

Ratiometric Linear Hall-Effect IC, Analog Output

1 Product Description

The MT910XDT-1616 device is a linear Hall effect IC that responds proportionally to magnetic flux density. The device can be used for accurate position sensing in a wide range of applications.

The device operates from 3.0V to 5.5V power supplies. When no magnetic field is present, the analog output drives $\frac{1}{2}$ of Vcc. The output changes linearly with the applied magnetic flux density, and four sensitivity options enable maximal output voltage swing based on the required sensing range. North and south magnetic poles produce unique voltages.

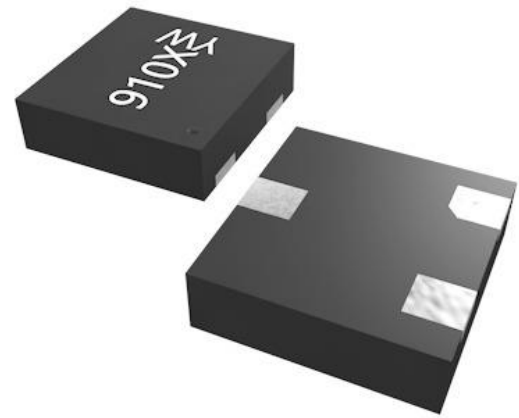
The MT910XDT-1616 family provides a variety of packages to customers. DFN1616 for surface mount and RoHS compliant.

2 Features

- BCD Technology
- Factory-programmed
- Ratiometric Rail to Rail Analog Output
- Low-Noise Output
- 3.0~5.5V Operating Vcc Range
- -40°C~150°C Operating Temperature
- Package Option: DFN1616
- Magnetic Sensitivity Option:
 - 1.00mV/Gs MT9101 Series @Vcc = 3.3V
 - 1.60mV/Gs MT9102 Series @Vcc = 3.3V
 - 2.15mV/Gs MT9103 Series @Vcc = 3.3V
 - 3.15mV/Gs MT9105 Series @Vcc = 3.3V
- RoHS Compliant: (EU)2015/863

3 Product Overview of MT910XDT-1616

Part No.	Description
MT910XDT-1616	DFN1616, tape & reel (3000pcs/bag)



4 Applications

- Home appliances
- Industrial
- Speed Detection
- Position Detection
- Magnetic Encoder
- Ferrous Metal Sensing
- Vibration Sensing
- Weight Sensing

5. Pin Configuration and Functions

	Vcc	Out	GND
DFN1616	1	3	2
Description	Power	Output	Ground

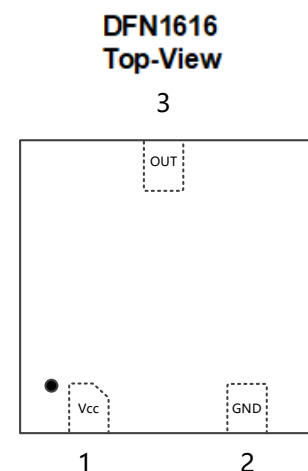


Figure.1 Pin Configuration & Functions

Table of Contents

1	Product Description.....	1
2	Features.....	1
3	Product Overview of MT910XDT-1616.....	1
4	Applications.....	1
5	Pin Configuration and Functions.....	1
6	Transfer Characteristics.....	3
7	Function Description.....	3
8	Feature Description.....	3
9	Functional Block Diagram.....	4
10	Electrical and Magnetic Characteristics.....	4
	10.1 Absolute Maximum Ratings.....	4
	10.2 ESD Ratings.....	4
	10.3 Electrical Specifications.....	5
	10.4 Magnetic Characteristics.....	6
	10.5 Characteristic Performance.....	7
11	Typical Application Circuit.....	9
12	Package Material Information.....	10
	12.1 DFN1616 Package Information.....	11
13	Copy Rights and Disclaimer.....	12

Reversion History

- 1 Originally Version

6 Transfer Characteristics

Figure.2 show four sensitivity options enable maximal output voltage swing based on the required sensing range

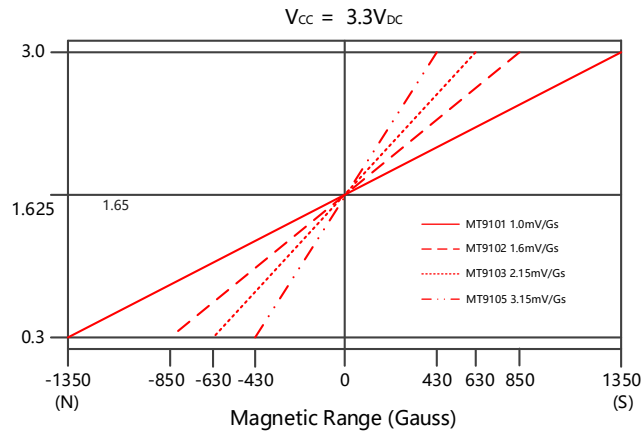


Figure.2 Transfer Characteristics ($V_{CC}=3.3V$)

7 Function Description

The device produces a linear response when the output voltage is within the specified voltage range. Outside this range, sensitivity is reduced and nonlinear

8 Feature Description

The MT910XDT-1616 device is sensitive to the magnetic field component that is perpendicular to the top of the package

When the magnetic field moving from the left side of the IC to the middle which showed in the left of the Figure.3, the V_{OUT} changing from 0.3 to 1.65V linearity when $V_{CC}=3.3V$

When the magnetic field located at the middle of the IC which showed in the middle of the Figure.3, the V_{OUT} is 1.65V (1/2 of the $V_{CC}=3.3V$)

When the magnetic field moving from the middle side of the IC to the right which showed in the right of the Figure.3, the V_{OUT} changing from 1.65 to 3V linearity when $V_{CC}=3.3V$

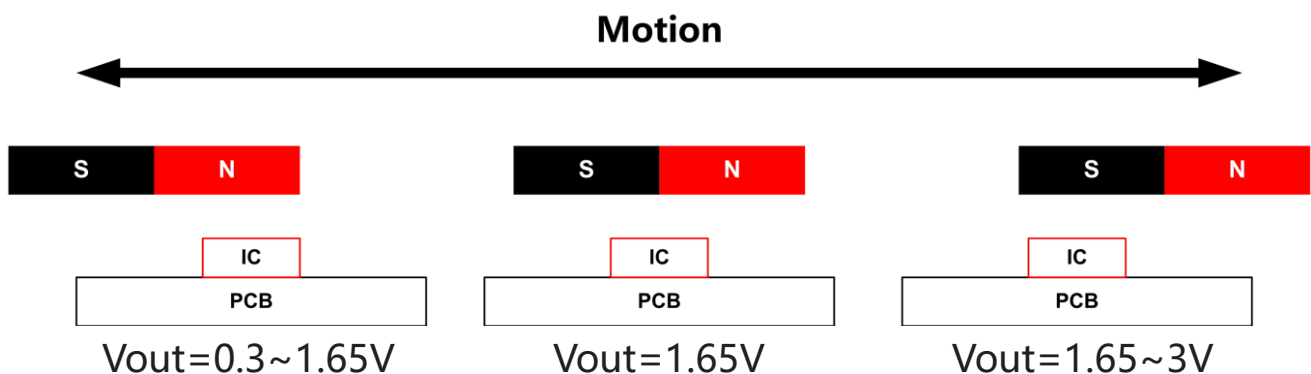


Figure.3 Feature Description

9 Functional Block Diagram

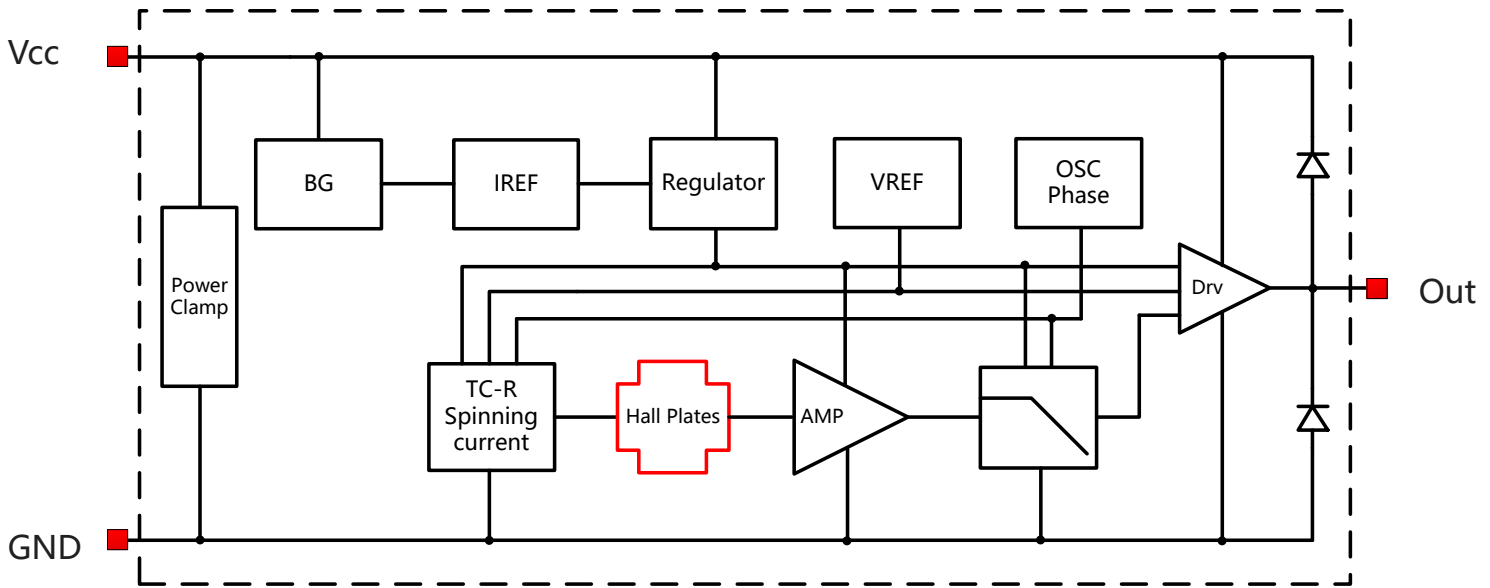


Figure.4 Functional Block Diagram

10 Electrical and Magnetic Characteristics

10.1 Absolute Maximum Ratings

Absolute maximum ratings are limited values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Symbol	Parameters	Min	Max	Units
VCC	Supply Voltage	-	30	V
VRCC	Reverse Battery Voltage	-0.2	-	V
VOUT	Output Voltage	-	30	V
IOUT	Continuous Output Current	-5	5	mA
TA	Operating Ambient Temperature	-40	150	°C
TS	Storage Temperature	-40	150	°C
TJ	Junction Temperature	-	165	°C

10.2 ESD Ratings

Symbol	Reference	Values	Unit	
VESD	Human-body model (HBM)	AEC-Q100-002	±3000	V
	Charged-device model (CDM)	AEC-Q100-011	±1000	V

10.3 Electrical Specifications

At $T_A = -40 \sim 150 \text{ }^\circ\text{C}$, $V_{CC} = 3.0\text{V} \sim 5.5\text{V}$ (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage		3.0	-	5.5	V
I_{CC}	Supply Current	$V_{CC} = 3.3\text{V}$; $B = 0$	-	6.0	7.0	mA
T_{PO}	Power on Time	$dV_{CC}/dt \geq 5\text{V}/\mu\text{s}$	-	-	30	μs
I_{SINK}	Sink Current	$B = 0$; $V_{OUT} = V_{CC}$	-1.5	-	-	mA
I_{SOURCE}	Source Current	$B = 0$; $V_{OUT} = 0$	-	-	1.5	mA
BW	Bandwidth		20	30	-	KHz
F_C	Chopper Frequency		-	780	-	KHz
T_{RESP}	Response Time	$T_A = 25^\circ\text{C}$	-	15	-	μs
T_R	Rise Time	$T_A = 25^\circ\text{C}$	-	12	-	μs
T_{PD}	Propagation Delay	$T_A = 25^\circ\text{C}$	-	5.5	-	μs
N_F	Noise	$B = 0$; $T_A = 25^\circ\text{C}$	-	1.9	2.6	mG/root(Hz)
		MT9101; $T_A = 25^\circ\text{C}$	-	1.46	-	mV _{RMS}
		MT9102; $T_A = 25^\circ\text{C}$	-	2.44	-	mV _{RMS}
		MT9103; $T_A = 25^\circ\text{C}$	-	3.32	-	mV _{RMS}
		MT9105; $T_A = 25^\circ\text{C}$	-	4.88	-	mV _{RMS}
R_{OUT}	Output Resistance	$I_{OUT} \leq \pm 1.5\text{mA}$ $V_{OUT} = 2.5\text{V}$	-	2	4	Ohm
R_L	Output Loading Resistance	$I_{OUT} \leq 1.5\text{mA}$ Output to GND or to V_{CC}	4.7	-	-	Kohm
C_L	Output Loading Capacitance	$I_{OUT} \leq \pm 1.5\text{mA}$ Output to GND	-	-	10	nF
R_{TH}	Thermal Resistance	DFN1616	-	301	-	$^\circ\text{C}/\text{W}$

10.4 Magnetic Characteristics

At $T_A = -40 \sim 150 \text{ }^\circ\text{C}$, $V_{CC} = 3.0\text{V} \sim 5.5\text{V}$ (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
LIN	Linearity		-1.5	-	1.5	%
V _{NULL}	Quiescent Voltage	$V_{CC} = 3.3\text{V}; B = 0$ $T_A = 25^\circ\text{C}$	1.630	1.650	1.670	V
V _{NULL} (V)	Ratiometry, V _{NULL}		-1.5	-	1.5	%
V _{NULL} (T)	V _{NULL} Variation Over Temperature		-1.5	-	1.5	%
S _{SENS} (T)	S _{SENS} Variation Over Temperature		-10	-	10	%
S _{SENS}	Sensitivity $T_A = 25^\circ\text{C}; V_{CC} = 3.3\text{V}$	MT9101	0.900	1.000	1.100	mV/Gs
		MT9102	1.464	1.600	1.736	mV/Gs
		MT9103	1.967	2.150	2.333	mV/Gs
		MT9105	2.880	3.150	3.420	mV/Gs
B	Magnetic Field Range $T_A = 25^\circ\text{C}; V_{CC} = 3.3\text{V}$	MT9101	-	± 1350	-	Gs
		MT9102	-	± 850	-	Gs
		MT9103	-	± 630	-	Gs
		MT9105	-	± 430	-	Gs

10.5 Characteristic Performance

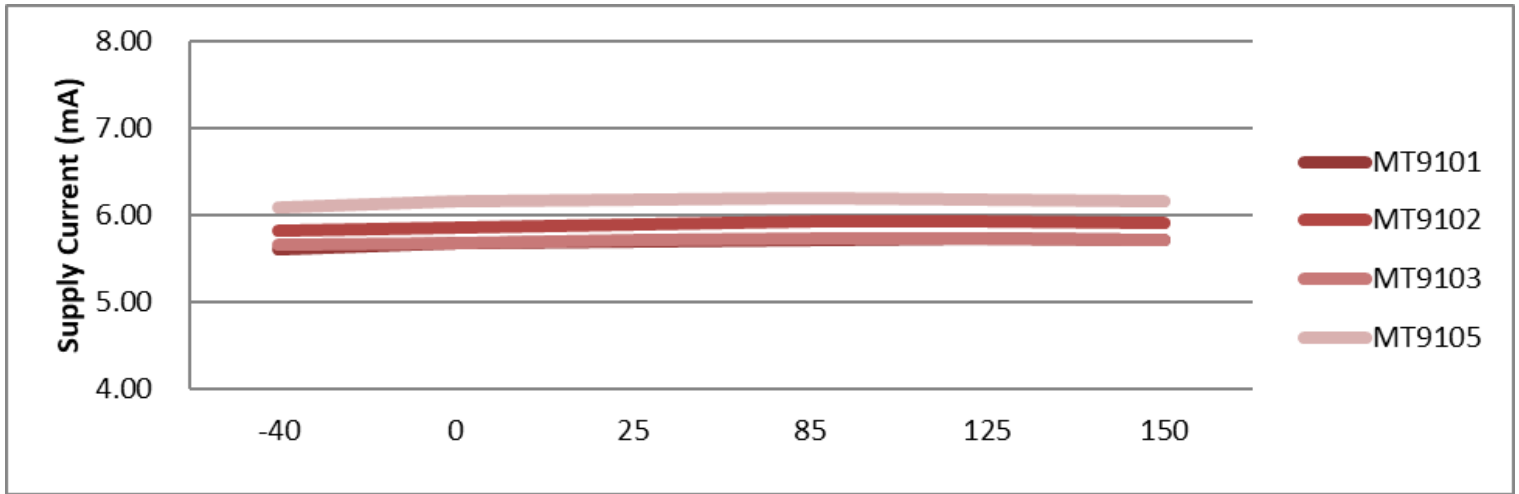


Figure.5 Supply Current vs. Temperature (At Vcc=3.3V)

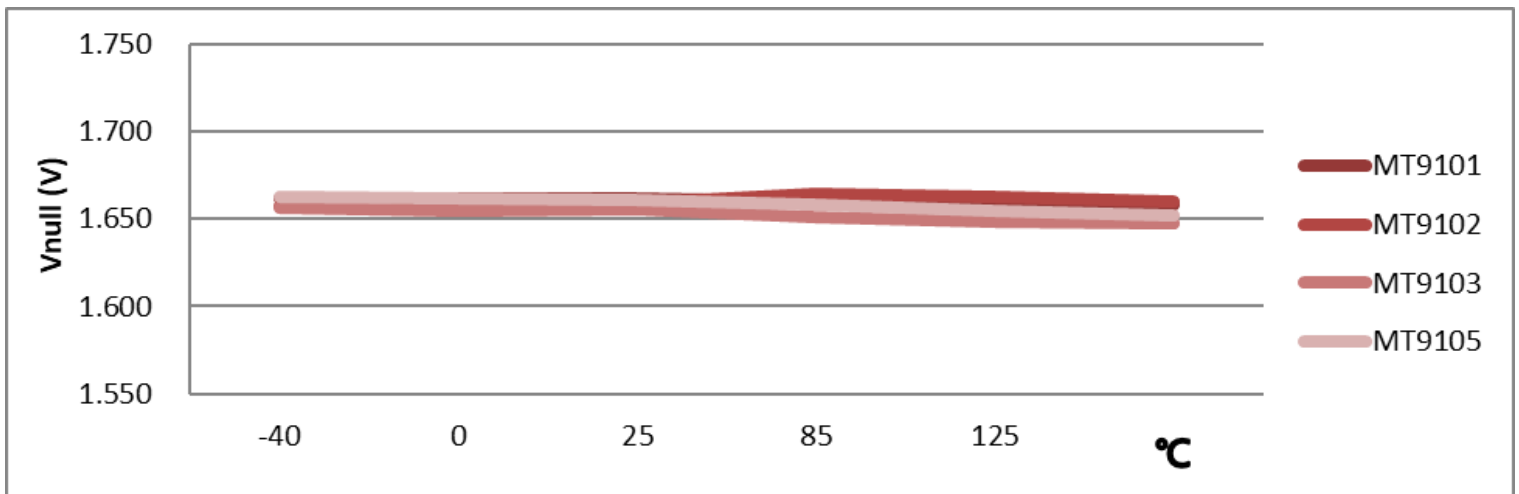


Figure.6 Vnull vs. Temperature (At Vcc=3.3V)

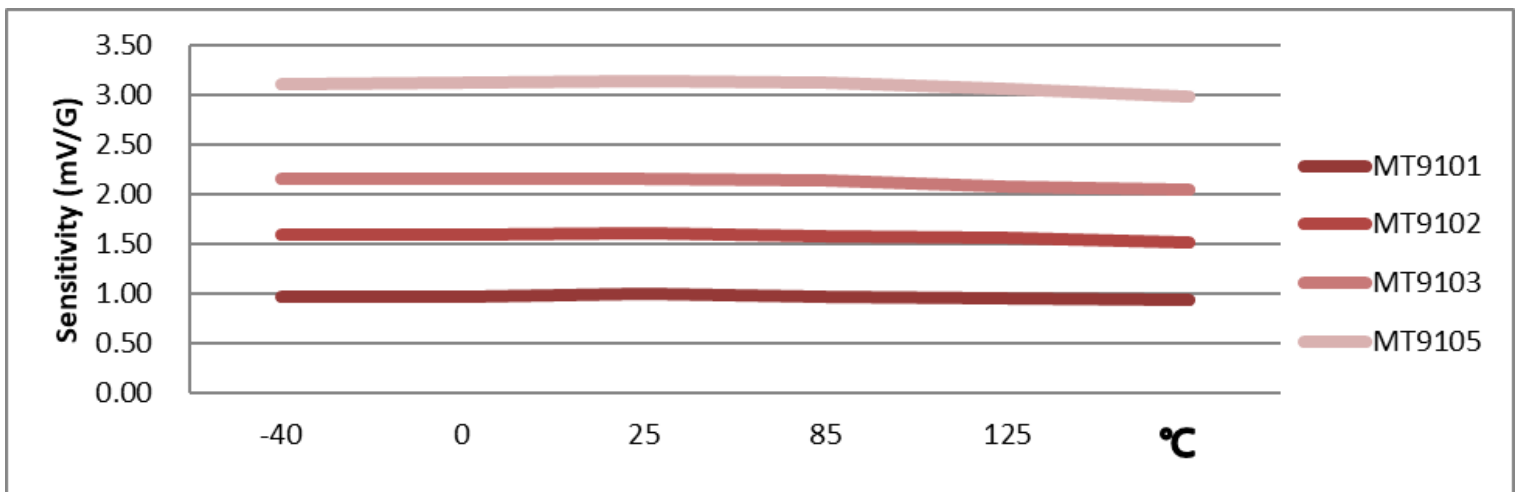


Figure.7 Sensitivity vs. Temperature (At Vcc=3.3V)

10.5 Characteristic Performance (continued)

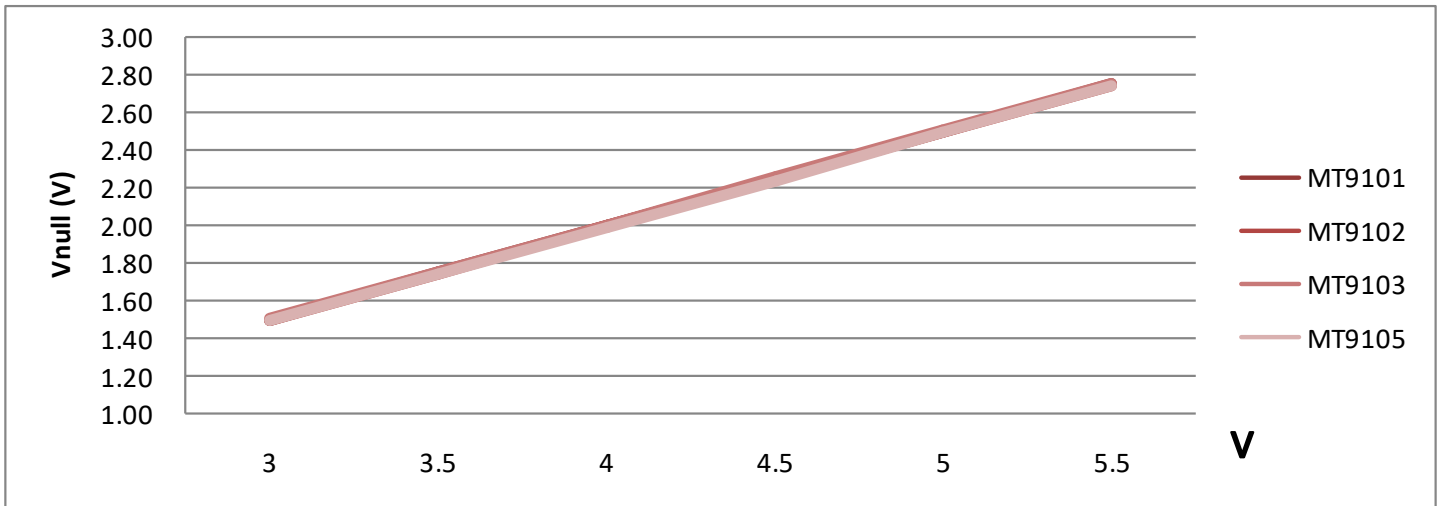


Figure.8 VNULL vs. Vcc (At B=0Gs; TA=25°C)

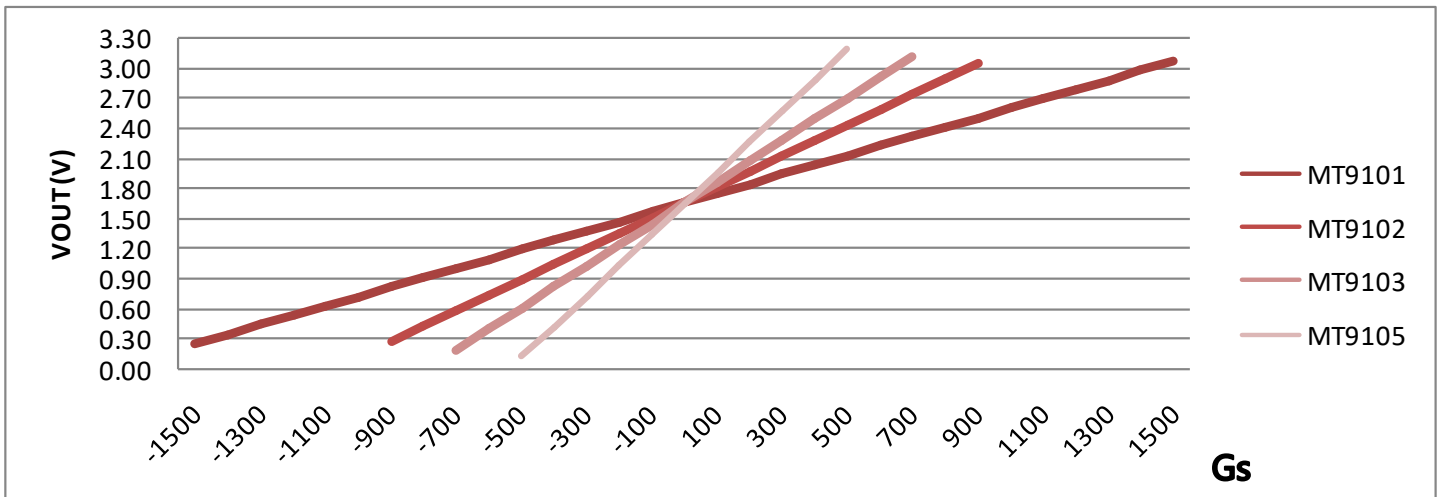


Figure.9 VOUT vs. Magnetic Field (At VCC=3.3V; TA=25°C)

11 Typical Application Circuit

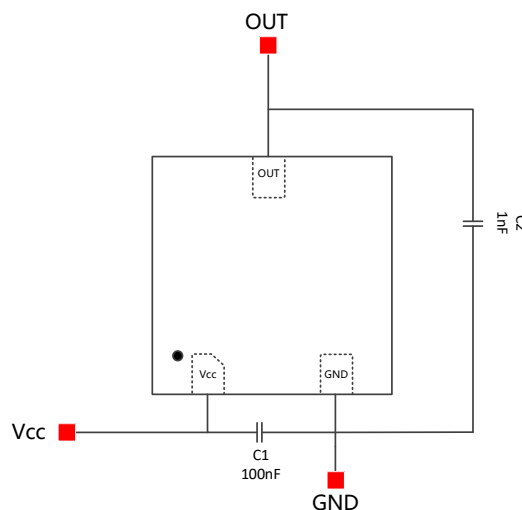


Figure.10 Typical Application Circuit

12 Package Material Information (For Reference Only – Not for Tooling Use)

12.1 DFN1616 Package Information

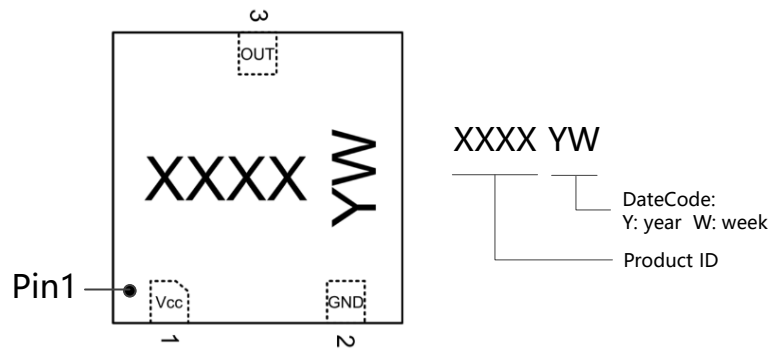


Figure.11 DFN1616 Chip Marking Spec

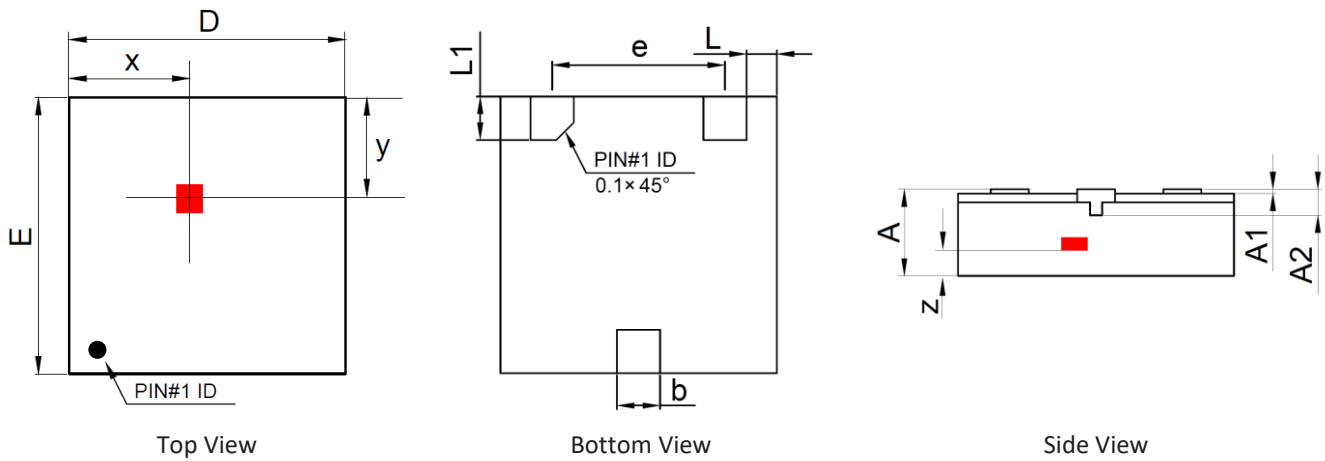


Figure.12 DFN1616 Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.450	0.550	0.018	0.022
A1	0.000	0.050	0.000	0.002
A2	0.150 TYP		0.006 TYP	
L	0.175 TYP		0.007 TYP	
L1	0.200	0.300	0.008	0.012
D	1.550	1.650	0.061	0.065
E	1.550	1.650	0.061	0.065
b	0.200	0.300	0.008	0.012
e	0.950	1.050	0.037	0.041
x	0.800		0.031	
y	0.650		0.026	
z	0.130		0.005	

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