AX222

User Manual

[AX222-UM-003-EN]

Rev 0.0.3
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AX222 SD/MMC/MS Card Reader Controller

AppoTech

High performance SOC

USB Features

- Support USB specification v2.0
- Support USB Storage Class specification v1.0

SD Card Features

- Support SD specification v2.0
- Support SDHC card up to 32GB
- Support write protection
- Support hot plug and removal

MMC Card Features

- Support MMC specification v4.2
- Support MMC card up to 32GB
- Support hot plug and removal

MS/MSPRO Features

- Support MS specification v1.43
- Support MSPRO specification v1.03
- Support MS PRO-HG Duo specification v1.01
- Support 1/4/8 bit bus mode
- Support card up to 32GB

LED Driver IO

Dual voltage regulator

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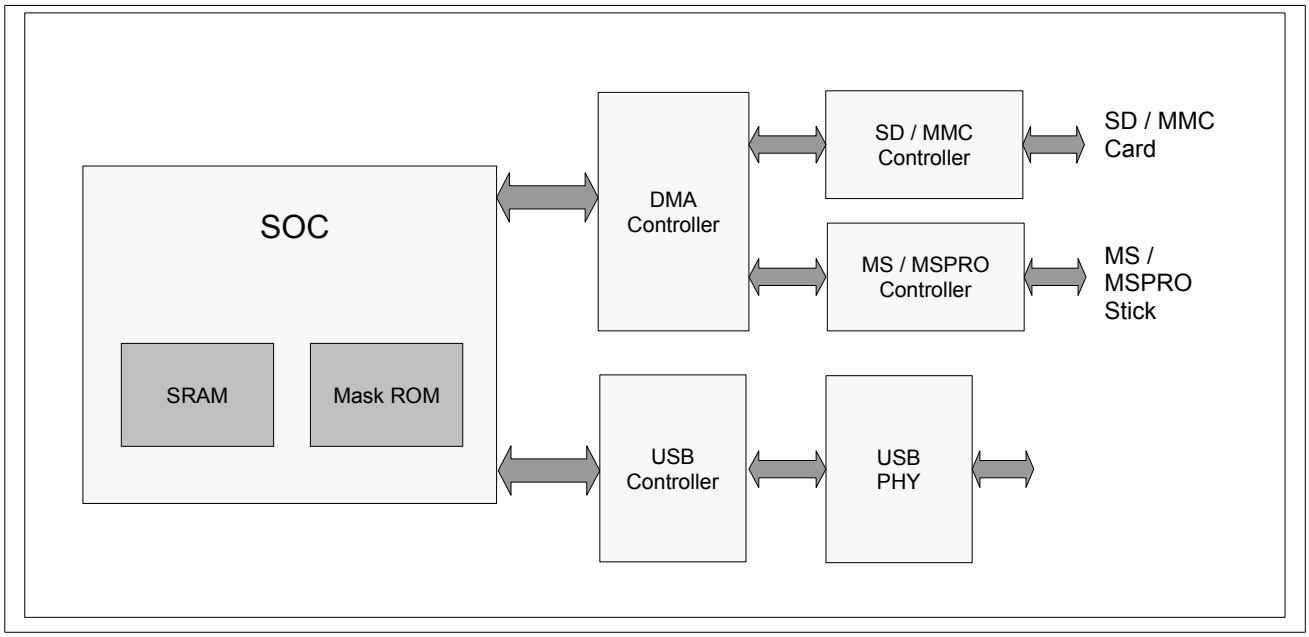
1 Architecture Overview

1.1 System architecture

Figure 1-1: AX222 hardware architecture



2 PIN DEFINITIONS

2.1 Pin Assignment

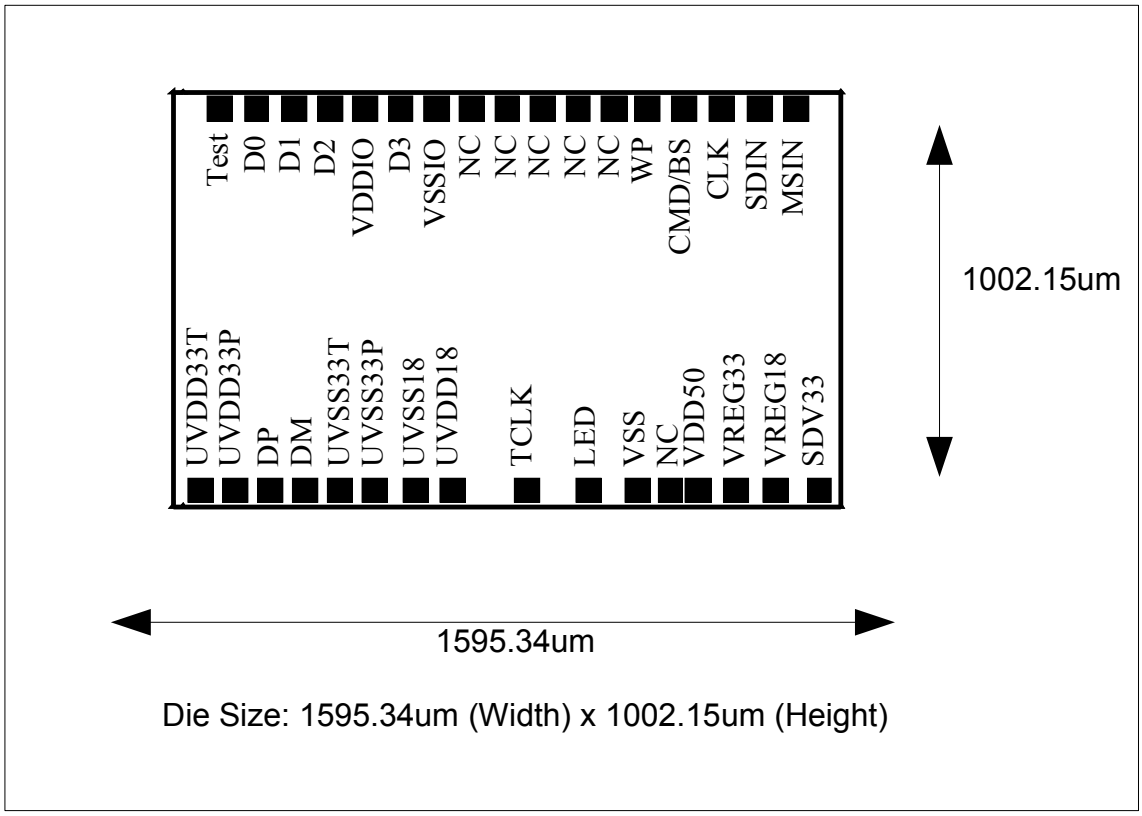


Table 2-1: Pad Coordinates

Pin No.	Name	X-axis (um)	Y-axis(um)
1	UVDD33T	39.8	38.7
2	UVDD33P	123.8	38.7
3	DP	208.4	38.7
4	DM	292.9	38.7
5	UVSS33T	376.2	38.7
6	UVSS33P	460.5	38.7
7	UVSS18	559.9	38.7
8	UVDD18	645.7	38.7
9	TCLK	824.9	38.7
10	P1.2/LED	973.2	38.7

11	VSS	1093.1	38.7
12	VDD50/NC	1170.5	38.7
13	VDD50	1238.4	38.7
14	VREG33	1328.1	38.7
15	VREG18	1423.3	38.7
16	SDV33	1529.0	38.7
17	P1.3/MSIN	1474.2	942.7
18	P1.4/SDIN	1385.5	942.7
19	P1.0/CLK	1295.3	942.7
20	P1.1/CMD/BS	1203.0	942.7
21	P1.6/WP	1114.8	942.7
22	P0.7/NC	1034.8	942.7
23	P0.6/NC	949.4	942.7
24	P0.5/NC	863.3	942.7
25	P0.4/NC	777.9	942.7
26	P1.7/NC	693.5	942.7
27	VSSIO	608.0	942.7
28	P0.3/D3	523.2	942.7
29	VDDIO	436.8	942.7
30	P0.2/D2	352.2	942.7
31	P0.1/D1	265.5	942.7
32	P0.0/D0	176.6	942.7
33	P1.5/Test	86.3	942.7

2.2 Pad Descriptions

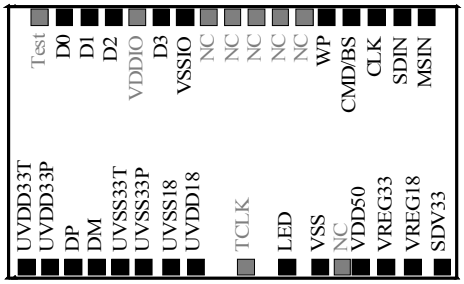
Name	Pad #	Nature	Functions
UVDD33T	1	P	**PHY analog power input** (Double-bond with UVDD33P)
UVDD33P	2	P	**PHY analog power input** (Double-bond with UVDD33T)
DP	3	IO	**USB D+**
DM	4	IO	**USB D-**

UVSS33T	5	P	**PHY analog ground** (Double-bond with UVSS33P)
UVSS33P	6	P	**PHY analog ground** (Double-bond with UVSS33T)
UVSS18	7	P	**1.8V Digital power ground**
UVDD18	8	P	**1.8V Digital power input**
TCLK	9	I	**Test mode external clock**
P1.2/LED	10	IO	**Port 1 pin 2** – LED0 indication or serial port
VSS	11	P	**Regulator ground**
VDD50/NC	12	P	**NC**
VDD50	13	P	**Regulator 5V power input**
VREG33	14	P	**Regulator 3.3V power output** (for external capacitor connection) Note: VREG33 is short-circuit with VDDIO
VREG18	15	P	**Regulator 1.8V power output** (for external capacitor connection)
SDV33	16	P	**SD/MMC/MS card output 3.3V power**
P1.3/MSIN	17	IO	**Port 1 pin 3** – MS card insertion indication signal
P1.4/SDIN	18	IO	**Port 1 pin 4** – MDC card insertion indication signal
P1.0/CLK	19	IO	**Port 1 pin 0** – MDC/MS clock
P1.1/CMD/BS	20	IO	**Port 1 pin 1** – MDC command, MS BS
P1.6/WP	21	IO	**Port 1 pin 6** – MDC write protect
P0.7/NC	22	IO	**Port 0 pin 7** – NC
P0.6/NC	23	IO	**Port 0 pin 6** – NC
P0.5/NC	24	IO	**Port 0 pin 5** – NC
P0.4/NC	25	IO	**Port 0 pin 4** – NC
P1.7/NC	26	IO	**Port 1 pin 7** – NC
VSSIO	27	P	**Digital ground**
P0.3/D3	28	IO	**Port 0 pin 3** – MDC/MS data 3
VDDIO	29	P	**Digital I/O 3.3V power input**
P0.2/D2	30	IO	**Port 0 pin 2** – MDC/MS data 2
P0.1/D1	31	IO	**Port 0 pin 1** – MDC/MS data 1
P0.0/D0	32	IO	**Port 0 pin 0** – MDC/MS data 0
P1.5/Test	33	IO	**Port 1 pin 5** – Test Pin

3 DIE SCHEMATICS

3.1 SD/MMC/MS 4-bit Mode

Figure 3-1: Valid pads for SD/MMC/MS 4-bit mode



Note: Only highlighted pads are valid.

Figure 3-2: Bonding Diagram for 4-bit Mode (SD/MMC/MS Card)

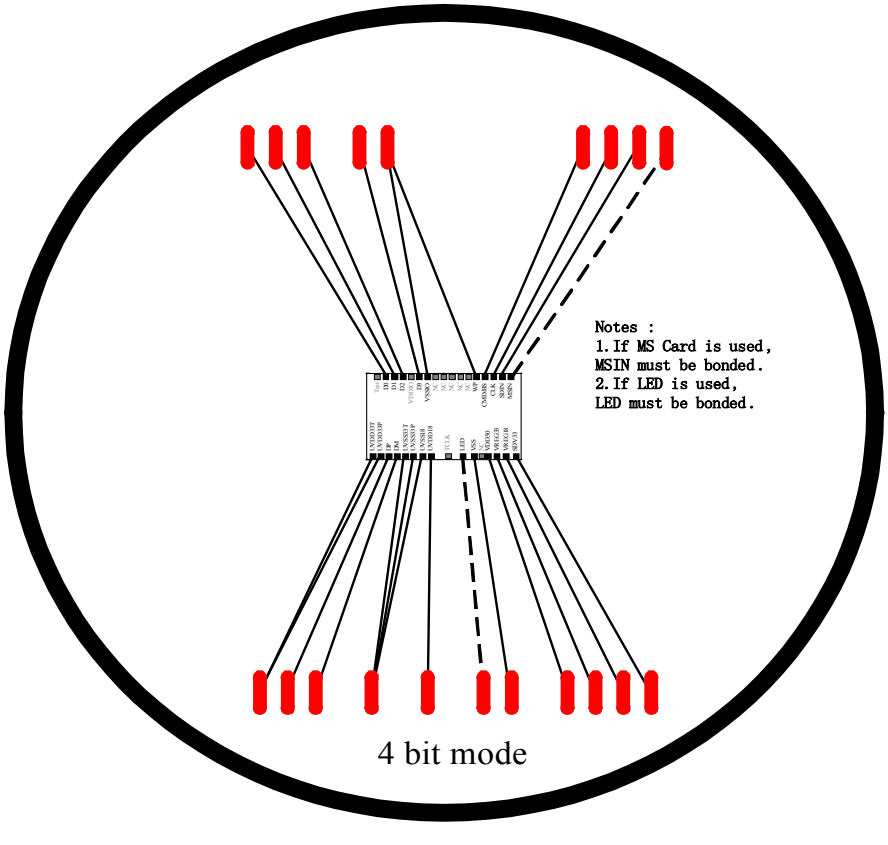
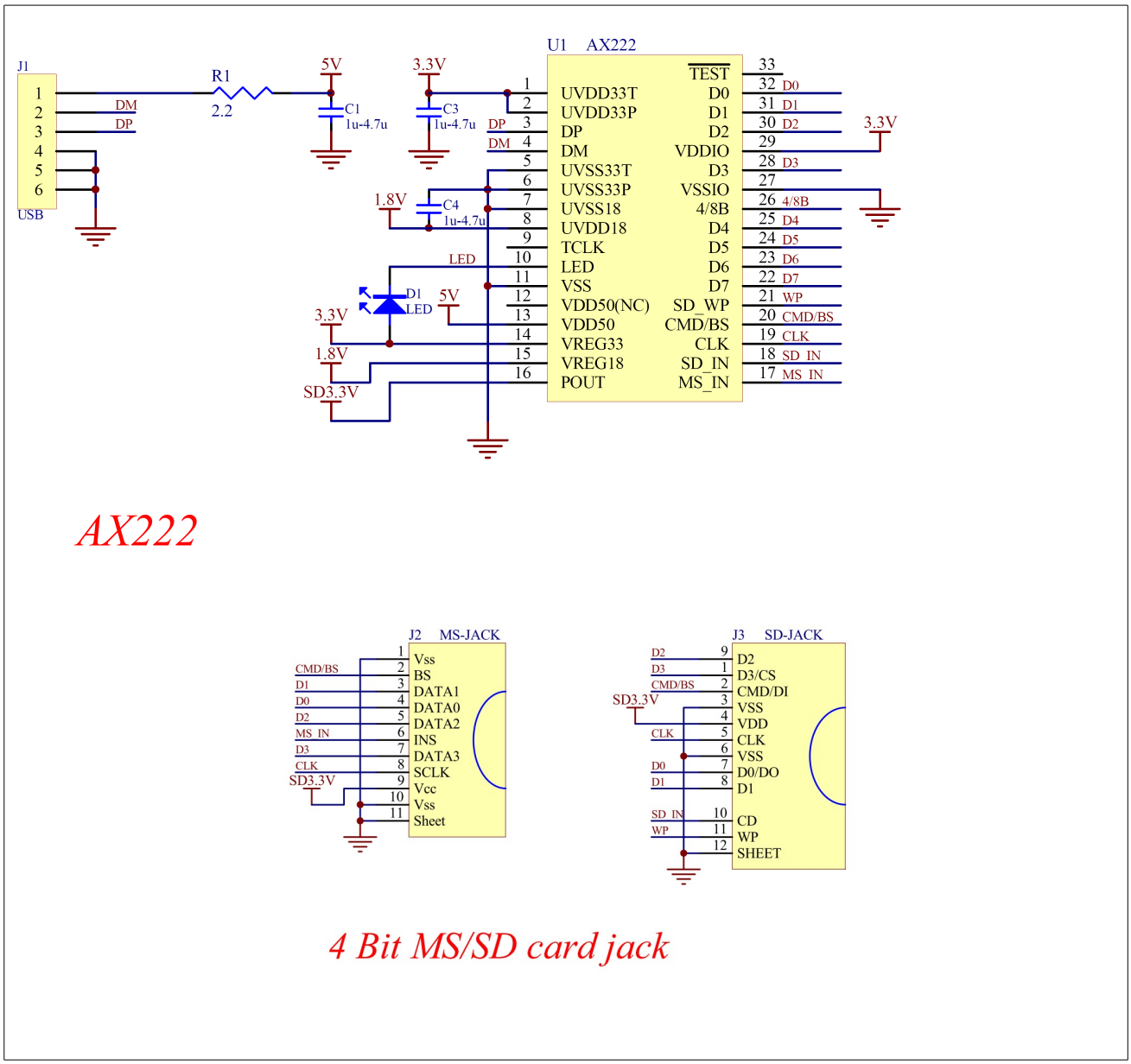


Figure 3-3: Schematic for SD/MMC/MS 4-bit mode



Note:

1. Choose R1, C1, C3 and C4 according to your needs. Lower value can minimize cost, while a higher value can provide stability.
2. Place C3 close to pin 2, and C4 close to pin 11. Routing for 3.3V and 1.8V should be as short as possible.
3. NC = Not Connected.

3.2 Electrical Characteristics

Table 3-1: Absolute maximum ratings

Symbol	Descriptions	Min	Typ	Max	Units	Conditions
V_{ESD}	Electrical Discharge Voltage	-	Passed 8k	-	V	
T_{STOR}	Storage Temperature	-40	-	125	ºC	
T_{AMB}	Ambient Temperature	0	-	70	ºC	

Table 3-2: Electrical Characteristics (Standard testing condition at 25ºC)

Symbol	Descriptions	Min	Typ	Max	Units	Conditions
USBVDD	USB supply voltage	4.5	5	5.5	V	
I_{DD}	Operating current	-	56	-	mA	No cards inserted
I_{SUP}	Operating current at suspend mode	-	0.37	-	mA	No cards inserted
I_{SDIDLE}	Operating current with SD card inserted	-	62	-	mA	No read/write operation

Table 3-3: Oscillator Characteristics (Standard testing condition at 25°C)

Symbol	Descriptions	Conditions	Min	Typ	Max	Units
F_{DT}	MCLK Frequency	Data transaction mode	-	-	48	MHz
F_{ID}	MCLK Frequency	Identification mode	-	-	235	KHz
T_{SET}	COMMAND/DAT setup time		6	-	-	ns
T_{HOLD}	COMMAND/DAT hold time		3	-	-	ns
T_{DELAY}	COMMAND/DAT output delay time	Data transaction mode	-	-	14	ns
		Identification mode	-	-	50	ns

Figure 3-4: Timing diagram for SD/MMC normal speed read/write operation

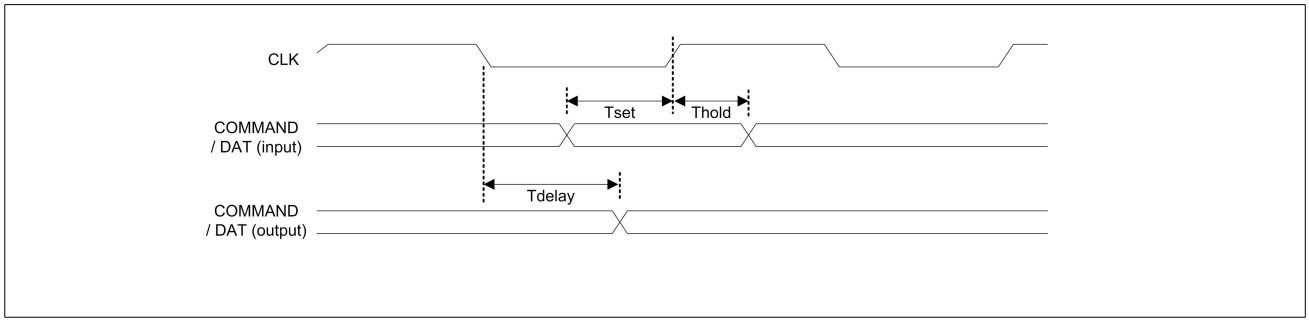
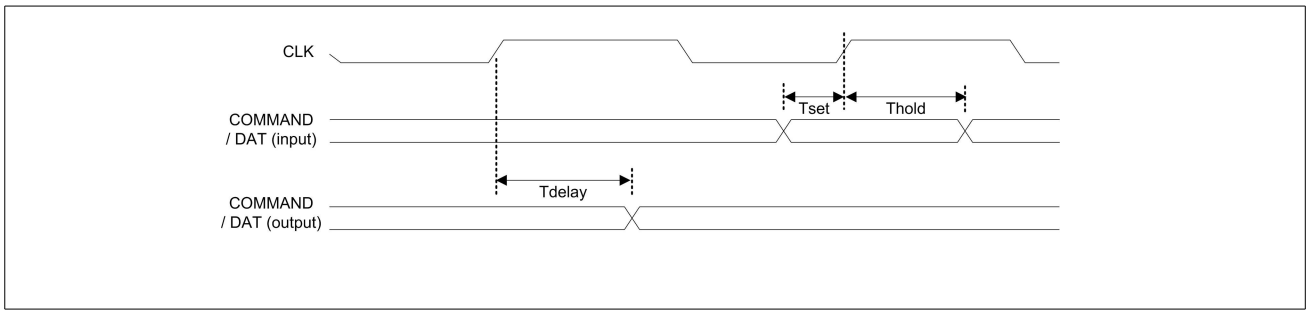
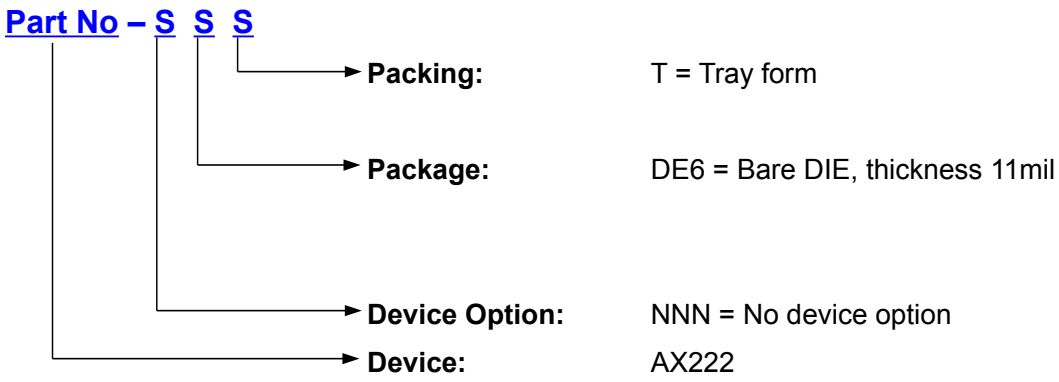


Figure 3-5: Timing diagram for SD/MMC high speed read/write operation



4 Ordering Code



Ordering Code	Brief Description
AX222-NNNDE6T	**Bare 11mil**

Please contact sales office (sales@appotech.com) for ordering procedures.

5 Appendix I Revision History

Date	Version	Comment	Revised by
2010-12-07	0.0.1	1. Change Format 2. Rename to AX222	Rimsky Cheng
2010-08-11	0.0.2	1. Add ordering code	Erica Cheong
2012-01-18	0.0.3	1. Update logo	Karen Keung

In case of any questions or comments about this documentation, please feel free to contact AppoTech at documents@appotech.com .