NATT Series
Surface Mount Aluminum Electrolytic Capacitors

AEC-Q200 QUALIFIED | 9001:2015 CERTIFIED | ROHS/REACH COMPLIANT HALOGEN FREE | NIC Components Corp.

FEATURES
- CYLINDRICAL V-CHIP CONSTRUCTION FOR SURFACE MOUNTING
- **AVAILABLE WITH ANTI-VIBRATION WIDE TERMINATIONS**
- EXTENDED TEMPERATURE & LOAD LIFE (1,000 ~ 2,000 HOURS @ +125°C)
- SUITABLE FOR DC-DC CONVERTER, DC-AC INVERTER, ETC.
- DESIGNED FOR AUTOMATIC MOUNTING AND REFLOW SOLDERING
- MEETS THE REQUIREMENTS OF AEC-Q200*

*Contact NIC for supporting test data

SAC Alloy Compatible
230°C ~ 260°C

LOW ESR COMPONENT
LIQUID ELECTROLYTE
For Performance Data
see www.LowESR.com

CHARACTERISTICS

Rated Voltage Rating	6.3 ~ 100Vdc								
Rated Capacitance Range	2.2 ~ 4,700µF								
Operating Temp. Range	-55 ~ +125°C								
Capacitance Tolerance	±20% (M)								
Max. Leakage Current After 2 Miuntes @ 20°C	0.01CV or 3µA whichever is greater								
Tan δ @ 120Hz/20°C	W.V. (Vdc)	6.3	10	16	25	35	50	63	100
	S.V. (Vdc)	8.0	13	20	32	44	63	79	125
	Tan δ	0.30	0.24	0.20	0.16	0.14	0.14	0.12	0.10
Low Temperature Stability Impedance Ratio @ 120Hz	W.V. (Vdc)	6.3	10	16	25	35	50	63	100
	Z-25°C/Z+20°C	4	3	2	2	2	2	2	2
	Z-40°C/Z+20°C	8	6	4	3	3	3	3	3
Load Life Test @ 125°C 1,000 ~ 2,000 hours (see specifications tables for specific part numbers)	Capacitance Change	Within ±30% of initial measured value							
	Tan δ	Less than ±300% of the specified maximum value							
	Leakage Current	Less than the specified maximum value							

STANDARD VALUES AND CASE SIZES (mm)

Cap (µF)	Code	Working Voltage (Vdc)							
		6.3	10	16	25	35	50	63	100
2.2	2R2	-	-	-	-	-	6.3x6.3	-	-
3.3	3R3	-	-	-	-	-	6.3x6.3	-	-
4.7	4R7	-	-	-	-	6.3x6.3	6.3x6.3	-	-
10	100	-	-	-	-	6.3x6.3	6.3x6.3	-	8x10.5
22	220	-	-	-	-	6.3x6.3	6.3x8	8x10.5	8x10.5
33	330	-	-	-	6.3x6.3	6.3x8	6.3x8 8x10.5	8x10.5	10x10.5
47	470	-	6.3x6.3	6.3x6.3	6.3x8	6.3x8 8x10.5	8x10.5 10x10.5	8x10.5 10x10.5	12.5x14
100	101	6.3x6.3	6.3x8	6.3x8 8x10.5	6.3x8 8x10.5	8x10.5 10x10.5	10x10.5 12.5x14	10x10.5 12.5x14	16x17
220	221	6.3x8	6.3x8 8x10.5	8x10.5	8x10.5 10x10.5	10x10.5 12.5x14	12.5x14	12.5x14 16x17	-
330	331	8x10.5	8x10.5	10x10.5	10x10.5 12.5x14	12.5x14	12.5x14 16x17	16x17	-
470	471	8x10.5	10x10.5	12.5x14	12.5x14	12.5x14 16x17	16x17	16x17	-
680	681	10x10.5	12.5x14	12.5x14	12.5x14	16x17	16x17	-	-
1000	102	12.5x14	12.5x14	12.5x14	16x17	16x17	-	-	-
1500	152	12.5x14	12.5x14	16x17	16x17	-	-	-	-
2200	222	12.5x14	16x17	16x17	-	-	-	-	-
3300	332	16x17	16x17	-	-	-	-	-	-
4700	472	16x17	-	-	-	-	-	-	-

PEAK REFLOW TEMPERATURE CODES

Code	Peak Reflow Temperature
N	260°C
L	250°C
K	245°C
J	240°C
H	235°C

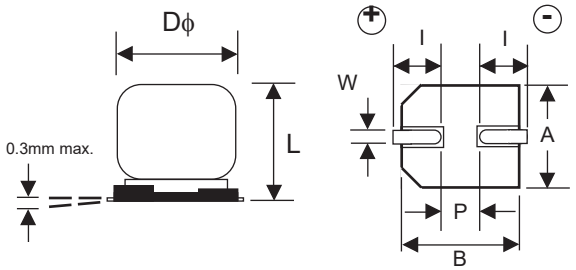
TERMINATION FINISH & PACKAGING OPTIONS CODES

Code	Finish & Reel Size
LB	Sn-Bi Finish & 15" Reel
LS	100% Sn Finish & 15" Reel

Note 1: 16mm diameter parts are only available with Sn finish.
Note 2: 12.5mm & 16mm parts are only available on 15" reels.

CASE SIZE DIMENSIONS (mm)

Case Size	ϕD±0.5	L max.	A±0.2	B±0.2	I±0.3	W	P±0.3
6.3x6.3	6.3	6.3	6.6	6.6	2.5	0.5~0.8	2.2
6.3X8	6.3	8.0	6.6	6.6	2.5	0.5~0.8	2.2
8x10.5	8.0	10.5	8.3	8.3	2.9	0.7~1.1	3.2
10x10.5	10.0	10.5	10.3	10.3	3.2	0.7~1.4	4.6
12.5x14	12.5	14.0	12.8	12.8	4.5	1.0~1.4	4.6
16x17	16.0	17.0	16.3	16.3	5.5	1.7~2.1	7.0



Performance Passives By Design

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STANDARD VALUES, CASE SIZES AND SPECIFICATIONS

NIC Part Number	Cap. (µF)	W.V. (Vdc)	Dissipaton Factor (Tan δ)	Max. ESR (Ω) 100KHz, +20°C	Max. Ripple Current (mA) +125°C, 100KHz	Load Life Hours @ +125°C
NATT101M6.3V6.3X6.3NLBF	100	6.3	0.30	1.60	70	1,000
NATT221M6.3V6.3X8NLBF	220		0.30	0.90	110	1,000
NATT331M6.3V8X10.5NLBF	330		0.30	0.40	160	2,000
NATT471M6.3V8X10.5NLBF	470		0.30	0.40	160	2,000
NATT681M6.3V10X10.5LLBF	680		0.30	0.30	296	2,000
NATT102M6.3V12.5X14KLBF	1000		0.30	0.12	550	2,000
NATT152M6.3V12.5X14KLBF	1500		0.30	0.12	550	2,000
NATT222M6.3V12.5X14KLBF	2200		0.30	0.12	550	2,000
NATT332M6.3V16X17JLSF	3300		0.30	0.08	900	2,000
NATT472M6.3V16X17JLSF	4700		0.30	0.08	900	2,000
NATT470M10V6.3X6.3NLBF	47	10	0.24	1.60	70	1,000
NATT101M10V6.3X8NLBF	100		0.24	0.90	110	1,000
NATT221M10V6.3X8NLBF	220		0.24	0.90	110	1,000
NATT221M10V8X10.5NLBF	220		0.24	0.40	160	2,000
NATT331M10V8X10.5NLBF	330		0.24	0.40	160	2,000
NATT471M10V10X10.5LLBF	470		0.24	0.30	296	2,000
NATT681M10V12.5X14KLBF	680		0.24	0.12	550	2,000
NATT102M10V12.5X14KLBF	1000		0.24	0.12	550	2,000
NATT152M10V12.5X14KLBF	1500		0.24	0.12	550	2,000
NATT222M10V16X17JLSF	2200		0.24	0.08	900	2,000
NATT332M10V16X17JLSF	3300		0.24	0.08	900	2,000
NATT470M16V6.3X6.3NLBF	47	16	0.20	1.60	70	1,000
NATT101M16V6.3X8NLBF	100		0.20	0.90	110	1,000
NATT101M16V8X10.5NLBF	100		0.20	0.40	160	2,000
NATT221M16V8X10.5NLBF	220		0.20	0.40	160	2,000
NATT331M16V10X10.5LLBF	330		0.20	0.30	296	2,000
NATT471M16V12.5X14KLBF	470		0.20	0.12	550	2,000
NATT681M16V12.5X14KLBF	680		0.20	0.12	550	2,000
NATT102M16V12.5X14KLBF	1000		0.20	0.12	550	2,000
NATT152M16V16X17JLSF	1500		0.20	0.08	900	2,000
NATT222M16V16X17JLSF	2200		0.20	0.08	900	2,000
NATT330M25V6.3X6.3NLBF	33	25	0.16	1.60	70	1,000
NATT470M25V6.3X8NLBF	47		0.16	0.90	110	1,000
NATT101M25V6.3X8NLBF	100		0.16	0.90	110	1,000
NATT101M25V8X10.5NLBF	100		0.16	0.40	160	2,000
NATT221M25V8X10.5NLBF	220		0.16	0.40	160	2,000
NATT221M25V10X10.5LLBF	220		0.16	0.30	296	2,000
NATT331M25V10X10.5LLBF	330		0.16	0.30	296	2,000
NATT331M25V12.5X14KLBF	330		0.16	0.12	550	2,000
NATT471M25V12.5X14KLBF	470		0.16	0.12	550	2,000
NATT681M25V12.5X14KLBF	680		0.16	0.12	550	2,000
NATT102M25V16X17JLSF	1000		0.16	0.08	900	2,000
NATT152M25V16X17JLSF	1500		0.16	0.08	900	2,000
NATT4R7M35V6.3X6.3NLBF	4.7	35	0.14	2.00	60	1,000
NATT100M35V6.3X6.3NLBF	10		0.14	1.60	70	1,000
NATT220M35V6.3X6.3NLBF	22		0.14	1.60	70	1,000
NATT330M35V6.3X8NLBF	33		0.14	0.90	110	1,000
NATT470M35V6.3X8NLBF	47		0.14	0.90	110	1,000
NATT470M35V8X10.5NLBF	47		0.14	0.40	160	2,000
NATT101M35V8X10.5NLBF	100		0.14	0.40	160	2,000
NATT101M35V10X10.5LLBF	100		0.14	0.30	296	2,000
NATT221M35V10X10.5LLBF	220		0.14	0.30	296	2,000
NATT221M35V12.5X14KLBF	220		0.14	0.12	550	2,000
NATT331M35V12.5X14KLBF	330		0.14	0.12	550	2,000
NATT471M35V12.5X14KLBF	470		0.14	0.12	550	2,000
NATT471M35V16X17JLSF	470		0.14	0.08	900	2,000
NATT681M35V16X17JLSF	680		0.14	0.08	900	2,000
NATT102M35V16X17JLSF	1000		0.14	0.08	900	2,000

For Automotive Equipment, see part number system

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STANDARD VALUES, CASE SIZES AND SPECIFICATIONS

NIC Part Number	Cap. (µF)	W.V. (Vdc)	Dissipaton Factor (Tan δ)	Max. ESR (Ω) 100KHz, +20°C	Max. Ripple Current (mA) +125°C, 100KHz	Load Life Hours @ +125°C
NATT2R2M50V6.3X6.3NLBF	2.2	50	0.14	3.50	45	1,000
NATT3R3M50V6.3X6.3NLBF	3.3		0.14	3.50	45	1,000
NATT4R7M50V6.3X6.3NLBF	4.7		0.14	3.50	45	1,000
NATT100M50V6.3X6.3NLBF	10		0.14	2.80	50	1,000
NATT220M50V6.3X8NLBF	22		0.14	2.00	80	1,000
NATT330M50V6.3X8NLBF	33		0.14	2.00	80	1,000
NATT330M50V8X10.5NLBF	33		0.14	0.70	140	2,000
NATT470M50V8X10.5NLBF	47		0.14	0.70	140	2,000
NATT470M50V10X10.5LLBF	47		0.14	0.50	247	2,000
NATT101M50V10X10.5LLBF	100		0.14	0.50	247	2,000
NATT101M50V12.5X14KLBF	100		0.14	0.23	490	2,000
NATT221M50V12.5X14KLBF	220		0.14	0.23	490	2,000
NATT331M50V12.5X14KLBF	330		0.14	0.23	490	2,000
NATT331M50V16X17JLSF	330		0.14	0.15	800	2,000
NATT471M50V16X17JLSF	470		0.14	0.15	800	2,000
NATT681M50V16X17JLSF	680		0.14	0.15	800	2,000
NATT220M63V8X10.5KLBF	22	63	0.12	1.0	100	1,500
NATT330M63V8X10.5KLBF	33		0.12	1.0	100	1,500
NATT470M63V8X10.5KLBF	47		0.12	1.0	100	1,500
NATT470M63V10X10.5JLBF	47		0.12	0.5	150	1,500
NATT101M63V10X10.5JLBF	100		0.12	0.5	150	1,500
NATT101M63V12.5X14JLBF	100		0.12	0.25	350	1,500
NATT221M63V12.5X14JLBF	220		0.12	0.25	350	1,500
NATT221M63V16X17HLSF	220		0.12	0.18	500	1,500
NATT331M63V16X17HLSF	330		0.12	0.18	500	1,500
NATT471M63V16X17HLSF	470		0.12	0.18	500	1,500
NATT100M100V8X10.5JLBF	10	100	0.10	1.00	70	1,500
NATT220M100V8X10.5JLBF	22		0.10	1.00	70	1,500
NATT330M100V10X10.5JLBF	33		0.10	0.80	115	1,500
NATT470M100V12.5X14HLBF	47		0.10	0.33	350	1,500
NATT101M100V16X17HLSF	100		0.10	0.24	500	1,500

For Automotive Equipment, see part number system

RIPPLE CURRENT FREQUENCY MULTIPLIER

Capacitance (µF)	Frequency (Hz)			
	100	1K	10K	100K
≤22	0.50	0.80	0.90	1.0
≤150	0.65	0.85	0.92	1.0
>150	0.70	0.85	0.95	1.0

PART NUMBER SYSTEM

NATT 101 M 16V 6.3x8 N _ W Y F

- F — RoHS Compliant
- Y — Optional: Suitable for automotive equipment, sourced to special production and inspection at IATF-16949 certified production site
- W — Wide Terminations (Optional ≥8mm diameter)
- _ — Termination/Packaging Code
- N — Reflow Temperature Code
- 6.3x8 — Size in mm
- 16V — Working Voltage
- M — Tolerance Code M=20%
- 101 — Capacitance Code in µF, first 2 digits are significant. Third digit is no. of zeros, "R" indicates decimal for values under 10µF
- NATT — Series

PRECAUTIONS

Please review the notes on correct use, safety and precautions found at
https://www.niccomp.com/resource/files/aluminum/AlumApplInfoCautions.pdf
If in doubt or uncertainty, please review your specific application - process details with NIC's technical support personnel: **tpmg@niccomp.com**

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PEAK REFLOW TEMPERATURE & DURATION (6.3 ~ 50V)

Diameter	Time above 200°C	Time above 217°C	Time above 230°C	Peak Temperature 5 seconds	Reflow Code
6.3mm ~ 8mm ϕ	80 sec. max.	70 sec. max.	40 sec. max.	260°C	N
10mm ϕ	70 sec. max.	60 sec. max.	40 sec. max.	250°C	L
12.5mm ϕ	60 sec. max.	50 sec. max.	30 sec. max.	245°C	K
16mm ϕ	50 sec. max.	40 sec. max.	20 sec. max.	240°C	J

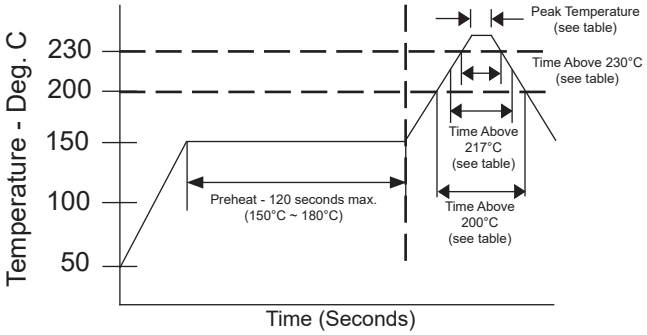
PEAK REFLOW TEMPERATURE & DURATION (63V)

Diameter	Time above 200°C	Time above 217°C	Time above 230°C	Peak Temperature 5 seconds	Reflow Code
8mm ϕ	60 sec. max.	50 sec. max.	30 sec. max.	245°C	K
10mm ϕ	50 sec. max.	40 sec. max.	20 sec. max	240°C	J
12.5mm ϕ	50 sec. max.	40 sec. max.	20 sec. max.	240°C	J
16mm ϕ	50 sec. max.	40 sec. max.	15 sec. max.	235°C	H

PEAK REFLOW TEMPERATURE & DURATION (100V)

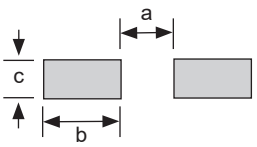
Diameter	Time above 200°C	Time above 217°C	Time above 230°C	Peak Temperature 5 seconds	Reflow Code
8mm ϕ	60 sec. max.	50 sec. max.	30 sec. max.	240°C	J
10mm ϕ	50 sec. max.	40 sec. max.	20 sec. max.	240°C	J
12.5mm ϕ	50 sec. max.	40 sec. max.	20 sec. max.	235°C	H
16mm ϕ	45 sec. max.	30 sec. max.	10 sec. max.	235°C	H

Capacitors can withstand two times reflow at the above conditions. Second reflow shall be at least one hour after natural cool to room temperature.



RECOMMENDED LAND PATTERN DIMENSIONS (mm)

Case Size	a	b	c
6x3x6.3 6.3x8	2.1	3.5	1.8
8x10.5	2.8	4.1	2.1
10x10.5	4.3	4.4	2.5
12.5x14	4.3	5.8	2.5
16x17	6.6	6.5	5.0

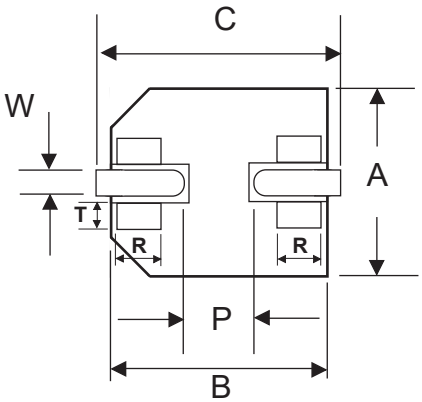


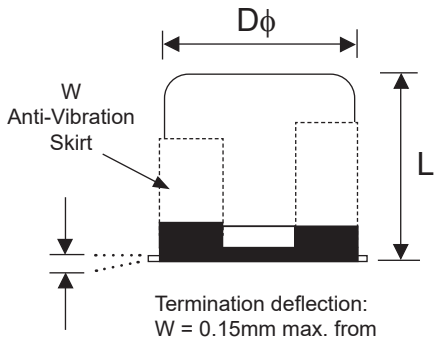
WIDE TERMINATION (W) DIM. (mm)

Case Size	Dϕ ±0.5	L ± 0.5	A, B	C ±0.2	P ±0.2	W	R	T
8 x 10.5W	8.0	10.5	8.3 ± 0.2	9.0	3.2	0.7 ~ 1.0	(0.7)	(1.3)
10 x 10.5W	10.0	10.5	10.3 ± 0.2	11.0	4.6	1.0 ~ 1.4	(0.7)	(1.3)
12.5 x 14W	12.5	14.0	13.5 ± 0.2	14.2	4.6	1.0 ~ 1.4	(2.2)	(2.4)
16 x 17W	16.0	17.0	17.0 ± 0.2	18.0	7.0	1.8 ~ 2.1	(3.0)	(2.0)

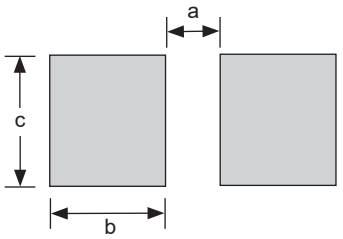
W LAND PATTERN DIM. (mm)

Case Size	a	b	c
8x10.5	2.5	4.5	4.7
10x10.5	3.8	4.8	4.7
12.5x14	3.8	6.1	6.9
16x17	5.0	8.0	9.5





Termination deflection:
W = 0.15mm max. from bottom of support terminals



Review & Compare Reflow Soldering Heat Limits
V-chip SMT Aluminum Electrolytic Capacitors
www.niccomp.com/RSL

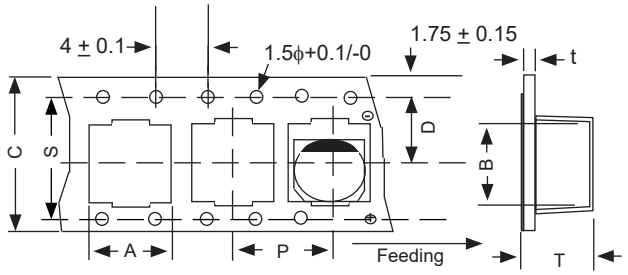
W (Wide Terminations) Anti-Vibration Test	
Test Method	Direction: X, Y, Z axis Frequency & Duration: 5 to 2000Hz reciprocation for 20 minutes, 2 hours each direction Peak to Peak Amplitude: 5mm Peak Acceleration: 30G Sweep Type: Log
Δ Capacitance	Within ± 10% of initial value
Tangent of Loss	≤ Specified value
Leakage Current	≤ Specified value

CARRIER TAPE DIMENSIONS (mm)

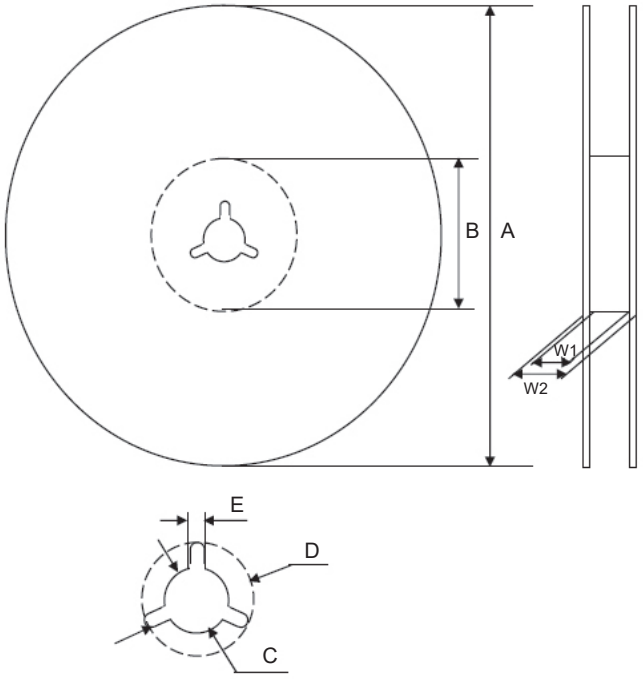
Case Size	A ±0.2	B ±0.2	C ±0.3	D ±0.1	P ±0.1	T ±0.2	t max.	S ±0.1
6.3 x 6.3	7.0	7.0	16.0	7.5	12.0	6.5	0.6	-
6.3 x 8	7.0	7.0	16.0	7.5	12.0	8.2	0.6	-
8 x 10.5	8.7	8.7	24.0	11.5	16.0	11.1	0.6	-
10 x 10.5	10.7	10.7	24.0	11.5	16.0	11.2	0.6	-
12.5 x 14	13.2	13.2	32.0	14.2	24.0	14.3	0.6	28.4
16 x 17	17.5	17.5	44.0	20.2	28.0	17.3	0.6	40.4

TAPING SPECIFICATIONS (mm)

1. Both Leader and Trailer tape: Minimum 40mm (1.57") empty carrier tape pockets.
2. Leader tape: Approximately 20cm of cover tape at leader.
3. Connection: Maximum 3 connections (slices) per reel.



V-Chip 15" (380mm) Reel (LBF or LSF suffix)



Dimensions (mm)

Case Size	Tape Width	W1	W2
6.3x6.3, 6.3x8	16.0	16.5 ~ 18.0	19.5 ~ 24.0
8x10.5, 10x10.5	24.0	24.5 ~ 26.0	27.5 ~ 32.0
12.5x14	32.0	33.0 ~ 34.0	36.5 ~ 38.5
16x17	44.0	45.0 ~ 46.0	48.5 ~ 50.5

Case Size	Tape Width	A	B	C	D	E
6.3x6.3, 6.3x8	16.0	ϕ380 ±2	ϕ80~105	ϕ13 ±0.5	ϕ21 ±1.0	2.0 ±0.5
8x10.5, 10x10.5	24.0					
12.5x14	32.0					
16x17	44.0					

Case Size	Quantity Per Reel
	15" (380mm)
6.3x6.3	1,000
6.3x8	900
8x10.5	500
10x10.5	500
12.5x14	250
16x17	200