Single IC biases LCD and GaAsFET amplifier

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Operating from a lithium-ion cell or a four-cell NiCd battery, the circuit in **Figure 1** provides –6V bias for LCDs and a separate, quiet negative bias for a GaAsFET power amplifier. This bias combination exists in cell phones, two-way pagers, wireless modems, and many other wireless devices. Not long ago, when most GaAsFET amplifiers required a positive voltage of 6V or more, you could easily obtain the LCD bias by simply inverting the power-amplifier voltage. With the advent of lower voltage power amplifiers and single Li-ion supplies, a negative doubler became necessary for the LCD bias. The various bias-generation techniques in use are generally bulky and require multiple ICs. One alternative is to select an LCD with lower negative bias voltage, but that approach compromises the LCD's temperature performance, contrast, and cost in favor of a simpler bias supply.

For most systems, the approach is to use two ICs: a negative doubling inverter, such as the MAX865, which provides a negative LCD bias of approximately –6V, and a linear regulator to provide the –3V GaAsFET bias. However, even two ICs can pose a problem in tiny systems. Moreover, a simple linear regulator may generate too much noise, and noise in the GaAsFET bias can appear in the transmitted RF signal. IC_1, which includes a charge-pump inverter and a low-noise linear regulator in an SO-8 package, generates a quiet GaAsFET bias by design. It operates from supplies as low as 2.5V and produces a negative bias voltage with only 1 mV p-p ripple. You can change the bias level by adjusting R_1 and R_2, according to instructions in the data sheet.

Circuitry in the dashed line provides the –6V LCD bias. A square-wave signal from the charge pump (Pin 1) adds to the unregulated negative voltage at Pin 3 to form a negative, doubled version of the input voltage. The voltage loss (two diode drops) is minimal because of the LCD's low bias current and the use of low-drop Schottky diodes. The diodes drop approximately 0.2V; a Li-ion cell can thus produce an LCD bias greater than –6V. (DI #2179) EDN

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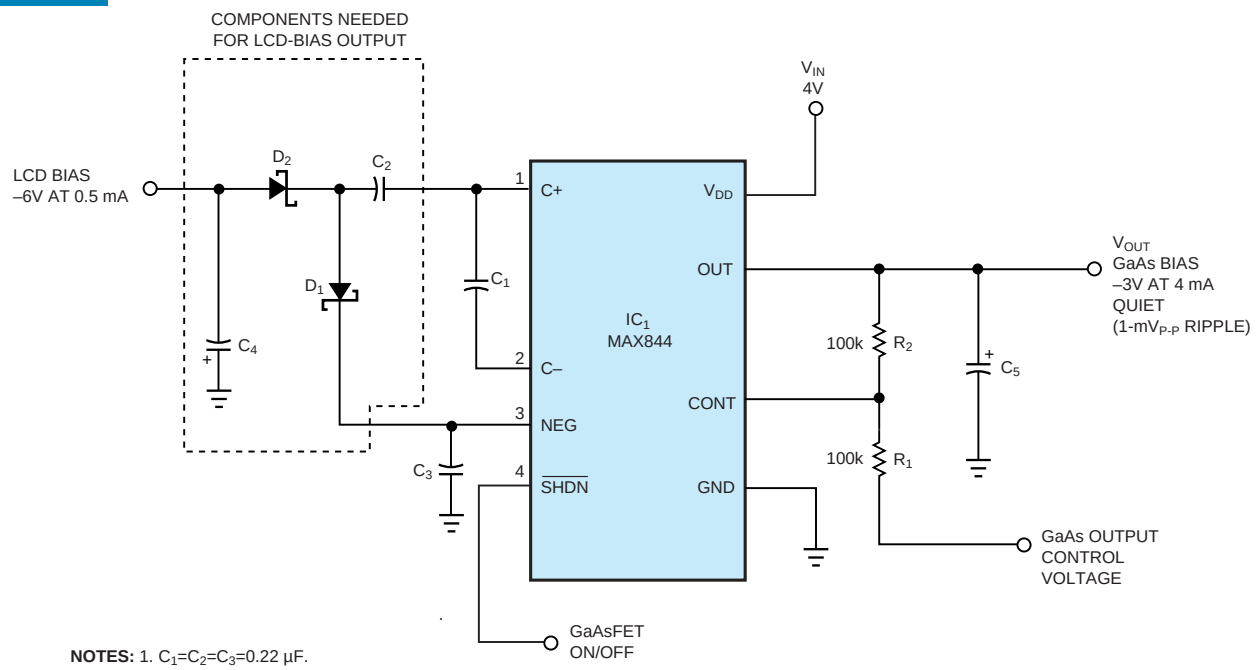
FIGURE 1



NOTES: 1. $C_1=C_2=C_3=0.22\ \mu F$.
2. $C_4=C_5=4.7\ \mu F$.
3. $D_1=D_2=SGL41$.
4. $V_{OUT}=(CONTROL\ VOLTAGE)\times\frac{R_2}{R_1}$
5. IF POWER-DOWN IS REQUIRED, USE MAX843 FOR IC_1.

A charge-pump/linear-regulator IC produces two negative bias voltages for wireless applications.