



***MITSUBISHI Acceleration Sensor***

MITSUBISHI ELECTRIC  
CORPORATION  
POWER DEVICE DIV.

# Location of Development and Production Facilities

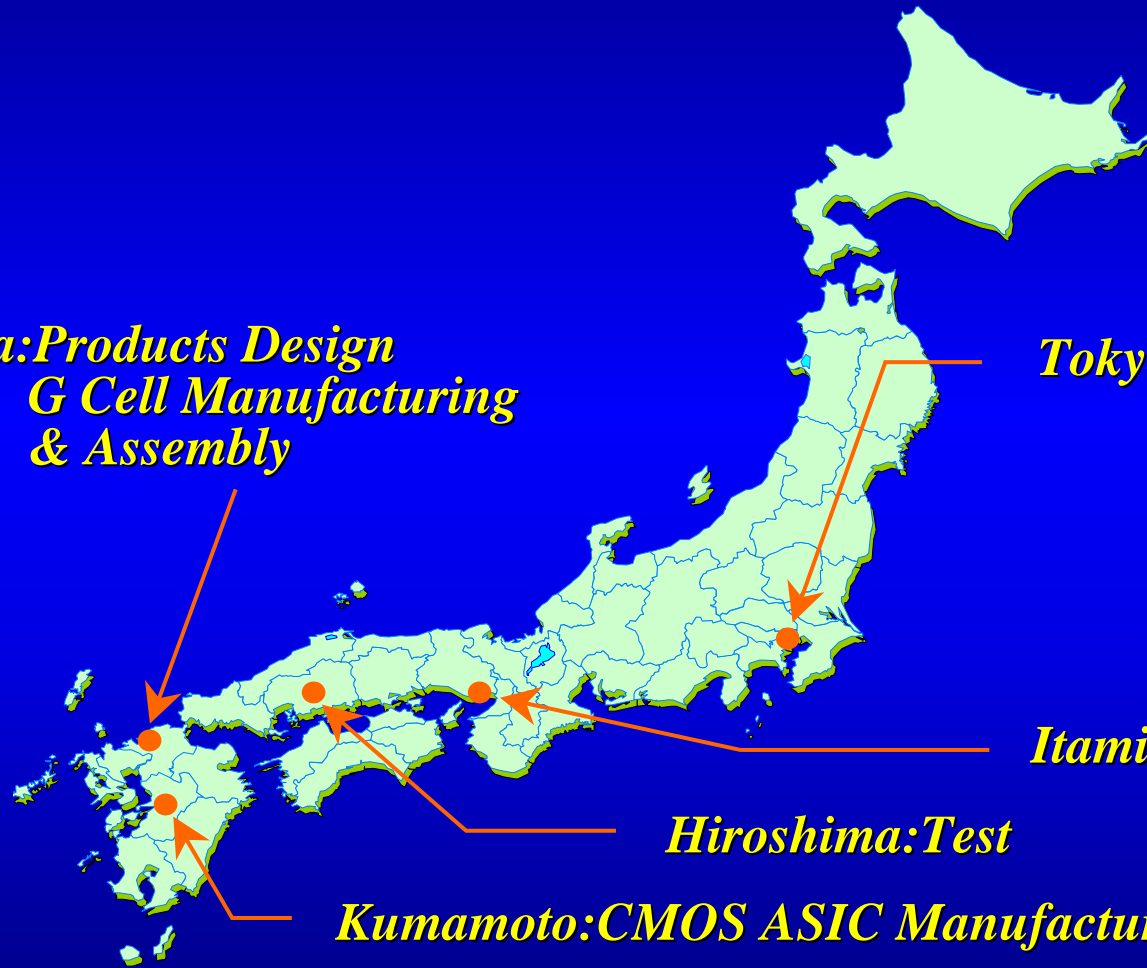
*Fukuoka: Products Design  
G Cell Manufacturing  
& Assembly*

*Tokyo: Head-Quarters*

*Itami: R&D*

*Hiroshima: Test*

*Kumamoto: CMOS ASIC Manufacturing*

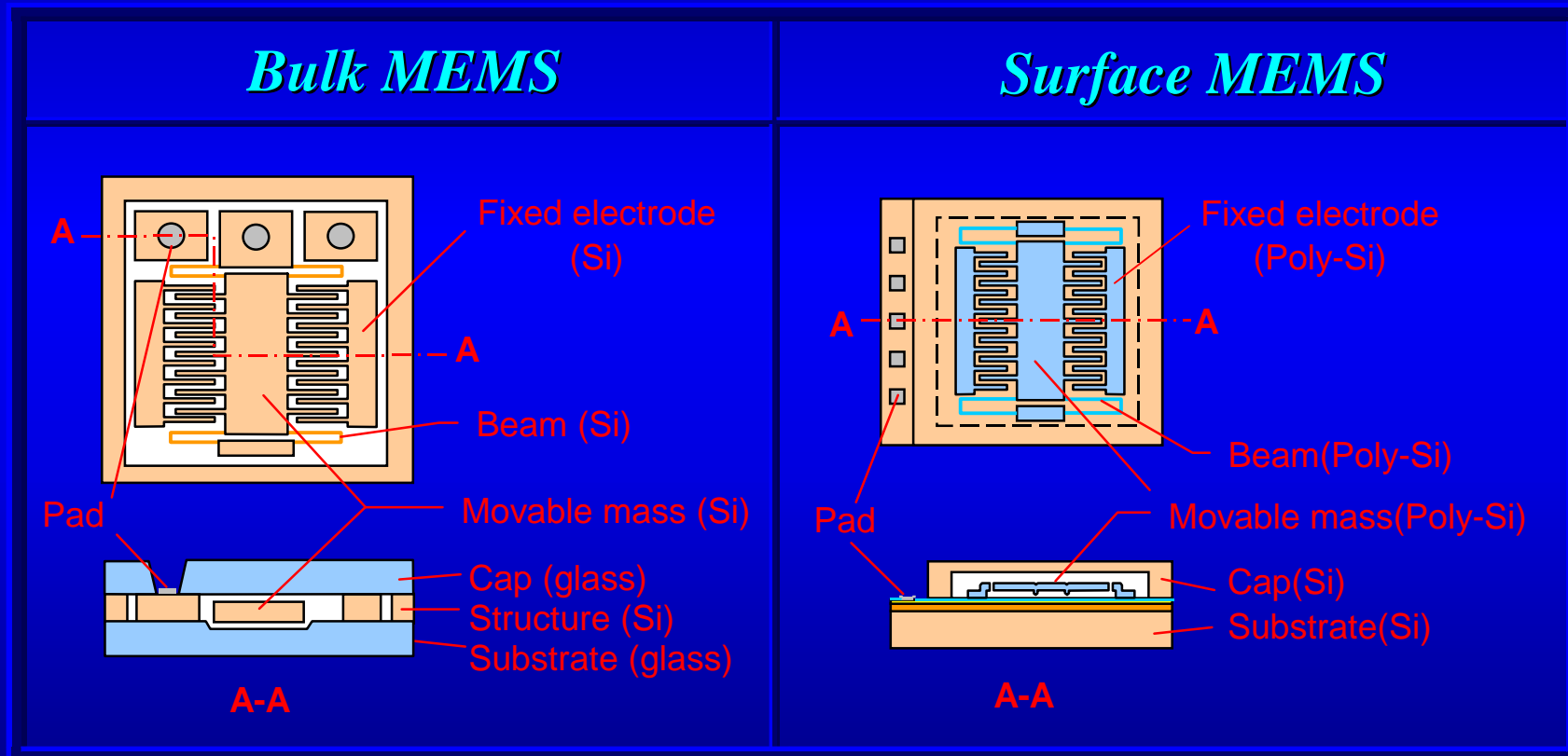


# MITSUBISHI Acceleration Sensor History

| Generation               | 1st Gen.('91MP)   | 2nd Gen.('96MP)   | 3rd Gen.('99MP)  |
|--------------------------|---|---|--|
| Package                  | Metal Can   | Plastic   | Molded   |
| Sensing Methods          | Si Piezo Resistive  |   | Capacitive<br>(Bulk MEMS)  |
| Outline<br><br>(Size:mm) | <br>(38.5X15.9X8) | <br>(20X19X7) | <br>(10.3X7.5X3.5) |
| Application              | ABS,Air Bag   | Air Bag   | Suspension   |

# Bulk Micro Machined Acceleration Sensor (Comparison with Surface Type)

## [G Cell Structure]



# Bluk Micro Machined Acceleration Sensor

## 1. Products Summary

*(1) Sensing Method: Capacitive*

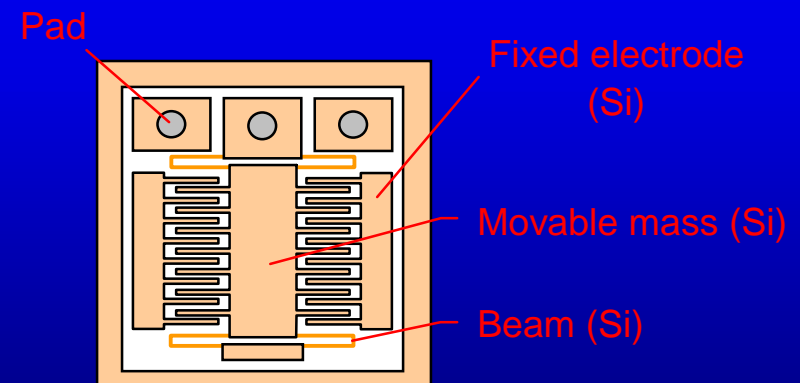
*(2) Signal Processing Circuit: CMOS ASIC (including C-V Converter & OTP)*

*(3) Sensitivity Calibration: Digital Trimming with OTP*

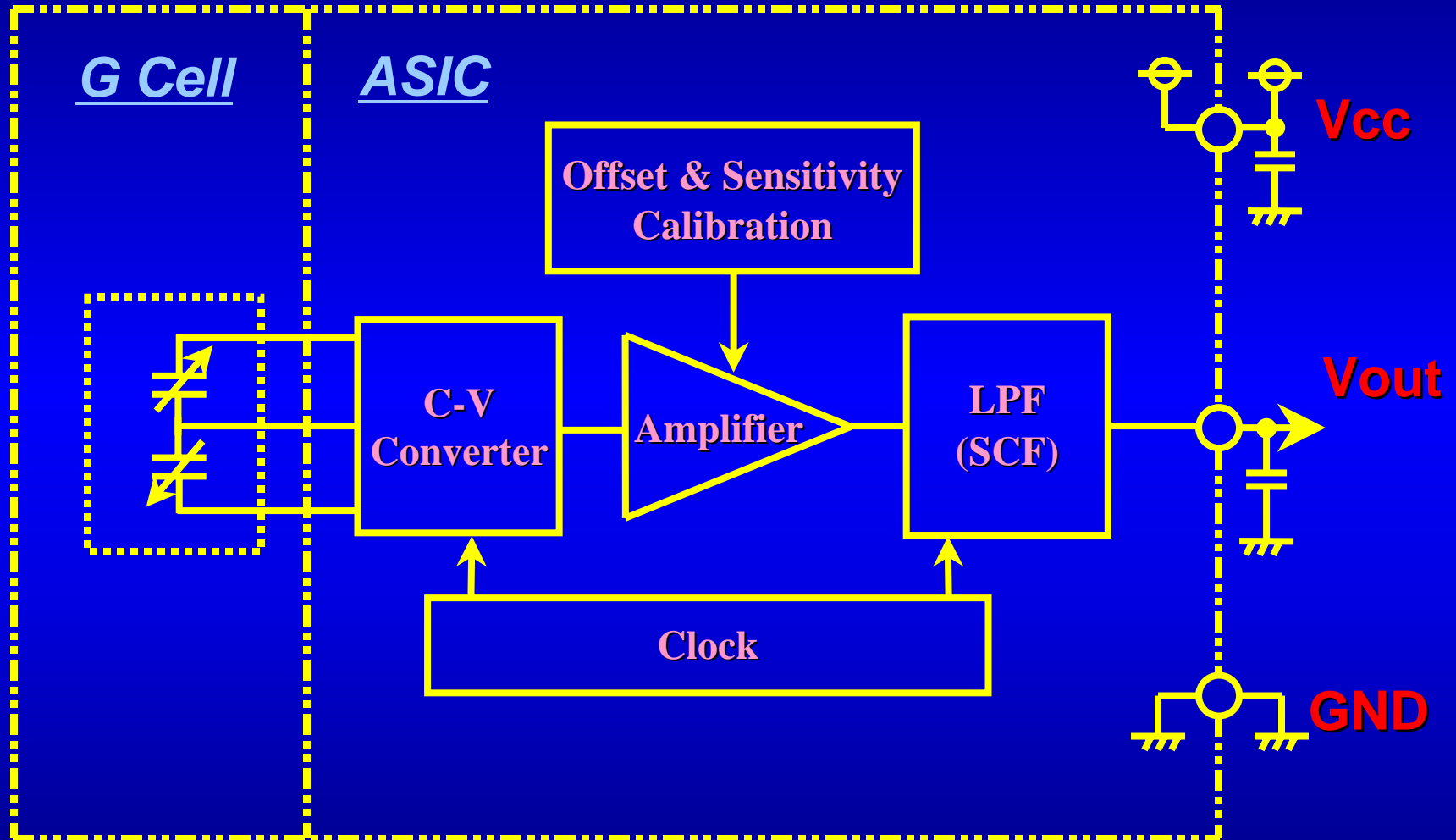
*(4) Product Outline: SOP16*

### [G Cell Concept]

**Bulk micro machined G cell has bigger movable mass, so that high sensitivity product is realized.**



## 2. Circuit Diagram





### 3. Specification

#### [Absolute Maximum Ratings]

| Items                    | Conditions | Specifications |
|--------------------------|------------|----------------|
| Maximum Supply Voltage   | 25         | 7V             |
| Storage Temperature      | -          | -40 ~ 105      |
| Shock Acceleration Range | 25         | $\pm 1000g$    |

#### [Ratings]

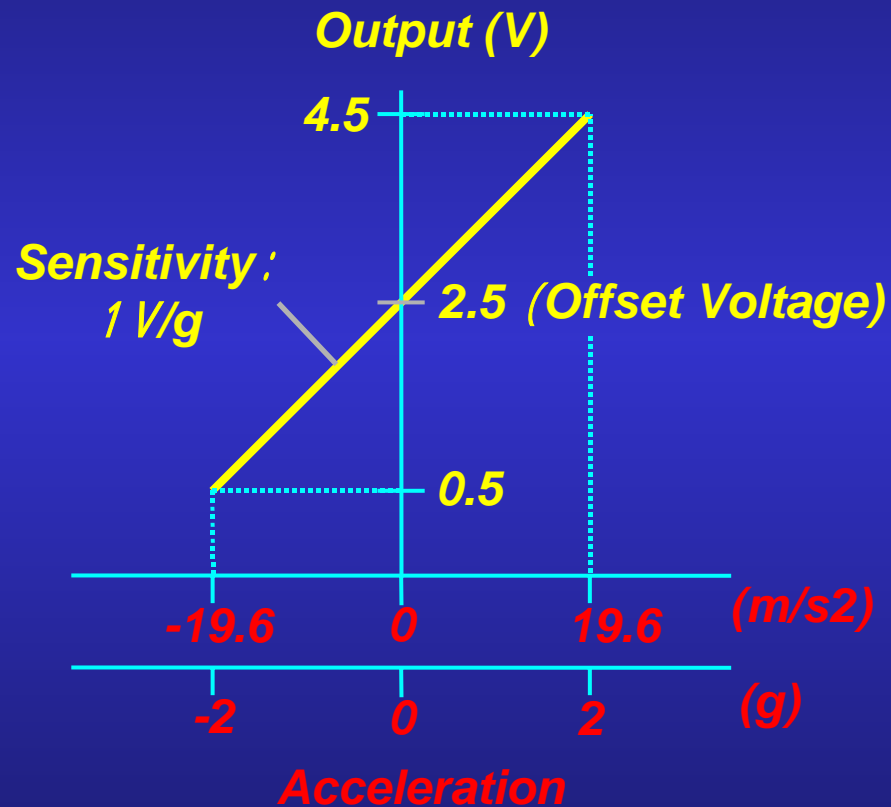
| Items                    | Conditions | Specifications |
|--------------------------|------------|----------------|
| Operating Supply Voltage | -30 ~ 85   | 4.75 ~ 5.25V   |
| Operating Temperature    | -          | -30 ~ 85       |
| Rated Acceleration Range | 25         | -2 ~ 2g        |

## [Electrical Characteristics]

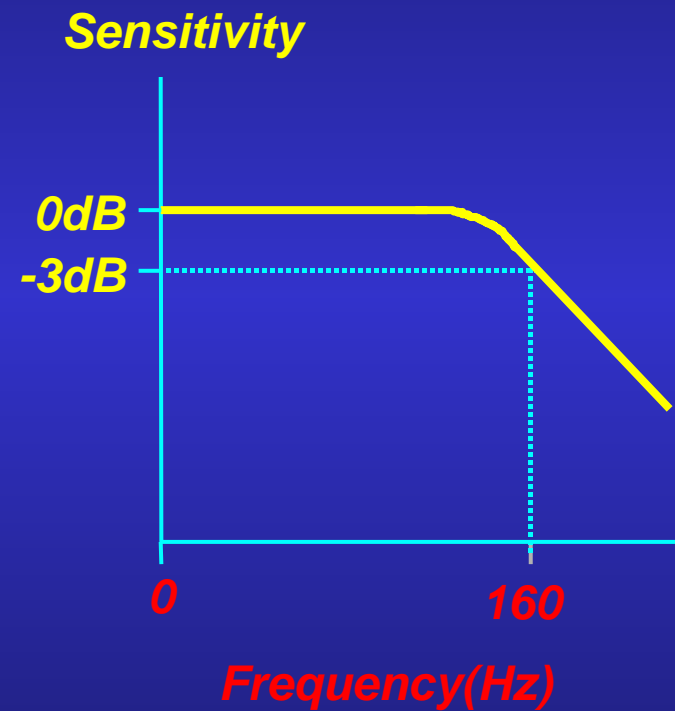
| Items                  | Conditions           | Specifications         |
|------------------------|----------------------|------------------------|
| Sensitivity            | -30 ~ 85             | $1 \pm 0.05\text{V/g}$ |
| Offset Voltage         | 25                   | $2.5 \pm 0.2\text{V}$  |
|                        | -30 ~ 85 ( from 25 ) | max1.5mV/              |
| Cross Axis Sensitivity | 25                   | 5%                     |
| Bandwidth(-3dB)        | 25                   | DC ~ 160Hz             |
| Current Consumption    | -30 ~ 85             | 3.5mA                  |
| Output Current         | -30 ~ 85             | $\pm 0.2\text{mA}$     |
| Noise Level            | -30 ~ 85             | 8mVp-p                 |



## Typical Characteristics

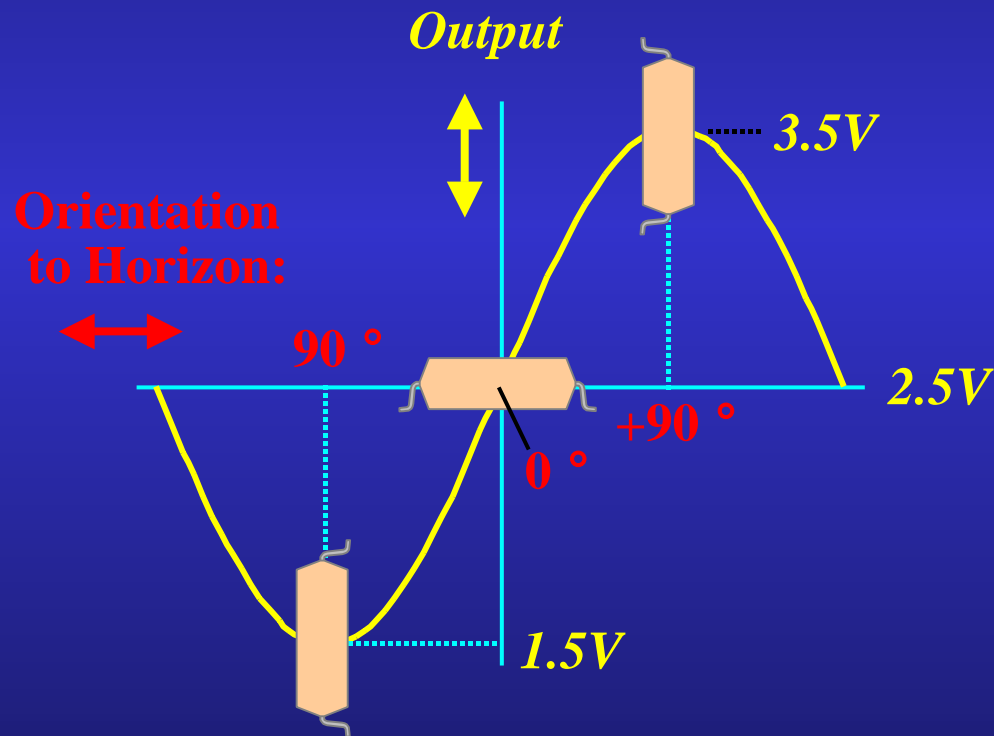


## Frequency Response



# Using the MAS1390P as TILT SENSOR

## Tilt Sensitivity



$$\text{Output} = \text{Sensitivity} \sin(\theta)$$

(Sensitivity=1V)



MAS1390P