

6.2. A short list of converters

An infinite number of converters are possible, which contain switches embedded in a network of inductors and capacitors

Two simple classes of converters are listed here:

- Single-input single-output converters containing a single inductor. The switching period is divided into two subintervals. This class contains eight converters.
- Single-input single-output converters containing two inductors. The switching period is divided into two subintervals. Several of the more interesting members of this class are listed.

Single-input single-output converters containing one inductor

- Use switches to connect inductor between source and load, in one manner during first subinterval and in another during second subinterval
- There are a limited number of ways to do this, so all possible combinations can be found
- After elimination of degenerate and redundant cases, eight converters are found:

dc-dc converters

buck boost buck-boost noninverting buck-boost

dc-ac converters

bridge Watkins-Johnson

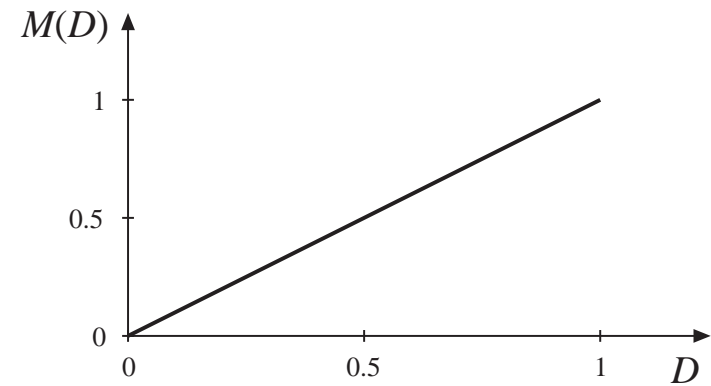
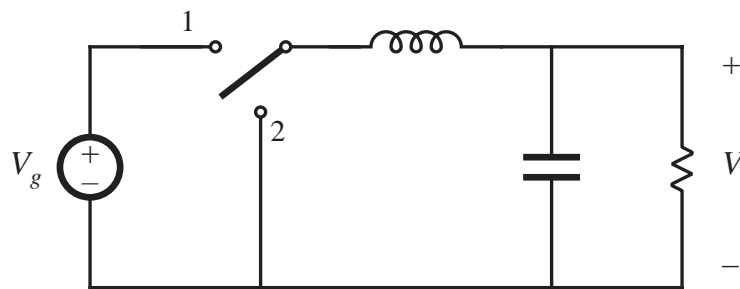
ac-dc converters

current-fed bridge inverse of Watkins-Johnson

Converters producing a unipolar output voltage

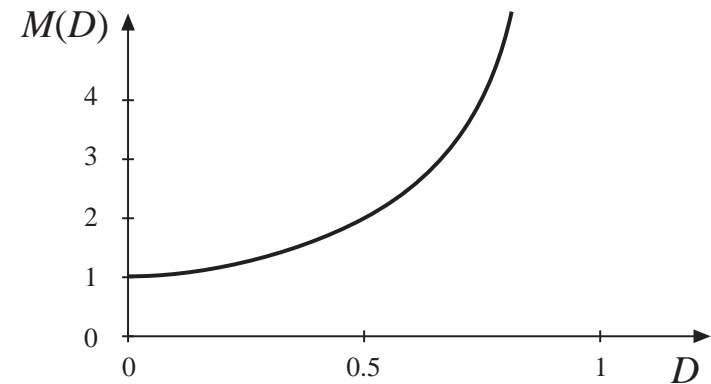
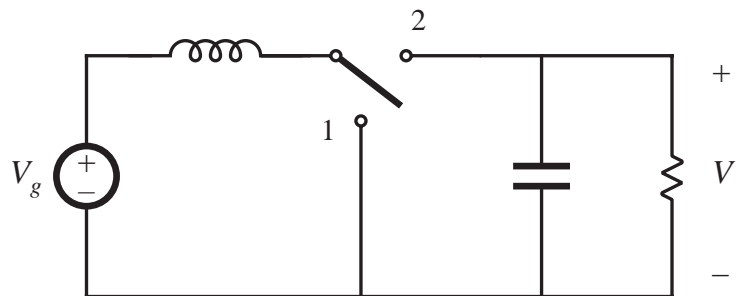
1. Buck

$$M(D) = D$$



2. Boost

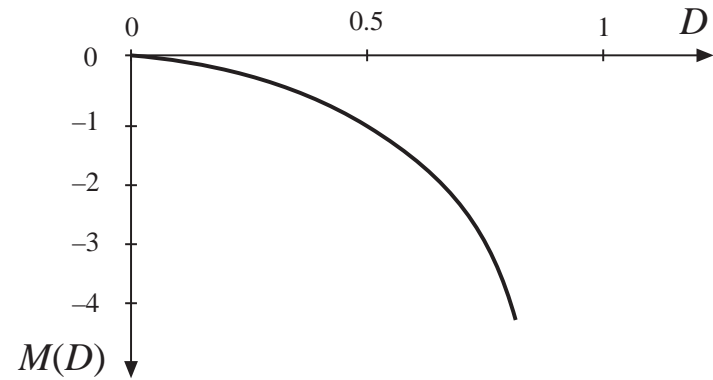
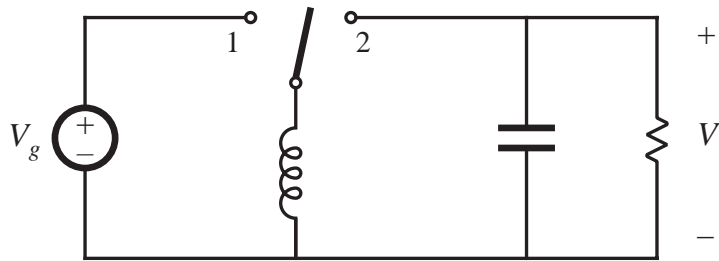
$$M(D) = \frac{1}{1-D}$$



Converters producing a unipolar output voltage

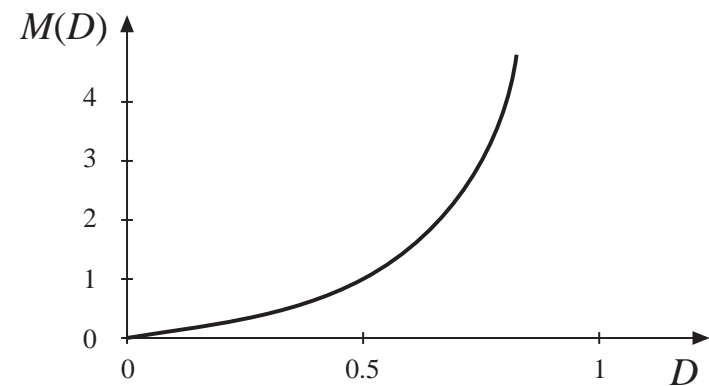
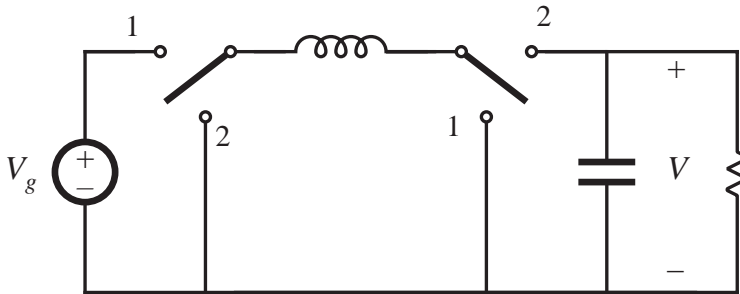
3. Buck-boost

$$M(D) = -\frac{D}{1-D}$$



4. Noninverting buck-boost

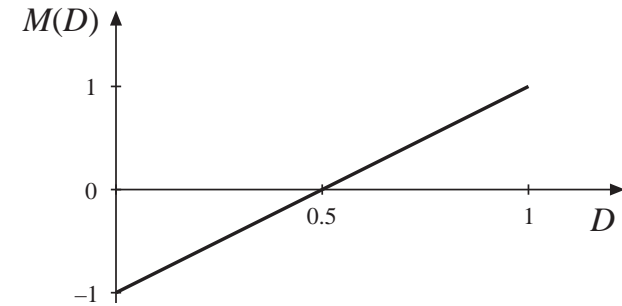
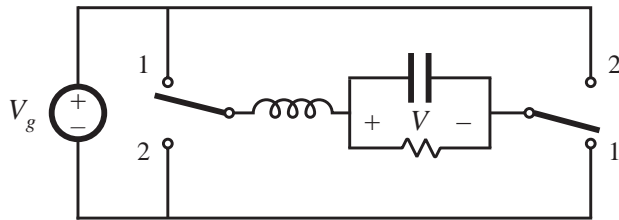
$$M(D) = \frac{D}{1-D}$$



Converters producing a bipolar output voltage suitable as dc-ac inverters

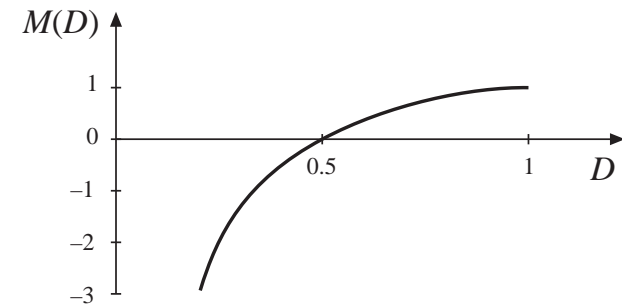
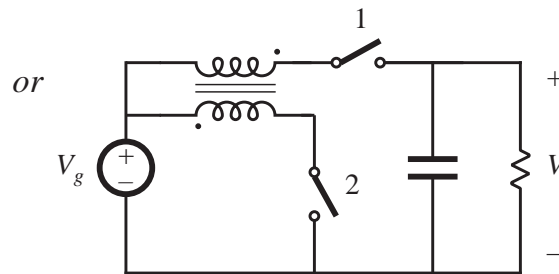
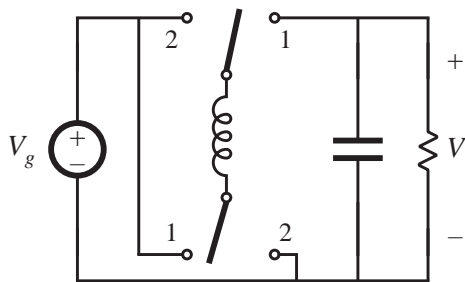
5. Bridge

$$M(D) = 2D - 1$$



6. Watkins-Johnson

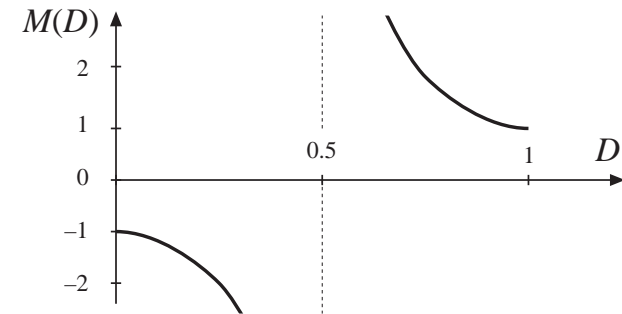
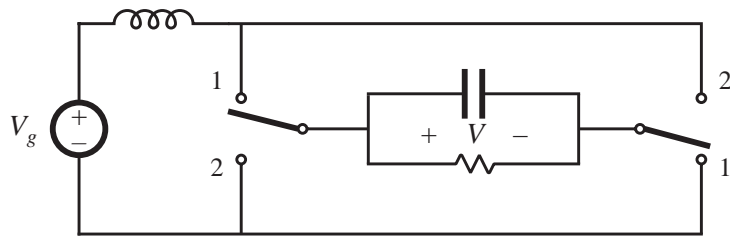
$$M(D) = \frac{2D - 1}{D}$$



Converters producing a bipolar output voltage suitable as ac-dc rectifiers

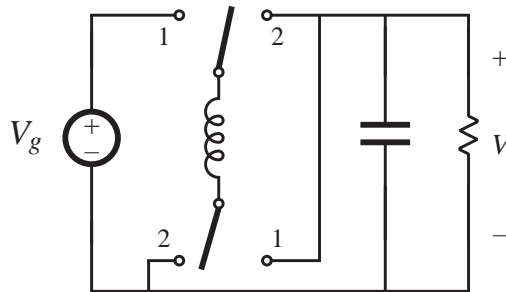
7. Current-fed bridge

$$M(D) = \frac{1}{2D - 1}$$

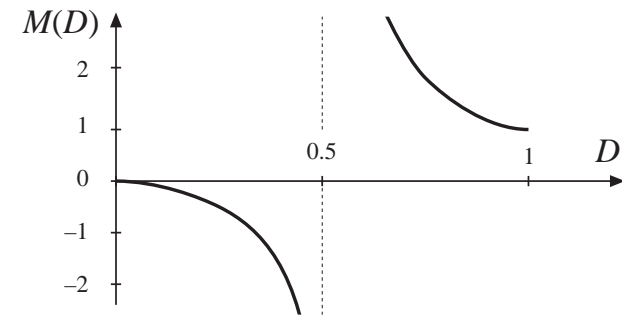
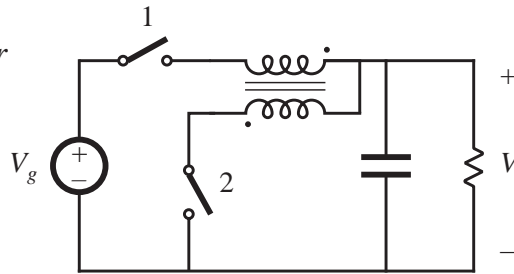


8. Inverse of Watkins-Johnson

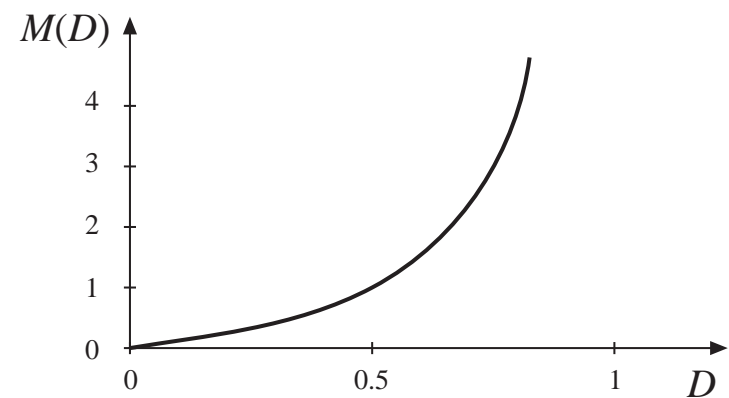
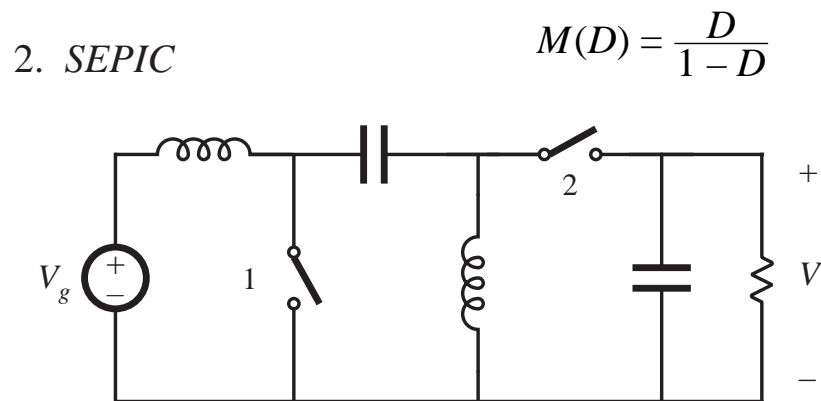
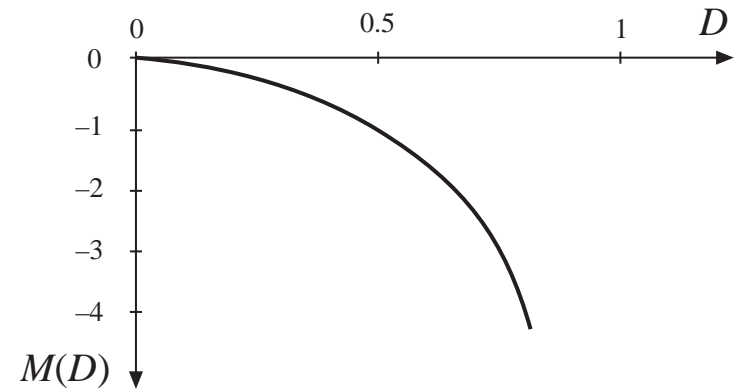
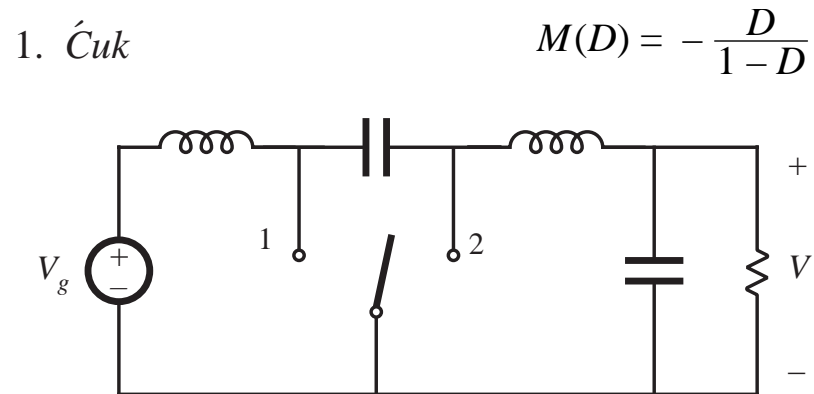
$$M(D) = \frac{D}{2D - 1}$$



or



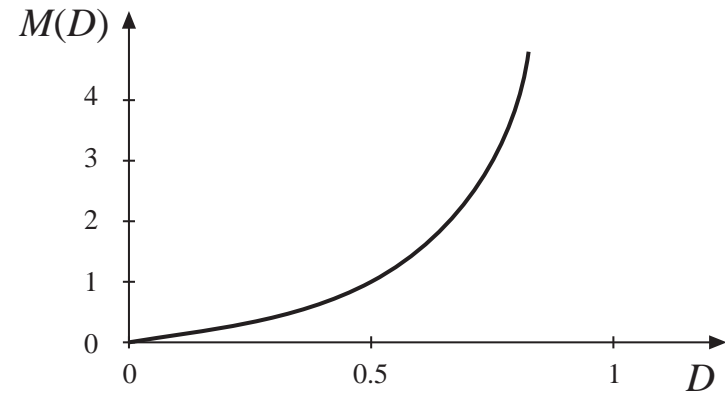
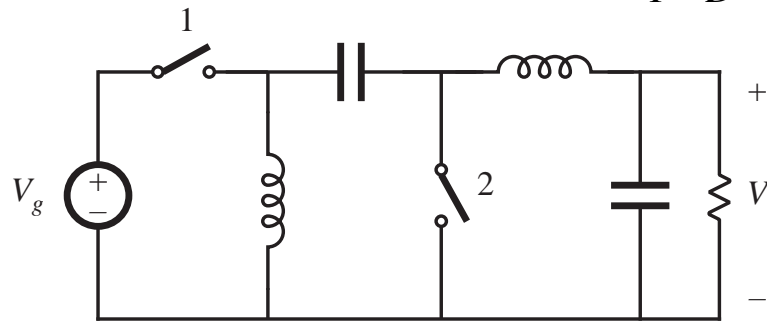
Several members of the class of two-inductor converters



Several members of the class of two-inductor converters

3. Inverse of SEPIC

$$M(D) = \frac{D}{1-D}$$



4. Buck²

$$M(D) = D^2$$

