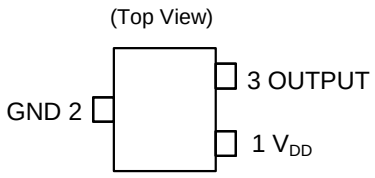
HIGH-VOLTAGE HIGH-SENSITIVITY AUTOMOTIVE HALL-EFFECT OMNIPOLAR SWITCH

Description

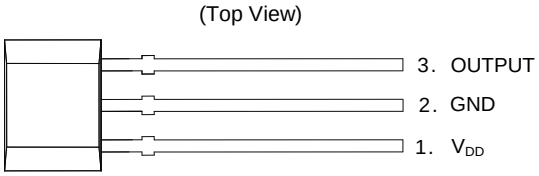
The AH352XQ is an AEC-Q100-qualified high-voltage, high-sensitivity Hall-effect omnipolar switch IC designed for position and proximity sensing in automotive applications, such as in seat and seatbelt buckle, steering lock/immobilization, gear stick, transmission actuator and gear position, HVAC compression, wiper, door/trunk closure, and so on. 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 AH352XQ 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 single open-drain output can be switched on with 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 stays on until the magnetic flux density B is lower than the release point (B_{RP}).

Pin Assignments



SOT23 (Type S)



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

Features

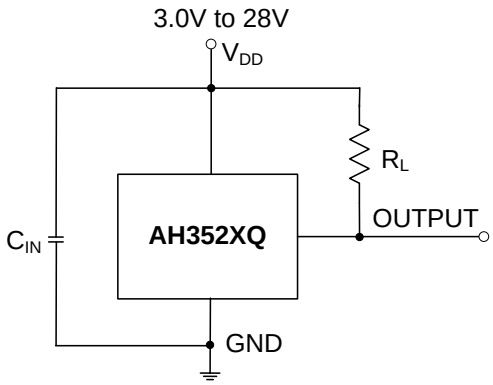
- Omnipolar Operation
- High Sensitivity: B_{OP} and B_{RP} of ±20G to ±40G and ±10G to ±25G Typical
- Single Open-Drain Output with Overcurrent Limit
- Resistant to Physical Stress
- 3.0V to 28V Operating Voltage Range
- 40V Load Dump Protection
- Chopper-Stabilized Design Provides
  - Superior Temperature Stability
  - Minimal Switch Point Drift
  - Enhanced Immunity to Stress
- Good RF Noise Immunity
- Reverse Blocking Diode
- Zener Clamp on Supply and Output Pins
- -40°C to +150°C Operating Temperature
- High ESD HBM: 8kV, CDM: 1kV
- AEC-Q100 Grade 0 Qualified
- 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)**
- **TheAH352XQ is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Applications

- Position and proximity sensing in automotive applications
- Open and close detection
- Position detection
- Level detection
- Flow meters
- Contactless switches
- Seatbelt buckles
- Seat positions

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.

Typical Applications Circuit



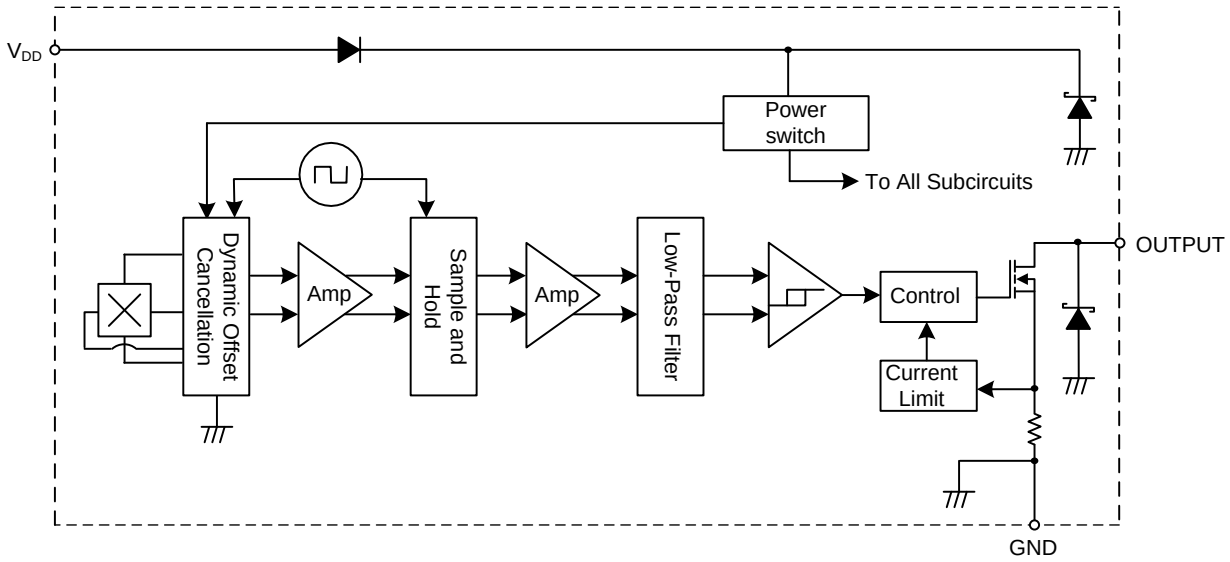
Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity. The recommended capacitance is 10nF to 100nF. R_L is the pullup resistor.

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)		40	V
V_{DDR}	Reverse Supply Voltage		-18	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) SIP-3 (Bulk Pack)	550	mW
		SOT23 (Type S)	230	
T_S	Storage Temperature Range		-65 to +165	°C
T_J	Maximum Junction Temperature		+170	°C
ESD HBM	Electrostatic Discharge Withstand Capability—Human Body Model		8	kV
ESD CDM	Electrostatic Discharge Withstand Capability—Charged Device Model		1	kV

Notes:
5. 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.
6. The absolute maximum V_{DD} of 40V 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 over 100ms.

Recommended Operating Conditions (@T_A = -40°C to +150°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 +150	°C

Electrical Characteristics (Notes 7 & 8) (@T_A = -40°C to +150°C, V_{DD} = 3V to 28V, unless otherwise specified.)

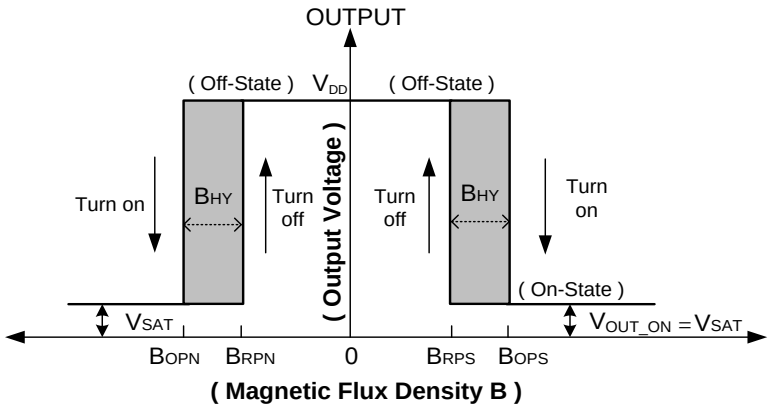
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT_ON}	Output On Voltage	I_{OUT} = 20mA, B > B_{OP}	—	0.2	0.4	V
I_{OUT_OFF}	Output Leakage Current (When Output Is Off)	V_{OUT} = 28V, B < B_{RP}, output off	—	< 0.1	10	μA
I_{DD}	Supply Current	Output open, T_A = +25°C	—	3	4	mA
		Output open, T_A = -40°C to +150°C	—	—	5	mA
I_{DD_R}	Reverse Supply Current	V_{DD} = -18V, T_A = +25°C	—	0.001	—	mA
		V_{DD} = -18V, T_A = -40°C to +150°C		0.001	2.3	mA
t_{P_ON}	Device Power-On Time (Startup Time)	V_{DD} ≥ 3V, B > B_{OP} (Note 7)	—	10	—	μs
f_C	Chopping Frequency	V_{DD} ≥ 3V (Note 9)	—	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

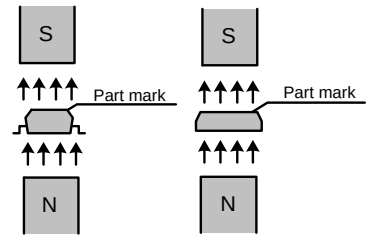
Notes:
7. When power is initially turned on, V_{DD} must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the startup time of 10μs typical from the operating voltage reaching 3V.
8. Typical values are defined at T_A = +25°C, V_{DD}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

Magnetic Characteristics (Notes 11 &12) (T_A = -40°C to +150°C, V_{DD} = 3.0V to 28V, unless otherwise specified)

Part Number	Symbol	Parameter	Min	Typ	Max	Unit	Output Type
AH3522Q	B_{OPS} (South Pole to the Part Marking Side)	Operation Point	8	20	30	Gauss	Open-Drain
	B_{OPN} (North Pole to the Part Marking Side)		-30	-20	-8		
	B_{RPS} (South Pole to the Part Marking Side)	Release Point	2	10	25		
	B_{RPN} (North Pole to the Part Marking Side)		-25	-10	-2		
	B_{HY} ($\|B_{OPX}\|$ - $\|B_{RPX}\|$)	Hysteresis (Note 13)	2	10	19		
AH3523Q	B_{OPS} (South Pole to the Part Marking Side)	Operation Point	15	30	45	Gauss	Open-Drain
	B_{OPN} (North Pole to the Part Marking Side)		-45	-30	-15		
	B_{RPS} (South Pole to the Part Marking Side)	Release Point	5	20	35		
	B_{RPN} (North Pole to the Part Marking Side)		-35	-20	-5		
	B_{HY} ($\|B_{OPX}\|$ - $\|B_{RPX}\|$)	Hysteresis (Note 13)	5	10	18		
AH3524Q	B_{OPS} (South Pole to the Part Marking Side)	Operation Point	20	40	60	Gauss	Open-Drain
	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	22		

Notes:
11. 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.
12. 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.
13. Maximum and minimum hysteresis is guaranteed by design, process control, and characterization.

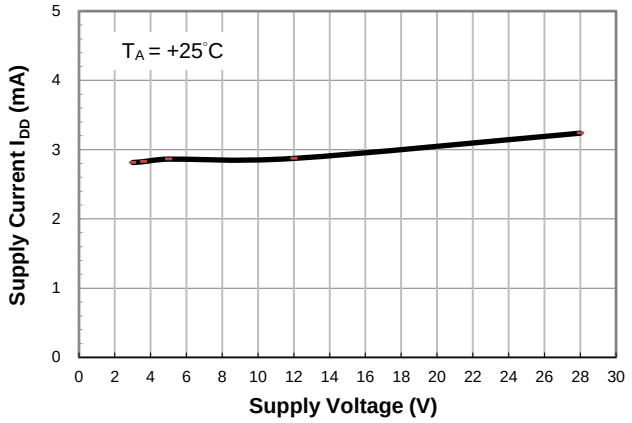




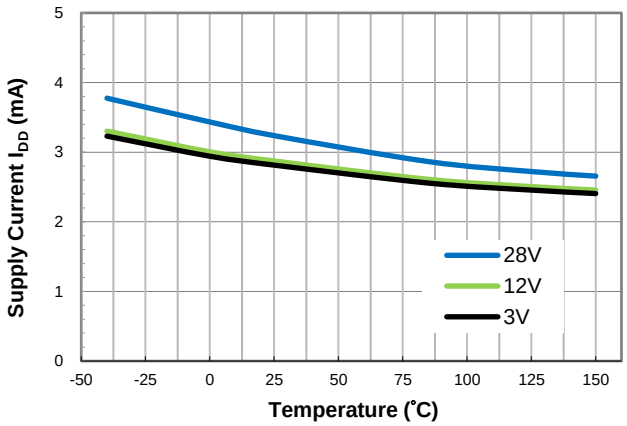
SOT23 (Type S) **SIP-3 (Ammo Pack) SIP-3 (Bulk Pack)**

Typical Operating Characteristics

Supply Current

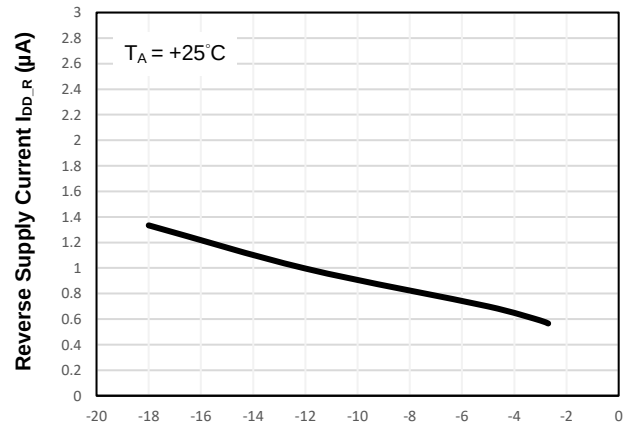


Operation current vs. Supply Voltage

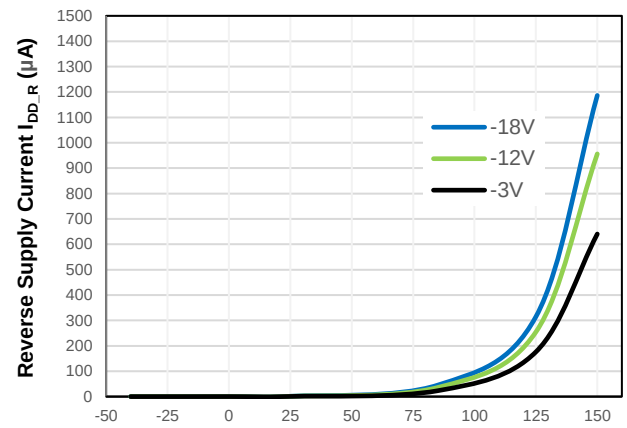


Operation Current vs. Temperature

Reverse Supply Current

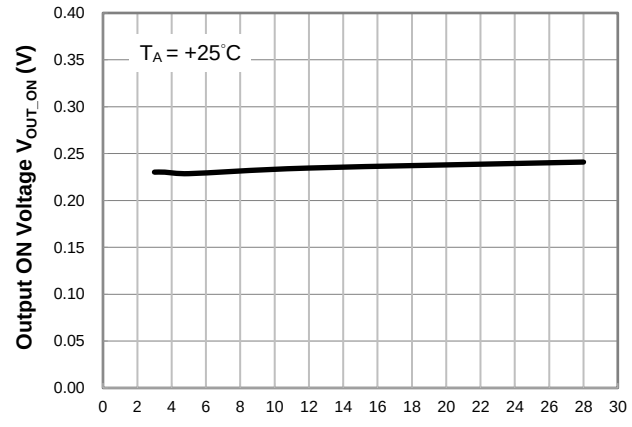


Reverse Supply Current vs. Supply Voltage

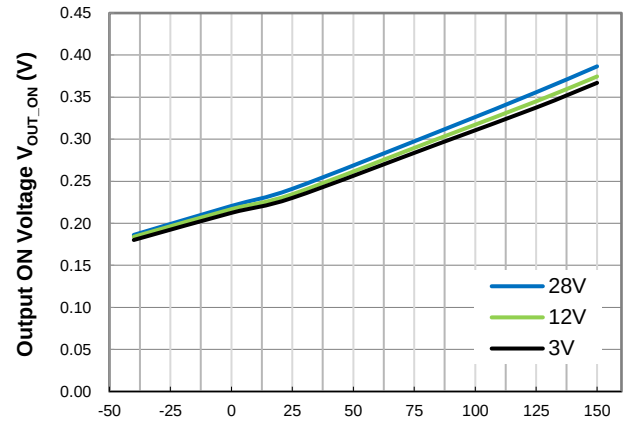


Reverse Supply Current vs. Temperature

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



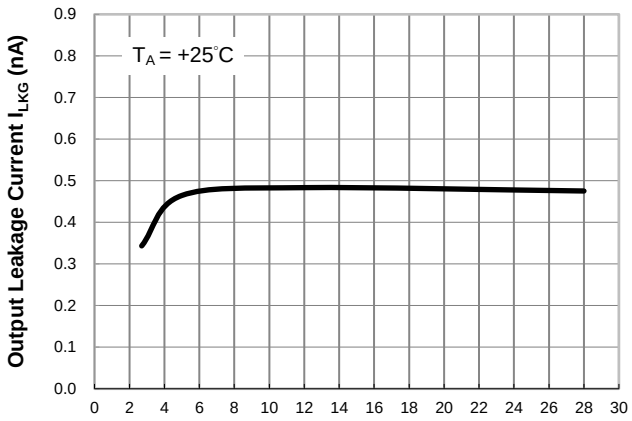
Output ON Voltage vs. Supply Voltage



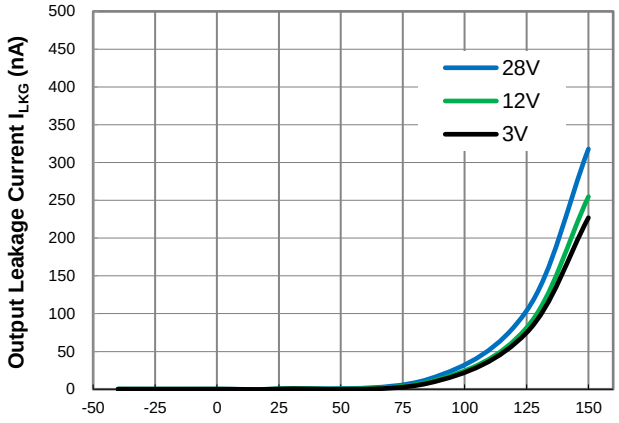
Output ON Voltage vs. Temperature

Typical Operating Characteristics (continued)

Output Leakage Current

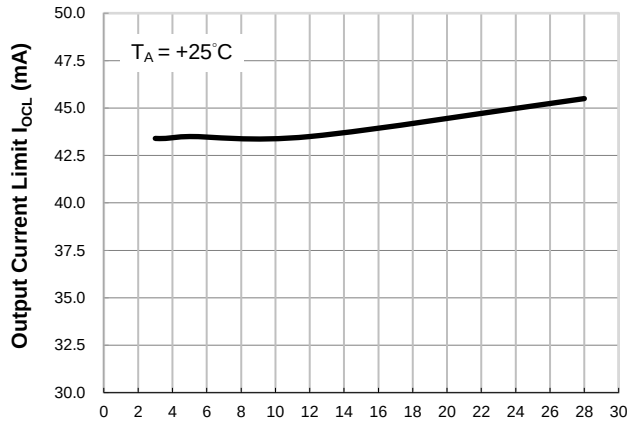


Output Leakage Current vs. V_{OUT} Voltage

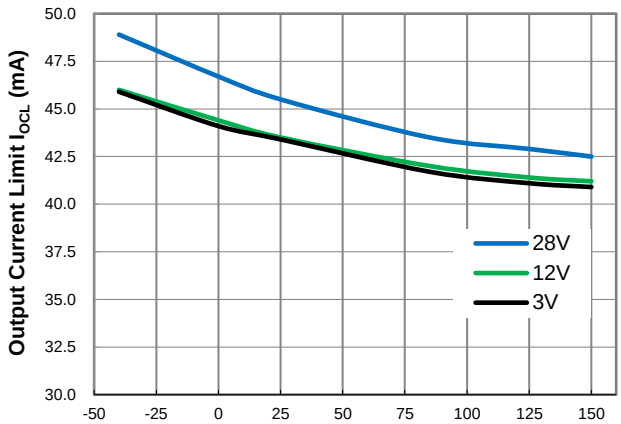


Output Leakage Current vs. Temperature

Output Current Limit

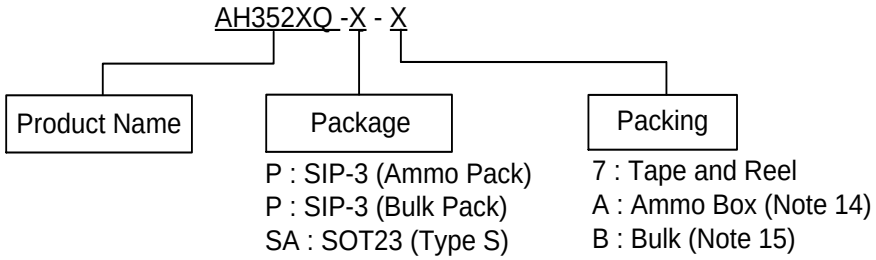


Output Current Limit vs. Supply Voltage



Output Current Limit vs. Temperature

Ordering Information



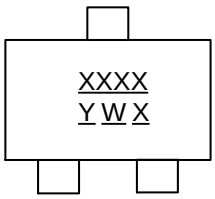
Part Number	Package Code	Package	Part Number Suffix	Packing	
				Qty.	Carrier
AH3522Q-P-A (Future Product)	P	SIP-3 (Ammo Pack)	-A	4,000	Ammo Box
AH3522Q-P-B (Future Product)	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3522Q-SA-7 (Future Product)	SA	SOT23 (Type S)	-7	3,000	7” Tape & Reel
AH3523Q-P-B	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3523Q-SA-7	SA	SOT23 (Type S)	-7	3,000	7” Tape & Reel
AH3524Q-P-A	P	SIP-3 (Ammo Pack)	-A	4,000	Ammo Box
AH3524Q-P-B	P	SIP-3 (Bulk Pack)	-B	1,000	Bulk
AH3524Q-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)

(Top View)



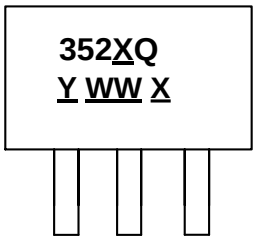
XXXX : Identification Code
Y : Year 0 to 9 (ex: 3 = 2023)
W : Week : A to Z : week 1 to 26;
a to z : week 27 to 52; z represents
week 52 and 53
X : Internal Code

Part Number	Package	Identification Code
AH3522Q-SA-7	SOT23 (Type S)	S6AQ
AH3523Q-SA-7	SOT23 (Type S)	S6BQ
AH3524Q-SA-7	SOT23 (Type S)	S6CQ

Marking Information (continued)

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

(Top View)



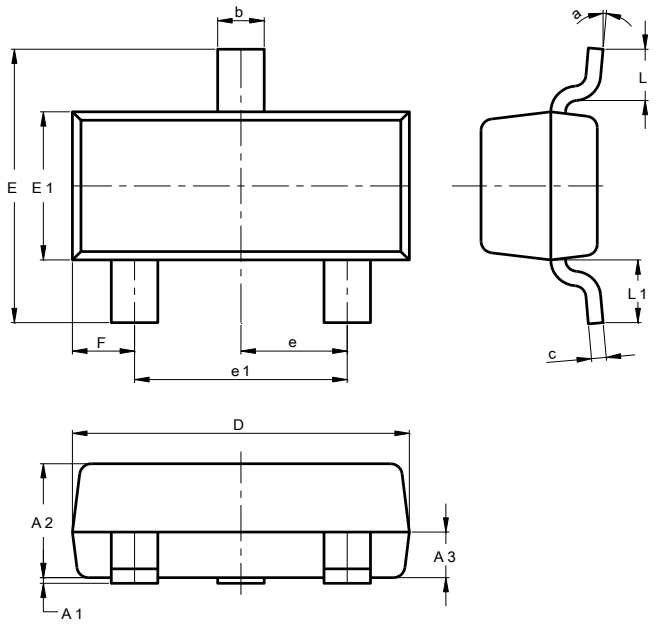
352XQ : Identification Code
Y : Year : 0 to 9 (ex: 3 = 2023)
WW : Week : 01 to 52, "52" represents week 52 and 53
X : Internal Code

Part Number	Package	Identification Code
AH3522Q-P-A	SIP-3 (Ammo Pack)	3522Q
AH3522Q-P-B	SIP-3 (Bulk Pack)	3522Q
AH3523Q-P-B	SIP-3 (Bulk Pack)	3523Q
AH3524Q-P-A	SIP-3 (Ammo Pack)	3524Q
AH3524Q-P-B	SIP-3 (Bulk Pack)	3524Q

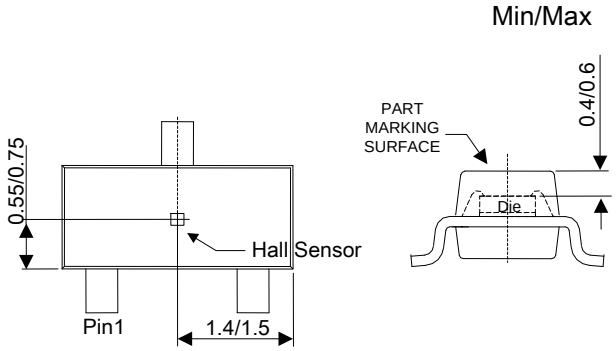
Package Outline Dimensions (All dimensions in mm.)

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			

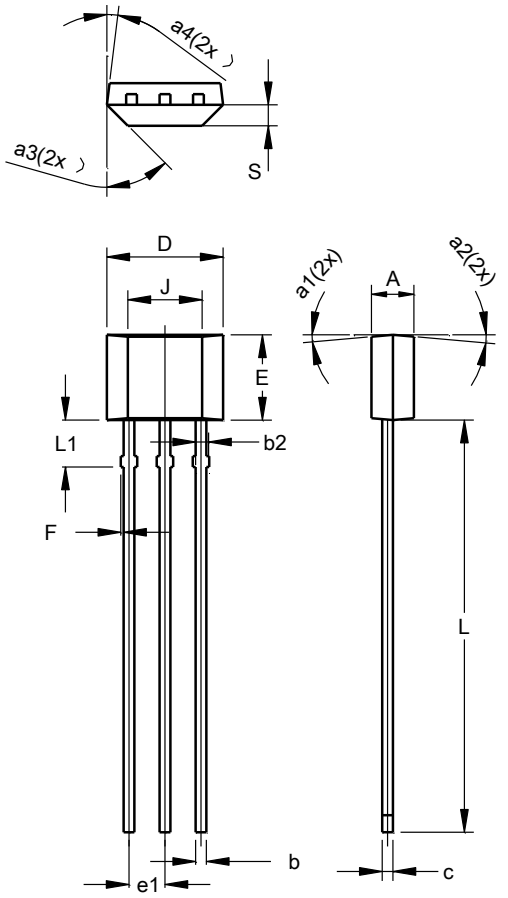


Sensor Location

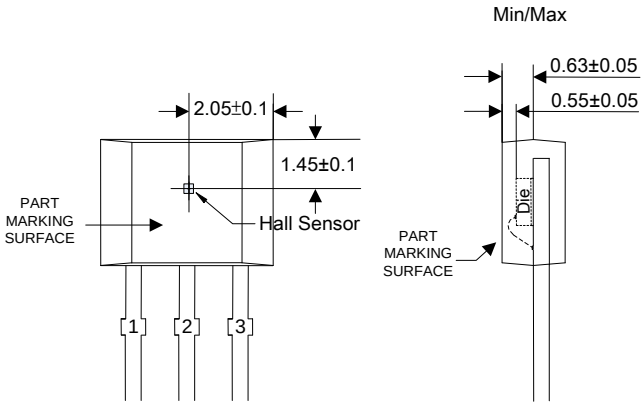
Package Outline Dimensions (All dimensions in mm.) (continued)

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			

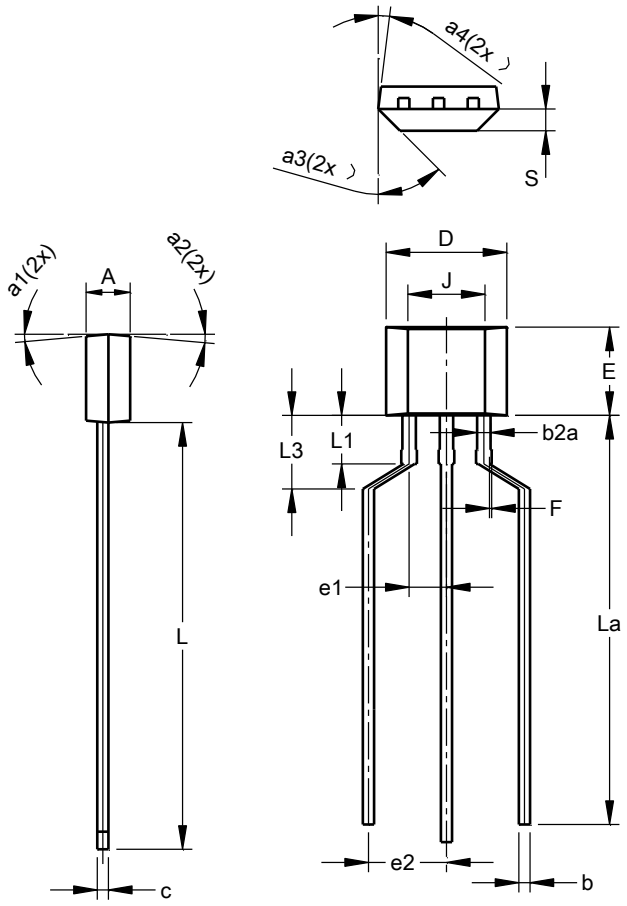


Sensor Location

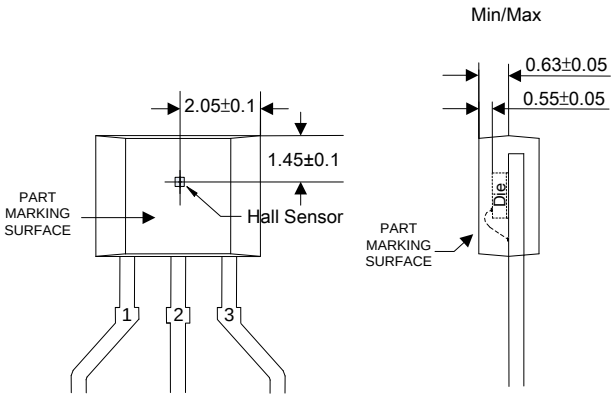
Package Outline Dimensions (All dimensions in mm.) (continued)

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			

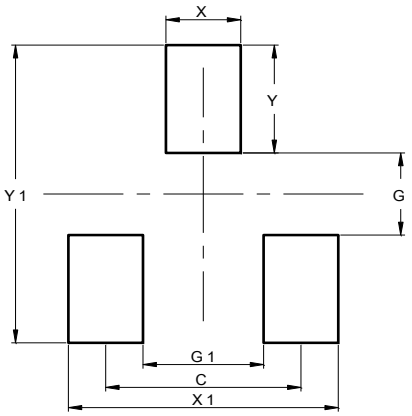


Sensor Location

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)

IMPORTANT NOTICE

1. DIODES INCORPORATED (Diodes) AND ITS SUBSIDIARIES MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes' products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes' products. Diodes' products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of Diodes' products for their intended applications, (c) ensuring their applications, which incorporate Diodes' products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.

3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes' websites, harmless against all damages and liabilities.

4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes' website) under this document.

5. Diodes' products are provided subject to Diodes' Standard Terms and Conditions of Sale (https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

6. Diodes' products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes' products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.

7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.

8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

9. This Notice may be periodically updated with the most recent version available at https://www.diodes.com/about/company/terms-and-conditions/important-notice

www.diodes.com

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Board Mount Hall Effect/Magnetic Sensors ***category:***

Click to view products by Diodes Incorporated ***manufacturer:***

Other Similar products are found below :

HGPRDT005A AH1894-FA-7 AH277AZ4-AG1 AV-10448 SS41C AH1894-Z-7 TLE4917 TLE4946-1L TLE4976L A1308KUA-1-T SS85CA BU52003GUL-E2 AH277AZ4-BG1 AH3376-P-B TLE4941 AH3382-P-B TLE4945-2L AH3360-FT4-7 TLE4941-1 AH374-P-A SS41-JL AH1913-W-7 AH3373-P-B MA732GQ-Z MA330GQ-Z S-57K1NBL2A-M3T2U S-57P1NBL9S-M3T4U S-576ZNL2B-L3T2U S-576ZNL2B-A6T8U S-57P1NBL0S-M3T4U S-57A1NSL1A-M3T2U S-57K1RBL1A-M3T2U S-57P1NBH9S-M3T4U S-57P1NBH0S-M3T4U S-57A1NSH1A-M3T2U S-57A1NSH2A-M3T2U S-57K1NBH1A-M3T2U S-57A1NNL1A-M3T2U S-57GNNL3S-A6T8U S-57TZ1L1S-A6T8U S-57GSNL3S-A6T8U S-5716ANDH0-I4T1U S-57GSNL5S-L3T2U S-57GDNL3S-L3T2U S-57GNNL3S-L3T2U S-57RBNL8S-L3T2U S-57RBNL9S-A6T8U S-57RB1L8S-L3T2U S-57GDNL5S-L3T2U S-57RBNL9S-L3T2U