



## L5201

CMOS IC

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

#### DESCRIPTION

The UTC **L5201-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 **L5201-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 **L5201-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 **L5201-ADJ** is available in MSOP-8 package and **L5201-fixed** in SOT-26 and TSOT-26 package.

#### FEATURES

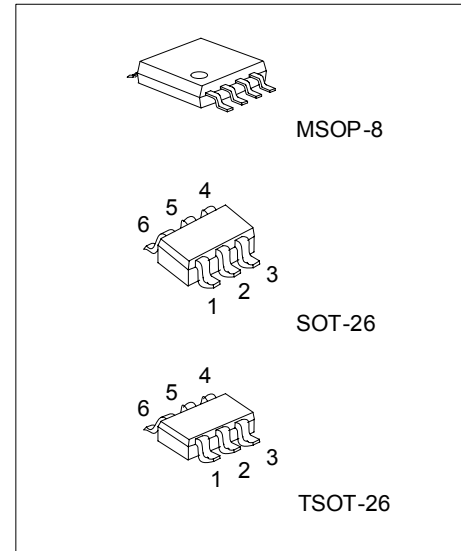
- \* Low Noise Constant Frequency Operation
- \* Output Current:  
90mA@3.0V< $V_{IN}$ <5V  
100mA@3.0V< $V_{IN}$ <4.5V
- \* 1MHz Switching Frequency
- \* 4.5V/5.0V Fixed Output Voltage
- \*  $V_{IN}$  Range: 2.7V ~  $V_{OUT}$
- \* Automatic Soft-Start.
- \* No Inductors
- \* Less than 1 $\mu A$  of Shutdown Current

#### ORDERING INFORMATION

Ordering Number		Package	Packing
Normal	Lead Free Plating		
L5201-AD-SM1-R	L5201L-AD-SM1-R	MSOP-8	Tape Reel
L5201-AD-SM1-T	L5201L-AD-SM1-T	MSOP-8	Tube
L5201-xx-AG6-R	L5201L-xx-AG6-R	SOT-26	Tape Reel
L5201-xx-AH6-R	L5201L-xx-AH6-R	TSOT-26	Tape Reel

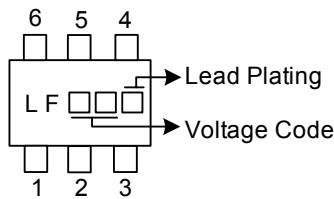
Note: xx :output voltage

<p>L5201L-AD-SM1-R</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage (4)Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) SM1: MSOP-8, AG6: SOT-26, AH6: TSOT-26 (3) AD: ADJ, xx: 45:4.5V, 50:5.0V (4) L: Lead Free Plating Blank: Pb/Sn</p>
---	---

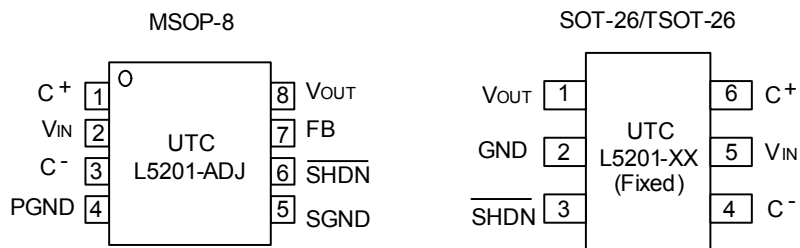


\*Pb-free plating product number: L5201L

■ MARKING (For SOT-26/TSOT-26)



■ PIN CONFIGURATIONS



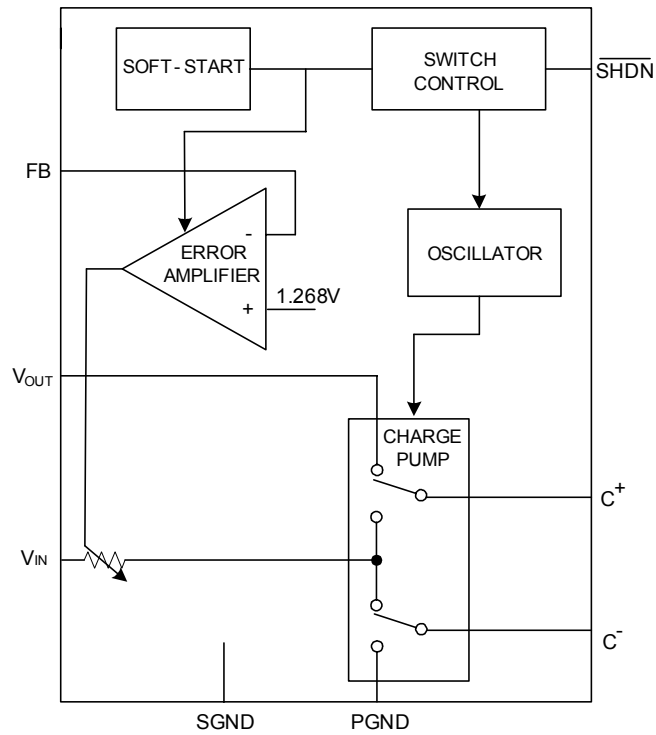
■ PIN DESCRIPTION

PIN NO.		PIN NAME	FUNCTION
L5201-ADJ MSOP-8	L5201-xx SOT-26/TSOT-26		
1	6	C+	Flying Capacitor Positive Terminal
2	5	V <sub>IN</sub>	Input Supply Voltage, should be bypassed with at least 6.8μf low ESR ceramic capacitor.
3	4	C <sup>-</sup>	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 L5201 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 at least 6.8μf low ESR ceramic capacitor as close as possible to the pin for best performance

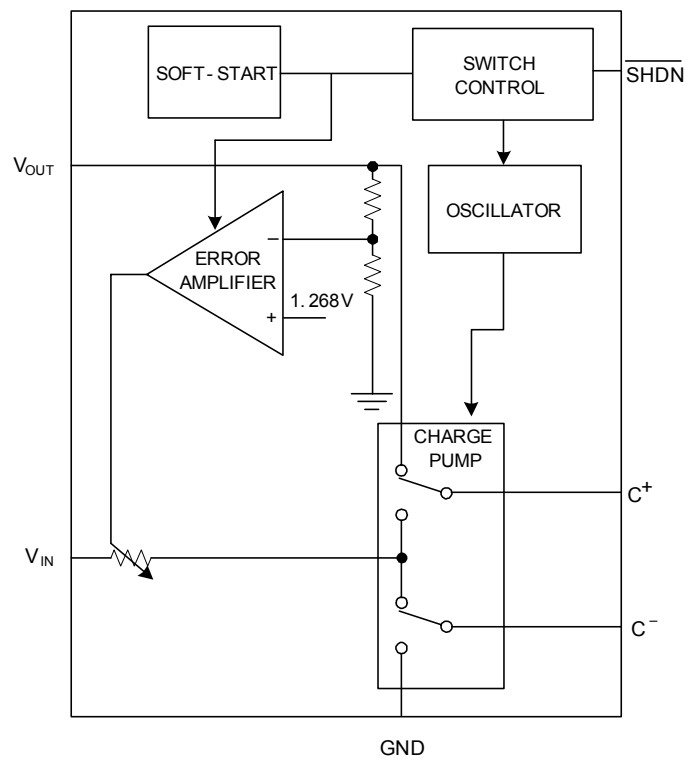
X : The pin is Inexistent for SOT-26 and TSOT-26 package.

■ BLOCK DIAGRAM

UTC L5201 Adjustable version (MSOP-8)



UTC L5201 fixed version (SOT-26/TSOT-26)



### ■ 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)	$V_{SHDN}$	-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	$T_{OPR}$	-40 ~ +85	
Storage Temperature	$T_{STG}$	-40 ~ +150	

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

2. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

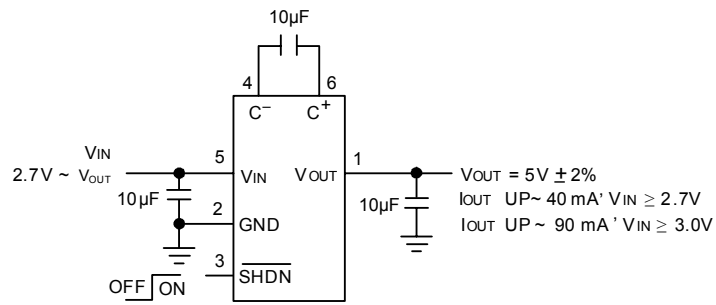
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ ELECTRICAL CHARACTERISTICS

( $V_{CC}=V_{SHDN} = 3V$ ,  $T_a=25^{\circ}C$ ,  $C_{FLY}=1\mu F$ ,  $C_{IN}=10\mu F$ ,  $C_{OUT}=10\mu F$ , unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	$V_{IN}$	$V_{OUT}=5.0V$	2.7		$V_{OUT}$	V
No Switching Supply Current	$I_Q$	$2.7V < V_{IN} < 5V$ , $I_{OUT}=0mA$ , $SHDN=V_{IN}$ , $V_{OUT}=5.5V$		90	140	$\mu A$
Output Voltage	L5201-4.5V	$2.7V < V_{IN} < 5V$ , $I_{OUT} \leq 50mA$	4.32	4.5	4.68	V
		$3.0V < V_{IN} < 5V$ , $I_{OUT} \leq 100mA$				
	L5201-5.0V	$2.7V < V_{IN} < 5V$ , $I_{OUT} \leq 40mA$	4.8	5	5.2	
		$3.0V < V_{IN} < 5V$ , $I_{OUT} \leq 90mA$				
SHDN Input Threshold	High	$V_{IH}$	1.4			V
	Low	$V_{IL}$			0.3	V
Feedback Voltage (For L5201-ADJ)	$V_{FB}$		1.217	1.268	1.319	V
Ripple Voltage (For L5201-Fixed)	$V_R$	$V_{IN} = 3V$ , $I_{OUT} = 50mA$		25		$mV_{P-P}$
		$V_{IN} = 3V$ , $I_{OUT} = 90mA$		25		
Shutdown Supply Current	$I_{SHDN}$	$2.7V < V_{IN} < 5V$ , $I_{OUT}=0mA$ , $V_{SHDN} = 0$			1	$\mu A$
Feedback Input Current (For L5201-ADJ)	$I_{FB}$	$V_{FB}=1.4V$	-50		50	nA
Efficiency (For L5201-Fixed)	$\eta$	$V_{IN} = 2.7V$ , $I_{OUT} = 40mA$		88		%
		$V_{IN} = 3V$ , $I_{OUT} = 90mA$		80		
Frequency	$F_{OSC}$	Oscillator Free Running	0.7	1	1.3	MHz
$V_{OUT}$ Turn-on time	$t_{ON}$	$V_{IN} = 3V$ , $I_{OUT} = 0mA$		0.35		ms
Short-Circuit Current	$I_{SC}$	$V_{IN} = 3V$ , $V_{OUT} = GND$ , $SHDN = 3V$		340		mA
Thermal Shutdown Temperature	$T_{SD}$			150		
Thermal Shutdown Hysteresis				30		

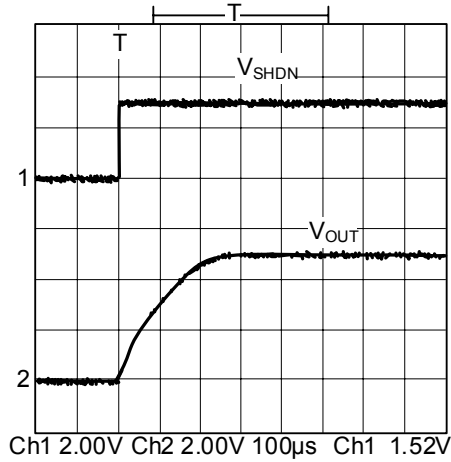
## ■ TYPICAL APPLICATION CIRCUIT



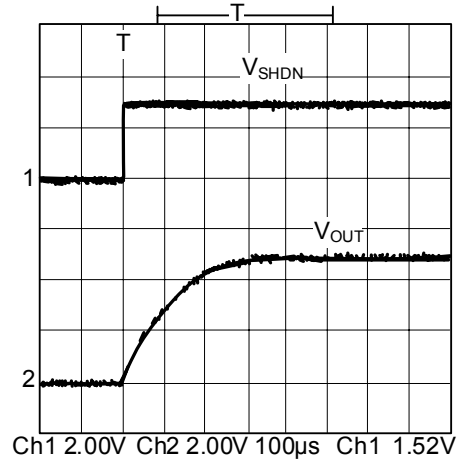
$C_{IN}, C_{OUT}$ : TAIYO YUDEN, JMK212BJ106KG  
 $C_{FLY}$ : TAIYO YUDEN, EMK212JB105KG

## TYPICAL CHARACTERISTICS

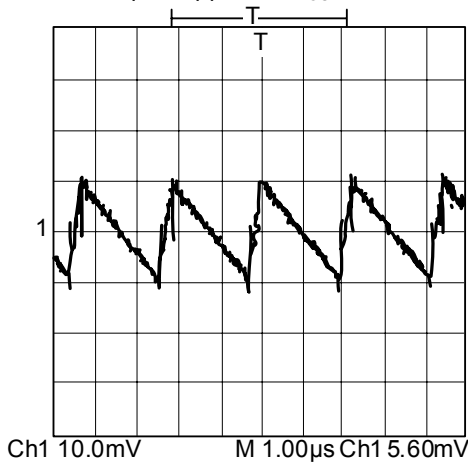
Startup Time with 50mA Load



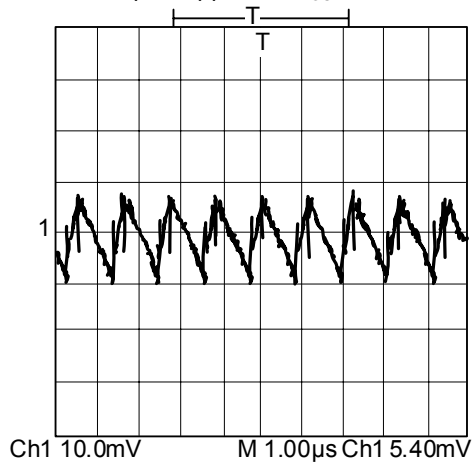
Startup Time with 90mA Load



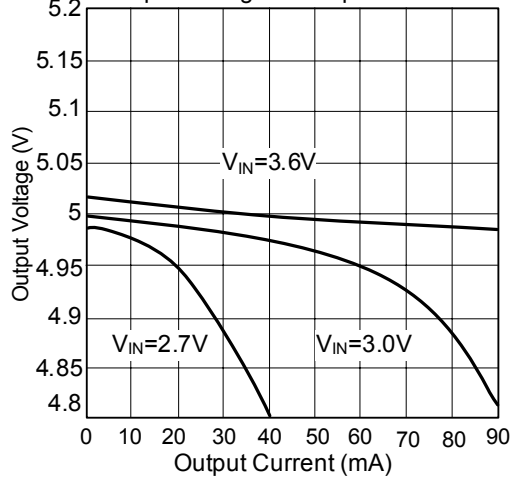
Output Ripple With  $I_{OUT}=50mA$



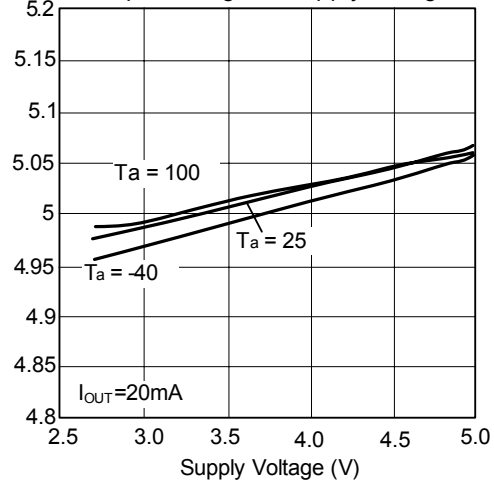
Output Ripple With  $I_{OUT}=90mA$



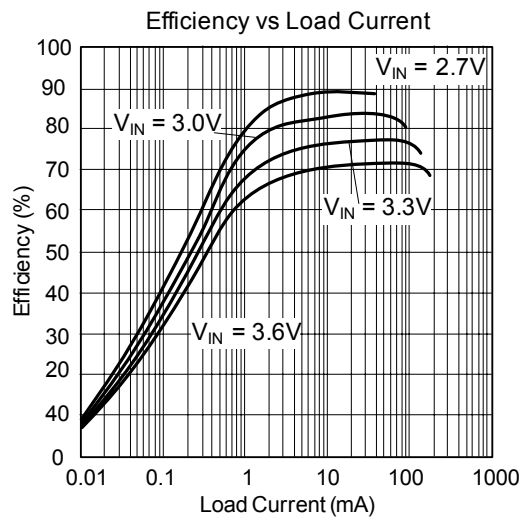
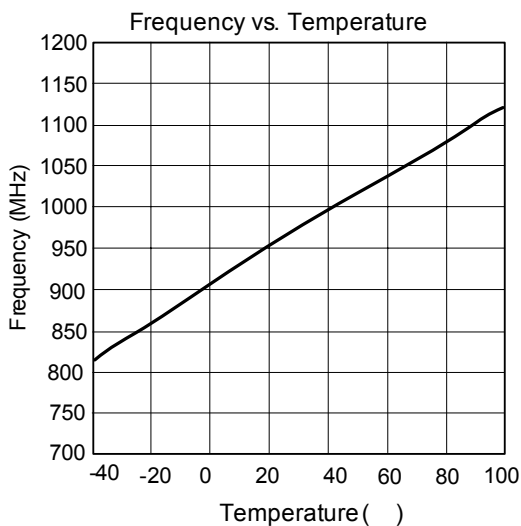
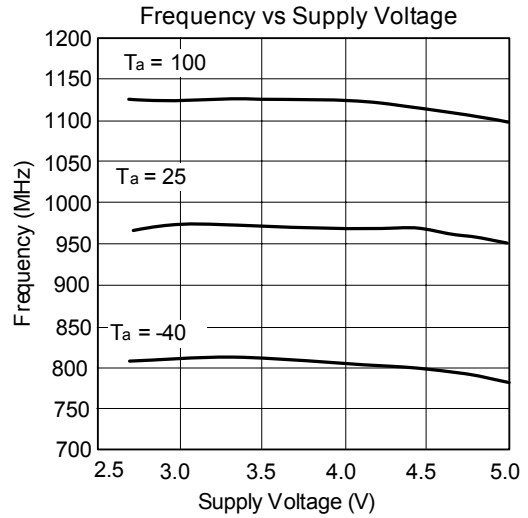
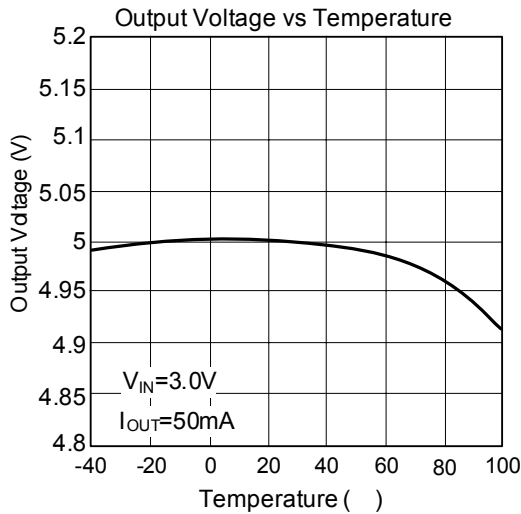
Output Voltage vs Output Current



Output Voltage vs Supply Voltage



■ TYPICAL CHARACTERISTICS(Cont.)



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.