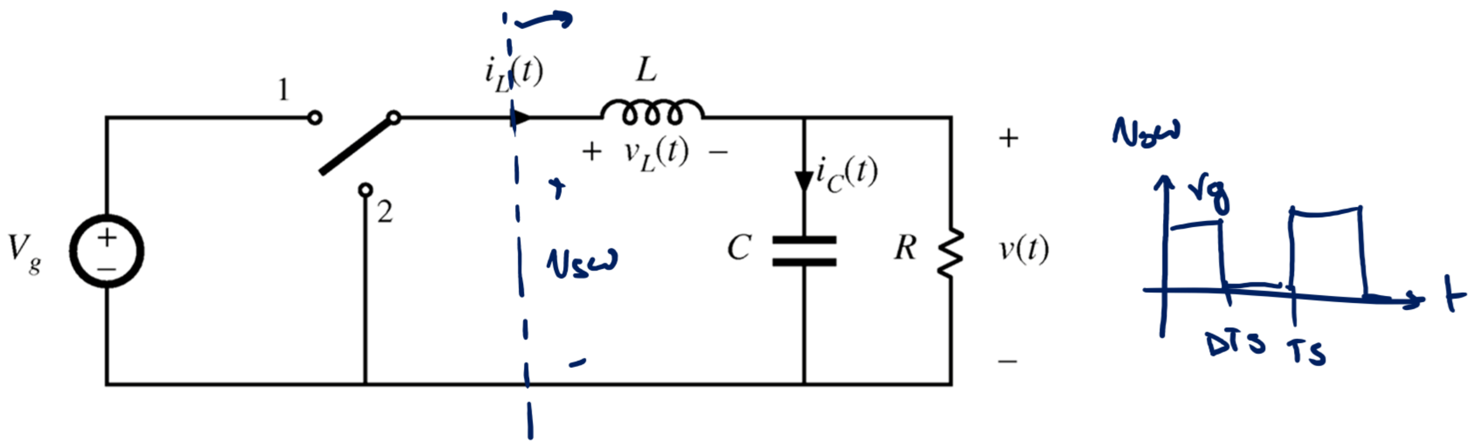
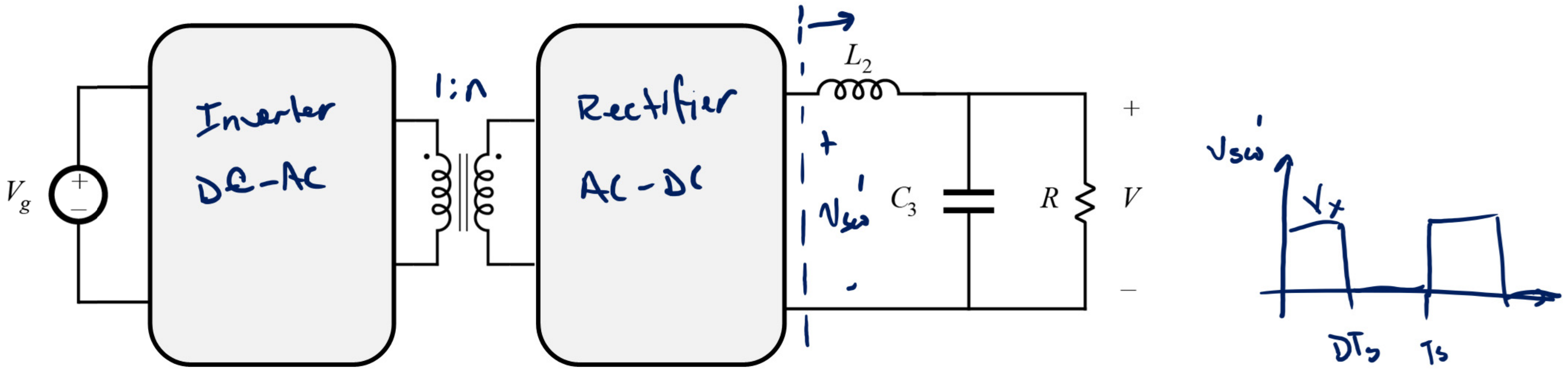
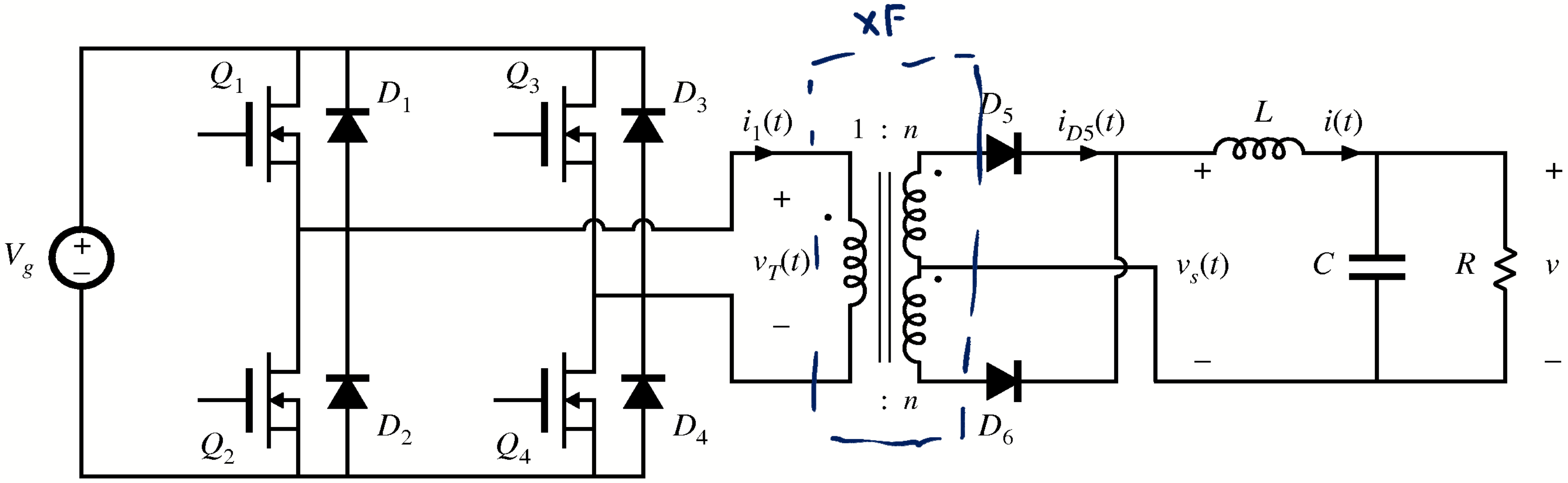
Buck-derived Isolated Converters





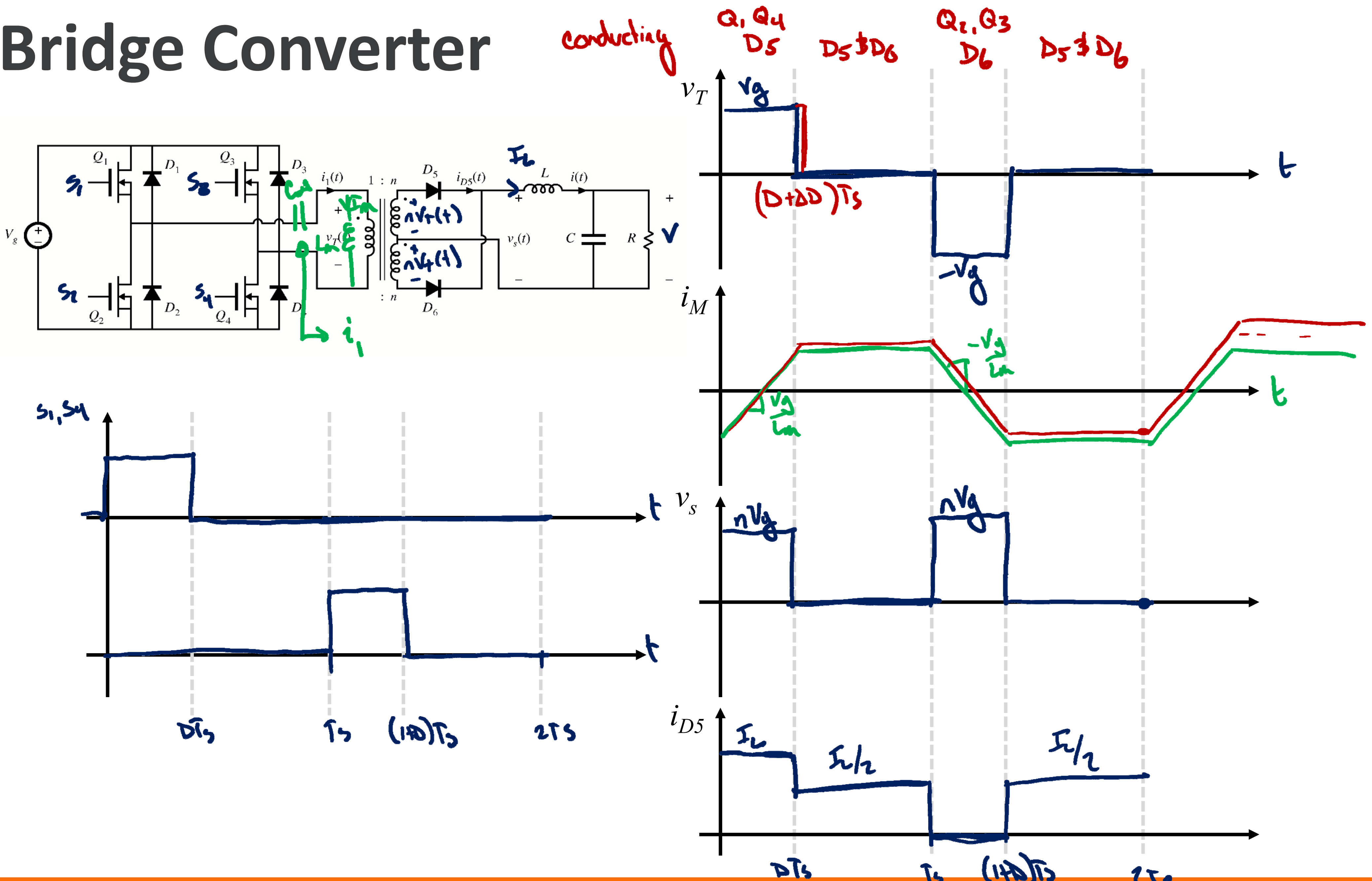
Full Bridge Converter



XF nearly ideal

– L_m is "very Large" → Negligible as long as it doesn't saturate

Full Bridge Converter



Conversion Ratio

$$\langle v_L \rangle = 0 = \left[\frac{1}{2T_s}\int_0^{2T_s} v_s(t)\,dt\right] - V = \frac{1}{2T_s}\left[2 \cdot nDV_g \cdot T_s\right] - V = 0$$

$$V = nDV_g$$

$$M = \frac{V}{V_g} = nD$$

$0 \le n \le \infty$

$0 \le D \le 1$

Transformer Saturation

$$\langle v_T \rangle = 0 = D V_g + D(-V_g) = 0$$

- Ideally, volt-sec balance always maintained in every period

If there is any unbalanced nonideality, we will accumulate volt-seconds & saturate

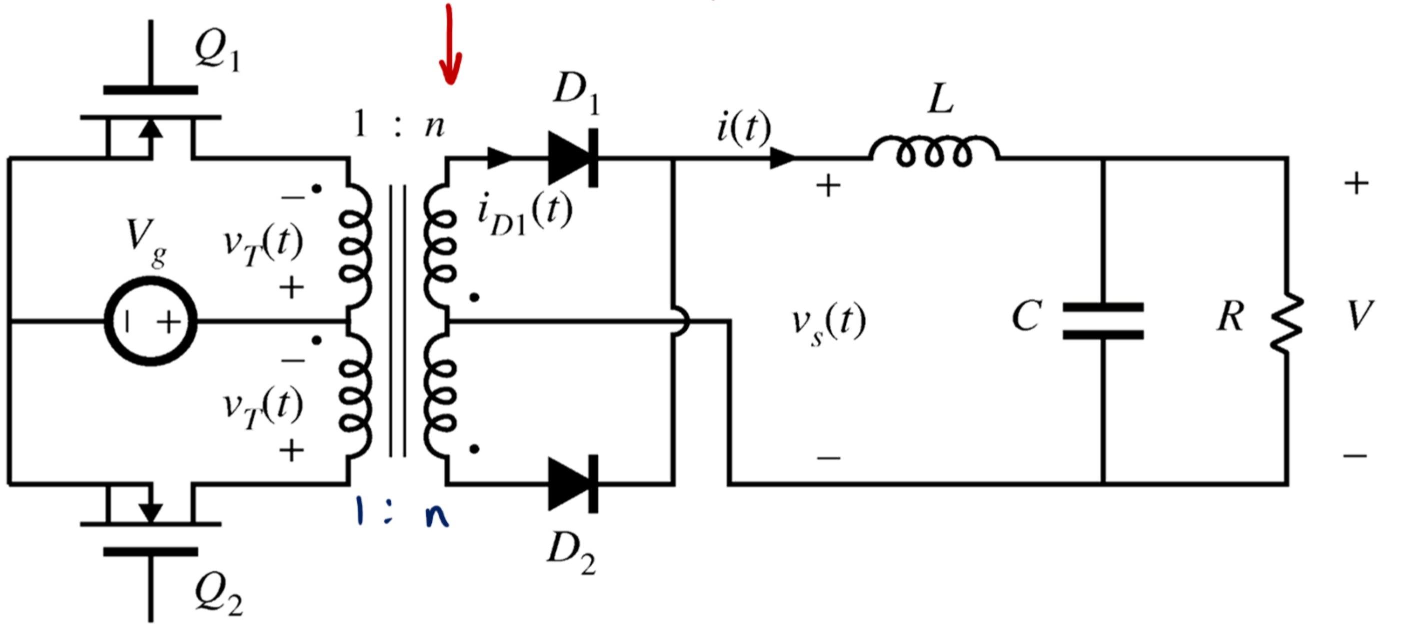
- Timing errors e.g. DTs mismatch between Q_1/Q_4 & Q_2/Q_3
- Minor variations in loss

$$\langle v_T \rangle = 0 = D\left(V_g - \frac{I_L}{n}(R_{on1} + R_{on4})\right) + D\left(-V_g + \frac{I_L}{n}(R_{on2} + R_{on3})\right)$$

Practically → use either current sensing or DC block in series w/ XF

Push Pull Converter

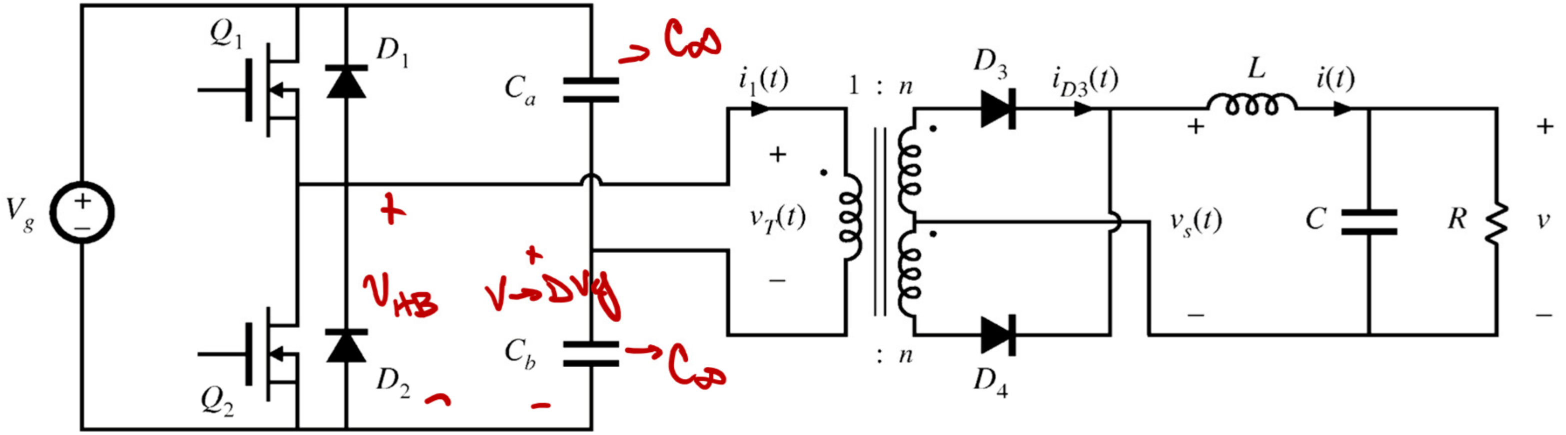
"center-tapped" winding of XF

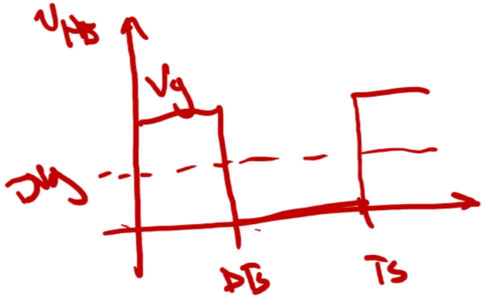


$M = nD$

same waveforms :

Half Bridge Isolated Buck





$$M = \frac{1}{2} n D$$