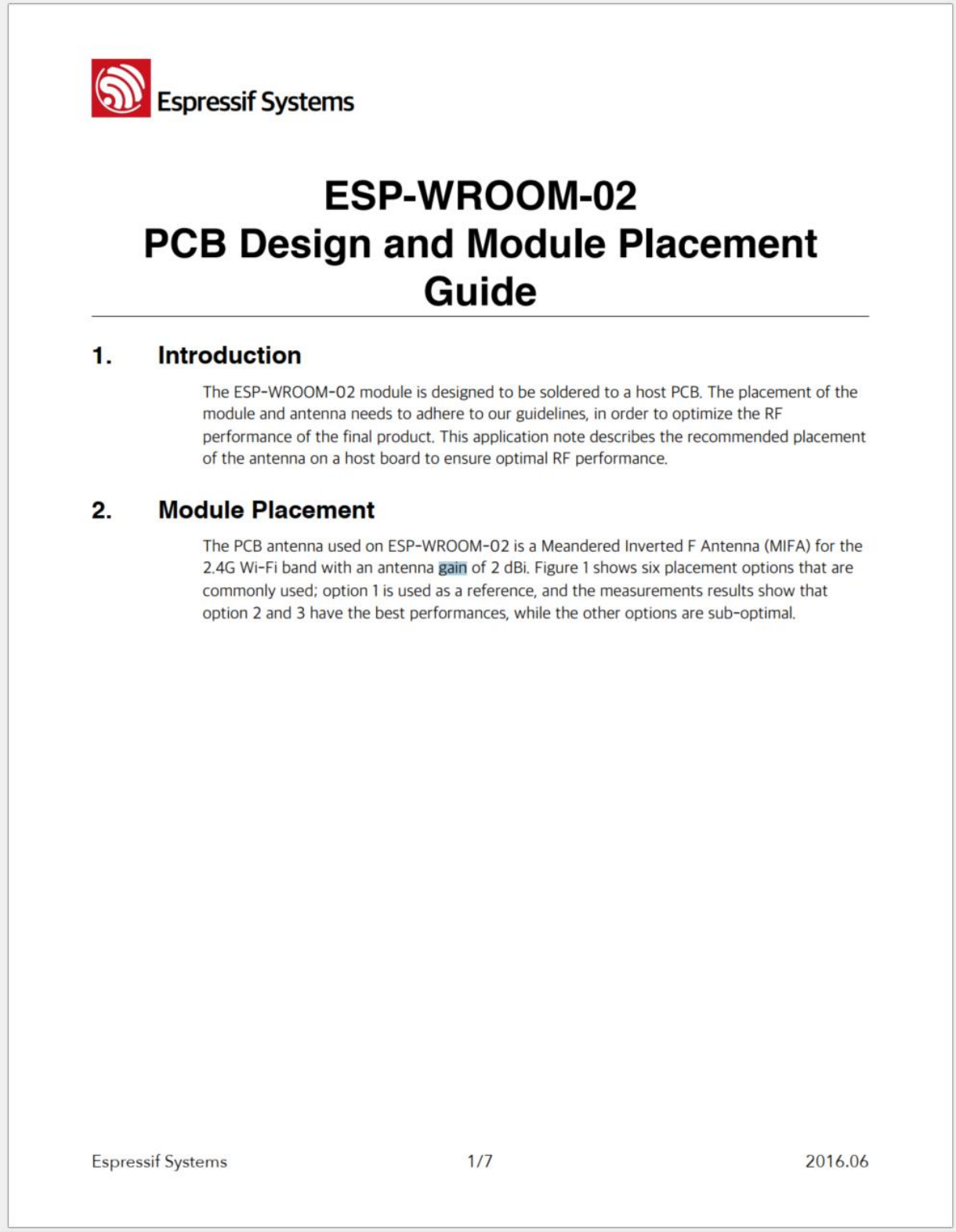
Connect FLX Antennas

433.92MHz Antenna

433.92MHz antennas are PCB trace antennas of the inverted F type attached to the PCB. This antenna type has a gain of 3dBi.

WiFi Antenna

The WiFi antenna is integral to the ESP32-WROOM WiFi module. The gain is shown in the specification as 2 dBi.



Espressif Systems

ESP-WROOM-02
PCB Design and Module Placement Guide

1. Introduction

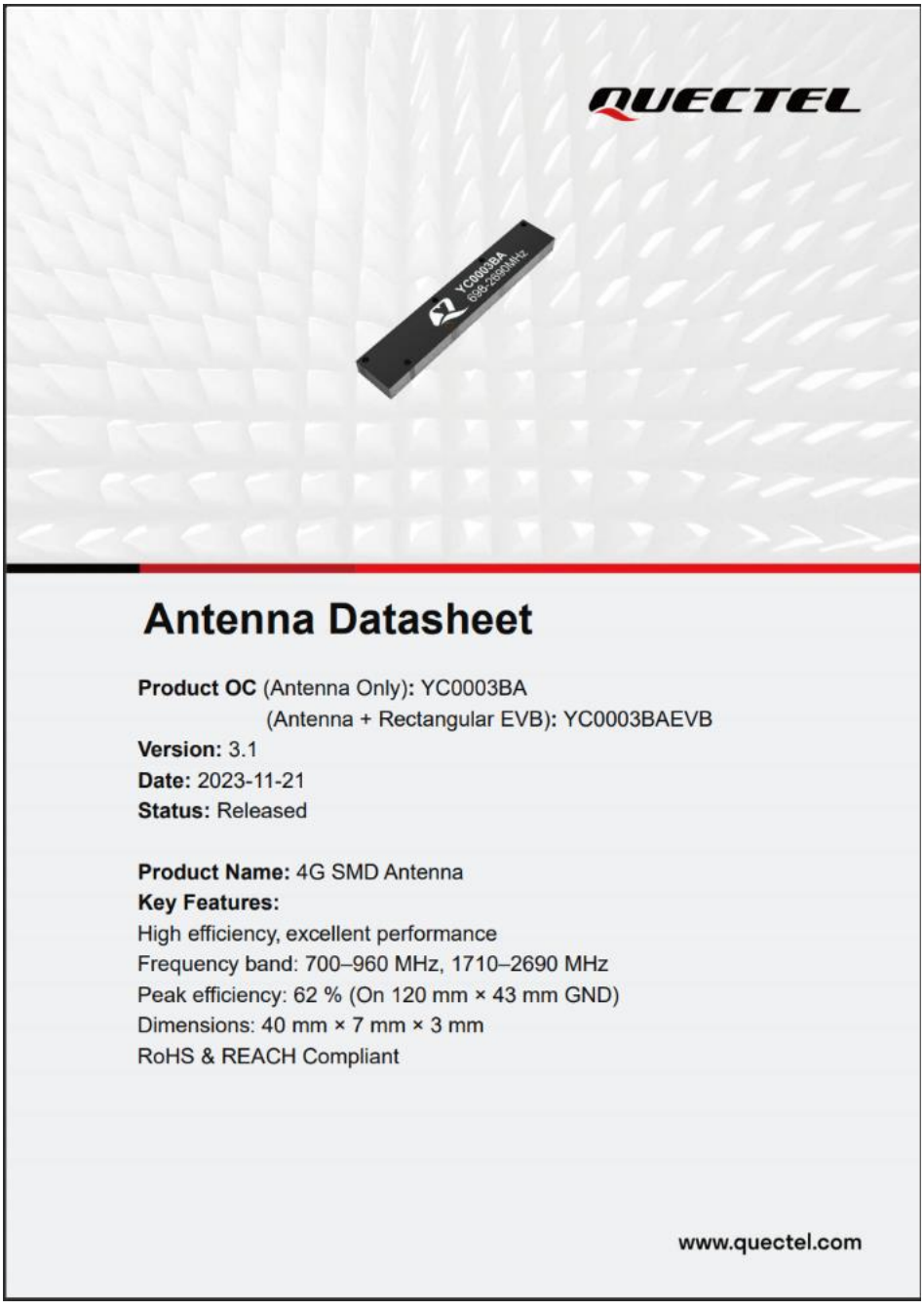
The ESP-WROOM-02 module is designed to be soldered to a host PCB. The placement of the module and antenna needs to adhere to our guidelines, in order to optimize the RF performance of the final product. This application note describes the recommended placement of the antenna on a host board to ensure optimal RF performance.

2. Module Placement

The PCB antenna used on ESP-WROOM-02 is a Meandered Inverted F Antenna (MIFA) for the 2.4G Wi-Fi band with an antenna gain of 2 dBi. Figure 1 shows six placement options that are commonly used; option 1 is used as a reference, and the measurements results show that option 2 and 3 have the best performances, while the other options are sub-optimal.

Cellular Antenna

The cellular antenna is a PCBA antenna, Quectel part number YC0003BA. The gain of this antenna is 3.1-3.5dBi.



AVG Eff. (%)	On 120 × 43 mm GND	-	57.3	55.8	51.6	46.9	40.8	42.9
	On 110 × 43 mm GND	-	47.7	54.2	52.3	49.7	42.6	42.3
	On 100 × 43 mm GND	-	37.1	44.2	44.8	52.5	48.4	46.4
	On 90 × 43 mm GND	-	30.3	34.6	43.7	46.3	44.2	44.5
	On 80 × 43 mm GND	-	25.6	29.1	54.0	54.3	48.6	45.0
AVG AVG Gain (dB)	On 120 × 43 mm GND	-	-2.4	-2.5	-2.9	-3.3	-3.9	-3.7
	On 110 × 43 mm GND	-	-3.2	-2.7	-2.8	-3.1	-3.7	-3.8
	On 100 × 43 mm GND	-	-4.3	-3.6	-3.5	-2.8	-3.2	-3.3
	On 90 × 43 mm GND	-	-5.2	-4.6	-3.6	-3.4	-3.6	-3.6
	On 80 × 43 mm GND	-	-6.0	-5.4	-2.7	-2.7	-3.2	-3.5
Max Peak Gain (dBi)	On 120 × 43 mm GND	-	0.5	0.7	3.0	3.1	2.6	2.8
	On 110 × 43 mm GND	-	0.0	0.5	2.9	2.9	3.0	3.4
	On 100 × 43 mm GND	-	-0.9	-0.4	2.5	2.7	3.0	2.7
	On 90 × 43 mm GND	-	-1.9	-1.6	2.3	2.8	3.0	2.7
	On 80 × 43 mm GND	-	-2.0	-2.1	2.6	3.2	3.5	2.9

VSWR	On 120 × 43 mm GND	≤ 3.5
	On 110 × 43 mm GND	≤ 3.5
	On 100 × 43 mm GND	≤ 3.9
	On 90 × 43 mm GND	≤ 4.3
	On 80 × 43 mm GND	≤ 4.8
Return Loss	On 120 × 43 mm GND	≤ -5.1 dB
	On 110 × 43 mm GND	≤ -5.1 dB
	On 100 × 43 mm GND	≤ -4.6 dB
	On 90 × 43 mm GND	≤ -4.1 dB
	On 80 × 43 mm GND	≤ -3.7 dB
Peak Gain	On 120 × 43 mm GND	≤ 3.1 dBi

	On 110 × 43 mm GND	≤ 3.4 dBi
	On 100 × 43 mm GND	≤ 3 dBi
	On 90 × 43 mm GND	≤ 3 dBi
	On 80 × 43 mm GND	≤ 3.5 dBi