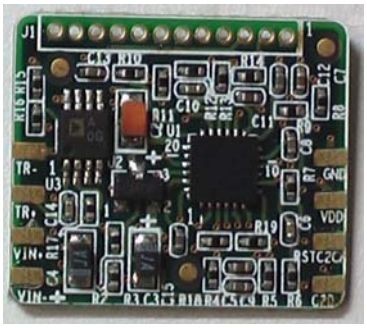
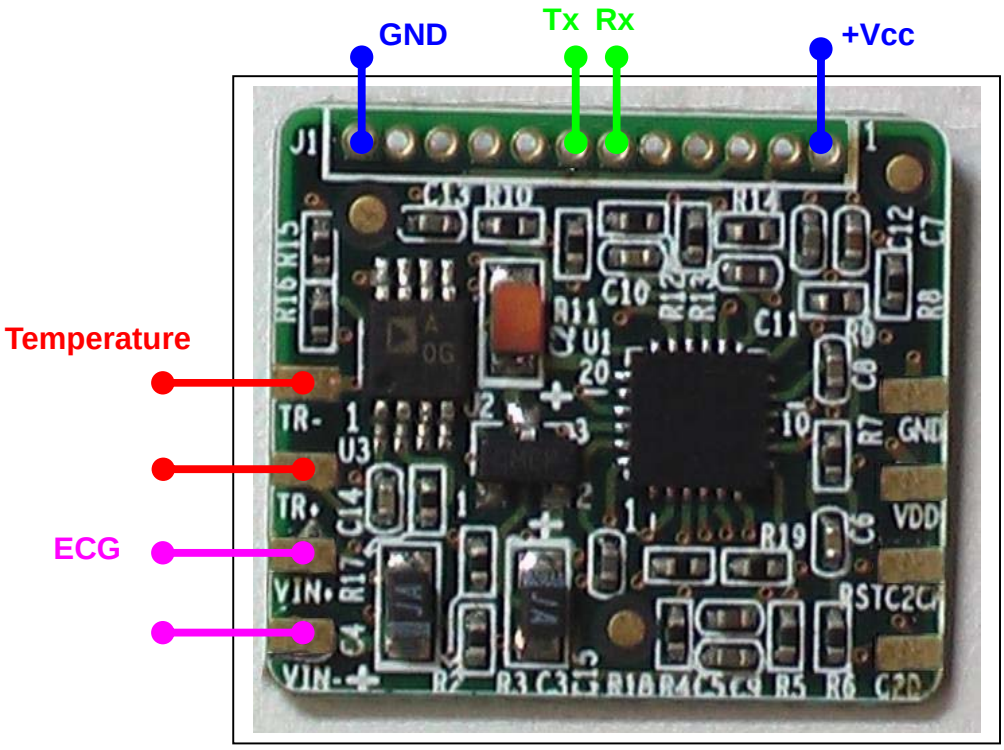
Model : KY202M

Heart Rate Variability Processing Module



Module Features

- ✓ **Weight : 0.88 g**
- ✓ **Dimension : 17mm x 20mm**
- ✓ **UART link (TTL level Tx / Rx / GND)**
- ✓ **Easy PC or Micro Controller Interface**
- ✓ **Time and Frequency Domain Analysis of Heart Rate Variability**
- ✓ **Instantaneous Heart Rate (IHR)**
- ✓ **Standard Deviation of R-R intervals (SD)**
- ✓ **High-frequency (HF) and Low-frequency (LF) powers of R-R interval variability**
  - **KY202A: Heart rate**
  - **KY202B: Heart rate and standard deviation**
  - **KY202C: Heart rate, standard deviation and frequency domain analysis**
- ✓ **Low Power : Input Range 0 to 2.5 V with Single 2.7~3.6V Supply**
- ✓ **Low power consumption (active 4 mA, power down 1 uA)**



Micro Controller Specifications

Parameter	Conditions	Min	Typ	Max	Units
Global Characteristics					
Supply Voltage		2.7	--	3.6	V
Supply Current		3.8	4.0	4.1	mA
Supply Current (power down)		--	1	--	μA
Clock Frequency Range		DC	--	25	MHz
Internal Oscillator					
Frequency		24.0	24.5	25.0	MHz
A/D Converter					
Resolution		--	10	--	bits
Integral Nonlinearity		--	± 0.5	± 1	LSB
Differential Nonlinearity	Guaranteed Monotonic	--	± 0.5	± 1	LSB
Signal-to-Noise Plus Distortion		53	55.5	--	dB
Built-in temperature sensor					
Resolution		--	± 0.3	--	°C
Temperature Range		- 40	--	+ 85	°C

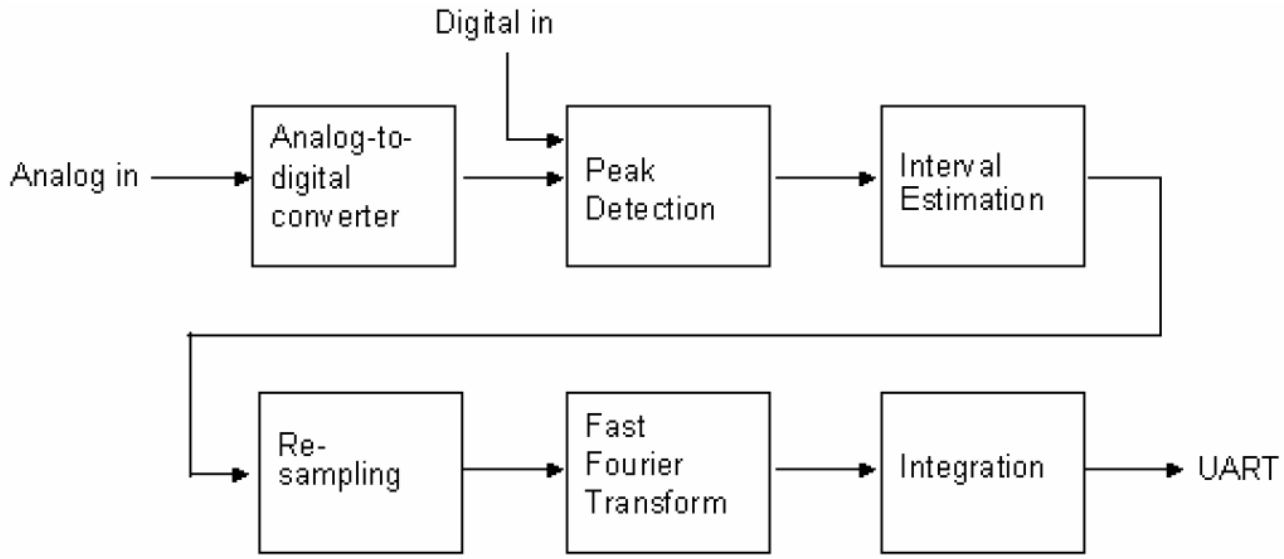
The KY202 is an evolutionary digital signal processing module for heart rate variability (HRV) analysis. It incorporates the state-of-the-art technologies of heart rate variability analysis into one single chip.

The technologies include R point detection, noise rejection, interpolation in time domain, and fast Fourier transform in frequency domain. The operation is fully automatic, and no command is needed. The input data can be in the form of analog waveform or digital series through a UART input.

The analysis result is formatted in ASCII codes (such as “HR=85”) and output through a standard UART output.

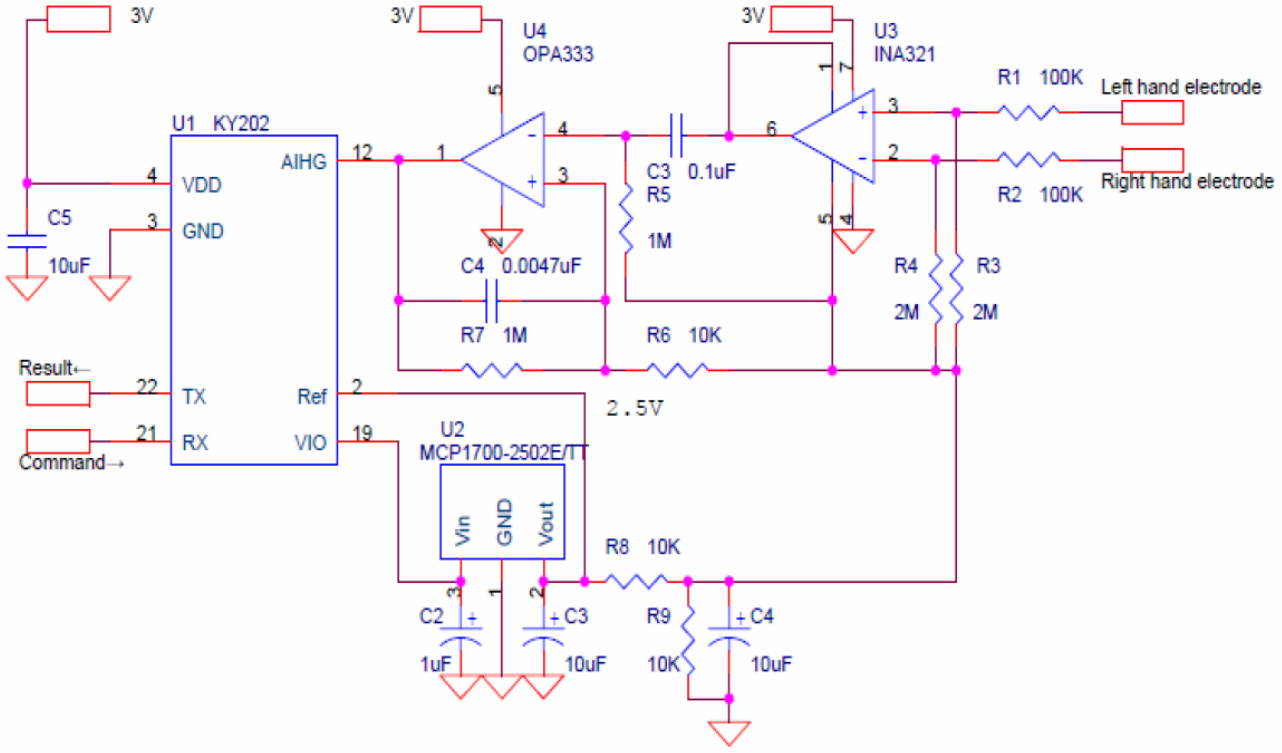
The module has a very small size (17mm x 20mm) and very low power consumption (4 mA), and is suitable for various hand held applications.

Block Diagram

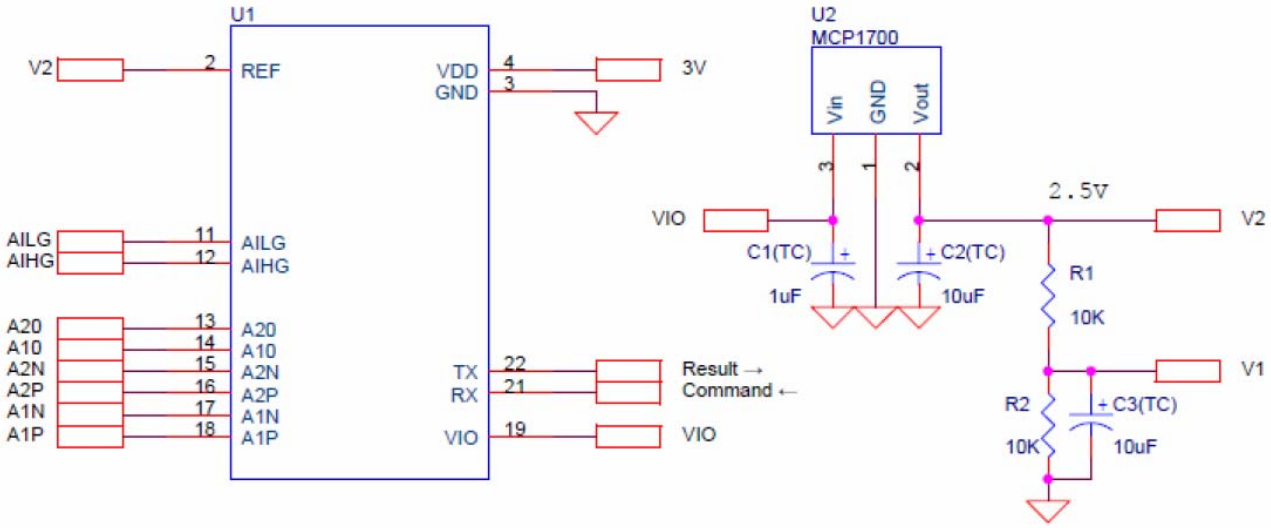


Typical Operating Circuit

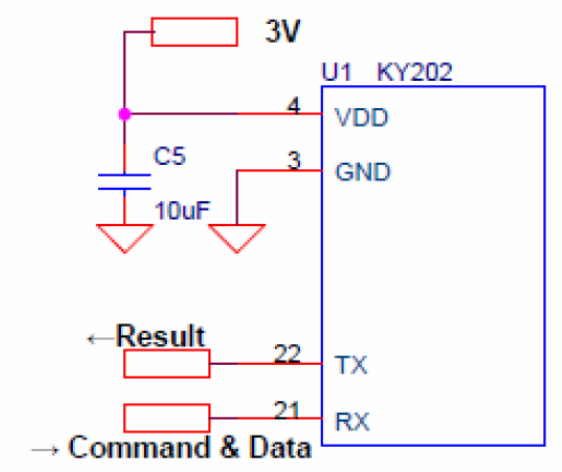
Data acquisition from analog input, using external amplifier



Data acquisition from analog input using internal amplifier



Data acquisition from digital input



UART Output Result of KY202

Baud rate = 19200

Command	IHR=nnnnn↵
Function	Instantaneous heart rate
Remarks	n=0~9

Command	HR=nnnnn↵ KY202B and KY202C only
Function	Mean heart rate
Remarks	UART output result of KY203 n=0.9

Command	SD=nnnnn KY202B and KY202C only
Function	Standard deviation of R-R intervals
Remarks	n=0~9

Command	HF=nnnnn↵ KY202C only
Function	High frequency power (0.15~0.4Hz) of heart rate variability
Remarks	n=0~9

Command	LF=nnnnn↵ KY202C only
Function	Low frequency power (0.04~0.15Hz) of heart rate variability
Remarks	n=0~9

Command	VL=nnnnn↵ KY202C only
Function	Very low frequency power (0-0.04Hz) of heart rate variability
Remarks	n=0~9

Command	TP=nnnnn↵ KY202C only
Function	Total power (0~0.625Hz) of heart rate variability
Remarks	n=0~9

Command	RAW=32↵
Function	Output digital data
Parameters	32 bytes wave form data
Delay Time (ms)	1
Return Values	Null
Remarks	

UART Input Commands of KY202

Baud rate = 19200

Command	↵ (0x0D)
Function	Wake up from power down mode (turn on)
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	Enter active mode

Command	RS ↵
Function	Reset and enter power down mode (turn off)
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	Power down mode 1uA

Command	INIT ↵
Function	Initialize
Parameters	Null
Delay Time (ms)	10
Return	INIT ↵
Remarks	Initialize operation

Command	W+↵ (W-↵)
Function	Toggle waveform output
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	Data output: “RAW=32” follow by 32 bytes wave from data Default: off

Command	S+↵ (S-↵)
Function	Toggle simulation
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	Generate simulation signal, Default: off

Command	D+↵ (D-↵)
Function	Toggle digital/analog input
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	Default: Analog input

Command	G+↵ (G-↵)
Function	Change Gain
Parameters	Null
Delay Time (ms)	10
Return	Null
Remarks	G+↵ : increase gain by 2 folds (max 4 folds) G -↵ : decrease gain by 2 folds (min 1 fold)

Command	RAW=32↵
Function	Input digital data
Parameters	32 bytes wave form data
Delay Time (ms)	1
Return	Null
Remarks	

2009/10/28

In God & brain we trust.