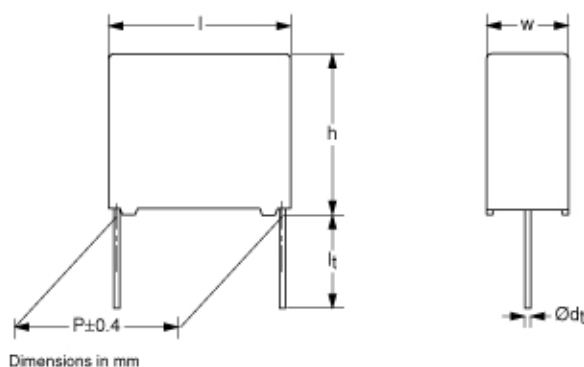


# AC and Pulse Metallized Polypropylene Film Capacitors

## MKP/MKP Radial Potted Type



### FEATURES

15 to 27.5 mm pitch. Supplied loose in box and taped on reel

Lead (Pb)-free product

RoHS-compliant product



**RoHS**  
COMPLIANT

### RATED (DC) VOLTAGE

630 V; 1000 V; 1600 V; 2000 V

### RATED (AC) VOLTAGE

300 V; 400 V; 500 V; 600 V

### RATED PEAK-TO-PEAK VOLTAGE

850 V; 1130 V; 1400 V; 1700 V

### CLIMATIC CATEGORY

55/085/56

### RATED (DC) TEMPERATURE

85 °C

### RATED (AC) TEMPERATURE

70 °C

### MAXIMUM APPLICATION TEMPERATURE

85 °C

### REFERENCE SPECIFICATIONS

IEC 60384-17

### PERFORMANCE GRADE

Grade 1 (long life)

### STABILITY GRADE

Pitch 15 mm: grade 2

Pitch 22.5 and 27.5 mm: grade 1

### DETAIL SPECIFICATION

For more detailed data and test requirements see "Type detail specification HQN-384-17/102"

### APPLICATIONS

Where steep pulses occur e.g. SMPS (switch mode power supplies). Motor control circuits. It is not advised to use these products as resonance capacitors in fly-back applications.

### MARKING

C-value; tolerance; rated voltage; manufacturer's type designation; code for dielectric material; manufacturer's emblem; code for factory of origin; year and week of manufacture

### DIELECTRIC

Polypropylene film

### ELECTRODES

Metallized film

### ENCAPSULATION

Flame retardant plastic case and epoxy resin (UL-class 94 V-0)

### CONSTRUCTION

Internal serial construction

### LEADS

Tinned wire

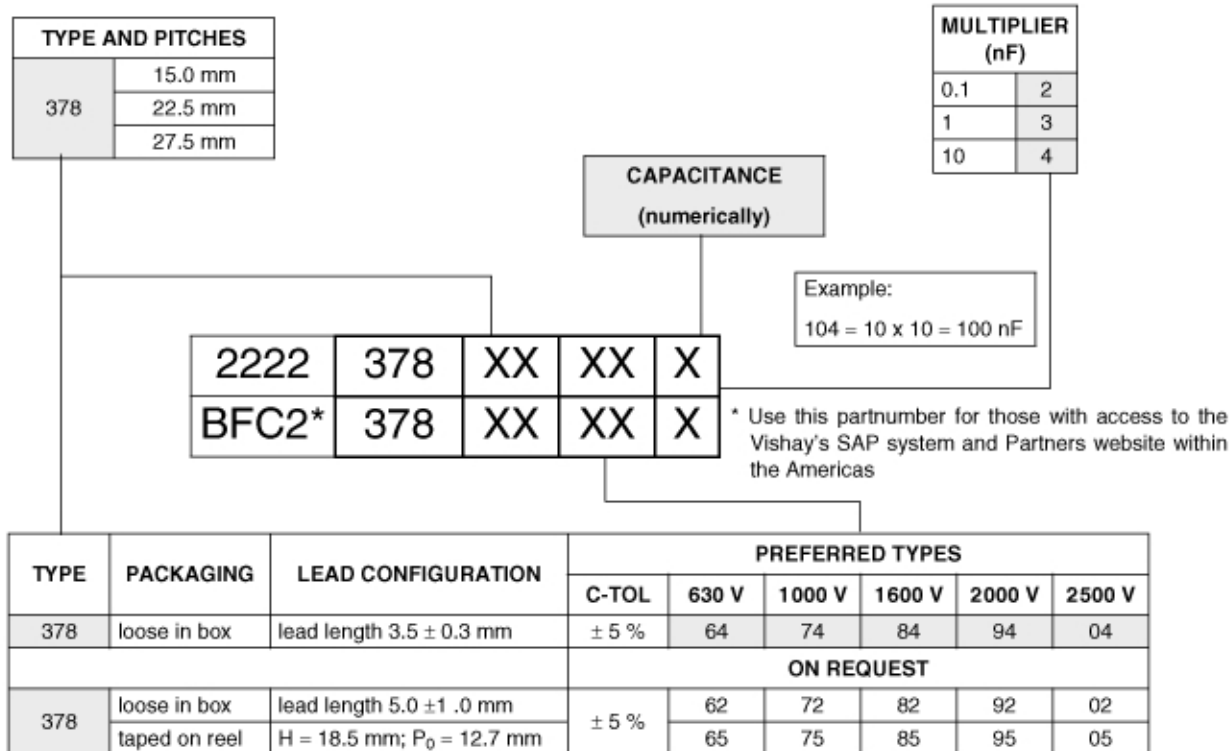
### CAPACITANCE RANGE (E24 SERIES)

0.002 to 0.68  $\mu$ F

### CAPACITANCE TOLERANCE

$\pm$  5 %

### COMPOSITION OF CATAOG NUMBER



### SPECIFIC REFERENCE DATA (630 VDC)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle:		
C ≤ 0.18 μF	≤ 8 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup>
0.2 μF ≤ C ≤ 0.3 μF	≤ 10 × 10 <sup>-4</sup>	≤ 25 × 10 <sup>-4</sup>
0.33 μF ≤ C ≤ 0.39 μF	≤ 10 × 10 <sup>-4</sup>	≤ 30 × 10 <sup>-4</sup>
0.43 μF ≤ C ≤ 0.51 μF	≤ 10 × 10 <sup>-4</sup>	≤ 40 × 10 <sup>-4</sup>
C > 0.51 μF	≤ 10 × 10 <sup>-4</sup>	≤ 45 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> :		
P = 15 mm	500 V/μs	
P = 22.5 mm	370 V/μs	
P = 27.5 mm	230 V/μs (b < 15 mm)	
P = 27.5 mm	120 V/μs (b ≥ 15 mm)	
R between leads, for C ≤ 1 μF; 500 V; 1 minute	> 100000 MΩ	
R between leads and case; 500 V; 1 minute	> 100000 MΩ	
Ionization (AC)voltage (typical value) at 50 pC peak discharge	> 400 V	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1008 V; 1 minute	
Withstanding (DC) voltage between leads and case	2840 V; 1 minute	

$U_{Rdc} = 630 \text{ V}; U_{Rac} = 300 \text{ V}; U_{p-p} = 850 \text{ V}$ 

C ( $\mu\text{F}$ )	DIMENSIONS W × H × L (mm)	MASS (g)	CATAOG NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	ALL LEADS	SPQ
			C-tol = $\pm 5 \%$	SPQ	
LAST 5 DIGITS OF CATAOG NUMBER			SPQ		SPQ
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}; d_t = 0.60 \pm 0.06 \text{ mm}</math></b>					
0.015	5.0 × 11.0 × 17.5	1.2	64153	1000	1100
0.016			64163		
0.018			64183		
0.02			64203		
0.022			64223		
0.024	6.0 × 12.0 × 17.5	1.4	64243	1000	900
0.027			64273		
0.03			64303		
0.033			64333		
<b>Pitch = <math>15.0 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.036	7.0 × 13.5 × 17.5	1.9	64363	1000	800
0.039			64393		
0.043			64433		
0.047	8.5 × 15.0 × 17.5	2.6	64473	1000	650
0.051			64513		
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.068	7.0 × 16.5 × 26.0	3.2	64683	200	550
0.075			64753		
0.082			64823		
0.091			64913		
0.1	8.5 × 18.0 × 26.0	4.4	64104	200	450
0.11			64114		
0.12			64124		
0.13			64134		
0.15	10.0 × 19.5 × 26.0	5.5	64154	200	350
0.16			64164		
0.18			64184		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.2	11.0 × 21.0 × 31.0	7.8	64204	100	
0.22			64224		
0.24			64244		
0.27			64274		
0.3	13.0 × 23.0 × 31.0	10.4	64304	100	
0.33			64334		
0.36			64364		
0.39			64394		
0.43	15.0 × 25.0 × 31.0	12.8	64434	100	
0.47			64474		
0.51			64514		
0.56	18.0 × 28.0 × 31.0	17.2	64564	100	
0.62			64624		
0.68			64684		

## SPECIFIC REFERENCE DATA (1000 VDC)

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: C ≤ 0.051 μF 0.056 μF ≤ C ≤ 0.22 μF	≤ 6 × 10 <sup>-4</sup> ≤ 8 × 10 <sup>-4</sup>	≤ 15 × 10 <sup>-4</sup> ≤ 20 × 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> : P = 15 mm P = 22.5 mm P = 27.5 mm P = 27.5 mm	1300 V/μs 1200 V/μs 600 V/μs (b < 15 mm) 300 V/μs (b ≥ 15 mm)	
R between leads, for C ≤ 1 μF; 500 V; 1 minute	> 100000 MΩ	
R between leads and case; 500 V; 1 minute	> 100000 MΩ	
Ionization (AC)voltage (typical value) at 50 pC peak discharge	> 500 V	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1600 V; 1 minute	
Withstanding (DC) voltage between leads and case	2840 V; 1 minute	

 $U_{Rdc} = 1000 \text{ V}; U_{Rac} = 400 \text{ V}; U_{p-p} = 1130 \text{ V}$ 

C (μF)	DIMENSIONS W × H × L (mm)	MASS (g)	CATAOG NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			l <sub>t</sub> = 3.5 ± 0.3 mm	ALL LEADS	SPQ
			C-tol = ± 5 %	SPQ	
LAST 5 DIGITS OF CATAOG NUMBER			SPQ	SPQ	
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>					
0.003	5.0 × 11.0 × 17.5	1.2	74302	1000	1100
0.0033			74332		
0.0036			74362		
0.0039			74392		
0.0043			74432		
0.0047			74472		
0.0051			74512		
0.0056			74562		
0.0062			74622		
0.0068			74682		
0.0075			74752		
0.0082	6.0 × 12.0 × 17.5	1.4	74822	1100	900
0.0091			74912		
0.01			74103		
0.011			74113		
<b>Pitch = 22.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>					
0.02	7.0 × 16.5 × 26.0	3.2	74203	200	550
0.022			74223		
0.024			74243		
0.027	8.5 × 18.0 × 26.0	4.4	74273	200	450
0.03			74303		
0.033			74333		
0.036			74363		
0.039	10.0 × 19.5 × 26.0	5.5	74393	200	350
0.043			74433		
0.047			74473		
0.051			74513		

C ( $\mu\text{F}$ )	DIMENSIONS W × H × L (mm)	MASS (g)	CATAOG NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	ALL LEADS	SPQ
			C-tol = $\pm 5 \%$	SPQ	
LAST 5 DIGITS OF CATAOG NUMBER			SPQ		SPQ
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.056	11.0 × 21.0 × 31.0	7.8	74563	100	
0.062			74623		
0.068			74683		
0.075			74753		
0.082			74823		
0.091	13.0 × 23.0 × 31.0	10.4	74913	100	
0.1			74104		
0.11			74114		
0.12	15.0 × 25.0 × 31.0	12.8	74124	100	
0.13			74134		
0.15			74154		
0.16	18.0 × 28.0 × 31.0	17.5	74164	100	
0.18			74184		
0.2			74204		
0.22			74224		

**SPECIFIC REFERENCE DATA (1600 VDC)**

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
$C \leq 0.022 \mu\text{F}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
$0.024 \mu\text{F} \leq C \leq 0.1 \mu\text{F}$	$\leq 6 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at 1600 V <sub>(DC)</sub> :	1600 V/ $\mu\text{s}$	
P = 22.5 mm	900 V/ $\mu\text{s}$ (b < 15 mm)	
P = 27.5 mm	450 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads, for $C \leq 1 \mu\text{F}$ ; 500 V; 1 minute	> 100000 M $\Omega$	
R between leads and case; 500 V; 1 minute	> 100000 M $\Omega$	
Ionization (AC)voltage (typical value) at 20 pC peak discharge	> 600 V	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	2560 V; 1 minute	
Withstanding (DC) voltage between leads and case	2840 V; 1 minute	

$U_{Rdc} = 1600 \text{ V}; U_{Rac} = 500 \text{ V}; U_{p-p} = 1400 \text{ V}$ 

C ( $\mu\text{F}$ )	DIMENSIONS W × H × L (mm)	MASS (g)	CATAOG NUMBER 2222 378 ..... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	ALL LEADS	SPQ
			C-tol = $\pm 5 \%$	SPQ	
LAST 5 DIGITS OF CATAOG NUMBER			SPQ		SPQ
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.0056	6.0 × 15.5 × 26.0	2.6	84562	300	600
0.0062			84622		
0.0068			84682		
0.0075	7.0 × 16.5 × 26.0	3.2	84752	200	550
0.0082			84822		
0.0091			84912		
0.01			84103		
0.011	8.5 × 18.0 × 26.0	4.4	84113	200	450
0.012			84123		
0.013			84133		
0.015			84153		
0.016			84163		
0.018	10.0 × 19.5 × 26.0	5.5	84183	200	350
0.02			84203		
0.022			84223		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}; d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.024	11.0 × 21.0 × 31.0	7.8	84243	100	
0.027			84273		
0.03			84303		
0.033			84333		
0.036			84363		
0.039	13.0 × 23.0 × 31.0	10.4	84393	100	
0.043			84433		
0.047			84473		
0.051			84513		
0.056	15.0 × 25.0 × 31.0	12.8	84563	100	
0.062			84623		
0.068			84683		
0.075	18.0 × 28.0 × 31.0	17.2	84753	100	
0.082			84823		
0.091			84913		
0.1			84104		

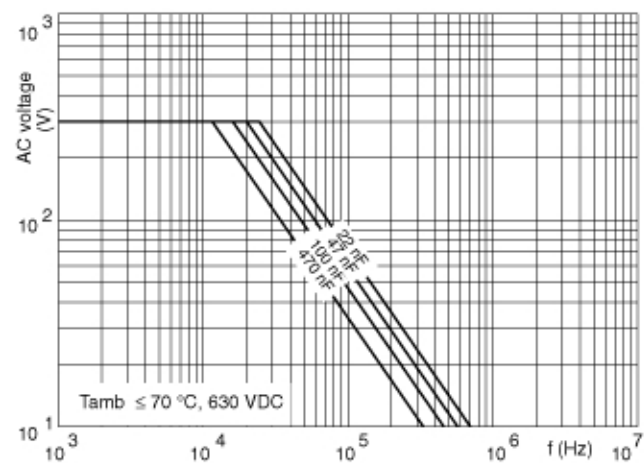
**SPECIFIC REFERENCE DATA (2000 VDC)**

DESCRIPTION	VALUE	
	at 10 kHz	at 100 kHz
Tangent of loss angle: $C \leq 0.051 \mu\text{F}$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$ at 2000 V (DC): P = 22.5 mm P = 27.5 mm P = 27.5 mm	2000 V/ $\mu\text{s}$ 1200 V/ $\mu\text{s}$ (b < 15 mm) 600 V/ $\mu\text{s}$ (b $\geq$ 15 mm)	
R between leads, for $C \leq 1 \mu\text{F}$ ; 500 V; 1 minute	> 100000 M $\Omega$	
R between leads and case; 500 V; 1 minute	> 100000 M $\Omega$	
Ionization (AC)voltage (typical value) at 20 pC peak discharge	> 600 V	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	3200 V; 1 minute	
Withstanding (DC) voltage between leads and case	2840 V; 1 minute	

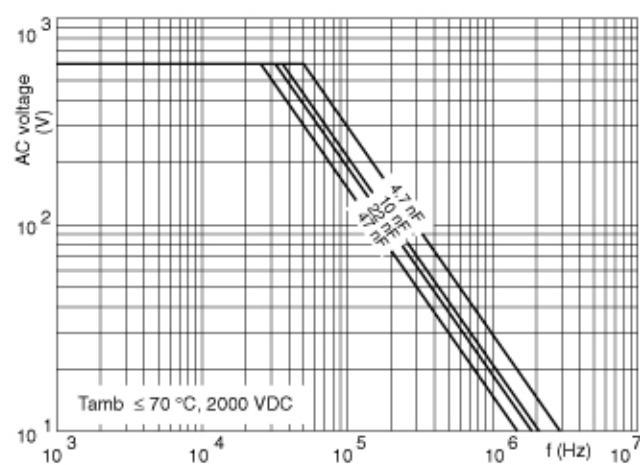
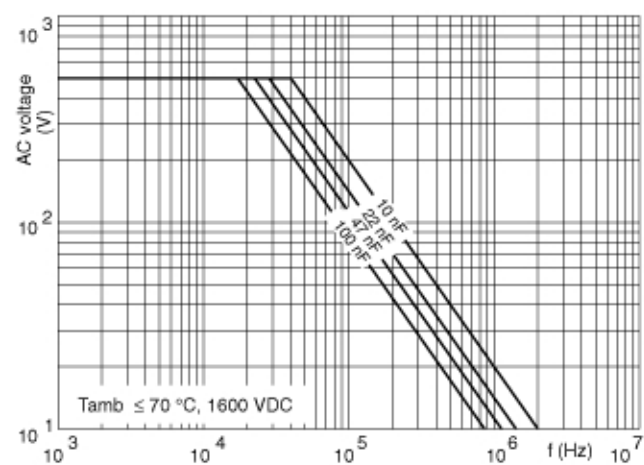
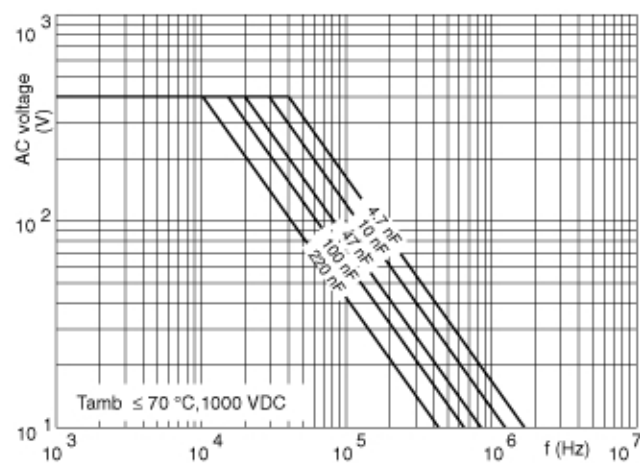
 **$U_{Rdc} = 2000 \text{ V}$ ;  $U_{Rac} = 600 \text{ V}$ ;  $U_{p-p} = 1700 \text{ V}$** 

C ( $\mu\text{F}$ )	DIMENSIONS W × H × L (mm)	MASS (g)	CATAOG NUMBER 2222 378 .... AND PACKAGING		
			LOOSE IN BOX		REEL
			$l_t = 3.5 \pm 0.3 \text{ mm}$	ALL LEADS	SPQ
			C-tol = $\pm 5 \%$	SPQ	
LAST 5 DIGITS OF CATAOG NUMBER			SPQ	SPQ	
<b>Pitch = <math>22.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.0033	6.0 × 15.5 × 26.0	2.6	94332	300	600
0.0036			94362		
0.0039	7.0 × 16.5 × 26.0	3.2	94392	200	550
0.0043			94432		
0.0047			94472		
0.0051			94512		
0.0056	8.5 × 18.0 × 26.0	4.4	94562	200	450
0.0062			94622		
0.0068			94682		
0.0075			94752		
0.0082			94822		
0.0091	10.0 × 19.5 × 26.0	5.5	94912	200	350
0.01			94103		
0.011			94113		
0.012			94123		
<b>Pitch = <math>27.5 \pm 0.4 \text{ mm}</math>; <math>d_t = 0.80 \pm 0.08 \text{ mm}</math></b>					
0.013	11.0 × 21.0 × 31.0	7.8	94133	100	
0.015			94153		
0.016			94163		
0.018			94183		
0.02			94203		
0.022	13.0 × 23.0 × 31.0	10.4	94223	100	
0.024			94243		
0.027			94273		
0.030	15.0 × 25.0 × 31.0	12.8	94303	100	
0.033			94333		
0.036			94363		
0.039	18.0 × 28.0 × 31.0	17.5	94393	100	
0.043			94433		
0.047			94473		
0.051			94513		

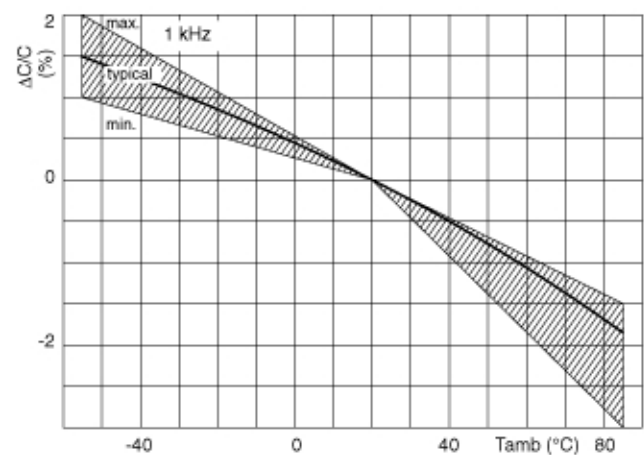
## MAXIMUM RMS VOLTAGE (SINEWAVE) AS A



## FUNCTION OF FREQUENCY



## CAPACITANCE



## IMPEDANCE

