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SMD Balun Transformers Series

Web: www.token.com.tw

Email: rfq@token.com.tw

Token Electronics Industry Co., Ltd.

Taiwan: No.137, Sec. 1, Zhongxing Rd., Wugu District,
New Taipei City, Taiwan. 248012
Tel: +886 2981 0109 Fax: +886 2988 7487

China: 17P, Nanyuan Maple Leaf Bldg., Nanshan Ave.,
Nanshan Dist., Shenzhen, Guangdong, China. 518054
Tel: +86 755 26055363



Production Index

SMD Balun Transformers Series

What is Balun Transformer?	1
What is Balun Transformer	1
(TCPWCH) Common Mode Chokes For USB, IEEE 394, Lan Interface.....	2
Product Introduction	2
Config. & Dim.	3
2012	4
3216	6
4525	8
4532	10
453226/453228	11
Environ. Characteristics	12
Order Codes	14
(TCPWCH) Common Mode Choke Coils for Automotive.....	15
Product Introduction	15
Config. & Dim.	16
4532AU Specifications	17
Order Codes	18
(TCPWCH) Common Mode Chokes	19
Product Introduction	19
Config. & Dim.	20
1210HS Specifications	21
2012HS Specifications	23
Order Codes	26
(TCPWCH-) HDMI Common Mode Filters & Chokes.....	27
Product Introduction	27
Config. & Dim.	28
Electrical Characteristics.....	29
Order Codes	31
(TCPWCH) Balun Transformers for Digital TV Tuners, WBL.....	32
Product Introduction	32
Config. & Dim.	33
Electrical Characteristics.....	34
Graph	34
Order Codes	36



(TCPSEH) High Current Common Mode Chokes.....	37
Product Introduction	37
Config. & Dim.	38
Electrical Characteristics.....	39
Order Codes	41
(TCPWCS) Low Profile Common Mode Chokes.....	42
Product Introduction	42
Config. & Dim.	43
TCPWCS-160808	44
TCPWCS-201209	45
Order Codes	46
(TCSG) Larger Current Common Mode Choke Coils.....	47
Product Introduction	47
Characteristics & Dim.....	48
TCSG Graph	48
Order Codes	49
(TCB4F) SMD RF Baluns Transformer.....	50
Product Introduction	50
Config. & Dim.	51
TCB4F-617DB Spec A	52
TCB4F-617DB Spec B	53
TCB4F-617DB Spec C	54
TCB4F-617PT Spec.....	55
Order Codes	56
(TCB5F) SMD RF Baluns Transformer.....	57
Product Introduction	57
Configurations & Dimensions	58
458DB Characteristics	59
458PT Characteristics	60
Order Codes	61
(TCB5FL) RF Baluns Transformer.....	62
Product Introduction	62
Configurations & Dimensions	63
TCB5FL Characteristics.....	64
Order Codes	65
General Information.....	65



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](http://www.token.com.tw)" for more information.

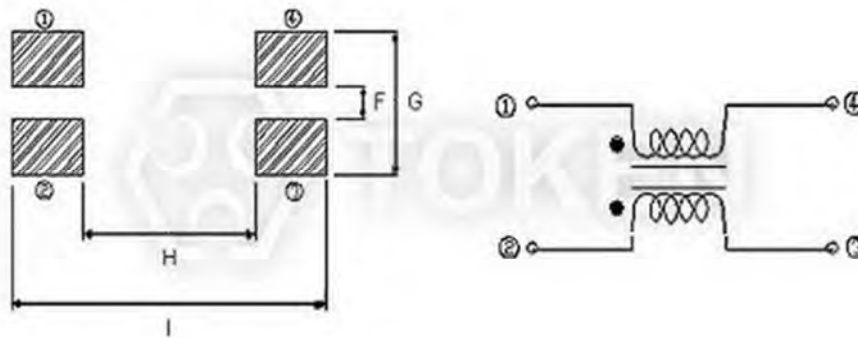
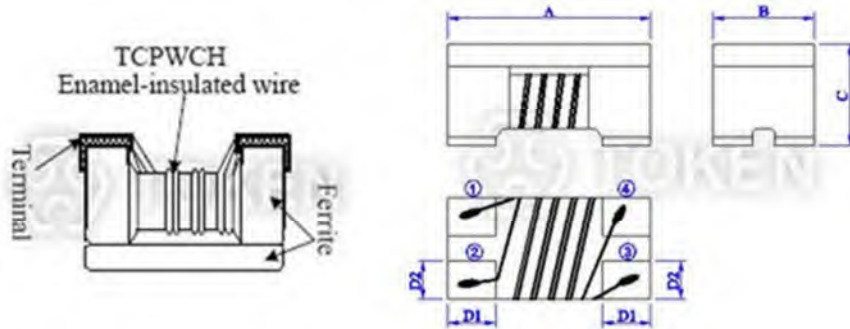


Config. & Dim.

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)



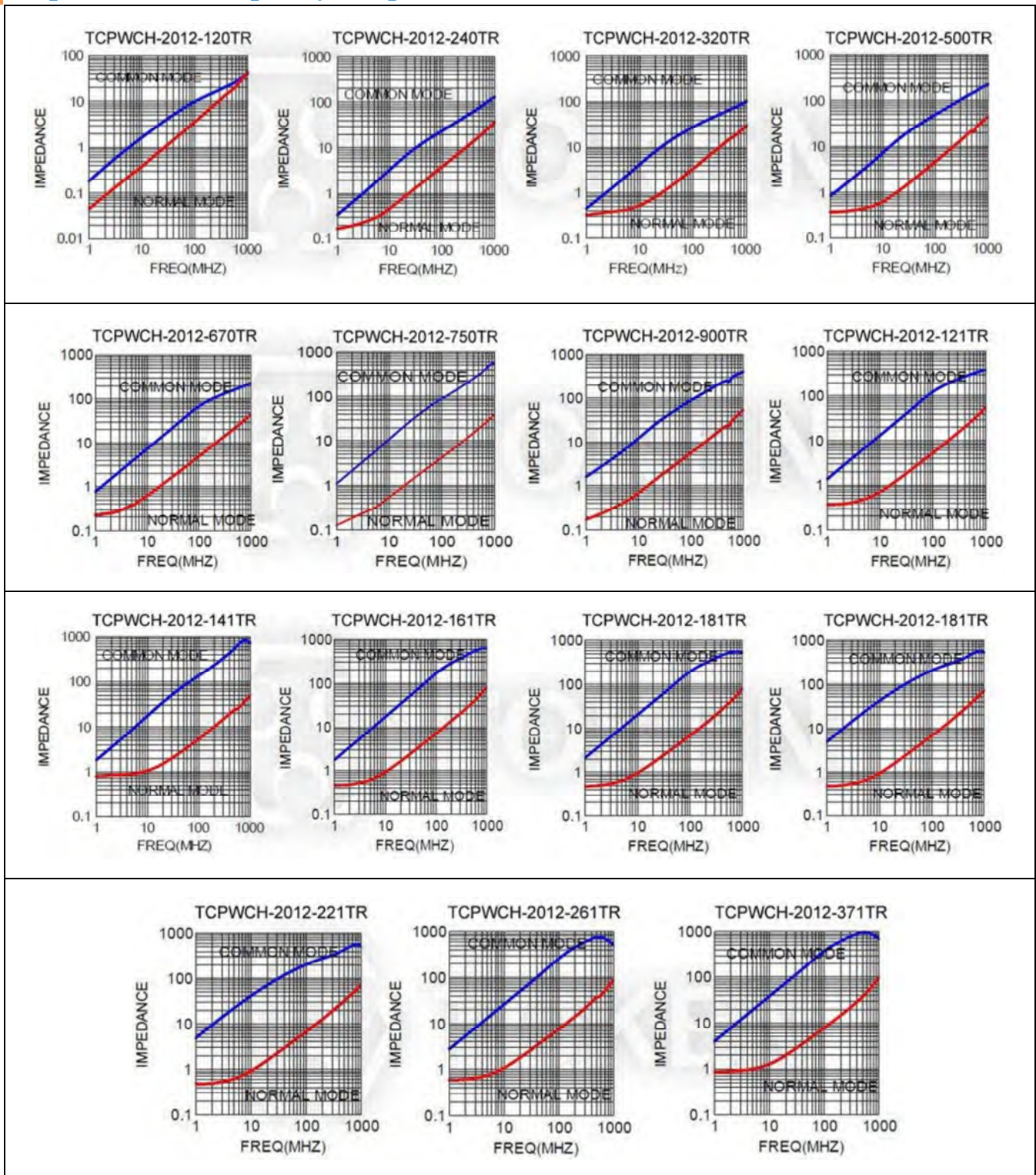
Common mode filter TCPWCH Structure diagram Unit: mm (Inch)

2012

Electrical Characteristics (TCPWCH-2012)

Part Number	Impedance (Ω)	Tolerance (\pm) %	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)

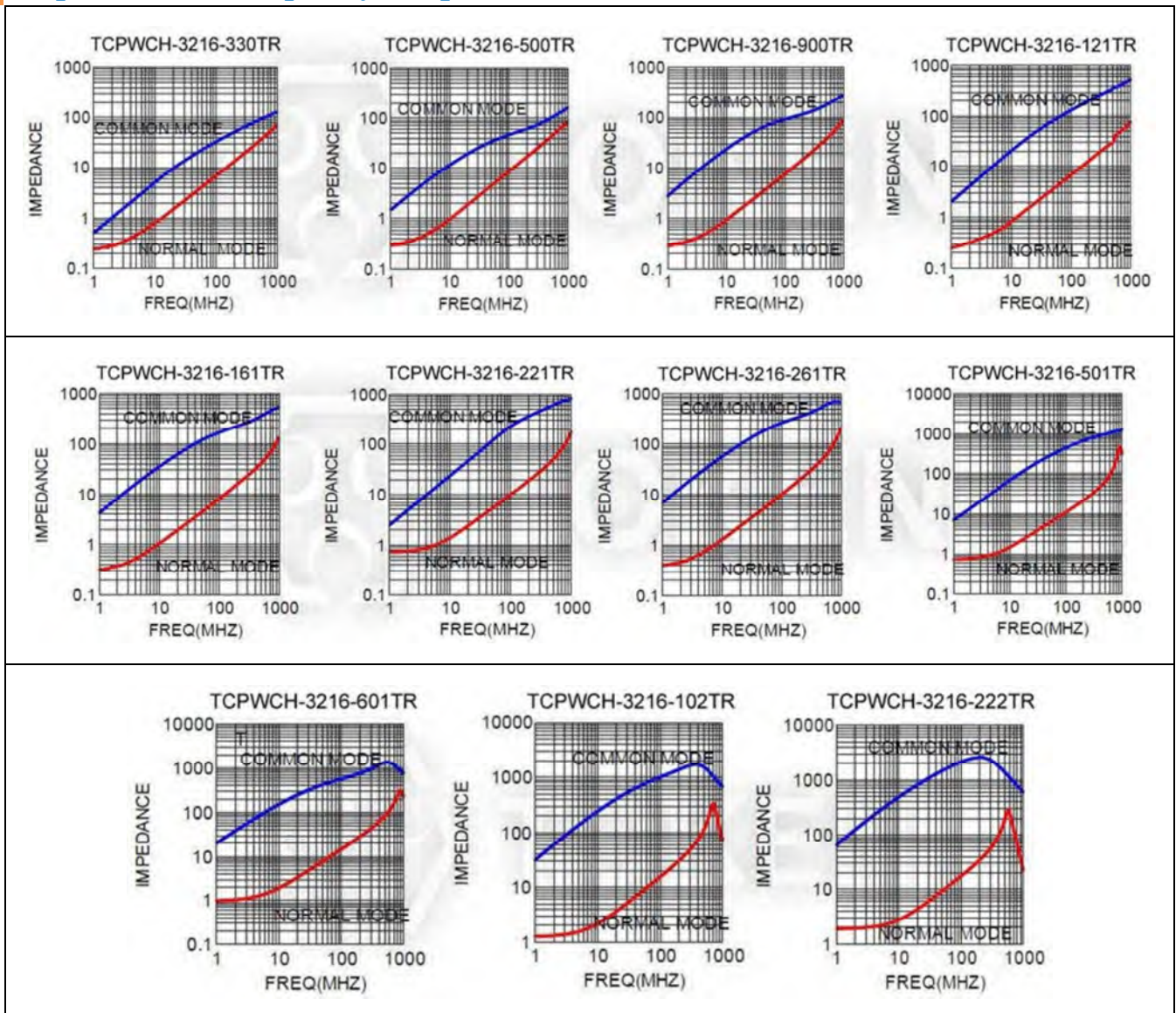


▶ 3216

Electrical Characteristics (TCPWCH-3216)

Part Number	Impedance (Ω)	Tolerance (\pm) %	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)

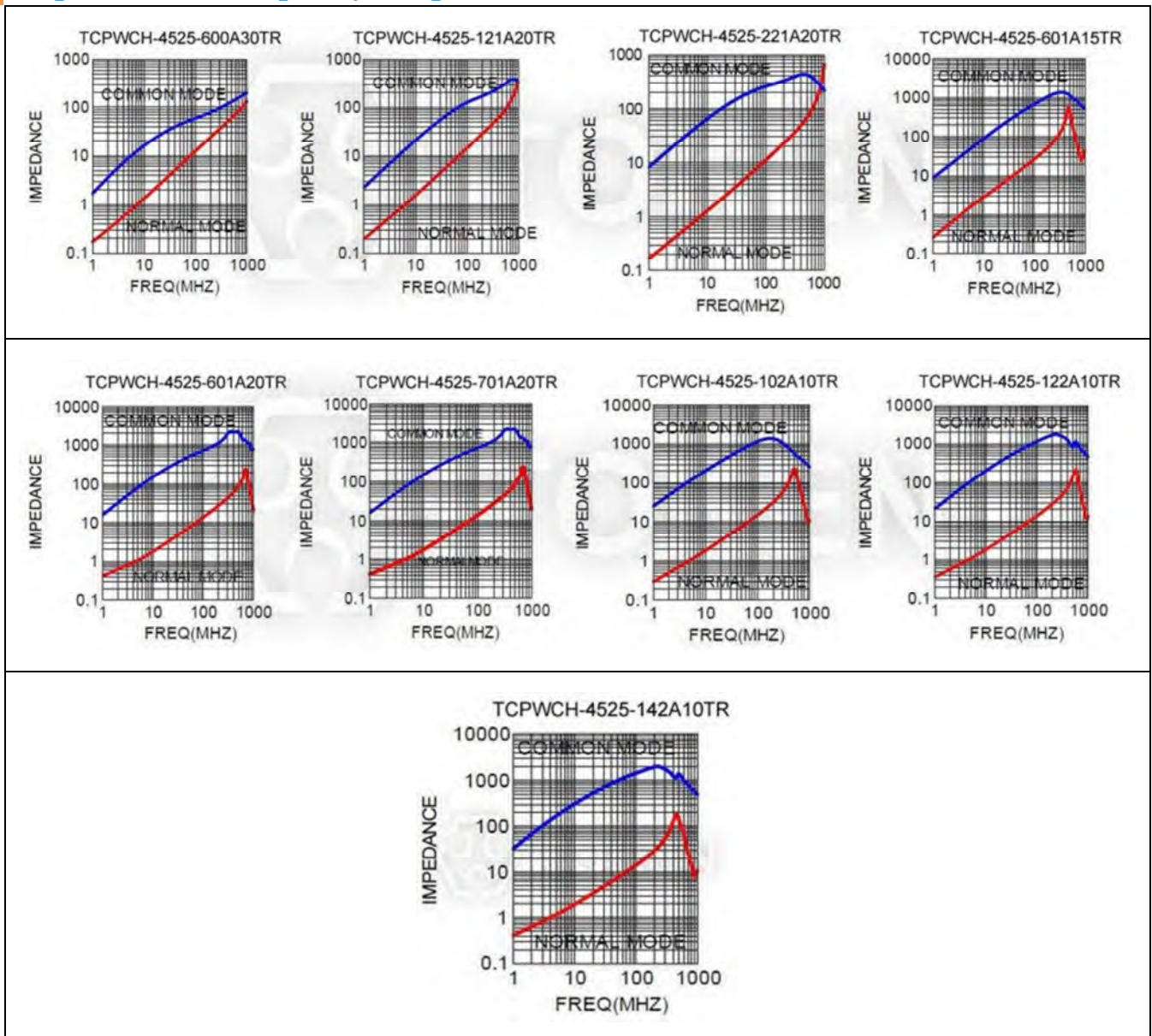


▶ 4525

Electrical Characteristics (TCPWCH-4525)

Part Number	Impedance (Ω)	Tolerance (\pm) %	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)

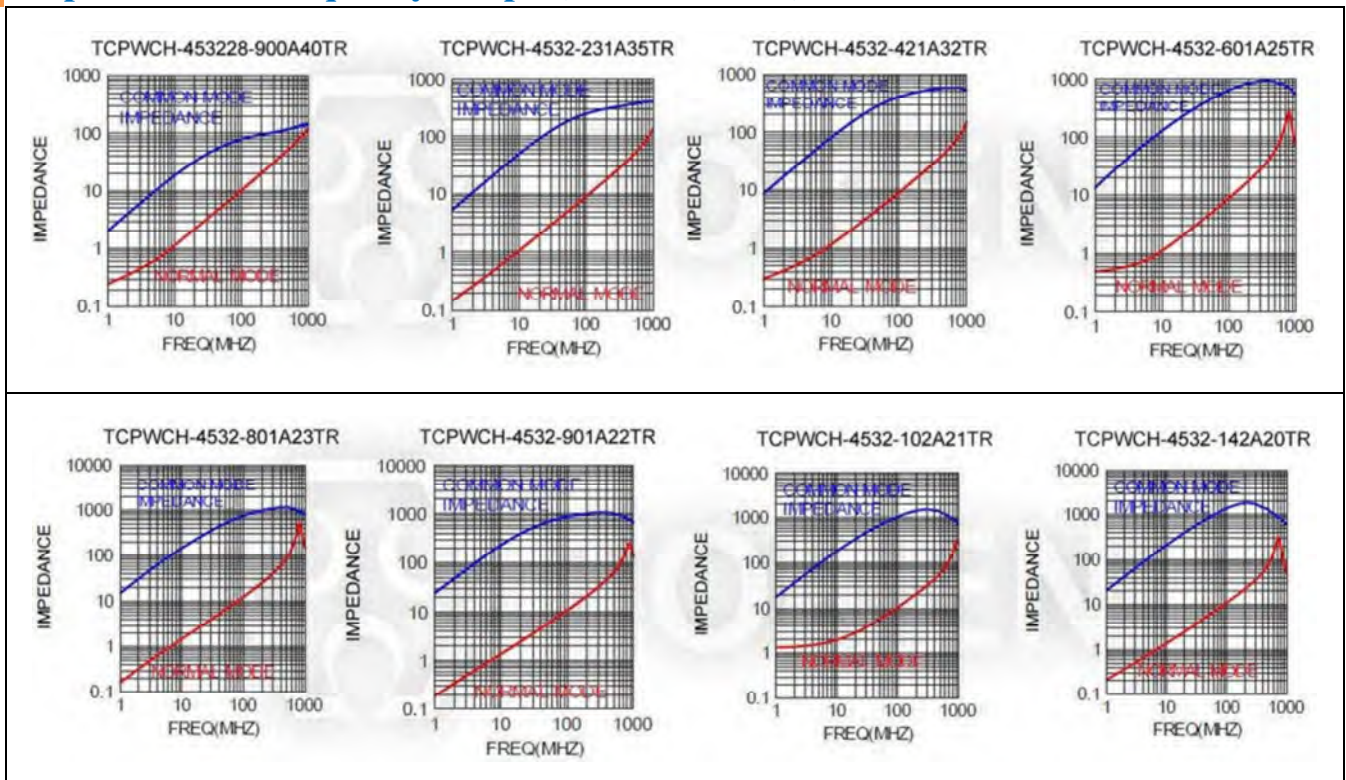


4532

Electrical Characteristics (TCPWCH-4532)

Part Number	Impedance (Ω)	Tolerance (\pm) %	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)

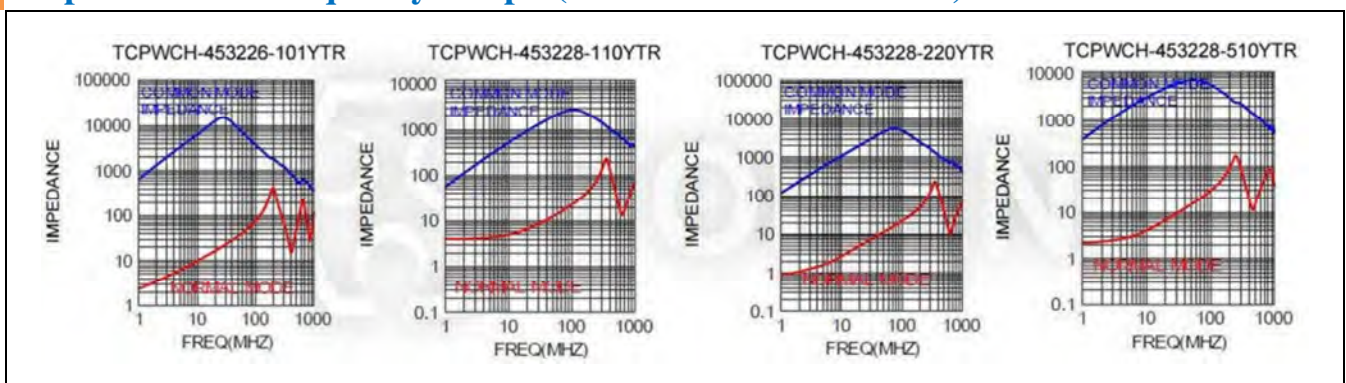


453226/453228

Electrical Characteristics (TCPWCH-453226/453228)

Part Number	Inductance (μ H) 100KHz/100mV	Impedance (Ω) TYP 10MHz	DC Resistance (Ω) Max.	Rated Current Max.	Rated Voltage (V) (DC)	Insulation Resistance (M Ω) 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

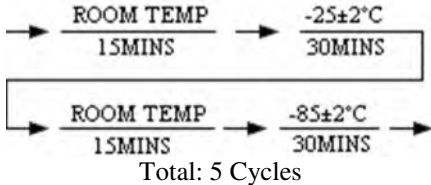
Electrical Performance Test (TCPWCH)

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 Testing Time: 60 sec. Charge Current: 0.5mA
Rated Voltage (VDC)		Test Voltage: Rated Voltage Testing Time: 1 to 5 sec. Charge Current: 1mA
Insulation Resistance (I.R.)		Charge Current: 1 minute 10M ohm Min.

Mechanical Performance Test (TCPWCH)

Test Items	Specifications	Test Conditions / Test Methods
Component Adhesion (push Test)	Base: 0805 \geq 2 Lbs Cover: 0805 \geq 1 Lbs Base: 1206 \geq 4 Lbs Cover: 1206 \geq 2 Lbs	The component should be soldered ($232^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 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. Drop 10 times in total Drop height: 100cm 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 $235^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 5 seconds.
Vibration Test (Low Frequency)	Component should not be damaged	1. Amplitude: 1.5 m/m 2. Frequency: 10-55-10 Hz(1Min.) 3. Direction: X, Y, Z 4. Duration: 2 Hrs/X, Y, Z

Climatic Test (TCPWCH)

Test Items	Specifications	Test Conditions / Test Methods
Low Temperature Storage Test	Impedance change: Within $\pm 20\%$ Without distinct damage in ppearance.	1. Temp: $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 2. Time: 1000 ± 48 Hours 3. Component should be tested after 1 hour at room temperature.
Thermal Shock Test		 <pre> graph LR Start(()) --> RT1[ROOM TEMP 15MINS] RT1 --> T1[-25±2°C 30MINS] T1 --> RT2[ROOM TEMP 15MINS] RT2 --> T2[-85±2°C 30MINS] T2 --> End(()) </pre> <p>Total: 5 Cycles</p>
High Temperature Storage Test		1. Temp: $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 2. Time: 1000 ± 48 Hours 3. Component should be tested after 1 hour at room temperature.
Humidity Test		1. Temp: $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 2. R.H.: 90%~95% 3. Time: 48 ± 2 Hours
High Temperature Load Life Test	There should be no evidence of short or open circuit	1. Temp: $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 2. Time: 96 ± 12 Hours 3. Load: Allowed DC Current
Low Temperature Load Life Test		1. Temp: $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 2. Time: 96 ± 12 Hours 3. Load: Allowed DC Current

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

Order Codes

Order Codes (TCPWCH-2012/3216)

TCPWC	H	-	2012			-	120		TR
Part Number	Shielding Type		Dimensions (mm)				Impedance (Ω)		Package
TCPWC	H	Shielding	2012	2.00×1.20×1.20	EIA0805		120	12 Ω	P Bulk
			3216	3.20×1.60×2.00	EIA1206		121	120 Ω	TR Taping Reel
							371	370 Ω	

Order Codes (TCPWCH-4525/4532)

TCPWC	H	-	4525			-	600		A30	TR
Part Number	Shielding Type		Dimensions (mm)				Impedance (Ω)		Stop current (mA)	Package
TCPWC	H	Shielding	4525	4.80×2.80×2.20	EIA1810		600	60 Ω	A30 3000mA	P Bulk
			4532	4.50×3.20×2.80	EIA1812		601	600 Ω	A25 2500mA	TR Taping Reel
							102	1000 Ω	A10 1000mA	

Order Codes (TCPWCH-453226/453228)

TCPWC	H	-	453226			-	101		Y	TR
Part Number	Shielding Type		Dimensions (mm)				Inductance (μ H)		Tolerance (%)	Package
TCPWC	H	Shielding	453226	4.50×3.20×2.60	EIA1812		101	100 μ H	Y +50/-30%	P Bulk
			453228	4.50×3.20×2.80	EIA1812		110	11 μ H		TR Taping Reel
							510	51 μ H		

(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°C to $+125^{\circ}\text{C}$.
- 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 customized designs and tighter tolerances are available on request.

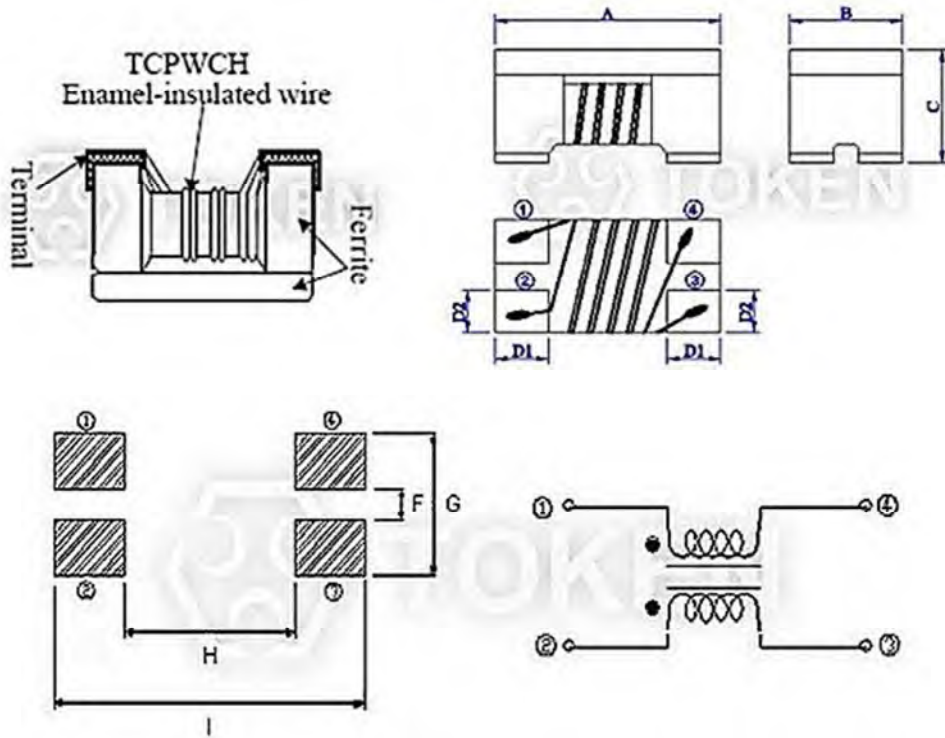
(TCPWCH-4532AU) conforms to the RoHS compliant and Lead-free. Token will also produce devices outside these specifications to meet customer requirements, with comprehensive design application engineering support for customers worldwide. Please contact our sales or link to Token official website "[SMD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

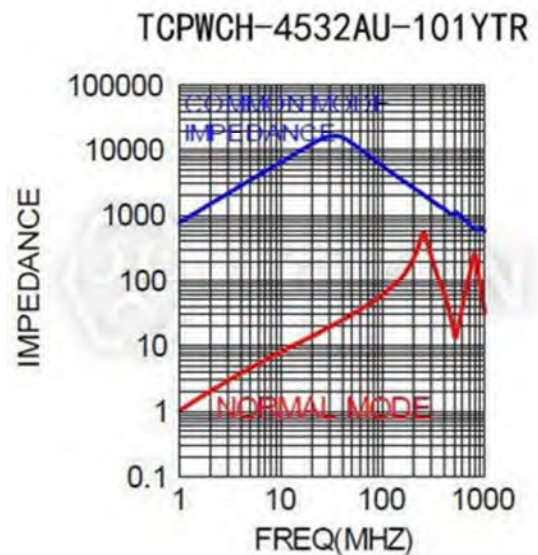
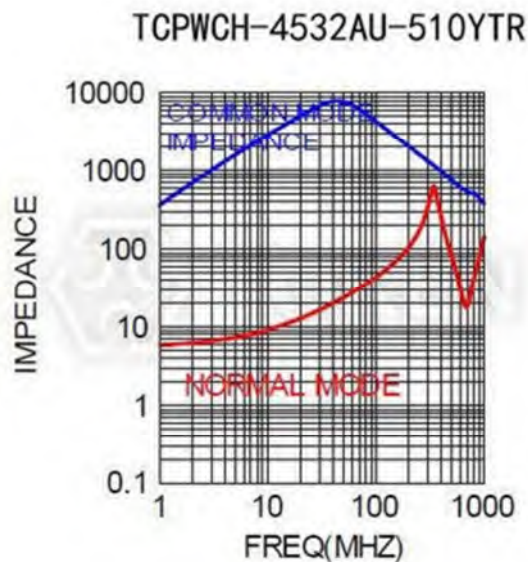
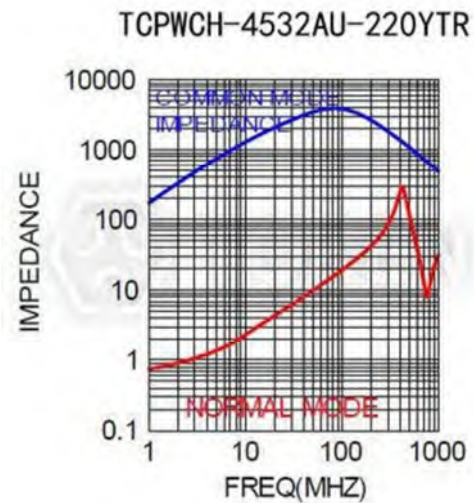
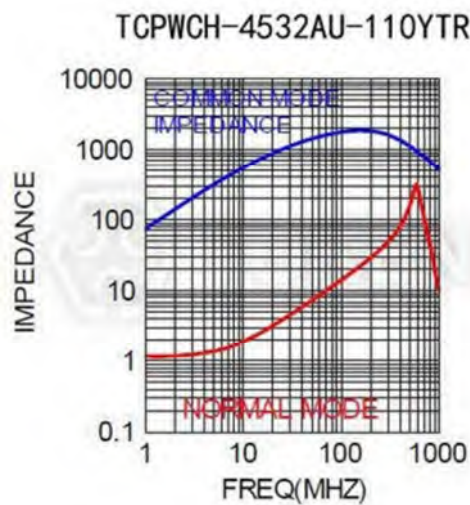


Common Mode Choke Coils for Automotive (TCPWCH-4532AU) Structure diagram UNIT: mm (inch)

4532AU Specifications

Electrical Characteristics (TCPWCH-4532AU)

Part Number	Inductance (μ H) 100KHz/100mV	Impedance (Ω) @ 10MHz	DC Resistance (Ω) Max.	Rated Current (mA) Max.	Rated Voltage (V) DC	Insulation Resistance (M Ω) 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	Shielding Type	Dimensions			Purpose	Inductance (μH)	Tolerance (%)	Package
TCPWCH	H Shielding	4532	4.5×3.2×2.8	EIA1812	AU Automotive	110 11	Y +50/-30%	P Bulk
						220 22		TR Taping Reel
						510 51		
						101 100		



(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.

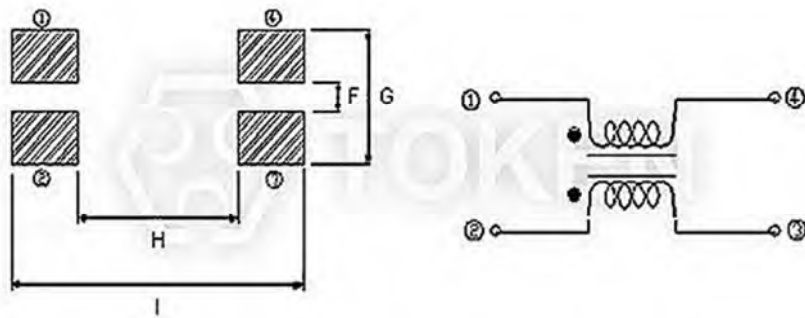
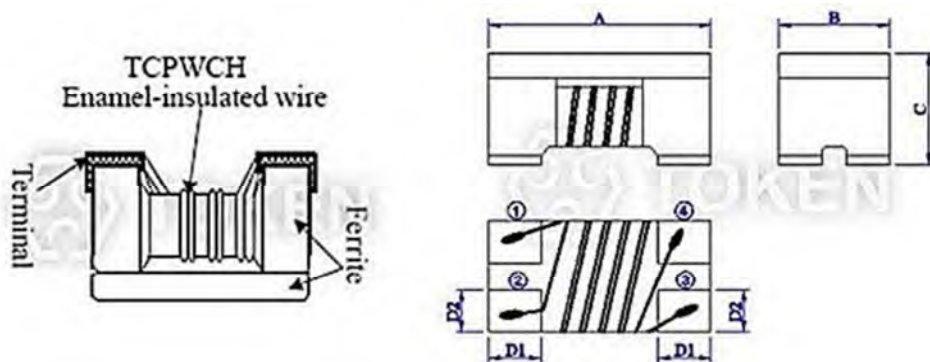
All (TCPWCH) series comes a wide variety of options to meet your needs with halogen free and feature RoHS Directive. Token is able to customize and manufacture your request. Please contact our sales or link to Token official website “[SMD Balun Transformers](http://www.token.com.tw)” for more information.

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)



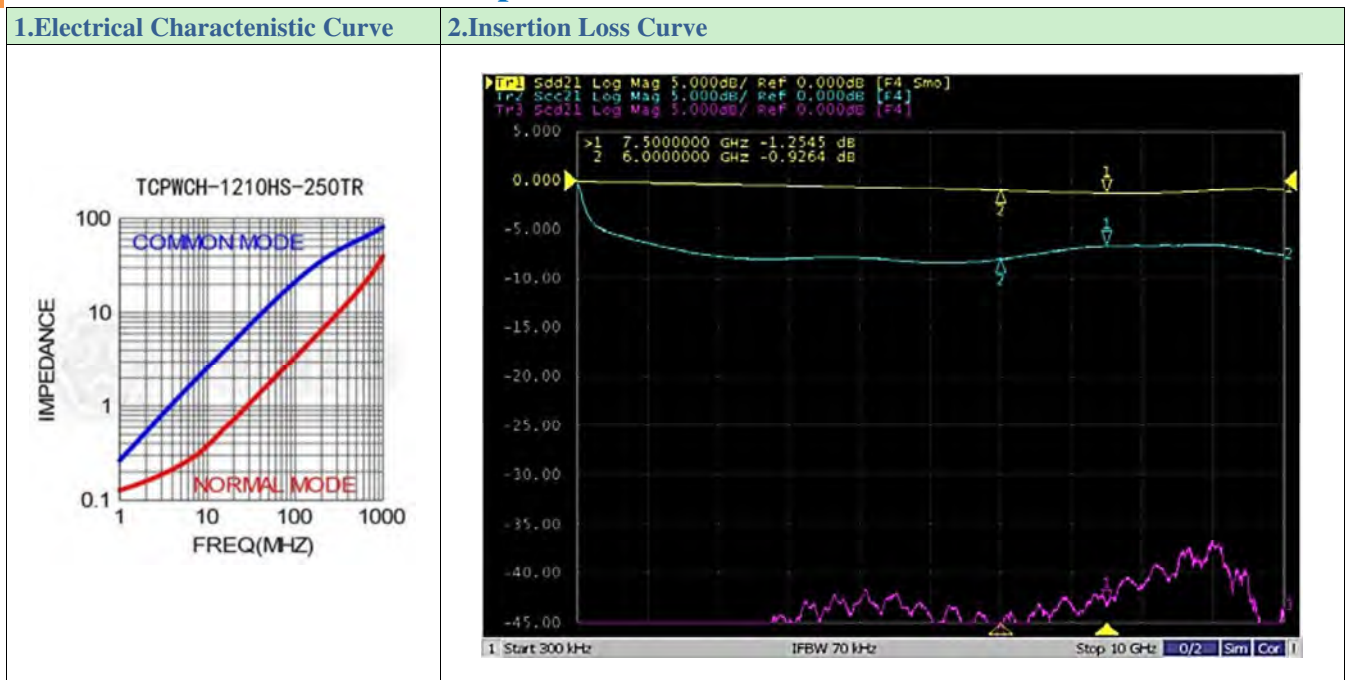
Common mode filter (TCPWCH-1210HS, TCPWCH-2012HS) Structure diagram Unit: mm (Inch)

1210HS Specifications

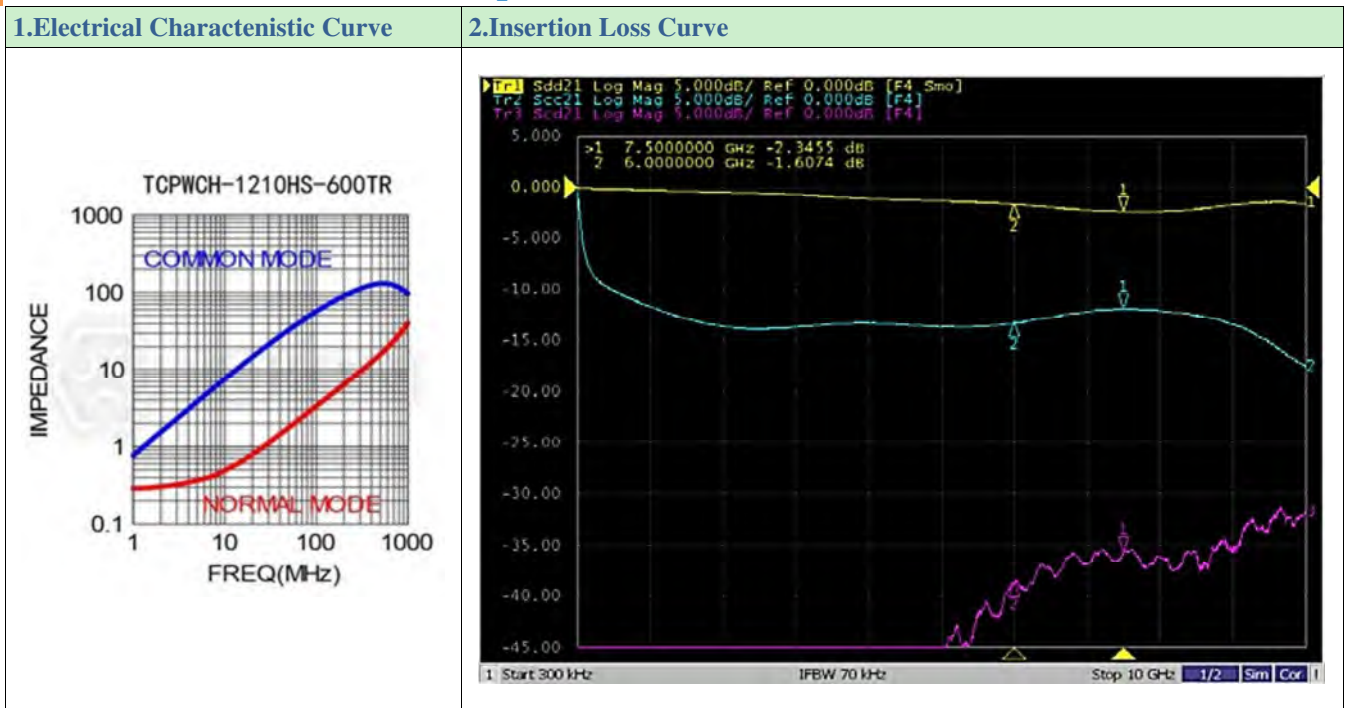
Electrical Characteristics (TCPWCH-1210HS)

Part Number	Impedance (Ω) 10MHz	Tolerance \pm %	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



Electrical Characteristics Graph TCPWCH-1210HS-600TR



Electrical Characteristics Graph TCPWCH-1210HS-900TR

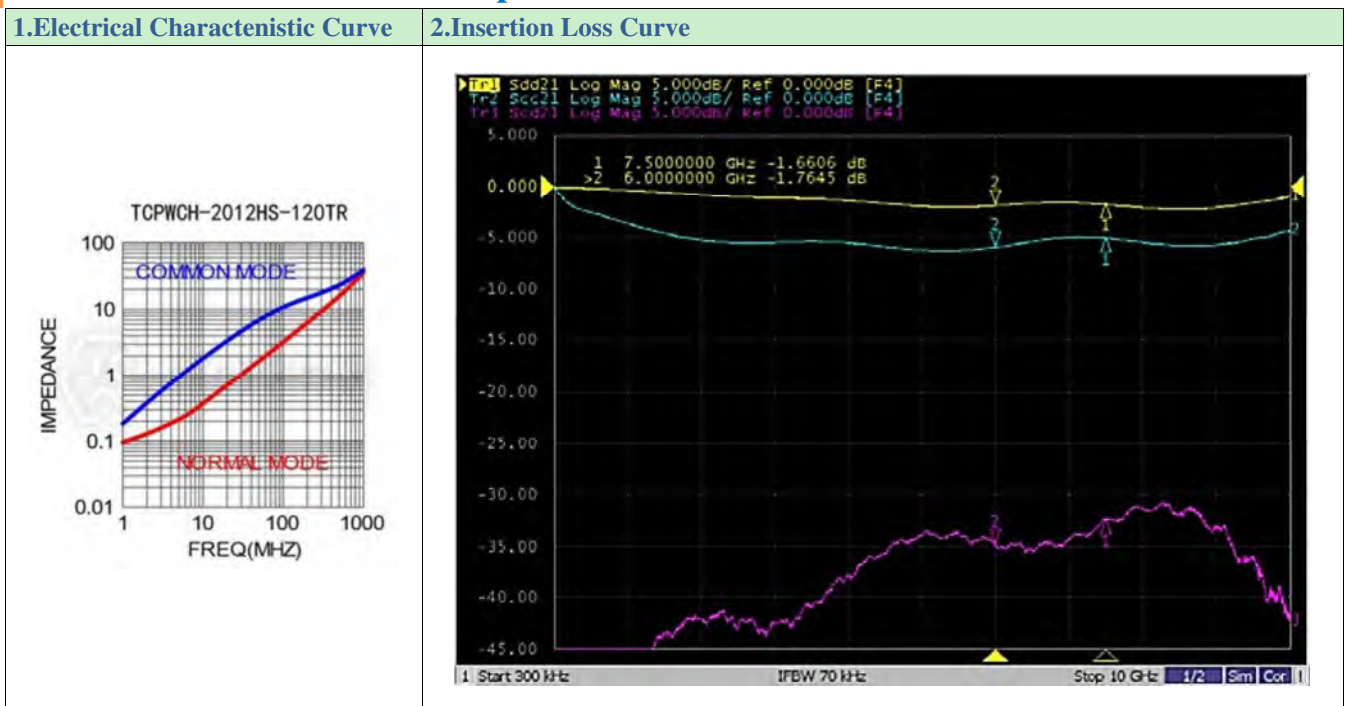


2012HS Specifications

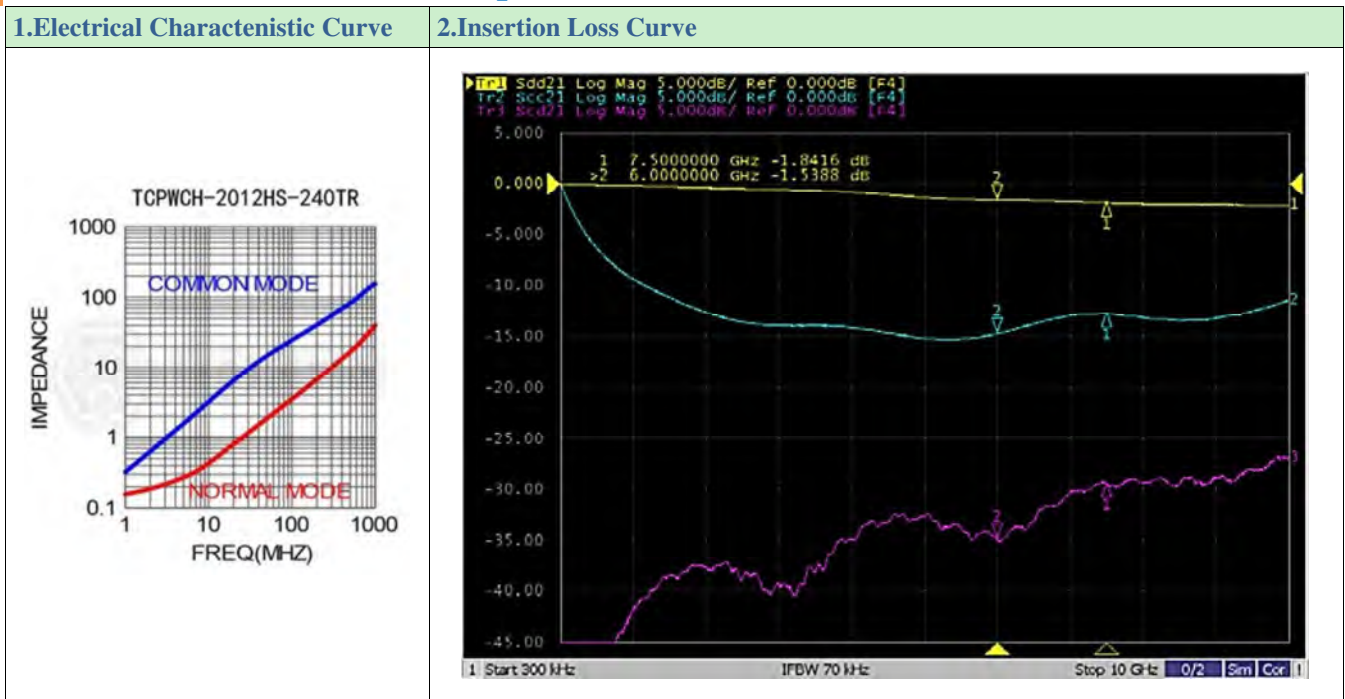
Electrical Characteristics (TCPWCH-2012HS)

Part Number	Impedance (Ω) 10MHz	Tolerance $\pm\%$	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

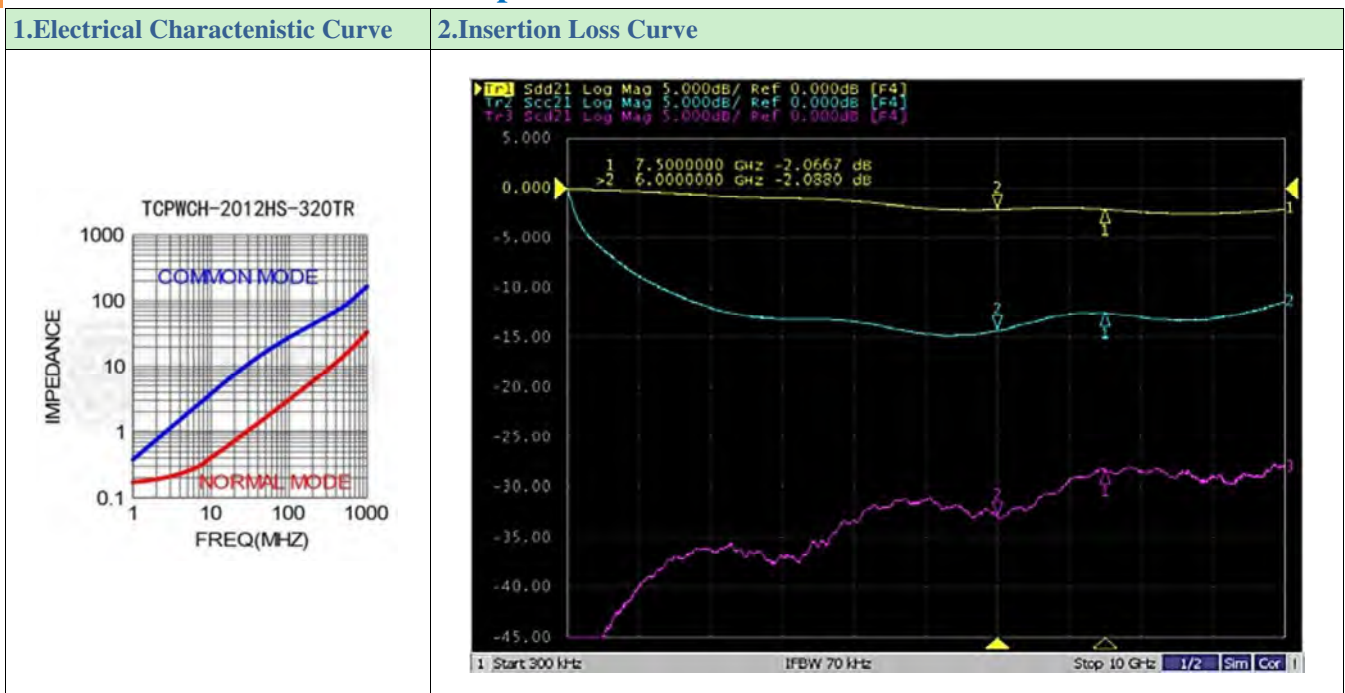
Electrical Characteristics Graph TCPWCH-2012HS-120TR



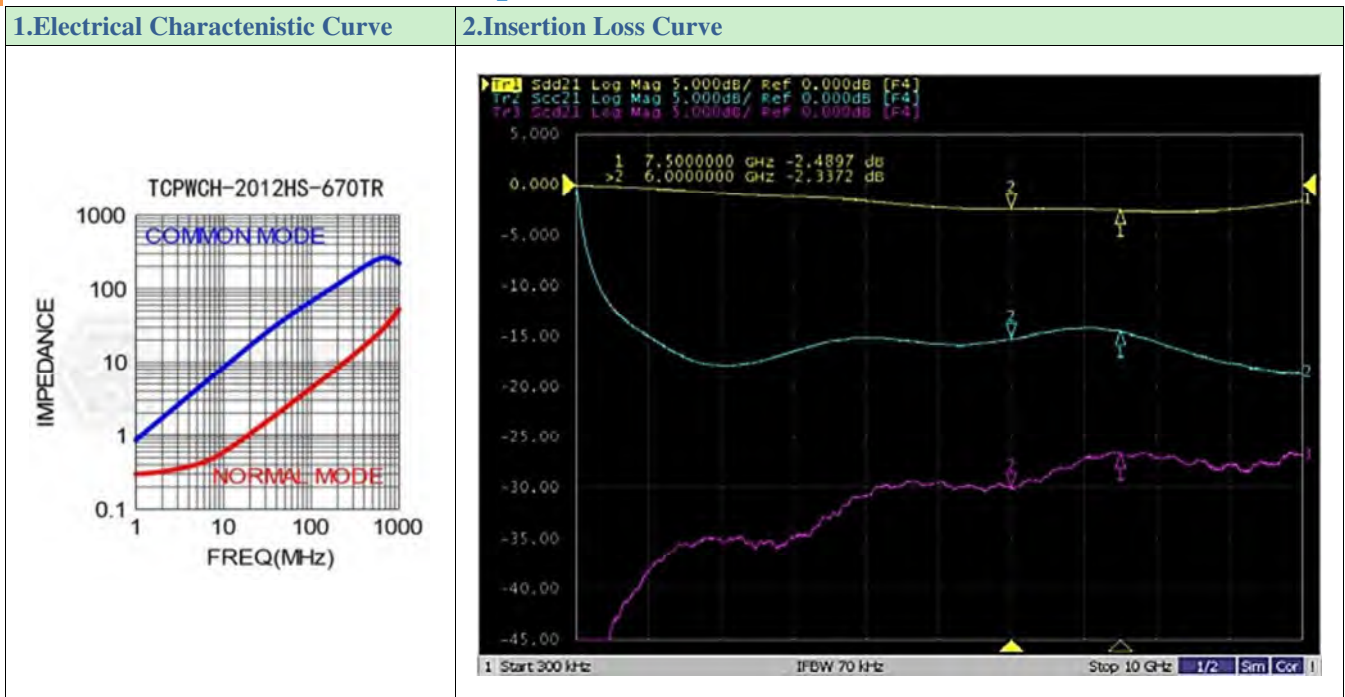
Electrical Characteristics Graph TCPWCH-2012HS-240TR



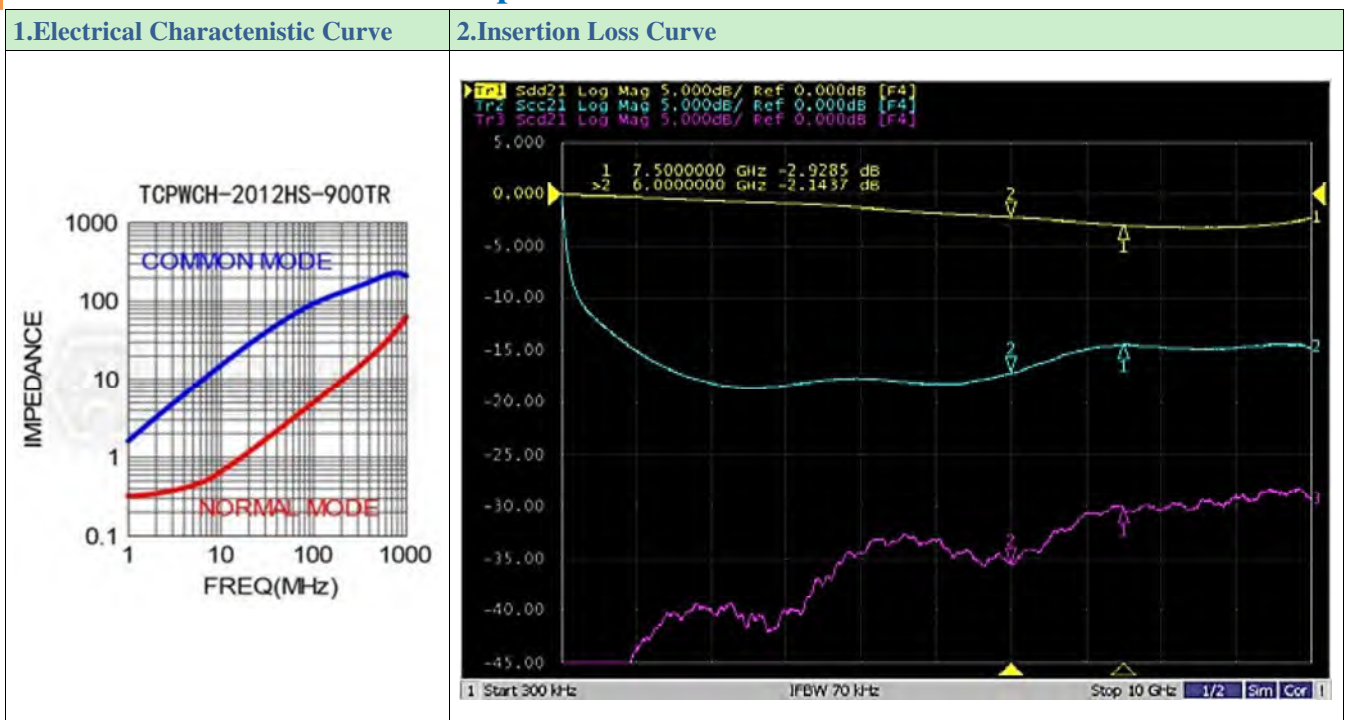
Electrical Characteristics Graph TCPWCH-2012HS-320TR



Electrical Characteristics Graph TCPWCH-2012HS-670TR



Electrical Characteristics Graph TCPWCH-2012HS-900TR



Order Codes

Order Codes (TCPWC)

TCPWC	H		-	1210			HS		-	250		TR	
Part Number	Shielding Type			Dimensions (mm)			Purpose			Impedance (Ω)		Package	
TCPWC	H	Shielding		1210	1.00×0.20×0.035	EIA0504	HS	High speed		120	12Ω	P	Bulk
				2012	2.00×1.20×1.20	EIA0805				250	25Ω	TR	Taping Reel
										320	32Ω		
										900	90Ω		

(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.

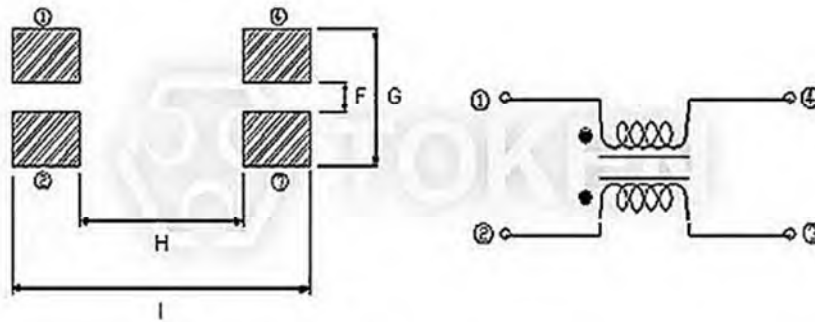
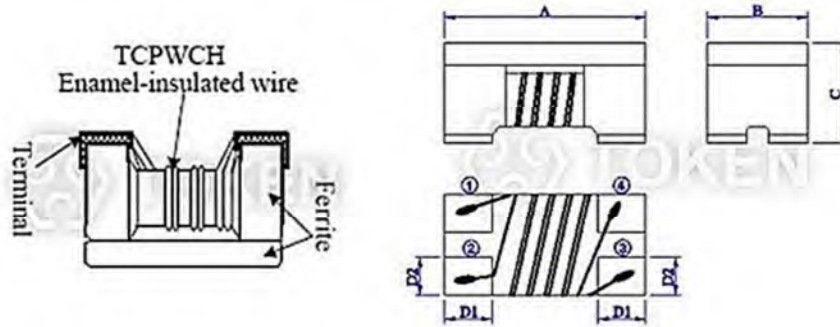
All (TCPWCH) series comes a wide variety of options to meet your needs with halogen free and RoHS Directive. Token is able to customize and manufacture your request, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website "[SMD Balun Transformers](http://www.token.com.tw)" 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)



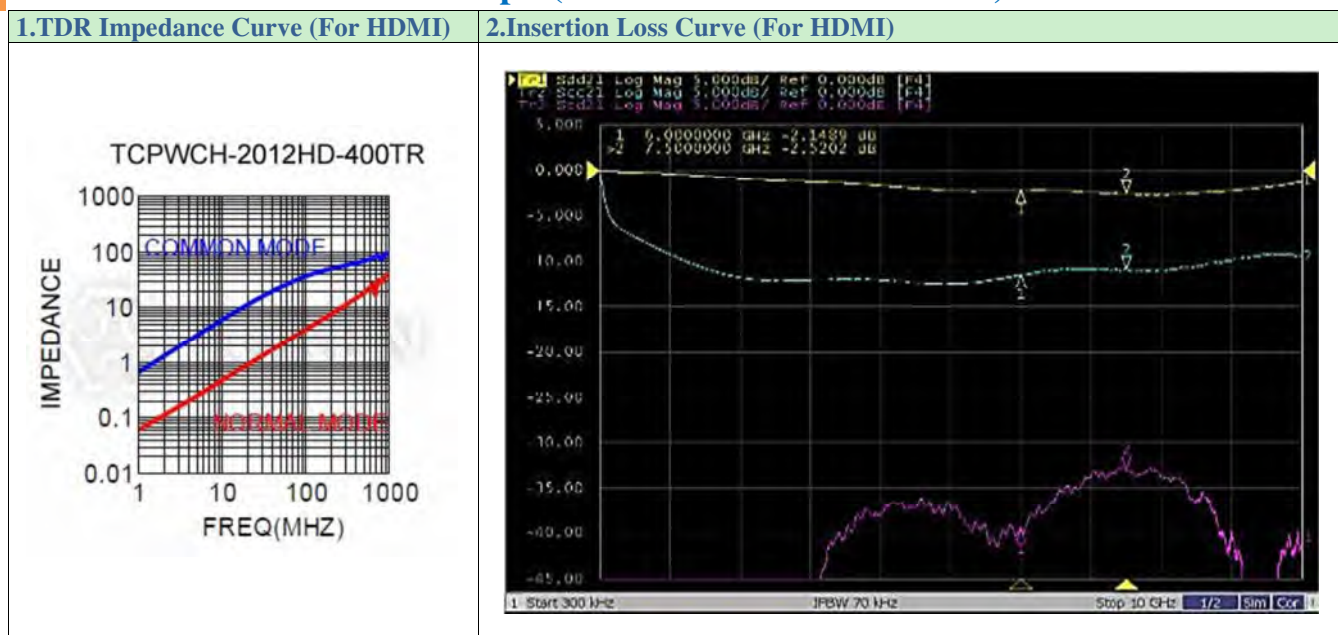
HDMI Common Mode Filters & Chokes (TCPWCH-2012HD) Structure diagram Unit: mm (Inch)

Electrical Characteristics

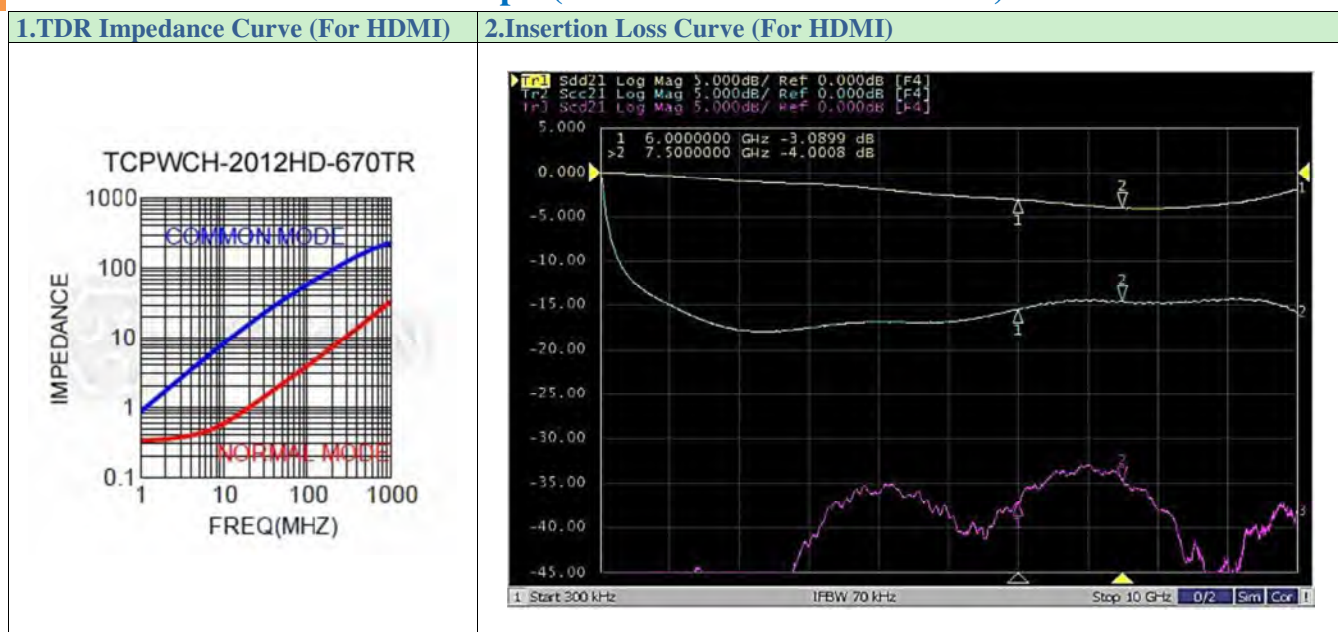
Electrical Characteristics (TCPWCH-2012HD)

Part Number	Impedance (Ω)	Tolerance $\pm\%$	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

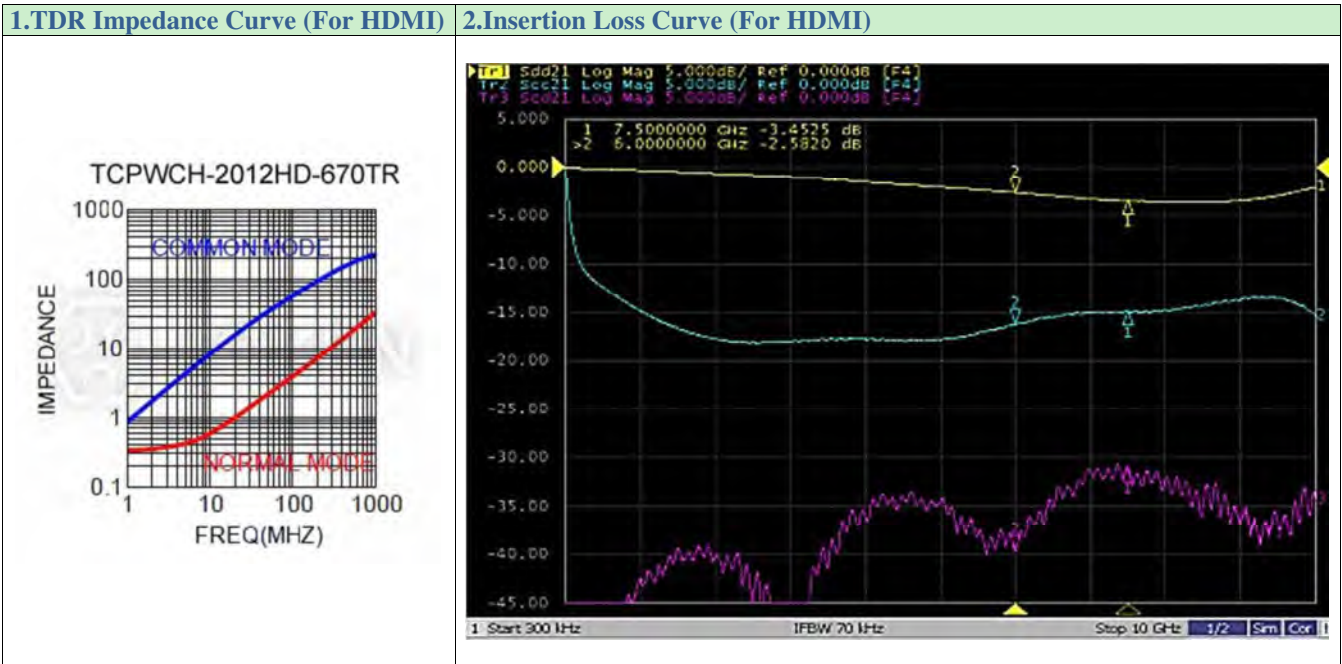
Electrical Characteristics Graph (TCPWCH-2012HD-400TR)



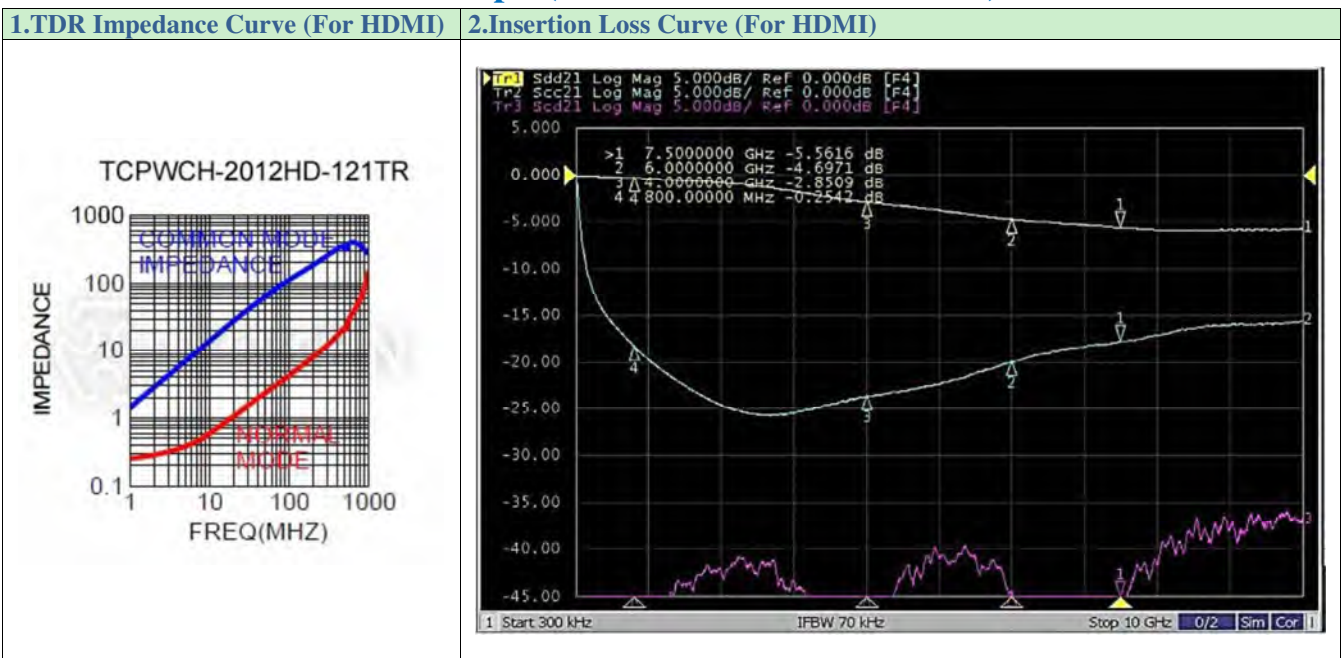
Electrical Characteristics Graph (TCPWCH-2012HD-670TR)



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



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



Order Codes

Order Codes (TCPWCH)

TCPWC	H	-	2012			HD		-	400		TR	
Part Number	Shielding Type		Dimensions (mm)			Purpose			Impedance (Ω)		Package	
TCPWC	H	Shielding	2012	2.00×1.20×1.20	EIA0805	HD	HDMI		400	40Ω	P	Bulk
									670	67Ω	TR	Taping Reel
									900	90Ω		
									121	120Ω		



(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 function 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.

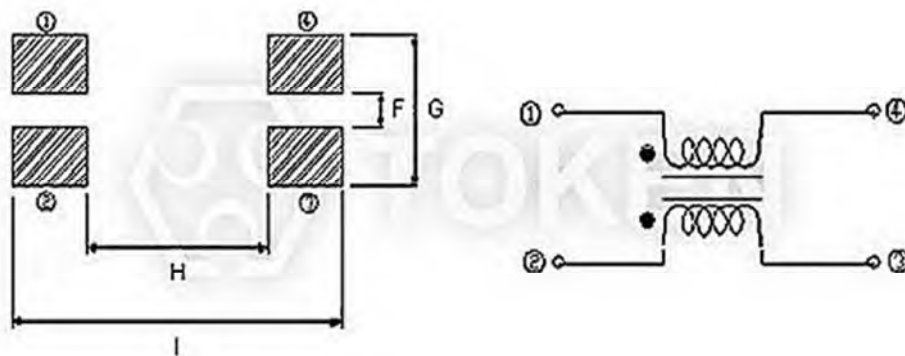
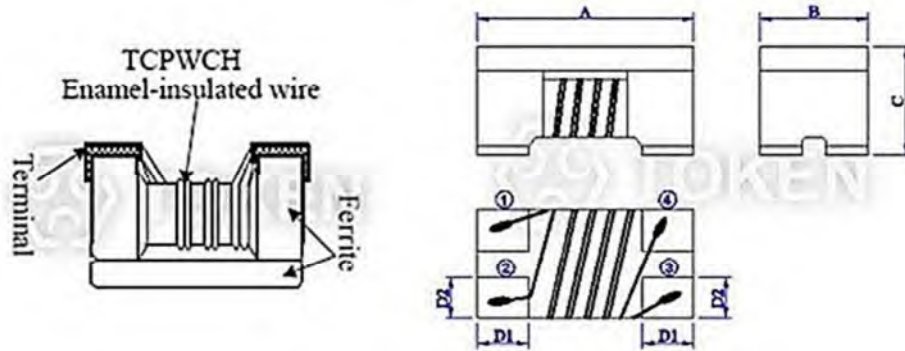
SMD Balun/Wideband Transformers can be used between various parts of a wireless or cable communications system. Balun transformers (TCPWCH-2012BL) provide port impedance with 50 Ω or 75 Ω to match coaxial cables which have characteristic impedances of 50 Ω or 75 Ω . The supported frequencies cover the 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](http://www.token.com.tw)" 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)

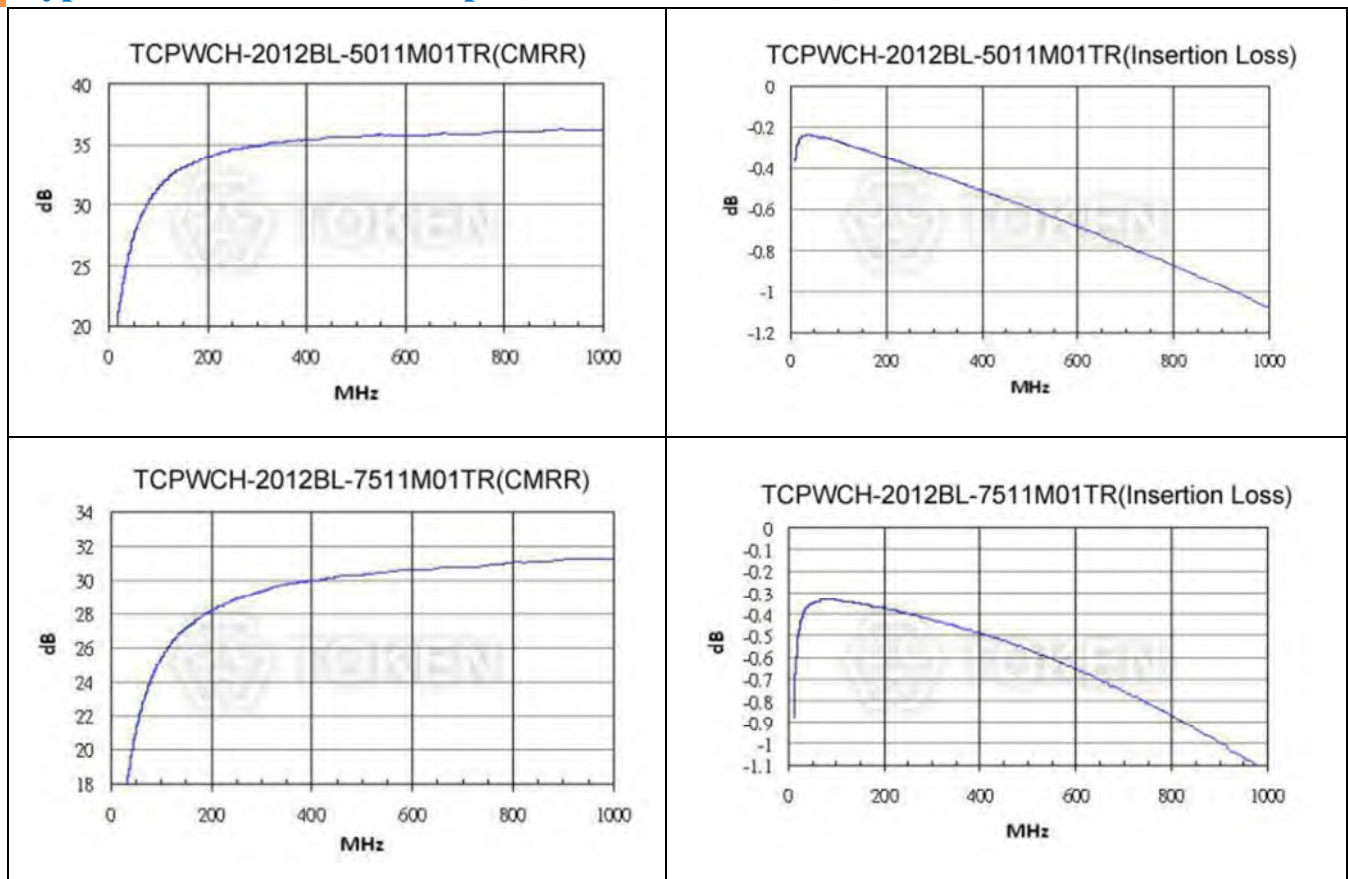
Electrical Characteristics

Electrical Characteristics (TCPWCH-2012BL)

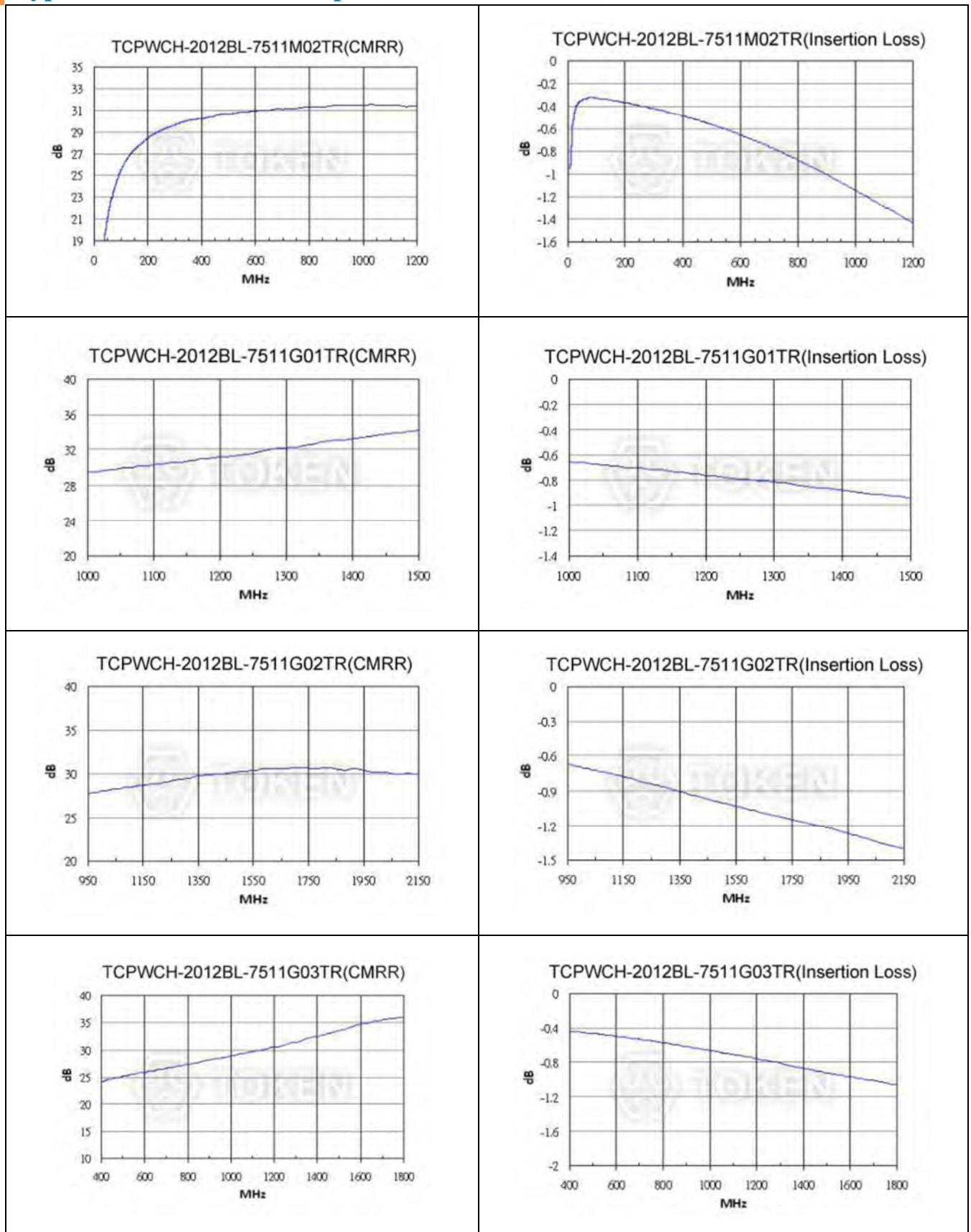
Part Number	Freq Range (MHz)	Port Impedance (Ω)	Insertion Loss (dB) Max.	CMRR (dB) Min.	DC Resistance (Ω) Max.	Rated Current (mA) Max.
TCPWCH-2012BL-5011M01TR	45 ~ 870	50/50	1.2	20	0.80	200
TCPWCH-2012BL-7511M01TR	45 ~ 870	75/75	1.1	18	0.77	200
TCPWCH-2012BL-7511M02TR	50 ~ 1200	75/75	1.6	19	0.40	300
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	Shielding Type		Dimensions (mm)			Purpose		Port impedance (Ω)		Impedance ratio		Frequency sequence		Package		
	TCPWC	H	Shielding	2012	2.00×1.20×1.20	EIA0805	BL	Balun Transformers	50	50/50Ω	11	1:1	M01	45~870	P	Bulk
									75	75/75Ω			M02	50~1200	TR	Taping Reel
													G01	1000~1500		
													G02	950~2150		
													G03	400~1800		



(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, $7.0 \times 6.0 \times 3.8$, $9.0 \times 7.0 \times 4.8$, $12.0 \times 10.8 \times 6.4$.
- 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.

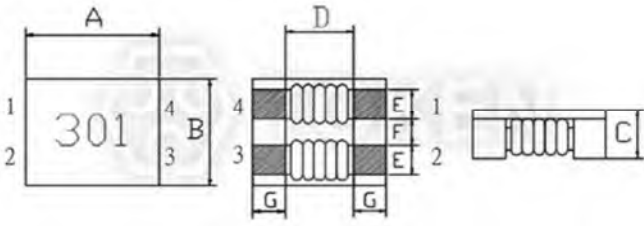
Token will also produce devices outside these specifications to meet customer requirements, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website "[SMD Balun Transformers](http://www.token.com.tw)" for more information.

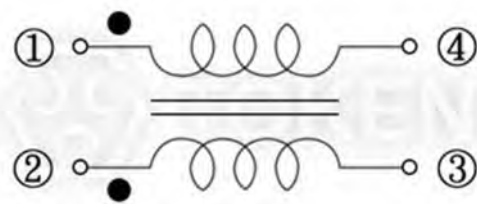


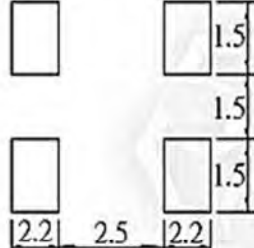
Config. & Dim.

Configurations & Dimensions (TCPSEH) Unit: mm

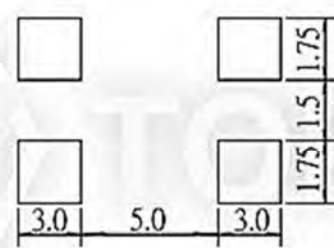
SIZE CODE	A	B	C	D	E	F	G
TCPSEH-7060	7.0±0.5	6.0±0.5	3.8Max.	3.5REF	1.5±0.2	1.5±0.2	1.75±0.2
TCPSEH-9070	9.0±0.5	7.0±0.5	4.8Max.	5.7REF	1.5±0.2	2.0±0.2	1.70±0.2
TCPSEH-1211	12.0±0.5	10.8±0.5	6.4Max.	7.0REF	2.7±0.2	2.5±0.2	2.5±0.2



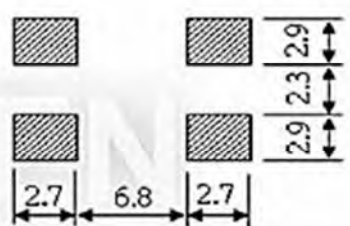




7060 PAD LAYOUT



9070 PAD LAYOUT



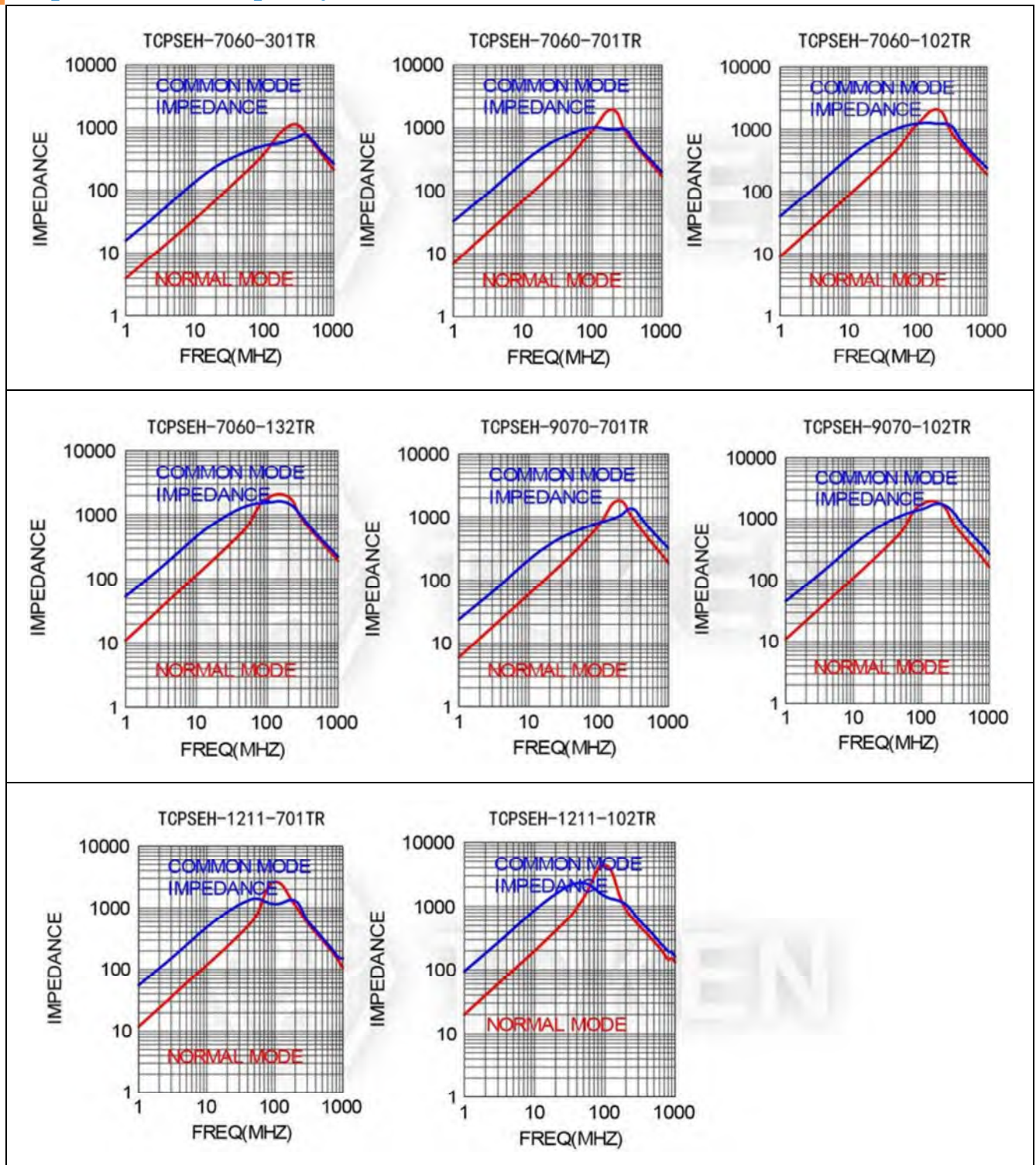
1211 PAD LAYOUT

Electrical Characteristics

Electrical Characteristics (TCPSEH)

Part Number	Impedance (Ω) Min.	DC Resistance ($m\Omega$) Max.	Rated Current (A) Max.	Rated Voltage V Max.	Insulation Resistance ($m\Omega$) Min.
	100MHz				
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				

(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.



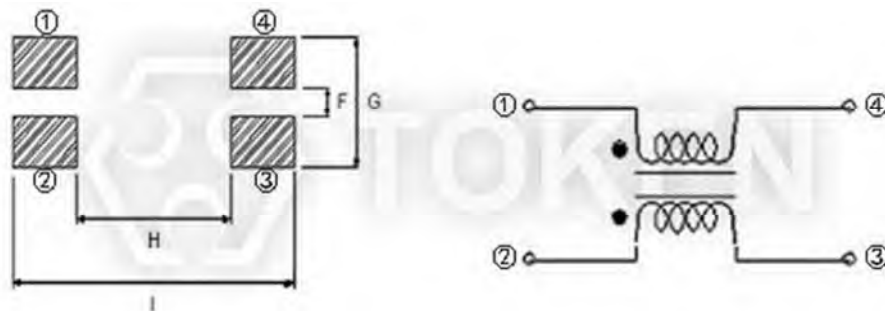
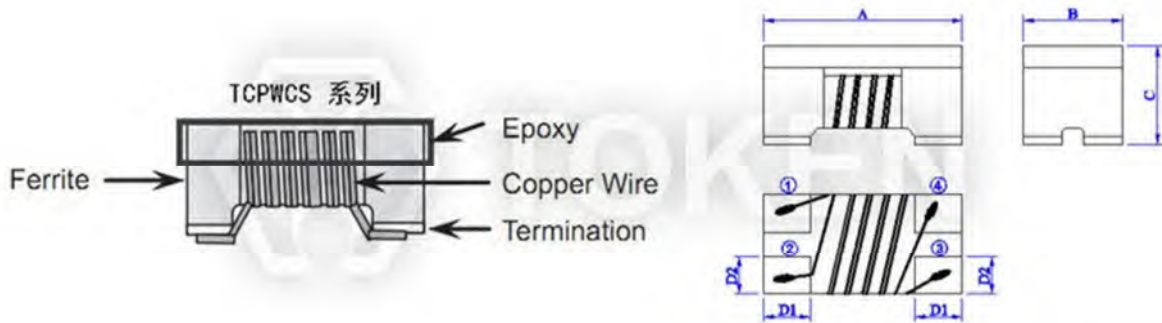
The (TCPWCS) series comes with very low DCR (0.25 to 0.80 Ohms) and current ratings up to 500 mA. Wide range impedance values are available to meet specific design requirements. All (TCPWCS) common mode chokes are halogen free and feature RoHS-compliant.

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](http://www.token.com.tw)" 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)



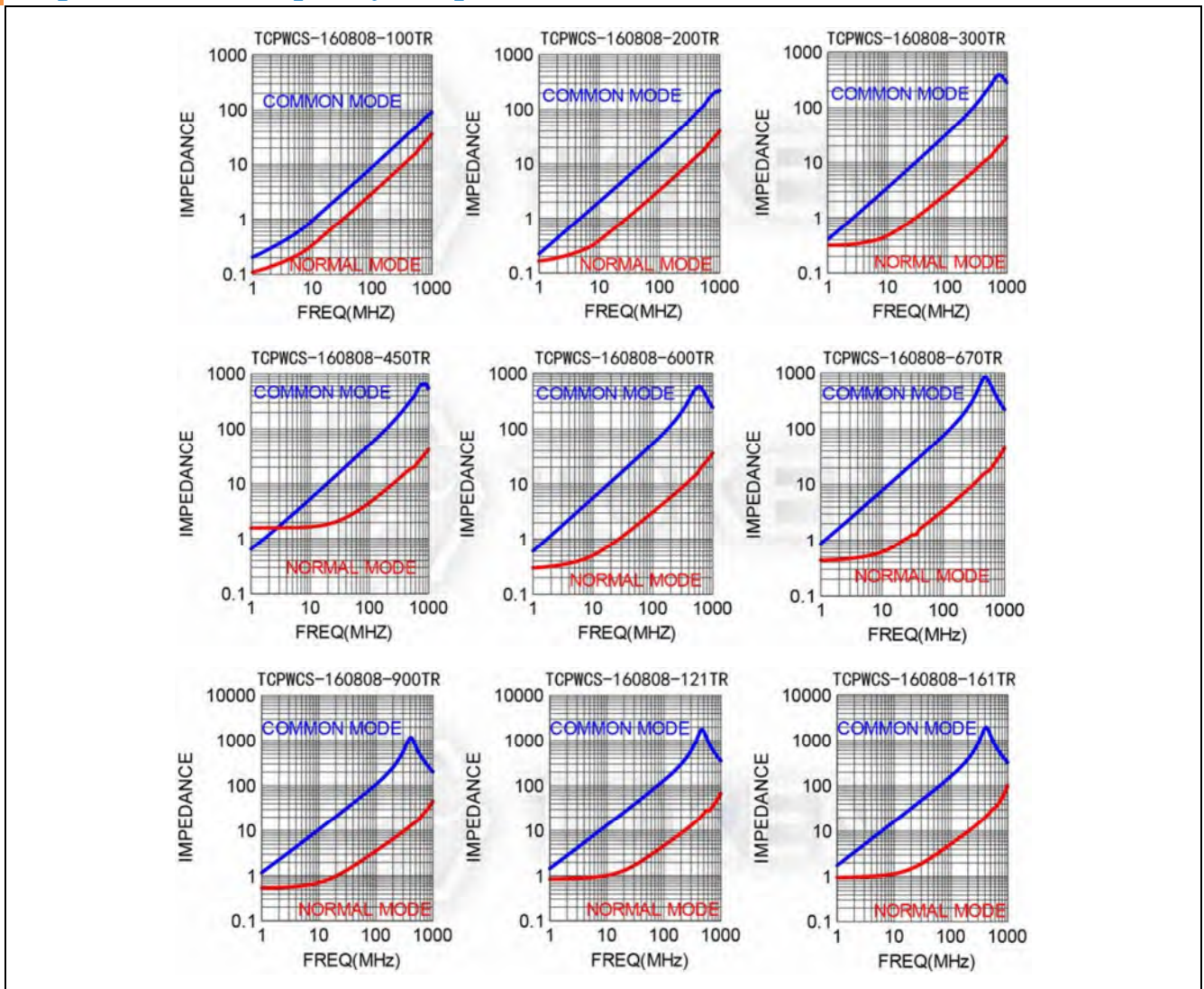
Common mode filter (TCPWCS) Configurations diagram

TCPWCS-160808

Electrical Characteristics (TCPWCS-160808)

Part Number	Impedance (Ω)	Tolerance \pm %	Test Frequency (MHz) Max.	DC Resistance (Ω) Max.	Rated Current (mA) Max.
	100MHz				
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)

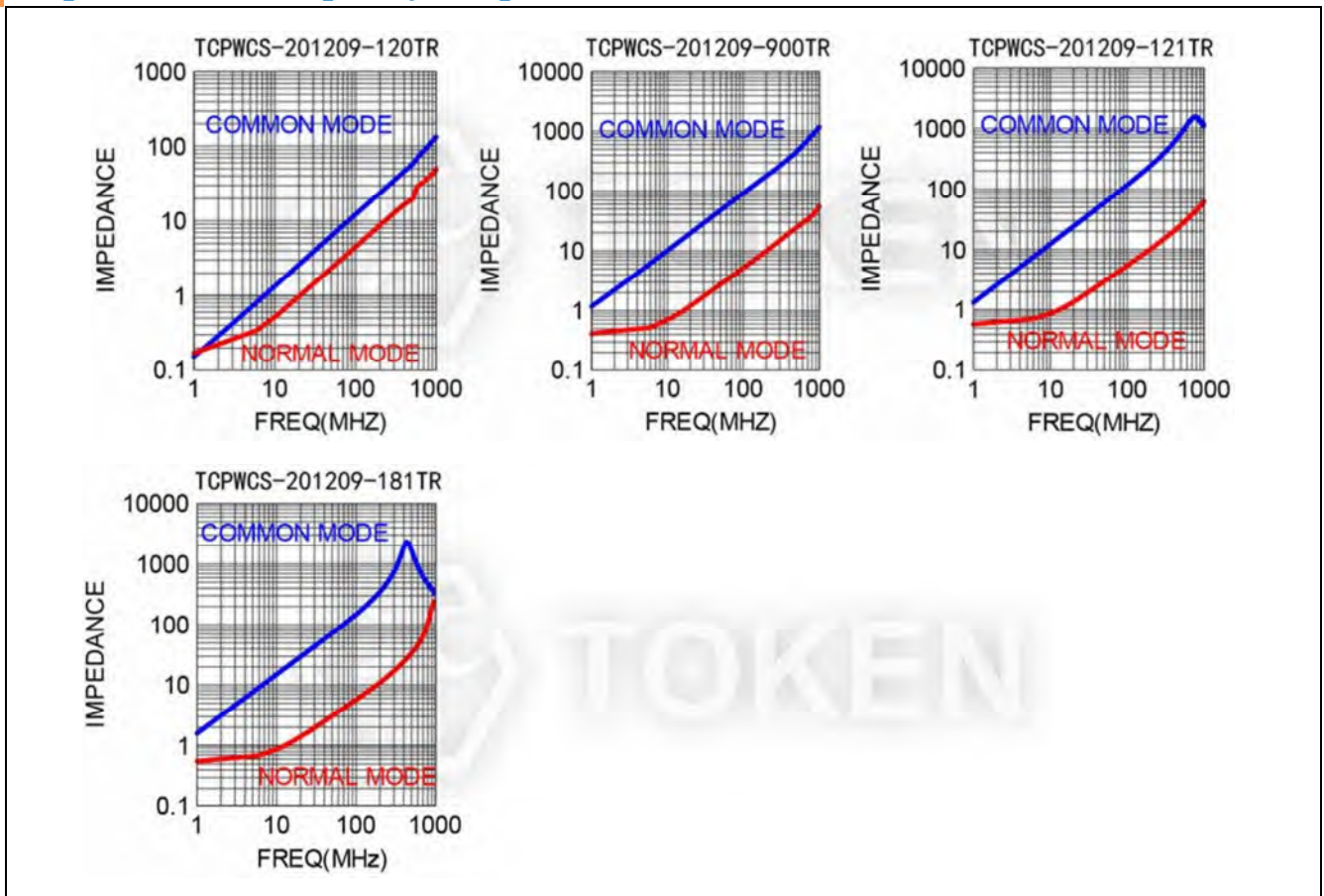


TCPWCS-201209

Electrical Characteristics (TCPWCS-201209)

Part Number	Impedance (Ω)	Tolerance $\pm\%$	Test Frequency (MHz) Max.	DC Resistance (Ω) Max.	Rated Current (mA) Max.
	100MHz				
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		Dimensions			Impedance (Ω)		Package	
TCPWC	S	Epoxy	160808	1.60×0.80×0.80	EIA 0603	100	10 Ω	P	Bulk
						450	45 Ω	TR	Taping Reel
			201209	2.00×1.20×0.90	EIA 0805	900	90 Ω		
						121	120 Ω		
						181	180 Ω		

(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 curve 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.

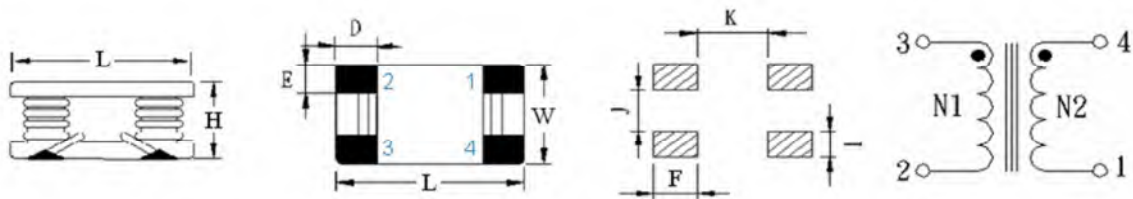
That is why, common mode choke coils are mostly employed in the low-frequency selection that can not be insured by line bypass capacitors. Additionally, the application of normal mode choke coils are able to provide enhanced differential mode noise removal results in some instances.

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](http://www.token.com.tw)" for more information.

Characteristics & Dim.

Characteristics & Dimensions (TCSG) Unit: mm

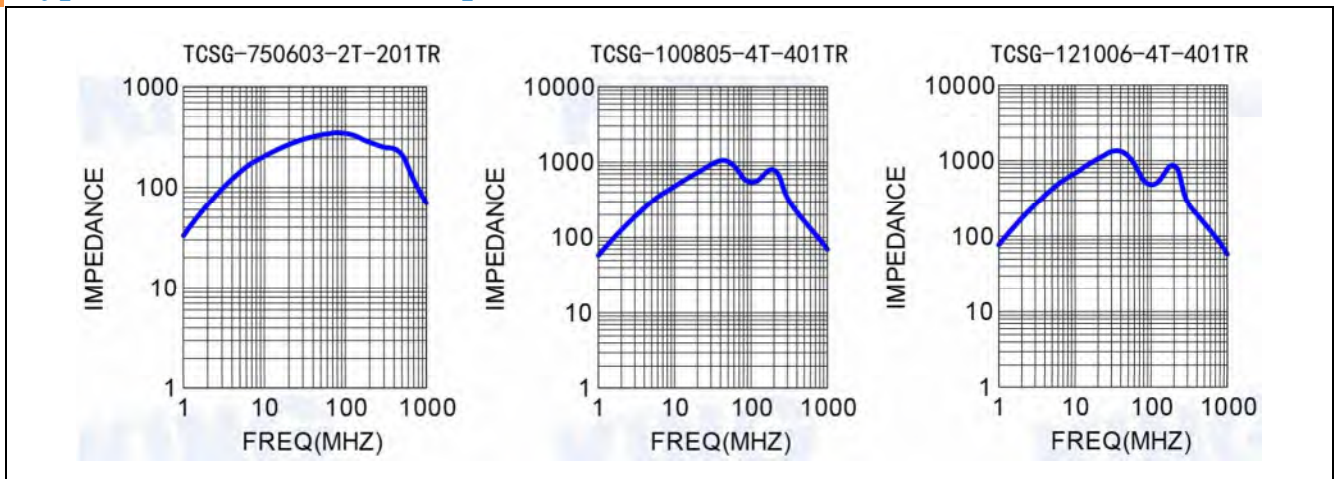
Part Number	L	W	H	D	E	F	I	J	K	BASE	WINDING	Z at 100MHz (Ω) Min.	RATED CURRENT (mA)	RDC (Ω) Max.
TCSG -750603	7.5±0.3	6.0±0.5	3.2±0.3	2.5	1.5	3.1	2.4	1.0	1.5	SMD-4P	φ0.35×2.5TS×2	200	2000	0.020
TCSG -100805	10.6 Max.	8.7 Max.	5.0±0.5	2.5	2.1	4.2	3.0	2.0	3.6	SMD-4P	φ0.55×4.5TS×2	400	4000	0.045
TCSG -121006	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		Dimensions			Core structure		Impedance(Ω)		Package	
TCSG		750603	7.5×6.0×3.2		2T		201	200Ω	P	Bulk
		100805	10.6×8.7×5.0		4T		401	400Ω	TR	Taping Reel
		121006	12.0×10.0×6.0							



(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 customized designs and tighter tolerances available on request.



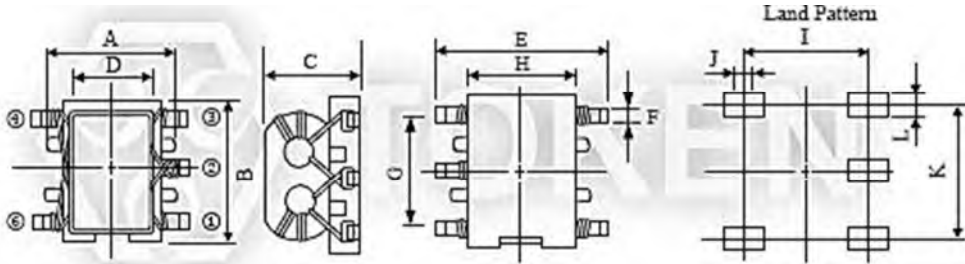
Windings use paired or and triple wires for high uniformity. Base pins are end processed to allow direct mounting on PCB. The Balun transformers are ideal for use in double balanced mixers and as broad band transformers, transistors, impedance conversion, and frequency mixer for STB and Cable Modem. 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](http://www.token.com.tw)" 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

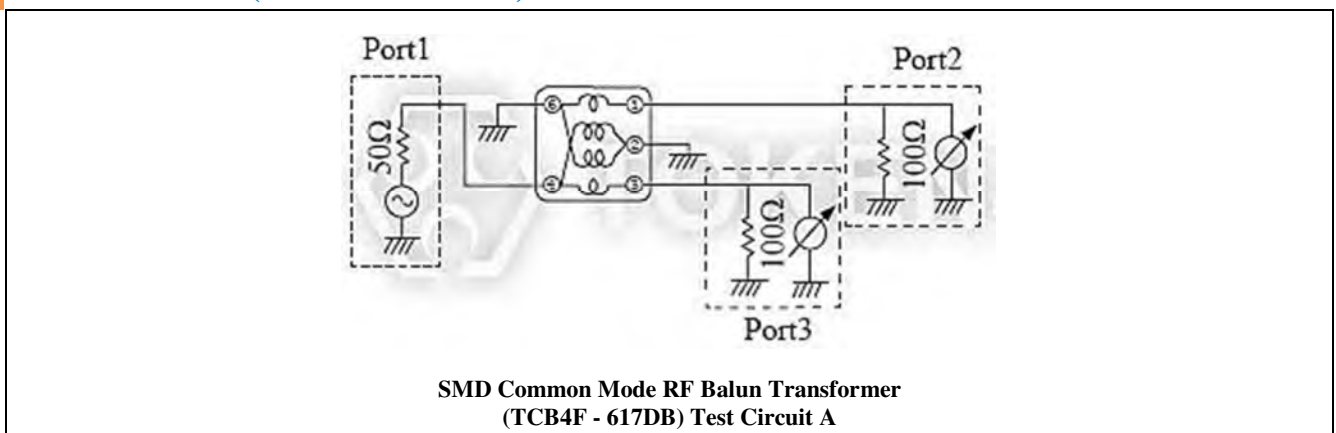
- Note: Design as Customer's Requested Specifications.

TCB4F-617DB Spec A

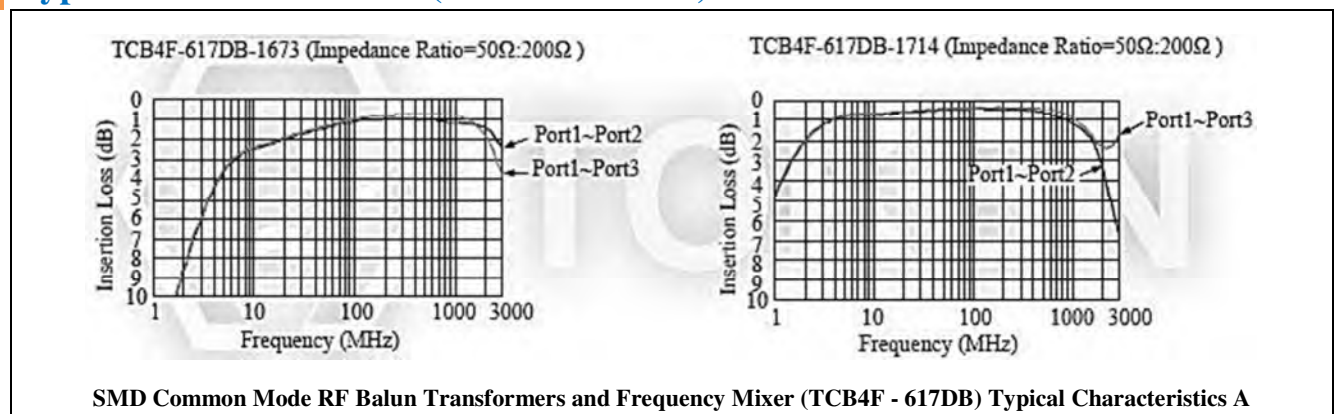
Electrical Characteristics A (TCB4F - 617DB)

Part Number	Winding Turns 1-6=2-4=2-6=3-4	μ iac
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)



Typical Characteristics A (TCB4F - 617DB)

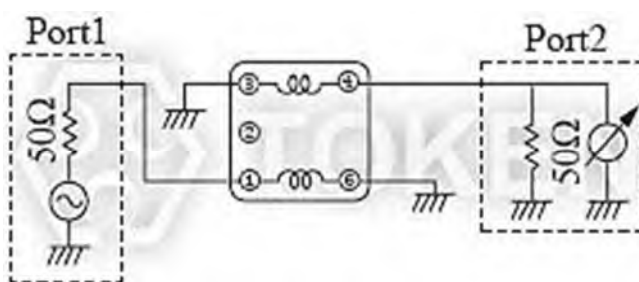


TCB4F-617DB Spec B

Electrical Characteristics B (TCB4F - 617DB)

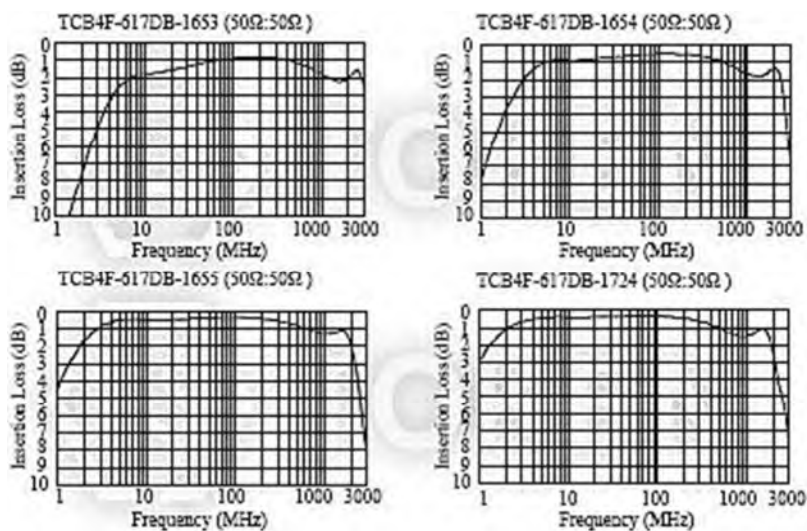
Part Number	Winding Turns	μ iac
TCB4F - 617DB1653	2 1/2 T	300
TCB4F - 617DB1654	3 1/2 T	300
TCB4F - 617DB1655	4 1/2 T	300
TCB4F - 617DB1724	5 1/2 T	300

Test Circuit B (TCB4F - 617DB)



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

Typical Characteristics B (TCB4F - 617DB)



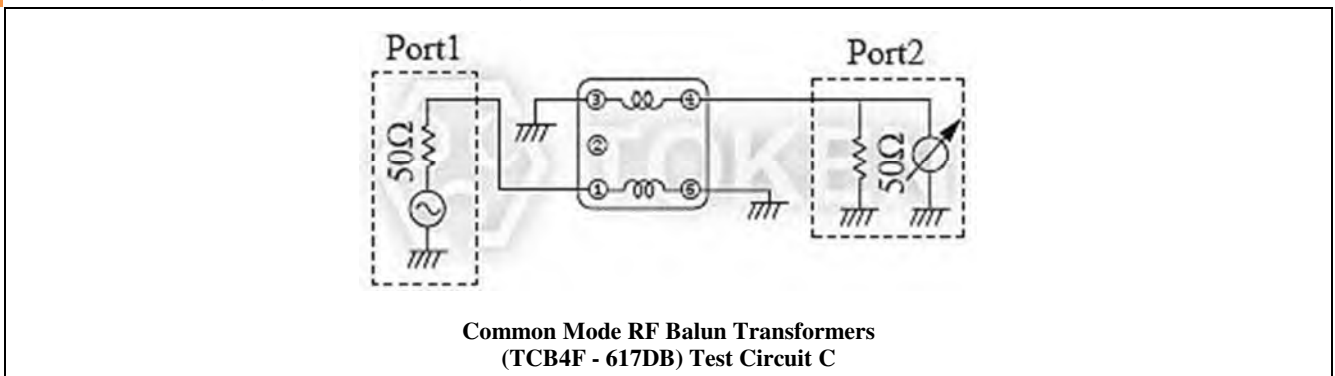
SMD Common Mode RF Balun Transformers (TCB4F - 617DB) Typical Characteristics B

TCB4F-617DB Spec C

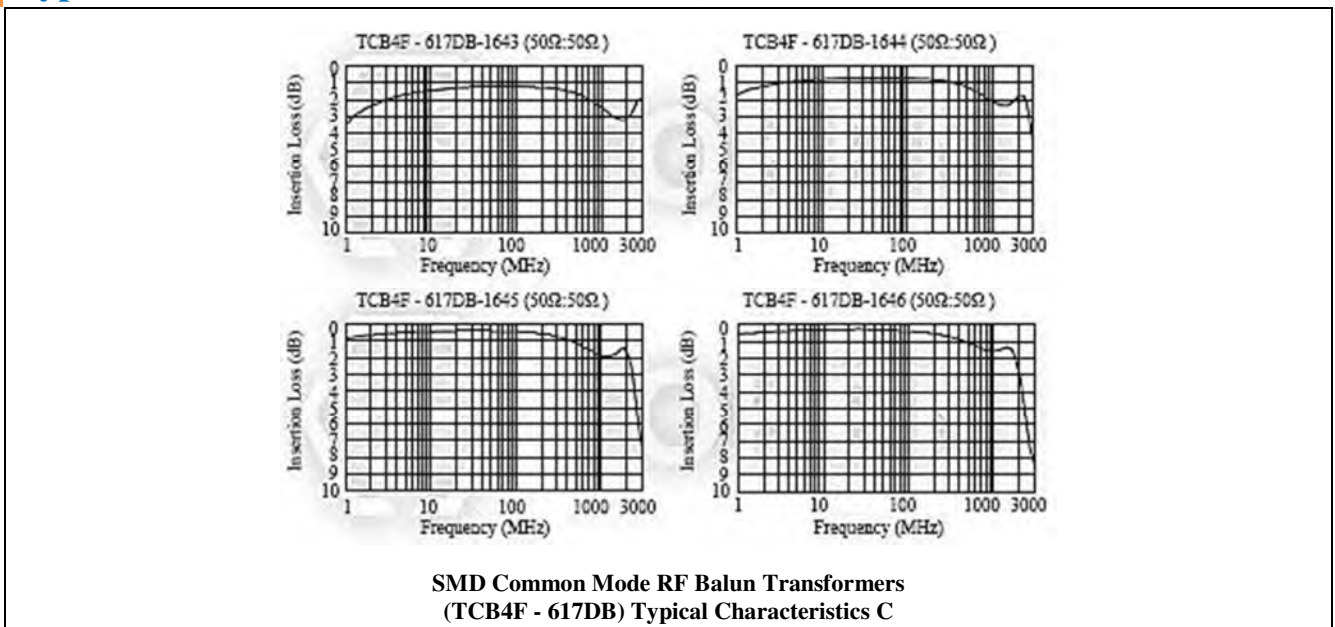
Electrical Characteristics C (TCB4F - 617DB)

Part Number	Winding Turns	μ iac
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)



Typical Characteristics C (TCB4F - 617DB)

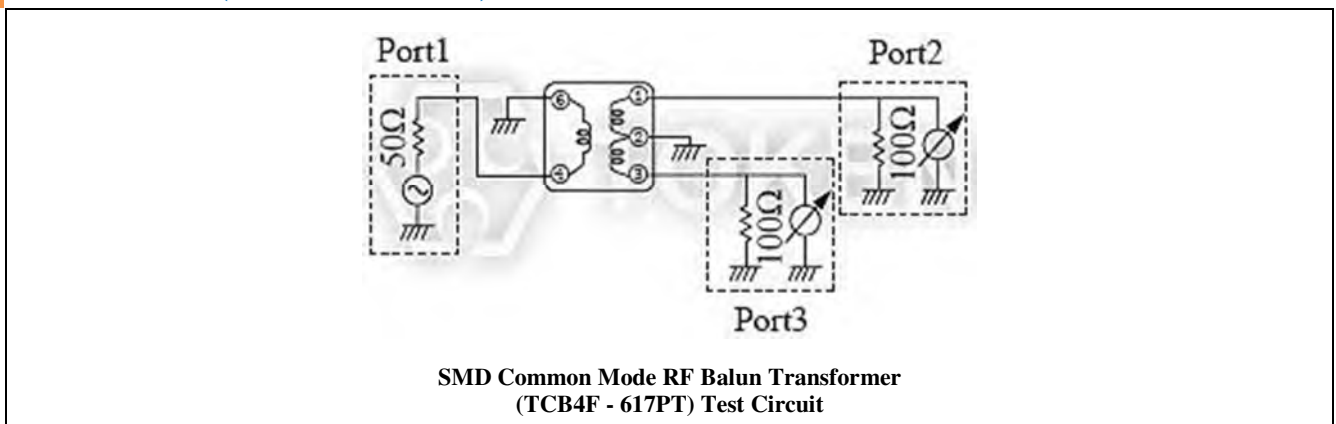


TCB4F-617PT Spec

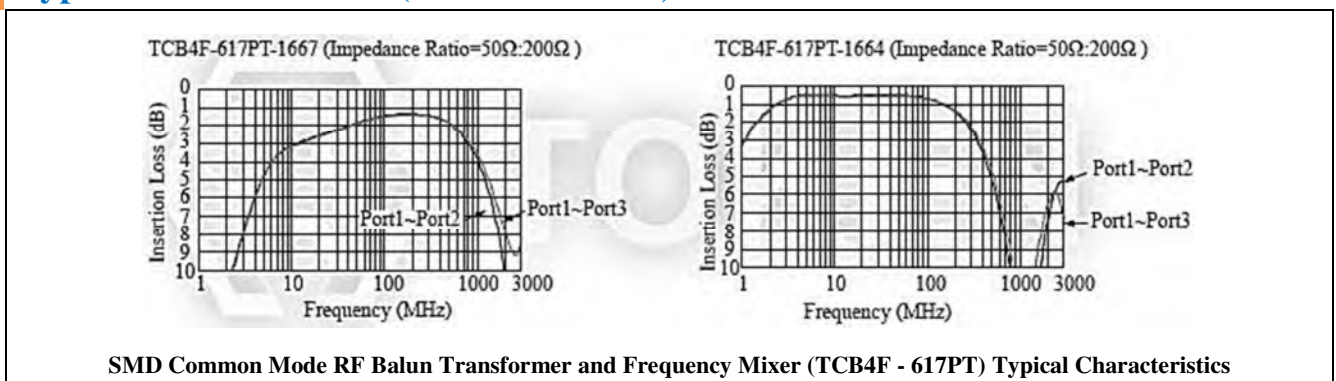
Electrical Characteristics (TCB4F - 617PT)

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

Test Circuit (TCB4F - 617PT)



Typical Characteristics (TCB4F - 617PT)



Order Codes

Order Codes (TCB4F)

TCB4F	-	617DB1673
Part Number		Type
TCB4F		617DB1673 Frequency Mixer
		617PT1667 Frequency Mixer
		617DB1653 Balun Transformers
		617DB1643 Balun Transformers

(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 customized 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.

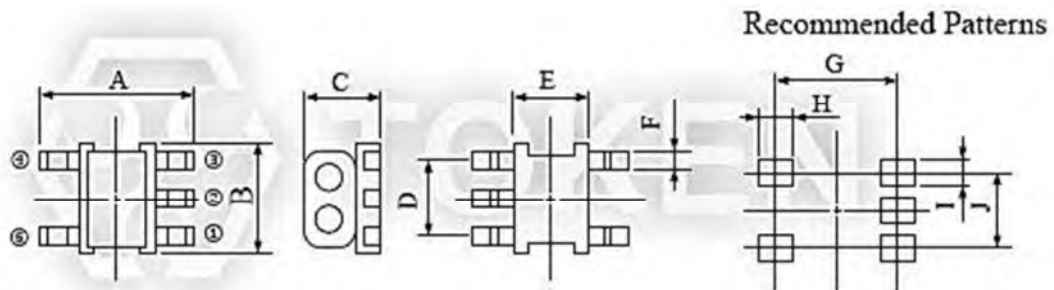
Token is equipped to design and produce custom components to meet many design and reliability demands. Custom parts are available on request. Token will also produce devices outside these specifications to meet specific customer requirements, please contact our sales or link to Token official website "[SMD Balun Transformers](http://www.token.com.tw)" 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

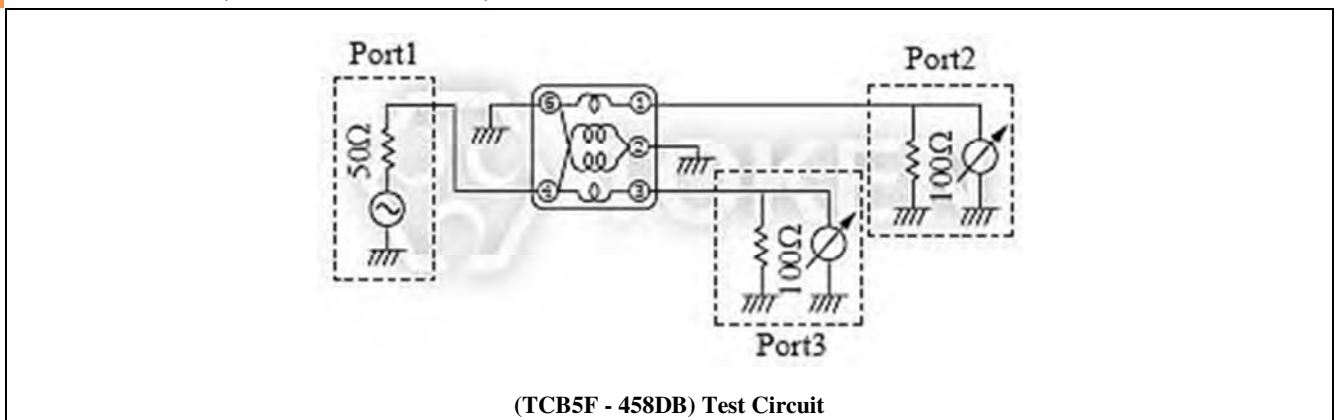
- Note: Design as Customer's Requested Specifications.

458DB Characteristics

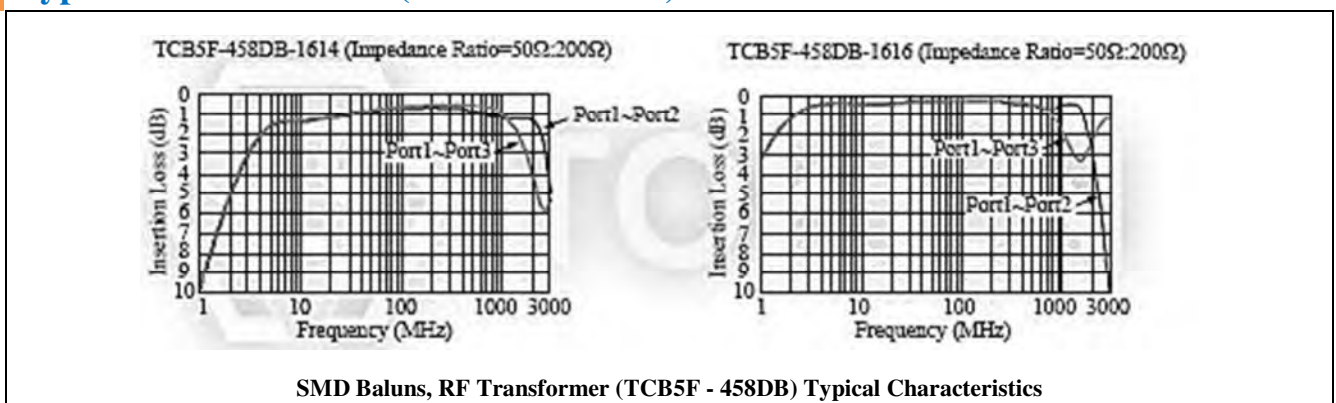
Electrical Characteristics (TCB5F - 458DB)

Part Number	Winding Turns 1-6=2-4=2-6=3-4	μ iac
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)



Typical Characteristics (TCB5F - 458DB)

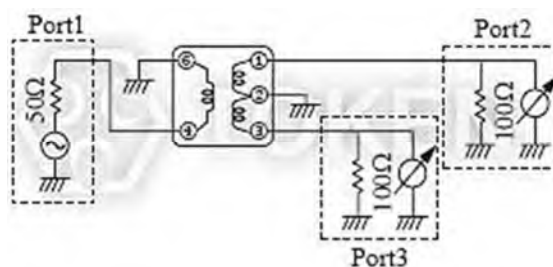


458PT Characteristics

Electrical Characteristics (TCB5F - 458PT)

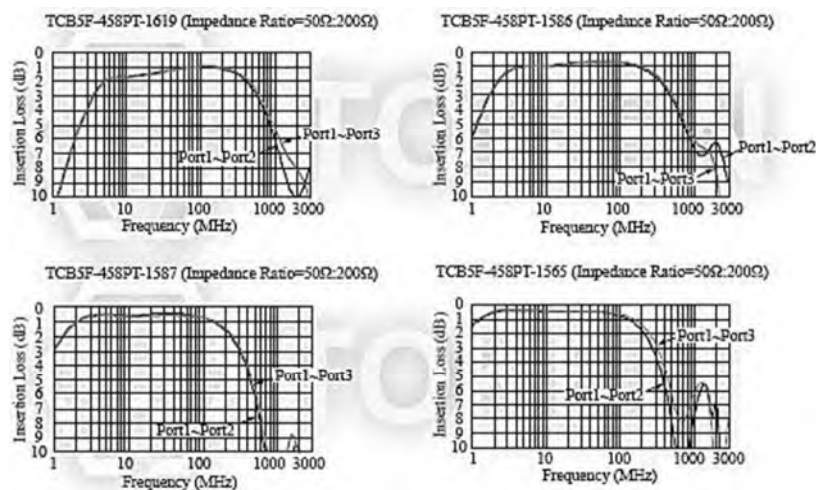
Part Number	Winding Turns 1-2=2-3=4-6	μ iac
TCB5F - 458PT1619	2 T	300
TCB5F - 458PT1586	3 T	230
TCB5F - 458PT1587	4 T	230
TCB5F - 458PT1565	5 T	230

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		Type
TCB5F		458DB1614 Frequency Mixer
		458DB1615 Frequency Mixer
		458PT1619 Frequency Mixer
		458PT1586 Frequency Mixer

(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 customized 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 processed to allow direct mounting on PCB. Ideal for use in double balanced mixers, and as broad band transformers, transistors and for impedance conversion.

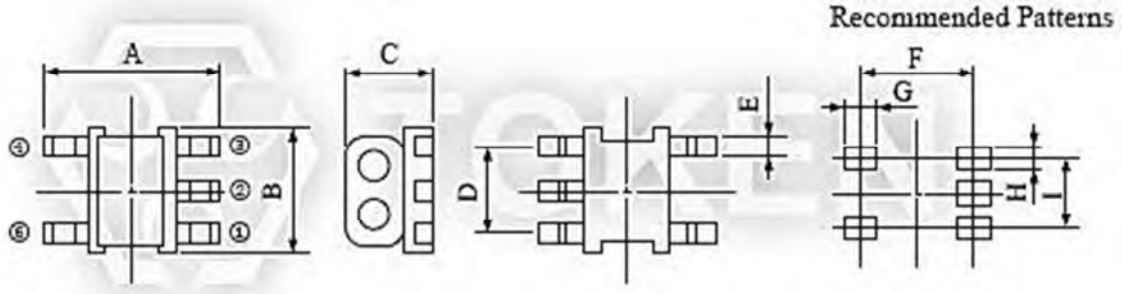
Token will also produce devices outside these specifications to meet customer requirements, with comprehensive application engineering and design support available for customers worldwide. Please contact our sales or link to Token official website "[SMD Balun Transformers](http://www.token.com.tw)" for 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

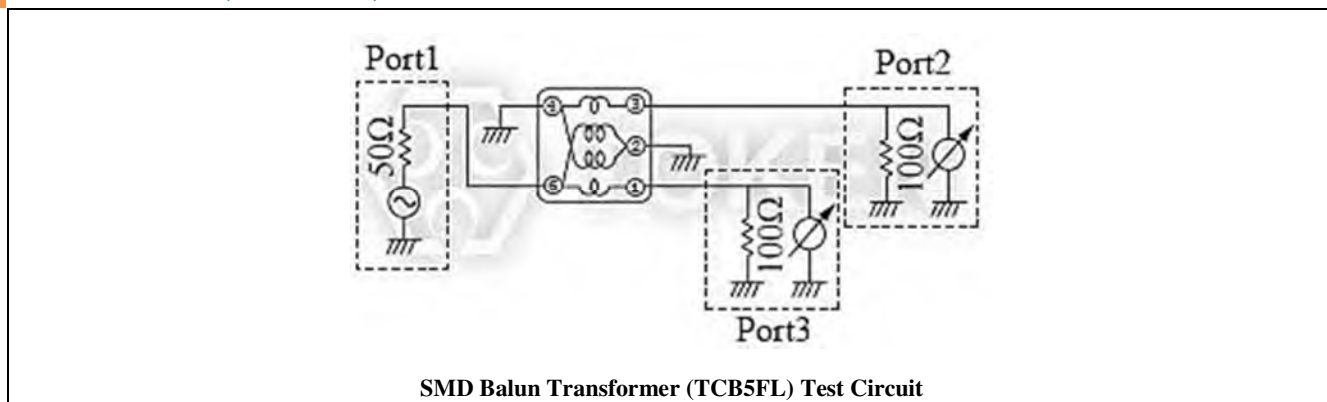
- Note: Design as Customer's Requested Specifications.

TCB5FL Characteristics

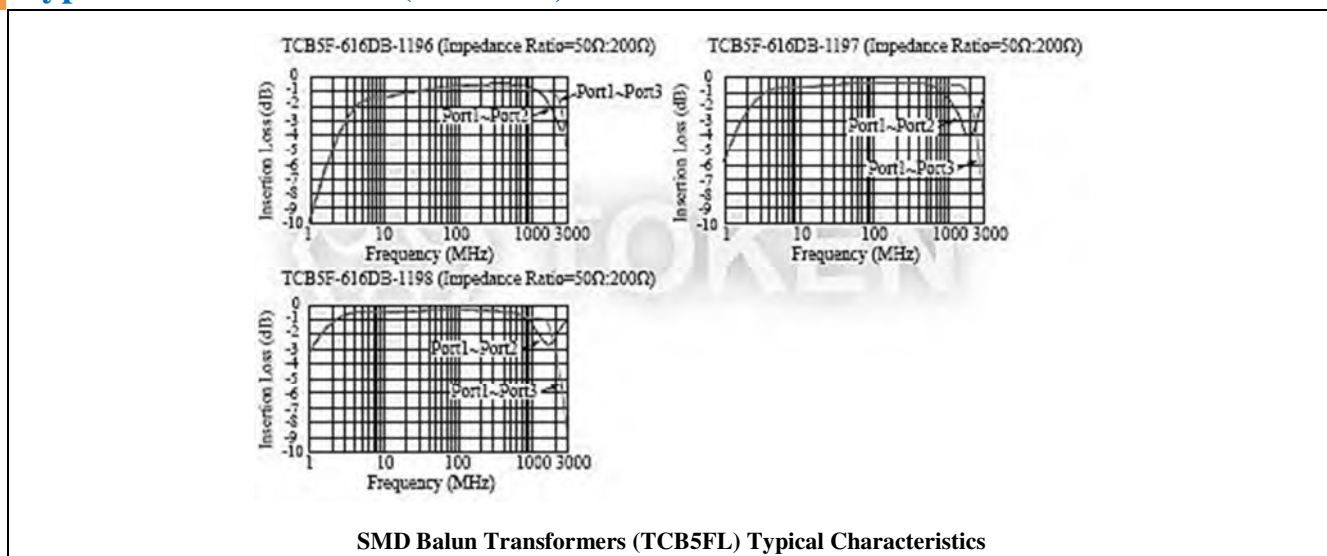
Electrical Characteristics (TCB5FL)

Part Number	Winding Turns 1-6=2-4=2-6=3-4	μ iac
TCB5FL - 616DB1196	2 1/2 T	300
TCB5FL - 616DB1197	3 1/2 T	300
TCB5FL - 616DB1198	4 1/2 T	300

Test Circuit (TCB5FL)



Typical Characteristics (TCB5FL)



Order Codes

Order Codes (TCB5FL)

TCB5F	-	616DB1196
Part Number		Type
TCB5FL		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.