Keywords: positive emitter-coupled logic, PECL, low-dropout regulators, LDO, line termination, linear regulators

APPLICATION NOTE 3198

Modified LDO Sinks PECL-Termination Current

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Abstract: By configuring a current-sinking negative LDO to operate as a positive-voltage sink, you can construct a low-voltage supply (1.3V) for terminating PECL-logic lines.

Also See: Modified LDO Regulator Sinks PECL-Termination Current

The positive emitter-coupled logic (PECL) used in high-speed telecommunications requires odd supply voltages: a positive V_{CC} of +3.3V, and a termination voltage (V_{TT}) equal to V_{CC} -2V = +1.3V. The V_{TT} supply is regulated with respect to V_{CC}, and must be able to sink current.

Most positive low-dropout (LDO) regulators cannot sink current. Negative LDOs are designed for that purpose but normally deliver a negative voltage.

Figure 1 shows a current-sinking negative LDO modified for positive-voltage operation. The GND pin connects to V_{CC}, and IN connects to ground. Those connections allow the negative LDO to operate as a positive-voltage sink in which the voltage at V_{SET} equals V_{CC} -1.25V:

$$V_{SET} = V_{CC} - 1.25V$$

$$V_{CC} - V_{SET} = 1.25V$$

$$\frac{(V_{CC} - V_{OUT})}{R_1 + R_2} R_2 = 1.25V$$

$$V_{OUT} = V_{CC} - (R_1 + R_2)\left(\frac{1.25V}{R_2}\right)$$

$$V_{OUT} = V_{TT} = V_{CC} - 2V \qquad \text{(For PECL)}$$

$$(R_1 + R_2)\left(\frac{1.25V}{R_2}\right) = 2V \qquad \text{(For PECL)}$$

$$R_1 = 0.6R_2 \qquad \text{(For PECL)}$$

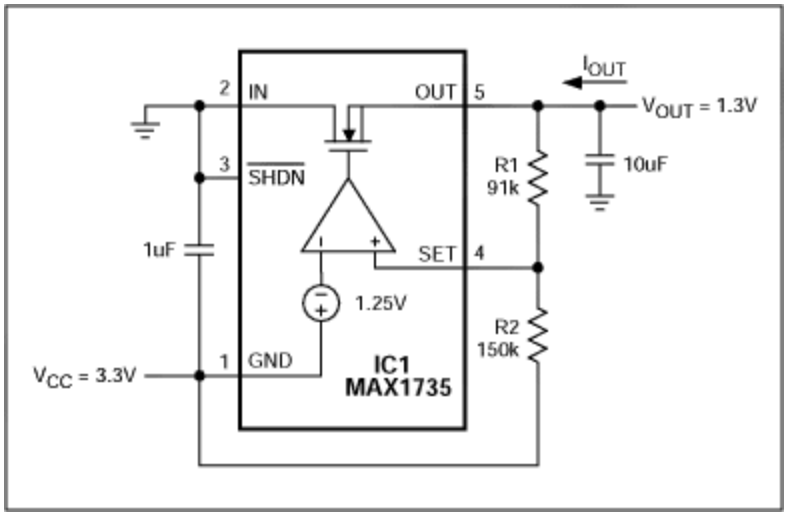

Figure 1. The connections shown enable a negative-output LDO (with its inherent current-sinking ability) to generate a positive output voltage.

The output voltage is regulated with respect to V_{CC}. That feature is perfect for PECL-termination applications, because it requires the output voltage to track the V_{CC} supply. Maximum output current is limited by the internal protection circuitry (to about 400mA) and by the package power-dissipation rating (about 550mW). For applications that require higher output voltage or higher current (or both), you can add series diodes to dissipate some of the power (**Figure 2**). You can add as many diodes as needed to dissipate power, but the voltage at OUT (Pin 5) must remain at least 300mV above ground (IN, pin 2).

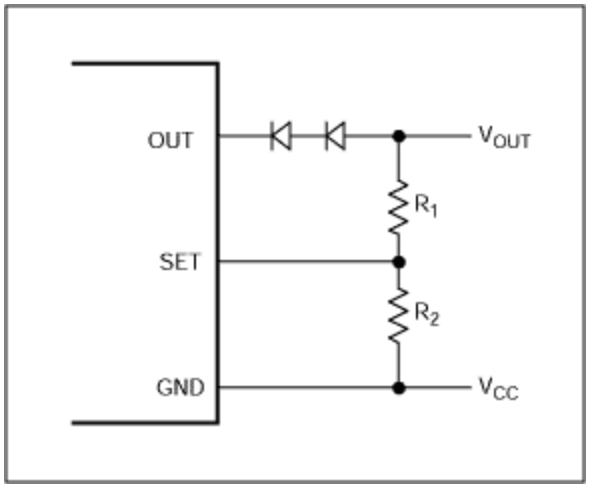

Figure 2. To operate the Figure 1 circuit at a voltage or current that would otherwise exceed IC1's internal or package power-dissipation ratings, add power-dissipating diodes as shown.

Related Parts		
MAX1735	200mA, Negative-Output, Low-Dropout Linear Regulator in SOT23	Free Samples

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