

# 3503

## RATIOMETRIC, LINEAR HALL EFFECT SENSORS

Type UGN3503U/UA and UGS3503U/UA Hall effect sensors accurately track extremely small changes in magnetic flux density—changes generally too small to operate Hall effect switches.

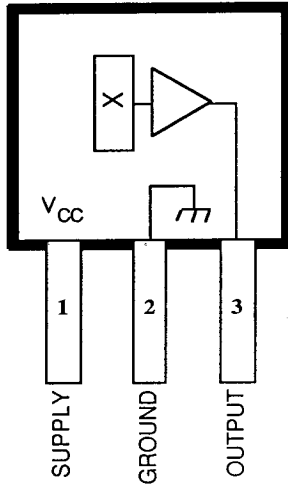
As motion detectors, gear tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

Each Hall effect integrated circuit includes a Hall sensing element, linear amplifier, and emitter-follower output stage. Problems associated with handling tiny analog signals are minimized by having the Hall cell and amplifier on a single chip.

The UGN3503U and UGN3503UA are rated for continuous operation over the temperature range of -20°C to +85°C. The UGS3503U and UGS3503UA operate over an extended temperature range of -40°C to +125°C.

### FEATURES

- Extremely Sensitive
- Flat Response to 23 kHz
- Low-Noise Output
- 4.5 V to 6 V Operation
- Magnetically Optimized Package



Dwg. PH-006

Pinning is shown viewed from branded side.

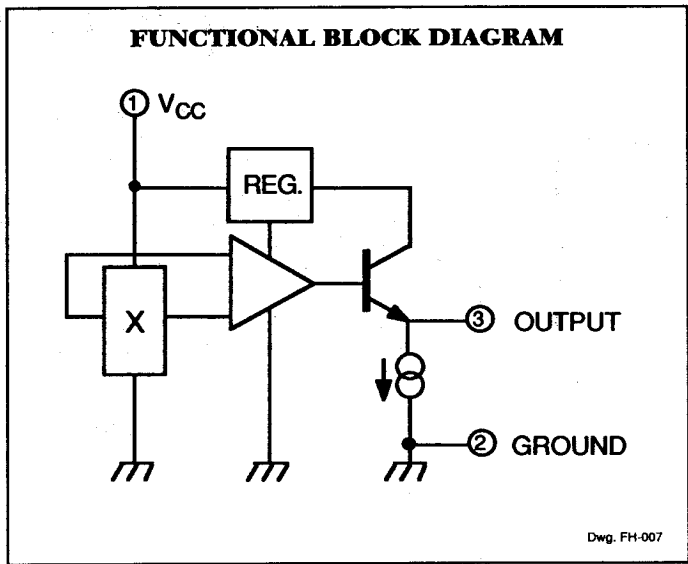
### ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $V_{CC}$	8 V
Magnetic Flux Density, B	Unlimited
Operating Temperature Range, $T_A$	
UGN3503U/UA	-20°C to +85°C
UGS3503U/UA	-40°C to +125°C
Storage Temperature Range, $T_S$	-65°C to +150°C

Always order by complete part number:

Part Numbers	Operating Temp.	Package
UGN3503U	-20°C to +85°C	3-Pin Mini-SIP
UGN3503UA	-20°C to +85°C	3-Pin Ultra-Mini-SIP
UGS3503U	-40°C to +125°C	3-Pin Mini-SIP
UGS3503UA	-40°C to +125°C	3-Pin Ultra-Mini-SIP

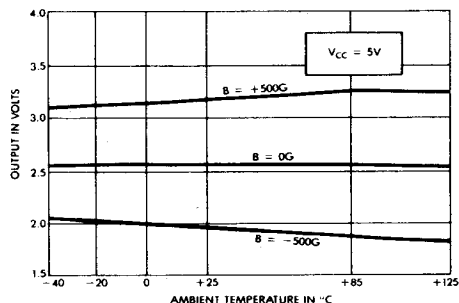
3503  
RATOMETRIC, LINEAR HALL EFFECT SENSORS



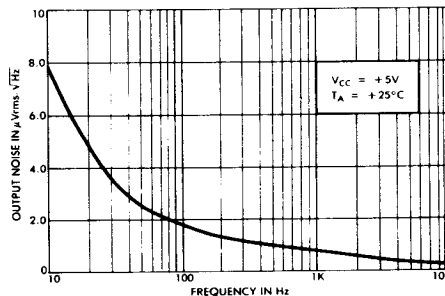
**ELECTRICAL CHARACTERISTICS at  $T_A = +25^{\circ}\text{C}$ ,  $V_{CC} = 5\text{ V}$**

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Operating Voltage	$V_{CC}$		4.5	—	6.0	V
Supply Current	$I_{CC}$		—	9.0	14	mA
Quiescent Output Voltage	$V_{OUT}$	$B = 0\text{ G}$	2.25	2.50	2.75	V
Sensitivity	$\Delta V_{OUT}$	$B = 0\text{ G to } \pm 900\text{ G}$	0.75	1.30	1.72	mV/G
Bandwidth (-3 dB)	BW		—	23	—	kHz
Broadband Output Noise	$V_{out}$	$BW = 10\text{ Hz to } 10\text{ kHz}$	—	90	—	$\mu\text{V}$
Output Resistance	$R_{OUT}$		—	50	—	$\Omega$

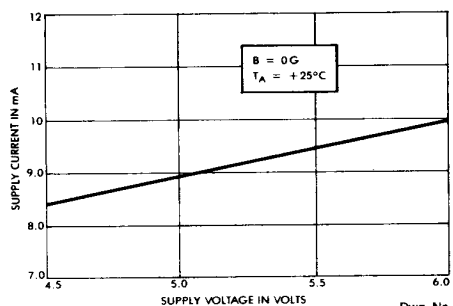
All output-voltage measurements are made with a voltmeter having an input impedance of at least 10 k $\Omega$ .  
Magnetic flux density is measured at most sensitive area of device located 0.016"  $\pm$  0.002" (0.41 mm  $\pm$  0.05 mm)  
below the branded face of the 'U' package.

**OUTPUT VOLTAGE AS A FUNCTION OF TEMPERATURE**

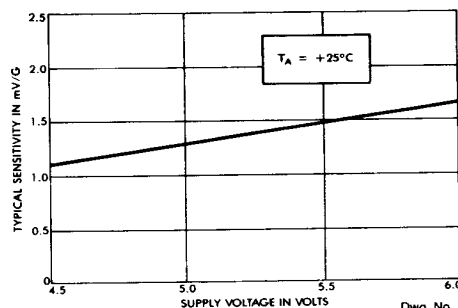
Dwg. No. A-12,573

**OUTPUT NOISE AS A FUNCTION OF FREQUENCY**

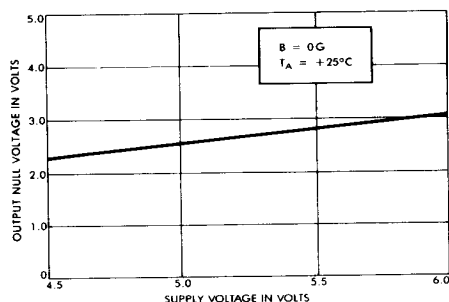
Dwg. No. A-12,505

**SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE**

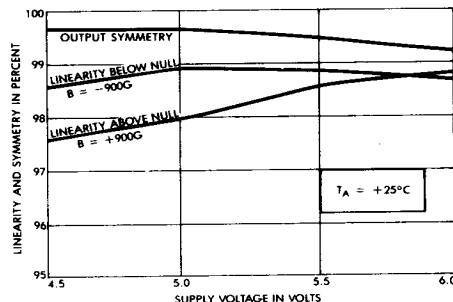
Dwg. No. A-12,506

**DEVICE SENSITIVITY AS A FUNCTION OF SUPPLY VOLTAGE**

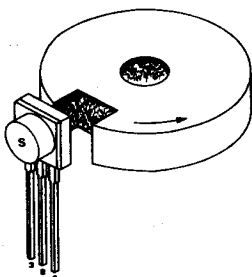
Dwg. No. A-12,507

**OUTPUT NULL VOLTAGE AS A FUNCTION OF SUPPLY VOLTAGE**

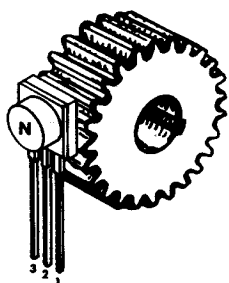
Dwg. No. A-12,508

**LINEARITY AND SYMMETRY AS A FUNCTION OF SUPPLY VOLTAGE**

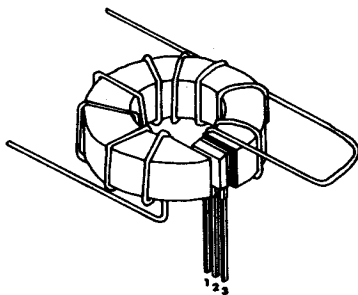
Dwg. No. A-12,509

**NOTCH SENSOR**

Dwg. No. A-12,574

**GEAR TOOTH SENSOR**

Dwg. No. A-12,512

**CURRENT MONITOR**

Dwg. No. A-12,513

**OPERATION**

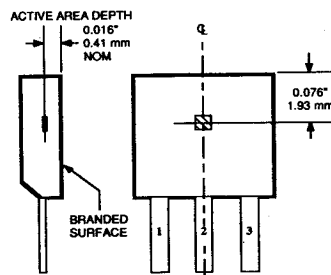
The output null voltage ( $B = 0$  G) is nominally one-half the supply voltage. A south magnetic pole, presented to the branded face of the Hall effect sensor will drive the output higher than the null voltage level. A north magnetic pole will drive the output below the null level.

In operation, instantaneous and proportional output-voltage levels are dependent on magnetic flux density at the most sensitive area of the device. Greatest sensitivity is obtained with a supply voltage of 6 V, but at the cost of increased supply current and a slight loss of output symmetry. The sensor's output is usually capacitively coupled to an amplifier that boosts the output above the millivolt level.

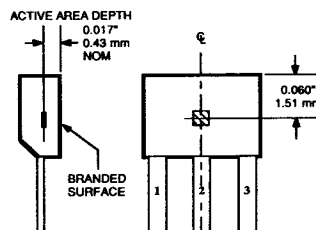
In two applications shown, a permanent bias magnet is attached with epoxy glue to the back of the epoxy package. The presence of ferrous material at the face of the package acts as a flux concentrator.

The south pole of a magnet is attached to the back of the package if the Hall effect IC is to sense the presence of ferrous material. The north pole of a magnet is attached to the back surface if the integrated circuit is to sense the absence of ferrous material.

Calibrated linear Hall devices, which can be used to determine the actual flux density presented to the sensor in a particular application, are available.

**SENSOR LOCATIONS****SUFFIX "U"**

Dwg. MH-002-5

**SUFFIX "UA"**

Dwg. MH-011-3