

# CAPACITANCE NOMOGRAM

*Relation among capacitance, voltage, stored charge, and amount of energy available upon discharge of capacitor.*

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**H**ERE is a nomogram relating the capacitance of a capacitor ( $C$ ), the voltage across its terminals ( $V$ ), the stored charge ( $Q$ ), and the available energy if the capacitor is discharged ( $W$ ). It is optimized about  $C=1 \mu\text{f}$ . This allows the nomogram to cover most of the capacitor values normally encountered in timing circuits, SCR firing circuits, and pulse-forming networks.  $V$  is in volts,  $Q$ , the stored charge, is microcoulombs; and  $W$ , the energy, is in microjoules.

The basis for the nomogram are two capacitor equations:  $Q=C \times V$  and  $W=Q \times V \times \frac{1}{2}$ . (Note: By substituting  $(C \times V)$  for  $Q$  in the second formula, we obtain the more familiar  $W=(C \times V) \times V \times \frac{1}{2} = \frac{1}{2} CV^2$ .)

Knowing any two of the variables lets a solution for the other two to be found.

To use the nomogram, find the point of intersection of the

two known values, and then read out the unknown values.

*Example 1.* A 2- $\mu\text{f}$ . capacitor is charged to 25 volts. What is the charge and the stored energy? The intersection point between  $C=2 \mu\text{f}$ . and  $V=25$  volts is found (point A). The charge is then read vertically downward and is seen to be 50 microcoulombs. The stored energy is between the 500- and 1000-microjoule lines and is nearer to the 500 line. Interpolation will give a value of 625 microjoules.

*Example 2.* An SCR needs 1000 microjoules of energy to insure firing. A capacitor charging voltage of 30 volts is available. What is the minimum value of capacitance that can provide this energy? The intersection between the  $W=1000$  and  $V=30$  is found (point B). Although this is close to the  $C=2 \mu\text{f}$ . line,  $2 \mu\text{f}$ . is not quite enough to provide this energy. A value closer to 2.23  $\mu\text{f}$ . or 3  $\mu\text{f}$ . would have to be chosen for this particular application. ▲

