

SA SERIES

FEATURES: GENERAL PURPOSE RADIAL TYPE FOR
CONSUMER ELECTRONICS MARKET.
REFERENCE
STANDARDS: IS4317/ IEC 384-4.

PRODUCT
MARKING



ENDURANCE: +85°C, 2000 Hrs
PROVIDED WITH ORANGE COLOUR
SLEEVE AND BLACK PRINT

SPECIFICATIONS

PARAMETERS.		PERFORMANCE CHARACTERISTICS													
Operating Temperature		- 40 ^o C to +85 ^o C for WV ≤ 250 Vdc, -25 ^o C to + 85 ^o C for WV > 250 Vdc.													
Working Voltage		6.3 Vdc to 450 Vdc. (500 Wvdc on request)													
Capacitance Range		0.10 to 22000µF (at +27 ^o C, 100 Hz)													
Capacitance Tolerance		±20%, (Other tolerance on request)													
Leakage Current (After 3mt charging through 1000 Ω resistor) IL in µA		IL ≤ 0.01 CV or 4 µA, whichever is greater for WV 6.3 to 100 V ≤ 0.02 CV+ 10µA for WV 160 to 500 V, Where IL = Leakage current in µA C= Capacitance(µF) , V= Working Voltage in Volt													
Dissipation factor (Tan δ) Max (at + 27 ^o C, 100 Hz)		WV Vdc	6.3	10	12	16	25	35	40	50	63	100	160	200	250 ~500
		Tan δ %	26	22	21	20	17	15	14	13	12	10	15	18	20
		For Capacitor ratings with cap value >1000µF add 2% for every 1000µF increase													
Low Temperature Stability		Impedance Ratio at 100 Hz.													
		Rated Voltage (V)	6.3	10~12	16	25	35~40	50~100	160	200 ~350	400~500				
		Z -25 ^o C/ Z + 27 ^o C	6	4	4	3	3	2	3	6	7				
		Z -40 ^o C/ Z + 27 ^o C	12	9	8	6	4	3	4	-	-				
		Add 0.5 to the Ratio for Z- 25 ^o C, 1.0 to the Ratio Z- 40 ^o C Per 1000µF, for Cap>1000µF													
Life Tests															
		Tests		Endurance DC Life Test							Storage Shelf Life Test				
		Test Condition Parameters		Capacitor under rated voltage At +85 ^o C for 2000 Hrs Measurements after recovery to +27 ^o C							Capacitor under no voltage At +85 ^o C for 1000 Hrs Measurements after recovery to +27 ^o C				
		Δ Capacitance		Within ± 30% for 6.3 to 16 V Within ± 25% for 25 to 100 V Within ± 20% for 160 to 500V } of initial measured Value							Within ± 25% of initial measured Value forWV≤100 Within ± 20% of initial measured Value forWV>100				
		Tan δ		Within 200% of initial limits for WV 6.3 ~16 V Within 150% of initial limits for WV 25 ~ 500 V							Within 150% of initial limit				
D.C Leakage Current		Within initial limit							Within 150% of initial limit for WV ≤100V Within 300% of initial limit for WV> 100v						

OTHER INFORMATION

Standard rating size, Ripple current, Temperature multiplier and Frequency multiplier	For details refer to page no. 2 &3.
Capacitor Codification System	For details refer to page no. 4
Dimensional Specification	For details refer to page no.5
Marking Specification	For details refer to page no. 6
Type of Packing and Lead Configuration.	(1) Bulk Packing - Straight Lead / Lead Formed and Cut / Kinking and Cut. (2) Taped Ammo Pack – 5mm Pitch / 2.5mm Pitch. For details refer to page no. 7,8&9.

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STANDARD RATING TABLE: -

Provides detailed information regarding applicable case size and the appropriate ripple current handling capability of the defined case size.

WV SV Cap(μF)	6.3 8		10 12		12 14		16 19		25 30		35 41		40 46		50 58		63 73	
	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC
0.1															47 HS	4 5	47 HS	4 5
0.22															47 HS	5 7	47 HS	5 8
0.33															47 HS	6 9	47 HS	6 9
0.47															47 HS	7 10	47 HS	8 11
1.0															47 HS	11 15	47 HS	12 16
2.2															47 HS	16 22	47 HS	17 23
3.3															47 HS	20 27	47 HS	21 28
4.7															47 HS	24 32	47 HS	25 34
10													47 HS	33 45	HS 67	47 45	67 HS	49 49
22							47	41	67 HS	59 61	HS	65	HS	67	HS AS	70 80	AS	83
33			47	48	47	48	47 HS	48 68	HS	74	HS	80	AS	94	AS	97	AS BB	94 125
47	47	52	47 HS	55 78	67 HS	64 80	HS	82	67 HS	86 89	HS AS	98 110	AS	115	AS	120	BB	150
68	HS	90	HS	94	HS	98	HS	98	HS AS	111 125	AS	130	BB	165	BB	170	BB	180
100	HS	105	67 HS	110 115	HS	120	67 HS	115 120	AS	150	AS	160	BB	200	BB	205	BB CB	215 245
150	HS	130	HS AS	134 160	AS	165	AS	170	AS BB	178 220	BB	235	BB CB	245 275	CB CD	280 310	CD	325
220	AS	180	AS	195	AS	200	AS	205	BB	270	BB CB	285 320	CB	330	CB CD	340 375	CD CG	395 430
330	BB	265	BB	290	BB	295	BB	300	BB	330	CB CD	400 430	CD	445	CG	505	DG	605
470	BB	315	BB	345	BB	355	BB	360	CB	440	CD CG	515 560	CD CG	530 580	CG DG	600 695	DG DK	720 775
680	BB CB	402 430	BB CB	422 465	CB	505	CD	535	CD CG	580 630	CG DG	675 775	CG DG	695 805	DG DK	835 895	EK	1060
1000	CB	520	CB CD	590 620	CD	640	CD	645	CG	765	CK DG	895 940	DK	1045	DK EK	1085 1235	EK ER	1290 1395
1500	CD	615	CD CG	665 725	CG	790	CG CK DG	805 830 900	DG DK	950 1015	DK EK	1105 1225	EK	1265	EK ER EU	1360 1425 1515	EU SH	1570 1695
2200	CG CK	830 860	CG CK DG	860 925 1040	CK DG	940 1060	CK DG DK	965 1015 1085	DG DK EK	1025 1165 1330	EK ER	1400 1520	ER	1565	EU SH	1715 1850	SJ TH	2000 2105
3300	DG	1070	DG DK	1100 1230	DK	1250	DK	1275	EK ER	1550 1685	ER EU	1765 1875	EU SH	1925 2075	SH SJ	2135 2235	TH TJ	2420 2545
4700	DK EK	1305 1490	EK	1585	EK	1620	EK ER	1640 1780	ER EU	1885 2005	SH SJ	2250 2360	SJ TH	2415 2540	TJ	2730	TJ TM	2800 3080
6800	EK	1695	EK ER	1850 1945	ER	1990	ER EU	2005 2130	EU SH	2235 2410	TH TJ	2755 2900	TJ TM	2955 3250	TM	3315		
10000	ER EU	2075 2200	EU SH	2310 2490	EU SH	2420 2540	EU SH TH	2410 2555 2815	SJ TH TJ	2730 2935 3085	TM	3480						
15000	SH	2625	SJ TH	2860 3005	SJ TH	2820	SJ TH TJ	2900 3070 3230	TM	3510								
22000	SJ TH	2970 3125	TJ TM	3385 3725	TJ TM	3300 3620	TJ TM	3335 3670										

Abbreviations used:

WV: Working voltage of the capacitor in Volts.

Cap: Capacitance in microfarad.

RC: Maximum Ripple current allowed in milli ampere at 100 Hz/ +85°C.

SV: Surge voltage in volts.

CC: Case code.

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STANDARD RATING TABLE (Contd.)

WV SV Cap (μF)	100		160		200		250		315		350		400		450		500	
	115		184		230		285		360		385		440		500		550	
	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC
0.1	HS	5																
0.22	HS	8																
0.33	HS	10																
0.47	HS	12													BB	12		
1.0	HS	17	HS	14	AS	14	AS	14	AS	14	AS	14	AS BB	14 17	BB	17	CB	19
2.2	HS	25	HS AS	19 23	AS	21	AS	20	BB	25	BB	25	CB	28	CB CD	28 30	CD	30
3.3	HS	31	AS	29	AS BB	28 32	BB	30	BB	30	CB	34	CB CD	32 37	CD	37	CD	37
4.7	HS	37	AS	34	BB	38	BB	36	BB	36	CB	40	CD	44	CD CG	44 48	CG	48
6.8	HS AS	43 50	BB	50	BB CB	46 51	CB	49	CB	49	CD CG	50 58	CG	58	CG DG	58 67	DG	67
10	AS	61	CB CD	68 75	CB CD	60 68	CD	65	CG	70	CG	70	CG DG	70 81	CG DK	70 87	DK	87
22	BB	110	CD	115	CG	115	CK DG	110 125	DG	125	DK	125	EK	150	DK EK ER	130 150 160	ER EU	160 170
33	CB	155	CG	150	CK DG	140 155	DG DK	145 160	EK	185	EK ER	190 200	ER	200	ER	200	EU	210
47	CB CD	185 200	CK DG	190 205	DG DK	190 200	DK	190	EK	220	ER	235	EU	250	EU SR SH	230 255 270		
68	CD CG	242 260	DG DK	250 265	EK	275	EK	260	ER	285	EU	300	SH	325	SH	325		
100	CG CK DG	315 330 365	EK	365	EK EU	360 385	EU	365	SH	395	SJ	405	TH	435	TJ	455		
150	DG DK	465 480	ER EU	485 515	EU SH	475 510	SH	480	TH	530	TM	580						
220	DK EK	525 660	EU SH	565 670	SJ TH	620 685	TH	640										
330	EK ER	820 880	SJ TH	810 905	TJ	870	TJ	825										
470	ER EU	1020 1115	TJ	1135														
680	SH	1445																
1000	TH	1930																
1500	TJ	2135																

Abbreviations used:

WV: Working voltage of the capacitor in Volts.

Cap: Capacitance in microfarad.

RC : Maximum Ripple current allowed in milli ampere at 100 Hz/ +85°C.

SV: Surge voltage in volts.

CC: Case code.

Frequency Multiplier for Ripple Current

Voltage	Freq Cap range	50	100	120	300	1K	10K or more
6.3-100	<47	0.81	1	1.07	1.44	1.68	2.14
	100-470	0.85	1	1.06	1.30	1.42	1.59
	1000-22000	0.89	1	1.05	1.15	1.18	1.20
160-450	0.47-220	0.85	1	1.06	1.32	1.48	1.70
	330-1500	0.93	1	1.05	1.15	1.18	1.20

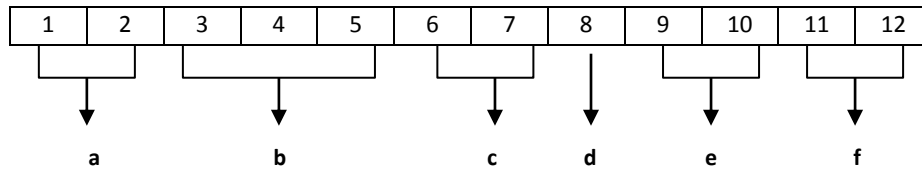
Temperature Multiplier for Ripple Current

Temp (°C)	40	60	70	85
Multipliers	1.3	1.28	1.15	1

SA SERIES

1. CAPACITOR ORDERING INFORMATION:

Capacitors are identified with the help of 12-digit code. Expansion of Part Nos. for SA series capacitors are detailed below.



a																								
Series Code. Eg: SA																								
b																								
Capacitance Value Code																								
Capacitance (μF)	0.1			1			0.22			2.2			22			220			2200			22000		
Code	R10			010			R22			2R2			220			221			222			223		
c																								
Voltage Code																								
Working Voltage (V)	6.3	10	12	16	25	35	40	50	63	100	160	200	250	315	350	400	420	450	500					
Code	0J	1A	1B	1C	1E	1V	1G	1H	1J	2A	2C	2D	2E	2P	2V	2G	2U	2W	2H					
d																								
Tolerance Code																								
Tolerance	Capacitance Tolerance															SpecI. Cap Tolerance	SpecI.Tanδ Tolerance							
	±5%			± 10%			± 20%			± 30%			-10% +30%					-10% +50%						
Code	J			K			M			N			Q			T			A	S				
e				f																				
Size Code				Capacitor Lead wire Termination Code																				
Follow respective Dimensional specification. Eg: HS, AS, BB etc.				Provided by the factory based on customer requirements. Eg:																				
				Item		Taped 5mm pitch			Taped 2.5mm pitch			Formed & cut			Kinking & cut			Bulk packing straight lead						
				Code		T0			T2			F0			FD			B0						

Capacitor Codification System:-

Example (ii) 2200 μ f / 35V; SA Series
Kinking & Cut

SA221VJEKFD

Kinking & Cut
Size/ Case Code(EK)
Cap. Tolerance $\pm 5\%$
Rated Voltage (35V)
Cap. Value (2200 μ f)
Series (SA)

Example (iv) 470 μ f / 25V; SA Series
Bulk Packing - Straight Lead

S	A	4	7	1	E	M	C	B	B	O
						Bulk Packing, Straight Lead				
						Size/ Case Code(CB)				
						Cap. Tolerance $\pm 20\%$				
						Rated Voltage (25V)				
						Cap. Value(470 μ f)				
						Series (SA)				

SA SERIES

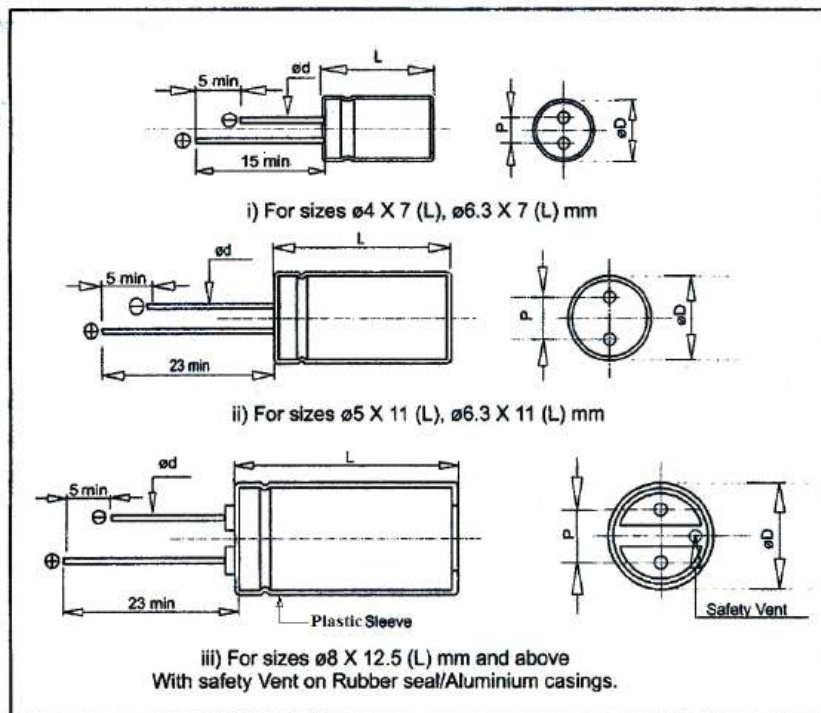
2. DIMENSIONAL SPECIFICATION FOR RADIAL LEAD TYPE CAPACITORS

Dimensions of SA series capacitors are detailed below.

Case Code	Diameter $\varnothing D \pm 0.5$ (mm)	Length $L \pm 1.0$ (mm)	Pitch $P \pm 0.5$ (mm)	Lead Dia $\varnothing d \pm 0.05$ (mm)
47	4	7	1.5	0.45
67	6.3	7	2.5	0.45
HS	5	11	2	0.5
AS	6.3	11	2.5	0.5
BB	8	12.5	3.5	0.6
CB	10	12.5	5	0.6
CD	10	16	5	0.6
CG	10	21	5	0.6
CK	10	25	5	0.6
DG	12.5	21	5	0.6
DK	12.5	25	5	0.6
EK	16	25	7.5	0.8
ER	16	31	7.5	0.8
EU	16	36	7.5	0.8
SR	18	31	7.5	0.8
SH	18	37	7.5	0.8
SJ	18	41	7.5	0.8
TH	22	37	10	0.8
TJ	22	41	10	0.8
TM	22	52	10	0.8

(All Dimensions in mm)

PHYSICAL OUTLINES



SA SERIES

3. MARKING ON THE CAPACITOR

Marking specifications of SA series capacitors are detailed below. Below mentioned details are printed on orange colored vinyl sleeve with black print.

- | | |
|---|--|
| a) Manufacturer's name and logo | b) Capacitor series & upper category temperature |
| c) Nominal capacitance value in μF | d) Capacitance tolerance code |
| e) Rated working voltage in V | f) Date code (Year-Month) |
| g) Negative terminals are indicated on the sleeve | |

Note: Manufacturer's logo, capacitor series, upper category temperature and date code are marked only for sizes $\varnothing$ 8mm and above.

Date Code:

Date code is provided on the capacitor sleeve in Year – Month format for sizes $\varnothing$ 8mm and above. Year & Month code for SA capacitor of diameter $\varnothing$ 8mm & above are detailed below.

Year code

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Letter Code	M	N	P	R	S	T	U	V	W	X

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Letter Code	A	B	C	D	E	F	H	J	K	L

Year codes repeats after each cycle of 20 years.

Month Code

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sep.	Oct.	Nov	Dec.
Code	1	2	3	4	5	6	7	8	9	O	N	D

SA SERIES

4. LEAD CONFIGURATION AND PRIMARY PACKING STANDARD FOR RADIAL ALUMINIUM ELECTROLYTIC CAPACITORS

LEAD CONFIGURATION

SA capacitors are available in the following lead configuration.

1. STRAIGHT LEAD – Applicable to case code starting from 47 (Size $\Phi 4 \times 7$ mm) to TM (Size $\Phi 22 \times 52$ mm).
2. LEAD FORMED AND CUT – Applicable to case code starting from CB (Size $\Phi 10 \times 12.5$ mm) to SJ (Size $\Phi 18 \times 41$ mm).
3. LEAD KINKED AND CUT – Applicable to case code starting from CB (Size $\Phi 10 \times 12.5$ mm) to SJ (Size $\Phi 18 \times 41$ mm).
4. TAPED FORM (5mm lead pitch) – Applicable to case code 47, 67, HS, AS, BB, CB and CD.
5. TAPED FORM (2.5 mm lead pitch) – Applicable to case code 47, 67, HS and AS.

PRIMARY PACKING STANDARD BULK PACKING

SA series capacitors are generally BULK PACKED in thick polythene bags which are heat sealed to avoid direct atmospheric exposure. Individual primary packing in polythene bag is provided with a LABEL which carries outgoing Inspection Report No, Work Order No, Capacitor Series, Capacitance Value, Working Voltage, Capacitor tolerance, Capacitor size, Capacitor Part No, Temperature, Quantity and Date of packing. **IT IS CUSTOMARY TO RETURN THE PACKING LABEL TO THE FACTORY IN CASE OF QUANTITY/QUALITY NON-CONFORMANCE.**

BULK PACKING QUANTITY DETAILS.

Size (Φ D x Lmm)	4x7	6.3x7	5x11	6.3x11	8x12.5	10x12.5	10x16	10x21	10x25	12.5x21
Case code	47	67	HS	AS	BB	CB	CD	CG	CK	DG
Nos/ Bag	500	500	500	500	500	300	300	300	200	200
Nos/ Carton	5000	5000	5000	4000	2500	1800	1500	1200	1000	800
Wt. (Kg) 1000 Nos (Approx)	1.2	2.1	2.2	2.6	2.6	3.3	3.0	2.9	3.3	3.2

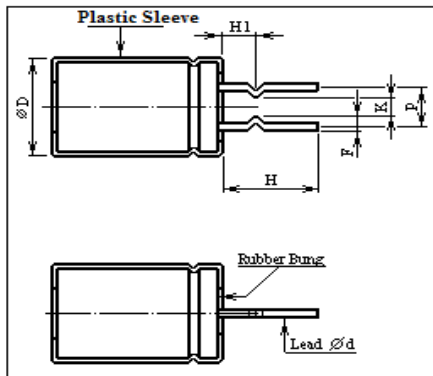
Size (Φ D x Lmm)	12.5x25	16x25	16x31	16x36	18x31	18x37	18x41	22x37	22x41	22x52
Case code	DK	EK	ER	EU	SR	SH	SJ	TH	TJ	TM
Nos/ Bag	200	100	100	100	50	50	50	50	25	25
Nos/ Carton	600	400	300	300	200	200	200	150	125	75
Wt. (Kg) 1000 Nos (Approx)	2.8	2.7	2.9	3.3	2.4	2.8	3.2	3.1	2.8	2.2

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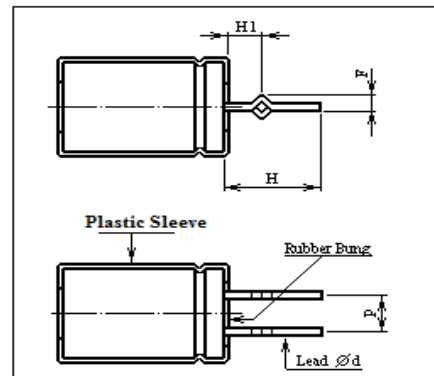
LEAD FORMED & CUT AND KINKING & CUT CAPACITORS.

Radial capacitors of size $\varnothing 10\text{mm}$ and above are also available in lead formed and lead kinked and cut configuration for direct insertion in PCB to facilitate wave soldering.

LEAD FORMED & CUT CAPACITORS



KINKING & CUT CAPACITORS



PHYSICAL DIMENSIONS; UNIT (mm)

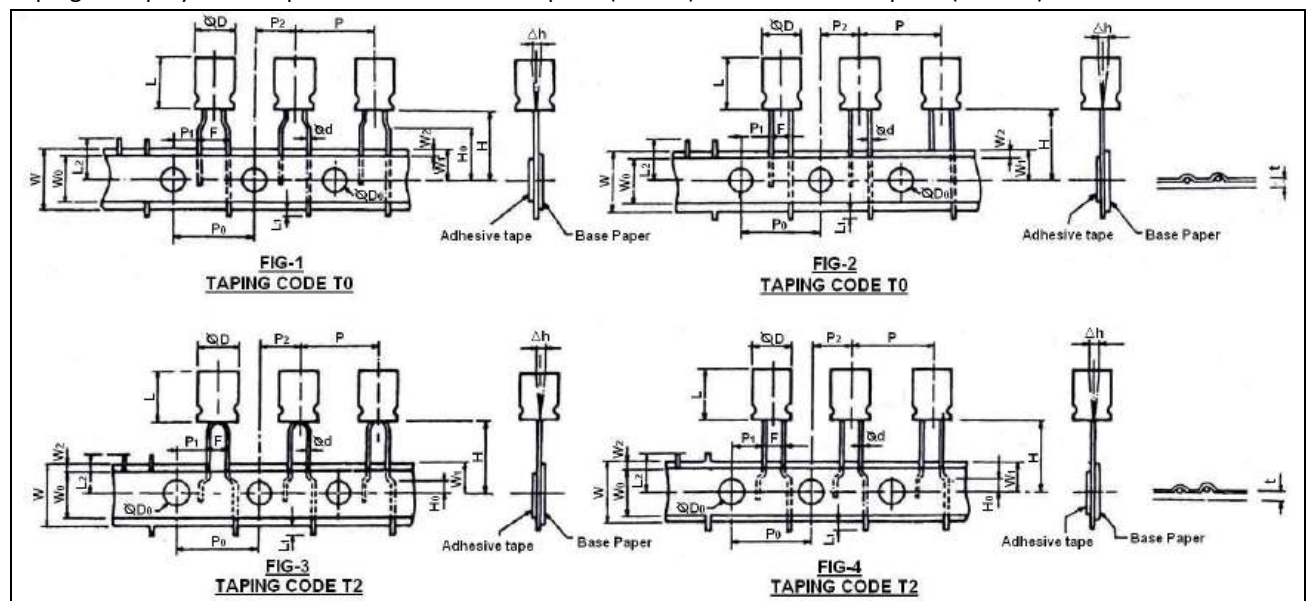
Case Diameter	$H \pm 0.5$	H1	$F \pm 0.3$	$P \pm 0.5$	$\varnothing d \pm 0.05$	K (min)
$\varnothing 10$	5.0	2.7	1.3	5.0	0.6	2.8
$\varnothing 12.5$	5.0	2.7	1.3	5.0	0.6	2.8
$\varnothing 16$	5.0	2.7	1.3	7.5	0.8	5.5
$\varnothing 18$	5.0	2.7	1.3	7.5	0.8	5.5

Packing Methods of Lead Formed & Cut Capacitors and Kinking & Cut Capacitors

Capacitors are packed in primary cardboard carton using separators and then filled into appropriate Mother & Master carton for despatch.

TAPING SPECIFICATIONS FOR RADIAL LEAD TYPE CAPACITORS

Taping is employed for capacitors with 5mm lead pitch (Table I) and 2.5 mm lead pitch (Table II)



All Dimensions are in mm and Not to scale

SA SERIES

TABLE I - 5mm LEAD PITCH (Taping Code T0)

CASE SIZE ITEM			LEAD WIRE PITCH 5 mm			
			4 x 7 6.3x 7	5 x 11 6.3x11	8x12.5	10x12.5 10 x 16
DESCRIPTION	TOLERANCE					
Figure. no. Ref			1	1	1	2
Ød Lead wire dia.	± 0.02		0.45	0.5	0.6	0.6
F Lead to lead Center	+ 0.8 - 0.2		5	5	5	5
P Pitch of Components	± 1.0		12.7	12.7	12.7	12.7
Po Feed hole Pitch*	± 0.3		12.7	12.7	12.7	12.7
P1 Feed hole Centre to lead	± 0.7		3.85	3.85	3.85	3.85
P2 Feedhole Centre to Comp. Centre	± 1.3		6.35	6.35	6.35	6.35
Δh Component alignment deviation	± 2.0		0	0	0	0
W Base Paper Width	± 0.2		18	18	18	18
W0 Adhesive Tape Width	+2.0 -0.0		13	13	13	13
W1 Feed hole Position	+0.75 -0.50		9	9	9	9
W2 Adhesive Tape Position	Max		3	3	3	3
H Comp. Base height from Centre	± 0.75		17.5	18.5	20	20
H0 Lead Wire Clinch height	± 0.5		16	16	16	0
L1 Lead Wire Protrusion	Max		0	0	0	0
ØD0 Feed hole diameters	± 0.3		4	4	4	4
t Total Tape thickness	± 0.2		0.7	0.7	0.7	0.7
L2 Length of Snapped Lead	Max		11	11	11	11

*Cumulative Pitch Error = 1mm/ 20 Pitch

TABLE II - 2.5mm LEAD PITCH (Taping Code T2)

CASE SIZE ITEM			LEAD WIRE PITCH 2.5 mm			
			4 x 7	6.3 x 7	5x11	6.3x11
DESCRIPTION	TOLERANCE					
Figure. no. Ref			3	4	3	4
Ød Lead wire dia.	± 0.02		0.45	0.45	0.5	0.5
F Lead to lead Center	+ 0.8 - 0.2		2.5	2.5	2.5	2.5
P Pitch of Components	± 1.0		12.7	12.7	12.7	12.7
Po Feed hole Pitch*	± 0.3		12.7	12.7	12.7	12.7
P1 Feed hole Centre to lead	± 0.7		5.1	5.1	5.1	5.1
P2 Feedhole Centre to Comp. Centre	± 1.3		6.35	6.35	6.35	6.35
Δh Component alignment deviation	± 2.0		0	0	0	0
W Base Paper Width	± 0.2		18	18	18	18
W0 Adhesive Tape Width	+2.0 -0.0		13	13	13	13
W1 Feed hole Position	+0.75 -0.50		9	9	9	9
W2 Adhesive Tape Position	Max		3	3	3	3
H Comp. Base height from Centre	± 0.75		17.5	17.5	18.5	18.5
H0 Lead Wire Clinch height	Approx		6.0	6.0	6.0	6.0
L1 Lead Wire Protrusion	Max		0	0	0	0
ØD0 Feed hole diameters	± 0.3		4	4	4	4
t Total Tape thickness	± 0.2		0.7	0.7	0.7	0.7
L2 Length of Snapped Lead	Max		11	11	11	11

*Cumulative Pitch Error = 1mm/ 20 Pitch

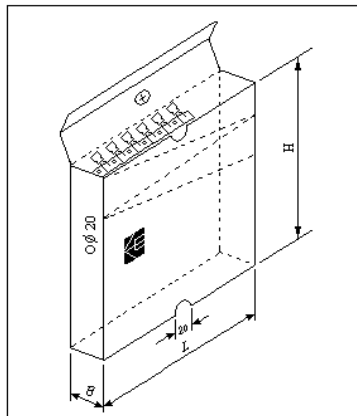
TAPED AMMO PACKING

Radial capacitors are available in Taped Ammo Pack for auto insertion in printed circuit boards.

Taped Ammo Packing Quantity Details: -

CAPACITOR SIZE (ØD x L mm)	4x7	6.3x7	5x11	6.3x11	8x12.5	10x12.5	10x16
Case Code	47	67	HS	AS	BB	CB	CD
Nos/ Carton	2000	1500	2000	1500	1000	600	600

All Dimensions in mm



Tape Ammo Box Spec:

Applicable case code	47, 67, HS, AS, BB, CB	CD
Box Dimensions		
L ± 2 (mm)	335	335
B ± 10 (mm)	46	50
H ± 2 (mm)	230	230