



## L5200

CMOS IC

### LOW NOISE, REGULATED CHARGE PUMP DC/DC CONVERTERS

#### ■ DESCRIPTION

The UTC **L5200-xx** series are low noise, constant frequency charge pump DC/DC converters and designed to increase efficiency in white LED application. The operating voltage range is 2.7V ~  $V_{OUT}$  input with up to 100mA of output current. Low external parts counts (one flying capacitor and two small bypass capacitors at  $V_{IN}$  and  $V_{OUT}$ ) make the UTC **L5200-xx** series ideally suited for small, battery-powered applications.

A charge-pump architecture maintains constant switching frequency to zero load and reduces both output and input ripple. The UTC **L5200-xx** series have thermal shutdown capability to escape the device damaged from a continuous short-circuit. With built-in soft-start circuitry to prevents excessive current flow at  $V_{IN}$  during start-up. High switching frequency enables the use of small ceramic capacitors. A low-current shutdown feature disconnects the load from  $V_{IN}$  and reduces quiescent current to  $<1\mu A$ .

The **L5200-ADJ** is available in MSOP-8 package and **L5200-fixed** in SOT-26 and TSOT-26 package.

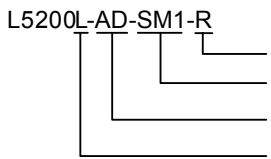
#### ■ FEATURES

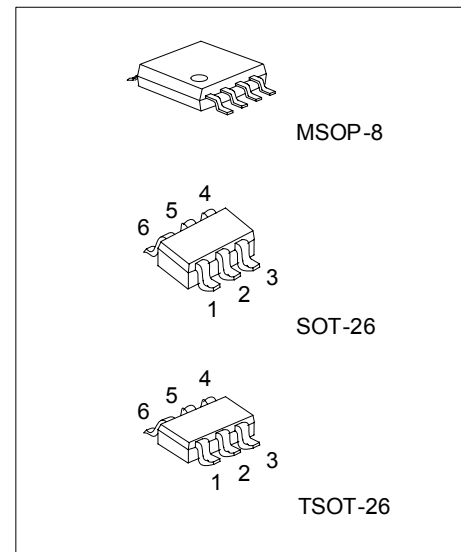
- \* Low Noise Constant Frequency Operation
- \* Output Current: 100mA
- \* 2MHz Switching Frequency
- \* 4.5V/5.0V Fixed Output Voltage
- \*  $V_{IN}$  Range: 2.7V ~  $V_{OUT}$
- \* Automatic Soft-Start.
- \* No Inductors
- \* Less than 1 $\mu A$  of Shutdown Current

#### ■ ORDERING INFORMATION

| Ordering Number |                   | Package | Packing   |
|-----------------|-------------------|---------|-----------|
| Normal          | Lead Free Plating |         |           |
| L5200-AD-SM1-R  | L5200L-AD-SM1-R   | MSOP-8  | Tape Reel |
| L5200-AD-SM1-T  | L5200L-AD-SM1-T   | MSOP-8  | Tube      |
| L5200-xx-AG6-R  | L5200L-xx-AG6-R   | SOT-26  | Tape Reel |
| L5200-xx-AH6-R  | L5200L-xx-AH6-R   | TSOT-26 | Tape Reel |

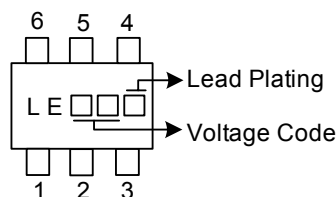
Note: xx :output voltage

|                                                                                     |                   |                                            |
|-------------------------------------------------------------------------------------|-------------------|--------------------------------------------|
|  | (1)Packing Type   | (1) R: Tape Reel, T: Tube                  |
|                                                                                     | (2)Package Type   | (2) SM1: MSOP-8, AG6: SOT-26, AH6: TSOT-26 |
|                                                                                     | (3)Output Voltage | (3) AD: ADJ, xx: 45:4.5V, 50:5.0V          |
|                                                                                     | (4)Lead Plating   | (4) L: Lead Free Plating Blank: Pb/Sn      |

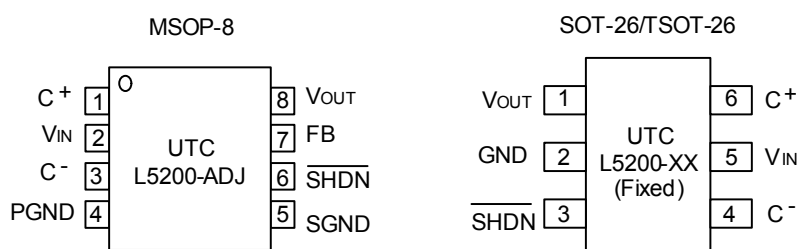


\*Pb-free plating product number: L5200L

## MARKING (For SOT-26/TSOT-26)



## PIN CONFIGURATIONS

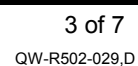


## PIN DESCRIPTION

| PIN NO.   |                | PIN NAME                 | FUNCTION                                                                                                                                             |
|-----------|----------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| L5200-ADJ | L5200-xx       |                          |                                                                                                                                                      |
| MSOP-8    | SOT-26/TSOT-26 |                          |                                                                                                                                                      |
| 1         | 6              | C+                       | Flying Capacitor Positive Terminal                                                                                                                   |
| 2         | 5              | V <sub>IN</sub>          | Input Supply Voltage, should be bypassed with a 1μF~4.7μF low ESR ceramic capacitor.                                                                 |
| 3         | 4              | C-                       | Flying Capacitor Negative Terminal                                                                                                                   |
| 4, 5      | 2              | GND                      | Ground terminal, should be tied to a ground plane for best performance                                                                               |
| 6         | 3              | $\overline{\text{SHDN}}$ | Shutdown Mode, Active-Low Input. A low on $\overline{\text{SHDN}}$ disables the L5200 series. $\overline{\text{SHDN}}$ must not be allowed to float. |
| 7         | X              | FB                       | Feedback Input Pin for Adjustable output. An output divider should be connected from V <sub>OUT</sub> to FB to program the output voltage.           |
| 8         | 1              | V <sub>OUT</sub>         | Regulated Output Voltage, should be bypassed with a 1μF~4.7μF low ESR ceramic capacitor as close as possible to the pin for best performance         |

X : The pin is Inexistent for SOT-26 and TSOT-26 package.

## UTC L5200 Adjustable version (MSOP-8)



## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                          | SYMBOL                | RATINGS                 | UNIT |
|------------------------------------|-----------------------|-------------------------|------|
| Input Voltage(to GND)              | $V_{IN}$              | -0.3 ~ 6                | V    |
| Charge Pump Voltage(to GND)        | $V_{OUT}$             | -0.3 ~ 5.5              | V    |
| Shutdown Voltage(to GND)           | $V_{\overline{SHDN}}$ | -0.3 ~ ( $V_{IN}+0.3$ ) | V    |
| Maximum DC Output Current (Note 1) | $I_{OUT}$             | 150                     | mA   |
| $V_{OUT}$ Short-Circuit Duration   |                       | Indefinite              |      |
| Operating Temperature              | $T_{OPR}$             | -20 ~ +85               | °C   |
| Storage Temperature                | $T_{STG}$             | -40 ~ +150              | °C   |

Note 1: Based on long-term current density limitations.

2: Stressed above Absolute Maximum Ratings may impair life or cause permanent damage to the device.

3. The device is guaranteed to meet performance specification within 0°C~+70°C operating temperature range and assured by design from -20°C~+85°C, characteristic and correlation with static process control.

## ■ ELECTRICAL CHARACTERISTICS

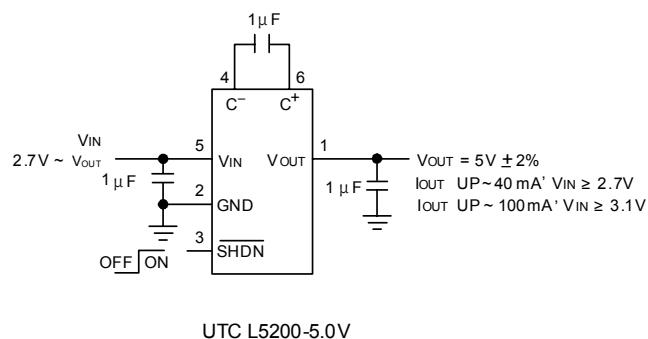
( $T_a = 25^\circ\text{C}$ ,  $V_{IN} = 3.6\text{V}$ ,  $C_{FLY} = 1\mu\text{F}$ ,  $C_{IN} = 1\mu\text{F}$ ,  $C_{OUT} = 1\mu\text{F}$ , unless otherwise specified.)

| PARAMETER                              | SYMBOL                | TEST CONDITIONS                                                                                                            | MIN | TYP   | MAX   | UNIT              |
|----------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------|-----|-------|-------|-------------------|
| Input Supply Voltage Range             | $V_{IN}$              |                                                                                                                            | *   | 2.7   |       | $V_{OUT}$ V       |
| Output Voltage                         | L5200-4.5V            | $I_{OUT} \leq 100\text{mA}$                                                                                                |     | 4.41  | 4.5   | 4.59 V            |
|                                        | L5200-5.0V            |                                                                                                                            | *   | 4.9   | 5     | 5.1 V             |
| Shutdown Input Threshold               | $V_{IH}$              |                                                                                                                            | *   | 1.3   |       | V                 |
|                                        | $V_{IL}$              |                                                                                                                            | *   |       | 0.4   | V                 |
| Feedback Voltage (For L5200-ADJ)       | $V_{FB}$              |                                                                                                                            | *   | 1.217 | 1.268 | 1.319 V           |
| Output Ripple Voltage(For L5200-fixed) | $V_R$                 | $V_{IN} = 3\text{V}$ , $I_{OUT} = 100\text{mA}$                                                                            |     | 30    |       | mV <sub>P-P</sub> |
| Operating Supply Current               | $I_{CC}$              | $I_{OUT} = 0\text{mA}$ , $\overline{SHDN} = V_{IN}$                                                                        | *   | 3.5   | 8     | mA                |
| Shutdown Current                       | $I_{\overline{SHDN}}$ | $\overline{SHDN} = 0\text{V}$ , $V_{OUT} = 0\text{V}$                                                                      | *   |       | 1     | $\mu\text{A}$     |
| Shutdown Input Current                 | $I_{IH}$              | $\overline{SHDN} = V_{IN}$                                                                                                 | *   | -1    | 1     | $\mu\text{A}$     |
|                                        | $I_{IL}$              | $\overline{SHDN} = 0\text{V}$                                                                                              | *   | -1    | 1     | $\mu\text{A}$     |
| Feedback Input Current (For L5200-ADJ) | $I_{FB}$              | $V_{FB} = 1.4\text{V}$                                                                                                     | *   | -50   | 50    | nA                |
| Open-Loop Output Resistance            | $R_{OL}$              | $V_{IN} = 3\text{V}$ , $I_{OUT} = 100\text{mA}$<br>$V_{FB} = 0\text{V}$<br>( $R_{OL} \equiv (2V_{IN} - V_{OUT})/I_{OUT}$ ) |     | 9.2   |       | $\Omega$          |
| Switching Frequency                    | $F_{OSC}$             |                                                                                                                            | 1   | 2     |       | MHz               |
| Efficiency (For UTC L5200-fixed)       | $\eta$                | $V_{IN} = 3\text{V}$ , $I_{OUT} = 50\text{mA}$                                                                             |     | 80    |       | %                 |
| Soft Start Time                        | $t_{ON}$              | $V_{IN} = 3\text{V}$ , $I_{OUT} = 0\text{mA}$<br>10%~90%                                                                   |     | 0.8   |       | ms                |

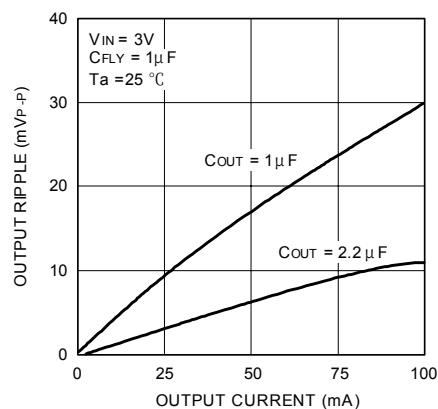
Note: \* stand for specifications which apply over the designed operating temperature range.

## TYPICAL APPLICATION CIRCUIT

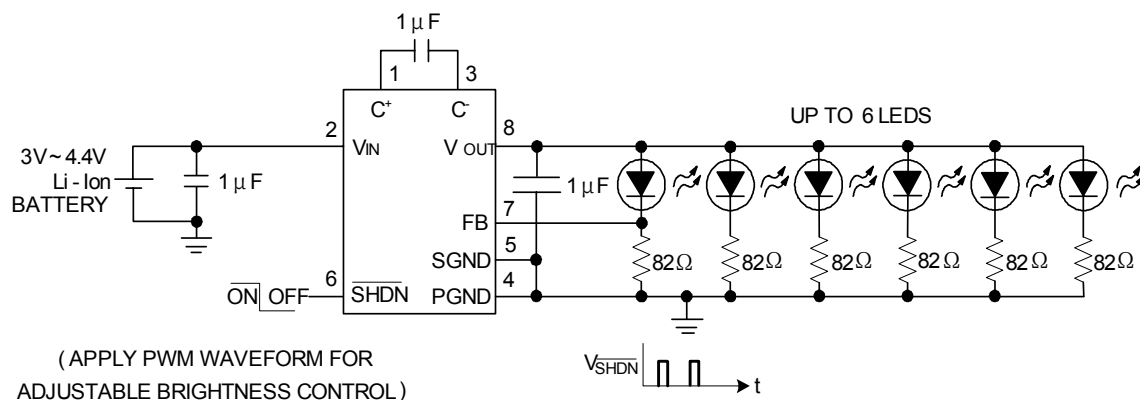
Regulated 5V Output from a 2.7V ~  $V_{OUT}$  Input



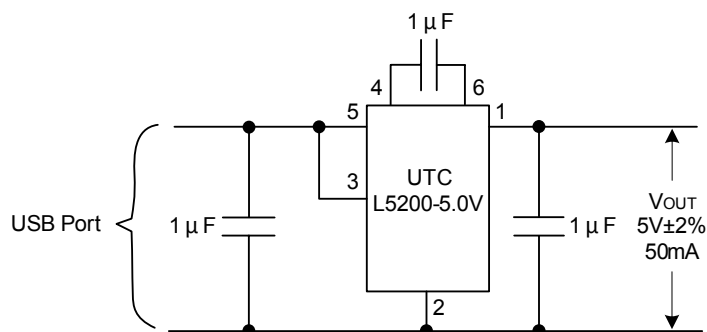
Output Ripple Voltage vs Load Current



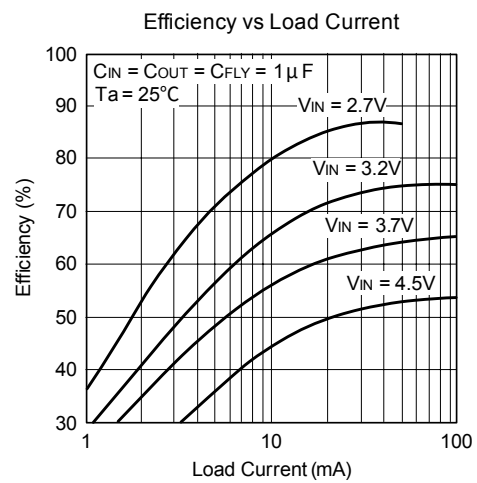
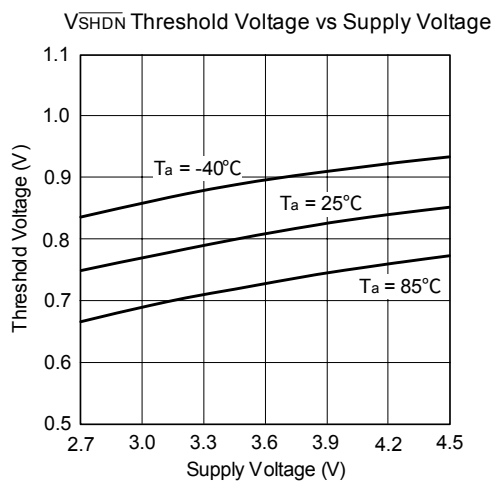
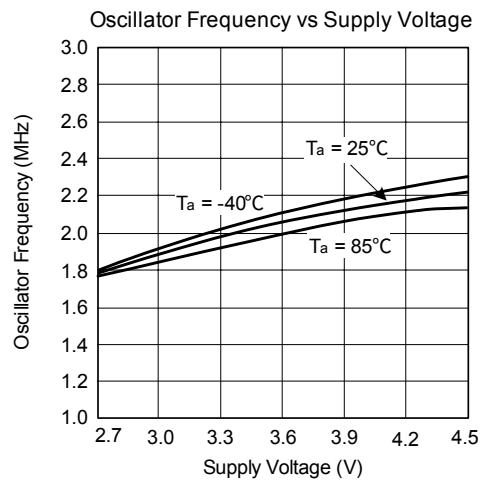
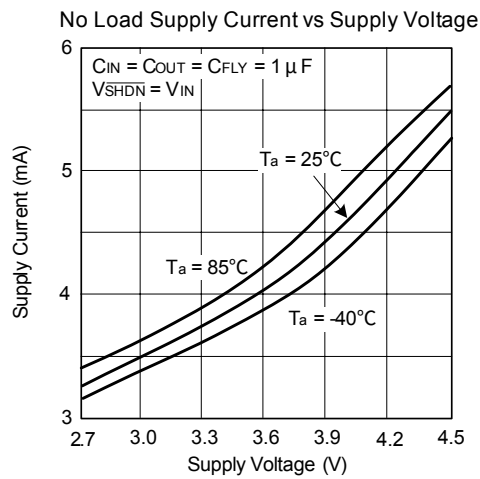
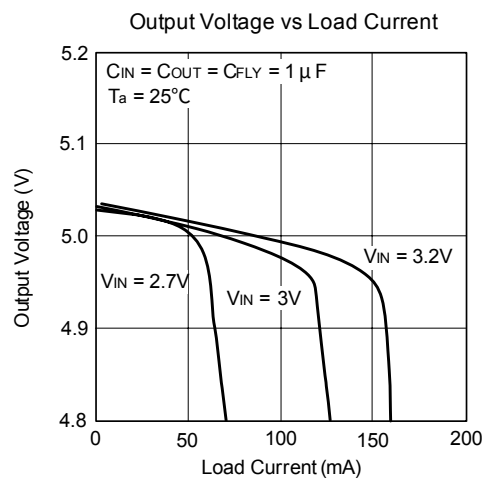
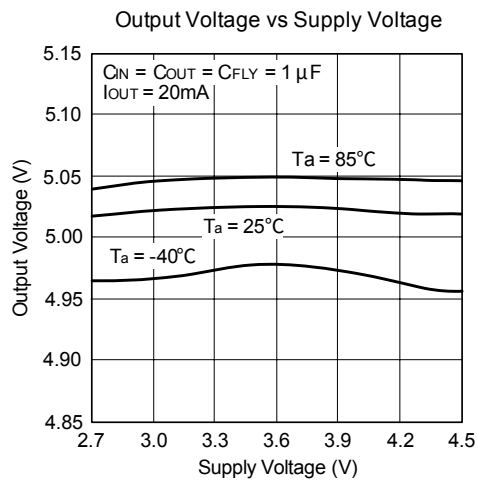
White or Blue LED Driver with LED Current Control (UTC L5200-ADJ)



USB Port to Regulated 5V Power Supply (UTC L5200-5.0V)

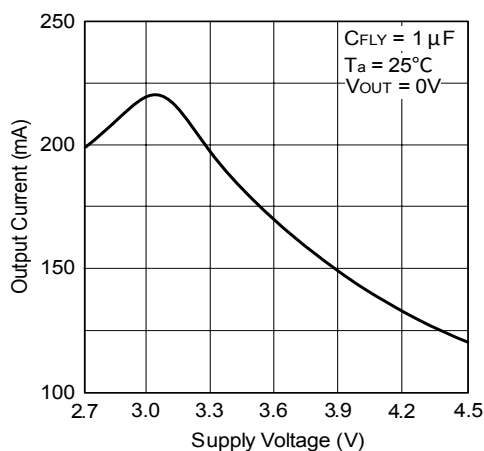
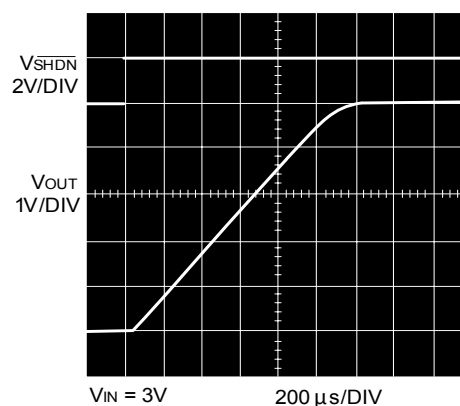


# ■ TYPICAL CHARACTERISTICS (L5200-5.0V)

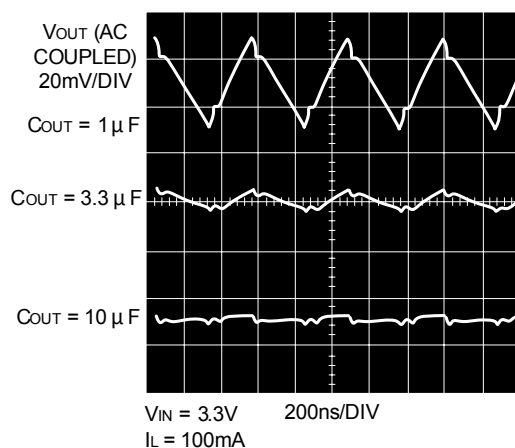


■ TYPICAL CHARACTERISTICS (L5200-5.0V) (cont.)

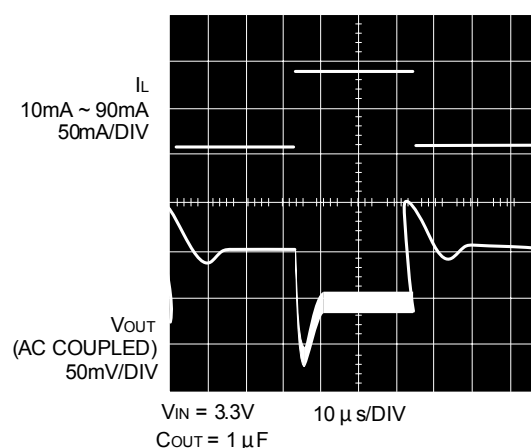
Short Circuit Current vs Supply Voltage

V<sub>OUT</sub> Soft-Start Ramp

Output Ripple



Load Transient Response



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.