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Understanding Embedded - Microprocessors

Embedded microprocessors are specialized computing chips designed to perform specific tasks within an embedded system. Unlike general-purpose microprocessors found in personal computers, embedded microprocessors are tailored for dedicated functions within larger systems, offering optimized performance, efficiency, and reliability. These microprocessors are integral to the operation of countless electronic devices, providing the computational power necessary for controlling processes, handling data, and managing communications.

Applications of Embedded - Microprocessors

Embedded microprocessors are utilized across a broad spectrum of applications, making them indispensable in

Details	
Product Status	Obsolete
Core Processor	PowerPC G2
Number of Cores/Bus Width	1 Core, 32-Bit
Speed	300MHz
Co-Processors/DSP	Communications; RISC CPM
RAM Controllers	DRAM, SDRAM
Graphics Acceleration	No
Display & Interface Controllers	-
Ethernet	10/100Mbps (3)
SATA	-
USB	-
Voltage - I/O	3.3V
Operating Temperature	0°C ~ 105°C (TA)
Security Features	-
Package / Case	480-LBGA Exposed Pad
Supplier Device Package	480-TBGA (37.5x37.5)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/kmpc8250azupibc

2 Electrical and Thermal Characteristics

This section provides AC and DC electrical specifications and thermal characteristics for the MPC8250.

2.1 DC Electrical Characteristics

This section describes the DC electrical characteristics for the MPC8250. Table 1 shows the maximum electrical ratings.

Table 1. Absolute Maximum Ratings [1]

Rating	Symbol	Value	Unit
Core supply voltage [2]	VDD	-0.3 – 2.5	V
PLL supply voltage[2]	VCCSYN	-0.3 – 2.5	V
I/O supply voltage [3]	VDDH	-0.3 – 4.0	V
Input voltage [4]	VIN	GND(-0.3) – 3.6	V
Junction temperature	T_j	120	°C
Storage temperature range	T_{STG}	(-55) – (+150)	°C

1 Absolute maximum ratings are stress ratings only; functional operation (see Table 2) at the maximums is not guaranteed. Stress beyond those listed may affect device reliability or cause permanent damage.

2 **Caution:** VDD/VCCSYN must not exceed VDDH by more than 0.4 V at any time, including during power-on reset.

3 **Caution:** VDDH can exceed VDD/VCCSYN by 3.3 V during power on reset by no more than 100 mSec. VDDH should not exceed VDD/VCCSYN by more than 2.5 V during normal operation.

4 **Caution:** VIN must not exceed VDDH by more than 2.5 V at any time, including during power-on reset.

Table 2 lists recommended operational voltage conditions.

Table 2. Recommended Operating Conditions [1]

Rating	Symbol	Value			Unit
Core supply voltage	VDD	1.7 – 1.9 [2]	1.7–2.1 [3]	1.9 –2.2 [4]	V
PLL supply voltage	VCCSYN	1.7 – 1.9[2]	1.7–2.1[3]	1.9–2.2[4]	V
I/O supply voltage	VDDH	3.135 – 3.465			V
Input voltage	VIN	GND (-0.3) – 3.465			V
Junction temperature (maximum)	T_j	105 [5]			°C
Ambient temperature	T_A	0–70[5]			°C

1 **Caution:** These are the recommended and tested operating conditions. Proper device operating outside of these conditions is not guaranteed.

2 CPU frequency less than or equal to 200 MHz.

3 CPU frequency greater than 200 MHz but less than 233 MHz.

4 CPU frequency greater than or equal to 233 MHz.

5 Note that for extended temperature parts the range is $(-40)_{T_A}$ – 105_{T_j}.

NOTE: Core, PLL, and I/O Supply Voltages

VDDH, VCCSYN, and VDD must track each other and both must vary in the same direction—in the positive direction (+5% and +0.1 Vdc) or in the negative direction (-5% and -0.1 Vdc).

This device contains circuitry protecting against damage due to high static voltage or electrical fields; however, it is advised that normal precautions be taken to avoid application of any voltages higher than maximum-rated voltages to this high-impedance circuit. Reliability of operation is enhanced if unused inputs are tied to an appropriate logic voltage level (either GND or V_{CC}).

Figure 2 shows the undershoot and overshoot voltage of the 60x and local bus memory interface of the MPC8280. Note that in PCI mode the I/O interface is different.

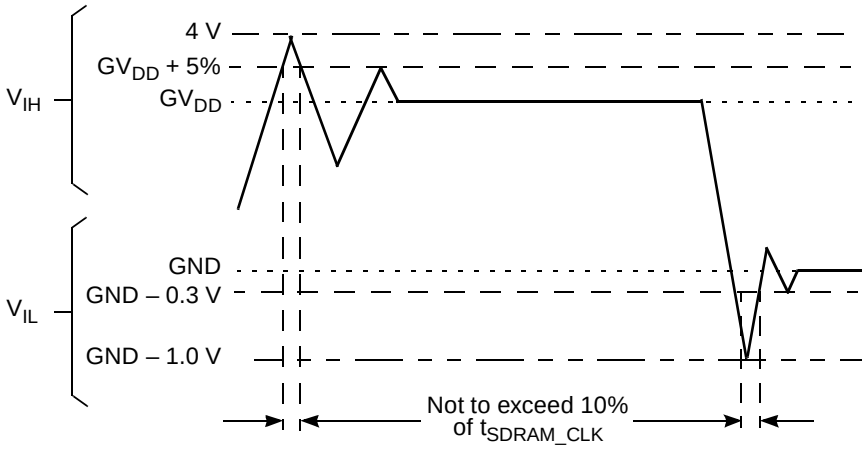


Figure 2. Overshoot/Undershoot Voltage

Table 3 shows DC electrical characteristics.

Table 3. DC Electrical Characteristics [1]

Characteristic	Symbol	Min	Max	Unit
Input high voltage, all inputs except CLKIN	V_{IH}	2.0	3.465	V
Input low voltage	V_{IL}	GND	0.8	V
CLKIN input high voltage	V_{IHC}	2.4	3.465	V
CLKIN input low voltage	V_{ILC}	GND	0.4	V
Input leakage current, V_{IN} = VDDH [2]	I_{IN}	—	10	µA
Hi-Z (off state) leakage current, V_{IN} = VDDH[2]	I_{OZ}	—	10	µA
Signal low input current, V_{IL} = 0.8 V	I_L	—	1	µA
Signal high input current, V_{IH} = 2.0 V	I_H	—	1	µA
Output high voltage, I_{OH} = –2 mA	V_{OH}	2.4	—	V

Table 3. DC Electrical Characteristics [1] (continued)

Characteristic	Symbol	Min	Max	Unit
I_{OL} = 7.0mA BR BG ABB/IRQ2 TS A[0-31] TT[0-4] TBST TSIZE[0–3] AACK ARTRY DBG DBB/IRQ3 D[0-63] DP(0)/RSRV/EXT_BR2 DP(1)/IRQ1/EXT_BG2 DP(2)/TLBISYNC/IRQ2/EXT_DBG2 DP(3)/IRQ3/EXT_BR3/CKSTP_OUT DP(4)/IRQ4/EXT_BG3/CORE_SREST DP(5)/TBEN/IRQ5/EXT_DBG3 DP(6)/CSE(0)/IRQ6 DP(7)/CSE(1)/IRQ7 PSDVAL TA TEA GBL/IRQ1 CI/BADDR29/IRQ2 WT/BADDR30/IRQ3 L2_HIT/IRQ4 CPU_BG/BADDR31/IRQ5 CPU_DBG CPU_BR IRQ0/NMI_OUT IRQ7/INT_OUT/APE PORESET HRESET SRESET RSTCONF QREQ	V_{OL}	—	0.4	V

Table 3. DC Electrical Characteristics [1] (continued)

Characteristic	Symbol	Min	Max	Unit
I_{OL} = 5.3mA CS[0-9] CS(10)/BCTL1 CS(11)/AP(0) BADDR[27–28] ALE BCTL0 PWE(0:7)/PSDDQM(0:7)/PBS(0:7) PSDA10/PGPL0 PSDWE/PGPL1 POE/PSDRAS/PGPL2 PSDCAS/PGPL3 PGTA/PUPMWAIT/PGPL4/PPBS PSDAMUX/PGPL5 LWE[0–3]LSDDQM[0:3]/LBS[0–3]/PCI_CFG[0–3 LSDA10/LGPL0/PCI_MODCKH0 LSDWE/LGPL1/PCI_MODCKH1 LOE/LSDRAS/LGPL2/PCI_MODCKH2 LSDCAS/LGPL3/PCI_MODCKH3 LGTA/LUPMWAIT/LGPL4/LPBS LSDAMUX/LGPL5/PCI_MODCK LWR MODCK1/AP(1)/TC(0)/BNKSEL(0) MODCK2/AP(2)/TC(1)/BNKSEL(1) MODCK3/AP(3)/TC(2)/BNKSEL(2)	V_{OL}	—	0.4	V
I_{OL} = 3.2mA L_A14/PAR L_A15/FRAME/SMI L_A16/TRDY L_A17/IRDY/CKSTP_OUT L_A18/STOP L_A19/DEVSEL L_A20/IDSEL L_A21/PERR L_A22/SERR L_A23/REQ0 L_A24/REQ1/HSEJSW L_A25/GNT0 L_A26/GNT1/HSLED L_A27/GNT2/HSENUM L_A28/RST/CORE_SRESET L_A29/INTA L_A30/REQ2 L_A31 LCL_D(0-31)/AD(0-31) LCL_DP(0-3)/C/BE(0-3) PA[0–31] PB[4–31] PC[0–31] PD[4–31] TDO				

where K is a constant pertaining to the particular part. K can be determined from equation (3) by measuring P_D (at equilibrium) for a known T_A. Using this value of K, the values of P_D and T_J can be obtained by solving equations (1) and (2) iteratively for any value of T_A.

2.3.1 Layout Practices

Each V_{CC} pin should be provided with a low-impedance path to the board's power supply. Each ground pin should likewise be provided with a low-impedance path to ground. The power supply pins drive distinct groups of logic on chip. The V_{CC} power supply should be bypassed to ground using at least four 0.1 µF by-pass capacitors located as close as possible to the four sides of the package. The capacitor leads and associated printed circuit traces connecting to chip V_{CC} and ground should be kept to less than half an inch per capacitor lead. A four-layer board is recommended, employing two inner layers as V_{CC} and GND planes.

All output pins on the MPC8250 have fast rise and fall times. Printed circuit (PC) trace interconnection length should be minimized in order to minimize overdamped conditions and reflections caused by these fast output switching times. This recommendation particularly applies to the address and data buses. Maximum PC trace lengths of six inches are recommended. Capacitance calculations should consider all device loads as well as parasitic capacitances due to the PC traces. Attention to proper PCB layout and bypassing becomes especially critical in systems with higher capacitive loads because these loads create higher transient currents in the V_{CC} and GND circuits. Pull up all unused inputs or signals that will be inputs during reset. Special care should be taken to minimize the noise levels on the PLL supply pins.

Table 5 provides preliminary, estimated power dissipation for various configurations. Note that suitable thermal management is required for conditions above P_D = 3W (when the ambient temperature is 70° C or greater) to ensure the junction temperature does not exceed the maximum specified value. Also note that the I/O power should be included when determining whether to use a heat sink.

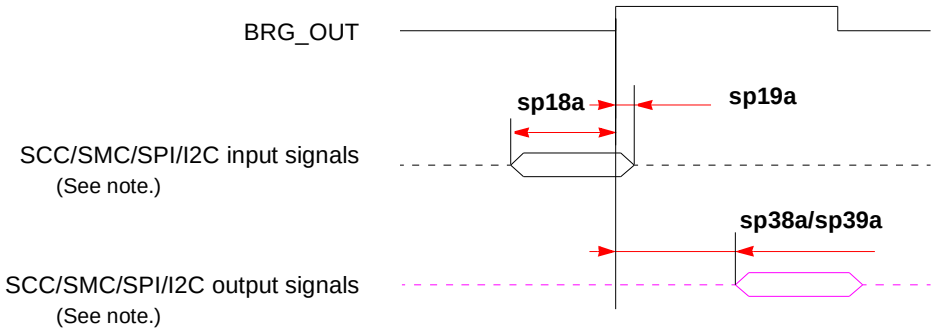
Table 5. Estimated Power Dissipation for Various Configurations [1]

Bus (MHz)	CPM Multiplier	Core CPU Multiplier	CPM (MHz)	CPU (MHz)	P_{INT}(W) [2]			
					Vddl 1.8 Volts		Vddl 2.0 Volts	
					Nominal	Maximum	Nominal	Maximum
66.66	2	3	133	200	1.2	2	1.8	2.3
66.66	2.5	3	166	200	1.3	2.1	1.9	2.3
66.66	3	4	200	266	—	—	2.3	2.9
66.66	3	4.5	200	300	—	—	2.4	3.1
83.33	2	3	166	250	—	—	2.2	2.8
83.33	2	3	166	250	—	—	2.2	2.8
83.33	2.5	3.5	208	291	—	—	2.4	3.1

1 Test temperature = room temperature (25° C)

2 $P_{INT} = I_{DD} \times V_{DD}$ Watts

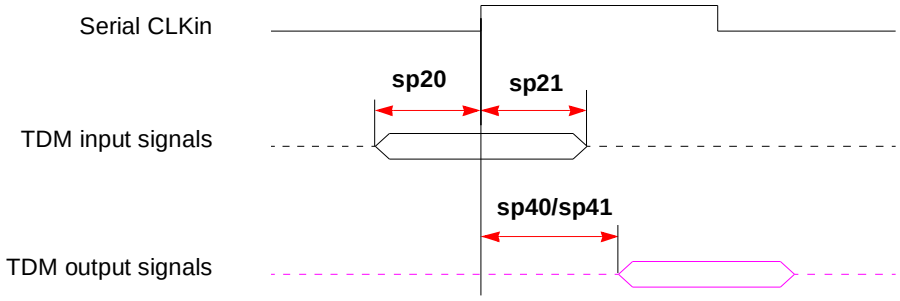
Figure 6 shows the SCC/SMC/SPI/I^{2}C internal clock.



Note: There are four possible timing conditions for SCC and SPI:
1. Input sampled on the rising edge and output driven on the rising edge (shown).
2. Input sampled on the rising edge and output driven on the falling edge.
3. Input sampled on the falling edge and output driven on the falling edge.
4. Input sampled on the falling edge and output driven on the rising edge.

Figure 6. SCC/SMC/SPI/I^{2}C Internal Clock Diagram

Figure 7 shows TDM input and output signals.



Note: There are four possible TDM timing conditions:
1. Input sampled on the rising edge and output driven on the rising edge (shown).
2. Input sampled on the rising edge and output driven on the falling edge.
3. Input sampled on the falling edge and output driven on the falling edge.
4. Input sampled on the falling edge and output driven on the rising edge.

Figure 7. TDM Signal Diagram

Figure 9 shows the interaction of several bus signals.

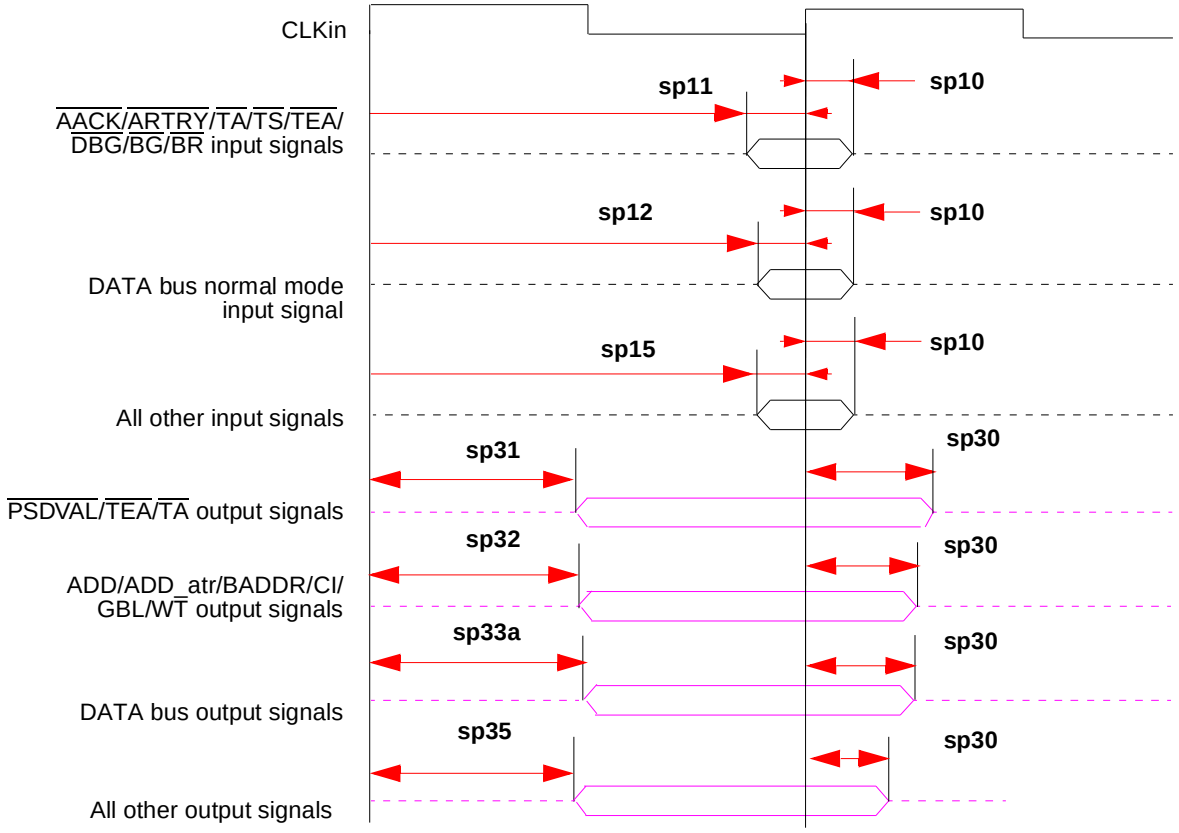


Figure 9. Bus Signals

Figure 10 shows signal behavior for all parity modes (including ECC, RMW parity, and standard parity).

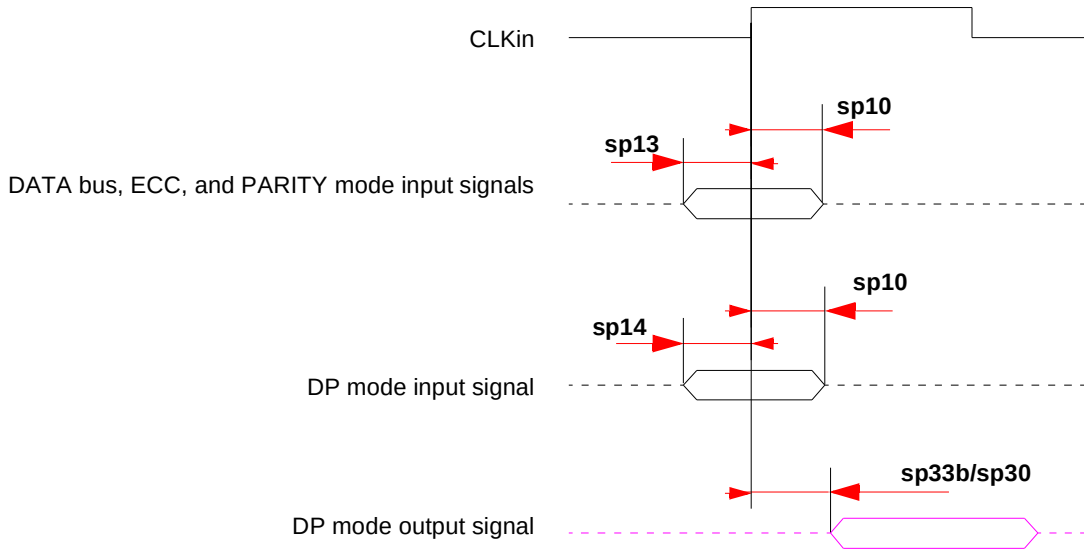


Figure 10. Parity Mode Diagram

Table 13. Clock Default Configurations

MODCK[1–3]	Input Clock Frequency	CPM Multiplication Factor	CPM Frequency	Core Multiplication Factor	Core Frequency
100	66 MHz	2	133 MHz	2.5	166 MHz
101	66 MHz	2	133 MHz	3	200 MHz
110	66 MHz	2.5	166 MHz	2.5	166 MHz
111	66 MHz	2.5	166 MHz	3	200 MHz

Table 14 describes all possible clock configurations when using the hard reset configuration sequence. Note also that basic modes are shown in **boldface** type. The frequencies listed are for the purpose of illustration only. Users must select a mode and input bus frequency so that the resulting configuration does not exceed the frequency rating of the user's device.

Table 14. Clock Configuration Modes [1]

MODCK_H–MODCK[1–3]	Input Clock Frequency[2,3]	CPM Multiplication Factor[2]	CPM Frequency[2]	Core Multiplication Factor[2]	Core Frequency[2]
0001_000	33 MHz	2	66 MHz	4	133 MHz
0001_001	33 MHz	2	66 MHz	5	166 MHz
0001_010	33 MHz	2	66 MHz	6	200 MHz
0001_011	33 MHz	2	66 MHz	7	233 MHz
0001_100	33 MHz	2	66 MHz	8	266 MHz
0001_101	33 MHz	3	100 MHz	4	133 MHz
0001_110	33 MHz	3	100 MHz	5	166 MHz
0001_111	33 MHz	3	100 MHz	6	200 MHz
0010_000	33 MHz	3	100 MHz	7	233 MHz
0010_001	33 MHz	3	100 MHz	8	266 MHz
0010_010	**33 MHz**	**4**	**133 MHz**	**4**	**133 MHz**
0010_011	**33 MHz**	**4**	**133 MHz**	**5**	**166 MHz**
0010_100	33 MHz	4	133 MHz	6	200 MHz
0010_101	33 MHz	4	133 MHz	7	233 MHz
0010_110	33 MHz	4	133 MHz	8	266 MHz
0010_111	33 MHz	5	166 MHz	4	133 MHz
0011_000	33 MHz	5	166 MHz	5	166 MHz
0011_001	33 MHz	5	166 MHz	6	200 MHz
0011_010	33 MHz	5	166 MHz	7	233 MHz
0011_011	33 MHz	5	166 MHz	8	266 MHz

3.2.1 PCI Host Mode

The frequencies listed in Table 15 are for the purpose of illustration only. Users must select a mode and input bus frequency so that the resulting configuration does not exceed the frequency rating of the user's device.

Table 15. Clock Default Configurations in PCI Host Mode (MODCK_HI = 0000)

MODCK[1–3][1]	Input Clock Frequency (Bus)	CPM Multiplication Factor	CPM Frequency	Core Multiplication Factor	Core Frequency	PCI Division Factor [2]	PCI Frequency[2]
000	66 MHz	2	133 MHz	2.5	166 MHz	2/4	66/33 MHz
001	66 MHz	2	133 MHz	3	200 MHz	2/4	66/33 MHz
010	66 MHz	2.5	166 MHz	3	200 MHz	3/6	55/28 MHz
011	66 MHz	2.5	166 MHz	3.5	233 MHz	3/6	55/28 MHz
100	66 MHz	2.5	166 MHz	4	266 MHz	3/6	55/28 MHz
101	66 MHz	3	200 MHz	3	200 MHz	3/6	66/33 MHz
110	66 MHz	3	200 MHz	3.5	233 MHz	3/6	66/33 MHz
111	66 MHz	3	200 MHz	4	266 MHz	3/6	66/33 MHz

1 Assumes MODCK_HI = 0000.

2 The frequency depends on the value of PCI_MODCK. If PCI_MODCK is high (logic '1'), the PCI frequency is divided by 2 (33 instead of 66 MHz, etc.) Refer to Table 12.

Table 16 describes all possible clock configurations when using the MPC8250's internal PCI bridge in host mode.

Table 16. Clock Configuration Modes in PCI Host Mode

MODCK_H – MODCK[1–3]	Input Clock Frequency [1] (Bus)	CPM Multiplication Factor	CPM Frequency	Core Multiplication Factor	Core Frequency	PCI Division Factor [2]	PCI Frequency[2]
0001_000	33 MHz	3	100 MHz	5	166 MHz	3/6	33/16 MHz
0001_001	33 MHz	3	100 MHz	6	200 MHz	3/6	33/16 MHz
0001_010	33 MHz	3	100 MHz	7	233 MHz	3/6	33/16 MHz
0001_011	33 MHz	3	100 MHz	8	266 MHz	3/6	33/16 MHz
0010_000	**33 MHz**	**4**	**133 MHz**	**5**	**166 MHz**	**4/8**	**33**/16 **MHz**
0010_001	33 MHz	4	133 MHz	6	200 MHz	4/8	33/16 MHz
0010_010	33 MHz	4	133 MHz	7	233 MHz	4/8	33/16 MHz
0010_011	33 MHz	4	133 MHz	8	266 MHz	4/8	33/16 MHz
0011_000 [3]	33 MHz	5	166 MHz	5	166 MHz	5	**33 MHz**
0011_001[3]	33 MHz	5	166 MHz	6	200 MHz	5	33 MHz

Table 16. Clock Configuration Modes in PCI Host Mode (continued)

MODCK_H – MODCK[1–3]	Input Clock Frequency [1] (Bus)	CPM Multiplication Factor	CPM Frequency	Core Multiplication Factor	Core Frequency	PCI Division Factor [2]	PCI Frequency[2]
1001_001	66 MHz	3.5	233 MHz	3	200 MHz	4/8	58/29 MHz
1001_010	66 MHz	3.5	233 MHz	3.5	233 MHz	4/8	58/29 MHz
1001_011	66 MHz	3.5	233 MHz	4	266 MHz	4/8	58/29 MHz
1001_100	66 MHz	3.5	233 MHz	4.5	300 MHz	4/8	58/29 MHz
1010_000	100 MHz	2	200 MHz	2	200 MHz	3/6	66/33 MHz
1010_001	100 MHz	2	200 MHz	2.5	250 MHz	3/6	66/33 MHz
1010_010	100 MHz	2	200 MHz	3	300 MHz	3/6	66/33 MHz
1010_011	100 MHz	2	200 MHz	3.5	350 MHz	3/6	66/33 MHz
1010_100	100 MHz	2	200 MHz	4	400 MHz	3/6	66/33 MHz
1011_000	100 MHz	2.5	250 MHz	2	200 MHz	4/8	62/31 MHz
1011_001	100 MHz	2.5	250 MHz	2.5	250 MHz	4/8	62/31MHz
1011_010	100 MHz	2.5	250 MHz	3	300 MHz	4/8	62/31 MHz
1011_011	100 MHz	2.5	250 MHz	3.5	350 MHz	4/8	62/31 MHz
1011_100	100 MHz	2.5	250 MHz	4	400 MHz	4/8	62/31 MHz

1 Input clock frequency is given only for the purpose of reference. User should set MODCK_H–MODCK_L so that the resulting configuration does not exceed the frequency rating of the user's part.

2 The frequency depends on the value of PCI_MODCK. If PCI_MODCK is high (logic '1'), the PCI frequency is divided by 2 (33 instead of 66 MHz, etc.). Refer to Table 12

3 In this mode, PCI_MODCK must be "0".

3.2.2 PCI Agent Mode

The frequencies listed in Table 17 are for the purpose of illustration only. Users must select a mode and input bus frequency so that the resulting configuration does not exceed the frequency rating of the user's device.

Table 17. Clock Default Configurations in PCI Agent Mode (MODCK_HI = 0000)

MODCK[1–3][1]	Input Clock Frequency (PCI)[2]	CPM Multiplication Factor [2]	CPM Frequency	Core Multiplication Factor	Core Frequency [3]	Bus Division Factor	60x Bus Frequency[4]
000	66/33 MHz	2/4	133 MHz	2.5	166 MHz	2	66 MHz
001	66/33 MHz	2/4	133 MHz	3	200 MHz	2	66 MHz
010	66/33 MHz	3/6	200 MHz	3	200 MHz	3	66 MHz
011	66/33 MHz	3/6	200 MHz	4	266 MHz	3	66 MHz

Table 17. Clock Default Configurations in PCI Agent Mode (MODCK_HI = 0000)

MODCK[1–3][1]	Input Clock Frequency (PCI)[2]	CPM Multiplication Factor [2]	CPM Frequency	Core Multiplication Factor	Core Frequency[3]	Bus Division Factor	60x Bus Frequency[4]
100	66/33 MHz	3/6	200 MHz	3	240 MHz	2.5	80 MHz
101	66/33 MHz	3/6	200 MHz	3.5	280 MHz	2.5	80 MHz
110	66/33 MHz	4/8	266 MHz	3.5	300 MHz	3	88 MHz
111	66/33 MHz	4/8	266 MHz	3	300 MHz	2.5	100 MHz

1 Assumes MODCK_HI = 0000.

2 The frequency depends on the value of PCI_MODCK. If PCI_MODCK is high (logic ‘1’), the PCI frequency is divided by 2 (33 instead of 66 MHz, etc.) and the CPM multiplication factor is multiplied by 2. Refer to Table 12

3 Core frequency = (60x bus frequency)(core multiplication factor)

4 Bus frequency = CPM frequency / bus division factor

Table 18 describes all possible clock configurations when using the MPC8250’s internal PCI bridge in agent mode.

Table 18. Clock Configuration Modes in PCI Agent Mode

MODCK_H – MODCK[1–3]	Input Clock Frequency (PCI) [1, 2]	CPM Multiplication Factor[1]	CPM Frequency	Core Multiplication Factor	Core Frequency[3]	Bus Division Factor	60x Bus Frequency[4]
0001_001	66/33 MHz	2/4	133 MHz	5	166 MHz	4	33 MHz
0001_010	66/33 MHz	2/4	133 MHz	6	200 MHz	4	33 MHz
0001_011	66/33 MHz	2/4	133 MHz	7	233 MHz	4	33 MHz
0001_100	66/33 MHz	2/4	133 MHz	8	266 MHz	4	33 MHz
0010_001	50/25 MHz	3/6	**150 MHz**	3	180 MHz	2.5	**60 MHz**
0010_010	50/25 MHz	3/6	**150 MHz**	3.5	210 MHz	2.5	**60 MHz**
0010_011	50/25 MHz	3/6	**150 MHz**	4	240 MHz	2.5	**60 MHz**
0010_100	50/25 MHz	3/6	**150 MHz**	4.5	270 MHz	2.5	**60 MHz**
0011_000	66/33 MHz	2/4	**133 MHz**	2.5	110MHz	3	44 MHz
0011_001	66/33 MHz	2/4	**133 MHz**	3	132 MHz	3	44 MHz
0011_010	66/33 MHz	2/4	**133 MHz**	3.5	154 MHz	3	**44 MHz**
0011_011	66/33 MHz	2/4	**133 MHz**	4	176MHz	3	**44 MHz**
0011_100	66/33 MHz	2/4	**133 MHz**	4.5	198 MHz	3	**44 MHz**
0100_000	66/33 MHz	3/6	200 MHz	2.5	166 MHz	**3**	66 MHz
0100_001	66/33 MHz	3/6	**200 MHz**	3	200 MHz	**3**	**66 MHz**
0100_010	66/33 MHz	3/6	**200 MHz**	3.5	233 MHz	**3**	**66 MHz**

Table 20. MPC8250 TBGA Package Pinout List (continued)

Pin Name	Ball
D37	C8
D38	E7
D39	A3
D40	D18
D41	A17
D42	A14
D43	B12
D44	A10
D45	D8
D46	B6
D47	C4
D48	C18
D49	E16
D50	B14
D51	C12
D52	B10
D53	A7
D54	C6
D55	D5
D56	B18
D57	B16
D58	E14
D59	D12
D60	C10
D61	E8
D62	D6
D63	C2
DP0/$\overline{\text{RSRV}}$/$\overline{\text{EXT\_BR2}}$	B22
$\overline{\text{IRQ1}}$/DP1/$\overline{\text{EXT\_BG2}}$	A22
$\overline{\text{IRQ2}}$/DP2/$\overline{\text{TLBISYNC}}$/$\overline{\text{EXT\_DBG2}}$	E21
$\overline{\text{IRQ3}}$/DP3/$\overline{\text{CKSTP\_OUT}}$/$\overline{\text{EXT\_BR3}}$	D21
$\overline{\text{IRQ4}}$/DP4/$\overline{\text{CORE\_SRESET}}$/$\overline{\text{EXT\_BG3}}$	C21
$\overline{\text{IRQ5}}$/DP5/$\overline{\text{TBEN}}$/$\overline{\text{EXT\_DBG3}}$	B21
$\overline{\text{IRQ6}}$/DP6/CSE0	A21
$\overline{\text{IRQ7}}$/DP7/CSE1	E20

Table 20. MPC8250 TBGA Package Pinout List (continued)

Pin Name	Ball
PSDVAL	V3
TA	C22
TEA	V5
GBL/IRQ1	W1
$\overline{\text{CI}}$/BADDR29/$\overline{\text{IRQ2}}$	U2
$\overline{\text{WT}}$/BADDR30/$\overline{\text{IRQ3}}$	U3
L2_HIT/IRQ4	Y4
$\overline{\text{CPU\_BG}}$/BADDR31/$\overline{\text{IRQ5}}$	U4
CPU_DBG	R2
CPU_BR	Y3
CS0	F25
CS1	C29
CS2	E27
CS3	E28
CS4	F26
CS5	F27
CS6	F28
CS7	G25
CS8	D29
CS9	E29
$\overline{\text{CS10}}$/$\overline{\text{BCTL1}}$	F29
$\overline{\text{CS11}}$/AP0	G28
BADDR27	T5
BADDR28	U1
ALE	T2
BCTL0	A27
PWE0/PSDDQM0/PBS0	C25
PWE1/PSDDQM1/PBS1	E24
PWE2/PSDDQM2/PBS2	D24
PWE3/PSDDQM3/PBS3	C24
PWE4/PSDDQM4/PBS4	B26
PWE5/PSDDQM5/PBS5	A26
PWE6/PSDDQM6/PBS6	B25
PWE7/PSDDQM7/PBS7	A25
PSDA10/PGPL0	E23

Table 20. MPC8250 TBGA Package Pinout List (continued)

Pin Name	Ball
PB24/FCC2_TXD2/L1RSYNCC2	AJ9[1]
PB25/FCC2_TXD3/L1TSYNCC2/L1GNTC2	AE9[1]
PB26/FCC2_MII_CRS/L1RXDC2	AJ7[1]
PB27/FCC2_MII_COL/L1TXDC2	AH6[1]
PB28/FCC2_MII_RX_ER/$\overline{\text{FCC2\_RTS}}$/L1TSYNCB2/L1GNTB2/TXD1	AE3[1]
PB29/L1RSYNCB2/FCC2_MII_TX_EN	AE2[1]
PB30/FCC2_MII_RX_DV/L1RXDB2	AC5[1]
PB31/FCC2_MII_TX_ER/L1TXDB2	AC4[1]
PC0/DREQ1/BRGO7/$\overline{\text{SMSYN2}}$/L1CLKOA2	AB26[1]
PC1/DREQ2/BRGO6/$\overline{\text{L1RQA2}}$	AD29[1]
PC2/$\overline{\text{FCC3\_CD}}$/$\overline{\text{DONE2}}$	AE29[1]
PC3/$\overline{\text{FCC3\_CTS}}$/$\overline{\text{DACK2}}$/$\overline{\text{CTS4}}$	AE27[1]
PC4/SI2_L1ST4/$\overline{\text{FCC2\_CD}}$	AF27[1]
PC5/SI2_L1ST3/$\overline{\text{FCC2\_CTS}}$	AF24[1]
PC6/$\overline{\text{FCC1\_CD}}$	AJ26[1]
PC7/$\overline{\text{FCC1\_CTS}}$	AJ25[1]
PC8/$\overline{\text{CD4}}$/RENA4/SI2_L1ST2/$\overline{\text{CTS3}}$	AF22[1]
PC9/$\overline{\text{CTS4}}$/CLSN4/SI2_L1ST1/L1TSYNCA2/L1GNTA2	AE21[1]
PC10/$\overline{\text{CD3}}$/RENA3	AF20[1]
PC11/$\overline{\text{CTS3}}$/CLSN3/L1TXD3A2	AE19[1]
PC12/$\overline{\text{CD2}}$/RENA2	AE18[1]
PC13/$\overline{\text{CTS2}}$/CLSN2	AH18[1]
PC14/$\overline{\text{CD1}}$/RENA1	AH17[1]
PC15/$\overline{\text{CTS1}}$/CLSN1/SMTXD2	AG16[1]
PC16/CLK16/TIN4	AF15[1]
PC17/CLK15/TIN3/BRGO8	AJ15[1]
PC18/CLK14/$\overline{\text{TGATE2}}$	AH14[1]
PC19/CLK13/BRGO7/SPICLK	AG13[1]
PC20/CLK12/$\overline{\text{TGATE1}}$	AH12[1]
PC21/CLK11/BRGO6	AJ11[1]
PC22/CLK10/$\overline{\text{DONE1}}$	AG10[1]
PC23/CLK9/BRGO5/$\overline{\text{DACK1}}$	AE10[1]
PC24/CLK8/$\overline{\text{TOUT4}}$	AF9[1]
PC25/CLK7/BRGO4	AE8[1]
PC26/CLK6/$\overline{\text{TOUT3}}$/TMCLK	AJ6[1]

Table 20. MPC8250 TBGA Package Pinout List (continued)

Pin Name	Ball
GNDSYN	AB1
CLKIN2	AE11
SPARE4 [2]	U5
$\overline{\text{PCI\_MODE}}$ [3]	AF25
SPARE6[2]	V4
THERMAL0 [4]	AA1
THERMAL1[4]	AG4
I/O power	AG21, AG14, AG8, AJ1, AJ2, AH1, AH2, AG3, AF4, AE5, AC27, Y27, T27, P27, K26, G27, AE25, AF26, AG27, AH28, AH29, AJ28, AJ29, C7, C14, C16, C20, C23, E10, A28, A29, B28, B29, C27, D26, E25, H3, M4, T3, AA4, A1, A2, B1, B2, C3, D4, E5
Core Power	U28, U29, K28, K29, A9, A19, B19, M1, M2, Y1, Y2, AC1, AC2, AH19, AJ19, AH10, AJ10, AJ5
Ground	AA5, AF21, AF14, AF8, AE7, AF11, AE17, AE23, AC26, AB25, Y26, V25, T26, R25, P26, M25, K27, H25, G26, D7, D10, D14, D16, D20, D23, C9, E11, E13, E15, E19, E22, B3, G5, H4, K5, M3, P5, T4, Y5, AA2, AC3

1 The default configuration of the CPM pins (PA[0–31], PB[4–31], PC[0–31], PD[4–31]) is input. To prevent excessive DC current, it is recommended to either pull unused pins to GND or VDDH, or to configure them as outputs.

2 Must be pulled down or left floating.

3 If PCI is not desired, this pin should be pulled up or left floating.

4 For information on how to use this pin, refer to *MPC8260 PowerQUICC II Thermal Resistor Guide* (AN2271/D) available at www.freescale.com.

4.2 PBGA Package

The following figures and table represent the alternate 516 PBGA package. For information on the standard package for the MPC8250, refer to Section 4.1, “TBGA Package.”

Table 22. MPC8250 PBGA Package Pinout List (continued)

Pin Name	Ball
D3	P4
D4	N3
D5	K5
D6	J4
D7	G1
D8	AB1
D9	U4
D10	U2
D11	N6
D12	N1
D13	L1
D14	J5
D15	G3
D16	AA2
D17	W1
D18	T3
D19	T1
D20	M2
D21	K2
D22	J1
D23	G4
D24	U5
D25	T5
D26	P5
D27	P3
D28	M3
D29	K3
D30	H2
D31	G5
D32	AA1
D33	V2
D34	U1
D35	P2
D36	M4
D37	K4

Table 22. MPC8250 PBGA Package Pinout List (continued)

Pin Name	Ball
IRQ7/INT_OUT/APE	E5
TRST	F22
TCK	A24
TMS	C24
TDI	A25
TDO	B24
TRIS	C19
PORESET	B25
HRESET	D24
SRESET	E23
QREQ	D18
RSTCONF	E24
MODCK1/AP1/TC0/BNKSEL0	B16
MODCK2/AP2/TC1/BNKSEL1	F16
MODCK3/AP3/TC2/BNKSEL2	A15
XFC	A18
CLKIN1	G22
PA0/$\overline{\text{RESTART1}}$/DREQ3	AC20 [1]
PA1/$\overline{\text{REJECT1}}$/$\overline{\text{DONE3}}$	AC21[1]
PA2/CLK20/$\overline{\text{DACK3}}$	AF25[1]
PA3/CLK19/$\overline{\text{DACK4}}$/L1RXD1A2	AE24[1]
PA4/$\overline{\text{REJECT2}}$/$\overline{\text{DONE4}}$	AA21[1]
PA5/$\overline{\text{RESTART2}}$/DREQ4	AD25[1]
PA6	AC24[1]
PA7/SMSYN2	AA22[1]
PA8/SMRXD2	AA23[1]
PA9/SMTXD2	Y26[1]
PA10/MSNUM5	W22[1]
PA11/MSNUM4	W23[1]
PA12/MSNUM3	V26[1]
PA13/MSNUM2	V25[1]
PA14/FCC1_RXD3	T22[1]
PA15/FCC1_RXD2	T25[1]
PA16/FCC1_RXD1	R24[1]
PA17/FCC1_RXD0/FCC1_RXD	P22[1]

Table 22. MPC8250 PBGA Package Pinout List (continued)

Pin Name	Ball
PA18/FCC1_TXD0/FCC1_TXD	N26[1]
PA19/FCC1_TXD1	N23[1]
PA20/FCC1_TXD2	K26[1]
PA21/FCC1_TXD3	L23[1]
PA22	K23[1]
PA23	H26[1]
PA24/MSNUM1	F25[1]
PA25/MSNUM0	D26[1]
PA26/FCC1_MII_RX_ER	D25[1]
PA27/FCC1_MII_RX_DV	C25[1]
PA28/FCC1_MII_TX_EN	C22[1]
PA29/FCC1_MII_TX_ER	B21[1]
PA30/FCC1_MII_CRS/$\overline{\text{FCC1\_RTS}}$	A20[1]
PA31/FCC1_MII_COL	A19[1]
PB4/FCC3_TXD3/L1RSYNCA2/ $\overline{\text{FCC3\_RTS}}$	AD21[1]
PB5/FCC3_TXD2/L1TSYNCA2/ L1GNTA2	AD22[1]
PB6/FCC3_TXD1/L1RXDA2/L1RXD0A2	AC22[1]
PB7/FCC3_TXD0/FCC3_TXD/ L1TXDA2/L1TXD0A2	AE26[1]
PB8/FCC3_RXD0/FCC3_RXD/TXD3	AB23[1]
PB9/FCC3_RXD1/L1TXD2A2	AC26[1]
PB10/FCC3_RXD2	AB26[1]
PB11/FCC3_RXD3	AA25[1]
PB12/FCC3_MII_CRS/TXD2	W26[1]
PB13/FCC3_MII_COL/L1TXD1A2	W25[1]
PB14/FCC3_MII_TX_EN/RXD3	V24[1]
PB15/FCC3_MII_TX_ER/RXD2	U24[1]
PB16/FCC3_MII_RX_ER/CLK18	R22[1]
PB17/FCC3_MII_RX_DV/CLK17	R23[1]
PB18/FCC2_RXD3/L1CLKOD2/ L1RXD2A2	M23[1]
PB19FCC2_RXD2/L1RQD2/L1RXD3A2	L24[1]
PB20/FCC2_RXD1/L1RSYNCD2/ L1TXD1A1	K24[1]
PB21/FCC2_RXD0/FCC2_RXD/ L1TSYNCD2/L1GNTD2	L21[1]
PB22/FCC2_TXD0/FCC2_TXD/ L1RXDD2	P25[1]
PB23/FCC2_TXD1/L1TXDD2	N25[1]
PB24/FCC2_TXD2/L1RSYNCC2	E26[1]

5.2.2 PBGA Package Dimensions

Figure 18 provides the mechanical dimensions and bottom surface nomenclature of the 516 PBGA package.

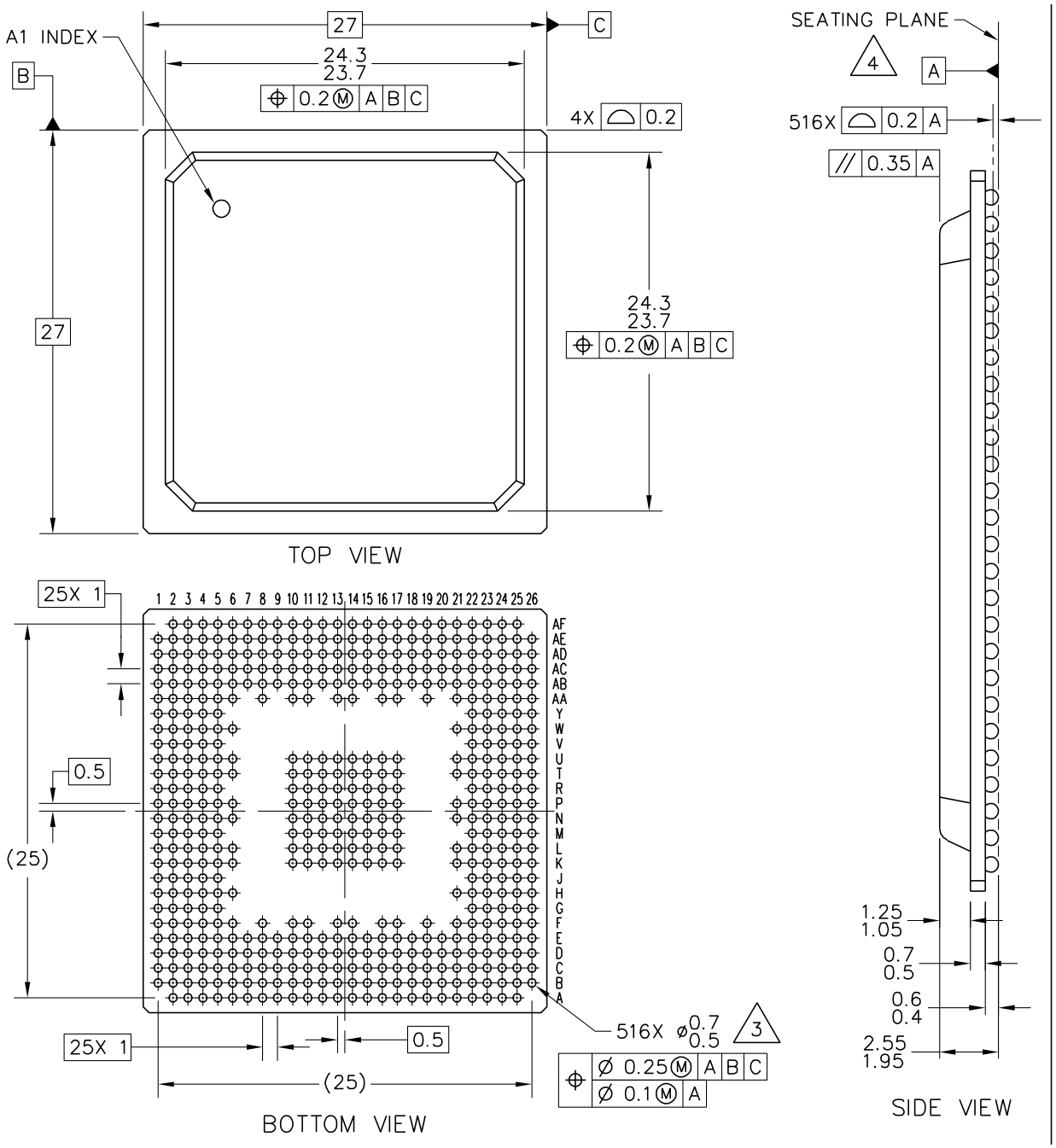


Figure 18. Mechanical Dimensions and Bottom Surface Nomenclature—516 PBGA

Table 24. Document Revision History (continued)

Revision	Date	Substantive Changes
0.6	10/2002	Table 22, “VR Pinout”: corrected ball assignment for the following pins—A12–A17, $\overline{TA}$, PD5, PC2.
0.5	9/2002	Addition of VR (516 PBGA) package information. Refer to sections 2.2, 4.2, and 5.
0.4	5/2002	• Table 2: Notes 2 and 3 • Addition of note on page 8:VDDH and VDD tracking • Table 14: Note 3 • Table 16: Note 1 • Table 18: Note 3
0.3	3/2002	• Table 20: modified note to pin AF25.
0.2	3/2202	• Table 20: modified notes to pins AE11 and AF25. • Table 20: added note to pins AA1 and AG4 (Therm0 and Therm1).
0.1	2/2002	• Note 2 for Table 4 (changes in italics): “...greater than *or equal to 266* MHz, *200* MHz CPM...” • Table 18: core and bus frequency values for the following ranges of MODCK_HMODCK: 0011_000 to 0011_100 and 1011_000 to 1011_1000 • Table 20: footnotes added to pins at AE11, AF25, U5, and V4.
0	11/2001	Initial version