21-92955: 802.11abg SDIO radio module

Integration Guide

USA – FCC	28 Mar 07

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1. Introduction

1.1 Background

21-92955 is the next generation SDIO radio module for ***Symbol*** embedded solutions and is intended for handheld applications.

1.2 Purpose

The purpose of this document is to define the functional characteristics (electrical, mechanical) of the module and provide regulatory information helpful to the product teams to integrate or embed the module in a variety of systems. A section outlining Good Design Practices is also incorporated to help with the overall integration of the device.

1.3 Part Number

Part Number	SKU
21-92955-01	Diversity version with RF connection through BGA pins

1.4 Key Features and Standards supported

The module supports all required modes of operation as an 802.11g and 802.11a Mobile Unit (MU). In 802.11g mode, the radio supports three different modulation modes: Legacy 1 and 2Mbps, Complimentary Code Keying (CCK), and Orthogonal Frequency Division Multiplexing (OFDM). The radio supports the following 12 data rates in 802.11b/g mode:

Data Rate (Mbps)	Modulation
1	DBPSK
2	DQPSK
5.5	CCK
6	OFDM with BPSK Carrier Modulation
9	OFDM with BPSK Carrier Modulation
11	CCK
12	OFDM with QPSK Carrier Modulation
18	OFDM with QPSK Carrier Modulation
24	OFDM with 16QAM Carrier Modulation
36	OFDM with 16QAM Carrier Modulation

48	OFDM with 64QAM Carrier Modulation
54	OFDM with 64QAM Carrier Modulation

The radio supports 8 data rates in 802.11a mode:

Data Rate (Mbps)	Modulation
6	OFDM with BPSK Carrier Modulation
9	OFDM with BPSK Carrier Modulation
12	OFDM with QPSK Carrier Modulation
18	OFDM with QPSK Carrier Modulation
24	OFDM with 16QAM Carrier Modulation
36	OFDM with 16QAM Carrier Modulation
48	OFDM with 64QAM Carrier Modulation
54	OFDM with 64QAM Carrier Modulation

2. Hardware

2.1 Introduction

The 21-92955 module can be used in handheld mobile devices to provide wireless network access. The module communicates using Radio Frequencies (RF) between two or more users or between a user and the wired network. The module implements the IEEE 802.11a and IEEE802.11g physical (RF) specification. The chipset used provides for modulation, demodulation, spreading and despreading of the RF signals.

2.2 Operating Channels

Channel Number	Channel Frequency (MHz)	Countries
1	2412	USA, Canada, EU, Japan
2	2417	USA, Canada, EU, Japan
3	2422	USA, Canada, EU, Japan
4	2427	USA, Canada, EU, Japan
5	2432	USA, Canada, EU, Japan
6	2437	USA, Canada, EU, Japan
7	2442	USA, Canada, EU, Japan
8	2447	USA, Canada, EU, Japan
9	2452	USA, Canada, EU, Japan
10	2457	USA, Canada, EU, Japan
11	2462	USA, Canada, EU, Japan

12	2467	EU, Japan
13	2472	EU, Japan
14	2484	Japan

Table 1. IEEE 802.11g Channels

UNII BAND	Channel Number	Channel Frequency (MHz)	Countries
	240	4920	Japan
	244	4940	Japan
	248	4960	Japan
	252	4980	Japan
		5040	Japan
		5060	Japan
		5080	Japan
Lower Band	34	5170	Japan
	36	5180	USA, Canada, EU, Japan
	38	5190	Japan
	40	5200	USA, Canada, EU, Japan
	42	5210	Japan
	44	5220	USA, Canada, EU, Japan
	46	5230	Japan
	48	5240	USA, Canada, EU, Japan
Middle Band	52	5260	USA, Canada, EU, Japan
	56	5280	USA, Canada, EU, Japan
	60	5300	USA, Canada, EU, Japan
	64	5320	USA, Canada, EU, Japan
	100	5500	USA, Canada, EU, Japan
	104	5520	USA, Canada, EU, Japan
	108	5540	USA, Canada, EU, Japan
	112	5560	USA, Canada, EU, Japan
	116	5580	USA, Canada, EU, Japan
	120	5600	USA, Canada, EU, Japan
	124	5620	USA, Canada, EU, Japan
	128	5640	USA, Canada, EU, Japan
	132	5660	USA, Canada, EU, Japan
	136	5680	USA, Canada, EU, Japan
	140	5700	USA, Canada, EU, Japan
Upper (ISM)	149	5745	USA, Canada
	153	5765	USA, Canada
	157	5785	USA, Canada
	161	5805	USA, Canada
	165	5825	USA, Canada

Table 2. IEEE 802.11a Channels

2.3 Electrical Interface

The electrical interface for the module is SDIO. The chipset used supports this interface; therefore no external component is required. The host must support the SDIO interface as well.

3. Regulatory Product Compliance

Legal Disclaimer: This Guide may contain information on regulatory matters. The information should be used with the understanding that Symbol is not engaged in rendering any legal, regulatory or other professional opinion. Each country has specific laws and regulations governing the use of radio communications. Please consult the official code for each country of interest. Symbol does not warrant the accuracy of the information contained herein and accepts no liability or responsibility for any use or misuse of the information

Symbol's wireless network devices are designed to be compliant with rules and regulations in locations they are sold.

Any changes or modifications to Symbol Technologies equipment, not expressly approved by Symbol Technologies, could void the user's authority to operate the equipment.

IMPORTANT NOTE:
End product user guide must NOT include any information regarding how to install or remove this RF module.

3.1 Final Product Compliance

The model Number used for Regulatory Approvals is: 21-92955

The module has been regulatory approved for integrations which meet the following conditions:

1. The radio integration is embedded
2. The antenna must be installed such that 20 cm is maintained between the antenna and users

3. The ‘Type’ and ‘Gain’ of the antenna selected for the integration of the external antenna must meet the requirements as detailed in section.

Used outside of these conditions will trigger re-approval

As the integrator, you are responsible to determine what additional specific regulatory requirements are required of the country in which your product will be marketed. Final product may require non-radio frequency approvals such as Product Safety, EMC, and SAR.

3.2 Reference Antenna

A reference antenna has been used during the approval process.

Specific details of the reference antenna used for testing is detailed in the table below.

Important Note:
Use of an antenna which is the same ‘type’ (eg. Dipole) and has a gain equal to or less that the reference antenna can be used without recertification.

Use of an alternative antenna, different ‘type’ or same ‘type’ but higher gain will invalidate the country approvals. Under this instant the integrator is responsible for re-evaluating the end product and obtaining separate approvals.

Antenna Type:

Dipole

Antenna Characteristics:

ML-2452-APA2-01

Antenna Characteristics	
Parameter	**Performance**
Model Number	C802-510001-A
Symbol P/N	ML-2452-APA2-01
Frequency (MHz)	2400-2500, 5150-5850
Gain (dBi)	3, 4
Cable Loss (dB)	N/A
Net Gain (dBi)	3, 4
Polarization	Linear, Vertical
VSWR	1.92:1
Azimuth Plane 3dB Beamwidth	360°
Elevation Plane 3dB Beamwidth	35°
Cable Length (inches)	N/A
Cable Attenuation (dB/100 ft.)	N/A
Cable Type	N/A
Cable P/N	N/A
Connector Type	RP-SMA MALE
Power	10 W
Weight	0.7 oz

3.3 Product Markings

Regulatory markings are applied to signify the radio module has been approved in the following countries: USA.

3.4 National Country Requirements

NOTE:
The sections below assume that all the conditions detailed in section 3.1 have been met.

3.4.1 United States of America

The radio card is already approved under the requirements of the FCC.

End-product requirements with this module installed should include:

- FCC Part 15 (emissions class B)

Final product markings must include:

Contains an approved Radio Module
Model: 21-92955
FCC ID: H9P2192955

IMPORTANT NOTES

1. Co-location
The FCC approval ***EXCLUDES*** co-location with any other transmitter.

If the module is co-located with another transmitter (eg, Bluetooth Module), the integrator is responsible for re-evaluating the end product and obtaining a separate FCC authorization.

2. Portable Use
The FCC approval of the module covers 'mobile' applications.

If the final product used in a manner where the antenna is closer than 20cm from the user (portable use), the OEM is integrator is responsible for re-evaluating the end product and obtaining a separate FCC authorization.

Symbol recommends the use of an accredited Laboratory to carry out the necessary tasks.

3. Channels
For use in the USA the available 802.11b/g channels are limited from 1 to 11.

3.5 Statements required for the User Guide

The following statements are for required in the final product guide.

Many on the statements are dependent on the application of the final product. Symbol recommends that the Integration team seeks the advice from an a TCB.

3.5.1 General Statements

Any changes or modifications not expressly approved by Symbol Technologies, Inc. could void the user's authority to operate the equipment.

Ad hoc Mode (5GHz)

Ad Hoc operation of the MODULE in the 5Ghz band will be limited to 5150 – 5250MHz (UNII 1).

3.5.2 FCC Statements

Co-located statement

To comply with FCC RF exposure compliance requirement, the antenna used for this transmitter must not be co-located or operating in conjunction with any other transmitter/antenna except those already approved in this filling.

Handheld Devices

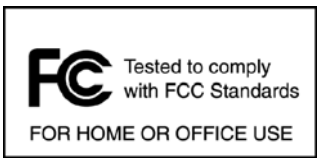
To comply with FCC RF exposure requirements, this device must be operated in

the hand with a minimum separation distance of 20 cm or more from a person's body. Other operating configurations should be avoided.

Remote and Standalone Antenna Configurations

To comply with FCC RF exposure requirements, antennas that are mounted externally at remote locations or operating near users at stand-alone desktop of similar configurations must operate with a minimum separation distance of 20 cm from all persons.

Radio Frequency Interference Requirements – FCC



Note: 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.

Radio Transmitters (Part 15)

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.

2.4GHz band operation

The available channels for 802.11 b/g operation in the US are Channels 1 to 11. The range of channels is limited by firmware.

UNII band 1

The use in the UNII (Unlicensed National Information Infractructure) band 1 5150-5250 MHz band is restricted to Indoor Use Only; any other use will make the operation of this device illegal.

