

Pelican Wireless Systems
45-5105
900 MHz IEEE Std. 802.15.4
RF Transceiver Module with PA/LNA

Features:

- IEEE Std. 802.15.4™ Compliant RF Transceiver
- 4-Wire Serial Peripheral Interface (SPI) with Interrupt
- Small size: 1.0" x 1.125"
- Surface Mountable
- Integrated Crystal, Internal Voltage Regulator, Matching Circuitry, Power Amplifier, Low Noise Amplifier
- External Antenna Connector: Ultra Miniature Coaxial (U.FL), 50Ω

Operational:

- Operating Voltage: 3.0V-3.6V (3.3V typical)
- Temperature Range: -40°C to +85°C Industrial
- Low-Current Consumption:
 - Rx Mode: 32 mA (typical)
 - Tx Mode: 400 mA (typical)

RF/Analog Features:

- ISM Band 902 MHz – 928 MHz Operation
- Data Rate: 250 kbps
- -97 dBm Typical Sensitivity
- +24 dBm Typical Output Power

MAC/Baseband Features:

- Automatic FCS Check
- Supports all CCA modes and RSS/LQI

Device Overview

The 45-5105 is a 900 MHz IEEE Std. 802.15.4 compliant, surface mount module with integrated crystal, internal voltage regulator, matching circuitry, Power Amplifier (PA), Low Noise Amplifier (LNA) with 50Ω external antenna connector. The module operates in the non-licensed 900 MHz frequency band. The integrated module design frees the integrator from extensive RF and antenna design, and regulatory compliance testing allowing quicker time to market.

To maintain compliance, user manuals for transmitters shall display the following notice in a conspicuous location:

FCC Compliance Statement

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

Changes or modifications to this product not authorized by Pelican could void the electromagnetic compatibility (EMC) and wireless compliance and negate your authority to operate the product.

The radiated output power of this device meets the limits of FCC/IC radio frequency exposure limits. This device should be operated with a minimum separation distance of 20 cm (8 inches) between the equipment and a person's body.

ISED Canada Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage ;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

"In order to comply with ISED RF Exposure requirements, this device must be installed to provide at least 20 cm separation from the human body at all times.

"Afin de se conformer aux exigences d'exposition RF ISED, cet appareil doit être installé pour fournir au moins 20 cm de séparation du corps humain en tout temps.

Interface Description

Figure 1-1 shows a simplified block diagram of the 45-5105 module. The module interfaces to many popular microcontrollers through a 4-wire SPI interface, interrupt, wake, reset, power and ground. Table 1-1 provides the pin descriptions.

FIGURE 1-1

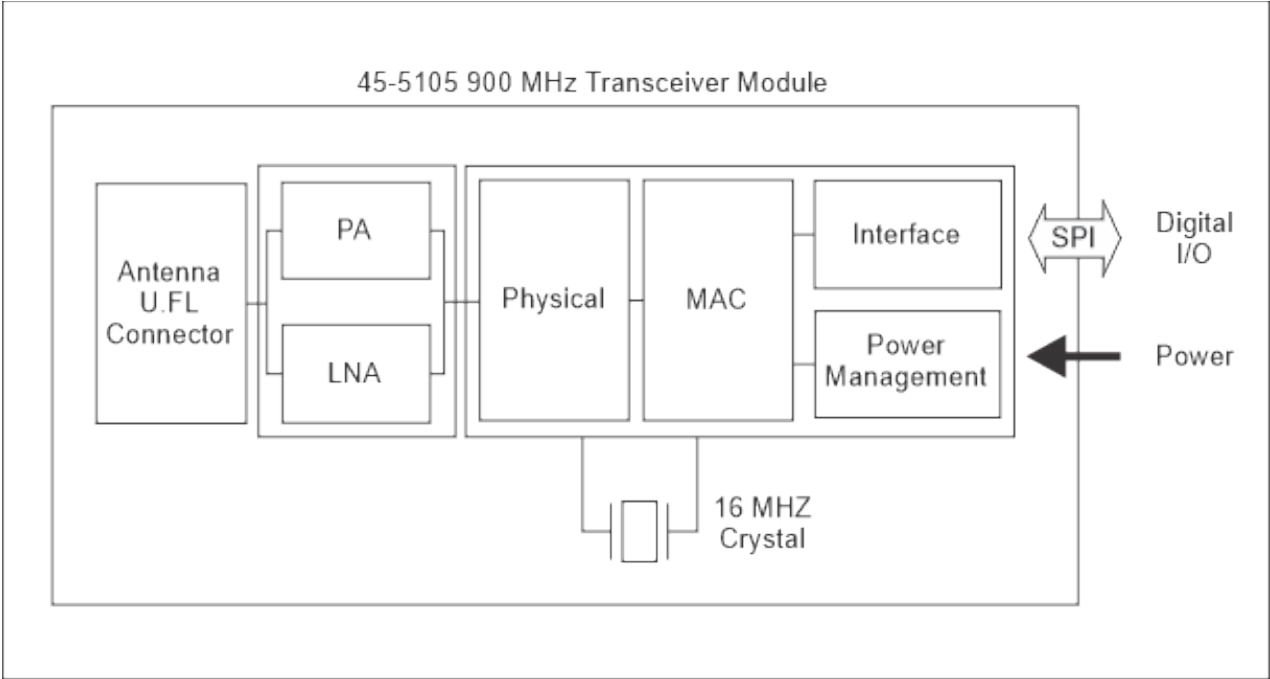


TABLE 1-1

Pin	Symbol	Type	Description
1	GND	Ground	Ground
2	GND	Ground	Ground
3	GND	Ground	Ground
4	VIN	Power	Power Supply
5	VIN	Power	Power Supply
6	/RESET	DI	Hardware Reset
7	SLP_TR	DI	Sleep, Transmit
8	SCK	DI	SPI interface clock
9	SDO	DO	SPI Data Output
10	SDI	DI	SPI Data Input
11	/SEL	DI	SPI Select
12	IRQ	DO	Interrupt Request

Mounting Details

The 45-5105 is a surface mountable module. Module dimensions are shown in Figure 1-2. The module Printed Circuit Board (PCB) is 0.062" thick with castellated mounting points on the edge. Figure 1-3 is the recommended host PCB footprint. The module has a 50Ω ultra miniature coaxial (U.FL) connector.

Soldering Recommendations

The module was assembled using a standard lead-free reflow profile. The module is compatible with standard lead-free solder reflow profiles.

Technical drawing of a mechanical assembly, likely a sensor or actuator, showing dimensions in inches. The drawing includes a top view and a side view.

Top View Dimensions:

- Overall width: 1.125"
- Distance from left edge to center of circular feature: 0.99"
- Radius of circular feature: 0.10"
- Distance from left edge to center of rectangular feature: 0.13"
- Distance from center of rectangular feature to center of circular feature: 0.06"
- Width of rectangular feature: 0.80"
- Overall width of rectangular feature: 1.00"

Side View Dimensions:

- Distance from top edge to center of circular feature: 0.10"
- Distance from top edge to center of rectangular feature: 0.80"

Technical drawing of a square hole in a plate. The plate has a width of 1.125" and a height of 1.00". The square hole has a side length of 0.10". The hole is centered horizontally and vertically. The distance from the top edge of the plate to the top edge of the hole is 0.08". The distance from the bottom edge of the plate to the bottom edge of the hole is 0.08". The distance from the left edge of the plate to the left edge of the hole is 0.08". The distance from the right edge of the plate to the right edge of the hole is 0.08".

Operation

The 45-5105 module is based on the Microchip AT86RF212B Transceiver IC. Serial communication and configuration are documented in Atmel-42002-MCU_Wireless-AT86RF212B_Datasheet.pdf which can be found on the micorchip.com website. The PA/LNA is based on the SKY66122-11 Front End Module. Documentation can be found on the www.skyworksinc.com website.

Host Integration

The module has not been authorized for co-location or simultaneous operation with other radio transmitters. The host integrator is responsible for ensuring continued compliance of the module. If the module is co-located and/or operating simultaneously with other radio transmitter(s), additional testing and/or equipment authorization may be required. In addition, the module is only authorized for use in fixed-mount and mobile equipment configurations. Use in portable configuration may require additional testing and/or equipment authorization.

Transmit Power Settings

For regulatory approval, the maximum power setting to maintain certification requirements controlled by the configuration registers PHY_TX_PWR (register 05) and RF_CTRL_0_REG (register 22). Use the following register settings: PHY_TX_REG = 0x02, RF_CTRL_0_REG = 0x32.

External Antenna

The 45-5105 module has a 50 Ω ultra miniature coaxial (U.FL) connector to connect to an external 900 MHz antenna. Modular certification was performed with the World Products WPANT10174-S1A antenna. Only the antenna type that has been tested shall be used. It is permissible to use a different antenna manufacturer provided the same antenna type and antenna gain (equal to or less than) is used. Use of a different type of antenna or an antenna with a higher gain will require additional testing and/or equipment authorization. See FIGURE 1-4 through 1-9 for reference.

FIGURE 1-4

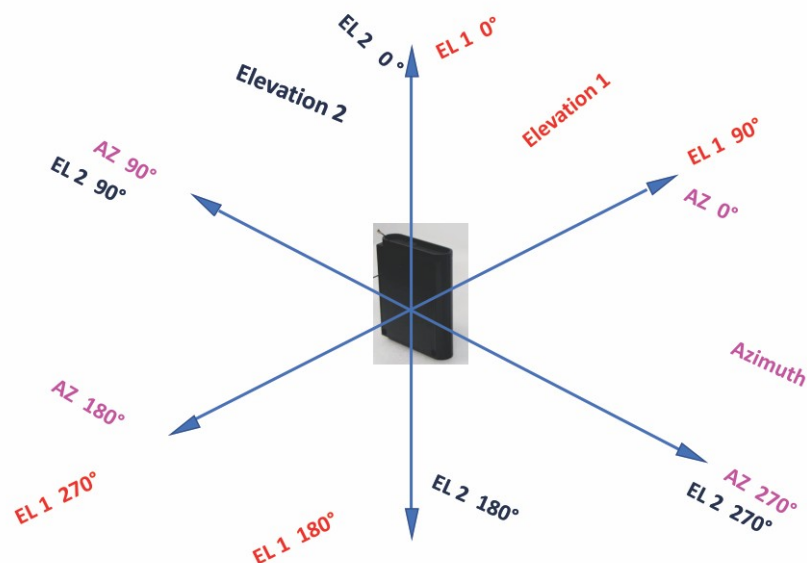


FIGURE 1-5



VSWR

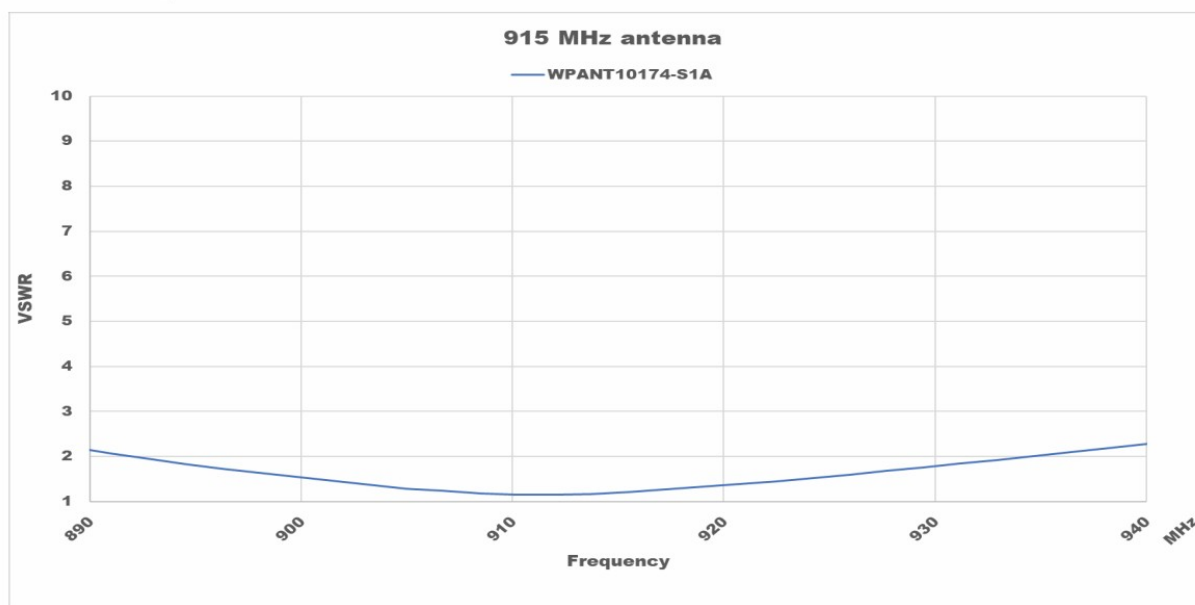


FIGURE 1-6



ELEVATION 1

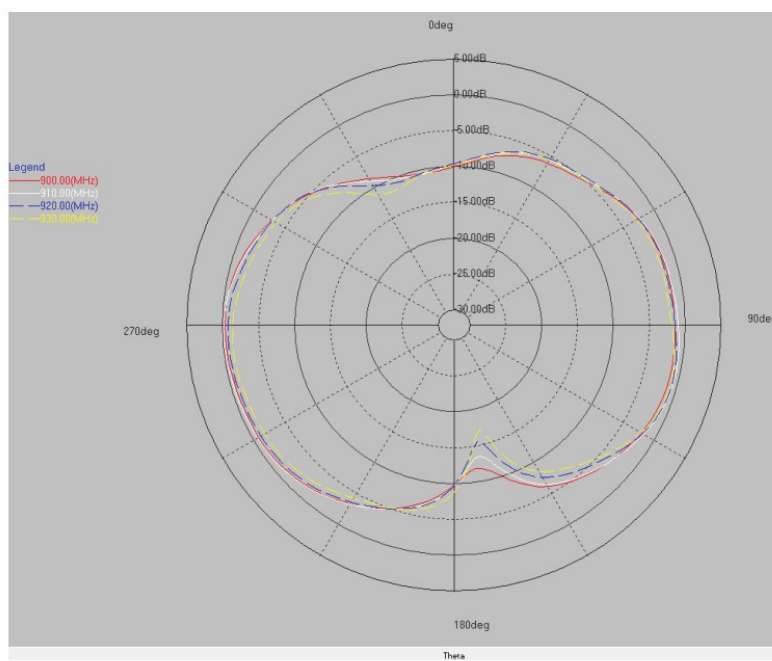


FIGURE 1-7



ELEVATION 2

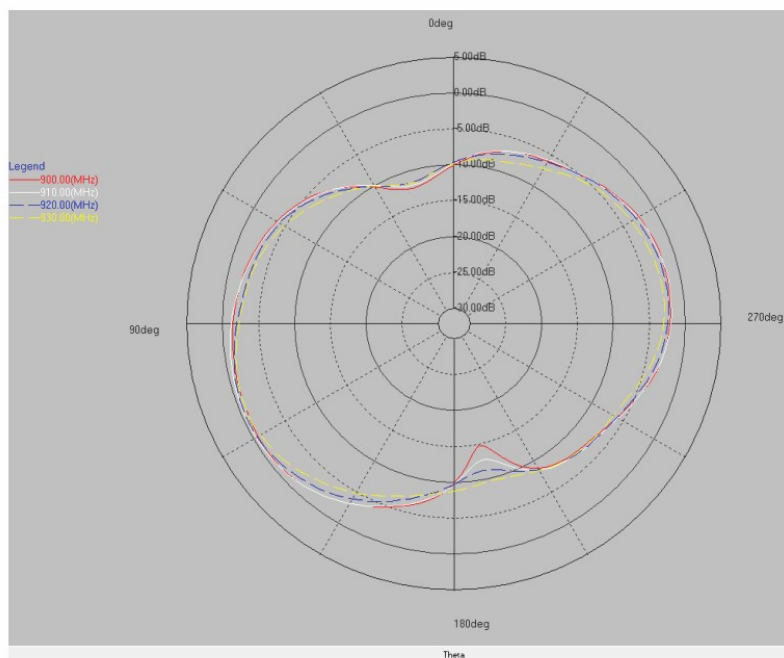


FIGURE 1-8



AZIMUTH

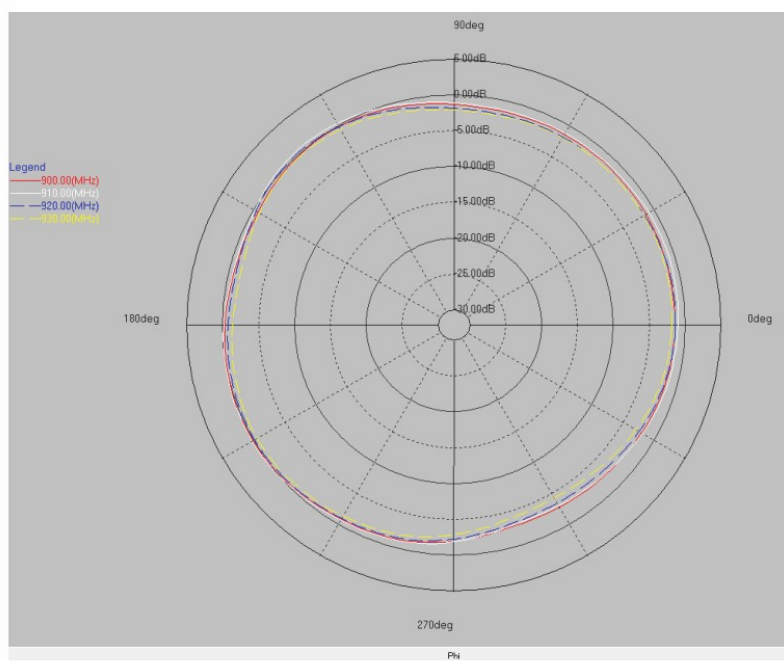
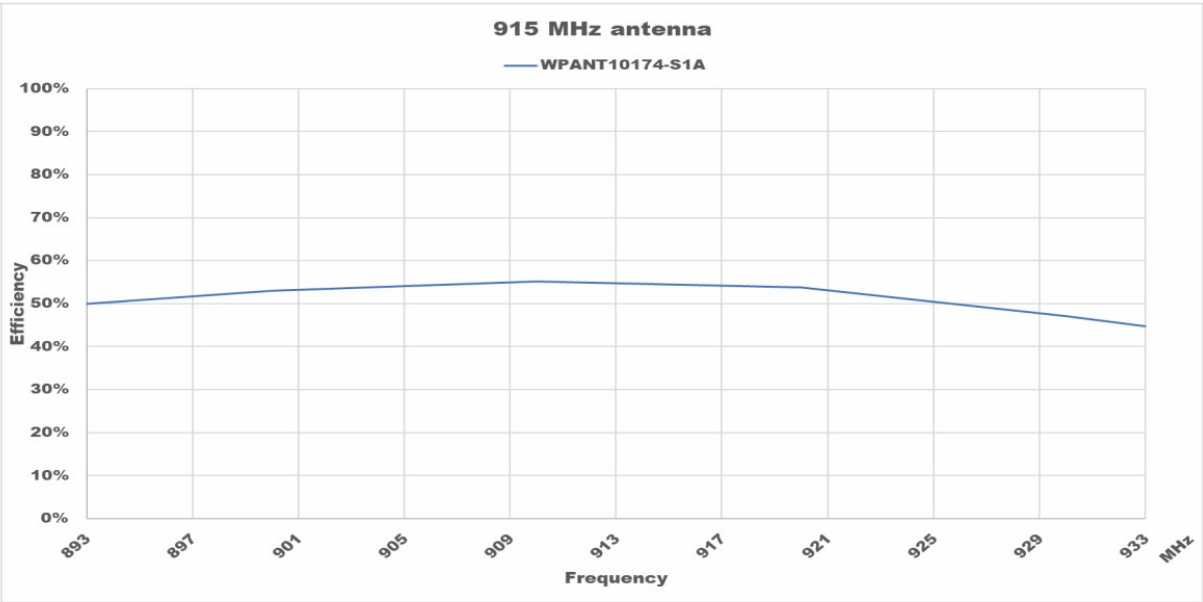


FIGURE 1-9



Module Schematic

The schematic diagram of the module is illustrated in FIGURE 1-10 and the Bill of Materials (BOM) is shown in TABLE 1-2.

FIGURE 1-10

TABLE 1-2

Description	Mfg Part No	Qty	Reference
100pF Capacitor, 0603	CL10C101JC81PNC	1	C31
12pF Capacitor, 0603	06035C120J4T2A	2	C25, C26
1uF Capacitor, 0603	CL10B105KO8NNNC	4	C23, C24, C27, C30
1000 pF Capacitor, 0402	GRM155R70J102KA01D	1	C7
4.7uF Capacitor, 0402	CL05A475MP5NRNC	1	C9
22pF Capacitor, 0402	C0402C220J8HACTU	1	C8
33pF Capacitor, 0402	VJ0402A330JXJCW1BC	3	C1, C5, C6
68pF Capacitor, 0402	C0402C680M8HACTU	1	C3
16MHz Crystal, 3.2mm x 2.5mm, Parallel, ABM8	ABM8-16.000MHZ-9-B1U-T	1	Y1
BALUN, 900MHz	0896FB15A0100001E	1	U2
3.3 nH Inductor, SMT, 0402	LQG15HN3N3S02D	1	L3
6.8 nH Inductor, SMT, 0402	LQG15WZ6N8J02D	1	L4
SKY66122-11 RF Front End OFDM	SKY66122-11	1	U3
AT86RF212B 900MHz Transceiver, QFN32	AT86RF212B-ZUR	1	U1
U.FL Connector, Coax, SMT	U.FL-R-SMT-1(10)	1	J3
RF Shield, 20mm x 20mm, SMT	36903205S	1	RFI
Wireless Module PCB, 900MHz		1	

Regulatory Approval

USA

The 45-5105 module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” modular approval in accordance with Part 15.212 Modular Transmitter approval and Part 15.247 Operation within bands 902-928 MHz. Modular approval and Operation within bands 902-928 MHz allows the end user to integrate the 45-5105 module into finished product without obtaining subsequent and separate FCC approvals for intentional radiation, provided no changes or modifications are made to the module circuitry. Changes or modifications could void the user’s authority to operate the equipment. The end user must comply with all instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorizations, regulations, requirements and equipment functions not associated with the transmitter module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15 Subpart B “Unintentional Radiators”), such as digital devices, computer peripherals, radio receivers, etc; and to additional authorization requirements for the non-transmitter functions of the transmitter module (i.e., Verification or Declaration of Conformity) (e.g., transmitter modules may also contain digital logic functions) as appropriate.

The host product must be labeled with the statement: “Contains FCC ID: 2BGK9PEL900” in an easily readable location using a minimum font size of 4pt.

Canada

The 45-5105 module has been certified for use in Canada under Industry Canada (IC) Radio Standards Specification (RSS) RSS-210 and RSSGen Modular approval permits the installation of the module in a host device without the need to recertify the device.

The host product must be labeled with the statement: "Contains IC: 32506-PEL900" in an easily readable location using a minimum font size of 4pt.