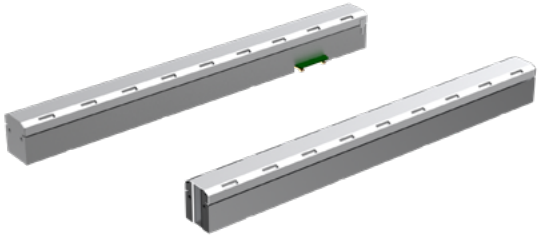
TMR6318C

72 Channels 180mm TMR Magnetic Image Sensors

Description

The TMR6318C is a 72 pixels, 10DPI magnetic image sensor (MIS) module. It integrates proprietary TMR magneto-resistance sensor, high-quality magnet to provide high sensitivity performance. The module is designed for full-scale paper bills, bank notes and security documents with magnetic materials and is suitable for scanning width up to 180mm. It features a 1-channel analog output to achieve a scanning rate of 15usec/line @ 5MHz pixel rate; Factory calibrated sensitivity of each pixel.



Features and Benefits

- 1-channel analog output
- 15usec/line scanning speed
- Compact size: L191.5mm x W16mm x H19mm
- Built-in signal conditioner for each pixel
- Built-in sensitivity calibration in factory
- Auto-set each pixel's bias voltage by SET pin
- No built-in magnet is available: TMR6318CN
- 10DPI resolution, 180mm detection width with 2.5mm x 72 pixels
- TMR sensor, magnets and signal processing are integrated in one module
- RoHS & REACH compliant

Applications

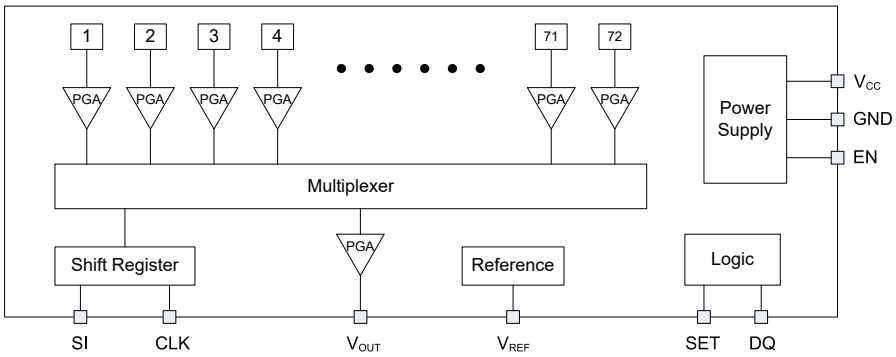
- Currency verification
- Magnetic Document Scanning
- Non Destructive Testing

Selection Guide

Part Number	Resolution × Channels	Sensing Width	Output Mode	Built-in Magnet
TMR6318C	2.5 mm × 72 channels	180 mm	Serial analog	Yes
TMR6318CN	2.5 mm × 72 channels	180 mm	Serial analog	No

Catalogue

1. Block Diagram



2. Pin Configuration

Connector type: Hirose FH12A-22S-0.5SH(55)

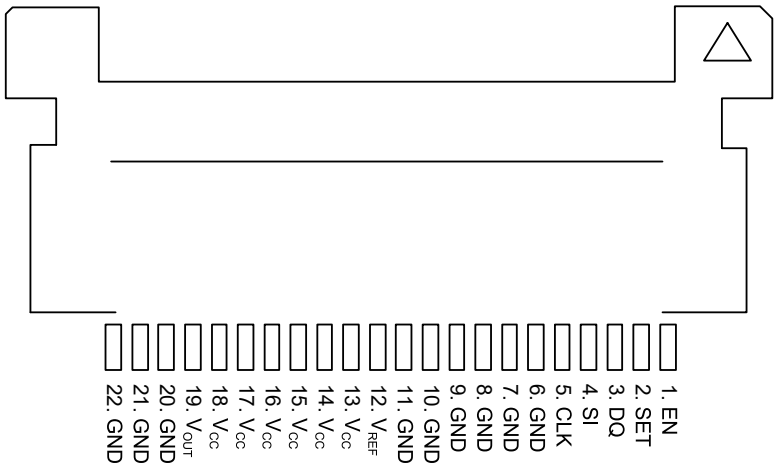


Figure 1. Pin configuration

Pin No.	Symbol	I/O[1)]	Description
1	EN	I	Enable input. High-level to enable the internal power, this pin has an internal 500kΩ pull-down resistor to hold the regulator off by default
2	SET	I	Auto-set bias voltage input. High-level for t_{SET} time to set the bias voltage of all pixels to the V_{REF}, this pin has an internal 100kΩ pull-down resistor
3	DQ	I/O	Test pin for factory settings, left it floating in normal use
4	SI	I	Sampling indication pulse input
5	CLK	I	Sampling clock pulse input
6, 7, 8, 9, 10, 11, 20, 21, 22	GND	P	Ground
12	V_{REF}	O	+1.65V Reference voltage output
13, 14, 15, 16, 17, 18	V_{CC}	P	+5V Power supply
19	V_{OUT}	O	Analog output, each pixel signal is shifted out by sampling clock pulse

Note: 1) I – Input，O – Output，I/O – Input/Output，P – Power

3. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Maximum Supply Voltage Range	V_{CC}	-0.3	6	V
Input Voltage Range (EN,SET,DQ,SI,CLK)	V_{IN}	-0.3	3.6	V
Operating Temperature Range	T_A	-10	50	°C
Storage Temperature Range	T_{STG}	-30	85	°C
Operating Humidity Range	HMD	10	90 (no dew)	%RH

4. Electrical Specifications

V_{CC} = 5 V, T_A = 25 °C, unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	-	3.6	-	5.5	V
Standby current consumption	I_{STB}	V_{CC} = 5 V, EN = Low	-	-	1	mA
Current consumption	I_{CC}	V_{CC} = 5 V, EN = High	-	140	200	mA
Sampling frequency	f_S	-	-	5	-	MHz
Output voltage range	V_{OUT}	-	0.4	-	2.9	V
Auto-set Bias accuracy	V_{BIAS}	After auto-set bias	V_{REF} - 0.3	V_{REF}	V_{REF} + 0.3	V
Reference output voltage[1)]	V_{REF}	-	1.6	1.65	1.7	V
Output impedance	RV_{OUT}	-	-	250	-	Ω
High-level input voltage	V_{IH}	EN, SET, DQ, SI, CLK	2.6	-	3.3	V
Low-level input voltage	V_{IL}	-	0	-	0.6	V
High-level output voltage	V_{OH}	DQ	2.6	-	3.3	V
Low-level output voltage	V_{OL}	-	0	-	0.6	V
Noise	Noise	Gain = 1024 V/V	-	100	-	mVpp
High-pass filter frequency	HPF	-3dB	-	150	-	Hz
Low-pass filter frequency	LPF	-3dB	-	4	-	kHz

5. Physical Characteristics

V_{CC} = 5 V, T_A = 25 °C, unless otherwise noted

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Detection width	Width	-	-	180	-	mm
Number of magnetic detectors	-	-	-	72	-	pixels
Pixel width	W	-	-	2.5	-	mm
Surface magnetic field	B	TMR6318C	-	2000	-	Gs
		TMR6318CN	-	0	-	
Magnetic sensitivity[2)]	S	TMR6318C	-	TBD	-	-
		TMR6318CN	-	TBD	-	

Note:

1) To provide good reference performance, a 0.1μF capacitor can be added between V_{REF} and GND.

2) According to the MultiDimension sensitivity measurement.

6. Function Description

6.1 Function Sequences

The EN pin is set to high-level to enable the power supply, the internal circuit will be setup within the delay time t_{ON}; when internal circuit power up, the SET pin is set to high-level for t_{SET} time, it will automatically set the bias voltage of each pixel to the V_{REF} level; After auto-set bias finished for the delay time t_{SA}, then start sampling, a sampling indication signal is sent by setting SI high-level at the falling edge of CLK, then the host can sample each pixel in sequence, after all pixels have been scanned, repeat the sampling indication signal again for the next line sampling.

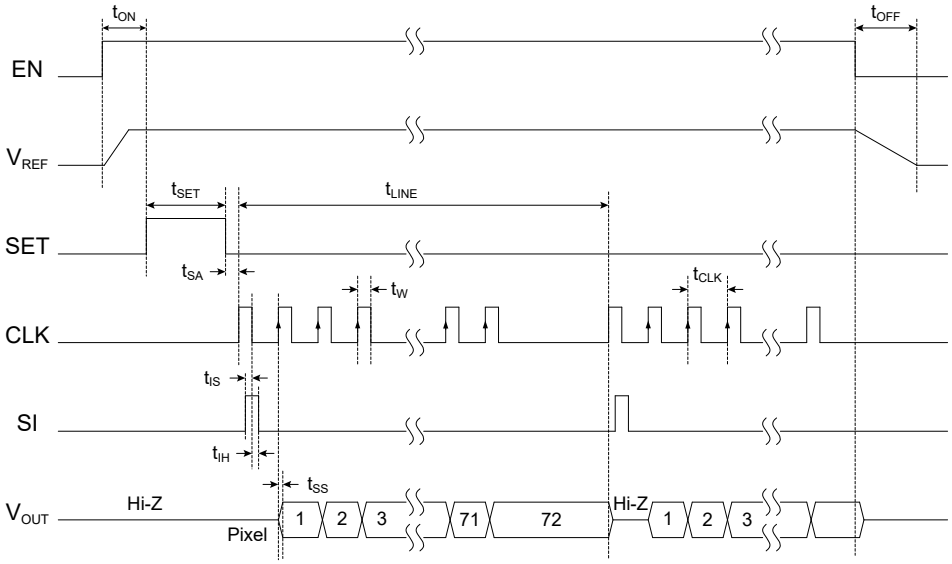


Figure 2. Function sequences

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power on delay time	t_{ON}	10	-	-	ms
Power off delay time	t_{OFF}	100	-	-	ms
Auto-set bias delay time	t_{SET}	100	-	-	ms
Line sampling rate	t_{LINE}	-	15	-	μs
Sample delay time after auto-set bias	t_{SA}	1	-	-	ms
Clock pulse width	t_W	50	-	-	ns
Clock cycle time	t_{CLK}	200	-	-	ns
SI setup time	t_{IS}	25	-	-	ns
SI hold time	t_{IH}	25	-	-	ns
V_{OUT} signal settling time	t_{SS}	150	-	-	ns

6.2 Power Supply

The external power supply should guarantee 0.2 A or more current for TMR6318C. A logic enable input controls the internal power switch, a logic high input on EN power up the internal circuit, and all circuit will setup within a delay time t_{ON}; a logic low input on EN will turn off the circuit, a delay time t_{OFF} should be taken to ensure internal power down; there is a 500kΩ pull-down resistor between EN and GND to ensure power off when EN floating.

6.3 Auto-set Bias Function

When power on, all pixels bias output voltage is different for offset variation. A logic high input on SET, the auto-set bias function will automatically adjust the bias output voltage of each pixel to the V_{REF}; after a delay time of t_{SET}, a logic low input on SET will stop the auto-set bias function. During the auto-set bias function, make sure external magnetic field and environment is stable, do not roll the motors or bearings near TMR6318C, otherwise it will take the signals as offset to adjust, then performs abnormal bias output voltage. A power off and power on sequence must be taken before starting the auto-set bias function.

6.4 Sampling Function

After auto-set bias function finished for the delay time t_{SA}, a logic high on SI captured at CLK falling edge will produce a start indication signal, it indicates the start of sampling function; V_{OUT} is in Hi-Z state till the CLK rising edge of the first pixel occur; V_{OUT} outputs each pixel signal on the rising edge of CLK pulse in sequence, the V_{OUT} voltage is settled within the settling time t_{SS}, then the ADC can sample that pixel voltage; after all pixels have been sampled for t_{LINE} time, a new start indication signal can be produced to repeat next line sampling. Do not generate start indication signal until all pixels have been sampled.

6.5 Signal Conditioner Amplifier

TMR6318C features programmable gain amplifier for each pixel, it built-in band-pass filter to provide good SNR performance, especially suitable for the low frequency magnetic interferences immunity, like bearings, motors, adapters and etc.; the amplification can be adjusted in factory setting, normally it is 60dB, the amplifier transfer characteristic is as figure 3 shown. Each pixel's sensitivity can be calibrated independently in factory, the TMR6318C can provide high uniformity performance for dedicated application like banking machine, NDT and etc. For other gain requirements please contact MultiDimension.

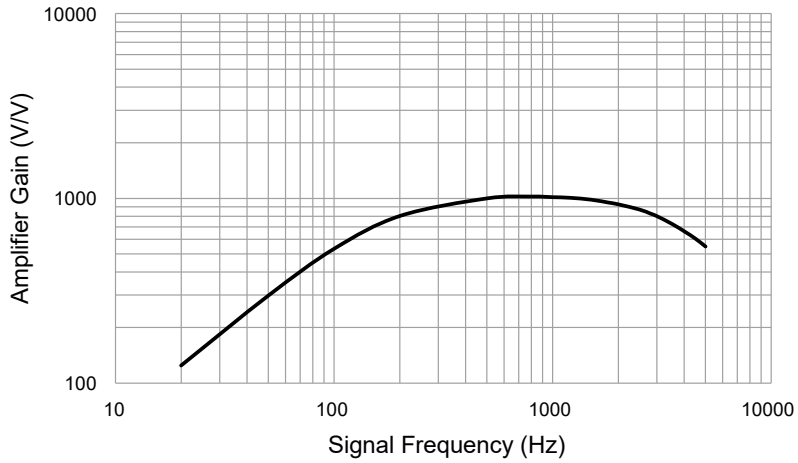


Figure 3. Band-pass amplifier transfer characteristics

6.6 Sampling Rate

For example, set TMR6318C pixel sampling rate 5 MHz, and line sampling rate is 15 usec/line of 72 pixels; if the paper bill is 77 mm long in the moving direction, and the moving speed is 1.5m/s, it will take time 0.077m / (1.5 m/s) = 0.0513s to finish the scanning, and the number of sampling lines will be 0.0513s / (15 μs/line) = 3420 lines, the sampling resolution will be 77 mm / 3420 lines = 0.0225 mm/line.

7. Application Information

Typical Application Circuit

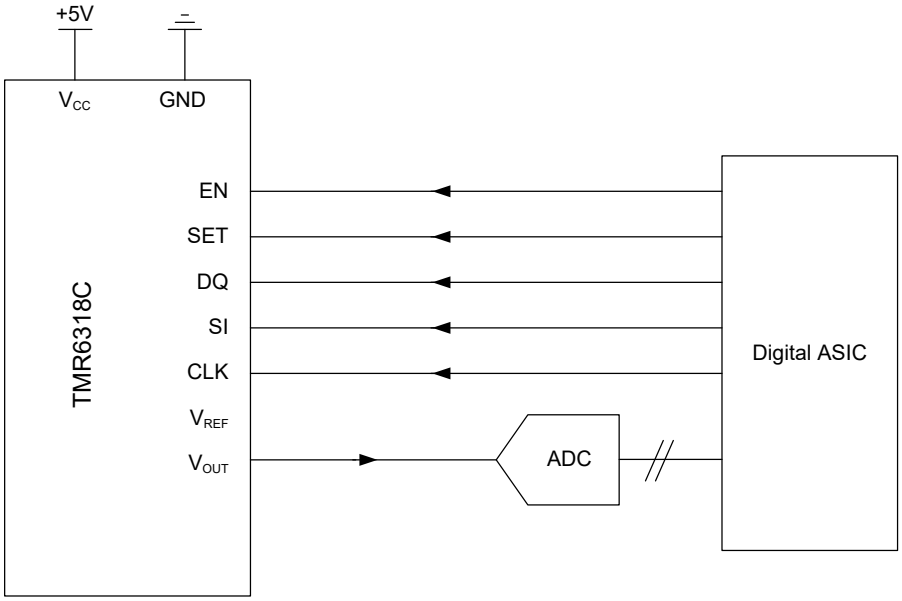


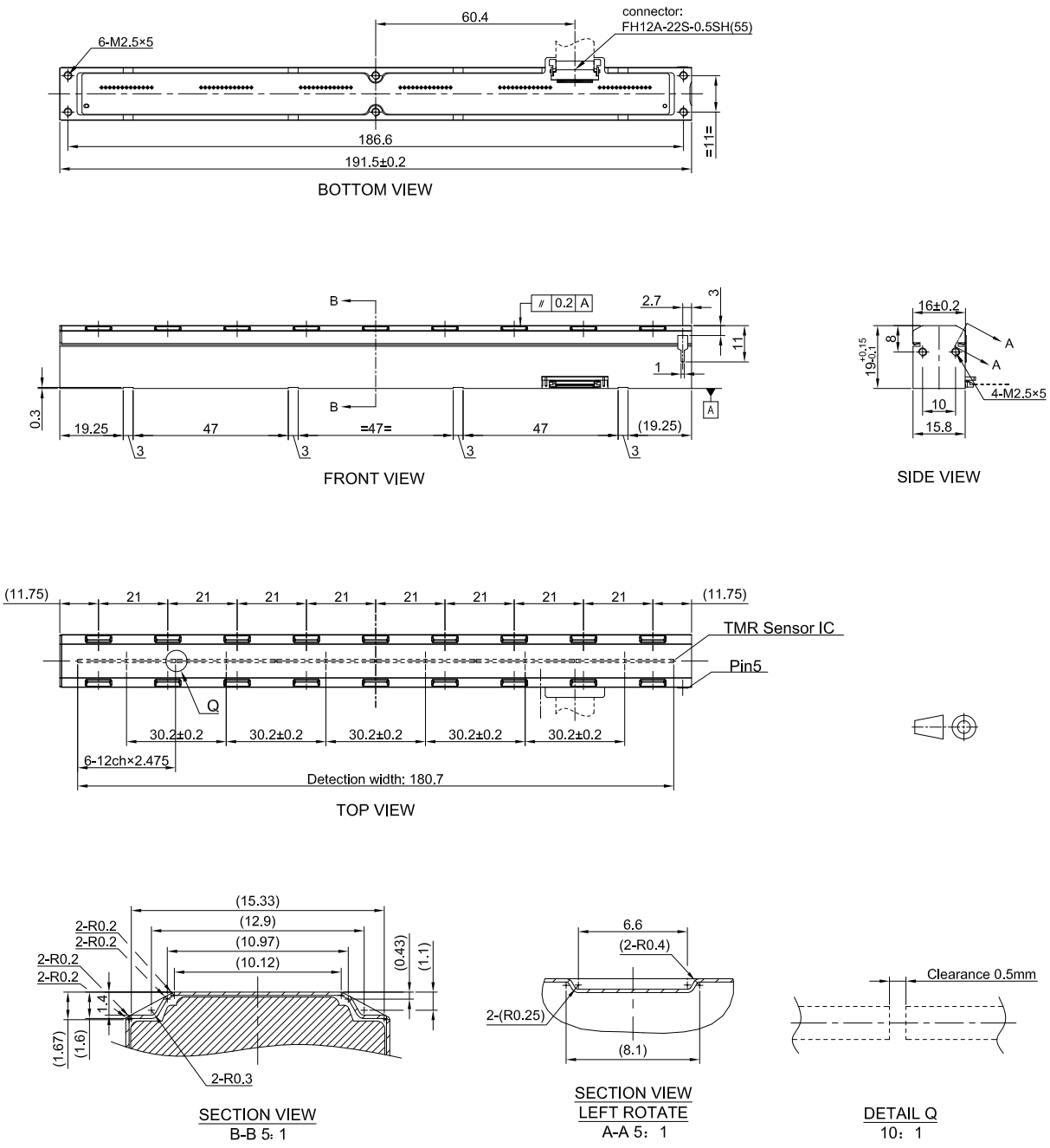
Figure 4. Typical application circuit

Notes:The metal case or the cover should be connected to the shielding ground.

Remarks

1. The sensor contains a permanent magnet, it will cause the recordable magnetic media damaged, such as cassette tapes, floppy disks, credit cards, hard drives, keep it away from such types of magnetic media.
2. To avoid the ferromagnetic particles being collected from a dirty environment.
3. Magnets tend to snap to each other or the magnetic metals, be careful when handling the sensor not to apply mechanical shock, otherwise the sensors might be abnormal or break.
4. Do not place the sensor near the person who has an electronic medical device. It is very dangerous and may cause malfunction of an electronic medical device.
5. Magnetic devices may be subject to special transport regulations.
6. To avoid the abrasion of the sensor's metal case or stuck the banknote, about 0.1mm gap between the sensor and the opposite side such as rollers is recommended to reduce the pressure of the sensor's metal case.
7. To avoid excessive force on terminals, please mount the sensor's base firmly on the PCB and solder all the terminals.
8. Hand soldering should be applied, the soldering temperature should be 350±10°C less than 3 seconds or 260±5°C less than 10 seconds.

8. Dimensions



Case: aluminum-alloy or Zine-alloy
(Electro-conductive)
Cover: stainless steel thickness 0.2mm
General tolerance: ±0.3
unit:mm

Figure 5. Dimension (unit: mm, tolerances for unmarked scales ±1 mm)

9. Packing Information

1. 5pcs sensors in 1 package

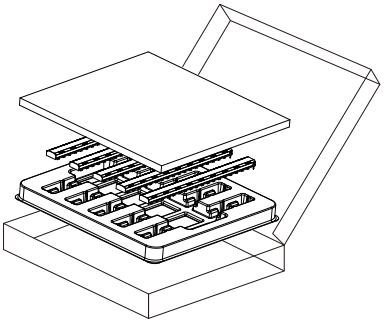


Figure 6-1. Package box

2. 1 carton contains 28pcs boxes, maximum 140pcs sensors in 1 carton

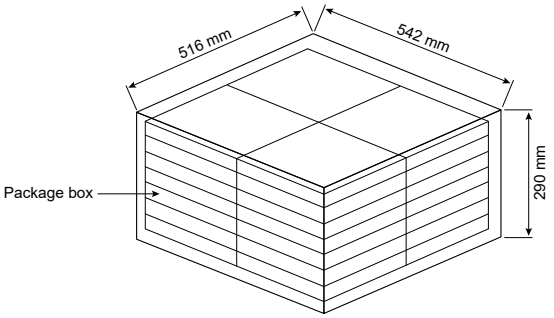


Figure 6-2. Carton

3. Label on the Carton

MultiDimension Technology Co., Ltd

P/N:

Po No.:

Quantity:

Data:

Figure 6-3. Label

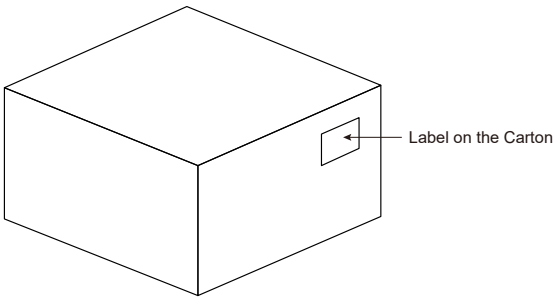


Figure 6-4. Label on the Carton

Recycling

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

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