

Definitions

Key

- Definitions are provided as a convenient reference for our customers.
- Definitions apply to filters and magnetics parameters
- The 10Base-T and Token Ring topologies operate at 10Mbps and 4/16Mbps respectively over unshielded twisted pairs.
- Sending data over unshielded twisted pair wires requires a MAU (Medium Access Unit) that includes some filtering at the receive and transmit ends of each link segment; this is necessary to ensure meeting EMI compatibility standards such as those of the FCC and VDE as well as providing the necessary equalization and impedance matching.

Application Notes and Definitions

General Terms:

Attenuation

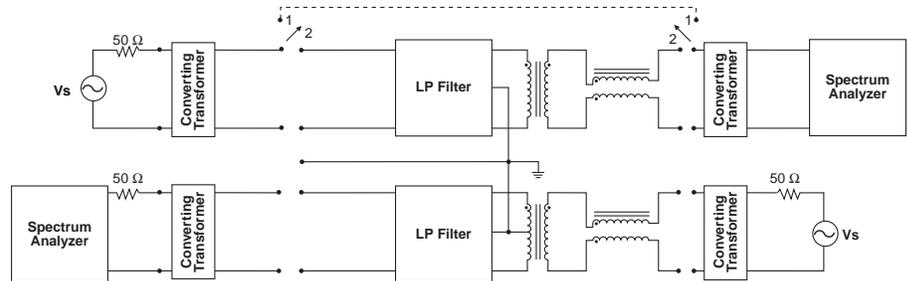
It is used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation is expressed as a scalar ratio of the output magnitude to the input magnitude and is expressed in decibels (dB).

Common Mode Impedance (Z)

The impedance measured between the input and the output of a network. This is measured with all the inputs shorted and all the outputs shorted. This impedance reduces the noise energy that causes EMI. The resulting impedance in the signal path should not modify the signal.

Common Mode Rejection Ratio (CMRR)

The ratio that defines the reduction in common mode signal (EMI). This is done with common mode impedances in the signal path and in combination with ground paths for the common mode signal. The CMRR is defined for specific range(s) of frequency.



Common Mode Signal

The signal that is in phase on both signal lines. This results in EMI. EMI can either be radiated or conducted (into the power line). Common mode signals in digital terminal equipment are created by imbalances in the signal transmission or in the conversion of differential mode signals by impedance mismatches.

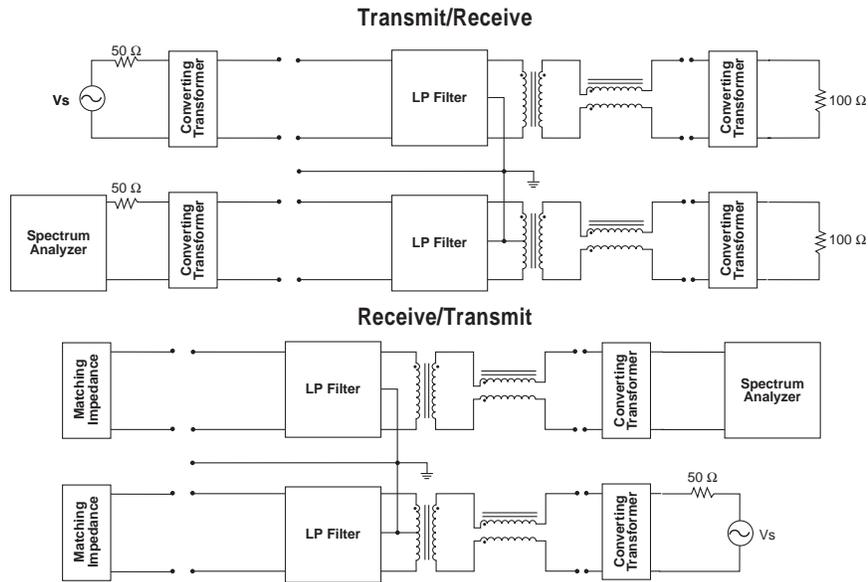
Coupling Capacitance (C_c)

Also known as *Winding Capacitance*, Coupling Capacitance appears as a capacitance between windings. It is related to the relative distances between the windings and their effective longitudinal cross-sectional areas. Typically, it is measured at 100 KHz and 20 mV.

Definitions

Crosstalk

Crosstalk measures undesirable energy coupled on a signal path from another nearby signal path. The value is expressed in decibels (dB) as a ratio of coupled voltage on a susceptible cable to the voltage on a nearby source.



Dielectric Withstanding Voltage (DWV)

Isolation or Hipot is the ability of the transformer to withstand a specific breakdown voltage between the primary and the secondary windings. The typical measurement is done with an RMS voltage at 60 Hz @ 1 minute.

Differential Mode Signal

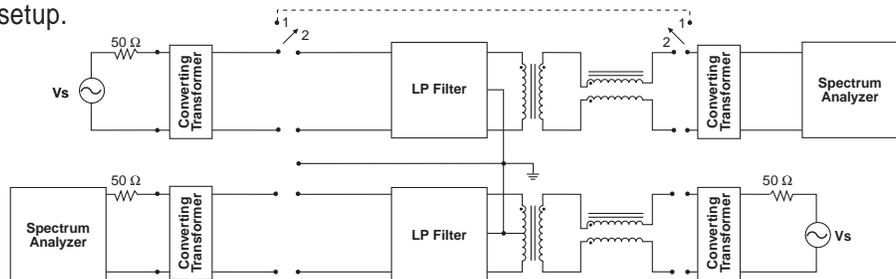
The data that is being sent. These signals are of equal amplitude and out of phase, thus no radiation occurs.

Electro Magnetic Interference (EMI)

EMI represents unwanted signals that are radiated or conducted to susceptible signal paths thus interfering with the proper function and performance of the transmission.

Insertion Loss

Insertion loss is the decrease in power delivered to the load when a filter is inserted between the source and the load. The figure below shows the testing setup.



Insertion loss is expressed by
$$I_{LdB} = 10 \log \frac{P_{L1}}{P_{L2}}$$

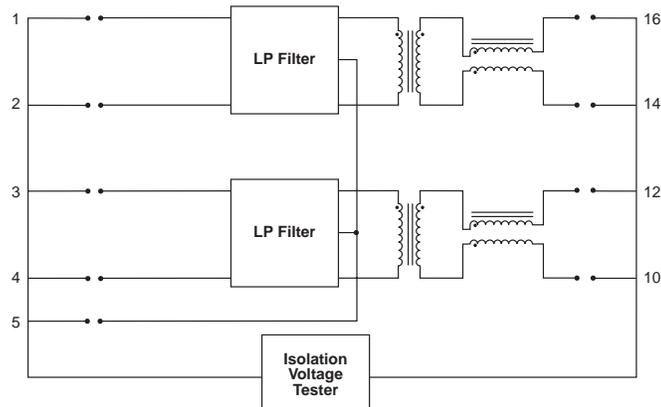
where P_{L1} is the power delivered to the load with both switches in position 1 with the filter bypassed. P_{L2} is the output power with both switches in position 2. This expression can also be shown in terms of amplitude voltage ratio. The decibel unit is used to express a measure of insertion loss.

$$I_{LdB} = 20 \log \frac{E_{L1}}{E_{L2}}$$

Application Notes and Definitions

Insulation Resistance (IR)

The DC Insulation Resistance describes the insulating properties of the magnetic device. The direct current insulation resistance is measured between each winding and all other windings and the core case. The measured value will be greater than a specified minimum value and is measured in Megohms at a specified DC voltage level. The voltage level is typically 500 VDC and is applied for a minimum of 10 seconds. Unless otherwise specified, the devices described in this catalog are able to meet a minimum of 10,000 Megaohms.



Leakage Inductance (L_l)

Leakage Inductance results from flux lines not commonly captured by the respective windings. Leakage determines the highest frequency for which a transformer can be used. Leakage inductance is generally measured across the primary winding with the respective secondary winding(s) short circuited.

Primary Inductance (L_p)

Inductance is measured across the primary winding with the other windings remaining open-circuit connected. Inductance is tested with a *sine wave*, unless otherwise stated. The test frequency and drive level is standardized at 100 KHz and 20 mV.

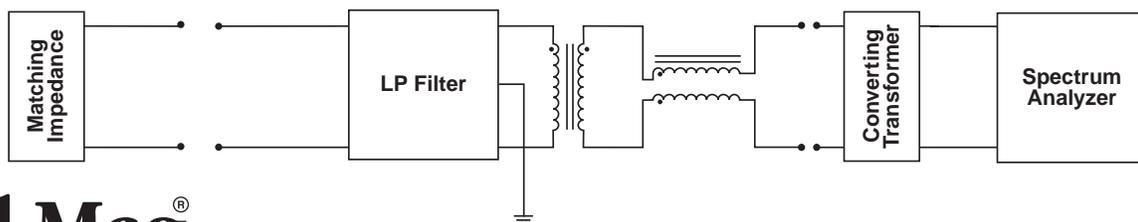
Return Loss

Return loss is a measure of dissimilarity or mismatch between a measured impedance and standard impedance, both in magnitude and phase angle. This measurement is expressed in decibels (dB). Return loss is expressed as

$$A = 20 \log \left| \frac{Z_s + Z_M}{Z_s - Z_M} \right|$$

where Z_s is the standard impedance and Z_M is measured impedance. For a perfect match, the return loss would be infinite.

$$A = 20 \log \left| \frac{V_{01}}{V_{02}} \right|$$



Definitions

Application Notes and Definitions

Transformer Terms:

Rise Time (RT)

Rise Time is measured to verify the transformer's effect on the signal waveform characteristics. It is highly dependent on leakage inductance, coupling capacitance, and circuit impedances. Rise Time is typically measured from the 10% to the 90% point of the pulse.

Series Resonant Frequency (SRF)

Frequency at which the inductive and capacitive reactance are equal and to which the following characteristics apply:

- Current is maximum at this frequency.
- The current is in phase with the generator voltage, or the phase angle of the circuit is zero.
- The voltage is maximum across either L or C alone.
- The impedance is minimum, equal only to the series resistance.

Turns Ratio

The Turns Ratio is simply the number of turns on the primary winding referenced to the number of turns on the secondary winding(s). Expressed as "Ns/Np".

Volt-Second Product (ET)

The ET product is a parameter used to measure the transformer's ability to maintain and support a pulse signal without saturating the core. It is determined as the product of the voltage applied at the primary and the time required for the magnetizing current to reach 1.5 times its linear value. Values for ET are dependent on the core geometry, core material, and the number of turns on the winding.

Winding Resistance (DCR)

DCR is the resistance of the windings when measured in DC conditions. It is a function of the wire size, number of turns, and mean length of turn for the core used.

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The components on this data sheet are Fil-Mag Legacy Parts.

In the construction of the components described, the full intent of the specification will be met. Pulse, however, reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products.

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