Electronic Devices and Circuits

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1 Circuit Analysis

1.1 Spice Elements

The passive and active circuit elements introduced in the previous section are all avaialable in SPIC modeling; however, the manner of node specification and the voltage and current sense or direction are clarified for each element by Figure 1.1. THe universal ground node is assigned the number 0. Otherwise, the node numbers n_1 (positive node) and n_2 (negative node) are positive integers selected to uniquely define each node in the network. The assumed direction of positive current flow is from the node n_1 t node n_2. The four controlled sources—voltage-controlled voltage source (VCVS), current-controlled voltage source (CCVS), voltage-controlled current source (VCCS), and current-controlled current source (CCCS)— hae the associated controlling element also shown with its nodes indicated by cn_1 (positive) and cn_2 (negative). Each element is described by an *element specification statement* in the SPICE netlist code. Table 1.1 presents the basic format for the element specification statement for each of the elements in Figure 1.1. The first letter of the element name specifies the device and the remaining characters must assure a unique name.

Element	Name	Signal Type	Control Source	Value
Resistor	R···			Ω
a. Time-varying signal types (SIN, PULSE, EXP, PWL, SFFM) also available. b. AC signal types may specify phase angle as well as magnitude.				

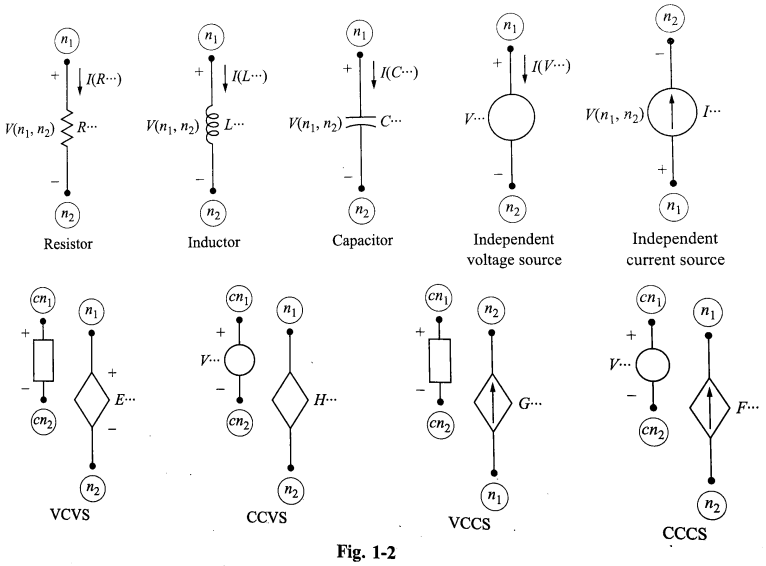
n_1
$I(R\cdots)$
$V(n_1, n_2)$
$R\cdots$
n_2
Resistor
$I(L\cdots)$
$L\cdots$
Inductor
$I(C\cdots)$
$C\cdots$
Capacitor
$I(V\cdots)$
$V\cdots$
Independent voltage source
n_2
$I\cdots$
Independent current source
cn_1
cn_2
$E\cdots$
VCVS
$H\cdots$
CCVS
$G\cdots$
VCCS
$F\cdots$
CCCS

Fig. 1-2