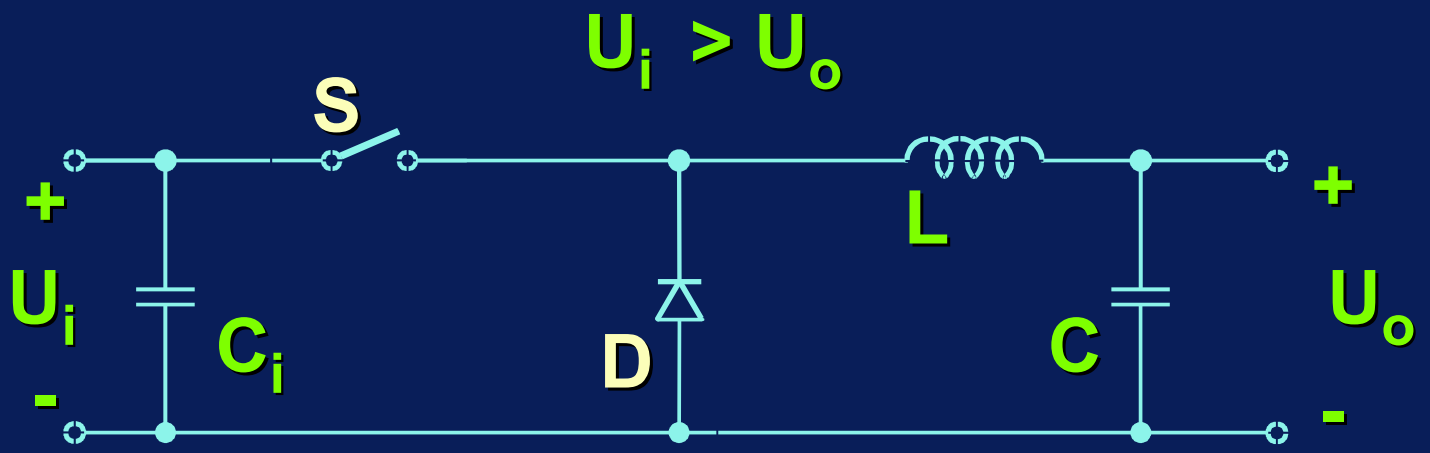
Corso di
ELETTRONICA INDUSTRIALE

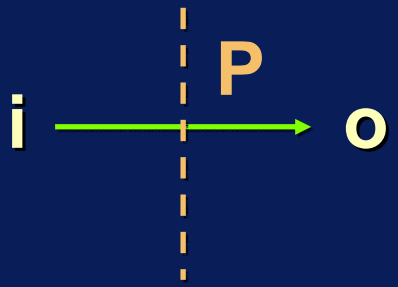
"Convertitori bidirezionali e half-bridge"

Convertitore bidirezionale

Convertitore bidirezionale



S + D = Buck



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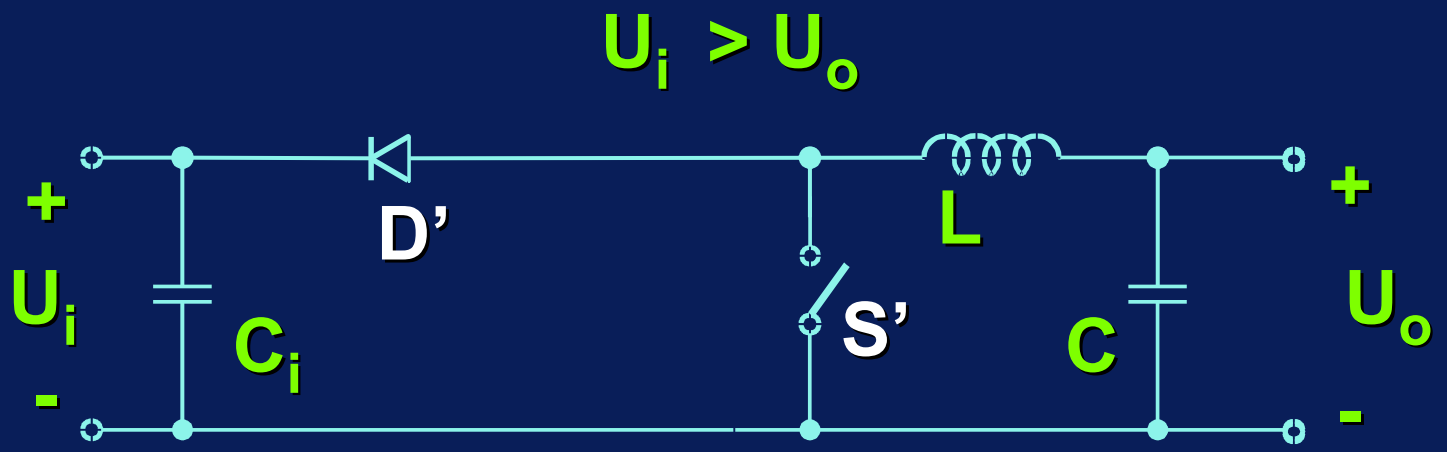
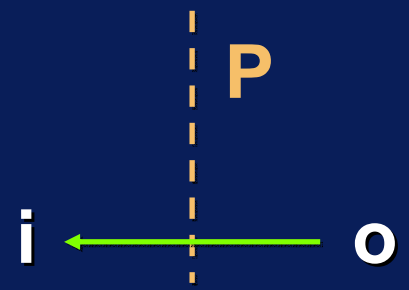
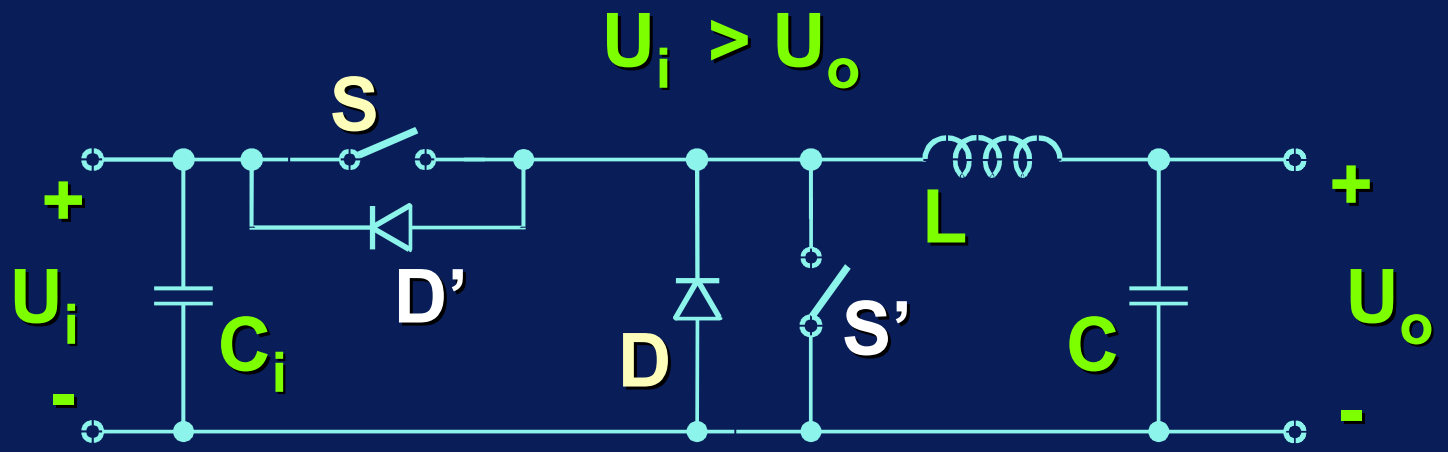




S' + D' = Boost

Convertitore bidirezionale



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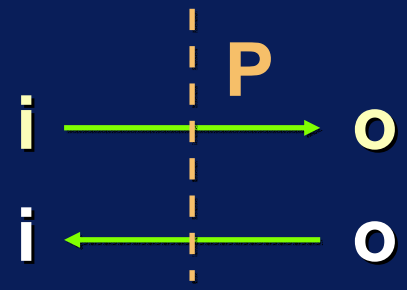
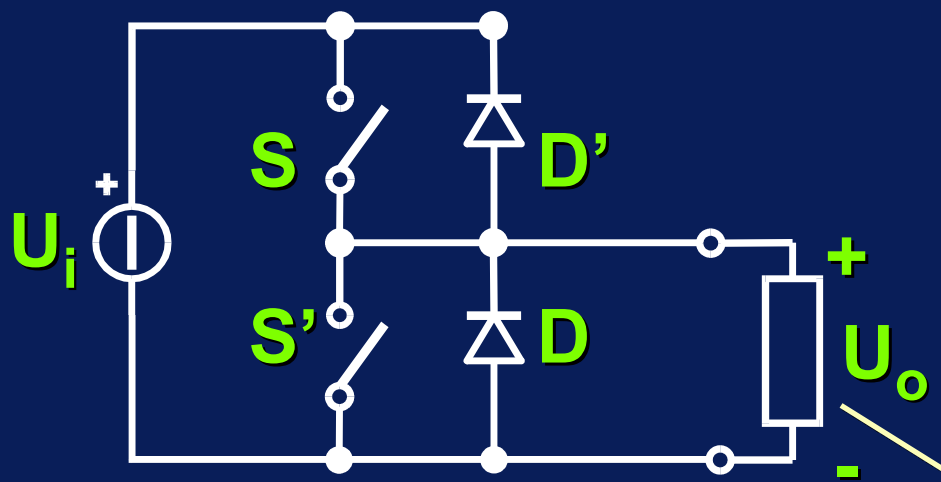
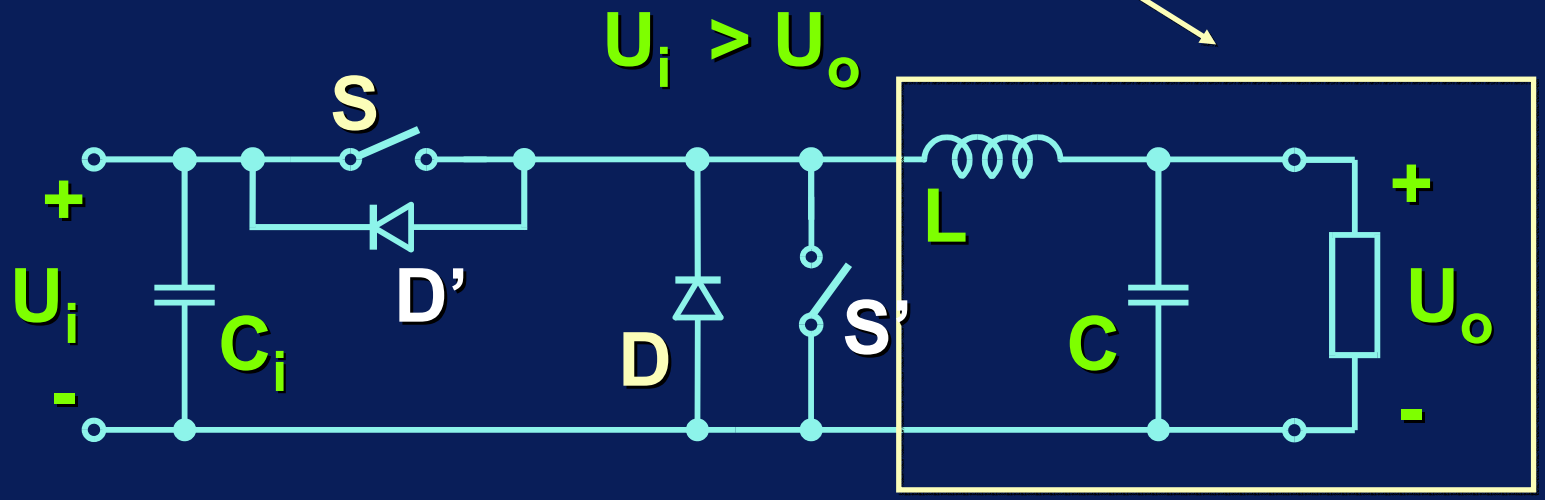


Il convertitore è in grado di trasferire energia in ambo le direzioni (invertendo la corrente i_L), con il solo vincolo che $0 < U_o < U_i$

Convertitore bidirezionale





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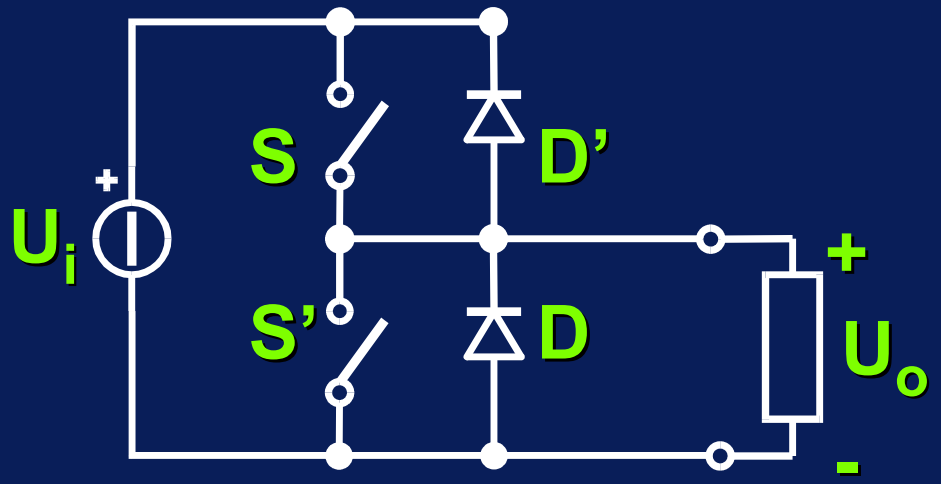
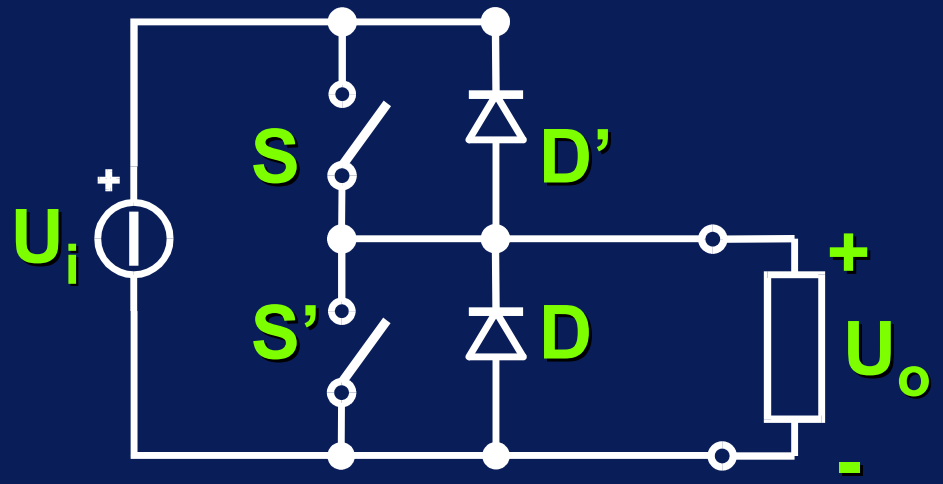


$0 \leq U_o \leq U_i$

Schema a mezzo ponte (half bridge)



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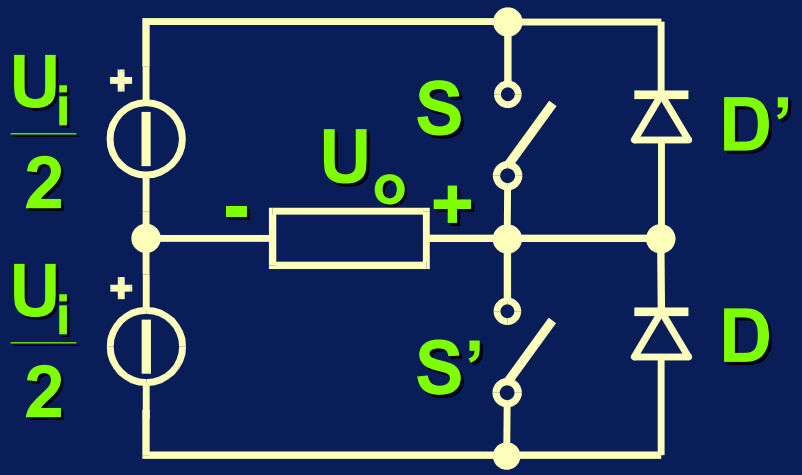

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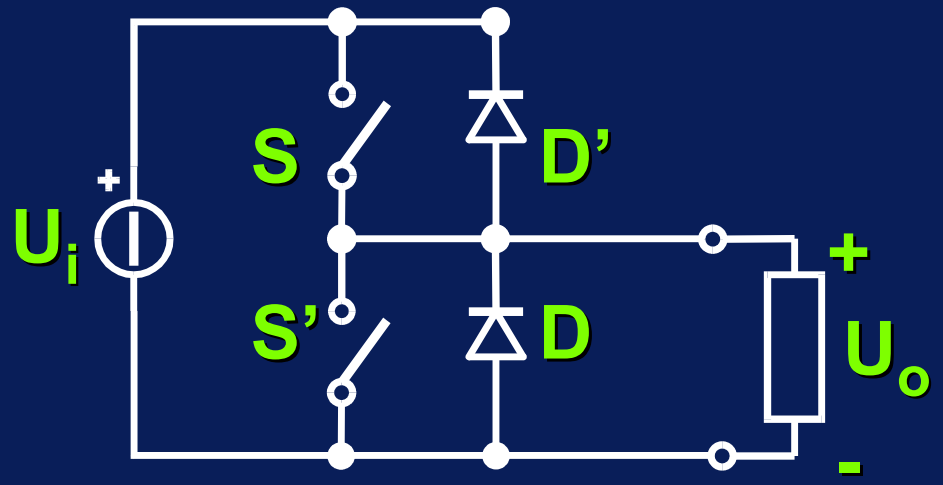

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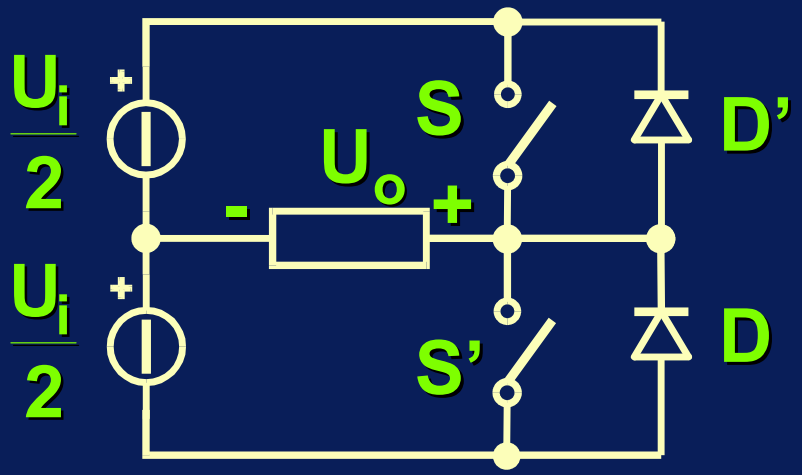
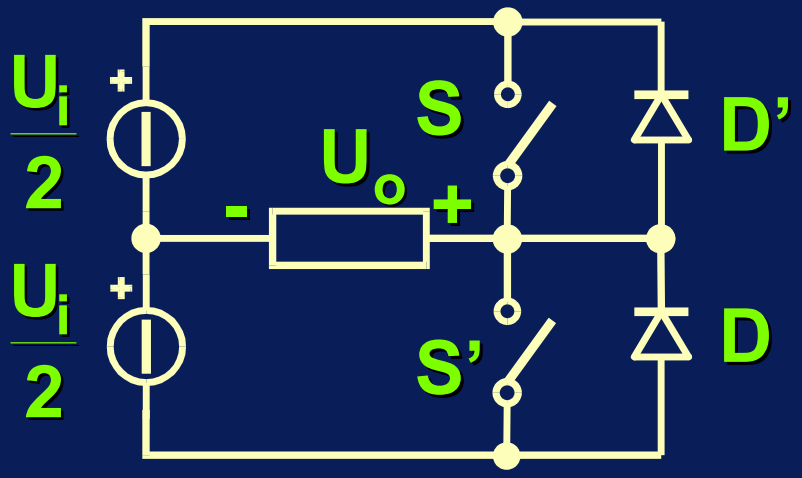


$$-\frac{U_i}{2} \leq U_o \leq \frac{U_i}{2}$$

Schema a mezzo ponte (half bridge)

La topologia half-bridge consente di erogare al carico tensioni (e correnti) con entrambe le polarità



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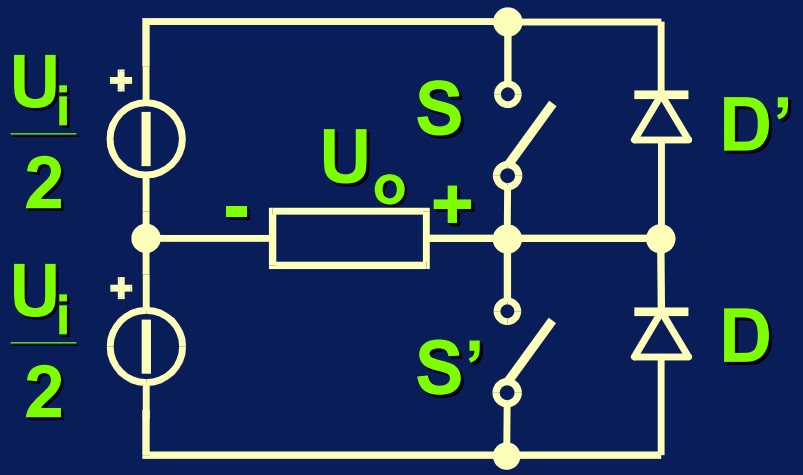
Si può allora alimentare un carico in c.a.



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La topologia half-bridge consente di erogare al carico tensioni (e correnti) con entrambe le polaritá

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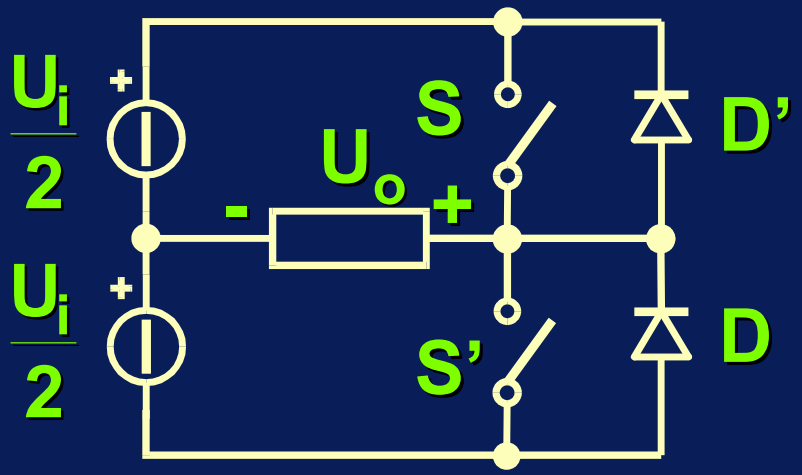
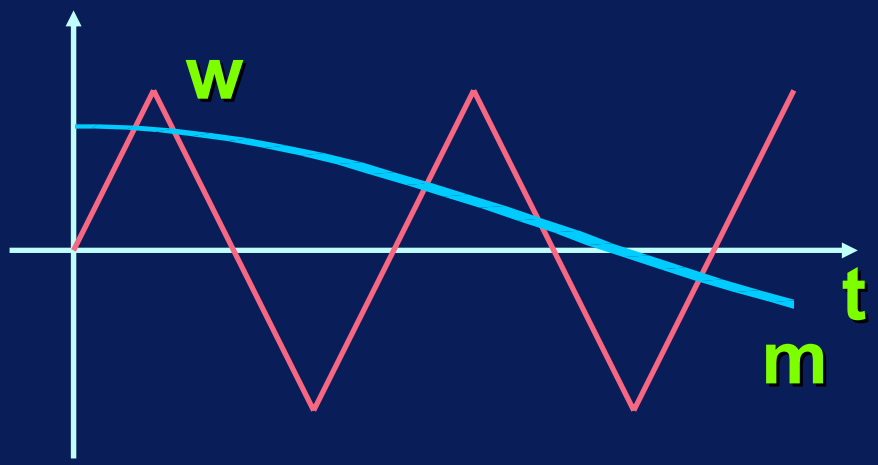
Il convertitore può funzionare da inverter (cc/ca)



$$-\frac{U_i}{2} \le u_o \le \frac{U_i}{2}$$

Adattamento della tecnica PWM al caso dell’inverter



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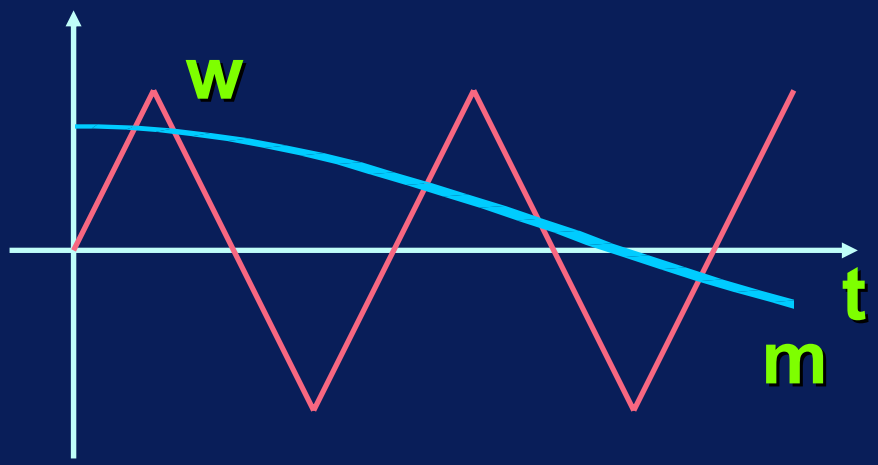

La portante triangolare ha valor medio nullo

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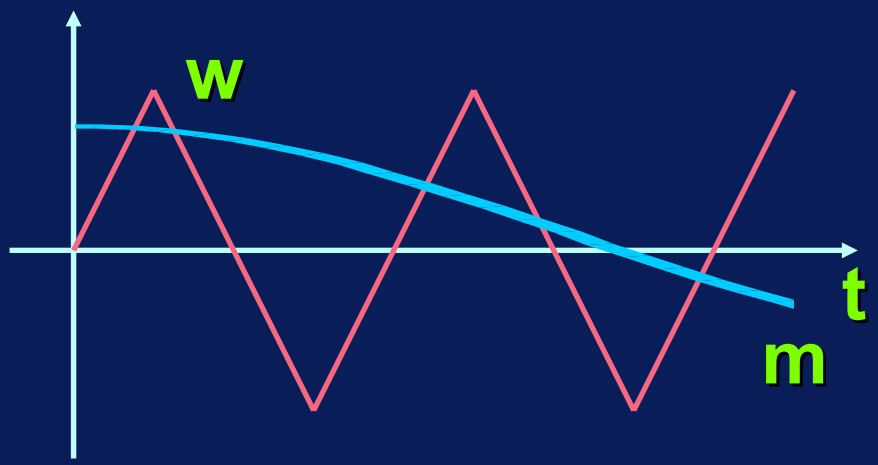
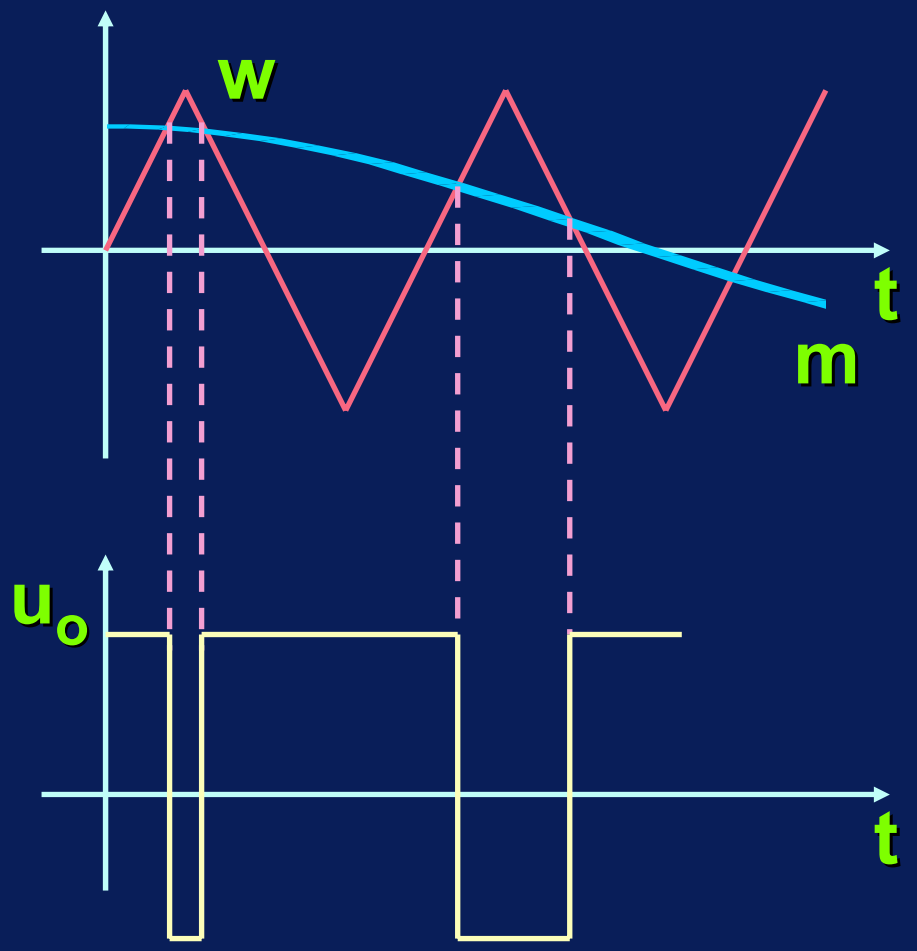


La portante triangolare ha valor medio nullo

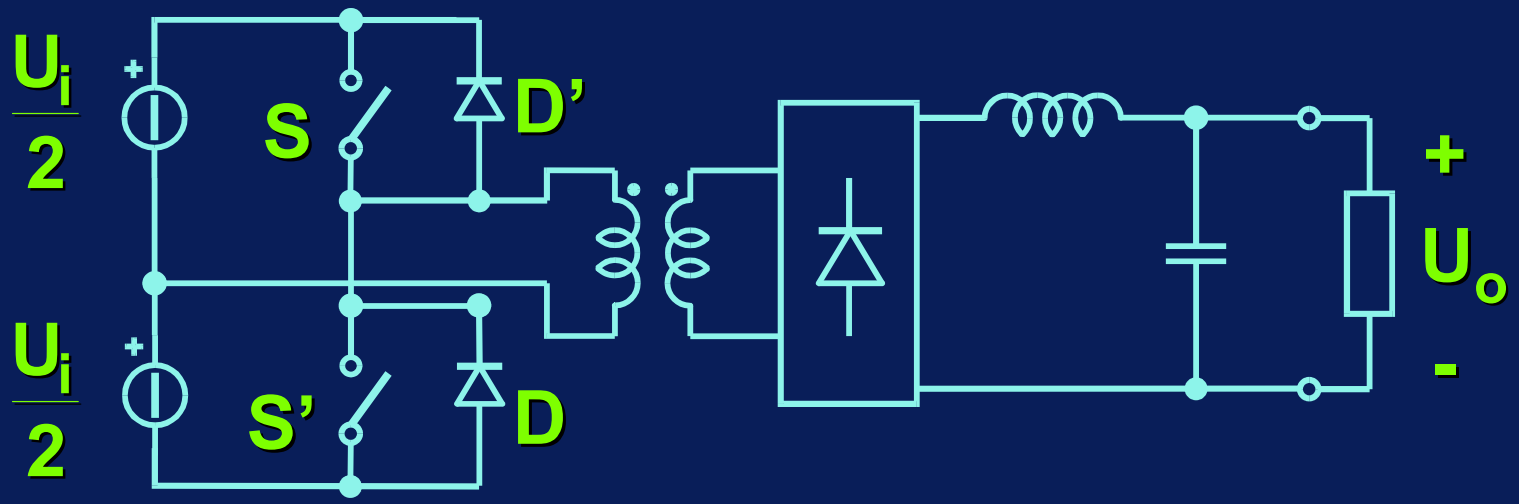
La modulante impone l'andamento a bassa frequenza della tensione d'uscita

Adattamento della tecnica PWM al caso dell'inverter



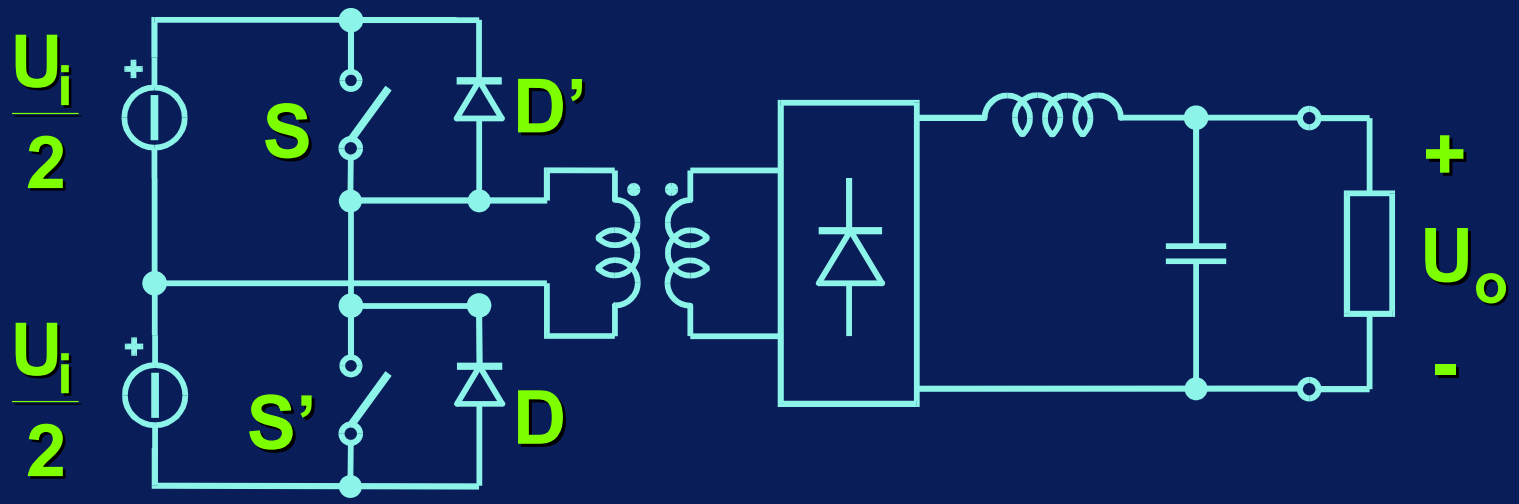
La tensione d'uscita ha impulsi positivi e negativi, con valor medio variabile da un ciclo all'altro

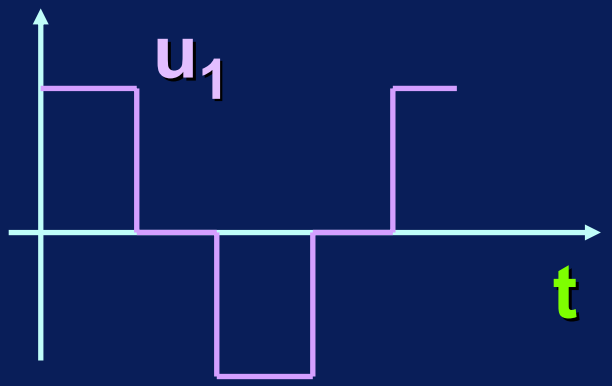
Convertitore cc/cc con isolamento: Half - bridge a trasformatore



Il funzionamento é lo stesso del convertitore push-pull (S e S' funzionano a cicli alterni)

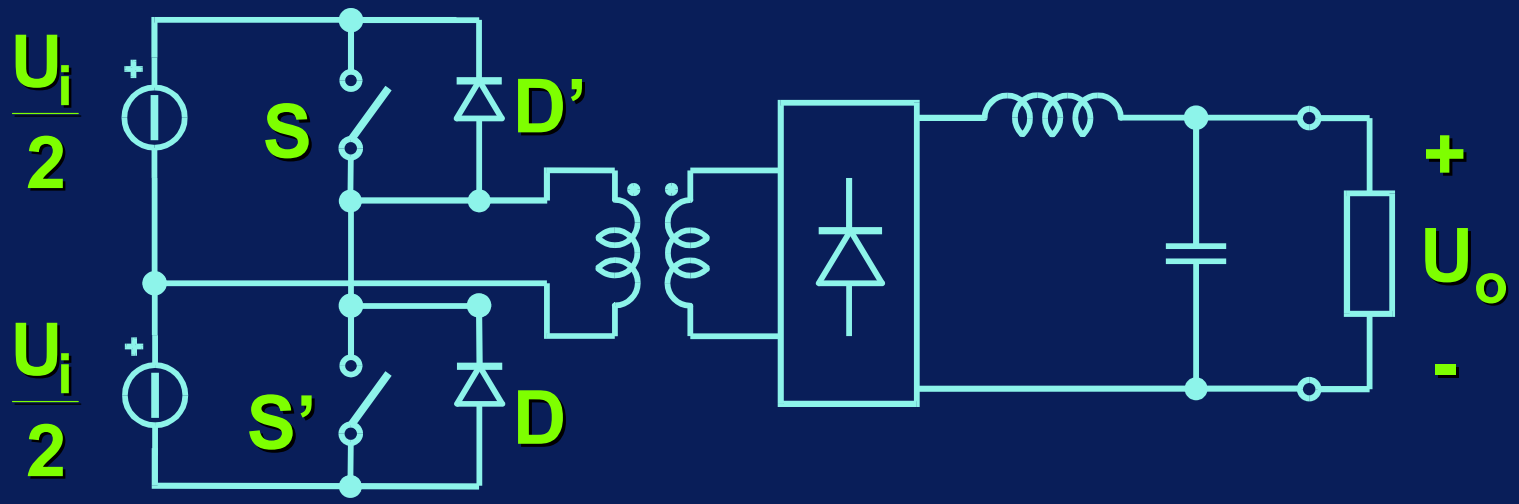
Convertitore cc/cc con isolamento: Half - bridge a trasformatore

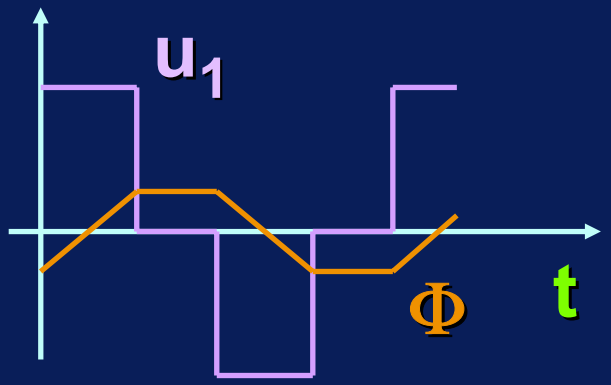




Tensione al primario

Convertitore cc/cc con isolamento: Half - bridge a trasformatore

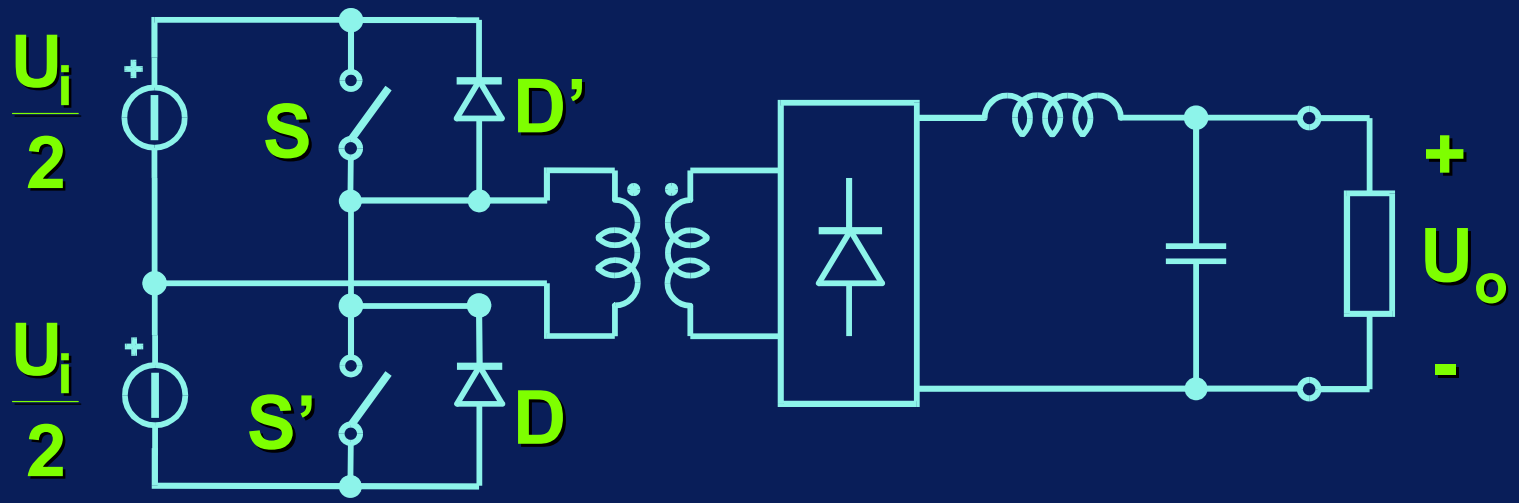


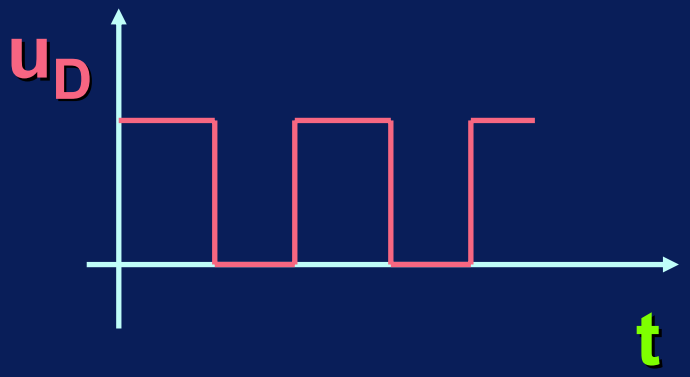


Tensione al primario

Flusso nel trasformatore

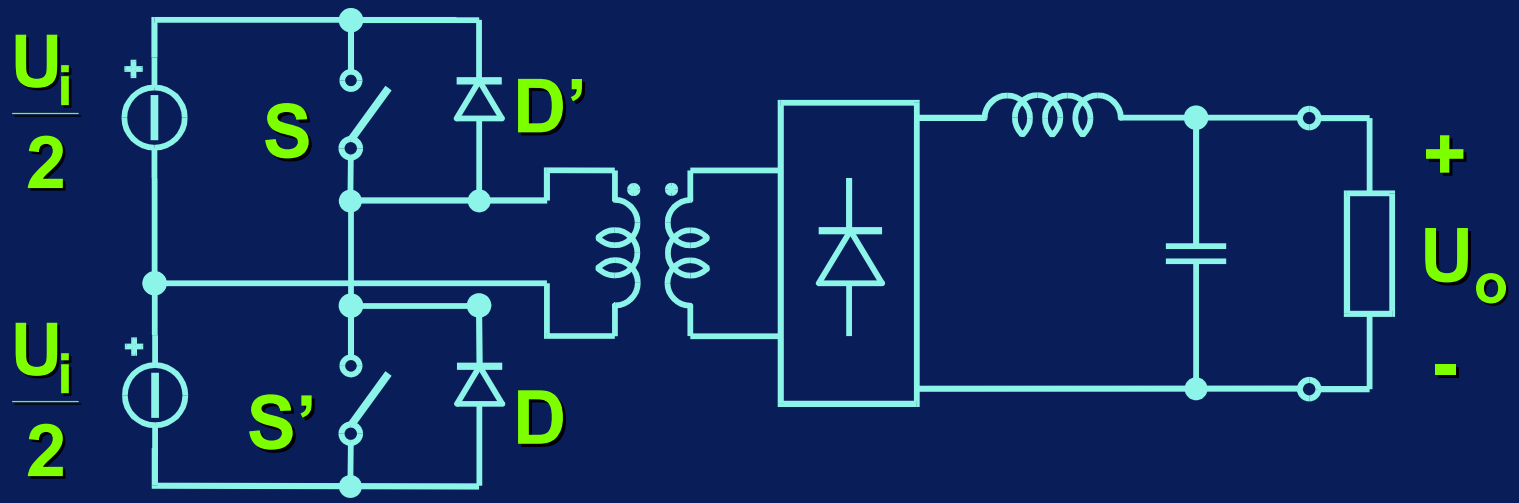
Convertitore cc/cc con isolamento: Half - bridge a trasformatore

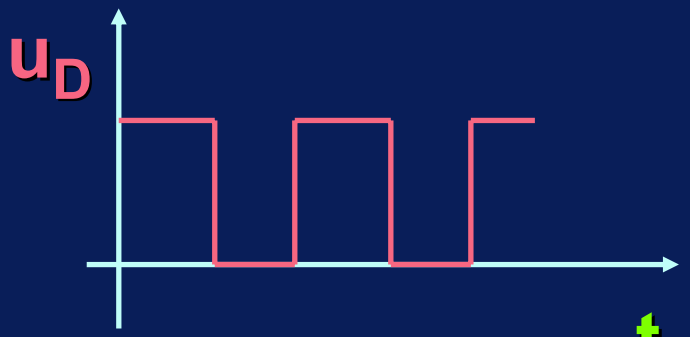




Tensione di uscita del ponte raddrizzatore

Convertitore cc/cc con isolamento: Half - bridge a trasformatore





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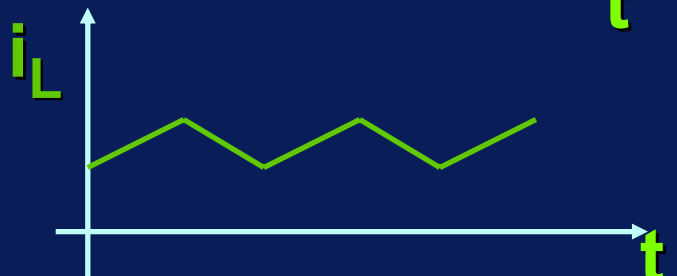

Corrente nell'induttanza di filtro

Conclusioni

- Una combinazione degli schemi buck e boost consente di realizzare un convertitore bidirezionale
- Scegliendo opportunamente il riferimento di tensione il convertitore bidirezionale può funzionare come inverter (convertitore cc/ca)
- L'inverter si presta anche ad operare come convertitore cc/cc con isolamento ad alta frequenza