

## Automotive Industry

The automobile industry has standardized power levels of 24 V DC or less. Reed switches perform exceptionally well at such low loads and consequently have very high life. Moulded and encapsulated reed sensors are specially manufactured to withstand shock and extremes of temperature and humidity. A few automobile applications are listed below.

### Impact sensors for triggering airbags

Statistics say almost 80% of automobiles use reed switch based crash sensors for triggering airbags. A ring magnet is mounted on a very precise tension spring and this assembly is slid over a reed switch. Depending on the impact which is required to trigger the reed switch, different tension springs are used. In most crash sensors, two reed switches are used instead of one as a failsafe mechanism. When a crash occurs, the mass of the magnet compresses the spring and moves closer to the reed switch, closing it. This signal is used to trigger the cylinder which inflates the airbags. Suitable products: **MM-1018** and **UM-0018** ultra-miniature reed switch in shock sensors.

### Anti-lock braking system (ABS)

In ABS control, the onboard electronics needs to apply differential hydraulic pressure to each brake to prevent the car from fishtailing and skidding. Four reed sensors are mounted near the wheels and magnets are mounted on the wheels themselves. This way, the individual rotational speed of each wheel is fed back to the onboard computer, as braking takes place, and if certain wheels are spinning faster, more hydraulic oil pressure is fed into those brakes. Suitable products: **MS-228** threaded sensors, and **MS-216-L** cylindrical sensors.

### Door, window and cap position sensing

Driver information. Instrument panel dashboards need to show more and more information for the safety of the driver and passengers. Special reed sensors which can withstand shock and vibration can be used to sense closing positions of doors, electric windows, sun roofs, trunks, engine hoods, radiator, and fuel caps. Reed sensors have the added advantage of withstanding temperatures of up to 150°C. Suitable products: **MS-10x** miniature PCB mountable reed sensors, **R2** SMD reed sensors, and **R2B** normally closed reed sensors.

### Seatbelt lock sensing

In some cars, the seat belts need to be "clicked" in, or the display flashes a message. Vane sensors are fitted inside the seatbelt locks female side, and when the seat belt lock is inserted, and comes in between, the magnetic field is shunted and the reed switch opens. Normally open (NO) vane sensors can be designed by using a normally closed reed switch on one side and a magnet on the other side which is strong enough to keep the NC reed switch open. Suitable products: **MO-1422** and **MC-1425** closed differential reed switches with cropped leads, in vane sensors.

### Hydraulic arm end position sensing in heavy vehicles

Bulldozers, earth movers, tractors, fork lifts and garbage compactor trucks use hydraulics to move cylinders and pistons to carry out various jobs. Reed sensors can be used on these pistons and cylinders to sense end position and intermediary positions for control of oil pressure to the hydraulic solenoids. Suitable products: **MS-328** flat pack sensors and **MS-228** threaded cylindrical sensors.

### Low fluid level monitoring

Wind screen wiper fluid, brake oil, power steering oil, and radiator coolant tanks can be fitted with a foamed magnet float attached to the inside stem of the cap. A reed sensor can be mounted outside the tank at the near empty level. The signal can be used to trigger an LED on the driver information panel. Because the reed sensor is mounted outside, the tanks can be removed easily for servicing without removing any connectors. Some automobile manufacturers also mount the reed sensor to sense a full tank instead of an empty tank, because it will be easier to detect a malfunction. Suitable products: **MS-324** miniature flat pack sensors and **MS-216** cylindrical sensors.

### Two wheeler applications

Motor bikes and other two wheelers use plunger type switches for detecting depression of the front and rear brake levers to switch the brake light on, and also for detecting the side stand position etc. These plunger type switches are purely mechanical, and they are likely to fail early due to environmental conditions. Reed sensors used in such applications fair well because of their inherent hermetically sealed nature and are free from moving mechanical parts. Reed sensors can also be used to sense the position of the throttle to give a signal to the processor to control the engine timing. Suitable products: **MS-324** miniature flat pack sensors, **MS-214** cylindrical sensors, and **MS-10x** miniature PCB mountable reed sensors.

### Defective lamp detection

Tail lamps and parking lamps are very vital elements and their failure can lead to adversities. Reed relays, by virtue of their small size and high life, find an important role in these applications. A reed relay and a resistor are connected across the lamp and when the lamp fuses, the reed relay energizes and the output can be used to trigger an alarm on the dash board. Although a bulb can be used instead of the reed relay, chances are that both bulbs may fail.

Due to continual improvement, specifications are subject to change without notice

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### Radiator, engine, and 4WD transmission temperature sensing

Thermal reed sensors can be mounted on the engine block to sense high temperatures and give an indication on the instrument panel. Thermal reed sensors, capable of switching loads as high as 60W, when used inside a radiator, can directly be wired to the radiator fan. When the temperature reaches a high, the fan is turned on, and after say 10°C less, the thermal reed sensor cuts off supply to the fan. They can also be mounted on the four wheel drive transmission system to check for over-heating. Thermal reed sensors can be designed to have temperature differentials as from 2°C to 10°C. Suitable products: TRS-P 30W or TRS-W 10W thermal reed sensors.

### Accurate fuel level sensing

Special reed sensors with an integrated resistor can be mounted on PCBs to give out a potentiometric feed back across two outputs as a foamed magnetic float moves along its length. The PCB tracks can be designed in such a way that a full tank gives high resistance and an empty tank gives low resistance, or vice versa. Being hermetically sealed devices, reed sensors are the best devices to use in explosive environments like fuel tanks. Suitable products: MK-xxxx reed sensors with integrated resistor, and MS-10x miniature PCB mountable reed sensors.

### Coolant flow sensing

A simple, cost effective reed switch based flow sensor can be connected in the coolant line of automobiles. As long as the coolant is flowing, the reed sensor does not actuate. If by chance, there is a block or if the coolant valve malfunctions, an indication is given on the instrument panel. Suitable products: MC-1425 and SM-1322 reed switches in flow sensors.

### Climate Control

Miniature reed relays, capable of switching high loads are used in automobile climate control circuits to switch on or switch off the heater and coolers. Thermal reed sensors can also be used to trigger these relays at required temperatures to keep the interiors a comfortable 23°C. Suitable products: TRS-M thermal reed switches.

### Tachometers, speedometers, and cruise control

A multi pole ring magnet can be attached to the speedometer actuating shaft, and a reed sensor can sense the pulses and generate a square wave. The onboard electronics can use these square pulses to calculate RPM and speed. In automobiles with cruise control, when cruise is set at say, 80kmph, and the road inclination changes, the onboard computer can adjust fuel supply to the engine to correct the cruise speed by monitoring these pulses. Suitable products: MS-225 and MS-228 threaded cylindrical sensors in shock proof casing.

### Inclination sensors for detecting rollover

Recent statistics on automobile accidents reveal that the majority of fatalities arise due to side-wise roll over. Reed switch based inclination sensors sense side-wise roll over and front and rear impact for triggering airbags. A magnet which moves like a pendulum sideways when a rollover occurs, activates multiple reed switches positioned at strategic points and trigger the airbags. A standard shock sensor combined with this inclination sensor is a complete package automobile manufacturers can use. Suitable products: SM-1322 and RM-1318 reed switches in inclination sensors.

### Door sensors for cars with electronic keys

In newer cars with electronic keys, the key code is compared with onboard computer which then sends a signal to the central locking system. Although these doors are controlled by remote also, for manual opening of the doors, reed sensors are used. The sensors are mounted on the doors, and magnets are mounted beneath the door handles. If the handle is lifted, the reed sensor detects this and sends a signal to the computer to open the doors. An added advantage is that the same reed sensors can be used as security devices to trigger alarms when the door is opened in an unlocked condition. Suitable products: R3 miniature SMD reed sensors, and MS-10x miniature PCB mountable reed sensors.

### Accidental airbag deployment prevention

When a collision occurs, accidental deployment of the airbags is prevented, by sensing whether passengers are sitting on the seats for which airbags are present. A reed sensor is mounted under the seat and a magnet fitted into the foam of the seat actuates the reed sensor whenever a passenger is present. This signal is used by the airbag deployment electronics. Suitable products: MS-324 miniature flat pack sensors, and MS-214 cylindrical sensors.

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