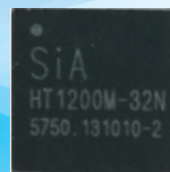


HT1200M
HART Modem ASIC
User Manual



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Version: V4.3

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The contents of this manual have been checked to confirm the consistency of the hardware described. Since errors cannot be completely excluded, absolute consistency cannot be guaranteed. However, we will periodically check the data in this manual and make the necessary corrections in subsequent versions. Any suggestions for improvements are welcome.

Microcyber Corporation 2023

Technical data is subject to change.

Company Introduction

Microcyber is a high-tech enterprise initiated and founded by Shenyang Institute of Automation, Chinese Academy of Sciences, mainly engaged in networked control system, industrial communication and instrumentation, development, production and application. Microcyber undertakes a number of national science and technology major projects, the National High Technology Research and 863 Program, intelligent manufacturing equipment development special projects and other national science and technology programs, is the national networked control system engineering research center construction relying on the unit.

Microcyber successfully developed the first internationally certified fieldbus protocol master stack, the first nationally certified fieldbus instrument, the first domestic safety instrument certified by TÜV, and co-chaired with other units the formulation of the first domestic industrial Ethernet protocol standard EPA and the first industrial wireless communication protocol standard WIA-PA, which became an IEC international standard.

Microcyber's products and technologies have won two National Science and Technology Progress Second Class Awards, one National Science and Technology Invention Award, one Chinese Academy of Sciences Science and Technology Progress First Class Award, and one Liaoning Province Science and Technology Progress First Class Award. The products are exported to many countries, and top companies in the industry, such as Emerson (USA), Rotork (UK), and Bifold (UK), have adopted key technologies or key components of Microcyber in their products and successfully completed more than 200 large-scale automation projects.

Microcyber is a member of the FCG organization; a member of the Profibus Nutzer Organization (PNO).

Microcyber has successfully passed ISO9001:2008 quality management system certification and ISO/TS16949 quality system certification for the automotive industry. Excellent R&D team, rich experience in automation engineering design and implementation, industry-leading products, large market network and excellent corporate culture have laid a solid foundation for the company's start-up and sustainable development.

Carrying employees' ideal, creating customer value and promoting enterprise development.

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Chapter 1 Performance Features

The HT1200M is a low power modem chip that can be used in HART devices and requires only a few external components to modulate and demodulate HART signals.

HT1200M Features:

- Single, half-duplex 1200b/s rate frequency shift keying (FSK) modem
- Bell202 standard FSK frequency shift keying signal with 1200Hz and 2200Hz carriers
- Internal integrated receive band-pass filter circuit and transmit signal waveform shaping circuit
- External 460.8kHz crystal or ceramic filter internal clock oscillator or use external input clock
- Working temperature: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Supply Voltage: 2.V~5.0V
- Meet HART physical layer requirements
- LQFP32 and QFN32 package
- Full compatibility with HT2015

Chapter 2 Pin Definition

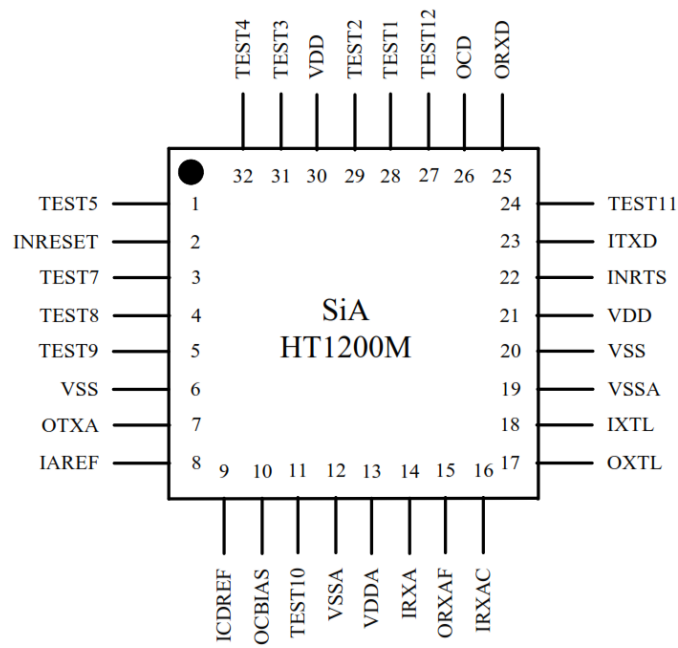


Figure 2.1 LQFP32 & QFN32 Pin Output

Chapter 3 Pin Description

Table 3.1 LQFP32 & QFN32

Pin	Definition	Type	Description
1	TEST5	input	Connect to VSS
2	INRESET	input	Reset all digital logic circuits when the input is low
3	TEST7	input	Connect to VSS
4	TEST8	input	Connect to VSS
5	TEST9	input	Connect to VSS
6	VSS	ground	Digital Ground
7	OTXA	output	Modulated output transmit and transmit signal to 4-20mA loop. FSK modulated HART interface circuit.
8	IAREF	input	Analog reference voltage
9	ICDREF	input	Carrier detect reference voltage
10	OCBIAS	output	Comparator bias current
11	TEST10	input	Connect to VSS
12	VSSA	ground	Analog ground
13	VDDA	power	Analog supply voltage
14	IRXA	input	FSK modulated HART receive signal from 4-20mA loop interface circuit
15	ORXAF	output	Analog receive filter output
16	IRXAC	input	Analog receive comparator input
17	OXTL	output	Crystal oscillator output
18	IXTL	input	Crystal oscillator input
19	VSSA	ground	Analog ground
20	VSS	ground	Digital ground
21	VDD	power	Digital power supply input
22	INRTS	input	Send request
23	ITXD	input	Input transmission data. The HART data stream to be sent from the UART
24	TEST11	NC	No connect
25	ORXD	output	The received demodulated HART data is transmitted to the UART
26	OCD	output	Carrier detection output
27	TEST12	NC	No connect
28	TEST1	input	Connect to VSS
29	TEST2	NC	No connect
30	VDD	power	Digital power supply input
31	TEST3	NC	No connect
32	TEST4	NC	No connect

Chapter 4 Electrical Characteristics

Table 4.1

ABSOLUTE MAXIMUMS				
Symbol	Parameter	Min.	Max.	Units
T _A	Environmental temperature	-40	+85	°C
T _S	Storage temperature	-55	+150	°C
V _{DD}	Supply voltage	2.7	5.5	V
V _{IN} , V _{OUT}	DC input and output voltage	-0.3	V _{DD} +0.3	V
T _L	Welding temperature		250	°C

Table 4.2

DC CHARACTERISTICS (V _{DD} = 2.7V to 5.5V, V _{SS} = 0V, T _A = -40°C to +85°C)						
Symbol	Parameter	V _{DD}	Min.	Typical	Max.	Units
V _{IL}	Input Voltage, Low	2.7-5.5V			0.3*V _{DD}	V
V _{IL}	INRESET、INRTS	2.7-3.3V	0.9	1.2	1.4	V
V _{IH}	Input Voltage, High	2.7-5.5V	0.7*V _{DD}			V
V _{IH}	INRESET、INRTS	2.7-3.3V	1.3	1.8	2.3	V
V _{OL}	Output Voltage, Low (I _{OL} = -1.8mA)	2.7-3.3V			0.4	V
V _{OH}	Output Voltage, High (I _{OH} = -1.8mA)	2.7-3.3V	V _{DD} -1.0			V
C _{IN}	Input Capacitance Analog Input IRXA Digital Input		2.1 20.8 3.1			pF
I _{IL/IH}	Input leakage current				±5	μA
I _{OLL}	Output leakage current				±5	μA
I _{DD}	Supply current (R _{BIAS} = 500kΩ, I _{AREF} = 1.235V)	3.3 5.0			170 200	μA
I _{AREF}	Analog voltage reference	3.3 5.0	1.2	1.235 2.5	2.6	V
I _{CDREF}	Carrier detection reference voltage (I _{AREF} = 0.08V)			1.15		V
O _{CBIAS}	Comparator deviation current (R _{BIAS} = 500kΩ, I _{AREF} = 1.235V)			2.5		μA

Table 4.3

AC CHARACTERISTICS ($V_{DD} = 2.7V$ to $5.5V$, $V_{SS} = 0V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$)					
Pin Name	Description	Min.	Typical	Max.	Units
IRXA	Receive analog input Leakage current			+/-150	nA
	Frequency-Sign (Logic 1)	1190	1200	1210	Hz
	Frequency-interval (Logic 0)	2180	2200	2220	Hz
ORXAF	High pass filter output Rotation rate		0.025		V/ μ s
	Increase bandwidth	150			kHz
	Voltage range	0.15		$V_{DD}-0.15$	V/ μ s
IRXAC	Carrier detection and receive filter input Leakage current			+/-500	nA
OTXA	Regulator output Frequency-Sign (Logic 1)		1196.9		Hz
	Frequency-interval (Logic 0)		2194.3		Hz
	Amplitude (IAREF =1.235 V)		500		mV p-p
	Slope	30	2.84		mV/ μ s
	Loading (IAREF =1.235 V)				k Ω
ORXD	Receive digital output Rise / Fall time	20			ns
OCD	Carrier detection output Rise / Fall time	20			ns

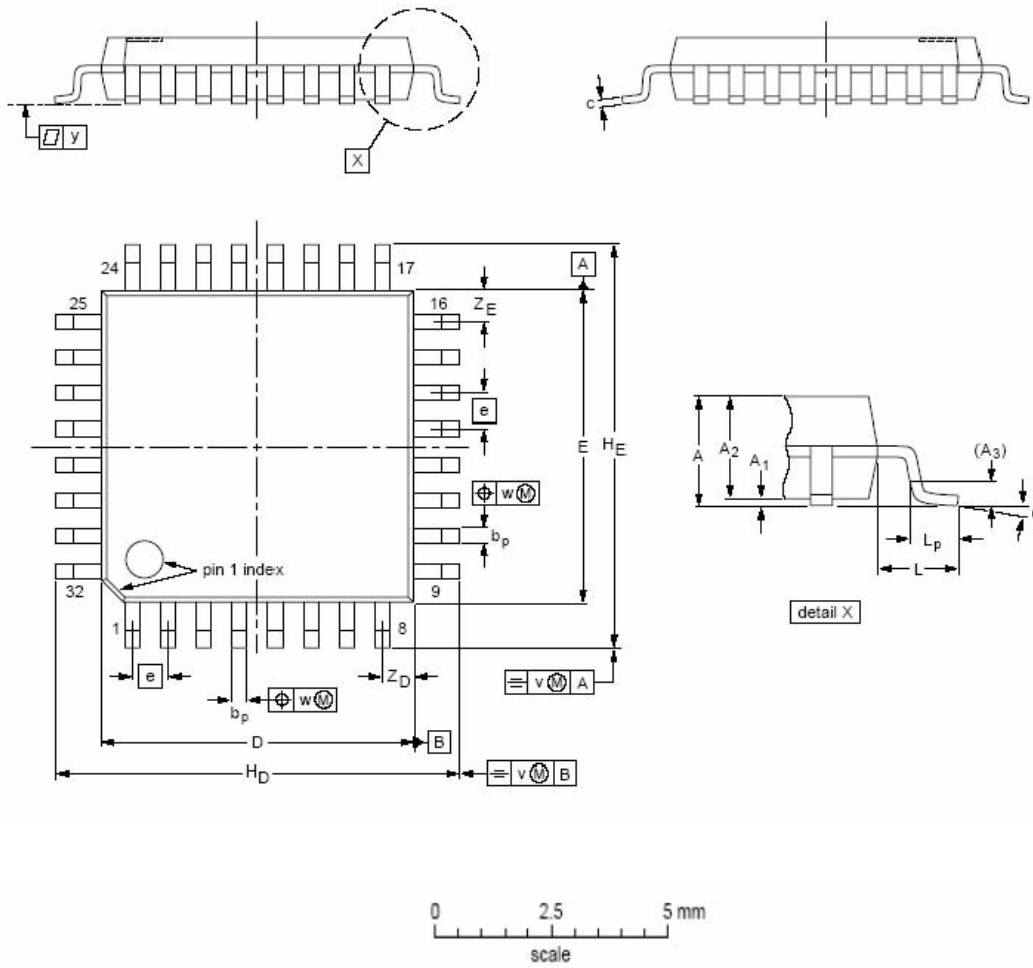
Table 4.4

MODEM CHARACTERISTIC ($V_{DD} = 2.7V$ to $5.5V$, $V_{SS} = 0V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$)				
Parameter	Min.	Typical	Max.	Units
Demodulator jitter Conditions: 1. Input frequency: 1200 Hz +/-10 Hz, 2200 Hz +/-20 Hz 2. Clock frequency: 460.8 kHz +/-0.1% 3. Input (HLXA) asymmetry, 0			12	% of 1 bit

Table 4.5

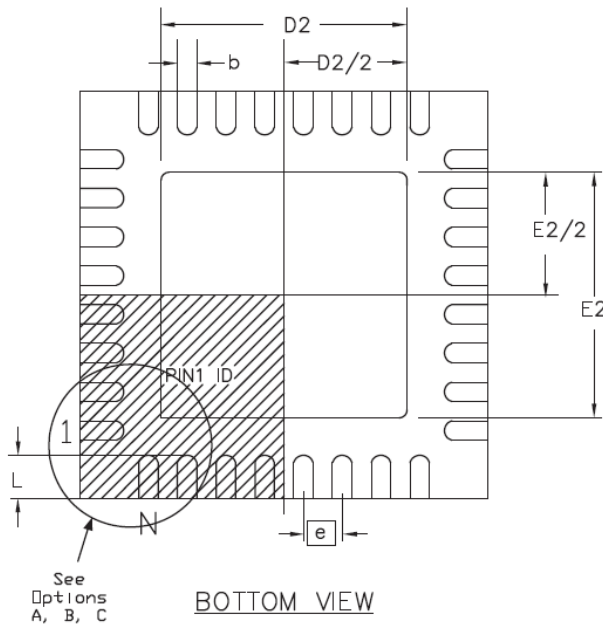
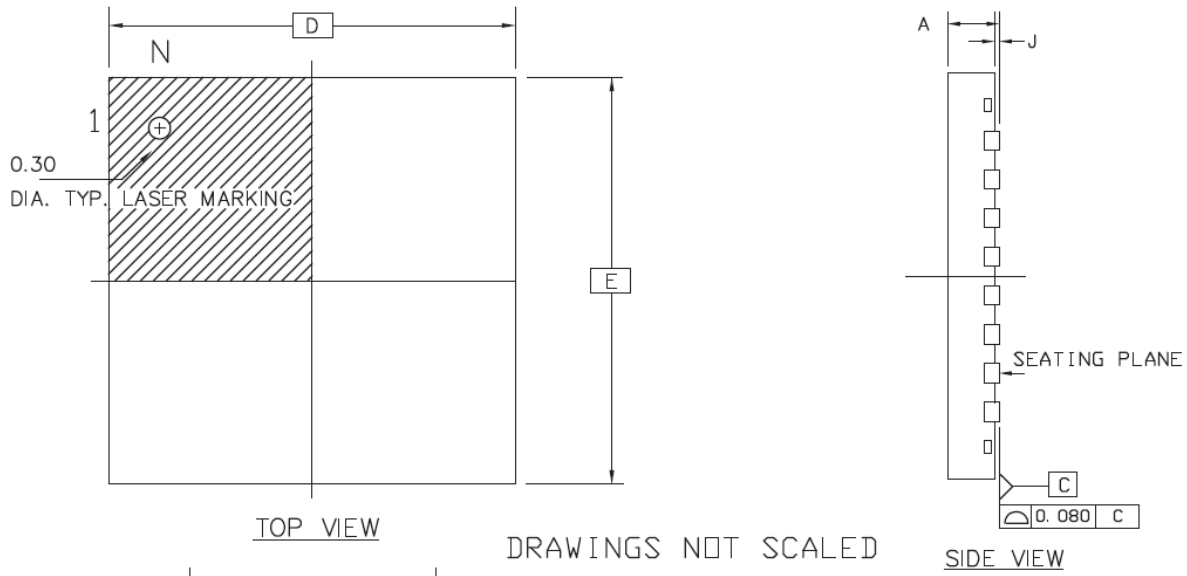
CERAMIC RESONATOR - EXTERNAL CLOCK SPECIFICATIONS ($V_{DD} = 2.7V$ to $5.5V$, $V_{SS} = 0V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$)				
Parameter	Min.	Typical	Max.	Units
Oscillator Deviation			1%	%
Frequency		460.8		kHz
External clock frequency	456.2	460.8	465.4	kHz
Responsibility cycle	40	50	60	% V
Amplitude		$V_{OH}-V_{OL}$		

Chapter 5 Mechanical Specifications



UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _D	H _E	L	L _p	v	w	y	Z _D ⁽¹⁾	Z _E ⁽¹⁾	θ
mm	1.60	0.20 0.05	1.45 1.35	0.25	0.4 0.3	0.18 0.12	7.1 6.9	7.1 6.9	0.8	9.15 8.85	9.15 8.85	1.0	0.75 0.45	0.2	0.25	0.1	0.9 0.5	0.9 0.5	7° 0°

Figure 5.1 LQFP32 Dimensional drawings



COMMON DIMENSIONS IN MM

SYMBOL	MIN.	NOM.	MAX.	NOTES
A	0.80	----	1.00	
J	0.00	----	0.05	
D/E	5.00 BSC			
D2/E2	3.50	3.60	3.70	
N	32			
e	0.50 BSC			
L	0.30	0.40	0.50	
b	0.18	0.25	0.30	

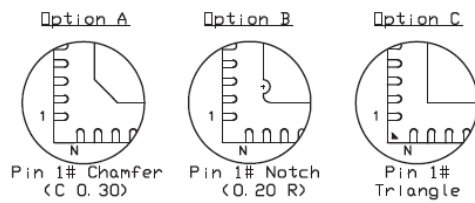


Figure 5.2 QFN32 Dimensional drawings

Chapter 6 Circuit Diagram

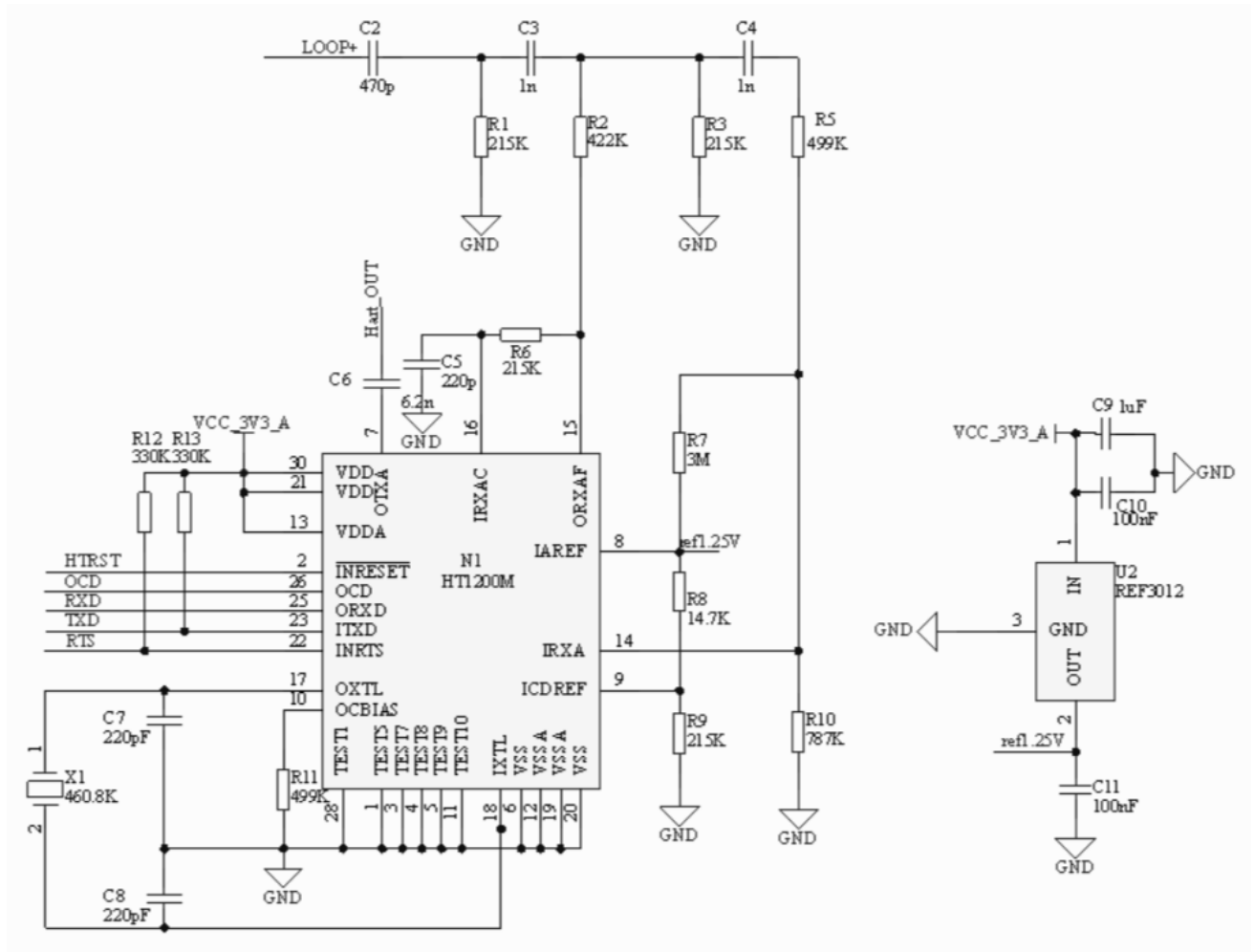


Figure 6.1 HT1200M Typical Application Circuit-1

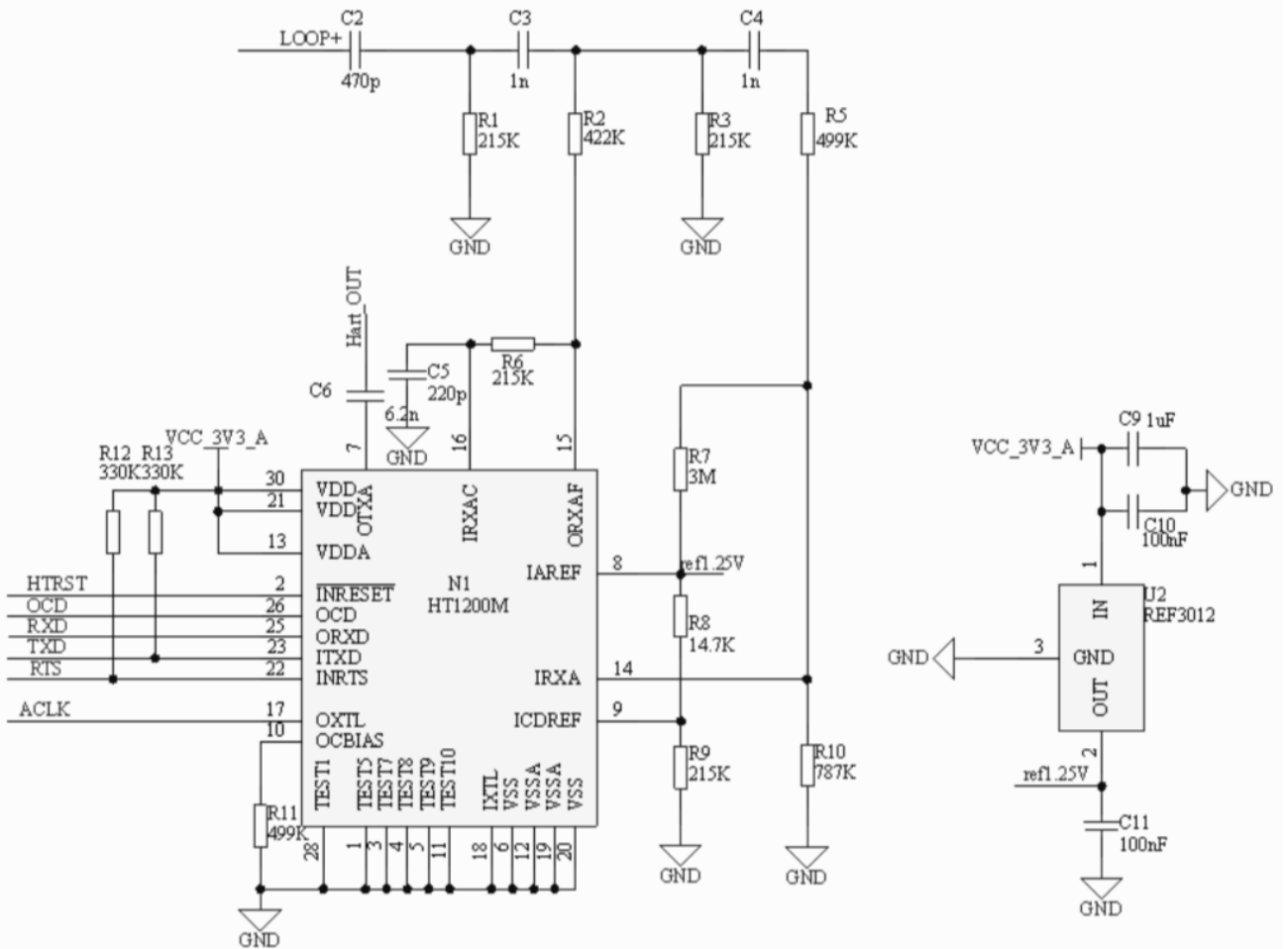


Figure 6.2 HT1200M Typical Application Circuit-2

Note: In Figure 6.2, the ACL K is connected to the clock output pin of the MCU, and the output frequency of the clock output pin of the MCU is 460.8KHz. For example, the single chip microcomputer uses a 3.6864MHz crystal oscillator, which can get 460.8KHz after internal octave division.

Appendix 1 Ordering Code

HT1200M		HT1200M HART Modem ASIC Ordering Code	
		Code	Package Type
		L	LQFP32
		Q	QFN32
HT1200M-	L	Selection Example (HT1200M-L, LQFP32 Package Type)	



<https://www.microcybers.com>

Address: 17-8 Wensu Street, Hunnan New District, Shenyang,
China

Postcode: 110179

Tel: 0086-24-31217295 / 31217296

Fax: 0086-24-31217293

Email: sales@microcyber.cn