

## IMU (Inertial Measurement Unit)

### ■ GENERAL DESCRIPTION

The M-V340PD is a small form factor inertial measurement unit (IMU) with 6 degrees of freedom: triaxial angular rates and linear accelerations, and provides high-stability and high-precision measurement capabilities with the use of high-precision compensation technology. A variety of calibration parameters are stored in memory of the IMU, and are automatically reflected in the measurement data being sent to the application after the power of the IMU is turned on. With a general-purpose SPI/UART supported for host communication, the M-V340PD reduces technical barriers for users to introduce inertial measurement and minimizes design resources to implement inertial movement analysis and control applications.

The features of the IMU such as high stability, high precision, and small size make it easy to create and differentiate applications in various fields of industrial systems.

### ■ FEATURES

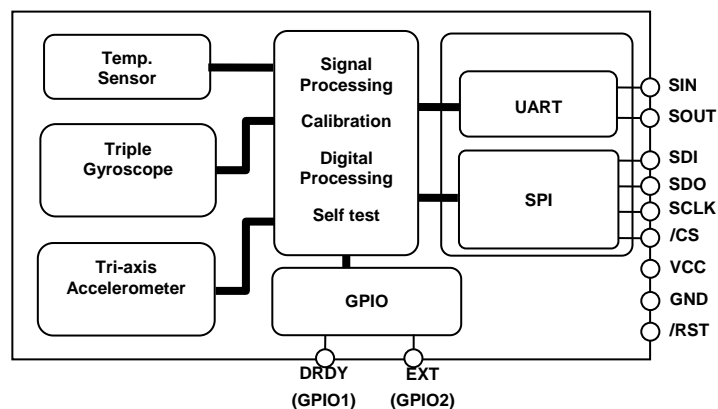
- Small Size, Lightweight : 10x12x4mm, 1 grams
- Low-Noise, High-stability
  - Gyro Bias Instability : 3.5 deg/hr
  - Angular Random Walk : 0.17 deg/ $\sqrt{\text{hr}}$
- Initial Bias Error : 0.5 deg/s (1 $\sigma$ )
- 6 Degrees Of Freedom
  - Triple Gyroscopes :  $\pm 450$  deg/s,
  - Tri-Axis Accelerometer :  $\pm 5.8$  G
- 16bit data resolution
- Digital Serial Interface : SPI / UART
- Calibrated Stability (Bias, Scale Factor, Axial Alignment)
- Data output rate : to 1k Sps
- Calibration temperature range :  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Operating temperature range :  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Single Voltage Supply : 3.3 V
- Low Power Consumption : 18mA (Typ.)



### ■ APPLICATIONS

- Unmanned systems
- Motion analysis and control
- Navigation systems
- Vibration control and stabilization
- Pointing and tracking systems

### ■ FUNCTIONAL BLOCK DIAGRAM



## ■ SENSOR SECTION SPECIFICATION

$T_A=25^{\circ}\text{C}$ ,  $V_{CC}=3.3\text{V}$ , angular rate=0 deg/s,  $\leq\pm 1\text{G}$ , unless otherwise noted.

Parameter	Test Conditions / Comments	Min.	Typ.	Max.	Unit
<b>GYRO SENSOR</b>					
Sensitivity					
Dynamic Range	—	$\pm 450$	—	—	deg/s
Sensitivity	—	—	0.015	—	(deg/s)/LSB
Temperature Coefficient	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	10	—	ppm/ $^{\circ}\text{C}$
Nonlinearity	Best fit straight line $<\pm 300\text{dps}$	—	0.1	—	% of FS
	$>\pm 300\text{dps}$	—	0.5	—	% of FS
Misalignment	$1\sigma$ , Axis-to-axis, $\Delta = 90^{\circ}$ ideal	—	0.1	—	deg
Bias					
Initial Error	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	0.5	—	deg/s
Temperature Coefficient (Linear approximation)	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	0.001	—	(deg/s)/ $^{\circ}\text{C}$
Bias Instability	Average	—	3.5	—	deg/hr
Angular Random Walk	Average	—	0.17	—	deg/ $\sqrt{\text{hr}}$
Linear Acceleration Effect	Average	—	0.01	—	(deg/s)/G
Noise					
Noise Density	Average, $f = 10$ to $20$ Hz	—	0.0025	—	(deg/s)/ $\sqrt{\text{Hz}}$ , rms
Frequency Property					
3 dB Bandwidth	—	—	200	—	Hz
<b>ACCELEROMETERS</b>					
Sensitivity					
Dynamic Range	—	$\pm 5.8$	—	—	G
Sensitivity	—	—	0.18	—	mG/LSB
Temperature Coefficient	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	35	—	ppm/ $^{\circ}\text{C}$
Nonlinearity	$\leq 1\text{G}$ , Best fit straight line	—	1	—	% of FS
Misalignment	$1\sigma$ , Axis-to-axis, $\Delta = 90^{\circ}$ ideal	—	0.2	—	deg
Bias					
Initial Error	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	8	—	mG
Temperature Coefficient (Linear approximation)	$1\sigma$ , $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	—	0.1	—	mG/ $^{\circ}\text{C}$
Bias Instability	Average	—	0.05	—	mG
Velocity Random Walk	Average	—	0.15	—	(m/sec)/ $\sqrt{\text{hr}}$
Noise					
Noise Density	Average, $f = 10$ to $20$ Hz	—	0.25	—	mG/ $\sqrt{\text{Hz}}$ , rms
Frequency Property					
3 dB Bandwidth	—	—	200	—	Hz
<b>TEMPERATURE SENSOR</b>					
Scale Factor *1	Output = 1469 @ $+25^{\circ}\text{C}$	—	-0.0053964	—	$^{\circ}\text{C}/\text{LSB}$

\*1) This is a reference value used for internal temperature compensation. We provide no guarantee that the value gives an absolute value of the internal temperature.

Note) The values in the specifications are based on the data calibrated at the factory. The values may change according to the way the product is used.

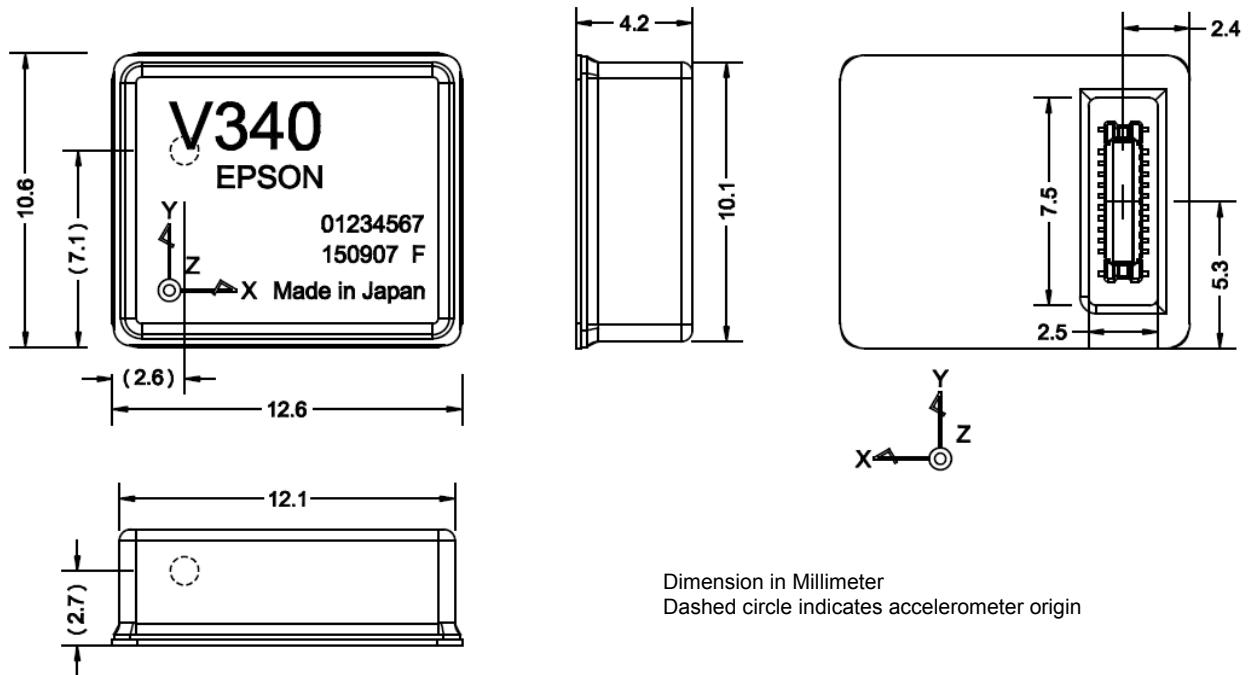
Note) The Typ values in the specifications are average values or  $1\sigma$  values.

Note) Unless otherwise noted, the Max / Min values in the specifications are design values or Max / Min values at the factory tests.

## RECOMMENDED OPERATING CONDITION

Parameter	Condition	Min	Typ	Max	Unit
VCC to GND		3.15	3.3	3.45	V
Digital Input Voltage to GND		GND		VCC	V
Digital Output Voltage to GND		-0.3		VCC +0.3	V
Calibration Temperature Range	Performance parameters are applicable	-40		85	°C
Operating Temperature Range		-40		85	°C

## OUTLINE DIMENSIONS



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