

## SP8000 SERIES HIGH SPEED DIVIDERS

 SP8602
 A, B&M
 500MHz+2

 SP8603
 A, B&M
 400MHz+2

 SP8604
 A, B&M
 300MHz+2

The SP8602, SP8603 and SP8604 are fixed ratio ECL -2 counters with maximum specified I/P frequencies of 500, 400 and 300 MHz respectively. The operating temperature range is specified by the final coding letter: 'A' denotes  $-55^{\circ}$ C to  $+125^{\circ}$ C, 'B' denotes  $0^{\circ}$ C to  $+70^{\circ}$ C and 'M' denotes  $-40^{\circ}$ C to  $+85^{\circ}$ C.

The devices can be operated with single input drive or with double, complementary, input drive; in both cases the input is normally capacitively coupled to the signal source. Two complementary emitter follower outputs are provided.



Fig. 1 Pin connections





## ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated)

| Tamb   | 'A' Grade<br>'B' Grade      |              |
|--------|-----------------------------|--------------|
| 0      | 'M' Grade                   | ,            |
| Operat | ting supply voltage: N<br>N | / cc<br>/ ee |

Input voltage (single drive- other input and bias decoupled to ground plane) Input voltage (double drive- bias decoupled to ground plane) Output load  $\begin{array}{c} -55^{\circ}\text{C to} + 125^{\circ}\text{C} \\ 0^{\circ}\text{C to} + 70^{\circ}\text{C} \\ -40^{\circ}\text{C to} + 85^{\circ}\text{C} \\ 0\text{V} \\ -5.2\text{V}^{\pm} \ 0.25\text{V} \\ 400 \ to \ 800 \ \text{mV} \ \text{p-p} \\ 250 \ to \ 800 \ \text{mV} \ \text{p-p} \\ 500\Omega \ \text{and} \ 3\text{pF} \end{array}$ 

| Characteristic  |                            | Value      |      |      |            | Con lititan   |
|---|----------------------------|------------|------|------|------------|---|
|   | Туре                       | Min.       | Тур. | Max. | Units      | Conditions  |
| Max, input freq.  | SP8602A,B.M                | 500        |      | i i  | MHz        | V <sub>ee</sub> = -5.2V   |
|   | SP8603A,B,M<br>SP8604A,B,M | 400<br>300 |      |      | MHz<br>MHz | $V_{ee} = -5.2V$<br>$V_{ee} = -5.2V$  |
| Min. input freq.<br>with sinusoidal<br>input                    | All                        |            | 20   | 40   | MHz        |   |
| Min. slew rate of<br>square wave input<br>for correct operation | All                        |            | 30   | 100  | V/µS       | single input drive  |
| Output voltage<br>swing   | All                        | 400        |      |      | mV         | $V_{ee} = -5.2V$<br>$T_{amb} = -55^{\circ}C$ to +70°C                       |
| Output voltage<br>swing   | SP602A                     | 350        |      |      | mV         | V <sub>ee</sub> = −5.2V<br>T <sub>amb</sub> = +125°C<br>I/P freq. = 500 MHz |
| Power supply<br>drain current                                   | All                        |            | 12   | 20   | mA         | $V_{ee} = -5.2V$ See note 1   |

#### NOTES

1. In practice, the 3.5kΩresistors specified in the test circuit (Fig.3) are not essential: omission of these resistors will reduce the maximum supply current to 18mA,



Fig. 3 Test circuit

#### ABSOLUTE MAXIMUM RATINGS

| Power supply voltage $V_{CC} - V_{ee}$ | 8V                    |  |  |  |
|--|-----------------------|--|--|--|
| Input voltage V <sub>in</sub>          | Not greater than the  |  |  |  |
|  | supply voltage in use |  |  |  |
| Output current lout                    | 10 mA                 |  |  |  |
| Operating junction                     | +150°C                |  |  |  |
| temperature                            |                       |  |  |  |
| Storage temperature                    | –55°C to +150°C       |  |  |  |
| range                                  |                       |  |  |  |

### **OPERATING NOTES**

It is recommended that a positive earth plane be used for the circuit layout, thus preventing damage if the output emitter-followers are inadvertently shorted to ground. All components used in the circuit layout should be suitable for the frequencies involved, and outside a controlled impedance environment, leads and connections should be kept short to minimise stray inductance.

The signal source is normally capacitively coupled to the input. A 1000pF capacitor is usually sufficient. If the input signal is likely to be interrupted a  $15K\Omega$  resistor should be connected between the input and the negative rail. In the single drive case it is preferable to connect the resistor to the input not in use – in the double drive case either input can be used. The addition of the input pulldown resistor causes a slight loss of input sensitivity,

but it prevents circuit oscillation under no-signal conditions.

The input waveform may be sinusoidal, but below about 40 MHz the operation of the circuit becomes dependent on the slew rate of the input rather than the amplitude. A square wave input with a slew rate of more than 100 V/ $\mu$ S will permit correct operation down to DC.

The output voltage swing can be increased by the addition of a DC load to the output emitter followers. Pulldown resistors of 1.5 K to the negative rail provide an increase of typically 25% in the output voltage swing.

### APPLICATION NOTES

# SP8602B and SP8604B interfacing to ECL 10 000 and ECL III

By increasing the output voltage swing using external pulldown resistors (see operating notes), the SP8604B canbe coupled directly into an E C L III or E C L 10 000 gate, but there is a reduction of the noise immunity. Where noise immunity is important the device can be connected to an E C L II 0000 or E C L III line receiver.

#### Divide-by-16 frequency scaler.

The SP8602B and SP8604B interfacing with the SP8601B and high-speed TTL to give a divide-by-16 frequency scaler is shown in Fig. 4.



Fig. 4 Divide-by-16 frequency scaler