

LM393: Dual differential comparator (flame, light, sound sensors)

The LM393 is a widely used dual-channel voltage comparator IC. On modules like the Flame Sensor, BME breakout boards, or Speed Sensors, it acts as the “*brain*” that converts messy analog signals into clean digital high/low signals.

LM393 Technical Description

The IC contains two independent voltage comparators that can operate from a single power supply.

Feature	Specification
Supply Voltage	2V to 36V (Supports both 3.3V and 5V logic)
Output Type	Open Collector (Requires a pull-up resistor to work)
Channels	2 Independent Comparators
Response Time	~1.3 microseconds (Fast enough for most DIY sensors)
Low Power	~0.4 mA current draw

LM393 Module

[LM393 \(KY-026\) Flame Sensor \(IR\) Module](#)

[LM393 \(HW-484, KY-037, KY-038\) High-Sensitivity Sound Detection Module](#)

[LM393 \(FC-03, HC-89\) Infrared Speed Sensor Module](#)

[LM393 \(KY-024\) Hall Sensor Module](#)

LM393 Flame Sensor (IR) Module

The LM393 (**KY-026**) Flame Sensor is an infrared (IR) based detector specifically tuned to sense wavelengths between 760nm and 1100nm, which are typically emitted by a fire. It features an onboard LM393 comparator to provide a clean digital signal, along with a potentiometer for sensitivity adjustment.



LM393 Flame Sensor Technical Specifications

- **Operating Voltage:** 3.3V to 5V DC
- **Spectral Range:** 760nm to 1100nm
- **(Infrared)Detection Angle:** Approximately 60 degrees
- **Detection Distance:** Up to ~1 meter (0.8m for lighter flames)
- **Output Type:** Digital (DO: 0 or 1) and Analog (AO: voltage level)
- **Comparator IC:** LM393
- **Sensitivity:** Adjustable via onboard potentiometer
- **Indicators:** Power LED (Red) and Status/Signal LED (Green)
- **Operating Temp:** -25°C to +85°C

LM393 Flame Sensor Pinout

Pin Label	Function	Connection to Microcontroller
VCC	Power Supply (3.3V - 5V)	3V3
GND	Ground	GND
DO	Digital Output (0 or 1)	Any Digital Pin (e.g., GP16)
AO	Analog Output (Voltage)	Any ADC Pin (e.g., GP26)

- **Digital Output (DO):** Provides a simple logic signal. By default, it stays HIGH. When a flame is detected and exceeds the potentiometer's threshold, the signal goes LOW.
- **Analog Output (AO):** Sends a real-time voltage signal. The voltage decreases as the flame intensity (or proximity) increases.
- **Sensitivity Adjustment:** Turning the onboard potentiometer clockwise increases sensitivity (longer detection range), while turning it counter-clockwise decreases it.

Important Safety Note

The photodiode is heat-sensitive. To prevent damage, keep it at least 80 cm away from the flame, such as a standard lighter.

LM393 High-Sensitivity Sound Detection Module

The **HW-484** typically refers to a High-Sensitivity Sound Detection Sensor module (similar to the **KY-037** or **KY-038**) or, in some markets, a (LM-393) Flame Sensor module. Both versions use the LM393 comparator you just asked about to provide both analog and digital outputs.



This module employs a small electret microphone to measure ambient noise levels. It detects sound vibrations and transforms them into electrical signals. The sensitivity can be adjusted using the onboard potentiometer. Ideal applications include clap-activated switches, noise monitoring, and security alarms. It is optimized for capturing human voices and sharp sounds such as claps and knocks within the 50Hz to 20kHz frequency range.

LM393 Sound Sensor Pinout

Pin Label	Function	Connection to Microcontroller
VCC	Power Supply (3.3V - 5V)	3V3
GND	Ground	GND
DO	Digital Output (0 or 1)	Any Digital Pin (e.g., GP16)
AO	Analog Output (Voltage)	Any ADC Pin (e.g., GP26)

- **Digital Output (DO):** Provides a simple logic signal. By default, it stays HIGH. When a flame is detected and exceeds the potentiometer's threshold, the signal goes LOW.
- **Analog Output (AO):** Sends a real-time voltage signal. The voltage decreases as the flame intensity (or proximity) increases.
- **Sensitivity Adjustment:** Turning the onboard potentiometer clockwise increases sensitivity (longer detection range), while turning it counter-clockwise decreases it.

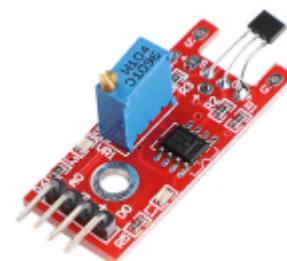
LM393 Infrared Speed Sensor Module



The Infrared Speed Sensor, often labelled **FC-03** or **HC-89**, is a “fork” or “U-shaped” sensor designed to measure motor RPM, speed, or position. The LM393 module acts as an infrared counter with integrated transmitter and receiver. When an obstacle blocks the sensor, it sends a signal to the microcontroller. This configuration is ideal for use with a microcontroller in applications like motor speed measurement, pulse counting, and setting positioning limits.

LM393 Hall Sensor Module

The **KY-024** Hall Sensor module detects magnetic fields using a linear Hall-effect sensor and an LM393 comparator. It provides both analog and digital outputs to indicate magnetic strength and presence. When a magnet is nearby, the output varies with the field strength or a set threshold.



Sensor topics on lamaPLC

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lamaPLC project: Arduino - Vibration sensors	2026/04/15 17:21	vibration , sensor , piezoelectric , mems , eddy-current , electrodynamic , gxfm0459 , ldtm-028k , arduino , arduino code
lamaPLC project: Digitales Potentiometer Board Moduls	2026/04/11 18:29	sensor , module , arduino code , renesas , x9c series , x9c102 , x9c103 , x9c104 , x9c503 , xdcp , digitally controlled potentiometer
lamaPLC project: Sension SCD CO² measurement module	2026/04/15 19:34	scd30 , scd40 , scd41 , iaq , ndir , sensor , i2c , arduino code
lamaPLC: A0221AU / A02YYUW Waterproof Ultrasonic Distance Sensor with UART communication	2026/04/23 21:52	a0221au , a02yyuw , waterproof , ultrasonic , distance , sensor , uart , ip67 , serial , sen0311 , dfrobot

- [LamaPLC: AHT10 Modul](#) 2026/03/22 03:14 [communication, i2c, temperature, humidity, sensor, aht, aht 10, modul](#)
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- [LamaPLC: Allegro ACS758 Hall-effect linear current sensors](#) 2026/04/23 21:52 [cjmcu, cjmcu-758, acs758, acs758lcb-050b, acs758lcb-100b, acs758kcb-150b, acs758ecb-200b, hall-effect, current, sensor, analog, arduino, code](#)
- [LamaPLC: APDS - Avago ALS and proximity detection sensors with I²C communication](#) 2026/04/23 21:52 [avago, apds-9900, apds-9930, apds-9960, als, proximity, detection, gesture recognition, gesture, i2c, communication, sensor, arduino, code](#)
- [lamaPLC: Arduino Modul: BME680](#) 2026/05/12 18:40 [code, c, 2026, arduino, bme680, sensor, i2c, comunication](#)
- [lamaPLC: AS5600 Magnetic Induction Angle Measurement Sensor Module](#) 2026/04/23 21:52 [communication, i2c, as5600, as-5600, magnetic, induction, angle, sensor](#)
- [LamaPLC: BMP/BME Bosch Temperature/Humidity/Pressure sensors with I²C communication](#) 2026/04/23 21:52 [bme280, bme680, bme688, bmp180, bmp280, hw-611, hw611, bosch, temperature, humidity, pressure, sensor, arduino, i2c, communication, ai, cjmcu, volatile organic compounds, vocs, volatile sulfur compounds, vscs, iaq](#)
- [LamaPLC: BQ25570 / CJMCU-2557 - Texas Instruments nano-power management IC and module](#) 2026/04/23 21:52 [bq25570, sensor, texas instruments, nano-power management, dc-dc boost charger, mppt, solar, thermoelectric, piezoelectric, energy harvesting, eh](#)
- [LamaPLC: CJMCU-219/INA-219 breakout board/IC with I²C communication](#) 2026/04/23 21:52 [cjmcu-219, ina-219, ina219, breakout board, i2c, communication, sensor, voltage, current, arduino, code, cjmcu](#)
- [LamaPLC: CJMCU-3216 / AP-3216 integrated digital ambient light and proximity sensor module/IC with I²C communication](#) 2026/04/23 21:52 [cjmcu-3216, cjmcu, ap-3216, ap3216, ambient light, proximity, sensor, arduino, code, i2c, communication](#)
- [LamaPLC: CJMCU-3901/PMW-3901 compact optical flow sensor module/IC by PixArt with SPI communication](#) 2026/04/23 21:52 [cjmcu-3901, cjmcu, pmw3901, pmw-3901, optical flow, sensor, pixart, spi, communication, arduino, code, pmw3901mb-txqt](#)
- [LamaPLC: CJMCU-6701: Biosensor for measuring Galvanic Skin Response \(GSR\) with SPI communication](#) 2026/04/23 21:52 [cjmcu, cjmcu-6701, acs758, acs-758, galvanic skin response, gsr, electrodermal activity, eda, spi, communication, arduino, code, sensor, healthcare](#)
- [LamaPLC: CJMCU-6814 combined gas sensor module for CO, NO₂, NH₃](#) 2026/04/23 21:52 [analog, cjmcu, cjmcu-6814, mics6814, mics-6814, sensor, arduino, code, carbon monoxide, co, ammonia, nh₃, nitrogen dioxide, no₂](#)

• lamaPLC: CJMCU-811 CCS811 Gas Sensor (VOCs TVOC CO2)	2026/04/23 21:52	cjmcu-811, ccs811, gas, sensor, vocs, tvoc, eco2, co2, arduino, air quality metal oxide, mox, i2c, micropython, rp2040-eth
• LamaPLC: CJMCU-8221 Analog Devices Precision instrumentation amplifier module	2026/04/23 21:52	cjmcu-8221, ad8221ar, analog devices, amplifier, sensor, cjmcu
• LamaPLC: D6T Omron Non-Contact Thermal Sensors with I ² C communication	2026/04/23 21:52	d6t, d6t-32l, d6t-44l, d6t-8l, d6t-1a, omron, non-contact, thermal, sensor, i2c, arduino, code
• LamaPLC: DHT Temperature /Humidity sensors with 1-wire / I ² C communication	2026/04/23 21:52	dht11, dht20, dht22, temperature, humidity, pressure, sensor, 1-wire, arduino, code
• LamaPLC: DPS Infineon Temperature/Pressure sensors with I2C communication	2026/04/23 21:52	dps310, infineon, temperature, pressure, sensor, arduino, i2c, communication, code
• lamaPLC: DS18B20 1-Wire Digital Thermometer	2026/04/23 21:52	ds18b20, sensor, 1-wire, communication, arduino, thermometer, parasitic mode
• lamaPLC: Energy, power, current, and voltage	2025/05/31 23:32	i2c, i c, communication, arduino, energy, power, current, sensor, ina226
• LamaPLC: ENS ScioSense Multi-gas sensors with I ² C communication	2026/04/23 21:52	ens160, sciotsense, gas-quality, i2c, communication, sensor, arduino, code, eco2, tvoc, aqi, indoor air quality, iaq, co2, voc
• lamaPLC: ENS160 + AHT21 Air Quality Sensor - CO, ECO, TVOC, Temp & Humidity Module	2026/04/23 21:52	arduino, ens160, aht21, air quality, sensor, co, eco, tvoc, module, aqi
• LamaPLC: Gas sensors	2023/07/01 17:29	gas, sensor, i2c, onewire, communication, mq-3, mq-4, mq-5, mq-6, mq-7, mq-8, mq-9, mq-135, gm-102b, gm-302b, gm-502b, gm-702b, alcohol, ch4, natural gas, smoke, lng, co, co2, lpg, h2, iso-butane, nox, nh3, benzene, town gas, formaldehyde, propane, humidity, temperature, voc, grv gas sens v2
• LamaPLC: GM MEMS Gas-sensors	2026/04/23 21:52	gm-102b, gm-302b, gm-502b, gm-702b, mems, gas-quality, sensor, arduino, code, nitrogen dioxide, no2, volatile organic compounds, voc, carbon monoxide, co, ethyl alcohol, c2h5ch, formaldehyde, ch2o, alcohol, c2h5oh
• lamaPLC: GY-511 6DOF sensor module	2026/03/22 01:44	stmicroelectronics, lsm303dlhc, i2c, lsm303, sensor, gy-511, 6dof, pololu, module, arduino
• LamaPLC: HC-SR04 Ultrasonic Sensor Module	2026/04/23 21:52	hc-sr04, ultrasonic, sensor, arduino, code

• LamaPLC: HDC Texas Instruments Temperature/humidity sensors with I²C communication	2026/04/23 21:52	sht21, htu21, si7021, gy-21, gy-213v, hdc1080, gy-213v-hdc1080, cjmcu, cjmcu-1080, texas instruments, temperature, humidity, sensor, i2c, communication, arduino, code
• LamaPLC: HTU TE Connectivity temperature/humidity sensors with I²C communication	2026/04/23 21:52	htu, htu31d, htu21d, htu20d, sht20, htu20, sht21, htu21, si7021, gy-21, gy-213v, hdc1080, si702, gy-20, sht31, htu31, si7031, gy-31, te connectivity, temperature, humidity, i2c, communication, sensor, arduino, code
• LamaPLC: HX711 24-bit analog-to-digital converter (ADC)	2026/04/11 18:28	hx711, hx-711, analog-to-digital, adc, converter, load cell, wheatstone bridge, weight, sensor, communication, arduino, code
• lamaPLC: INA modules with Arduino libraries	2026/04/11 19:54	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina219, gy-219, ina226, gy-216, ina228, gy-228, ina237, ina238, ina260, ina3221, ina
• lamaPLC: INA226 - current/voltage/power monitor with I²C communication	2026/04/23 21:52	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina226, ina219, ina
• lamaPLC: LTC3588 - Nanopower energy harvesting power supply IC	2026/04/23 21:52	communication, arduino, sensor, energy harvesting, eh, energy, ambient power
• LamaPLC: M01 - V0.4 Laser ranging sensor with UART communication	2026/04/23 21:52	distance measurement, laser, distance, sensor, m01
• LamaPLC: MAX30100/MAX30102 Heart Rate Click Sensor Module	2026/04/23 21:52	max30102, max30100, heart rate click, sensor, communication, i2c, arduino, code
• lamaPLC: Max31865 RTD to Digital Converter - PT100/PT1000 Platine	2026/04/23 21:52	max31865, rtd, pt 100, pt 1000, temperature, spi, platinum, arduino, code, sensor, adafruit
• LamaPLC: MAX4466/MAX9814: Low-noise Microphone Preamplifiers	2026/04/23 21:52	audio, microphone, analogue audio, max4466, max9814, max 4466, max 9814, agc, preamplifiers, sensor, arduino, code
• LamaPLC: MH-Z19 series of NDIR CO₂ sensors	2026/04/23 21:52	mh-z19, mh-z19d, mh-z19c, mh-z19b, mh-z19e, ndir, co ₂ , sensor, winsen, uart, pwm, communication, non-dispersive infrared, infrared, ir, temperature, arduino, code, tasmota
• lamaPLC: MPU-6050 (HW-123, GY-521) 6-axis MotionTracking device	2026/04/23 21:52	mpu-6050, hw-123, gy-521, 6-axis motiontracking, dmp, temperature, sensor, mems, arduino code, arduino, accelerometer, gyroscope, tilt

• LamaPLC: MQ Winsen Gas-sensors	2026/04/23 21:52	mq , mq-2 , mq-3 , mq-4 , mq-5 , mq-6 , mq-7 , mq-8 , mq-9 , mq-131 , mq-135 , mq-137 , winsen , gas-sensor , sensor , arduino , code , alcohol , c2h5oh , benzine gas , smoke , lpg , propane , c3h8 , hydrogen , h2 , methane , ch4 , iso-butane , town gas , ammonia , nh3
• LamaPLC: PIR sensors	2026/04/23 21:52	hc-sr501 , hc-sr505 , am-312 , ekmb , ekmc , pir , motion , sensor , arduino , code
• LamaPLC: Pixart PAJ7620U2 Gesture recognition sensors/module with I²C communication	2026/04/23 21:52	paj7620u2 , gy-paj7620 , pixart , gesture recognition , i2c , communication , sensor , arduino , code
• lamaPLC: PT100 / PT1000	2025/09/23 18:59	pt100 , pt1000 , temperature , sensor , platine , rtd
• lamaPLC: PTA8C04 4-channel PT100 Modbus Modul	2026/02/14 18:42	pta8c04 , sensor , modbus , rtu , rs-485 , communication , platine , um72
• LamaPLC: RCWL - Microwave radar sensor	2026/04/23 21:52	rcwl-0516 , rcwl , microwave , radar , sensor , arduino , code
• lamaPLC: RD-xx - Ai-Thinker Radar Module with UART communication	2026/04/23 21:52	radar , s3km1110 , fmcw , rd-01 , rd-03 , rd-03d , ai-thinker , k-band , 24 ghz , sensor , distance , micro-movements
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data	2026/05/12 21:06	code , micropython , 2026 , rp2040 eth , bme680 , i2c , sensor , communication
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data and store in Modbus input registers	2026/05/12 18:58	code , micropython , 2026 , rp2040 eth , bme680 , i2c , sensor , communication
• LamaPLC: SGP Sensirion TVOC/VOC sensors with I²C communication	2026/04/15 19:41	sgp30 , sgp40 , sgp41 , sensirion , gas-sensor , i2c , communication , sensor , arduino , code , eco2 , voc , tvoc , indoor air quality , iaq , nox , hydrogen
• LamaPLC: SHT Sensirion Temperature/humidity sensor with I²C communication	2026/04/23 21:52	sht20 , sht21 , sht25 , sht30 , sht31 , sht35 , sht40 , gy21 , temperature , humidity , i2c , communication , sensor , arduino , code
• LamaPLC: Texas Instruments ADCs: Delta-sigma multi-channel Analog Converters with SPI communication	2026/04/23 21:52	ads111x , ads12xx , delta-sigma , converter , texas instruments , adc , spi , communication , sensor , arduino , code , ads1110 , ads1112 , ads1113 , ads1114 , ads1115 , ads1118 , ads1119 , ads1220 , ads1232 , ads1234 , ads1256 , ads1261 , ads1263 , multi channel
• LamaPLC: TOFnnnC STMicroelectronics Time-of-Flight (ToF) sensors with I²C communication	2026/04/23 21:52	tof050c , vl6180 , tof200c , vl53l0x , tof400c , vl53l1x , stmicroelectronics , time-of-flight , tof , i2c , communication , sensor , arduino , code
• LamaPLC: UICPAL Temp.humi.sensor	2023/06/25 00:43	simatic , s7 , modbus , communication , temperature , humidity , sensor
• LamaPLC: VL53Lnn STMicroelectronics time-of-flight (ToF) laser-ranging sensors with I²C communication	2026/04/23 21:52	vl53l0x , vl53l1x , vl53l0 1xv2 , gy-530 , time-of-flight , tof , laser-ranging , i2c , communication , sensor , arduino , code

- [LamaPLC: VL6180X STMicroelectronics Time-of-Flight \(ToF\) sensor with I²C communication](#) 2026/04/23 21:52 [vl6180x, stmicroelectronics, time-of-flight, tof, i2c, communication, sensor, arduino, code](#)
- [LamaPLC: Waveshare TOF Laser Range Sensor with UART / I²C communication](#) 2026/04/23 21:52 [distance measurement, laser, range, sensor, tof, waveshare](#)
- [lamaPLC: YR-3180 - Weight sensor module with UART or Modbus communication](#) 2026/02/15 00:00 [communication, modbus, rtu, sensor, weight, yr-3180, hx710b, arduino, ttl, rs-485](#)
- [LM393: Dual differential comparator \(flame, light, sound sensors\)](#) 2026/05/12 22:18 [communication, analog, lm393, lm-393, flame, ir, sound, hall, sensor, ky-026, hw-484, ky-037, ky-038, fc-03, hc-89, ky-024, modul](#)
- [Magnetic angle sensors](#) 2026/03/05 21:19 [magnetic angle sensor, magnetic flux, sensor, spi, i2c, pwm, communication, modul, as5047p, as5600, mt6701, mt6816, mt6835, tle5012b, amr, gmr, tmr, anisotropic magnetoresistive](#)
- [NT18B07: 7 Kanal RS485 Temperatur Sensor with Modbus RTU](#) 2026/02/14 18:49 [nt18b07, sensor, modbus, rtu, rs-485, communication, platine](#)
- [PT100 / PT1000 sensors](#) 2026/04/23 21:52 [rtd, pt100, pt1000, sensor, temperature](#)
- [Radar Module RD-xx](#) 2026/04/23 21:52 [radar, s3km1110, fmcw, rd-03, k-band, 24 ghz, sensor, distance, micro-movements](#)

[communication, analog, LM393, LM-393, flame, IR, sound, hall, sensor, KY-026, HW-484, KY-037, KY-038, FC-03, HC-89, KY-024, modul](#)

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