

SocketModem[®] Cell LTE

MTSMC-Lxx Device Guide

SocketModem® Cell LTE Developer Guide

Models: MTSMC-LEU1, MTSMC-LEU1-U, MTSMC-LAT1, MTSMC-LAT1-U, MTSMC-LVW2, MTSMC-LVW2-U

Part Number: S000614, Version 1.6

Copyright

This publication may not be reproduced, in whole or in part, without the specific and express prior written permission signed by an executive officer of Multi-Tech Systems, Inc. All rights reserved. **Copyright © 2017 by Multi-Tech Systems, Inc.**

Multi-Tech Systems, Inc. makes no representations or warranties, whether express, implied or by estoppels, with respect to the content, information, material and recommendations herein and specifically disclaims any implied warranties of merchantability, fitness for any particular purpose and non-infringement.

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.

Trademarks and Registered Trademarks

Multi-Tech, and the Multi-Tech logo, and SocketModem are trademarks and registered trademarks of Multi-Tech Systems, Inc. All other products and technologies are the trademarks or registered trademarks of their respective holders.

Legal Notices

The MultiTech products are not designed, manufactured or intended for use, and should not be used, or sold or re-sold for use, in connection with applications requiring fail-safe performance or in applications where the failure of the products would reasonably be expected to result in personal injury or death, significant property damage, or serious physical or environmental damage. Examples of such use include life support machines or other life preserving medical devices or systems, air traffic control or aircraft navigation or communications systems, control equipment for nuclear facilities, or missile, nuclear, biological or chemical weapons or other military applications (“Restricted Applications”). Use of the products in such Restricted Applications is at the user’s sole risk and liability.

MULTITECH DOES NOT WARRANT THAT THE TRANSMISSION OF DATA BY A PRODUCT OVER A CELLULAR COMMUNICATIONS NETWORK WILL BE UNINTERRUPTED, TIMELY, SECURE OR ERROR FREE, NOR DOES MULTITECH WARRANT ANY CONNECTION OR ACCESSIBILITY TO ANY CELLULAR COMMUNICATIONS NETWORK. MULTITECH WILL HAVE NO LIABILITY FOR ANY LOSSES, DAMAGES, OBLIGATIONS, PENALTIES, DEFICIENCIES, LIABILITIES, COSTS OR EXPENSES (INCLUDING WITHOUT LIMITATION REASONABLE ATTORNEYS FEES) RELATED TO TEMPORARY INABILITY TO ACCESS A CELLULAR COMMUNICATIONS NETWORK USING THE PRODUCTS.

The MultiTech products and the final application of the MultiTech products should be thoroughly tested to ensure the functionality of the MultiTech products as used in the final application. The designer, manufacturer and reseller has the sole responsibility of ensuring that any end user product into which the MultiTech product is integrated operates as intended and meets its requirements or the requirements of its direct or indirect customers. MultiTech has no responsibility whatsoever for the integration, configuration, testing, validation, verification, installation, upgrade, support or maintenance of such end user product, or for any liabilities, damages, costs or expenses associated therewith, except to the extent agreed upon in a signed written document. To the extent MultiTech provides any comments or suggested changes related to the application of its products, such comments or suggested changes is performed only as a courtesy and without any representation or warranty whatsoever.

Contacting MultiTech

Knowledge Base

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

Support Portal

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

Support

Business Hours: M-F, 8am to 5pm CT

Country	By Email	By Phone
Europe, Middle East, Africa:	support@multitech.co.uk	+(44) 118 959 7774
U.S., Canada, all others:	support@multitech.com	(800) 972-2439 or (763) 717-5863

Warranty

To read the warranty statement for your product, visit www.multitech.com/warranty.go. For other warranty options, visit www.multitech.com/es.go.

World Headquarters

Multi-Tech Systems, Inc.
 2205 Woodale Drive, Mounds View, MN 55112
 Phone: (800) 328-9717 or (763) 785-3500
 Fax (763) 785-9874

Contents

Product Overview	6
Product Overview.....	6
Documentation	6
Product Build Options	7
Mechanical Drawings.....	8
MTSMC-Lxxx.....	8
MTSMC-Lxxx-U	9
Specifications.....	10
MTSMC-LAT1 and MTSMC-LAT1-U Specifications	10
MTSMC-LVW2 and MTSMC-LVW2-U Specifications	11
MTSMC-LEU1 and MTSMC-LEU1-U Specifications.....	12
Underwriters Laboratories, Inc. Required Global Positioning System (GPS) Statement	13
Device Reset.....	13
.....	13
Powering Down Your Device	14
UART DC Electrical Characteristics.....	14
Absolute Maximum Rating.....	14
Electrical Characteristics Other Pins	15
Pinout Specifications.....	15
Pin Availability by Build.....	16
Power Measurements.....	17
MTSMC-LAT1 Power Draw.....	17
MTSMC-LAT1-U Power Draw	17
MTSMC-LVW2 Power Draw	18
MTSMC-LVW2-U Power Draw	18
MTSMC-LEU1 Power Draw.....	18
MTSMC-LEU1-U Power Draw.....	19
Mounting Hardware.....	19
Recommended Parts.....	19
Antennas	20
Antenna System Cellular Devices.....	20
Requirements for Cellular Antennas with regard to FCC/IC Compliance	20
PTCRB Requirements	20
Antenna Overview	20
Laird Antenna	20
Wieson Antenna.....	21
LTE Antenna Diversity	22

Selecting Antennas	22
Placing External Antennas	22
Placing GPS Antennas	22
Antenna Approvals and Safety Considerations	22
Diversity and Power Draw	23
GPS Antenna Specifications	23
MultiTech Ordering Information.....	23
Antenna Specifications.....	23
OEM Integration	23
FCC & IC Information to Consumers	23
FCC Grant Notes.....	24
Host Labeling.....	24
Safety Information.....	25
Handling Precautions	25
Radio Frequency (RF) Safety	25
Sécurité relative aux appareils à radiofréquence (RF).....	25
Interference with Pacemakers and Other Medical Devices	26
Potential interference	26
Precautions for pacemaker wearers	26
Vehicle Safety.....	26
Device Maintenance	26
User Responsibility.....	27
Regulatory Information.....	28
EMC, Safety, and R&TTE Directive Compliance	28
47 CFR Part 15 Regulation Class B Devices	28
Industry Canada Class B Notice.....	28
FCC Grant Information	29
MTSMC-LAT1 and MTSMC-LAT1-U	29
MTSMC-LVW2 and MTSMC-LVW2-U	31
Industry Canada Certification	31
MTSMC-LAT1 and MTSMC-LAT1-U	32
MTSMC-LVW2 and MTSMC-LVW2-U	34
Environmental Notices.....	36
Waste Electrical and Electronic Equipment Statement	36
WEEE Directive.....	36
Instructions for Disposal of WEEE by Users in the European Union	36
REACH Statement	36
Registration of Substances.....	36
Substances of Very High Concern (SVHC)	36
Restriction of the Use of Hazardous Substances (RoHS)	38
Information on HS/TS Substances According to Chinese Standards	39

Information on HS/TS Substances According to Chinese Standards (in Chinese)	40
Labels	41
Approvals and Certifications	41
Example Labels.....	41
Index.....	43

Product Overview

Product Overview

SocketModem Cell models are complete, ready-to-integrate communications devices that offer standards-based LTE performance. These quick-to-market communications devices allow developers to add wireless communication to products with a minimum of development time and expense. SocketModem Cell models are based on industry-standard open interfaces and use MultiTech's Universal Socket design.

Documentation

The following documentation is available at multitech.com/support.

Document	Description	Part Number
SocketModem Cell LTE Device Guide	This document. Provides overview, safety and regulatory information, design considerations, schematics, and device information.	S000614
Universal Developer Kit 2.0 Developer Guide	Information for developing with the MTUDK2 Developer Kit. Includes an overview, design considerations, schematics, and installation and operation information.	S000610
Universal Socket Developer Guide	Information for developing with the MTSMI-UDK Developer Kit. Includes an overview, design considerations, schematics, and installation and operation information.	S000342
USB Driver Installation Guide	Instructions for installing USB drivers on Linux and Windows Systems.	S000616
Getting Started with AT Commands for LEU1 Devices	AT Command release notes and basic operations for MTSMC-LEU1 and MTSMC-LEU1-U Devices.	S000615
Getting Started with AT Commands for LAT1 Devices	AT Command release notes and basic operations for MTSMC-LAT1 and MTSMC-LAT1-U Devices.	S000617
Telit LE910 AT Commands Reference Guide	For LAT1 and LEU1 . Lists AT Commands and parameters used to configure your device, used with firmware version 17.00.5x3	80421ST10585A Rev 3
Getting Started with AT Commands for LVW2 Devices	AT Command release notes and basic operations for MTSMC-LVW2 and MTSMC-LVW2-U Devices.	S000618 (pending)
Telit LE 910 AT Commands Reference Guide	For LVW2 . Lists AT Commands and parameters used to configure your device, used with firmware version 17.01.571	80407ST10116a Rev 12

Product Build Options

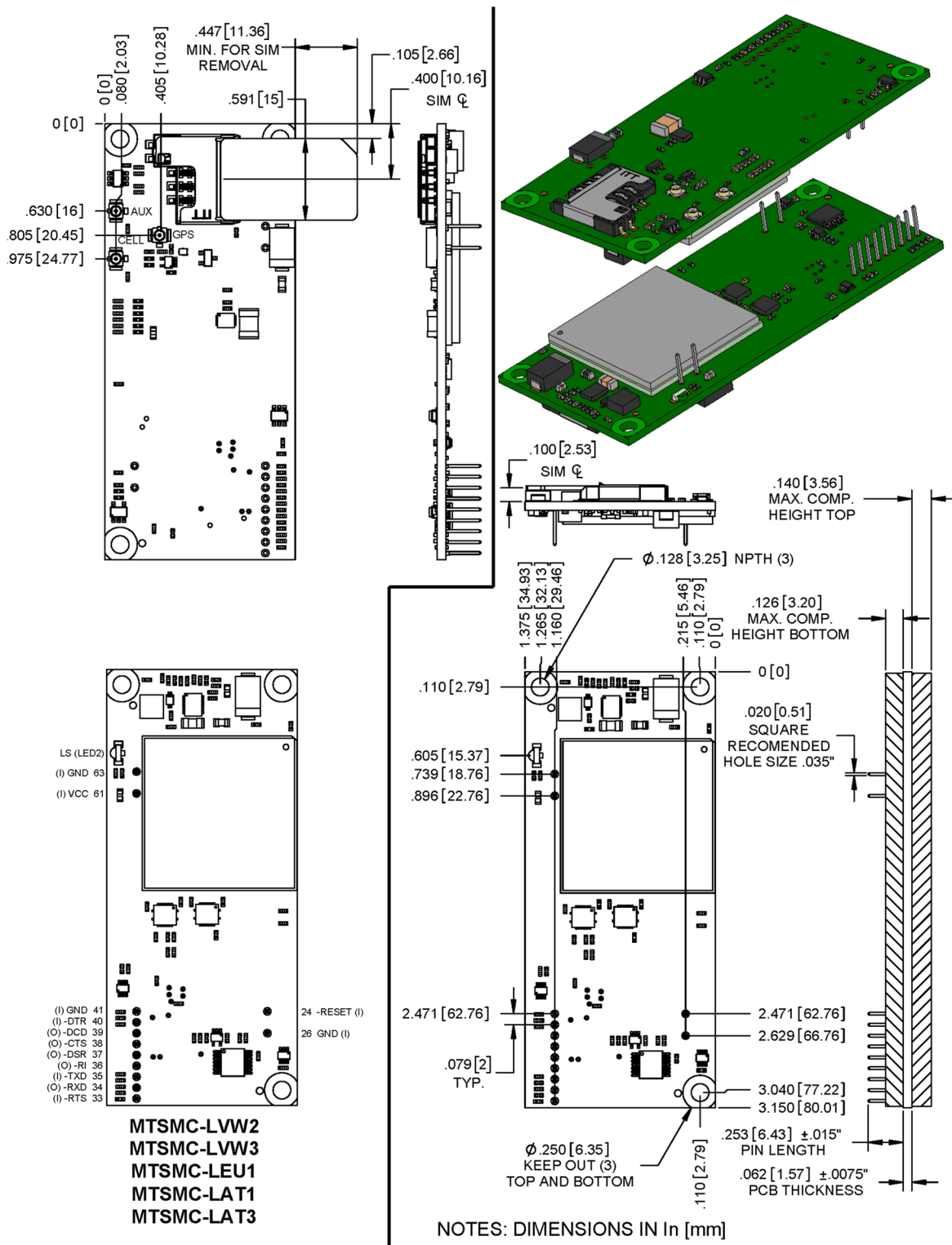
Product	Description	Carrier/Region
MTSMC-LVW2	4G LTE embedded cellular modem with GPS/GLONASS (Serial Interface)	Verizon
MTSMC-LVW2-U	4G LTE embedded cellular modem with GPS/GLONASS (USB Interface)	Verizon
MTSMC-LEU1	4G LTE with HSPA+ fallback embedded cellular modem with GPS/GLONASS (Serial Interface)	Europe/Australia
MTSMC-LEU1-U	4G LTE with HSPA+ fallback embedded cellular modem with GPS/GLONASS (USB Interface)	Europe/Australia
MTSMC-LAT1	4G LTE with HSPA+ fallback embedded cellular modem with GPS/GLONASS (Serial Interface)	AT&T/North America
MTSMC-LAT1-U	4G LTE with HSPA+ fallback embedded cellular modem with GPS/GLONASS (USB Interface)	AT&T/North America
Developer Kits		
Use either of the following developer kits with MTSMC devices.		
MTUDK2-ST-Cell	Developer Kit for SocketModem, and Dragonfly cellular devices.	All
MTSMI-UDK	Developer Kit for cellular, analog, BlueTooth, and WiFi SocketModems.	All

Note:

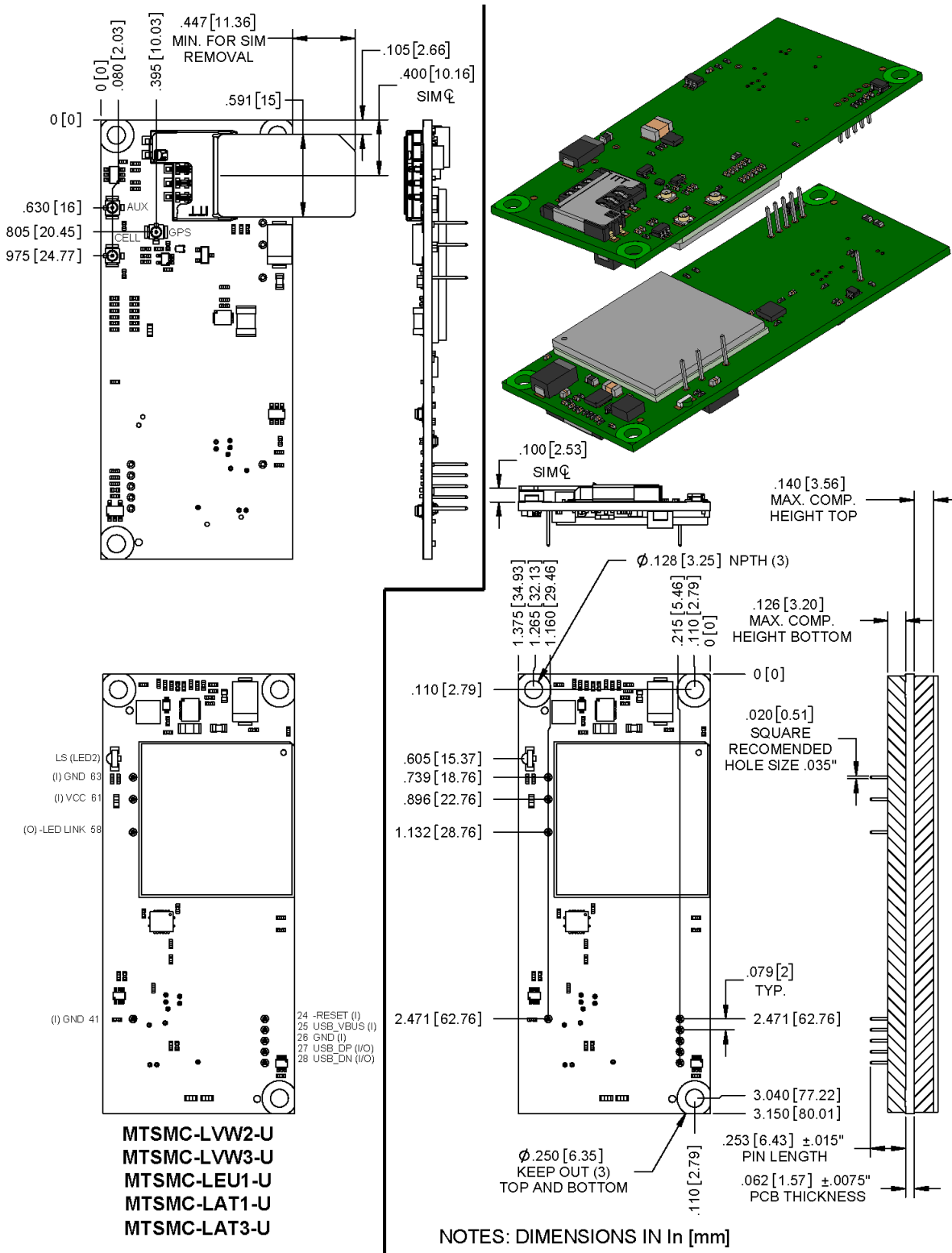
- These units ship without network activation.
- To connect them to the cellular network, you need a cellular account. For more information, refer to Account Activation.
- The complete product code may end in .Rx. For example, MTSMC-LAT1.Rx, where R is revision and x is the revision number.
- All builds can be ordered individually or in 50-packs. Add SP to the model number for a single pack.

Mechanical Drawings

MTSMC-Lxxx



MTSMC-Lxxx-U



Specifications

MTSMC-LAT1 and MTSMC-LAT1-U Specifications

Category	Description
General	
Standards	LTE 3GPP Release 9
	HSPA+ 21/GPRS fallback
	USB Interface is CDC-ACM compliant
TCP/IP Functions	FTP, SMTP, SSL, TCP, UDP
Frequency Bands	4G: 700 (B17)/850 (B5)/AWS 1700 (B4)/1900 (B2)
	3G: 850 (B5)/1900 (B2)
	2G: 850/1900
Speed	
Data Speed	LTE: 100 Mbps downlink/50 Mbps uplink
	HSPA+: 21 Mbps downlink/5.76 Mbps uplink
Interface	
USB Interface	USB 2.0 high speed 480 Mbps
Serial Modem Interface	Up to 921.6 Kbps
Physical Description	
Weight	0.4 oz. (10 g)
Dimensions	Refer to Mechanical Drawing for Dimensions.
Connectors	
Antenna Connector	3 surface mount UFL connectors for cellular, Rx diversity/MIMO, and GPS
SIM	1.8V and 3V SIM holder for mini-SIM card
Environment	
Operating Temperature	-40° C to +85° C
Storage Temperature	-40° C to +85° C
Humidity	20%-90% RH, non-condensing
Power Requirements	
Input Voltage	3.3 - 5 VDC

Category	Description
SMS	
SMS	Point-to-Point messaging
	Mobile-Terminated SMS
	Mobile-Originated SMS
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
Radio Compliance	FCC Part 22, 24, 27
Safety Compliance	UL 60950-1 2nd ED
	cUL 60950-1 2nd ED
	IEC 60950-1 2nd ED
Network Compliance	PTCRB
Carrier	AT&T

MTSMC-LVW2 and MTSMC-LVW2-U Specifications

Category	Description
General	
Standards	LTE 3GPP Release 9
	USB Interface is CDC-ACM compliant
TCP/IP Functions	FTP, SMTP, SSL, TCP, UDP
Frequency Bands	4G: 700 (B13) / AWS 1700 (B4)
Speed	
Data Speed	LTE: 100 Mbps downlink/50 Mbps uplink
Interface	
USB Interface	USB 2.0 high speed compatible
UART Interface	0-1.8V
Physical Description	
Weight	0.4 oz. (10 g)
Dimensions	Refer to Mechanical Drawing for Dimensions.
Connectors	
Antenna Connector	3 surface mount UFL connectors for cellular, Rx diversity/MIMO, and GPS
SIM	1.8V and 3V SIM holder for mini-SIM card
Environment	
Operating Temperature	-40° C to +85° C

Category	Description
Storage Temperature	-40° C to +85° C
Humidity	20%-90% RH, non-condensing
Power Requirements	
Operating Voltage	3.1 V to 3.5 V, normal is 3.3 V
Input Voltage	3.3-5 VDC
SMS	
SMS	Point-to-Point messaging
	Mobile-Terminated SMS
	Mobile-Originated SMS
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
Radio Compliance	FCC Part 27
Safety Compliance	UL 60950-1 2nd ED
	cUL 60950-1 2nd ED
	IEC 60950-1 2nd ED
Carrier	Verizon

MTSMC-LEU1 and MTSMC-LEU1-U Specifications

Category	Description
General	
Standards	LTE 3GPP Release 9
	HSPA+ 21/GPRS fallback
	USB Interface is CDC-ACM compliant
TCP/IP Functions	FTP, SMTP, SSL, TCP, UDP
Frequency Bands	4G: 800 (B20)/1800 (B3)/2600 (B7)
	3G: 850 (B5)/900 (B8)/2100 (B1)
	2G: 900/1800
Speed	
Data Speed	LTE: 100 Mbps downlink/50 Mbps uplink
	HSPA+: 42 Mbps downlink/5.76 Mbps uplink
Interface	
USB Interface	USB 2.0 high speed compatible
UART Interface	0-1.8V

Category	Description
Physical Description	
Weight	0.4 oz. (10 g)
Dimensions	Refer to Mechanical Drawing for Dimensions.
Connectors	
Antenna Connector	3 surface mount UFL connectors for cellular, Rx diversity/MIMO, and GPS
SIM	1.8V and 3V SIM holder for mini-SIM card
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	3.1 V to 3.5 V, normal is 3.3 V
Input Voltage	3.3-5 VDC
SMS	
SMS	Point-to-Point messaging
	Mobile-Terminated SMS
	Mobile-Originated SMS
Certifications and Compliance	
EMC Compliance	EN55022 Class B, EN55024
Radio Compliance	EN 301 511, EN 301 489-1, EN 301 489-7, EN 301 489-24
Safety Compliance	IEC 60950-1 2nd ED
	AS/NZS 60950.1

Underwriters Laboratories, Inc. Required Global Positioning System (GPS) Statement

Note the following information required by Underwriters Laboratories: Underwriters Laboratories, Inc.

Underwriters Laboratories Inc. (“UL”) has not tested the performance or reliability of the Global Positioning System (“GPS”) hardware, operating software or other aspects of this product. UL has only tested for fire, shock or casualties as outlined in UL’s Standard(s) for Safety. UL60950-1 Certification does not cover the performance or reliability of the GPS hardware and GPS operating software. UL MAKES NO REPRESENTATIONS, WARRANTIES OR CERTIFICATIONS WHATSOEVER REGARDING THE PERFORMANCE OR RELIABILITY OF ANY GPS RELATED FUNCTIONS OF THIS PRODUCT.

Device Reset

For the -B02 models, reset is connected to the 3G_ONOFF signal. Refer to the 3G_ONOFF topic for functionality.

Powering Down Your Device

CAUTION: Failing to properly power down the device before removing power may corrupt your device's file system.

To properly power down your device, use the following sequence or pull 3G_ONOFF signal low:

1. Issue the AT#SHDN command.
2. Wait 30 seconds.
3. Power off or disconnect power.

Note: If you send AT#SHDN and do not remove power AND the 3G_ONOFF line is high, the control chip on the device turns the radio back on after 60 seconds.

UART 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 Min	VIL Max	VIH Min	VIH Max	VOL Min	VOL Max	VOH Min	VOH 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	--	--	--	--	--	--	--	--
J58	-LED LINK	--	--	--	--	0	0.45	2.85	3.3
J61	VCC	--	--	--	--	--	--	--	--
J63	GND	--	--	--	--	--	--	--	--

Pinout Specifications

Pin	Signal Name	Logic Level Voltage ¹	In/Out	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
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 Availability by Build

Pin	Signal Name	Serial Only	USB Only
J24	–RESET	X	X
J25	USB VBUS		X
J26	GND	X	X
J27	USB DP		X
J28	USB DN		X
J33	–RTS	X	
J34	–RXD	X	
J35	–TXD	X	
J36	–RI	X	
J37	–DSR	X	
J38	–CTS	X	
J39	–DCD	X	
J40	–DTR	X	
J41	GND	X	X
J58	–LED LINK		X
J61	VCC	X	X
J63	GND	X	X

Power Measurements

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

Note:

The following notes apply to the following tables.

- **Tx Pulse:** The average peak current during a GSM850 transmission burst period or HSDPA/LTE connection. The transmission burst duration for GSM850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).
- **Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power.
- **Inrush Charge:** The input current during power up, or a reset.

MTSMC-LAT1 Power Draw

Radio Protocol	Sleep Mode w/ Connection to Live Network (Active SIM Installed) (Amps)	Sleep Mode Current (Amps)	Cellular Connection Idle (No Data) (Amps)	(AVG) Measured Current (Amps) at Max Power
3.3 Volts				
WCDMA	0.0049	0.021	0.026	0.558
LTE	0.027	0.033	0.034	0.401
5 Volts				
WCDMA	0.012	0.012	0.018	0.556
LTE	0.013	0.020	0.019	0.4000

MTSMC-LAT1-U Power Draw

Radio Protocol	Sleep Mode Current (Amps)	Cellular Connection Idle (No Data) (Amps)	(AVG) Measured Current (Amps) at Max Power	TX Pulse (AVG) Amplitude Current (Amps) for GSM850 or Peak Current for HSDPA/LTE)	Total Inrush Charge Measured in Millicoulomb (mC)
3.3 Volts					
GPRS	N/A	0.056	0.750	3.48	2.65
LTE	N/A	0.048	0.909	N/A	N/A
5 Volts					
GPRS	N/A	0.032	0.293	2	3.64
LTE	N/A	0.029	0.560	N/A	N/A

MTSMC-LVW2 Power Draw

Radio Protocol	Sleep Mode Current (If Applicable) (Amps)	Cellular Call Box Connection No Data (Amps)	Average Measured Current (Amps) at Maximum Power	TX Pulse (Avg) Amplitude Current (Amps)) for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge Measured in Millicoulombs (mC)
3.3 Volts					
LTE	0.006	0.026	0.691	0.768	1.24
5 Volts					
LTE	0.004	0.015	0.445	0.492	1.24

MTSMC-LVW2-U Power Draw

Radio Protocol	Sleep Mode Current (If Applicable) (Amps)	Cellular Call Box Connection No Data (Amps)	Average Measured Current (Amps) at Maximum Power	TX Pulse (Avg) Amplitude Current (Amps)) for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge Measured in Millicoulombs (mC)
3.3 Volts					
LTE	N/A	0.049	0.766	N/A	1.72
5 Volts					
LTE	N/A	0.027	0.500	N/A	1.57

MTSMC-LEU1 Power Draw

Radio Protocol	Sleep Mode Current (If Applicable) (Amps)	Cellular Call Box Connection No Data (Amps)	Average Measured Current (Amps) at Maximum Power	TX Pulse (Avg) Amplitude Current (Amps)) for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge Measured in Millicoulombs (mC)
3.3 Volts					
EGSM 900Mhz	0.012	0.031	0.549	2.42	1.13
LTE	0.010	0.059	0.990	N/A	N/A
5 Volts					
EGSM 900Mhz	0.006	0.018	0.236	1.34	1.09
LTE	0.004	0.049	0.610	N/A	N/A

MTSMC-LEU1-U Power Draw

Radio Protocol	Sleep Mode Current (If Applicable) (Amps)	Cellular Call Box Connection No Data (Amps)	Average Measured Current (Amps) at Maximum Power	TX Pulse (Avg) Amplitude Current (Amps)) for GSM850 or Peak Current for HSDPA/LTE	Total Inrush Charge Measured in Millicoulombs (mC)
3.3 Volts					
EGSM 900Mhz	N/A	0.0561	0.780	2.75	1.65
LTE	N/A	0.075	0.980	N/A	N/A
5 Volts					
EGSM 900Mhz	N/A	0.030	0.285	1.50	1.42
LTE	N/A	0.043	0.610	N/A	N/A

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 (Penn Engineering & Manufacturing)	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

Antennas

Antenna System Cellular Devices

The cellular/wireless performance depends on the implementation and antenna design. The integration of the antenna system into the product is a critical part of the design process; therefore, it is essential to consider it early so the performance is not compromised. If changes are made to the device's certified antenna system, then recertification will be required by specific network carriers.

Requirements for Cellular Antennas with regard to FCC/IC Compliance

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

PTCRB Requirements

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.

Antenna Overview

- For MTSMC-LAT1 models, we tested with the Laird LTE Antenna.
- For MTSMC-LEU1 or MTSMC-LVW2 models, we tested with the Wieson LTE Antenna

Laird Antenna

The cellular radio portion of the device is approved with the following antenna or for alternate antennas meeting the given specifications.

Manufacturer:	Laird Technologies
Description:	Dipole Blade Antenna for LTE
Model Number:	DBA6927C1-FSMAM
MultiTech Part Number:	95218149LF

MultiTech ordering information:

Model	Quantity
ANLTE1-2HRA	2
ANLTE1-10HRA	10
ANLTE1-50HRA	50

LTE Antenna Specifications

Category	Description	
Frequency Range	698-806 MHz	
	824-894 MHz	
	880-960 MHz	
	1710-1880 MHz	
	1850-1990 MHz	
	1920-2170 MHz	
	2100-2500 MHz	
	2500-2690 MHz	
Impedance	50 Ohms	
VSWR	< 2.5:1	
Typical Radiated Gain	Low band	0.5 dBi (698-960 MHz)
	High band	2.2 dBi (1710-2700 MHz)
Radiation	Omni-directional	
Polarization	Linear	

Wieson Antenna

Devices were approved with the following antenna:

Manufacturer:	Wieson
Description:	LTE GY115HT467-017
Model Number:	11320Y11194A1
MultiTech Part Number:	45009890L

MultiTech ordering information:

Model	Quantity
ANLTE2-1HRA	1
ANLTE2-10HRA	10
ANLTE2-50HRA	50

Antenna Specifications

Category	Description
Frequency Range	.069~0.96GHz, 1.71~2.17GHz, 2.3GHz~2.69GHz
Impedance	50 Ohms
VSWR	VSWR should not exceed 3:1 at any point across the bands of operation

Category	Description
Peak Gain	3.53 dBi
Radiation	Omni-directional
Polarization	Linear Vertical

LTE Antenna Diversity

Antenna diversity uses two receive antennas to improve the downlink connection (cell tower to mobile). It has no effect on the uplink (mobile to cell tower).

Antenna diversity is useful in environments where the signal arrives at the device after bouncing off or around buildings or other objects. The bounced signal may be attenuated by going through semi-transparent (to the signal) objects. Each signal alteration can change its magnitude, phase, orientation, or polarization. This complex environment can exist in cities, inside buildings or in traffic. In this environment, signal paths from the cell tower form an interference pattern of peaks and nulls. These peaks and nulls can be very close together.

Antenna diversity provides an advantage in complex environments because if one receive antenna has a poor signal due to an interference null pattern, the other antenna is likely not in the null and has better reception. The radio compares the reception from both receive antennas and uses the one with the strongest signal.

Important: You must deploy with two antennas, unless your carrier has authorized you to deploy with one antenna.

Selecting Antennas

Select an antenna based on your product and application. Typically, both antennas are the same and either can be the main receive antenna.

Placing External Antennas

Antennas are usually a quarter wavelength apart from each other. With multiband radios where the quarter wavelengths in each band are diverse from each other, this rule may not be practical. Choose spacing based on the band used most often or the band with connection difficulty. Some environments are harsher on particular bands. MultiTech products have antenna connectors at the best spacing for the product size.

Placing antennas in close proximity to each other is not optimal, but you can do it if necessary. It depends on the signal strength to and from each antenna.

If the antennas are too close together for your application, use a similar antenna on a short cable for the second receive only antenna.

Placing GPS Antennas

GPS antennas need a clear view of the sky. Position the GPS antenna so the diversity antennas do not block its view of the sky.

Antenna Approvals and Safety Considerations

Note the following:

- Carriers conduct antenna diversity tests.
- There are no EMC concerns about antenna diversity.

- All antennas need to have a minimum flammability rating.
- Safety requirements depend on your final product.
- Unless otherwise noted, antennas certified by MultiTech are not approved for outdoor use. Do not extend these antennas outside of any building.

Diversity and Power Draw

There are no significant power draw differences.

GPS Antenna Specifications

Manufacturer:	Trimble
Description:	GPS Antenna with low noise amplifier
Model Number:	66800-52
Multi-Tech Part Number:	45009665L

MultiTech Ordering Information

Model	Quantity
ANGPS-1MM	1
ANGPS-10MM	10
ANGPS-50MM	50

Antenna Specifications

Category	Description
Frequency Range	1575.24 MHz
Impedance	50 Ohms
VSWR	2.0:1 max
Gain	10-30 dBi
LNA Current Consumption	40 mA max
Noise Figure	< 2dB
Polarization	RHCP
Input voltage	3.0V MM 0.2V

OEM Integration

FCC & IC Information to Consumers

The user manual for the consumer must contain the statements required by the following FCC and IC regulations: 47 C.F.R. 15.19(a)(3), 15.21, 15.105 and RSS-Gen Issue 3, Dec 2010; 7.1.2 and 7.1.3

FCC Grant Notes

The OEM should follow all the grant notes listed below. Otherwise, further testing and device approvals may be necessary.

FCC Definitions

Portable: (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

Mobile: (§2.1091) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

Actual content pending Grant: *This device is a mobile device with respect to RF exposure compliance. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons, and must not be collocated or operate in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product guidelines. Installers and end-users must be provided with specific information required to satisfy RF exposure compliance for installations and final host devices. (See note under Grant Limitations.) Compliance of this device in all final host configurations is the responsibility of the Grantee.*

Note: Host design configurations constituting a device for portable use (<20 cm from human body) require separate FCC/IC approval.

Note: Only use antennas approved respectively as listed for the unlicensed radios (Bluetooth/Wi-Fi)

Host Labeling

The following statements are required to be on the host label:

This device contains FCC ID: {Add the FCC ID of the specific device}

This device contains equipment certified under IC ID: {Add the IC ID of the specific device}

For additional labeling requirements, see the product's Labeling Requirements. For the FCC and IC IDs, see specific certificate information in the Regulatory Statement chapter.

Safety Information

Handling Precautions

To avoid damage due to the accumulation of static charge, use proper precautions when handling any cellular device. Although input protection circuitry has been incorporated into the devices to minimize the effect of static build-up, use proper precautions to avoid exposure to electronic discharge during handling and mounting the device.

Radio Frequency (RF) Safety

Due to the possibility of radio frequency (RF) interference, it is important that you follow any special regulations regarding the use of radio equipment. Follow the safety advice given below.

- Operating your device close to other electronic equipment may cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.
- Different industries and businesses restrict the use of cellular devices. Respect restrictions on the use of radio equipment in fuel depots, chemical plants, or where blasting operations are in process. Follow restrictions for any environment where you operate the device.
- Do not place the antenna outdoors.
- Switch OFF your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and is illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.
- Switch OFF your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your wireless device in hospitals and any other place where medical equipment may be in use.

Sécurité relative aux appareils à radiofréquence (RF)

À cause du risque d'interférences de radiofréquence (RF), il est important de respecter toutes les réglementations spéciales relatives aux équipements radio. Suivez les conseils de sécurité ci-dessous.

- Utiliser l'appareil à proximité d'autres équipements électroniques peut causer des interférences si les équipements ne sont pas bien protégés. Respectez tous les panneaux d'avertissement et les recommandations du fabricant.
- Certains secteurs industriels et certaines entreprises limitent l'utilisation des appareils cellulaires. Respectez ces restrictions relatives aux équipements radio dans les dépôts de carburant, dans les usines de produits chimiques, ou dans les zones où des dynamitages sont en cours. Suivez les restrictions relatives à chaque type d'environnement où vous utiliserez l'appareil.
- Ne placez pas l'antenne en extérieur.
- Éteignez votre appareil sans fil dans les avions. L'utilisation d'appareils électroniques portables en avion est illégale: elle peut fortement perturber le fonctionnement de l'appareil et désactiver le réseau cellulaire. S'il ne respecte pas cette consigne, le responsable peut voir son accès aux services cellulaires suspendu ou interdit, peut être poursuivi en justice, ou les deux.
- Éteignez votre appareil sans fil à proximité des pompes à essence ou de diesel avant de remplir le réservoir de votre véhicule de carburant.

- Éteignez votre appareil sans fil dans les hôpitaux ou dans toutes les zones où des appareils médicaux sont susceptibles d'être utilisés.

Interference with Pacemakers and Other Medical Devices

Potential interference

Radio frequency energy (RF) from cellular devices can interact with some electronic devices. This is electromagnetic interference (EMI). The FDA helped develop a detailed test method to measure EMI of implanted cardiac pacemakers and defibrillators from cellular devices. This test method is part of the Association for the Advancement of Medical Instrumentation (AAMI) standard. This standard allows manufacturers to ensure that cardiac pacemakers and defibrillators are safe from cellular device EMI.

The FDA continues to monitor cellular devices for interactions with other medical devices. If harmful interference occurs, the FDA will assess the interference and work to resolve the problem.

Precautions for pacemaker wearers

If EMI occurs, it could affect a pacemaker in one of three ways:

- Stop the pacemaker from delivering the stimulating pulses that regulate the heart's rhythm.
- Cause the pacemaker to deliver the pulses irregularly.
- Cause the pacemaker to ignore the heart's own rhythm and deliver pulses at a fixed rate.

Based on current research, cellular devices do not pose a significant health problem for most pacemaker wearers. However, people with pacemakers may want to take simple precautions to be sure that their device doesn't cause a problem.

- Keep the device on the opposite side of the body from the pacemaker to add extra distance between the pacemaker and the device.
- Avoid placing a turned-on device next to the pacemaker (for example, don't carry the device in a shirt or jacket pocket directly over the pacemaker).

Vehicle Safety

When using your device in a vehicle:

- Do not use this device while driving.
- Respect national regulations on the use of cellular devices in vehicles.
- If incorrectly installed in a vehicle, operating the wireless device could interfere with the vehicle's electronics. To avoid such problems, use qualified personnel to install the device. The installer should verify the vehicle electronics are protected from interference.
- Using an alert device to operate a vehicle's lights or horn is not permitted on public roads.
- UL evaluated this device for use in ordinary locations only. UL did NOT evaluate this device for installation in a vehicle or other outdoor locations. UL Certification does not apply or extend to use vehicles or outdoor applications or in ambient temperatures above 40° C.

Device Maintenance

When maintaining your device:

- Do not attempt to disassemble the device. There are no user serviceable parts inside.

- Do not expose your device to any extreme environment where the temperature or humidity is high.
- Do not expose the device to water, rain, or spilled beverages. It is not waterproof.
- Do not place the device alongside computer discs, credit or travel cards, or other magnetic media. The information contained on discs or cards may be affected by the device.
- Using accessories, such as antennas, that MultiTech has not authorized or that are not compliant with MultiTech's accessory specifications may invalidate the warranty.

If the device is not working properly, contact MultiTech Technical Support.

User Responsibility

Respect all local regulations for operating your wireless device. Use the security features to block unauthorized use and theft.

Regulatory Information

EMC, Safety, and R&TTE Directive Compliance



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

Council Directive 2014/30/EU on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 2014/35/EU on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

and

Council Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment;

and

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

47 CFR Part 15 Regulation Class B Devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Class B Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.

This device complies with Industry Canada license-exempt RSS standard(s). The operation is permitted for the following two conditions:

1. the device may not cause interference, and

2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

FCC Grant Information

MTSMC-LAT1 and MTSMC-LAT1-U

FCC Part 15

FCC Identifier:	RI7LE910NA
Equipment Class:	Part 15 Class Computing Device Peripheral
Notes:	LTE/3G/2G Module
FCC Rule Parts:	15B
Approval:	Single Modular

FCC Parts 22, 24, and 27

FCC Identifier:	RI7LE910NA
Equipment Class:	PCS Licensed Transmitter
Notes:	LTE/3G/2G Module
Approval:	Single Modular

FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designators
22H	824.4-848.2	1.64059	1.0 PM	248KGXW
22H	824.4-848.2	0.42554	1.0 PM	248KG7W
24E	1850.2-1909.8	0.93325	1.0 PM	253KGXW
24E	1850.2-1909.8	0.23439	1.0 PM	246KG7W
22H	826.4-846.6	0.21727	1.0 PM	4M16G9W
22H	826.4-846.6	0.20845	1.0 PM	4M18G9W
22H	826.4-846.6	0.20989	1.0 PM	4M17G9W
24E	1852.4-1907.6	0.22336	1.0 PM	4M15G9W
24E	1852.4-1907.6	0.19231	1.0 PM	4M17G9W
24E	1852.4-1907.6	0.18155	1.0 PM	4M17G9W
27	706.5-713.5	0.18408	1.0 PM	4M52G7W

FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designators
27	706.5-713.5	0.16406	1.0 PM	4M52D7W
27	709-711.0	0.18967	1.0 PM	8M98G7W
27	709-711.0	0.17458	1.0 PM	9M01D7W
22H	826.5-846.5	0.20559	1.0 PM	4M51G7W
22H	826.5-846.5	0.16904	1.0 PM	4M50D7W
22H	829.0-844.0	0.19409	1.0 PM	9M00G7W
22H	829.0-844.0	0.16331	1.0 PM	9M00D7W
27	1712.5-1752.5	0.17378	1.0 PM	4M51G7W
27	1712.5-1752.5	0.17906	1.0 PM	4M51D7W
27	1715.0-1750.0	0.1803	1.0 PM	9M01G7W
27	1715.0-1750.0	0.1766	1.0 PM	8M89D7W
27	1720.0-1745.0	0.18113	1.0 PM	17M9G7W
27	1720.0-1745.0	0.19454	1.0 PM	18M0D7W
24E	1852.5-1907.5	0.19815	1.0 PM	4M50G7W
24E	1852.5-1907.5	0.18793	1.0 PM	4M51D7W
24E	1855.0-1905.0	0.18155	1.0 PM	9M01G7W
24E	1855.0-1905.0	0.18323	1.0 PM	8M97D7W
24E	1860.0-1900.0	0.1803	1.0 PM	17M9G7W
24E	1860.0-1900.0	0.17579	1.0 PM	17M9D7W

Single Modular Approval. Power output listed is conducted. This device is approved for mobile and fixed use with respect to RF exposure compliance, and may only be marketed to OEM installers. The antenna(s) used for this transmitter, as described in this filing, must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operate in conjunction with any other antenna or transmitter, except in accordance with FCC multi0-transmitter product procedures. Installers and end-users must be provided with operating conditions for satisfying RF exposure compliance. Maximum permitted antenna gain/cable loss: 700 MHz: 8.74 dBi, 850MHz: 6.93 dBi, 1700MHz: 5.0 dBi, 1900Mhz: 2.51 dBi.

MTSMC-LVW2 and MTSMC-LVW2-U

FCC Part 15

FCC Identifier:	RI7LE910SV
Equipment Class:	Part 15 Class Computing Device Peripheral
Notes:	LTE Module
FCC Rule Parts:	15B
Approval:	Single Modular

FCC Parts 27

FCC Identifier:	RI7LE910SV
Equipment Class:	Licensed Non-Broadcast Station Transmitter
Notes:	LTE Module
Approval:	Single Modular

FCC Rule Parts	Frequency Range (MHz)	Output Watts	Frequency Tolerance	Emission Designators
27	779.5 - 784.5	0.19543	14.0 Hz	5M52G7D
27	779.5 - 784.5	0.20749	14.0 Hz	4M53D7D
27	782.0 - 782.0	0.19231	14.0 Hz	8M95G7D
27	782.0 - 782.0	0.17824	14.0 Hz	8M95D7D
27	1712.5-1752.5	0.22856	27.0 Hz	4M52G7D
27	1712.5-1752.5	0.21928	27.0 Hz	4M53D7D
27	1715.0-1752.5	0.22336	27.0 Hz	8M95G7D
27	1715.0-1752.5	0.19123	27.0 Hz	8M94D7D
27	1720.0-1745.0	0.21928	27.0 Hz	17M9G7D
27	1720.0-1745.0	0.20559	27.0 Hz	17M9D7D

Single Modular Approval. Power output listed is conducted. This device is approved for mobile and fixed use with respect to RF exposure compliance, and may only be marketed to OEM installers. The antenna(s) used for this transmitter, as described in this filing, must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operate in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures. Installers and end-users must be provided with operating conditions for satisfying RF exposure compliance. Maximum permitted antenna gain/cable loss: LTE Band 4: 5.0 dBi, LTE Band 13: 9.16 dBi.

Industry Canada Certification

MTSMC-LAT1 and MTSMC-LAT1-U

Certification Number/No. de Certification	5131A-LE910NA
Type of Radio Equipment/Genre de Matériel	Advanced Wireless Services Equipment/Matériel des services sans fil évolués (1710-1755 MHz and 2110-2155 MHz)
	Cellular Mobile GSM/ Téléphone cellulaire mobile GSM (824-849 MHz)
	Cellular Mobile New Technologies/Téléphone cellulaire mobile - Nouvelles technologies (824-849 MHz)
	PCS Mobile/Téléphone mobile SCP (1850-1910 MHz)
	Mobile Broadband Service (MBS)/Matériel du service mobile à large bande (SMLB) (698-756 and (777-787)
	Modular Approval/Approbation modulaire
Model/Modèle	LE910-NAG

Specification/Charge	Issue/Édition	From Frequency/Départ des Fréquences	To Frequency/À Fréquences	Emmission Designation/Designation D'émission	Minimum Power	Maximum Power
RSS130	1.0	709 M	711 M	8M98G7W	189.67 mW	189.67 mW
RSS132	3.0	826.5 M	846.5 M	4M51G7W	205.59 mW	205.59 mW
RSS132	3.0	824.2 M	848.2 M	248KG7W	425.54 mW	425.54 mW
RSS133	6.0	1.85 G	1.91 G	253KGXW	933.25 mW	933.25 mW
RSS132	3.0	826.4 M	846.6 M	4M17G9W	209.89 mW	209.89 mW
RSS130	1.0	706.5 M	713.5 M	4M52D7W	164.06 mW	164.06 mW
RSS132	3.0	826.4 M	846.6 M	4M16G9W	217.27 mW	217.27 mW
RSS132	3.0	826.5 M	846.5 M	4M50D7W	169.04 mW	169.04 mW
RSS133	6.0	1.85 G	1.91 G	246KG7W	234.39 mW	234.39 mW
RSS133	6.0	1.852 G	1.908 G	4M17G9W	181.55 mW	181.55 mW

Specification/Classification des Charges	Issue/Édition	From Frequency/Département des Fréquences	To Frequency/À Fréquences	Emission Designation/Designation D'émission	Minimum Power	Maximum Power
RSS132	3.0	829 M	844 M	9M00D7W	163.31 mW	163.31 mW
RSS139	2.0	1.713 G	1.752 G	4M51G7W	173.78 mW	173.78 mW
RSS133	6.0	1.852 G	1.908 G	4M17G9W	192.31 mW	192.31 mW
RSS139	2.0	1.72 G	1.745 G	18M0D7W	194.54 mW	194.54 mW
RSS139	2.0	1.713 G	1.752 G	4M51D7W	179.06 mW	179.06 mW
RSS133	6.0	1.852 G	1.908 G	4M50G7W	198.15 mW	198.15 mW
RSS132	3.0	829 M	844 M	9M00G7W	194.09 mW	194.09 mW
RSS132	3.0	826.4 M	846.6 M	4M18G9W	208.45 mW	208.45 mW
RSS139	2.0	1.72 G	1.745 G	17M9G7W	181.13 mW	181.13 mW
RSS133	6.0	1.86 G	1.9 G	17M9G7W	180.3 mW	180.3 mW
RSS130	1.0	709 M	711 M	9M01D7W	174.58 mW	174.58 mW
RSS139	2.0	1.715 G	1.75 G	8M89D7W	176.6 mW	176.6 mW
RSS133	6.0	1.852 G	1.908 G	4M51D7W	187.93 mW	187.93 mW
RSS133	6.0	1.852 G	1.908 G	4M15G9W	223.36 mW	223.36 mW
RSS133	6.0	1.855 G	1.905 G	9M01G7W	181.55 mW	181.55 mW
RSS139	2.0	1.715 G	1.75 G	9M01G7W	180.3 mW	180.3 mW
RSS132	3.0	824.2 M	848.2 M	248KGXW	1.641 W	1.641 W
RSS130	1.0	706.5 M	713.5 M	4M52G7W	184.08 mW	184.08 mW

Specification/Charge des Charges	Issue/Édition	From Frequency/Départ des Fréquences	To Frequency/À Fréquences	Emission Designation/Designation D'émission	Minimum Power	Maximum Power
RSS133	6.0	1.86 G	1.9 G	17M9D7W	175.79 mW	175.79 mW
RSS133	6.0	1.855 G	1.905 G	8M97D7W	183.23 mW	183.23 mW

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the Industry Canada issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements and procedures issued by Industry Canada. The equipment for which this certificate is issued shall not be manufactured, imported distributed, leased, offered for sale or sold unless the equipment complies with the applicable technical specifications and procedures issued by Industry Canada.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance d'Industrie Canada et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux procédures d'Industrie Canada. Le matériel à l'égard duquel le présent certificat est délivré ne doit pas être fabriqué, importé, distribué, loué, mis en vente ou vendu à moins d'être conforme aux procédures et aux spécifications techniques applicable publiées par Industrie Canada.

MTSMC-LVW2 and MTSMC-LVW2-U

Certification Number/No. de Certification	5131A-LE910SV
Type of Radio Equipment/Genre de Matériel	Advanced Wireless Services Equipment/Matériel des services sans fil évolués (1710-1755 MHz and 2110-2155 MHz) Mobile Broadband Service (MBS)/Matériel du service mobile à large bande (SMLB) (698-756 and (777-787) Modular Approval/Approbation modulaire
Model/Modèle	LE910-SVG

Specification/Charge des Charges	Issue/Édition	From Frequency/Départ des Fréquences	To Frequency/À Fréquences	Emission Designation/Designation D'émission	Minimum Power	Maximum Power
BETS1	1.0	782 M	782 M	8M95D7W	178.24 mW	178.24 mW
RSS139	2.0	1.72 G	1.745 G	17M9G7W	219.28 mW	219.28 mW

Specification/Charger des Charges	Issue/Édition	From Frequency/Départ des Fréquences	To Frequency/À Fréquences	Emission Designation/Designation D'émission	Minimum Power	Maximum Power
RSS130	1.0	779.5 M	784.5 M	5M52G7W	195.43 mW	195.43 mW
RSS130	1.0	779.5 M	784.5 M	4M53D7W	207.49 mW	207.49 mW
RSS139	2.0	1.72 G	1.745 G	17M9D7W	205.59 mW	205.59 mW
RSS130	1.0	782 M	782 M	8M95G7W	192.31 mW	192.31 mW
RSS139	2.0	1.715 G	1.75 G	8M94D7W	192.31 mW	192.31 mW
RSS139	2.0	1.715 G	1.75 G	8M95G7W	223.36 mW	223.36 mW
RSS139	2.0	1.713 G	1.752 G	4M53D7W	219.28 mW	219.28 mW
RSS139	2.0	1.713 G	1.752 G	4M52G7W	228.56 mW	228.56 mW

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the Industry Canada issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements and procedures issued by Industry Canada. The equipment for which this certificate is issued shall not be manufactured, imported distributed, leased, offered for sale or sold unless the equipment complies with the applicable technical specifications and procedures issued by Industry Canada.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance d'Industrie Canada et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux procédures d'Industrie Canada. Le matériel à l'égard duquel le présent certificat est délivré ne doit pas être fabriqué, importé, distribué, loué, mis en vente ou vendu à moins d'être conforme aux procédures et aux spécifications techniques applicable publiées par Industrie Canada.

Environmental Notices

Waste Electrical and Electronic Equipment Statement

Note: This statement may be used in documentation for 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 MultiTech 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



REACH Statement

Registration of Substances

After careful review of the legislation and specifically the definition of an “article” as defined in EC Regulation 1907/2006, Title II, Chapter 1, Article 7.1(a)(b), it is our current view that Multi-Tech Systems, Inc. products would be considered as “articles.” In light of the definition in § 7.1(b) which requires registration of an article only if it contains a regulated substance that “is intended to be released under normal or reasonably foreseeable conditions of use,” our analysis is that Multi-Tech Systems, Inc. products constitute nonregisterable articles for their intended and anticipated use.

Substances of Very High Concern (SVHC)

Per the candidate list of Substances of Very High Concern (SVHC) published October 28, 2008 we have reviewed these substances and certify the Multi-Tech Systems, Inc. products are compliant per the EU “REACH” requirements of less than 0.1% (w/w) for each substance. If new SVHC candidates are published by the European Chemicals Agency, and relevant substances have been confirmed, that exceeds greater than 0.1% (w/w), Multi-Tech Systems, Inc. will provide updated compliance status.

Multi-Tech Systems, Inc. also declares it has been duly diligent in ensuring that the products supplied are compliant through a formalized process which includes collection and validation of materials declarations and selective materials analysis where appropriate. This data is controlled as part of a formal quality system and will be made available upon request.

Restriction of the Use of Hazardous Substances (RoHS)



Multi-Tech Systems, Inc.

Certificate of Compliance

2011/65/EU

Multi-Tech Systems, Inc. confirms that its embedded products comply with the chemical concentration limitations set forth in the directive 2011/65/EU of the European Parliament (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment - RoHS).

These MultiTech products do not contain the following banned chemicals¹:

- 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

Environmental considerations:

- Moisture Sensitivity Level (MSL) =1
- Maximum Soldering temperature = 260C (in SMT reflow oven)

¹Lead usage in some components is exempted by the following RoHS annex, therefore higher lead concentration would be found in some modules (>1000 PPM);

- Resistors containing lead in a glass or ceramic matrix compound.

Information on HS/TS Substances According to Chinese Standards

In accordance with China's Administrative Measures on the Control of Pollution Caused by Electronic Information Products (EIP) # 39, also known as China RoHS, the following information is provided regarding the names and concentration levels of Toxic Substances (TS) or Hazardous Substances (HS) which may be contained in Multi-Tech Systems Inc. products relative to the EIP standards set by China's Ministry of Information Industry (MII).

Hazardous/Toxic Substance/Elements

Name of the Component	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Printed Circuit Boards	O	O	O	O	O	O
Resistors	X	O	O	O	O	O
Capacitors	X	O	O	O	O	O
Ferrite Beads	O	O	O	O	O	O
Relays/Opticals	O	O	O	O	O	O
ICs	O	O	O	O	O	O
Diodes/ Transistors	O	O	O	O	O	O
Oscillators and Crystals	X	O	O	O	O	O
Regulator	O	O	O	O	O	O
Voltage Sensor	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
Speaker	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
Screws, Nuts, and other Hardware	X	O	O	O	O	O
AC-DC Power Supplies	O	O	O	O	O	O
Software /Documentation CDs	O	O	O	O	O	O
Booklets and Paperwork	O	O	O	O	O	O
Chassis	O	O	O	O	O	O

X Represents that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/Txxx-2006 Requirements for Concentration Limits.

O Represents that no such substances are used or that the concentration is within the aforementioned limits.

Information on HS/TS Substances According to Chinese Standards (in Chinese)

依照中国标准的有毒有害物质信息

根据中华人民共和国信息产业部 (MII) 制定的电子信息产品 (EIP) 标准—中华人民共和国《电子信息产品污染控制管理办法》(第 39 号), 也称作中国 RoHS, 下表列出了 Multi-Tech Systems, Inc. 产品中可能含有的有毒物质 (TS) 或有害物质 (HS) 的名称及含量水平方面的信息。

有害/有毒物质/元素

成分名称	铅 (PB)	汞 (Hg)	镉 (CD)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板	O	O	O	O	O	O
电阻器	X	O	O	O	O	O
电容器	X	O	O	O	O	O
铁氧体磁环	O	O	O	O	O	O
继电器/光学部件	O	O	O	O	O	O
ICs	O	O	O	O	O	O
二极管/晶体管	O	O	O	O	O	O
振荡器和晶振	X	O	O	O	O	O
调节器	O	O	O	O	O	O
电压传感器	O	O	O	O	O	O
变压器	O	O	O	O	O	O
扬声器	O	O	O	O	O	O
连接器	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
螺丝、螺母以及其它五金件	X	O	O	O	O	O
交流-直流电源	O	O	O	O	O	O
软件/文档 CD	O	O	O	O	O	O
手册和纸页	O	O	O	O	O	O
底盘	O	O	O	O	O	O

X 表示所有使用类似材料的设备中有害/有毒物质的含量水平高于 SJ/Txxx-2006 限量要求。

O 表示不含该物质或者该物质的含量水平在上述限量要求之内。

Labels

Approvals and Certifications

This device is an industry and/or carrier approved modem. In most cases, when integrated and used with an antenna system that was part of the MultiTech modem certification, additional approvals or certifications are not required for the device that you develop as long as the following requirements are met:

- **PTCRB Requirements:** The antenna system cannot be altered.
- **Model Identification:** The MultiTech model identification allows the carrier to verify the modem as one of its approved models. This information is located on the modem's label below the bar code.

Example Labels

Note: Actual labels vary depending on the regulatory approval markings and content.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

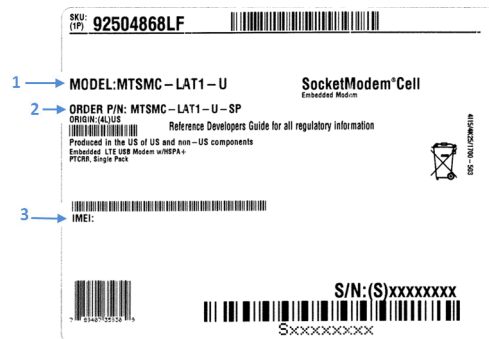
The label shown is not than actual size.

- 1 - Multi-Tech Model Identification.
- 2 - Multi-Tech Ordering Part Number.
- 3 - IMEI (International Mobile Equipment Identity).

MTSMC-LAT1 Package Label



MTSMC-LAT1-U Package Label



MTSMC-LAT1 Device Label



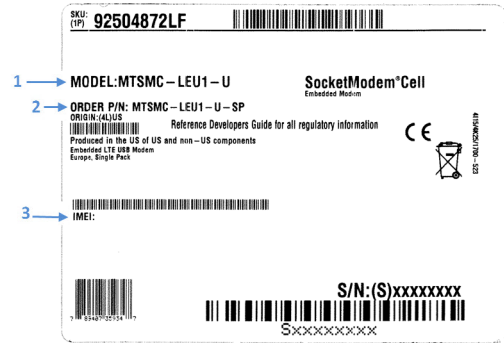
MTSMC-LAT1-U Device Label



MTSMC-LEU1 Package Label



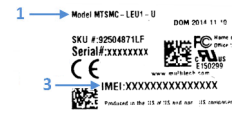
MTSMC-LEU1-U Package Label



MTSMC-LEU1 Device Label



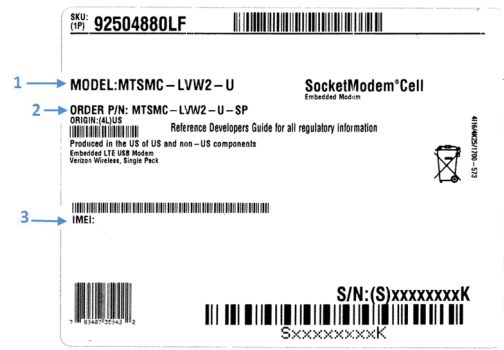
MTSMC-LEU1-U Device Label



MTSMC-LVW2 Package Label



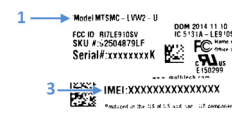
MTSMC-LVW2-U Package Label



MTSMC-LVW2 Device Label



MTSMC-LVW2-U Device Label



Index

A		G	
antenna	21	GPS	13
cellular devices.....	20	antenna.....	23
diversity.....	22	H	
GPS.....	23	hazardous substances	38
LTE.....	20	host labeling.....	23
AT#SHDN	14	I	
B		Industry Canada	
build options	7	Class B	28
C		MTSMC-LAT1	32
certification		MTSMC-LAT1-U.....	32
FCC	29 31	MTSMC-LVW2	34
Industry Canada	32 34	MTSMC-LVW2-U	34
Chinese hazardous substances		interférence des radiofréquences.....	25
Chinese version.....	40	K	
English version	39	KDB 447498 Section 8	23
Class B	28	L	
Industry Canada	28	labeling	
D		host	23
device		labels	41
maintenance	26	LTE	
device reset.....	13	antenna.....	20
diversity.....	22	M	
documentation.....	6	maintenance	26
E		mechanical drawings.....	8 9
electrical characteristics, pins	15	model location	41
F		mounting hardware	19
FCC		MTSMC-LAT1.....	17 29 32
grant notes.....	23	MTSMC-LAT1-U.....	17 29 32
FCC certification		MTSMC-LEU1	18
MTSMC-LAT1	29	MTSMC-LEU1-U.....	19
MTSMC-LAT1-U.....	29	MTSMC-LVW2	18 31 34
MTSMC-LVW2.....	31	MTSMC-LVW2-U	18 31 34
MTSMC-LVW2-U	31	M	
FCC Notice		maintenance	26
Class B	28	mechanical drawings.....	8 9
		model location	41
		mounting hardware	19
		MTSMC-LAT1.....	17 29 32
		MTSMC-LAT1-U.....	17 29 32
		MTSMC-LEU1	18
		MTSMC-LEU1-U.....	19
		MTSMC-LVW2	18 31 34
		MTSMC-LVW2-U	18 31 34

P

power down14
power draw17 18 19
PTCRB20

R

radio frequency interference25
RoHS38

S

safety
 RF interference25
 vehicle26
shutdown14

specifications.....10 11 12
static.....25
sécurité
 interférences RF25

U

UL13
user responsibility27

V

vehicle safety26