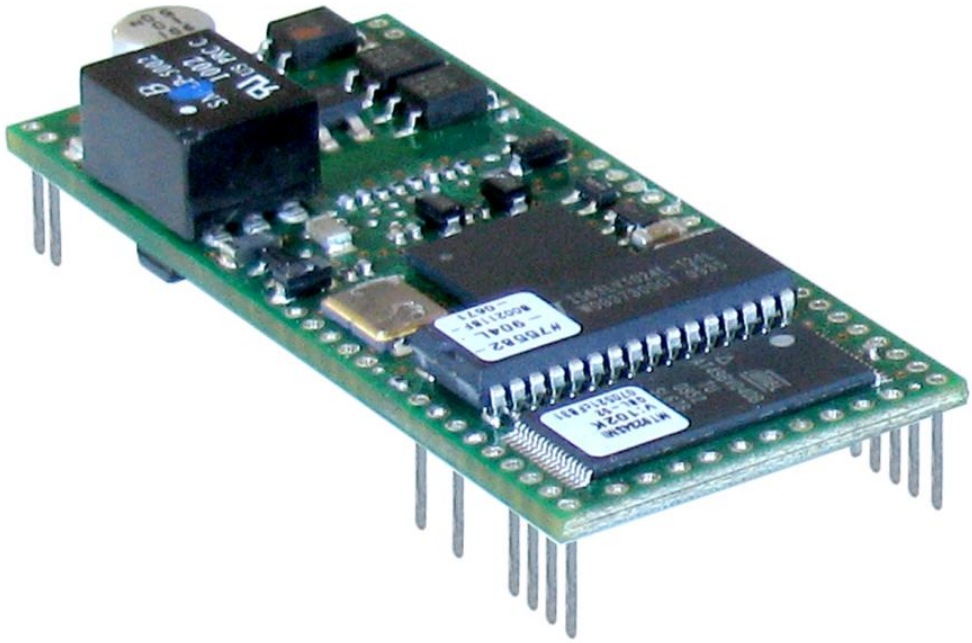
MultiTech® Systems



SocketWireless® Bluetooth®

MTS2BTSMI Device Guide

SocketWireless Bluetooth Device Guide

S000539, Version A
MTS2BTSMI, MTS2BTSMI -L

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Revisions

Revision	Date	Description
A	10/15/2012	Initial release. Information was part of Universal Socket Developer Guide.

Contacting Multi-Tech

Knowledge Base

The Knowledge Base provides immediate access to support information and resolutions for all Multi-Tech products. Visit http://www.multitech.com/kb.go.

Support Portal

To create an account and submit a support case directly to our technical support team, visit: https://support.multitech.com

Support

Business Hours: M-F, 9am to 5pm CT

Country	By Email	By Phone
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Warranty

To read the warranty statement for your product, please visit: http://www.multitech.com/warranty.go.

Contents

Chapter 1 – Device Overview

Description

The SocketWireless Bluetooth device server uses Bluetooth technology to provide a secure, standards-based wireless connection between a host and peripheral device. Providing wireless data transfer up to 100 meters, it eliminates the need for serial cable connections. This ready-to-integrate, embedded, wireless communications device is designed around Multi-Tech's space-efficient, universal socket architecture.

Product build options

Product	Description	Region
MT100SEM-IP		
MTS2BTSMI	Embedded Serial-to-Bluetooth, Class 1 Bluetooth – 5V	Global
MTS2BTSMI-L	Embedded Serial-to-Bluetooth, Class 1 Bluetooth – 3.3V	Global
Developer Kit		
MTSMI-UDK	Universal Developer Kit	Global

Notes:

All builds can be ordered individually or in 50-packs.

The complete product code may end in .Rx, for example MTS2BTSMI.Rx, where R is revision and x is the revision number.

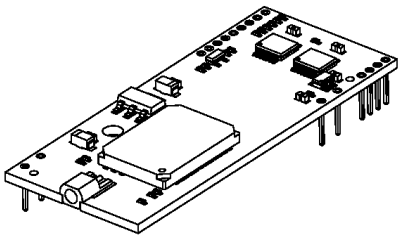
Documentation

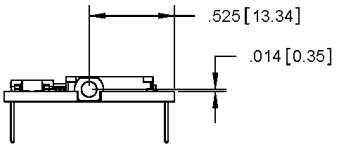
The following documentation is available by email to oemsales@multitech.com or by using the Developer Guide Request Form on the multitech.com website.

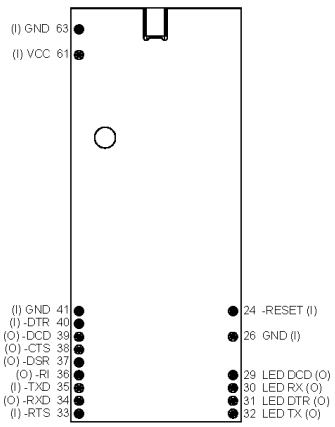
- **Device Guides** – This document. Provides model-specific specifications and developer information.
- **Universal Socket Developer Guide** – Provides an overview, safety and regulatory information, design considerations, schematics, and general device information.
- **AT Command Guide** – Use S000360 the SocketWireless Bluetooth AT Command Guide.

Chapter 2 – Mechanical Drawings

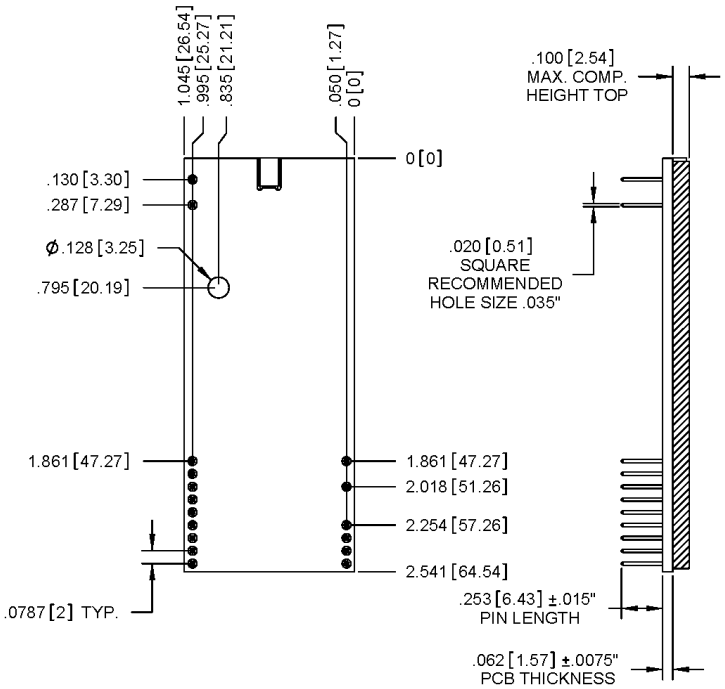
MTS2BTSMI All builds







MTS2BTSMI
MTS2BTSMI-L



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Chapter 3 – Specifications

Technical specifications

Category	Description
General	
Standards	Class 1 Bluetooth V2.0 compliant **Note:** For Bluetooth protocol V2.0, the circuit board I/O pin 7 now controls flow control. In V1.2, circuit board I/O pin 3 controlled flow control. V2.0 now supports multipoint connections.
Frequency Range	2402 to 2480 MHz (2.402 to 2.480 GHz)
Speed, Format	
Serial Speed	Supports speeds from 1200 bps to 920K bps
Data Format	For serial interface: Asynchronous
Output Level (Class 1)	20dBm maximum
Operation Modes	Inquiry, Idle, Data, Fast Data, Park, Sniff, Command, Master, Slave
Device Profiles	Serial Port (SPP), Dial-up Network (DUN)
Physical Description	
Weight	0.6 oz. (0.017kg)
Dimensions	2.541” L x 1.045” W x 0.68” H (6.45cm L x 2.65cm W x 1.7cm H)
Environment	
Operating Temperature	-40° C to +70° C
Storage Temperature	-40° C to +85° C
Humidity	20% to 90% non-condensing
Power Requirements	
Operating Voltage	3.3VDC ± 0.1V < 10mVp-p noise 5VDC ± 0.1V < 10mVp-p noise
Input Power	3.3V or 5V depending on build
Transmission	
Flow Control	Hardware
Buffer	Serial: 50 bytes RF: 50 byte RX buffer
Certifications, Compliance, Warranty	
EMC Compliance	FCC Part 15.247:2004 (subpart C) EN 301 489-1 V1.4.1 (2002-08)
Safety	UL 60950 cUL 60950 EN 60950 AS/NZS 60950:2000
Warranty	Two years

Device Reset

The device is ready to accept commands after a fixed amount of time (“X” Time) after power-on or reset.

Model	Time Constant	"X" Time	Minimum Reset Pulse
MTS2BTSMI	250 ms	6 seconds	100us

DC electrical characteristics

Units: Volts 5VDC Characteristics (VDD = 5V ± 0.25V) VDDMAX = 5.25V
3.3VDC Characteristics (VDD = 3.3V ± 0.3V) VDDMAX = 3.6V

Parameter	Minimum	Maximum	
5V – All builds			
Digital Inputs –DTR (40), –TXD (35), –RTS (33) , –Reset (24)	Input High Min 2.0V	Input Low Max 0.8V	
Digital Outputs –DCD (39), –CTS (38), –DSR (37), –RI (36), –RXD (34)	Output High Min 4V/2.4V	Output Low Max 0.5V/0.5V	Current Drive 3.2mA, 7.0mA for TXD
Digital Input Capacitance			15pF
3.3V – All builds			
Digital Inputs –DTR (40), –TXD (35), –RTS (33), –Reset (24)	Input High Min 2.0V	Input Low Max 0.8V	
Digital Outputs –DCD (39), –CTS (38), –DSR (37), –RI (36), –RXD (34)	Output High Min. 2.4V	Output Low Max 0.5V/0.5V	Current Drive 3.2mA, 7.0mA for TXD
Digital Input Capacitance			15pF

Power measurements

Multi-Tech Systems, Inc. recommends that you incorporate a 10% buffer into your power source when determining product load.

	Idle	Master Unconnected	Master Connected	Fast Data	Master Inquiry (Maximum)
3.3 Volt					
Current (AMPS)	1.5mA	1.5mA	6mA	21mA	68mA
5.0 Volt					
Current (AMPS)	1.6mA	NA	7mA	38mA	74mA

Notes:

Power measurements taken with no LEDs connected.

Driving an LED through 330 ohm resistor to GND draws an additional 4mA on 5V for each LED.

Chapter 4 – FCC and Industry Canada Information

The following is device specific FCC information. For additional approval and regulatory information, see the Universal Socket Developer Guide.

FCC Part 15

FCC Identifier	AU792U05A28780
Equipment Class	Part 15 Spread Spectrum Transmitter
Notes	Bluetooth Socket Modem
Modular Type	Single Modular
Approval	Modular

FCC Rule Parts	Frequency Range (MHz)	Output Watts
15C	2402.0-2480.0	0.074

Mobile device intended for OEM integration only. Output is EIRP. Antenna is a half wave dipole, 5dBi gain. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter. End-users must be provided with specific operating instructions for satisfying RF exposure compliance.

Industry Canada

Certification Number/No. de Certification	125A-0016
Type of Radio Equipment/Type de Matériel	Bluetooth Device
Model/Modele	MTS2BTSMI

Specification/ Cahier des Charges	Issue/ Édition	From Frequency/ De Fréquences	To Frequency/ Á Fréquences	Emission Designation/ Designation D'émission	Minimum Power
RSS210	5.0	2.4020 GHz	2.4800 GHz	741KF7D	74.0 mW

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du materiel certifié sont traitées en conséquence par le bureau de délivrance et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation

Chapter 5 – Application Notes

Byte gaps and data latency

Random byte gaps of 5ms to 20ms are common with the way Bluetooth operates. Packet size varies from transmission to transmission.

The serial band frequency operates up to 920Kbps, although effective data throughput in fast streaming mode is approximately 200Kbps. In regular data mode, effective data throughput is 60Kbps, because the AT parser looks at each character for ASCII valid command scripts in the regular mode's data stream.

The SocketWireless RX has very limited buffering. If you do not use hardware flow control, the 50-byte buffer quickly overflows because of RF retransmissions, etc

When the SocketWireless device connects with Bluetooth, the device goes into regular data mode per the power-up factory default settings. This allows you to configure the SocketWireless settings remotely via a remove RF Bluetooth connection. You can setup the device so no commands are required to be sent from the embedded side of the device. This allows you to seamlessly interface with legacy systems without modify the host device.

Antenna

Antenna information is available in the Universal Socket Developer Guide.

Default power up settings

Parameter	Value
AT Command Response Form	Long Form
Bluetooth Service Profile	Serial Port Profile {SPP}
Device Role	Slave
Baud Rate	9600bps
Data Bits	8 bits
Parity	None
Stop bits	1 bit
Hardware Flow Control RTS/CTS	Enabled
Power Mode	Never go into deep sleep mode
Country Code	North America and Europe
Name of Device (local name)	SocketWireless
My Radio Status	1,0 {slave, disconnected}
Service Name	COM0
Power up default ATSW24 settings	0,0,0,0 {long response, no authentication, no auto SCO connect, no minor}
Power up default ATSW25 settings	0,1,0,0 {slave, data, allow data to pass, SPP}
Major & Minor Class Of Device (COD)	00000000 {undefined}
Security PIN and Encryption	Disabled. The default PIN is "default" It is caps sensitive so do not use any capital letters **Warning:** There is no way to retrieve a forgotten PIN from the device or software. If you forget the PIN, you will need a new SocketWireless Bluetooth.

Parameter	Value
Page Scan Interval	0x400 {2560msec.}
Page Scan Window	0x200 {11msec.}
Inquiry Scan Interval	0x400 {2560msec.}
Inquiry Scan Window	0x200 {11msec.}
Timeout Connection Parameters	Inquiry = 60 seconds Slave Connect = 60 seconds Master Connect = 60 seconds ATDM idle mode = 60 seconds ATDM Master Mode = indefinitely (need to perform **ATUCL** to cancel last command)
Timeout for loss of Bluetooth connection	4 seconds

Chapter 6 – Basic Operation Examples

Changing configuration

Parameters, such as the Bluetooth name, service name, class of device, and serial port settings can be viewed and configured. Do this either locally through the serial port UART or from a remote Bluetooth RF link. To configure the SocketWireless Bluetooth device, use +++ to put the device into command mode.

Use the developer board and the RS-232 cable to connect to a PC and pass ASCII characters through the terminal to the SocketWireless Bluetooth device. The communications settings should match the settings used when the SocketWireless Bluetooth device connects. For example, the defaults are:

9600bps

8 bits

No Parity

1 stop bit

Hardware flow control enabled.

When you change these parameters, you can store them permanently in the non-volatile memory. To do this:

1. Run a terminal emulator, HyperTerminal, or similar program.
2. Type **AT** and enter a carriage return **<cr>**. The device returns **OK**. This verifies that the cable and communications settings are correct. When the SocketWireless device is not connected to another Bluetooth device, you can type the AT commands directly into the SocketWireless' UART; you do not have to type **+++** to change from data mode to command mode.
3. Enter any of the AT commands discussed in the following examples. Follow commands with **<cr>**. Valid commands return an **OK** or a valid response. Invalid commands will reply **ERROR**.
4. To return to data mode, type **ATMD**. You can now pass or receive data from a remote connected Bluetooth device.

Notes:

If you change communications parameter settings, remember to change your terminal or emulator communications settings to correspond to the newly created parameter settings.

AT commands will not echo back to the terminal.

Master discovery/connection sequence example

From power up and no connection

1. Verify local device is Master in Data Mode.
   Send: ATSi,7 <cr>
   Reply: <cr_lf>1,1,0,0<cr_lf>
2. If not Master, set to Master and Data Mode.
   Send: ATSW25,1,1,0,0 <cr>
   Reply: <cr_lf>OK<cr_lf>
3. Perform an Inquiry to obtain BT Address (unless it is already known).

Send: ATUCL<cr> // Clears radio state and places in Idle Mode
Reply: <cr_lf>OK<cr_lf>
Send: ATDI,1,00000000 {Class of Device}<cr> // Looks for only one Bluetooth device
Reply: <cr_lf>00A0961F2023,00000104,Socket Wireless<cr_lf>
<cr_lf>DONE<cr_lf>

4. Perform a Master Connect over SPP using the BT Address.
   Send: ATDM, 00A0961F2023,1101<cr> // SPP connection
   Reply: <cr_lf>CONNECT,00A0961F008F <cr_lf> // Returns Slave BT address radios is in Data Mode
5. Place radio into Fast Data Mode.
   Send: ATMF<cr> // Places radio in Fast Data Mode
   Reply: <cr_lf>OK<cr_lf>
6. Send Data.

Note:

When the Slave connects in Fast Data Mode (ATSW25/or issuing ATMF), all valid AT commands sent through the Slave's UART will be interpreted and responded to by the Master radio as if it was the local Slave radio. In this configuration, you can obtain status from the Slave end and configure from the remote Master radio.

To exit data mode and check status

1. Delay at least 50 milliseconds; this could be less or more.
2. Get into command Mode.
   Send: +++<cr> // Default escape sequence of characters
   Reply: <cr_lf>OK<cr_lf>
3. Check status
   Send: AT<cr>
   Reply: <cr_lf>OK<cr_lf>
4. Send any AT Command example:
   Send: ATSI,0<cr>
   Reply: <cr_lf>SocketWireless AT<cr_lf>

Slave command sequence example

From power up

1. Check and verify communication to Slave.
   Sent: AT<cr>
   Reply: <cr_lf>OK<cr_lf>
2. Get information on Slave Bluetooth address.
   Sent: ATSi,1<cr>
   Reply: 12-digit address
   <cr_lf>OK<cr_lf>
3. Set Slave to automatically connect in Fast Data Mode on Bluetooth connection.
   Sent: ATSW25,0,0,0,0 <cr>
   Reply: <cr_lf>OK<cr_lf>
4. Either cycle power or send ATURST.

Note:

This command sequence assumes the radio is in factory default in which it automatically comes up and is connectable as a Slave from a Master request.

Using AT commands to disable flow control

Protocol Change:

For Bluetooth protocol V2.0, the circuit board I/O pin 7 now controls flow control.

Previous Protocol V1.2	New Protocol V2.0
ATSW22,3,x,x	ATSW22,7,x,x
ATSW23,3,x,x	ATSW23,7,x,x

Disabling Flow Control Using Protocol V.2.0

Using a terminal screen with flow control enabled, issue commands to turn off flow control.

Sent: ATSW22,7,1,0 <cr> // Set PIO7 as output and do not store in flash

Reply: OK<cr_lf>

Sent: ATSW23,7,1,0<cr> // Set PIO7 output high and do not store in flash

Reply: OK<cr_lf>

To store the setting in flash:

Sent: ATSW22,7,1,1<cr> // Set PIO7 as output and store in flash

Reply: OK<cr_lf>

Sent: ATSW23,7,1,1<cr> // Set PIO7 output high and store in flash

Reply: OK<cr_lf>

Now you can communicate with the Bluetooth device with flow control turned off.

Other examples

See the Bluetooth AT Commands Reference Guide for other examples:

- Multipoint example using the SocketWireless MTS2BTSMI or the Bluetooth Adapter MT2BTA – One Slave and Four Master Devices.
- Multipoint example using the SocketWireless MTS2BTSMI or the Bluetooth Adapter MT2BTA – One Master and Four Slave Devices.
- Repeater example using the SocketWireless MTS2BTSMI or the Bluetooth Adapter MT2BTA.