WT6633P

USB Power Delivery and Qualcomm® Quick Charge™ 4/4+ Controller

Brief Specification

Rev. 1.02

May 2018

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1. General Description

The WT6633P is a highly integrated USB Power Delivery (PD) controller that supports USB PD 3.0 Programmable Power Supply specification and Qualcomm® Quick Charge™ 4 or Quick Charge 4+ technologies. It is designed for USB Type-C power source applications such as power adapters, wall chargers, car chargers, power strip, power bank, and etc.

The WT6633P minimizes external components by integrating USB PD baseband PHY, Type-C detection, shunt regulator, voltage and current monitors, NMOS load switch driver and an 8-bit MCU to allow small form factor and low BOM cost. Wide operation voltage range (3V to 24V) supports PD 3.0 Programmable Power Supply (PPS) specification. One-Time-Programmable ROM is provided for program code and user configuration data.

2. Features

- USB Type-C and USB-PD
  - Supports USB PD 3.0 including Programmable Power Supply (PPS)
  - Programmable Type-C pull-up Rp
  - Integrated VCONN power and switch for reading E-marked cable
- Supports USB BC1.2 DCP, Quick Charge 4 and Quick Charge 4+ (backward compatible Quick Charge 3.0 and Quick Charge 2.0)
- Supports Fast Charge Protocol and Smart Charge Protocol
- Built-in shunt regulator
  - Programmable constant voltage control
  - Programmable constant current control
  - Integrated low side current sense amplifier
  - Cable drop compensation
- Programmable fault protections
  - Over Voltage Protection (OVP)
  - Under Voltage Protection (UVP)
  - Over Current Protection (OCP)
  - Over Temperature Protection (OTP)
- 10-bit ADC for voltage and current monitoring
- MCU
  - Turbo 8051 compatible MCU
  - 16K bytes One-Time-Programmable ROM
- Driver for NMOS load switch
- Built-in discharge MOS transistor
- Internal RC oscillator
- Internal VDD regulator
- General purpose I/Os
- Supports power saving mode
- Operating voltage range: 3V ~ 24V (30V tolerant)
- Operating temperature range: -20°C ~ +105°C
- Package: 16-Pin QFN, 14-pin SOP and 10-pin SOP

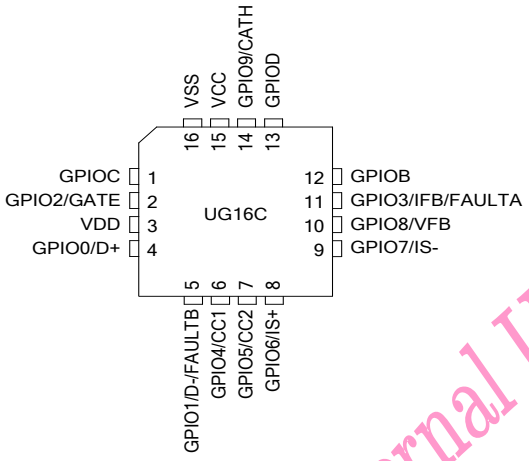
Applications:

USB Type-C with Power Delivery power adapters, wall chargers, car chargers, power strip, power banks, and etc.

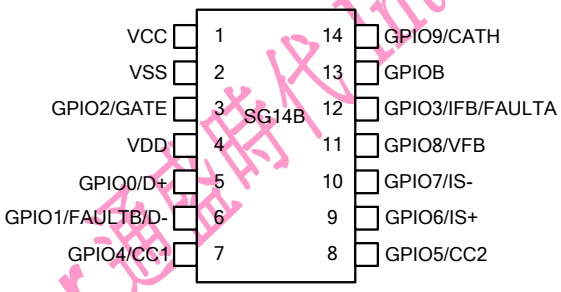
3. Pin Configuration

3.1 Package

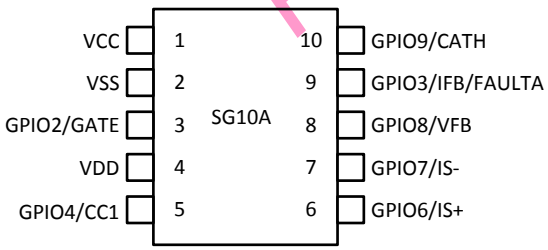
16-pin QFN

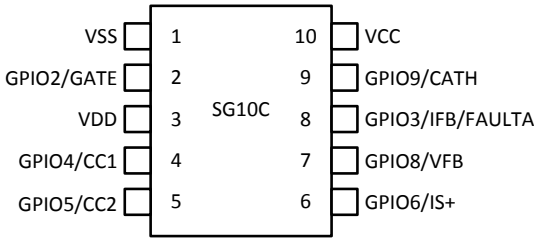


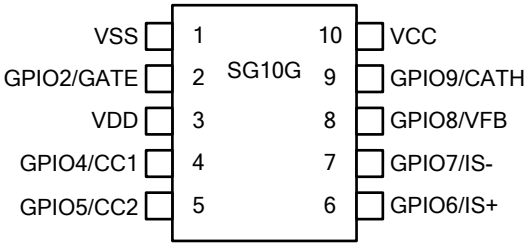
14-pin SOP



10-pin SOP







3.2 Pin Description

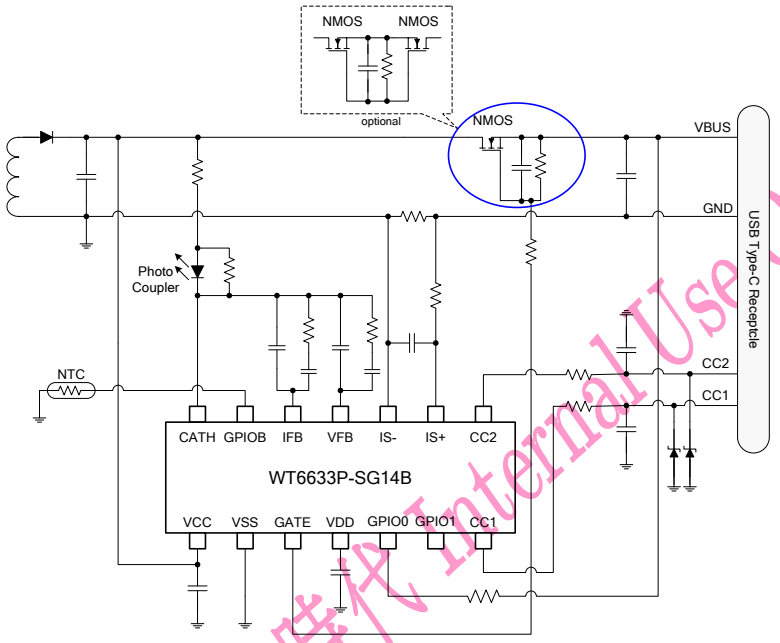
Pin Number					Pin Name	Function	I/O Voltage	Type		Description
QFN	SOP							Input	Output	
16C	14B	10A	10C	10G						
15	1	1	10	10	VCC	VCC	HV	-	-	Positive power supply
						DISC		-	OD	Discharge
16	2	2	1	1	VSS	VSS	-	-	-	Ground
1					GPIOC	GPIOC	HV	TTL	OD	Serial purpose I/O.
						OTPA		AN	-	Temperature sensing pin
						ADC9		AN	-	ADC input
						P07		TTL	OD	8051 port I/O
2	3	3	2	2	GPIO2	GPIO2	HV	TTL	OD	General purpose I/O.
						GATE		-	PP	Gate driver of load switch
3	4	4	3	3	VDD	VDD	LV	-	AN	4.8V regulator
4	5				GPIO0	GPIO0	HV	TTL	OD	General purpose I/O.
						D+		AN	-	USB D+
						ADC6		AN	-	ADC input
						TX		TTL	OD	UART transmitter
						SDAB		TTL	OD	I^2C SDA path B
						P00		TTL	OD	8051 port I/O
5	6				GPIO1	GPIO1	LV	TTL	OD	General purpose I/O.
						D-		AN	-	USB D-
						FAULTB		TTL	OD	Fault indication. Active low.
						ADC7		AN	-	ADC input
						RX		TTL	-	UART receiver
						SCLB		TTL	OD	I^2C SCL path B
						P01		TTL	OD	8051 port I/O
6	7	5	4	4	GPIO4	GPIO4	HV	TTL	-	General purpose Input
						CC1		CC	PP	USB Type-C Configuration Channel
						ADC4		AN	-	ADC input
7	8		5	5	GPIO5	GPIO5	HV	TTL	-	General purpose Input
						CC2		CC	PP	USB Type-C Configuration Channel
						OTPC		AN	-	Temperature sensing pin
						ADC5		AN	-	ADC input
8	9	6	6	6	GPIO6	GPIO6	LV	TTL	OD	General purpose I/O.
						IS+		AN	-	Positive input of current sense amplifier.
						SCLA		TTL	OD	I^2C SCL path A
9	10	7		7	GPIO7	GPIO7	LV	TTL	OD	General purpose I/O.
						IS-		AN	-	Negative input of current sense amplifier.
						SDAA		TTL	OD	I^2C SDA path A

Pin Number					Pin Name	Function	I/O Voltage	Type		Description
QFN	SOP							Input	Output	
16C	14B	10A	10C	10G						
10	11	8	7	8	GPIO8	GPIO8	LV	TTL	OD	General purpose I/O.
						VFB		AN	-	Feedback of constant voltage loop
						P04		TTL	OD	8051 port I/O
11	12	9	8		GPIO3	GPIO3	HV	TTL	OD	General purpose I/O. Open drain output.
						IFB		AN	-	Feedback of constant current loop
						FAULTA		TTL	OD	Fault indication. Active low.
						ADC3		AN	-	ADC input
						P03		TTL	OD	8051 port I/O
12	13				GPIOB	GPIOB	HV	TTL	OD	General purpose I/O.
						OTPB		AN	-	Temperature sensing pin
						ADC8		AN	-	ADC input
						P06		TTL	OD	8051 port I/O
13					GPIOD	GPIOD	HV	TTL	OD	General purpose I/O
						OTPD		AN	-	Temperature sensing pin
						P02		TTL	OD	8051 port I/O
14	14	10	9	9	GPIO9	GPIO9	HV	TTL	OD	General purpose I/O.
						CATH		-	AN	Cathode of shunt regulator
						P05		TTL	OD	8051 port I/O

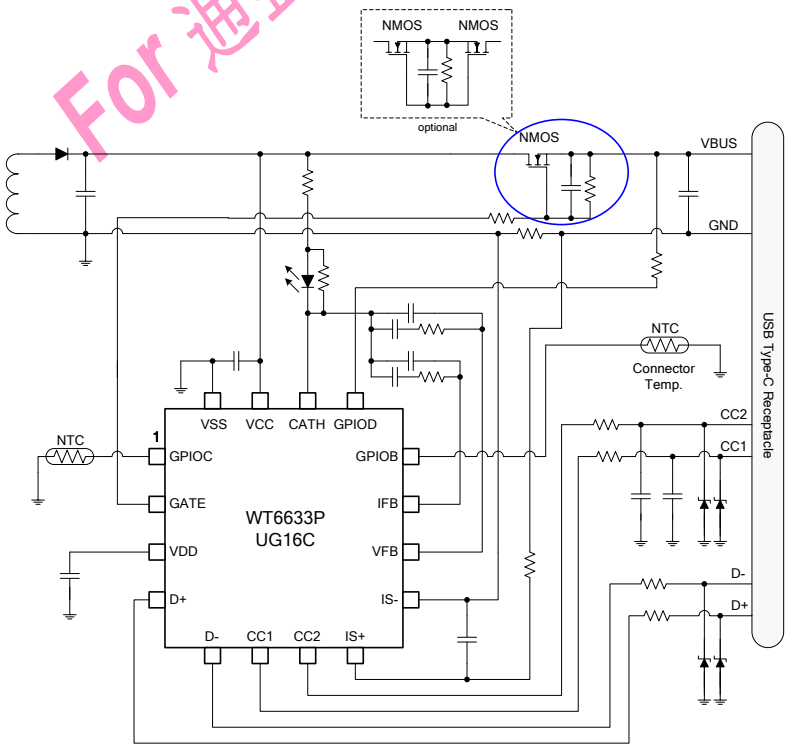
Legend: HV=High Voltage (max. 30V), LV=Low voltage (max. 5.5V), OD=Open Drain, PP=Push Pull, AN=analog, TTL= TTL compatible input, CC= USB PD baseband input

4. Application Information

4.1 USB PD 3.0 Power Adapter with PPS



4.2 QC4 Charger



5. Electrical Characteristics

5.1 Absolute Maximum Ratings

Parameter		Min.	Max.	Units
Supply voltage VCC pin		–0.3	30	V
Input voltage	GPIO0, GPIO2, GPIO3, GPIO4, GPIO5, GPIO9, GPIOB, GPIOC, GPIOD	–0.3	VCC + 0.3 (max. 30V)	V
	GPIO1, GPIO6, GPIO7, GPIO8	–0.3	VDD + 0.3V	V
Output voltage	GPIO0, GPIO2, GPIO3, GPIO9, GPIOB, GPIOC, GPIOD	–0.3	VCC + 0.3 (max. 30V)	V
	GPIO1, GPIO6, GPIO7, GPIO8, VDD	–0.3	VDD + 0.3V	V
Operating temperature		-40	125	°C
Storage temperature		-55	150	°C

Note: Maximum ratings applied to the device are individual stress limit value. Stresses above those listed may cause permanent damage and reliability may be affected.

5.2 Recommended Operating Conditions

Parameter		Condition	Min.	Typ.	Max.	Units
V_{CC_OPR}	Operating voltage		3		24	V
T_{OPR}	Operating Temperature		-20		105	°C

5.3 Thermal Resistance

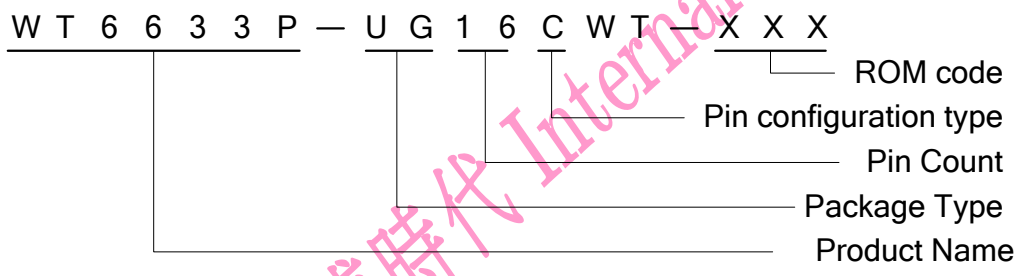
Package	Parameter		Min.	Typ.	Max.	Units
16-pin QFN	θ_{JA}	Thermal Resistance (Junction to Air)		47		°C /W
	θ_{JC}	Thermal Resistance (Junction to Case)		4.5		°C /W
	T_{JMAX}	Maximum Junction Temperature		125		°C
14-pin SOP	θ_{JA}	Thermal Resistance (Junction to Air)		90		°C /W
	θ_{JC}	Thermal Resistance (Junction to Case)		37		°C /W
	T_{JMAX}	Maximum Junction Temperature		125		°C
10-pin SOP	θ_{JA}	Thermal Resistance (Junction to Air)		88		°C /W
	θ_{JC}	Thermal Resistance (Junction to Case)		37		°C /W
	T_{JMAX}	Maximum Junction Temperature		125		°C

6. Ordering Information

Package Type	Package Outline	Part Number	Ordering Number	Note
16-pin QFN	4mm x 4mm	WT6633P	WT6633P-UG16CWT-XXX	-
14-pin SOP	150 mil		WT6633P-SG14BWT-XXX	-
10-pin SOP			WT6633P-SG10AWT-XXX	-
			WT6633P-SG10CWT-XXX	-
			WT6633P-SG10GWT-XXX	-

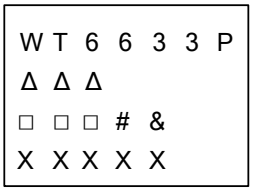
Note: suffix number number-XXX for difference Firmware code, please refer to Firmware control list.

Example:

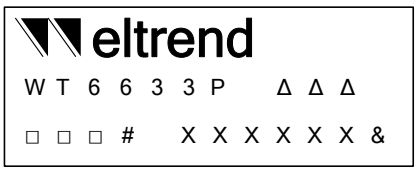


Top Mark

16-pin QFN Top Mark



14-pin/10-pin SOP Top Mark



Δ ROM Code

□ Date Code

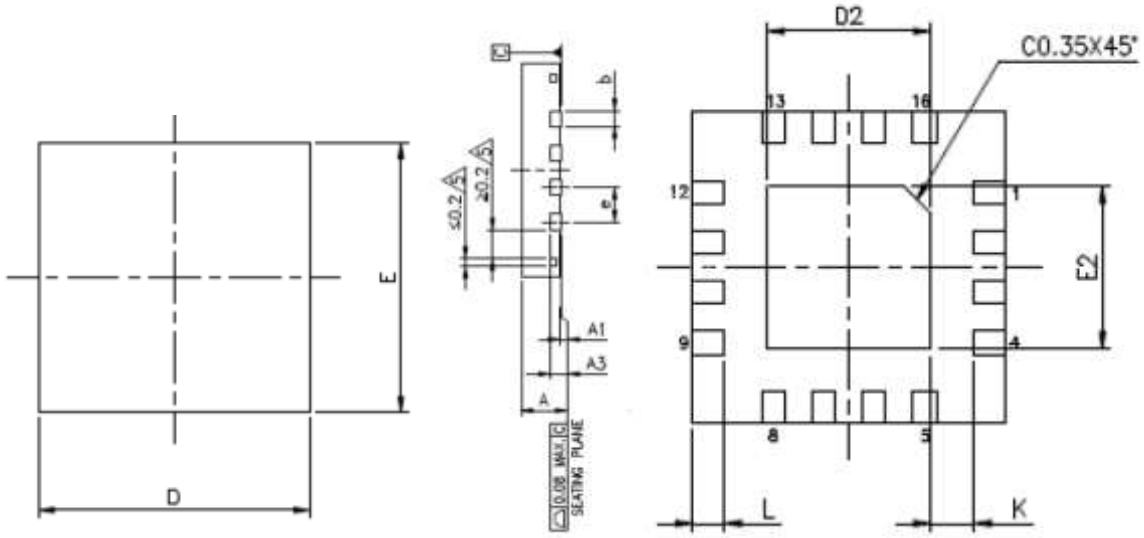
FW Version Code

& Pin configuration type

X Production Tracking code

7. Package Dimension

16-PIN QFN



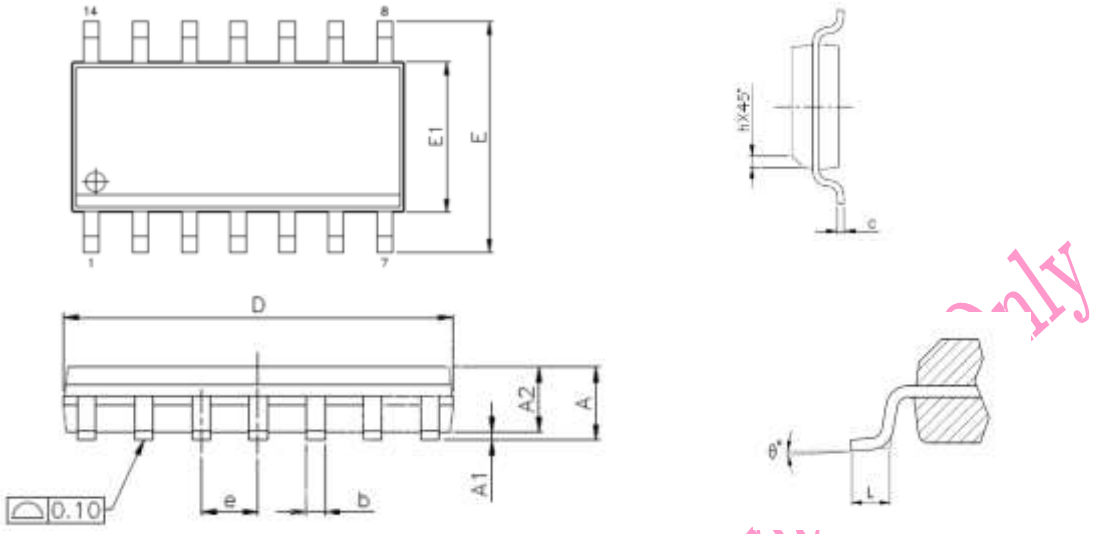
All dimensions shown in mm

SYMBOL	MIN	NOR	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.20	
b	0.25	0.30	0.35
D	3.90	4.00	4.10
E	3.90	4.00	4.10
e		0.65	
K	0.20	-	-
L	0.30	-	0.50
D2	2.00	-	2.80
E2	2.00	-	2.80

NOTE:

1. Dimension “b” applies to metallized terminal and is measured between 0.15mm and 0.30mm from the terminal tip. If the terminal has the optional radius on the other end of the terminal, the dimension “b” should not be measured in that radius area.

14-PIN SOP



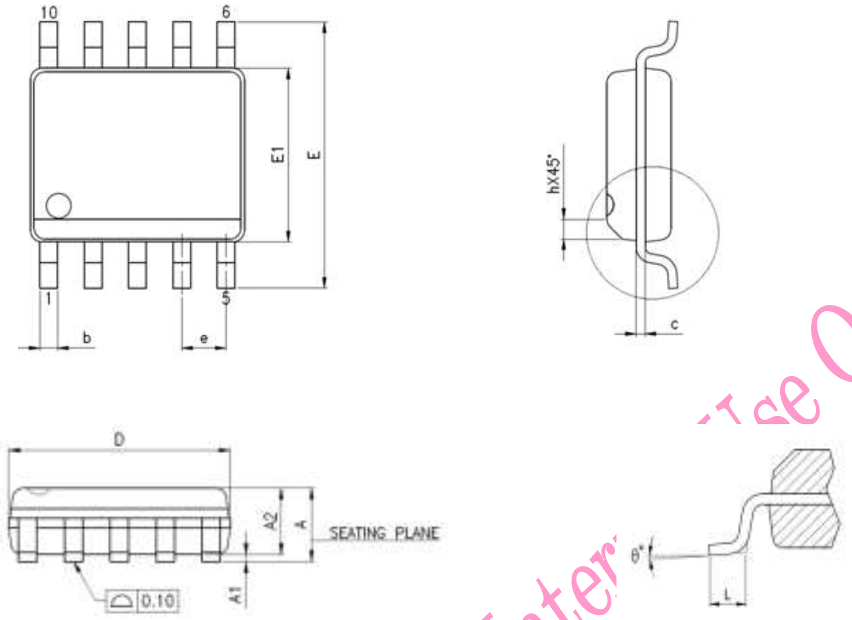
All dimensions shown in mm

SYMBOL	MIN.	MAX.
A	-	1.75
A1	0.10	0.25
A2	1.25	-
b	0.31	0.51
c	0.10	0.25
D	8.55	8.75
E	5.8	6.2
E1	3.8	4.0
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.50
θ°	0	8

NOTES:

1. Dimension “D” does not include mold flash, protrusions or gate burrs mold flash. Protrusions or gate burrs shall not exceed 0.15mm.
2. Dimension “E1” does not include inter-lead flash, or protrusions. Inter-lead flash and protrusions shall not exceed 0.25mm per side.

10-PIN SOP



All dimensions shown in mm

SYMBOL	MIN.	MAX.
A	-	1.75
A1	0.10	0.25
A2	1.25	-
b	0.30	0.45
c	0.10	0.25
D	4.80	4.95
E	6.00 BSC	
E1	3.80	4.00
e	1.0 BSC	
L	0.40	1.27
h	0.25	0.50
θ°	0	8

Notes:

1. Dimension “D” does not include mold flash, protrusions or gate burrs mold flash. Protrusions or gate burrs shall not exceed 0.15mm.
2. Dimension “E1” does not include inter-lead flash, or protrusions. Inter-lead flash and protrusions shall not exceed 0.25mm per side.

8. Revision History

Version	History	Date
0.83	Preliminary	2017/08/25
0.84	Remove SG14A Package	2017/09/06
1.00	1. Update General Description & Features description (section 1 & 2)) 2. Add SG10C package (3.1 package, 3.2 pin description, 6. Ordering Information) 3. Update 5.1 Absolut Maximum ratings	2017/09/20
1.01	1. Update GPIO2 pin description 2. Update D/E/E1 of package dimension for 14-pin SOP (section 7) 3. Update Application circuit 4. Add SG10G package	2018/02/13
1.02	1. Add QC4 description on the title and cover page	2018/05/07

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