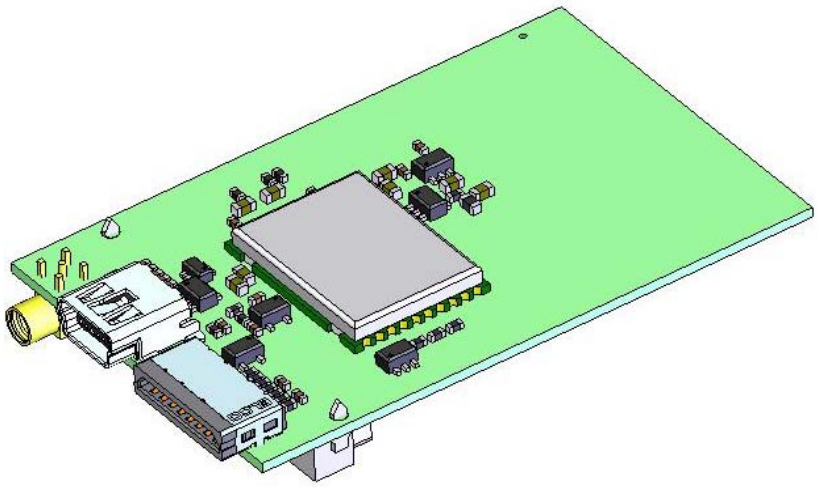
Plug and Play Fastrack Supreme Wireless CPU®

IESM-GPS+USB+IO User Guide

Reference: WA_DEV_Fastrk_UGD_008
Revision: 001
Date: 06 June, 2007



Document History

Revision	Date	List of revisions	
001	06 June, 07	First Issue	

Overview

The Internal Expansion Socket Module (IESM) is a Plug & Play device to expand the functionality of a standard Fastrack Supreme 10 and Supreme 20 into a state of the art GPS+USB+IO device for machine to machine applications.

With the IESM it is possible to utilize the Internal Expansion Socket (IES) which opens wide applications for Fastrack Supreme 10 and Supreme 20 by simply plugging in.

Fastrack Supreme with IESM-GPS+USB+IO plugged-in may utilize one or more AT Plug-Ins of the powerful Open AT® software suite. Open AT® is the world's most comprehensive cellular development environment, which allows embedded standard ANSI C applications to be natively executed directly on the Wireless CPU®.

Topics covered by this document;

- General description
- Functional description
- Basic services available
- Technical characteristics
- Installing and using the IESM-GPS+USB+IO
- User-level troubleshooting
- Recommended accessories to be used with the product

Note 1:

This document covers the IESM-GPS+USB+IO Plug & Play alone and does not include;

- The programmable capabilities provided via the use of Open AT® Software Suites.
- The development guide for IESM for expanding the application feature through the IES interface.

For details, please refer to the documents shown in the "Reference documents" section.

Note 2:

To use the IESM-GPS+USB+IO for Fastrack Supreme, the GPS Feature must be activated first. This activation is specific to GPS application which is made during Fastrack Supreme production.

To verify, enter "AT+WCFM=5". If Fastrack Supreme responds "+WCFM: 00000031, 0", this means it is not activated. Please contact your nearest distributor for assistance before installing IESM-GPS+USB+IO.

RoHS Directive

The Fastrack Supreme and IESM-GPS+USB+IO are now compliant with RoHS Directive 2002/95/EC, which sets limits for the use of certain restricted hazardous substances. This directive states that "from 1st July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE)".

Plug & Plays which are compliant with this directive are identified by the RoHS logo on their label.

RoHS COMPLIANT 2002/95/EC

Disposing of the product

This electronic product is subject to the EU Directive 2002/96/EC for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed off at a municipal waste collection point. Please refer to local regulations for directions on how to dispose off this product in an environmental friendly manner.

Cautions

Information furnished herein by WAVECOM is accurate and reliable. However, no responsibility is assumed for its use. Please read carefully the safety recommendations given in Chapter 10 for an application based on Fastrack Supreme Plug & Play.

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Web Site Support

General information about Wavecom and its range of products:	www.wavecom.com
Specific support is available for the Fastrack Supreme Plug & Play Wireless CPU®:	www.wavecom.com/FASTRACK
Carrier/Operator approvals:	www.wavecom.com/approvals
Open AT® Introduction:	www.wavecom.com/OpenAT
Developer support for software and hardware:	www.wavecom.com/forum

Contents

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1 References

1.1 Reference Documents

For more details, several reference documents may be consulted. The Wavecom reference documents are provided in the Wavecom documents package contrary to the general reference documents, which are not Wavecom owned.

1.1.1 Open AT® Software Documentation

[1] Getting started with Open AT® (Ref.WM_ASW_OAT_CTI_001)

[2] Open AT® Tutorial (Ref.WM_ASW_OAT_UGD_001)

[3] Tools Manual (Ref. WM_ASW_OAT_UGD_003)

[4] Open AT® Programming Guide (Ref. WM_ASW_OAT_UGD_006)

[5] Open AT® Customer Release Note (Ref. WM_ASW_OAT_DVD_00062)

1.1.2 AT Software Documentation

[6] AT commands interface Guide for X51 (Ref. WM_ASW_OAT_UGD_00016)

[7] Customer Release Note X51 (Ref. WM_ASW_OAT_DVD_00120)

Remark:

The documents above are for X51. Fastrack Supreme will use new release Firmware 6.63 and reference documents will be available soon.

1.1.3 Firmware Upgrade Documents

[8] Firmware upgrade procedure (Ref. WM_SW_GEN_UGD_001)

1.1.4 Fastrack Supreme Related Documents

[9] Fastrack Supreme User Guide (Ref. WA_DEV_Fastrk_UGD_001)

1.1.5 IESM Related Documents

[10] IESM Product Technical Specifications (Ref. WA_DEV_Fastrk_PTS_001)

[11] C-GPS Overview and Usage (Ref. WA_DEV_C-GPS_APN_001_001)

[12] C-GPS Development Kit User Guide (Ref. WA_DEV_C-GPS_UGD_001)

Note:

New versions of software may be available. Wavecom recommends customers to check the web site for the latest documentation.

1.2 Abbreviations

Abbreviation	Definition

Abbreviation	Definition
AC	**A**lternating **C**urrent
ACM	**A**ccumulated **C**all **M**eter
AT	**AT**tention (prefix for Wireless CPU® commands)
CLK	**CL**oc**K**
CMOS	**C**omplementary **M**etal **O**xide **S**emiconductor
CS	**C**oding **S**cheme
CTS	**C**lear **T**o **S**end
dB	**D**eci**b**el
dBc	**D**eci**b**el relative to the **C**arrier power
dBi	**D**eci**b**el relative to an **I**sotropic radiator
dBm	**D**eci**b**el relative to one **m**illiwatt
DC	**D**irect **C**urrent
DCD	**D**ata **C**arrier **D**etect
DCE	**D**ata **C**ommunication **E**quipment
DCS	**D**igital **C**ellular **S**ystem
DSR	**D**ata **S**et **R**eady
DTE	**D**ata **T**erminal **E**quipment
DTMF	**D**ual **T**one **M**ulti-**F**requency
DTR	**D**ata **T**erminal **R**eady
EEPROM	**E**lectrically **E**rasable **P**rogrammable **R**ead-**O**nly **M**emory
EFR	**E**nhanced **F**ull **R**ate
E-GSM	**E**xtended **GSM**
EMC	**E**lectro**M**agnetic **C**ompatibility
EMI	**E**lectro**M**agnetic **I**nterference
ESD	**E**lectro**S**tatic **D**ischarges
ETSI	**E**uropean **T**elecommunications **S**tandards **I**nstitute
FIT	**Series of connectors (micro-FIT)**
FR	**F**ull **R**ate
FTA	**F**ull **T**ype **A**pproval
GCF	**G**lobal **C**ertification **F**orum
GND	**G**rou**ND**
GPIO	**G**eneral **P**urpose **I**nput **O**utput
GPRS	**G**eneral **P**acket **R**adio **S**ervice
GPS	**G**lobal **P**ositioning **S**ystem
GSM	**G**lobal **S**ystem for **M**obile communications
HR	**H**alf **R**ate

Abbreviation	Definition
I	**I**nput
IEC	**I**nternational **E**lectrotechnical **C**ommission
IES	**I**nternal **E**xpansion **S**ocket
IESM	**I**nternal **E**xpansion **S**ocket **M**odule
IMEI	**I**nternational **M**obile **E**quipment **I**dentification
I/O	**I**nput / **O**utput
LED	**L**ight **E**mitting **D**iode
MAX	**MAX**imum
ME	**M**obile **E**quipment
MIC	**MIC**rophone
Micro-Fit	**Family of connectors from Molex**
MIN	**MIN**imum
MNP	**M**icrocom **N**etworking **P**rotocol
MO	**M**obile **O**riginated
MS	**M**obile **S**tation
MT	**M**obile **T**erminated
NOM	**NOM**inal
O	**O**utput
Pa	**Pa**scal (for speaker sound pressure measurements)
PBCCH	**P**acket **B**roadcast **C**ontrol **CH**annel
PC	**P**ersonal **C**omputer
PCL	**P**ower **C**ontrol **L**evel
PDP	**P**acket **D**ata **P**rotocol
PIN	**P**ersonal **I**dentity **N**umber
PLMN	**P**ublic **L**and **M**obile **N**etwork
PUK	**P**ersonal **U**nblocking **K**ey
RF	**R**adio **F**requency
RFI	**R**adio **F**requency **I**nterference
RI	**R**ing **I**ndicator
RMS	**R**oot **M**ean **S**quare
RTS	**R**equest **T**o **S**end
RX	**R**eceive
SIM	**S**ubscriber **I**dentification **M**odule
SMA	**S**ub**M**iniature version **A** RF connector
SMS	**S**hort **M**essage **S**ervice
SNR	**S**ignal-to-**N**oise **R**atio

Abbreviation	Definition
SPL	**S**ound **P**ressure **L**evel
SPK	**Sp**ea**K**er
SRAM	**S**tatic **RAM**
TCP/IP	**T**ransmission **C**ontrol **P**rotocol / **I**nternet **P**rotocol
TDMA	**T**ime **D**ivision **M**ultiple **A**ccess
TU	**T**ypical **U**rban fading profile
TUHigh	**T**ypical **U**rban, **High** speed fading profile
TX	**T**ransmit
TYP	**TYP**ical
USB	**U**niversal **S**erial **B**us
VSWR	**V**oltage **S**tationary **W**ave **R**atio

2 Packaging

2.1 Contents

The complete package contents of the Fastrack IESM-GPS+USB+IOconsists of the following:

- One packaging box (**A**),
- One IESM-GPS+USB+IO (**B**),
- One Backplate (**C**),
- Short notice (**E**) with:
  - a summary of the main technical features,
  - safety recommendations,
  - EC declaration of conformity.

Figure 1: Complete package contents

2.2 Packaging Box

The packaging box external dimensions:

- width: xx.xx mm
- height: xx.xx mm
- length: xx.xx mm

Label placed indicates:

- WAVECOM logo
- Product reference (IESM-GPS+USB+IO)
- CE mark
- RoHS logo
- WEEE logo

PICTURE TO BE ADDED HERE

Figure 2: Packaging box

The packaging label dimensions are:

- height: XX mm
- length: XX mm

2.3 Production Sticker

A production sticker (see Figure 3) located at the back side with the following information:

- product reference (IESM),

- part number (WMxxxxx),
- CE mark
- RoHS logo,
- WEEE logo.

PICTURE TO BE ADDED HERE

Figure 3: Production sticker

3 General Information

3.1 Description

The IESM-GPS+USB+IO description is shown below.

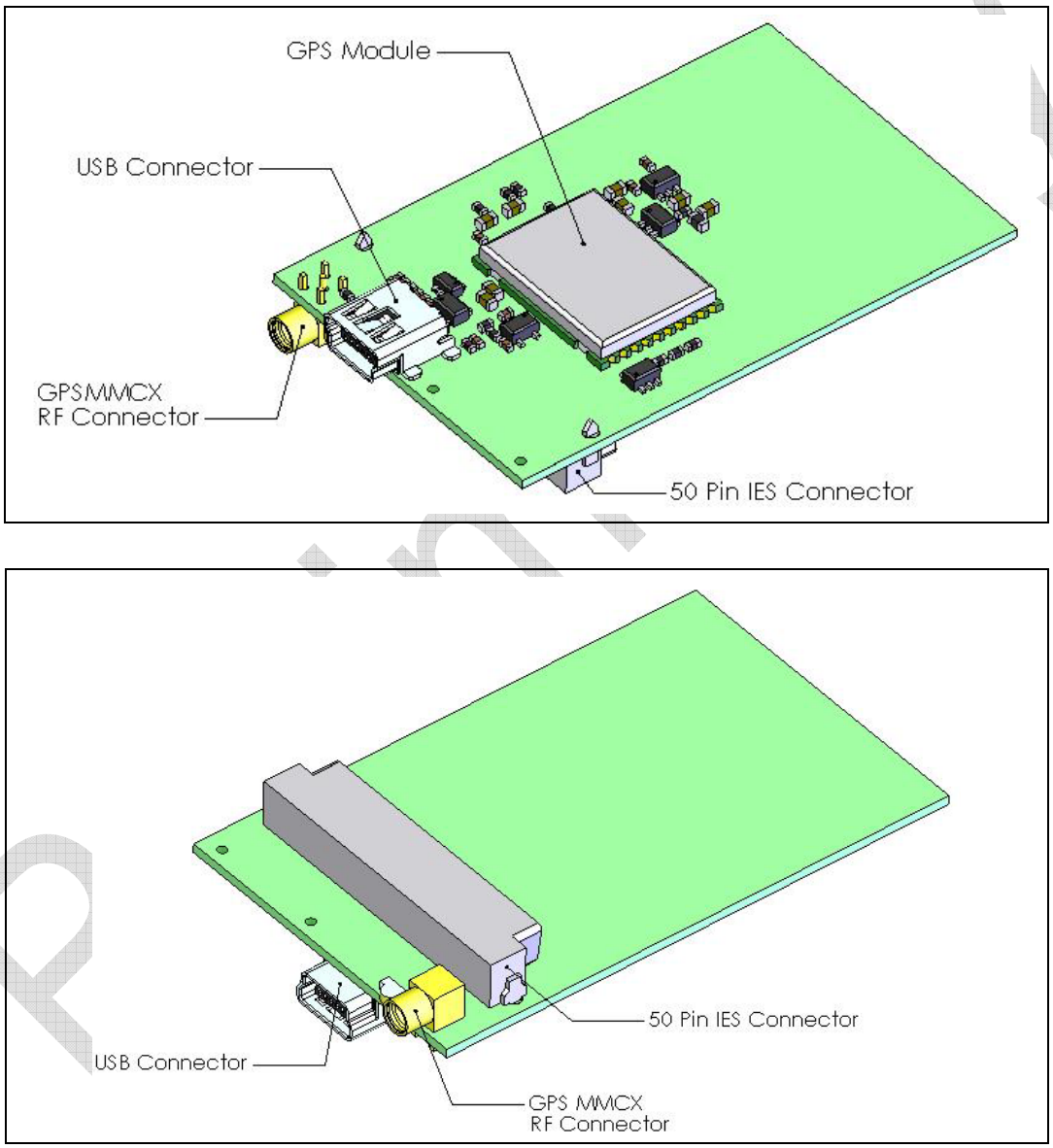


Figure 4: IESM general description

3.2 External Connections

3.2.1 GPS Antenna Connector

The GPS antenna connector is an MMCX type connector for a 50 Ω RF connection. 3.3VDC is available on this connector for supplying GPS active antennas.

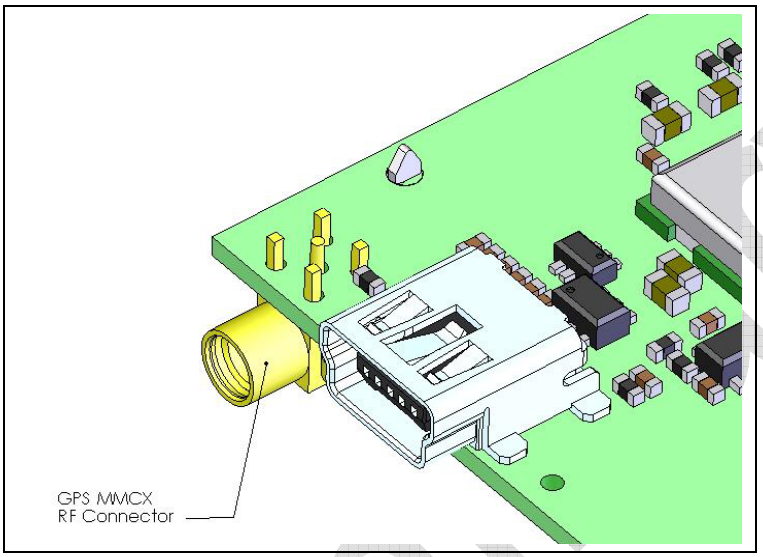


Figure 5: MMCX connector for antenna connection

3.2.2 Mini-B USB Connector

Standard Mini-B USB connector for communicating with:

- Wireless CPU

This port is USB 2.0 compliant.

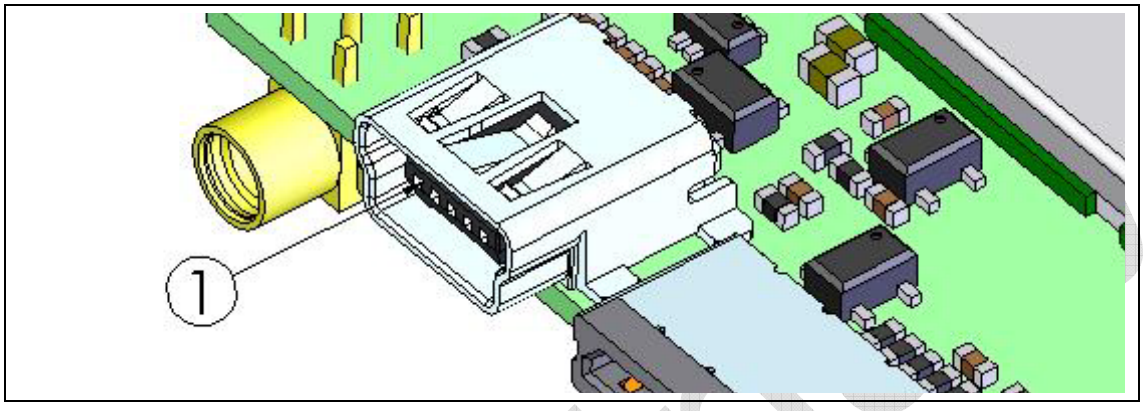


Figure 6: Mini-B USB connector

For Min-B USB connector specifications please refer to Chapter 10, "Connector and Peripheral Devices References".

Table 1: Mini-B USB Pin Description

Pin #	Pin Description
1	VBUS
2	D-
3	D+
4	NC
5	GND

3.3 External Connections

3.3.1 16-Way IO Socket

The 16-Way IO expander socket is an external interface for the IESM for customer's applications.

Available on this socket;

- 2 - GPIOs
- 1 – AUX-DAC
- 1 – AUX-ADC
- 1 – SPI1 (SPI1-IO, SPI-I1, SPI1-CLK, SPI1-CS)
- GPS Status Indicator Output

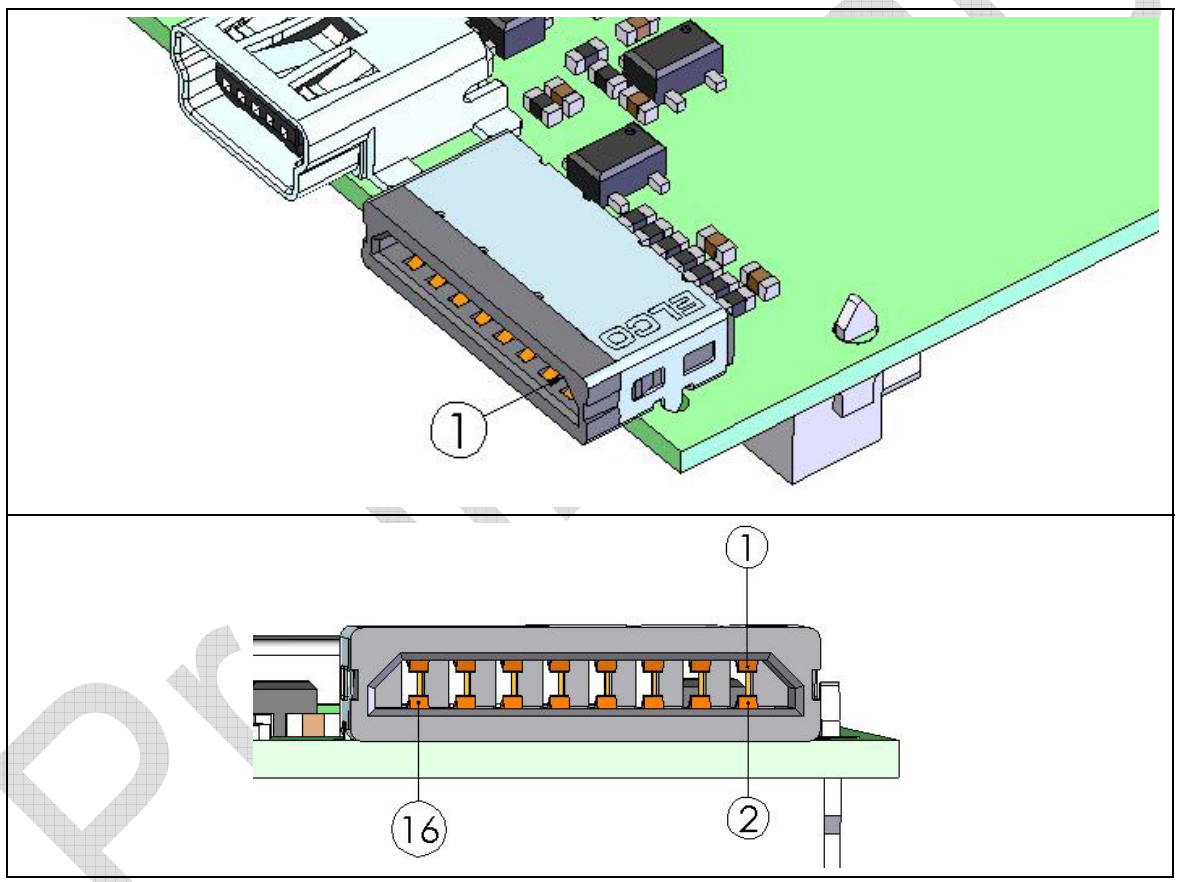


Figure 7: 16-Way IO Expander Socket

For 16-Way connector specifications please refer to Chapter 10, "Connector and Peripheral Devices References".

Table 2: 16-Way IO Expander Description

Pin #	Pin Description	Pin #	Pin Description
1	Not Connected	9	GPIO26
2	Not Connected	10	AUX-DAC
3	Not Connected	11	AUX-ADC
4	Not Connected	12	SPI1-IO
5	Not Connected	13	SPI1-I
6	GPS Status Indicator	14	SPI1-CLK
7	GPIO27	15	SPI1-CS
8	Not Connected	16	GND

3.3.2 General Purpose Input/Output

The IES-GPIO+USB+IO provide in total of 6 General Purpose I/O and available only if the multiplexed counterpart is not used. These can be used to control any external devices such as a GPS, Bluetooth, LCD or other customer external applications.

Table 3: Pin Description of GPIOs

Signal	Pin number	I/O	I/O type*	Reset state	Multiplexed with
GPIO26	9	I/O	Open Drain	Z	SCL
GPIO27	7	I/O	Open Drain	Z	SDA
GPIO28	14	I/O	2V8	Z	SPI1-CLK
GPIO29	12	I/O	2V8	Z	SPI1-IO
GPIO30	13	I/O	2V8	Z	SP1-I
GPIO31	15	I/O	2V8	Z	~SPI1-CS

3.3.3 IES 50-pin Connector

IESM high density 50-pin connector is used for:

- IESM Interface with Fastrack Supreme motherboard

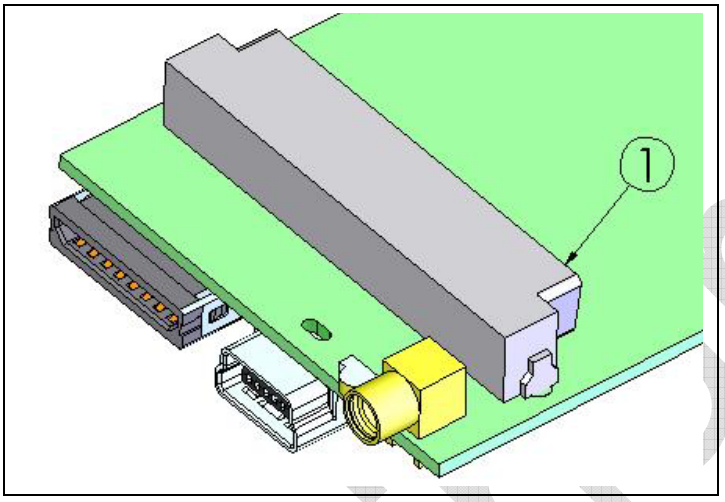


Figure 8: IESM 50-pin connector

For IESM 50-Pin connector specifications please refer to Chapter 10, "Connector and Peripheral Devices References".

Table 4: IESM 50-pin connector description

Pin #	Pin Description	Pin #	Pin Description
1	GND	26	RTS2
2	GND	27	SHTDN
3	Reserved	28	GPIO26
4	Reserved	29	GPIO19
5	Reserved	30	GPIO27
6	Reserved	31	GPIO20
7	VPAD-USB	32	INT0/GPIO3
8	USB-DP	33	GPIO23
9	USB-DM	34	GPIO22
10	GSM-1V8	35	DTR1-CT108/2
11	GSM-2V8	36	PCM-SYNC
12	BOOT	37	PCM-IN
13	RESET	38	PCM-CLLK
14	AUX-ADC	39	PCM-OUT
15	SPI1-CS	40	AUX-DAC

16	SPI1-CLK	41	VCC-2V8
17	SPI1-I	42	GND
18	SPI1-IO	43	DC-IN
19	SPI2-CLK	44	DC-IN
20	SPI2-IO	45	GND
21	SPI2-CS	46	4V
22	SPI2-I	47	4V
23	RXD2	48	GND
24	TXD2	49	GND
25	CTS2	50	GND

4 IESM GPS+USB+IO Basic Requirements

IESM GPS+USB+IO require the necessary environment to function properly.

4.1 GPS Requirements

- GPS feature must first be activated on the Fastrack Supreme, please consult your distributor regarding this matter.
- Companion GPS (C-GPS) library must be loaded to Fastrack Supreme. This can be found on the Open AT SDK V4.11 or later versions.
- Wavecom's sample Open AT GPS application must be running on the Fastrack Supreme. or customer's own developed application.

4.2 USB Requirements

- USB driver for Fastrack Supreme

5 Features and Services

5.1 Basic Features and Services

Basic features of the IESM-GPS+USB+IOare summarized in the table below.

Table 5: Basic features of IESM-GPS+USB+IO

Features	Description
Open AT®	Open AT® programmable: Native execution of embedded standard ANSI C applications, Custom AT command creation, Custom application library creation, Standalone operation.
GPS Standard	GPS L-Band (1575.42MHz) C/A Code
Interfaces	USB 2.0 Compliant AT command set based on V.25ter and GSM 07.05 & 07.07. Open AT® interface for embedded application.

6 Technical Characteristics

6.1 Mechanical Characteristics

Table 6: Mechanical characteristics

PCB Dimensions	57mm x 35.7mm x 1mm
Overall Dimension	59.5 x 35.7 x 10.01mm (including connectors)
Weight	≈ TBD grams

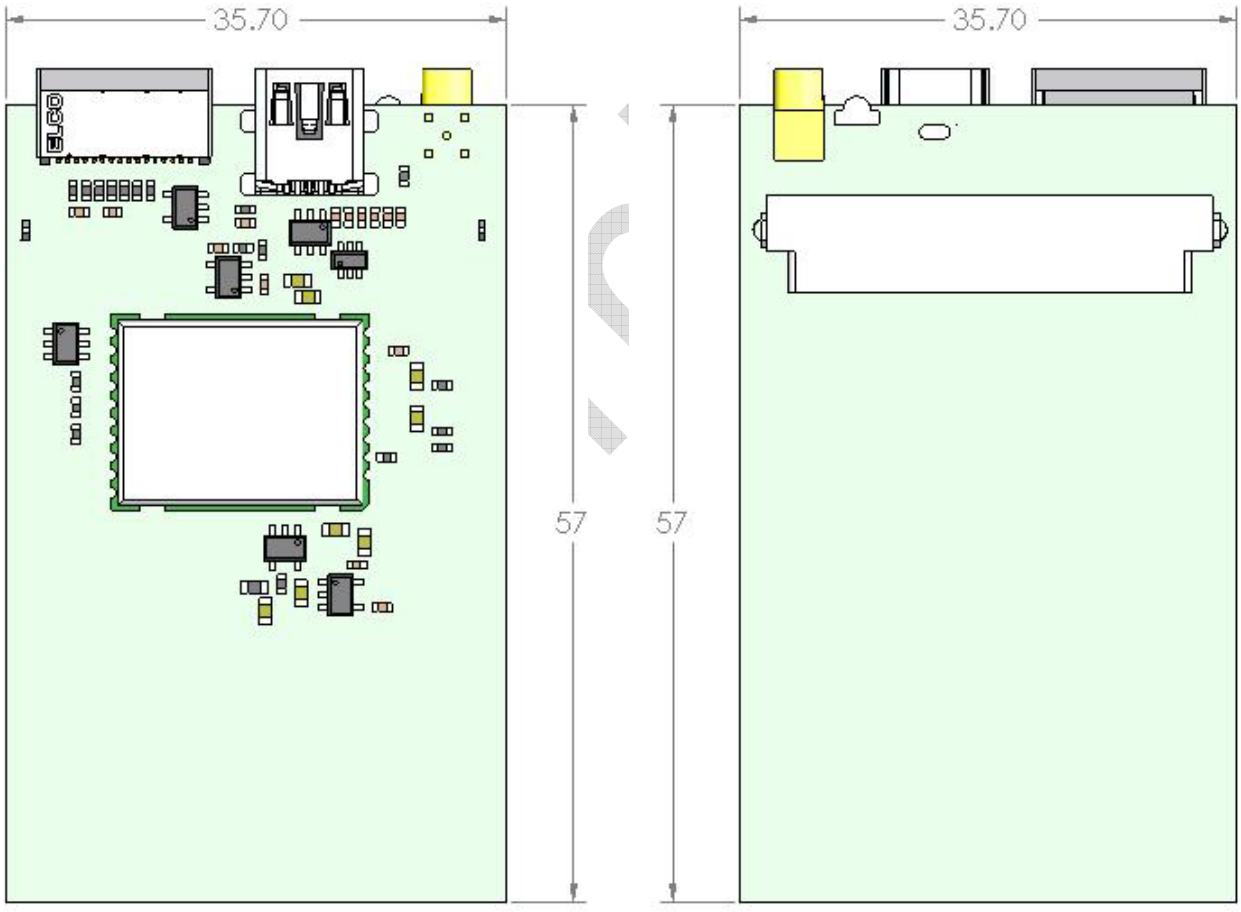


Figure 9: IESM-GPS+USB+IO Dimensions

7 Using Fastrack Supreme IESM-GPS+USB+IO

7.1 Getting Started

7.1.1 Installing IESM-GPS+USB+IO

To install the IESM-GPS+USB+IO please follow the procedures below. It is important to remove the power to Fastrack Supreme when performing this installation;

1. Remove the screws and the original backplate cover of the Fastrack Supreme
2. Insert the IESM-GPS+USB+IO board. Replace the original backplate with the IESM-GPS+USB+IO backplate provided and place back the screws.

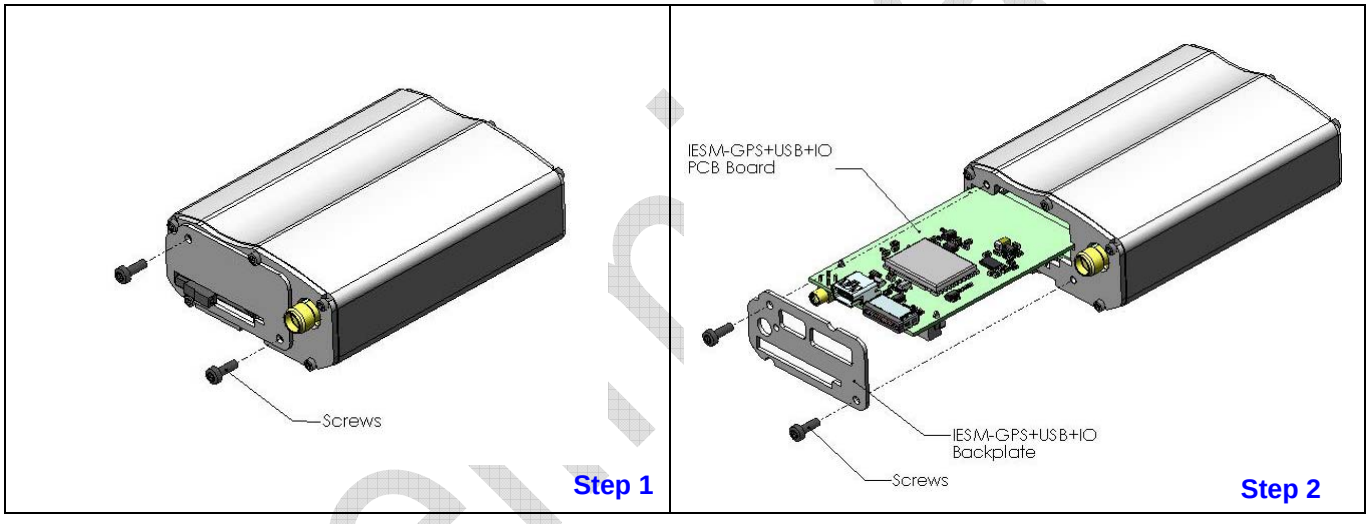


Figure 10: IESM-GPS+USB+IO Mounting

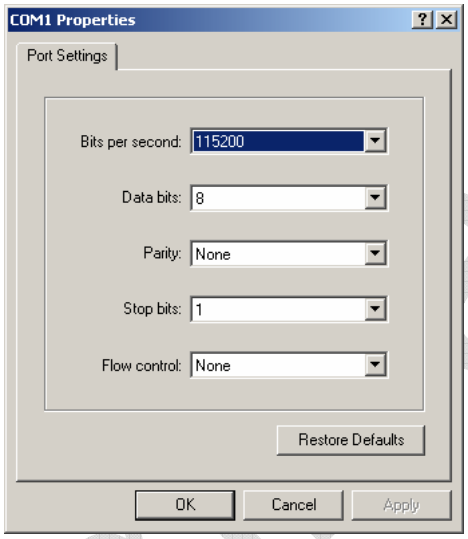
7.1.2 IESM-GPS+USB+IO Quick Check

To check if the installation of the IESM-GPS+USB+IO with Fastrack Supreme is ok, please perform a simple test on USB.

1 Connect a serial cable between Fastrack Supreme and PC COM port

2 Apply power on Fastrack Supreme

3 Open communication software (Hyperterminal), if COM port not configured yet please enter as follows;



4 Activate the USB port, enter AT command shown below;

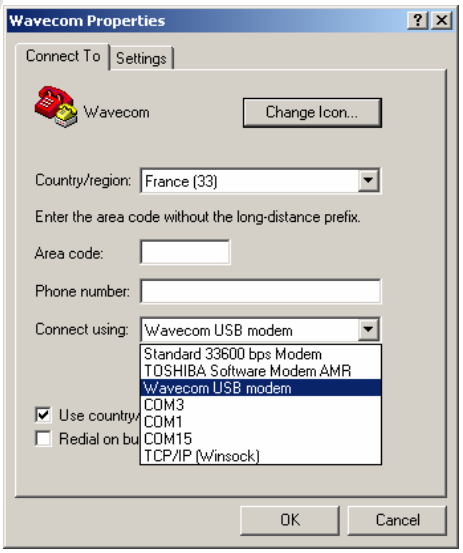
AT+WMFM=0,1,3

5 Connect USB cable between IESM and PC

6 PC running Windows should detect the new USB device. It will prompt to install the USB driver.

7 Install the USB driver on Fastrack Supreme, driver could be found on SDK V4.11.

8 Once USB driver is installed, open a new connection this time configure it to use the USB port



9 On the new communication window type the AT command shown below. This will echo on the screen what is being typed;

ATE1➔ Fastrack Supreme responds “OK”

10 Enter the AT command as indicated below to enable USB;

AT+CGMI ➔ Fastrack Supreme responds “WAVECOM MODEM”

IESM is now properly installed. For further information on these AT commands and their associated parameters, refer to "AT Commands Interface Guide" [7].

7.1.3 GPS Check

Make sure the necessary GPS environment is already set-up in Fastrack Supreme.

- GPS feature must be activated
- C-GPS library is loaded
- Companion GPS sample code or customer Open AT application is loaded
- Apply power to Fastrack Supreme

AT Command	Response	Remarks
AT+WOPEN=1	OK	Activates the C-GPS Sample Code
AT+NMEA=1	OK	Specifies that the NMEA frames sent in standard format
AT+CGPS=2	OK	Specifies the UART2 is used by GPS module
AT+CONFIG=1	OK	Saves the configuration

If everything is followed carefully the Fastrack Supreme should start sending the NMEA frames to the PC COM port.

7.1.4 GPS Active Antenna Supply Activation

GPS Active Antenna power supply by default is disabled. This can be activated with the following AT Commands.

The power enable is controlled by GPIO8.

Enabling the active antenna power supply

AT Command	Response	Remarks
AT+WHCNF=0,0	OK	Deactivates the Keypad feature of Fastrack Supreme
AT+WIOM=8,1,0	OK	Activates GPIO8 as an output and low at initial state
AT+WIOW=8,0	OK	Sends a low to GPIO8 and enables the 3.3V supply output

Note:

Once the power is removed from Fastrack Supreme at the next power ON the GPS active antenna supply will be activated automatically in a condition where the Open AT® C-GPS is also running.

If Open AT® C-GPS is turned OFF, the active antenna power supply will also power OFF.

Turning ON/OFF the active antenna power supply

AT Command	Response	Remarks
AT+WIOW=8,1	OK	Sends a high to GPIO8 and disables the 3.3V supply output
AT+WIOW=8,0	OK	Sends a low to GPIO8 and enables the 3.3V supply output

Note:

If AT+WIOM=8,1,0 is entered initially, regardless of the status of GPIO8 at next power ON the GPIO8 will always be at low at initial state.

Changing to AT+WIOM=8,1,1 will alter the initial state of GPIO8 to high, at the next power ON GPIO8 will always be at high at initial state.

7.2 IESM-GPS+USB+IO Operational Status

The IESM-GPS+USB+IO operational status could be interpreted by the green LED status located near the GPS RF connector.

Table 7: Fastrack IESM-GPS+USB+IO operational status

LED Status	LED light activity	M1306B status
ON	LED ON	GPS fix has not been achieved
	LED Blinking	GPS Fix has been achieved
OFF	LED OFF	Fastrack Supreme is switched OFF.

8 Troubleshooting

This section describes possible problems might be encountered when using the Fastrack Supreme IESM-GPS+USB+IO.

To review other troubleshooting information, refer the 'FAQs' (Frequently Asked Questions) page at www.wavecom.com or use the following link:
http://www.wavecom.com/support/faqs.php

8.1 No Communication with IESM–GPS+USB+IO through the Serial Link

If the Fastrack Supreme IES-GPS+USB+IO do not responds to AT commands through the USB or serial link, refer to the table below for possible causes and solutions.

Table 8: Solutions for no connection with Supreme through serial link

Symptoms	Check if	Action
Fastrack Supreme UART no response	• Serial cable is connected on both sides?	• Check the serial cable connection • Fastrack Supreme UART factory setting is: ▪ Data bits = 8 ▪ Parity = none ▪ Stop bits = 1 ▪ Baud = 115 200 bps ▪ Flow control = hardware
	• Power is applied?	• Check Power Cable • Check Fuse
	• There is another program interfering with the communication program (i.e. Conflict on communication port access)	• Close the interfering program
USB not detected	• USB cable properly inserted?	• Unplug cable from PC. Then plug back again if possible on another USB port on the PC.
	• IESM powered properly?	• Make sure the IESM is plugged securely to the Fastrack Supreme
USB does not respond	• USB port activated?	• Send AT+WMFM=0,1,3 to activate USB
GPS not sending data	• Open AT® application running?	• Run the Open AT® and GPS AT Plug-In

9 Functional Description

The IESM-GPS+USB+IO is interfaced to the Fastrack Supreme mother board through the 50 pin connector. All the DC supplies are applied through this connector so no external supply is necessary.

With the Open AT® application running, the Fastrack Supreme motherboard communicates to IESM-GPS+USB+IO on UART2. GPS module communicates on UART2 with the following configuration;

- baud rate: 57600 bps
- character framing: 8 Data bits
- parity: 1 stop bit and Odd Parity
- Flow Control: No Flow control

Open AT® application controls the following;

- Enables/disables the internal LDOs of the IESM to power-up the GPS
- Enables/disables the RF block of the GPS
- Enables a trigger to reset the GPS module
- GPS status indicator output which is connected to an LED driver

USB is a four wire slave interface that complies with USB 2.0 protocol signaling. This can be used to communicate with the Wireless CPU or GPS module.

9.1 Architecture

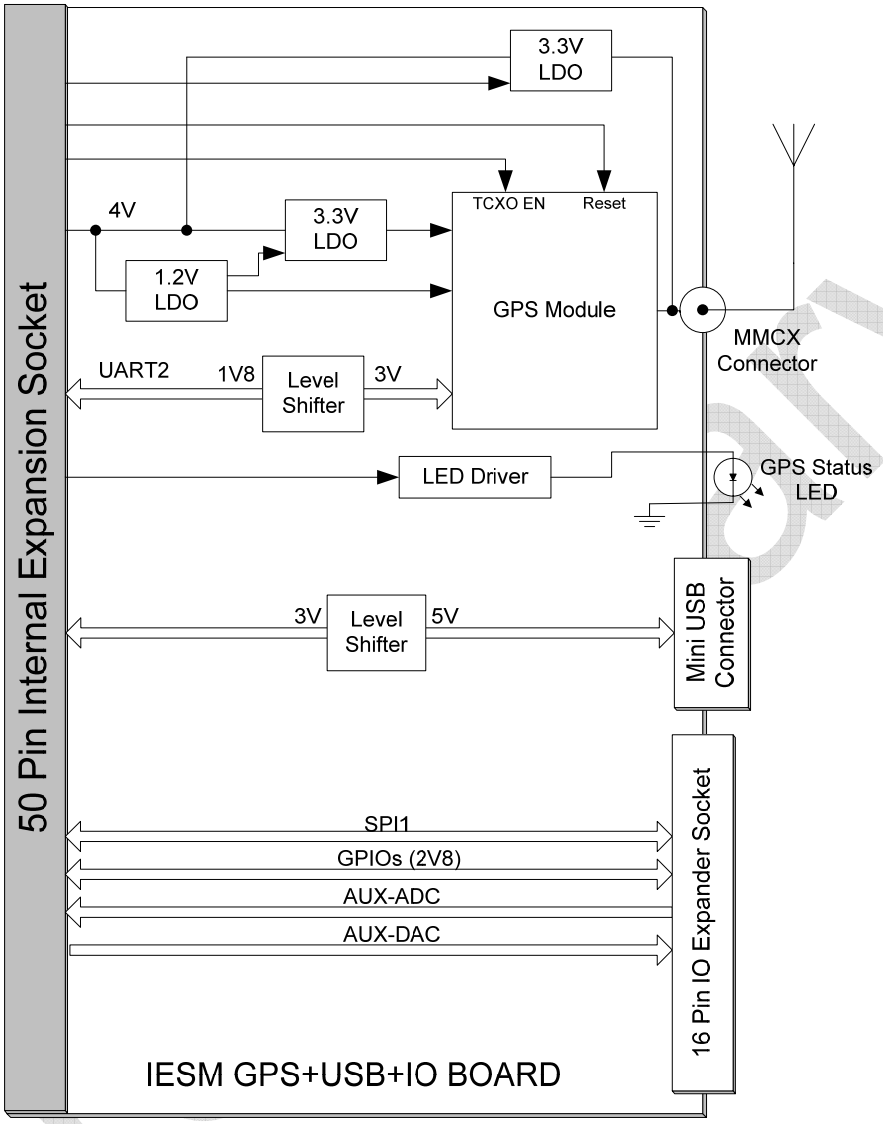


Figure 11: Functional architecture

9.2 IESM-GPS+USB+IO Electrical Characteristics

9.2.1 Power Supply

Table 9: Electrical characteristics

Operating Voltage	4VDC

Note:

The IESM-GPS+USB+IO is powered once the power enable pins are activated by the Open AT® application. The following table describes the consumption based on operating conditions.

Table 10: GPS Power consumption

Mode	Typ	Unit
GPS Powered ON	96	mA

Note: The power consumption indicated excludes the active antenna consumption.

9.2.2 RF Characteristics

9.2.2.1 GPS Receiver Frequency

Table 11: GPS Receiver Frequency

Characteristic	GPS
Frequency RX	1575.42 MHz

9.2.2.2 GPS RF Performance

The GPS RF performance for receiver is given in the table below.

Table 12: Receiver performances

Open AT® SDK v 4.11	Conditions	Notes	Value	Remarks
Accuracy	-130 dBm (outdoor) In dynamic mode	50% percentile	3.7 m CEP	
	-130 dBm (outdoor) In dynamic mode	95% percentile	6.8 m CEP	
	-140 dBm In dynamic mode	50% percentile	6.1 m CEP	
	-145 dBm In dynamic mode	50% percentile	13.9 m CEP	
Velocity Accuracy	Static mode	First fix only	0.1 m/s	Typ
	Static mode	Continuous fixes	0 m/s	Typ
TTFF Hot Start		Mean	3.5 s	Typ
TTFF Warm Start		Mean	30s	Typ
TTFF Cold Start	Clear Sky conditions	Mean	38 s	Typ
	Clear Sky conditions	95% percentile	45 s	Typ
Update Rate	-130 dBm	Continuous fixes	1 Hz	Typ

9.2.2.3 External Antenna

The external antenna is connected to the IESM's GPS via the MMCX connector.

The external antenna must fulfill the characteristics listed in the table below.

Table 13: **External antenna characteristics**

Antenna frequency range	1.57542GHz ± 1.023MHz (L1-Band)
Impedance	50 Ohms nominal
Voltage Supply	3V ± 0.5VDC
Gain (antenna + cable)	2dBi

9.3 USB 2.0 Interface

Is a 4-wire Mini USB slave interface that complies with USB 2.0.

The USB interface signals are VPAD-USB, USB-DP, USB-DM and GND.

USB interface features:

- 12Mbit/s full-speed transfer rate
- 5V typ compatible
- USB Softconnect feature
- Download feature is not supported by USB
- CDC 1.1 – ACM compliant

Pin description of the USB interface

Signal	Mini USB Pin number	I/O	I/O type USB Standard	Description
VPAD-USB	1	I	VBUS	+5V USB Power Supply
USB-DM	2	I/O	D-	Differential data interface negative
USB-DP	3	I/O	D+	Differential data interface positive
ID	4	-	-	NC
GND	5	-	GND	Ground

9.4 Analog to Digital Converter

The **A**nalog to **D**igital **C**onverter input is available at the 16-Way IO Expander Socket. The converter is 10-bit resolution, ranging from 0 to 2V.

The AT Command retrieves measurements on ADC A, ADC B, ADC C and ADC D in mV. The **<ADCValC>** is the AUX_ADC measured value in mV.

AT Command	Response	Remark
AT+ADC ?	+ADC : <ADCValA>, <ADCValB>, <ADCValC>, <ADCValD>	Reads the A/D converter measured value

Pin description of the ADC

Signal	Pin number	I/O	I/O type	Description
AUX-ADC	11	I	Analog	A/D converter

Electrical Characteristics of the ADC

Parameter		Min	Typ	Max	Unit
Resolution			10		bits
Sampling rate				138[1]	sps
Input signal range		0		2	V
INL (Integral non linearity)			15		mV
DNL (Differential non linearity)			2.5		mV
Input impedance	AUX-ADC		1M		Ω

*** Internal pull-up to 2.8V**

[1] Sampling rate only for AUX-ADC and Open AT® application

9.5 Digital to Analogue Converter

One **D**igital to **A**nalog **C**onverter input is available at the 16-Way IO Expander Socket. The converter is 8-bit resolution, ranging from 0 to 2.3V.

Pin description of the DAC

Signal	Pin number	I/O	I/O type	Description
AUX-DAC	10	O	Analog	D/A converter

This output assumes a typical external load of 2kΩ and 50pF in parallel.

Electrical Characteristics of the DAC

Parameter	Min	Typ	Max	Unit
Resolution		8		bits
Output signal range	0		2.3	V
Output voltage after reset		1.147		V
INL (Integral non linearity)	-5		+5	LSB
DNL (Differential non linearity)	-1		+1	LSB

9.6 Environmental Characteristics

The IESM-GPS+USB+IO is compliant with the following operating class. To ensure the proper operation of the IESM-GPS+USB+IO, the temperature of the environment must be within a specific range as described in the table below.

Table 14: Ranges of temperature

Conditions	Temperature range
Operating / Class A	-20 °C to +55°C
Operating / Class B	-30 °C to +85°C
Storage	-40 °C to +85°C

Function Status Classification:

Class A:

The IESM-GPS+USB+IO remain fully functional across the specified temperature range.

Class B:

The IESM-GPS+USB+IO remain fully functional, across the specified temperature range. Some parameters may occasionally deviate from the specified requirements and this deviation does not affect the ability of the IESM-GPS+USB+IO to function fully, as it does within the Class A range.

The detailed climatic and mechanics standard environmental constraints applicable to the Fastrack Supreme are listed in the table below:

Table 15: Environmental standard constraints

Environmental Tests (IEC TR 60721-4)		Environmental Classes (IEC 60721-3)			
Tests	**Standards**	**Storage (IEC 60721-3-1) Class IE13**	**Transportation** (IEC 60721-3-2) Class IE23	**Operation**	
				Stationary (IEC 60721-3-3) **Class IE35**	Non-Stationary **(IEC 60721-3-7) Class IE73**
Cold	IEC 60068-2-1 : Ab/Ad	-25°C, 16 h	-40°C, 16 h	-5°C, 16 h	-5°C, 16 h
Dry heat	IEC 60068-2-2 : Bb/Bd	+70°C, 16 h	+70°C, 16 h	+55°C, 16 h	+55°C, 16 h
Change of temperature	IEC 60068-2-14 : Na/Nb	-33°C to ambient 2 cycles, t1=3 h 1 °C.min^{-1}	-40°C to ambient 5 cycles, t1=3 h t2<3 min	-5°C to ambient 2 cycles, t1=3 h 0,5 °C.min^{-1}	-5°C to ambient 5 cycles, t1=3 h t2<3 min
Damp heat	IEC 60068-2-56 : Cb	+30°C, 93% RH 96 h	+40°C, 93% RH 96 h minimum	+30°C, 93% RH, 96 h	+30°C, 93% RH, 96 h
Damp heat, cyclic	60068-2-30 : Db Variant 1 or 2	+40°C, 90% to 100% RH One cycle Variant 2	+55°C, 90% to 100% RH Two cycles Variant 2	+30°C, 90% to 100% RH Two cycles Variant 2	+40°C, 90% to 100% RH Two cycles Variant 1
Vibration (sinusoidal)	IEC 60068-2-6 : Fc	1-200 Hz 2 m.s^{-2} 0,75 mm 3 axes 10 sweep cycles	1-500 Hz 10 m.s^{-2} 3,5 mm 3 axes 10 sweep cycles	1-150 Hz 2 m.s^{-2} 0,75 mm 3 axes 5 sweep cycles	1-500 Hz 10 m.s^{-2} 3,5 mm 3 axes 10 sweep cycles
Vibration (random)	IEC 60068-2-64 : Fh	-	10-100 Hz / 1,0 m^2.s^{-3} 100-200 Hz / -3 dB.octave^{-1} 200-2000 Hz / 0,5 m^2.s^{-3} 3 axes 30 min	-	-
Shock (half-sine)	IEC 60068-2-27 : Ea	-	-	50 m.s^{-2} 6 ms 3 shocks 6 directions	150 m.s^{-2} 11 ms 3 shocks 6 directions
Bump	IEC 60068-2-29 : Eb	-	250 m.s^{-2} 6 ms 50 bumps vertical direction	-	-
Free fall	ISO 4180-2	-	Two falls in each specified attitude	-	2 falls in each specified attitude 0,025 m (<1kg)
Drop and topple	IEC 60068-2-31 : Ec	-	One drop on relevant corner One topple about each bottom edge	-	One drop on each relevant corner One topple on each of 4 bottom edges

Notes:

Short description of Class IE13 (*For more information see standard IEC 60721-3-1)*

"Locations without controlled temperature and humidity, where heating may be used to raise low temperatures, locations in buildings providing minimal protection against daily variations of external climate, prone to receiving rainfall from carrying wind".

Short description of Class IE23 (*For more information, see standard IEC 60721-3-2)*

"Transportation in unventilated compartments and in conditions without protection against bad weather, in all sorts of trucks and trailers in areas of well developed road network, in trains equipped with buffers specially designed to reduce shocks and by boat".

Short description of Class IE35 (*For more information see standard IEC 60721-3-3)*

"Locations with no control on heat or humidity where heating may be used to raise low temperatures, to places inside a building to avoid extremely high temperatures, to places such as hallways, building staircases, cellars, certain workshops, equipment stations without surveillance".

Short description of Class IE73 (*For more information see standard IEC 60721-3-7)*

"Transfer to places where neither temperature nor humidity are controlled but where heating may be used to raise low temperatures, to places exposed to water droplets, products can be subjected to ice formation, these conditions are found in hallways and building staircases, garages, certain workshops, factory building and places for industrial processes and hardware stations without surveillance".

Warning: The specification in the above table applies to the Supreme product only. Customers are advised to verify that the environmental specification of the SIM Card used is compliant with the Supreme environmental specifications. Any application must be qualified by the customer with the SIM Card in storage, transportation and operation.

The use of standard SIM cards may drastically reduce the environmental conditions in which the Product can be used. These cards are particularly sensible to humidity and temperature changes. These conditions may produce oxidation of the SIM card metallic layers and cause, in the long term, electrical discontinuities. This is particularly true in left alone applications, where no frequent extraction/insertion of the SIM card is performed.

In case of mobility when the application is moved through different environments with temperature variations, some condensation may appear. These events have a negative impact on the SIM and may favor oxidation.

If the use of standard SIM card, with exposition to the environmental conditions described above, can not be avoided, special care must be taken in the integration of the final application in order to minimize the impact of these conditions. The solutions that may be proposed are:

- Lubrication of the SIM card to protect the SIM Contact from oxidation.
- Putting the Supreme Plug & Play in a waterproof enclosure with desiccant bags.

Lubrication of the SIM card had been tested by Wavecom (using Tutela Fluid 43EM from MOLYDUVAL) and gives very good results.

If waterproof enclosure with a desiccant solution is used, check with your desiccant retailer the quantity that must be used according to the enclosure dimensions. Ensure humidity has been removed before sealing the enclosure.

Any solution selected must be qualified by the customer on the final application.

To minimize oxidation problem on the SIM card, its manipulation must be done with the greatest precautions. In particular, the metallic contacts of the card must never be touched with bare fingers or any matter which may contain polluted materials liable to produce oxidation (such as, e.g. substances including chlorine). In case a cleaning of the Card is necessary, a dry cloth must be used (never use any chemical substance).

9.7 Conformity

The complete product complies with the essential requirements of article 3 of R&TTE 1999/5/EC Directive and satisfied the following standards:

Domain	Applicable standard
Safety standard	EN 60950 (ed.1999)
Efficient use of the radio frequency spectrum	EN 301 419-(v 4.1.1) EN 301 511 (V 7.0.1)
EMC	EN 301 489–1 (edition 2002) EN 301 489-7 (edition 2002)
Global Certification Forum – Certification Criteria	GCF-CC V3.13.0

10 Connector and Peripheral Devices References

10.1 General Purpose Connector References

GPC is a 50-pin plug connector with 0.5mm pitch from Kyocera Elco:

14 5078 050 515 861+

AVX
14-5078-050-515-861

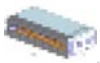
Mini-B USB connector with 0.8mm pitch from Molex:

54819-0572

Molex
548190572_sd.pdf

16 Way I/O Socket with 0.625mm pitch from Kyocera Elco:

20 9257 016 001 013 (IESM side)



AVX
20-9257-01-000S.pdf

16 Way I/O plug with 0.625mm pitch from Kyocera Elco:

58-9257-000-000-012S

More information is also available from;

http://www.avxcorp.com/

http://www.molex.com/

11 Safety recommendations

11.1 General Safety

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

Switch OFF your Wireless CPU®:

- When in an aircraft. The use of cellular telephones in an aircraft may endanger the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both,
- When at a refueling point,
- When in any area with a potentially explosive atmosphere which could cause an explosion or fire,
- In hospitals and any other place where medical equipment may be in use.

Respect restrictions on the use of radio equipment in:

- Fuel depots,
- Chemical plants,
- Places where blasting operations are in progress,
- Any other area where signalization reminds that the use of cellular telephone is forbidden or dangerous.
- Any other area where you would normally be advised to turn off your vehicle engine.

There may be a hazard associated with the operation of your Supreme Plug & Play close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.

Operation of your Supreme Plug & Play close to other electronic equipment may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.

The Supreme Plug & Play is designed for and intended to be used in "***fixed***" and "***mobile***" applications:

- **"*Fixed*"** means that the device is physically secured at one location and is not able to be easily moved to another location.
- **"*Mobile*"** means that the device is designed to be used in other than fixed locations and generally in such a way that a separation distance of at least 20 cm (8 inches) is normally maintained between the transmitter's antenna and the body of the user or nearby persons.

The Supreme Plug & Play is not designed for and intended to be used in portable applications (within 20 cm or 8 inches of the body of the user) and such uses are strictly prohibited.

11.2 Vehicle Safety

Do not use your Supreme Plug & Play while driving, unless equipped with a correctly installed vehicle kit allowing 'Hands-Free' Operation.

Respect national regulations on the use of cellular telephones in vehicles. Road safety always comes first.

If incorrectly installed in a vehicle, the operation of Supreme Plug & Play telephone could interfere with the correct functioning of vehicle electronics. To avoid such problems, make sure that the installation has been

performed by a qualified personnel. Verification of the protection of vehicle electronics should form part of the installation.

The use of an alert device to operate a vehicle's lights or horn on public roads is not permitted.

11.3 Care and Maintenance

Your Supreme Plug & Play is the product of advanced engineering, design and craftsmanship and should be treated with care. The suggestion below will help you to enjoy this product for many years.

Do not expose the Supreme Plug & Play to any extreme environment where the temperature or humidity is high.

Do not use or store the Supreme Plug & Play in dusty or dirty areas. Its moving parts (SIM holder for example) can be damaged.

Do not attempt to disassemble the Wireless CPU®. There are no user serviceable parts inside.

Do not expose the Supreme Plug & Play to water, rain or spilt beverages. It is not waterproof.

Do not abuse your Supreme Plug & Play by dropping, knocking, or violently shaking it. Rough handling can damage it.

Do not place the Supreme Plug & Play alongside computer discs, credit or travel cards or other magnetic media. The information contained on discs or cards may be affected by the Wireless CPU®.

The use of third party equipment or accessories, not made or authorized by Wavecom may invalidate the warranty of the Wireless CPU®.

Do contact an authorized Service Center in the unlikely event of a fault in the Wireless CPU®.

11.4 Your Responsibility

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

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

12 Recommended Accessories

Accessories recommended by Wavecom for the IESM-GPS+USB+IO are given in the table below.

Table 16: List of recommended accessories

Designation	Part number	Supplier
GPS antenna with MMCX connector		

13 Online Support

Wavecom provides an extensive range on online support which includes the following areas of Wavecom's wireless expertise:

- the latest version of this document
- new versions of our Operating System user guides
- comprehensive support for Open AT®
- regulatory certifications
- carrier certifications
- application notes

To gain access to this support, simply visit our web site at www.wavecom.com and click on "Support". Privileged access via user login is provided to Wavecom authorized distributors.