

EPCOS

Film Capacitors

Section 3

Applications



AGENDA

CFL

- Ü EPCOS solution
- Ü Wound / Film Foil / Stack comparison
- Ü Trend of CFL

Ballast

- Ü New Lamp Capacitor
- Ü New PFC Capacitor
- Ü EPCOS Solution
- Ü X2 Road Map



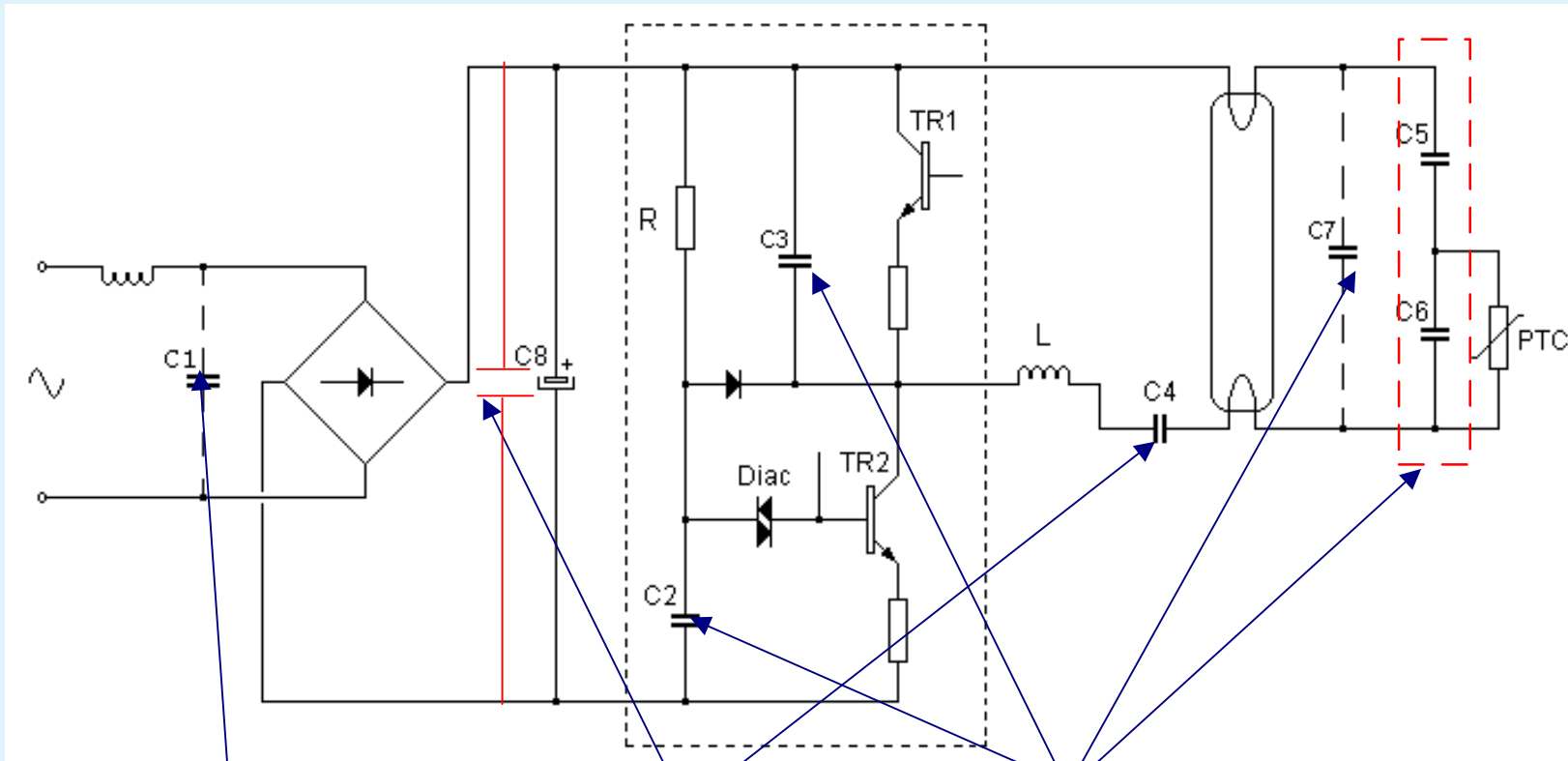
Compact Fluorescent Lamp (CFL) / 节能灯

-Worldwide market is estimated to be about 250 million lamps with about 90% of the PCB Production in China

-20 – 25W is common for US market
9 - 13 W is the most standard for European and Asian



Compact Fluorescent Lamp (CFL) / 节能灯



Compact Fluorescent Lamp (CFL) / 节能灯

Capacitor	Type	Series	Typical dV/dt	Rated voltage	Capacitance
C1	X2	B81130 B32560		275Vac 400Vdc	47 - 100nF
C2	MKT	B32559 B32529		63...100 V	22 - 100nF
C3	MKP MKT	B32620 B32559	1000V/ μ s	630 – 1000V	680pF – 1.5 nF
C4	MKT	B32560		250 – 400V	22 - 100nF
C5	MKT	B32560 B32559	<300V/ μ s	400 – 630V	4.7 - 10nF
C6	MKT	B32560 B32559	<300V/ μ s	400 – 630V	1.5 - 15nF
C7	MKT	B32560 B32559	<500V/ μ s	400 – 1000V	1.0 - 10nF
C8	ELKO				

If customer requires very high temperature capacitors (140°C),

Promote B32860 series , silver capacitor with PEN dielectric instead of PET



Compact Fluorescent Lamp (CFL) / 节能灯

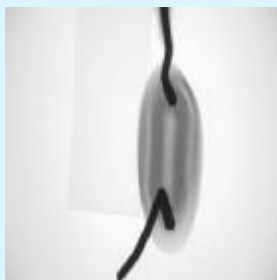
TYPE	C1	C2	C3	C4	C5	C6
3W	105; 400V; E	102J; 1200V; PD	223J; 100V; PD	473K; 250V; PD	152K; 1200V; PD	
5W	335; 400V; E	102J; 1200V; PD	223J; 100V; PD	473K; 250V; PD	152K; 1200V; PD	
7W	335; 400V; E	152J; 1200V; PD	223J; 100V; PD	473K; 250V; PD	222J; 1200V; PD	
9W	335; 400V; E	152J; 1200V; PD	223J; 100V; PD	473J; 250V; PD	152J; 1200V; PD	
11W	475; 350V; E	152J; 1200V; PD	223J; 100V; PD	473K; 250V; PD	562J; 400V; PD	562J; 400V; PD
25W	106; 400V; E	102K; 1200V; PD	223K; 100V; PD	473K; 400V; PD	123J; 400V; PD	123J; 400V; PD
35W	226; 400V; E	102J; 1500V; PD	223K; 100V; PD	104K; 400V; PD	512K; 630V; PD	
45W	226; 400V; E	102J; 1500V; PD	223K; 100V; PD	104K; 400V; PD	512K; 630V; PD	
60W	336; 350V; E	272K; 1000V; PD	223J; 100V; PD	104K; 630V; PD	472K; 1600V; PD	272K; 1000V; PD
	E: electrolytic capacitors					
	PD: powder dipped capacitor					
	102J; 1200V; PD: capacitor submitted to breakdown voltage test					

Compact Fluorescent Lamp (CFL) / 节能灯

TYPE	Tecnology	Dielectric	CLEARING1 (V)	Competitor b*h*I	EPCOS	EPCOS b*h*I	CLEARING1 (V)	体积相差
102J-1200V	Wound	KT	X	x	B32620-J102 (1000V)	5,0*10,5*10	X	
222J-100V	Wound	KT	2,280	x	B32529-C1223	2,5*6,5*7,2	X	
473K-250V	Wound	MKT	2,220	3,4*6,3*9,2	B32560-J3473	2,5*5,2*9,0	701	-68%
152J-1200V	Wound	KT	7,180	3,9*12,1*6,4	B32620-J152 (1000V)	5,0*10,5*10	X	
222J-1200V	Wound	K?	8,120	4,3*12,4*6,9	B32620-J222 (1000V)	5,0*10,5*10	X	
562J-400V	Wound	KT	3,375	3,6*11,7*6,7	B32529-C6562	2,5*6,5*7,2	X	
473K-400V	Wound	K?	4,344	6,0*16,2*12,4	B32561-J6473	2,6*6,0*11,5	701	-572%
123J-400V	Wound	KT	5,375	4,7*14,9*8,4	B32529-C6123	3,5*8,0*7,2	X	
102J-1500V	Wound	KT	X	3,7*12,3*6,4	B32620-J102 (1000V)	5,0*10,5*10	X	
104K-400V	Wound	MKT	2,690	5,2*10,2*12,9	B32561-J6104	4,0*6,9*11,5	761	-116%
512K-630V	Wound	MKP	4,344	4,2*7,8*12,0	B32561-J8512	2,6*4,9*11,5	X	
272K-1000V	Wound	MKP	X	4,2*8,0*11,9	B32621-A272	4,0*9,0*13,0	X	
104K-630V	Wound	MK?	2,250	5,8*10,7*16,9	B32562-J8104	6,2*9,3*16,5	1161	
472K-1600V	Wound	MKP	3,940	4,9*8,4*17,6	B32612-A1472	6,5*12,0*18,0	X	
272K-1000V	Wound	MK?	2,620	4,2*8,0*11,9	B32651-A7272	5,0*11,0*13,0	X	

Wound : 卷绕
MK? : 金属化技术
K? : 涤纶
CLEARING1 (V) : 最高承受电压

KT



MKT



结论:

- 卷绕 (包括涤纶) 能承受相对高电压, 不过体积比较大.
- 涤纶 没有自愈能力
- 叠片 体积最小



Compact Fluorescent Lamp (CFL) / 节能灯

Requirement on Lamp (灯的要求)	Requirement on Capacitor (电容要求)	Advantage of EPCOS Solution (EPCOS 方案的好处)
Longer life time (长寿) (6,000 ~ 12,000hrs)	High reliability (高可靠性) esp. Lamp Capacitor (亮辉电容)	Reliable Quality (可靠) MKT Solution => Self healing
Compact (小性化)	Small size (体积小) Able to withstand high Temperature (承受高温)	Stack : Silver (B3256x) MiniBlue (B32559) PEN (B32860)

Electronic Ballast (电子镇流器)



镇流器 主要要求:

- Small dimensions; 体积小
- High AC Voltage; 高AC 电压
- High dv/dt; 承受高脉冲电压
- Operation at high frequency and temperature
承受高频率和温度

LS 7,5...LS 22,5 (脚距)

Cap = 1nF...4,7 μ F

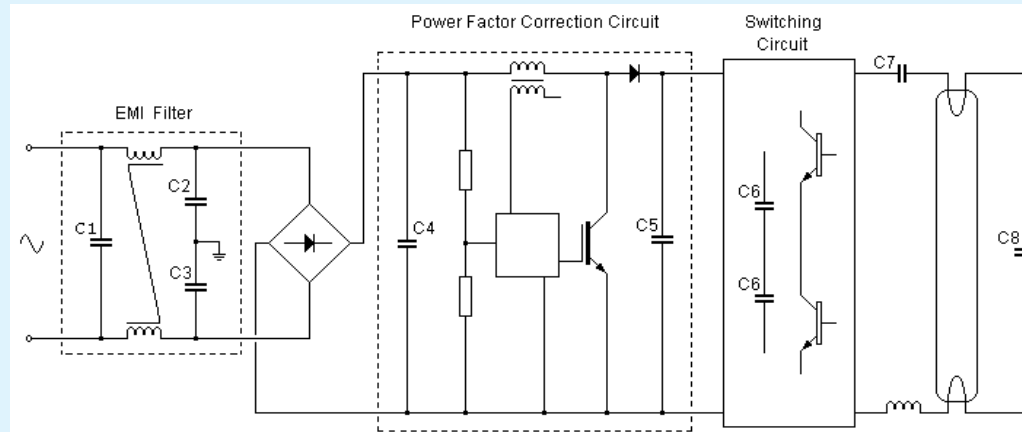
Vdc = 250V-...2500Vdc

Vac = 160Vac...1000Vac

dv/dt = 2000 V/ μ s



Electronic Ballast (电子镇流器)



Capacitor	Type	Series	Typical dV/dt	Rated voltage	Capacitance
C1	X2	B3292x		275Vac	47 – 470nF
C2	Y2	B81122		250Vac	1 - 4.7nF
C3	Y2	B81122		250Vac	1 – 4.7nF
C4	MKT MKP	B3252x B3256x B3259x B3267x-Z		250 – 630V	220nF - 1 μ F
C5	MKT	B3223x B3256x		350 – 480V	4.7 - 15 μ F
C6	MKP	B3267x-L B3261x	<1000V/ μ s	400 - 1000V	680pF - 2.2nF
C7	MKP	B3267x-L B3261x	<300V/ μ s	630V	22 - 100nF
C8	MKP	B3267x-L B3263x	<500V/ μ s	1000 - 2000 V	470pF - 10nF



新的灯丝电容 (MKP: B3267x-L)

现有的MKP (55/100/56)

LS: 10mm (B32621)

Cap.: 2,2nF...6,8nF

tol.: $\pm 10\%$, $\pm 5\%$, $\pm 3,5\%^*$

Voltage: 1250 Vdc / 450Vac

dv/dt: 2000 Volts/ μ sec.

Category Voltage Vc:

T 85°C Vc = 1,0 V_{R,DC} Or 1,0 V_{R,AC}

T 100°C Vc = 0,8 V_{R,DC} or 0,8 V_{R,AC}

* upon request

新的MKP (55/110/56)

LS: 10mm - B32671L0 and B32671L1

Cap.: 1,2nF...12,0nF

tol.: $\pm 10\%$, $\pm 5\%$, $\pm 3,5\%^*$

Voltage: 1000Vdc/500Vac ; 1600Vdc/500Vac

dv/dt: 2300 up to 8500 Volts/ μ sec.

Category Voltage Vc:

T 85°C Vc = 1,0 V_{R,DC} Or 1,0 V_{R,AC}

T 100°C Vc = 0,8 V_{R,DC} or 0,8 V_{R,AC}

T 105°C Vc = 0,75 V_{R,DC} or 0,75 V_{R,AC}

T 110°C Vc = 0,7 V_{R,DC} or 0,7 V_{R,AC}



新的灯丝电容 (MKP: B3267x-L)

现有的MKP (55/100/56)

LS: 15mm (B32652)

Cap.: 1,0nF....0,68 μ F

tol.: $\pm 10\%$, $\pm 5\%$, $\pm 3,5\%^*$

Voltage: 250Vdc /160 Vac
2000 Vdc /700 Vac

dv/dt: 200...2200 Volts/ μ sec.

Category Voltage Vc:

T 85°C Vc = 1,0 V_{R,DC} Or 1,0 V_{R,AC}

T 100°C Vc = 0,8 V_{R,DC} or 0,8 V_{R,AC}

* upon request

新的MKP (55/110/56)

LS: 15mm - **B32672L1 and B32672L8**

Cap.: 1,0nF....33nF

tol.: $\pm 10\%$, $\pm 5\%$, $\pm 3,5\%^*$

Voltage: 1600Vdc / 600Vac
1600Vdc / 700 Vac

dv/dt: **1900....5300 Volts/ μ sec.**

Category Voltage Vc:

T 85°C Vc = 1,0 V_{R,DC} Or 1,0 V_{R,AC}

T 100°C Vc = 0,8 V_{R,DC} or 0,8 V_{R,AC}

T 105°C Vc = 0,75 V_{R,DC} or 0,75 V_{R,AC}

T 110°C Vc = 0,7 V_{R,DC} or 0,7 V_{R,AC}



新的灯丝电容 (MKP: B3267x-L)

Cr (nF)	Lead Space 10 mm		Lead Space 15 mm	
	Vr (Vrms f < 1KHz)		Vr (Vrms f < 1KHz)	
	1000 Vdc (500 Vac)	1600 Vdc (500 Vac)	1600 Vdc (600 Vac)	1600 Vdc (700 Vac)
	B32651-L0XXX-*+++	B32651-L1XXX-*+++	B32652-L1XXX-*+++	B32652-L8XXX-*+++

1.0				
1.2		4,0 x 9,0 x 13,0		
1.5		5,0 x 11,0 x 13,0		
2.2		5,0 x 11,0 x 13,0		
2.7	4,0 x 9,0 x 13,0	5,0 x 11,0 x 13,0		
3.3	4,0 x 9,0 x 13,0	6,0 x 12,0 x 13,0		
3.9	4,0 x 9,0 x 13,0	6,0 x 12,0 x 13,0		
4.1	4,0 x 9,0 x 13,0	6,0 x 12,0 x 13,0		
4.7	4,0 x 9,0 x 13,0			5,0 x 10,5 x 18,0
5.6	5,0 x 11,0 x 13,0			
6.2	5,0 x 11,0 x 13,0		5,0 x 10,5 x 18,0	6,0 x 11,0 x 18,0
6.8	5,0 x 11,0 x 13,0			
8.2	5,0 x 11,0 x 13,0		6,0 x 11,0 x 18,0	6,0 x 12,0 x 18,0
10.0	6,0 x 12,0 x 13,0		6,0 x 11,0 x 18,0	7,0 x 12,5 x 18,0
12.0	6,0 x 12,0 x 13,0		6,0 x 12,0 x 18,0	8,5 x 12,5 x 18,0
15.0			7,0 x 12,5 x 18,0	8,5 x 12,5 x 18,0
22.0			8,5 x 12,5 x 18,0	9,0 x 17,5 x 18,0
33.0			9,0 x 17,5 x 18,0	



新的灯丝电容 (MKP: B3267x-L)

	EPCOS	ARCO R74	ARCO R75	ARCO R76	ARCO R77
4,7nF/1KVdc (500Vac)	468	936			990
8,2nF/1KVdc (500Vac)	715	1296			1296
12nF/1KVdc (500Vac)	936	1823			1823
1,2nF/1K6Vdc (500Vac)	468	468			990
2,2nF/1K6Vdc (500Vac)	715	715			990
3,3nF/1k6Vdc (500Vac)	936	936			990
6,2nF/1K6Vdc (600Vac)	945				
8,2nF/1K6Vdc (600Vac)	1188		990	1296	
12nF/1K6Vdc (600Vac)	1296		1296	1688	
33nF/1K6Vdc (600Vac)	2835		2880	3762	
4,7nF/1K6Vdc (700Vac)	945	1296	990	1296	1823
8,2nF/1K6Vdc (700Vac)	1296	1823	1823	2219	2880
10nF/1K6Vdc (700Vac)	1575	2219	1823	2880	
15nF/1K6Vdc (700Vac)	1913	2880	2219	3762	
22nF/1K6Vdc (700Vac)	2835		3762		
(总体积) sizes in mm ³	MKP	MKP	MKP	MMKP	MMKP



新的灯丝电容 (MKP: B3267x-L)

	EPCOS	ARCO R74	ARCO R75	ARCO R76	ARCO R77
Spectrum	1,0nF...33nF	1,0nF...33nF	1,0nF...33nF	1,0nF...47nF	1,0nF...33nF
Lead Space	10; 15mm	10; 15mm	15mm	10; 15mm	15mm
Vac	500 ; 600; 700	500 ; 700	600; 650; 700	600; 650; 700	400 ; 500; 700
dv/dt	min. 1900 V/us max. 8500 V/us	min. 1300 V/us max. 3000 V/us	min. 3300 V/us max. 9500 V/us	min. 3300 V/us max. 9500 V/us	min. 3300 V/us max. 9500 V/us
Self Heating (自温升)	+ 10 C	+ 20 C	+ 20 C	+ 40 C	+ 40 C
Climatic Categ.	55/110/56	55/100/56	55/100/56	55/100/56	55/100/56
	MKP	MKP	MKP	MMKP	MMKP



EPCOS PFC Solutions

MKT PFC Solution: B3259x Series

K438 : 0.47uF ~ 2.2uF/450Vdc in LS15 & 22.5mm Mini size

K440/K442 : 0.47uF ~ 1uF/450Vdc SuperMini

MKP PFC Solution: B32672-Z Series

420Vdc(220Vac) and 520Vdc(277Vac) available

0.1uF ~ 2.2uF



EPCOS Solutions in Ballast



MKP

(C6 ; C7 ; C8)

B3262X / B3265X /B3267x-L

400....2500 Vdc

680pF....100nF

LS 7,5...22,5 mm

Very high DV/DT

High AC voltage 700...1000 V

High Corona Voltage



MFP (C8)

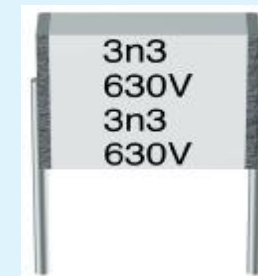
B32632..3

630....2500 Vdc

1nF....10nF

LS 15...22,5 mm

Asia and US market



PFC Capacitor (C4)

MKT: B3252X / B3256X /B3259x

MKP: B3267x-Z

250....630 Vdc

100nF....2.2 μ F

LS 7,5...27,5 mm



EPCOS Solutions in Ballast



X2 (C1)

B3292X - Very small dimensions

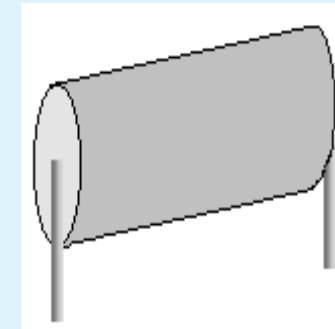
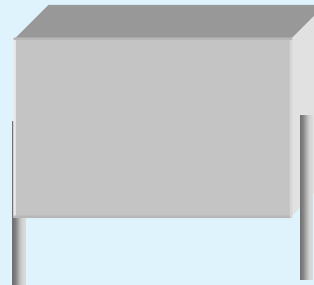
275 and 300 Vac

10nF....4.7 μ F

LS 10...37,5 mm

MKP technology

Self healing properties



Elco replacement (C5)

B32564 / B32232

420...480 V-

4.7 μ F....15 μ F

Radial and Axial construction

MKT technology

Long life expectance



X2 Capacitors Roadmap

	2002	2003	2004
Miniaturization	B3292x-A2 Size reduction	Low profile X2 B32922-T2 Max height = 14mm Lighting Application mainly	New small series
Technology Upgrade	Voltage increase B3292x-A3 275Vac & 300Vac		B3292x-A2 100°C to 105°C
			Rated voltage upgrade B3292x-A2 275Vac to 305Vac
Product Spectrum		Spectrum expansion B3292x-A2 (in 275Vac) 0.1µF LS10 470nF LS 15 1µF LS22.5 3.3µF, 4.7µF LS27.5	Spectrum expansion B3292x-A2 for filter application 6,8...10µF LS37,5 105°C, 305Vac