WT6639F Dual-port USB Power Delivery and Qualcomm® Quick Charge™ Controller

Product Spec.

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1. General Description

The WT6639F is a dual-port USB Power Delivery (USB 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 dual USB Type-C® power source applications such as multi-port Wall Charger, Car Charge and etc.

The WT6639F minimizes external components by integrating USB PD baseband PHY, USB Type-C detection, 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 USB PD 3.0 Programmable Power Supply (PPS) specification. A Multi-Time-Programmable (MTP) ROM is provided for program code and user configuration data.

2. Features

➢ Integrated two USB-PD PHYs
  ♦ Supports USB PD 3.0 including Programmable Power Supply (PPS)
  ♦ Programmable USB Type-C pull-up Rp
  ♦ Integrated VCONN power and switch for reading E-marked cable
➢ Integrated two USB charge detect blocks, supports USB BC1.2 DCP, Quick Charge 4/4+
➢ Integrated two VBUS voltage/current control
  ♦ Programmable constant voltage control
  ♦ Programmable constant current control
  ♦ Integrated high 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)
➢ CC1/CC2/D+/D- Pins Over Voltage Protection
➢ 10-bit ADC for voltage and current monitoring
➢ MCU
  ♦ Turbo 8051 compatible MCU
  ♦ 32K bytes Multi-Time-Programmable (MTP) ROM
➢ Integrated two 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 to 24V (30V tolerant)
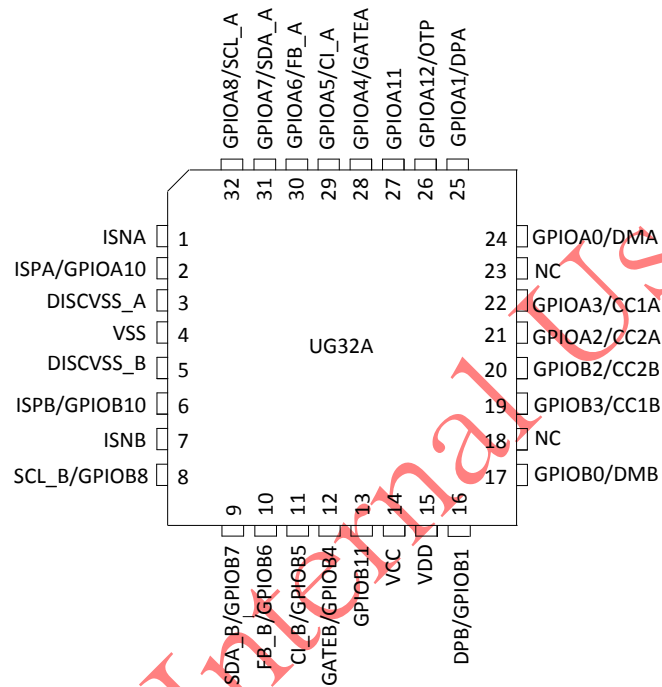➢ Operating temperature range: -20°C to +105°C
➢ Package: 32-pin QFN

Applications:

➢ Multi-port Wall Charger & Car Charge and etc.

3. Pin Configuration

3.1 Package

32-pin QFN

3.2 Pin Description

Pin Number				Type		
QFN	Pin Name	Function	I/O Voltage			description
32A				Input	Output	
1	ISNA	ISNA	HV	AN	-	Current sense input (negative)
2	GPIOA10	GPIOA10	HV	TTL	OD	General purpose I/O.
		ISPA		AN	-	Current sense input (positive)
3	DISCVSS_A	VSS	-	-	-	Ground
4	VSS	VSS	-	-	-	Ground
5	DISCVSS_B	VSS	-	-	-	Ground
6	GPIOB10	GPIOB10	HV	TTL	OD	General purpose I/O.
		ISPB		AN	-	Current sense input (positive)
7	ISNB	ISNB	HV	AN	-	Current sense input (negative)

Pin Number QFN 32A	Pin Name	Function	I/O Voltage	Type Input	Type Output	description
8	GPIOB8	GPIOB8	LV	TTL	OD	General purpose I/O.
		SCL_B		AN	-	Master/Slave I2C SCL port
		DETA		AN	-	Type-A detect port
		ADC13		AN	-	ADC input
9	GPIOB7	GPIOB7	LV	TTL	OD	General purpose I/O.
		SDA_B		AN	-	Master/Slave I2C SDA port
10	GPIOB6	GPIOB6	LV	TTL	OD	General purpose I/O.
		FB_B		AN	-	Voltage regulation feedback pin
11	GPIOB5	GPIOB5	LV	TTL	OD	General purpose I/O.
		CI_B		AN	-	Constant current pin
		DETB		AN	-	Type-A detect port
		OTPD		AN	-	Temperature sensing pin
		ADC11		AN	-	ADC input
12	GPIOB4	GPIOB4	HV	TTL	OD	General purpose I/O.
		GATEB		-	PP	Blocking MOS Control
		OTPB		AN	-	Temperature sensing pin
		ADC9		AN	-	ADC input
13	GPIOB11	GPIOB11	HV	TTL	OD	General purpose I/O.
14	VCC	VCC	HV	-	-	Power supply
15	VDD	VDD	LV	-	AN	4.7V regulator
16	GPIOB1	GPIOB1	LV	TTL	OD	General purpose I/O.
		DPB		AN	-	D+ for B.C. with USB device side
		ADC7		AN	-	ADC input
17	GPIOB0	GPIOB0	LV	TTL	OD	General purpose I/O.
		DMB		AN	-	D- for B.C. with USB device side
		FCPB		AN	-	FCP pin
		ADC6		AN	-	ADC input
19	GPIOB3	GPIOB3	HV	TTL	OD	General purpose I/O.
		CC1B		CC	PP	USB Type-C Configuration Channel
20	GPIOB2	GPIOB2	HV	TTL	OD	General purpose I/O.
		CC2B		CC	PP	USB Type-C Configuration Channel
21	GPIOA2	GPIOA2	HV	TTL	OD	General purpose I/O.
		CC2A		CC	PP	USB Type-C Configuration Channel
		TRXC		TTL	OD	UART transmitter and receiver
22	GPIOA3	GPIOA3	HV	TTL	OD	General purpose I/O.
		CC1A		CC	PP	USB ion Channel
		TRXB		TTL	OD	UART transmitter and receiver
24	GPIOA0	GPIOA0	LV	TTL	OD	General purpose I/O.
		DMA		AN	-	D- for B.C. with USB device side

Pin Number QFN 32A	Pin Name	Function	I/O Voltage	Type Input	Type Output	description
		FCPA		AN	-	FCP pin
		ADC4		AN	-	ADC input
		RXA		TTL	OD	UART receiver
25	GPIOA1	GPIOA1	LV	TTL	OD	General purpose I/O.
		DPA		AN	-	D+ for B.C. with USB device side
		ADC5		AN	-	ADC input
		TXA		TTL	OD	UART transmitter
26	GPIOA12	GPIOA12	LV	TTL	OD	General purpose I/O.
		OTPE		AN	-	Temperature sensing pin
		ADC15		AN	-	ADC input
27	GPIOA11	GPIOA11	HV	TTL	OD	General purpose I/O.
28	GPIOA4	GPIOA4	HV	TTL	OD	General purpose I/O.
		GATEA		-	PP	Blocking MOS Control
		OTPA		AN	-	Temperature sensing pin
		ADC8		AN	-	ADC input
29	GPIOA5	GPIOA5	LV	TTL	OD	General purpose I/O.
		CI_A		AN	-	Constant current pin
		DETA		AN	-	Type-A detect
		OTPC		AN	-	Temperature sensing pin
		ADC10		AN	-	ADC input
30	GPIOA6	GPIOA6	LV	TTL	OD	General purpose I/O.
		FB_A		AN	-	Voltage regulation feedback pin
31	GPIOA7	GPIOA7	LV	TTL	OD	General purpose I/O.
		EN_A		TTL	OD	Enable pin
		SDA_A		TTL	OD	Master/Slave I2C SDA port with pull high
32	GPIOA8	GPIOA8	LV	TTL	OD	General purpose I/O.
		SCL_A		TTL	OD	Master/Slave I2C SCL port with pull high
		DETA		AN	-	Type-A detect
		ADC12		AN	-	ADC input

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. Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter		Min.	Max.	Units
Supply voltage VCC pin		−0.3	30	V
HV I/O voltage	GPIOA2, GPIOA3, ISNA, GPIOA10, GPIOA11, GPIOB2, GPIOB3, ISNB, GPIOB10, GPIOB11,	−0.3	VCC + 0.3 (Max. 30V)	V
	GPIOA4, GPIOB4	−0.3	37	V
LV I/O voltage	GPIOA0, GPIOA1, GPIOA5, GPIOA6, GPIOA7, GPIOA8, GPIOA12, GPIOB0, GPIOB1, GPIOB5, GPIOB6, GPIOB7, GPIOB8	−0.3	VDD + 0.3	V
Output voltage	VDD	-0.3	6	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. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

4.2 Recommended Operating Conditions

Parameter		Condition	Min.	Typ.	Max.	Units
V_{CC_OPR}	Operating voltage		3		24	V
V_{IO_HV}	GPIOA2, GPIOA3, GPIOA10, GPIOA11, GPIOB2, GPIOB3, GPIOB10, GPIOB11,		0		V_{CC_OPR} + 0.3	V
V_{ISNA}	ISNA		GPIOA10-5[1]		GPIOA10	V
V_{ISNB}	ISNB		GPIOB10-5[1]		GPIOB10	V
V_{GATE_HV}	GPIOA4, GPIOB4		0		V_{CC_OPR} + 8.5	V
V_{IO_LV}	GPIOA0, GPIOA1, GPIOA5, GPIOA6, GPIOA7, GPIOA8, GPIOA12, GPIOB0, GPIOB1, GPIOB5, GPIOB6, GPIOB7, GPIOB8		0		V_{DD_LDO} + 0.3	V
V_{DD_LDO}	VDD pin			4.8		V
T_{OPR}	Operating Temperature		-20		105	°C

*(1) It is required that both the voltage levels of (GPIOA10 -5) and (GPIOB10 -5), respectively, must be≧0V
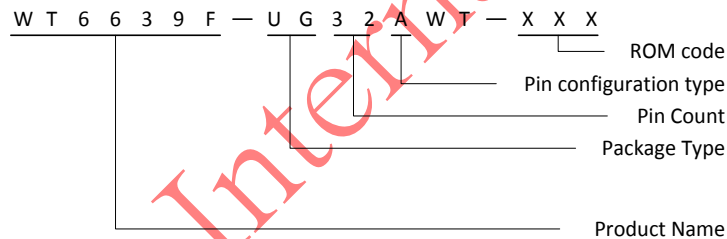
4.3 Thermal Resistance Notice

32-pin QFN

Parameter		Condition	Min.	Typ.	Max.	Units
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

5. Ordering Information

Package Type	Package Outline	Part Number	Ordering Number	Note
32-pin QFN	5mm x 5mm	WT6639F	WT6639F-UG32AWT-XXX	-

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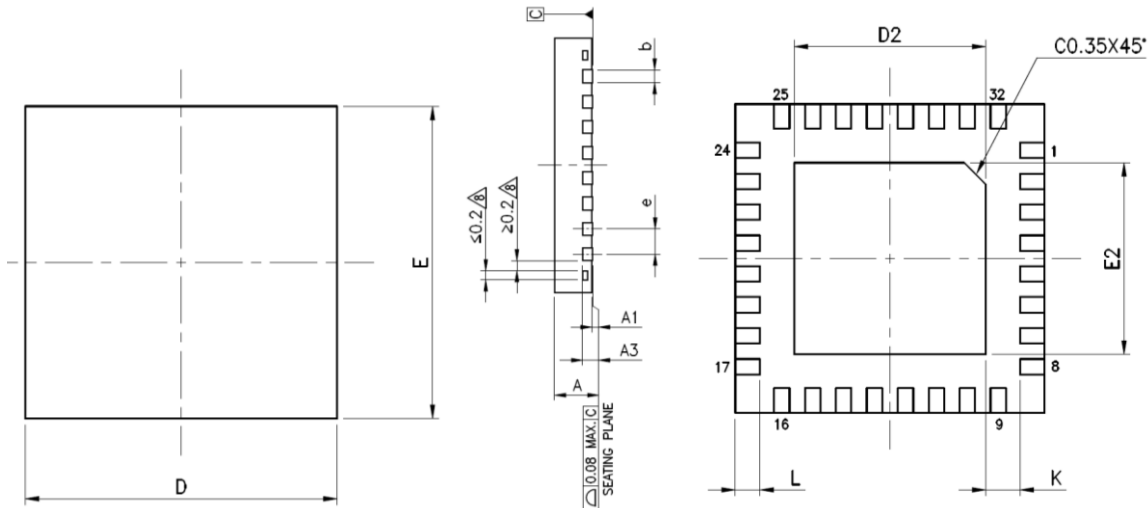
Example:

```
W T 6 6 3 9 F — U G 3 2 A W T — X X X
                                      └── ROM code
                                  └────── Pin configuration type
                              └────────── Pin Count
                          └────────────── Package Type

        └────────────────────────────── Product Name
```

Top Marking

32-pin QFN Top Marking

```
W T 6 6 3 9 F
△ △ △
□ □ □ # &
X X X X X
```

△△△	ROM Code
□□□	Date Code
#	F/W Version Code
&	Pin configuration type

6. Package Dimension

32-pin QFN (5mmx5mm)

All dimensions shown in mm

SYMBOL	MIN	NOR	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.203	
b	0.18	0.25	0.30
D	4.90	5.00	5.10
E	4.90	5.00	5.10
e		0.50	
K	0.20	-	-
L	0.35	0.40	0.45
D2	3.05	3.25	3.30
E2	3.05	3.25	3.30

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.

7. Revision History

Version	History	Date
0.92	Initial issue	March 20, 2020
0.93	1. Update General description. 2. Update I/O naming	October 08, 2020

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