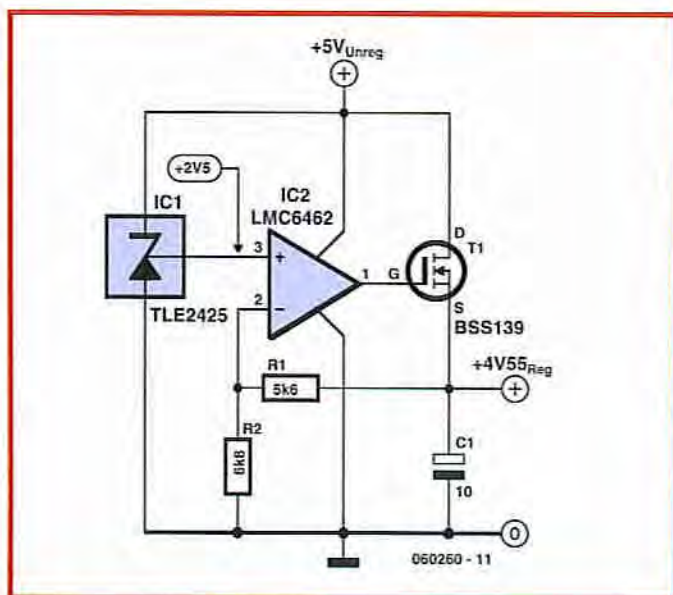


## LDO Regulator

Stephen Bernhoeft

Recently the author had to adapt a standard circuit configuration (which often uses an npn bipolar) so as to operate as a low-dropout (LDO) regulator. The circuit shown here uses that rarity, a depletion-mode MOSFET to implement the LDO function.

What to do when you have to derive an analogue supply voltage (close to +5 V) from an existing 'digital' 5-volt rail, ensuring sufficient decoupling between the two? One answer is to step up and then use a linear regulator to step back down. However, if around 4.5 volts will suffice then an alternative is a home-made LDO regulator. The circuit is usually a fairly standard shape — typically an npn transistor (with base-current



limiting resistor) is used. Initially, it would appear that this design suffices — after all, the text-

books say the saturation voltage is around 0.2 V. Unfortunately, this is no longer true when the

collector is tied directly to the positive supply. An enhancement-mode MOSFET suffers similar disadvantages: with the drain tied High you need greater than drain potential at the gate to achieve low  $R_{DS(on)}$ . Enter that seldom-used beast — the depletion-mode MOSFET!

Depletion-mode MOSFETS are 'on' even when  $V_{gs} = 0$ , and you have to back-bias the gate to achieve an increase in channel resistance.

In the circuit shown the BSS139, an NMOS depletion device, operates with the gate forward-biased. With a load of 10 mA, the measured FET resistance was 38 ohms.

(060260-1)

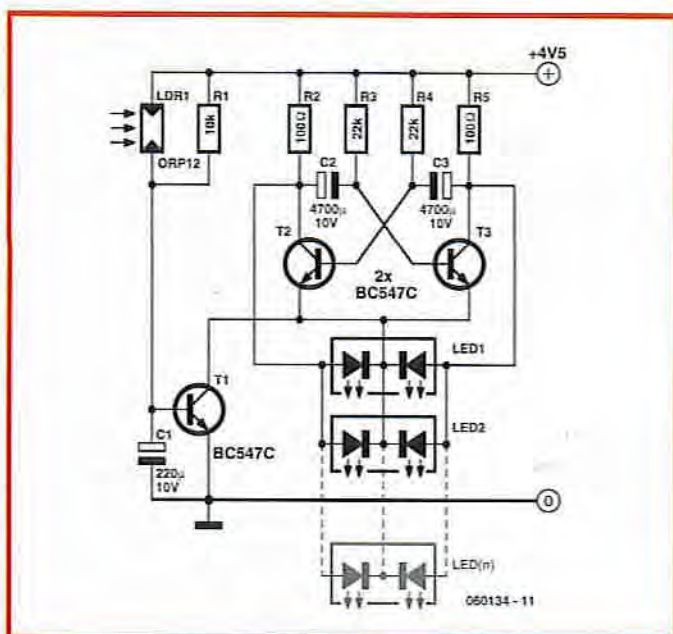
## Bi-colour LEDs operated by LDR

Ken Barry

The author thought it be nice to render a number '4' (his house number) using a slowly changing two-colour LED display.

The display shown here employs an LDR which causes the LEDs to dim during the dark hours, and light at slowly increasing brightness with daylight. The function ensures the house number would always be visible day or night. The circuit diagram shows an astable multivibrator T2-T3 combined with switchable potential divider T1. The latter is switched on and off by an LDR and a capacitor.

Assuming a supply voltage of 4.5 volts the circuit consumes



about 80 mA to light 37 bi-colour LEDs of the three-pin common-cathode type. The LEDs used in the prototype were supplied by CPC/Farnell (<http://cpc.farnell.com>), order code LP00362. All LEDs are connected in parallel as shown in the schematic by the dashed outline.

A 10-kΩ resistor is connected in parallel with the LDR (a type ORP12) to govern the threshold level to a degree. You may want to experiment with the value.

(060134-1)

<b>Pin Pitch</b>	2.54mm
<b>PIV Max.</b>	5
<b>View Angle</b>	24°

### LP00360 LP00361 LP00362 LP00363 5mm (T1) tri-colour LEDs

5mm untinted clear lens LEDs • Common cathode • Both diodes connected gives third intermediate colour • Low power consumption

Colour	Lum. Intensity (mcd) @ 20mA		If (mA) Max.
	Min.	Max.	
HE Red/Green	100/50	300/200	30/25
HE Red/Yellow	100/30	300/80	30/30
Green/Yellow	50/30	200/80	25/30
Ultra Red/Green	300/80	700/200	30/25