Data Book

AU6362

USB 2.0 Multiple Slots Flash Memory Card Reader

Technical Reference Manual

Product Specification

Official Release

Revision 2.00W

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Data sheet status

Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.

Revision History

Date	Revision	Description
Jan 2005	2.00W/D34	Removed the schematics. Please contact our sales if you need it.

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1.0 Introduction

1.1 Description

This AU6362 is a highly integrated single chip USB 9-in-1 flash memory card reader controller. It supports USB v2.0 high-speed transmission to all of the popular storage media interface on one chip, such as Compact Flash (CF), Micro Drive (MD), Smart Media Card (SMC), Secure Digital (SD), Multi Media Card (MMC), Memory Stick (MS, MS Pro, MS Duo) and Digital photo (xD),

The AU6362 supports USB v2.0 and USB v1.0 Storage Class specification. It can read digital contents stored on memory card designed to cover a wide area of applications such as digital cameras, PDAs, MP3 players and smart phones…etc. With the AU6362, users can transfer digital data between flash memory card and PC or these electronic devices.

The integration of various mixed mode makes component AU6362 is the most powerful and most effective solution for multi-slot flash memory readers.

1.2 Features

- Support USB v2.0 specification and USB Device Class Definition for Mass Storage, Bulk-Transport v1.0
- Integrated USB 2.0 Transceiver Macrocell Interface (UTMI) transceiver and Serial interface Engine
- Support CF/MD, SD/MMC, MS/MS PRO/MS ROM/MS Duo AND xD/SMC specification
- Support 1 piece NAND type flash memory up to 2Gbit capacity.
- Work with default driver from Windows ME, Windows XP, and Mac OS X. Windows 98, Windows 2000 are supported by vendor AP (The AP included both win98 and 2000 driver) from Alcor.
- Ping-pong FIFO implementation for concurrent bus operation
- Support multiple sectors transfer optimize performance
- Support optional external EEPROM for USB VID, PID and string customization
- Support slot-to-slot read/write operation.
- Support auto-detecting slot with card inserted on Win 2000 without driver.
- Capable of handing ~~4~~ sets of built-in PID, VID and strings to minimize inventory control and improve lead production lead-time.
- Support LED for bus activity indication.
- Runs at 30MHz, built-in 480 MHz PLL
- Built-in 3.3V to 2.5V regulator

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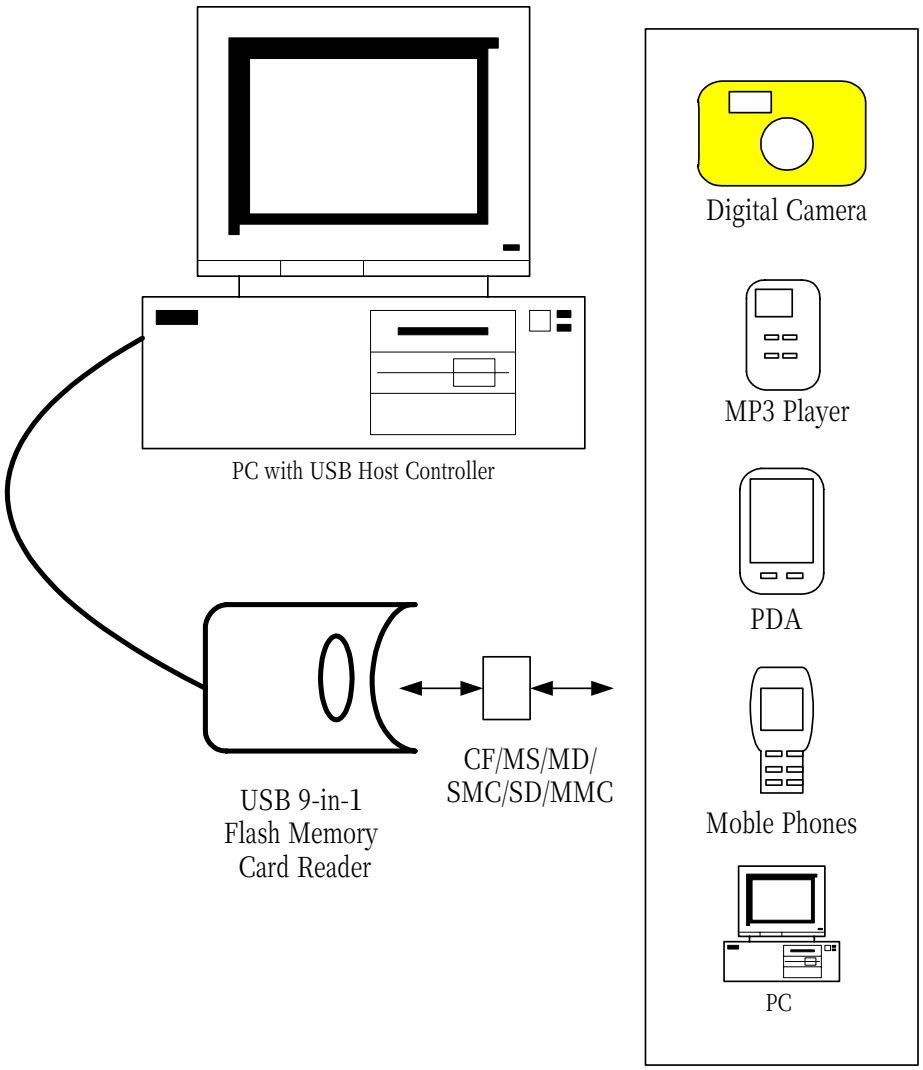
2.0 Application Block Diagram

Following is the application diagram of a typical card reader product with AU6362. By connecting the card reader to a desktop or notebook PC through USB bus, AU6362 is implemented as a bus-powered, full speed USB card reader, which can be used as a bridge for data transfer between Desktop PC and Notebook PC.

2.1 Block Diagram



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3.0 Pin Assignment

The AU6362 is packed in 100pin-LQFP-form factor. The following figure shows signal name for each pin and the table in the following page describes each pin in detail.

Figure 3.1 Pin Assignment Diagram

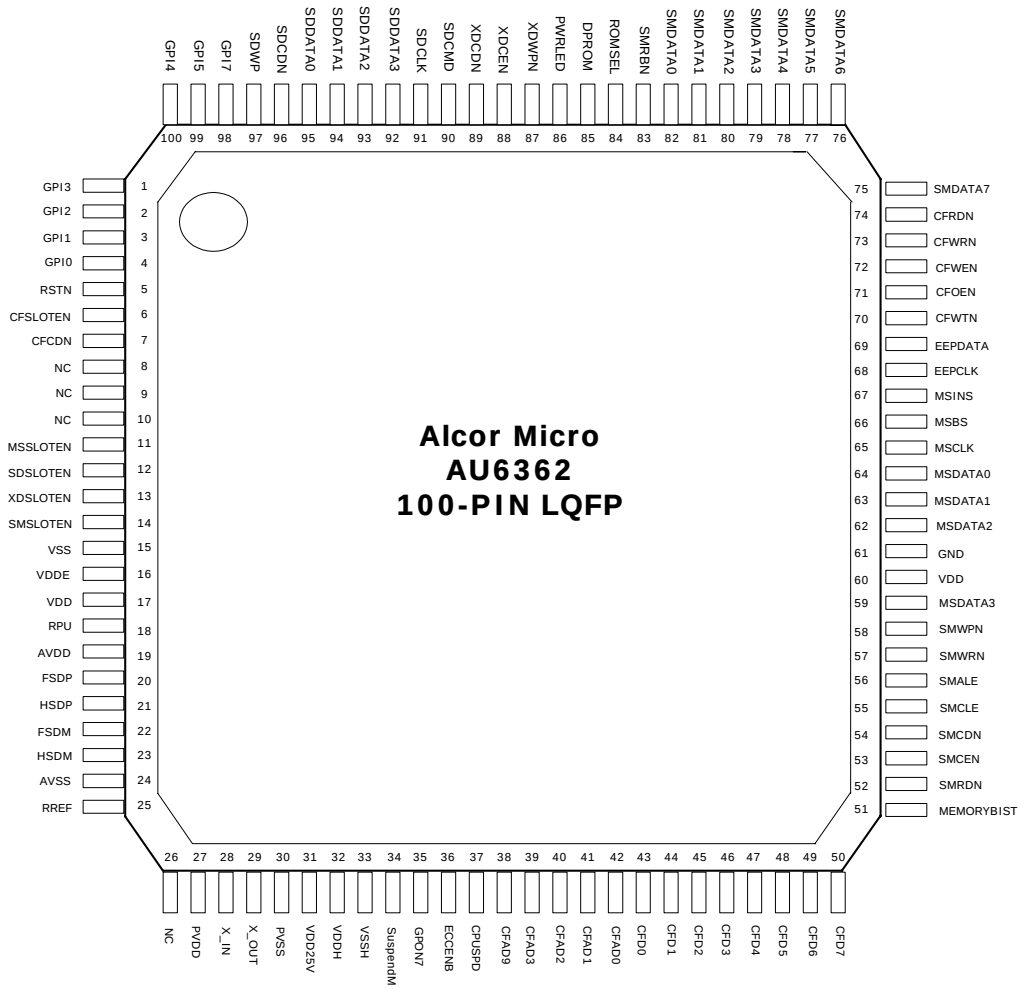

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Table 3.1 Pin Descriptions

Pin #	Pin Name	I/O	Description
1	GPI3	I	Reserved. (need to pull low)
2	GPI2	I	Reserved. (need to pull high)
3	GPI1	I	Slot mode selection. (GPI0,GPI1)=(0,0) : Reserved (GPI0,GPI1)=(0,1) : 4.5 slot mode (GPI0,GPI1)=(1,0) : 2 slot mode (GPI0,GPI1)=(1,1) : 1 slot mode
4	GPI0	I	
5	RSTN	I	Reset. ("0":Reset; "1":Normal) (need to pull up with RC)
6	CFSLOTEN	I	CF Slot Enable. ("1": Enable; "0": Disable; Default: "1")
7	CFCDN	I	CF Card Detect. ("0":Detected; "1":unDetected)
8	NC		
9	NC		
10	NC		
11	MSSLOTEN	I	MS slot enable.("1": Enable; "0": Disable; Default: "1")
12	SDSLOTEN	I	SD slot enable.("1": Enable; "0": Disable; Default: "1")
13	XDSLOTEN	I	XD slot enable.("1": Enable; "0": Disable; Default: "1")
14	SMSLOTEN	I	SMC slot enable.("1": Enable; "0": Disable; Default: "1")
15	VSS	PWR	Ground
16	VDDE	I	3.3V Power Supply
17	VDD	I	Core Power 2.5V
18	RPU	I	Connected with an 1.5k pull up resistor to 3.3 VDD
19	AVDD	I	3.3V Power Supply Input
20	FSDP	I/O	Full speed DP
21	HSDP	I/O	High speed DP
22	FSDM	I/O	High speed DM
23	HSDM	I/O	Full speed DM
24	AVSS	PWR	Analog Ground
25	RREF	I	Connected an 1k resistor to A GND for impedance match
26	NC		
27	PVDD	I	3.3V Power Support Input for Pad
28	X_IN	I	12MHz crystal input
29	X_OUT	O	12MHz crystal output
30	PVSS	PWR	Pad Ground
31	VDD25V	O	2.5V Power Supply Output
32	VDDH	I	3.3V Power Supply for IO
33	VSSH	PWR	IO Ground

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34	SuspendM	O	Suspend status. ("0": Suspend; "1": Normal)
35	GPON7	O	LED for card insert/exsert status
36	ECCENB	I	Selection Ecc. ("0": Disable; "1": Enable; Default:"1")
37	CPUSPD	I	Selection CPU Speed. ("0": 30MHz; "1": 15MHz; Default:"0")
38	CFAD9	O	CF Address9
39	CFAD3	O	CF Address3
40	CFAD2	O	CF Address2
41	CFAD1	O	CF Address1
42	CFAD0	O	CF Address0
43	CFD0	I/O	CF Data0
44	CFD1	I/O	CF Data1
45	CFD2	I/O	CF Data2
46	CFD3	I/O	CF Data3
47	CFD4	I/O	CF Data4
48	CFD5	I/O	CF Data5
49	CFD6	I/O	CF Data6
50	CFD7	I/O	CF Data7
51	MEMORYBIST	I	Reserved. (Need to pull low)
52	SMRDN	O	SMC read control enable. ("0": Enable; "1": Disable)
53	SMCEN	O	SMC card enable. ("0": Enable; "1": Disable)
54	SMCDN	I	SMC card detect. ("0": Detected; "1": unDetected)
55	SMCLE	O	SMC Command Latch Enable. ("0": Disable; "1": Enable)
56	SMALE	O	SMC Address Latch Enable. ("0": Disable; "1": Enable)
57	SMWRN	O	SMC Write Control Enable. ("0": Enable; "1": Disable)
58	SMWPN	I	SMC Write Protect. ("0": Protected; "1": unProtected) (External pull up with 47K to SMPWR)
59	MSDATA3	I/O	MS Data3
60	VDD	I	Core Power 2.5V
61	GND	PWR	Core Ground
62	MSDATA2	I/O	MS Data2
63	MSDATA1	I/O	MS Data1
64	MSDATA0	I/O	MS Data0
65	MSCLK	O	MS CLK
66	MSBS	O	MS Bus State
67	MSINS	I	MS INS
68	EEPCLK	O	EEPROM serial clock.
69	EEPDATA	I/O	EEPROM Data
70	CFWTN	I	CF WAITN. (External pull up with 100K to CFPWR)

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71	CFOEN	O	CF OEN.
72	CFWEN	O	CF WEN.
73	CFWRN	O	CF IOWRN
74	CFRDN	O	CF IORDN
75	SMDATA7	I/O	SMC data7
76	SMDATA6	I/O	SMC data6
77	SMDATA5	I/O	SMC data5
78	SMDATA4	I/O	SMC data4
79	SMDATA3	I/O	SMC data3
80	SMDATA2	I/O	SMC data2
81	SMDATA1	I/O	SMC data1
82	SMDATA0	I/O	SMC data0
83	SMRBN	I	SMC Read/Busy. (External pull up with 470K to 3.3V)
84	ROMSEL	I	External ROM Selection. ("0":Internal ROM; "1": External ROM; Default:"0")
85	DPROM	I	Reserved. (Need to pull low)
86	PWRLED	O	LED for device power, Off when in suspend mode
87	XDWPN	O	XD Write Protect. ("0": Protected; "1": unProtected)
88	XDCEN	O	XD Card Enable. ("0": Enable; "1": Disable)
89	XDCDN	I	XD Card Detect. ("0": Detected; "1": unDetected)
90	SDCMD	I/O	SD CMD
91	SDCLK	O	SD CLK
92	SDDATA3	I/O	SD Data3
93	SDDATA2	I/O	SD Data2
94	SDDATA1	I/O	SD Data1
95	SDDATA0	I/O	SD Data0
96	SDCDN	I	SD Card Detect. ("0": Detected; "1": unDetected)
97	SDWP	I	SD Write Protect. ("1": Protected; "0": unProtected)
98	GPI7	I	Reserved. (Need to pull low)
99	GPI5	I	FLASH_MEMORY_SETTING ("1": Flash memory exists;"0": Flash memory not exists; default:"0")
100	GPI4	I	Reserved. (Need to pull low)

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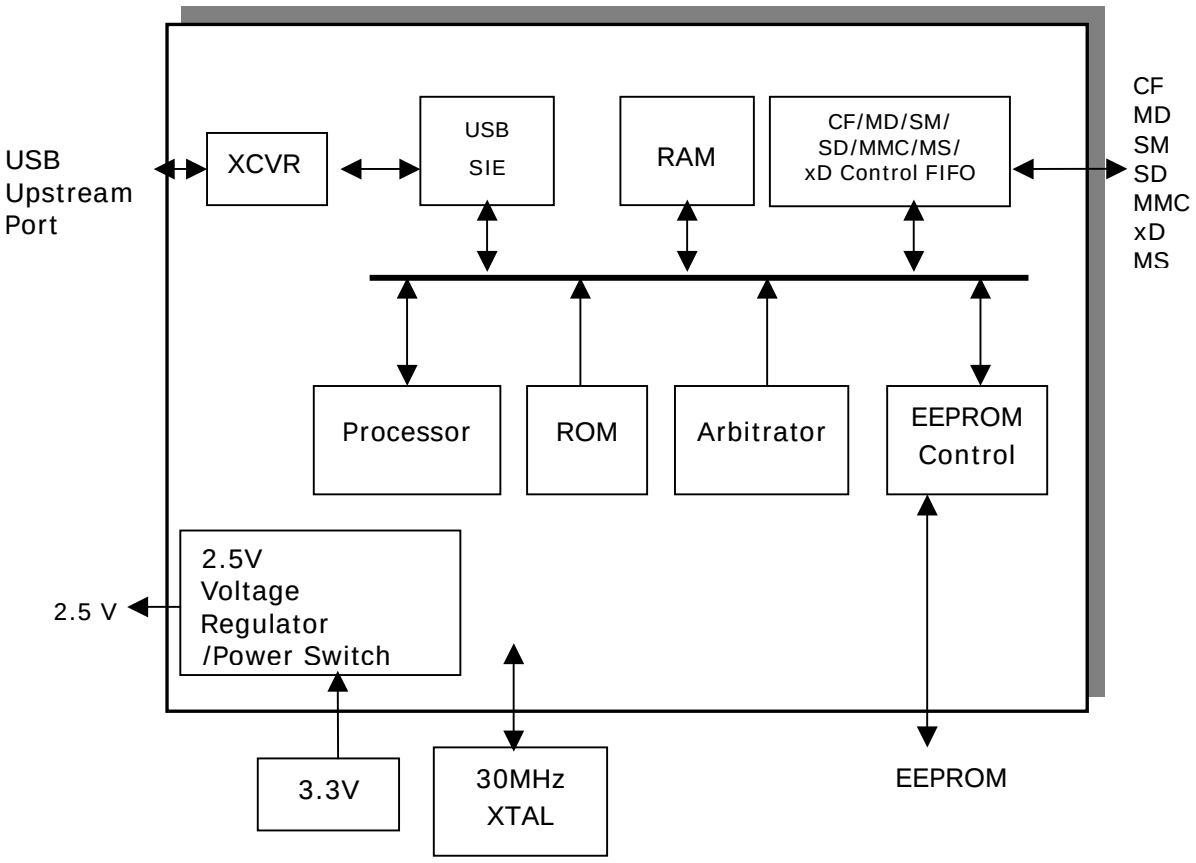
4.0 System Architecture and Reference Design

4.1 AU6362 Block Diagram

Figure 4.1 AU6362 Block Diagram



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5.0 Electrical Characteristics

5.1 Absolute Maximum Ratings

Table 5.1 Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	Power Supply	-0.3 to V_{CC}+0.3	V
V_{IN}	Input Voltage	-0.3 to 3.3	V
V_{OUT}	Output Voltage	-0.3 to V_{CC}+0.3	V
T_{STG}	Storage Temperature	-40 to 150	^{O}C

5.2 Recommended Operating Conditions

Table 5.2 Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC}	Power Supply	3.0	3.3	3.6	V
V_{IN}	Input Voltage	0	3.3	5.2	V
T_{OPR}	Operating Temperature	-40		115	^{O}C

5.3 Leakage Current and Capacitance

Table 5.3 General DC Characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
I_{IN}	Input current	no pull-up or pull-down	-10	±1	10	μA
I_{OZ}	Tri-state leakage current		-10	±1	10	μA
C_{IN}	Input capacitance	Pad Limit		2.8		ρF
C_{OUT}	Output capacitance	Pad Limit		2.8		ρF
C_{BID}	Bi-directional buffer capacitance	Pad Limit		2.8		ρF

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5.4 DC Electrical Characteristics of 3.3V I/O Cells

Table 5.4 DC Electrical Characteristics of 3.3V I/O Cells

SYMBOL	PARAMETER	CONDITIONS	Limits			UNIT
			MIN	TYP	MAX	
V_{CC}	Power supply	3.3V I/O	3.0	3.3	3.6	V
V_{il}	Input low voltage	LVTTL			0.8	V
V_{ih}	Input high voltage		2.0			V
V_{ol}	Output low voltage	$\|I_{ol}\|$ =2~16mA			0.4	V
V_{oh}	Output high voltage	$\|I_{oh}\|$ =2~16mA	2.4			V
R_{pu}	Input pull-up resistance	PU=high, PD=low	40	75	190	KΩ
R_{pd}	Input pull-down resistance	PU=low, PD=high	40	75	190	KΩ
I_{in}	Input leakage current	V_{in}= V_{CC} or 0	-10	±1	10	μA
I_{oz}	Tri-state output leakage current		-10	±1	10	μA

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5.5 USB Transceiver Characteristics

Table 5.5 Electrical characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
AVCC	Analog supply current		3.0	3.3	3.6	V
VCC	Digital supply current		2.25	2.5	2.75	V
I_{CC}	Operating supply current	High speed operating at 480 MHz			73	mA
$I_{CC(susp)}$	Suspend supply current	In suspend mode, current with 1.5kΩ pull-up resistor on pin RPU disconnected			120	μA

Table 5.6 Static characteristic：Digital pin

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Input levels						
V_{IL}	Low-level input voltage				0.8	V
V_{IH}	High-level input voltage		2.0			V
Output levels						
V_{OL}	Low-level output voltage				0.2	V
V_{OH}	High-level output voltage		VCC-0.2			V

AVCC=3.0V~3.6V；VCC=2.25V~2.75V；Temp=0℃~115℃

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Table 5.7 Static characteristic：Analog I/O pins（DP/DM）

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
USB2.0 Transceiver（HS）						
Input Levels（differential receiver）						
V_{HSDIFF}	High speed differential input sensitivity	$\lvert V_{I(DP)} - V_{I(DM)} \rvert$ measured at the connection as application circuit	300			mV
V_{HSCM}	High speed data signaling common mode voltage range		-50		500	mV
V_{HSSQ}	High speed squelch detection threshold	Squelch detected			100	mV
		No squelch detected	150			mV
V_{HSDSC}	High speed disconnection detection threshold	Disconnection detected	625			mV
		Disconnection not detected			525	mV
Output Levels						
V_{HSOI}	High speed idle level output voltage(differential)		-10		10	mV
V_{HSOL}	High speed low level output voltage(differential)		-10		10	mV
V_{HSOH}	High speed high level output voltage(differential)		-360		400	mV
V_{CHIRPJ}	Chirp-J output voltage（differential）		700		1100	mV
V_{CHIRPK}	Chirp-K output voltage（differential）		-900		-500	mV
Resistance						
R_{DRV}	Driver output impedance	Equivalent resistance used as internal chip only	3	6	9	Ω
		Overall resistance including external resistor	40.5	45	49.5	
Termination						
V_{TERM}	Termination voltage for pull-up resistor on pin RPU		3.0		3.6	V
USB1.1 Transceiver（FS/LS）						
Input Levels（differential receiver）						
V_{DI}	Differential input sensitivity	$\lvert V_{I(DP)} - V_{I(DM)} \rvert$	0.2			V
V_{CM}	Differential common mode voltage		0.8		2.5	V
Input Levels（single-ended receivers）						

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V_{SE}	Single ended receiver threshold		0.8		2.0	V
Output levels						
V_{OL}	Low-level output voltage		0		0.3	V
V_{OH}	High-level output voltage		2.8		3.6	V

AVCC=3.0V~3.6V；VCC=2.25V~2.75V；Temp=0℃~115℃

Table 5.8 Dynamic characteristic：Analog I/O pins（DP/DM）

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Driver Characteristics						
High-Speed Mode						
t_{HSR}	High-speed differential rise time		500			ps
t_{HSF}	High-speed differential fall time		500			ps
Full-Speed Mode						
t_{FR}	Rise time	CL=50pF；10 to 90% of $\lvert V_{OH}-V_{OL}\rvert$；	4		20	ns
t_{FF}	Fall time	CL=50pF；90 to 10% of $\lvert V_{OH}-V_{OL}\rvert$；	4		20	ns
t_{FRMA}	Differential rise/fall time matching（t_{FR} / t_{FF}）	Excluding the first transition from idle mode	90		110	%
V_{CRS}	Output signal crossover voltage	Excluding the first transition from idle mode	1.3		2.0	V
Low-Speed Mode						
t_{LR}	Rise time	CL=200pF-600pF；10 to 90% of $\lvert V_{OH}-V_{OL}\rvert$；	75		300	ns
t_{LF}	Fall time	CL=200pF-600pF；90 to 10% of $\lvert V_{OH}-V_{OL}\rvert$；	75		300	ns
t_{LRMA}	Differential rise/fall time matching（t_{LR} / t_{LF}）	Excluding the first transition from idle mode	80		125	%
V_{CRS}	Output signal crossover voltage	Excluding the first transition from idle mode	1.3		2.0	V
V_{OH}	High-level output voltage		2.8		3.6	V

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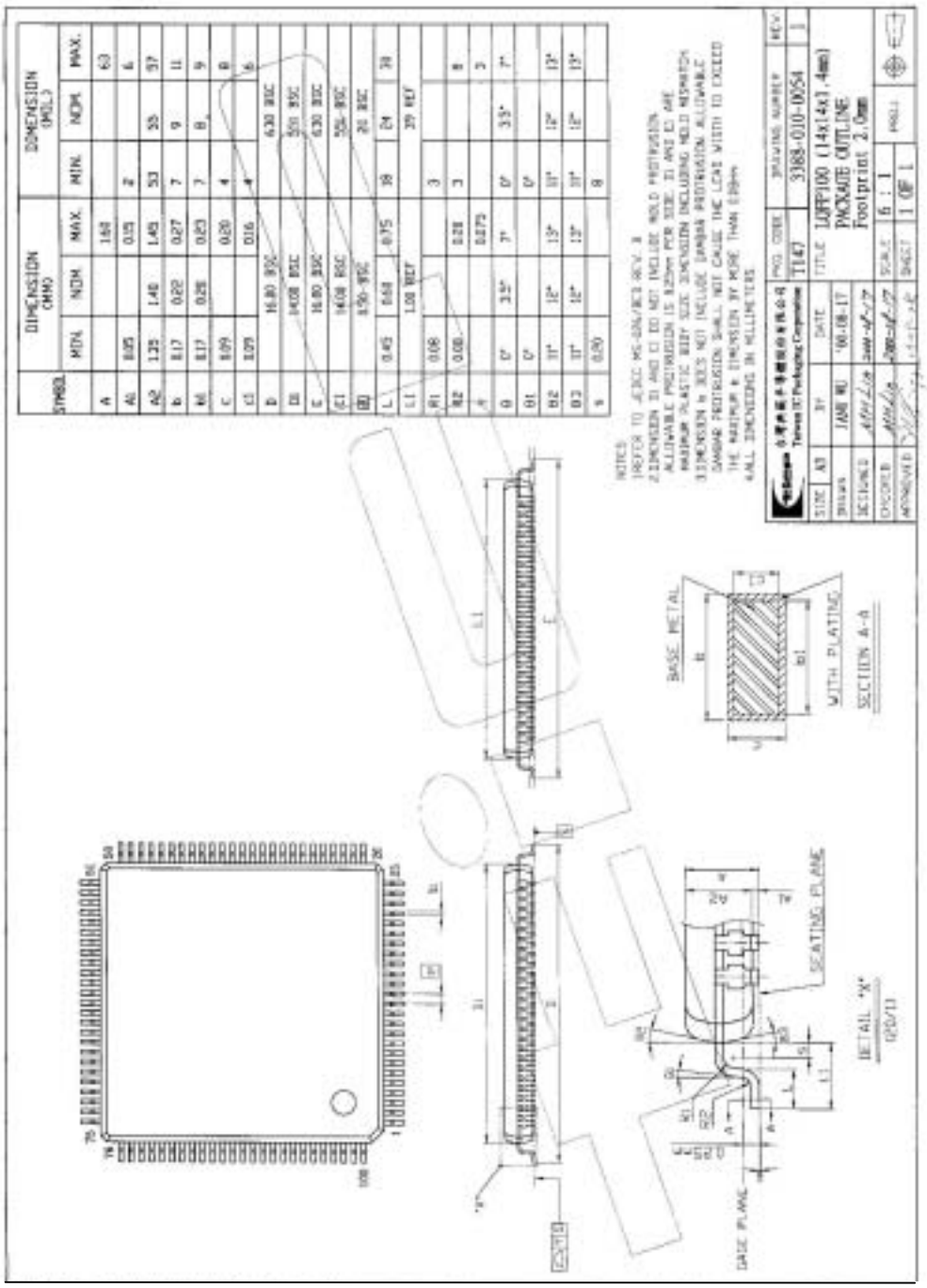
6.0 Mechanical Information

Figure 6.1 Mechanical Information Diagram



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7.0 Abbreviations

This chapter lists and defines terms and abbreviations used throughout this specification.

SIE	Serial Interface Engine
CF	Compact Flash
MD	Micro Drive
SMC	SmartMedia Card
MS	Memory Stick
SD	Secure Digital
MMC	Multimedia Card
UTMI	USB Transceiver Macrocell Interface

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Alcor Micro, Corp. designs, develops and markets highly integrated and advanced peripheral semiconductor, and software driver solutions for the personal computer and consumer electronics markets worldwide. We specialize in USB solutions and focus on emerging technology such as USB and IEEE 1394. The company offers a range of semiconductors including controllers for USB hub, integrated keyboard/USB hub and USB Flash memory card reader…etc. Alcor Micro, Corp. is based in Taipei, Taiwan, with sales offices in Taipei, Japan, Korea and California.

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