RF Module Specification

Model No: SNPRFM001

Short Description:	This document provides technical details and functional description of DWAM83-TB module used in our system. DWAM83 module from Standard Microsystems Corporation (SMSC) is customized to suit Snap Networks Pvt. Ltd. needs and the technical data mentioned here is taken from the relevant sections in SMSC manual "DWAM83 TB Datasheet Rev1.0" with due permissions.
Document Owner:	SNAP Networks Pvt. Limited
Confidentiality Status:	Under NDA
Revision Number & Date:	Rev 0.0; 10/03/2014

FCC Statement
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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—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.
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.
Caution!
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

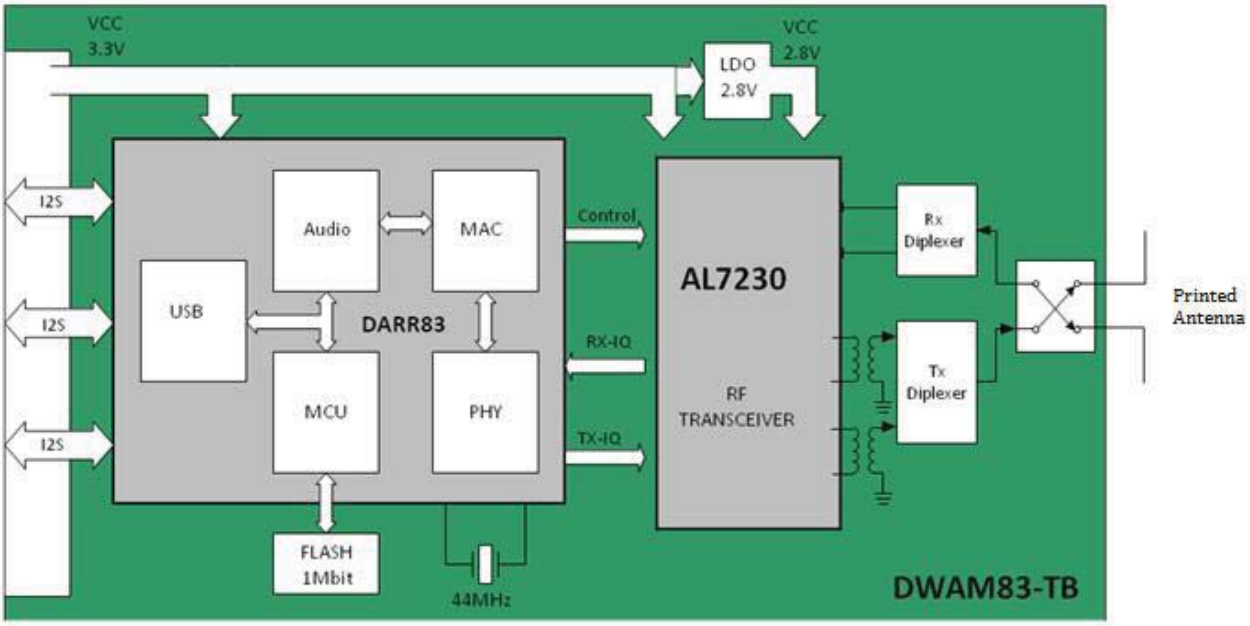
System Specifications

ID	Parameter	Value	Unit	Remarks
RF Characteristics				
	RF frequency range	5725 - 5875	MHz	
	Number of RF channels	3		
Air framing				
	Addressing	24	Bit	
	Data message size	32	Byte	Application dependent
	CRC	16, 24 and 32	Bit	Hybrid
Control				
	Control interface	I^2C		Compliant with the I^2C protocol (slave), 0…400kbps. Base address 0x80.
Data				
	Data Bandwidth	100	Kbps	Bi-directional wireless data channel
	Data latency	5	ms	Minimum under good RF link conditions for applications that support the 100kbps data rate.
Interference Robustness				
	Fixed frequency devices (e.g. WLAN, microwave oven)			Fully coexistent[1]
	Frequency hopping devices (e.g. 5.8GHz cordless phones)			Fully coexistent[1]

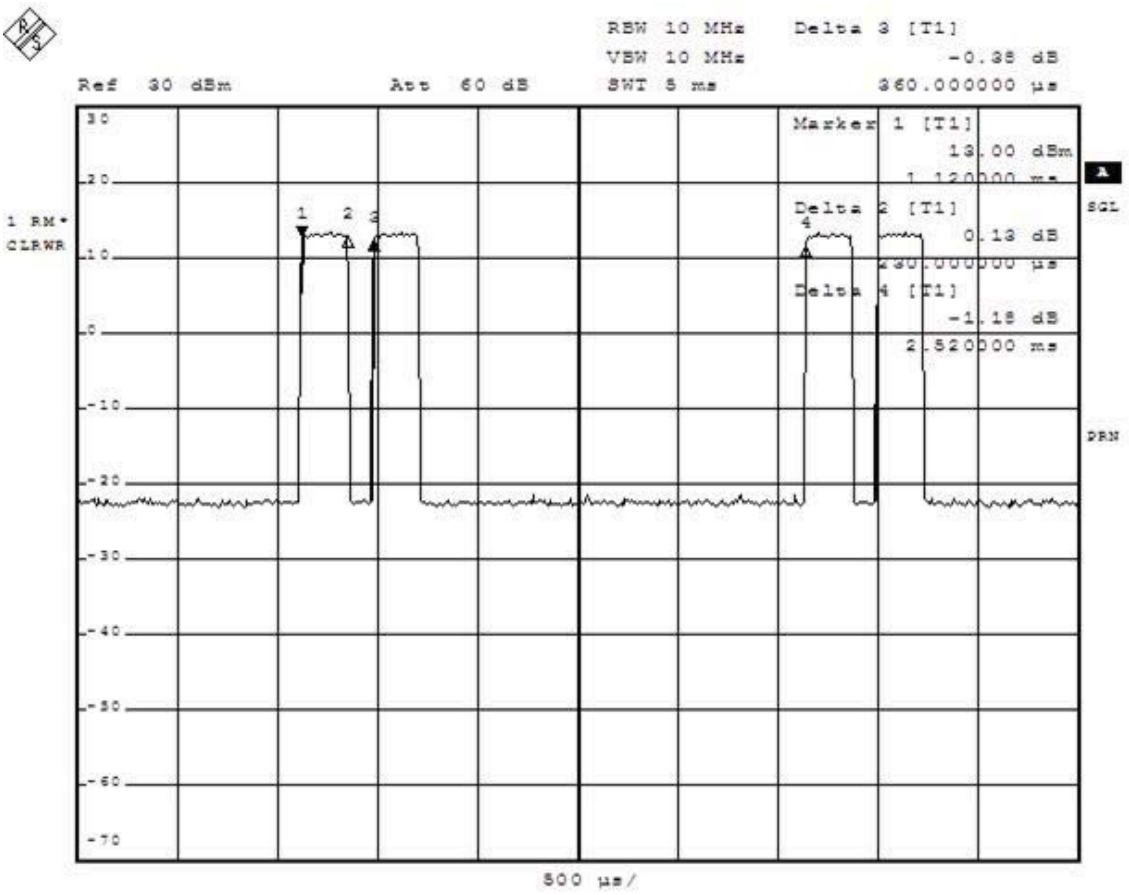
Audio Interface			
Available Interface Types	I^2S S/PDIF		Can be used simultaneously Incl. S/PDIF detection.
Number of stereo audio output channels on Mobile Unit	1, 2, 3 or 4		Bidirectional, incl. audio loop
Number of stereo audio input channels on Central Unit	1, 2, 3 or 4		Bidirectional, incl. audio loop
Audio Quality			
Sample rate	44.1, 48 or 96	ksps	
Sample width	16 or 24	bit	
Latency	20	ms	Configurable from 10 to 23.6ms, depending on the application.
Dynamic Range	98	dB	16 bit 48ksps, A-weighted
	146	dB	24 bit 48ksps, A-weighted
THD+N	-96	dB	16 bit 48ksps
	-143	dB	24 bit 48ksps
Frequency response	0	dB	20Hz…22kHz [2]
Dimensions			
Module dimensions	35 x 35 x 4.3	mm	

Symbol	Parameter	Min.	Typ	Max	Unit
VCC	Supply Voltage			3.8	V
$T_{storage}$	Storage Temperature	-25	–	85	℃
V_{ESD}	ESD Contact Discharge	-2	–	+2	kV

Symbol	Parameter	Min.	Typ	Max	Unit
VCC	Supply Voltage	3.1	3.3	3.5	V
VCC Ripple	Peak to Peak Ripple (in circuit)	–	0	100	mV
T_{amb}	Operating Temperature	-10	25	60	℃

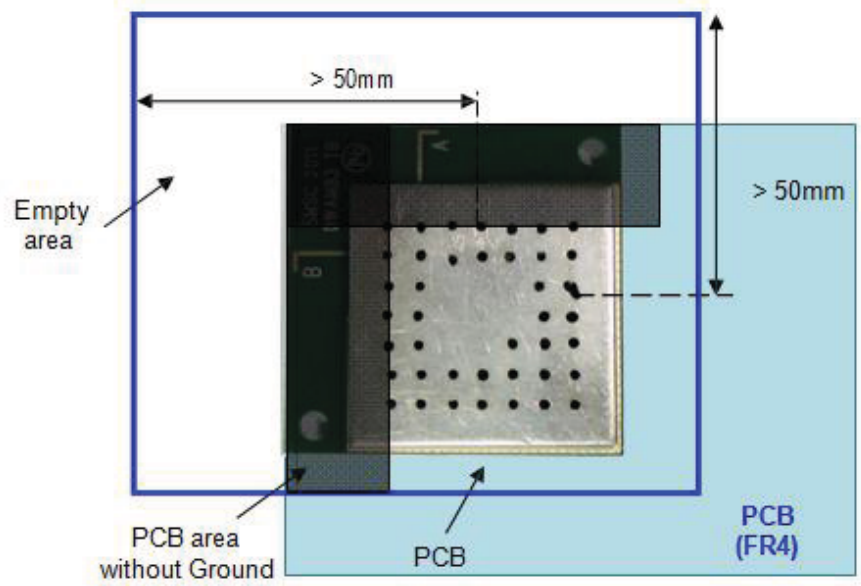


Application*	5.8GHz	
	MU (in mA)	CU (in mA)
Standby mode*	21	21
1 Stereo NACK	36	96
2-1 Stereo NACK BiDir	82	146
2 ACK	65	127
TX Continuous mode (peak	-	300



Parameter		Condition	Min.	Typ.	Max	Units
RF Frequency Range			5725	–	5875	MHz
Number of RF-channels		Carriers in the spectrum	–	3	–	
Transmission Power[3]		Depending on antenna design		9		dBm
Channel Frequency (dynamic or fixed allocation)	CH1 CH2 CH3		–	5736 5762 5814	–	MHz
Channel Spacing			–	26	–	MHz
RF Bandwidth		Null-to-null	–	22	–	MHz
Rx sensitivity			–	-81	–	dBm
Antenna Diversity		TX/RX	–	ON	–	.

Pin Number	Pin Name	I/O	Description
1	VDD	Power	Regulated 3.3V input
2	GND	Ground	Ground
3	MCLK	In	12.288MHz audio clock In
4	DARR83_GPIO_2	I/O	Configurable. Please refer to the DARR83 datasheet
5	DARR83_GPIO_7	I/O	Configurable. Please refer to the DARR83 datasheet
6	DARR83_GPIO_4	I/O	Configurable. Please refer to the DARR83 datasheet
7	DARR83_GPIO_23	I/O	Configurable. Please refer to the DARR83 datasheet
8	DARR83_GPIO_13	I/O	Configurable. Please refer to the DARR83 datasheet
9	DARR83_GPIO_3	I/O	Configurable. Please refer to the DARR83 datasheet
10	DARR83_GPIO_15	I/O	Configurable. Please refer to the DARR83 datasheet
11	NC		NOT CONNECTED
12	NC		NOT CONNECTED
13	DARR83_GPIO_24	I/O	Configure as MON_TXD
14	DARR83_GPIO_14	I/O	Configure as IRQ
15	DARR83_GPIO_1	I/O	Configure as WP
16	NC		NOT CONNECTED
17	DARR_RST		DARR RESET (external pull up required)
18	I2C_SCL_SLV		I2C SLAVE (SCLK)
19	I2C_SDA_SLV		I2C SLAVE (SDA)
20	DARR83_GPIO_12	I/O	Configure as SDIO Z
21	DARR83_GPIO_11	I/O	Configure as SDIO X
22	DARR83_GPIO_10	I/O	Configure as LRCK W
23	GND	Ground	Ground
24	DARR83_GPIO_8	I/O	Configure as BCK W
25	DARR83_GPIO_6	I/O	Configure as SDIO Y
26	DARR83_GPIO_5	I/O	Configure as SDIO W



Typical Module (RF) Placement: >30mm separation (all directions) from antennae is recommended.

4.2 General Power Supply Decoupling

The RF frame rate is in the audio frequency band. So the switching between TX and RX will cause a power supply ripple (because of the change in current between TX and RX mode) that is also in the audio frequency band. Therefore, it is important that the module power supply is isolated from the audio circuitry power supply.

Listed here below are some general guide lines:

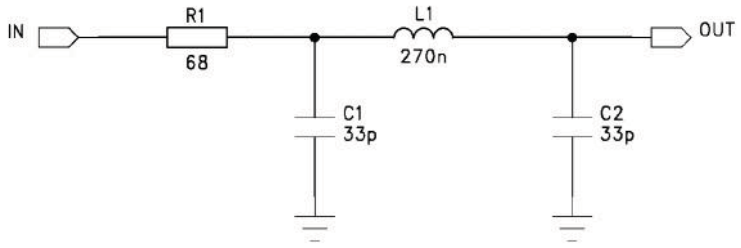
- Use a dedicated power supply for the module.
- Consider the Pi-network for power supply decoupling from the regulator to the module (large capacitor to ground, series bead inductor, large capacitor to ground).
- Isolate the control loop of the application board regulator from this 3.3V power supply domain
- Use a very short and solid ground connection from the star point of the power supply to the module.
- Isolate the module's ground from the analog ground.
- Use low ESR capacitors (e.g. Nichicon HDM)

With the above guide lines, it should be possible to suppress the switching peaks to well over 110dB below the full scale output.

4.3 Digital IO filtering

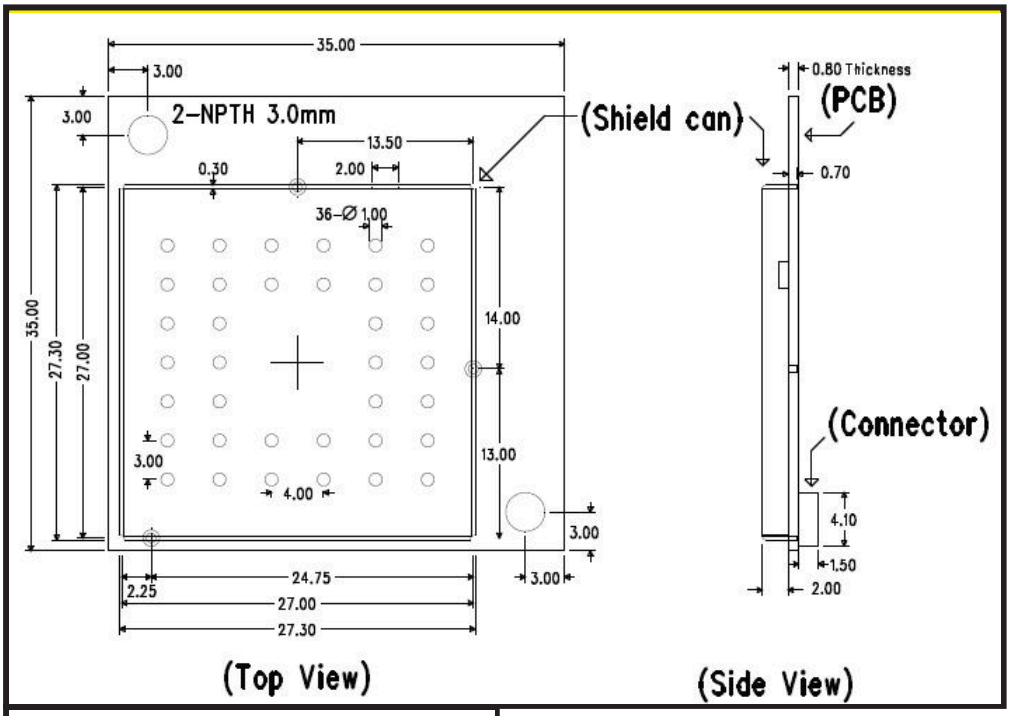
4.3.1 MCLK filtering

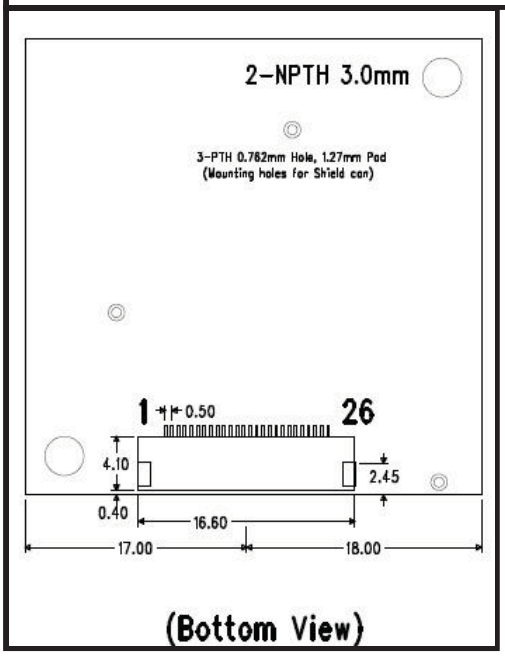
The audio clock signal runs over the flat foil cable to the module. The harmonics can easily radiate and exceed the regulatory limits if the drive strength is too strong and/or cable and/or PCB trace lengths are too long. To overcome this, the audio clock signal can be filtered at the source (i.e. at the crystal oscillator itself) by a simple filtering circuit such as depicted here below:

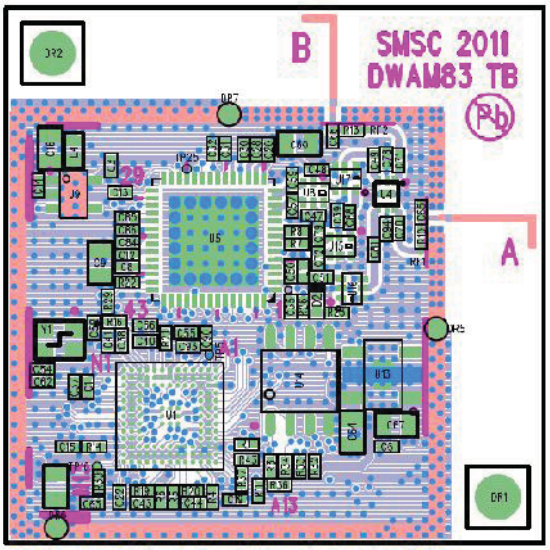


4.3.2 I^2S Bus

The I^2S bus signals are transported over the FFC. To overcome potential radiation problems, it is advised that the bus is filtered on the application board with a resistor array (e.g. 33…68Ohm) and small valued (e.g.10pF) capacitors.







Revision	Author	Date	Detail
0.0	PKK	12 Mar 2014	Initial Release

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter.
This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.
IMPORTANT NOTE:
In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
End Product Labeling
The final end product must be labeled in a visible area with the following:
“Contains FCC ID: 2AB3G-SNPRFM001”.
Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.