

# 3141 THRU 3144

Data Sheet  
27621.6\*

## SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMPERATURE OPERATION

Dwg. PH-003A

Pinning is shown viewed from branded side.

**ABSOLUTE MAXIMUM RATINGS**  
at  $T_A = +25^\circ\text{C}$

Supply Voltage, $V_{CC}$ .....	28 V
Reverse Battery Voltage, $V_{RCC}$ .....	-35 V
Magnetic Flux Density, B .....	Unlimited
Output OFF Voltage, $V_{OUT}$ .....	28 V
Reverse Output Voltage, $V_{OUT}$ .....	-0.5 V
Continuous Output Current, $I_{OUT}$ .....	25 mA
Operating Temperature Range, $T_A$	
Suffix 'E-' .....	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Suffix 'L-' .....	$-40^\circ\text{C}$ to $+150^\circ\text{C}$
Storage Temperature Range, $T_S$ .....	$-65^\circ\text{C}$ to $+170^\circ\text{C}$

These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to  $+150^\circ\text{C}$ , 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  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , suffix 'L-' is for the automotive and military temperature range of  $-40^\circ\text{C}$  to  $+150^\circ\text{C}$ . 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

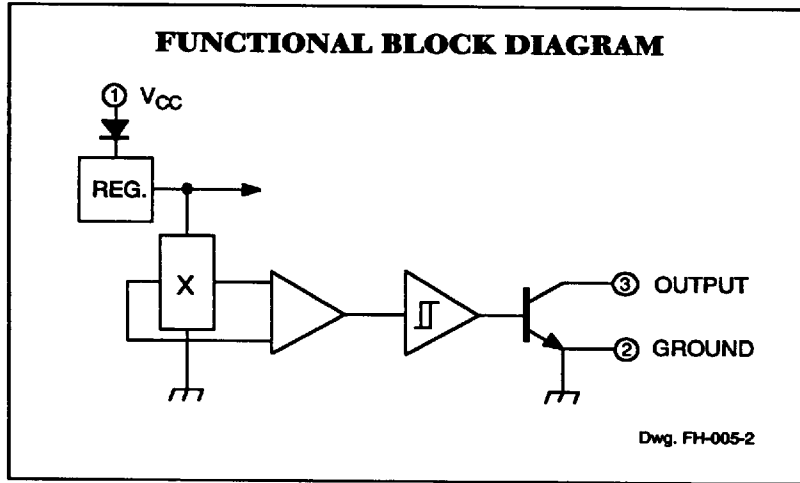
- Superior Temp. Stability for Automotive or Industrial Applications
- 4.5 V to 24 V Operation ... Needs Only An Unregulated Supply
- Open-Collector 25 mA Output ... Compatible with Digital Logic
- Reverse Battery Protection
- Activate with Small, Commercially Available Permanent Magnets
- Solid-State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

Always order by complete part number, e.g., **A3141ELL**.



0504338 0009273 096

**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**



**ELECTRICAL CHARACTERISTICS at  $V_{CC} = 8\text{ V}$  over operating temperature range.**

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Supply Voltage	$V_{CC}$	Operating	4.5	—	24	V
Output Saturation Voltage	$V_{OUT(SAT)}$	$I_{OUT} = 20\text{ mA}$ , $B > B_{OP}$	—	175	400	mV
Output Leakage Current	$I_{OFF}$	$V_{OUT} = 24\text{ V}$ , $B < B_{RP}$	—	<1.0	10	$\mu\text{A}$
Supply Current	$I_{CC}$	$B < B_{RP}$ (Output OFF)	—	4.4	9.0	mA
Output Rise Time	$t_r$	$R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$	—	0.04	2.0	$\mu\text{s}$
Output Fall Time	$t_f$	$R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$	—	0.18	2.0	$\mu\text{s}$

**MAGNETIC CHARACTERISTICS in gauss over operating supply voltage range.**

Characteristic	Part Numbers*											
	A3141-			A3142-			A3143-			A3144-		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
$B_{OP}$ at $T_A = 25^\circ\text{C}$	50	100	160	130	180	230	220	280	340	70	—	350
over operating temp. range	30	100	175	115	180	245	205	280	355	35	—	450
$B_{RP}$ at $T_A = 25^\circ\text{C}$	10	45	130	75	125	175	165	225	285	50	—	330
over operating temp. range	10	45	145	60	125	190	150	225	300	25	—	430
$B_{hys}$ at $T_A = 25^\circ\text{C}$	20	55	80	30	55	80	30	55	80	20	55	—
over operating temp. range	20	55	80	30	55	80	30	55	80	20	55	—

NOTES: Typical values are at  $T_A = +25^\circ\text{C}$  and  $V_{CC} = 8\text{ V}$ .

$B_{OP}$  = 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).



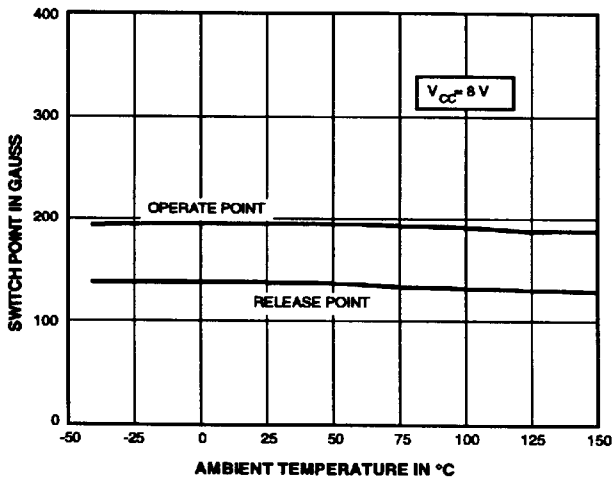
115 Northeast Cutoff, Box 15036  
 Worcester, Massachusetts 01615-0036 (508) 853-5000  
 Copyright © 1993, 1995 Allegro MicroSystems, Inc.

0504338 0009274 T22

**3141 THRU 3144  
SENSITIVE  
HALL-EFFECT SWITCHES  
FOR HIGH-TEMP. OPERATION**

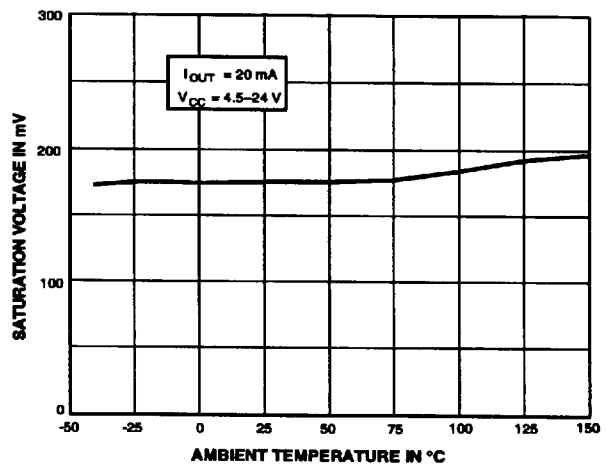
**TYPICAL OPERATING CHARACTERISTICS**

**A3142- SWITCH POINTS**



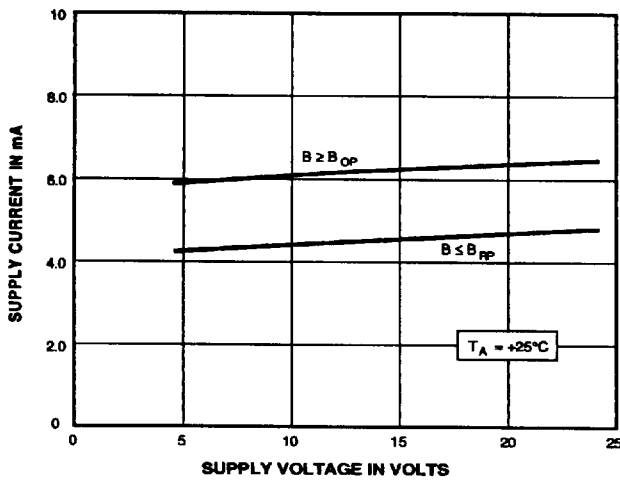
Dwg. GH-044

**OUTPUT SATURATION VOLTAGE**



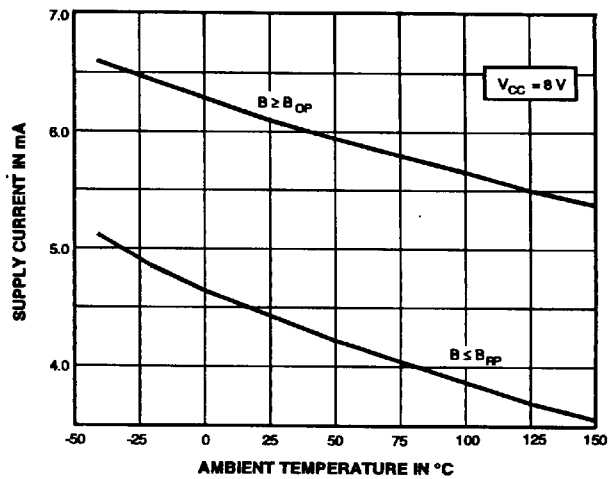
Dwg. GH-040-1

**SUPPLY CURRENT**



Dwg. GH-041-1

**SUPPLY CURRENT**



Dwg. GH-038-1

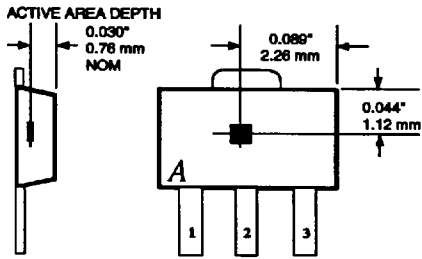
\* Complete part number includes a suffix denoting operating temperature range (E- or L-) and package type (-LL, -LT, -U, or -UA).

0504338 0009275 969

**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**

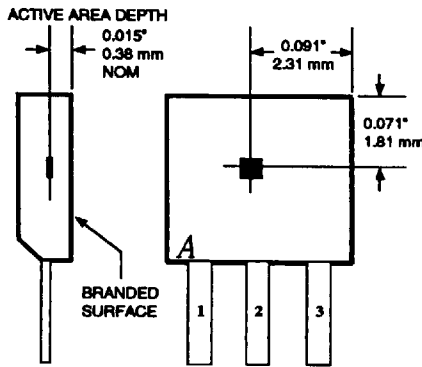
**SENSOR LOCATIONS**

**Suffix "LL" and "LT"**



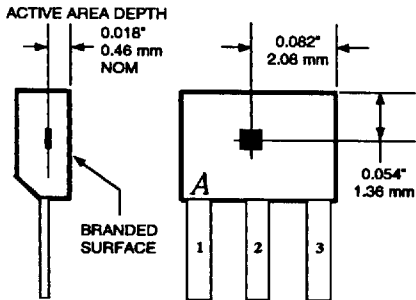
Dwg. MH-006-2B

**Suffix "U"**



Dwg. MH-002-2A

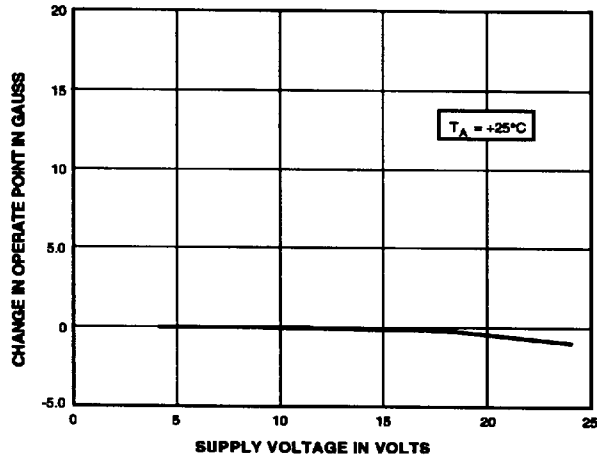
**Suffix "UA"**



Dwg. MH-011-2B

**TYPICAL OPERATING CHARACTERISTICS (cont.)**

**CHANGE IN OPERATE POINT**



Dwg. GH-042-1

**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  $V_{OUT(SAT)}$ . 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 ( $B_{HYS}$ ) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.



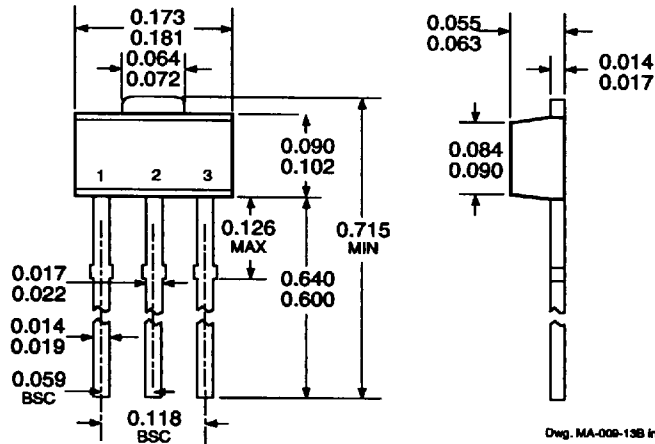
115 Northeast Cutoff, Box 15036  
 Worcester, Massachusetts 01615-0036 (508) 853-5000

0504338 0009276 8T5

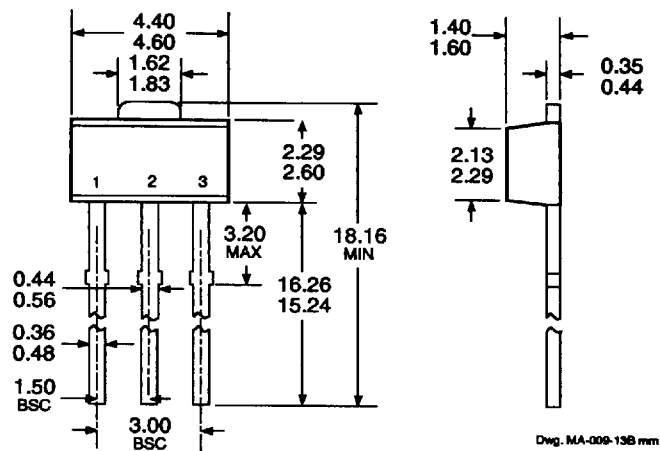
**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**

**PACKAGE DESIGNATOR LL**

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



**Dimensions in Millimeters**  
**(controlling dimensions)**

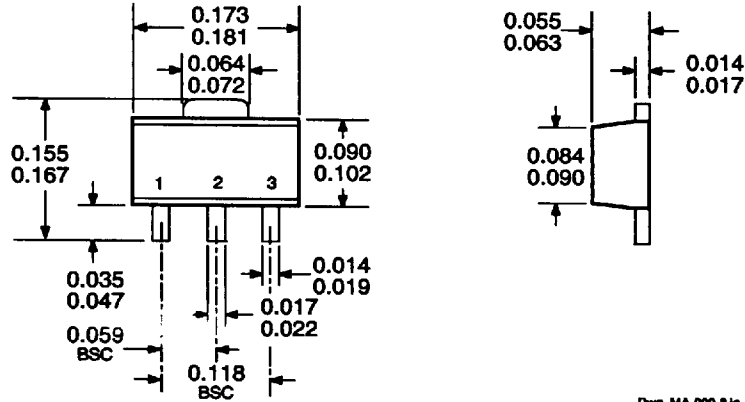


050433& 0009277 731

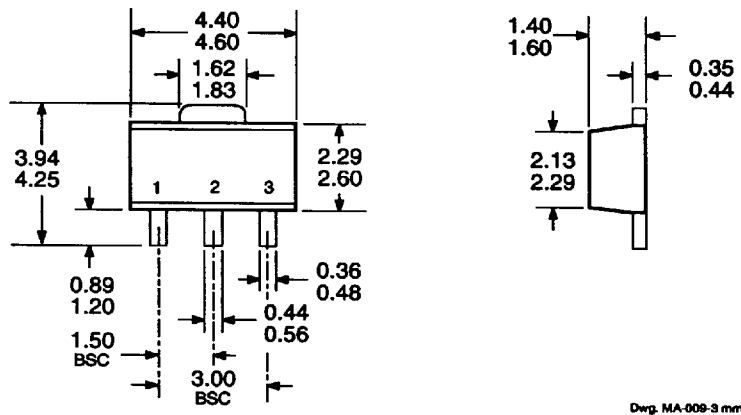
**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**

**PACKAGE DESIGNATOR LT**

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



**Dimensions in Millimeters**  
**(controlling dimensions)**

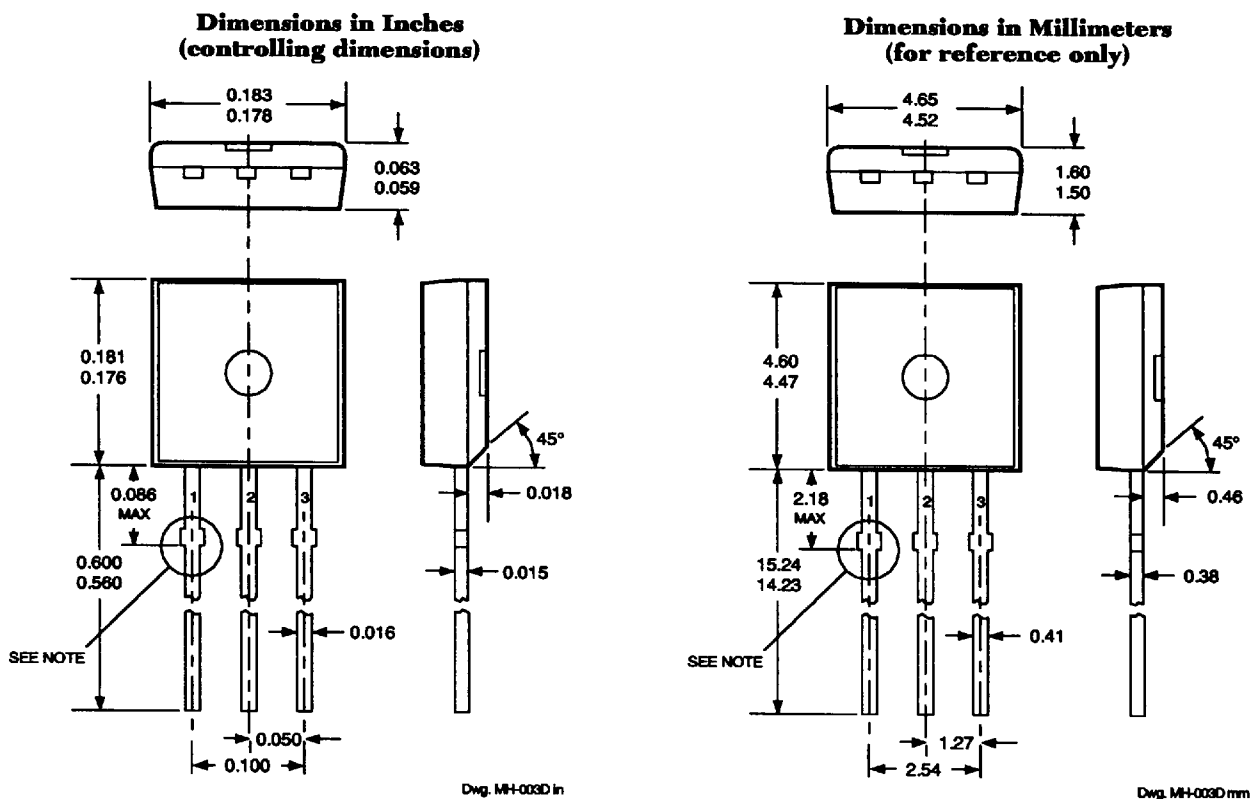


115 Northeast Cutoff, Box 15036  
 Worcester, Massachusetts 01615-0036 (508) 853-5000

0504338 0009278 678

**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**

**PACKAGE DESIGNATOR U**



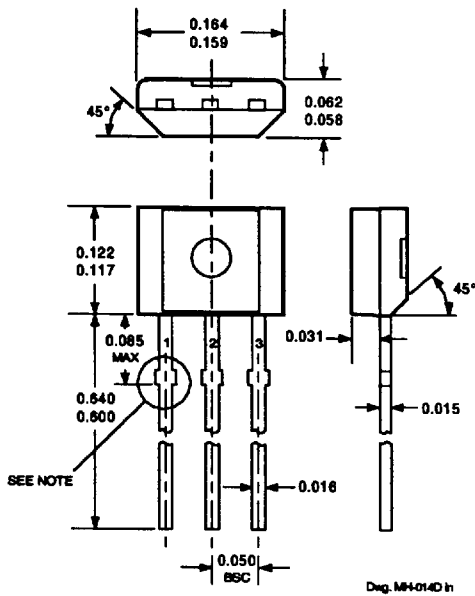
- NOTES:
1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
  2. Exact body and lead configuration at vendor's option within limits shown.
  3. Height does not include mold gate flash.
  4. Recommended minimum PWB hole diameter to clear transition area is 0.035" (0.89 mm).

0504338 0009279 504

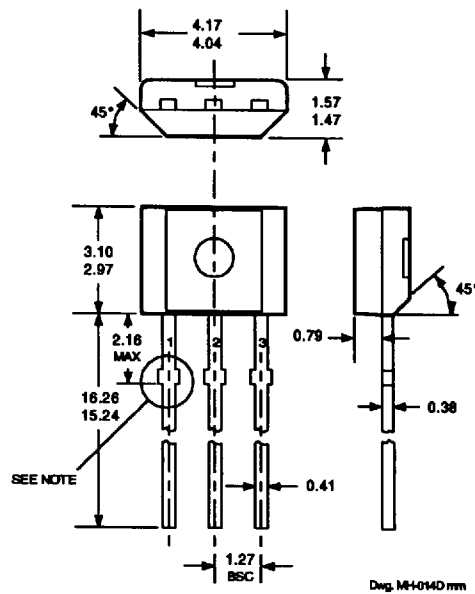
**3141 THRU 3144**  
**SENSITIVE**  
**HALL-EFFECT SWITCHES**  
**FOR HIGH-TEMP. OPERATION**

**PACKAGE DESIGNATOR UA**

**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.

*Allegro MicroSystems, Inc. reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products.*

*The information included herein is believed to be accurate and reliable. However, Allegro MicroSystems, Inc. assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.*



115 Northeast Cutoff, Box 15036  
 Worcester, Massachusetts 01615-0036 (508) 853-5000

0504338 0009280 226