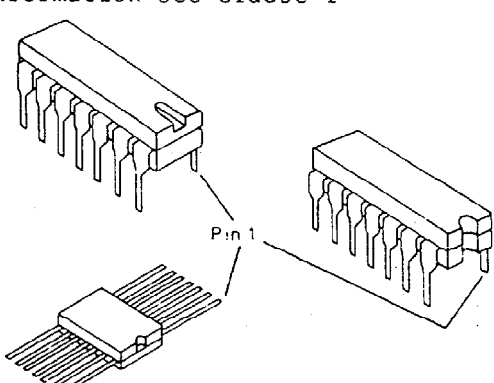


|                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>BRITISH STANDARDS INSTITUTION</b><br/>2 PARK STREET, LONDON. W1A 2BS</p> <p>Specification available from:- AS SHOWN IN PD 9002<br/>AND CECC 00 200 AND</p>                                                                                                                                                     | <p>BS CECC 90103 - 128</p> <p>ISSUE 1</p> <p>NOVEMBER 1981</p> <p>Page 1 of 19 pages</p>                                                                                                                                                                              |
| <p><b>ELECTRONIC COMPONENTS OF ASSESSED QUALITY</b><br/>DETAIL SPECIFICATION IN ACCORDANCE WITH:</p> <p>BS CECC 90 000 : 1976<br/>BS CECC 90 100 : 1977</p>                                                                                                                                                          | <p><b>MANUFACTURERS TYPE NUMBER</b></p> <p>54LS390<br/>64LS390<br/>74LS390<br/>84LS390</p>                                                                                                                                                                            |
| <p>Outline not to scale: Isometric projection<br/>Marking information see clause 1</p>  <p>Refer to IEC 191-1-50a (type A50B)<br/>Dual-in-Line (plastic or ceramic)<br/>refer to Appendix A1.3<br/>Flatpack (metal or ceramic)</p> | <p>SEE PD 9002 AND CECC 00 200<br/>For ordering information see<br/>clause 1</p> <p><b>DUAL DECADE COUNTER</b></p> <p><b>TYPICAL CONSTRUCTION</b><br/>SILICON MONOLITHIC<br/>BIPOLAR TTL-LOW-POWER<br/>SCHOTTKY</p> <p><b>ASSESSMENT LEVELS</b><br/>R, S, T AND V</p> |

1. Type description

1.1 Truth table (see page 2)

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

## 1.1 Truth table (contd)

B.C.D. COUNT SEQUENCE\*  
(EACH COUNTER)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | L              | H              | L              | H              |
| 6     | L              | H              | H              | L              |
| 7     | L              | H              | H              | H              |
| 8     | H              | L              | L              | L              |
| 9     | H              | L              | L              | H              |

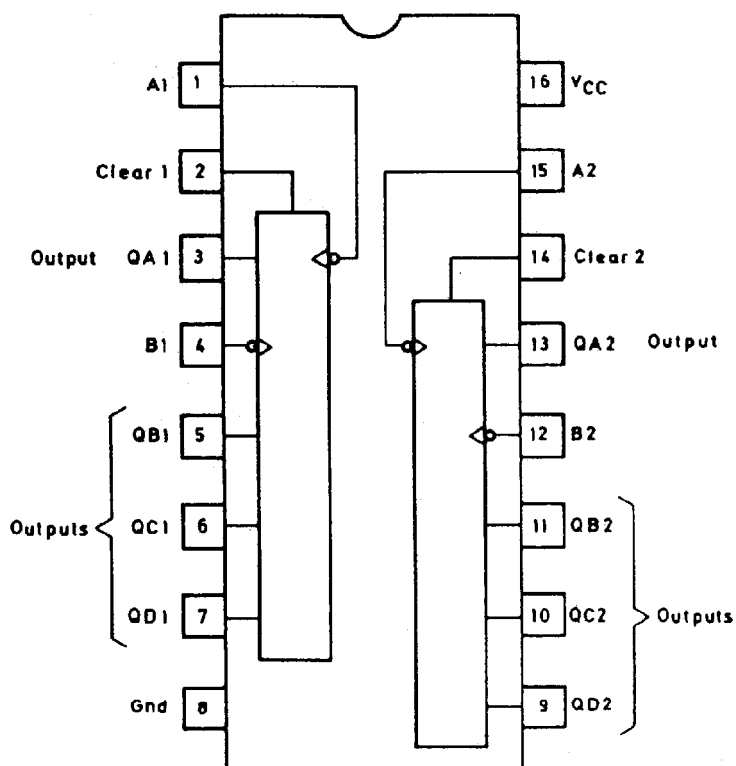
Bi-QUINARY (5 - 2)\*\*  
(EACH COUNTER)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>A</sub> | Q <sub>B</sub> | Q <sub>C</sub> | Q <sub>D</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | H              | L              | L              | L              |
| 6     | H              | L              | L              | H              |
| 7     | H              | L              | H              | L              |
| 8     | H              | L              | H              | H              |
| 9     | H              | H              | L              | L              |

\* = Output Q<sub>A</sub> is connected to input B for B.C.D count  
 \*\* = Output Q<sub>B</sub> is connected to input A for Bi-Quinary  
 H = High level  
 L = Low level

## 1.2 Terminal identification, type designation and marking

### 1.2.1 Terminal identification



Dual decade counter

## 1.2.2 Type designation

| TEMPERATURE<br>RANGE | PACKAGE                 |                         |                     |
|----------------------|-------------------------|-------------------------|---------------------|
|                      | Ceramic<br>Dual-in-Line | Plastic<br>Dual-in-Line | Ceramic<br>Flatpack |
| 0 + 70               | 74LS390J                | N                       | W                   |
| -25 + 85             | 84LS390J                |                         |                     |
| -40 + 85             | 64LS390J                |                         |                     |
| -55 +125             | 54LS390J                |                         |                     |

## 1.2.3 Marking

Each integrated circuit shall bear the following markings:

- (1) Terminal identification
- (2) Type designation
- (3) Date code
- (4) Factory identification code (unless derived from trademark)
- (5) Manufacturers trade name or mark
- (6) Mark of conformity (unless a certificate of conformity is used)

## 1.3 Ordering information

Orders for these integrated circuits shall contain the following minimum information:

Manufacturers integrated circuit type designation screening procedures and assessment levels as detailed to this CECC specification number.

(For details of screening procedures see Appendix A1.1)

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

- |       |                                                                  |          |                |
|-------|------------------------------------------------------------------|----------|----------------|
| 2.1   | Maximum continuous supply voltage                                | $V_{CC}$ | -0,5V<br>+7,0V |
| 2.2   | Maximum input voltages                                           |          |                |
| 2.2.1 | Maximum input voltage                                            | $V_I$    | -0,5V<br>+7,0V |
| 2.2.2 | Maximum input voltage between multiple emitter transistor inputs | $V_{II}$ | +5,5V          |

54LS 64LS 74LS 84LS

- 2.3 Minimum and maximum operating ambient temperatures  $T_{amb}(^{\circ}\text{C})$  min. -55 -40 0 -25  
max. +125 +85 +70 +85
- 2.4 Minimum and maximum storage temperatures  $T_{stg}(^{\circ}\text{C})$  min. -65 (All types)  
max. +150

3. Recommended operating conditions and associated characteristics (not for inspection purposes)

3.1 Recommended operating conditions.

These apply over the operating ambient temperature range unless otherwise stated.

| Description                                                                                        | Symbol               | Type                            | Value                    | Unit          |
|----------------------------------------------------------------------------------------------------|----------------------|---------------------------------|--------------------------|---------------|
| Positive supply voltage range                                                                      | $V_{CC}$             | 54LS<br>64/74/84LS              | 4,5 - 5,5<br>4,75 - 5,25 | V<br>V        |
| Minimum value of High level input voltage                                                          | $V_{IHB}$            | All types                       | 2,0                      | V             |
| Maximum value of High level input voltage                                                          | $V_{IHA}$            | All types                       | 5,5                      | V             |
| Minimum value of Low level input voltage                                                           | $V_{ILB}$            | All types                       | -0,3                     | V             |
| Maximum value of Low level input voltage                                                           | $V_{ILA}$            | 54LS<br>64/74/84LS              | 0,7<br>0,8               | V<br>V        |
| Maximum value of Low level output current for each output                                          | $I_{OLA}$            | 54LS<br>64/74/84LS              | 4,0<br>8,0               | mA<br>mA      |
| Maximum value of output current for each output at $V_{OH}$                                        | $I_{OHA}$            | All types                       | -400,0                   | $\mu\text{A}$ |
| D.C. noise margin<br>at Low level ( $V_{ILA} - V_{OLA}$ )<br>at High level ( $V_{OHB} - V_{IHB}$ ) | $V_{NL}$<br>$V_{NH}$ | All types<br>54LS<br>64/74/84LS | 0,3<br>0,5<br>0,7        | V<br>V<br>V   |

## 3.2 Associated characteristics

3.2.1 Minimum and maximum values are given for the worst case operation over the ambient temperature range, except for those conditions marked with an asterisk (\*)

|                        | 54LS | 64LS | 74LS | 84LS |    |
|------------------------|------|------|------|------|----|
| T <sub>amb</sub> .min. | -55  | -40  | 0    | -25  | °C |
| T <sub>amb</sub> max.  | +125 | +85  | +70  | +85  |    |
| V <sub>CC</sub> min.   | 4,5  | 4,75 |      |      | V  |
| V <sub>CC</sub> max.   | 5,5  | 5,25 |      |      |    |

## 3.2.2

| Characteristics                  | Conditions                                                                         | $V_{CC}(V)$   | Symbol      | Min. | Max.  | Unit |
|----------------------------------|------------------------------------------------------------------------------------|---------------|-------------|------|-------|------|
| Total supply current per package | Outputs open circuit<br>Clear inputs 4,5V then grounded.<br>Other inputs grounded. | $V_{CC} max.$ | $I_{CC}$    | -    | 26,0  | mA   |
| High level input current         | Clear                                                                              | $V_{CC} max.$ | $I_{IH(1)}$ | -    | 0,1   | mA   |
|                                  | A input                                                                            |               | $I_{IH(1)}$ | -    | 0,2   | mA   |
|                                  | B input                                                                            |               | $I_{IH(1)}$ | -    | 0,4   | mA   |
|                                  | Clear                                                                              |               | $I_{IH(2)}$ | -    | 20,0  | μA   |
|                                  | A input                                                                            |               | $I_{IH(2)}$ | -    | 100,0 | μA   |
|                                  | B input                                                                            |               | $I_{IH(2)}$ | -    | 20,0  | μA   |
| Low level input current          | Clear                                                                              | $V_{CC} max.$ | $-I_{IL}$   | -    | 0,4   | mA   |
|                                  | A input                                                                            |               | $-I_{IL}$   | -    | 1,6   | mA   |
|                                  | A input                                                                            |               | $-I_{IL}$   | -    | 2,4   | mA   |

(1) To each input in turn

3.2.2 (contd)

| Characteristics              | Conditions                                                                         | $V_{CC}(V)$           | Symbol       | Min. | Max.  | Unit |
|------------------------------|------------------------------------------------------------------------------------|-----------------------|--------------|------|-------|------|
| Input clamping voltage       | $-I_{IC} = 18,0mA$                                                                 | $V_{CC} \text{ min.}$ | $-V_{ICA}$   | -    | 1,5   | V    |
| Output voltage               | $I_{OH} = -400,0\mu A$                                                             | $V_{CC} \text{ min.}$ | $V_{OH}$     | 2,5  | -     | V    |
| 54LS                         | $I_{OH} = -400,0\mu A$                                                             |                       | $V_{OH}$     | 2,7  | -     | V    |
| 64/74/84LS                   | $I_{OL(1)} = 4,0mA$ (2)                                                            |                       | $V_{OL(1)}$  | -    | 0,4   | V    |
| All types                    | $I_{OL(2)} = 8,0mA$ (3)                                                            |                       | $V_{OL(2)}$  | -    | 0,5   | V    |
| 64/74/84LS                   |                                                                                    |                       |              |      |       |      |
| Output short circuit current | $V_{IN} = V_{ILA}^*$ or $V_{IHB}^*$<br>as appropriate†<br>$V_O = 0V$ or $4,5V$ (4) | $V_{CC} \text{ max.}$ | $-I_{OS}$    | 15,0 | 130,0 | mA   |
| Propagation times            | $T_{amb} = 25^{\circ}C^*$<br>test conditions as<br>in Sub-group A5                 | 5,0V                  |              |      |       |      |
| All types                    |                                                                                    |                       |              |      |       |      |
| From                         | To                                                                                 |                       | $t_{PHL}$    |      |       |      |
| A                            | $Q_A$                                                                              |                       |              | -    | 20,0  | ns   |
| A                            | $Q_C$                                                                              |                       |              | -    | 60,0  | ns   |
| B                            | $Q_B$                                                                              |                       |              | -    | 21,0  | ns   |
| B                            | $Q_C$                                                                              |                       |              | -    | 39,0  | ns   |
| B                            | $Q_D$                                                                              |                       |              | -    | 21,0  | ns   |
| Clear                        | Any                                                                                |                       |              | -    | 39,0  | ns   |
| From                         | To                                                                                 |                       | $t_{PLH}$    |      |       |      |
| A                            | $Q_A$                                                                              |                       |              | -    | 20,0  | ns   |
| A                            | $Q_C$                                                                              |                       |              | -    | 60,0  | ns   |
| B                            | $Q_B$                                                                              |                       |              | -    | 21,0  | ns   |
| B                            | $Q_C$                                                                              |                       |              | -    | 39,0  | ns   |
| B                            | $Q_D$                                                                              |                       |              | -    | 21,0  | ns   |
| Maximum clock frequency      |                                                                                    |                       |              |      |       |      |
| A input                      |                                                                                    |                       | $f_{clock}$  | 25,0 | -     | MHz  |
| B input                      |                                                                                    |                       | $f_{clock}$  | 12,5 | -     | MHz  |
| Duration of clock pulse      |                                                                                    |                       |              |      |       |      |
| A input                      |                                                                                    |                       | $t_{pclock}$ | 20,0 | -     | ns   |
| B input                      |                                                                                    |                       | $t_{pclock}$ | 40,0 | -     | ns   |

(2) Fan out = 10, (3) Fan out = 20,  
 (4) Only one output at a time, duration  $t \leq 1 \text{ sec}$   
 \*See 3.2.1 of this specification  
 †Refer to truth table

- 0 -

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