PLESSEY
SEMICONDUCTORS

SP8000 SERIES
HIGH SPEED DIVIDERS

SP8619B 1.5GHz ÷ 4
SP8617B 1.3GHz ÷ 4

The SP8619 series of UHF counters are fixed ratio ÷4 asynchronous emitter coupled logic counters with, in the case of the SP8619B a maximum operating frequency in excess of 1.5GHz over a temperature range of 0°C to +70°C. The input is normally capacitively coupled to the signal source but can be DC coupled if it is required. The two complementary emitter follower outputs are capable of driving 100 ohm lines and interfacing to ECL with the same positive supply. The SP8619 series require supplies of 0V and −6.8V (± 0.35V).

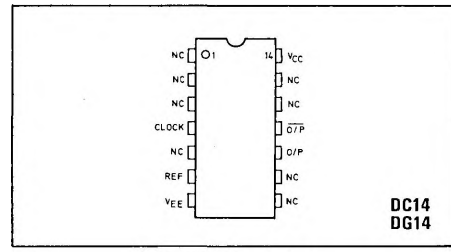

Fig. 1 Pin connections

FEATURES

- DC to 1.5GHz Operation
- 0°C to 70°C Operation Guaranteed at Maximum Specified Frequency and Over a Wide Dynamic Input Range
- Complementary Emitter Follower O/Ps, ECL10K and ECL III Compatible

APPLICATIONS

- UHF Instrumentation, Including Counters and Timers
- Prescaling for UHF Synthesisers

QUICK REFERENCE DATA

- $V_{CC} = 0V$ $V_{EE} = -6.8V \pm 0.35V$
- Input Voltage Range 400mV to 1.2V p-p
- Temperature Range 0°C to +70°C
- Output Voltage Swing 800mV Typ.

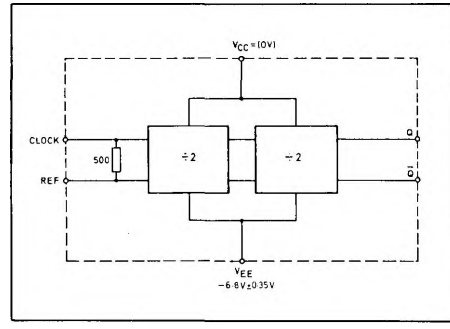

Fig. 2 Functional diagram

ABSOLUTE MAXIMUM RATINGS

Power supply voltage $|V_{CC} - V_{EE}|$ 10V
Input voltage V_{INac} 2.5V p-p
Output current 15mA
Storage temperature range −55°C to +150°C
Maximum operating function temperature +150°C

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated)
T_{amb} = 0°C to +70°C
Supply voltage V_{CC} = 0V V_{EE} = −6.8 ± 0.35V
Input voltage 400 − 1200mV p-p

Characteristic	Type	Value			Units	Conditions
		Min.	Typ.	Max.		
Max. toggle frequency	SP8619B	1.5			GHz	
	SP8617B	1.3			GHz	
Min. toggle frequency for correct operation with sine wave input	All			150	MHz	V_{IN} = 600mV to 1.2Vp-p
Min. toggle frequency for correct operation with sine wave input	All			100	MHz	V_{IN} = 800mV to 1.2Vp-p
Min slew rate for square wave input to guarantee operation to 0Hz	All			200	V/µs	
Output voltage swing	All	600	800		mV	
Power supply drain current	All		80	110	mA	V_{EE} = −7.15V

Toggle Frequency Test Board Layout

1. All connections to the device are kept short
2. The capacitors are leadless ceramic types
3. In practice, the device is tested in an Augat 14 lead DIL socket which degrades the performance slightly. If the device is mounted in a low profile socket or soldered into a printed circuit board, the specified performance will be exceeded.

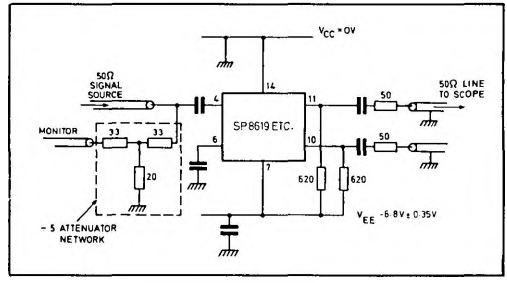

Fig. 3 Toggle frequency test circuit

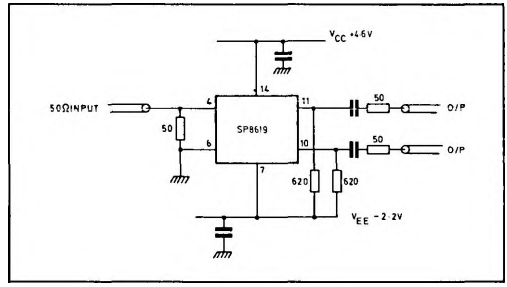

Fig. 4 Circuit for using the input signal about earth potential

OPERATING AND APPLICATION NOTE

The SP8619 series of dividers are very simple to use but normal high frequency rules should be followed for optimum performance - for example, all connections should be kept short and the capacitors and resistors should be types suitable for the frequencies involved.

The input is normally capacitively coupled to the signal source. There is an internal 400 ohm resistor connecting the input to a reference voltage; this biases the input in the middle of the transfer characteristic. The reference voltage is brought out onto pin 6, which should be decoupled to the earth plane.

The sensitivity of the device can be increased by DC coupling the input signal about earth (see Fig. 4).

$|V_{CC} - V_{EE}|$ should be kept inside the specified 6.8V $\pm$0.35V but the actual value of V_{CC} relative to earth is not very critical and can be varied between 4.2V and 5.0V with only a small effect on performance. A V_{CC} of about 4.6V is the optimum for full temperature range operation.

In the absence of an input signal both the DC coupled and the capacitively coupled circuits will self-oscillate with an output frequency of approximately 300MHz. This can be prevented by connecting a 10k ohm resistor between the input and the negative rail. This offsets the input sufficiently to stop the oscillation but it also reduces the input sensitivity by approximately 100mV.

The SP8619 will miscount with low frequency sine-wave inputs or slow ramps. A slew rate of 200V/μs or greater is necessary for safe operation at low frequencies.

The output can be interfaced to ECL 10K or ECL III (see Fig. 5).

The input impedance of the SP8619 is a function of frequency and minimises at about the same frequency as the maximum input sensitivity, so, although it can load the signal source significantly there is usually enough signal to operate the device satisfactorily when the input impedance is at a minimum input signal requirement. The worst case occurs at the maximum frequency because this is where the input sensitivity is worst.

The SP8619 series can be used in instrumentation for direct counting applications up to 1.5GHz and in frequency synthesisers.

In a frequency synthesiser, the SP8619 and the SP8643 can be used together (see Fig. 6).

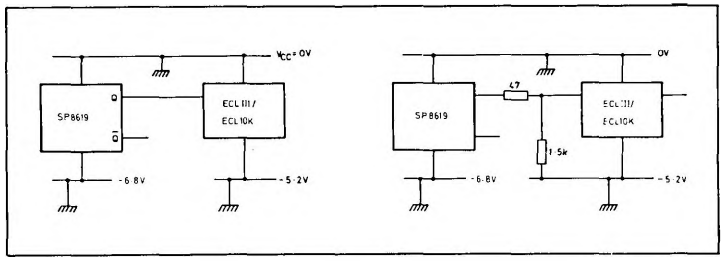

Fig. 5 Interfacing SP8619 series to ECL 10K and ECL III

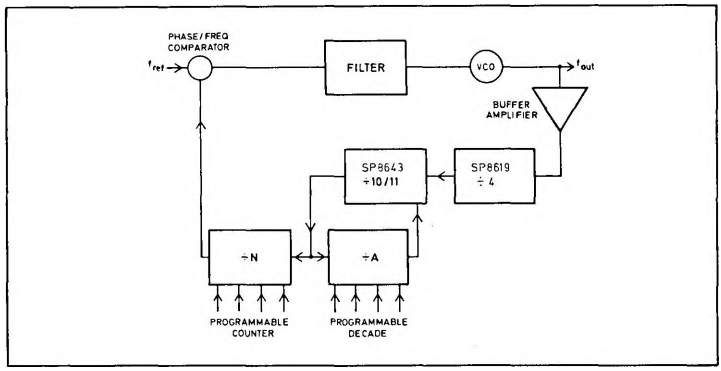

Fig. 6 A 1.5GHz synthesiser loop