ANTI-LOCK BRAKING SYSTEM(ABS)

INTRODUCTION:

Wheel lockup during braking causes skidding which in turn cause a loss of traction and vehicle control. This reduces the steering ability to change direction. So the car slides out of control. With ABS system, the driver can brake hard, take the evasive action and still be in control of the vehicle in any road condition at any speed and under any load.

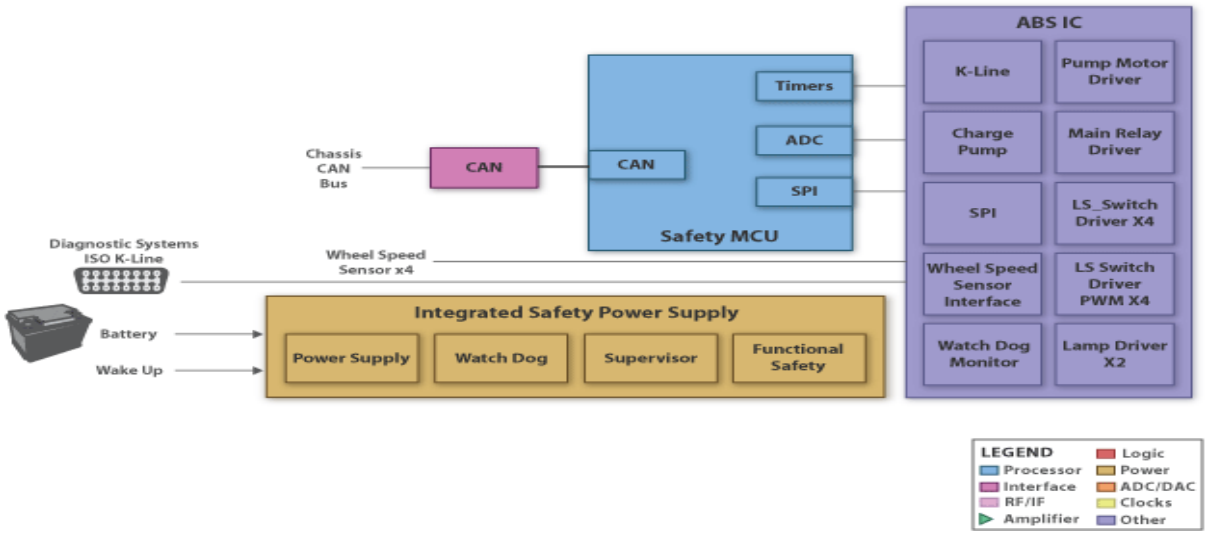
PRINCIPLE:

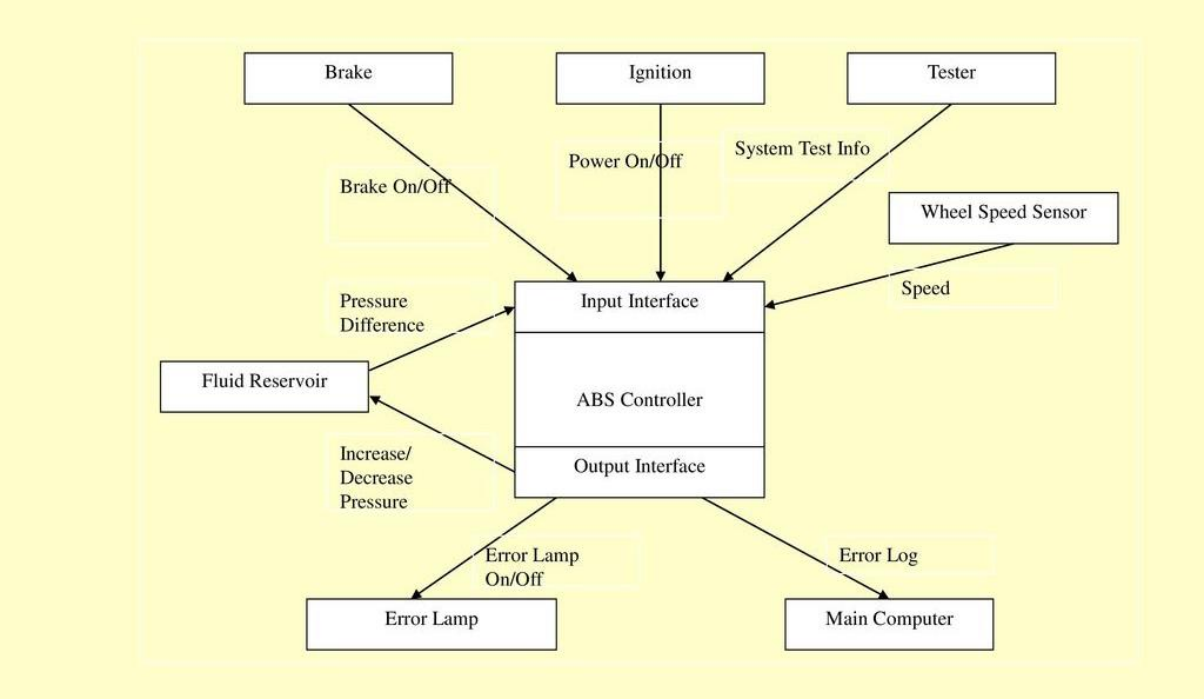
The skidding and lack of control was caused by the locking of wheels.The release and reapply of the brake pedal will avoid the locking of the wheels which in turn avoid the skidding.This is exactly what an antilock braking system does.

HISTORY:

ABS was first tested on aircraft and railways. The first form of 'anti-slipping' systems were experimented and implemented in rail and aviation industries during the mid-50s, including Royal Air Force fighter planes, the Concorde and a lot of diesel locomotives. The modern ABS system was invented in 1971 by Mario Palazzetti (known as 'Mister ABS') in the Fiat Research Center and is now standard in almost every car. The system was called Antiskid and the patent was sold to Bosch who named it ABS.

BLOCK DIAGRAM:





Microcontroller :

An automotive-grade ARM based microcontroller is used to compare speed sensor data, control brake cylinder pressure and control the return pump for each wheel brake cylinder. The MCU is also responsible for diagnostics, warning notification and communication with other on board control units. Newer automotive MCUs from TI can provide evidence of their suitability for use in systems where IEC61508 and ISO26262 safety standards compliance may be required.

Anti-Lock Braking IC:

The TPIC7218 is an antilock brake controller designed for use in harsh automotive environments, requiring few external components. It has eight high current low-side drivers for use with solenoid valves, four configurable wheel speed sense inputs capable of handling both Intelligent and Active sensors, and high-side gate drivers for controlling two external N-channel MOSFETs for use with a pump motor and master relay.

Power Management :

The TPS65381-Q1 is a multi-rail power supply designed to supply microcontrollers in safety-critical applications, such as those found in automotive. The devices supports Texas Instruments' TMS570LS series 16/32-bit RISC flash MCU and other microcontrollers with dual-core lockstep (LS) or loosely coupled architectures (LC).

Fluid reservoir:

Brake fluid reservoirs are canisters that connect to the brake master cylinder. The brake fluid reservoir stores your vehicle's brake fluid and protects it so that your hydraulic braking system can work properly.

Wheel speed sensor:

The wheel speed sensor, also known as the vehicle speed sensor (VSS), is a SENSOR used to measure the steering of the car wheels. Commonly used wheel speed sensors are: magnetoelectric wheel speed sensors and Hall effect wheel speed sensors.

For modern vehicles, wheel speed information is essential. Vehicle dynamic control system (VDC), automotive electronic stabilization program (ESP), anti-lock braking system (ABS), automatic transmission control system, etc., all require wheel speed information.

TYPES:

- Four channel, four sensor ABS:

  This is the best scheme. there is speed sensor on all four wheels and a separate valve for all the four wheels.

- Three channel , three sensor ABS:

  This scheme is commonly found on pick up trucks with four wheels ABS, has a speed sensor and a valve for each of the front wheels, with one valve and one sensor for both rear wheels.

- One channel , one sensor ABS:

  It has one valve ,which controls both rear wheels , and one speed sensor, located in the rear axle .

ADVANTAGES:

- It allows the driver to maintain directional stability and control over steering during braking.
- Safe and effective.
- Automatically changes the brake fluid pressure at each wheel to maintain optimum brake performance.
- ABS absorbs the unwanted turbulence shock waves and modulates the pulses thus permitting the wheel to continue turning under maximum braking pressure.

DISADVANTAGE:

- Maintenance cost of a car equipped with ABS is more.

CONCLUSION:

Statistics show that approximately 40 % of automobile accidents are due to skidding. These problems commonly occur on vehicle with conventional brake system which can be avoided by adding devices called ABS.If there is an ABS failure, the system will revert to normal brake operation. Normally the ABS warning light will turn on and let the driver know there is a fault