



**THE DATASHEET OF  
AH3762Q-P-A**





## Description

The AH3762Q is an AEC-Q100 qualified high-voltage, high-sensitivity Hall-Effect latch IC designed for brushless DC-motor commutation speed measurement, angular or linear encoders and position sensors in automotive applications. To support a wide range of 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 AH3762Q 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 pole of sufficient strength and switched off with North pole of sufficient strength. When the magnetic flux density (B) perpendicular to the package is larger than the operate point (Bop) the output is switched on (pulled low). The output is held latched until magnetic flux density reverses and becomes lower than the release point (Brp).

The magnetic operating and release polarity is opposite for SOT23 and SC59 packages. SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) packages will require south pole to the part marking side to operate while SC59 will require south pole to the non part-marking side.

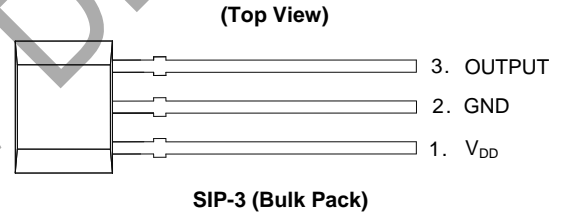
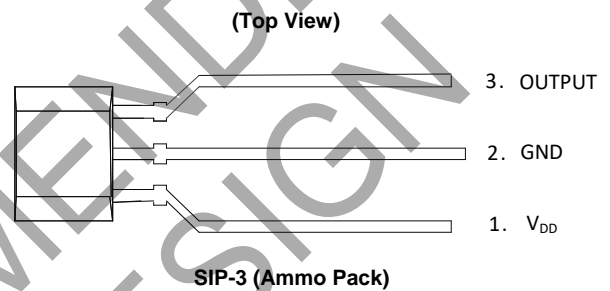
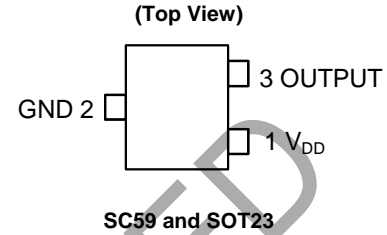
## Features

- Bipolar Latch Operation (South Pole: On, North Pole: Off)
- High Sensitivity: Bop and Brp of +25G and -25G Typical
- Single Open-Drain Output with Overcurrent Limit
- 3.0V to 28V Operating Voltage Range
- 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
- ESD: HBM > 8kV, CDM > 2kV
- AEC-Q100 Grade 0 Qualified
- Industry Standard SC59, SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) Packages
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green Device (Note 3)**
- **The AH3762Q is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<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.

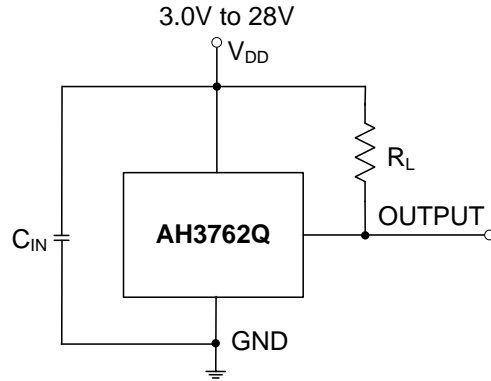
## Pin Assignments



## Applications

- Brushless DC-motor commutations
- Revolution per minute (RPM) measurements
- Angular and linear encoders and position sensing and indexing
- Flow meters
- Contactless commutations, speed measurements and angular position sensing/indexing in automotive applications

**Typical Applications Circuit** (Note 4)



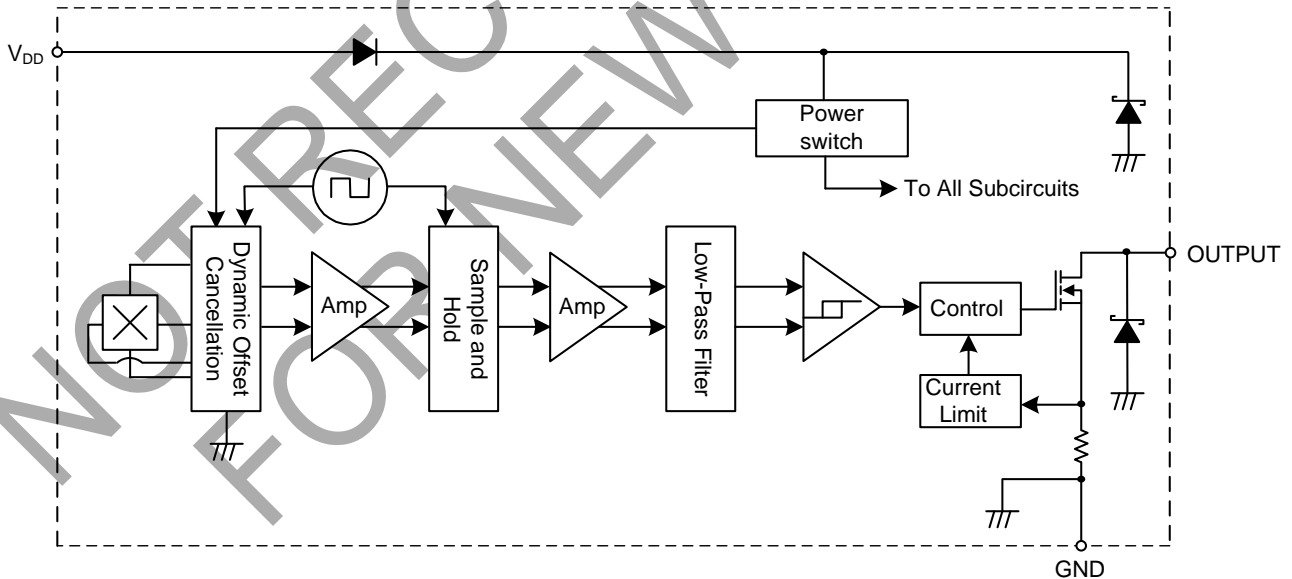
Note: 4. CIN is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 10nF to 100nF. RL is the pull-up resistor.

**Pin Descriptions**

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

Pin Number	Pin Name	Function
1	VDD	Power Supply Input
2	GND	Ground
3	OUTPUT	Output Pin

**Functional Block Diagram**



**Absolute Maximum Ratings** (Notes 5 and 6) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Characteristic	Value	Unit	
V <sub>DD</sub>	Supply Voltage (Note 6)	32	V	
V <sub>DDR</sub>	Reverse Supply Voltage (Note 6)	-32	V	
V <sub>OUT_MAX</sub>	Output Off Voltage (Note 6)	32	V	
I <sub>OUT</sub>	Continuous Output Current	60	mA	
I <sub>OUT_R</sub>	Reverse Output Current	-50	mA	
B	Magnetic Flux Density	Unlimited		
P <sub>D</sub>	Package Power Dissipation	SIP-3 (Ammo Pack), SIP-3 (Bulk Pack)	550	mW
		SC59 and SOT23	230	
T <sub>S</sub>	Storage Temperature Range	-65 to +165	°C	
T <sub>J</sub>	Maximum Junction Temperature	+150	°C	
ESD HBM	Electro Static Discharge Withstand – Human Body Model (HBM)	8	kV	
ESD MM	Electro Static Discharge Withstand - Machine Model (MM)	800	V	
ESD CDM	Electro Static Discharge Withstand - Charged Device Model (CDM)	2	kV	

- Notes:
- Stresses greater than the 'Absolute Maximum Ratings' specified above can cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability can be affected by exposure to absolute maximum rating conditions for extended periods of time.
  - The absolute maximum V<sub>DD</sub> 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<sub>A</sub> = -40°C to +150°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V <sub>DD</sub>	Supply Voltage	Operating	3.0 to 28	V
T <sub>A</sub>	Operating Temperature Range	Operating	-40 to +150	°C

**Electrical Characteristics** (Notes 7 and 8) (@T<sub>A</sub> = -40°C to +150°C, V<sub>DD</sub> = 3V to 28V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OUT_ON</sub>	Output ON Voltage	I <sub>OUT</sub> = 20mA, B > Bop	—	0.2	0.4	V
I <sub>LKG</sub>	Output Leakage Current (When Output is Off)	V <sub>OUT</sub> = 28V, B < Brp, Output Off	—	<0.1	10	μA
I <sub>DD</sub>	Supply Current	Output Open, T <sub>A</sub> = +25°C	—	3	3.5	mA
		Output Open, T <sub>A</sub> = -40°C to +150°C	—	—	4	mA
I <sub>DD_R</sub>	Reverse Supply Current	V <sub>DD</sub> = -18V, T <sub>A</sub> = +25°C	—	0.6	—	μA
		V <sub>DD</sub> = -18V, T <sub>A</sub> = -40°C to +150°C	—	0.6	1,500	μA
		V <sub>DD</sub> = -28V, T <sub>A</sub> = +25°C	—	1.6	—	μA
		V <sub>DD</sub> = -28V, T <sub>A</sub> = -40°C to +150°C	—	1.6	2,500	μA
t <sub>P_ON</sub>	Device Power-On Time (Start-Up Time)	V <sub>DD</sub> ≥ 3V, B > Bop (Note 8)	—	10	—	μs
f <sub>C</sub>	Chopping Frequency	V <sub>DD</sub> ≥ 3V	—	800	—	kHz
t <sub>d</sub>	Response Time Delay (Time from Magnetic Threshold Reached to the Start of the Output Rise or Fall)	(Note 9)	—	3.75	—	μs
t <sub>r</sub>	Output Rising Time (External Pull-Up Resistor R <sub>L</sub> and Load Capacitance Dependent)	R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 20pF	—	0.2	1	μs
t <sub>f</sub>	Output Falling Time (Internal Switch Resistance and Load Capacitance Dependent)	R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 20pF	—	0.1	1	μs
I <sub>OCL</sub>	Output Current Limit	B > Bop (Note 10)	30	—	55	mA
V <sub>Z</sub>	Zener Clamp Voltage	I <sub>DD</sub> = 5mA	28	—	—	V

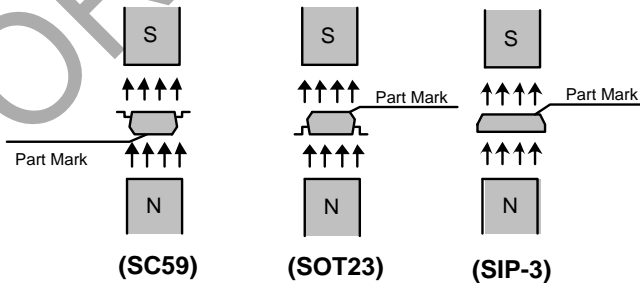
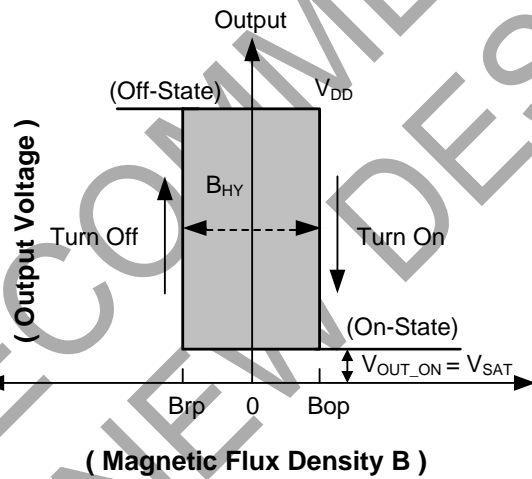
- Notes:
- When power is initially turned on, V<sub>DD</sub> must be within its correct operating range (3.0V to 28V) to guarantee the output sampling. The output state is valid after the start-up time of 10μs typical from the operating voltage reaching 3V.
  - Typical values are defined at T<sub>A</sub> = +25°C, V<sub>DD</sub> = 12V. Maximum and minimum values over the operating temperature range are 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 will limit the output current I<sub>OUT</sub> to current limit of I<sub>OCL</sub>.

**Magnetic Characteristics** (Notes 11 and 12) ( $T_A = -40^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ ,  $V_{DD} = 3.0\text{V}$  to  $28\text{V}$ , unless otherwise specified.)

(1mT=10 Gauss)

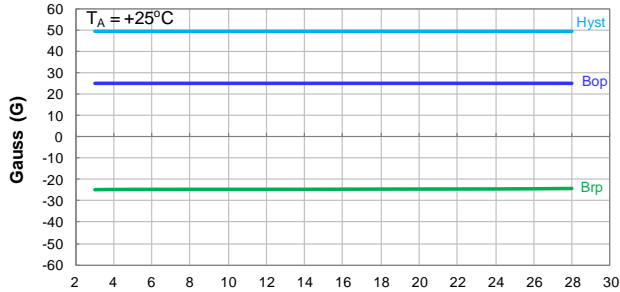
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Bop (South pole to part marking side for SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) packages; South pole to the non-part marking side for SC59 package. See diagram below)	Operation Point	$V_{DD} = 12\text{V}$ , $T_A = +25^{\circ}\text{C}$	—	25	—	Gauss
		$T_A = -40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$	10	25	40	
Brp (North pole to part marking side for SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) packages; North pole to the non-part marking side for SC59 package. See diagram below)	Release Point	$V_{DD} = 12\text{V}$ , $T_A = +25^{\circ}\text{C}$	—	-25	—	
		$T_A = -40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$	-40	-25	-10	
B <sub>HY</sub> ( Bopx - Brpx )	Hysteresis (Note 13)	$V_{DD} = 12\text{V}$ , $T_A = +25^{\circ}\text{C}$	—	50	—	
		$T_A = -40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$	20	50	80	

- 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 start-up 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.

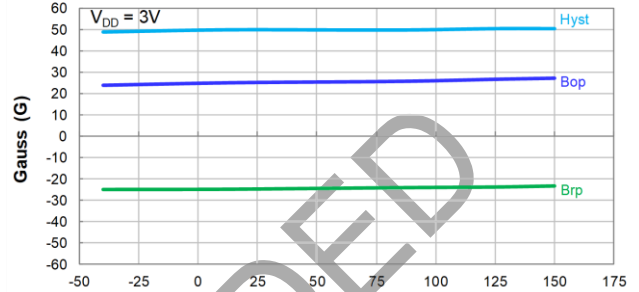


**Typical Operating Characteristics**

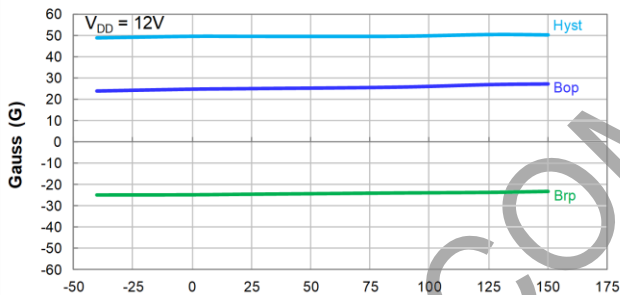
**Output Switch Operate and Release Points (Magnetic Thresholds) – Bop and Brp**



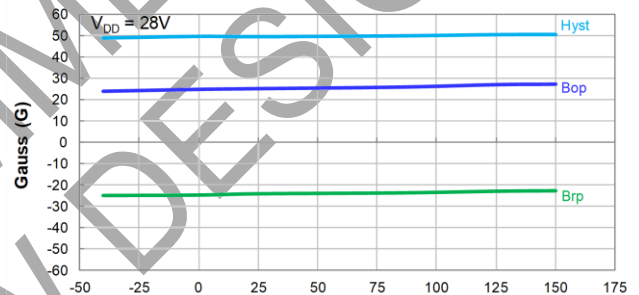
Switch Points Bop and Brp vs Supply Voltage



Switch Points Bop and Brp vs Temperature

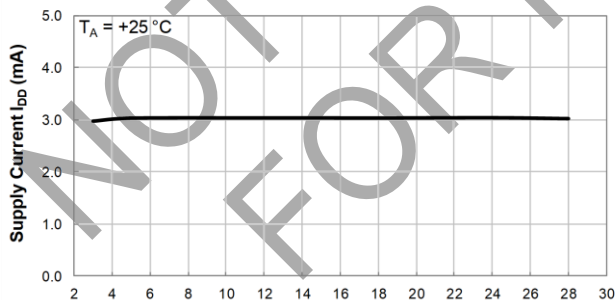


Switch Points Bop and Brp vs Temperature

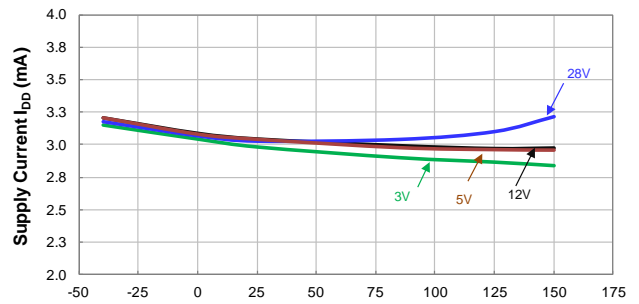


Switch Points Bop and Brp vs Temperature

**Supply Current**



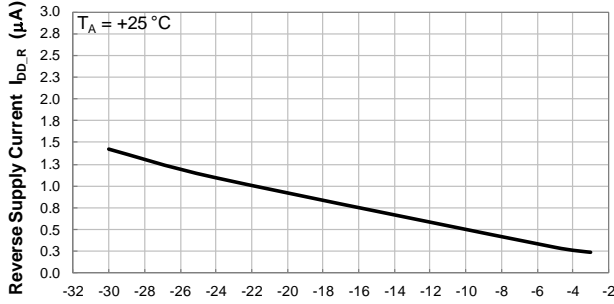
Supply Current vs Supply Voltage



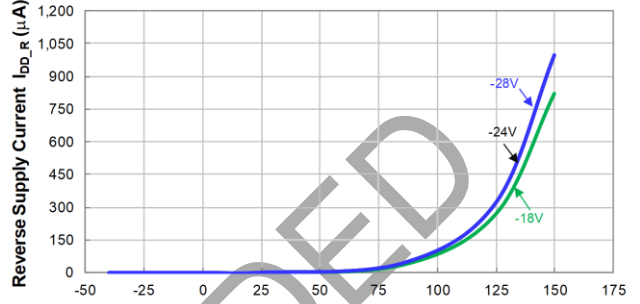
Supply Current vs Temperature

**Typical Operating Characteristics** (continued)

**Reverse Supply Current**

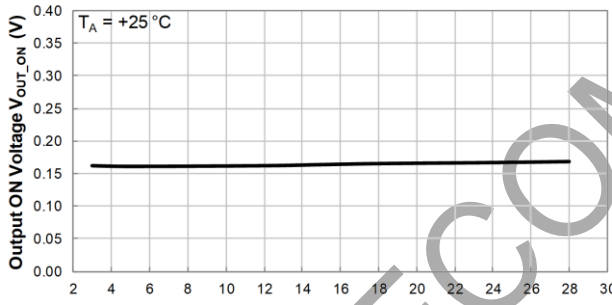


Reverse Supply Current vs Supply Voltage

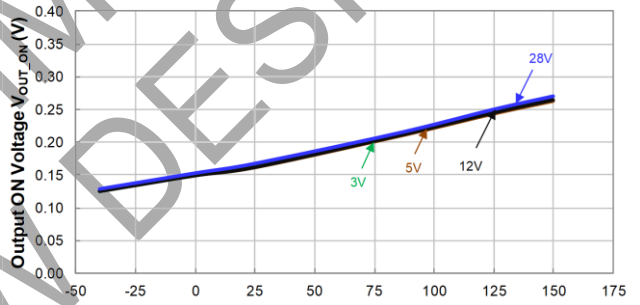


Reverse Supply Current vs Temperature

**Output Switch On Voltage**

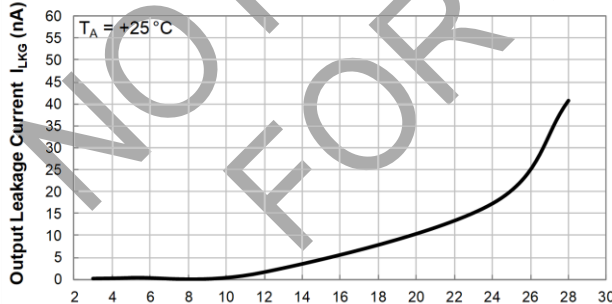


Output ON Voltage vs Supply Voltage

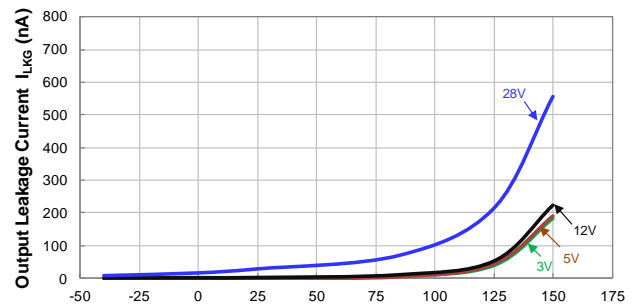


Output ON Voltage vs Temperature

**Output Switch Leakage Current**



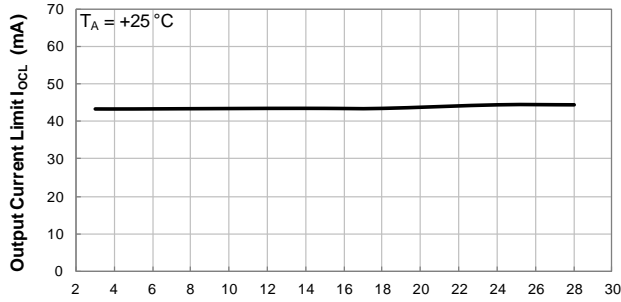
Output Leakage Current vs Supply Voltage



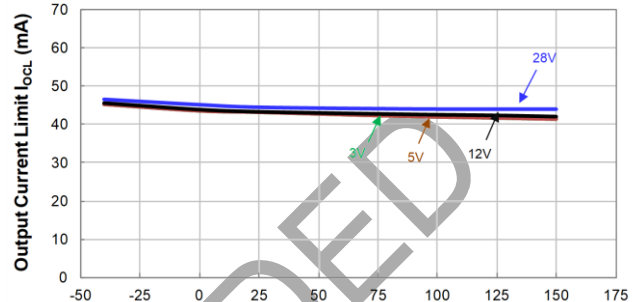
Output Leakage Current vs Temperature

**Typical Operating Characteristics** (continued)

**Output Current Limit**



Supply Voltage (V)  
Output Current Limit vs Supply Voltage



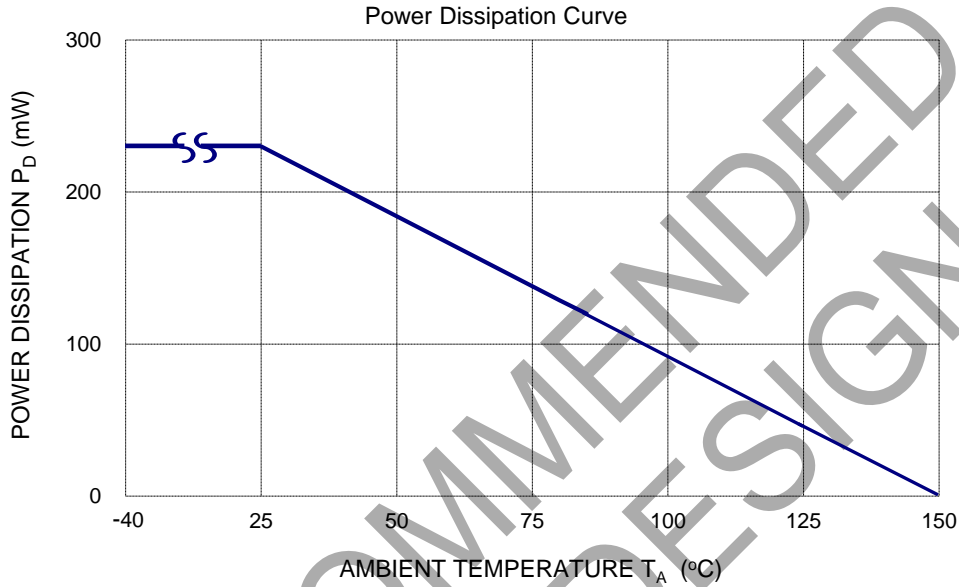
Temperature (°C)  
Output Current Limit vs Temperature

NOT RECOMMENDED FOR NEW DESIGN

**Thermal Performance Characteristics**

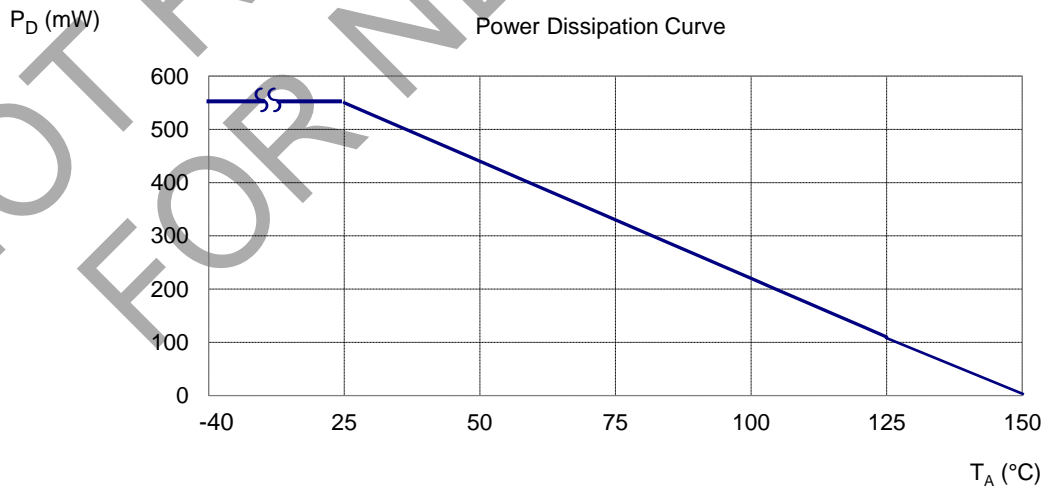
**(1) Package Types: SC59 and SOT23**

T <sub>A</sub> (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P <sub>D</sub> (mW)	230	184	166	147	129	120	110	92	83	74	55	46	37	18	0

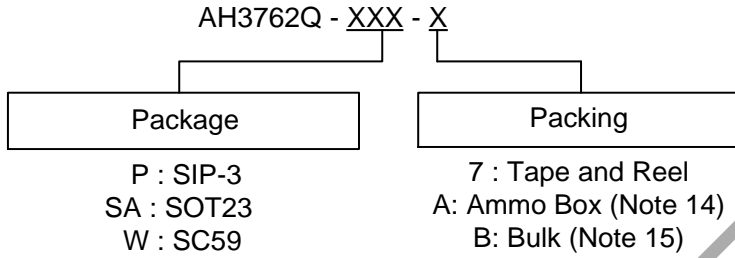


**(2) Package Types: SIP-3 (Ammo Pack), SIP-3 (Bulk Pack)**

T <sub>A</sub> (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P <sub>D</sub> (mW)	550	440	396	362	308	286	264	220	198	176	132	110	88	44	0



**Ordering Information** (Note 16)



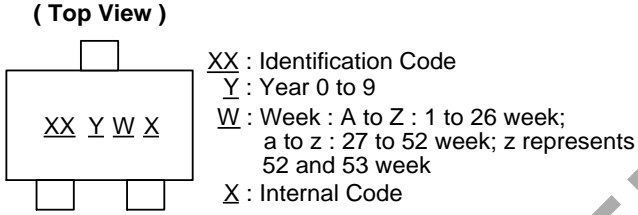
Part Number	Package	Package Code	Part Number Suffix	Packing	
				Qty.	Carrier
AH3762Q-P-A	SIP-3 (Ammo Pack)	P	-A	4,000	Ammo Box
AH3762Q-P-B	SIP-3 (Bulk Pack)	P	-B	1,000	Bulk
AH3762Q-SA-7	SOT23	SA	-7	3,000	Tape & Reel
AH3762Q-W-7	SC59	W	-7	3,000	Tape & Reel

- Notes:
- 14. Ammo Box is for SIP-3 Spread Lead.
  - 15. Bulk is for SIP-3 Straight Lead.
  - 16. Disclaimer: Semiconductor die are subjected to stress when initially assembled into the plastic packages; mold curing times/profiles are used to try to alleviate these stresses but cannot completely remove them. When soldering the device onto the PCB these stresses can be reduced or increased, which may result in a shift of certain characteristics. These shifts can be/are dependent on PCB material and solder profiles used to mount the device to the PCB, and therefore to a certain degree outside of Diodes Incorporated's control. Some further shifts maybe observed throughout the life of the product as both the PCB and device are subjected to multiple temperature cycles.

NOT RECOMMENDED FOR NEW DESIGN

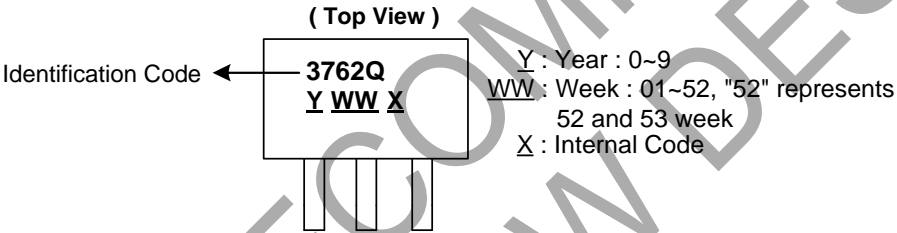
**Marking Information**

(1) Package Types: SC59 and SOT23



Part Number	Package	Identification Code
AH3762Q	SC59	YK
AH3762Q	SOT23	WK

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



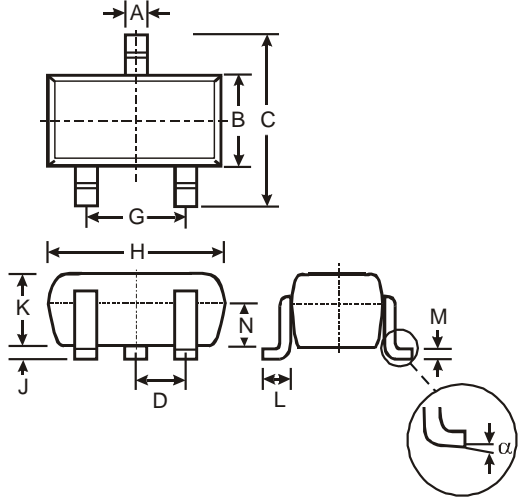
Part Number	Package	Identification Code
AH3762Q	SIP-3 (Ammo Pack), SIP-3 (Bulk Pack)	3762Q

NOT RECOMMENDED FOR NEW DESIGN

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

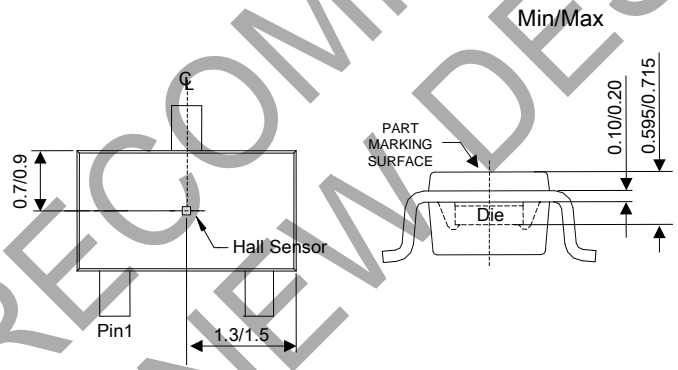
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) 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
$\alpha$	0°	8°	-

All Dimensions in mm



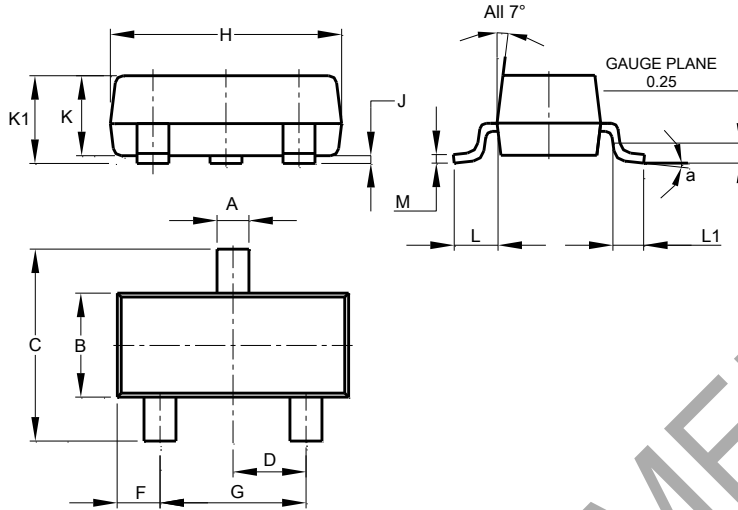
**Sensor Location**

NOT RECOMMENDED FOR NEW DESIGN

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

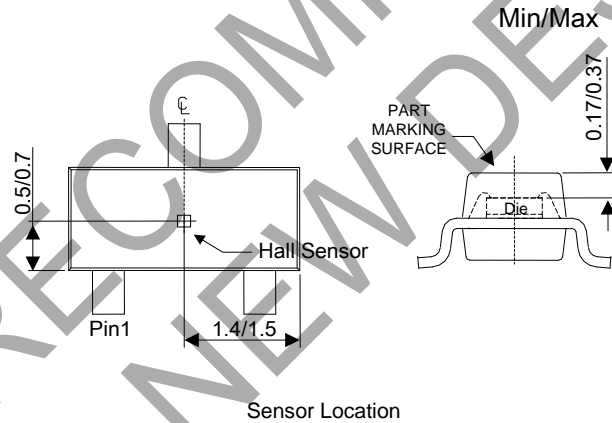
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(2) Package Type: SOT23



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--

All Dimensions in mm

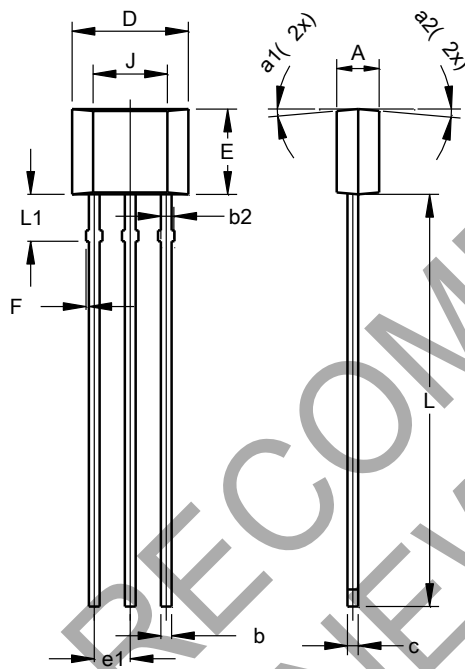
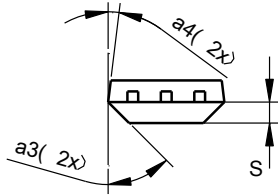


NOT RECOMMENDED FOR NEW DESIGNS

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

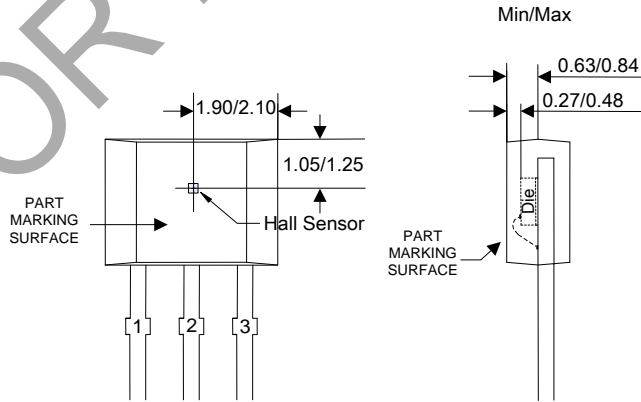
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**(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			

NOT RECOMMENDED FOR NEW DESIGN

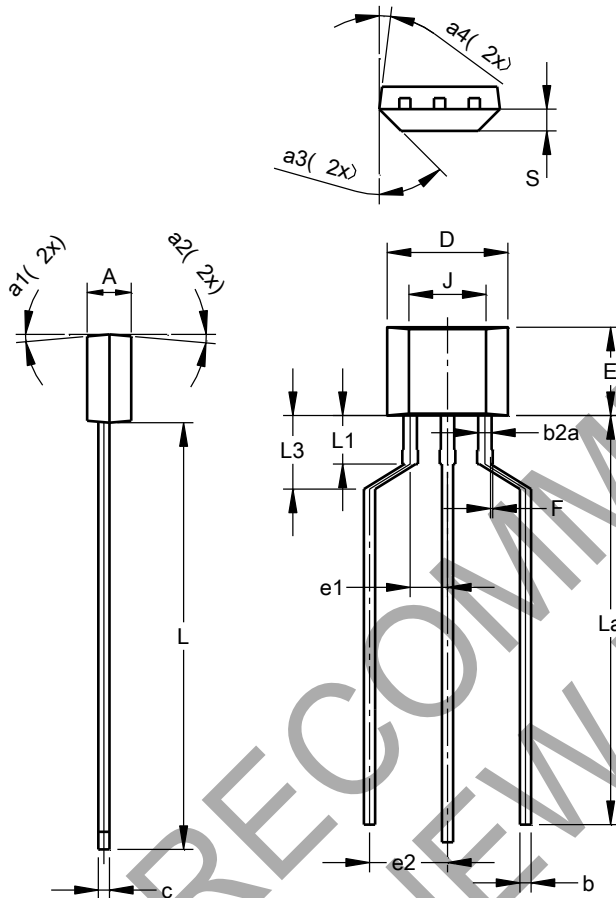


Sensor Location

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

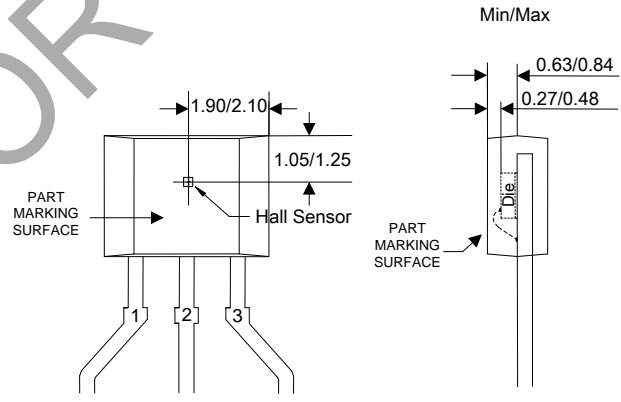
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**(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			

NOT RECOMMENDED FOR NEW DESIGN

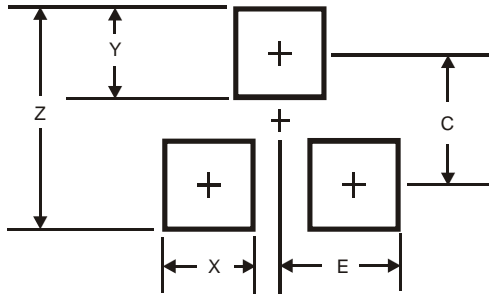


Sensor Location

**Suggested Pad Layout**

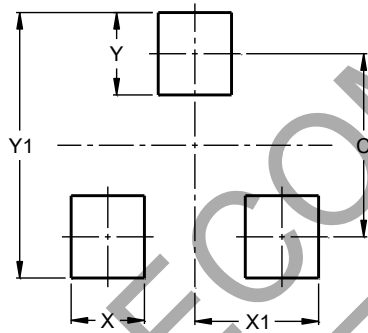
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SC59



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

(2) Package Type: SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

NOT RECOMMENDED FOR NEW DESIGN

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