Control one-shot divides frequency by up to 30

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A three-gate control allows precision frequency divisions of up to 30 merely by changing a resistance. A crystal oscillator acts as the frequency source so that all subharmonics of the reference frequency have crystal stability.

NAND gates G_1 and G_2 and the crystal comprise the oscillator that generates the reference frequency. The one-shot, consisting of NAND gates G_3 and G_4, controls gate G_5, which is synchronized by the oscillator.

After one pulse of the reference frequency passes to the output, the one-shot locks out gate G_5 for a period of time determined by the setting of potentiometer R_t. When the one-shot resets, another single pulse reaches the output, and the cycle repeats.

The input frequency, f_{in}, is simply a multiple of the output frequency, f_{out}:

$$f_{in} = Nf_{out}$$

where N is the division factor. N can have any integral value between 2 and 30. The circuit shown divides a 1.1-megahertz reference frequency by 11 to yield an output frequency of 100 kilohertz.

Additional versatility is possible by substituting a field-effect transistor or voltage-variable resistor for the potentiometer. Then, frequency divisions can be electronically swept over a wide range. □

Precision division. Crystal oscillator supplies reference frequency for three-gate divider scheme. NAND gates G_3 and G_4 form one-shot that controls gate G_5. After G_5 passes single reference pulse, one-shot inhibits this gate for period selected by adjustment of potentiometer R_t. When one-shot resets, another reference pulse passes to output. Crystal frequency can be divided by up to 30 without loss of stability.