

# SP8000 SERIES

## HIGH SPEED DIVIDERS

### ÷5 COUNTERS

## SP8620 A, B & M (400MHz)

## SP8621 A, B & M (300MHz)

## SP8622 A, B & M (200MHz)

The SP8620, SP8621 and SP8622 are fixed ratio emitter-coupled logic ÷5 counters with specified input frequency ranges of DC to 400MHz (SP8620), 300MHz (SP8621) and 200MHz (SP8622) respectively. The operating temperature is specified by the final coding letter: -55°C to +125°C ('A' grade), 0°C to +70°C ('B' grade) and -40°C to +85°C ('M' grade).

The counter is normally capacitively coupled to the signal source and is specified with an input signal range of 400-800mv p-p (-4dBm to +22dBm). There are two bias points on the circuit that should be capacitively decoupled to the ground plane.

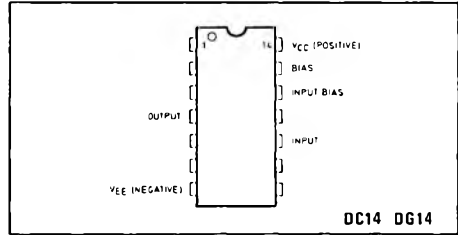


Fig.1 Pin connections (bottom view)

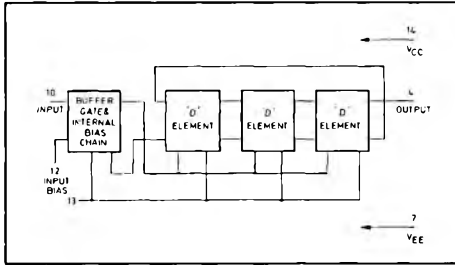


Fig.2 Circuit diagram (all resistor values are nominal)

### FEATURES

- D.C. to 400MHz Operation.
- Temperature Ranges of -55°C to +125°C ('A' Grade), 0°C to +70°C ('B' Grade) and -40°C to +85°C ('M' Grade) Over Full Specified Input Range and Frequency.

### APPLICATIONS

- Frequency Counters and Timers
- Frequency Synthesisers

### ABSOLUTE MAXIMUM RATINGS

|  |                         |
|--|-------------------------|
| Power supply voltage $ V_{CC} - V_{EE} $ | 8V                      |
| Input voltage $V_{IN}$                   | Not greater than supply |
| Output current $I_{OUT}$                 | 15mA                    |
| Operating junction temperature           | +150°C                  |
| Storage temperature                      | -55° to +150°C          |

### ELECTRICAL CHARACTERISTICS

#### Test Conditions (unless otherwise stated)

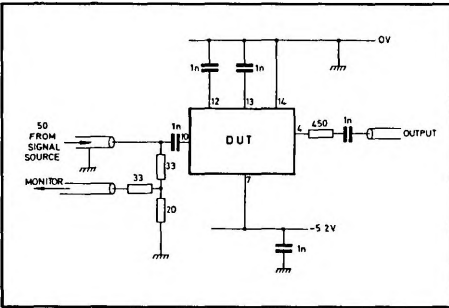
|       |                           |
|-------|---------------------------|
| Tamb: | 'A' grade: -55°C to +85°C |
|       | 'B' grade: 0°C to +70°C   |
|       | 'M' grade: -40°C to +85°C |

| Characteristic  | Type                       | Value             |      |      | Units             | Conditions       |
|---|----------------------------|-------------------|------|------|-------------------|------------------|
|   |                            | Min.              | Typ. | Max. |                   |                  |
| Max. input frequency                                      | SP8620<br>SP8621<br>SP8622 | 400<br>300<br>200 |      |      | MHz<br>MHz<br>MHz |                  |
| Min. input frequency with sinusoidal input                | All                        |                   | 20   | 40   | MHz               |                  |
| Min. slew rate of square wave input for correct operation | All                        |                   | 30   | 100  | V/μS              |                  |
| Output voltage swing                                      | All                        | 400               | 800  |      | mV                | $V_{EE} = -5.2V$ |
| Power supply drain current                                | All                        |                   | 55   |      | mA                | $V_{EE} = -5.2V$ |

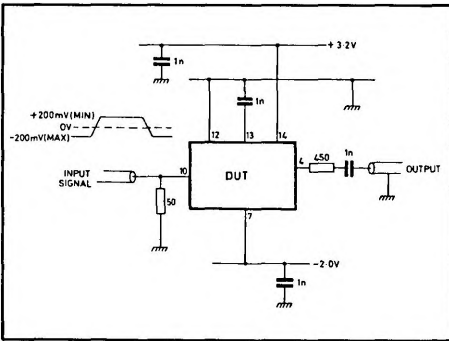
**OPERATING NOTES**

It is recommended that a positive earth plane is used for the circuit layout, thus preventing damage if the output is short-circuited to earth.

The signal source is normally capacitively coupled to the input (see Fig. 3). A 1000pF capacitor is suitable at high frequencies, but if lower frequency operation is also required, say below 10MHz, then an additional capacitor should be connected in parallel: The device can be DC coupled if it is required – see Fig. 4.



*Fig.3 Test circuit*



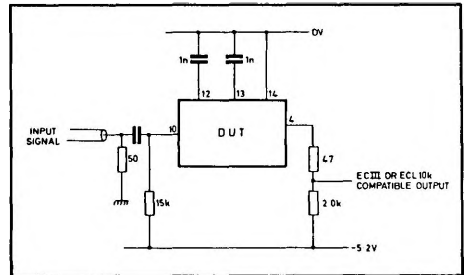
*Fig.4 Divide by 16 frequency scaler*

The circuit may self oscillate when there is no input signal or when the input signal is well below the specified input signal. This can be prevented by connecting a 15kΩ resistor between the input and the negative rail. This causes a loss in sensitivity of up to 100mV p-p.

The input waveform may be sinusoidal, but below about 20MHz the circuit tends to malfunction on minimum amplitude input signals and the condition becomes worse as the frequency is decreased. This is because correct operation of the circuit depends on the slew rate of the input signal. A square wave input with a slew rate greater than 100V/μS ensures correct operation down to DC.

The output swing of the devices can be significantly increased by the addition of a DC load on the emitter follower output. For instance, the maximum DC load of 1.5kΩ will give an increase of typically 50% in output swing with no effect on input drive level or maximum operating frequency. This allows the SP8620 devices to interface directly to ECL II devices with no loss in noise immunity. If the devices are required to interface to ECL III or ECL 10,000 then an interface similar to Fig. 5 should be used.

The values of the decoupling capacitors are not critical, but they should be of a type suitable for the frequencies involved.



*Fig. 5 Interfacing to ECL III or ECL 10,000*