Get power from a telephone line without disturbing it

Yongping Xia, Navcom Technology, Torrance, CA

An idle telephone line tempts designers to use its 48V potential as a power source. However, Part 68 of the US Federal Communications Commission's telecommunications regulations states that any device that connects to the phone line and is not actively communicating must present

a resistance of at least 5 $M\Omega$ (Reference 1). To meet this requirement, a device's continuous-current drain must not exceed 10 $\mu A.$ Fortunately, many devices that connect to the phone line do not require continuous power and can remain off for long intervals, awakening only for a short time before

relapsing into power-off mode. Providing power for these applications from the phone line presents obvious advantages by eliminating the need for a battery or another power source and the cost of battery maintenance.

The circuit in **Figure 1** charges a 1.5F supercapacitor, C_1 , from the phone line through a diode bridge and a 5.6-M Ω resistor. A Maxim (www. maxim-ic.com) MAX917 nanopower comparator, IC₁, consumes only 0.75 μ A from its power supply. Resistors

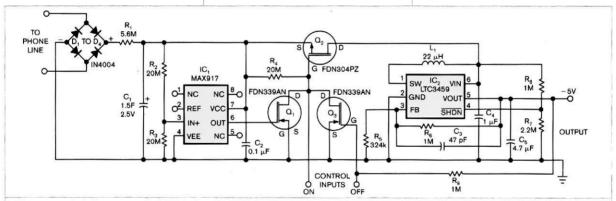


Figure 1 This power-conversion circuit delivers intermittent bursts of regulated voltage from a supercapacitor charged by a trickle of current from a telephone line.

designideas

 R_2 and R_3 halve the voltage across C_1 and apply it to IC_1 's positive input voltage at Pin 3 for comparison with its built-in 1.245V reference. For voltages across C_1 that do not exceed 2.49V, IC_1 's output at Pin 6 remains low. When C_1 's voltage reaches 2.5V, Pin 3's voltage exceeds the reference voltage, and IC_1 's output goes high, turning on Q_1 and Q_2 .

Several days must elapse before C_1 becomes fully charged, given its huge capacitance and a charging current of less than 10 μ A. The voltage on C_1 can never exceed 2.5V because, once it reaches 2.49V, Q_1 and Q_2 turn on, connecting C_1 to a switched-mode-power-supply circuit. Because the power-supply current exceeds the

charging current, the voltage across C_1 starts to decrease when Q_2 turns on. Transistor Q_3 holds Q_2 on when C_1 's decreasing voltage causes Q_1 to turn off.

The switched-mode-power-supply circuit comprises a Linear Technology (www.linear.com) LTC3459 micropower boost converter, IC,, and its associated components, which deliver 5V at 10 mA. A fully charged C, can supply power to a 10-mA load for approximately 40 sec. With no load, the circuit can sustain its 5V output for more than 10 hours. For greater output current and shorter operating time, select another boost converter that can operate at a low input voltage.

Mechanical switches, open-drain

MOSFETs, open-collector transistors, or a microcontroller's open-drain output pins can drive two external control inputs to force the circuit on and off. Pulling the On input low forces Q, to turn on and deliver power from C, to the power converter, and pulling the Off input low turns off Q, and removes power from the converter. Note that the power converter's output-return line connects to the telephone line and thus should not connect to an earth ground or to grounded equipment.EDN

REFERENCE

■ "Part 68," Federal Communications Commission, www.fcc.gov/wcb/iatd/ part_68.html.