WLAN6090SD

Wireless LAN SDIO Card Datasheet

Preliminary Version

V 0.1

Confidential Information

Document Version Control

Version	Date	Remarks
Initial draft V0.1	3/9/04	Initial Release

WARNINGS

THIS EQUIPMENT COMPLIES WITH PART 15 OF THE FCC RULES. ANY CHANGE OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE MANUFACTURER COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

THIS DEVICE WAS EVALUATED FOR BODY SAR IN A PDA WITH A SEPARATION DISTANCE OF 0.5 MM. FAILURE TO INSTALL THIS DEVICE AS DESCRIBED WILL RESULT IN A FAILURE TO COMPLY WITH FCC RULES FOR EXPOSURE AND IS DISCOURAGED. ONLY ANTENNAS APPROVED WITH THE DEVICE MAYBE USED. NO EXTERNAL ANTENNAS MAY BE USED. THIS DEVICE MAY NOT BE CO-LOCATED WITH OTHER TRANSMITTERS WITHOUT FURTHER APPROVAL BY THE FCC. THIS DEVICE HAS NOT YET BEEN TESTED FOR HEAD SAR AND AS SUCH IS NOT APPROVED FOR USE WITH ANY SMARTPHONE DEVICE OR PDAS WITH BUILT IN PHONE CAPABILITY.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS B DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE IN A RESIDENTIAL INSTALLATION. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTIONS, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. HOWEVER, THERE IS NO GUARANTEE THAT INTERFERENCE WILL NOT OCCUR IN A PARTICULAR INSTALLATION. IF THIS EQUIPMENT DOES CAUSE HARMFUL INTERFERENCE TO RADIO OR TELEVISION RECEPTION, WHICH CAN BE DETERMINED BY TURNING THE EQUIPMENT OFF AND ON, THE USER IS ENCOURAGED TO TRY TO CORRECT THE INTERFERENCE BY ONE OR MORE OF THE FOLLOWING MEASURES:
- REORIENT OR RELOCATE THE RECEIVING ANTENNA.
- INCREASE THE SEPARATION BETWEEN THE EQUIPMENT AND RECEIVER.
- CONNECT THE EQUIPMENT INTO AN OUTLET ON A CIRCUIT DIFFERENT FROM THAT TO WHICH THE RECEIVER IS CONNECTED.
- CONSULT THE DEALER OR AN EXPERIENCED RADIO/TV TECHNICIAN FOR HELP.

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1   Introduction

1.1   Overview

SyChip Inc. introduces the Low Power WLAN6090SD SDIO form factor Network Interface Card (NIC) incorporating the popular Wireless Ethernet standard, 802.11b. This is the first available combination SDIO card to incorporate both WLAN and memory functions. It uses Direct Sequence Spread Spectrum (DSSS) Wireless LAN technology to provide bandwidths of up to 11Mbps and ranges of up to 1000 feet*. The card incorporates 256MB of flash memory for storage applications. The card enables next generation power sensitive PDAs, cellular phones, and ultra-thin notebooks to access and store information from the Internet, email, corporate networks, receive streaming video or audio and share images or large files in a WLAN-enabled environment. The design has been targeted for battery sensitive applications where battery capacity is at a premium and/or the host device needs to be used for extended periods without recharging. The card is ideal for portable equipment where there is only one SD slot available for peripheral devices. The configuration utility allows user selection and optimization of both performance and battery life. In addition, the utility also allows users to be able to select an Access Point Search Threshold based on the Access Point Density. This optimizes the threshold at which the utility hands of between one Access Point and another for seamless roaming and reduction in dropped connections.

In the consumer market, this WLAN card is ideal for users of Windows® based Pocket PCs, SmartPhones, Printers and Scanners which incorporate an SDIO capable SD slot utilizing the BSquare SDIOnow! Architecture[1]. In the future, the card will support Symbian ™ OS based phone designs that incorporate an SDIO capable slot.

   The WLAN6090SD NIC is a complete card design incorporating the Baseband processor, MAC, Memory, VCO, Transceiver, Antenna, 256MB memory and all necessary software drivers for both functions.

   In addition the flexible driver design supports both Microsoft® WinCE Wireless Zero Configuration (WZC) capabilities** and the SyChip configuration utility. This is especially beneficial where enterprise customers require full control of the configuration setup.

   This card will pass Wi-Fi® certification and the reference design has been FCC and CE certified to ensure radio compliance in all regions

1.2   Key Features

- Low Power design. Ideal for battery sensitive applications
- WLAN 802.11b and 256MB memory functions in a single card design
- Capability to control device for optimum power or performance depending on user need
- AP search threshold capability
- Capability to control device configuration through Windows Zero configuration or SyChip utility for maximum flexibility**
- Wi-Fi® certified – interoperable with other Wi-Fi® certified WLAN products
- Very small footprint: Card Measurements: 57mm X 24mm

Key Features (Cont.)

- Driver support for Microsoft® WinCE (v4.2 and higher)
- Smart Utilities enhance user experience by simplifying the set up process
- High performance security via support for 40/128 bit WEP key, LEAP and WPA protocols

* Depending on environment and data throughput
** Applies to Microsoft PPC2003 only

Figure 1 Sychip Combo function SDIO NIC (reference picture only)

1.3   Certifications

WLAN6090SD is a complete WLAN solution incorporating the baseband processor, MAC, memory, VCO, Transceiver, Antenna, Antenna Switch and power amplifier. The card is fully WiFi compliant, FCC and Industry Canada approved, and will meet CE, TELEC, and Korean certification requirements.

- Wi-Fi is a registered trademark of the Wireless Ethernet Compatibility Alliance.
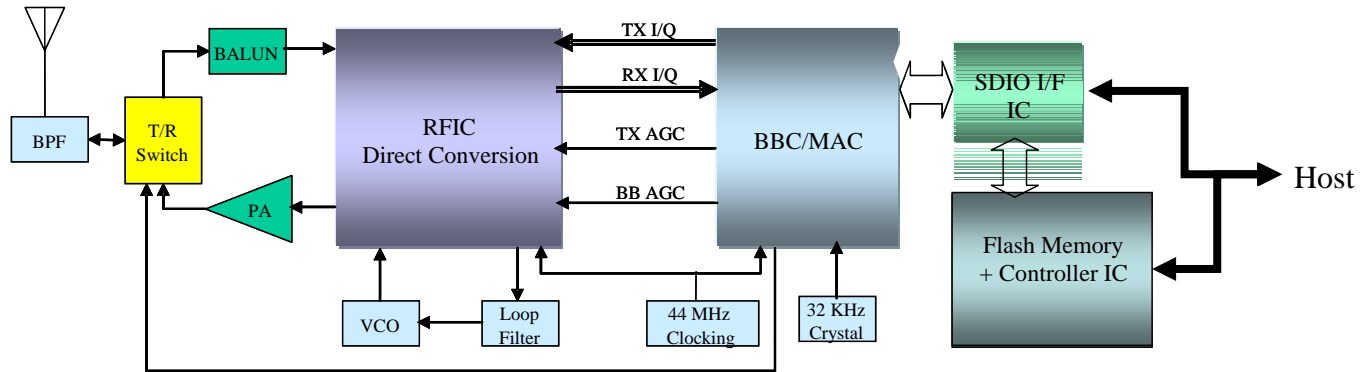
WLAN6090SD Architecture

Figure 2 WLAN6090SD Functional Block Diagram

The WLAN6090SD is a completed Combo 802.11b Wireless LAN plug-and-play Network Interface Card (NIC) and memory card for Pocket PC and handheld devices.

The WLAN6090SD NIC is built with the chip set consisting of an RF Transceiver, Power Amplifier, Baseband Processor aswell as 256MB of NAND MLC flash memory. The block diagram in Figure 2 shows the main functional components in the system. The memory bock includes an intelligent controller that manages interface protocols and data storage and retrieval as well as Error Correction Code (ECC) algorithms, defect handling and diagnostics, power management and clock control.

The RFIC radio transceiver includes a LNA, a transmit pre-amplifier, a quadrature up/down converter, a synthesizer, a low pass filter, and an Rx amplifier. It utilizes Direct Conversion technology, eliminating the need for intermediate-frequency mixer(s), amplifier and filter components.

The RF function in WLAN6090SD covers all of the RF channels frequencies specified in 802.11b standard, operating in the IMS frequency band from 2.4 GHz to 2.5 GHz.

The Baseband Processor is a highly integrated Baseband /MAC which complements the RFIC radio transceiver. The SDIO interface IC enables the SD 1-bit mode and SD 4-bit mode communications with the host.

WLAN6090SD provides bandwidths of up to 11Mbps. The WLAN6090SD card can adjust its transmit /receive speed to 1, 2, 5.5, or 11Mbps using dynamic throughput management. This technique ensures that the WLAN6090SD NIC is performing at the optimal transmission rate for various environments and communication ranges.

The WLAN6090SD supports a 3-wire protocol that allows for status reporting between the 2 functions, allows for correct command/response handling and correct initialization and de-initialization sequences.

The device can be used in a stand alone mode for either memory in an SD only enabled host or for WLAN functionality in a single function SDIO host.

Product Specifications

1.4 SDIONow! Interface

The WLAN6090SD interface supports the Bsquare SDIO Now![1] Architecture. The device drivers for WinCE OS versions support SD 1-bit and SD 4-bit I/O mode.[2]

The Sychip SDIO interface ASIC is designed to utilize the full potential of SD bus bandwidth, 25Mbps in 1-bit mode, and 100Mbps in 4-bit mode.

1.5 Operating systems support

The WLAN6090SD card driver currently supports the following Operating Systems:

- Win CE 4.2 and WinCE.NET

The driver utility User Interface (UI) currently supports

- PPC 2003

1.6 UI language localization

The card User Interface (UI) is in English only as general offering.

The UI can be customized to support other localized language appearance. Sychip can provide UI resource file template utility to enable a customer to implement the language localization.

1.7 International channel settings

The WLAN SDIO card uses frequencies in the 2.4 GHz to 2.5 GHz ISM band, as defined by IEEE 802.11 standards.

Table 1 WLAN channel center frequencies

Ch #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Freq. MHz	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457	2462	2467	2472	2484

Channel numbers 1~11 are available as standard and can be used in most regions worldwide. The cards can be configured for the operation channels in accordance with the required regulatory authority.

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[1] SDIO Now! is a trademark of BSquare. This will be the same architecture that will be employed by Microsoft in their next generation OS
[2] The WLAN6090SD hardware interface supports both SD modes and the SPI mode.

Table 2 Regional channel requirements[3]

Zone	Region/Countries	Channels	Comments
Zone 1	North America (NA) USA & Canada	1 ~ 11	
Zone 2	Europe/CEPT (ETS)= most of Europe, Australia, Korea	1 ~ 13	
Zone 3	France (FR)	10~13	Not supported
Zone 4	Japan (JP)	1 ~ 14	
Zone 5	Spain (SP)	10~11	Not supported

1.8   WLAN security

Security is one of the requirements in wireless communications. It is critical to enterprise users as well as to the SOHO and residential users.

1.8.1   WEP support

The WLAN6090SD has built-in 64-bit/128-bit WEP key support.

1.8.2   LEAP support

The WLAN6090SD can support Cisco LEAP via a third-party supplicant for WinCE 3.0 (PPC2002).

1.8.3   IEEE 802.1x authentication

The WLAN6090SD adopts IEEE 802.1x authentication framework and supports a set of EAP (Extensible Authentication protocol) types with Microsoft PPC2002 and PPC2003 environment.

1.8.4   Wi-Fi WPA and IEEE 802.11i

Wi-Fi WPA is a subset of the IEEE 802.11i security standard. It supports enterprise-level mutual authentication and enhanced encryption.

The WLAN6090SD will support native WPA functionality in PPC2003 when made available through a future release by Microsoft.

1.9   LED specification

The WLAN6090SD card has a built-in visible LED. Its activity is used to indicate the card status. The blinking pattern and information carried is listed in Table 3.

Table 3 LED blinking pattern specification

LED Specification	
State	LED Pattern
Radio Disabled	Off
Radio enabled, associating	Blinking
Radio enabled, connected to network	Continuous on

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[3] Zone 3 (France), zone 5 (Spain) are not currently supported due to the very low transmitting power regulations in these regions

1.10 DC Electrical Specifications

Table 4 DC electrical specification

Parameter	Condition	Min	Typical	Max	Units
Supply Voltage (Vcc)		2.7	3.3	3.6	V
Current (Receiving)	3.3V, continuous Rx Both functions operational		250		mA
Current (Transmitting)	3.3V, continuous Tx Pout = 13 dBm Both functions operational		270		mA
Current (Receiving)	3.3V, Continuous Rx, Memory function only		20		mA
Current (Transmitting)	3.3V Continuous Tx Memory function only		25		mA
Current (Deep-sleep[4]) – WLAN + memory functions	3.3V, power-save enabled		6		mA
Current (Deep-sleep) – Memory only function	3.3V		40		μA
Current (Average[5]) – WLAN + Memory functions	3.3V, power-save enabled		20		mA
Logic high input		0.7Vcc			V
Logic low input				0.3Vcc	V
Logic high output		Vcc – 0.2			V
Logic low output			0.1	0.2	V

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[4] Deep-sleep current reflects the idle current level when 32 KHz clocking is engaged. The radio is turned off; the MAC and the SDIO I/F are operating at the reduced clock rate.
[5] Average current includes the beacon interactions and the idle periods in deep-sleep mode. The 200 ms beacon period is used for the reading.

1.11 Rx/Tx Specifications

Table 5 Rx/Tx specifications *

Parameter	Condition	Min	Typical	Max	Units
Physical Layer Data Rate			1		Mbps
			2		Mbps
			5.5		Mbps
			11		Mbps
Frequency Range	Based on channel center frequency	2412		2484	MHz
Frequency Tolerance				+/- 25	ppm
Carrier Frequency Suppression			35		dBc
Output Power[6]	3.3V		13		dBm
Transmit Spectral Mask	1st Side-lobe, 3.3V			-30	dBc
Transmit Spectral Mask	2nd Side-lobe, 3.3V			-50	dBc
Sensitivity	1Mbps, 3.3V		-90		dBm
	2Mbps, 3.3V		-88		dBm
	5.5Mbps, 3.3V		-87		dBm
	11Mbps, 3.3V		-83		dBm
Memory Capacity (MLC Flash)			256		M Bytes
Memory Read Access Speed	FClk = 20MHz		10		Mb/sec
Memory Write Access Speed			3		Mb/sec

* All at 25°C room temperature

1.12 Absolute maximum ratings and reliability

The tables in this section summarize the reliability tests and qualifications the WLAN6090SD cards passed. The Full *WLAN6090SD Network Interface Card Product Reliability & Qualification Report* is available upon request.

1.12.1 Absolute maximum ratings

Table 6 Absolute maximum ratings

Parameter	Min	Max	Units
Operating Temperature	-25	+60	°C
Storage Temperature	-30	+80	°C
Supply Voltage Vcc		+3.6	V
Input, Output I/O Voltage	GND -0.5	+5.5	

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[6] The output power range covers channels 1 to 13. To meet Japanese regulatory requirement for spread-spectrum processing gain, Channel 14 uses an FIR spectrum shaping digital filter. The side effect is that the available Tx power is compromised by 2~2.5 dBm when using this filter.

1.12.2 Product performance characterizations

Table 7 performance characterizations

Test Name	Test Standard PASS/FAIL Criteria	Status & Results	Comments
Low Temperature Tests Receiver & Transmitter 0^oC	IEEE 802.11 spec	Passed Done -Only storage, non-operational	Limitation in Cabling
High Temperature Tests Receiver & Transmitter 80^oC	IEEE 802.11 spec	Passed Done -Only storage, non-operational	As above
Low Temperature Storage Tests (0^oC)-168hrs(95% RH)	PC card / SDIO	Passed Done -Only storage, non-operational	As above
High Temperature Storage Tests(80^oC) 168hrs(95% RH)	PC card / SDIO	Passed Done -Only storage, non-operational	As above
Power ON / OFF Cycling Tests	PC card / SDIO	Passed Done Operational test	1000 cycles through Hi & Lo cycles

1.12.3 Mechanical Stress Qualifications

Table 8 Mechanical stress tests

Test Name	Test Standard PASS/FAIL Criteria	Status & Results
Vibrations Test	Customer Spec 15G, 10 to 2000 Hz @13.0 H/Min, 3 axis	PASSED
Shock Test	Customer Spec 50G @11 ms, 3 axis;30 shocks	PASSED
Card Drop Test	Industrial Spec 1.5m , non-cushioning vinyl floor , 6 axis	PASSED
Insertion & Removal & Insertion position Test	Customer Spec 5000 K per slot- (3 pers)	PASSED
Insertion / Removal force Tests	Customer Spec SD 40 N	PASSED
Package Sheer Tests	Industrial Spec 40 N cycle load	PASSED
Package Drop Test	Customer Spec 1.5m , non-cushioning vinyl floor , 6 axis	PASSED
Card Bend Test	Customer Spec- 19.6N cycle load (PC card)	PASSED
Card Twist Test	Customer Spec (PC card) 10° for 5 min for 5X	PASSED
Chip / die Sheer Test	Mil STD-883E/2019 43, 100 & 45 kg 3 dies respectively	PASSED

1.12.4 Electrical & Environmental Stress Qualifications

Table 9 Electrical & environmental stress tests

Test Name & ID	Test Standard PASS/FAIL Criteria	Status & Results
Moisture Sensitivity Tests (Weight Gain Analysis)	168 hours -PCMCIA/-Card -0 ^{o}C to 55 ^{o}C @ 95% RH	PASSED -> 1% Moisture Absorption, card recovered 100%
Dynamic Operational Life Tests	168 hours -PCMCIA/-Card Environmental -0 ^{o}C to 55 ^{o}C @95% RH	PASSED
Temperature Cycling Tests	100 cycles PCMCIA /-Card Environmental @ 0 to 55 ^{o}C 40 min/cycle	PASSED
Temperature Humidity Test	168 hours – @ 95% RH PCMCIA/-Card Environmental	PASSED
Temperature Humidity & Bias Tests	168 hours @ 95% RH PCMCIA/-Card Environmental	PASSED

Packaging outline

1.13 Physical dimensions

Table 10 Mechanical specifications

Parameter	Nominal values	Units
Outline dimensions (LxWxH)	57.0x24.0x2.1	mm^3
Weight	4.3	g

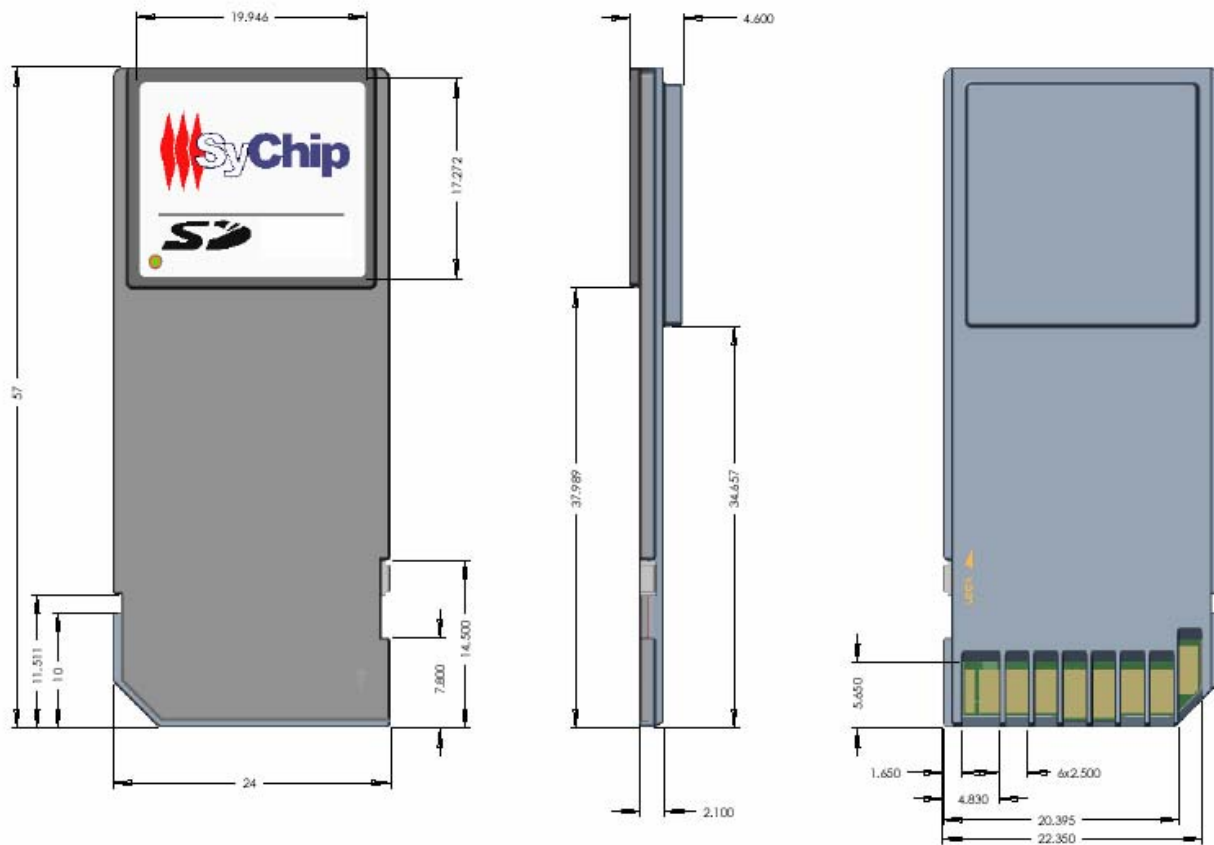The figure following shows nominal geometry of the WLAN6090SD card.

Figure 3 WLAN6090SD Geometry

1.14 Pin configuration

The SD interface of the WLAN6060EB supports both the SD 4-bit mode, SD 1-bit mode, and the SPI mode. The pin definitions for each mode are shown in the table followed.

Table 11 Pin definition in SDIO card[7]

PIN	SD 4-bit mode		SD 1-bit mode		SPI mode	
1	CD/DAT[3]	Data line 3	N/C	Not Used	CS	Card Select
2	CMD	Command line	CMD	Command line	DI	Data input
3	VSS1	Ground	VSS1	Ground	VSS1	Ground
4	VDD	Supply voltage	VDD	Supply voltage	VDD	Supply voltage
5	CLK	Clock	CLK	Clock	SCLK	Clock
6	VSS2	Ground	VSS2	Ground	VSS2	Ground
7	DAT[0]	Data line 0	DATA	Data line	DO	Data output
8	DAT[1]	Data line 1 or Interrupt (optional)	IRQ	Interrupt	IRQ	Interrupt
9	DAT[2]	Data line 2 or Read Wait (optional)	RW	Read Wait (optional)	NC	Not Used

1.15 Bulk packaging

The WLAN6090SD cards are packaged in 50-piece partition boxes. A carton containing 20 boxes is labeled for shipping (1,000 cards per carton). The detailed package for shipping is illustrated in the following figure for reference.
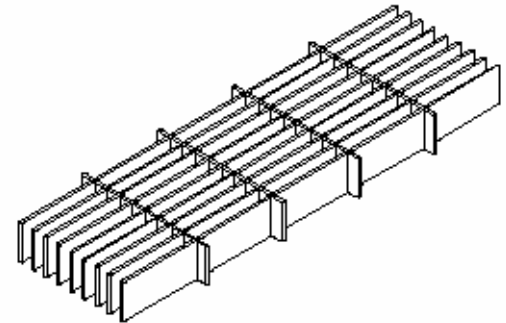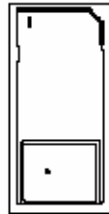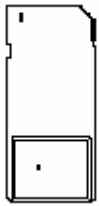
Retail packages are also available upon request. A retail package will contain a single WLAN6090SD card, the device driver, and the user manual in a CD.

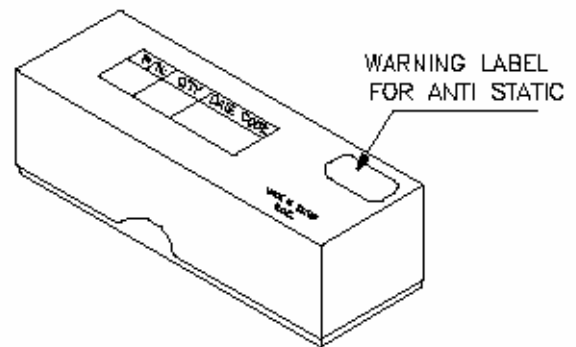[7] SD Input/Output (SDIO) Card Specification 1.0.
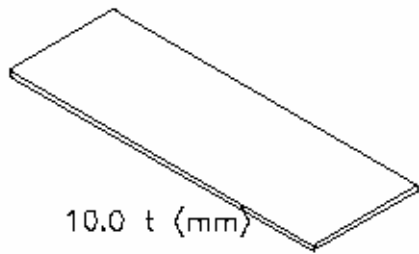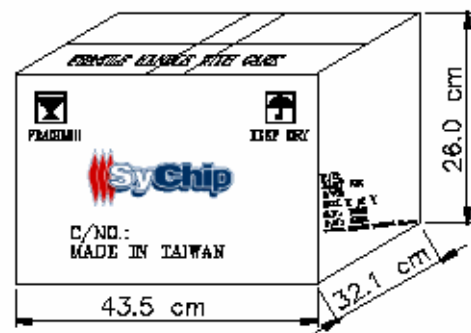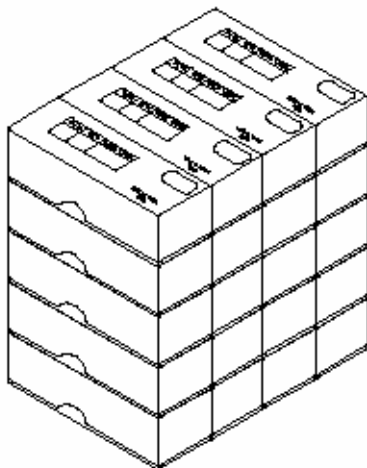
PRODUCTS   PUT IN ESD PE BAG

50-CELL PARTITION

ANTI-STATIC
ANTI STATIC EPE FOAM (2 PIECES EACH BOX)
(PLACE ON UPPER & BOTTOM OF BOX)

INNER BOX
(50 EA/EACH BOX)

WARNING LABEL
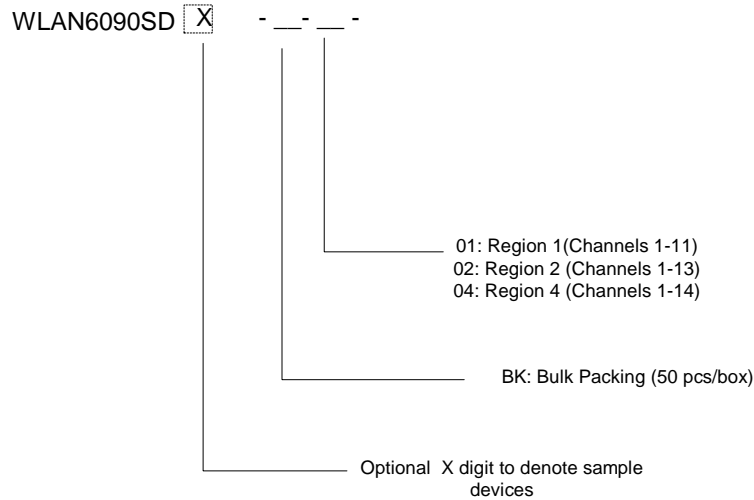FOR ANTI STATIC

10.0 t (mm)

(20 BOXES EACH CARTON)

MAIN CARTON
(20 BOXES EACH CARTON)
(1000 EA EACH CARTON)

26.0 cm

32.1 cm

43.5 cm

C/NO.:
MADE IN TAIWAN

2 Ordering Information

2.1 WLAN SDIO card naming convention

The WLAN SDIO card naming convention is shown below.

WLAN6090SD X   - __- __ -

01: Region 1(Channels 1-11)
02: Region 2 (Channels 1-13)
04: Region 4 (Channels 1-14)

BK: Bulk Packing (50 pcs/box)

Optional X digit to denote sample
devices

2.2 Sample orders

WLAN6090SD can be ordered as sample kits with part number

WLAN6090SDX

The sample kit includes a WLAN6090SDX card and a companion CD with device drivers and related user documentation.

WLAN6090SDX sample cards are calibrated to the same specifications as defined in this document except for the operating channel setting. All the samples are opened to operate in Channel 1-14 to facilitate testing. Please observe the warnings below.

WARNING

THE SAMPLES ARE NOT FOR COMMERCIAL USE. THEY ARE FOR INTERNAL LAB ENVIRONMENT ONLY. AS SUCH, THEY MAY OPERATE OVER THE COMPLETE 802.11b SPECTRUM (i.e. CH. 1-14).

2.3 Production orders

Production order is in bulk packaging. The *minimal order quantity* (MOQ) is 1,000 cards.

Example:

WLAN6090SD-BK-02

This is a bulk production order of 1,000 pieces in one carton. The cards will be operating in Region 2 (most Europe countries, Korea, etc) with RF channels configured from CH 1~13.

3 Technical Support

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