MH489 is a monolithic programmable Hall sensor IC featuring the planar Hall technology, which is sensitive to the flux density applied orthogonally to the IC surface. The sensor provides an output signal proportional to the applied magnetic flux density and is preferably suited for current measurement.

The transfer characteristic of MH489 is factory trimmed over temperature, and is programmable (offset, gain) during end-of-line customer calibration. The linear analog output is designed for applications where a very fast response is required, such as inverter applications.

In a typical application, the sensor is used in combination with a soft ferromagnetic core. This core is recommended to be laminated for high bandwidth applications. The Hall IC is placed in a small air gap and the current conductor is passed through the inner part of the ferromagnetic core.

The core concentrates and amplifies the magnetic flux on the Hall sensor IC, which generates an output voltage proportional to the current flowing in the conductor.

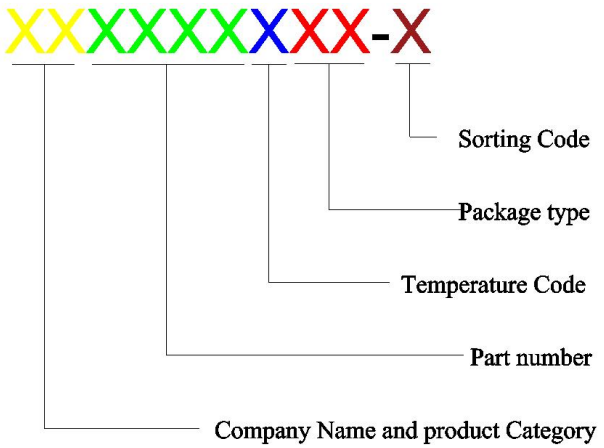
Features and Benefits

- End-of-line programmable sensor
- User-selectable internal or external reference voltage
- User-selectable ratiometry of QVO
- Sensitivity is independent from VDD
- Measurement range from ±0.9 to ±25mV/G
- Wideband sensing: DC to 240KHz
- Very short response time (<3μs)
- Supply voltage 5V or 3.3V
- RoHS compliant
- TO-94(3-pin) package
- MSL-1
- Automotive Grade1
- Automotive Grade AECQ100-Grade0 with diagnostics for safety-critical

Applications

- High Voltage Traction Motor Inverter
- 48V Boost Recuperation Inverter
- DC/DC Converter
- BLDC motor current monitoring
- Smart Fuse Overcurrent Detection

Ordering Information



Company Name and Product Category

MH:MST Hall Effect/MP:MST Power IC

Part number

181,182,183,184,185,248,249,276,477,381,381F,381R,382…..

If part # is just 3 digits, the forth digit will be omitted.

Temperature range

E: 85 ℃, I: 105 ℃, K: 125 ℃, L: 150 ℃

Package type

UA:TO-92S, VK:TO-94(4pin), VF:TO-92S(5pin),

VL:TO-94(3pin),SO:SOT-23,SQ:QFN-3,ST:TSOT-23,

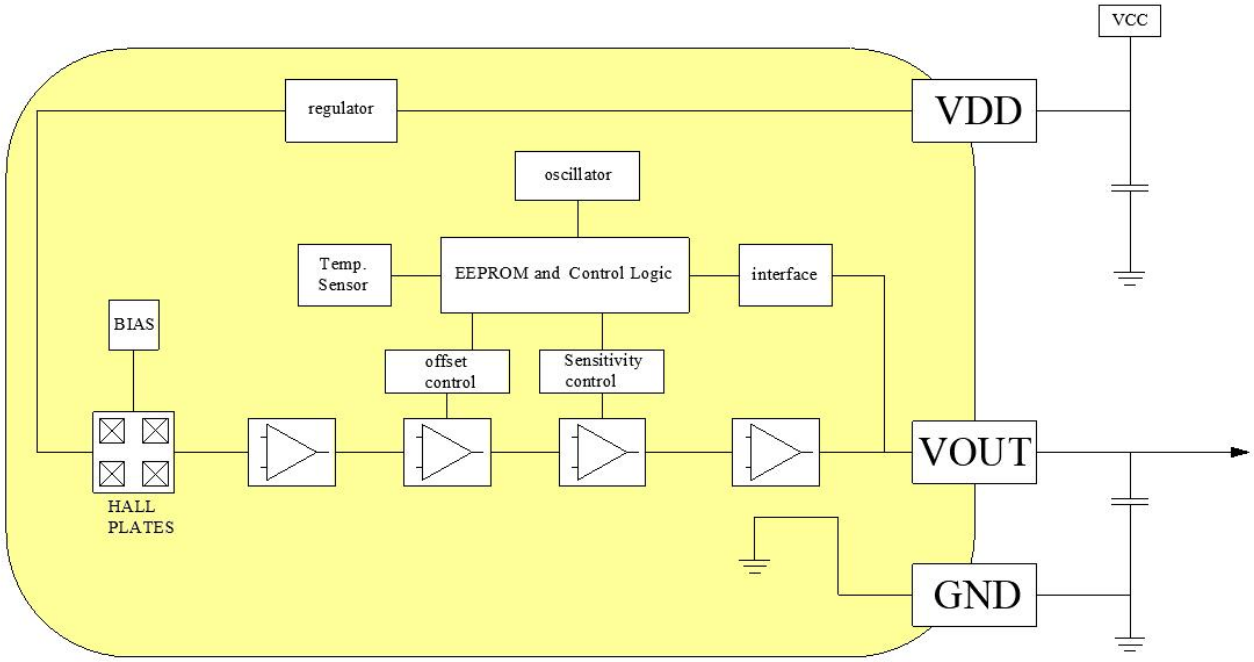
SN:SOT-553, SF:SOT-89(5pin),SS:TSOT-26,SD:DFN-6

Sorting

α , β ,Blank…..

Part No.	**Temperature Suffix**	**Package Type**
MH489KVL	K (-40°C to + 125°C)	VL (To-94-3pin)

Functional Diagram



Absolute Maximum Ratings *At (Ta=25℃)*

Parameter	Symbol	Value	Unit
Positive Supply Voltage (overvoltage)	V_{DD}	6.5	V
Reverse Voltage	VS_{REV}	-0.3	V
Positive Output Voltage	V_{OUT}	5.5	V
Output Sink Current	I_{Sink}	-40	mA
Output Source Current	I_{Source}	60	mA
Reverse Output Voltage	VO_{REV}	-0.3	V
Reverse Output Current	IO_{REV}	-50	mA
Operating Ambient Temperature Range	T_A	-40 to +125	°C
Storage Temperature Range	T_S	-65 to +165	°C
ESD – Human Body Model	ESD_{HBM}	8	KV
Maximum Number of EEPROM Write Cycles	$EEPROM_{W(max)}$	1000	cycle

***Note**:Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum - rated conditions for extended periods of time may affect device reliability.*

General Electrical Specifications

Operating Parameters T_A = -40 to 125°C, V_{DD} = 5V±10%, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Supply Current	I_{DD}	No OUT load		13	18	mA
Output Impedance	R_{OUT}	Normal Operation		8		Ω
Output Capacitive Load	C_L			1	100	nF
Output Resistive Load	R_L		2	4.7		KΩ
Linear Output Range	VO_{LIN}	pull-down ≥ 10 kΩ	10		90	%Vdd

Analog output specification

Accuracy specifications

Operating Parameters T_A = -40 to 125°C, V_{DD} = 5V±10%, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
RMS Output Noise(high-gain)	N_{RMS-HG}	Values for S=12.5mV/G, 1KHz-100KHz		7		mV_{RMS}
VOQ Ratiometry	$\Delta^R V$	V_{DD} = 5V±5%, V_{OQ} = 50%V_{DD}		±0.24	±0.4	$\%V_{OQ}$
Temperature coefficient variation of Sensitivity	δ_{TCVO}	Over full range of B_M and T_A, calibrated IC, without TC_{OF}	-200		200	ppm/°C
Sensor output Voltage	Vout	T_A = 25°C, after trimming V_{DD} = 5V	0.496	0.50	0.504	V
			2.496	2.50	2.504	V
			0.496	0.5	0.504	V
			$V_{DD}/2$ -4m	$V_{DD}/2$	$V_{DD}/2$ +4m	V
			$V_{DD}/10$ -4m	$V_{DD}/10$	$V_{DD}/10$ +4m	V
Offset Temperature characteristic	TC_{VOF}	B_M = 0 μT, S=12.5mV/G, V_{OUT} – $V_{DD}/2$	-0.120		0.120	mV/°C
Average Fine Sensitivity Programming Step Size	$Step_{SENS}$	S=12.5mV/G, T_A = 25°C		1.5		μV/G

***Note:**The accuracy specifications are defined for the factory calibrated sensitivity. The achievable accuracy is dependent on the user's end-of-line calibration.*

Timing specifications

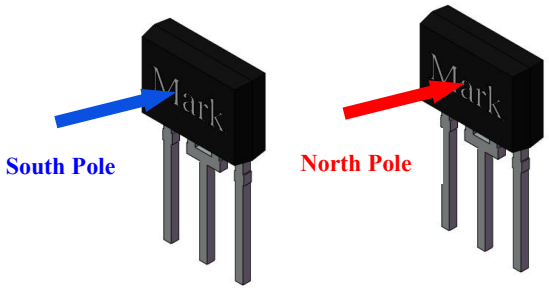
Operating Parameters T_A = -40 to 125°C, V_{DD} = 5V±10%, unless otherwise specified.

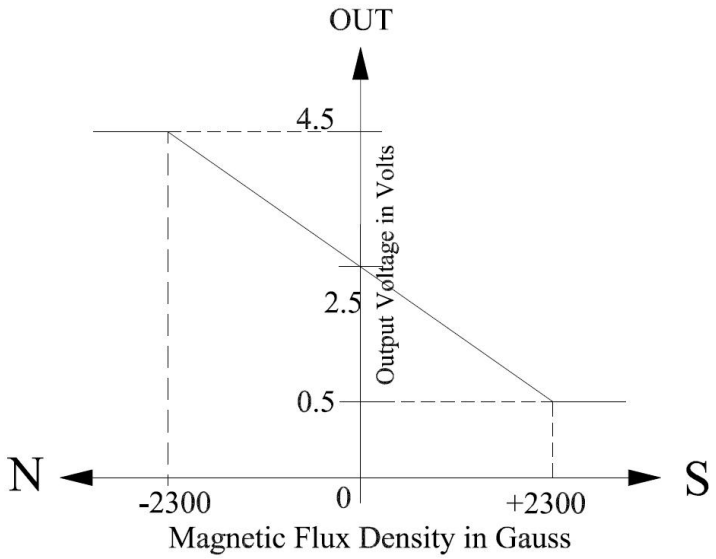
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Response Time	tRESP	T_A = 25 °C, C_L=1nf, Magnetic field step of 400G, Sens=2mV/G, Measured 90% input to 90% output.		2		µs
Frequency bandwidth	BW	-3 dB, T_A = 25 °C		240		kHz

Magnetic specification

Operating Parameters T_A = -40 to 125°C, V_{DD} = 5V±10%, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operational Magnetic Field Range	BOP		±100	±1000	±2300	G
Programmable Sensitivity	S		0.9	2	25	mV/G
Linearity Error (Magnetic)	NL	V_{OUT} in [10%V_{DD}, 90%V_{DD}], T_A = 25°C, $R_L \geq$ 10 kΩ			±0.25	%FS

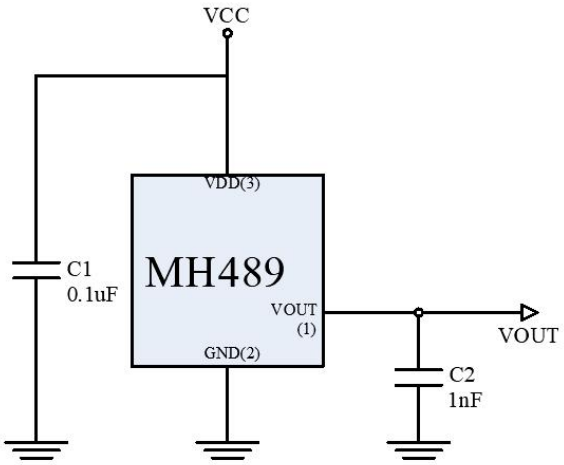




Programmable Items

Parameter	Bits	Factory Setting	Comment
VOQ[4:0]	5	trimmed	Quiescent output level (0 Gauss) adjustment
RG[4:0]	5	trimmed	Rough gain adjustment
FG[7:0]	8	trimmed	Fine gain adjustment
POL	1	0	0: default polarity as described in section 10 (figure 4)
			1: opposite polarity
ID[19:0]	20		CUSTOMER ID
VSEL[2:0]	3	4	0: 0.5V 1:VDD/10 2: 2.5V 3: VDD/2
VQ_RATIOM	1	0	0: QVO Ratiometry 1: QVO fixed

Recommended Application Diagram

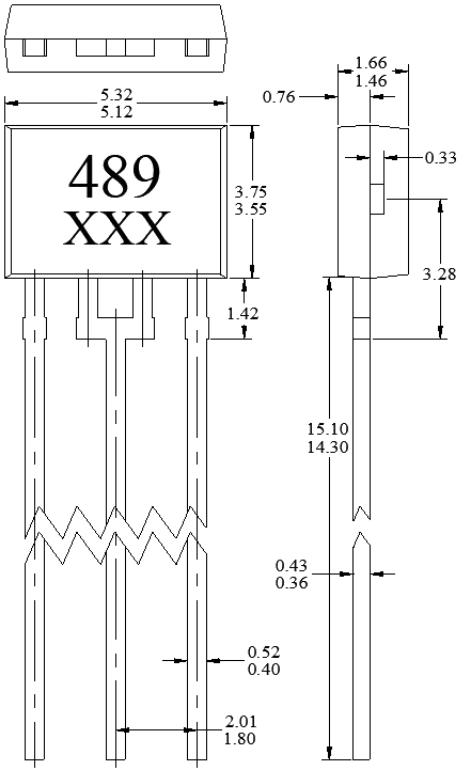


ESD Precautions

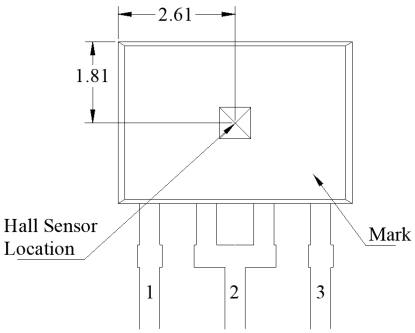
Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Sensor Location, package dimension and marking

VL Package (To-94-3pin)



Hall Chip location



NOTES:

1.Controlling dimension: mm
2.Leads must be free of flash and plating voids
3.Do not bend leads within 1 mm of lead to package interface.
4.PINOUT:

Pin 1	VOUT
Pin 2	GND
Pin 3	VCC

Output Pin Assignment