



# **Magnetics modules and RJ45 Jacks for LAN applications**

Terms and definitions

Date:                      October 2008

© EPCOS AG 2008. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

## Magnetics modules and RJ45 Jacks for LAN applications

### Terms and definitions

<b>10 Base-T</b>	IEEE 802.3 physical layer specification for a 10 Mbit/s CSMA/CD local area network over two twisted-pair telephone wires (IEEE 802.3 clause 14).
<b>100 Base-T</b>	IEEE 802.3 physical layer specification for a 100 Mbit/s CSMA/CD local area network. 100 Base-T summarizes specifications using different cables. The most commonly used specification is 100 Base-TX, which works over two pairs of Category 5 unshielded twisted pair (UTP) or shielded twisted pair (STP) wire.
<b>1000 Base-T</b>	IEEE 802.3 physical layer specification for 1000 Mbit/s CSMA/CD local area network using four pairs of Category 5 unshielded twisted pair cable (UTP).
<b>Auto MDIX</b>	Automated detection of MDI and MDIX devices
<b>BST</b>	Bob Smith Termination – BST is integrated in most RJ45 Jacks. This network provides a matching impedance to the common-mode characteristic impedance of a Cat5 cable, which prevent the cable acting as a resonant antenna.
<b>CAT5</b>	Category 5 cable – balanced 100 $\Omega$ and 120 $\Omega$ cables and associated connecting hardware with specified transmission characteristics up to 100 MHz (ISO/IEC 11801).
<b>CMR</b>	Common Mode Rejection – CMR is a measure how effectively common-mode noise is suppressed. It is measured as the ratio of the common-mode signal with the magnetics inserted between source and load to the common-mode signal without magnetics. CMR is expressed in dB.
<b>Crosstalk</b>	Crosstalk is a phenomenon which occurs on signal paths. The signal transmitted on one path is coupled into the other path. Crosstalk is specified as the ratio between the power coupled into the nearby path and the power of the source and is given in dB.
<b>CSMA/CD</b>	Carrier Sense Multiple Access with Collision Detection – access method used in Ethernet networks.
<b>DCMR</b>	Differential to Common Mode Rejection – the voltage difference between two wires of a signal path causes a current in the load. This voltage is called differential-mode voltage and carries the information transmitted on the signal path. If both wires of a signal path have equal voltage in reference to ground, a current is flowing via the impedances between the wires of the signal path and ground. This voltage is called common-mode voltage. Due to asymmetries in the signal path, part of the differential-mode voltage is converted into a common-mode voltage. DCMR is defined as the ratio between the common-mode and the differential-mode voltage and is expressed in dB.

<b>Ethernet</b>	Ethernet is a family of computer network technologies for local area networks standardized in IEEE 802.3. The first standard was published in 1985 for a transmission speed of 10 Mbit/s using CSMA/CD as media access protocol. The standard was continuously extended to make it suitable for various transmission media as e.g. coaxial cable, unshielded twisted pairs or fibre optics. Also the transmission speed increased continuously. Ethernet with 100 Mbit/s is also known as Fast Ethernet. Gigabit Ethernet provides 1000 Mbit/s. Meanwhile, speeds up to 10 Gbit/s are possible.
<b>Inductance L</b>	L specifies the inductance of the primary winding of a transformer (OCL – Open Circuit Inductance).
<b>Insertion loss</b>	Insertion loss represents the loss in power delivered to a load when a magnetic component, e.g. a transformer or common-mode choke, is inserted between source and load. It is measured as the ratio of power with the component inserted to the power without the component. Insertion loss is expressed in dB.
<b>MDI</b>	Medium Dependant Interface – the mechanical and electrical interface between the PHY and the transmission media
<b>MDIX</b>	Medium Dependent Interface Cross-Over – in an Ethernet network transmitting and receiving of two devices must be connected. Transmit and receive pins of MDIX devices are switched internally to ensure the use of standard cables. For example, PCs are MDI devices, and switches and hubs are MDIX devices according to the convention.
<b>MSL</b>	MSL stands for Moisture Sensitivity Level and is specified in JEDEC J-STD-020C as well as the solder profile applicable to magnetics modules.
<b>PHY</b>	Physical Layer Entity – the PHY contains the functions that transmit, receive and manage the encoded signals that are recorded on and recovered from the physical medium.
<b>PoE</b>	Power over Ethernet – ethernet network capable to provide power to connected devices. PoE is standardized in IEEE 802.3af (IEEE 802.3 clause 33). Connected devices are powered with 48 V and up to 15.4 W.
<b>Return loss</b>	Part of the power delivered to a load is reflected if the impedance of the source and the load are not perfectly matched. Return loss is defined as the ratio between the reflected power and the power of the source. Return loss is expressed in dB.
<b>RJ45</b>	Register Jack 45 – an eight-wire connector used for the connection of devices in Ethernet networks.
<b>Turns ratio</b>	The turns ratio is defined as the ratio between the number of turns of the primary and secondary winding of a transformer. A transformer with a center tap winding and a turns ratio of 1 is specified in the data sheets with 1CT:1CT.

<b>UTP</b>	Unshielded twisted pair – an electrically conducting cable, comprising one or more twisted pairs, none of which are shielded.
<b>VoIP</b>	Voice over internet – transmission of voice signals over the internet. PoE technology is necessary to power the phone via the network.
<b>Voltage test <math>V_{\text{test}}</math></b>	$V_{\text{test}}$ specifies the maximum voltage between primary and secondary winding of a transformer which does not cause a breakdown. For AC voltages the frequency as well as the duration time of the voltage test are specified.