

Multi-Type-A Controller With Plug In/Out Auto Detection

FEATURES

- Vin Supply Voltage: 3.2V to 25V
- Supports Hi-Silicon Fast/Super Charging Protocol (FCP/SCP selection)
- VOOC(Optional)
- Supports Qualcomm® Quick Charge™ 2.0/3.0/3.0+ protocol
- Support Class A, Class B output voltage from 3.6V to 20V
- Supports USB DCP Shorting D+ Line to D- Line per USB Battery Charging Specification, Revision 1.2
- Supports USB DCP Applying 2.7V on D+ Line and 2.7V on D- Line
- USB Type-A Plug In/Out Detection and light load shutdown;
- Multi-Ports Control Application
- Over-Voltage Protection and VBUS Discharge Function
- Short-Circuit Protection
- Over-Current Protection
- Over temperature protection
- DP/DM short protection
- CC/CV function(decrease the system application cost)
- Support link function
- Support parameter upgrade online
- NMOS outside
- Apple lighting head is no a load for detection
- Line loss compensation
- Support NMOS switch, no external bootstrap capacitor, driving level VGS = 5V

APPLICATIONS

- Wall-Adapter
- USB Power Output Port
- Car Charger
- Power Strip

DESCRIPTION

The UC2703 is USB Type-A fast charging protocol controller with plug in/out auto detection for Hi-Silicon Fast/Super Charging Protocol (FCP/SCP), Samsung AFC Protocol, VOOC Protocol and Qualcomm® Quick Charge™ 2.0/3.0/3.0+ (QC 2.0/3.0/3.0+) USB interface. The UC2703 monitors USB DP/DM data line and automatically adjusts the output voltage depending on different portable device requirement. The charging time of portable device is therefore optimized by the UC2703.

UC2703 can support not only USB BC compliant devices, but also Apple / Samsung / HUAWEI/XIAOMI/OPPO devices and automatically detects whether a connected powered device is QC 2.0/3.0/3.0+ or FCP/SCP AFC VOOC capable before enabling output voltage adjustment. If a PD is not compliant with above fast charger protocol, the UC2703 will disable the adjustment of output voltage and keep the default 5V output voltage for safe operation.

Additionally, the UC2703 also monitors automatically adjust the output voltage depending on different device requirement. It is capable providing output voltage of 3.6V to 20V.

PACKAGE

Package CPC-24

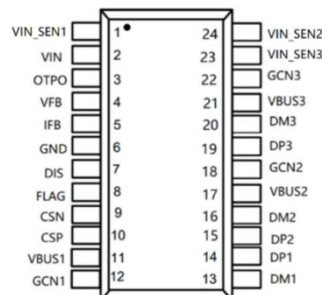


Figure. Pin Assignment of UC2703

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APPLICATION

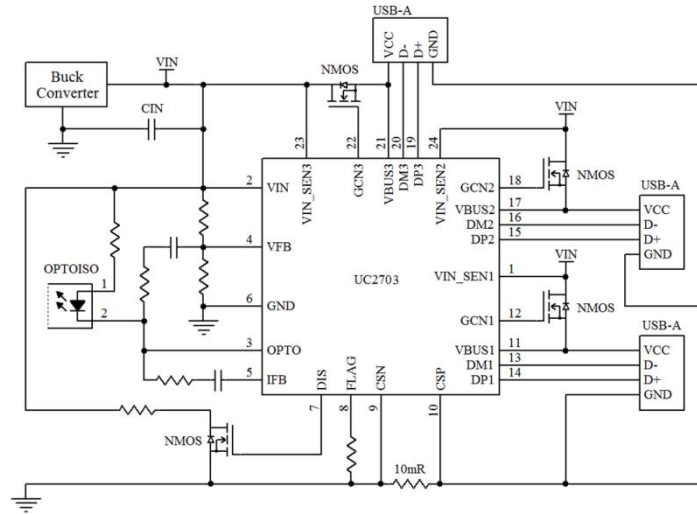


Figure. Application of UC2703 for 3 USB-A port fast charger

注：此 3 USB-A 应用简单，苹果线不当负载；当插任意一个 A 口，可以支持快充，插入两个或者两个以上设备，降为普通 5V 充电，IC 通过光耦配合 AC/DC，可以支持低压恒流；提高客户体验和节省成本。

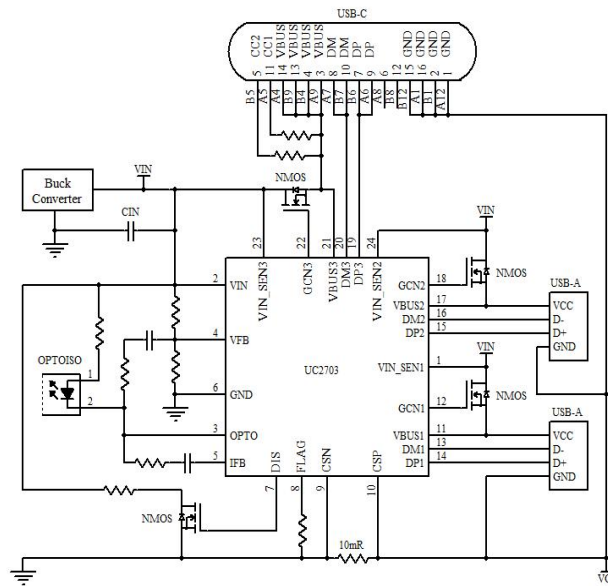
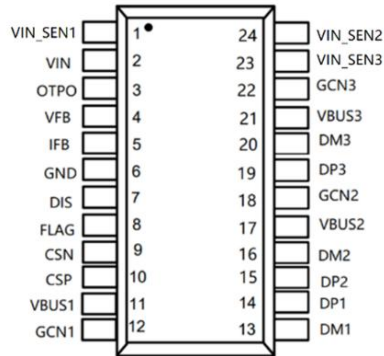


Figure: Application of UC2703 for 2 USB-A and 1C fast charger

注：此 2 USB-A 加 1C 应用简单，苹果线不当负载；当插任意一个口，可以支持快充（C 口支持快充和 5V/3A 的 C 口协议），插入两个或者两个以上设备，降为普通 5V 充电，IC 配合 AC/DC，可以支持低压恒流。

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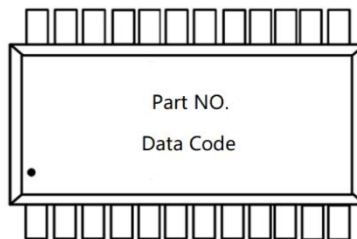
PART NO. TABLE



ORDERING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)
UC2703	CPC24	3000	-40~85

MARK INFORMATION



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ABSOLUTE MAXIMUM RATINGS (1)

Over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	MAX	UNIT
	V _{IN} OPTO,	4.5	25	V
	VBUS1, GCN1, DP1, DM1, VIN_SEN1, VIN_SEN2, DP2, DM2, VBUS2, GCN2, DP2, DM2, GCN3, VBUS3	4.5	25	
	VFB, IFB	4.5	6.5	
	DIS, ISN, ISP	4.5	6.5	
ESD rating, Human Body Model (HBM)	V _{IN} , VBUS1, VBUS2, VBUS3 GND		6	kV
	OPTO, GCN1, DP1, DM1, DP2, DM2, GCN2, DP3, DM3, GCN3, VFB, IFB, DIS, ISN, ISP, VIN_SEN1, VIN_SEN2, VIN_SEN3		3	
Operating Junction Temperature	T _J	-40	125	°C
Storage Temperature Range	T _{stg}	-65	150	

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

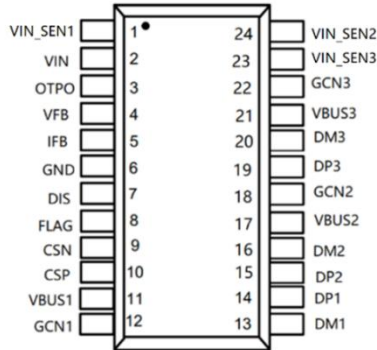
over operating free-air temperature range (unless otherwise noted)

THERMAL METRIC			UNIT
θ_{JA}	Package thermal impedance ⁽¹⁾	TBD	°C/W

(1) The package thermal impedance is calculated in accordance with JESD 51-7.

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PINOUT



PIN FUNCTIONS

NO	Pin Name	Pin Function
1	VIN_SEN1	Channel 1 load sense point
2	VIN	Power supply
3	OPTO	Opto coupler driver
4	VFB	Voltage output control
5	IFB	Loop compensation for constant current control
6	ADGND	Analog/ Digital GND
7	DIS	External discharger control
9	CSN	CC detection input negative
10	CSP	CC detection input positive
11	VBUS1	Port A1 output voltage detection A1
12	GCN1	Port A1 output power MOS Gate control A1
13	DM1	A1 port DM, multiplexed as I2C SCL
14	DP1	A1 port DP, multiplexed as I2C SDA
15	DP2	A2 port DP
16	DM2	A2 port DM
17	VBUS2	Port A2 output voltage detection
18	GCN2	Port A2 output power MOS Gate control
19	DP3	A3 port DP
20	DM3	A3 port DM
21	VBUS3	Port A3 output voltage detection
22	GCN3	Port A3 output power MOS Gate control
23	VIN_SEN3	Channel 3 load sense point
24	VIN_SEN2	Channel 2 load sense point

(1) G = Ground, I = Input, O = Output, P = Power

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APPLICATION INFORMATION

Function Description

The UC2703 integrates three USB high voltage dedicated charging port interface IC for Qualcomm Quick Charge 2.0/3.0/3.0+ class A/class B, Samsung AFC, VOOC and Hi-Silicon FCP/SCP specification.

The UC2703 can fast charge most of the handheld devices. It could be treated as the original charging adapter.

The UC2703 also supports BC1.2, Samsung and HUAWEI devices. It also supports output voltage range of QC 3.0 Class A/Class B (3.6V to 20V) or QC 2.0 Class A (5V, 9V, 12V).

DP/DM Support Protocol:

- Support D+ / D - 2.7V/2.7V apple 2.4A;
- mode; Support D+/D- 1.2V/1.2V Samsung
- charging mode; Support DCP, BC1.2 mode
- Support FCP, SCP(Only one active)
- Support AFC protocol

Quick Charge 3.0+/3.0/2.0 D+ /D- configuration list:

DP	DM	Class-A	Class-B
0.6V	GND	5V	5V
3.3V	0.6V	9V	9V
0.6V	0.6V	12V	12V
0.6V	3.3V	Continuous mode	Continuous mode
3.3V	3.3V	Keep	20V

Light load detection:

The voltage between the VIN and VBUS is detected, that is the voltage drop on the power MOS (VDS voltage); Based on the conduction impedance of MOS is calculated with a typical value of 20mΩ, the current threshold for light load judgment is set to 5mA or 10mA (the threshold can be configured).

Current design:

Light load point $I = V / R_{on}$ (mA);

Where $V = 50 / 100 / 200 / 600\text{mV}$, four values are optional, and R_{on} is the external MOS on impedance;

Filtering time: 2.5s/3.25s/4s/6s/8s/10s/12s/15s

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LINK(Flag PIN) Function:

The Link function supports the interconnection of two or more ICs; when the link takes effect, all ICs return to the 5V protocol state.

If only one chip works, connect the link pin directly to GND. If two UC2703 links work, connect the pin together directly. If only one chip works, the voltage on the link pin is $10\mu\text{A} * 10\text{K} = 0.1\text{V}$, output low level. If both chips work, the output is high level;

CC Limitation function:

Current adjustment target: V_{CC}/R_{SENSE}

Constant current clamp voltage V_{CC} fuse configuration: 33mV / 50mV / 67mV / 83mV;

Detect the sense resistance current on the external main circuit, so it has nothing to do with single port

Over-Current Protection:

The threshold values are $V_{th} = 80 / 120 / 160 / 200 / 240 / 280 / 320 \text{ mV}$ respectively

The over-current point $I_{ocp} = V_{th} / R_{on}$; R_{on} is the external MOS on impedance

DSG function:

Limited by pin resources, it can be realized internally with a discharge capacity of 200mA / 100mA; DIS PAD is reserved to provide external setting and personalized discharge capacity.

Start with load:

During soft start, OCP does not limit current. If CC is triggered, it is determined by CC setting value; After soft start, it is limited by the setting value of OCP

Line loss compensation:

80mV/A, 120mV/A selection

IPHONE charger cable treat as load question:

Usually, the Iphone charger cable dissipation is less than 1mA; The load detection threshold is bigger than 10mA; So Iphone cable won't be treated as a load;

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PACKAGE INFORMATION

尺寸 标注	最小(mm)	最大(mm)	尺寸 标注	最小(mm)	最大(mm)
A	6.50	6.70	C	0.85	1.05
A1	0.23	0.33	C1	0.00	0.15
e	0.53 (BSC)		C2	0.15	0.18
B	2.50	2.70	L	0.40	0.60
B1	3.85	4.15	θ	0°	8°
b	0.16	0.26			

