



MQN18

NFC Antenna Module

Datasheet Version 1.2

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FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

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.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

CAUTION:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

Information for the OEMs and Integrators

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product. The user manual which is provided by OEM integrators for end users must include the following information in a prominent location.

To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

If the end product integrating this module is going to be operated in 13.56MHz frequency range, the warning statement in the user manual of the end product should include the restriction of operating this device in indoor could void the user's authority to operate the equipment.

End Product Labeling

Label for the final end product must include:

- Contains FCC ID: 2AAYI-MQN18-NFC
- A RF transmitter inside, FCC ID: 2AAYI-MQN18-NFC

Revision History

This section describes the changes that were implemented in this document. The changes are listed by revision, starting with the most current publication.

Revision 1.0

Revision 1.0 of this datasheet was published in December 2014. This was the first publication of the document.

Revision 1.1: Modified page header.

Revision 1.2: Added power consumption description.

Revision 1.3: Updated NFC module outline.

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1 Introduction

This document consists of descriptions and specifications for both functional and physical aspects of the MQN18 NFC reader / writer module.

In addition to the datasheet, Smart Approach maintains an extensive device-specific library of support and collateral materials that you may find useful in your application. Depending upon the Smart Approach device, this library may include:

- Presentations highlighting the operational features and specifications of the device to assist in developing your own product road map.
- Application notes that provide detailed descriptions of the use of the particular Smart Approach product to solve real-world problems.

2 Product Overview

MQN18 is full featured NFC controllers designed for integration in portable equipment. It is optimized for low power consumption with fully host controllable power states and for small footprint for portable equipment applications.

The module's compact, flexible design with and exposed pad is optimal for size-sensitive applications, assures robust performance.

The following illustration shows a high-level, generic view of a MQN18 application.

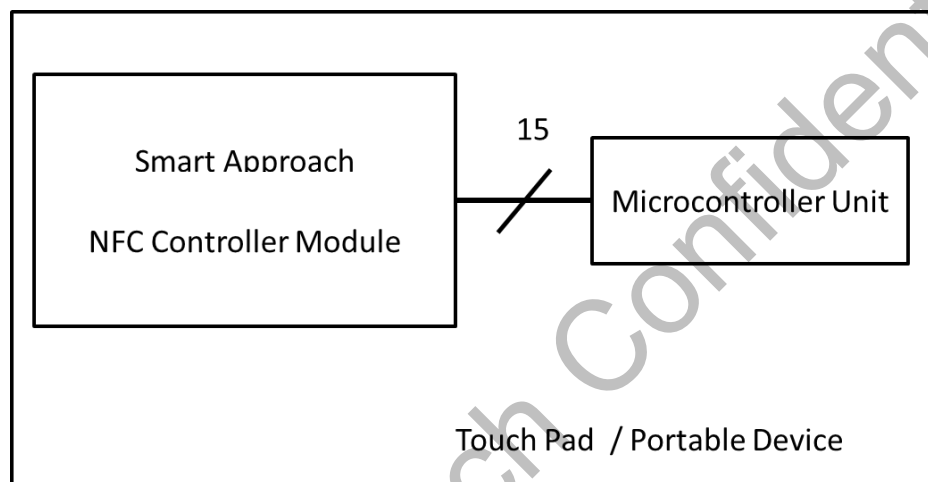


Figure 1 Typical Application

2.1 Features

This section Tables key aspects of the MQN18 module functionality and design that distinguish it from similar products:

- NXP NPC100 NFC Controller
- Compliant with ISO/IEC 14443 A/B
- Compliant with ISO/IEC 15693/18092
- Antenna pairing could be customized
- I²C interface

2.2 Application

Suggested applications for the MQN18 module include:

- NFC writer
- NFC reader
- NFC peer to peer controller
- NFC payment
- NFC identification

3 Functional Descriptions

This section provides detailed information about how MQN18 module works, what configurations and operational features are available.

The following illustration shows the primary functional blocks of MQN18 module.

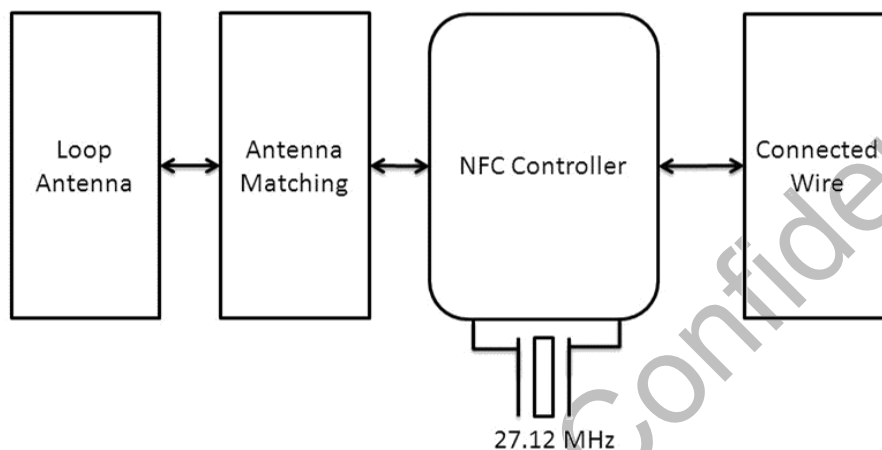


Figure 2 Module Block Diagram

Loop Antenna is Smart Approach customize solution. Antenna matching is also a customize solution. NFC controller includes NXP NPC100 chipset, and has an I²C control interface through the connector to mother board.

4 Electrical Specifications

This section provides the DC characteristics, AC characteristics, recommended operating conditions. It includes information on the various timing functions of the module.

4.1 Pin Description

The following Table shows the pin description for MQN18 module.

The connection ground is internally connected and should be connected to GND on the main board as well.

Table 1 Module Pin Description

PIN No.	Name	Description	Power Reference	P/I/O
1	V _{BAT}	+3.3V power supply input	3.3V	P
2	MOD_GND	Module Ground	GND	P
3	SWP	SWP data line to UICC/SIM, Input / Output	PMUV _{CC}	I/O
4	RFU	Unused pin could be floating	-	-
5	IRQ	Interrupt to host, High: Interrupt; Low: Normal	VDD_IO	O
6	PMUV _{CC}	Power supply to UICC/SIM, input, + 1.8V	1.8V	P
7	I ² C_SDA	I ² C Data Line	VDD_IO	I/O
8	I ² C_SCL	I ² C Clock	VDD_IO	I
9	MOD_GND	Module Ground	GND	P
10	V _{EN}	Wake up the module from standby mode or reset the module	V _{BAT}	I
11	DWL_REQ	Firmware download control: Active High	VDD_IO	I
12	SIMV _{CC}	The power rail used to power UICC / SIM, input	PMUV _{CC}	P(O)
13	V _{BAT}	+3.3V Power Supply	3.3V	P
14	VDD_IO	+1.8V or +3.3V for host IO reference voltage	1.8V/3.3V	P
15	MOD_GND	Module Ground	GND	P

4.2 I²C Address

MQN18 I²C 7bit address is defined to 0x28. To write data, MQN18 is addressed using 0x50, to read data, MQN18 is addressed using 0x51.

Table 2 I²C Address

I2C address (R/W=0, write)	I2C address (R/W=1, read)
0x50	0x51

4.3 Temperature Maximum Ratings

Thermal specifications for this module have been modeled using a two-layer test board.

Table 3 Temperature Maximum Ratings

Symbol	Definition	Value		Units
		Min	Max	
T	Operating Temperature	-20	80	°C
T _s	Storage Temperature	-40	100	°C

4.4 DC Electrical Parameters

DC Electrical specifications for this module have been modeled using a two-layer test board.

Table 4 DC Electrical Specification

Symbol	Definition	Value			Units
		Min	Typ	Max	
V_{BAT}	Power Supply	3.1	3.3	3.5	Volts
I_{VBAT}	DC Current	-	-	170	mA
P_{BAT}	Power Consumption	-	-	0.595	W

4.5 Antenna Specifications

Customized Antenna specifications for this module have been modeled using a two-layer test board.

Table 5 Antenna Specifications

Item	Value			Unit	Note
	Min	Typ	Max		
DC Resistance	0.5	1	2	Ω	
AC Impedance		50		Ω	
Frequency	13.06	13.56	14.06	MHz	VSWR <2
Q factor	25	30	35		
Antenna Type	FPC Loop Coil				Add the Ferrite sheet
Module Material	FR4				
Antenna Size	(40 \pm 0.3) X (60 \pm 0.3)			mm	

4.6 Power Consumption

Table 6 Current Consumption

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{HPD}	Hard power down current	$V_{BAT}=3.6V$, $V_{EN}=0V$	-	10.5	12	μA
I_{STBY}	Standby state current	$V_{BAT}=3.6V$	-	-	20	μA
I_{ACT}	Active state current	$V_{BAT}=3.6V$	-	6	-	mA
I_{TVDD}	Transmitter supply current	$V_{BAT}=3.1V$	-	30	100	mA
I_{PMUVCC}	PMUVCC supply	Class B	-	1.5	3	μA
		Class C	-	1	2	μA

4.7 Thermal Protection

Table 7 Thermal Protection

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{OVERTEMP}$	Temperature protection trigger		120	125	130	$^{\circ}C$

4.8 System power modes

Table 8 System Power Modes Description

Mode	Description
Full power mode	The battery supply (V_{BAT}) as well as the pad supply (VDD_{IO}) is available, all use cases can be executed
Low-power mode	The pad supply (VDD_{IO}) is not available. Only the Card Emulation mode use cases via SWP are allowed
Powered by the Field	The battery supply (V_{BAT}) and pad supply (VDD_{IO}) are not available. The system is powered via PbF interface. Only Card Emulation use cases via SWP are allowed.
Power Off mode	The system is not supplied from any source or the system is kept Hard Power Down (HPD)

Table 9 Power Mode Configuration

V_{BAT}	VDD_IO	V_{EN}	Power mode
Off	Off	X	Power Off mode
On	X	Off	Power Off mode
On	Off	On	Low Power Mode
On	On	On	Full power mode

Note: X: Don't care

4.9 Reset and download concept

To enter reset there are 2 ways:

- Pulling V_{EN} low (Hard Power Down state)
- If V_{BAT} monitor is enabled: lowering V_{BAT} below the monitor threshold (monitor mode, if V_{EN} is kept above 1.1 V) This reset mode can be left if PbF is enabled when the field is high enough (RF field detected) to enter PbF mode.

To get out of reset, there are 2 ways:

- Pulling V_{EN} high with V_{BAT} above V_{BAT} monitor threshold if enabled
- Entering a field strong enough to power the IC

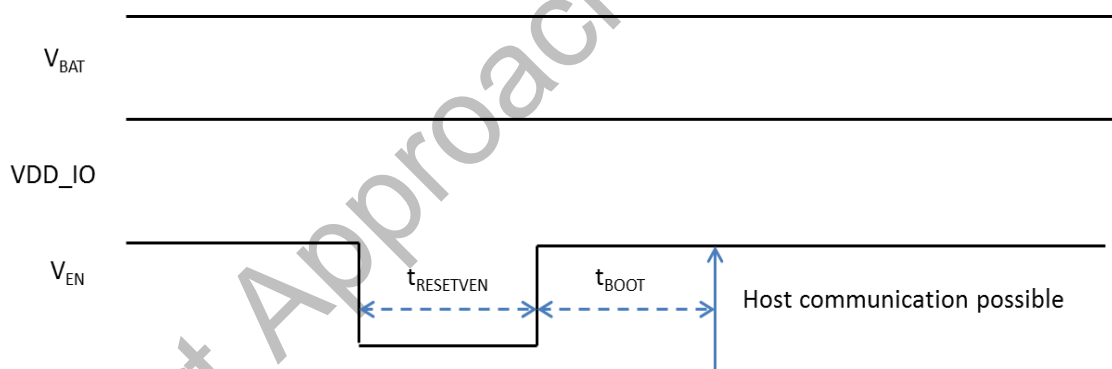

Figure 3 Reset via V_{EN} pin

Table 10 Reset Timing

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{RESETVEN}$	V_{EN} pulse width to reset		3			μs
t_{BOOT}	Boot time				10	ms

4.10 NFC Connection Recommendation

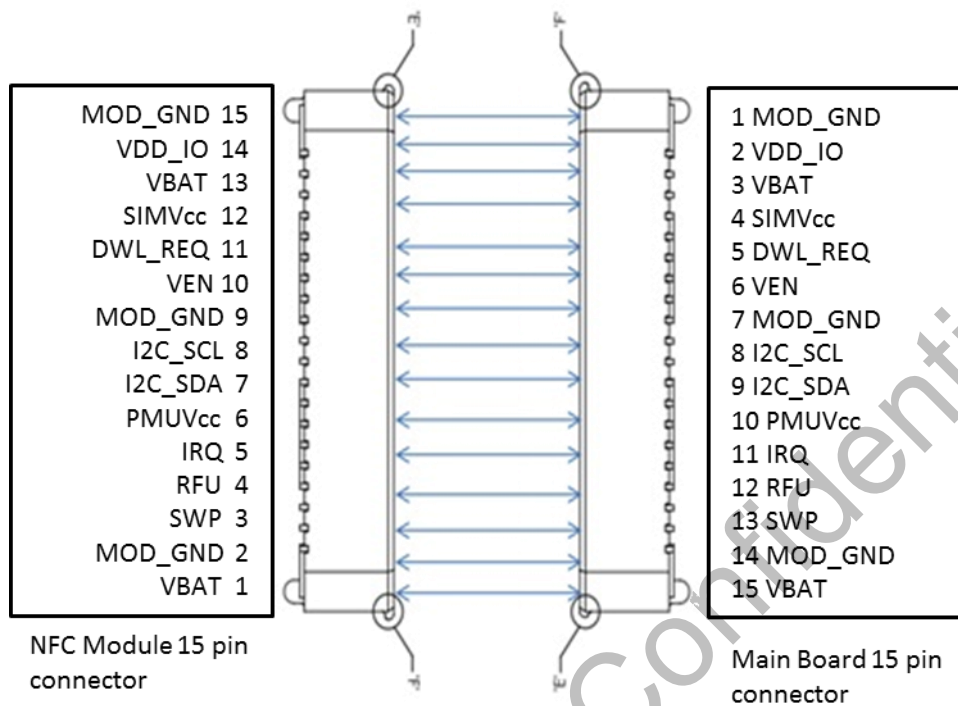


Figure 4 Connection Recommendation

4.11 Main Board Design Reference

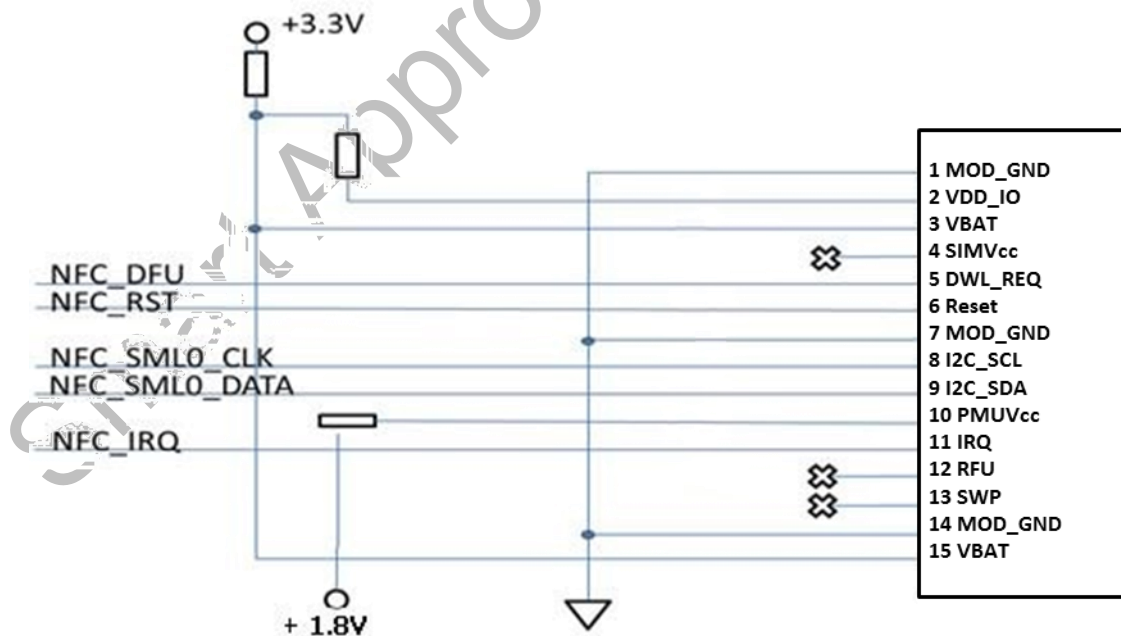


Figure 5 Main Board Design W/O UICC Reference

5 Ordering Information

Table 11 Ordering Information Table

Order Number	Descriptions
MQN18	NFC Controller Module (NXP NPC100) with Integrated Antenna
Dimension	Module: 12x26mm; Antenna Area Size: 60x40 mm

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6 Reliability Verification

Table 12 Reliability Item Table

No.	Item	Condition	Benchmark	Result	Qty
1	Low Temperature Storage Test	-40°C	IEC60068-2-1	Pass	5
2	High Temperature Storage Test	80°C, Humidity: 95%	IEC60068-2-78	Pass	5
3	Low Temperature Operation Test	-20°C	IEC60068-2-1	Pass	5
4	High Temperature Operation Test	80°C	IEC60068-2-2	Pass	5
5	High Temperature Operation Test	65°C, Humidity: 95%	IEC60068-2-78	Pass	5
6	Salt Test	PH: 3.0 ~ 3.2 ,50°C, 72 hrs, Density: 5%±1%	ASTM B368	Pass	5
7	RoHS	Normal	Compliance	Pass	5
8	HF	Normal	Compliance	Pass	5

7 NFC Module Outline

The following illustration shows the package drawing for MQN18 module. The drawing contains the detail views, dimensions, tolerances, and notes.

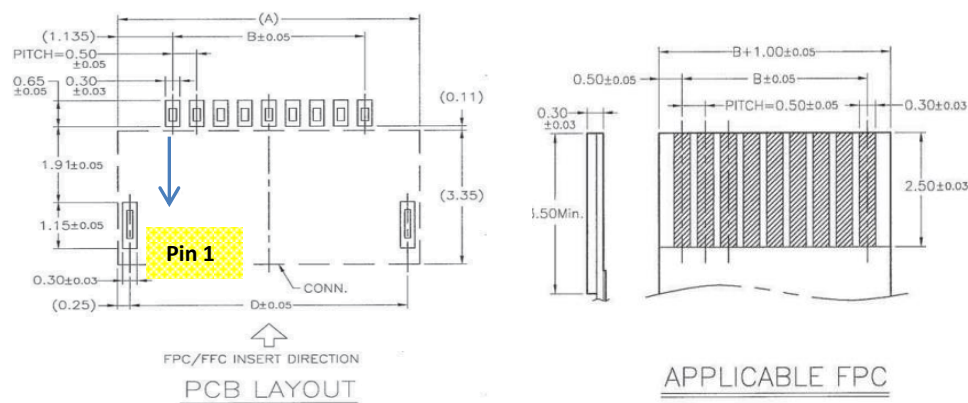


Figure 6 Module FPC Connection Foot Print

NO.OF CONTACTS	PART NUMBER	DIM. A	DIM. B	DIM. D
04	BL115H-04RL-TAxx	3.77	1.5	3.27
05	BL115H-05RL-TAxx	4.27	2.0	3.77
06	BL115H-06RL-TAxx	4.77	2.5	4.27
07	BL115H-07RL-TAxx	5.27	3.0	4.77
08	BL115H-08RL-TAxx	5.77	3.5	5.27
09	BL115H-09RL-TAxx	6.27	4.0	5.77
10	BL115H-10RL-TAxx	6.77	4.5	6.27
11	BL115H-11RL-TAxx	7.27	5.0	6.77
12	BL115H-12RL-TAxx	7.77	5.5	7.27
13	BL115H-13RL-TAxx	8.27	6.0	7.77
14	BL115H-14RL-TAxx	8.77	6.5	8.27
15	BL115H-15RL-TAxx	9.27	7.0	8.77

Figure 7 FPC Wire Dimension

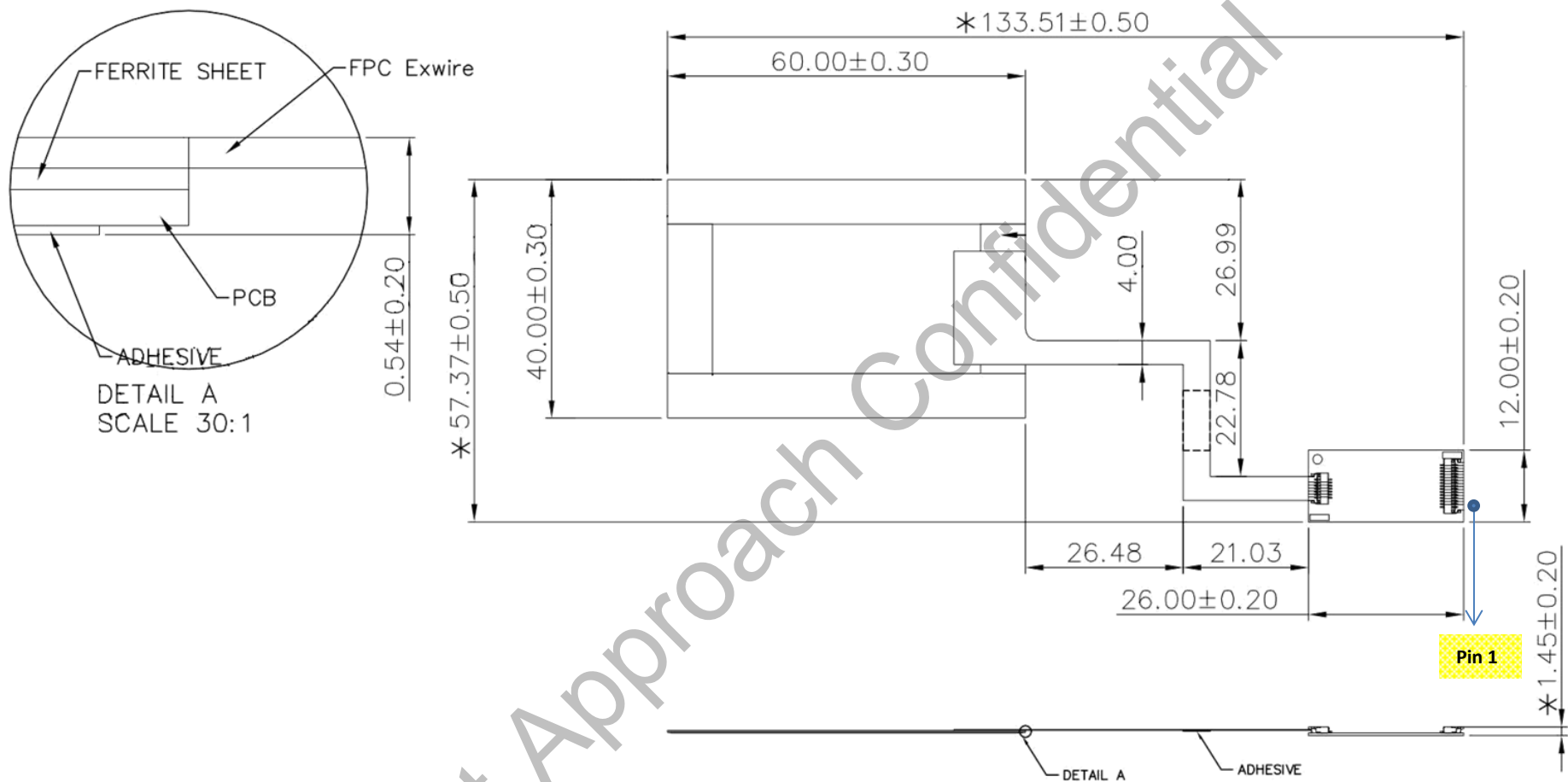


Figure 8 MQN18 NFC Module Drawing