

SZ SERIES

**FEATURES : RADIAL LEAD TYPE
WITH LOW ESR.**
ENDURANCE : +85°C, 2000Hrs.
**REFERENCE
STANDARDS : IS4317/ IEC 384-4.**
**PRODUCT
MARKING**
**PROVIDED WITH ORANGE COLOUR
SLEEVE AND BLACK PRINT**
■ SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS													
Operating Temperature	- 40°C to +85°C for WV ≤ 250 Vdc, -25°C to + 85°C for WV > 250 Vdc.													
Working Voltage	6.3 Vdc to 450 Vdc.													
Capacitance Range	1.0 to 22000µF (at +27°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°C, 100 Hz)	WV Vdc	6.3	10	16	25	35	50	63	100	160	250	350	400	450
	Tan δ %	20	16	14	12	11	10	9	8	11	11	14	13	12
	For Capacitor ratings with cap value >1000µF add 2% for every 1000µF increase													
Low Temperature Stability	Rated Voltage (V)	6.3	10	16	25	35	40~50	63~100	160~250	350~450				
	Z -25°C/ Z +27°C	6	4	3	3	2	2	2	3	7				
	Z -40°C/ Z + 27°C	12	8	6	5	4	3	3	4	-				
	Impedance Ratio at 100 Hz. Add 0.5 to the Ratio Z- 25°C Per 1000µF, for Cap>1000µF													
Life Tests	Tests		Endurance DC Life Test						Storage Shelf Life Test					
	Condition	Test	Capacitor at rated voltage At +85°C for 200Hrs Measurements after recovery to +27°C						Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C					
		Parameters												
	(i). Endurance Test at High Temperature + 85°C at WV.	Δ Capacitance	Within ± 30% for 6.3 to 16 V Within ± 25% for 25 to 100 V Within ± 20% for 160 to 450V						} of initial measured Value Within ± 25% of initial measured Value for WV<100 Within ± 20% of initial measured Value for WV>100					
		Tan δ	Within 200% of initial limits for WV 6.3 ~16 V Within 150% of initial limits for WV 25 ~ 450 V						Within 150% of initial limit					
(ii). Storage Test at High Temperature +85°C at 0V.	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 / 2.5 mm pitch For details refer to page no. 7,8 &9.

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STANDARD RATING TABLE: -

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

WV SV Cap (µF)	6.3			10			16			25			35			50			63			
	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	
4.7																HS	38	42.35	HS	41	38.12	
10																HS	56	19.90	HS	59	17.91	
22									HS	73	10.86	HS	78	9.95	HS AS	84 96	9.05	AS	100	8.14		
33							HS	68		HS	89	7.24	HS	96	6.63	AS	116	6.03	BB	150	5.43	
47							HS	98.4	5.93	HS	107	5.08	HS AS	118 132	4.66	As	144	4.23	BB	180	3.81	
68				HS	112.8	4.68	HS	117.6	4.09	HS AS	133 150	3.51	AS	156	3.22	BB	204	2.93	BB	216	2.63	
100				HS	138	3.18	HS	144	2.79	AS	180	2.39	AS	180	2.19	BB	246	1.99	CB	294	1.79	
150				AS	192	2.12	AS	204	1.86	BB	264	1.59	BB	282	1.46	CB CD	336 372	1.33	CD	390	1.19	
220	AS	216	1.81	AS	234	1.45	AS	246	1.27	BB	324	1.09	CB	384	0.99	CD	450	0.90	CG	516	0.81	
330	BB	318	1.21	BB	348	0.96	BB	360	0.84	BB	396	0.72	CB CD	480 516	0.66	CG	606	0.60	DG	726	0.54	
470	BB	378	0.85	BB	414	0.68	BB	432	0.59	CB	528	0.51	CD CG	618 672	0.47	DG	834	0.42	DK	930	0.38	
680	CB	516	0.59	CB	558	0.47	CD	642	0.41	CD CG	696 756	0.35	CG DG	810 930	0.32	DG DK	1002 1074	0.29	EK	1272	0.26	
1000	CB	624	0.40	CD	744	0.32	CD	774	0.28	CG	918	0.24	CK DG	1074 1128	0.22	EK	1482	0.19	ER	1674	0.18	
1500	CD	738	0.28	CG	870	0.23	CG CK DG	966 996 1080	0.20	DG DK	1140 1218	0.17	DK EK	1326 1470	0.16	EK ER EU	1632 1710 1818	0.15	EU SH	1884 2034	0.13	
2200	CK	1032	0.20	CK DG	1110 1248	0.17	DG DK	1218 1302	0.15	DK EK	1398 1596	0.13	EK ER	1680 1824	0.01	EU SH	2058 2220	0.112	SJ TH	2400 2526	0.10	
3300	DG	1284	0.15	DK	1476	0.12	DK	1530	0.11	EK ER	1860 2022	0.10	ER EU	2118 2250	0.09	SH SJ	2562 2682	0.09	TJ	3054	0.08	
4700	DK EK	1566 1788	0.12	EK	1902	0.10	EK ER	1968 2136	0.09	ER EU	1885 2406	0.08	SH SJ	2700 2832	0.08	TJ	3276	0.07	TM	3696	0.07	
6800	EK	2034	0.10	EK ER	2220 2334	0.08	ER EU	2406 2556	0.08	EU SH	2682 2892	0.07	TH TJ	3306 3480	0.07	TM	3978	0.06				
10000	ER EU	2430 2640	0.08	EU SH	2772 2988	0.07	SH TH	3102 3018	0.06	SJ TH TJ	3276 3522 3702	0.06	TM	4176	0.06							
15000	SH	3150	0.06	SJ TH	3432 3606	0.06	TH TJ	3684 3876	0.06	TM	5054	0.05										
22000	TH	3750	0.06	TJ TM	4602 4470	0.05	TM	4512	0.05													

Abbreviations used:

WV: Working voltage of the capacitor in Volts.

SV: Surge voltage in volts.

Cap: Capacitance in microfarad.

CC: Case code.

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

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STANDARD RATING TABLE (Contd.)

WV Cap (µF) \ SV	100			160			250			350			400			450		
	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR	CC	RC	ESR
1.0	HS	20	159.24										BB	20		BB	20	238.85
2.2	HS	30	72.38							BB	30	126.66	CB	34	117.62	CB CD	34 44	108.57
3.3	HS	37	48.25				BB	36	66.35	CB	41	84.44	CB CD	38 44	78.41	CD	53	72.38
4.7	HS	44	33.88				BB	43	46.60	CB	48	59.29	CD	53	55.05	CD CG	58 70	50.82
6.8	HS AS	52 60	23.42	BB	60	32.20	CB	59	32.20	CD CG	60 70	40.98	CG	70	38.05	CG DG	80 104	35.13
10	AS	73	15.92	CB CD	82 90	21.89	CD	78	21.89	CG	84	27.87	DG	97	25.88	DK	180	23.69
22	BB	132	7.24	CD	138	9.95	CK DG	132 150	9.95	DK	150	12.67	EK	180	11.76	EK ER	192 240	10.86
33	CB	186	4.83	CG	180	6.63	DK	192	6.63	EK ER	228 240	8.44	ER	240	7.84	ER	276	7.24
47	CB CD	222 240	3.39	CK DG	228 246	4.66	DK	228	4.66	ER	282	5.93	EU	300	5.51	EU SR SH	306 324	5.08
68	CD CG	290 312	2.34	DG DK	300 318	3.22	EK	312	3.22	EU	360	4.10	SH	390	3.81	SH	390	3.51
100	CG CK DG	378 396 438	1.59	EK	438	2.19	EU	438	2.19	SJ	486	2.79	TH	522	2.59	TJ	546	2.39
150	DG DK	558 576	1.06	ER EU	582 618	1.46	SH	576	1.46	TM	696	1.86						
220	DK EK	630 792	0.72	EU SH	678 804	1.00	TH	768	1.00									
330	EK ER	984 1056	0.48	SJ TH	972 1086	0.66	TJ	990	0.66									
470	ER EU	1224 1338	0.34	TJ	1362	0.47												
680	SH	1734	0.23															
1000	TH	2316	0.16															
1500	TJ	2562	0.12															

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
	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-	0.47-220	0.85	1	1.06	1.32	1.48	1.70
450	330-1500	0.93	1	1.05	1.15	1.18	1.20

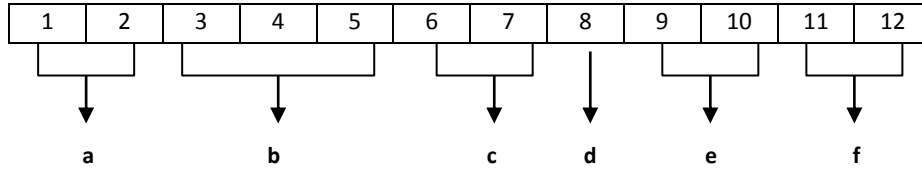
Temperature Multiplier For Ripple Current

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

SZ SERIES

1. CAPACITOR ORDERING INFORMATION:

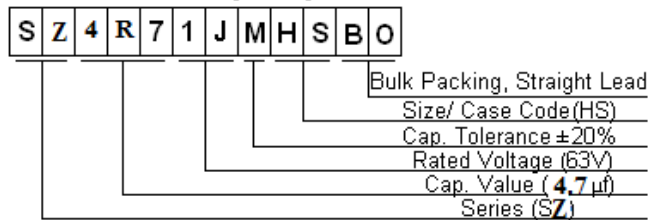
Capacitors are identified with the help of 12-digit code. Expansion of Part Nos. for SZ series capacitors are detailed below.



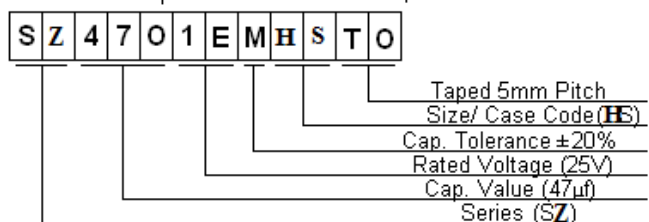
a																			
Series Code. Eg: SZ																			
b																			
Capacitance Value Code																			
Capacitance (µF)	0.1	1	0.22	2.2	22	220	2200	22000											
Code	R10	010	R22	2R2	220	221	222	223											
c																			
Voltage Code																			
Working Voltage (V)	6.3	10	12	16	25	35	40	50	63	100	160	200	250	315	350	400	420	450	
Code	0J	1A	1B	1C	1E	1V	1G	1H	1J	2A	2C	2D	2E	2P	2V	2G	2U	2W	
d																			
Tolerance Code																			
Tolerance	Capacitance Tolerance															Spec'l. Cap Tolerance	Spec'l. 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 (i) 4.7µf / 63V; SZ Series
Bulk Packing - Straight Lead



Example (iii) 47µf / 25V; SZ Series
Taped 5mm Pitch - Ammo pack



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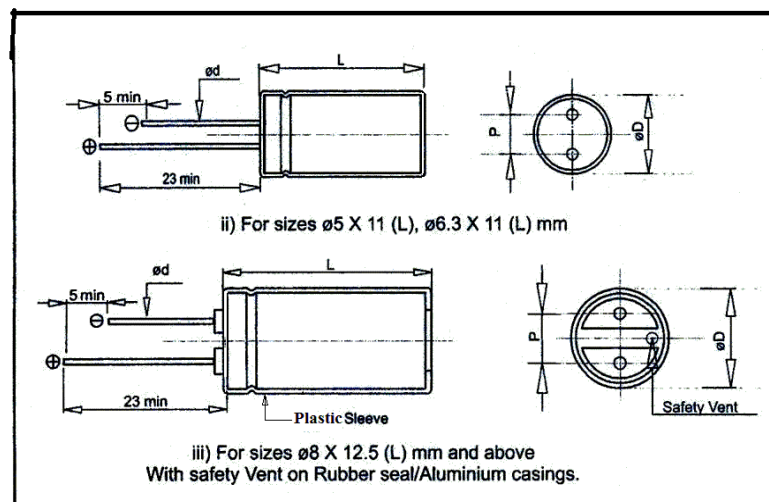
2. DIMENSIONAL SPECIFICATION FOR RADIAL LEAD TYPE CAPACITORS

Dimensions of SZ 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



SZ SERIES

3. MARKING ON THE CAPACITOR

Marking specifications of SZ 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 of SZ 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

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

LEAD CONFIGURATION

SZ capacitors are available in the following lead configuration.

1. STRAIGHT LEAD – Applicable to case code starting from hs(Size $\Phi 5 \times 11$ 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 HS, AS, BB, CB and CD.
5. TAPED FORM (2.5 mm lead pitch) – Applicable to case code HS and AS.

PRIMARY PACKING STANDARD BULK PACKING

SZ 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)	5x11	6.3x11	8x12.5	10x12.5	10x16	10x21	10x25	12.5x21
Case code	HS	AS	BB	CB	CD	CG	CK	DG
Nos/ Bag	500	500	500	300	300	300	200	200
Nos/ Carton	5000	4000	2500	1800	1500	1200	1000	800
Wt. (Kg) 1000 Nos (Approx)	2.2	2.6	2.6	3.3	3.0	2.9	3.3	3.2

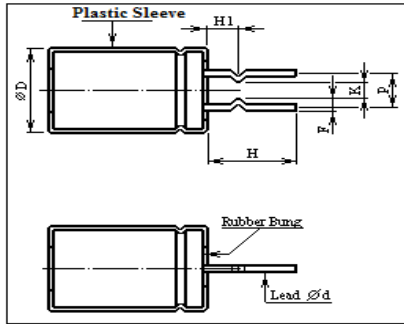
Size (Φ D x Lmm)	12.5x25	16x25	16x31	16x36	18x31	18x37	18x41	22x37	22x41	22x52
Case code	DK	EK	ER	EU	SR	SH	SJ	TH	TJ	TM
Nos/ Bag	200	100	100	100	50	50	50	50	25	25
Nos/ Carton	600	400	300	300	200	200	200	150	125	75
Wt. (Kg) 1000 Nos (Approx)	2.8	2.7	2.9	3.3	2.4	2.8	3.2	3.1	2.8	2.2

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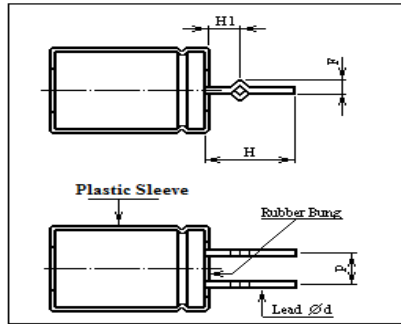
LEAD FORMED & CUT AND KINKING & CUT CAPACITORS.

Radial capacitors of size \varnothing 10mm 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)

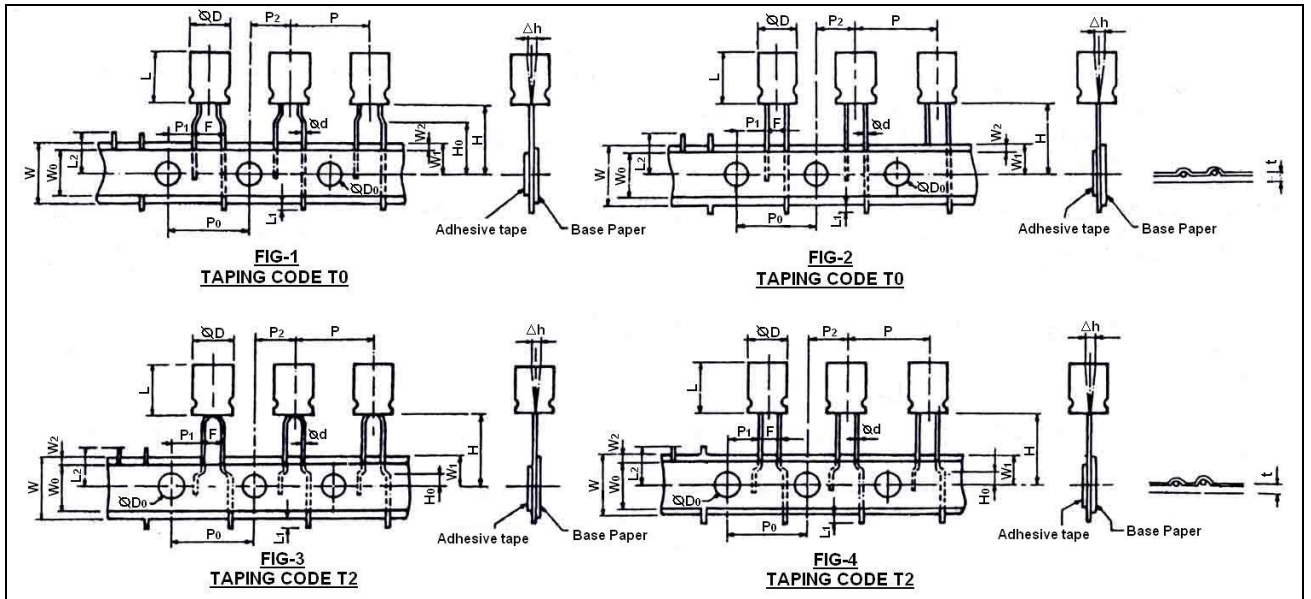
Case Diameter	H ± 0.5	H1	F ± 0.3	P ± 0.5	$\varnothing d \pm 0.05$	K (min)
\varnothing 10	5.0	2.7	1.3	5.0	0.6	2.8
\varnothing 12.5	5.0	2.7	1.3	5.0	0.6	2.8
\varnothing 16	5.0	2.7	1.3	7.5	0.8	5.5
\varnothing 18	5.0	2.7	1.3	7.5	0.8	5.5

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
not to scale

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

CASE SIZE			LEAD WIRE PITCH 2.5 mm		
			5 x 11 6.3x11	8x12.5	10x12.5 10 x 16
ITEM	DESCRIPTION	TOLERANCE	ØDXL		
	Figure. no. Ref		1	1	2
Ød	Lead wire dia.	± 0.02	0.5	0.6	0.6
F	Lead to lead Center	+ 0.8 - 0.2	5	5	5
P	Pitch of Components	± 1.0	12.7	12.7	12.7
P0	Feed hole Pitch*	± 0.3	12.7	12.7	12.7
P1	Feed hole Centre to lead	± 0.7	3.85	3.85	3.85
P2	Feedhole Centre to Comp. Centre	± 1.3	6.35	6.35	6.35
Δh	Component alignment deviation	± 2.0	0	0	0
W	Base Paper Width	± 0.2	18	18	18
W0	Adhesive Tape Width	+2.0 -0.0	13	13	13
W1	Feed hole Position	+0.75 -0.50	9	9	9
W2	Adhesive Tape Position	Max	3	3	3
H	Comp. Base height from Centre	± 0.75	18.5	20	20
H0	Lead Wire Clinch height	± 0.5	16	16	0
L1	Lead Wire Protrusion	Max	0	0	0
ØD0	Feed hole diameters	± 0.3	4	4	4
t	Total Tape thickness	± 0.2	0.7	0.7	0.7
L2	Length of Snapped Lead	Max	11	11	11

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

CASE SIZE			LEAD WIRE PITCH 2.5 mm	
			5x11	6.3x11
ITEM	DESCRIPTION	TOLERANCE	ØDXL	
	Figure. no. Ref		3	4
Ød	Lead wire dia.	± 0.02	0.5	0.5
F	Lead to lead Center	+ 0.8 - 0.2	2.5	2.5
P	Pitch of Components	± 1.0	12.7	12.7
P0	Feed hole Pitch*	± 0.3	12.7	12.7
P1	Feed hole Centre to lead	± 0.7	5.1	5.1
P2	Feedhole Centre to Comp. Centre	± 1.3	6.35	6.35
Δh	Component alignment deviation	± 2.0	0	0
W	Base Paper Width	± 0.2	18	18
W0	Adhesive Tape Width	+2.0 -0.0	13	13
W1	Feed hole Position	+0.75 -0.50	9	9
W2	Adhesive Tape Position	Max	3	3
H	Comp. Base height from Centre	± 0.75	18.5	18.5
H0	Lead Wire Clinch height	Approx	6.0	6.0
L1	Lead Wire Protrusion	Max	0	0
ØD0	Feed hole diameters	± 0.3	4	4
t	Total Tape thickness	± 0.2	0.7	0.7
L2	Length of Snapped Lead	Max	11	11

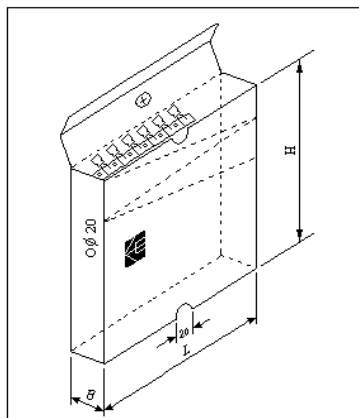
TAPED AMMO PACKING

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)	5x11	6.3x11	8x12.5	10x12.5	10x16
Case Code	HS	AS	BB	CB	CD
Nos/ Carton	2000	1500	1000	600	600

All Dimensions in mm



Tape Ammo Box Spec:

Applicable case code	HS, AS, BB, CB	CD
Box Dimensions		
L ± 2 (mm)	335	335
B ± 1 ₀ (mm)	46	50
H ± 2 (mm)	230	230