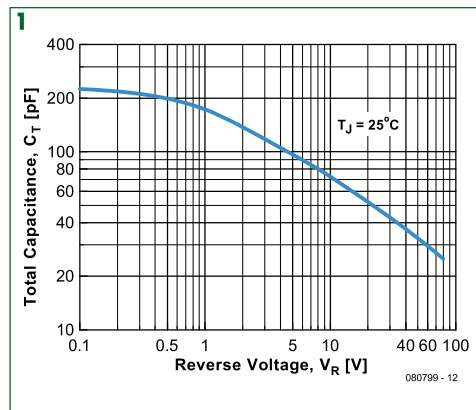


No Varicap? Try a Schottky diode

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Varactor diodes (Varicaps) along with many other exotic components which are often specified in HF and RF designs are sometimes difficult to obtain and in some cases may even have gone out of production. Not very encouraging if you had been planning to build a design that we featured in an earlier edition of Elektor. Anyone finding themselves in this situation may be surprised to learn that help may be on hand from an unexpected source...

Any general-purpose silicon diode has capacitive properties when reverse biased; the depletion region at the PN junction acts as a dielectric. Increasing the reverse bias widens the region, reducing the capacitance. Power engineers are aware that high voltage rectifiers can store high levels of charge at their depletion region. This property is not beneficial in rectification applications but using a little lateral thinking and with the motto "It's not a bug... it's a feature" in mind, we can maybe use this characteristic to substitute a diode for a varactor. The datasheet

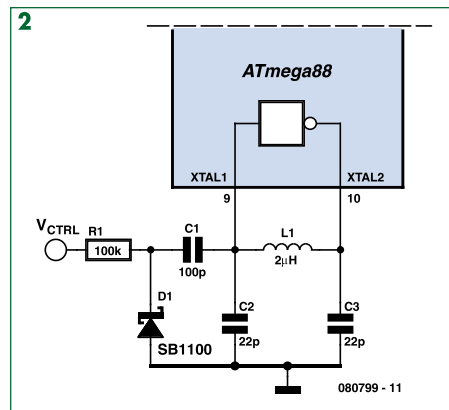


of an SB1100 Schottky power diode indicates that at 4 V reverse bias the diode has a "total capacitance" of 110 pF, and looking at the curve of this characteristic it is indeed proportional to voltage (see **Figure 1**).

To test the idea a simple LC oscillator was built (**Figure 2**) around the crystal oscillator inverter circuit integrated in an AtMega88 microcontroller. The application note AN456 Philips/NXP "Using LC oscillator circuits with Philips microcontrollers" [1] is a useful reference here. The finished volt-

age-controlled LC oscillator (VCLCO) actually works surprisingly well. The values of effective small signal capacitance (as measured on a capacitance meter) are given in the **Table** along with the oscillator output frequency.

The next time you are stumped for a varicap, instead of pulling your hair out it would be worthwhile taking a look through your collection of power diodes, you may well find something suitable there.



Internet Link

[1] Philips/NXP Application note AN456:

www.nxp.com/acrobat_download/applicationnotes/AN456.pdf

Table		
V_{ctrl} [V]	C_{eff} [pF]	F [MHz]
0	125	19.49
1	82	19.70
2	64	20.00
3	54	20.19
4	48	20.34
5	44	20.46