

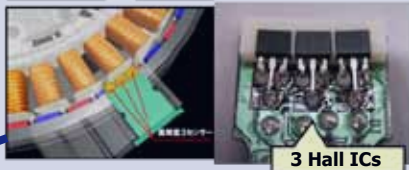


## 2011 Sensor Product Guide

### Input Dial/Selector



**Drum motor sensor  
Clothing detection**



3 Hall ICs

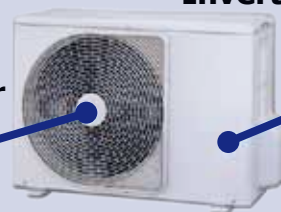


**Dryer fan/Heat pump motor**

**Weight sensor**

**Lint filter sensor**

**Outdoor  
Fan motor**



**Inverter Circuits**



### Air Cleaner & Humidifier



**Fan motor**

**Filter sensor**

**Water pump sensor  
flow sensor**

**Water Tank  
weight sensor/SW**



**Touch sensor**



**Angle sensor**



**Fan motor**

**Filter sensor**

**Door switch**

**Drawer switch**

**Compressor  
pump motor**

### Security



# Sensor Solutions

Hall Elements, Unipolar, Bipolar, & Omnipolar Hall Effect Switches, Bipolar Hall Effect Latches, Linear Hall Effect ICs, Current Sensor Modules, Angle Position Sensor ICs

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# Hall Sensor Types

## AKM Hall Elements

A Hall Element is a magneto-electric transducer which utilizes the Hall Effect to measure or sense a magnetic field perpendicular to the Element. AKM Hall Elements typically have 4 pins, 2 input pins and 2 output pins, and can be driven by either a voltage or a current source. The output is a Hall voltage that is proportional to the magnetic field. The output from a Hall Element is analog and typically requires additional amplification. AKM uses four different semiconductor materials in its Hall Elements. These different materials represent AKM's 4 different series of part numbers. The different materials provide different performance characteristics (magnetic sensitivity represented by electron mobility and band gap, operating voltage, temperature sensitivity, etc.) allowing the design engineer to choose the best solution for the particular application.

Applications	AKM Series	Hall Element Material	Magnetic Sensitivity		Temperature Coefficiency	
			Relative Ranking	Electron Mobility of Semiconductor (cm <sup>2</sup> /Vs)	Temperature Dependence of Sensitivity	Band Gap Eg (eV)
---	---	Si	Low	1,450	Low	1.12
Weight sensor, Inverter, position sensor, current sensor (low cost)	HGXXX	GaAs	Medium	8,000	Low	1.43
Inverter, Smart Meter, Power Meter, current sensor, etc.	HZXXX	InAs	High	30,000	Medium	0.33
Position detection	HQXXX	InAs (Quantum well)	High	30,000	Medium	0.33
Brushless DC motor, current sensor	HWXXX	InSb	Ultra High	75,000	High	0.16

## AKM Current Sensor Modules

The Current Sensor Modules use a Hybrid Hall IC, which includes: a high sensitivity Hall element, an amplifier, a buffer, compensation circuitry, and a drive circuit for the Hall sensor. CQ206x and CQ209x Series also include an EEPROM unit providing factory-adjusted sensitivity and offset voltage for high accuracy. The compensation circuitry provides flat temperature dependence. The current conductor is electrically isolated from the sensor IC. The output is linear and ratiometric to the supply voltage.

Applications	AKM Series	Hall Element Material	Operating Voltage	Measuring Current Range	Current Sensitivity	Output
Inverter, Smart Meter, Power Meter, circuit protection, current monitoring, home & industrial equipment, etc.	CQXXXX	Hybrid	3 ~5.5 4.5~5.5	±20A to ±130A	12mV/A to 100mV/A	Analog Ratiometric

## AKM Hall Effect ICs

A Hall Effect IC uses a Hall Element combined with additional circuitry internal to the IC to provide an output based on a particular function. This provides the design engineer with a complete Hall solution. Additional circuitry to interpret the output is typically not required. AKM Hall Effect ICs offer digital switch, digital latch, linear output and other specialized functions. AKM uses four different semiconductor materials in its Hall Elements. The different materials provide different performance characteristics allowing the design engineer to choose the best solution for the particular application.

Applications	AKM Series	Hall Element Material	Operating Voltage	Magnetic Sensitivity	Type	Output
<b>Switches</b>						
<b>Open/Close detection:</b> Laptop, flip phone, slide phone, appliance door, security door, portable game, switch, touch sensor, louvre, etc. <b>Presence detection:</b> Ice tray, phone is in holder, phone is near hearing aid, filter, etc.	EMXXX	Si Monolithic	1.6~5.5V	$B_{OP}$ 2.5mT or 3mT	Omnipolar Switch	CMOS Single & Dual
	AKXXX	Si Monolithic	1.6~5.5V 1.7~3.6V	$B_{OP}$ * 2.5mT or 3mT	Omnipolar Switch	CMOS Single & Dual
	EZXXX	InAs Hybrid	2~24V	$B_{OP} S_{POLE}$ 26mT	Unipolar Switch	Open Collector
	EWXXX	InSb Hybrid	2.4~3.3V, 2.5~5.5V 3~26.4V	$B_{OP} S_{POLE}$ 1.5, 3, or 6mT	Unipolar Switch	Open Collector & CMOS
*AK8783 allows user defined sensitivity (operate and release points) via external resistor						
<b>Latches</b>						
<b>Position Detection:</b> Flow sensor, speed sensor, jog dial, angle sensor, brushless DC motors, etc.	EMXXX	Si Monolithic	1.6~5.5V 3.5~18V	$B_{OP}$ 1.8mT or 3mT	Bipolar Latch	Open Drain & CMOS
	AKXXX	Si Monolithic	1.6~5.5V	$B_{OP}$ 1.5mT or 1.8mT	Bipolar Latch *	Open Drain & CMOS
	EZXXX	InAs Hybrid	3.8~24V	$B_{OP}$ 4.2mT	Bipolar Latch	Open Collector
	EWXXX	InSb Hybrid	2.5~5.5V 3.0~26.4V 4.5~18V	$B_{OP}$ 3 or 10mT	Bipolar Latch	Open Collector
*AK8775 & AK8776 detect both horizontal and vertical magnetic fields						
<b>Linear</b>						
<b>Position:</b> Weight sensor <b>Rotation/Angle:</b> Robot, jog dial, joy stick, etc. <b>Current sensor:</b> Inverter, Smart Meter, Power Meter, circuit protection, current monitoring, home & industrial equipment, etc.	EQXXX	InAs Hybrid (Quantum well)	3~5.5V	20, 40, 65, or 130mV/mT	Linear	Analog Ratiometric

# Selection Guide

## Hall Elements

P/N	R <sub>IN</sub> (Feature)	Supply Voltage	Sensitivity mV/mT @ HE	Response time	Supply Current	Output	Temp range	Package
HG0811	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SON
HG0812	600	0.5 ~ 8	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SON
HG0813	1250	0.5 ~ 12	1.8 at 6V	< 1μs	4.8mA at 6V	Analog	-40~+125	4SON
HG0814	2000	0.5 ~ 8	1.8 at 6V	< 1μs	3mA at 6V	Analog	-40~+125	4SON
HG0815	2400	0.5 ~ 8	1.9 at 6V	< 1μs	2.5mA at 6V	Analog	-40~+125	4SON
HG106A	600	0.5 ~ 10	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SMT
HG106C	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SMT
HG106C2U	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SMT
HG116A-K	600	0.5 ~ 10	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SMT
HG116C	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SMT
HG116C-KN	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SMT
HG166A	1250	0.5 ~ 12	1.8 at 6V	< 1μs	4.8mA at 6V	Analog	-40~+125	4SMT
HG166A-2U	1250	0.5 ~ 12	1.8 at 6V	< 1μs	4.8mA at 6V	Analog	-40~+125	4SMT
HG186A	2400	0.5 ~ 8	1.9 at 6V	< 1μs	2.5mA at 6V	Analog	-40~+125	4SMT
HG302A	600	0.5 ~ 8	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SIP
HG302A-K	600	0.5 ~ 8	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SIP
HG302A-KK	600	0.5 ~ 8	1.7 at 6V	< 1μs	10mA at 6V	Analog	-40~+125	4SIP
HG302C	750	0.5 ~ 10	1.3 at 6V	< 1μs	8mA at 6V	Analog	-40~+125	4SIP
HG362A	1250	0.5 ~ 8	1.8 at 6V	< 1μs	4.8mA at 6V	Analog	-40~+125	4SIP
HG372A	2000	0.5 ~ 8	1.8 at 6V	< 1μs	3mA at 6V	Analog	-40~+125	4SIP
HQ0111		0.5 ~ 8	2.2 at 3V	< 1μs	3.2mA at 3V	Analog	-40~+125	4SON
HQ0221	(2 elements)	0.5 ~ 6	2.2 at 3V	< 1μs	6.4mA at 3V	Analog	-40~+125	6SON
HQ0222	(2 elements)	0.5 ~ 6	2.2 at 3V	< 1μs	6.4mA at 3V	Analog	-40~+125	6SON
HQ0811		0.5 ~ 8	2.2 at 3V	< 1μs	3.2mA at 3V	Analog	-40~+125	4SON
HQ8220	(4 elements)	0.5 ~ 6	2.2 at 3V	< 1μs	3.2mA at 3V	Analog	-40~+125	16TSSOP
HS0111	(Hypersensitive)	0.5 ~ 2	1.09 at 1V	< 1μs	3.0mA at 1V	Analog	-40~+110	4SON
HW101A	(Hypersensitive)	0.5 ~ 2	3.7 - 6.8 at 1V	< 1μs	2.5mA at 1V	Analog	-40~+110	4SMT
HW101A4T	(Hypersensitive)	0.5 ~ 2	3.7 - 6.8 at 1V	< 1μs	2.5mA at 1V	Analog	-40~+110	4DIP
HW102A-FT	(Hypersensitive)	0.5 ~ 2	4.3 - 6.8 at 1V	< 1μs	2.9mA at 1V	Analog	-40~+110	4SMT
HW102A-FU	(Hypersensitive)	0.5 ~ 2	4.3 - 6.8 at 1V	< 1μs	2.9mA at 1V	Analog	-40~+110	4DIP
HW105A	(Hypersensitive)	0.5 ~ 1.6	3.7 - 5.0 at 1V	< 1μs	2.9mA at 1V	Analog	-40~+110	4SMT
HW105C	(Hypersensitive)	0.5 ~ 1.6	1.0 - 1.3 at 1V	< 1μs	2.9mA at 1V	Analog	-40~+110	4SMT
HW108A	(Hypersensitive)	0.5 ~ 1.7	3.7 - 5.9 at 1V	< 1μs	2.9mA at 1V	Analog	-40~+110	4SMT
HW300B	(Hypersensitive)	0.5 ~ 2	3.2 - 5.9 at 1V	< 1μs	2.5mA at 1V	Analog	-40~+110	4SIP
HW322B	(Hypersensitive)	0.5 ~ 2	5.0 - 6.8 at 1V	< 1μs	2.5mA at 1V	Analog	-40~+110	4SIP
HZ116C		0.5 ~ 6	1.1 at 3V	< 1μs	10mA at 3V	Analog	-40~+125	4SMT
HZ312C		0.5 ~ 6	1.1 at 3V	< 1μs	10mA at 3V	Analog	-40~+125	4SIP

## Hall Effect Linear ICs

P/N	Feature	Supply Voltage	Sensitivity mV/mT @ HE	Response time	Supply Current	Output	Temp range	Package
EQ430L	Ratiometric	3 ~ 5.5	130 at 5V	5 $\mu$ s	9mA at 5V	Analog	-40~+100	3TSOP
EQ431L	Ratiometric	3 ~ 5.5	65 at 5V	5 $\mu$ s	9mA at 5V	Analog	-40~+100	3TSOP
EQ432L	Ratiometric	3 ~ 5.5	40 at 5V	5 $\mu$ s	9mA at 5V	Analog	-40~+100	3TSOP
EQ433L	Ratiometric	3 ~ 5.5	20 at 5V	5 $\mu$ s	9mA at 5V	Analog	-40~+100	3TSOP

## Hall Effect Switch ICs

P/N	Feature	Supply Voltage	Sensitivity Bop/Brp @HIC	Response time	Supply Current	Output	Temp range	Package
AK8783	Omnipolar Adj sensitivity via external resistor	1.70 ~ 3.6	2.6 - 4.4 1.6 - 3.4	50ms	5.0 $\mu$ A at 1.8V	Push-pull CMOS	-30~+85	4WLCSP
AK8788	Omnipolar Ultra-small package	1.6 ~ 5.5	3.0 / 2.2	50ms	4.5 $\mu$ A at 1.85V	Push-pull CMOS	-30~+85	4SON
AK8789	Dual Output Omnipolar Ultra-small package	1.6 ~ 5.5	2.5 / 2.0	50ms	6.5 $\mu$ A at 1.85V	Push-pull CMOS	-30~+85	4SON
EM1781	Omnipolar	1.6 ~ 5.5	3.0 / 2.2	50ms	6.5 $\mu$ A at 1.85V	Push-pull CMOS	-30~+85	4SOP
EM1791	Dual Output Omnipolar	1.6 ~ 5.5	2.5 / 2.0	50ms	6.5 $\mu$ A at 1.85V	Push-pull CMOS	-30~+85	4SOP
EM6781	Omnipolar	1.6 ~ 5.5	3.0 / 2.2	50ms	6.5 $\mu$ A at 1.85V	Push-pull CMOS	-30~+85	3SOT
EW463	Unipolar	2.5 ~ 5.5	3 / 2.2	3 $\mu$ s	6mA at 3V	Open collector	-30~+115	3SOT
EW650B	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SOT
EW650B-K	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SOT
EW652B	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SOT
EW652B-K	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SOT
EW6672	Unipolar	2.4 ~ 3.3	1.5 / 1.2	50ms	5 $\mu$ A at 3V	Push-pull CMOS	-30~+85	3SOT
EW750B	Unipolar	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	Open collector	-40~+115	3SIP
EW750B-K	Unipolar	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	Open collector	-40~+115	3SIP
EW752B	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SIP
EW752B-K	Unipolar Internal pull-up	3 ~ 26.4	6 / 5	3 $\mu$ s	5mA at 12V	NPN	-40~+115	3SIP
EZ470	Unipolar	2 ~ 24	26 / 20	3 $\mu$ s	3mA at 12V	Open collector	-40~+125	3SOT

# Selection Guide

## Hall Effect Latch ICs

P/N	Feature	Supply Voltage	Sensitivity Bop/Brp @HIC	Response time	Supply Current	Output	Temp range	Package
AK8771	Ultra-small package	1.6 ~ 5.5	1.8 / -1.8	24μs	2.5mA at 3V	Push-pull CMOS	-30~+85	4SON
AK8772	Ultra-small package	1.6 ~ 5.5	1.8 / -1.8	1ms	60μA at 3V	Push-pull CMOS	-30~+85	4SON
EM1011		3.5 ~ 18	3.0 / -3.0	25μs	3mA at 12V	Open drain	-30~+115	4SMT
EM1711		1.6 ~ 5.5	1.8 / -1.8	24μs	2.5mA at 3V	Push-pull CMOS	-30~+85	4SOP
EM1712		1.6 ~ 5.5	1.8 / -1.8	1ms	60μA at 3V	Push-pull CMOS	-30~+85	4SOP
EW400		4.5 ~ 18	10 / -10	3μs	6mA at 12V	Open collector	-20~+115	3SOT
EW403		2.5 ~ 5.5	10 / -10	3μs	6mA at 3V	Open collector	-30~+115	3SOT
EW413		2.5 ~ 5.5	3 / -3	3μs	6mA at 3V	Open collector	-30~+115	3SOT
EW610B		3 ~ 26.4	3 / -3	3μs	5mA at 12v	Open collector	-40~+115	3SOT
EW610B-K		3 ~ 26.4	3 / -3	3μs	5mA at 12v	Open collector	-40~+115	3SOT
EW612B	Internal pull-up	3 ~ 26.4	3 / -3	3μs	5mA at 12v	NPN	-40~+115	3SOT
EW612B-K	Internal pull-up	3 ~ 26.4	3 / -3	3μs	5mA at 12v	NPN	-40~+115	3SOT
EW710B		3 ~ 26.4	3 / -3	3μs	5mA at 12V	Open collector	-40~+115	3SIP
EW710B-K		3 ~ 26.4	3 / -3	3μs	5mA at 12V	Open collector	-40~+115	3SIP
EW712B	Internal pull-up	3 ~ 26.4	3 / -3	3μs	5mA at 12V	NPN	-40~+115	3SIP
EW712B-K	Internal pull-up	3 ~ 26.4	3 / -3	3μs	5mA at 12V	NPN	-40~+115	3SIP
EZ410		3.8 ~ 24	4.2 / -4.2	3μs	5mA at 12V	Open collector	-40~+125	3SOT

## Hall Effect Special ICs

P/N	Feature	Supply Voltage	Sensitivity Bop/Brp @HIC	Response time	Supply Current	Output	Temp range	Package
AK8775	Encoder Dual output A/B Quadrature	1.6 ~ 5.5	1.5 / -1.5	1ms	90µA at 3V	Pulse Push-pull CMOS	-30~+85	4SMT
AK8776	Encoder Dual output F - pulse D - rotation direction	1.6 ~ 5.5	1.5 / -1.5	1ms	90µA at 3V	Push-pull CMOS	-30~+85	4SMT
EM3242	Angle sensor Ratiometric	2.7 ~ 3.3	-	140µs	8mA	Analog	-30~+85	6TSSOP
EQ0442	Hybrid APD Analog Pointing Device	VDD:2.5~3.3 VDI:1.65~VDD	-	16ms	6µA at 3V (Ext Clk)	SPI Serial Peripheral Interface	-30~+85	20GFN

## Current Sensor Modules

P/N	Current (Feature)	Supply Voltage	Sensitivity mV/A	Response time	Supply Current	Output	Temp range	Package
CQ121E	20A	3 ~ 5.5	63.5	3µs	9mA at 5V	Analog (Ratiometric)	-30~+85	5SIP
CQ131E	30A	3 ~ 5.5	27	3µs	9mA at 5V	Analog (Ratiometric)	-30~+85	5SIP
CQ2063	35A (2% accuracy)	4.5~5.5	60	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SIP
CQ2064	54A (2% accuracy)	4.5~5.5	40	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SIP
CQ2065	85A (2% accuracy)	4.5~5.5	25	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SIP
CQ2066	130A (2% accuracy)	4.5~5.5	12	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SIP
CQ2092	21A (2% accuracy)	4.5~5.5	100	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SMT
CQ2093	35A (2% accuracy)	4.5~5.5	60	1µs	6.6mA at 5V	Analog (Ratiometric)	-40~+90	7SMT



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