# **Arrakis Pico Mk4 Series**

Version: v1.0.0

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# 1 Copyright

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We reserve the right to revise this document or make changes in the specifications of the product described therein at any time without notice and without obligation to notify any person of such revision or change.



# 2 Regulatory Compliances

## 2.1 CE and UKCA Notice

The Arrakis Pico Mk4 Series may contain the following LTE Module:

Trademark: Quectel

Model Number: EM05-G

Complies with: RADIO EQUIPMENT DIRECTIVE 2014/53/EU and Radio Equipment Regulations 2017 (SI 2017 No. 1206)

Article 3.1a Safety: Low Voltage Directive 2014/35/EU

- EN 62368-1:2018
- EN IEC 62368-1 :2020+A11:2020
- BS EN IEC 62368-1 :2020+A11:2020
- EN IEC 62368-1 :2020+A11:2020 (module)

Article 3.1a Health:

• EN IEC 62311:2020 (module)

Article 3.1b EMC: EMC Directive 2014/30/EU

- EN 55032:2015+AC:2016
- EN 55035:2017
- EN 61000-3-2:2014
- EN 61000-3-3:2013
- EN 61000-4-2:2009
- EN 61000-4-3:2006+A1
- EN 61000-4-4:2012
- EN 61000-4-5:2014+A1:2017
- EN 61000-4-6:2014+AC:2015
- EN 61000-4-8:2010
- EN 61000-4-11:2004+A1:2017
- BS EN 50121-4:2006+A1:2019
- BS EN 61000-6-4:2014
- BS EN 61000-4-2:2009
- BS EN IEC 61000-4-3:2020
- BS EN 61000-4-4:2012
- BS EN 61000-4-5:2014+A1:2017
- BS EN 61000-4-6:2014
- BS EN 61000-4-8:2010



- EN 301 489-1 V2.2.3 (module)
- Draft EN 301 489-19 V2.2.0 (module)
- EN 301 489-52 V1.2.1 (module)
- EN 55032:2015+A1:2020 (module)
- EN 55035:2017+A11:2020 (module)

#### Article 3.2 Radio:

- EN 301 908-1 V15.1.1 (module)
- EN 301 908-2 V13.1.1 (module)
- EN 301 908-13 V13.2.1 (module)
- EN 303 413 V1.2.1 (module)

#### RoHS 2 Directive 2011/65/EU & 2015/863/EU

- Exemption(s) used:
  - 6a, 6b, 6c

The corresponding markings are located on the device:

## 2.2 FCC PART 15 VERIFICATION STATEMENT

#### WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice: The 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.

May Contain transmitter module:

- RYK-WNFQ262ACNIBT
- N7NEM75T
- XMR2021EM05G



## 2.3 ICES-003 ISSUE 7 VERIFICATION STATEMENT

#### CAN ICES3(A)/NMB3(A)

This device complies with CAN ICES-003 Issue 7 Class A. 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. Cet appareil est conforme à la norme CAN ICES-003 Issue 7 Class A. Le fonctionnement est soumis auxdeux conditions suivantes : (1) cet appareil ne doit pas causer d'interférences nuisibles et (2) cet appareil doit accepter toute interférence reçue, y compris les interférences pouvant opération indésirable.

May Contain transmitter module:

- 2417C-EM75T
- 6158A-FQ262ACNIBT



# **3** Safety Instructions

Please read these instructions carefully and retain them for future reference.

- 1. Disconnect this equipment from the power outlet before cleaning. Do not use liquid or sprayed detergent for cleaning. Use a moist cloth or sheet.
- 2. Keep this equipment away from humidity.
- 3. Ensure the power cord is positioned to prevent tripping hazards and do not place anything on top of it.
- 4. Pay attention to all cautions and warnings on the equipment.
- 5. If the equipment is not used for an extended period, disconnect it from the main power to avoid damage from transient over-voltage.
- 6. Prolonged usage with less than 12V may damage the PSU or destroy the mainboard.
- 7. Never pour any liquid into openings as this could cause fire or electrical shock.
- 8. Have the equipment checked by service personnel if:
  - The power cord or plug is damaged.
  - Liquid has penetrated the equipment.
  - The equipment has been exposed to moisture in a condensation environment.
  - The equipment does not function properly, or you cannot get it to work by following the user manual.
  - The equipment has been dropped and damaged.
- 9. Do not leave this equipment in an unconditioned environment, with storage temperatures below -20 degrees or above 60 degrees Celsius for extended periods, as this may damage the equipment.
- 10. Unplug the power cord when performing any service or adding optional kits.
- 11. Lithium Battery Caution:
  - Risk of explosion if the battery is replaced incorrectly. Replace only with the original or an equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.
  - Do not remove the cover, and ensure no user-serviceable components are inside. Take the unit to a service center for service and repair.



# **4** Product Specifications





Fea- ture	Spec <sup>.</sup> ifi- ca- tion	Arrakis Pico Mk4 - Standard 8GB/16GB	Arrakis Pico Mk4 - Light	Arrakis Pico Mk4 - Headless
Pro- ces- sor	CPU	Intel Atom® x6413E Processor, 1.5/3.0 GHz	Intel Atom <sup>®</sup> x6211E Processor, 1.3/3.0 GHz	Intel Atom® x6200FE Pro- cessor, 1.0 GHz
Mem ory	- RAM	8GB / 16GB LP-DDR4	4GB LP-DDR4	4GB LP-DDR4
Stor- age	SSD	1x NVMe SSD on M.2 socket 2 (128 GB up to 1 TB)	1x NVMe SSD on M.2 socket 2 (128 GB up to 1 TB)	1x NVMe SSD on M.2 socket 2 (128 GB up to 1 TB)
Se- cu- rity	ТРМ	TPM 2.0 (Infineon SLB 9670VQ2.0)	TPM 2.0 (Infineon SLB 9670VQ2.0)	TPM 2.0 (Infineon SLB 9670VQ2.0)
	Se- cure Boot	Yes	Yes	Yes
I/O Ports	HDMI	1x HDMI	1x HDMI	-
	Gi- ga- bit Eth- er- net	3x 2.5 GbE (i226-IT)	2x 2.5 GbE (i226-V)	3x 2.5 GbE (i226-IT)
	USB 3.0	3x USB 3.0	3x USB 3.0	1x USB 3.0
	USB 2.0	1x USB 2.0	1x USB 2.0	-
	Se- rial Ports	1x RS232/RS-485 (Bios selectable)	-	1x RS232/RS-485 (Bios selectable)
	DIO	1x DI, 12-24V 1x DO, 12-24V max. 2A (voltage defined by DC input)	-	1x DI, 12-24V 1x DO, 12-24V max. 2A (voltage defined by DC input)
	M.2	Socket 1: M.2 3042 B-Key, USB 3.0/2.0/SATA for SSD or LTE Socket 2: M.2 2242 B-Key, USB 2.0/PCIe x2 for NVMe SSD/WiFi/AI	Socket 1: M.2 3042 B-Key, USB 3.0/2.0/SATA for SSD or LTE Socket 2: M.2 2242 B-Key, USB 2.0/PCIe x2 for NVMe SSD/WiFi	Socket 1: M.2 3042 B-Key, USB 3.0/2.0/SATA for SSD or LTE Socket 2: M.2 2242 B-Key, USB 2.0/PCIe x2 for NVMe SSD/WiFi
	SIM Slot	1 push-push Type Nano-SIM Slot	1 push-push Type Nano-SIM Slot	1 push-push Type Nano-SIM Slot
Con- nec- tiv- ity	LTE (op- tional	Quectel EM05-G Quectel EM05-E	Quectel EM05-G Quectel EM05-E	Quectel EM05-G Quectel EM05-E
Welotec	WLAN (op- <sup>G</sup> ୩୧୭୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦	I Sparklan WNFQ-262ACNI(BT) with SATA-SSD	Sparklan WNFQ-262ACNI(BT) with SATA-SSD w.welotec.com	Sparklan WNFQ- 262ACNI(BT) with SATA-SSD
48 <b>58</b> 6 La	enbach ei <mark>Al</mark> Boost	Hailo-8™ edge AI processor with <sub>4</sub> æ\$ATA-SSD	9 2554 9130 00	_ Page 9



Model	RAM	LTE	WiFi	Al processor
Arrakis Pico Mk4 Standard 8 GB	8 GB LPDDR4			
Arrakis Pico Mk4 Standard 16 GB	16 GB LPDDR4			
Arrakis Pico Mk4 Light	4 GB LPDDR4			
Arrakis Pico Mk4 Headless	4 GB LPDDR4			
Arrakis Pico Mk4 Standard 8 GB w/ LTE	8 GB LPDDR4	Cat. 4		
Arrakis Pico Mk4 Standard 16 GB w/ LTE	16 GB LPDDR4	Cat. 4		
Arrakis Pico Mk4 Light w/ LTE	4 GB LPDDR4	Cat. 4		
Arrakis Pico Mk4 Headless w/ LTE	4 GB LPDDR4	Cat. 4		
Arrakis Pico Mk4 Standard 8 GB w/ Wifi	8 GB LPDDR4		WiFi Client/ Soft AP	
Arrakis Pico Mk4 Standard 16 GB w/ Wifi	16 GB LPDDR4		WiFi Client/ Soft AP	
Arrakis Pico Mk4 Light w/ Wifi	4 GB LPDDR4		WiFi Client/ Soft AP	
Arrakis Pico Mk4 Headless w/ Wifi	4 GB LPDDR4		WiFi Client/ Soft AP	
Arrakis Pico Mk4 Standard 8 GB w/ Al	8 GB LPDDR4			Hailo-8™ edge AI proces- sor
Arrakis Pico Mk4 Standard 16 GB w/ Al	16 GB LPDDR4			Hailo-8™ edge AI proces- sor



# **5** System Information

Attention: When opening the chassis make sure to slide the chassis top to the rear. Lifting the top up may shear the SIM Slot from the PCB.



Being a powerful, yet small fanless system, the Arrakis Pico Mk4 may reach very high surface temperatures in excess of 60°C/140°F with risk of injury. Users should ensure sufficient protection against touching.

To allow for sufficient heat removal we recommend: 30mm distance on either side of the Arrakis Pico Mk4 when mounted on a DIN-Rail 100mm headroom above the Arrakis Pico Mk4 when mounted horizontally. The heatsink should be on top.



# 5.1 System Drawing





## 5.2 Mainboard Block Diagram

This block diagram describes the relationship among all interfaces and modules on the mainboard.





# 6 Power Supply



☑ Please ensure no external voltage is applied to SW! This could cause damage.

Use the terminal block to connect the Arrakis Pico Mk4 to a 12-24V DC power source.

Pin	Description
Pin 0 – VCC	V+ 12-24V
Pin 1 – SW	External power switch
Pin 2 – NC	Not connected
Pin 3 – GND	Ground
Pin 4 – GND	Ground



# 7 Interfaces and Connections



## 7.1 Arrakis Pico Mk4 Series



www.welotec.com info@welotec.com +49 2554 9130 00



# 7.2 Arrakis Pico Mk4 Series (with optional Radio Module)



Welotec GmbH Zum Hagenbach 7 48366 Laer

www.welotec.com info@welotec.com +49 2554 9130 00



# 8 Radio Modules (only relevant with optional LTE/WiFi Modules)

The Arrakis Pico Mk4 may contain one of the following RF Modules:

#### LTE:

Quectel EM05-G	Supported Bands
LTE	FDD B1/ B2/ B3/ B4/ B5/ B7/B8/ B12/B13/B14/ B18/ B19/B20/ B25/ B26/ B28/B66/B71TDD B38/ B39/ B40/ B41
WCDMA	B1/ B2/ B4/ B5/ B6/ B8/ B19

Sierra Wireless EM7590	Supported Bands
LTE	FDD B1/ B2/ B3/ B4 /B5 /B7 /B8 /B12 /B13 /B14 /B18 /B19 /B20 /B25 /B26 /B28 /B29 /B32 /B66 / B71 TDD B38 /B39 /B40 /B41 /B42 /B43 /B48
WCDMA	B1 /B2 /B4 /B8 /B19 /B5 /B6 /B9

#### WiFi:

SparkLAN WNFQ-262ACNI(BT) industrial Wifi with Qualcomm Atheros QCA6174A chipset. 802.11a/b/g/n/ac/ac wave 2



# 9 BIOS

## 9.1 Introduction:

The BIOS is a program stored in the Flash Memory on the motherboard, acting as a bridge between the hardware and the operating system. When you start the computer, the BIOS gains control and performs an auto-diagnostic test called POST (Power on Self Test) to check all necessary hardware. It detects all hardware devices and configures their parameters for synchronization. Once these tasks are completed, the BIOS hands control over to the operating system (OS).

Since the BIOS is the sole channel for hardware and software communication, it is crucial for system stability and optimal performance. In the BIOS Setup main menu, you can see several options. These options will be explained in detail down below. First, let's look at the function keys you may use here:

- Press Esc to quit the BIOS Setup.
- Press ↑↓←→ (up, down, left, right) to choose the option you want to confirm or modify.
- Press F10 to save these parameters and exit the BIOS Setup menu after you complete the setup.
- Press Page Up/Page Down or +/- keys to modify the BIOS parameters for the active option.

## 9.2 Enter BIOS

Power on the computer and press the Del key immediately to enter Setup. If the message disappears before you respond but you still wish to enter Setup, restart the system by turning it OFF then ON. You may also restart the system by simultaneously pressing Ctrl, Alt, and Delete keys.

### 9.3 BIOS menu and function keys

Hain Advanced Securi	InsydeH20 Setup Util ty Power Boot Exit	ity Rev. 5.0
BIOS Version UEFI Version	Arrakis Pico MK4 99A1 2.80	
Build Date	09/08/2023 16:16:37	
Processor Type	Intel Atom(R) x6413E Pro 1.50GHz	cessor 0
System Bus Speed	100 MHz	
Cache RAM	1536 KB	
Total Memory	8192 MB	
▶Platform Information		
System Time System Date	[13:53:10] [10/05/2023]	
F1 Help	1/4 Select Item F5/F6 Cha	nge Values F9 Setup Defaults
Esc Exit	+/+ Select Item Enter Sel	ect ► SubMenu F10 Save and Exit



In the above BIOS Setup main menu, you can see several options. These options will be explained step by step. First, let's look at a brief description of the function keys you may use here:

- Press  $\leftarrow \rightarrow$  (left, right) to select the screen.
- Press ↑↓ (up, down) to choose the option you want to confirm or modify.
- Press Enter to select.
- Press + or to modify the BIOS parameters for the active option.
- F1: General help.
- F2: Previous value.
- F3: Optimized defaults.
- F4: Save & Reset.
- Press Esc to quit the BIOS Setup.

There are six menu bars on top of the BIOS screen:

- Main: To change system basic configuration
- Advanced: To change system advanced configuration
- Security: BIOS Password settings
- Power: ACPI and wake device settings
- Boot: To change system boot configuration
- Exit: Save settings, loading, and exit options

The selected menu bar is highlighted.



## 9.4 BIOS Help

	In	sydeH20 Setup Utility	Rev. 5.0
Hain Advanced Security Po	ower Boot Exit		
		Help Dialog	
<pre>[F1]: Help [Esc]: Exit [1]: Select Iten [1]: Select Iten [+]: Select Iten [+]: Select Iten [F5]: Change Values [F6]: Change Values [Enter]: Select ▶ SubHenu [F9]: Setup Defaults [F10]: Save and Exit</pre>			
C1 Units	1/1 Salaat Haa	EF./E6 Channe Value	EQ. Satur Dafaulta
Esc Exit	+/+ Select Iten	Enter Select > Subhenu	F10 Save and Exit

#### Status Page Setup Menu/Option Page Setup Menu

Press F1 to open a help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window, press Esc.



## 9.5 Main Menu

	InsydeH20 Setup Utility	Rev. 5.0
Main Advanced Securi	ty Power Boot Exit	
BIOS Version UEFI Version Build Date	Arrakis Pico MK4 99A1 2.80 09/08/2023 16:16:37	
Processor Type System Bus Speed System Memory Speed Cache RAM Total Memory	Intel Atom(R) x6413E Processor @ 1.50GHz 100 MHz 3200 MHz 1536 KB 8192 MB	
▶Platform Information		
System Time System Date	[13:53:10] [10/05/2023]	
F1 Help Esc Exit	1/1 Select Item F5/F6 Change Value +/→ Select Item Enter Select ► Sub	es F9 Setup Defaults Menu F10 Save and Exit

The Main menu screen includes some basic system information. Highlight the item and then use the + or – keys and numerical keyboard keys to select the value you want in each item.

- System Date: Set the Date. Use Tab to switch between date elements.
- System Time: Set the Time. Use Tab to switch between time elements.

### 9.6 Advanced

	InsydeH20	Setup Utility		Rev. 5.0
Advanced				
Advanced ACP1 Settings CPU Power Hanagement Control CPU Power Limit Configuration System Agent (SA) Configuration PPCH-IO Configuration PPCH-FW Configuration	on		System ACPI Parameters	
F1 Help 1/4 Se	lect Item	F5/F6 Change Values	s F9 Setup Defaults	
Esc Exit +/+ Se	lect Item	Enter Select 🕨 Subh	lenu F10 Save and Exit	



#### 9.6.1 ACPS Settings

		InsydeH20	Setup Utility		Rev. 5.0
	Advanced				
ACP I	Settings		E	nable ACPI S3 support	
ACP I	S3 Support	<d i="" led="" sab=""></d>			
E1	Help	t/1 Select Item	E5/E6 Change Values	E9 Setup Defaults	
Esc	Exit	→ Select Item</td <td>Enter Select &gt; SubMe</td> <td>mu F10 Save and Exit</td> <td></td>	Enter Select > SubMe	mu F10 Save and Exit	

Toggle to enable/disable ACPI S3 support.

#### 9.6.2 CPU Power Limit Configuration

Advanced	insy	deH20 Setup Utility	Rev. 5.
Current Power Limit Setting	s	6	nable/Disable Power Limit 1 override.
Pockage TDP Limit	9.0	1	f this option is disabled, BIOS will
Power Limit 1	5.0	1	rogram the default values for Power
Power Limit 2	9.0	1	imit 1 and Power Limit 1 Time Window.
Power Limit 1 Override Power Limit 1 Power Limit 2 Override Power Limit 2	4Enables5 (5000) 4Enables5 (8000)		
F1 Help	1/1 Select Item	F5/F6 Change Values	P3 Setup Defaults
Exc Exit	•/4 Select Item	Enter Sciect + Subleve	F10 Save and Exit

By default, both power limit overrides are enabled. Recommended values are:

- Power Limit 1: 5000
- Power Limit 2: 9000

Increasing these values will result in higher power consumption, which will raise the case temperature and reduce the operating temperature range. Lowering these values will reduce device performance and may lead to undesired behavior.



#### 9.6.3 PCH-IO Configuration

	InsydeH20 Setup Utility	Rev. 5.0
Advanced		
PCH-10 Configuration		PCI Express Configuration settings
▶PCI Express Configuration ▶SATA Configuration		
F1 Help 1/4 Selec	t Item F5/F6 Change Value	s F9 Setup Defaults
Esc Exit +/+ Selec	t Item Enter Select 🕨 Sub	Menu F10 Save and Exit

#### 9.6.4 PCI-Express Configuration

Advanced	InsydeH20	Setup Utility	Rev. 5.0
Advanced NGFF1 M. 2 B-Key PC1e Speed	<enab led=""> <auto></auto></enab>	Cor Poi	ntrol the PCI Express Root rt.
Esc Exit	+/+ Select Item +/+ Select Item	Enter Select ► SubMen	u F10 Save and Exit

There is usually no need for users to make any changes here. The default settings are:

- MGFF1 M.2 B-Key: Enabled
- PCIe Speed: Auto



#### 9.6.5 SATA Configuration

Advanced	InsydeH20	Setup Utility		Rev. 5.0
SATA Configuration		Ena	ble/Disable SATA	Device.
SATA Controller(s)	<enabled></enabled>			
Serial ATA Port O Software Preserve Port O	<enabled> Unknown Empty</enabled>			
F1 Help Esc Exit	1/↓ Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubMenu	F9 Setup Defau F10 Save and Ex	lts it

There is usually no need for users to make any changes here. The default settings are:

- SATA Controller(s): Enabled
- Serial ATA Port 0: Enabled

Port 0 will show the type and capacity of any installed SATA drives.

Please note that the Arrakis Pico Mk4 uses NVMe storage by default, so this field will often appear empty.



#### 9.6.6 Console Redirect

Main Advanced Securi	InsydeH20 ty Power Boot Exit	Setup Utility	Rev. 5.0
<ul> <li>▶Boot Configuration</li> <li>▶SOC Config Configurati</li> <li>▶Console Redirection</li> <li>▶S10 F81804</li> <li>▶NVH Express Information</li> </ul>	lon m	C	onsole Redirection Settings
F1 Help Fre Exit	1/1 Select Item	F5/F6 Change Values	F9 Setup Defaults
	InsvdeH20	Setup Ittility	Rev 5.0
Advanced	Insyden20		Key. 5.0
Console Redirection Set Console Serial Redirect Terminal Type Baud Rate Data Bits Parity Stop Bits Flow Control	tup (VT_100> (115200> (8 Bits> (None> (1 Bit> (None> Console Se Enabled Disabled	rial Redirect	nable Console Redirection unction
F1 Help Esc Exit	1/1 Select Item +/+ Select Item	F5/F6 Change Values Enter Select ► SubMe	F9 Setup Defaults nu F10 Save and Exit

Toggle **Console Serial Redirect** to enable/disable the function.

• Default: Enabled

You can configure the terminal settings in this dialogue.



## 9.7 UART Port 1 Configuration

	InsydeH20	Setup Utility	Rev. 5.0
Advanced			
F81804 Chip 1 I/O Configuration Port PUART Port 1 Configurat PHardware Monitor Restore On Power Loss	2Eh/2Fh Ion <last state=""></last>	UAR	T Configuration
F1 Help	1/4 Select Item	F5/F6 Change Values	F9 Setup Defaults
Esc Exit	+/+ Select Item	Enter Select ► SubMenu	F10 Save and Exit
	Insyde#20	Setup Iltility	Dev 5.0
Advanced	maydenzo		Revi oro
UART Port 1 Configurati UART Port 1 Base 1/0 Address Interrupt Peripheral Type	on <enabled> &lt;3F8h&gt; &lt;1RQ4&gt; <r\$232></r\$232></enabled>	Con opt I use	figure UART Port using ions : Disabled] Disable device Enabled] Enable device and below settings

Toggle to enable/disable the serial interface.

Be advised that in RS232 mode, only RX/TX lines are supported.



## 9.8 Restore on Power Loss

	InsydeH20	Setup Utility	Rev. 5.0
Advanced			
F81804 Chip 1 1/0 Configuration Port PUART Port 1 Configurati	2Eh/2Fh on		Restore system when abnormal power condition occurs [Always Off] keep computer power off after power failure.
Restore On Power Loss	<last state=""></last>		[Always On] Turn on the
			computer after power failure.
			[Last State] After power resumes, restore computer to last state before power failure.
F1 Help	t/l Select Iten	E5/E6 Change Values	E9 Setup Defaults
Esc Exit	+/+ Select Item	Enter Select  Subh	lenu F10 Save and Exit
	Inevdal/20	Satur IItility	Pay 5.0
Advanced	msydenzo		REY. 0.0
F81804 Chip 1 1/0 Configuration Port ÞUART Port 1 Configurati	2Eh/2Fh on		Restore system when abnormal power condition occurs [Always Off] keep computer power off after power failure.
▶Hardware Monitor Restore On Power Loss	<last state=""></last>		[Always On] Turn on the

		Restore C Always Of Always Of Last Stat	On Power Loss	[Last State] After power resumes, restore computer to last state before power failure.
F1 Help	1/1 Select	Item	F5/F6 Change Va	ues F9 Setup Defaults

Toggle to configure the desired behavior after power loss. The available options are:

- Last State (default): After power resumes, the Arrakis Pico Mk4 is restored to the state it was in before the power loss.
- Always On: The Arrakis Pico Mk4 powers on automatically when power is applied.
- Always Off: The Arrakis Pico Mk4 remains off after power is restored.



## 9.9 Security

	InsydeH20	Setup Utility	Rev. 5.0
Main Advanced Security	Power Boot Exit		
Current TPM Device TPM State TPM Active PCR Hash Algor TPM Hardware Supported Ha Algorithm BIOS Supported Hash Algor TrEE Protocol Version TPM Availability TPM Operation Clear TPM	<pre><tph (dtph)="" 2.0="" <1.1="" all="" ash="" hierarchies="" rithm="" s="" sh3_256="" sha1,="" sha256="" sha256,=""> <available> <no operation=""> [ ]</no></available></tph></pre>	)> s Enabled, Owned SHA384, SHA512,	Install or Change the password and the length of password must be greater than one character.
Supervisor Password Set Supervisor Password	Not Installed		
F1 Help Esc Exit	1/↓ Select Item ⊢/+ Select Item	F5/F6 Change Values Enter Select ► Sub	: F9 Setup Defaults lenu F10 Save and Exit

- Configure the TPM
- Clear TPM

#### 9.9.1 Supervisor Password

To set up a Supervisor password:

- 1. Select Supervisor Password. A "Create New Password" dialog will pop up.
- 2. Enter your desired password (must be between 3 and 10 characters).
- 3. Press Enter to submit.

#### 9.9.2 Security Advisory

To enhance device security, we recommend the following steps in the BIOS:

- 1. Create an Admin Password in the BIOS -> Security section.
- 2. Deactivate all unnecessary boot media in the **BIOS** -> **Boot** section.



### 9.10 Power

Hain     Advanced     Security     Power     Boot     Exit       Wake     On     LAN1 <disabled>     LAN1     Function.       Wake     On     USB     <disabled>     Function.       Wake     On     RTC     <disabled></disabled></disabled></disabled>	v. 5.0
Wake On LAN1 <disabled> Wake On USB <disabled> Wake On RTC <disabled></disabled></disabled></disabled>	
	9
F1 Help 1/4 Select Item F5/F6 Change Values F9 Setup Defaults	

Toggle to enable desired Wake-up Events.

#### 9.11 Boot

	Insyde	420 Setup Utility	Rev. 5.0
Main Advanced Securi	ity Power Boot Exit	t	
Hain Advanced Securi Boot Type Quiet Boot Network Stack PXE Boot capability EF1 ▶Boot Device Priority	ty Power Boot Exit	Type> Di Te	sables or enables booting in xt Mode.
E1 Halo	1/1 Salact Itan	E5/E6 Change Values	EQ. Satua Dafaulte
Esc Exit	+/+ Select Item	Enter Select ► SubMen	u F10 Save and Exit



#### 9.11.1 Boot Type

The Arrakis Pico Mk4 is a UEFI boot-only system.

#### 9.11.2 Quiet Boot

- Options:
  - Enabled (default)
  - Disabled

#### 9.11.3 Network Stack

Enable this option if you need PXE functionality.

• Default: Disabled

#### 9.11.4 PXE Boot Capability

This item determines the protocol used during PXE boot:

- Disabled (default)
- UEFI: IPv4
- UEFI: IPv6

#### 9.11.5 EFI

Determine which **EFI storage device** the Arrakis will boot from. This item will only appear if EFI is present on the storage media.

## 9.12 Exit

	- h	nsydeH20 Setup	Utility		Rev. 5.0
Main Advanced Security	Power Boot	Exit			
Exit Saving Changes Exit Discarding Changes Load Optimal Defaults			Exit your	system setup and s changes.	save
F1 Help 1 Esc Exit +	/i Select Iter /+ Select Iter	F5/F6 Enter	Change Values Select ► SubMenu	F9 Setup Default F10 Save and Exit	s



#### 9.12.1 Exit Saving Changes

This option allows the user to reset the system after saving any changes made.

#### 9.12.2 Exit Discarding Changes

This option allows the user to restart the system without saving any changes.

#### 9.12.3 Load Optimal Defaults

Use this option to restore the optimal default settings for all setup options.



# **10 Driver Installation**

#### The Arrakis Pico Mk4 is usually shipped with an Operating System preinstalled (recommended)

In case you have chose to purchase an Arrakis Mk4 without preinstalled operating system or need to reinstall, you can download all available System drivers from this address:



Welotec Download Service

To Install the Drivers, please execute the driver installation programs according to the on-screen instructions.

www.welotec.com info@welotec.com +49 2554 9130 00

# **11** Appendix A: Power Consumption

Item	Specification
CPU	Intel Atom <sup>®</sup> x6413E Processor
RAM	LP-DDR4 8GB 3200MHz
Operating System	Windows 10 IoT 2021 LTSC
Test Program	3DMark06
mSATA	128GB

#### Results are for reference only!

Voltage	Power Off	Start up max.	Start up stable	Burn in Max	Shut Down
12V	0.07A	1.48A	0.63A	1.70A	1.31A
24V	0.04A	0.73A	0.35A	0.91A	0.65A

The Power Consumption depends on options and Software.



# 12 Appendix B: F75111N DIO & Watchdog Device

The Arrakis Pico MK4 includes optional DIO Ports. This Appendix provides an introduction to programming these ports.

## 12.1 Watchdog Timer under DOS

The necessary software resources for programming the watchdog timer can be accessed from the Driver Download section:

- Source file: F75111\_Dos\_Src.rar
- Binary file: F75111\_Dos\_Bin.rar
- USERNAME & PASSWORD: sf

#### 12.1.1 How to Use the Demo Application:

- 1. Boot into the MS-DOS Operating System.
- 2. Execute the 75WDT.EXE binary file.
- 3. Input 1 to enable the WDT timer or 0 to disable it.
- 4. Input the number of seconds for the chip countdown and reset the computer.



#### 12.1.2 Introduction:

How to use the Watchdog Timer Demo in different ways:

```
WriteI2CByte(I2CADDR, CONFIG, 0x03); // Set Watchdog Timer function
WriteI2CByte(I2CADDR, WDT_TIMER, timer); // Set Watchdog Timer range from 0-255
WriteI2CByte(I2CADDR, WDT_TIMER_CTL, 0x73); // Enable Watchdog Timer in second and pulse mode
```

Or:

WriteI2CByte(I2CADDR, WDT\_TIMER\_CTL, 0x00);

Or:



```
void pause(int time) {
    asm mov ah,Oh; // Ah = 00 Read System Time Counter
    asm int 1ah; // Read time from Time Counter and store it in DX register
    asm add dx, time;
    asm mov bx, dx;
label:
    asm int 1ah;
    asm cmp bx, dx;
    asm jne label;
}
```

### 12.2 Watchdog Timer and DIO under Windows:

The necessary software resources for programming the watchdog timer can be accessed from the Driver Download section:

- Source file: F75111\_DIOSrc.rar
- Binary file: F75111\_DemoBin.rar
- USERNAME & PASSWORD: sf



#### 12.2.1 How to Use the Demo Application:

ustomize 7511	1 Addı	ess —						
Input y	ourcu	stomiz	e addr	ess : O	x			
IO Test					-			_
🖉 di/do te	ST(LO	)			-			
🖉 di/do te:	ST(HI)				-	_		
	7	6	5	4	3	2	1	0
DO Status :	0	0	0	0	0	0	0	0
DI Status :	0	0	0	0	0	0	0	0
							Start	
VDT Test						_		
Enable	I	10	]	Dissi	le			
Enable L	oop							
						1	nstall \	NDI

- 1. Press the Start button to test the DIO function.
- 2. Press the Enable button to test the WDT function.
- 3. Press the Disable button to disable the WDT.
- 4. Check the Enable Loop box and press Enable to do a WDT loop test.
- 5. Press Install WDT to set the system to autorun this application when booting. Press it again to remove the application from booting. The icon will show when active.





The F75111 will send F75111\_SetWDTEnable(BYTE byteTimer) including a timer parameter. If there's no disable signal (F75111\_SetWDTDisable()) to stop it before the timer countdown reaches 0, the system will reboot. If a disable signal is received, it will reset the Enable WDT signal to prevent a reboot loop.

#### 12.2.2 Introduction:

**Initial Internal F75111 port address (0x9c)** Define GPIO1X, GPIO2X, GPIO3X as input or output and enable the WDT function pin.

# 12.2.3 Set F75111 DI/DO (Sample Code Below to Get Input Value/Set Output Value):

- **DO**:InterDigitalOutput(BYTE byteValue)
- DI: InterDigitalInput()

#### 12.2.4 Enable/Disable WDT:

- Enable: F75111\_SetWDTEnable(BYTE byteTimer)
- **Disable**: F75111\_SetWDTDisable()

#### 12.2.5 Pulse Mode:

Example to set GP33, 32, 31, 30 output to 1mS low pulse signal:

```
{
    this->Write_Byte(F75111_INTERNAL_ADDR, GPIO3X_PULSE_CONTROL, 0x00); // Set low pulse output
    this->Write_Byte(F75111_INTERNAL_ADDR, GPIO3X_PULSE_WIDTH_CONTROL, 0x01); // Set pulse width_u
    to 1mS
    this->Write_Byte(F75111_INTERNAL_ADDR, GPIO3X_CONTROL_MODE, 0x0F); // Set GP33, 32, 31, 30 to_u
    output function
    this->Write_Byte(F75111_INTERNAL_ADDR, GPIO3X_Output_Data, 0x0F); // Set GP33, 32, 31, 30_u
    output data
}
```



#### 12.2.6 Initialize Internal F75111:

```
void F75111::InitInternalF75111() {
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI01X_CONTROL_MODE, 0x00); // Set GPI01X to input_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI03X_CONTROL_MODE, 0x00); // Set GPI03X to input_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI02X_CONTROL_MODE, 0xFF); // Set GPI02X to output_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, F75111_CONFIGURATION, 0x03); // Enable WDT OUT function
}
```

#### 12.2.7 Set Output Value:

```
void F75111::InterDigitalOutput(BYTE byteValue) {
   BYTE byteData = 0;
   byteData = (byteData & 0x01) ? byteValue + 0x01 : byteValue;
   byteData = (byteData & 0x02) ? byteValue + 0x02 : byteValue;
   byteData = (byteData & 0x04) ? byteValue + 0x04 : byteValue;
   byteData = (byteData & 0x80) ? byteValue + 0x08 : byteValue;
   byteData = (byteData & 0x40) ? byteValue + 0x10 : byteValue;
   byteData = (byteData & 0x20) ? byteValue + 0x20 : byteValue;
   byteData = (byteData & 0x10) ? byteValue + 0x40 : byteValue;
   byteData = (byteData & 0x10) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
   byteValue + 0x80 : byteValue + 0x80 : byteValue;
   byteValue + 0x80 : byteValue + 0x80 : byteValue;
   byteValue + 0x80 : byteValue + 0x80 : byteValue;
   byteValue + 0x80 :
```

#### 12.2.8 Get Input Value:

```
BYTE F75111::InterDigitalInput() {
   BYTE byteGPIO1X = 0;
    BYTE byteGPIO3X = 0;
   BYTE byteData = 0;
    this->Read_Byte(F75111_INTERNAL_ADDR, GPIO1X_INPUT_DATA, &byteGPIO1X); // Get value from GPIO1X
    this->Read_Byte(F75111_INTERNAL_ADDR, GPI03X_INPUT_DATA, &byteGPI03X); // Get value from GPI03X
    byteGPI01X = byteGPI01X & 0xF0; // Mask unuseful value
    byteGPIO3X = byteGPIO3X & OxOF; // Mask unuseful value
    byteData = (byteGPIO1X & 0x10) ? byteData + 0x01 : byteData;
    byteData = (byteGPI01X & 0x80) ? byteData + 0x02 : byteData;
    byteData = (byteGPIO1X & 0x40) ? byteData + 0x04 : byteData;
   byteData = (byteGPIO3X & 0x01) ? byteData + 0x08 : byteData;
    byteData = (byteGPIO3X & 0x02) ? byteData + 0x10 : byteData;
    byteData = (byteGPIO3X & 0x04) ? byteData + 0x20 : byteData;
    byteData = (byteGPIO3X & 0x08) ? byteData + 0x40 : byteData;
    byteData = (byteGPIO1X & 0x20) ? byteData + 0x80 : byteData; // Get correct DI value from
→ GPIO1X & GPIO3X
    return byteData;
3
```



#### 12.2.9 Enable Watchdog:

```
void F75111_SetWDTEnable(BYTE byteTimer) {
    WriteByte(F75111_INTERNAL_ADDR, WDT_TIMER_RANGE, byteTimer); // Set Watchdog range and timer
    WriteByte(F75111_INTERNAL_ADDR, WDT_CONFIGURATION, WDT_TIMEOUT_FLAG | WDT_ENABLE | WDT_PULSE | 
    WDT_PSWIDTH_100MS);
    // Enable Watchdog, Setting Watchdog configure
}
```

#### 12.2.10 Disable Watchdog:

```
void F75111_SetWDTDisable() {
    WriteByte(F75111_INTERNAL_ADDR, WDT_CONFIGURATION, 0x00); // Disable Watchdog
}
```

## 12.3 IO Device: F75111 VB6 under Windows

The necessary software resources for programming the watchdog timer can be accessed from the Driver Download section:

- Source file: 75111\_VB\_v10.rar
- Binary file: 75111\_VB\_Src.rar111\_DemoBin.rar
- USERNAME & PASSWORD: sf



#### 12.3.1 How to Use the Demo Application

■ 75111_DEMC	) VB v1.0	i [	_ 🗆 🔀
Please key-in the tin	A A Nable WDT	<b>B</b> Disable WDT	
Please key-in the D	0 Value by he D0 Value	ex II exp:0xFF =	FF
Push the Button will s	show the DI 1>	<_3X Value II	
D Check DI Value	1×∨alue 2×∨alue		

- A Function Enable WDT timer: Enter the value in seconds, then the system will reboot after the specified time.
- B Function Disable WDT timer: Press the button to clear the WDT timer value.
- C Function Set DO Value: Enter the DO value in hex, then press the button.
- D Function Check DI Value: The two text boxes on the right display DI 1X & 2X values when you press the button.



#### 12.3.2 SDK Function Introduction

#### Function EnableWDT:

```
Function EnableWDT(timer As Integer)
Call WriteI2CByte(&H3, &H3)
Call WriteI2CByte(&H37, timer)
Call WriteI2CByte(&H36, &H73)
End Function
```

#### Function DisableWDT:

```
Function DisableWDT()
Call WriteI2CByte(&H36, &H0)
End Function
```

#### **Function SetDOValue:**

```
Function SetDOValue(dovalue As Integer)
Call WriteI2CByte(&H23, &H0)
Call WriteI2CByte(&H20, &HFF)
Call WriteI2CByte(&H2B, &HFF)
Call WriteI2CByte(&H21, dovalue)
End Function
```

#### Function CheckDIValue:

```
Function CheckDIValue()
Dim GPI01X As Integer
Dim GPI03X As Integer
Dim DI1Xhex As String
Call ReadI2CByte(&H12, GPI01X)
Call ReadI2CByte(&H42, GPI03X)
DI1Xhex = Hex(GPI01X)
DI3Xhex = Hex(GPI03X)
Text3.Text = "0x" + DI1Xhex
Text4.Text = "0x" + DI3Xhex
End Function
```

## 12.4 Watchdog Timer and DIO under Linux

The necessary software resources for programming the watchdog timer can be accessed from the Driver Download section:

- Source file: F75111v2.0L.tar.gz
- Binary file: F75111v2.0LBin.tar.gz
- USERNAME & PASSWORD: sf



#### 12.4.1 How to Compile the Source Code

#### 1. Compile with Code::Blocks:

- Download and install Code::Blocks with the command apt-get install codeblocks.
- Open the existing project (F75111.cbp) in Code::Blocks and click the compile button.
- Add the option pkg-config --libs gtk+-2.0 gthread-2.0 in "Project -> Build Option -> Linker Setting -> Other linker option".

#### 2. Compile with "make":

- Navigate to the F75111 directory: cd F75111.
- Compile the source: make.
- Execute the binary file: src/f75111.

#### 12.4.2 How to Use the Demo Application

		177	511	111	2.01	Ε.				
Customize F	7511	L1 A	ddre	ess	:	0×	90			
			DIC	Te	st					
DI / DO Test	(Low	()						0	%	1
DI / DO Test	( Hig	h)						0	%	
	7	6	5	4	3	2	1	0		
DO Status			0			0				
DI Status									-	_
									L	Start
		-	WD	т Те	st					
Enable	10		I	Disa	ille;					
🗌 Enable L	oop T	Test							C	Install
WDT Stand b	NV.								T	Uninstall

- 1. Press the "Start" button to test the DIO function.
- 2. Press the "Enable" button to test the WDT function.
- 3. Press the "Disable" button to disable the WDT.
- 4. Check the "Enable Loop" box and press "Enable" to do a WDT loop test.



- 5. Press "Install" to set the system to autorun this application at boot, press "Uninstall" to remove it from boot.
- 6. If WDT is enabled, the system icon will blink.



The F75111 will send F75111\_SetWDTEnable(BYTE byteTimer) with a parameter timer. If no disable signal (F75111\_SetWDTDisable()) is received before the timer counts down to 0, the system will reboot. If a disable signal is received, it will resend the enable WDT signal to prevent a reboot loop.

#### 12.4.3 Introduction

IO Function in the file SMBus.c:

```
void SMBusIoWrite(BYTE byteOffset, BYTE byteData) {
    outb(byteData, m_SMBusMapIoAddr + byteOffset);
}
BYTE SMBusIoRead(BYTE byteOffset) {
    DWORD dwAddrVal;
    dwAddrVal = inb(m_SMBusMapIoAddr + byteOffset);
    return (BYTE)(dwAddrVal & 0xOFF);
}
```

Init Internal F75111:

```
void F75111::InitInternalF75111() {
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI01X_CONTROL_MODE, 0x00); // Set GPI01X to Input_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI03X_CONTROL_MODE, 0x00); // Set GPI03X to Input_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, GPI02X_CONTROL_MODE, 0xFF); // Set GPI02X to Output_
    function
    this->Write_Byte(F75111_INTERNAL_ADDR, F75111_CONFIGURATION, 0x03); // Enable WDT OUT function
}
```

Set Output Value:

```
void F75111::InterDigitalOutput(BYTE byteValue) {
   BYTE byteData = 0;
   byteData = (byteData & 0x01) ? byteValue + 0x01 : byteValue;
   byteData = (byteData & 0x02) ? byteValue + 0x02 : byteValue;
   byteData = (byteData & 0x04) ? byteValue + 0x04 : byteValue;
   byteData = (byteData & 0x80) ? byteValue + 0x08 : byteValue;
   byteData = (byteData & 0x40) ? byteValue + 0x10 : byteValue;
   byteData = (byteData & 0x20) ? byteValue + 0x20 : byteValue;
   byteData = (byteData & 0x20) ? byteValue + 0x20 : byteValue;
   byteData = (byteData & 0x20) ? byteValue + 0x40 : byteValue;
   byteData = (byteData & 0x10) ? byteValue + 0x40 : byteValue;
   byteData = (byteData & 0x08) ? byteValue + 0x80 : byteValue;
```

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#### Get Input Value:

```
BYTE F75111::InterDigitalInput() {
   BYTE byteGPIO1X = 0;
    BYTE byteGPIO3X = 0;
   BYTE byteData = 0;
   this->Read_Byte(F75111_INTERNAL_ADDR, GPI01X_INPUT_DATA, &byteGPI01X); // Get value from GPI01X
   this->Read_Byte(F75111_INTERNAL_ADDR, GPI03X_INPUT_DATA, &byteGPI03X); // Get value from GPI03X
   byteGPI01X = byteGPI01X & 0xF0; // Mask unnecessary value
    byteGPIO3X = byteGPIO3X & 0x0F; // Mask unnecessary value
    byteData = (byteGPI01X & 0x10) ? byteData + 0x01 : byteData;
    byteData = (byteGPIO1X & 0x80) ? byteData + 0x02 : byteData;
    byteData = (byteGPI01X & 0x40) ? byteData + 0x04 : byteData;
    byteData = (byteGPIO3X & 0x01) ? byteData + 0x08 : byteData;
    byteData = (byteGPIO3X & 0x02) ? byteData + 0x10 : byteData;
    byteData = (byteGPIO3X & 0x04) ? byteData + 0x20 : byteData;
    byteData = (byteGPIO3X & 0x08) ? byteData + 0x40 : byteData;
    byteData = (byteGPIO1X & 0x20) ? byteData + 0x80 : byteData; // Get correct DI value from
→ GPIO1X & GPIO3X
   return byteData;
3
```

#### Enable WatchDog:

```
void F75111_SetWDTEnable(BYTE byteTimer) {
    WriteByte(F75111_INTERNAL_ADDR, WDT_TIMER_RANGE, byteTimer); // Set WatchDog range and timer
    WriteByte(F75111_INTERNAL_ADDR, WDT_CONFIGURATION, WDT_TIMEOUT_FLAG | WDT_ENABLE | WDT_PULSE |_
    WDT_PSWIDTH_100MS);
    // Enable WatchDog, Setting WatchDog configuration
}
```

#### Disable WatchDog:

```
void F75111_SetWDTDisable() {
    WriteByte(F75111_INTERNAL_ADDR, WDT_CONFIGURATION, 0x00); // Disable WatchDog
}
```