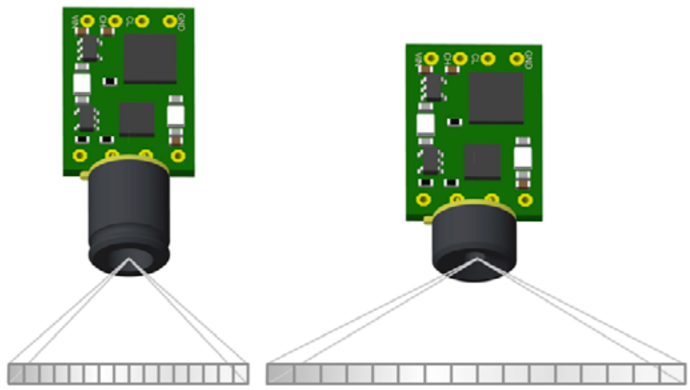
INFRARED TEMPERATURE SENSOR
IRTS-PCB-V2

The Izze-Racing infrared sensor is specifically designed to measure the highly transient surface temperature of a tire with spatial fidelity, providing invaluable information for chassis tuning, tire exploitation, compound selection, and driver development.

The sensor is capable of measuring temperature at 16, 8, or 4 laterally-spaced points, at a sampling frequency of up to 100Hz, object temperature between -20 to 300˚C, using CAN 2.0A protocol, and priced to be affordable to all tiers of motorsport. The sensor is available with two field-of-views: ultra-wide (120˚) or wide (60˚).

The sensor is now offered as a PCB assembly, without an enclosure, amounting to a significant reduction in cost and allowing the end user to package the sensor to their specific needs.



SENSOR SPECIFICATIONS

Temperature Measurement Range, T_o	-20 to 300˚C
Package Temperature Range, T_p	-20 to 85˚C
Accuracy (Central 10 Channels, Nominal) (16-Ch Sensor)	±1.0˚C for 0˚C < T_p < 50˚C ±2.0˚C for T_p < 0˚C and T_p > 50˚C
Accuracy (First & Last 3 Channels, Nominal) (16-Ch Sensor)	±2.0˚C for 0˚C < T_p < 50˚C ±3.0˚C for T_p < 0˚C and T_p > 50˚C
Noise Equivalent Temperature Difference, NETD	0.5˚C at 16Hz, ε = 0.85, T_o = 25˚C
Field of View, FOV	60˚x 8˚ (wide) 120˚x 15˚ (ultra-wide)
Number of Channels	16, 8, or 4
Sampling Frequency	100[1], 64[1], 32, 16, 8, 4, 2, or 1Hz
Thermal Time Constant	2 ms
Effective Emissivity	0.01 to 1.00 (default = 0.78)
Spectral Range	8 to 14 μm

1 – Optional Extra, 64Hz limit for IRTS-120-PCB-V2, 100Hz limit for IRTS-60-PCB-V2

ELECTRICAL SPECIFICATIONS

Supply Voltage, V_{in}	5 to 8 V
Supply Current, I_s (typ)	30 mA
Features	• Reverse polarity protection • Over-temperature protection (125˚C)

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IRTS-PCB-V2

MECHANICAL SPECIFICATIONS

Weight, 60˚FOV	< 2 g
Weight, 120˚FOV	< 2 g
L x W x H (max), 60˚FOV	32.15 x 15 x 9.3 mm
L x W x H (max), 120˚FOV	26.8 x 15 x 9.3 mm

CAN SPECIFICATIONS

Standard	CAN 2.0A (11-bit identifier), ISO-11898
Bit Rate (Default)	1 Mbit/s
Byte Order	Big-Endian / Motorola
Data Conversion	0.1˚C per bit, -100˚C offset, unsigned
Base CAN ID's (Default)	LF Sensor: 1200 (Dec) / 0x4B0 (Hex) RF Sensor: 1204 (Dec) / 0x4B4 (Hex) LR Sensor: 1208 (Dec) / 0x4B8 (Hex) RR Sensor: 1212 (Dec) / 0x4BC (Hex)
Termination	None

CAN ID: Base ID

Channel 1		Channel 2		Channel 3		Channel 4	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+1

Channel 5		Channel 6		Channel 7		Channel 8	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+2

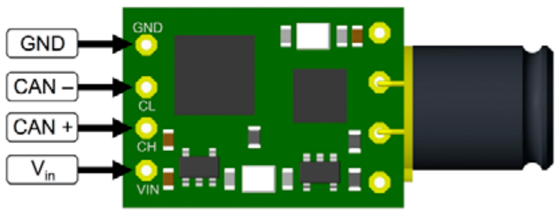
Channel 9		Channel 10		Channel 11		Channel 12	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+3

Channel 13		Channel 14		Channel 15		Channel 16	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

PCB PINOUT:

PCB Label	Description
GND	Ground
CL	CAN -
CH	CAN +
VIN	V_{in} (5–8V)



(Recommended Wire: 26 AWG M22759/32, DR25 jacket)

SENSOR CONFIGURATION:

To modify the sensor's configuration, send the following CAN message at 1Hz for at least 10 seconds and then reset the sensor by disconnecting power for 5 seconds:

CAN ID: Current Base ID

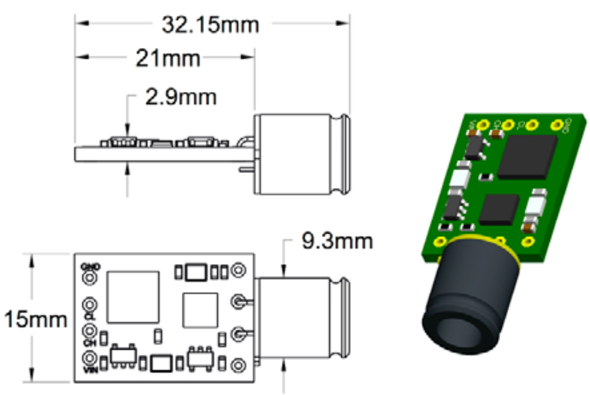
Programming Constant		New CAN Base ID (11-bit)		Emissivity	Sampling Frequency	Channels	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4	Byte 5	Byte 6	Byte 7
30000 = 0x7530		1 = 0x001 ⋮ 2047 = 0x7FF		1 = 0.01 ⋮ 100 = 1.00	1 = 1Hz 2 = 2Hz 3 = 4Hz 4 = 8Hz 5 = 16Hz 6 = 32Hz 7 = 64Hz[1] 8 = 100Hz[1]	40 = 4Ch 80 = 8Ch 160 = 16Ch	

1 – Optional Extra, 64Hz limit for IRTS-120-PCB-V2, 100Hz limit for IRTS-60-PCB-V2

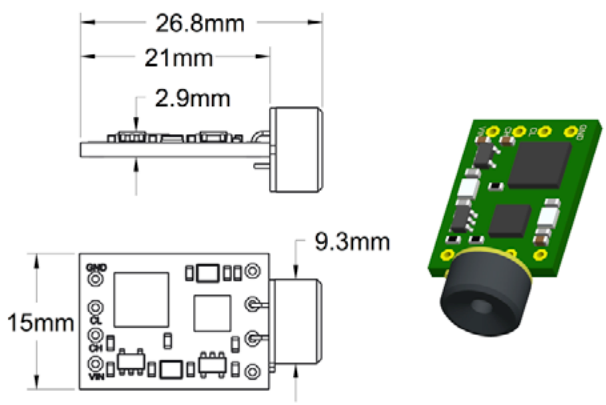
CAN messages should only be sent to the sensor during the configuration sequence.
DO NOT continuously send CAN messages to the sensor.

DIMENSIONS:

60° Field-of-View (FOV), IRTS-60-PCB-V2

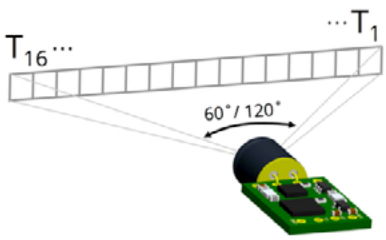


120° Field-of-View (FOV), IRTS-120-PCB-V2

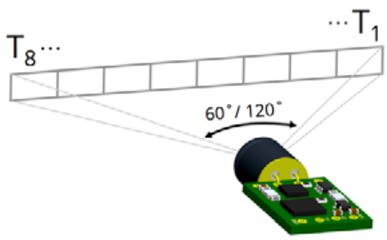


Field-of-View (FOV):

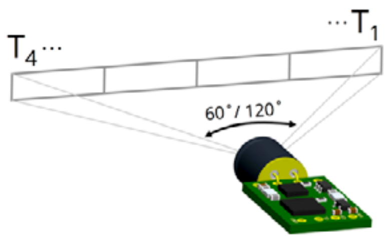
16-Channel



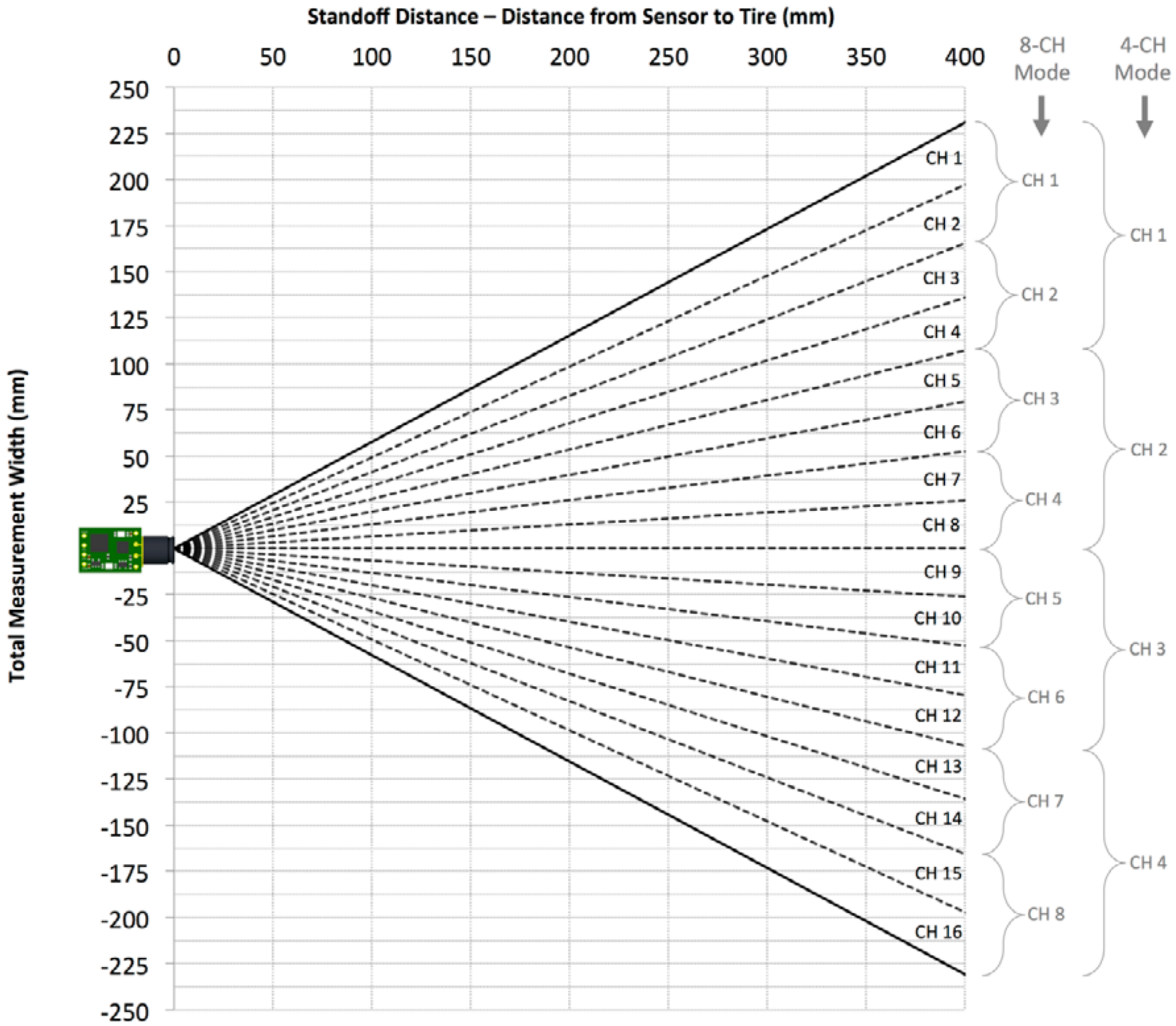
8-Channel



4-Channel

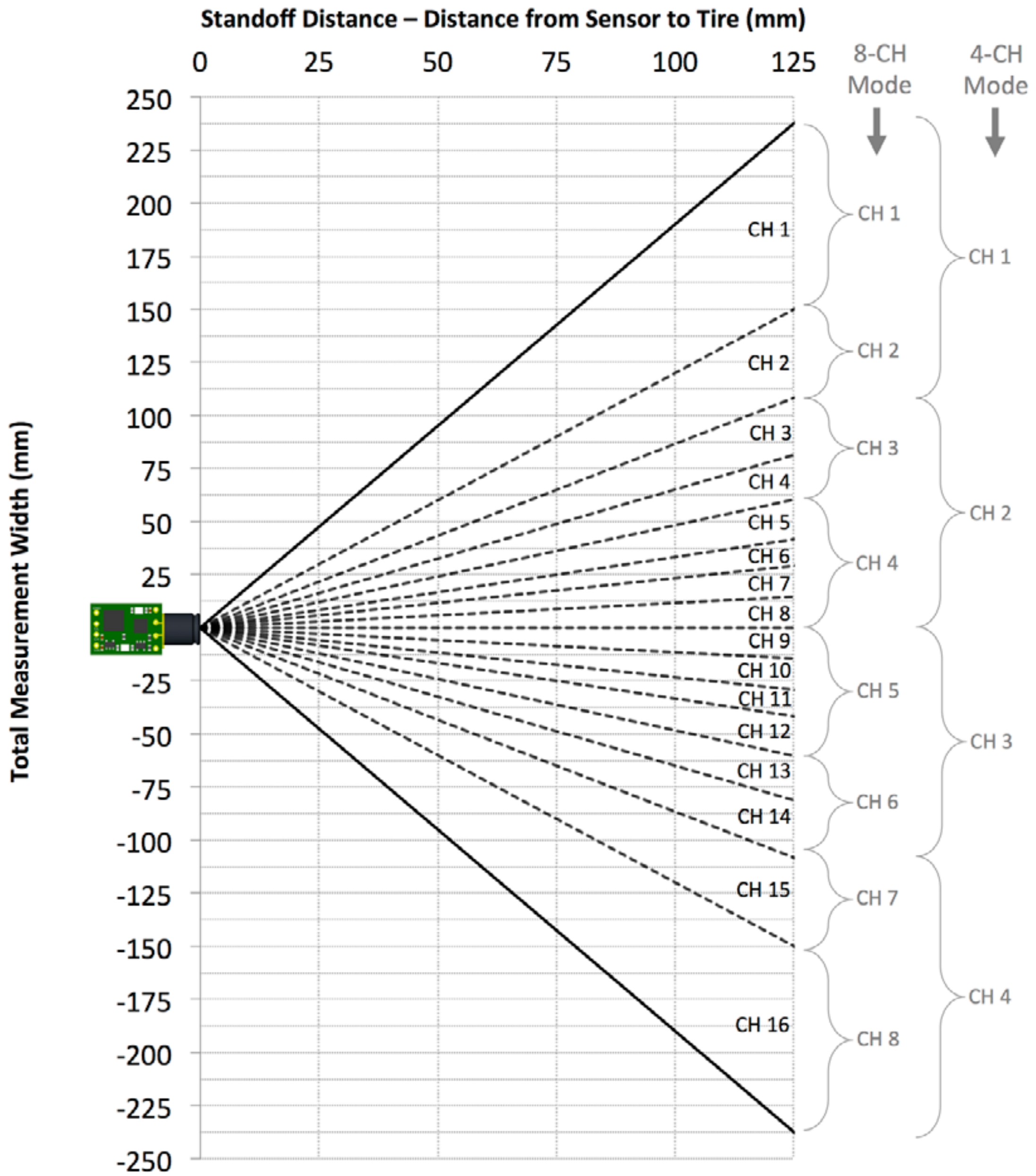


60˚ Field-of-View, IRTS-60-PCB-V2:



(Approximate. Angle offset (z-axis rotation) between -5˚ and +5˚, mounts should allow adjustment accordingly)

120˚ Field-of-View, IRTS-120-PCB-V2:



(Approximate. Angle offset (z-axis rotation) between -5˚ and +5˚, mounts should allow adjustment accordingly)

ADDITIONAL INFORMATION:

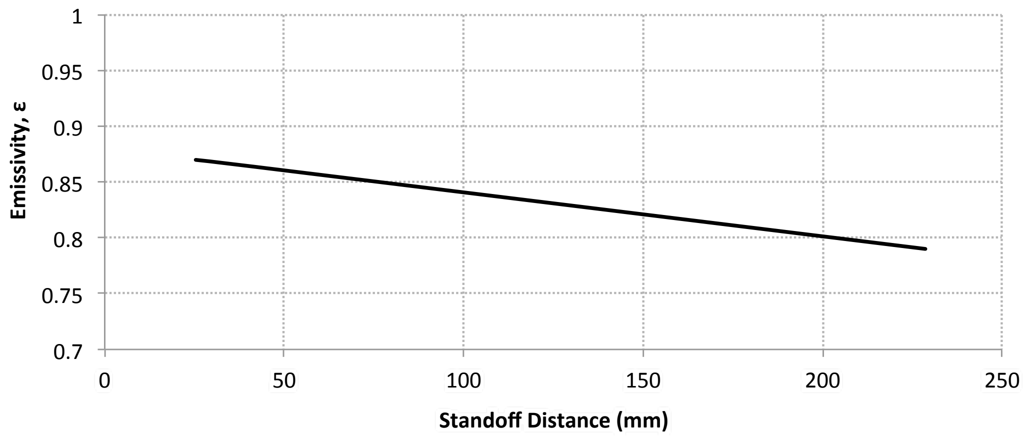
- With the sensor enclosed (aluminum is preferable), encapsulated, and installed, place an object with a uniform temperature – such as a tire – in front of the sensor and adjust the offset of each temperature channel until each channel matches the known temperature of the object. The test object should have an elevated (> 50˚C) and uniform temperature. This calibration procedure will offset any *subtle* temperature non-uniformities caused by the sensor's unique packaging and will allow the sensor to achieve the stated ±1.0˚C accuracy.

- Stated accuracy is under isothermal package conditions; for utmost accuracy, avoid abrupt temperature transients and gradients across the sensor's package.

- Point the sensor in the downstream direction (facing front of tire) to avoid contamination, pitting, and/or destruction of the sensor's lens from debris. Protective windows are available upon request.

- The *effective* emissivity of most tires ranges from approximately 0.75 to 0.90 in the 8 to 14 µm spectrum.

  - Generally, the emissivity should be lowered as the standoff distance (distance from tire to sensor) increases; this is particularly important with the 60˚ FOV sensor due to the larger standoff distances required. The suggested emissivity vs. standoff distance is shown in the graph below:



  - Lowering the emissivity increases the measured object temperature and vice versa

- Noise Equivalent Temperature Difference (NETD) increases with increasing sampling frequency:
  - Provided that tire surface temperature is highly transient, it is usually advantageous to use a higher sampling frequency at the cost of increased noise. A sampling frequency of 16 or 32 Hz is recommended for most applications.