



NXP magneto-resistive sensors KMA & KMZ series

Position sensors for a safer, cleaner, more comfortable ride

These advanced sensors, with their ability to help reduce emissions, increase vehicle stability, add driver-independent control functions, and help realize the future of green cars.

Key features

- ▶ Contactless angle measurements up to 180°
- ▶ High temperature range up to 160 °C
- ▶ Automotive qualification acc. to AEC Q100

Key benefits

- ▶ Insensitive to
 - magnetic drift during lifetime
 - magnetic drift with temperature
 - mechanical tolerances
 - mechanical shifts caused by thermal stress

Applications

- ▶ Throttle position
- ▶ Pedal position
- ▶ Wiper position
- ▶ Electronic steering
- ▶ Active suspension
- ▶ Automatic headlight adjustment

The NXP KMA and KMZ series of magneto-resistive (MR) position sensors support the worldwide commitment to reduce CO₂ emissions from cars. They help OEMs enhance their engine concepts, creating new ways to meet emissions targets.

In electronic valve actuators, for example, they can help reduce untreated emissions through optimization of the combustion air supply and the recirculation rate of exhaust gas.

In diesel engines, they can assist with particle filter regeneration by throttling the intake air and thereby reducing the amount of emitted particulate mass.

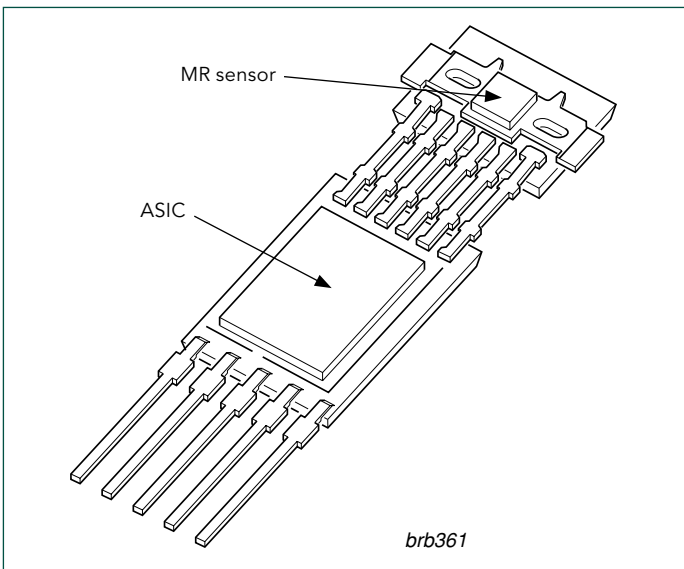
As part of the load control unit on drive-by-wire engines, the sensors can enable a range of features, including driver-independent control of air intake, control functions for idle speed and cruise control, and Electronic Stability Program (ESP) functions.



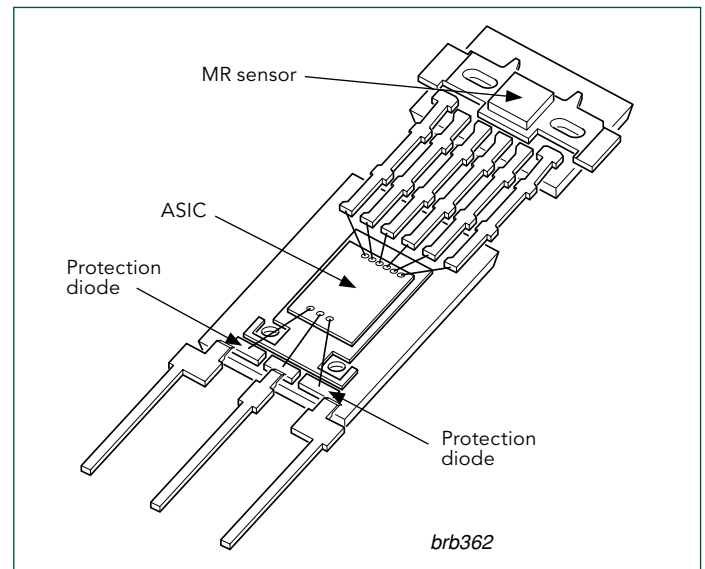
KMA series: KMA199, KMA199E and KMA200

The KMA series, which includes the KMA199, KMA199E, KMA200 is a family of pre-aligned, ready-to-use angular sensor systems. Each device consists of a magneto-resistive element equipped with two independent MR sensor

bridges and a signal-conditioning IC. Each device is housed in a special multi-chip package that allows 90° bending of the MR element.



KMA200 sensor system



KMA199 / KMA199E sensor system

KMA200 features

- ▶ Programmable angle range: up to 180°
- ▶ Operating temperature range: -40 to +160 °C
- ▶ Ratiometric analog output
- ▶ Four analog and two digital output modes selectable
- ▶ Over- and reverse-voltage protection
- ▶ On-line diagnosis of all functional blocks
- ▶ User-programmable EEPROM

KMA199/199E features

- ▶ Programmable angle range: up to 180°
- ▶ Operating temperature: -40 to 160 °C
- ▶ Ratiometric analog output
- ▶ Two analog output modes selectable
- ▶ Detects magnet lost and power lost
- ▶ Failsafe EEPROM (programmable via one-wire interface)

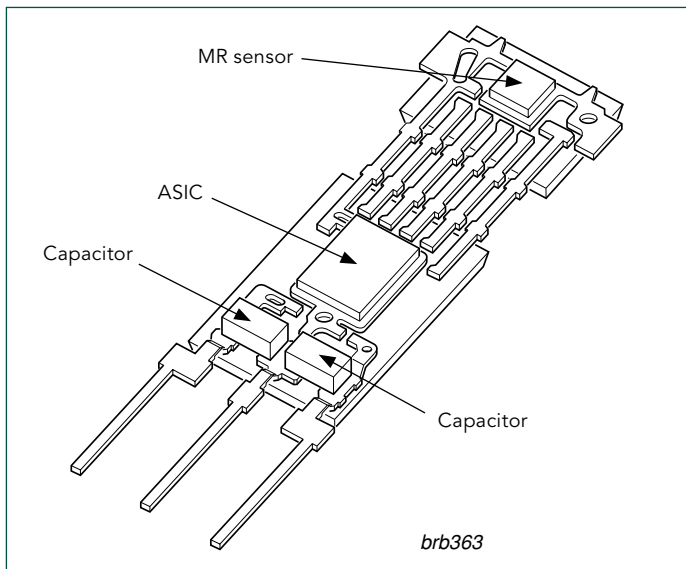
Selection guide: KMA series

Specification	KMA200	KMA199E	Preliminary KMA199
Over-voltage protection / inverse polarity protection	26.5 V -16.5 V	Coupled transient & ESD pulses without galvanic coupled	Coupled transient & ESD pulses without galvanic coupled
Number of outputs	2x analog 1x digital	1x analog	1x analog
Operating temperature range	-40 to +160 °C	-40 to +160 °C	-40 to +160 °C
Temperature drift error -25 to +125 °C (3sigma) -40 to +140 °C (3sigma) Referred to +25 °C (3sigma)	±0.64° - -	- ±0.80° ±0.55°	- ±0.80° ±0.55°
Linearity error -40 to +140 °C -40 to +160 °C	- ±1.65° ⁽¹⁾	- ±1.55°	±1.00° ±1.20°
Diagnostics	Full set of diagnostic features	CRC at power on Magnet lost Power lost	CRC at power on Magnet lost Power lost

⁽¹⁾ Corresponds to overall angular error, including temperature drift.

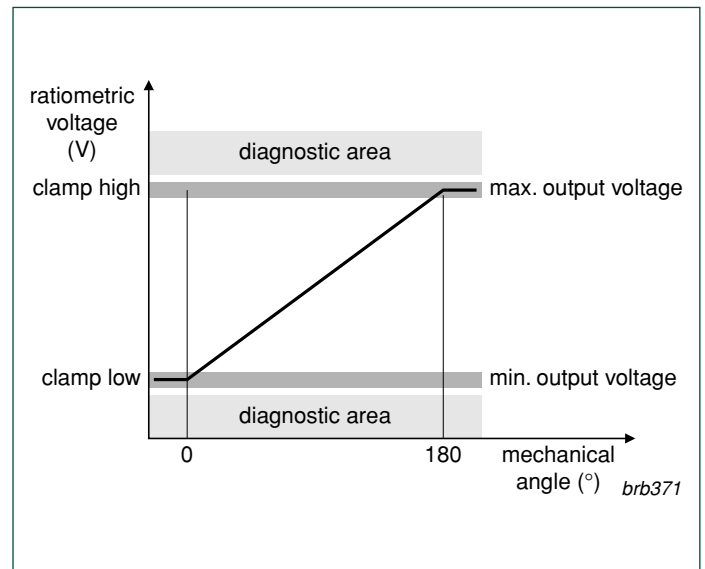
KMA series: Upcoming angular sensor system KMA210

The upcoming KMA210 is a next-generation version of the KMA199. It adds capacitors to the package and as a result requires no external components for operation. It uses an ABCD9 ASIC and offers over-voltage protection up to 16 V.



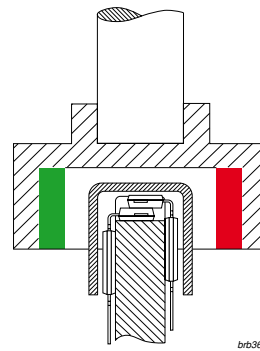
KMA210 sensor system

The integrated capacitors deliver supply blocking of 47 nF and output decoupling of 2.2 nF. Engineering samples of the KMA210 will be available Q3, 2009, followed by production volumes in early 2011.



KMA210 features

- ▶ Programmable angle range: up to 180°
- ▶ Operating temperature range: -40 to +160 °C
- ▶ Ratiometric analog output
- ▶ Over-voltage protection
- ▶ Detects magnet lost and power lost
- ▶ Failsafe non-volatile memory with write protection (lock bit)
- ▶ Enhanced EMC and ESD performance
- ▶ Built-in capacitors
- ▶ No external components required



Example KMA210 application
redundant sensor with ring magnet

Selection guide: KMA series

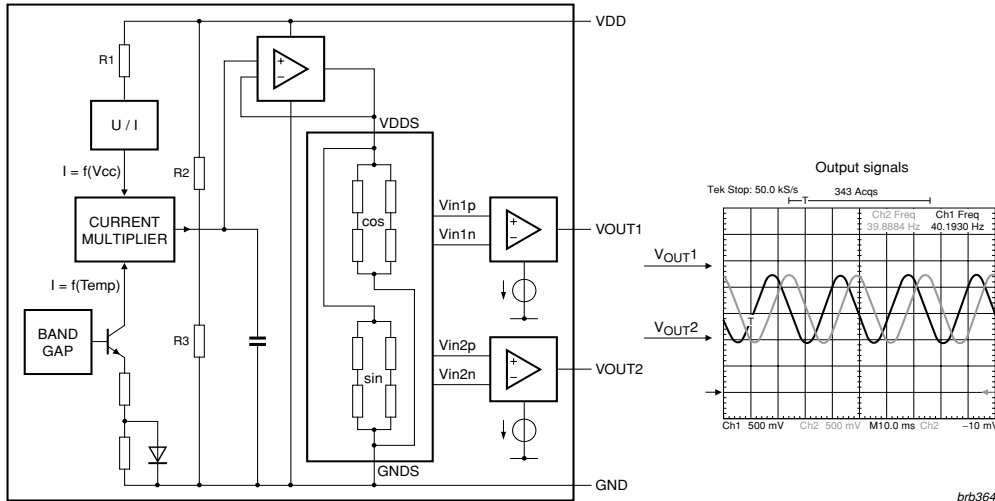
Preliminary Specification	KMA210
Over-voltage protection / inverse polarity protection	+16 V Reverse: current limited
Number of outputs	1x analog
Operating temperature range	-40 to +160 °C
Temperature drift error	
-25 to +125 °C (3sigma)	-
-40 to +140 °C (3sigma)	±0.80°
Referred to +25 °C (3sigma)	±0.55°
Linearity error	
-40 to +140 °C	±1.00°
-40 to +160 °C	±1.20°
Diagnostics	CRC at power on Magnet lost Power lost

⁽¹⁾ Corresponds to overall angular error, including temperature drift.

KMZ series: Upcoming angular sensor system KMZ60

The KMZ series includes angular sensors designed for use in brushless (BL) DC motors and steering applications. Each device consists of a magneto-resistive element equipped with two independent MR sensor bridges and two instrumentation amplifiers with temperature compensation. The upcoming KMZ60 offers performance similar to the KMZ43T, but with

increased output levels and temperature compensation. Available in a small SO8 package, it supports level-shift functions in microcontroller applications. Engineering samples of the KMZ60 will be available Q4 of 2009, with production volumes planned for early 2011.



KMZ60 application

KMZ60 features

- ▶ Temperature-compensated output amplitude
- ▶ Ratiometric output voltage
- ▶ Temperature-compensation circuit can be switched off in case of external compensation
- ▶ Temperature sensor output



KMZ60 package

KMZ60 operating parameters

Preliminary Specification	KMZ60
Ambient working temperature range ⁽¹⁾	40 to 150 °C
Supply voltage range	3.0 to 5.5 V
Maximum supply current ⁽²⁾	< 12 mA
Linearity error ⁽³⁾	-0.5 to +0.5°
Phase error at 25,000 rpm	< 1.5°
Amplitude matching of output signals ⁽⁴⁾	≤ ±2%
Peak-to-peak output voltage	> 30% to <60%V _{DD}

⁽¹⁾ Over full specification

⁽²⁾ Including maximum permissible output loads

⁽³⁾ After offset compensation and amplitude correction

⁽⁴⁾ For sinusoidal input signals inside the permissible output range up to 1 kHz

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