JL4200B

Image Controller
for Digital Photo Reader

Revision: 3.0

Date: 1/23/2006

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0. Revision History

Revision	Description of Changes	Date
1.0	First Release	2003/06/05
1.1	Change pin names and description	2003/7/1
1.2	Change SD_PROTECT description	2003/7/7
1.3	1. Re-format the document 2. Correct some un-documented description	2003/9/18
2.0	Change JL4200A to JL4200B. (JL4200A has been phased out.)	2003/11/13
2.1	Add the description of design change from JL4200A to JL4200B. 1. Add the interface for both Memory Stick and Memory Stick Pro. 2. Provide power saving function that can be suspended by PC or MPU of JL4200B. This function doesn't include the USB PHY. MPU can choose the system clock either 30 MHz or other low clock rate. 3. Provide 8-bit register for audio playback, and also embed one D/A for audio output. 4. Support non-standard Huffman table. 5. The PIO mode of CF can be programmable. 6. Solve the bugs in JL4200A. 7. About 70 pins of location are changed by JL4200B, so the PCBA designed with JL4200A must be re-laid out in order to fit the pin out of JL4200B.	2003/11/14
2.2	Re-name the pin name of GPIO.	2004/02/12
2.3	Add audio function 1. Modify Feature 2. Block Diagram 3. Pin Definition for Audio Function	2004/04/14
2.31	Change the pin description of pin 179 and 180.	2004/05/10
2.4	Modify Block Diagram in page 6. ● Add “LCD TV” block through CCIR601/656 signal.	2004/10/08
2.41	Correct the typo of Block Diagram in page 6. ● USB1.1 → USB2.0	2004/10/11
2.5	Correct the typo in Pin Definition of pin 195, which should be high-active, not low-active signal for Card Protection ● /SD_PROTECT → SD_PROTECT	2004/11/15
2.6	Fix the major error in pin definition of pin 3 and pin 4. These pins can only be used as output pin, but we wrongly define it as GPIO.	2005/01/26
2.7	Change the pin definition of pin 3 and pin 4.	2005/07/01

Revision	Description of Changes	Date
2.8	1. Modify Features paragraph. 2. Add AVI specification. 3. Add more description in the Application paragraph. 4. Add more description in pin 3 and pin 4. ● Pin 3: Since JL4200B pin 3 is internally connected to the function block of USB Resume, pin 3 must be held at HIGH while USB_PLUG is ON. ● Note: Both pin 3 and pin 4 can only be used as output pin.	2005/11/14
2.9	Modify specification of AVI playback in page 5. ● Change frame rate of QVGA playback to 10 fps. ● Change frame rate of VGA playback to 5 fps.	2005/12/16
3.0	Standardize the Jeilin company logo.	2006/01/23

1. Generation Description

JL4200B is an image controller for so-called Photo Viewer, Digital Photo Reader and Digital Photo Frame. It consists of memory card interface, USB 2.0 interface, embedded Turbo 8051, JPEG Decoder, Audio/Video DAC, and CCIR601/656 interface.

Nowadays, DSC (Digital Camera) is more and more popular with customers of traditional film camera, so a lot of people use memory card to store their photos instead of traditional film. JL4200B is a good solution to most of camera users who they can directly view the photos in TV or LCD display. Besides the application for Photo Viewer, JL4200B solution can also be used as normal USB2.0 Card Reader. JL4200B system supports several different kinds of memory cards such CompactFlash (MicroDrive), SmartMedia (xD), SD (Mini-SD), MMC (RS-MMC), and Memory Stick (Memory Stick Pro, Memory Stick Duo), and even 2.5” or 1.8” Hard Disk Drive.

2. Features

1) Jpeg (still photo) Display
   - Non-progressive Jpeg
   - Maximal supported Jpeg resolution: 16,384 pixels (Horizontal) X Unlimited (Vertical)

2) AVI Playback
   - AVI file format: Only support motion Jpeg.
   - Audio: Only support PCM format.
   - QVGA:

JL4200B Playback Frame Rate for QVGA AVI		
AVI with audio data	Video	1. 10 fps with frame loss (original frame rate ＞ 10 fps) 2. 10 fps (original frame rate ＝ 10 fps) 3. Same with original frame rate (original frame rate ＜ 10 fps) Note: Playback frame rate will be downed to 5 fps if the memory card is MMC version 1.
	Audio	OK
AVI without audio data	Video: Slow motion without frame loss.	

   - VGA:

JL4200B Playback Frame Rate for VGA AVI		
AVI with audio data	Video	1. 5 fps with frame loss (original frame rate ＞ 5 fps) 2. 5 fps (original frame rate ＝ 5 fps) 3. Same with original frame rate (original frame rate ＜ 5 fps) Note: Playback frame rate will be downed to 3 fps if the memory card is MMC version 1.
	Audio	OK
AVI without audio data	Video: Slow motion without frame loss.	

3) Support 6 different kinds of memory card
   - CompactFlash card and MicroDrive
   - SmartMedia and xD card
   - SecureDisk (SD), Mini-SD, MultiMedia (MMC), and RS-MMC card
   - Memory Stick, Memory Stick Pro, and Memory Stick Duo

4) Compact Flash Interface
   - Fully compliant with Compact Flash (CF) v1.4 Specification

- Support part of the CF-ATA commands
- Using True IDE Mode to access CF Card

5) SmartMedia Interface
   - Compliant SmartMedia version 1.00 standard
6) SD Interface
   - Compliant Secure Digital Specification Version 1.01 SPI mode
7) Memory Stick Interface
   - Compliant Memory Stick Standard Format Specifications ver.1.40-00
   - Compliant Memory Stick Standard Memory Stick Pro Format Specifications ver.1.00-01
8) USB2.0 Interface
   - Conform to USB 2.0 specification
   - Faster Transfer
   - Backward compatible with USB1.1 Interface
   - Conform to USB Mass Storage Class Specification, Version 1.0 (Bulk Only Transport)
   - Supports one control pipe, one bulk in pipe, and one bulk out pipe
9) Support Mass Storage Class Specification
   - No Device Driver is required for Windows Me, 2000, and XP, Mac OS 9.x, OS 10.x.
   - Jeilin provides a proprietary device driver for Windows 98SE.
10) Video Interface
   - Composite Video: One TV Encoder is embedded to directly output Composite video to TV without extra DAC.
   - S-Video: Need one external TV Encoder that has two DAC inside. Image quality of S-Video is better than Composite Video because Luminance signal and Chroma signal is separated.
   - CCIR601/656 Video: Directly send digital video signal to LCD panel without signal loss due to Digital-to-Analog Conversion in JL4200B and Analog-to-Digital Conversion in LCD panel, therefore image quality is better than composite video and S-Video.
11) Support CCIR601/656 interface to output digital signal to following display devices:
   - LCD TV
   - LCD Panel
   - Traditional TV with S-Video input
12) SDRAM size: ≧ 4 MW
13) Support NTSC/PAL format.
14) Embedded Turbo 8051
   - Embedded 8KB SRAM
   - Embedded 64KB ROM
   - Provide one external interrupt input
   - Provide one UART port
15) External Program Memory
   - 64KB, 128KB, 256KB, and 512KB flash ROM are supported.

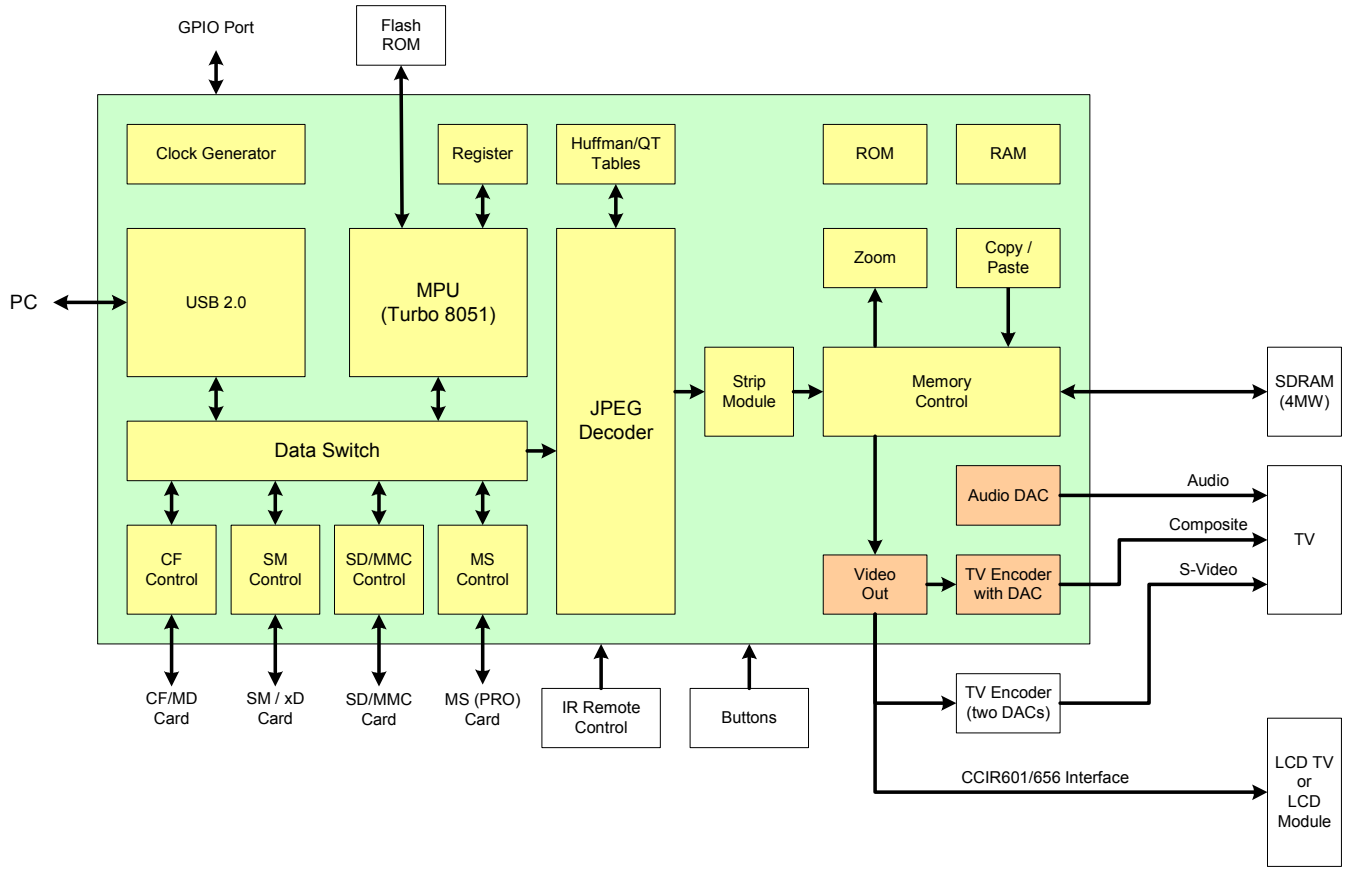
- Support external SRAM for other application.

16) Support In-circuit Programming (ISP) function
    - ISP provides an easy way to upgrade the firmware using memory card.
17) Support infrared remote control.
18) 3.3/2.5V, 208-pin PQFP package

3. Applications

1) USB2.0 Card Reader with TV Output
2) Digital Photo Frame
3) Photo Viewer
4) Photo Bank
5) Photo Reader in LCD TV

4. Functional Block Diagram



5. Pin Description and Pin Configuration

Pin No.	Pin Name	Type	Description
1	MS_SCLK	O4	Memory Stick Clock Output
2	MS_BS	O4	Memory Stick Bus State Output
3	GPO1	B8, U	General Purpose Out 1 → MPU P1.0 Note: Since JL4200B pin 3 is internally connected to the function block of USB Resume, pin 3 must be held at HIGH while USB_PLUG is ON.
4	GPO2	B8, U	General Purpose Out 2 → MPU P1.1
5	CF_D0	B4	CF Data Bus
6	CF_D1	B4	CF Data Bus
7	DAC_VREF	AO	Voltage Reference
8	CF_D2	B4	CF Data Bus
9	CF_D3	B4	CF Data Bus
10	CF_D4	B4	CF Data Bus
11	CF_D5	B4	CF Data Bus
12	CF_D6	B4	CF Data Bus
13	CF_D7	B4	CF Data Bus
15	CF_D8	B4	CF Data Bus
16	CF_D9	B4	CF Data Bus
17	CF_D10	B4	CF Data Bus
18	CF_D11	B4	CF Data Bus
19	CF_D12	B4	CF Data Bus
20	CF_D13	B4	CF Data Bus
22	CF_D14	B4	CF Data Bus
23	CF_D15	B4	CF Data Bus
24	/CF_CS0	O4	CF Chip Select 0 in True IDE mode
25	/CF_CS1	O4	CF Chip Select 1 in True IDE mode
26	CF_A0	O4	CF Address Line
27	CF_A1	O4	CF Address Line
28	CF_A2	O4	CF Address Line
29	/CF_CD1	I, S, U	CF Card Detection: This pin is connected to ground within CF card when the CF card is inserted.
30	/CF_PWR_ON	O4	This pin is used to turn on the power of CF card.
31	SPI_DATA_IN	I, U	SD Data Input
32	SPI_CLK	O2	SD Clock Output

Pin No.	Pin Name	Type	Description
33	/SPI_CS	O2	SD Chip Select Output
34	SPI_DATA_OUT	O2	SD Data Output
35	/CF_IOR	O4	This pin is a read-strobe control to CF card.
36	/CF_IOW	O4	This pin is a write-strobe control to CF card.
37	/SMC_WR	O2	SMC Write Enable
38	/SMC_RD	O2	SMC Read Enable
39	/SMC_WP	O2	SMC Write Protection
41	SMC_READY	I	SMC Ready/Busy → 1: Ready, 0: Busy
42	SMC_LVD	I	SMC Low Voltage Detect
43	/SMC_CE	O2	SMC Card Enable
44	/SMC_CD	I, S	SMC Card Detect: This is the card detection signal from SM card to indicate if the card is inserted.
45	MS_SDIO0	B4	Memory Stick Serial Data Line
46	MS_SDIO1	B4	Memory Stick Parallel Data Line
48	/SMC_PROTECT	I, S	SMC Write Protection
49	/SMC_INSERT	I, S	SMC Card Insertion: This pin is Low when SmartMedia Card is inserted.
50	SMC_D0	B2	SMC Data/Address/Command bus
51	SMC_D1	B2	SMC Data/Address/Command bus
52	SMC_D2	B2	SMC Data/Address/Command bus
53	SMC_D3	B2	SMC Data/Address/Command bus
54	SMC_CLE	O2	SMC Command Latch Enable
55	USB_PLUG	I, S	USB Insertion: This pin is High when USB cable is plugged.
56	SMC_ALE	O2	SMC Address Latch Enable
57	SMC_D4	B2	SMC Data/Address/Command Bus
58	SMC_D5	B2	SMC Data/Address/Command Bus
59	SMC_D6	B2	SMC Data/Address/Command Bus
60	SMC_D7	B2	SMC Data/Address/Command Bus
61	/RESET	I, S, U	Power-on Reset
63	ROM_A0	O2	FlashROM Address Bus
64	ROM_A1	O2	FlashROM Address Bus
65	ROM_A2	O2	FlashROM Address Bus
67	ROM_A3	O2	FlashROM Address Bus

Pin No.	Pin Name	Type	Description
68	ROM_A4	O2	FlashROM Address Bus
69	ROM_A5	O2	FlashROM Address Bus
70	ROM_A6	O2	FlashROM Address Bus
71	ROM_A7	O2	FlashROM Address Bus
72	ROM_A8	O2	FlashROM Address Bus
74	ROM_A9	O2	FlashROM Address Bus
75	ROM_A10	O2	FlashROM Address Bus
76	ROM_A11	O2	FlashROM Address Bus
77	ROM_A12	O2	FlashROM Address Bus
78	ROM_A13	O2	FlashROM Address Bus
79	ROM_A14	O2	FlashROM Address Bus
81	ROM_A15	O2	FlashROM Address Bus
82	MS_SDIO2	B4	Memory Stick Parallel Data
83	MS_SDIO3	B4	Memory Stick Parallel Data
84	INT	I, D	External Interrupt Input
85	/ROM_RD	O2	Read Strobe of FlashROM
86	/ROM_WR	O2	Write Strobe of FlashROM
87	ROM_D0	B2	FlashROM Data Bus
88	ROM_D1	B2	FlashROM Data Bus
89	ROM_D2	B2	FlashROM Data Bus
90	ROM_D3	B2	FlashROM Data Bus
91	ROM_D4	B2	FlashROM Data Bus
92	ROM_D5	B2	FlashROM Data Bus
93	ROM_D6	B2	FlashROM Data Bus
94	ROM_D7	B2	FlashROM Data Bus
95	/MEMORY_WR	O4	Write Strobe of External SRAM
96	/CPU_EA	I, U	0: External Program Memory 1: Internal Program Memory
97	/MEMORY_RD	O4	Read Strobe of External SRAM
100	XTAL_IN	ICLK	Crystal terminal or Oscillator Input: Frequency of crystal or oscillator can be chosen either 12 or 30 MHz. Pin 177 (XTAL_SEL) is used to select which frequency is chosen.
101	XTAL_OUT	OCLK	Crystal terminal
104	PHY_REF	USB	Connect an external resistor (12K ohm +/- 1%) to AGND.

Pin No.	Pin Name	Type	Description
105	PHY _DM	USB	USB2.0 Data Line (-)
106	PHY _DP	USB	USB2.0 Data Line (+)
108	PHY _RPU	USB	Connect an external resistor (1.5 K ohms +/- 1%) to VCCA3.3V.
109	PHY _DMRS	USB	USB1.1 Data Line (-): Connect to pin PHY _DM through an external resistor (39 ohms +/- 1%).
110	PHY _DPRS	USB	USB1.1 Data Line (+): Connect to pin PHY _DP through an external resistor (39 ohms +/- 1%).
114	GPIO16	B8, U	General Purpose I/O 16 → MPU P3.0 (RXD)
115	GPIO17	B8, U	General Purpose I/O 17 → MPU P3.1 (TXD)
116	GPIO18	B8, U	General Purpose I/O 18 → MPU P3.4
117	GPIO8	B8, U	General Purpose I/O 8 or Auxiliary Port 0 → MPU P2.0
118	GPIO9	B8, U	General Purpose I/O 9 or Auxiliary Port 1 → MPU P2.1
119	GPIO10	B8, U	General Purpose I/O 10 or Auxiliary Port 2 → MPU P2.2
120	GPIO11	B8, U	General Purpose I/O 11 or Auxiliary Port 3 → MPU P2.3
121	GPIO12	B8, U	General Purpose I/O 12 or Auxiliary Port 4 → MPU P2.4
122	GPIO13	B8, U	General Purpose I/O 13 or Auxiliary Port 5 → MPU P2.5
123	GPIO14	B8, U	General Purpose I/O 14 or Auxiliary Port 6 → MPU P2.6
124	GPIO15	B8, U	General Purpose I/O 15 or Auxiliary Port 7 → MPU P2.7
125	GPIO0	B8, U	General Purpose I/O 0 → MPU P0.0
126	GPIO1	B8, U	General Purpose I/O 1 → MPU P0.1
128	GPIO2	B8, U	General Purpose I/O 2 → MPU P0.2
129	GPIO3	B8, U	General Purpose I/O 3 → MPU P0.3
130	GPIO4	B8, U	General Purpose I/O 4 → MPU P0.4
131	GPIO5	B8, U	General Purpose I/O 5 → MPU P0.5
132	GPIO6	B8, U	General Purpose I/O 6 → MPU P0.6
133	GPIO7	B8, U	General Purpose I/O 7 → MPU P0.7
135	SDRAM_A0	O2	SDRAM Address Bus

Pin No.	Pin Name	Type	Description
136	SDRAM_A1	O2	SDRAM Address Bus
137	SDRAM_A2	O2	SDRAM Address Bus
138	SDRAM_A3	O2	SDRAM Address Bus
139	SDRAM_A4	O2	SDRAM Address Bus
140	SDRAM_A5	O2	SDRAM Address Bus
141	SDRAM_A6	O2	SDRAM Address Bus
142	SDRAM_A7	O2	SDRAM Address Bus
143	SDRAM_A8	O2	SDRAM Address Bus
144	SDRAM_A9	O2	SDRAM Address Bus
145	SDRAM_A10	O2	SDRAM Address Bus
146	SDRAM_A11	O2	SDRAM Address Bus
147	SDRAM_CLK	O2	SDRAM Clock Input
148	SDRAM_A12	O2	SDRAM Address Bus
149	SDRAM_UDQM	O2	SDRAM Input/output Mask
150	/SDRAM_CAS	O2	SDRAM Column Address Strobe
151	/SDRAM_RAS	O2	SDRAM Row Address Strobe
152	/SDRAM_WR	O2	SDRAM Write Enable
156	SDRAM_BS0	O2	SDRAM Bank Select
157	SDRAM_BS1	O2	SDRAM Bank Select
158	SDRAM_D0	B2	SDRAM Data Bus
159	SDRAM_D1	B2	SDRAM Data Bus
160	SDRAM_D2	B2	SDRAM Data Bus
161	SDRAM_D3	B2	SDRAM Data Bus
162	SDRAM_D4	B2	SDRAM Data Bus
164	SDRAM_D5	B2	SDRAM Data Bus
165	SDRAM_D6	B2	SDRAM Data Bus
166	SDRAM_D7	B2	SDRAM Data Bus
167	SDRAM_D8	B2	SDRAM Data Bus
168	SDRAM_D9	B2	SDRAM Data Bus
169	SDRAM_D10	B2	SDRAM Data Bus
171	SDRAM_D11	B2	SDRAM Data Bus
172	SDRAM_D12	B2	SDRAM Data Bus
173	SDRAM_D13	B2	SDRAM Data Bus
174	SDRAM_D14	B2	SDRAM Data Bus
175	SDRAM_D15	B2	SDRAM Data Bus
177	XTAL_SEL	I, D	Crystal Select

Pin No.	Pin Name	Type	Description
			0: 12Mhz, 1: 30Mhz
178	TEST	I, U	Test Pin for Tester or external clock input for USB PHY
179	CCIR_HSYNC	O2	CCIR601 HSYNC
180	CCIR_VSYNC	O2	CCIR601 VSYNC
181	CCIR_D0	O2	CCIR601/656 Data Bus
182	CCIR_D1	O2	CCIR601/656 Data Bus
183	CCIR_D2	O2	CCIR601/656 Data Bus
184	CCIR_D3	O2	CCIR601/656 Data Bus
186	CCIR_D4	O2	CCIR601/656 Data Bus
187	CCIR_D5	O2	CCIR601/656 Data Bus
188	CCIR_D6	O2	CCIR601/656 Data Bus
189	CCIR_D7	O2	CCIR601/656 Data Bus
190	CCIR_PCLK	O2	CCIR601/656 Pixel Clock
191	CCIR_ENABLE	I, U	Enable or disable the function of CCIR601/656: 0: Disable, 1: Enable
192	DATA_REQ	B2, U	Data Request of Auxiliary Port
193	DATA_STROBE	B2	Data Strobe of Auxiliary Port
194	/SD_INSERT	I, U	SD Card Insertion: This pin is Low when SD Card is inserted.
195	SD_PROTECT	I, U	SD Write Protection
196	/CF_RESET	O4	Hardware Reset to CompactFlash Card
197	/MS_INSERT	I, U	Memory Stick Card Insertion: This pin is Low when Memory Stick Card is inserted.
198	REMOTE_IN	I	Remote Controller Input
199	CF_INTRQ	I, D	CF Interrupt Request
200	CF_IORDY	I, U	CF Card Ready
205	TV_OUT_P	AO	Composite Video Output
206	TV_OUT_N	AO	Connect this pin to Analog Ground
207	AUDIO_OUT	AO	Audio Output
14,40,80,127,153	VCC3.3V	PWR	+3.3V I/O power
102,111,113	VCCA3.3V	PWR	+3.3V Analog power
202	VD33	PWR	+3.3V Analog power

Pin No.	Pin Name	Type	Description
66,154,170,185, 204	VCC2.5V	PWR	+2.5V core power
98	VCCA2.5V	PWR	+2.5V Analog power
21,47,62,73,134, 163,176,201, 208	GND	GND	Ground Reference
99,103,107,112, 155	AGND	GND	Analog Ground Reference
203	VS33	GND	Analog Ground Reference

Note:

Type	Description
I	Input Pin
O2	Output Pin with 2 mA drive
O4	Output Pin with 4 mA drive
O8	Output Pin with 8 mA drive
B2	Bi-directional Pin with 2 mA drive
B4	Bi-directional Pin with 4 mA drive
B8	Bi-directional Pin with 8 mA drive
U	Internal weak pull-up resistor
D	Internal weak pull-down resistor
S	Schmitt Trigger
USB	USB Interface
AO	Analog Output
ICLK	XTAL Clock Input
OCLK	XTAL Clock Output
PWR	Power Pin
GND	Ground Pin

6. Electrical Characteristics

- Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	Power Supply (3.3V)	-0.3 to 3.6	V
V_{CC1}	Power Supply (2.5V)	-0.3 to 2.75	V
V_{IN}	Input Voltage	-0.3 to VCC+0.3	V
V_{OUT}	Output Voltage	-0.3 to VCC+0.3	V
T_{STG}	Storage Temperature	-55 to 150	℃

- Recommended Operation Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC}	Power Supply (3.3V)	3.0	3.3	3.6	V
V_{CC1}	Power Supply (2.5V)	2.25	2.5	2.75	V
T_{OPR}	Operating Temperature	0	25	70	℃

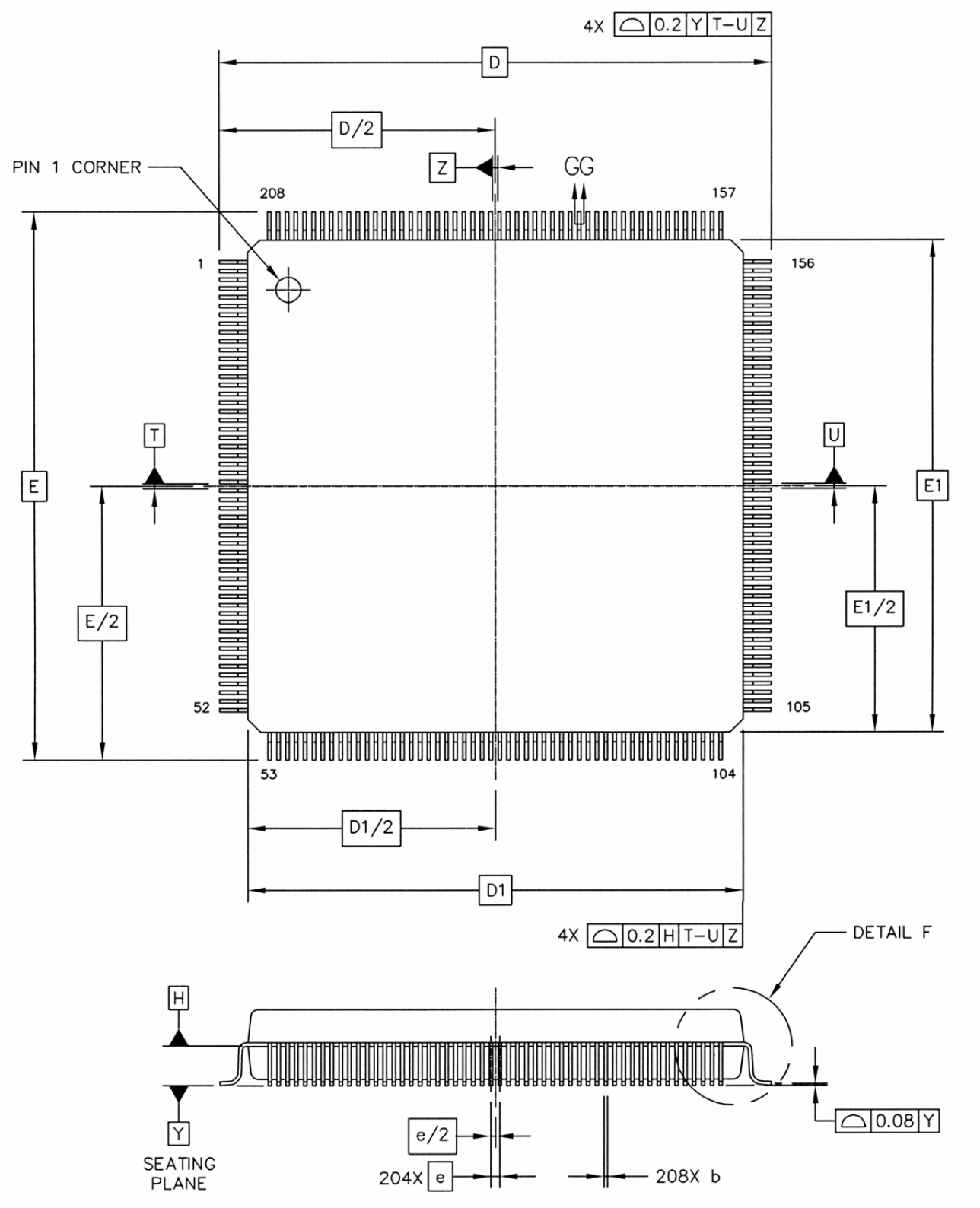
- DC Electrical Characteristics for 3.3 volts operation

(Under Recommended Operating Conditions and V_{CC} = 3.0V ~ 3.6V, Tj = 0℃ to + 70℃)

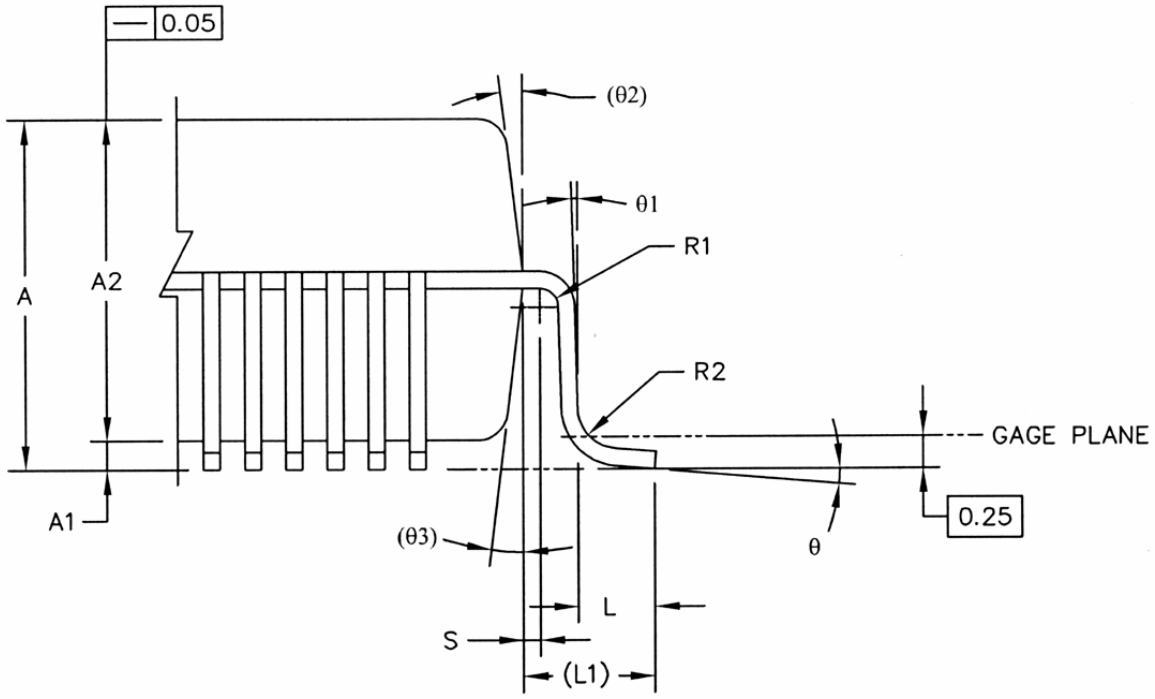
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IL}	Input Low Voltage	CMOS	-0.3		0.8	V
V_{IH}	Input High Voltage	CMOS	2.0		Vcc+0.3	V
V_{T-}	Schmitt input Low Voltage	CMOS	-0.3		0.8	V
V_{T+}	Schmitt input High Voltage	CMOS	2.0		Vcc+0.3	V
V_{OL}	Output low voltage				0.4	V
V_{OH}	Output high voltage		2.4			V

7. Package Outline and Dimension

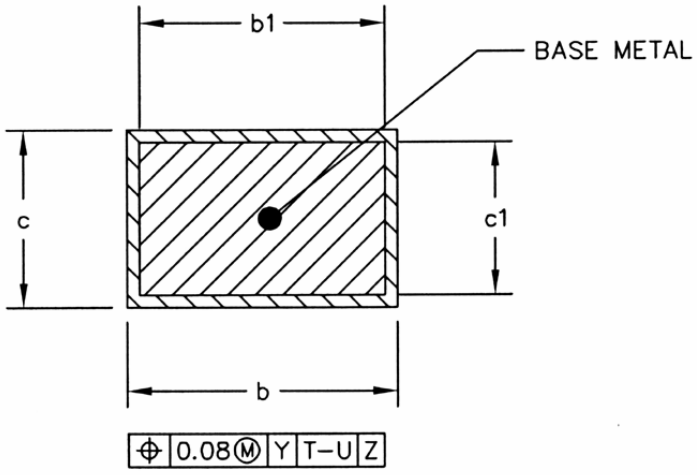
- Package Outline (208-pin PQFP)



- Package Outline (208-pin PQFP) - continued



DETAIL F



SECTION G–G

- Dimension (208-pin PQFP)

Dimension	Min	Nom	Max
A			4.1
A1	0.25		0.5
A2	3.2	3.35	3.6
b	0.17		0.27
b1	0.17	0.2	0.23
c	0.09		0.2
c1	0.09	0.15	0.16
D		30.6 BSC	
D1		28 BSC	
e		0.5 BSC	
E		30.6 BSC	
E1		28 BSC	
L	0.45	0.6	0.75
L1		1.3 REF	
R1	0.08		
R2	0.08		0.25
S	0.2		
θ	0°	3.5°	8°
θ1	0°		
θ2		8° REF	
θ3		8° REF	

Unit: mm

REF: Reference

BSC: Basic Spacing between Centers (integrated circuit package dimension)

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