

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 - 191

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ELECTRONIC COMPONENTS OF ASSESSED QUALITY
DETAIL SPECIFICATION IN ACCORDANCE WITH:

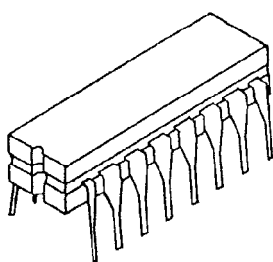
BS CECC 90 000 : 1976
BS CECC 90 100 : 1977

MANUFACTURERS TYPE NUMBER

4162B

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

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



SYNCHRONOUS DECADE COUNTER
WITH SYNCHRONOUS CLEAR

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

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

For detail dimensions see IEC 191-2 (A50C)

CAUTION: THESE ARE STATIC SENSITIVE DEVICES - See clause 1.11

Limiting conditions of use (not for inspection purposes)

All voltages referenced to V_{SS}

1.1	Maximum supply voltage, positive	V_{DD}	+18,0V
1.2	Maximum supply voltage, negative	V_{DD}	-0,5V
1.3	Maximum positive input voltage	V_I	$V_{DD} + 0,5V$
1.4	Maximum negative input voltage	V_I	-0,5V

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

Limiting conditions of use (contd)

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

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	$V_O = 0,4V$ $V_O = 0,5V$ $V_O = 1,5V$	I_{OLB}	5,0	0,64	0,51	0,36	mA
		I_{OLB}	10,0	1,60	1,30	0,90	mA
		I_{OLB}	15,0	4,20	3,40	2,40	mA
Limited temperature range	$V_O = 0,4V$ $V_O = 0,5V$ $V_O = 1,5V$	I_{OLB}	5,0	0,52	0,44	0,36	mA
		I_{OLB}	10,0	1,30	1,10	0,90	mA
		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} V_{NLB} V_{NLB}	5,0 10,0 15,0	1,0 2,0 2,5	1,0 2,0 2,5	1,0 2,0 2,5	V V V
Noise margin at HIGH level output (equal to the difference between V_{IH} and V_{OH} for worst case combinations)		V_{NHB} V_{NHB} V_{NHB}	5,0 10,0 15,0	1,0 2,0 2,5	1,0 2,0 2,5	1,0 2,0 2,5	V V 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 HIGH to LOW and LOW to HIGH level		t _{TLHA} /	5,0	-	200,0	-	ns
		t _{THLA}	10,0	-	100,0	-	ns
			15,0	-	80,0	-	ns
Propagation Delay Time HIGH to LOW and LOW to HIGH level Clock to Q		t _{PLHA} /	5,0	-	700,0	-	ns
		t _{PHLA}	10,0	-	300,0	-	ns
			15,0	-	200,0	-	ns
Propagation Delay Time HIGH to LOW and LOW to HIGH level Clock to Carry Out		t _{PLHA} /	5,0	-	880,0	-	ns
		t _{PHLA}	10,0	-	370,0	-	ns
			15,0	-	250,0	-	ns
Propagation Delay Time HIGH to LOW and LOW to HIGH level TE to Carry Out		t _{PLHA} /	5,0	-	600,0	-	ns
		t _{PHLA}	10,0	-	260,0	-	ns
			15,0	-	180,0	-	ns
Set Up Time Data to Clock		t _{PWSTB}	5,0	-	320,0	-	ns
		t _{PWSTB}	10,0	-	130,0	-	ns
		t _{PWSTB}	15,0	-	90,0	-	ns
Set Up Time Load to Clock		t _{PWSTB}	5,0	-	600,0	-	ns
		t _{PWSTB}	10,0	-	260,0	-	ns
		t _{PWSTB}	15,0	-	180,0	-	ns
Set Up Time Enable to Clock (PE or TE)		t _{PWSTB}	5,0	-	420,0	-	ns
		t _{PWSTB}	10,0	-	170,0	-	ns
		t _{PWSTB}	15,0	-	120,0	-	ns
Set Up Time Clear to Clock		t _{PWSTB}	5,0	-	310,0	-	ns
		t _{PWSTB}	10,0	-	110,0	-	ns
		t _{PWSTB}	15,0	-	70,0	-	ns
Clock Pulse Width, HIGH level		t _{PWCB}	5,0	-	250,0	-	ns
		t _{PWCB}	10,0	-	100,0	-	ns
		t _{PWCB}	15,0	-	70,0	-	ns
Clock Rise Time		t _{rA}	5,0	-	15,0	-	ns
		t _{rA}	10,0	-	15,0	-	ns
		t _{rA}	15,0	-	15,0	-	ns

Characteristics	Conditions	Symbol	$V_{DD}(V)$	T_{amb} LOW	T_{amb} = 25°C	T_{amb} HIGH	Unit
Clock Pulse Frequency		Freq.A	5,0	-	1,0	-	MHz
		Freq.A	10,0	-	2,5	-	MHz
		Freq.A	15,0	-	4,0	-	MHz

Terminal identification

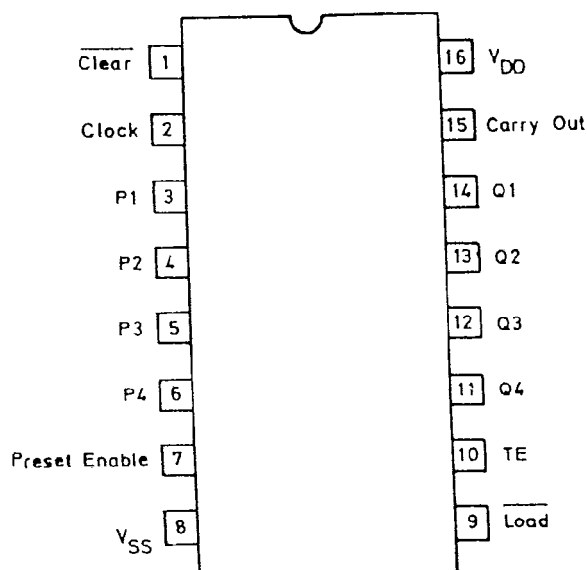


Figure 1

Function Table

Table 1

CLOCK	$\overline{CLEAR}$	$\overline{LOAD}$	PE	TE	OPERATION
	H	L	X	X	Preset
	H	H	L	X	NC
	H	H	X	L	NC
	H	H	H	H	Count (1)
	L	X	X	X	Reset
	H	X	X	X	NC

H = HIGH level

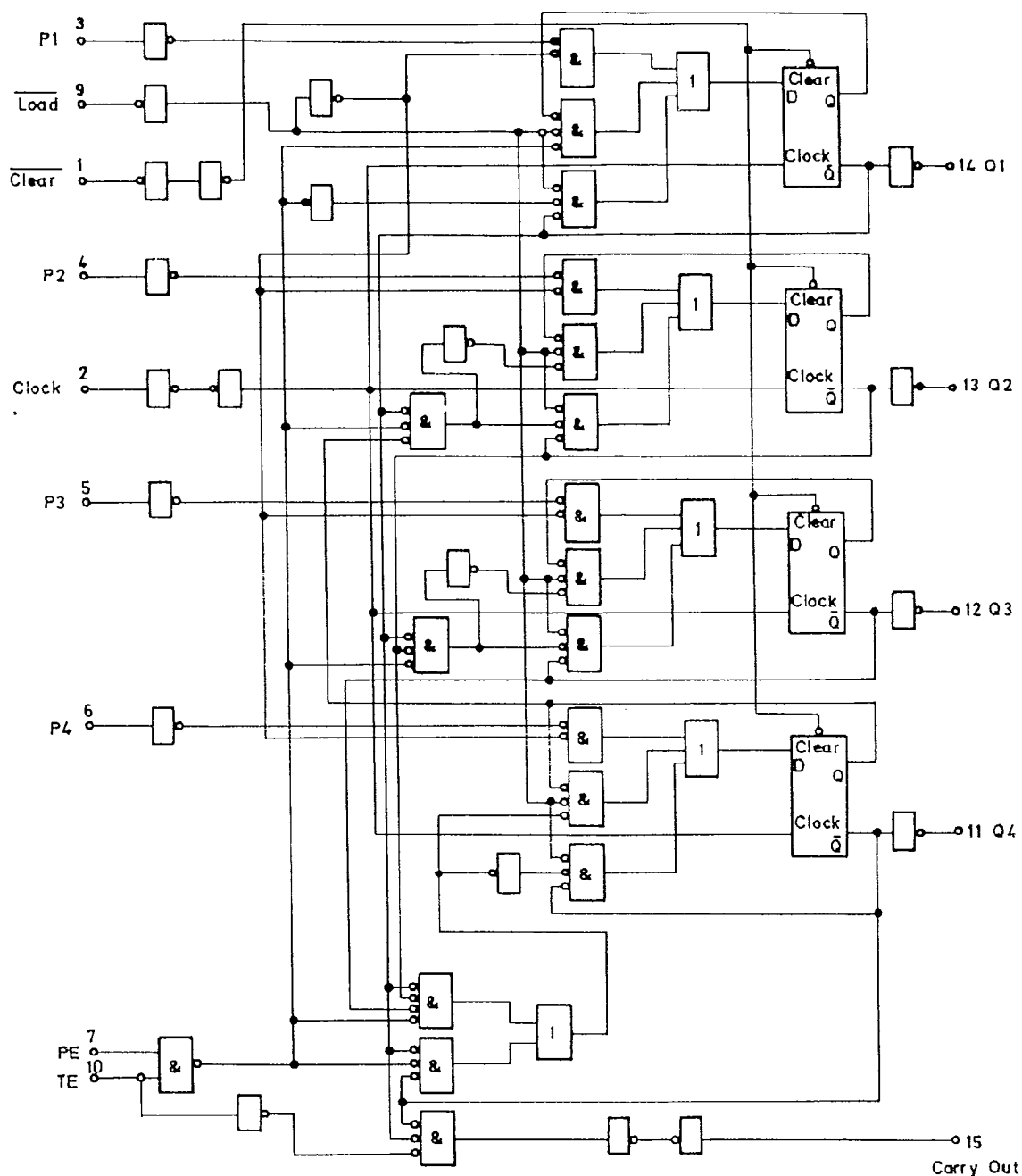
L = LOW level

X = Level irrelevant

NC = No change

(1) = Carry Out enabled by TE only

Typical logic diagram



This is a graphic representation, not a circuit diagram

Figure 2

Switching time waveforms

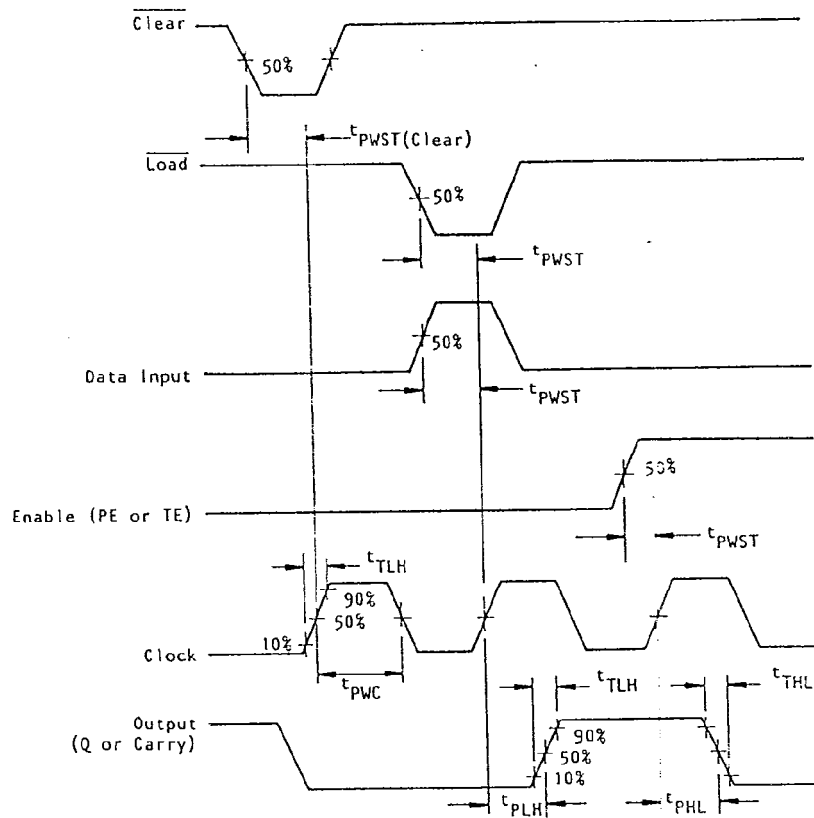
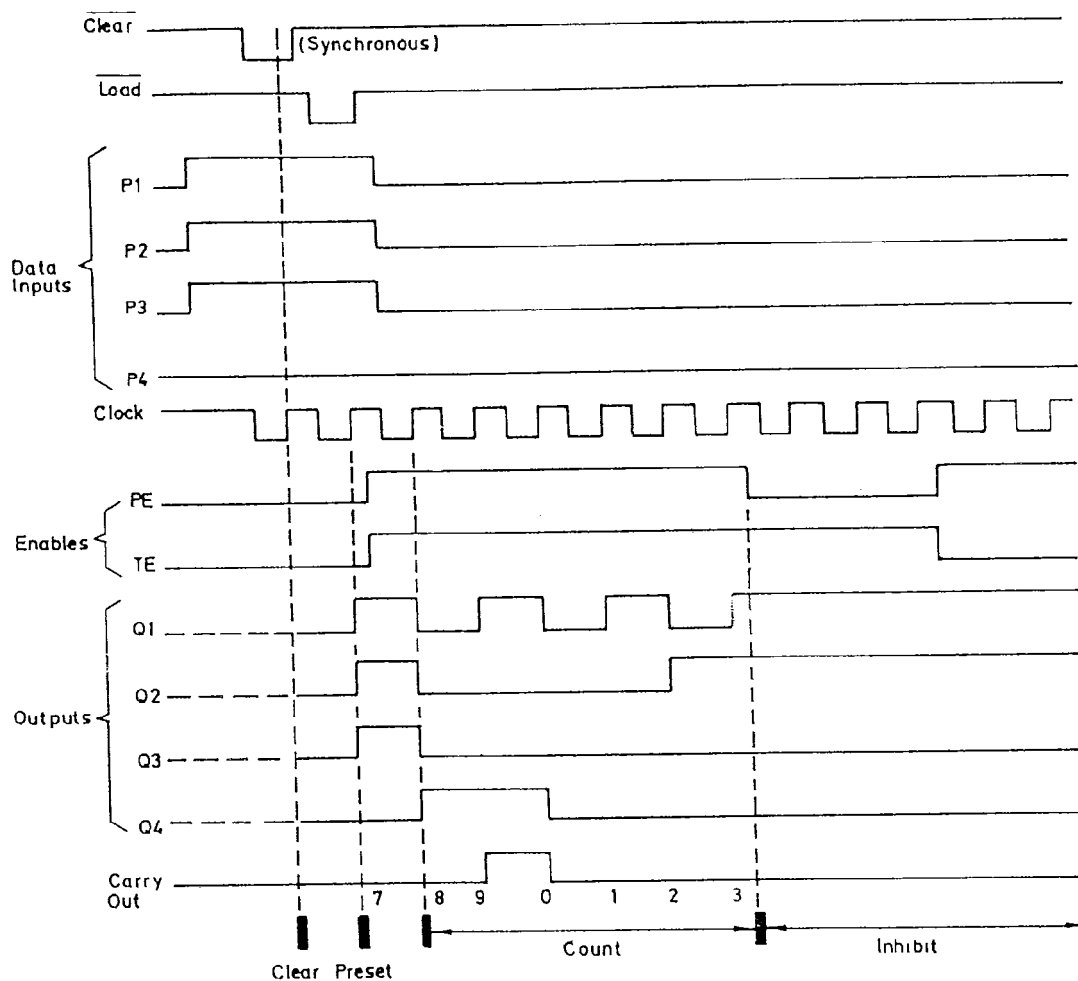


Figure 3

Timing diagram



Sequence illustrated in waveforms:

1. Clear outputs to zero.
2. Preset to BCD seven.
3. Count to eight, nine, zero, one, two, and three.
4. Inhibit.

Figure 4