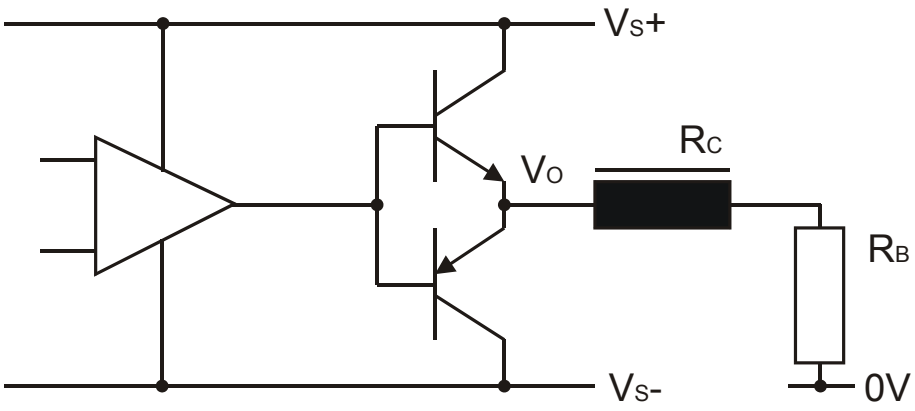
CALCULATION OF MEASURING RANGE OF HALL EFFECT CT's

The maximum output of an HECT is limited by the maximum voltage that can be developed across the coil and burden resistance. In other words, the output current will be able to increase until this voltage level is reached.



The maximum voltage, VO, will be the output swing of the op-amp less the base-emitter voltage drop of the output transistor. A conservative figure for this voltage, Vo, is (Vs -3), that is, 3 volts less than the supply voltage. This would allow a swing of ±12V for a ±15V supply.

Therefore, a rule of thumb for the maximum output current, Io, for an HECT with coil resistance Rc and used with burden or load resistance R_B will be

$$I_{O_{MAX}} = \frac{(V_S - 3)}{R_B + R_C}$$

COIL RESISTANCE

The coil resistance will be modified by changes in ambient temperature, as follows

$$R_{CT} = R_{20} (1 = 0.00393 (T - 20))$$

where R_{20} is the coil resistance specified at 20°C and R_{CT} is the resulting coil resistance at temperature, T°C.

Coil resistance for TELCON HECT 's are normally specified at 20°C; if the coil resistance is specified at 70°C, the value of the temperature T°C will be

$$R_{CT} = R_{70} (1 - 0.00328 (70 - T))$$

where R_{70} is the coil resistance at 70°C.

As there will be a change in coil resistance of the order of 20% for temperature change from 20°C to 70°C, it is important that allowance is made for this change.

BURDEN RESISTANCE

Correction for thermal variation of the burden resistance can also be made but this is often low enough to be neglected.

For example, for a resistor with change of resistance with temperature of 100ppm/°C, the revised value of resistance would be

$$R_{BT} = R_B (1 + 0.0001 (T – 20))$$

This would give 0.5% change for a temperature rise from 20°C to 70°C.

The effect of the changes with temperature will result in considerable differences in the maximum output current of an HECT between ambient and higher temperatures.

For example, an HTP50 with ±15V power supply rails, coil resistance 52Ω and burden resistance 100Ω at 20°C, will have a maximum output current of 79mA at 20°C and this will have fallen to 73.5mA at 70°C.

OTHER FACTORS

The above calculations and maximum output currents are based on experience and nominal values, and are intended as a first-order guide to the likely measuring range for HECT's. Other factors such as the tolerance on the power supply voltages, which will affect the maximum output current, should be considered.

Additionally, for critical applications, consultation of the various device data sheets gives a worst-case output swing less than those stated above, with the available output swing possibly as low as (Vs-3.8).