

ARF52

User Guide



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DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN45014



Manufacturer's name: **ADEUNIS R.F.**

Address: Parc technologique PRE ROUX IV
283 rue Paul Louis NEEL
38920 CROLLES - FRANCE

declares that the product

Product Name: ARF52
Product Number(s): ARF7456
Product options:

conforms to the RTTE Directive 99/5/EC:

EMC: conformity is proven by compliance to the standard EN 301 489 according to the requirements of EMC Directive 89/336/EEC.

Safety: conformity to the standard EN 60950 according to the requirements of Low Voltage Directive 73/23/EEC.

Radio: conformity is proven by compliance to harmonized standard EN 300-328 covering essential radio requirements of the RTTE directive.

Notes:

- Conformity has been evaluated according to the procedure described in Annex III of the RTTE directive.
- The use of the spectrum is harmonized by the fact that the product never falls in one of the restrictions listed in appendix 3 (Annex 1, band E) of the CEPT recommendation 70-03.
- Receiver class (if applicable) : 2.

Restrictions: - CE marking applies only to End Products: Because this equipment is only a subassembly, conformity testing has been reduced (equipment has been design in accordance to standards but full testing is impossible). Manufacturer of End Products, based on such a solution, has to insure full conformity to be able to CE label marking.

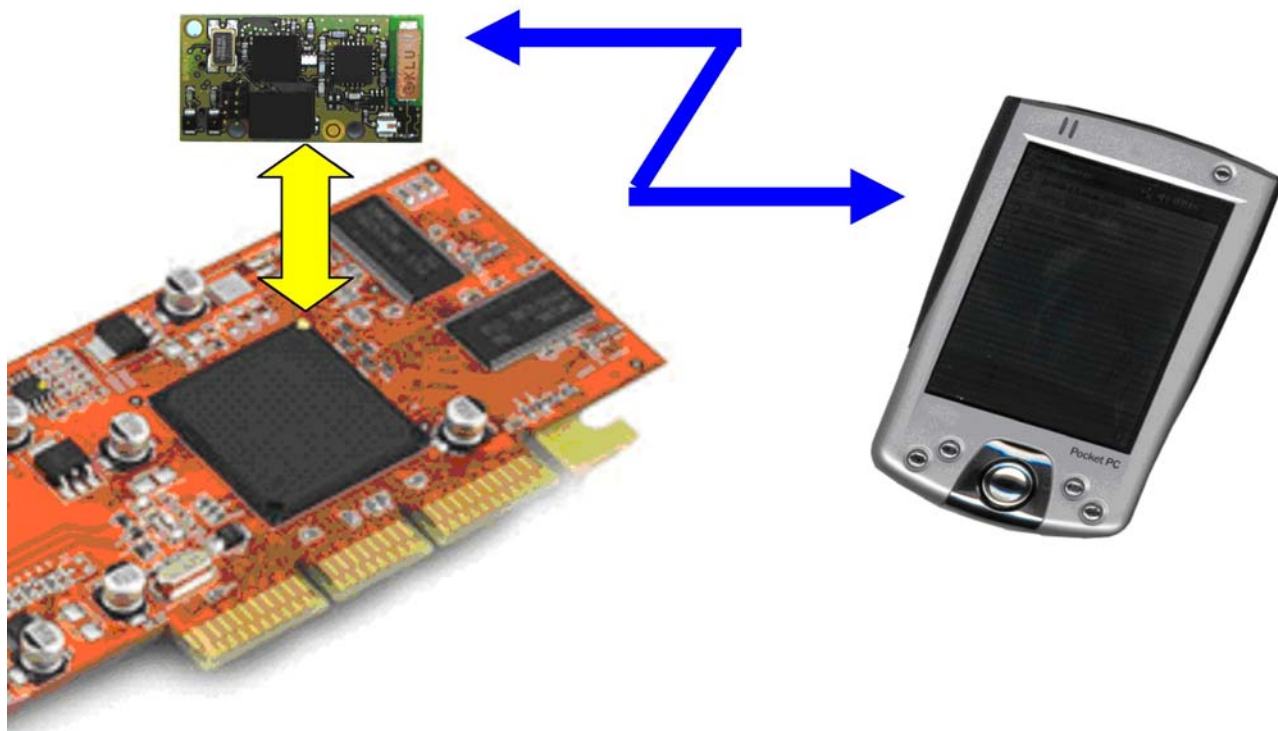
Crolles, September 4th, 2007

VINCENT Hervé / Quality manager

A handwritten signature in black ink, appearing to be 'V. Hervé'.

OVERVIEW

The ARF52 Bluetooth class 1 module enables Bluetooth® compliant duplex communications over a 150-meter range in the worldwide 2.45 GHz frequency band.



The ARF52 module fully complies with the V2.0+EDR Bluetooth® standard and data rate goes up to 3 Mbps. Data exchange and set-up are only done through an UART data port, under SPP profile. A miniature antenna is integrated.

ARF52 can be used in two modes: command mode and transparent mode. The command mode is used to established Bluetooth communications and set/get parameters. The transparent mode is used for data exchange.

The module converts data from a serial link into a Bluetooth radio frame to be sent to a similar piece of equipment. The communication is half-duplex.

The operating parameters of the Bluetooth module (serial link, bluetooth management...) can be fully updated through AT commands via the serial link.

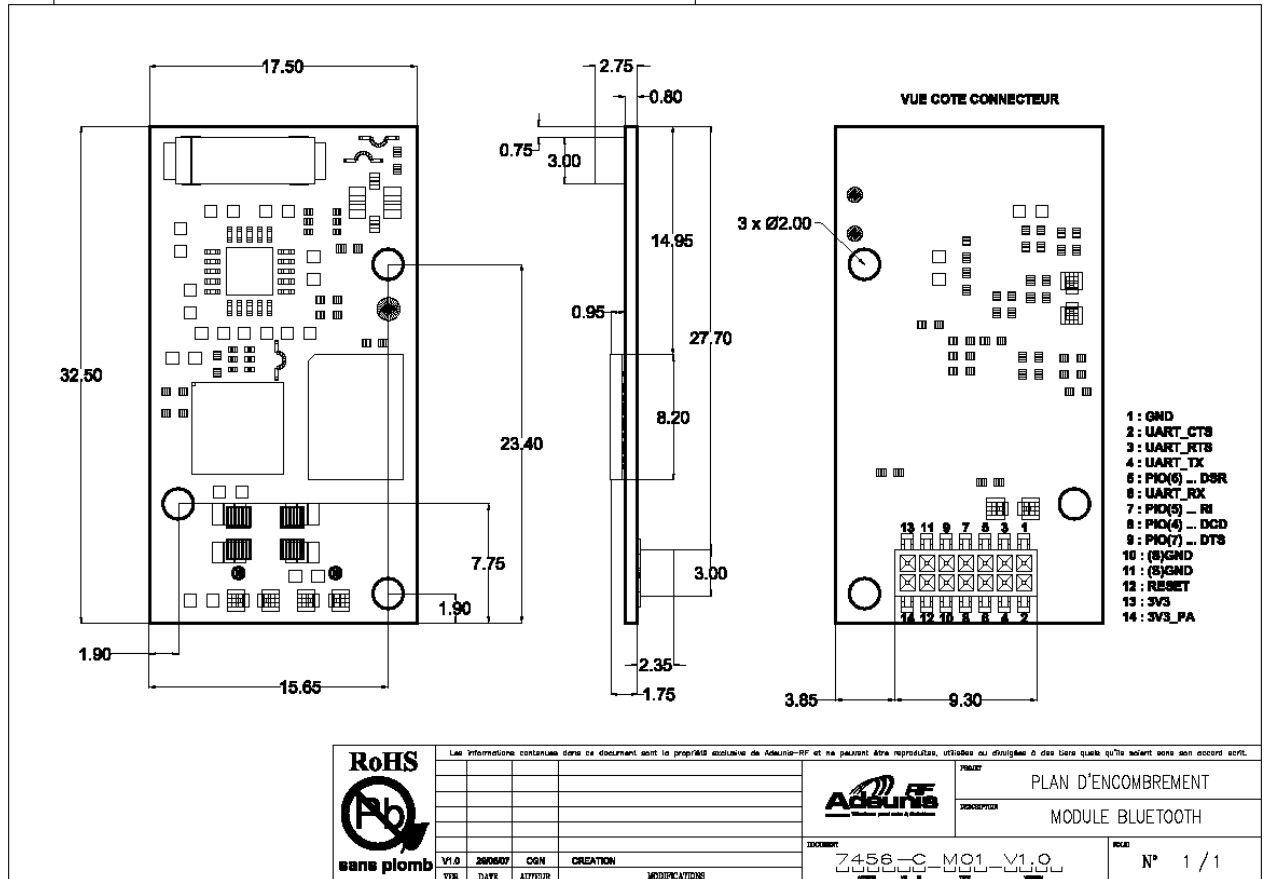
ARF52 modules are available as standalone ARF7456 module or in a demo kit. This demo kit can be fully set-up using a PC terminal.

We recommend reading the "specification of the Bluetooth system core 2.0 + EDR" document available at the www.bluetooth.com web site.

INTERFACE

- Mechanical specification

33x18 mm



 RoHS sans plomb	Les informations contenues dans ce document sont la propriété exclusive de Adeunis-RF et ne peuvent être reproduites, utilisées ou divulguées à des tiers sans qu'ils soient son accord écrit.				 Adeunis RF	PROJET	PLAN D'ENCOMBREMENT	
						IDENTIFICATION	MODULE BLUETOOTH	
V1.0	260607	CGN	CREATION		DOCUMENT	Z456-C-MC01-V1.0	SEULE	N° 1 / 1
TRK	DATE	AUTEUR	MODIFICATIONS					

- **Signal description**

14 pins 1,27mm male SMD connector.

Interface Pin	Name	I/O	Description
Digital interface			
1,10,11	GND		Ground
13	VDD_DIG		Digital voltage 3,3V +/- 10%
14	VDD_ANA		Analog voltage 3,3V +/- 10%
4	TXD	O	Serial data transmission
6	RXD	I	Serial data reception
2	/CTS	I	Clear To Send CTS = GND, the DCE is able to receive serial data CTS = VDD, serial data received by the DCE are lost
3	/RTS	O	Request To Send RTS = GND, the DTE is able to receive serial data RTS = VDD, serial data received by the DTE are lost
12	/RESET	I	Reset signal
9 (PIO7)	DTR	I/O	Data Terminal ready Output for the Slave Input for the Master
5 (PIO6)	DSR	I/O	Data Set Ready Input for the Slave Output for the Master
7 (PIO5)	RI	I/O	Ring Input for the Slave Output for the Master
8 (PIO4)	DCD	I/O	Data Carrier Detect Input for the Slave Output for the Master

PROFILES

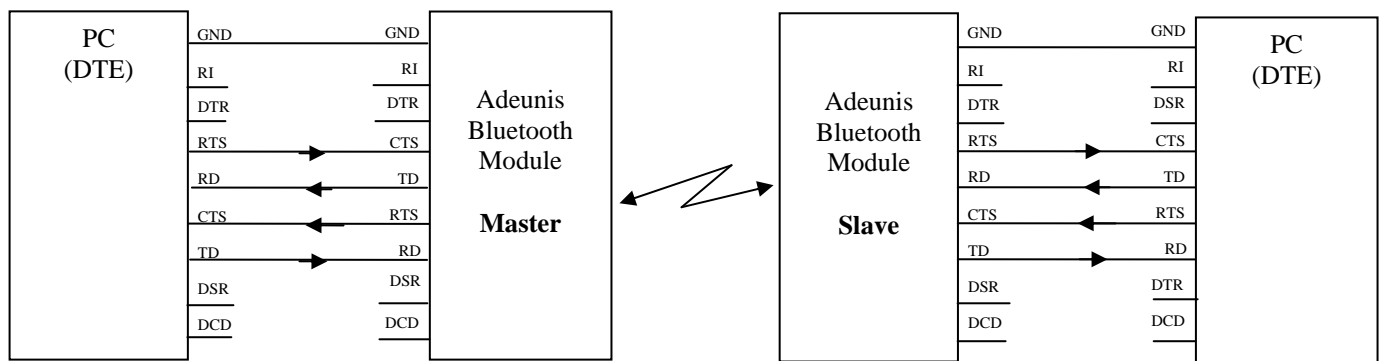
The module supports 2 different profiles: **SPP and DUN**.

A basic module configuration is provided as a guideline for each profile (for more details or customisation see § AT commands).

The module can be configured using a terminal at 115200 baud, 8 bits, 1 stop, HW flow control (default serial configuration)

- **SPP wiring and configuration**

SPP (Serial Port Profile) is the standard Bluetooth profile.

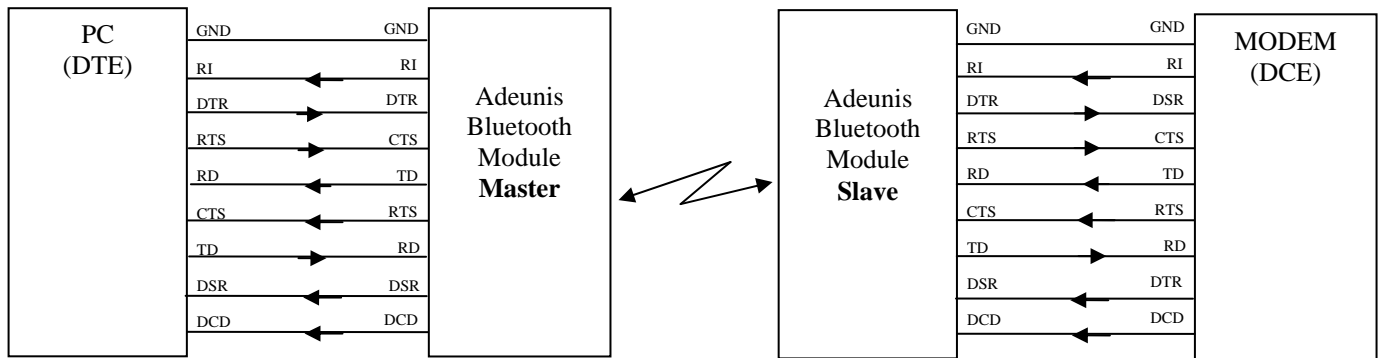


SPP configuration guideline: in the following example, the Master is configured to performed an auto-connection on reset.

1. Master configuration: enters the command mode using the A++ sequence. When the <OK> answer is receive, send the following commands:
 - ATS202=1 (auto-connect on reset)
 - ATS220=1 (SPP profil, default value)
 - ATS203= slave BT address (use ATINQ 0,10 command to discover the slave @)
 - AT&W (save the configuration)
2. Slave configuration: enters the command mode and then send the following commands:
 - ATS202=0 (auto-connect disable, default value)
 - ATS220=1 (SPP profil)
 - AT&W (save the configuration)
3. Perform a power cycle on both modules. The modules are now in transparent mode; the link will be established automatically on reset by the master. When the link is established data can be exchanged using the serial link.
4. Caution the BT connection establishment can takes several seconds (you can check this establishment in command mode using the AT&L command).

- **DUN wiring and configuration**

DUN (Dial up Network) profile is above the SPP profile. This profile manages the 4 lines DTR, DSR, DCD and RI and is dedicated to PSTN or GSM modems.



DUN configuration guideline : in the following example, the Master is configured to performed an auto-connection on DSR.

1. Master configuration: enters the command mode using the A+++ sequence. When the <OK> answer is receive, send the following commands:
 ATS202=2 (auto-connect on DTR)
 ATS220=2 (Dun profil)
 ATS203= slave BT address (use ATINQ 0,10 command to discover the slave @)
 AT&W (save the configuration)
2. Slave configuration: enters the command mode and then send the following commands:
 ATS202=0 (auto-connect disable, default value)
 ATS220=2 (Dun profil) AT&W (save the configuration)
3. Exit the command mode or perform a power cycle on both modules. The modules are now in transparent mode; the link will be established when the DTR is activated on the master. When the link is established data can be exchanged using the serial link.
4. Caution the BT connection establishment can takes several seconds (you can check this establishment either in command mode using the AT&L command or by checking report of a remote signal).

DTR/DSR/RI and DCD I/O configuration:

- These lines are set as inputs while the connection is not established or released,
- And set as input and output according to the DUN illustration and to the description done in signal description table

MODULE OPERATING MODE

Two operating modes are available:

- Command mode (usage of AT commands and SPP_CONFIG mode),
- Transparent mode (serial data are transmitted on radio link).

At power up the transceiver is in transparent mode according to the registers configuration. The boot time is about 1s.

- **Command mode**

The command mode is used to read and update the modem configuration registers using AT commands.

In command mode, the radio is inhibited (reception and transmission), excepted when using test command.

Entering command mode: issues on the serial link a A+++ sequence. The sequence A+++ characters is accepted only if no character has been seen before and after the A+++ sequence. Register (S214) defines the silence duration.

Tips : if you are using a terminal (such as Hyperterm), you have to send the A+++ sequence using a text file (first create a text file containing only the A+++ characters, and then use in Hyperterm the command "Send text file" in the "Transfer menu")

Exiting command mode (return back in transceiver mode): send the serial command

ATO <cr>

- **Transparent mode**

In transparent mode, data received from the serial link are transmitted on the radio link. When data are received on the radio link, these data are sent on the serial link.

REMOTE CONFIGURATION

SPP_CONFIG mode is used to remotely configure the slave module through the master module serial link. This is done, on master side, in 4 steps:

1. Activation of the SPP_CONFIG mode using the ATC1 command. When this mode is activated, the command issued on the master will be ignored by the master and transmitted to the slave by radio.
2. Slave configuration: send command to the slave using the Master serial link.
3. When the remote configuration is done, the master must sent an AT&W command to the slave (the AT&W command is mandatory because the slave reboots when the master leaves the SPP_CONFIG mode or when the RF link is loosed).
4. Leaving of the SPP_CONFIG mode using the ATC0 command.

AT COMMANDS

- Description

AT commands are interpreted only when the module is in Command mode.

Commands: are used to read and update the modem parameters

- A command starts with the 2 ASCII 'AT' characters. 'AT' means 'Attention' follow with one or several characters or other data.
- Each command is ended with <cr> (carriage return).
- In the same command, the time between 2 characters must be less than 10s.

Response: is sent back for each command on the serial link. The answer is:

- <cr><lf>'OK'<cr><lf> (ASCII character 0x4F) for accepted command (or OK command)
- <cr><lf>'ERROR'<cr><lf> for error
- Specific string when specified

- Set of commands

The SPP CONFIG column indicates whether the command is available or not when the module is in SPP CONFIG mode (ATC1 command).

Commands	Description	SPP CONFIG
	<u>Operating mode selection</u>	
ATO	Return back to transparent mode.	NO
<silence>A+++ <silence>	Command mode activation. The A+++ sequence must be preceded and followed by a calibrated silence (no other character)	NO
	<u>Registers management</u>	
ATSn?	Displays the Sn register content where n represents the register number. The response has the following format: Sn=y<cr><lf>	YES
ATSn=m	Sets the Sn register value with 'm'. n represents the register number..	YES
AT&W	Saves the new register configuration in EEPROM. Each time you switch on the modem, the EEPROM configuration will be loaded in the modem registers.	YES
AT&V	Displays all register values. The response has the following format: Sxxx=y<cr><lf> for each register.	YES
ATI	Software version display. The response has the following format: Adeunis RF : 7456 Vxx.yy<cr><lf>	YES
AT&F	Restore the register default values	YES
ATINQ<space>MaxDe vice, TimeOut	Launch Bluetooth inquiry of devices for a duration d multiple of 1.28s <1..48>, for maximum n (0=unlimited, 1= one device, ...) devices Return BT address and class of device of each peripheral Example : ATINQ 0,10	NO
ATD<space>Bluetooth address	Establish Bluetooth link with device <Bluetooth address> Link established : answer 'OK'<cr><lf>	NO

	Link not established : answer 'NO CARRIER'<cr><lf> Example : ATD 0018B2000110	
ATH	Release Bluetooth link	NO
AT&L	Link connection status. released or established	NO
<u>ATC0</u>	Exit SPP Config mode	YES
<u>ATC1</u>	Enter SPP Config mode	NO
	<u>Test modes</u>	
AT&T0=xxxx,yyyy,zzz zz	Continuous transmission at xxxx (2402<=xxxx<=2480) MHz, with a designated output power yy (0<=yyyy<=65530) and designated tone modulation frequency zzzzz (0<=zzzzz<=65535). Example : AT&T0=2450,65530,0	NO
AT&T1=xxxx, yyyy	Enables the transmitter at xxxx (2402<=xxxx<=2480) MHz, with a designated output power yy (0<= yyyy <=65530). Payload is PRBS9 data. Example : AT&T1=2450,65530	NO
AT&T2=x, yyyy	Enables the transmitter with a simplified hop sequence designated by the country code x (0<=x<=3), with a designated output power yy (0<=yyyy<=65535). Payload is PRBS9 data. Example : AT&T2=0,65530	NO
AT&T3=xxxx,y,zz	Enables the receiver in continuous reception at xxxx (2402<=xxxx<=2480) MHz, with a choice of low (y=0) or high (y=1) side modulation and a designated attenuation zz (0<=zz<=15). Example : ATT&T3=2450,0,0	NO
AT&T4=xxxx, yyyy	Test loopback at xxxx (2402<=xxxx<=2480) MHz, with a designated output power yy (0<= yyyy <=65530). Example : AT&T4=2450,65530	NO

- **Register description**

The register value could be updated using the ATSn=m<cr> command and displayed using Aton?<cr> command.

At power-up, the previous transceiver configuration is read from E2PROM (non volatile) and stored in RAM. The registers are located in RAM, any modification is performed in RAM: To save current register configurations, it is necessary to use the AT&W<cr> command (If not, the updated parameters are lost in case of power shortage).

The registers are shared in 2 types: read only (R) or read/write (R/W)

Type	Register	Function	Description	Default value	Link disconnection if register value change
			Bluetooth management		
R	S200	Local Bluetooth address	Local Bluetooth address of the module The local BT address is read only.		NO
R/W	S201	Local device name	Device name must be lower or equal than 32 bytes	"Serial Port Device"	YES
R/W	S202	Auto-connect mode	Auto-connect mode : 0 = disable 1 = Auto-connect on reset or power up 2 = Auto-connect on GPIO (DTR)	0	YES
R/W	S203	Remote Bluetooth address	Remote Bluetooth address used with auto-connect mode enabled.	000000 000000 h	YES
R/W	S204	reconnection management	Reconnection management used with auto-connection mode Send 'NO CARRIER' <cr><lf> in case of no connection 0 : no reconnection N : number of retries (N<>0 and N <>255) 255 : always	255	YES
R/W	S205	Pin code	Pin code of the module must be lower or equal than 16 bytes	0000	YES
R/W	S206	Encryption	Encryption type : '0' = disabled '1' = enabled	0	YES
R/W	S207	Security	Security type : '0' = disabled the pin code demand '1' = enabled the pin code demand	0	YES
R/W	S208	Class of device	0xXXXXXX	000000 h	YES

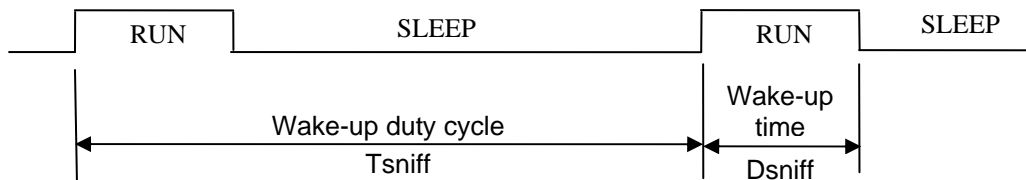
			Serial link		
R/W	S210	Baudrate	Serial link rate in bits/s, see Note 1. '4': 9 600 '5': 19 200 '6': 38 400 '7': 57 600 '8': 115 200 For baudrates above 115200 bits/s be sure that your system can support the speed. '9' : 230 400 '10' : 460 800 '11' : 921 600	8	NO
R/W	S211	Data length	'8' : 8 bits, see Note 1.	8	NO
R/W	S212	Parity	see Note 1. '1' : none '2' : even '3' : odd	1	NO
R/W	S213	Stop bits	see Note 1. '1' : 1 stop bit '2' : 2 stop bit	1	NO
R/W	S214	Command timeout	Time out duration for detecting the A+++ pattern, unit 1/50s (20ms) : from 1 up to 255x50ms.	50	NO
R/W	S215	Flow control	Flow control management : 0 : disable (RTS/CTS management) 1 : enable (RTS/CTS management) Modifying is enable after ATO command which reboot the system.	1	NO
			Protocol		
R/W	S220	Protocol	'1'= SPP '2'= DUN	1	YES
R/W	S230	Sniff mode	0 : not used 1 : very low power consumption and low throughput 2 : low power consumption and medium throughput 3 : low power consumption and maximum throughput 4 : customer sniff mode (Bluetooth expert only) – use parameters S231..S234	0	YES
R/W	S231	Sniff parameter Max interval	see Note 2. 6..1344 Wake-up duty cycle (Tsniff) – multiply 625us	800	YES
R/W	S232	Sniff parameter Min interval	see Note 2. 0..1342 Sniff offset (Dsniff) – multiply 625us Dsniff must be lower or equal to Tsniff-2	80	YES

R/W	S233	Sniff parameter Attempt	0..672 Number of slots listen by slave during wake-up Sniff parameter attempt must be lower than $T_{sniff}/2$	8	YES
R/W	S234	Sniff parameter Timeout	0..40 Number of additional slots listen by slave during wake-up	8	YES

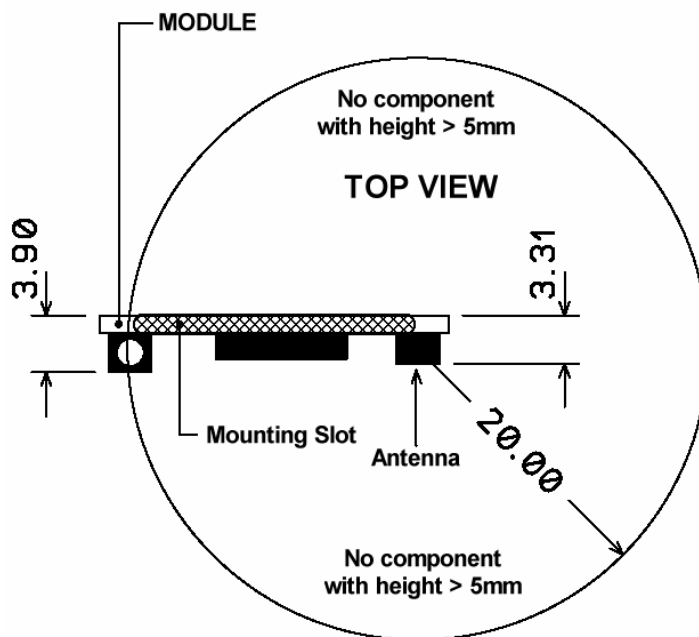
The column “link disconnection if register value change” does not apply if the modification is done remotely (for a slave configured using the SPP CONFIG mode).

Note 1: when changing the serial link configuration (rate, parity, stop bit...), the answer is done using the old serial link format, the next command must be sent using the new serial format.

Note 2: when



- Recommended exclusion zone around antenna**

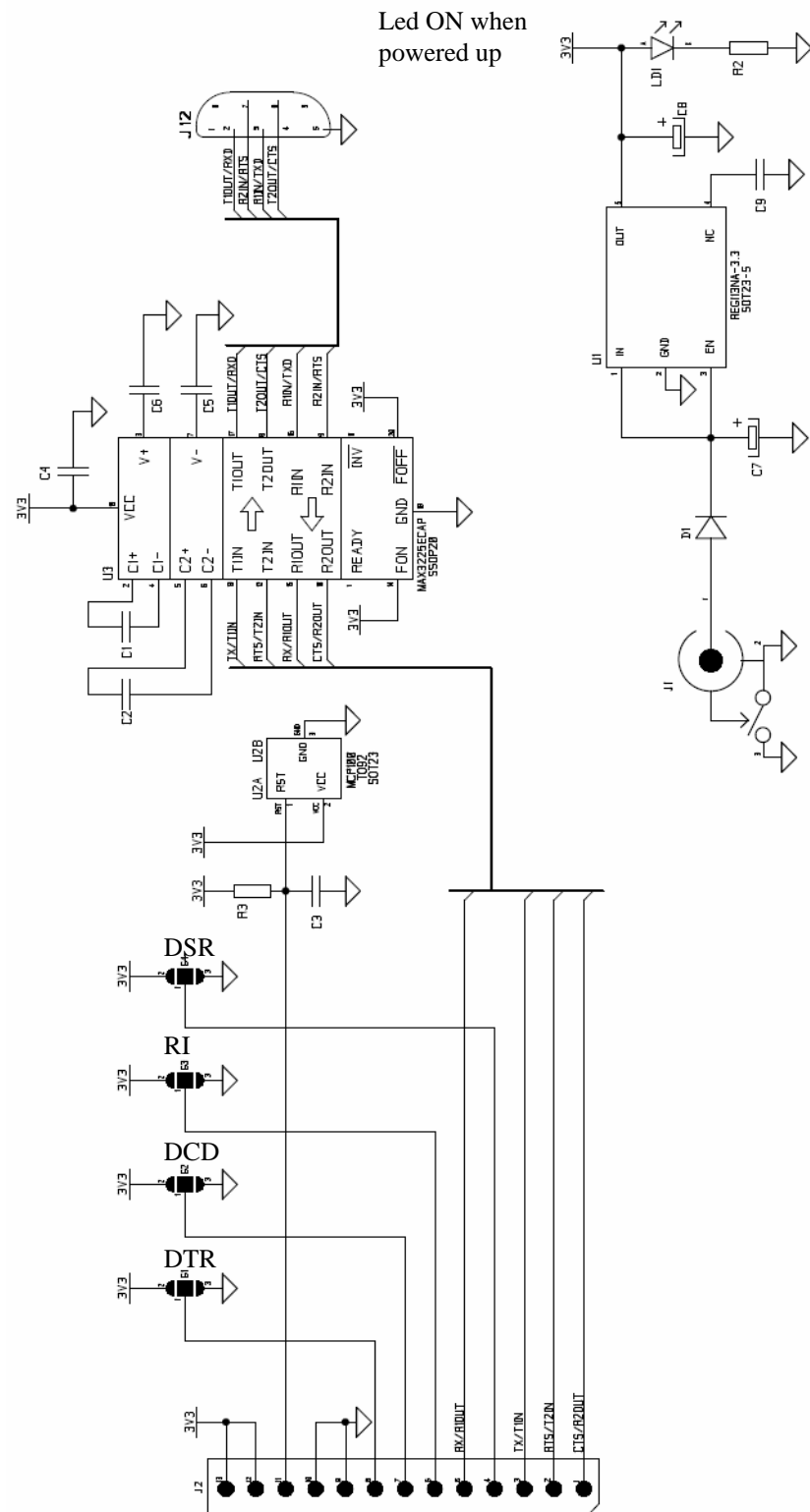


SPECIFICATIONS

Embedded profiles	SPP, DUN, SPP config
Link set-up and status	Through Hayes commands
Radio rough data rate	723 kbps Bluetooth radio rate bps (3Mbps on EDR mode)
UART programmable format	Serial rate from 600 bps to 921 600 bps
UART TTL ports	TD – RD – RTS – CTS (& DTR-DSR-DCD-RI / DUN profile)
Operating-mode	Transparent
RF radiated power	20 dBm (100 mW – Class 1)
Sensitivity	Up to -87 dBm
Operating range (outdoor)	Integrated antenna : up to 150 m
Operating voltage	3 to 3.6 V
Waiting for connection consumption	3 mA
Connected consumption	6 mA
Burst transmission consumption (max)	300 mA (Better to use a 500 mA regulator)
Transmission consumption (typical value in file transfer)	50mA
Operating temperature	-20°C / +70°C
Dimensions	33 x 18 x 6 mm
Standards compliance	EN 300-328 / EN 301 489

Designation	References
Bluetooth® Class 1 Module	ARF7456A
RS232 Demo Kit	ARF7469B → DUN signal not electrically reported on the RS232 interface

ARF7469 DEMOKIT SCHEMATICS



ANNEX 1 : Firmware and document updates

Firmware	Updates
V1.03	DUN + SPP profile with auto-connect on DTR
V1.0	Original version

Document	Updates
V2.0	CE Conformity correction + Detailed consumption & Picture addition
V1.0	Original version