

Drive a blue LED from a 3V battery

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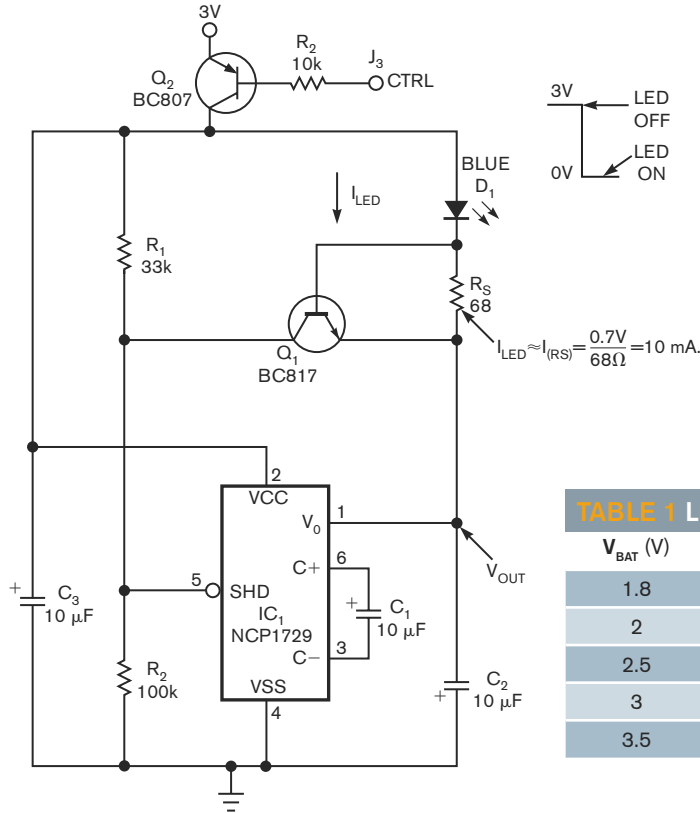


Figure 1 This circuit uses the On Semiconductor NCP1729 voltage inverter, IC₁, to produce enough voltage to drive blue LED D₁.

Using a blue LED can pose problems when available power-supply voltages don't meet or exceed the LED's 3V forward-voltage drop. This Design Idea shows how to drive a blue LED from a 3V battery or another power supply. The circuit in **Figure 1** uses the On Semiconductor (www.onsemi.com) NCP1729 voltage inverter, IC₁, to produce enough voltage to drive blue LED D₁. Transistor Q₁ serves as a constant-current limiter for the LED's forward current. When current through the LED and R_S increases to a level that develops enough base-emitter voltage to turn on Q₁, Q₁'s collector draws current from the voltage divider comprising R₁ and R₂ and forces IC₁ to shut down. The voltage inverter restarts when the voltage drop across R_S falls below Q₁'s base-emitter

turn-on threshold. Pulling transistor Q₂'s base to ground through R₂ turns on the circuit.

In this application, the LED exhibits a voltage drop of approximately 3.3V at 10 mA forward-bias current.

Table 1 illustrates the LED's applied voltage, V_{BAT} + |V_{OUT}|, and Q₁'s base-emitter voltage for various battery-voltage values. **EDN**

TABLE 1 LED APPLIED VOLTAGE

V _{BAT} (V)	V _{OUT} (V)	V _{BE(Q1)} (V)
1.8	-1.5	0.41
2	-1.37	0.46
2.5	-0.79	0.42
3	-0.27	0.4
3.5	0.23	0.41