USB Type-C&BC1.2 Charger Emulator with Adjustable Power Switch

FEATURES

- Meet Type-C discharge requirement
- Support Type-C 3A DFP port
- Fully Autonomous Type-C Controller Support Type-C Version 1.2
- 26 mΩ High-Side MOSFET
- 2uA supply current under idle state
- 4.2V ~ 6.5V Single Supply Operation.
- 2.0~4.0 A (typ.) Adjustable Current Limit
- Low Average Current in OUT shorted GND
- Support Apple® 2.7V/2.7V Fast Charging Mode
- Support Samsung® 1.2V/1.2V Fast Charging Mode
- Support BC1.2 & YD/T 1591-2009 Charging Mode
- Available ESOP8 package

APPLICATIONS

- USB Charger
- USB Wall Adapter
- Car Charger

DESCRIPTION

The UC2504_S is an autonomous source only Type-C controller optimized power chargers and mobile chargers. It broadcasts the available current of the charger over CC1/CC2 using the USB Type-C standard and prevents VBUS from being asserted until a valid connection has been verified. It can be used for up to 16.5W charging using Type-C protocols.

The UC2504_S integrated USB charger emulators with automatic host charger identification circuitry and high performance adjustable current limiting power switch. An automatic USB charger identification circuit allows mobile power supply can automatically provides the correct modes on the data lines to charger compliant devices among the Apple, Samsung and BC1.2 modes.

The UC2504_S is a 26mΩ power switch intended for applications where heavy capacitive loads and short-circuits are likely to be encountered. This also provides hiccup mode when enters OTSD mode and meet the latest VBUS discharge time requirements.
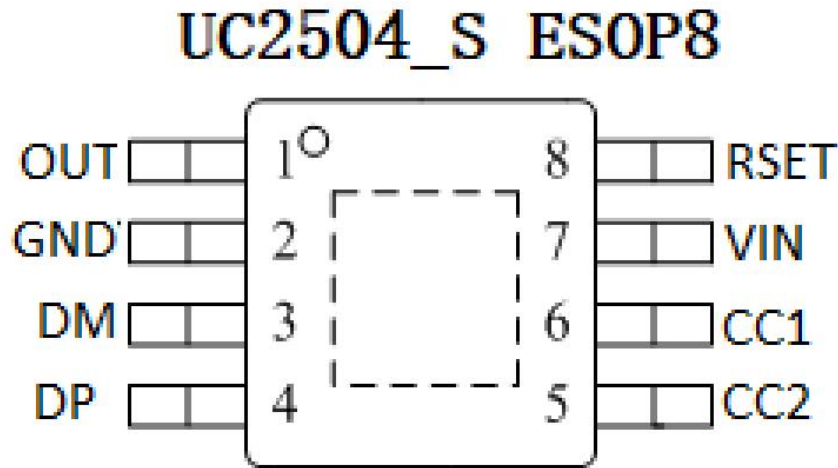
PACKAGE AND SIMPLIFIED APPLICATION
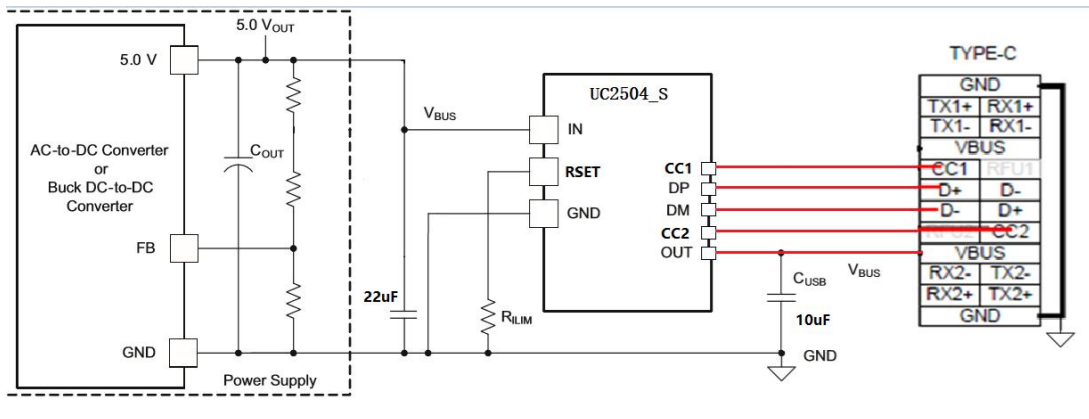
ORDING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)	Mark
UC2504_S	ESOP8	4000	-40~85	UC2504_S XXX

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PINOUT

UC2504_S ESOP8

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OUT  [1°      8]  RSET
GND  [2       7]  VIN
DM   [3       6]  CC1
DP   [4       5]  CC2
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PIN FUNCTIONS

NO.	NAME	TYPE[1]	DESCRIPTION
1	OUT	O	Power-switch output, connected to VBUS of USB; connect a 10µF or greater ceramic capacitor from OUT to GND as close to the IC as possible
2	GND	G	Ground connection
3	DM	O/I	DM data line to connector, input for hand-shake voltage from portable equipment high impedance while disabled
4	DP	O/I	DP date line to connector, output for hand-shake voltage to portable equipment, high impedance while disabled
5	CC2	O/I	Analog input/output that connects to the Type-C receptacle CC2 pin
6	CC1	O/I	Analog input/output that connects to the Type-C receptacle CC1 pin
7	VIN	P/I	Power supply/Input voltage connected to Power Switch; connect a 10µF or greater ceramic capacitor from IN to GND as close to the IC as possible
8	RSET	I	External resistor used to set current-limit threshold;

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

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ABSOLUTE MAXIMUM RATINGS (1)

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

PARAMETER		MIN	MAX	UNIT
Supply Voltage Range	VIN	-0.3	7.0	V
Input voltage range	DP,DM,CC1,CC2	-0.3	5.8	
ESD rating, Human Body Model (HBM)	VIN, OUT		6	kV
	DP, DM, CC1,CC2		6	
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（EMSOP8）			UNIT
θ_{JA}	ESOP8 Package thermal impedance[1]	48	°C/W
θ_{JCtop}	Junction-to-case (top) thermal resistance	53	
θ_{JCbot}	Junction-to-case (bottom) thermal resistance	13.5	
Θ_{JB}	Junction-to-board thermal resistance	37	

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

RECOMMENDED OPERATING CONDITIONS

| PARAMETER		MIN	MAX	UNIT
V_{IN}	Input voltage of IN	4.5	6.5	V
$V_{DP/DM}$	DP data line input voltage		5.5	
$I_{DP/DM}$	Continuous sink/source current		±10	mA
R_{SET}	Resistance of R_{SET}	13	100	kΩ
I_{OUT}	Continuous sink/source current	2000	4000	mA
T_J	Operating Junction Temperature	-40	125	°C

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ELECTRICAL CHARACTERISTICS

Conditions are: T_A = 25°C, V_{IN} = 5.0 V and R_{SET} = 17.4kΩ. Positive current are into pins. All voltages are with respect to GND (unless otherwise noted).

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Power Switch						
R_{DSON}		I_{OUT}=1.0A		26	28	mΩ
T_{DL}	Power-on delay			0.46		S
UVLO	Under voltage lock out			3.6		V
	Hysteresis			0.3		V
Current Limit						
I_{OUT}	OUT current limited	BIN1 RSET=15.4K	3.1	3.3	3.5	A
I_{OUT}	OUT current limited	BIN2 RSET=17.4K	3.1	3.3	3.5	A
SUPPLY CURRENT						
I_{IN}	IN ON supply current			226		μA
I_{INI}	IN idle supply current	CC1/CC2 floating		0	5	
BC 1.2 DCP MODE						
R_{DPM_SHORT}	DP / DM shorting resistance			125	200	Ω
IPAD MODE 2.4A Mode						
V_{DP_IPAD}	DP output voltage		2.5	2.7	2.9	V
V_{DM_IPAD}	DM output voltage		2.5	2.7	2.9	V
Galaxy Tab MODE						
V_{DP_GAL}	DP output voltage		1.1	1.2	1.3	V
V_{DM_GAL}	DM output voltage		1.1	1.2	1.3	
UFP Mode						
I_{SRC}	Sourcing current			326		uA
Thermal Shutdown						
T_{OTSD}	Temperature Rising Threshold			150		℃
	Hysteresis			20		

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BLOCK FUNCTION DIAGRAM
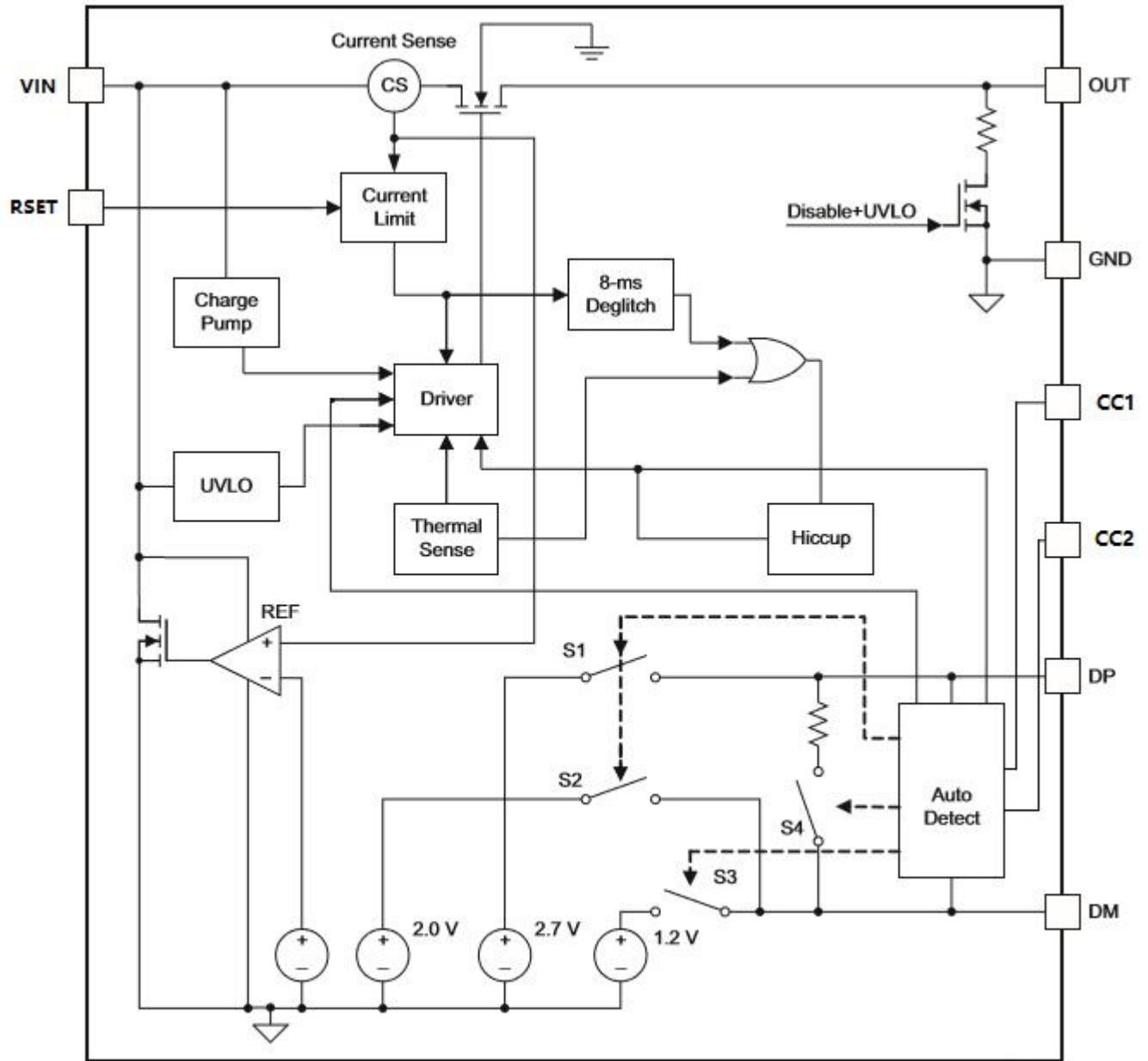
PCB LAYOUT NOTIFICATION

Input capacitance C1 of the pin 7 of UC2504_S:

The voltage entering the pin 7 must pass through the input capacitor C1 at a single point(单点过电容), the C1 must be close to the pin 7.
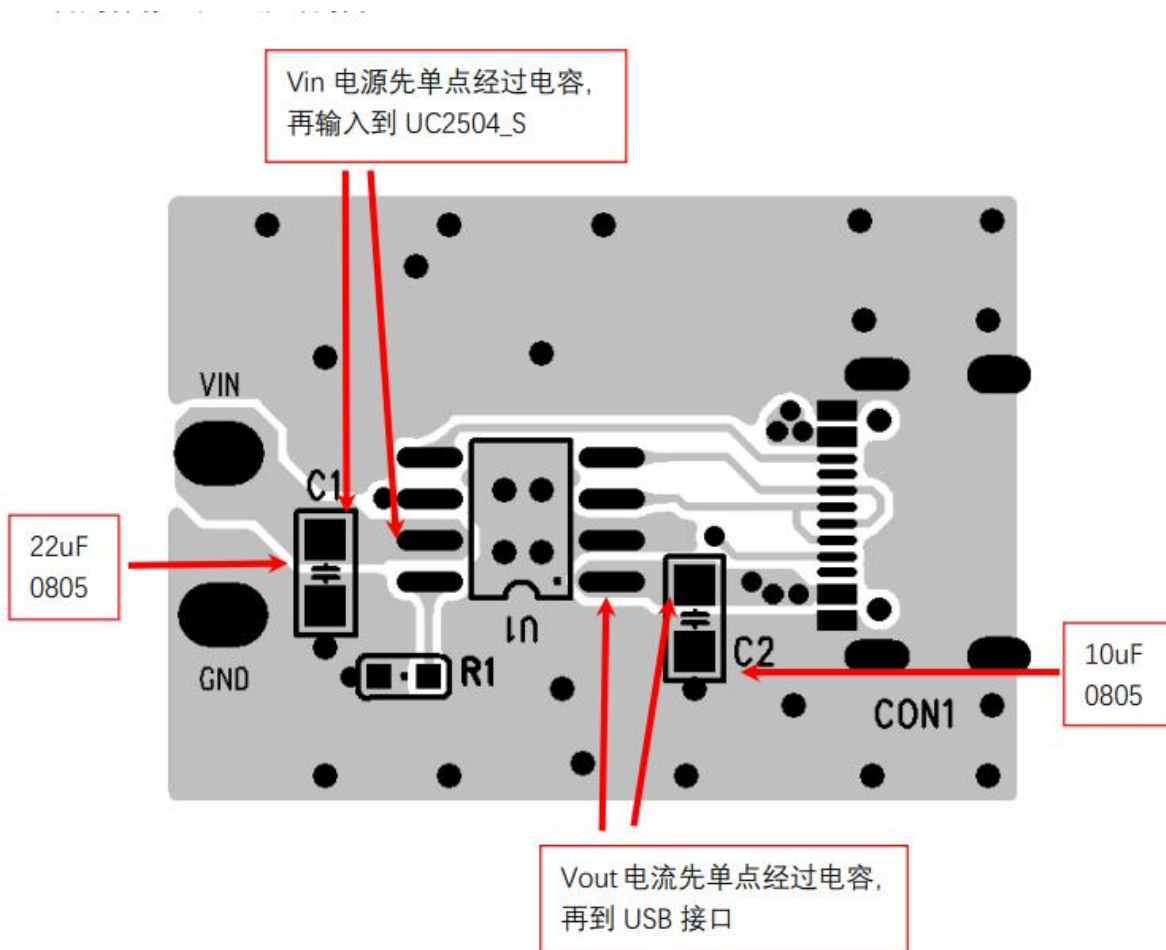
Output capacitance C2 of pin 1:

The pin1 to Type-C must pass through the output capacitor C2 and be close to pin 1.

Recommended capacitance C1 is 0805 size, value is 22uF;

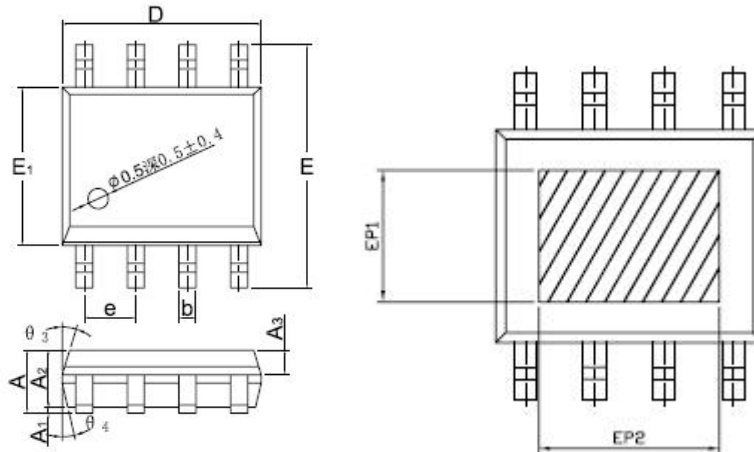Recommended capacitance C2 is 0805 size, value is 10uF;

Based the difference of AC/DC or DC/DC, the C1 and C2 can be bigger or smaller.

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PACKAGE INFORMATION

ESOP8

DIMENSIONS IN MUILIMETERS

SYMBOL	MIN	NOM	MAX
A	1.35	1.55	1.75
A₁	0.00	—	0.10
A₂	1.25	1.40	1.65
A₃	0.50	0.60	0.70
b	0.39	—	0.49
b₁	0.28	—	0.48
c	0.10	—	0.25
c₁	0.10	—	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E₁	3.80	3.90	4.00
e	1.27BSC		
L	0.45	—	1.00
L₁	1.04REF		
L₂	0.25BSC		
R	0.07	—	—
R₁	0.07	—	—
h	0.3	0.4	0.5
θ	0°	—	8°
θ₁	11°	17°	19°
θ₂	11°	13°	15°
θ₃	15°	17°	19°
θ₄	11°	13°	15°
EP1	2.40	—	—
EP2	3.30	—	—

BASE METAL

SECTIONA-A
6:1