

**HIGH-VOLTAGE HIGH-SENSITIVITY HALL-EFFECT
 LATCH WITH INTERNAL PULLUP RESISTOR**

Description

The AH3722A/AH3724A is a high-voltage, high-sensitivity Hall-effect latch IC with internal pullup resistor designed for commutation of brushless DC motors, flow meters, linear encoders and position sensors in industrial, consumer home appliances and personal care applications.

To support a wide range of the demanding applications, the design is optimized to operate over the supply range of 3.0V to 28V. With chopper stabilized architecture and an internal bandgap regulator to provide temperature compensated supply for internal circuits, the AH3722A/AH3724A provides a reliable solution over the whole operating range. For robustness and protection, the device has a Zener clamp on the supply. The output has an overcurrent limit and a Zener clamp.

The internally pulled-up output can be switched on with South pole of sufficient strength and switched off with North pole of sufficient strength. When the magnetic flux density (B) perpendicular to the part marking surface is larger than the operate point (B_{OP}) the output is switched on (pulled low). The output is held latched until the magnetic flux density reverses and becomes lower than the release point (B_{RP}).

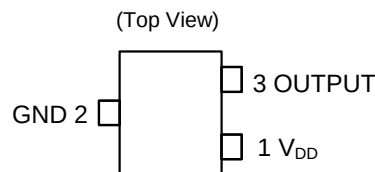
Features

- Bipolar Latch (South Pole: On, North Pole: Off)
- 3.0V to 28V Operating Voltage Range
- High Sensitivity: B_{OP} and B_{RP} of 25G to 40G and -25G to -40G Typical
- Internally Pullup Resistor on the Output Pin
- Resistant to Physical Stress
- Output Overcurrent Limit
- Chopper Stabilized Design Provides
 - Superior Temperature Stability
 - Minimal Switch Point Drift
 - Enhanced Immunity to Stress
- Good RF Noise Immunity
- Reverse Blocking Diode and Zener Clamp on Supply
- -40°C to +125°C Operating Temperature
- High ESD HBM: 8kV
- Industry Standard SC59, SOT23 (Type S), SIP-3 (Ammo Pack) and SIP-3 (Bulk Pack) Packages
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative.**
<https://www.diodes.com/quality/product-definitions/>

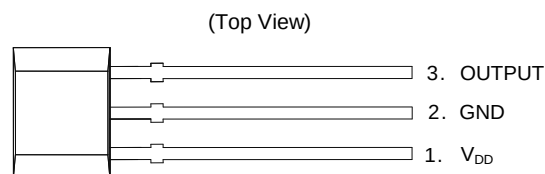
Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments



SC59 and SOT23 (Type S)

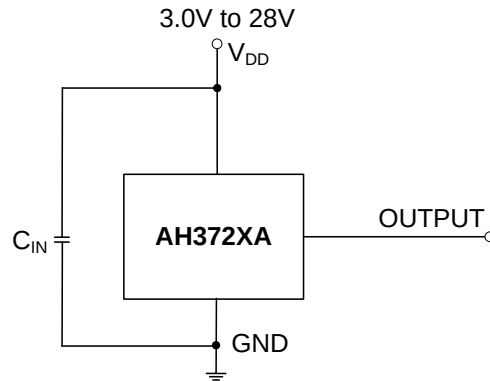


SIP-3 (Ammo Pack) and SIP-3 (Bulk Pack)

Applications

- Brushless DC motor commutation
- Revolution per minute (RPM) measurement
- Flow meters
- Angular and linear encoders and position sensors
- Contactless commutation, speed measurement and angular position sensing/indexing in consumer home appliances, office equipment and industrial applications

Typical Applications Circuit

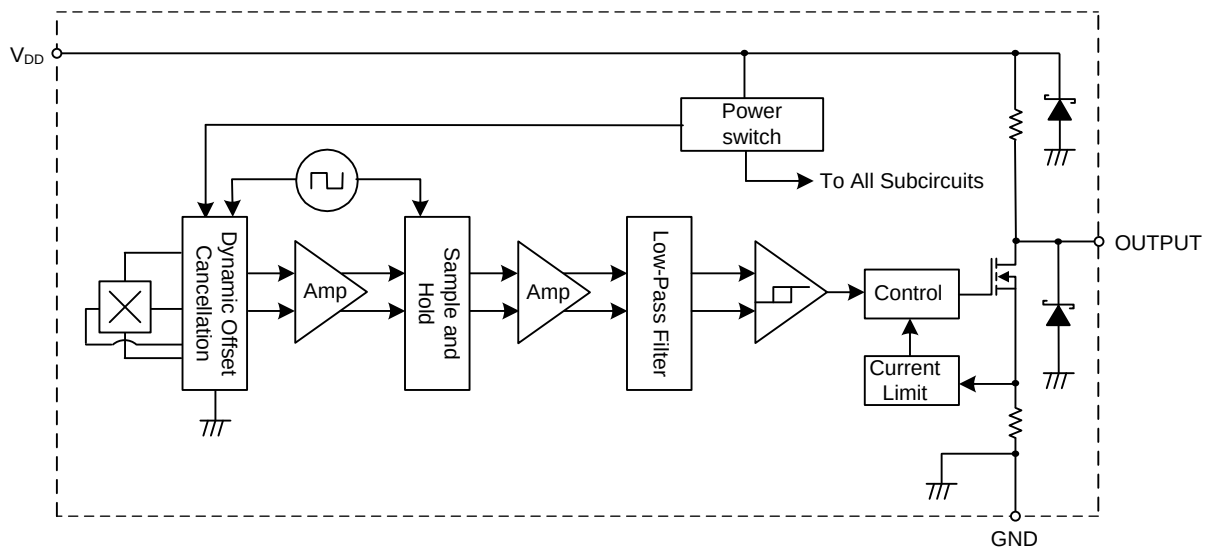


Pin Descriptions

Packages: SC59, SOT23 (Type S) SIP-3 (Ammo Pack), and SIP-3 (Bulk Pack)

Pin Number	Pin Name	Function
1	V _{DD}	Power Supply Input
2	GND	Ground
3	OUTPUT	Output Pin

Functional Block Diagram



Absolute Maximum Ratings (Notes 4 & 5) (@T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic	Value	Unit
V _{DD}	Supply Voltage (Note 5)	32	V
V _{OUT_MAX}	Output Pin Off Voltage (Note 5)	32	V
I _{OUT}	Continuous Output Current	60	mA
I _{OUT_R}	Reverse Output Current	-50	mA
B	Magnetic Flux Density	Unlimited	
P _D	Package Power Dissipation	SIP-3 (Ammo Pack)	mW
		SIP-3 (Bulk Pack)	
		SOT23 (Type S)	
T _S	Storage Temperature Range	-65 to +165	°C
T _J	Maximum Junction Temperature	+150	°C
ESD HBM	Electrostatic Discharge Withstand Capability—Human Body Model	8	kV

- Notes:
- Stresses greater than those listed under *Absolute Maximum Ratings* can cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to *Absolute Maximum Ratings* for extended periods can affect device reliability.
 - The absolute maximum V_{DD} of 32V is a transient stress rating and is not meant as a functional operating condition. It is not recommended to operate the device at the absolute maximum-rated conditions for any period of time.

Recommended Operating Conditions (@T_A = -40°C to +125°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V _{DD}	Supply Voltage	Supply voltage, between V _{DD} and GND pins	3.0 to 28	V
T _A	Operating Temperature Range	Operating ambient temperature range	-40 to +125	°C

Electrical Characteristics (Notes 6 & 7) (@T_A = -40°C to +125°C, V_{DD} = 3V to 28V, C_{IN} = 0.1μF, unless otherwise specified.)

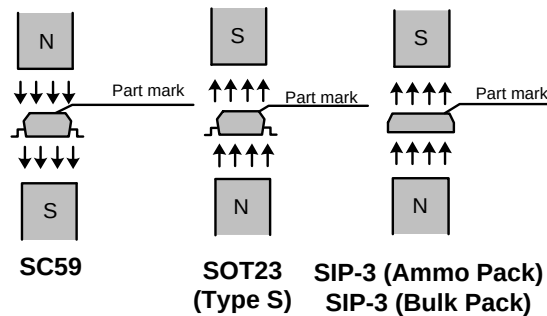
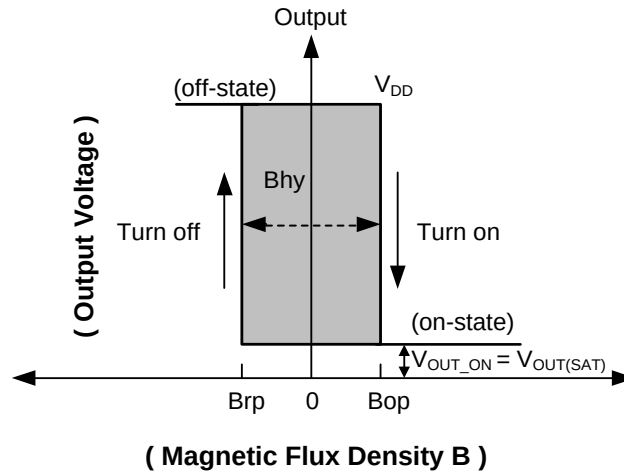
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{OUT_ON}	Output On Voltage	I _{OUT} = 20mA, B > B _{OP}	—	0.2	0.4	V
I _{OUT_OFF}	Output Leakage Current	V _{OUT} = 28V, B < B _{RP} , output off	—	< 0.1	10	μA
I _{DD}	Supply Current	Output open, T _A = +25°C	—	3	4	mA
		Output open, T _A = -40°C to +125°C	—	—	5	mA
R _{PU}	Internal Pullup Resistance	T _A = -40°C to 125°C	10	14	18	kΩ
t _{ST}	Device Startup Time	V _{DD} ≥ 3V, B > B _{OP} or B < B _{RP} (Note 6)	—	10	—	μs
f _C	Chopping Frequency	V _{DD} ≥ 3V (Note 8)	—	500	—	kHz
t _D	The Time Delay from Magnetic Threshold Reached to the Start of the Output Rise or Fall	(Note 8)	—	4	—	μs
t _R	Output Rising Time (External Pullup Resistor R _L and Load Capacitance Dependent)	R _L = 1kΩ, C _L = 20pF (Note 8)	—	0.2	1	μs
t _F	Output Falling Time (Internal Switch Resistance and Load Capacitance Dependent)	R _L = 1kΩ, C _L = 20pF (Note 8)	—	0.1	1	μs
I _{OCL}	Output Current Limit	B > B _{OP} (Note 9)	30	—	55	mA
V _Z	Zener Clamp Voltage	I _{DD} = 5mA, T _A = +25°C	28	—	—	V

- Notes:
- When power is initially turned on, V_{DD} must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the startup time of 10μs typical from the operating voltage reaching 3V.
 - Typical values are defined at T_A = +25°C, V_{DD} = 12V. Maximum and minimum values over the operating temperature range is not tested in production but guaranteed by design, process control and characterization.
 - Guaranteed by design, process control, and characterization. Not tested in production.
 - The device limits the output current I_{OUT} to current limit of I_{OCL}.

Magnetic Characteristics (Notes 10 & 11) ($T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $V_{DD} = 3.0\text{V}$ to 28V , unless otherwise specified)

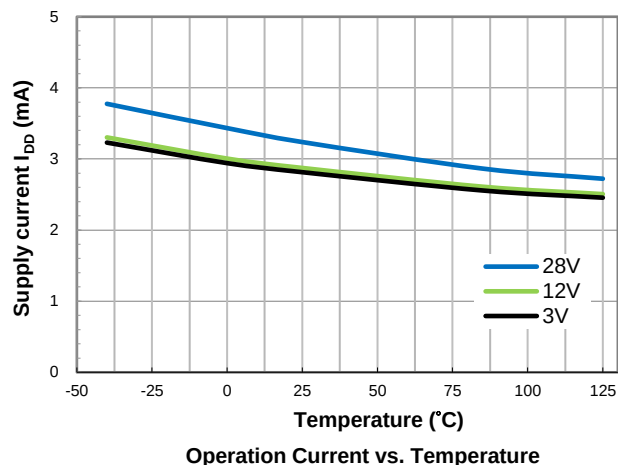
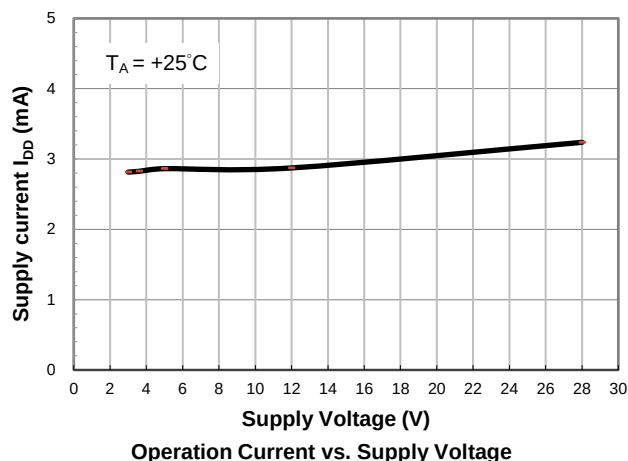
Part Number	Symbol	Parameter	Min	Typ	Max	Unit
AH3722A	B_{OP} (South pole to part marking side)	Operation Point	10	25	40	Gauss
	B_{RP} (North pole to part marking side)	Release Point	-40	-25	-10	
	B_{HY} ($ B_{OPX} - B_{RPX} $)	Hysteresis (Note 12)	20	50	80	
AH3724A	B_{OP} (South pole to part marking side)	Operation Point	20	40	60	Gauss
	B_{RP} (North pole to part marking side)	Release Point	-60	-40	-20	
	B_{HY} ($ B_{OPX} - B_{RPX} $)	Hysteresis (Note 12)	40	80	120	

- Notes:
- When power is initially turned on, V_{DD} must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the startup time of $10\mu\text{s}$ typical from the operating voltage reaching 3V.
 - Typical values are defined at $T_A = +25^\circ\text{C}$, $V_{DD} = 12\text{V}$. Maximum and minimum values over the operating temperature range is not tested in production but guaranteed by design, process control, and characterization.
 - Maximum and minimum hysteresis is guaranteed by design, process control, and characterization.

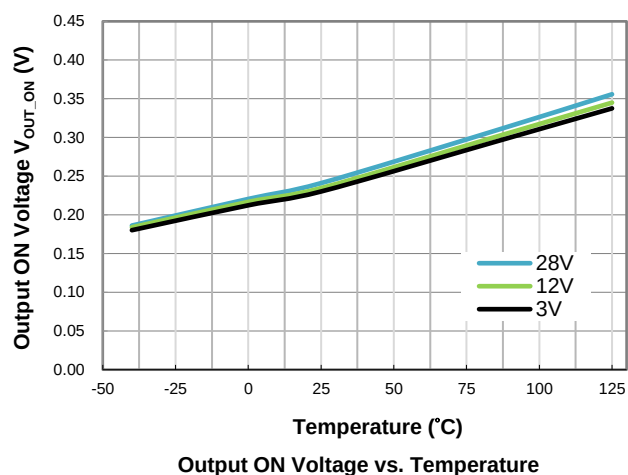
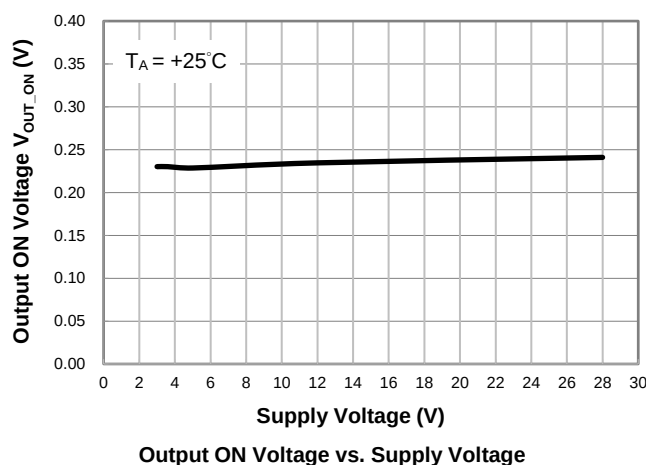


Typical Operating Characteristics

Supply Current

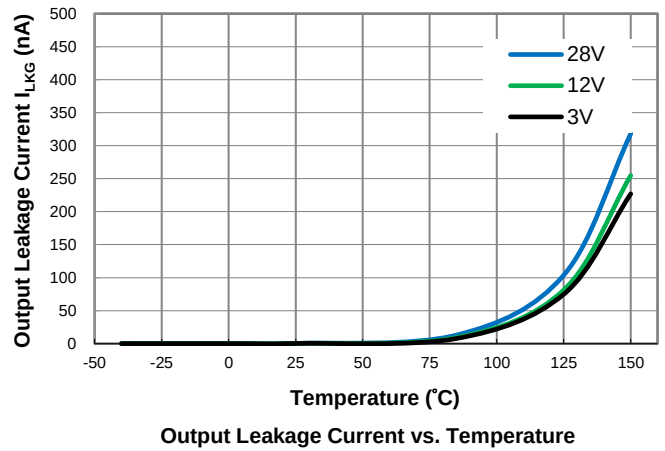
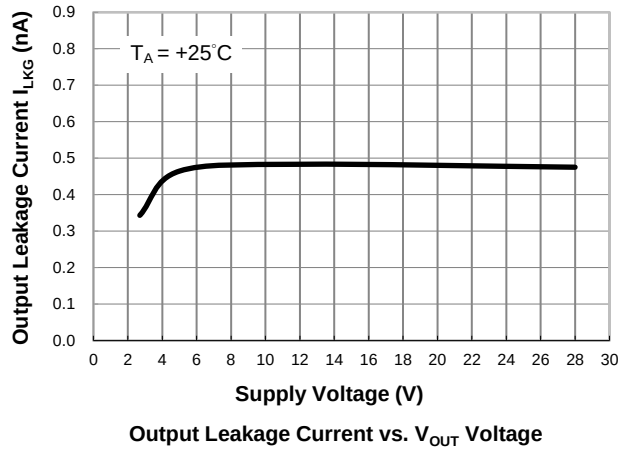


Output Switch On Voltage, $I_{OUT} = 20\text{mA}$

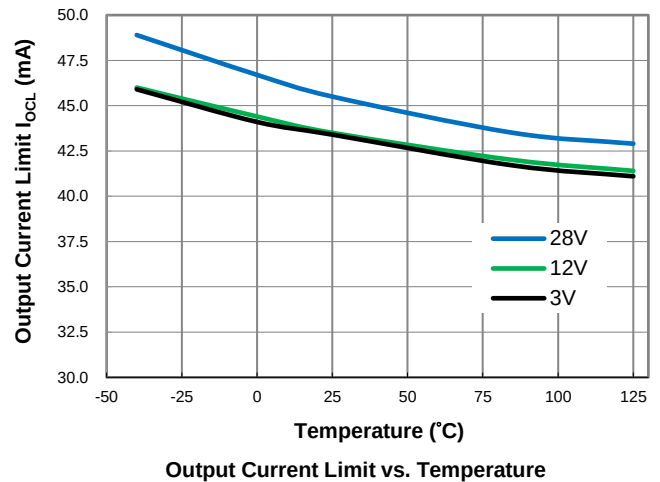
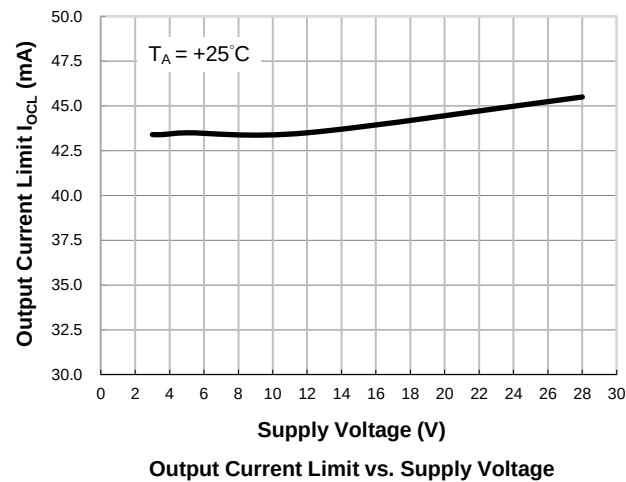


Typical Operating Characteristics (continued)

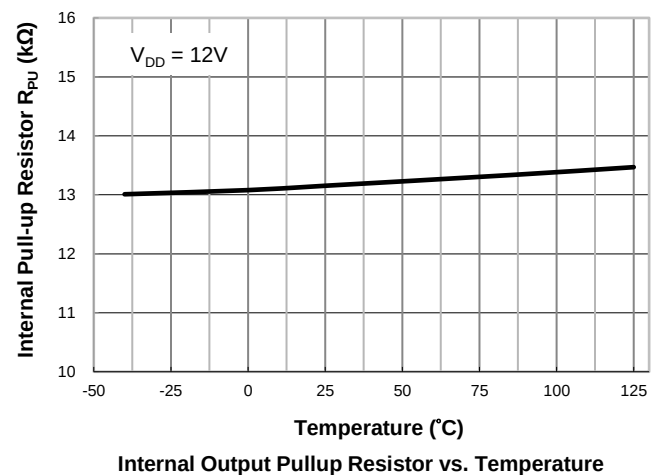
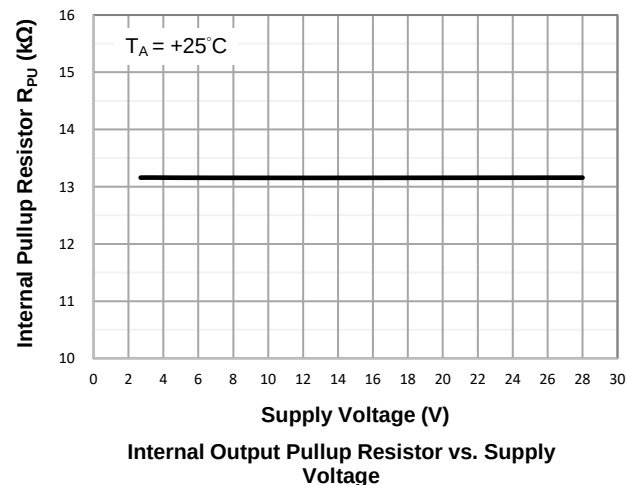
Output Leakage Current



Output Current Limit

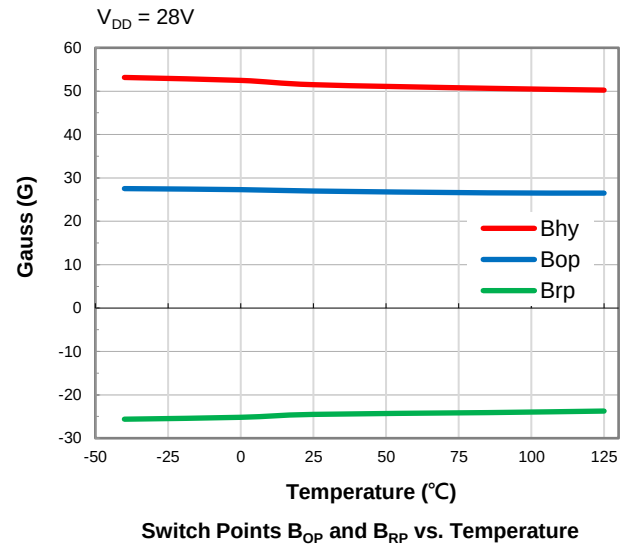
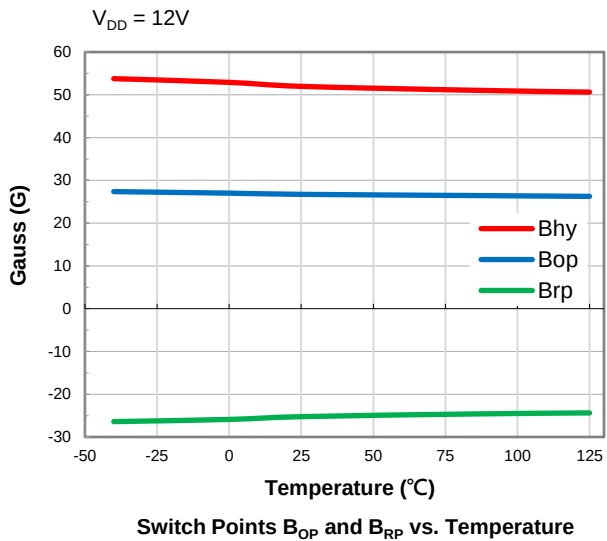
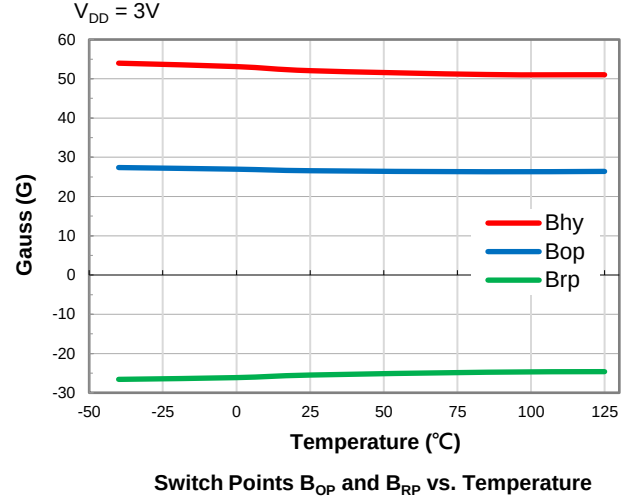
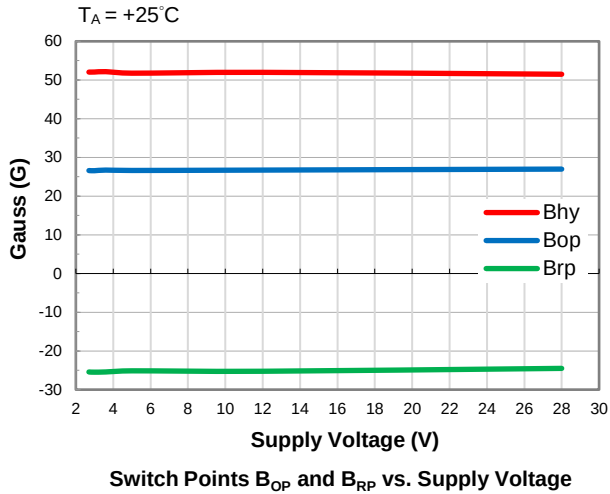


Output Pullup Resistor (Internal)



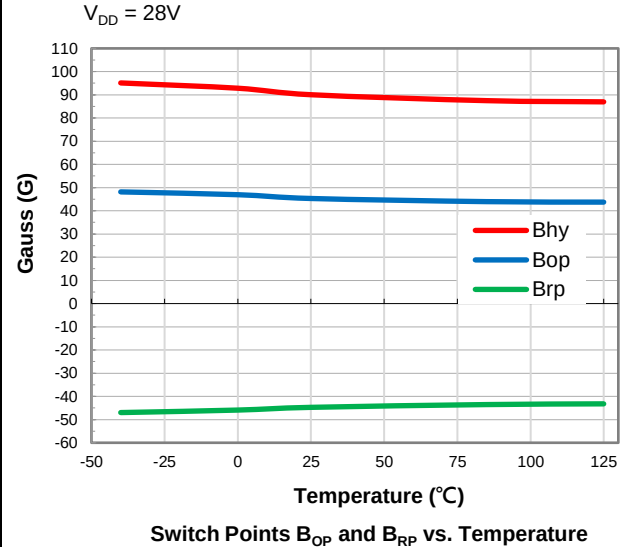
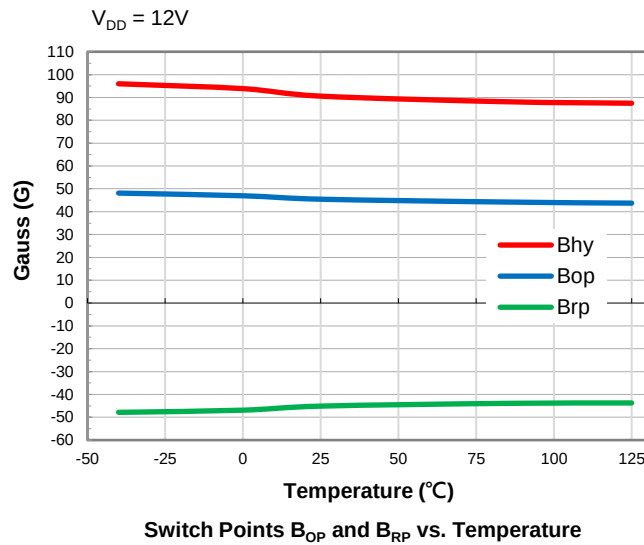
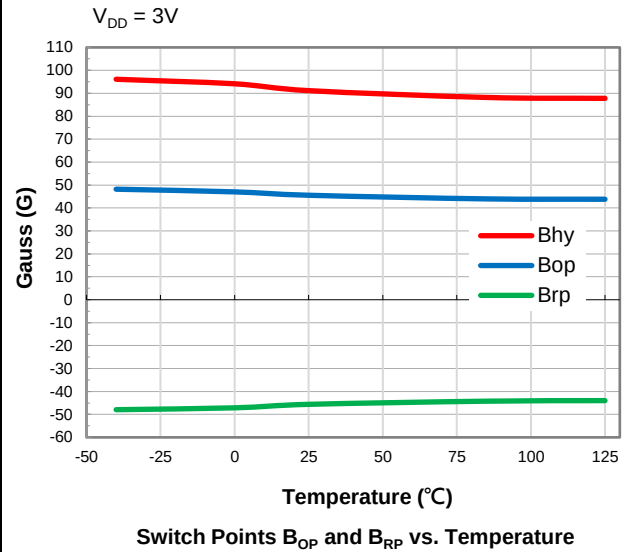
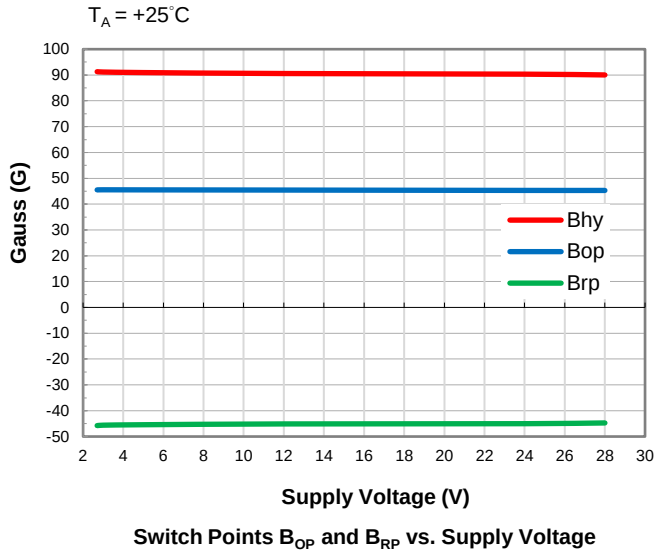
Typical Operating Characteristics (continued)

AH3722A Output Points (Magnetic Thresholds) – B_{OP} and B_{RP}

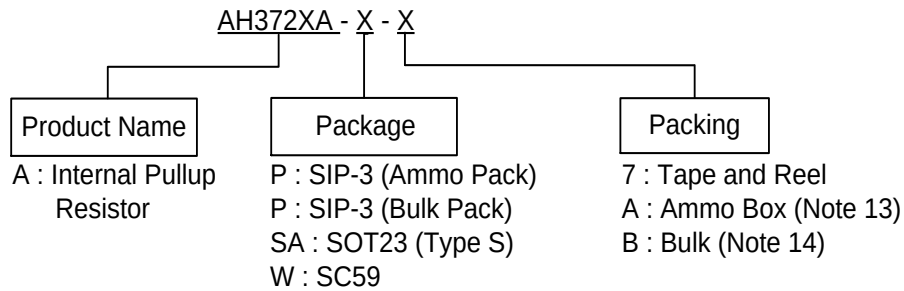


Typical Operating Characteristics (continued)

AH3724A Output Points (Magnetic Thresholds) – B_{OP} and B_{RP}



Ordering Information

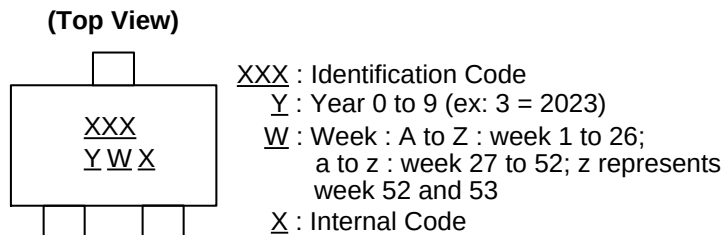


Part Number	Package Code	Package	Part Number Suffix	Packing	
				Qty.	Carrier
AH3722A-P-A	P	SIP-3 (Ammo Pack)	-A	4,000	Ammo Box
AH3722A-P-B	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3722A-SA-7	SA	SOT23 (Type S)	-7	3,000	7" Tape & Reel
AH3724A-P-B	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3724A-SA-7	SA	SOT23 (Type S)	-7	3,000	7" Tape & Reel
AH3724A-W-7	W	SC59	-7	3,000	7" Tape & Reel

Notes: 13. Ammo Box is for SIP-3 Spread Lead.
 14. Bulk is for SIP-3 Straight Lead.

Marking Information

(1) SOT23 (Type S)

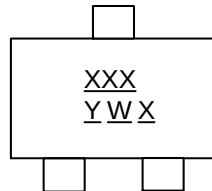


Part Number	Package	Identification Code
AH3722A-SA-7	SOT23 (Type S)	S4J
AH3724A-SA-7	SOT23 (Type S)	S4M

Marking Information (continued)

(2) SC59

(Top View)

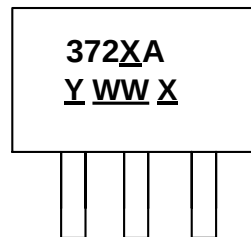


XXX : Identification Code
Y : Year 0 to 9 (ex: 3 = 2023)
W : Week : A to Z : week 1 to 26;
a to z : week 27 to 52; z represents
week 52 and 53
X : Internal Code

Part Number	Package	Identification Code
AH3724A-W-7	SC59	S5F

(3) SIP-3 (Ammo Pack)/SIP-3 (Bulk Pack)

(Top View)



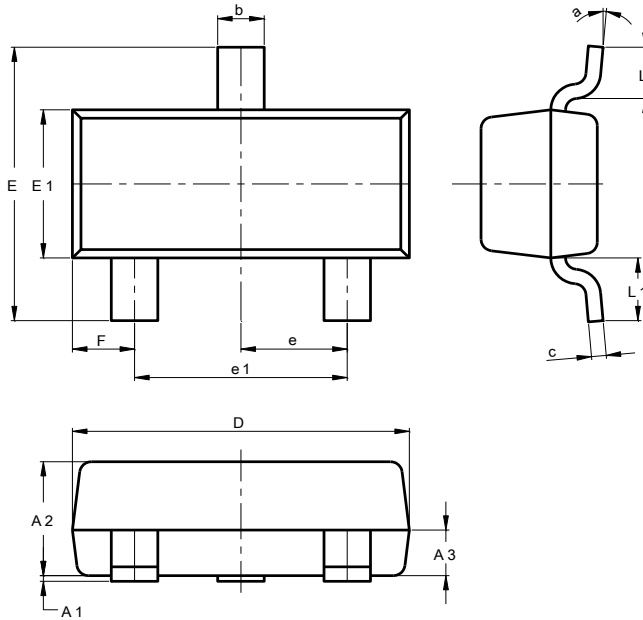
372XA : Identification Code
Y : Year : 0 to 9 (ex: 3 = 2023)
WW : Week : 01 to 52, "52" represents
week 52 and 53
X : Internal Code

Part Number	Package	Identification Code
AH3722A-P-A	SIP-3 (Ammo Pack)	3722A
AH3722A-P-B	SIP-3 (Bulk Pack)	3722A
AH3724A-P-B	SIP-3 (Bulk Pack)	3724A

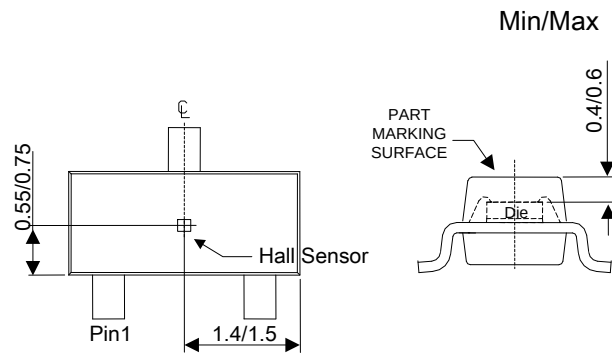
Package Outline Dimensions (All dimensions in mm.)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SOT23 (Type S)



SOT23 (Type S)			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	0.90	1.025	1.00
A3	0.375	0.425	0.40
b	0.37	0.51	0.40
c	0.10	0.18	0.125
D	2.80	3.00	2.90
E	2.30	2.50	2.40
E1	1.20	1.40	1.30
e	0.89	1.03	0.915
e1	1.78	2.05	1.83
F	0.45	0.60	0.535
L1	0.45	0.61	0.55
L	0.25	0.55	0.40
a	0°	8°	--
All Dimensions in mm			

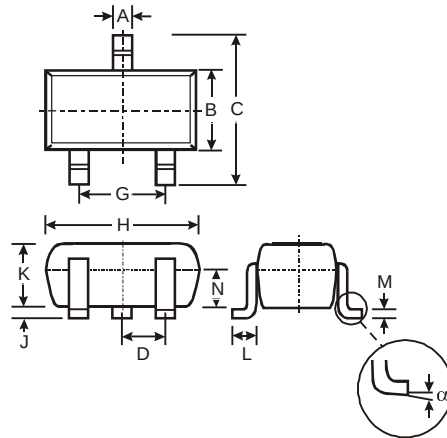


Sensor Location

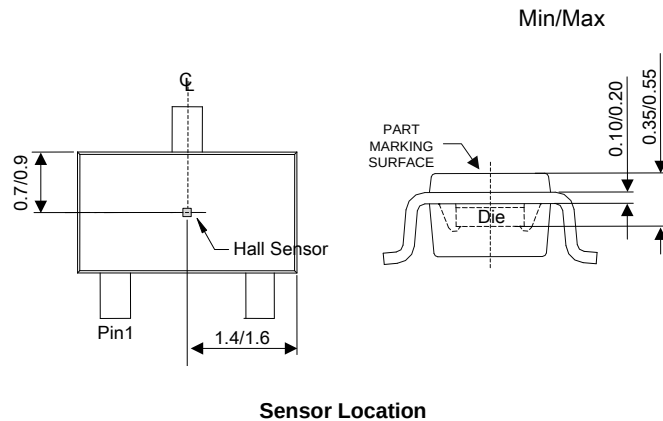
Package Outline Dimensions (All dimensions in mm.) (continued)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(2) Package Type: SC59



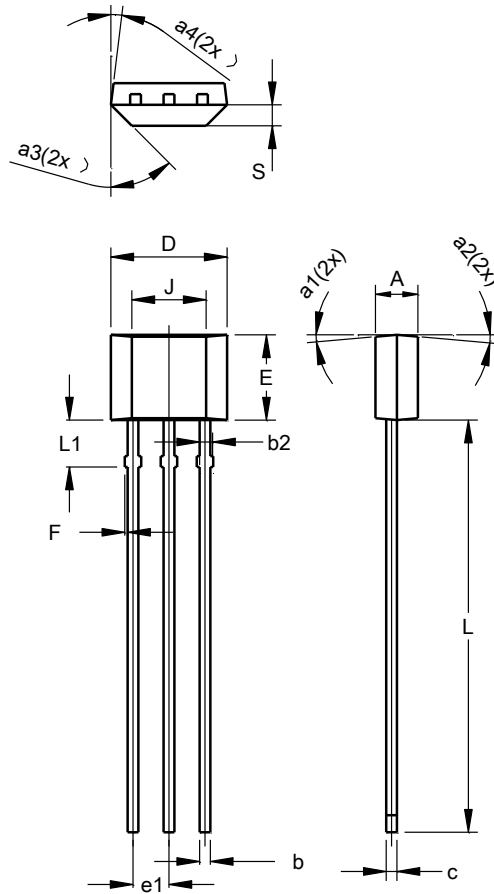
SC59			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			



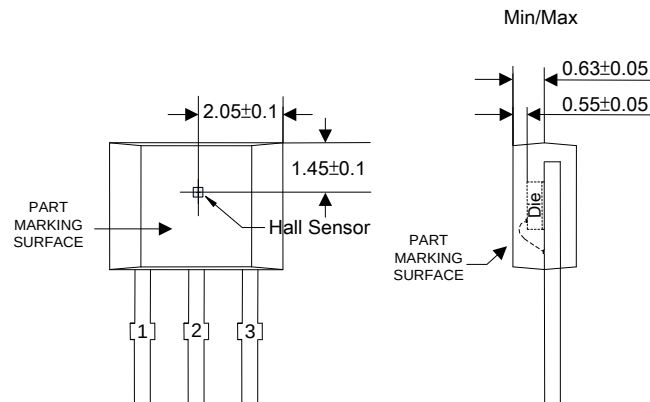
Package Outline Dimensions (All dimensions in mm.) (continued)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(3) Package Type: SIP-3 (Bulk Pack)



SIP-3 (Bulk Pack)			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
b	0.33	0.43	0.38
b2	0.40	0.508	0.46
c	0.35	0.41	0.38
D	3.90	4.30	4.10
E	2.80	3.20	3.00
e1	1.24	1.30	1.27
F	0.00	0.20	--
J	2.62 REF		
L	14.00	15.00	14.50
L1	1.55	1.75	1.65
S	0.63	0.84	0.74
a1	--	--	5°
a2	--	--	5°
a3	--	--	45°
a4	--	--	3°
All Dimensions in mm			

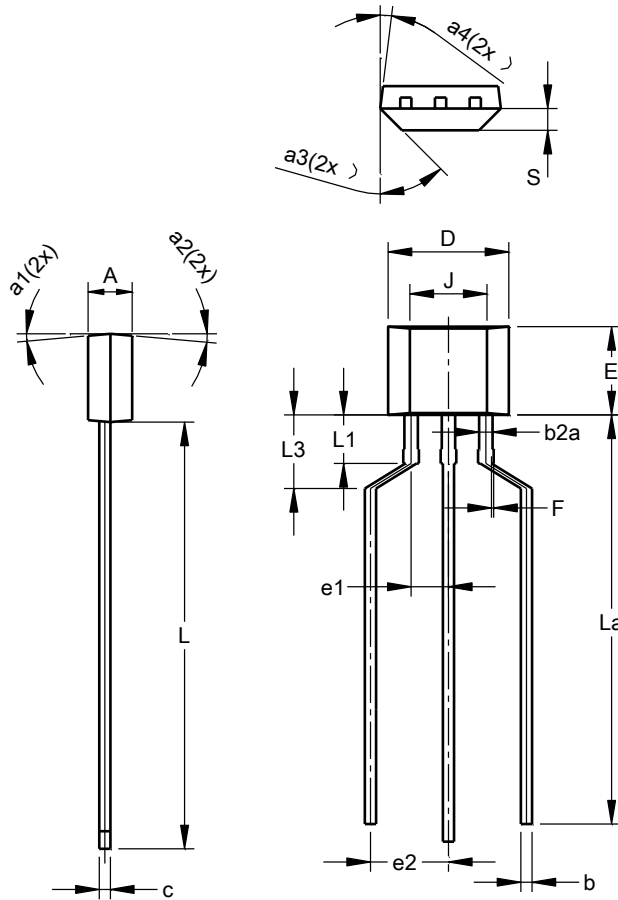


Sensor Location

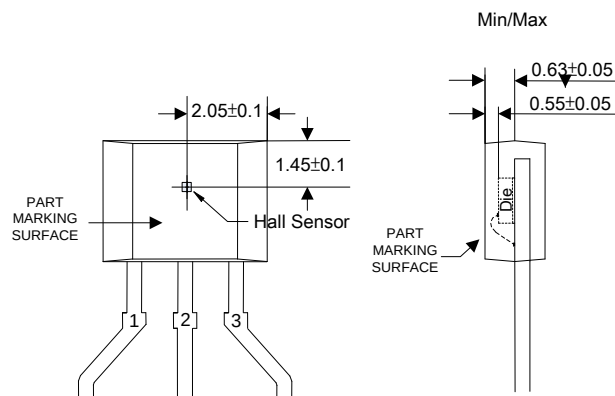
Package Outline Dimensions (All dimensions in mm.) (continued)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(4) Package Type: SIP-3 (Ammo Pack)



SIP-3 (Ammo Pack)			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
b	0.33	0.43	0.38
b2a	0.40	0.52	0.46
c	0.35	0.41	0.38
D	3.90	4.30	4.10
E	2.80	3.20	3.00
e1	1.24	1.30	1.27
e2	2.40	2.90	2.65
F	0.00	0.20	--
J	2.62 REF		
L	14.00	15.00	14.50
La	12.90	14.90	13.90
L1	1.55	1.75	1.65
L3	2.00	3.00	2.50
S	0.63	0.84	0.74
a1	--	--	5°
a2	--	--	5°
a3	--	--	45°
a4	--	--	3°
All Dimensions in mm			

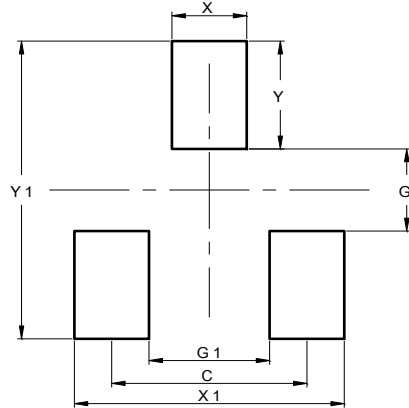


Sensor Location

Suggested Pad Layout

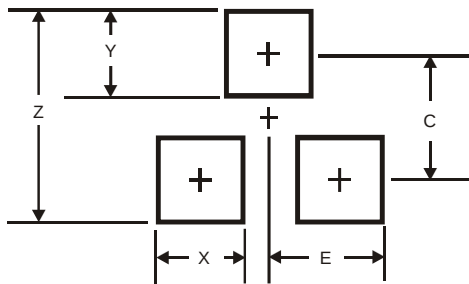
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SOT23 (Type S)



Dimensions	Value (in mm)
C	1.830
G	0.800
G1	1.130
X	0.700
X1	2.530
Y	1.050
Y1	2.900

(2) Package Type: SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

Mechanical Data

- Moisture Sensitivity: SOT23 (Type S)/SC59 – Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight: SIP-3 (Ammo Pack)/SIP-3 (Bulk Pack) – 0.077 grams (Approximate)
 SOT23 (Type S) – 0.009 grams (Approximate)
 SC59 – 0.015 grams (Approximate)

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