

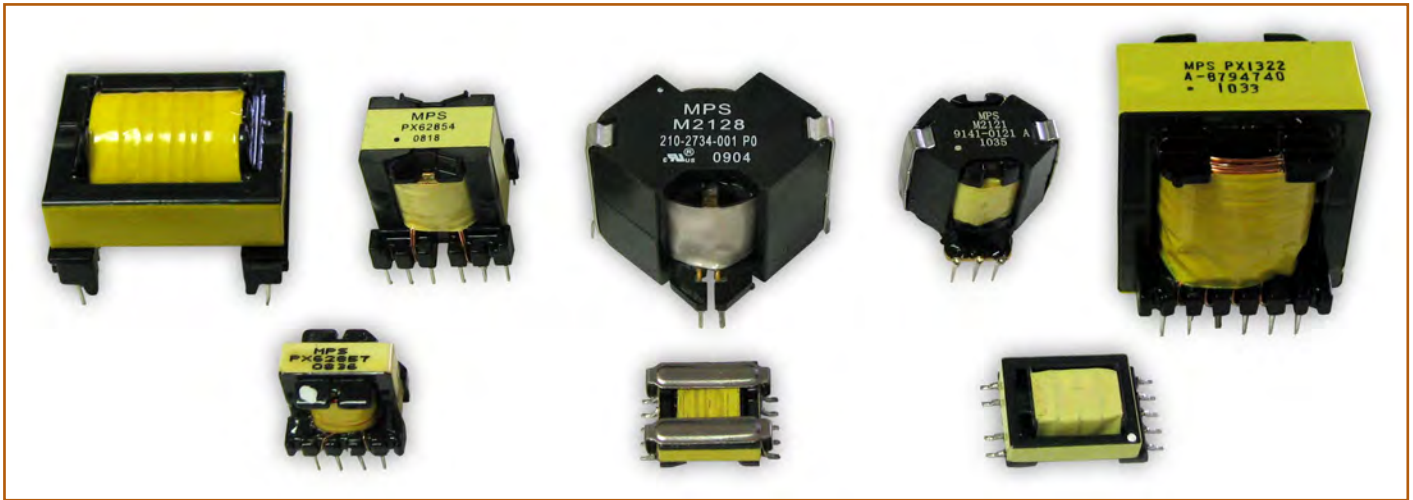


# MAGNETIC COMPONENTS

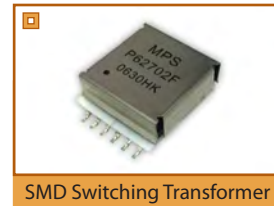


Our line of magnetic components covers a wide array of products and applications to meet all your project needs on magnetics.

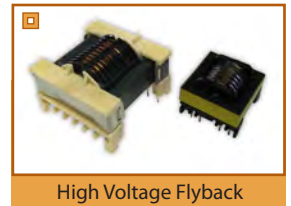
## SWITCHING POWER SUPPLY (SMPS) TRANSFORMERS



**Power Output:** 1 Watt to 1,000 Watts  
**Switching Frequency:** 10KHz to 5MHz  
**Topology:** Full Range  
**Package:** Surface Mount and Thru Hole  
**Material:** UL94V-0, Class A to Class N  
**Compliance:** RoHS and REACH  
**Construction in compliance with:** VDE, CSA, IEC60950, IEC 61558, and UL60601 (subjected to customer request)



SMD Switching Transformer

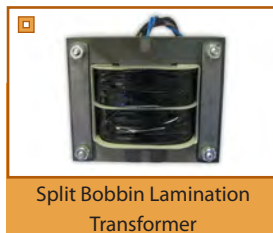


High Voltage Flyback Transformer

## LINEAR TRANSFORMERS | EE, EI AND TOROIDAL TYPE

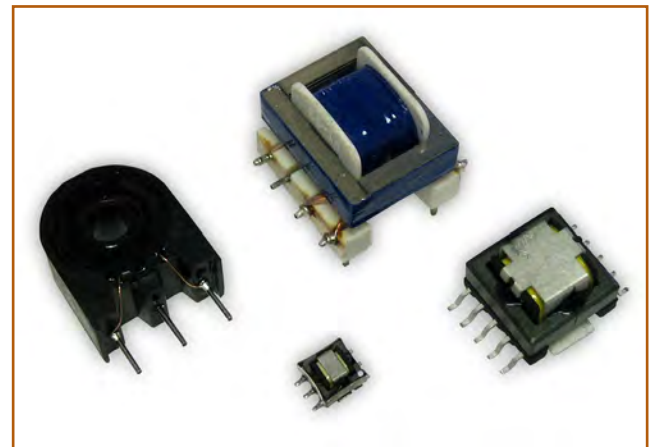


**Power Output:** 1 Watt to 1,000 Watts  
**Operating Frequency:** 50Hz to 400Hz  
**Topology:** Traditional  
**Package:** Surface Mount and Thru Hole  
**Material:** UL94V-0, Class A to Class F  
**Compliance:** RoHS and REACH  
**Construction in compliance with:** VDE, UL, CSA



Split Bobbin Lamination Transformer

## CURRENT TRANSFORMER | EI AND TOROIDAL TYPE



**Current Capacity:** 0.1A to 100A  
**Operating Frequency:** 50Hz to 500KHz  
**Accuracy:** up to  $\pm 0.2\%$   
**Package:** SMD and Thru Hole  
**Material:** UL94V-0, Class A to Class H  
**Compliance:** RoHS and REACH



1000:1 Current Transformer

## POWER INDUCTORS



**Current Capacity:** 1mA to 50A

**Operating Frequency:** DC to 10MHz

**Package:** SMD and Thru Hole, Radial and Axial

**Material:** UL94V-0, Class A to Class N

**Compliance:** RoHS and REACH

**Application:** AC Flux Choke, Differential Choke, Filter, Buck/Boost Converter, PFC Inductor

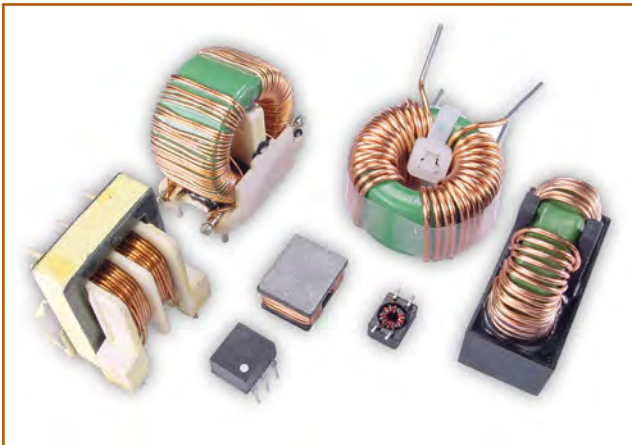


SMD Self-Leaded Inductor



SMD High Current Inductor

## COMMON MODE CHOKES



**Current:** Up to 50A, Single phase and Three Phase

**Inductance:** Up to 100mH

**Operating Frequency:**

Up to 100MHz

**Package:** SMD and Thru Hole

**Material:** UL94V-0, Class A to Class F

**Hipot:** Up to 4KV<sub>RMS</sub>

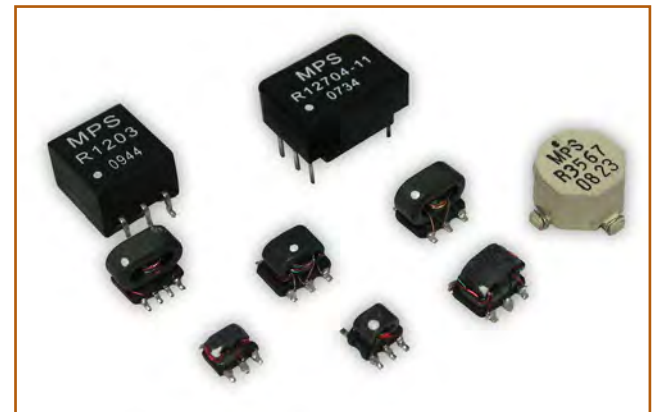
**Compliance:** RoHS and REACH



Three Phase CMC

## RF and BALUN TRANSFORMER

IMPEDANCE MATCHING, FREQUENCY MIXER AND DIRECTION COUPLER



**Frequency:** Up to 3GHz

**Impedance Ratio:**

Subject to request

**Package:** SMD and Thru Hole

**Material:**

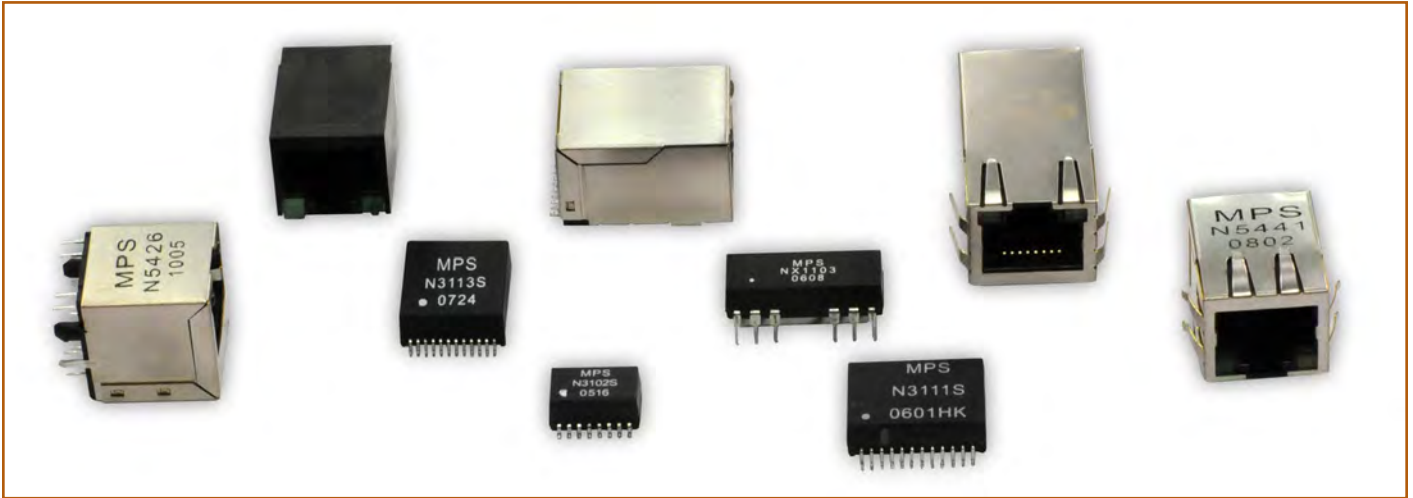
UL94V-0, Class A to Class F

**Compliance:** RoHS and REACH



Audio Transformer

## LAN AND RJ45 WITH MAGNETIC MODULES



**Application:** 10 BASE-T, 10/100 BASE-T, Gigabit, PoE

### RJ45 with Magnetic Module:

Vertical, Horizontal, SMD, 1xN, 2xN, USB Combo

Meets and exceeds IEEE 802.3 requirements

**Operating Temp:** 0°C to 70°C, extended temperature range available upon request

**Compliance:** RoHS and REACH compliance

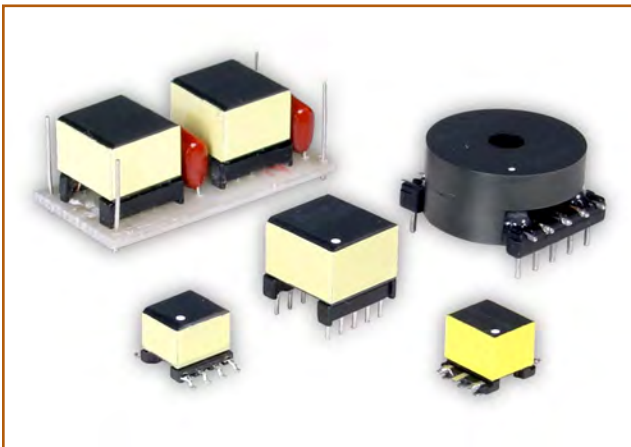


Verticle Mount RJ45



Surface Mount RJ45

## ADSL, HDSL, SHDSL AND VDSL



**Baud Rate:** Up to 100Mbps

### Harmonic Distortion:

Extremely low

**Package:** SMD and Thru Hole

**Isolation:** IEC950 Basic and Supplementary

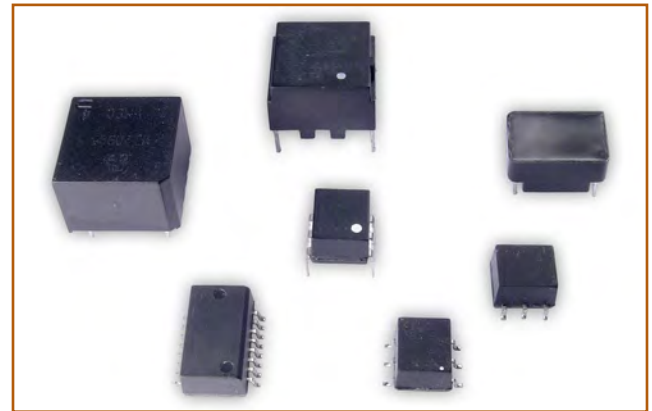
**Compliance:** RoHS and REACH



VDSL2 Transformer

## OTHER TELECOM TRANSFORMER

T1/E1, ISDN, T3/E3, E4/STM-1, FIBRE CHANNEL



**Baud Rate:** Up to 155Mbps

### Harmonic Distortion:

Extremely low signal distortion

Meets and exceeds CCITT G703

**Package:** SMD and Thru Hole

**Material Insulation:**

UL94V-0, Class B to Class F

**Compliance:** RoHS and REACH



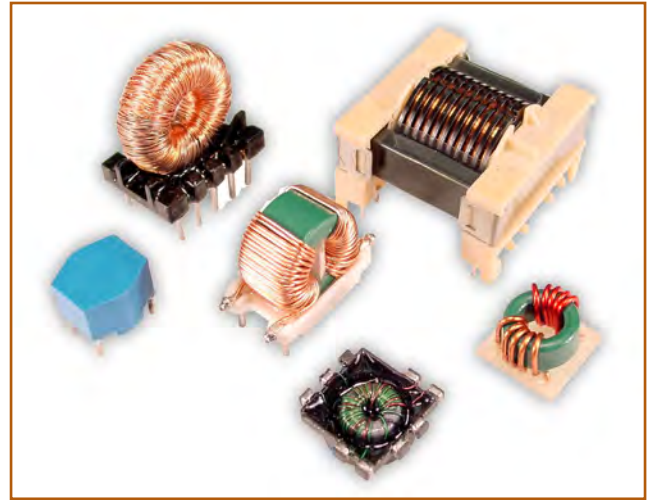
Telecom T3/E3 SMD

## Video Isolation Transformers



- Frequency:** 10Hz to 12MHz  
**Package:**  
 Shielded Enclosure or Open frame
- Different sizes for special requirements
  - 75Ω:75Ω, 75Ω: 100Ω and custom impedance
  - RoHS and REACH Compliance

## MEDICAL GRADE MAGNETICS



- Medical Grade Transformer constructed to comply with IEC60950 and UL60601 Reinforced Isolation
- Designed to support Video, Telecom and Power applications
- Power from 1 Watt to 1000 Watts
- Switching frequency from 10KHz to 1MHz
- Other safety requirements subject to request
- RoHS and REACH Compliance



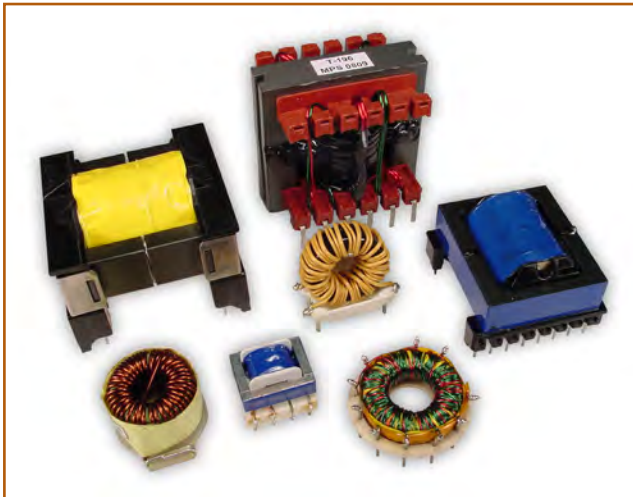
IEC950 Transformer

## DIGITAL AUDIO TRANSFORMER



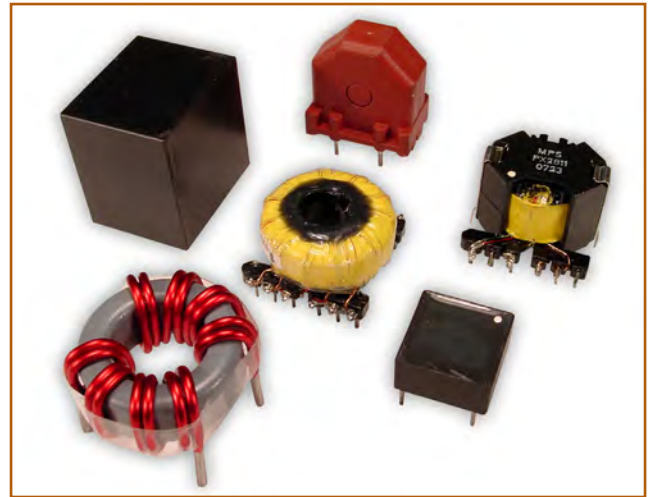
- Shielded and non shielded version available
- Low leakage, low capacitance and low distortion
- Compatible to AES/EBU and SPDIF
- RoHS and REACH Compliance

## Automotive



- Complies with Automotive and Industrial Standards PPAP, MSDS and Reliability Testing
- Supports -40°C to +130°C and better
- Custom Design and Manufacturing of Transformers, Common Mode Chokes, Power Inductors and Current Transformers
- Material Insulation: UL94V-0, Class B to Class H
- RoHS and REACH Compliance

## Military and Aerospace



- Solderability:** MII-STD-202, 208D  
**Applicable standards:**  
 MIL-STD-1553B
- Designed and Manufactured in the USA
  - Solder: Sn60Pb40 or SN63Pb37
  - 100% Testing per MII-PRF-27
  - Cage Code: 4QGP2



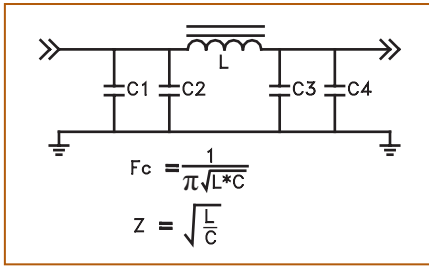
Military Pulse Transformer

# Magnetic Terms and Measurement

## 1. Short form explanation:

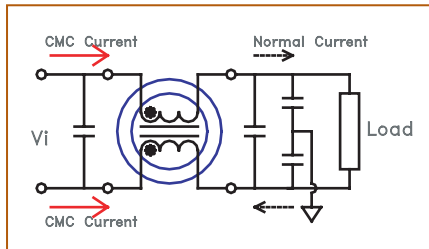
- OCL = Open Circuit Inductance, in  $\mu\text{H}$  or  $\text{mH}$
- L or  $L_p$  = Primary Inductance, in  $\mu\text{H}$  or  $\text{mH}$
- $L_L$  = Leakage Inductance, in  $\mu\text{H}$
- $C_{ww}$  = Interwinding Capacitance, in  $\text{pF}$
- $C_d$  = Distributed Capacitance, in  $\text{pF}$
- DCR = Direct Current Resistance, in  $\Omega$
- 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  $\Delta T$  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  
 $\pi = 3.14$

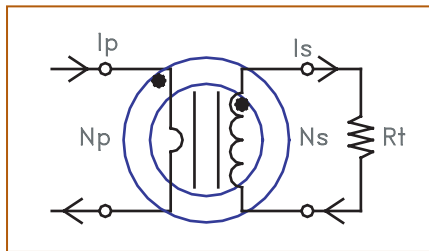
## 3. Common Mode Choke for EMI



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

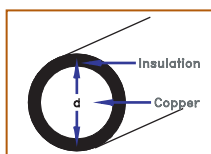
- A. Magnetic Flux caused by common mode current is accumulated to produce impedance
- B. Magnetic Flux caused by differential mode current cancels each other so none or very little impedance is produced.

## 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

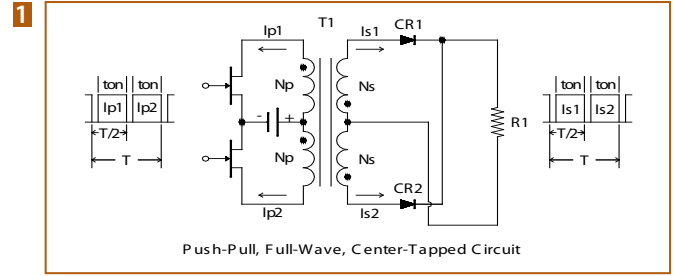


OCL = inductance in  $\mu\text{H}$   
L = length of wire, in cm  
d = diameter of wire, in cm

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.

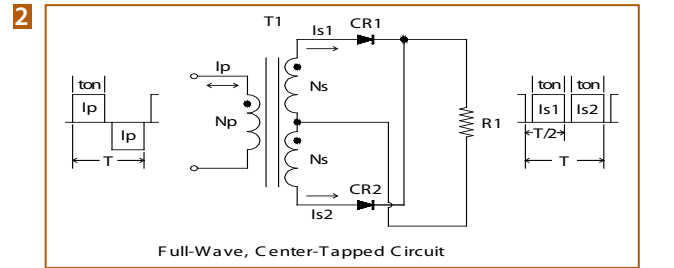
Please contact MPS for more magnetic technical information.

# Application Notes on Transformers



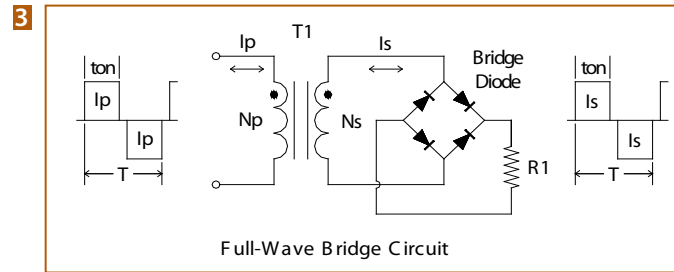
Push-Pull, Full-Wave, Center-Tapped Circuit

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



Full-Wave, Center-Tapped Circuit

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

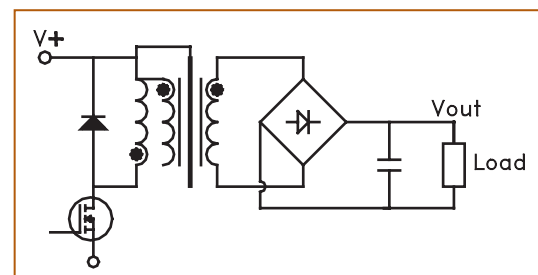


Full-Wave Bridge Circuit

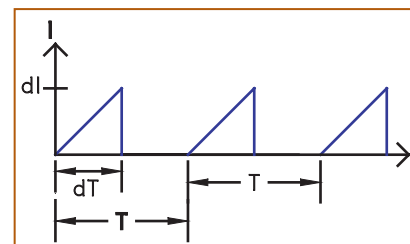
$$P_t = P_o (1/\eta + 1) \text{ Watts}$$

Where  $P_t$  = Apparent Power,  $P_o$  = Output Power,  $\eta$  = 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.