

## Hall Effect Sensor IC

### Features

- On-chip Hall Sensor
- Low Operating Supply Voltage : 3 V
- High Output Sinking Capability up to 400mA
- Versatile sensitivity and hysteresis setting
- Reliable and Rugged
- 4 pin TO-92M Package

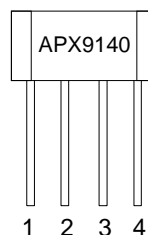
### General Description

The APX9140 is an integrated Hall Effect Sensor IC designed for electric commutation of DC brushless motor applications. The APX9140 still can operate at as low as 3 volts. The APX9140 is available in low cost TO -92M package with 3 different magnetic ranks.

### Applications

- Speed Measurement
- Revolution Counting
- Brushless DC Motor
- Brushless DC Fan

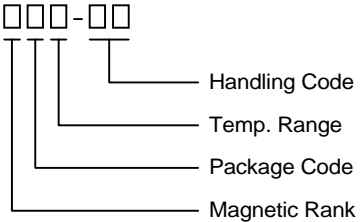
### Pin Description



Front View

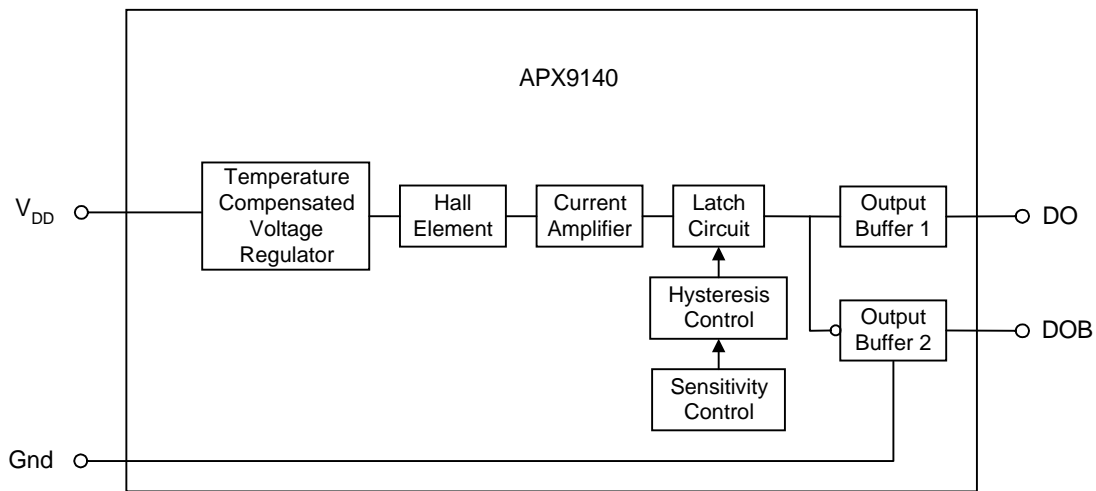
- 1 : V<sub>DD</sub>
- 2 : DO
- 3 : DOB
- 4 : GND

### Ordering Information

<p>APX9140 □□□-□□</p>  <p>Handling Code</p> <p>Temp. Range</p> <p>Package Code</p> <p>Magnetic Rank</p>	<p>Magnetic Rank</p> <p>A :   Bop , Brp   &lt; 70 Gauss</p> <p>B :   Bop , Brp   &lt; 100 Gauss</p> <p>D :   Bop , Brp   &lt; 150 Gauss</p> <p>Package Code</p> <p>E : TO - 92M4</p> <p>Temp. Range</p> <p>E : - 20 to 85 °C</p> <p>Handling Code</p> <p>PB : Plastic Bag                      TB : Tape &amp; Box</p> <p>TR : Tape &amp; Reel</p>
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ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

## Block Diagram



## Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating	Unit
$V_{DD}$	Supply Voltage	20	V
$V_{BD}$	Output Breakdown Voltage	55	V
$I_{DD}$	Supply Current	25	mA
$I_{OUT}$	Output Current – Continuous	400	mA
	Hold Current	600	
	Peak (Start Up)	800	
$P_D$	Maximum Power Dissipation	500	mW
$T_A$	Operating Ambient Temperature	-20 to 85	°C
$T_{STG}$	Storage Temperature Range	-65 to 150	
$T_{SOL}$	Soldering Temperature (10 Sec.)	260	

## Electrical Characteristics $T_A = 25^\circ\text{C}$ , $V_{DD}=14\text{V}$ unless otherwise noted

Symbol	Parameter	Test Condition	APX9140			Unit
			Min.	Typ.	Max.	
$V_{DD}$	Supply Voltage	Operating	3		20	V
$V_{SAT}$	Output Saturation Voltage	$V_{DD}=14\text{V}$ , $I_{OUT}=400\text{mA}$ , $B>Bop$		250	500	mV
$I_{DD}$	Supply Current	$V_{DD}=20\text{V}$ , Output Open		18	25	mA
$I_{Leak}$	Output Leakage Current	$V_{OUT}=20\text{V}$ , $V_{DD}=20\text{V}$ , $B<Brp$		<0.1	10	$\mu\text{A}$
$t_r^a$	Output Rise Time	$V_{DD}=14\text{V}$ , $R_L=820\Omega$ $C_L=20\text{pF}$		1.0	5	$\mu\text{s}$
$t_f^a$	Output Fall Time			0.1	1	$\mu\text{s}$
$\Delta t^a$	Switch Time Different			3.5	7	$\mu\text{s}$

Notes <sup>a</sup>: use Figure 1

**Magnetic Characteristics**  $T_A = 25^{\circ}\text{C}$ ,  $V_{DD}=14\text{V}$  unless otherwise noted

Rank	Maximum Operate Point Bop	Maximum Release Point Brp	Unit
A	+70	-70	Gauss
B	+100	-100	
D	+150	-150	

Notes : For 5cm and below DC fan application, grade A device is recommended to avoid magnetic sensitivity problem. For above 5cm DC fan application, grade B device is acceptable for most cases.

**Test Information**

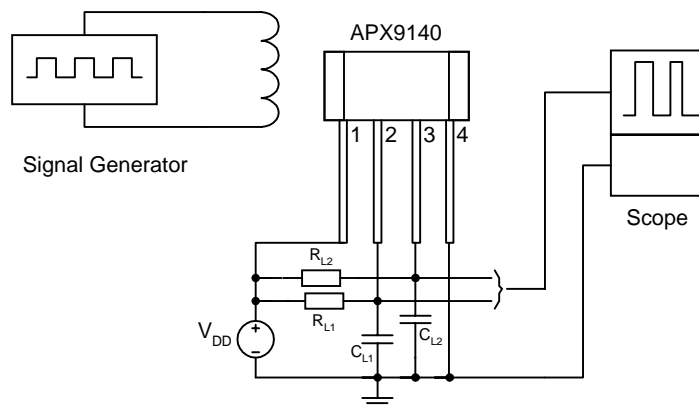


Figure 1 : Switching Circuit for Output Rise Time and Fall Time Measurement

**Application Circuit**

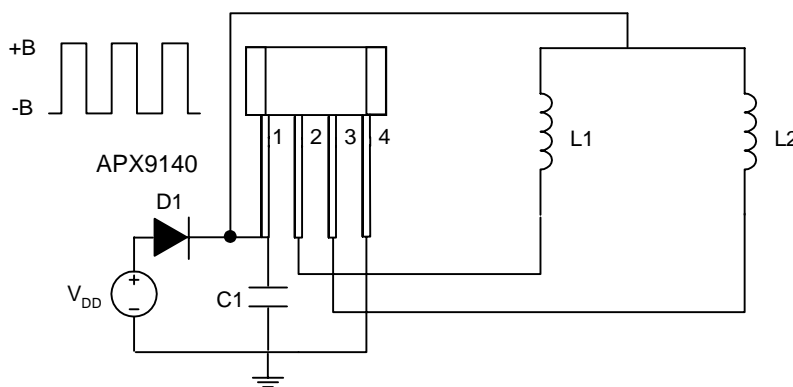
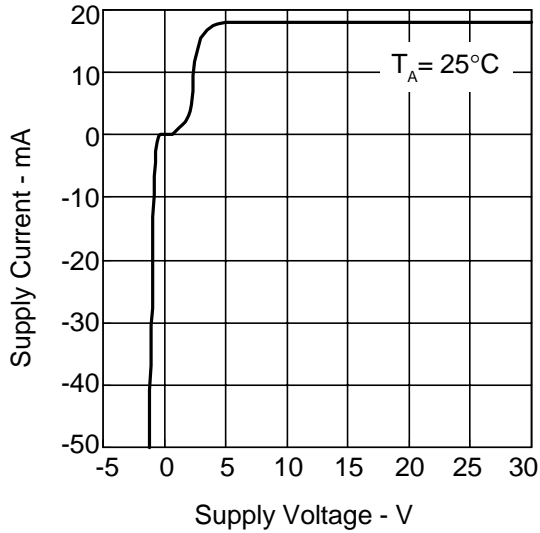


Figure 2 Typical DC brushless fan application circuit

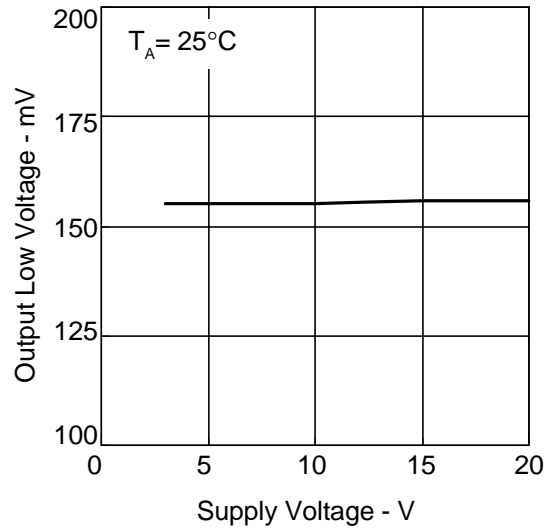
Note: Add diode(D1) for reverse voltage protection and add capacitor (C1) to eliminate high voltage spike into Hall IC.

## Typical Characteristics

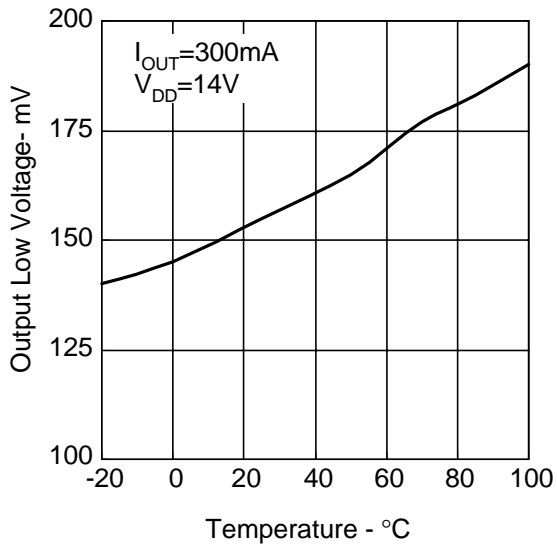
Supply Current Vs Supply Voltage



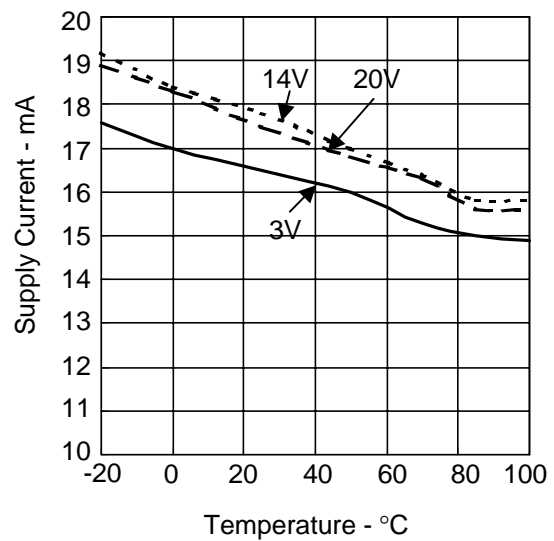
Output Low Voltage Vs Supply Voltage



Output Low Voltage vs Ambient Temperature

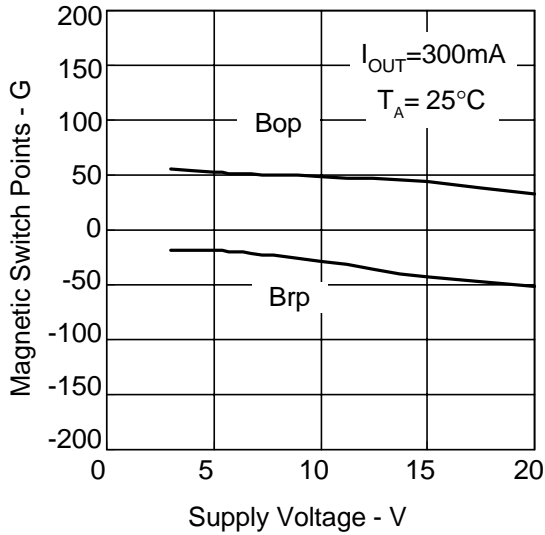


Supply Current vs Temperature

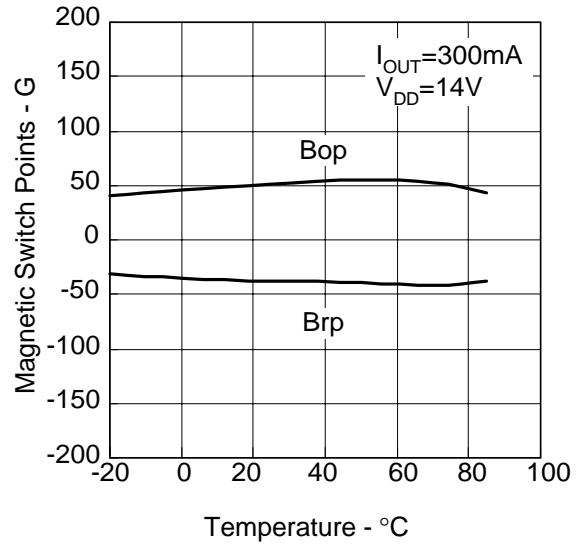


Typical Characteristics (Cont.)

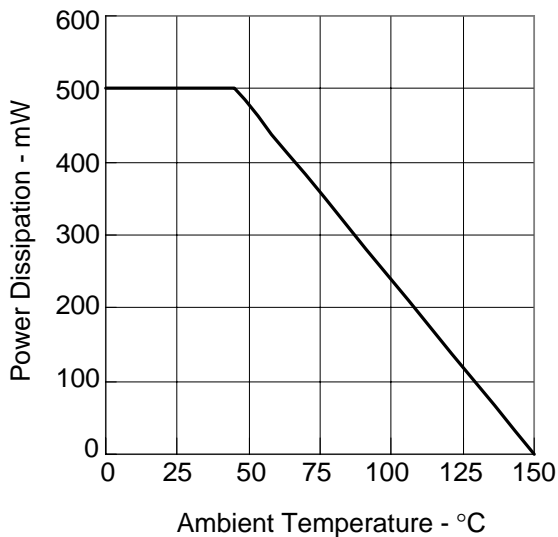
Magnetic Switch Points vs Supply Voltage



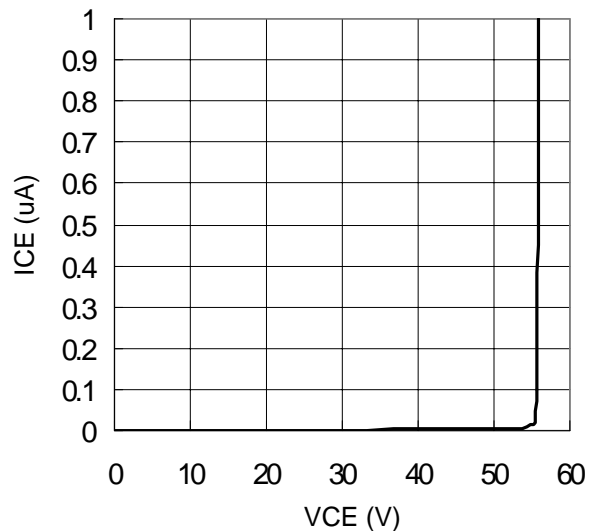
Magnetic Switch Points vs Temperature



Power Dissipation vs. Ambient Temperature

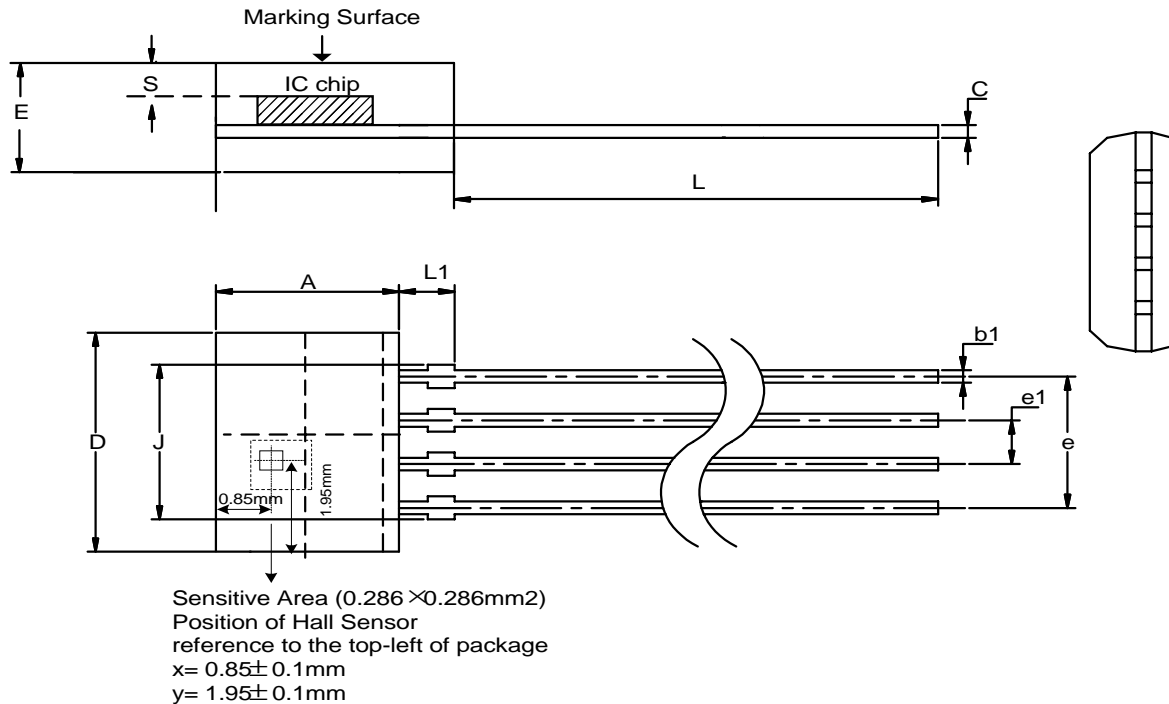


Output Breakdown Voltage



## Package Information

TO-92M4



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.60	3.70	0.141	0.145
b1	0.35	0.41	0.014	0.016
C	0.351	0.411	0.014	0.016
D	5.17	5.27	0.203	0.207
e	3.78	3.84	0.148	0.150
e1	1.24	1.30	0.049	0.051
E	1.50	1.60	0.059	0.063
J	4.04	4.34	0.158	0.170
L	14.0	15.0	0.549	0.588
L1	1.342	1.542	0.053	0.060
S	0.45	0.55	0.018	0.022

## Customer Service

### **Anpec Electronics Corp.**

Head Office :

5F, No. 2 Li-Hsin Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

Taipei Branch :

7F, No. 137, Lane 235, Pac Chiao Rd.,

Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.

Tel : 886-2-89191368

Fax : 886-2-89191369