

DATA SHEET

Introduction and Applications for Ceramic Band-Pass Filters

Applications

- High Q ceramic
- Rugged
- Temperature compensated
- Custom designs

Features

- Low insertion loss
- Small compact design
- Frequency stability
- Mechanical stability



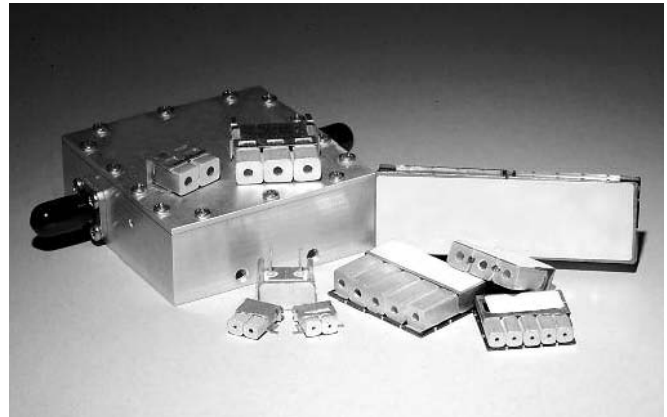
Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

Description

Skyworks, through its wholly-owned subsidiary Trans Tech, is a world-class supplier of high-performance ceramic band-pass filters. Specializing in band-pass, notch, and diplexing applications, our products cover a frequency range from 250 MHz to 7000 MHz with surface-mount or connectorized devices. Using state-of-the-art assembly automation, we provide cost-effective solutions that meet high-performance specifications.

Our surface-mount PCB configured filters are designed to comply with “green” manufacturing initiatives eliminating heavy metal elements. This configuration is designed to comply with pending European regulations regarding the elimination of lead in electronic assemblies. Custom assemblies can be obtained with legacy style SMT devices, through-hole or HasL-coated PCB surface-mount designs.

New higher power filter capability, constructed with 12 mm and 20 mm resonators. These filters will have high Q, low insertion loss and can be compared to cavity style filters but at a fraction of the size.



Our assembly methodology offers a wide array of designs, from 1.5 mm x 2-pole to 12 mm x 12-pole band pass filters and diplexers, to advanced band stop (notch) designs and high-pass or low-pass filters. For typical applications and ranges of products, refer to the Standard Filters/Duplexers listing included in this document. Detailed specifications, both mechanical and electrical, are maintained for many popular designs on our web site, or by contacting us.

The nature of applications utilizing a band pass filter, diplexer, or notch filter necessitates the close interaction of our customers and our application engineering staff. Our application engineers employ the latest in simulation and circuit analysis software with accurately defined design rules to provide rapid turnaround on new filter designs. With our experience and design aids, we can provide the necessary support for your application from prototype through production. In addition to the personal attention, we offer a computer-aided design tool, CRaFT, to assist engineers designing filters (the latest version can be downloaded from our web site, www.skyworksinc.com).

The strength of these designs begins with our ability to produce our own coaxial resonators from proprietary ceramic formulations. These resonators provide a high Q element that allows us to maintain our low filter insertion loss values. With numerous design package styles, we offer aggressive lead times on both prototype and volume applications.

Standard Filter Selection Guide

We offer a wide range of standard filters, as well as the capability to rapidly create new custom designs. Table 1 illustrates our general capability for filters. If a desired requirement falls within the listed categories, we can easily offer a suitable design. Beyond this general list, our staff of experienced filter designers can provide new custom and more technologically difficult filters. In addition, the CRaFT program functions as a useful tool when analyzing filter requirements. Our staff welcomes the chance to review specifications and determine a design solution.

Standard Filters/Duplexers

Table 1 provides specifications for our most popular filter and duplexer designs. A variety of footprints and configurations are available for application-specific needs. Contact us with your specifications or for more information on any of these designs. We maintain a list of over 700 active filters and duplexers. We welcome every opportunity to assist in the selection or creation of a filter or duplexer that will meet your specifications.

Table 1. Standard Capabilities¹

Parameter	Value
Center frequency	250 MHz to 7 GHz
Standard filter type	Ceramic band pass, duplexer, notch, LPF
Number of poles	2 to 12
Resonator sizes	2, 3, 4, 6, 8 and 12
Bandwidth	1.0%–20% (May vary depending on resonator size, F ₀ and ε _r)
Insertion loss	1 to 4 dB typical by design
Attenuation	Varies by number of poles
Impedance	50 or 75 Ω
VSWR	2.0:1 maximum, 1.5:1 typical
Operating temperature range	–40 to +85 °C
Mechanical packaging options	PCB surface mount, through-hole, and flat-pack surface-mount
Power handling (continuous)	1 W to 50 W*

¹ Contact Skyworks Application Engineering for assistance with any other requirements.

CATV

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT3P2-1068P0-3507	Band Pass	3 mm/2 pole	1068	35	0.7	PCB SMT
TT4P2-1013P2-2020	Band Pass	4 mm/2 pole	1013	20	2	PCB SMT
TT4P2-1082.5P2-0720	Band Pass	4 mm/2 pole	1082.5	07	2	PCB SMT
TT4P2-1082P2-0620	Band Pass	4 mm/2 pole	1082	06	2	PCB SMT
TT4P2-1090P2-0610	Band Pass	4 mm/2 pole	1090	06	1	PCB SMT
TT4P3-1030P2-1535	Band Pass	4 mm/3 pole	1030	15	3.5	PCB SMT
TT4P3-1067P2-4420	Band Pass	4 mm/3 pole	1067	44	2	PCB SMT
TT6P4-1080P4-7015	Band Pass	6 mm/4 pole	1080	70	1.5	PCB SMT
TT6P4-1090P2-1036	Band Pass	6 mm/4 pole	1090	10	3.6	PCB SMT

WCS

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT6P6-0750P0-5017	Band Pass	6 mm/6 pole	750	50	1.7	PCB SMT
TT6P5-0765P0-11225	Band Pass	6 mm/5 pole	765	112	2.5	PCB SMT
TT6P2-0770T-1215	Band Pass	6 mm/2 pole	770	12	1.5	PCB SMT
TT6P3-0770T-1225	Band Pass	6 mm/3 pole	770	12	2.5	PCB SMT
TT6P3-0770T-2020	Band Pass	6 mm/3 pole	770	20	2	PCB SMT

MDS

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT4P3-2120P2-6020	Band Pass	4 mm/3 pole	2120	60	2	PCB SMT
TT4P6-2122P0-2835	Band Pass	4 mm/6 pole	2122	28	3.5	PCB SMT
TT6P4-2158P2-1422	Band Pass	6 mm/4 pole	2158	14	2.2	PCB SMT
TT6P6-2500P3-3635	Band Pass	6 mm/6 pole	2500	36	3.5	PCB SMT

ISM

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT4P2-0915P2-2620	Band Pass	4 mm/2 pole	915	26	2	PCB SMT
TT6P2-0902F-2518	Band Pass	6 mm/2 pole	902	25	1.8	PCB SMT
TT6P2-0915T-2518	Band Pass	6 mm/2 pole	915	25	1.8	PCB SMT
TT6P3-0902T-2520	Band Pass	6 mm/3 pole	902	25	2	PCB SMT
TT6P3-0915T-2520	Band Pass	6 mm/3 pole	915	25	2	PCB SMT
TT6P3-0917F-1425	Band Pass	6 mm/3 pole	917	14	2.5	PCB SMT
TT3P3-2400P1-1030	Band Pass	3 mm/3 pole	2400	10	3	PCB SMT
TT3P3-2450P1-1445	Band Pass	3 mm/3 pole	2450	14	4.5	PCB SMT
TT6P3-2467P0-3330	Band Pass	6 mm/3 pole	2467	33	3	PCB SMT

Cellular/PCS/DCS/UMTS

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT3P2-1880P0-6010	Band Pass	3 mm/2 pole	1880	60	1	PCB SMT
TT3P3-0881.5P2-2530	Band Pass	3 mm/3 pole	881.5	25	3	PCB SMT
TT3P3-1880P0-6022	Band Pass	3 mm/3 pole	1880	60	2.2	PCB SMT
TT3P3-1960P0-6022	Band Pass	3 mm/3 pole	1960	60	2.2	PCB SMT
TT3P3-1960P2-6030	Band Pass	3 mm/3 pole	1960	60	3	PCB SMT
TT3P4-0836.5P2-2525	Band Pass	3 mm/4 pole	836.5	25	2.5	PCB SMT
TT3P4-0881.5P2-2525	Band Pass	3 mm/4 pole	881.5	25	2.5	PCB SMT
TT3P4-1880P2-6020	Band Pass	3 mm/4 pole	1880	60	2	PCB SMT
TT3P4-1880P2-6030	Band Pass	3 mm/4 pole	1880	60	3	PCB SMT
TT4P3-0863P0-0585	Band Pass	4 mm/3 pole	863	5	8.5	PCB SMT
TT4P3-2180P1-2540	Band Pass	4 mm/3 pole	2180	25	4	PCB SMT
TT4P4-1880P0-6216	Band Pass	4 mm/4 pole	1880	62	1.6	PCB SMT
TT4P4-1960P0-6216	Band Pass	4 mm/4 pole	1960	62	1.6	PCB SMT
TT4P5-2240P2-1032	Band Pass	4 mm/5 pole	2240	10	3.2	PCB SMT
TT4P6-0860.5P0-1937	Band Pass	4 mm/6 pole	860.5	19	3.7	PCB SMT
TT6P3-0836T-2520	Band Pass	6 mm/3 pole	836	25	2	PCB SMT
TT6P3-0860P3-2020	Band Pass	6 mm/3 pole	860	20	2	PCB SMT
TT6P3-0860T-2020	Band Pass	6 mm/3 pole	860	20	2	PCB SMT
TT6P3-0881F-2520	Band Pass	6 mm/3 pole	881	25	2	PCB SMT
TT6P5-1960P0-6025	Band Pass	6 mm/5 pole	1960	60	2.5	PCB SMT
TT6P5-2280P1-7032	Band Pass	6 mm/5 pole	2280	70	3.2	PCB SMT
TT6P6-1900P3-8035	Band Pass	6 mm/6 pole	1900	80	3.5	PCB SMT
TT6P3-2140P2-6011	Band Pass	6 mm/3 pole	2140	60	1.1	PCB SMT
TT6P10-R1950-T2140	Diplexer	6 mm/10 pole	1950	-	-	PCB SMT

GPS

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT4P4-R1227.6-T1575.42	Diplexer	4 mm/4 pole	1227.6	-	-	PCB SMT
TT4P3-1227.6P1-2030	Band Pass	4 mm/3 pole	1227.6	20	3.0	PCB SMT
TT4P3-1575.42P2-2040	Band Pass	4 mm/3 pole	1575.42	20	4.0	PCB SMT
TT3P3-1227.6P1-1030	Band Pass	3 mm/3 pole	1227.6	10	3.0	PCB SMT
TT3P3-1575.42P2-1030	Band Pass	3 mm/3 pole	1575.42	10	3.0	PCB SMT

Other

Part Number	Filter Type	Size/Poles	Center Frequency (MHz)	Bandwidth (MHz)	Insertion Loss (dB)	Package
TT3P4-2513P2-5055	Band Pass	3 mm/4 pole	2513	50	5.5	PCB SMT
TT3P5-3687P1-7466	Band Pass	3 mm/5 pole	3687	74	6.6	PCB SMT
TT4P3-3417P2-0220	Band Pass	4 mm/3 pole	3417	02	2.0	PCB SMT
TT4P5-1090P0-1050	Band Pass	4 mm/5 pole	1090	10	5.0	PCB SMT
TT6P5-0810P3-5030	Band Pass	6 mm/5 pole	0810	50	3.0	PCB SMT
TT6P4-0509P7-0148	Band Pass	6 mm/4 pole	0509	01	4.8	PCB SMT
TT4P4-1000P2-1030	Band Pass	4 mm/4 pole	1000	10	3.0	PCB SMT
TT6P3-0826.5P3-0520	Band Pass	6 mm/3 pole	0826.5	05	2.0	PCB SMT
TT6P3-0827P3-0620	Band Pass	6 mm/3 pole	0825	06	2.0	PCB SMT
TT6P6-1000P5-8530	Band Pass	6 mm/6 pole	1000	85	3.0	PCB SMT
TT6P6-0545P6-3022	Band Pass	6 mm/6 pole	0545	30	2.2	PCB SMT
TT4P3-3500P2-10020	Band Pass	4 mm/3 pole	3500	100	2.0	PCB SMT
TT6P6-0889P3-4029	Band Pass	6 mm/6 pole	0889	40	2.9	PCB SMT
TT6P4-0722P4-4817	Band Pass	6 mm/4 pole	0722	48	1.7	PCB SMT
TT3P3-1088P2-9015	Band Pass	3 mm/3 pole	1088	90	1.5	PCB SMT
TT6P3-0740P3-2020	Band Pass	6 mm/3 pole	0740	20	2.0	PCB SMT
TT6P5-1950P3-6040	Band Pass	6 mm/5 pole	1950	60	4.0	PCB SMT
TT3P4-0917P2-4524	Band Pass	3 mm/4 pole	0917	45	2.4	PCB SMT
TT6P3-1090P2-1029	Band Pass	6 mm/3 pole	1090	10	2.9	PCB SMT
TT6P4-0770P0-1240	Band Pass	6 mm/4 pole	0770	12	4.0	PCB SMT
TT6P3-1030P2-1029	Band Pass	6 mm/3 pole	1030	10	2.9	PCB SMT
TT6P5-0881.5P0-2530	Band Pass	6 mm/5 pole	0881.5	25	3.0	PCB SMT
TT6P3-0730P3-1213	Band Pass	6 mm/3 pole	0730	12	1.3	PCB SMT
TT6P3-0445.25T-0145	Band Pass	6 mm/3 pole	0445.25	01	4.5	PCB SMT
TT4P3-2400P1-20015	Band Pass	4 mm/3 pole	2400	200	1.5	PCB SMT
TT6P3-1080P2-0650	Band Pass	6 mm/3 pole	1080	06	5.0	PCB SMT
TT6P3-0745.3P3-1920	Band Pass	6 mm/3 pole	0745.3	19	2.0	PCB SMT
TT6P4-0435P0-3019-NS	Band Pass	6 mm/4 pole	0435	30	1.9	PCB SMT
TT3P4-0895.5P2-3926	Band Pass	3 mm/4 pole	0895.5	39	2.6	PCB SMT

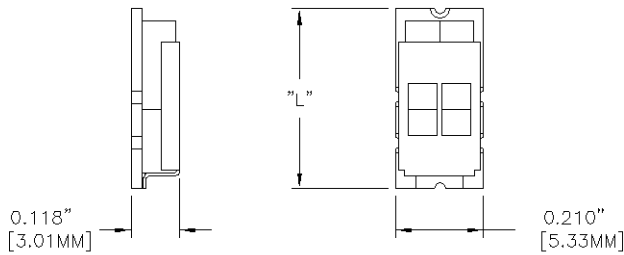
Available Packages

We offer filters in a number of standard packages. In addition to SMT, we offer a flat-pack and through-hole configuration. Mechanical drawings are provided for most of our filters. In addition to our standard offering, we have the capability and experience to meet many unique footprint layouts and custom packages.

For each of our 2 to 6 pole packages, we offer profiles ranging from 2 mm to 6 mm.

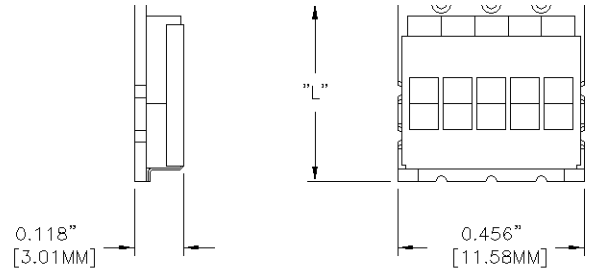
2 mm SMT

TT2P2—P—



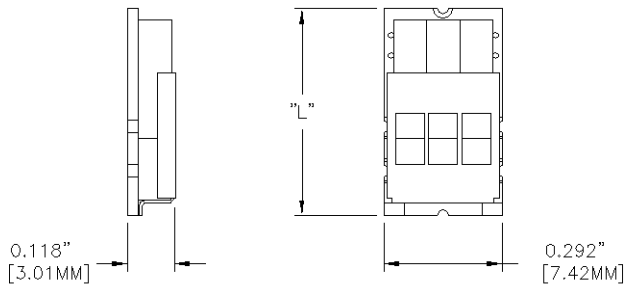
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TT2P5—P—



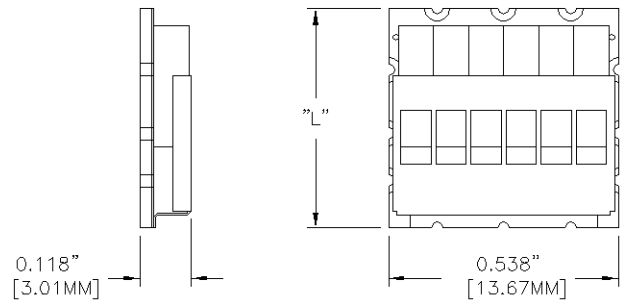
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TT2P3—P—



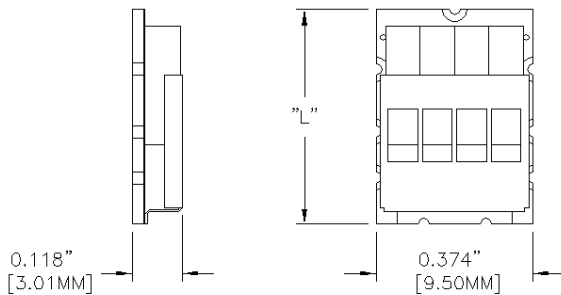
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TT2P6—P—



TOLERANCE:
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TT2P4—P—



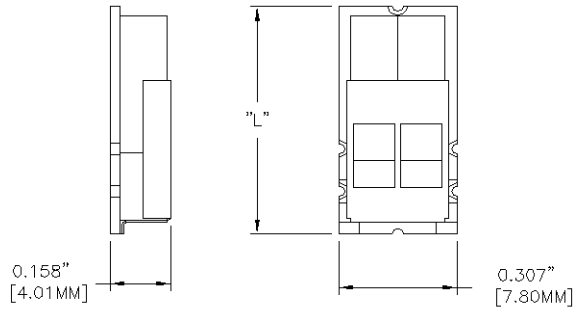
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SMT Filter Length

Filter	Inches	mm
P1	0.434	11
P2	0.512	13
P3	0.590	15
P4	0.669	17
P5	0.748	19
P6	0.827	21
P7	0.906	23
P0	Custom	Custom

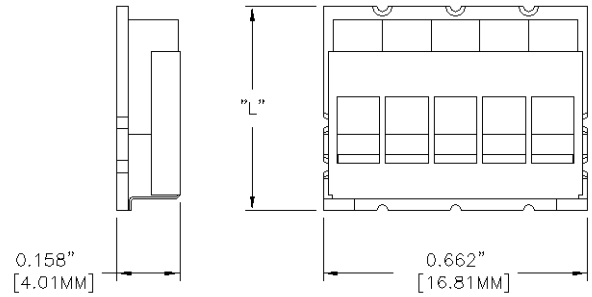
3 mm SMT

TT3P2—P—



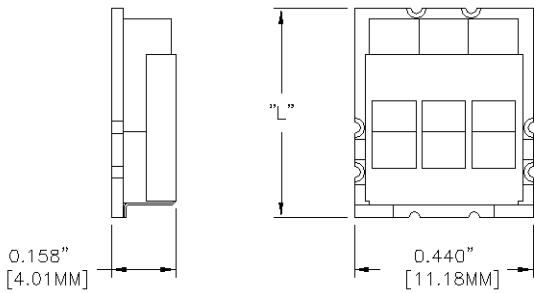
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TT3P5—P—



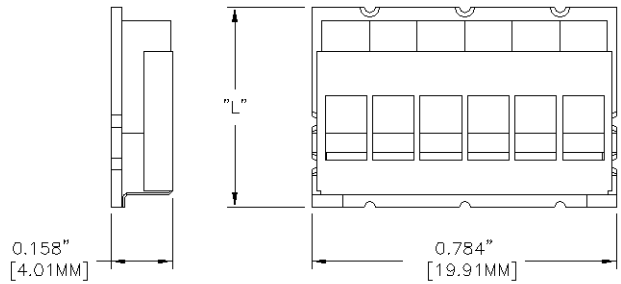
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TT3P3—P—



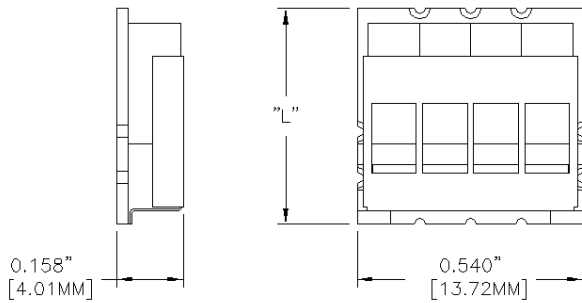
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TT3P6—P—



TOLERANCE:
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TT3P4—P—



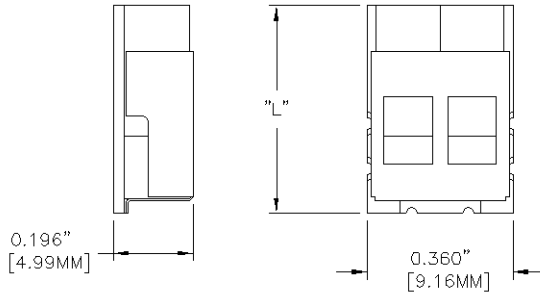
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SMT Filter Length

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P7	0.906	23
P0	Custom	Custom

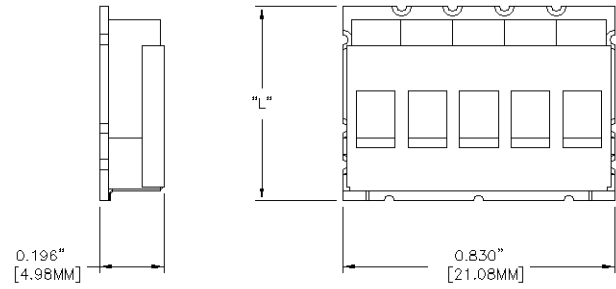
4 mm SMT

TT4P2—P—



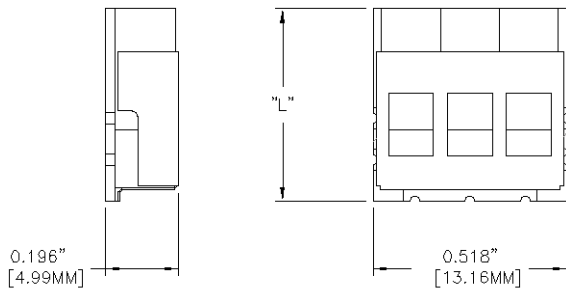
TOLERANCE:
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TT4P5—P—



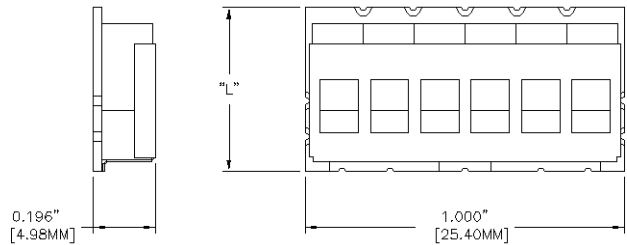
TOLERANCE:
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TT4P3—P—



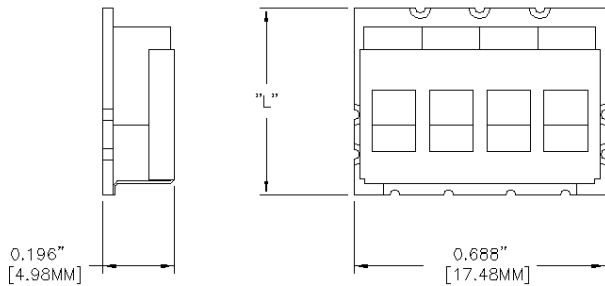
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TT4P6—P—



TOLERANCE:
0.XXX = ±0.010" [0.25MM]

TT4P4—P—



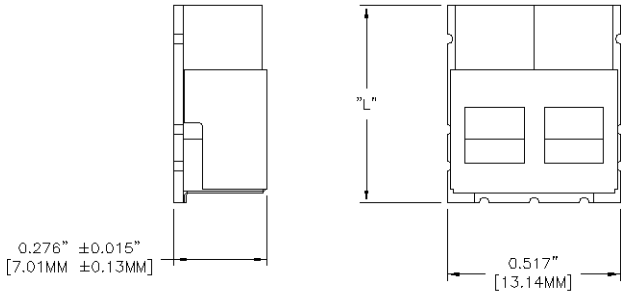
TOLERANCE:
0.XXX = ±0.010" [0.25MM]

SMT Filter Length

Filter	Inches	mm
P1	0.434	11
P2	0.512	13
P3	0.590	15
P4	0.669	17
P5	0.748	19
P6	0.827	21
P7	0.906	23
P0	Custom	Custom

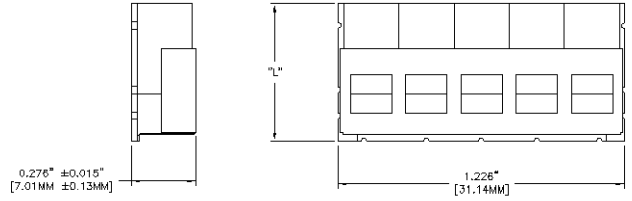
6 mm SMT

TT6P2—P—



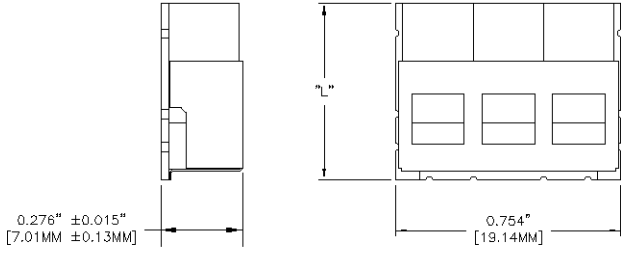
TOLERANCE:
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TT6P5—P—



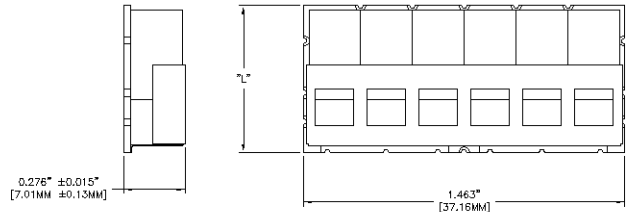
TOLERANCE:
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TT6P3—P—



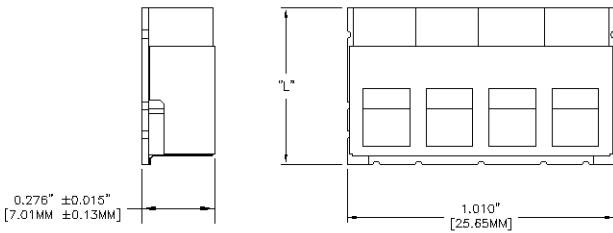
TOLERANCE:
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TT6P6—P—



TOLERANCE:
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TT6P4—P—



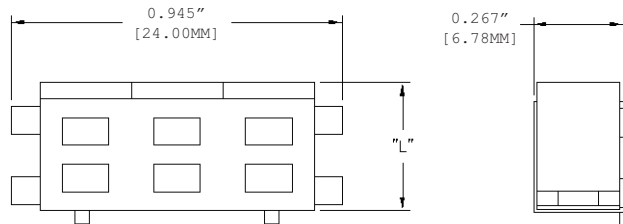
TOLERANCE:
0.XXX = ±0.010" [0.25MM]

SMT Filter Length

Filter	Inches	mm
P1	0.434	11
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P7	0.906	23
P0	Custom	Custom

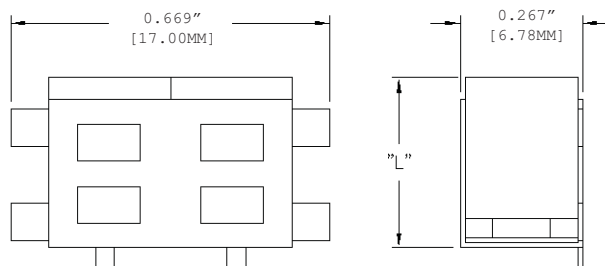
6 mm Flat Pack (F)

TT6P2—F



TOLERANCE:
0.XXX = ±0.005" [0.13MM]

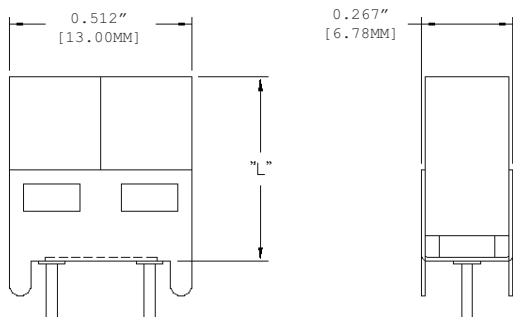
TT6P3—F



TOLERANCE:
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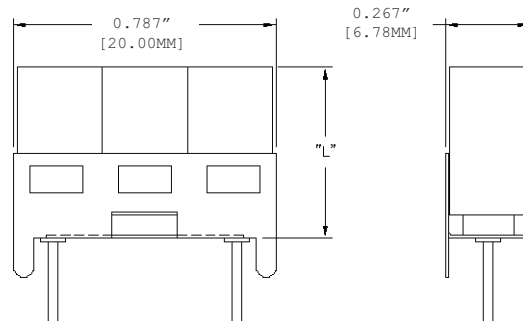
6 mm Through-Hole (T)

TT6P2—T



TOLERANCE:
0.XXX = ±0.005" [0.13MM]

TT6P3—T



TOLERANCE:
0.XXX = ±0.005" [0.13MM]

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