HIGH VOLTAGE MEDIUM SENSITIVITY AUTOMOTIVE HALL EFFECT UNIPOLAR SWITCH

NEW PRODUCT

Description

The AH3364Q is an AECQ100 qualified high voltage medium sensitivity Hall Effect Unipolar switch IC designed for position and proximity sensing in automotive applications such as in seat and seatbelt buckle, steering lock/immobilisation, gear stick, transmission actuator and gear position, HVAC compression, wiper, door/trunk closure, etc. To support wide range of 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 AH3364Q 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 over current limit and a Zener clamp.

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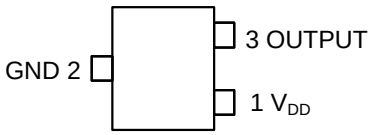
The single open drain output can be switched on with South pole of sufficient strength. When the magnetic flux density (B) perpendicular to the package is larger than the operate point (B_{OP}) the output is switched on (pulled low) and is held on until magnetic flux density B is lower than the release point (B_{RP}). The output remains switched off for North pole fields to or no magnetic fields.

Features

- Unipolar Operation
- Medium Sensitivity: B_{OP} and B_{RP} of 80G and 60G Typical
- Single Open Drain Output with Over Current 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
- AECQ100 Grade 0 Qualified
- Industry Standard 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)**

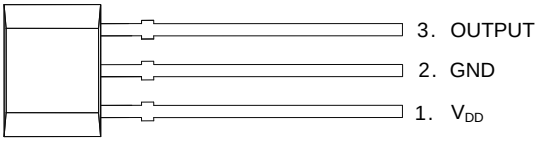
Pin Assignments

(Top View)



SOT23

(Top View)



SIP-3 (Bulk Pack)

Applications

- Position and Proximity Sensing in Automotive Applications
- Seat Position
- Seatbelt Buckle
- Steering Lock/Immobilisation
- Gear Stick
- HVAC Compression
- Transmission Actuator
- Transmission Gear Position
- Wipers
- Sunroof and Windows
- Door/Trunk Closure
- Door Locks
- Contact-Less Switches

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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.

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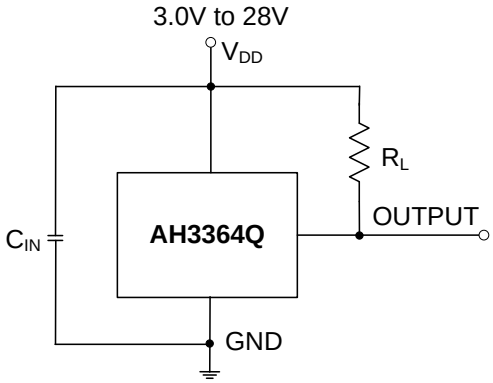
Typical Applications Circuit



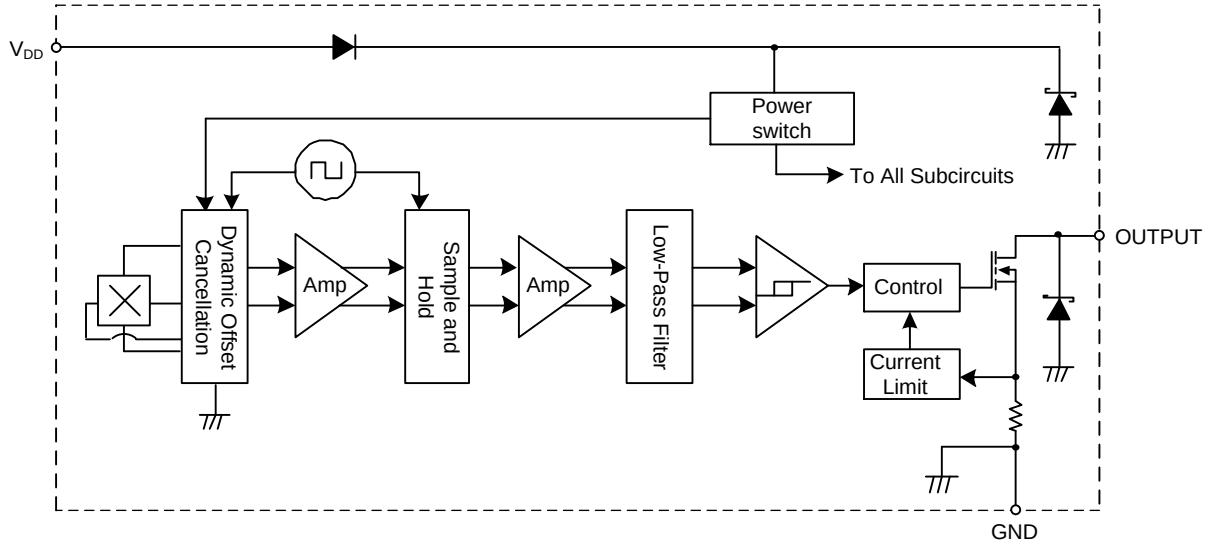
Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 10nF ~ 100nF.
R_L is the pull-up resistor.

Pin Descriptions

Package: SOT23 and SIP-3 (Ammo Pack), 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



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Absolute Maximum Ratings (Note 5 & 6) (@T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic		Value	Unit
V_{DD}	Supply Voltage (Note 6)		32	V
V_{DDR}	Reverse Supply Voltage (Note 6)		-32	V
V_{OUT_MAX}	Output 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	230	
Ts	Storage Temperature Range		-65 to +165	°C
T_J	Maximum Junction Temperature		+150	°C
ESD HBM	Electros Static Discharge Withstand - Human Body Model (HMB)		8	kV
ESD MM	Electros Static Discharge Withstand - Machine Model (MM)		800	V
ESD CDM	Electros Static Discharge Withstand - Charged Device Model (CDM)		2	kV

Notes: 5. Stresses greater than the 'Absolute Maximum Ratings' specified above may 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 may be affected by exposure to absolute maximum rating conditions for extended periods of time.

6. 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 +150°C, unless otherwise specified.)

Symbol	Parameter	Condition	Rating	Unit
V_{DD}	Supply Voltage	Operating	3.0 to 28	V
T_A	Operating Temperature Range	Operating	-40 to +150	°C

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

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{OUT_ON}	Output ON Voltage	I_{OUT} = 20mA, B > Bop	-	0.2	0.4	V
I_{LKG}	Output Leakage Current (When output is off)	V_{OUT} = 28V, B < Brp, Output off	-	<0.1	10	μA
I_{DD}	Supply Current	Output open, T_A = +25°C	-	3	3.5	mA
		Output open, T_A = -40°C to +150°C	-	-	4	mA
I_{DD_R}	Reverse Supply Current	V_{DD} = -18V, T_A = +25°C	-	0.6	-	μA
		V_{DD} = -18V, T_A = -40°C to +150°C	-	0.6	1500	μA
		V_{DD} = -28V, T_A = +25°C	-	1.6	-	μA
		V_{DD} = -28V, T_A = -40°C to +150°C	-	1.6	2500	μA
t_{P_ON}	Device Power-On Time (Start-up time)	V_{DD} >= 3V, B > Bop (Note 7)	-	10	-	μs
f_C	Chopping Frequency	-	-	800	-	kHz
t_D	Response Time Delay (Time from magnetic threshold reached to the start of the output rise or fall)	(Note 9)	-	3.75	-	μs
t_R	Output Rising Time (External pull-up resistor R_L and load capacitance dependent)	R_L = 1kΩ, C_L = 20pF	-	0.2	1	μs
t_F	Output Falling Time (Internal switch resistance and load capacitance dependent)	R_L = 1kΩ, C_L = 20pF	-	0.1	1	μs
I_{OCL}	Output Current Limit	B > Bop (Note 10)	30	-	55	mA
V_Z	Zener Clamp Voltage	I_{DD} = 5mA	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 start-up 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 will limit the output current I_{OUT} to current limit of I_{OCL}.

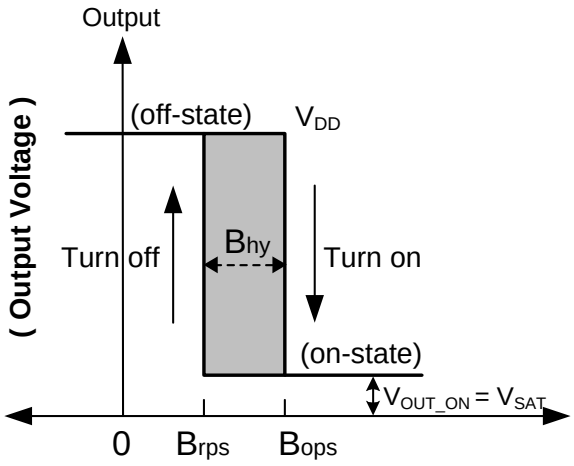
NEW PRODUCT

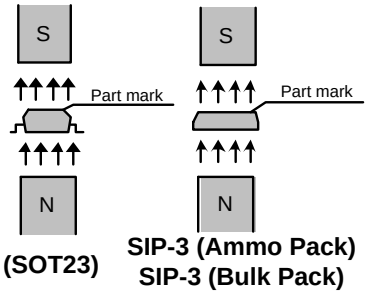
Magnetic Characteristics (Note 11 &12) (T_A = -40°C to +150°C, V_{DD} = 3.0V to 28V, unless otherwise specified.)

(1mT=10 Gauss)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
B_{OPS} (South pole to the part marking side of SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) packages)	Operation Point	V_{DD} = 12V, T_A = +25°C	-	80	-	Gauss
		T_A = -40°C to +150°C	60	80	100	
B_{RPS} (South pole to the part marking side of SOT23 and SIP-3 (Ammo Pack), SIP-3 (Bulk Pack) packages)	Release Point	V_{DD} = 12V, T_A = +25°C	-	60	-	
		T_A = -40°C to +150°C	40	60	80	
B_{HY} ($\|B_{OPX}\|$-$\|B_{RPX}\|$)	Hysteresis (Note 13)	V_{DD} = 12V, T_A = +25°C	-	20	-	
		T_A = -40°C to +150°C	14	20	29	

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 start-up 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.

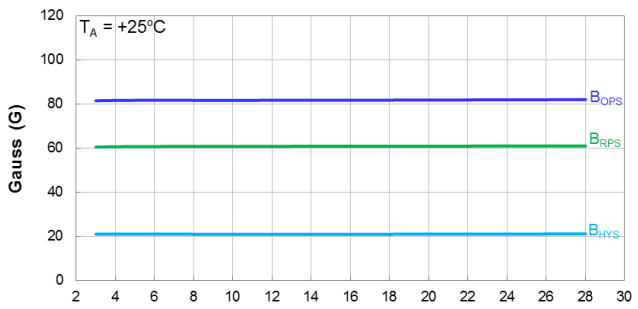




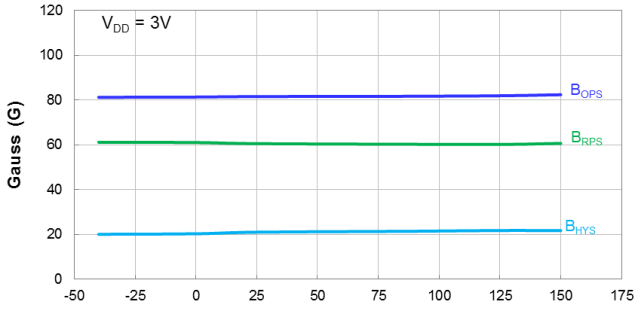
NEW PRODUCT

Typical Operating Characteristics

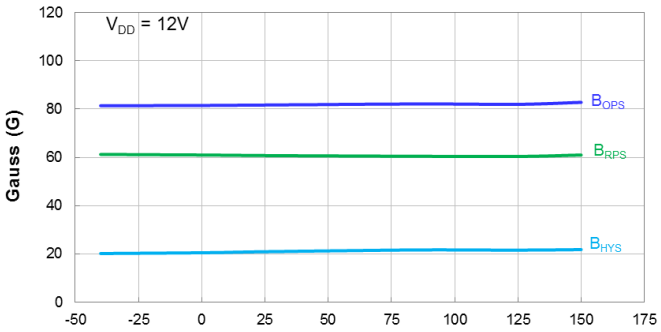
Output Switch Operate and Release Points (Magnetic Thresholds) – B_{OPS} and B_{RPS}



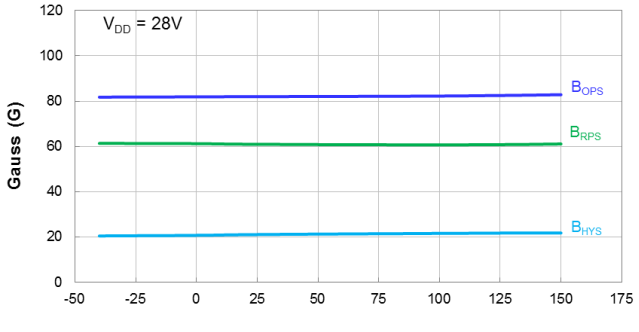
Switch Points B_{OPS} and B_{RPS} vs Supply Voltage



Switch Points B_{OPS} and B_{RPS} vs Temperature

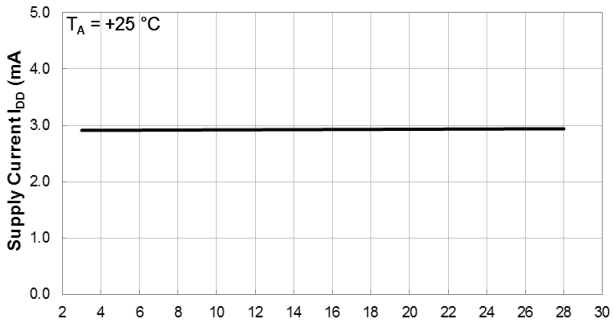


Switch Points B_{OPS} and B_{RPS} vs Temperature

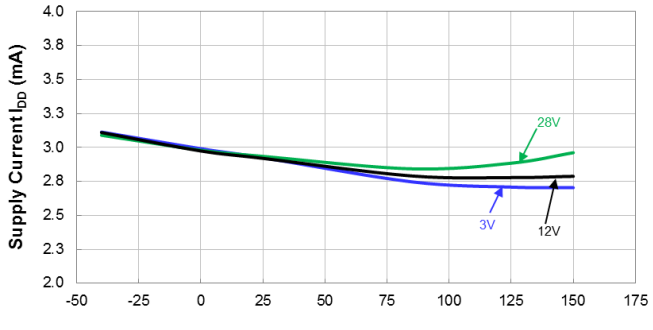


Switch Points B_{OPS} and B_{RPS} vs Temperature

Supply Current



Supply Current vs Supply Voltage



Supply Current vs Temperature

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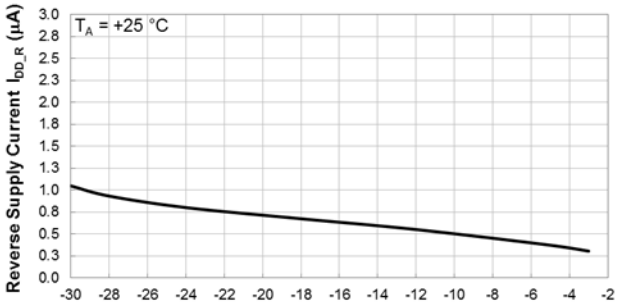
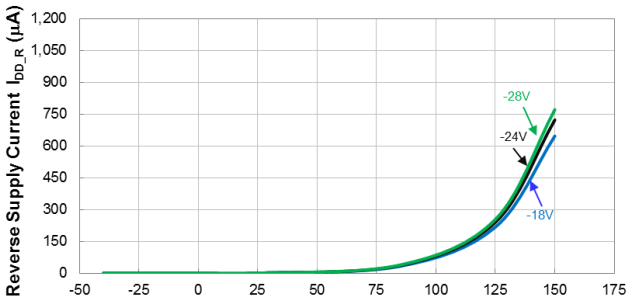
Typical Operating Characteristics (Cont.)

Supply Reverse Current

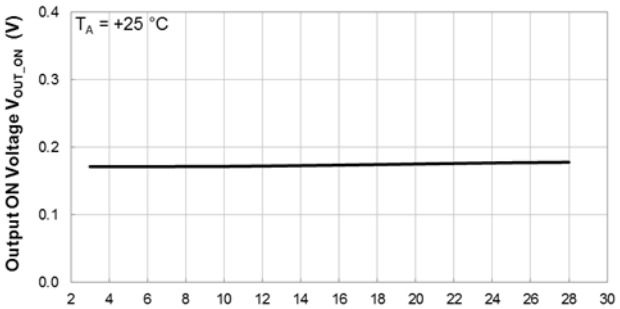


Reverse Supply Current vs Supply Voltage

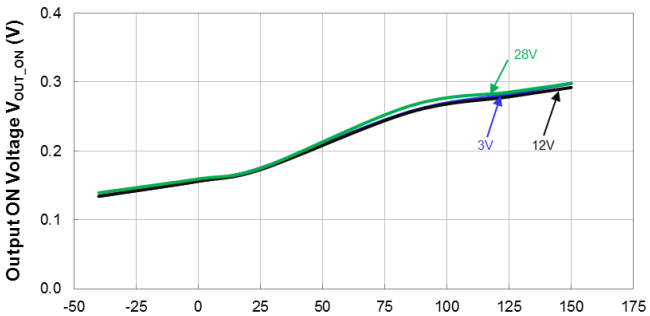


Reverse Supply Current vs Temperature

Output Switch On Voltage

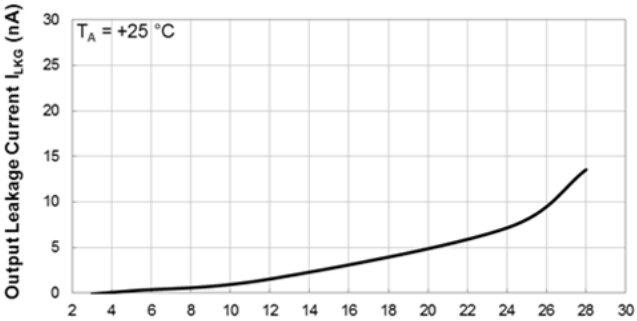


Output ON Voltage vs Supply Voltage

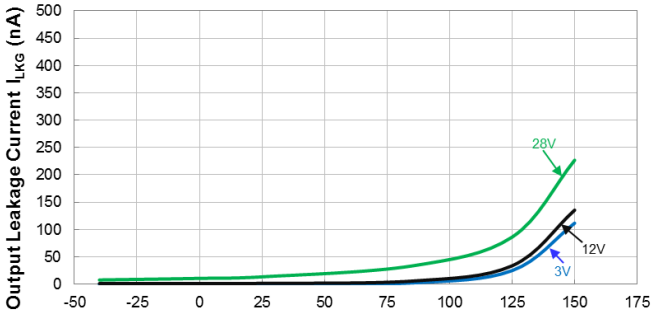


Output ON Voltage vs Temperature

Output Switch Leakage Current



Output Leakage Current vs Supply Voltage



Output Leakage Current vs Temperature

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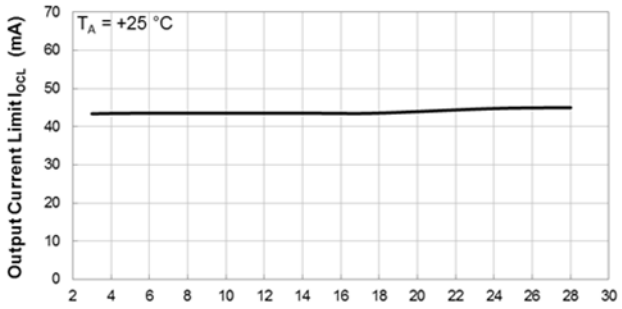
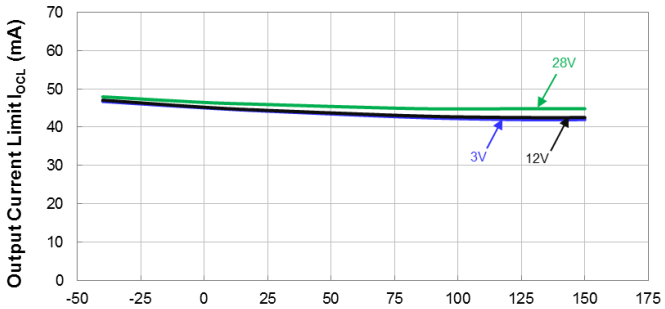
Typical Operating Characteristics (Cont.)

Output Current Limit



Output Current Limit vs Supply Voltage



Output CurrentLimit vs Temperature

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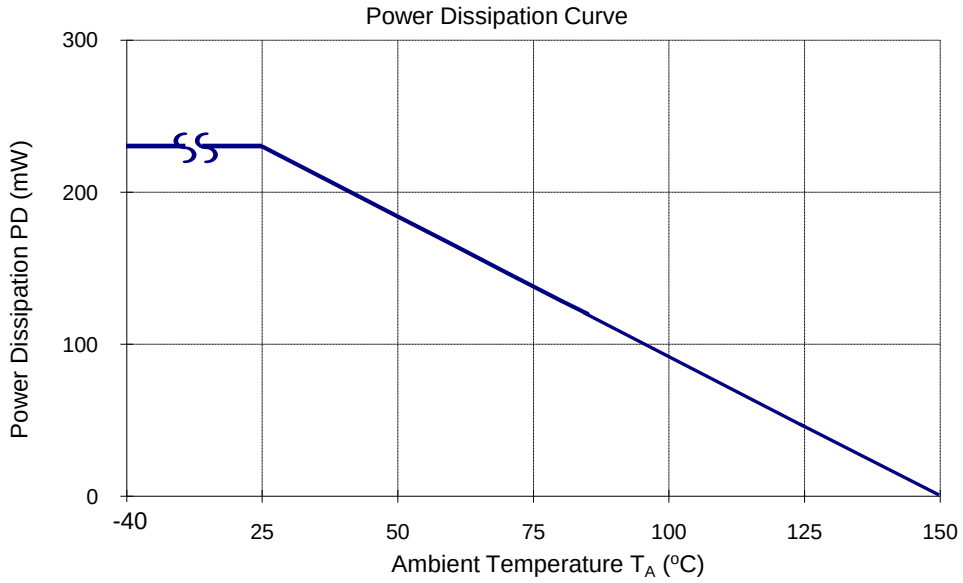
Thermal Performance Characteristics

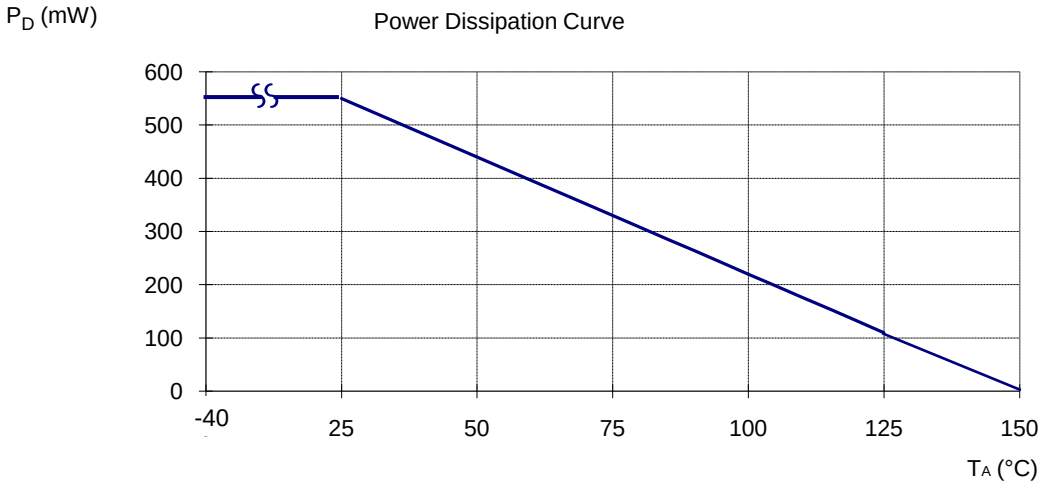
(1) Package type: SOT23

T_A (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P_D (mW)	230	184	166	147	129	120	110	92	83	74	55	46	37	18	0



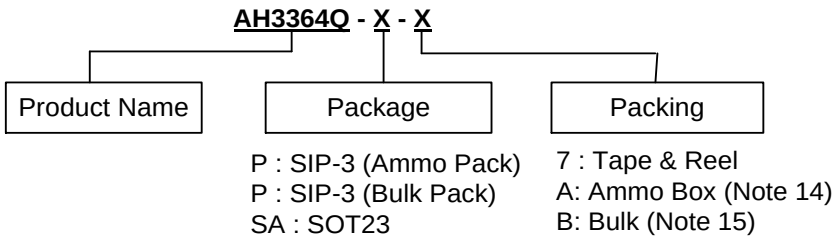
(2) Package type: SIP-3

T_A (°C)	25	50	60	70	80	85	90	100	105	110	120	125	130	140	150
P_D (mW)	550	440	396	362	308	286	264	220	198	176	132	110	88	44	0



NEW PRODUCT

Ordering Information



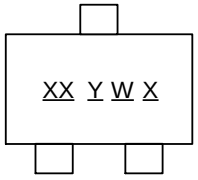
Part Number	Package Code	Packaging	Bulk Box		7" Tape and Reel		Ammo Box	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix	Quantity	Part Number Suffix
AH3364Q-P-A	P	SIP-3 (Ammo Pack)	NA	NA	NA	NA	4000/Box	-A
AH3364Q-P-B	P	SIP-3 (Bulk Pack)	1000	-B	NA	NA	NA	NA
AH3364Q-SA-7	SA	SOT23	NA	NA	3000/Tape & Reel	-7	NA	NA

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

Marking Information

(1) Package Type: SOT23

(Top View)

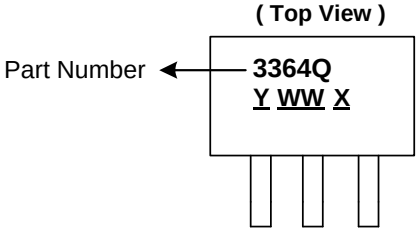


XX : Identification code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents
52 and 53 week
X : Internal code

Part Number	Package	Identification Code
AH3364Q	SOT23	MG

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

(Top View)



Y : Year : 0~9
WW : Week : 01~52, "52" represents
52 and 53 week
X : Internal Code

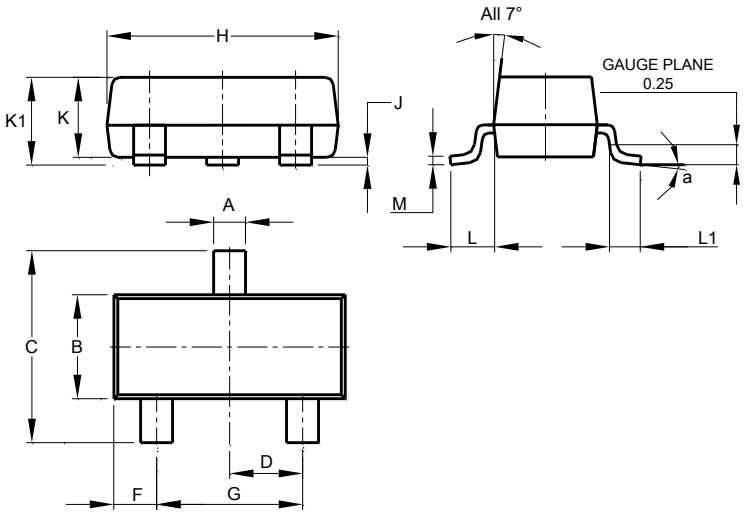
Part Number	Package	Identification Code
AH3364Q	SIP-3	3364Q

NEW PRODUCT

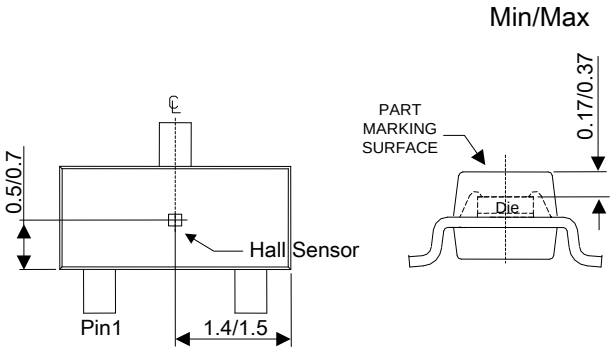
Package Outline Dimensions (All dimensions in mm.)

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

(1) 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			

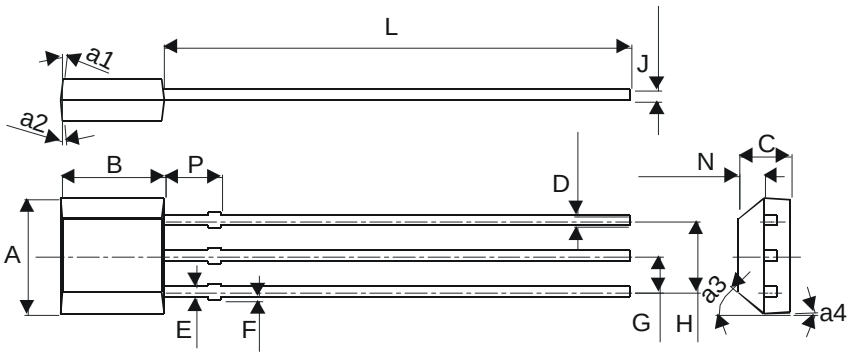


Sensor Location

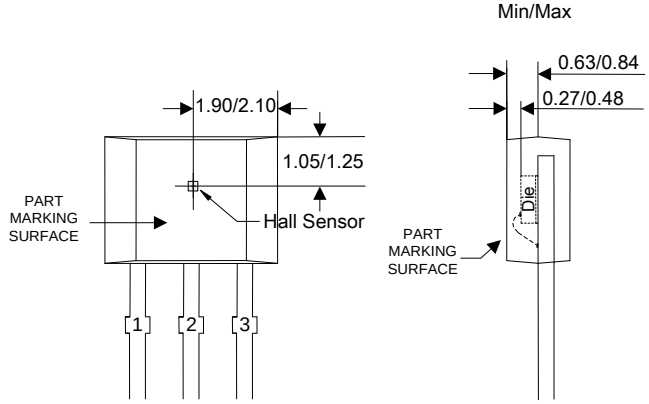
NEW PRODUCT

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

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



SIP-3 (Bulk Pack)		
Dim	**Min**	**Max**
A	3.9	4.3
a1	5° Typ	
a2	5° Typ	
a3	45° Typ	
a4	3° Typ	
B	2.8	3.2
C	1.40	1.60
D	0.33	0.432
E	0.40	0.508
F	0	0.2
G	1.24	1.30
H	2.51	2.57
J	0.35	0.43
L	14.0	15.0
N	0.63	0.84
P	1.55	-
All Dimensions in mm		

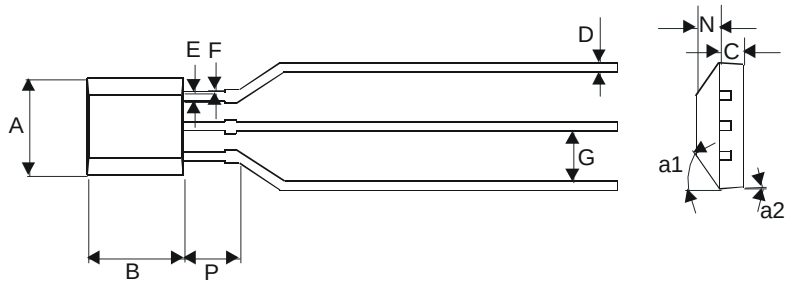


Sensor Location

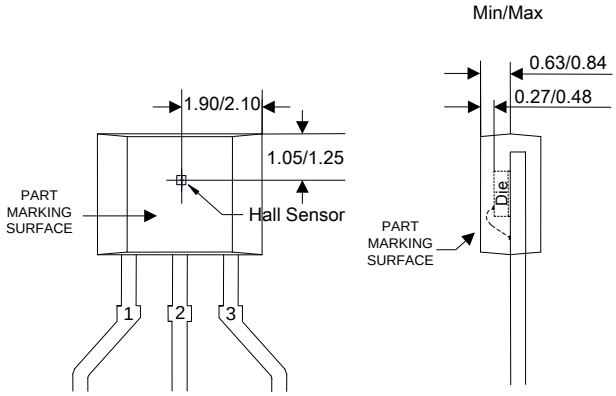
NEW PRODUCT

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

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



SIP-3 (Ammo Pack)		
Dim	**Min**	**Max**
A	3.9	4.3
a1	45° Typ	
a2	3° Typ	
B	2.8	3.2
C	1.40	1.60
D	0.35	0.41
E	0.43	0.48
F	0	0.2
G	2.4	2.9
N	0.63	0.84
P	1.55	-
All Dimensions in mm		



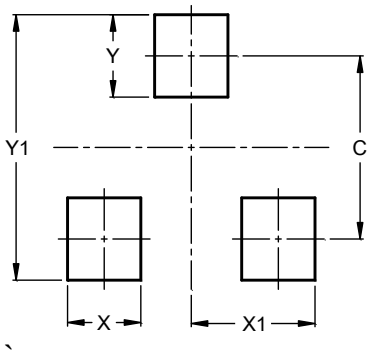
Sensor Location

NEW PRODUCT

Suggested Pad Layout

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

(1) Package Type: SOT23



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

NEW PRODUCT

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