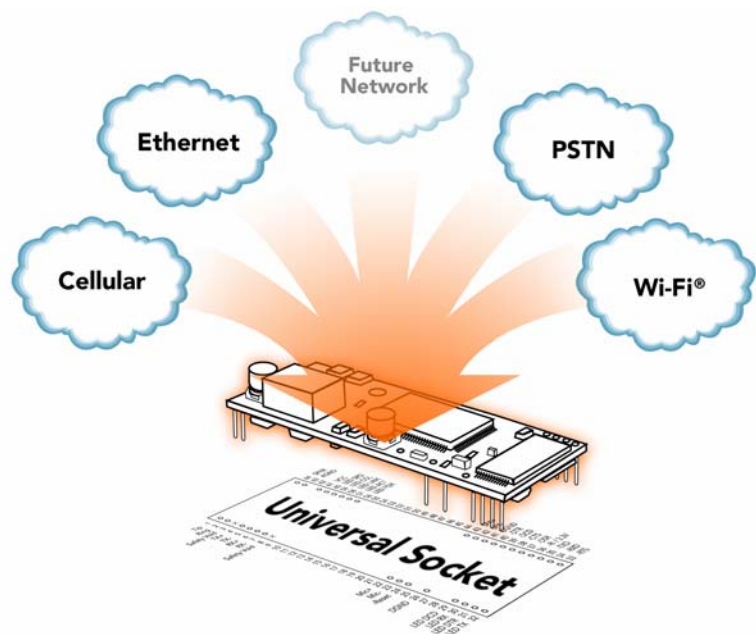

Universal Socket Connectivity

Embedded Device Networking Solutions



Hardware Guide for Developers



**Universal Socket Connectivity
Hardware Guide for Developers for HDSOA Approval
Rev. A, 08/267/07**

Copyright

This publication may not be reproduced, in whole or in part, without prior expressed written permission from Multi-Tech Systems, Inc. All rights reserved.

Copyright © 2004-7 by Multi-Tech Systems, Inc.

Multi-Tech Systems, Inc. makes no representations or warranties with respect to the contents hereof and specifically disclaim any implied warranties of merchantability or fitness for any particular purpose. Furthermore, Multi-Tech Systems, Inc. reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Multi-Tech Systems, Inc. to notify any person or organization of such revisions or changes. See the Multi-Tech Web site for current revisions of documentation.

Trademarks

Trademarks and Registered Trademarks of Multi-Tech Systems, Inc. are **SocketModem**, **SocketWireless** and the Multi-Tech logo.

Patents

This device covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; 5,355,365; 5,309,562; 5,301,274. Other Patents Pending.

World Headquarters

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112
Phone: 763-785-3500 or 800-328-9717
Fax: 763-785-9874
Internet Address: <http://www.multitech.com>

Technical Support

Country

Europe, Middle East, Africa:
U.S., Canada, all others:

By Email

support@multitech.co.uk
support@multitech.com

By Phone

+(44) 118 959 7774
800-972-2439 or 763-717-5863

Universal Developer Kit Contents

All products covered in this document can be evaluated using the MTSMI-UDK (Universal Developer Kit).

- One MTSMI-UDK Developer Board
- One 100-240V 9V-1A power supply w/IEC-320 connector
- One IEC-320 power cord w/US type plug
- One IEC-320 power cord w/EURO type plug
- One IEC-320 power cord w/UK type plug
- One RJ-45 cable (CARJ45NK-RJ45 7'8C non-keyed)
- One 7 foot RJ-11 cable plug - plug/4C
- One SMA jack to MMCX plug antenna cable (for CDMA and GPRS antennas)
- One RSMA jack to MMCX plug antenna cable (for Bluetooth antenna)
- One antenna 850/1900, right angle, 3-stripe (for CDMA and GPRS modules)
- One antenna 900/1800, right angle 4-stripe (for GPRS modules)
- One 2.4GHz ½ WAVE antenna with reverse polarity (for SocketWireless Bluetooth and SocketWireless Wi-Fi)
- One DB9F-DB25M 6 foot modem serial cable
- One generic CDMA Activation Notice
- One Verizon Activation Notice
- One Spring Activation Notice
- One Cingular Activation Notice
- One Universal Socket Connectivity Developer CD with BVRP Mobile PhoneTools
- One Promo Screwdriver

AT Commands Are Included on the Developer CD

AT Commands

Multi-Tech provides Reference Guides for each SocketModem's AT commands, fax commands, and voice commands. These reference guides are available on the CD included in the Developer Kit. They are also available by email at <mailto:oemsales@multitech.com> or by using the *Developer Guide Request Form* on Multi-Tech's Web site.

Fax Commands

Fax Commands are included in the AT Command Reference Guide when applicable to the product. They are available on the CD included in the Developer Kit.

Note: Fax Commands supported by product:

- SocketModem MT5600SMI supports Class 1 & 1.0
- SocketModem MT5656SMI supports Class 1 & 2 (not 2.0/2.1)
- SocketModem MT9234SMI supports all Class 1 and Class 2 commands (Class 1, 1.0, 2, 2.0/2.1)
- SocketModem MT5634SMI supports all Class 1 and Class 2 commands (Class 1, 1.0, 2, 2.0/2.1)
- Wireless SocketModem GPRS MTSMC-G supports Class 1 core commands only (defined by ITU T.31)
- Wireless SocketModem CDMA MTSMC-C supports Class 2.0 Group 3
- Wireless SocketModem EDGE MTSMC-E supports Class 1 Group 3
- Wireless SocketModem HSDPA MTSMC-H supports Class 1 Group 3

Design Considerations

Noise Suppression Design Considerations

Engineering noise-suppression practices must be adhered to when designing a printed circuit board (PCB) containing the SocketModem module. Suppression of noise is essential to the proper operation and performance of the modem itself and for surrounding equipment.

Two aspects of noise in an OEM board design containing the SocketModem must be considered: on-board/off-board generated noise that can affect digital signal processing. Both on-board and off-board generated noise that is coupled on-board can affect interface signal levels and quality. Of particular concern is noise in frequency ranges affecting modem performance.

On-board generated electromagnetic interference (EMI) noise that can be radiated or conducted off-board is a separate, but equally important, concern. This type of noise can affect the operation of surrounding equipment. Most local government agencies have stringent certification requirements that must be met for use in specific environments.

Proper PC board layout (component placement, signal routing, trace thickness and geometry, etc.) component selection (composition, value, and tolerance), interface connections, and shielding are required for the board design to achieve desired modem performance and to attain EMI certification.

Other aspects of proper noise-suppression engineering practices are beyond the scope of this designer guide. The designer should consult noise suppression techniques described in technical publications and journals, electronics and electrical engineering text books, and component supplier application notes.

PC Board Layout Guidelines

In a 4-layer design, provide adequate ground plane covering the entire board. In 4-layer designs, power and ground are typically on the inner layers. All power and ground traces should be 0.05 inches wide.

The recommended hole size for the SocketModem pins is 0.036 in. +/-0.003 in. in diameter. Spacers can be used to hold the SocketModem vertically in place during the wave solder process. A spacer should be placed on pin 32 and pin 64 of the SocketModem. A suggested part number for the spacer is BIVAR 938-0.130 for P1 (0.310in) option SocketModems. The spacers can be left on permanently and will not effect operation.

All creepages and clearances for the SocketModem have been designed to meet requirements of safety standards EN60950 or EN60601. The requirements are based on a working voltage of 125V or 250V. When the recommended DAA* circuit interface is implemented in a third party design, all creepage and clearance requirements must be strictly followed in order to meet safety standards. The third party safety design must be evaluated by the appropriate national agency per the required specification.

User accessible areas: Based on where the third party design is to be marketed, sold, or used, it may be necessary to provide an insulating cover over all TNV exposed areas. Consult with the recognized safety agency to determine the requirements.

Note: Even if the recommended design considerations are followed, there are no guarantees that a particular system will comply with all the necessary regulatory requirements. It is imperative that specific designs be completely evaluated by a qualified/recognized agency.

**DAA stands for Data Access Arrangement. DAA is the telephone line interface of the module.*

Electromagnetic Interference (EMI) Considerations

The following guidelines are offered to specifically help minimize EMI generation. Some of these guidelines are the same as, or similar to, the general guidelines but are mentioned again to reinforce their importance. In order to minimize the contribution of the SocketModem-based design to EMI, the designer must understand the major sources of EMI and how to reduce them to acceptable levels.

1. Keep traces carrying high frequency signals as short as possible.
2. Provide a good ground plane or grid. In some cases, a multilayer board may be required with full layers for ground and power distribution.
3. Decouple power from ground with decoupling capacitors as close to the SocketModem module power pins as possible.
4. Eliminate ground loops, which are unexpected current return paths to the power source and ground.
5. Decouple the telephone line cables at the telephone line jacks. Typically, use a combination of series inductors, common mode chokes, and shunt capacitors. Methods to decouple telephone lines are similar to decoupling power lines; however, telephone line decoupling may be more difficult and deserves additional attention. A commonly used design aid is to place footprints for these components and populate as necessary during performance/EMI testing and certification.
6. Decouple the power cord at the power cord interface with decoupling capacitors. Methods to decouple power lines are similar to decoupling telephone lines.
7. Locate high frequency circuits in a separate area to minimize capacitive coupling to other circuits.
8. Locate cables and connectors so as to avoid coupling from high frequency circuits.
9. Lay out the highest frequency signal traces next to the ground grid.
10. If a multilayer board design is used, make no cuts in the ground or power planes and be sure the ground plane covers all traces.
11. Minimize the number of through-hole connections on traces carrying high frequency signals.
12. Avoid right angle turns on high frequency traces. Forty-five degree corners are good; however, radius turns are better.
13. On 2-layer boards with no ground grid, provide a shadow ground trace on the opposite side of the board to traces carrying high frequency signals. This will be effective as a high frequency ground return if it is three times the width of the signal traces.
14. Distribute high frequency signals continuously on a single trace rather than several traces radiating from one point.

Electrostatic Discharge Control

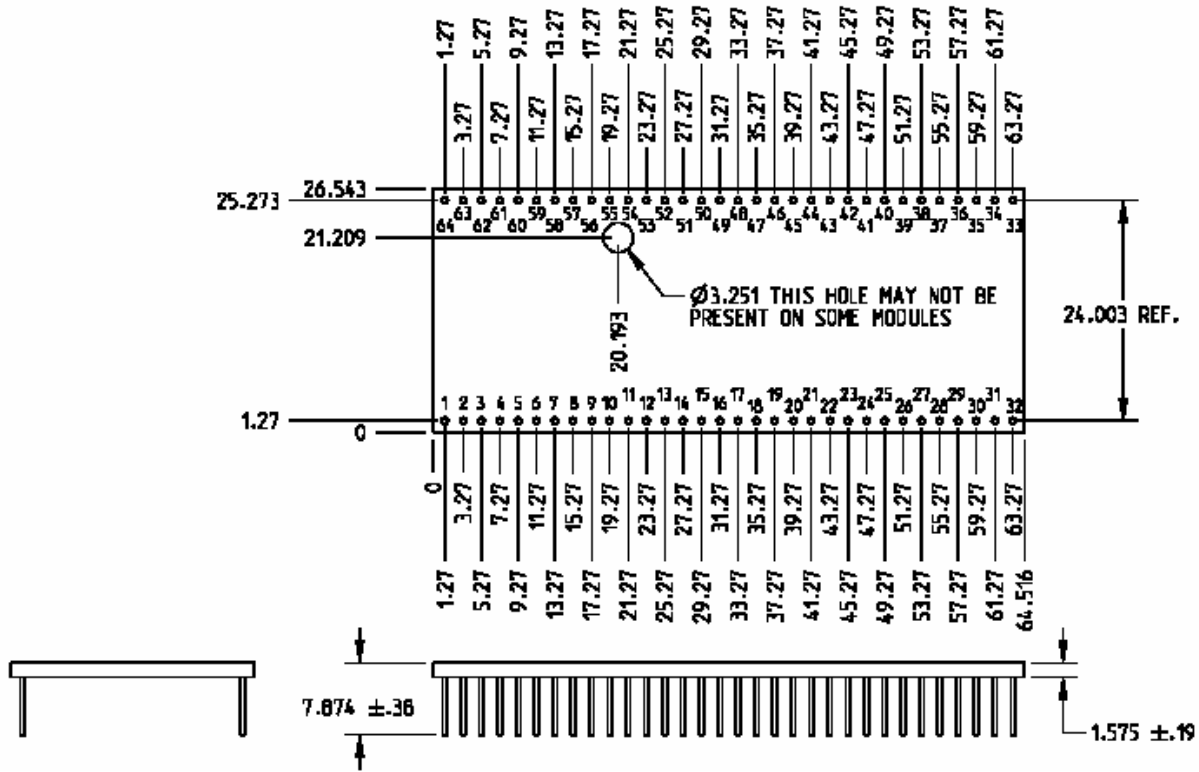
All electronic devices should be handled with certain precautions to avoid damage due to the accumulation of static charge.

See the ANSI/ESD Association Standard (ANSI/ESD S20.20-1999) – a document “for the Development of an Electrostatic Discharge Control for Protection of Electrical and Electronic Parts, Assemblies and Equipment.” This document covers ESD Control Program Administrative Requirements, ESD Training, ESD Control Program Plan Technical Requirements (grounding/bonding systems, personnel grooming, protected areas, packaging, marking, equipment, and handling), and Sensitivity Testing.

Multi-Tech Systems, Inc. strives to follow all of these recommendations. Input protection circuitry has been incorporated into the Multi-Tech devices to minimize the effect of this static buildup, proper precautions should be taken to avoid exposure to electrostatic discharge during handling.

Multi-Tech uses and recommends that others use anti-static boxes that create a faraday cage (packaging designed to exclude electromagnetic fields). Multi-Tech recommends that you use our packaging when returning a product and when you ship your products to your customers.

Mechanical Dimensions in Millimeters



Dimensions Are Shown in Millimeters

Maximum Component Height

Product	Measurement from top of board to highest topside component	Measurement from bottom of board to lowest bottom-side component
SocketModem – MT5600SMI	.110 inches (2.794 mm)	.110 inches (2.794 mm)
SocketModem – MT5656SMI	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketModem – MT5634SMI	.290 inches (7.366 mm)	.114 inches (2.895 mm)
SocketModem – MT9234SMI	.290 inches (7.366 mm)	.114 inches (2.895 mm)
SocketModem – MT2492SMI	.177 inches (4.495 mm)	NA
SocketModem – MT2456SMI	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketModem IP – MT2456SMI-IP	.228 inches (5.791 mm)	.114 inches (2.895 mm)
SocketModem IP – MT5656SMI-IP	.212 inches (5.384 mm)	.110 inches (2.794 mm)
SocketEthernet IP – MTXCSEM	.315 inches (8.001 mm)	.075 inches (1.905 mm)
SocketEthernet IP – MT100SEM	.341 inches (8.661 mm)	.110 inches (2.794 mm)
SocketModem ISDN – MT128SMI	.299 Inches (7.594 mm)	.069 inches (1.752 mm)
SocketModem GPRS – MTSMC-G	.153 inches (3.886 mm)	.118 inches (2.997 mm)
SocketModem CDMA – MTSMC-C	.238 inches (6.045 mm)	.118 inches (2.997 mm)
SocketModem EDGE – MTSMC-E	.253 inches (6.426 mm)	.118 inches (2.997 mm)
SocketModem HSDPA – MTSMC-H	.253 inches (6.426 mm)	.118 inches (2.997 mm)
SocketWireless Wi-Fi – MT800SWM	.202 inches (5.130 mm)	NA
SocketWireless Bluetooth – MTS2BTSMI	.089 inches (2.260 mm)	NA

Antenna System for Embedded GSM and CDMA Modems

The antenna system for use with Multi-Tech GSM or CDMA modems includes a coax cable to interface between UFL or MMCX connection on the modem and the antenna.

RF Specifications

GSM/EGSM RF Specifications

	GSM 850	EGSM 900	GSM 1800	GSM 1900
Frequency RX	869 to 894 MHz	925 to 960 MHz	1805 to 1880 MHz	1930 to 1990 MHz
Frequency TX	824 to 849 MHz	880 to 915 MHz	1710 to 1785 MHz	1850 to 1910 MHz
RF Power Stand	2W at 12.5% duty cycle	2W at 12.5% duty cycle	1W at 12.5% duty cycle	1W at 12.5% duty cycle

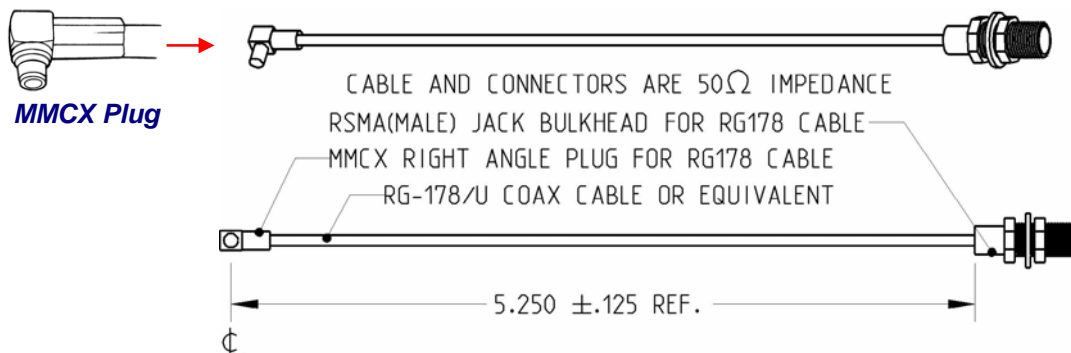
CDMA RF Specifications

	CDMA 800	CDMA 1900
Frequency RX	869 to 894 MHz	1930 to 1990 MHz
Frequency TX	824 to 849 MHz	1850 to 1910 MHz

Coax Cable

An optional 6" antenna cable (SMA Jack to MMCX Plug) can be ordered from **Multi-Tech Systems, Inc.**

Part Number	Description
CASMA-MMCX-1	SMA to MMCX COAX RF 6 inch cable (Single Pack)
CASMA-MMCX-10	SMA to MMCX COAX RF 6 inch cable (Ten Pack)



Cable Specifications

Cable Type:	G-178/u
Attenuation:	<1.0db
Connector Impedance:	50 ohm

Connector

An antenna with an SMA connector may be directly connected to a SocketModem GPRS/CDMA through a mating MMCX to SMA adapter.

MMCX / SMA Connector Available from Amphenol

Amphenol
<http://www.amphenol.com/>
 Order No: 908-31100



Antenna

GSM/EGSM Antenna Requirements/Specifications

Frequency Range:	2.4 to 2.5 GHz
Impedance:	50 ohm
VSWR:	<2.0:1
Typical Radiated Gain:	0 dBi on azimuth plane
Radiation:	Omni
Polarization:	Vertical
Wave:	Half Wave Dipole

Antennas Available from Multi-Tech:

Description	Part Number
Hinged Right Angle 900/1800 MHz Cellular Modem Antenna	ANF1-1HRA
Hinged Right Angle 800/1900 MHz Cellular Modem Antenna	ANCF2-1HRA

PTCRB Requirements Note:

There cannot be any alteration to the authorized antenna system. The antenna system must be the same type with similar in-band and out-of-band radiation patterns and maintain the same specifications.

Safety Notices and Warnings

Note to OEMs: The following safety statements may be used in the documentation of your final product applications.

Telecom Safety Warning

1. Never install telephone wiring during a lightning storm.
2. Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
3. This product is to be used with UL and cUL listed computers.
4. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
5. Use caution when installing or modifying telephone lines.
6. Avoid using a telephone during an electrical storm. There may be a remote risk of electrical shock from lightning.
7. Do not use a telephone in the vicinity of a gas leak.
8. To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.
9. This product must be disconnected from its power source and telephone network interface when servicing.

Wireless Safety

General Safety

The modem is designed for and intended to be used in fixed and mobile applications. “Fixed” means that the device is physically secured at one location and is not able to be easily moved to another location. “Mobile” means that the device is designed to be used in other than fixed locations.

Caution: Maintain a separation distance of at least 20 cm (8 inches) is normally maintained between the transmitter’s antenna and the body of the user or nearby persons. The Modem is not designed for or intended to be used in portable applications within 20 cm. (8 inches) of the body of the user.

RF Interference Issues

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

- Switch OFF your Wireless MultiModem when in an aircraft. The use of cellular telephones in an aircraft may endanger the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.
- Switch OFF your Wireless MultiModem when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your Wireless MultiModem in hospitals and any other place where medical equipment may be in use.
- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or where blasting operations are in progress.
- There may be a hazard associated with the operation of your Wireless MultiModem close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.
- Operation of your Wireless MultiModem close to other electronic equipment may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers’ recommendations.

Vehicle Safety

- Do not use your MultiModem while driving.
- Respect national regulations on the use of cellular telephones in vehicles. Road safety always comes first.
- If incorrectly installed in a vehicle, the operation of Wireless MultiModem telephone could interfere with the correct functioning of vehicle electronics. To avoid such problems, be sure that qualified personnel have performed the installation. Verification of the protection of vehicle electronics should be part of the installation.
- The use of an alert device to operate a vehicle's lights or horn on public roads is not permitted.

Maintenance of Your Modem

Your Wireless MultiModem is the product of advanced engineering, design, and craftsmanship and should be treated with care. The suggestions below will help you to enjoy this product for many years.

- Do not expose the Wireless MultiModem to any extreme environment where the temperature is above 50°C or humidity is above 90% noncondensing.
- Do not attempt to disassemble the Wireless MultiModem. There are no user serviceable parts inside.
- Do not expose the Wireless MultiModem to water, rain, or spilled beverages. It is not waterproof.
- Do not place the Wireless MultiModem alongside computer discs, credit or travel cards, or other magnetic media. The phone may affect the information contained on discs or cards.
- The use of accessories not authorized by Multi-Tech or not compliant with Multi-Tech's accessory specifications may invalidate the warranty of the Wireless MultiModem.
- In the unlikely event of a fault in the Wireless MultiModem, contact Multi-Tech Tech Support.

Your Responsibility

This Wireless MultiModem is your responsibility. Please treat it with care respecting all local regulations. It is not a toy. Therefore, keep it in a safe place at all times and out of the reach of children.

Try to remember your Unlock and PIN codes. Become familiar with and use the security features to block unauthorized use and theft.

Waste Electrical and Electronic Equipment Statement

Note to OEMs: The statement is included for your information and may be used in the documentation of your final product applications.

WEEE Directive

The WEEE directive places an obligation on EU-based manufacturers, distributors, retailers, and importers to take-back electronics products at the end of their useful life. A sister Directive, ROHS (Restriction of Hazardous Substances) complements the WEEE Directive by banning the presence of specific hazardous substances in the products at the design phase. The WEEE Directive covers all Multi-Tech products imported into the EU as of August 13, 2005. EU-based manufacturers, distributors, retailers and importers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

July, 2005



Restriction of the Use of Hazardous Substances (RoHS)



Multi-Tech Systems, Inc. Certificate of Compliance 2002/95/EC

Multi-Tech Systems Inc. confirms that MTxxxxSMI, MTSMC-G-F1, MTxxxxSEM, MTIFM, and MTxxxSWM now comply with the chemical concentration limitations set forth in the directive **2002/95/EC** of the European Parliament (Restriction Of the use of certain Hazardous Substances in electrical and electronic equipment - **RoHS**)

These Multi-Tech Systems, Inc. products do not contain the following banned chemicals:

- Lead, [Pb] > 1000 PPM
- Mercury, [Hg] > 1000 PPM
- Hexavalent Chromium, [Cr+6] > 1000 PPM
- Cadmium, [Cd] > 100 PPM
- Polybrominated Biphenyl, [PBB] > 1000 PPM
- Polybrominated Diphenyl Ether, [PBDE] > 1000 PPM

Moisture Sensitivity Level (MSL) = 1
Tin Whisker Growth = None detected
Maximum Soldering temperature = 260C (wave only)

Notes:

1. Lead usage in some components is exempted by the following RoHS annex; therefore, higher lead concentration would be found in some modules (>1000ppm).
 - a. Lead in high melting temperature type solders (i.e., tin-lead solder alloys containing more than 85% lead).
 - b. Lead in electronic ceramic parts (e.g., piezoelectronic devices).
2. Moisture Sensitivity Level (MSL) – Analysis is based on the components/material used on the board.
3. Tin Whisker Study was done per NEMI guidelines (Elevated temperature cycle of 60°C and non-condensing relative humidity of 87% exposed to this environment for 1000 hours).

Chapter 2 – SocketModem HSDPA

Introduction

The Multi-Tech SocketModem HSDPA embedded wireless modem delivers some of the fastest cellular data speeds by utilizing HSDPA technology. It allows users to connect to the Internet and send and receive data faster than possible with an ordinary GSM/GPRS network making it ideal for highly data-intensive applications. Based on industry-standard open interfaces, the SocketModem wireless modem is equipped with quad-band, high-speed RS232 technology, which means it can be used worldwide on all existing GSM networks. In addition, it utilizes Multi-Tech's universal socket design.

Product Ordering Information

Product	Description	Region	Order This Product ✓
MTSMC-H	SocketModem Quad Band HSPDA Class 10 – 5V	Global	
MTSMC-H-U	SocketModem Quad Band HSPDA Class 10 w/USB	Global	
MTSMI-UDK	Universal Developer Kit	Global	

How to Read the Product Codes in the Table Above:

H HSDPA (High-Speed Downlink Packet Access)
 U USB
 UDK Universal Developer Kit

Other Product Codes:

The complete product code will end in .Rx. For example, MTSMC-H.Rx.
 “R” indicates product revision. “x” is the revision number.

Technical Specifications

Category	Description
Standards: GSM Class	Small MS
GSM / GPRS / EGPRS Data Transfer	<p>GPRS</p> <ul style="list-style-type: none"> • Multislot Class 10 • Full PBCCH support • Mobile Station Class B • Coding Scheme 1 – 4 <p>EGPRS</p> <ul style="list-style-type: none"> • EDGE E2 power class for 8 PSK • Downlink coding schemes – CS 1-4, MCS 1-9 • Uplink coding schemes – CS 1-4, MCS 1-9 • BEP reporting • SRB loopback and test mode B • 8-bit, 11-bit RACH • PBCCH support • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B <p>CSD</p> <ul style="list-style-type: none"> • V.110, RLP, non-transparent • 9.6 kbps
UMTS Data Rate (Release 99, June 2004, W-CDMA FDD standard)	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64 kbps DL / 64 kbps UL
Bandwidth	<ul style="list-style-type: none"> • UMTS/HSDPA: Single band, 2100MHz • GSM/GPRS/EDGE: Dual band, 900/1800MHz • UMTS/HSDPA: Triple band, 850//1900/2100MHz • GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz
Connectors	Antenna: MMCX SIM: Standard 3V SIM receptacle
Operating Voltage (Power Supply)	5V
Output power (according to Release 99)	<p>Class 4 (+33dBm ±2dB) for EGSM850 Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900 Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD Bdl Class 3 (+24dBm +1/-3dB) for UMTS 1900,WCDMA FDD BdII Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV</p>
Operating Temperatures	Min -30 °C Typ +25 °C Max +75
Storage Environment	-40° to +85° C
Humidity	20% to 90% non-condensing
Dimensions	2.55" L x 1.4" W x 0.563" H (6.48 cm x 3.5 cm x 1.43 cm)
Weight	1 oz. (0.028 kg.)
Certifications & Approvals	<p>Certifications: CE Mark</p> <p>Safety Certifications: UL 60950 cUL 60950 EN 60950 AS/NZS 60950:2000</p> <p>EMC Approvals: FCC Part 2, 15, 22, 24 EN 55022 EN 55024</p> <p>Network: PTCRB</p>

Warranty	2 years
Intelligent Features	<p>SMS – Text & PDU, Point-to-Point, cell broadcast</p> <p>AT Command Compatible</p> <p>Voice features include Half Rate (HR), Full Rate (FR), Enhanced Full Rate (EFR), Adaptive multi rate (AMR), as well as hands free echo cancellation, and noise reduction</p> <p>Embedded TCP/IP protocol stack brings Internet connectivity</p> <p>Audio</p> <p>Audio speech codecs</p> <ul style="list-style-type: none"> • GSM: AMR, EFR, FR, HR • 3GPP: AMR-WB • 3GPP2: EVRC, EVRC-B (4GV-WB/NB) • Diverse: G.711 vocoder • One ringing melody supported • CEPT supervisory tones supported • DTMF supported <p>Other</p> <ul style="list-style-type: none"> • Handset, Headset, Speakerphone and Transparent mode • TTY support selecting a dedicated audio mode • Download of audio parameters • Gains and volumes can be controlled by AT commands • Several additional ringing melodies • CEPT and ANSI supervisory tones supported

Pin Configurations

(I/O) Tip	1	○	64	SPKR (O)
(I/O) Ring	2	○	63	GND (O)
Safety Void	3	×	62	MICV (I)
(O) TX+	4	○	61	VCC (I)
(O) TX-	5	○	60	-LED SPD (O)
(I) RX-/RX+	6	○	59	-LED COL (O)
(I) RX+/RX-	7	○	58	-LED LINK (O)
Safety Void	8	×	57	-LED ACT (O)
	9		56	-LED FDX (O)
	10		55	
(O) TXCLK	11	○	54	
(O) RXCLK	12	○	53	
	13		52	
	14		51	GPIO (I/O)
	15		50	GPIO (I/O)
	16		49	GPIO (I/O)
	17		48	GPIO (I/O)
	18		47	
	19		46	
	20		45	
	21		44	
(I) Mic+	22	○	43	SPK+ (O)
(I) Mic-	23	○	42	SPK- (O)
(I) -Reset	24	○	41	GND (I)
(I) USB_VBUS	25	○	40	-DTR (I)
(I) GND	26	○	39	-DCD (O)
(I/O) USB_DP	27	○	38	-CTS (O)
(I/O) USB_DN	28	○	37	-DSR (O)
(O) LED DCD	29	○	36	-RI (O)
(O) LED RX	30	○	35	-TXD (I)
(O) LED DTR	31	○	34	-RXD (O)
(O) LED TX	32	○	33	-RTS (I)

Top View
SocketModem HSDPA Pinout

For pin descriptions, see the *Universal Pinout Descriptions* in Chapter 1.

HSPDA Electrical Characteristics

I/O Electrical Characteristics

5VDC Characteristics (VDD = 5V ± 0.25V) VDDMAX = 5.25V

Digital Inputs -DTR (40), -TXD (35), -RTS (33)	Input High Min 2.0V	Input Low Max 0.8V	
-RESET	Input High Min 2.6V	Input Low Max 1.0V	
Digital Outputs -DCD (39), -CTS (38), -DSR (37), -RI (36), -RXD (34)	Output High Min 4V	Output Low Max 0.4V	Current Drive 2mA
Digital Input Capacitance			5 pF

HSPDA Power Consumption

Voice Mode Power Consumption

GSM Call Power Consumption in EGSM900 and GSM850 @ 25 degrees C

Voltage	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 2W	1.2 A	2.0 A
+5V	Average @ 2W	250mA	335mA
+5V	Average idle mode	28mA	35mA

GSM Call Power Consumption in GSM1800 & 1900 MHz @ 25 degrees C

Voltage	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 1W	1.1 A	1.6 A
+5V	Average @ 1W	210mA	285mA
+5V	Average idle mode	28mA	35mA

Data Mode Power Consumption

GPRS Class 10 Power Consumption in EGSM/GPRS 900 MHz and GSM/GRPS 850 MHz

Voltage	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 2W	1.5 A	2.0 A
+5V	Average @ 2W	400mA	610mA
+5V	Average @ 1W	280mA	488mA
+5V	Average idle mode	28mA	35mA

GPRS Class 10 Power Consumption in GSM/GRPS 1800 MHz and GSM/GRPS 1900 MHz

Voltage	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 1W	1.1 A peak	1.2 A peak
+5V	Average @ 1W	350mA	510mA
+5V	Average @ .25W	180mA	460mA
+5V	Average idle mode	28mA	35mA

EGRPS Class 10 Power Consumption in EGRPS 900 MHz and EGRPS 850 MHz

Voltage	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 5W	1.4 A peak	1.6 A peak
+5V	Average @ .5W	430mA	525mA
+5V	Average @ .25W	375mA	450mA
+5V	Average idle mode	28mA	35mA

Application Notes

Radio Characteristics

	GSM 850	EGSM 900	GSM 1800	GSM 1900
Frequency RX	869 to 894 MHz	925 to 960 MHz	1805 to 1880 MHz	1930 to 1990 MHz
Frequency TX	824 to 849 MHz	880 to 915 MHz	1710 to 1785 MHz	1850 to 1910 MHz
RF Power Stand	2W at 12.5% duty cycle	2W at 12.5% duty cycle	1W at 12.5% duty cycle	1W at 12.5% duty cycle
Impedance	50 ohms			
VSWR	<2			
Typical Radiated Gain	0 dBi on azimuth plane			

Receiver Features

- EGSM Sensitivity : < -108 dBm
- GSM 1800/GSM 1900 Sensitivity : < -107 dBm
- Selectivity @ 200 kHz : > +9 dBc
- Selectivity @ 400 kHz : > +41 dBc
- Dynamic range : 62 dB
- Intermodulation : > -43 dBm
- Co-channel rejection : + 9 dBc

Transmitter Features

- Maximum output power (EGSM) : 24 dBm +/- 2 dB
- Maximum output power (DCS/PCS) : 30 dBm +/- 2 dB
- Minimum output power (EGSM): 5 dBm +/- 5 dB
- Minimum output power (DCS/PCS): 0 dBm +/- 5 dB
- H2 level : < -30 dBm
- H3 level : < -30 dBm
- Noise in 925 - 935 MHz : < -67 dBm
- Noise in 935 - 960 MHz : < -79 dBm
- Noise in 1805 - 1880 MHz : < -71 dBm
- Phase error at peak power : < 5 ° RMS
- Frequency error : +/- 0.1 ppm max

Audio Interface – Electrical Characteristics

Speaker Output

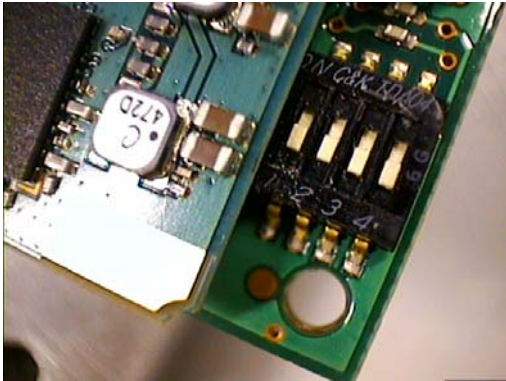
Differential speaker output capable of driving 8 ohm load. 1.0945 Vpp (differential) typical.

Microphone Input

Balanced microphone input: full scale input 1.1 Vpp.

Baud Rate Switches on the HSDPA SocketModem

MTSMC-H SocketModem Baud Rate dip switch settings



← Switch Bank

				920K
•	•	•	•	
1	2	3	4	

•				460K
	•	•	•	
1	2	3	4	

	•			230K
•		•	•	
1	2	3	4	

•	•			115K
		•	•	
1	2	3	4	

		•		57.6K
•	•		•	
1	2	3	4	

•		•		38.4K
	•		•	
1	2	3	4	

	•	•		19.2K
•			•	
1	2	3	4	

•	•	•		9.6K
			•	
1	2	3	4	

Operating Modes

The table below briefly summarizes the various operating modes.

Mode	Function	
	GSM / GPRS / UMTS / HSDPA SLEEP	Power saving mode set automatically when no call is in progress and the USB connection is suspended by host or not present.
	GSM IDLE	Software is active. Once registered to the GSM network, paging with BTS is carried out in order to achieve synchrony with the GSM network. The repetition rate depends on the parameter BSPA_Multiframe. The module is ready to send and receive.
	GSM TALK	Connection between two subscribers is in progress. Power consumption depends on the GSM network coverage and several connection settings (e.g. DTX off/on, FR/EFR/HR, hopping sequences and antenna connection). The following applies when power is to be measured in TALK_GSM mode: DTX off, FR and no frequency hopping, otherwise same as for IDLE measurements.
Normal operation	GPRS IDLE	Module is attached and ready for GPRS data transfer, but no data is currently sent or received.
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and GPRS configuration (e.g. used multislot settings).
	EGPRS DATA	EGPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and EGPRS configuration (e.g. used multislot settings).
	UMTS / HSDPA IDLE	Module is attached and ready for UMTS / HSDPA data transfer, but no data is currently sent or received.
	UMTS DATA	UMTS data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	HSDPA DATA	HSDPA data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.

Turn off the Module Using AT Command

The best and safest approach to powering down is to issue the AT^SMSO command. This procedure lets the module log off from the network and allows the software to enter into a secure state and save data before disconnecting the power supply. The mode is referred to as Power-down mode. In this mode, only the RTC stays active. After sending AT^SMSO do not enter any other AT commands. There are two ways to verify that the module turns off: Wait for the "OK" – response. It indicates that data has been stored non-volatile and that the module turns off in less than TBD second.

Important Note: The SocketModem requires a reset to become active again.

USB Interface

The Module supports a USB 1.1 Full Speed (12Mbit/s) device interface.

The USB I/O-pins are capable of driving the signal at min 3.0V.

To properly connect the module's USB interface to the host a USB 1.1 compatible connector is required. Furthermore, the USB modem driver for Windows XP delivered with the module be installed as described in the Installation Guide.

While the USB connection is active, the module will not change into SLEEP Mode. To enable switching into SLEEP mode the USB host has to be able to change into suspend mode. On incoming calls, the module will then generate a remote wake up request to resume the USB connection. This can be realized by means of the HOST_WAKEUP line. If no call, data or message transfer is in progress, the HOST_WAKEUP line is passive. To save power, the host could then shut down the USB interface. If a call or other request (URC's, messages) arrives, the host can be woken up again by activation of HOST_WAKEUP (passive to active transition).

Analog Audio Interface

The module supports one analog audio interface available on the board to board connector.

The following two pictures show the balanced headset interface with microphone feeding and the line interface.

Network Connectivity Status Signals

One status signal is provided for signaling the module's connectivity status (58 of the socket).