

Keywords: analog switches, low voltage, charge pump, voltage regulator, power supply, switching time, transition time, analog switch, power supplies

APPLICATION NOTE 130

How Dual-Supply Analog Switches Can Operate with a Single 3V or 5V Supply

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Abstract: By adding a voltage doubler and voltage inverter, a single 3V or 5V power supply can produce the voltages necessary to improve the performance on a dual voltage analog switch. With the higher power supplies and wider range, the on-resistance and timing performance are enhanced.

By adding a single component to a 3V-only or 5V-only board, you can operate conventional CMOS analog switches with performance approaching that specified with dual $\pm 15V$ supplies. This simple modification provides fast switching, low on-resistance, CMOS/TTL compatibility, low-power consumption, and a signal range ($\pm V_{CC}$) that exceeds the input supply range (V_{CC} to ground).

Simply add a dual-output charge-pump voltage converter (IC1), which produces $\pm 2V_{CC}$ outputs from a single V_{CC} input. These unregulated voltages ensure reliable switch operation for V_{CC} levels as low as 2.5V.

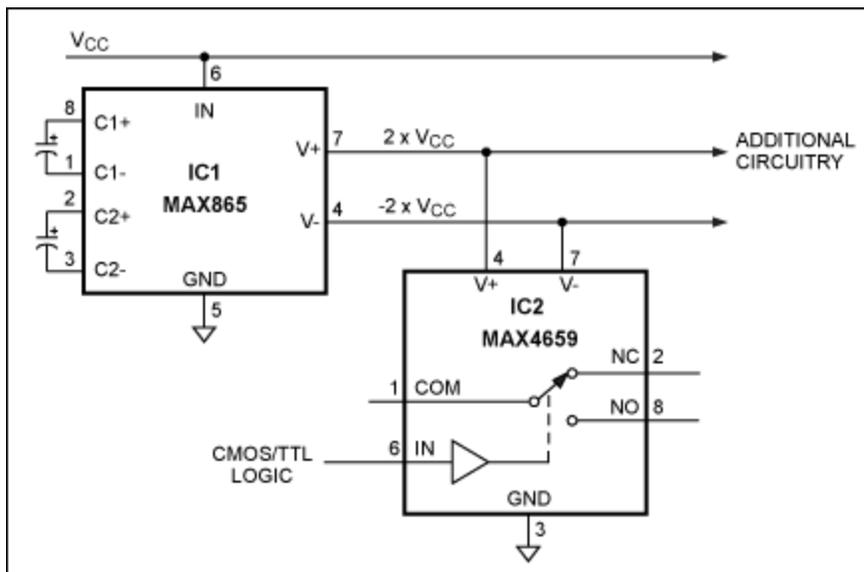


Figure 1. The MAX865 dual-output charge pump (IC1) provides a local bipolar power supply for the MAX4659 CMOS analog switch (IC2).

A V_{CC} supply voltage of 3V for the MAX865 charge pump produces $\pm 6V$ rails for the switch (IC2). Using

the [MAX4659](#) CMOS analog switch results in a switch on-resistance of less than 30Ω, a transition time of less than 200ns, and low leakage current. Raising the V_{CC} voltage to 5V generates ±10V rail supplies for the switch, reducing the on-resistance to less than 25Ω and transition times to less than 100ns. See the **Typical Operating Characteristics** in the MAX4659 data sheet for more information.

While the charge pump is capable of powering additional switches and/or low-power op amps, more than a few milliamps of load current degrades performance by lowering the unregulated supply rails.

Related Parts

MAX4659	High-Current, 25Ω, SPDT, CMOS Analog Switches	Free Samples
MAX865	Compact, Dual-Output Charge Pump	Free Samples

More Information

For Technical Support: <http://www.maximintegrated.com/support>

For Samples: <http://www.maximintegrated.com/samples>

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