

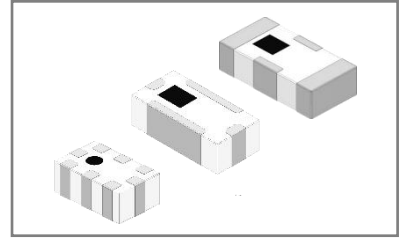
■ LTCC 滤波器

LTCC Filter

◆ 特征

Feature

- * 优异的承受功率
Excellent power handling
- * 小尺寸
Small size
- * 宽温度使用范围
Temperature stable
- * LTCC 结构, 具备良好的耐湿性、耐腐蚀性、高可靠性
LTCC construction, and has good moisture resistance, corrosion resistance, high reliability.
- * 符合 RoHS 指令和无卤素要求
Compliant with RoHS directive and Halogen free requirement.



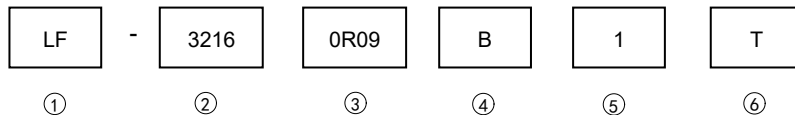
◆ 应用

Application

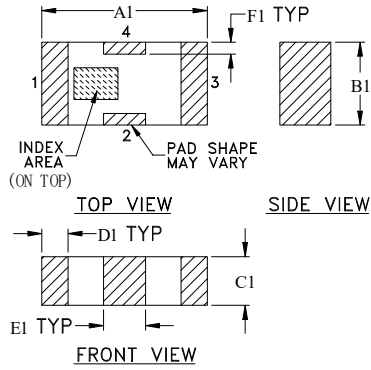
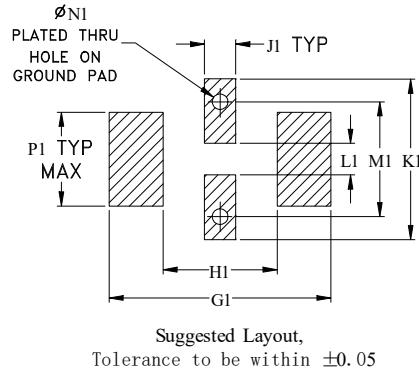
- * 谐波抑制
Harmonic rejection
- * 高频/甚高频 收发使用等
VHF/UHF transmitters/receivers

◆ 型号表示法

Part Number



- ① 表示产品代号 (2 位数): “LF” 代表低通、“BF” 代表带通、“HF” 代表高通。
Indicates the product code (2 digits): "LF" stands for low-pass, "BF" stands for band-pass, and "HF" stands for high-pass.
- ② 表示产品外形尺寸 (4 位数): 如公制 3216 尺寸等。
Indicates the overall dimension of the product (4 digits): such as the metric 3216 size.
- ③ 表示产品工作频率 (4 位数): 单一滤波器使用 GHz 单位, “R” 代表小数点。
Represents product operating frequency (4 digits): Single filter uses GHz unit, and "R" represents decimal point.
- ④ 表示外部电极实现方式 (1 位字母): 参照附件 1 产品型号外部电极实现方式。
Indicate the external electrode realization method (1-digit letter): refer to Appendix 1 Product Model External Electrode Realization Method.
- ⑤ 表示产品设计 (1 位数): 数字 “1” 代表常规、以数字 “2” 开始依次往后编排阿拉伯数字或者字母代表不同类型的特殊定制。
Represent product design (1 digit): the number "1" represents the general, and the number "2" starts with the Arabic numerals or letters to represent different types of special customization.
- ⑥ 表示包装方式 (1 位字母): “T” 代表编带包装, “B” 代表塑料盒包装, “C” 代表塑料袋包装。
Indicates the packaging method (1 digit letter): "T" represents ribbon packaging, "B" represents plastic box packaging, and "C" represents plastic bag packaging.

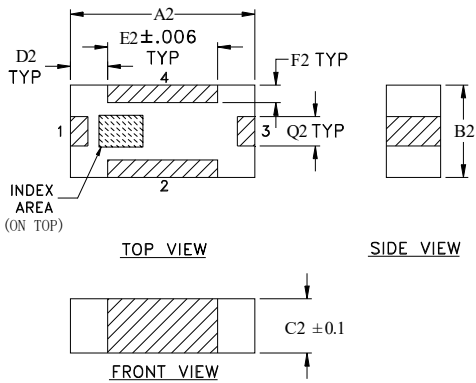
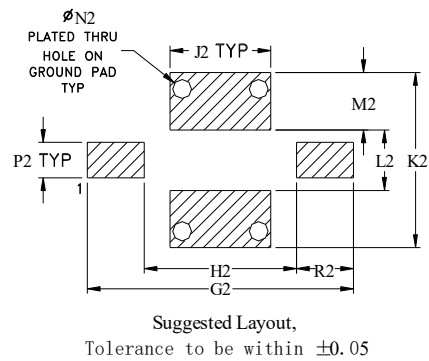
◆ 产品规格尺寸
Product Dimension
*** B 形外电极方式的产品尺寸**
B-shaped outer electrode method product size

PCB 焊盘样式
PCB Land Pattern


Unit:mm

A1	B1	C1	D1	E1	F1	G1
3.2±0.2	1.6±0.2	0.95±0.2	0.51±0.15	1.0±0.1	0.25±0.1	4.29±0.05
H1	J1	K1	L1	M1	N1	P1
2.21±0.05	0.61±0.05	3.1±0.05	0.61±0.05	2.21±0.05	0.3±0.05	1.8±0.05

产品引脚连接
Pin Connections

输入 Input Port	(1)
接地 GND	(2)、(4)
输出 output Port	(3)

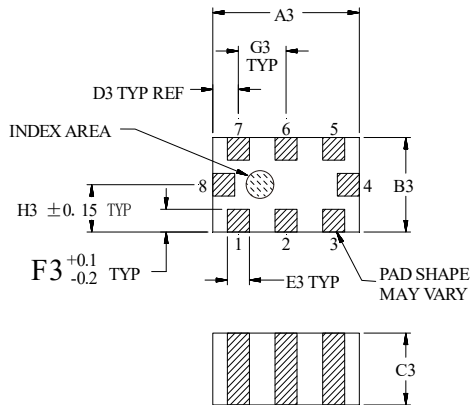
*** F 形外电极方式的产品尺寸**
F-shaped outer electrode method product size

PCB 焊盘样式
PCB Land Pattern


Unit:mm

A2	B2	C2	D2	E2	F2	G2	H2
3.2±0.2	1.6±0.2	0.95±0.1	0.66±0.2	1.91±0.15	0.30±0.15	4.62±0.05	2.64±0.05
J2	K2	L2	M2	N2	P2	Q2	R2
1.75±0.05	3.02±0.05	1.04±0.05	0.99±0.05	0.33±0.05	0.61±0.05	0.51±0.15	0.99±0.05

产品引脚连接
Pin Connections

输入 Input Port	(1)
接地 GND	(2)、(4)
输出 output Port	(3)

*** G 形外电极方式的产品尺寸**
G-shaped outer electrode method product size


Unit:mm

A3	B3	C3	D3	E3	F3
2.0±0.15	1.25±0.15	0.94±0.1	0.36±0.2	0.30±0.15	0.30±0.15
G3	H3	J3	K3	L3	M3
0.66±0.05	0.64±0.15	3.40±0.05	2.64±0.05	0.36±0.05	0.99±0.05

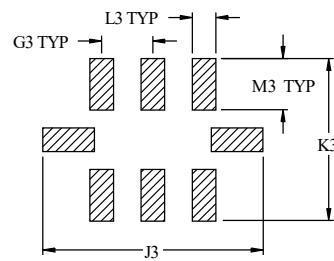
产品引脚连接
Pin Connections

输入 Input	(8)
输出 Output	(4)
接地 Ground	(1,3,5,7)
隔离 Isolate(Do not ground)	(2, 6)

◆最大额定值
Maximum Ratings

类型Type	低通(3216) Low Pass	低通(2012) Low Pass	高通(3216) High Pass	带通(3216) Band Pass
工作温度 Operating Temperature	-55℃ to 100℃	-55℃ to 100℃	-55℃ to 100℃	-55℃ to 100℃
储存温度 Storage Temperatur	-55℃ to 100℃	-55℃ to 100℃	-55℃ to 100℃	-55℃ to 100℃
射频输入功率 RF Power Input*	10W max. at25℃ 3.5W max. at100℃	2W max. at25℃ 1W max. at100℃	7W max. at25℃ 3W max. at100℃	5W max. at25℃ 1W max. at100℃

* Permanent damage may occur if any of these limits are exceeded.

PCB 焊盘样式
PCB Land Pattern

 Suggested Layout,
 Tolerance to be within ±0.05

◆电性能参数规格
Electrical Specification at 25°C

产品型号	通带MHz				阻带MHz			阻抗 Ω
	通带 频率 MHz	插入 损耗 dB MAX	截止 频率 MHz TYP	驻波比 MAX	衰减1 dB MIN	衰减2 dB MIN	衰减3 dB MIN	
LF-32160R08B1T	DC~80	1.2	140	1.5	20@200MHz	30@225~1550MHz	20@4500MHz	50
LF-32160R12B1T	DC~120	1.0	180	1.5	20@280MHz	35@300~1850MHz	20@4750MHz	50
LF-32160R18B1T	DC~180	1.0	266	1.5	20@370MHz	30@525~525MHz	20@2350MHz	50
LF-32160R19B1T	DC~190	1.0	280	1.5	20@400MHz	30@510~2850MHz	20@2850MHz	50
LF-32160R22B1T	DC~225	1.2	334	1.5	20@460MHz	30@510~2500MHz	20@5500MHz	50
LF-32160R32B1T	DC~320	1.0	408	1.5	20@560MHz	30@640~2500MHz	20@5300MHz	50
LF-32160R40B1T	DC~400	1.0	560	1.5	20@660MHz	30@525~2350MHz	20@6400MHz	50
LF-32160R49B1T	DC~490	1.2	639	1.5	20@800MHz	40@880~2500MHz	20@6000MHz	50
LF-32160R53B1T	DC~530	1.2	674	1.5	20@820MHz	40@945~3000MHz	20@6000MHz	50
LF-32160R57B1T	DC~575	1.2	775	1.5	20@900MHz	40@1050~3200MHz	20@6000MHz	50
LF-32160R63B1T	DC~630	1.2	809	1.5	20@1000MHz	40@1050~3500MHz	20@6000MHz	50
LF-32160R90B1T	DC~900	1.3	1015	1.5	20@1150MHz	30@1350MHz	20@5100MHz	50
LF-32161R00B1T	DC~1000	1.0	1342	1.5	20@1550MHz	30@2000~5500MHz	/	50
LF-32161R20B1T	DC~1200	1.2	590	1.5	25@1880MHz	30@2000MHz	20@5000MHz	50
LF-32161R50B1T	DC~1500	1.2	790	1.5	25@2220MHz	30@2380MHz	20@6800MHz	50
LF-32161R80B1T	DC~1800	1.2	2190	1.5	25@2410MHz	30@2770MHz	20@7200MHz	50
LF-32162R25B1T	DC~2250	1.3	2425	1.5	27@2850MHz	30@2850MHz	20@7800MHz	50
LF-32162R50B1T	DC~2500	1.3	2620	1.5	20@3560MHz	30@3800~6100MHz	20@8000MHz	50
LF-32162R60B1T	DC~2600	1.3	2800	1.5	20@3675MHz	30@3900~8000MHz	20@8400MHz	50
LF-32162R75B1T	DC~2750	0.9	3230	1.5	32@3600MHz	32@3600~6000MHz	/	50
LF-32163R00B1T	DC~3000	0.9	3620	1.5	20@4550MHz	30@4850~7500MHz	20@10000MHz	50
LF-32163R60B1T	DC~3600	0.9	4162	1.5	30@4790MHz	30@4790~6000MHz	/	50
LF-32163R90B1T	DC~3900	1.2	5090	1.5	20@5700MHz	30@6000~8300MHz	20@13000MHz	50
LF-32164R40B1T	DC~4400	1.0	5290	1.5	20@6700MHz	30@6280~9800MHz	20@9800~13000MHz	50

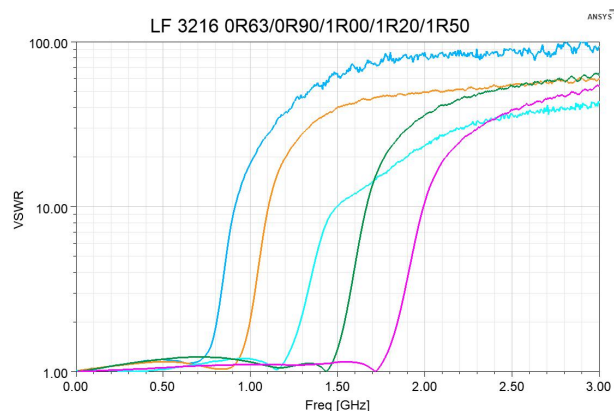
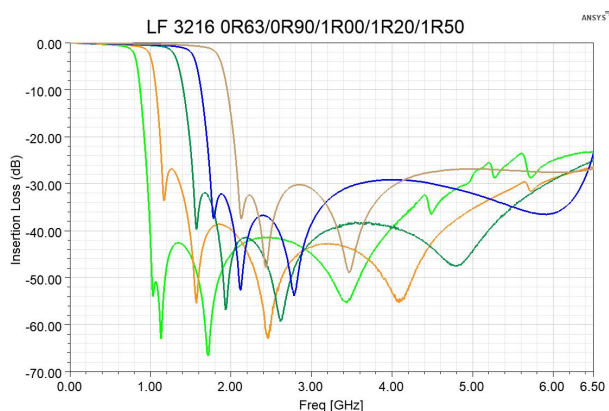
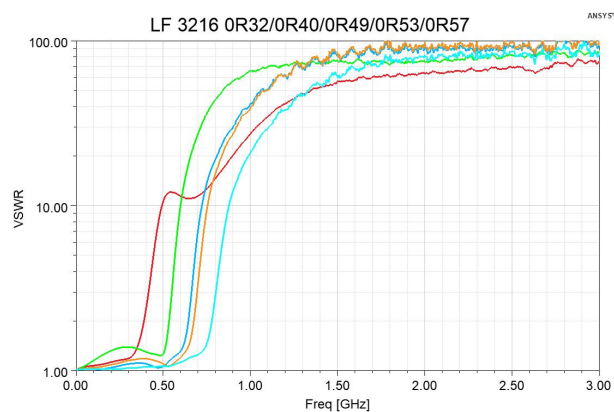
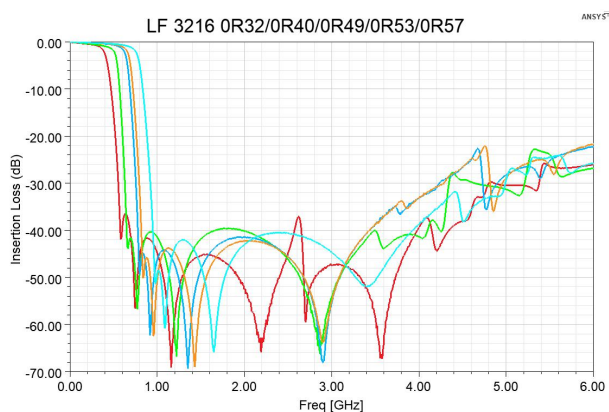
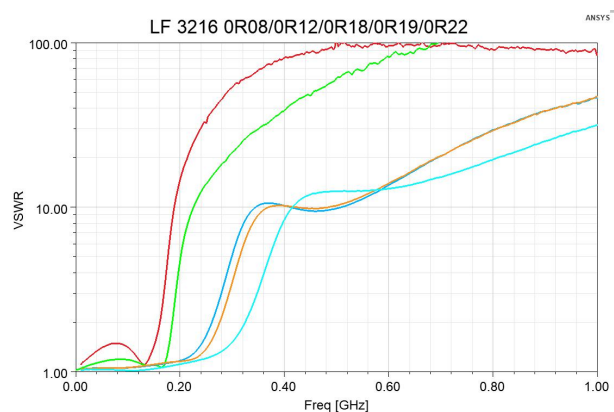
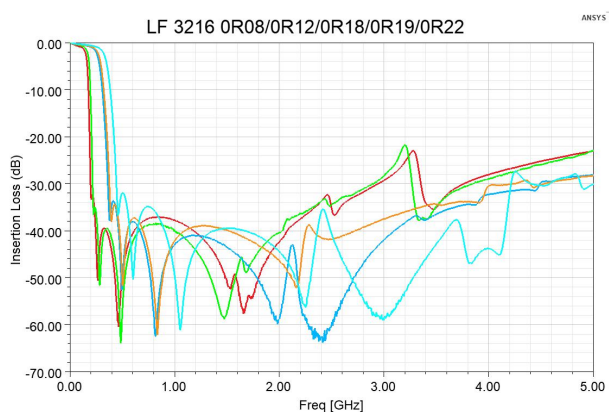
LF-32165R00B1T	DC~5000	1.5	5610	1.8	25@6700MHz	30@7050MHz	20@18000MHz	50
LF-32166R00B1T	DC~6000	1.5	6680	1.8	20@8500MHz	35@8700~14000MHz	20@20000MHz	50
LF-32166R40B1T	DC~6400	1.5	7200	1.5	20@8500MHz	25@12500MHz	/	50
LF-32166R70B1T	DC~6700	1.5	7600	1.5	20@9300MHz	25@9500~11000MHz	15@18000MHz	50
LF-32167R20B1T	DC~7200	1.3	7560	1.6	20@8850MHz	35@9500~12300MHz	20@12300~18000MHz	50
LF-32167R20F1T	DC~7200	1.3	7970	1.6	20@8980MHz	30@9270~10060MHz	30@15000MHz	50
LF-32169R17F1T	DC~9170	1.5	9800	1.5	20@11630MHz	30@12630~18770MHz	/	50
LF-321611R0F1T	DC~10800	1.3	11610	1.6	20@14000MHz	30@14500~20000MHz	/	50
LF-321612R8F1T	DC~12800	1.3	13900	1.7	20@16200MHz	30@16200~19500MHz	30@16500~20000MHz	50
LF-20120R49G1T	DC~490	1.5	570	1.6	20@800~960MHz	35@960~3000MHz	30@8000~15000MHz	50
LF-20120R53G1T	DC~530	1.5	601	1.6	30@980~2600MHz	40@2600~4000MHz	/	50
LF-20121R00G1T	DC~1000	1.5	1240	1.5	20@1550~1900MHz	35@960~3000MHz	30@8000~15000MHz	50
LF-20121R52G1T	DC~1525	1.5	1710	1.6	20@2125~2350MHz	30@2350~7000MHz	20@7000~12000MHz	50
LF-20121R80G1T	DC~1800	1.4	1240	1.7	20@2450~2900MHz	30@2900~8500MHz	20@10000MHz	50
LF-20122R25G1T	DC~2250	1.4	2360	1.6	20@2800~3600MHz	35@3600~8000MHz	30@8000~15000MHz	50
LF-20122R85G1T	DC~2850	1.4	3090	1.8	20@3800~4400MHz	35@4400~12000MHz	20@12000~14000MHz	50
LF-20123R40G1T	DC~3400	1.5	3750	1.8	20@4700~5000MHz	32@5000~8500MHz	25@8500~15000MHz	50
HF-32160R44B1T	600~1700	1.3	450	1.6	40@230MHz	20@350MHz	/	50
	500~2500	2.0		(500~1700)				
HF-32160R65B1T	850~2000	1.3	650	1.6	40@390MHz	20@480MHz	/	50
	710~2490	2.0		(760~1700)				
HF-32160R88B1T	1060~2500	1.3	880	1.5	30@500MHz	20@640MHz	/	50
	950~3200	2.0		(970~2400)				
HF-32161R32B1T	1700~3800	1.3	1390	1.6	40@880MHz	20@1060MHz	/	50
	1400~5000	2.0		(1700~3700)				
HF-32163R10D1T	3500~9500	1.3	3020	1.6	30@2400MHz	20@2350MHz	/	50
	3400~11000	2.0		(3100~9000)				
BF-20123R60A1T	3300~3800	1.45	/	1.45	32@ DC~2800MHz	20@4700MHz	30@5150~10800MHz	50
BF-32161R86B1T	1580~200	3.5	/	2.5	20@DC~1300MHz	20@2600~4800MHz	/	50
BF-32162R50F1T	2100~2900	2.0	/	1.8	28@DC~1600MHz	28@3700~5200MHz	/	50
BF-32163R11B1T	2720~3570	2.0	/	2.0	25@DC~1850MHz	23@4300~8160MHz	/	50

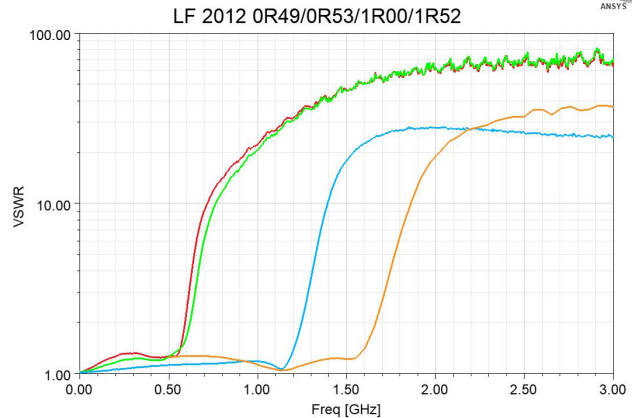
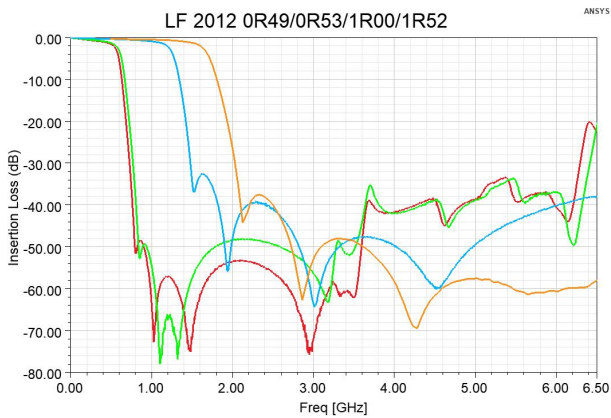
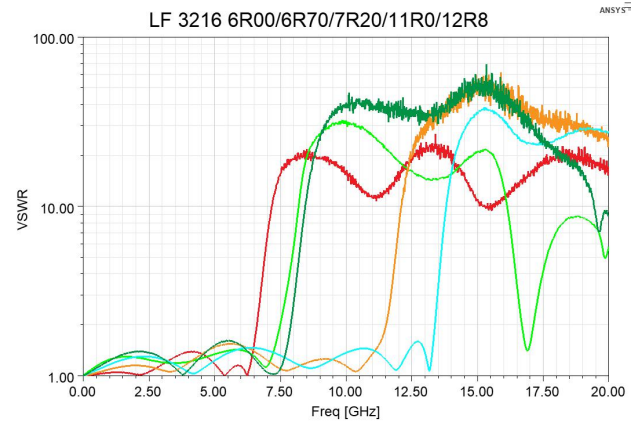
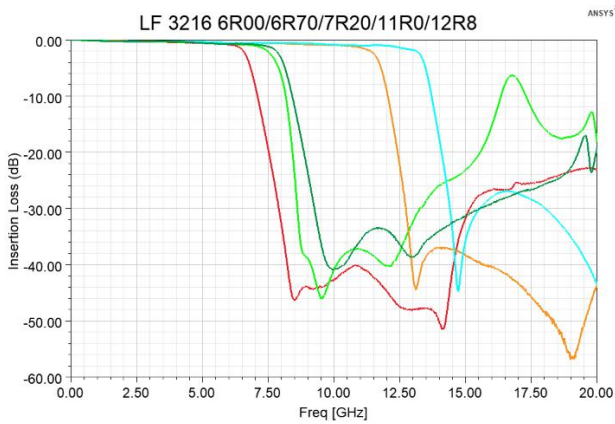
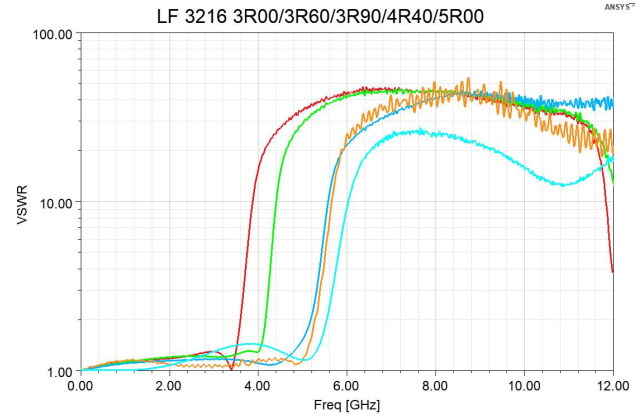
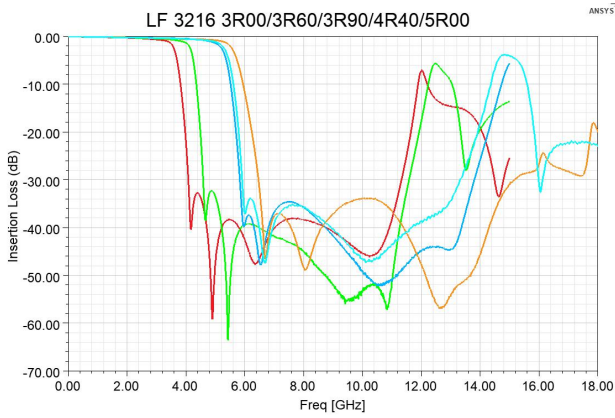
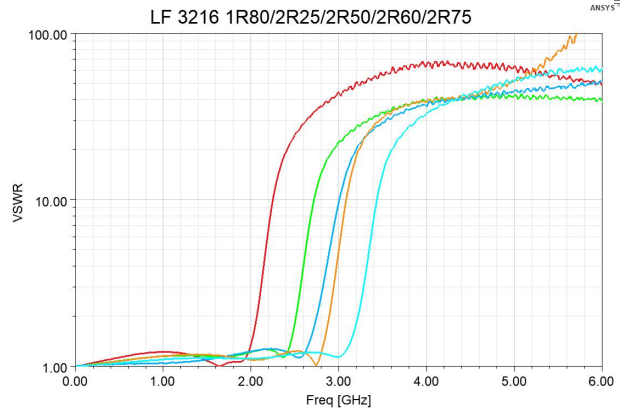
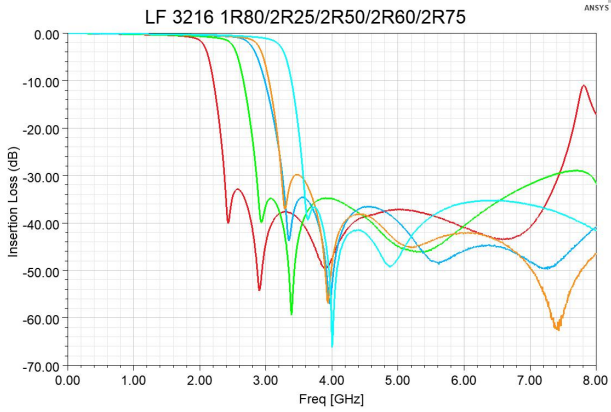
BF-32163R70B1T	3000~600	3.5	/	2.2	21@DC~2100MHz	20@5600~8000MHz	/	50
BF-32164R10B1T	3700~4500	2.0	/	1.8	25@DC~2200MHz	25@6000~9000MHz	/	50
BF-32165R10G1T	3100~7100	2.0	/	2.0	25@DC~2100MHz	20@9500~17000MHz	/	50

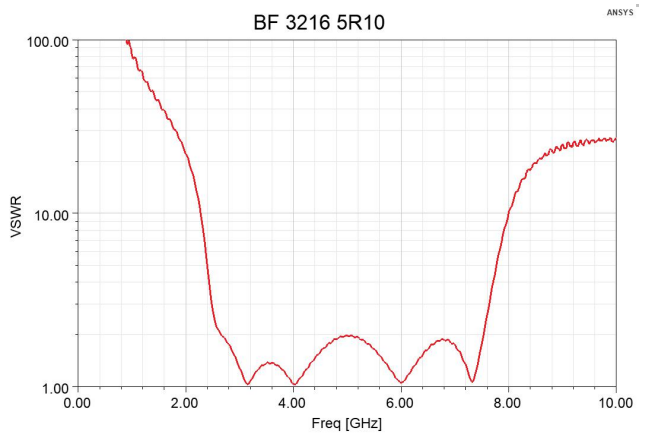
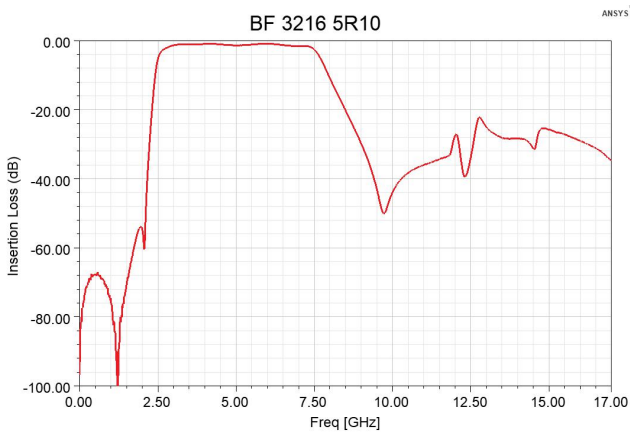
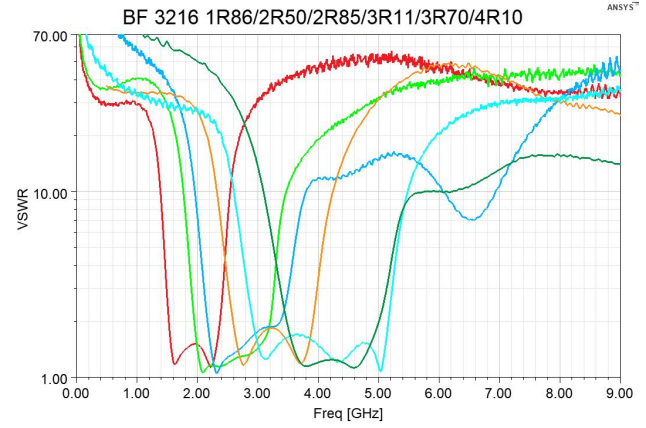
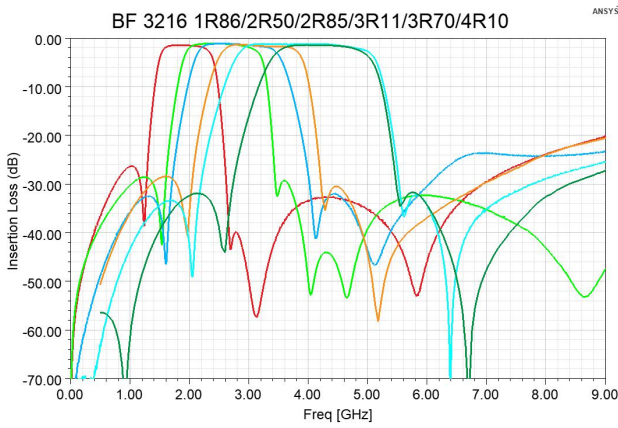
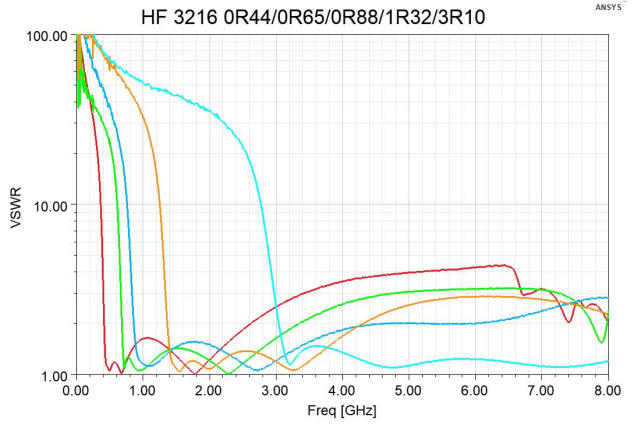
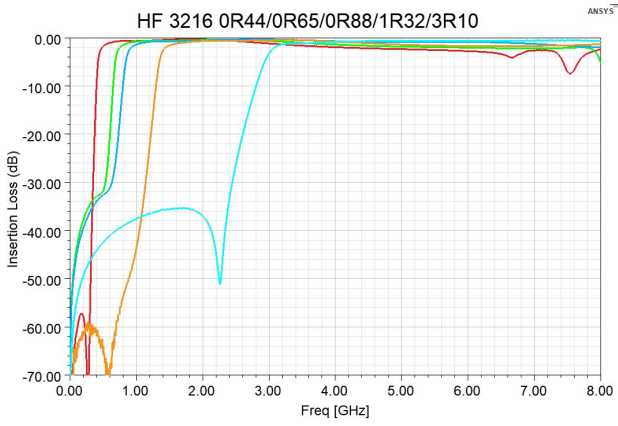
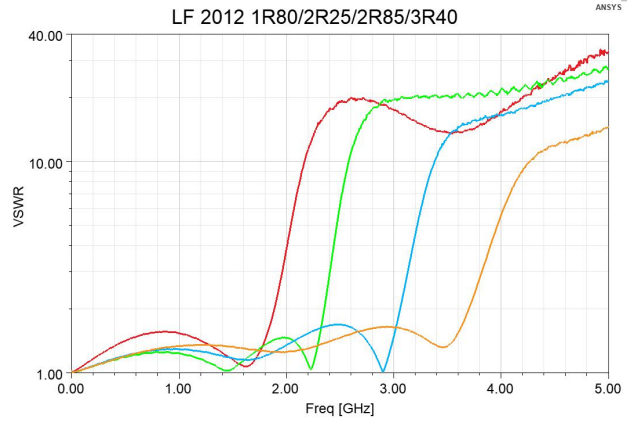
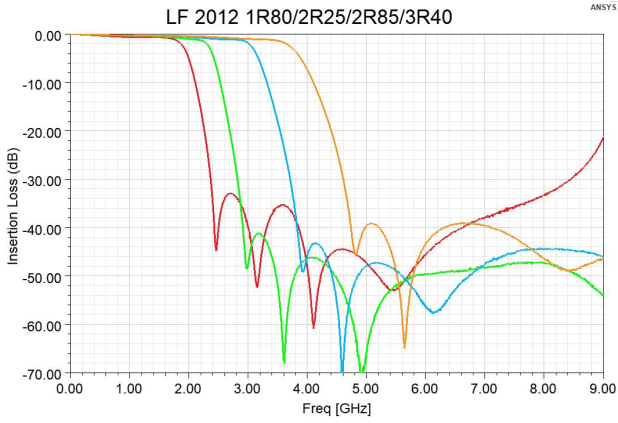
* Measured on Fenghua Characterization Test Board.

◆ 产品特性曲线图

Product Characteristic Curve







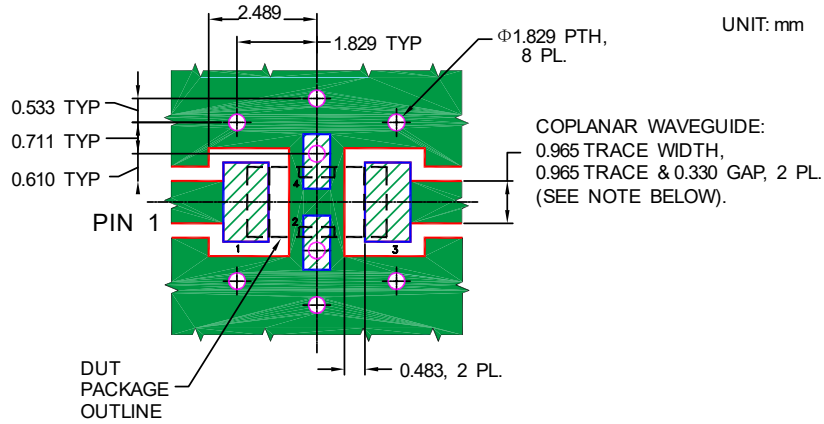
附录 Appendix

◆ 推荐的 PCB 布线:

Suggested PCB layout:



* B 形外电极方式产品:

B-shaped outer electrode method products:



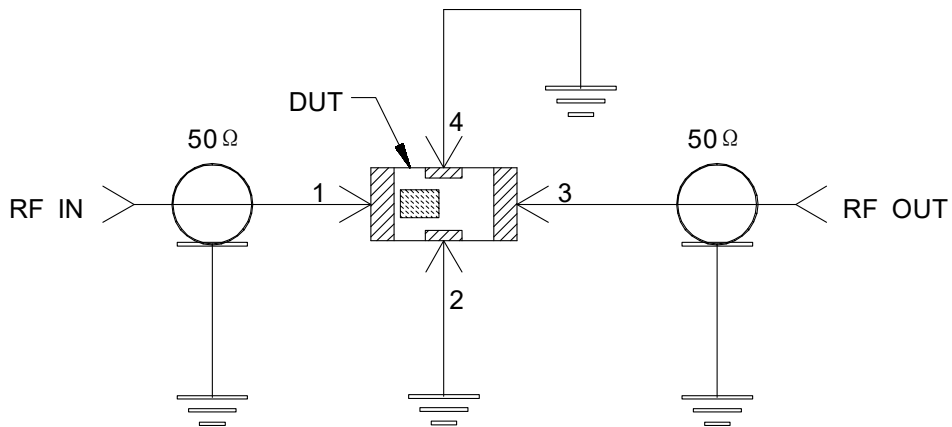
注：1. 如图所示为罗杰斯 R04350B 板材的共面波导参数，厚度为 $0.508 \pm 0.038\text{mm}$ 。覆铜厚度：每面 1/2 盎司。对于其他板材，馈线宽度和间隙可能需要修改。Coplanar waveguide parameters are shown for Rogers RO4350B with thickness $0.508 \pm 0.038\text{mm}$. Copper: 1/2 OZ. each side. For other materials trace width & gap may need to be modified.

2. PCB 底面为连续接地层。Bottom side of the pcb is continuous ground plane.

-  表示带 SMOBC 的 PCB 铜布局（裸铜上的阻焊层） Denotes pcb copper layout with smobc. (solder mask over bare copper)
-  表示不含阻焊层的铜焊盘图案。 Denotes copper land pattern free of solder mask.

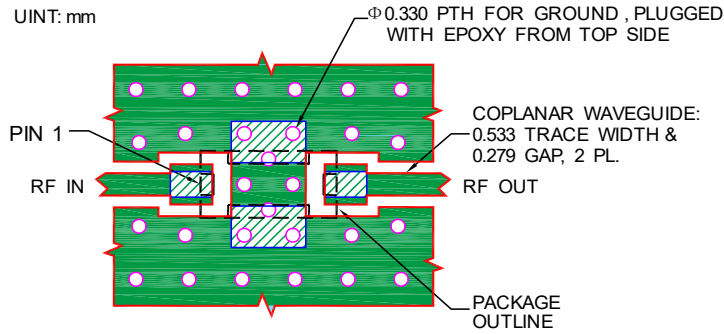
* 原理图:

Schematic diagram:





*** F 形外电极方式产品:**

F-shaped outer electrode method products:



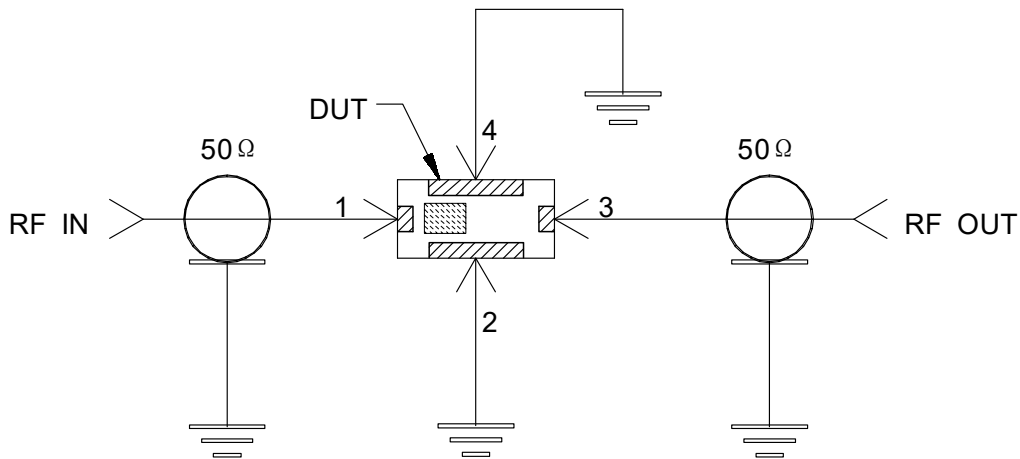
注: 1. 如图所示介质厚度为 0.254 ± 0.025 mm 的罗杰斯 R04350B 板材的馈线宽度和间隙参数。覆铜厚度: 每面 1/2 盎司。对于其他板材, 馈线宽度和间隙可能需要修改。Trace width & gap parameters are shown for Rogers RO4350B with dielectric thickness 0.254 ± 0.025 . Copper: 1/2 OZ. each side. For other materials trace width & gap may need to be modified.

2. PCB 底面为连续接地层。Bottom side of the pcb is continuous ground plane.

-  表示带 SMOBC 的 PCB 铜布局 (裸铜上的阻焊层) Denotes pcb copper layout with smobc. (solder mask over bare copper)
-  表示不含阻焊层的铜焊盘图案。Denotes copper land pattern free of solder mask.

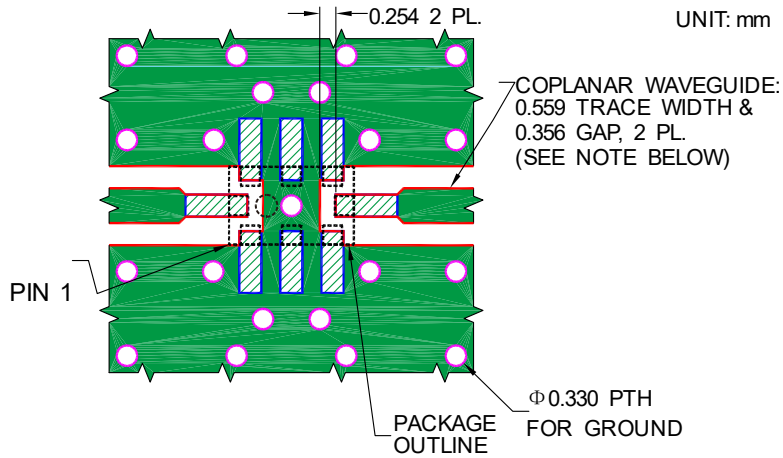
*** 原理图:**

Schematic diagram:



*** G 形外电极方式产品:**

G-shaped outer electrode method products:



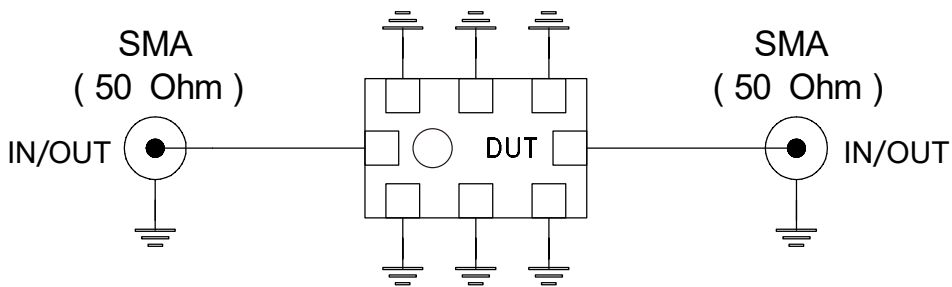
注: 1. 如图所示为罗杰斯 R04350B 板材的共面波导参数, 厚度为 $0.508 \pm 0.038\text{mm}$ 。覆铜厚度: 每面 1/2 盎司。对于其他板材, 馈线宽度和间隙可能需要修改。Coplanar waveguide parameters are shown for Rogers RO4350B with thickness $0.508 \pm 0.038\text{mm}$. Copper: 1/2 OZ. each side. For other materials trace width & gap may need to be modified.

2. PCB 底面为连续接地层。Bottom side of the pcb is continuous ground plane.

- 表示带 SMOBC 的 PCB 铜布局 (裸铜上的阻焊层) Denotes pcb copper layout with smobc. (solder mask over bare copper)
- 表示不含阻焊层的铜焊盘图案。Denotes copper land pattern free of solder mask.

*** 原理图:**

Schematic diagram:

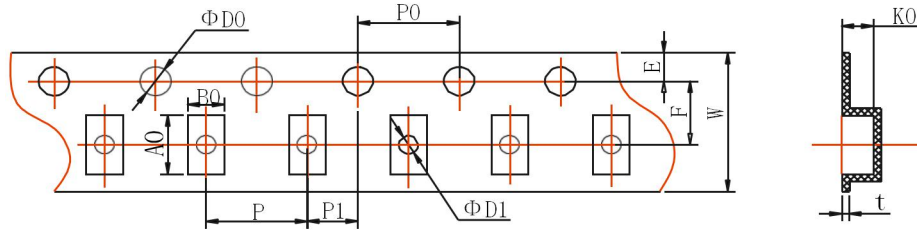


◆ 包装
Packaging

* 塑料带编带 Embossed Taping

适用于2012、3216:

For 2012、3216:

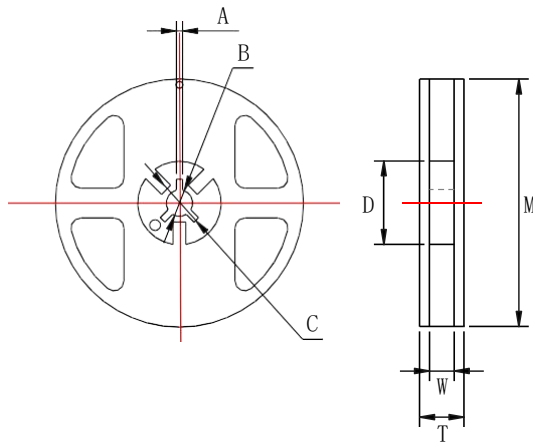


单位 unit: mm

型号 Type	A0	B0	W	F	E	t
2012	2.35±0.10	1.65±0.10	8.00±0.20	3.50±0.05	1.75±0.10	0.25±0.05
3216	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10	0.25±0.05

型号 Type	P	P0	P1	ΦD0	ΦD1	K0
2012	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	1.00±0.10
3216	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	1.20±0.10

* 卷盘 Reel



单位 unit: mm

型号 Type	M	W	T	A	B	C	D
2012、3216	178±2.0	13.0±0.5	15.5±1.5	2.0±0.5	13.0±0.5	21.0±0.5	57.0±2.0

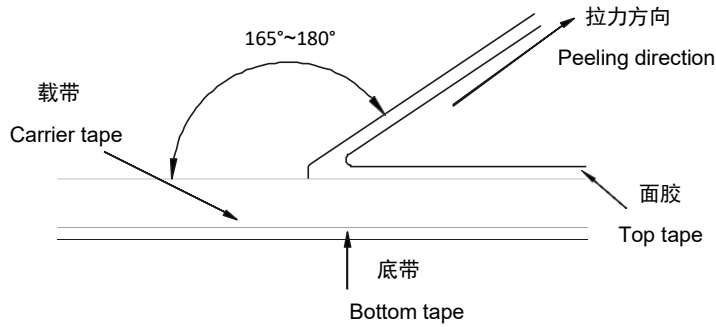
* 编带包装能力 Taping Ability

面带拉力 Top tape peel strength

面带拉力强度为 11~70g (0.1N~0.7N)，速度：300mm/min,经下列试验后不允许有破裂断带现象。

Peel strength is 11~70g (0.1N~0.7N),with speed of 300mm/min,and should not have flash and tear after peeling.

测试方法 Test method:



产品松动自如，无粘面胶带、底胶带现象。

Filter is free, no sticking to top tape and bottom tape.

产品易从载带中取出，且产品孔无机械损伤。

Filter is easy to take out from carrier tape and chip hole have no mechanical damage.

* 包装数量 Packaging Quantity

包装方法 Packaging style	编带 Tape & reel	塑料袋散装 Case
型号 Type	2012、3216	2012、3216
数量 Quantity(pcs)	≤3000	≤10000

◆ LTCC 滤波器使用说明

* 本产品在以下特殊环境下应用，性能可能会受到影响：

- 1、在各种类型的液体，包括水、油、化学品、有机溶剂的使用。
- 2、在户外直接暴露在阳光的地方，或在灰尘多的地方使用。
- 3、在产品暴露的地方，有海风或腐蚀性气体，包括氯气、硫化氢、氨气、二氧化硫、二氧化氮等。
- 4、在产品暴露于静电或强电磁波的地方使用。
- 5、在产生热量的部件、塑料线，或其他易燃物品附近使用。
- 6、在用树脂或其他涂层材料密封产品的情况下使用。
- 7、焊接后使用不洁焊料或使用水或水溶性清洗剂清洗产品。
- 8、片式滤波器的基材主要是氧化铝和玻璃。由于和安装基板的热膨胀系数不同，在反复施加提供热循环等热应力时，接合部的焊锡（焊缝部）有时会发生裂纹。如果环境温度反复发生很大的变动，并且载荷反复进行 ON/OFF，则需要注意龟裂的发生。因热应力而发生的龟裂，取决于所安装的焊盘的大小、焊锡量、安装基板的散热性等，因此在环境温度有很大的变化或载荷 ON/OFF 的条件下使用时，请充分注意以进行设计。

◆ LTCC Filter Instructions for Use

* **Application of the products in a special environment can deteriorate product performance:**

- 1、Use in various types of liquid, including water, oils, chemicals, and organic solvents.
- 2、Use outdoors where the products are exposed to direct sunlight, or in dusty places.
- 3、Use in places where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, Nh₃, SO₂, and No₂ etc.
- 4、Use in places where the products are exposed to static electricity or strong electromagnetic waves.
- 5、Use in proximity to heat-producing components, plastic cords, or other flammable items.
- 6、Use involving sealing or coating the products with resin or other coating materials.
- 7、Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering.
- 8、The substrate of chip filter are mainly alumina and glass. Cracks may occur at the connection of solder (solder fillet portion) due to the difference of the coefficient of thermal expansion from a mounting board when heat stress like heat cycle, etc. are repeatedly given to them. Care should be taken to the occurrence of the cracks when the change in ambient temperature or ON/OFF of load is repeated. The occurrence of the crack by heat stress may be influenced by the size of a pad, solder volume, heat radiation of mounting board etc., so please pay careful attention to designing when a big change in ambient temperature and conditions for use like ON/OFF of load can be assumed.

◆ 产品使用注意事项

- 1、避免采用超过正常额定功率的功率，超过额定功率的稳态负载条件下可能会对产品性能和可靠性产生负面影响。
- 2、用镊子拿起产品时要小心，有可能会将保护或电阻体夹碎。
- 3、手动安装产品时，烙铁头勿触碰产品。
- 4、建议贮存条件：温度 5℃~30℃，相对湿度 30%~70%。
建议在符合上述储存条件下六个月内使用。
- 5、用于车载设备、医疗设备、航空设备以及其它涉及人身安全、或可能引起重大损失的设备上时，请务必事先与我公司联系。这些产品在这类用途中出现故障或失灵可能导致人身事故或严重损坏。

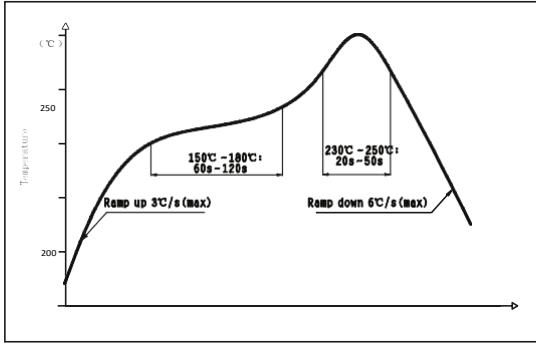
◆ Precautions on use of products

- 1、Avoid applying power exceeding normal rated power, exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 2、Be careful when pick up the products with tweezers. There may be a care that the overcoat and / or the body can be chipped.
- 3、Soldering tip shall not touch the product when install product manually.

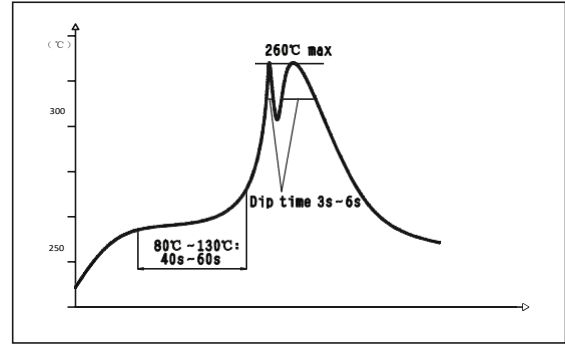
- 4、Storage conditions: T: 5°C ~ 30°C , RH: 30% ~ 70%. The products are suggested to be used within six months when received, and the storage condition mentioned above should be followed.
- 5、Contact our sales representatives before you use our products for applications including automotive, medical equipment and aerospace equipment. Malfunction or failure of the products in such applications may cause loss of human life or serious damage.

◆ **焊接 Soldering**

* 推荐的回流焊曲线 Recommended reflow profile



* 推荐的波峰焊曲线 Recommended wave solder profile



* 推荐的焊膏类型 Recommended solder alloy: 96.5Sn/3.0Ag/0.5Cu.