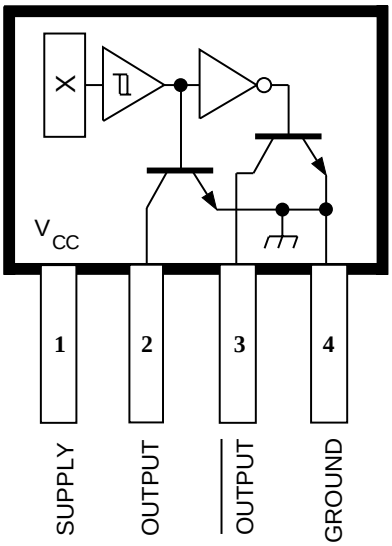
5275

COMPLEMENTARY OUTPUT POWER HALL® LATCH



Dwg. PH-002

Pinning is shown viewed from branded side.

ABSOLUTE MAXIMUM RATINGS
at T_A = +25°C

Supply Voltage, V_{CC} . . . . . **14 V**
Magnetic Flux Density, B . . . . . **Unlimited**
Output OFF Voltage, V_{CE} . . . . . **60 V**
Output ON Current, I_C
  Continuous . . . . . **0.5 A**
  Peak (Start Up) . . . . . **0.9 A**
Operating Temperature Range,
  T_A . . . . . **-20°C to +85°C**
Storage Temperature Range,
  T_S . . . . . **-65°C to +150°C**
Package Power Dissipation,
  P_D . . . . . **750 mW**

Type UGN5275K latching Hall-effect sensors are bipolar integrated circuits designed for electronic commutation of brushless dc motors. They feature open-collector complementary power outputs that are capable of sinking up to 300 mA continuously. Increased current ratings, complementary outputs, and sensitive switching points that are stable over temperature and time ideally suit these devices for minimum-component brushless dc motor designs.

Each sensor IC includes a Hall-voltage generator, an operational amplifier, a Schmitt trigger, a voltage regulator, and large-area dual npn-output transistors. The regulator allows the IC to operate with supply voltages ranging from 4.5 V to 14 V. On-chip compensation circuitry stabilizes switch point performance over temperature. The large bipolar junction output transistors are fed by a unique driver stage, which minimizes power dissipation within the IC. The magnetic operation of this device is similar to that of the UGN3275K complementary-output Hall-effect latch.

Output Q of the IC switches to the LOW state when the internal Hall generator experiences a magnetic field that exceeds the rated operate point. Output $\overline{Q}$ switches HIGH within one µs of the Output Q change of state. When the device is exposed to a sufficient magnetic field of opposite polarity, Output Q returns to the HIGH state, and Output $\overline{Q}$ returns to the LOW state.

The UGN5275K is rated for operation over a temperature range of -20°C to +85°C, and is supplied in an environmentally rugged, four-pin miniature plastic SIP. Consult the factory for alternate packaging and custom magnetic requirements.

FEATURES

- High Sink-Current Capability
- Magnetic Sensing, Complementary-Output Latch
- On-Chip Schmitt Trigger Provides Hysteresis
- Temperature-Compensated Switch Points
- Rugged, Low-Profile SIP

Always order by complete part number: **UGN5275K** .

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ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{CC} = 4.5 V to 14 V (unless otherwise noted).

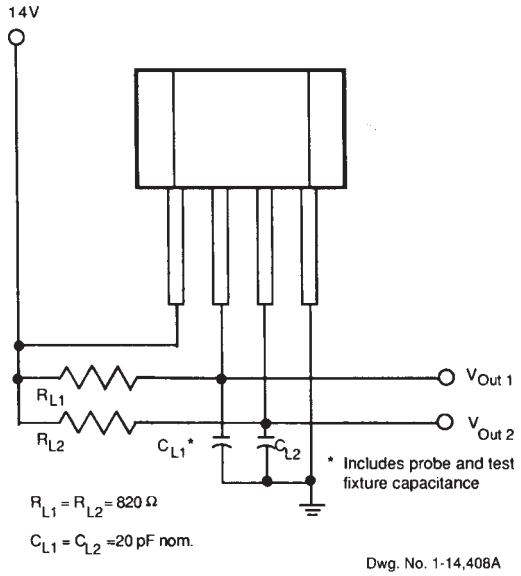
Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}		4.5	—	14	V
Output Saturation Voltage	$V_{CE(SAT)}$	V_{CC} = 14 V, I_C = 300 mA	—	400	600	mV
Output Leakage Current	I_{CEX}	V_{CE} = 14 V, V_{CC} = 14 V	—	—	10	µA
Supply Current	I_{CC}	V_{CC} = 14 V, Output Open	—	18	30	mA
Output Rise Time	t_r	V_{CC} = 14 V, R_L = 45 Ω, C_L = 20 pF	—	0.3	1.5	µs
Output Fall Time	t_f	V_{CC} = 14 V, R_L = 45 Ω,C_L = 20 pF	—	0.3	1.5	µs
Switch Time Differential	Δt	V_{CC} = 14 V, R_L = 45 Ω, C_L = 20 pF	—	1.0	3.0	µs

MAGNETIC CHARACTERISTICS

Characteristic	Symbol	T_A = +25°C		T_A = -20°C to +85°C		Units
		Min.	Max.	Min.	Max.	
Operate Point	B_{OP}	25	250	15	250	G
Release Point	B_{RP}	-250	-25	-250	-15	G
Hysteresis	B_{hys}	100	—	100	—	G

NOTE: As used here, negative flux densities are defined as less than zero (algebraic convention).

TEST CIRCUIT



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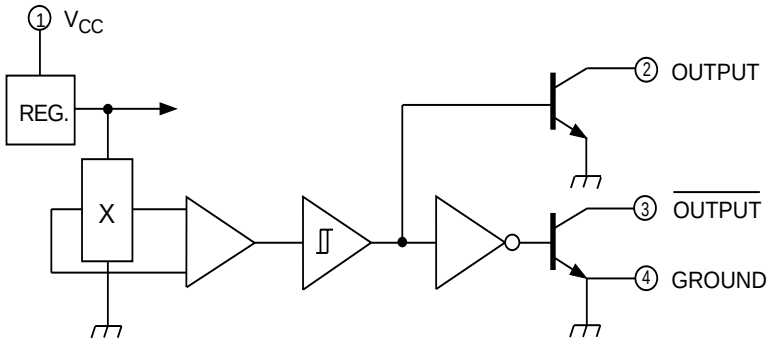
FUNCTIONAL BLOCK DIAGRAM



Dwg. FH-002

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MOTOR COIL DRIVER

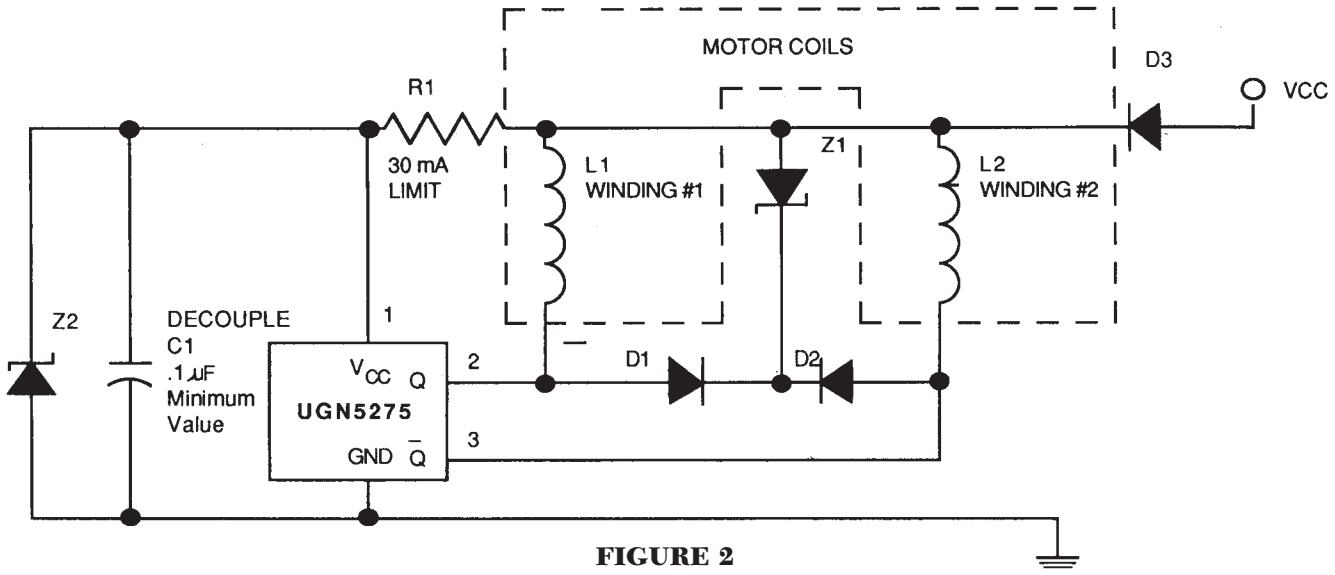
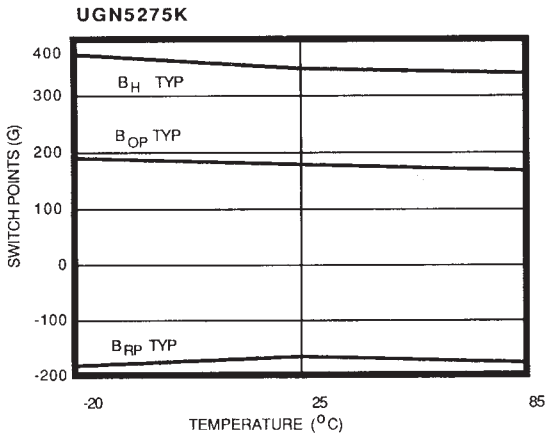


FIGURE 2

SWITCH POINTS VERSUS TEMPERATURE



APPLICATIONS

The increased current sinking capability of the UGN5275K ideally suits it for building small, inexpensive brushless dc motors using a minimum number of external components. Figure 2 shows that the only components required to commutate motor windings L1 and L2 are the Hall effect IC, flyback diodes D1 and D2, and one decoupling capacitor. The remaining components are optional for improving motor performance. Care should be taken to ensure that the motor winding impedances are high enough to guarantee that start-up surge currents do not exceed the maximum rating of the Hall effect IC.

In the circuit shown, diodes D1 and D2 supply a flyback path for the current of each winding to prevent reactive voltages from exceeding the sustained voltage rating of the Hall-effect IC output transistors. Zener diode Z1 enables the windings to switch more rapidly by allowing the output voltage to rise above the source voltage, while simultaneously clamping the extreme reactive voltages.

The maximum output voltage level will be restricted to the following: $V_{CC} - V_{D3} + V_Z + V_{D1}$ (blocking diode D3 voltage drop). Blocking diode D3 provides reverse input-polarity protection, and should be used only if reverse battery voltage is a possibility. Capacitor C1 decouples the Hall-effect IC from any high dv/dt transients injected onto the V_{CC} rail to prevent regulator latch-up within the device. Zener diode Z2 and resistor R1 are required for operation from a V_{CC} exceeding 14 V.

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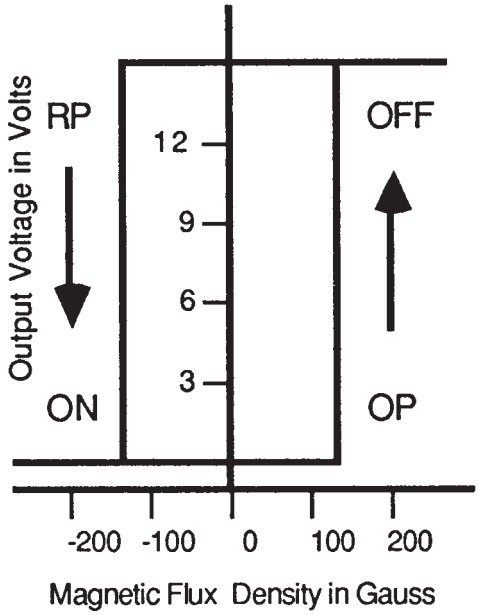
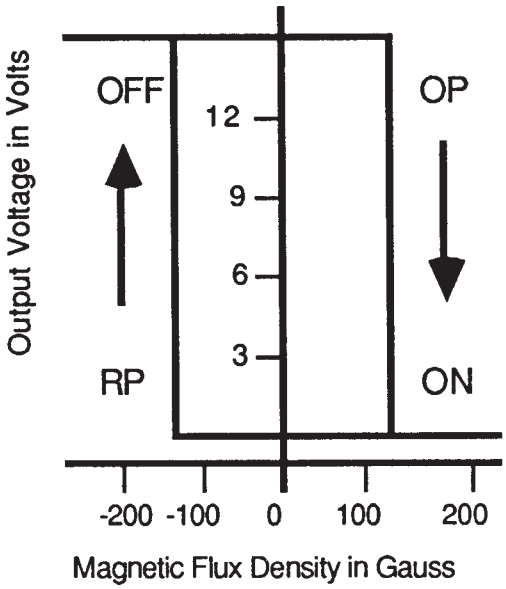
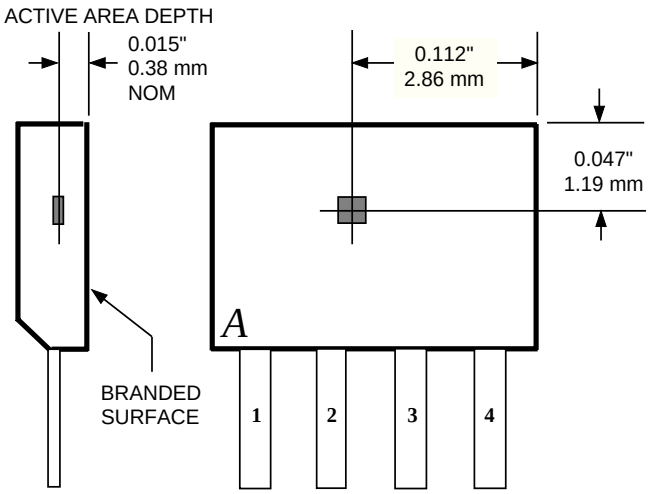
HYSTERESIS CHARACTERISTICS



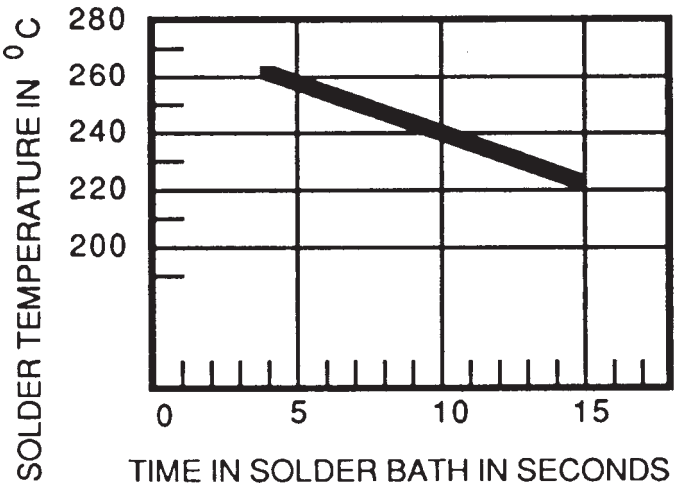


SENSOR LOCATION



Dwg. MH-001-3A

GUIDE TO INSTALLATION



Dwg. No. A-12,062

1. All Hall Effect integrated circuits are susceptible to mechanical stress effects. Caution should be exercised to minimize the application of stress to the leads or the epoxy package. Use of epoxy glue is recommended. Other types may deform the epoxy package.
2. To prevent permanent damage to the Hall cell, heat-sink the leads during hand-soldering. Recommended maximum conditions for wave soldering are shown in the graph above.

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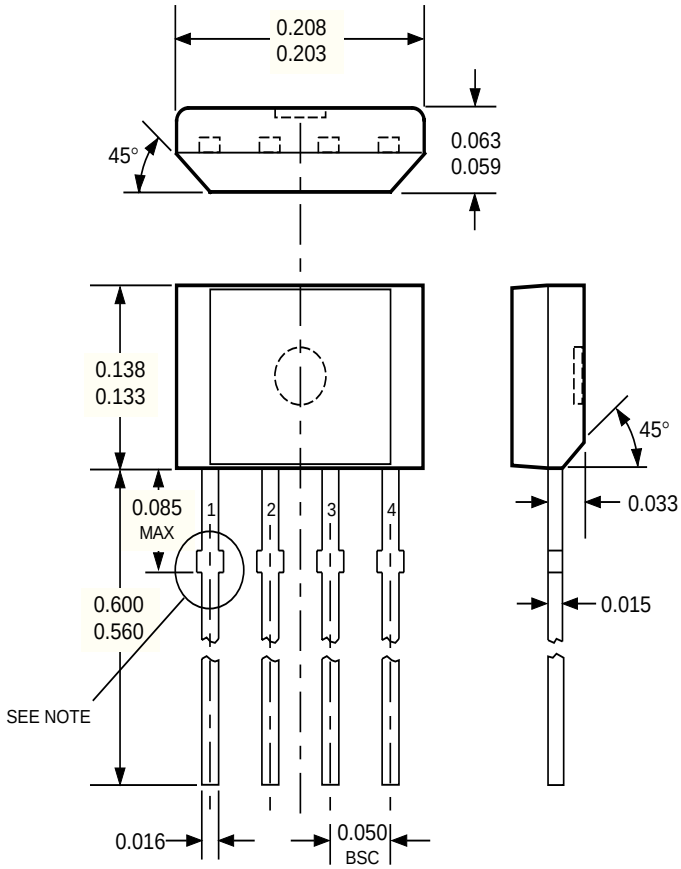
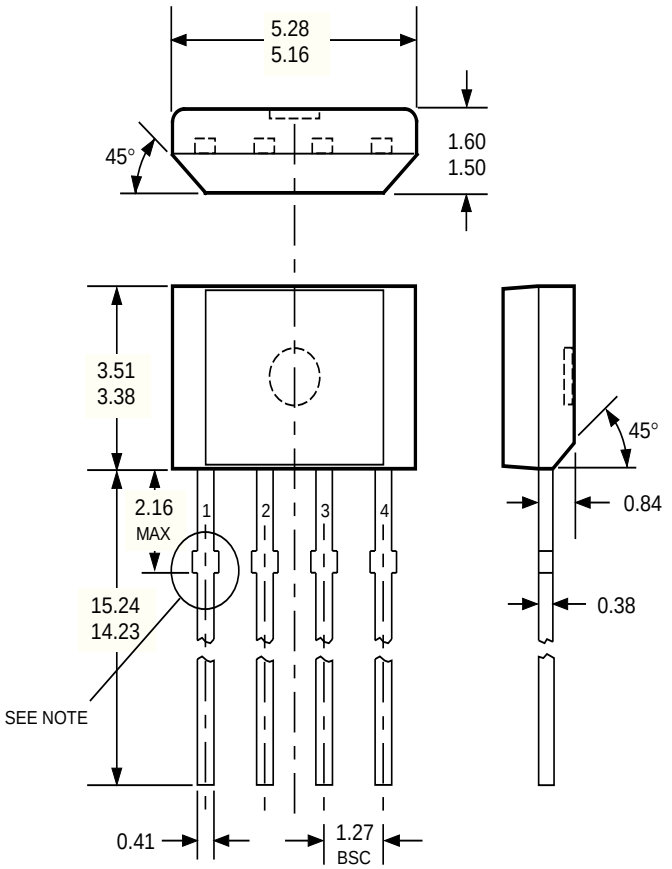
Dimensions in Inches
(controlling dimensions)



Dwg. MH-009C in

Dimensions in Millimeters
(for reference only)



Dwg. MH-009C mm

NOTES:
1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
2. Exact body and lead configuration at vendor's option within limits shown.
3. Height does not include mold gate flash.
4. Recommended minimum PWB hole diameter to clear transition area is 0.035" (0.89 mm).
5. Where no tolerance is specified, dimension is nominal.

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HALL-EFFECT SENSORS SELECTION GUIDE

Partial Part Number	Avail. Oper. Temp.	Operate Limits Over Temp. B_{OP} max	B_{RP} min	B_{hys} min	Function†	Notes
3046	E/L	+200	-200	15	Gear-Tooth Sensor	
3054	K/S	+300	+5	5.0	Unipolar Multiplex	1
3056	E/L	+225	-225	15	Gear-Tooth Sensor	
3058	E/L	+300	-300	150	Gear-Tooth Sensor	
3059	K/S	+100	-100	20	AC Gear-Tooth Sensor	
3060	K/S	+35	-35	10	AC Gear-Tooth Sensor	
3121	E/L	+500	+80	60	Unipolar Switch	
3122	E/L	+430	+120	70	Unipolar Switch	
3123	E/L	+470	+160	70	Unipolar Switch	
3132	K/L/S	+95	-95	30	Bipolar Switch	
3133	K/L/S	+75	-75	30	Bipolar Switch	
3134	E/L	+50	-40	10	Bipolar Switch	
3141	E/L	+175	+10	20	Unipolar Switch	
3142	E/L	+245	+60	30	Unipolar Switch	
3143	E/L	+355	+150	30	Unipolar Switch	
3144	E/L	+450	+25	20	Unipolar Switch	
3161	E	+160	+30	5.0	2-Wire Unipolar Switch	
3175	S	+180	-180	80	Bipolar Latch	
3177	S	+150	-150	50	Bipolar Latch	
3185	E/L	+300	-300	280	Bipolar Latch	
3187	E/L	+175	-175	100	Bipolar Latch	
3188	E/L	+200	-200	160	Bipolar Latch	
3189	E/L	+250	-250	100	Bipolar Latch	
3195	E/L	+200	-200	110	Bipolar Latch	2, 3
3197	L	+200	-200	110	Bipolar Latch	3
3235	S	+200	+15	15	Unipolar Switch	4
		-200	-15	15	Unipolar Switch	
3275	S	+250	-250	100	Bipolar Latch	5
3421	E/L	+300	-300	240	Direction Detection	
3422	E/L	+85	-85	10	Direction Detection	
3503	S	Typ. 1.3 mV/G		–	Linear Sensor	
3515	E/L	Typ. 5.0 mV/G		–	Chopper-Stabilized Linear Sensor	
3516	E/L	Typ. 2.5 mV/G		–	Chopper-Stabilized Linear Sensor	
3517	L/S	Typ. 5.0 mV/G		–	Chopper-Stabilized Linear Sensor	
3518	L/S	Typ. 2.5 mV/G		–	Chopper-Stabilized Linear Sensor	
3625	S	+150	-150	200*	900 mA Bipolar Latch	3, 5, 6
3626	S	+150	-150	200*	400 mA Bipolar Latch	3, 5, 6
5140	E	+240	+25	20	300 mA Unipolar Switch	3, 6

Operating Temperature Ranges:
C = 0°C to +70°C, S = -20°C to +85°C, E = -40°C to +85°C, K = -40°C to +125°C, L = -40°C to +150°C

Notes
1. Multiplexed two-wire sensor; after proper address, power/signal bus current indicates magnetic field condition.
2. Active pull down.
3. Protected.
4. Output 1 switches on south pole, output 2 switches on north pole for 2-phase, bifilar-wound, unipolar-driven brushless dc motor control.
5. Complementary outputs for 2-phase bifilar-wound, unipolar-driven brushless dc motor control.
6. Power driver output.
* Typical.
† Latches will not switch on removal of magnetic field; bipolar switches may switch on removal of field but require field reversal for reliable operation over operating temperature range.

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