

Introduction

Syfer Technology Ltd is a leader in EMI Filter technology, providing products for surface and panel mount applications.

As part of our product range extensions we are now able to offer filters for power applications where currents up to several hundred amps are required.

Utilising plastic film technology the range includes high ac and dc working voltage options along with parts designed and tested to meet the rigorous demands of EN132400/EN60950 safety specifications.

Typical applications include IT servers, telecoms base stations, MRI room equipment, power supplies, radar and military vehicles.

Filters designed and tested to meet EN132400/ EN60950 class Y2 and Y4 requirements are intended for use on mains supply systems or lower voltage lines where safety is important.

Other products in Syfer's EMI component range include: surface mount feedthrough capacitors and filters, panel mount ceramic based feedthrough filters, X2Y integrated passive components and LTCC multi element high frequency filters.

Syfer is a world class manufacturer of surface mount and radial leaded ceramic capacitors, including safety and surge protection devices. Syfer is also a leading supplier of discoidal and planar ceramic capacitors to the EMI filter industry.







Syfer - EMI Power Filters

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Ordering information

SLE	K	С	250	0105	M	1	1
Case style	Rated current (A)	Electrical configuration	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric	Class
SLB SLC SLD SLE SLF SLG SLH SLJ SLK SLL SLM SLQ	A = 0.3 B = 0.45 C = 0.5 D = 1 E = 3 F = 5 G = 8 H = 10 J = 15 K = 20 L = 32 M = 63 N = 100	C = C section P = Pi section	030 = 30Vdc 063 = 63Vdc 100 = 100Vdc 160 = 160Vdc 250 = 250Vdc 400 = 400Vdc 600 = 600Vdc A13 = 130Vac A25 = 250Vac	First digit is 0. Second and third digits are significant figures of capacitance code. The fourth digit is number of zeros following Examples: $0132 = 1.3 \text{nF} \\ 0105 = 1.0 \mu \text{F} \\ 0406 = 40 \mu \text{F}$	M = ±20% (Standard)	1 = Plastic Film	1 = STD Y = Y4 (130Vac only) Y = Y2 (250Vac only)

Note: Ordering code can have up to 4 additional digits on the end to denote special requirements.

All supplied with nuts and washers.

Example ordering information - Y2 Range

SLG	M	P	A25	0943	M	1	Y
Case style	Rated current (A)	Electrical configuration	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric	Class
SLG	M = 63	P = Pi section	A25 = 250Vac	Example: 0943 = 94nF	$M = \pm 20\%$ (Standard)	1 = Plastic Film	Y = Y2 (250Vac only)

Example ordering information - Y4 Range

SLL	N	С	A13	A13 0105		1	Y
Case style	Rated current (A)	Electrical configuration	Voltage	Capacitance in picofarads (pF)	Capacitance tolerance	Dielectric	Class
SLL	N = 100	C = C section	A13 = 130Vac	Example: $0105 = 1\mu F$	$M = \pm 20\%$ (Standard)	1 = Plastic Film	Y = Y4 (130Vac only)

Installation and technical notes

Background to Power Filters

Feedthrough filters offer high insertion loss performance from kHz to GHz and high feedthrough currents to 100A+.

Stable, self-healing plastic film capacitors offering very low series inductance and very high self resonant frequency and through bulkhead mounting gives them a defined performance advantage over board level or discrete component filtering with traditional 2 terminal capacitors.

'C' Circuit filters (also known as feedthrough capacitors) offer good general purpose performance at low cost. Improved performance and sharper cut-off curves are achieved with the use of Pi filters. Other package configurations (e.g. L-C or T filters) are also available for low or mismatched source and load impedances – please refer to the factory.

Typical applications include power input lines on IT servers and telephone base stations or high performance power supplies.

Construction

All Syfer power filters in this catalogue are manufactured using self-healing polyester film wound capacitors and incorporate a non-soldered construction for maximum reliability.

Plastic film capacitors are used as standard and offer the best mix of performance and temperature range, allowing high volumetric capacitance and operating temperatures up to 85°C (including self heating effect).

For specialist applications alternative plastic films can be used to offer low dielectric losses or higher operating temperatures. Please refer to the factory for further information.

Unlike some manufacturers, Syfer do not use oil impregnated paper film capacitors which can catch fire or explode in the case of failure.

Pi filters incorporate iron powder core inductors for maximum performance with minimal degradation of insertion loss due to high through currents. Declared performance is for full load.

Through conductors are copper alloy for maximum conductivity with minimum loss or heating effect. Bodies are brass or aluminium. All metal parts are nickel plated as standard to present good electrical conductivity and anti corrosion properties. All filters are resin sealed to protect against harsh environments.

Mounting

All these filters and capacitors are designed to be mounted in a bulkhead or partition wall to achieve maximum high frequency filtering performance through exploitation of the Faraday cage effect. Filtering performed using discrete components at board level will generally offer a lower level of filtering performance as high frequency signals radiate over and around the filter.

When mounting the filters, take care not exceed the maximum mounting torques quoted as this may cause damage to the metalwork or the internal components. All filters are supplied as standard with the requisite nuts and washers to successfully mount the part. When tightening conductor nuts, use two spanners to prevent twisting the internal conductor and risking damage to the resin seal.

Particular care must be taken to ensure good contact is made to the through conductor, as high currents can result in localised 'hot spots' through high resistive joints.

Safety

Care should be taken not to exceed the maximum rated voltage and current for the filter.

Standard feedthrough capacitors rated at 600Vdc / 250Vac are tested to either 1250V or 2250Vdc during manufacture which can make them suitable for use in mains 250Vac applications, but if operating safety is critical, or high transients are anticipated, then the Y2 and Y4 class filters are designed and tested to meet or exceed the test requirements of EN132400 and EN60950 including the 5000V DWV and 5000V peak pulse testing requirements (Y2) or 2500V DWV and 2500V peak pulse testing requirements (Y4).

All insulating materials are UL94 V-0 rated.

High currents will generate some heating effect, and particular care should be paid to the current derating calculation shown on each page. If current exceeds the maximum rating for the filter, change to a higher rated device or talk to the factory for possible alternatives.

All the filters in this catalogue are designed to operate at high currents / high voltages and may be fitted with high capacitances resulting in a potential electric shock hazard. Electrical energy may be stored for some time after switch off – do not handle filters without first discharging and / or checking that the stored voltage is at a low level.

Failure mode

All the filters in this catalogue utilise plastic film capacitors that will self-heal following break down due to excessive voltage. The initial fail would be detected by a brief short circuit transient followed by recovery to normal operation. If the part is repeatedly subjected to over voltage transients, then the capacitance will gradually decrease as the capacitor operating layer is effected.

If a part is repeatedly driven to failure, subjected to a severe over voltage condition or subjected to high ac voltages to drive high ac current through the capacitor then a significant heat build up can occur causing irreversible damage to the capacitor which may result in a permanent open or short circuit condition being generated.

RoHS compliance

All the filters in this catalogue are RoHS compliant.

Custom Specials

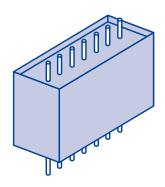
The vast majority of filters manufactured are customised to meet the specific requirements of individual customers. Syfer offer the option to manufacture to a customer specification or to work together with the customer to develop a solution to the problem.

If standard designs have been used for prototypes or initial production, please talk to us about modifying the package to suit your requirements to improve cost and ease assembly. Prototypes can be arranged quickly and in small quantities to solve particular problems.

Typical customisations include:

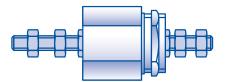
Multi-way packaging

Installing the capacitive and inductive elements of the catalogue filters in a multi-way housing saves space and cost as well as speeding the customers assembly into the bulkhead. Typical packages would be 2, 4 or 8 feedthrough filters to a single housing, but more can be accommodated.



Different housing design

Special designs are available to suit any particular customer requirement. All standard filters are designed with round bodies and a single, large mounting nut as the optimum combination of cost and ease of mounting. Typical changes include full hexagonal bodies to enable fitting in tight spaces, or bodies with multiple mounting locations for critical vibration.





Other options

- Standard circuit configurations are C and Pi filters, but L-C, C-L, T and multi-element (e.g. L-C-L-C-L) filters can all be considered to suit particular applications.
- Alternative materials can be considered eg Polypropylene or PPS plastic films can be used to offer low dielectric losses or higher operating temperatures. Pure copper conductors can be used to improve the current carrying capacity or self heating effect.
- Higher working voltages (to 1000Vdc typical) and higher current carrying capacities (to 300A typical) are available.







EMI Power Filters - 10A - SLQ Range





Description

A range of miniature dc and ac feedthrough capacitors rated at 10A. Capacitance values from 1.3nF to 1.5µF. Rated voltages from 30Vdc to 600Vdc and 250Vac. RoHS compliant.

Ratings and characteristics

Rated Current, I _R	¹ 10A @ 50°C
Insulation Resistance	>100MΩ
dc Resistance	<2mΩ
Operating Temperature Range	-55°C to +85°C
¹ Current derating between 50°C and For temperature θ , $I = I$ $\sqrt{(85-8)}$	<u></u>

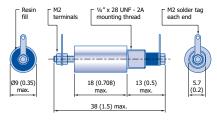


Product range

Casa	Capacitance Value (±20%) Rated Voltage Vdc		Max. Leakage	Typical Insertion Loss (dB) in 50 Ω system										Circuit Configuration	
Case style		Voltage	Test Voltage Vdc	tage (mA) @	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz	10 MHz	30 MHz	100 MHz	300 MHz	1 GHz	Config
	1.3nF	² 600	2250	0.12	-	-	-	-	-	7	16	26	36	46	
	3.3nF	² 600	2250	0.31	-	-	-	-	-	14	24	34	44	54	
	4.7nF	² 600	2250	0.45	-	-	-	-	-	17	27	37	47	57	
	100nF	400	800	-	-	1	5	14	24	44	-	70	-	84	
SLQ	200nF	250	500	-	-	3	10	20	30	50	-	74	-	90	T
	300nF	160	320	-	-	5	14	24	34	50	-	74	-	90	C
	600nF	100	200	-	3	10	20	30	40	50	-	80	-	90	
	900nF	63	126	-	5	13	23	33	43	51	-	83	-	90	
	1.5µF	30	60	-	8	17	27	37	47	55	-	87	-	90	

²600Vdc are dual rated at 250Vac. Order as a 600Vdc part.

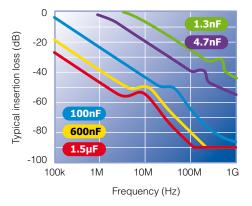
Case style SLQ - Dimensions - mm (inches)



Mechanical details

Mounting hardware	8 A/F fixing nut and crinkle washer
Terminals and Case	Nickel plated brass
Weight	5g
Maximum torque:	Terminals - 0.2Nm (use 2 spanners) Mounting thread - 1Nm

Insertion Loss





Description

A range of miniature dc feedthrough capacitors rated at 20A. Capacitance values from 5nF to $12\mu F$. Rated voltages from 30Vdc to 600Vdc and 250Vac. RoHS compliant.

Ratings and characteristics

Rated Current, I _R	¹ 20A @ 50°C				
Insulation Resistance	>100MΩ				
dc Resistance	<1mΩ				
Temperature Range	-55°C to +85°C				
¹ Current derating between 50°C and For temperature θ , $I = I$, $\sqrt{(85-\theta)}$					

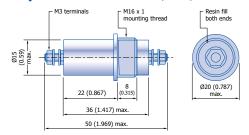


Product range

	Cit	Batad	Test	Max. Leakage	Typical Insertion Loss (dB) in 50 Ω system									Circuit				
Case style	Capacitance Value (±20%)	Rated Voltage Vdc	ge Voltage	Voltage	Voltage	Voltage	Voltage	Current (mA) @ 250V 50Hz	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz	10 MHz	100 MHz	300 MHz	1 GHz	Config
	5nF	²600	2250	0.5	-	-	-	-	2	17	37	47	57					
	10nF	²600	2250	1	-	-	-	1	6	24	44	54	64					
	20nF	²600	2250	1.9	-	-	-	3	10	30	46	60	70					
	50nF	²600	2250	4.7	-	-	-	8	18	38	58	68	78					
	80nF	²600	2250	7.5	-	-	-	12	22	42	62	72	82					
	100nF	²600	1250	9.4	-	-	-	14	24	44	70	74	84					
	200nF	²600	1250	19	-	-	-	20	30	50	74	80	90	-				
SLE	300nF	² 600	1250	28	-	-	-	24	34	50	74	84	90	÷				
	800nF	400	800	-	4	12	22	32	42	51	82	-	90	С				
	1μF	250	500	-	5	14	24	34	44	52	84	-	90					
	2μF	160	320	-	10	20	30	40	50	58	90	90	90					
	4µF	100	200	-	16	26	36	46	56	70	90	90	90					
	5μF	80	160	-	18	28	38	48	58	74	90	90	90					
	7μF	63	126	-	21	31	41	51	60	79	90	90	90					
	12µF	30	60	-	26	36	46	56	62	86	90	90	90					

²600Vdc are dual rated at 250Vac. Order as a 600Vdc part.

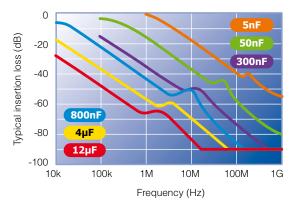
Case style SLE - Dimensions - mm (inches)



Mechanical details

Mounting hardware	19 A/F fixing nut and crinkle washer
Terminals and Case	Nickel plated brass
Weight	25g
Maximum torque:	Terminals - 0.5Nm (use 2 spanners) Mounting thread - 7Nm

Insertion Loss



EMI Power Filters - 100A - SLM Range





Description

A range of dc and ac feedthrough capacitors rated at 100A. Capacitance values from $0.1\mu F$ to $12\mu F$. Rated voltages from 30Vdc to 600Vdc and 250Vac. RoHS compliant.

Ratings and characteristics

Rated Current, $I_{\rm R}$	¹ 100A @ 50°C				
Insulation Resistance	>100MΩ				
dc Resistance	<0.5mΩ				
Temperature Range	-55°C to +85°C				
10	0500				

 $^{\text{1}}\text{Current}$ derating between 50°C and 85°C For temperature $\theta,~I_{\theta}=I_{\text{R}}\sqrt{(85-\theta)/35}$

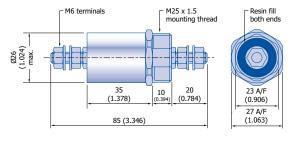


Product range

	Capacitance Rated Test		Max. Leakage	Leakage in 50 Ω system with load							В)			
Case style	Value (±20%)	Voltage Vdc	Voltage Vdc	Current (mA) @ 250V 50Hz	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz	10 MHz	100 MHz	1 GHz	Circuit Configuration	
	100nF	²600	2250	9.4	-	-	5	14	24	44	70	84		
	200nF	²600	2250	19	-	-	10	20	30	50	74	90		
	250nF	²600	2250	24	-	-	12	22	32	50	74	90		
	500nF	²600	1250	47	-	-	18	28	38	50	78	90		
	1μF	²600	1250	94	-	-	24	34	44	52	84	90		
SLM	2μF	400	800	-	10	20	30	40	50	58	90	90	T	
SLM	4μF	250	500	-	16	26	36	46	56	70	90	90	C ±	
	6µF	160	320	-	20	30	40	50	60	77	90	90		
	14μF	100	200	-	27	37	47	57	63	87	90	90		
	18μF	80	160	-	29	39	49	59	66	90	90	90		
	25μF	63	126	-	32	42	52	62	66	90	90	90		
	40μF	30	60	-	36	46	56	66	66	90	90	90		

²600Vdc are dual rated at 250Vac. Order as a 600Vdc part.

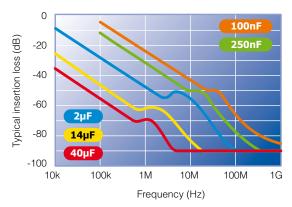
Case style SLM - Dimensions - mm (inches)



Mechanical details

Mounting hardware	30 A/F fixing nut and crinkle washer
Terminals and Case	Nickel plated brass
Weight	120g
Maximum torque:	Terminals - 2.5Nm (use 2 spanners) Mounting thread - 14Nm

Insertion Loss



Class Y2 and Y4 introduction

The class Y2 and Y4 high current feedthrough filters are designed and tested to meet or exceed the stringent test requirements of EN132400 and EN60950 including the 5000V DWV and 5000V peak pulse testing (Y2) or 2500V DWV and 2500V peak pulse testing (Y4).

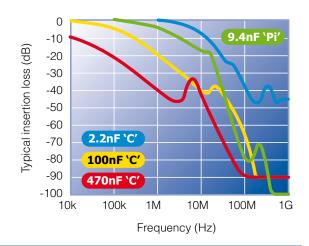
This makes these filters particularly suitable for all high performance applications demanding high reliability coupled with very good high frequency insertion loss performance, such as servers, IT switches and telecoms base stations. This range is fully RoHS compliant and available in 'C' and 'Pi' configuration as standard, with other configurations available on request.





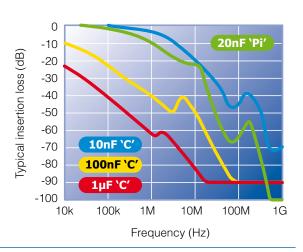
Y2 Ratings and characteristics

Rated voltage	250Vac 50/60 Hz
Test voltage	5000Vdc 2 seconds
Capacitor class (EN132400)	Y2
Rated current	10A to 100A
Pulse test (EN132400)	5000V peak
Insulation resistance: (within 1 minute)	C < 0.33μF, R > 15000MΩ C > 0.33μF, RC > 5000s (ΜΩμF)
dc resistance	< 6mΩ
Temperature range	-40°C to +85°C
Insulating materials flammability rating	UL94 V-0



Y4 Ratings and characteristics

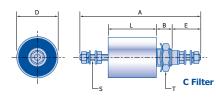
Rated voltage	130Vac 50/60 Hz (Also 130Vdc)
Test voltage	2500Vdc 2 seconds
Capacitor class (EN132400)	Y4
Rated current	10A to 100A
Pulse test (EN132400)	2500V peak
Insulation resistance: (within 1 minute)	C < 0.33μF, R > 15000MΩ C > 0.33μF, RC > 5000s (ΜΩμF)
dc resistance	≼ 6mΩ
Temperature range	-40°C to +85°C
Insulating materials flammability rating	UL94 V-0

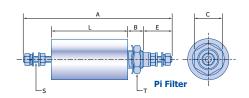


Mechanical details

Mounting hardware	Fixing nuts and crinkle washers supplied
Terminals & Case	Nickel plated brass
Maximum torque: (Mounting thread)	M10 - 3Nm (26.55lbf in), M12 - 4Nm (35.4lbf in), M16 - 7Nm (61.69lbf in), M20 - 10Nm (88.51lbf in), M24 - 14Nm (123.9lbf in)
Maximum torque: (Terminals) Use 2 spanners	M3 - 0.5Nm (4.43lbf in), M4 - 1.2Nm (1.62lbf in), M6 - 2.5Nm (22.13lbf in), M8 - 5Nm (44.25lbf in)

EMI Power Filters - Class Y2 - 250Vac (A25)



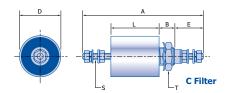


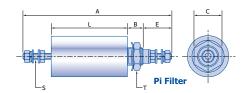
Product range

	*Current			Max. Leakage		Т			tion Lo		3)			Circuit Configuration
Case style	Rating I _R (A) @60°C	Capacitance Value (±20%)	Inductance (nH)	Current (mA) @ 250V 50Hz	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz	10 MHz	100 MHz	1 GHz	Dimensions	Config
CLD	10	2.2nF	-	0.21	-	-	-	-	-	8	38	45	A = 57mm B = 10mm C = 13mm D = 15mm	•
SLB	10	4.7nF	-	0.44	-	-	-	-	-	14	43	60	E = 16mm L = 18mm S = M3 T = M10 x 1	С
SLC	10	9.4nF	70	0.9	-	-	-	-	4	18	80	100	A = 98mm B = 12mm C = 17mm D = 20mm E = 16mm L = 57mm S = M3 T = M12 x 1	Pi
		4.7nF	-	0.44	-	-	-	-	-	14	43	60	A = 63 to 106mm	
SLD	32	10nF	-	0.94	-	-	-	-	3	21	45	70	B = 12mm C = 17mm D = 20mm	С
	32	47nF	-	4.4	-	-	2	6	15	34	50	90	E = 18mm L = 18 to 61mm	
		20nF	70	1.9	-	-	2	4	10	22	65	100	S = M4 T = M12 x 1	Pi
SLF	32	100nF	-	9.4	-	2	5	11	20	40	65	90	A = 77mm B = 14mm C = 22mm D = 25mm E = 18mm L = 30mm S = M4 T = M16 x 1	С
		10nF	-	0.94	-	-	-	-	3	21	45	70	A = 96 to 160mm	
SLG	63	47nF	-	4.4	-	-	2	6	15	34	50	90	B = 14mm C = 22mm D = 25mm	С
520	03	100nF	-	9.4	-	2	5	11	20	40	65	90	E = 26mm L = 30 to 94mm	
		94nF	80	8.9	-	-	6	11	21	50	85	100	S = M6 T = M16 x 1	Pi
		47nF	-	4.4	-	-	2	6	15	34	50	90	A = 113 to 184mm B = 16mm	С
SLK	100	100nF	-	9.4	-	2	5	11	20	40	65	90	C = 27mm D = 32mm E = 32mm L = 33 to 104mm	
		200nF	90	19	-	2	10	18	27	60	100	100	S = M8 T = M20 x 1	Pi
SLL	100	470nF		44	6	9	16	22	33	33	90	90	A = 133mm B = 19mm C = 27mm D = 38mm E = 32mm L = 50mm S = M8 T = M24 x 1	С

*Current derating between 60°C and 85°C: For temperature θ , $I_{\theta} = I_{R} \sqrt{(85-\theta)/25}$

EMI Power Filters - Class Y4 - 130Vac/130Vdc (A13)





Product range

	ct range												
	*Current			Typical Insertion Loss (dB) in 50Ω system									Circuit
Туре	Rating I _R (A) @60°C	Capacitance Value (±20%)	Inductance (nH)	10 kHz	30 kHz	100 kHz	300 kHz	1 MHz	10 MHz	100 MHz	1 GHz	Dimensions	Config
SLB	10	10nF	-		-			3	21	45	70	A = 57mm B = 10mm C = 13mm D = 15mm E = 16mm L = 18mm S = M3 T = M10 x 1	С
SLC	10	20nF	70	-	-	2	4	10	23	65	100	A = 90mm B = 12mm C = 17mm D = 20mm E = 16mm L = 49mm S = M3 T = M12 x 1	Pi
		10nF	-	-	-	-	-	3	21	45	70	A = 63 to 98mm B = 12mm	
SLD	32	47nF	-	-	-	2	6	15	34	50	90	C = 17mm D = 20mm	С
SLD	32	100nF	-	-	2	5	11	20	40	65	90	E = 18mm L = 18 to 53mm	
		20nF	70	-	-	2	4	10	23	65	100	S = M4 T = M12 x 1	Pi
		10nF	-	-	-	-	-	3	21	45	70	A = 96 to 160mm B = 14mm C = 22mm D = 25mm E = 26mm L = 30 to 94mm	
CI C	62	47nF	-	-	-	2	6	15	34	50	90		С
SLG	63	100nF	-	-	2	5	11	20	40	65	90		
		200nF	80	2	4	10	18	27	62	95	100	S = M6 T = M16 x 1	Pi
SLH	32	470nF	-	6	9	15	22	33	33	90	90	A = 82mm B = 16mm C = 27mm D = 32mm E = 18mm L = 33mm S = M4 T = M20 x 1	С
su	63	470nF	-	6	9	15	22	33	33	90	90	A = 101mm B = 16mm C = 27mm D = 32mm E = 26mm L = 33mm S = M6 T = M20 x 1	C
		47nF	-	-	-	2	6	15	34	50	90	A = 113 to 184mm	
CLIK	100	100nF	-	-	2	5	11	20	40	65	90	B = 16mm C = 27mm D = 32mm	С
SLK		470nF	-	6	9	15	22	33	33	90	90	E = 32mm L = 33 to 104mm	
		940nF	90	7	14	23	30	32	70	100	100	S = M8 T = M20 x 1	Pi
SLL	100	1µF	-	10	15	24	32	42	50	90	90	A = 133mm B = 19mm C = 27mm D = 38mm E = 32mm L = 50mm S = M8 T = M24 x 1	С

^{*}Current derating between 60°C and 85°C: For temperature $\theta,~I_{_{\theta}}=I_{_{R}}~\sqrt{(85-\theta)/25}$





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