SE SERIES

FEATURES: RADIAL TYPE HIGH TEMPERATURE
CATEGORY: +105^{0}C, FOR USE IN SWITCHED MODE POWER SUPPLIES, AUTOMOBILE ELECTRONIC CIRCUITS AND INDUSTRIAL EQUIPMENTS.
REFERENCE STANDARDS: IS4317/ IEC 384-4.

ENDURANCE: + 105 ^{0}C, 1000 Hrs FOR DIAMETER <8mm
+ 105 ^{0}C, 2000 Hrs FOR DIAMETER ≥8mm

PRODUCT MARKING } **PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT**

■SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40^0 C to +105^{0}C for WV ≤ 250 Vdc, -25^{0}C to + 105^{0}C for WV > 250 Vdc.
Working Voltage	6.3 Vdc to 450 Vdc.
Capacitance Range	0.47µF to 10,000µF (at +27^{0}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+ 4µA for WV 160 to 450 V, Where IL = Leakage current in µA C= Capacitance (µF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at + 27^{0}C, 100 Hz)

WV Vdc	6.3	10	16	25	35	40	50	63	100	160	200	250-450
Tan δ %	24	21	19	16	14	13	12	11	9	14	14	15

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	16	25	35	40~50	63~100	160~250	350~450
Z -25^{0}C/ Z +27^{0}C	6	4	3	3	2	2	2	3	7
Z -40^{0}C/ Z + 27^{0}C	12	8	6	5	4	3	3	4	-

Add 0.5 to the Ratio for Z- 25^{0}C, 1.0 to the Ratio Z- 40^{0}C Per 1000µF, for Cap>1000µF

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage (For Ø< 8mm, 1000 Hrs +105^{0}C) (For Ø≥ 8mm, 2000 Hrs +105^{0}C) Measurements after recovery to +27^{0}C	Capacitor under no voltage At +105^{0}C for 1000 Hrs Measurements after recovery to +27^{0}C
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 forWV≤100 Within±20% of initial measured Value for WV>100
Tan δ	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit for WV≤ 6.3-100V Within 300% of initial limit for WV >100V

(i). Endurance Test at High Temperature +105^{0}C at WV.

(ii). Storage Test at High Temperature +105^{0}C at 0V.

■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

SE SERIES

STANDARD RATING TABLE: -

WV / SV / cap(µF)	6.3 / 8		10 / 12		16 / 19		25 / 30		35 / 41		40 / 46		50 / 58		63 / 73		100 / 115	
	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC
0.47															HS	8		
1.0															HS	12	HS	12
2.2															HS	18	AS	21
3.3															HS	21	AS	26
4.7													HS	24	HS	26	AS	31
6.8													HS	29	HS AS	31 35	BB	45
10											HS	34	67 HS	35 36	HS AS	37 43	AS BB	46 55
22							HS	47	HS	49	AS	58	HS AS	53 61	BB	77	BB CD	95 100
33					HS	54	HS	57	HS AS	61 69	AS	71	AS	74	BB	94	CB CG	110 135
47			HS	59	HS	64	HS AS	69 79	AS	82	AS	85	AS BB	89 110	CB	130	CD DG	155 185
68			HS	71	HS	77	AS	95	AS BB	92 120	BB	125	BB	130	CB	155	CG	180
100	HS	80	HS	86	HS AS	94 110	AS	115	BB	145	BB	150	BB	160	CD	205	CG CK DK	280 285 290
220	AS	140	AS BB	150 180	BB	195	BB	210	CB	245	CD	275	CD	290	CK	360	DK	420
330	BB	205	BB	220	BB	240	CB	285	CD	325	CG	370	CG CK	400 420	DG	465	EK	560
470	BB	240	BB	260	BB CB	295 320	CD	375	CD	390	CG	440	CK DG	500 530	DK	595	ER	720
680	BB CB	280 330	CD	385	CD	420	CG	490	CG	510	DG	610	DK	681	EK	815	SJ	1010
1000	CB CD	390 435	CD	465	CD CG	535 555	CG CK DG	620 650 685	DG DK EK	710 760 920	EK	905	EK ER	980 1023	ER EU	1060 1140	TH	1300
2200	CK	720	DG	810	DG DK EK	910 935 1065	EK	1125	ER	1260	ER EU	1300 1380	SH	1540	SJ TH TJ	1700 1765 1855		
3300	DK	960	DK	1015	DK EK	1150 1240	ER	1415	SH	1665	SH SJ	1700 1795	TM	2200	TM	2100		
4700	EK	1235	EK	1345	EK ER	1460 1505	EU SH	1710 1800	SJ	1930	TH	2400	TM	2820	TM	2700		
6800	ER	1520	EU	1740	EU SH	1810 1915	SJ	2600	TJ	2640	TM	2710						
10000	EU	1805			SH SJ	2400 2480	TJ	3700										

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

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/ +105ºC.

SE SERIES

STANDARD RATING TABLE (Contd.)

WV / SV / Cap (µF)	160 / 184		200 / 230		250 / 285		350 / 385		400 / 440		450 / 500	
	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC	CC	RC
1.0	AS	12	AS	12	AS BB	11 15	BB	15	BB	14	BB CB	13 15
2.2	AS	18	BB	22	BB	22	BB CB	18 22	CB	22	CB CD	20 25
3.3	BB	27	BB	27	BB CB	24 31	CB CD	26 30	CB CD	26 30	CD CG	30 33
4.7	BB	33	BB CB	31 37	BB CB	30 37	CD	36	CD	36	CD CG	35 39
6.8	BB CB	40 44	BB CD	40 48	CB CD	41 48	CG	47	CG	47	CG	47
10	CB CD	50 59	CB CD	49 59	CD CG	59 64	CG	57	CG	57	CG DK	57 71
22	CK DG	100 110	CD CG	96 110	DG	110	DK	105	DK	105	EK ER	125 130
33	DG DK	130 145	CK DG	130 140	DK	145	EK	150	ER	160	EK EU	150 170
47	DG EK	175 195	DG	170	EK ER	200 215	EU	205	SH	220	EU SJ	200 230
100	EK ER	290 310	EK EU	285 330	SH	320	TH	305	TH	300	TH	295
220	EU	420	SH	495	TH	510	TM	470	TM	460		
330	SJ TH	690 800	TH	790	TM	820						
470	TJ	960	TJ	905								
560	TM	1150	TM	1110								

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/ +105°C.

Temperature Multiplier for Ripple Current

Temp (°C)	40	60	70	85	95	105
Multipliers	1.85	1.75	1.61	1.4	1.25	1

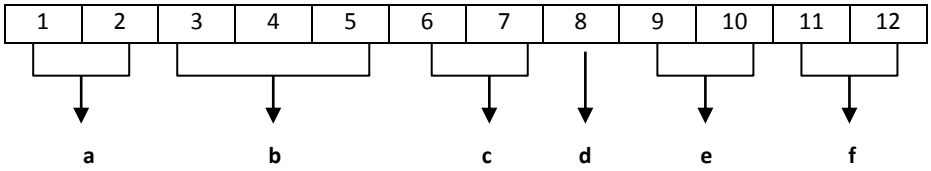
Frequency Multiplier for Ripple Current

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
	1000-10000	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
	330-1000	0.93	1	1.05	1.15	1.18	1.20

SE SERIES

1. CAPACITOR ORDERING INFORMATION:

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



a

Series Code. Eg: SE

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						Specl. Cap Tolerance	Specl.Tan∂ Tolerance
	±5%	± 10%	± 20%	± 30%	-10% +30%	-10% +50%	A	S
Code	J	K	M	N	Q	T		

e

Size Code

Follow respective Dimensional specification. Eg: HS, AS, BB etc.

f

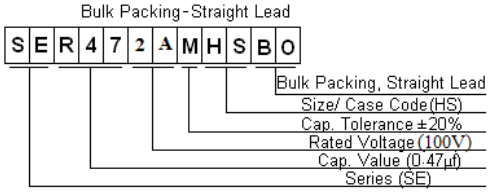
Capacitor Lead wire Termination Code

Provided by the factory based on customer requirements. Eg:

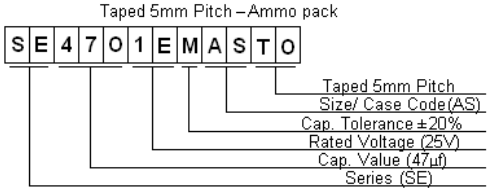
Item	Taped 5mm pitch	Taped 2.5mm pitch	Formed & cut	Kinking & cut	Bulk packing straight lead
Code	T0	T2	F0	FD	B0

Capacitor Codification System:-

Example (i) 0.47µf / **100V**
Bulk Packing - Straight Lead



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



SE SERIES

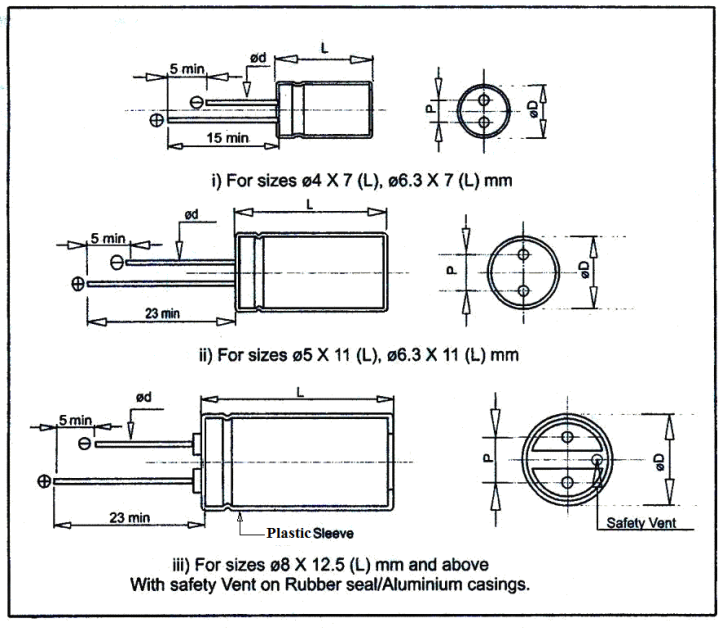
2. DIMENSIONAL SPECIFICATION FOR RADIAL LEAD TYPE CAPACITORS

Dimensions of SE series capacitors are detailed below.

Case Code	Diameter ØD ± 0.5 (mm)	Length L ± 1.0 (mm)	Pitch P ± 0.5 (mm)	Lead Dia Ød ± 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



SE SERIES

3. MARKING ON THE CAPACITOR

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

a) Manufacturer's name and logo KELTRON®
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 Ø 8mm and above.

Date Code:

Date code is provided on the capacitor sleeve in Year – Month format for sizes Ø 8mm and above. Year & Month code of SE capacitor of diameter Ø 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

SE SERIES

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

LEAD CONFIGURATION

SE capacitors are available in the following lead configuration.

1. STRAIGHT LEAD – Applicable to case code starting from 47 (Size Φ4 x 7 mm) to TM (Size Φ22 x 52 mm).
2. LEAD FORMED AND CUT – Applicable to case code starting from CB (Size Φ10 x 12.5mm) to SJ (Size Φ18 x 41 mm).
3. LEAD KINKED AND CUT – Applicable to case code starting from CB (Size Φ10 x 12.5mm) to SJ (Size Φ18 x 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

SE 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.

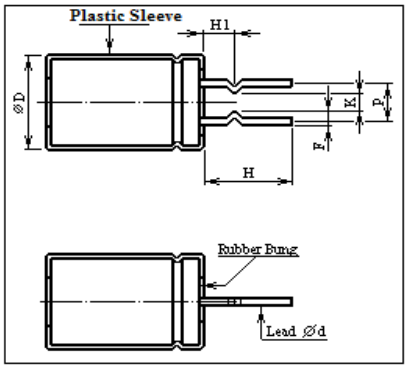
Size (Ø D x Lmm)	12.5x25	16x25	16x31	16x36	18x31	18x37	18x41	22x37	22x41	22x52
Case code	DK	EK	ER	EU	SR	SH	SJ	TH	TJ	TM
Nos/ Bag	200	100	100	100	50	50	50	50	25	25
Nos/ Carton	600	400	300	300	200	200	200	150	125	75
Wt. (Kg) 1000 Nos (Approx)	2.8	2.7	2.9	3.3	2.4	2.8	3.2	3.1	2.8	2.2

Size (Ø 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

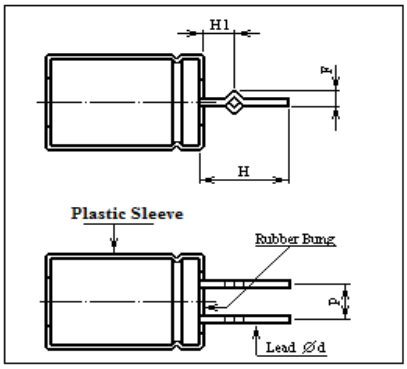
LEAD FORMED & CUT AND KINKING & CUT CAPACITORS.

Radial capacitors of size Ø 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	Ød ± 0.05	K (min)
Ø10	5.0	2.7	1.3	5.0	0.6	2.8
Ø 12.5	5.0	2.7	1.3	5.0	0.6	2.8
Ø 16	5.0	2.7	1.3	7.5	0.8	5.5
Ø 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)

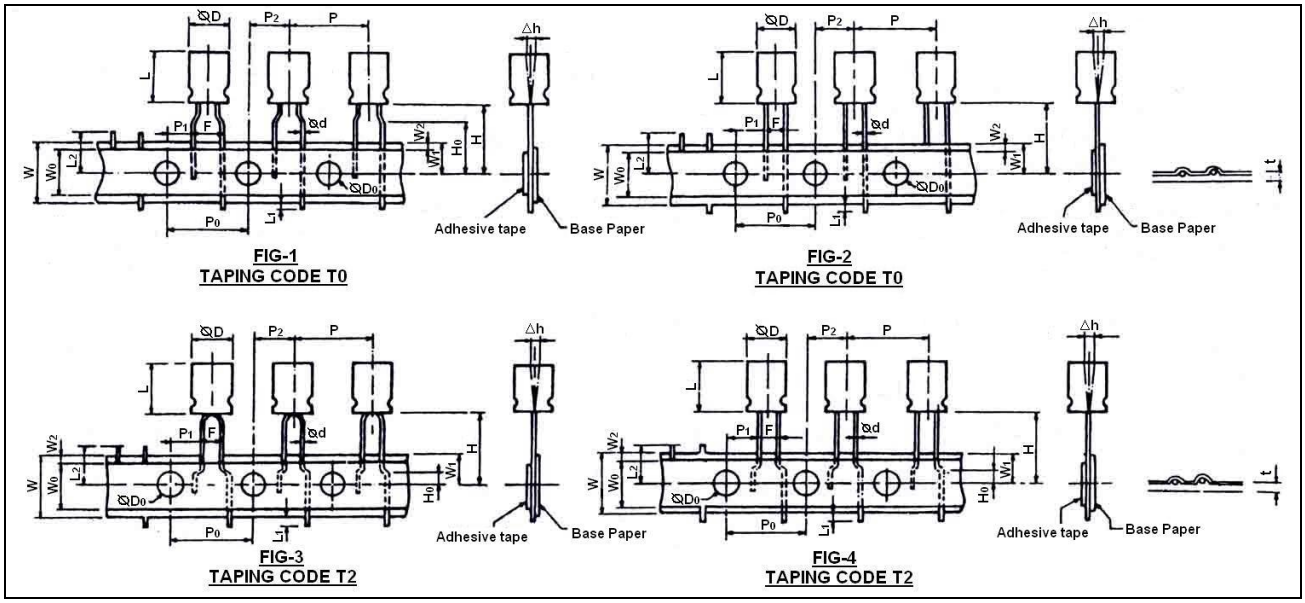


FIG-1
TAPING CODE T0

FIG-2
TAPING CODE T0

FIG-3
TAPING CODE T2

FIG-4
TAPING CODE T2

All Dimensions are in mm and Not to scale

SE SERIES

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

ITEM \ CASE SIZE ØDXL	DESCRIPTION	TOLERANCE	LEAD WIRE PITCH 5 mm: 4 x 7 6.3x 7	5 x 11 6.3x11	8x12.5	10x12.5 10 x 16
	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
P_O	Feed hole Pitch*	± 0.3	12.7	12.7	12.7	12.7
P_1	Feed hole Centre to lead	± 0.7	3.85	3.85	3.85	3.85
P_2	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
W_0	Adhesive Tape Width	+2.0 -0.0	13	13	13	13
W_1	Feed hole Position	+0.75 -0.50	9	9	9	9
W_2	Adhesive Tape Position	Max	3	3	3	3
H	Comp. Base height from Centre	± 0.75	17.5	18.5	20	20
H_0	Lead Wire Clinch height	± 0.5	16	16	16	0
L_1	Lead Wire Protrusion	Max	0	0	0	0
$ØD_0$	Feed hole diameters	± 0.3	4	4	4	4
t	Total Tape thickness	± 0.2	0.7	0.7	0.7	0.7
L_2	Length of Snapped Lead	Max	11	11	11	11
*Cumulative Pitch Error = 1mm/ 20 Pitch						

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

ITEM \ CASE SIZE ØDXL	DESCRIPTION	TOLERANCE	LEAD WIRE PITCH 2.5 mm: 4 x 7	6.3 x 7	5x11	6.3x11
	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
P_O	Feed hole Pitch*	± 0.3	12.7	12.7	12.7	12.7
P_1	Feed hole Centre to lead	± 0.7	5.1	5.1	5.1	5.1
P_2	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
W_0	Adhesive Tape Width	+2.0 -0.0	13	13	13	13
W_1	Feed hole Position	+0.75 -0.50	9	9	9	9
W_2	Adhesive Tape Position	Max	3	3	3	3
H	Comp. Base height from Centre	± 0.75	17.5	17.5	18.5	18.5
H_0	Lead Wire Clinch height	Approx	6.0	6.0	6.0	6.0
L_1	Lead Wire Protrusion	Max	0	0	0	0
$ØD_0$	Feed hole diameters	± 0.3	4	4	4	4
t	Total Tape thickness	± 0.2	0.7	0.7	0.7	0.7
L_2	Length of Snapped Lead	Max	11	11	11	11
*Cumulative Pitch Error = 1mm/ 20 Pitch						

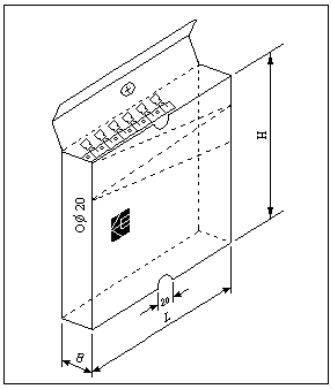
TAPED AMMO PACKING

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:

Box Dimensions \ Applicable case code	47, 67, HS, AS, BB, CB	CD
L ± 2 (mm)	335	335
B ± $^1_0$ (mm)	46	50
H ± 2 (mm)	230	230