
SocketModem[®] EDGE

Embedded Wireless Modem

Preliminary Copy
Not for Release

Developer's Guide



SocketModem EDGE Developer's Guide
MTSMC-E
PN S000376A, Version A

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Chapter 1 – Product Description and Specifications

Product Description

The Multi-Tech SocketModem EDGE embedded wireless modem delivers some of the fastest cellular data speeds by utilizing EDGE technology. It allows users to connect to the Internet and send and receive data up to three times 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 EDGE wireless modem is equipped with quad-band GSM, which means it can be used worldwide on all existing GSM networks. In addition, it utilizes Multi-Tech's universal socket design.

Multi-Tech's SocketModem EDGE Embedded Wireless Modem Builds

Product	Trade Name	Description	Region
MTSMC-E	SocketModem® EDGE	Quad-band EDGE Class 10	Global
MTSMC-E-V	SocketModem® EDGE	Quad-band EDGE Class 10 w/Voice	Global

Product Features

- EDGE (E-GPRS) Class 10
- GPRS Class 12
- Quad-band GSM 850/900/1800/1900 MHz
- Packet data rates up to 240K bps (coding scheme, MCS-9, LLC layer, 4 time slots)
- Embedded TCP/IP stack supports TCP, UDP, DNS, FTP, SMTP, POP3, HTTP
- Circuit-switched data up to 9600 bps transparent and non-transparent
- Supports Short Message Service features including text and PDU mode, point to point (MT/MO), and cell broadcast
- SMA antenna connector
- Serial interface supporting DTE speeds to 460K bps
- AT command compatible*
- Carrier approved
- 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
- Two-year warranty

AT Commands

AT commands for this product are published in a separate document available on the Developer's Kit system CD or from Multi-Tech. For a copy of this document, contact OEM Sales at oemsales@multitech.com or call: (800) 972-2439.

Feature Details

Applications. With packet data speeds up to three times faster than ordinary CPRS modems, the SocketModem EDGE wireless modem is targeted at highly data-intensive applications such as remote video surveillance and other multimedia applications that send digital images, Web pages, and photographs.

Integration Reduces Space, Power, and Cost. The SocketModem EDGE wireless modem integrates the controller, RF transceiver, and antenna interface in one module. This integration requires low power and low real estate, and provides an overall reduction in costs.

Reduces Development Time. The SocketModem EDGE wireless modem enhances your product while you focus on developing its core features. It actually provides faster time-to-market because it relieves the burden and expense of obtaining PTCRB and RF approvals.

Internet-Enabled. The SocketModem EDGE wireless modem includes an embedded TCP/IP stack to bring Internet connectivity to any device without making changes to its hardware design. Using the Internet protocols and the wireless connection to an IP network, it sends and receives data over the Internet.

SocketModem EDGE Pin-Out. The SocketModem EDGE wireless modem interfaces easily with existing products through a standard serial communication channel. The serial DTE channel is capable of transfer speeds of 460K bps and can be interfaced directly to an UART or microcontroller. The complete on-board RF transceiver interfaces with an antenna for direct connection to wireless SMS, circuit-switched dial-up, or packet data networks. It also includes an onboard LED to display network status.

Universal Socket Connectivity. Multi-Tech's Universal Socket flexible comm-port architecture provides analog dial-up, ISDN, wireless, or Ethernet socket connectivity with interchangeable modules. This allows you to utilize one system design and populate it with your communication module of choice. In addition, you are assured a seamless migration to future technologies.

Developer's Kit

The Developer's Kit allows you to plug in the module and use it for testing, programming, and evaluation. The kit includes:

- one development board with RS-232 DB-25 connector
- universal power supply
- antenna
- RS-232 cable

Technical Specifications

The SocketModem EDGE wireless modem meets the following specifications:

Packet Data	EDGE: E-GPRS Class 10, Modulation & coding scheme MCS 1-9, Mobile station Class B GPRS: GPRS Class 12, full PBCCH support, coding scheme 1-4, Mobile station Class B
Circuit-Switched Data	Asynchronous, transparent & non-transparent up to 9600 bps
Fax	Class 1 Group 3 Fax
SMS	Text & PDU, Point-to-Point, cell broadcast
Connectors	Antenna: MMCX SIM: Standard 3V SIM receptacle
IP Protocols Supported	TCP, UDP, DNS, FTP, SMTP, POP3, HTTP
Power Requirements	5 VDC to 32 VDC; 400mA typical
Operating Environment	-30° to +50° C
Physical Description	Dimensions: 2.55" L x 1.4" W x 0.5" H (6.48 cm x 3.5 cm x .87 cm) Weight: 1 oz. (20 g)
Certifications	CE Mark EMC: FCC Part 2, 15, 22, 24, EN 55022 & EN55024 Safety: cUL, UL 60950, EN 60950 Network: PTCRB
Warranty	2 years

Safety

Instructions to OEMs

The Multi-Tech product manual includes specific warnings and cautions in order to ensure that OEMs are aware of their responsibilities, with regards to RF exposure compliance, for products into which the modem is integrated. With this guidance, the OEM will be able to incorporate into their documentation the necessary operating conditions and warnings.

OEMs need to provide a manual with the “final” product that clearly states the operating requirements and conditions and that these must be observed to ensure compliance with current FCC RF exposure requirements / MPE limits (see the “RF Exposures” section below). This will enable the OEM to generate (and provide the end-user with) the appropriate operating instructions, warnings and cautions, and/or markings for their product.

IMPORTANT!

FOR THE EFFICIENT AND SAFE OPERATION OF YOUR E-GPRS INTEGRATED MODEM, READ THIS INFORMATION BEFORE USE.

Radio Frequency (RF) Safety

General

Your SocketModem is based on the EGPRS standard for cellular technology. The standard is spread all over the world. It covers Europe, Asia, and some parts of America and Africa. This is the most used telecommunication standard. Your modem is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your SocketModem integrated modem, the cellular system, which handles your calls controls both the radio frequency and the power level of your cellular modem.

Exposure to RF Energy

There has been some public concern about possible health effects of using GSM modems. Although research on health effects from RF energy has focused on the current RF technology for many years, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product was fitted for use. If you are concerned about exposure to RF energy there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular modem efficiently by following the below guidelines.

Efficient Modem Operation

For your modem to operate at the lowest power level, consistent with satisfactory call quality:

- If your modem has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However your modem operates more efficiently with the antenna fully extended.
- Do not hold the antenna when the modem is IN USE. Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

Antenna Care and Replacement

Do not use the modem with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician. Use only the supplied or approved antenna. Unauthorized antennas, modifications, or attachments could damage the modem and may contravene local RF emission regulations or invalidate type approval.

Electronic Devices

Most electronic equipment, for example in hospitals and motor vehicles, is shielded from RF energy. However, RF energy may affect some improperly shielded electronic equipment.

Vehicle Electronic Equipment

Check your vehicle manufacturer representative to determine if any on-board electronic equipment is adequately shielded from RF energy.

Medical Electronic Equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy. Turn your modem OFF in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

Aircraft

Turn your modem OFF before boarding any aircraft.

- Use it on the ground only with crew permission.
- Do not use it in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your modem while the aircraft is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem while airborne.

Handling Precautions

All devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. Although input protection circuitry has been incorporated into the devices to minimize the effect of this static buildup, proper precautions should be taken to avoid exposure to electrostatic discharge during handling and mounting.

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.

Driving

Check the laws and the regulations regarding the use of cellular devices in the area where you have to drive as you must comply with these laws and regulations. When using your modem while driving, please give full attention to driving. Pull off the road and park before making or answering a call if driving conditions so require.

Children

Do not allow children to play with your modem. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem or make calls that increase your modem bills.

Blasting Areas

To avoid interfering with blasting operations, turn your unit OFF when in a “blasting area” or in areas posted “turn off two-way radio”. Construction crews often use remote control RF devices to set off explosives.

Potentially Explosive Atmospheres

Turn your modem OFF when in any area with a potentially explosive atmosphere. It is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injuries or even death. Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fueling areas such as gas stations; below deck on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders. Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle, which contains your modem or accessories. Before using your modem in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

Multi-Tech's Compliance with Safety Standards

THIS WIRELESS SOCKETMODEM COMPLIES WITH ALL APPLICABLE RF SAFETY STANDARDS. This cellular modem meets the standards and recommendations for the protection of public exposure to RF electromagnetic energy that have been established by governmental bodies and other qualified organizations, such as the following:

- Directives of the European Community,
- Directorate General V in Matters of Radio Frequency Electromagnetic Energy

Radio Frequency Exposures

Pursuant to 47 CFR § 24.52 of the FCC Rules and Regulations, personal communications services (PCS) equipment is subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093 as appropriate.

The Multi-Tech SocketModem is a GSM (cellular 850/PCS 1900) terminal which operates in the US licensed PCS frequency spectrum. The device transmits over the 1850-1910 MHz or 824-849 MHz bands and receives over the 1930-1990 MHz or 869-894 MHz bands. Multi-Tech Systems, Inc. certifies that it has determined that the Modem complies with the RF hazard requirements applicable to broadband PCS equipment operating under the authority of 47 CFR Part 24, Subpart E of the FCC Rules and Regulations. This determination is dependent upon installation, operation, and use of the equipment in accordance with all instructions provided.

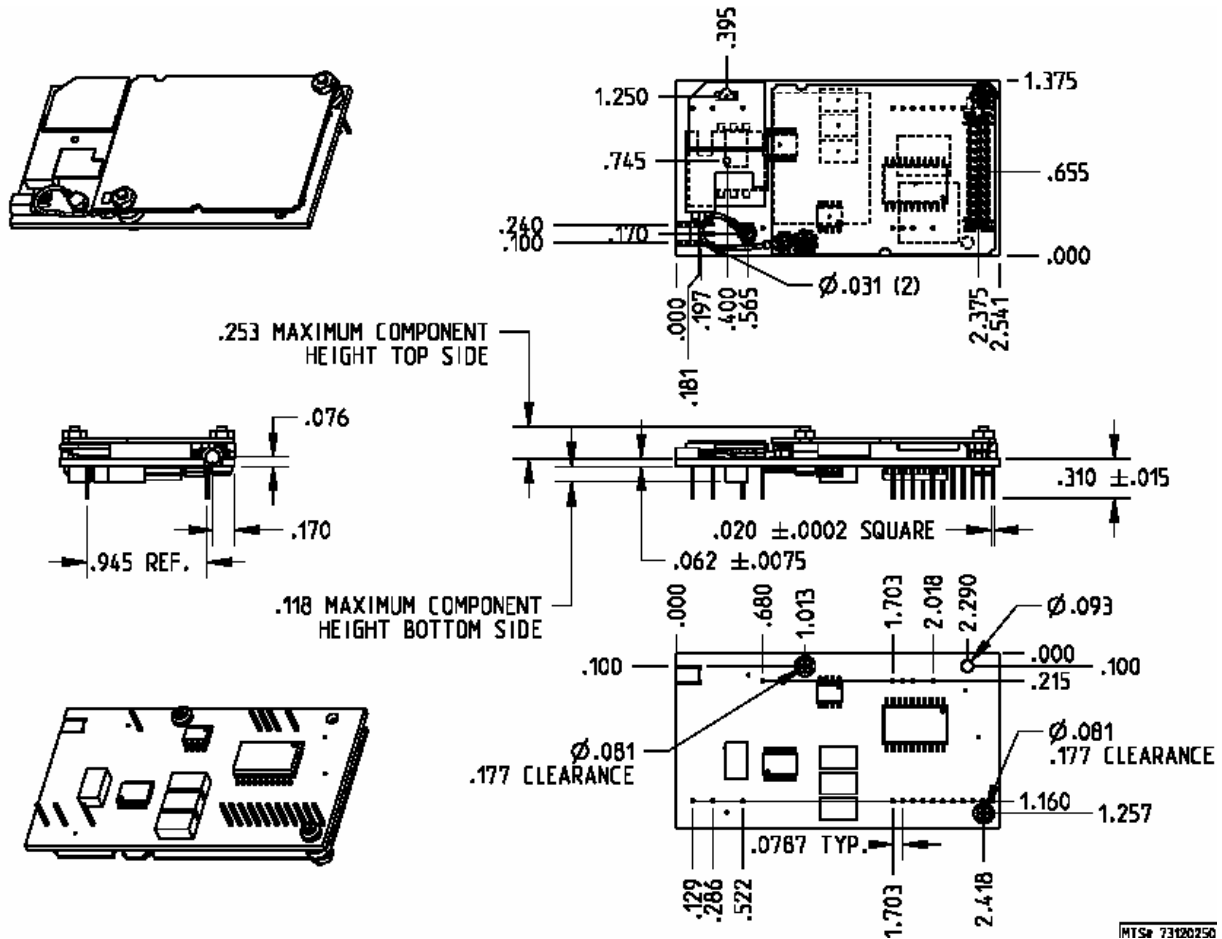
The modem is designed for and intended to be used in fixed and mobile applications. "Fixed" means that the device is physically secured at one location and is not able to be easily moved to another location. "Mobile" means that the device is designed to be used in other than fixed locations and generally in such a way that a separation distance of at least 20 cm 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 of the body of the user) and such uses are strictly prohibited. To ensure that the unit complies with current FCC regulations limiting both maximum RF output power and human exposure to radio frequency radiation, a separation distance of at least 20 cm must be maintained between the unit's antenna and the body of the user and any nearby persons at all times and in all applications and uses.

Additionally, in mobile applications, maximum antenna gain must not exceed 2.6 dBi for mobile applications and 3.5 dBi for fixed applications in the 850 MHz band to comply with 24.232(b) and is limited to 8.8 dBi for fixed applications and 4.8 dBi for mobile applications in the 1900 band.

Finally, the tune-up procedure for the modem ensures that the maximum RF output power of the device does not exceed 30.0 dBm within the variations that can be expected due to quantity production and testing on a statistical basis.

Chapter 2 – Mechanical Specifications

Physical Dimensions



SocketModem EDGE Wireless Modem Mechanical Drawing

Pin Configurations

Tip	1	○		○	64	SPKR
Ring	2	○		○	63	GND
Safety Void	3	×		○	62	MICV
TX+	4	○		○	61	VCC
TX-	5	○		○	60	-LED SPD
RX+	6	○		○	59	-LED COL
RX-	7	○		○	58	-LED LINK
Safety Void	8	×		○	57	-LED ACT
	9			○	56	-LED FDX
	10				55	
TXCLK	11	○			54	
RXCLK	12	○			53	
	13		Universal Socket		52	
	14				51	
	15		SocketModem		50	
	16		SocketModem w/Voice		49	
	17		SocketModem IP		48	
	18		SocketEthernet IP		47	
	19		SocketModem ISDN		46	
	20		SocketModem GSM/GPRS		45	
	21		SocketModem CDMA		44	
Mic+	22	○	SocketModem EDGE	○	43	SPK+
Mic-	23	○		○	42	SPK-
-Reset	24	○		○	41	GND
	25			○	40	-DTR
GND	26	○		○	39	-DCD
	27			○	38	-CTS
	28			○	37	-DSR
LED DCD	29	○		○	36	-RI / 3.3V
LED RX	30	○		○	35	-TXD
LED DTR	31	○		○	34	-RXD
LED TX	32	○		○	33	-RTS

Universal Socket Pins

EDGE Pin Descriptions

Pin #	Signal Name	I/O Type	Description
9	Dummy		Dummy
22	MIC+	I	Wireless
23	MIC-	O	Wireless
24	-Reset	I	Device Reset (with pull-up). The active low -RESET input resets the device logic and returns the configuration of the device to the original factory default values of "stored values" in the NVRAM. -RESET is tied to VCC through a time-constant circuit for "Power-on-Reset" functionality. The module is ready to accept commands after a fixed amount of time after power-on or reset.
26	GND	GND	Ground
33	-RTS	I	The -RTS signal is used for hardware flow control.
34	-RXD	O	Data Set Ready. The -DSR indicates modem status to the DTE. -DSR OFF (high) indicates that the DTE is to disregard all signals appearing on the interchange circuits except Ring Indicator (-RI). It reflects the status of the local data set and does not indicate an actual link with any remote data equipment.
35	-DSR	O	Clear To Send. -CTS is controlled by the modem to indicate whether or not the modem is ready to transmit data. -CTS ON, indicates to the DTE that signals presented on TXD will be transmitted. -CTS OFF indicates to the DTE that it should not transfer data across the interface on TXD.
36	-RI / 3.3V	O	RING (Active Low). Incoming ring signal from phone. Ring Indicate. -RI output ON (low) indicates the presence of an ON segment of a ring signal on the telephone line. The modem will not go off-hook when -RI is active; the modem waits for -RI to go inactive before going off-hook.

Pin #	Signal Name	I/O Type	Description
38	–CTS	O	Clear to Send (Active Low). –CTS is controlled by the module to indicate whether or not the module is ready to transmit data. –CTS ON indicates to the DTE that signals on TXD will be transmitted. –CTS OFF indicates to the DTE that it should not transfer data on TXD.
39	–DCD	O	Data Carrier Detect (Active Low). –DCD output is ON (low) when a data connection is established and the module is ready to send/receive data.
40	–DTR	I	Data Terminal Ready (Active Low). The –DTR input is turned ON (low) when the DTE is ready to communicate. –DTR ON prepares the modem to be connected, and, once connected, maintains the connection. –DTR OFF places the modem in the disconnect state under control of the &Dn and &Qn commands. Note: When the –DTR pin is not in use, it should be tied low.
41	GND	GND	Ground
42	SPK–	O/O	Wireless
43	SPK+	O/I	Wireless
58	LED LINK	O	LED LINK (Active Low). LED Output. During normal operation, this pin lights the LINK LED to indicate a good link is detected. See LED Mode Table below.
61	VCC	PWR	DC Input Power. 3.3 V or 5 V DC power, depending upon the build.
63	GND	GND	Ground

Pin 58 – LED Mode

LED Mode – Pin 58	Operating Status
Off	SCME is off or run in SLEEP, Alarm, or Charge-only mode.
600 ms ON / 600ms OFF	No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.
75 ms ON / 75 ms OFF / 75 ms ON 3 s OFF Flashing	One or more GPRS contexts activated. Indicates GPRS data transfer: When a GPRS transfer is in progress, the LED goes on within 1 second after data packets were exchanged. Flash duration is approximately 0.5 s.
ON	Depending on type of call: Voice Call: Connected to remote party. Data Call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.

LEDs and SocketModem Status

The flashing LED signal is used to indicate the working mode of the SocketModem.

Signal	SocketModem Status	
OFF	Download mode or switched OFF>	
ON	Continuously lit	Switched ON (not registered on the network)
	Flashing	Switched ON (registered on the network)

Chapter 3 – Electrical Characteristics

Electrical characteristics for the 5V Serial SocketModem are presented in this chapter.

I/O Electrical Characteristics

5 Vdc Characteristics (TA = -20° C to 55° C; VDD = 5 V ± 0.25 V) VDDMAX = 5.25 V

Digital Inputs –DTR (40), –TXD (35), –RTS (33), –RESET (24)	Input High Min 3.675 V	Input Low Max .7 V	
Digital Outputs –DCD (39), –CTS (38), –DSR (37), –RI (36), –RXD (34)	Output High Min. 4 V	Output Low Max 0.4 V	Current Drive: 2 ma
Digital Input Capacitance			5 PF

Voice Mode Power Consumption

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

	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @2W	1.2 A	1.3 A
+5V	Average @ 2W	250 mA	320 mA
+5V	Average @ .5W	180 mA	200 mA
+5V	Average idle mode	15 mA	25 mA

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

	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @1W	1.1 A	1.2 A
+5V	Average @1W	210 mA	235 mA
+5V	Average @ 0.25W	165 mA	185 mA
+5V	Average idle mode	15 mA	25 mA

Data Mode Power Consumption

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

	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 2W	1.2 A	1.3 A
+5V	Average @ 2W	420 mA	470 mA
+5V	Average @ 0.5W	280 mA	320 mA
+5V	Average idle mode	15 mA	25 mA

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

	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 1W	1.1 A peak	1.2 A peak
+5V	Average @ 1W	350 mA	400 mA
+5V	Average @ .25W	180 mA	210 mA
+5V	Average idle mode	15 mA	25 mA

EGPRS Class 10 Power Consumption in EGRPS 1800 MHz and EGRPS 1900 MHz

	Conditions	I _{NOM}	I _{MAX}
+5V	During TX bursts @ 5W	1.4 A peak	1.6 A peak
+5V	Average @ .5W	430 mA	525 mA
+5V	Average @ .25W	375 mA	450 mA
+5V	Average idle mode	15 mA	25 mA

SIM Interface Electrical Characteristics

SIM Interface Electrical Characteristics

This information is repeated in the next chapter under the SIM Interface section.

Parameter	Conditions	Min	Typ	Max	Unit
SIMDATA V_{IH}	$I_{IH} = +/- 20\mu A$	$0.7 \times SIMVCC$			V
SIMDATA V_{IL}	$I_{IL} = 1 \text{ mA}$			$0.3 \times SIMVCC$	V
SIMRST, SIMDATA SIMCLK V_{OH}	Source current $= 20\mu A$	$SIMVCC - 0.1V$			V
SIMRST, SIMDATA SIMCLK V_{OL}	Sink current $= -200\mu A$			0.1	
SIMVCC Output Voltage	$I_{SIMVCC} \leq 6 \text{ mA}$	2.70	2.80	2.85	V
SIMCLK Rise/Fall Time	Loaded with 30pF			50	ns
SIMRST, SIMDATA Rise/Fall Time	Loaded with 30pF			1	μs
SIMCLK Frequency	Loaded with 30pF			3.25	MHz

Chapter 4 – SIM Connector and Antenna Connector

This chapter describes the SocketModem SIM connector and the antenna and its connector.

SIM Connector

The internal SIM interface of the SocketModem supports the standard 3V SIM only.

Antenna

The integrated modem antenna connector is a MMCX connector. The MMCX connector incorporates a 'Snap On' latching action in order to make the connection easier with an excellent RF performance. An additional advantage is its small physical size, which is 50% of the standard MCX connector.

This type of connector is suitable for the standard ranges of flexible and semi-rigid cables. The characteristic impedance of the MMCX coaxial connector is 50 ohm. The antenna manufacturer must guarantee that the antenna will be working according to the radio characteristics presented in the table below.

RF performances are compliant with the ETSI recommendation 05.05 and 11.10.

The main parameters are:

Receiver Features

- EGSM Sensitivity : < -104 dBm
- GSM 1800/GSM 1900 Sensitivity : < -102 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

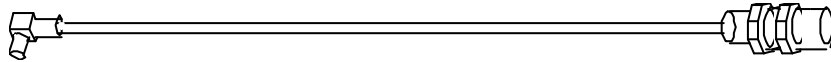
- Maximum output power (EGSM) : 33 dBm +/- 2 dB
- Maximum output power (DCS/PCS) : 30 dBm +/- 2 dB
- Minimum output power (EGSM): 5 dBm +/- 5 dB
- Minimum output power (DCS/PCS): 0 dBm +/- 5 dB
- H2 level : < -30 dBm
- H3 level : < -30 dBm
- Noise in 925 - 935 MHz : < -67 dBm
- Noise in 935 - 960 MHz : < -79 dBm
- Noise in 1805 - 1880 MHz : < -71 dBm
- Phase error at peak power : < 5 ° RMS
- Frequency error : +/- 0.1 ppm max

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			

Ordering an Antenna

An antenna with mating connector can be ordered, for example, from Multi-Tech or GMBH:



6-Inch Antenna Cable – SMA Jack to MMCX Plug

Multi-Tech Systems, Inc.

<http://www.multitech.com>

Order No: 45009630

IMS Connectors Systems GMBH

<http://www.imscs.com/>

MMCX Plug

The SocketModem requires an MMCX plug to connect to an antenna.



MMCX Connector Example (right angle type)

A small MMCX / SMA adapter can be ordered, for example, from:

Amphenol

<http://www.amphenol.com/>

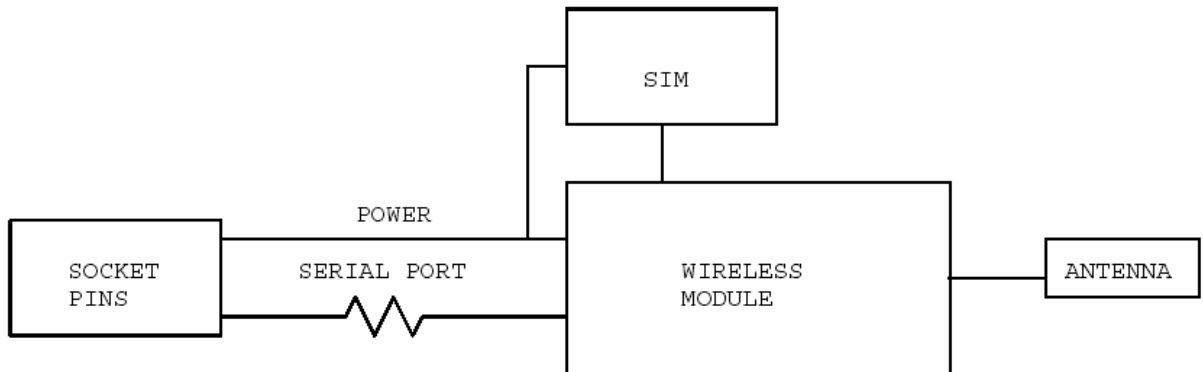
Order No: 908-31100

Top view of the PCB showing components and their locations. The components are labeled as follows:

- LED1: LED component at the top left.
- FID3: FID component at the top left.
- J3: Jumper component at the top left.
- J2: Jumper component at the bottom left.
- TP3, TP10, TP5: Test points at the bottom left.
- TP9, TP12, TP8, TP11, TP7, TP6, TP4: Test points at the bottom left.
- J5: Jumper component at the bottom left.
- U8: IC component in the center.
- J4: Jumper component at the top right.
- FID2: FID component at the top right.
- TH1: Thermal pad at the bottom right.

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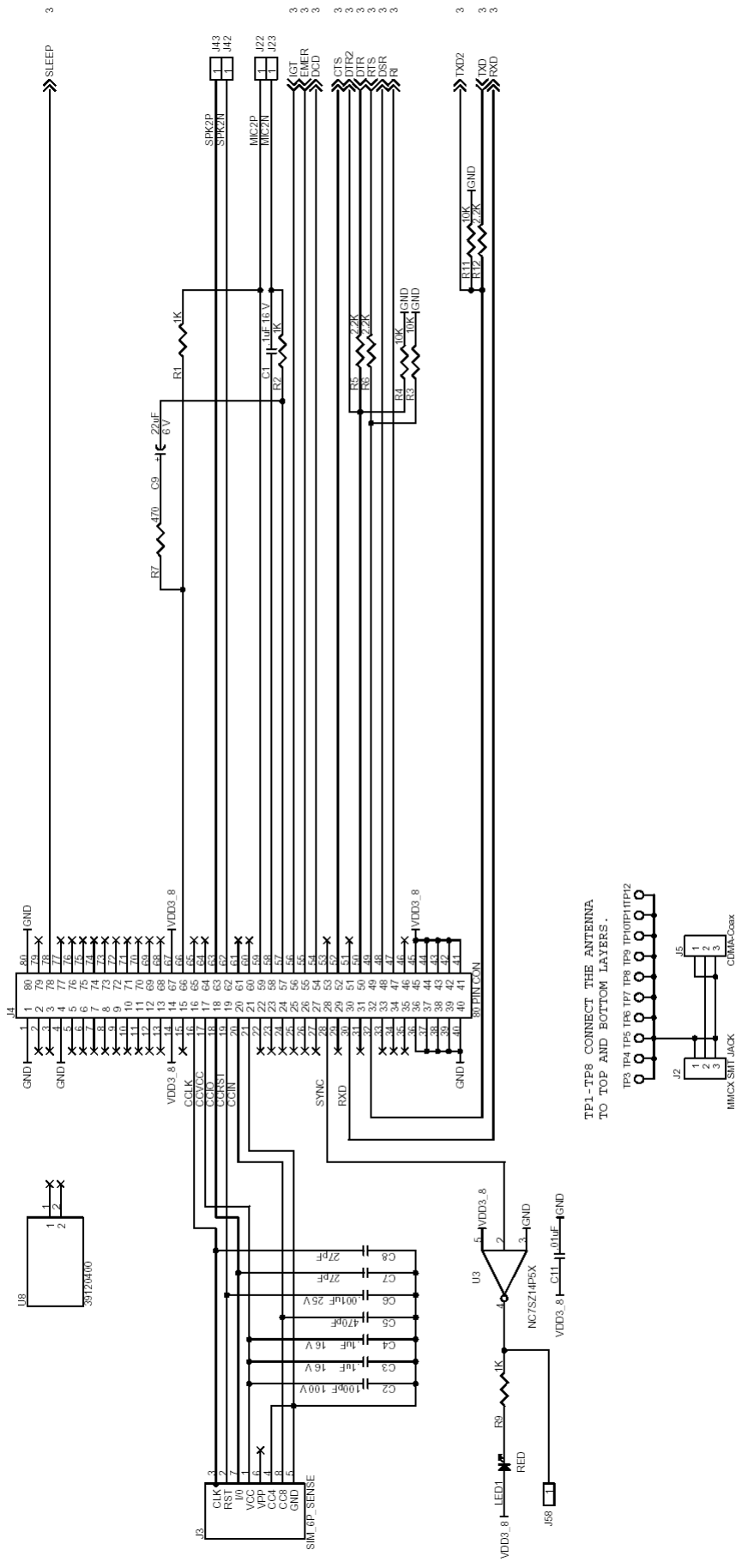
SocketModem EDGE Block Diagram



Block Diagram for the SocketModem EDGE

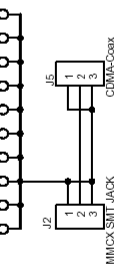
SocketModem EDGE Schematics

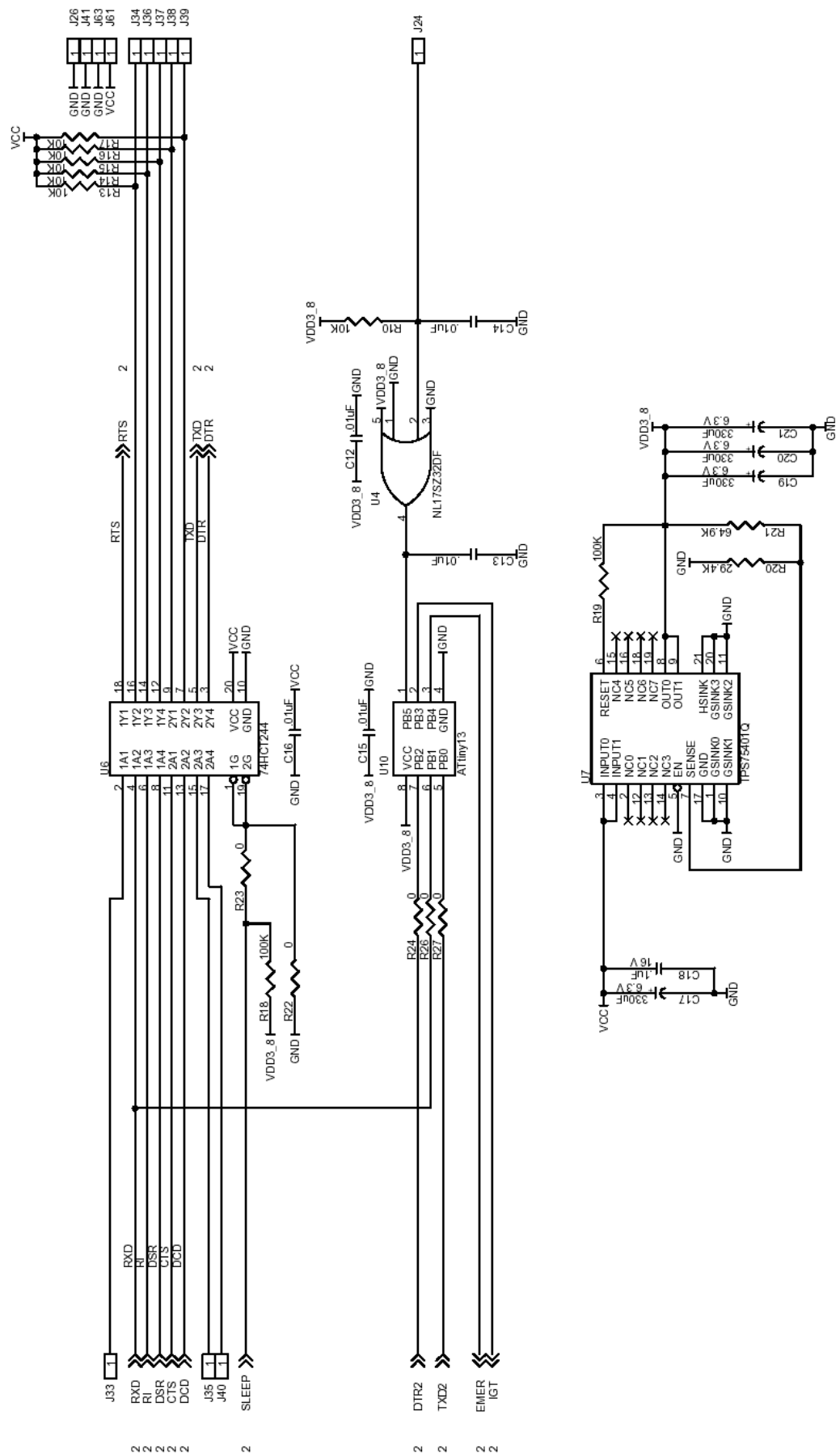
To view the text and numbers, increase the viewing percentage to 150% or print the page.



TP1-TP8 CONNECT THE ANTENNA TO TOP AND BOTTOM LAYERS.

TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10B1 TP12





Chapter 6 – Hardware Guidelines

General Guidelines for the Use of the SocketModem

Hardware and RF

- Ground plane: Multi-Tech recommends having a common ground plane for analog, digital, and RF grounds.
- ESD protection on serial link.
- Possible spurious emission radiated by the application to the RF receiver in the receiver band

The Antenna

The antenna sub-system and integration in the application is a major issue. It is a major issue in the choice of the antenna cable (type, length, performances, thermal resistance, etc.)

These elements could affect EGPRS performances such as sensitivity and emitted power.

The antenna should be isolated as much as possible from the digital circuitry including the interface signals.

Multi-Tech recommends shielding the terminal. On terminals including the antenna, a poor shielding could dramatically affect the sensitivity of the terminal. Subsequently, the power emitted through the antenna could affect the application.

Soldering and Cleaning the SocketModem

The pins of the SocketModem may be hand soldered or wave soldered. If wave soldered, the temperature on the top of the SocketModem must not exceed 100° C.

There should be no solvent or water washing of the SocketModem.

Do not use a hot air gun on the SocketModem.

Appendix A – Warranty and Repairs

Multi-Tech Warranty Statement

Multi-Tech Systems, Inc., (hereafter “MTS”) warrants that its products will be free from defects in material or workmanship for a period of two years from date of purchase, or if proof of purchase is not provided, two years from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory — transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Repair Procedures for U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS to destinations in U.S. and Canada.

Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

For out of warranty repair charges, go to www.multitech.com/DOCUMENTS/Company/warranty/

Extended two-year overnight replacement service agreements are available for selected products. Please call MTS customer service at (888) 288-5470 or visit our web site at www.multitech.com/PARTNERS/Programs/orc/ for details on rates and coverage’s.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at (800) 972-2439 or email support@multitech.com. Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at (800) 328-9717 or (763) 717-5631, or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Customers (Outside U.S.A. and Canada)

Your original point of purchase Reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product. The Multi-Tech sales office directory is available at www.multitech.com/PARTNERS/Channels/offices/

In the event that factory service is required, products may be shipped, freight prepaid to our Mounds View, Minnesota factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any International shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units shall be shipped freight collect, unless other arrangements are made in advance.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you or email support@multitech.com. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A., or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Distributors

International distributors should contact their MTS International sales representative for information about the repairs for their Multi-Tech product.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our International Technical Support department at +(763)717-5863. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A. or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

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