Free PDK Documentation

Free PDK is an open sourced and independently created tool-chain for the Padauk 8-Bit Microcontrollers, created as an alternative to the proprietary and closed tools provided by the Taiwanese company itself.

This includes the EasyPDKProg µC programmer hardware, adding support for the Padauk µCs to the SDCC C-Compiler, as well as comprehensive documentation of the instruction set architecture, and code examples.

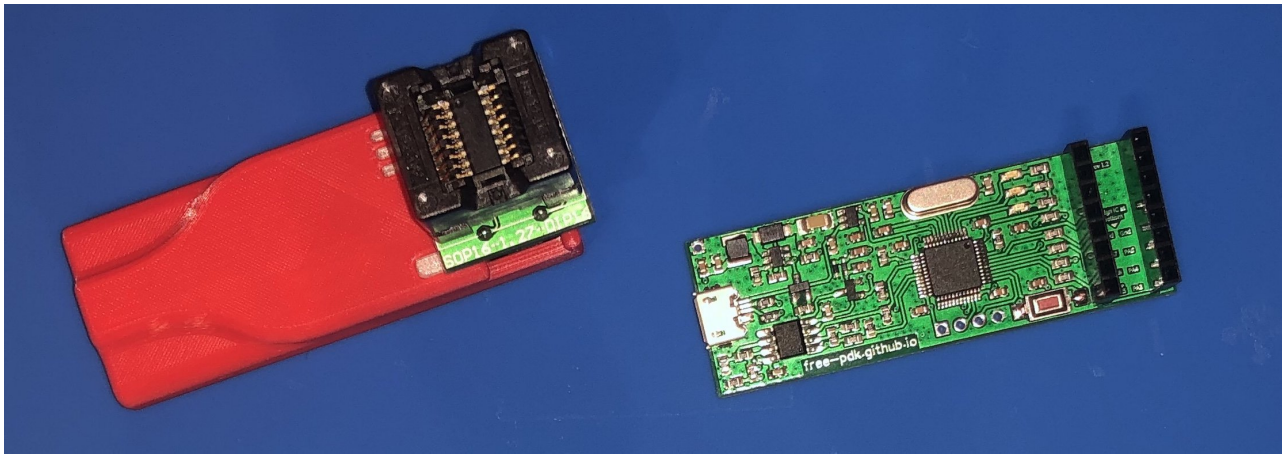
The main focus is on supporting µCs of two Padauk series:

- M series OTP (OTP = *one time programmable*)
- F series MTP (MTP = *multiple time programmable*)

Padauk µCs are extremely inexpensive, priced as low as $0.03/pc in volumes of 100, which is why they generated a lot of interest after being featured by Dave from the EEVblog (first video and a bunch of follow-up videos). Despite the low price, it was found that the Padauk µCs sport an interesting architecture that can be a seen as a significant and meaningful extension of the Microchip PIC architecture. There is an extensive and active discussion on the EEVblog forum for this project and further discussion here on µC.net (German).

This page provides an overview of the different sub-projects created in the free-pdk GitHub organization. It also provides custom pinout diagrams for some of the Padauk µCs.

Easy PDK Programmer



Padauk µCs are programmed via a proprietary high-voltage protocol. The protocol was reverse engineered and a fully open source programmer that already supports almost two dozen Padauk µCs has been created. All sources for the programmer are available at:

- Easy PDK Programmer Hardware
- Easy PDK Programmer Software

SDCC-based Open Source Tool-Chain

Padauk's own tool-chain is based on a custom programming language called "Mini-C" with a syntax based on the C-language. This language is only supported by their own tool-chain, including IDE ("Padauk Developer Studio") and programmer ("Writer"). The tool-chain also uses a custom binary format with encryption/obfuscation. Should you be interested in code samples in that custom language, take a look at free-pdk/fppa-code-examples.

The open source tool-chain is based on the Small Device C-Compiler (SDCC) and therefore does support Standard C and common binary output formats (intel hex and bin), including those used by the Easy PDK Programmer.

Please note that right now there is no interchangeability between both tool-chains. Binaries generated by SDCC cannot be written by the official Padauk programmer, but only by the Easy PDK Programmer.

Padauk µCs use different kinds of instruction sets: 13, 14, 15, or 16 bit (more information on these instruction sets can be found below). Support for the 14 and 15 bit Padauk instruction sets has been added to SDCC, a C compiler for small devices. Support for the 13 bit Padauk instruction set is being worked on.

Helpful SDCC resources:

- SDCC Documentation
- Open bugs in the Padauk integration
- Feature Requests related to the Padauk integration

Installing SDCC

The latest binaries and sources of SDCC can be obtained on the SDCC website. If SDCC is available via your operating system's package manager, please ensure that it is at least SDCC 4.0.0; older versions may not have support or only limited support for the Padauk µC.

µC-specific Information and Pinouts

Note: Other µCs than the µCs listed here may be supported. If you want to learn more about the naming scheme, read more here.

MTP (Flash) Variants

MCU	OSS Status	Arch.	max IO	ROM	RAM	Timers	PWM	CMP	
PFS154	Supported	PDK14	14	2 KW	128	T16 T2 T3	2x 8-Bit 3x 11-Bit	1	
PFS172	Supported	PDK14	14	2 KW	128	T16 T2 T3	2x 8-Bit	1	
PFS173	Supported	PDK15	18	3 KW	256	T16 T2 T3	2x 8-Bit 3x 11-Bit	1	

OTP Variants

MCU	OSS Status	Arch.	max IO	ROM	RAM	Timers	PWM	CI
PMS150C	Supported	PDK13	6	1 KW	64	T16 T2	1x 8-Bit	
PMS15A	Supported	PDK13	6	0.5 KW (1 KW *)	64	T16 T2	1x 8-Bit	
PMS152	Supported	PDK14	14	1.25 KW	80	T16 T2	1x 8-Bit 3x 11-Bit	
PMS154C	Supported	PDK14	14	2 KW	128	T16 T2 T3	2x 8-Bit 3x 11-Bit	
PMS171B	Supported	PDK14	14	1.5 KW	96	T16 T2 T3	2x 8-Bit	

Evaluation Boards

These are evaluation boards for the online-programmable MTP (as opposed to the OTP parts, which can only be programmed offline and once) Padauk µC. free-pdk/f-eval-boards.

Instruction Sets, Opcodes, and Programming Sequence

The different Padauk µCs use either 13, 14, 15, or 16 bit instruction sets. The following files provide an overview over the different instruction sets.

- PDK13
- PDK14
- PDK15
- PDK16

More information, including information on the programming sequence, can be found at free-pdk/fppa-pdk-documentation

Other Tools

- **Schematic Symbols**: A collection of schematic symbols for many of the Padauk µCs.
  - **gEDA gschem**: free-pdk/pdk-gschem-symbols
  - **KiCad**: free-pdk/pdk-kicad-symbols
- **Padauk µC Emulator written in VHDL**: This project aims to provide a fully functional, timing accurate VHDL model for simulating PADAUK FPPA microcontrollers. free-pdk/fppa-pdk-emulator-vhdl
- A bunch more tools are located at free-pdk/fppa-pdk-tools.
  - **Disassembler**: dispdk supports 13 bit, 14 bit, 15 bit and 16 bit opcodes
  - **Emulator**: emupdk supports 14 bit opcodes, no peripheral support yet requires mapping of processor ID in emucpu.c
  - **PDK converter**: depdk convert/deobfuscate any PDK file to binary

Projects from the Community

These projects are auto-populated once per day by searching GitHub for repositories with

the `padauk` topic. Projects that additionally have the `free-pdk` topic are highlighted as Uses Free PDK toolchain . Projects that contain `.PRE` files are marked as Uses proprietary toolchain .

free-pdk

free-pdk-examples

Uses Free PDK toolchain

Code Examples for Padauk MCUs using the free-pdk/SDCC toolchain

`pfs154` `pfs172` `pfs173` `pms150c` `pms152` `pms154c` `pms171b`

updated 1 month ago · 15 ⭐

cpldcpu

BitNetPDK

Uses Free PDK toolchain

A proof-of-concept (hack) to implement neural network inference on a very tiny 8-bit microcontroller.

`pfs154` `pms150c`

updated 2 months ago · 30 ⭐

free-pdk

easy-pdk-programmer-software

Uses Free PDK toolchain

Easy PDK programmer for PADAUK microcontroller

`pfs154` `pfs173` `pmc150` `pmc154` `pms150` `pms150c` `pms154`

updated 3 months ago · 106 ⭐

brainsmoke

ws2812tester

Uses Free PDK toolchain

Padauk based WS2812 LED tester

`pfs154` `pms150c` `ws2812`

updated 6 months ago

akionu

clover-timer

Uses Free PDK toolchain

Simple Countdown Timer using 3-Cent Padauk MCU

`pms150g`

updated 7 months ago

free-pdk

pdk-includes

Uses Free PDK toolchain

Device Include files for Padauk MCUs

`pfs154` `pfs172` `pfs173` `pms150c` `pms152` `pms154c` `pms15a` `pms171b`

updated 1 year ago · 9 ⭐

brainsmoke

softpwmpdk

Uses Free PDK toolchain

free-pdk

easy-pdk-showcase-

serisman

pdk-continuity-tester

3-channel software PWM LED driver

`pfs154` `pms150c`

updated 1 year ago · 4 ⭐

projects

Uses Free PDK toolchain

Complete showcase projects for PADAUK MCUs using only free and open source tools like the SDCC compiler and the Easy-PDK-Programmer.

`pfs154` `pfs172` `pfs173` `pms150c`

updated 1 year ago · 7 ⭐

Uses Free PDK toolchain

A simple standalone continuity tester, based on the ultra-inexpensive Padauk microcontrollers and a piezo buzzer.

`pfs154` `pfs173` `pms150c` `pms152` `pms154c` `pms15a`

updated 1 year ago · 9 ⭐

serisman

pdk-logic-probe

Uses Free PDK toolchain

A simple logic probe, based on the ultra-inexpensive Padauk microcontrollers.

`pfs154` `pfs173` `pms150c` `pms152` `pms154c` `pms15a`

updated 1 year ago · 2 ⭐

serisman

pdk-digital-clock

Uses Free PDK toolchain

A 4-digit 7-segment digital clock, based on the inexpensive Padauk microcontrollers

`pfs154` `pfs173` `pms152` `pms154c`

updated 1 year ago · 11 ⭐

brainsmoke

charliepdk

Uses Free PDK toolchain

Charlieplexed led array driven using a Padauk, animation / 9600 baud uart input

`charlieplexing` `pfs154` `pms150c`

updated 1 year ago · 8 ⭐

1500WK1500

platform-padauk

Uses Free PDK toolchain

jjflash65

Padauk-pfs154

Uses Free PDK toolchain

An Arduino based programmer for PFS154. Programmer is realised with external switching regulator and OP-Amp LM358 (like

free-pdk

easy-pdk-programmer-lite-hardware

Uses Free PDK toolchain

A version of the easy pdk programmer that can be fully assembled using the JLCPCB

platformio
platformio-platform
updated 2 years ago

Easy-PDK-Programmer). For now, the progammer can only flash the PFS154. I'm analyzing programming sequence for PFS173 but for the moment I have no idea to realise it. Perhaps in the future. A complete toolchain is include so you can change to a project directory and execute a "make" and a "make flash". Sorry that all comments are in german language, and sorry that this project works only in Linux (and not in Windows)

pfs154
updated 3 years ago · 20 ⭐

assembly service.

updated 3 years ago · 9 ⭐

serisman

pdk-temp-pwm-fan

Uses Free PDK toolchain

A temperature controlled PWM fan controller using an ultra-inexpensive (3 cent) Padauk microcontroller.

pms150c
updated 3 years ago · 6 ⭐

pacmancoder

easy-pdk-mini

Uses Free PDK toolchain

Padauk MCU programmer variant for hand soldering.

hardware programmer
updated 3 years ago · 15 ⭐

cpldcpu

Addressable_7-Segment

Uses Free PDK toolchain

Addressable 7 Segment Display based on the Padauk PFS154 Microcontroller

pfs154
updated 3 years ago · 4 ⭐

Kashouryo

Padauk-tone

Uses Free PDK toolchain

Turn your Padauk microcontroller into a cheap melody IC! Crude implementation of tone function in padauk micro.

`pfs154` `pms150c`

updated 3 years ago · 1 ⭐

asjadenet

padauk-serial-read-write

Uses Free PDK toolchain

Serial port read-write sample, based on the inexpensive Padauk microcontrollers

`pfs154` `pfs173`

updated 3 years ago · 5 ⭐

free-pdk

easy-pdk-programmer-hardware

Easy PDK programmer for PADAUK microcontroller. EDA, schematic, gerber, bom, housing stl, firmware

`pfs154` `pfs173` `pmc150` `pmc154` `pms150` `pms154`

updated 5 months ago · 173 ⭐

cmfcmf

ic-pinout-diagram-generator

Generate beautiful pinout diagrams for integrated circuits.

`ic` `microcontroller` `mikrocontroller` `pinout-diagram`

updated 1 year ago · 63 ⭐

serisman

pdk-device-json

.json files describing Padauk microcontrollers, generated from Padauk IDE .INC files.

`pfs154` `pfs172` `pfs173` `pms150c` `pms152` `pms154c` `pms171b`

updated 1 year ago · 2 ⭐

piotr-go

PADAUK

updated 1 year ago · 6 ⭐

screwbreaker

free-pdk

xbwpc

MDmod

Another Mega Drive switchless MOD

`megadrive` `mod` `pfs173` `pfs173-s14` `pic` `pic16f630` `sega` `sega-genesis` `sega-mega-drive` `switchless`

updated 2 years ago · 1

fppa-pdk-tools

PDK FPPA disassembler, simulator, ...

updated 3 years ago · 42

CheaPADAUK

Low cost PADAUK MCU programmer

updated 3 years ago · 5

Kashouryo

FreePDK-WRITER

Easy to use GUI frontend for easypdkprog cli. Written in C# with WPF

`pfs154` `pfs173` `pms150c` `pms15a`

updated 3 years ago · 4

free-pdk

pdk-kicad-symbols

KiCad schematic symbol library for Padauk MCUs

`pfs154` `pfs173` `pms150c` `pms152`

updated 3 years ago · 6

serisman

Padauk

A toolchain and library with example projects for the ultra cheap Padauk MCUs

`pfs154` `pfs173` `pms150c` `pms152`

updated 3 years ago · 3

LovelyA72

EZPDK8

Minimalist 8 pin Padauk MCU breakout board with pin labelled and a sharpie field

`breakout-board`

kaweksl

pdk-codebucket

Some code for Padauk uC's , mostly using I2C slave

cpldcpu

SimPad

Work towards an open source programmer for Padauk MCUs

`kicad` `pcb` `pfs154` `pms150c`

updated 4 years ago · 2

`pms150c`

updated 4 years ago · 10

`pfs154` `pms150c`

updated 4 years ago · 70

pacmancoder

vpadauk

Padauk mcu emulator

updated 4 years ago · 6

free-pdk

fppa-pdk-emulator-vhdl

VHDL simulation model for PADAUK PDK microcontrollers

updated 4 years ago · 18

retiredfeline

codeblocks-wizard-pdk

Wizard directory for Padauk projects using SDCC for the code::blocks IDE

`pdk-wizard`

updated 4 years ago · 1

benlhy

Padauk

Uses proprietary toolchain

Example code for Padauk Microcontrollers.

`low-cost` `microcontrollers`

updated 1 year ago · 22

free-pdk

fppa-code-examples

Uses proprietary toolchain

updated 4 years ago · 16

AndersBNielsen

pms150c-projects

Uses proprietary toolchain

Small Padauk Mini-C projects

updated 5 years ago · 34

Latest Activity

The latest activity in the `free-pdk` GitHub organization is fetched at least once per day and displayed below.

@spth pushed to free-pdk/fppa-pdk-documentation
bf05c1d Add PMS152G

@cpldcpu pushed to free-pdk/free-pdk.github.io
800787d Only use two threads to avoid running into rate limits

@cmfcmf commented on pull request free-pdk/free-pdk.github.io#66
remove link to dead thread.
Why not keep the link? The conversation in there remains valid, even when it is no longer active.

@gtryasak commented on issue free-pdk/easy-pdk-programmer-software#62
PMS171B RSP 0xe360 not 0xd360
easypdkprog.exe probe
Probing IC... found.
TYPE:OTP RSP:0xE360 VPP=4.50 VDD=2.00
Unsupported IC

Edit this page on GitHub

Checkout /doc-style for more information on some of the special Markdown formatting features we use.

Free PDK

Free PDK

free-pdk

Free PDK is an effort to create an open source alternative to the proprietary Padauk µC programmer, as well as adding support to SDCC for Padauk µCs.