

# Revision Note

## NFC (Near Field Communication)

### NXP NPC300 Module

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## Revision History

Revision	Date	Originator	Comment
1.0	2016/01/28	Smile. Ming	Initial release
2.0	2016/04/20	Bandy.Jiang	<ul style="list-style-type: none"> <li>1&gt; Add pin 1 marking for mechanical drawing.</li> <li>2&gt; Add SM bus support in addition to I2C bus. (in page 4,5)</li> <li>3&gt; Add description of pin9 (TX_PWR_REQ) signal with active high 1.8V level output. (in page 15)</li> <li>4&gt; Change the PN of antenna connector from BM05B-ACHSS-A-GAN-ETF(LF)(SN) to BM05B-ACHKS-A-GAN-ETF(HF)</li> <li>5&gt; Update material in shielding drawing.</li> <li>6&gt; Following the latest schematic, update the material description into BOM</li> <li>7&gt; Add Tray ID label, Carton label, Pallet label into label information</li> <li>8&gt; Update packing information</li> </ul>
3.0	2016/04/26	Bandy.Jiang	<ul style="list-style-type: none"> <li>1&gt; Update Module picture in page 18</li> <li>2&gt; Update packing information in page 23~24</li> <li>3&gt; Update vendor PN of host interface connector in page 15</li> </ul>
4.0	2016/06/24	Bandy.Jiang	<ul style="list-style-type: none"> <li>1&gt; Remove R5 from BOM.</li> <li>2&gt; Change Foxconn project name from T77H747.00 to T77H747.10</li> <li>3&gt; Change FRU part No. from 00JT548 to 01AX745.</li> <li>4&gt; Based on above change list, update module picture, BOM, label contents and packing information.</li> </ul>
5.0	2016/06/28	Bandy. Jiang	<ul style="list-style-type: none"> <li>1&gt; Change Host JST part number from ACHR-05V-A-S to ACHR-05V-A-K(HF) in page 14</li> </ul>

T77H747.10 is made in China,  
 Manufactured by HongFuJin Precision Industry Co., LTD  
 Manufacture Site: ChongQing  
<http://www.foxconn.com>

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## 1. Introduction

The T77H747.10 is an NFC module designed for integration in computer or portable equipment and consumer devices compliant with NFC standards (NFC Forum, NCI, ISO/IEC 14443 and ISO/IEC 15693) etc. This module is based on NXP NPC300 solution, which is a highly integrated transmission module for contactless communication at 13.56MHz.

### 1.1 Scope

The NFC module RF protocols supported:

- NFCIP-1, NFCIP-2 protocol
- NFC Forum device 1.3
- ISO/IEC 14443A, ISO/IEC 14443B
- ISO/IEC 15693/ICODE VCD mode
- FeliCa PCD mode/PICC mode
- MIFARE PCD encryption mechanism(MIFARE 1K/4K)
- MIFARE PICC mode
- NFC Forum tag (type 1/type 2/type 3/type 4/type V)

### 1.2 Function

- NFC Features
  - Reader & Writer mode
  - Peer-to-Peer Communication mode
  - Card emulation mode
- I<sup>2</sup>C-bus and SM-bus compatible for host Interface
- Windows 8 Logo Device Requirement compliant
  - NFC Forum Wave1 Certification
  - LLCP
  - SNEP
- Windows 10 Logo system Requirement compliant
  - Peer to Peer Communication over 2cm distance less than 10cm
- Modular certification
  - FCC
  - CE
  - UL/CB
  - meet other regulatory requirements (as defined by 108 countries)

(Remark: Regulatory Certification is not started at this phase)

- Support Intel Windows 7/8.x/10 platform
- RoHS and Green Compliant

### 1.3 Hardware block diagram

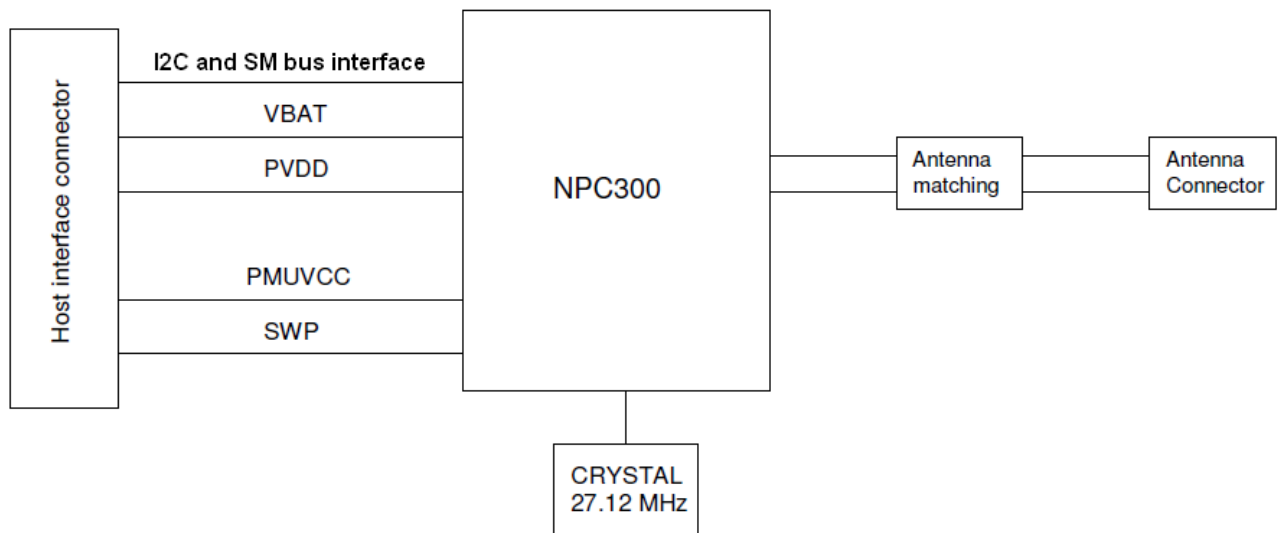
The T77H747.10 NFC module is based on NXP NPC300 solution with includes ARM microcontroller core, EEPROM, demodulator and decoder, power management unit, host interface. This module is powered from the host (5V) and interfaces to the host with I<sup>2</sup>C -bus compatible signals, on-board 27.12 MHz XTAL. Also includes on board low profile FPC/FFC 12pin connector for host interface and 5pin WTB antenna connector for antenna interface.

Form factor: 20.0mm x13.0mm x 2.1mm (typical) NFC module

Host Interface: I<sup>2</sup>C and SM bus compatible interface with 12-pin FPC connector

PCB: 4-layers HDI design

The functional block diagram is shown as below:



## 2. Electrical Characteristics

### 2.1 operating conditions

#### Absolute Maximum Rating

Symbol	Condition	Min.	Typ.	Max	Unit
VBAT	Respect to GND	--	5.0	6.0	V
PVDD	Respect to GND	--	3.3	4.35	V
ESD Limit Level	HBM	--	--	+/-1.0	KV
	CDM	--	--	+/-500	V
Operating Temperature	--	0	+25	+70	°C
Storage Temperature	--	-20	+25	+85	°C
Storage Humidity	--	0	--	+85	%

#### Recommended Operating Condition

Symbol	Condition	Min.	Typ.	Max	Unit
VBAT	Respect to GND	4.5	5.0	5.5	V
PVDD	Respect to GND	3.0	3.3	3.6	V
PMUVCC	Respect to GND	1.62	1.8	1.98	V
VDD	Respect to GND	1.65	1.8	1.95	V
VDD(SIM)	Respect to GND	1.62	1.8	1.98	V

Remark: VDD for TX\_PWR\_REQ referred voltage, VDD(SIM) for SWIO\_UICC referred voltage.

#### Power Consumption

Condition		Min.	Typ.	Max	Unit
Power consumption	Reader mode (PCD active)	--	130	--	mA
	Reader mode (PCD standby)	--	50	--	uA
	Peer to peer mode (active)	--	130	--	mA
	Peer to peer mode (standby)	--	50	--	uA
	Continue TX mode	--	130	--	mA
	Hard Power Down mode	--	10	--	uA

## 2.1 Host interface characteristics

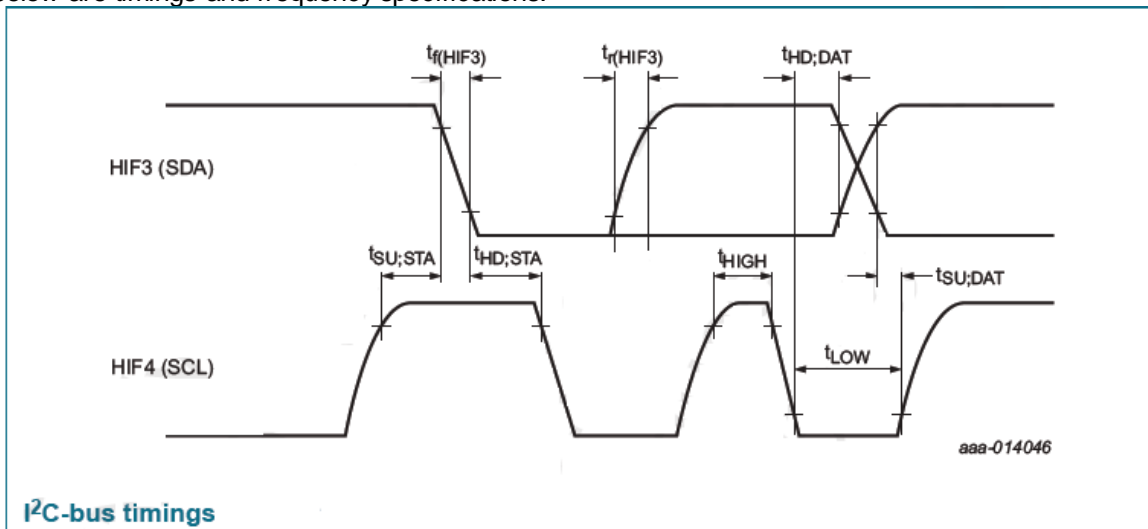
### I<sup>2</sup>C-bus Interface

The I<sup>2</sup>C-bus Interface implements a slave I<sup>2</sup>C-bus interface with integrated shift register, shift timing generation and slave address recognition.

I<sup>2</sup>C-bus Standard mode (100 KHz SCL), Fast mode (400 KHz SCL) and High-speed mode (3.4 MHz SCL) are supported.

### I<sup>2</sup>C-bus timings

Here below are timings and frequency specifications.



### High-speed mode I2C-bus timing specification

Symbol	Parameter	Conditions	Min	Max	Unit
$f_{CLK(HIF4)}$	Clock frequency on pin HIF4	I <sup>2</sup> C-bus SCL; $C_b < 100\text{pF}$	0	3.4	MHz
$t_{SU;STA}$	Set-up time for a repeated START condition	$C_b < 100\text{pF}$	160	-	ns
$t_{HD;STA}$	Hold time(repeated) START condition	$C_b < 100\text{pF}$	160	-	ns
$t_{LOW}$	LOW period of the SCL clock	$C_b < 100\text{pF}$	160	-	ns
$t_{HIGH}$	HIGH period of the SCL clock	$C_b < 100\text{pF}$	60	-	ns
$t_{SU;DAT}$	Date set-up time	$C_b < 100\text{pF}$	10	-	ns
$t_{HD;DAT}$	Data hold time	$C_b < 100\text{pF}$	0	-	ns
$t_r(HIF3)$	Rise time on pin HIF3	I <sup>2</sup> C-bus SDA; $C_b < 100\text{pF}$	10	80	ns
$t_f(HIF3)$	Fall time on pin HIF3	I <sup>2</sup> C-bus SDA; $C_b < 100\text{pF}$	10	80	ns
$V_{hys}$	Hysteresis voltage	Schmitt trigger inputs; $C_b < 100\text{pF}$	$0.1 \cdot V_{PVDD}$	-	V

### Fast mode I2C-bus timing specification

Symbol	Parameter	Conditions	Min	Max	Unit
$f_{CLK(HIF4)}$	Clock frequency on pin HIF4	I <sup>2</sup> C-bus SCL; $C_b < 400\text{pF}$	0	400	KHz
$t_{SU;STA}$	Set-up time for a repeated START condition	$C_b < 400\text{pF}$	600	-	ns
$t_{HD;STA}$	Hold time(repeated) START condition	$C_b < 400\text{pF}$	600	-	ns
$t_{LOW}$	LOW period of the SCL clock	$C_b < 400\text{pF}$	1.3	-	ns
$t_{HIGH}$	HIGH period of the SCL clock	$C_b < 400\text{pF}$	600	-	ns
$t_{SU;DAT}$	Date set-up time	$C_b < 400\text{pF}$	100	-	ns
$t_{HD;DAT}$	Data hold time	$C_b < 400\text{pF}$	0	900	ns
$V_{hys}$	Hysteresis voltage	Schmitt trigger inputs; $C_b < 400\text{pF}$	$0.1 \cdot V_{PVDD}$	-	V

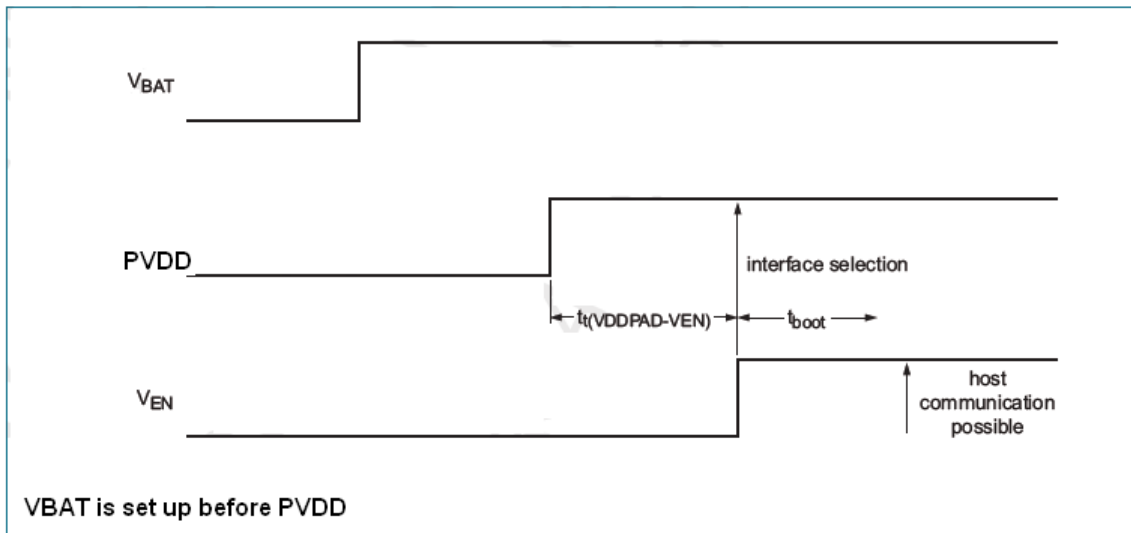
## 2.2 Power-up sequence

There are 2 different supplies for module which allows set up independently, therefore different power-up sequences have to be considered.

1> VBAT is set up before PVDD

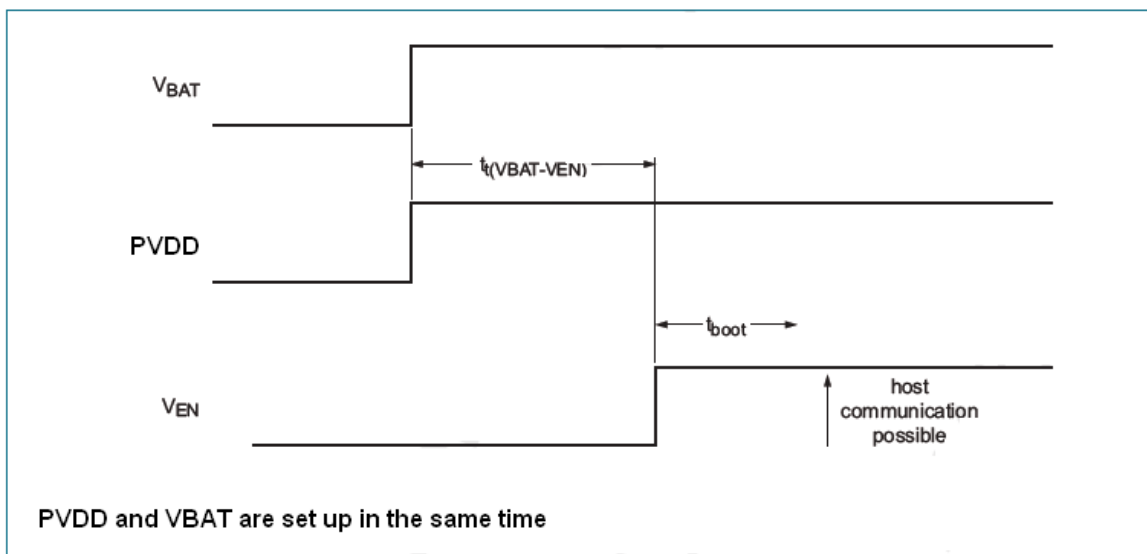
This is at least the case when VBAT pin is directly connected to the battery and when module VBAT is always supplied as soon the system is supplied.

As VEN pin is referred to VBAT pin, VEN voltage shall go high after VBAT has been set.



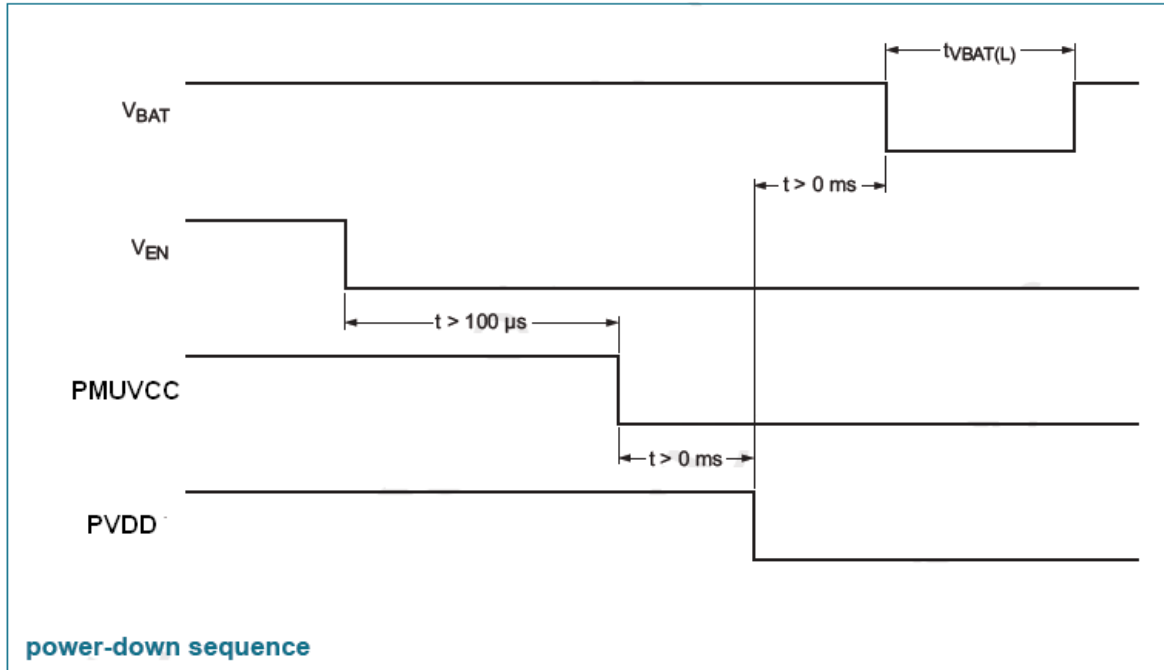
2> PVDD and VBAT are set up in the same time

It is at least the case when VBAT pin is connected to a PMU/regulator which also supplies PVDD.





### 2.3 Power-down sequence



### 2.4 Function timing characteristics

#### Reset timing

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{W(VEN)}$	VEN pulse width	To reset	10	-	-	us
$t_{boot}$	Boot time		-	-	2.5	ms

#### Power-up timings

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{t(VBAT- VEN)}$	Transition time from pin VBAT to pin VEN	VBAT, VEN Voltage=HIGH	0	0.5	-	ms
$t_{t(PVDD- VEN)}$	Transition time from pin PVDD to pin VEN	PVDD, VEN Voltage=HIGH	0	0.5	-	ms
$t_{t(VBAT- PVDD)}$	Transition time from pin VBAT to pin PVDD	VBAT, PVDD Voltage=HIGH	0	0.5	-	ms

#### Power-down timings

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{VBAT(L)}$	Time $V_{BAT}$ LOW		20	-	-	ms

#### Download mode timings

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{t(DWL\_REQ- VEN)}$	Transition time from pin DWL_REQ to pin VEN	DWL_REQ, VEN voltage=HIGH	0	0.5	-	ms

### 3. NFC contactless standard conformance

#### 3.1 Frequency interoperability

When in communication, NFC module is generating some RF frequencies. It is also sensitive to some RF signals as it is looking for data in the field.

In order to avoid interference with others RF communication, it is required to tune the antenna matching for antenna board.

(Remark: The antenna matching tuning is responsible for antenna vendor)

It must limit the RF frequency dispersion to 13.56MHz +/-50ppm.

#### 3.2 Supported smart card types

Card Types	Read CSN (Card Serial Number)	Read/Write application data area	Supported baud rates
NFC Forum Type1 Tag	Yes	Yes	106 kbps
NFC Forum Type2 Tag	Yes	Yes	106 kbps
NFC Forum Type3 Tag	Yes	Yes	212, 424 kbps
NFC Forum Type4 Tag	Yes	Yes	106 kbps
NFC Forum TypeV Tag	Yes	Yes	106 kbps
ISO/IEC 14443 Type A compliance cards	Yes	Yes (with application)	106 kbps
Mifare Classics 1K,4K	Yes	Yes (with application)	106 kbps
Mifare DESFire	Yes	Yes (with application)	106 kbps
Mifare Ultralight	Yes	Yes (with application)	106 kbps
Mifare Plus	Yes	Yes (with application)	106 kbps
(Mifare) SmartMX	Yes	Yes (with application)	106 kbps
ISO/IEC 14443 Type B compliance cards	Yes	Yes (with application)	106 kbps
FeliCa general card	Yes	Yes (with application)	212, 424 kbps
FeliCa Edy card	Yes	Yes (with application)	212, 424 kbps
FeliCa Suica card	Yes	Yes (with application)	212, 424 kbps
FeliCa PKI Option card	Yes	Yes (with application)	212, 424 kbps
HID iCLASS Seos	Yes	Yes (with application)	106 kbps

### 3.3 Contactless interface unit

The NFC module supports various communication modes at different transfer speeds and modulation schemes. The following chapters give more detailed overview of selected communication modes.

#### 1> Reader/Writer communication modes

Generally 5 reader/writer communication modes are supported:

- PCD reader/writer for ISO/IEC 14443A/MIFARE  
The transfer speed includes 106 kbit/s, 212 kbit/s, 424 kbit/s and 848 kbit/s.
- PCD reader/writer for ISO/IEC 14443B  
The transfer speed includes 106 kbit/s, 212 kbit/s, 424 kbit/s and 848 kbit/s.
- PCD reader/writer for Jewel/Topaz tags  
The transfer speed includes 106 kbit/s, 212 kbit/s, 424 kbit/s and 848 kbit/s.
- PCD reader/writer for FeliCa cards  
The transfer speed includes 212 kbit/s, 424 kbit/s.
- VCD reader/writer for ISO/IEC 15693/ICODE  
The transfer speed includes 1.65 kbit/s, 26.48 kbit/s.

#### 2> Peer to Peer communication modes

(ISO/IEC 18092, Ecma 340 NFCIP-1 communication modes)

An NFCIP-1 communication takes place between 2 devices:

- NFC initiator: generates RF field at 13.56 MHz and starts the NFCIP-1 communication.
- NFC Target: responds to NFC initiator command either in a load modulation scheme in Passive communication mode or using a self-generated and self-modulated RF field for Active communication mode.

The NFCIP-1 communication differentiates between Active and Passive communication modes.

- Active communication mode means both the NFC initiator and the NFC target are using their own RF field to transmit data
- Passive communication mode means that the NFC target answers to an NFC initiator command in a load modulation scheme. The NFC initiator is active in terms of generating the RF field.

The NFC module supports the Active Target, Active Initiator, Passive Target and Passive Initiator communication modes at the transfer speeds 106 kbit/s, 212 kbit/s and 424 kbit/s.

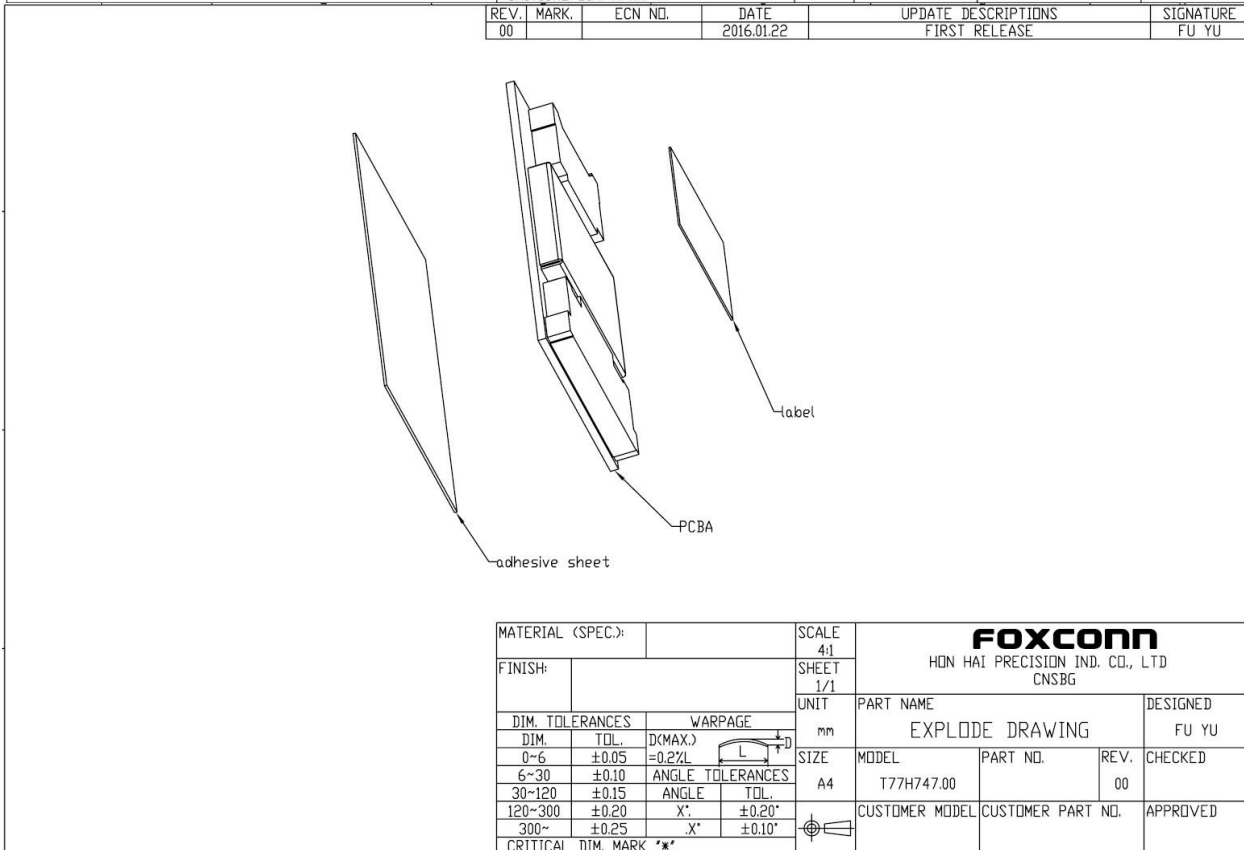
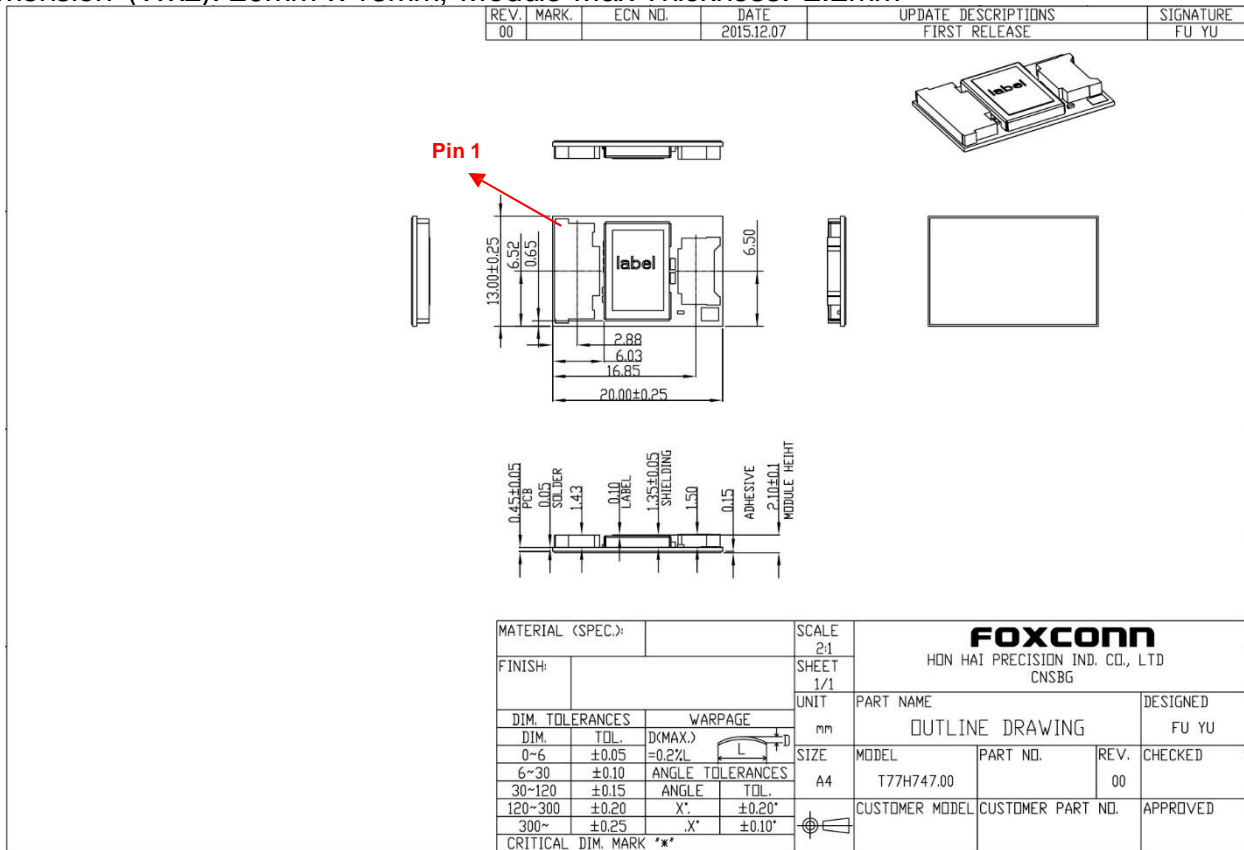
#### 3> Card communication modes

The NFC module can be addressed as an ISO/IEC 14443A or ISO/IEC 14443B cards. This means that the NFC module can generate an answer in a load modulation scheme. The transfer speed includes 106 kbit/s, 212 kbit/s and 424 kbit/s.

4. Mechanical Architecture

4.1 Module Mechanical Drawing

Dimension (WxL): 20mm x 13mm, Module Max Thickness: 2.2mm



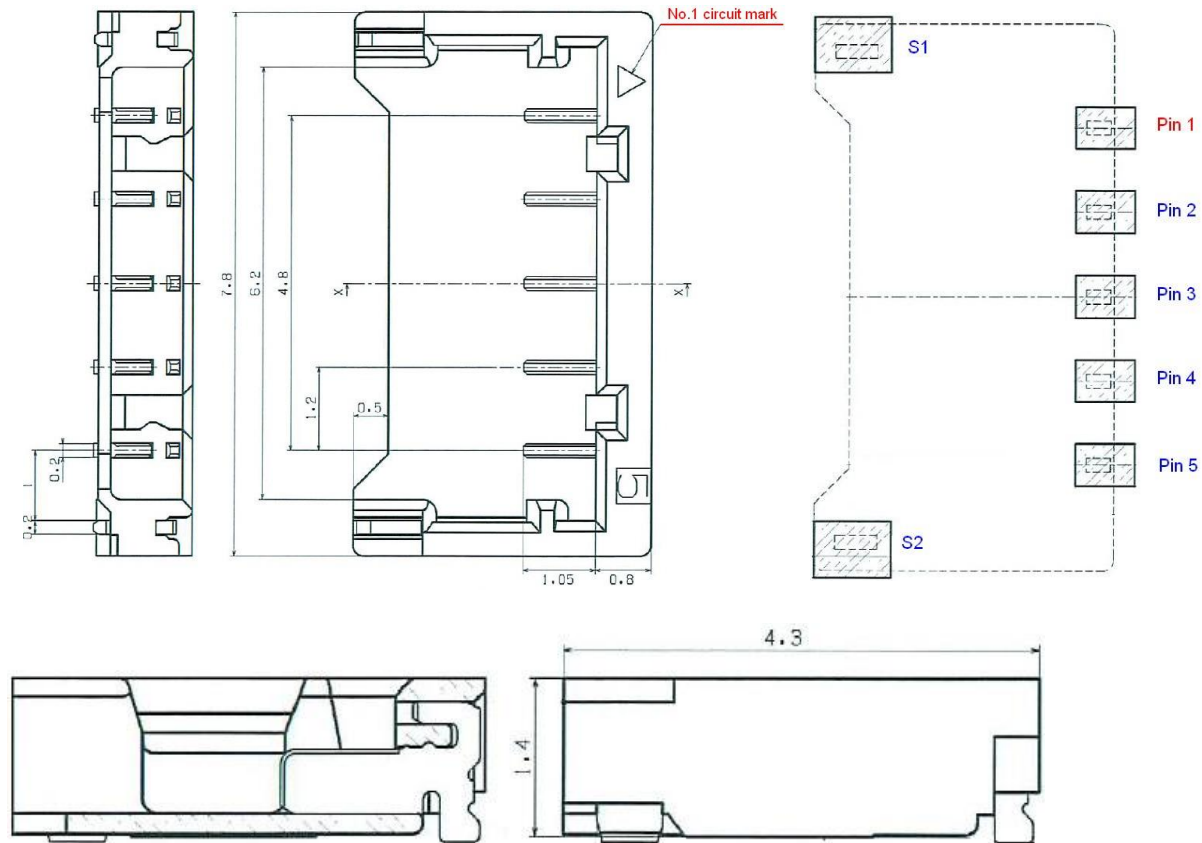
4.2 Antenna interface of NFC module

1> Antenna connector

Manufacturer: JST Manufacturer PN: BM05B-ACHKS-A-GAN-ETF(HF)

Connector Type	Manufacture PN	Size
ACH connector SMT type with 1.2mm pitch	JST : BM05B-ACHKS-A-GAN-ETF(HF)	7.8mm x 4.3mm x 1.5mm

Connector 2D drawing:



Remark: Dimension Tolerance: +/-0.3mm

Pin definition:

Pin	Symbol	I/O	Refer	Note
1	RXP	I	VDD	Positive receiver input
2	TX1	O	VDD	Antenna output1
3	GND	G	N/A	Ground
4	TX2	O	VDD	Antenna output2
5	RXN	I	VDD	Negative receiver input
S1	GND	G	N/A	Ground
S2	GND	G	N/A	Ground

Remark: P = power supply, G = ground, I = input, O = output, I/O = input/output

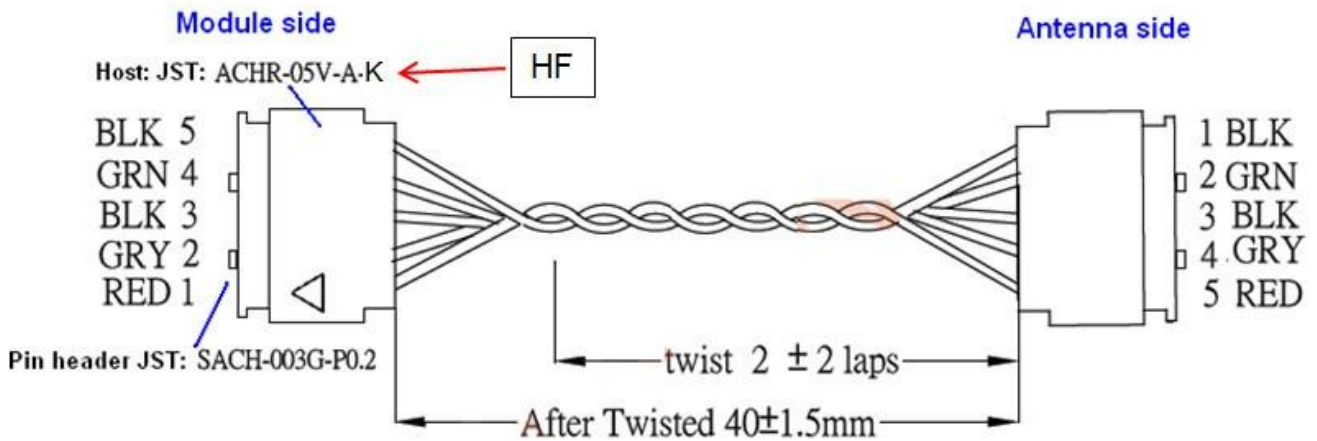
2> Recommend Antenna cable design.

**T77H747.00 Module connector side**

Pin#	Signal name to antenna (from NFC module)
1	RXP (Antenna reception path#1)
2	TX1 (Antenna transmission wire#1)
3	GND (Antenna ground)
4	TX2 (Antenna transmission line#2)
5	RXN (Antenna reception path #2)

**Antenna connector side**

Pin#	Signal name to antenna (from NFC module)
5	RXP (Antenna reception path#1)
4	TX1 (Antenna transmission wire#1)
3	GND (Antenna ground)
2	TX2 (Antenna transmission line#2)
1	RXN (Antenna reception path #2)

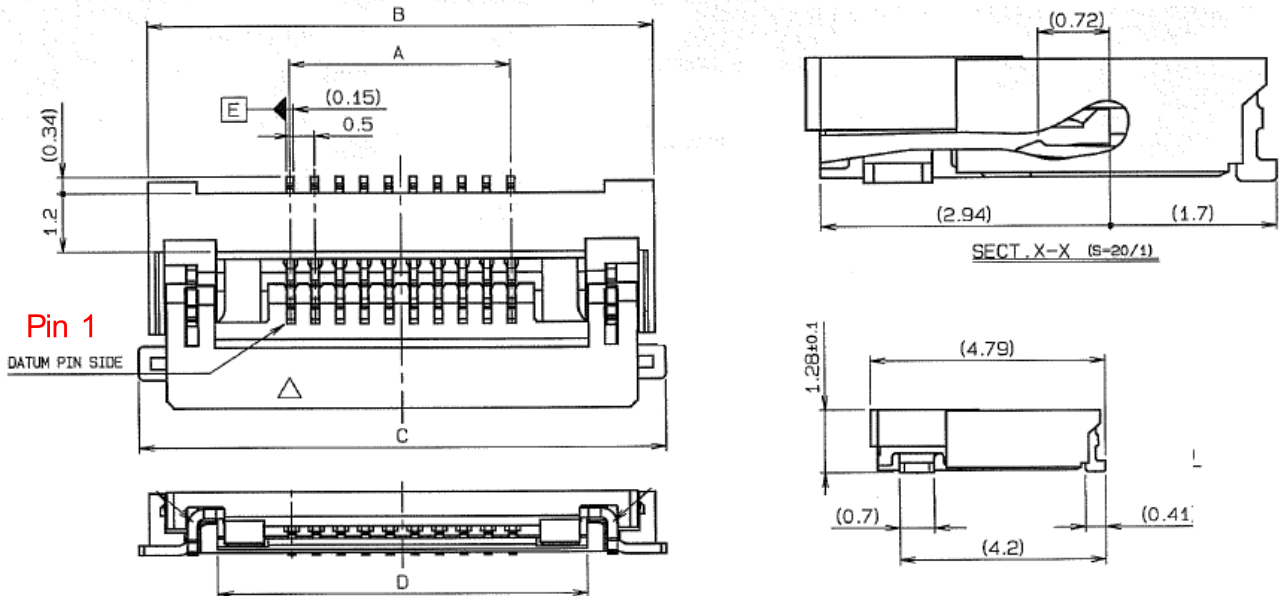


4.3. Host interface of NFC module

1> Host interface connector

Manufacturer: KYOCERA Manufacturer PN: 046811612000846 +

Connector	Manufacture PN	Size
FPC/FFC connector SMT type with 0.5mm pitch	KYOCERA: 046811612000846+	11.73mm x 4.79mm x 1.28mm



NO. OF POS.	A	B	C	D
12	5.5	11.3	11.73	8.52

Remark: The connector is bottom conduct with golden plating of FPC cable

Pin	Symbol	Pin Type	Refer	Description
1	VBAT	Input Power	N/A	Power supply from system (4.5V - 5.5V)
2	PVDD	Input Power	N/A	Power supply to I/O (3.0V – 3.6V)
3	I2C_SDA	I/O	PVDD	I2C data
4	I2C_SCL	I	PVDD	I2C clock
5	GND	G	N/A	Ground
6	IRQ	O	PVDD	Interrupt from NFC module to the host (Host_Wake)
7	NFC_Presence	G	N/A	Connect to ground for NFC module presence bit (Low active)
8	VEN	I	VBAT	Reset pin. Set the device in Hard Power Down
9	TX_PWR_REQ	O	VDD	(External TX power supply request) (Active high 1.8V level output) Indicates NFC busy state during NFC communication to touchpad.
10	PMUVCC	Input Power	N/A	Power supply to UICC(1.78V~3.3V)
11	SWIO_UICC	I/O	VDD(SIM)	SWP data connection to SIM
12	DWL_REQ	I	PVDD	Firmware download control pin
S1	GND	G	N/A	Ground
S2	GND	G	N/A	Ground

Remark: P = power supply, G = ground, I = input, O = output, I/O = input/output

2> Pin characteristics

VEN input pin characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IH</sub>	HIGH-level input voltage		1.1	-	V <sub>BAT</sub>	V
V <sub>IL</sub>	LOW-level input voltage		0	-	0.4	V
I <sub>IH</sub>	HIGH-level input current	VEN voltage=V <sub>BAT</sub>	-	-	1	μA
I <sub>IL</sub>	LOW-level input current	VEN voltage=0V	1	-	-	μA
C <sub>i</sub>	Input capacitance		-	5	-	pF

Pin characteristics for IRQ, and TX\_PWR\_REQ

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OH</sub>	HIGH-level output voltage	I <sub>OH</sub> <3mA	-	-	-	-
		IRQ and CLK_REQ pin	V <sub>PVDD</sub> -0.4	-	V <sub>PVDD</sub>	V
		TX_PWR_REQ pin	V <sub>DD</sub> -0.4	-	V <sub>DD</sub>	V
V <sub>OL</sub>	LOW-level output voltage	I <sub>OL</sub> <3mA	0	-	0.4	V
C <sub>L</sub>	Load capacitance		-	-	20	pF
t <sub>f</sub>	Fall time	C <sub>L</sub> =12pF max				
		High speed	1	-	3.5	ns
		Low speed	2	-	10	ns
t <sub>r</sub>	Rise time	C <sub>L</sub> =12pF max				
		High speed	1	-	3.5	ns
		Low speed	2	-	10	ns
R <sub>pd</sub>	Pull-down resistance	IRQ and CLK_REQ pins <sup>[1]</sup>	0.35	-	0.85	MΩ
		TX_PWR_REQ pin <sup>[1]</sup>	55	-	120	kΩ

<sup>[1]</sup> Activated in HPO and Monitor states.

Input pin characteristics for DWL\_REQ

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IH</sub>	HIGH-level input voltage	V <sub>PVDD</sub> =1.8V	0.65*V <sub>PVDD</sub>	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>PVDD</sub> =1.8V	-	-	0.35*V <sub>PVDD</sub>	V
V <sub>IH</sub>	HIGH-level input voltage	V <sub>PVDD</sub> =3V	2	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>PVDD</sub> =3V	-	-	0.8	V
I <sub>IH</sub>	HIGH-level input current		-	-	1	μA
I <sub>IL</sub>	LOW-level input current		1	-	-	μA
C <sub>i</sub>	Input capacitance		-	5	-	pF
R <sub>pd</sub>	Pull down resistance	Extra pull-down	0.35	-	0.85	MΩ

Pin characteristics for HIF3(used as I<sup>2</sup>C-bus SDA) and HIF4(used as I<sup>2</sup>C-bus SCL)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	LOW-level output voltage	I <sub>OL</sub> <3mA <sup>[1]</sup>	0	-	0.4	V
C <sub>L</sub>	Load capacitance		-	-	10	pF
t <sub>f</sub>	Fall time	C <sub>L</sub> =100 pF; <sup>[1]</sup> R <sub>pull-up</sub> =2kΩ; Standard and Fast mode	30	-	250	ns
		C <sub>L</sub> =100 pF; <sup>[1]</sup> R <sub>pull-up</sub> =1kΩ; High-speed mode	80	-	110	ns
t <sub>r</sub>	Rise time	C <sub>L</sub> =100 pF; <sup>[1]</sup> R <sub>pull-up</sub> =2kΩ; Standard and Fast mode	30	-	250	ns
		C <sub>L</sub> =100 pF; <sup>[1]</sup> R <sub>pull-up</sub> =1kΩ; High-speed mode	10	-	100	ns
V <sub>IH</sub>	HIGH-level input voltage		0.7*V <sub>PVDD</sub>	-	V <sub>PVDD</sub>	V
V <sub>IL</sub>	LOW-level input voltage		0	-	0.3*V <sub>PVDD</sub>	V
I <sub>IH</sub>	HIGH-level input current	V <sub>I</sub> =V <sub>PVDD</sub> ; high impedance	-	-	1	μA
I <sub>IL</sub>	LOW-level input current	V <sub>I</sub> =0V; high impedance	-1	-	-	μA
C <sub>i</sub>	Input capacitance		-	5	-	pF

<sup>[1]</sup> Only for pin HIF3(I<sup>2</sup>C-bus SDA), HIF4(I<sup>2</sup>C-bus SCL) is only used as input.



SWIO UICC pin characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OH</sub>	HIGH-level output voltage	I <sub>IH</sub> =1mA; <sup>[1]</sup> I <sub>DD(SIM)</sub> =50mA; V <sub>DD(SIM_PMU)</sub> =2.75V; V <sub>DD(SIM_PMU)</sub> in class B	1.4	-	-	V
V <sub>OH</sub>	HIGH-level output voltage	I <sub>SIM_SWIO</sub> =1mA; <sup>[1]</sup> I <sub>DD(SIM)</sub> =30mA; V <sub>DD(SIM_PMU)</sub> =1.67V; V <sub>DD(SIM_PMU)</sub> in class C	0.85 V <sub>DD(SIM)</sub>	-	-	V
V <sub>OH</sub>	HIGH-level output voltage	I <sub>IH</sub> =1mA; <sup>[1]</sup> I <sub>DD(SIM)</sub> =5mA; V <sub>DD(SIM_PMU)</sub> =0V; V <sub>DD(SIM)</sub> -V <sub>DDD</sub>	0.85 V <sub>DD(SIM)</sub>	-	-	V
V <sub>OL</sub>	LOW-level output voltage	0μA<I <sub>IL</sub> <20Ma <sup>[1]</sup>	-	-	0.15V <sub>DD(SIM)</sub>	V
I <sub>IH</sub>	HIGH-level input current		-	300	+0.3V	μA

To allow for overshoot, the voltage on SWIO shall remain between -0.3V and V<sub>OHmax</sub>+0.3V during dynamic operation.

3> Recommend FPC cable

適用FPC/FFC寸法  
APPLICABLE FPC/FFC

NO.	DESCRIPTION	PART NO.	QTY	MATERIAL	DRW. NO.	REMARKS
1.	CONTACT TAIL AND ANCHOR PLATE HEIGHT SHALL BE 0.1MM.					
2.	DIMENSION M, Wp, SELECT AN APPLICABLE FPC/FFC					

	FPC	FFC
M	1.5±0.1	1.5±0.08
Wp	0.35±0.05	0.3±0.05

**FPC構造**  
FPC STRUCTURE  
(推奨仕様)

**FFC構造**  
FFC STRUCTURE  
(推奨仕様)

**PRELIMINARY**

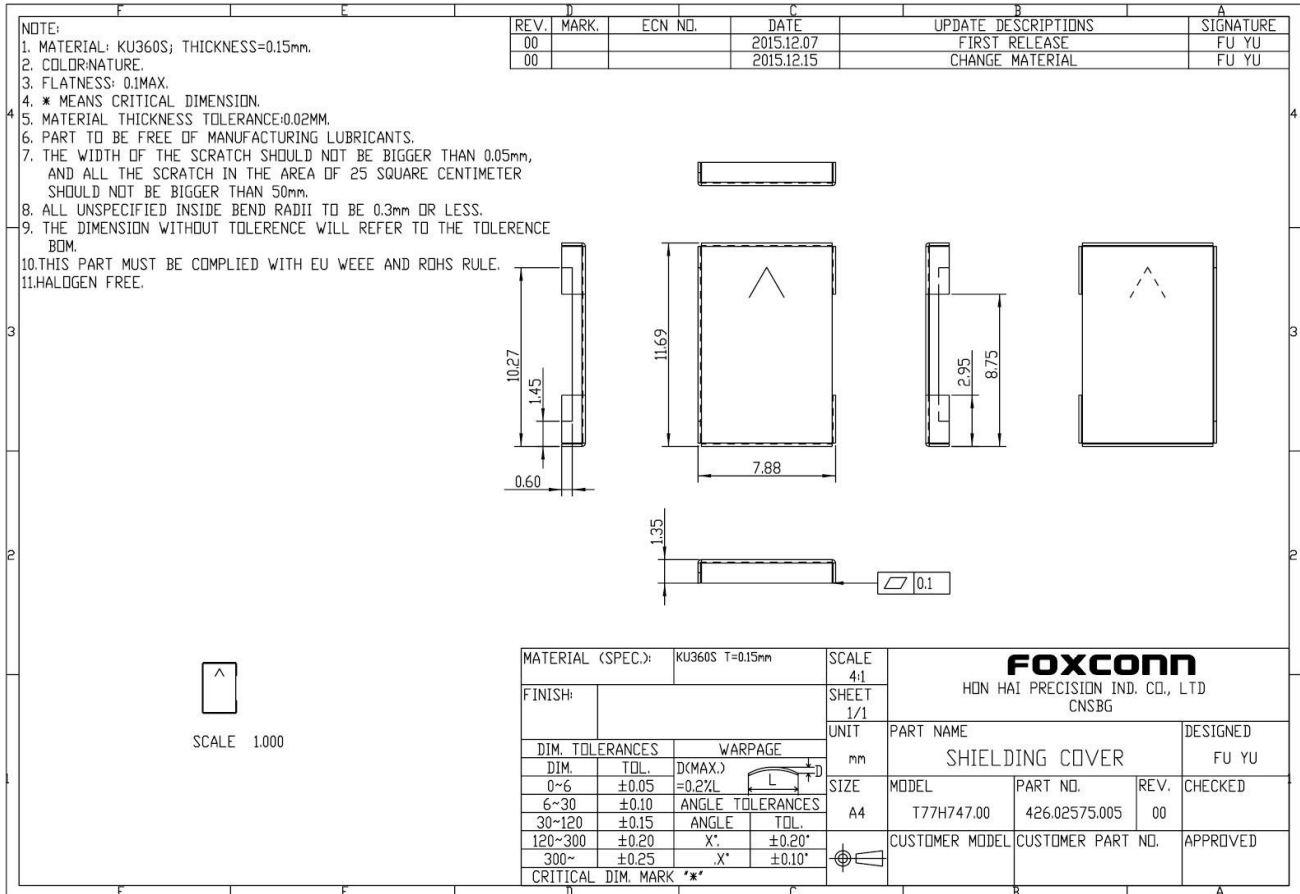
RoHS規制対応  
COMPLIANT WITH  
RoHS REGULATIONS

TOLERANCE / 公差 (S)	PRODUCT SPEC / 製品仕様
X <10 ±0.2	UNIT mm ANGLE 3RD
10 ≤ X <30 ±0.25	SCALE 10/1 DATE 12-12-14
30 ≤ X ±0.3	CHECKED APPROVED

#### 4.4. Shielding Cover of NFC module

Dimension (L x W x H): 11.69mm x 7.88mm x 1.35mm, Thickness: 0.15mm

Materials: KU360S



#### 4.5. Picture of NFC module



(Top view)



(Bottom view)

7. Marking Information

Label information

REV.	MARK	ECR/ECN NO.	DATE	UPDATE DESCRIPTION	SIGNATURE
0	N/A	N/A	2016.06.24	First Release	

2.MAC ID label (503.01251.005)

**Human readable:**

- XXXXXXXXXX-VVSS;  
XXXXXXXXXX---MO工单号  
VVSS---label版本  
VV为工程版本  
SS为A300/A400产品之版本
- T77H747.10;Foxconn PN
- FRU P/N:01AX745  
FRU P/N:01AX745---fixed
- EC NO:1498230  
EC NO:1498230---fixed

5.8SSW10K97523F1CHYMDSSSS  
8S-Fixed  
SW10K97523-Lenovo P/N  
F1CH-Header code  
YMD:Year, Month and Date,  
Y : Last digit of year (for example, 1 for 2001 and 2 for 2002)  
M: Month (1=January,2=February,3=March,4=April,5=May  
6=June,7=July,8=August,9=September,A=October,  
B=November,C=December)  
D: Day of the month (1=1, 2=2, 3=3, 4=4, 5=5, 6=6, 7=7,  
8=8,9=9,A=10,B=11,C=12,D=13,E=14,F=15,G=16,H=17,  
J=18,K=19,L=20,M=21,N=22,P=23,R=24,S=25,T=26,V=27,  
W=28,X=29,Y=30,Z=31 (I, O, Q, U are not used in the date  
code sequence)  
SSSS: serial number, from 0000 to ZZZZ  
"I", "O", "Q" and "U" are not used in the serial number,  
all other characters are used for new build numbers  
All of the font:Arial, 0, 6mm

Scannable:  
A.8SSW10K97523F1CHYMDSSSS :  
Barcode type:2D barcode, Data Matrix, ECC200,  
Barcode size:3, 5\*3, 5mm

scale:4:1

標籤製作黏貼方式/T77H747.10/00/2 OF 7

MATERIAL (SPEC.)		SCALE	<b>FOXCONN</b> HON HAI PRECISION IND. CO., LTD. CNSBG		
FINISH		SHEET			
50# Mylar		1/1	PART NAME MAC ID label		
UNIT		MM	MODEL	PART NO.	DESIGNED
A4			T77H747.10	503.01251.005	hong jun
CUSTOMER MODEL			APPROVED		

.Tray ID label

Foxconn PN: 503.00090.005, size: 45\*8mm



Human readable:

TFYWWSSSS

Font: TRIUMVIRATE COND.(打印機自帶字體) , height: 6pt

Scannable:

- Barcode type: code128
- Barcode height: 2.96mm
- Barcode content: TFYWWSSSS

T---Tray

F---產地代產

Y---西元年最後一碼

WW---生產周別

SSSS---流水號四碼, 36進制, 隔周reset為0001

具體黏貼位置請參考組立圖及包裝出貨方式, 貼於tray有缺口一側

Carton label:P/N:503.00098.005



- A.XXXXXXXX: the Foxconn MO(工單號)
- B.Qty : XXX  
XXX.the quantity of product in carton(carton內裝的產品數量)  
Barcode content:the quantity of product in carton(carton內裝的產品數量)
- C.REV:VVSS  
VV:the engineering version(refer to Foxconn label Rev column in the cover of the MFG document)  
VV為工程版本 (參見製造文件封面Foxconn Label Rev.欄位)
- SS:the version of A300/A400 product(refer to Doc Rev.in the cover of MFG document)  
SS為A300/A400產品之版本 (參見製造文件封面Doc Rev.之主版本)
- D.CIPPYWWXXXX  
C+ production location + production line + production year + production week + Serial Number(Base on 36)  
C: carton I: production location(refer to attachment of the last page)  
PP:Production line YWW: Production year & production week.  
XXXX:Serial number(Base on 36,every two week reset to 0001)

.Pallet label:P/N:503.00089.005



Follow Foxconn standard

PIPPYWWXXXX:

P+ production location + production line + production year + production week + Serial Number(Base on 36)

P: Pallet

I: Production location(refer to attachment on page 3)

PP: production line

Y: the last digital of production year

WW: production week

XXXX: Serial number(Base on 36,every two week reset to 0001)

VVSS:

VV: the engineering version (refer to Foxconn label Rev column in the cover of the MFG document)

SS: the version of A300/A400 product (refer to Doc Rev.in the cover of MFG document)

8. Packing information

	VER. MARK	ECR/ECN NO.	DATE	UPDATE DESCRIPTION	SIGNATURE
	00		2016. 06. 24	First release	hongjun
	01				

the picture just for reference

1. Qty:60pcs/layer, 15layers/carton  
 2. The top layer used as shield cover, without products.  
 3. The two neighboring layers always laid reversely.

Carton outer size:278\*233\*134  
 Carton=15 layers=(1\*0+14\*60)pcs=840pcs

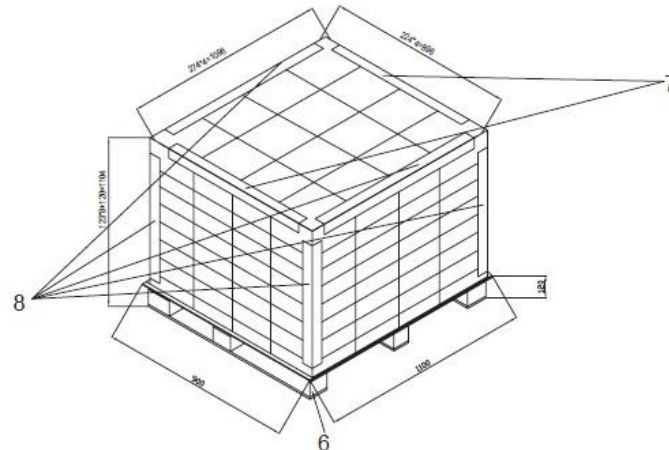
Part No.	Part Name	Part No.	Part No.
5	Carton	520.00521.005	1/840
4	Paper board	522.01672.015	1/840
3	PE bag	510.00464.005	1/840
2	Tray	513.00434.005	15/840
1	Drier	528.00011.005	2/840

組立圖及包裝出貨方式/T77H747.10/00/1 OF 3

MATERIAL (SPEC.)		SCALE	<b>FOXCONN</b> HON HAI PRECISION IND. CO., LTD.		
FINISH		SHEET			
Select Dim. Tol.	A B C EPS EPE BAG CTN Label USR	UNIT mm	PART NAME Carton ASY		
0~5	0.05 0.05 0.10 0.50 0.50 3.00 0.20	SIZE A4			
6~30	0.10 0.15 0.20 0.50 0.50 5.00 0.25		MODEL T77H747.10	PART NO.	DESIGNED hongjun
30~120	0.15 0.20 0.30 0.50 0.50 10.00 0.30		CUSTOMER MODEL CUSTOMER PART NO. APPROVED		
120~300	0.20 0.30 0.40 1.00 1.00 15.00 0.50				
300~450	0.25 0.40 0.50 2.00 2.00 20.00 0.80				
450~600	0.30 0.50 0.60 3.00 3.00 20.00 0.80				
DRAFT TOLERANCE ±0.2*					

REV.	MARK	ECR/ECN NO.	DATE	UPDATE DESCRIPTION	SIGNATURE
00			2016.6.20	First release	hong jun
01					



1 pallet = 8 layers = 8\*16 cartons = 8\*16\*840 = 107520pcs

組立圖及包裝出貨方式/T77H747.10/00/2 OF 3

Item	Description	P/N	QTY
8	Paper board bezel	522.00214.005	6/107520
7	Paper board bezel	522.00044.005	2/107520
6	Pallet	527.00010.005	1/107520

MATERIAL (SPEC.)										SCALE															
FINISH										SHEET															
Select	A	F	B	C	R	E	P	S	E	P	E	B	A	G	C	T	N	L	o	b	e	l	U	S	R
0~6	0.05	0.05	0.10																						
6~30	0.10	0.15	0.20	0.25	0.30	0.50	0.50	3.00																	
30~120	0.15	0.20	0.30	0.50	0.50	5.00	2.00	0.25																	
120~300	0.20	0.30	0.40	1.00	1.00	10.00	3.00	0.30																	
300~450	0.25	0.40	0.50	2.00	2.00	15.00	5.00	0.50																	
450~600	0.30	0.50	0.60	3.00	3.00	20.00	5.00	0.80																	
DRAFT TOLERANCES										±0.2*	CRITICAL DIM. MARK *														

<b>FOXCONN</b>		
HON HAI PRECISION IND. CO., LTD. CNSBG		
PART NAME Pallet ASM		
MODEL T77H747.10	PART NO.	DESIGNED hongjun
CUSTOMER MODEL	CUSTOMER PART NO.	APPROVED

9. Reliability Test plan

No	Item	Test Condition	Qty	Criteria	Result
1	Pull test & Cross Section (2pcs) Cross Section: 1pcs Pull Test: 1pcs	<ol style="list-style-type: none"> <li>Visual inspection: All locations</li> <li>Cross section: BGA/Connector/PTH Hole/Via Hole (SMT/PIH)</li> <li>Pull strength: 0.4mm/0.5mm pitch QFP</li> </ol>		<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass;</li> <li>Cross section - No separation - Allowable Crack Length: Max. 25% of pad diameter</li> <li>Pull test - 800g for 0.4mm pitch QFP, 1kg for 0.5mm pitch QFP</li> </ol>	TBD
2	Low Temperature Test	<ol style="list-style-type: none"> <li>Power on;</li> <li>Temp.= -40 ;</li> <li>Test Period = 240hrs.</li> </ol>	2	Pls refer to ATC	TBD
3	Hot Start Test	<ol style="list-style-type: none"> <li>Power Off ,</li> <li>Temperature=100</li> <li>Test period=96 Hours</li> <li>Power on 3times</li> </ol>	2	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass.</li> </ol>	TBD
4	Cold Start Test	<ol style="list-style-type: none"> <li>Power Off</li> <li>Temperature=</li> <li>Test period= Hours</li> <li>Power on times</li> </ol>	2	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass.</li> </ol>	TBD
5	Temperature-Humidity Bias (THB)	<ol style="list-style-type: none"> <li>Power On (apply core voltage to PCBA )</li> <li>Temp.= 85 &amp; Humi.= 85%R.H</li> <li>Test period= 400 Hours</li> </ol>	2	Pls refer to ATC	TBD
6	Accelerated Thermal Cycles (ATC)	<p>ATC:</p> <ol style="list-style-type: none"> <li>Power off</li> <li>Ta=85 for 7.5mins</li> <li>Ta=85 to -40 for 7.5mins</li> <li>Ta=-40 for 7.5mins</li> <li>Ta=-40 to 85 for 7.5mins</li> <li>Repeat 630cycles</li> </ol> <p>Cross Section(both Bright &amp; Dark): BGA/CONNECTOR/PTH Hole/ Via Hole (SMT/PIH)</p>	2	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass;</li> <li>Cross section ( AFTER 630 cycles ) - No separation - Allowable Crack Length: Max. 25% of pad diameter</li> </ol>	TBD
7	Sine Vibration(Unpackaged )	<ol style="list-style-type: none"> <li>Frequency = 5 ~ 500 ~ 5 HZ;</li> <li>Acceleration = 2 G;</li> <li>Sweep time: 3mins/cycle;</li> <li>Each of x, y, z axis/ 30 min;</li> <li>Power on and continuously ping AP/SG./Golden(AP for WLAN, SG for WWAN, Golden for BT)</li> <li>Product need to be connected with the mating connector which used in laptop.</li> </ol>	2	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass;</li> <li>No disconnect between device &amp; AP/SG /Golden during the test .</li> </ol>	TBD
8	Shock Test(Unpackaged)	<ol style="list-style-type: none"> <li>Half-Sine wave ,50G ,11msec</li> <li>Test +/- x, y, z axes</li> <li>Three shock per axes, total 18 shocks.</li> <li>Product need to be connected with the mating connector which used in laptop.</li> <li>Detect by an electrical discontinuity monitor.</li> </ol>	2	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>No electrical discontinuity is greater than 1 microsecond.</li> </ol>	TBD
9	Sine Vibration(Packaged)	<ol style="list-style-type: none"> <li>Frequency = 5 ~ 500 ~ 5 HZ;</li> <li>Acceleration = 2 Gms;</li> <li>Each of x, y, z axis/ 30 mins.</li> </ol>	1 Carton	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass.</li> </ol>	TBD
10	Shock Test(Packaged)	<ol style="list-style-type: none"> <li>Sine wave ,230G ,3msec ;</li> <li>Test +/- x, y, z axes</li> </ol>	1 Carton	<ol style="list-style-type: none"> <li>Visual Inspection – Compliance with IPC-A-610D Class 3 &amp; 39T0261;</li> <li>Function test Pass.</li> </ol>	TBD
11	Tin Wisker	<ol style="list-style-type: none"> <li>Power off 60/95%RH for 2000hrs;</li> <li>Room Temperature 2000hrs.</li> </ol>	10	Whisker Length <50um	TBD

|

|



## 10. Notice

### Operating Temperature Conditions

The product shall be capable of continuous reliable operation when operating in ambient temperature of 0°C to 70°C.

### Non-Operating Temperature Conditions

Neither subassembly shall be damaged nor shall the operational performance be degraded when restored to the operating temperature when exposed to storage temperature in the range of -20°C to +85°C.

### Operating Humidity Conditions

The product shall be capable of continuous reliable operation when subjected to relative humidity in the range of 0% and 85% non-condensing.

### Handling Environment

Please make sure to avoid mechanical shock and vibration for this module.

Please do not drop the module.

Please do not clean the module.

### **Federal Communication Commission Interference 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 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.

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### **Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body.

**Radiation Exposure Statement:**

The product complies with the FCC portable RF exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this manual. Further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such a function is available.

**This device is intended only for OEM integrators under the following conditions:**

The antenna must be installed such that 20 cm is maintained between the antenna and users, and  
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. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID:MCLT77H747”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

**Manual Information To the End User**

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’s manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

**Industry Canada statement:**

This device complies with ISED’s licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d’ ISED applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

**Radiation Exposure Statement:**

The product comply with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

**Déclaration d'exposition aux radiations:**

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé.

Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

**Radiation Exposure Statement:**

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

**Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

The antenna must be installed and operated with greater than 20cm between the antenna and users, and

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. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

L'antenne doit être installé et exploité avec plus de 20 cm entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coimplanté 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. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

### End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 2878D-T77H747".

### Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 2878D-T77H747".

### End Product Labeling

The product can be kept as far as possible from the user body or set the device to lower output power if such function is available. The final end product must be labeled in a visible area with the following: "Contains IC: 2878D-T77H747".

### Plaque signalétique du produit final

L'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 2878D-T77H747".

### Manual Information To the End User

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's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

### Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

### DETACHABLE ANTENNA USAGE

This radio transmitter (IC: 2878D-T77H747 / Model: T77H747) has been approved by ISED to operate with the antenna type listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 2878D-T77H747 / Model: T77H747) a été approuvé par ISED pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

2. The antennas provided to the EUT, please refer to the following table:

Antenna No.	Brand	Model	Antenna Gain(dBi)	Frequency range (MHz)	Antenna Type
1	SAA	LX8416-12-000-C	NA	13.56	PCB
2	Dexerials	ANT-M041A	NA	13.56	PCB
3	Dexerials	ANT-M043A	NA	13.56	PCB
4	Dexerials	ANT-M047A	NA	13.56	PCB
5	SAA	LX7828-12-000-C	NA	13.56	PCB
6	Murata	FLANBPA-0715	NA	13.56	PCB

低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

模組認證：

1. 本模組於取得認證後將依規定於模組本體標示審驗合格標籤。
2. 系統廠商應於平台上標示「本產品內含射頻模組：XXXyyyLPDzzz-x」字樣。  
「電磁波曝露量 MPE 標準值  $1\text{mW}/\text{cm}^2$ ，送測產品實測值為  $0.97\text{mW}/\text{cm}^2$ 」