SEXTILE HALL-EFFECT SWITCHES FOR HIGH-TEMPERATURE OPERATION

These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to +150°C, and are more stable with both temperature and supply voltage changes. The unipolar switching characteristic makes these devices ideal for use with a simple bar or rod magnet. The four basic devices (3141, 3142, 3143, and 3144) are identical except for magnetic switch points.

Each device includes a voltage regulator for operation with supply voltages of 4.5 volts to 24 volts, reverse battery protection diode, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 25 mA. With suitable output pull up, they can be used with bipolar or CMOS logic circuits. The A3141- and A3142- are improved replacements for the UGN/UGS3140-; the A3144- for the UGN/UGS3120-.

The first character of the part number suffix determines the device operating temperature range; suffix 'E-' is for the automotive and industrial temperature range of -40°C to +85°C, suffix 'L-' is for the automotive and military temperature range of -40°C to +150°C. Four package styles provide a magnetically optimized package for most applications. Suffix '-LL' is a long-leaded version of suffix '-LT', a miniature SOT-89/TO-243AA transistor package for surface-mount applications; suffix '-U' is a three-lead plastic mini-SIP while suffix '-UA' is a three-lead ultra-mini-SIP.

FEATURES and BENEFITS

- Superior Temp. Stability for Automotive or Industrial Applications
- 4.5 V to 24 V Operation ... Needs Only An Unregulated Supply
- Open-Collector 25 mA Output ... Compatible with Digital Logic
- Reverse Battery Protection
- Activate with Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

Always order by complete part number, e.g., A3141ELL.
ELECTRICAL CHARACTERISTICS at $V_{CC} = 8$ V over operating temperature range.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td>Operating</td>
<td>Min.</td>
</tr>
<tr>
<td>Output Saturation Voltage</td>
<td>$V_{OUT(SAT)}$</td>
<td>$I_{OUT} = 20$ mA, $B &gt; B_{OP}$</td>
<td>—</td>
</tr>
<tr>
<td>Output Leakage Current</td>
<td>$I_{OFF}$</td>
<td>$V_{OUT} = 24$ V, $B &lt; B_{RP}$</td>
<td>—</td>
</tr>
<tr>
<td>Supply Current</td>
<td>$I_{CC}$</td>
<td>$B &lt; B_{RP}$ (Output OFF)</td>
<td>—</td>
</tr>
<tr>
<td>Output Rise Time</td>
<td>$t_r$</td>
<td>$R_L = 820$ Ω, $C_L = 20$ pF</td>
<td>—</td>
</tr>
<tr>
<td>Output Fall Time</td>
<td>$t_f$</td>
<td>$R_L = 820$ Ω, $C_L = 20$ pF</td>
<td>—</td>
</tr>
</tbody>
</table>

MAGNETIC CHARACTERISTICS in gauss over operating supply voltage range.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Part Numbers*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A3141—</td>
</tr>
<tr>
<td>$B_{OP}$ at $T_A = 25^\circ$C</td>
<td>50</td>
</tr>
<tr>
<td>over operating temp. range</td>
<td>30</td>
</tr>
<tr>
<td>$B_{RP}$ at $T_A = 25^\circ$C</td>
<td>10</td>
</tr>
<tr>
<td>over operating temp. range</td>
<td>10</td>
</tr>
<tr>
<td>$B_{HYS}$ at $T_A = 25^\circ$C</td>
<td>20</td>
</tr>
<tr>
<td>over operating temp. range</td>
<td>20</td>
</tr>
</tbody>
</table>

NOTES: Typical values are at $T_A = +25^\circ$C and $V_{CC} = 8$ V.
$B_{OP}$ = operate point (output turns ON); $B_{RP}$ = release point (output turns OFF); $B_{HYS}$ = hysteresis ($B_{OP} - B_{RP}$).
*Complete part number includes a suffix to identify operating temperature range (E- or L-) and package type (-LL, -LT, -U, or -UA).
TYPICAL OPERATING CHARACTERISTICS

A3142 - SWITCH POINTS

OUTPUT SATURATION VOLTAGE

SUPPLY CURRENT

SUPPLY CURRENT

* Complete part number includes a suffix denoting operating temperature range (E- or L-) and package type (-LL, -LT, -U, or -UA).
OPERATION

The output of these devices (pin 3) switches low when the magnetic field at the Hall sensor exceeds the operate point threshold \( B_{Op} \). At this point, the output voltage is \( V_{\text{OUT(SAT)}} \). When the magnetic field is reduced to below the release point threshold \( B_{RP} \), the device output goes high. The difference in the magnetic operate and release points is called the hysteresis \( B_{Hyp} \) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.
PACKAGE DESIGNATOR LL

Dimensions in Inches
(Based on 1 mm = 0.03937"")

Dimensions in Millimeters
PACKAGE DESIGNATOR LT

Dimensions in Inches
(Based on 1 mm = 0.03937")

Dimensions in Millimeters
3141 THRU 3144
SENSITIVE HALL-EFFECT SWITCHES
FOR HIGH-TEMPERATURE OPERATION

Dimensions in Inches

Dimensions in Millimeters
(Based on 1" = 25.4 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).
PACKAGE DESIGNATOR UA

Dimensions in Inches

Dimensions in Millimeters
(Based on 1" = 25.4 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.

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