

Early Fire Detection Sensor

AI-powered IoT sensors that rapidly detect outdoor fires at an ultra-early stage, before they grow into deadly infernos.

Torch Sensors detect a flame at a radically early stage, before any existing technology. One Torch device has multiple infrared cameras, filtered visible cameras, as well as gas, temperature, and humidity sensors. An intelligent algorithm combines all of these variables in real-time to continuously analyze the environment. Torch sensors don't require specialized equipment to install, and can be attached at human height or above to a tree, pole or building. Even if you live in a remote area, Torch devices communicate locally via radio signals, with only one WiFi-connected device required per dozens of offline Torch sensors. All information is sent to your mobile or desktop application, giving you warnings of fires in seconds, at your fingertips. Torch devices connect to each other in a 'mesh network', enabling users to protect large lands from outdoor fires.



Early detection

Torch's patented technology can detect a flame as small as 2x2 feet, warning in seconds.

Large coverage

Placed 10 acres apart, sensors connect in a mesh network and can be deployed by the millions.

Solar-powered

Torch Sensors are always on, 24/7. Built to resist weather and connectivity issues.

How **Early** is "Early Detection"?

When it comes to fire, every second matters.



TORCH

Gas Sensors

Cameras

Satellites

Characteristics

General Characteristics	
Maintenance	Maintenance-free (5+ years)
Coverage area for each sensor	4-5 hectares per sensor to detect a fire the size of a car (as small as 1x1 meter)
Power source	Solar-powered, standalone without external power
Sensor to Gateway (Ratio)	Typically dozens of sensors connected in a daisy chain configuration per WiFi-enabled Gateway device, depending on topology
Installation	Mounted on a tree, pole, or building (minimum human height, maximum height of electric power transmission lines)
Energy storage	Rechargeable battery pack
Firmware updates	Remotely
Time synchronization	From the gateway
Sustainable operation	With some devices in the chain being offline (self recovering option of daisy chain)

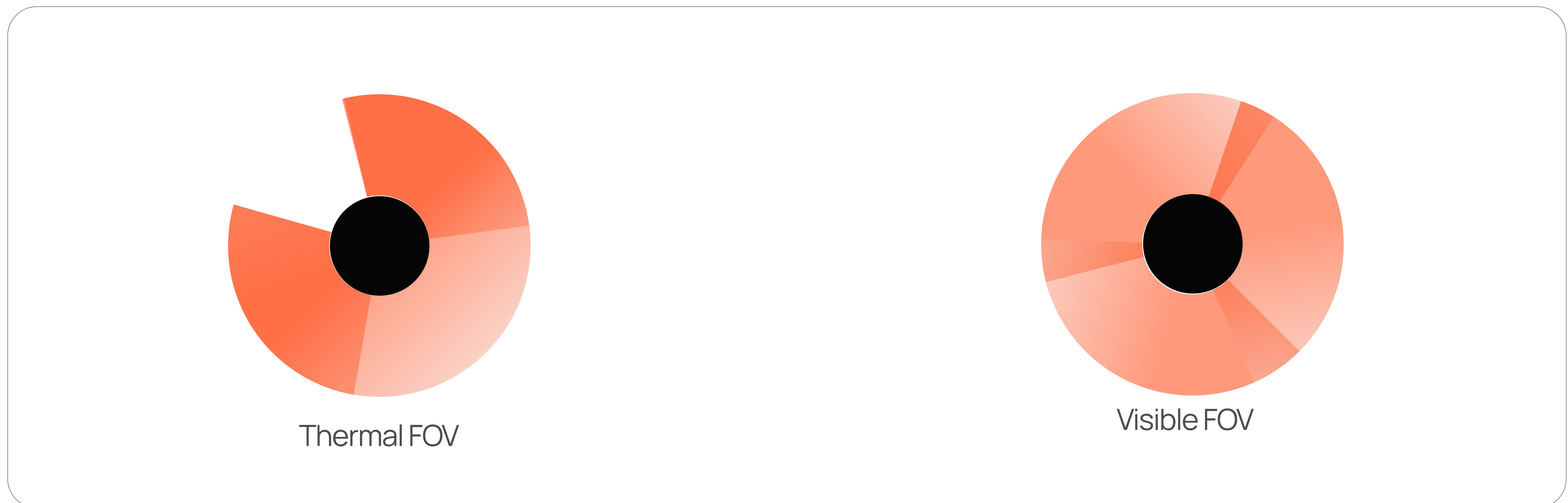
Mechanical	
Size	11cm diameter x 12cm height
Weight	0.35kg
Solar Panel	11 cm diameter + external panel in case of low-light (15x20 cm)
Operational Temperature	-20°C to +60°C
Operational Humidity	0% to 100% Condensing
USB Connector	IP67-rated
Material	Aluminum metal, plastic (Weather, UV-proof)



Cameras

Thermal Cameras	
Amount	2-3 per device
Field of View	300 (entire device)
Measurable Temperature	0 C to >1000 C

Visible Cameras	
Amount	2-3 per device
Field of View	137°(diagonal)/(H):102°/(V):76°
Total visible camera	360 degrees combined



Sensors

Gas Sensors		CO, CO2 and air quality sensors
Linear Relationship	between gas concentration and sensor output	
Requirements	Meets EN50291, UL2034, and EN54-31	
Typical Detection	500 ~ 8,000 ppm	
Accuracy	±(50 ppm + 5 %)	
Repeatability	High repeatability/selectivity to CO and CO2 gasses Typical ± 20 ppm	

Temperature/Humidity Sensor	
Temperature	Measurement range -20°C – 85°C
Accuracy	Temperature: (Typical) ± 0.5 °C Humidity: (Typical) ± 3 % RH
Repeatability	(Typical) ± 0.2 % RH

Connectivity

Characteristics of the LORA chip

Symbol	Description	Conditions	Min	Typ	Max	Unit
FR	Frequency synthesizer range	Low-power PA	150	-	960	MHz
FSTEP	Frequency synthesizer step	High-resolution mode HSE32 / 2 ⁽²⁾⁽⁵⁾	-	095	-	Hz
PHN ⁽¹⁾ (2)	Synthesizer phase noise (868 to 915 MHz)	100 kHz offset	-	-100	-	dBc/Hz
		1 MHz offset	-	-120	-	
		10 MHz offset	-	-135	-	
TS_FS	Synthesizer wakeup time	From Standby, HSE32 mode	-	40	-	μs
TS_HO P	Synthesizer hop time	10 MHz step	-	40	-	
TS_OS C	Crystal oscillator wakeup time	From Standby, RC ⁽³⁾ normal mode from HSE32 off	-	170	-	
OSC_ TRM	Crystal oscillator trimming range for crystal frequency error compensation ⁽⁴⁾	Min/max XTAL specifications	±15	±30	-	ppm
BR_F	Bitrate, FSK	Programmable (min modulation index is 0.5)	0.6	-	300 ⁽⁵⁾	Kbit/s
FDA	Frequency deviation, FSK	Programmable (FDA + BR_F/2 ≤ 250 kHz)	0.6	-	200	kHz
BR_L	Bitrate, LoRa	Min for SF12, BW_L = 7.8 kHz Max for SF5, BW_L = 500 kHz	0.018	-	62.5 ⁽⁶⁾	Kbit/s
BW_L	Signal BW, LoRa	Programmable	7.8	-	500 ⁽⁶⁾	kHz
SF	Spreading factor for LoRa	Programmable, chips/symbol = 2 ^{SF}	5	-	12	-

LORA Radio characteristics

Tx Power 14-20 dBm FCC/FCE approved

Europe	EU868 (863-870/873 MHz)
South America	AU915/AS923-1 (915-928 MHz)
North America	US915 (902-928 MHz)
India	IN865 (865-867 MHz)