

## USB Charger Emulator with Adjustable Power Switch

### FEATURES

- 45 mΩ High-Side MOSFET
- 1.0~4.0 A (typ.) Adjustable Current Limit
- Low Average Current in OUT shorted GND
- Support Apple® Devices fast charging (Apple® 2.1A / 2.4A mode)
- Support Samsung Galaxy Tab Devices fast Charging
- Support BC1.2 & YD/T 1591-2009 Charging Spec
- Built-in Soft-Start
- Support single layer PCB layout.
- 4.5 ~ 6.5V Single Supply Operation.
- Available EMSOP8/ESOP8 package.

### APPLICATIONS

- USB Charger
- USB Wall Adapter
- Car Charger

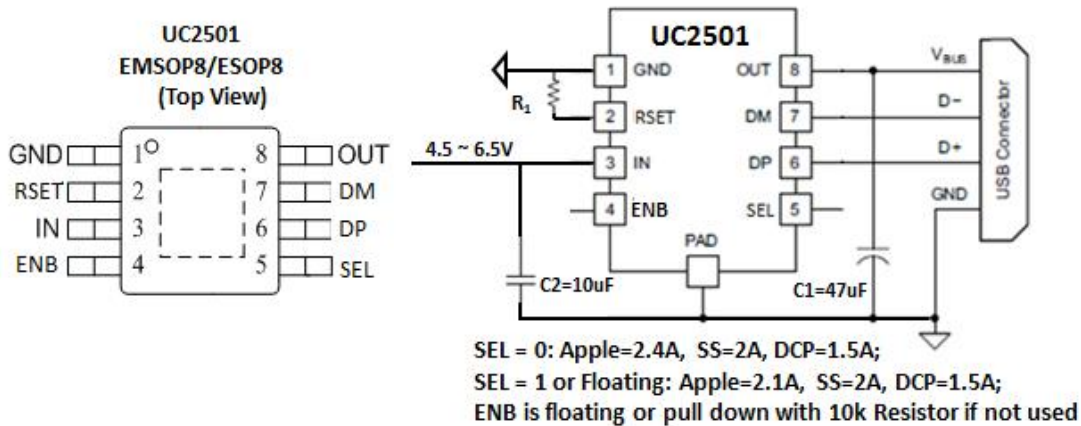
### DESCRIPTION

The UC2501 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 UC2501 is a 45mΩ power switch intended for applications where heavy capacitive loads and short-circuits are likely to be encountered. This also provides hiccup mode when OUT voltage is less than 2.85V or OTSD.

The UC2501 provides an ENB pin to turn on or turn off UC2501 and an SEL pin to select 10W or 12W mode in application.

### PACKAGE AND APPLICATION

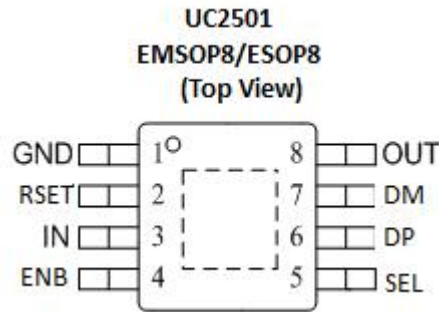


### ORDING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)	Mark
UC2501	EMSOP8	3000	-40~85	UC2501
UC2501	ESOP8	4000	-40~85	UC2501

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### PINOUT



### PIN FUNCTIONS

NO.	NAME	TYPE <sup>(1)</sup>	DESCRIPTION
1	GND	G	Ground connection
2	RSET	I	External resistor used to set current-limit threshold;
3	IN	P/I	Power supply/Input voltage connected to Power Switch; connect a 1 μF or greater ceramic capacitor from IN to GND as close to the IC as possible
4	ENB	I	Enable input, logic low turns on UC2501
5	SEL	I	Logic-level control input; When it is high or floating, DP/DM operate in 2.1A mode , when it is Low, DP/DM operate in 2.4A mode;
6	DP	O/I	DP date line to connector, output for hand-shake voltage to portable equipment, high impedance while disabled
7	DM	O/I	DM data line to connector, input for hand-shake voltage from portable equipment high impedance while disabled
8	OUT	O	Power-switch output, connected to VBUS of USB; connect a 22μF or greater ceramic capacitor from OUT to GND as close to the IC as possible

(1) G = Ground, I = Input, O = Output, P = Power  
(2)

### MARK INFORMATION



## USB Charger Emulator with Adjustable Power Switch

### ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

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

PARAMETER		MIN	MAX	UNIT
Supply Voltage Range	IN	-0.3	7.0	V
Input voltage range	DP,DM	-0.3	5.8	
Continuous output sink current	DP input current, DM input current		35	mA
Continuous output source current	DP output current, DM output current		35	
ESD rating, Human Body Model (HBM)	IN		2	kV
	DP, DM		2	
Operating Junction Temperature	T <sub>J</sub>	-40	150	°C
Storage Temperature Range	T <sub>stg</sub>	-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
$\theta_{JA}$	EMSOP8 Package thermal impedance <sup>(1)</sup>	65	°C/W
	ESOP8 Package thermal impedance <sup>(1)</sup>	42	

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

### RECOMMENDED OPERATING CONDITIONS

PARAMETER		MIN	MAX	UNIT
V <sub>IN</sub>	Input voltage of IN	4.5	6.5	V
V <sub>DP/DM</sub>	DP data line input voltage		5.5	
I <sub>DP/DM</sub>	Continuous sink/source current		±10	mA
R <sub>SET</sub>	Resistance of R <sub>SET</sub>	13	100	kΩ
I <sub>OUT</sub>	Continuous sink/source current	1000	4000	mA
T <sub>J</sub>	Operating Junction Temperature	-40	125	°C

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### ELECTRICAL CHARACTERISTICS

Conditions are:  $T_A = 25^\circ\text{C}$ ,  $V_{IN} = \text{SEL} = 5.0\text{ V}$ ,  $\text{ENB} = \text{GND}$  and  $\text{RSET} = 33.0\text{k}\Omega$ . Positive current are into pins. All voltages are with respect to GND (unless otherwise noted).

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>Power Switch</b>						
$R_{\text{DS(on)}}$	EMSOP8 Package	$I_{\text{OUT}}=1\text{A}$		45	m $\Omega$	
	ESOP8 Package			55		
<b>Current Limit</b>						
$I_{\text{OS}}$	OUT current limited	BIN1: $R_{\text{SET}}=18.7\text{k}$ BIN2: $R_{\text{SET}}=20.5\text{K}$	2.50	2.70	2.90	A
<b>Enable Pin (ENB)</b>						
$V_{\text{ENB}}$	ENB threshold voltage, falling		0.8	1.33	2.3	V
$V_{\text{ENB\_HYS}}$	Hysteresis			150		mV
$R_{\text{PD}}$	Pull Down Resistor		200	290	380	k $\Omega$
<b>Hiccup Mode</b>						
$V_{\text{OUT\_SHORT}}$	OUT Threshold Voltage to enter Hiccup mode			2.85		V
$T_{\text{ON\_HICCUP}}$	ON Time of Hiccup mode		70	130	190	ms
$T_{\text{OFF\_HICCUP}}$	OFF Time of Hiccup mode		0.7	1.3	1.9	s
<b>Thermal Shutdown</b>						
	Temperature Rising Threshold			172		$^\circ\text{C}$
	Hysteresis			20		

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### ELECTRICAL CHARACTERISTICS

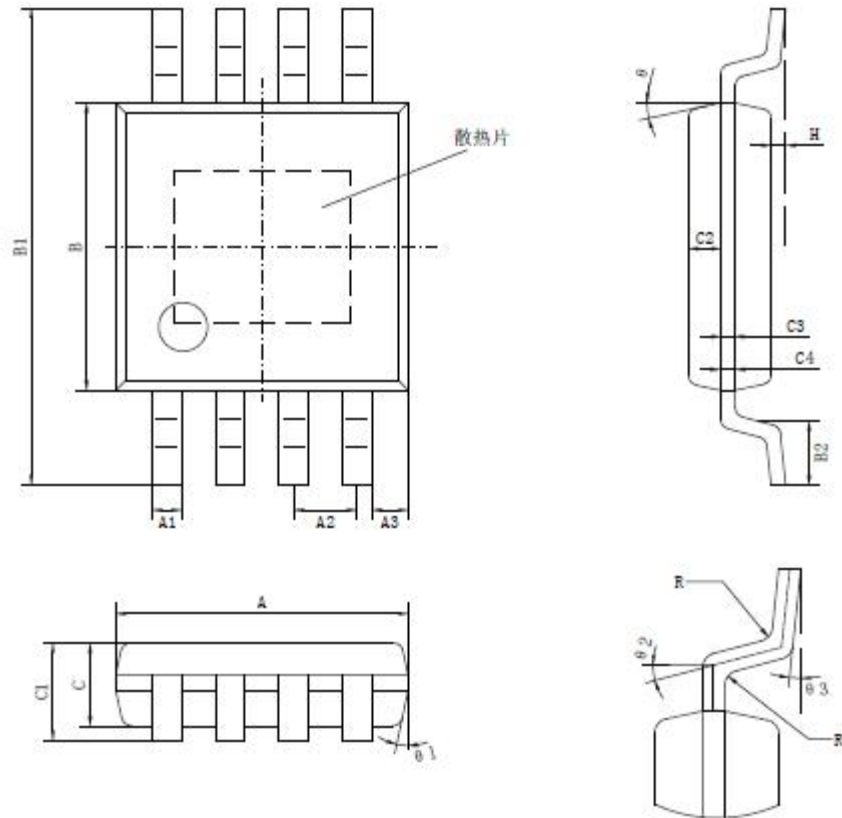
Conditions are: TA = 25°C, VIN = SEL = 5.0 V, ENB = GND and RSET = 19.1 kΩ. Positive current are into pins. All voltages are with respect to GND (unless otherwise noted).

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>UNDERVOLTAGE LOCKOUT</b>						
V <sub>UVLO</sub>	IN rising UVLO threshold voltage	3.75	3.95	4.15	V	
	Hysteresis		100		mV	
<b>SUPPLY CURRENT</b>						
I <sub>IN</sub>	IN supply current	VIN=5.0V, ENB=0V	160	280	μA	
I <sub>DDL</sub>	IN Disable Supply Current	VIN=ENB=5.0V	0	2		
<b>BC 1.2 DCP MODE (SHORT)</b>						
R <sub>DPM_SHORT</sub>	DP / DM shorting resistance		125	200	Ω	
R <sub>DCHG_SHORT</sub>	Resistors connected DP /DM to GND after hand-shaking		200	400	kΩ	
V <sub>DPL_TH_DETACH</sub>	DP low threshold while detaching BC1.2 devices	310	330	350	mV	
V <sub>DPL_TH_DETACH_HYS</sub>	hysteresis		50		mV	
<b>IPAD MODE 2.1A Mode (SEL=1 or Floating)</b>						
V <sub>DP_IPAD</sub>	DP output voltage	2.5	2.7	2.9	V	
V <sub>DM_IPAD</sub>	DM output voltage	1.85	2.0	2.15	V	
R <sub>DP_IPAD</sub>	DP output impedance	I <sub>DP</sub> = -5uA	20	30	40	kΩ
R <sub>DM_IPAD</sub>	DM output impedance	I <sub>DM</sub> = -5uA	20	30	40	kΩ
<b>IPAD MODE 2.4A Mode (SEL=0)</b>						
V <sub>DP_IPAD</sub>	DP output voltage	2.5	2.7	2.9	V	
V <sub>DM_IPAD</sub>	DM output voltage	2.5	2.7	2.9	V	
R <sub>DP_IPAD</sub>	DP output impedance	I <sub>DP</sub> = -5uA	20	30	40	kΩ
R <sub>DM_IPAD</sub>	DM output impedance	I <sub>DM</sub> = -5uA	20	30	40	kΩ
<b>Galaxy Tab MODE</b>						
V <sub>DP_GAL</sub>	DP output voltage	1.1	1.2	1.3	V	
V <sub>DM_GAL</sub>	DM output voltage	1.1	1.2	1.3		
R <sub>DP_GAL</sub>	DP output impedance	I <sub>DP</sub> = -5uA	70	105	140	kΩ
R <sub>DM_GAL</sub>	DM output impedance	I <sub>DM</sub> = -5uA	70	105	140	

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**PACKAGE INFORMATION**

EMSOP8

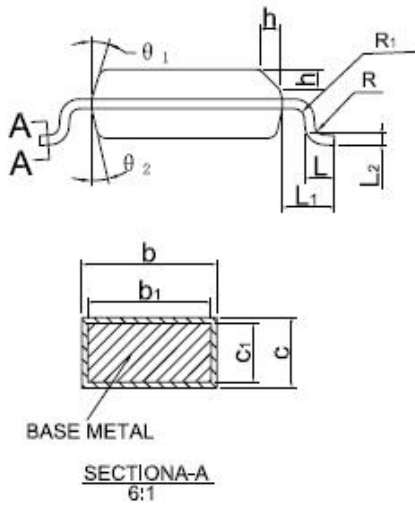
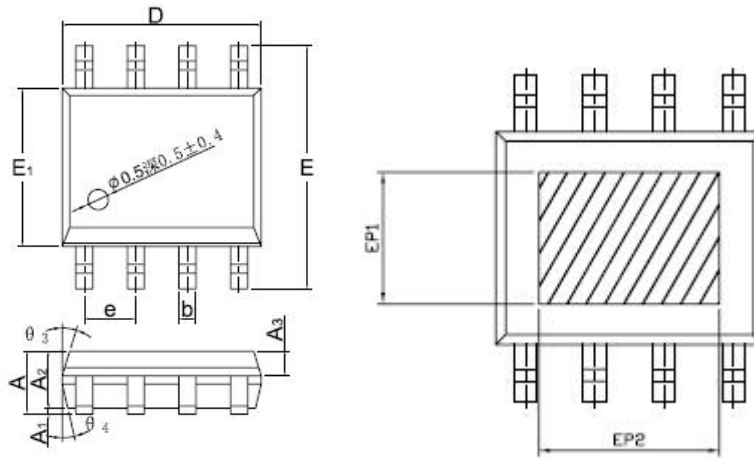


标注	尺寸	最小(mm)	最大(mm)	标注	尺寸	最小(mm)	最大(mm)
A		2.90	3.20	C3		0.152	
A1		0.26	0.35	C4		0.15	0.23
A2		0.65TYP		H		0.02	0.15
A3		0.375TYP		$\theta$		12° TYP4	
B		2.90	3.20	$\theta 1$		12° TYP4	
B1		4.70	5.10	$\theta 2$		14° TYP	
B2		0.45	0.75	$\theta 3$		0° ~ 6°	
C		0.75	0.95	R		0.15TYP	
C1		--	1.10	R1		0.15TYP	
C2		0.328TYP					

\* 注: EMSOP8产品框架基高尺寸为1.80X1.80, 散热片尺寸为1.80X1.55 (单位: mm)

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ESOP8



DIMENSIONS IN MULLIMETERS

SYMBOL	MIN	NOM	MAX
A	1,35	1,55	1,75
A <sub>1</sub>	0,00	—	0,10
A <sub>2</sub>	1,25	1,40	1,65
A <sub>3</sub>	0,50	0,60	0,70
b	0,39	—	0,49
b <sub>1</sub>	0,28	—	0,48
c	0,10	—	0,25
c <sub>1</sub>	0,10	—	0,23
D	4,80	4,90	5,00
E	5,80	6,00	6,20
E <sub>1</sub>	3,80	3,90	4,00
e	1,27BSC		
L	0,45	—	1,00
L <sub>1</sub>	1,04REF		
L <sub>2</sub>	0,25BSC		
R	0,07	—	—
R <sub>1</sub>	0,07	—	—
h	0,3	0,4	0,5
$\theta_1$	0°	—	8°
$\theta_2$	11°	17°	19°
$\theta_3$	11°	13°	15°
$\theta_4$	15°	17°	19°
$\theta_5$	11°	13°	15°
EP1	2,40	—	—
EP2	3,30	—	—