

## USB USB Charger Emulator with Adjustable Power Switch

### FEATURES

- 23 mΩ High-Side MOSFET in Package
- 2.0~4.0 A Adjustable Current Limit
- Low Average Current in OUT shorted GND
- Support Apple @ 2.4A fast Charging
- Support Samsung @ 2.1A fast Charging
- Support BC1.2 & YD/T 1591-2009 Charging
- Built-in Soft-Start
- Available EMSOP8 AND ESOP8 package

### APPLICATIONS

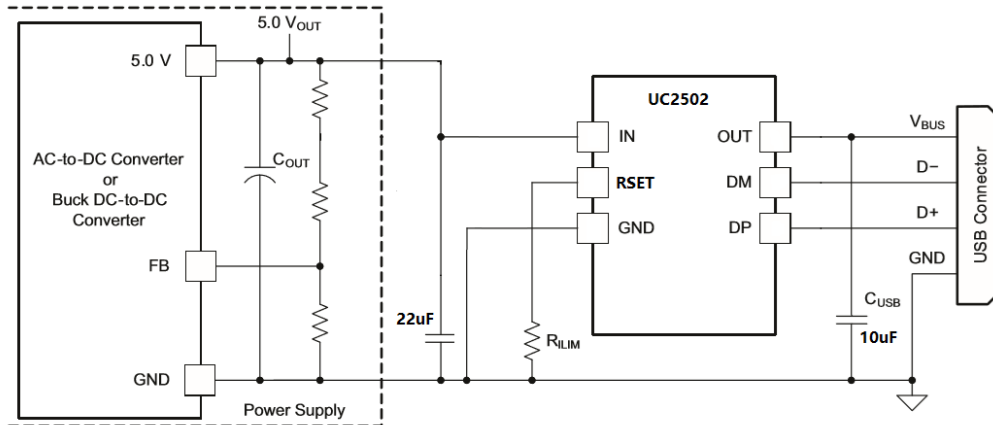
- USB Charger
- USB Wall Adapter
- Car Charger

### DESCRIPTION

The UC2502 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 UC2502 is a 28 mΩ in EMSOP8 AND ESOP8 package 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 3.0V or OTSD.

### PACKAGE AND APPLICATION

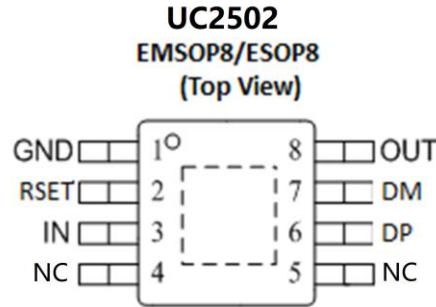


### ORDERING INFORMATION

| Part Number | Package Type | Package Qty | Op Temp( °C) | Mark       |
|-------------|--------------|-------------|--------------|------------|
| UC2502      | EMSOP8       | 3000        | -40~85       | UC2502 XXX |
| UC2502      | ESOP8        | 3000        | -40~85       | UC2502 XXX |

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### PINOUT



### PIN FUNCTIONS

| Pin Name | TYPE <sup>(1)</sup> |           | DESCRIPTION  |
|----------|---------------------|-----------|--|
|          | EMSOP8              | AND ESOP8 |  |
| GND      | 1                   | O         | Ground connection  |
| RSET     | 2                   | I         | External resistor used to set current-limit threshold;   |
| IN       | 3                   | P/I       | Power supply/Input voltage connected to Power Switch; connect a 10 μF or greater ceramic capacitor from IN to GND as close to the IC as possible |
| NC       | 4                   |           | No connection  |
| NC       | 5                   |           | No connection  |
| DP       | 6                   | O/I       | DP data line to connector, input for hand-shake voltage from portable equipment high impedance while disabled                                    |
| DM       | 7                   | O/I       | DM data line to connector, input for hand-shake voltage from portable equipment high impedance while disabled                                    |
| OUT      | 8                   | O         | Power-switch output, connected to VBUS of USB; connect a 10 μF or greater ceramic capacitor from OUT to GND as close to the IC as possible       |

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

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### 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, DP, DM                           |      | 4   | kV   |
| Operating Junction Temperature     | T <sub>J</sub>                       | -40  | 128 | °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 |
| $\theta_{JA}$  | ESOP8 Package thermal impedance <sup>(1)</sup>  | 45 | °C/W |

(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 | 2000 | 4000 | mA   |
| T <sub>J</sub>     | Operating Junction Temperature | -40  | 128  | °C   |

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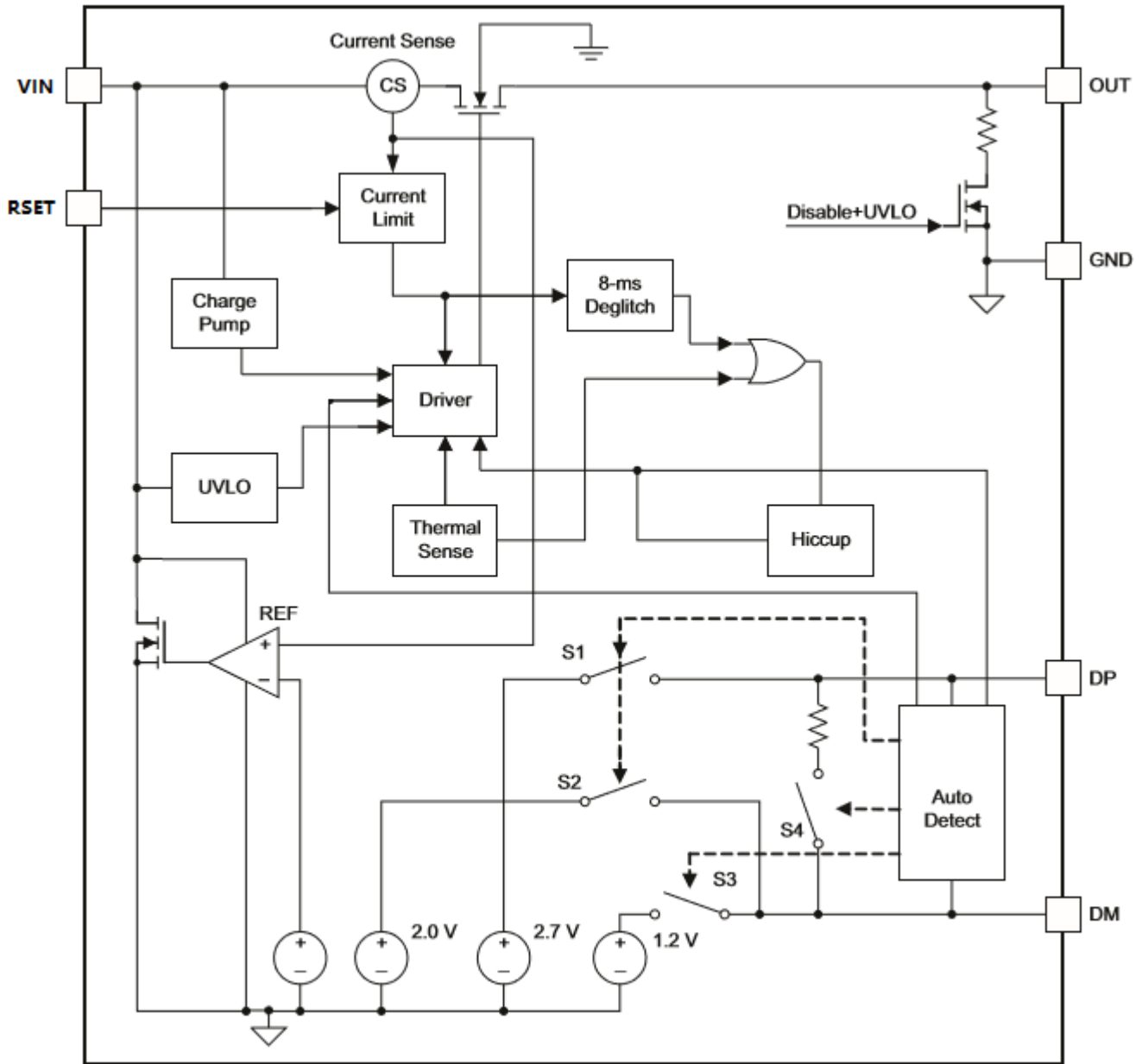
### ELECTRICAL CHARACTERISTICS

Conditions are: TA = 28 °C, IN = 5.0 V, 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 <sub>DS(on)</sub>         | EMSOP8 AND ESOP8                           | I <sub>OUT</sub> =2.4A | 23   |      | mΩ   |    |
| <b>Current Limit</b>        |  |                        |      |      |      |    |
| I <sub>OS</sub>             | OUT current limited                        | RSET=19.1 k            | 2.50 | 2.75 | 3.00 | A  |
| <b>Hiccup Mode</b>          |  |                        |      |      |      |    |
| V <sub>OUT_SHORT</sub>      | OUT Threshold Voltage to enter Hiccup mode |                        | 2.85 |      | V    |    |
| T <sub>ON_HICCUP</sub>      | ON Time of Hiccup mode                     |                        | 70   | 130  | 190  | ms |
| T <sub>OFF_HICCUP</sub>     | OFF Time of Hiccup mode                    |                        | 0.7  | 1.3  | 1.9  | s  |
| <b>Thermal Shutdown</b>     |  |                        |      |      |      |    |
|                             | Temperature Rising Threshold               |                        | 150  |      | °C   |    |
|                             | Hysteresis                                 |                        | 20   |      |      |    |
| <b>UNDERVOLTAGE LOCKOUT</b> |  |                        |      |      |      |    |
| V <sub>UVLO</sub>           | IN rising UVLO threshold voltage           |                        | 3.75 | 3.95 | 4.15 | V  |
|                             | Hysteresis                                 |                        | 100  |      | mV   |    |
| <b>IPAD MODE 2.4A Mode</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  |    |
| <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  |    |
| <b>SUPPLY CURRENT</b>       |  |                        |      |      |      |    |
| I <sub>IN</sub>             | IN supply current                          | IN= 5.0V,              |      | 230  | 400  | μA |
| I <sub>INL</sub>            | IN Disable Supply Current                  | IN= 5.0V               |      | 0    | 5    |    |

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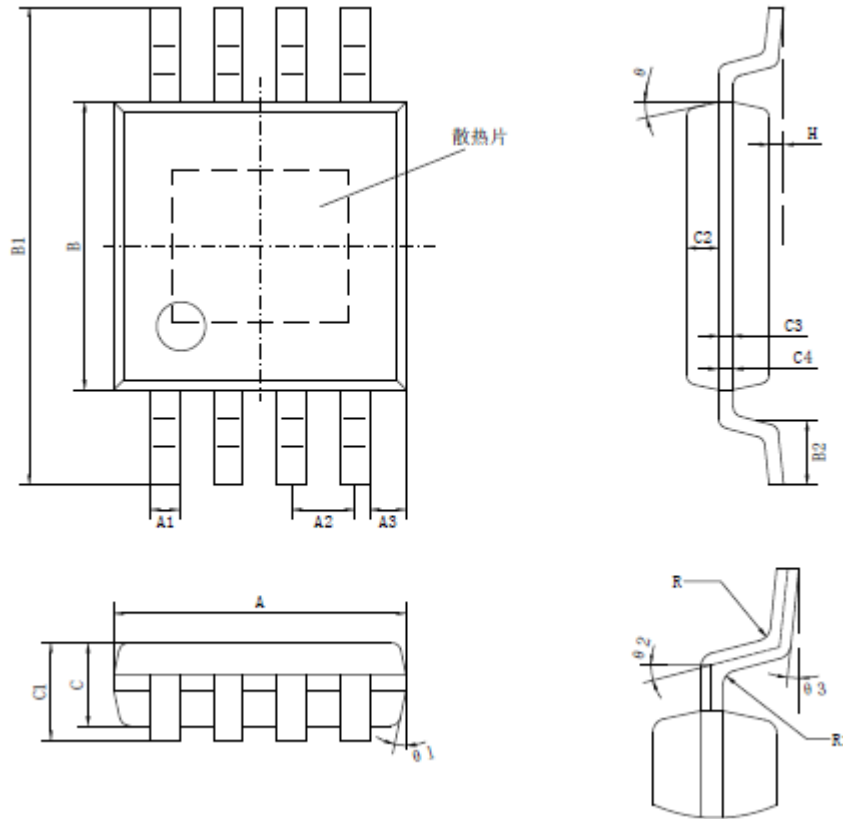
**Function Block Diagram**



USB USB Charger Emulator with Adjustable Power Switch

**PACKAGE INFORMATION**

EMSOP8

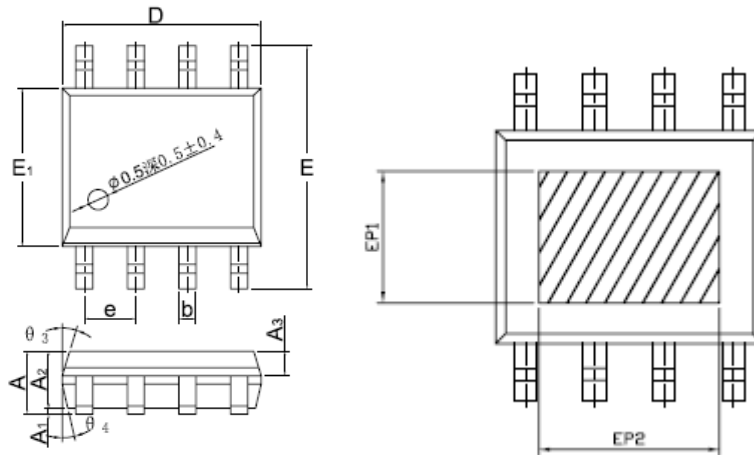


| 标注 | 尺寸 | 最小(mm)   | 最大(mm) | 标注      | 尺寸 | 最小(mm)   | 最大(mm) |
|----|----|----------|--------|---------|----|----------|--------|
| A  |    | 2.90     | 3.20   | C3      |    | 0.152    |        |
| A1 |    | 0.26     | 0.35   | C4      |    | 0.15     | 0.23   |
| A2 |    | 0.65TYP  |        | H       |    | 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产品框架基岛尺寸为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    | —    | —    |

