



## 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

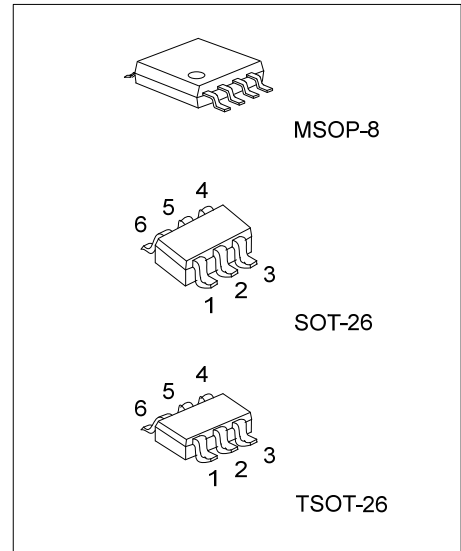
- \* Low Noise Constant Frequency Operation
- \* Output Current:  
90mA@3.0V< $V_{IN}$ <5V  
100mA@3.0V< $V_{IN}$ <4.5V
- \* 1MHz Switching Frequency
- \* 4.5V/5.0V Fixed Output Voltage
- \*  $V_{IN}$  Range: 2.7V ~  $V_{OUT}$
- \* Automatic Soft-Start.
- \* No Inductors
- \* Less than 1 $\mu A$  of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

#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
L5200L-xx-AG6-R	L5200G-xx-AG6-R	SOT-26	Tape Reel
L5200L-xx-AH6-R	L5200G-xx-AH6-R	TSOT-26	Tape Reel
L5200L-xx-SM1-R	L5200G-xx-SM1-R	MSOP-8	Tape Reel

Note: xx: Output Voltage, Refer to Marking Information

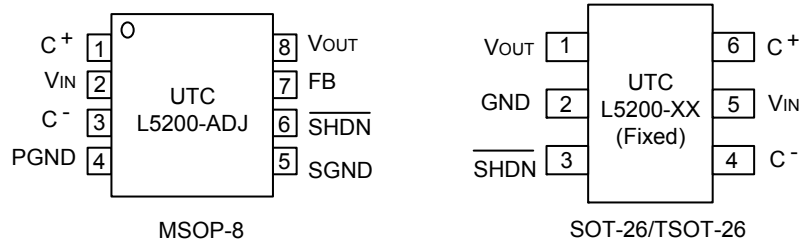
<p>L5201G-xx-AG6-R</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage (4)Green Package</p>	<p>(1) R: Tape Reel (2) AG6: SOT-26, AH6: TSOT-26, SM1: MSOP-8 (3) xx: refer to Marking Information (4) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-26 TSOT-26	45: 4.5V 50: 5.0V	
MSOP-8	AD: ADJ	

## PIN CONFIGURATIONS



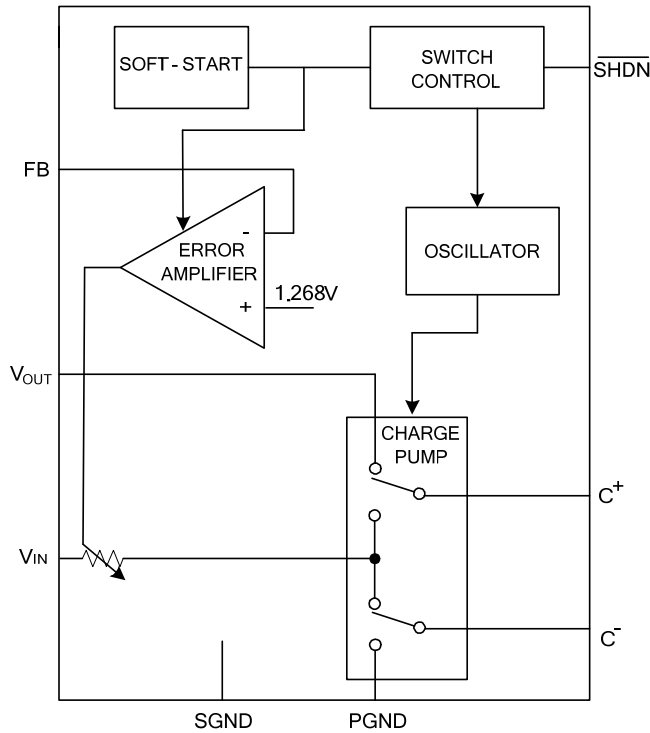
## PIN DESCRIPTION

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 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	SHDN	Shutdown Mode, Active-Low Input. A low on SHDN disables the L5200 series. 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

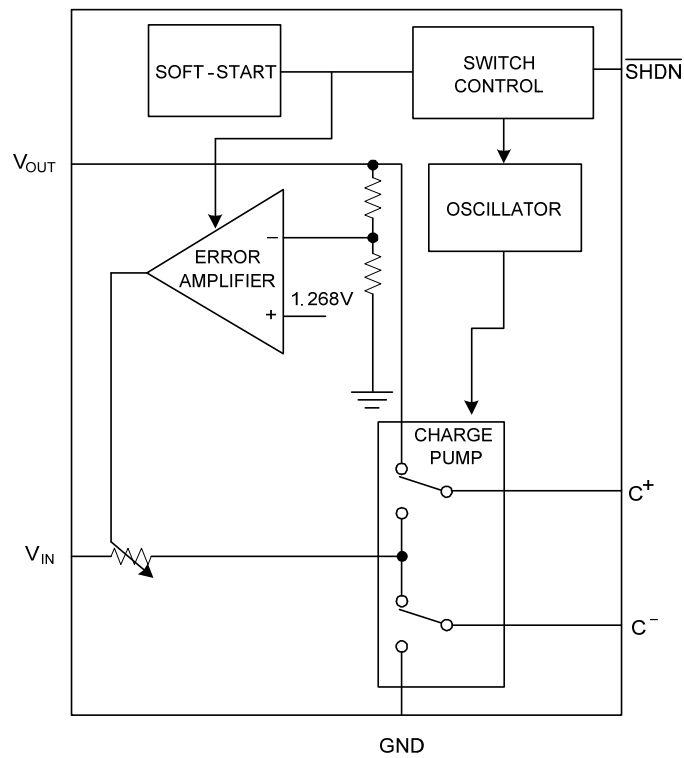
X : The pin is Inexistent for SOT-26 and TSOT-26 package.

■ BLOCK DIAGRAM

UTC L5200 Adjustable version (MSOP-8)



UTC L5200 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)	$V_{\overline{SHDN}}$	-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	$T_{OPR}$	-40 ~ +85	°C
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.

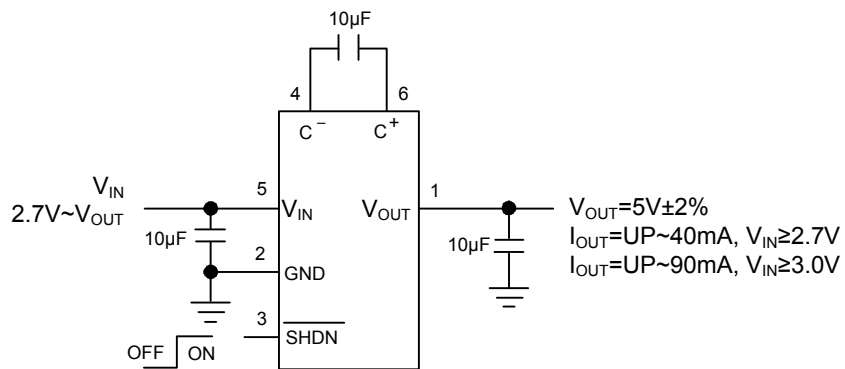
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ ELECTRICAL CHARACTERISTICS

( $V_{CC}=V_{\overline{SHDN}}=3V$ ,  $T_A=25^\circ C$ ,  $C_{FLY}=1\mu F$ ,  $C_{IN}=10\mu F$ ,  $C_{OUT}=10\mu F$ , 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	$I_Q$	$2.7V < V_{IN} < 5V$ , $I_{OUT}=0mA$ , $\overline{SHDN}=V_{IN}$ , $V_{OUT}=5.5V$		90	140	$\mu A$	
Output Voltage	L5200-4.5V	$V_{OUT}$	$2.7V < V_{IN} < 5V$ , $I_{OUT} \leq 50mA$	4.32	4.5	4.68	V
			$3.0V < V_{IN} < 5V$ , $I_{OUT} \leq 100mA$				
	L5200-5.0V	$2.7V < V_{IN} < 5V$ , $I_{OUT} \leq 40mA$	4.8	5	5.2		
		$3.0V < V_{IN} < 5V$ , $I_{OUT} \leq 90mA$					
$\overline{SHDN}$ Input Threshold	High	$V_{IH}$	1.4			V	
	Low	$V_{IL}$			0.3	V	
Feedback Voltage (For L5200-ADJ)	$V_{FB}$		1.217	1.268	1.319	V	
Ripple Voltage (For L5200-Fixed)	$V_R$	$V_{IN} = 3V$ , $I_{OUT} = 50mA$		25		mV <sub>P-P</sub>	
		$V_{IN} = 3V$ , $I_{OUT} = 90mA$		25			
Shutdown Supply Current	$I_{SHDN}$	$2.7V < V_{IN} < 5V$ , $I_{OUT}=0mA$ , $\overline{SHDN} = 0$			1	$\mu A$	
Feedback Input Current (For L5200-ADJ)	$I_{FB}$	$V_{FB}=1.4V$	-50		50	nA	
Efficiency (For L5200-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	$I_{SC}$	$V_{IN} = 3V$ , $V_{OUT} = GND$ , $\overline{SHDN} = 3V$		340		mA	
Thermal Shutdown Temperature	$T_{SD}$			150		°C	
Thermal Shutdown Hysteresis				30		°C	

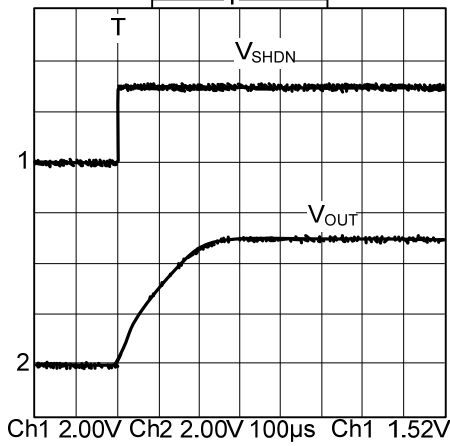
## ■ TYPICAL APPLICATION CIRCUIT



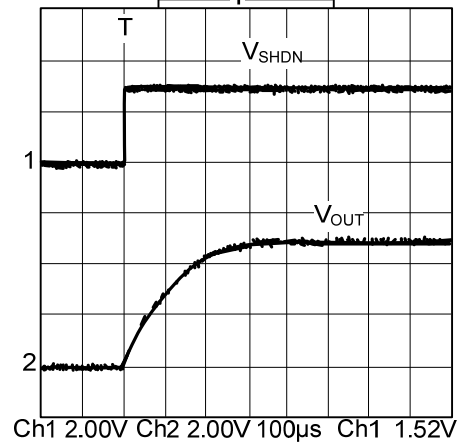
$C_{IN}, C_{OUT}$ : TAIYO YUDEN, JMK212BJ106KG  
 $C_{FLY}$ : TAIYO YUDEN, EMK212JB105KG

## TYPICAL CHARACTERISTICS

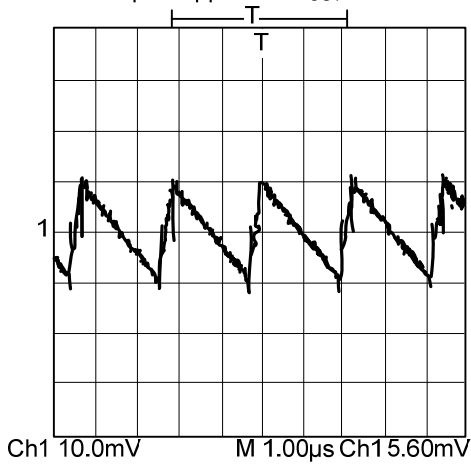
Startup Time with 50mA Load



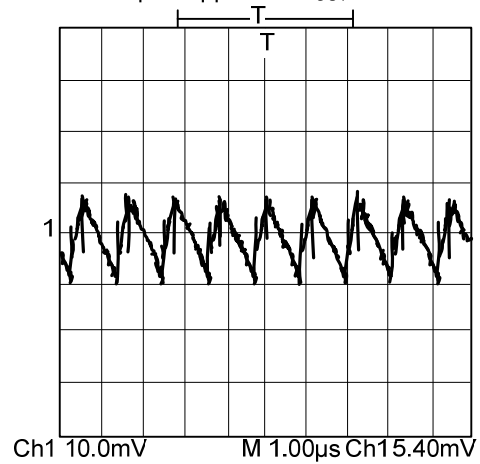
Startup Time with 90mA Load



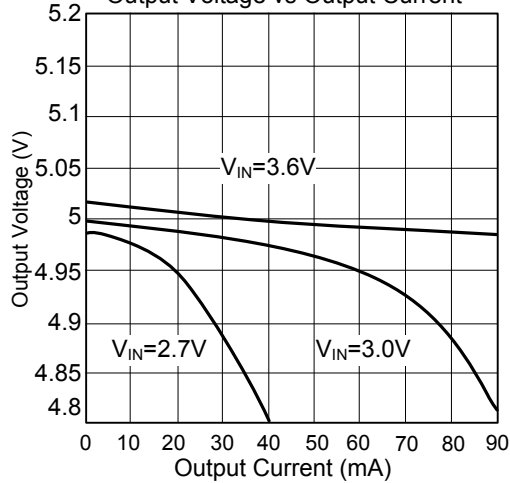
Output Ripple With  $I_{OUT}=50mA$



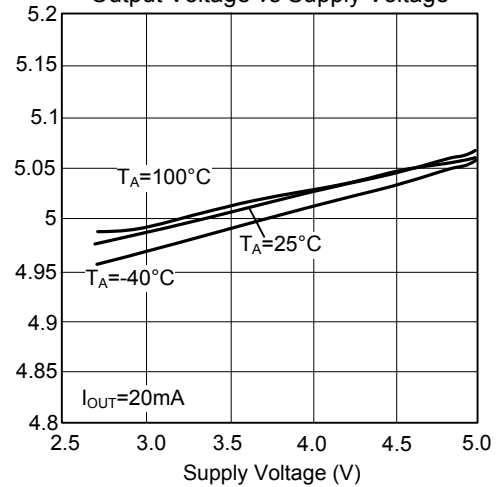
Output Ripple With  $I_{OUT}=90mA$



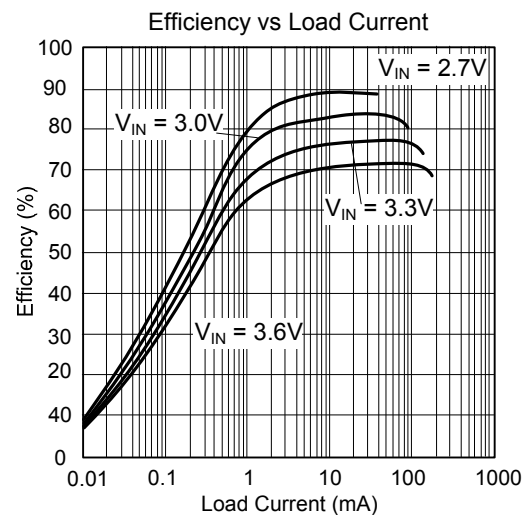
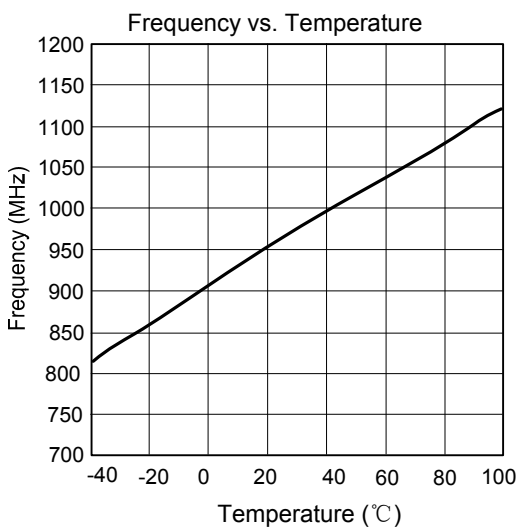
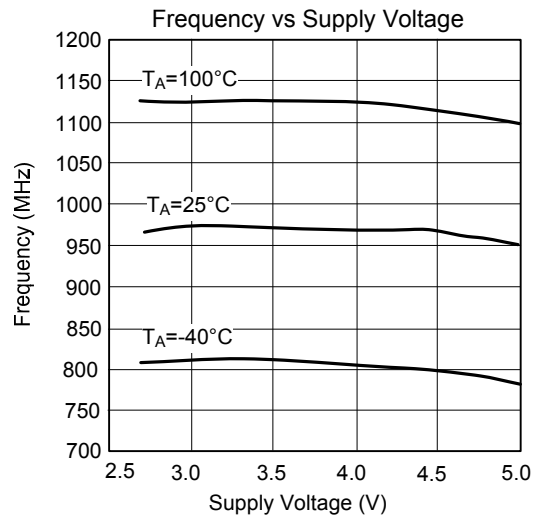
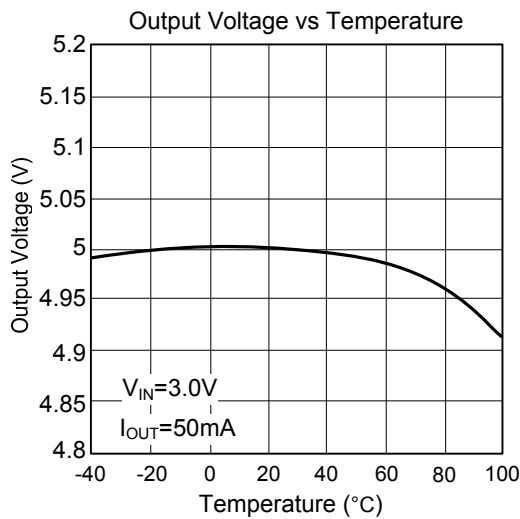
Output Voltage vs Output Current



Output Voltage vs Supply Voltage



## ■ TYPICAL CHARACTERISTICS (Cont.)



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