User Guide

AirPrime Q26 Carrier Board

SIERRA WIRELESS®

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Document History

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1.0	July 30, 2015	Creation
1.1	August 13, 2015	Added: • 6 Packaging • 7.4 Component Placement
		Updated: • 4.2.1 PCM Voltage Level Shifter Selection • 7.3 Mechanical Drawings
2.0	September 14, 2015	Added compatibility information for Q2698
		Updated: • Table 6 General Features • 5 Using the Q26 Carrier Board
3.0	February 05, 2016	Added 4.1.11 RF Performance
		Updated: • Table 5 Operating Temperature • 4.1.2 General Purpose Input/Output • 4.1.10.1 Analog Audio • 4.2.1 PCM Voltage Level Shifter Selection • 4.2.2 LED0 • Figure 9 Schematic Diagram • 7.4 Component Placement
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3.2	March 08, 2016	Updated 4.1.11 RF Performance
3.3	March 11, 2016	
4.0	June 08, 2016	Updated: • 1 Introduction • 6 Packaging
5.0	August 18, 2016	Updated 7.4 Component Placement
6.0	December 19, 2016	Added weight in Table 1 Physical Dimension

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1. Introduction

The AirPrime Q26 Carrier Board is used to provide an interface between applications using an AirPrime Q26 (which includes Q2686, Q2687, Q2686 Refreshed, Q2687 Refreshed and Q2698) form factor and the AirPrime HL6528, HL6528RD or HL8548 embedded module.

Note: HL6528 and HL6528RD refer to 1.8V variants of the HL6. 2.8V variants (which are not supported by the Q26 Carrier Board) are designated as HL6528-2.8V and HL6528RD-2.8V.

AirPrime HL modules are inserted in a Snap-in Socket which is mounted on a PCB to form the Q26 Carrier Board.

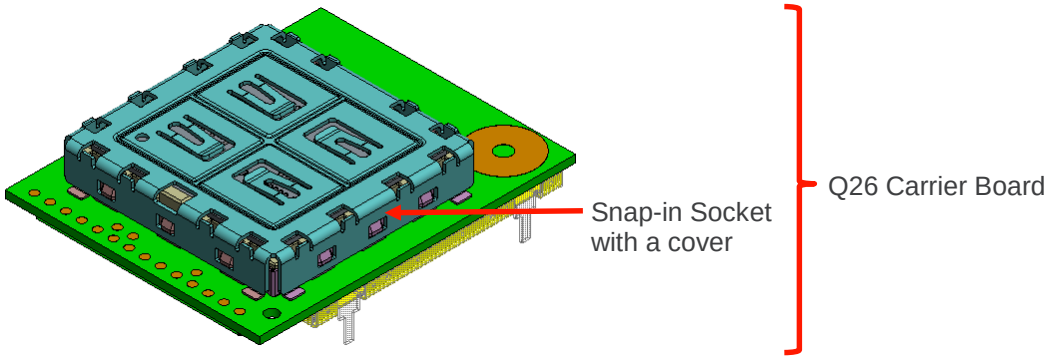


Figure 1. Q26 Carrier Board

This document describes how the Q26 Carrier Board enables applications to change from using a Q26 module to an HL6528, HL6528RD or HL8548 module, as well as provides schematic diagrams and mechanical details to facilitate the user's understanding and configuration of the Q26 Carrier Board.

The current Q26 Carrier Board is compatible with the following AirPrime HL modules:

- HL6528
- HL6528RD
- HL8548

For simplicity, these three modules will be collectively referred to as "HL6 and HL8 modules" throughout this document.

Likewise, the Q2686, Q2687, Q2686 Refreshed, Q2687 Refreshed will be collectively referred to as "Q268xx", AirPrime Q26 variants as "Q26", and the Q26 Carrier Board to "Q26CB" in this document.

For more information regarding AirPrime Q26, and HL6 and HL8 modules, refer to the specific product technical specifications listed in section 7.1 Reference Documents.

2. General Description

2.1. Physical Dimension

The following table shows the physical dimension of the Q26 module and the Q26 Carrier Board.

Table 1. Physical Dimension

Dimension	Q268xx	Q2698	Q26 Carrier Board*
Length	40 mm	40 mm	40 mm
Width	32.2 mm	32.2 mm	32.2 mm
Thickness	4.0 mm	6.2 mm	8.9 mm
Board-to-board stack up height	3.0 mm	3.0 mm	3.0 mm
Weight	8 g	11.8 g	12 g

* Dimensions listed do not include shielding pins.

The Q26 Carrier Board can be assembled to any existing Q26 product design without the need for any additional setup or configuration.

2.2. Operating Voltage

Refer to the following table for the operating voltages of the Q26, and the HL6 and HL8 modules.

Table 2. Operating Voltage

Module	Vmin	Vnom	Vmax
Q268xx	3.2 V	3.6 V	4.8 V
Q2698	3.4 V	3.8 V	4.2 V
HL6528	3.2 V	3.7 V	4.5 V
HL6528RD	3.35 V	3.7 V	4.3 V
HL8548	3.2 V	3.7 V	4.5 V

Note: Take note of the difference between voltage ranges when using the Q26 Carrier Board on an existing Q26 application.

2.3. Power Supply Output

The power supply output can be used to pull up signals such as IOs, as well as act as a voltage references for the ADC interface.

The Q26 modules have two digital power supply outputs – VCC_2V8 (pin 10) and VCC_1V8 (pin 5); while the HL6 and HL8 modules only have one – VGPIO (pin 45). Refer to the tables below for more information.

Table 3. VCC_2V8 and VCC_1V8 on the Q26 Modules

Parameter		Minimum	Typical	Maximum	Unit
VCC_2V8	Output voltage	2.74	2.8	2.86	V
	Output current			15	mA
VCC_1V8	Output voltage	1.76	1.8	1.94	V
	Output current			15	mA

Table 4. VGPIO on the HL6 and HL8 Modules

Parameter	Minimum	Typical	Maximum	Unit
Output voltage	1.7	1.8	1.9	V
Output current			50	mA

2.4. Operating Temperature

The Q26 Carrier Board is an industrial-grade device and has the following operating temperature range.

Table 5. Operating Temperature

Condition	Q26	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Operating/Class A	-30°C to +70°C	-30°C to +70°C	-30°C to +70°C
Operating/Class B	-40°C to +85°C	-40°C to +80°C	-40°C to +75°C
Storage	-40°C to 85°C	-40°C to +85°C	-40°C to +85°C

2.5. General Features

Table 6. General Features

Feature	Q268xx	Q2698	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Shielding	The Q268xx embedded module has complete body shielding.	The Q2698 embedded module has complete body shielding.	Complete body shielding (Q26 Carrier Board and HL module)	Complete body shielding (Q26 Carrier Board and HL module)
Application interface	• Full set of AT commands for GSM/GPRS/EGPRS including GSM 07.07 and 07.05 AT command sets • Status indication for GSM	• Full set of AT commands for GSM/GPRS/EGPRS including GSM 07.07 and 07.05 AT command sets • Status indication for GSM	• Full set of AT commands for GSM/GPRS including GSM 07.07 and 07.05 • AT command sets • Comprehensive set of dedicated AT commands for M2M applications	• NDIS NIC interface support (Windows XP, Windows 7, Windows 8, Windows CE, Linux) • Multiple non-multiplexed USB channel support • Dial-up networking • USB selective suspend to maximize power savings • CMUX multiplexing over UART • AT command interface – 3GPP 27.007 standard, plus proprietary extended AT commands
GSM/DCS Output Power	• Class 4 (2 W) for GSM 850 and E-GSM • Class 1 (1 W) for DCS and PCS	• Quad-Band GSM GPRS EDGE 850/900/1800/1900 MHz • GPRS class 12 • EDGE (E-GPRS) multi-slot class 12	• Class 4 (2 W) for GSM 850 and E-GSM • Class 1 (1 W) for DCS and PCS • Quad-band GSM850/E-GSM/DCS/PCS • GPRS Multi-slot class 10 • R99 support • PBCCH support	Quad-band GSM / GPRS / EDGE (850 MHz, 900 MHz, 1800 MHz, 1900 MHz)
GPRS	• GPRS multislot class 10 • Multislot class 2 supported • PBCCH support • Coding schemes: CS1 to CS4			

Feature	Q268xx	Q2698	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
EGPRS	• EGPRS multislot class 10 • Multislot class 2 supported • PBCCH support • Coding schemes MCS1 to MCS9		• Coding schemes: ▪ CS1 to CS4 (GPRS) ▪ MCS 5 to MCS 9 (EDGE)	
3G		Penta-Band UMTS/HSPA (WCDMA/FDD) 2100/1900/850/800/ 900 MHz (band I, II, V, VI, VIII): • Downlink data rates up to HSDPA Category 10 (14.4 Mbps) • Uplink data rates up to HSUPA Category 6 (5.76 Mbps)		Hexa-band UMTS WCDMA FDD (800 MHz (B19), 850 MHz (B5/B6), 900 MHz (B8), 1900 MHz (B2), 2100 MHz (B1))
Voice	• GSM Voice Features with Emergency calls 118 XXX • Full Rate (FR), Enhanced Full Rate (EFR), Half Rate (HR) and Adaptive Multi-rate (AMR) • Echo cancellation and noise reduction • Full duplex Hands free	• Half Rate (HR), Full Rate (FR) and Enhanced Full Rate (EFR) and Adaptive multi-rate (AMR) • Echo cancellation and noise reduction • Hands free	• Analog and Digital interfaces • Supports Full Rate (FR), Enhanced Full Rate (EFR), Half Rate (HR) and Adaptive Multi-rate (AMR) • Noise reduction and echo cancellation • DTMF generation	• Digital interface (ONLY) • Supports Enhanced Full Rate (EFR), Full Rate (FR), Half Rate (HR), and both Narrow-Band and Wide-band Adaptive Multi-rate (AMR-NB and AMR-WB) vocoders • MO and MT calling • Echo cancellation and noise reduction • Emergency calls (112, 110, 911, etc.) • Incoming call notification • DTMF generation

Feature	Q268xx	Q2698	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
SMS	• SMS MT, MO • SMS CB • SMS storage into SIM card	• SMS MT, MO • SMS CB • SMS storage into SIM card	• SMS class 0,1 and 2 • SMS MT, MO • SMS storage into SIM card or Flash memory • Concatenation of MT SMS	• SMS MT, MO • CS and PS support • SMS saving to SIM card or ME storage • SMS reading from SIM card or ME storage • SMS sorting • SMS concatenation • SMS Status Report • SMS replacement support • SMS storing rules (support of AT+CNMI, AT+CNMA)
GSM Supplementary Services	• Call Forwarding, Call Barring • Multiparty • Call Waiting, Call Hold • USSD	• Call Forwarding, Call Barring • Multiparty • Call Waiting, Call Hold • USSD	• Call Forwarding • Call Barring • Multiparty Service • Call Waiting • Call Hold • USSD • Automatic answer	• Call Barring • Call Forwarding • Call Hold • Caller ID • Call Waiting • Multi-party service • USSD • Automatic answer
Data/Fax	• Data circuit asynchronous, transparent, and non-transparent up to 14400 bits/s • Fax Group 3 compatible	Data and fax not supported	Data circuit asynchronous non-transparent at 9600 bits/s	Circuit switched data at 9600 bits/s

Feature	Q268xx	Q2698	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
SIM Interface	• 1.8V/3V SIM interface • 5V SIM interfaces are available with external adaptation • SIM Tool Kit Release 99	1.8V/3V USIM interface	• Dual SIM Dual Standby support • 1.8V/3.0V support for SIM1 • 3V interface for SIM2 • Hot plug and hot extraction detection (SIM1 only) • Supports SIM application tool kit with proactive SIM commands	• Dual SIM Single Standby with fast network switching capability • 1.8V/3V support • SIM extraction / hot plug detection • SIM/USIM support • Conforms with ETSI UICC Specifications. • Supports SIM application tool kit with proactive SIM commands
Real Time Clock	Real Time Clock (RTC) with calendar and alarm	Real Time Clock (RTC) with calendar and alarm	Real Time Clock (RTC) with calendar and alarm	Real Time Clock (RTC) with calendar and alarm
Temperature Sensor	• Temperature monitoring • Alarms	• Temperature monitoring • Alarms	• Temperature monitoring • Alarms	• Temperature monitoring • Alarms

2.6. Interfaces

The following table enumerates the interfaces available on the Q26 modules and indicates whether these interfaces are also available on the HL6 and HL8 modules.

The table is marked with the following indicators:

●: Fully supported

●: Partially supported or with specific behavior

●: Not supported

Compatibility details are described in section 4 Features Configuration and Limitations.

Table 7. Interface Compatibility

Interface	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Power Supply	●	●
Digital section running under 2.8V and 1.8V	●	●
3V/1V8 SIM Interface	●	●
Main Serial Link	●	●
Auxiliary Serial Link	●	●

Interface	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Analog Audio	●	●
Digital Audio (PCM)	●	●
USB 2.0	●*	●
General Purpose IO	●	●
Keyboard	●	●
Serial Interface (SPI)	●	●
Parallel Interface	●	●
RF Interface	●	●
ADC	●	●
PWM/Buzzer Output	●	●
Backup Battery (BAT_RTC)	●	●
Battery Charging Interface	●	●
External Interrupt	●	●
JTAG	●	●
RF Interface	●	●
LED0 Signal	●	●

* The HL6528RD supports USB 2.0; while the HL6528 does not.

2.7. Test Points

The following table describes the 20 test points available for customer use on the Q26 Carrier Board. Locations of these 20 test points are shown in Figure 2 Test Point Locations below.

Table 8. Test Points

Q26 Carrier Board Test Point Number	Signal Name	Group Designation	Remark
TP202	VBATT	Power	
TP245	V_GPIO		
TP205	VCC_1V8		
TP277	GND		
TP219	ON-OFF	ON/OFF Signal	
TP218	\RESET		
TP252	USB-VBUS	USB	Only supported with an HL8548 modules
TP254	USB_D+		
TP256	USB_D-		
TP272	UART_RTS	UART	
TP271	UART_TXD		
TP276	UART_DTR		
TP275	UART_CTS		
TP273	UART_RXD		
TP270	UART_DCD		
TP274	UART_DSR		

Q26 Carrier Board Test Point Number	Signal Name	Group Designation	Remark
TP278	SP1_SRDY	Debug	Only supported with an HL6528 and HL6528RD module

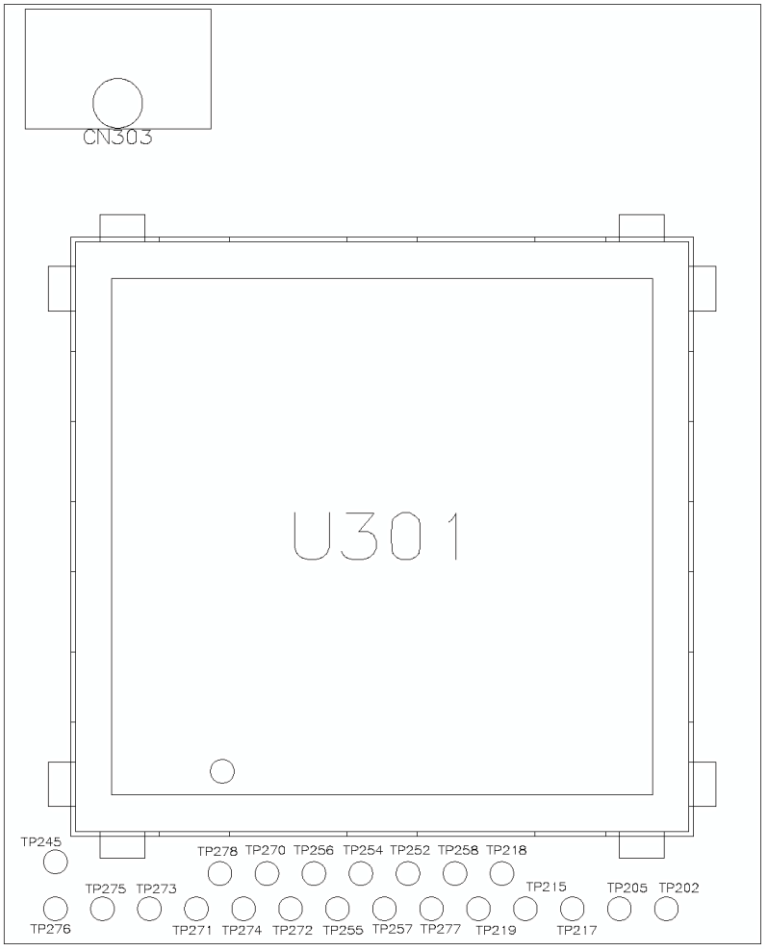


Figure 2. Test Point Locations

3. Pin Mapping

The following table lists the pin assignment mapping of the Q26 Carrier Board and the HL6528, HL6528RD and HL8548 modules (which are inserted in the Snap-in Socket on the Carrier Board); as well as indicates restrictions or limitations on the signals/pins, if any.

The pin number specified in the table below refers to the corresponding pin number on the board-to-board connector (CN301) of the Q26 Carrier Board, while signal names refer to the module's signal name. For more information about module signal names, refer to the product technical specifications listed in section 7.1 Reference Documents.

Table 9. Pin Mapping

CN301 Pin #	Q268xx Signal Name	Q2698 Signal Name	Q26 Carrier Board with HL6528, HL6528RD Signal Name	Q26 Carrier Board with HL8548 Signal Name	Compatibility Notes
1	ADC0/VBATT	ADC0/VBATT	VBATT_PA	VBATT_PA	
2	ADC0/VBATT	ADC0/VBATT	VBATT_PA	VBATT_PA	
3	ADC0/VBATT	ADC0/VBATT	VBATT	VBATT	
4	ADC0/VBATT	ADC0/VBATT	VBATT	VBATT	
5	VCC_1V8	VCC_1V8	VGPIO	VGPIO	
6	CHG-IN	CHG-IN	-	-	Not supported
7	BAT-RTC	BAT-RTC	BAT_RTC	BAT_RTC	The HL8548 supports a different voltage range
8	CHG-IN	CHG-IN	-	-	Not supported
9	SIM-VCC	SIM-VCC	UIM1_VCC	UIM1_VCC	
10	VCC_2V8	VCC_2V8	-	-	
11	SIM-IO	SIM-IO	UIM1_DATA	UIM1_DATA	
12	SIMPRES	SIMPRES/GPIO18	UIM1_DET/GPIO3	GPIO3 / UIM1_DET	
13	~SIM-RST	~SIM-RST	UIM1_RESET	UIM1_RESET	
14	SIM-CLK	SIM-CLK	UIM1_CLK	UIM1_CLK	
15	BUZZER0	BUZZER0	UIM2_RESET/BUZZER	PWM1	

CN301 Pin #	Q268xx Signal Name	Q2698 Signal Name	Q26 Carrier Board with HL6528, HL6528RD Signal Name	Q26 Carrier Board with HL8548 Signal Name	Compatibility Notes
16	BOOT	BOOT	TP1	TP1	
17	LED0	LED0	-	-	Not supported
18	~RESET	~RESET	RESET_IN	RESET_IN_N	
19	ON/~OFF	ON/~OFF	PWR_ON	PWR_ON_N	
20	ADC1/BAT-TEMP	ADC1/BAT-TEMP	ADC0	ADC0	The HL modules support a different voltage range
21	ADC2	ADC2	ADC1	ADC1	The HL modules support a different voltage range
22	GPIO31/SPI1-LOAD	GPIO31/SPI1-Load	-	-	Not supported
23	SPI1-CLK/GPIO28	SPI1-CLK/GPIO28	-	-	Not supported
24	SPI1-I/GPIO30	SPI1-I/GPIO30	-	-	Not supported
25	SPI1-IO/GPIO29	SPI1-IO/GPIO29	-	-	Not supported
26	SPI2-CLK/GPIO32	SPI2-CLK/GPIO32	GPIO7	GPIO7	
27	SPI2-IO/GPIO33	SPI2-IO/GPIO33	GPIO8	GPIO8	
28	GPIO35/SPI2-Load	GPIO35/SPI2-Load	GPIO6	GPIO6	
29	SPI2-I/GPIO34	SPI2-I/GPIO34	UIM2_DET/GPIO4	GPIO4	
30	CT104-RXD2/GPIO15/INT4	CT104-RXD2/GPIO15/INT4	-	-	Not supported
31	CT103-TXD2/GPIO14	CT103-TXD2/GPIO14	-	-	Not supported
32	~CT106-CTS2/GPIO16	~CT106-CTS2/GPIO16	-	-	Not supported
33	~CT105-RTS2/GPIO17	~CT105-RTS2/GPIO17	-	-	Not supported
34	MIC2N	MIC2N	MIC_N	NC	Only supported in the HL6528
35	SPK1P	SPK1P	SPKR_P	NC	Only supported in the HL6528
36	MIC2P	MIC2P	MIC_P	NC	Only supported in the HL6528
37	SPK1N	SPK1N	SPKR_N	NC	Only supported in the HL6528
38	MIC1N	MIC1N	MIC_N	NC	Only supported in the HL6528
39	SPK2P	SPK2P	SPKR_P	NC	Only supported in the HL6528

CN301 Pin #	Q268xx Signal Name	Q2698 Signal Name	Q26 Carrier Board with HL6528, HL6528RD Signal Name	Q26 Carrier Board with HL8548 Signal Name	Compatibility Notes
40	MIC1P	MIC1P	MIC_P	NC	Only supported in the HL6528
41	SPK2N	SPK2N	SPKR_N	NC	Only supported in the HL6528
42	A1*/Reserved	Reserved	-	-	Not supported
43	GPIO0/32kHz	GPIO0/32kHz	NC	32K_CLKOUT	Not supported in the HL6528
44	SCL1/GPIO26	SCL1/GPIO26	-	-	Not supported
45	GPIO19	GPIO19	GPIO2/UIM2_VCC_CTRL	GPIO2	
46	SDA1/GPIO27	SDA1/GPIO27	-	-	Not supported
47	GPIO21	GPIO21	UIM2_CLK/PWM	PWM2/GPIO12	Not supported in the HL6528
48	GPIO20	GPIO20	GPIO1/I2C_CLK	GPIO1/I2C_CLK	
49	INT1/GPIO25	INT1/GPIO25	-	-	Not supported
50	INT0/GPIO3	INT0/GPIO3	-	-	Not supported
51	GPIO1/A25/~CS2*	GPIO1	GPIO5/I2C_DATA	GPIO5/I2C_SDA	
52	VPAD-USB	VPAD-USB	NC	USB_VBUS	Not supported in the HL6528
53	GPIO2/A24*	GPIO2	SPI1_MRDY	DEBUG_RX	
54	USB-DP	USB-DP	NC	USB_D+	Only supported in the HL8548
55	GPIO23	GPIO23	SPI1_CLK	GPIO11	Not supported in the HL6528
56	USB-DM	USB-DM	NC	USB_D-	Only supported in the HL8548
57	GPIO22	GPIO22	SPI1_MISO	GPIO10	Not supported in the HL6528
58	GPIO24	GPIO24	SPI1_MOSI	GPIO15	Not supported in the HL6528
59	COL0/GPIO4	COL0/GPIO4	-	-	Not supported
60	COL1/GPIO5	COL1/GPIO5	-	-	Not supported
61	COL2/GPIO6	COL2/GPIO6	-	-	Not supported
62	COL3/GPIO7	COL3/GPIO7	-	-	Not supported
63	COL4/GPIO8	COL4/GPIO8	-	-	Not supported
64	ROW4/GPIO13	ROW4/GPIO13	-	-	Not supported
65	ROW3/GPIO12	ROW3/GPIO12	-	-	Not supported

CN301 Pin #	Q268xx Signal Name	Q2698 Signal Name	Q26 Carrier Board with HL6528, HL6528RD Signal Name	Q26 Carrier Board with HL8548 Signal Name	Compatibility Notes
66	ROW2/GPIO11	ROW2/GPIO11	-	-	Not supported
67	ROW1/GPIO10	ROW1/GPIO10	-	-	Not supported
68	ROW0/GPIO9	ROW0/GPIO9	-	-	Not supported
69	~CT125-RI/GPIO42	~CT125-RI/GPIO42	UART1_RI	UART1_RI	
70	~CT109-DCD1/GPIO43	~CT109-DCD1/GPIO43	UART1_DCD	UART1_DCD	
71	CT103-TXD1/GPIO36	CT103-TXD1/GPIO36	UART1_TX	UART1_TX	
72	~CT105-RTS1/GPIO38	~CT105-RTS1/GPIO38	UART1_RTS	UART1_RTS	
73	CT104-RXD1/GPIO37/INT2	CT104-RXD1/GPIO37/INT2	UART1_RX	UART1_RX	
74	~CT107-DSR1/GPIO40	~CT107-DSR1/GPIO40	UART1_DSR	UART1_DSR	
75	~CT106-CTS1/GPIO39	~CT106-CTS1/GPIO39	UART1_CTS	UART1_CTS	
76	~CT108-2-DTR1/GPIO41/INT3	~CT108-2-DTR1/GPIO41/INT3	UART1_DTR	UART1_DTR	
77	PCM-SYNC	PCM-SYNC	PCM_SYNC	PCM_SYNC	
78	PCM-IN	PCM-IN	PCM_IN	PCM_IN	
79	PCM-CLK	PCM-CLK	PCM_CLK	PCM_CLK	
80	PCM-OUT	PCM-OUT	PCM_OUT	PCM_OUT	
81	/OE-R/W*/Reserved	Reserved	-	-	Not supported
82	DAC0*/Reserved	Reserved	-	-	Not supported
83	/CS3*/Reserved	Reserved	-	-	Not supported
84	/WE-E*/Reserved	Reserved	-	-	Not supported
85	D0*/Reserved	Reserved	-	-	Not supported
86	D15*/Reserved	Reserved	-	-	Not supported
87	D1*/Reserved	Reserved	-	-	Not supported
88	D14*/Reserved	Reserved	-	-	Not supported
89	D2*/Reserved	Reserved	-	-	Not supported
90	D13*/Reserved	Reserved	-	-	Not supported
91	D3*/Reserved	Reserved	-	-	Not supported

CN301 Pin #	Q268xx Signal Name	Q2698 Signal Name	Q26 Carrier Board with HL6528, HL6528RD Signal Name	Q26 Carrier Board with HL8548 Signal Name	Compatibility Notes
92	D12*/Reserved	Reserved	-	-	Not supported
93	D4*/Reserved	Reserved	-	-	Not supported
94	D11*/Reserved	Reserved	-	-	Not supported
95	D5*/Reserved	Reserved	-	-	Not supported
96	D10*/Reserved	Reserved	-	-	Not supported
97	D6*/Reserved	Reserved	-	-	Not supported
98	D9*/Reserved	Reserved	-	-	Not supported
99	D7*/Reserved	Reserved	-	-	Not supported
100	D8*/Reserved	Reserved	-	-	Not supported

* This signal is only available on the Q2687.

4. Features Configuration and Limitations

The following sub-sections describes the adjustments or configuration needed to ensure full compatibility when using the Q26 Carrier Board in an existing design.

4.1. Hardware Features

4.1.1. Antenna

The Q26 Carrier Board only supports UFL/SMA and RF pad antenna connectors; it does not support Precidip antenna connectors.

4.1.2. General Purpose Input/Output

The Q26 modules support up to 44 GPIOs; however, the Q26 Carrier Board has limited GPIO support due to the HL6 and HL8 modules having less GPIOs (the HL6528 and HL6528RD modules only support 8, while the HL8548 module supports 12).

Table 10. Compatible GPIOs

Q26			Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Pin #	**Signal Name**	**Voltage**	**Signal Name***	**Signal Name***
26	GPIO32	2.8V	GPIO7	GPIO7
27	GPIO33	2.8V	GPIO8	GPIO8
28	GPIO35	2.8V	GPIO6	GPIO6
29	GPIO34	2.8V	GPIO4	GPIO4
43	GPIO0/32kHz	2.8V	-	32K_CLKOUT
45	GPIO19	2.8V	GPIO2	GPIO2
47	GPIO21	2.8V	UIM2_CLK/PWM2**	GPIO12
48	GPIO20	2.8V	GPIO1	GPIO1
51	GPIO1	1.8V	GPIO5	GPIO5
53	GPIO2	1.8V	SPI_MRDY**	DEBUG_RX**
55	GPIO23	2.8V	SPI_CLK**	GPIO11
57	GPIO22	2.8V	SPI_MISO**	GPIO10
58	GPIO24	2.8V	SPI_MOSI**	GPIO15
12	GPIO18/SIMPRES	1.8V	GPIO3/UIM1_DET	GPIO3/UIM1_DET

* HL embedded module signal name. For more information about HL signal names, refer to the product technical specifications listed in section 7.1 Reference Documents.

** This signal is an extended function and can't be used as a GPIO.

Additionally, all HL6 and HL8 GPIOs have an output voltage of 1.8 V. To compensate for this, level shifters are incorporated into the Q26 Carrier Board to match the Q26 module's GPIO output voltage.

The level shifter used in the Q26 Carrier Board contains an auto-sense translator which quickly transforms an input driver to an output driver and vice versa. The input driver to the auto-sense translator should be capable of driving 2 mA of peak output current for proper operation. Note that although the peak current from the input signal is relatively large, the average current is small and consistent with a standard CMOS input stage.

4.1.3. Serial Interface

Q26 modules support two serial interfaces – SPI and I^2C. However, both serial interfaces are controlled by the Open AT Application Framework which is not supported by the HL6 and HL8 modules; SPI and I^2C buses are not supported in the Q26 Carrier Board.

4.1.4. Parallel Interface

The parallel interface of the Q26 is controlled by the Open AT Application Framework, which is not supported by the HL6 and HL8 modules; parallel interface is not supported in the Q26 Carrier Board.

4.1.5. Keyboard Interface

The keyboard interface of the Q26 is controlled by the Open AT Application Framework, which is not supported by the HL6 and HL8 modules; keyboard interface is not supported in the Q26 Carrier Board.

4.1.6. Main Serial Link (UART1)

The main serial link (UART1) is used for communication between the Q26 Carrier board and a PC or host processor. It consists of a flexible 8-wire serial interface that complies with the RS-232 interface.

The UART1 voltage level of the HL6 and HL8 modules (1.8 V) is different from that of the Q26 modules (2.8 V). To ensure that UART is fully compatible, an 8-bit voltage level shifter is added in the Q26 Carrier Board to match the Q26 module's 2.8 V voltage and also remain 3.3 V tolerant.

4.1.7. Auxiliary Serial Link (UART2)

Although Q26 modules support an auxiliary serial link (UART2) interface, this interface is not supported by the HL6 and HL8 modules and so is also not supported in the Q26 Carrier Board.

4.1.8. SIM Interface

A fully compatible 1.8V and 3V SIM card interface is available on the Q26 Carrier Board.

4.1.9. USB 2.0

A 4-wire USB slave interface is available on the Q26 modules that comply with USB 2.0 protocol signaling, but not with the electrical interface due to the 5V interface of VPAD-USB. The VPAD-USB of the Q26 is 3V3 so an extra regulator is needed on the application. However, the USB VBUS of the HL6528RD and HL8548 modules is 5V, which is directly compatible to the USB interface. The extra regulator on the Q26 application should be removed when using the Q26 Carrier Board.

Caution: *Due to the difference in USB speeds between the Q26 and the HL modules, it is recommended that a low capacitance (0.5 pF) ESD diode be used in the application USB port.*

Note: *The HL6528 does not support USB.*

4.1.10. Audio

4.1.10.1. Analog Audio

The Q26 Carrier Board can only support the use of one analog audio interface (MIC1/MIC2 and SPK1/SPK2). If the existing Q26 application uses an external single-ended MIC, the external bias circuitry must be removed when using the Q26 Carrier Board because the HL6528 and HL6528RD already includes a built-in internal bias voltage; the HL8548 does not support analog audio.

Note: *Sierra Wireless does not recommend using single-ended audio as the DTMF noise floor is typically high when using the Q26 Carrier Board.*

4.1.10.2. Digital Audio (PCM)

The digital audio output of the HL8548 is electrically compatible with Q26 modules; however, the HL6528 and HL6528RD have a 2.8 V PCM output so an internal level shifter is reserved as an option when using the Q26 Carrier Board with an HL6528 or HL6528RD module.

For details about PCM protocol, refer to the product technical specification of the corresponding HL6 or HL8 embedded module in section 7.1 Reference Documents.

4.1.11. RF Performance

The Q26 Carrier Board's RF performance meets with 3GPP specifications when equipped with an HL6528 or an HL6528RD. However, when equipped with an HL8548, the Q26 Carrier Board has the following exceptions to 3GPP specifications:

1. RX sensitivity deviates in specific channels of 2G bands (channel 202 of the GSM850 band, channel 5 of the GSM900 band, channel 846 of the DCS band and channel 741 of the PCS band).
2. RX sensitivity deviates in specific channels of 3G bands (channels 10625 to 10670 of Band 1, channels 9875 to 9885 of Band 2, and channels 2975 to 2980 of Band 8).

4.1.12. Battery Charging Interface

Battery charging function is not supported in the Q26 Carrier Board.

4.1.13. Power ON Signal

The HL6 and HL8 modules have an active low power ON signal pin, while Q26 modules have an active high power ON signal. An inverter is added to the Q26 Carrier Board to reverse the polarity of the signal.

4.1.14. Reset Signal

When using the Q26 Carrier Board, a low level pulse must be sent on the reset pin for 10 ms. This action will immediately restart the AirPrime HL6 or HL8 module with the PWR_ON_N signal at low level.

4.1.15. BOOT Signal

Because the BOOT pin is connected to VCC_1V8 in the Q268xx (the Q2698 does not have a BOOT pin), and set to active low, the BOOT signal has to be reversed when using the Q26 Carrier Board.

4.1.16. ADC

Two Analog to Digital converter inputs, ADC1/BAT-TEMP and ADC2 are available when using the Q26 Carrier Board. These converters are 10-bit resolution ADCs with voltage range shown in the table below.

Table 11. ADC Voltage Range

Condition	Q268xx	Q2698	Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
ADC1/BAT-TEMP	0 – 2 V	0 – 4 V	0 – 3 V (TBC)	0 – 1.2 V (TBC)
ADC2	0 – 2 V	0 – 4 V	0 – 3 V (TBC)	0 – 1.2 V (TBC)

Because the HL8548 voltage range is narrower than the Q26 input range, if an HL8548 module is used in the Q26 Carrier Board and receives an input voltage of more than 1.2 V, the ADC port might be damaged. To protect the Q26 Carrier Board from overvoltage input, additional circuitry has been added to the carrier board.

Similarly, the HL6528 and HL6528RD voltage range is also narrower than the Q2698 input range and additional circuitry on the Q26 Carrier Board protects it from overvoltage when migrating from an application that uses a Q2698.

However, if the existing application uses a Q268xx module, using an HL6528 or HL6528RD module with the Q26 Carrier Board might not provide enough resolution as the voltage range of the HL6 is wider than that of the Q268xx.

4.1.17. BAT_RTC

As shown in the table below, the voltage range varies between Q26 modules, and the HL6 and HL8 modules. Additional circuitry has been added on the Q26 Carrier Board to protect it from overvoltage input.

Table 12. BAT_RTC

Parameter	Q26			Q26 Carrier Board with HL6528, HL6528RD			Q26 Carrier Board with HL8548		
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
Input Voltage	1.85 V	-	3 V	-	3 V	-	1.0 V	1.8 V	1.9 V
Input current consumption	3.0 µA	3.3 µA	3.6 µA	-	2.5 µA	-	-	1 µA	-
Output Voltage	2.40 V	2.45 V	2.50 V	2.82 V	3.0 V	3.18 V	1.71 V	1.8 V	1.89 V
Output current	-	-	2 mA	-	0.6 mA	-	-	25 mA	-

Note: The HL6528 and HL6528RD output is higher than the Q26.

The HL8548 output is only 1.8 V (typical) which might not be enough to charge the application's battery.

4.1.18. Debug Port

HL6 and HL8 embedded modules support a software trace interface that provides real-time instruction and data trace of the modem core.

The following table provides the pin mapping of the debug port between the Q26 Carrier Board and the HL6 and HL8 embedded modules.

Table 13. Debug Port

Q26		Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
Pin #	Signal Name	Signal Name	Signal Name
53	GPIO2	SPI1_MRDY	DEBUG_RX
55	GPIO23	SPI1_CLK	
57	GPIO22	SPI1_MISO	
58	GPIO24	SPI1_MOSI	

In addition to the pins specified in the table above, the Q26 Carrier Board also has a test pad, TP278, which corresponds to pin 44 of the HL6 and HL8 module (SPI1_SRDY on the HL6528 and HL6528RD, DEBUG_TX on the HL8548) which is also used for debug.

4.2. Optional Pad Configuration

4.2.1. PCM Voltage Level Shifter Selection

Because the voltage level output of the PCM varies between the HL6528, HL6528RD and HL8548 (with the HL6528 and HL6528RD having 2.8 V, and the HL8548 having 1.8 V), optional component configuration is made available in the Q26 Carrier Board.

The Q26 Carrier Board's PCM interface is configured to use HL8548 (1.8 V) by default. When using an HL6528 or HL6528RD module, resistors R301, R313, R322 and R323 must be removed and resistors R336 and R337 installed if PCM is to be used. Otherwise, PCM should be turned and kept off when using an HL6528 or HL6528RD module to prevent the application's PCM codec from being damaged with an incorrect carrier board configuration.

Note: Ensure that the module used in the Q26 Carrier Board is compatible with the carrier board's PCM configuration. Using a module with the incorrect carrier board configuration will damage the customer's PCM application.

Table 14. Optional Component Configuration for PCM

Q26 Carrier Board with HL6528, HL6528RD	Q26 Carrier Board with HL8548
R336, R337	R301, R313, R322, R323 (default configuration)

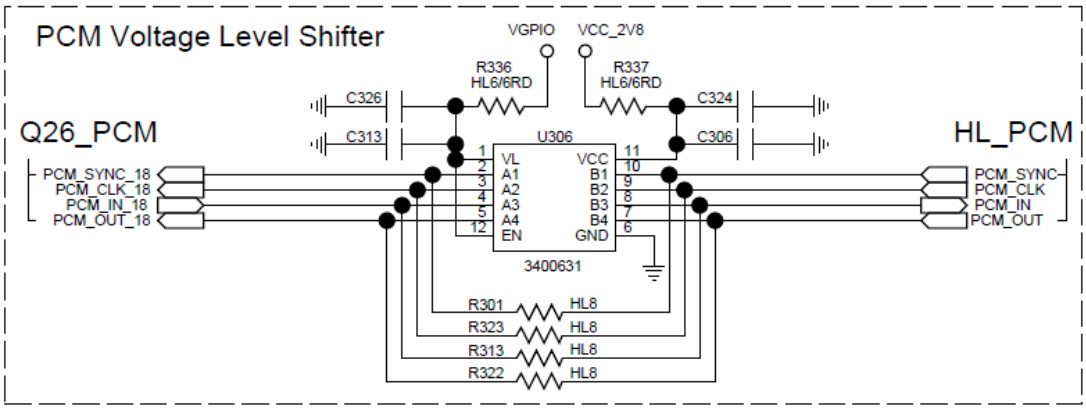


Figure 3. PCM Voltage Level Shifter

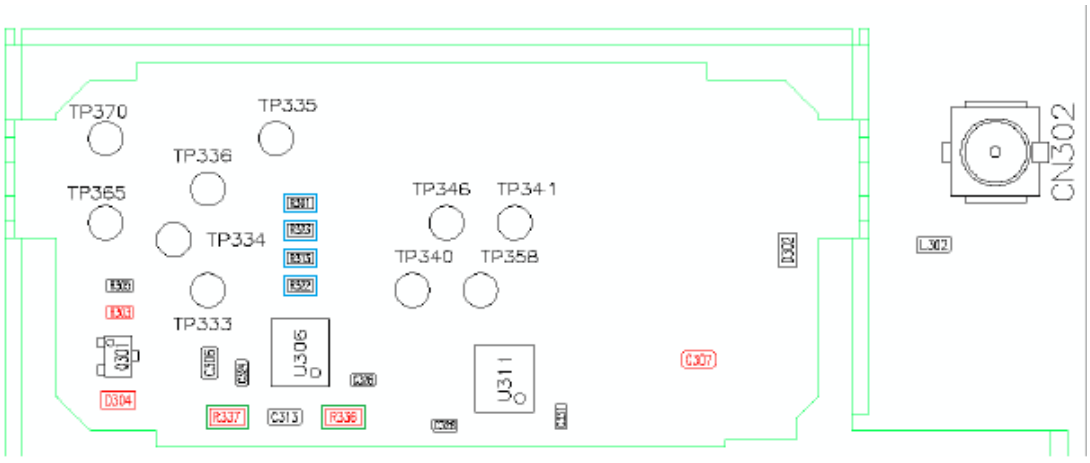


Figure 4. Optional Components Placement

4.2.2. LED0

FLASH-LED indicates the GSM activity status of the modules inside the Snap-in Socket on the Q26 Carrier Board and can also be used to drive an LED. Application designers have the option of selecting to use GPIO4 for concurrent common GPIO use and FLASH-LED.

By default, R305 is connected on the Q26 Carrier Board to allow GPIO4 to be used as a regular GPIO and LED0 at the same time.

Refer to command **+KSYNC** in document [7] AirPrime HL6 and HL8 Series AT Commands Interface Guide for more information about using LED with the HL6 and HL8 modules.

Table 15. LED0 Resistor Selection

LED0	By Default
R305	0R

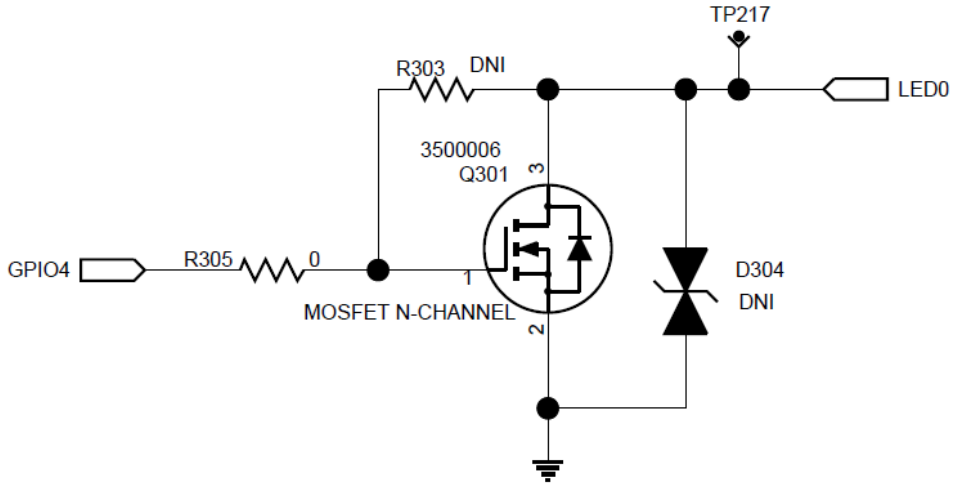


Figure 5. R305 Configuration on the Q26 Carrier Board

Note: Component placement is detailed in Figure 4.

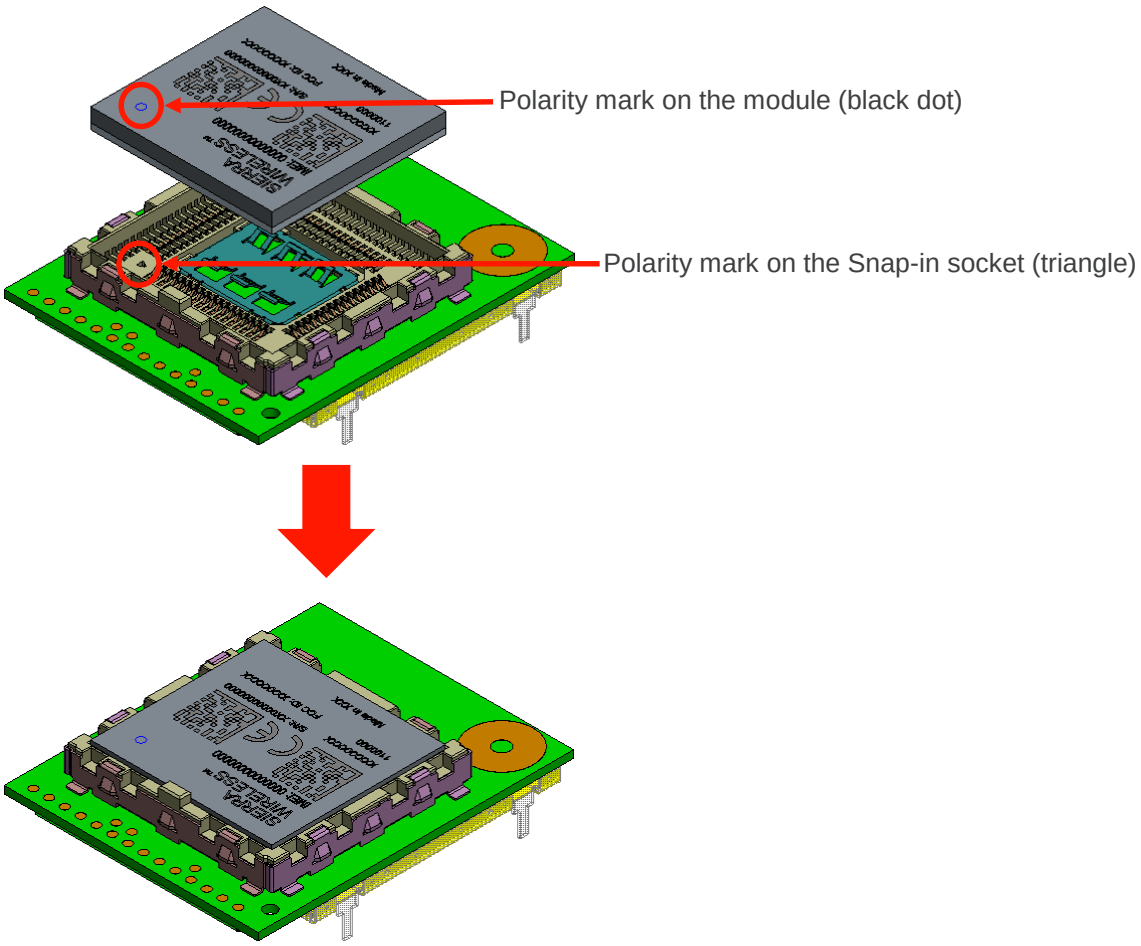
4.3. Software Features

The Open AT Application Framework is not available when using the Q26 Carrier Board as the HL6 and HL8 modules do not support it.

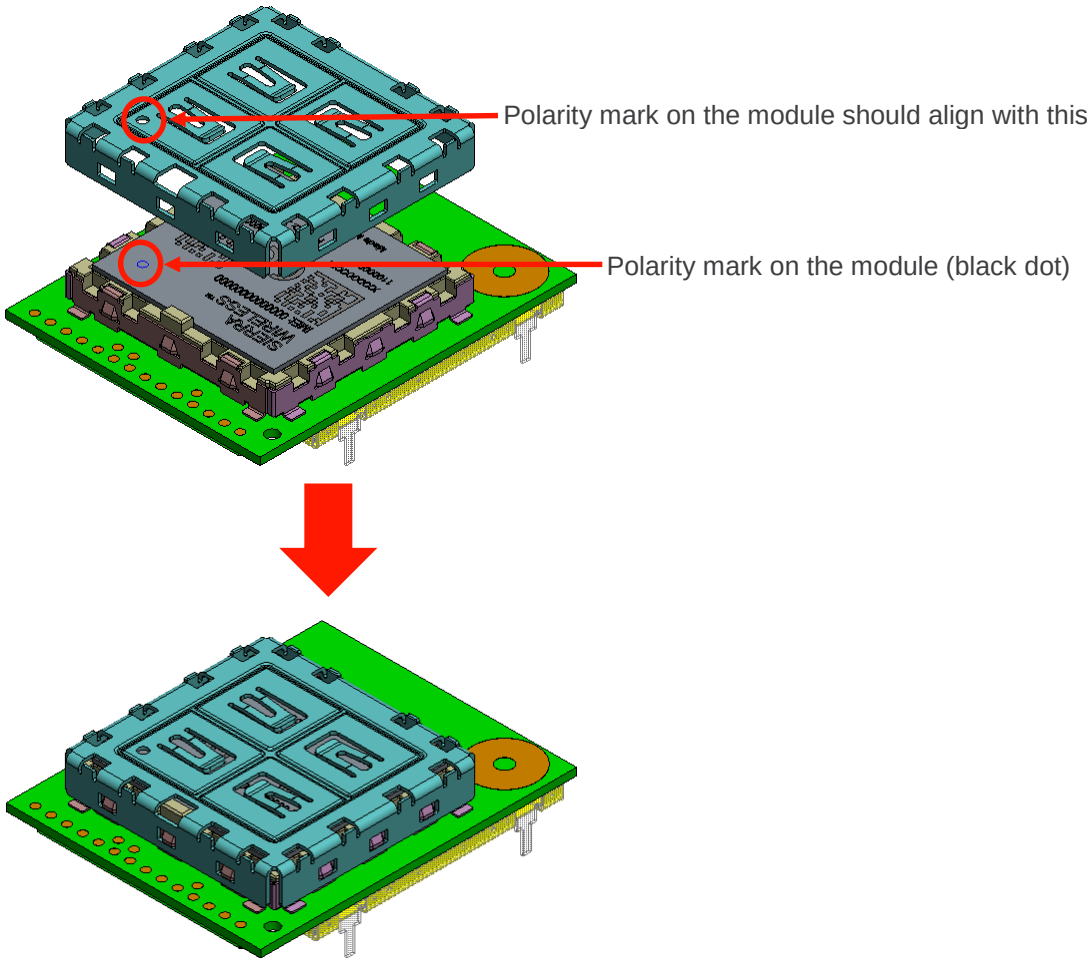
5. Using the Q26 Carrier Board

To install the AirPrime Q26 Carrier Board, follow these steps.

1. Plug the Q26 Carrier Board into the application.
   Insert an HL6528, HL6528RD or HL8548 embedded module into the Snap-in Socket on the Q26 Carrier Board. Ensure that the polarity mark on the embedded module is aligned with the polarity mark on the Snap-in Socket.



2. Press the cover down on the embedded module and Snap-in Socket. Again, ensure that the polarity mark of the cover is aligned with the polarity mark of the embedded module and Snap-in Socket.



Note: The Snap-in cover is not included in the packaging, and must be ordered separately.

6. Packaging

Q26 Carrier Boards are packed in plastic trays, with each plastic tray containing 100 pieces of the carrier board as shown in Figure 6.

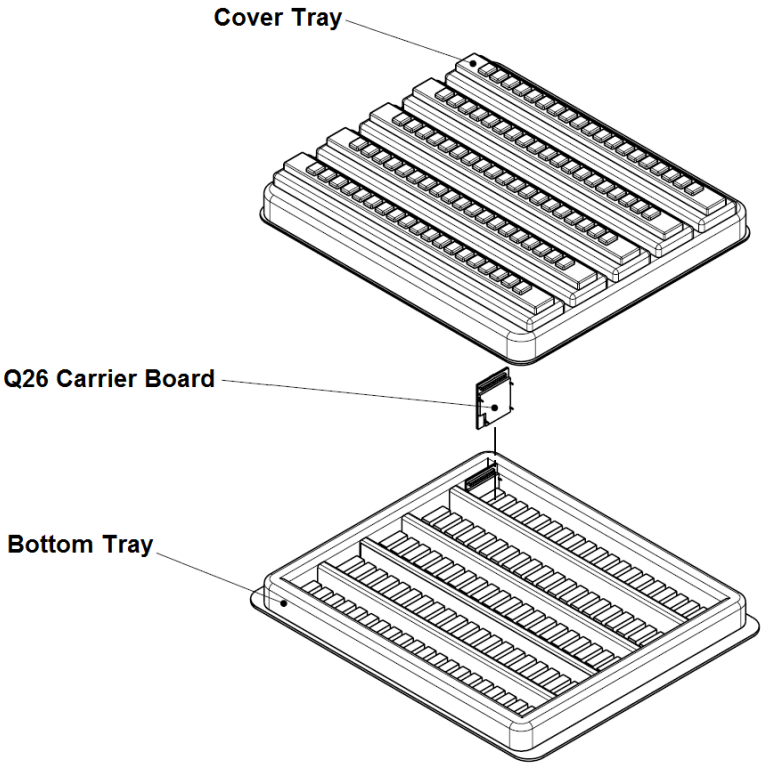


Figure 6. Q26 Carrier Boards in Plastic Trays

Note that a protective plastic tape is affixed to the Snap-in Socket (as shown in Figure 7) to prevent the Snap-in Socket's pins from becoming deformed.

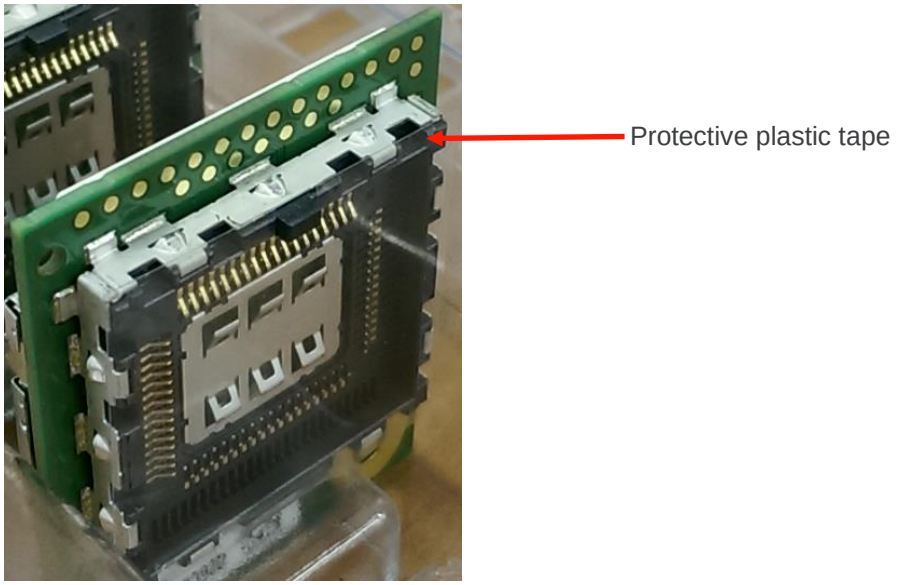


Figure 7. Plastic Tape on the Snap-in Socket

The plastic trays are then packed in pizza boxes.

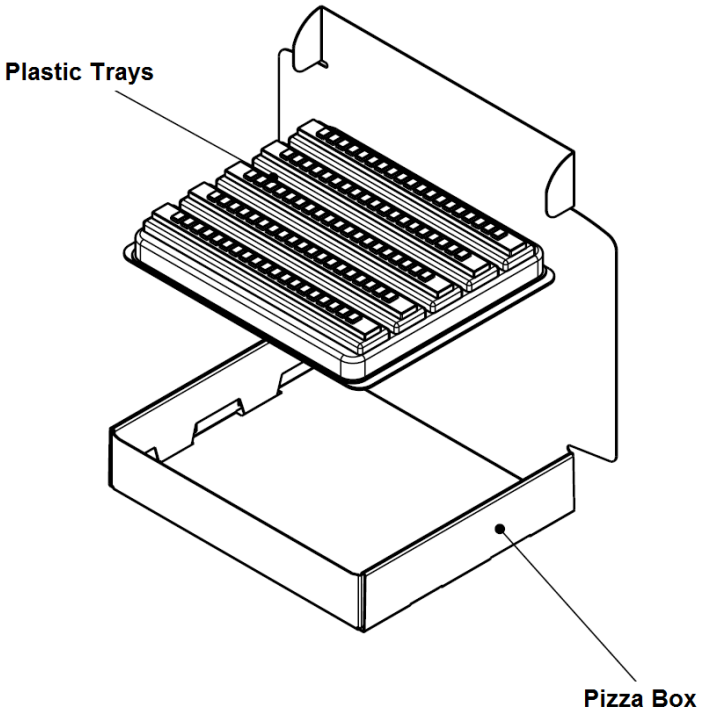


Figure 8. Plastic Trays Packed in a Pizza Box

Note: The snap-in cover is not included in the packaging, and must be ordered separately.

7. References

7.1. Reference Documents

[1] AirPrime Q2686 Refreshed Product Technical Specification & Customer Design Guidelines
Reference number: 4111963

[2] AirPrime Q2687 Refreshed Product Technical Specification & Customer Design Guidelines
Reference number: 4111964

[3] AirPrime Q2698 Product Technical Specification & Customer Design Guidelines
Reference number: 4111754

[4] AirPrime HL6528x Product Technical Specification
Reference number: 4114016

[5] AirPrime HL6528RDx Product Technical Specification
Reference number: 4117701

[6] AirPrime HL8548 and HL8548-G Product Technical Specification
Reference number: 4114663

[7] AirPrime HL6 and HL8 Series AT Commands Interface Guide
Reference number: 4114680

[8] AirPrime HL6528RDx AT Commands Interface Guide
Reference number: 4117743

7.2. Schematic Diagram

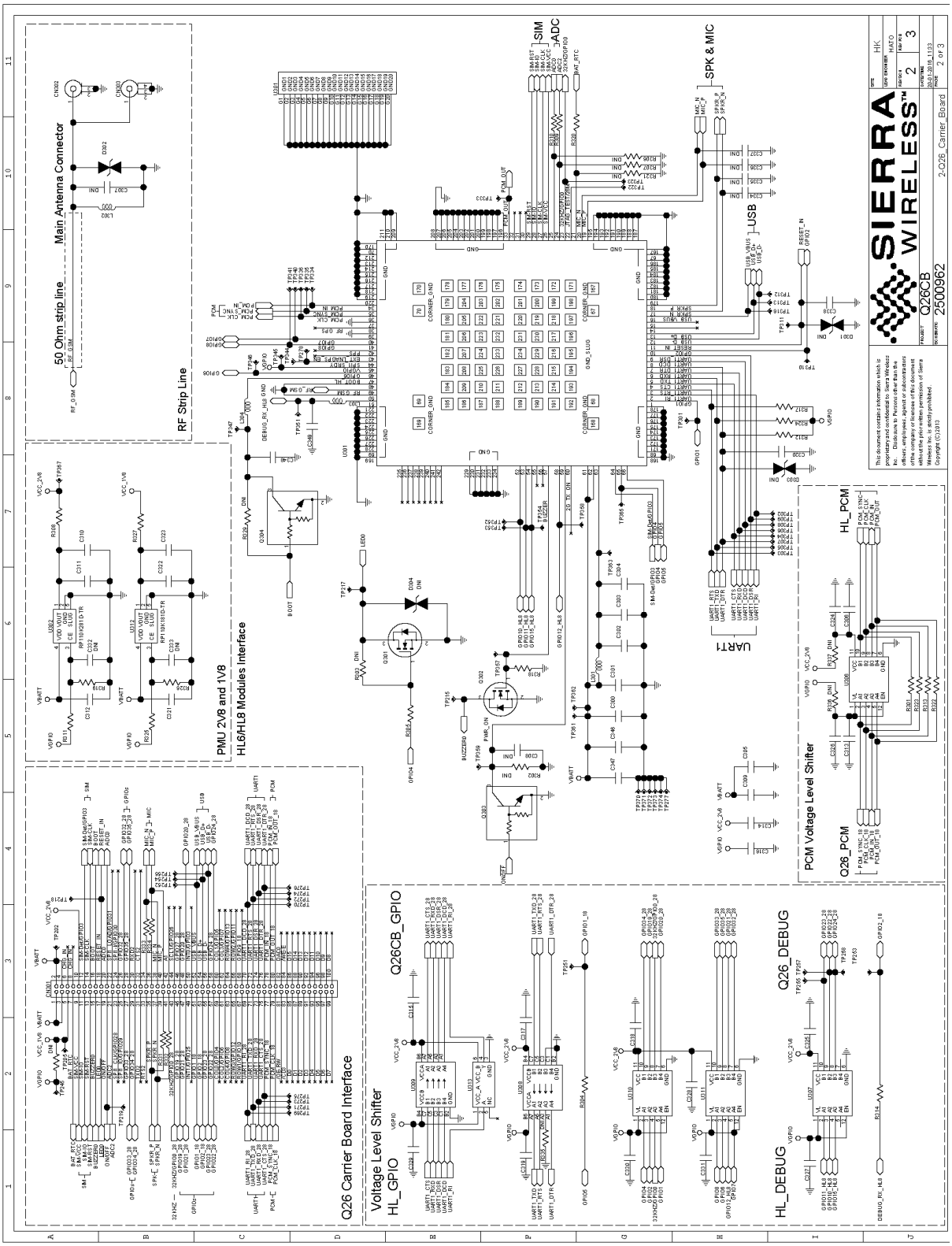


Figure 9. Schematic Diagram

7.3. Mechanical Drawings

Note: The following drawings show the Q26 Carrier Board with a mounted snap-in cover.

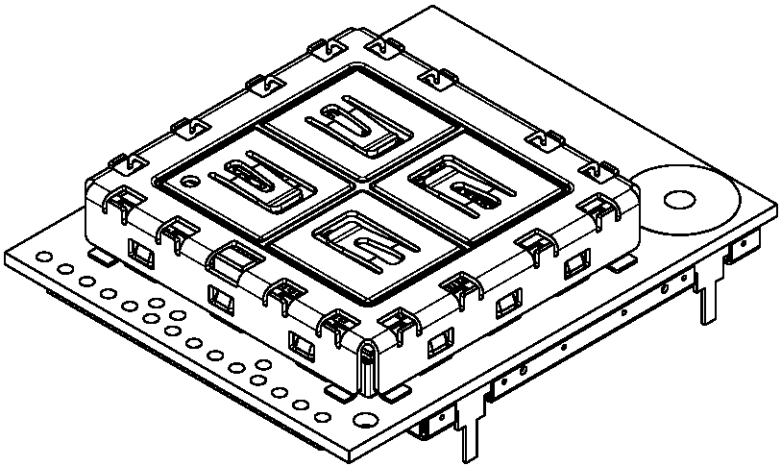


Figure 10. Top View

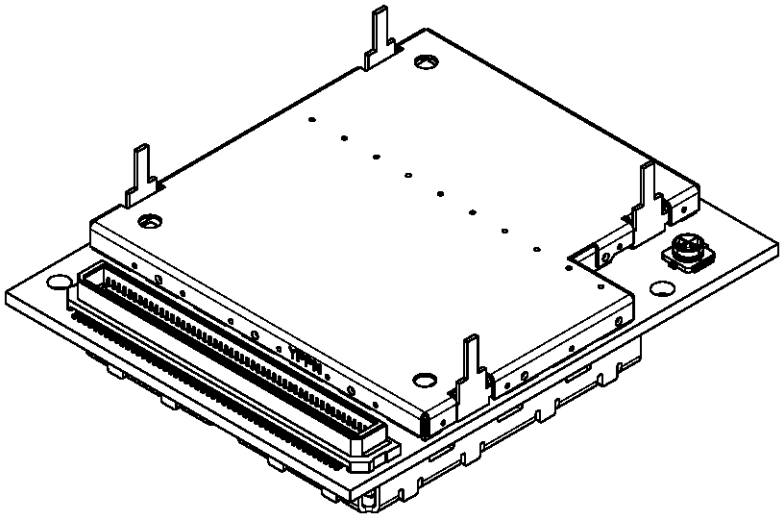


Figure 11. Bottom View

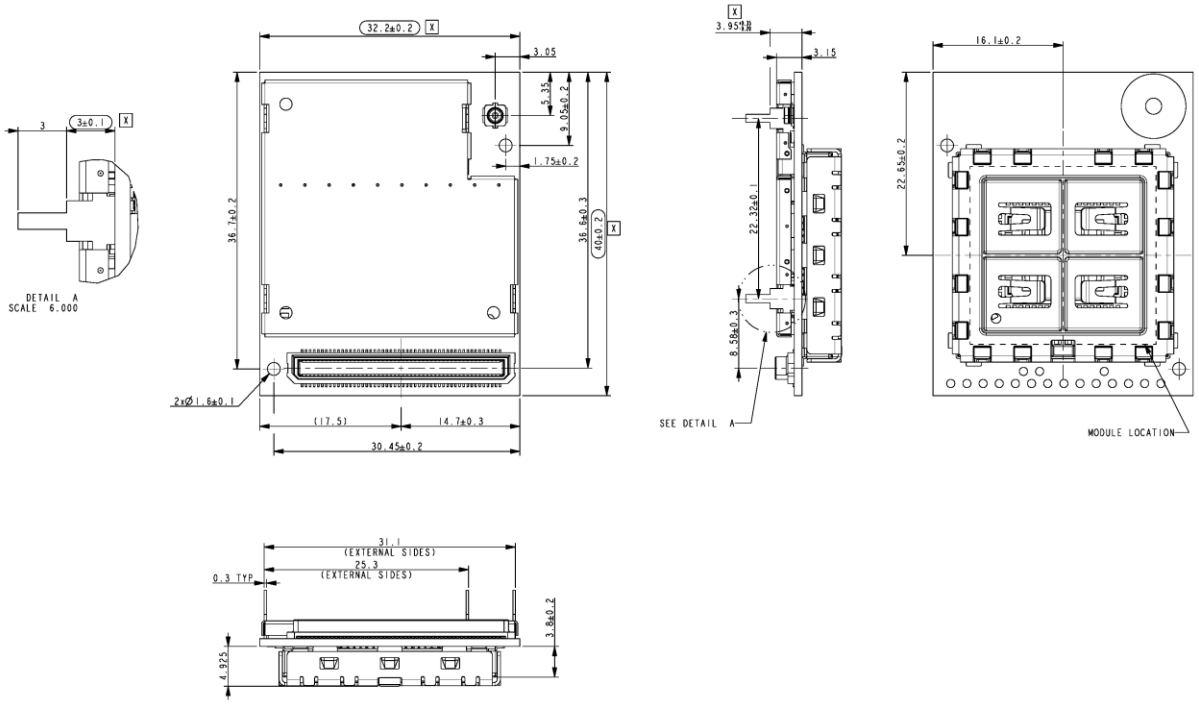


Figure 12. Circuit Card Assembly

7.4. Component Placement

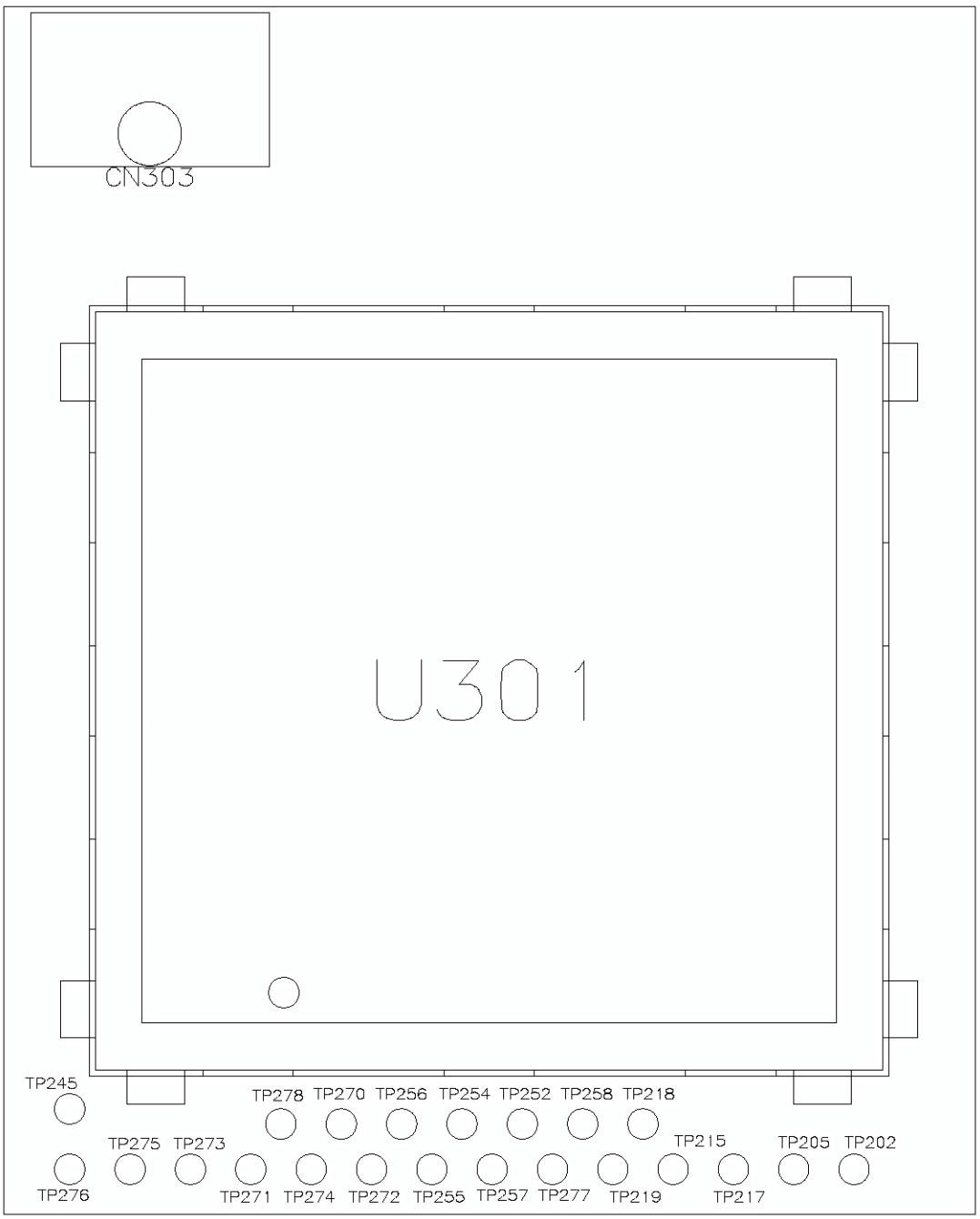
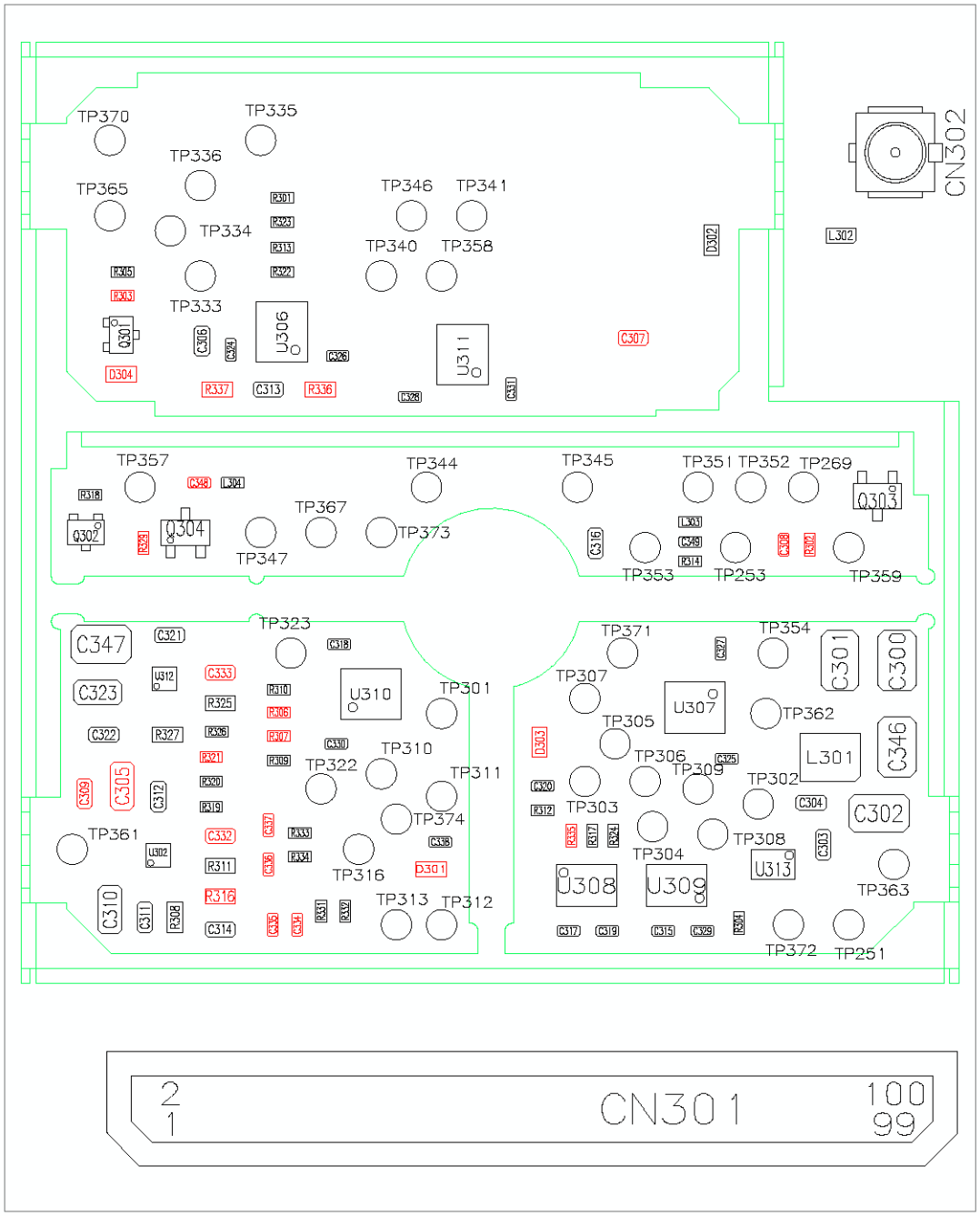


Figure 13. Component Placement – Top View



NOTES:

1. NOT ALL COMPONENTS ARE INSTALLED ON THE BOARD.
2. REFER TO THE LATEST REVISION OF BILL OF MATERIALS FOR INSTALLED PARTS LIST.
3. [ ] DO NOT INSTALLED COMPONENT

Figure 14. Component Placement – Bottom View

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