Quasi resonant converter pdf

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The almost resonant flyback converter is a variant of the flyback converter, where it uses parasit elements to partially resemble the resonance function. According to the dictionary, the word quasi can refer in part, in part, in relative terms or proportionally. So seemingly resonance means partial resonance, not total resonance. With a light load, the Quasi resonance flyback operation is in DCM. However, it comes closer to border or transition mode under full load. It's one thing how an almost resonant flyback works compared to a flyback converter. Read also How the Flyback Converter works – Action and principle to compare both functions. Using a basic flyback converter The basic function of an almost resonant flyback is just like a flyback converter. It stores energy in the quantities during the switched-on cycle. It transfers stored energy to the secondary during the switching cycle. To explain in detail how the flyback converter works, see How the flyback converter works - action and principle. The difference between flyback converter and Quasi Resonant Flyback operation in terms of circuit diagram they are the same. They have the same parts, too. The differences are in its operation and driver type. The Flyback converter can be used in three operating modes in the same way as quasi-resonance. For more information about flyback converter operating modes, see Quasi Resonant Flyback modes. However, an almost resonant flyback can switch on the on/off switch at the lowest drain voltage. The flyback converter can't do this and instead only offers a hard change. The flyback converter can have a fixed frequency, while an almost resonant flyback can have a variable frequency. The almost resonant flyback desperately needs a correctly selected primary induction than the flyback converter needs. Advantages of quasi Resonant Flyback Converter Compared to Flyback Converter It offers lower switching losses especially when connected to the lowest valley point After it is able to connect the lowest valley, it can behave as partial resonance and with this EMI is better Partial resonance actions are performed with parasitic elements, so the number of add-ons no longer increases. It can handle multiple outputs Wide pitching range It has a better transient responseEasier to compensate for the inconvenience quasi resonant flyback If you can't connect the lowest valley, its advantage of low switching loss is compensated for or even over the effect of higher peak currents, as it operates within the DCM range It may require higher capacitive output as it operates in the DCM range Not usually recommended for reference applications above 100 watts between True Resonant Converter and Quasi Resonant Flyback Converter in the Actual Resonance Converter , the current is blue-shaped. The connection occurs when the drainage voltage is zero. The actual resonance converter has a resonance inducer and a capacitor (although sometimes the resonance inductor can be led by a transformer leak). On the one hand, the almost resonant flyback converter, on the other hand, the current is not blue-shaped, but triangular in shape. The connection is made at the lowest drainage voltage (valley connection). Also in the almost resonant flyback, parasitic elements (parasitic induction and circuit capacity) perform resonance actions. Quasi Resonant Flyback Converter Equivalent Circuit Diagram Below is a detailed circuit of the apparent resonant flyback converter. Lm – this is a magnetizing inductive for the transfer of energy storage to the load Llk – this is the inductive of primary leakage. This stores energy that cannot be transferred to the secondary side. Cd – this is a draining condensation consisting of Coss, stray capacitance, intra coaking capacitance and other Quasi resonance Flyback Schematic Resonant Frequencies Quasi resonance flyback converter has two resonant frequencies. 1. Combination of Llk and Cd. This is happening from higher frequencies. 2. Combination of Lm+Llk and CD. This is happening at a lower frequency. How Quasi Resonant Flyback works – Quasi Resonant Flyback Operation Quasi resonant flyback is designed in the DCM area. In a dead time, energy no longer exists. This leads to natural vibration, such as a second-class system. This vibration is due to the combination of Lp and Cd in the above image. Almost resonant Flyback Valley Switching Where; Ton – THE ON time when the primary charge Tfb – flyback time or time when primary energy is transferred to the secondary Toff – the total time when the switch is not ledTd – dead time or idle timeT – period (1/Fsw)Vref – reflected voltageVin – the input voltage Kvasi resonance function occurs in the orange zone with the waveform above. Responsible for this are Lp and Cd. They are the primary inductive and parasitic capacity. The converter can be switched on again at any time during these vibrations. However, the best time to turn on is when VDS is at the minimum level. This is called the minimum valley exchanger. At this point, the turnover losses are small. An important role of the controller in the operation of quasi Resonant Flyback A very important part of the operation of the almost resonant flyback is the controller. The best result when using an almost resonant flyback is when it is able to operate at the lowest valley point. At this point, the turnover losses are small. However, this is not possible if the controller is not doing his or her job. The virtual resonant flyback operation will not work if the correct driver is not selected. Therefore, the controller must be able to detect minimum voltage before switching on mosfet. Switching in the minimum valley reduces loss and helps improve EMI. In common cases, the controller allows more than one valley point before it switches on the power switch or MOSFET again in the circuits above. This is not a problem because the load is small. However, with larger loads, the regulator should turn on the on/off switch in the first valley for optimal performance. Quasi Resonant Flyback controller types Free-to-drive QR controller This control type forces the power switch to always be switched on in the first valley. This increases the frequency when the load decreases. At some point, however, a fixed frequency function (reaching the maximum limit) will occur. Ideal QR controller This type of control turns on mosfet power at different valley points, such as the first, second, third, etc., depending on the load. The first valley change takes place only with a certain load (usually designed for a higher load). The frequency increases as the load increases and decreases as the load decreases. How Quasi Resonant Flyback Works – Turning on First Valley The best point to turn on the on/off switch is in the first valley. It has several advantages. Like lower switching lossesBetter EMI response The following derivatives format equations that can be used to select key parameters for the apparent resonant flyback converter. Where; Ton – the time when the switch is ONTfb – the time when the energy is transferred to the secondaryTv valley time (or dead time)Toff – the total time when the switch is OFFT – the switching cycle Replace eq. 2, 3 and 4 eq.1 and connect to eq. 5. When this equation is used, the switching element is turned on at the first valley minimum. Where; Lp – Primary inductancePin – Input Power – Input voltageVref – reflected in voltageFr – Lp and Cd Skip resonance frequency to main content P. Vinciarelli, forward converter switching to zero power, U.S. Patent 4,415, 959, November 1983.Google ScholarK. Liu, R. Oruganti and F. C. Lee, Resonant Switches: Topologies and Features, IEEE Power Electronics Specialists Conference, 1985 Record, 106-116.Google ScholarM. F. Schlecht and L. F. Casey, Comparison of Square-Wave and Quasi-Resonant Topologies, IEEE Applied Power Electronics Conference, 1987 Record, 124-134.Google ScholarK. Liu and F. C. Lee, zero voltage switching technology for DC-DC converters, IEEE Power Electronics Specialists Conference, 1986 Record, 58-70.Google ScholarW. A. Tabisz and F. C. Lee, zero-voltage multi-resonant technology – a new approach to improve the performance of high frequency quasi-resonant converters, IEEE Power Electronics Konferenssi, 1988 Record, s. 9-17.Google ScholarW. A. Tabisz, M. M. Jovanovic ja F. C. Lee, High Frequency Multi-Resonant Converter Technology and Its Applications, IEE International Conference on Power Electronics and Variable Speed Drives, 17.-19.7.1990, s. 1 - 8.Google ScholarR. Farrington, M. Jovanovic ja F. C. Lee, vakiotaajuus nollajännitteellä kytketyt monijännitteiset monijännitteiset muuntimet: analyysi, suunnittelu ja kokeelliset tulokset, IEEE Power Electronics Specialists Conference, 1990 Record, s. 197-205.Google ScholarR. Redl, B. Molnar ja N. Sokal, luokka E Resonant Säännellyt Dc-Dc-tehomuuntimet: Toiminnan ja kokeellisten tulosten analyysi 1,5 MHz: llä, IEEE-tapahtumat Power Electronicsilla, 1986, Vol. 1, No. 2, s. 111 - 120.Google ScholarN. Sokal ja A. Sokal, Luokka-E, Uusi luokka korkean hyötyvasteen virittittyjä yksipäisten kytkentätehovahvistinten luokkaa, IEEE Journal of Solid State Circuits, Vol. SC-10, kesäkuu 1975, s. 168 - 176.Google ScholarF. H. Raab, E-luokan viritettyjen tehovahvistinten idealisoitu toiminta, IEEE-tapahtumat piireissä ja järjestelmissä, vol. 24, nro 12, joulukuu 1977, s. 725 - 735.CrossRefGoogle ScholarK. D. T. no, Resonant-kytkimien ja kvasi-resonoivien dc-dc-muunninten yleistys, IEEE Power Electronics Specialists Conference, 1987 Record, s. 395-403.Google ScholarV. Vorperian, Quasi-Square Wave Converters: Topologies and Analysis, IEEE Transactions on Power Electronics, Vol. 3, No. 2, Huhtikuu 1988, s. 183 - 191.CrossRefGoogle ScholarD. Maksimovic, Nollajännitteen kytkentä quasi-neliö-aalto resonanssikytkimen suunnittelu, IEEE Power Electronics Specialists Conference, 1993 Record, s. 323-329.Google ScholarO. D. Patterson ja D. M. Divan, Pseudo-Resonant Full-Bridge Dc–Dc Converter, IEEE Power Electronics Specialists Conference, 1987 Record, s. 424-430.Google ScholarY. Jang, uudet Quasi-Square Wave ja Multi-Resonant Integrated Magnetic Zero Voltage Switching Converters, IEEE Power Electronics Specialists Conference, 1993 Record, s. 721-727.Google ScholarV. Vorperian, R. Tymerski ja F. C. Lee, vastaavat piirimallit resonantti- ja PWM-kytkimille, IEEE-transaktiot tehoelektroniikalla, vol. 4, nro 2, huhtikuu 1989, s. 205 - 214.CrossRefGoogle Scholars. Freeland ja R. D. Middlebrook, resonanttivaihteilla yhdistetty muunninanalyysi, IEEE Power Electronics Specialists Conference, 1987 Record, s. 20-30.Google ScholarA. Witulski ja R. Erickson, valtion tilan keskiarvon laajentaminen resonoimattomiin kytkimiin – ja sen jälkeen, IEEE-tapahtumat power electronicsilla, vol. 5, nro 1, s. 98 - 109, tammikuu 1990.CrossRefGoogle ScholarD. Maksimovic ja S. Cuk, yleisnäkemys kvasi-resonoivien muunninten synteesiin ja analysointiin, IEEE-liiketoimet tehoelektroniikalla, vol. 6, nro 1, tammikuu 1991, s. 127 - 140.CrossRefGoogle ScholarR. Erickson, A. Hernandez, A. Witulski ja R. Xu, A Nonlinear Resonant Switch, IEEE on Power Power Vol. 4, nro 2, huhtikuu 1989, s. 242 - 252.CrossRefGoogle ScholarI. Barbi, D. Martins ja R. DO Prado, Nonlinear Resonant Inductorin vaikutukset nollajännitteen kytkennän kvasi-resonoivien muunninten käyttäytymiseen, IEEE Power Electronics Specialists Conference, 1990 Record, s. 522-527.Google ScholarS. Freeland, minä. Muunninten yhtenäinen analyysi resonanttivaihtimilla, II. Tulovirran muotoilu yksivaiheisiin ac–dc-tehomuuntimistimia varten, ph.D. Thesis, California Institute of Technology, 1988.Google Scholar