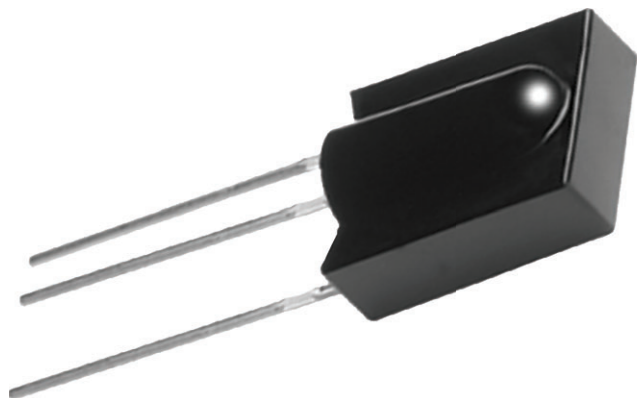




## IR Receiver Modules for Remote Control Systems



### DESCRIPTION

This IR receiver series is optimized for short burst remote control systems in different environments. The customer can choose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

### FEATURES

- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 V to 5.5 V
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### LINKS TO ADDITIONAL RESOURCES



Product Page



Marking



Packages



Holders

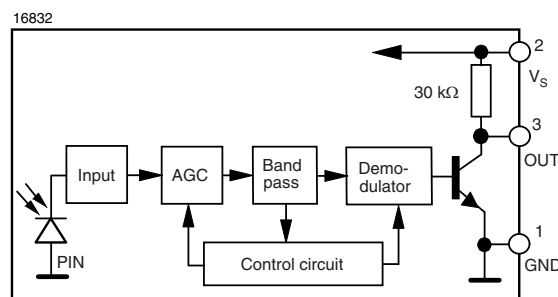


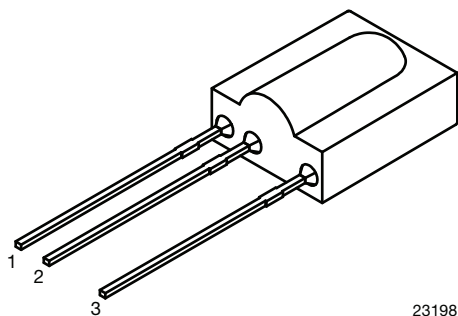
Bends and Cuts

### DESIGN SUPPORT TOOLS

- [3D models](#)

### BLOCK DIAGRAM



**MECHANICAL DATA****Pinning:**1 = GND, 2 =  $V_S$ , 3 = OUT

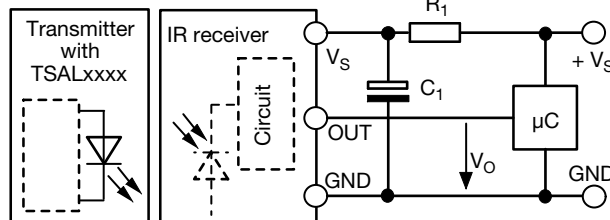
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**ORDERING CODE**

TSO.1. - 1000 pieces in tubes

**APPLICATION CIRCUIT**

17170-14



$R_1$  and  $C_1$  recommended in case there are strong ripple or spikes on the supply line.

**PARTS TABLE**

AGC		LEGACY, FOR SHORT BURST REMOTE CONTROLS (AGC1)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
Carrier frequency	30 kHz	TSOP31130	TSOP31330	TSOP31530
	33 kHz	TSOP31133	TSOP31333	TSOP31533
	36 kHz	TSOP31136	TSOP31336 <sup>(1)(6)</sup>	TSOP31536
	38 kHz	TSOP31138	TSOP31338 <sup>(2)(3)(4)(5)</sup>	TSOP31538
	40 kHz	TSOP31140	TSOP31340	TSOP31540
	56 kHz	TSOP31156	TSOP31356	TSOP31556
Package		Cast		
Pinning		1 = GND, 2 = $V_S$ , 3 = OUT	1 = GND, 2 = $V_S$ , 3 = OUT	1 = GND, 2 = $V_S$ , 3 = OUT
Dimensions (mm)		10.0 W x 12.5 H x 5.8 D		
Mounting		Leaded		
Application		Remote control		
Best remote control code		<sup>(1)</sup> MCIR <sup>(2)</sup> r-step <sup>(3)</sup> RECS-80 Code <sup>(4)</sup> r-map <sup>(5)</sup> XMP <sup>(6)</sup> RCMM		

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		$V_S$	-0.3 to +6	V
Supply current (pin 2)		$I_S$	3	mA
Output voltage (pin 3)		$V_O$	-0.3 to ( $V_S + 0.3$ )	V
Output current (pin 3)		$I_O$	5	mA
Junction temperature		$T_j$	100	°C
Storage temperature range		$T_{stg}$	-25 to +85	°C
Operating temperature range		$T_{amb}$	-25 to +85	°C
Power consumption	$T_{amb} \leq 85^\circ\text{C}$	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10$ s, 1 mm from case	$T_{sd}$	260	°C

**Note**

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability.



ELECTRICAL AND OPTICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 2)	$E_v = 0$ , $V_S = 3.3\text{ V}$	$I_{SD}$	0.25	0.35	0.45	mA
	$E_v = 40\text{ klx}$ , sunlight	$I_{SH}$	-	0.45	-	mA
Supply voltage		$V_S$	2.0	-	5.5	V
Transmission distance	$E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 50\text{ mA}$	$d$	-	26	-	m
Output voltage low (pin 3)	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1	$V_{OSL}$	-	-	100	mV
Minimum irradiance	Test signal: RC5 code	$E_{e\text{ min.}}$	-	0.1	0.2	$\text{mW/m}^2$
	Test signal: XMP code	$E_{e\text{ min.}}$	-	0.15	0.3	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 3/f_0 < t_{po} < t_{pi} + 3.5/f_0$ , test signal see Fig. 1	$E_{e\text{ max.}}$	30	-	-	$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\Phi_{1/2}$	-	$\pm 45$	-	$^{\circ}$

### TYPICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified)

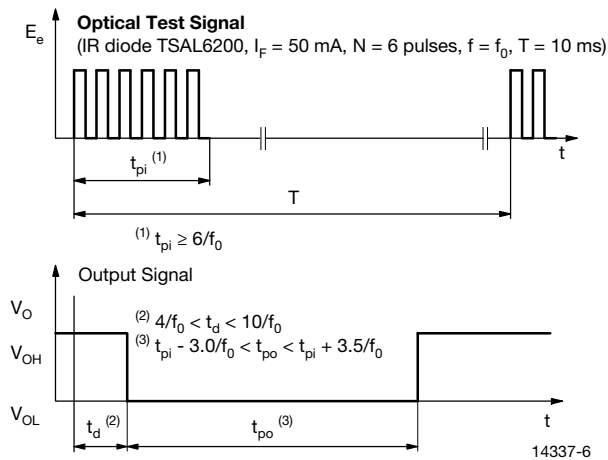


Fig. 1 - Output Active Low

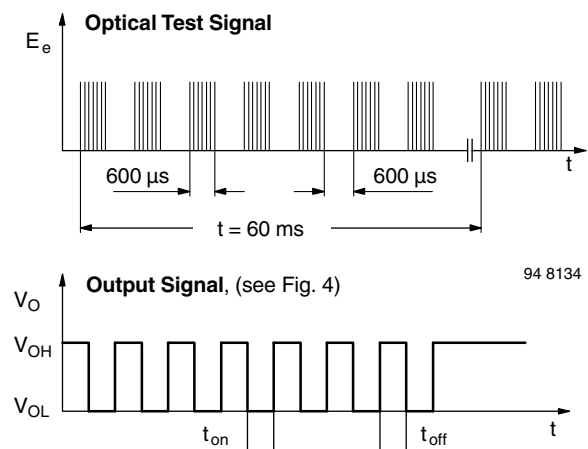


Fig. 3 - Output Function

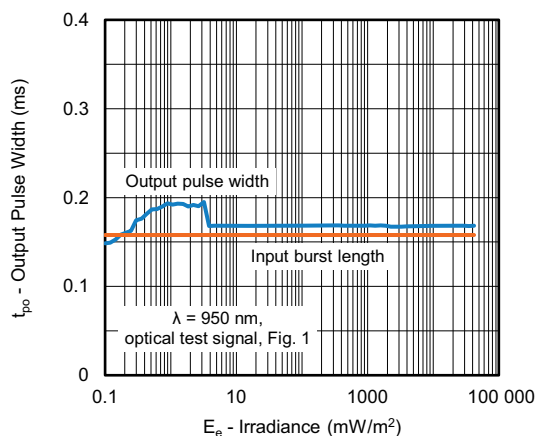


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

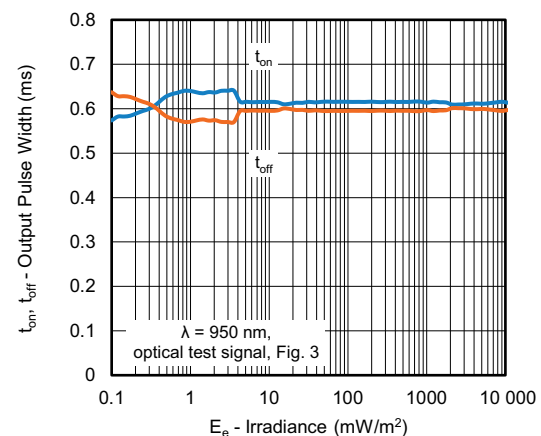


Fig. 4 - Output Pulse Diagram



Fig. 5 - Frequency Dependence of Responsivity

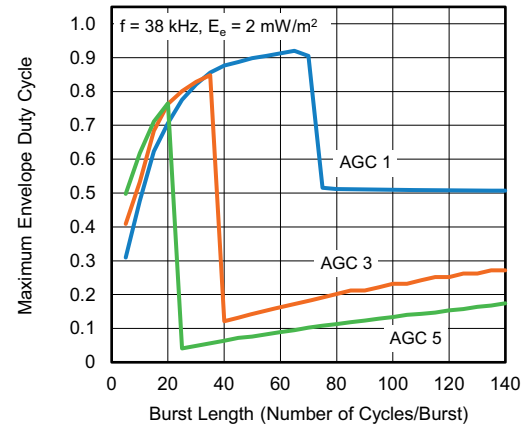


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

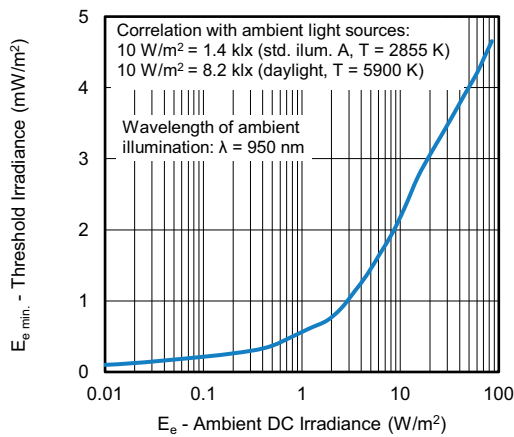


Fig. 6 - Sensitivity in Bright Ambient

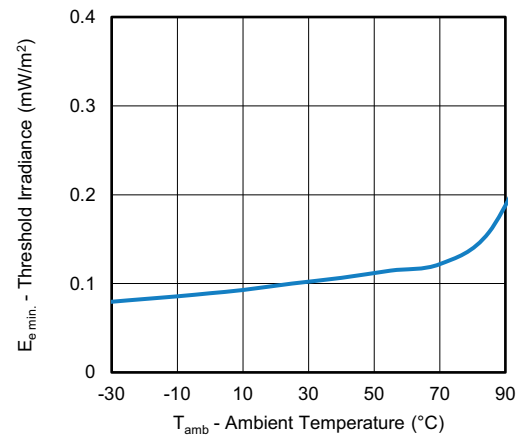


Fig. 9 - Sensitivity vs. Ambient Temperature

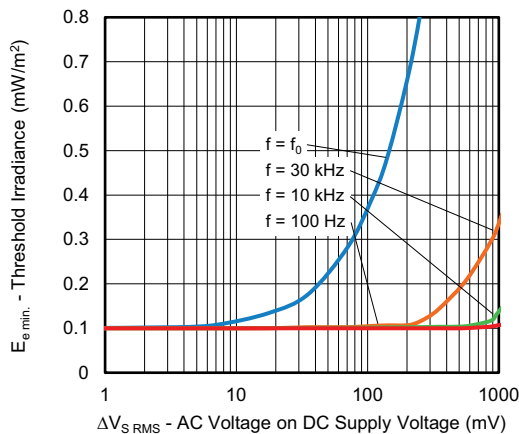


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

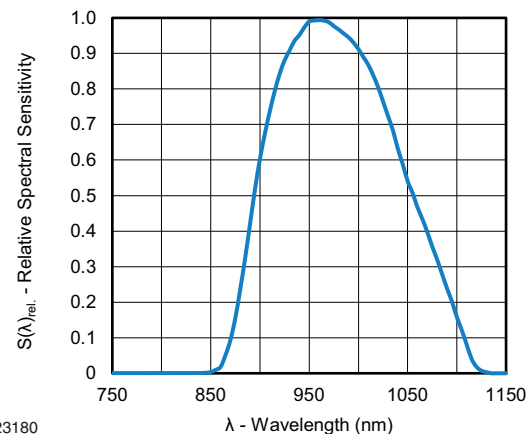


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

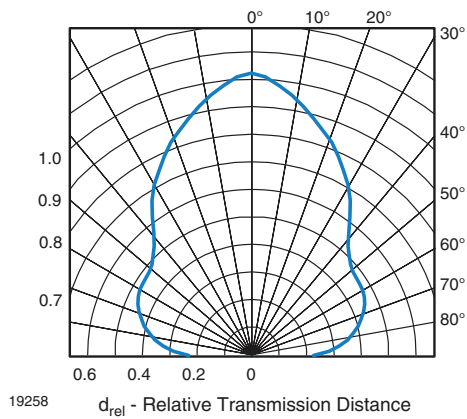


Fig. 11 - Horizontal Directivity

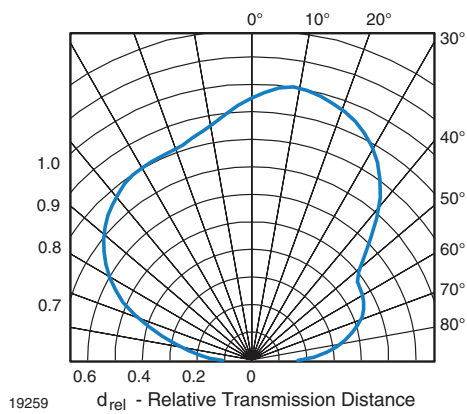


Fig. 12 - Vertical Directivity

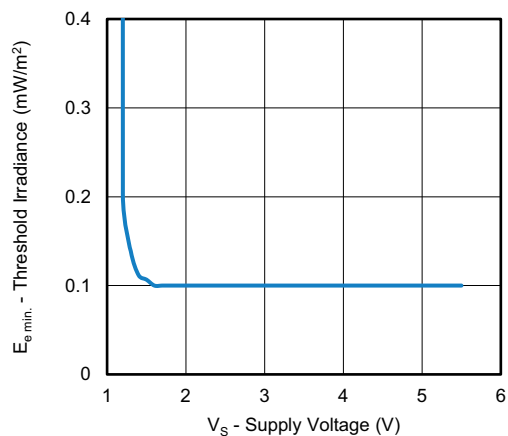


Fig. 13 - Sensitivity vs. Supply Voltage



## SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 14 or Fig. 15).

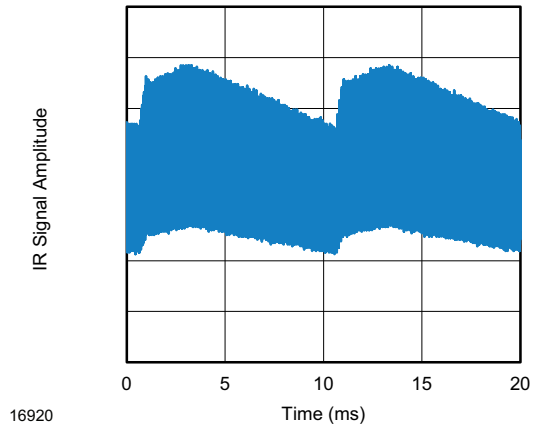


Fig. 14 - IR Disturbance from Fluorescent Lamp with Low Modulation

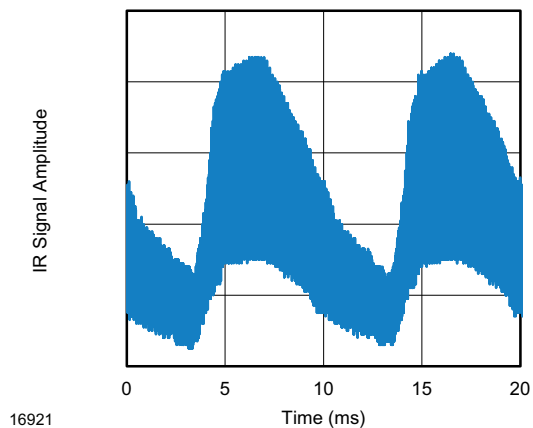
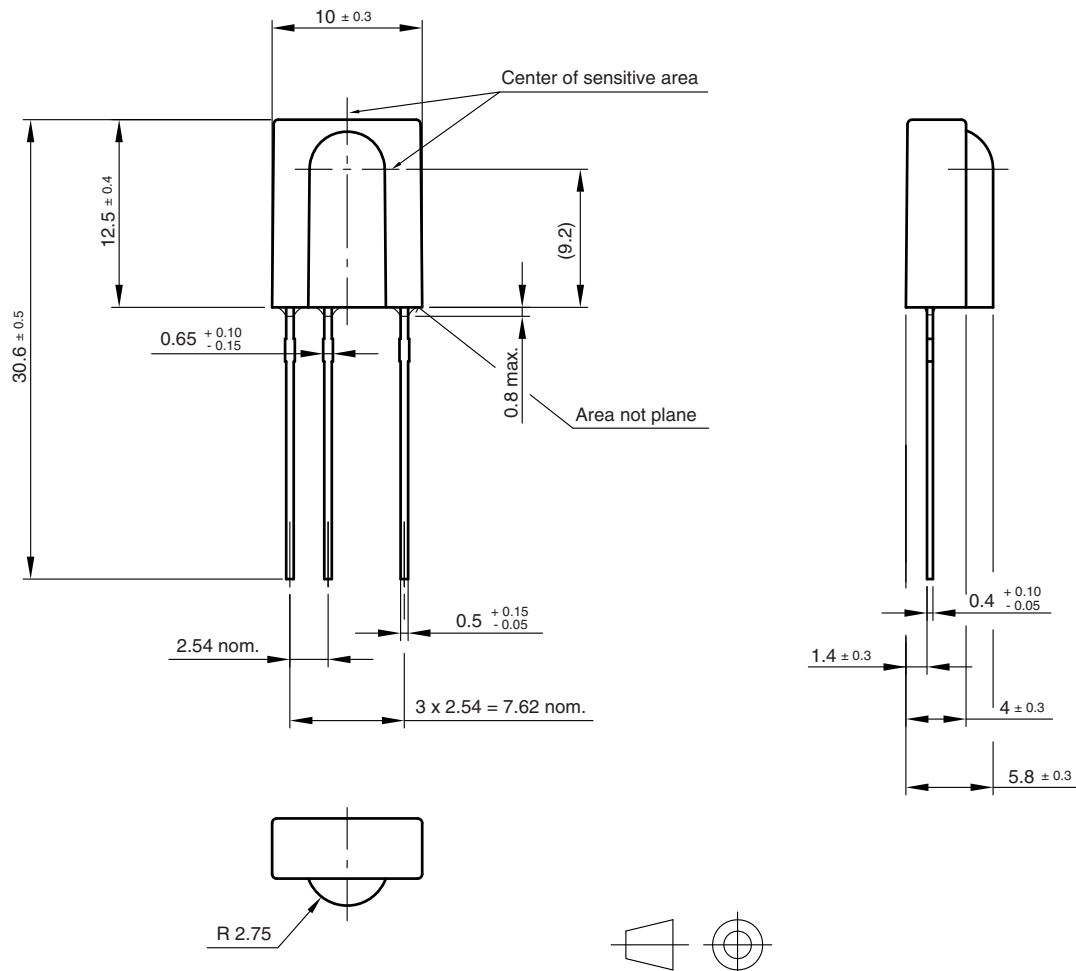


Fig. 15 - IR Disturbance from Fluorescent Lamp with High Modulation

	TSOP311..	TSOP313..	TSOP315..
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 20 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 2 x burst length	35 cycles > 9 x burst length	20 cycles > 25 x burst length
Maximum number of continuous short bursts/second	2000	2000	2000
MCIR code	Yes	Preferred	No
RCMM code	Yes	Preferred	Yes
XMP code	Yes	Preferred	Yes
RECS-80 code	Yes	Preferred	Yes
r-map code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Fig. 14	Fig. 14 and Fig. 15	Fig. 14 and Fig. 15

### Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP312.., TSOP314..

**PACKAGE DIMENSIONS** in millimeters

Drawing-No.: 6.550-5095.01-4

Issue: 20; 15.03.10

96 12116



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