



# Series MHQ

This range offers the highest 'Q' factor available in fixed ceramic capacitors with a minimum of 5,000 at 1MHz and typical values in excess of 10,000.

The fine silver leads are bonded to the capacitor element using a unique solderless process conferring the ability of operation at temperatures well in excess of the melting point of solder and assuring a very low dissipation factor.

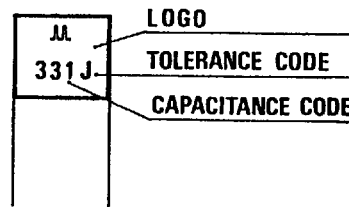
The proprietary ceramic multilayer construction permits high power handling capabilities per unit volume and reliable operation under severe environmental conditions. The glass encapsulation of the MHQ 1, 2 and 3 styles gives the added benefits of maximum resistance to moisture and surface contaminants.

The leadless unencapsulated chips are ideal where low inductance is critical.

For non-standard values and tolerances and other special requirements contact our technical department.

- Glass encapsulated, leaded, or unencapsulated chips.
- Leaded types available with fine silver ribbon or wire in axial or radial configuration.
- Multilayer construction offering high power handling capability per unit volume.
- Designed for direct mounting to microwave substrates, P.C.B.'s and hybrid circuits.
- Standard range 0.5pF to 3000pF.
- 'Q' 5000 min at 1MHz and 25°C for C ≤ 1000pF.
- 55°C to +125°C operation.

### Standard Marking:



### Technical Data

#### Temperature Range

-55°C to +125°C without derating

#### Capacitance Tolerance:

±10%, ±5%, ±2%, ±1%, ±0.5pF ±0.25pF

#### Capacitance Temperature Coefficient:

+90 ± 20ppm/°C at 1MHz over the range -55 to +125°C. (see graph on p. 32, Fig. 2).

#### Capacitance Long Term Stability

When stressed at 150% of rated voltage for 2000 hours at +125°C the change in capacitance should not exceed 0.5% or 0.5pF, whichever is the greater, of the value measured at 25°C.

#### 'Q'

5000 min. at 1MHz and +25°C for capacitance values not exceeding 1000pF.

#### Dissipation Factor:

< 0.0002 at 1KHz and +25°C for capacitance values above 1000pF

#### Insulation Resistance:

At +25°C >10<sup>6</sup> MΩ

At +125°C >10<sup>5</sup> MΩ or 500 ohm farads

**Dielectric Test Voltage:** Twice rated d.c. voltage

**Typical Characteristics:** See pages 32,33 and 35.

### Ordering information

MHQ	0	2	13	1	J
Type Designation	Configurations	Case Size	Capacitance Code	No. of Zeros	Capacitance Tolerance
Chip Capacitor	0	1	First two digits of capacitance value	Following the two digits of capacitance value in pF.	C=± .25pF G= ± 2%
Axial Ribbon	1	2	in pF (R signifies decimal point)	value in pF.	D=± .50pF J= ± 5%
Axial Wire	2	3			F= ± 1% K= ±10%
Radial Wire	3	4			Note:± 0.1pF available on special request for low capacitance values.
		5			

Example shown is a Case Style MHQ02 130pF ±5% with a maximum WV d.c. of 300

# Multilayer Miniature High "Q" Ceramic Capacitors

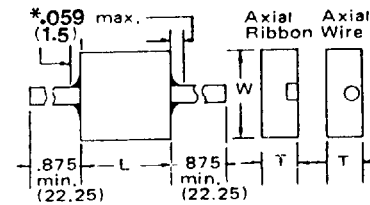


## Series MHQ

### Outline Drawings and Dimensions

#### Axial Ribbon & Axial Wire Leads

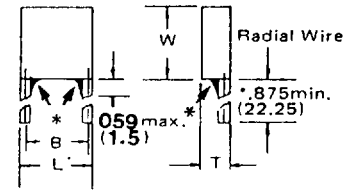
Styles		Case size				Wire Diameter		Ribbon Lead Size	
Axial Ribbon	Axial Wire	L & W		T		inch ±0.03	mm. ±0.08	inch ±.003	mm. ±0.08
		inch	mm.	inch	mm.				
MHQ 11	MHQ 21	.109±.041	2.75±1.00	.062±.039	1.55±1.00	.023	0.58	.050x.010	1.25x0.25
MHQ 12	MHQ 22	.140±.041	3.55±1.00	.062±.039	1.55±1.00	.023	0.58	.050x.010	1.25x0.25
MHQ 13	MHQ 23	.187±.041	4.75±1.00	.078±.051	2.00±1.30	.023	0.58	.050x.010	1.25x0.25
MHQ 14	MHQ 24	.250±.041	6.35±1.00	.078±.051	2.00±1.30	.023	0.58	.050x.010	1.25x0.25
MHQ 15	MHQ 25	.406±.041	10.30±1.00	.078±.051	2.00±1.30	.023	0.58	.050x.010	1.25x0.25



Note: MHQ11 and MHQ21 are available with wire leads on special order only.  
All units available in extended capacitance range: reduced voltage rating and/or increased thickness may be necessary.

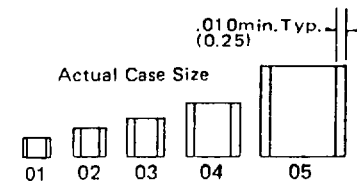
#### Radial Wire Leads

Styles	Case size					Wire Diameter		
	L & W		T		B		inch ±.003	mm. ±0.8
	inch	mm.	inch	mm.	inch ±0.03	mm. ±0.8		
MHQ 32	.140±.039	3.55±1.00	.062±.039	1.55±1.00	.123	3.10	0.23	0.58
MHQ 33	.187±.039	4.75±1.00	.078±.039	2.00±1.00	.175	4.45	0.23	0.58
MHQ 34	.250±.039	6.35±1.00	.078±.039	2.00±1.00	.225	5.70	0.23	0.58
MHQ 35	.406±.039	10.30±1.00	.078±.039	2.00±1.00	.375	9.50	0.23	0.58



#### Unencapsulated Chips

Styles	MAX. CAP. (pF)		L & W max.		T max.	
	300 WVDC		inches	mm.	inches	mm.
MHQ 01	62	other voltages can be ordered as specials	.119	3.02	.060	1.50
MHQ 02	130		.150	3.81	.060	1.50
MHQ 03	470		.200	5.08	.080	2.00
MHQ 04	680		.270	6.86	.080	2.00
MHQ 05	2000		.425	10.79	.090	2.29



\* Glass meniscus can extend .059 (1.5) max. from the body of the capacitor, it can be held closer on special order.



# Series MHQ

## Standard Capacitance Values (pF)

Available Case	Cap. Code	Cap. (pF)	Cap. Tolerance						WV d.c.		Available Case	Cap. Code	Cap. (pF)	Cap. Tolerance						WV d.c.							
			C	D	F	G	J	K	200	300				C	D	F	G	J	K	200	300						
MHQ 01 MHQ 11 MHQ 21	OR5	0.5								MHQ 02 MHQ 12 MHQ 22 MHQ 32	680	68							MHQ 03 MHQ 13 MHQ 23 MHQ 33	151	150						
	1R0	1.0							750		75							161		160							
	1R5	1.5							820		82							181		180							
	2R2	2.2							910		91							201		200							
	2R7	2.7							101		100							221		220							
	3R0	3.0							111		110							241		240							
	3R3	3.3							121		120							271		270							
	3R6	3.6							131		130							301		300							
	3R9	3.9							111		110							331		330							
	4R3	4.3							121		120							361		360							
4R7	4.7							131	130							391	390										
MHQ 01 MHQ 02 MHQ 12 MHQ 22 MHQ 32	5R1	5.1							MHQ 04 MHQ 14 MHQ 24 MHQ 34	511	510						MHQ 05 MHQ 15 MHQ 25 MHQ 35	112	1100								
	5R6	5.6						561		560						122		1200									
	6R2	6.2						621		620						132		1300									
	6R8	6.8						681		680						152		1500									
	7R5	7.5						751		750						162		1600									
	8R2	8.2						821		820						182		1800									
	9R1	9.1						911		910						202		2000									
	100	10						102		1000						222		2200									
	110	11						112		1100						242		2400									
	120	12						122		1200						272		2700									
	130	13						132		1300						302		3000									
	150	15						152		1500																	
	160	16						162		1600																	
	180	18						182		1800																	
	200	20						202		2000																	
	220	22						222		2200																	
	240	24						242		2400																	
	270	27						272		2700																	
300	30						302	3000																			



# Series MHP, MHQ

Fig. 5 Typical Retrace Characteristics

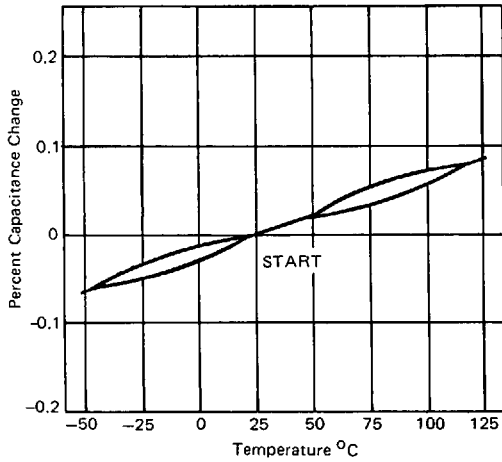


Fig. 6 Capacitance Drift vs Capacitance

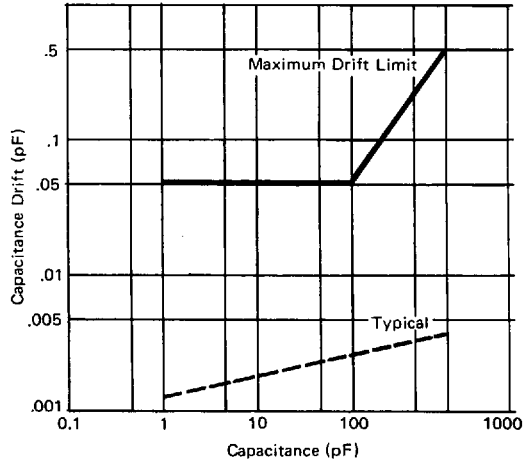


Fig. 7 Typical 'Q' vs Frequency

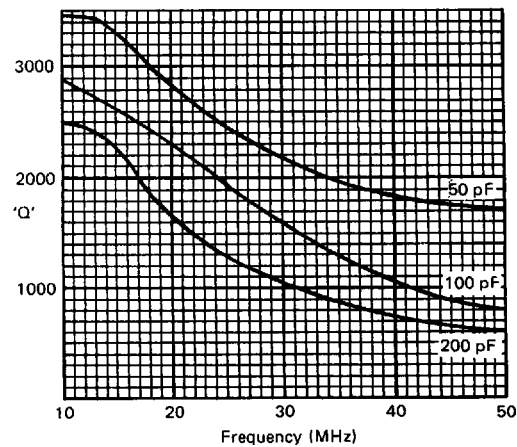
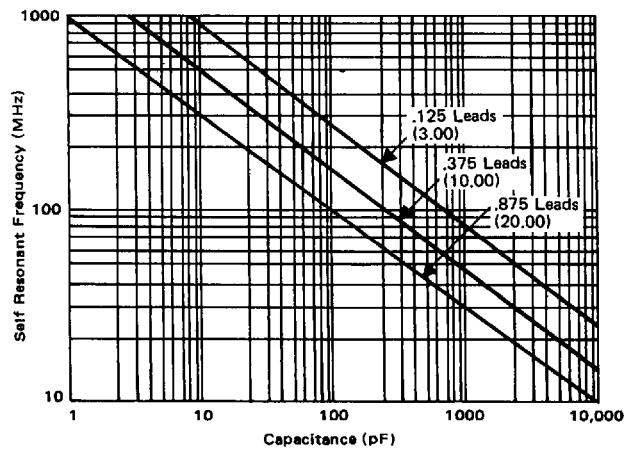


Fig. 9 Self-Resonant Frequency vs Capacitance of MHQ Capacitors





# Series MHP, MHQ, MPV

At the operating frequency the capacitive impedance is calculated as:

$$Z_c = \frac{1}{2\pi fC}$$

Where f is the frequency and C denotes the capacitance.

1. If  $Z_c > Z_{VL}$ , the voltage limiting impedance shown in the table, then the capacitor is voltage limited.
2. If  $Z_c < Z_{IL}$ , the current limiting impedance shown in the table, then the capacitor is current limited.
3. If  $Z_{IL} < Z_c < Z_{VL}$ , the capacitor is reactive power limited. Voltage and current is calculated according to the formulae:

$$V = \sqrt{P_R \times Z_c} \quad I = \sqrt{\frac{P_R}{Z_c}}$$

where  $P_R$  denotes the reactive power rating shown in the table.

## RF Rating and Limiting Data for Leaded Devices

Style	Capacitance Range (pF)	RF at 25° c		Limiting Impedance (OHMS)		Reactive Power Rating KW
		Voltage r.m.s	Current r.m.s	Voltage	Current	
MHQX2	0.5-130	300	1.4	450	100	0.2
MHQX3	150-470		2	167	135	0.54
MHQX4	510-680		3		128	111
	750-1000	111				
MHQX5	1100-2000	300	5	90	40	1.0
	2200-3000	200		40		
MPVA 81	10-360	500	3.5	166		1
MPVA 83	390-1000		5.5	100		2
MPVC 81	10-360	500	3.5	150		2
MPVC 83	390-1000		5.5	100		4
MPVS 81	10-130	2000	3.5	4000	81.6	1
MPVS 82	150-360			2000	163.3	2
MPVS 83	390-1000		5.5	1000	132.2	4
MPVI 81	10-130	2000	3.5	2000	163.5	2
MPVI 82	150-360			1000	326.5	4
MPVI 83	390-1000		5.5	500	264	8
MPVO 10	5-91	500	3.5	150		2
	100-220	200				
	240-300	100				
MHP 1	10-390	2500	12	520.8	83.3	12
	430-680	1800		540	41.7	6
	750-2200	700		81.7	41.7	6
	2400-3000	425		60.2	20.8	3
MHP 2	10-75	5000	12	1388.9	125.0	18
MHP 3	82-150	5000	12	1388.9	125.0	18
	160-330	3500		680.6	125.0	18
	360-620	2500		520.8	83.3	12

### Standard capacitance values (pF)

MHP1					MHP2		MHP3	
10	33	100	330	1.000	10	33	82	240
11	36	110	360	1.100	11	36	91	270
12	39	120	390	1.200	12	39	100	300
13	43	130	430	1.300	13	43	110	330
15	47	150	470	1.500	15	47	120	360
16	51	160	510	1.600	16	51	130	390
18	56	180	560	1.800	18	56	150	430
20	62	200	620	2.000	20	62	160	470
22	68	220	680	2.200	22	68	180	510
24	75	240	750	2.400	24	75	200	560
27	82	270	820	2.700	27		220	620
30	91	300	910	3.000	30			



# Series MHP, MHQ, MPV

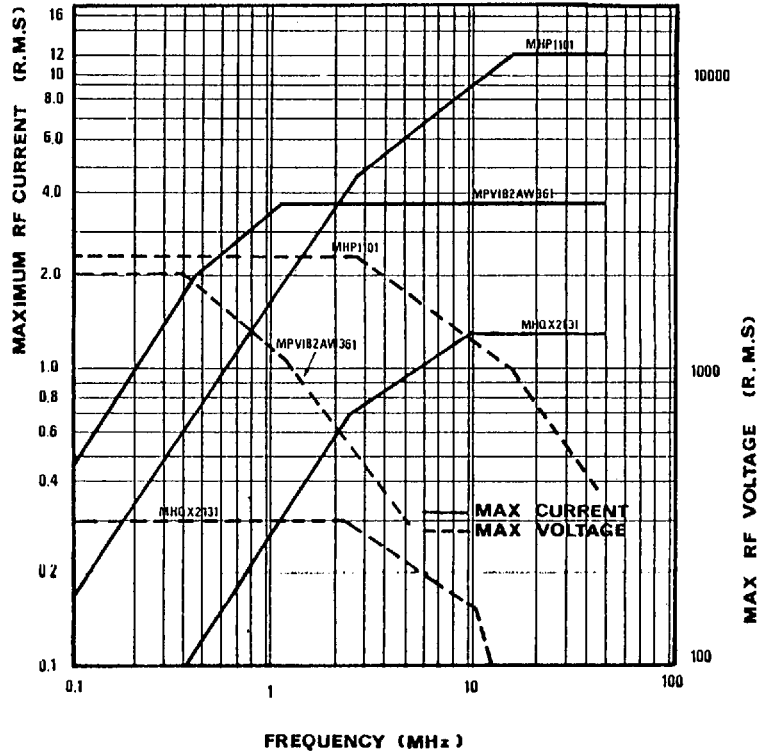
## Electrical derating factors

For operation between 85°C and 150°C the adjacent derating factors apply for the MPV, MHQ, MHP capacitors.

For operation above 150°C and up to 200°C consult Technical Department.

## Derating Factor Table

	RF Voltage Limited (V)	RF Current I (A)	Reactive Power Limited
MHQ MPV	- 1.25%/°C	- 0.4%/°C	- 0.5%/°C
MHP	- 0.16%/°C	- 0.4%/°C	- 0.5%/°C



## Ordering Information

MHP	1	15	1	K
Type designation	Case Size	Capacitance Code	No. of Zeros	Tolerance
	1	First two digits of capacitance value	Following the first two digits of capacitance value in pF.	*D = ± 5pF (10pF & below)
	2	in pF.		J = ± 5%
	3			K = ± 10%

\* For values below 10pF on MHP2 Style consult our technical department.  
 Example shown is a style MHP1 150pF ± 10% with a maximum WV d.c. of 3600.

MPVS 81	AW	201	J	S
Series Designation	Lead Style	Capacitance Code	Tolerance Code	S = Short Lead L = Long Lead Option
	AW= Axial Wire RW= Radial Wire only for MPVO Series P = Pellet	First two digits of capacitance in pF - Third digit is multiplier eg: no of zeros.	K ± 10% J ± 5% G ± 2% F ± 1% D ± 0.5pF C ± 0.25pF B ± 0.1 pF Special option to 0.1% consult Tech. DEPT.	