GSM0508IG001

Expedite L10-G

Integration Guide

Version: 1.00

NOVATEL WIRELESS

Wednesday, May 07, 2014

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Warranty Information

This warranty applies to (a) products sold directly by Novatel Wireless, unless a different warranty is specified in a written agreement between Novatel Wireless and the purchaser; and (b) products sold to end users through a distributor authorized by Novatel Wireless, but only where the authorized distributor does not provide a separate warranty on such products, and Novatel Wireless has agreed to provide this warranty to such end users. If you purchased the product from an authorized distributor, please check whether this warranty from Novatel Wireless or a separate warranty from the distributor applies to your purchase. This warranty does not apply to any (i) accessories or batteries for the products; or (ii) demonstration samples or prototypes of the products. Unless otherwise provided in a written agreement between Novatel Wireless and the purchaser, all such accessories, batteries, samples or prototypes are provided by Novatel Wireless AS IS without any warranty of any kind.

Novatel Wireless warrants to the original purchaser of the product from Novatel Wireless or its authorized distributor (as applicable) that, for a period of one (1) year from the date of shipment of the product from Novatel Wireless, the product hardware will be substantially free from defects in material or workmanship under normal operation, and the product firmware will perform substantially in accordance with the product documentation provided by Novatel Wireless. Novatel Wireless does not warrant that (a) the product hardware or firmware will meet the purchaser's requirements; (b) the operation of the product hardware or firmware will be uninterrupted or error-free; or (c) the product, when integrated in, or combined with, other products or software not supplied by Novatel Wireless, will continue to perform substantially in accordance with the product documentation. This limited warranty is for the benefit of the original purchaser, and is not transferable.

During the warranty period, Novatel Wireless, at its expense and in its sole discretion, will repair the product, or replace the product with a corresponding or equivalent product, if it is determined to have a covered defect, provided that the purchaser first notifies Novatel Wireless (directly or through its authorized distributor from which the product was purchased) of any such defect, furnishes Novatel Wireless with a proof of purchase (if required), requests and obtains a return merchandize authorization (RMA) number from Novatel Wireless, and returns the product under that RMA to Novatel Wireless (or, at Novatel Wireless option, to its authorized distributor), with the shipping charges being prepaid by purchaser. If, upon reasonable examination of the returned product, Novatel Wireless does not substantiate the defect claimed by purchaser, or determines that the defect is not covered under this limited warranty, Novatel Wireless will not be required to repair or replace the product, but may instead reship the product to the purchaser (or, at Novatel Wireless' option, to its authorized distributor where the product can be made available to purchaser), in which case the purchaser shall be responsible for paying Novatel Wireless' cost for reshipping the product to purchaser (or to Novatel Wireless' authorized distributor), and Novatel Wireless' usual charges for unpacking, testing, and repacking the product for reshipment to

purchaser (or to Novatel Wireless' authorized distributor).Purchaser shall bear the risk of loss or damage in transit to any product returned by purchaser to Novatel Wireless, or any returned product not found to be defective or covered under this warranty, and reshipped by Novatel Wireless to purchaser (or to Novatel Wireless' authorized distributor). In the event Novatel Wireless repairs or replaces a defective product covered by this limited warranty, the repaired or replacement product will be covered under this limited warranty for the remainder of the original warranty period on the defective product, or a period of ninety (90) days, whichever is longer. If Novatel Wireless is unable to repair or replace a defective product covered by this limited warranty, Novatel Wireless will provide to purchaser a credit or a refund (at Novatel Wireless' option) of the original purchase price (excluding taxes and shipping charges). Any returned and replaced product, or any product for which Novatel Wireless has furnished a credit or a refund, becomes the property of Novatel Wireless.

Novatel Wireless shall not have any obligation to provide any firmware bug fixes, upgrades or new releases except as may be necessary to correct any covered defect of which purchaser notifies Novatel Wireless in writing during the warranty period. Novatel Wireless, from time to time and in its sole discretion, may make available for download on its website (www.novatelwireless.com), or may provide via email, certain firmware bug fixes, upgrades or new releases for the product. Download and use of any such bug fixes, upgrades or new releases is subject to all of the applicable terms and conditions of Novatel Wireless' technical support policy as posted and updated on its website.

Novatel Wireless shall have no obligation under this limited warranty for (a) normal wear and tear; (b) the cost of procurement of substitute products; or (c) any defect that is (i) discovered by purchaser during the warranty period but for which purchaser does not request an RMA number from Novatel Wireless, as required above, until after the end of the warranty period, (ii) caused by any accident, misuse, abuse, improper installation, handling or testing, or unauthorized repair or modification of the product, (iii) caused by use of any materials not supplied by Novatel Wireless, or by use of the product other than in accordance with its documentation, or (iv) the result of electrostatic discharge, electrical surge, fire, flood or similar causes.

The purchaser (or its customers, as applicable) shall be solely responsible for the proper configuration, testing and verification of the Novatel Wireless product prior to deployment in the field, and for ensuring that any end user product or system into which the Novatel Wireless product is integrated or incorporated operates as intended and meets the requirements of purchaser (or its customers). Novatel Wireless shall have no responsibility whatsoever for the integration, configuration, testing, verification, installation, upgrade, support or maintenance of any such end user product or system, or for any liabilities, damages, costs or expenses associated therewith.

NOVATEL WIRELESS' SOLE RESPONSIBILITY AND PURCHASER'S SOLE REMEDY UNDER THIS LIMITED WARRANTY SHALL BE FOR NOVATEL WIRELESS TO REPAIR OR REPLACE THE PRODUCT (OR IF REPAIR OR REPLACEMENT IS NOT POSSIBLE, PROVIDE A CREDIT OR REFUND OF THE PURCHASE PRICE) AS PROVIDED ABOVE. NOVATEL WIRELESS EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, SATISFACTORY PERFORMANCE AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL NOVATEL WIRELESS BE LIABLE FOR ANY INDIRECT, SPECIAL, EXEMPLARY, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OR INTERRUPTION OF USE, DATA, REVENUES OR PROFITS) RESULTING FROM A BREACH OF THIS WARRANTY OR BASED ON ANY OTHER LEGAL THEORY, EVEN IF NOVATEL WIRELESS HAS BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH DAMAGES.

Some jurisdictions may require a longer warranty period than specified above and, accordingly, for products sold in those jurisdictions the applicable warranty period shall be extended as required under the laws of those jurisdictions. Furthermore, some jurisdictions may not allow the disclaimer of implied warranties or the exclusion or limitation of incidental or consequential damages, so the above disclaimer, limitation or exclusion may not apply to products sold in those jurisdictions. This limited warranty gives the purchaser specific legal rights and the purchaser may have other legal rights that vary from jurisdiction to jurisdiction.

This limited warranty shall be governed by the laws of the State of Texas, United States of America, without regard to conflict of laws principles. This limited warranty shall not be governed in any respect by the United Nations Convention on Contracts for the International Sale of Goods.

Regulatory Compliance

FCC CERTIFICATION

Novatel Wireless certifies that the Expedite L10-G GSM Radio Module complies with the RF requirements applicable to broadband PCS equipment operating under the authority of 47 CFR Part 24, Subpart E and Part 22 Subpart H of the FCC Rules and Regulations. This certification is contingent upon installation, operation and use of the Expedite L10-G module and its host product in accordance with all instructions provided to both the OEM and end user. When installed and operated in a manner consistent with the instructions provided, the Expedite L10-G module meets the maximum permissible exposure (MPE) limits for general population / uncontrolled exposure as defined in Section 1.1310 of the FCC Rules and Regulations.

The Expedite L10-G module is designed for use in a variety of host units, enabling the host platform to perform wireless data communications. However, there are certain criteria relative to integrating the modem into a host platform such as a PC, laptop, handheld, monitor and control unit, etc. that must be considered to ensure continued compliance with FCC compliance requirements.

Important Information for Canada/USA OEM Integrators

This section provides guidance for using the Expedite L10-G in host devices through the FCC Permissive Change process. When utilizing the permissive change process, Novatel Wireless, the grantee, is responsible for all integrations and must be consulted on all regulatory matters involving the Expedite L10-G.

The Expedite L10-G module is granted with FCC/IC modular approval for mobile[1] applications, and may be installed as a standalone[2] transmitter in final products meeting the following conditions. If the following conditions are followed, it may be used in final products without additional FCC/IC certification. Otherwise, additional FCC/IC approvals must be obtained.

[1]Mobile Device Definition – FCC defines as a transmitting antenna located at a distance ≥ 20cm from the user.
[2]Standalone is defined as a single transmitter transmitting as opposed to 2 or more transmitters transmitting simultaneously.

- The antenna connected to the Expedite L10-G module must be installed to provide at least 20 cm separation from the human body at all times.
- The Expedite L10-G module and transmitter antennas must not be co-located with any other transmitter or antenna within a host device.
- The transmitter antenna used with the Expedite L10-G module must not exceed the following level:

    - Cellular maximum permitted antenna gain: 5.39dBi
    - PCS band maximum permitted antenna gain: 3.31dBi
- To comply with the aspects of KDB996369, strict adherence to the design parameters in Section 4.1.1.3 Antenna And RF Signal Trace must be observed. Section 4.1.1.3 provides PCB RF trace design guidelines for the coplanar microstrip between the Expedite L10-G RF compression pads and the U.FL style coaxial connector.
- A label containing the FCC and Industry Canada IDs must be permanently affixed to the exterior of the host device into which the Expedite L10-G module is installed. The label may also be under a panel or battery pack if it is readily accessible and cannot be separated from the host device itself. The label must contain a statement similar to the following;
    - This device contains FCC ID: PKRNVWGSM0508
    - This equipment contains equipment certified under IC: 3229A-GSM0508

If any of these conditions are not met then additional information should be sought from the FCC or an FCC qualified test laboratory.

If the Expedite L10-G module is intended for use in a portable[1] device, the OEM integrator is responsible to design the product to comply with RF exposure, and must work with Novatel Wireless (the grantee) to satisfy FCC/IC SAR requirements. Refer to FCC OET Bulletin 65 Supplement C for information about FCC RF exposure compliance requirements for mobile and portable devices.

The system user manuals and other documentation must clearly indicate operating conditions that must be observed to ensure compliance with FCC/IC RF exposure guidelines and also include appropriate caution and warning statements and information.

The host device containing the Expedite L10-G module may also require compliance to FCC Part 15 Subpart B – Unintentional Radiators.

[1]Portable Device Definition – FCC defines as a transmitting antenna located at a distance ≤ 20cm from the user.

FCC NOTICE TO USERS

Novatel Wireless has not approved any changes or modifications to this device by the user. Any changes or modifications could void the users authority to operate the device. See 47 CFR Sec. 15.21. The 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. See 47 CFR Sec. 15.19.

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.

If the FCCID of the module is not visible when installed in the host platform, then a permanently attached or marked label must be displayed on the host unit referring to the module.

The label should contain wording such as:

Contains FCC ID: PKRNVWGSM0508
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.

Industry Canada

IC: 3229A-GSM0508 MODEL NUMBER: GSM0508

This device complies with Industry Canada RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

In order to use the Expedite L10-G module without any additional FCC certification the installation must meet the following conditions:

- The system antenna(s) connected to the Expedite L10-G module must be installed to provide at least 20 cm separation from the human body during normal operation.
- The system antennas must not be co-located with any other transmitter or antenna.
- The system antenna(s) used with the Expedite L10-G module must not exceed the following level:

    - Cellular maximum permitted antenna gain: 5.39dBi
    - PCS band maximum permitted antenna gain: 3.31dBi

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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Afin d'utiliser le Expedite L10-G module sans aucune certification de d'Industrie Canada supplémentaire l'installation doit satisfaire aux conditions suivantes:

- L'utilisation du système connectée au module de Expedite L10-G doit être installée pour fournir la séparation d'au moins 20 cm du corps humain pendant une opération normale.
- Les antennes du système ne doivent pas être colocalisés avec un autre émetteur ou antenne.
- L'utilisation du système utilisée avec le module de Expedite L10-G ne doit pas dépasser les niveaux suivants:

    - Cellulaires le permis gain maximal est de 5.39dBi
    - PCS groupent le gain maximal est de 3.31dBi

ROHS COMPLIANCE

As a part of Novatel Wireless' corporate policy of environmental protection, Novatel Wireless takes every step to ensure that the Expedite L10-G modules are designed and manufactured to comply to the European Union Directive 2002/95/EC for the Restriction of Hazardous Substances (RoHS).

CE (European Union Notice)

If this product has telecommunications functionality, it also complies with the essential requirements of the following EU Directive:

* R&TTE Directive 1999/5/EC

Compliance with these directives implies conformity to harmonized European standards (European Norms) that are listed in the EU Declaration of Conformity issued by Novatel Wireless Inc. for this product or product family.

This compliance is indicated by one of the following conformity markings placed on the product. This CE marking is valid for EU non-harmonized telecommunications products “CE 0560”

NCC NOTICE

「減少電磁波影響，請妥適使用」

NCC ID: CCAF133G0170T1

Important Safety Information

The following information applies to the devices described in this manual. Always observe all standard and accepted safety precautions and guidelines when handling any electrical device.

- Save this manual: it contains important safety information and operating instructions.
- Do not expose the Expedite L10-G product to open flames.
- Ensure that liquids do not spill onto the devices.
- Do not attempt to disassemble the product: Doing so will void the warranty. This product does not contain consumer-serviceable components.

The Enabler Expedite L10-G module may not be used in an environment where radio frequency equipment is prohibited or restricted in its use. This includes aircraft, airports, hospitals, and other sensitive electronic areas.

Do not operate RF devices in an environment that may be susceptible to radio interference resulting in danger, specifically;

- Areas where prohibited by the law.
    - Follow any special rules and regulations and obey all signs and notices. Always turn off the host device when instructed to do so, or when you suspect that it may cause interference or danger.
- Where explosive atmospheres may be present.
    - Do not operate your modem in any area where a potentially explosive atmosphere may exist. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death. Be aware of and comply with all signs and instructions.
- Users are advised not to operate the modem while they are at a refueling point or service station.
    - Users are reminded to observe restrictions on the use of radio equipment in fuel depots (fuel storage and distribution areas), chemical plants or where blasting operations are in progress.
- Areas with a potentially explosive atmosphere are often but not always clearly marked.
    - Potential locations can include gas stations, below deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), areas where the air contains chemicals or particles, such as grain, dust or metal powders, and any other area where you would normally be advised to turn off your vehicle engine.
- Near Medical and life support equipment.
    - Do not operate your modem in any area where medical equipment, or life support equipment may be located, or near any equipment that may be susceptible to any form of radio interference. In such areas, the host communications device must be turned off. The modem may transmit signals that could interfere with this equipment.
- On an aircraft, either on the ground or airborne.
    - In addition to FAA requirements, many airline regulations state that you must suspend wireless operations before boarding an airplane. Please ensure that the host device is turned off prior to boarding an aircraft in order to comply with these regulations. The modem can transmit signals that could interfere with various onboard systems and controls.

- While operating a vehicle
  - The driver or operator of any vehicle should not operate a wireless data device. Doing so will detract from the driver or operator's control and operation of that vehicle. In some countries, operating such communication devices while in control of a vehicle is an offense.

Disclaimer

The information and instructions contained within this publication comply with all FCC, GCF, PTCRB, R&TTE, IMEI and other applicable codes that are in effect at the time of publication. Novatel Wireless disclaims all responsibility for any act or omissions, or for breach of law, code or regulation, including local or state codes, performed by a third party.

Novatel Wireless strongly recommends that all installations, hookups, transmissions, etc., be performed by persons who are experienced in the fields of radio frequency technologies. Novatel Wireless acknowledges that the installation, setup and transmission guidelines contained within this publication are guidelines, and that each installation may have variables outside of the guidelines contained herein. Said variables must be taken into consideration when installing or using the product, and Novatel Wireless shall not be responsible for installations or transmissions that fall outside of the parameters set forth in this publication.

Novatel Wireless shall not be liable for consequential or incidental damages, injury to any person or property, anticipated or lost profits, loss of time, or other losses incurred by Customer or any third party in connection with the installation of the Products or Customer's failure to comply with the information and instructions contained herein.

Table of Contents

1

Introduction

The Expedite L10-G 2G data modem is a small wireless data modem providing 2G wireless data connectivity for portable and hand held computers, point-of-sale devices, and other machine-to-machine applications.

It is a compact, wireless OEM module that uses the Global System for Mobile Communications (GSM) international communications standard to provide two-way wireless capabilities. The Expedite L10-G module is a fully approved GSM device, enabling application-specific, two-way communication and control.

The small size of the Expedite L10-G module allows it to integrate easily into the application and packaging.

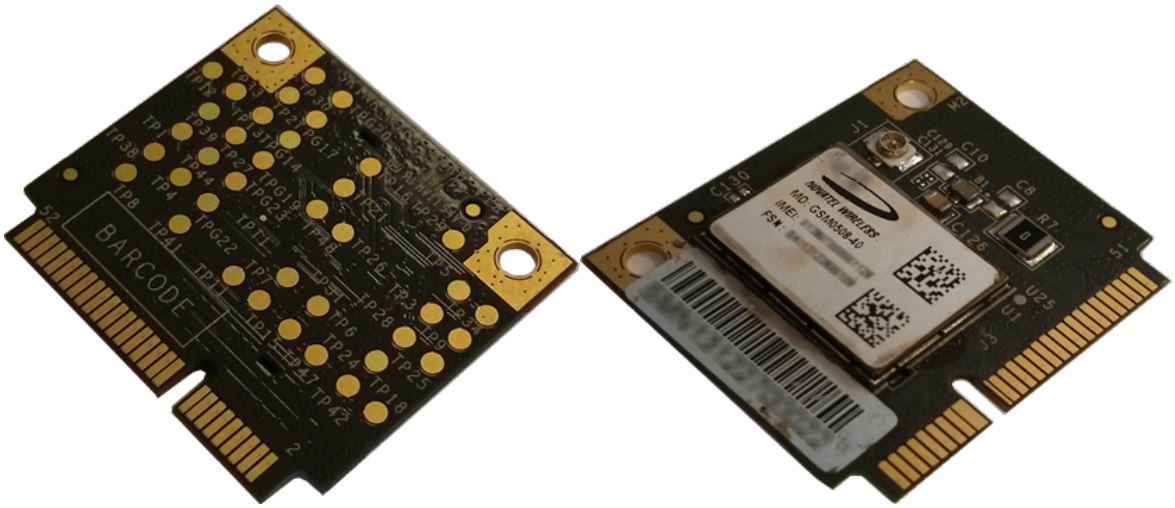


Figure 1-1 Expedite L10-G Module

Technical Specifications

General

Name:	Expedite L10-G
Model:	GSM0508-40

Radio Technology

Quad-band EDGE/GSM/GPRS:	850/900/1800/1900 MHz
Class:	Supports class 8, 10 and 12 (The default GPRS class is 8)
Modulation Coding Schemes:	CS-1 to CS-4
Mode of Operation:	Class B (attaches to both GSM and GPRS at the same time)

Speech Features

Speech Codec:	AMR HR FR EFR
Speech Interface:	Analog/PCM

Supplementary Services

Speech Codec:	Number identification Call Offering Call Completion Multi-Party USSD

USB/UART Features

USB 1.1:	For download image only.
USB VID/PID:	MTK's VID/PID as 0E8D/0003, Only for download mode.
UART1 (2-wire):	For download image and debug port
UART2 (4 wire):	CMUX Support

SMS Features

SMS over GPRS:	Mobile Originated and Mobile Terminated
Concatenated SMS:	Yes, up to 10 messages
SMS Cell Broadcast:	Supported by AT commands
SMS Immediate Notification:	Supported by AT commands

SIM-Based Features

SIM Personalization Locks:	SIM Lock/Network lock , Supports restricting SIM/USIM card
SIM Application Toolkit:	Supported by AT commands

Customized Features

Notification for incoming call and SMS:	Provide one GPIO pin for notification
Host wake-up modem event:	Provide one interrupt pin to wake-up modem
Modem AT command ready event:	Provide one GPIO pin to notify host that AT command is ready
CMUX:	Supports CMUX feature
Boot up ready message:	Shows “AT Command Interpreter Ready” as boot up ready
Monitor modem power on/off status:	Provide a resistor – VEXT28 to monitor the power on/off status of modem
AT command to adjust the band, channel and output max power:	For verifying the RF power in customer product.

Multiple Configurations

AT command to switch speech interface (Analog/PCM):	1. Supports to switch speech interface between PCM and analog.
AT command to change UART2’s baud rate:	1. Supports baud rate up to 921,600 bps 2. The default baud rate of UART2 is 115,200 bps
AT command to change GPRS class:	1. Supports class 8, 10 and 12 2. The default GPRS class is 8
AT command to change UART2 flow control:	1. Supports to change the UART2’s flow control as None, HW flow control and SW flow control 2. The default flow control is none flow control
AT command to read the operator data (MCC/MNC):	1. Read Network Lock Data
AT command to read the network lock password:	1. Read Network Lock Password

Customer Tool

Debug tool:	Catcher tool execution package Supports Windows XP, Windows Vista and Windows 7
Catcher tool user guide:	Catcher_Tool_user_guide-v0.1-2013.05.31.pdf
Flash tool:	Flash tool execution package Supports Windows XP, Windows Vista and Windows 7
Flash tool user guide:	Flash_Tool_user_guide-v0.1-2013.05.31.pdf
Tx Power Adjust tool:	USI_TX_Power_Adjust_Tool-V0.1-20130829.pdf
IMEI re-write tool:	IMEI_API_Introduction-V0.1-20130923.pdf

Design Package

Upgrade agent introduction:	1. BROM_Lite_Introduction-v0.2-20130709.pdf 2. System Information to build the BROM lite tool-v0.1-2013.07.09.pdf
Compare between BROM Lite and Flash Tool:	BROM_Lite_vs_Flash_Tool-V0.1-2013.06.10.pdf
CMUX sample code (Linux):	smmux-alpha-2.tar.gz
CMUX introduction:	1. CMUX_introduction-v0.1-2013.05.31.pdf 2. pppd.7z
UART flow control introduction:	UART_Flow_Control-v0.1-2013.05.31.pdf
AT Command set:	Expedite L10-G_AT_Command_Set_v0.8.6_20131008.doc
Audio parameter adjustment:	Expedite L10-G_Audio_Parameter_Adjustment-V0.3-2013.08.22.pdf
The user guide of AT command to adjust the band, channel and output max power:	AT_ERFTX-V0.1-20130924.pdf

Power

Electrical Power:	3.3 to 4.35 Vdc (vbat)
	Supply Vripple must be less than 200 mV across all frequencies
Peak currents and average power dissipation:	Refer to the Operating Power table in the Technical Specifications for peak currents and average power dissipation for various modes of operation.

Environmental

Compliant Operating Temperature:	-20 °C to 60 °C
Operating Temperature:	-30 °C to 70 °C
Storage Temperature:	-40 °C to 85 °C
Humidity:	Up to 95% non condensing
Emissions:	FCC 47 CFR Parts 2,15,22 & 24

Packet Data Transfer

Protocol:	
Short Message Services:	Text, MO/MT

Regulatory

Agency approvals:	FCC Certification Industry Canada PTCRB CE GCF

Reference Documents

CNN0401xAT001 - HS 3002 AT Command Reference
CNN0401xTG001 - HS 3002 Transition Guide
ENF0000SD001 - HDK Guide
CNN0401AN001 - Using Digital Audio on the HS 3002

Typical Usage

The following applications can use the Expedite L10-G module for transmitting/receiving data/voice:

- Automated Meter Reading (AMR)
- Point of Sale Applications (POS)
- E-mail and Internet access
- Automated Vehicle Location (AVL)
- Machine to Machine communication (M2M)
- Telematics
- Telemetry
- Wireless Security
- Smart Phones
- Telemedicine

Contacting Novatel Wireless

For technical support and customer service dealing with the modem itself, contact the company where you purchased the product. If you purchased the product directly from Novatel Wireless, visit the Support page on the Novatel Wireless web site: www.novatelwireless.com

2

Module Power

Operating Power

Operating Power

The Expedite L10-G module requires an in/out voltage of 3.3V to 4.35V. The supply ripple must be less than 200 mV across all frequencies.

Typical Input Current

Typical Results @ 3.8 V 25 deg C, with 1 µF at connector input on V_{BAT} and RF terminated into a 50Ω resistive load. Traffic Data Rate: Full

Band	Mode	Avg (mA)	Peak (mA)	Notes
GSM850	PCL=5, TX=32.5dBm	211	1810	GPRS, 1TX
	PCL=19, TX=5dBm	59.8	-	
EGSM	PCL=5, TX=32.5dBm	231	2040	GPRS, 1TX
	PCL=19, TX=5dBm	59.6	-	
DCS	PCL=0, TX=29.5dBm	142	1140	GPRS, 1TX
	PCL=15, TX=0dBm	57.3	-	
PCS	PCL=0, TX=29.5dBm	149	1190	GPRS, 1TX
	PCL=15, TX=0dBm	57.9	-	
Both	Sleep with Paging Multi-frames=5	<1	90	Modem registered; peak during network activity
Both	Sleep	< 0.9	-	
Both	Shutdown	0.25	0.3	For minimum current draw in shut down mode, we recommend you shut down the modem by either sending AT$OFF (AT$OFFDLY must be >0) or by sending a pulse on PON line (pin 35), and then setting the ON/OFF line (pin 37) low to remove power from the device.

3

Interfaces

I/O Connector Pin Assignments

Analog audio interface

Specific Absorption Rate (SAR) Guidelines

Figure 3-1 Pin 1 Reference, 68-Pin I/O Connector

I/O Connector Pin Assignments

The following table shows the pin assignments for the input/output connector.

Pin	Function	Description	Notes
01	GND	Ground	
02	DAIPCMIN	PCM data in	2.8V
03	Reserve Pin	Reserved for debug	
04	DAISYNC	PCM sync	2.8V
05	Reserve Pin	Reserved for debug	
06	Reserve Pin	Reserved for debug	
07	VSIM1	LDO - VSIM output.Provide 1.8/3.0V to SIM card.	1.8/3.0V

Pin	Function	Description	Notes
08	PWR_KEY	Power Key to enable MT6260 internal PMU	1.8V~2.8V
09	GPIO/INT1	General Purpose I/O,For customize./INT1	2.8V
10	ACCDET	Headset Microphone detect	2.8V
11	AP_READY_INT	INTFor Host/AP to wake up Expedite L10-G module.	1.8V
12	U2RTS	UART2 Request to send	2.8V
13	NOTIFY_AP	Notification for incoming call and SMS	1.8V
14	U2CTS	UART2 Clear to send	2.8V
15	U2RXD	UART2 Serial Data Output	2.8V
16	U2TXD	UART2 Serial data input	2.8V
17	GND	Ground	
18	EAR_EINT	Headset Detect	2.8V
19	2G_ANT	The signal of RF antenna input/output.	
20	JTAG_EN	JTAG Strap Pin, pull high 1K to 2.8V to enable JTAG f	2.8V
21	GND	Ground	
22	VEXT28	2.8 V out – Reference for external level translation	2.8V
23	VBAT	Power Pins	Min: 3.3V, Typ: 3.8V, Max: 4.35V
24	VBAT	Power Pins	Min: 3.3V, Typ: 3.8V, Max: 4.35V
25	GND	Ground	
26	U1TXD	UART1 Serial data input	2.8V
27	U1RXD	UART1 Serial Data Output	2.8V
28	GPIO2	General Purpose I/O,For customize.	1.8V
29	LED_B	LED control	Output, VBAT_VA(KPLED)
30	GPIO1	General Purpose I/O,For customize.	1.8V
31	SPK_OUTN	speaker amplifier (-) (Analog)	VBAT
32	SPK_OUTP	speaker amplifier (+) (Analog)	VBAT
33	MP3_OUT_L	headset amplifier Left	2.8V
34	MP3_OUT_R	headset amplifier Right	2.8V
35	GND	Ground	

Pin	Function	Description	Notes
36	SDA28/GPIO	I2C Serial clock/General Purpose I/O,For customize.	I/O, 2.8V
37	SDA28/GPIO	I2C Serial data/General Purpose I/O,For customize.	I/O, 2.8V
38	MIC1_IN-	Microphone input (Headset)	2.8V
39	MIC1_IN+	Microphone input (Headset)	2.8V
40	MIC0_IN-	Microphone amplifier negative input	2.8V
41	MIC0_IN+	Microphone amplifier positive input	2.8V
42	MICBIAS0	Microphone bias	2.8V
43	VBUS	INPUT POWER for VUSB	POWER
44	VBAT	Power Pins	Min: 3.3V, Typ: 3.8V, Max: 4.35V
45	VBAT	Power Pins	Min: 3.3V, Typ: 3.8V, Max: 4.35V
46	VBAT	Power Pins	Min: 3.3V, Typ: 3.8V, Max: 4.35V
47	ADCIN1	10-bit A-to-D	2.8V
48	Reserve Pin	Reserved for debug	
49	GPIO3	General Purpose I/O, For customization	1.8V
50	AT_READY	AT command ready signal	1.8V
51	Reserve Pin	Reserved for debug	
52	Reserve Pin	Reserved for debug	
53	USB_DM	Universal Serial BUS	I/O
54	Reserve Pin	Reserved for debug	
55	USB_DM	Universal Serial BUS	I/O
56	GPIO/JTRST	General Purpose I/O,For customize./JTAG Test Reset	3.3V
57	GPIO/JTMS	General Purpose I/O,For customize./JTAG Test Mode Select	3.3V
58	GPIO/JTDI	General Purpose I/O,For customize./JTAG Test Data In	3.3V
59	GND	Ground	
60	GPIO/JRTCK	General Purpose I/O,For customize/JTAG Return TCK	3.3V
61	GPIO/JTCK	General Purpose I/O,For customize./JTAG Test Clock	3.3V
62	GPIO/JTDO	General Purpose I/O,For customize./JTAG Test Data Out	3.3V

Pin	Function	Description	Notes
63	SIM1_DATA	SIM data I/O	VSIM1
64	SIM1_CLK	SIM clock	VSIM1
65	SIM1_RST	SIM reset	VSIM1
66	DAIPCMOUT	PCM data out	I/O, 2.8V
67	DAICLK	PCM clock	I/O, 2.8V
68	DAIRST	PCM RST	I/O, 2.8V

Table 3-1 I/O Connector Pin Assignments

Analog Audio Interface

The Expedite L10-G module provides analog audio interface, include speaker, microphone, and headset.

Speaker

Pin No.	Pin name	Description
29	SPK_OUTN	speaker amplifier (-) (Analog)
31	SPK_OUTP	speaker amplifier (+) (Analog)

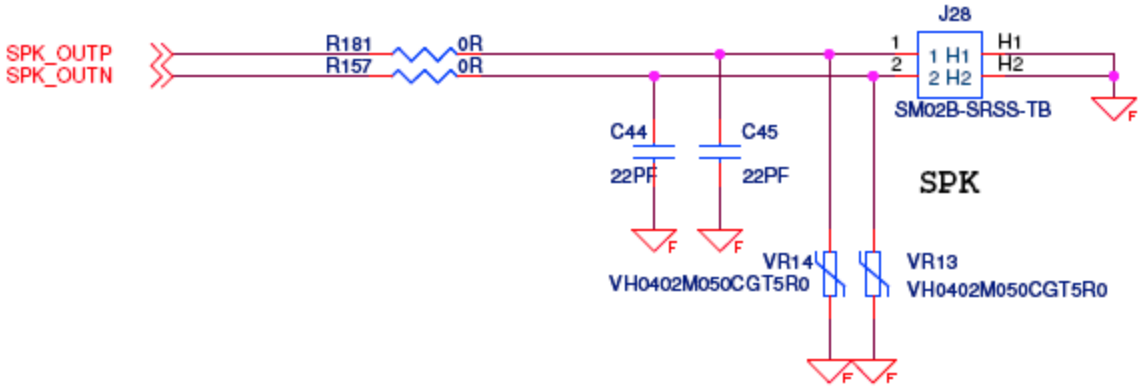
Speaker functional specification

Symbol	Parameter	Min.	Typ.	Max.	Unit
IDC	Current consumption		4		mA
SINAD	Signal to noise and distortion ratio Input level: -40 dBm0 Input level: 0 dBm0	 29	 69		 dB dB
RLOAD	Output resistor load (differential)	16	32		Ω
CLOAD	Output capacitor load			250	pF
ICN	Idle channel noise of transmit path			-67	dBm0
XT	L-R channel cross talk			-66	dBm0
Vout	Full Scale output voltage SPK_OUT		0.7		Vrms

Expedite L10-G integrate class-AB audio AMP, the following table is the maximum output power:

	Test Condition	
Maximum output power	SPK_OUTN	0.87W
	3.3V, 8 ohm THD+N=1%	0.53W
	4.2V, 8 ohm THD+N=10%	1.08W
	3.3V, 8 ohm THD+N=10%	0.65W

Speaker reference circuit



Microphone

Pin No.	Pin name	Description
40	MIC1_IN-	Microphone input (Headset)
41	MIC1_IN+	Microphone input (Headset)
42	MIC0_IN	Microphone amplifier negative input
43	MIC0_IN+	Microphone amplifier positive input
44	MICBIAS0	Microphone bias

MicBias output

Mic Bias Output	Typ.	Max	Unit
MICBIAS0	1.9	2.2	V
MICBIAS0 current draw		2	mA

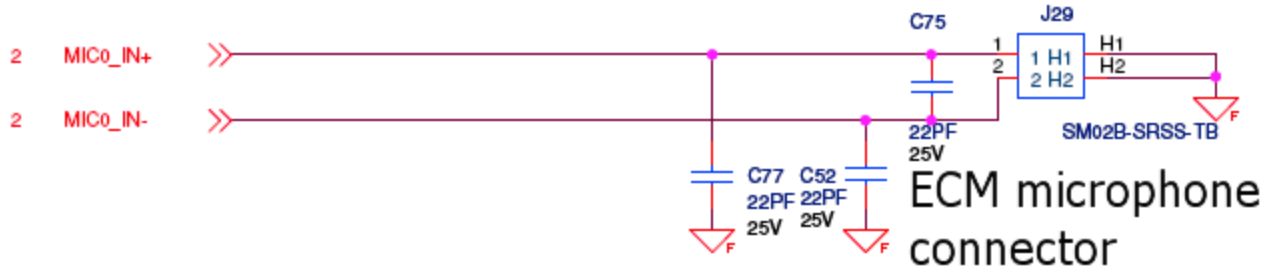
Microphone functional specification

Symbol	Parameter	Min.	Typ.	Max.	Unit
IDC	Current consumption for one channel		1.5		mA
SINAD	Signal to noise and distortion ratio Input level: -40 dBm0 Input level: 0 dBm0	29	69		dB dB
RIN	Input impedance (differential)	13	20	27	KΩ
ICN	Idle channel noise			-67	dBm0
Vout	Full Scale output voltage MIC0		1		Vrms

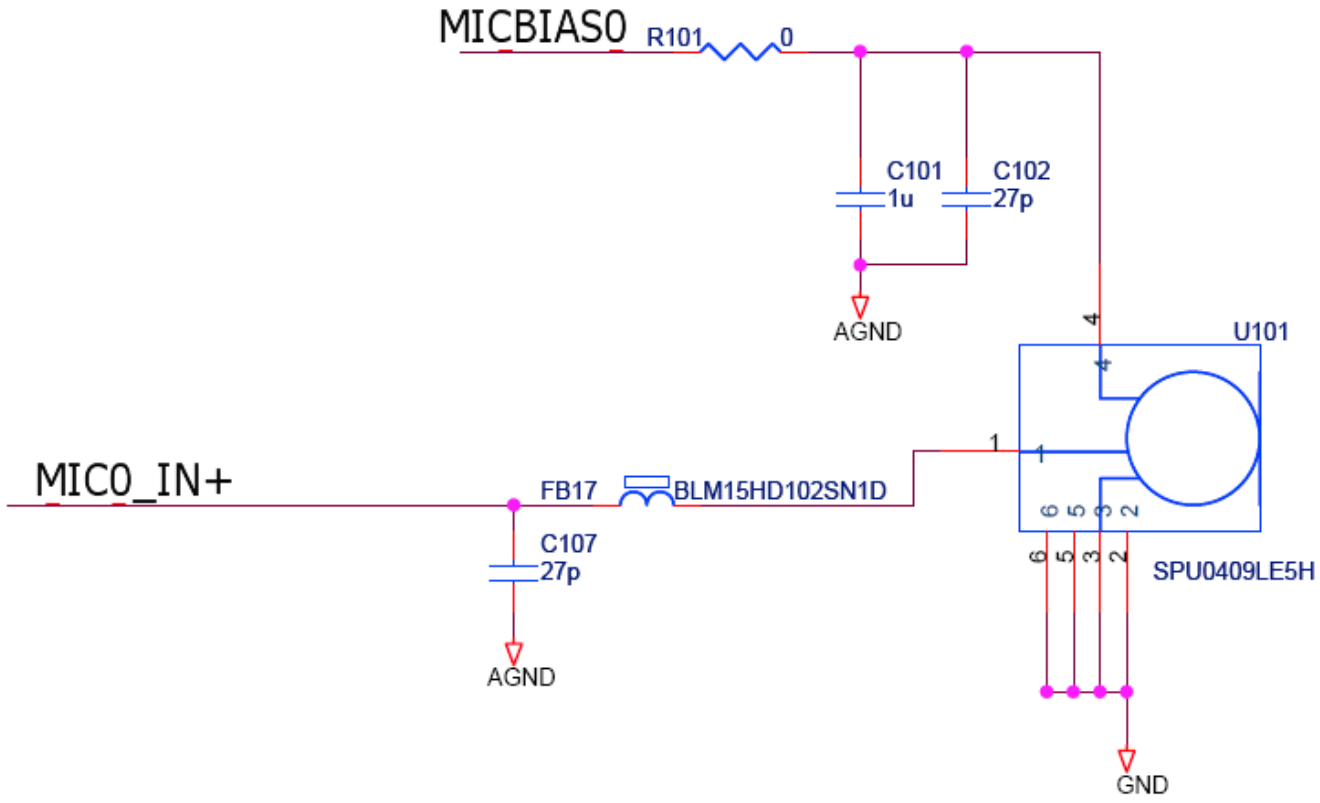
Microphone Type Support

Expedite L10-Gcan support ECM microphone and MEMS microphone.

ECM Microphone reference circuit



MEMS Microphone reference circuit



Headset

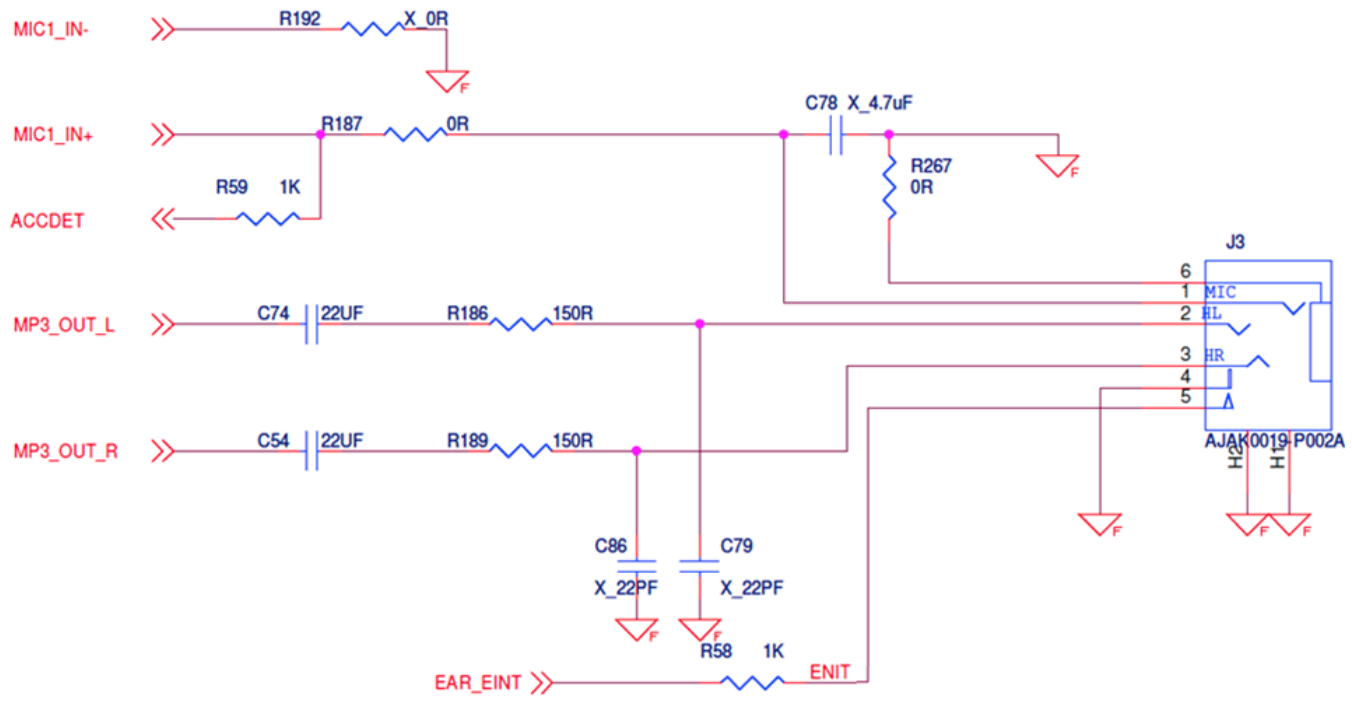
Pin No.	Pin name	Description
9	ACCDET	Headset Microphone Detect
14	EAR_EINT	Headset Detect (Internal PU, no need external PU circuit)
36	MP3_OUT_L	headset amplifier Left
37	MP3_OUT_R	headset amplifier Right

Pin No.	Pin name	Description
40	MIC1_IN-	Microphone input (Headset)
41	MIC1_IN+	Microphone input (Headset)

Earphone functional specification

Symbol	Parameter	Min.	Typ.	Max.	Unit
FCK	Clock frequency		6.5		MHz
Fs	Sample rate	32	44.1	48	KHz
IDC	Current consumption		4		mA
PSNR	Peak signal to noise ratio		88		dB
DR	Dynamic range		88		dB
VOUT	Full Scale output voltage MP3_OUT		0.78		Vrms
THD	Total harmonic distortion 10mW at 64Ω load			-70	dB
RLOAD	Output resistor load	64			Ω
CLOAD	Output capacitor load			250	pF
XT	L-R channel cross talk	70			dB

Headset reference circuit



Specific Absorption Rate (SAR) Guidelines

Portable RF exposure evaluation must be completed on host devices that provide ≤20.0 cm of separation distance between the transmitter antenna and the end user.

Portable Device Definition

The FCC defines a Portable Device as a device having a transmitting antenna located at a distance ≤ 20cm from the user.

Mobile Device Definition

The FCC defines a Mobile Device as a device having a transmitting antenna located at a distance ≥ 20cm from the user.

SAR Compliance

European and US certification bodies require that you test Specific Absorption Rate (SAR). SAR is a measure of energy absorbed by organic tissue over a specific time. The factors that affect SAR readings are:

- output power
- frequency of the radiation
- proximity to antenna
- antenna counterpoise
- duty cycle

Early in the physical design stage of the UE, the antenna and the mechanical engineering design teams must collaborate on the design to ensure that they can meet the SAR requirements. Carefully reading and understanding the FCC requirements can help designers choose the antenna type, the antenna location, and the industrial design of the UE. The placement and characteristics of the main antenna are the most critical factors affecting SAR performance.

3

Tune Up Procedures

Tune Up Procedure

Tune Up Procedure

During manufacturing each device will be individually calibrated. Measurement is performed in a fully calibrated environment using an CMW500 base station simulator. The measurement procedure is outlined below:

Measurement Procedure:

1. Set the device to operational voltage and on a predefined channel in a special test mode.
2. The actual output power is measured at several power levels.
3. The gain factors of each individual device are adjusted until the target value is met. The appropriate gain control settings for each output power level are stored in each device individually (for each power level). The user has no possibility to change these settings later on.
4. The maximum gains of each individual device are adjusted and measured until the target value is met. The production target power with tolerance compiles with the maximum power in test report.

Maximum Target Power for Production Unit (dBm)

Mode	GSM 850	GSM 900	GSM 1800	GSM 1900
GPRS 8 (1 Uplink) CS1	32.5 (+0.5/-0.7dB)	32.5 (+0.5/-0.7dB)	29.5 (+0.5/-0.7dB)	29.5 (+0.5/-0.7dB)
GPRS 10 (2 Uplink) CS1	30 (+0.5/-0.7dB)	30 (+0.5/-0.7dB)	27 (+0.5/-0.7dB)	27 (+0.5/-0.7dB)
GPRS 11 (3 Uplink) CS1	28.2 (+0.5/-0.7dB)	28.2 (+0.5/-0.7dB)	25.2 (+0.5/-0.7dB)	25.2 (+0.5/-0.7dB)
GPRS 12 (4 Uplink) CS1	27 (+0.5/-0.7dB)	27 (+0.5/-0.7dB)	24 (+0.5/-0.7dB)	24 (+0.5/-0.7dB)