F5B

Capacitor / Diode unit

METALLIZED POLYESTER FILM CAPACITOR WITH INTEGRATED BIDIRECTIONAL SUPPRESSOR DIODE
HIGH PERFORMANCE PEAK REDUCTION

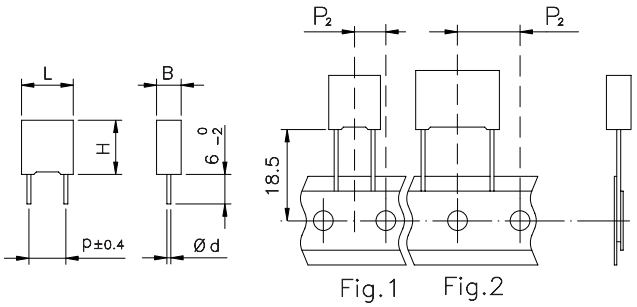


Fig.1 Fig.2

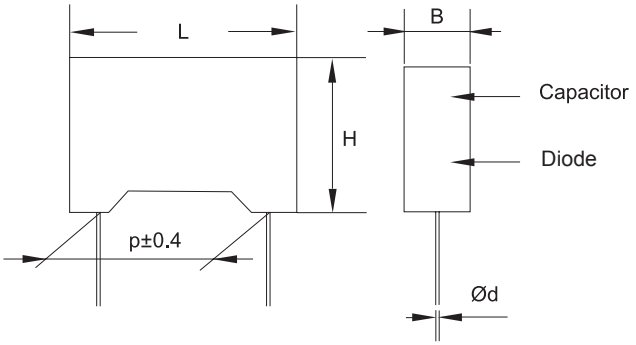
Ød ±0.05	p = 5mm	p = 10mm
	0.6	0.7

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

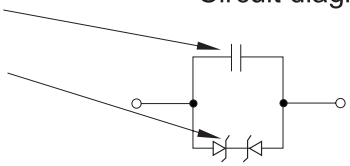
- Engine blower fans
- Heating/air-conditioning blowers
- Electric window regulators
- Electric windshield wipers
- Central locking systems
- Electric sun roofs
- Fuel/oil pumps
- Electrically operated seats

PRODUCT CODE: **F5B**

Pitch	Box thickness (B)	Maximum dimensions (mm)		
(mm)	(mm)	B max	H max	L max
5.0		B +0.1	H +0.1	L +0.3
10.0		B +0.1	H +0.1	L +0.35



Circuit diagram



The F5B Series was designed for ambitious suppression demands 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 bidirectional suppressor diode (TVS, Transient Voltage Suppressor) in one single case.
The leaded EMI-RFI suppression element F5B 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:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
F	5	B										-	

Digit 1 to 3	Series code.
Digit 4	d.c. Rated voltage: A = 5V B = 18V 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 (Table1)
Digit 12	Nominal diode voltage (Table 2).
Digit 13	Size code
Digit 14	Capacitance tolerance: J=5%; K=10%; M=20%.

GENERAL CHARACTERISTICS

Capacitor:	metallized polyester film (MKT).
Varistor:	bidirectional Transient Voltage Suppressor Diode
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 (F5B), capacitance, tolerance, D.C. rated voltage, manufacturing date code.

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

Operating temperature range: -55 to +125°C

Table 1 **Packaging**

Standard packaging style	Lead length (mm)	Taping style P_2 (mm)	Taping style Fig. (No)	Taping style Pitch (mm)	Ordering code (Digit 10 to 11)
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 BIDIRECTIONAL SUPPRESSOR DIODE
HIGH PERFORMANCE PEAK REDUCTION

PRODUCT CODE: **F5B**

ELECTRICAL CHARACTERISTICS

Capacitance range: 100nF to 3.3µF
Capacitance values: E12 series (IEC 60063 Norm).
Capacitance tolerance: ±5% (J); ±10% (K); ±20% (M).
Rated voltage (V_R): 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_R.
Breakdown Voltage (V_{BR}): see table 2, tolerance ±10%
Diode Voltage range: 10Vdc to 78Vdc
Max **Clamping voltage (V_c) at max. Peak Current** :see Table 2
Power dissipation (P_{max}): 400W or 600W (Pulse 10/700µs)
Thermal Resistance: see Table 3
Leakage current (I_{dc}): ≤50µA @ V_R
Dissipation Factor (D.F.):
tgδ x 10^{-4} at 25°C ±5°C

kHz	tgδ x 10^{-4}
1	80
100	250

Table 2 **Voltage and energy**

Digit 4		Digit 12			600W type		400W type	
letter	V_R (Vdc)	**letter** (600W type)	**letter** (400W type)	V_{BR} (Vdc) @1mA	V_{Cmax} (V)@Ip(A) 10/700µs		V_{Cmax} (V)@Ip(A) 10/700µs	
A	5	E	F	10	14	37	15	28
		I	K	15	20	29	20	21
B	18	B	C	22	28	24	28	16
		E	F	27	33	31	33	14
H	25	A	B	30	36	20	36	13
		C	D	33	40	19	40	12
J	30	D	E	36	43	18	43	12
		I	K	39	46	17	46	11
		N	P	44	52	16	52	10
N	45	B	C	53	62	14	61	9
C	50	C	D	68	78	12	78	8
D	63	C	D	78	89	11	88	7

Table 3 **Capacitance and size**

Rated Cap. (µF)	R_{th} (°C/W)	**Size Code**	**Rated Voltage** V_R	Ød ±0.05	**Size** (Std dimensions)			
					B	H	L	p
0.1 to 1.2	82	7	5 to 63	0.6	6.0	11.0	7.2	5.0
1.5 to 2.2	73	8	5 to 50	0.6	7.2	13.0	7.2	5.0
0.1 to 1.5	64	3	5 to 63	0.7	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±2°C
Relative humidity (RH): 93% ±2%
Test duration: 56 days

Performance
Capacitance change |ΔC/C|: ≤5%
Varistor voltage change: ≤10%
DF change (Δtgδ): ≤50x10^{-4} @ 1kHz
Leakage current at V_R: ≤100µA

Endurance:

Test conditions
Temperature: +125°C±2°C / 100°C±2°C
Voltage applied: 0.5xV_R / 1.0xV_R
Test duration: 1000 h

Performance
Capacitance change |ΔC/C|: ≤10%
Varistor voltage change: ≤10%
DF change (Δtgδ): ≤50x10^{-4} @ 1kHz
Leakage current at V_R: ≤100µA

Resistance to soldering heat:

Test conditions
Temperature: +260°C±5°C
Test duration: 10±1s

Performance
Capacitance change |ΔC/C|: ≤3%
Varistor voltage change: ≤5%
DF change (Δtgδ): ≤30x10^{-4} @ 1kHz
Leakage current at V_R: ≤50µA

Peak current derating:

Test conditions
Pulse 10/700µs, 300V_p; 100 cycles with alternating polarity
Time between each current peak: 120s

Performance
Capacitance change |ΔC/C|: ≤10%
Breakdown voltage change: ≤10%
DF change (Δtgδ): ≤30x10^{-4} @ 1kHz
Leakage current at V_R: ≤100µA

Long term stability (after two years):

Test conditions
Temperature: -40°C to +80°C
Humidity: ≤70%

Performance
Capacitance change |ΔC/C|: ≤3%
Varistor voltage change: ≤5%
DF change (Δtgδ): ≤20x10^{-4} @ 1kHz
Leakage current at V_R: ≤50µA

Reliability:
Reference MIL HDB 217

Application conditions:
Temperature: +40°C±2°C
Voltage: 0.5xV_R
Failure rate: ≤3 FIT
(1FIT = 1x10^{-9} failures/componentsxh)

Failure criteria:
Capacitance change |ΔC/C|: >10%
Varistor voltage change: >10%
DF change (Δtgδ): >20x10^{-4} @ 1kHz
Leakage current at V_R: >200µA

Warning: the component F5B 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.