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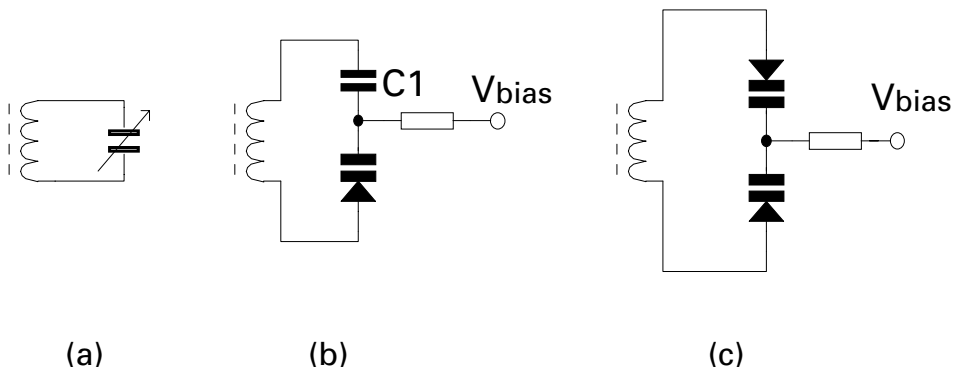# ZDC833A Dual Variable Capacitance Diode

(a)   (b)   (c)

Figure 1.
Basic Tuned Circuits.

Variable capacitance diodes have established a broad applications base from voltage controlled crystal oscillators (VXCO) to television and cellular communications. They are capable of providing many advantages in terms of space and cost savings, and also allow implementation of such features as frequency scanning and stored tuning.

The standard 'LC' parallel circuit is shown in figure 1a). For electronically tuned systems the 'C' element is replaced by a variable capacitance diode as figure 1b) - this design requires a DC blocking capacitor C1, and a voltage bias supply. This method does have some disadvantages, namely:

1. Under high signal conditions, the diode can become forward biased leading to rectification and generation of distortion products.

2. The maximum frequency of operation is limited by the minimum capacitance exhibited by a single diode.

3. The DC blocking capacitor required needs to have a large value which may be undesirable in space limited designs.

Many oscillator circuits are designed for the higher frequency bands where low values of capacitance are required. In these cases, a common option is to use two variable capacitance diodes in series as shown in figure 1c).

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This provides a circuit capacitance of a half that of a single diode, prevents forward biasing (as each diode is blocked by its reverse connected partner), and removes the requirement for a DC blocking capacitor.

To allow further cost and space reductions, Zetex have produced a monolithic dual variable capacitance diode available in the industry standard SOT23 package. This part is based on the single diode ZC833A device, and so has been called a ZDC833A - the capacitance versus voltage curve (C-V) has been reproduced in figure 2. As the dual diode is produced monolithically (Eg. on the same piece of silicon), the parametric matching is inherently excellent, typically within 0.25%.
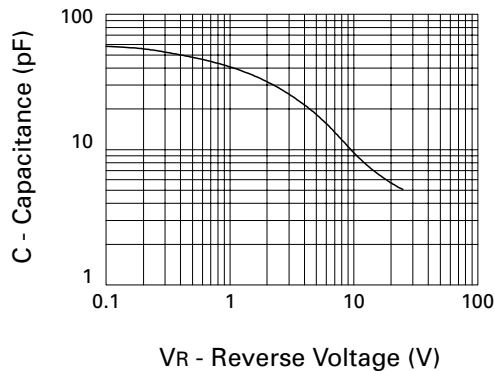
Figure 2.
Capacitance v Reverse Voltage for the ZDC833A.

Appendix

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Reverse Breakdown Voltage	V_{BR}	25			V	$I_R = 10\mu A$
Reverse Leakage Current	I_R			20	nA	$V_R = 20V$
Temperature Coefficient	η			400	ppm/°C	$V_R = 3V$, f=1MHz
Diode Capacitance	C_d	29.7	33	36.3	pF	$V_R = 2V$, f=1MHz
Capacitance Ratio	C_d / C_d	5.0		6.5		$V_R = 2V/20V$, f=1MHz
Figure of Merit	Q	200				$V_R = 3V$, f=50MHz

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