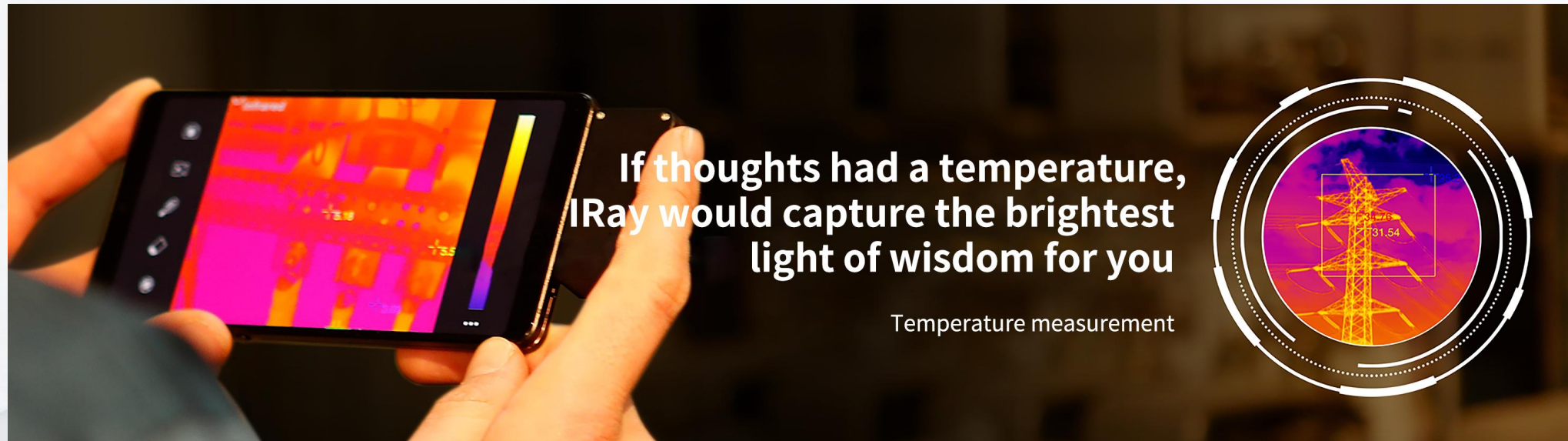




Application of Thermal Imaging in UAV Industry

IRay Technology Co., Ltd.

Wholly-Owned Subsidiary of Raytron

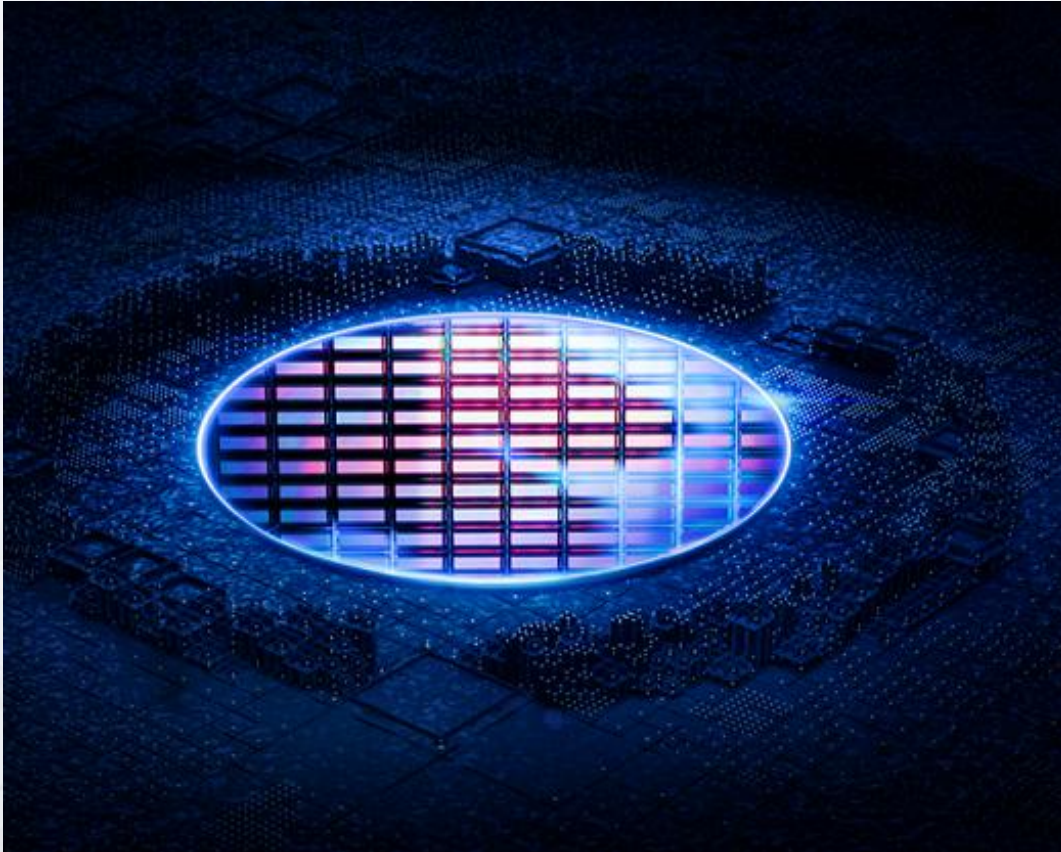


**If thoughts had a temperature,
IRay would capture the brightest
light of wisdom for you**

Temperature measurement

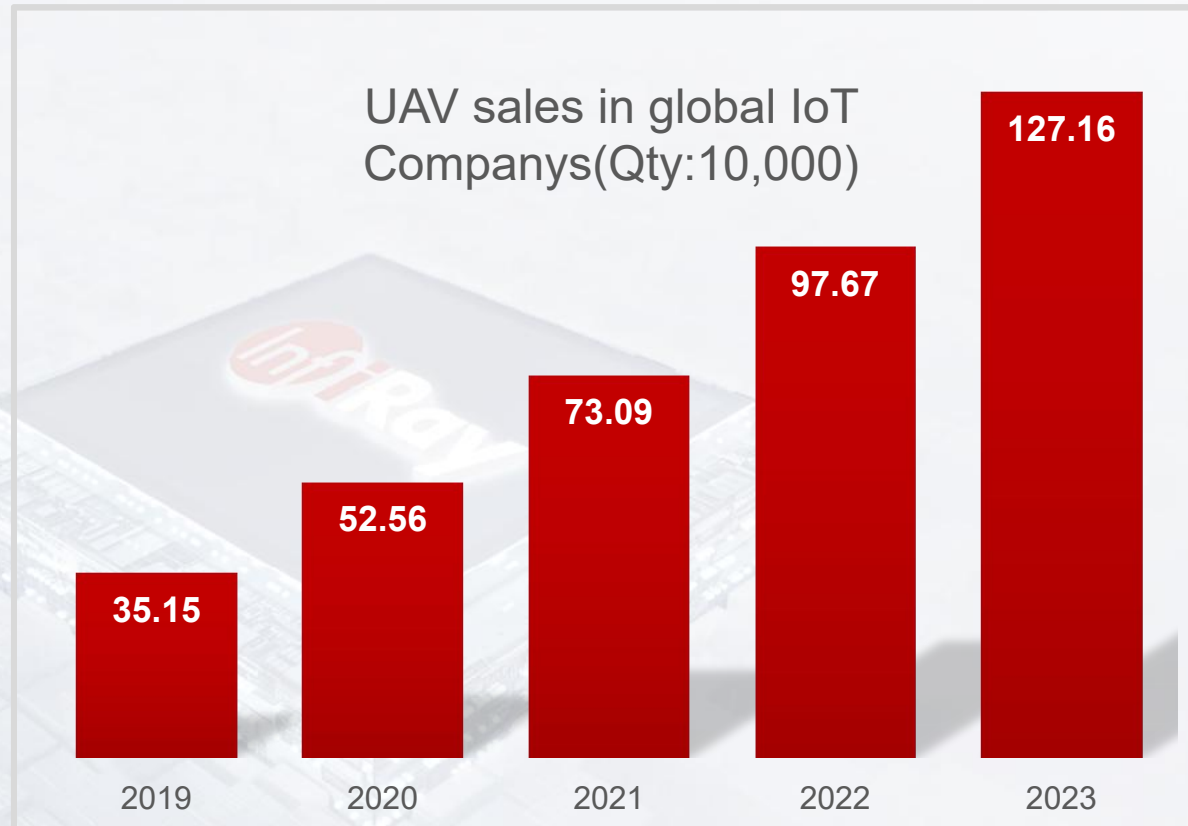
IRay concentrates on developing infrared thermal imaging technologies and manufacturing relevant products, with completely independent intellectual property rights. IRay is committed to providing global customers with professional and competitive infrared thermal imaging products and solutions. The main products include IRFPA detectors, thermal imaging modules, and application terminal products.

InfiRay Overview



- Subsidiary of Raytron Technology Co., Ltd. (SSE: 688002), a listed company on STAR Market, a leading manufacturer of uncooled IRFPA, focusing on the R&D and manufacturing of infrared thermal imaging products
- Products cover infrared detectors, thermal camera cores, thermal modules, and finished thermal imaging products
- Leading the global technology, released the world's 1st $8\mu\text{m}$ 1920×1080 uncooled infrared detector
- Realize mass supply of $12\mu\text{m}$ 1280×1024 、 640×512 、 384×288 、 256×192 、 160×120 uncooled infrared detectors and thermal camera cores

UAV Industry Background



The UAV industry has gained fast growth with related technology breakthroughs in recent years.

Development trend of UAV industry:

The new technologies, typically thermal imaging technology, can endow the UAV with new capabilities besides the basic flight control, communication and GPS technologies which keep the UAV industry move forward.

Situation of leading companies :

DJI, 3D Robotics, Parrot, Autel Robotics and XAG have launched UAVs with thermal imaging pods.



World's Leading Thermal Imaging Facilitating Penetrating Insight of UAV

IRay, as world's leading manufacturers of thermal imaging chips and modules, provide professional thermal imaging modules for UAV companys , facilitate launch of new-generation UAVs which can penetrate in darkness, rain or fog and possess the functions of disguiser detection, anti-glare interference and thermal image diagnosis.



1) Police

- ✓ anti-terrorist/antiriot
- ✓ emergency rescue
- ✓ patrol in waters

2) Industrial & Agricultural Production

- ✓ power grid patrol
- ✓ chemical industry park
- ✓ Photovoltaic solar power station
- ✓ agriculture, forestry, animal husbandry and fishery

3) Environmental protection

- ✓ forest fire prevention
- ✓ animal protection
- ✓ sewage & flue gas discharge monitoring

4) construction industry

- ✓ external wall insulation of high-rise buildings
- ✓ pipeline laying on construction sites

Multiple Application Scenarios - Broad Market



Emergency rescue



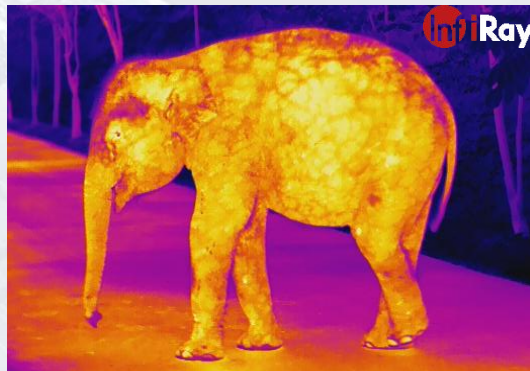
Anti-terrorist/antiriot



Power grid patrol



Photovoltaic power station



Animal protection



Sewage & flue gas discharge monitoring



Forest fire prevention



Patrol in waters

Multiple Application Scenarios - Broad Market



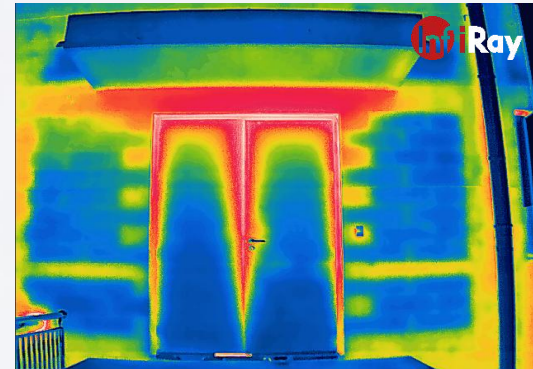
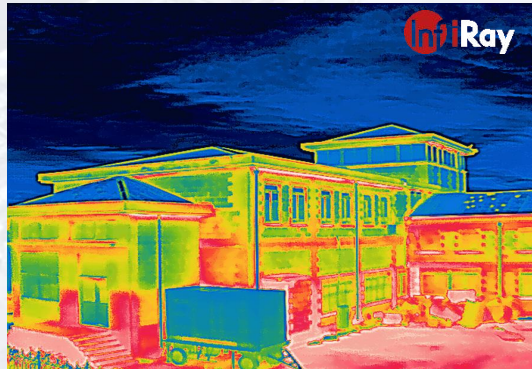
Pipeline inspection



Agricultural monitoring



Pumping unit monitoring



Cavity , thermal insulation and leak troubleshooting

◆ Product Overview for UAVs

MicroIII 640/384



Compact size ,dedicated thermal imaging module for UAVs

LT1280M



High resolution

FTII 640/1280



Long distance monitoring
High temperature/fire alarming

◆ Dedicated Thermal Imaging Module for UAVs -Xcore Microll

Resolution: 640*512/384*288

Pixel pitch: 12 μ m

Detector frame rate: 50HZ

Temperature Measurement : -20 $^{\circ}$ C~550 $^{\circ}$ C (optional)

Fixed Lens:4.1mm/5.8mm/9.1mm/13mm/19mm/25mm/35mm



Size: 26mm×26mm

Weight: 21g

Power consumption: ≤ 1.0 W (excluding user expansion component)

Anti-vibration: 6.06g, random vibration, all axes

Anti-shock: 80g, 4ms, backpeak sawtooth wave, 3 axes 6 directions

◆ Dedicated Thermal Imaging Module for UAVs -Xcore Microll



Video output

Digital video:

BT.656/BT.1120/LVCMOS/LVDS
/MIPI/Camera Link / USB-UVC

Analog video: NTSC/PAL

Serial communication interface

RS-232/UART(3.3V)

◆ Thermal Imaging Module with High Resolution-LT1280M



Resolution: 1280*1024

Pixel pitch: 12 μ m

Lens: 10mm/19mm/35mm (optional)

Temperature measurement: -20°C~550°C

Size: 45mm×45mm×49.85mm

Weight: 119g±5g

Power consumption: ≤2.3W (excluding user interface board)

Anti-vibration: 4.3g, random vibration, all axes

Anti-shock: 40g, 11ms, backpeak sawtooth wave
3 axes 6 directions

◆ Thermal Imaging Module with High Resolution-LT1280M



Digital video output

BT.1120/LVCMOS/Cameralink
/LVDS/USB-UVC

Serial communication interface

RS-232/UART(3.3V)

Alarm Thermal Imaging Module FTII Series



Resolution: 640×512 / 1280*1024

Pixel pitch: 12μm

Lens: 75mm/25mm~75mm/30mm~150mm etc.

Detector frame rate: 640 pixels: 50HZ; 1280 pixels: 30HZ

Size: min. 44.5×43mm; 1280 pixels : ≤55×55mm

Weight: min. 80g

Power consumption: 384 pixels < 1.8W; 1280 pixels < 2.6W

Fire detection

Smart alarm : IP address conflict, full memory ,abnormal detection, etc.

Smart analysis : tripwire, cross border, region intrusion etc.

Alarm Linkage: Recording, Capture, Email, PTZ, Alarm output



Alarm Thermal Imaging Module FTII Series



Serial communication interface

RS-232, RS-485(support PELCO-D for PTZ)

Video output

Digital video:

LVCMOS/BT.656/BT.1120/LVDS/SDI/Ethernet

Analog video: PAL/NTSC

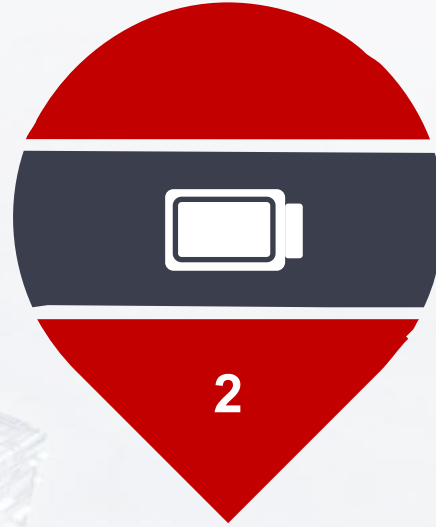
◆ IRay Strengthes for UAV Industry



1

Quickly boot up and get stable

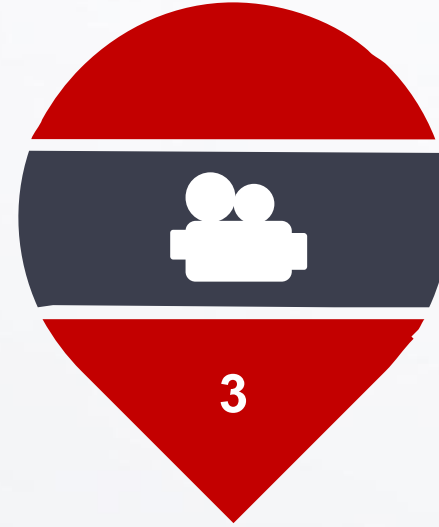
- Accurate temperature measurement within 1 min. after power up



2

Stable temperature measurement

- Self-developed AI-temp algorithm
- Smart sense of ambient temperature drift-dynamic compensation
- Strong adaptability to environment

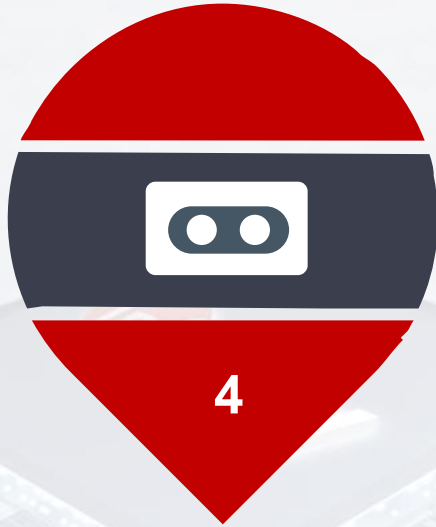


3

Various product shapes and functions

- Multiple fixed focus and zoom lens option
- 1.0~8.0× continuous E-zoom
- Clear image far and near
- Fire alarm targeted for 1×1m object from 4.1km
- Various interfaces for option

◆ Special Advantages for UAV Industry



SWaP

- Compact Size
- Light Weight
- Low Power Consumption
- Bring lighter gimbal, longer endurance



Clear image

- Self-developed high sensitivity detector
- Self-developed Matrix IV algorithm
- AGC-Automatic Gain Control



External Sync

- Support Input external sync signal or output intrinsic sync signal of module according to set sync mode, easy to integrate