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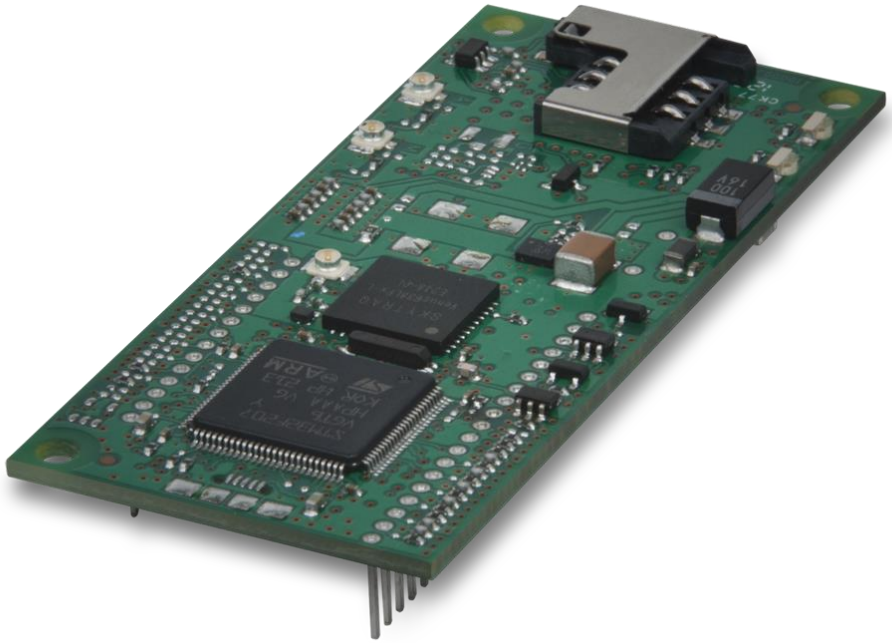

SocketModem® Cell HSPA+
SocketModem® iCell HSPA+

MTSMC-H5 Device Guide

SocketModem Cell HSPA+ and SocketModem iCell HSPA+ MTSMC-H5 Device Guide

S000540, Version E
MTSMC-H5-xx, MTSMC-H5-U-xx, MTSMC-H5-IP-xx, MTSMC-H5-GP-xx, MTSCMC-H5-MI-IP-xx, MTSMC-H5-MI-GP

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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 SocketModem Cell and iCell HSPA+ models are complete, ready-to-integrate communications devices that offer standards-based HSPA+ 21 performance. These quick-to-market communications devices allow developers to add wireless communication and GPS tracking to products with a minimum of development time and expense. Both models are based on industry-standard open interfaces and use Multi-Tech's Universal Socket design. The SocketModem iCell features the intelligence of the embedded Universal IP stack, which allows for automatic/persistent connectivity for mission critical applications and enhanced M2M functionality.

Product Build Options

Product	Description	Region
MTSMC-H5-MI-GP	Global HSPA+ 21M - Data Only, MTS GPS, Serial, USB, GPIO, Universal IP	US Europe Canada Australia
MTSMC-H5-MI-IP	Global HSPA+ 21M - Data Only, Serial, USB, GPIO, Universal IP	US Europe Canada Australia
MTSMC-H5-GP	Global HSPA+ 21M - Data Only, MTS GPS, Serial, Universal IP	US Europe Canada Australia
MTSMC-H5-IP	Global HSPA+ 21M - Data Only, Serial, Universal IP	US Europe Canada Australia
MTSMC-H5	Global HSPA+ 21M - Data Only, Serial	US Europe Canada Australia
MTSMC-H5-U	Global HSPA+ 21M - Data Only, USB	US Europe Canada Australia
Developer Kit		
MTSMI-UDK	Universal Developer Kit	Global

Notes:

- These units ship without network activation. To connect them to the cellular network, you need a cellular account. For more information, refer to Account Activation for Cellular Devices in the Universal Socket Developer's Guide.
- GP devices have a dedicated GPS receiver.
- MI devices have multiple interfaces.
- The complete product code may end in **.Rx**. For example, MTSMC-H5.Rx, where R is revision and x is the revision number.
- All builds can be ordered individually or in 50-packs.

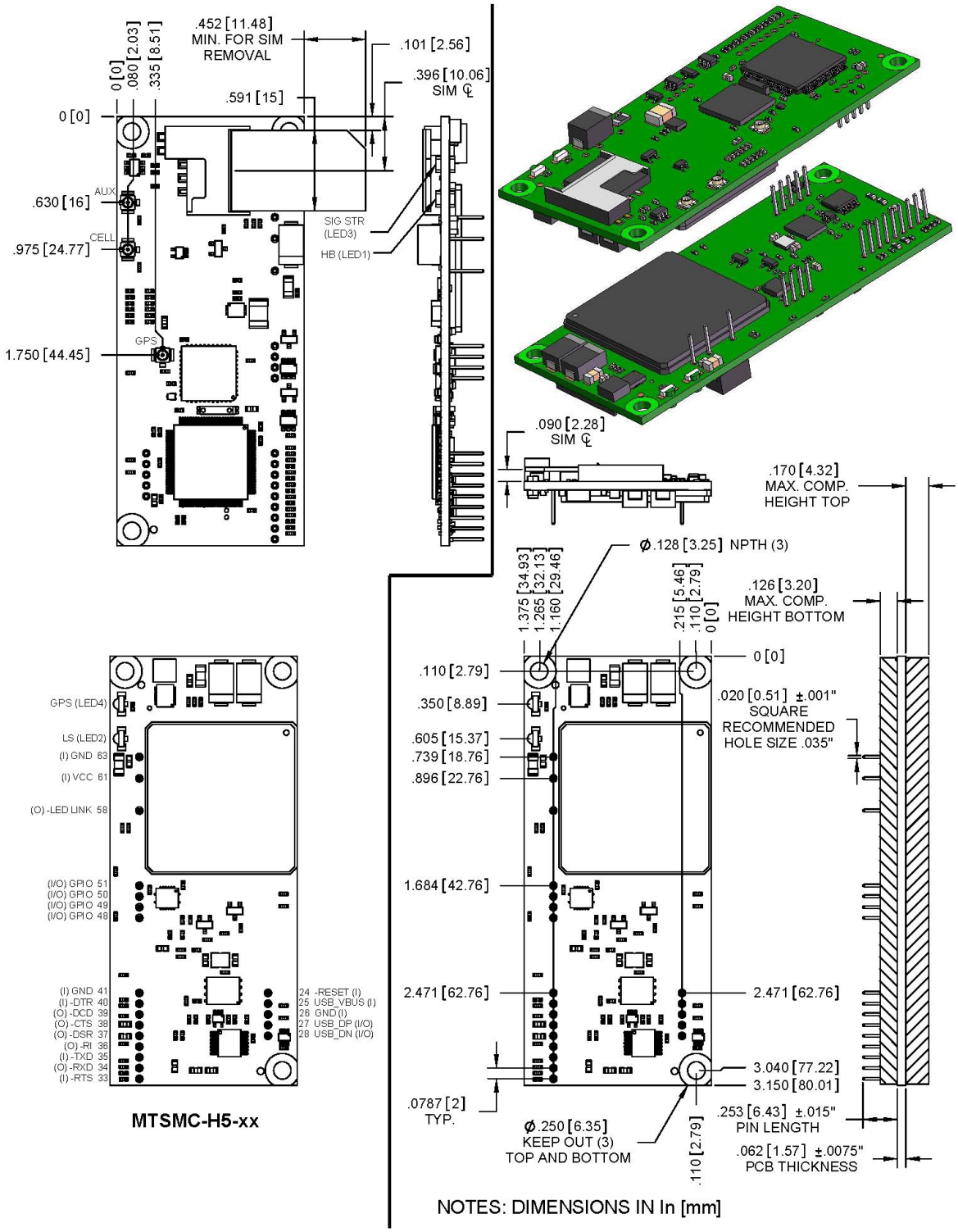
Documentation

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

- **Device Guide** – 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. (S000342)
- **USB Driver Installation Guide for H5 and G3 Devices** – Provides steps for installing USB drivers. (S000533)
- **AT Command Guide** – Use the following AT Command Guides with HSPA devices:
  - S000574 for H5-xx.R1 Modems
  - S000528 for H5-xx Modems (not .R1)
  - S000457 Universal IP Commands

Chapter 2 – Mechanical Drawing

MTSMC-H5 All Builds



Chapter 3 – Specifications

Technical Specifications

Category	Description
General	
Standards	Penta-band HSPA+ 21 Quad-band GSM/GPRS/EDGE SMS is based on CS/Packet-Switched (PS) domain of GSM and WCDMA USB Interface is CDC-ACM compliant
Frequency Bands	Penta-band HSPA+: 850/900/1700/1900/2100 MHz Quad-band GSM/GPRS/EDGE: 850/900/1800/1900 MHz
Speed	
Data Speed	HSPA+: Up to 21.0 Mbps downlink/5.76 Mbps uplink EDGE: Up to 296 Kbps downlink/236.8 Kbps uplink GPRS: Up to 107 Kbps downlink/85.6 Kbps uplink
Interface, Ports	
USB Interface	MI builds: USB 2.0 full speed High speed on other builds: 480 Mbps
Serial Modem Interface	Up to 921.6 Kbps
Ports	GPIO ports – MI builds only
Physical Description	
Weight	0.4 oz. (10g)
Dimensions	Refer to mechanical drawing for details.
Connectors	
Antenna Connector	3 surface mount UFL: cellular, GPS, RX diversity
SIM Holder	Standard 1.8V and 3V.
Environment	
Operating Temperature	-40° C to +85° C
Storage Temperature	-40° C to +85° C
Humidity	20%-90% RH, non-condensing
Power Requirements	
Operating Voltage	3.3V - 5V
Input Power	3.3 - 5VDC
IP, M2M, SMS	
Supported IP Protocols	DNS resolve, FTP client, Ping, POP3 client, PPP (dialout), SMTP client, TCP RAW client & server
M2M Applications	Universal IP models: Automatic connect/reconnect, device monitor, modem emulation, Ping & TCP keep alive, wake-up on caller ID, wake-up on ring, GPS tracking (GP model only)
SMS	Point-to-Point messaging Mobile-Terminated SMS Mobile-Originated SMS

Category	Description
Certifications, Compliance, Warranty	
EMC Compliance	FCC Part 15 Class B FCC Part 15.31 (Co-location) EN55022 Class B EN55024
Radio Compliance	FCC Part 22 FCC Part 24 RSS 132 RSS 133 EN 301 511 EN 301 489-1 EN 301 489-7 EN 301 489-24
Safety Compliance	UL 60950-1 cUL 60950-1 EN 60950-1 AS/NZS 60950-1
Network Compliance	PTCRB AT&T
Warranty	Two years

Notes:

- Radio performance may be affected by temperature extremes. This is normal. The radio is designed to automatically fallback in class and reduces transmitter power to avoid damage to the radio. When this occurs depends on the interaction of several factors, such as ambient temperature, operating mode, and transmit power.

Mounting Hardware

The board has three mounting holes at corners. Use #4 or M3 hardware for mounting the SocketModem to the board. Refer to the Mechanical Drawings for more information.

Recommended Parts

Manufacturer	Part	Part Number
PEM PennEngineering	Surface Mount Standoff	SMTSO-M3-4ET
RAF Electronic Hardware	3/16” Hex Female Standoff	2051T-440-S-12-Zinc
RAF Electronic Hardware	4.5mm Hex Female Standoff	1251-3005-S-12-Zinc

Device Reset

The SocketModem 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[1]
MTSMC-H5	250 ms	10 seconds	200 US

[1]The SocketModem may respond to a shorter reset pulse.

RS-232 Signal DC Electrical Characteristics

Units: Volts

Applies to the following pins:

Pin	Signal Name	Pin	Signal Name
J33	-RTS	J37	-DSR
J34	-RXD	J38	-CTS
J35	-TXD	J39	-DCD
J36	-RI	J40	-DTR

Parameter	Minimum	Maximum
3.3 Volt Powered		
Input Low Level	0	0.55
Input High Level	1.5	3.3
Output Low Level	0	0.55
Output High Level	2.35	3.3
5 Volt Powered		
Input Low Level	0	0.8
Input High Level	2.3	5
Output Low Level	0	0.55
Output High Level	3.7	5

Absolute Maximum Rating

All models can run with an input voltage of either 3.3V or 5V. The maximum voltage on any signal pin equals the input voltage.

Electrical Characteristics Other Pins

Pin	Signal Name	VIL		VIH		VOL		VOH	
		Min	Max	Min	Max	Min	Max	Min	Max
J24	-RESET		0.8	2.0		--	--	--	--
J25	USB VBUS	-0.3	0.8	2.0	8.7	--	--	--	--
J26	GND	--	--	--	--	--	--	--	--
J27	USB DP		0.8	2			0.3	2.8	
J28	USB DN		0.8	2			0.3	2.8	
J41	GND	--	--	--	--	--	--	--	--
J48	GPIO0	-0.3	0.8	2.0	5.5		0.4	2.9	

Pin	Signal Name	VIL		VIH		VOL		VOH	
		Min	Max	Min	Max	Min	Max	Min	Max
J49	GPIO1	-0.3	0.8	2.0	5.5		0.4	2.9	
J50	GPIO2	-0.3	0.8	2.0	5.5		0.4	2.9	
J51	GPIO3	-0.3	0.8	2.0	5.5		0.4	2.9	
J58	-LED LINK	--	--	--	--	0	0.45	2.85	3.3
J61	VCC	--	--	--	--	--	--	--	--
J63	GND	--	--	--	--	--	--	--	--

Pinout Specifications

Pin	Signal Name	Logic Level Voltage[1]	I/O	Description
J24	–RESET	3.3 – 5.0	I	Device reset (active low)
J25	USB VBUS	3.3 – 5.0	I	USB power supply input
J26	GND	GND	GND	Ground
J27	USB DP	3.3	I/O	USB data
J28	USB DN	3.3	I/O	USB data
J33	–RTS	5.0	I	Request to send (active low)
J34	–RXD	5.0	O	Received data (active low)
J35	–TXD	5.0	I	Transmitted data (active low)
J36	–RI	5.0	O	Ring indicator (active low)
J37	–DSR	5.0	O	Data set ready (active low)
J38	–CTS	5.0	O	Clear to send (active low)
J39	–DCD	5.0	O	Data carrier detect (active low)
J40	–DTR	5.0	I	Data terminal ready (active low)
J41	GND	GND	GND	Ground
J48	GPIO0	3.3	I/O	User configurable general purpose I/O
J49	GPIO1	3.3	I/O	User configurable general purpose I/O
J50	GPIO2	3.3	I/O	User configurable general purpose I/O
J51	GPIO3	3.3	I/O	User configurable general purpose I/O
J58	–LED LINK	3.3	O	Link status (active low, can sink up to 150mA)
J61	VCC	5.0	PWR	DC input power
J63	GND	GND	GND	Ground

[1] A hyphen (-) indicates a range of acceptable logic levels.

Pin 58

Note: Pin 58 may or may not be available on some SocketModems.

Pin 58 LED Mode	Operating Status	
OFF	Subscriber Carrier Mode is OFF or running in SLEEP or ALARM mode.	
600 ms ON/600ms OFF	No SIM card inserted, no PIN entered, network search in progress, ongoing user authentication, or network login in progress.	
75 ms ON / 75 ms OFF / 75 ms ON 3 s OFF Flashing or Blinking	One or more EDGE/GPRS/CDMA contexts activated. Indicates EDGE/GPRS/CDMA data transfer: When a 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 call type:	
	Voice Call:	Connected to remote party.
	Data Call:	Connected to remote party or parameter exchange while call is set up or disconnected.

Pin Availability by Build

Pin and Function	MI-IP/GP	IP/GP	Serial only	USB only
J24 Reset	x	x	x	x
J25 USB_VBUS	x			x
J26 GND	x	x	x	x
J27 USB_DP	x			x
J28 USB_DN	x			x
J33 -RTS	x	x	x	
J34 -RXD	x	x	x	
J35 -TXD	x	x	x	
J36 -RI	x	x	x	
J37 -DSR	x	x	x	
J38 -CTS	x	x	x	
J39 -DCD	x	x	x	
J40 -DTR	x	x	x	
J41 GND	x	x	x	x
J48 GPIO	x			
J49 GPIO	x			
J50 GPIO	x			
J51 GPIO	x			
J58 -LED LINK	x			x
J61 VCC	x	x	x	x
J63 GND	x	x	x	x

Power Measurements

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

MTSMC-H5

Radio Protocol	AT command used to set radio function and power mode	Time (sec) to reduced power from command or DTE signal change	Time (sec) to "ready for data connection" from reduced power	Registered Power Radio Idle, SIM installed and connected to tower
3.3 Volts				
GSM850/HSDPA	AT+CFUN=1	N/A	N/A	30mA
	AT+CFUN=5	Approx. 1 second	Approx. 1 second	17mA
	AT+CFUN=7	Approx. 1 second	Approx. 2 seconds	17mA/30mA
5 Volts				
GSM850/HSDPA	AT+CFUN=1	N/A	N/A	28mA
	AT+CFUN=5	Approx. 1 second	Approx. 1 second	19mA
	AT+CFUN=7	Approx. 1 second	Approx. 2 seconds	17mA/30mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	100mA	28	4.70	104mA	15	13	481mA	0	32.9
HSDPA	286mA	Alternating Bits	N/A	288mA	Active Bits	N/A	610mA	All Up Bits	N/A
5 Volts									
GSM850	72mA	28	4.75	74mA	15	13.02	226mA	0	32.88
HSDPA	162mA	Alternating Bits	N/A	173mA	Active Bits	N/A	397mA	All Up Bits	N/A

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Instant Peak TX Current (Amps)	Peak Reset Current (InRush) (Amps)	Peak Reset Current (InRush) Duration
3.3 Volts			
GSM850	3.81A	1.82A	3.68ms
HSDPA	700mA	1.82A	3.68ms
5 Volts			
GSM850	1.73A	1.95A	3.12ms
HSDPA	390mA	1.95A	3.12ms

Notes:

- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- **Inrush Current:** The input current during power up, or a reset.
- **Registered Power:** Registered to tower. Receive active for SMS. No data is sent.

MTSMC-H5-U

Radio Protocol	AT command used to set radio function and power mode	Registered Power Radio Idle, SIM installed and connected to tower
3.3 Volts		
GSM850/HSDPA	AT+CFUN=1	62mA
5 Volts		
GSM850/HSDPA	AT+CFUN=1	46mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Control Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Control Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Control Level	GSM Xmit Powr or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	126mA	28	4.70	130mA	15	13	492mA	0	32.9
HSDPA	250mA	Alternating bits		294mA	Active bits		672mA	All up bits	
5 Volts									
GSM850	81mA	28	4.75	89mA	15	13.02	231mA	0	32.88
HSDPA	163mA	Alternating bits		192mA	Active bits		416mA	All up bits	

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Instant Peak TX Current (Amps)	Peak Reset Current (InRush) (Amps)	Peak Reset Current (InRush) Duration
3.3 Volts			
GSM850	3.53A	2.14A	4.80ms
HSDPA	620mA	2.14A	4.80ms
5 Volts			
GSM850	1.48A	2.11A	3.00ms
HSDPA	407mA	2.11A	3.00ms

Notes:

- The USB model does not have sleep mode.
- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- **Inrush Current:** The input current during power up or a reset.
- **Registered Power:** Registered to tower. Receive active for SMS. No data is sent.

MTSMC-H5-IP

Radio Protocol	AT command used to set radio function and power mode	Radio Registration Data			Radio Idle, SIM installed and connected to tower (Amps)
		Peak Current Amplitude during radio registration (Amps)	Peak Current Pulse Duration during radio registration	Time (sec) to Peak Registration Current Pulse	
3.3 Volts					
GSM850	AT+CFUN=1	2.2A	.720ms	54	0.117mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.115mA
5 Volts					
GSM850	AT+CFUN=1	1.11A	.720ms	54	0.078mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.078mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	0.173mA	28	4	0.178mA	15	12.4	0.566mA	0	31.7
HSDPA	0.262mA	All Down	N/A	0.318mA	Active	N/A	0.804mA	All Up	N/A

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
5 Volts									
GSM850	0.114mA	28	4	0.116mA	15	12.4	0.275mA	0	31.7
HSDPA	0.169mA	All Down	N/A	0.211mA	Active	N/A	0.476mA	All Up	N/A

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Peak Amplitude TX Current (Amps) for GSM850 or Peak Current for HSDPA	Peak Current during power up (InRush Amps)	Peak Current Duration during powerup (InRush duration)	Peak Current during Reset (InRush Amps)	Peak Current Duration during Reset (InRush Duration)
3.3 Volts					
GSM850	3.37A	3.84	2.04ms	3.31A	0.640ms
HSDPA	0.856mA	3.84	2.04ms	N/A	N/A
5 Volts					
GSM850	1.95A	3.78	2.00ms	1.73A	0.560ms
HSDPA	0.536mA	3.78	2.00ms	N/A	N/A

Notes:

- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- **Inrush Current:** The input current during power up, or a reset.
- **Registered Power:** Registered to tower. Receive active for SMS. No data is sent.

MTSMC-H5-GP

Radio Protocol	AT command used to set radio function and power mode	Radio Registration Data			Radio Idle, SIM installed and connected to tower (Amps)
		Peak Current Amplitude during radio registration (Amps)	Peak Current Pulse Duration during radio registration	Time (sec) to Peak Registration Current Pulse	
3.3 Volts					
GSM850	AT+CFUN=1	2.37A	.760ms	10	0.24mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.241mA
5 Volts					
GSM850	AT+CFUN=1	1.2A	.460ms	10	0.155mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.155mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	0.308mA	28	3.5	0.313mA	15	12.1	0.731mA	0	31.9
HSDPA	0.395mA	All Down	N/A	0.457mA	Active	N/A	1.15mA	All Up	N/A
5 Volts									
GSM850	0.197mA	28	3.5	0.198mA	15	12.1	0.358mA	0	31.9
HSDPA	0.249mA	All Down	N/A	0.286mA	Active	N/A	0.678mA	All Up	N/A

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Peak Amplitude TX Current (Amps) for GSM850 or Peak Current for HSDPA	Peak Current during power up (InRush Amps)	Peak Current Duration during powerup (InRush duration)	Peak Current during Reset (InRush Amps)	Peak Current Duration during Reset (InRush Duration)
3.3 Volts					
GSM850	3.56A	3.96A	2.00ms	2.4A	0.760ms
HSDPA	1.236A	3.96A	2.00ms	2.4A	0.760ms
5 Volts					
GSM850	1.92A	3.96A	1.88ms	1.2A	0.400ms
HSDPA	0.728mA	3.96A	1.88ms	1.2A	0.400ms

Notes:

- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- **Inrush Current:** The input current during power up, or a reset.
- **Registered Power:** Registered to tower. Receive active for SMS. No data is sent.

MTSMC-H5-MI-IP

Radio Protocol	AT command used to set radio function and power mode	Radio Registration Data			Radio Idle, SIM installed and connected to tower (Amps)
		Peak Current Amplitude during radio registration (Amps)	Peak Current Pulse Duration during radio registration	Time (sec) to Peak Registration Current Pulse	
3.3 Volts					
GSM850	AT+CFUN=1	1.9A	.390ms	32	0.123mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.123mA
5 Volts					
GSM850	AT+CFUN=1	0.911A	.390ms	32	0.081mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.081mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	0.179mA	28	3.8	0.185mA	15	12.4	0.669mA	0	32
HSDPA	0.265mA	All Down	N/A	0.321mA	Active	N/A	0.831mA	All Up	N/A
5 Volts									
GSM850	0.12mA	28	3.8	0.122mA	15	12.4	0.264mA	0	32
HSDPA	0.174mA	All Down	N/A	0.211mA	Active	N/A	0.502mA	All Up	N/A

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Peak Amplitude TX Current (Amps) for GSM850 or Peak Current for HSDPA	Peak Current during power up (InRush Amps)	Peak Current Duration during powerup (InRush duration)	Peak Current during Reset (InRush Amps)	Peak Current Duration during Reset (InRush Duration)
3.3 Volts					
GSM850	2.33A	2.33	1.41ms	3.31A	0.400ms
HSDPA	0.904mA	2.23	1.41ms	N/A	N/A
5 Volts					
GSM850	1.22A	2.95	1.68ms	1.23A	0.360ms
HSDPA	0.572mA	2.95	1.68ms	N/A	N/A

Notes:

- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- **Inrush Current:** The input current during power up, or a reset.
- **Registered Power:** Registered to tower. Receive active for SMS. No data is sent.

MTSMC-H5-MI-GP

Radio Protocol	AT command used to set radio function and power mode	Radio Registration Data			Radio Idle, SIM installed and connected to tower (Amps)
		Peak Current Amplitude during radio registration (Amps)	Peak Current Pulse Duration during radio registration	Time (sec) to Peak Registration Current Pulse	
3.3 Volts					
GSM850	AT+CFUN=1	2.37A	.400ms	28	0.238mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.238mA
5 Volts					
GSM850	AT+CFUN=1	1.07A	.400ms	28	0.157mA
HSDPA	AT+CFUN=1	N/A	N/A	N/A	0.156mA

Radio Protocol	Low Power			Half Power			Max Power		
	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)	Measured Current (Amps)	MS Xmit or Power Cntrl Level	GSM Xmit Power or HSDPA Ch Power Meas. (avg)
3.3 Volts									
GSM850	0.295mA	28	3.7	0.3mA	15	12.6	0.862mA	0	31.8
HSDPA	0.386mA	All Down	N/A	0.445mA	Active	N/A	0.945mA	All Up	N/A
5 Volts									
GSM850	0.195mA	28	3.7	0.198mA	15	12.6	0.368mA	0	32.1
HSDPA	0.253mA	All Down	N/A	0.290mA	Active	N/A	0.581mA	All Up	N/A

Note: This data is measured using an Agilent call box connected to the cellular radio.

Radio Protocol	Peak Amplitude TX Current (Amps) for GSM850 or Peak Current for HSDPA	Peak Current during power up (InRush Amps)	Peak Current Duration during powerup (InRush duration)	Peak Current during Reset (InRush Amps)	Peak Current Duration during Reset (InRush Duration)
3.3 Volts					
GSM850	2.500A	2.18A	1.48ms	3.59A	0.400ms
HSDPA	1.036A	2.18A	1.48ms	N/A	N/A
5 Volts					
GSM850	1.560A	2.95A	1.60ms	1.51A	0.400ms
HSDPA	0.656mA	2.95A	1.60ms	N/A	N/A

Notes:

- AT+CFUN=1 used to set radio function and power mode.
- **Instant Peak Tx:** The peak current during a GSM850 transmission burst period or HSDPA connection. This current is handled by bulk capacitance in a design.
- **Measured Current:** The continuous current during a Transmit with the radio transmitter at specified power.
- Inrush Current: The input current during power up, or a reset.
- Registered Power: Registered to tower. Receive active for SMS. No data is sent.

Additional Information for the MTSMC-H5 Serial Device

Mode	Average (mA)	Mode description
IDLE mode (WCDMA)		
AT+CFUN=5	17ma	Full Function with power save
IDLE mode (GSM/EDGE)		
AT+CFUN=1	30ma	Normal mode: full functionality of the module
AT+CFUN=5 Reset hold AT+CFUN=7	17ma 13ma 17-30	Full function with power save. Deep sleep mode. Need to hold unit in reset event until wake up. Disabled TX and RX and AT commands. Full Function w/periodic power save.
Operative mode (WCDMA)		
WCDMA HSPA+ (0dBm)	286	WCDMA data call (Cat 14, TX = 0dBm)
WCDMA HSPA+ (22dBm)	610	WCDMA data call (Cat 14, TX = 22dBm)
Operative mode (EDGE)		
EDGE 4TX+2RX		EDGE Sending data mode
GSM900 PL5	495	
DCS1800 PL0	484	
Operative mode (GSM)		
GPRS 4TX+2RX		GPRS Sending data mode
GSM900 PL5	580	
DCS1800 PL0	438	

Set Phone and Registration Functionality +CFUN

AT+CFUN=[<fun>[,<rst>]]	Sets the functionality level in the ME.
<fun>	Power saving function mode.
0	+CFUN=0 is not operational. The board wakes it.
1	Mobile full functions with power saving disabled. **Default: 1.**
4	Disable both TX and RX.
5	Mobile full functions with power saving enabled.
7	CYCLIC SLEEP mode. In this mode, the serial interface is periodically enabled while CTS is active. If characters are recognized on the serial interface, the ME stays active for 2 seconds after the last character was sent or received. ME exits SLEEP mode only, if AT+CFUN=1 is entered.
<rst>	Reset flag.
0	Do not reset the ME before setting it to <fun> function level.
1	Reset the device. The device is fully functional after the reset. This value is available only for <fun> = 1

Notes

- Issuing **AT+CFUN=4[,0]** actually causes the device to perform either a network deregistration or a SIM deactivation.
- Enabling power saving reduces power consumption during idle time, thus allowing a longer standby time with a given battery capacity.
  - To place the device in power saving mode, set the **<fun>** parameter to value = 5 and the line **DTR** (RS232) to **OFF**.
  - Once in power saving, the **CTS** line switch to the **OFF** status to signal that the device is really in power saving condition.
  - During the power saving condition, before sending any **AT** command on the serial line, set the **DTR** to **ON** (0V) to exit from power saving and wait for the **CTS** (RS232) line to go in **ON** status.
- Power saving does not affect the network behavior of the device. Even during the power save condition the device remains registered on the network and reachable for incoming calls or SMS. If a call comes in during the power save, the device will wake up and proceed normally with the unsolicited incoming call code.
- When the device detects a connected USB port, the power saving mode is not allowed.
- In CYCLIC SLEEP mode (**AT+CFUN=7**) CTS line toggles slowly, the toggle delay is about 2 seconds.
- In CYCLIC SLEEP mode (**AT+CFUN=7**) during incoming voice call the CTS line continues to toggle.

GSM Power Saving Modes for Serial Devices

The H5 serial devices provide a function that reduces the power consumption when they are in IDLE state (waiting for a call), allowing a longer activity with a given battery capacity. You can configure the power saving function in several modes as needed.

To verify the power saving modes supported by your device, use the AT+CFUN=? command.

AT+CFUN=? +CFUN: (0,1,2,4,5,7,9),(0) OK	Legacy device.
AT+CFUN=? +CFUN: (0,1,2,4,5,7,9),(0, 1) OK	Device supports all modes.
AT+CFUN=? +CFUN: (0,1,4,5,7),(0, 1) OK	Device in the H5 family.

To select the power saving mode for your device, use the following AT Command:

AT+CFUN=[<fun>[,<rst>]]

Example

Check the current mode:

AT+CFUN?
+CFUN: 1
OK
CFUN = 1, device with full functionality and power saving disabled (factory setting)

RTS Control of Power Mode AT+CFUN=9.

Device in power saving mode, this command forces the module to monitor the RTS control line indicating if the user application (DTE) is ready to receive data from the module (DCE):

- **RTS OFF**: This condition causes the module (DCE) to power down its serial port and stays in CFUN=0 or CFUN=9 mode, in accordance with the entered command.
- **RTS ON:** This condition causes the module (DCE) to power up its serial port and enters CFUN=1 mode (Normal Operative Mode, factory setting).

DTR Control of Power Mode AT+CFUN=5

In CFUN=5 mode, the module monitors the DTR line, indicating if the user application (running on the DTE) is ready to operate:

- **DTR OFF:** The module enters power saving mode (11- 20ma)
- **DTR ON:** The module detects this control line condition and exits power saving mode.

In AT+CFUN=7 mode, the module forces CTS=OFF when it enters power saving mode. After exiting power saving mode, it forces CTS=ON.

CTS control line indicates permission from the DCE for the DTE to send data to the DCE. When the module is not ready to receive data (e.g.: commands) it ties up the CTS line, when it is ready to receive data it ties down the CTS line. The user application can monitor the CTS control line to check if the module is ready for commands, in accordance with V.24 Standard

Notes

- When the module is powered ON the power saving function is disabled (CFUN=1, factory setting) in order to guarantee the data exchange between the H5 device and the user device; for this reason the CFUN mode command should be entered after every power up.
- The protocol implementation of the module requires a delay between consecutive activation of CFUN=1 and CFUN=4 (or vice versa) modes. It is suggested you use a delay of 10 sec.
- The power saving function does not affect the network activity of the module. During the power saving mode the module remains registered on the network and reachable for incoming calls or SMS. If a call comes in during the power saving mode, the module will wake up and proceed normally with the unsolicited incoming call code.
- Assume that the module is in power saving mode. The paging time range is 0.5 - 2.1 sec, depending on DRX time set by network. When the module wakes up from the power saving mode, it takes a maximum of 150 ms before checking the DTR line coming from the DTE. If a command is received during power saving, the module needs at least 0.5-2.1 sec +150 ms to be ready. Use a delay of at least 2250 ms between opening the port (DTR=ON) and sending commands.

Chapter 4 – Device Specific Regulatory Information

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

FCC Part 15

FCC Identifier	RI7HE910
Equipment Class	Part 15 Class Computing Device Peripheral
Notes	WWAN Module
FCC Rule Parts	15B
Approval	Single Modular

FCC Grant Parts 22, 24, and 27

FCC Identifier	RI7HE910
Equipment Class	PCS Licensed Transmitter
Notes	WWAN Module
Approval	Single Modular

FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designators
22H	824.2 - 824.2	1.995	1.0 PM	300KGXW
22H	824.2 - 848.8	0.997	1.0 PM	300KG7W
22H	826.4 - 846.4	0.446	1.0 PM	4M20F9W
27	1712.4 - 1752.6	0.226	1.0 PM	4M20F9W
24E	1850.2 - 1909.8	0.993	1.0 PM	300KGXW
24E	1850.2 - 1909.8	0.38	1.0 PM	300KG7W
24E	1852.4 - 1907.6	0.243	1.0 PM	4M20F9W

Power listed is conducted. The maximum antenna gain including cable loss for compliance with radiated power limits, RF exposure requirements and the categorical exclusion requirements of 2.1091 is 5.22 dBi for part 22H, 3.31 dBi for part 24E and 6.45 dBi for part 27. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operated in conjunction with any antenna or transmitter not described under this FCC id, except in accordance with FCC multi-transmitter product procedures. The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements. Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.

This device contains GSM functions that are not operational in the U.S. Territories. This filing is only applicable for U.S. operations.

Industry Canada

Certification Number/No. de Certification	5131A-HE910
Type of Radio Equipment/Genre de Matériel	Advanced Wireless Services Equipment (1710-1755 MHz and 2110-2155 MHz) Cellular Mobile GSM (824-849 MHz) Modular Approval PCS Mobile (1850-1910 MHz)
Model/Modele	HE910

Specification/ Cahier des Charges	Issue/ Édition	From Frequency/ De Fréquences	To Frequency/ Á Fréquences	Emission Designation/ Designation D'émission	Minimum Power	Maximum Power
RSS133	5.0	1.85 G	1.91 G	241KGXW	993 mW	993 mW
RSS133	5.0	1.852 G	1.908 G	4M09F9W	243 mW	243 mW
RSS132	2.0	824.2 M	848.8 M	248KG7W	997 mW	997 mW
RSS139	2.0	1.712 G	1.753 G	4M06F9W	226 mW	226 mW
RSS133	5.0	1.85 G	1.91 G	252KG7W	380 mW	380 mW
RSS132	2.0	826.4 M	846.4 M	4M07F9W	446 mW	446 mW
RSS132	2.0	824.2 M	848.8 M	240KGXW	1.995 mW	1.995 mW

EMC, Safety, and R&TTE Directive Compliance

Hereby, MULTI-TECH SYSTEMS INC, declares that these SocketModem Cell and iCell HSPA+ modules are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

In order to satisfy the essential requirements of 1999/5/EC Directive, the module is compliant with the following standards:

RF spectrum use (R&TTE art. 3.2)	EN 301 511 V9.0.2 EN 301 908-1 V5.2.1 EN 301 908-2 V5.2.1 EN 300 440-2 V1.4.1 (1)
EMC (R&TTE art. 3.1b)	EN 301 489-1 V1.9.2 EN 301 489-3 V1.4.1 (1) EN 301 489-7 V1.3.1 EN 301 489-24 V1.5.1
Health & Safety (R&TTE art. 3.1a)	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 EN 62311:2008

(1)Only applicable to MTSMC-H5-MI-GP and MTSMC-H5-IP-GP product version.

The conformity assessment procedure referred to in Article 10 and detailed in Annex IV of Directive 1995/5/EC has been followed with the involvement of the following Notified Body:

AT4 wireless, S.A.
Parque Tecnologico de Andalucía
C/ Severo Ochoa 2
295990 Campanillas – Málaga
SPAIN
Notified Body No: 1909

Thus, the following marking is included on the product:

CE 1909

There is no restriction for the commercialization of this device in all European Union countries.

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

Council Directive 2004/108/EC of 15 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 2006/95/EC of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

and

Council Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Chapter 5 – Carrier Specific Information

Notice for Devices that Use Aeris Radios

One component of your device is a radio. A radio algorithm prevents your device from repeatedly attempting to connect to the network when the radio:

- cannot establish a packet data connection or
- fails to access the application server.

When writing applications for your devices, ensure that your applications do not interfere with the radio's connection retry algorithm. If you fail to do so, Aeris might block network access for your devices.

After your devices reach the end of their commercial lifespan, you must remove them from the Aeris network. To do so, remove power from the devices and remove their antennas. If your devices continue to attempt to register with the network after you cancel device subscriptions, Aeris can bill you for any traffic generated by those devices.

Chapter 6 – Application Notes

LED Interface

The LED signal indicates the SocketModem working status. Refer to the mechanical drawing for LED locations.

LED 1 – Heartbeat – IP and –GP Builds Only

LED 1 Signal	Heartbeat LED
OFF	No power to the unit.
Blinking	Power on.

LED 2 – Link Status – All Builds

LED 2 Signal	Link Status LED	
OFF	No power to the unit.	
ON	Continuously lit	Powered and connected, but not transmitting or receiving.
	Slow blink (-0.2Hz)	Powered and searching for a connection.
	Faster blink (-3Hz)	Transmitting or receiving.

Note:

For non-IP builds, to ensure that the Link Status LED works properly, issue the following AT Command sequence to the GPIO:

AT#GPIO=1,0,2

AT#SLED=2

LED 3 – Signal Strength –IP and –GP Builds Only

LED 3 Signal	Signal Strength LED	
OFF	No signal.	
		+CSQ
	GSM	99
	HSDPA	99
Blinking	The faster the LED blinks, the stronger the signal.	
	1.5 s flash	**+CSQ**
	GSM	5-10
	HSDPA	4-10
	600ms flash	**+CSQ**
	GSM	11-20
	HSDPA	11-20
	200ms flash	**+CSQ**
	GSM	21-31
	HSDPA	21-31

LED 4 – GPS Status – GP Builds

LED 4 Signal	GPS Status LED	
OFF	No power to the unit.	
ON	Continuously lit	Satellite not acquired.
	Blinking	Satellite acquired.

RF Performances

RF performances are compliant with the ETSI recommendation 05.05 and 11.10. The module's radio transceiver meets the requirements of 3GPP Release 5 & 6. All values indicated are conducted.

Receiver Features

Category	Description
GSM 850 Sensitivity	< -109 dBm
E-GSM 900 Sensitivity	< -106 dBm
DCS 1800 Sensitivity	< -105 dBm
PCS 1900 Sensitivity	< -105 dBm
UMTS Band I 2100 Sensitivity	< -109 dBm
UMTS Band II 1900 Sensitivity	< -108 dBm
UMTS Band V 850 Sensitivity	< -110 dBm
UMTS Band VI 800 Sensitivity	< -110 dBm

Transmitter Features

Category	Description
Maximum output power (GSM 850 / GSM 900)	+32 dBm ± 1 dBm GSMK mode (class 4) +27 dBm ± 1 dBm 8PSK mode (class E2)
Maximum output power (DCS 1800 / PCS 1900)	+29 dBm ± 1 dBm GSMK mode (class 1) +26 dBm ± 1 dBm 8PSK mode (class E2)
Maximum output power (UMTS Band II 1900, V 850, &VI 800)	+23 dBm ± 1 dBm (class 3)
Maximum output power (UMTS Band I 2100)	+23 dBm ± 1 dBm (class 3)

RF Connection and Antenna

The RF connector on the SocketModem is a UFL standard type. See the Universal Socket Developer Guide for antenna details.

Frequency Bands

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels	TX - RX offset
GSM850	824.2- 848.8	869.2 - 893.8	128 - 251	45 MHz
EGSM900	890.0 - 914.8	935.0 - 959.8	0 - 124	45 MHz
	880.2 - 889.8	925.2 - 934.8	975 - 1023	45 MHz
DCS1800	1710.2 - 1784.8	1805.2 - 1879.8	512 - 885	95MHz
PCS1900	1850.2 - 1909.8	1930.2 - 1989.8	512 - 810	80MHz
WCDMA850 (band V)	826.4 - 846.6	871.4 - 891.6	Tx: 4132 - 4233 Rx: 4357 - 4458	45MHz
WCDMA900 (band VIII)	882.4 - 912.6	927.4 - 957.6	Tx: 2712 - 2863 Rx: 2937 - 3088	45MHz
WCDMA1700 (band IV)	1710.4 - 1755.6	2112.4 - 2167.6	Tx: 1312 - 1513 Rx: 9662 - 9938	400MHz
WCDMA1900 (band II)	1852.4 - 1907.6	1932.4 - 1987.6	Tx: 9262 - 9538 Rx: 9662 - 9938	80MHz
WCDMA2100 (band I)	1922.4 - 1977.6	2112.4 - 2167.6	Tx: 9612 - 9888 Rx: 10562 - 10838	190MHz