LA7995M



# Charge Pump Type DC-DC Converter

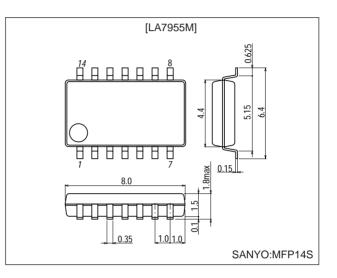
### Overview

This DC-DC converter IC supplies 30V from a V<sub>CC</sub> of 5V. Possible applications include use as a power supply for tuner circuitry on a PC video board.

Conventional DC-DC converters utilize the counterelectromotive force in a coil to step up the voltage. This method suffers from high-frequency noise caused by sharp pulses. The so-called charge pump principle adopted in the LA7995M chip results in much lower noise and also has the advantage of using only capacitors, reducing the cost for peripheral components.

# **Package Dimensions**

unit:mm 3111-MFP14S



# **Specifications**

#### Maximum Ratings at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		7	V
Allowable power dissipation	Pd max	Ta 65°C*	380	mW
Operating temperature	Topr		-10 to +65	°C
Storage temperature	Tstg		–55 to +150	°C

Note: \*Includes substrate (phenol) 144.3 x 76.1 x 1.6 mm

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#### **Operating Conditions at Ta = 25^{\circ}C**

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>cc</sub>		5	V
Operating supply voltage range	V <sub>CC</sub> op		4.75 to 5.25	V

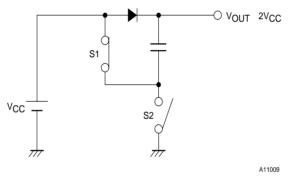
#### Operating Characteristics at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings			
			min	typ	max	Unit
Current drain	I <sub>IN</sub>	I <sub>O</sub> =1 mA, V <sub>CC</sub> =5V	19	24	29	mA
Output voltage	V <sub>OUT</sub>	I <sub>O</sub> =1 mA, V <sub>CC</sub> =5V	29	30.7	32	V
Output voltage fluctuation	V <sub>OUT</sub>	I <sub>O</sub> =1 mA, V <sub>IN</sub> =4.75 to 5.25V		1.0	1.5	V
Output current	I <sub>OUT</sub>	V <sub>O</sub> =29V	1.5	1.7		mA
Oscillation frequency	f	C <sub>OSC</sub> =150pF	35	50	65	KHz

Note: The above specifications are measured with external capacitance provided by three  $0.33 \,\mu\text{F}$  chip capacitors(C1, C2, C3).

### **Charge Pump Principle**

Figure 1 shows a charge pump circuit. Driving S1 and S2 with opposite phase produces a doubled voltage



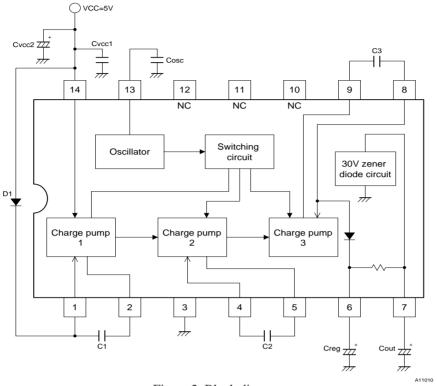
Figrue 1 Chrage pump circuit

In order to supply 30V from 5V, the LA7995M uses three charge pump circuits in series to produce a step-up factor of 2 x  $2 \times 2 = 8$ .

### **Block Diagram**

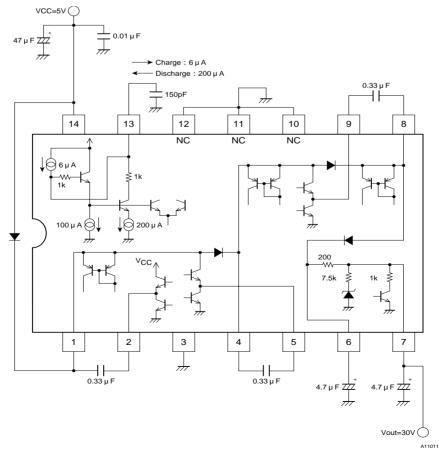
The LA7995M incorporates the following functions for controlling the 3-stage charge pump circuit:

- Oscillator
- Switching circuit

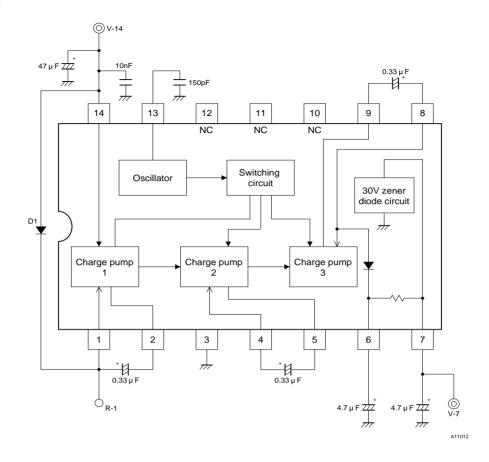




# Equivalent Internal Circuit and Recommended Peripheral Circuitry



# **Test Circuit**



### **Test Method**

ltem	Symbol	Measurement point	<b>-</b>	Output current (mA)	
			Test method	V-7	
Current consumption	I <sub>IN</sub>	V-14	Connect a DC current generator to V-7 and use an	1.0	
			ammeter to measure the current supplied to V-14 when		
			1mA is drawn from V-7.		
Output voltage	V <sub>OUT</sub>	V-7	Mesure voltage at V-7.	1.0	
Output voltage fluctuation	V <sub>OUT</sub>	V-7	Vary power supply voltage from 4.75 to 5.25V. Measure	1.0	
			voltage change at V-7.		
Output current	I <sub>OUT</sub>	V-7	Measure output current required to obtain 29V from V-7.	-	
Oscillation frequency	f	R-1	Measure frequency of pulse wave form at R-1.	1.0	

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