IMISG501 SYSTEM CLOCK CHIP

March 1996

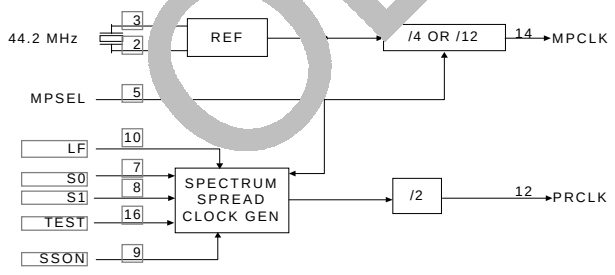
PATENT PENDING

REDUCED EMI CLOCK GENERATOR

PRODUCT FEATURES

- Generates CPU Clock Signals for Microprocessor Systems
- Reduces Measured EMI by 10 db nominal
- 4V to 7V Operating Supply Range
- Supports 80286-, 80386-, 80486-, Pentium™- and 29000-based designs
- Wide range of selectable output frequencies including 50, 25, 20 and 10 Mhz
- single, low cost crystal used as reference frequency
- Glitch-free switching
- 50% duty cycle
- Power down mode for low power consumption
- TTL or CMOS compatible outputs with 6mA drive capability
- Low, short- and long-term jitter
- 16 PDIP and 16 Pin SOIC (300 mil body) package options

BLOCK DIAGRAM

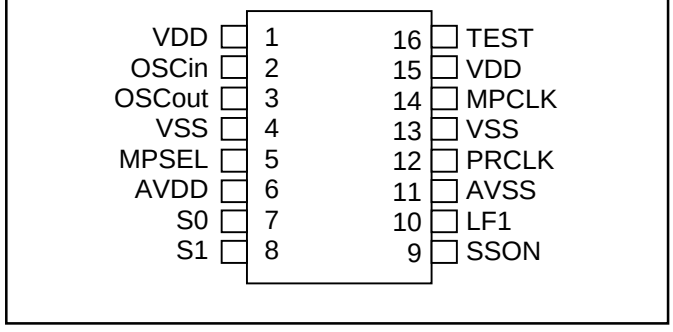


PRODUCT DESCRIPTION

The IMISG501 is a spectrum spread clock generator specially designed for personal computers, laser printers and other digital systems. IMISG501 uses a patent pending concept to generate popular clock frequencies that are intentionally broadbanded to reduce electromagnetic interference. IMISG501 attenuates the radiated emission amplitudes from products associated with either the clock harmonics or any signals derived from the clock signals nominally 10 db and could significantly reduce the cost of complying with the regulatory requirements.

PRCLK is the broadbanded output and can be programmed to generate 50, 25, 20 and 10 Mhz with S0 and S1 bits. A single, low cost external crystal is required as reference frequency for the synthesizer. Output modulation function can be turned off with the SSON pin. Several power down modes add the flexibility to operate the device in a completely static mode to reduce standby currents and simplify system board tests.

PDIP/SOIC CONNECTION DIAGRAM



APPLICATIONS

IMISG501 eliminates the need for multiple oscillators and generates the CPU clock signals for personal computers, laser printers and other digital systems. Supports 8086-, 80286-, 80386-, 80486-, Pentium™- and 29000-based designs. IMISG501 can be used with laptop or notebook computers to save power by running the system slower than normal CPU speeds or completely disabling the clocks in standby mode.

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PIN DESCRIPTION

OSCin, OSCout - These pins form an on-chip reference oscillator when connected to terminals of an external 44.2 Mhz third overtone parallel resonant crystal. OSCin may also serve as an input for an externally generated CMOS level or AC coupled reference signal.

S0, and S1 - Frequency select inputs. These inputs control the PRCLK frequency selection. S0-S1 inputs control the CPU clock frequencies. All these inputs have internal pull-downs.

Table 1 shows the output freuqncy selection conditions.

TEST - Controls power down and Test Mode selection. When high, S0-S1 and MPSEL controls the mode selection as shown on Table 1 and Table 2. When low, device operates in normal mode. This pin has an internal pull-down.

MPSEL - Controls MPCLK output frequency selections. Table 2 shows the selected frequencies for MPCLK. This input has an internal pull-up.

SSON - This pin controls the sprectrum spread function. When low, PRCLK is modulated. When high, spread is turned off. This pin has an internal pull-up.

LF1 - This is the control output for the clock generator. It is a single-ended, tri-state output. Component connections are shown in Figure 1.

MPCLK - This is a nonmodulated output. This output can be programmed to be 3.7 Mhz or 11.06 mHz. The selection of these frequencies are controlled by the MPSEL pin shown in Table 1.

PRCLK - Output from the spectrum spread clock generator. Frequency selection is shown on Table 1. When the SSON pin is high, outputs are not modulated. When SSON is low, spectrum spread function is enabled.

VSS - Circuit ground

VDD - Positive power supply

AVSS - Analog circuit ground

AVDD - Analog positive power supply

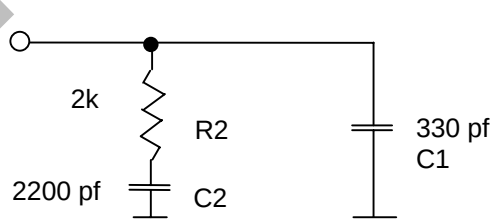

Figure 1

PRCLK FREQUENCY SELECTION			
Inputs			Output
TEST	S1	S0	PRCLK
0	0	0	9.96 Mhz
0	0	1	19.92 Mhz
0	1		24.9 Mhz
0	1	1	49.80 Mhz
1	0	0	0; Power Down
1	0	1	1; Power Down
1	1	0	TEST
1	1	1	Hi-Z

TABLE 1: When Power Down address is slected, the VCO is turned off and the device goes to standby mode. Phase detector is in tri-state mode.

MPCLK FREQUENCY SELECTION				
Inputs				Output
TEST	MPSEL	S1	S0	PRCLK
0	0	X	X	3.7 Mhz
0	1	X	X	11.06 MHz
1	X	0	0	0; Power Down
1	X	0	1	1; Power Down
1	X	1	0	TEST
1	X	1	1	Hi-Z

TABLE 2: When Power Down address is selected, the VCO is turned off and the device goes to standby mode. Phase detector is in tri-state mode.

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MAXIMUM RATINGS

Voltage Relative to VSS:	-0.3V to 7V
Voltage Relative to VDD:	0.3V
Storage Temperature:	-65°C to 150°C
Ambient Temperature:	-0°C to 70°C
Recommend Operating Range:	4.5-5.5V

This device contains circuitry to protect the inputs against damage due to high static voltages or electric field; however, precautions should be taken to avoid application of any voltage higher than the maximum rated voltages to this circuit. For proper operation, Vin and Vout should be constrained to the range:

$V_{SS} < (Vin \text{ or } Vout) < V_{DD}$

All inputs are tied high or low internally.

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units
Input Low Voltage	V_{IL}	-	-	0.8	Vdc
Input High Voltage	V_{IH}	2.0	-	-	Vdc
Input Low Current with Pull-up/ Pull-down	$I_{IL/IH}$	-	-	10/100	µA
Output Low Voltage IOL = 6mA	V_{OL}	-	-	0.4	Vdc
Output High Voltage IOH=6mA	V_{OH}	2.5	-	-	Vdc
Tri-State leakage Current	I_{OZ}	-	-	10	µA
Static Supply Current	I_{DD}	-	-	250	µA
Dynamic Supply Current	I_{CC}	-	25	30	mA
Short Circuit Current	I_{SC}	25	-	-	mA

VDD = 5V ± 10%, TA = 0°C to 70°C

SWITCHING CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units
Output Rise and Fall Time Measured at 10% - 90% of VDD	*tTLH, tTHL*	-	-	*5*	*ns*
Output Rise and Fall Time Measured at 0.8V - 2.0V	*tTLH, tTHL*	-	-	*3*	*ns*
Output Duty Cycles	*TsymF1*	-	-	*45/55*	*%*
Jitter One Sigma	*tj1s*	-	-	*2*	*% of Fout*
Cycle-to-Cycle Jitter with Normal Crystal	*tjcc*	-	-	*50*	*ps*
					VDD = 5 10%, TA = 0°C to 70°C, CL = 15 pF

OSCILLATOR CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Transconductance	gm	20	80	18	Millimhos	@ 44.2 Mhz
Output Impedance	Zo	-	2	800	ohms	@ 44.2 Mhz
Input Capacitance	Ci	8	1	18	pf	-
Output Capacitance	Co		6		pf	-
DC Bias Voltage	Vb	1.5	VDD	3.5	Volt	-
Start-up Time	ts	-	-	2	ms	@ VDD = 4.5V
Duty Cycle	TsymF1	-		45/55	%	-
Input Rise Time OSCin	TCLKr	-	-	20	ns	-

VCO CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
VCO Gain	Ko	35	55	65	MHz/Volt	ΔF/ΔV Measured with VCO Control at 2V - 3V
Phase Detector Gain	Kd	100	145	200	μA/rad	

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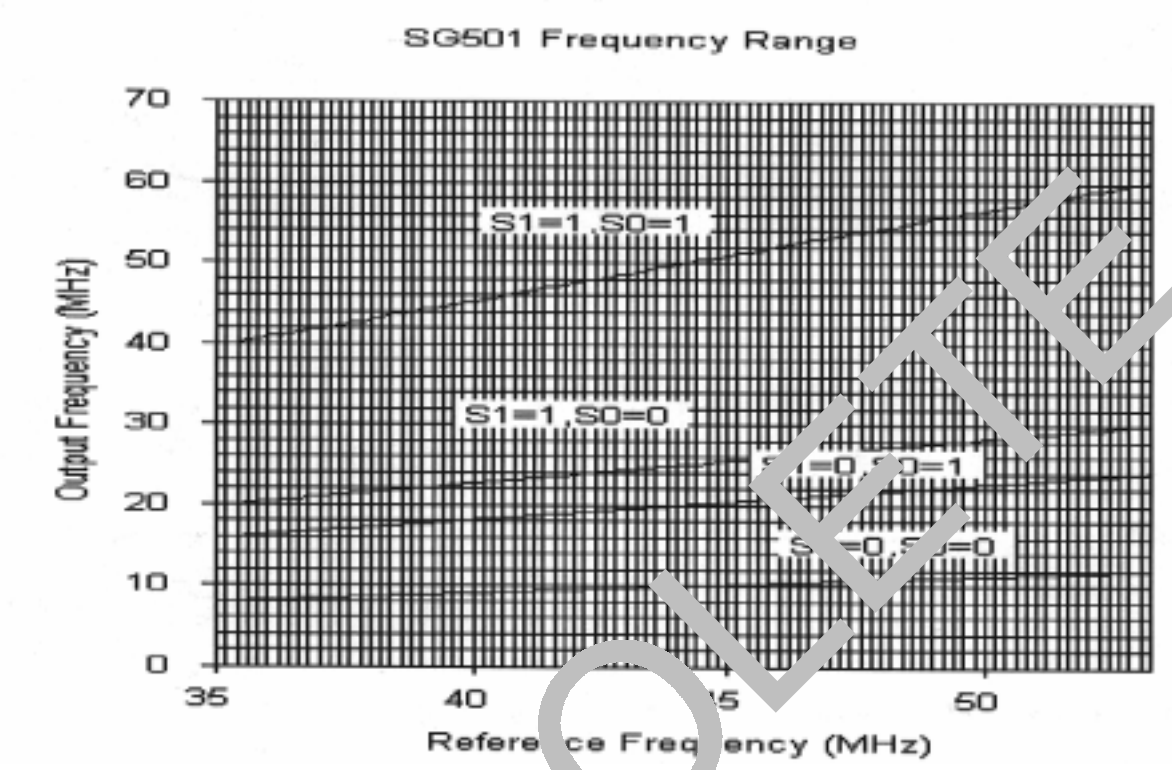
CHARTS



FREQUENCY SELECTION		
S0	S1	SCALING FACTOR $\left(\frac{\text{PRCLK}}{\text{REFERENCE}}\right)$
0	0	.225
0	1	.450
1	0	.562
1	1	1.25

Reference Range: 35 Mhz $_{MIN}$ to 55 MHZ$_{MAX}$
Output Range: 8 MHz$_{MIN}$ to 60 MHz$_{MAX}$

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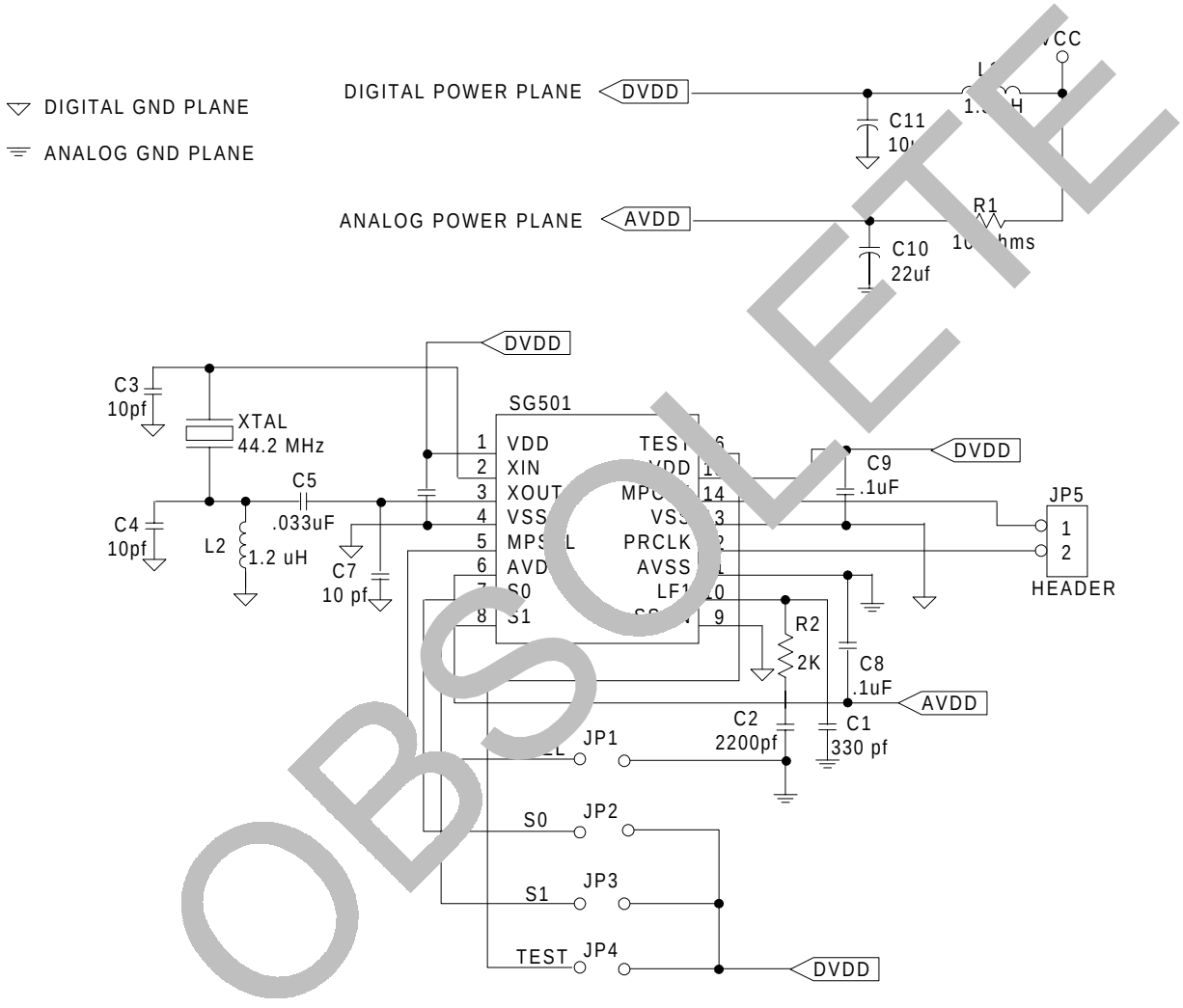
EXTERNAL CONNECTIONS



NOTE1: KEEP C3, C4, C5, C6 CLOSE TO THEIR PINS (4, 11, 13, 10, 9 RESPECTIVELY).

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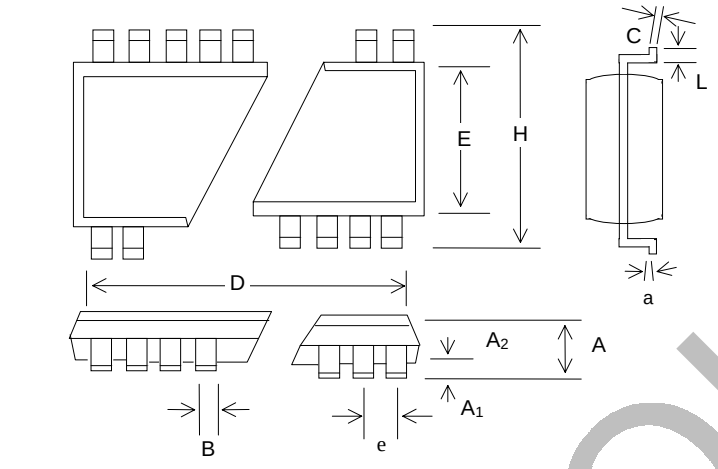
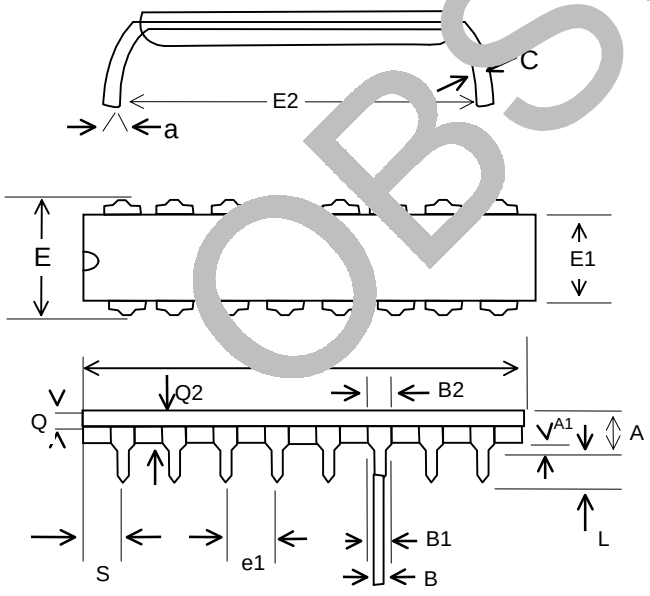
PACKAGE DRAWING AND DIMENSIONS





16 PIN SOIC OUTLINE DIMENSIONS

SYMBOL	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A			0.104	2.46	2.56	2.64
A_1	0020	0.0	15	0.060	0.22	0.38
A2		0.092	0.111	2.29	2.34	2.39
B	0.014	0.016	0.019	0.35	0.41	0.48
C	0.0091	0.010	0.0125	0.23	0.25	0.32
D	.399	.407	.412	10.13	10.34	10.46
E	.285	0.296	0.299	7.24	7.52	7.59
e	0.050 BSC			1.27 BSC		
H	0.400	0.406	0.410	10.16	10.31	10.41
a	0°	5°	10°	0°	5°	10°
L	0.024	0.032	0.040	0.61	0.81	1.02

16-PIN PLASTIC DIP DIMENSIONS

SYMBOL	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.150	0.160	0.170	3.81	4.06	4.318
A_1	0.015	-	-	0.381	-	-
B	0.016	0.018	0.020	0.40	0.45	0.50
B_1	0.056	0.059	0.062	1.47	1.52	1.57
B_2	0.046	0.049	0.052	1.17	1.24	1.32
C	0.008	0.010	0.012	0.20	0.25	0.30
D	0.748	0.750	0.752	19.00	19.05	19.10
E	0.300	0.312	0.325	7.62	7.924	8.255
E_1	0.240	0.252	0.260	6.096	6.49	6.604
E_2	0.335	0.345	0.355	8.51	8.76	9.01
e_1	0.100 BSC			2.54 BSC		
L	0.25	0.230	0.135	3.175	3.30	3.429
a	0°	7°	15°	0°	7°	15°
Q_1	0.059	0.060	0.061	1.50	1.53	1.55
Q_2	0.128	0.130	0.132	3.25	3.30	3.35
S	0.073	0.075	0.077	1.85	1.90	1.95

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ORDERING INFORMATION

Part Number	Package Type	Production Flow
IMISG501xPB	16 Pin Plastic Dip	Commercial, 0°C to + 70°C
IMISG501xXB	16 Pin SOIC	Commercial, 0°C to + 70C°

Note: The "x" following the IMI Device Number denotes the device revision. The ordering part number is formed by a combination of device number, device revision, package style, and screening as shown below.

Marking: Example: IMI
SG501xPB
Date Code, Lot #

IMISG501xPB

Flow

B = Commercial, 0°C to + 70°C

Package

P = Plastic Dip
X = Small Outline

Revision

IMI Device Number

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