

Mobile Pentium® Processor Application Clock Generator with SSCG, USB and Power Management Support

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Product Features

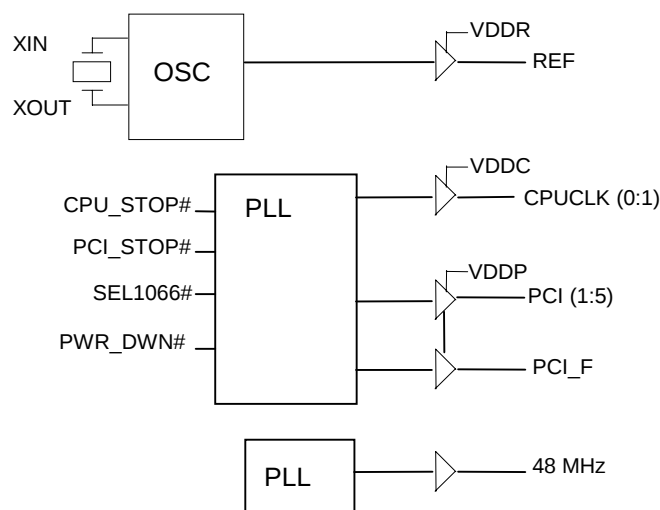
- Supports clock requirements for Mobile Pentium® Processor
- 2 Host and 5 PCI clocks
- Separate supply pins for mixed (3.3/2.5V) voltage application.
- <175ps skew among CPU clocks.
- < 250ps skew among PCI clocks.
- 48mhz for USB.
- 28-pin SSOP package for minimum board space.
- Power management capabilities

Frequency Table

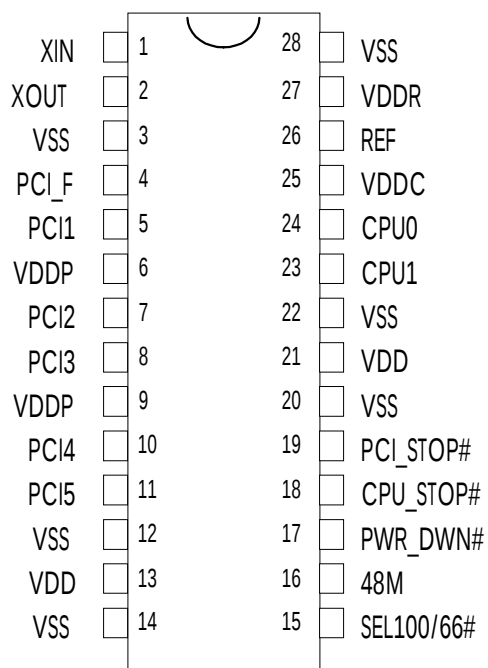
SEL100/66#	CPU	PCI
0	66.4 Mhz*	33.3 Mhz
1	99.8 Mhz**	33.2 MHz

*Down Spread 1.25% (total); **Down Spread .5% (total)

Block Diagram



Pin Configuration



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Pin Description

PIN No.	Pin Name	PWR	I/O	TYPE	Description
1	XIN	VDD	I	OSC1	On-chip reference oscillator input pin. Requires either an external parallel resonant crystal (nominally 14.318 MHz) or externally generated reference signal
2	XOUT	VDD	O	OSC1	On-chip reference oscillator output pin. Drives an external parallel resonant crystal. When an externally generated reference signal is used at Xin, this pin is left unconnected
15	SEL100/66#	-	I	PADI4	Frequency select input pins. See frequency select table on page 1.
23, 24	CPUCLK (0:1)	VDDC	O	BUF1	Clock outputs. CPU frequency table specified on page 1.
4	PCI_F	VDDP	O	BUF4	Free running PCI clock. When PCI_STP# = 0, this clock does NOT stop.
16	48M	VDD48	O	BUF3	48 MHz fixed clock.
5, 7, 8, 10, 11	PCI(1:5)	VDDP	O	BUF4	PCI bus clocks. See frequency select table on page 1.
26	REF	VDDR	O	BUF3	Buffered outputs of on-chip reference oscillator.
19	PCI_STOP#	-	I	PAD PU	When driven to a logic low level, this pin will synchronously stop all PCI clocks (except PCI_F) at a logic low level.
18	CPU_STOP#	-	I	PAD PU	When driven to a logic low level, this pin will synchronously stop all CPU clocks at a logic low level.
17	PWR_DWN#	-	I	PAD PU	This pin is active low. When asserted low, the device is in shutdown mode. VCO's, Crystal, and outputs are turned off.
13, 21	VDD	-	P	-	3.3 volt power supply for core logic.
3, 12, 14, 20, 22, 28	VSS	-	P	-	Ground pins for the device.
9, 6	VDDP	-	P	-	3.3 Volt power supply pins for PCI (1:5) and PCI_F clock output buffers.
25	VDDC	-	P	-	3.3 or 2.5 Volt power supply for CPUCLK (0:1) outputs.
27	VDDR	-	P	-	3.3 Volt power supply pins for reference clock output buffers and crystal circuit.

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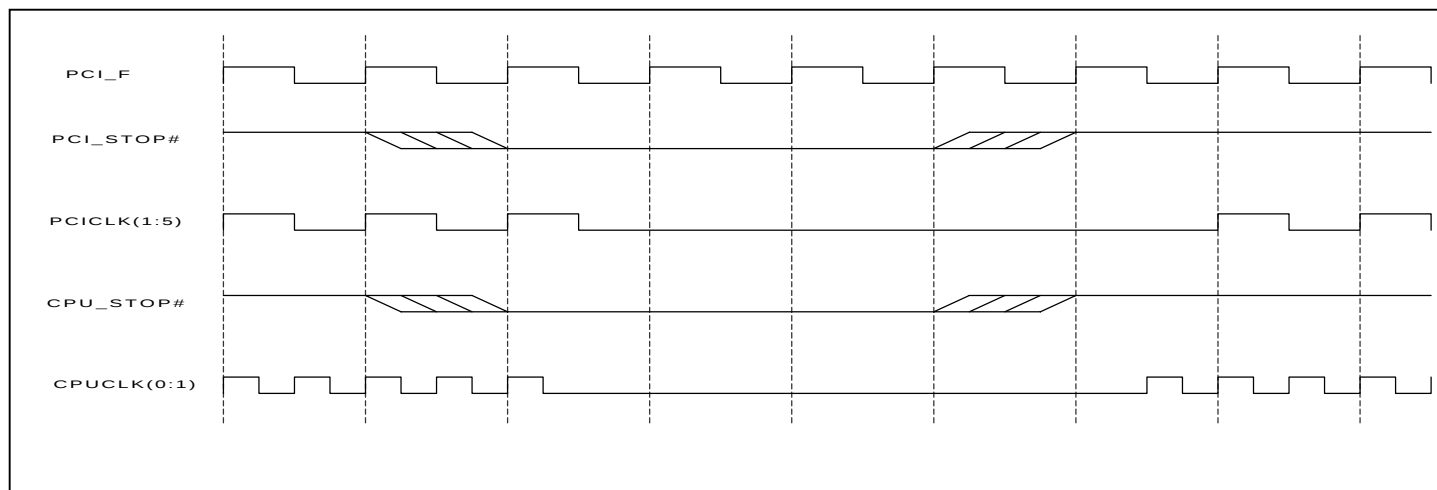
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Power Management Functions

All PCI (excluding PCI_F) and CPU clocks can be enabled or stopped via the PCI_STOP# and CPU_STOP# input pins. 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 0.2 mS. The CPU and PCI clocks transition between running and stopped by waiting for one positive edge on PCI_F followed by a negative edge on the clock of interest, after which high levels of the output are either enabled or disabled.

PWR_DWN#	CPU_STOP#	PCI_STOP#	CPUCLK	PCICLK	OTHER CLKs	XTAL & VCOs
1	0	0	LOW	LOW	RUNNING	RUNNING
1	0	1	LOW	RUNNING	RUNNING	RUNNING
1	1	0	RUNNING	LOW	RUNNING	RUNNING
1	1	1	RUNNING	RUNNING	RUNNING	RUNNING
0	x (don't care)	x (don'tcare)	LOW	LOW	LOW	OFF

Power Management Timing



Power Management Timing

Signal	Signal State	Latency
		No. of rising edges of free running PCICLK (PCIF)
CPU_STOP#	0 (disabled)	1
	1 (enabled)	1
PCI_STOP#	0 (disabled)	1
	1 (enabled)	1

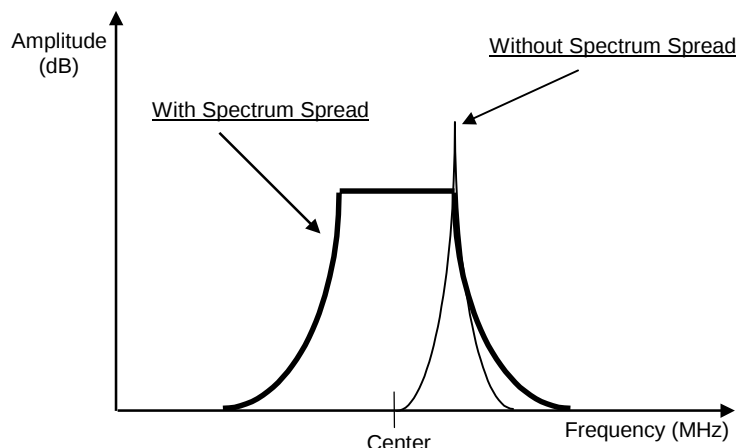
NOTES:

1. Clock on/off latency is defined in the number of rising edges of free running PCI CLOCK between the clock disable goes low/high to the first valid clock comes out of the device.

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Spectrum Spread Clocking

Down Spread



Spectrum Analysis

Maximum Ratings

Voltage Relative to VSS:	-0.3V
Voltage Relative to VDD:	0.3V
Storage Temperature:	-65°C to +150°C
Operating Temperature:	0°C to +70°C
Maximum Power Supply:	7V

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, V_{in} and V_{out} should be constrained to the range:

$$VSS < (V_{in} \text{ or } V_{out}) < VDD$$

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

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Electrical Characteristics

Characteristic	Symbol	Min	Typ	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 IOL = 4mA	VOL	-	-	0.4	Vdc	All Outputs (see buffer spec)
Output High Voltage IOH = 4mA	VOH	2.4	-	-	Vdc	All Outputs Using 3.3V Power (see buffer spec)
Tri-State leakage Current	Ioz	-	-	10	μA	
Dynamic Supply Current	Idd	-	-	140	mA	CPU = 66.6 MHz, PCI = 33.3 MHz
Static Supply Current	Isdd	-	-	70	μA	pwr_dwn# (PIN17) = 0
Short Circuit Current	ISC	25	-	-	mA	1 output at a time - 30 seconds
VDD = VDDP=VDDR =3.3V ±5%, VDDC = 2.5V ±5%, TA = 0°C to +70°C						

Switching Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Output Duty Cycle	-	45	50	55	%	Measured at 1.5V
CPU to PCI Offset	tOFF	1	3	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	ΔP	-	-	±250	ps	-
Jitter Spectrum 20 dB Bandwidth from Center	BW _J			500	KHz	
VDD = VDDP =VDDR =3.3V ±5%, VDDC = 2.5V ±5%, TA = 0°C to +70°C						

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Buffer Characteristics

Buffer Characteristics for CPUCLK(0:1)

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Pull-Up Current Min	IOH_{min}	-40	-	-	mA	$V_{out} = V_{DD} - 0.5V$
Pull-Up Current Max	IOH_{max}	-74	-	-	mA	$V_{out} = 1.25V$
Pull-Down Current Min	IOL_{min}	55	-	-	mA	$V_{out} = 0.4V$
Pull-Down Current Max	IOL_{max}	75	-	-	mA	$V_{out} = 0.6V$
Dynamic Output Impedance	Z_o	10	-	15	Ohms	66 and 100 MHz
Rise Time Between 0.4 V and 2.0 V	TR	0.4	-	1.6	nS	20 pF Load
Fall Time Between 0.4 V and 2.0 V	TF	0.5	-	1.6	nS	20 pF Load
$V_{DD} = V_{DDP} = V_{DDR} = 3.3V \pm 5\%$, $V_{DDC} = 2.5V \pm 5\%$, $T_A = 0^{\circ}C$ to $+70^{\circ}C$						

Buffer Characteristics for REF, 48M

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Pull-Up Current Min	IOH_{min}	-13	-	-	mA	$V_{out} = V_{DD} - 0.5V$
Pull-Up Current Max	IOH_{max}	-30	-	-	mA	$V_{out} = 1.5V$
Pull-Down Current Min	IOL_{min}	13	-	-	mA	$V_{out} = 0.4V$
Pull-Down Current Max	IOL_{max}	30	-	-	mA	$V_{out} = 1.5V$
Dynamic Output Impedance	Z_o	18	-	25	Ohms	66 and 100 MHz
Rise Time Between 0.4 V and 2.4 V	TR	0.5	-	2.0	nS	20 pF Load
Fall Time Between 0.4 V and 2.4 V	TF	0.5	-	2.0	nS	20 pF Load
$V_{DD} = V_{DDP} = V_{DDR} = 3.3V \pm 5\%$, $V_{DDC} = 2.5V \pm 5\%$, $T_A = 0^{\circ}C$ to $+70^{\circ}C$						

Buffer Characteristics for PCI_F, PCI(1:5)

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Pull-Up Current Min	IOH_{min}	-18	-	-	mA	$V_{out} = V_{DD} - 0.5V$
Pull-Up Current Max	IOH_{max}	-44	-	-	mA	$V_{out} = 1.5V$
Pull-Down Current Min	IOL_{min}	18	-	-	mA	$V_{out} = 0.4V$
Pull-Down Current Max	IOL_{max}	50	-	-	mA	$V_{out} = 1.5V$
Dynamic Output Impedance	Z_o	14	-	20	Ohms	66 and 100 MHz
Rise Time Between 0.4 V and 2.4 V	TR	0.5	-	2.0	nS	30 pF Load
Fall Time Between 0.4 V and 2.4 V	TF	0.5	-	2.0	nS	30 pF Load
$V_{DDP} = V_{DDR} = 3.3V \pm 5\%$, $V_{DDC} = 2.5V \pm 5\%$, $T_A = 0^{\circ}C$ to $+70^{\circ}C$						

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Crystal and Reference Oscillator Parameters

Characteristic	Symbol	Min	Typ	Max	Units	Conditions
Frequency	F ₀	12.00	14.31818	16.00	MHz	
Tolerance	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	-	-	-		Parallel Resonant
Pin Capacitance	CP		5		pF	Capacitance of XIN and Xout pins
DC Bias Voltage	V _{BIAS}	0.3Vdd	Vdd/2	0.7Vdd	V	
Startup time	Ts	-	-	30	μS	
Load Capacitance	CL	-	20	-	pF	Note 1
Effective Series resonant resistance	R1	-	-	40	Ohms	
Power Dissipation	DL	-	-	0.10	mW	Note 1
Shunt Capacitance	CO	-	--	7	pF	
X1 and X2 Load	CL		17		pF	Internal crystal loading capacitors on each pin (to ground)

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

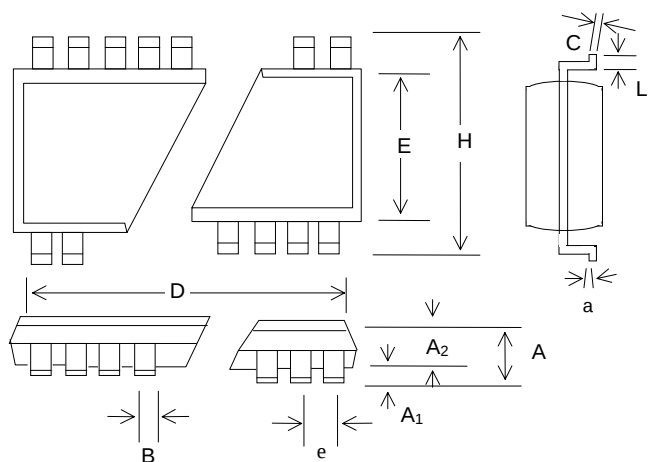
Typical trace capacitance, (< half inch) is 4 pF, Load to the crystal is therefore 2.0 pF
 Clock generator internal pin capacitance of 36 pF, Load to the crystal is therefore 18.0 pF
 the total parasitic capacitance would therefore be = 20.0 pF(matching CL)

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

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Package Drawing and Dimensions



28 Pin SSOP Outline Dimensions

SYMBOL	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.068	0.073	0.078	1.73	1.86	1.99
A ₁	0.002	0.005	0.008	0.05	0.13	0.21
A ₂	0.066	0.068	0.070	1.68	1.73	1.78
B	0.010	0.012	0.015	0.25	0.30	0.38
C	0.005	0.006	0.009	0.13	0.15	0.22
D	0.397	0.402	0.407	10.07	10.20	10.33
E	0.205	0.209	0.212	5.20	5.30	5.38
e	0.0256 BSC			0.65 BSC		
H	0.301	0.307	0.311	7.65	7.80	7.90
a	0°	4°	8°	0°	4°	8°
L	0.022	0.030	0.037	0.55	0.75	0.95

Ordering Information

Part Number	Package Type	Production Flow
IMISG556BYB	28 PIN SSOP	Commercial, 0°C to +70°C

Note: The ordering part number is formed by a combination of device number, device revision, package style, and screening as shown below.

Marking: Example: IMI
SG556BYB
Date Code, Lot #

