

# GroupGets PureThermal Mini

## FLIR Lepton® Smart I/O Module



The PureThermal Mini FLIR Lepton Smart I/O Module is a hackable thermal webcam module for the FLIR Lepton Longwave Infrared (LWIR) camera core. It ships pre-configured to operate as a plug-and-play UVC 1.0 USB thermal webcam that will work with standard webcam apps such as VLC Media Player on PC, Linux, Mac, and Android.



For developers, it's reference firmware is open source for customized applications. We have also created an open source software application, [GetThermal](#), to view Lepton data on x86 Linux and macOS platforms. For computers using a Microsoft Windows OS you can use the [FLIR Lepton User App](#) on the Lepton Getting Started page under the Downloads section. GetThermal as well as the FLIR Lepton User App with a PureThermal Mini (PTM) both support the *radiometric* mode of Lepton 2.5 & 3.5. Stay up to date with resources, video, and software for PTM at its [resource page](#).

## FEATURES

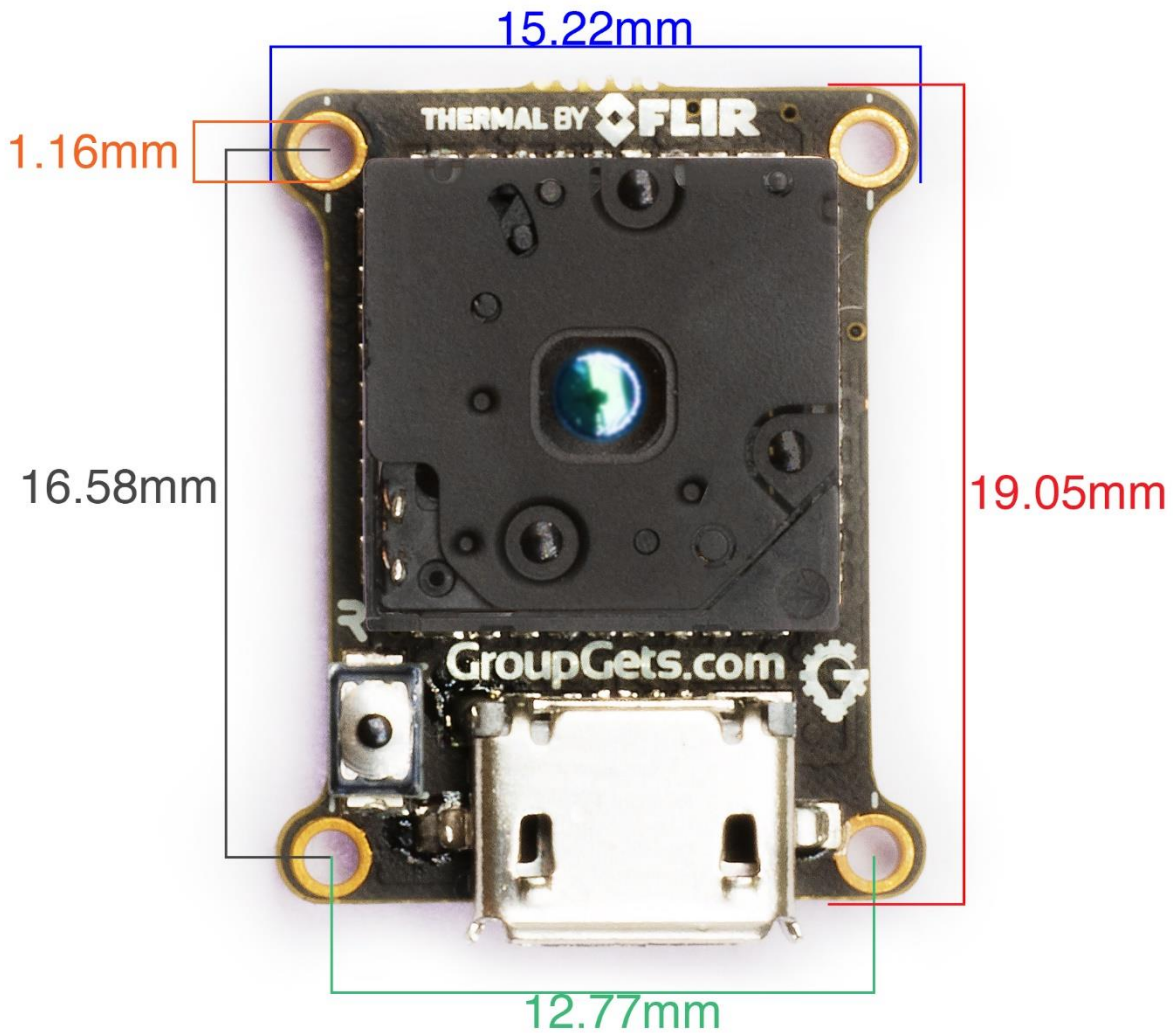
- Get Thermal video over USB right out of the box using freeware apps like VLC on Mac, Linux, Windows, or Android
- PTM can do 9 Hz color video over usb using the [USB UVC class](#)
- STM32F412 ARM microprocessor. Execute on-board image processing without the need for an external system
- Open source reference firmware is on the [GroupGets Github](#)
- Device Firmware Upgrade (DFU) the STM32 ARM MCU over USB
- Powered via USB
- Compatible with all current 2.x and 3.x Lepton cores
- Compact 19.5 x 15.32mm form-factor that can be embedded into other modules or inconspicuously housed as a standalone web, research, or security camera

## APPLICATIONS

- Thermal Imaging
- Non-contact temperature measurements
- Motion Sensing
- Night Vision
- Gesture Recognition

## PureThermal Mini Specifications

Power Inputs	Micro USB
Maximum Input Voltage (LiPo/H1)	5.5v
Lepton Core Support	Lepton 2.x and 3.x
Processor	STM32F412 (1M Flash, 512K RAM)
Thermal Video Outputs	UVC over USB
PureThermal Mini Part Number	PURETHERMAL-M
RoHS Compliant	Yes



## Power Characteristics

	PureThermal 2		PureThermal Mini & Pro JST	
	No Lepton	W/ Lepton	No Lepton	W/ Lepton
	24.8	61.5	24	63
	24.5	60.7	23.9	62.5
	24.8	60.7	24	62.2
	24.4	61.5	23.8	62.7
<b>Average</b>	<b>24.625</b>	<b>61.1</b>	<b>23.925</b>	<b>62.6</b>
<b>MIN</b>	24.4	60.7	23.8	62.2
<b>MAX</b>	24.8	61.5	24	63
<b>Shutter</b>				
	Peak (mA)		Rise Time ( $\mu$ S)	
	230 $\pm$ 15mA		160	

## Application Information



### Compatible applications include:

- [FLIR Lepton Application](#) for Windows (above image on left).
- [GetThermal](#) for Mac OS and Linux (above image on right).
- VLC, and many other video players.

## UVC-Capture Examples

The PureThermal FLIR Lepton development board by GroupGets supports the USB video class (UVC), and this makes it very easy to capture thermal imaging data from a host PC using standard tools and libraries. If you want to prototype quickly, your application demands increasing processing power, or you simply don't want to hack on the firmware, check out these examples to get started.

For more information see our purethermal1-uv-capture examples GitHub repository: <https://github.com/groupgets/purethermal1-uv-capture>

## FLIR Lepton Windows SDK

SDK for Windows 10 is provided below. The FLIR Windows Lepton Software Development Kit (SDK) is a software package that you'll include in your project. It is a .NET library for communication over the UVC protocol. These commands allow you to execute commands, pull serial number information, and other useful functions of the camera component. Make sure to visit the Get Started Guide to learn to effectively use the SDK.

<https://lepton.flir.com/sdk/>



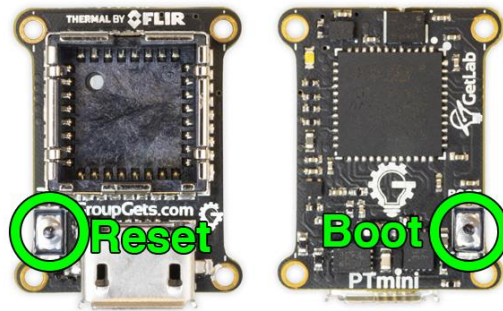
## Programming PureThermal Mini

You can program the PureThermal Mini over USB in DFU-Mode.

If you're not compiling from source you can download the firmware from [our PureThermal Firmware releases section here](#) and substitute the .bin file in the .tgz for main.bin in the commands below.

### Entering bootloader (DFU) mode

1. Locate the buttons to press on your PureThermal board.



2. Press and hold the BOOT button
3. Without releasing BOOT, press and release RST
4. Release BOOT
5. When you successfully enter DFU mode, the indicator LED will stop blinking and dim to half brightness

### Linux / MacOS Flashing

Install dfu-util:

```
sudo apt-get install dfu-util  
or
```

```
brew install dfu-util  
or your system's package manager.
```

Then run:

```
dfu-util -a 0 -D main.bin -s 0x08000000  
or use:
```

```
scripts/flash.sh
```

### Windows Flashing

DfuSe USB

drivers. <http://www.st.com/web/en/catalog/tools/FM147/CL1794/SC961/SS1533/PF257916#>

win32 DFU tools [https://files.groupgets.com/purethermal/win32\\_dfu.zip](https://files.groupgets.com/purethermal/win32_dfu.zip)

To install DFU drivers, may need to use the device manager to select the st drivers

extract win32\_dfu.zip to the current folder.

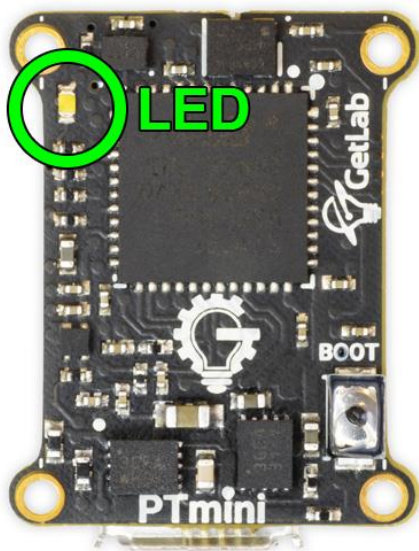
```
win32_dfu\bin2dfu --i main.bin --a 0x08000000 --o main.dfu
```

```
win32_dfu\DfuSeCommand -c -d --fn main.dfu
```

or use:

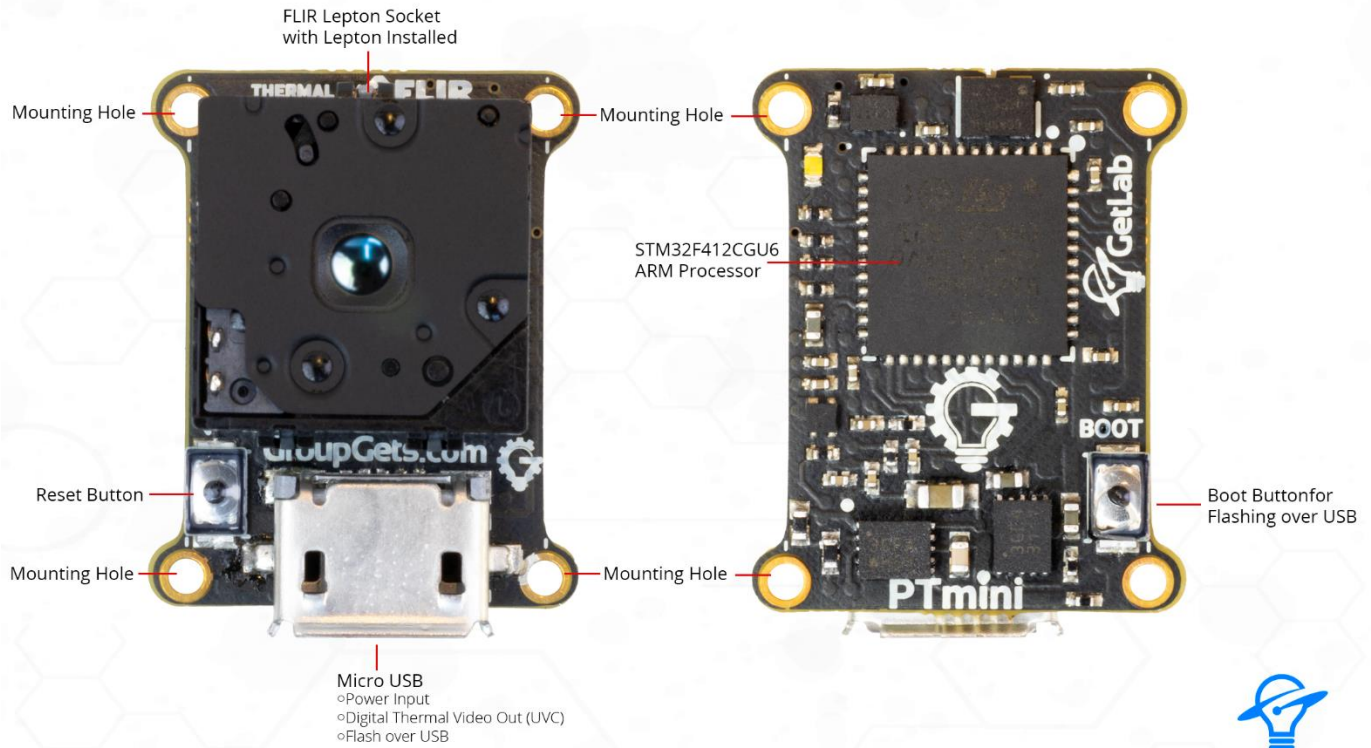
```
scripts/make_and_flash.bat
```

## Functions



**LED:** When plugged in to micro-usb power and a Lepton is inserted in the socket LED will flash slowly. When video is being transmitted to the viewing program, LED will flash more rapidly

# PureThermal Mini Interface Diagram



•PureThermal Mini supports all FLIR Lepton 2.x - 3.x cores with and without radiometry

