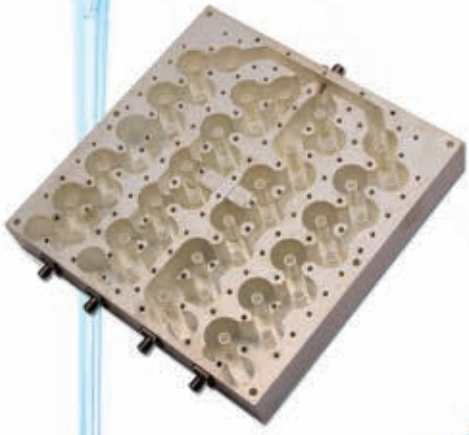
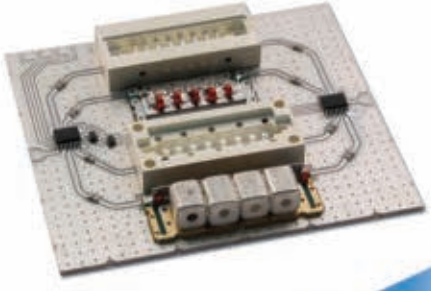
Lark Engineering Co.™

THE FILTER SOURCE

Product Specification Guide

- Filters
- Multiplexers
- Switch Filter Banks
- Digital Control Filters
- Multi-Function Assemblies





Lark Engineering Co.™
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Perry Johnson Registrars

ISO 9001:2008
ISO 14001:2004

LARK ENGINEERING CO.

A Division of Baier and Baier, Inc.

Lark Engineering is a leading supplier of RF and Microwave filters with ISO 9001 and ISO 14001 certifications. The company was established in 1986 with the goal to design and manufacture quality products to meet or exceed the customer's individual needs and requirements. Currently Lark Engineering's products are being utilized in major digital and analog wireless devices ranging in use from communications systems to test equipment and military systems. Lark Engineering also produces filters for GPS, Cellular, ISM, PCN, PCS and many other wireless applications. For each customer, Lark Engineering is committed to providing the very best quality of filters and is dedicated to meeting our customer's Microwave and Radio Frequency filter needs. Our commitment to quality and customer service has been a cornerstone of the company since its inception.

Today, with an ever-changing industry, Lark Engineering continues to be the leader in RF and Microwave filters by focusing on design, quality and customer service. We offer an extensive product mix with filters and Multiplexers that satisfy requirements from 1 MHz to 40 GHz. Our web based filter design tool allows you to design Band Reject, Surface Mount Combline, High Power Ceramics and many other filters. Many of our filters can be sampled in as little as 10 days.

Lark Engineering Standard Filter Capabilities include the following:

BANDPASS	CENTER FREQUENCY RANGE	3db BW (% OF Fc)	CONFIGURATION
MC	1 – 6000 MHz	2 – 75	Miniature PCB Mount / SMA
SMC	5000 – 15000 MHz	3 – 30	SMT Combline
MS	1 – 6500 MHz	2 – 75	SMT Leadless
SD	200 – 6000 MHz	1 – 10	SMT Leadless Ceramic
SDP	350 – 2250 MHz	3 – 10	High Power Ceramic
3B	1000 – 32000 MHz	1 – 50	Combline Coaxial Connecters
4B	1000 – 32000 MHz	1 – 50	Combline Coaxial Connecters
2C	50 – 500 MHz	1 – 2.5	Cavity
3C	400 – 2500 MHz	0.2 – 5	Cavity
4C	800 – 2500 MHz	0.2 – 5	Cavity
5C	800 – 4000 MHz	0.2 – 5	Cavity
6C	2000 – 9000 MHz	0.2 – 5	Cavity

BAND REJECT	CENTER FREQUENCY RANGE	3db BW (% OF Fc)	CONFIGURATION
SDN	250 – 3500 MHz	1 – 10	SMT Leadless Ceramic

HIGHPASS	CUT OFF FREQUENCY RANGE	CONFIGURATION
HMS	1 – 2500 MHz	SMT Leadless
HMC	10 – 3000 MHz	Miniature PCB / SMA

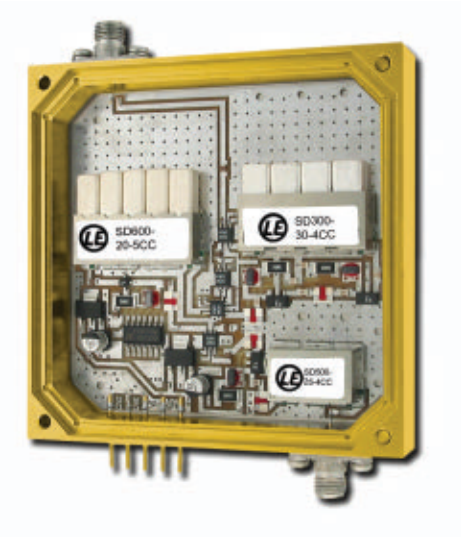
LOWPASS	CUT OFF FREQUENCY RANGE	CONFIGURATION
LMS	0.5 – 5000 MHz	SMT Leadless
LMC	0.5 – 6000 MHz	Miniature PCB / SMA

Please call Lark Engineering if your requirements fall outside of our standard range.

Multi-Function Assemblies

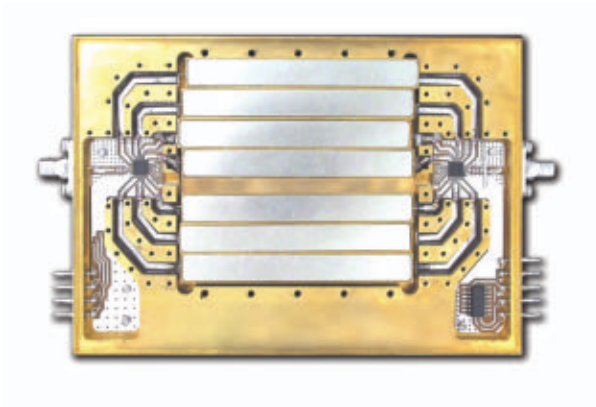
Lark's new Switch Filter Systems are designed with a wide array of Switch Filter Banks and low noise amplifiers. They are available in Ceramic and Lumped Element configurations, low profile connectorized packages and a wide frequency range. Switch Filters are ideally suited for receiver applications and assisting in overall system performance.

Switch Filter Amplifier- SFA series



SPECIFICATION	STANDARD
Frequency	100 to 8000 MHz
3dB Bandwidth	1 to 40%
Nominal Impedance	50 Ω
Gain	10 to 40 dB
Return Loss	18 dB typical 14 dB min.
Noise Figure	1.5-5.0 dB typical
Number of channels	2, 3, 4, 5, and 6
Switching Speed	300 µS max.
Bias	+ 5, +10, +15 V DC
Shock	5 G's
Gross Leak	Mil STD 202 Method 112 Condition D
Fine Leak 10^ -7	Mil STD 202 Method 112 Test Condition C
Vibration	5 G's
Humidity	95%
Altitude	+/- 50,000 ft
Package	SMA, feed thru pins, or SMT

Switch Filter Bank- SFB series



SPECIFICATION	STANDARD
Frequency	DC to 18 GHz
3dB Bandwidth	1 to 40%
Nominal Impedance	50 Ω
Max Insertion Loss	2-10 dB
Return Loss	18 dB typical 14 dB min.
Number of channels	2 to 10
Input Power	+27 dBm
Switching Speed	50 ns to 1 µS
Bias	+5, -5, -12, -15, +10, +15 V DC
Control	TTL
Shock	5 G's
Gross Leak	Mil STD 202 Method 112 Condition D
Fine Leak 10^ -7	Mil STD 202 Method 112 Test Condition C
Vibration	5 G's
Humidity	95%
Altitude	+/- 50,000 ft
Package	SMA, feed thru pins, or SMT

New Products

Switch Filter Systems

PRODUCT SPECIFICATIONS:

Frequency Range	DC to 18 GHz
Number of channels	2 to 10
Insertion Loss	2 to 10 typical
Isolation	40 to 75 dB typical
VSWR	1.5:1 to 2.0:1 typical
Switching Speed	50 ns typical to 1 µs
Input Power	+27 dBm CW
Control	TTL, BCD
Power Supply	+5, -5, -12, -15 V DC
Connectors	Connectorized, Pin or Leadless SMT

* Low Profile Models Available

LOW PROFILE, LEADLESS CAVITY FILTERS

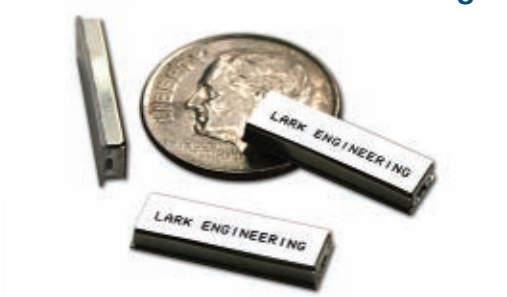
0.22" Height

PRODUCT SPECIFICATIONS:

- Frequency Range: Up to 20 GHz
- Bandwidths: Up to 30%
- Low Insertion Loss
- Meets Mil-Std-202
- Leadless SMT Package
- Available on Tape & Reel
- Custom Designed to your Specifications

ULTRA-THIN FILTERS

Less than 0.09" High



When size is critical, Lark is offering a full line of Ultra-Thin filters for the Commercial and Military markets. Lark's new Ultra-Thin package offers superior performance in less than **0.09"** high package. The Ultra-Thin filter series offers low insertion loss and ultimate rejection levels of 60 dB while maintaining better than 1.5:1 VSWR. These units are lightweight and ruggedized for today's military applications.

PRODUCT SPECIFICATIONS:

- Available in Bandpass, Highpass, Lowpass & Band Reject
- Frequency Range: 20 MHz to 5.0 GHz
- Passbands: Up to 60%
- VSWR: 1.5:1 typical
- Ultimate Rejection: 60 dB
- Meets Mil-Std-202 conditions
- Temperature Range: -55° C to +85° C

Digitally Tunable Filters

MINIATURE VOLTAGE CONTROLLED FILTERS

PRODUCT SPECIFICATIONS:

- Frequency Coverage: 10 MHz to 1 GHz
- Percent Bandwidth: 5 to 20%
- 3 dB/30 dB Shape Factor: 4.5:1
- Input/Output Impedance: 50 Ohms
- Inband RF Power Handling: Up to 1 Watt
- Inband Third Order Intercept: 10 dBm
- Tuning Control: Voltage Controlled
- Tuning Speed: 450 µS
- DC Power: 0 to 15v @ 1mA
- Operating Temperature Range: -40 to +85 °C
- Size (L x W x H inches): 1.00 x .75 x 0.35 max.

COMPACT DIGITAL CONTROL FILTERS

PRODUCT SPECIFICATIONS:

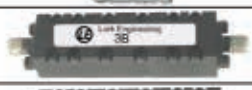
- Frequency Coverage: 10 MHz to 1 GHz
- Percent Bandwidth: 5 to 20%
- 3 dB/30 dB Shape Factor: 4.5:1
- Input/Output Impedance: 50 Ohms
- Inband RF Power Handling: Up to 1 Watt
- Inband Third Order Intercept: 10 dBm
- Tuning Control: 8 bit parallel TTL
- Tuning Speed: 450 µS
- DC Power: 15 VDC @ 50 mA
- Operating Temperature Range: -40 to +85 °C
- Size (L x W x H inches): 1.25 x 1.5 x .35 max.

STANDARD DIGITAL CONTROL FILTERS

PRODUCT SPECIFICATIONS:

- Frequency Coverage: 1.5 MHz to 1 GHz
- Percent Bandwidth: 4 to 20%
- 3 dB/30 dB Shape Factor: 6.8:1
- Input/Output Impedance: 50 Ohms
- Inband RF Power Handling: Up to 1 Watt
- Inband Third Order Intercept: 30 dBm
- Tuning Control: 8 bit parallel
- Tuning Speed: 10 µS to 50 µS
- DC Power: (+5) VDC @ 10 to 250 mA
  (+) 50 VDC @ 1mA
- Operating Temperature Range: -40 to +85 °C
- Size (L x W x H inches): 2.5 x 2 x .75 max.

ELECTRICAL SPECIFICATIONS
1 MHz to 32 GHz

Series	Configuration	Center Frequency (Fc)	Number of sections	Nominal Impedance	Max. VSWR	Max. Input Power (avg.)	Max. Input Power (peak)
BANDPASS FILTERS							
MS 	Surface Mount	1 to 5000 MHz	3 to 7	50 Ω	1.5/1	2 W	20 W
		1 to 6500 MHz	2 to 10	50 to 300 Ω	1.3/1	10 W	50 W
MC 	Miniature	1 to 5000 MHz	3 to 7	50Ω	1.5/1	2 W	20 W
		0.1 to 6000MHz	2 to 10	50 to 300 Ω	1.3/1	20 W	100 W
SD 	Ceramic	250 to 5000 MHz	2 to 7	50Ω	2/1	1 W	2 W
		200 to 6000 MHz	2 to 10	50 to 75 Ω	1.5/1	10 W	50 W
SDP 	High Power	400 to 2000 MHz	2 to 4	50Ω	1.5/1	50 W	250 W
	Surface Mount	350 to 2250 MHz	2 to 5	50 to 75 Ω	1.3/1	50 W	250 W
SDN 	Band Reject	300 to 2500 MHz	3 to 6	50 Ω	2/1	1 W	2 W
	Surface Mount	250 to 3500 MHz	2 to 8	50 to 75 Ω	1.5/1	2 W	10 W
3B 	Combline	1000 to 26000 MHz	3 to 10	50 Ω	1.5/1	Up to 20 W	Up to 200 W
		1000 to 32000 MHz	2 to 14	50 Ω	1.3/1	Call Lark	Call Lark
4B 	Miniature	1000 to 26000 MHz	3 to 8	50 Ω	1.5/1	Up to 10 W	Up to 100 W
	Combline	1000 to 32000 MHz	2 to 14	50 Ω	1.3/1	Call Lark	Call Lark
SMC 	Surface Mount	5000 to 15000 MHz	2 to 6	50 Ω	1.5/1	Call Lark	Call Lark
	Combline						
2C 	Hi-Q	50 to 400 MHz	3 to 6	50 Ω	1.5/1	Up to 8 W	Up to 37.5 W
	Cavity	50 to 500 MHz	2 to 7	50 to 100 Ω	1.3/1	Call Lark	Call Lark
3C 	Hi-Q	400 to 2000 MHz	3 to 6	50 Ω	1.5/1	Up to 30 W	Up to 30 W
	Cavity	400 to 2500 MHz	2 to 7	50 Ω	1.3/1	Call Lark	Call Lark
4C 	Hi-Q	800 to 2500 MHz	3 to 6	50 Ω	1.5/1	Up to 50 W	Up to 200 W
	Cavity	750 to 2500 MHz	2 to 7	50 Ω	1.3/1	Call Lark	Call Lark
5C 	Hi-Q	1000 to 3000 MHz	3 to 6	50 Ω	1.5/1	Up to 7.5 W	Up to 30 W
	Cavity	800 to 4000 MHz	2 to 7	50 Ω	1.3/1	Call Lark	Call Lark
6C 	Hi-Q	2000 to 7500 MHz	3 to 6	50 Ω	1.5/1	Up to 7.5 W	Up to 30 W
	Cavity	2000 to 9000 MHz	2 to 7	50 Ω	1.3/1	Call Lark	Call Lark
LOWPASS FILTERS		CUT OFF FREQUENCY					
LMS 	Surface Mount	1 to 3500 MHz	3 to 7	50 Ω	1.5/1	2 W	20 W
		0.5 to 5000 MHz	2 to 10	50 to 300 Ω	1.3/1	10 W	50 W
LMC 	Miniature	1 to 3500 MHz	3 to 6	50 Ω	1.5/1	2 W	20 W
		0.5 to 6000 MHz	2 to 10	50 to 300 Ω	1.3/1	20 W	100 W
HIGHPASS FILTERS		CUT OFF FREQUENCY					
HMS 	Surface Mount	10 to 1500 MHz	3 to 6	50 Ω	1.5/1	2 W	20 W
		1 to 2500 MHz	2 to 10	50 to 300 Ω	1.3/1	10 W	50 W
HMC 	Miniature	10 to 2000 MHz	3 to 6	50 Ω	1.5/1	2 W	20 W
		1 to 3000 MHz	2 to 10	50 to 100 Ω	1.3/1	20 W	100W

ENVIRONMENTAL SPECIFICATIONS
ISO 9001 AND ISO 14001 Certified

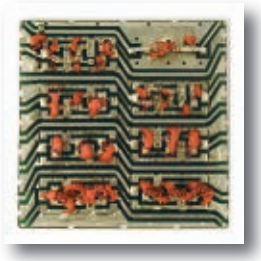
Shock	Vibration	Humidity (% Relative)	Temp. Range (Operating)	Temp. Range (Non- Operating)			Series
All packages can be designed to meet full Military environmental requirements.						BANDPASS FILTERS	
20 G's	10 G's	95%	-40°C to + 85°C	-65°C to + 125°C	Standard		MS
75 G's	30 G's	95%	-55°C to + 125°C	-65°C to + 150°C	Special		
20 G's	10 G's	95%	-40°C to + 85°C	-65°C to + 125°C	Standard		MC
75 G's	30 G's	100%	-55°C to + 125°C	-65°C to + 150°C	Special		
20 G's	10 G's	95%	-40°C to + 85°C	-65°C to + 125°C	Standard		SD
75 G's	30 G's	100%	-55°C to + 125°C	-65°C to + 150°C	Special		
15 G's	5 G's	90%	-30°C to + 85°C	-54°C to + 100°C	Standard		SDP
75 G's	30 G's	100%	-54°C to + 100°C	-62°C to + 150°C	Special		
15 G's	5 G's	90%	-30°C to + 85°C	-54°C to + 100°C	Standard		SDN
75 G's	30 G's	100%	-54°C to + 100°C	-62°C to + 150°C	Special		
25 G's	10 G's	95%	-40°C to + 85°C	-65°C to + 125°C	Standard		3B
50 G's	20 G's	100%	-55°C to + 125°C	-65°C to + 150°C	Special		
25 G's	10 G's	95%	-40°C to + 85°C	-65°C to + 125°C	Standard		4B
50 G's	20 G's	100%	-55°C to + 125°C	-65°C to + 150°C	Special		
Call Lark	Call Lark	95%	-40°C to + 85°C	-54°C to + 100°C	Standard		SMC
20 G's	10 G's	95%	-25°C to + 85°C	-54°C to + 125°C	Standard		2C
20 G's	15 G's	100%	-54°C to + 85°C	-54°C to + 125°C	Special		
20 G's	10 G's	95%	-25°C to + 85°C	-54°C to + 125°C	Standard		3C
20 G's	15 G's	100%	-54°C to + 85°C	-62°C to + 125°C	Special		
20 G's	10 G's	95%	-25°C to + 85°C	-54°C to + 125°C	Standard		4C
25 G's	20 G's	100%	-54°C to + 85°C	-54°C to + 125°C	Special		
20 G's	10 G's	95%	-25°C to + 85°C	-54°C to + 125°C	Standard		5C
25 G's	20 G's	100%	-54°C to + 85°C	-54°C to + 125°C	Special		
20 G's	10 G's	95%	-25°C to + 85°C	-54°C to + 125°C	Standard		6C
25 G's	20 G's	100%	-25°C to + 85°C	-54°C to + 125°C	Special		
All packages can be designed to meet full Military environmental requirements.						LOWPASS FILTERS	
20 G's	10 G's	95%	-55°C to + 85°C	-65°C to + 125°C	Standard		LMS
50 G's	15 G's	100%	-55°C to + 100°C	-65°C to + 125°C	Special		
20 G's	10 G's	95%	-55°C to + 85°C	-65°C to + 125°C	Standard		LMC
50 G's	15 G's	100%	-55°C to + 100°C	-65°C to + 125°C	Special		
All packages can be designed to meet full Military environmental requirements.						HIGHPASS FILTERS	
20 G's	10 G's	95%	-55°C to + 85°C	-65°C to + 125°C	Standard		HMS
50 G's	15 G's	100%	-55°C to + 100°C	-65°C to + 125°C	Special		
20 G's	10 G's	95%	-55°C to + 85°C	-65°C to + 125°C	Standard		HMC
50 G's	15 G's	100%	-55°C to + 100°C	-65°C to + 125°C	Special		

LARK ENGINEERING CAPABILITES

Satcom Diplexer

In response to the current market demand for a lighter filter with a reduced form factor while maintaining competitive electrical performance, Lark offers its compact satcom diplexers. Our new design saves both space and weight for all systems working in the Satcom bands.

- Standard Diplexer Dimensions: 21.00” L x 6.50” W x 5.00” H
- Compact Diplexer Dimensions: 6.25” L x 3.00” W x 2.00” H



Ceramic Diplexers

Lark Engineering’s family of Ceramic Diplexers is based on our stand-alone ceramic filter series. The ceramic diplexer series uses a PCB / PWB board carrier with outputs in the corners and an axial port along the opposite side to provide the best channel-to-channel isolation. Through the addition of input matching circuitry, the ceramic diplexer is able to provide the best common junction match. Our design algorithms are capable of matching any two non-contiguous passbands using various filter configurations.

Triplexers and Multiplexers

Along with the Diplexer series of filters, Lark also offers Triplexers and Multiplexers. By creating a basic network of three or more bandpass series filters, a Triplexer or Multiplexer is able to separate the passband frequencies and apply the signal to isolated terminals. The passband of the individual network may be contiguous or separated by overlapping stopbands.

Ultra Compact Ceramic Filters

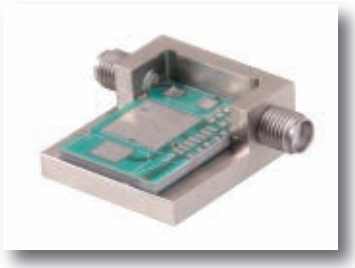
When board space is a premium and getting the best performance in a very small footprint is a must, Lark can offer ultra compact ceramic filters with resonator sizes as small as 1.5mm. This filter provides the performance you need from a standard ceramic filter but in a size equal to or smaller than 8x8mm depending on the number of resonators.

Elliptic Function Filters

Elliptic designs are available for very sharp rejection responses. This type of response can be used on Lump Element, Ceramic and Cavity filter designs.

Cross Coupled Cavities

To improve rejection in your filter without increasing the size, Lark offers a cross coupled cavity filter design. Using a semi-elliptical arrangement, resonators are cross-coupled to approach zeros in transmission. The zeros in transmission can be placed in the upper or lower side of the rejection skirt depending on your needs.



True Tune™ Test Fixtures

With designs becoming more and more complex it is essential that the performance of the filters be similar on a test fixture as on your board. Lark Engineering will take your PCB / PWB and create a test fixture to fine tune the filters. This will significantly reduce the need for final tuning in production by matching the impedance and capacitance associated with your board. Lark offers this service to its customers to facilitate their time to market and success.

Legacy Filters

In addition to our surface mount and ceramic bandpass filters, Lark Engineering continues to offer the 2B, TO-8 and Tubular filter series. The 2B series is an interdigital configuration ranging in center frequency from 1,000 to 12,000MHz. The TO-8 series is offered in Lowpass, Highpass and Bandpass, and range in center frequency from 10 to 5000 MHz. The Tubular series offers Bandpass, Lowpass and Highpass filters ranging in center frequency of 60 to 8000 MHz.

LARK ENGINEERING FILTER DESIGN TOOL

Visit our website FILTER DESIGN TOOL at www.larkengineering.com.

CLICK ON THE FILTER DESIGN TOOL ICON.

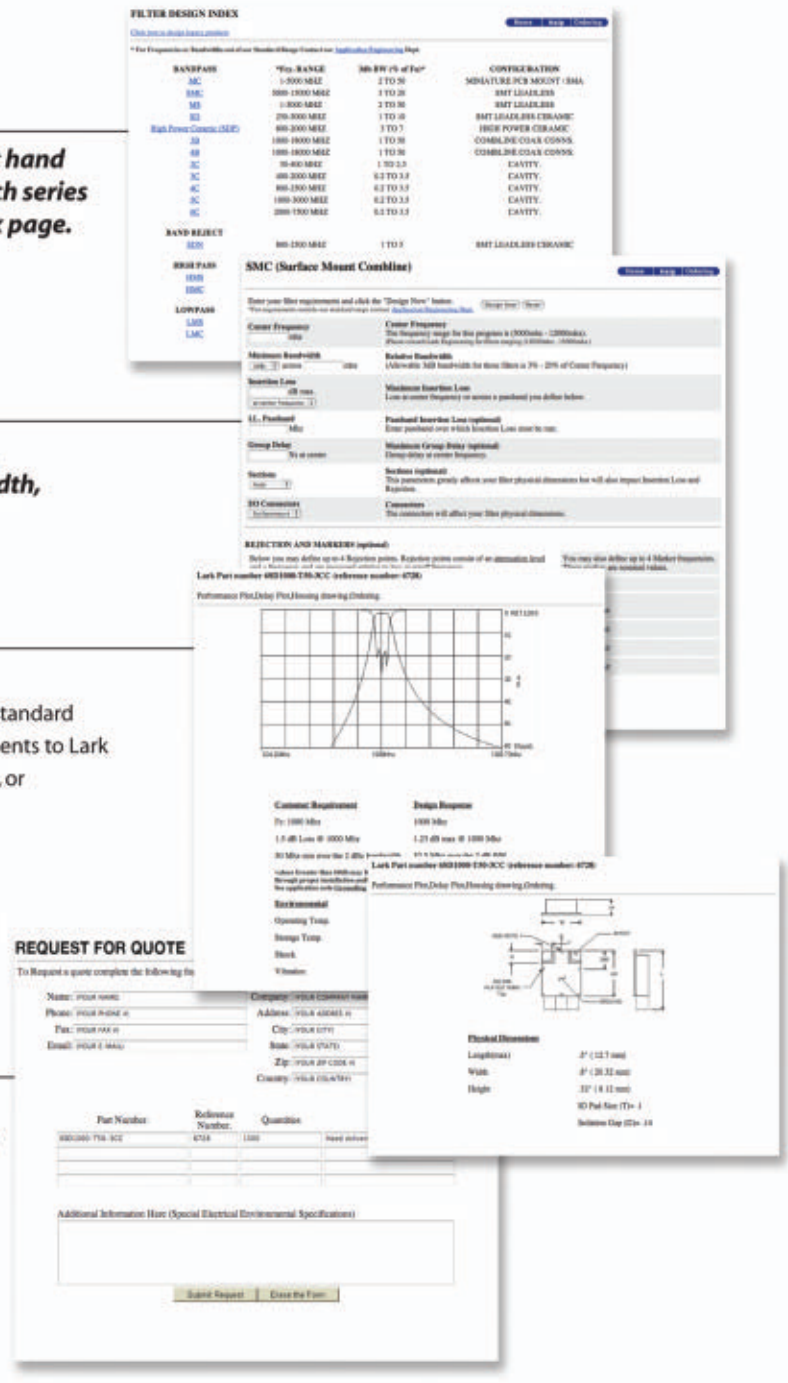
Just follow the simple steps to determine the optimal filter Lark Engineering can offer for your requirements. At any time you can click on the HELP button and use the FILTER DESIGN DEMO for directions and examples.

1 ***Select a FILTER SERIES in the left hand column. If you are not sure which series to use, check out our Filter Index page.***

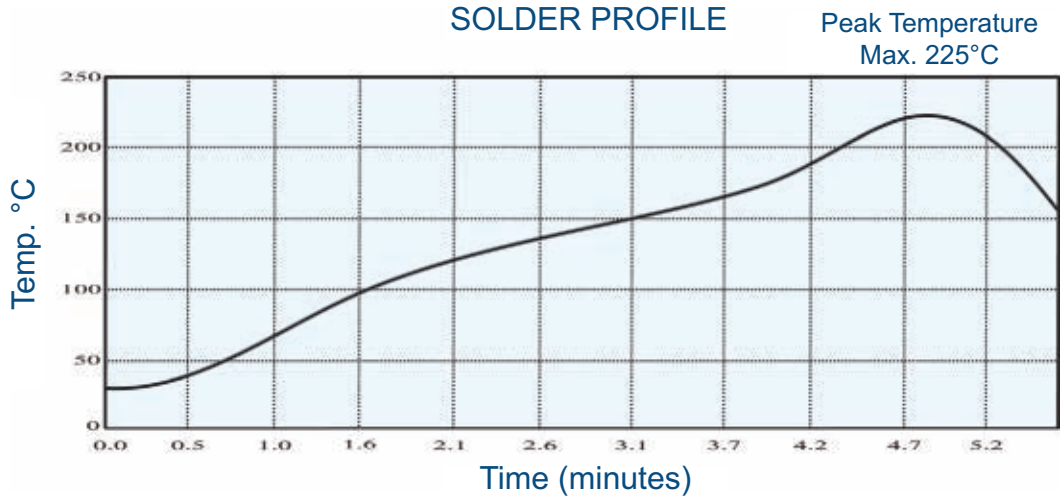
2 ***Enter your filter requirements... Your desired frequency, bandwidth, insertion loss, etc.***

3 ***Click the "Design Now" button.***
If your filter design is outside of Lark's standard range, forward your captured requirements to Lark via e-mail: Sales@larkengineering.com, or fax to: 949-240-7910.

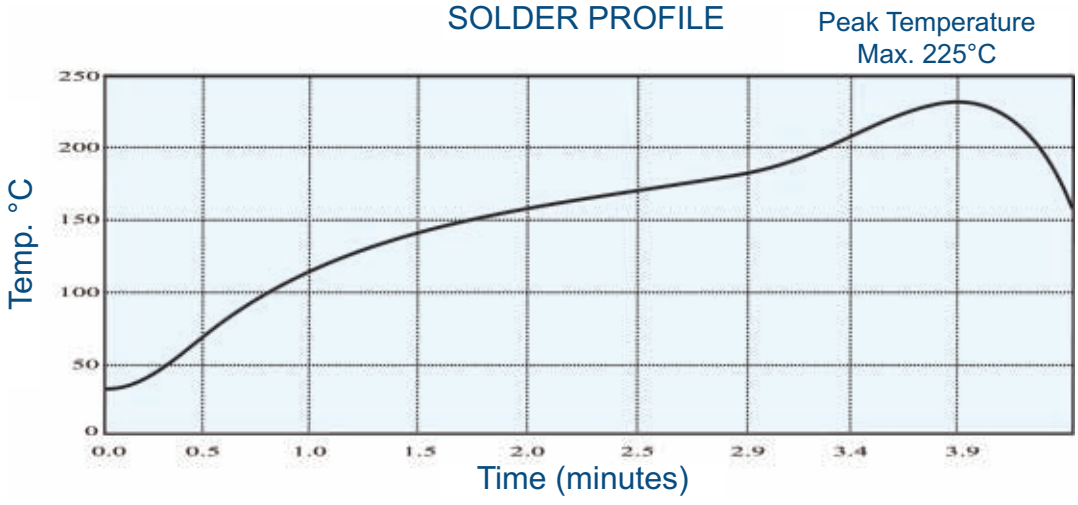
For your convenience a Request for Quote form is available on our website.



Recommended Solder Conditions for
Non RoHS compliant (Leaded) Surface Mount Ceramic Filters: SD, MXD & SMC Series



Recommended Solder Conditions for
Non RoHS compliant (Leaded) Surface Mount Filters: MS Series

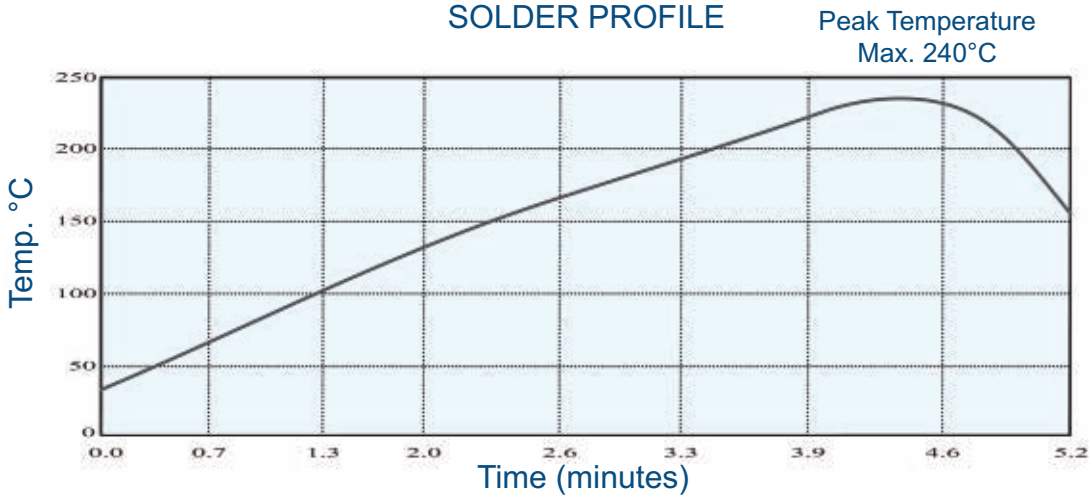


If acqueous cleaning is used for flux removal, bake parts at least 1 minute at 80°C maximum after water rinse.

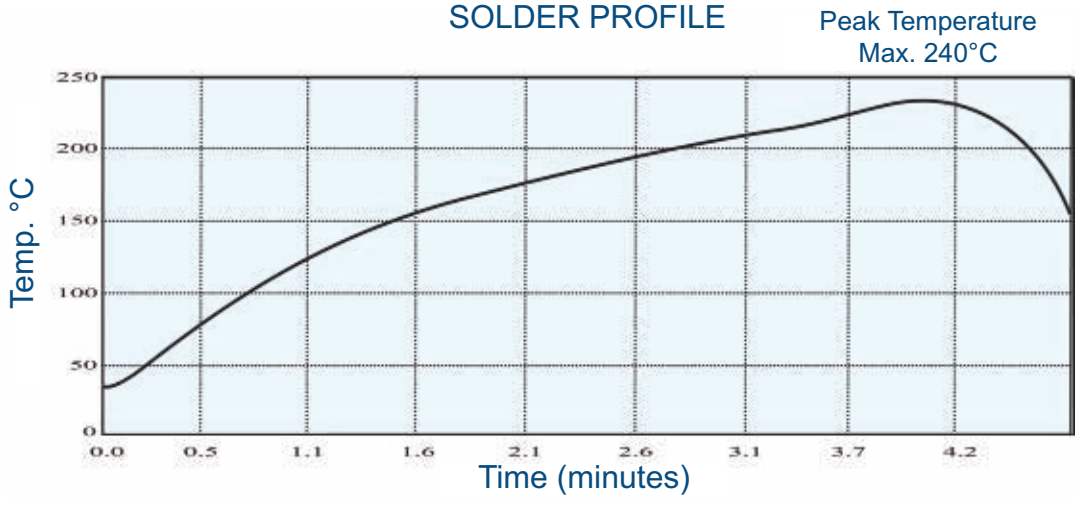
- Reflow must be done with alloys SN62 or SN63
- Registration of solder paste should cover a minimum of 90% of in/out pads, and the thickness should be .006" minimum to .010" maximum.
- Pre-tinned with an SN90/10 alloy.
- No solderability problems should occur if prior recommendations are followed.

NOTE: Must apply solder paste in conformance with layout printed circuit design (registration) as shown in the Lark catalog. The complete Lark Engineering catalog can be downloaded by visiting our website at www.larkengineering.com

Recommended Solder Conditions for
RoHS compliant (Lead Free) Surface Mount Ceramic Filters: SD, MXD & SMC Series



Recommended Solder Conditions for
RoHS compliant (Lead Free) Surface Mount Filters: MS Series



If acqueous cleaning is used for flux removal, bake parts at least 1 minute at 80°C maximum after water rinse.

- Lark recomends using SAC305 (Tin / Silver / Copper) or Sn96/Ag4 (Tin / Silver) solder paste.
- Alternative alloys may be used provided the liquidous temperature does not exceed 221°C
- Registration of solder paste should cover a minimum of 90% of in/out pads and the thickness should be .006" minimum to .010" maximum.
- No solderability problems should occur if prior recommendations are followed.

NOTE: Must apply solder paste in conformance with layout printed circuit design (registration) as shown in the Lark catalog. The complete Lark Engineering catalog can be downloaded by visiting our website at www.larkengineering.com

Rest at Ease with our Customer Friendly Website and Ordering Process.

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