



Data Book

AU6332

USB2.0 SD/MMC Single LUN

Card Reader Controller

Technical Reference Manual

Product Specification

Preliminary Release

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Confidential

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Data sheet status

Objective specification	This data sheet contains target 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.

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Contact Information:

Web site: <http://www.alcormicro.com/>

Taiwan

Alcor Micro Corp.
4F, No 200 Kang Chien Rd., Nei Hu,
Road ,ShenZhen,China.
Taipei, Taiwan, R.O.C.
Phone: 886-2-8751-1984
Fax: 886-2-2659-7723

China ShenZhen Office

Rm.2407-08 ,Industrial Bank Building
No.4013, Shennan

518026
Phone: (0755) 8366-9039
Fax: (0755) 8366-9101

Santa Clara Office

2901 Tasman Drive, Suite 206
Santa Clara, CA 95054
USA
Phone: (408) 845-9300
Fax: (408) 845-9086

Los Angeles Office

9400 Seventh St., Bldg. A2
Rancho Cucamonga, CA 91730
USA
Phone: (909) 483-9900
Fax: (909) 944-0464



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1.0 Introduction

1.1 Description

The AU6332 is a single chip integrated USB 2.0 multimedia card reader controller that enables PC/DVD/Printer to read/write various type of SD/MMC cards. Flash media cards such as SD and MMC are widely used in digital camera, cell phone, PDA and MP3 player to store digital photos and compressed music.

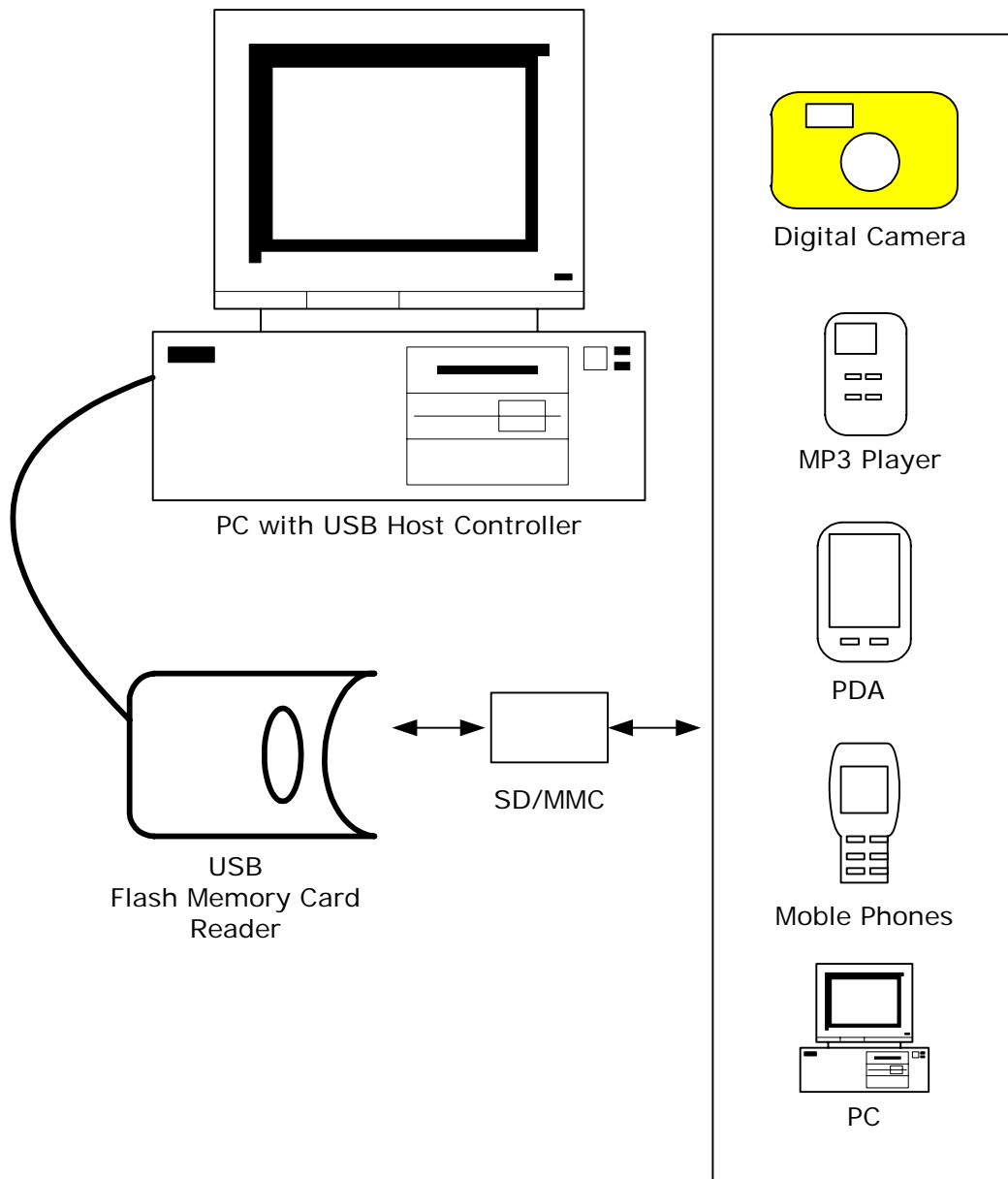
1.2 Features

- Supports USB 2.0 specification and USB Device Class Definition for Mass Storage, Bulk-Transport V1.0
- Support SD/MMC compatible flash card
- Support SD 2.0/MMC 4.1 specification
- Work with default Mass Storage Class driver from Windows ME/2000/XP and Mac OS X; Windows 98/2000(SP1/SP2) and Mac OS 9 drivers are available from Alcor.
- Ping-pong FIFO implementation for concurrent bus operation
- Supports LED for bus activities indication
- Power switch integrated to reduce production BOM cost
- Runs at 12MHz crystal
- 28pin-SSOP package

2.0 Application Block Diagram

Following application diagram demonstrates a typical card reader using the AU6332 chip. By connecting the card reader to a desktop or notebook PC through USB bus, the AU6332 becomes a bus-powered, high speed USB card reader, which can be used as a bridge for data transfer between Desktop PC and Notebook PC.

2.1 Block Diagram





3.0 Pin Assignment

AU6332 is available in 28-pin SSOP package. Below diagram shows signal name of each pin and table in the following page describes each pin in detail.

Figure 3.1 Pin Assignment Diagram

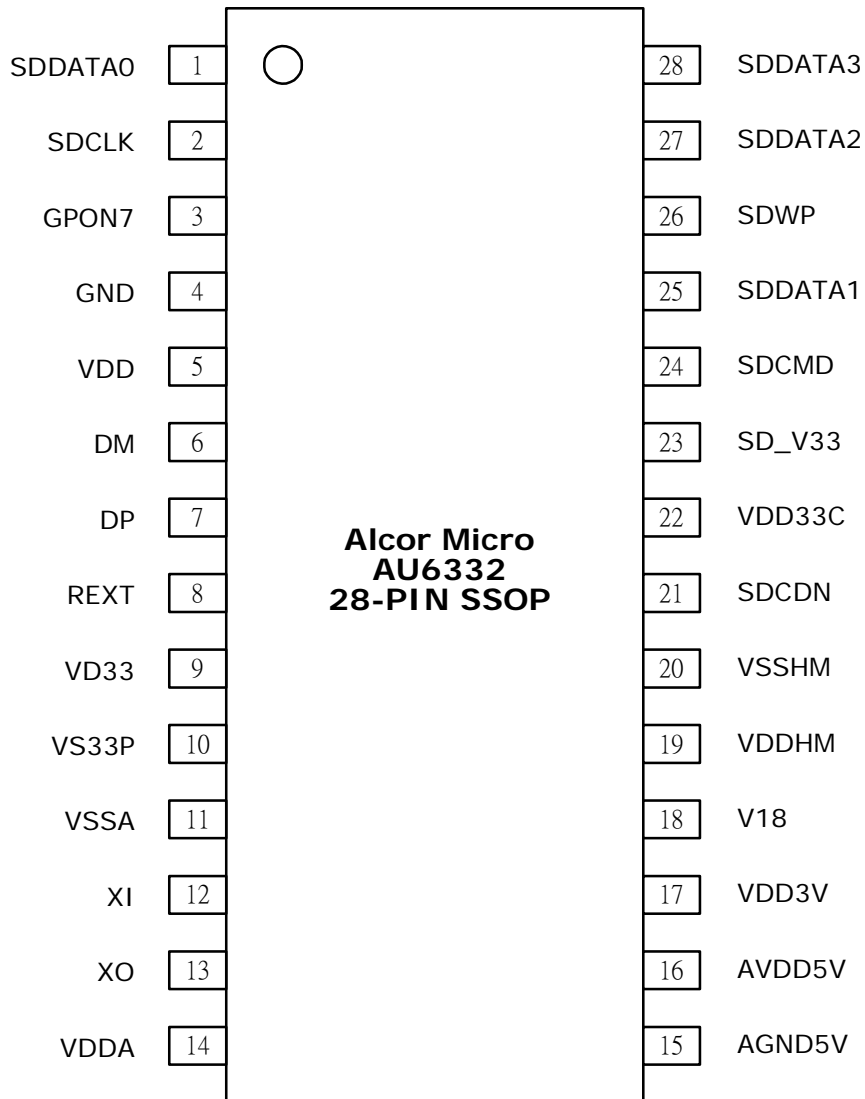




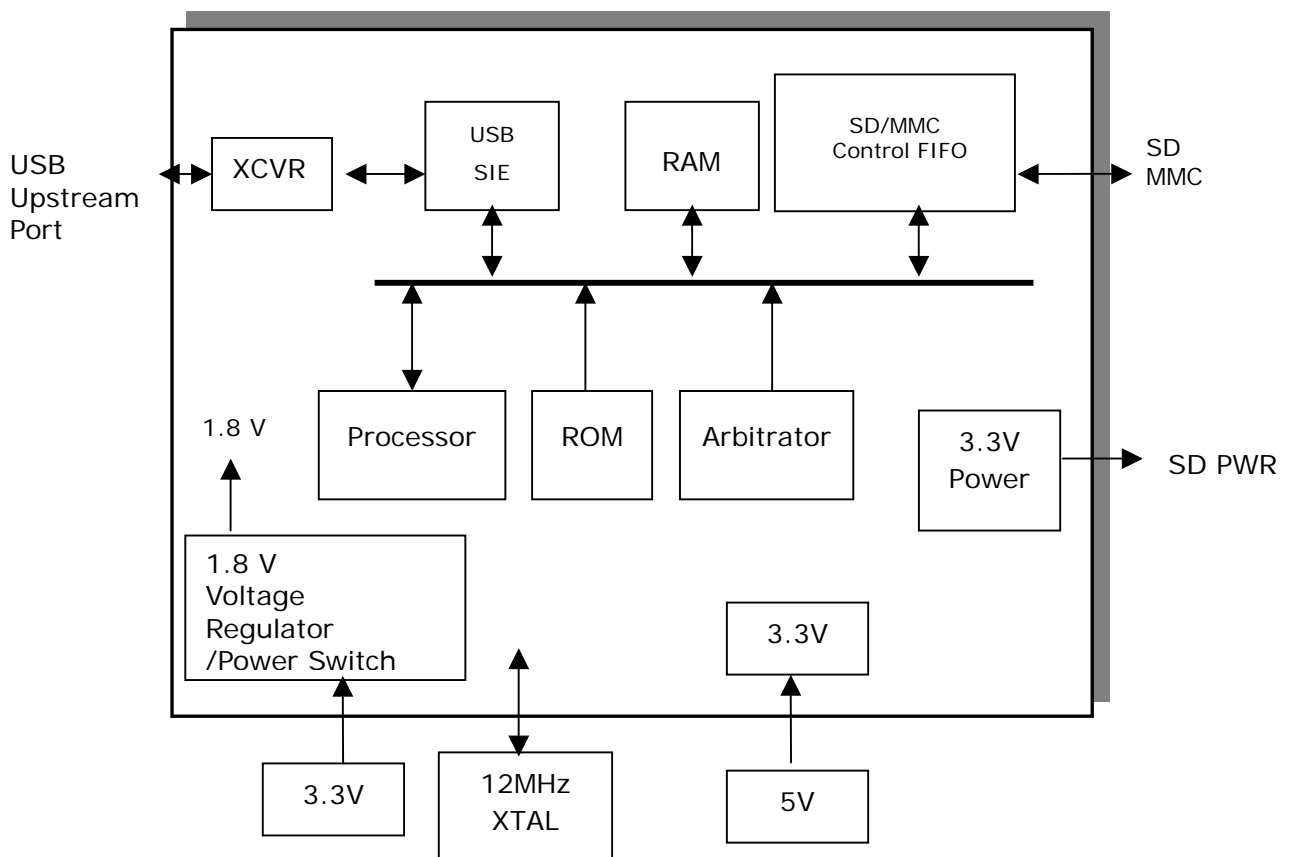
Table 3.1 Pin Descriptions

Pin #	Pin Name	I/O	Description
1	SDDATA0	I/O	SD Data0
2	SDCLK	I/O	SD CLK
3	GPON7	O	LED indicator for card operation
4	GND	GND	GND
5	VDD	I	1.8V Power Source for UTMI
6	DM	I/O	USB DM
7	DP	I/O	USB DP
8	REXT	I	External 6K Resister to Ground
9	VD33	I	3.3V Power Source for UTMI
10	VS33P	GND	Ground
11	VSSA	GND	Ground
12	XI	I	12 MHz crystal input.
13	XO	O	12 MHz crystal output.
14	VDDA	I	1.8V Power Source for PLL
15	AGND5V	GND	5V ground for regulator to 3.3V
16	AVDD5V	I	5V power for regulator to 3.3V
17	VDD3V	O	3.3V power from regulator 5V to 3.3V
18	V18	O	1.8V Power Out for Core
19	VDDHM	I	3.3V Power Source for IO pad
20	VSSHM	GND	3.3V ground for IO pad
21	SDCDN	I	SD CDN
22	VDD33C	I	3.3V power for PMOS
23	SD_V33	O	SD card power
24	SDCMD	I/O	SD CMD
25	SDDATA1	I/O	SD Data1
26	SDWP	I	SD WP
27	SDDATA2	I/O	SD Data2
28	SDDATA3	I/O	SD Data3

4.0 System Architecture and Reference Design

4.1 AU6332 Block Diagram

Figure 4.1 AU6332 Block Diagram





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 3.6	V
V _{OUT}	Output Voltage	-0.3 to V _{CC} +0.3	V
T _{STG}	Storage Temperature	-40 to 150	°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 _{DD}	Digital Supply	1.62	1.8	1.98	V
V _{IN}	Input Voltage	0	3.3	3.6	V
T _{OPR}	Operating Temperature	0		85	°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



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	LVTTTL			0.8	V
V_{ih}	Input high voltage		2.0			V
V_{ol}	Output low voltage	$ I_{ol} = 2 \sim 16\text{mA}$			0.4	V
V_{oh}	Output high voltage	$ I_{oh} = 2 \sim 16\text{mA}$	2.4			V
R_{pu}	Input pull-up resistance		40	75	190	$K\Omega$
R_{pd}	Input pull-down resistance		40	75	190	$K\Omega$
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



5.5 USB Transceiver Characteristics

Table 5.5 Electrical characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
AVCC	Analog supply Voltage		3.0	3.3	3.6	V
VCC	Digital supply Voltage		1.62	1.8	1.98	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=1.62V~1.98V ; Temp=0°C~85°C



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	$ V_{I(DP)} - V_{I(DM)} $ 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	$ V_{I(DP)} - V_{I(DM)} $	0.2			V
V_{CM}	Differential common mode voltage		0.8		2.5	V
Input Levels (single-ended receivers)						



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=1.62V~1.98V ; Temp=0°C~85°C

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 $ V_{OH}-V_{OL} $;	4		20	ns
t_{FF}	Fall time	CL=50pF ; 90 to 10% of $ V_{OH}-V_{OL} $;	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 $ V_{OH}-V_{OL} $;	75		300	ns
t_{LF}	Fall time	CL=200pF-600pF ; 90 to 10% of $ V_{OH}-V_{OL} $;	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

5.6 Power Switch Feature

AU6332 integrates a 3.3V to 2.5V voltage regulator and power switches to save the MOS chips for controlling flash card power.

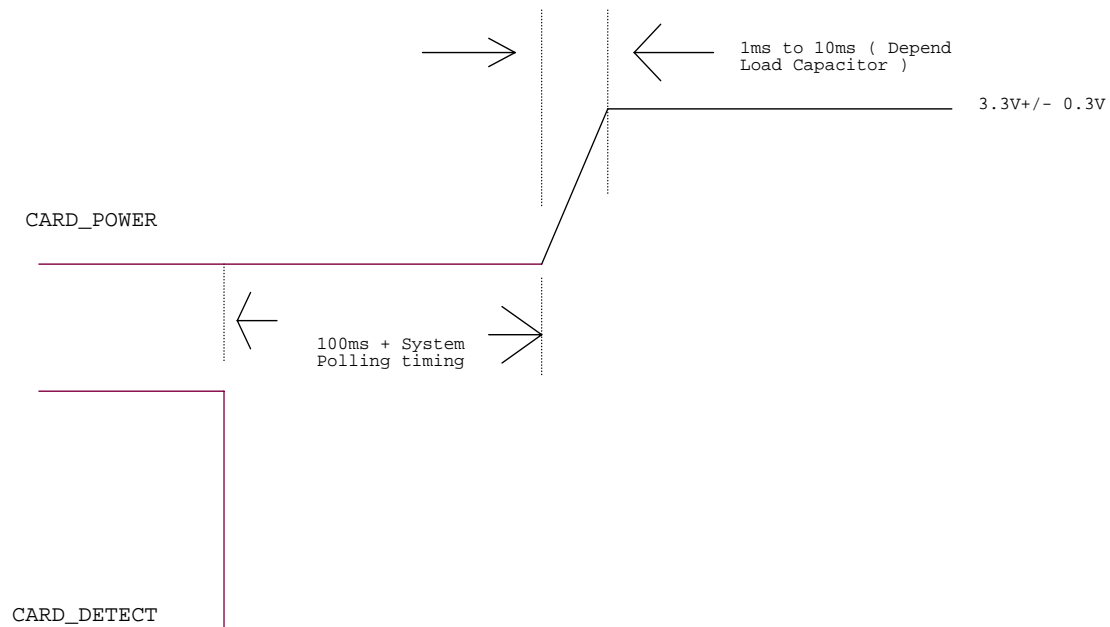
Card Power Output Current Range

- For SD/MMC
 - ◆ MAX: 100mA

- Card power output voltage range
 - ◆ SD/MMC: 3.3V±0.3V

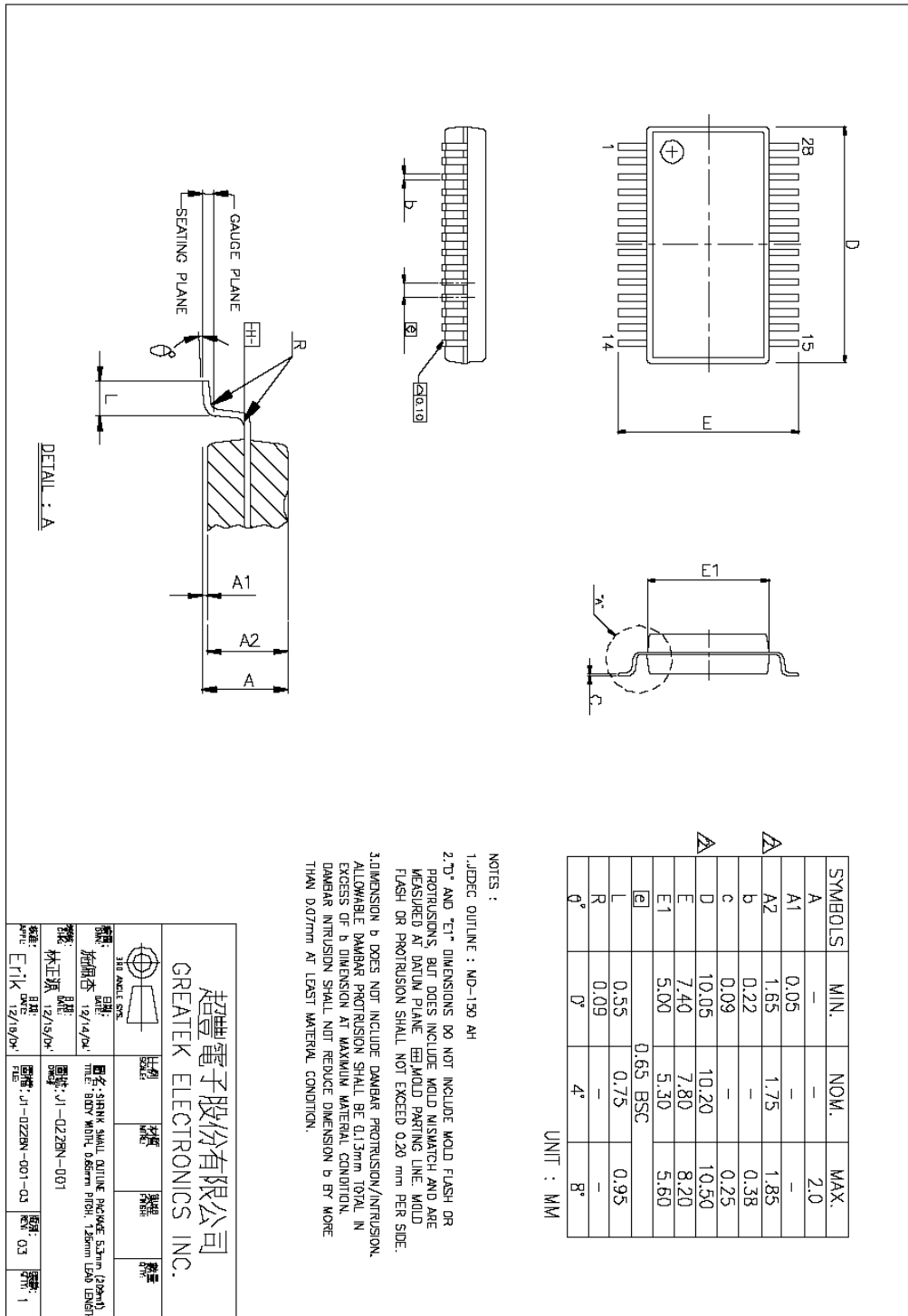
- AU6332 will turn off all of Card Power in suspend mode

Figure 5.1 Card Detect Power-on Timing



6.0 Mechanical Information

Figure 6.1 Mechanical Information Diagram





7.0 Abbreviations

In this chapter some of the terms and abbreviations used throughout the technical reference manual are listed as follows.

SIE	Serial Interface Engine
SD	Secure Digital
MMC	Multimedia Card
UTMI	USB Transceiver Macrocell Interface



【MEMO】

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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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