JuiceBox 3.0 NA

RFID Module Manual

ENGLISH

Scope

This document is applied to the ST25R3911B, a highly integrated NFC Initiator / HF reader IC, of the manufacturer STMicroelectronics.

Description

The ST25R3911B is a highly integrated NFC Initiator / HF reader IC, including the analog front end (AFE) and a highly integrated data framing system for ISO 18092 (NFCIP-1) initiator, ISO 18092 (NFCIP-1) active target, ISO 14443A and B reader (including high bit rates), ISO 15693 reader and FeliCa™ reader.
The ST25R3911B is designed to operate from a wide (2.4 V to 5.5 V) power supply range; peripheral interface IO pins support power supply range from 1.65 V to 5.5 V.
The module is mounted on the RFID Board of the Juice Box 3.0 NA.

Diagrams

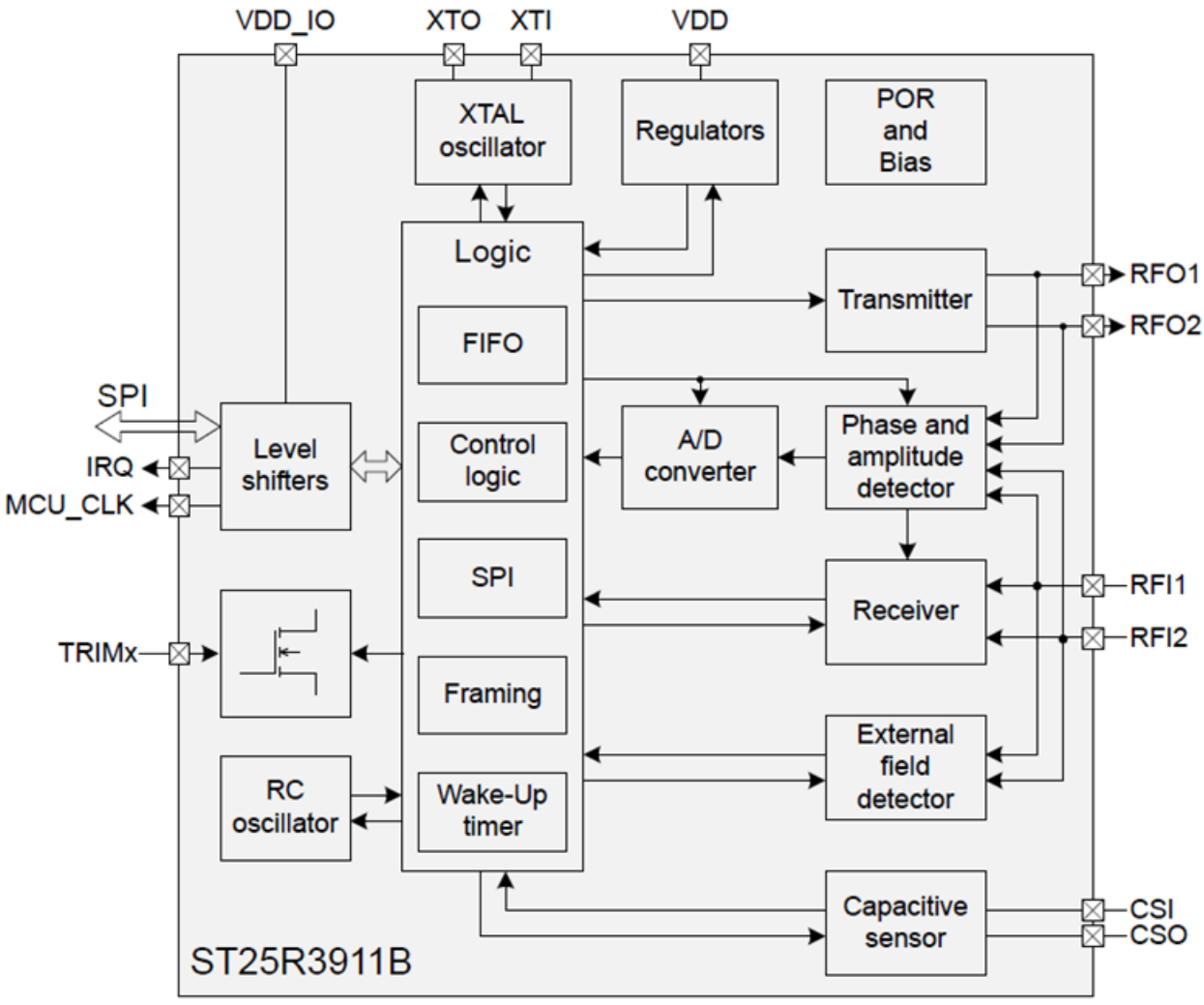

Figure 1 - RFID module block diagram

- Controller: ST25R3911B
- Communication bus with MCU: SPI
- Crystal Fo: 27,12 MHz
- Controller and antenna lay on the same PCB

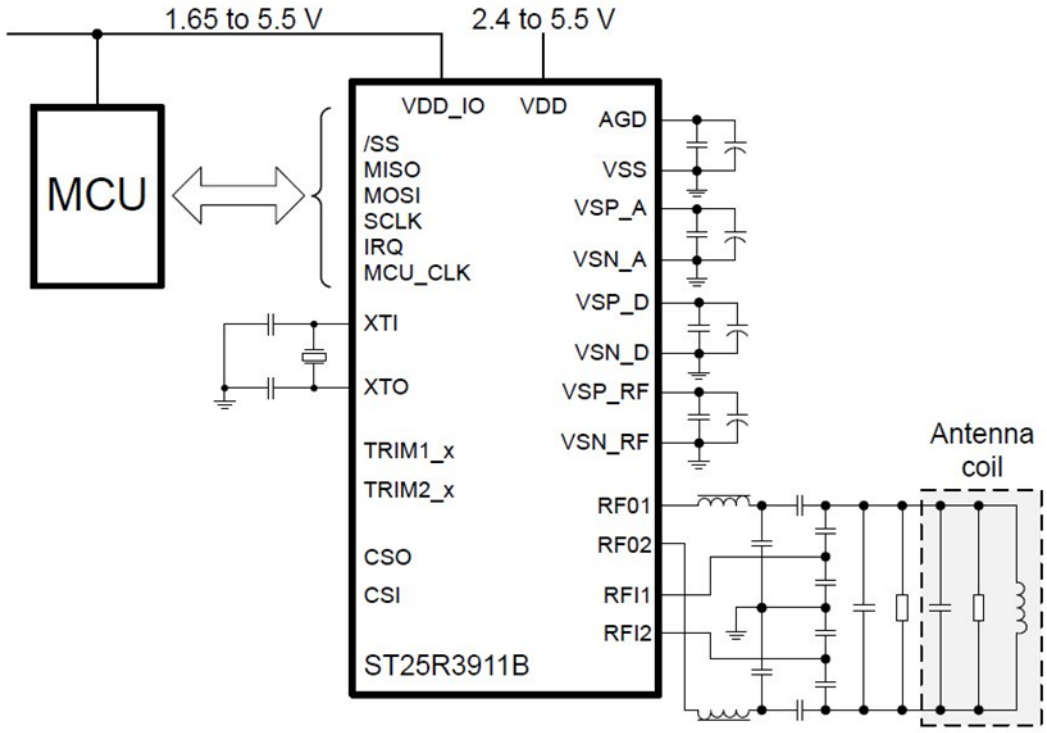

Figure 2 - RFID module diagram

Pictures

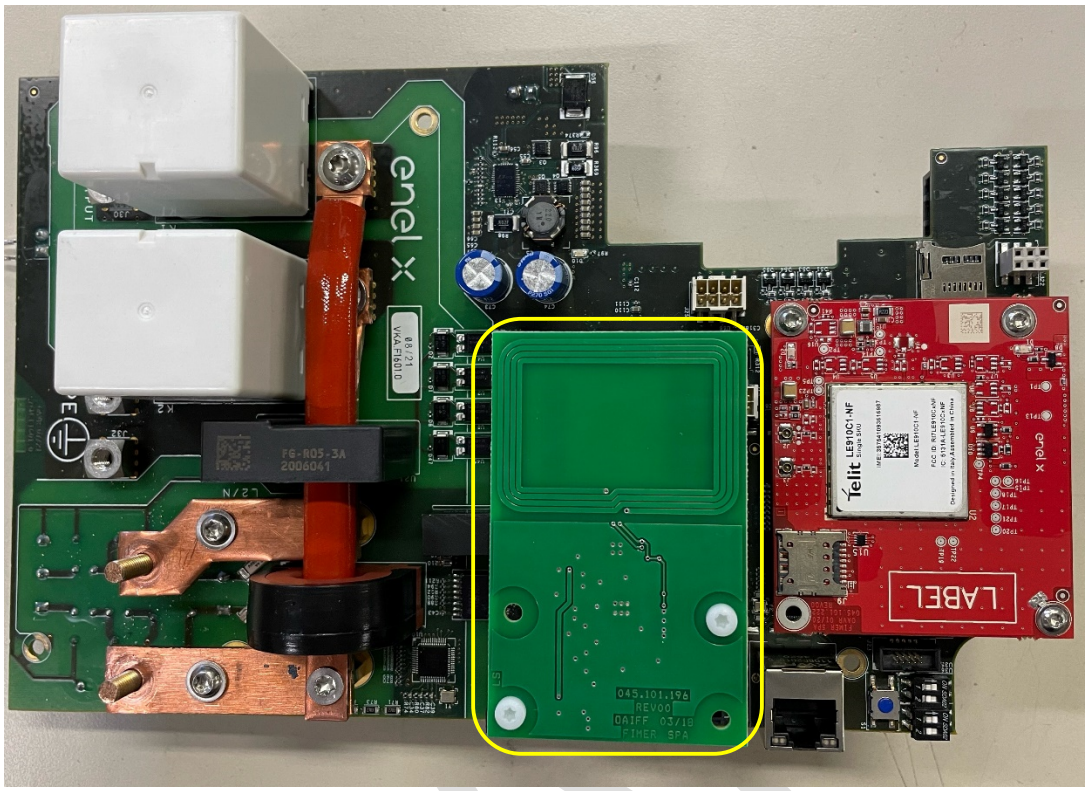

Figure 3 - RFID Board (encircled) mounted on the Main Board

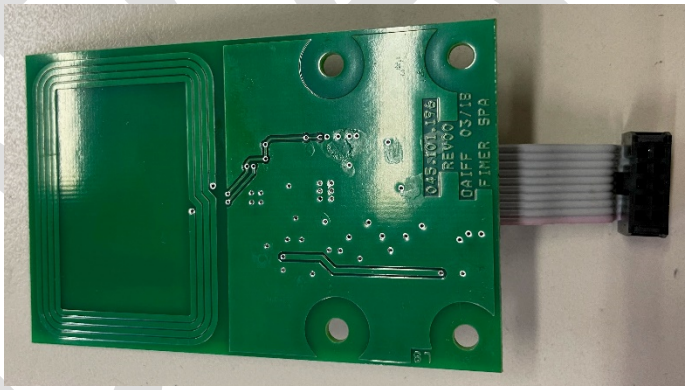

Figure 4 – RFID Board (top view)

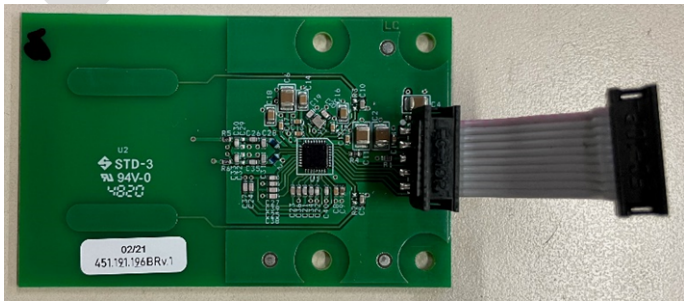

Figure 5 – RFID Board (bottom view)

Dimensions

The ST25R3911B is available in a 32-pin QFN (5 x 5 mm) package. Dimensioning and tolerances conform to ASME Y14.5M-1994. Coplanarity applies to the exposed heat slug as well as to the terminal. Radius on terminal is optional. N is the total number of terminals. All dimensions are in mm. All angles are in degrees.

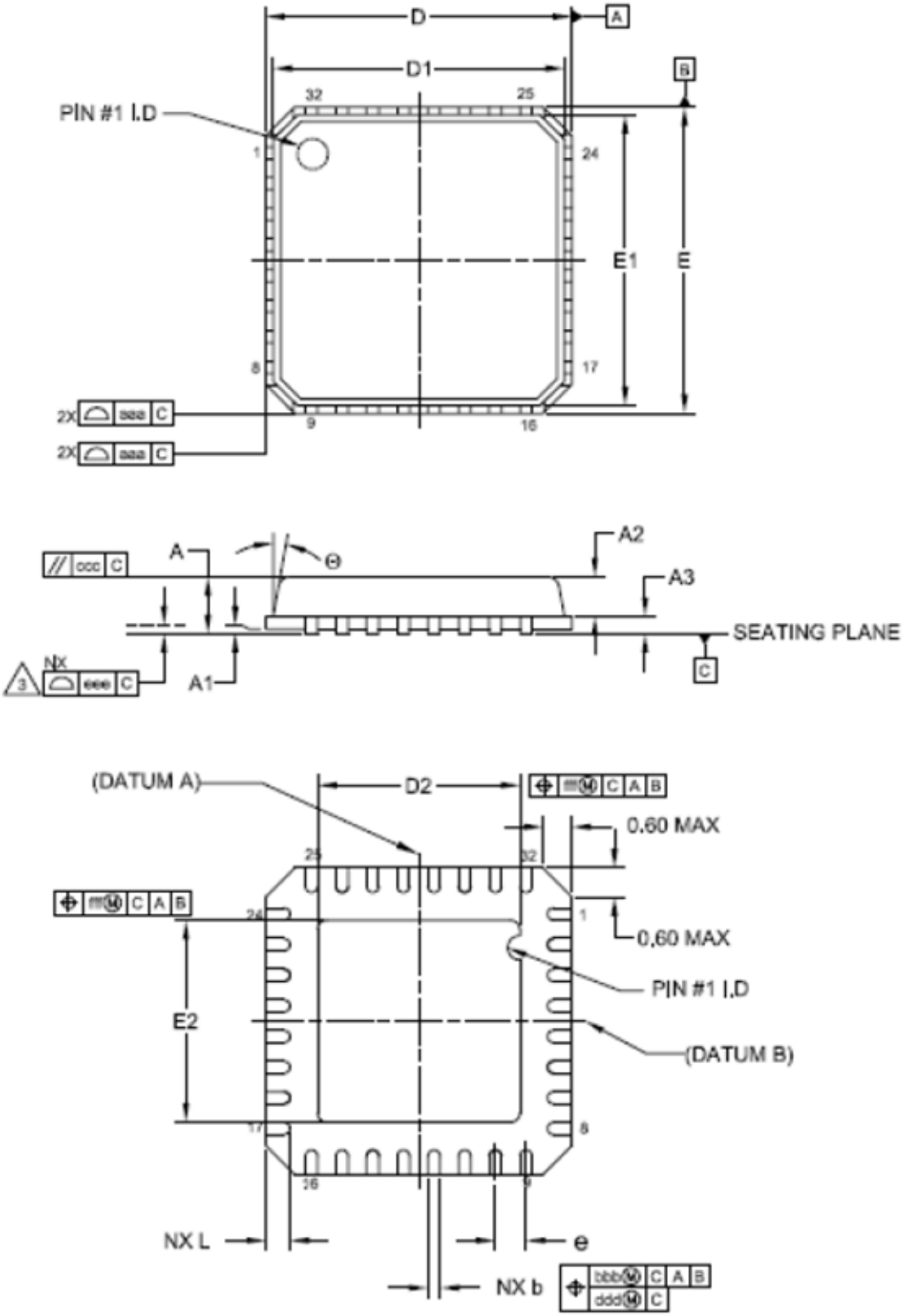

Figure 6 - QFN32 - Outline

Symbol	Min.	Typ.	Max.
A	0.80	0.90	1.00
A1	0	0.02	0.05
A2	-	0.65	1.00
A3	-	0.20	-
L	0.35	0.40	0.45
q	0°	-	14°
b	0.18	0.25	0.30
D	-	5.00 (with BSC)	-
E	-	5.00 (with BSC)	-
e	-	0.50 (with BSC)	-
D2	3.40	3.50	3.60
E2	3.40	3.50	3.60
D1	-	4.75 (with BSC)	-
E1	-	4.75 (with BSC)	-
aaa	-	0.15	-
bbb	-	0.10	-
ccc	-	0.10	-
ddd	-	0.05	-
eee	-	0.08	-
fff	-	0.10	-
N (1)		32	

Figure 7 - QFN32 - Mechanical data

Pin Layout

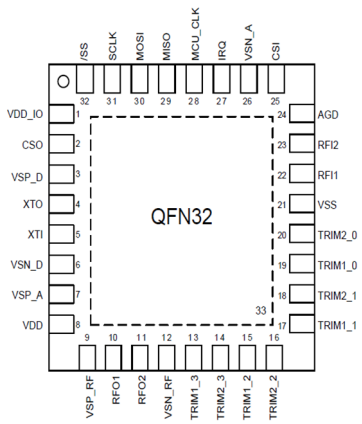

Figure 8 - ST25R3911B QFN32 pinout

Pin number	Pin name	Pin type	Description
1	VDD_IO	Supply pad	Positive supply for peripheral communication
2	CSO	Analog output	Capacitor sensor output
3	VSP_D		Digital supply regulator output
4	XTO		Xtal oscillator output
5	XTI	Analog input / Digital input	Xtal oscillator input
6	VSN_D	Supply pad	Digital ground
7	VSP_A	Analog output	Analog supply regulator output
8	VDD	Supply pad	External positive supply
9	VSP_RF	Analog output	Supply regulator output for antenna drivers
10	RFO1		Antenna driver output
11	RFO2		
12	VSN_RF	Supply pad	Ground of antenna drivers
13	TRIM1_3	Analog I/O	Input to trim antenna resonant circuit
14	TRIM2_3		
15	TRIM1_2		
16	TRIM2_2		
17	TRIM1_1	Analog I/O	Input to trim antenna resonant circuit
18	TRIM2_1		
19	TRIM1_0		
20	TRIM2_0		
21	VSS	Supply pad	Ground, die substrate potential
22	RFI1	Analog input	Receiver input
23	RFI2		
24	AGD	Analog I/O	Analog reference voltage
25	CSI	Analog input	Capacitor sensor input
26	VSN_A	Supply pad	Analog ground
27	IRQ	Digital output	Interrupt request output
28	MCU_CLK		Microcontroller clock output
29	MISO	Digital output / tristate	Serial Peripheral Interface data output
30	MOSI	Digital input	Serial Peripheral Interface data input
31	SCLK		Serial Peripheral Interface clock
32	/SS		Serial Peripheral Interface enable (active low)
33	VSS	Supply	Ground, die substrate potential, connected to V_{SS} on PCB

Figure 9 - ST25R3911B pin definitions - QFN32 package

Electrical characteristics

Symbol	Parameter	Min	Max	Unit	Comments
V_{DD}	DC supply voltage	-0.5	6.0	V	-
VDD_IO	DC_IO supply voltage	-0.5	6.0	V	-
V_{INTRIM}	Input pin voltage TRIM pins	-0.5	25.0	V	-
V_{IN}	Input pin voltage for peripheral communication pins	-0.5	6.5	V	-
V_{INA}	Input voltage for analog pins	-0.5	6.0	V	-
I_{scr}	Input current (latch-up immunity)	-100	100	mA	Norm: JEDEC 78
I_{outmax}	Drive capability of output driver	0	600	mA	-

Figure 10 - Electrical parameters

Symbol	Parameter	Min	Max	Unit	Comments
T_{strg}	Storage temperature	-55	125	°C	-
T_{body}	Package body temperature	-	260	°C	The reflow peak soldering temperature (body temperature) is specified according to IPC/JEDEC J-STD-020 "Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices." The lead finish for Pb-free leaded packages is matte tin (100% Sn).
RH_{NC}	Relative Humidity non-condensing	5	85	%	
MSL	Moisture sensitivity level	3		-	Represents a maximum floor life time of 168h.

Figure 11 - Temperature ranges and storage conditions

Symbol	Parameter	Min	Max	Unit	Comments
V_{DD}	Positive supply voltage	2.4	5.5	V	In case power supply is lower than 2.6 V, PSSR cannot be improved using internal regulators V_{DD_IO} (minimum regulated voltage is 2.4 V).
V_{DD_IO}	Peripheral communication supply voltage	1.65	5.5	V	
V_{SS}	Negative supply voltage	0	0	V	-
V_{INTRIM}	Input pin voltage TRIM pins	-	20	V	-
T_{JUN}	Junction temperature	-40	125	°C	-
V_{RFI_A}	RFI input amplitude	0.150	3	V_{pp}	Minimum RFI input signal definition is meant for NFC receive mode. In HF reader mode and NFC transmit mode the recommended signal level is 2.5 Vpp.
RFO	Driver current	0	500	mA	-

Figure 12 - Operating conditions

Frequency bands

- Fo: 13,56 MHz
- Bandwidth: 2,26 kHz

Construction information

- Coil realized on PCB
- Internal
- Gain: N/A

- RFID board external dimensions: 79mm x 50mm
- Antenna external dimensions: 47mm x 34mm

- Four turns antenna

Antenna check

The concrete contents of a check are the following two points:

- It is the same type as the antenna type of antenna specifications.
- Confirm the same size as the Gerber file.

Radio Certification Information

Enel X Way FCC ID:	2A5OV-ST25
Enel X Way ISED ID:	28561-ST25

Federal Communications Commission (FCC) compliance statements

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.

FCC CAUTION
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

The module is only for integration in Enel X Way products and will not be sold to the general public. KDB 996369 D04 will be considered for new hosts. The following conditions will also need to be met when installing the module in a new host:
1)The antenna must be installed such that 20 cm is maintained between the antenna and users
2)The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required; a C2PC is required to change any of these conditions.

Industry Canada (IC) compliance statements

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;
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie 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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptibled'en compromettre le fonctionnement.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.
Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement noncontrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipementdoit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

RF Exposure requirements are met when installed in mobile equipment.

The module is only for integration in Enel X Way products and will not be sold to the general public. KDB 996369 D04 will be considered for new hosts. The following conditions will also need to be met when installing the module in a new host:
1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required; a C2PC is required to change any of these conditions.
Le module est uniquement destiné à être intégré dans les produits Enel X Way et ne sera pas vendu au public. KDB 996369 D04 sera considéré pour les nouveaux hôtes. Les conditions suivantes devront également être remplies lors de l'installation du module dans un nouvel hôte :
1)L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
2)Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.
Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires; un C2PC est nécessaire pour modifier l'une de ces conditions.
Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

2.0 INTEGRATION INSTRUCTIONS

2.1 General

Sections 2.2 through 2.12 describe the items provided in the integration instructions to use when integrating a module in a host product.

2.2 List of applicable FCC rules

See the following chapters:

- "Radio Certification Information"
- "Federal Communications Commission (FCC) compliance statements"
- "Industry Canada (IC) compliance statements"
- "APPENDIX"

2.3 Summarize the specific operational use conditions

The JuiceBox 3.0 NA and the RFID module are designed for indoor and outdoor use, according to the Installation Manual of the JuiceBox 3.0 NA.

2.4 Limited module procedures

N.A.

2.5 Trace antenna designs

The layout of the RFID board (i.e., RFID module, antenna, traces, etc.) follows the guidelines provided by the Manufacturer STMicroelectronics.

2.6 RF exposure considerations

See the following chapters:

- "Federal Communications Commission (FCC) compliance statements"
- "Industry Canada (IC) compliance statements"
- "APPENDIX"

2.7 Antennas

See the chapter "Construction information" and the document "Antenna Specifications".

2.8 Label and compliance information

See the documents describing the RFID and JuiceBox3.0NA label.

2.9 Information on test modes and additional testing requirements

See the documents "FCC Modular request" and "IC Modular request".

2.10 Additional testing, Part 15 Subpart B disclaimer

See the chapter "FCC Compliance Statement/Part 15".

2.11 Note EMI Considerations

N.A.

2.12 How to make changes

The module manufacture will provide contact information and some guidance to host providers in the integration instructions if the module will be used differently than granted.

APPENDIX
Federal Communications Commission (FCC) and Industry Canada (IC) compliance statements of JuiceBox 3.0 NA

FCC Compliance Statement

Part 15

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 not expressly approved by Enel X Way could void the user's authority to operate the equipment.

FCC ID

The equipment contains the FCC IDs 2A5OV-ST25, 2A5OV-LB1DX, RI7-LE910CXNF.

Formal notices required by the Industry Canada ("IC")

Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). 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.

Declaration de Conformité

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.

IC ID

The equipment contains the ICs 28561-ST25, 28561-LB1DX, 5131A-LE910CXNF

Mobile Devices

To ensure compliance with FCC and ISED RF exposure requirements this device must be installed to provide a minimum of 20cm between the device and people.
Pour garantir la conformité aux exigences d'exposition RF de la FCC et d'ISED Canada, cet appareil doit être installé de manière à laisser un minimum de 20 cm entre l'appareil et les personnes.