

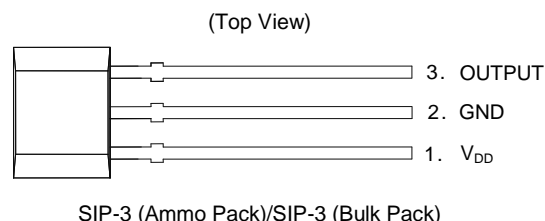
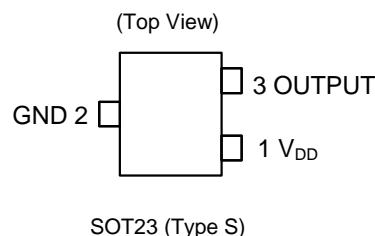
HIGH-VOLTAGE HIGH-SENSITIVITY HALL-EFFECT OMNIPOLAR SWITCH WITH INTERNAL PULLUP RESISTOR

Description

The AH3524A is a high-voltage high-sensitivity Hall-effect Omnipolar switch IC designed for proximity, position and level sensing in industrial and consumer home appliances and personal care applications. To support the wide range of the demanding applications, the design has been 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 AH3524A provides a reliable solution over the whole operating range. For robustness and protection, the device has a reverse blocking diode with 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 either South or North pole of sufficient strength. When the magnetic flux density (B) perpendicular to the package is larger than the operate point (B_{OP}) the output is switched on (pulled low) and is held on until magnetic flux density B is lower than the release point (B_{RP}).

Pin Assignments



Features

- Omnipolar Operation
- High Sensitivity: B_{OP} and B_{RP} of ±40G and ±25G Typical
- Internally Pullup Resistor on the Output with Overcurrent Limit
- 3.0V to 28V Operating Voltage Range
- Resistant to Physical Stress
- Chopper Stabilized Design Provides
 - Superior Temperature Stability
 - Minimal Switch Point Drift
 - Enhanced Immunity to Stress
- Good RF Noise Immunity
- Zener Clamp on Supply and Output Pins
- -40°C to +125°C Operating Temperature
- High ESD HBM: 8kV
- Industry Standard 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](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.**
<https://www.diodes.com/quality/product-definitions/>

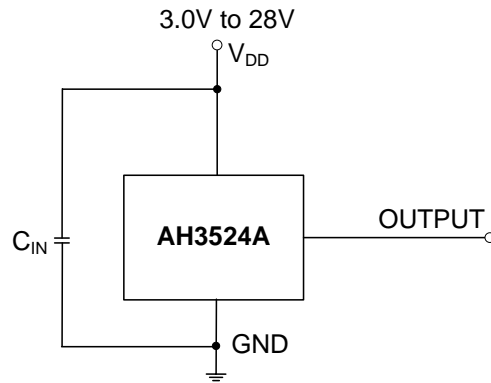
Notes:

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.

Applications

- Position and proximity sensing in industrial applications
- Open and close detection
- Position detection
- Level detection
- Flow meters
- Contactless switches

Typical Applications Circuit



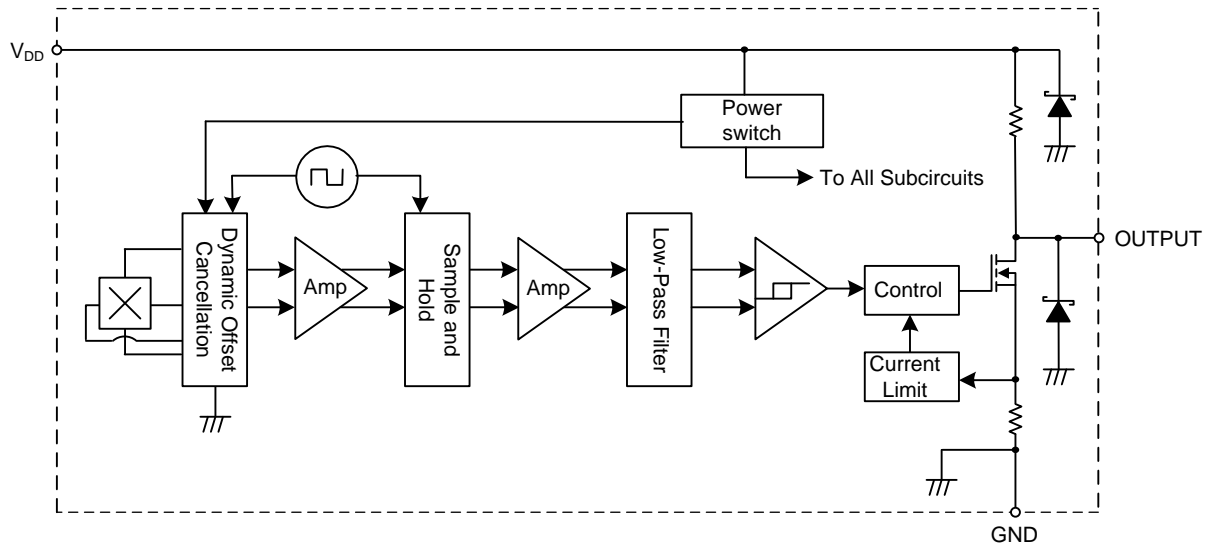
Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity. The recommended capacitance is 10nF to 100nF. R_L is the pullup resistor.

Pin Descriptions

Packages: 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 5 & 6) (@T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic	Value	Unit	
V _{DD}	Supply Voltage (Note 6)	32	V	
V _{OUT_MAX}	Output Pin Off Voltage (Note 6)	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)		550
		SOT23 (Type S)		230
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 7 & 8) (@T_A = -40°C to +125°C, V_{DD} = 3V to 28V, unless otherwise specified.)

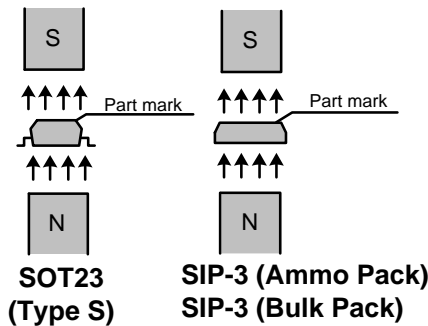
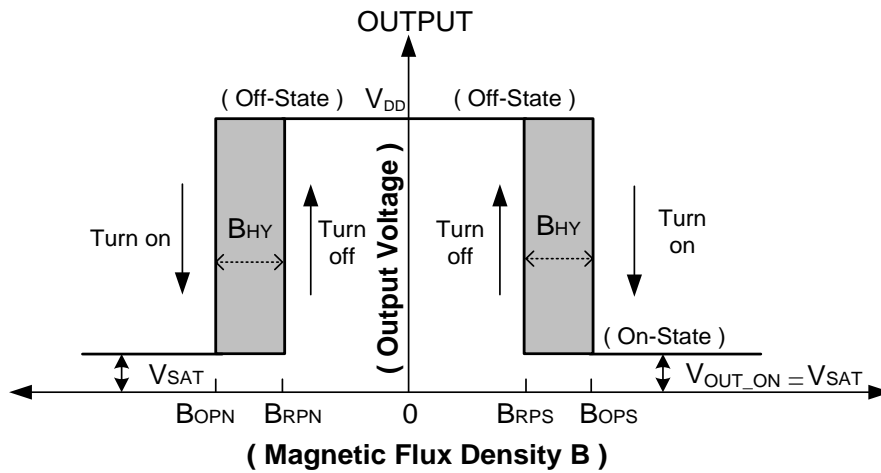
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{OUT_ON}	Output On Voltage	I _{OUT} = 20mA, B > B _{OP}	—	0.2	0.4	V
I _{OUT_OFF}	Output Leakage Current (When Output Is Off)	V _{OUT} = 28V, B < B _{RP} , output off	—	< 0.1	10	μA
I _{DD}	Supply Current	Output open, T _A = +25°C	—	3	4	mA
		Output open, 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} (Note 7)	—	10	—	μs
f _c	Chopping Frequency	V _{DD} ≥ 3V	—	500	—	kHz
t _d	Response Time Delay (Time from Magnetic Threshold Reached to the Start of the Output Rise or Fall)	(Note 9)	—	4	—	μs
t _R	Output Rising Time (External Pullup Resistor R _L and Load Capacitance Dependent)	R _L = 1kΩ, C _L = 20pF (Note 9)	—	0.2	1	μs
t _F	Output Falling Time (Internal Switch Resistance and Load Capacitance Dependent)	R _L = 1kΩ, C _L = 20pF (Note 9)	—	0.1	1	μs
I _{OCL}	Output Current Limit	B > B _{OP} (Note 10)	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 11 & 12) ($T_A = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{DD} = 3.0\text{V}$ to 28V , unless otherwise specified)

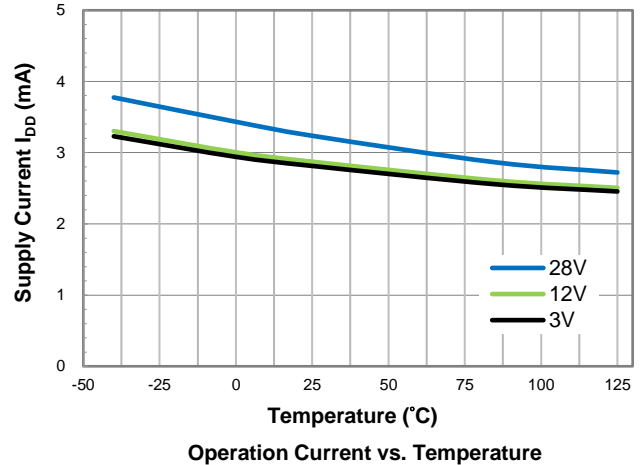
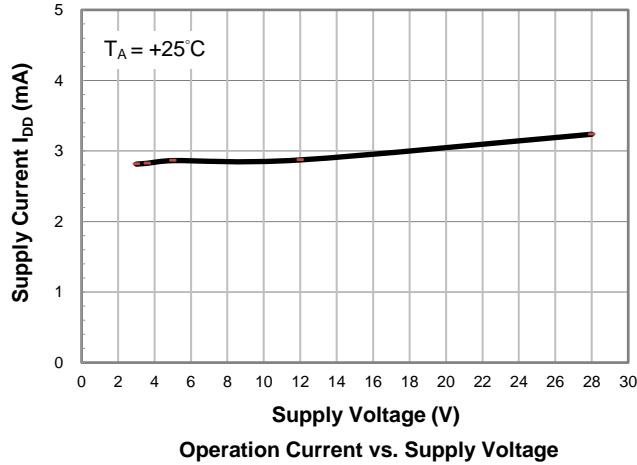
Part Number	Symbol	Parameter	Min	Typ	Max	Unit
AH3524A	B_{OPS} (South Pole to the Part Marking Side)	Operation Point	20	40	60	Gauss
	B_{OPN} (North Pole to the Part Marking Side)		-60	-40	-20	
	B_{RPS} (South Pole to the Part Marking Side)	Release Point	10	25	45	
	B_{RPN} (North Pole to the Part Marking Side)		-45	-25	-10	
	$B_{HY} (B_{OPX} - B_{RPX})$	Hysteresis (Note 13)	9	15	23	

- 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 μs 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.

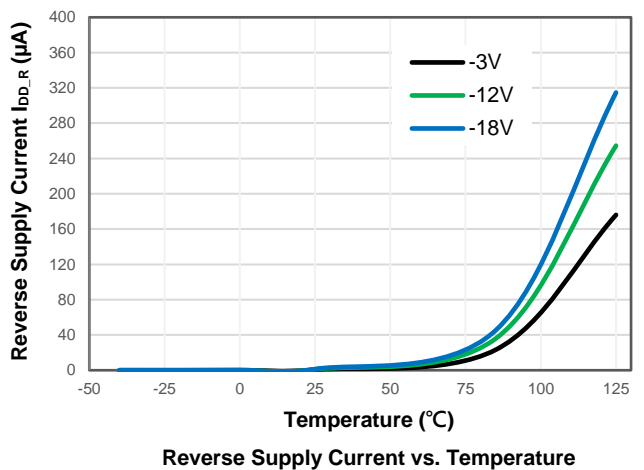
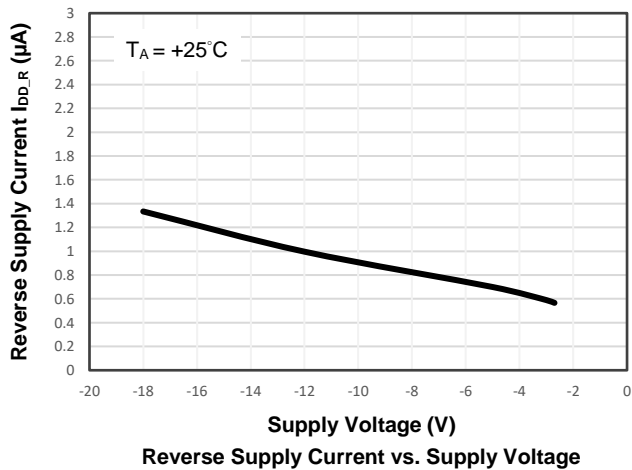


Typical Operating Characteristics

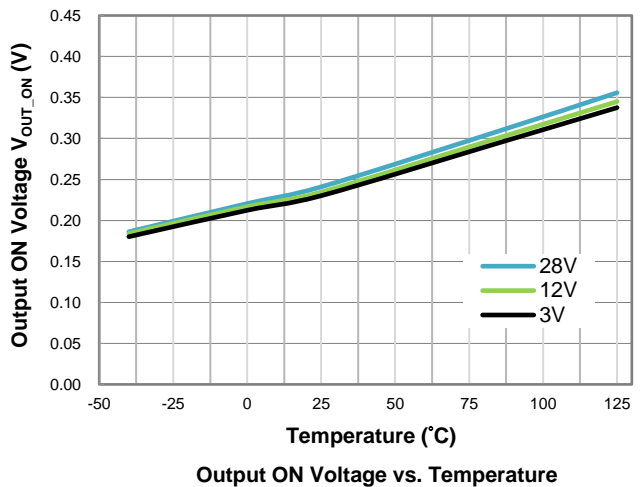
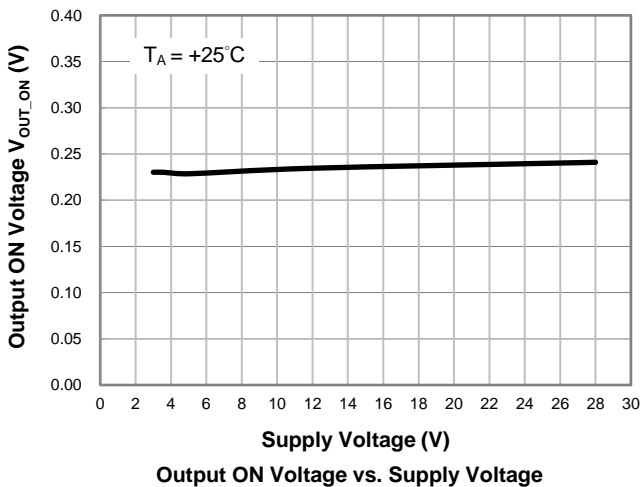
Supply Current



Reverse Supply Current

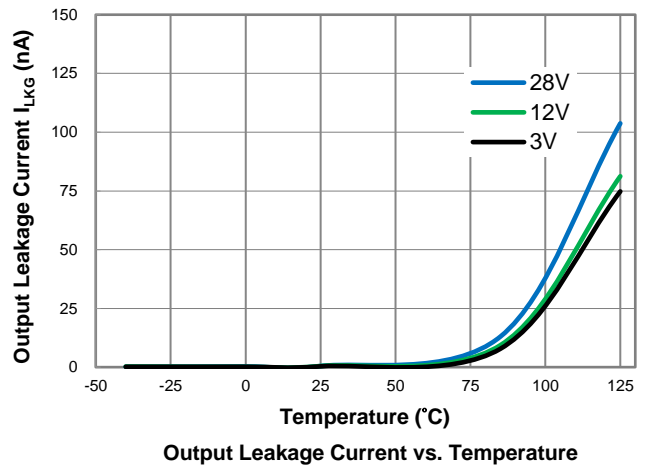
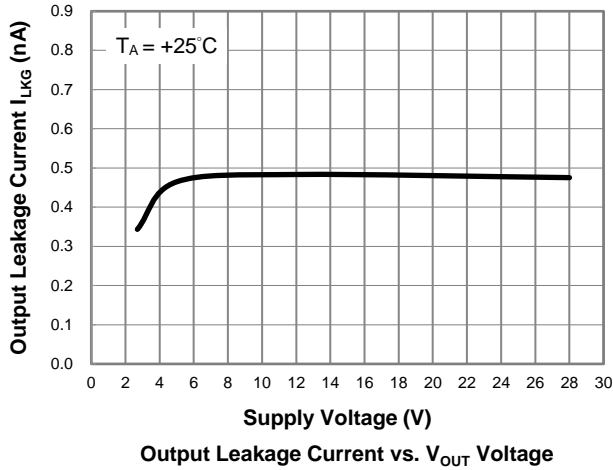


Output Switch On Voltage, $I_{OUT} = 20mA$

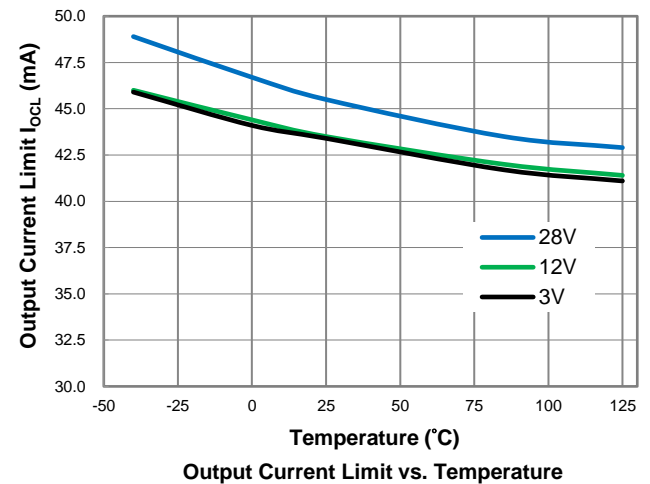
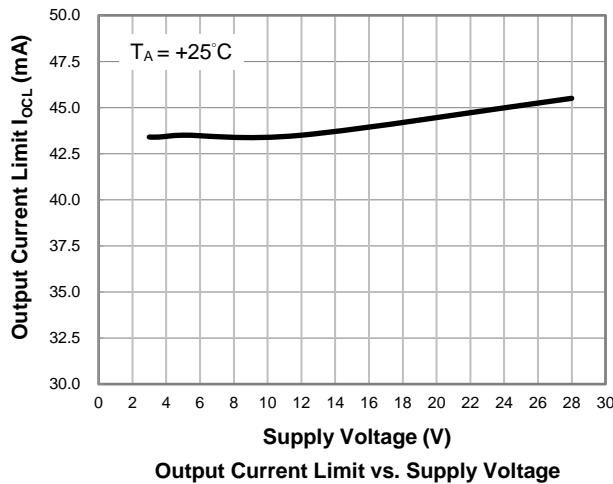


Typical Operating Characteristics (continued)

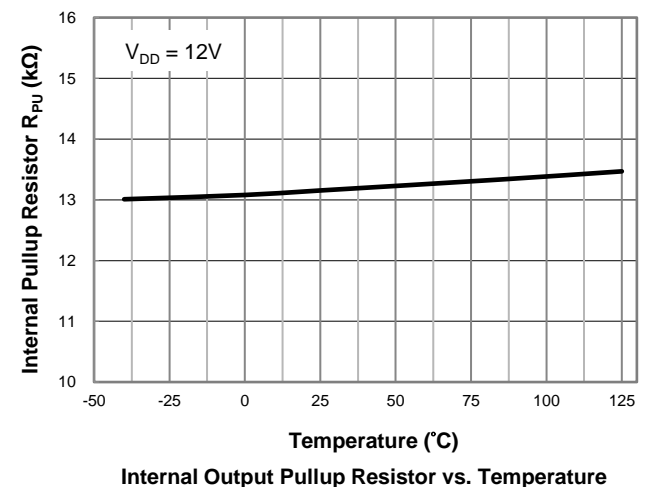
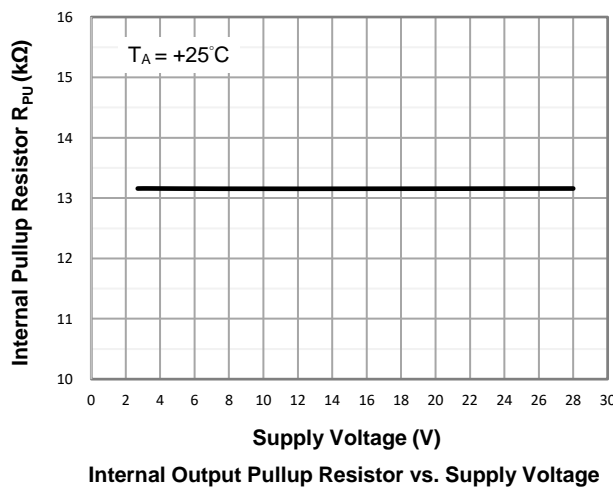
Output Leakage Current



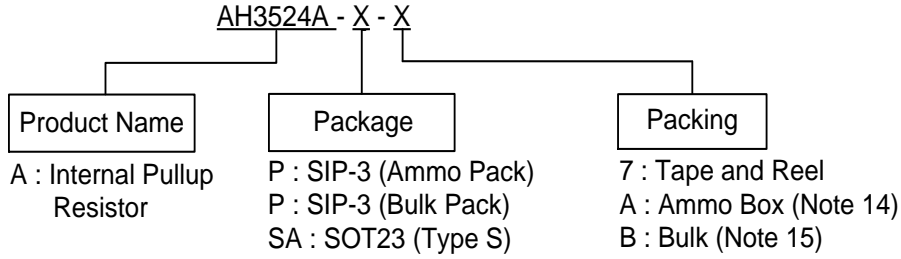
Output Current Limit



Output Pullup Resistor (Internal)



Ordering Information

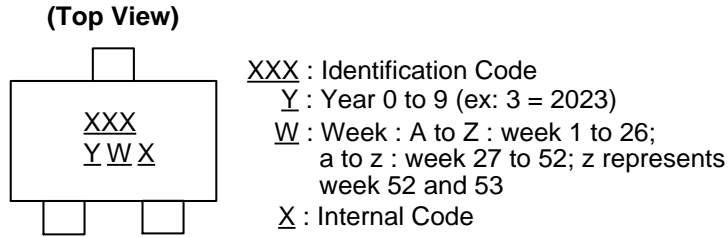


Part Number	Package Code	Package	Part Number Suffix	Packing	
				Qty.	Carrier
AH3524A-P-A	P	SIP-3 (Ammo Pack)	-A	4,000	Ammo Box
AH3524A-P-B	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3524A-SA-7	SA	SOT23 (Type S)	-7	3,000	7" Tape & Reel

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

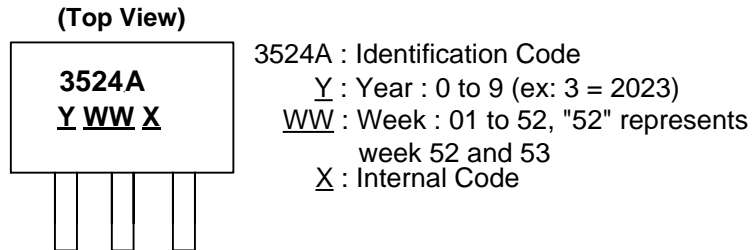
Marking Information

(1) Package Type: SOT23 (Type S)



Part Number	Package	Identification Code
AH3524A-SA-7	SOT23 (Type S)	S6D

(2) Package Types: SIP-3 (Ammo Pack)/SIP-3 (Bulk Pack)

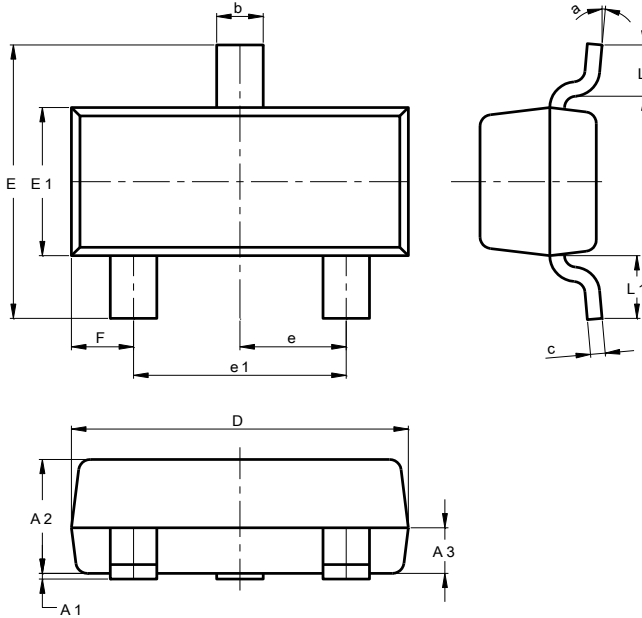


Part Number	Package	Identification Code
AH3524A-P-A	SIP-3 (Ammo Pack)	3524A
AH3524A-P-B	SIP-3 (Bulk Pack)	3524A

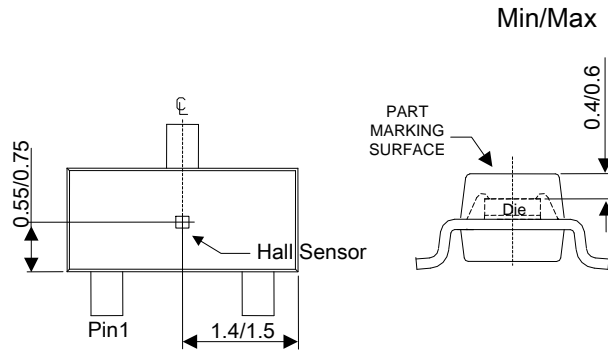
Package Outline Dimensions (All dimensions in mm.)

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			

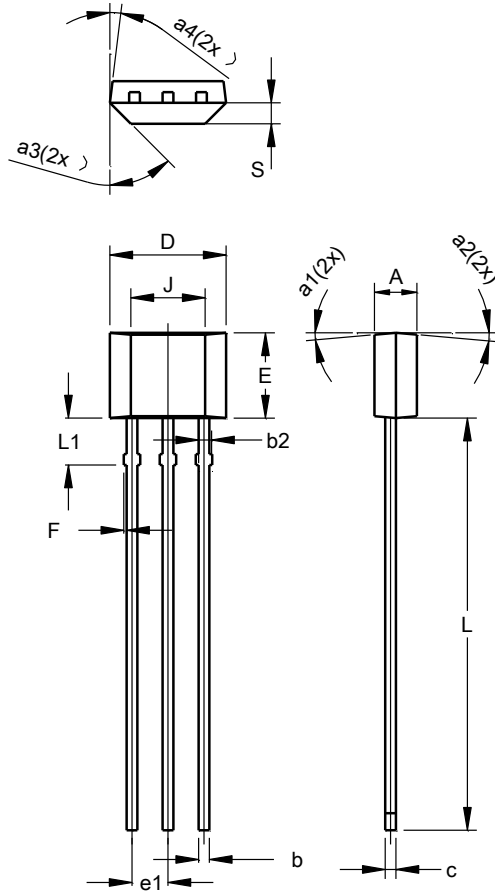


Sensor Location

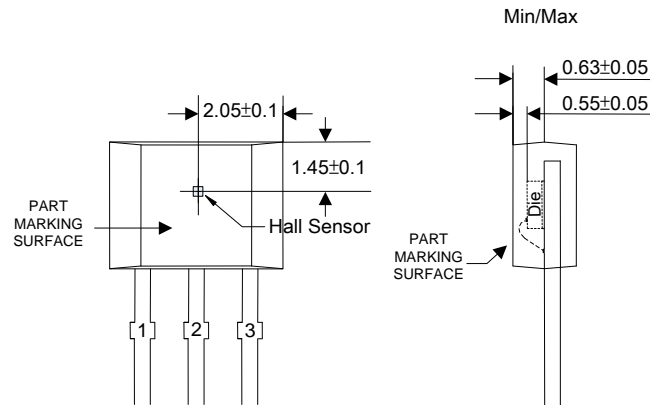
Package Outline Dimensions (All dimensions in mm.) (continued)

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

(2) Package Type: 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			

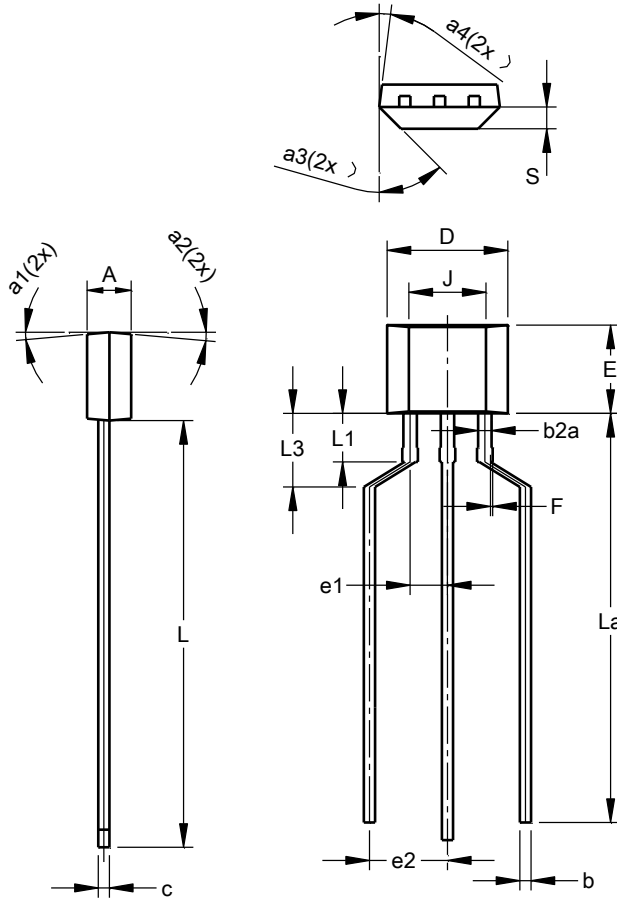


Sensor Location

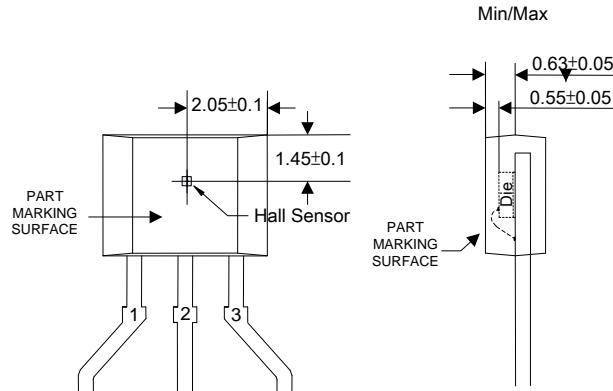
Package Outline Dimensions (All dimensions in mm.) (continued)

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

(3) 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			

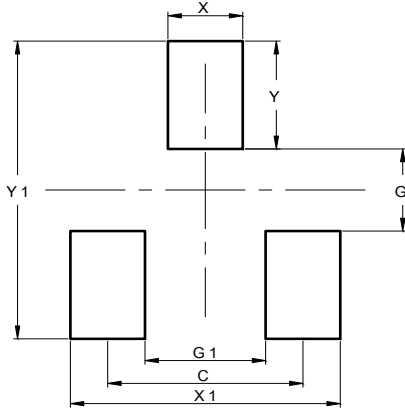


Sensor Location

Suggested Pad Layout

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

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

Mechanical Data

- Moisture Sensitivity: SOT23 (Type S) – 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)

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