

BRITISH STANDARDS INSTITUTION

2 PARK STREET, LONDON. W1A 2BS

Specification available from:- AS SHOWN IN PD 9002
AND CECC 00 200 AND

BS CECC 90 104 - 176

ISSUE 1

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ELECTRONIC COMPONENTS OF ASSESSED QUALITY
DETAIL SPECIFICATION IN ACCORDANCE WITH:

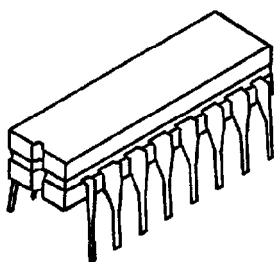
BS CECC 90 000 : 1976
BS CECC 90 100 : 1977

MANUFACTURERS TYPE NUMBER

4521B

SEE PD 9002 AND CECC 00 200
For ordering information
see page 11

Outline not to scale: Isometric projection
Marking information see page 10



24 STAGE COUNTER/DIVIDER

SILICON COMPLEMENTARY MOS.
WITH (B) BUFFERED OUTPUTS AND
CAVITY PACKAGING.

For detail dimensions see IEC 191-2 (A50C)

Assessment levels
R, S, T and V
and optional screening
categories A, B, C and D

CAUTION: THESE ARE STATIC SENSITIVE DEVICES - See clause 1.11

1. Limiting conditions of use (not for inspection purposes)

All voltages referenced to V_{SS}

- 1.1 Maximum supply voltage, positive
- 1.2 Maximum supply voltage, negative
- 1.3 Maximum positive input voltage
- 1.4 Maximum negative input voltage

V_{DD}	+18,0V
V_{DD}	-0,5V
V_I	V_{DD} +0,5V
V_I	-0,5V

Refer to Qualified Products List PD 9002 and/or CECC 00 200
for details of manufacturers approved to this specification

1. Limiting conditions of use (contd)

1.5	Maximum power dissipation, per package per output	P_{D1}	200,0mW
		P_{D2}	25,0mW
1.6	Maximum continuous current into any input.	$ I_I $	10,0mA
1.7	Maximum continuous current into any output.	$ I_O $	10,0mA
1.8	Operating temperature range	T_{amb}	
		Full	-55 to +125°C
		Limited	-40 to + 85°C
1.9	Storage temperature range	T_{stg}	-65 to +150°C
1.10	Transient energy rating		400V at 100pF through 1,5kΩ

1.11 Recommended handling precautions

- 1.11.1 Store devices in either conductive foam or conductive rails, or connect all leads together using a similar electrical shorting method.
- 1.11.2 Use grounded tip soldering irons.
- 1.11.3 Ground all test equipment.
- 1.11.4 Connect all unused device inputs to V_{DD} or V_{SS} .
- 1.11.5 PC boards used to mount MOS devices should have all metal leads grounded during device mounting or flow soldering operations.
- 1.11.6 Soldering equipment, solder pots or flow soldering equipment should be grounded whenever in contact with PC boards and/or MOS devices.
- 1.11.7 Do not use ungrounded automatic insertion equipment or other handling equipment that precludes the use of suitable device lead grounding techniques during inspection or handling.
- 1.11.8 When PC boards containing mounted MOS devices are removed from equipment for test, shipping or storage, 'Dummy connectors' should be used to electrically short all PC board terminals together.
- 1.11.9 Switch off power supply before inserting or removing devices from circuits.
- 1.11.10 Disconnect all low impedance equipment and input signals from the device before d.c. power supplies are switched off.

2. Recommended conditions of use and associated characteristics (not for inspection purposes)

These apply over the operating temperature range unless otherwise stated. All voltages referenced to V_{SS} .

Characteristics	Conditions	Symbol	$V_{DD}(V)$	T_{amb} LOW	T_{amb} = 25°C	T_{amb} HIGH	Unit
Quiescent device current	$V_{IL} = 0V$ $V_{IH} = V_{DD}$						
Full temperature range	Outputs open circuit	I_{DDA}	5,0	5,0	5,0	150,0	μA
		I_{DDA}	10,0	10,0	10,0	300,0	μA
		I_{DDA}	15,0	20,0	20,0	600,0	μA
Limited temperature range		I_{DDA}	5,0	20,0	20,0	150,0	μA
		I_{DDA}	10,0	40,0	40,0	300,0	μA
		I_{DDA}	15,0	80,0	80,0	600,0	μA
LOW level output voltage at $ I_O < 1,0\mu A$	$V_{IL} = 0V$ $V_{IH} = V_{DD}$	V_{OLA}	5,0	0,05	0,05	0,05	V
		V_{OLA}	10,0	0,05	0,05	0,05	V
		V_{OLA}	15,0	0,05	0,05	0,05	V
HIGH level output voltage at $ I_O < 1,0\mu A$	$V_{IL} = 0V$ $V_{IH} = V_{DD}$	V_{OHB}	5,0	4,95	4,95	4,95	V
		V_{OHB}	10,0	9,95	9,95	9,95	V
		V_{OHB}	15,0	14,95	14,95	14,95	V
LOW level output voltage (for worst case combinations) at $ I_O < 1,0\mu A$	$V_{IL} = 1,5V$ $V_{IL} = 3,0V$ $V_{IL} = 4,0V$	V_{OLA}	5,0	0,5	0,5	0,5	V
		V_{OLA}	10,0	1,0	1,0	1,0	V
		V_{OLA}	15,0	1,5	1,5	1,5	V
HIGH level output voltage (for worst case combinations) at $ I_O < 1,0\mu A$	$V_{IH} = 3,5V$ $V_{IH} = 7,0V$ $V_{IH} = 11,0V$	V_{OHB}	5,0	4,5	4,5	4,5	V
		V_{OHB}	10,0	9,0	9,0	9,0	V
		V_{OHB}	15,0	13,5	13,5	13,5	V
Output LOW (sink) current							
Full temperature range	$V_O = 0,4V$	I_{OLB}	5,0	0,64	0,51	0,36	mA
	$V_O = 0,5V$	I_{OLB}	10,0	1,60	1,30	0,90	mA
	$V_O = 1,5V$	I_{OLB}	15,0	4,20	3,40	2,40	mA
Limited temperature range	$V_O = 0,4V$	I_{OLB}	5,0	0,52	0,44	0,36	mA
	$V_O = 0,5V$	I_{OLB}	10,0	1,30	1,10	0,90	mA
	$V_O = 1,5V$	I_{OLB}	15,0	3,60	3,00	2,40	mA

Characteristics	Conditions	Symbol	V _{DD} (V)	T _{amb} LOW	T _{amb} = 25°C	T _{amb} HIGH	Unit
Output HIGH (source) current							
Full temperature range	V _O = 4,6V	-I _{OHB}	5,0	0,64	0,51	0,36	mA
	V _O = 9,5V	-I _{OHB}	10,0	1,60	1,30	0,90	mA
	V _O = 13,5V	-I _{OHB}	15,0	4,20	3,40	2,40	mA
Limited temperature range	V _O = 4,6V	-I _{OHB}	5,0	0,52	0,44	0,36	mA
	V _O = 9,5V	-I _{OHB}	10,0	1,30	1,10	0,90	mA
	V _O = 13,5V	-I _{OHB}	15,0	3,60	3,00	2,40	mA
Input leakage current	V _{IL} = 0V V _{IH} = V _{DD}						
Full temperature range		I _{IA}	15,0	0,10	0,10	1,00	µA
Limited temperature range		I _{IA}	15,0	0,30	0,30	1,00	µA
Input capacitance per unit load (Any input)	V _I = 0V f = 1MHz	C _{IA}	-	-	7,5	-	pF
Noise margin at LOW level output (equal to the difference between V _{IL} and V _{OL} for worst case combinations)		V _{NLB}	5,0	1,0	1,0	1,0	V
		V _{NLB}	10,0	2,0	2,0	2,0	V
		V _{NLB}	15,0	2,5	2,5	2,5	V
Noise margin at HIGH level output (equal to the difference between V _{IH} and V _{OH} for worst case combinations)		V _{NHB}	5,0	1,0	1,0	1,0	V
		V _{NHB}	10,0	2,0	2,0	2,0	V
		V _{NHB}	15,0	2,5	2,5	2,5	V
Propagation and Transition Times	C _L = 50pF (Test conditions as in Sub-group A5)						

Characteristics	Conditions	Symbol	V _{DD} (V)	T _{amb} LOW	T _{amb} = 25°C	T _{amb} HIGH	Unit
Transition Time LOW to HIGH level		t _{TLHA}	5,0	-	360,0	-	ns
		t _{TLHA}	10,0	-	180,0	-	ns
		t _{TLHA}	15,0	-	130,0	-	ns
		t _{THLA}	5,0	-	200,0	-	ns
		t _{THLA}	10,0	-	110,0	-	ns
		t _{THLA}	15,0	-	80,0	-	ns
Propagation Delay Time HIGH to LOW and LOW to HIGH level Clock to Q18		t _{PLHA} /	5,0	-	9,0	-	µs
		t _{PHLA}	10,0	-	3,5	-	µs
		t _{PHLA}	15,0	-	2,7	-	µs
Propagation Delay Time HIGH to LOW and LOW to HIGH level Clock to Q24		t _{PLHA} /	5,0	-	12,0	-	µs
		t _{PHLA}	10,0	-	4,5	-	µs
		t _{PHLA}	15,0	-	3,5	-	µs
Propagation Delay Time HIGH to LOW level Reset to Qn		t _{PHLA}	5,0	-	2600,0	-	ns
		t _{PHLA}	10,0	-	1000,0	-	ns
		t _{PHLA}	15,0	-	750,0	-	ns
Clock Pulse Width		t _{PWCB}	5,0	-	385,0	-	ns
		t _{PWCB}	10,0	-	150,0	-	ns
		t _{PWCB}	15,0	-	120,0	-	ns
Clock Pulse Frequency		Freq A	5,0	-	2,0	-	MHz
		Freq A	10,0	-	5,0	-	MHz
		Freq A	15,0	-	6,5	-	MHz
Clock Pulse Rise and Fall Time		t _{rA} , t _{fA}	5,0	-	15,0	-	µs
		t _{rA} , t _{fA}	10,0	-	15,0	-	µs
		t _{rA} , t _{fA}	15,0	-	15,0	-	µs
Reset Pulse Width		t _{PWRB}	5,0	-	1400,0	-	ns
		t _{PWRB}	10,0	-	600,0	-	ns
		t _{PWRB}	15,0	-	450,0	-	ns

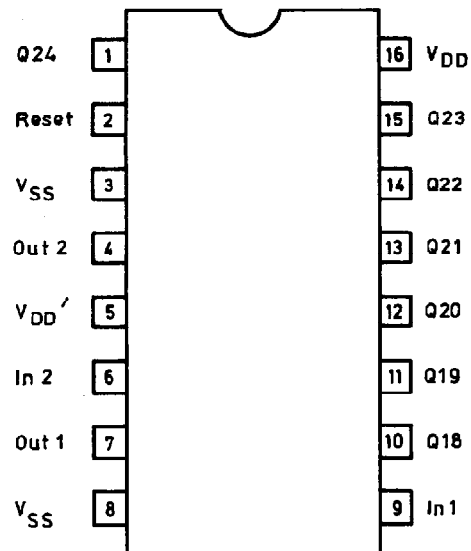


Figure 1

Switching time waveforms

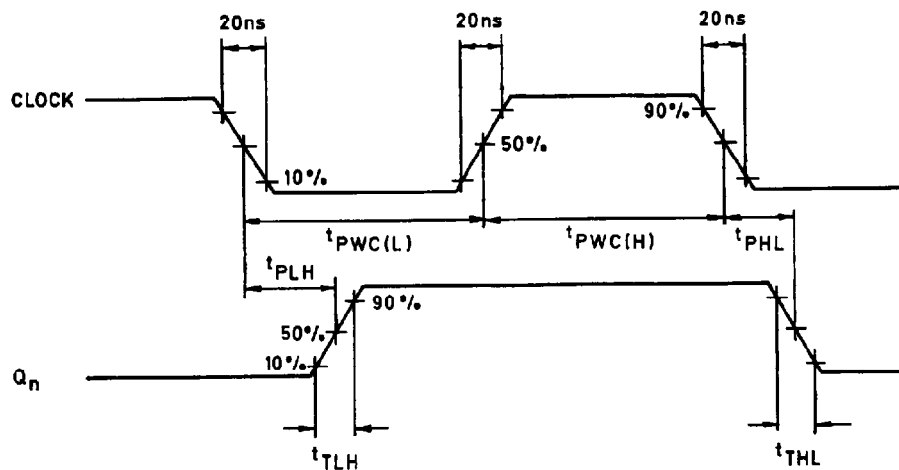
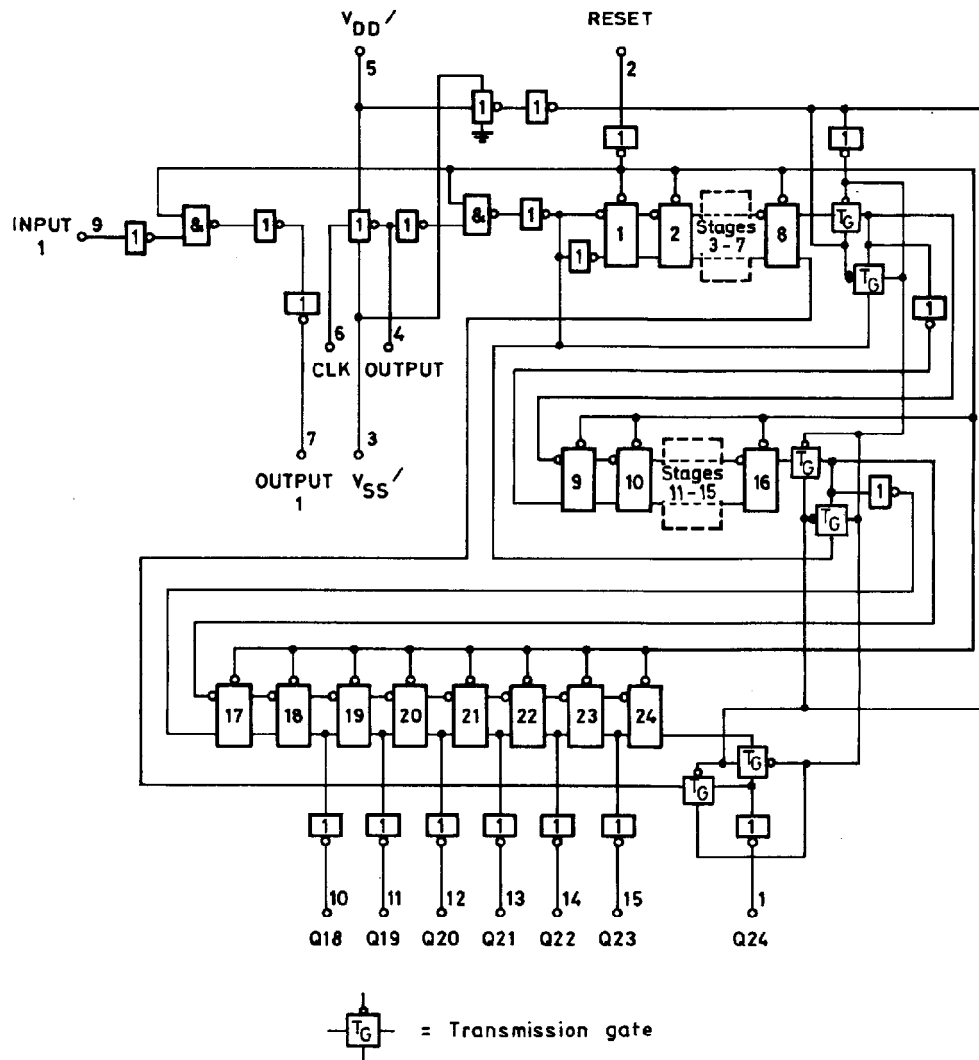


Figure 2

Typical logic diagram



This is a graphic representation, not a circuit diagram

Figure 3

Timing diagram

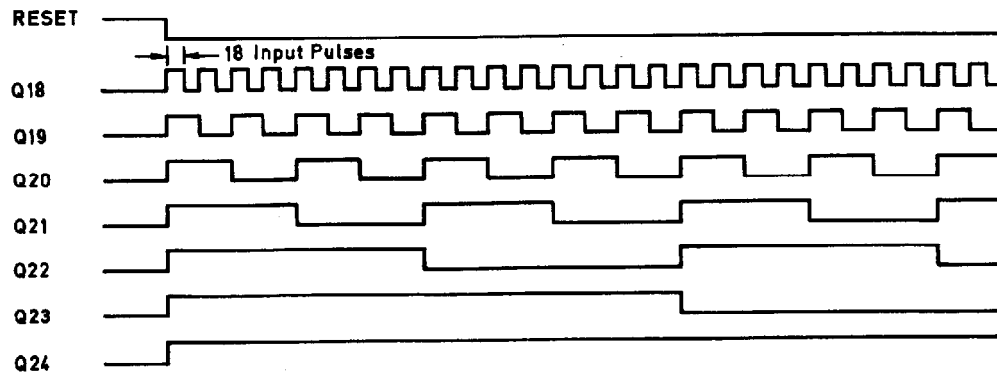
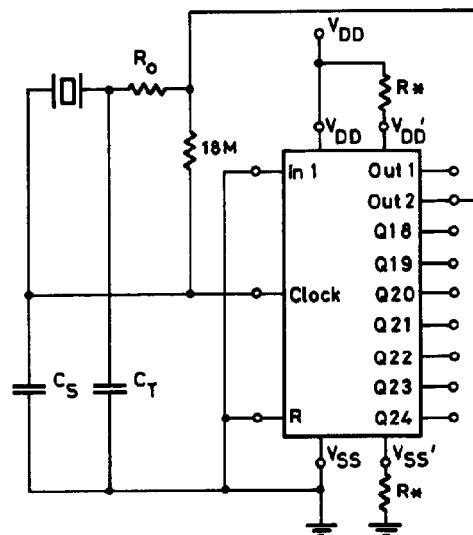


Table 1

OUTPUT	COUNT CAPACITY
Q18	$2^{18} = 262,144$
Q19	$2^{19} = 524,288$
Q20	$2^{20} = 1,048,576$
Q21	$2^{21} = 2,097,152$
Q22	$2^{22} = 4,194,304$
Q23	$2^{23} = 8,388,608$
Q24	$2^{24} = 16,777,216$

Figure 4

Crystal oscillator circuit



* Optional for low power operation

Figure 5

Table 2

CHARACTERISTIC	500 kHz CIRCUIT	50 kHz CIRCUIT	UNIT
Crystal Characteristics			
Resonant Frequency	500	50	kHz
Equivalent Resistance, R_S	1.0	6.2	k Ω
External Resistor/Capacitor Values			
R_O	47	750	k Ω
C_T	82	82	pF
C_S	20	20	pF
Frequency Stability			
Frequency Change as a Function of V_{DD} ($T_A = 25^\circ\text{C}$)			
V_{DD} Change from 5,0V to 10,0V	+6.0	+2.0	ppm
V_{DD} Change from 10,0V to 15,0V	+2.0	+2.0	ppm
Frequency Change as a Function of Temperature ($V_{DD} = 10,0\text{V}$)			
T_A Change from -55°C to $+25^\circ\text{C}$			
Complete Oscillator*	+100	+120	ppm
T_A Change from $+25^\circ\text{C}$ to $+125^\circ\text{C}$			
Complete Oscillator*	-160	-560	ppm

*Complete oscillator includes crystal, capacitors and resistors