—Phase/ Frequency Detector

Description

The U2892B is a monolithic integrated circuit. It is realized using the advanced silicon bipolar UHF5S technology of TEMIC. The device integrates a phase-frequency detector (PFD) and two synchronous-programmable, high-speed dividers. U2892B is applicable for GSM cellular phones in a transmitter architecture where the VCO oscillates at the TX output frequency. The N divider can be set to divide by 2 or 3, the R divider to divide by 5 or 6, respectively. The TX control loop includes the U2891B integrated I/Q modulator and mixer.

The U2892B exhibits low power consumption, and the power-down function extends battery life.

The IC is available in a shrinked small-outline 20 pin (SSO20) package.

Features

- Supply voltage 2.7 V to 5.5 V
- Current consumption 20 mA
- Power-down function
- Low-current standby mode
- High-speed PFD
- Integrated switchable dividers

Benefits

- High integration
- Small package
- TX architecture saves filter costs

Block Diagram

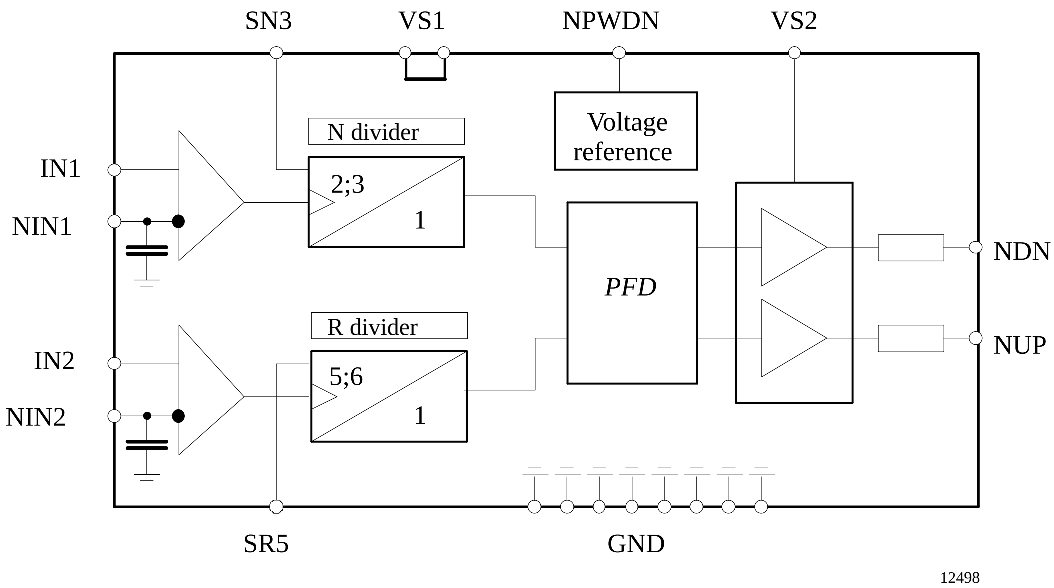


Figure 1. Block diagram

Preliminary Information

Pin Description

Figure 2. Pinning

Pin	Symbol	Function
1	GND 1)	GROUND
2	GND 1)	GROUND
3	VS1 2)	Positive supply
4	IN1	Input N divider
5	NIN1	Complementary input N divider
6	NIN2	Complementary input R divider
7	IN2	Input R divider
8	GND 1)	GROUND
9	GND 1)	GROUND
10	SR5	SET R divider
11	SN3	SET N divider
12	NPWDN	Power-down input
13	GND 1)	GROUND
14	GND 1)	GROUND
15	NUP	Inv. PFD-up output
16	VS2	Supply voltage for output stages
17	NDN	Inv. PFD-down output
18	VS1 2)	Supply voltage
19	GND 1)	GROUND
20	GND 1)	GROUND

Note:

1) All GND pins must be connected to ground.

2) VS1 pins are connected internally together. Capacitive blocking is necessary only at one of the two VS1 pins.

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage VS1	V_{VS1}	$\leq$ V_{VS2}	V
Supply voltage VS2	V_{VS2}	5.5	V
Input voltage at any input	V_{Vi}	–0.5 to V_{VS1} +0.5	V
Output currents	| I_{NUP}, INDN |	5	mA
Ambient temperature	Tamb	–20 to + 85	°C
Storage temperature	Tstg	–40 to +125	°C

Operating Range

Parameters	Symbol	Value	Unit
Supply voltage	V_{VS1}, V_{VS2}	2.7 to 5.5	V
Ambient temperature	T_{amb}	–20 to +85	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction case	SSO20	R_{thJC}	140	K/W

Electrical Characteristics

T_{amb} = 25°C, Vs = 2.7 to 5.5 V, unless otherwise specified (T_{amb} = –20 to +85°C)

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
DC supply						
Supply voltage VS1		V_{VS1}	2.7		5.5	V
Supply voltage VS2		V_{VS2}	V_{VS1}		5.5	V
Supply current	Active	I_{VS1A}		20		mA
	Power down	I_{VS1P}			50	μA
RF inputs						
N divider freq.	1/2 and 1/3 mode		50		350	MHz
R divider freq.	1/5 and 1/6 mode		100		650	MHz
Input impedance IN1 & IN2	Active & standby mode		1 kΩ		2pF	
Input sensitivity IN1 & IN2	Source impedance 50		50		200	mVeff
N divider modes	2/1 divider mode	V_{SN3L}	0		0.4	V
	3/1 divider mode	V_{SN3H}	V_{VS1}–0.5		VVS1	V
R divider modes	6/1 divider mode	V_{SR5L}	0		0.4	V
	5/1 divider mode	V_{SR5H}	V_{VS1}–0.5		VVS1	V
Phase-frequency detector						
Output resistance				500		Ω
Output voltage swing	Load 500 // 2pF			0.5		Vss
Output high level	Without load	V_{NUP}, V_{NDN}		V_{VS2}– 0.9		V
Power-down input (NPWDN)						
Settling time of the circuit	t_{settle}			5	20	μs
High level	Active	V_{NPWDNH}	2.5			V
Low level	Standby	V_{NPWDNL}	0		0.4	V
High-level current	Active, VNPWDNH = 2.7 V	I_{NPWDNH}	0.1		0.6	mA
Low-level current	Standby, VNPWDNL = 0.4 V	I_{NPWDNL}	–10		0	A

Functional Model

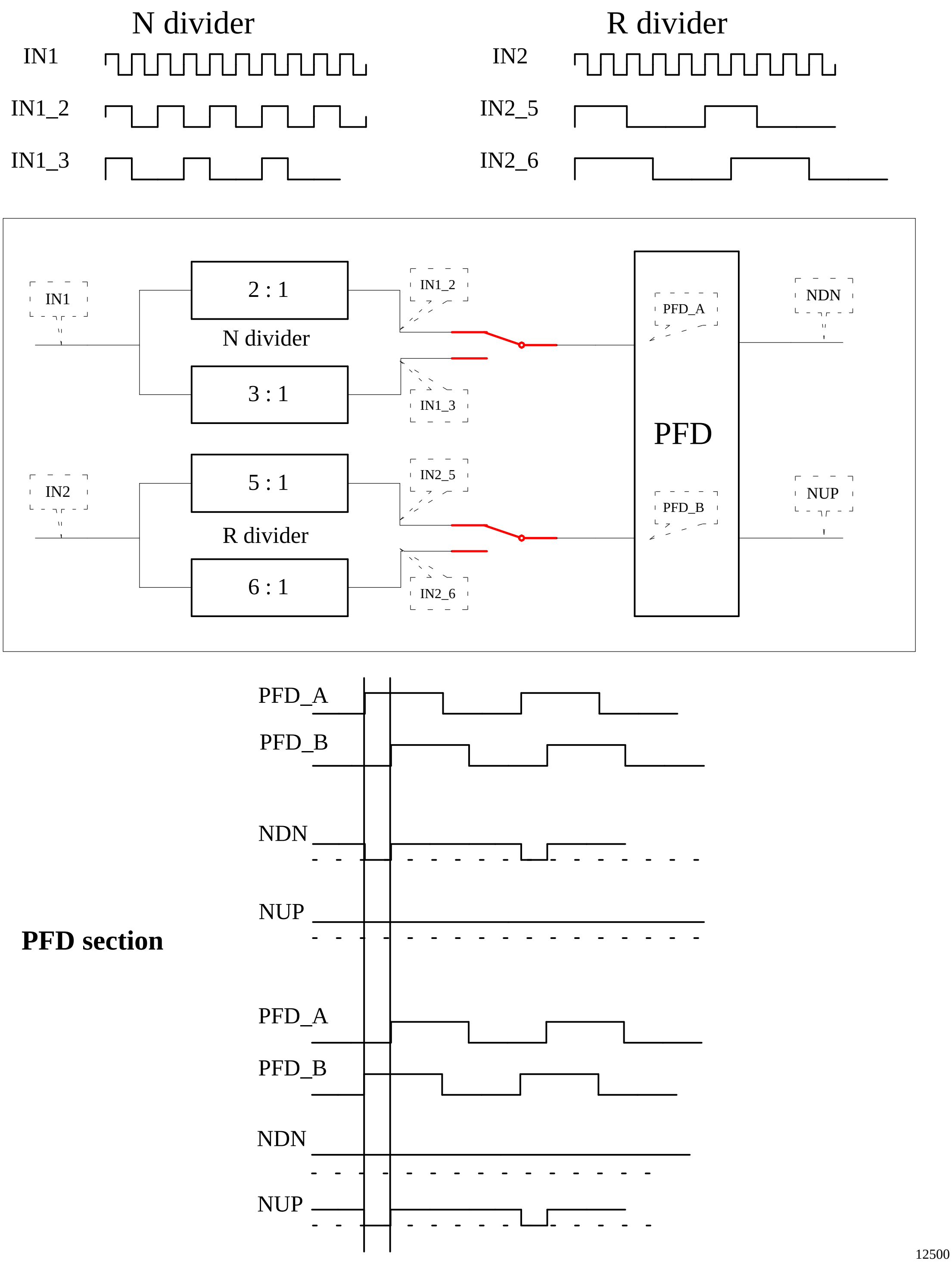


Figure 3.

Application Circuit

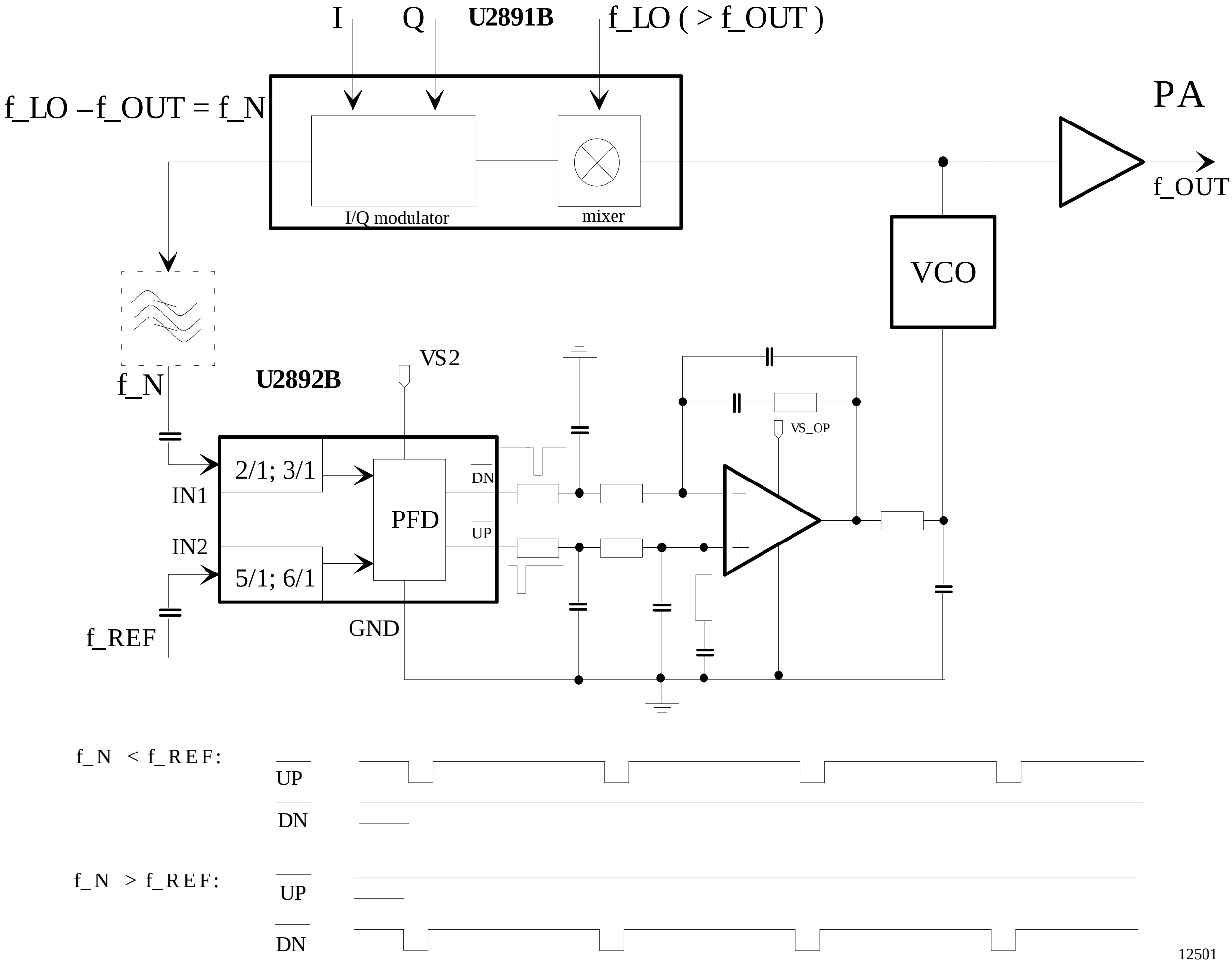


Figure 4.

This application shows a 'modulation–loop' frequency synthesis architecture, utilizing the U2892B. In those schemes, the baseband I/O-spectrum (in-phase and quadrature-phase) is frequency-shifted by an I/Q modulator. This function is performed in the I/Q modulator section of the U2891B (a standard part from TEMIC). The output of the U2891B is fed to the IN1 input of the U2892B. Depending on the application an optional filter is necessary in this path. The frequency-divided I/Q modulator output is phase-compared with the frequency-divided reference frequency f_REF. Depending on the settings of the divider ratios, different sets of frequencies, f_REF, f_LO, and f_OUT, can be combined fitting into many applications. The modulation-loop filter is built around a low-noise, high gain amplifier. Filter poles have to be defined according the application. Via the VCO and a mixer (mixer section of the U2891B), the modulation-loop is closed. The modulated output signal is available through a buffer which isolates the loop from succeeding stages.

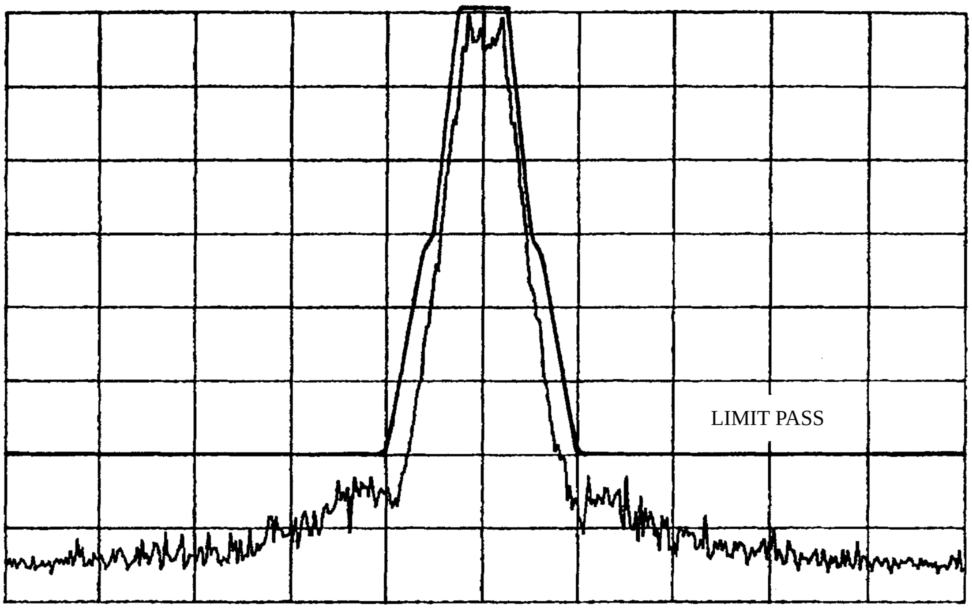


Figure 5. RF-output spectrum using U2892B and U2891B in a GSM application

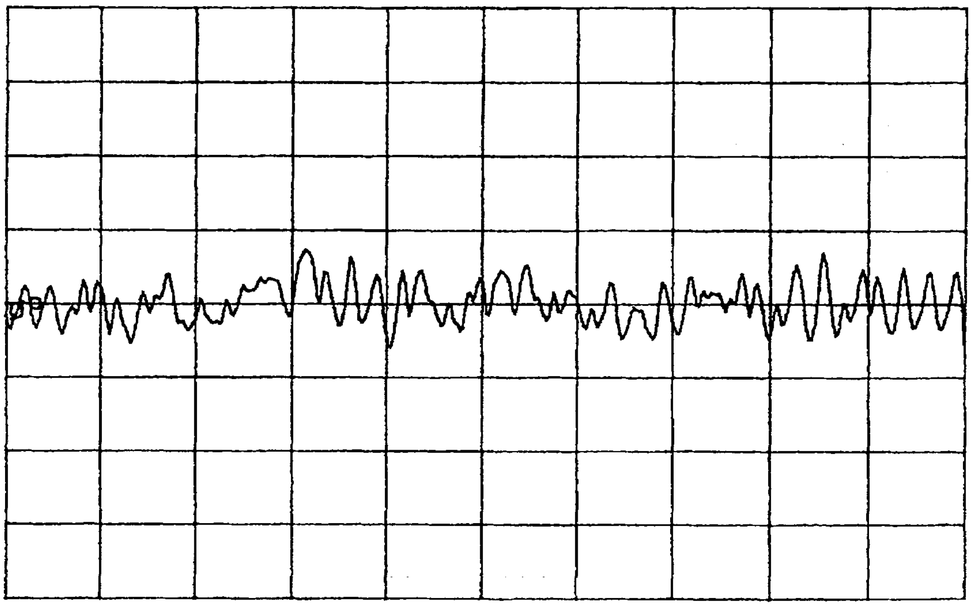
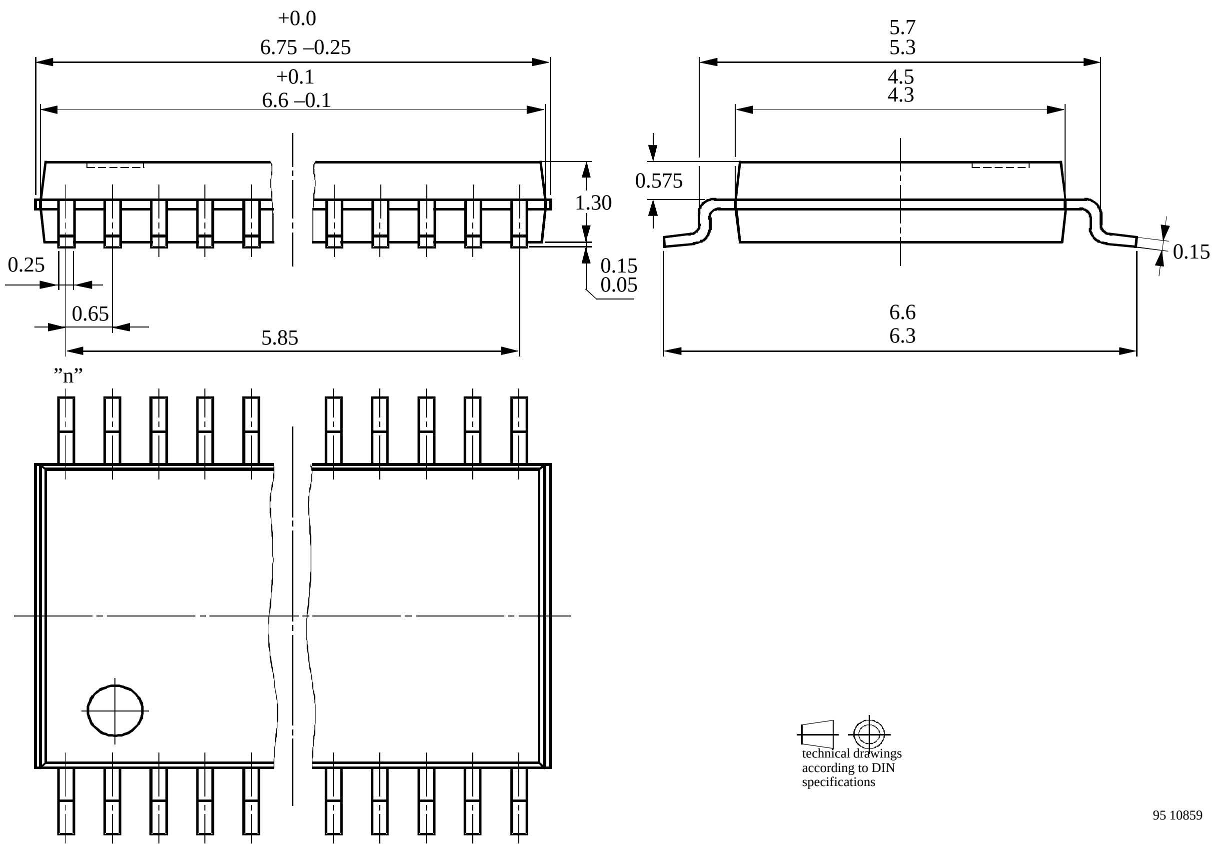


Figure 6. Phase error using U2892B and U2891B in a GSM application

Package Information

Package: SSO20
Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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