TWO PHASE HALL-EFFECT SMART FAN MOTOR CONTROLLER

Description

The AH2984 is a single-chip solution for driving two-coil brushless direct current (BLDC) fans and motors. The device includes a Hall-effect sensor, dynamic offset correction and two complementary open-drain output drivers with internal Zener diode protection. It is optimized for low start-up voltage.

To help protect the motor coils, the AH2984 provides Rotor Lock Protection which shuts down output drives if rotor lock is detected. The device automatically re-starts when the rotor lock is removed. Over temperature shutdown provides thermal protection for the device.

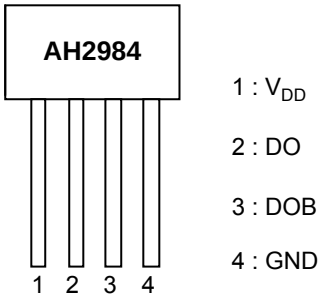
The AH2984 is available in SIP4 and SOT89-5 packages.

Features

- Single-chip solution
- Operating Voltage: 2.5V to 15V
- Built-in Hall sensor and input amplifier
- Rotor Lock Protection (Lock detection, output shutdown and automatic re-start)
- Built-in reverse voltage protection diode
- Built-in Zener protection for output drivers
- Average output current up to 500mA
- Packages: SIP-4 and SOT89-5
- "Green" Molding Compound
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

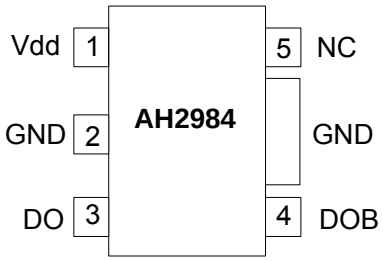
Pin Assignments

(Top View)



SIP-4

(Top View)



SOT89-5

Applications

- Two-coil BLDC Cooling Fans
- Low Voltage/ Low Power BLDC Motors

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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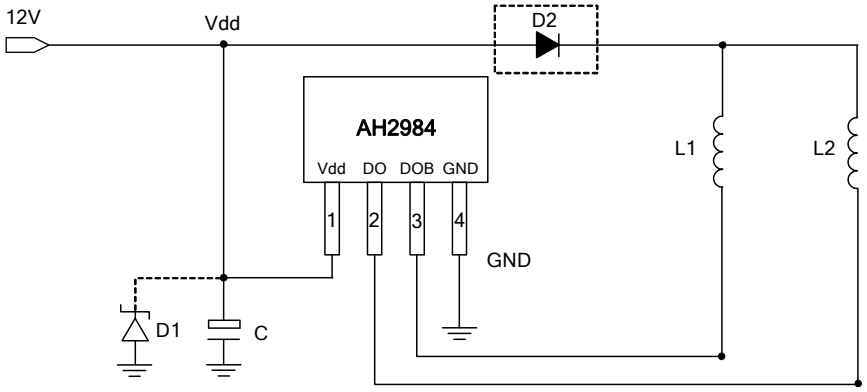
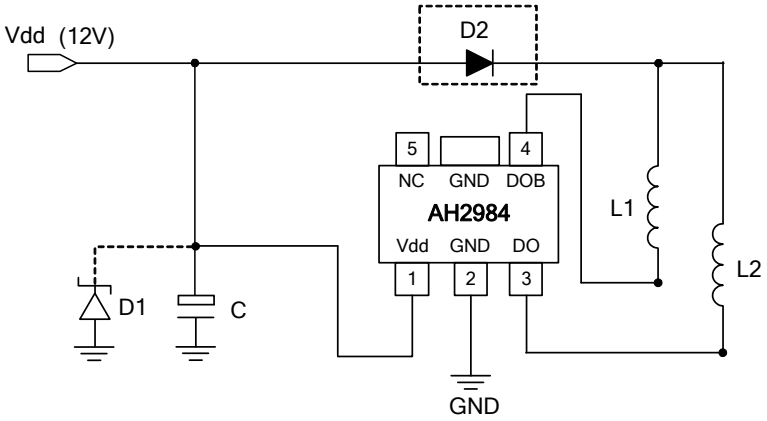
Typical Applications Circuit (Note 4)

(1) For SIP-4



12V Brushless DC Fan

(2) For SOT89-5



12V Brushless DC Fan

Note: 4. D1 (Zener Diode) and Capacitor C are for power stabilization. Recommended value of C is 1μF/ 50V (E-Cap). Diode D2 is optional and helps to protect the device and fan coils from reverse power conditions. The AH2984 also includes an internal reverse blocking diode at V_{DD} pin.

Pin Descriptions

Pin Name	SIP-4	SOT89-5	Description
V_{DD}	1	1	Input Power
DO	2	3	Output Pin
DOB	3	4	Output Pin
GND	4	2	Ground
NC	—	5	No Connection

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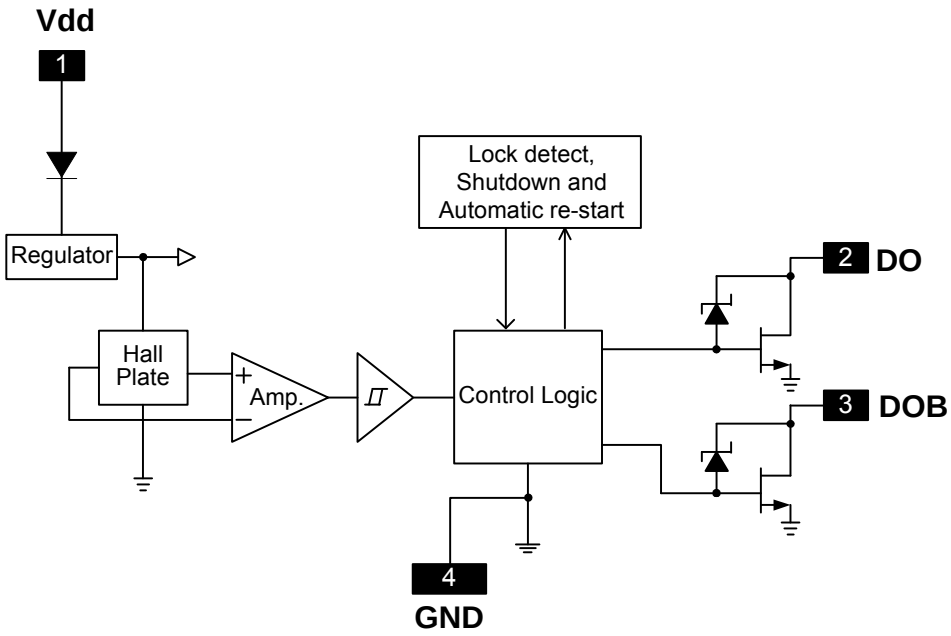
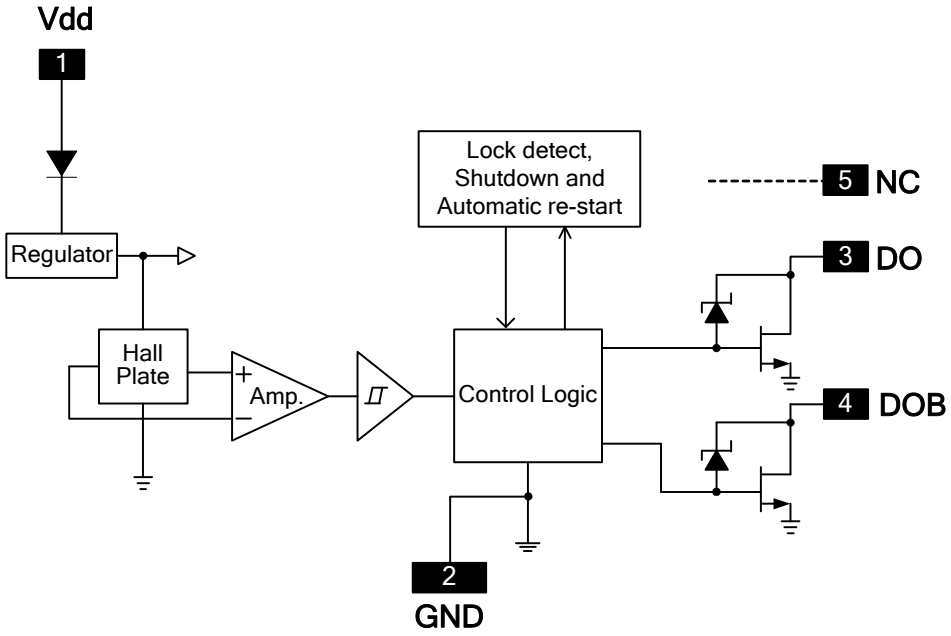
Functional Block Diagram

(1) For SIP-4



(2) For SOT89-5



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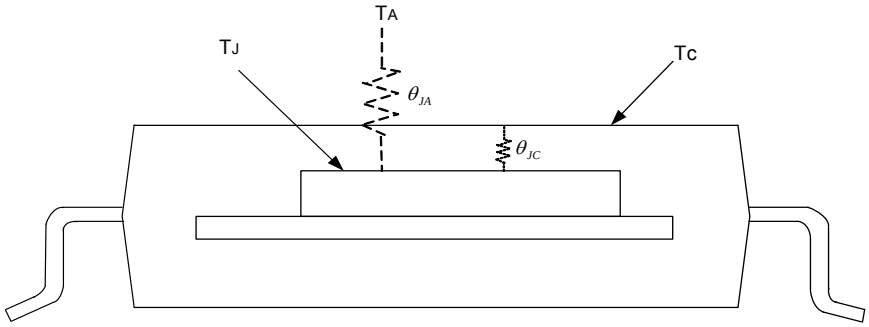
Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Conditions		Rating	Unit
V_{DD}	Supply Voltage		18	V
V_{RDD}	Reverse V_{DD} Polarity Voltage		-15	V
$I_{O(AVE)}$	Output Current (Note 5)		500	mA
$I_{O(peak\ as\ hold)}$			800	
P_D	Power Dissipation	SIP-4	550	mW
		SOT89-5	800	mW
T_{ST}	Storage Temperature		-55 to +150	°C
T_J	Maximum Junction Temperature		+150	°C
θ_{JA}	Thermal Resistance (Note 6)	SIP-4	227	°C/W
		SOT89-5	168	°C/W
θ_{JC}	Thermal Resistance (Note 6)	SIP-4	49	°C/W
		SOT89-5	36	°C/W



Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	Supply Voltage	Operating	2.5	15	V
T_A	Operating Ambient Temperature (Note 5)	Operating	-40	+105	°C

Electrical Characteristics (@T_A = +25°C; V_{DD} = 12V; unless otherwise specified, Note 4)

Symbol	Characteristics	Conditions	Min	Typ.	Max	Unit
I_{DD}	Supply Current	Operating, V_{DD} = 12V	2.0	3.5	5.0	mA
T_{on}	Locked Protection On Time	—	—	0.25	—	s
T_{off}	Locked Protection Off Time	—	—	3.25	—	s
R_{duty}	Locked Protection Duty Ratio	T_{off}/T_{on}	—	13	—	—
$R_{DS(ON)}$	Output On Resistance	I_O= 300mA	—	1	1.67	Ω
		I_O= 500mA	—	1.25	1.8	
V_Z	Output Zener-Breakdown Voltage	(Note 7)	24	33	42	V

Notes: 5. Shall not exceed P_D and Safety Operation Area.

6. θ_{JA} should be confirmed with heat sink thermal resistance. SOT89 exposed pad soldered to minimum recommended landing pads (see Package Outline Dimension section) on 2"x2" two-layer 2oz.copper FR4 PCB with thermal vias in the exposed pad connecting to the copper flood on the bottom layer.

7. The V_Z value is in D.C voltage measurement. The V_Z may vary with coils in A.C. voltage measurements.

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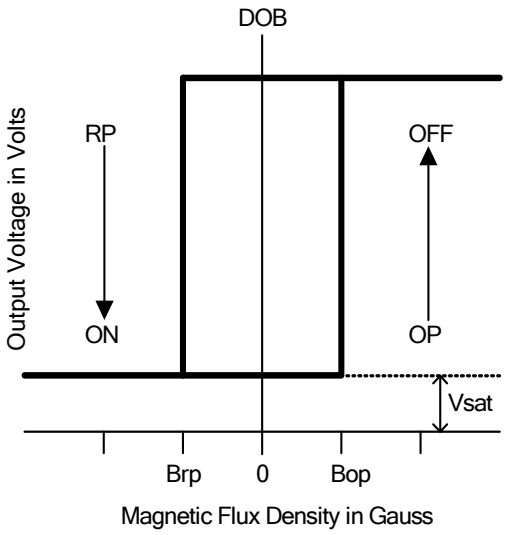
Magnetic Characteristics (T_A = +25°C, V_{DD} = 2.5V to 15V, Note 8)

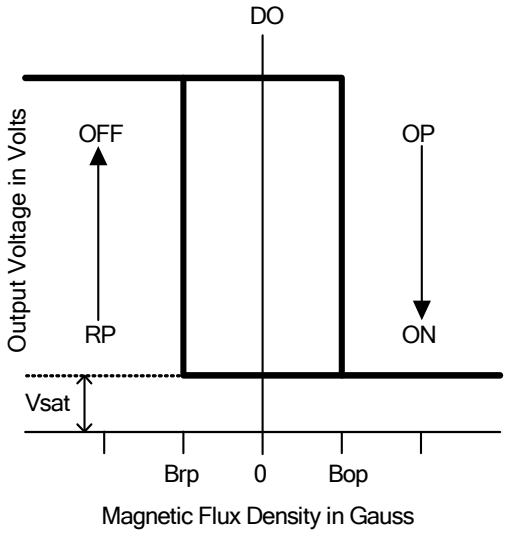
(1mT=10 Gauss)

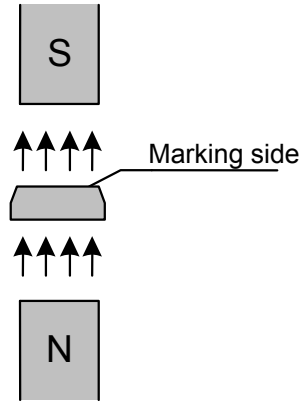
Symbol	Characteristics	Min	Typ.	Max	Unit
B_{OP}	Operate Point	5	30	60	Gauss
B_{RP}	Release Point	-60	-30	-5	Gauss
B_{HY}	Hysteresis	20	60	120	Gauss

Note: 8. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

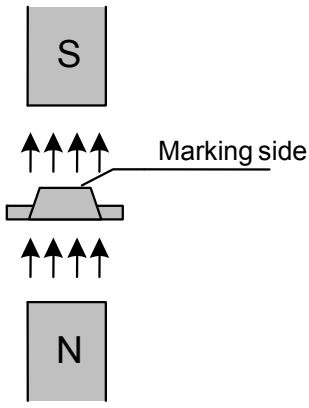
Operating Characteristics







(SIP-4)



(SOT89-5)

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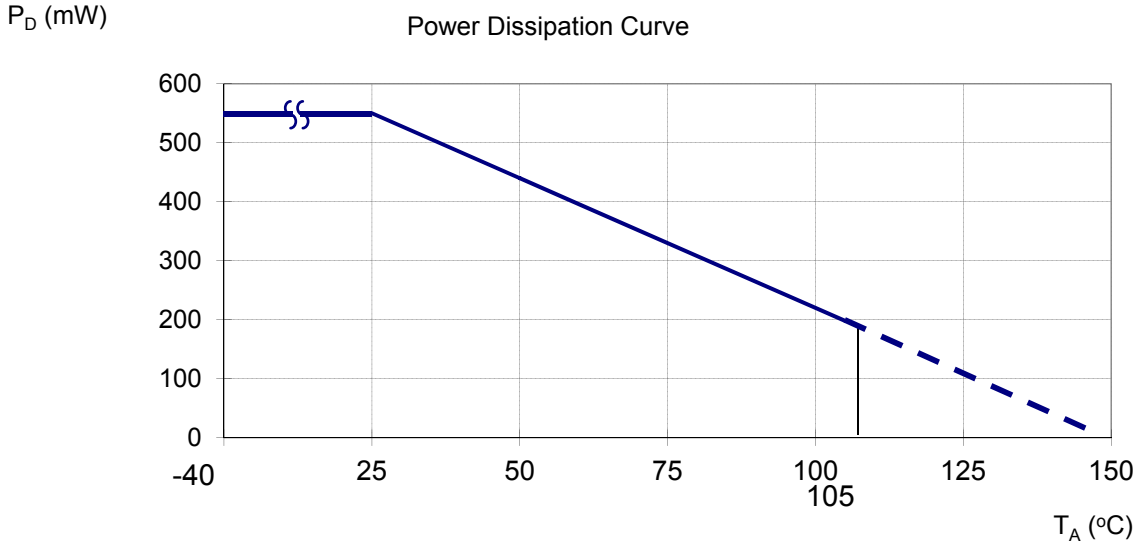
Performance Characteristics

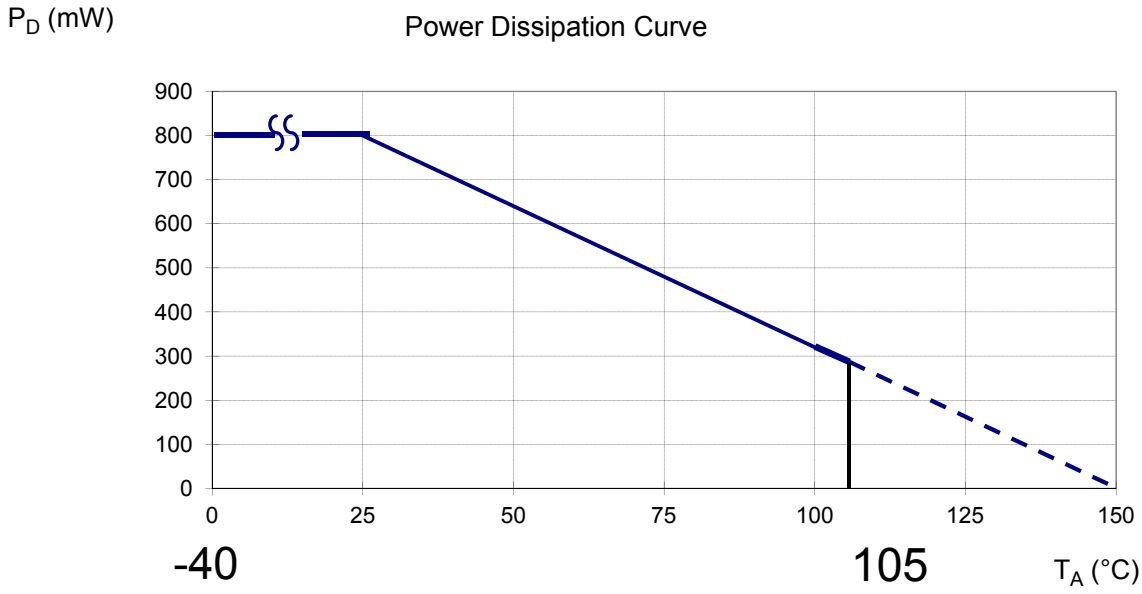
(1) SIP-4

T_A(°C)	25	50	60	70	80	85	90	95	100
P_D(mW)	550	440	396	352	308	286	264	242	220
T_A(°C)	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**150**
P_D(mW)	198	176	154	132	110	88	66	44	0



(2) SOT89-5

T_A (°C)	25	50	60	70	75	80	85	90	95	100
P_D (mW)	800	640	576	512	480	448	416	384	352	320
T_A (°C)	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**	**150**
P_D (mW)	288	256	224	192	160	128	96	64	32	0



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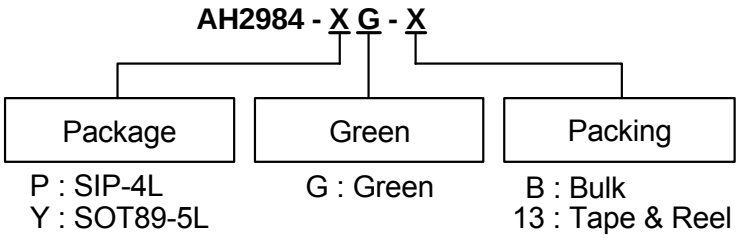
Ordering Information (Note 9)

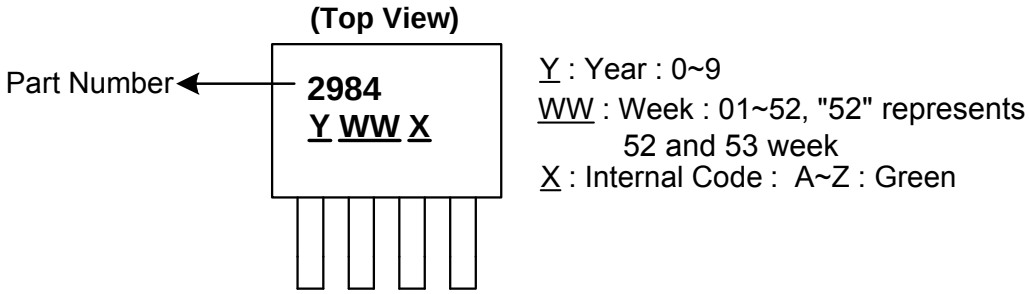


Device	Package Code	Packaging (Note 9)	Bulk		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AH2984-PG-B	P	SIP-4	1000	-B	NA	NA
AH2984-YG-13	Y	SOT89-5	NA	NA	2500/Tape & Reel	-13

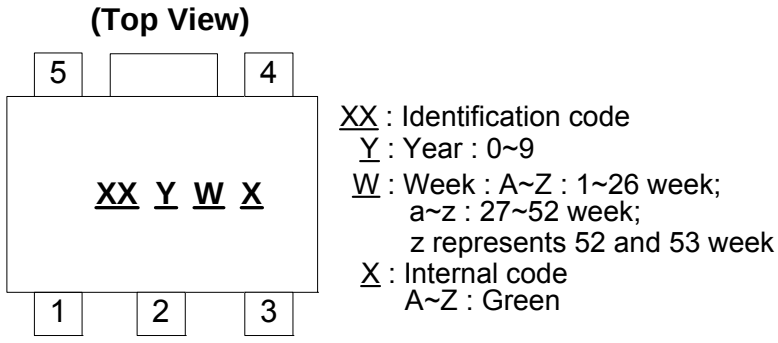
Note: 9. For packaging details, go to our website at http://www.diodes.com/products/packages.html

Marking Information

(1) SIP-4



(2) SOT89-5



Device	Package	Identification Code
AH2984	SOT89-5	K1

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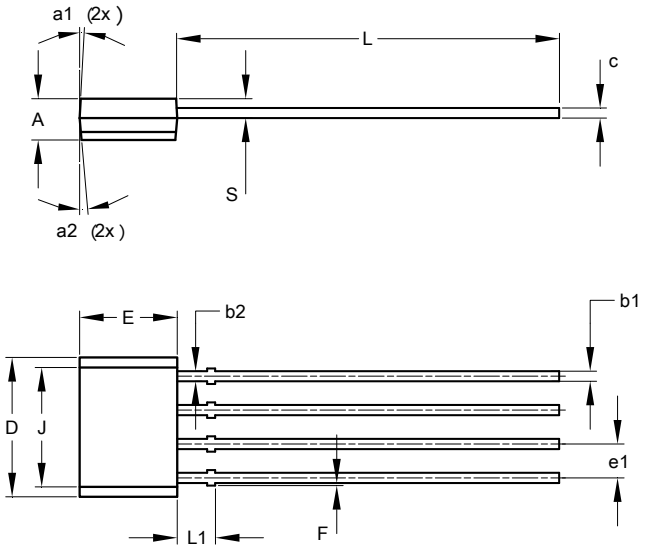
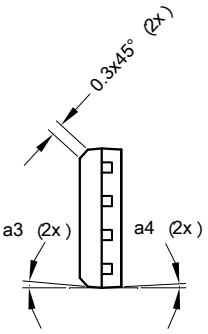
Package Outline Dimensions (All dimensions in mm.)

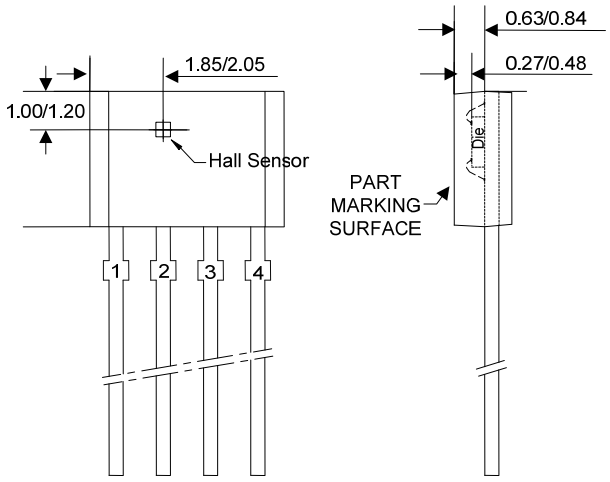
(1) Package type: SIP-4L





SIP-4			
Dim	**Min**	**Max**	**Typ**
A	1.45	1.65	1.55
b1	0.38	0.44	0.40
b2	—	—	0.48
c	0.35	0.45	0.40
D	5.12	5.32	5.22
e1	1.24	1.30	1.27
E	3.55	3.75	3.65
F	0.00	0.20	—
J	4.10	4.30	4.20
L	14.00	14.60	14.30
L1	1.32	1.52	1.42
S	0.63	0.83	0.73
a1	—	5°	3°
a2	4°	7°	5°
a3	4°	7°	5°
a4	—	5°	3°
All Dimensions in mm			

Min/Max (in mm)



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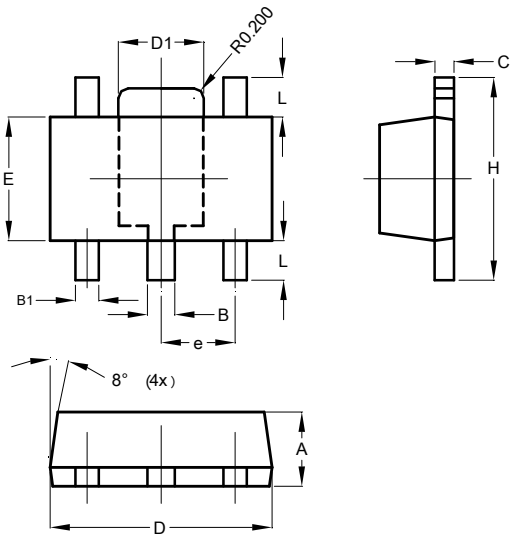
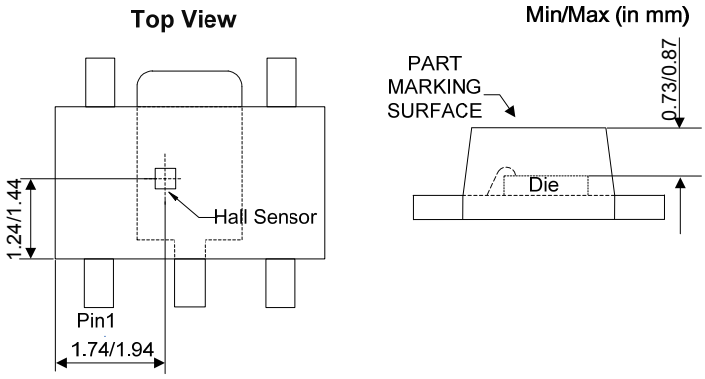
Package Outline Dimensions (All dimensions in mm.)

(2) Package type: SOT89-5L



SOT89-5			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.44	0.54	0.48
C	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
E	2.40	2.60	2.50
e	—	—	1.50
H	3.95	4.25	4.10
L	0.65	0.95	0.80
All Dimensions in mm			



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