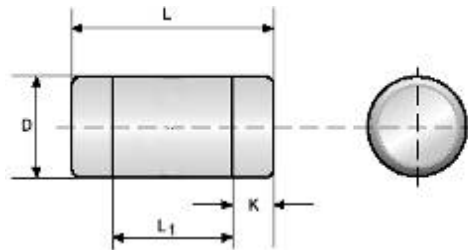


- Features:
- Thin Film Technology for precision and stability
 - Excellent power to size ratio
 - Exhibits good pulse power characteristics
 - RoHS compliant / lead-free



Note: (1) Lesser of √PR or maximum working voltage

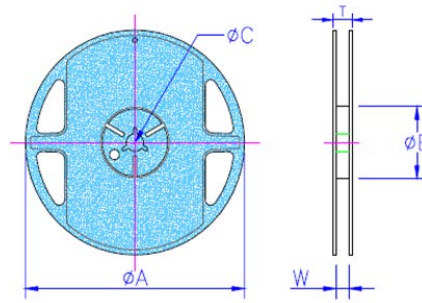


Mechanical Specifications						
Type / Code	Weight (1000 pc) (g)	L Body Length	D Body Diameter	L1 Inner Body	K Termination	Unit
MLF18 (0102)	7.2	0.079 ± 0.004 2.00 ± 0.10	0.051 ± 0.002 1.30 ± 0.05	0.031 0.80	0.020 ± 0.004 0.50 ± 0.10	inches mm
MLFM15 (0102)	7.2	0.079 ± 0.004 2.00 ± 0.10	0.051 ± 0.002 1.30 ± 0.05	0.031 0.80	0.020 ± 0.004 0.50 ± 0.10	inches mm
MLF14 (0204)	18.7	0.138 ± 0.008 3.50 ± 0.20	0.055 ± 0.006 1.40 ± 0.15	0.091 2.30	0.020 ± 0.004 0.50 ± 0.10	inches mm
MLF12 (0207)	80.9	0.232 ± 0.008 5.90 ± 0.20	0.087 ± 0.008 2.20 ± 0.20	0.185 4.70	0.020 ± 0.004 0.50 ± 0.10	inches mm
MLFM1 (0207)	80.9	0.232 ± 0.008 5.90 ± 0.20	0.087 ± 0.008 2.20 ± 0.20	0.185 4.70	0.020 ± 0.004 0.50 ± 0.10	inches mm

Performance Characteristics		
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As specified	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C ~ +125°C, 25°C is the reference temperature
Short Time Overload	0204/0207: $\pm (0.15\% + 0.05\Omega)$ 0102: $\pm (0.5\% + 0.05\Omega)$	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or max. overload voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. overload voltage for 1 minute
Endurance	0204/0207: $\pm (0.15\% + 0.05\Omega)$ 0102: $\pm (0.5\% + 0.05\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 $\pm$ 2°C, RCWV for 1000 h. with 1.5 h. "ON" and 0.5 h. "OFF"
Damp Heat with Load	0204/0207: $\pm (1.0\% + 0.05\Omega)$ 0102: $\pm (1.5\% + 0.05\Omega)$	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 h. with 1.5 h. "ON" and 0.5 h. "OFF"
Dry Heat	0204/0207: $\pm (1.0\% + 0.05\Omega)$ 0102: $\pm (1.5\% + 0.05\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +155°C for 1000 h.
Bending Strength	$\pm (0.5\% + 0.05\Omega)$	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds with 2mm
Solderability	95% min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm (0.5\% + 0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times max. operating voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total Leaching area $\leq 10\%$	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm (0.5\% + 0.05\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles

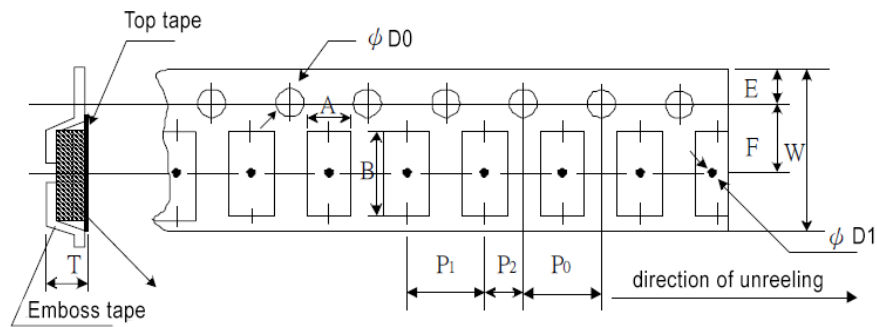
RCWV (rated continuous working voltage) = $\sqrt{P \cdot R}$ or max. operating voltage whichever is lower.

Storage temperature: 25 $\pm$ 3°C, humidity < 80% R.H.



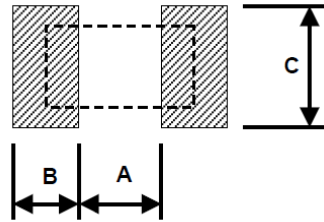
Reel Specifications

Type / Code	ϕA	ϕB	ϕC	W	T	Unit
MLF18	7.028 ± 0.059	2.362 ± 0.039	0.512 ± 0.008	0.354 ± 0.020	0.492 ± 0.020	inches
	178.50 ± 1.50	60.00 ± 1.00	13.00 ± 0.20	9.00 ± 0.50	12.50 ± 0.50	mm
MLFM15	7.028 ± 0.059	2.362 ± 0.039	0.512 ± 0.008	0.354 ± 0.020	0.492 ± 0.020	inches
	178.50 ± 1.50	60.00 ± 1.00	13.00 ± 0.20	9.00 ± 0.50	12.50 ± 0.50	mm
MLF14	7.028 ± 0.059	2.362 ± 0.039	0.512 ± 0.008	0.354 ± 0.020	0.492 ± 0.020	inches
	178.50 ± 1.50	60.00 ± 1.00	13.00 ± 0.20	9.00 ± 0.50	12.50 ± 0.50	mm
MLF12	7.028 ± 0.059	2.362 ± 0.039	0.512 ± 0.020	0.512 ± 0.020	0.610 ± 0.020	inches
	178.50 ± 1.50	60.00 ± 1.00	13.00 ± 0.50	13.00 ± 0.50	15.50 ± 0.50	mm
MLFM1	7.028 ± 0.059	2.362 ± 0.039	0.512 ± 0.020	0.512 ± 0.020	0.610 ± 0.020	inches
	178.50 ± 1.50	60.00 ± 1.00	13.00 ± 0.50	13.00 ± 0.50	15.50 ± 0.50	mm



Emboss Plastic Tape Specifications

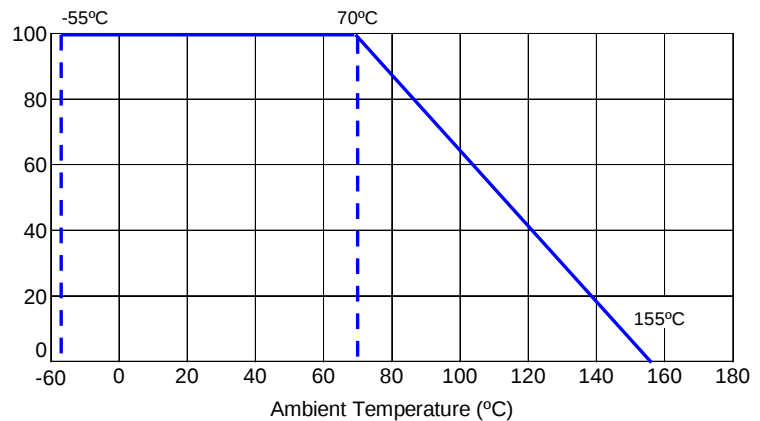
Type / Code	A	B	W	E	F	P0	Unit
MLF18	0.059 ± 0.004	0.091 ± 0.004	0.315 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	inches
	1.50 ± 0.10	2.30 ± 0.10	8.00 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	mm
MLFM15	0.059 ± 0.004	0.091 ± 0.004	0.315 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	inches
	1.50 ± 0.10	2.30 ± 0.10	8.00 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	mm
MLF14	0.061 ± 0.004	0.144 ± 0.004	0.315 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	inches
	1.55 ± 0.10	3.65 ± 0.10	8.00 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	mm
MLF12	0.094 ± 0.004	0.242 ± 0.004	0.472 ± 0.004	0.069 ± 0.004	0.217 ± 0.002	0.157 ± 0.004	inches
	2.40 ± 0.10	6.15 ± 0.10	12.00 ± 0.10	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	mm
MLFM1	0.094 ± 0.004	0.242 ± 0.004	0.472 ± 0.004	0.069 ± 0.004	0.217 ± 0.002	0.157 ± 0.004	inches
	2.40 ± 0.10	6.15 ± 0.10	12.00 ± 0.10	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	mm
Type / Code	P1	P2	D0	D1	T	Unit	
MLF18	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.035 min.	0.067 ± 0.004	inches	
	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	0.90 min.	1.70 ± 0.10	mm	
MLFM15	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.035 min.	0.067 ± 0.004	inches	
	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	0.90 min.	1.70 ± 0.10	mm	
MLF14	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.035 min.	0.071 ± 0.004	inches	
	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	0.90 min.	1.80 ± 0.10	mm	
MLF12	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.055 min.	0.106 ± 0.004	inches	
	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.40 min.	2.70 ± 0.10	mm	
MLFM1	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.055 min.	0.106 ± 0.004	inches	
	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.40 min.	2.70 ± 0.10	mm	



Recommended Land Pattern

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

Power Derating Curve:



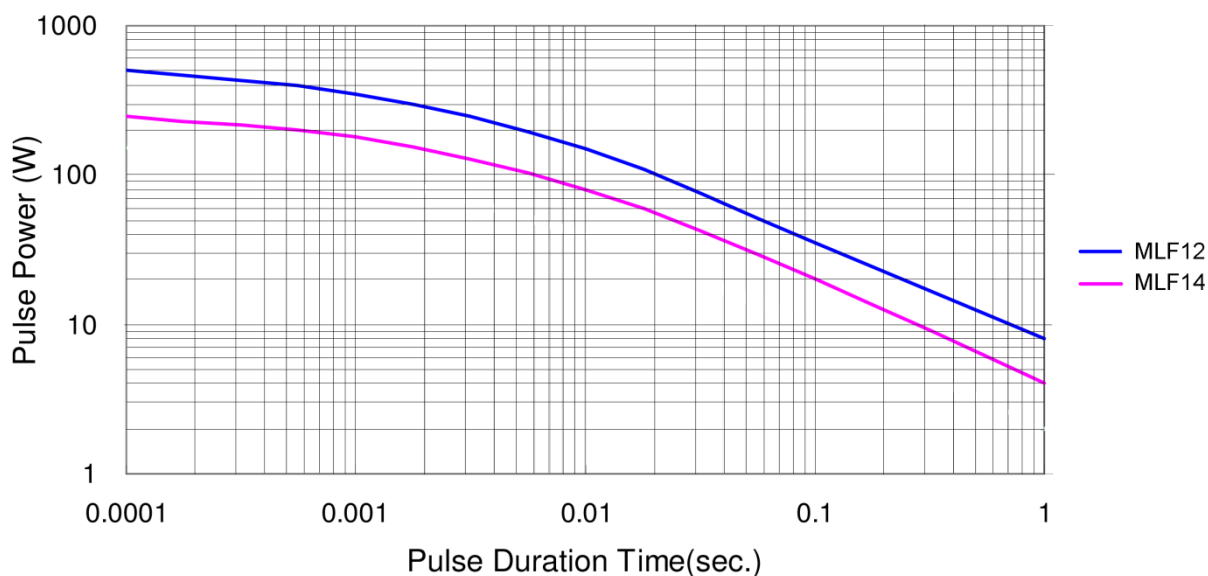
How to Order

1	2	3	4	5	6	7	8	9	10	11	12
M	L	F	1	2	D	T	E	4	K	7	5
Product Series		Size	Power	Tolerance			Packaging		TCR		Resistance Value
MLF	Standard	18	0.125W	Code	Tol	Value	Code	Description	Size	Quantity	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
MLFM	Mini	15	0.2W	B	0.1%	E96, E24	T	7" Reel	18, 15, 14	3,000	
		14	0.25W	D	0.5%			Plastic Tape	12, 1	2,000	
		12	0.5W	F	1%						
		1	1W	J	5%	E24					
				Z	jumper						

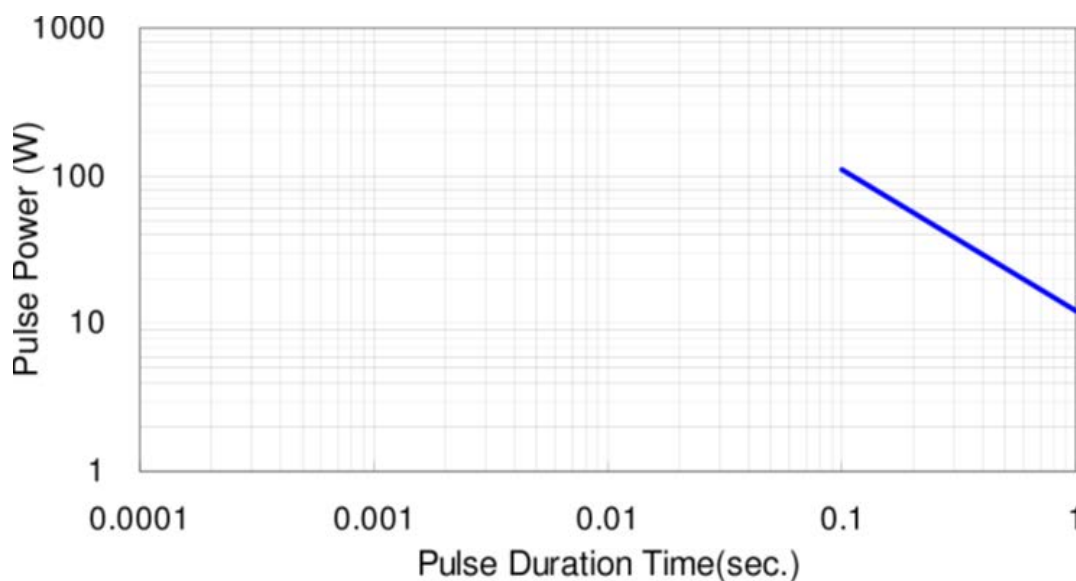
Pulse withstanding capacity

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.

MLF Series Single Pulse (100 Ohm)



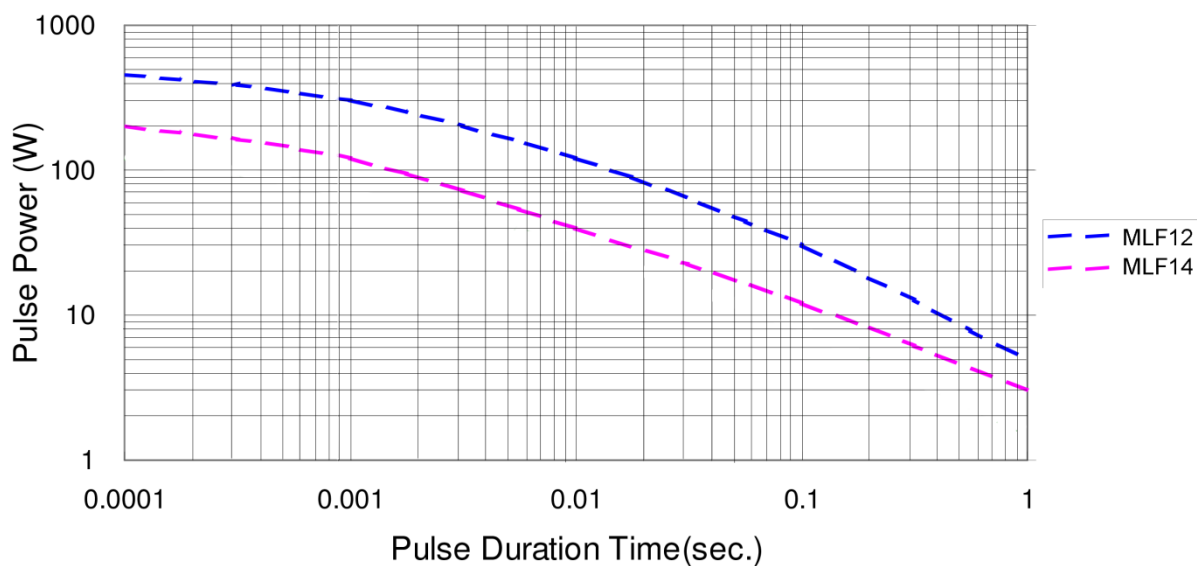
MLFM1 Single Pulse (1 Kohm)



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 70°C. Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.

MLF Series Continuous Pulse (100 Ohm)

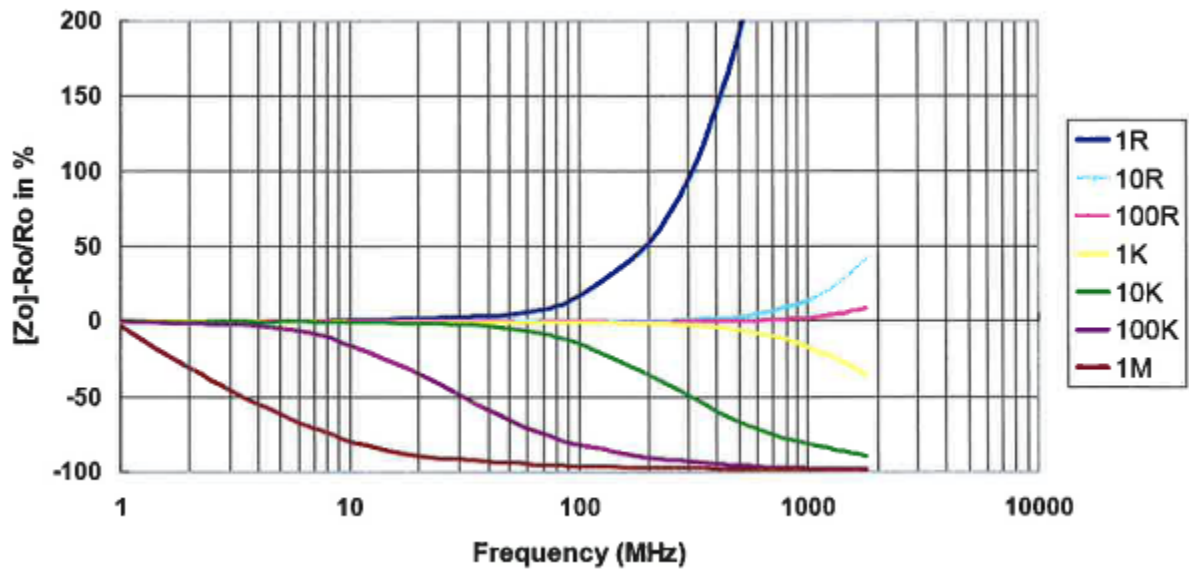


Frequency behavior

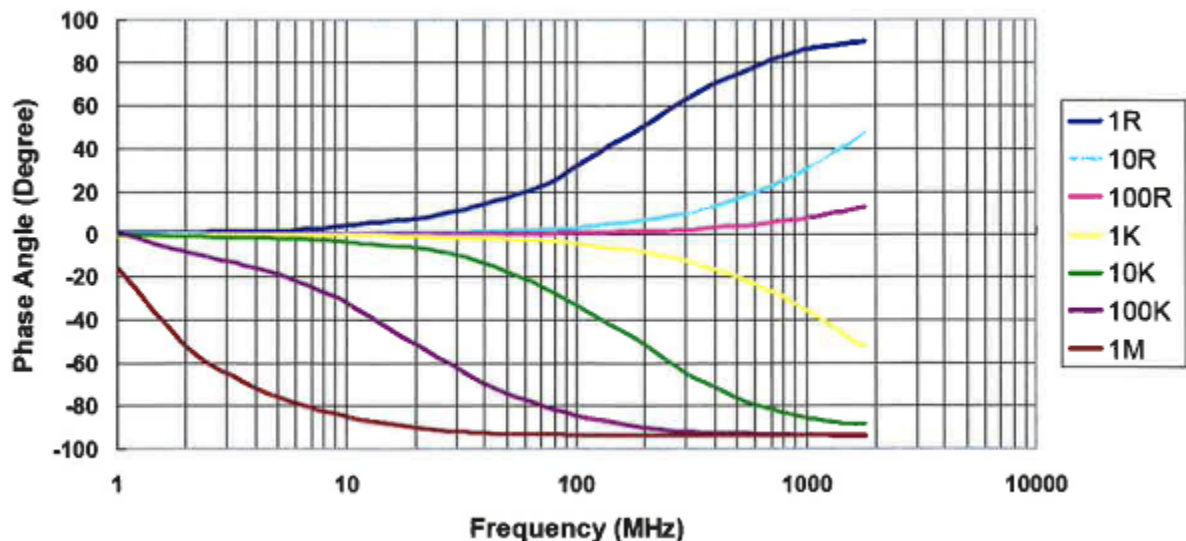
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100 kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The 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.

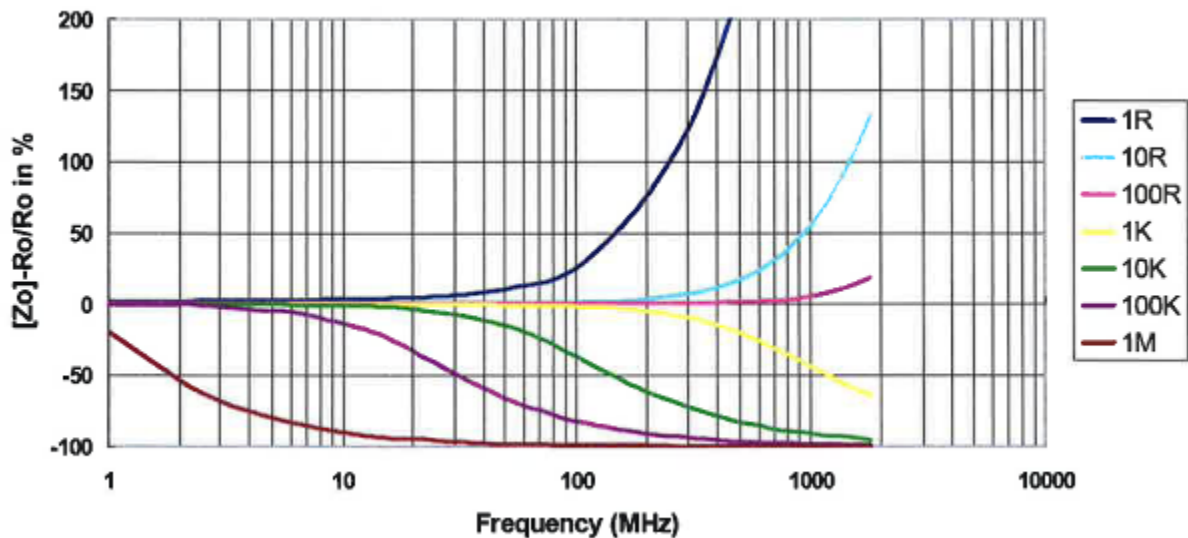
Frequency versus Impedance MLF14



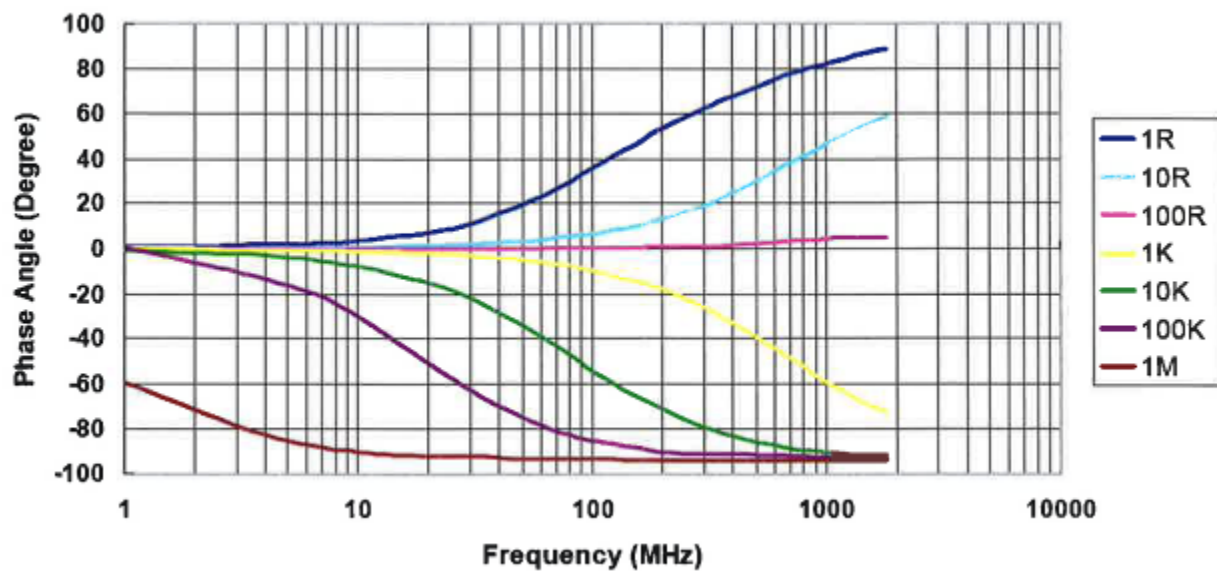
Frequency versus Phase Angle MLF14



**Frequency versus Impedance
MLF12**



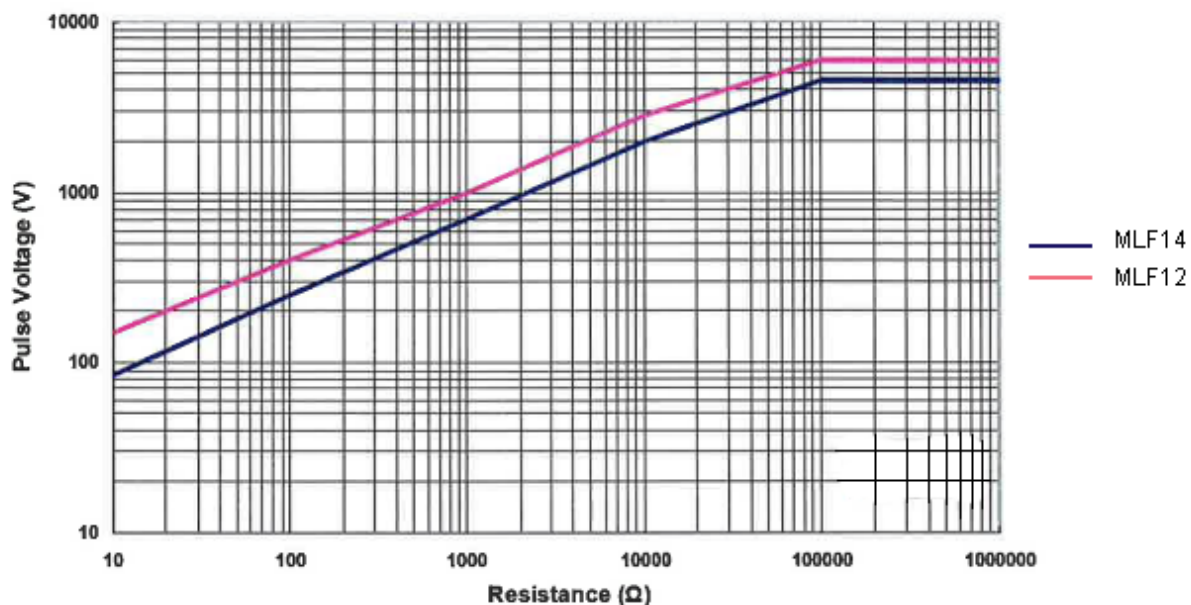
**Frequency versus Phase Angle
MLF12**



Lightning Surge

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

1.2/50 μ s Lightning Surge



10/700 μ s Lightning Surge

