

Feature

- Two-wire current interface
- Self adjust magnetic range
- High speed operation frequency
- Zero speed detection
- No direction of rotation concern
- Short circuit protection
- RoHs Compliant 2011/65/EU

Application

- ABS sensor
- Gear tooth sensor
- Cam sensor

Product Description

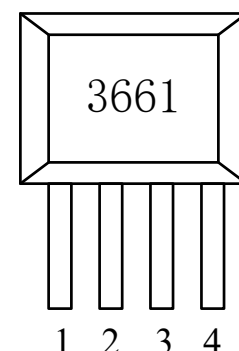
The MT3661 is gear tooth sensor IC for use in automotive camshaft sensing. MT3661 is used with a bias magnet south facing the back (no mark) side of the IC. The technology used for the IC is Hall-effect based. The Chip incorporate Hall Effect plate, an A/D converter with self-calibrates the internal gain of the device to adjust the air-gap variations. And digital sample and hold circuit, Schmitt trigger and short circuit protected.

The output has been designed as a two wire current interface. As the gear tooth rotate, the chip sample an increasing or decreasing flux density. When the flux has reached its minimum value and increased hysteresis flux, the $I_{DD}(on)$ is 14mA(typical). When the flux has reached its maximum value and decreased hysteresis flux, the $I_{DD}(off)$ is 7mA(typical).

The MT3661 is ideal for use in gather speed, position and direction detection to those gear-tooth based configurations. Particularly suited to those applications that require accurate duty cycle or accurate edge detection, such as automotive camshaft sensing.

Pin definition

Name	Number	Description
V_{DD}	1	Connects power supply to chip
V_{DD}	2	Connects power supply to chip
GND	3	Ground terminal
GND	4	Ground terminal

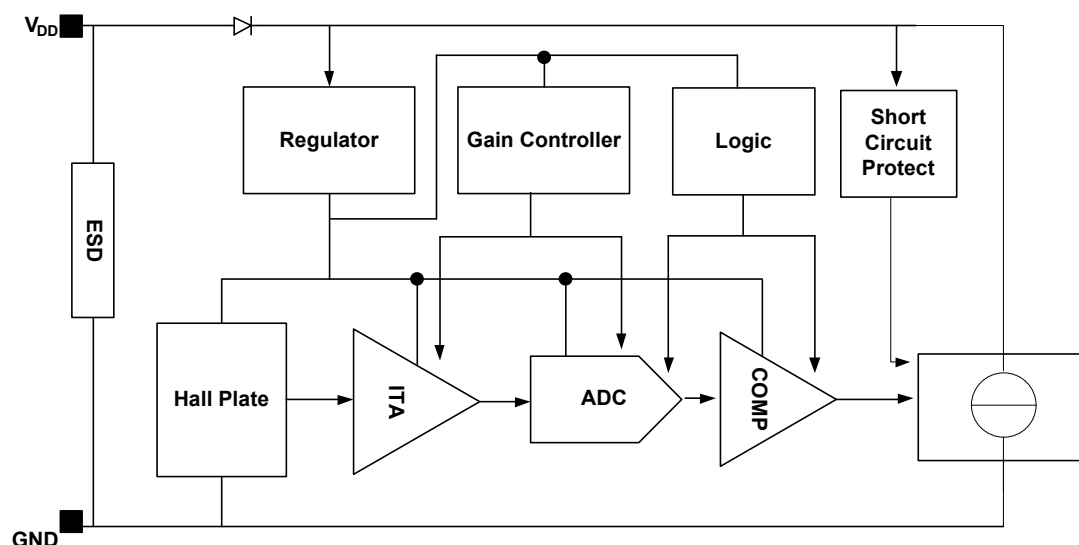


Family members

Part Number	Description
MT3661A	Flat TO-94 package ,bulk packaging(1000pcs/bag)

The MT3661 is provided in a 4-pin Flat TO-94 that is Pb(lead) free with 100% matt tin plated leadframe

Block Diagram



Electrical and Magnetic Characteristics

Absolute Maximum Rating

Absolute maximum ratings are limiting 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.

Absolute maximum ratings: all voltages listed are referenced to GND

Symbol	Parameters	Min	Max	Unit
V_{DD}	Supply Voltage(Operating)	-0.5	28	V
I_{DD}	Supply Current(Fault)	--	50	mA
T_A	Operating Temperature Range	-40	150	°C
T_S	Storage Temperature Range	-65	150	°C
T_J	Junction Temperature Range	--	170	°C

Magnetic Characteristics

At $T_A = -40^{\circ}\text{C}$ to 150°C , $V_{DD} = 4.5\text{V}$ to 24V (Unless other specified)

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units
B_{BIAS}	Back bias range	Operating	10	--	500	mT
B_{LIN}	Linear region	$V_{DD} = 12\text{V}$	50	--	400	mT
B_{HYST}	Hysteresis window		1	2	3	mT

Note: 10Gauss=1mT.

Electrical CharacteristicsAt $T_A = -40^{\circ}\text{C}$ to 150°C , $V_{DD} = 4.5\text{V}$ to 24V (Unless other specified)

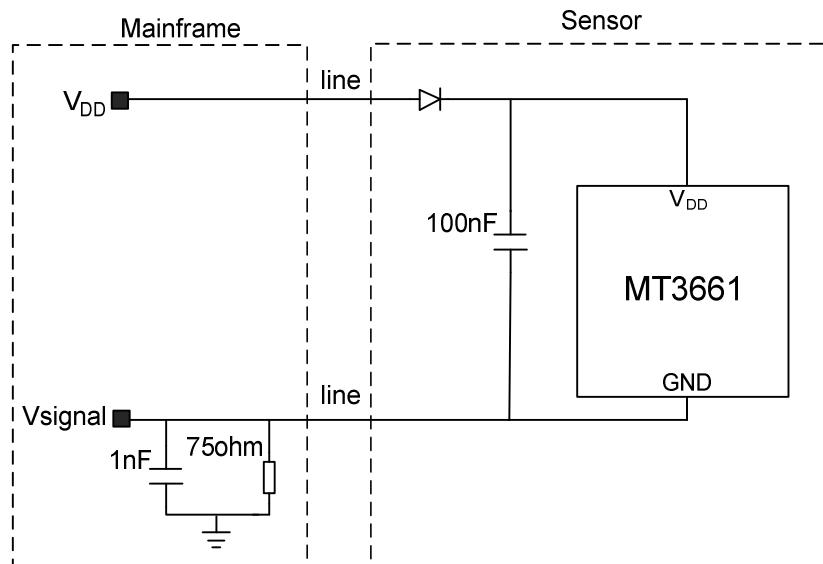
Symbol	Parameters	Test Conditions	Min	Typ	Max	Units
V_{DD}	Supply voltage	Operating	4.5	12	24	V
$I_{DD(\text{Off})}$	Supply current off	$V_{DD} = 12\text{V}$	5.5	7.0	8.5	mA
$I_{DD(\text{on})}$	Supply current on	$V_{DD} = 12\text{V}$	12.0	14.0	16.5	mA
POS	Power-up state	$V_{DD} > V_{DD(\text{min})}$	--	H	--	
I_{DD}	Supply current	$V_{DD} = 4.5\text{V}$ to 24V	3.0	--	20.0	mA
I_{LIMIT}	Output current limit	$V_{DD} = 12\text{V}$	50	100	150	mA
T_R	Output rise time	$I_{DD} = 4\text{mA} \rightarrow 16\text{mA}$	--	--	1.0	us
T_F	Output fall time	$I_{DD} = 16\text{mA} \rightarrow 4\text{mA}$	--	--	1.0	us
F_{CLK}	Internal Clock frequency	Operating	400	500	600	KHz
F_{SW}	Maximum switching frequency		20	--	--	KHz
I_{SH}	Output short circuit current		50	100	150	mA
T_{SH}	Output short circuit shutdown		50	100	150	us
RTH	TO-94 package thermal resistance		--	230	--	$^{\circ}\text{C/W}$

Device Evaluation Standard: EMC (Electromagnetic Compatibility)

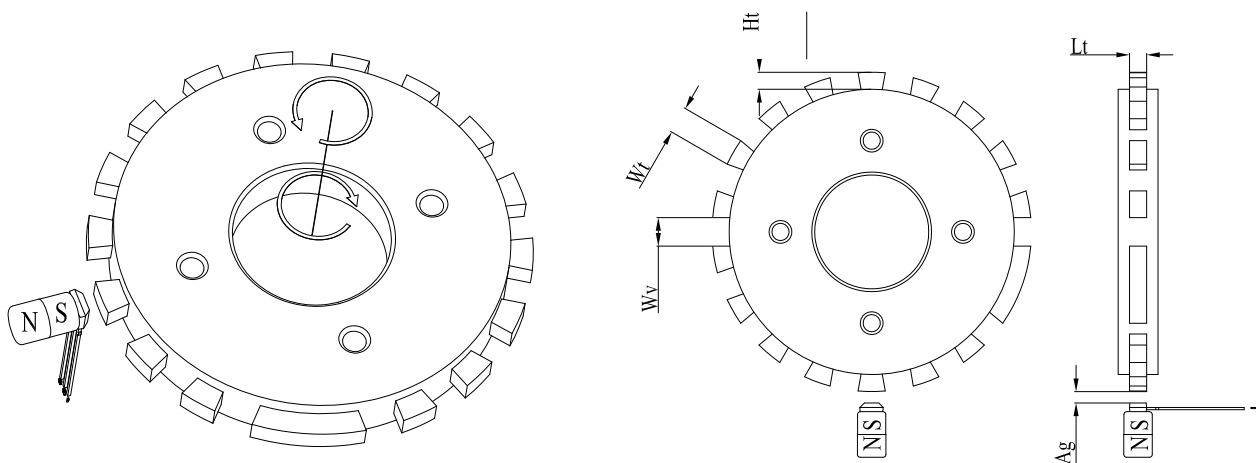
Test name	Reference Specification
ESD-Human Body Model	JEDEC EIA /JESD22-A114F
ESD-Machine Model	JEDEC EIA /JESD22-A115
Conducted Transients	ISO 7637-1
Direct RF Injection	ISO11452-7
TEM Cell	ISO11452-3

Application Information

Application Circuit



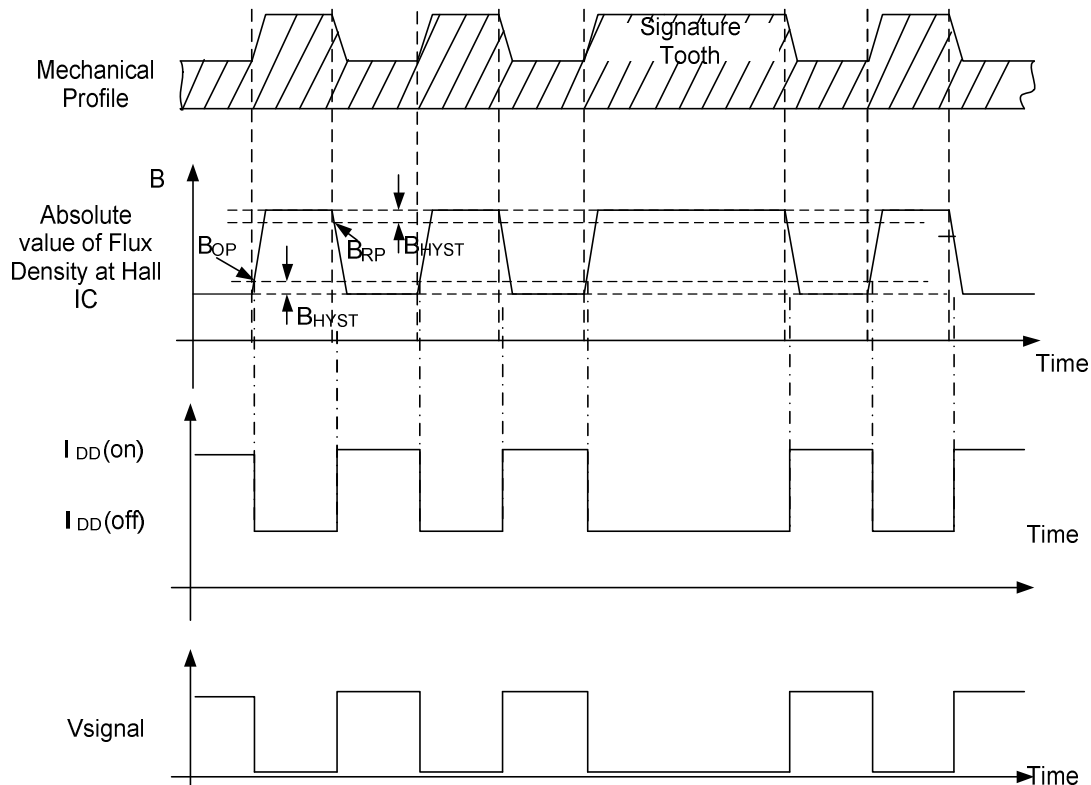
Configuration with Radial-Tooth



For the generation of adequate magnetic field level, the following recommendations should be followed in the design and specification of targets:

Symbol	Parameters	Min	Typ	Max	Units
AG	Distance of air gap	0.5	--	2.5	mm
H _T	Height of tooth	3.0	--	--	mm
L _T	Length of tooth	3.0	--	--	mm
W _T	Width of tooth	2.0	--	--	mm
W _V	Width of valley	2.0	--	--	mm
Material	Low carbon steel				

Operating Waveform



B_{OP} : Operate point, switches the I_{DD} ON ($I_{DD(on)}=14mA$)

B_{RP} : Release point, switches the I_{DD} OFF ($I_{DD(off)}=7mA$)

Application Note:

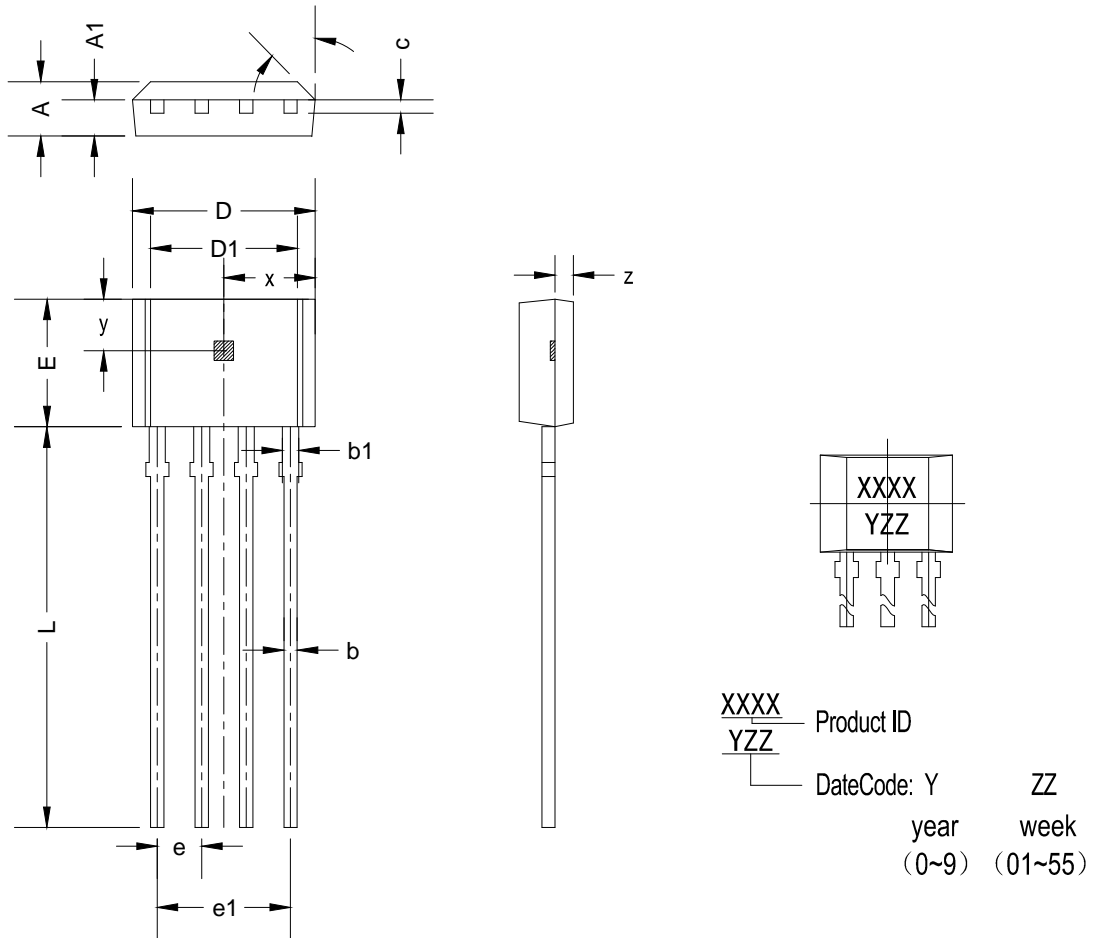
Maximum dynamic range is 500 mT, linear dynamic range is 400mT. The hysteresis is fixed at 4mT, When the magnetic loop provides peak magnetic flux at the chip near the high end of the linear range of 400mT, best angular accuracy will be get.

The I_{DD} is reset to the low level (I_{DD} is off) at chip power on whatever the magnetic field is. The output only changes after the first min is detected.

If the power supply of the chip is raised slowly, the reset state will be not stable,

The bias magnet must be glued to the back surface (unbranded side) of the IC, the south pole face the unbranded side of the device.

PACKAGE DESIGNATOR (MT3661A) Flat TO-94



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.660	0.056	0.065
A1	0.660	0.860	0.026	0.034
b	0.350	0.480	0.014	0.019
b1	0.400	0.650	0.016	0.026
c	0.360	0.510	0.014	0.020
D	5.100	5.320	0.201	0.210
D1	4.100	4.300	0.161	0.169
E	3.550	3.750	0.140	0.147
e	1.267	1.273	0.050	0.050
e1	3.780	3.840	0.149	0.151
L	13.500	15.500	0.531	0.610
x	2.605TYP		0.103TYP	
y	1.825TYP		0.072TYP	
z	0.500TYP		0.020TYP	
θ	10°	12°	10°	12°