KH3106

Medium-sensitivity Unipolar Hall-Effect Switch

General Description

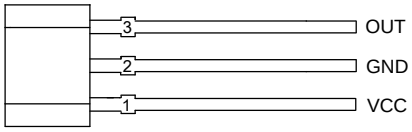
The KH3106 is a medium-sensitivity Unipolar Hall-effect switch with digital latched output, special designed for automotive, industrial and consumer applications.

The KH3106 combined with a voltage regulator, Hall voltage generator, small-signal amplifier, Dynamic offset cancellation system, Schmitt trigger and open-drain output. The integrated voltage regulator permits operation from 3.5V to 24V and extended choice of temperature range. The Chopper stabilized amplifier improves stability of magnetic switch points. If the magnetic flux density is larger than operating point (B_{OP}), the output will be turned on; if it is less than releasing point (B_{RP}), the output will be turned off.

The KH3106 is available in TO-92S-3 and SOT-23-3 packages which are optimized for most applications.

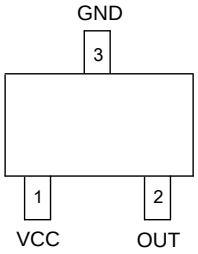
Pin Assignments

(Front View)



TO-92S-3

(Top View)



SOT-23-3

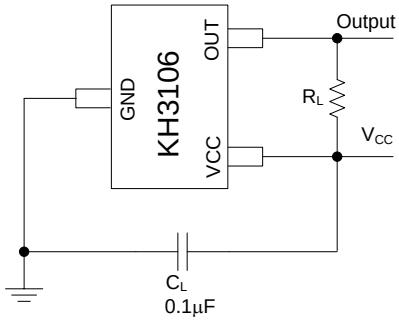
Features

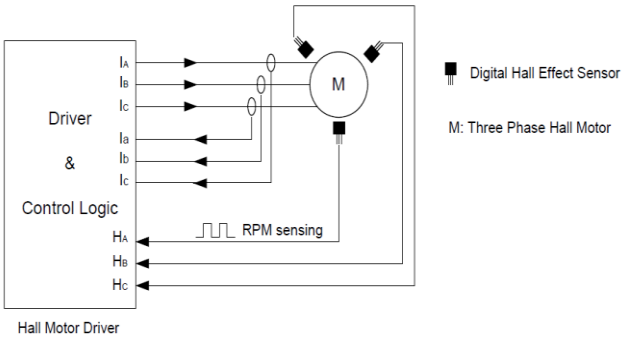
- 3.5V to 24V Wide Operating Voltage
- CMOS technology
- Stabilized Chopper
- Superior Temperature Stability: -40~+125℃
- Open drain Output
- 25mA Output Sink Current
- Lead Free package: TO-92S-3 and SOT23-3

Applications

- Rotor Position Sensing
- Current Switch
- Encoder
- RPM Detection
- Proximity Detection

Typical Applications Circuit





Pin Descriptions

Pin Number		Pin Name	Function
TO-92S-3	SOT-23-3		
1	1	VCC	Supply voltage
2	3	GND	Ground pin
3	2	OUT	Output Pin

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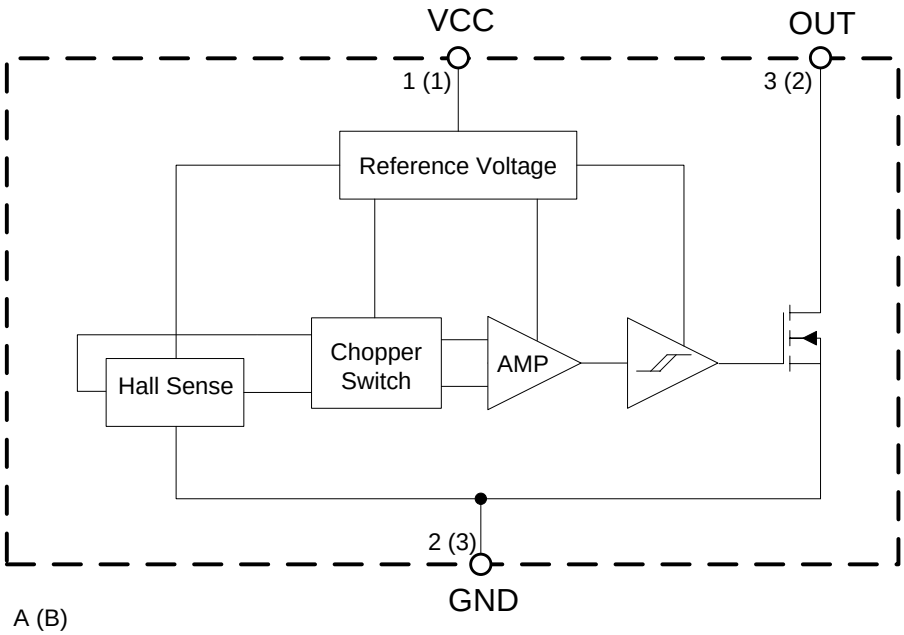
Functional Block Diagram



A (B)
A for TO-92S-3
B for SOT-23-3

Absolute Maximum Rates (@T_A=+25°C, Note 1)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	28		V
I_{CC}	Supply Current (Fault)	6		mA
V_{OUT}	Output Voltage	28		V
I_{OUT}	Output Current	50		mA
B	Magnetic Flux Density	Unlimited		Gauss
P_D	Power Dissipation	TO-92S-3	400	mW
		SOT-23-3	230	
T_{STG}	Storage Temperature	-55 to +150		°C
T_J	Junction Temperature	+150		°C
–	ESD (Human Body Model) (Note 2)	4000		V
–	ESD (Machine Model) (Note 2)	400		V

Notes: 1. Stresses greater than those listed under "Absolute Maximum Ratings" may 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 may affect device reliability.
2. Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3.5	24	V
T_{OP}	Operating Temperature	-40	+125	°C

Medium-sensitivity Unipolar Hall-Effect Switch

Electrical Characteristics ($@T_A$=+25°C, V_{CC}=12V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	3.5	12	24	V
I_{cc}	Supply current	VDD=3.5 to 24V, Output Off	–	2	5	mA
I_{LE}	Output Leakage current	Released	–	–	10	uA
V_{SAT}	Saturation Voltage	I_{OUT}=10mA	–	–	300	mV
		I_{OUT}=20mA	–	–	500	mV
T_r	Rise Time	RL=820 Ω ,CL=20pF	–	–	45	µs
T_f	Fall Time	RL=820 Ω ,CL=20pF	–	–	45	µs
Fsw	Maximum Switching Frequency	–	–	10	–	kHz

Magnetic Characteristics ($@T_A$=+25°C, V_{CC}=12V, unless otherwise specified. Note 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
B_{OP}	Operating Point	B>B_{OP},V_{OUT}=low(output on)	100	120	140	Gauss
B_{RP}	Releasing Point	B<B_{RP},V_{OUT}=high(output off)	70	90	110	Gauss
B_{HYS}	Hysteresis	| B_{OP} - B_{RP} | (Note 4)	10	30	50	Gauss

Notes: 3. The specifications stated here are guaranteed by design. 1 Gauss=0.1mT
4. B_{OP}=operating point (output turns on); B_{RP}=releasing point (output turns off)

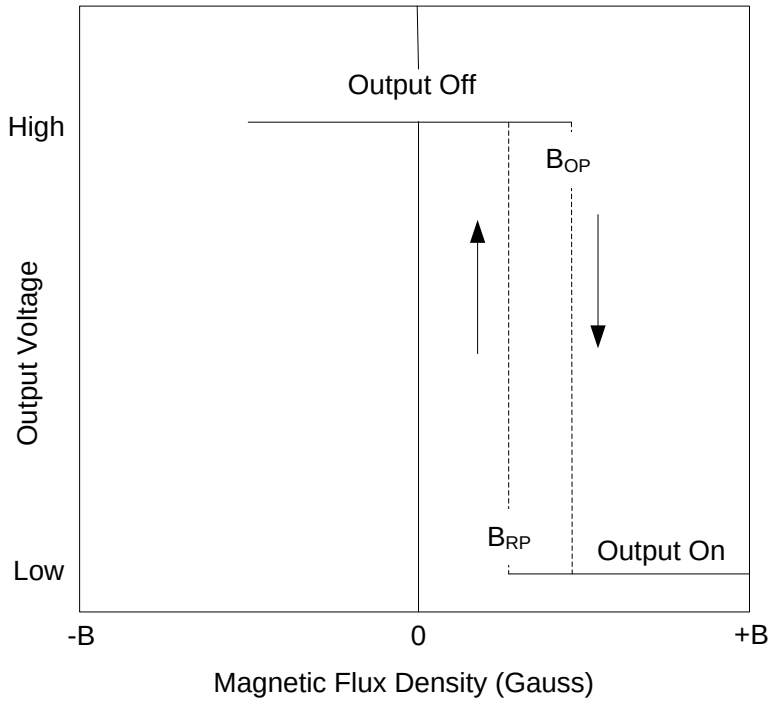
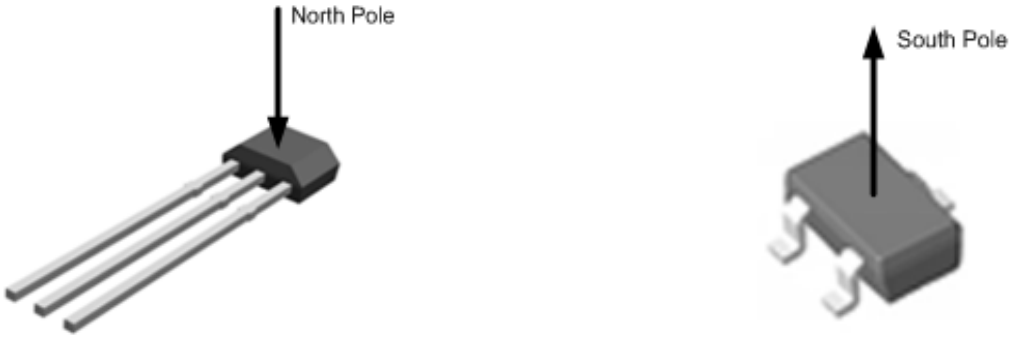


Figure 1. Output Voltage vs. Magnetic Flux Density



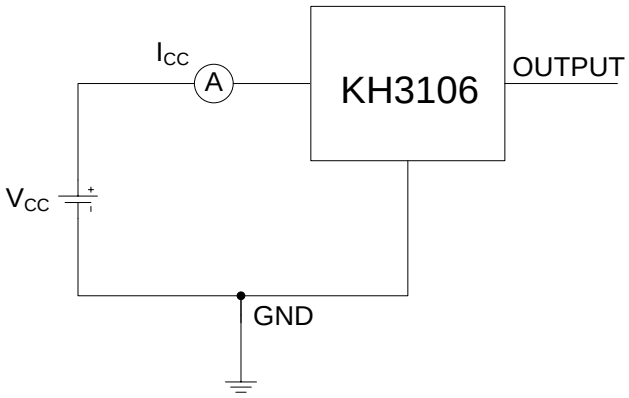
The TO-92S-3 package is north pole active and the SOT-23-3 package is south pole active. Removing the magnetic field (B=0) switches the output high.

Figure 2. Output Status vs. Magnetic Pole

Package Type	Parameter	Test Condition	Output
TO-92S-3	North Pole Active	$B > B_{OP}$	High
		$B < B_{RP}$	Low
SOT-23-3	South Pole Active	$B > B_{OP}$	High
		$B < B_{RP}$	Low

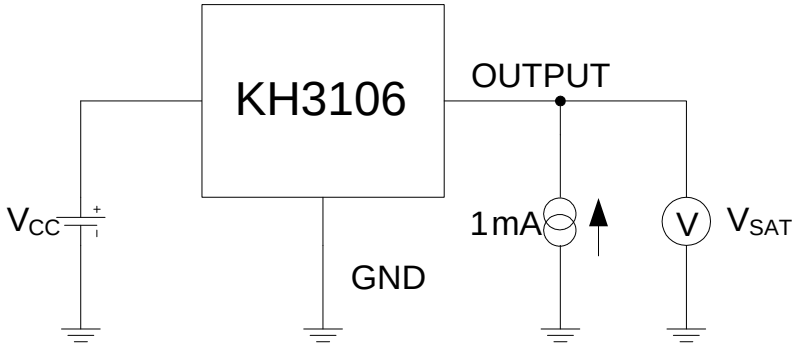
Table 1. Output Status vs. Magnetic Flux Density

Test Conditions



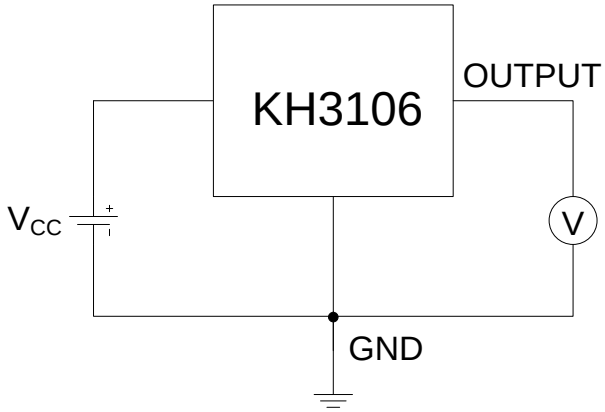
Supply Current (Note 5, Note 6)

Note 5: I_{CC} represents the supply current. OUTPUT is open during measurement.
Note 6: The device is put under magnetic field with $B<B_{RP}$.



Output Saturation Voltage (Note 7, Note 8)

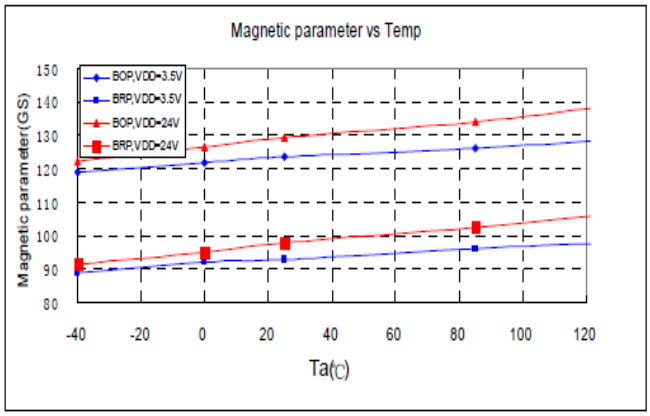
Note 7: The output saturation voltage V_{SAT} is measured at V_{CC}=3.5V and V_{CC}=24V.
Note 8: The device is put under magnetic field with B>B_{OP}.

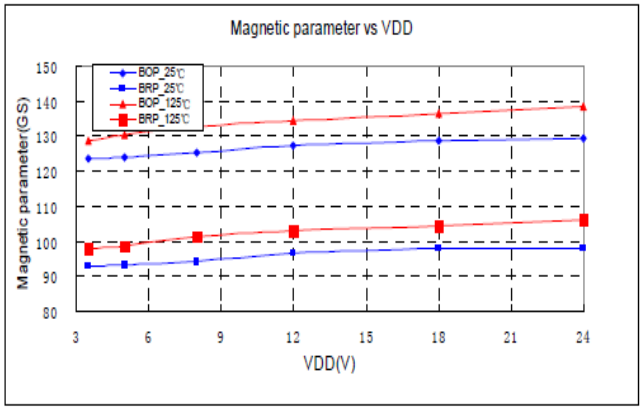


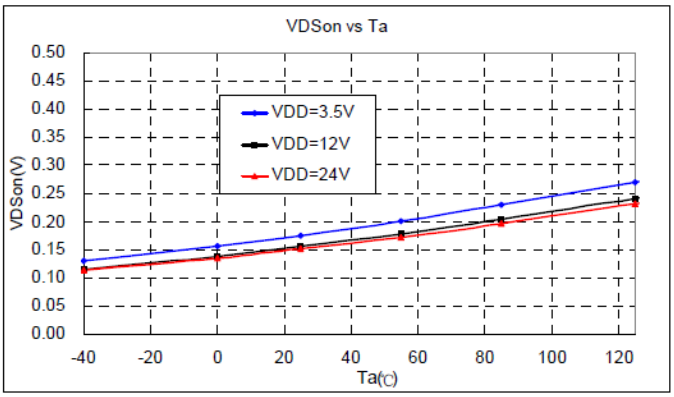
Magnetic Thresholds (Note 9, Note10)

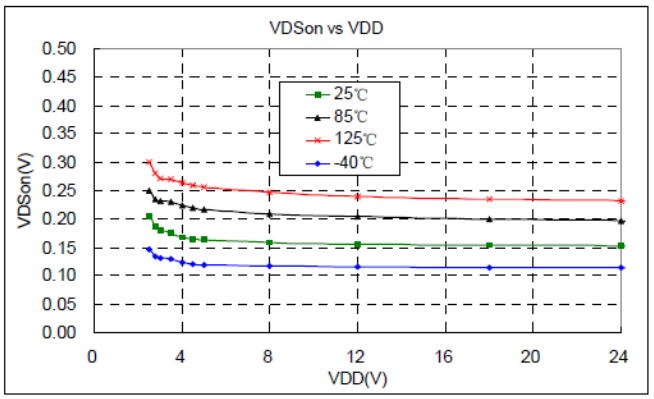
Note 9: B_{OP} is determined by putting the device under magnetic field swept from $B_{RP(min)}$ to $B_{OP(max)}$ until the output is switched on.
Note 10: B_{RP} is determined by putting the device under magnetic field swept from $B_{OP(max)}$ to $B_{RP(min)}$ until the output is switched off.

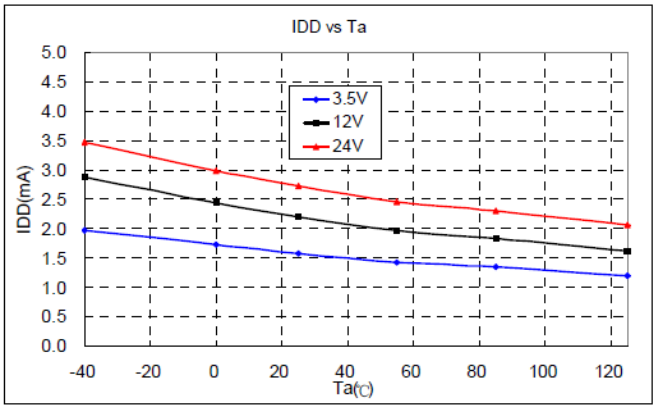
Performance Characteristics

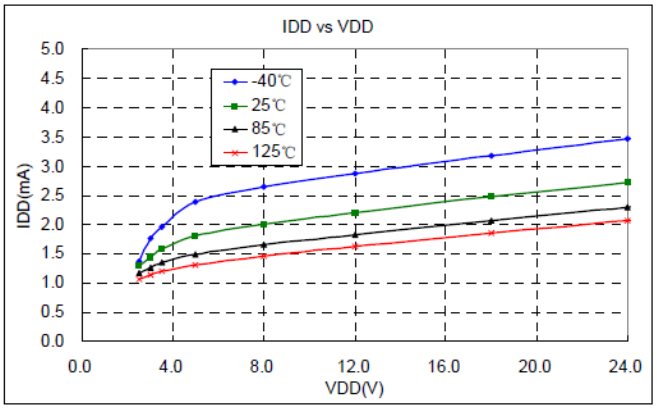


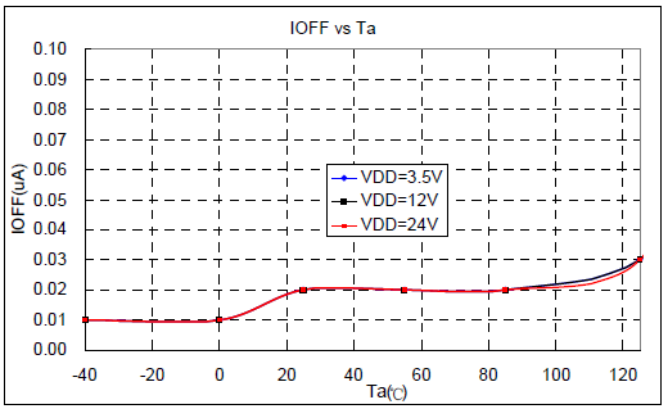


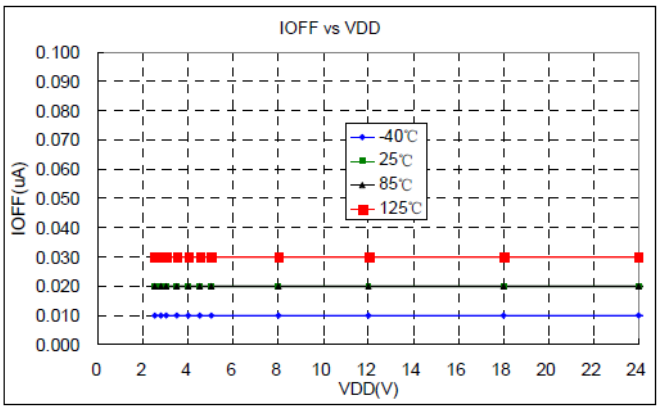

VDSon vs Ta
VDSon(V)
Ta(℃)
VDD=3.5V
VDD=12V
VDD=24V


VDSon vs VDD
VDSon(V)
VDD(V)
25℃
85℃
125℃
-40℃


IDD vs Ta
IDD(mA)
Ta(℃)
3.5V
12V
24V

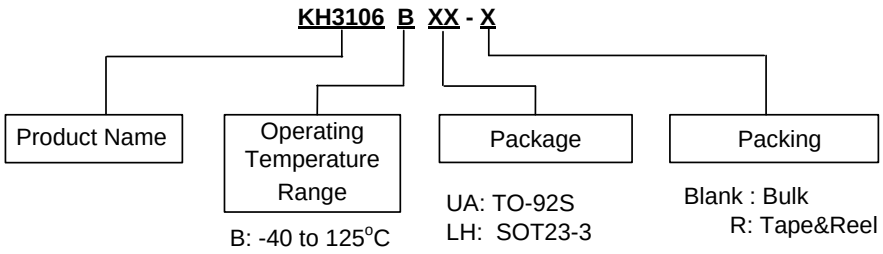

IDD vs VDD
IDD(mA)
VDD(V)
-40℃
25℃
85℃
125℃


IOFF vs Ta
IOFF(uA)
Ta(℃)
VDD=3.5V
VDD=12V
VDD=24V


IOFF vs VDD
IOFF(uA)
VDD(V)
-40℃
25℃
85℃
125℃

Medium-sensitivity Unipolar Hall-Effect Switch

Ordering Information



Our Pb-free products with "G1" suffix in the part number are RoHS compliant and green.

Package	Part Number	Marking ID	Packing Type
TO-92S	KH3106BUA	3106	1000/Bulk
SOT23-3	KH3106BLH-R	3106	3000/Tape&Reel

Marking Informaiton

Package Type: TO-92S

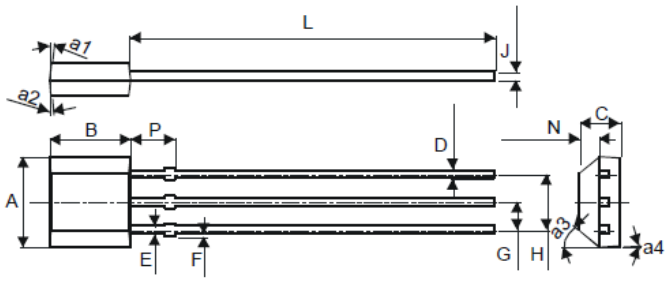
First lines: Marking ID
Second line: Date Code
Y: Year 0 to 9
WW: Week 00 to 52 (Work week of molding)
X: Internal Code

Package Type: SOT23-3

First lines: Marking ID

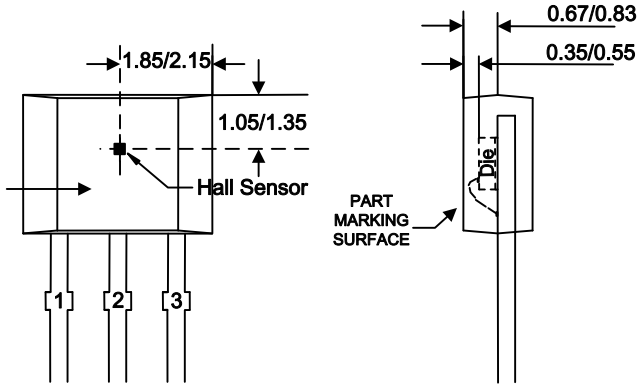
Package Outline Demension

Package Type: TO-92S



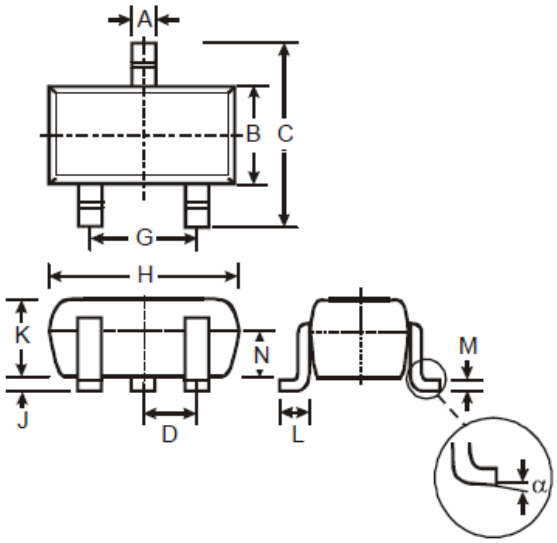
TO-92S		
Dim	Min	Max
A	4.0	4.2
a1	3° Typ	
a2	6° Typ	
a3	45° Typ	
a4	3° Typ	
B	3.08	3.28
C	1.48	1.68
D	0.36	0.56
E	0.44 Typ	
F	-0.05	0.20
G	1.27 Typ	
H	2.54 Typ	
J	0.38 Typ	
L	13.5	14.5
N	0.71	0.81
P	2.60	3.00
All Dimensions in mm		

Min/Max



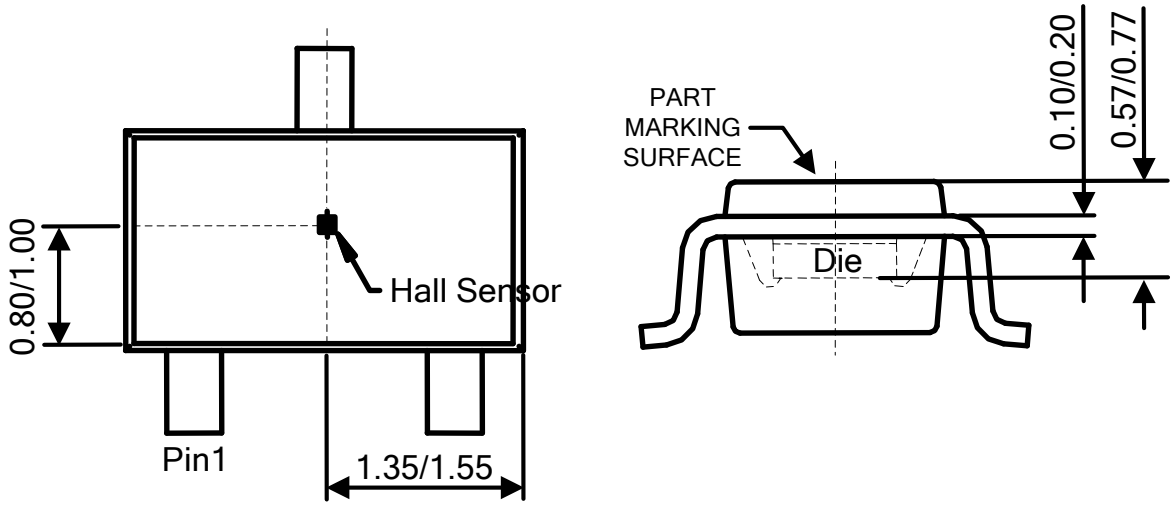
Sensor Location

Package Type: SOT23-3



SOT23-3			
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
α	0°	8°	-
All Dimensions in mm			

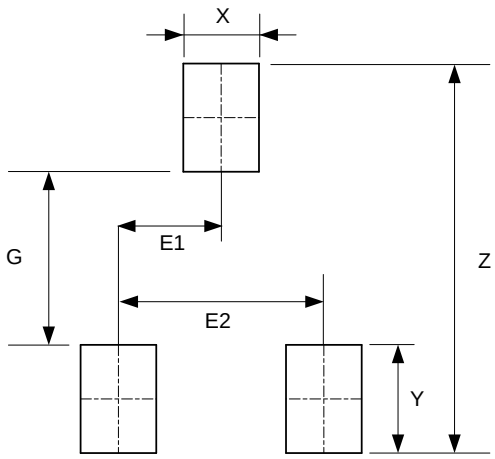
Min/Max



Sensor Location

Suggested Pad layout

Package Type:SOT-23-3



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

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