



# CYPRESS

**PRELIMINARY**

**W215B**

## Notebook PC System Frequency Generator for K6 Processors

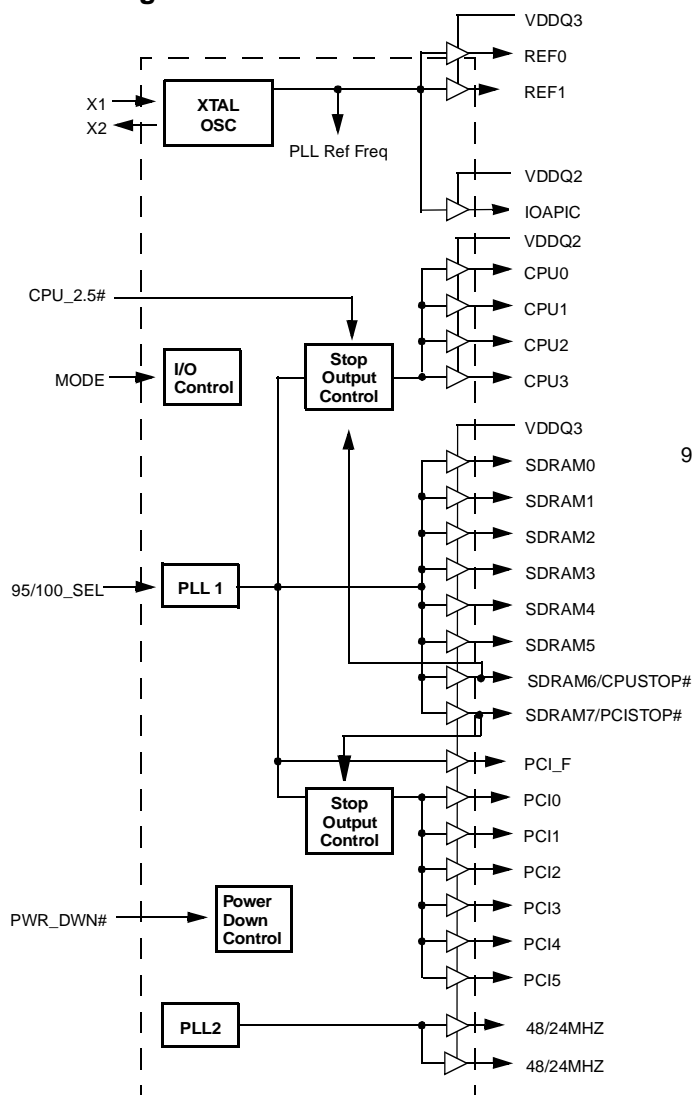
### Features

- Generates system clocks for CPU, IOAPIC, SDRAM, PCI, USB plus 14.318 MHz (REF0:1)
- MODE input pin selects optional power management input control pins (reconfigures pins 26 and 27)
- Two fixed outputs separately selectable as 24-MHz or 48-MHz (default = 48-MHz)
- $V_{DDQ3} = 3.3V \pm 5\%$ ,  $V_{DDQ2} = 3.3V \pm 5\%$
- Uses external 14.318-MHz crystal
- Available in 48-pin TSSOP (6.1-mm)
- 10 $\Omega$  CPU output impedance

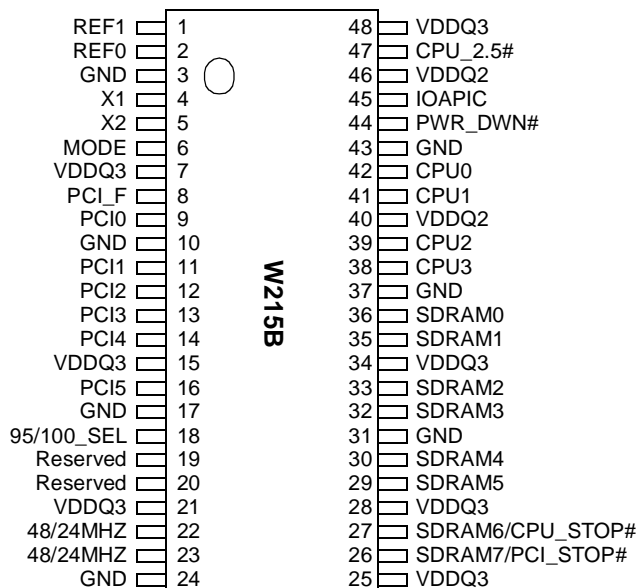
Table 1. Pin Selectable Frequency

95/100_SEL	CPU, SDRAM Clocks (MHz)	PCI Clocks
0	95.0	CPU/3
1	100.0	CPU/3

### Block Diagram



### Pin Configuration



**Pin Definitions**

Pin Name	Pin No.	Pin Type	Pin Description
CPU0:3	42, 41, 39, 38	O	<b>CPU Outputs 0 through 3:</b> These four CPU outputs are controlled by the CPU_STOP# control pin. Output voltage swing is controlled by voltage applied to VDDQ2.
PCI0:5	9, 11, 12, 13, 14, 16	O	<b>PCI Bus Outputs 0 through 5:</b> These six PCI outputs are controlled by the PCI_STOP# control pin. Output voltage swing is controlled by voltage applied to VDDQ3.
PCI_F	8	O	<b>Free Running PCI Output:</b> Unlike PCI0:5 outputs, this output is not controlled by the PCI_STOP# control pin. Output voltage swing is controlled by voltage applied to VDDQ3.
SDRAM0:5	36, 35, 33, 32, 30, 29	O	<b>SDRAM Clock Outputs 0 through 5:</b> These six SDRAM clock outputs run synchronous to the CPU clock outputs. Output voltage swing is controlled by voltage applied to VDDQ3.
SDRAM6/ CPU_STOP#	27	I/O	<b>SDRAM Clock Output 6 or CPU Clock Output Stop Control:</b> This pin has dual functions, selectable by the MODE input pin. When MODE = 0, this pin becomes the CPU_STOP# input. When MODE = 1, this pin becomes SDRAM clock output 6.  Regarding use as a CPU_STOP# input: When brought LOW, clock outputs CPU0:3 are stopped LOW after completing a full clock cycle (2–3 CPU clock latency). When brought HIGH, clock outputs CPU0:3 are started beginning with a full clock cycle (2–3 CPU clock latency).  Regarding use as a SDRAM clock: Output voltage swing is controlled by voltage applied to VDDQ3.
SDRAM7/ PCI_STOP#	26	I/O	<b>SDRAM Clock Output 7 or PCI Clock Output Stop Control:</b> This pin has dual functions, selectable by the MODE input pin. When MODE = 0, this pin becomes the PCI_STOP# input. When MODE = 1, this pin becomes SDRAM clock output 7.  PCI_STOP# input: When brought LOW, clock outputs PCI0:5 are stopped LOW after completing a full clock cycle. When brought HIGH, clock outputs PCI0:5 are started beginning with a full clock cycle. Clock latency provides one PCI_F rising edge of PCI clock following PCI_STOP# state change.  Regarding use as a SDRAM clock: Output voltage swing is controlled by voltage applied to VDDQ3.
IOAPIC	45	O	<b>I/O APIC Clock Output:</b> Provides 14.318-MHz fixed frequency. The output voltage swing is controlled by VDDQ2.
48/24MHz	22, 23	O	<b>48-MHz / 24-MHz Output:</b> Fixed clock outputs that default to 48 MHz following device power-up. Either or both can be changed to 24 MHz through use of the serial data interface (Byte 0, bits 2 and 3). Output voltage swing is controlled by voltage applied to VDDQ3.
REF0:1	2, 1	O	<b>Fixed 14.318-MHz Outputs 0 through 1:</b> Used for various system applications. Output voltage swing is controlled by voltage applied to VDDQ3. REF0 is stronger than REF1 and should be used for driving ISA slots.
CPU_2.5#	47	I	Set to logic 1 for 3.3V CPU I/O.
95/100_SEL	18	I	<b>95- or 100-MHz Input Selection:</b> Selects power-up default CPU clock frequency as shown in Table 1 on page 1 (also determines SDRAM and PCI clock frequency selections).
X1	4	I	<b>Crystal Connection or External Reference Frequency Input:</b> This pin has dual functions. It can be used as an external 14.318-MHz crystal connection or as an external reference frequency input.
X2	5	I	<b>Crystal Connection:</b> An input connection for an external 14.318-MHz crystal. If using an external reference, this pin must be left unconnected.

**Pin Definitions**

Pin Name	Pin No.	Pin Type	Pin Description
PWR_DWN#	44	I	<b>Power-Down Control:</b> When this input is LOW, device goes into a low-power standby condition. All outputs are actively held LOW while in power-down. CPU, SDRAM, and PCI clock outputs are stopped LOW after completing a full clock cycle (2–4 CPU clock cycle latency). When brought HIGH, CPU, SDRAM, and PCI outputs start with a full clock cycle at full operating frequency (3 ms maximum latency).
MODE	6	I	<b>Mode Control:</b> This input selects the function of device pin 26 (SDRAM7/PCI_STOP#) and pin 27 (SDRAM6/CPU_STOP#). Refer to description for those pins.
VDDQ3	7, 15, 21, 25 28, 34, 48	P	<b>Power Connection:</b> Power supply for PCI0:5, REF0:1, and 48-/24-MHz output buffers. Connected to 3.3V supply.
VDDQ2	46, 40	P	<b>Power Connection:</b> Power supply for IOAPIC0, CPU0:3 output buffer. Connected to 3.3V supply.
GND	3, 10, 17, 24, 31, 37, 43	G	<b>Ground Connection:</b> Connect all ground pins to the common system ground plane.
Reserved	19, 20	I	<b>Reserved Pins:</b> Connect to Logic 1.

## Absolute Maximum Ratings

Stresses greater than those listed in this table may cause permanent damage to the device. These represent a stress rating only. Operation of the device at these or any other conditions

above those specified in the operating sections of this specification is not implied. Maximum conditions for extended periods may affect reliability.

Parameter	Description	Rating	Unit
$V_{DD}, V_{IN}$	Voltage on any pin with respect to GND	-0.5 to +7.0	V
$T_{STG}$	Storage Temperature	-65 to +150	°C
$T_B$	Ambient Temperature under Bias	-55 to +125	°C
$T_A$	Operating Temperature	0 to +70	°C
$ESD_{PROT}$	Input ESD Protection	2 (min.)	kV

## DC Electrical Characteristics

$T_A = 0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ ,  $V_{DDQ3} = 3.3\text{V} \pm 5\%$  (3.135–3.465V),  $f_{XTL} = 14.31818\text{ MHz}$ ,  $V_{DDQ2} = 3.3\text{V} \pm 5\%$

Parameter	Description	Test Condition	Min.	Typ.	Max.	Unit
<b>Supply Current</b>						
$I_{DDQ3}$	Supply Current (3.3V)	CPU0:3 = 100 MHz Outputs Loaded <sup>[1]</sup>		150		mA
$I_{DDQ2}$	Supply Current (3.3V)	CPU0:3 = 100 MHz Outputs Loaded <sup>[1]</sup>		80		mA
<b>Logic Inputs</b>						
$V_{IL}$	Input Low Voltage				0.8	V
$V_{IH}$	Input High Voltage		2.0			V
$I_{IL}$	Input Low Current <sup>[2]</sup>				10	μA
$I_{IH}$	Input High Current <sup>[2]</sup>				10	μA
<b>Clock Outputs</b>						
$V_{OL}$	Output Low Voltage	$I_{OL} = 2\text{ mA}$			50	mV
$V_{OH}$	Output High Voltage	$I_{OH} = -1\text{ mA}$	3.1			V
$I_{OL}$	Output Low Current	CPU0:3	$V_{OL} = 1.5\text{V}$		140	mA
		SDRAM0:7	$V_{OL} = 1.5\text{V}$		110	mA
		PCI_F, PCI0:5	$V_{OL} = 1.5\text{V}$		110	mA
		IOAPIC	$V_{OL} = 1.5\text{V}$		95	mA
		REF0	$V_{OL} = 1.5\text{V}$		75	mA
		REF1	$V_{OL} = 1.5\text{V}$		70	mA
		48/24MHZ	$V_{OL} = 1.5\text{V}$		70	mA
$I_{OH}$	Output High Current	CPU0:3	$V_{OL} = 1.5\text{V}$		120	mA
		SDRAM0:7	$V_{OL} = 1.5\text{V}$		95	mA
		PCI_F, PCI0:5	$V_{OL} = 1.5\text{V}$		95	mA
		IOAPIC	$V_{OL} = 1.5\text{V}$		95	mA
		REF0	$V_{OL} = 1.5\text{V}$		80	mA
		REF1	$V_{OL} = 1.5\text{V}$		62	mA
		48/24MHZ	$V_{OL} = 1.5\text{V}$		60	mA

### Notes:

- All clock outputs loaded with maximum lump capacitance test load specified in AC Electrical Characteristics section.
- W215B logic inputs have internal pull-up devices (not CMOS level).

**DC Electrical Characteristics (continued)**
 $T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ ,  $V_{DDQ3} = 3.3\text{V} \pm 5\%$  (3.135–3.465V),  $f_{XTL} = 14.31818 \text{ MHz}$ ,  $V_{DDQ2} = 3.3\text{V} \pm 5\%$ 

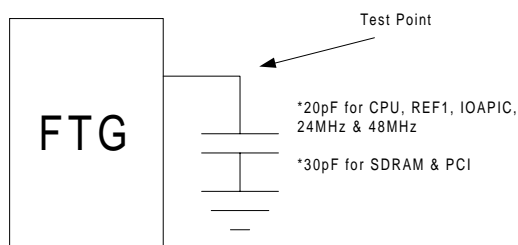
Parameter	Description	Test Condition	Min.	Typ.	Max.	Unit
<b>Crystal Oscillator</b>						
$V_{TH}$	X1 Input Threshold Voltage <sup>[3]</sup>	$V_{DDQ3} = 3.3\text{V}$		1.65		V
$C_{LOAD}$	Load Capacitance, Imposed on External Crystal <sup>[4]</sup>			14		pF
$C_{IN,X1}$	X1 Input Capacitance <sup>[5]</sup>	Pin X2 unconnected		28		pF
<b>Pin Capacitance/Inductance</b>						
$C_{IN}$	Input Pin Capacitance	Except X1 and X2			5	pF
$C_{OUT}$	Output Pin Capacitance				6	pF
$L_{IN}$	Input Pin Inductance				7	nH

**Notes:**

- X1 input threshold voltage (typical) is  $V_{DDQ3}/2$ .
- The W215B contains an internal crystal load capacitor between pin X1 and ground and another between pin X2 and ground. Total load placed on crystal is 14 pF; this includes typical stray capacitance of short PCB traces to crystal.
- X1 input capacitance is applicable when driving X1 with an external clock source (X2 is left unconnected).

**AC Electrical Characteristics (Lump Load Model)**
 $T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ ,  $V_{DDQ3} = 3.3\text{V} \pm 5\%$  (3.135–3.465V)  $f_{XTL} = 14.31818 \text{ MHz}$ ,  $V_{DDQ2} = 3.3\text{V} \pm 5\%$ 

AC clock parameters are tested and guaranteed over stated operating conditions using the stated lump capacitive load at the clock output.


**CPU Clock Outputs, CPU0:3 (Lump Capacitance Test Load = 20 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
$t_P$	Period	Measured on rising edge at 1.5V		10		ns
$f$	Frequency, Actual	Determined by PLL divider ratio		100		MHz
$t_H$	High Time	Duration of clock cycle above 2.4V		5		ns
$t_L$	Low Time	Duration of clock cycle below 0.4V		5		ns
$t_R$	Output Rise Edge Rate	Measured from 0.4V to 2.4V	1		4	V/ns
$t_F$	Output Fall Edge Rate	Measured from 2.4V to 0.4V	1		4	V/ns
$t_D$	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
$t_{JC}$	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			500	ps
$t_{SK}$	Output Skew	Measured on rising edge at 1.5V			250	ps
$f_{ST}$	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
$Z_o$	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		10		$\Omega$

**SDRAM Clock Outputs, SDRAM0:7 (Lump Capacitance Test Load = 30 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
t <sub>P</sub>	Period	Measured on rising edge at 1.5V		10		ns
f	Frequency, Actual	Determined by PLL divider ratio	100			MHz
t <sub>R</sub>	Output Rise Edge Rate	Measured from 0.4V to 2.4V	1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate	Measured from 2.4V to 0.4V	1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
t <sub>JC</sub>	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			500	ps
t <sub>SK</sub>	Output Skew	Measured on rising edge at 1.5V		100		ps
t <sub>SK</sub>	CPU to SDRAM Clock Skew	Covers all CPU/SDRAM outputs. Measured on rising edge at 1.5V.			1.5	ns
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		16		Ω

**PCI Clock Outputs, PCI0:5 (Lump Capacitance Test Load = 30 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
t <sub>P</sub>	Period	Measured on rising edge at 1.5V		30		ns
f	Frequency, Actual	Determined by PLL divider ratio	33.3			MHz
t <sub>H</sub>	High Time	Duration of clock cycle above 2.4V	12			ns
t <sub>L</sub>	Low Time	Duration of clock cycle below 0.4V	12			ns
t <sub>R</sub>	Output Rise Edge Rate		1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate		1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
t <sub>JC</sub>	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			500	ps
t <sub>SK</sub>	Output Skew	Measured on rising edge at 1.5V			250	ps
t <sub>O</sub>	CPU to PCI Clock Skew	Covers all CPU/PCI outputs. Measured on rising edge at 1.5V. CPU leads PCI output.	1		4	ns
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		15		Ω

**I/O APIC Clock Output (Lump Capacitance Test Load = 20 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.31818			MHz
t <sub>R</sub>	Output Rise Edge Rate		1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate		1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		15		Ω

**REF0 Clock Output (Lump Capacitance Test Load = 45 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.318			MHz
t <sub>R</sub>	Output Rise Edge Rate		1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate		1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		16		Ω

**REF1 Clock Output (Lump Capacitance Test Load = 20 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.318			MHz
t <sub>R</sub>	Output Rise Edge Rate		0.5		2	V/ns
t <sub>F</sub>	Output Fall Edge Rate		0.5		2	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45		55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		25		Ω

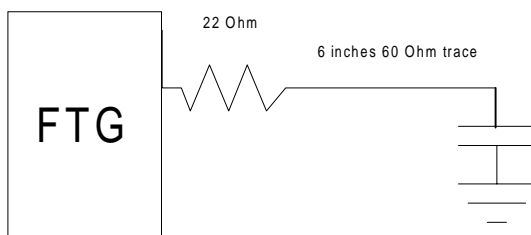
**48-/24-MHz Clock Output (Lump Capacitance Test Load = 20 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
m/n	PLL Ratio		57/17			
t <sub>R</sub>	Output Rise Edge Rate		0.5		2	V/ns
t <sub>F</sub>	Output Fall Edge Rate		0.5		2	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>0</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		25		Ω

**AC Electrical Characteristics (Transmission Line Model)**

T<sub>A</sub> = 0°C to +70°C, V<sub>DDQ3</sub> = 3.3V±5% (3.135–3.465V), f<sub>xTL</sub> = 14.31818 MHz, V<sub>DDQ2</sub> = 3.3±5%

AC clock parameters are tested and guaranteed over stated operating conditions using the stated transmission line load at the clock output.


**CPU Clock Outputs, CPU0:3 (Test Load: R = 33Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
t <sub>P</sub>	Period	Measured on rising edge at 1.5V		10		ns
f	Frequency, Actual	Determined by PLL divider ratio	100			MHz
t <sub>H</sub>	High Time	Duration of clock cycle above 2.4V		5		ns
t <sub>L</sub>	Low Time	Duration of clock cycle below 0.4V		5		ns
t <sub>R</sub>	Output Rise Edge Rate	Measured from 0.4V to 2.4V	1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate	Measured from 2.4V to 0.4V	1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
t <sub>JC</sub>	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			250	ps
t <sub>SK</sub>	Output Skew	Measured on rising edge at 1.5V			250	ps
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>0</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		10		Ω



**SDRAM Clock Outputs, SDRAM0:7 (Test Load: R = 22Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
t <sub>P</sub>	Period	Measured on rising edge at 1.5V		10		ns
f	Frequency, Actual	Determined by PLL divider ratio	100			MHz
t <sub>R</sub>	Output Rise Edge Rate	Measured from 0.4V to 2.4V	1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate	Measured from 2.4V to 0.4V	1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
t <sub>JC</sub>	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			250	ps
t <sub>SK</sub>	Output Skew	Measured on rising edge at 1.5V		100		ps
t <sub>SK</sub>	CPU to SDRAM Clock Skew	Covers all CPU/SDRAM outputs. Measured on rising edge at 1.5V.			850	ps
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		16		Ω

**PCI Clock Outputs, PCI0:5 (Test Load: R = 22Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
t <sub>P</sub>	Period	Measured on rising edge at 1.5V		30		ns
f	Frequency, Actual	Determined by PLL divider ratio	33.3			MHz
t <sub>H</sub>	High Time	Duration of clock cycle above 2.4V	12			ns
t <sub>L</sub>	Low Time	Duration of clock cycle below 0.4V	12			ns
t <sub>R</sub>	Output Rise Edge Rate		1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate		1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
t <sub>JC</sub>	Jitter, Cycle-to-Cycle	Measured on rising edge at 1.5V. Maximum difference of cycle time between two adjacent cycles.			250	ps
t <sub>SK</sub>	Output Skew	Measured on rising edge at 1.5V			250	ps
t <sub>O</sub>	CPU to PCI Clock Skew	Covers all CPU/PCI outputs. Measured on rising edge at 1.5V. CPU leads PCI output.	1		4	ns
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		15		Ω

**I/O APIC Clock Output (Test Load: R = 33Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.31818			MHz
t <sub>R</sub>	Output Rise Edge Rate		1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate		1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		15		Ω

**REF0 Clock Output (Test Load: R = 33Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.318			MHz
t <sub>R</sub>	Output Rise Edge Rate	Measured from 0.4V to 2.4V	1		4	V/ns
t <sub>F</sub>	Output Fall Edge Rate	Measured from 2.4V to 0.4V	1		4	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		16		Ω

**REF1 Clock Output (Lump Capacitance Test Load = 20 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
f	Frequency, Actual	Frequency generated by crystal oscillator	14.318			MHz
t <sub>R</sub>	Output Rise Edge Rate		0.5		2	V/ns
t <sub>F</sub>	Output Fall Edge Rate		0.5		2	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45		55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			1.5	ms
Z <sub>O</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		25		Ω

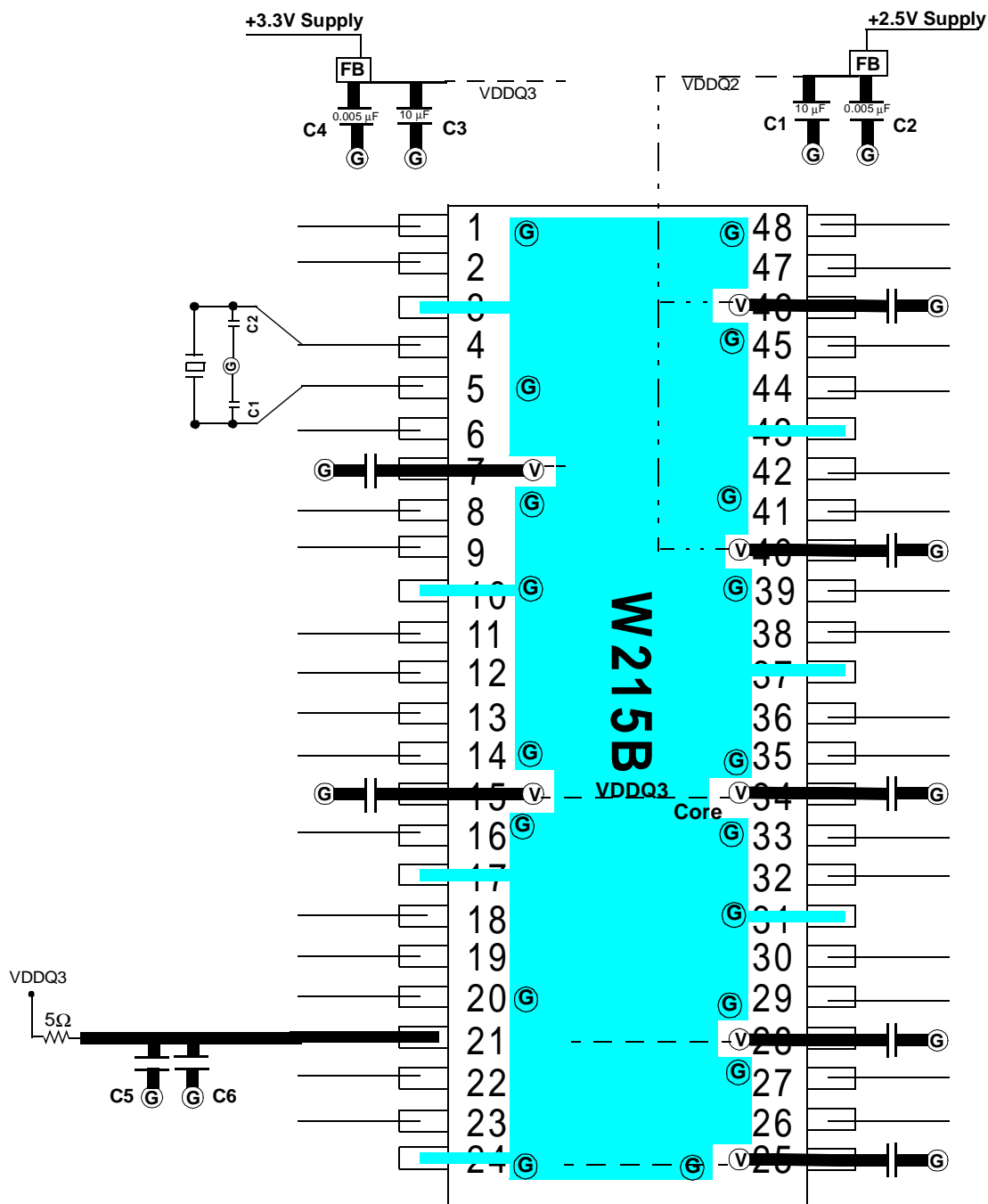
**48-/24-MHz Clock Output (Test Load: R = 33Ω; C = 22 pF)**

Parameter	Description	Test Condition/Comments	CPU = 100 MHz			Unit
			Min.	Typ.	Max.	
m/n	PLL Ratio		57/17			
t <sub>R</sub>	Output Rise Edge Rate		0.5		2	V/ns
t <sub>F</sub>	Output Fall Edge Rate		0.5		2	V/ns
t <sub>D</sub>	Duty Cycle	Measured on rising and falling edge at 1.5V	45	50	55	%
f <sub>ST</sub>	Frequency Stabilization from Power-up (cold start)	Assumes full supply voltage reached within 1 ms from power-up. Short cycles exist prior to frequency stabilization.			3	ms
Z <sub>o</sub>	AC Output Impedance	Average value during switching transition. Used for determining series termination value.		25		Ω

**Ordering Information**

Ordering Code	Package Name	Package Type
W215B	X	48-pin TSSOP (6.1 mm)

Document #: 38-00886

**Layout Example**


FB = Dale ILB1206 - 300 (300 $\Omega$  @ 100 MHz)

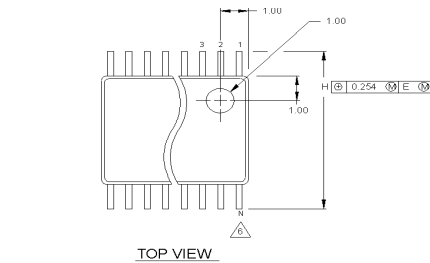
C1 & C3 = 10–22  $\mu$ F    C2 & C4 = 0.005  $\mu$ F    C5 = 47  $\mu$ F    C6 = 0.1  $\mu$ F

(G) = VIA to GND plane layer    (V) = VIA to respective supply plane layer

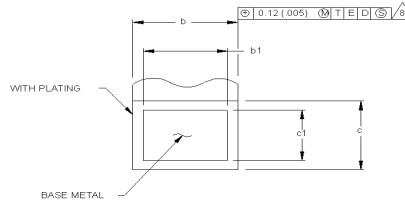
**Note:** Each supply plane or strip should have a ferrite bead and capacitors

# Package Diagram

## 48-Pin Small Shrink Outline Package (TSSOP, 6.1 mm)



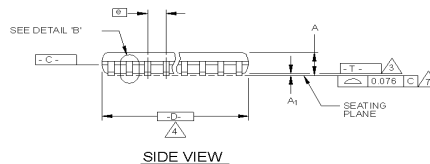
TOP VIEW



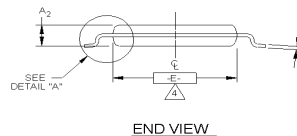
DETAIL "C"

SCALE: 120/1

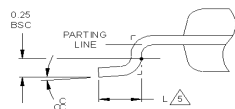
(SEE NOTE 9)



SIDE VIEW



END VIEW



DETAIL "A"

SCALE: 30/1

DETAIL "B"

SCALE: 30/1

DAMBAR PROTRUSION

### NOTES:

1. DIE THICKNESS ALLOWABLE IS 0.27mm ± 0.0127 (0.0110 ± 0.0005 INCHES).
2. DIMENSIONING & TOLERANCES PER ANSI Y14.5M-1992.
3. "T" IS A REFERENCE DATUM.
4. "D" & "E" ARE REFERENCE DATUMS AND DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS, AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15mm PER SIDE. DIMENSION IS THE LENGTH OF TERMINAL FOR SOLDERING TO A SUBSTRATE.
5. TERMINAL POSITIONS ARE SHOWN FOR REFERENCE ONLY.
6. FORMED LEADS SHALL BE PLANAR WITH RESPECT TO ONE ANOTHER WITHIN 0.075mm AT SEATING PLANE.
7. THE LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND AN ADJACENT LEAD TO BE 0.14mm. SEE DETAILS "B" AND "C".
8. DETAIL "C" TO BE DETERMINED AT 0.10 TO 0.25 mm FROM THE LEAD TIP.
9. CONTROLLING DIMENSION: MILLIMETERS.
10. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION MO-153.
11. VARIATIONS AA, AB, AC, AD AND AE.

