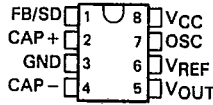


**LT1054**  
**SWITCHED-CAPACITOR VOLTAGE CONVERTER**  
**WITH REGULATOR**  
 D3202, JANUARY 1989

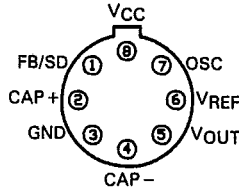
- Output Current . . . 100 mA
- Low Loss . . . 1.1 V at 100 mA
- Operating Range . . . 3.5 V to 15 V
- Reference and Error Amplifier for Regulation
- External Shutdown
- External Oscillator Synchronization
- Devices Can Be Paralleled
- Pin Compatible with the LTC1044/7660

JG AND P PACKAGE  
(TOP VIEW)



T-57-11

L PACKAGE  
(TOP VIEW)



AVAILABLE OPTIONS

T <sub>A</sub>	PACKAGE		
	CERAMIC DIP (JG)	METAL CAN (L)	PLASTIC DIP (P)
0°C to 70°C	LT1054CJG	LT1054CL	LT1054CP
-55°C to 125°C	LT1054MJG	LT1054ML	N/A

**description**

The LT1054 is a monolithic, bipolar, switched capacitor voltage converter and regulator. It provides higher output current and significantly lower voltage losses than previously available converters. An adaptive switch drive scheme optimizes efficiency over a wide range of output currents. Total voltage drop at 100 mA output current is typically 1.1 V. This holds true over the full supply voltage range of 3.5 V to 15 V. Quiescent current is typically 2.5 mA.

The LT1054 also provides regulation, a feature not previously available in switched capacitor voltage converters. By adding an external resistive divider, a regulated output can be obtained. This output is regulated against changes in both input voltage and output current. The LT1054 can also be shut down by grounding the feedback pin. Supply current in shut down is less than 100 μA.

The internal oscillator of the LT1054 runs at a nominal frequency of 25 kHz. The oscillator pin can be used to adjust the switching frequency, or to externally synchronize the LT1054.

The LT1054 is pin compatible with previous converters such as the LTC1044/7660.

**Product Previews**

**3**

PRODUCT PREVIEW documents contain information on products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



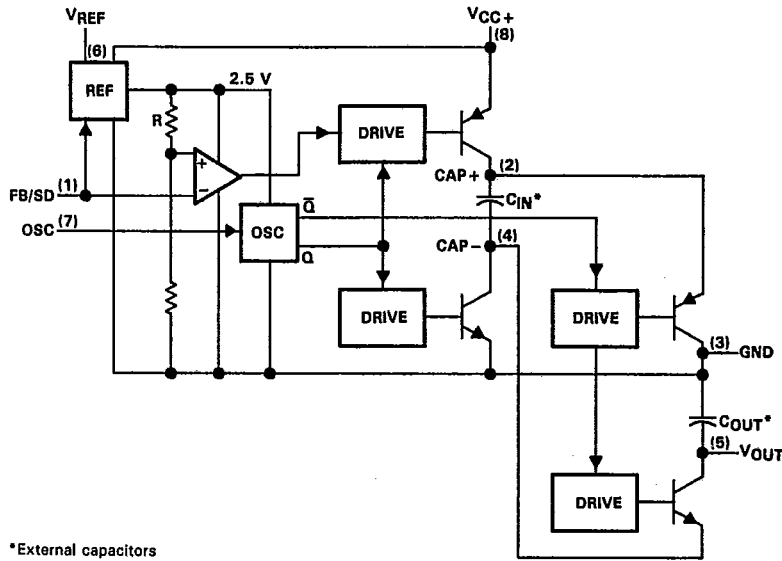
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**LT1054  
SWITCHED-CAPACITOR VOLTAGE CONVERTER  
WITH REGULATOR**

T-57-11

functional block diagram



\*External capacitors

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, VCC (see Note 1) .....	16 V
Input voltage, FB/SD terminal .....	0 V to VCC+
Input voltage, OSC terminal .....	0 V to Vref
Junction temperature (see Note 2): LT1054C .....	125°C
LT1054M .....	150°C
Storage temperature range .....	-55°C to 150°C
Lead temperature, 1,6 mm (1/16 inch) from case for 10 seconds: JG or L package .....	300°C
Lead temperature, 1,6 mm (1/16 inch) from case for 10 seconds: P package .....	260°C

- NOTES: 1. The absolute maximum supply voltage rating of 16 V is for unregulated circuits. For regulation mode circuits with  $V_O \leq 15$  V, this rating may be increased to 20 V.  
2. The devices are functional up to the absolute maximum junction temperature.

3

Product Previews

**LT1054**  
**SWITCHED-CAPACITOR VOLTAGE CONVERTER**  
**WITH REGULATOR**

T-57-11

**recommended operating conditions**

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage	3.5	15	V	
T <sub>A</sub>	Operating free-air temperature	LT1054C	0	70	°C
		LT1054M	-55	125	

**electrical characteristics**

PARAMETER	TEST CONDITIONS	T <sub>A</sub> <sup>†</sup>	MIN	TYP	MAX	UNIT
Regulated output voltage, V <sub>O</sub>	V <sub>CC</sub> = 7 V, T <sub>J</sub> = 25°C, See Note 3	25°C	-4.7	-6	-5.2	V
Input regulation	V <sub>CC</sub> = 7 V to 12 V, See Note 3	Full range		5	25	mV
Output regulation	V <sub>CC</sub> = 7 V, R <sub>L</sub> = 100 Ω to 500 Ω, See Note 3	Full range		10	50	mV
Voltage loss, V <sub>CC</sub> -  V <sub>O</sub>   (see Note 4)	C <sub>1</sub> = C <sub>O</sub> = μF tantalum	I <sub>O</sub> = 10 mA	Full range	0.35	0.55	V
		I <sub>O</sub> = 100 mA	Full range	1.1	1.6	
Output resistance	ΔI <sub>O</sub> = 10 mA to 100 mA, See Note 5	Full range		10	15	Ω
Oscillator frequency	V <sub>CC</sub> = 3.5 V to 15 V	Full range	15	25	35	kHz
		25°C	2.35	2.5	2.65	
Reference voltage, V <sub>ref</sub>	I <sub>ref</sub> = 60 μA, T <sub>J</sub> = 25°C	Full range	2.25		2.75	V
		25°C		300		
Maximum switch current		25°C				mA
Supply current, I <sub>CC</sub>	I <sub>O</sub> = 0	V <sub>I</sub> = 3.5 V	Full range	2.5	3.5	mA
		V <sub>I</sub> = 15 V	Full range	3	4.5	
Supply current in shutdown	V <sub>FB/SD</sub> = 0 V	Full range	100	150		μV

<sup>†</sup>Full range is -55°C to 125°C for the LT1054M and 0°C to 70°C for the LT1054C. For the LT1054C, the specifications apply up to a junction temperature of 100°C.

- NOTES: 3. All regulation specifications are for a device connected as a positive to negative converter/regulator with R<sub>1</sub> = 20 kΩ, R<sub>2</sub> = 102.5 kΩ, C<sub>1</sub> = 10 μF (tantalum), and C<sub>O</sub> = 100 μF (tantalum).
4. For voltage-loss tests, the device is connected as a voltage inverter, with pins 1, 6, and 7 unconnected. The voltage losses may be higher in other configurations.
5. Output resistance is defined as the slope of the curve (ΔV<sub>O</sub> vs ΔI<sub>O</sub>) for output currents of 10 mA to 100 mA. This represents the linear portion of the curve. The incremental slope of the curve will be higher at currents of less than 10 mA due to the characteristics of the switch transistors.

**3**  
Product Previews