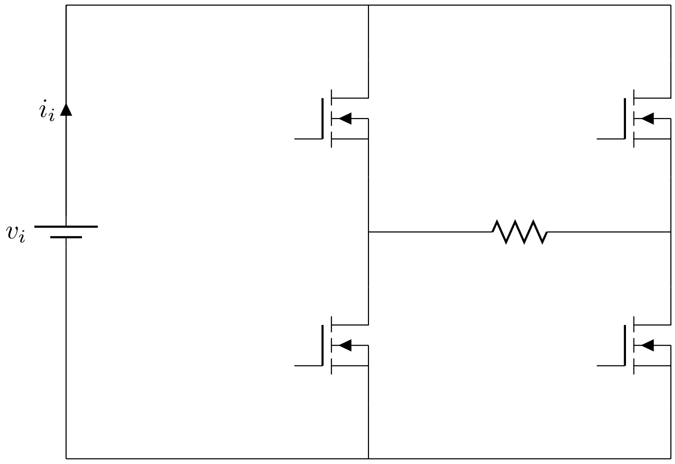
DC to AC converters

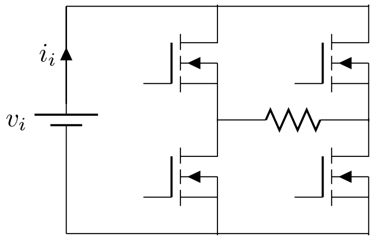
Diego Trapero

Table of contents

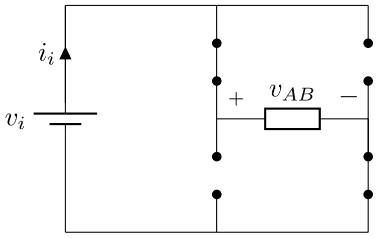
1 DC to AC converters

1.1 Full bridge circuit



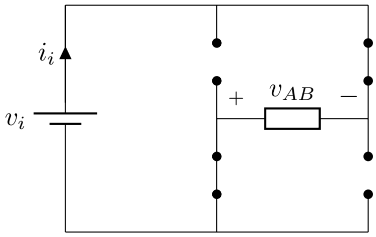


Direct polarization of the load. S1 and S4



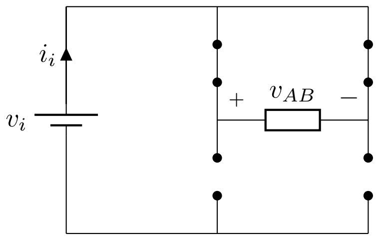
$$v_{AB} = V_i$$

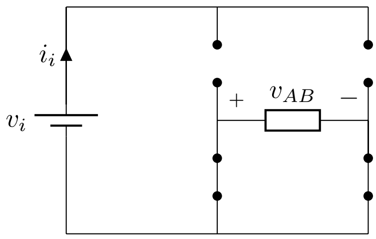
Inverse polarization of the load. S2 and S3



$$v_{AB} = -V_i$$

Grounding. S1 and S3 OR S2 and S4





$$v_{AB} = 0$$

Shorting the source. The two switches of a branch cannot be closed at the same time because it would short the source. That's the reason why same-branch switch control signals have to be complementary:

$$S1 = \bar{S}3$$
$$S2 = \bar{S}4$$

2 Square wave control

3 Phase shift control

4 PWM control

4.1 Unipolar control

4.2 Bipolar control

5 Triphasic inverters

6 Inverter amplitudes tables

PWM Sinusoidal Unipolar. Normalized amplitudes, V_n/V_{DC}

m_a	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
$n = 1$	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
$n = 2mf + -1$	0.10	0.19	0.27	0.33	0.36	0.37	0.35	0.31	0.25	0.18
n= 2mf+-3	0.00	0.00	0.01	0.02	0.04	0.07	0.10	0.14	0.18	0.21

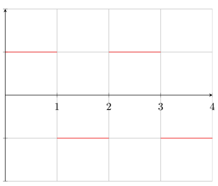
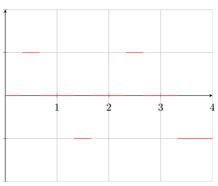
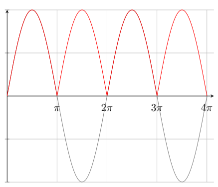
PWM Sinusoidal Bipolar. Normalized amplitudes, V_n/V_{max}

m_a	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
$n = 1$	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
$n = mf$	1.27	1.24	1.20	1.15	1.08	1.01	0.92	0.82	0.71	0.60
$n = mf + -2$	0.00	0.02	0.03	0.06	0.09	0.13	0.17	0.22	0.27	0.32

PWM Sinusoidal Triphasic. Normalized amplitudes, V_n/V_{DC} (line tension)

m_a	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
$n = 1$	0.087	0.173	0.260	0.346	0.433	0.520	0.606	0.693	0.779	0.866
$n = mf + -2$	0.003	0.013	0.030	0.053	0.801	0.114	0.150	0.190	0.232	0.275
$n = 2mf + -1$	0.086	0.165	0.232	0.282	0.313	0.321	0.307	0.272	0.221	0.157

Fourier series table

Function	Fourier Series
	$\frac{4}{\pi}\left(\frac{\sin(t)}{1} + \frac{\sin(3t)}{3} + \frac{\sin(5t)}{5} + ...\right)$
	$\frac{4}{\pi}\left(\frac{\sin(t)\cos(\beta)}{1} + \frac{\sin(3t)\cos(3\beta)}{3} + \frac{\sin(5t)\cos(5\beta)}{5} + ...\right)$
	$\frac{2}{\pi} - \frac{4}{\pi}\left(\frac{\sin(t)}{1\cdot 3} + \frac{\sin(2t)}{3\cdot 5} + \frac{\sin(3t)}{5\cdot 7} + ...\right)$