WT6636F
USB Power Delivery and Qualcomm® Quick Charge™ 4/4+ Controller

Product Spec.

Rev. 1.02

August 2018

Table of Contents

1. General Description

The WT6636F 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 strips, power banks, and etc.

The WT6636F 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. A Multi-Time-Programmable (MTP) 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)
- 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 Multi-Time-Programmable (MTP) 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 to 24V (30V tolerant)
- Operating temperature range: -20°C to +105°C
- Package: 16-Pin QFN, 14-pin SOP and 10-pin SOP

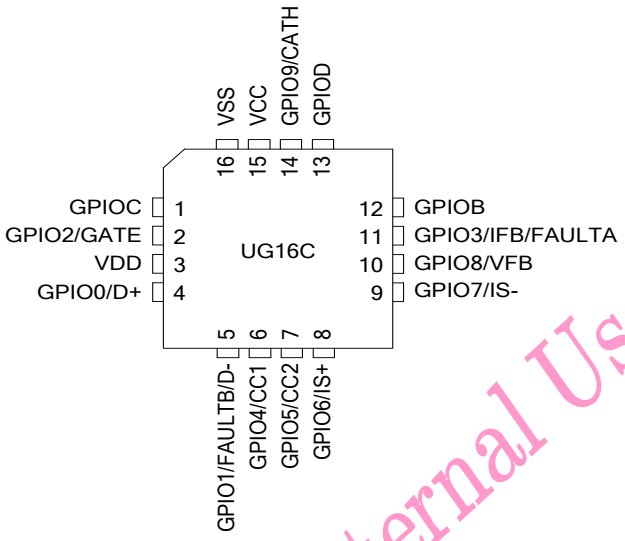
Applications:

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

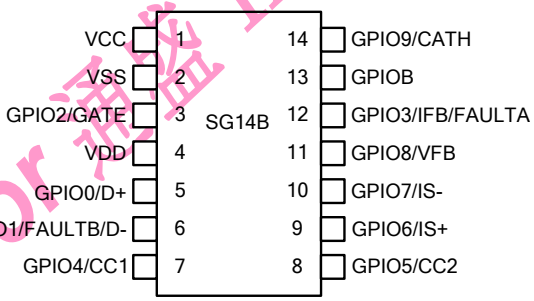
3. Pin Configuration

3.1 Package

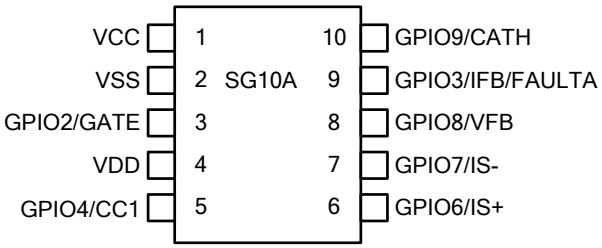
16-pin QFN

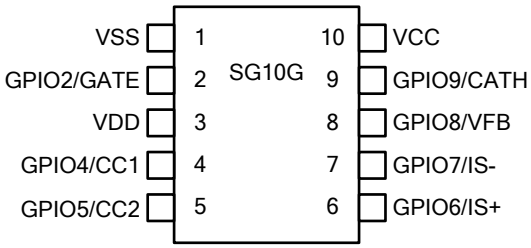


14-pin SOP



10-pin SOP





3.2 Pin Description

Pin Number				Pin Name	Function	I/O Voltage	Type		Description
QFN	SOP						Input	Output	
16C	14B	10A	10G						
15	1	1	10	VCC	VCC	HV	-	-	Positive power supply
15	1	1	10	GPIOA	GPIOA	HV	TTL	OD	General purpose I/O
					DISC		-	OD	Discharge
16	2	2	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	GPIO2	GPIO2	HV	TTL	OD	General purpose I/O
					GATE		-	PP	Blocking MOS Control
					ADC12		AN	-	ADC input
3	4	4	3	VDD	VDD	LV	-	AN	4.8V regulator
4	5			GPIO0	GPIO0	HV	TTL	OD	General purpose I/O
					D+		AN	-	D+ for B.C. with USB device side
					ADC6		AN	-	ADC input
					TX		TTL	OD	UART transmitter
					SDAB		TTL	OD	I^2C SDA B path
					P00		TTL	OD	8051 port I/O
5	6			GPIO1	GPIO1	LV	TTL	OD	General purpose I/O
					D-		AN	-	D- for B.C. with USB device side
					FAULTB		TTL	OD	Fault indication. Outputs low when OVP/OCP
					ADC7		AN	-	ADC input
					RX		TTL	-	UART receiver
					SCLB		TTL	OD	I^2C SCL B path
					P01		TTL	OD	8051 port I/O
6	7	5	4	GPIO4	GPIO4	HV	TTL	-	General purpose Input
					CC1		CC	PP	USB Type-C Configuration Channel
					ADC4		AN	-	ADC input
7	8		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	GPIO6	GPIO6	LV	TTL	OD	General purpose I/O
					IS+		AN	-	Positive input of current sensing amplifier
					SCLA		TTL	OD	I^2C SCL A path

Pin Number				Pin Name	Function	I/O Voltage	Type		Description
QFN	SOP						Input	Output	
16C	14B	10A	10G						
9	10	7	7	GPIO7	GPIO7	LV	TTL	OD	General purpose I/O
					IS-		AN	-	Negative input of current sensing amplifier.
					SDAA		TTL	OD	I^2C SDA A path
10	11	8	8	GPIO8	GPIO8	LV	TTL	OD	General purpose I/O.
					VFB		AN	-	Feedback of shunt regulator
					P04		TTL	OD	8051 port I/O
11	12	9		GPIO3	GPIO3	HV	TTL	OD	General purpose I/O. Open drain output.
					IFB		AN	-	Feedback of shunt regulator
					FAULTA		TTL	OD	Fault indication. Output low when OVE/OCP.
					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	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. Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter		Min.	Max.	Units
Supply voltage VCC pin		–0.3	30	V
I/O voltage	GPIO0, GPIO3, GPIO4, GPIO5, GPIO9, GPIOB, GPIOC, GPIOD	–0.3	VCC + 0.3 (max. 30V)	V
	GPIO2	–0.3	37	V
	GPIO1, GPIO6, GPIO7, GPIO8	–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}	GPIO0, GPIO3, GPIO4, GPIO5, GPIO9, GPIOB, GPIOC, GPIOD		0		V_{CC_OPR} + 0.3	V
V_{GATE_HV}	GPIO2 pin		0		V_{CC_OPR} + 8.5	V
V_{IO_LV}	GPIO1, GPIO6, GPIO7, GPIO8		0		V_{O_LDO} + 0.3	V
V_{DD_LDO}	VDD pin		4.6075		5.0925	V
T_{OPR}	Operating Temperature		-20		105	°C

4.3 Thermal Resistance Notice

16-pin QFN

Parameter		Condition	Min.	Typ.	Max.	Units
θ_{JA}	Thermal Resistance (Junction to Air)			44		°C /W
θ_{JC}	Thermal Resistance (Junction to Case)			7.3		°C /W
T_{JMAX}	Maximum Junction Temperature			125		°C

14-Pin SOP

Parameter		Condition	Min.	Typ.	Max.	Units
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

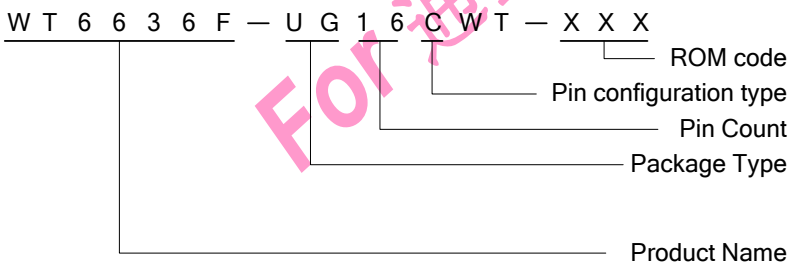
Parameter		Condition	Min.	Typ.	Max.	Units
θ_{JA}	Thermal Resistance (Junction to Air)			88		°C /W
θ_{JC}	Thermal Resistance (Junction to Case)			37		°C /W
T_{JMAX}	Maximum Junction Temperature			125		°C

5. Ordering Information

Package Type	Package Outline	Part Number	Ordering Number	Note
16-pin QFN	5mm x 5mm	WT6636F	WT6636F-UG16CWT-XXX	-
14-pin SOP	150mil	WT6636F	WT6636F-SG14BWT-XXX	-
10-pin SOP	150mil	WT6636F	WT6636F-SG10AWT-XXX	-
			WT6636F-SG10GWT-XXX	-

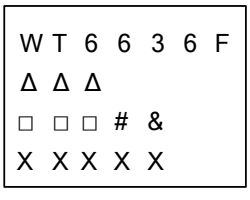
Notes: suffix number number-XXX for difference Firmware code, please refer to Firmware control list.

Example:



Top Mark

16-pin QFN Top Mark



14pin/10-pin SOP Top Mark

ΔΔΔ ROM Code

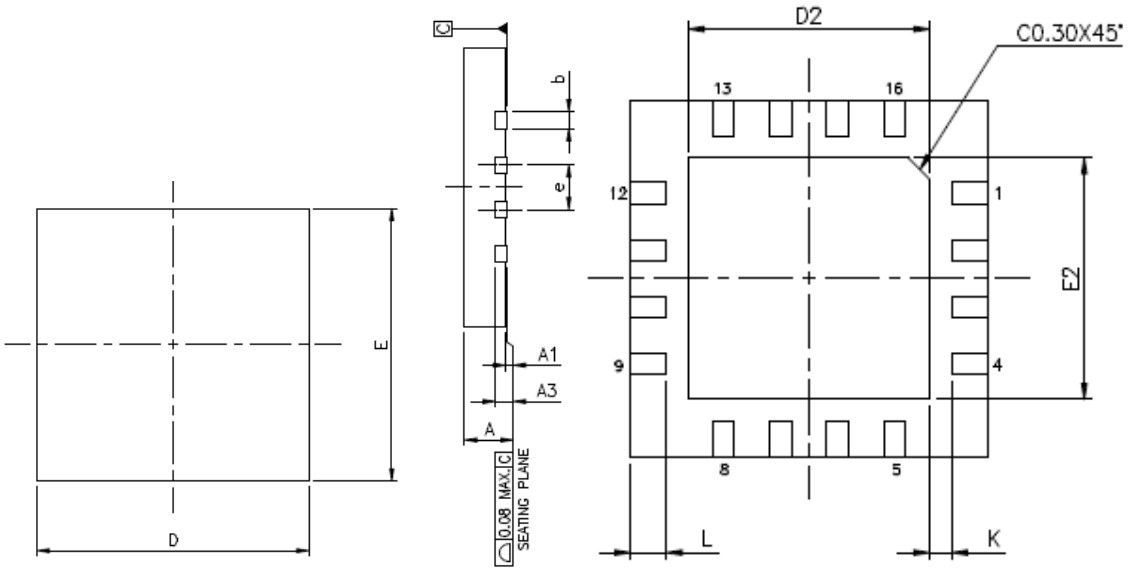
□□□ Date Code

F/W Version Code

& Pin configuration type

6. Package Dimension

16-pin QFN



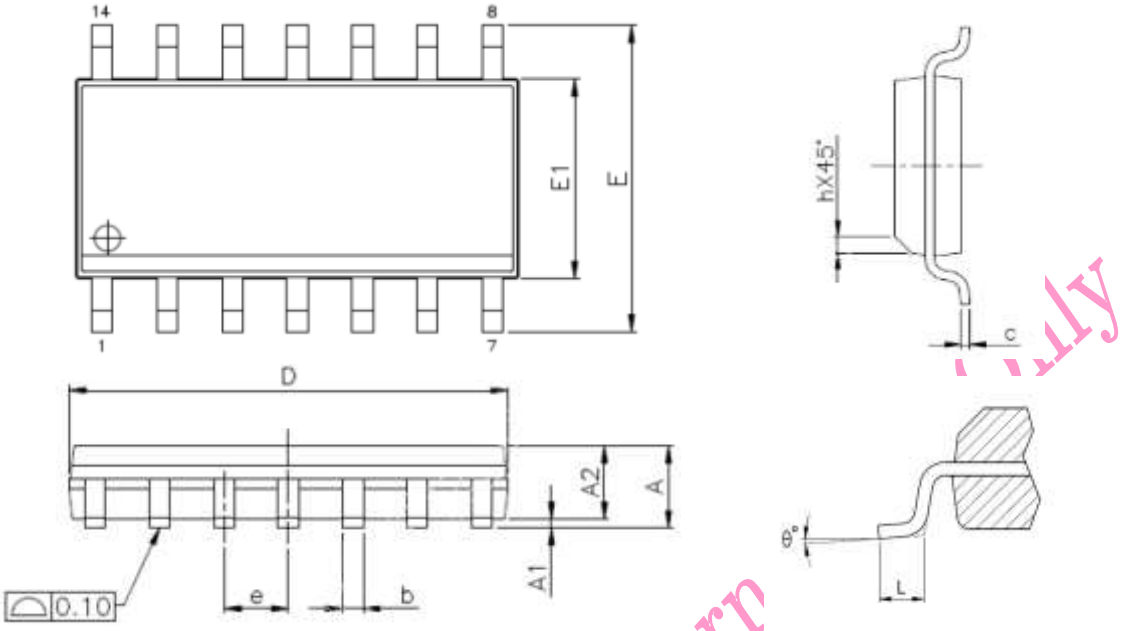
All dimensions shown in mm

SYMBOL	MIN	NOR	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.203	
b	0.25	0.30	0.35
D	4.95	5.00	5.05
E	4.95	5.00	5.05
e		0.80	
K	0.20	-	-
L	0.45	0.50	0.55
D2	3.28	3.38	3.43
E2	3.28	3.38	3.43

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



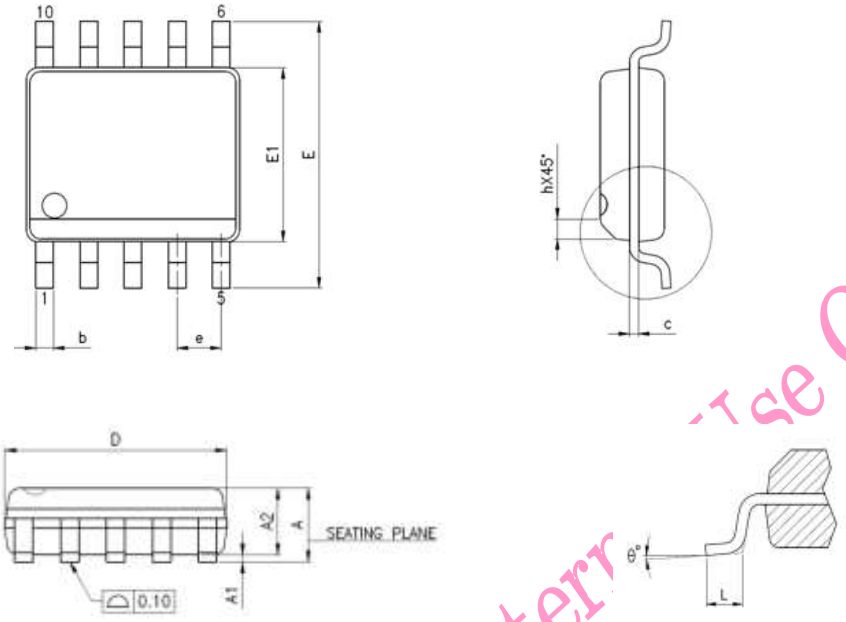
All dimensions shown in mm

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

7. Revision History

Version	History	Date
1.00	Initial issue	May 03, 2018
1.01	Add QC4 description on the title & cover page	May 07, 2018
1.02	1. Update Spec. naming to “Product Spec.” 2. Update “Pin Description” description 3. Update “Absolute Maximum Rating” description 4. Update “Recommended Operating Conditions” description	August 8, 2018

Qualcomm Quick Charge is a product of Qualcomm Technologies, Inc.

Qualcomm is a trademark of Qualcomm Incorporated, registered in the United States and other countries.

Quick Charge is a trademark of Qualcomm Incorporated. All Qualcomm Incorporated trademarks are used with permission.