

Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application**FEATURES**

- USB-IF TID: 6481
- Vin Supply Voltage: 3.2V to 25V
- USB Power Delivery (PD) 3.0 Certified Provider, USB Type-C™ Rev. 1.2 Compliant Source
- Auto detect TYPE-C device plug in or plug out
- Hardware BMC transmitter and receiver
- Integrated PD3.0 protocol engine
- Support QC2.0/QC3.0 protocol
- Support Class-A , Class-B output voltage , the lowest output voltage is 3.6V, max output is 20V
- Support FCP/SCP protocol; Support Samsung AFC; Support apple 2.4A; Support BC1.2
- High Voltage and Safety Integration
- Overvoltage, Overcurrent, Over-temperature Protection and VBUS Discharge
- Input Pin for Fast Shutdown Under Fault
- Dynamical feedback for voltage adjustment
- CC1/CC2/DP/DM over voltage protection
- Line loss compensation (0 / 60mV / A / 90mV / A / 120mV / a)
- CC (external sense resistance is 5m Ω / 10m Ω)
- CV function
- Support two cascading trigger modes: Flag cascading and AISENP /AISENM load state detection, and realize automatic power decrease in multi port application (the power reduction level is determined by the second type of PDO configured in FT process)

PACAKAGE

Package: QFN16

- ESD 4KV

APPLICATIONS

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

DESCRIPTION

UC4500 is an intelligent power distribution chip dominated by type-C PD protocol charging and with insertion detection function, which can be applied to multi port charging. The products are widely used in mobile sockets, wall switches, converters, car chargers and multi-port travel chargers. Type-C supports PPS protocol and various fast charging protocols; The product has the insertion detection function, and cooperates with buck, Which can be easily used to charger ordinary 5V USB-A and ordinary type-C port. When an ordinary USB-A or ordinary type-C device is inserted, the type-C PD port will automatically reduce the charging power of the type-C PD port through protocol broadcasting, distribute the power to DC / DC, and provide it to the ordinary charging port through DC / DC; Type-C PD charging port can continuously maintain PD charging; At the same time, it enriches the selectivity of various charging line connections; Simple product application and low overall solution cos

Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application

APPLICATION

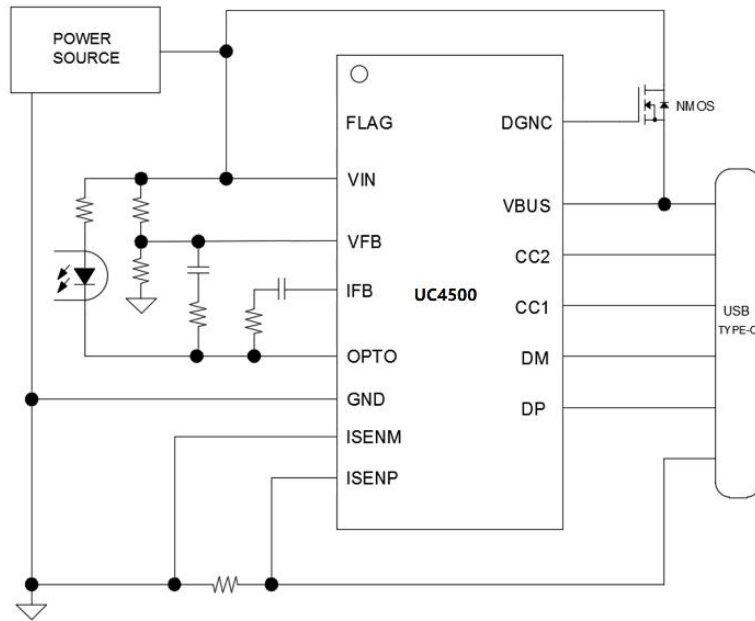


Figure 1. UC4500 single C port application

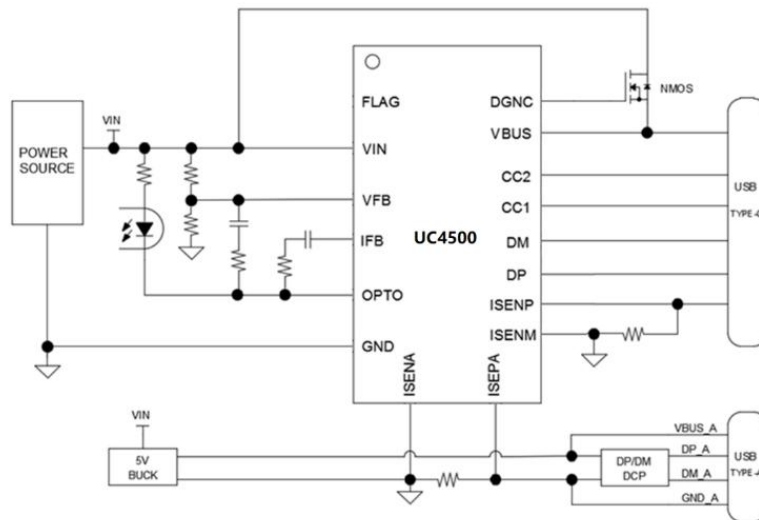


Figure 2. UC4500 C+A application

注：UC4500 配合 DC/DC，产品可以定义为 TYPE-C (PD 降功率) +1A (普通) 或者 TYPE-C (PD 降功率) +2A (普通)，TYPE-C (PD 降功率) +TYPE-C (普通) +1A (普通)

Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application

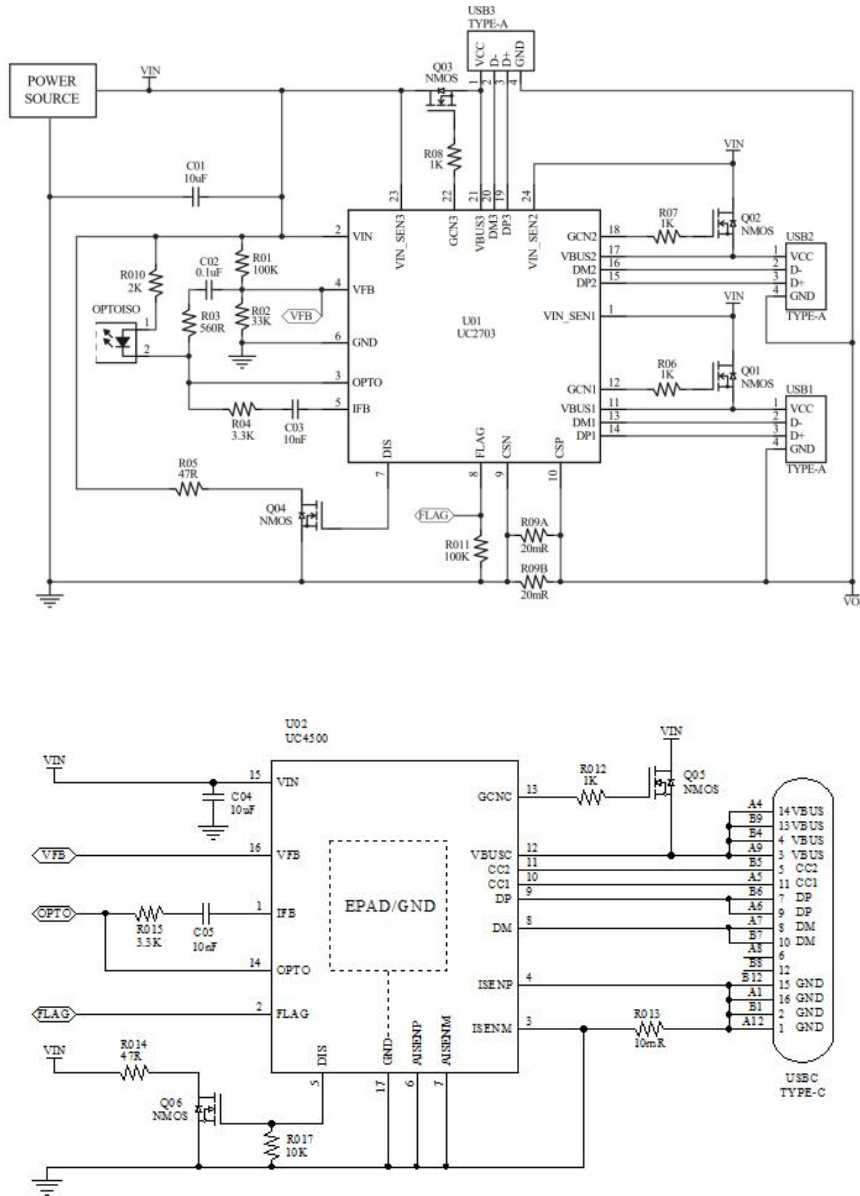
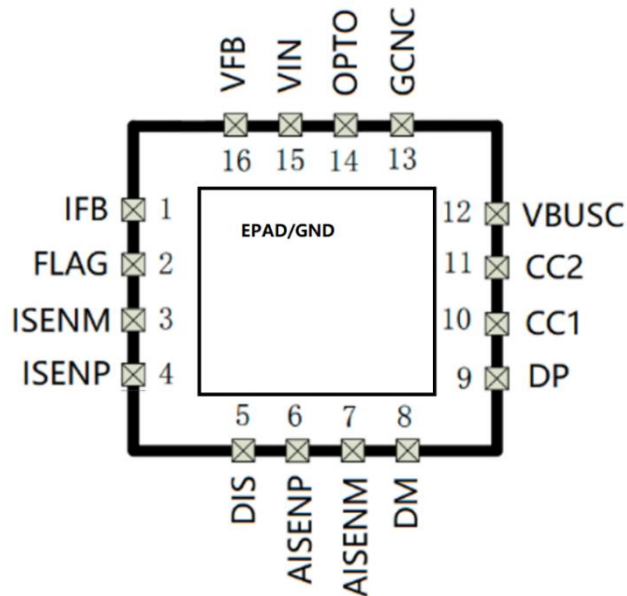


Figure 3. UC4500+UC2703 for 1C+2A/3A

注： UC4500+UC4500为功率关联，单插C口或者A口可以支持PD或者快充，当插入2个或者2个以上设备，降为普通5V充电；此方案，C口苹果线不当负载，A口的同时充电，小设备充电性能表现优；以上应用可以支持低压5V恒流功能，从而避免低压5V因为多口重载设备插入发生充电打嗝的问题；

PINOUT AND PIN FUNCTIONS



The Exposed PAD is the ground connection of the device

Pin Name	Pin NO	Function Description
VIN	15	Power input
OPTO	14	Opto coupler drive
VFB	16	Output voltage control terminal
IFB	1	Loop current amplifier output
DGND	EPAD	Chip Digital ground
AGND	EPAD	Chip Analog ground
FLAG	2	Multi port operation status indication, and multi chip parallel operation power control. When the payload is inserted, the port switches from strong pull-down to weak pull-up; If the port is pulled up by external force, the chip will be forced to exit the fast charging state and only provide 5V output
ISENM	3	C-Port loop current detection input negative terminal
ISENP	4	C port loop current detection input positive terminal
DIS	5	External discharger control
AISENM	7	A port loop current detection input negative terminal
AISENP	6	A port loop current detection input positive terminal
DM	8	DM, multiplexed as I2C SDA end
DP	9	DP, multiplexed as I2C SCL end
CC1	10	Configuration channel interface pin to USB Type-C
CC2	11	Configuration channel interface pin to USB Type-C
VBUSC	12	Output voltage terminal
GCNC	13	External NMOS FET gate drive signal

Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application

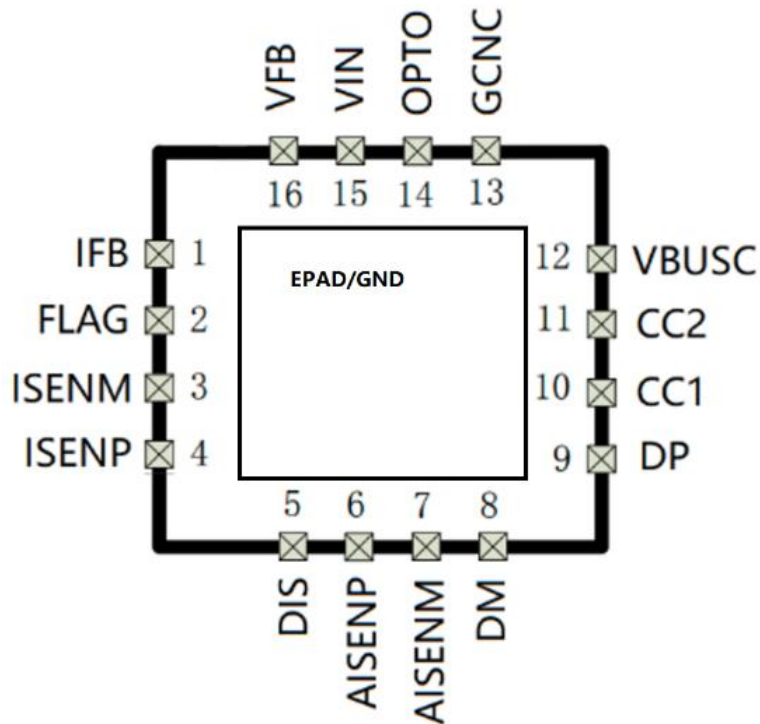
ORDERING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)
UC4500	CPC20	3000	-40~85
UC4500	QFN16	3000	-40~85

AVAILABLE FUNCTION

UC4500	QC3.0	FCP/SCP	AFC	PD3.0	PPS	Class-A	Class-B	PD-link
	Y	Y	Y	Y	Y	Y	Y	Y

MARK INFORMATION



Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application

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
VBUSC, GDNC, DP, DM, CC1,CC2		4.5	25	
VFB, IFB		4.5	6.5	
DIS, ISENM, ISENP,AISENP,AISENM, FLAG		4.5	6.5	
ESD rating, Human Body Model (HBM)	V_{IN}		5	kV
	OPTO, VBUSC, GDNC, DP, DM, CC1,CC2, VFB, IFB, DIS, ISENM, ISENP, AISENP, AISENM, FLAG		4.5	
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.

Application Information

VCC AND VBUS

VCC is the input power of type-C and type-a ports. It is used as the power input of VBUS and the power supply pin of the chip to connect the output of ACDC or DCDC. It is recommended to connect GND to 2 ~ 10uF ceramic capacitor near VCC and VBUS pins.

OPTO

OPTO is used to Drive Opto coupler, with withstand voltage of more than 24V .

VFB

VFB and OPTO form CV loop, which needs to be compensated. The reference at VFB is 1.24v, and the partial voltage resistance near VCC must be 100k, and the other is 33K (corresponding to VCC = 5V); the resistance accuracy affects the power supply accuracy, so it is recommended to use 1% accuracy resistance.

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

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 UC4500 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.

Type-C Controller With Plug In/Out Auto Detection For Multi-Port Application

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

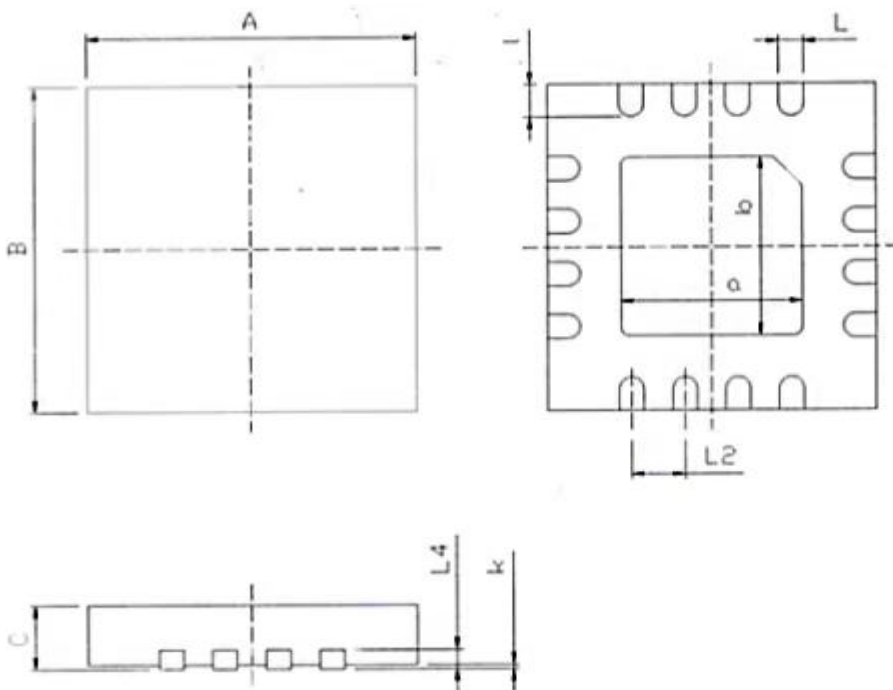
Line loss compensation:

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;

QFN4*4-16L



Dimensions In Millimeterer			
Symbol	MIN	TYP	MAX
A	3.90	4.00	4.10
B	3.90	4.00	4.10
C	0.70	0.75	0.80
L	0.25	0.30	0.35
L2	-	0.65	-
L4	0.18	0.20	0.25
a	2.10	2.20	2.30
b	2.10	2.20	2.30
k	0.00	0.02	0.05
t	0.35	0.40	0.45