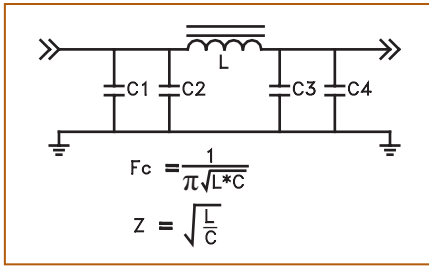


Magnetic Terms and Measurement

1. Short form explanation:

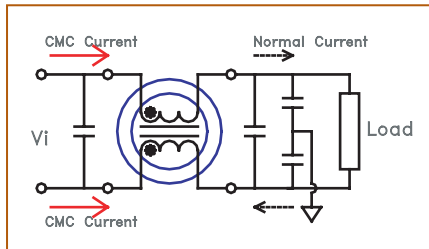
- OCL = Open Circuit Inductance, in μH or mH
- L or L_p = Primary Inductance, in μH or mH
- L_L = Leakage Inductance, in μH
- C_{ww} = Interwinding Capacitance, in pF
- C_d = Distributed Capacitance, in pF
- DCR = Direct Current Resistance, in Ω
- DWV = Dielectric Withstanding Voltage, in DCV
- Hipot = High Potential Isolation, in ACV
- SRF: Self Resonance Frequency, in KHz or MHz
- I_M = Magnetization Current, in mA
- I_{DC} = L_p drops 10%* typical from initial value at this DC current
- I_{RMS} = Typical ΔT of 40°C* rise at this RMS current
- I_{SAT} = same as I_{DC} , different terms
- IL = Insertion Loss, in dB
- RL = Return Loss, in dB
- CMRR = Common Mode Rejection Ratio, in dB
- DCMR = Differential Mode to Common Mode Rejection Ratio, in dB
- Xtalk = Cross Talk, in dB

2. Differential Choke for RFI.



F_c = Cut off Frequency
(Normally = -3dB)
L = Total Inductance
C = Total Capacitance
Z = Impedance
 $\pi = 3.14$

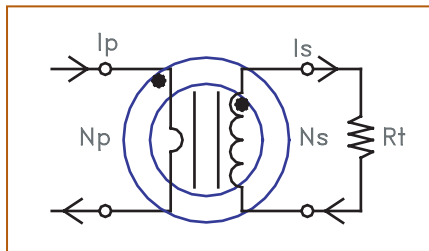
3. Common Mode Choke for EMI



F_c = Corner Frequency
D = Damping factor
(normally = 0.707)
 $L = (R_{load} * D) / (\pi * F_c)$
 $C = 1 / ((\pi * F_c)^2 * L)$

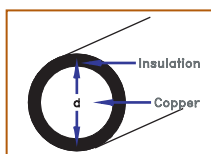
- A. Magnetic Flux caused by common mode current is accumulated to produce impedance
- B. Magnetic Flux caused by differential mode current cancels each other so none or very little impedance is produced.

4. Current Transformer



$I_p * N_p = I_s * N_s$
If $N_p = 1, I_p = I_s * N_s$
 $V_{out} = I_s * R_t$
 $V_{out} = V_{ref}$
 $R_t = V_{ref} * N_s / I_p$

4. Straight Wire Inductor



OCL = inductance in μH
L = length of wire, in cm
d = diameter of wire, in cm

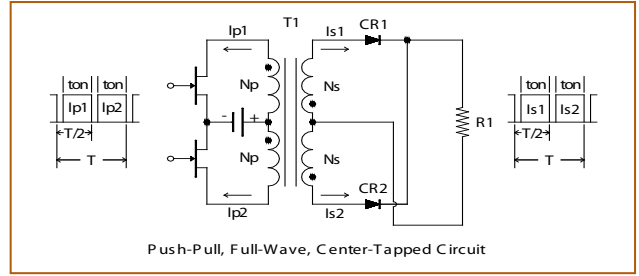
$$OCL = 0.002 * L * [2.3 * \log(4 * L / d - 0.75)] \mu\text{H}$$

The insulation thickness of the wire plays an important role of inductance over rod core and aircoil. At the same time, the leakage inductance interwinding capacitance is counting on the distance between 2 wires distance from center to center of the copper.

Please contact MPS for more magnetic technical information.

Application Notes on Transformers

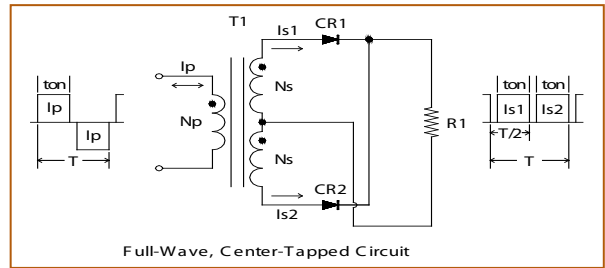
1



Push-Pull, Full-Wave, Center-Tapped Circuit

$$P_t = P_o (\sqrt{2/\eta} + \sqrt{2}) \text{ Watts}$$

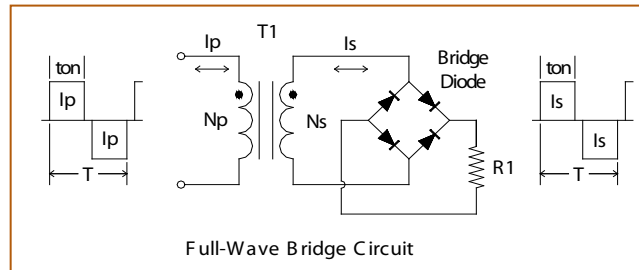
2



Full-Wave, Center-Tapped Circuit

$$P_t = P_o (1/\eta + \sqrt{2}) \text{ Watts}$$

3

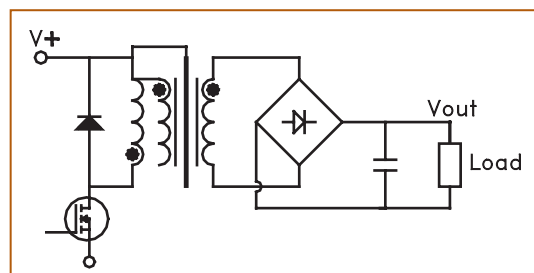


Full-Wave Bridge Circuit

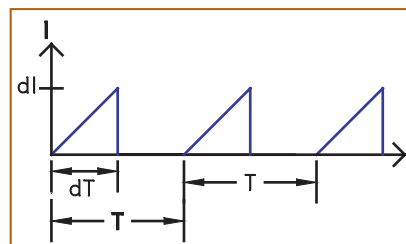
$$P_t = P_o (1/\eta + 1) \text{ Watts}$$

Where P_t = Apparent Power, P_o = Output Power, η = Efficiency

4 Flyback transformer with flux band and shield connection



- Connecting the Flux Band and Faraday shield to V_{High} other than ground will give better result on EMI suppression.
- Diode helps to reduce the flywheel effect on transformer.



Calculation of OCL

$$E(J) = \frac{1}{2} * L * I^2$$

$$e = L * (dI/dT)$$

$$L = (e * dT) / dI$$

$$dI = (e * dT) / L$$

$$E(\text{Joule}) = \frac{1}{2} * L * (e * dT / L)^2$$

$$E(\text{Joule}) = (\frac{1}{2} * e^2 * T^2) / L$$

Please contact MPS for more magnetic technical information.