# UGN-3220K
LOW-COST DUAL OUTPUT HALL EFFECT SWITCH

FEATURES

- Operable with a Small Permanent Magnet
- High Reliability—Eliminates Contact Wear, Contact Bounce
- No Moving Parts
- Small Size
- Outputs Compatible with All Logic Families
- Operation to 100 kHz.
- Dual Output Transistors Can Drive Independent Loads

UGN-3220K integrated circuits are low-cost magnetically activated electronic switches that utilize the Hall Effect for sensing a magnetic field. Each circuit consists of a voltage regulator, Hall sensor, signal amplifier, Schmitt trigger, and current-sinking output stage, integrated onto a single monolithic silicon chip.

FUNCTIONAL BLOCK DIAGRAM

Dwg. No. A-11.007
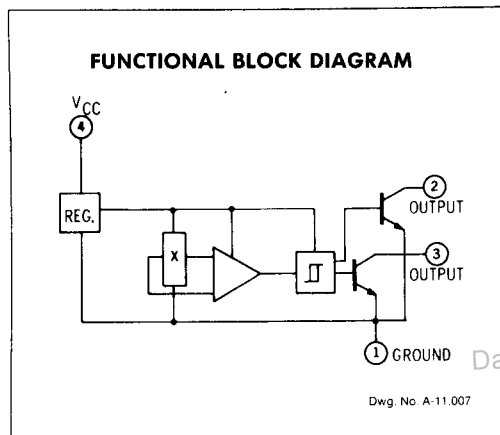
This device is supplied in a 4-pin single in-line molded package.

ABSOLUTE MAXIMUM RATINGS

Power Supply, V_{CC} . . . . 17 V
Magnetic Flux Density, B . . . . Unlimited
Output OFF Voltage, $V_{OUT(OFF)}$ . . . . 17 V
Output ON Current, I_{SINK} . . . . 30 mA
Operating Temperature Range, T_A . . . . −20°C to +85°C
Storage Temperature Range, T_S . . . . −65°C to +125°C

ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{CC} = 4.5 V to 16 V (unless otherwise noted)

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Operate Point	B_{OP}		—	220	350	Gauss
Release Point	B_{RP}		50	160	—	Gauss
Hysteresis	B_H		20	60	—	Gauss
Output Saturation Voltage	$V_{CE(SAT)}$	B ≥ 350 Gauss, I_{SINK} = 15 mA	—	110	400	mV
Output Leakage Current	I_{OFF}	B ≤ 50 Gauss, V_{CC} = 16 V	—	0.1	20	μA
Supply Current	I_{CC}	B ≤ 50 Gauss, V_{CC} = 5 V	—	3.5	9.0	mA
Operating Voltage Range	V_{CC}		4.5	—	16	V

OPERATION

The output transistors are normally OFF when the magnetic field perpendicular to the surface of the chip is below the threshold or operate point. As magnetic flux density surpasses the operate point, the output transistors switch ON and are each capable of sinking 15 mA of current. Selections with 30 mA constant current ratings are available.

The output transistors switch OFF as the magnetic flux density falls below the release point (which is less than the operate point). This is illustrated graphically in the transfer characteristic curve. The hysteresis characteristic provides for unambiguous and non-oscillatory switching.

The simplest form of magnet that will operate the Hall Effect digital switch is a bar magnet as shown. Other methods are possible. In the illustration, the magnet's axis is on the center line of the packaged device and the magnet is moved toward and away from the device. Also note the orientation of the magnet's south pole in relation to the branded surface of the package.

The magnetic flux density is indicated for the most sensitive area of the device. This area is centrally located and 0.016″ ± 0.002″ (0.4 mm ± 0.05 mm) below the branded surface of the package.

For reference purposes, both an Alnico VIII magnet, 0.212″ (5.38 mm) in diameter and 0.187″ (4.75 mm) long, and a samarium cobalt magnet, 0.100″ (2.54 mm) square and 0.040″ (1.02 mm) thick, are approximately 1200 gauss at their surfaces. The flux density decays at a high rate as the distance from a pole increases.

As an example, using the Alnico VIII magnet in good alignment and with the pole surface in contact with the branded surface of the package, the flux density at the active Hall sensing area of the device would be approximately 1150 gauss (0.016″ below the package surface).
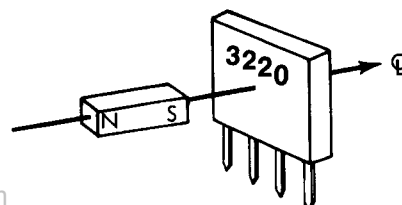
The flux density would drop to approximately 1000 gauss with an air-gap between the package and the magnet of 0.031″ (0.79 mm).
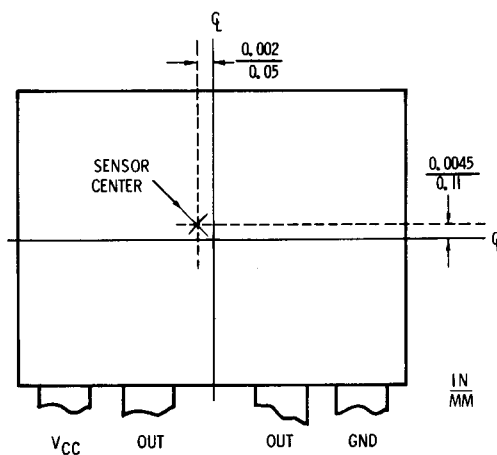
TRANSFER CHARACTERISTICS
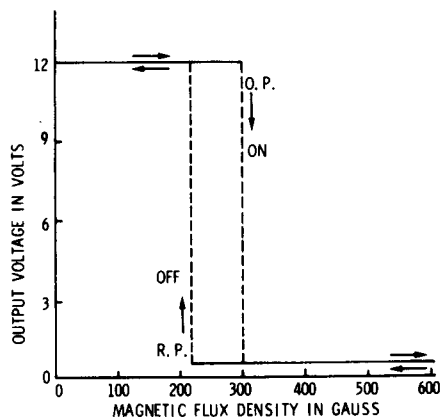
Dwg. No. A-11,006 A

BASIC HEAD-ON MODE OF OPERATION

Dwg. No. A-14,471

LOCATION OF SENSOR CENTER

Dwg. No. A-11,009 B