Answer to question about AN2450

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AN2450 question

- From equation (40) and (41) we get relationship (a):

(40) $I_{ZVS} = C_{ZVS}\frac{V_{dc}}{T_D}$

(41) $I_{ZVS} = \sqrt{2}I_{rt}sin\Phi$

➔ $sin\Phi = \frac{C_{ZVS}V_{dc}}{\sqrt{2}I_{rt}T_D}$ (a)

- From equation (3) and (42) we get relationship (b):

(3) $V_{i.FHA} = \frac{\sqrt{2}}{\pi}V_{dc}$

(42) $I_{act} = I_{rt}cos\Phi = \frac{P_{in}}{V_{i.FHA}}$

➔ $cos\Phi = \frac{\pi P_{in}}{\sqrt{2}I_{rt}V_{dc}}$ (b)

AN2450 question

- From relationships (a) and (b) we get the equality in equation (45):

$$tan\Phi = \frac{sin\Phi}{cos\Phi} = \frac{C_{ZVS}}{\pi T_D}\frac{V_{dc}^2}{P_{in}}$$

- From a physical stand point, the resonant tank current anticipation (with respect to the half bridge node ➔ i.e. the angle Φ and therefore also tanΦ) has to be at least what calculated by the above relationship.

- The meaning is that, in order to get ZVS, the resonant tank recirculating current (I_{ZVS}) has to be sufficiently high (far from zero) during the time period during which the HB node swings rail-to-rail.