

DEFINITIONS AND MEASUREMENT TECHNIQUES FOR TRANSFORMERS AND INDUCTORS

Open Circuit Inductance (OCL)

The Open Circuit Inductance of a transformer is determined by the core permeability and the number of turns in the winding. It affects the low frequency response of a transformer. The OCL is measured using a sinusoidal input by a LCR Meter.

Pulse Inductance (Lp)

The Pulse Inductance like the OCL is determined by the core permeability and the number of turns in the winding. The Pulse Inductance is affected by the pulse conditions used for the test.

ET Volt-Microsecond Constant

The primary ET Constant is the product of the voltage (E) applied across the primary winding and the time (T) for the magnetizing current to reach 1.5 times its linear extrapolated value. The ET Constant is a measure of the energy handling capability of a pulse transformer and is dependent upon the core, core area, the number of turns, the saturation flux density of the core material and the duty cycle of the applied pulse.

Droop

Droop is the percentage tilt of the top of a pulse and is determined by the primary pulse inductance of the transformer and the circuit impedance.

Turns Ratio

The Turns Ratio of a transformer is approximately the open circuit voltage ratio.

Rise Time (t_r)

The time required for the pulse amplitude to increase from 10% to 90% amplitude is known as the rise time of the pulse transformer. Rise Time is controlled by the dynamic parameters of the transformer and the circuit impedances.

Fall Time (t_f)

The time required for the pulse to decay from 90% to 10% amplitude is known as the fall time. Fall Time is dependent on pulse inductance, effective capacitance, core resistance and circuit impedances.

Leakage Inductance (Le)

Leakage Inductance (Le) is a function of the transformer winding geometry, which affects rise and fall times. This parameter is measured at 130 kHz on an L-C Meter used to measure Le of standard transformers.

Interwinding Capacity (Cw/w)

The Interwinding Capacity is determined by the winding geometry of the transformer and affects rise and fall times. This parameter is measured at 130 kHz on an L-C meter used to measure the Cw/w of standard transformers.

Notes

Pulse Inductance may be determined by measuring magnetizing current.

Apply a pulse to the primary winding with all other windings open circuited as shown in Fig.1, and monitor on an oscilloscope. The magnetizing current is easily measured from a linear part of the magnetizing current slope. The measurement interval is between point T₁ and T₂. L_p may be determined using the follow equation,

$$L_p = E \frac{T_2 - T_1}{I_2 - I_1}$$

Where E is the pulse amplitude at 1 volt with 0.4μSec at PRR = 1MHz.

