AT170503US Integration Manual

REGULATORY NOTICES

FCC

This device complies with the RF safety requirements as per FCC Part 1.1310, RF Exposure radiation limits for the General Population / Uncontrolled Exposure.

This device shall be installed to maintain a separation distance of 20 cm from the general population.

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.

Any changes or modifications not expressly approved by 3SI Security Systems could void the user's authority to operate the equipment.

INDUSTRY CANADA

This device complies with the RF safety requirements for Canada as per RSS-102, RF Exposure radiation limits for the General Population / Uncontrolled Exposure.

Cet appareil est conforme aux exigences de sécurité RF pour le Canada selon RSS-102, Limites de rayonnement RF d'exposition pour la population générale / exposition incontrôlée.

This device shall be installed to maintain a separation distance of 20 cm from the general population.

Cet appareil doit être installé pour maintenir une distance de séparation de 20 cm par rapport à la population générale.

This device complies with Industry Canada's licence-exempt RSSs. 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.

Cet appareil est conforme aux RSS exempts de licence d'Industrie Canada. L'opération est soumise aux deux conditions suivantes:
(1) Cet appareil ne doit pas causer d'interférences; et
(2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

1. Product description

1.1 General

AT170503US is a radio product designed by 3SI Security Systems to perform event monitoring and location tracking services. To facilitate the data transfer to 3SI servers, this product has provisions to host a wide range of LTE modems. The following information represents AT170503US integration example with a Telit LTE modem ME866. Other modems may require a layout modification (limited to U5 area only).

NOTE: only FCC and/or IC certified modems shall be used for the purpose of integration with AT170503US.

1.2 Sub-sections

AT170503US contains the following sub-sections:

Sub-section	TYPE	FREQUENCY [MHz]	COMMENT
GNSS	receiver	1559 – 1610	
WiFi	transceiver	2412 - 2462	
Beacon	transceiver	2402 - 2480	Bluetooth
Beacon	transmitter	216.475	UHF
Battery charger	charger	N/A	Optional use
Processor	system logic	40	

Please refer to Q6KAT170503US Block Diagram exhibit for more information.

1.3 Interface definitions.

REF	SIGNAL TYPE	I/O	FUNCTION	CONNECTOR	COMMENT
J1	DC	input	Auxiliary battery	Header	Optional battery connector
J2	DC	input	DC power	Header	Optional
J3	Digital	Bi-directional	Test port	Header	For factory use only
J4	DC	input	Main battery connector	Header	Internal battery
J5	RF	Bi-directional	LTE modem diversity port	U.FL	optional
J6	RF	Bi-directional	Modem transceiver port	U.FL	External antenna
J7	DC	input	DC power	Micro USB	Primary charger source
J8	DC	input	Auxiliary battery	Header	Optional battery connector
J9	RF	input	GNSS receiver input	U.FL	External antenna
J10	RF	output	UHF beacon diagnostics	U.FL	optional
P1	Digital	Bi-directional	Expansion connector	Header	Expanded functionality
U5	Digital	Bi-directional	Hosted LTE modem	Solder pads	xE866 family of LTE modems manufactured by Telit

2. J1 External Battery connector (header pin)

2.1 J1 description

This connector is intended for connections to externally mounted batteries, when internal 3SI battery is not required.   (NOTE: all J1 signal lines are parallel with J4 and J8 connectors). For details on battery operating voltage range refer to "Q6KAT1705093US Theory of Operation" exhibit.

2.2 Modem pinout information

Pin	Signal	I/O	Function
1	PLUS	I	Positive battery terminal
2	MINUS	I	Negative battery terminal
3	TS	I	Thermistor

3. J2 DC Power Connector (header pin)

3.1 J2 description

This connector is intended for optional connection to external battery charger power sources when connection through J7 is not required. The J2 signal lines are parallel with J7 lines.

3.2 J2 pinout information

Pin	Signal	I/O	Function
1	PVBUS	I	Positive DC source terminal
2	GND	I	Negative DC source terminal

4. J3 Test Port (Hirose 14-pin female)

4.1 J3 Description
This port is used for factory test and diagnostic purposes only. Integrators or users do not require to access this port.

5. J4 Internal Battery connector (knife contacts)

5.1 J4 connector description
This connector provides connection to the internally mounted battery. The J4 signal lines are parallel with J1 and J8 lines.

5.2 J4 pinout information (NOTE: all J8 signal lines are parallel to J1 and J8 connectors)

Pin	Signal	I/O	Function
1	PLUS	I	Positive battery terminal
2	MINUS	I	Negative battery terminal
3	TS	I	Thermistor

6. J5 Modem Diversity port (U.FL)

6.1 J5 connector description

This connector is reserved for future connection to modem diversity antenna input port. Currently not placed in production. The characteristic impedance of this connector is 50 Ohms.

7. J6 Modem main antenna port (U.FL)
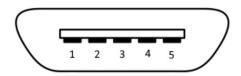
7.1 J6 connector description

This U.FL RF connector provides connection to modem transceiver input port via an RF switch to an external LTE antenna. The characteristic impedance of this connector is 50 Ohms.

8. J7 DC power connector (micro USB)

8.1 J7 connector pin arrangement

8.2 J7 pinout information

Pin	Signal	I/O	Function
1	VBUS	I	Power for charger
2	N/C	-	NOT CONNECTED
3	N/C	-	NOT CONNECTED
4	N/C	-	NOT CONNECTED
5	GND	I	Ground

9. J8 auxiliary battery connector (header, 3 pin)

9.1 J8 connector description

J8 connector is designed be optionally placed to connect an auxiliary battery to this radio product.

9.2 J8 pinout information (NOTE: all J8 signal lines are parallel to J1 and J4 connectors)

Pin	Signal	I/O	Function
1	PLUS	I	Positive battery terminal
2	MINUS	I	Negative battery terminal
3	TS	I	Thermistor

10. J9 GNSS input connector (U.FL)

10.1   J9 connector description

This connector allows attachment of an external GNSS active (i.e. amplified) antenna to the AT170503US product. The expected range of incoming signals is 1559 – 1610 MHz. This connector is rated for 50 Ohms characteristic impedance.

11. J10 beacon output connector (U.FL)

11.1   J10 connector description

J10 connector is intended to be used during the test and/or development phase and is normally not installed in production.

12. P1 expansion connector (header, 14 positions)

12.1   P1 connector description

This port enables the system functionality expansion through addition of auxiliary sensors or actuators.

12.2   P1 connector pinout information

Pin	Signal	I/O	Function
1	GND	I	Ground
2	VBAT	I	Battery power from expansion module
3	EXP-INT	I	Expansion module interrupt
4	EXP-SPI-CLK	I/O	Expansion module generic interface control signal
5	EXP-ENABLE	O	Expansion module Enable signal
6	EXP-SPI-MISO	I/O	Expansion module generic interface control signal
7	V1.8_uP	O	1.8V IO power from device to Expansion module
8	EXP-SPI-MOSI	I/O	Expansion module generic interface control signal
9	EXP-I2C-SDA	I/O	Expansion module generic interface control signal
10	EXP-SPI-CS	I/O	Expansion module generic interface control signal
11	EXP-I2C-SCL	I/O	Expansion module generic interface control signal
12	EXP-BATT-TS	O	Expansion module battery thermistor signal
13	VBAT	I	Battery power from expansion module
14	GND	I	Ground

13. U5 modem hosting socket (solder pads)

13.1   U5 description

U5 pad grid was designed to host LTE M2M xE866 modem family manufactured by Telit. The modem selection is driven by the type of LTE network to support i.e. Verizon or AT&T. All modems belonging to xE866 family share the same pinout and can be placed directly on the reserved solder pads.

Other types of modems may require layout modifications (U5 area only).

13.2   U5 modem pin grid layout

TOP VIEW

	A	B	C	D	E	F	G
0	RESERVED	GND	RESERVED	GND	VBATT_PA	GND	GND
1	C105/RTS	C106/CTS	TX AUX	GND	VBATT_PA	GND	GND
2	C108/DTR	C109/DCD	RX AUX	GND	VBATT	GND	MAIN ANT
3	C107/DSR	C125/RING	GND	PSM_WAKE	GND	GND	GND
4	C103/TXD	GPIO_06	GPIO_07	RESERVED	DAC_OUT	ADC_IN1	RESET*
5	C104/RXD	GPIO_05	GPIO_01	GPIO_04	USB_D+	RESERVED	RESERVED
6	SIMIO	RESERVED	GPIO_02	GPIO_03	USB_D-	GND	VAUX/PWR MON
7	SIMCLK	SIMRST	SIMVCC	RESERVED	RESERVED	RESERVED	RESERVED
8	GND	RESERVED	RESERVED	VDDIO_IN	PSM STATUS	PSM ENA OUT	GND
9	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
10	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
11	GND	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	GND

13.3 U5 modem pinout information

13.3.1 USB HS 2.0 communications port

Pin	Signal	I/O	Function	Comment
E5	USB_D+	I/O	USB differential Data (+)	NOT CONNECTED
E6	USB_D-	I/O	USB differential Data (-)	NOT CONNECTED

13.3.2 Asynchronous Serial Port (USIF0) - Data + HW Flow Control

Pin	Signal	I/O	Function	Type
A4	C103/TXD	I	Serial data input (TXD) from DTE	CMOS 1.8V
A5	C104/RXD	O	Serial data output to DTE	CMOS 1.8V
A2	C108/DTR	I	Input for (DTR) from DTE	CMOS 1.8V
A1	C105/RTS	I	Input for Request to send signal (RTS) from DTE	CMOS 1.8V
B1	C106/CTS	O	Output for Clear to send signal (CTS) to DTE	CMOS 1.8V
B2	C109/DCD	O	Output for (DCD) to DTE NOT CONNECTED	CMOS 1.8V
A3	C107/DSR	O	Output for (DSR) to DTE NOT CONNECTED	CMOS 1.8V
B3	C125/RING	O	Output for Ring (RI) to DTE	CMOS 1.8V

13.3.3 Asynchronous Auxiliary Serial Port (USIF1)

Pin	Signal	I/O	Function	Type
C1	TX_AUX	O	Auxiliary UART (TX Data to DTE) NOT CONNECTED	CMOS 1.8V
C2	RX_AUX	I	Auxiliary UART (RX Data from DTE) NOT CONNECTED	CMOS 1.8V

13.3.4 SIM card interface

Pin	Signal	I/O	Function	Type
C7	SIMVCC	-	External SIM signal – Power supply for the SIM	1.8V Only
B7	SIMRST	O	External SIM signal – Reset	CMOS 1.8
A7	SIMCLK	O	External SIM signal – Clock	CMOS 1.8
A6	SIMIO	I/O	External SIM signal – Data I/O	CMOS 1.8
X	SIMIN	I	Presence SIM input	CMOS 1.8

13.3.5 Digital I/O

Pin	Signal	I/O	Function	Type
C5	GPIO_01 SIM_IN	I/O INT	Main Function: GPIO01 Configurable GPIO Alternate Function: SIM_IN NOT CONNECTED	CMOS 1.8V
C6	GPIO_02 SIM_IN	I/O INT	Main Function: GPIO02 Configurable GPIO Alternate Function: SIM_IN NOT CONNECTED	CMOS 1.8V
D6	GPIO_03 SIM_IN	I/O INT	General Purpose IO Alternate Function: SIM_IN NOT CONNECTED	CMOS 1.8V
D5	GPIO_04 SIM_IN	I/O INT	Main Function: GPIO04 Configurable GPIO Alternate Function: SIM_IN ANT-SELECT-EXT/INT#	CMOS 1.8V
B5	GPIO_05 SIM_IN	I/O INT	Main Function: GPIO05 Configurable GPIO Alternate Function 1: SIM_IN NOT CURRENTLY USED	CMOS 1.8V
B4	GPIO_06 ALARM SIM_IN	I/O INT	Main Function: GPIO06 Configurable GPIO Alternate Function 1: ALARM Alternate Function 2: SIM_IN NOT CONNECTED	CMOS 1.8V
C4	GPIO_07 STAT_LED SIM_IN	I/O INT	Main Function: GPIO07 Configurable GPIO Alternate Function 1: STATLED Alternate Function 2: SIM_IN NOT CONNECTED	CMOS 1.8V
D8	VDDIO_IN	I	IO bus Supply input	Power

13.3.6 ADC and DAC

Pin	Signal	I/O	Function	Type
F4	ADC_IN1	AI	Analog/Digital converter input NOT CONNECTED	A/D
E4	DAC_OUT	AO	Digital/Analog converter output NOT CONNECTED	D/A

13.3.7 RF

Pin	Signal	I/O	Function	Type
G2	MAIN_ANT	I/O	LTE Main Antenna (50 ohm)	RF

13.3.8 Miscellaneous Functions

Pin	Signal	I/O	Function	Type
G4	RESET*	I	Reset Input	VBATT
G6	VAUX PWRMON	O	1.8V stabilized output Power ON monitor	Power
D3	PSM_WAKE	I	PSM Wake Up	Analog
E8	PSM_STATUS	O	PSM Status	CMOS 1.8V
F8	PSM_ENA_OUT	O	NOT CONNECTED	CMOS 1.8V

13.3.9 Power Supply

Pin	Signal	I/O	Function	Type
E2	VBATT	-	Main power supply (Baseband)	Power
E0	VBATT_PA	-	Main power supply (Radio PA)	Power
E1	VBATT_PA	-	Main power supply (Radio PA)	Power
B0	GND	-	Ground	Power
D0	GND	-	Ground	Power
F0	GND	-	Ground	Power
G0	GND	-	Ground	Power
D1	GND	-	Ground	Power
F1	GND	-	Ground	Power
G1	GND	-	Ground	Power
D2	GND	-	Ground	Power
F2	GND	-	Ground	Power
C3	GND	-	Ground	Power
E3	GND	-	Ground	Power
F3	GND	-	Ground	Power
G3	GND	-	Ground	Power
F6	GND	-	Ground	Power
A8	GND	-	Ground	Power
G8	GND	-	Ground	Power
A11	GND	-	Ground	Power
G11	GND	-	Ground	Power

13.3.10 Reserved

Pin	Signal	I/O	Function
A0	RESERVED	-	NOT CONNECTED
C0	RESERVED	-	NOT CONNECTED
G5	RESERVED	-	Optionally connected to MODEM-RING for NE866 PSM mode support
B6	RESERVED	-	NOT CONNECTED
D7	RESERVED	-	NOT CONNECTED
E7	RESERVED	-	NOT CONNECTED
F7	RESERVED	-	NOT CONNECTED
G7	RESERVED	-	NOT CONNECTED
B8	RESERVED	-	NOT CONNECTED
C8	RESERVED	-	NOT CONNECTED
A9	RESERVED	-	NOT CONNECTED
B9	RESERVED	-	NOT CONNECTED
C9	RESERVED	-	NOT CONNECTED
D9	RESERVED	-	NOT CONNECTED
E9	RESERVED	-	NOT CONNECTED
F9	RESERVED	-	NOT CONNECTED
G9	RESERVED	-	NOT CONNECTED
A10	RESERVED	-	NOT CONNECTED
B10	RESERVED	-	NOT CONNECTED
C10	RESERVED	-	NOT CONNECTED
D10	RESERVED	-	NOT CONNECTED
E10	RESERVED	-	NOT CONNECTED
F10	RESERVED	-	NOT CONNECTED
G10	RESERVED	-	NOT CONNECTED
B11	RESERVED	-	NOT CONNECTED
C11	RESERVED	-	NOT CONNECTED
D4	RESERVED	-	NOT CONNECTED
F5	RESERVED	-	NOT CONNECTED
F11	RESERVED	-	NOT CONNECTED
E11	RESERVED	-	NOT CONNECTED
D11	RESERVED	-	NOT CONNECTED

14. Integration procedure

- Select a xE866 Telit modem that covers desired LTE bands
    - o the modem must be FCC and/or IC approved
- Add the modem as U5 to AT170503US schematic
- Perform on-board antenna optimization for the desired frequency range
    - o Antenna geometry (if required)
    - o Matching network (if required)
- Perform EMC evaluation to validate continued FCC and IC compliance

15. Product labeling

- Place on the product the label with the following content:

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CONTAINS:
FCC ID: Q6KAT170503A, [MODEM FCC ID]
IC:   5043A-AT170503A, [MODEM IC ID]
```

16. Tune Up Information

The module tuning is performed during the manufacturing process. The integrated product requires no further tuning.   The user cannot access nor alter any tuning parameters.