

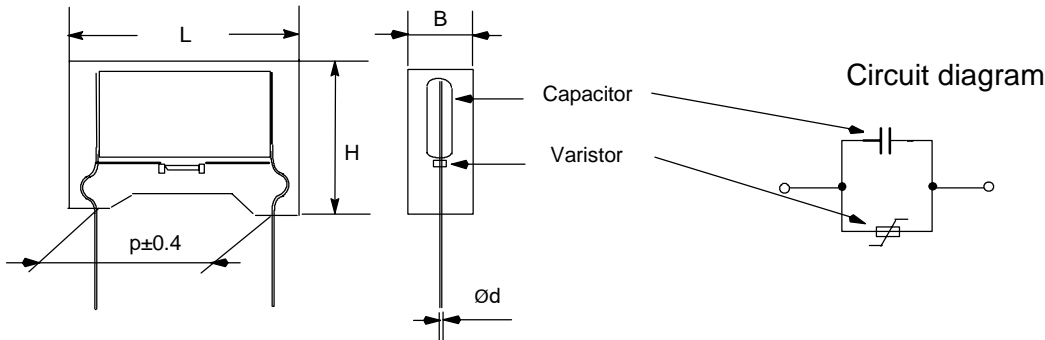
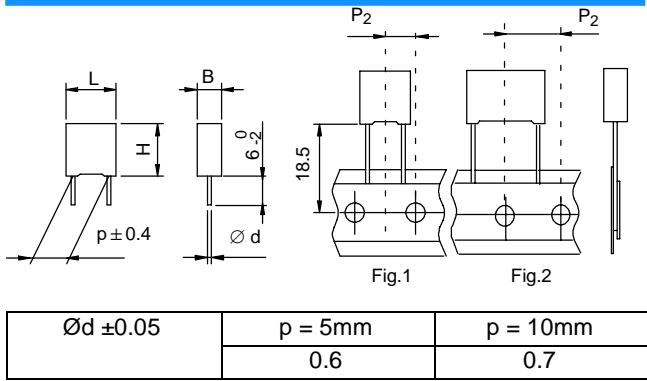
Capacitor / Varistor unit

## METALLIZED POLYESTER FILM CAPACITOR WITH INTEGRATED CERAMIC VARISTOR

**Typical applications:** these component units are used to reduce transient phenomena and act as EMI-RFI suppressors for automotive motors and other suppression applications.

- Engine blower fans
- Heating/air-conditioning blowers
- Electric window regulators
- Electric windshield wipers
- Central locking systems
- Electric sun roofs
- Fuel/oil pumps
- Electrically operated seats

PRODUCT CODE: **F5A**



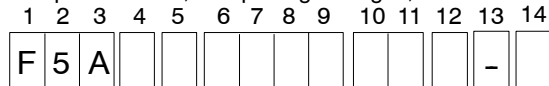
The F5A Series was designed for different suppression conditions and peak voltage limitation. Different operating and clamping voltages allow an optimal adaption to the different application requirements. Best results for suppression purposes are achieved by using low inductive MKT capacitors in parallel construction with ceramic varistor in one single case.

The leaded EMI-RFI suppression element F5A is mainly prepared for Automotive applications without PC-board (e.g. motor suppression) or mixed leaded and SMD PC-boards.

Upon customer's request there is also the possibility to create and deliver special versions.

### PRODUCT CODE SYSTEM

The part number, comprising 14 digits, is formed as follows:



Digit 1 to 3 Series code.

Digit 4 d.c. Rated voltage:

A = 5V B = 15V H = 25V J = 30V  
N = 45V C = 50V D = 63V

Digit 5 Pitch (mm): C=5; F=10

Digit 6 to 9 Digits 7 - 8 - 9 indicate the first three digits of Capacitance value and the 6th digit indicates the number of zeros that must be added to obtain the Rated Capacitance in pF.

Digit 10 to 11 Mechanical version and/or packaging (Table 1)

Digit 12 Varistor voltage (Table 2).

Digit 13 Internal use

Digit 14 Capacitance tolerance:  
J=5%; K=10%; M=20%.

### GENERAL CHARACTERISTICS

**Capacitor:** metallized polyester film (MKT).

**Varistor:** metal oxide with silver palladium plates.

**Protection:** plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL 94 V0.

**Leads:** tinned wire.

**Marking:** Manufacturer's logo (only pitch 10mm), series (F5A), capacitance, tolerance, D.C. rated voltage, manufacturing date code.

**Climatic category:** 55/125/56 IEC 60068-1

Table 1 Packaging

Standard packaging style	Lead length (mm)	Taping style			Ordering code (Digit 10 to 11)
		P <sub>2</sub> (mm)	Fig. (No)	Pitch (mm)	
AMMO-PACK		6.35	1	5	DQ
AMMO-PACK		1.27	2	10	DQ
REEL Ø 355mm		6.35	1	5	CK
REEL Ø 500mm		1.27	2	10	CK
Loose, short leads	4 +2				AA
Loose, long leads	17+1/-2				Z3

Other packaging styles are available upon request.

**METALLIZED POLYESTER FILM CAPACITOR WITH INTEGRATED CERAMIC VARISTOR**

PRODUCT CODE: F5A

**ELECTRICAL CHARACTERISTICS**

**Capacitance range:** 0.1 $\mu$ F to 3.3 $\mu$ F (see Table 3)  
**Capacitance values:** E12 series (IEC 60063 Norm).  
**Capacitance tolerance:**  $\pm$ 5% (J);  $\pm$ 10% (K);  $\pm$ 20% (M).  
**Rated voltage (V<sub>R</sub>):** 5Vdc - 15Vdc - 25Vdc - 30Vdc - 45Vdc - 50Vdc - 63Vdc

**Temperature derated voltage:**  
 for temperature over 100°C a decreasing factor of 2% per degree has to be applied on the rated voltage V<sub>R</sub>.

**Varistor voltage (V<sub>V</sub>):** 1mA (see Table 2) tol.  $\pm$ 10%  
**Varistor voltage range:** 8Vdc to 82Vdc  
**V<sub>RMS</sub> range:** 4Vac to 50Vac  
**Clamping voltage (V<sub>C</sub>):** 1A; 8/20 $\mu$ s (see Table 2).  
**Peak current (I<sub>p</sub>):** 8/20 $\mu$ s (see Table 2).  
**Transient Energy (W<sub>p</sub>):** max (2ms) (see Table 2).  
**Power dissipation (P<sub>max</sub>):** 0.008W

**Leakage current (I<sub>dc</sub>):**  $\leq$ 50 $\mu$ A @ V<sub>R</sub>

**Dissipation Factor (D.F.):**

tg $\delta$  x 10<sup>-4</sup> at 25°C  $\pm$ 5°C

kHz	tg $\delta$ x 10 <sup>-4</sup>
1	80
100	300

Table 2 **Voltage and energy**

Digit 4		Digit 12					
letter	V <sub>R</sub> (Vdc)	letter	V <sub>V</sub> (Vdc)	V <sub>RMS</sub> (Vac)	V <sub>C</sub> (V)	W <sub>p</sub> (J)	I <sub>p</sub> (A)
A	5	B	8	4	17	0.3	150
		E	11	6	25	0.4	200
		I	15	8	30	0.5	200
B	15	B	22	14	38	0.5	200
		E	27	17	44	0.6	200
H	25	A	33	20	54	0.7	200
J	30	D	39	25	65	1.0	200
		I	47	30	77	1.0	200
N	45	B	56	35	90	0.4	100
C	50	C	68	40	110	0.5	100
D	63	C	82	50	135	0.6	100

Table 3 **Capacitance and size**

Rated Cap. ( $\mu$ F)	Rated Voltage (V <sub>R</sub> )	Size			
		B	H	L	p
0.1 to 0.47	5 to 63	4.5	9.5	7.2	5.0
0.56 to 1.5	5 to 63	5.0	10.0	7.2	5.0
1.8 to 2.2	5 to 63	6.0	11.0	7.2	5.0
2.7 to 3.3	5 to 50	7.2	13.0	7.2	5.0
0.1 to 1.0	5 to 63	5.0	11.0	13.0	10.0
1.2 to 1.5	5 to 63	6.0	12.0	13.0	10.0

All dimensions are in mm.

**TEST METHOD AND PERFORMANCE**

**Damp heat, steady state:**

**Test conditions**

Temperature: +40°C  $\pm$  2°C

Relative humidity (RH): 93%  $\pm$  2%

Test duration: 56 days

**Performance**

Capacitance change  $|\Delta C/C|$ :  $\leq$  5%

Varistor voltage change:  $\leq$  10%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  50x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  100 $\mu$ A

**Endurance:**

**Test conditions**

Temperature: +125°C  $\pm$  2°C / 100°C  $\pm$  2°C

Voltage applied: 0.5 x V<sub>R</sub> / 1.0 x V<sub>R</sub>

Test duration: 1000 h

**Performance**

Capacitance change  $|\Delta C/C|$ :  $\leq$  10%

Varistor voltage change:  $\leq$  10%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  50x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  100 $\mu$ A

**Resistance to soldering heat:**

**Test conditions**

Temperature: +260°C  $\pm$  5°C

Test duration: 10 $\pm$ 1s

**Performance**

Capacitance change  $|\Delta C/C|$ :  $\leq$  3%

Varistor voltage change:  $\leq$  5%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  30x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  50 $\mu$ A

**Peak current derating:**

**Test conditions**

Reference CECC 42000 / test C 2.1;

Test duration: 100 times (2ms)

Time between each current peak: 120s

**Performance**

Capacitance change  $|\Delta C/C|$ :  $\leq$  10%

Varistor voltage change:  $\leq$  10%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  30x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  100 $\mu$ A

**Long term stability (after two years):**

**Test conditions**

Temperature: -40°C to +80°C

Humidity:  $\leq$  70%

**Performance**

Capacitance change  $|\Delta C/C|$ :  $\leq$  3%

Varistor voltage change:  $\leq$  5%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  20x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  50 $\mu$ A

**Reliability:**

Reference MIL HDB 217

**Application conditions:**

Temperature: +40°C  $\pm$  2°C

Voltage: 0.5 x V<sub>R</sub>

Failure rate:  $\leq$  2 FIT

(1FIT = 1 x 10<sup>-9</sup> failures/components x h)

**Failure criteria:**

Capacitance change  $|\Delta C/C|$ :  $>$  10%

Varistor voltage change:  $>$  10%

DF change ( $\Delta$ tg $\delta$ ):  $\leq$  20x10<sup>-4</sup> @ 1kHz

Leakage current at V<sub>R</sub>:  $\leq$  200 $\mu$ A

**Warning: the component F5A is a protection and suppression combined passive component. Strong overloading (much higher energy, current or voltage) can strongly damage the component with the risk of explosion and fire.**