

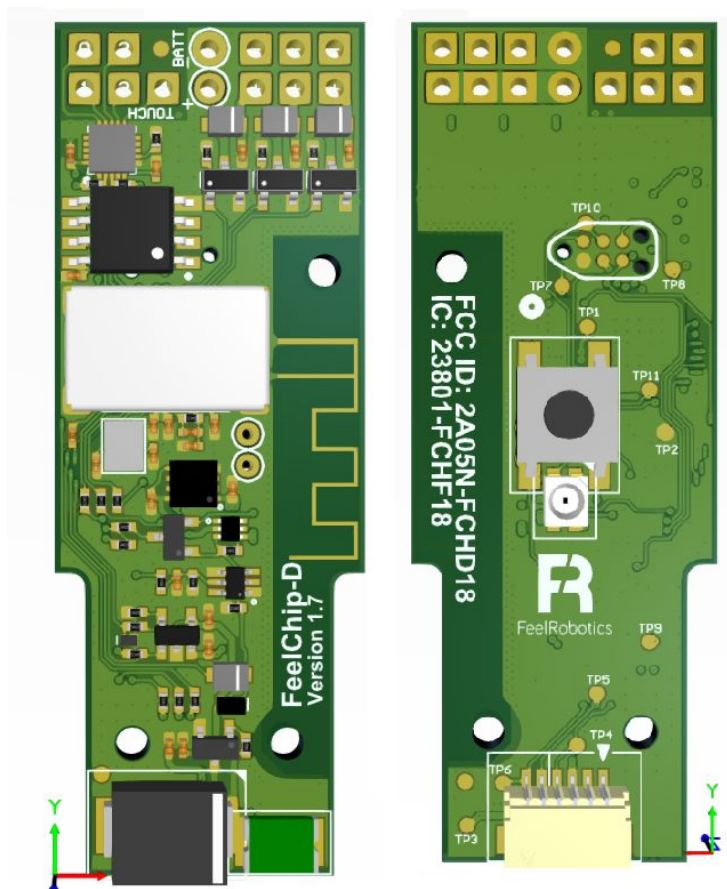


FeelRobotics

## FeelChip-D Manual

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version 1 , 20190607



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## Introduction

The FeelChip D is PCBA board designed for the haptic industry. It has 3 motor channels and 5 touch channels. The FeelChip D is equipped with:

1. a LIPO charging unit
  - a. 5 volt
2. RGB LED light
  - a. Charging (red)
  - b. Almost empty (blinking red)
  - c. Bluetooth (blue)
  - d. Charged (green)
3. Press Button
  - a. Turn the device on/off
  - b. Switch through patterns
4. Programmer
  - a. Pin to program the ESP32
5. MPR121
  - a. ReceiPintove up to 5 capacitive touch inputs
6. Bluetooth and Main processor (Espressif ESP32)
  - a. Get firmware version
  - b. Get hardware version
  - c. Get battery level
  - d. Control up to 1 to 3 motors
  - e. Read up to 5 touch sensors

## Programming

The FeelChip-D-2p can be programmed with a Tag connect TC2030-IDC-NL<sup>1</sup> or a TC2030-MCP-NL<sup>2</sup> on the small footprint PCB Tag-Connect PAD. Alternatively it can be programmed using the test pads with the aid of a Pogo Pin test setup.

There are two methods to programming the FeelChipD:

- 1) Via Tag-Connect PCB pads
- 2) Via Pogo-Pin Test pads

### Tag-Connect PCB Pads

For manual programming, the Feel Robotics ESP32 programmer is used which is only compatible with the TC2030-MCP-NL cable. The programmer features an FT232RL<sup>3</sup> USB to UART.

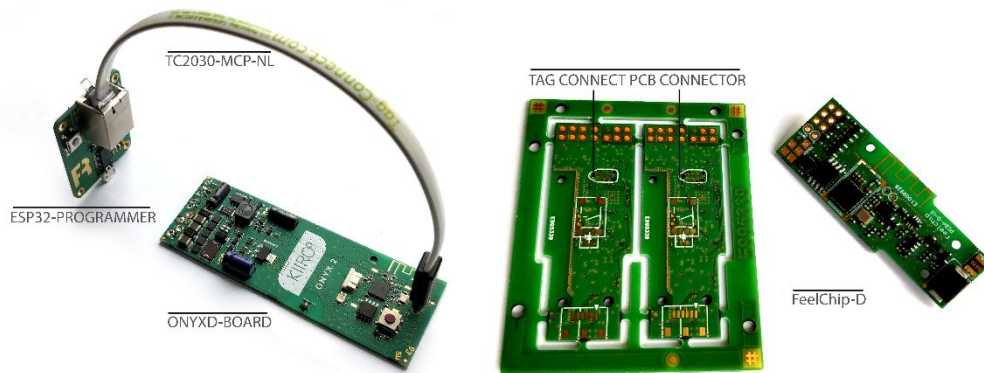


Figure 1 - ESP32 Programmer

Pad #	Net Name	Test PAD	Layout <sup>4</sup>
1	GND	TP2	
2	EN	TP7	
3	2V8	TP1	
4	ESP_RX	TP10	
5	EPS_TX	TP11	
6	IO0/PwrOn	TP8	

Table 1 – Tag Connect Pinout

ESP\_RX and EPS\_TX are used for serial communication from the FT232RL to the ESP32. EN and IO0 are used to toggle the ESP32 during boot go into bootloader modus so the FT232RL can upload to code to the flash memory. For programming either the ESP32 Flash-Tool or the python script from Espressif. 2V8 and GND are used to power up the ESP32 during programming.

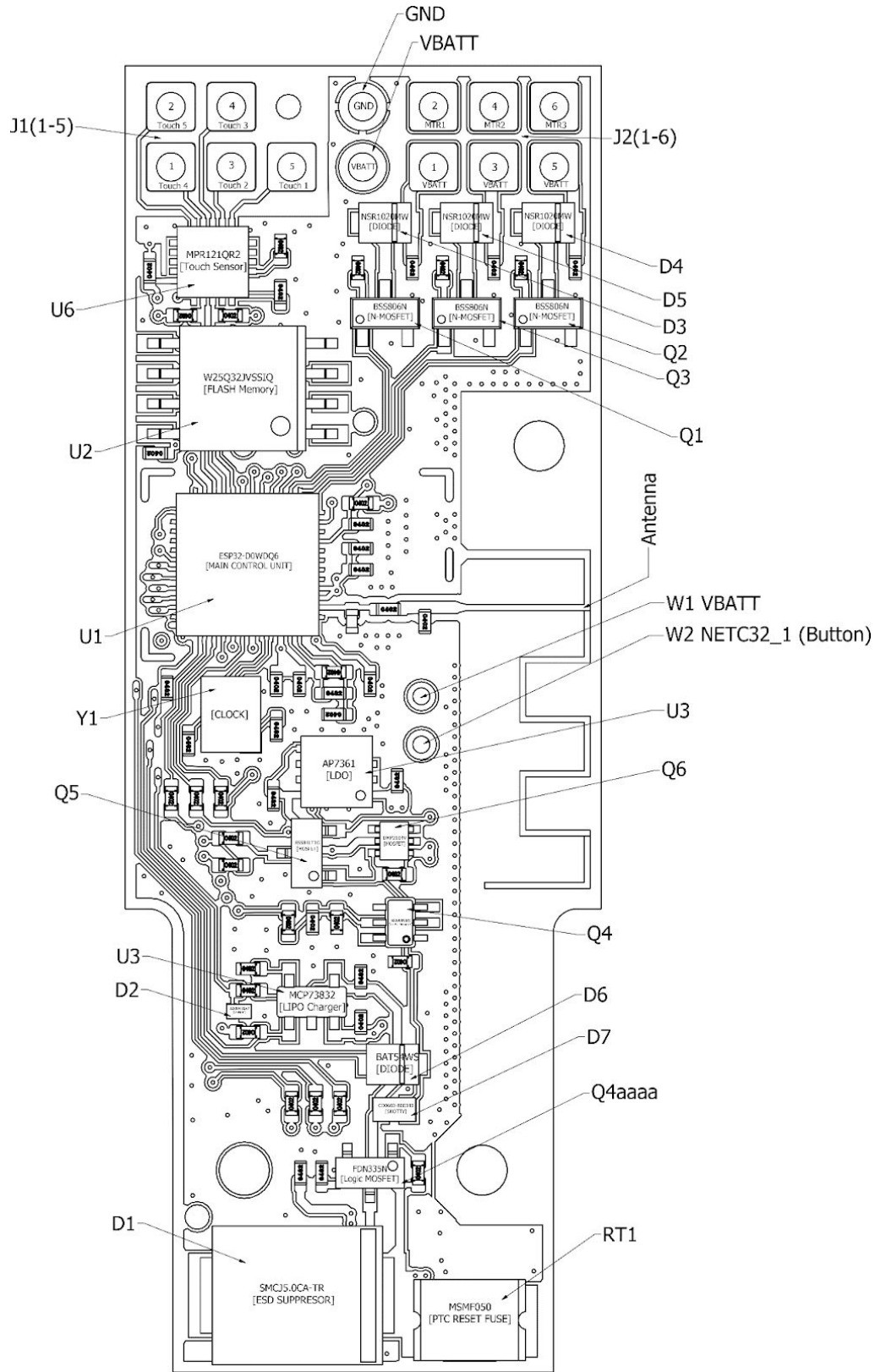
<sup>1</sup> <http://www.tag-connect.com/TC2030-IDC-NL>

<sup>2</sup> <http://www.tag-connect.com/TC2030-MCP-NL>

<sup>3</sup> [https://nl.mouser.com/datasheet/2/163/DS\\_FT232R-11534.pdf](https://nl.mouser.com/datasheet/2/163/DS_FT232R-11534.pdf)

<sup>4</sup> <http://www.tag-connect.com/Materials/TC2030-IDC-NL.pdf>

# Board Overview TOP



## TOP Parts

PART	UNIT	PART NUMBER	FUNCTION	DESCRIPTION
PART	U1	ESP32-D0WDQ6	MCU	Main processor
PART	U2	WS25Q32JVSSIQ	FLASH	Flash memory
PART	U3	AP7361	LDO	Voltage regulator
PART	U4	Removed	Removed	
PART	U5	MPC7382	Lipo Charger	
PART	U6	MPR121QR2	TOUCH	Touch sensor

Table 2 - Main units

PART	UNIT	PART NUMBER	FUNCTION	DESCRIPTION
PART	RT1	MSMF050	PTC Reset Fuse	
PART	Y1	CLOCK	CLOCK	

Table 3 - Miscellaneous

PART	UNIT	PART NUMBER	FUNCTION	DESCRIPTION
PART	Q1	BSS806N	N-Channel Mosfet	Drives Motor 1
PART	Q2	BSS806N	N-Channel Mosfet	Drives Motor 2
PART	Q3	BSS806N	N-Channel Mosfet	Drives Motor 3
PART	Q4	NX3008NBKS (Dual)	N-Channel Mosfet	On/Off Control
PART	Q5	BSS84LT1G	P-Channel Mosfet	Voltage divider
PART	Q6	DMP2104V	P-Channel Mosfet	Powers LDO
PART	Q7	FDN335N	N-Channel Mosfet	ESD Protector

Table 4 - Switches

PART	UNIT	PART NUMBER	FUNCTION	DESCRIPTION
PART	D1	SMCJ5.0CA-TR	ESD Suppressor	ESD Suppressor
PART	D2	BZX88-B2V7	Zener diode	
PART	D3	NSR1020MW	Flyback diode MTR1	For Motor 1
PART	D4	NSR1020MW	Flyback diode MTR3	For Motor 3
PART	D5	NSR1020MW	Flyback diode MTR2	For Motor 2
PART	D6	BAT54WS	Skotty Diode	
PART	D7	CD0603-B00340	Skotty Diode	

Table 5 - Diodes

## TOP Pads

PAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	J1(1)	Touch PAD 1	Touch 4	MPR121 Electrode 6
PAD	J1(2)	Touch PAD 2	Touch 5	MPR121 Electrode 7
PAD	J1(3)	Touch PAD 3	Touch 2	MPR121 Electrode 4
PAD	J1(4)	Touch PAD 4	Touch 3	MPR121 Electrode 5
PAD	J1(5)	Touch PAD 5	Touch 1	MPR121 Electrode 3

Table 6 - Touch Pads

PAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	J2(1)	Motor PAD 1	VBATT	
PAD	J2(2)	Motor PAD 2	MTR 1	For Motor 1
PAD	J2(3)	Motor PAD 3	VBATT	
PAD	J2(4)	Motor PAD 4	MTR 2	For Motor 2
PAD	J2(5)	Motor PAD 5	VBATT	
PAD	J2(6)	Motor PAD 6	MTR 3	For Motor 3

Table 7 - Motor Pads

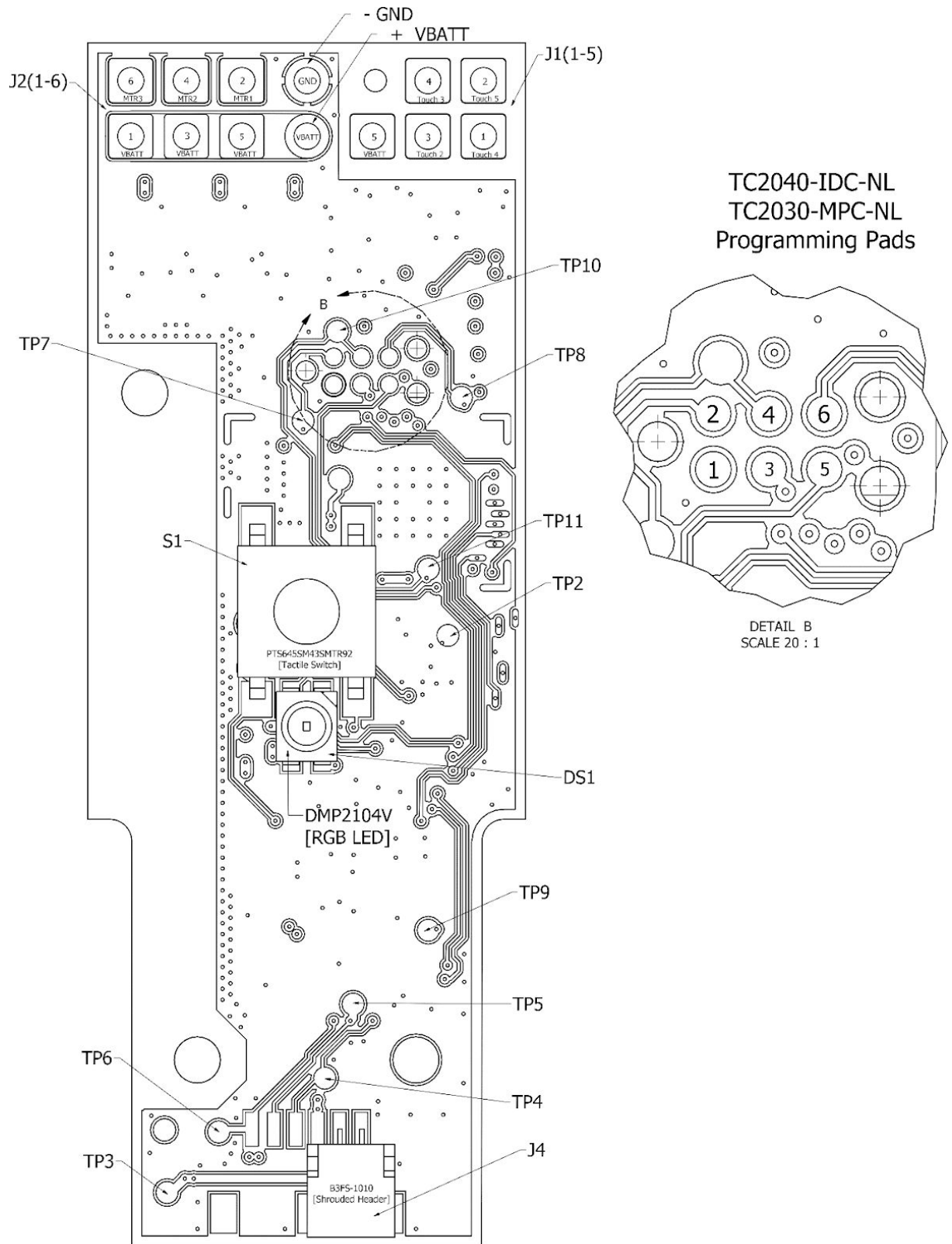
TPAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	W1	Button PAD 1	Short button	
PAD	W2	Button PAD 1	Short button	

Table 8 - Switch Pads

PAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	+	Battery PAD	VBATT	
PAD	-	Battery PAD	GND	

Table 9 - Battery Pads

# Board overview BOTTOM





## BOTTOM Parts

PART	UNIT	PART NUMBER	FUNCTION	DESCRIPTION
PART	S1	B3FS-1010	Tactile Switch	Tactile Switch
PART	DS1	AAA3528LSEEZGK QBKS	RGB LED	RGB LED
PART	J4	SM02B-SRSS-TB	Shrouded Header	USB 5V

Table 10 - Switches

## BOTTOM Pads

Testpoint	Net Name	Function	Function
TP1	2V8	LDO Voltage source 2.8V	Programming, Power Test
TP2	GND	Ground	Programming
TP3	5Vin	USB Voltage source 5.0V	Power Test
TP4	RED 2	Rgb led red	RGB2 Test
TP5	BLUE 2	Rgb led blue	RGB2 Test
TP6	GREEN 2	Rgb led green	RGB2 Test
TP7	EN	ESP32 Enable	Programming
TP8	IO0/PwrOn	ESP32 IO0	Programming
TP9	2V8	LDO Voltage source 2.8V	Programming, Power Test
TP10	ESP_RX	ESP32 RX programming	Programming
TP11	ESP_TX	ESP32 TX programming	Programming

Table 11 – Pinout

PAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	J1(1)	TouchPAD1	Touch 4	MPR121 Electrode 6
PAD	J1(2)	TouchPAD 2	Touch 5	MPR121 Electrode 7
PAD	J1(3)	TouchPAD 3	Touch 2	MPR121 Electrode 4
PAD	J1(4)	TouchPAD 4	Touch 3	MPR121 Electrode 5
PAD	J1(5)	TouchPAD 5	Touch 1	MPR121 Electrode 3

Table 12 - TTouchPads

PAD	PAD	PART NUMBER	NET	DESCRIPTION
PAD	J2(1)	Motor PAD 1	VBATT	
PAD	J2(2)	Motor PAD 2	MTR 1	For Motor 1
PAD	J2(3)	Motor PAD 3	VBATT	
PAD	J2(4)	Motor PAD 4	MTR 2	For Motor 2
PAD	J2(5)	Motor PAD 5	VBATT	
PAD	J2(6)	Motor PAD 6	MTR 3	For Motor 3

Table 13 - Motor Pads

Alternative to Tag-Connect PCB Pads the test pads can be used for programming and basic power testing as described in 5.

## USB Battery Charger

To test if the battery charger<sup>5</sup> is working 5V is applied over TP3(5V) and TP2(GND). If pads +(VBATT) and -(GND) will have approx. 4.2V across the battery charger is functioning properly.

## LDO Power

To test if the battery charger<sup>6</sup> is working 5V is applied over with POGO pins connected to TP3(5V) and TP2(GND). If POGO pins connected to TP(1) or TP9(2V8) will have 2.8V across it to TP2(GND) the LDO is functioning properly.

## Battery power

To test if the battery power is functioning 4,2V is applied over pads +(VBATT) and -(GND). If TP(1) or TP9(2V8) will have 2.8V across it to TP2(GND) battery power is functioning properly.

## DC motor

Up to three small brushed DC motors can be controlled by the FeelChip D board. The motors are driven by three N-channel MOSFETs with designators Q1, Q2, Q3 (MPN: BSS806N) with a maximum voltage of 3.3V and a maximum current of 3A. PWM can be applied to each of these channels.

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<sup>5</sup> Designator in schematic = U5 and part number is MPC7382

<sup>6</sup> Designator in schematic = U5 and part number is MPC7382

## FCC information

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

*Host manufacturer (OEM) is responsible for ensuring that the host continues to be compliant with the Part 15 subpart B unintentional radiator requirements after the module is installed and operational.*

*The grantee's FCC ID can be used only when all FCC compliance requirements are met.*

### *End Product Labeling*

*This transmitter module is authorized only for use in a portable configuration where the antenna may be installed such that 0 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: 2A05N -FCHD18".*

### *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 shown in this manual.*