Intelligent Vehicle - MEMS Sensor Test Solutions

In the past two years, car networking, autonomous driving, unmanned driving, and automobile intelligence have become hot topics in the automotive industry, and have also guided the future development direction of automobiles. The purpose is to further improve the safety, reliability and comfort of vehicles during driving. For example, traditional emergency braking is controlled by the driver. Once the driver is in a state of fatigue driving, it is prone to traffic accidents. However, autonomous vehicles with a higher level can automatically determine the safety distance from the left and right vehicles, respond in milliseconds, and reduce their dependence on personnel. The development behind all this is inseparable from the sensor technology which is an important cornerstone for sensing the driving status of the vehicle and the surrounding environment.

MEMS sensor is a new type of high-performance sensor, the more high-end cars, the more used. Compared with traditional sensors, MEMS sensor adopts integrated technology like IC, which is with small size, low power consumption and high stability. MEMS sensors are mainly used in ABS, ESP, ECS, EPB, EPMS, vehicle inclination measurement, etc. The testing requirements for automotive-grade MEMS sensors are also more stringent. First, when the vehicle vibration or ambient temperature changes, the analog signal output by the sensor must be very stable; then, the sensor must have high anti-interference ability and low power consumption.

MEMS Sensor Low Power Consumption Test Solution

99% of automotive MEMS sensors are mainly divided into 4 categories: pressure sensors, accelerometers, gyroscopes and flow sensors. Some manufacturers now integrate accelerometers and gyroscopes in a sensor module. The following figure is an indicator of an internationally renowned MEMS sensor. It can be seen from the indicator that the corresponding working current under different working states ranges from uA to mA. GA_Idd is the working current of the accelerometer and gyroscope, A_Idd is the working current of the accelerometer, and the current in sleep mode is smaller.

How to achieve seamless full current detection? The traditional method is to select a power supply as the power supply for the MEMS sensor, and then then cooperate with a high-precision DVM meter, which will increase the cost and make the wiring more complicated. At the same time, the core of the MEMS sensor is the sensor chip, which is very sensitive to the voltage and current overshoot.

Symbol	Parameter	Test conditions	Min.	Typ.(1)	Max.	Unit
Vdd	Supply voltage		2.0		3.6	V
Vdd_IO	Power supply for I/O		1.62		3.6	V
GA_Idd	Gyroscope and Accelerometer current consumption	ODR = 1.6 kHz		1.3	1.6	mA
A_Idd	Accelerometer current consumption	ODR < 1.6 kHz		360	530	µA
IddPD	Gyroscope and accelerometer current consumption during power-down	@25°C		3	13	µA
Ton	Turn-on time(2)			35		ms
V_{IH}(3)	Digital high-level input voltage		0.7 * VDD_IO			V
V_{IL}(3)	Digital low-level input voltage				0.3 * VDD_IO	V
V_{OH}(3)	High-level output voltage	I_{OH} = 4 mA (4)	VDD_IO - 0.2			V
V_{OL}(3)	Low-level output voltage	I_{OL} = 4 mA (4)			0.2	V
Top	Operating temperature range		-40		+105	°C

However, ITECH high-precision programmable DC power supply can solve all the above problems in one unit. On the one hand, IT-M3200 measurement accuracy can reach nA level, which fully meets the above uA level current measurement requirements. Secondly, IT-M3200 provides four current ranges of 100uA / 20mA / 10A / Auto, full seamless current detection can be achieved under Auto mode. More importantly, IT-M3200 provides foldback and CC / CV priority setting functions, which can solve problems such as starting current overshoot and protect the DUT.