Features:

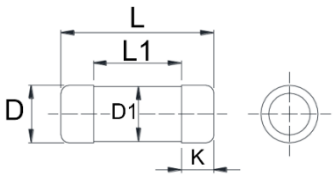
- Thin film technology for precision and stability
- Excellent power to size ratio
- Exhibits good pulse power characteristics
- Part is inherently anti-sulfur
- RoHS compliant, REACH compliant, lead free, and halogen free

Electrical Specifications

Type/Code	Package Size	Power Rating (W) @ 70ºC	Maximum Working Voltage (V)[1]	Maximum Overload Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance			
						0.1%	0.5%	1%	5%
MLF18	0102	0.125	150	300	± 15	100 - 56K			-
					± 25	100 - 82K	49.9 - 200K	49.9 - 390K	-
					± 50	-	1 - 1M		
					± 100	-		1 - 1M	
		Jumper: 2 A			-	0 Ω (< 15mΩ)			
MLFM15	0102	0.2	200	400	± 15	100 - 56K			-
					± 25	100 - 82K	49.9 - 200K	49.9 - 390K	-
		0.3			± 50	-	1 - 1M		
					± 100	-		1 - 1M	
		Jumper: 2 A			-	0 Ω (< 15mΩ)			
MLF14	0204	0.25	200	400	± 5	10 - 332K	-		
					± 10	10 - 20K			
					± 15	10 - 300K			
					± 25	10 - 1M	10 - 3.4M	1 - 3.4M	
					± 50	10 - 1M	1 - 3.4M	0.2 - 10M	
					± 100	-		0.1 - 10M	
		Jumper: 3 A			-	0 Ω (< 15mΩ)			
MLFM25	0204	0.4	200	400	± 5	10 - 332K	-		
					± 15	10 - 100K			
					± 25	10 - 1M		1 - 3.4M	
					± 50	10 - 1M	1 - 1M	0.2 - 1M	
					± 100	-		0.1 - 1M	
		Jumper: 3 A			-	0 Ω (< 15mΩ)			
MLF12	0207	0.5	300	600	± 5	10 - 332K	-		
					± 10	10 - 20K			
					± 15	10 - 300K			
					± 25	10 - 1M	10 - 3.4M	1 - 3.4M	
					± 50	10 - 1M	1 - 3.4M	0.2 - 10M	
					± 100	-		0.1 - 10M	
		Jumper: 5 A			-	0 Ω (< 15mΩ)			
MLFM1	0207	1	350	700	± 5	10 - 332K	-		
					± 15	10 - 100K			
					± 25	10 - 1M		1 - 3.4M	
					± 50	10 - 1M	1 - 1M	0.2 - 10M	
					± 100	-		0.1 - 10M	
		Jumper: 5 A			-	0 Ω (< 15mΩ)			

Note: (1) Lesser of √P*R or maximum working voltage

Mechanical Specifications



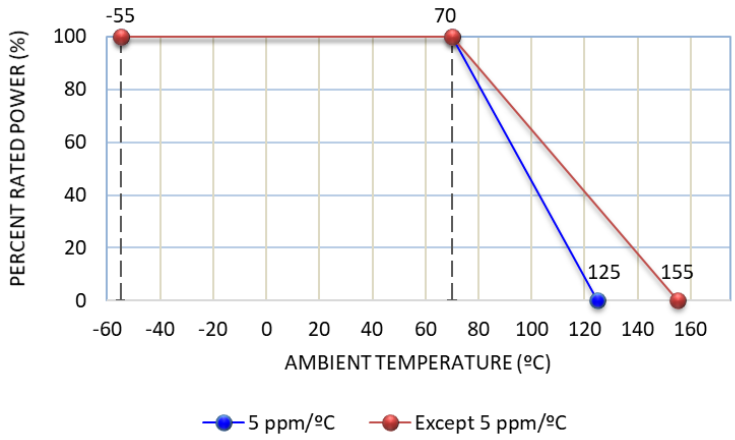
Type/Code	Typical Unit Weight (mg)	L Body Length	L1 (min.) Inner Body Length	D Body Diameter	D1 Middle Body Dia.	K Termination	Unit
MLF18	7.7	0.087 ± 0.004 2.20 ± 0.10	0.043 1.10	0.043 ± 0.004 1.10 ± 0.10	0.043 +0/-0.006 1.10 +0/-0.15	0.018 ± 0.002 0.45 ± 0.05	inches mm
MLFM15	7.7	0.087 ± 0.004 2.20 ± 0.10	0.043 1.10	0.043 ± 0.004 1.10 ± 0.10	0.043 +0/-0.006 1.10 +0/-0.15	0.018 ± 0.002 0.45 ± 0.05	inches mm
MLF14	18.7	0.138 ± 0.008 3.50 ± 0.20	0.067 1.70	0.055 ± 0.006 1.40 ± 0.15	0.055 +0/-0.008 1.40 +0/-0.20	0.031 ± 0.004 0.80 ± 0.10	inches mm
MLFM25	18.7	0.138 ± 0.008 3.50 ± 0.20	0.067 1.70	0.055 ± 0.006 1.40 ± 0.15	0.055 +0/-0.008 1.40 +0/-0.20	0.031 ± 0.004 0.80 ± 0.10	inches mm
MLF12	80.9	0.232 ± 0.008 5.90 ± 0.20	0.114 2.90	0.087 ± 0.008 2.20 ± 0.20	0.087 +0/-0.008 2.20 +0/-0.20	0.051 ± 0.004 1.30 ± 0.10	inches mm
MLFM1	80.9	0.232 ± 0.008 5.90 ± 0.20	0.114 2.90	0.087 ± 0.008 2.20 ± 0.20	0.087 +0/-0.008 2.20 +0/-0.20	0.051 ± 0.004 1.30 ± 0.10	inches mm

Performance Characteristics

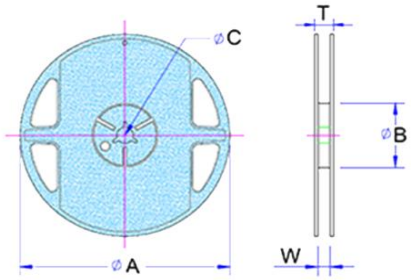
Test	Test Method	Test Condition	Test Specification	
			5% and below	Jumper
Temperature Coefficient of Resistance (T.C.R.)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature. 5ppm: At 25°C/-10°C and 25ºC/+85°C, 25°C is the reference temperature	As specified	
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	RCWV*2.5 or max. overload voltage whichever is lower for 5 seconds	0204/0207: ± (0.15% + 0.05Ω) 0102: ± (0.15% + 0.01Ω) 5 ppm: ± (0.05% + 0.01Ω)	< 15mΩ
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Max. overload voltage for 1 minute	≥10G	
Endurance	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70 ± 2ºC, RCWV for 1000 hours with 1.5 hour "ON" and 0.5 hour "OFF"	0204/0207: ± (0.15% + 0.05Ω) 0102: ± (0.5% + 0.05Ω) 5 ppm: ± (0.25% + 0.01Ω)	< 15mΩ
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40 ± 2ºC, 90 ~ 95% R.H., RCWV for 1000 hours with 1.5 hour "ON" and 0.5 hour "OFF"	0204/0207: ± (1% + 0.05Ω) 5 ppm: ± (0.25% + 0.01Ω)	< 15mΩ
Dry Heat	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2	At +125°C / +155°C for 1000 hours	0204/0207: ± (1% + 0.05Ω) 0102: ± (1% + 0.05Ω) 5 ppm: ± (0.25% + 0.01Ω)	< 15mΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds with 2 mm	± (0.5% + 0.05Ω) 5 ppm: ± (0.1% + 0.01Ω)	< 15mΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245 ± 5ºC for 3 seconds	95% min. coverage	
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260 ± 5ºC for 10 seconds	± (0.5% + 0.05Ω) 5 ppm: ± (0.05% + 0.01Ω)	< 15mΩ
Voltage Proof	JIS-C-5201-1 4.7 IEC-60115-1 4.7	1.42 times max. operating voltage for 1 minute	No breakdown or flashover	
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260 ± 5ºC for 30 seconds	Individual leaching area ≤ 5% Total Leaching area ≤ 10%	
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55 to +125°C / +155°C, 5 cycles	± (0.5% + 0.05Ω) 5 ppm: ± (0.2% + 0.01Ω)	< 15mΩ

RCWV (rated continuous working voltage) = √(P*R) or max. operating voltage whichever is lower.
Recommended storage temperature: 25 ± 3ºC, humidity < 80% R.H.
Operating temperature range is -55 to +155°C except for 5 ppm/ºC.
Operating temperature range for 5 ppm/ºC is -55 to +125°C.

Power Derating Curve:

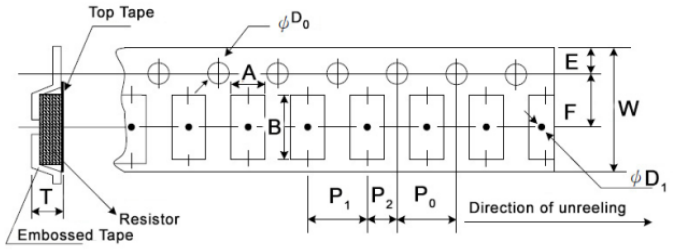


Reel Specifications



Type/Code	Reel Diameter	øA	øB	øC	W	T	Unit
MLF18	7 inches	7.028 ± 0.059 178.50 ± 1.50	2.362 ± 0.039 60.00 ± 1.00	0.512 ± 0.008 13.00 ± 0.20	0.354 ± 0.020 9.00 ± 0.50	0.492 ± 0.020 12.50 ± 0.50	inches mm
MLFM15							
MLF14							
MLFM25							
MLF12				0.512 ± 0.020 13.00 ± 0.50	0.512 ± 0.020 13.00 ± 0.50	0.610 ± 0.020 15.50 ± 0.50	inches mm
MLF18	13 inches	12.992 ± 0.039 330.00 ± 1.00	3.937 ± 0.020 100.00 ± 0.50	0.512 ± 0.008 13.00 ± 0.20	0.374 ± 0.020 9.50 ± 0.50	0.531 ± 0.020 13.50 ± 0.50	inches mm
MLFM15							
MLF14							
MLFM25							
MLF12			3.898 ± 0.020 99.00 ± 0.50	0.531 ± 0.020 13.50 ± 0.50	0.528 ± 0.039 13.40 ± 1.00	0.701 ± 0.039 17.80 ± 1.00	inches mm

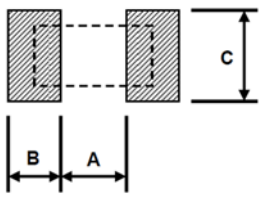
Packaging Specifications - Plastic Tape



Type/Code	A	B	W	E	F	P0	Unit
MLF18	0.051 ± 0.008 1.30 ± 0.20	0.094 ± 0.008 2.40 ± 0.20	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	inches mm
MLFM15							inches mm
MLF14	0.061 ± 0.008 1.55 ± 0.20	0.144 ± 0.008 3.65 ± 0.20					inches mm
MLFM25							inches mm
MLF12	0.094 ± 0.004 2.40 ± 0.10	0.242 ± 0.004 6.15 ± 0.10	0.472 ± 0.004 12.00 ± 0.10		0.217 ± 0.002 5.50 ± 0.05		inches mm
MLFM1							inches mm

Type/Code	P1	P2	D0	D1	T	Unit
MLF18	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.059 ± 0.004 1.50 ± 0.10	0.035 min. 0.90 min.	0.059 ± 0.004 1.50 ± 0.10	inches mm
MLFM15						inches mm
MLF14					0.071 ± 0.004 1.80 ± 0.10	inches mm
MLFM25						inches mm
MLF12				0.055 min. 1.40 min.	0.106 ± 0.004 2.70 ± 0.10	inches mm
MLFM1						inches mm

Recommended Pad Layout



Type/Code	A	B	C	Unit
MLF18, MLFM15	0.039 1.00	0.031 0.80	0.059 1.50	inches mm
MLF14, MLFM25	0.063 1.60	0.047 1.20	0.063 1.60	inches mm
MLF12, MLFM1	0.118 3.00	0.067 1.70	0.094 2.40	inches mm

Recommended Solder Profile

This information is intended as a reference for solder profiles for Stackpole resistive components. These profiles should be compatible with most soldering processes. These are only recommendations. Actual numbers will depend on board density, geometry, packages used, etc., especially those cells labeled with "*".

100% Matte Tin / RoHS Compliant Terminations

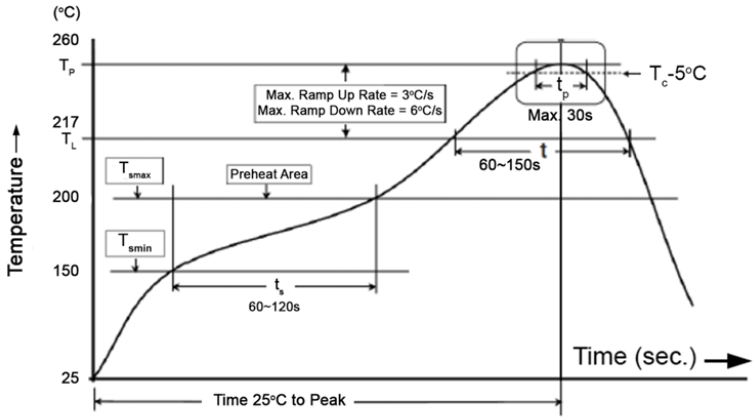
Soldering iron recommended temperatures: 330 to 350°C with minimum duration.
Maximum number of reflow cycles: 3.

Wave Soldering			
Description	Maximum	Recommended	Minimum
Preheat Time	80 seconds	70 seconds	60 seconds
Temperature Diff.	140°C	120°C	100°C
Solder Temp.	260°C	250°C	240°C
Dwell Time at Max.	10 seconds	5 seconds	*
Ramp DN (°C/sec)	N/A	N/A	N/A

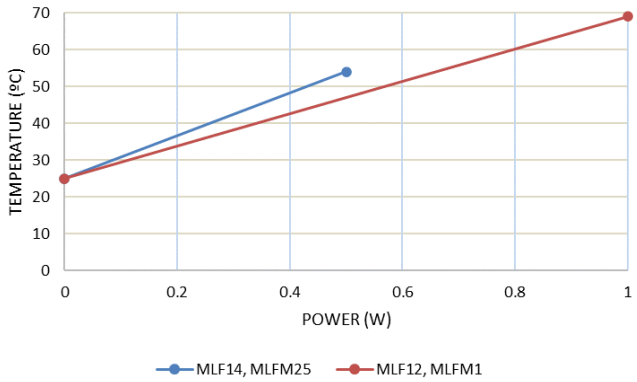
Temperature Diff. = Difference between final preheat stage and soldering stage.

Convection IR Reflow			
Description	Maximum	Recommended	Minimum
Ramp Up (°C/sec)	3°C/sec	2°C/sec	*
Dwell Time > 217°C	150 seconds	90 seconds	60 seconds
Solder Temp.	260°C	245°C	*
Dwell Time at Max.	30 seconds	15 seconds	10 seconds
Ramp DN (°C/sec)	6°C/sec	3°C/sec	*

Recommended Resistor Reflow Profile



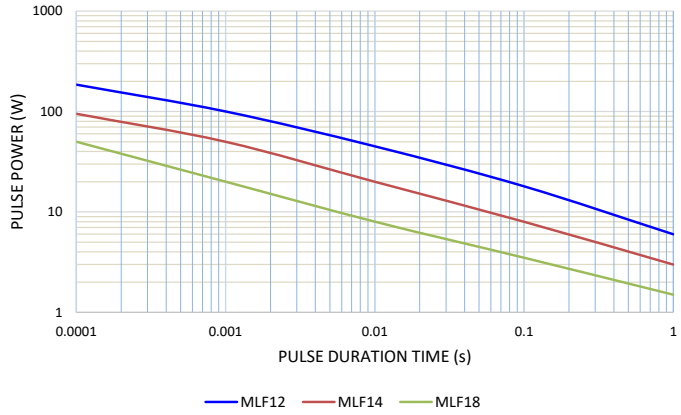
Hot Spot Temperature



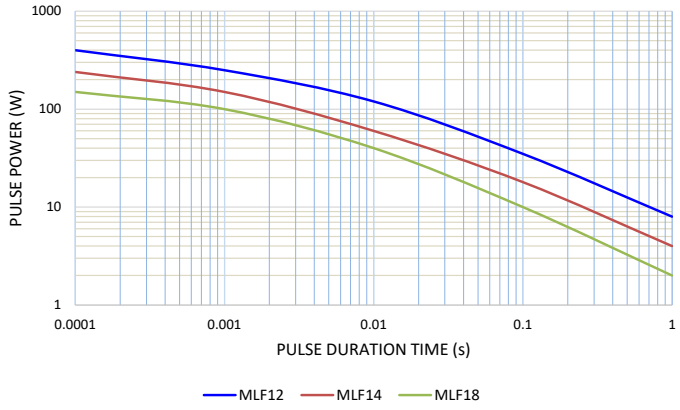
Pulse Withstanding Capacity

The single impulse graph is the result of 50 impulses of rectangular shape applied at one-minute intervals. The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.

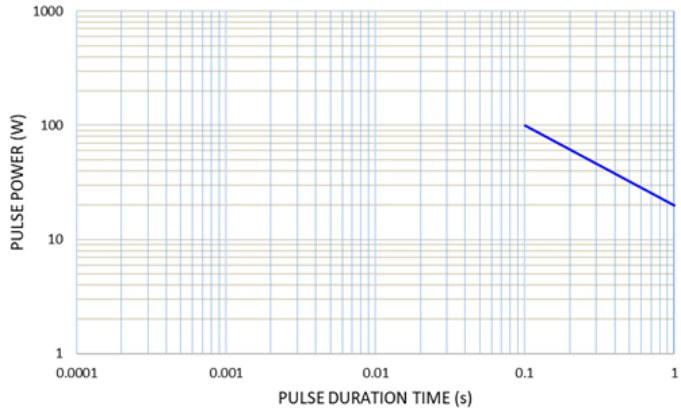
SINGLE PULSE (R < 10Ω)



SINGLE PULSE (R ≥ 10Ω)

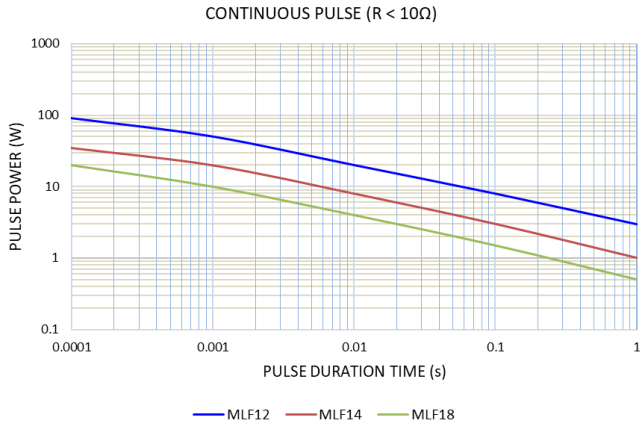


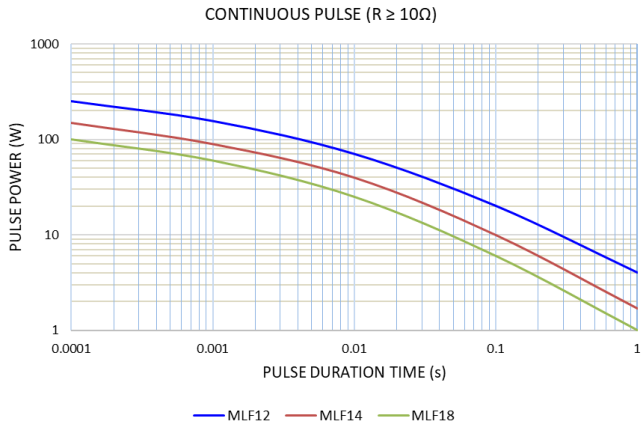
MLFM1 SINGLE PULSE (1 KOHM)



Continuous Pulse

The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70ºC. Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.

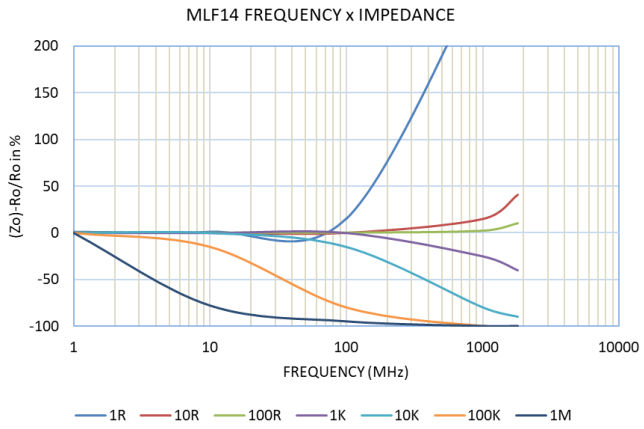


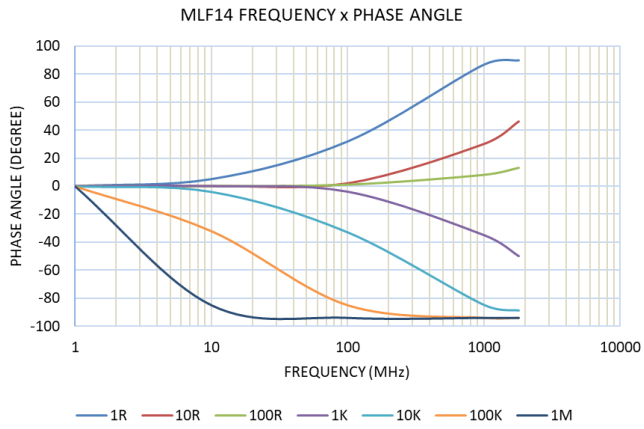


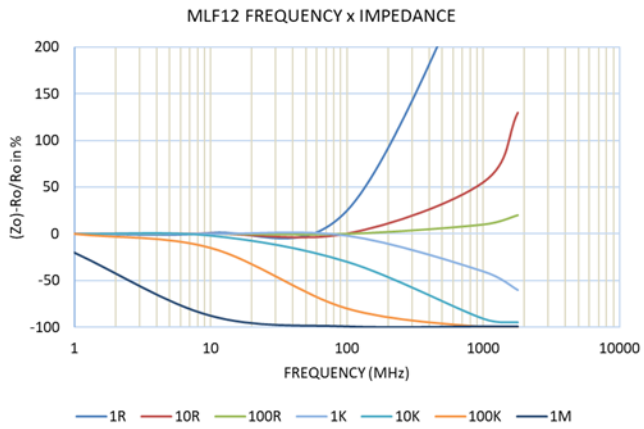
Frequency Behavior

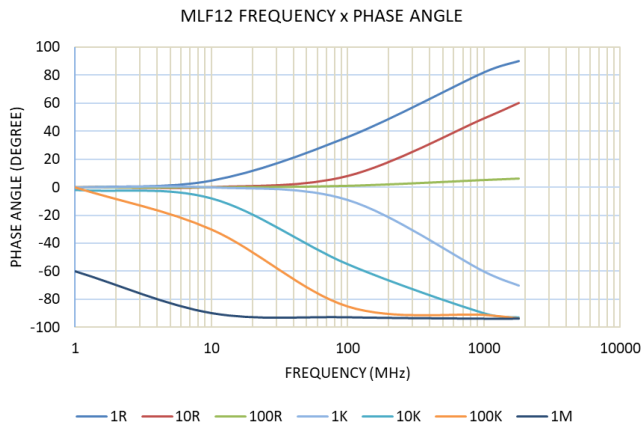
Resistors are designed to function according to Ohmic laws. This is basically true of resistors for frequencies up to 100 kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The values of the capacitance and inductance are mainly determined by the dimensions of the terminations and the conductive path length.

The environment surrounding components has a large influence on the behavior of the component on the printed-circuit board.



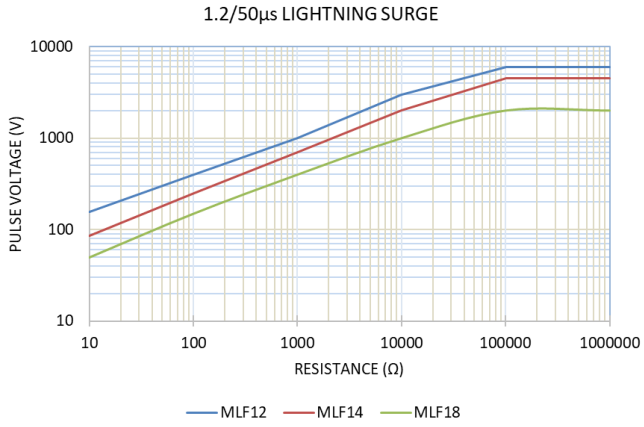


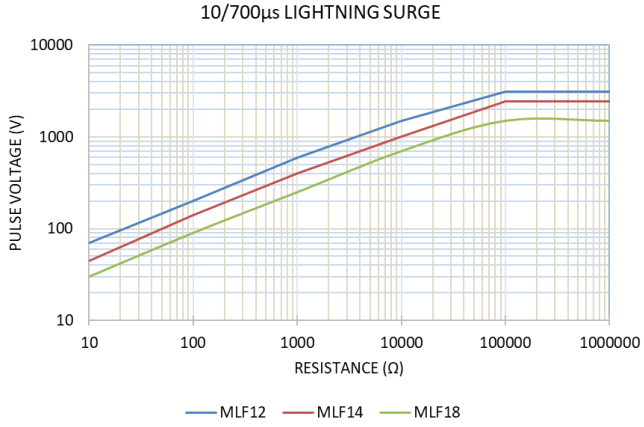




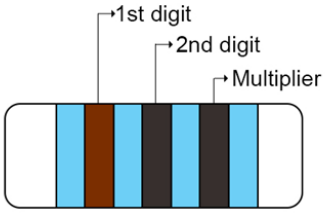
Lightning Surge

Resistors are tested in accordance with IEC 60 115-1 using both 1.2/50us and 10/700us pulse shapes. The limit of acceptance is a shift in resistance of less than 0.5% from the initial value.

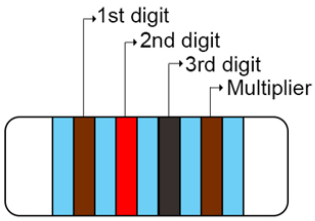




Color Marking Instructions



±5%	E24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1



±1%	E96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74
		1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.10	2.15	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87	2.94	3.01	3.09
		3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49
		5.62	5.76	5.90	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45	8.66	8.87	9.09	9.31	9.53	9.76
±0.5% ±0.25% ± 0.1%	E192	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	13.0	13.2
		13.3	13.5	13.7	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.2	17.4	17.6
		17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.1	22.3	22.6	22.9	23.2	23.4
		23.7	24.0	24.3	24.6	24.9	25.2	25.5	25.8	26.1	26.4	26.7	27.1	27.4	27.7	28.0	28.4	28.7	29.1	29.4	29.8	30.1	30.5	30.9	31.2
		31.6	32.0	32.4	32.8	33.2	33.6	34.0	34.4	34.8	35.2	35.7	36.1	36.5	37.0	37.4	37.9	38.3	38.8	39.2	39.7	40.2	40.7	41.2	41.7
		42.2	42.7	43.2	43.7	44.2	44.8	45.3	45.9	46.4	47.0	47.5	48.1	48.7	49.3	49.9	50.5	51.1	51.7	52.3	53.0	53.6	54.2	54.9	55.6
		56.2	56.9	57.6	58.3	59.0	59.7	60.4	61.2	61.9	62.6	63.4	64.2	64.9	65.7	66.5	67.3	68.1	69.0	69.8	70.6	71.5	72.3	73.2	74.1
		75.0	75.9	76.8	77.7	78.7	79.6	80.6	81.6	82.5	83.5	84.5	85.6	86.6	87.6	88.7	89.8	90.9	92.0	93.1	94.2	95.3	96.5	97.6	98.8

COLOR	DIGIT	MULTIPLIER
silver	-	10^{-2}
gold	-	10^{-1}
black	0	10^{0}
brown	1	10^{1}
red	2	10^{2}
orange	3	10^{3}
yellow	4	10^{4}
green	5	10^{5}
blue	6	10^{6}
violet	7	10^{7}
grey	8	10^{8}
white	9	10^{9}

Note: Resistance with more than 2 significant figures (<1Ω) or more than 3 significant figures (>1Ω) will not be color coded.

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

RoHS Compliance Status

Standard Product Series	Description	Package / Termination Type	Standard Series RoHS Compliant	Lead-Free Termination Composition	Lead-Free Mfg. Effective Date (Std Product Series)	Lead-Free Effective Date Code (YY/WW)
MLF	Metal Film Melf Resistor	SMD	YES	100% Matte Sn over Ni	Always	Always
MLFM	Metal Film Mini Melf Resistor					

"Conflict Metals" Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the "conflict region" of the eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

Compliance to "REACH"

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, "The Registration, Evaluation, Authorization and Restriction of Chemicals", otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. (SEI) to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

How to Order

M	L	F	1	2	D	T	E	4	K	7	5

Product Series

Code	Description
MLF	Standard
MLFM	Mini

Power Rating

Code	Size	W
18	0102	0.125
15	0102	0.2, 0.3
14	0204	0.25
25	0204	0.4
12	0207	0.5
1	0207	1

Tolerance

Code	Tol	Value
B	0.1%	E96, E24
D	0.5%	
F	1%	
J	5%	E24
Z	jumper	

Packaging

Code	Description	Product Code	Quantity
T	7" Reel Plastic Tape	MLF18, MLF14, MLFM15, MLFM25	3000
		MLF12, MLFM1	2000
J	13" Reel Plastic Tape	MLF18, MLF14, MLFM15, MLFM25	10000
		MLF12, MLFM1	6000

TCR

Code	ppm
Z	jumper
Y	5
T	10
S	15
E	25
C	50
D	100

Resistance Value

Four characters with the multiplier used as the decimal holder.

10 ohm = 10R0
100 ohm = 100R
1 Kohm = 1K00
560 Kohm = 560K
zero ohm jumper = 0R00