Introduction

Features

SKU:DFR1117 (https://www.dfrobot.com/product-2778.html)

(https://www.dfrobot.com/product-2778.html)

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The Beetle ESP32-C6, a minuscule Arduino IoT development board designed around the ESP32-C6 chip, exhibits a lowpower consumption and is as small as a coin, measuring only 25*20.5mm. The ESP32-C6, equipped with a highperformance 160MHz RISC-V 32-bit processor, supports



communication protocols such as Wi-Fi 6, Bluetooth 5, Zigbee 3.0, and Thread 1.3, thus allowing it to connect to various IoT networks. The board also integrates a lithium battery charging management system, eliminating the need for additional modules, thus making the project compact.

Highly Integrated, Ultra-Small Volume

The Beetle ESP32-C6, despite its coin-size volume, offers up to 13 IO ports, erasing any concerns about a lack of IOs while creating projects. It integrates a lithium battery charging management feature, ensuring safe charging of the lithium battery. This development board also supports battery voltage monitoring, enabling actions to be taken when the power level is insufficient to ensure the device's continuous operation.



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Support for Various Transmission Protocols, Expanded Wireless Connectivity

The Beetle ESP32-C6 supports Wi-Fi and Thread communication protocols, thus it can be used to create Matter Wi-Fi terminal devices and Matter Thread terminal devices, achieving seamless communication and cooperation between multi-system, multi-platform smart home devices. Furthermore, the Beetle ESP32-C6 also supports BLE and Zigbee communication protocols. When combined with other MCUs, it can serve as a Thread border router, Matter gateway, and Zigbee bridge.



Supports Wi-Fi 6, Enabling Ultra-Low Power IoT Devices

The ESP32-C6 is Espressif's first chip to support the Wi-Fi 6 protocol (802.11ax), which provides improved network capacity, enabling devices to operate with high efficiency and low latency. Moreover, the Target Wake Time (TWT) technology of Wi-Fi 6 effectively reduces device power consumption, prolongs battery life, and ensures long-term device operation.



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- Boasting an ultra-compact size, the dimensions are a mere 25*20.5mm.
- Equipped with the ESP32-C6 chip, it supports Wi-Fi, BLE, Zigbee, and Thread communication protocols.
- Supports the Wi-Fi 6 protocol, ensuring lower latency and reduced power consumption.
- Exhibits ultra-low power consumption, with a deep-sleep mode of 14uA.
- Incorporates a lithium battery charging function.
- Supports battery voltage detection, providing insight into device power levels.

Application Scenarios

- Intelligent lighting projects.
- Smart environmental monitoring projects.
- Intelligent switch projects.

Specification

Features

Basic Parameters

- Operating Voltage: 3.3V
- Type-C Input Voltage: 5V DC
- Max Charging Current: 0.5A
- Sleep current: 14uA (in deep sleep mode, powered by battery)
- Operating Temperature: -10~60°C

• Dimension: 20.5x25mm

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- Processor: RISC-V single-core processor
- Main Frequency: 160 MHz
- SRAM: 512KB
- ROM: 320KB
- Flash: 4MB
- RTC SRAM: 16KB
- USB: USB 2.0 CDC

WIFI

- WIFI Protocol: IEEE 802.11b/g/n
 IEEE 802.11ax (20 MHz-only non-AP mode)
- Bandwidth: Support 20 MHz and 40 MHz at 2.4 GHz band
- WIFI Mode: Station, SoftAP, SoftAP+Station combined mode
- WIFI Frequency: 2.4GHz
- Frame Aggregation: TX/RX A-MPDU, TX/RX A-MSDU

Bluetooth

- Bluetooth Protocol: Bluetooth 5, Bluetooth mesh
- Bluetooth Frequency: 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps

IEEE 802.15.4

- Compatible with IEEE 802.15.4-2015 protocol
- Frequency band: 2.4GHz

- Data rate: 250Kbps
- Supports Thread 1.3 and Zigbee 3.0

Ports

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- Digital I/O x13
- LED PWM 6 Channel
- SPI x1
- UART x3 (LP UART x1)
- I2C x2 (LP I2C x1)
- I2S x1
- IR Transceiver: transmit channel x5, receive channel x5
- 1 × 12-bit SAR ADC, 7 Channel
- DMA Controller: transmit channel x3, receive channel x3



Board Overview

- Type-C:Type-C USB port
- IO15/D13:onboard LED pin
- Charge:Charging indicator
 - Off: n ot plugged in power supply or fully charged
 - On: charging
 - Blinking: battery not connected
- **RST:** Reset button

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- IO9/D9/BOOT: GPIO9 / Boot button
- ESP32-C6 (https://dfimg.dfrobot.com/60c1e008bddfc41c3293de80/wiki/bd5febb16dd4b86eb34cb387815 080ae.pdf): ESP32-C6FH4 chip
- TP4057: TP4057 lithium battery charge management chip
- RT9080

(https://dfimg.dfrobot.com/5d57611a3416442fa39bffca/wiki/d310c343a276135955547d238c122 064.pdf): 3.3V Low power LDO

Pin Diagram



Pin Definition

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- Power: Power pin
 - VIN: 5V DC
 - 3V3: 3.3V stable output
- GND: common ground pin
- GPIO: ESP32 default GPIO number
- Arduino: Beetle ESP32-C6 GPIO mapping in Arduino
- ADC: ESP32 default analog-to-digital conversion pin
- I2C: I2C interface
 - Beetle ESP32-C6 I2C mapping in Arduino
 - LP_SDA/SCL: Low power I2C pin
- UART: UART interface
 - LP_TX/RX: Low power UART pin
- SPI: Beetle ESP32-C6 SPI mapping in Arduino
- SDIO: ESP32 default SDIO pin
- JTAG: debug interface

Tutorial - First Time Use

Arduino IDE Configuration

Please pay attention to the followings when using FireBeetle 2 ESP32-C6 for the first time.

1. Add the json link in the IDE

2. Download the core of the MCU

5. Get to know the serial monitor

- 3. Select the development board and serial port
- 4. Open the sample code and burn it into the board

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Arduino IDE compiler environment config

- Configure URL to the Arduino IDE
- 1. Open Arduino IDE and click File->Preferences, as shown below.

.

>

ĺ	Blink Arduino 1.8.0
1	ile Edit Sketch Tools Help
e	New Ctrl+N
Introduction	Open Ctrl+O
Features	Open Recent
Application Sconorico	Sketchbook 🕨
Application Scenarios	Examples
Specification	Close Ctrl+W
Board Overview	Save Ctrl+S rd LED you can control. On the UNO, MEGA and ZERO
Pin Diagram	Save As Ctrl+Shift+S n 13, on MKR1000 on pin 6. LED_BUILTIN is set to
Pin Definition	Page Setup Ctrl+Shift+P ent of which board is used.
Tutorial – First Time Use	Print Ctrl+P
Basic Tutorial	board at <u>https://www.arduino.cc/en/Main/Products</u>
	Preferences Ctrl+Comma
	Ouit Ctrl+O
FAQ	13 modified 8 May 2014
More Documents	14 by Scott Fitzgerald
	15
	16 modified 2 Sep 2016
	17 by Arturo Guadalupi
	18 19 modified 8 Sep 2016
	20 by Colby Newman
	21 */
8	22
	23
1	24 // the setup function runs once when you press reset or power the board
	25 void setup () {
I	20 // initialize digital pin LED_BUILTIN as an output.
I	28 }
	29

2. In the newly opened interface, click the button in the red circle as shown below

	Settings Network				
	Sketchbook location:				
	C:\Users\Fman\Documents\Arduino Brows				
Introduction	Editor language:	English (English)	~	(requires restart of Arduino)	
Features	Editor font size:	19			
Application Scenarios	Interface scale:	Automatic 100 📥 % (requires r	restart of Arduino)		
Specification	Theme:	Default theme \lor (requires resta	rt of Arduino)		
Board Overview	Show verbose output during:	🗌 compilation 🔲 upload			
Pin Diagram	Compiler warnings:	None 🗸			
Pin Definition	🗹 Display line numbers		🗹 Enable Code Foldi	ng	
Tutorial – First Time Use	🗹 Verify code after upload	L	🗌 Use external edit	or	
Basic Tutorial	🗹 Check for updates on sta	rtup	🗹 Save when verifyi	ng or uploading	
Advanced Tutorial	Use accessibility featur	es			
FAQ	Additional Boards Manager UN	RLs: 2_dev_index.json,http://downlog	ad. dfrobot. top/FireBee	etle/package_DFRobot_index.json	▫)
More Documents	More preferences can be edit	ted directly in the file			\smile
	C:\Users\Fman\AppData\Local	\Arduino15\preferences.txt			
	(edit only when Arduino is n	not running)			

3. Copy the following link into the new pop-up dialog box:

Stable version: https://espressif.github.io/arduino-esp32/package_esp32_index.json (https://espressif.github.io/arduino-esp32/package_esp32_index.json)

Development release: https://espressif.github.io/arduino-esp32/package_esp32_dev_index.json (https://espressif.github.io/arduino-esp32/package_esp32_dev_index.json)

Note:

0K

Cancel

.

5 10:17	Beetle ESP32-C6 Microcontroller Wiki - DFRobot
	 Please choose the appropriate version according to Chip Support Situation
	(https://github.com/espressif/arduino-esp32#supported-chips).
	• If you have installed another environment before, you can press Enter key at the beginning or end of
Introduction	the previous link and paste the link at a new line.
Features	
Application Scenarios	Additional Boards Manager URLs
Specification	Enter additional URLs, one for each row
Board Overview	https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_dev_index.json
Pin Diagram	http://download.dfrobot.top/FireBeetle/package_DFRobot_index.json
Pin Definition	
Tutorial – First Time Use	
Basic Tutorial	
Advanced Tutorial	Click for a list of unofficial boards support URLs
FAQ	OK Cancel
More Documents	

4. Click OK. Update the board. Open Tools->Board:->Boards Manager... as shown below:

>

 \times

	💿 Blink Arduino 1.8	3.0			
	File Edit Sketch To	ols Help			
		Auto Format	Ctrl+T		
		Archive Sketch			
	Blink	Fix Encoding & Reload			
Introduction	1 /* 2 Blink	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L		Â
Features	3 Turns on an 4 7	WiFi101 Firmware Updater			
Application Scenarios	5 Most Arduin 6 it is attac	Board: "Arduino/Genuino Zero (Programming P	'ort)"	Boards Manager	
Specification	7 the correct 8 If you want	Port: "COM134" Get Board Info	I	Arduine SAMB (32-bits ARM Cortex-M0+) Boards	
Board Overview	9 the Technic	Programmer: "ArduinoISP.org"	,	Arduino/Genuino Zero (Native USB Port)	_
Pin Diagram	11 This exampl	Burn Bootloader		Arduino AVR Boards Arduino Yún	
Pin Definition	13 modified 8 May	2014		Arduino/Genuino Uno	E
Tutorial – First Time Use	14 by Scott Fitzg	er al d		Arduino Duemilanove or Diecimila Arduino Nano	
Basic Tutorial	16 modified 2 Sep 17 by Arturo Guad	2016 Lalupi		Arduino/Genuino Mega or Mega 2560 Arduino Mega ADK	
Advanced Tutorial	18 19 modified 8 Sep	2016		Arduino Leonardo	
FAQ	20 by Colby Newma 21 */	n		Arduino Leonardo ETH Arduino/Genuino Micro	
More Documents	22			Arduino Esplora	
	23		, ,	Arduino Mini	
	24 // the setup fun 25 woid setup 0 {	action runs once when you press reset or power the	e board	Arduino Ethernet	
		ב		Arduino Fio	

5. Boards Manager will automatically update the boards as shown below:

	💿 Boards Manager
	Type All - Filter your search
Introduction	Arduino AVR Boards by Arduino version 1.6.17 INSTALLED Boards included in this package:
Features	MegaADK, Arduino Jeonardo, Arduino Leonardo Ethernet, Arduino Jecimila, Arduino Mano, Arduino Belora, Arduino Mega, Arduino Arduino Fio, Arduino Leonardo, Arduino Leonardo Ethernet, Arduino/Genuino Micro, Arduino Esplora, Arduino Mini, Arduino Ethernet, Arduino Fio, Arduino BT, Arduino LilyPadUSB, Arduino Lilypad, Arduino Pro, Arduino ATMegaNG, Arduino Robot Control, Arduino
Application Scenarios	Robot Motor, Arduino Gemma, Adafruit Circuit Playground, Arduino Yún Mini, Arduino Industrial 101, Linino One.
Specification	More info
Board Overview	
Pin Diagram	Arduino SAM Boards (32-bits ARM Cortex-M3) by Arduino
Pin Definition	Boards included in this package: Arduino Due.
Tutorial – First Time Use	Online help More linfo
Basic Tutorial	
Advanced Tutorial	
FAQ	Boards included in this package:
More Documents	Arduino/Genuino Zero, Arduino/Genuino MKR1000, Arduino MKRZero, Arduino MKRFox1200, Arduino M0 Pro, Arduino M0, Arduino Tian, Adafruit Circuit Playground Express. Online help
	Downloading platforms index

6. After completing the update, you can enter esp32 at the top, select esp32 and click install when the following occurs (It's recommended to install the latest version):



7. Wait for the end of the following progress bar:

	🥯 Boards Manager	×
	Type All V ESP32	
	DFRobot ESP32 Boards	^
Introduction	by DFRobot version 0.2.1 INSTALLED Boards included in this package:	
Features	FireBettle ESP32-E Borad.	
Application Scenarios		
Specification		
Board Overview	esp32	
Pin Diagram	by Espressif Systems Boards included in this package:	
Pin Definition	ESP32 Dev Module, WEMOS LoLin32, WEMOS D1 MINI ESP32. More Info	
Tutorial – First Time Use	Instal	ling
Basic Tutorial		
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		×
	Verifying archive integrity	Cancel

8. After completing the installation, the list will show that the esp32 has been installed, as shown below:

>

	🥯 Boards Manager	×
	Type All V ESP32	
	DFRobot ESP32 Boards	^
Introduction	by DFRobot version 0.2.1 INSTALLED	
Features	FireBettle ESP32-E Borad, FireBettle ESP32 Borad.	
Application Scenarios	More Into	
Specification		
Board Overview	esp32	
Pin Diagram	by Espressif Systems version 2.0.0 INSTALLED Boards included in this package:	
Pin Definition	ESP32 Dev Module, WEMOS LoLin32, WEMOS D1 MINI ESP32. More Info	
Tutorial – First Time Use	Select version V Install Remove	
Basic Tutorial		
Advanced Tutorial		
FAQ		
More Documents		
		~
		Close

9. Click Tools->Board, select DFRobot FireBeetle 2 ESP32-C6.

	🐵 sketch jan12a Arduino 1.8.19				
	File Edit Sketch To	ools Help			
		Auto Format	Ctrl+T		
		Archive Sketch			
	sketch_jan12a	Fix Encoding & Reload			
	1 void s	Manage Libraries	Ctrl+Shift+I		
Introduction	2 // p	Serial Monitor	Ctrl+Shift+M		
	3	Serial Plotter	Ctrl+Shift+L		
Features	4	WiFi101 / WiFiNINA Firmware Updater			
Application Scenarios	4 }				7
	5	Board: "DFRobot FireBeetle 2 ESP32-C6"		Boards Manager	_
Specification	6 void 1	Upload Speed: "921600"	1	Arduino AVR Boards 🔅	▲
De and Over days	7 // p	USB CDC On Boot: "Enabled"	1	ESP32 Arduino	DFRobot Beetle ESP32-C3
Board Overview	8	CPU Frequency: "160MHz (WiFi)"	>		DFRobot Beetle ESP32-C6
Pin Diagram	9 1	Flash Frequency: "80MHz"	>		FireBeetle 2 ESP32-E
r in Biagrain	- I	Flash Mode: "QIO"	>		DFRobot Firebeetle 2 ESP32-S3
Pin Definition		Flash Size: "4MB (32Mb)"	>		DFRobot FireBeetle 2 ESP32-C6
		Partition Scheme: "Default 4MB with spiffs (1.2MB APP/1.5MB SPIFFS)"	>		DFRobot Romeo ESP32-S3
Tutoriai – First Time Use		Core Debug Level: "None"	>		FireBeetle-ESP32
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10. Before starting, you need to configure the following settings (when you select Disabled, the serial port is RX(17), TX(16), if you need to print on the Arduino monitor via USB, you need to select Enable)

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>

		sketch	jan1	2a	Arduino 1.8.19	
	File	Edit	Sket	ch 1	Tools Help	
					Auto Format	Ctrl+T
					Archive Sketch	
Introduction	s	ketch_	jan13	2a	Fix Encoding & Reload	
Features	1	L vo	id	s	Manage Libraries	Ctrl+Shift+I
Application Scenarios	2	2	11	q	Serial Monitor	Ctrl+Shift+M
Specification	3	3		1	Serial Plotter	Ctrl+Shift+L
Board Overview	4	1 }			WiFi101 / WiFiNINA Firmware Updater	
Pin Diagram	F	5			Board: "DFRobot FireBeetle 2 ESP32-C6"	>
Pin Definition	6	5 v o	id	1	Upload Speed: "921600"	>
Tutorial – First Time Use	-	7	11	p	USB CDC On Boot: "Enabled"	>
Basic Tutorial	2	2	<i>, ,</i>	1	CPU Frequency: "160MHz (WiFi)"	>
Advanced Tutorial					Flash Frequency: "80MHz"	>
FAQ	2	2 }			Flash Mode: "QIO"	>
Mara Documento					Flash Size: "4MB (32Mb)"	>
More Documents					Partition Scheme: "Default 4MB with spiffs (1.2MB APP/1.5MB SPIFFS)"	>
					Core Debug Level: "None"	>
					Erase All Flash Before Sketch Upload: "Disabled"	>
					JTAG Adapter: "Disabled"	>
					Port: "COM151 (ESP32H2 Dev Module)"	>
					Get Board Info	

11. Click Port to select the corresponding serial port.

Programmer

Burn Bootloader

LED Blinking

1

The default pin for the onboard LED is pin 15.

>

Sample Code

}

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>

```
int led = 15;
void setup() {
   pinMode(led,OUTPUT);
}
void loop() {
   digitalWrite(led,HIGH);
   delay(1000);
   digitalWrite(led,LOW);
   delay(1000);
```

- Copy the codes above to the code editing box.
- Click the arrow to complile the program and burn it into your development board.

Burning Successful



mage above shows that your codes have been successfully loaded into the board. Then, the onboard LED will start blinking.

• Burning failed? Click here.

(https://wiki.dfrobot.com/SKU_DFR1075_FireBeetle_2_Board_ESP32_C6#target_9)

Basic Tutorial

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The basic tutorial (https://wiki.dfrobot.com/SKU_DFR1075_FireBeetle_2_Board_ESP32_C6_Basic_Tutorial) includes the use of Battery voltage detection, PWM, interrupt, serial port, servo, and SD card.

Advanced Tutorial

The advanced tutorial (https://wiki.dfrobot.com/SKU_DFR1075_FireBeetle_2_Board_ESP32_C6_Advanced_Tutorial) domenstrates how to use screen, Bluetooth, WiFi, ESP-NOW, one-key for networking config and sample projects.

FAQ

1. What will cause burning error?

• There is no delay or too short delay in Loop.

A fatal error occurred: Timed out waiting for packet header A fatal error occurred: Timed out waiting for packet header

• The USB cannot be recognized by the PC as some functions are incorrectly called.

How to solve

• Press and hold BOOT, click RST, and then release the BOOT button to burn.

Principle During the initialization process, ESP32 undertakes a verification of the voltage level on the BOOT (IO9) pin. If the voltage level is determined to be high, the system proceeds with a normal startup. In contrast, if the voltage level is deemed to be low, the device enters into the programming mode. By default,

the BOOT pin maintains a high voltage level, but it transitions to a low level when a button is pressed.

2. Data cannot be printed on serial port

Check if the USB CDC is enabled

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Check print information using other serial debugger.

For any questions, advice or cool ideas to share, please visit the **DFRobot Forum** (https://www.dfrobot.com/forum/).

More Documents

- ESP32-C6 Chip Datasheet (https://dfimg.dfrobot.com/60c1e008bddfc41c3293de80/wiki/bd5febb16dd4b86eb34cb387815080a e.pdf)
- DFR1117-Schematics.pdf (https://dfimg.dfrobot.com/60c1e008bddfc41c3293de80/wiki/68dbe234c15e4e218d4c9b54a674ea61 .pdf)
- DFR1117-Dimension.pdf (https://dfimg.dfrobot.com/60c1e008bddfc41c3293de80/wiki/b6ccaa7b1c039a85403ae8ec6a33c98a .png)
- RT9080 Chip Datasheet (https://dfimg.dfrobot.com/5d57611a3416442fa39bffca/wiki/d310c343a276135955547d238c122064. pdf)

Get Beetle ESP32-C6 (https://www.dfrobot.com/product-2778.html) from DFRobot Store or DFRobot Distributor. (https://www.dfrobot.com/distributor)

Turn to the Top (https://wiki.dfrobot.com/SKU_DFR1117_Beetle_ESP32_C6#target_0)