Migration Guide

AirPrime Q2687 Refreshed

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Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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Document History

Version	Date	Updates
001	November 23, 2009	Creation
002	December 3, 2009	Updated the following sections: • 4.2.2 Precidip Connector • 4.2.3 Precidip PCB Coordinate
003	January 28, 2010	Updated Table 7 Power Consumption of the Q26 Series, Typical Values
		Updated the list of tests in section 6 Certification Continuity
		Updated section 5 Software Constraint
004	April 8, 2010	Reformatted in the rebranded SWI template
		Removed inapplicable references to IMP connectors throughout the document
		Added section 4.1.1.4 Temperature Sensor Interface
		Updated FCC and IC ID information in section 6 Certification Continuity
		Updated section 4.1.2.1 Power Consumption
		Added Figure 4 and Figure 5.
005	June 3, 2010	Updated the signal name for pin number 83 in Table 10 Pin Out Difference Between the Q26 Series Embedded Modules
		Updated the operating mode naming convention in Table 7 Power Consumption of the Q26 Series, Typical Values
006	September 03, 2010	Updated power consumption values for the Q2686 in Table 7.
		Updated the firmware and software suite version in section 5 Software Constraint.
007	October 19, 2010	Updated section 4.2.2 Precidip Connector.
		Added reference document [6] AirPrime Q26 Series Customer Process Guidelines.
008	March 01, 2011	Updated Table 9 Delta Parts List from Q2687 to Q2687 Refreshed.
		Added section 3.3 Label Differences.

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1. Introduction

This document sums up the differences between the Q2687 Refreshed Embedded Module and Legacy Q2687/Q2687 Classic/Q2686. The Q2687 Refreshed is a product enhancement of the Legacy Q2687 with a new RF chip set applied. It aims to extend the product life cycle.

2. Reference Documents

2.1. List of References

[1] AT Commands Interface Guide for Firmware 7.4
Reference: WM_DEV_OAT_UGD_079

[2] AirPrime Q2686 Product Technical Specification
Reference: WM_PRJ_Q2686_PTS_001

[3] AirPrime Q2687 Product Technical Specification
Reference: WA_ENG_Q2687_PTS_001

[4] AirPrime Q2687 Classic Product Technical Specification
Reference: WM_DEV_Q2687_PTS_001

[5] AirPrime Q2687 Refreshed Product Technical Specification and Customer Design Guideline
Reference: WA_DEV_Q26RD_PTS_001

[6] AirPrime Q26 Series Customer Process Guidelines
Reference: WM_PRJ_Q2686_PTS_004

3. General Description

3.1. General Information

The Q26 series is offered in several different versions. The table below defines each product of the Q26 series together with the Q2687 Refreshed embedded module.

Table 1. Comparison Table Between the Q26 Series Embedded Modules

Q2686	Q2687	Q2687 Classic	Q2687 Refreshed
Quad band GSM	Quad band GSM	Quad band GSM	Quad band GSM
GSM / GPRS Class 10	GSM / GPRS Class 10 / EDGE Class 10	GSM / GPRS Class 10	GSM / GPRS Class 10 / EDGE Class 10
ARM946, 32 bit, 104MHz	ARM946, 32 bit, 104MHz	ARM946, 32 bit, 104MHz	ARM946, 32 bit, 104MHz
-20°C / +55°C Class A -40°C / +85°C Class B	-20°C / +55°C Class A -40°C / +85°C Class B	-20°C / +55°C Class A -40°C / +85°C Class B	-30°C / +70°C Class A -40°C / +85°C Class B
1 UFL connector, 1 IMP connection which allows to support board to board solution, 1 RF solder pad, 100 I/O Pins connector	1 UFL connector, 1 IMP connection which allows to support board to board solution, 1 RF solder pad, 100 I/O Pins connector	1 UFL connector, 1 IMP connection which allows to support board to board solution, 1 RF solder pad, 100 I/O Pins connector	1 UFL connector, 1 Precidip connection which allows the support of board to board solution, 1 RF solder pad, 100 I/O Pins connector
40mm x 32.2mm x 4mm	40mm x 32.2mm x 4mm	40mm x 32.2mm x 4mm	40mm x 32.2mm x 4mm

3.2. Correspondences PNMKT
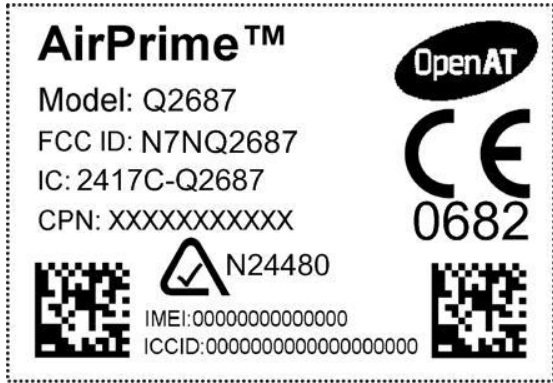
Table 2. Correspondences PNMKT

Q26 Series	Memory Size	PNMKT
Q2686H	32Mb Flash, 8Mb Ram	Q2686H
Q2686G	64Mb Flash, 16Mb Ram	Q2686G
Q2687H	32Mb Flash, 8Mb Ram	Q2687H
Q2687G	64Mb Flash, 16Mb Ram	Q2687G
Q2687 Classic	32Mb Flash, 8Mb Ram	Q2687CL01
Q2687 Classic	64Mb Flash, 16Mb Ram	Q2687CL02
Q2687 Refreshed	64Mb Flash, 16Mb Ram	Q2687RD

3.3.   Label Differences

The following table describes the differences between the legacy Q2687 label and the Q2687 Refreshed label.

Table 3.   Label Differences

Legacy Q2687 Label	Q2687 Refreshed Label
The legacy Q2687 label provides the following information: • Wireless CPU • Product Name (Q2687) • FCC ID (O9EQ2687) • Open AT Logo • Serial barcode, Serial number • RoHS Logo • CE Marking with certification number (CE 1065)	The Q2687 Refreshed label provides the following information: • AirPrime^{TM} • Product Name (Q2687) • Open AT Logo • FCC ID (N7NQ2687) • IC Number (2417C-Q2687) • CPN: Optional Customer Number • CE Marking with certification number (CE 0682) • A-Tick Logo and Number (N24480) • IMEI barcode, IMEI number • ICC ID number, ICC ID barcode

4. Hardware Constraint

4.1. Electrical Differences

4.1.1. Functional Differences

4.1.1.1. RF Band

The entire Q26 series supports GSM quad band at 900 / 1800 / 850 / 1900 MHz and GPRS Class 10 connection. Q2687 Refreshed and Q2687 also support EDGE CL 10. The following table shows the summary of the RF capabilities of each embedded module.

Table 4.   RF Band Supported by the Q26 Series Embedded Modules

Product Reference	RF Band
Q2686	EGSM / GPRS CL 10 850 / 900 / 1800 /1900 MHz
Q2687	EGSM / GPRS CL 10 / EDGE CL 10 850 / 900 / 1800 /1900 MHz
Q2687 Classic	EGSM / GPRS CL 10 850 / 900 / 1800 /1900 MHz
Q2687 Refreshed	EGSM / GPRS CL 10 / EDGE CL 10 850 / 900 / 1800 /1900 MHz

4.1.1.2. Temperature Range

The Q2687 Refreshed is targeted to have a wider temperature range in Class A. Refer to the following table for the temperature comparison between the various embedded modules.

Table 5.   Operating Temperature Range of the Q26 Series Embedded Modules

Product Reference	Operating Temperature Range
Q2686	-20°C to +55°C Class A *-40°C to +85°C Class B
Q2687	-20°C to +55°C Class A *-40°C to +85°C Class B
Q2687 Classic	-20°C to +55°C Class A *-40°C to +85°C Class B
Q2687 Refreshed	-30°C to +70°C Class A -40°C to +85°C Class B

    *   Specific BOM version

4.1.1.3.   Power Supply

The nominal voltage throughout the Q26 Series embedded modules is 3.6V, with the minimum voltage at 3.2V and the maximum voltage at 4.5V to 4.8V. The table below summarizes the differences between the power supplies of the various embedded modules in the series.

Table 6.   Operating Voltages of the Q26 Series Embedded Modules

	Q2686	Q2687	Q2687 Classic	Q2687 Refreshed
V_{in} Max.	4.8 volt	4.5 volt	4.5 volt	4.8 volt
V_{in} Nominal	3.6 volt	3.6 volt	3.6 volt	3.6 volt
V_{in} Min.	3.2 volt	3.2 volt	3.2 volt	3.2 volt

4.1.1.4.   Temperature Sensor Interface

A temperature sensor is implanted in the Q2687 Refreshed embedded module which is used to detect the temperature in the embedded module.

This temperature sensor is built inside the Front-End-Module of the Q2687 Refreshed. The characteristic of the temperature sensor is improved compared to Q2687.

The following waveform describes the characteristic of this function in Q2687 Refreshed in contrast to Q2687. The new characteristic has an enhanced linearity as shown in the figure below.

The average step of Q2687 Refreshed is 13mV/°C and the formula for computing the temperature sensor output is as follows:

$$\text{VTemp (V)} = -0.013 \times \text{Temperature (°C)} + 1.182$$
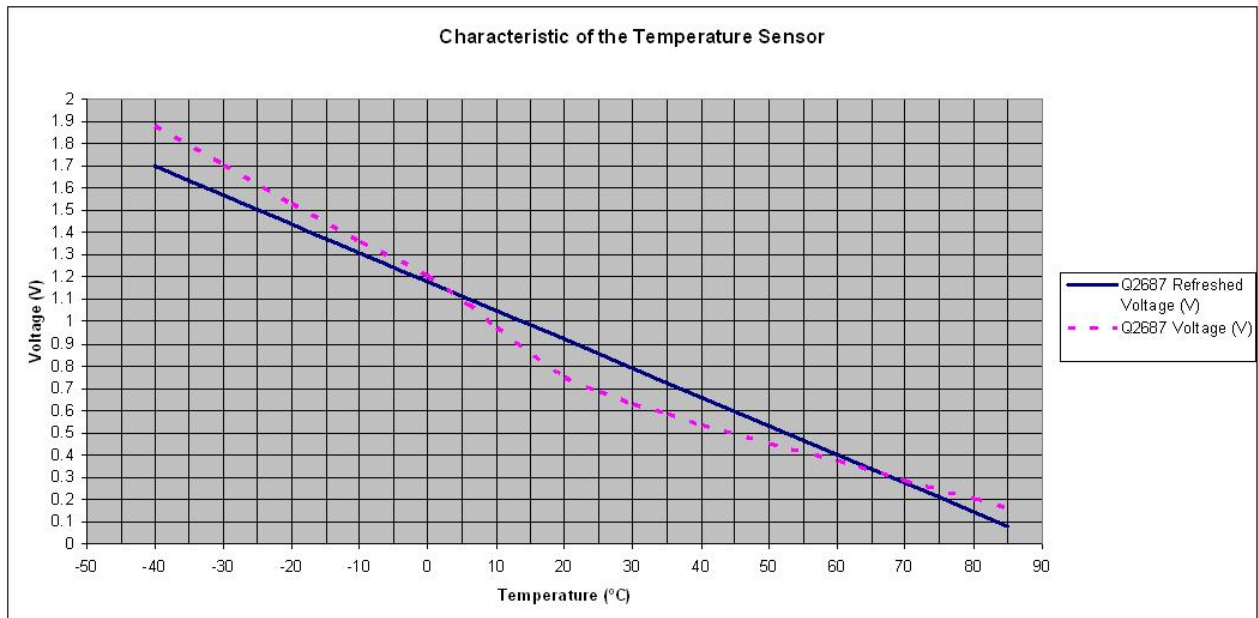

Figure 1.   Temperature Sensor Characteristics

4.1.2.   Performance Differences

4.1.2.1.   Power Consumption

Table 7.   Power Consumption of the Q26 Series, Typical Values

Operating Mode	Parameters		I_{NOM} Average				Unit
			Q2686	Q2687	Q2687 Classic	Q2687 Refreshed	
Alarm Mode			16	16.2	16.2	11.1	µA
Active Idle Mode	Paging 9 (Rx burst occurrence ~2s)		21.48	19.3	19.3	21.9	mA
	Paging 2 (Rx burst occurrence ~0,5s)		22.66	21.2	21.2	23.4	mA
Sleep Idle Mode	Paging 9 (Rx burst occurrence ~2s)		4.08	1.76	1.76	1.85	mA
	Paging 2 (Rx burst occurrence ~0,5s)		6.79	5.09	5.09	5.43	mA
Active Mode			40.10	41.54	41.54	44	mA
Sleep Mode			0.45	0.56	0.56	0.39	mA
Connected Mode	850/900 MHz	PCL5 (TX power 33dBm)	231	247	247	246	mA
		PCL19 (TX power 5dBm)	95	97	97	97	mA
	1800/ 1900 MHz	PCL0 (TX power 30dBm)	164	241	241	191	mA
		PCL15 (TX power 0dBm)	88	100	100	94	mA
Transfer Mode	GPRS Class 10 (max power)		388	423	423	423	mA
	EGPRS Class 10 (max power)		--	302	--	363 (Automatic DSP Boost Mode ON)	mA

The current consumption data listed above are referred from the following Production Technical Specification references:

- AirPrime Q2686 Product Technical Specification

  Reference: WM_PRJ_Q2686_PTS_001

- AirPrime Q2687 Product Technical Specification

  Reference: WA_ENG_Q2687_PTS_001

- AirPrime Q2687 Classic Product Technical Specification

  Reference: WM_DEV_Q2687_PTS_001

- AirPrime Q2687 Refreshed Product Technical Specification and Customer Design Guideline

  Reference: WA_DEV_Q26RD_PTS_001

4.1.2.2.   RF Performance

Table 8.   RF Performance of the Q26 Series, Typical Values

Parameters	Q2686	Q2687	Q2687 Classic	Q2687 Refreshed
Receiver Parameters				
GSM850 Reference Sensitivity	-107dBm Static	-107dBm Static	-107dBm Static	-109dBm Static
E-GSM900 Reference Sensitivity	-107dBm Static	-107dBm Static	-107dBm Static	-109dBm Static
DCS1800 Reference Sensitivity	-106dBm Static	-106dBm Static	-106dBm Static	-108dBm Static
PCS1900 Reference Sensitivity	-106dBm Static	-106dBm Static	-106dBm Static	-108dBm Static
Selectivity @ 200 kHz	> +9dBc	> +9dBc	> +9dBc	> +9dBc
Selectivity @ 400 kHz	> +41dBc	> +41dBc	> +41dBc	> +41dBc
Linear dynamic range	63dB	63dB	63dB	63dB
Co-channel rejection	>= 9dBc	>= 9dBc	>= 9dBc	>= 9dBc
Transmitter Parameters (Output Power)				
EGSM & GSM850 (Maximum)	33dBm +/- 2dB	33dBm +/- 2dB	33dBm +/- 2dB	33dBm +/- 2dB
GSM1800 & PCS1900 (Maximum)	30dBm +/- 2dB	30dBm +/- 2dB	30dBm +/- 2dB	30dBm +/- 2dB
EGSM & GSM850 (Minimum)	5dBm +/- 5dB	5dBm +/- 5dB	5dBm +/- 5dB	5dBm +/- 5dB
GSM1800 & PCS1900 (Minimum)	0dBm +/- 5dB	0dBm +/- 5dB	0dBm +/- 5dB	0dBm +/- 5dB

4.1.3.   Delta Parts List

The Q2687 Refreshed is modified from Q2687. The following table shows the delta for the parts list of both Q2687 and Q2687 Refreshed.

Table 9.   Delta Parts List from Q2687 to Q2687 Refreshed

Description	Q2687/Q2687 Classic	Q2687 Refreshed
RF Transceiver	R2A60163BG	AERO4223EL/C1
Front End – Power Amplifier	Power Amplifier RPF09036B-TB	SKY77528
SAW Filter	Front-End + SAW HWXR594-1	B39941B9504L310 B39202B9502L310
PAD for B2B RF connection	IMP	Precidip
100 pin System Connector	AXK600347BN1-060831 (Panasonic)	AXK600347BN1-060831 (Panasonic) B2S01-A0C0K (Plastron)

4.1.4.   General Purpose Connector Pin Out Differences

Table 10.   Pin Out Difference Between the Q26 Series Embedded Modules

Pin #	Q2686			Q2687 / Q2687 Classic			Q2687 Refreshed		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
42	Reserved	Not in Use	-	A1	Address Bus	1V8	A1	Address Bus	1V8
51	GPIO1	General Purpose IO	1V8	CS2 /A25 /GPIO1	Chip Select, Address bus, General Purpose IO	1V8	CS2 /A25 /GPIO1	Chip Select, Address bus, General Purpose IO	1V8
53	GPIO2	General Purpose IO	1V8	A24 / GPIO2	Address bus, General Purpose IO	1V8	A24 / GPIO2	Address bus, General Purpose IO	1V8
83	NC-3	Not Connected	-	/CS3	Chip Select 3	1V8	/CS3	Chip Select 3	1V8
81, 84-100	NC	Not Connected	-	Parallel Interface	Parallel Bus Interface	1V8	Parallel Interface	Parallel Bus Interface	1V8

4.2.   Mechanical Differences

4.2.1.   RF Connection

All Q26 series embedded modules support the same type of UFL connector on the bottom side.

Table 11.   Available RF Connection Between the Q26 Series

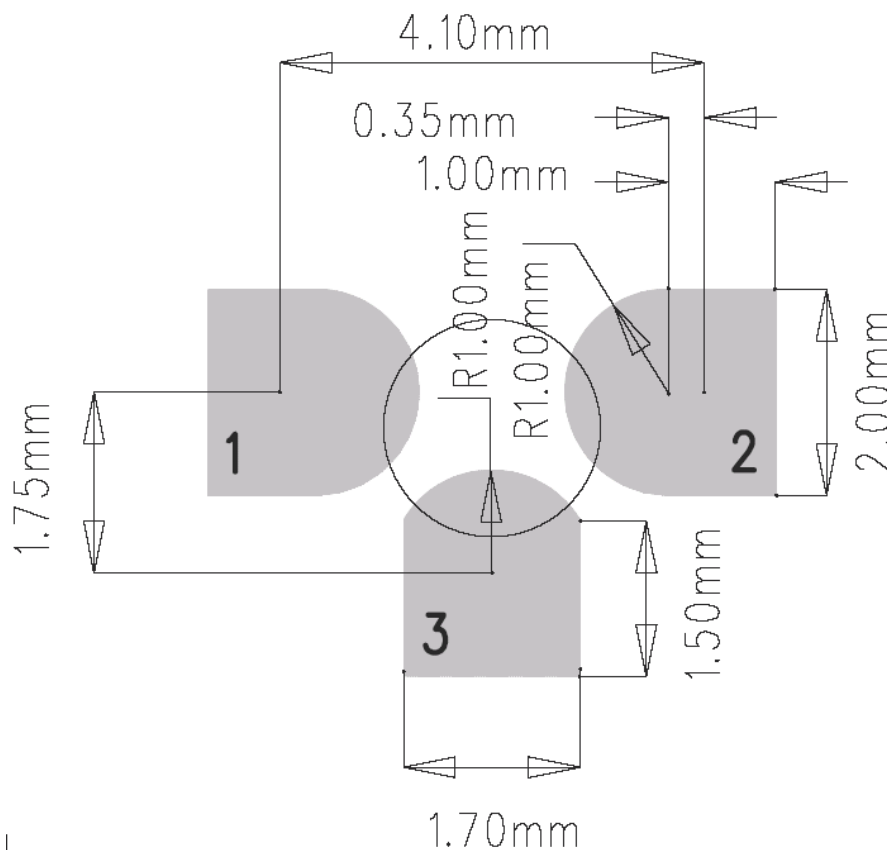| Product Reference	UFL on Bottom Side	Antenna Pad on Top Side	IMP on Bottom Side	Precidip on Bottom Side
Q2686	×	×	×	N/A
Q2687	×	×	×	N/A
Q2687 Classic	×	×	×	N/A
Q2687 Refreshed	×	×	N/A	×

4.2.2.   Precidip Connector

Figure 2.   Precidip Pads on the Q2687 Refreshed

For more information regarding the Precidip connector on the Q26 Refreshed, please refer to document [6] AirPrime Q26 Series Customer Process Guidelines.
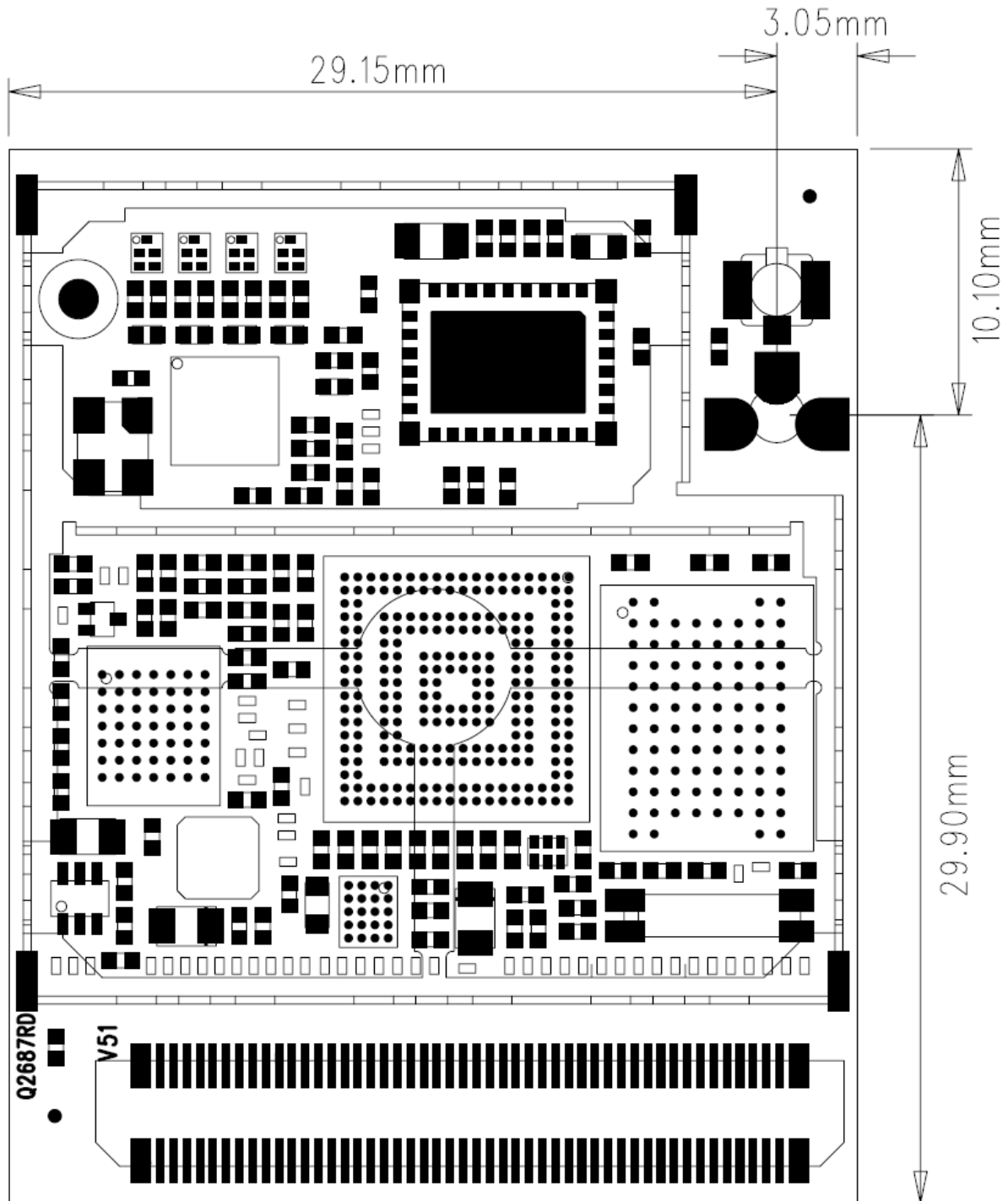
4.2.3.   Precidip PCB Coordinate

Figure 3.   Precidip PCB Coordinate

4.2.4.   Physical Dimensions

There is no difference in the physical dimension of all embedded modules within the Q26 series. The standard dimensions are listed below:

- Length   :   40mm
- Width   :   32.2mm
- Height   :   4mm (except shielding pins)

Refer to the following figures for more information about the mechanical specifications of the Q2687 Refreshed embedded module.
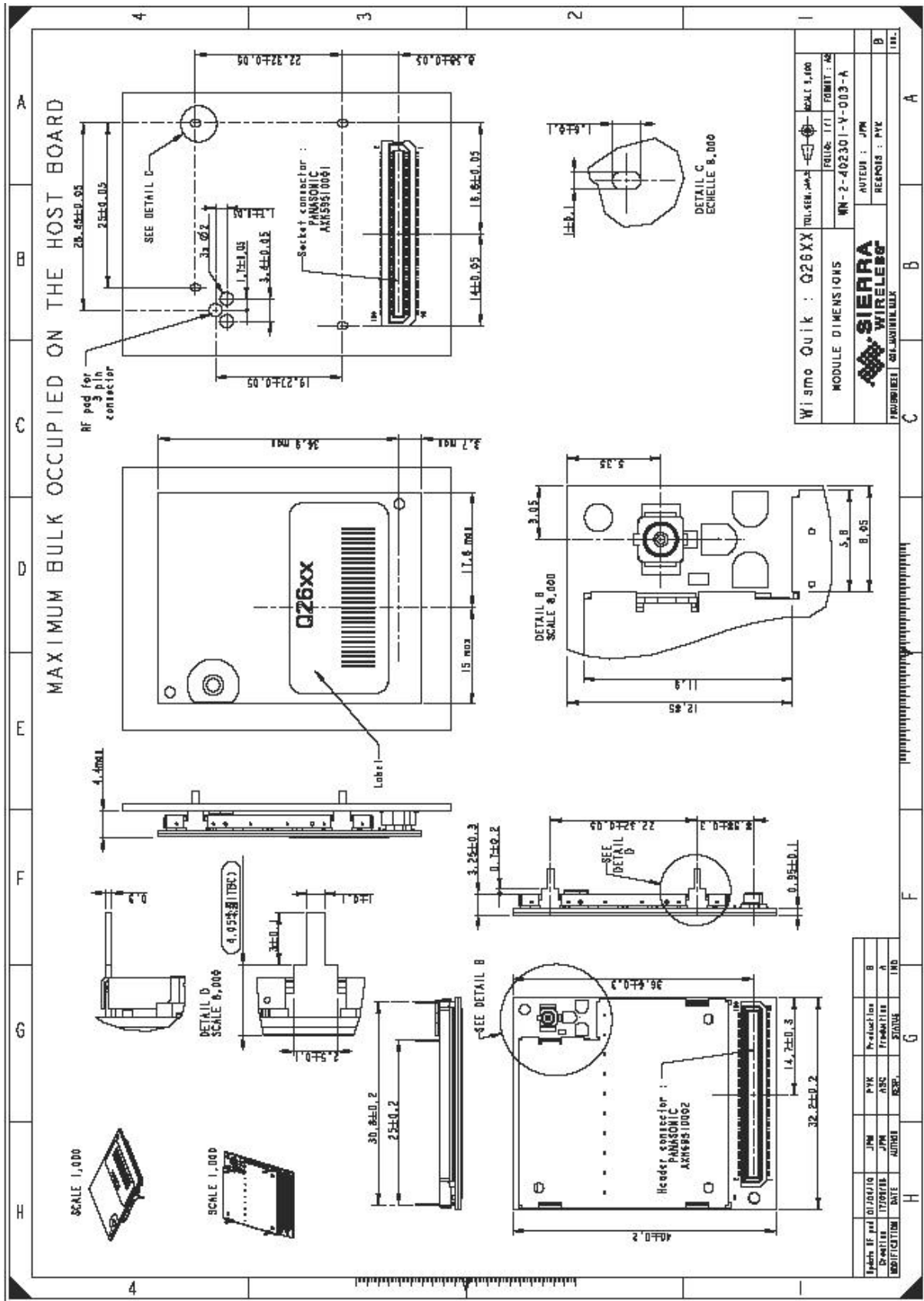
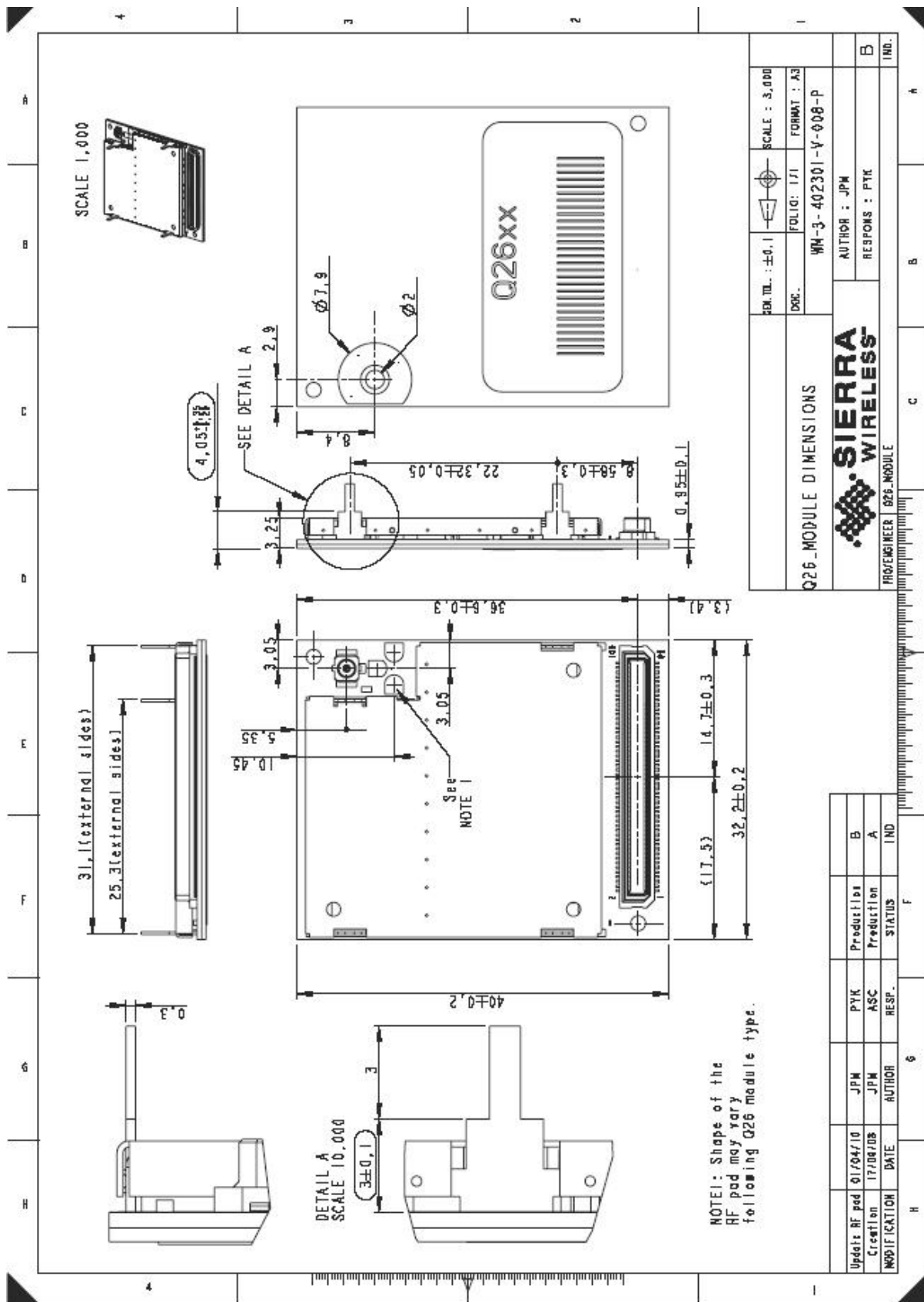Figure 4. Maximum Bulk Occupied on the Host Board

Figure 5.   Q2687 Refreshed Dimensions

4.2.5.   Shielding Can

The bottom side shielding frame provides 4 legs for connecting to the application board, as the starter kit, for a GND connection between two boards. The positions of the 4 legs are the same for all embedded modules within the Q26 series.

5. Software Constraint

The Q2687 Refreshed embedded module will be supported with Sierra Wireless Software Suite 2.33.

Note: *Sierra Wireless Software Suite 2.33.A3 (Firmware 7.43.0.A3) has been AT&T approved and Sierra Wireless recommends using this software suite version for North American customers looking for AT&T approved software.*

The Q2687 Refreshed embedded module is compatible with Firmware 7.43 or higher versions. Firmware 7.43 used by the Q2687 Refreshed embedded module will offer 100% AT command compatibility with Sierra Wireless Software Suite 2.31 and Sierra Wireless Software Suite 2.32.

All functionalities and plug-ins provided within Sierra Wireless Software Suite 2.31 and 2.32 with Q268X will be available within the first Sierra Wireless Software Suite 2.33 supported by the Q2687 Refreshed embedded module. The upgrade compatibility will consequently cover:

- AT parser
- Sierra Wireless Software Suite applications
- TCP/IP
- Internet
- Security: SSL, Crypto, Jamming
- C-GPS
- Intelligent Device Service

The Q2687 Refreshed embedded module software modification mainly consists of RF transceiver and FEM driver development.

6. Certification Continuity

The Q2687 Refreshed embedded module will be certified covering the same standards as the previous generation of Q2687. This certification update for Q2687 Refreshed will ensure update according to standards most recent evolutions and compatibility for customer use. The scope of this update will cover the following certifications:

- GCF and R&TTE
- PTCRB, FCC and IC
- Other standards, operators or local approval such as: AT&T and RTE

For customer products, the migration to Q2687 Refreshed will be facilitated[1] with a much reduced need and scope of testing. Based on the discussions held with Cetecom Worldwide, the list of required tests is as follows:

- GCF/PTCRB related tests:
    - RSE (Radiated Spurious Emission) will be spot-checked
        - No full span testing
        - No extreme conditions since it will be fully tested on the embedded module itself
    - SIM Electric
        - Not required if the customer application design is not modified
- PTCRB/CTIA-related only:
    - OTA (Over The Air)
        - Only required if applicable to the customer device (antenna fixed or less than 20 cm long)
        - Fully tested (since it is a CTIA rule to perform it in full span)
    - IMEISV Check
        - Mandatory (Test duration is 2 minutes)
    - FCC/IC
        - New FCC and IC IDs is required to reflect the Sierra Wireless/Wavecom merge.
            - New FCC ID: N7NQ2687
            - New IC ID: 2417C-Q2687
        - FCC Part 15b delta testing is therefore required (IC delta covered).
- GCF-related only:
    - None

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[1] In addition to certification and mandatory requirements, Sierra Wireless can propose to its customers a testing service to demonstrate the success of product migration to Q2687 Refreshed which includes the following:

- Evaluation Check List (covering RF performance and base band interface)
- Full Certification Service (Evaluation Check List plus Product Certification – using accredited laboratory with pass verdict from Notified Body Expert Opinion)

Please contact our FAE team for more detail and booking.

This test list scope has been negotiated with CETECOM Worldwide so any customer willing to manage this certification upgrade by itself will have to handle negotiations directly with the test lab it selected.

6.1.   AT&T Approval

As far as the AT&T approval on the migrated application is concerned, the amount of tests is still being discussed.

But a limited re-run at AT&T is expected.