C.H.I.P. Pro Overview

The C.H.I.P. Pro System-on-a-Module is designed to get you making great products instead of re-inventing computers. It's a low-cost, high-capability module that lets you focus on fast iterations of brilliant ideas that will be ready to manufacture.

This document provides technical details on the module and basic guides for getting started with working with C.H.I.P. Pro. To get the most out of developing and designing for C.H.I.P. Pro, we recommend the C.H.I.P. Pro Development Kit.

Overview

C.H.I.P. Pro is a breadboard-friendly and surface-mount-ready computer designed from the ground up to power the next generation of smart devices.

C.H.I.P. Pro is powered by GR8, a system-in-package (SiP) that was designed by us at Next Thing Co. GR8 features a 1GHz Allwinner R8 ARM Cortex-A8 processor, Mali400 GPU, and 256MB of Nanya DDR3 DRAM. in a 14mm x 14mm FBGA package. C.H.I.P. Pro adds to the GR8 with 512MB of high-speed NAND storage, WiFi and Bluetooth connectivity, power and battery management, pins for popular I/O busses, USB gadget, the verstatility of mainline Linux, all on a compact footprint.

The module offers all the popular interfaces you'd expect. With two UARTs, a Two Wire Interface, a parallel camera interface, SPI, two PWM channels, a USB 2.0 OTG, and a USB 2.0 Host, C.H.I.P. Pro is packed full of opportunity. Comprehensive audio handling includes a built-in 24-bit ADC/DAC for stereo audio in and out, One Wire Audio digital out, and I2S digital audio for interfacing with professional audio DACs.

C.H.I.P Pro is CE, IC, and FCC part 15 modularly certified, making integration into end products easy. The on-board Realtek 8723DS combination module provides compliant Wi-Fi B/G/N and Bluetooth 4.2 Low-Energy connectivity. A software controlled antenna path selects between the on-

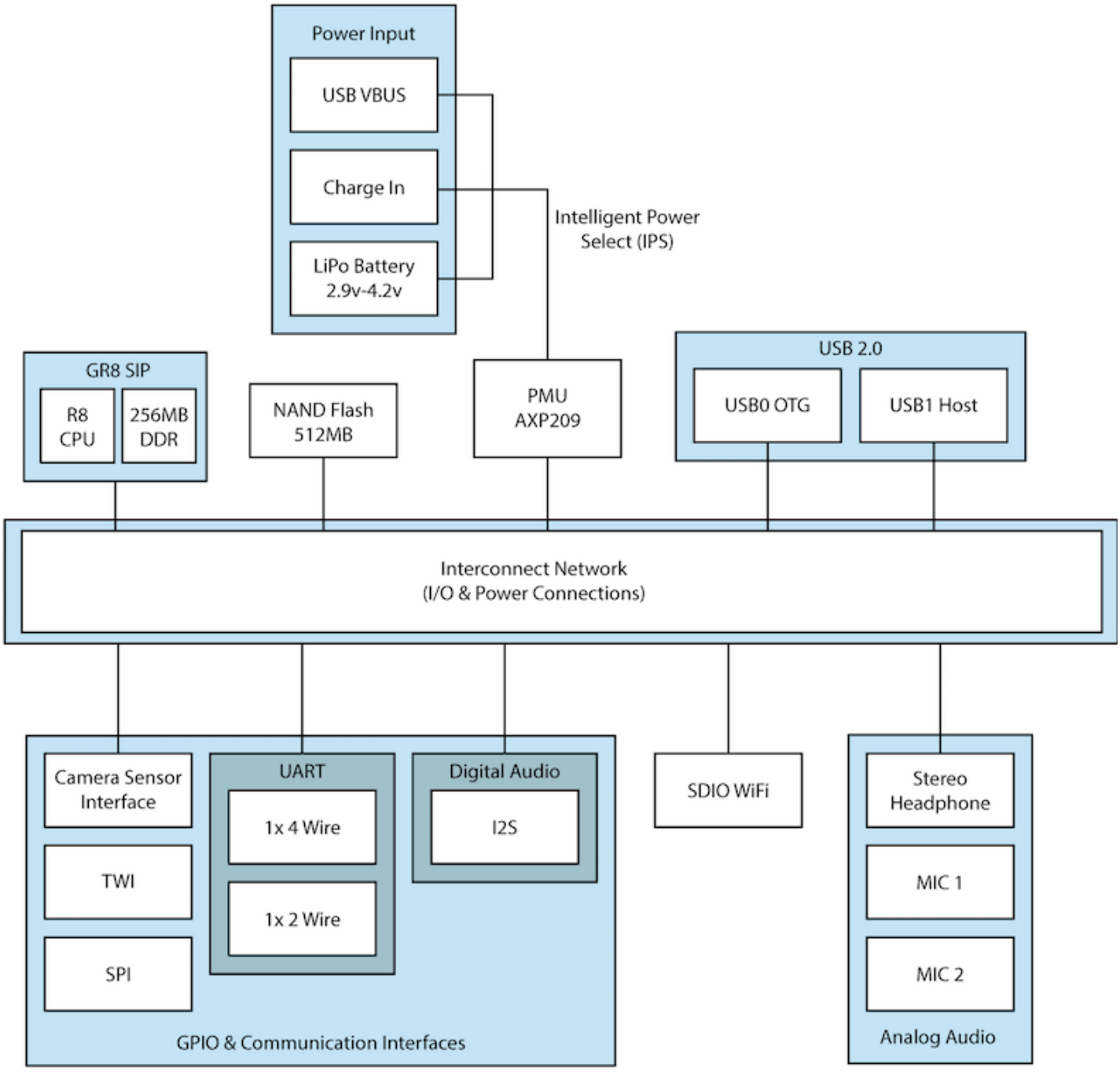
board chip antenna or a uFL antenna connector where several pre-certified antennas can be added to boost wireless transmit and receive range.

Charge or power from an AC/DC adapter or power it from USB or a rechargable battery. On-board Power management with the AXP209 provides plenty of power options to better match your applications: mobile, industrial, and low-power are all possible with C.H.I.P. Pro.

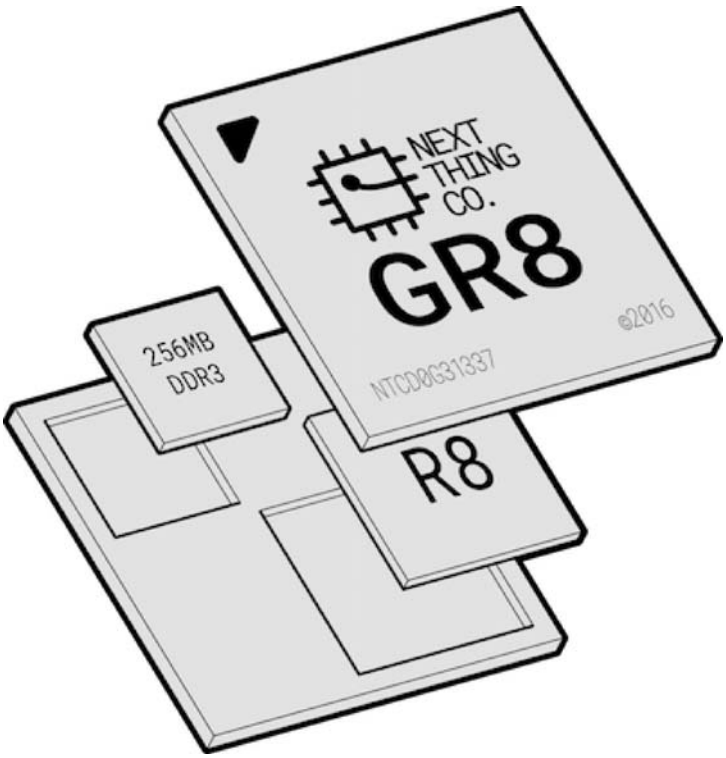
C.H.I.P. Pro is rated to operate between 2.9V-6V in temperatures ranging between 0 and 70 degrees Celsius and measures 45mm x 30mm.

We can't wait to see how you'll integrate C.H.I.P Pro into your next product.

Block Diagram



GR8 SiP



C.H.I.P. Pro is built around the GR8 System-in-Package that combines an Allwinner R8 with DDR3 memory on the same piece of silicon. Basic specifications are as follows:

- 1GHz Next Thing Co. GR8 ARM Cortex-A8 with ARMv7 instruction set and NEON coprocessor
- Mali-400 GPU supporting OpenGL ES1.1/ 2.0 and OpenVG 1.1
- 256MB DDR3 RAM

More information about the GR8 SiP can be found in the GR8 data sheet

Specifications

C.H.I.P. Pro Exposed Interfaces

- 1x Two Wire Interface
- 2x UART (1x 2-wire and 1x 4-wire)
- SPI enabling SD card interface
- SPI Bus
- 2x PWM
- 6-bit ADC
- I2S Digital Audio
- S/PDIF IEC-60958 Digital Audio Input and Output
- 2x USB HS/FS/LS
    - USB 2.0 Host
    - USB 2.0 OTG
- Parallel Camera Interface
- 3.3V DC supply
- 27 GPIO

Audio

- Stereo analog input 44.1K or 48K sampling rate
- Stereo analog output 44.1K or 48K sampling rate
- Programmable phantom power for mic in
- Bi-directional I2S bus for external DAC codecs

Power and Battery Management

- AXP209 power management unit, connected to a dedicated I2C bus
- 2.9V to 6V
- 0 to 70 degrees Celsius

Wireless Connectivity

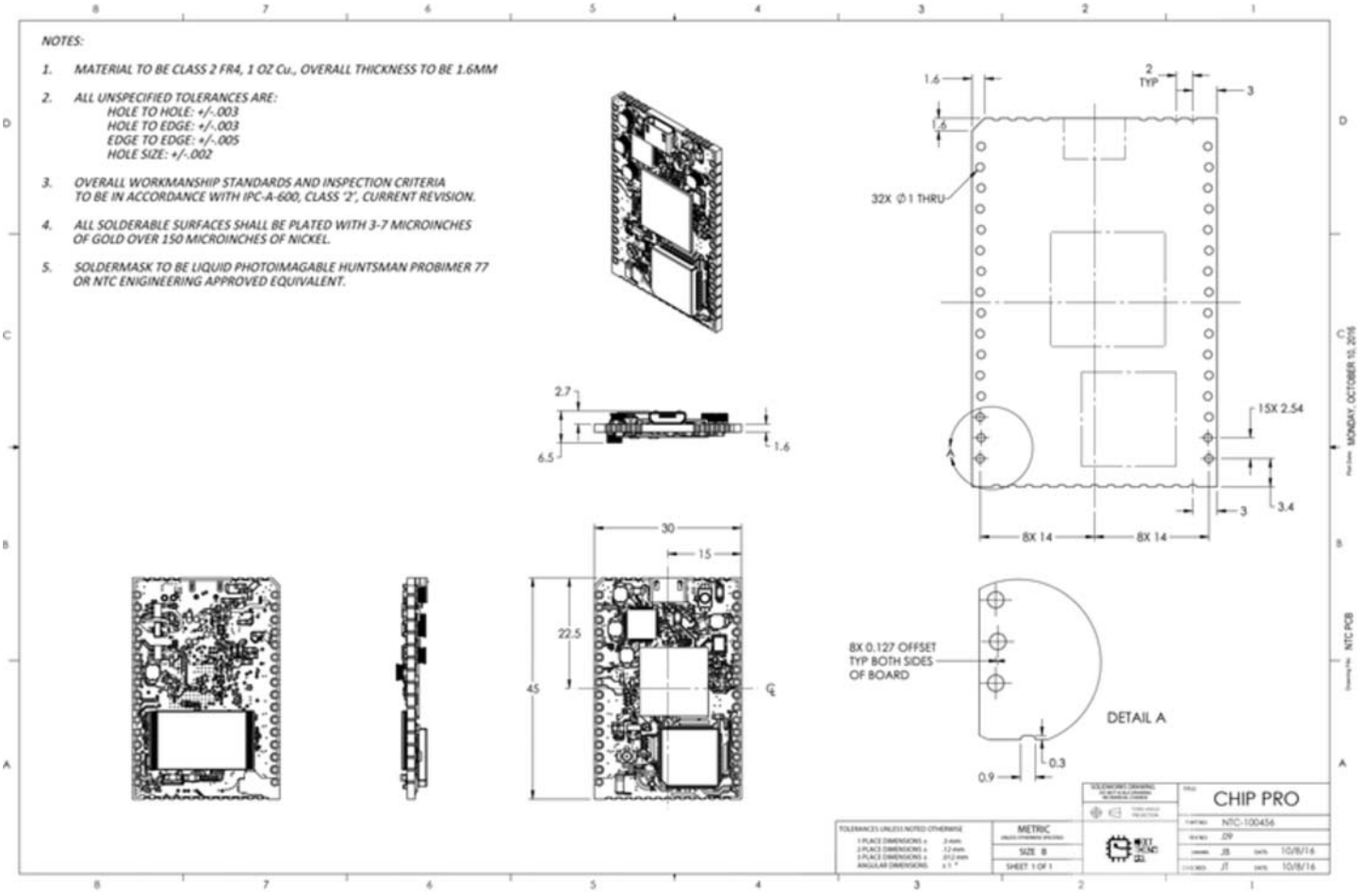
- Realtek 8723DS Combination Module
- Bluetooth 4.2 LE
- WiFi 802.11 b/g/n
- uFL antenna connector
- FCC/CE/IC certified

Operating System

- GadgetOS, a Linux optimized for GR8 and C.H.I.P. Pro
- Debian for C.H.I.P. Pro, for a familiar Linux experience
- Next Thing Co. rootfs on GitHub so developers can create their own Linux distro for C.H.I.P. Pro

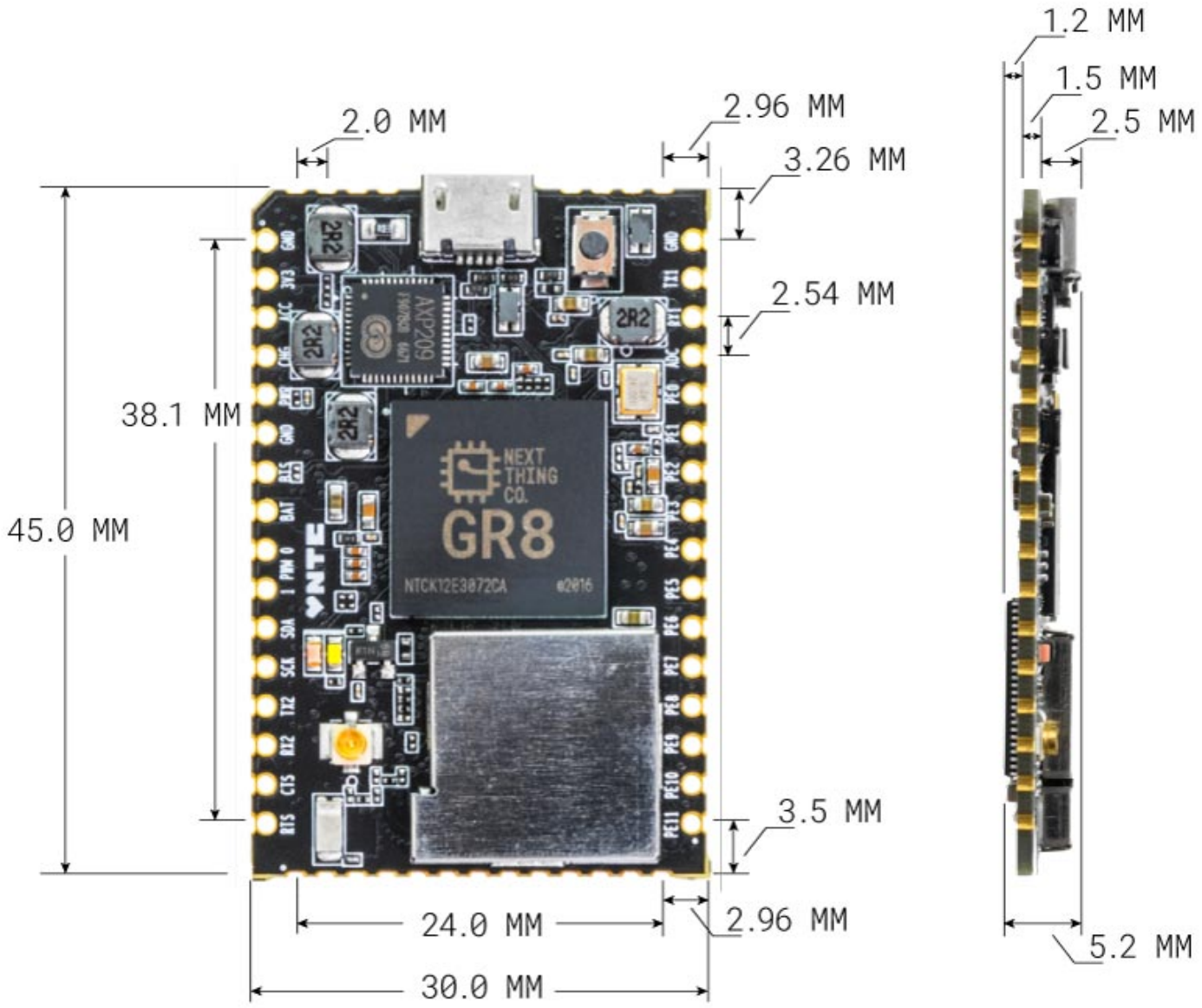
Mechanical Drawing

You can download a high resolution version of this image here



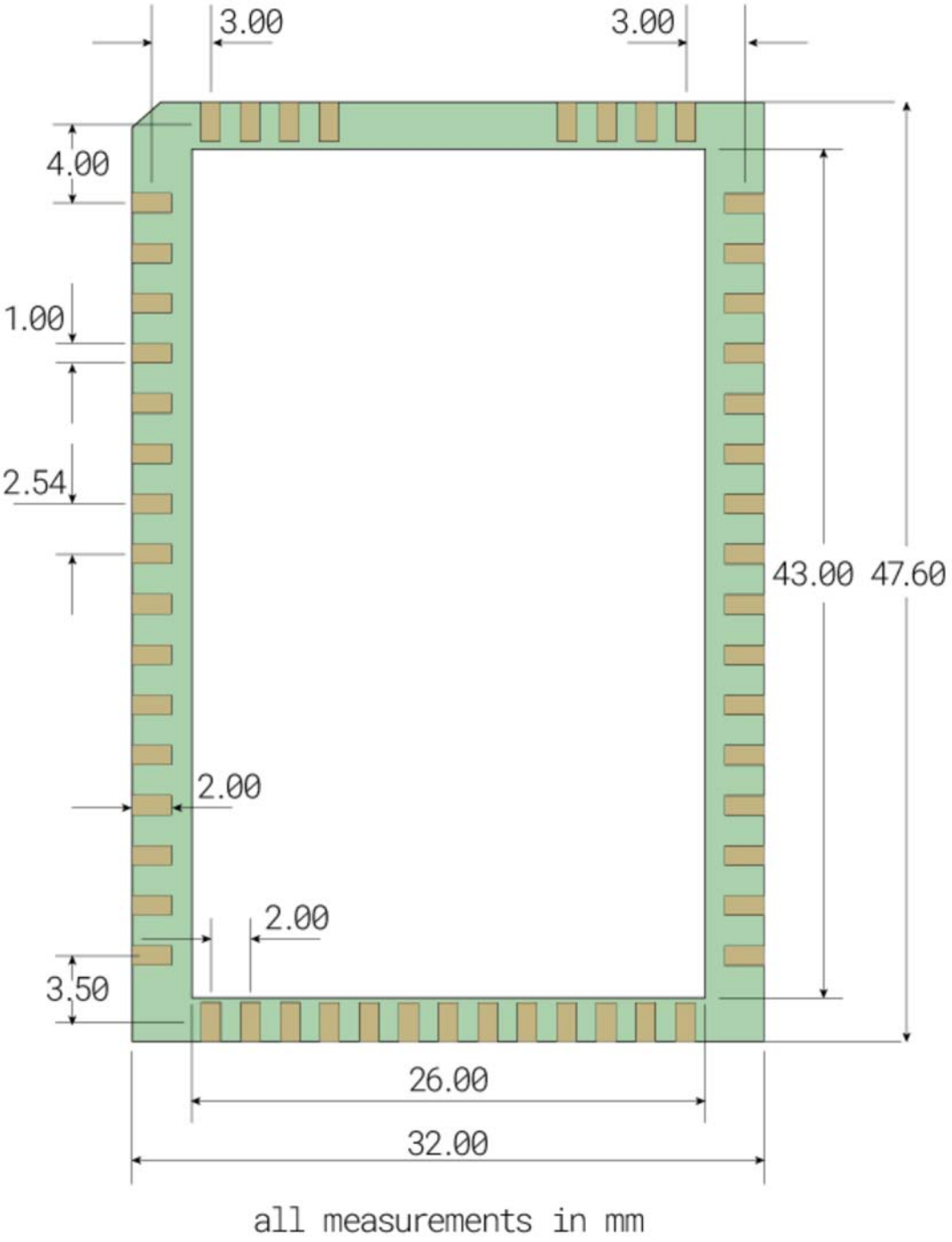
DIMENSIONS

Refer to the following diagram for the complete dimensions of C.H.I.P. Pro:



PCB Footprint

C.H.I.P. Pro is designed for scale so it's ready to drop into any SMT manufacturing line. The exterior dimensions for the PCB pads for C.H.I.P. Pro are 32 mm x 47.60 mm (1.26 in x 1.87 in). More detailed dimensions for your board layout are in the following diagram:



Data Sheet

While this documentation contains much of the needed technical info for C.H.I.P. Pro, the complete data sheet for C.H.I.P. Pro is available on our C.H.I.P. Pro Hardware github repo

Get Working With C.H.I.P. Pro

Power In, Power Out

C.H.I.P. Pro can be powered in a few ways, all managed by the AXP209 power management circuit. For simple applications on the test desk, power can be provided over the micro USB connector from a USB power supply or powered USB hub. But C.H.I.P. is for building, and depending on the nature of your product, there are different power options to make it easier to make with C.H.I.P. Pro.

- **CHG-IN** - connect 4.8 to 6 volts of power to this pin (and GND) to provide power for C.H.I.P. Pro. If you have a Lithium Polymer (LiPo) battery connected to BAT, then power provided to CHG-IN will also charge the battery.
- **BAT** - connect a 3.7 volts Lithium Polymer (LiPo) battery to this pin (and GND) to provide power to C.H.I.P. Pro and receive charge from power inputs.
- **VBUS** - connect 5 volts to this pin (and GND to pin 53) to provide power to C.H.I.P.. Power connected to VBUS will also charge a battery, just at a slower rate than from CHG-IN

C.H.I.P. Pro has three options for providing power to peripherals and sensors.

- **VCC-3V3** - provides 3.3V for sensors.
- **IPSOUT** - the Intelligent Power Select provides up to 2.5 amps at up to 5 volts, depending on power provided at CHG-IN or VBUS. If a 3.7V LiPo battery is the only source of power, IPSOUT will provide a bit less than 3.7 volts. In general, the voltage at IPSOUT is a bit less than voltage in, with a max voltage of 5 volts.
- **PWRON** - connect to ground to turn C.H.I.P. Pro on and boot the operating system.

If you need to provide power to a USB device connected to USB1, connect IPSOUT to an appropriate switching regulator to the USB connector pad on your circuit board.

Powering Off

Ideally C.H.I.P. Pro should be powered off through a terminal window using the `poweroff` command. Alternatively, connect PWR pin to GND for 7-10 seconds to power off or disconnect power supply.

Get an Operating System

Like its larger brother C.H.I.P., C.H.I.P. Pro's GR8 SiP can run mainline Linux. This provides security, flexibility, robust tools, and open-source options for getting your product working. In the interest of power consumption and storage space, we have several options to best fit your production.

GADGET OS

There are several examples of the Gadget OS for the Developer's Kit. These examples are designed around the hardware on the Developer's Kit board. If you are building a circuit that incorporates mics and LEDs you can start with these examples and a bare C.H.I.P. Pro. Read more in the developer's kit documentation

DEBIAN

We provide a standard Debian distribution, complete with all the package managers and conveniences you know and love. This package is ideal for development, since it is more flexible than the buildroot-based Gadget OS. However, you will want to keep track of your dependencies to more easily transition to the more nimble Gadget OS.

THINGS YOU WILL NEED

- C.H.I.P. Pro
- Standard-USB to micro-USB connector
- An appendage to hold down the FEL button
- Separate computer with Chrome or Chromium browser

FLASH

Visit our OS flash site at flash.getchip.com in Chrome or Chromium browser. Hold down the FEL button on C.H.I.P. Pro and follow all the instructions in the browser. If you haven't already, you'll be asked to install the C.H.I.P. Flasher Plug-in for Chrome.

USE IT

Now that you have power and an operating system, you can connect to your C.H.I.P. Pro to test software and hardware, customize it, or load new software. There are two very important connections for this: serial and network.

Serial Connection

The most basic connection to C.H.I.P. Pro is a serial connection controlled through a host computer's terminal program.

UART

THINGS YOU WILL NEED

- USB-UART cable (for example)
- Drivers

- Soldering gun
- Solder
- Pin headers
- Computer with monitor (for example, a C.H.I.P.!)
- Terminal program for Windows such as Cygwin or PuTTY (OS X and Linux have terminals built-in)

A UART to USB serial connection between C.H.I.P. Pro and your computer offers the most comprehensive look at what's happening in C.H.I.P. Pro as it boots, since you can get all message output from the moment it starts booting. You'll need a USB to UART cable and the appropriate drivers for your computer's OS.

For example, this cable uses the Prolific hardware, with drivers available on their site. Another popular chipset for these cables is FTDI.

Connect the cable to your computer and the UART pins on C.H.I.P. Pro. You'll need to solder some headers onto C.H.I.P. Pro for a reliable connection to the loose wires on the cable. The black cable goes to ground, green is usually RX, and white is usually TX, but there's no guarantee. So, make sure to check the manufacturer's product description for the correct pinouts.

From your computer's terminal use the command:

```
screen /dev/tty.usbserial 115200 #OS X
screen /dev/ttyUSB0 115200       #Linux
```

Another popular program besides screen is `cu`.

For Windows read our guide on connecting with PuTTY or Cygwin.

USB GADGET SERIAL

THINGS YOU WILL NEED

- USB A to micro-USB cable (for example)
- Computer with monitor (for example, a C.H.I.P.!)
- Terminal program for Windows such as Cygwin or PuTTY (OS X and Linux have terminals built-in)

If your OS is configured for Gadget serial, this is usually the easiest way to get inside C.H.I.P. Pro's software. While you won't be able to get boot messages, since the serial emulation won't be ready, all you need is a USB A to micro-USB cable to connect C.H.I.P. Pro to your computer. From your computer's terminal:

```
screen /dev/tty.usbmodem1440 115200 #OS X
screen /dev/ttyACM0 115200          #Linux
```

Note that for OS X you either need to list out all the tty devices with `ls /dev/tty.usbm*` to find the actual ID or use the tab key to autocomplete, like `screen /dev/tty.usbm <tab>`.

For Windows read our guide on connecting with PuTTY or Cygwin.

Log In

Once you have connected via serial you'll be prompted for a username and password. The defaults are `chip` and `chip`. Change your password with `passwd`.

Network

Once you have connected to C.H.I.P. Pro with a serial connection, you can set it up for network access. How this happens depends on the OS you have loaded onto C.H.I.P. Pro. Most likely you'll be able to make basic connections to a WiFi network using either `connman` or `nmcli` in the command line.

CONNMAN

The basic commands to connect are done in a connman terminal. You can learn more about connman here

```
sudo connmanctl # enter the connman terminal

>enable wifi # turn on wifi
>scan wifi # find networks
>agent on # let connman prompt for a password when needed
```

```
>services # list all the visible networks so you can get the wifi_ id string
>connect wifi_7cc70905cd77_4e5443_managed_psk #connect to wifi_ id, connman will then prompt for password
>quit # get back to linux terminal
```

If your network does not have a password (ends with `managed_none`), you can connect using the `wifi_` id that does not have the word “hidden” in it.

Confirm your connection with `ping -c 4 8.8.8.8` and get your IP address from the wlan0 line from `ip a`.

SSH ON BUILDROOT

Once you have your C.H.I.P. Pro on the network, chances are that you’ll want to use `ssh` to connect to it. You can `ssh chip@<ip address>`. However, you’ll probably want to switch to `root` once you are in. You can do that with the command `su` and use `root` as the password.

NMCLI

You may find `nmcli` is the gateway to your network if you are using a Debian linux image on C.H.I.P. Pro. There’s a lot of information about nmcli on the archlinux site. If nmcli is what you need, here are the commands you can use to connect to a network using your serial connection in the terminal:

```
sudo nmcli d wifi # list visible wifi networks
sudo nmcli d wifi connect "Network SSID Name" password "Your Password" ifname wlan0 # if network is hidden add this to end: hidden yes
```

SSH ON DEBIAN

If you want to connect to C.H.I.P. Pro with `ssh` you will probably find it convenient to setup a unique name for your C.H.I.P. Pro. This gist has a simple script to make this easy.

PING!

It’s always reassuring to check that you have a connection with ping:

```
ping 8.8.8.8 #google dns server
```

Access I/O via sysfs

GPIO INPUT

These lines of code will let us read values on pin CSIDO, which corresponds to pin 132 in the linux sysfs (CSID0-CSID7 have numbers 132-139) First, we tell the system we want to listen to this pin:

```
sudo sh -c 'echo 132 > /sys/class/gpio/export'
```

View the mode of the pin. This should return “in”:

```
cat /sys/class/gpio/gpio132/direction
```

Connect a jumper wire or switch between Pin CSID0 and GND. Now use this line of code to read the value:

```
cat /sys/class/gpio/gpio132/value
```

GPIO OUTPUT

You could also change the mode of a pin from “in” to “out”

```
sudo sh -c 'echo out > /sys/class/gpio/gpio132/direction'
```

Now that it’s in output mode, you can write a value to the pin:

```
sudo sh -c 'echo 1 > /sys/class/gpio/gpio132/value'
```

If you attach an LED to the pin and ground, the LED will illuminate according to your control messages.

GPIO DONE

When you are done experimenting tell the system to stop listening to the gpio pin:

```
sudo sh -c 'echo 132 > /sys/class/gpio/unexport'
```

FINDING GPIO PIN NAMES

You can calculate the sysfs pin number using the Allwinner R8 Datasheet, starting on page 18.

The letter index is a multiple of 32 (where A=0), and the number is an offset. For example PE4 is `CSID_D0` so

```
E=4
(32*4)+4 = 132
```

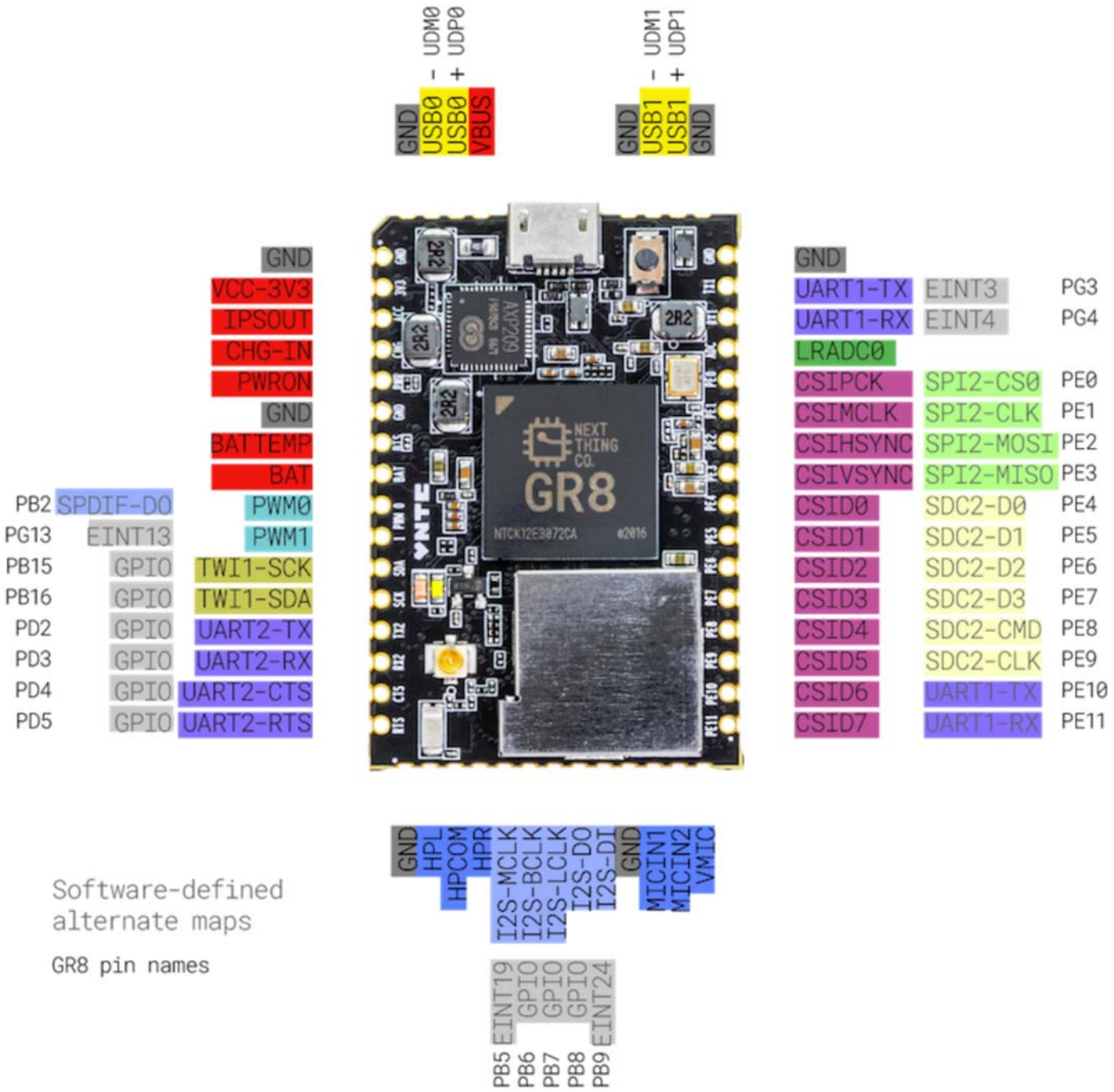
Therefore, listening to CSID0 in sysfs would begin with

```
sudo sh -c 'echo 132 > /sys/class/gpio/export'
```

Open Source

The C.H.I.P. Pro is open source hardware. Get all the details in our github repo.

Pin Descriptions



The C.H.I.P. Pro has a number of specialized pins for input and output, plus 27 general purpose input and output (GPIO) pins. The image above shows the pin location and muxing on C.H.I.P. Pro, and tables below organize pins according to their specialized functions.

- Pin Number
- Port
- GR8 Pin Name
- Signal Description
- Type

For more detailed information about pins on C.H.I.P. Pro and the GR8, please see the data sheets available here.

BATTEMP

Pin Number	Port	GR8 Pin Name	Signal Description	Type
7	NA	BATTEMP	Thermistor connection for battery heat detection	I

PWM

Pin Number	Port	GR8 Pin Name	Signal Description	Type
9	PB2	PWM0	Pulse Width Module Channel0 Output	O
10	PG13	PWM1	Pulse Width Module Channel1 Output	O

TWI1

Pin Number	Port	GR8 Pin Name	Signal Description	Type
11	PB16	TWI1-SCK	TWI0 Clock	I/O
12	PB15	TWI1-SDA	TWI0 Data/Address	I/O

UART – Universal Asynchronous Receiver/Transmitter

Pin Number	Port	GR8 Pin Name	Signal Description	Type
44	PG3	UART1-TX	UART1 Data Transmit	O
43	PG4	UART1-RX	UART1 Data Receive	I
13	PD2	UART2-TX	UART2 Data Transmit	I
14	PD3	UART2-RX	UART2 Data Receive	O
15	PD4	UART2-CTS	UART2 Data Clear to Send	I
16	PD5	UART2-RTS	UART2 Data Request to Send	I

Audio Codec

Pin Number	Port	GR8 Pin Name	Signal Description	Type
26	NA	AGND	Audio Codec Analog Ground	G
19	NA	HPCOM	Headphone Common Reference Output	AO
18	NA	HPL	Headphone Left Channel Output	AO
20	NA	HPR	Headphone Right Channel Output	AO
27	NA	MICIN1	Microphone Input	AI
28	NA	MICIN2	Microphone Input	AI
29	NA	VMIC	Bias Voltage Out	AO

I2S

Pin Number	Port	GR8 Pin Name	Signal Description	Type
21	PB5	I2S-MCLK	I2S Master Clock	O
22	PB6	I2S-BCLK	I2S Bit Clock	I/O
23	PB7	I2S-LRCK	I2S Left/Right Channel Select Clock	I/O
24	PB8	I2S-DO	I2S Data Output	O
25	PB9	I2S-DI	I2S Data Input	I

OWA – One Wire Audio

Pin Number	Port	GR8 Pin Name	Signal Description	Type
9	PB2	OWA-DO	OWA Data Output	O

LRADC

Pin Number	Port	GR8 Pin Name	Signal Description	Type
42	NA	LRADC0	ADC Input Channel0 for Multi-Button Input	I

SPI – Serial Peripheral Interface

Pin Number	Port	GR8 Pin Name	Signal Description	Type
41	PE0	SPI2-CS0	SPI2 Chip Slect Signal (active low)	I/O
40	PE1	SPI2-CLK	SPI2 Clock Signal	I/O
39	PE2	SPI2-MISO	SPI2 Master Data In, Slave Data Out	I/O
38	PE3	SPI2-MOSI	SPI2 Master Data Out, Slave Data In	I/O

D0-D7 – General Purpose In/Out

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
37-30	D0-D7	GPIO	Digital I/O	I/O

CSI – Camera Sensor Interface

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
41	PE0	CSI-PCLK	CSI Pixel Clock	I
40	PE1	CSI-MCLK	CSI Master Clock	O

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
39	PE2	CSI-HSYNC	CSI Horizontal Sync	I
38	PE3	CSI-VSYNC	CSI Vertical Sync	I
37-30	PE4-PE11	CSI-Data[7:0]	CSI Data Bit	I

SD/MMC

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
37-34	PE4-PE7	SDC2-D[3:0]	SDC2 Data Bit [3:0]	I/O
33	PE8	SDC2-CMD	SDC2 Command Signal	I/O
32	PE9	SDC2-CLK	SDC2 Clock	O

External Interrupt

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
44	PG3	EINT3	External Interupt Input	I
42	PG4	EINT4	External Interupt Input	I
10	PG13	EINT13	External Interupt Input	I
21	PB5	EINT19	External Interupt Input	I
25	PB9	EINT24	External Interupt Input	I

USB1 and USB0

Pin Number	Port Name	GR8 Pin Name	Signal Description	Type
52	UDM0	USB0-DM	USB0 D- Signal	A I/O
51	UDP0	USB0-DP	USB0 D+ Signal	A I/O
48	UDM1	USB1-DM	USB1 D- Signal	A I/O
47	UDP1	USB1-DP	USB1 D+ Signal	A I/O
50	VUSB	VCC-USB	VBUS Power Supply	P

Note: The on-board micro-USB connector is wired in series with the castellated edge points at VBUS, UDP0, UDM0, and GND. If you connect a USB host to both the castellated edges AND the connector, at best your USB will no longer work, at worst you may damage your equipment.

C.H.I.P. Pro FAQ

What are the C.H.I.P. Pro specifications?

- 1GHz Next Thing Co. GR8 processor - ARM Cortex-A8 with ARMv7 instruction set and NEON instruction set
- Mali-400 supporting OpenGL ES1.1 /2.0 and OpenVG 1.1
- 512MB NAND flash storage
- 256MB DDR3 RAM
- WiFi B/G/N
- Bluetooth 4.2 LE
- I2S
- 1x Two Wire Interface
- 2x UART (1x 2-wire and 1x 4-wire)
- 2x SPI controllers
- 27 GPIO

How much does C.H.I.P. Pro cost?

C.H.I.P. Pro costs $16.

Are there quantity discounts?

C.H.I.P. Pro is $16 no matter how many you order. But, if you have to ask you should contact sales@nextthing.co.

Is the C.H.I.P. Pro open source?

Yes, you can see our design files in our git repository.

Does C.H.I.P. Pro replace C.H.I.P.?

C.H.I.P. is still a huge part of what we do. We made C.H.I.P. Pro and Gadget so the enterprising members of the CHIPster community would have a great option for scalable hardware, software and infrastructure for their products.

Where can I buy the C.H.I.P. Pro?

Currently, we're offering the C.H.I.P. Pro Dev kit for $49 in our web store with an estimated shipping by the end of this year. C.H.I.P. Pro will be available in Q1 of 2017.

How many may I order?

As many or as few as you'd like. 1 to 1 million (or more). For larger orders, hit us up at sales@nextthing.co

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When will C.H.I.P. Pro ship?

C.H.I.P. Pro Dev kits are shipping in late Q4 of 2016 and C.H.I.P. Pro will be available in any quantity starting Q1 of 2017.

What is the lead time on a C.H.I.P. Pro order?

Once available in Q1 of 2017, small orders (1-20) will ship immediately. For large orders taking advantage of our factory flashing offering, there will be a lead time of 60 days.

I made a C.H.I.P. prototype, will it be hardware and software compatible with GR8?

Yes! GR8 has the same Allwinner R8 processor that is in C.H.I.P., so your C.H.I.P. software is 100% compatible with C.H.I.P. Pro. We believe you shouldn't have to change your software to go into production.

C.H.I.P v C.H.I.P Pro

C.H.I.P and C.H.I.P Pro have a lot of similarities, but there are some very important distinctions that go beyond the obvious size differences.

feature	C.H.I.P	C.H.I.P Pro
RAM	512 MB	256 MB
Storage	4GB NAND SLC or 8GB NAND MLC	512 MB SLC NAND
SD Card Interface	Yes, 4-bit	Yes, 4-bit
I2S Digital Audio	No	Yes
Video Interface	Composite	No
Certification	Section 15	Section 15 Modular
Easy to Mass Produce with	No	Yes
Easy to Play With	Yes	No

feature	C.H.I.P	C.H.I.P Pro
Size	Big (40.64 mm x 60.50 mm)	Small (30 mm x 45 mm)
Pin Headers	Yes	No
Operating System	Debian	Gadget
SOC	Allwinner R8 ARM7	Next Thing GR8 ARM7
Speed	1 Ghz	1 Ghz
Wifi	B/G/N 2.4GHz (Realtek RTL8723BS)	B/G/N 2.4GHz (Realtex RTL8723DS)
Bluetooth	4.0	4.2
PWM	1	2
Audio Input	1 channel	2 channel

If you are looking for a more C.H.I.P-like experience with connectors and LEDS, we recommend the Development Kit.

GR8 Pins in C.H.I.P. Pro

Function	Pin Name	On C.H.I.P. Pro	Future Use	Multi2	Multi3	Multi4	Multi5	Multi6	Multi7
PB(21)	PB0		TWI0	TWI0_SCK					
	PB1		TWI0	TWI0_SDA					
	PB2	PWM0		PWM0	SPDIF_DO			EINT16	
	PB3		IR	IR_TX				EINT17	
	PB4		IR	IR_RX				EINT18	
	PB5	I2S		I2S_MCLK				EINT19	
	PB6	I2S		I2S_BCLK				EINT20	
	PB7	I2S		I2S_LRCK				EINT21	
	PB8	I2S		I2S_DO				EINT22	
	PB9	I2S		I2S_DI	SPDIF_DI			EINT23	
	PB10	SPDIF		SPI2_CS1	SPDIF_DO			EINT24	
	PB11		JTAG0	SPI2_CS0	JTAG_MS0			EINT25	
	PB12		JTAG0	SPI2_CLK	JTAG_CK0			EINT26	
	PB13		JTAG0	SPI2_MOSI	JTAG_DO0			EINT27	
	PB14		JTAG0	SPI2_MISO	JTAG_DI0			EINT28	
	PB15	TWI1		TWI1_SCK					
	PB16	TWI1		TWI1_SDA					
	PB17		TWI2	TWI2_SCK					
	PB18		TWI2	TWI2_SDA					
PC(20)	PC0	NAND		NWE	SPI0_MOSI				
	PC1	NAND		NALE	SPI0_MISO				

Function	Pin Name	On C.H.I.P. Pro	Future Use	Multi2	Multi3	Multi4	Multi5	Multi6	Multi7
	PC2	NAND		NCLE	SPI0_CLK				
	PC3	NAND		NCE1	SPI0_CS0				
	PC4	NAND		NCE0					
	PC5	NAND		NRE					
	PC6	NAND		NRB0	SDC2_CMD				
	PC7	NAND		NRB1	SDC2_CLK				
	PC8	NAND		NDQ0	SDC2_D0				
	PC9	NAND		NDQ1	SDC2_D1				
	PC10	NAND		NDQ2	SDC2_D2				
	PC11	NAND		NDQ3	SDC2_D3				
	PC12	NAND		NDQ4	SDC2_D4				
	PC13	NAND		NDQ5	SDC2_D5				
	PC14	NAND		NDQ6	SDC2_D6				
	PC15	NAND		NDQ7	SDC2_D7				
	PC19	NAND		NDQS	UART2_RX	UART3_RTS			
	PD2	UART2	LCD	LCD_D2	UART2_TX				
	PD3	UART2	LCD	LCD_D3	UART2_RX				
	PD4	UART2	LCD	LCD_D4	UART2_CTS				
	PD5	UART2	LCD	LCD_D5	UART2_RTS				
	PD6		LCD	LCD_D6	ECRS				
	PD7		LCD	LCD_D7	ECOL				
	PD10		LCD	LCD_D10	ERXD0				
	PD11		LCD	LCD_D11	ERXD1				
	PD12		LCD	LCD_D12	ERXD2				
	PD13		LCD	LCD_D13	ERXD3				
	PD14		LCD	LCD_D14	ERXCK				
	PD15		LCD	LCD_D15	ERXERR				
	PD18		LCD	LCD_D18	ERXDV				
	PD19		LCD	LCD_D19	ETXD0				
	PD20		LCD	LCD_D20	ETXD1				
	PD21		LCD	LCD_D21	ETXD2				
	PD22		LCD	LCD_D22	ETXD3				
	PD23		LCD	LCD_D23	ETXEN				
	PD24		LCD	LCD_CLK	ETXCK				
	PD25		LCD	LCD_DE	ETXERR				
	PD26		LCD	LCD_HSYNC	EMDC				

Function	Pin Name	On C.H.I.P. Pro	Future Use	Multi2	Multi3	Multi4	Multi5	Multi6	Multi7	
	PD27		LCD	LCD_VSYNC	EMDIO					
PE(12)	PE0	SPI2	CSI	TS_CLK	CSI_PCLK	SPI2_CS0		EINT14		
	PE1	SPI2	CSI	TS_ERR	CSI_MCLK	SPI2_CLK		EINT15		
	PE2	SPI2	CSI	TS_SYNC	CSI_HSYNC	SPI2_MOSI				
	PE3	SPI2	CSI	TS_DVLD	CSI_VSYNC	SPI2_MISO				
	PE4	SDC2	CSI	TS_D0	CSI_D0	SDC2_D0				
	PE5	SDC2	CSI	TS_D1	CSI_D1	SDC2_D1				
	PE6	SDC2	CSI	TS_D2	CSI_D2	SDC2_D2				
	PE7	SDC2	CSI	TS_D3	CSI_D3	SDC2_D3				
	PE8	SDC2	CSI	TS_D4	CSI_D4	SDC2_CMD				
	PE9	SDC2	CSI	TS_D5	CSI_D5	SDC2_CLK				
	PE10	UART1	CSI	TS_D6	CSI_D6	UART1_TX				
	PE11	UART1	CSI	TS_D7	CSI_D7	UART1_RX				
PF(6)	PF0		SDC0	SDC0_D1		JTAG_MS1				
	PF1		SDC0	SDC0_D0		JTAG_DI1				
	PF2		SDC0	SDC0_CLK		UART0_TX				
	PF3		SDC0	SDC0_CMD		JTAG_DO1				
	PF4		SDC0	SDC0_D3		UART0_RX				
	PF5		SDC0	SDC0_D2		JTAG_CK1				
PG(14)	PG0		GPS	GPS_CLK				EINT0		
	PG1		GPS	GPS_SIGN				EINT1		
	PG2		GPS	GPS_MAG				EINT2		USB0-IDDET
	PG3		UART1	SDC1_CMD	MS_BS	UART1_TX		EINT3		
	PG4		UART1	SDC1_CLK	MS_CLK	UART1_RX		EINT4		
	PG5		UART1	SDC1_D0	MS_D0	UART1_CTS		EINT5		
	PG6		UART1	SDC1_D1	MS_D1	UART1_RTS	UART2_RTS	EINT6		
	PG7		UART2	SDC1_D2	MS_D2		UART2_TX	EINT7		
	PG8		UART2	SDC1_D3	MS_D3		UART2_RX	EINT8		
	PG9		SPI1	SPI1_CS0	UART3_TX			EINT9		
	PG10		SPI1	SPI1_CLK	UART3_RX			EINT10		
	PG11		SPI1	SPI1_MOSI	UART3_CTS			EINT11		
	PG12		SPI1	SPI1_MISO	UART3_RTS			EINT12		
	PG13	PWM1	SPI1	SPI1_CS1	PWM1		UART2_CTS	EINT13		
TVOUT	TVOUT		TVOUT							
USB	UDM0	USB0								

Function	Pin Name	On C.H.I.P. Pro	Future Use	Multi2	Multi3	Multi4	Multi5	Multi6	Multi7
	UDP0	USB0							
	UDM1	USB1							
	UDP1	USB1							
	VCC_USB								
TP	TPX1		TP						
	TPX2		TP						
	TPY1		TP						
	TPY2		TP						
	LINEINL		LINEIN						
	LINEINR		LINEIN						
	MIC1OUTP								
	MIC1OUTN								
	VMIC								
	MICIN2	MICIN2							
	MICIN1	MICIN1							
	VRA1								
	VRA2								
	AVCC								
	VRP								
	AGND								
	HPR	AUDIO-OUT							
	HPCOM	AUDIO-OUT							
	HPCOMFB								
	VCC_HP								
	HPBP								
	HPL	AUDIO-OUT							
LRADC	LRADC0	LRADC0							
	LRADC1								