

Future Technology Devices International Ltd.

FT3243S

(Low Power +3V to +5.5V, 3D, 5R 250kbps
RS232 Transceiver IC)



The FT3243S is a low power +3V to +5.5V RS232 transceiver with the following advanced features:

- Meets or exceeds the EIA/TIA-323F and CCITT V.28/V.24 Specifications for Vcc at +3.3V +/- 10%.
- Interoperable with EIA/TIA-232 and adheres to EIA/TIA-562 down to a +2.7V power source.
- Low quiescent current, 0.5mA (typical) and 1mA (max).
- Low shutdown current, 1uA (typical) and 10uA (max).
- 3 channels for driving RS232 data
- 5 channels for receiving RS232 data
- Data transfer rates up to 250kbps.
- Switch-capacitor regulated voltage converters.
- Latch-up free.
- ESD Protection for RS232 IO's
 - +/-15kV Human Body Model (HBM)
 - +/-15kV IEC1000-4-2 Air Gap Discharge
 - +/-8kV IEC1000-4-2 Contact Discharge
- Drop-in replacement for MAX3243E, ICL3243E, ISL4243E, ST3243E, SP3243E and ZT3243E
- ONLY AVAILABLE AS PART OF THE USB-DUO KIT (FT231X +FT4232E)

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**FT3243S Low Power +3V to +5.5V, 3D, 5R 250kbps RS232 Transceiver IC
Datasheet
Version 1.0**

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Glasgow G41 1HH United Kingdom. Scotland Registered Company Number: SC136640

1 Typical Applications

- RS232 interface designs
- USB to RS232 converter cables (with FT231X)
- Data cables
- ePOS adapters

1.1 Part Numbers

Part Number	Package
FT3243S	28 Pin SSOP

Table 1.1 Part numbers

Note: Packaging is per reel:

Taped and Reel, SSOP is 3,000pcs per reel.

Must be purchased as part of USB-DUO Kit.

Only full reels available.

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2 Device Pin Out and Signal Description

2.1 28-LD SSOP Package

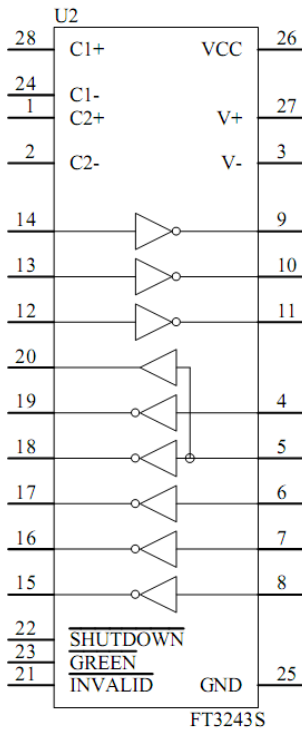


Figure 2.1 SSOP Package Pin Out and Schematic Symbol

2.2 SSOP Package Pin Out Description

Note: The convention used throughout this document for active low signals is the signal name followed by a #

Pin No.	Name	Type	Description
1	C2+	PWR	Positive terminal of the inverted voltage switch capacitor
2	C2-	PWR	Negative terminal of the inverted voltage switch capacitor
3	V-	PWR	Regulated -5.7V output generated by the voltage converter
4	R1IN	Input	First RS232 receiver input
5	R2IN	Input	Second RS232 receiver input
6	R3IN	Input	Third RS232 receiver input
7	R4IN	Input	Fourth RS232 receiver input
8	R5IN	Input	Fifth RS232 receiver input
9	T1OUT	Output	First RS232 transmitter output
10	T2OUT	Output	Second RS232 transmitter output
11	T3OUT	Output	Third RS232 transmitter output

Pin No.	Name	Type	Description
12	T3IN	Input	Third TTL/CMOS transmitter input
13	T2IN	Input	Second TTL/CMOS transmitter input
14	T1IN	Input	First TTL/CMOS transmitter input
15	R5OUT	Output	Fifth TTL/CMOS receiver output
16	R4OUT	Output	Fourth TTL/CMOS receiver output
17	R3OUT	Output	Third TTL/CMOS receiver output
18	R2OUT	Output	Second TTL/CMOS receiver output
19	R1OUT	Output	First TTL/CMOS receiver output
20	R2OUTB	Output	Second TTL/CMOS receiver non-inverting output. Always active
21	INVALID#	Output	Output of a valid signal detection. INVALID is enabled high if a valid RS232 level is present on any receiver input line
22	SHUTDOWN#	Input	Shutdown control. A logic LOW to disable drivers and voltage converter.
23	GREEN#	Input	Set to logic HIGH to keep transmitters on.
24	C1-	PWR	Negative terminal of the bootstrapped voltage switch capacitor
25	GND	PWR	Ground pin of the device
26	VCC	PWR	+3 to 5.5V supply voltage
27	V+	PWR	Regulated +5.4V output generated by the voltage converter
28	C1+	PWR	Positive terminal of the bootstrapped voltage switch capacitor

Table 2.1 Device pinout

3 Function Description

The FT3243S device is a 3V powered EIA/TIA-232 and V.28/V.24 communications interface device tailored for low power designs. The device consists of 3 line drivers, 5 line receivers and switch-capacitor regulated voltage converters. The device operates from a single 3V to 5.5V power supply at guaranteed data rates of 250kbps with enhanced ESD protection on all RS232 IO pins, exceeding +/-15kV IEC1000-4-2 Air gap discharge and +/-8kV IEC1000-4-2 Contact discharge.

3.1 Switch-Capacitor Regulated Voltage

The FT3242S device uses switch-capacitor voltage-controlled source and current sink generators to provide bipolar voltages to maintain compliant EIA/RS232 levels regardless of power supply fluctuations. The design consists of an internally regulated oscillator, a two phase clock cycling, regulated complementary MOS switches, fast switching diode and switch capacitors.

The switch capacitor bi-directional current generators operate with smartly regulated CMOS switches and fast switching diode. The efficiency of these bi-directional current generators is greater than 70%. The switching frequency is generated by an internal oscillator and regulated by the current loads. The switch capacitor pump design delivers higher negative bucked voltage than the positive boosted voltage to achieve a balanced voltage controlled source and sink current generators resulting in balanced bipolar voltage supplies to the chip.

3.2 Controlled Power Down

FT3243S has a low power shutdown mode controlled by the SHUTDOWN# pin. During shutdown the driver output and the switch-capacitor regulated voltage converter are disabled with the supply current falling to less than 1uA.

3.3 ESD Immunity

The RS232 transceiver is usually routed from the serial port connector to the transceiver IC through the metal trace on the PCB. This trace will have some small amount of resistance that will add some protection in terms of limiting transient current to the IC. However for added voltage protection, transient voltage suppressors (TVS) or transorbs are usually necessary to protect the serial port circuitry.

The FT3243S includes built-in transient voltage suppression whereby external ESD protection circuitry is not required, allowing for a reduction in bill of materials and PCB area required to realise the design.

The FT3243S transceivers meet and exceed the minimum criteria for EN6100-4-2 with +/- 15kV for air gap discharge and +/- 8kV for contact discharge.

3.4 Output Control Truth Table

The following truth table provides the various output control states.

GREEN#	Valid RC I/P	SHUTDOWN#	TxOUT	RxOUT	RxOUTB	INVALID#
0	No	1	Z	Active	Active	0
0	Present	1	Active	Active	Active	1
1	X	1	Active	Active	Active	X
X	X	0	Z	Z	active	X

Table 3.1 output Control Truth table

4 Devices Characteristics and Ratings

4.1 Absolute Maximum Ratings

The absolute maximum ratings for the FT3243S devices are as follows. These are in accordance with the Absolute Maximum Rating System (IEC 60134). Exceeding these may cause permanent damage to the device.

Parameter	Value	Unit	Conditions
Storage Temperature	-65°C to 150°C	Degrees C	
Floor Life (Out of Bag) At Factory Ambient (30°C / 60% Relative Humidity)	168 Hours (MSL Level 3 Compliant)*	Hours	IPC/JEDEC J-STD-033A
Ambient Operating Temperature (Power Applied)	-40°C to 85°C	Degrees C	
Power Supply Vcc	-0.3V to +6.0V	Volts	
V+	-0.3V to +7.0V	Volts	
V-	+0.3V to -7.0V	Volts	
V+ + V-	+13.0V	Volts	
Icc (DC Vcc or GND current)	+/- 100mA	Milliamps	
TxIN, GREEN#, SHUTDOWN#	-0.3V to +6.0V	Volts	
RxIN	+/-25V	Volts	
TxOUT	+/-15V	Volts	
RxOUT, INVALID#	-0.3V to (Vcc+0.3V)	Volts	
Short circuit duration TXOUT	Continuous	Time	

Table 4.1 Absolute Maximum Ratings

* If devices are stored out of the packaging beyond this time limit the devices should be baked before use. The devices should be ramped up to a temperature of +125°C and baked for up to 17 hours.

4.2 Electrical Characteristics

Unless otherwise stated $V_{cc} = +3.0V$ to $+5.0V$, $T_A = T_{min}$ to T_{max} , $C1$ to $C4 = 0.1\mu F$, typical values apply at $V_{cc} = +3.3V$ or $+5.0V$ and $T_A = 25^\circ C$

Parameter	Condition	Min	Typ	Max	Units
TTL logic input	T1IN, T2IN, T3IN, GREEN#, SHUTDOWN#				
TTL logic output	R1OUT, R2OUT, R3OUT, R4OUT, R5OUT, R1OUTB, R2OUTB, INVALID#				
RS232 input	R1IN, R2IN, R3IN, R4IN, R5IN				
RS232 output	T1OUT, T2OUT, T3OUT				
Charge pump pin	C1+, C1-, C2+, C2-				
Power pin	Vcc, GND, V+, V-				
Charge pump Caps	C1+, C1-, C2+, C2-	0.1	0.1	1	μF
Temp $-40^\circ C$ to $+85^\circ C$	Industrial grade	-40	+25	+85	$^\circ C$
Vcc Voltage range	Vcc = +5.0V Supply	4.5	5	5.5	V
	Vcc = +3.3V Supply	3	3.3	3.6	V
Supply current	TTL inputs = Vcc/GND, RS232 input = float, Vcc = 3.3V		0.5	1	mA
Supply current, AUTOGREEN disabled	GREEN# = Vcc; SHUTDOWN# = Vcc TTL inputs = Vcc/GND, RS232 input = float, Vcc = 3.3V		0.5	1	mA
Supply current, AUTOGREEN enabled	GREEN# = GND; SHUTDOWN# = Vcc TTL inputs = Vcc/GND, RS232 input = float, Vcc = 3.3V		1	10	μA
Supply current, SHUTDOWN# enabled	GREEN# = Vcc/GND; SHUTDOWN# = GND; TTL inputs = Vcc/GND, RS232 input = float, Vcc = 3.3V		1	10	μA
TTL LOGIC INPUT					
Input threshold low				0.8	V
Input threshold high	Vcc = +5.0V supply	2.4			V
Input threshold high	Vcc = +3.3V supply	2			V
Input hysteresis			0.5		V
Input leakage current	Vin = Vcc and GND, TIN, GREEN#, SHUTDOWN#		+/- 0.01	+/-1	mA

Parameter	Condition	Min	Typ	Max	Units
TTL LOGIC OUTPUT					
Output voltage low	$I_{out} = 1.6\text{mA}$			0.4	V
Output voltage high	$I_{out} = -1.0\text{mA}$	$V_{cc} - 0.6$	$V_{cc} - 0.1$		V
Output leakage current	Receiver outputs disabled, $V_{out} = V_{cc}$ or GND, SHUTDOWN# = GND		+/- 0.05	+/-10	μA
Receiver input					
Input voltage range	$T_A = T_{min} - T_{max}$	-25		+25	V
Input threshold low	$T_A = 25^\circ\text{C}$, $V_{cc} = 5.0\text{V}$	0.8	1.5		V
	$T_A = 25^\circ\text{C}$, $V_{cc} = 3.3\text{V}$	0.6	1.2		V
Input threshold high	$T_A = 25^\circ\text{C}$			2.4	V
Input hysteresis	$T_A = 25^\circ\text{C}$		0.5		V
Input resistance	$V_{in} = +/-25\text{V}$, $T_A = 25^\circ\text{C}$	3		7	$\text{k}\Omega$
Transmitter output					
Output voltage swing	$R_L = 3\text{k}\Omega$, All outputs are loaded	+/-5			V
Output resistance	$V_{cc} = V_+ = V_- = \text{GND}$, $V_{OUT} = +/-2\text{V}$	300			Ω
Output short circuit current	$V_{OUT} = \text{GND}$			+/-60	mA
Output leakage current	Transmitter disabled, $V_{OUT} = +/-12\text{V}$		+/-5	+/-25	μA
Mouse driving ability					
Transmitter output voltage	$T1IN = T2IN = \text{GND}$; $T3IN = V_{cc}$; $T3OUT = 3\text{k}\Omega$; $T1OUT = T2OUT = -2.5\text{mA}$	+/-5			V
Timing Characteristics					
Maximum Data rate	$R_L = 3\sim 7\text{k}\Omega$, $C_L = 50\text{pF}\sim 1000\text{pF}$; DR/RC switching, $T_A = 25^\circ\text{C}$	250			kbps
Transition region slew rate	$R_L = 3\sim 7\text{k}\Omega$, $C_L = 150\text{pF}\sim 1000\text{pF}$; one transmitter switching, $T_A = 25^\circ\text{C}$, measured from 3V to -3V or -3V to 3V	6		30	V/ μs

Parameter	Condition	Min	Typ	Max	Units
Transmitter propagation t_{PLH}	$R_L = 3k\Omega, C_L = 1000pF$; All loaded		2		us
Transmitter propagation t_{PHL}	$R_L = 3k\Omega, C_L = 1000pF$; All loaded		2		us
Transmitter skew	$t_{PHL} - t_{PLH}$		100		ns
Transmitter output enable time			400		ns
Transmitter output disable time			250		ns
Receiver propagation t_{PLH}	$C_L = 150pF$		0.15		us
Receiver propagation t_{PHL}	$C_L = 150pF$		0.15		us
Receiver skew	$t_{PHL} - t_{PLH}$		50		ns
Receiver output enable time			200		ns
Receiver output disable time			200		ns
AUTOGREEN TIMING					
Receiver input to INVALID output high				1	us
Receiver input to INVALID output low				30	us
Power save mode to transmitter enabled			100		us
ESD tolerance					
ESD HBM			+/-15		kV
IEC 1000-4-2 Contact discharge			+/-8		kV
IEC 1000-4-2 Air gap discharge			+/-8		kV

Table 4.2 Electrical Characteristics

5 Package Parameters

The FT3243S is available in a 28 pin SSOP package. The solder reflow profile for the package is described in Section 5.3.

5.1 SSOP-28 Package Mechanical Dimensions

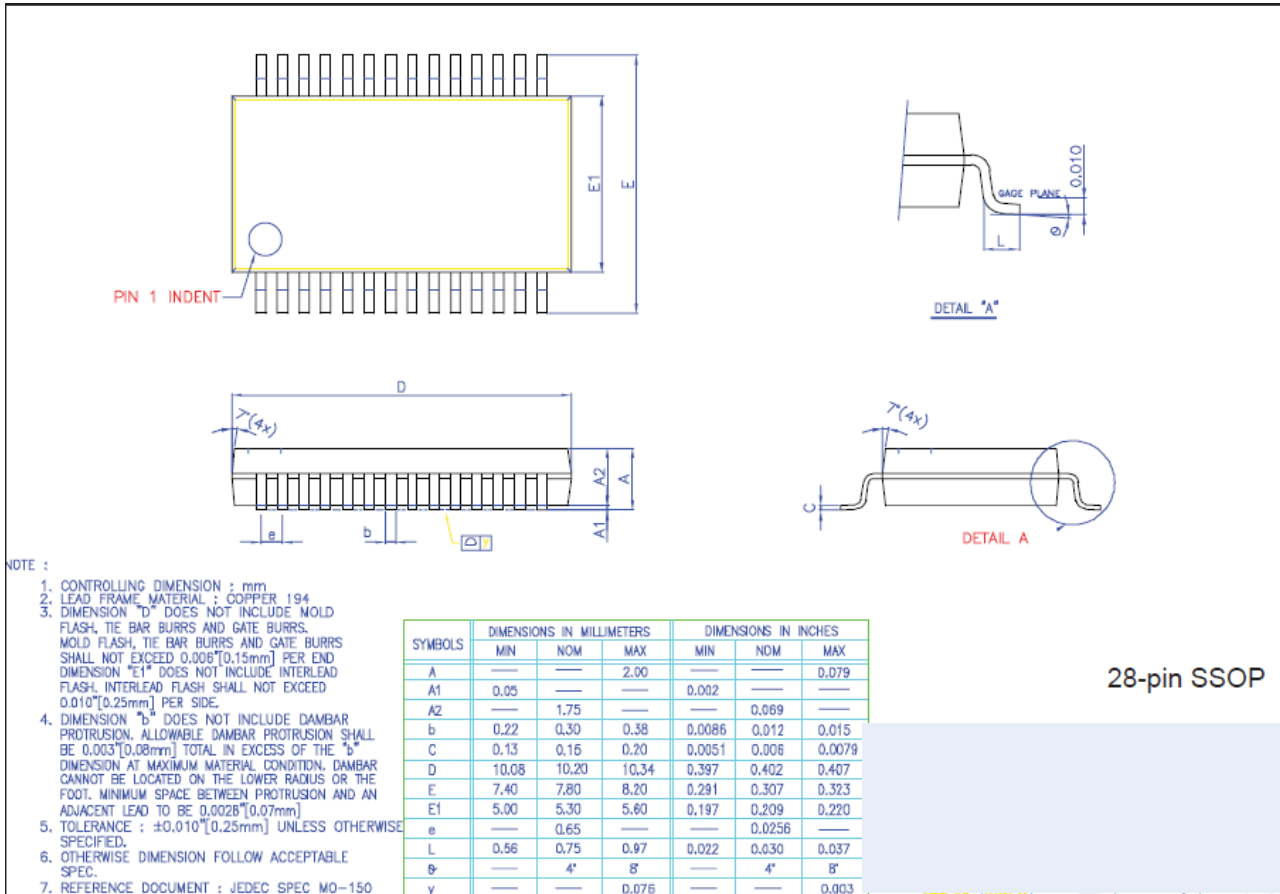


Figure 5.1 SSOP-28 Package Dimensions

The FT3243S is supplied in a RoHS compliant 28 pin SSOP package. The package is lead (Pb) free and uses a 'green' compound. The package is fully compliant with European Union directive 2002/95/EC.

This package is nominally 10.20mm x 5.30mm body (10.20mm x 7.80mm including pins). The pins are on a 0.65 mm pitch. The above mechanical drawing shows the SSOP-28 package.

5.2 Package Markings

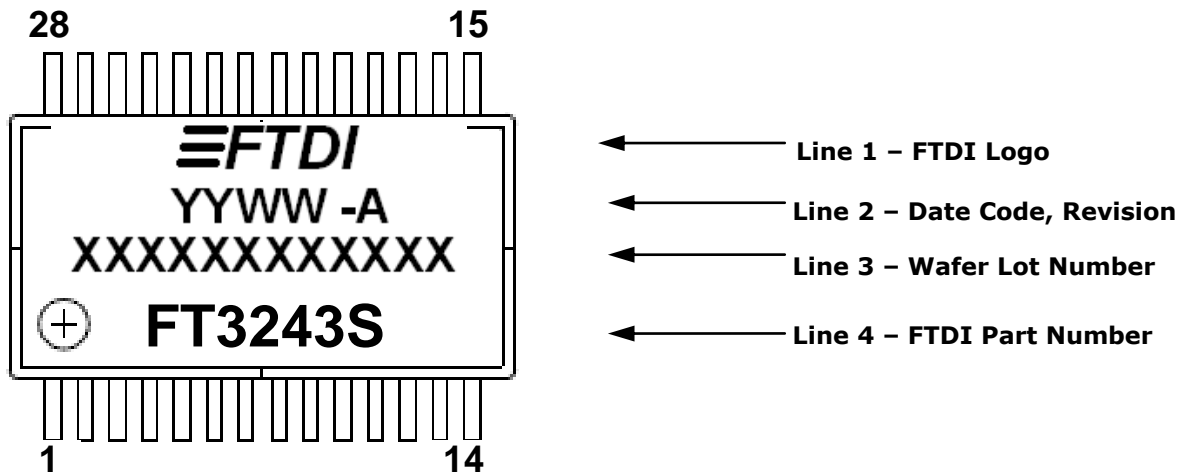


Figure 5.2 SSOP-28 Package Markings

Notes:

1. YYWW = Date Code, where YY is year and WW is week number
2. Marking alignment should be centre justified

5.3 Solder Reflow Profile

The FT3243S is supplied in Pb free 28 LD SSOP package. The recommended solder reflow profile for both package options is shown in 5.3.

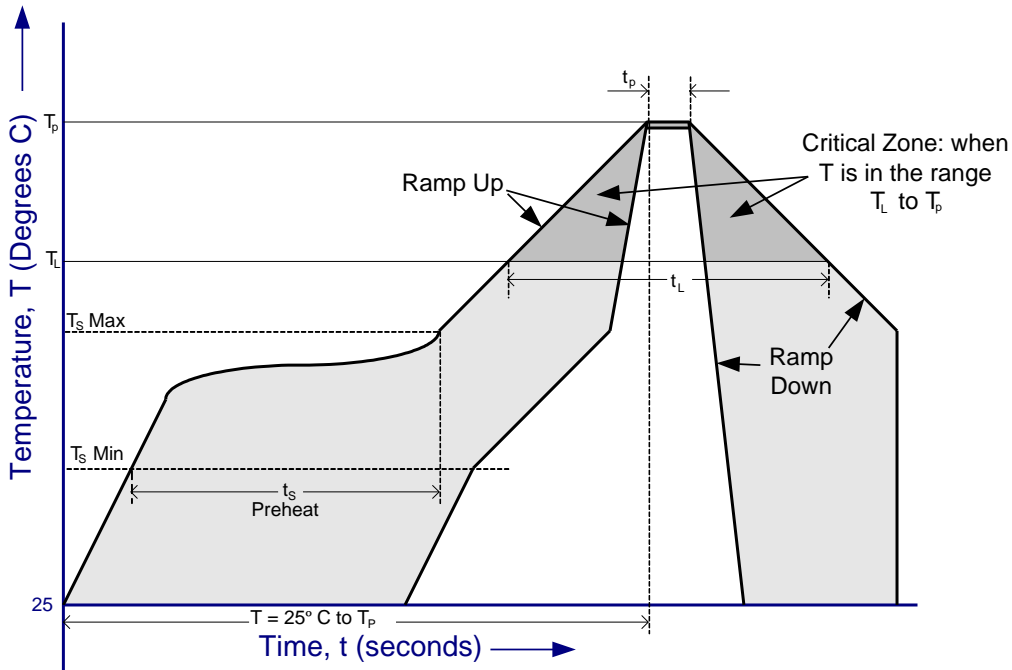


Figure 5.3 FT3243 Solder Reflow Profile

The recommended values for the solder reflow profile are detailed in Table 5.1. Values are shown for both a completely Pb free solder process (i.e. the FT240X is used with Pb free solder), and for a non-Pb free solder process (i.e. the FT240X is used with non-Pb free solder).

Profile Feature	Pb Free Solder Process	Non-Pb Free Solder Process
Average Ramp Up Rate (T_s to T_p)	3°C / second Max.	3°C / Second Max.
Preheat - Temperature Min (T_s Min.) - Temperature Max (T_s Max.) - Time (t_s Min to t_s Max)	150°C 200°C 60 to 120 seconds	100°C 150°C 60 to 120 seconds
Time Maintained Above Critical Temperature T_l : - Temperature (T_l) - Time (t_l)	217°C 60 to 150 seconds	183°C 60 to 150 seconds
Peak Temperature (T_p)	260°C	240°C
Time within 5°C of actual Peak Temperature (t_p)	20 to 40 seconds	20 to 40 seconds
Ramp Down Rate	6°C / second Max.	6°C / second Max.
Time for $T= 25^\circ\text{C}$ to Peak Temperature, T_p	8 minutes Max.	6 minutes Max.

Table 5.1 Reflow Profile Parameter Values

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Appendix A - References

<http://www.ftdichip.com/FT-X.htm>

http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT231X.pdf

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