Keywords: Regulated Charge Pump Delivers 50mA

APPLICATION NOTE 35

Regulated Charge Pump Delivers 50mA

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The DC-DC converter circuit of **Figure 1** substitutes a voltage tripler in place of the external inductor and diode normally associated with switching regulator IC1. Inverting and noninverting drivers in the MOSFET-driver chip (IC2) activate a diode/capacitor tripling network (D1-D3, C1-C3). In comparison with charge pumps based on single-polarity drivers, the buffer/inverter combination of IC2 enables this circuit to deliver more current with fewer parts.
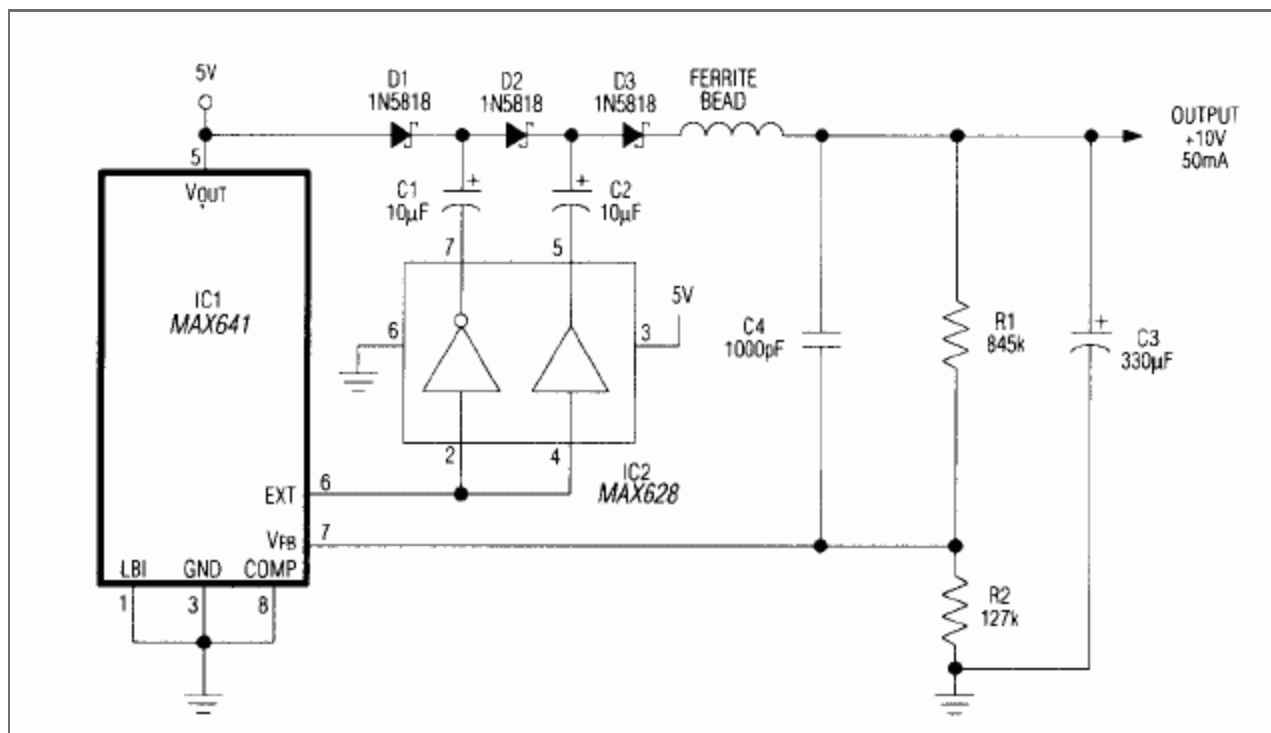
The diode-capacitor tripler network in this step-up switching regulator develops 10V from a 5V input, and delivers 50mA.

A 50kHz oscillator within IC1 produces the EXT signal (pin 6), which IC2 converts to drive signals (180° out of phase) for the tripler. The resulting charge-discharge action in the capacitors recharges C3 toward 10V every 20µs. The ferrite bead limits output ripple to about 20mV$_{P-P}$ for a 50mA load.

Conversion efficiency (**Figure 2**) is about 70% for the 5V-in, 10V-out configuration shown. You should use

low-ESR capacitors and Schottky diodes to assure the 50mA-output capability. Resistors R1 and R2 determine V_{OUT}, which can range as high as 15V with proportionally lower output current: $R_1 = R_2[(V_{OUT}/1.31V)-1]$.
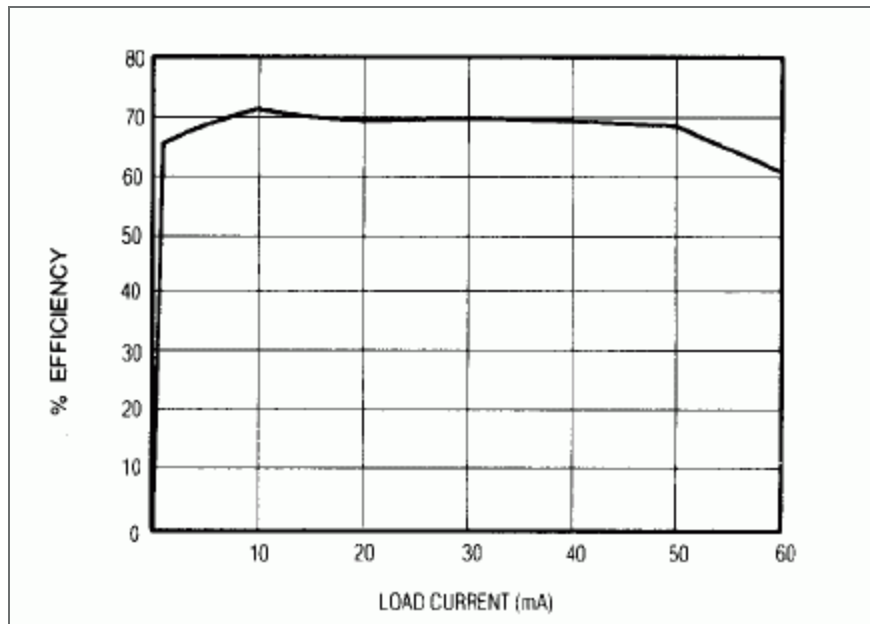

Figure 2. DC-DC conversion efficiency in the Figure 1 circuit varies with load current as shown.

Related Parts		
MAX641	5V Adjustable, 10W, CMOS, Step-Up, Switching Regulator Controller	Free Samples

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