ESP-EYE

User manual

Version 0.1
Espressif Systems

About This Guide

This document describes the specification of the ESP-EYE development board.

Release Notes

Date	Version	Release notes
2019.01	V0.1	For certification purpose.

Documentation Change Notification

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Certification

Download certificates for Espressif products from *https://www.espressif.com/en/certificates*.

1. Overview

ESP-EYE is an ESP32-based development board that integrates a digital microphone, 8 MB PSRAM and 4 MB flash, as well as provides an external 2-million-pixel camera, which makes the board very suitable for applications in the fields of face detection, face recognition, and speech recognition. Besides, the board can also support image transmission over Wi-Fi and debugging using the Micro USB port, which enables the users' development of advanced AI solutions.

2. Circuit Components

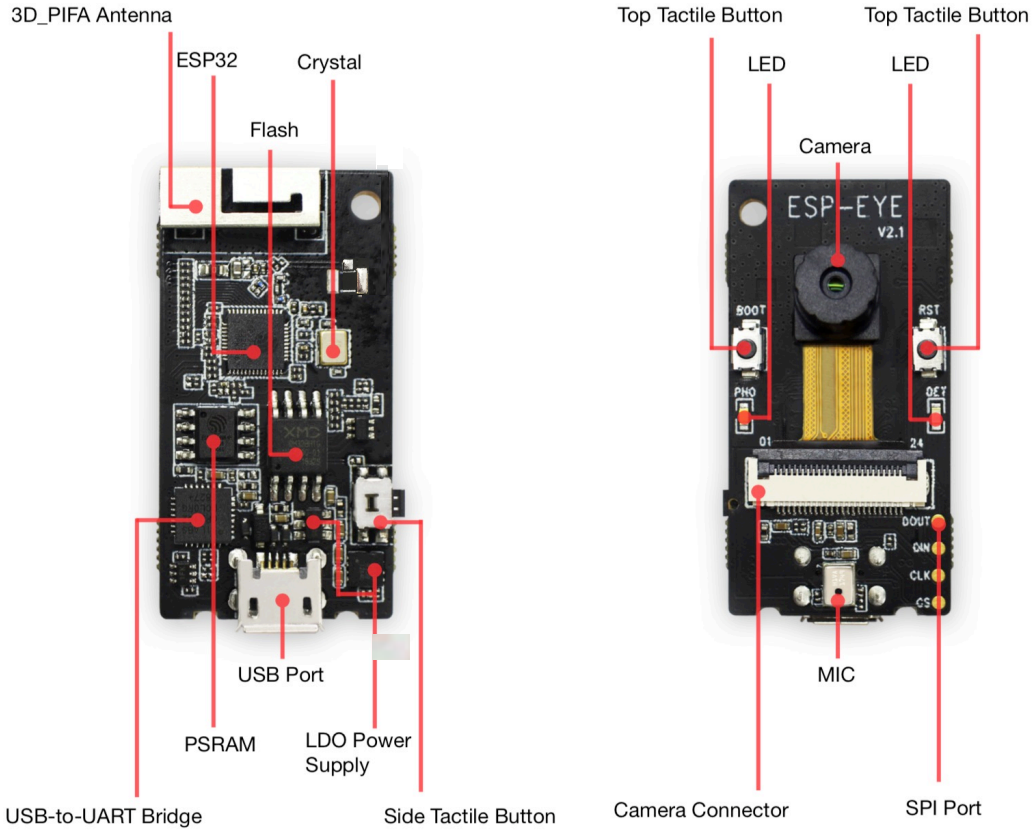


Figure 3-1. ESP-EYE Circuit components

The list and figure below describe the key components, interfaces, and controls of the ESP-EYE development board:

3D_PIFA Antenna

A 3D PIFA antenna is used for this module, The antenna gain is 2.98dBi.

ESP32 Chip

A 2.4 GHz Wi-Fi and Bluetooth combo chip

Crystal Oscillator

Provides an external clock for ESP32.

Flash & PSRAM

Provides memory to store applications.

CP2102 USB-to-UART Chip

Converts the USB signals to UART signals.

USB Port

Provides the power supply to the whole system.

LDO Power Supply

Provides the required power supplies to the ESP32 chip, camera and LED indicators.

Side Tactile Button

A function key

Top Tactile Button

Reset/Boot button. We recommend that you do not configure this button for other uses.

LED Indicators

The board has a red indicator and a white indicator. Different combinations of red and white indicators reflect the different status of the board, such as waking up, networking, face detection, face recognition, face enrollment, and face recognition...

Camera

An external 2-million-pixel camera module for face detection, face recognition and Face ID enrollment

Camera Connector

Used to connect the external camera.

MIC

A digital microphone for voice control functions

SPI Port

A reserved port for data transmission

3.

3.1 Limit Parameters

Table 1. ESP-EYE Limit Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Power supply voltage	VDD	4.75	5.0	5.25	V
Power supply current	I_{VDD}	0.5	-	-	A
Low-level input voltage	V_{IL}	-0.3	-	0.25xV_{IO}	V
High-level input voltage	V_{IH}	0.75xV_{IO}	-	V_{IO}+0.3	V
Input leak current	I_{IL}	-	-	50	nA
Pin capacitance	C_{PAD}	-	-	2	pF
Low-level output voltage	V_{OL}	-	-	0.1xV_{IO}	V
High-level output voltage	V_{OH}	0.8xV_{IO}	-	-	V
Maximum IO output current	I_{MAX}	-	-	40	mA
Storage temperature	T_{STR}	-40	-	85	°C
Operating temperature	T_{OPR}	0	-	50	°C

3.2. RF Performance

Table 2. ESP-EYE RF Performance

Description	Min	Typ	Max	Unit
Frequency range	2412	-	2462	MHz
TX power				
RF output power	802.11b:25.83dBm,802.11g:24.78dBm,802.11n20:24.86dBm, 802.11n40:23.84dBm			
Sensitivity				

Description	Min	Typ	Max	Unit
DSSS, 1 Mbps	-	-97	-	dBM
CCK, 11 Mbps	-	-87	-	dBM
6 Mbps (1/2 BPSK)	-	-92	-	dBM
54 Mbps (3/4 64-QAM)	-	-74	-	dBM
HT20, MCS0	-	-91	-	dBM
HT20, MCS7	-	-71	-	dBM
HT40, MCS0	-	-89	-	dBM
HT40, MCS7	-	-69	-	dBM
Adjacent channel rejection				
OFDM, 6 Mbps	-	31	-	dB
OFDM, 54 Mbps	-	14	-	dB
HT20, MCS0	-	31	-	dB
HT20, MCS7	-	13	-	dB

Table 3. ESP-EYE BT Performance

Description	Min	Typ	Max	Unit
Frequency range	2402	-	2480	MHz
TX power				
RF output power	BLE:2.17dBm,BT:5.82dBm			

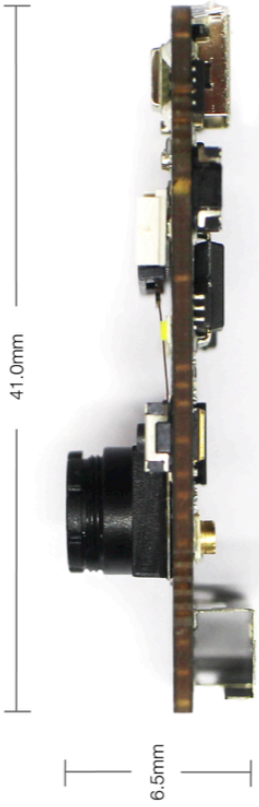
Receiver Characteristics

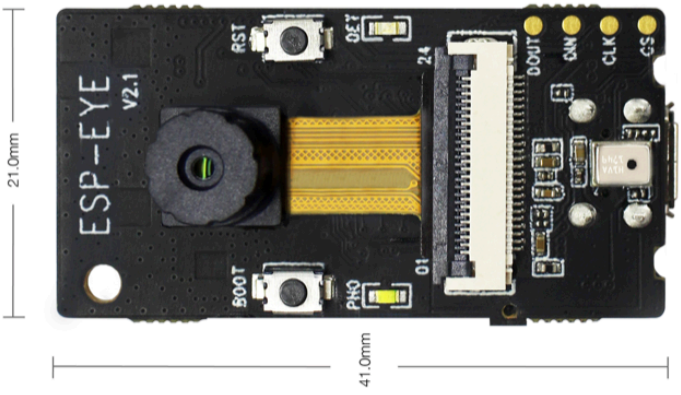
Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity @30.8% PER	-	-	–97	-	dBm
Maximum received signal @30.8% PER	-	0	-	-	dBm
Co-channel C/I	-	-	+10	-	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	-	–5	-	dB
	F = F0 – 1 MHz	-	–5	-	dB
	F = F0 + 2 MHz	-	–25	-	dB
	F = F0 – 2 MHz	-	–35	-	dB
	F = F0 + 3 MHz	-	–25	-	dB
	F = F0 – 3 MHz	-	–45	-	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	–10	-	-	dBm
	2000 MHz ~ 2400 MHz	–27	-	-	dBm
	2500 MHz ~ 3000 MHz	–27	-	-	dBm
	3000 MHz ~ 12.5 GHz	–10	-	-	dBm
Intermodulation	-	–36	-	-	dBm

Transmitter Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Adjacent channel transmit power	F = F0 ± 2 MHz	-	–52	-	dBm
	F = F0 ± 3 MHz	-	–58	-	dBm
	F = F0 ± > 3 MHz	-	–60	-	dBm
$\Delta f1_{avg}$	-	-	-	265	kHz
$\Delta f2_{max}$	-	247	-	-	kHz
$\Delta f2_{avg}/\Delta f1_{avg}$	-	-	–0.92	-	-
ICFT	-	-	–10	-	kHz
Drift rate	-	-	0.7	-	kHz/50 μs
Drift	-	-	2	-	kHz

4. Dimensions





FCC Statement

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.

FCC 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 minimum distance 20cm between the radiator& your body.

FCC Label Instructions:

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: 2AC7Z-ESPEYE",or "Contains FCC ID:2AC7Z-ESPEYE", Any similar wording that expresses the same meaning may be used.