SPRAGUE
THE MARK OF RELIABILITY

ULTRA-SENSITIVE HALL EFFECT BIPOLAR SWITCHES

FEATURES

- 4.5V to 24V Operation
- High Reliability—No Moving Parts
- Constant Output Amplitude
- Output Compatible with All Digital Logic Families
- Superior Temperature Stability
- Highly Resistant to Physical Stress

Type 3131 bipolar switches are extremely sensitive devices made possible by Sprague breakthroughs in Hall sensor design and technology. The sensors have superior magnetic characteristics, are less susceptible to mechanical stress than previous Hall Effect ICs, and are very stable over temperature. On-chip compensation closely maintains magnetic operate and release points and hysteresis limits over their operating temperature ranges.

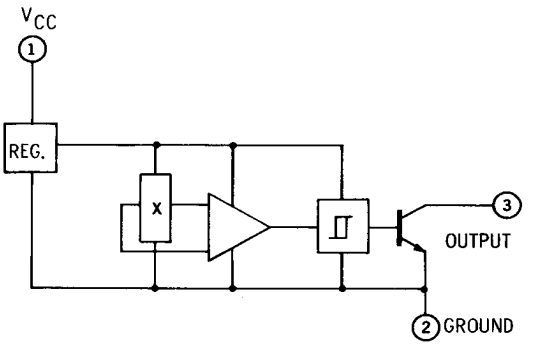
Each Hall Effect circuit includes a voltage regulator, quadratic Hall voltage generator, temperature stability circuit, signal amplifier, Schmitt trigger, and open-collector output on a single silicon chip. The on-board regulator permits operation with supply voltages of 4.5 to 30 V. The switches' output can sink up to 20 mA at a conservatively-rated repetition rate of 100 kHz. They can be used directly with bipolar or MOS logic circuits. Selected devices, with outputs capable of sinking 50 mA, are available on special order.

Types UGN-3131T and UGN-3131U are rated for operation over the temperature range of −20°C to +85°C. Types UGS-3131T and UGS-3131U have an operating range of −40°C to +125°C.

The Hall Effect switches are offered in two three-pin plastic packages—a 60-mil (1.54 mm) magnetically-optimized "U" package, and one 80 mils (2.03 mm) thick specified by the suffix "T".

Type 3131 is also available in SOT 89 (TO-243AA) for surface-mount applications as UGN-3131L and UGS-3131L, and in a hermetically sealed three-pin ceramic package. The high-temperature hermetic device (UGS-3131H) can be supplied with Sprague HYREL® screening as UGS-3131HH. For more information on surface-mount and hermetic switches, contact the factory.

FUNCTIONAL BLOCK DIAGRAM



Dwg. No. A-11,002A

ABSOLUTE MAXIMUM RATINGS

Power Supply, V_{CC}	30V
Magnetic Flux Density, B	Unlimited
Output OFF Voltage	30V
Output ON Current, I_{SINK}	25mA
Operating Temperature Range, T_A	
UGN-3131T	−20°C to + 85°C
UGN-3131U	−20°C to + 85°C
UGS-3131T	−40°C to +125°C
UGS-3131U	−40°C to +125°C
Storage Temperature Range, T_S	−65°C to +150°C *

*Devices can be stored at + 200°C for short periods of time.

SPRAGUE DATA SHEET 27631

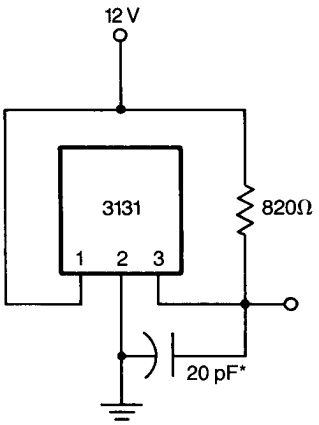
ELECTRICAL CHARACTERISTICS at $T_A = +25°C$, $V_{CC} = 4.5\ V$ to $30\ V$ (unless otherwise noted)

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}		4.5	—	30	V
Output Saturation Voltage	$V_{CE\ (sat)}$	$B \geq 95G$, $V_{CC} = 30V$, $I_{SINK} = 20mA$	—	—	400	mV
Output Leakage Current	I_{OFF}	$B \leq -95G$, $V_{OUT} = 30V$, $V_{CC} = 30V$	—	—	10	μA
Supply Current	I_{CC}	$B \leq -95G$, $V_{CC} = 30V$, Output Open	—	—	7.0	mA
Output Rise Time	t_r	$V_{CC} = 12V$, $R_L = 820\Omega$, $C_L = 20pF$	—	0.04	2.0	μs
Output Fall Time	t_f	$V_{CC} = 12V$, $R_L = 820\Omega$, $C_L = 20pF$	—	0.18	2.0	μs

MAGNETIC CHARACTERISTICS

Characteristic	Symbol	$T_A = +25°C$		$T_A = -20°C$ to $+85°C$		$T_A = -40°C$ to $+125°C$		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
Operate Point	B_{OP}	−75	95	−75	95	−115	135	G
Release Point	B_{RP}	−95	75	−95	75	−135	115	G
Hysteresis	B_H	20	—	20	—	15	—	G

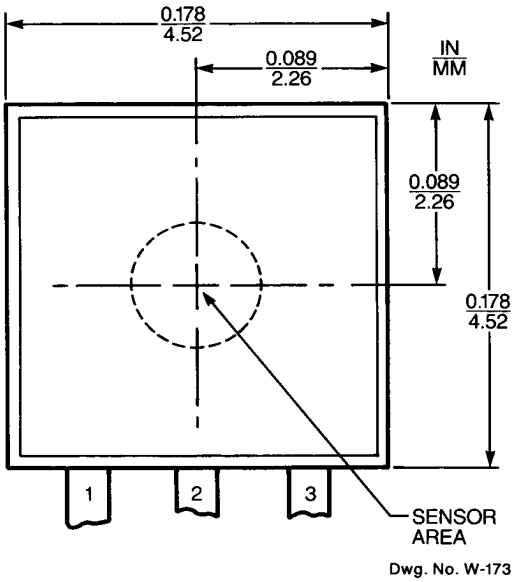
TEST CIRCUIT



Dwg. No. W-241

*Includes probe and test fixture capacitance.

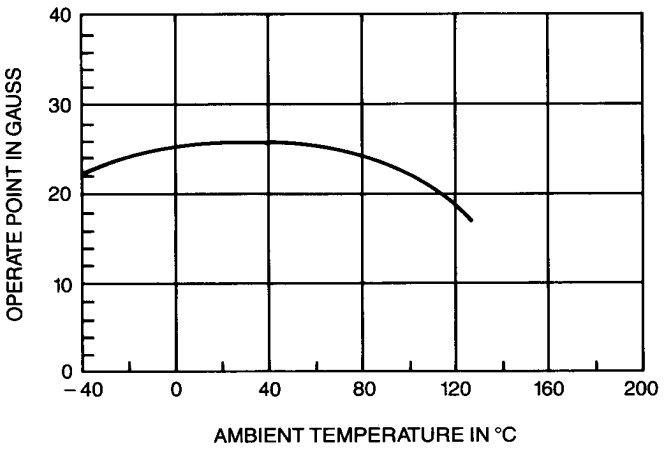
SENSOR LOCATION



Dwg. No. W-173

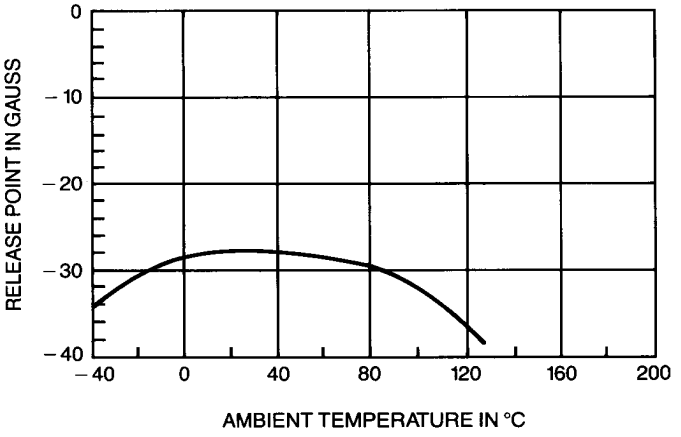
TYPICAL CHARACTERISTICS AS FUNCTIONS OF TEMPERATURE

OPERATE POINT

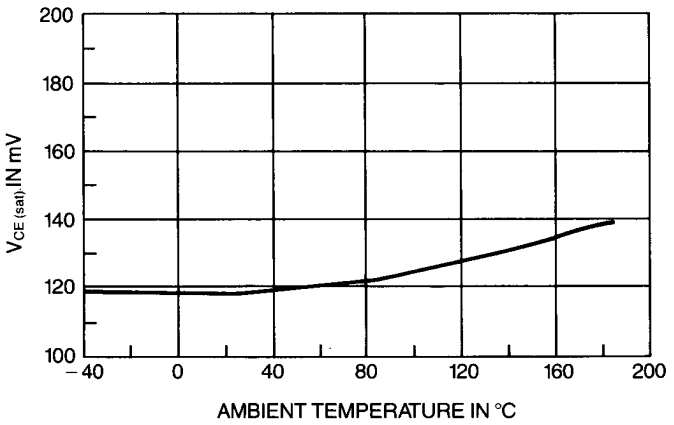


Dwg. No. W-242

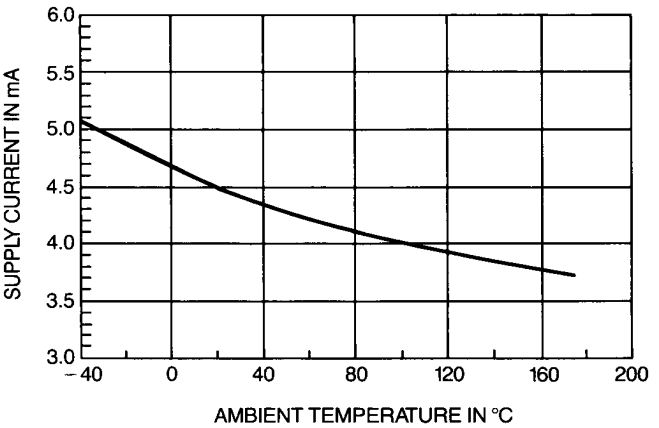
RELEASE POINT



Dwg. No. W-243



Dwg. No. W-176

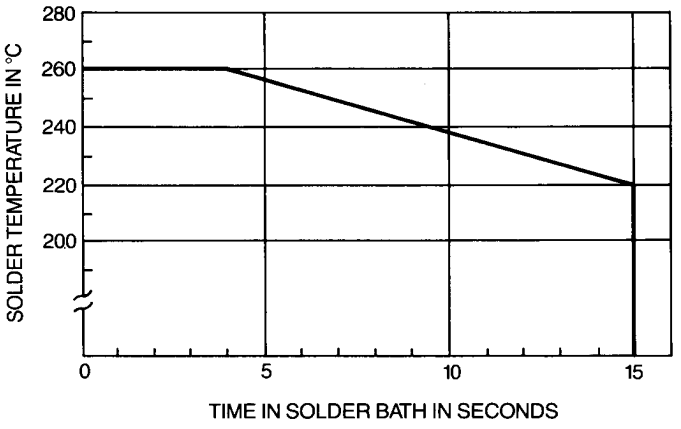


Dwg. No. W-167

GUIDE TO INSTALLATION

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.

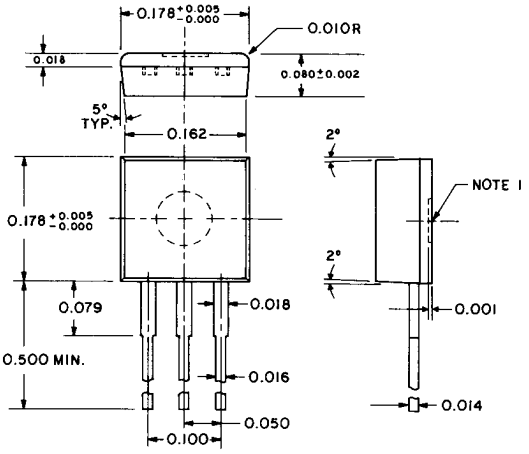
2. To prevent permanent damage to the Hall cell, heat-sink the leads during hand-soldering. Recommended maximum conditions for wave soldering are shown in the graph at right. Solder flow should be no closer than 0.125″ (3.18 mm) to the epoxy package.



Dwg. No. A-12,062

'T' PACKAGE

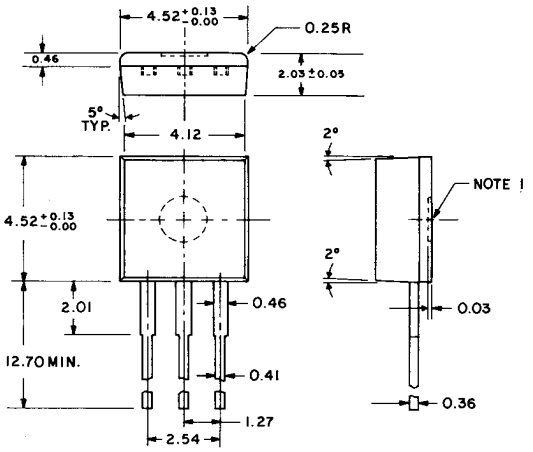
DIMENSIONS IN INCHES



Dwg. No. A-11,900 IN

DIMENSIONS IN MILLIMETERS

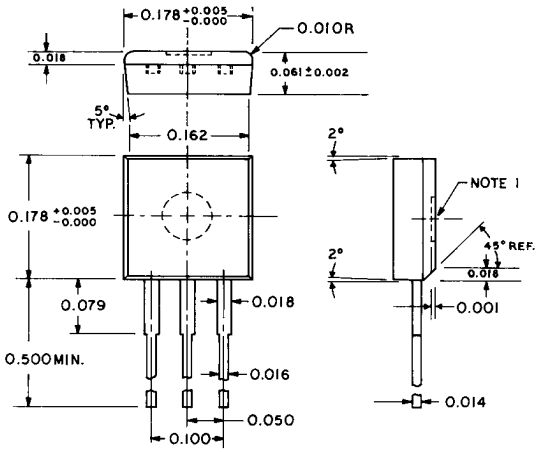
Based on 1" = 25.4mm



Dwg. No. A-11,900 MM

'U' PACKAGE

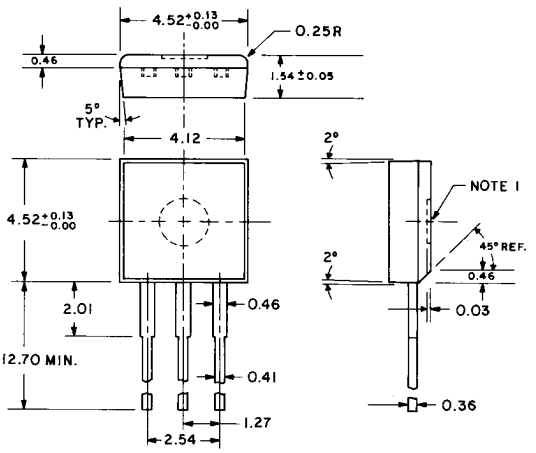
DIMENSIONS IN INCHES



Dwg. No. A-11,901 IN

DIMENSIONS IN MILLIMETERS

Based on 1" = 25.4mm



Dwg. No. A-11,901 MM

NOTES:

1. Ejector pin indent is centrally located.
2. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
3. Tolerances, unless otherwise specified, are ± 0.005" (0.13mm) and ± ½°.