

# SP8690 200MHz÷10/11 SP8691 200MHz÷8/9

The SP8690 and SP8691 are low power ECL variable modulus dividers, with both ECL10K and TTL/CMOS compatible outputs. They divide by the lower division ratio when either of the ECL control inputs, <u>PE1</u> or <u>PE2</u>, is in the high state and by the higher ratio when both are low (or open circuit).

## **FEATURES**

- ECL and TTL/CMOS Compatible Outputs
- AC-Coupled Input
- Control Inputs ECL Compatible

## **QUICK REFERENCE DATA**

- Supply Voltage:  $-5.2V\pm0.25V$  (ECL),  $5V\pm0.25V$  (TTL)
- Power Consumption: 70mW (Typ.)
- Temperature Range:
  - -55°C to +125°C (A Grade) -30°C to +70°C (B Grade)

## **ABSOLUTE MAXIMUM RATINGS**

Supply voltage, $ V_{CC} - V_{EE} $	8V
ECL output current	10mA
Storage temperature range	−65°C to +150°C
Max. junction temperature	+175°C
TTL output voltage	+12V
Input voltage	2·5V p-p
Max. open collector current	15mA

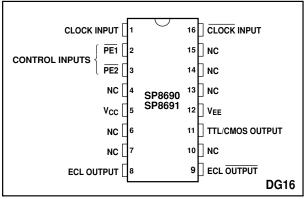


Fig. 1 Pin connections - top view

# **ORDERING INFORMATION**

SP8690 A DG SP8690 B DG SP8691 A DG 5962-87678 (SMD) (SP8690)

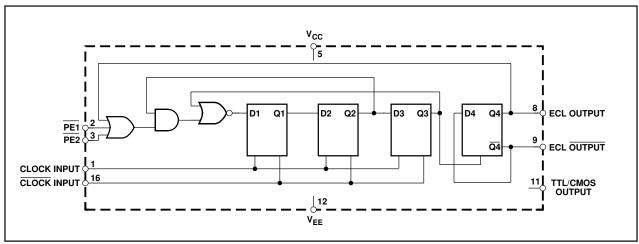


Fig. 2 Functional diagram (SP8690)

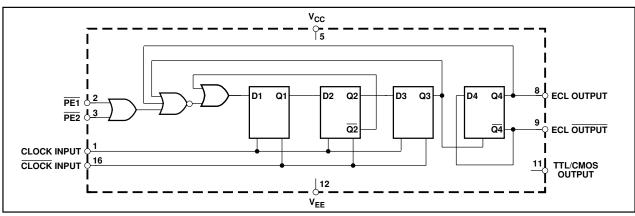


Fig. 3 Functional diagram (SP8691)

## **ELECTRICAL CHARACTERISTICS**

Unless otherwise stated, the Electrical Characteristics are guaranteed over specified supply, frequency and temperature range ECL OPERATION

Supply voltage, 
$$V_{CC}$$
 = 0V,  $V_{EE}$  =  $-5.2V \pm 0.25V$   
Temperature,  $T_{AMB}$  =  $-55$ °C to  $+125$ °C (A Grade),  $-30$ °C to  $+70$ °C (B Grade)

Characteristic	Symbol	Value		Units	Canditions	Notes
		Min.	Max.	Office	Conditions	Notes
Maximum frequency (sinewave input)	f <sub>MAX</sub>	200		MHz	Input = 400-800mV p-p	5
Minimum frequency (sinewave input)	f <sub>MIN</sub>		40	MHz	Input = 400-800mV p-p	5
Power supply current	I <sub>EE</sub>		21	mA	$V_{EE} = -5.0V$	5
ECL output high voltage	$V_{OH}$	-0.85	-0.7	V	$V_{EE} = -5.2V (25^{\circ}C)$	
ECL output low voltage	$V_{OL}$	<b>−1·8</b>	−1.5	V	$V_{EE} = -5.2V (25^{\circ}C)$	
PE input high voltage	$V_{INH}$	-0.93		V	$V_{EE} = -5.2V (25^{\circ}C)$	
PE input low voltage	$V_{INL}$		-1.62	V	V <sub>EE</sub> = -5·2V (25°C)	
Clock to ECL output delay	t <sub>p</sub>		9	ns		6
Set-up time	ts	3		ns		3, 6
Release time	t <sub>r</sub>	8		ns		4, 6

## **TTL OPERATION**

Supply voltage, V<sub>CC</sub> = 5V  $\pm$  0·25V, V<sub>EE</sub> = 0V Temperature, T<sub>AMB</sub> =  $-55^{\circ}C$  to  $+125^{\circ}C$  (A Grade),  $-30^{\circ}C$  to  $+70^{\circ}C$  (B Grade)

Characteristic	Symbol	Value		Units	Conditions	Notes
		Min.	Max.	Uiiis	Conditions	Notes
Maximum frequency (sinewave input)	f <sub>MAX</sub>	200		MHz	Input = 400-800mV p-p	5
Minimum frequency (sinewave input)	f <sub>MIN</sub>		40	MHz	Input = 400-800mV p-p	5
Power supply current	I <sub>EE</sub>		21	mA	$V_{CC} = 5.0V$	5
TTL output low voltage	$V_{OL}$		0.5	V	$V_{CC} = 5V$ , $R_L = 560\Omega$	5, 7
TTL output high voltage	$V_{OH}$	3.75		V	$R_L = 560\Omega$	5, 7
Clock to TTL output high delay,+ve going	t <sub>PLH</sub>		32	ns	$R_L = 560\Omega$	6
Clock to TTL output low delay,-ve going	t <sub>PHL</sub>		18	ns	$R_L = 560\Omega$	6
Set-up time	t <sub>s</sub>	3		ns		3, 6
Release time	t <sub>r</sub>	8		ns		4, 6

# NOTES

- 1. The temperature coefficients of  $V_{OH}$  =  $+1.63 mV/^{\circ}C$ ,  $V_{OL}$  =  $+0.94 mV/^{\circ}C$  and of  $V_{IN}$  =  $+1.22 mV/^{\circ}C$ .
- 2. The test configuration for dynamic testing is shown in Fig.8
- The set-up time t<sub>s</sub> is defined as the minimum time that can elapse between L→H transition of control input and the next L→H clock pulse transition
  to ensure that division by the lower modulus is obtained.
- 4. The release time t<sub>r</sub> is defined as the minimum time that can elapse between H→L transition of control input and the next L→H clock pulse transition to ensure that division by the higher modulus is obtained.
- SP8690/1B tested at 25°C only.
- Guaranteed but not tested
- The open collector output is not recommended for use at output frequencies above 15MHz. C<sub>LOAD</sub> ≤ 5pF.

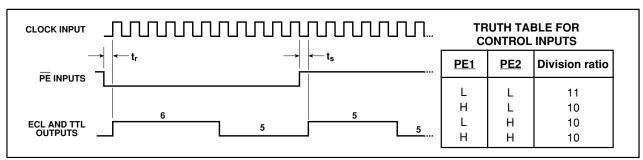


Fig. 4 Timing diagram, SP8690

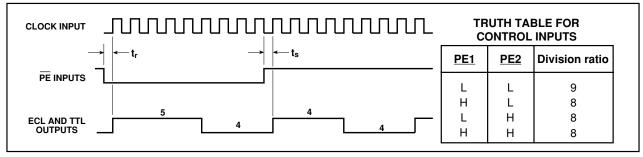


Fig. 5 Timing diagram, SP8691

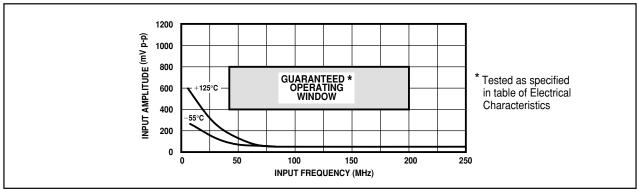


Fig. 6 Typical input characteristics, SP8690/1

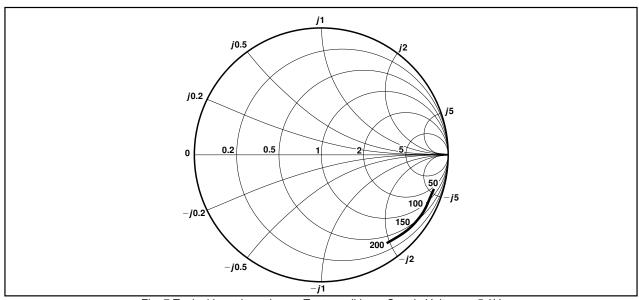


Fig. 7 Typical input impedance. Test conditions: Supply Voltage = 5.0V, Ambient Temperature =  $25^{\circ}C$ . Frequencies in MHz, impedances normalised to  $50\Omega$ .

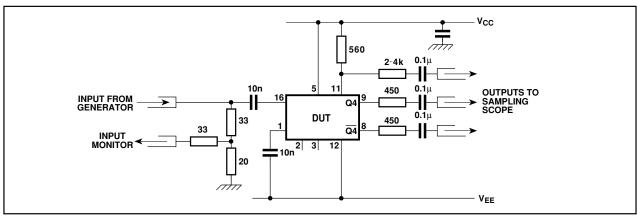


Fig. 8 Test circuit for dynamic measurements

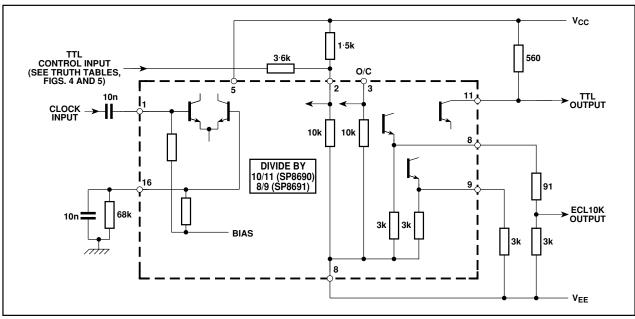


Fig. 9 Typical application showing interfacing.

### **OPERATING NOTES**

- 1. The clock inputs can be single or differentially driven. The clock input is biased internally and is coupled to the signal source with a suitable capacitor. The input signal path is completed by an input reference decoupling capacitor which is connected to ground.
- 2. In the absence of a signal the device will self-oscillate. If this is undesirable, it may be prevented by connecting a  $68k\Omega$  resistor from the input to  $V_{EE}$  i.e., from pin 1 or pin 16 to pin 12. This reduces the input sensitivity by approximately 100mV.
- 3. The circuit will operate down to DC but slew rate must be better than  $100V/\mu s$ .
- 4. The  $Q_4$  and  $Q_4$  outputs are compatible with ECLII but can be interfaced to ECL10K as shown in Fig. 9.

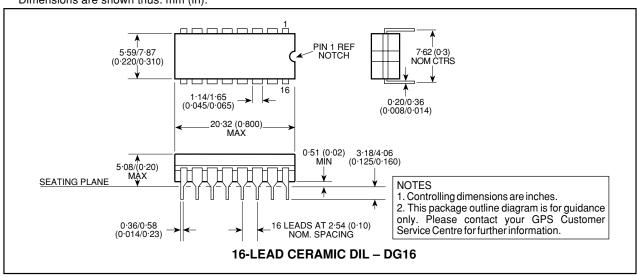
- 5. The PE inputs are ECLIII/10K compatible and include internal  $10k\Omega$ pulldown resistors. Unused inputs can therefore be left open circuit.
- 6. The input impedance of the SP8690/1 varies as a function of frequency. See Fig. 7.
- 7. The TTL/CMOS output is a free collector and the high state output voltage will depend on the supply that the collector load is taken to. This should not exceed 12V.
- 8. The rise/fall time of the open collector output waveform is directly proportional to load capacitance and load resistor value. Therefore, load capacitance should be minimised and the load resistor kept to a minimum consistent with system power requirements. In the test configuration of Fig. 8 the output rise time is approximately 10ns and the fall time

**NOTES** 

## SP8690/SP8691

## **PACKAGE DETAILS**

Dimensions are shown thus: mm (in).





## HEADQUARTERS OPERATIONS **GEC PLESSEY SEMICONDUCTORS**

Cheney Manor, Swindon, Wiltshire SN2 2QW, United Kingdom.

Tel: (0793) 518000 Fax: (0793) 518411

### **GEC PLESSEY SEMICONDUCTORS**

P.O. Box 660017 1500 Green Hills Road. Scotts Valley, CA95067-0017 United States of America. Tel (408) 438 2900 Fax: (408) 438 5576

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Swindon Tel: (0793) 518510 Fax: (0793) 518582

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