PHE 425

- High capacitance density
- High stability
- High reliability
- MUAHAG approval
- CECC 31201-001

Applications

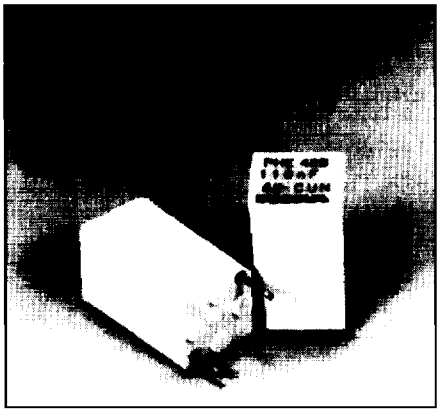
This capacitor covers 7.5×7.5 mm PCB area, and together with RM6 ferrite cores it can be designed into very dense constructions i.e. LC-filters in telephone systems or measurement equipment. Timing circuits.

Basic design

The winding in PHE 425 is metallized polypropylene. It is designed to achieve low inductance and low ESR.

The encapsulation is of self-extinguishing material (UL 94/V-O).

The capacitor will withstand all commonly used solvents and rinsing liquids without damage. The mechanical design will assure narrow dimensional tolerances and highest possible packing density on PCB.



Specification

Capitance range nF	3.3–10	3.3–10	10–35	35–135
Rated voltage U_R VDC	400	250	100	63
VAC, 50Hz	220	125	063	40
Capitance tolerance	1 %, 2 %, 5 %,			
Climatic category	55/85/56			
IEC standard	384–16, Grade 1, Stability class 1			

Technical data

Dissipation factor

Capacitance nF	Frequency kHz	tanδ × 10^4
3.3–135	1	<3
3.3–135	10	<5
3.3–34.8	100	<20
36.5–135	100	<35

Measured at + 23°C.

Insulation resistance
Measured after 60 seconds at 10 VDC for 63 VDC capacitors and at 100 VDC for 100 and 250 VDC capacitors. The test is to be done at room temperature (+ 23°C). The requirement to meet is a minimum of 200 GΩ.

Pulse rise time
The capacitors can whithstand an unlimited number of pulses whith a pulse steepness according to values given in table. The capacitors are sample tested with five times stated values and with 10,000 pulses.

Capacitance (nF)	max dU/dt (V/µs)
3.3– 10	40
10.5– 35	30
36.5–135	10

Inductance
Measured 1.5 mm from the body of the capacitor. Typical value 12 nH. Maximum value 15 nH. Add 1.5 nH/mm for extra wire length.

Terminals
Heavily tinned, low resistance wires are placed symmetrically along the base diagonal.

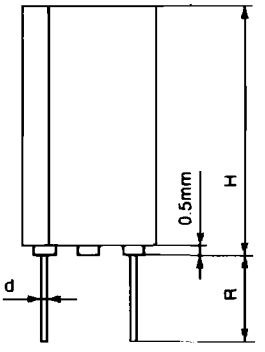
Needle flame test
According to IEC Publ. 695-2-2 with underlaying layer of tissue paper. The flame can be applied for 20 seconds, without any glowing particles falling.

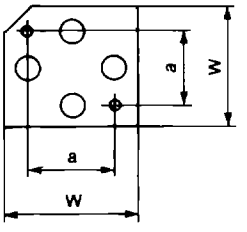
Rated capacitance
According to article table. The E12 and E48 series are preferred. Measured at + 23°C and at 1 kHz. Other values on request.

Long term stability
After three years at rated voltage, a maximum temperature of + 50°C and max 70 % relative humidity, the capacitance drift will not exceed 0.2 % + 2 pF.

Dielectric absorption
According to MIL-C-19978 B paragraph 4.6.15 the dielectric absorption is less than 0.01 %.

Reliability
The failure rate of PHE 425 is so low that reliability data referring to normal operation cannot be achieved in laboratory tests. However operational statistics for a total of 0.6×10^6 unit-hours with no failure have revealed a mean failure rate of $\leq 3\times10^{-9}$/h.





W 7.4 $\pm^{0.1}_{0}$ mm

H≤13.1 mm
a 5.08 mm
R Standard 3.1 ± 0.3 mm
Optional 6–10 mm with tolerance $\pm^{0}_{1}$ mm

d 0.6 mm
Weight 1.2 g

Temperature coefficient

Capacitance nF	Typical values ppm/°C <23°C	ppm/°C >23°C
3.3– 10	135 ± 35	170 ± 60
10.0– 35	180 ± 30	235 ± 40
35.0–135	205 ± 35	250 ± 50

Environmental and testing data

Soldering heat
According to IEC 68-2-20 Test TB, Method 1A (Solder bath 260°C during ten seconds).

The following requirements are met:
1. $\Delta C/C \geq 0.5\%$
2. The change in $\tan\delta \leq 20 \times 10^{4}$ at 100 kHz or lower than 5×10^{-4} at 10 kHz.
3. No visible damage.

Endurance test DC
2000 h at 1.25 × U_R and +85°C. The following requirements are met:
1. Insulation resistance more than 100 GΩ.
2. Other requirements according to "Soldering heat".

Endurance test AC
1000 h at 1.25 × U_R (VAC) and 85°C. The following requirements are met:
1. Insulation resistance more than 100 GΩ.
2. $\Delta C/C < 5\%$ at 1 kHz.
3. $\Delta tg\delta < 15 \times 10^{-4}$ at 1 kHz.

Test voltage
Between terminals: 1.6 × U_R (rated voltage). The capacitor will withstand the voltage above without breakdowns or flashovers for 60 seconds. Between terminals and case: 400 VDC.

Damp heat steady state
According to IEC 68-2-3 Test Ca. The same requirements as under "Solder heat" must be met after 56 days at +40°C and relative humidity of 93%. Insulation resistance ≥ 100 GΩ.

Bumps
According to IEC 68-2-29 Test Eb mounted on a PCB. 4000 bumps with a peak acceleration of 390 m/s^2. The same requirements as under "Solder heat" will be met.

Vibration
According to IEC 68-2-6 Test Fc procedure B4. Six hours with 10–2000 Hz and 0.75 mm displacement amplitude.

Low air pressure
According to IEC 68-2-13 Test M. The capacitor is to be stored at 20 mbar (2 kPa) for one hour. The last five minutes with rated voltage between the terminations. The requirements demand no breakdowns or flashovers may occur in the voltage test, and no visible damage.

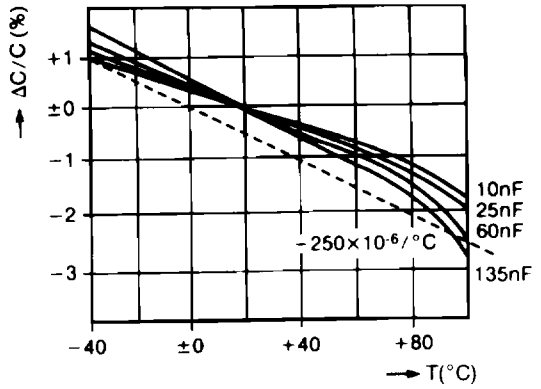
CECC-approval
PHE 425 has its properties documented in its own detail specification. Compared to the standard sectional specification the AQL levels are lower for PHE 425.
Sectional=( ).
Visual inspection, marking, dimensions, 1.0% (2.5%).
Voltage proof, C, tanδ and insulation, 0.25% (1%).
The complete detail specification will be sent on request.

Article table

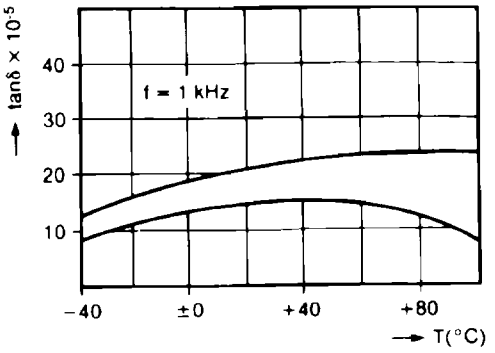
Article code	Capacitance nF	Rated voltage VDC	VAC	Quantity Std package pcs
PHE 425 KB	3.3–10	400	220	250
PHE 425 HB	3.3–10	250	125	250
PHE 425 DB	10.5–34.8	100	63	250
PHE 425 CB	36.5–135	63	40	250

Typical data graphs

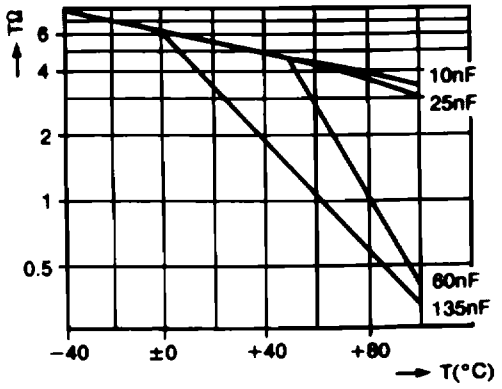
Capacitance vs. temperature



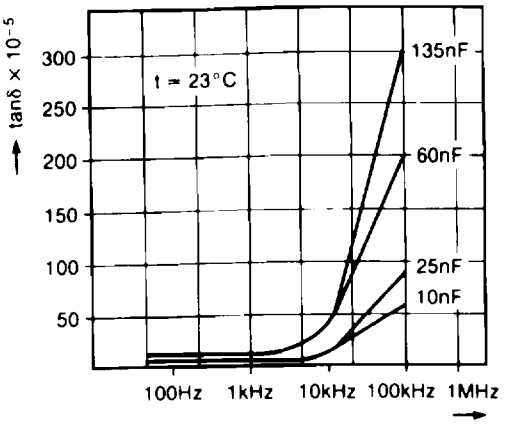
Tanδ vs. temperature



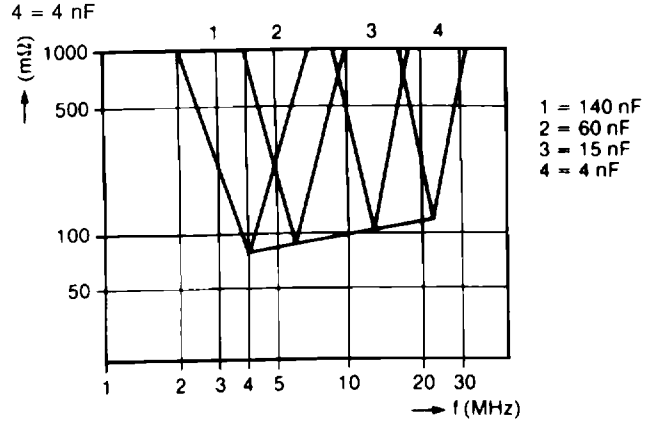
Insulation resistance vs. temperature



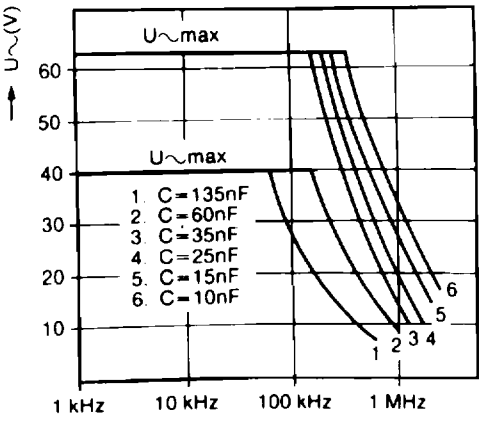
Tanδ vs. frequency



Resonance diagram (2 mm from cap. body)
1 = 135 nF
2 = 60 nF
3 = 15 nF
4 = 4 nF



Permitted AC-voltage vs. frequency



Ordering information

Article code

1st block See "Article table" and below	**2nd block** The capacitor is also available with 6 or 10 mm lead length (add R06 or R10 in pos. 14—16). Tolerance $\pm^{0}_{1}$mm.
P H E 4 2 5 D B 5 1 5 0 G	**R 0 6 C**
1 2 3 4 5 6 7 8 9 10 11 12 13	14 15 16 17 18 19 20

Pos. 9 No. of digits in cap. value (pF)
Pos. 10—12 Sign. digits.
Pos. 13 Code for tolerance J ± 5 %, G= ± 2 %, F= ± 1 %.
Pos. 14—16 Lead length (when not standard 3.1 mm).
Pos. 17 If CECC approved cap. is requested.

Marking

The capacitors are marked with:

- RIFA
- RIFA article code
- Rated capacitance
- Tolerance on rated capacitance, (see RIFA article code system on page 3)
- Rated voltage
- Code for manufacturing date (month and year)
- type designation unless otherwise specified under each detail specification.

Packing

The capacitors are packed bulk in a box with dimensions 230×155×72 mm for capacitor types PFE 210, 216 and with the dimensions 146×55×62 mm for capacitor types PFE 225, PHE 425.