Power Electronics
No. 13: Full-bridge Inverter

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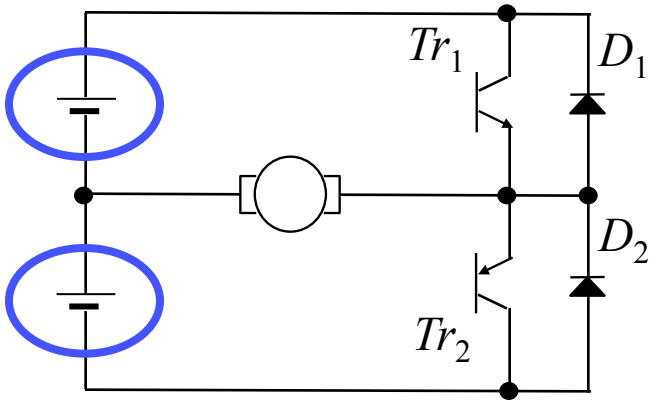
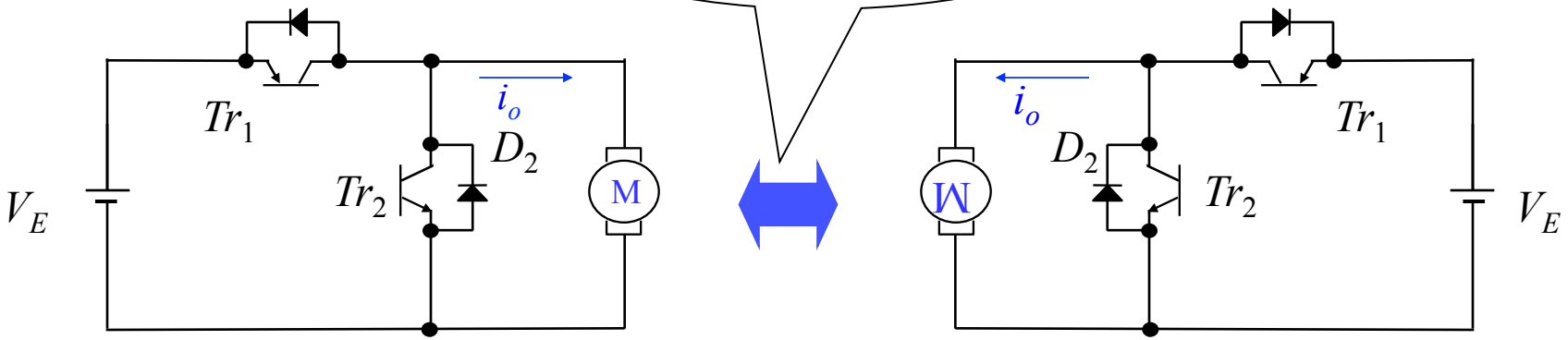


Half-bridge inverter

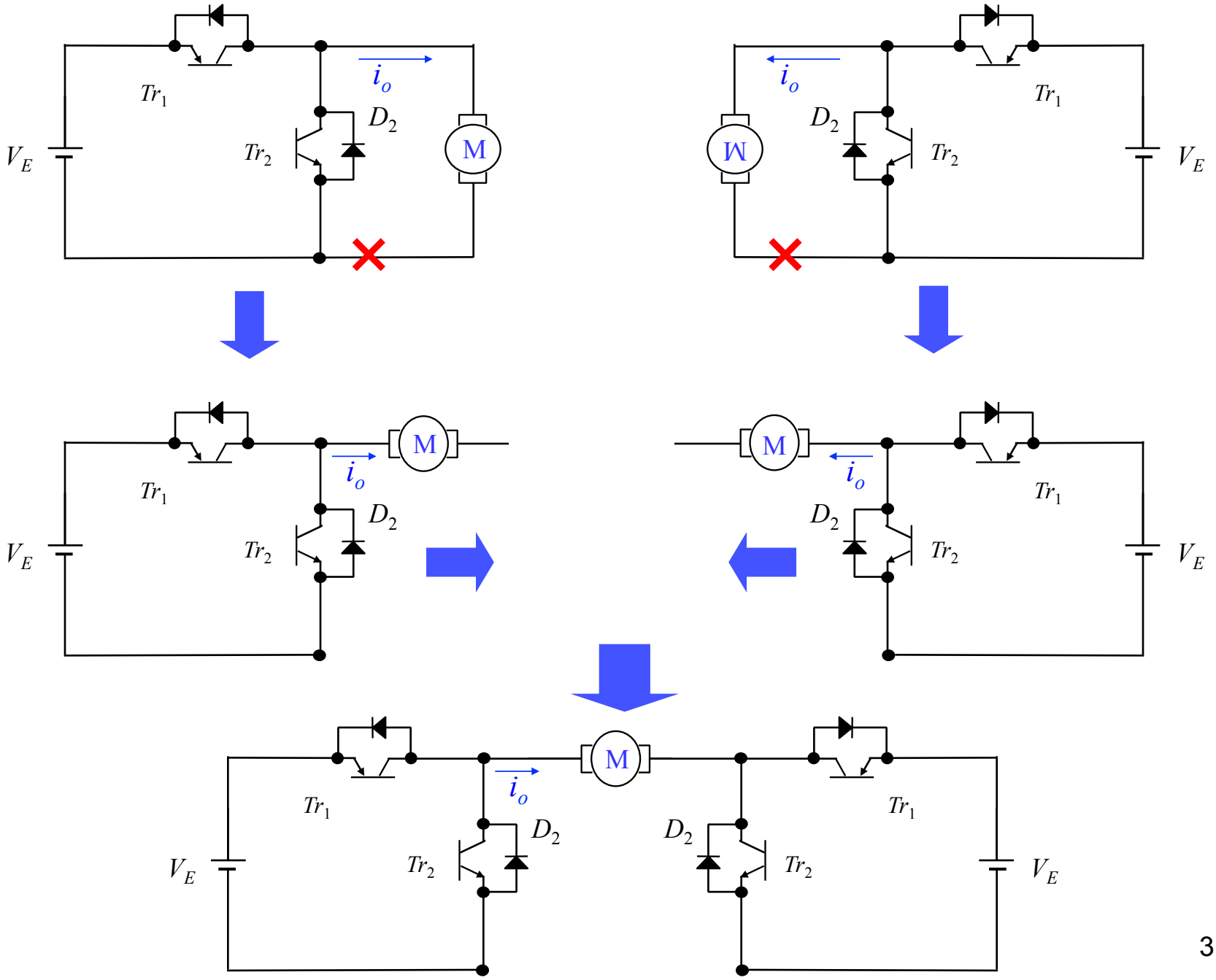
Two batteries are needed

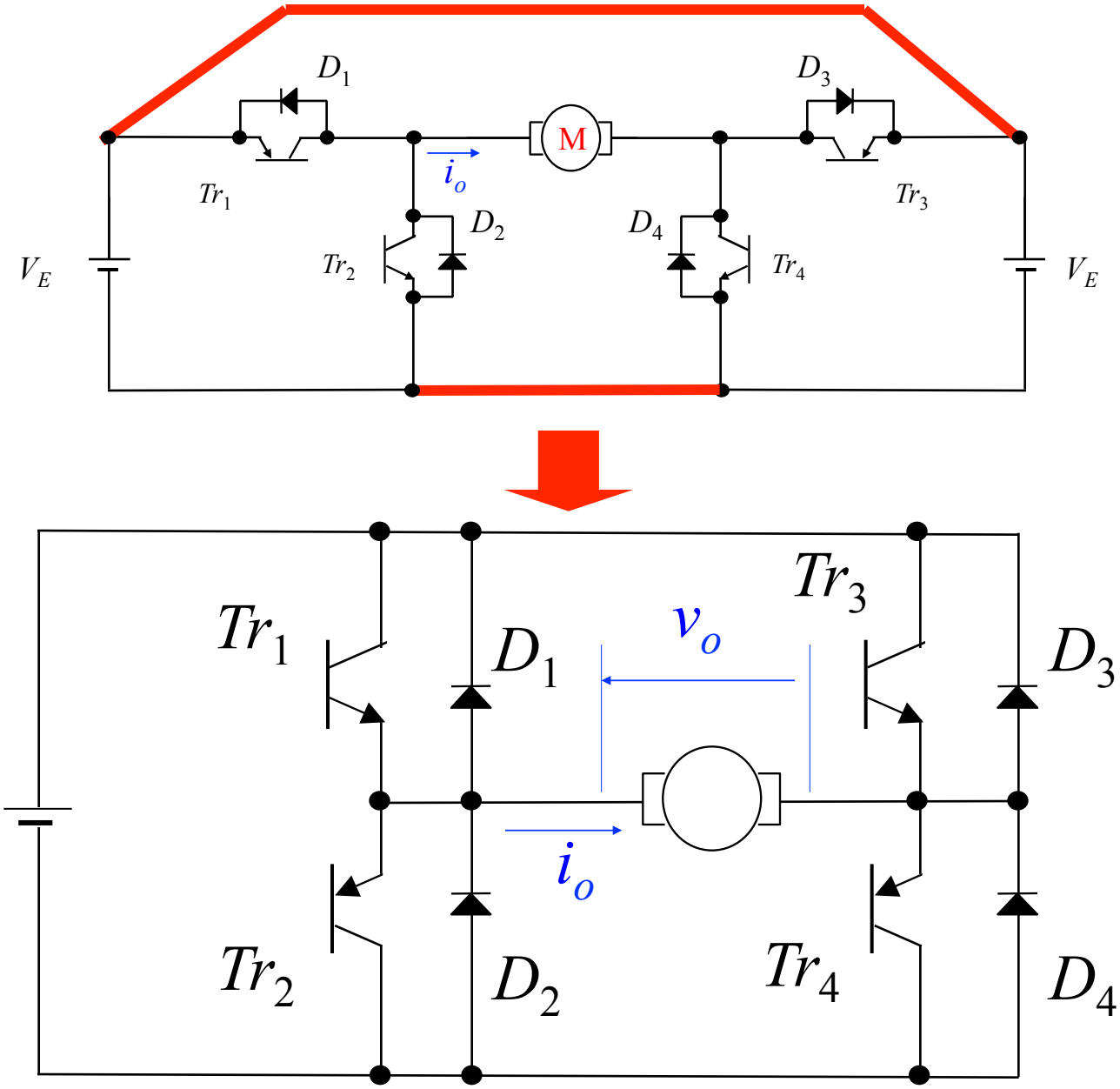
An inverter with one battery is more desirable.

How can these be integrated?

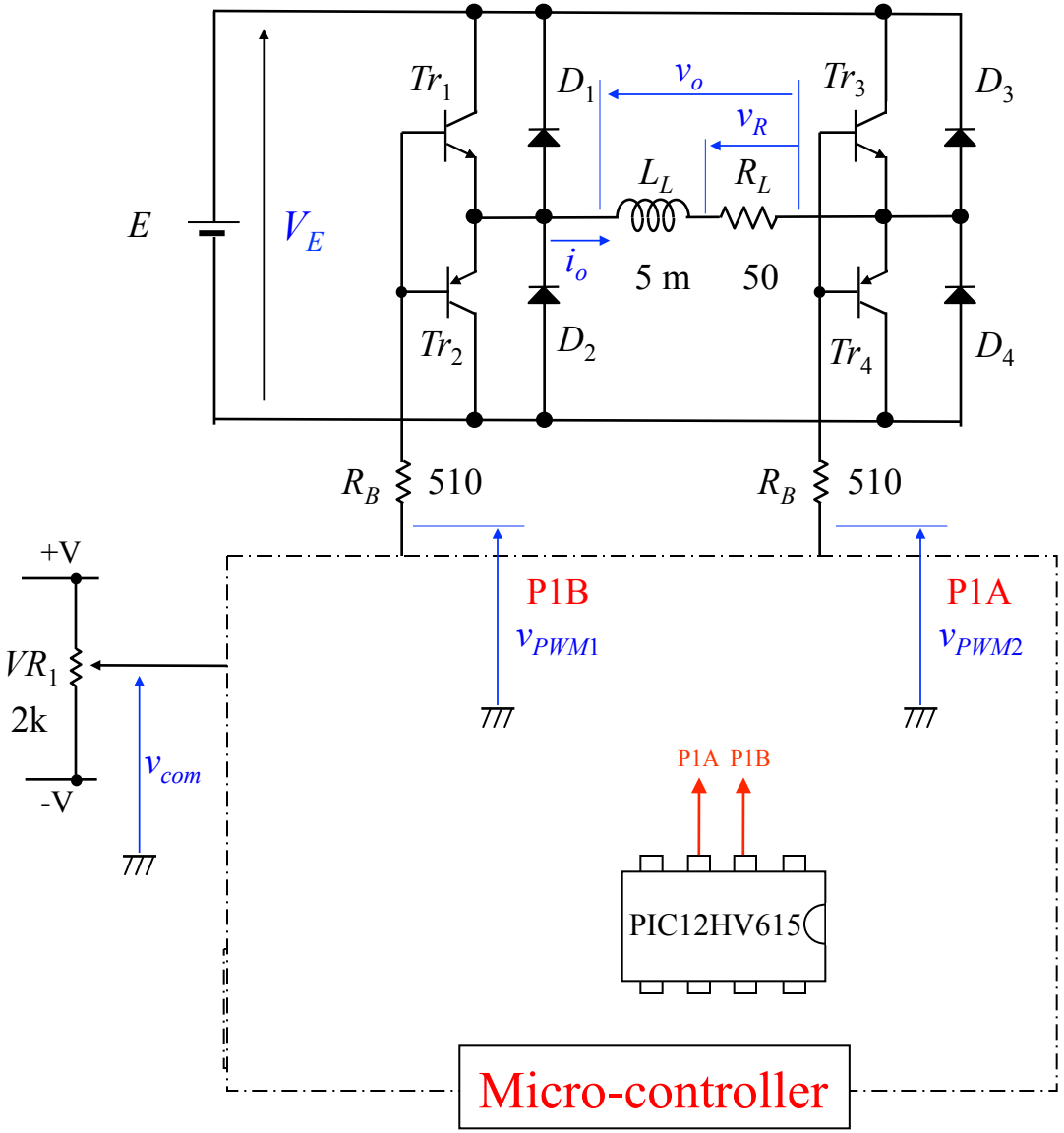


(a) Chopper for forward driving/braking (b) Chopper for backward driving/braking


Tr_1
i_o
D_2
Tr_2
M
V_E



Full-bridge inverter



Full bridge inverter and controller

If $v_{com} \geq v_{tri}$

Tr_1 ON, Tr_3 OFF

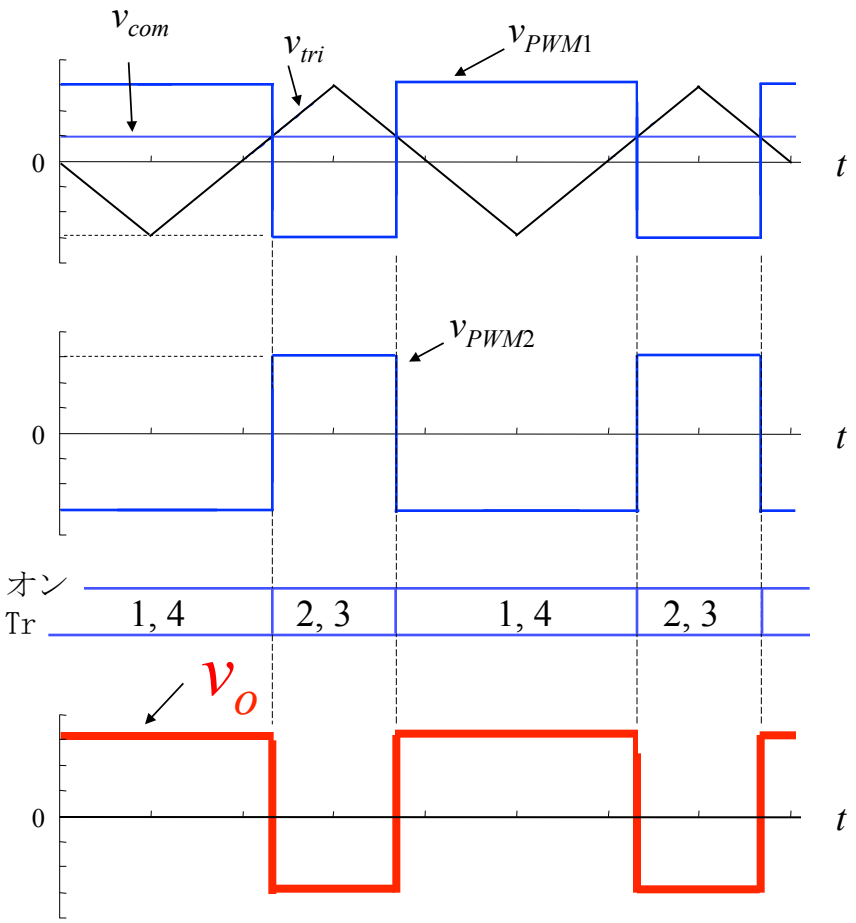
Tr_2 OFF, Tr_4 ON

If $v_{com} < v_{tri}$

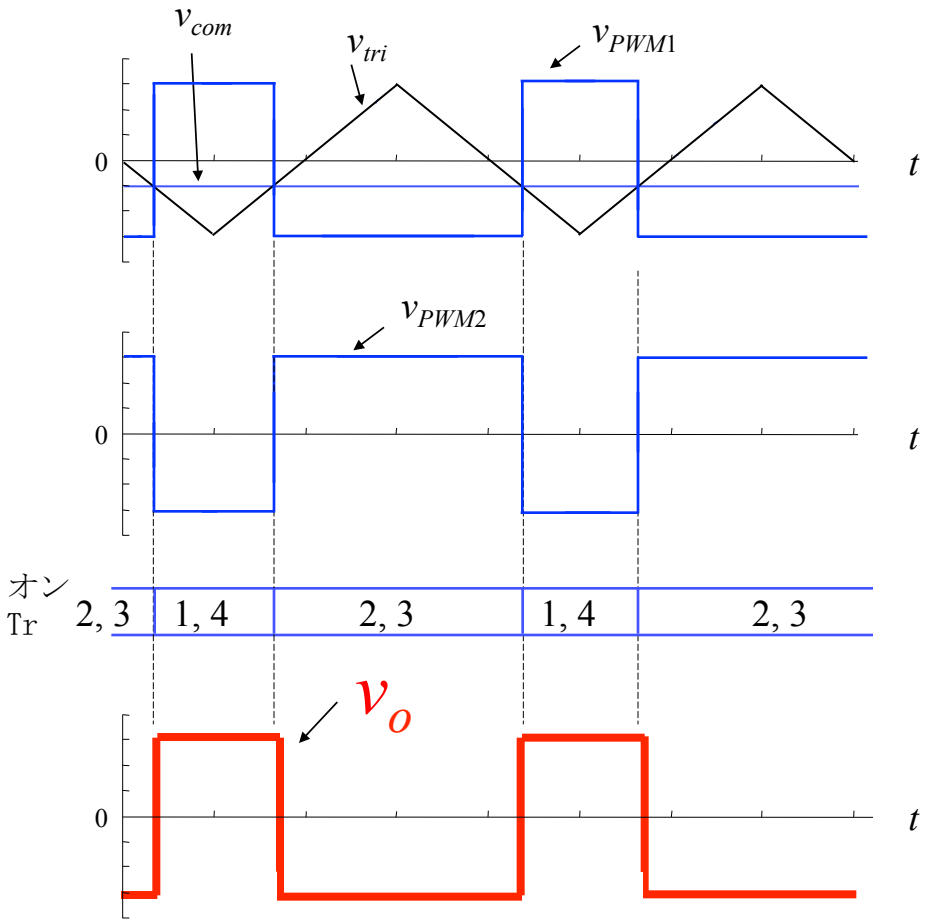
Tr_1 OFF, Tr_3 ON

Tr_2 ON, Tr_4 OFF

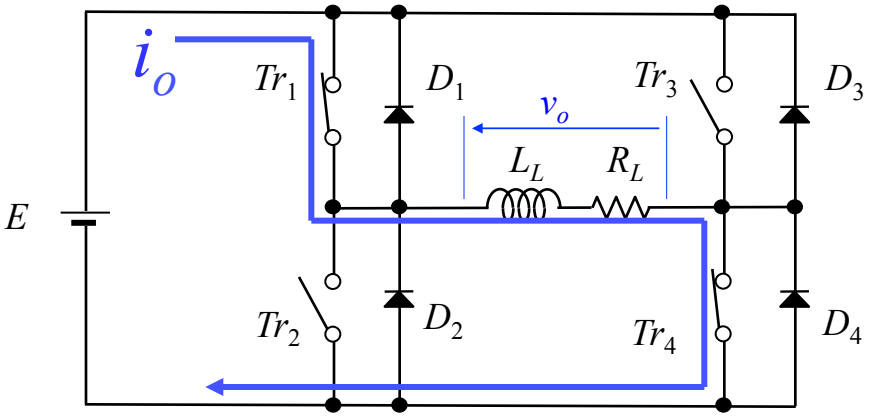
(10.1)



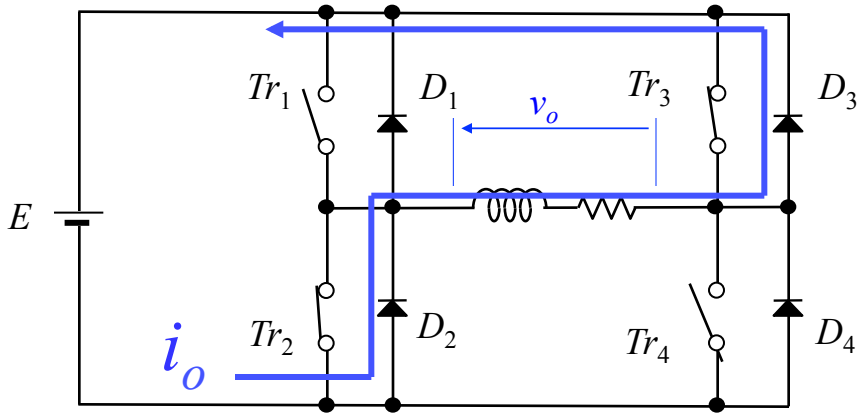
PWM control scheme and output voltage
$(v_{com} > 0)$



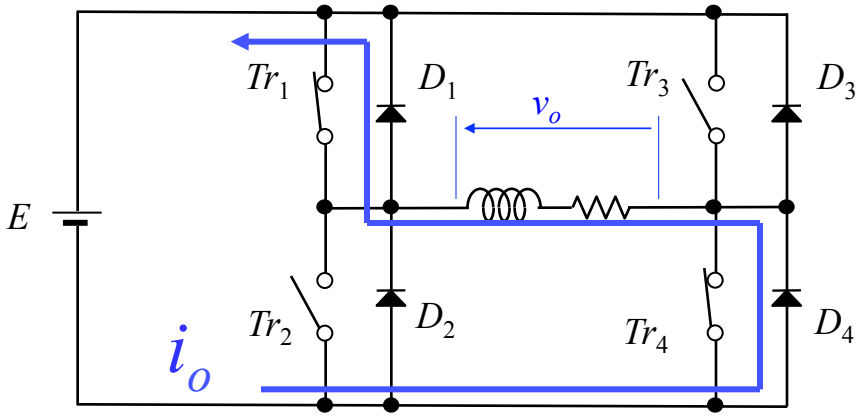
PWM control scheme and output voltage
$(v_{com} < 0)$



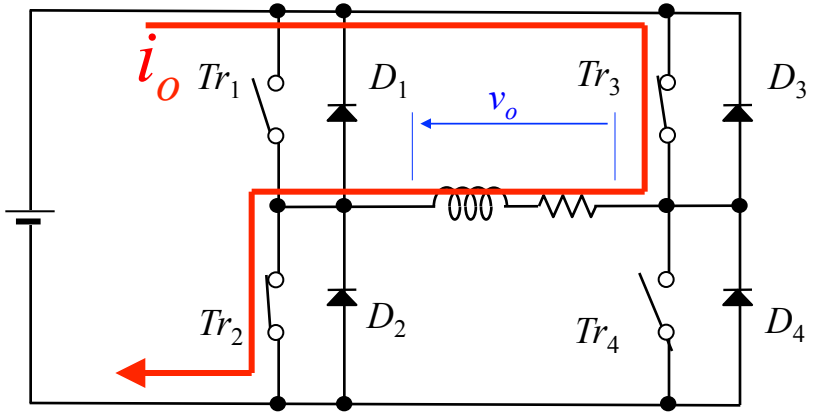
(a) $i_o > 0$, Tr_1, Tr_4:ON, Tr_2 , Tr_3 :OFF, $v_o = V_E$



(b) $i_o > 0$, Tr_1, Tr_4:OFF, Tr_2 , Tr_3 :ON, $v_o = - V_E$

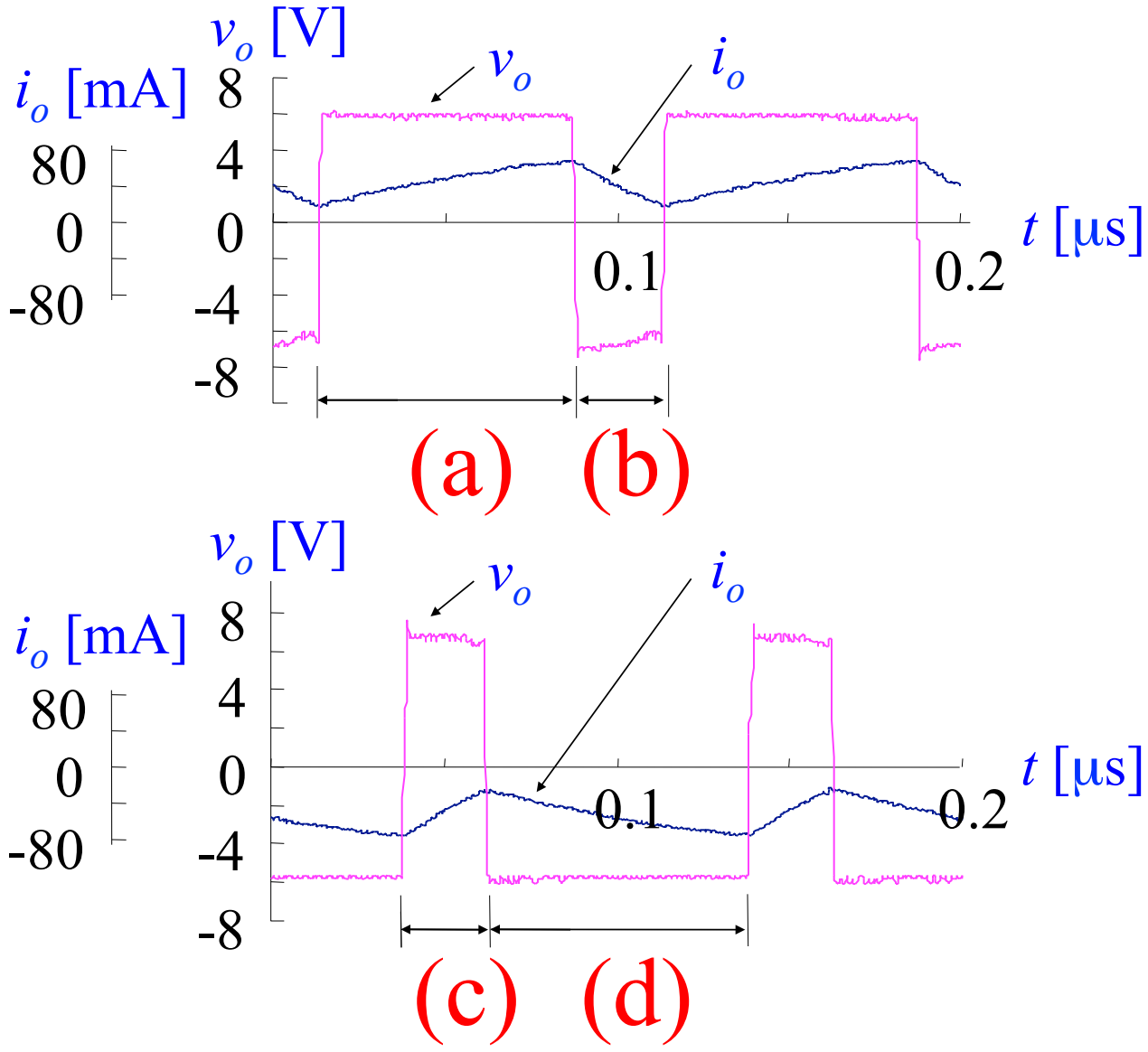


(c) $i_o < 0$, Tr_1, Tr_4:ON, Tr_2 , Tr_3 :OFF, $v_o = V_E$



(d) $i_o < 0$, Tr_1, Tr_4:OFF, Tr_2 , Tr_3 :ON, $v_o = - V_E$

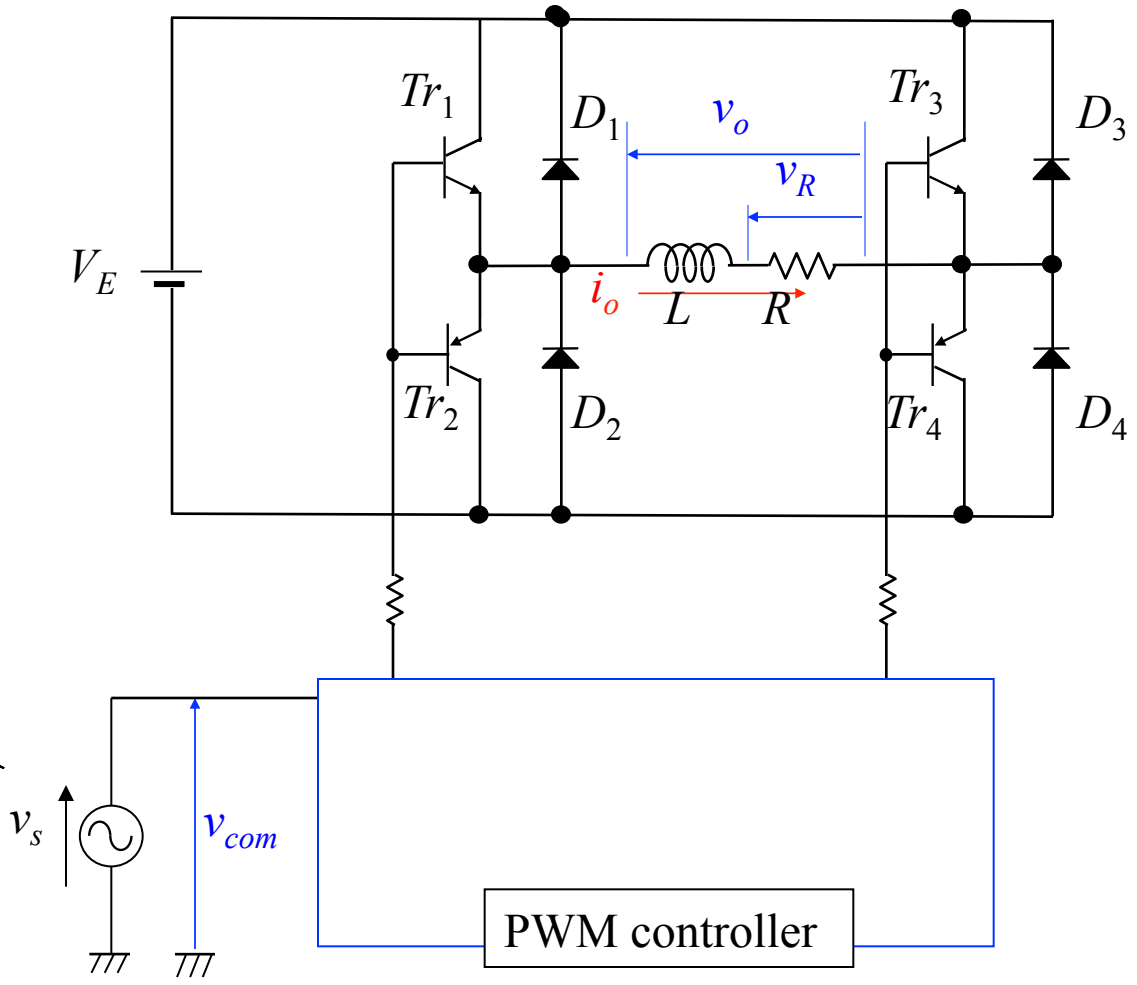
Four modes of the PWM control scheme



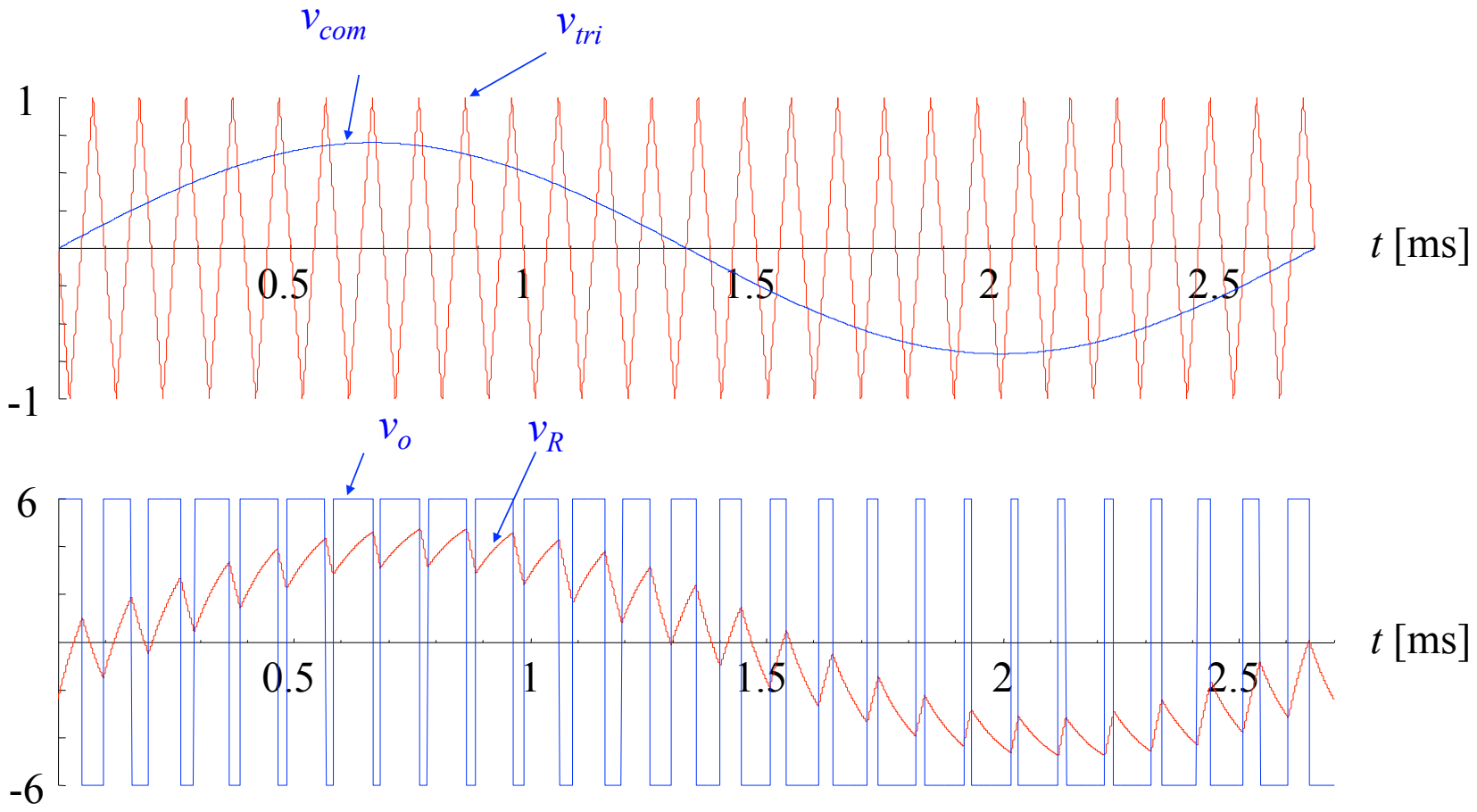
Output voltage and current of the PWM inverter

AC inverter

AC signal can be applied.



AC voltage output by a full-bridge inverter



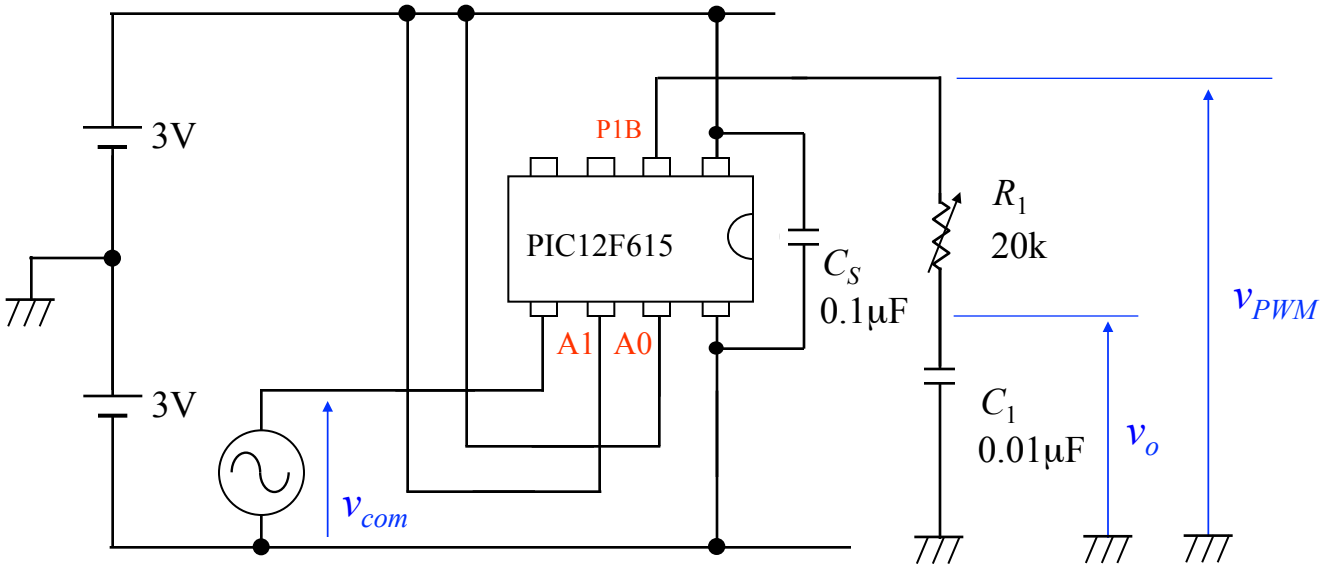
Output voltage v_o and voltage across resister v_R ($f_{com} / f_{tri} = 1/27$)

Experiment

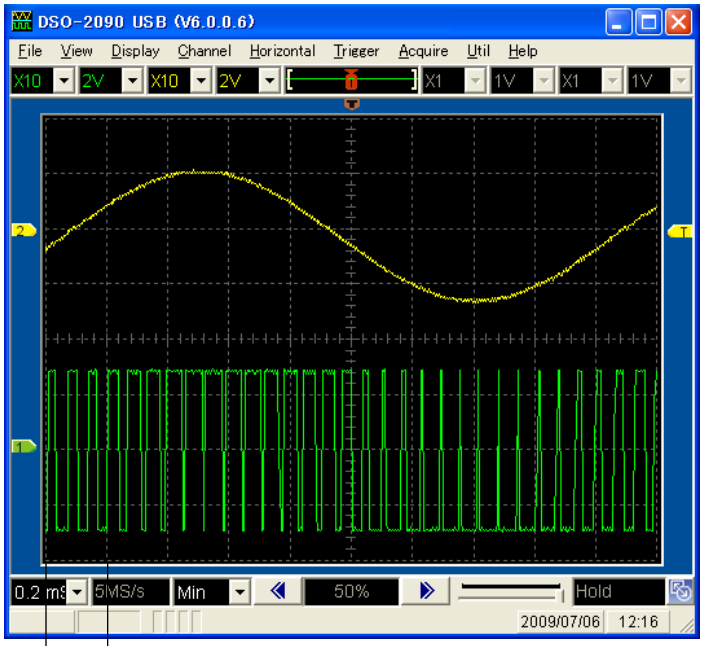
$f_{com} / f_{tri} = 1/27$

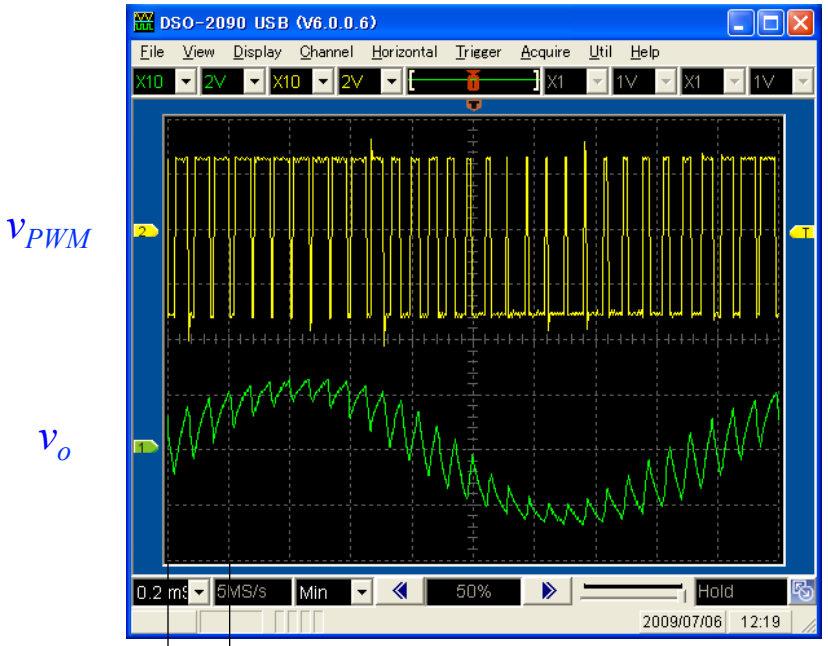
$f_{com} = 555$ [Hz]

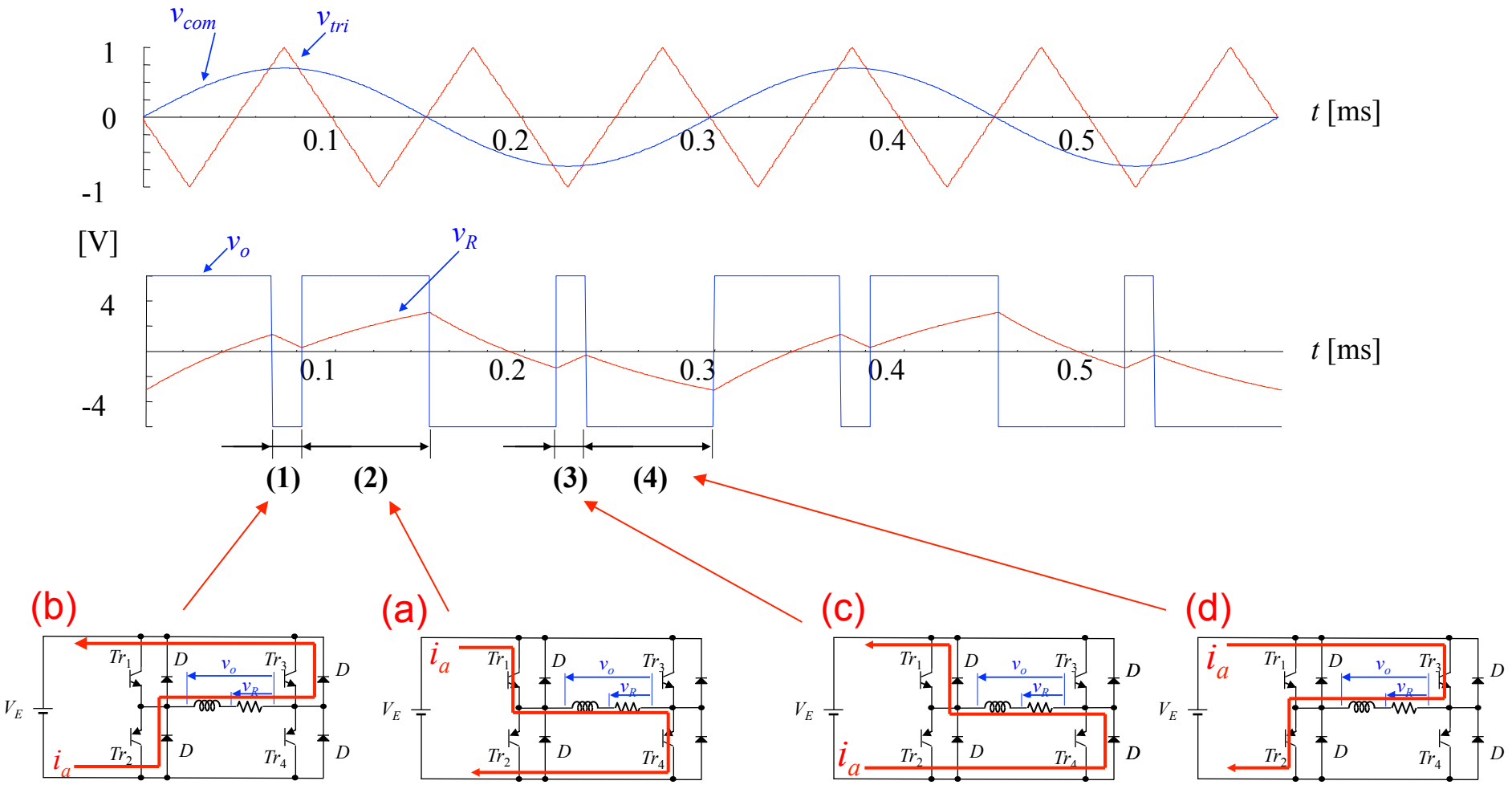
$f_{tri} = 15$ [kHz]



(A1 A0 = 11)







Four modes of the PWM control scheme