MTL200QA

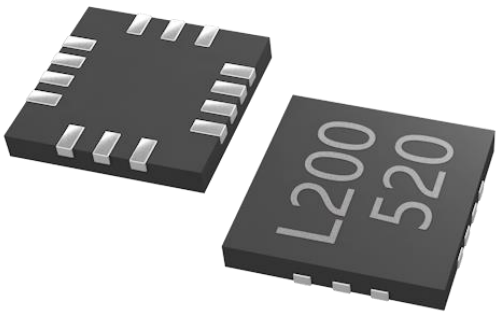
Integrated Solution of Inductive Position Sensor

1 Product Description

The MTL200QA supports all kinds of inductive position sensors.

The MTL200QA is a IC which can process all kinds of inductive position sensor signals. It integrates oscillator & LDO & temperature sensor & signal processing module.

The MTL200QA provides QFN2*2-14L for surface mount (MSL2)，RoHS compliant.



2 Features

- 3.6~5.5V Operating VCC Range
- Sampling Frequency: Up to 4KHz
- Oscillator Frequency: Up to 5MHz
- -40℃~105℃ Operating Temperature
- Input Signal Threshold Adjustment
- Package Option: QFN2*2
- RoHS Compliant: (EU)2015/863

3 Product Overview of MTL200QA

Part No.	Description
MTL200QA	QFN2*2-14L，tape & reel (3000pcs/bag)

4 Applications

- Inductive Position Sensor

5. Pin Configuration and Functions

No.	Name	Description
1	VCC	Power Supply
2	CTRL	Control Pin
3	RHY	Hysteresis Setting
4	RDI	Distance Setting
5	LC	LC Oscillator
6	NC	
7	Out	Digital Output
8	NC	
9	Vrefer In	Reference In
10	ANA Out	Analog Out
11	Temp Out	Temp. Out
12	GND	Ground
13	NC	
14	NC	

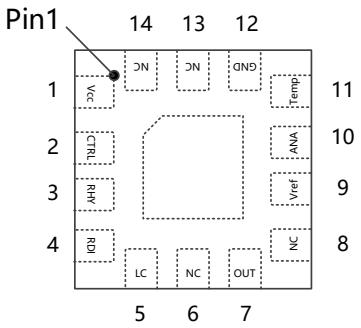


Figure.1 Pin Configuration & Functions

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Reversion History

1	1.0 Version	Originally Version
2	1.1 Version	Update the Product Overview

6 Functional Block Diagram

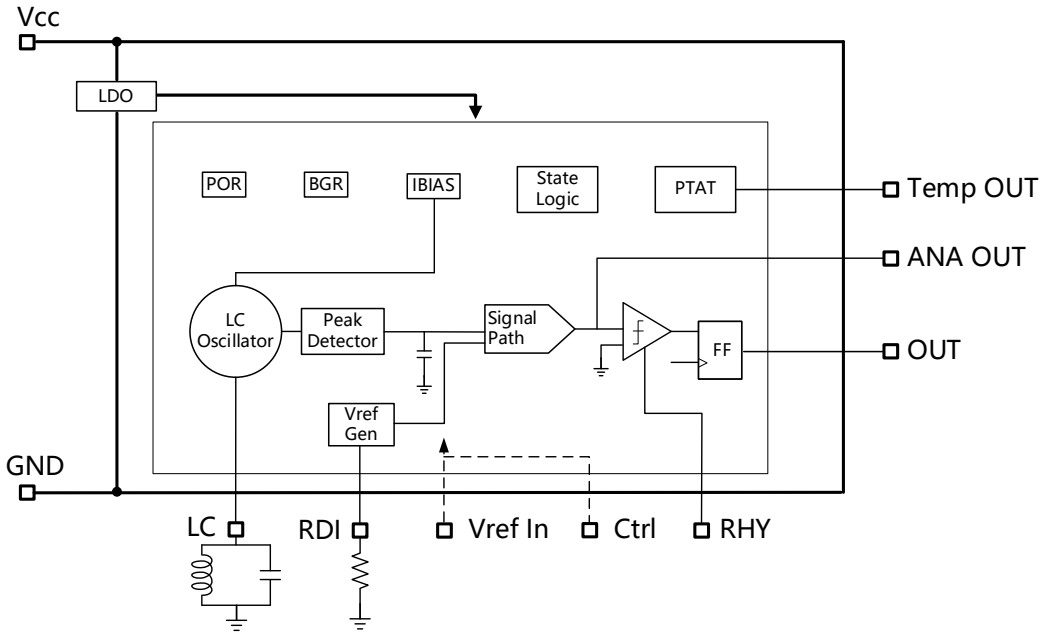


Figure.2 Functional Block Diagram

7 Electrical and Magnetic Characteristics

7.1 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
All voltages listed are referenced to GND.

Symbol	Parameters	Min	Max	Units
V_{CC}	Supply Voltage	-	7	V
V_{OUT}	Output Voltage	-	7	V
V_{RDI}、V_{RHY}、V_{ANA_OUT}、V_{TEMP}、V_{CTRL}、V_{REFER}	I/O pin Voltage	-	7	V
V_{LC}	LC pin Voltage	-7	7	V
I_{OUT}	Continuous Output Current	-10	10	mA
T_A	Operating Ambient Temperature	-40	105	℃
T_S	Storage Temperature	-50	150	℃

7.2 ESD Ratings

Symbol	Parameters	Reference	Values	Unit
V_{ESD}	Human-body model (HBM)	AEC-Q100-002	2000	V
	Charged-device model (CDM)	AEC-Q100-011	1500	V

7.3 Electrical Specifications

At T_A=-40~105 ℃, Vcc=3.6V~5.5V (unless otherwise specified)

Symbol	Parameters	Test Condition	Min	Typ	Max	Unit
V_{CC}	Supply Voltage		3.6	-	5.5	V
I_{CC}	Supply Current	V_{CC}=5V	-	-	2	mA
R_{DI}	R_{DI} Resistance		-	-	Rp of the LC Coil	Ohm
R_{HY}	R_{HY} Resistance	Series Application	-	R_{DI}/30	-	Ohm
		Parallel Application	-	40*R_{DI}	-	Ohm
V_{SAT}	Output Saturation Voltage	I_{OUT}=5mA; Output On	-	-	0.5	V
I_{OFF}	Output Leakage Current	Output Off	-	-	1	uA
$F_{Sampling}$	Sampling Frequency	Vcc=5V Target @ ½ D_{OP} (Max)	-	4	-	KHz
D_{OP}	Operation Point of Detection (Can be adjusted through R_{DI})	The Ratio of the Coil' s Diameter (Depends on the performance of the Coil)	50	-	150	%
D_{HYST}	Detection Hysteresis (Can be adjusted through R_{HY})	The Ratio of the Detection Distance	1		20	%
T_R	Output Rise Time	RL=10KΩ; CL=20pf;	-	-	1	us
T_F	Output Fall Time	RL=10KΩ; CL=20pf;	-	-	1	us
T_{PO}	Power on Time	Without the Settling Time of the Coil	-	8	15	ms
PA	Position Accuracy	1 sigma of Q Value < 1.5%	-10	-	+10	%
RA	Repetition Accuracy		-	-	3	%
F_{osc}	Oscillator Frequency		-	-	5	MHz
A_{OSC}	Oscillator Amplitude	Depends on the Rp & R_{DI} of the the Coil		3.6	-	Vpp
ANA_{OUT}	ANA Out	Depends on the Rp & R_{DI} of the the Coil	0.70		3.0	V
$TEMP_{OUT}$	TEMP. Out	-40℃ ~ 110℃	0.75		1.5	V

8 Typical Application Circuit

This typical application circuit provides user integration solution of the inductive position sensor. MTL200QA integrates oscillator & LDO & temperature sensor & signal processing module. MT5201DT integrates LDO & driver & circuit protection module (short circuit protection/over current protection/reversed power supply protection/reversed output protection/out Temp. protection). Small footprint (MTL200QA: 2mm*2mm & MT5201DT: 2mm*3mm) makes user easily cover the small size of the inductive position sensor.

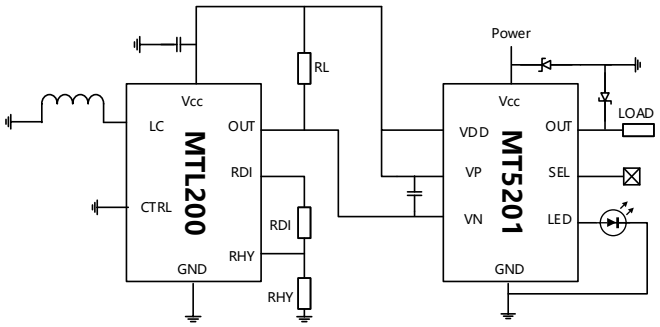


Figure.3 Series Application of RDI & RHY (MTL200QA + MT5201DT) Normal Open Connection

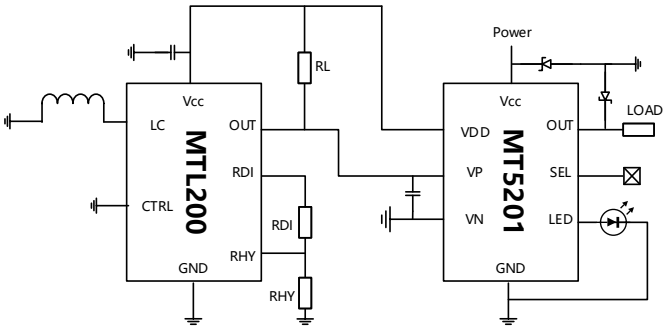


Figure.4 Series Application of RDI & RHY (MTL200QA + MT5201DT) Normal Close Connection

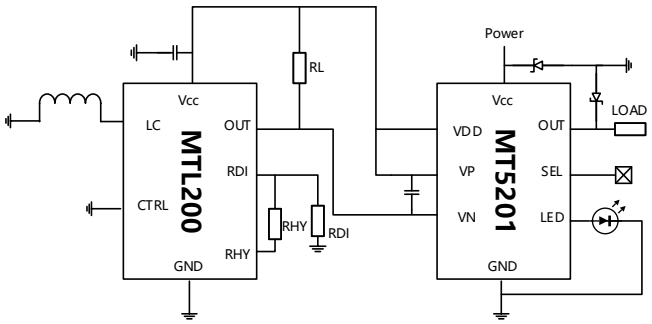


Figure.5 Parallel Application of RDI & RHY (MTL200QA + MT5201DT) Normal Open Connection

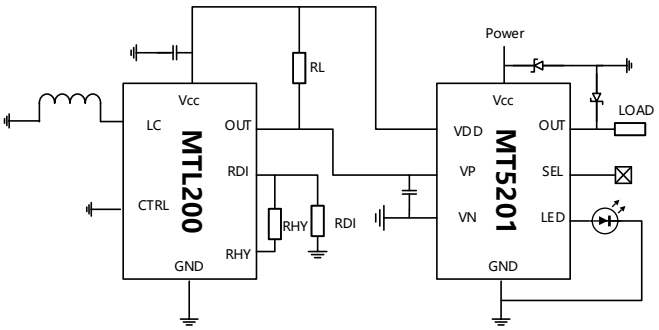


Figure.6 Parallel Application of RDI & RHY (MTL200QA + MT5201DT) Normal Close Connection

MTL200QA Out		VN	VP	NPN Out	PNP Out	LED
To VN (Figure.3 & Figure.5) (NO Connection)	Off	VDD	VDD	High	Low	Off
To VN (Figure.3 & Figure.5) (NO Connection)	On	GND	VDD	Low	High	On
To VP (Figure.4 & Figure.6) (NC Connection)	Off	GND	VDD	Low	High	On
To VP (Figure.4 & Figure.6) (NC Connection)	On	GND	GND	High	Low	Off

9 Characteristic Performance

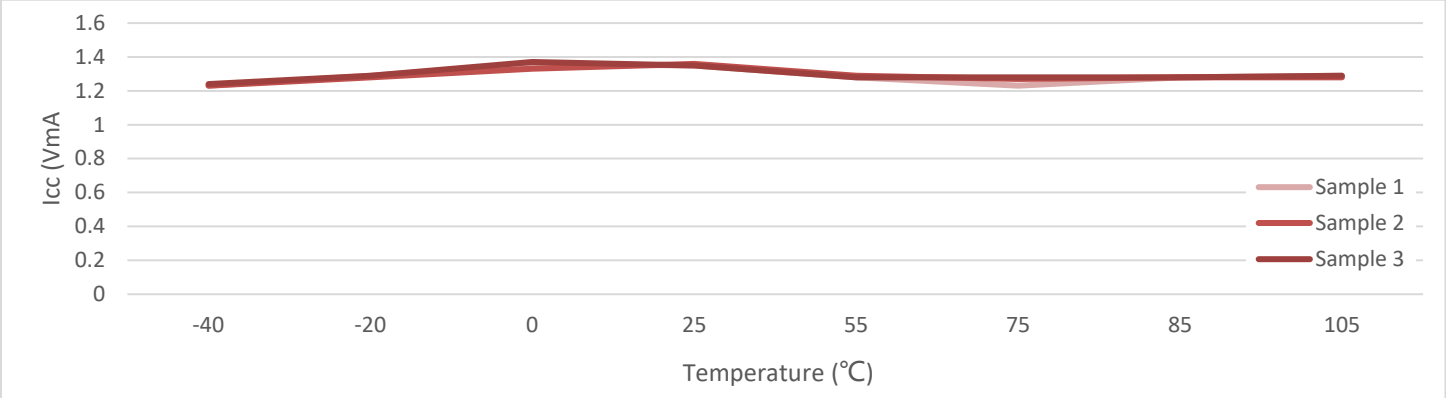


Figure.7 Icc vs, Temperature @ Vcc=5V

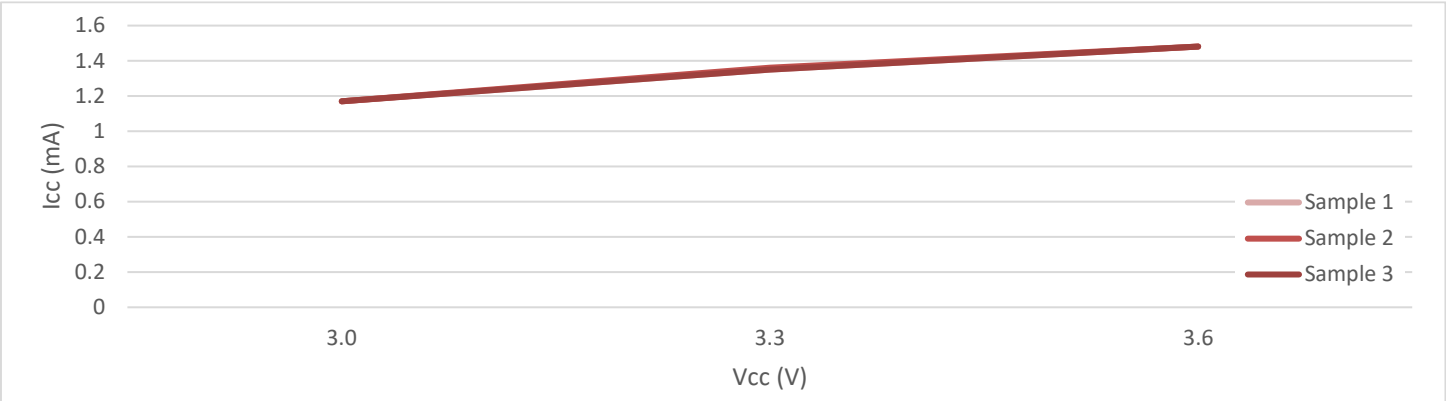


Figure.8 Icc vs, Vcc @ Temperature @ 25℃

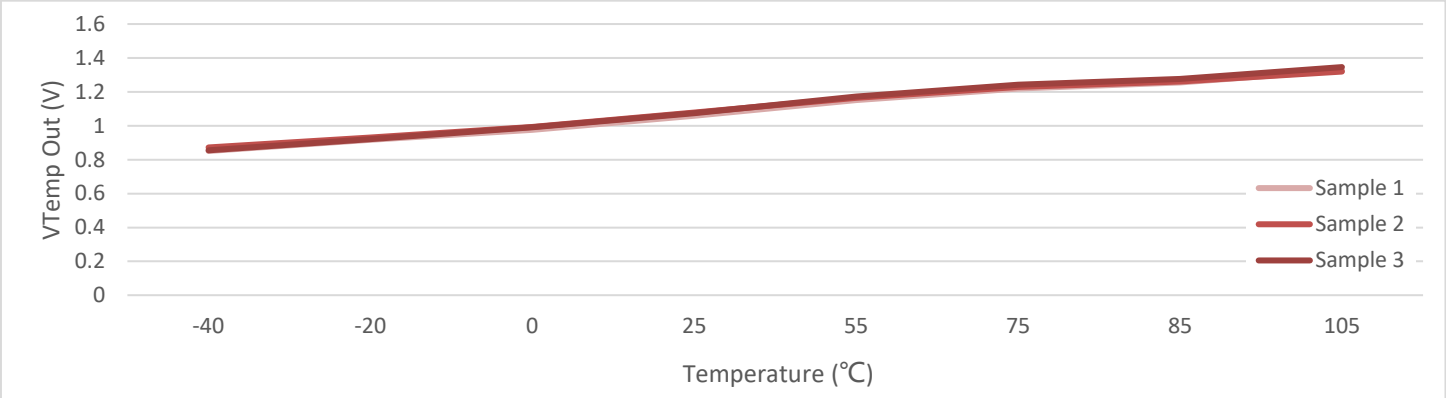


Figure.9 VTemp Out vs, Temperature @ Vcc=5V

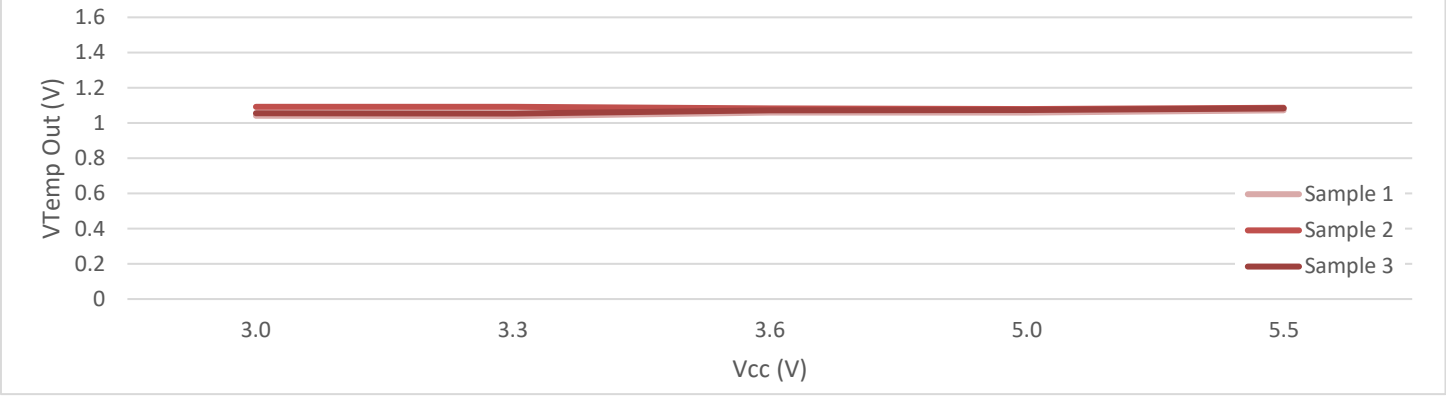


Figure.10 VTemp Out vs, Vcc @ Temperature @ 25℃

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

10.1 QFN2*2 14L Package Information

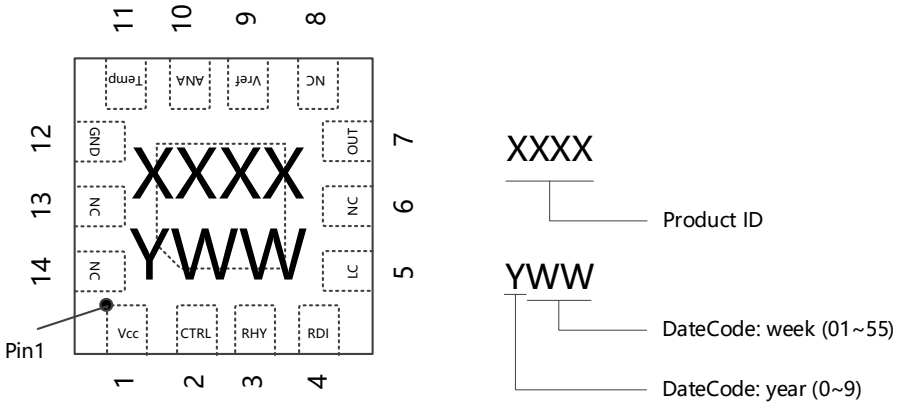


Figure.11 QFN2*2 14L (Thin Outline) Chip Marking Spec

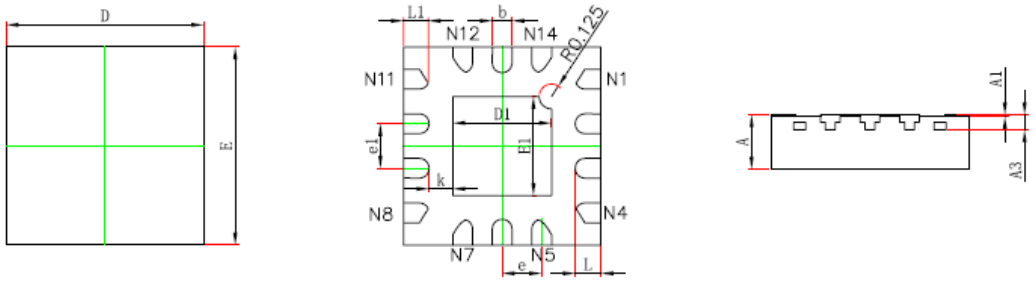


Figure.12 QFN2*2 14L (Thin Outline) Package Drawing

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A3	0.152 TYP		0.006 TYP	
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
D1	0.900	1.100	0.035	0.043
E1	0.900	1.100	0.035	0.043
b	0.150	0.250	0.006	0.010
e	0.400 TYP		0.016 TYP	
e1	0.450 TYP		0.018 TYP	
K	0.240 TYP		0.009 TYP	
L	0.184	0.336	0.007	0.013
L1	0.175	0.327	0.007	0.013

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