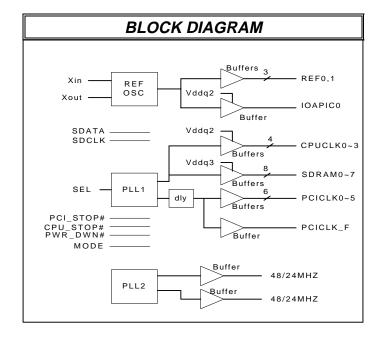


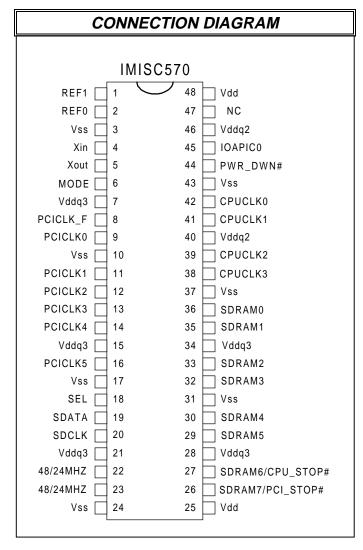
Preliminary

PRODUCT FEATURES

- Supports Pentium® Processor CPUs.
- 4 CPU clocks up to 8 loads.
- Up to 8 SDRAM clocks for 2 DIMMs.
- Supports Power Management.
- 7 PCI synchronous clocks.
- Optional common or mixed supply mode:
- (Vdd = Vddq3 = Vddq2 = 3.3V) or
- (Vdd = Vddq3 = 3.3V, Vddq2 = 2.5V)
- < 250ps skew CPU and SDRAM clocks.
- < 250ps skew among PCI clocks.
- I²C 2-Wire serial interface
- Programmable registers featuring:
 - enable/disable each output pin
 - mode as tri-state, test, or normal
 - 24/48 MHz selections
- 1 IOAPIC clock for multiprocessor support.
- 48-pin SSOP package
- Spread Spectrum Technology for up to 13dB of EMI reduction



FREQUENCY TABLE					
SEL	CPU	PCI			
0	60.0	30.0			
1	66.6	33.3			



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PIN DESCRIPTION

Xin, Xout - These pins form an on-chip reference oscillator when connected to terminals of an external parallel resonant crystal (nominally 14.318 MHz). Xin may also serve as input for an externally generated reference signal.

SEL - Standard frequency select input. It has internal pull-up.

CPUCLK(0:3) - Low skew (<250 pS) clock outputs for host frequencies such as CPU, Chipset, Cache. Vddq2 is the supply voltage for these outputs.

SDRAM(0:5) - Synchronous DRAM DIMs clocks. They are powered by Vddq3.

SDRAM6/CPU_STOP# - If MODE=1, this pin is a Synchronous DRAM DIMs clock output powered by Vddq3. If MODE=0, this pin is a CPU_STOP# input signal, where a low level stops the CPU however, the SDRAM clocks will stay active. It has an internal pullup.

SDRAM7/PCI_STOP# - If MODE=1, this pin is a Synchronous DRAM DIMs clock output powered by Vddq3. If MODE=0, this pin is a PCI_STOP# input signal, where a low level stops the PCI clocks. It has an internal pull-up.

MODE - A low level on this pin causes pins 26, and 27 to be power management inputs PCI_STOP#, and CPU_STOP# respectly. A high level on this pin causes pins 26, and 27 to be clock output signals SDRAM7, and SDRAM6 respectively. It has an internal pull-up resistor.

PCICLK(0:5) - Low skew (<250pS) clock outputs for PCI frequencies. These buffers voltage level is controlled by Vddq3

PCICLK_F - A PCI clock output that does not stop until in power down mode. It is synchronous with other PCI clocks.

REF(0:1) - Buffered outputs of on-chip reference.

IOAPIC0 - Buffered output of 14.3MHZ for multiprocessor support. It is powered by Vddq2.

PWR_DWN# - Power down pin. When this pin is asserted low, the IC is in shutdown mode where all circuitry is turned off including VCO, crystal buffer and PCICLK_F. It has an internal pull-up. The I²C interface is disabled with the PWR_DWN# pin is low.

48/24MHz(0:1) - Programmable 48 MHZ or 24 MHZ clock outputs.

SDATA - serial data of I²C 2-wire control interface. Has internal pull-up resistor.

SDCLK - serial clock of I²C 2-wire control interface. Has internal pull-up resistor.

Vss - Ground pins for the chip.

Vdd - 3.3 Volt power supply pins for analog circuit and core logic.

Vddq3 - Power supply pins for 3.3V IO pins.

Vddq2 - Power supply pins for 2.5V/3.3V IO pins.



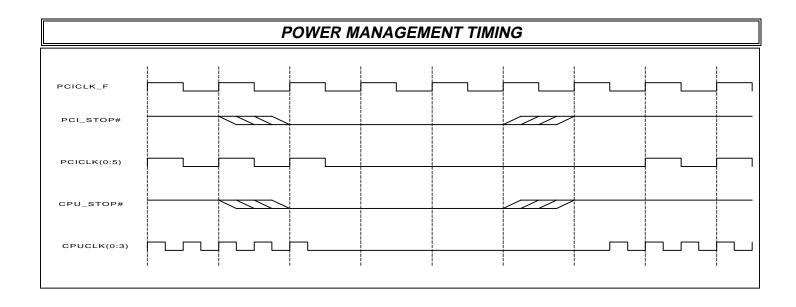
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POWER MANAGEMENT FUNCTIONS

All clocks can be individually enabled or stopped via the 2-wire control interface. All clocks are stopped in the low state. All clocks maintain a valid high period on transitions from running to stopped and on transitions from stopped to running when the chip was not powered down. On power up, the VCOs will stabilize to the correct pulse widths within about 0.2 mS. The CPU, SDRAM, and PCI clocks transition between running and stopped by waiting for one positive edge on PCICLK_F followed by a negative edge on the clock of interest, after which high levels of the output are either enabled or disabled.

When MODE=0, pins 26 and 27 are inputs PCI_STOP# and CPU_STOP# respectively (when MODE=1, these functions are not available). A particular output is enabled only when both the serial interface and these pins indicate that it should be enabled. The IMISG570 clocks may be disabled according to the following table in order to reduce power consumption. All clocks are stopped in the low state. All clocks maintain a valid high period on transitions from running to stopped. On low to high transitions of PWR_DWN#, external circuitry should allow 0.2 mS for the VCOs to stabilize prior to assuming the clock periods are correct. The CPU and PCI clocks transition between running and stopped by waiting for one positive edge on PCICLK_F followed by a negative edge on the clock of interest, after which high levels of the output are either enabled or disabled.

CPU_STOP#	PCI_STOP#	PWR_DWN#	CPUCLK	PCICLK	OTHER CLKs	XTAL & VCOs
X	Х	0	LOW	LOW	LOW	OFF
0	0	1	LOW	LOW	RUNNING	RUNNING
0	1	1	LOW	33/30 MHZ	RUNNING	RUNNING
1	0	1	66/60 MHZ	LOW	RUNNING	RUNNING
1	1	1	66/60 MHZ	33/30 MHZ	RUNNING	RUNNING





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2-WIRE I'C CONTROL INTERFACE

The 2-wire control interface implements a write only slave interface. The IMISG570D cannot be read back. Sub-addressing is not supported, thus all preceding bytes must be sent in order to change one of the control bytes. The 2-wire control interface allows each clock output to be individually enabled or disabled. It also allows 24/48 MHZ frequency selection and test mode enable.

During normal data transfer, the SDATA signal only changes when the SDCLK signal is low, and is stable when SDCLK is high. There are two exceptions to this. A high to low transition on SDATA while SDCLK is high is used to indicate the start of a data transfer cycle. A low to high transition on SDATA while SDCLK is high indicates the end of a data transfer cycle. Data is always sent as complete 8-bit bytes, after which an acknowledge is generated. The first byte of a transfer cycle is a 7-bit address with a Read/Write bit as the LSB. Data is transferred MSB first.

The device will respond to writes to 10 bytes (max) of data to address <u>D2</u> by generating the acknowledge (low) signal on the SDATA wire following reception of each byte. The device will not respond to any other control interface conditions. The I²C interface is disabled when the PWR_DWN# pin is low. Previously set control registers are retained.

SERIAL CONTROL REGISTERS

NOTE: The Pin# column lists the affected pin number where applicable. The @Pup column gives the state at true power up. Bytes are set to the values shown only on true power up, and not when the PWR_DWN# pin is activated.

Following the acknowledge of the Address Byte (D2), two additional bytes must be sent:

- 1) "Command Code " byte, and
- 2) "Byte Count" byte.

Although the data (bits) in these two bytes are considered "don't care", they <u>must be sent and will be</u> acknowledged.

Byte 0: Function Select Register

Bit	@Pup	Pin#	Description
7	0	*	Reserved
6	0	*	Reserved
5	0	*	Reserved
4	0	*	Reserved
3	1	23	48/24 Mhz (a"1" sets the output to 48MHz, a "0" sets the output to 24MHz)
2	1	22	48/24 Mhz (a"1" sets the output to 48MHz, a "0" sets the output to 24MHz)
1	0		Bit1 Bit0
0	0		1 1 Tri-State
			1 0 Spread Spectrum operating mode
			0 1 Test Mode
			0 0 Normal operating mode



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SERIAL CONTROL REGISTERS (Cont.)

Function Table

Function	Outputs								
Description	CPU	CPU PCI SDRAM Ref IOAPIC 24MHZ 48MHZ							
Tri-State	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z		
Test Mode	Tclk/2	Tclk/4	Tclk/2	Tclk	Tclk	Tclk/4	Tclk/2		
Normal SEL=1	66	CPU/2	CPU	14.318	14.318	24	48		
Normal SEL=0	60	CPU/2	CPU	14.318	14.318	24	48		

Notes:

- 1. Tclk is a test clock over driven on the Xin input during test mode.
- 2. The frequency ratio Fout/Fin for the USB output is 3.35294.

Byte 1: CPU, 48/24 MHz Clock Register (1 = enable, 0 = Stopped)

Bit	@Pup	Pin#	Description			
7	1	23	48/24 MHz enable/Stopped			
6	1	22	48/24 MHz enable/Stopped			
5	Х	-	Reserved			
4	Х	-	Reserved			
3	1	38	CPUCLK3 enable/Stopped			
2	1	39	CPUCLK2 enable/Stopped			
1	1	41	CPUCLK1 enable/Stopped			
0	1	42	CPUCLK0 enable/Stopped			

Byte 2: PCI Clock Register (1 = enable, 0 = Stopped)

Bit	@Pup	Pin#	Description			
7	Х	-	Reserved			
6	1	8	PCICLK_F enable/Stopped			
5	1	16	PCICLK5 enable/Stopped			
4	1	14	PCICLK4 enable/Stopped			
3	1	13	PCICLK3 enable/Stopped			
2	1	12	PCICLK2 enable/Stopped			
1	1	11	PCICLK1 enable/Stopped			
0	1	9	PCICLK0 enable/Stopped			



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SERIAL CONTROL REGISTERS(Continued)

Byte 3: SDRAM Clock Register (1 = enable, 0 = Stopped)

Bit	@Pup	Pin#	Description			
7	1	26	SDRAM7 enable/Stopped			
6	1	27	SDRAM6 enable/Stopped			
5	1	29	SDRAM5 enable/Stopped			
4	1	30	SDRAM4 enable/Stopped			
3	1	32	SDRAM3 enable/Stopped			
2	1	33	SDRAM2 enable/Stopped			
1	1	35	SDRAM1 enable/Stopped			
0	1	36	SDRAM0 enable/Stopped			

Byte 4: Additional SDRAM Clock Register (1 = enable, 0 = Stopped)

Bit	@Pup	Pin#	Description		
7	х	-	Reserved		
6	х	-	Reserved		
5	Х	-	Reserved		
4	Х	-	Reserved		
3	х	-	Reserved		
2	Х	-	Reserved		
1	Х	-	Reserved		
0	х	-	Reserved		

Byte 5: Peripheral Control (1 = enable, 0 = Stopped)

Bit	@Pup	Pin#	Description			
7	Х	-	Reserved			
6	Х	-	Reserved			
5	1	-	Reserved			
4	1	45	IOAPIC0 enable/Stopped			
3	Х	-	Reserved			
2	1	47	Reserved			
1	1	1	REF1 enable/Stopped			
0	1	2	REF0 enable/Stopped			



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SERIAL CONTROL REGISTERS(Continued)

Byte 6: Reserved Register

Bit	@Pup	Pin#	Description		
7	х	-	Reserved		
6	Х	-	Reserved		
5	Х	-	Reserved		
4	Х	-	Reserved		
3	Х	-	Reserved		
2	Х	-	Reserved		
1	Х	-	Reserved		
0	х	-	Reserved		

Byte 7: Frequency Control

At power up, bit2 of this Byte defaults to "1", the frequency is controlled by the SEL pin 18. If bit2 is forced to a zero "0", then the CPU/SDRAM clock frequencies become 33 MHz and the PCI clock frequencies will be 16.6MHz. The IC is set to doze mode.

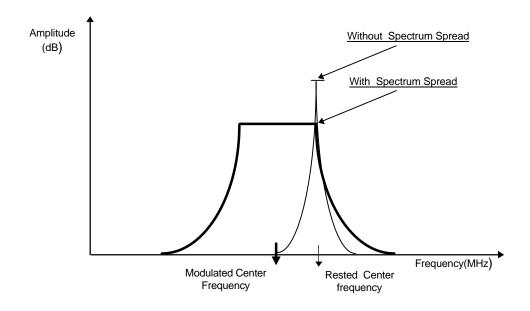
Bit	@Pup	Description
7	х	Reserved
6	х	Reserved
5	х	Reserved
4	х	Reserved
3	х	Reserved
2	1	Doze (see description above)
1	Х	Reserved
0	х	Reserved



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Spread Spectrum Clock Generation (SSCG)

Spread Spectrum is a modulation technique applied here for maximum efficiency in minimizing Electro-Magnetic Interference radiation generated from repetitive digital signals mainly clocks. A clock accumulates EM energy at the center frequency it is generating. Spread Spectrum distributes this energy over a small frequency bandwidth therefore spreading the same amount of energy over a spectrum. This technique is achieved by modulating the clock down from its resting frequency by a certain percentage (which also determines the energy distribution bandwidth). In this product, the modulation is 1.0% down from the resting frequency.



Spectrum Analysis





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MAXIMUM RATINGS

Voltage Relative to VSS:

Voltage Relative to VDD:

Storage Temperature:

Operating Temperature:

Maximum Power Supply:

-0.3V

0°C to + 125°C

0°C to +70°C

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:

VSS<(Vin or Vout)<VDD

Unused inputs must always be tied to an appropriate logic voltage level (either VSS or VDD).

ELECTRICAL CHARACTERISTICS								
Characteristic	Symbol	Min	Тур	Max	Units	Conditions		
Input Low Voltage	VIL	-	-	0.8	Vdc	-		
Input High Voltage	VIH	2.0	-	-	Vdc	-		
Input Low Current	IIL			-66	μA			
Input High Current	IIH			5	μA			
Output Low Voltage	VOL	-	-	0.4	Vdc	All Outputs (see buffer spec)		
IOL = 4mA								
Output High Voltage	VOH	2.4	-	-	Vdc	All Outputs Using 3.3V Power		
IOH = 4mA						(see buffer spec)		
Tri-State leakage Current	loz	ı	-	10	μA			
Dynamic Supply Current	Idd	•	-	90	mA	CPU = 66.6 MHz, PCI = 33.3 MHz		
Static Supply Current	Isdd	-	-	150	μA	Powered Down = 1		
Short Circuit Current	ISC	25	-	-	mA	1 output at a time - 30 seconds		
	·		VOD	VDDO	0.01/ 5.0/	VDD00 0.5VIEW TA 000 to . 7000		

 $VDD = VDDQ3 = 3.3V \pm 5\%$, $VDDQ2 = 2.5V \pm 5\%$, TA = 0% to +70%



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SWITCHING CHARACTERISTICS							
Characteristic	Symbol	Min	Тур	Max	Units	Conditions	
Output Duty Cycle	-	45	50	55	%	Measured at 1.5V	
CPU to PCI Offset	tOFF	1	-	4	ns	15 pf Load Measured at 1.5V	
Buffer out Skew All CPU and PCI Buffer Outputs	tSKEW	-	-	250	ps	15 pf Load Measured at 1.5V	
ΔPeriod Adjacent Cycles	ΔΡ	-	-	<u>+</u> 250	ps	-	
Jitter Spectrum 20 dB Bandwidth from Center	BWJ			500	KHz		
Overshoot/Undershoot Beyond Power Rails	V _{over}	-	-	1.5	V	22 ohms @ source of 8 inch PCB run to 15 pf load	
Ring Back Exclusion	V_{RBE}	0.7		2.1	V	note1	

 $VDD = VDDQ3 = 3.3V \pm 5\%$, $VDDQ2 = 2.5V \pm 5\%$, TA = 0°C to +70°C

note 1: Ring Back must not enter this range.

note 1. King Back must not once this range.								
TYPE 1 BUFFER CHARACTERISTICS FOR CPUCLK(0:3)								
Symbol	Min	Тур	Max	Units	Conditions			
IOH	-91	-131	-183	mA	Vout = 1.0 V			
IOH	-43	-62	-87	mA	Vout = 2.0 V			
IOL	83	119	167	mA	Vout = 1.2 V			
IOL	26	38	53	mA	Vout = 0.3 V			
TRF _{min}	0.4	-	-	nS	10 pF Load			
TRF _{max}	-	-	2.0	nS	20 pF Load			
	E 1 BUFFE Symbol IOH IOH IOL TRF _{min}	E 1 BUFFER CH Symbol Min IOH -91 IOH -43 IOL 83 IOL 26 TRF _{min} 0.4	E 1 BUFFER CHARAC Symbol Min Typ IOH -91 -131 IOH -43 -62 IOL 83 119 IOL 26 38 TRF _{min} 0.4 -	E 1 BUFFER CHARACTERISTI Symbol Min Typ Max IOH -91 -131 -183 IOH -43 -62 -87 IOL 83 119 167 IOL 26 38 53 TRF _{min} 0.4 - -	E 1 BUFFER CHARACTERISTICS FOR Symbol Min Typ Max Units IOH -91 -131 -183 mA IOH -43 -62 -87 mA IOL 83 119 167 mA IOL 26 38 53 mA TRF _{min} 0.4 - - nS			

 $VDD = VDDQ3 = 3.3V \pm 5\%$, $VDDQ2 = 2.5V \pm 5\%$, $TA = 0^{\circ}C$ to $+70^{\circ}C$

 $VDD = VDDQ3 = 3.3V \pm 5\%$, $VDDQ2 = 2.5V \pm 5\%$, TA = 0% to +70%

TYPE 2 BUFFER CHARACTERISTICS FOR IOAPIC								
Characteristic	Symbol	Min	Тур	Max	Units	Conditions		
Pull-Up Current	IOH	-91	-131	-183	mA	Vout = 1.0 V		
Pull-Up Current	IOH	-43	-62	-87	mA	Vout = 2.0 V		
Pull-Down Current	IOL	83	119	167	mA	Vout = 1.2 V		
Pull-Down Current	IOL	26	38	53	mA	Vout = 0.3 V		
Rise/Fall Time Min Between 0.4 V and 2.0 V	TRF _{min}	0.4	-	-	nS	10 pF Load		
Rise/Fall Time Max Between 0.4 V and 2.0 V	TRF _{max}	-	-	1.9	nS	20 pF Load		



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TYPE 3 BUFFER CHARACTERISTICS FOR REF(1) and 48/24 MHz							
Characteristic	Symbol	Min	Тур	Max	Units	Conditions	
Pull-Up Current	IOH	-40	-53	-69	mA	Vout = 1.0 V	
Pull-Up Current	IOH	-32	-42	-53	mA	Vout = 2.0 V	
Pull-Down Current	IOL	37	47	58	mA	Vout = 1.2 V	
Pull-Down Current	IOL	12	15	19	mA	Vout = 0.3 V	
Rise/Fall Time Min Between 0.4 V and 2.4 V	TRF _{min}	1.0	-	-	nS	10 pF Load	
Rise/Fall Time Max Between 0.4 V and 2.4 V	TRF _{max}	-	-	2.0	nS	20 pF Load	
	VDD = V	DDQ3 =	3.3V ±5	%, VDD	Q2 = 2.3	5V±5%, TA = 0°C to +70°C	

TYPE 4 BUFFER CHARACTERISTICS FOR REF0 and SDRAM(0:7)								
Characteristic	Symbol	Min	Тур	Max	Units	Conditions		
Pull-Up Current	IOH	-94	-134	-188	mA	Vout = 1.0 V		
Pull-Up Current	IOH	-74	-106	-148	mA	Vout = 2.0 V		
Pull-Down Current	IOL	83	119	167	mA	Vout = 1.2 V		
Pull-Down Current	IOL	26	38	53	mA	Vout = 0.3 V		
Rise/Fall Time Min Between 0.4 V and 2.4 V	TRF _{min}	0.5	-	-	nS	20 pF Load		
Rise/Fall Time Max Between 0.4 V and 2.4 V	TRF _{max}	-	-	2.0	nS	30 pF Load		
	VDD = V	DDQ3 =	3.3V ±5	%, VDD	Q2 = 2.3	5V±5%, TA = 0°C to +70°C		

TYPE 5 BUFFER CHARACTERISTICS FOR PCICLK(0:5,F)								
Characteristic	Symbol	Min	Тур	Max	Units	Conditions		
Pull-Up Current	IOH	-94	-134	-188	mA	Vout = 1.0 V		
Pull-Up Current	IOH	-74	-106	-148	mA	Vout = 2.0 V		
Pull-Down Current	IOL	83	119	167	mA	Vout = 1.2 V		
Pull-Down Current	IOL	26	38	53	mA	Vout = 0.3 V		
Rise/Fall Time Min Between 0.4 V and 2.4 V	TRF _{min}	0.5	-	-	nS	15 pF Load		
Rise/Fall Time Max Between 0.4 V and 2.4 V	TRF _{max}	-	-	2.0	nS	30 pF Load		
	VDD = V	DDQ3 =	3.3V ±59	%, VDD	Q2 = 2.	5V±5%, TA = 0°C to +70°C		



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	CRYSTAL AND REFERENCE OSCILLATOR PARAMETERS									
Characteristic	Symbol	Min	Тур	Max	Units	Conditions				
Frequency	Fo	12.00	14.31818	16.00	MHz					
Tolerence	TC	-	-	+/-100	PPM	Calibration note 1				
	TS	-	-	+/- 100	PPM	Stability (Ta -10 to +60C) note 1				
	TA	-	-	5	PPM	Aging (first year @ 25C) note 1				
Mode	OM	-	-	-		Parallell Resonant				
Pin Capacitance	СР		6		pF	Capacitance of XIN and Xout pins to ground (each)				
DC Bias Voltage	V _{BIAS}	0.3Vdd	Vdd/2	0.7Vdd	V					
Startup time	Ts	-	-	30	μS					
Load Capacitance	CL	-	20	-	pF	the crystals rated load. note 1				
Effective Series resonant resistance	R1	-	-	40	Ohms					
Power Dissipation	DL	-	-	0.10	mW	note 1				
Shunt Capacitance	СО	-		8	pF	crystals internal package capacitance (total)				

For maximum accuracy, the total circuit loading capacitance should be equal to CL. This loading capacitance is the effective capacitance across the crystal pins and includes the device pin capacitance (CP) in parallel with any circuit traces, the clock generator and any onboard discrete load capacitors. Budgeting Calculations

Typical trace capacitance, (< half inch) is 4 pF, Load to the crystal is therefore

Clock generator internal pin capacitance of 36 pF, Load to the crystal is therefore

External crystal loading capacitors (connect to ground)

the total parasitic capacitance would therefore be

2.0 pF

3.0 pF

15.0 pF

= 20.0.0 pF.

Note 1: It is recommended but not mandatory that a crystal meets these specifications.



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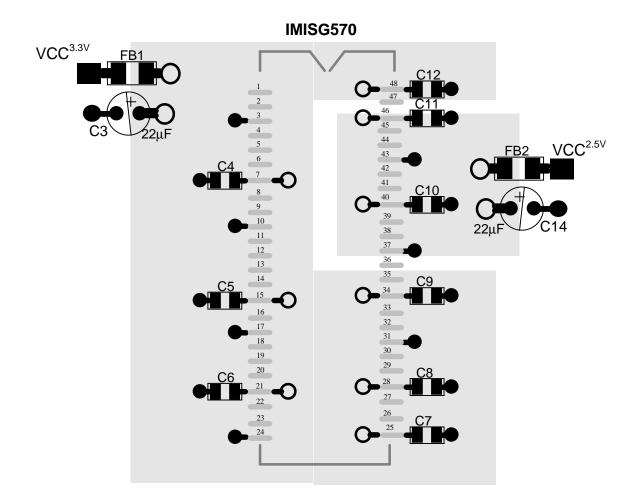
PCB LAYOUT SUGGESTION



Via to VDD Island

● V

Via to GND plane

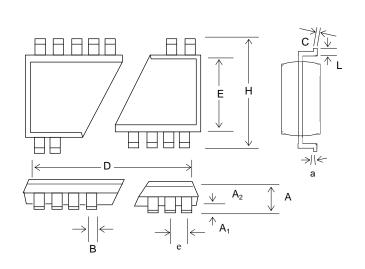


This is only a layout recommendation for best performance and lower EMI. The designer may choose a different approach but C4, C5, C6, C7, C8, C9, C10, C11and C12 (all are $0.1\mu f$) should always be used and placed close to their VDD pins.



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PACKAGE DRAWING AND DIMENSIONS



48 P	48 PIN SSOP OUTLINE DIMENSIONS									
		INCHES		MII	LLIMETE	RS				
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX				
Α	0.095	0.102	0.110	2.41	2.59	2.79				
A ₁	0.008	0.012	0.016	0.20	0.31	0.41				
A2	0.088	0.090	0.092	2.24	2.29	2.34				
В	0.008	0.010	0.0135	0.203	0.254	0.343				
С	0.005	-	0.010	0.127	-	0.254				
D	0.620	0.625	0.630	15.75	15.88	16.00				
Е	0.292	0.296	0.299	7.42	7.52	7.59				
е		0.025 BS0		C).635 BS	C				
Н	0.400	0.406	0.410	10.16	10.31	10.41				
а	0.10	0.013	0.016	0.25	0.33	0.41				
L	0.024	0.032	0.040	0.61	0.81	1.02				
а	00	5°	8º	00	5°	8º				
Х	0.085	0.093	0.100	2.16	2.36	2.54				

ORDERING INFORMATION							
Part Number	Package Type	Production Flow					
IMISG570CYB	48 PIN SSOP	Commercial, 0°C to +70°C					

The ordering part number is formed by a combination of device number, device revision, package style, and Note:

screening as shown below.

Marking: Example: IMI

SG570CYB

Date Code, Lot #

