WURTH ELECTRONICS
Product Line
for
Common Mode Chokes

Presented by
Mouser Electronics

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Introduction

Purpose
• Provide an overview of the common mode choke series and an understanding of how they work.

Objectives
• Discuss the features and benefits of using common mode chokes

Content
• 19 pages

Estimated Completion Time
• 20 minutes
Common Mode vs Differential mode
Example: Flyback Converter

Formation of a differential mode interference current on the mains supply line of a flyback converter.
Example: Flyback Converter

Formation of a common mode interference current on the mains supply line of a flyback converter.
Common Mode Chokes – Advantages

Filter using two chokes

Filter using Common Mode Choke
Bifilar / Sectional Winding

Sectional

\[ C = \varepsilon_0 \cdot \varepsilon_R \cdot \frac{A}{d} \]

Bifilar

\[ M = k \cdot \sqrt{L_1 \cdot L_2} \]
Bifilar Winding

Example: WE-SL2 744227

Common Mode Impedance:

Differential Mode Impedance
Sectional Winding

Example: WE-SL2 744227S

Common Mode Impedance:

Differential Mode Impedance
Data Line Common Mode Chokes

Data Lines – topologies:

• Bus Topology

• Line Topology

• Ring Topology
Data Line Common Mode Chokes

Data buses – topologies:

• Bus Topology

• USB:
Common Mode Choke – Example: USB

USB 2.0 IC

→ Filtered
→ Unfiltered / Distorted
→ Undistorted (Unfiltered)

Data Flow

Common Mode Choke

HF-Generator

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Common Mode Choke – Example: USB

Increasing Impedance

Failrate: 3.4 ‰
CM → 32 Ohm
DM → 0.7 Ohm @ 12 MHz

Failrate: 0 ‰
CM → 363 Ohm
DM → 1 Ohm @ 12 MHz

Failrate: 2.55 ‰
CM → 41 Ohm
DM → 0.7 Ohm @ 12 MHz

Failrate: 2.05 ‰
CM → 77 Ohm
DM → 1 Ohm @ 12 MHz

Increase Impedance
Chip Bead Ferrite – Example: USB

Failrate: 4.4‰

DM → 35 Ohm @ 12 MHz

Increasing Impedance

Failrate: 7.5‰

DM → 110 Ohm @ 12 MHz

2x Chip Bead Ferrite

D+ —— D+

D- —— D-

Failrate: 0‰
Data Line Common Mode Chokes

Data Line Applications

WE-SL, -SL2, -SL5

WE-SL, -SL1, -SL2, -SL3, -SLM

WE-CNSW

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Common Mode Chokes (SMD)

WE-SL2 74422xx
for signal / data lines up to $I_{\text{max}} = 1.6$ A

| MnZn | NiZn $L \sim 25 \mu H \ldots \sim 47 \text{ mH}$ |

WE-SL3 74425xxx
for signal / data lines up to $I_{\text{max}} = 0.7$ A

| NiZn $L \sim 20 \mu H \sim 100 \mu H$ |

WE-SL5 74427xxxx
for signal / data lines up to $I_{\text{max}} = 2.5$ A

| MnZn | $L \sim 120 \mu H \ldots \sim 4.7 \text{ mH}$ |

Frequency ($f$) (MHz)

0.1  1   10   100  1000

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Common Mode Chokes (SMD)

CM SMD-Ferrite 7427521
for signal / data lines up to $I_{\text{max}} = 5 \text{ A}$

- NiZn $Z = 52 \text{ Ohm @100MHz}$

WE-SL 74420x
for signal / data lines up to $I_{\text{max}} = 5.6 \text{ A}$ order code 74420x

- MnZn $\text{NiZn } L \sim 10 \mu\text{H} \ldots \sim 47\text{mH}$

WE-CNSW 74423xxxx
for signal / data lines up to $I_{\text{max}} = 0.4 \text{ A}$ order code 74423xxxx

- NiZn $Z = 67–2200 \text{ Ohm @ 100 MHz}$
Offline Common Mode Chokes, WE-FC

**Characteristics:**
Closed rectangular ferrite core
2-section winding for excellent high frequency performance
1% stray inductance for symmetrical interference suppression
Recyclable due to no encapsulation
2kV AC Isolation Voltage
Operating temperature: –25°C up to +125°C

**Applications:**
Switch mode power supplies
Electronic ballasts for lamps

**Specifications:**
Rated for 250VAC
Currents to 2A
THT only
Order Code 744864xxxx
Offline CMC, WE-CMB

**Characteristics:**
- Nickel-Zinc core
- High suppression rates of asymmetric interference @ high and medium frequencies
- Small size
- High interference stability against RF interference and burst signals
- Noise suppression up to 300 MHz

**Applications:**
- Power electronics
- Power line in- and output filter
- Optimized for Burst signals

**Specifications:**
- Rated to 10A at 250VAC
- THT only
- 1.5KV Isolation
Common Mode Chokes

- for 115 / 250VAC / max. 20A sectional winding
  - SMD
    - WE-LF SMD
    - WE-LF
    - WE-CMB
    - WE-FC
  - THT
    - WE-MLS ferrite bridge, 6 hole ferrite bead

- for signal / data lines
  - U_{max.} = 80VDC / I up to 2,5A
    - THT
    - SMD
    - sectional
    - bifilar
      - WE-MLS series
      - WE-CNSW
      - WE-FC
      - WE-SL series
      - WE-CMS
      - WE-SL series
      - WE-CNSW
Common Mode chokes internal to our RJ45’s

No common mode
In std RJ45

Common mode added
To HPLE series
This ends the product presentation

For more information, or to purchase Wurth Electronics products, please visit www.mouser.com
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