Four-component Missing-pulse Detector

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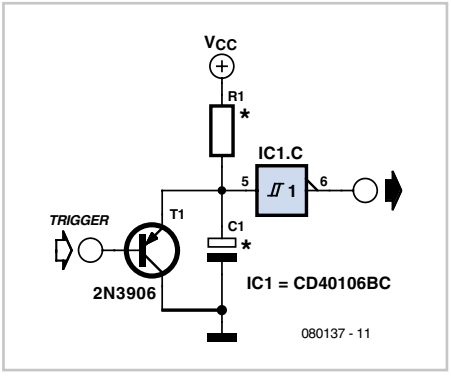
A missing-pulse detector is a 'one-shot' triggered device that is continuously retriggered by incoming pulses before a predefined timing cycle is completed. At room temperature, the positive-going threshold voltage (V_{th+}) for the CD40106BC hex Schmitt trigger IC falls in the range of 60% to 86% of its supply voltage (V_{cc}: 5 V–15 V). If we also take into account that capacitor C1 takes a time constant defined as R1×C1 [seconds] to reach 63% of its full charge voltage, the constant is roughly the time C1 takes to charge up to the level V_{th+}, thus changing the logic state of pin 6 on IC1.C.

Based on the above assumption, if a pulse train with a High-level period shorter than

$T = R1C1$ [s]

is present on the base of T1, this pnp transistor will remain in the cutoff state. This allows



R1 to charge up capacitor C1, but not sufficiently to reach the positive voltage threshold set at input pin 5 of the gate. Consequently Schmitt trigger output pin 6 will remain High. For a retriggered pulse period of 3 seconds (or 0.3Hz) you'd use R1 = 330 kΩ and C1 = 10 µF.

Now, if the High-level pulse duration on the base of transistor T1 is longer than *T*, the transistor will remain cut off, but the capacitor will charge until V_{th+} is reached and the output pin 6 of the Schmitt trigger gate will change to logic Low.

When no pulse (i.e. a logic Low state) is present on the base of T1, the transistor is driven into saturation. This allows C1 to instantly discharge, setting up the initial conditions for the next pulse.

The trigger signal can for instance be supplied by a Hall-Effect switch set up to measure if a wheel with a magnet is rotating or not.

This circuit uses one gate in the CD40106BC, leaving the other gates free for use for other purposes. Do take into account that CD40106 devices from different manufacturers or production batches may have slightly different threshold voltages, which requires the calculated value of T to be adapted carefully to match the specifications of the gate used.

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