

USB Type-C PD3.0 Quick Charging Protocol

Intelligent Management Chip

❖ GENERAL DESCRIPTION

The AXQ9603 is selectively compatible with mainstream charging protocols. It can intelligently identify the type of mobile phone inserted and select the most appropriate protocol to meet the needs of mobile phone quick charging.

The AXQ9603 D+/D- and CC withstand voltages are higher than 12V and 30V respectively, making it extremely reliable.

The voltage regulation range of AXQ9603 is from a minimum of 3V to a maximum of 20V, adapting to the output voltage of various quick charging protocols.

The AXQ9603 leaves common Type-C PDO settings to the user to choose. Users can choose different system settings according to application needs by configuring the external resistor on the FUNC pin. The AXQ9603 is available in SSOP10 package.

❖ FEATURES

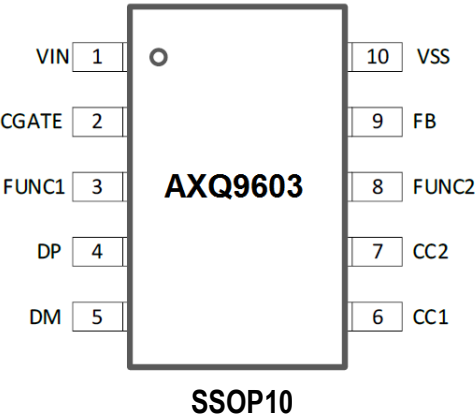
- Supports USB Type-A Protocol, including
 - BC1.2, Apple2.4A, QC2.0 Class A, QC3.0 Class A, FCP, SCP AFC, Low-voltage direct charging, etc..
- Supports USB Type-C Protocol, including
 - Type-C protocol, Type-C PD2.0, Type-C PD3.0, Type-C PD3.0 PPS and other protocols
- The highest current of the adapted system is optional
- D+/D- withstand voltage 13V
- CC withstand voltage 30V
- Voltage regulation accuracy 20mV/Step
- VBUS voltage regulation range from 3V to 20V
- Supports pin setting common Type-C PD PDO
- Supports customized customer Type-C PD PDO
- Available in SSOP10 package
- AEC-Q100 Automotive Qualified
- RoHS and Halogen free compliance

❖ APPLICATION

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

❖ PIN CONFIGURATION

10-pin SSOP



Pin Description

No	Name	Description
1	VIN	Power supply input pin.
2	CGATE	Control output of CVBUS and control by PMOSFET. This pin can float.
3	FUNC1	For PDO Setting.
4	DP	Connect Type-C D+ pin.
5	DM	Connect Type-C D- pin.
6	CC1	Connect USB Type-C CC1 pin.
7	CC2	Connect USB Type-C CC2 pin.
8	FUNC2	For PDO Setting.
9	FB	Feedback Input. Connect FB to the center of the external resistor divider from the output to the AGND to set the output voltage.
10	VSS	System Analog Ground.

ORDER/MARKING INFORMATION

Order Information	Top Marking
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>AXQ9603XXXXX</p> <div style="display: flex; justify-content: space-around; width: 100%;"> <div> <p>PD Type</p> <p>A : 27W</p> <p>B : 36W</p> </div> <div> <p>Package Type</p> <p>S10:SSOP10</p> </div> </div> </div> <div> <p>Packing Blank : Tube A : Taping</p> </div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-between; width: 100%;"> Logo ← AX9603 → Part number </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> Q T Y Y W W X → ID code: internal </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> WW: 01~52 </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> Year: 19=2019 </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> 20=2020 </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> ⋮ </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 5px;"> 49=2049 </div> </div> <div style="margin-top: 20px; text-align: left;"> <p>AXQ9603</p> <p>↓</p> <p>A or B</p> </div>

❖ABSOLUTE MAXIMUM RATINGS (Reference to GND)

I/O Voltage CVBUS, CGATE	-0.3V to 30V
I/O Voltage CC1, CC2	-0.3V to 30V
I/O Voltage DP, DM	-0.3V to 13V
I/O Voltage FB, VIN	-0.3V to 5.5V
Operating Temperature.....	-40°C to +125°C
Storage Temperature.....	-55°C to +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.

❖RECOMMENDED OPERATION CONDITIONS

Operating Voltage VIN.....	+3V to +5.6V
Operating Voltage D+/D-	+0V to 3.3V
Operating FUNC, FB	+0V to 3.3V
Operating Temperature T _{OPR}	-40°C to +125°C

❖ THERMAL INFORMATION

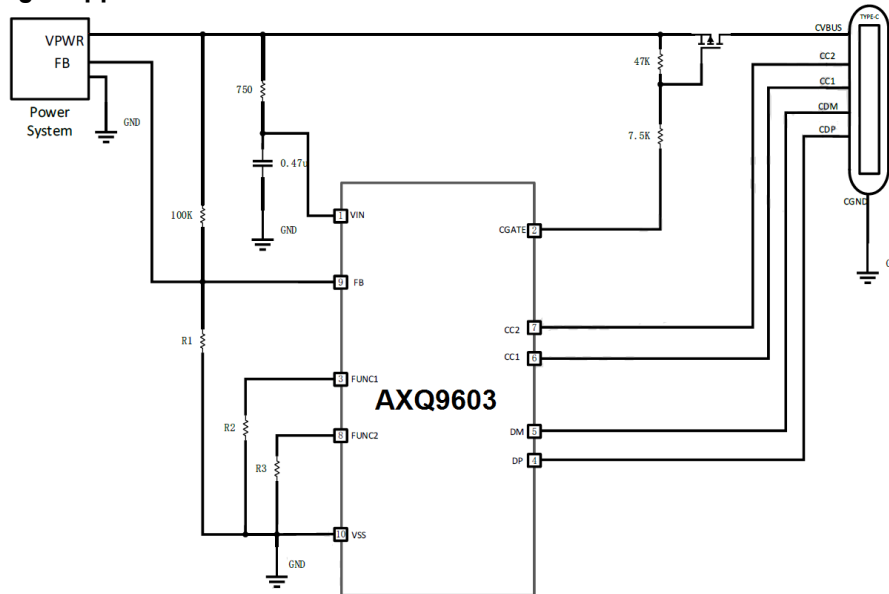
Thermal Resistance (Junction to Air, θ_{JA}).....60°C/W

Thermal Resistance (Junction to Case, θ_{JC}).....20°C/W

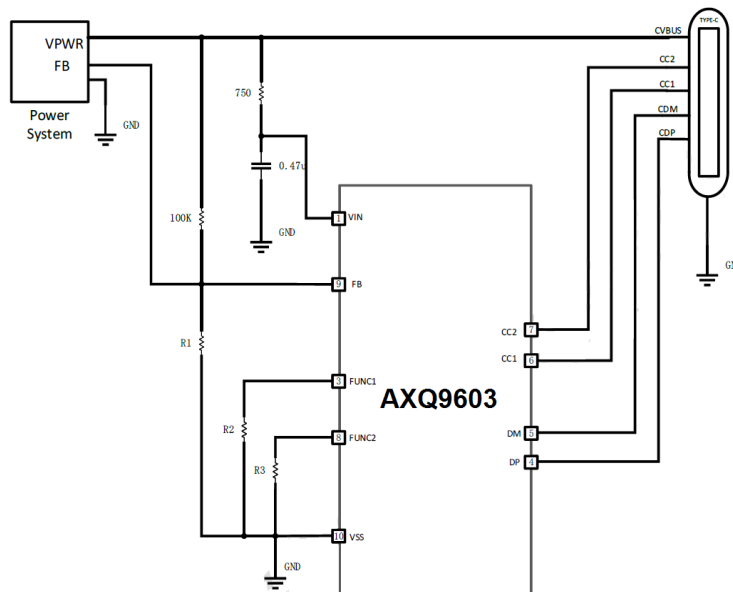
Maximum Junction Temperature, T_{JMAX} 125°C

❖ TYPICAL APPLICATIONS

Car Charger Application Circuit



Low Cost Application for Car Charger Circuit, can remove ecternal MOSFET



❖ FUNCTION DESCRIPTION

VIN

The VIN supplies power to the AXQ9603 and requires an external 750Ω resistor to be pulled up to VBUS. For applications up to 12V, you can choose 0603/0805 resistors, for applications up to 20V, it is recommended to choose 1206 resistors. Use 0.47uF capacitor.

DP and DM

The withstand voltage of DP and DM is greater than 12V, which improves the stability of system plugging and unplugging.

CC1 and CC2

The CC1 and CC2 connect to CC1 and CC2 in the Type-C port. CC1 and CC2 can withstand a voltage of 30V, which improves the stability of system plugging and unplugging.

FUNC1 and FUNC2

By connecting external resistors to the FUNC1 and FUNC2 pins, different PDO and system characteristics can be selected, as shown in the table below. It is recommended to use a 100KΩ resistor with 1% accuracy.

AXQ9603A Function Table

FUNC2	FUNC1	PDO0	PDO1	PDO2	PDO3	PDO4	Remark
F	F	5V3A	9V3A			3.3~11V3A	27W
G	F	5V3A	9V2.22A				20W
G	R	5V3A	9V2.22A	12V1.67A			20W
R	F	5V3A	9V2A	12V1.5A	3.3~5.9V3A	3.3~11V1.5A	18W
R	R	5V3A	9V2.77A	12V2.1A	3.3~5.9V3A	3.3~11V2.45A	25W
R	G	5V3A	9V2A				18W
F	R	5V3A	9V2.77A	3.3~5.9V3A	3.3~11V2.25A		Samsung 25W
F	G	5V3A	9V3A	12V2.25A	3.3~5.9V3A	3.3~11V2.45A	27W
G	G	5V3A					15W

F : Floating, G : Ground, R Resistor

AXQ9603B Function Table

FUNC2	FUNC1	PDO0	PDO1	PDO2	PDO3	PDO4	Remark
F	F	5V3A	9V4A				36W
G	F	5V3A	9V2.22A				20W
G	R	5V3A	9V2.22A	12V1.67A			20W
R	F	5V3A	9V2A	12V1.5A	3.3~5.9V3A	3.3~11V1.5A	18W
R	R	5V3A	9V2.77A	12V2.1A	3.3~5.9V3A	3.3~11V2.45A	25W
R	G	5V3A	9V2A				18W
F	R	5V3A	9V2.77A	3.3~5.9V3A	3.3~11V2.25A		Samsung 25W
F	G	5V3A	9V3A	12V2.25A	3.3~5.9V3A	3.3~11V2.45A	27W
G	G	5V3A					15W

F : Floating, G : Ground, R Resistor

CGATE

External PMOS controls the path switch between VIN and CVBUS. AXQ9603, this pin can be left floating.

FB

FB is connected to this power system and is used to control the VBUS voltage of the USB. After the terminal device and AXQ9603 negotiate the agreement and the required voltage through D+/D- or CC, It initiates voltage regulation through FB. The voltage regulation accuracy of FB is 20mV, and the voltage regulation speed is 20mV/1uS. FB connects external resistor R2 to ground. The usual calculation formula is as follows,

$$R_2 = \frac{R_1 V_{FB}}{V_{VBUS} - V_{FB}}$$

❖ **PACKAGE INFORMATION**

SSOP-10 Outline Dimensions

