Version:
June 29, 2017

# SMD Balun Transformers Series


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# Production Index

## SMD Balun Transformers Series

# What is Balun Transformer?

## What is Balun Transformer

### What is Balun Transformer?

Balun is name of device that can be like a **common mode choke**, unbalance to balance transformer, or a step up or down transformer.
**Balun** is an acronym of **BAL**anced **UN**balanced, it's used to convert an unbalanced signal to a balanced one or vice versa.
A balun transformer is a device that:

- joins a balanced line (one that has two conductors, with equal currents in opposite directions, such as a twisted pair cable).
- to an unbalanced line (one that has just one conductor and a ground, such as a coaxial cable).

Baluns isolate a transmission line and provide a balanced output. A typical use for a balun is in a television antenna.

**Balanced**: A method of transmitting signals using two signal lines. One line carries the source signal; the other carries a signal of opposite phase (antiphase).

**Unbalanced**: A method of transmitting signals using one signal line, with a ground line providing a reference potential.

### Why Use a Balun?

Baluns are used for two primary reasons:

- One : Eliminate “common mode current” on the transmission line.
- Two : Matching antenna impedance to the transmission line.

### Insertion Loss (dB)

Loss due to transmission from primary dot port to secondary dot port and secondary port. Most balun transformers are symmetrical through their central horizontal axis; therefore, an input can be applied at the primary dot port or the primary port with differential outputs at the secondary dot and secondary ports.

### Basics of Broadband Transformers

There are two kinds of broadband transformers. One is known as a conventional type, which has separate primary and secondary windings, as do power and audio transformers. The other type is called a transmission-line transformer. It is believed that the latter variety is the most efficient of the two. Transmission-line transformers are wound with twisted or parallel windings and produce specific integers of impedance transformation, such as 4:1, 9:1, and 16:1. Conventional transformers permit you to obtain any transformation ratio you need.

# (TCPWCH) Common Mode Chokes For USB, IEEE 394, Lan Interface

## Product Introduction

### Token Extends Low-Profile Common Mode Choke Enhance Space Savings.

**Features :**

- Recommended solder profile: reflow.
- Low profile and very small size SMD Design.
- Wound Chip constructure with standard 0805 to 1812 size.
- Best EMI suppression effect but least impact to data signal wave form.

**Applications :**

- Preventive measure against high speed signal radiation emissions such as USB, IEEE 1394 (Firewire) or LAN interface.
- Best for NB, DSC, mobile device design.

Common mode chokes (TCPWCH) are used in order to filter common mode electromagnetic interference (EMI) currents without de-rating under high currents and without causing signal degradation. Common mode chokes are applied to supply and return pairs of conductors and are ideal for EMI filtering of signal lines.


Token Electronics offers SMD Common Mode Inductors & EMI Filters (TCPWCH) in standard 0805, 1206, 1810, and 1812 size, with a maximum height of 1.2 mm, 2.0 mm, 2.2 mm, and 2.8 mm making them low profile common mode chokes available.

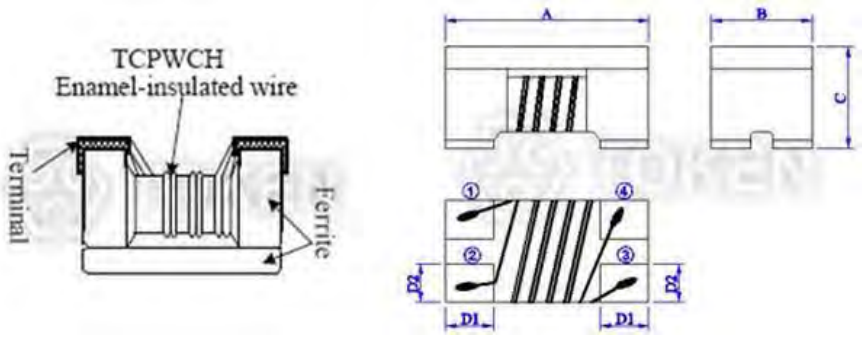
They provide high differential mode cutoff frequency and common mode noise attenuation across a wide frequency range, suiting them as ideal for noise suppression in super-high-speed signal lines such as DisplayPort, DVI, USB 3.x, and HDMI 2.0. The chokes are also suited for high-speed differential signal lines such as USB, IEEE1394, and LVDS, and are compatible with USB Type-C specification.

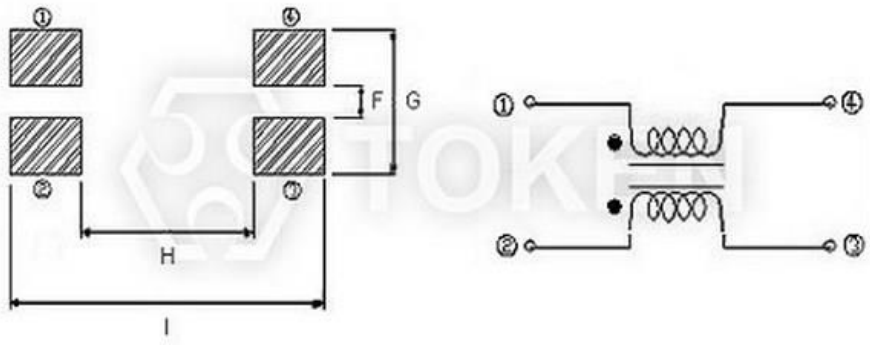
All (TCPWCH) series comes a wide variety of options to meet your needs with halogen free and feature RoHS Directive. Token is able to customize and manufacture your request. Please contact our sales or link to Token official website "SMD Balun Transformers" for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCH-2012/3216/4525/4532/453226/453228)
## UNIT: mm (inch)

| SIZE CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCH-2012 (0805)** | 2.00±0.20 (0.079±0.008) | 1.20±0.20 (0.047±0.008) | 1.20±0.20 (0.047±0.008) | 0.45 (0.018) | 0.40 (0.016) | 0.40 (0.016) | 1.20 (0.047) | 0.80 (0.031) | 2.60 (0.102) |
| **TCPWCH-3216 (1206)** | 3.20±0.20 (0.126±0.008) | 1.60±0.20 (0.063±0.008) | 2.00±0.20 (0.079±0.008) | 0.60 (0.024) | 0.60 (0.024) | 0.40 (0.016) | 1.60 (0.063) | 1.60 (0.063) | 3.70 (0.146) |
| **TCPWCH-4525 (1810)** | 4.80±0.20 (0.189±0.008) | 2.80±0.20 (0.110±0.008) | 2.20±0.20 (0.087±0.008) | 0.75 (0.030) | 0.75 (0.030) | 0.70 (0.027) | 2.70 (0.106) | 3.00 (0.118) | 5.50 (0.216) |
| **TCPWCH-4532 (1812)** | 4.50±0.20 (0.177±0.008) | 3.20±0.20 (0.126±0.008) | 2.80±0.20 (0.110±0.008) | 1.00 (0.039) | 1.00 (0.039) | 0.40 (0.016) | 3.60 (0.141) | 2.10 (0.082) | 4.90 (0.192) |
| **TCPWCH-453226 (1812)** | 4.50±0.20 (0.177±0.008) | 3.20±0.20 (0.126±0.008) | 2.60±0.20 (0.102±0.008) | 1.00 (0.039) | 1.00 (0.039) | 0.40 (0.016) | 3.60 (0.141) | 2.10 (0.082) | 4.90 (0.192) |
| **TCPWCH-453228 (1812)** | 4.50±0.20 (0.177±0.008) | 3.20±0.20 (0.126±0.008) | 2.80±0.20 (0.110±0.008) | 1.00 (0.039) | 1.00 (0.039) | 0.40 (0.016) | 3.60 (0.141) | 2.10 (0.082) | 4.90 (0.192) |



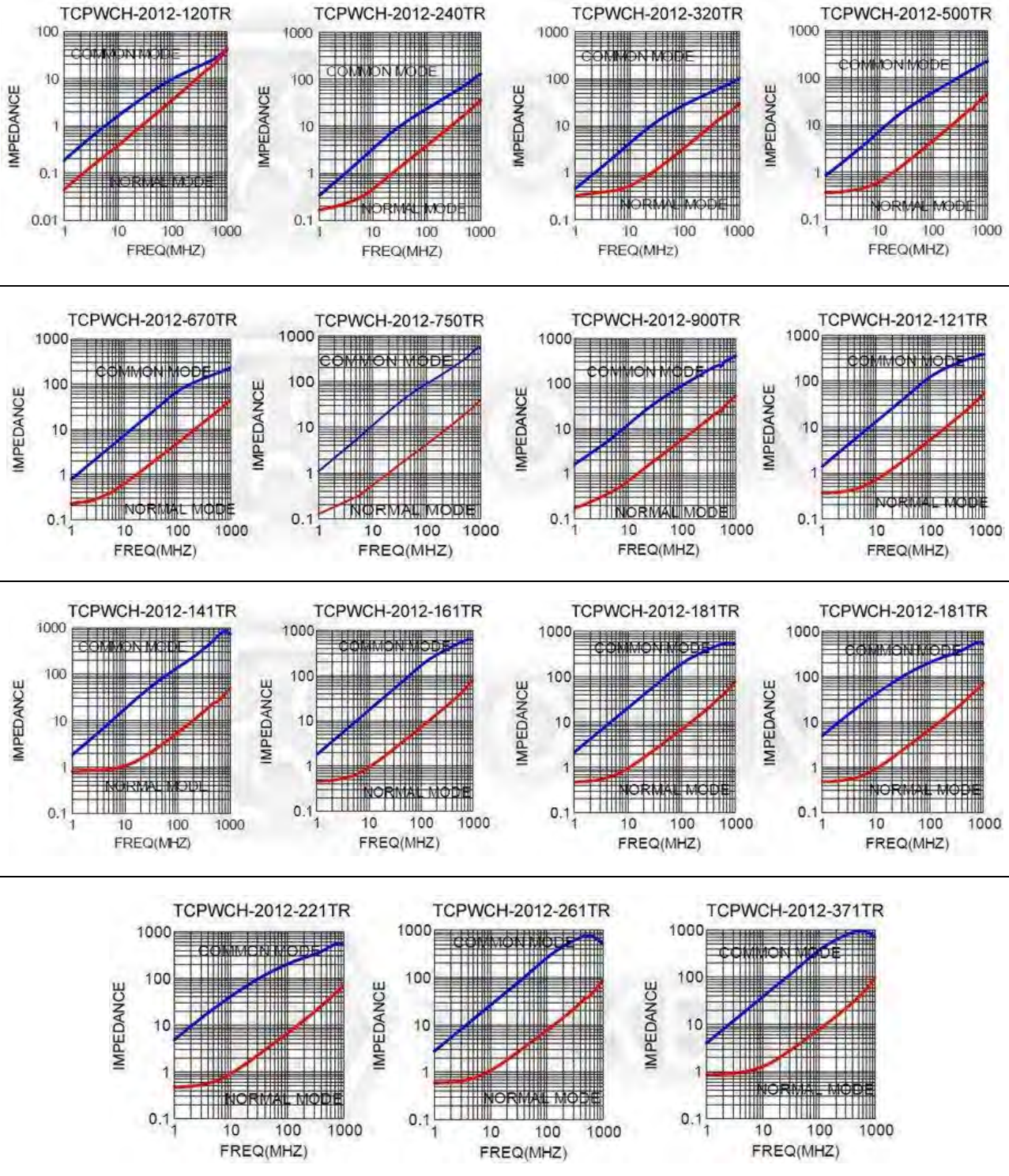

Common mode filter TCPWCH Structure diagram Unit: mm (Inch)

# 2012

## Electrical Characteristics (TCPWCH-2012)

| Part Number | Impedance (Ω) | Tolerance (±) % | Test Frequency (MHz) | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCH-2012-120TR | 12 | 25% | 100 | 0.20 | 450 |
| TCPWCH-2012-240TR | 24 | 25% | 100 | 0.25 | 420 |
| TCPWCH-2012-320TR | 32 | 25% | 100 | 0.25 | 400 |
| TCPWCH-2012-500TR | 50 | 25% | 100 | 0.25 | 400 |
| TCPWCH-2012-670TR | 67 | 25% | 100 | 0.25 | 400 |
| TCPWCH-2012-750TR | 75 | 25% | 100 | 0.70 | 280 |
| TCPWCH-2012-900TR | 90 | 25% | 100 | 0.30 | 400 |
| TCPWCH-2012-121TR | 120 | 25% | 100 | 0.30 | 370 |
| TCPWCH-2012-141TR | 140 | 25% | 100 | 0.32 | 360 |
| TCPWCH-2012-161TR | 160 | 25% | 100 | 0.35 | 350 |
| TCPWCH-2012-181TR | 180 | 25% | 100 | 0.35 | 330 |
| TCPWCH-2012-201TR | 200 | 25% | 100 | 0.40 | 300 |
| TCPWCH-2012-221TR | 220 | 25% | 100 | 0.40 | 300 |
| TCPWCH-2012-261TR | 260 | 25% | 100 | 0.40 | 300 |
| TCPWCH-2012-371TR | 370 | 25% | 100 | 0.45 | 280 |

## Impedance VS Frequency Graph (TCPWCH-2012)

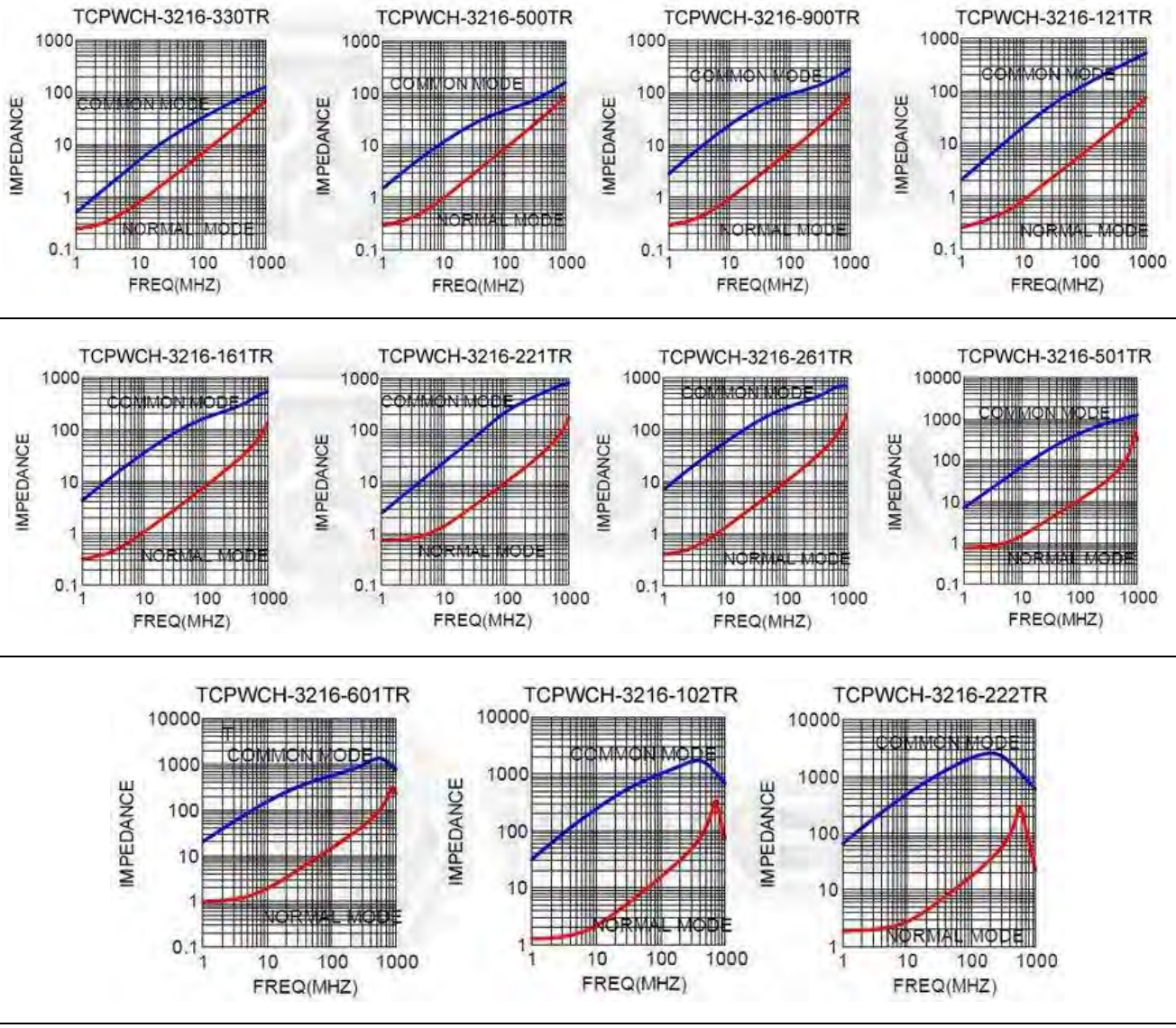


# 3216

## Electrical Characteristics (TCPWCH-3216)

| Part Number | Impedance (Ω) | Tolerance (±) % | Test Frequency (MHz) | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCH-3216-330TR | 33 | 25% | 100 | 0.20 | 400 |
| TCPWCH-3216-500TR | 50 | 25% | 100 | 0.25 | 400 |
| TCPWCH-3216-900TR | 90 | 25% | 100 | 0.30 | 400 |
| TCPWCH-3216-121TR | 120 | 25% | 100 | 0.30 | 400 |
| TCPWCH-3216-161TR | 160 | 25% | 100 | 0.40 | 350 |
| TCPWCH-3216-221TR | 220 | 25% | 100 | 0.45 | 300 |
| TCPWCH-3216-261TR | 260 | 25% | 100 | 0.50 | 310 |
| TCPWCH-3216-501TR | 500 | 25% | 100 | 0.80 | 260 |
| TCPWCH-3216-601TR | 600 | 25% | 100 | 0.80 | 260 |
| TCPWCH-3216-102TR | 1000 | 25% | 100 | 1.00 | 250 |
| TCPWCH-3216-222TR | 2200 | 25% | 100 | 1.20 | 200 |

## Impedance VS Frequency Graph (TCPWC-3216)

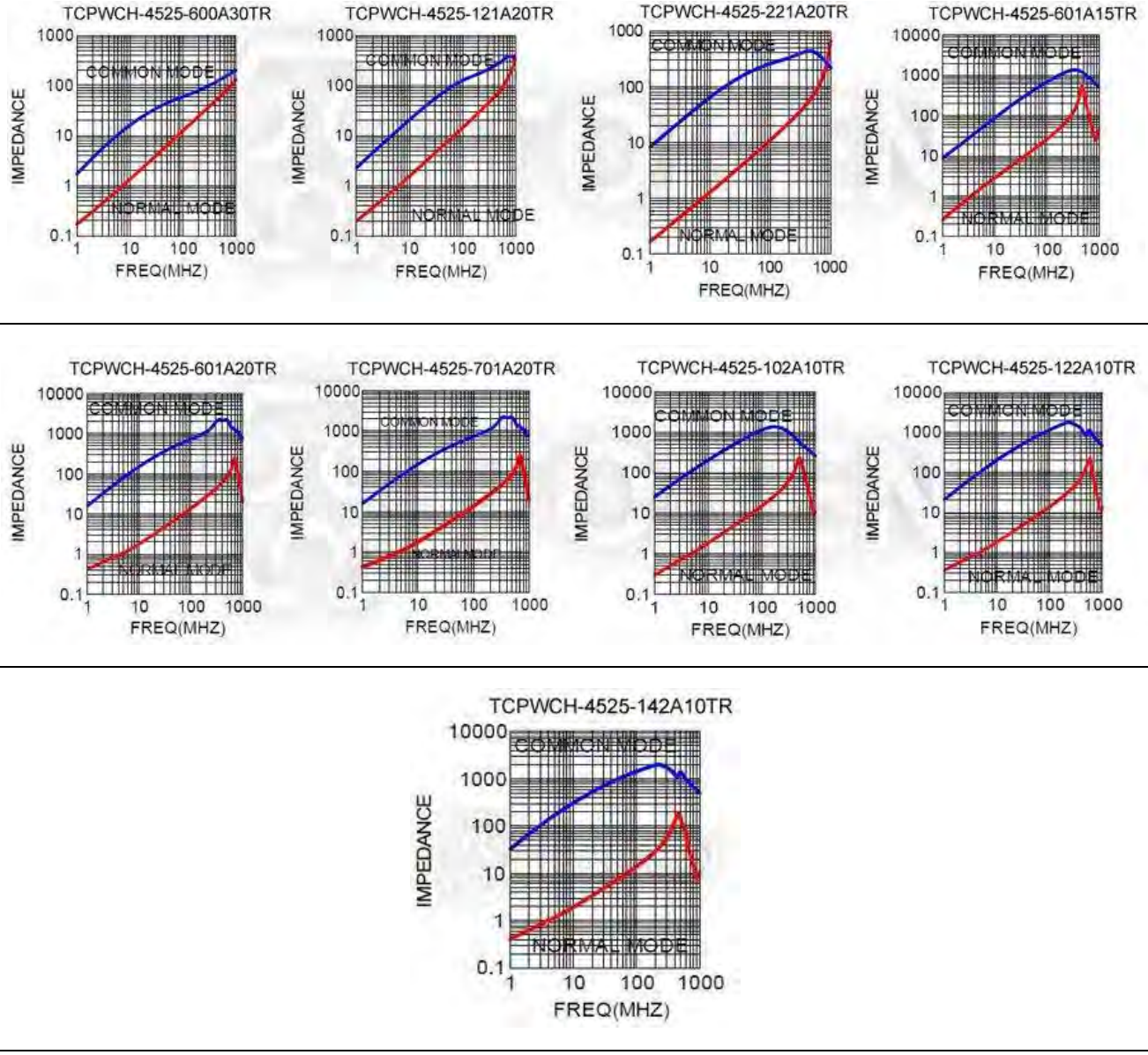


# 4525

## Electrical Characteristics (TCPWCH-4525)

| Part Number | Impedance (Ω) | Tolerance (±) % | Test Frequency (MHz) | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCH-4525-600A30TR | 60 | 25% | 100 | 0.10 | 3000 |
| TCPWCH-4525-121A20TR | 120 | 25% | 100 | 0.20 | 2000 |
| TCPWCH-4525-221A20TR | 220 | 25% | 100 | 0.20 | 2000 |
| TCPWCH-4525-601A15TR | 600 | 25% | 100 | 0.30 | 1500 |
| TCPWCH-4525-601A20TR | 600 | 25% | 100 | 0.20 | 2000 |
| TCPWCH-4525-701A20TR | 700 | 25% | 100 | 0.15 | 2000 |
| TCPWCH-4525-102A10TR | 1000 | 25% | 100 | 0.40 | 1000 |
| TCPWCH-4525-122A10TR | 1200 | 25% | 100 | 0.40 | 1000 |
| TCPWCH-4525-142A10TR | 1400 | 25% | 100 | 0.40 | 1000 |

## Impedance VS Frequency Graph (TCPWC-4525)

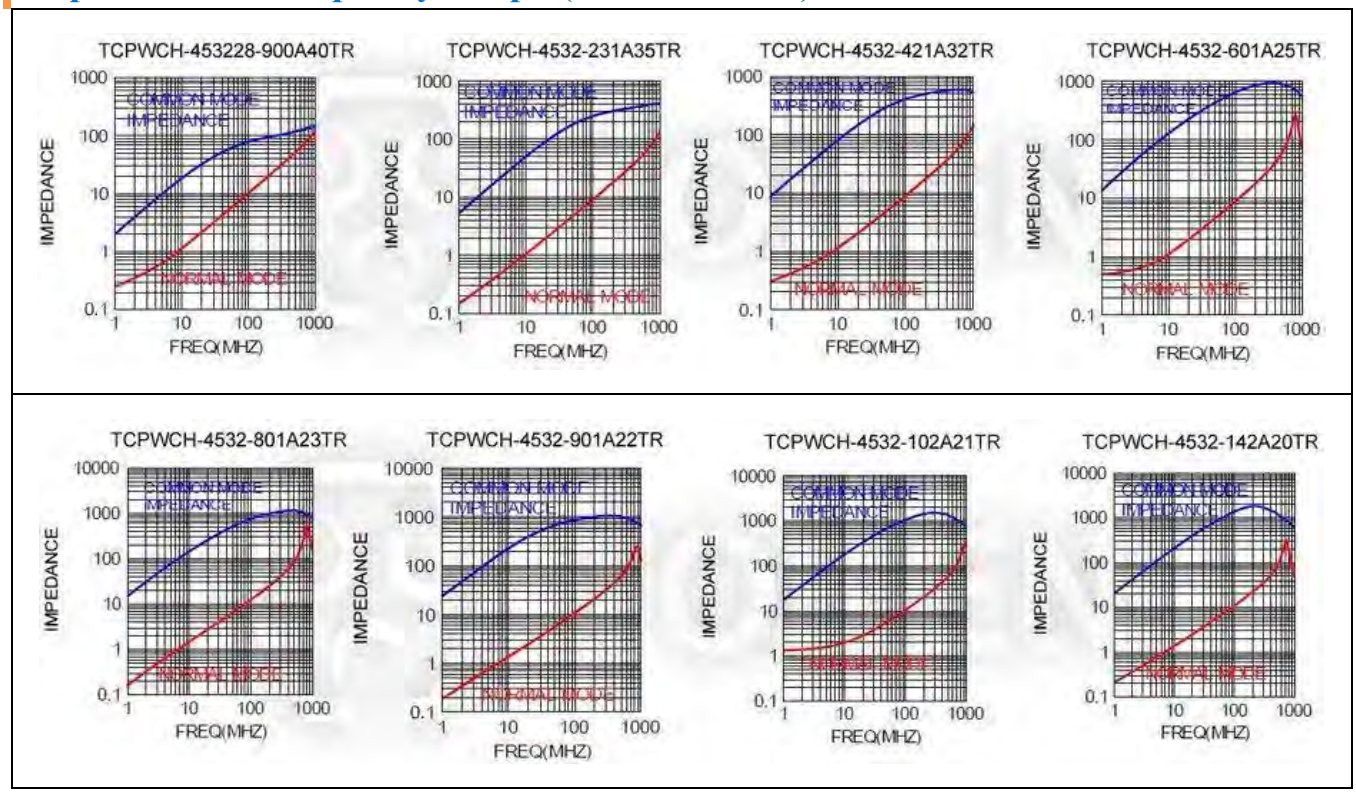


# 4532

## Electrical Characteristics (TCPWCH-4532)

| Part Number | Impedance (Ω) | Tolerance (±) % | Test Frequency (MHz) | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| **TCPWCH-453228-900A40TR** | 90 | 25% | 100 | 0.050 | 4000 |
| **TCPWCH-4532-231A35TR** | 230 | 25% | 100 | 0.051 | 3500 |
| **TCPWCH-4532-421A32TR** | 420 | 25% | 100 | 0.052 | 3200 |
| **TCPWCH-4532-601A25TR** | 600 | 25% | 100 | 0.065 | 2500 |
| **TCPWCH-4532-801A23TR** | 800 | 25% | 100 | 0.100 | 2300 |
| **TCPWCH-4532-901A22TR** | 900 | 25% | 100 | 0.100 | 2200 |
| **TCPWCH-4532-102A21TR** | 1000 | 25% | 100 | 0.110 | 2100 |
| **TCPWCH-4532-142A20TR** | 1400 | 25% | 100 | 0.120 | 2000 |

## Impedance VS Frequency Graph (TCPWC-4532)

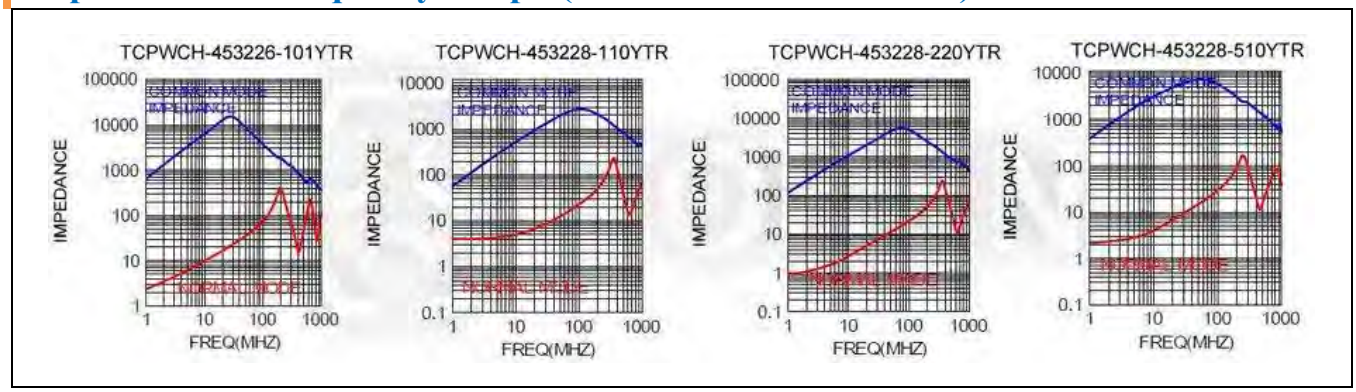


# 453226/453228

## Electrical Characteristics (TCPWCH-453226/453228)

| Part Number | Inductance (µH) 100KHz/100mV | Impedance (Ω) TYP 10MHz | DC Resistance (Ω) Max. | Rated Current Max. | Rated Voltage (V) (DC) | Insulation Resistance (MΩ) Min. |
|---|---|---|---|---|---|---|
| **TCPWCH-453226-101YTR** | 100 (+50/-30%) | 5800 | 2.0 | 250 | 50 | 10 |
| **TCPWCH-453228-110YTR** | 11 (+50/-30%) | 600 | 0.6 | 250 | 50 | 10 |
| **TCPWCH-453228-220YTR** | 22 (+50/-30%) | 1200 | 1.0 | 200 | 50 | 10 |
| **TCPWCH-453228-510YTR** | 51 (+50/-30%) | 5800 | 1.0 | 200 | 50 | 10 |

## Impedance VS Frequency Graph (TCPWC-453226/453228)



# Environ. Characteristics

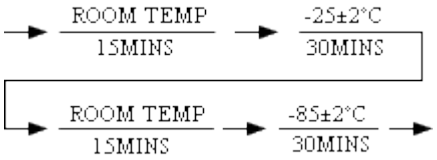
## Electrical Performance Test (TCPWCH)

| Test Items | Specifications | Test Conditions / Test Methods |
|---|---|---|
| **Impedance** | Refer to standard electrical characteristic spec. | LCR Meter HP 4291B |
| **DC Resistance (RDC)** | | Micro-Ohm meter (GOM-801G) |
| **Withstand Voltage (VDC)** | Component should not be damaged | Test Voltage: 2.5 Times Rated Voltage<br>Testing Time: 60 sec.<br>Charge Current: 0.5mA |
| **Rated Voltage (VDC)** | | Test Voltage: Rated Voltage<br>Testing Time: 1 to 5 sec.<br>Charge Current: 1mA |
| **Insulation Resistance (I.R.)** | | Charge Current: 1 minute<br>10M ohm min |

## Mechanical Performance Test (TCPWCH)

| Test Items | Specifications | Test Conditions / Test Methods |
|---|---|---|
| **Component Adhesion (push Test)** | Base: 0805 ≥ 2 Lbs<br>Cover: 0805 ≥ 1 Lbs<br>Base: 1206 ≥ 4 Lbs<br>Cover: 1206 ≥ 2 Lbs | The component should be soldered (232℃±5℃ for 10 sec.) totinned copper substrate. Applied force gauge to the side of component It must withstand force of 2 or 4 pounds without failure of the component. |
| **Drop Test** | Component should not be damaged | Dropping chip by each side and corner.<br>Drop 10 times in total<br>Drop height:100cm<br>Drop weight:125g |
| **Solderability Test** | The terminal should at least be 90% covered with solder | The component shall be dipped in a melted solder bath at 235℃±5℃ for 5 seconds. |
| **Vibration Test (Low Frequency)** | Component should not be damaged | 1. Amplitude: 1.5 m/m<br>2. Frequency: 10-55-10 Hz(1min)<br>3. Direction: X, Y, Z<br>4. Duration: 2 Hrs/X, Y, Z |

## Climatic Test (TCPWCH)

| Test Items | Specifications | Test Conditions / Test Methods |
|---|---|---|
| **Low Temperature Storage Test** | Impedance change:<br>Within±20%<br>Without distinct damage in ppearance. | 1. Temp: -40℃±2℃<br>2. Time: 1000±48 Hours<br>3. Component should be tested after 1 hour at room temperature. |
| **Thermal Shock Test** | |  <br>Total: 5 Cycles |
| **High Temperature Storage Test** | | 1. Temp: 85℃±2℃<br>2. Time: 1000±48 Hours<br>3. Component should be tested after 1 hour at room temperature. |
| **Humidity Test** | | 1. Temp: 40℃±2℃<br>2. R.H.: 90%~95%<br>3. Time: 48±2 Hours |
| **High Temperature Load Life Test** | There should be no evidence of short or open circuit | 1. Temp: 85℃±2℃<br>2. Time: 96±12 Hours<br>3. Load: Allowed DC Current |
| **Low Temperature Load Life Test** | | 1. Temp: -40℃±2℃<br>2. Time: 96±12 Hours<br>3. Load: Allowed DC Current |

- **Note: Storage Temperature: 25℃; Humidity:<80%RH**

# Order Codes

## Order Codes (TCPWCH-2012/3216)

| TCPWC | H | - | 2012 | - | 120 | TR |
|---|---|---|---|---|---|---|

**Part Number**

| TCPWC |
|---|

**Shielding Type**

| | |
|---|---|
| H | Shielding |

**Dimensions (mm)**

| | | |
|---|---|---|
| 2012 | 2.00×1.20×1.20 | EIA0805 |
| 3216 | 3.20×1.60×2.00 | EIA1206 |

**Impedance (Ω)**

| | |
|---|---|
| 120 | 12Ω |
| 121 | 120Ω |
| 371 | 370Ω |

**Package**

| | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

## Order Codes (TCPWCH-4525/4532)

| TCPWC | H | - | 4525 | - | 600 | A30 | TR |
|---|---|---|---|---|---|---|---|

**Part Number**

| TCPWC |
|---|

**Shielding Type**

| | |
|---|---|
| H | Shielding |

**Dimensions (mm)**

| | | |
|---|---|---|
| 4525 | 4.80×2.80×2.20 | EIA1810 |
| 4532 | 4.50×3.20×2.80 | EIA1812 |

**Impedance (Ω)**

| | |
|---|---|
| 600 | 60Ω |
| 601 | 600Ω |
| 102 | 1000Ω |

**Stop current (mA)**

| | |
|---|---|
| A30 | 3000mA |
| A25 | 2500mA |
| A10 | 1000mA |

**Package**

| | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

## Order Codes (TCPWCH-453226/453228)

| TCPWC | H | - | 453226 | - | 101 | Y | TR |
|---|---|---|---|---|---|---|---|

**Part Number**

| TCPWC |
|---|

**Shielding Type**

| | |
|---|---|
| H | Shielding |

**Dimensions (mm)**

| | | |
|---|---|---|
| 453226 | 4.50×3.20×2.60 | EIA1812 |
| 453228 | 4.50×3.20×2.80 | EIA1812 |

**Inductance (µH)**

| | |
|---|---|
| 101 | 100µH |
| 110 | 11µH |
| 510 | 51µH |

**Tolerance (%)**

| | |
|---|---|
| Y | +50/-30% |

**Package**

| | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPWCH) Common Mode Choke Coils for Automotive

## Product Introduction

### Token (TCPWCH-4532AU) complete portfolio of common mode chokes for automotive bus systems.

**Features :**

- For Automotive wire wound common mode choke coil Effective for EMI suppression of common mode noise emission.
- Compatible with Automotive required operating temperature –40℃ to +125℃.
- Compatible with RoHS Directive and AEC-Q200.

**Applications :**

- Preventive measure against high speed signal radiation emission such as CAN-Bus.
- Modem, Fax, ISDNs… etc.


SMD common mode choke coils (TCPWCH-4532AU) series is primarily designed for automotive networking applications. such as automotive ethernet, FlexRay, and CAN-Bus. Of course, ethernet is already the firmly established networking protocol for computers, peripherals, communication devices, and multimedia.

The attenuation of the noise is higher, the performance of the common-mode choke is better. Token taking advantage of the latest winding technology, (TCPWCH-4532AU) consists ferrite core and a pair lines enabling the most effective in noise suppression designs. Feature high common-mode impedance at noise band and low differential-mode impedance at signal band. Low differential-mode impedance with high coupling factor, there is almost no distortion on high speed signal.

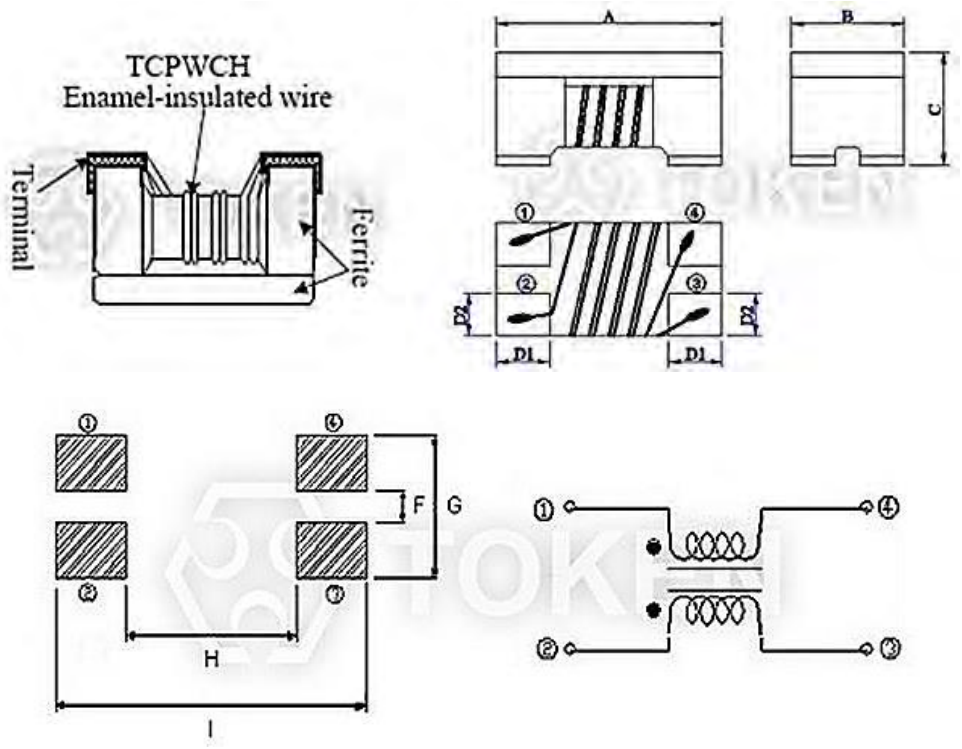
This automotive common mode chokes construction provides for a more lean and cost saving approach then comparable larger, heavier, wire-wound toroidal inductors. Wide inductance selection, and low-resistance coils can be customed designs and tighter tolerances are available on request.

(TCPWCH-4532AU) conforms to the RoHS compliant and Lead-free. Token will also produce devices outside these specifications to meet customer requirements, with comprehensive design application engineering support for customers worldwide. Please contact our sales or link to Token official website "SMD Balun Transformers" for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCH-4532AU) UNIT: mm (inch)

| CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCH-4532 (1812)** | 4.50±0.2 (0.177±0.008) | 3.2±0.2 (0.126±0.008) | 2.8±0.2 (0.110±0.008) | 1.00 (0.039) | 1.00 (0.039) | 0.40 (0.016) | 3.60 (0.141) | 2.10 (0.082) | 4.90 (0.192) |

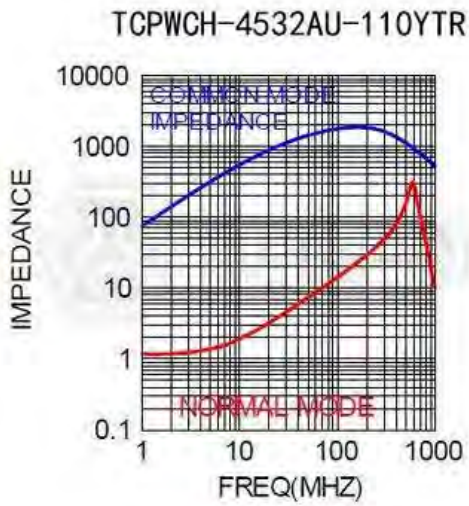


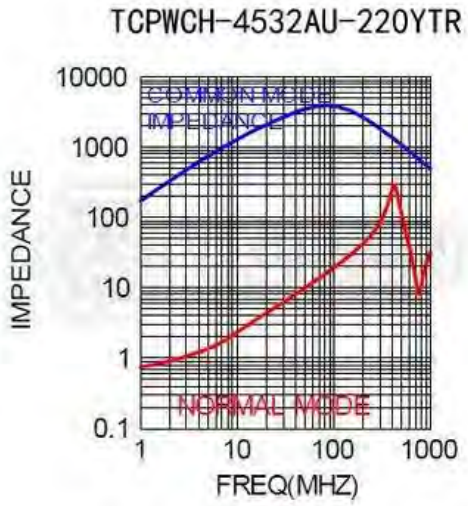

Common Mode Choke Coils for Automotive (TCPWCH-4532AU) Structure diagram UNIT: mm (inch)

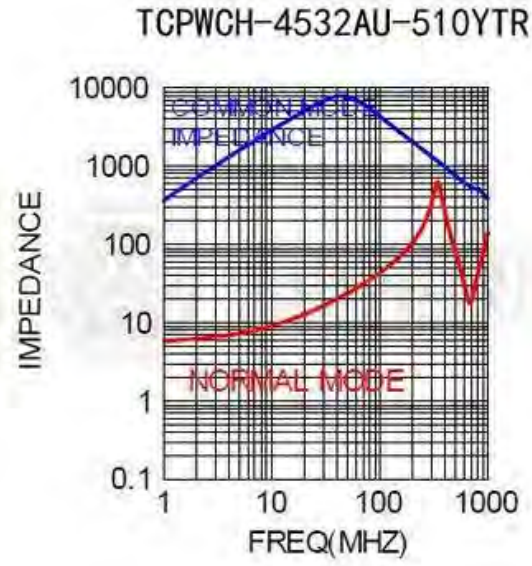
# 4532AU Specifications

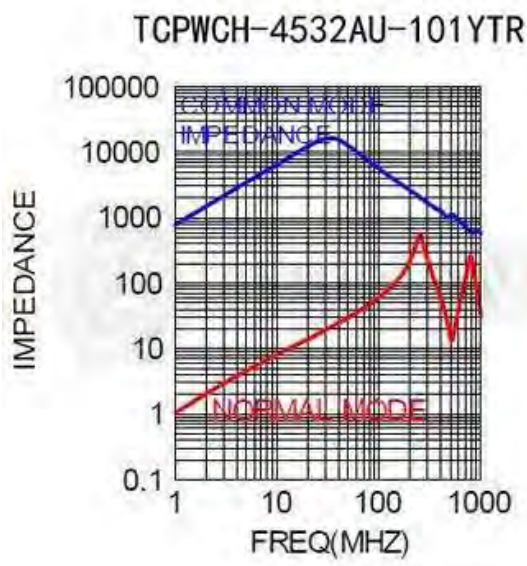
## Electrical Characteristics (TCPWCH-4532AU)

| Part Number | Inductance (µH) 100KHz/100mV | Impedance (Ω) @ 10MHz | DC Resistance (Ω) Max. | Rated Current (mA) Max. | Rated Voltage (V) DC | Insulation Resistance (MΩ) Min. |
|---|---|---|---|---|---|---|
| TCPWCH-4532AU-110YTR | 11(+50/30%) | 600 | 0.6 | 250 | 50 | 10 |
| TCPWCH-4532AU-220YTR | 22(+50/30%) | 1200 | 1.0 | 200 | 50 | 10 |
| TCPWCH-4532AU-510YTR | 51(+50/30%) | 2800 | 1.0 | 200 | 50 | 10 |
| TCPWCH-4532AU-101YTR | 100(+50/30%) | 5800 | 2.0 | 150 | 50 | 10 |



# Order Codes

## Order Codes (TCPWC)

| TCPWC | H | - | 4532 | AU | - | 110 | Y | TR |
|---|---|---|---|---|---|---|---|---|

| Part Number |
|---|
| TCPWCH |

| Shielding Type | |
|---|---|
| H | Shielding |

| Dimensions | | |
|---|---|---|
| 4532 | 4.5×3.2×2.8 | EIA1812 |

| Purpose | |
|---|---|
| AU | Automotive |

| Inductance (µH) | |
|---|---|
| 110 | 11 |
| 220 | 22 |
| 510 | 51 |
| 101 | 100 |

| Tolerance (%) | |
|---|---|
| Y | +50/-30% |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPWCH) Common Mode Chokes

## Product Introduction

### Token Extends common mode chokes in high speed data links for USB 3.0.

**Features & Applications :**

- Lowprofile and very small size SMD Design.
- Wound Chip constructure with standard 0504 and 0805 size.
- Very high self-resonance frequency enables high cut-off frequency.
- Matching to characteristic impedance enables good transmission of high-speed signals.


In the electronics environment seen by today there are numerous sources of radio frequency interference (RFI) and electromagnetic interference (EMI). This is due in large component to the increased use of RF technology. These types of interference result in the need for common mode filtering in applications utilizing differential interfaces. Token common mode chokes help maintain the integrity of high speed communications and may be necessary for conformance with international regulatory standards.

Token (TCPWCH-1210HS/2012HS) Series SMD Common Mode Choke Coils are for high-speed and ultra-high-speed differential signal lines such as LVDS, IEEE1394//FireWire, USB, etc. The chip type (TCPWCH-1210HS/2012HS) series provides EMI suppression in case sizes 0504, and 0805. The SMD Common Mode Chokes are useful in a number of applications, such as power supply units, cellular baseband, audio circuit, CPU, interface, display panel, remote controllers, and inverters.

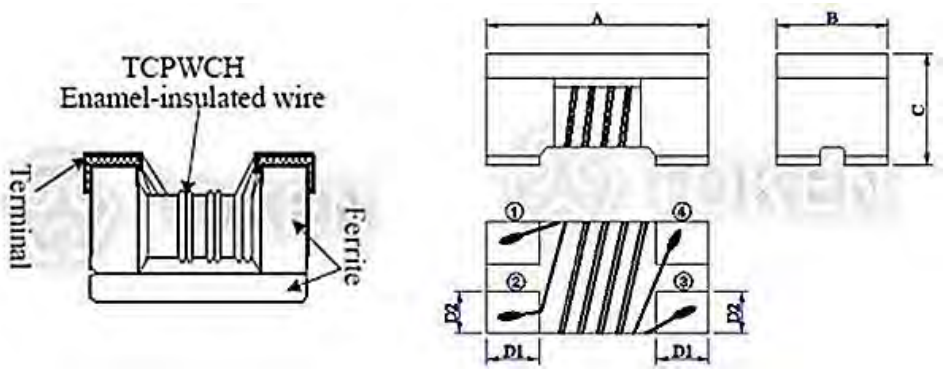
Updated News! Token has expanded its (TCPWCH-1210HS/2012HS) series common mode chokes to include the TCPWCH-1210HS-900TR and TCPWCH-2012HS-900TR, designed to address the unique noise issues of higher frequencies of USB 3.0 (SuperSpeed) devices. The Token TCPWCH-1210HS/2012HS-900TR, matches the characteristic impedance of the 90Ω USB3.0 standard. The common mode chokes utilize winding technology using EMI Suppression Ferrite cores processes to successfully boost the cut-off frequency in the transmission characteristics of the choke coils from the cut-off frequency featured by previous series to a higher, enabling SuperSpeed signals to be transmitted.

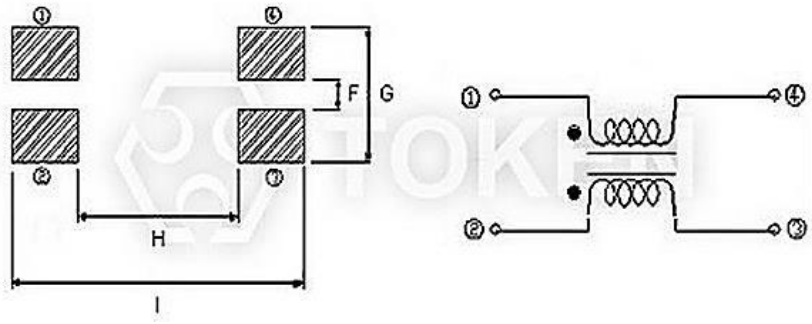
All (TCPWCH) series comes a wide variety of options to meet your needs with halogen free and feature RoHS Directive. Token is able to customize and manufacture your request. Please contact our sales or link to Token official website "SMD Balun Transformers" for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCH-1210HS, TCPWCH-2012HS)
## UNIT: mm (inch)

| SIZE CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCH-1210HS (0504)** | 1.20±0.20 (0.047±0.008) | 1.00±0.20 (0.069±0.008) | 0.035±0.20 (0.110±0.008) | 0.36 (0.014) | 0.38 (0.015) | 0.30 (0.012) | 1.20 (0.047) | 0.60 (0.024) | 1.50 (0.059) |
| **TCPWCH-2012HS (0805)** | 2.00±0.20 (0.079±0.008) | 1.20±0.20 (0.047±0.008) | 1.20±0.20 (0.047±0.008) | 0.45 (0.018) | 0.40 (0.016) | 0.40 (0.016) | 1.20 (0.047) | 0.80 (0.031) | 2.60 (0.102) |



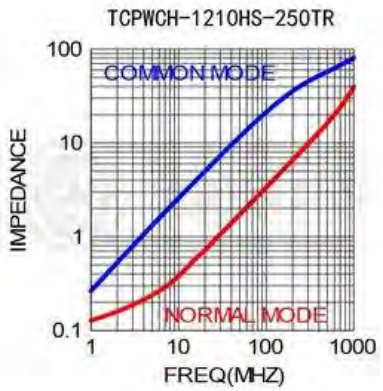
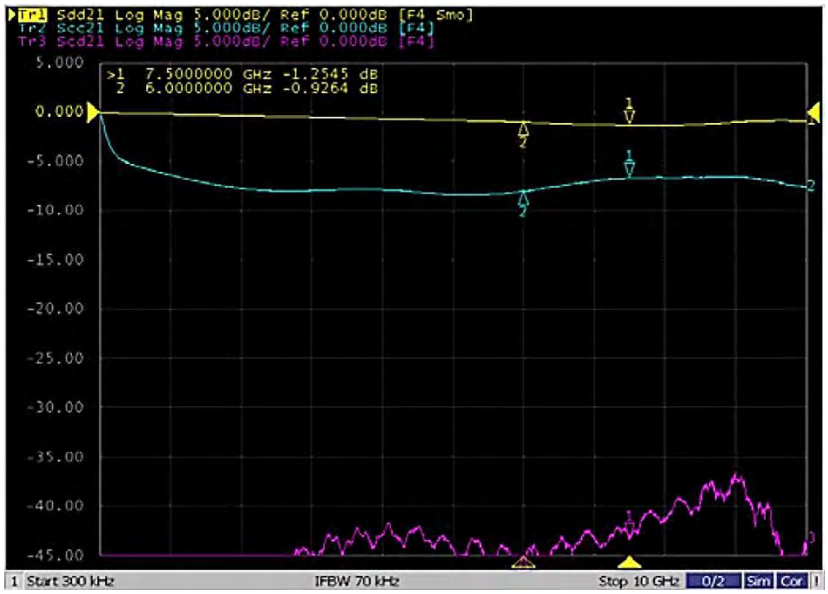

**Common mode filter (TCPWCH-1210HS, TCPWCH-2012HS) Structure diagram Unit: mm (Inch)**

# 1210HS Specifications

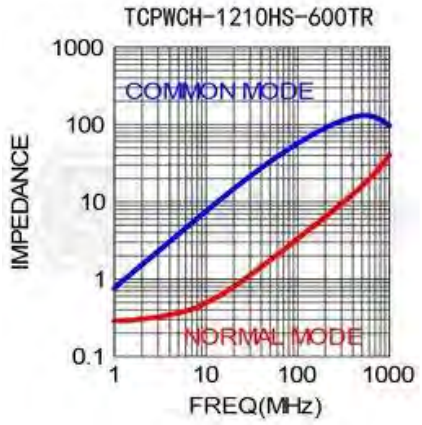
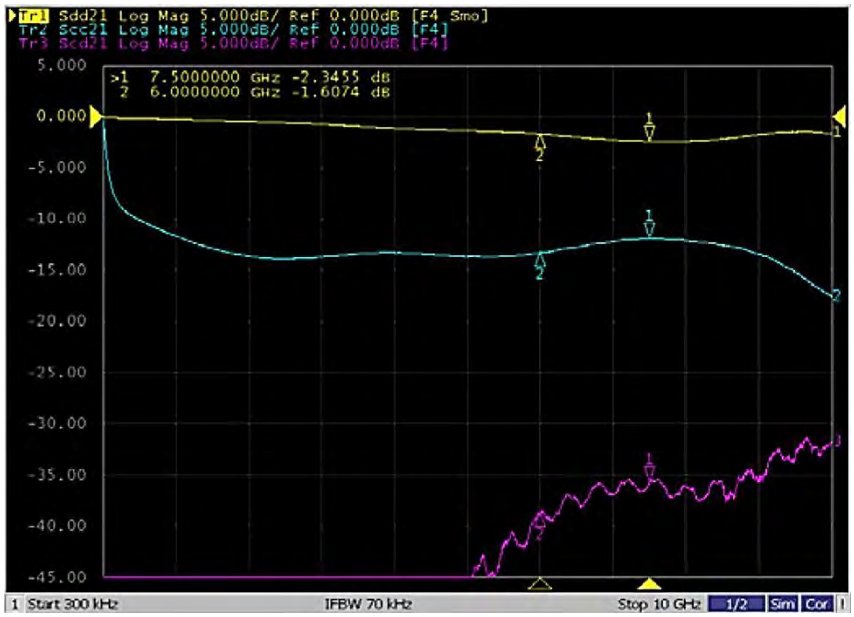
## Electrical Characteristics (TCPWCH-1210HS)

| Part Number | Impedance (Ω) 10MHz | Tolerance ±% | CUT-OFF FREQUENCY (GHz) Typ. | Rated Voltage (Ω) Max. | DC Resistance (mA) Max. |
|---|---|---|---|---|---|
| **TCPWCH-1210HS-250TR** | 25 | 25% | 7.5 | 0.25 | 420 |
| **TCPWCH-1210HS-600TR** | 60 | 25% | 6.0 | 0.25 | 400 |
| **TCPWCH-1210HS-900TR** | 90 | 25% | 6.0 | 0.30 | 400 |

## Electrical Characteristics Graph TCPWCH-1210HS-250TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |

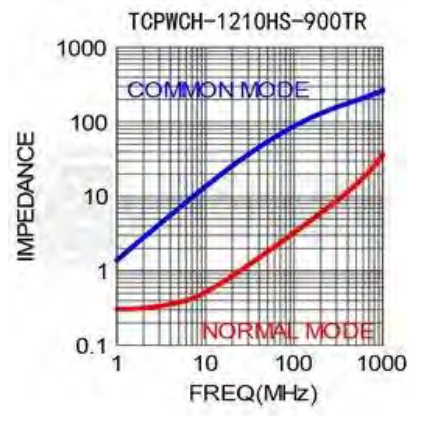
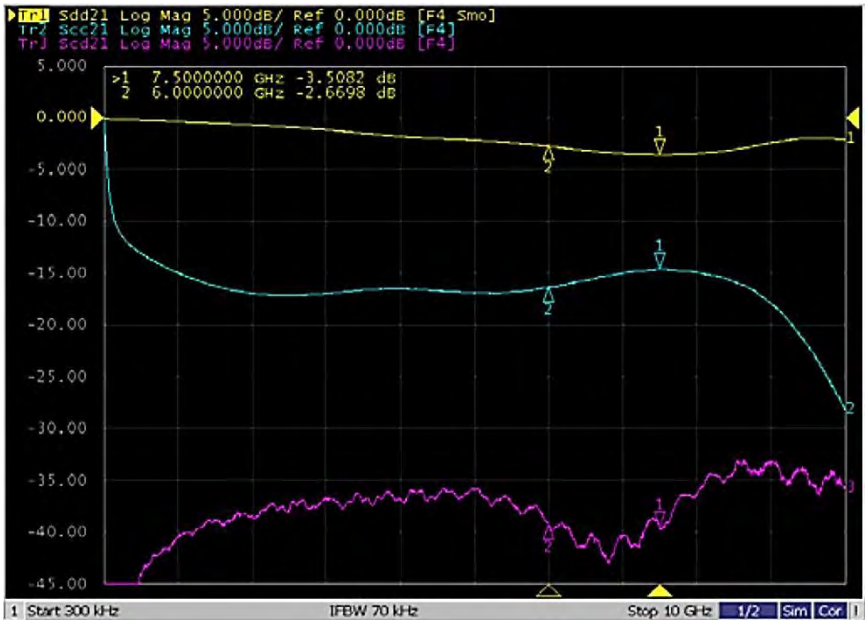
## Electrical Characteristics Graph TCPWCH-1210HS-600TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |





## Electrical Characteristics Graph TCPWCH-1210HS-900TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |

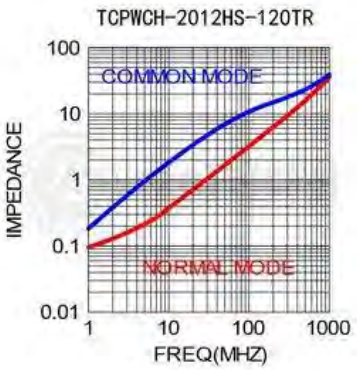
# 2012HS Specifications

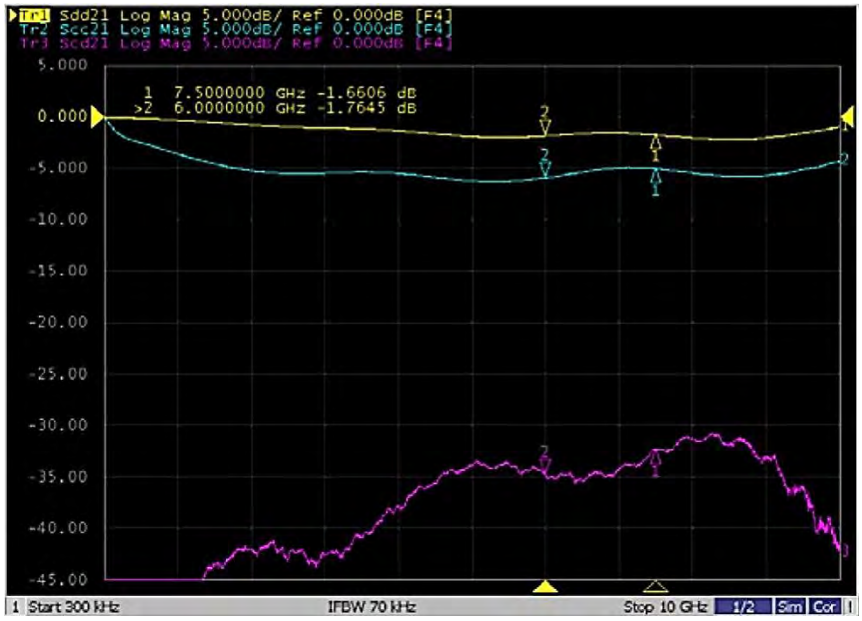
## Electrical Characteristics (TCPWCH-2012HS)

| Part Number | Impedance (Ω) 10MHz | Tolerance ±% | CUT-OFF FREQUENCY (GHz) Typ. | Rated Voltage (Ω) Max. | DC Resistance (mA) Max. |
|---|---|---|---|---|---|
| **TCPWCH-2012HS-120TR** | 12 | 25% | 7.5 | 0.20 | 450 |
| **TCPWCH-2012HS-240TR** | 24 | 25% | 7.5 | 0.25 | 420 |
| **TCPWCH-2012HS-320TR** | 32 | 25% | 7.5 | 0.25 | 400 |
| **TCPWCH-2012HS-670TR** | 67 | 25% | 6.0 | 0.25 | 400 |
| **TCPWCH-2012HS-900TR** | 90 | 25% | 6.0 | 0.30 | 400 |

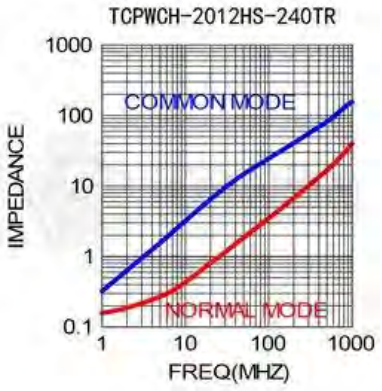
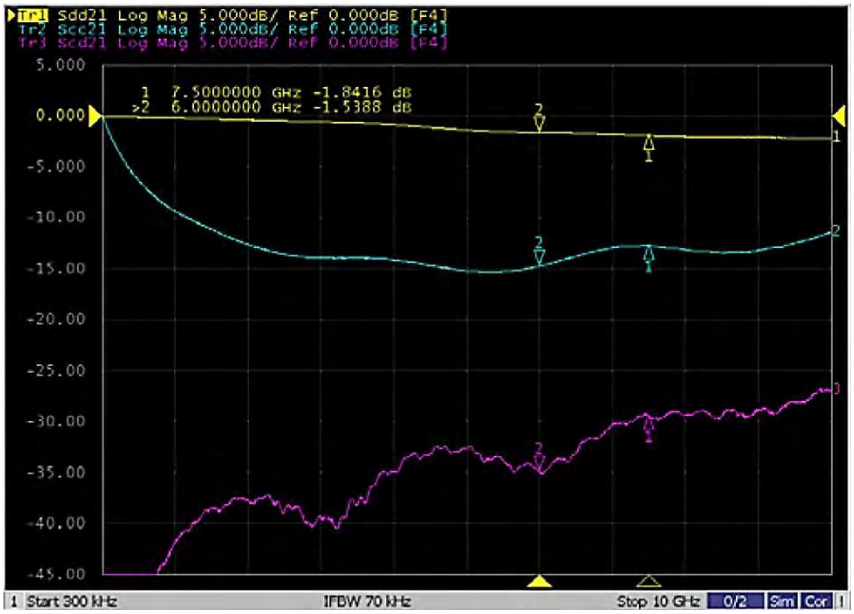
## Electrical Characteristics Graph TCPWCH-2012HS-120TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|



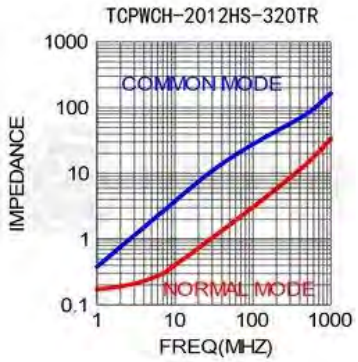
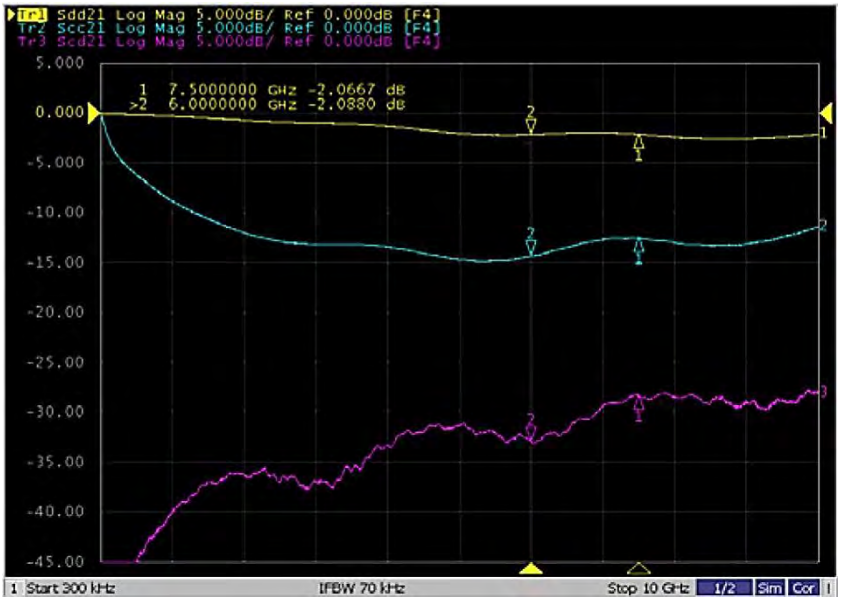
## Electrical Characteristics Graph TCPWCH-2012HS-240TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |

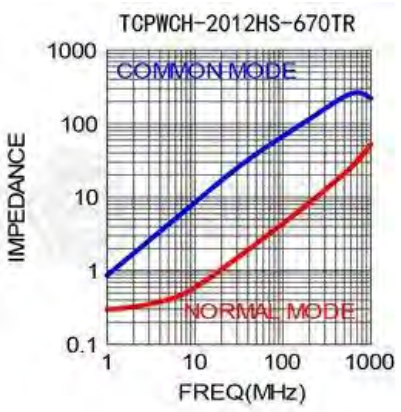
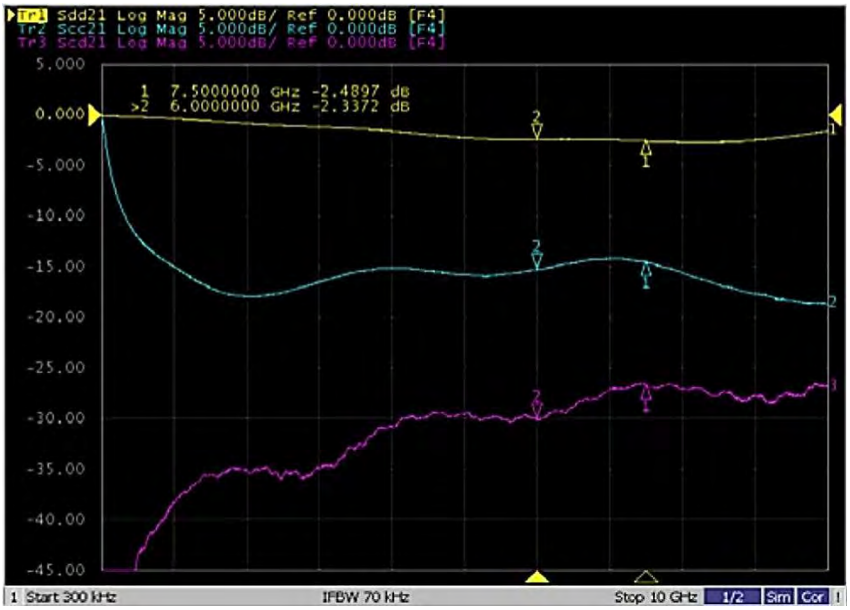




## Electrical Characteristics Graph TCPWCH-2012HS-320TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |

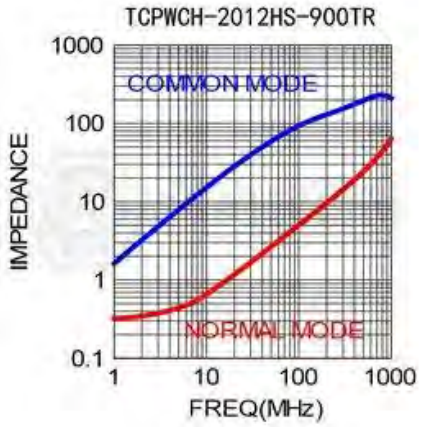
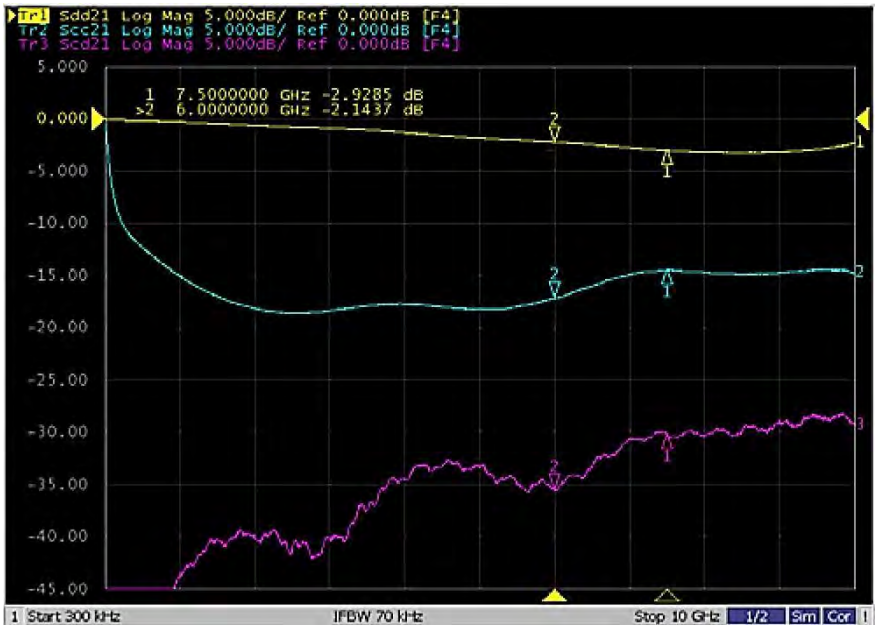
## Electrical Characteristics Graph TCPWCH-2012HS-670TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |





## Electrical Characteristics Graph TCPWCH-2012HS-900TR

| 1.Electrical Charactenistic Curve | 2.Insertion Loss Curve |
|---|---|
|  |  |

# Order Codes

## Order Codes (TCPWC)

| TCPWC | H | - | 1210 | HS | - | 250 | TR |
|---|---|---|---|---|---|---|---|

| Part Number |
|---|
| TCPWC |

| Shielding Type | |
|---|---|
| H | Shielding |

| Dimensions (mm) | | |
|---|---|---|
| 1210 | 1.00×0.20×0.035 | EIA0504 |
| 2012 | 2.00×1.20×1.20 | EIA0805 |

| Purpose | |
|---|---|
| HS | High speed |

| Impedance (Ω) | |
|---|---|
| 120 | 12Ω |
| 250 | 25Ω |
| 320 | 32Ω |
| 900 | 90Ω |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPWCH-) HDMI Common Mode Filters & Chokes

## Product Introduction

### Comprehensively transmits image on Token HDMI Common Mode Filters / Chokes For High-speed Differential Signal Line.

**HDMI Common Mode Choke Coils on The Selection :**

- Select the optimum impedance matching components in accordance with the frequencies at which noise is a problem, the cost and space.
- In the case that the chip common mode choke coil is used with ESD protection device with large capacitance, signal quality may result to fail to meet regulation.
- In the case that there are impedance mismatch to HDMI signal line, signal quality may become worse.
- Some items are under confirmation of waveform compatibility. Please contact us for latest information.

**Features & Applications :**

- Suppress noise for the high-speed differential signal lines.
- Low profile wound Chip constructure with standard 0805 size.
- Best EMI suppression effect, least impact of HDMI signal wave form.


HDMI port has been widely used in all kinds of A/V equipments with the development of HD & full HD video technology. HDMI provides ultra high transfer rate and supports hot plug and play technology. According to the latest HDMI1.4 specification, HDMI provide a max transfer rate of 4.8Gbps, which could well address the need of full HD video transmission.

Token has introduced the (TCPWCH-2012HD) series of low-profile choke coils. Designed for use as noise-control components adaptable to high-speed differential transmission systems, these series feature a wide variation of impedance values and the ability to match transmission-line impedance with component image impedance.

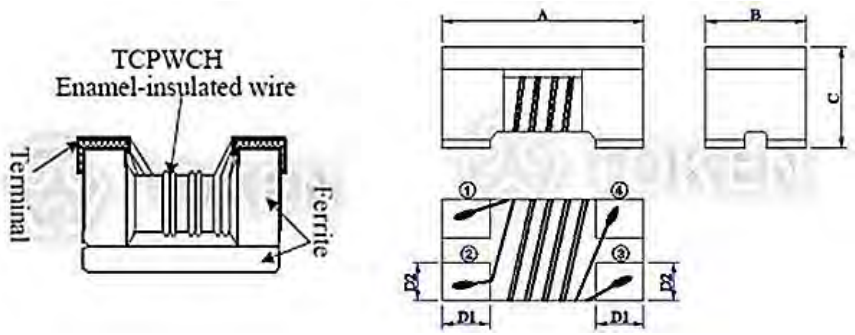
Different applications have different standards designed to govern the quality of signal waveforms. Components that will be used on such transmission lines need to have a certain level of waveform quality when they are inserted. In addition, as noise-suppression components, they need to provide noise-control effects. With the commonmode choke coils (TCPWCH-2012HD), insertion loss of HDMI waveform specifications can be satisfied without having any significant impact on initial signal waveforms, proving the capability to support high-speed signals.

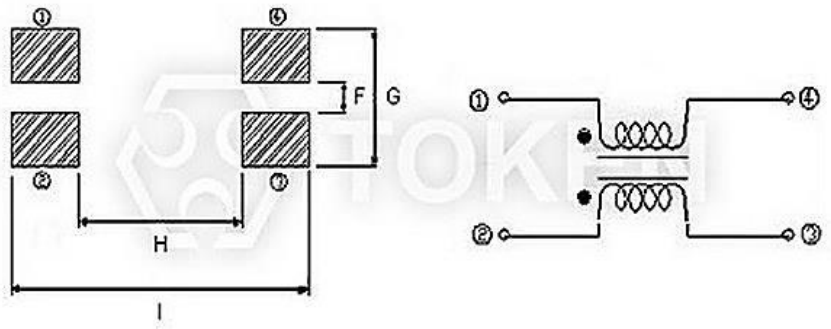
All (TCPWCH) series comes a wide variety of options to meet your needs with halogen free and RoHS Directive. Token is able to customize and manufacture your request, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCH-2012HD) Unit: mm (Inch)

| SIZE CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCH-2012HD (0805)** | 2.00±0.20 (0.079±0.008) | 1.2±0.20 (0.047±0.008) | 1.2±0.20 (0.047±0.008) | 0.45 (0.018) | 0.40 (0.016) | 0.40 (0.016) | 1.20 (0.047) | 0.80 (0.031) | 2.60 (0.102) |



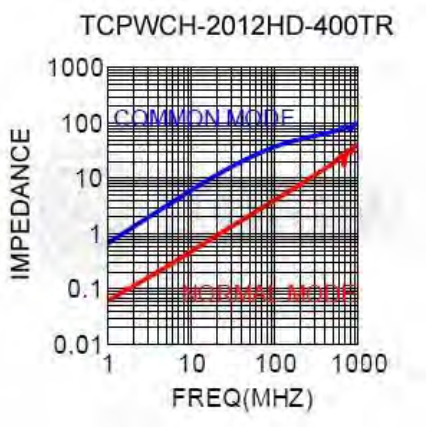

**HDMI Common Mode Filters & Chokes (TCPWCH-2012HD) Structure diagram Unit: mm (Inch)**

# Electrical Characteristics

## Electrical Characteristics (TCPWCH-2012HD)

| Part Number | Impedance (Ω) | Tolerance ±% | Test Frequency (MHz) | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCH-2012HD-400TR | 40 | 25% | 100 | 0.25 | 400 |
| TCPWCH-2012HD-670TR | 67 | 25% | 100 | 0.25 | 400 |
| TCPWCH-2012HD-900TR | 90 | 25% | 100 | 0.30 | 400 |
| TCPWCH-2012HD-121TR | 120 | 25% | 100 | 0.30 | 370 |

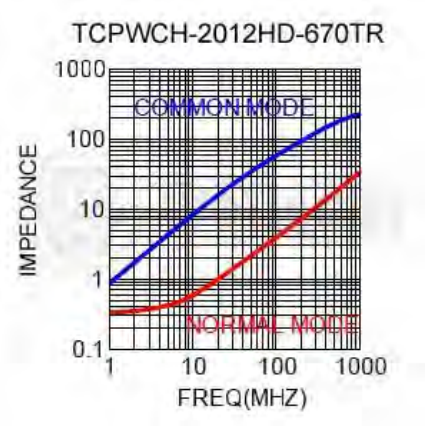
## Electrical Characteristics Graph (TCPWCH-2012HD-400TR)

| 1.TDR Impedance Curve (For HDMI) | 2.Insertion Loss Curve (For HDMI) |
|---|---|
|  |  |

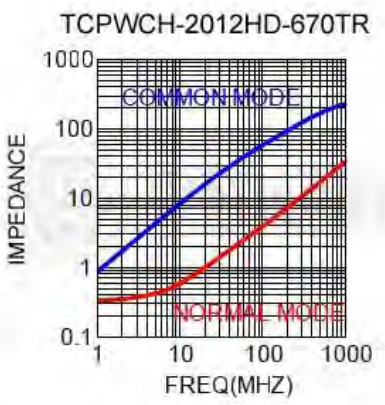
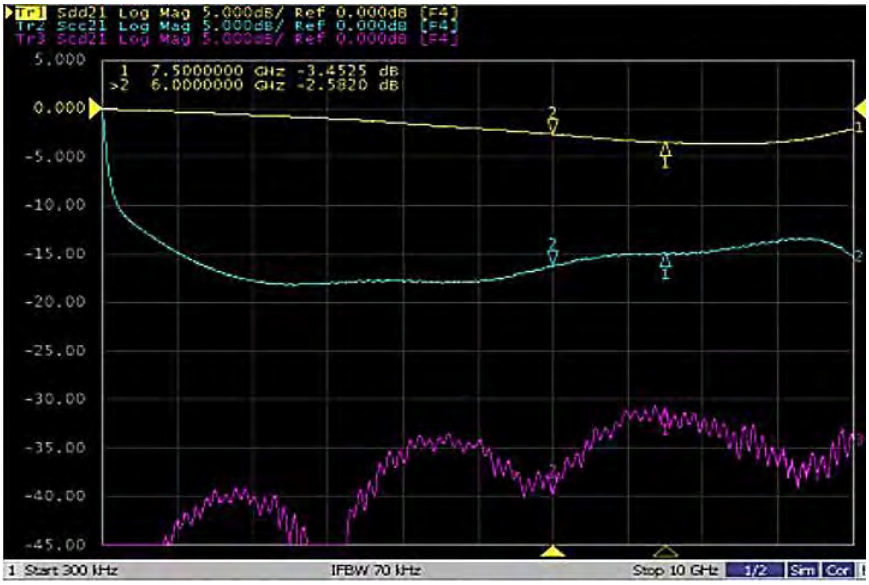




## Electrical Characteristics Graph (TCPWCH-2012HD-670TR)

| 1.TDR Impedance Curve (For HDMI) | 2.Insertion Loss Curve (For HDMI) |
|---|---|
|  |  |

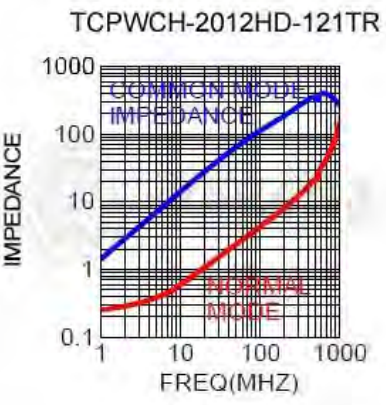
## Electrical Characteristics Graph (TCPWCH-2012HD-900TR)

| 1.TDR Impedance Curve (For HDMI) | 2.Insertion Loss Curve (For HDMI) |
|---|---|
|  |  |





## Electrical Characteristics Graph (TCPWCH-2012HD-121TR)

| 1.TDR Impedance Curve (For HDMI) | 2.Insertion Loss Curve (For HDMI) |
|---|---|
|  |  |

# Order Codes

## Order Codes (TCPWCH)

| TCPWC | H | - | 2012 | HD | - | 400 | TR |
|---|---|---|---|---|---|---|---|

| Part Number |
|---|
| TCPWC |

| Shielding Type | |
|---|---|
| H | Shielding |

| Dimensions (mm) | | |
|---|---|---|
| 2012 | 2.00×1.20×1.20 | EIA0805 |

| Purpose | |
|---|---|
| HD | HDMI |

| Impedance (Ω) | |
|---|---|
| 400 | 40Ω |
| 670 | 67Ω |
| 900 | 90Ω |
| 121 | 120Ω |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

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Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPWCH) Balun Transformers for Digital TV Tuners, WBL

## Product Introduction

### Balun-Transformers TCPWCH-2012BL) Provide The Key for Digital TV Tuners Design.

**HDMI Common Mode Choke Coils on The Selection :**

- Check the characteristic impedance of the antenna side (input side), and select 50 Ω or 75 Ω.
- 75 Ω is generally used for terrestrial wave systems, and 50 Ω for CATV and mobile systems.
- Check the characteristic impedance matching in order to achieve the fullest balun characteristics.
- However, the desired characteristics may not be achieved. This is because the actual impedance on the IC side does not exactly match the ideal impedance (50 Ω/75 Ω). In these cases, the impedance must be matched, or the balun must be reselected. Feel free to contact Token for details and solutions.

**Features :**

- Wideband Frequency Range for AV equipment.
- Realized balun fuction in a ultra-small SMD design.
- Wound Chip constructure with standard 0805 size.

**Applications :**

- Digital/Aanalog TV tuners.
- Cable TV tuners and Communication application.

A balun is a type of transformer. Balun transformer is a device which one pair of terminals is balanced, the currents are equal in magnitude and opposite in directions, such as a twisted pair cable. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal, such as a coaxial cable.


Token (TCPWCH-2012BL) has commercialized chip transformers (balun transformers), which are used to convert between unbalanced-balanced signals in the antenna inputs of TV tuner circuits for terrestrial digital broadcast compatible compact mobile devices.

By taking advantage of the advanced winding technology which using paired or/and triple wires enabling high uniformity, Token balun transformers for TV tuners have been made by winding wire around a fine ferrite core, and are widely used in large-scale devices such as TVs and desktop PCs.

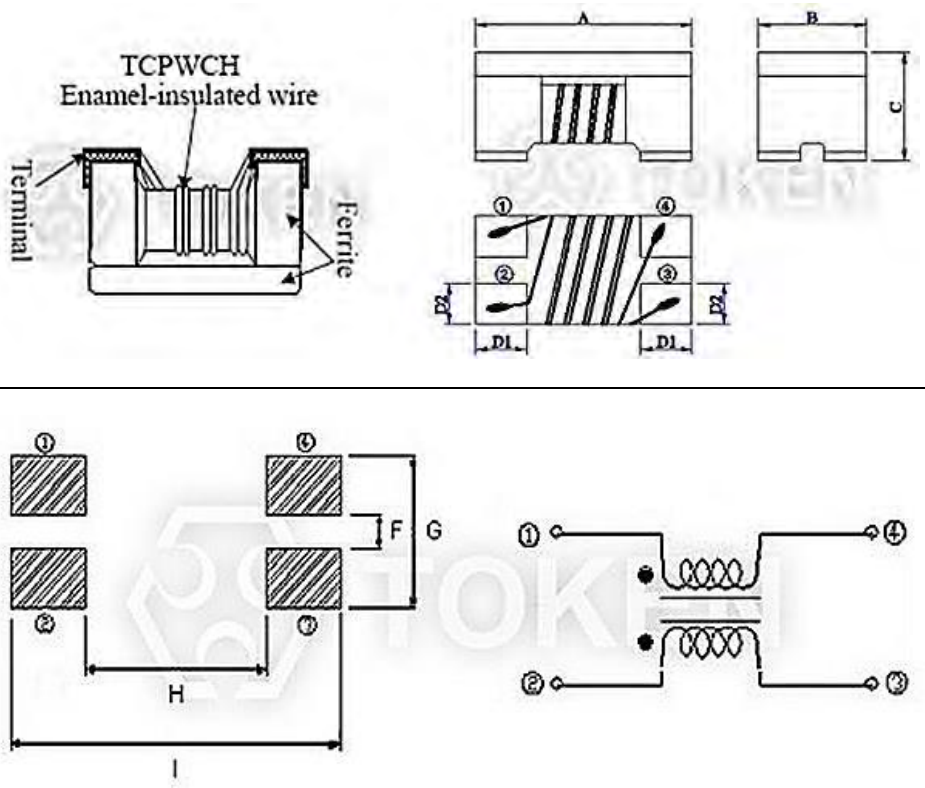
SMD Balun/Wideband Transformers can be used between various parts of a wireless or cable communications system. Balun transformers (TCPWCH-2012BL) provide port impedance with 50 Ω or 75 Ω to match coaxial cables which have characteristic impedances of 50 Ω or 75 Ω. The supported frequencies cover the 45 MHz to 870 MHz range that includes the full terrestrial broadcasting band, and other 50 MHz ~ 1200 MHz, 1000 MHz ~ 1500 MHz, 950 MHz ~ 2150 MHz, and 400 MHz ~ 1800 MHz range to cover a wide variety of applications.

All (TCPWCH-2012BL) series comes a wide variety of options to meet your needs with halogen free and RoHS Directive. Token is able to customize and manufacture your request, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website "SMD Balun Transformers" for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCH-2012BL)

| SIZE CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCH-2012BL (0805)** | 2.00±0.20 (0.079±0.008) | 1.2±0.20 (0.047±0.008) | 1.2±0.20 (0.047±0.008) | 0.45 (0.018) | 0.40 (0.016) | 0.40 (0.016) | 1.20 (0.047) | 0.80 (0.031) | 2.60 (0.102) |




**Balun-Transformers (TCPWCH-2012BL) Structure diagram Unit: mm (Inch)**

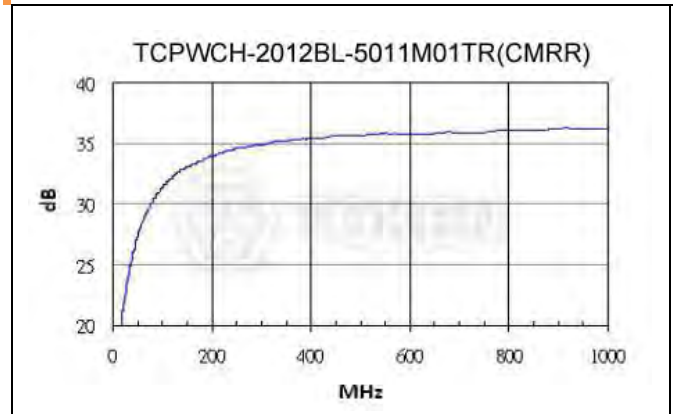
# Electrical Characteristics

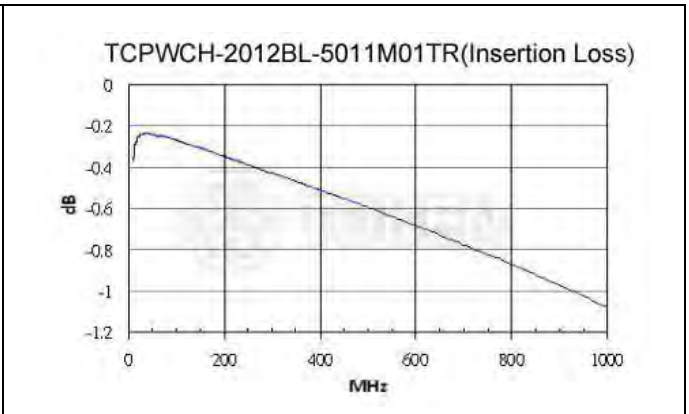
## Electrical Characteristics (TCPWCH-2012BL)

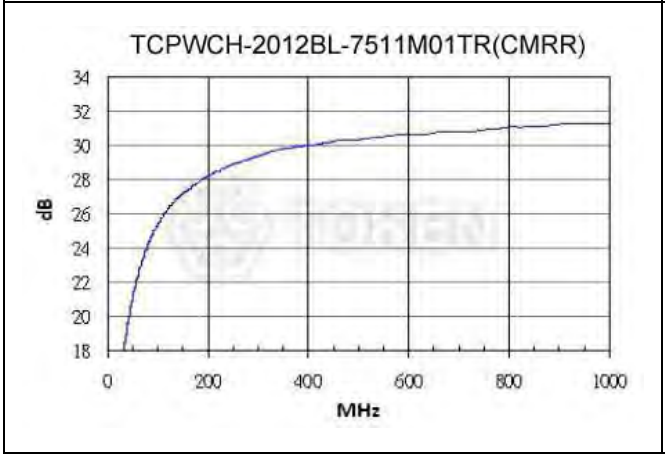
| Part Number | Freq Range (MHz) | Port Impedance (Ω) | Insertion Loss (dB) Max. | CMRR (dB) Min. | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|---|
| TCPWCH-2012BL-5011M01TR | 45 ~ 870 | 50/50 | 1.2 | 20 | 0.80 | 200 |
| TCPWCH-2012BL-7511M01TR | 45 ~ 870 | 75/75 | 1.1 | 18 | 0.77 | 200 |
| TCPWCH-2012BL-7511M02TR | 50 ~ 1200 | 75/75 | 1.6 | 19 | 0.40 | 300 |
| TCPWCH-2012BL-7511G01TR | 1000 ~ 1500 | 75/75 | 1.4 | 20 | 0.42 | 290 |
| TCPWCH-2012BL-7511G02TR | 950 ~ 2150 | 75/75 | 1.5 | 20 | 0.42 | 290 |
| TCPWCH-2012BL-7511G03TR | 400 ~ 1800 | 75/75 | 2.0 | 10 | 0.42 | 290 |

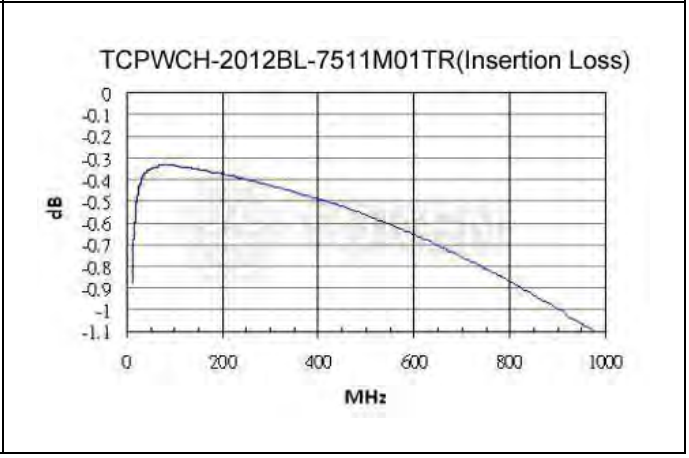
# Graph

## Typical Characteristics Graph (TCPWCH-2012BL)

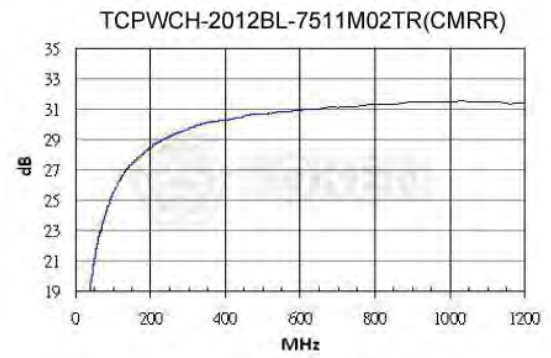


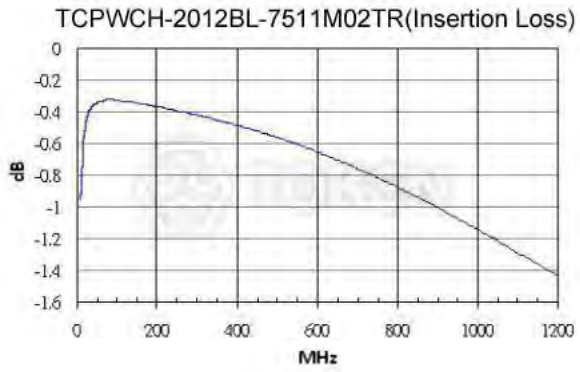



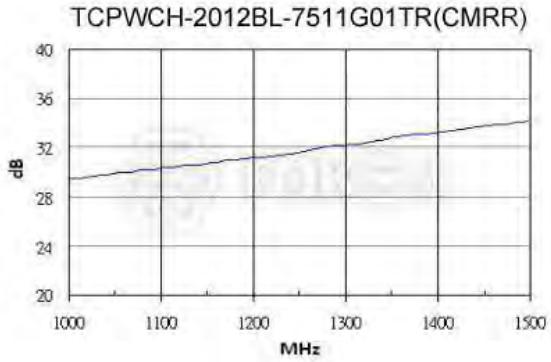



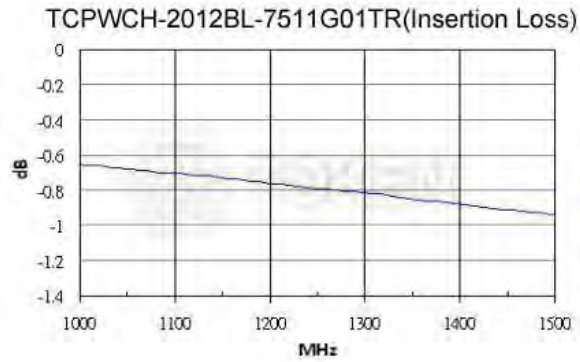



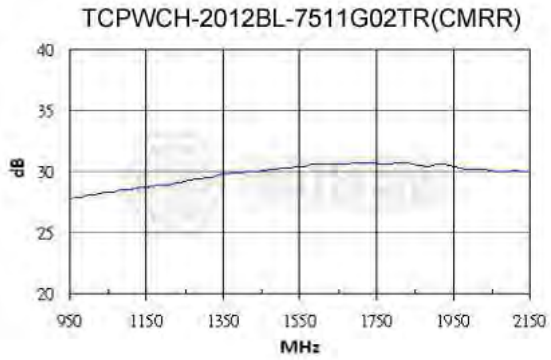
## Typical Characteristics Graph (TCPWCH-2012BL)

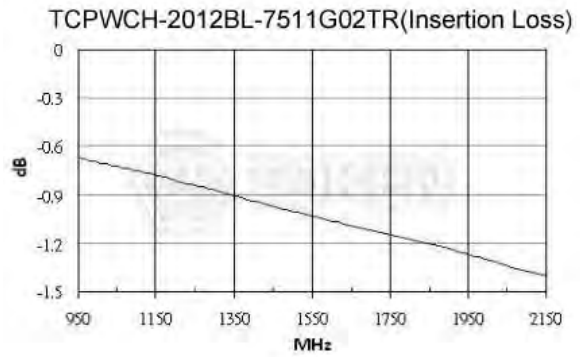


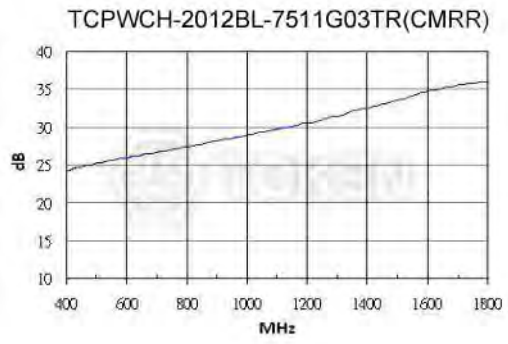



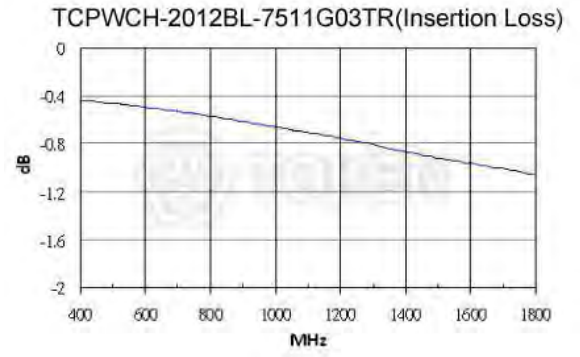



# Order Codes

## Order Codes (TCPWC)

| TCPWC | H | - | 2012 | BL | - | 50 | 11 | M01 | TR |
|---|---|---|---|---|---|---|---|---|---|

| Part Number |
|---|
| TCPWC |

| Shielding Type | |
|---|---|
| H | Shielding |

| Dimensions (mm) | | |
|---|---|---|
| 2012 | 2.00×1.20×1.20 | EIA0805 |

| Purpose | |
|---|---|
| BL | Balun Transformers |

| Port impedance (Ω) | |
|---|---|
| 50 | 50/50Ω |
| 75 | 75/75Ω |

| Impedance ratio | |
|---|---|
| 11 | 1:1 |

| Frequency sequence | |
|---|---|
| M01 | 45~870 |
| M02 | 50~1200 |
| G01 | 1000~1500 |
| G02 | 950~2150 |
| G03 | 400~1800 |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPSEH) High Current Common Mode Chokes

## Product Introduction

### Token newly released Common Mode Choke (TCPSEH) which handles currents up to 8.0 amps.

**Features :**

- A wide range of SMD package design, 7.0 × 6.0 × 3.8 , 9.0 × 7.0 × 4.8 , 12.0 × 10.8 × 6.4.
- Wire wound constructure common mode choke.
- With best EMI suppression effect high impedance.
- Very high rated current and low RDC.

**Applications :**

- Preventive measure against common mode noise, radiation emissions from power line or else.
- Wireless charging and power device design.
- Best for high current circuit such as car.


Comprehending the distinction between common mode signals and differential mode signals is very essential as we have to understand what the circuit requires to lessen noise.

How can we determine if the noise is differential or common mode? One method to test whether the issue is common mode or differential mode is always to fasten a snap cable ferrite towards the cable under consideration. By attaching the snap cable ferrite, we must make sure that If there's a noticable difference within the decrease in noise, the issue is common mode. Otherwise, then there's a differential problem. But bear in mind that within the cable are generally wires incorporated, towards and backwards the burden.

Common mode chokes are utilized to reduce a particular kind of electrical noise referred to as Common Mode Noise. They are also known as Current Compensated chokes or Current Cancellation chokes. Common mode chokes (TCPSEH) work nicely in applications like AC/Electricity power supplies (lines with large current movement) and signal lines, where distortion from the signal can create problems.

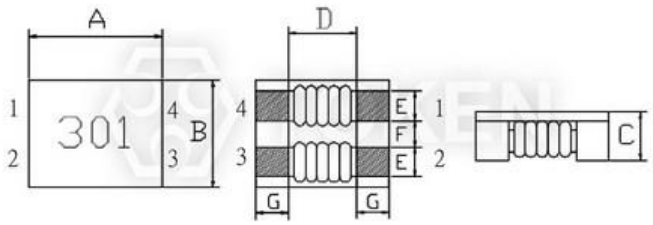
To precisely decide which common mode will support your requirements, here we use Nickel Zinc for wideband and greater frequency applications and Manganese Zinc for lower bandwidth and frequency applications. Token Common Mode Choke (TCPSEH) taking the advantage of Manganese Zinc and Nickel Zinc materials booms frequency up to higher 100 megahertz side.

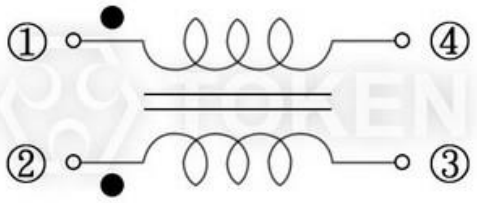
Token will also produce devices outside these specifications to meet customer requirements, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

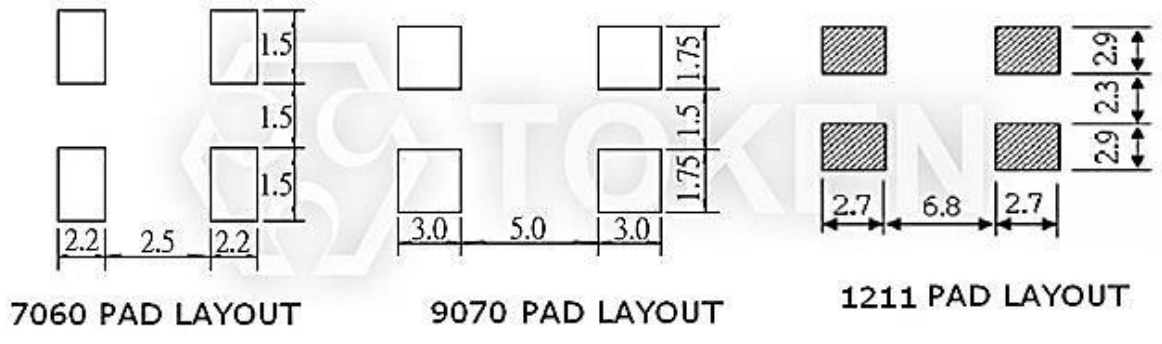
# Config. & Dim.

## Configurations & Dimensions (TCPSEH) Unit: mm

| SIZE CODE | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| **TCPSEH-7060SE** | 7.0±0.5 | 6.0±0.5 | 3.8max | 3.5REF | 1.5±0.2 | 1.5±0.2 | 1.75±0.2 |
| **TCPSEH-9070SE** | 9.0±0.5 | 7.0±0.5 | 4.8max | 5.7REF | 1.5±0.2 | 2.0±0.2 | 1.70±0.2 |
| **TCPSEH-1211SE** | 12.0±0.5 | 10.8±0.5 | 6.4max | 7.0REF | 2.7±0.2 | 2.5±0.2 | 2.5±0.2 |



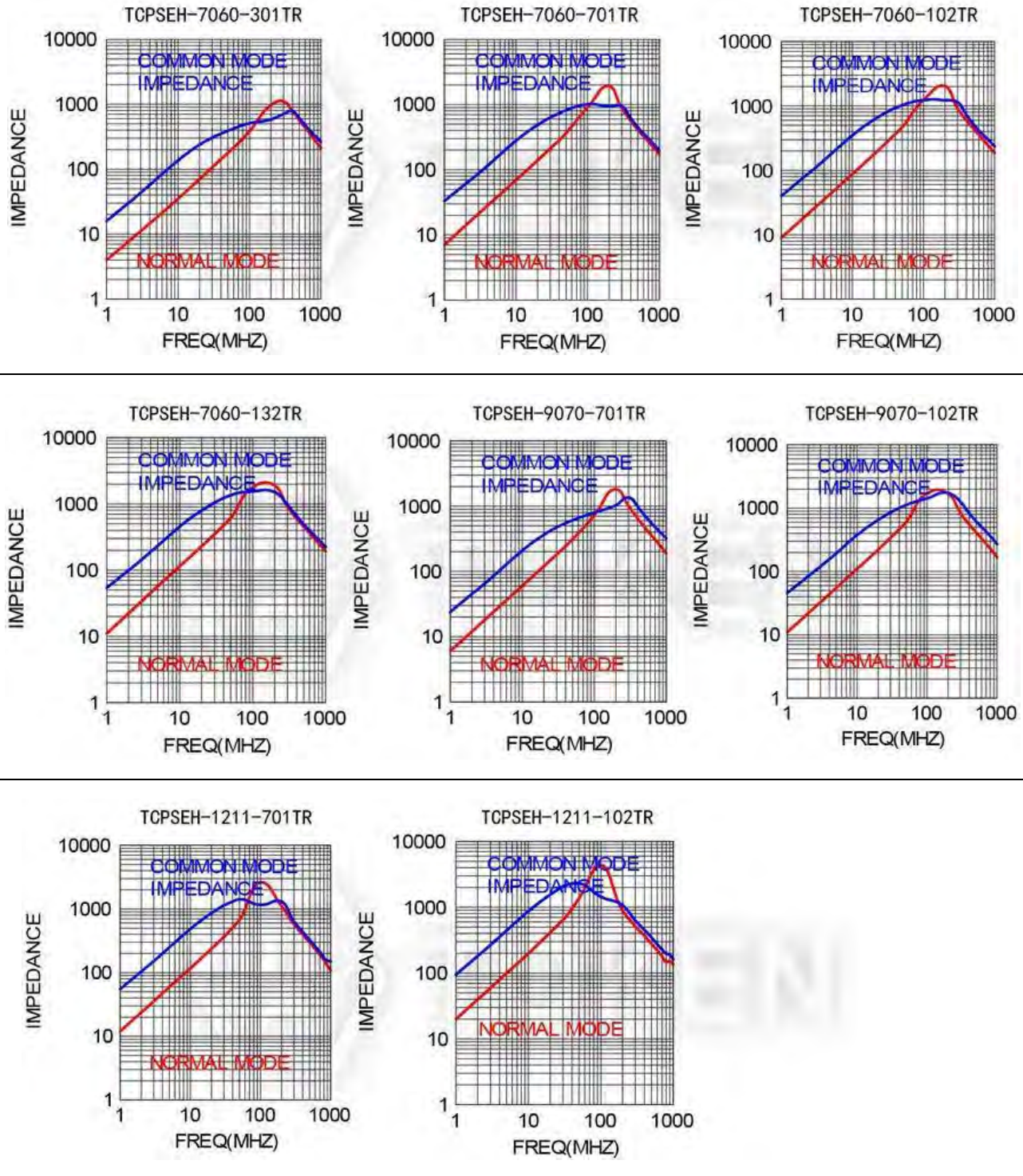



# Electrical Characteristics

## Electrical Characteristics (TCPSEH)

| Part Number | Impedance (Ω) Min. 100MHz | DC Resistance (mΩ) Max. | Rated Current (A) Max. | Rated Voltage V Max. | Insulation Resistance (mΩ) Min. |
|---|---|---|---|---|---|
| **TCPSEH-7060-301TR** | 225 | 10.0 | 5.0 | 80 | 10 |
| **TCPSEH-7060-701TR** | 500 | 15.0 | 4.0 | 80 | 10 |
| **TCPSEH-7060-102TR** | 800 | 17.0 | 3.0 | 80 | 10 |
| **TCPSEH-7060-132TR** | 910 | 21.0 | 2.5 | 80 | 10 |
| **TCPSEH-9070-701TR** | 500 | 10.0 | 5.0 | 50 | 10 |
| **TCPSEH-9070-102TR** | 750 | 13.0 | 4.0 | 50 | 10 |
| **TCPSEH-1211-701TR** | 500 | 6.0 | 8.0 | 125 | 10 |
| **TCPSEH-1211-102TR** | 750 | 14.0 | 6.0 | 125 | 10 |

## Impedance VS Frequency (TCPSEH)



# Order Codes

## Order Codes (TCPSEH)

| TCPSE | H | - | 7060 | - | 301 | TR |
|---|---|---|---|---|---|---|

| Part Number | Shielding Type | | Dimensions (mm) | | Impedance | Package | |
|---|---|---|---|---|---|---|---|
| TCPSE | H | Shielding | 7060 | 7.0×6.0×3.8 | Reference function specification table | P | Bulk |
| | | | 9070 | 9.0×7.0×4.8 | | TR | Taping Reel |
| | | | 1211 | 12.0×10.8×6.4 | | | |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCPWCS) Low Profile Common Mode Chokes

## Product Introduction

### Use of Token (TCPWCS) SMD common mode chokes in point-to-point high speed data links.

**Applications :**

- Preventive measure against high speed signal radiation emissions such as USB 2.0, IEEE1394 or LAN interface.
- Best for NB, DSC, mobile device design.

**Features :**

- Special very Low profile and small size design.
- Wound chip construction with standard 0805 or 0603 size, with best EMI suppression effect at higher frequency 500MHz~up.
- And least impact to signal wave form.

Token (TCPWCS) series common mode chokes offer just 1.6 x 0.8 mm (0603) and 2.0 x 1.2 mm (0805), with a maximum height of 0.8mm and 0.9 mm, making them the lowest-profile common mode chokes available.


They provide high differential mode cutoff frequency and common mode noise attenuation across a wide frequency range, suiting them as ideal for noise suppression in super-high-speed signal lines such as USB 3.x, HDMI 2.0, DisplayPort and DVI. The chokes are also suited for high-speed differential signal lines such as USB, IEEE1394, and LVDS, and are compatible with USB Type-C specification.

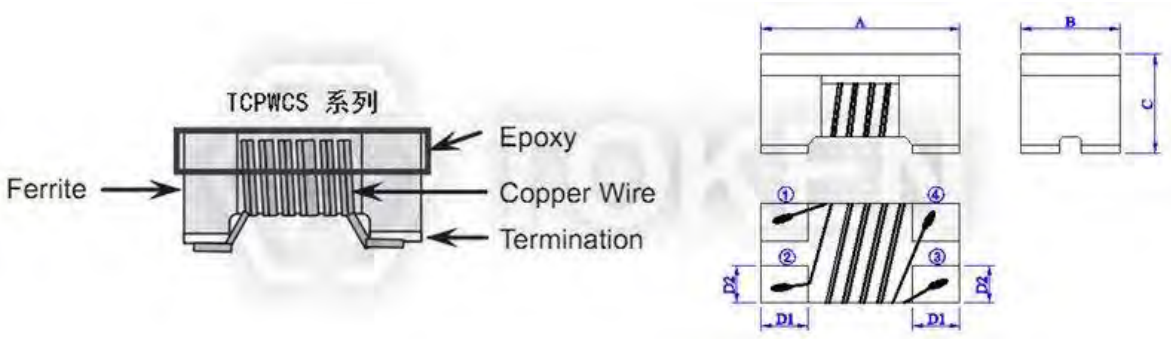
The (TCPWCS) series comes with very low DCR (0.25 to 0.80 Ohms) and current ratings up to 500 mA. Wide range impedance values are available to meet specific design requirements. All (TCPWCS) common mode chokes are halogen free and feature RoHS-compliant.

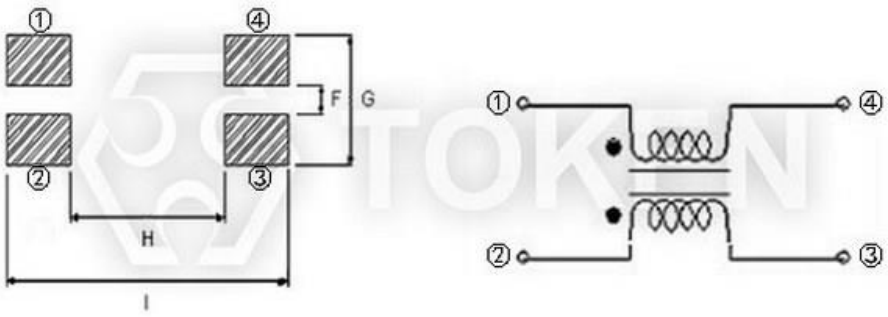
Token offers a wide variety of options to meet your needs. From common mode constructions that meet highest self-resonant frequencies to constructions for low profile and minimum board space coverage, Token are able to customize your request. Please contact our sales or link to Token official website "SMD Balun Transformers" for more information.

# Config. & Dim.

## Configurations & Dimensions (TCPWCS) Unit: mm (Inch)

| SIZE CODE | A | B | C | D1 TYP | D2 TYP | F TYP | G TYP | H TYP | I TYP |
|---|---|---|---|---|---|---|---|---|---|
| **TCPWCS-160808 (0603)** | 1.60±0.20 (0.063±0.008) | 0.80±0.30 (0.031±0.012) | 0.80±0.20 (0.031±0.008) | 0.30 (0.012) | 0.30 (0.012) | 0.30 (0.012) | 1.00 (0.039) | 0.70 (0.028) | 2.10 (0.083) |
| **TCPWCS-201209 (0805)** | 2.00±0.20 (0.079±0.008) | 1.20±0.30 (0.047±0.012) | 0.90±0.20 (0.035±0.008) | 0.45 (0.018) | 0.40 (0.016) | 0.40 (0.016) | 1.20 (0.047) | 0.80 (0.031) | 2.60 (0.102) |



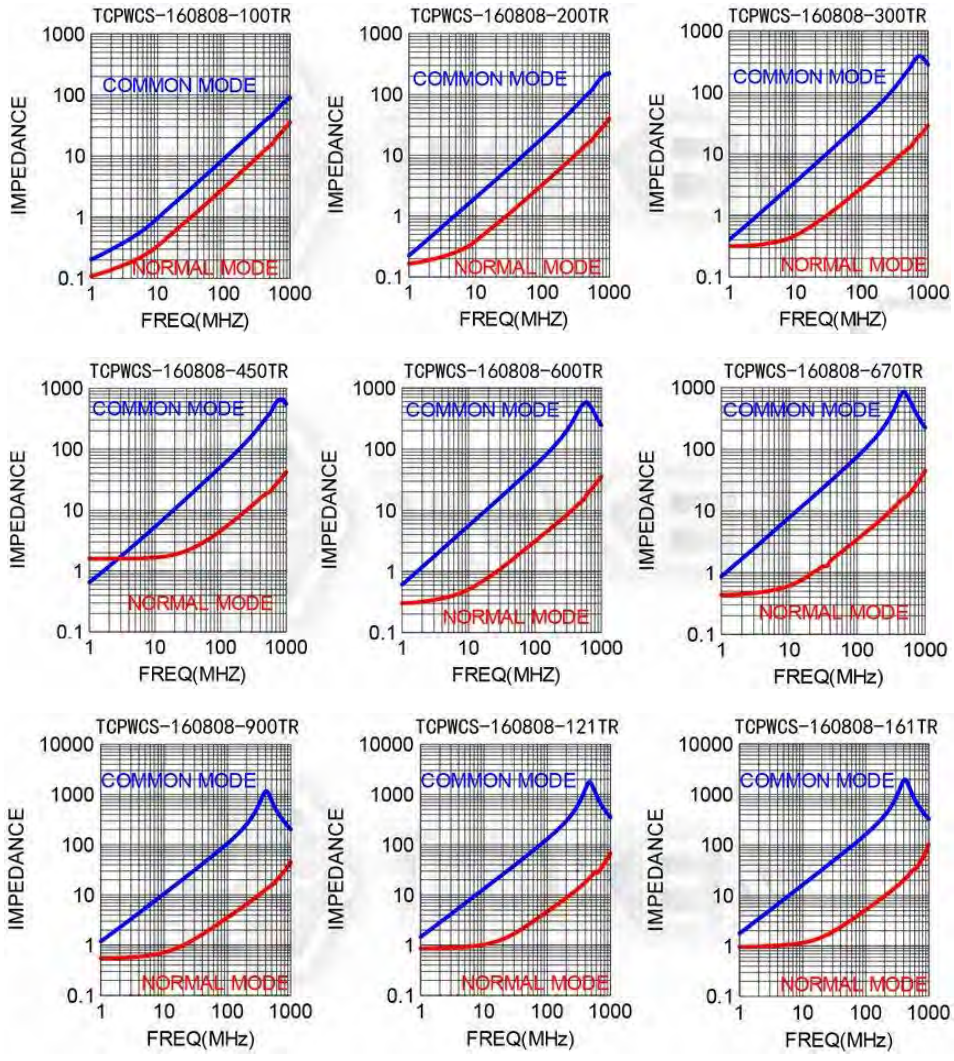

**Common mode filter (TCPWCS) Configurations diagram**

# TCPWCS-160808

## Electrical Characteristics (TCPWCS-160808)

| Part Number | Impedance (Ω) 100MHz | Tolerance ±% | Test Frequency (MHz) Max. | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCS-160808-100TR | 10 | 25% | 100 | 0.30 | 500 |
| TCPWCS-160808-200TR | 20 | 25% | 100 | 0.40 | 400 |
| TCPWCS-160808-300TR | 30 | 25% | 100 | 0.45 | 350 |
| TCPWCS-160808-450TR | 45 | 25% | 100 | 0.50 | 300 |
| TCPWCS-160808-600TR | 60 | 25% | 100 | 0.50 | 300 |
| TCPWCS-160808-670TR | 67 | 25% | 100 | 0.50 | 300 |
| TCPWCS-160808-900TR | 90 | 25% | 100 | 0.55 | 250 |
| TCPWCS-160808-121TR | 120 | 25% | 100 | 0.80 | 200 |
| TCPWCS-160808-161TR | 160 | 25% | 100 | 0.80 | 200 |

## Impedance VS Frequency Graph (TCPWCS-160808)

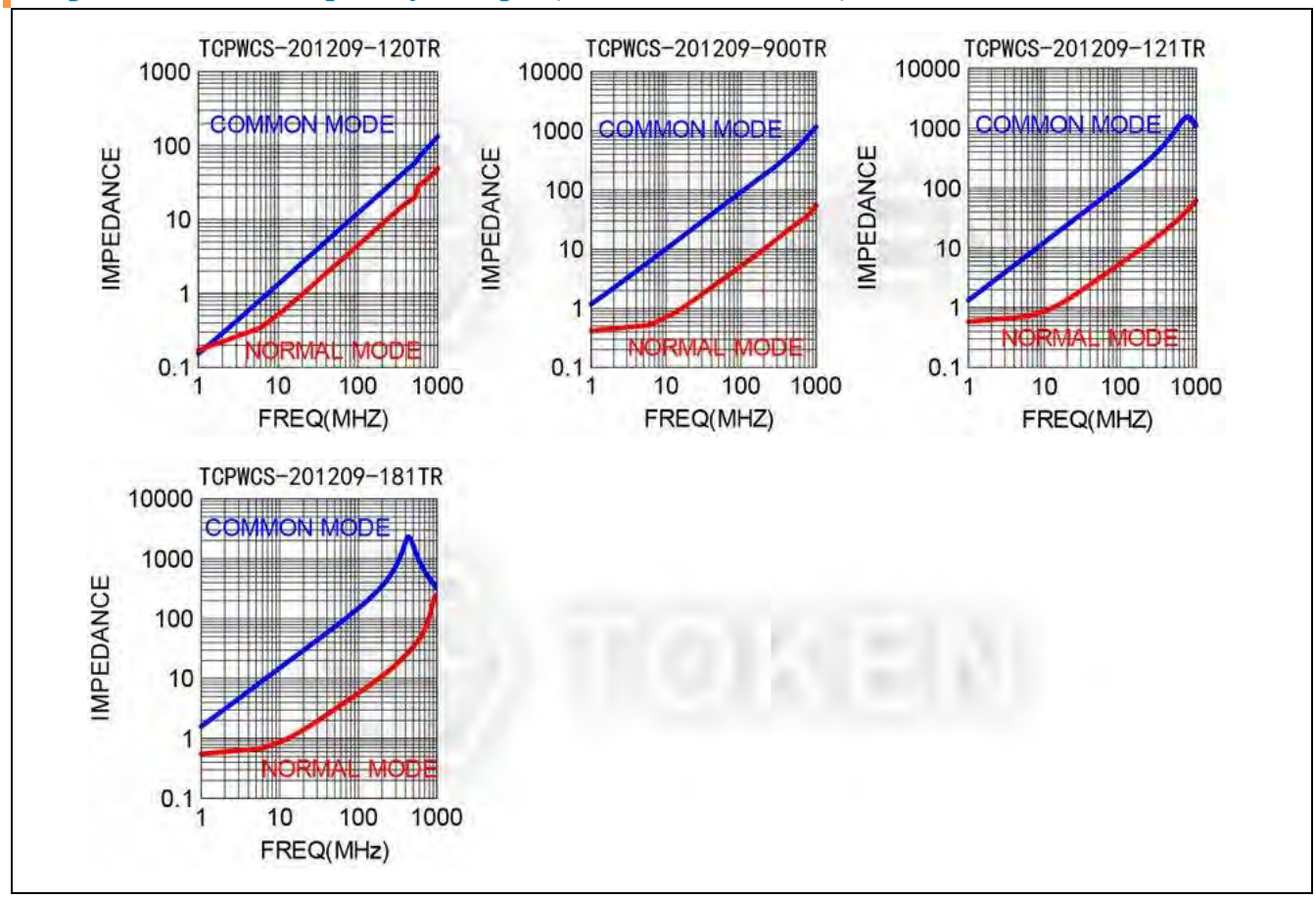


# TCPWCS-201209

## Electrical Characteristics (TCPWCS-201209)

| Part Number | Impedance (Ω) 100MHz | Tolerance ±% | Test Frequency (MHz) Max. | DC Resistance (Ω) Max. | Rated Current (mA) Max. |
|---|---|---|---|---|---|
| TCPWCS-201209-120TR | 12 | 25% | 100 | 0.25 | 500 |
| TCPWCS-201209-900TR | 90 | 25% | 100 | 0.35 | 400 |
| TCPWCS-201209-121TR | 120 | 25% | 100 | 0.40 | 500 |
| TCPWCS-201209-181TR | 180 | 25% | 100 | 0.50 | 250 |

## Impedance VS Frequency Graph (TCPWCS-201209)



# Order Codes

## Order Codes (TCPWCS)

| TCPWC | S | - | 160808 | 900 | TR |
|---|---|---|---|---|---|

| Part Number | Epoxy | |
|---|---|---|
| TCPWC | S | Epoxy |

| Dimensions | | |
|---|---|---|
| 160808 | 1.60×0.80×0.80 | EIA 0603 |
| 201209 | 2.00×1.20×0.90 | EIA 0805 |

| Impedance (Ω) | |
|---|---|
| 100 | 10Ω |
| 450 | 45Ω |
| 900 | 90Ω |
| 121 | 120Ω |
| 181 | 180Ω |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCSG) Larger Current Common Mode Choke Coils

## Product Introduction

### Token (TCSG) is capable of handling noise in larger current sets for a 5 A class.

**Features :**

- High impedance for common mode noise and low impedance for differential mode signal.
- Wide band or sharp type impedance cure available.
- Large rated current available.
- SMD or DIP available.

**Applications :**

- Prevention of common mode noise on signal Lines and power lines for computer related or electronic products.

Some common mode choke coils are applied in circuits linked to AC power lines (commercial power lines), like the primary side of switching power supplies. Common mode choke coils utilized in these locations are frequently known as "line filters".

These common mode choke coils are utilized along with over the line capacitors (X-capacitors) and line bypass capacitors (Y-capacitors), and are utilized to prevent noise generated through the secondary side circuit from dripping towards the primary side, and also to prevent noise generated through the power circuit from getting away through the cord.

Common mode chokes and Line bypass capacitors remove common mode noise, while over-the-line capacitors remove differential mode noise. Growing the capacitance of a line bypass capacitor causes elimination of lower frequency common mode noise, however the chance of current leaking to the ground expands along with the capacitance, to ensure the capacitance need to be detained to a certain value or less.

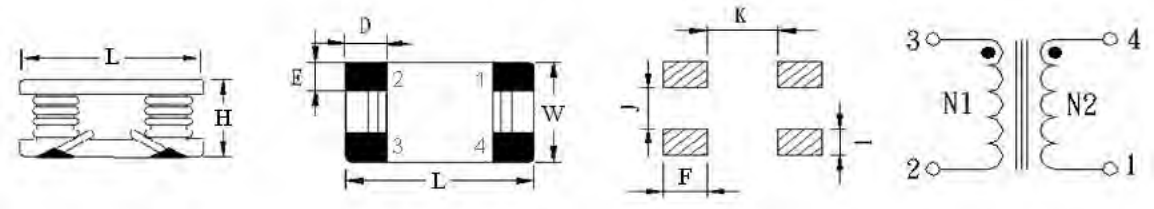
That is why, common mode choke coils are mostly employed in the low-frequency selection that can not be insured by line bypass capacitors. Additionally, the application of normal mode choke coils are able to provide enhanced differential mode noise removal results in some instances.

Token will also produce devices outside these specifications to meet customer requirements, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

# Characteristics & Dim.

## Characteristics & Dimensions (TCSG) Unit: mm

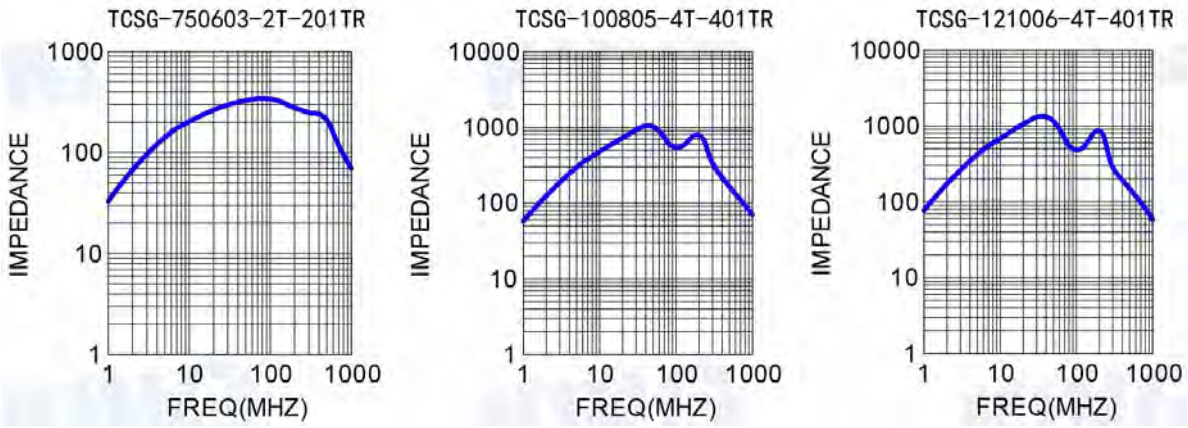
| Part Number | L | W | H | D | E | F | I | J | K | BASE | WINDING | Z at 100MHz (Ω) Min. | RATED CURRENT (mA) | RDC (Ω) Max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCSG -750603 | 7.5±0.3 | 6.0±0.5 | 3.2±0.3 | 2.5 | 1.5 | 3.1 | 2.4 | 1.0 | 1.5 | SMD-4P | φ0.35×2.5TS×2 | 200 | 2000 | 0.020 |
| TCSG -100805 | 10.6 max | 8.7 max | 5.0±0.5 | 2.5 | 2.1 | 4.2 | 3.0 | 2.0 | 3.6 | SMD-4P | φ0.55×4.5TS×2 | 400 | 4000 | 0.045 |
| TCSG -121006 | 12.0±0.5 | 10.0±0.5 | 6.0±0.5 | 3.5 | 2.0 | 4.75 | 4.5 | 3.0 | 4.5 | SMD-4P | φ0.50×4.5TS×2 | 400 | 5000 | 0.025 |




Common mode filter (TCSG) Configurations diagram

# TCSG Graph

## Typical Characteristics Graph (TCSG)



# Order Codes

## Order Codes (TCSG)

| TCSG | - | 121006 | - | 4T | - | 401 | TR |
|---|---|---|---|---|---|---|---|

| Part Number |
|---|
| TCSG |

| Dimensions | |
|---|---|
| 750603 | 7.5×6.0×3.2 |
| 100805 | 10.6×8.7×5.0 |
| 121006 | 12.0×10.0×6.0 |

| Core structure |
|---|
| 2T |
| 4T |

| Impedance(Ω) | |
|---|---|
| 201 | 200Ω |
| 401 | 400Ω |

| Package | |
|---|---|
| P | Bulk |
| TR | Taping Reel |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCB4F)
# SMD RF Baluns Transformer

## Product Introduction

**Balun transformer resolves the challenge of interfacing differential RF circuits to single-ended ones.**

**Features :**
- Pair and triple wire coil for high stability and high balance.
- Available in tape & reel for automatic surface mounting..

**Applications :**
- Impedance Transformers.
- Broad-Band Transformers.
- Double Balance Mixers, Frequency Mixer.
- Common Mode Filter, Balun Transformers.


Token Electronics has introduced SMD Common Mode RF Transformers (RF Balun Transformers) in 3.8 × 4.4 mm compact size, which are used to convert between unbalanced-balanced signals in the antenna inputs of tuner circuits for terrestrial digital broadcast compatible compact devices. Up to now baluns have been made by winding wire around a high-quality ferrite core, and are widely used in electronic devices such as TVs and desktop PCs.

Token SMD RF Balun Transformers Frequency Mixer (TCB4F) is primarily designed for choking power lines and conform to the RoHS compliant and Lead-free. SMD (TCB4F) can be customed designs and tighter tolerances available on request.

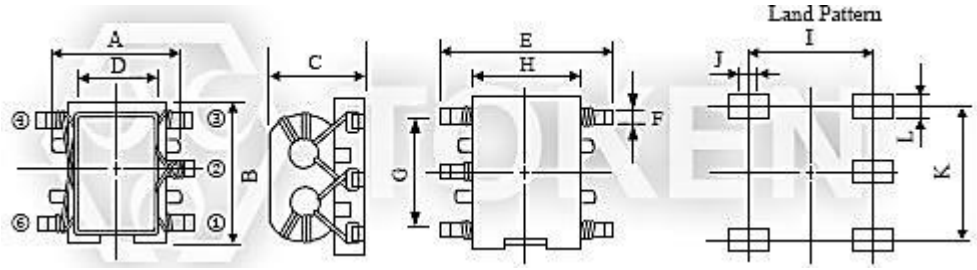
Windings use paired or and triple wires for high uniformity. Base pins are end proccessed to allow direct mounting on PCB. The Balun transformers are ideal for use in double balanced mixers and as broad band transformers, transistors, impedance conversion, and frequency mixer for STB and Cable Modem. Application of SMD choke coils specific designs also available including different inductance values and Q specifications adjusted to frequency requirements.

Token is equipped to design and produce standard and custom Balun components to meet many design and reliability demands. Custom parts are available on request. Token will also produce devices outside these specifications to meet specific customer requirements, please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

# Config. & Dim.

## Configurations & Dimensions (Unit: mm) (TCB4F)

| Type | A | B (max) | C (max) | D | E (max) | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCB4F** | 3.8 | 4.4 | 3.2 | 2.0 | 5.5 | 0.45 | 3.0 | 2.7 | 4.4 | 1.3 | 3.0 | 1.0 |




SMD Common Mode RF Balun Transformer (TCB4F) Dimensions

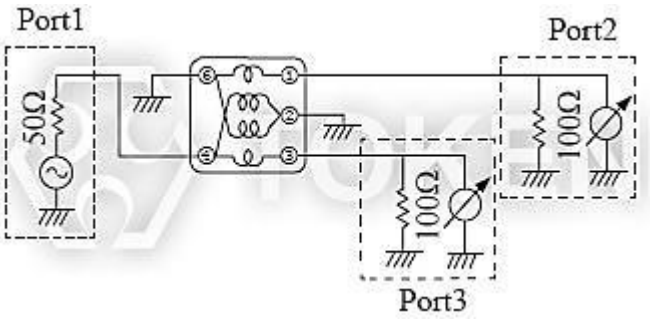
- **Note: Design as Customer's Requested Specifications.**

# TCB4F-617DB Spec A

## Electrical Characteristics A (TCB4F - 617DB)

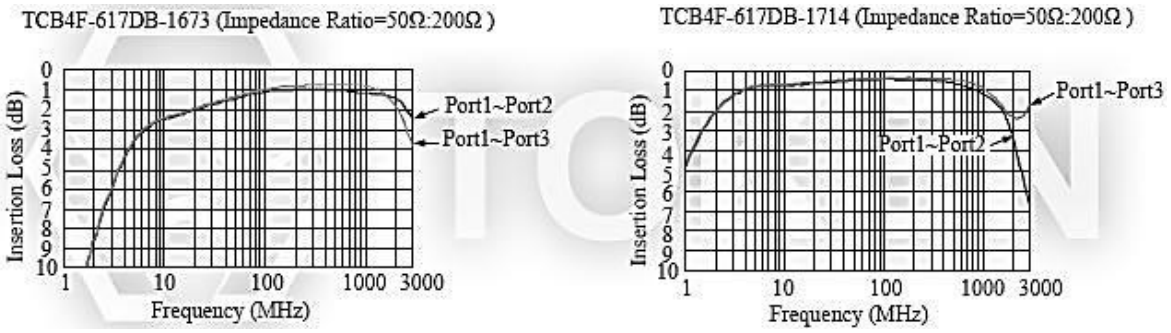
| Part Number | Winding Turns 1-6=2-4=2-6=3-4 | μiac |
|---|---|---|
| **TCB4F - 617DB1673** | 2 1/2 T | 300 |
| **TCB4F - 617DB1674** | 3 1/2 T | 300 |
| **TCB4F - 617DB1675** | 4 1/2 T | 300 |
| **TCB4F - 617DB1714** | 5 1/2 T | 300 |

## Test Circuit A (TCB4F - 617DB)




**SMD Common Mode RF Balun Transformer (TCB4F - 617DB) Test Circuit A**

## Typical Characteristics A (TCB4F - 617DB)



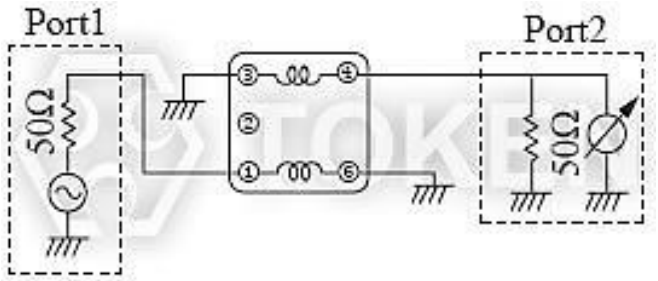

**SMD Common Mode RF Balun Transformers and Frequency Mixer (TCB4F - 617DB) Typical Characteristics A**

# TCB4F-617DB Spec B

## Electrical Characteristics B (TCB4F - 617DB)

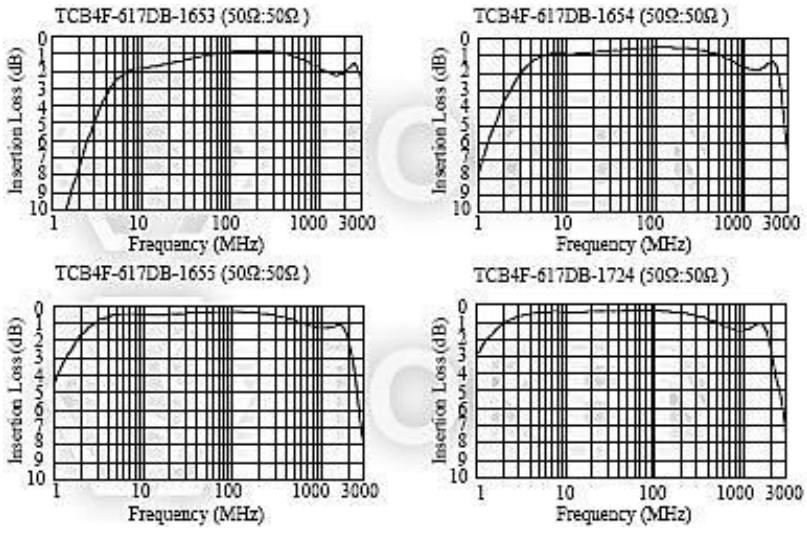
| Part Number | Winding Turns | μiac |
|---|---|---|
| **TCB4F - 617DB1653** | 2 1/2 T | 300 |
| **TCB4F - 617DB1654** | 3 1/2 T | 300 |
| **TCB4F - 617DB1655** | 4 1/2 T | 300 |
| **TCB4F - 617DB1724** | 5 1/2 T | 300 |

## Test Circuit B (TCB4F - 617DB)




**Common Mode RF Balun Transformers (TCB4F - 617DB) Test Circuit B**

## Typical Characteristics B (TCB4F - 617DB)



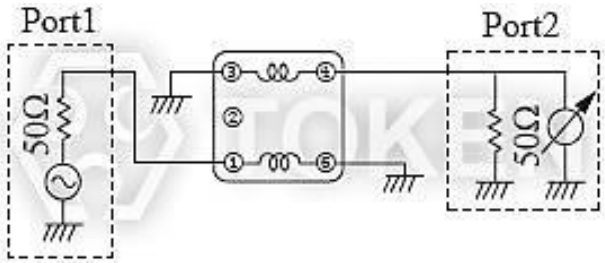

**SMD Common Mode RF Balun Transformers (TCB4F - 617DB) Typical Characteristics B**

# TCB4F-617DB Spec C

## Electrical Characteristics C (TCB4F - 617DB)

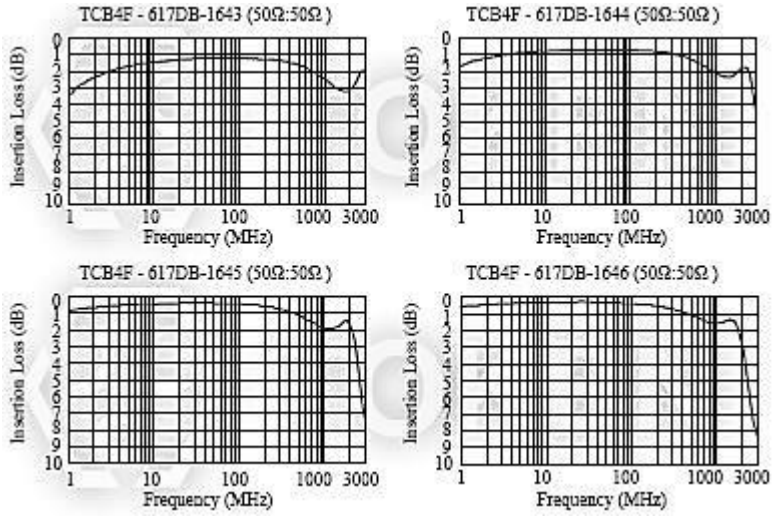
| Part Number | Winding Turns | μiac |
|---|---|---|
| **TCB4F - 617DB1643** | 2 1/2 T | 1500 |
| **TCB4F - 617DB1644** | 3 1/2 T | 1500 |
| **TCB4F - 617DB1645** | 4 1/2 T | 1500 |
| **TCB4F - 617DB1646** | 5 1/2 T | 1500 |

## Test Circuit C (TCB4F - 617DB)




**Common Mode RF Balun Transformers**
**(TCB4F - 617DB) Test Circuit C**

## Typical Characteristics C (TCB4F - 617DB)



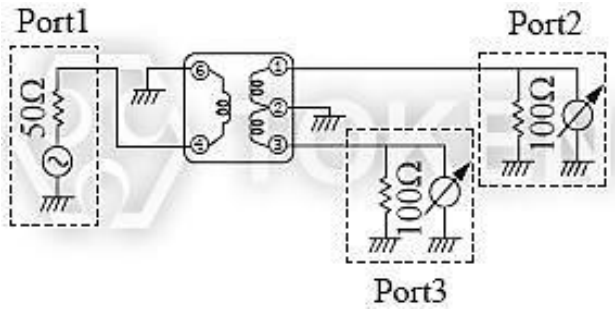

**SMD Common Mode RF Balun Transformers**
**(TCB4F - 617DB) Typical Characteristics C**

# TCB4F-617PT Spec

## Electrical Characteristics (TCB4F - 617PT)

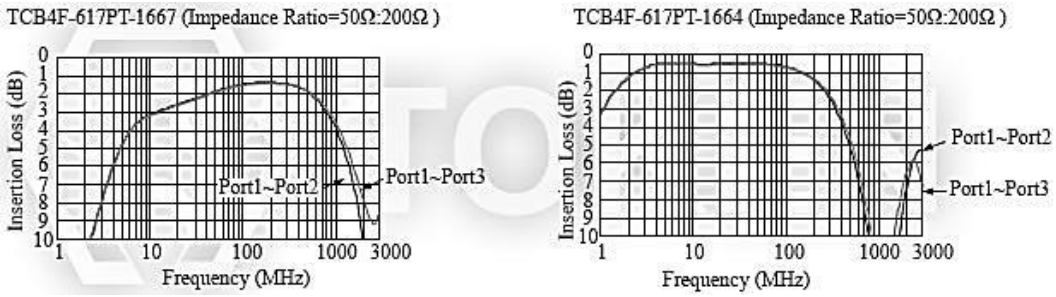
| Part Number | Winding Turns 1-2=2-3=4-6 | μiac |
|---|---|---|
| **TCB4F - 617PT1667** | 2T | 300 |
| **TCB4F - 617PT1669** | 3T | 300 |
| **TCB4F - 617PT1699** | 4T | 300 |
| **TCB4F - 617PT1664** | 5T | 300 |

## Test Circuit (TCB4F - 617PT)




**SMD Common Mode RF Balun Transformer (TCB4F - 617PT) Test Circuit**

## Typical Characteristics (TCB4F - 617PT)




**SMD Common Mode RF Balun Transformer and Frequency Mixer (TCB4F - 617PT) Typical Characteristics**

# Order Codes

## Order Codes (TCB4F)

| TCB4F | - | 617DB1673 |
|---|---|---|

| Part Number |
|---|
| TCB4F |

| Type | |
|---|---|
| 617DB1673 | Frequency Mixer |
| 617PT1667 | Frequency Mixer |
| 617DB1653 | Balun Transformers |
| 617DB1643 | Balun Transformers |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCB5F) SMD RF Baluns Transformer

## Product Introduction

### Balun transformer covers the task of interfacing differential RF circuits to single-ended oness.

**Features :**

- Pair wire coil
  for high balance and higher consistency.
- Offered in tape & reel
  for automatic surface mounting..

**Applications :**

- Broad-Band Transformers.
- Impedance Transformers.
- Common Mode Filter, Balun Transformers.
- Double Balance Mixers, Frequency Mixer.


Token takes advantage of the most recent turning expertise utilizing coupled wiring for top consistency in addition to allowing one of the most cost-effective products throughout developing surface mount baluns.

Bottom portion pinastre are generally finish manufactured to let for straight installation on PCB (printed circuit board). Excellent for use as double balanced mixers, broad band transformers, transistors as well as impedance transformation.

Token (TCB5F) balun is particularly for choking power lines and also in accordance the RoHS compliant and in addition Lead-free. SMD (TCB5F) include while having ultra-compact size, extensive inductance choice, and low-resistance coils. Chip (TCB5F) can be customed designs together with more restrictive tolerances available on request.

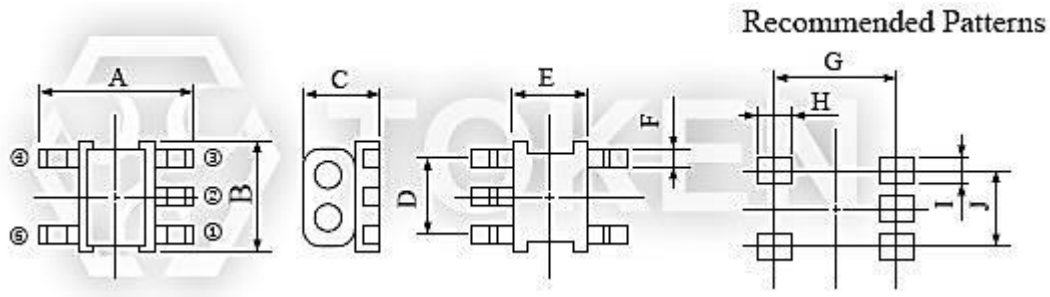
Application of RF Transformer specific designs also available including different inductance values and Q specifications adjusted to frequency requirements.

Token is equipped to design and produce custom components to meet many design and reliability demands. Custom parts are available on request. Token will also produce devices outside these specifications to meet specific customer requirements, please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

# Configurations & Dimensions

## Configurations & Dimensions (TCB5F)

| Type | A (max) | B (max) | C (max) | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| **TCB5F** | 6.9 | 6.9 | 4.4 | 4.0 | 3.8 | 0.6 | 5.7 | 1.7 | 1.2 | 4.0 |




Surface mount RF Balun Transformer (TCB5F) Dimensions

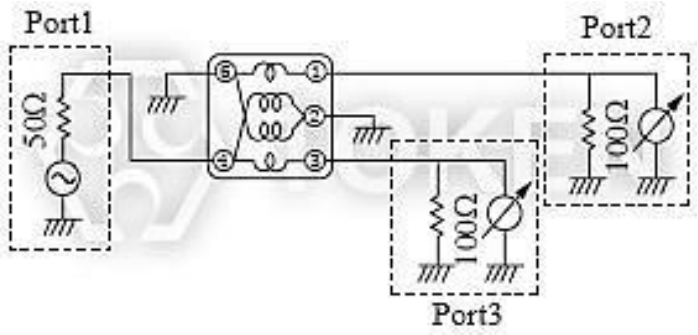
- **Note: Design as Customer's Requested Specifications.**

# 458DB Characteristics

## Electrical Characteristics (TCB5F - 458DB)

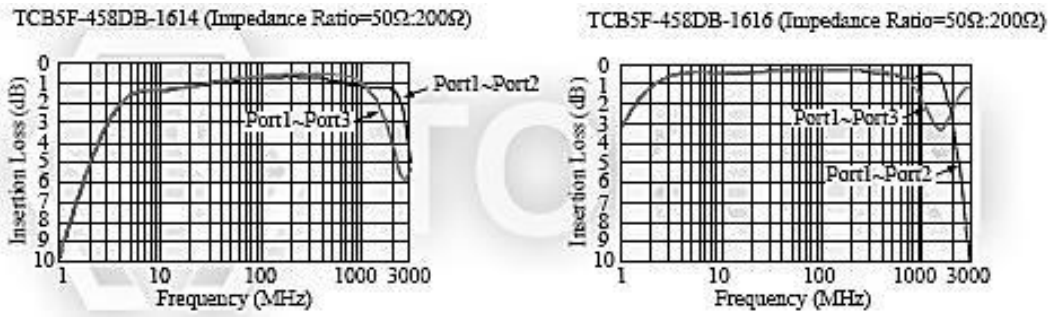
| Part Number | Winding Turns<br>1-6=2-4=2-6=3-4 | μiac |
|---|---|---|
| **TCB5F - 458DB1614** | 2 1/2 T | 300 |
| **TCB5F - 458DB1615** | 3 1/2 T | 300 |
| **TCB5F - 458DB1616** | 4 1/2 T | 300 |

## Test Circuit (TCB5F - 458DB)




**(TCB5F - 458DB) Test Circuit**

## Typical Characteristics (TCB5F - 458DB)



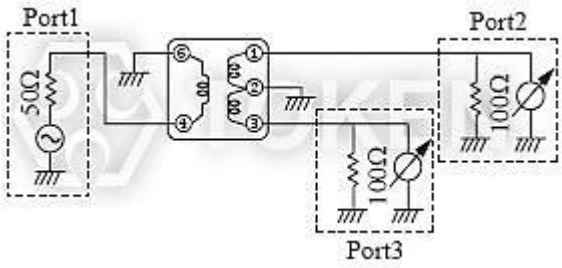

**SMD Baluns, RF Transformer (TCB5F - 458DB) Typical Characteristics**

# 458PT Characteristics

## Electrical Characteristics (TCB5F - 458PT)

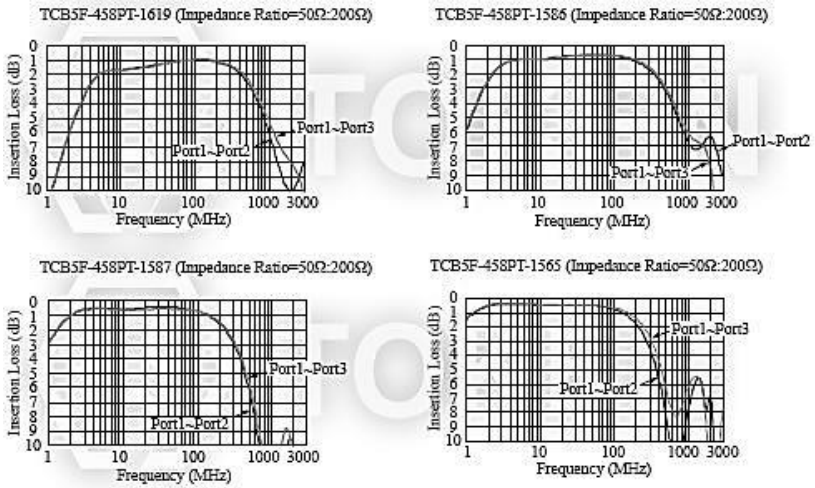
| Part Number | Winding Turns 1-2=2-3=4-6 | μiac |
|---|---|---|
| **TCB5F - 458PT1619** | 2 T | 300 |
| **TCB5F - 458PT1586** | 3 T | 230 |
| **TCB5F - 458PT1587** | 4 T | 230 |
| **TCB5F - 458PT1565** | 5 T | 230 |

## Test Circuit (TCB5F - 458PT)




**(TCB5F - 458PT) Test Circuit**

## Typical Characteristics (TCB5F - 458PT)




**SMD Baluns, RF Transformers (TCB5F - 458PT) Typical Characteristics**

# Order Codes

## Order Codes (TCB5F)

| TCB5F | - | 458DB1614 |
|---|---|---|

| Part Number |
|---|
| TCB5F |

| Type | |
|---|---|
| 458DB1614 | Frequency Mixer |
| 458DB1615 | Frequency Mixer |
| 458PT1619 | Frequency Mixer |
| 458PT1586 | Frequency Mixer |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

# (TCB5FL) RF Baluns Transformer

## Product Introduction

**RF Balun transformer handles the work associated with interfacing differential RF circuits to single-ended ones.**

**Features :**

- Pair wire coil for higher stability and optimum balance.
- Available in tape & reel for automatic surface mounting..

**Applications :**

- Double Balance Mixers.
- Broad-Band Transformers.
- Impedance Transformers, Frequency Mixer.
- Balun Transformers, Common Mode Filter.


A Balun is actually a device that typically transforms balanced impedance to unbalanced and the other. What is more, baluns have the ability to as well furnish impedance transformation, that's why the title Balun Transformers.

Token makes use of the most up-to-date turning technique utilizing coupled wiring for top consistency along with permitting one of the most cost-effective products when it comes to producing surface mount baluns.

Token (TCB5FL) baluns are primarily designed for choking power lines and conform to the RoHS compliant and Lead-free. SMD (TCB5FL) feature with ultra-compact size, wide inductance selection, and low-resistance coils. SMD (TCB5FL) can be customed designs and tighter tolerances available on request.

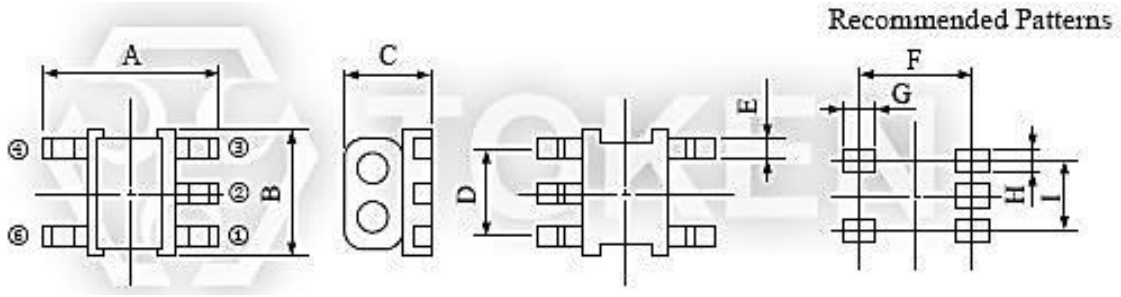
Application of RF balun transformer specific designs also available including different inductance values and Q specifications adjusted to frequency requirements. Base pins are end proccessed to allow direct mounting on PCB. Ideal for use in double balanced mixers, and as broad band transformers, transistors and for impedance conversion.

Token will also produce devices outside these specifications to meet customer requirements, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website “SMD Balun Transformers” for more information.

# Configurations & Dimensions

## Configurations & Dimensions (TCB5FL)

| Type | A (max) | B (max) | C (max) | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| **TCB5FL** | 6.9 | 6.9 | 3.6 | 4.0 | 5-0.6 | 5.7 | 1.7 | 1.2 | 4.0 |




Common Mode Surface Mount Balun Transformers (TCB5FL) Dimensions

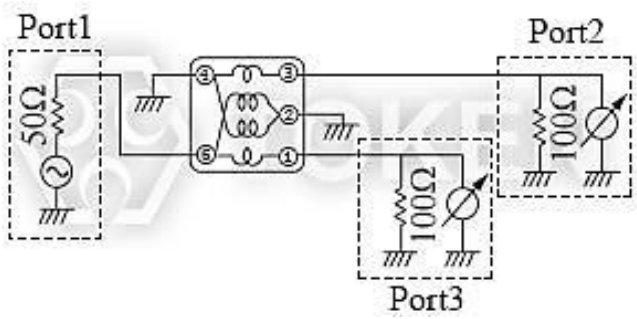
- **Note: Design as Customer's Requested Specifications.**

# TCB5FL Characteristics

## Electrical Characteristics (TCB5FL)

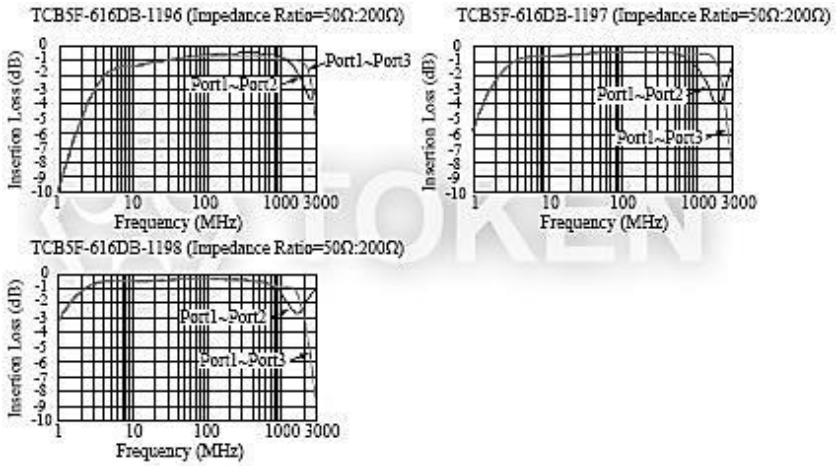
| Part Number | Winding Turns<br>1-6=2-4=2-6=3-4 | μiac |
|---|---|---|
| **TCB5FL - 616DB1196** | 2 1/2 T | 300 |
| **TCB5FL - 616DB1197** | 3 1/2 T | 300 |
| **TCB5FL - 616DB1198** | 4 1/2 T | 300 |

## Test Circuit (TCB5FL)




**SMD Balun Transformer (TCB5FL) Test Circuit**

## Typical Characteristics (TCB5FL)




**SMD Balun Transformers (TCB5FL) Typical Characteristics**

# Order Codes

## Order Codes (TCB5FL)

| TCB5F | - | 616DB1196 |
|---|---|---|

| Part Number |
|---|
| TCB5FL |

| Type | |
|---|---|
| 616DB1196 | Frequency Mixer |
| 616DB1197 | Frequency Mixer |

# General Information

## Applications of Baluns

In a **RF balun transformer**, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal. Balun transformers can be used between various parts of a wireless or cable communications system. Some common applications denotes as following:

- Television receiver (Balanced) - coaxial cable network or Coaxial antenna system (Unbalanced)
- FM broadcast receiver (Balanced) - Coaxial antenna system (Unbalanced)
- Dipole antenna (Balanced) - Coaxial transmission line (Unbalanced)
- Parallel-wire transmission line (Balanced) - Coaxial transmitter output, or Coaxial receiver input (Unbalanced)

Token's baluns provide impedance transformation in addition to conversion between balanced and unbalanced signal modes. Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are available and used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.