage (Schmitt)		0	V_{DD}x0.35	V_{DD}x0.15	
V_{ILC}	Input Low Voltage (X_{IN} input)		-	-	V_{DD}x0.25	
I_{IH}	Input High Current	V_{DD}=6V, V_{IN}=6V	-	-	20	µA
I_{IL}	Input Low Current	V_{DD}=6V, V_{IN}=0V	-	-	-20	
R_{IN}	Input Resistance (PI5)	V_{DD}=5V	75	150	350	KΩ
V_{OH}	Output High Voltage	V_{DD}=5V, Output Open	4.7	4.9	-	V
V_{OL}	Output Low Voltage		-	0.1	0.3	
I_{OH}	Output High Current	V_{DD}=4.5V, V_{OH}=2.4V	-0.7	-	-	mA
I_{OH1}	Output High Current (PO6)	V_{DD}=4.5V, V_{OH}=2.5V	-1	-	-	
	Output High Current (PO5, P10)	V_{DD}=4.5V, V_{OH}=2.5V	-7	-	-	
I_{OL}	Output Low Current	V_{DD}=4.5V, V_{OL}=0.45V	1.6	-	-	
I_{LO}	Output Leak Current (PO_5, PO_6, P_{10})	V_{DD}=6V, V_{OUT}=-26V	-	-	-20	µA
I_{DDO}	V_{DD} Supply Current in Normal Operation (f_X = 400kHz)	V_{DD}=6V, V_{IN}=5.9V/0.1V (all valid)	-	400	1200	µA
I_{DDH}	V_{DD} Supply Current in Hold Operation (f_X = 400kHz)	PI_5 Open C_L=50pF Output Open	-	150	450	

Note 1: Typical values are at Ta=25°C and V_{DD}=5V.

2: Output characteristic excludes X_{OUT} terminal.

3: X_{IN} input waveform at the time of measuring V_{DD} supply current.



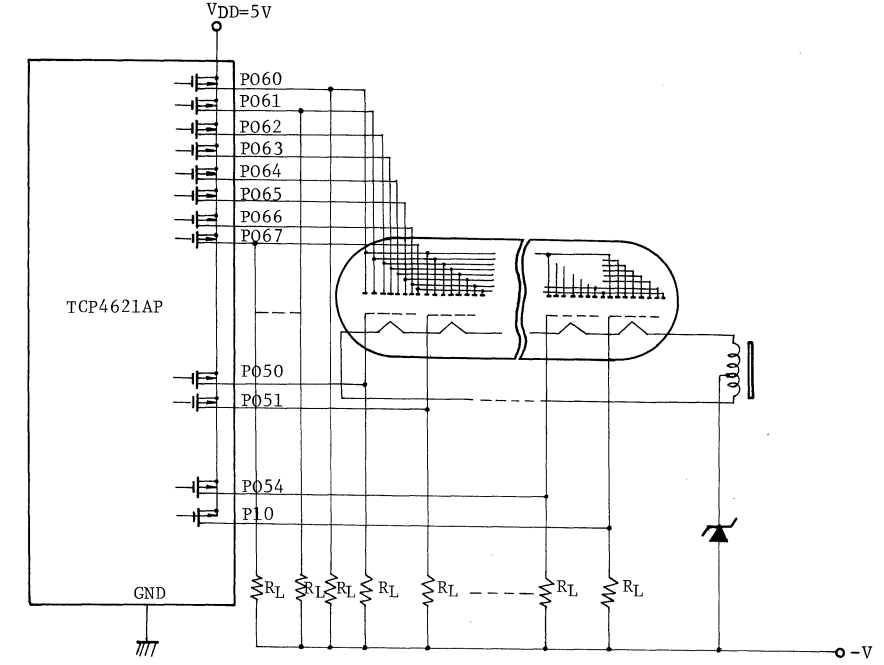
; duty = 50%

; tr, tf < 50 ns

AC CHARACTERISTICS (Ta = -20 to +70°C, V_{DD} = 4 to 6V)

SYMBOL	PARAMETER	TESTCONDITION	MIN.	TYP.	MAX.	UNIT
t_{WXIN}	X_{IN} Pulse Width	External Input V_{IN}=V_{IHC}/V_{ILC}	0.4/f_X	-	0.6/f_X	SEC
t_{WRESET}	$\overline{RESET}$ Pulse Width	V_{IN}=V_{IHS}/V_{ILS}	2 tcy	-	-	µS
t_{WINT}	$\overline{INT}$ Pulse Width		2 tcy	-	-	
t_{WPI60}	PI60 Pulse Width		2 tcy	-	-	

INTERFACE OF FLUORESCENT DIAPLAY TUBE



INTERFACE WITH PMOS