

# **S3C2800**

## **32-BIT RISC MICROPROCESSOR DATA SHEET**

**Revision 1.0**



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# S3C2800

## 32-Bit RISC Microprocessor

Data Sheet

### OVERVIEW

SAMSUNG's S3C2800 32-bit RISC microprocessor is designed to provide a cost-effective and high-performance micro-controller solution for general applications. The S3C2800 features the following integrated on-chip support to help design a system a low cost: 16KB I/D caches, 2-ch UART with handshake, 4-ch DMA, memory controller, 3-ch timer, GPIO (General-Purpose Input/Output) ports, RTC (Real Time Clock), 2-ch IIC-BUS interface, and a built-in PLL for system clock.

Based on ARM920T core, the S3C2800 is developed using 0.18 um CMOS standard cells and a memory compiler. Its simple, elegant, and fully static low-power design is particularly suitable for both cost-sensitive and power-sensitive applications. The 32-bit ARM920T RISC processor core (220Mips @200MHz), designed by Advanced RISC Machines, Ltd., provides architectural enhancements such as the Thumb de-compressor, a 32-bit hardware multiplier, and an on-chip ICE debug support. Also, the S3C2800 features the Harvard BUS architecture for efficient data/instruction transfers.

By integrating various common system peripherals, the S3C2800 minimizes the overall system cost and eliminates the need to configure additional components. The integrated on-chip functions are summarized as follows :

- PCI BUS interface (32-bit, up to 66MHz).
  - 1.8V static ARM920T CPU core with 16KB I/D (Instruction/Data) cache. (Harvard bus architecture up to 200MHz).
  - External memory controller. (FP/EDO/SDRAM control, Chip select logic).
  - 4-ch general DMAs with external request pins.
  - 2-ch UART with handshake (IRDA1.0, 16-byte FIFO), Modem Interface.
  - 2-ch multi-master IIC-BUS controller.
  - 3-ch 16-bit timer.
  - 16-bit Watchdog timer.
  - 44 general-purpose GPIO ports including 8 external interrupt source.
  - Power management: Normal, Slow, and Idle modes.
  - RTC with calendar function.
  - On-chip PLL clock generator.
-

## FEATURES

### Architecture

- Little-/Big-endian support for external memory.
- Address space: 32Mbytes per each bank (Total 256Mbyte)
- Supports programmable 8/16/32-bit data bus width for each memory bank
- Fixed bank start address for all (static memory and dynamic memory banks)
- 8 memory banks
  - 4 memory banks for static memory (ROM, SRAM, FLASH etc)
  - 4 memory banks for dynamic memory (Fast Page, EDO, and Synchronous DRAM)
- Fully programmable access cycles for all static memory banks
- Supports external wait signal to extend the bus cycle
- Supports self-refresh mode in DRAM/SDRAM.
- Supports asymmetric/symmetric address of DRAM

### I/D (Instruction/Data) Cache Memory

- 64-way set-associative ICache (16KB) and DCache (16KB)
- 8 words per line with one valid bit and 2 dirty bits per line
- Pseudo-random or round-robin replacement

algorithm

- Write-through and Write-back cache operation.
- The write buffer can hold 16 words of data and 4 addresses
- Low voltage cache for reduced power consumption

### Clock & Power Manager

- The on-chip PLL generates the necessary clock for the operation of MCU at maximum of 200MHz@1.8V
- Input frequency range: (Fin) = 6MHz – 10MHz.
- Output frequency range: (F<sub>CLK</sub>) = 20MHz – 200MHz
- Clock can be selectively provided to each function block by software
- Power Down Mode: NORMAL, SLOW, and IDLE mode
  - NORMAL mode: Normal operating mode
  - SLOW mode: Low frequency clock without PLL
  - IDLE mode: Clock to CPU is disabled

### PCI Bus Interface

- Embedded PCI Host Bridge
- 32-bit data bus at 66MHz

## FEATURES (Continued)

### Interrupt Controller

- 34 Interrupt sources. (3 for Timers, 6 for UART, 8 for External interrupts, 4 for DMA, 2 for RTC, 2 for IIC, 2 for RCSR (Remote Control Signal Receiver), and 7 for PCI)
- Software polling Interrupt mode
- Selectable level- or edge-triggered external interrupts source
- Programmable IRQ/FIQ for each interrupt request
- Supports FIQ (Fast Interrupt Request) for very urgent interrupt request

### Timer

- 3-ch 16-bit Timer with DMA-based or interrupt-based operation

### Watchdog Timer

- 16-bit Watchdog Timer

### RCSR (Remote Control Signal Receiver)

- 8-step FIFO
- FIFO interrupt is generated on full (8) step overflow

### RTC (Real Time Clock)

- Full clock feature: sec, min, hour, date, day, week, month, and year
- 32.768 kHz input clock
- Alarm interrupt
- Time tick interrupt

### GPIO (General-Purpose Input/Output) Ports

- 8 external interrupt ports
- 44 multiplexed input/output ports.

### UART

- 2-channel UART with DMA-based or interrupt based operation
- Supports 5-bit, 6-bit, 7-bit, or 8-bit serial data transmit/receive
- Supports hardware handshaking during transmit/receive operation
- Programmable baud rates (up to 230.4Kbps).
- Supports IrDA 1.0 (up to 115.2Kbps)
- Loop back mode for testing
- Program accessible 16-byte FIFO (2x16 byte FIFO for transmit/receive data)

### DMA Controller

- 4-channel general-purpose Direct Memory Access controller without CPU intervention.
- Support memory to memory, memory to I/O and I/O to I/O DMA operations of the following 6 types:  
Software, 3 internal function blocks (UART0, UART1, Timer), and 2 External requests
- Burst transfer mode to enhance the transfer rate on the FPDRAM, EDODRAM and SDRAM

### IIC-BUS Interface

- 2-ch Multi-Master IIC-Bus with interrupt-based operation
- Serial, 8-bit oriented, bi-directional data transfers at up to 100 Kbit/s in the standard mode or up to 400 Kbit/s in the fast mode

### Operating Voltage Range

- Core: 1.8 V -0.1 V/+0.15 V
- I/O: 3.3 V  $\pm$  0.3 V

### Operating Frequency

- Up to 200 MHz.

### Package

- 208-pin LQFP

BLOCK DIAGRAM

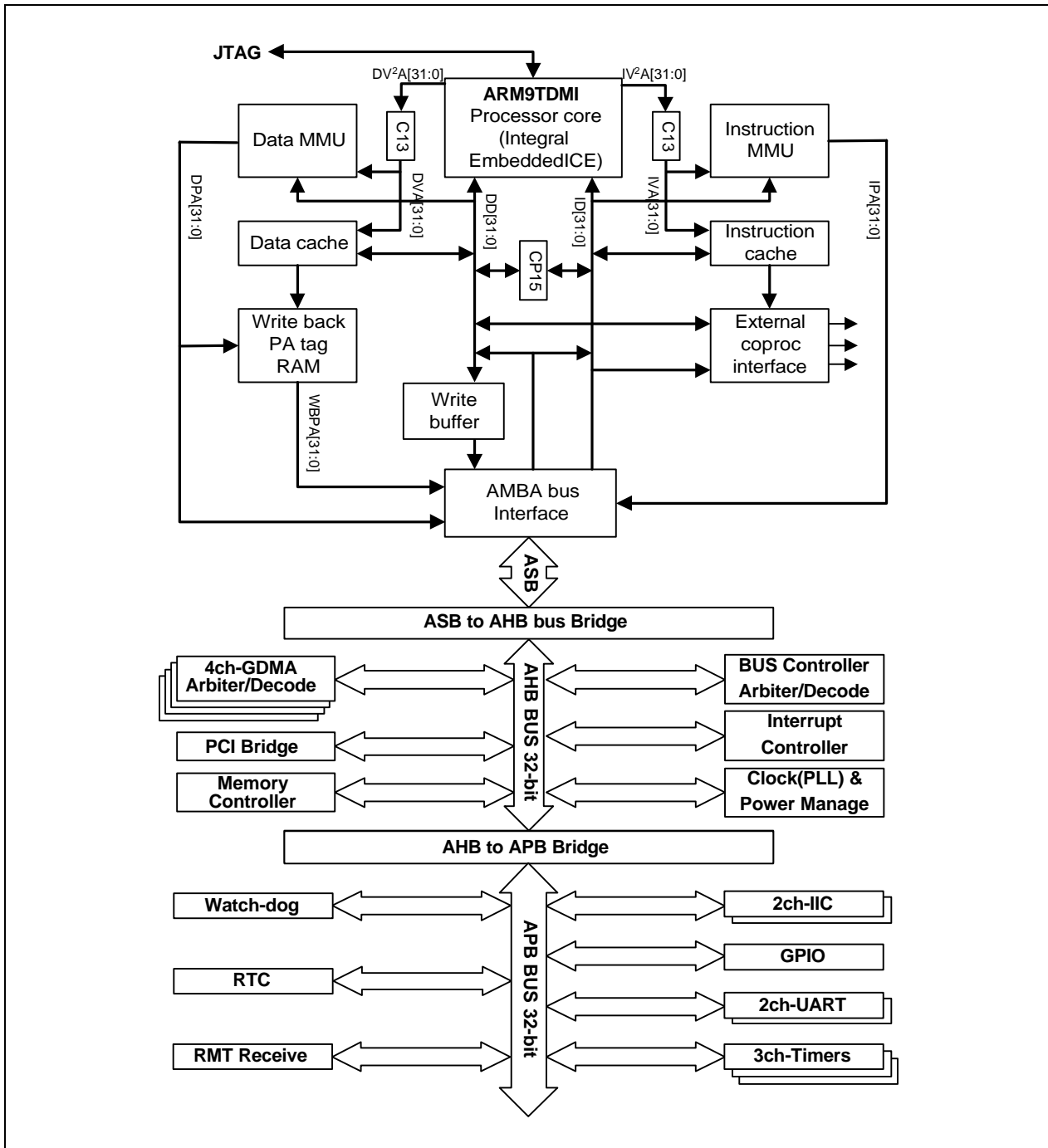


Figure 1. S3C2800 Block Diagram

PIN DIAGRAM (208-LQFP)

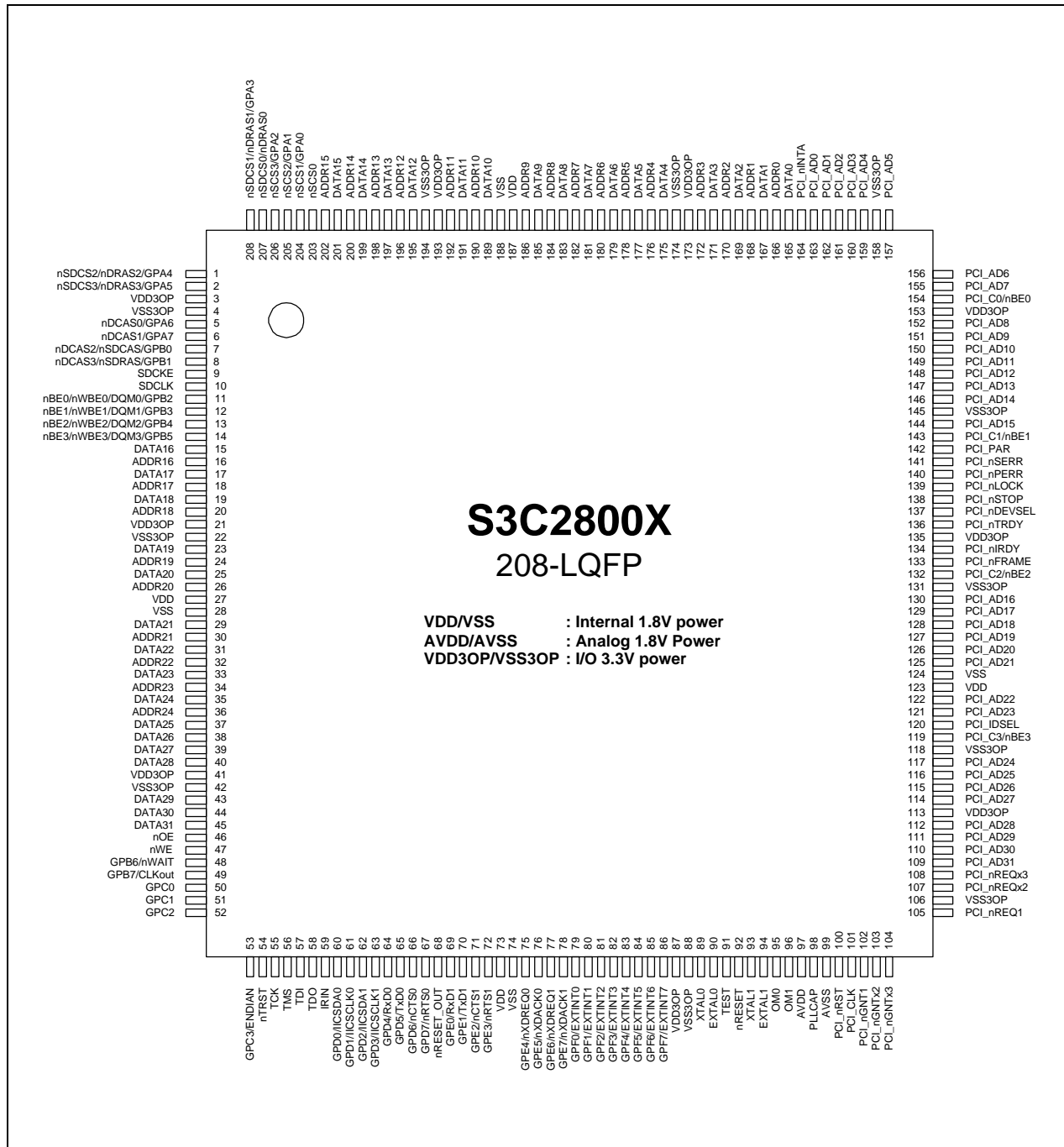


Figure 2. S3C2800 Pin Assignment (208-LQFP)

## PIN ASSIGNMENTS

Table 1. Pin Assignment Description

I/O Type	Descriptions
vdd1ih, vss3l vdd1ih_pci, vss3l_pci	1.8V power/ground for internal logic
vdd1t_abb, vss1t_abb	1.8V power/ground for analog circuitry
vdd3op, vss3op vdd3op_pci, vss3op_pci	3.3V power/ground for external interface logic
poar50_abb	1.8V analog output (A capacitor is connected between the pin and analog ground)
phsosc16	Oscillator cell width enable and feedback resistor (6 M – 40 MHz)
phsosc17	Oscillator cell width enable and feedback resistor (– 100 kHz)
Phis	3.3V interface LVCMOS schmitt trigger level input buffers
Phisu	3.3V interface LVCMOS schmitt trigger level input buffers with 100 K $\Omega$ pull-up resistor.
phob8	3.3V LVCMOS normal output buffers, lo = 8 mA
phob8sm	3.3V LVCMOS normal output buffers with medium slew-rate, lo = 8 mA
phot8	3.3V LVCMOS tri-state output buffers, lo = 8 mA
phob12	3.3V LVCMOS normal output buffers, lo = 12 mA
phbsud4	3.3V open-drain bi-directional buffers with 100 K $\Omega$ pull-up resistor. lo=4mA
phbsu50cd4sm	3.3V bi-directional pad, LVCMOS schmitt trigger, open-drain, 50 K $\Omega$ pull-up resistor with control, tri-state, lo = 4 mA
phbsu50ct8sm	3.3V bi-directional pad, LVCMOS schmitt trigger, 50 K $\Omega$ pull-up resistor with control, tri-state, lo = 8 mA
phbsu50ct12sm	3.3V bi-directional pad, LVCMOS schmitt trigger, 50 K $\Omega$ pull-up resistor with control, tri-state, lo = 12 mA
ptipci	3.3V input buffer
ptopci	3.3V output buffer with tri-state
ptbpci	3.3V bi-directional buffer with input and tri-state output
ptbdpci	3.3V bi-directional buffer with input and open-drain output, tri-state

## NOTES:

1. ENDIAN value is latched only at the rising edge of nRESET: when nRESET is Low, the ENDIAN (GPC3) pin operates in input mode; nRESET becomes High, the ENDIAN pin will automatically switch to output mode.
2. IICSDA, IICCLK, PCI\_nSERR, and PCI\_nINTA pins are of open-drain type.
3. AI/AO means analog input/output.



Table 2. 208-Pin LQFP Pin Assignment

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
1	nSDCS2/nDRAS2/GPA4	nSDCS2	O/IO	phbsu50ct8sm
2	nSDCS3/nDRAS3/GPA5	nSDCS3	O/IO	
3	VDD3OP	VDD3OP	P	vdd3op
4	VSS3OP	VSS3OP	P	vss3op
5	nDCAS0/GPA6	nDCAS0	O/IO	phbsu50ct8sm
6	nDCAS1/GPA7	nDCAS1	O/IO	
7	nDCAS2/nSDCAS/GPB0	nSDCAS	O/IO	
8	nDCAS3/nSDRAS/GPB1	nSDRAS	O/IO	
9	SDCKE	SDCKE	O	phob8
10	SDCLK	SDCLK	O	phob12
11	nBE0/nWBE0/DQM0/GPB2	DQM0	O/IO	phbsu50ct8sm
12	nBE1/nWBE1/DQM1/GPB3	DQM1	O/IO	
13	nBE2/nWBE2/DQM2/GPB4	DQM2	O/IO	
14	nBE3/nWBE3/DQM3/GPB5	DQM3	O/IO	
15	DATA16	DATA16	I/O	phbsu50ct12sm
16	ADDR16	ADDR16	O	phot8
17	DATA17	DATA17	I/O	phbsu50ct12sm
18	ADDR17	ADDR17	O	phot8
19	DATA18	DATA18	I/O	phbsu50ct12sm
20	ADDR18	ADDR18	O	phot8
21	VDD3OP	VDD3OP	P	vdd3op
22	VSS3OP	VSS3OP	P	vss3op
23	DATA19	DATA19	I/O	phbsu50ct12sm
24	ADDR19	ADDR19	O	phot8
25	DATA20	DATA20	I/O	phbsu50ct12sm
26	ADDR20	ADDR20	O	phot8
27	VDD	VDD	P	vdd1ih
28	VSS	VSS	P	vss3i
29	DATA21	DATA21	I/O	phbsu50ct12sm
30	ADDR21	ADDR21	O	phot8
31	DATA22	DATA22	I/O	phbsu50ct12sm
32	ADDR22	ADDR22	O	phot8
33	DATA23	DATA23	I/O	phbsu50ct12sm
34	ADDR23	ADDR23	O	phot8
35	DATA24	DATA24	I/O	phbsu50ct12sm

Table 2. 208-Pin LQFP Pin Assignment (Continued)

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
36	ADDR24	ADDR24	O	phot8
37	DATA25	DATA25	I/O	phbsu50ct12sm
38	DATA26	DATA26	I/O	
39	DATA27	DATA27	I/O	
40	DATA28	DATA28	I/O	
41	VDD3OP	VDD3OP	P	vdd3op
42	VSS3OP	VSS3OP	P	vss3op
43	DATA29	DATA29	I/O	phbsu50ct12sm
44	DATA30	DATA30	I/O	
45	DATA31	DATA31	I/O	
46	nOE	nOE	O	phob8sm
47	nWE	nWE	O	
48	GPB6/nWAIT	GPB6	IO	phbsu50ct8sm
49	GPB7/CLKout	GPB7	IO	
50	GPC0	GPC0	IO	
51	GPC1	GPC1	IO	
52	GPC2	GPC2	IO	
53	GPC3/ENDIAN	ENDIAN	I(1)	
54	nTRST	nTRST	I	phis
55	TCK	TCK	I	phis
56	TMS	TMS	I	phis
57	TDI	TDI	I	phis
58	TDO	TDO	O	phot8
59	IRIN	IRIN	I	phis
60	GPD0/IICSDA0	GPD0	IO(2)	phbsu50cd4sm
61	GPD1/IICCLK0	GPD1	IO(2)	
62	GPD2/IICSDA1	GPD2	IO(2)	
63	GPD3/IICCLK1	GPD3	IO(2)	
64	GPD4/RxD0	GPD4	IO	phbsu50ct8sm
65	GPD5/TxD0	GPD5	IO	
66	GPD6/nCTS0	GPD6	IO	
67	GPD7/nRTS0	GPD7	IO	
68	nRESET_OUT	nRESET_OUT	O	phob8
69	GPE0/RxD1	GPE0	IO	phbsu50ct8sm
70	GPE1/TxD1	GPE1	IO	

Table 2. 208-Pin LQFP Pin Assignment (Continued)

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
71	GPE2/nCTS1	GPE2	IO	phbsu50ct8sm
72	GPE3/nRTS1	GPE3	IO	
73	VDD	VDD	P	vdd1ih
74	VSS	VSS	P	vss3i
75	GPE4/nXDREQ0	GPE4	IO	phbsu50ct8sm
76	GPE5/nXDACK0	GPE5	IO	
77	GPE6/nXDREQ1	GPE6	IO	
78	GPE7/nXDACK1	GPE7	IO	
79	GPF0/EXTINT0	GPF0	IO	
80	GPF1/EXTINT1	GPF1	IO	
81	GPF2/EXTINT2	GPF2	IO	
82	GPF3/EXTINT3	GPF3	IO	
83	GPF4/EXTINT4	GPF4	IO	
84	GPF5/EXTINT5	GPF5	IO	
85	GPF6/EXTINT6	GPF6	IO	
86	GPF7/EXTINT7	GPF7	IO	
87	VDD3OP	VDD3OP	P	
88	VSS3OP	VSS3OP	P	vss3op
89	XTAL0	XTAL0	AI(3)	phsoscsm16
90	EXTAL0	EXTAL0	AO(3)	
91	TEST	TEST	I	phis
92	nRESET	nRESET	I	phisu
93	XTAL1	XTAL1	I	phsoscck17
94	EXTAL1	EXTAL1	O	
95	OM0	OM0	I(1)	phis
96	OM1	OM1	I(1)	
97	AVDD	AVDD	P	vdd1t_abb
98	PLLCAP	PLLCAP	AO(3)	poar50_abb
99	AVSS	AVSS	P	vss1t_abb/vbb1_abb
100	PCI_nRST	PCI_nRST	I	ptipci
101	PCI_CLK	PCI_CLK	I	
102	PCI_nGNT1	PCI_nGNT1	IO	ptbpci
103	PCI_nGNTx2	PCI_nGNTx2	O	ptopci
104	PCI_nGNTx3	PCI_nGNTx3	O	
105	PCI_nREQ1	PCI_nREQ1	IO	ptbpci

Table 2. 208-Pin LQFP Pin Assignment (Continued)

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
106	VSS3OP	VSS3OP	P	vss3op_pci
107	PCI_nREQx2	PCI_nREQx2	I	ptipci
108	PCI_nREQx3	PCI_nREQx3	I	
109	PCI_AD31	PCI_AD31	I/O	ptbpci
110	PCI_AD30	PCI_AD30	I/O	
111	PCI_AD29	PCI_AD29	I/O	
112	PCI_AD28	PCI_AD28	I/O	
113	VDD3OP	VDD3OP	P	vdd3op_pci
114	PCI_AD27	PCI_AD27	I/O	ptbpci
115	PCI_AD26	PCI_AD26	I/O	
116	PCI_AD25	PCI_AD25	I/O	
117	PCI_AD24	PCI_AD24	I/O	
118	VSS3OP	VSS3OP	P	vss3op_pci
119	PCI_C3/nBE3	PCI_C3/nBE3	I/O	ptbpci
120	PCI_IDSEL	PCI_IDSEL	I	ptipci
121	PCI_AD23	PCI_AD23	I/O	ptbpci
122	PCI_AD22	PCI_AD22	I/O	
123	VDD	VDD	P	vdd1ih_pci
124	VSS	VSS	P	vss3i_pci
125	PCI_AD21	PCI_AD21	I/O	ptb_pci
126	PCI_AD20	PCI_AD20	I/O	
127	PCI_AD19	PCI_AD19	I/O	
128	PCI_AD18	PCI_AD18	I/O	
129	PCI_AD17	PCI_AD17	I/O	
130	PCI_AD16	PCI_AD16	I/O	
131	VSS3OP	VSS3OP	P	vss3op_pci
132	PCI_C2/nBE2	PCI_C2/nBE2	I/O	ptbpci
133	PCI_nFRAME	PCI_nFRAME	I/O	
134	PCI_nIRDY	PCI_nIRDY	I/O	
135	VDD3OP	VDD3OP	P	vdd3op_pci
136	PCI_nTRDY	PCI_nTRDY	I/O	ptbpci
137	PCI_nDEVSEL	PCI_nDEVSEL	I/O	
138	PCI_nSTOP	PCI_nSTOP	I/O	
139	PCI_nLOCK	PCI_nLOCK	I	ptipci
140	PCI_nPERR	PCI_nPERR	I/O	ptbpci

Table 2. 208-Pin LQFP Pin Assignment (Continued)

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
141	PCI_nSERR	PCI_nSERR	I/O(2)	ptbdpci
142	PCI_PAR	PCI_PAR	I/O	ptbpci
143	PCI_C1/nBE1	PCI_C1/nBE1	I/O	
144	PCI_AD15	PCI_AD15	I/O	
145	VSS3OP	VSS3OP	P	
146	PCI_AD14	PCI_AD14	I/O	ptbpci
147	PCI_AD13	PCI_AD13	I/O	
148	PCI_AD12	PCI_AD12	I/O	
149	PCI_AD11	PCI_AD11	I/O	
150	PCI_AD10	PCI_AD10	I/O	
151	PCI_AD9	PCI_AD9	I/O	
152	PCI_AD8	PCI_AD8	I/O	
153	VDD3OP	VDD3OP	P	
154	PCI_C0/nBE0	PCI_C0/nBE0	I/O	ptbpci
155	PCI_AD7	PCI_AD7	I/O	
156	PCI_AD6	PCI_AD6	I/O	
157	PCI_AD5	PCI_AD5	I/O	
158	VSS3OP	VSS3OP	P	vss3op_pci
159	PCI_AD4	PCI_AD4	I/O	ptbpci
160	PCI_AD3	PCI_AD3	I/O	
161	PCI_AD2	PCI_AD2	I/O	
162	PCI_AD1	PCI_AD1	I/O	
163	PCI_AD0	PCI_AD0	I/O	
164	PCI_nINTA	PCI_nINTA	I/O(2)	phbsud4
165	DATA0	DATA0	I/O	phbsu50ct12sm
166	ADDR0	ADDR0	O	phot8
167	DATA1	DATA1	I/O	phbsu50ct12sm
168	ADDR1	ADDR1	O	phot8
169	DATA2	DATA2	I/O	phbsu50ct12sm
170	ADDR2	ADDR2	O	phot8
171	DATA3	DATA3	I/O	phbsu50ct12sm
172	ADDR3	ADDR3	O	phot8
173	VDD3OP	VDD3OP	P	vdd3op
174	VSS3OP	VSS3OP	P	vss3op
175	DATA4	DATA4	I/O	phbsu50ct12sm

Table 2. 208-Pin LQFP Pin Assignment (Continued)

Pin #	Pin Name	Default Function	I/O State @Initial	I/O TYPE
176	ADDR4	ADDR4	O	phot8
177	DATA5	DATA5	I/O	phbsu50ct12sm
178	ADDR5	ADDR5	O	phot8
179	DATA6	DATA6	I/O	phbsu50ct12sm
180	ADDR6	ADDR6	O	phot8
181	DATA7	DATA7	I/O	phbsu50ct12sm
182	ADDR7	ADDR7	O	phot8
183	DATA8	DATA8	I/O	phbsu50ct12sm
184	ADDR8	ADDR8	O	phot8
185	DATA9	DATA9	I/O	phbsu50ct12sm
186	ADDR9	ADDR9	O	phot8
187	VDD	VDD	P	vdd1ih
188	VSS	VSS	P	vss3i
189	DATA10	DATA10	I/O	phbsu50ct12sm
190	ADDR10	ADDR10	O	phot8
191	DATA11	DATA11	I/O	phbsu50ct12sm
192	ADDR11	ADDR11	O	phot8
193	VDD3OP	VDD3OP	P	vdd3op
194	VSS3OP	VSS3OP	P	vss3op
195	DATA12	DATA12	I/O	phbsu50ct12sm
196	ADDR12	ADDR12	O	phot8
197	DATA13	DATA13	I/O	phbsu50ct12sm
198	ADDR13	ADDR13	O	phot8
199	DATA14	DATA14	I/O	phbsu50ct12sm
200	ADDR14	ADDR14	O	phot8
201	DATA15	DATA15	I/O	phbsu50ct12sm
202	ADDR15	ADDR15	O	phot8
203	nSCS0	nSCS0	O	phob8sm
204	nSCS1/GPA0	nSCS1	O/IO	phbsu50ct8sm
205	nSCS2/GPA1	nSCS2	O/IO	phbsu50ct8sm
206	nSCS3/GPA2	nSCS3	O/IO	phbsu50ct8sm
207	nSDCS0/nDRAS0	nSDCS0	O	phob8sm
208	nSDCS1/nDRAS1/GPA3	nSDCS1	O/IO	phbsu50ct8sm



Table 3. S3C2800 Signal Descriptions (Continued)

Signal	I/O	Description
<b>UART</b>		
RxD[1:0]	I	UART receives data input.
TxD[1:0]	O	UART transmits data output.
nCTS[1:0]	I	UART clear to send input signal.
nRTS[1:0]	O	UART request to send output signal.
<b>IIC-BUS</b>		
IICSDA[1:0]	IO	IIC-bus data.
IIC_SCL[1:0]	IO	IIC-bus clock.
<b>Remote Control Signal Input Interrupt</b>		
IRIN	I	Remote controller signal receive interrupt
<b>GENERAL-PURPOSE I/O PORTS</b>		
GPx[7:0] x 5 GPC[3:0]	IO	General-purpose input/output ports (GPA[7:0], GPB[7:0], GPC[3:0], GPD[7:0], GPE[7:0], GPF[7:0])
<b>RESET &amp; CLOCK</b>		
nRESET	ST	nRESET suspends any operation in progress and places S3C2800 into a known reset state. For a reset, nRESET must be held to low level for at least 4 CPUCLK after the processor power is stabilized.
nRESET_OUT	O	The nRESET_OUT pin is asserted during hardware reset(POR,nRESET), software reset and watchdog reset.
XTAL0	AI	Crystal Input for internal OSC circuit for system clock. If it isn't used, XTAL0 has to be high level.
EXTAL0	AO	Crystal output for internal OSC circuit for system clock. It is the inverted output of XTAL0. If it isn't used, it has to be a floating pin.
PLLCAP	AI	Loop filter capacitor for system clocks PLL. (1uF )
XTAL1	AI	32 KHz crystal input for RTC.
EXTAL1	AO	32 KHz crystal output for RTC. It is the inverted output of XTAL1.
<b>JTAG TEST LOGIC</b>		
nTRST	I	nTRST(TAP Controller Reset) resets the TAP controller at start. If debugger is used, A 10K pull-up resistor has to be connected. If debugger(black ICE) isn't used, nTRST pin has to be low level or low active pulse.
TMS	I	TMS (TAP Controller Mode Select) controls the sequence of the TAP controller's states. A 10K pull-up resistor has to be connected to TMS pin.
TCK	I	TCK (TAP Controller Clock) provides the clock input for the JTAG logic. A 10K pull-up resistor has to be connected to TCK pin.
TDI	I	TDI (TAP Controller Data Input) is the serial input for test instructions and data. A 10K pull-up resistor has to be connected to TDI pin.
TDO	O	TDO (TAP Controller Data Output) is the serial output for test instructions and data.



Table 3. S3C2800 Signal Descriptions (Continued)

Signal	I/O	Description
<b>POWER</b>		
VDD	P	S3C2800 core logic $V_{DD}$ (1.8 V).
VSS	P	S3C2800 core logic $V_{SS}$ .
AVDD	P	S3C2800 Analog logic (PLL loop filter) $V_{DD}$ (1.8V).
AVSS	P	S3C2800 Analog logic (PLL loop filter) $V_{SS}$ .
VDD3OP	P	S3C2800 GPIO port $V_{DD}$ (3.3 V).
VSS3OP	P	S3C2800 GPIO port $V_{SS}$ .
<b>PCI-BUS</b>		
PCI_AD[31:0]	I/O	PCI Address/Data Bus. Multiplexed address and data bus.
PCI_C[3:0]/ nBE[3:0]	I/O	PCI C (bus command) or Byte enables.
PCI_PAR	I/O	PCI-parity. Parity is even across PCI_AD[31:0] and PCI_C[3:0]/nBE[3:0]. PCI_PAR is valid one cycle after either an address or data phase. The PCI device that drives PCI_AD[31:0] is responsible for driving PCI_PAR on the next PCI bus clock.
PCI_nFRAME	I/O	PCI_nFRAME is driven by the current PCI bus master to indicate beginning and duration of a PCI access.
PCI_nTRDY	I/O	The target of the current PCI transaction drives PCI_nTRDY. Assertion of PCI_nTRDY indicates that the PCI target is ready to transfer data.
PCI_nIRDY	I/O	The current PCI bus master drives PCI_nIRDY. Assertion of PC_nIRDY indicates that the PCI initiator is ready to transfer data.
PCI_nSTOP	I/O	The target of the current PCI transaction may assert PCI_nSTOP to indicate to the requesting PCI master that it wants to end the current transaction.
PCI_nDEVSEL	I/O	The target of the current PCI transaction drives PCI_nDEVSEL. A PCI target asserts PCI_nDEVSEL when it decodes an address and command encoding, and claims the transaction.
PCI_IDSEL	I	PCI_IDSEL is used during configuration cycles to select the PCI slave interface for configuration.
PCI_nPERR	I/O	PCI_nPERR is used for reporting data parity errors on PCI transactions. PCI_nPERR is driven active by the device receiving PCI_AD[31:0], PCI_C[3:0]/nBE[3:0], and PCI_PARITY, two PCI clocks following the data in which bad parity is detected.
PCI_nSERR	I/O	PCI_nSERR is used for reporting address parity errors or catastrophic failures detected by a PCI target.
PCI_nLOCK		PCI_nLOCK indicates an atomic operation to a bridge that may require multiple transactions to complet. When PCI_nLOCK is asserted, non-exclusive transactions may proceed to a bridge that is not currently locked. A grant to start a transaction on PCI does not guarantee a control of PCI_nLOCK. Locked transactions may be initiated only by the host bridges.
PCI_nREQ1	I/O	When internal arbiter is used, PCI_nREQ1 is input mode. or when external arbiter is used, PCI_nREQ1 is output mode.

Table 3. S3C2800 Signal Descriptions (Continued)

Signal	I/O	Description
PCI_nREQx[3:2]	I	PCI_nREQx[3:2] input when internal arbiter is used. Request indicates to the arbiter that this agent desires use of the bus. This is a point-to-point signal. Every master has its own PCI_nREQx, which must be tri-stated, while PCI_nRST is asserted.
PCI_nGNT1	I/O	When internal arbiter is used, PCI_nGNT1 is output mode. Or when external arbiter is used, PCI_nGNT1 is input mode.
PCI_nGNTx[3:2]	O	PCI_nGNTx[3:2] output when internal arbiter is used. Grant indicates to the agent that access to the bus has been granted. This is a point-to-point signal. Every master has its own PCI_nGNTx, which must be ignored while PCI_nRST is asserted.
PCI_CLK	I	PCI_CLK is used as the asynchronous PCI clock.
PCI_nRST	O	PCI specific reset
PCI_nINTA	O	PCI interrupt.

## ELECTRICAL DATA

## ABSOLUTE MAXIMUM RATINGS

Table 4. Absolute Maximum Rating

Symbol	Parameter	Rating		Unit
$V_{DD}$	1.8V Core DC Supply Voltage	2.4		V
$V_{DDP}$	3.3V I/O DC Supply Voltage	3.8		V
$V_{IN}$	DC Input Voltage	3.3 V Input buffer	3.8	V
$V_{OUT}$	DC Output Voltage	3.3 V Output buffer	3.8	V
$I_{latch}$	Latch-up Current	$\pm 200$		mA
$T_{STG}$	Storage Temperature	- 65 to 150		$^{\circ}\text{C}$

## RECOMMENDED OPERATING CONDITIONS

Table 5. Recommended Operating Conditions

Symbol	Parameters	Condition	Min	Type	Max	Unit
$V_{DD}$	1.8V Core DC Supply Voltage	Commercial	1.7	1.8	1.95	V
$V_{DDP}$	3.3V I/O DC Supply Voltage	Commercial	3.0	3.3	3.6	V
$V_{IN}$	DC Input Voltage	3.3V Input buffer	3.0	3.3	3.6	V
$V_{OUT}$	DC Output Voltage	3.3V Output buffer	3.0	3.3	3.6	V
$T_{OPR}$	Operating Temperature	Commercial	0		70	$^{\circ}\text{C}$
$I_{DD}$	Normal operating current (FCLK : HCLK : PCLK = 1: 1/2 : 1/4)					mA
	1.8V core supply current	FCLK = 200MHz, $V_{DD} = 1.95\text{V}$	-	210	300	
	3.3V I/O supply current	FCLK = 200MHz, $V_{DDP} = 3.6\text{V}$	-	75	110	
$I_{DD1}$	Idle mode current (FCLK : HCLK : PCLK = 1: 1/2 : 1/4)					mA
	1.8V core supply current	FCLK = 200MHz, $V_{DD} = 1.95\text{V}$	-	75	110	
	3.3V I/O supply current	FCLK = 200MHz, $V_{DDP} = 3.6\text{V}$	-	15	30	
$I_{DD2}$	Slow mode current (FCLK : HCLK : PCLK = 1: 1/2 : 1/2)					mA
	1.8V core supply current	FCLK = 6MHz, $V_{DD} = 1.95\text{V}$	-	15	30	
	3.3V I/O supply current	FCLK = 6MHz, $V_{DDP} = 3.6\text{V}$	-	5	10	

## DC ELECTRICAL CHARACTERISTICS

Table 6. Normal I/O PAD DC Electrical Characteristics

( $V_{DD} = 1.8\text{ V} - 0.1\text{ V}/+0.15\text{ V}$ ,  $V_{DDP} = 3.3\text{ V} \pm 0.3\text{ V}$ ,  $T_{OPR} = 0\text{ to }70\text{ }^{\circ}\text{C}$ )

Symbol	Parameters	Condition	Min	Type	Max	Unit
$V_{IH}$	High level input voltage					V
	LVC MOS interface		2.0			
$V_{IL}$	Low level input voltage					V
	LVC MOS interface				0.8	
$V_T$	Switching threshold			1.4		V
$V_{T+}$	Schmitt trigger, positive-going threshold	CMOS			2.0	V
$V_{T-}$	Schmitt trigger, negative-going threshold	CMOS	0.8			V
$I_{IH}$	High level input current					$\mu\text{A}$
	Input buffer	$V_{IN} = V_{DDP}$	-10		10	
$I_{IL}$	Low level input current					$\mu\text{A}$
	Input buffer	$V_{IN} = V_{SS}$	-10		10	
	Input buffer with pull-up		-120	-66	-20	
$V_{OH}$	High level output voltage					V
	Type B4	$I_{OH} = -4\text{ mA}$	2.4			
	Type B8	$I_{OH} = -8\text{ mA}$	2.4			
	Type B12	$I_{OH} = -12\text{ mA}$	2.4			
$V_{OL}$	Low level output voltage					V
	Type B4	$I_{OL} = 4\text{ mA}$			0.4	
	Type B8	$I_{OL} = 8\text{ mA}$			0.4	
	Type B12	$I_{OL} = 12\text{ mA}$			0.4	
$C_{IN}$	Input capacitance	Any Input and Bi-directional Buffers			4	pF
$C_{OUT}$	Output capacitance	Any Output Buffers			4	pF

**Table 7. PCI I/O PAD DC Electrical Characteristics**

( $V_{DD} = 1.8\text{ V} - 0.1\text{ V}/+0.15\text{ V}$ ,  $V_{DDP} = 3.3\text{ V} \pm 0.3\text{ V}$ ,  $T_{OPR} = 0\text{ to }70\text{ }^{\circ}\text{C}$ )

Symbol	Parameters	Condition	Min	Type	Max	Unit
$V_{IH}$	High level input voltage		$0.47V_{DDP}$		$V_{DDP}+0.5$	V
$V_{IL}$	Low level input voltage		-0.5		$0.33V_{DDP}$	V
$I_I$	Input Leakage Current		-10		10	$\mu\text{A}$
$V_{OH}$	High level output voltage	$I_{OH} = -500\text{ }\mu\text{A}$	$0.9V_{DDP}$			V
$V_{OL}$	Low level output voltage	$I_{OL} = 1500\text{ }\mu\text{A}$			$0.1V_{DDP}$	V

MECHANICAL DATA

PACKAGE DIMENSIONS

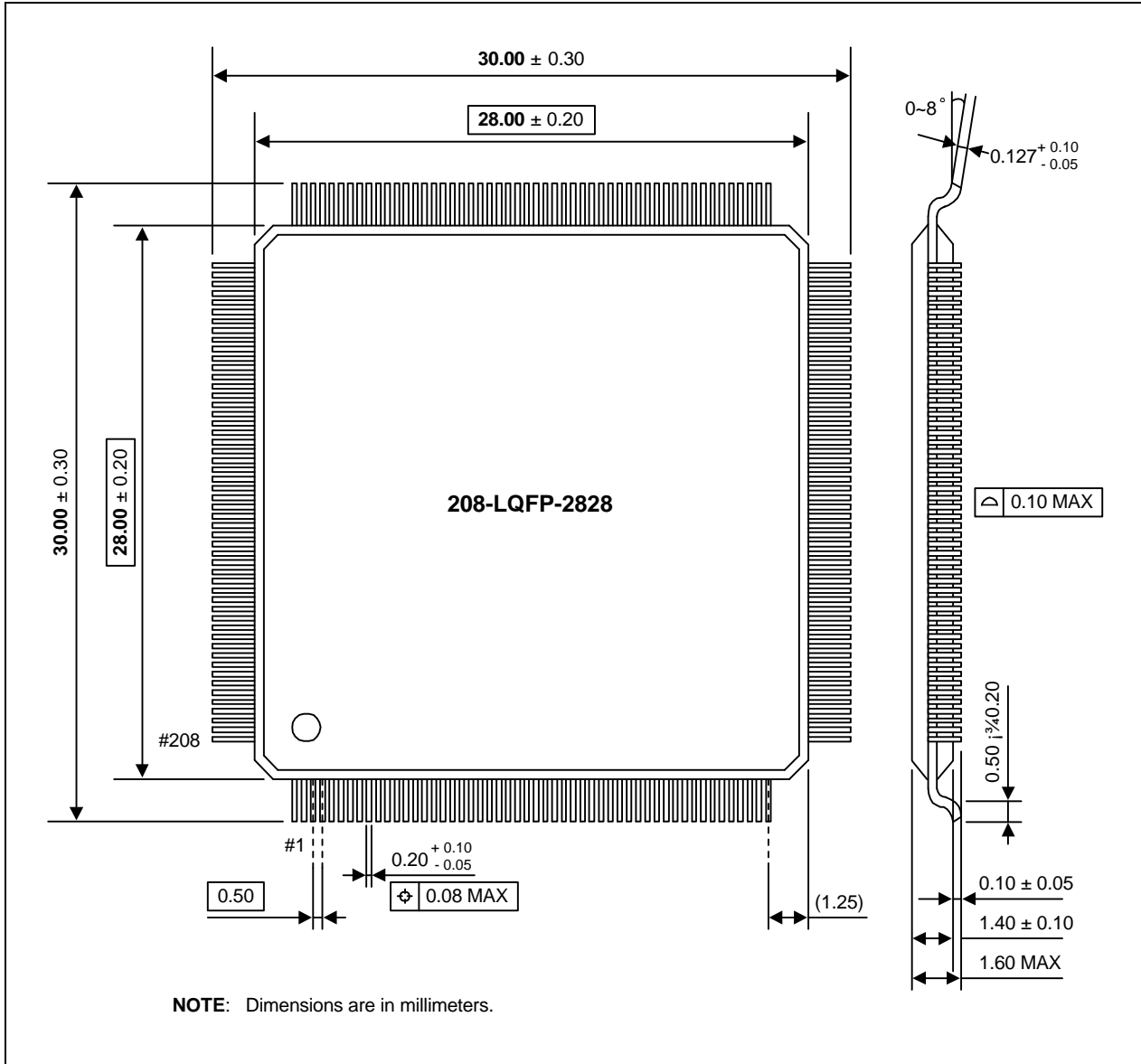


Figure 3. 208-LQFP-2828 Package Dimensions