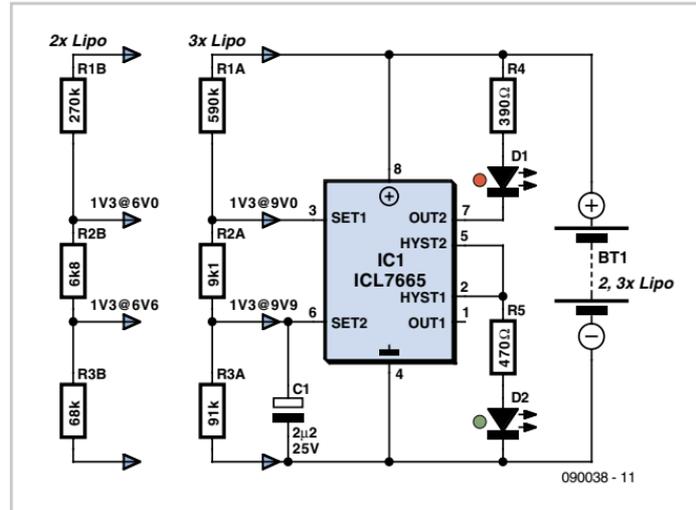# LiPo Monitor

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The LiPo Monitor simplifies voltage monitoring of Lithium Polymer (LiPo) batteries during use. You clearly want to avoid discharging them too far and another thing on your wish list should be a warning when the permitted limit of safe discharge is approaching. A green LED remains on for all the time that the battery voltage remains adequate. If the volts drop as far as the terminal voltage level, a red LED lights to signal that further use (and discharge) of the battery will be harmful and not allowed. Before this happens, in the lower but still OK voltage range, both LEDs illuminate to warn that the end is nigh. The circuit is particularly suitable for

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monitoring the LiPo propulsion batteries of radio control models that are used primarily in short range operation, such as indoor model helicopters.

The ICL7665 device used in this circuit contains two comparators plus an internal 1.3 V voltage reference. Each comparator has two outputs, OUT and HYST. This enables you to monitor each of the two inputs SET1 and SET2 for over and under-voltage.

OUT1 is an inverting output, whereas the other three are non-inverting. The maximum current is 25 mA per output. OUT1 and OUT2 are current sinks (open-drain outputs of N-channel MOSFETS, source to ground). HYST1 and HYST2 are current sources (open-drain outputs of P-channel MOSFETS, source to $+U_B$). The truth table shown below provides information on the switching behaviour of the ICL7665.

The two comparators in the LiPo Monitor form a window discriminator (voltage range

sensor). The battery voltage under observation is applied, via a voltage divider, to both of the inputs. The voltage dividers in this circuit are designed for situations using two or three LiPo cells and are arranged so that the warning range, in which both LEDs

ICL7665 Truth Table		
SET1/SET2	OUT1/OUT2	HYST1/HYST2
USET1 > 1.3 V	OUT1 = ON = LOW	HYST1 = ON = HIGH
USET1 < 1.3 V	OUT1 = OFF = high-impedance	HYST1 = OFF = high-impedance
USET2 > 1.3 V	OUT2 = OFF = high-impedance	HYST2 = ON = HIGH
USET2 < 1.3 V	OUT2 = ON = LOW	HYST2 = OFF = high-impedance

light together, lies between 3.0 and 3.3 volts per cell. This makes for timely charging and avoids deep discharge of propulsion batteries.

Internet Link