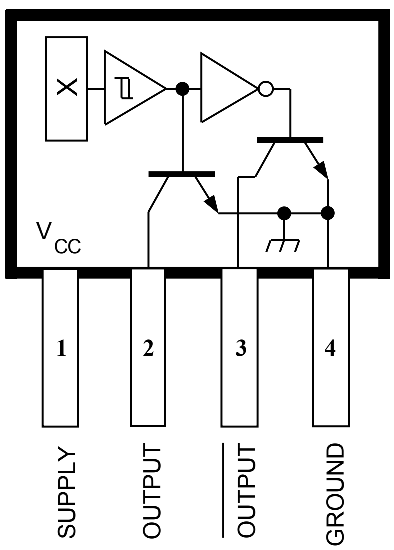
Data Sheet
27632B

# 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 sensor ICs 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 device 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** .

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

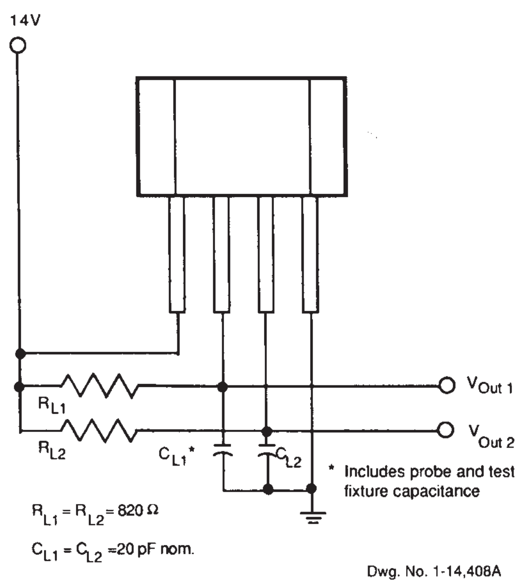
| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 4.5 | — | 14 | V |
| Output Saturation Voltage | $V_{CE(SAT)}$ | $V_{CC}$ = 14 V, $I_C$ = 300 mA | — | 400 | 600 | mV |
| Output Leakage Current | $I_{CEX}$ | $V_{CE}$ = 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

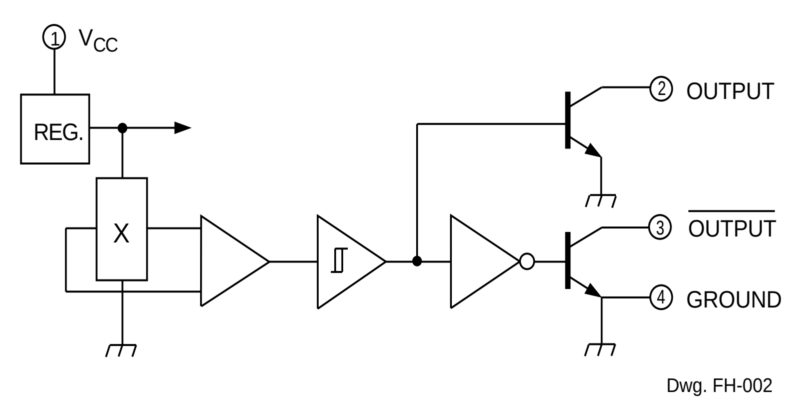
| Characteristic | Symbol | $T_A$ = +25°C | | $T_A$ = -20°C to +85°C | | Units |
|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | |
| Operate Point | $B_{OP}$ | 25 | 250 | 15 | 250 | G |
| Release Point | $B_{RP}$ | -250 | -25 | -250 | -15 | G |
| Hysteresis | $B_{hys}$ | 100 | — | 100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

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

## TEST CIRCUIT




## FUNCTIONAL BLOCK DIAGRAM



## MOTOR COIL DRIVER

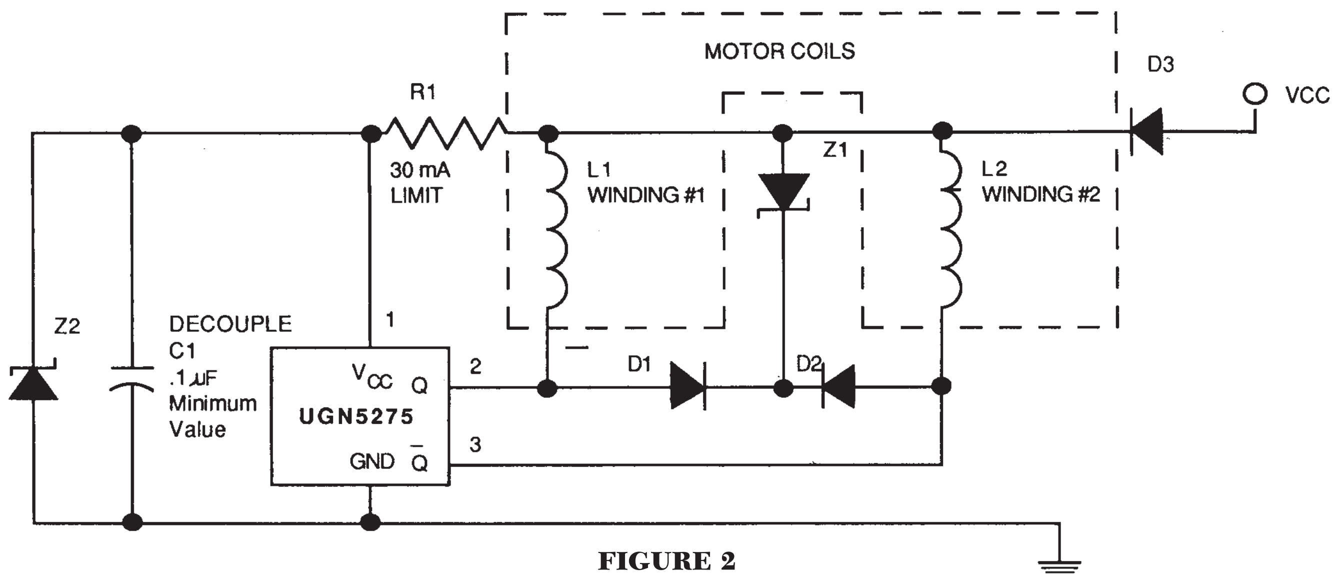
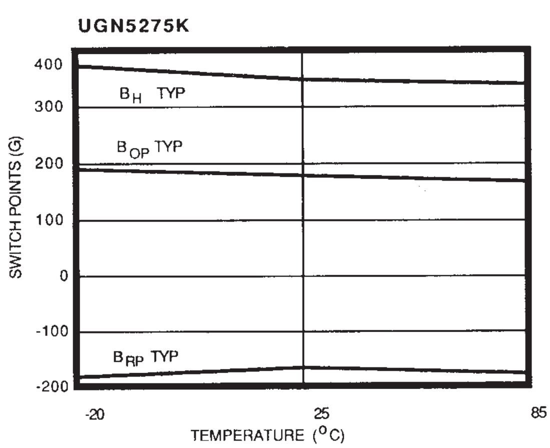



**FIGURE 2**

## SWITCH POINTS VERSUS TEMPERATURE



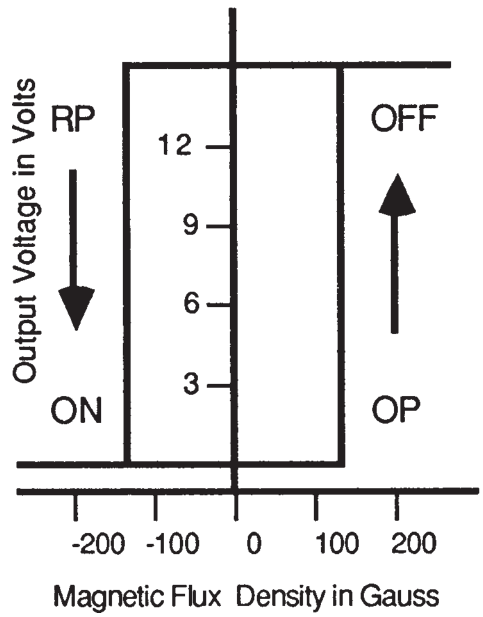

## APPLICATIONS

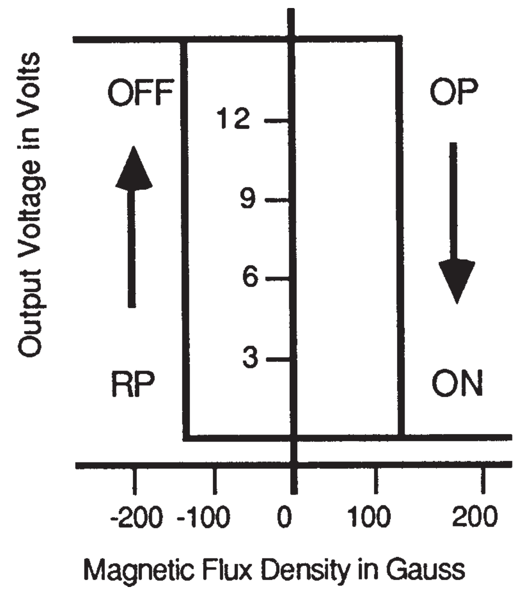
The increased current sinking capability of the UGN5275K ideally suits it for building small, inexpensive brushless dc motors using a minimum number of external components. Figure 2 shows that the only components required to commutate motor windings L1 and L2 are the Hall effect IC, flyback diodes D1 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.

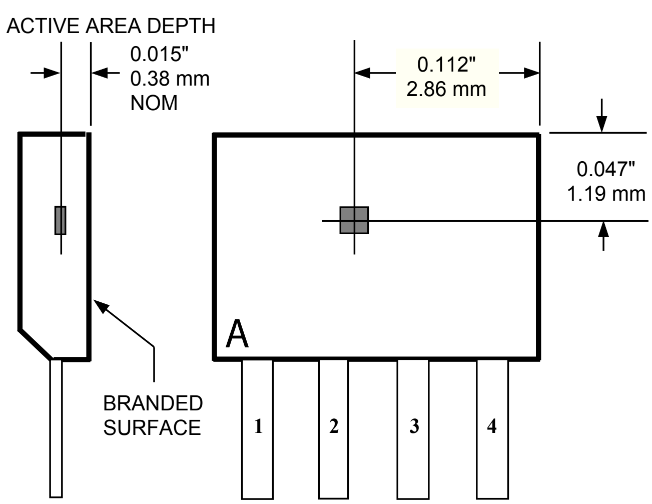
The maximum output voltage level will be restricted to the following: $V_{CC} - V_{D3} + V_Z + V_{D1}$ (blocking diode D3 voltage drop). Blocking diode D3 provides reverse input-polarity protection, and should be used only if reverse battery voltage is a possibility. Capacitor C1 decouples the Hall-effect 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.

## HYSTERESIS CHARACTERISTICS



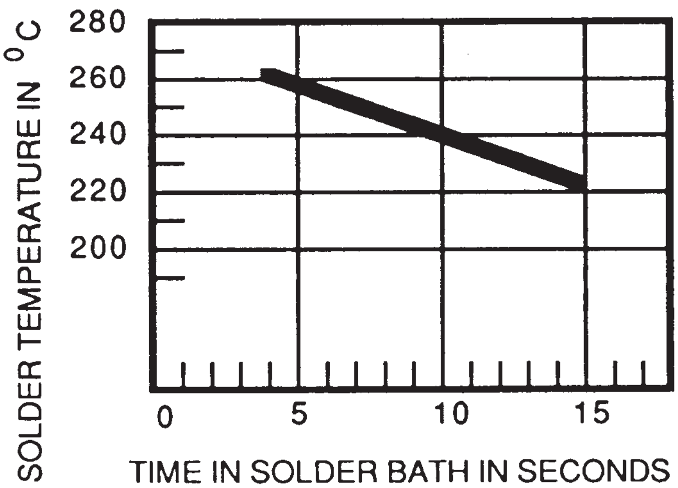




## ELEMENT LOCATION




Dwg. MH-001-3A

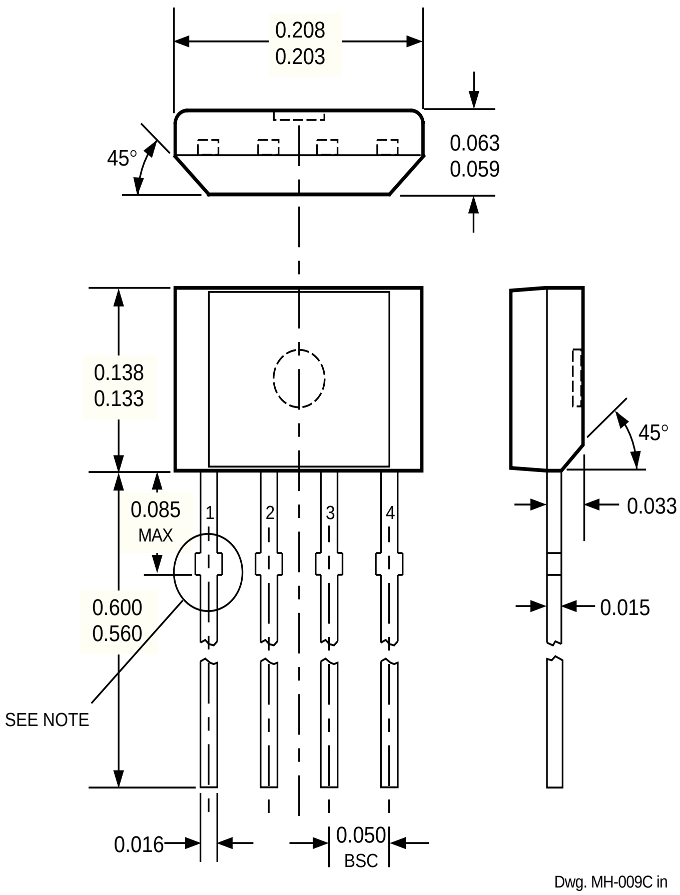
## GUIDE TO INSTALLATION



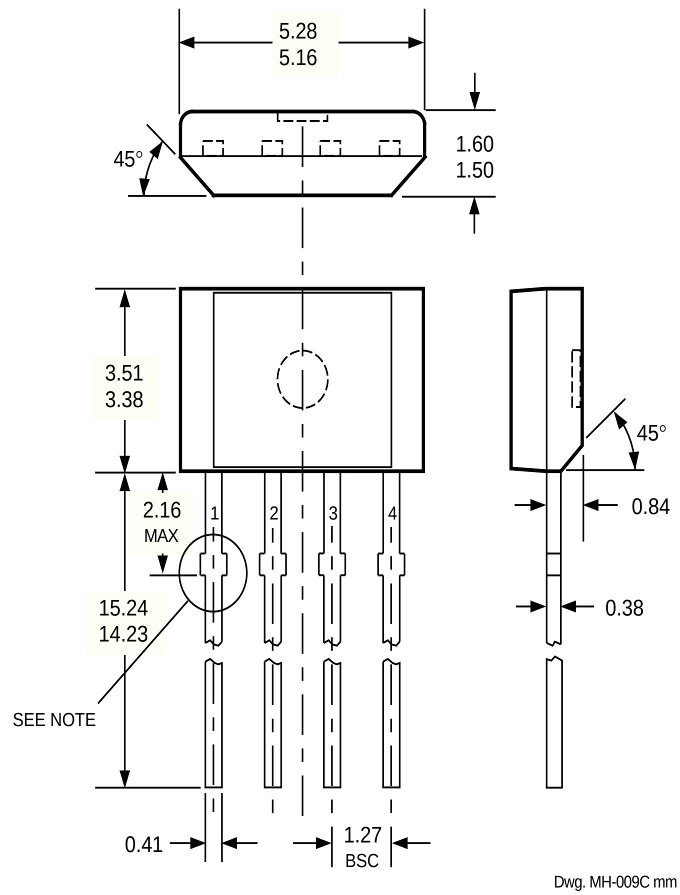

Dwg. No. A-12,062

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.

**Dimensions in Inches**
(controlling dimensions)




**Dimensions in Millimeters**
(for reference only)




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.