


Product Family: General Purpose Thin Film Chip Resistor

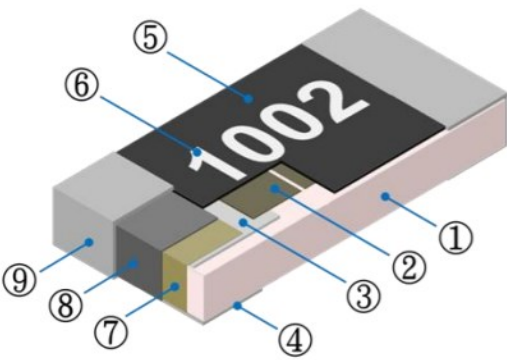
Part Number Series: KN Series


	Construction: <ul style="list-style-type: none"> • High purity alumina ceramic • Ni alloy thin film resistive element • 100% matte tin over Ni terminations • Halogen free • RoHS compliant and Pb free • Inherently anti-sulfur 	Features: <ul style="list-style-type: none"> • 0201, 0402, 0603, 0805, 1206, 1210, 2010, and 2512 English case sizes • Power up to 3/4W • Resistances from 2.49Ω ~ 1.5MΩ • TCR down to ±10ppm/°C • Tolerance down to ±0.1% • Moisture Sensitivity Level (MSL) = 1
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Description:

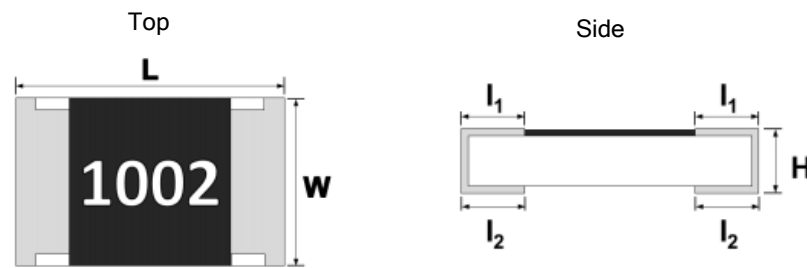
These thin film chip resistors offer great performance, TCR and tolerance. They are excellent in applications such as consumer electronics, computer, telecom, measuring instruments, printing equipment, and converters. High volume production provides excellent pricing and is suitable for commercial and special applications.

Product Construction:

	Number	Description
	1	Alumina substrate
	2	Resistive layer
	3	Top inner electrode
	4	Bottom inner electrode
	5	Protective overcoat
	6	Marking
	7	Side inner electrode
	8	Nickel barrier
	9	Solder coating (Sn)

Part Numbering: Ex: KN0402AE10R0F-T10

Series Name	English Size (Metric Size)	Internal Code	Temp. Coefficient of Resistance (TCR)	Resistance Value	Resistance Tolerance	T&R Packaging Quantity
KN	0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 2010 (5025) 2512 (6432)	A	Y = ±10ppm/°C X = ±15ppm/°C E = ±25ppm/°C Q = ±50ppm/°C	For all sizes, use 4 digit code for all values. "R" denotes decimal position as necessary.	B = ±0.10% C = ±0.25% D = ±0.50% F = ±1.00%	-T4 = 4,000 -T5 = 5,000 -T10 = 10,000 (Refer to electrical tables)

Product Dimensions:

All dimensions in inches, mm in parentheses.

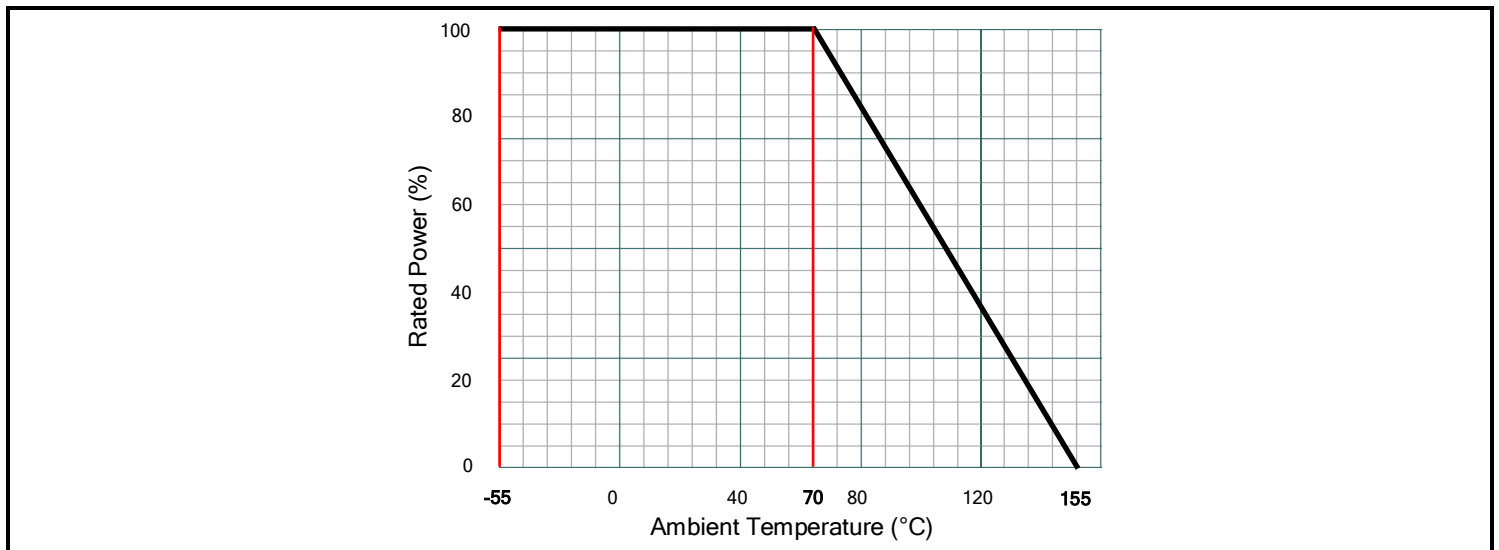
Dimension (Metric)	L	W	H	l ₁	l ₂
KN0201 (0603)	0.024 ±0.002 (0.60 ±0.05)	0.012 ±0.002 (0.30 ±0.05)	0.009 ±0.002 (0.23 ±0.05)	0.005 ±0.002 (0.12 ±0.05)	0.006 ±0.002 (0.15 ±0.05)
KN0402 (1005)	0.039 ±0.004 (1.00 ±0.10)	0.020 ±0.002 (0.50 ±0.05)	0.012 ±0.002 (0.30 ±0.05)	0.008 ±0.004 (0.20 ±0.10)	0.008 ±0.004 (0.20 ±0.10)
KN0603 (1608)	0.063 ±0.006 (1.60 ±0.15)	0.031 ±0.004 (0.80 ±0.10)	0.018 ±0.004 (0.45 ±0.10)	0.012 ±0.008 (0.30 ±0.20)	0.012 ±0.008 (0.30 ±0.20)
KN0805 (2012)	0.079 ±0.006 (2.00 ±0.15)	0.049 ±0.006 (1.25 ±0.15)	0.022 ±0.004 (0.55 ±0.10)	0.014 ±0.008 (0.35 ±0.20)	0.016 ±0.008 (0.40 ±0.20)
KN1206 (3216)	0.122 ±0.006 (3.10 ±0.15)	0.063 ±0.006 (1.60 ±0.15)	0.022 ±0.004 (0.55 ±0.10)	0.018 ±0.008 (0.45 ±0.20)	0.020 ±0.008 (0.50 ±0.20)
KN1210 (3225)	0.122 ±0.006 (3.10 ±0.15)	0.098 ±0.006 (2.50 ±0.15)	0.022 ±0.004 (0.55 ±0.10)	0.018 ±0.008 (0.45 ±0.20)	0.020 ±0.008 (0.50 ±0.20)
KN2010 (5025)	0.197 ±0.006 (5.00 ±0.15)	0.098 ±0.006 (2.50 ±0.15)	0.022 ±0.004 (0.55 ±0.10)	0.024 ±0.008 (0.60 ±0.20)	0.024 ±0.008 (0.60 ±0.20)
KN2512 (6432)	0.248 ±0.006 (6.30 ±0.15)	0.126 ±0.006 (3.20 ±0.15)	0.022 ±0.004 (0.55 ±0.10)	0.024 ±0.008 (0.60 ±0.20)	0.024 ±0.008 (0.60 ±0.20)

Electrical Specifications:

Type	KN0201		KN0402		KN0603		KN0805		
Metric Size	0603		1005		1608		2012		
Power Ratings	1/20W (0.05W)		1/16W (0.063W)		1/10W (0.10W)		1/8W (0.125W)		
Max Operating Voltage	25V		50V		75V		150V		
Max Overload Voltage	50V		100V		150V		300V		
TCR ppm/°C (code)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)	
Resistance Tolerance (code)	±0.10%(B)	10Ω ~5.1KΩ	10Ω ~82KΩ	10Ω ~68KΩ	4.7Ω ~220KΩ	10Ω ~332KΩ	4.7Ω ~680KΩ	10Ω ~680KΩ	4.7Ω ~1MΩ
	±0.25%(C)								
	±0.50%(D)								
	±1.00%(F)								
Operating Temp. Range	-55°C ~+155°C								
Packaging (code)	10,000pcs/reel (-T10)				5,000pcs/reel (-T5)				

Electrical Specifications (Cont.):

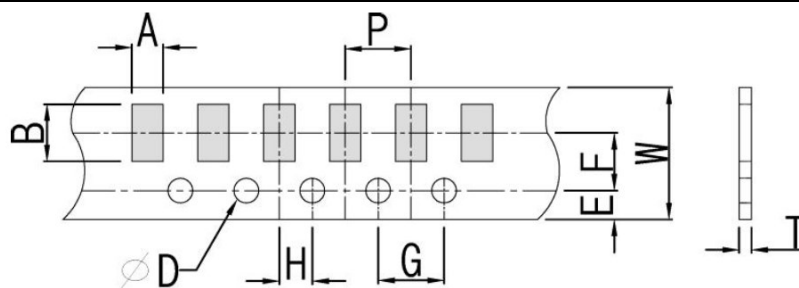
Type	KN1206		KN1210		KN2010		KN2512	
Metric Size	3216		3225		5025		6432	
Power Ratings	1/4W (0.25W)		1/4W (0.25W)		1/2W (0.50W)		3/4W (0.75W)	
Max Operating Voltage	200V		200V		200V		200V	
Max Overload Voltage	400V		400V		400V		400V	
TCR ppm/°C (code)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)	±10(Y) ±15(X)	±25(E) ±50(Q)
Resistance Tolerance (code)	±0.10%(B)	10Ω ~1MΩ	10Ω ~1MΩ	4.7Ω ~1.5MΩ	10Ω ~1MΩ	4.7Ω ~1MΩ	10Ω ~1MΩ	4.7Ω ~1MΩ
	±0.25%(C)			2.49Ω ~1.5MΩ		2.49Ω ~1MΩ		2.49Ω ~1MΩ
	±0.50%(D)							
	±1.00%(F)							
Operating Temp. Range	-55°C ~ +155°C							
Packaging	5,000pcs/reel (-T5)				4,000pcs/reel (-T4)			

Power Derating Curve:**Reliability Specifications:**

Test	Procedure	Specification
Temperature Coefficient of Resistance (TCR) JIS C 5201-1 clause 4.8	At +25°C/-55°C and +25°C/+125°C	Refer to Electrical Specifications
Short Time Overload JIS C 5201-1 clause 4.13	2.5 times RCWV or max. overload voltage whichever is less for 5 seconds.	±(0.5%+0.05Ω) No visual damage
Solderability JIS C 5201-1 clause 4.17	245 ±5°C for 3 ±0.5secs.	>95% Coverage No visual damage
Resistance to Soldering Heat JIS C 5201-1 clause 4.18	260 ±5°C for 10 seconds.	±(0.5%+0.05Ω) No visual damage
Leaching JIS C 5201-1 clause 4.18	260 ±5°C for 30 seconds.	>95% Coverage No visual damage
Temperature Cycling JIS C 5201-1 clause 4.19	-55°C to +155°C, 300 cycles.	±(0.5%+0.05Ω) No visual damage
Insulation Resistance JIS C 5201-1 clause 4.6	100V for 1 minute	≥10GΩ

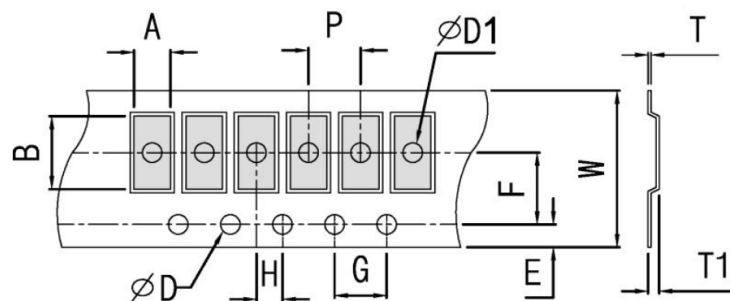
Reliability Specifications (Cont.):

Test	Procedure	Specification
High Temperature Exposure JIS C 5201-1 clause 4.25	At 155 ±5°C for 1000 hrs.	±(0.5%+0.05Ω)
Resistance to Solvent JIS C 5201-1 clause 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs. Then the resistor is left in the room for 48 hrs.	±(0.5%+0.05Ω) No visual damage
Load Life in Humidity JIS C 5201-1 clause 4.24	40 ±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs. with 90 mins "ON" and 30 mins "OFF".	±(0.5%+0.05Ω)
Load Life (Endurance) JIS C 5201-1 clause 4.25	70 ±2°C, RCWV, or Max. working voltage whichever is less for 1000 hrs. with 90 mins "ON" and 30 mins "OFF".	±(0.5%+0.05Ω)
Terminal Bending Strength JIS C 5201-1 clause 4.33	Bending once for 5 seconds D: 0201, 0402, 0603, 0805 = 5mm 1206, 1210 = 3mm 2010, 2512 = 2mm	±(0.5%+0.05Ω) No visual damage

Paper Tape Dimensions:

All dimensions in mm.

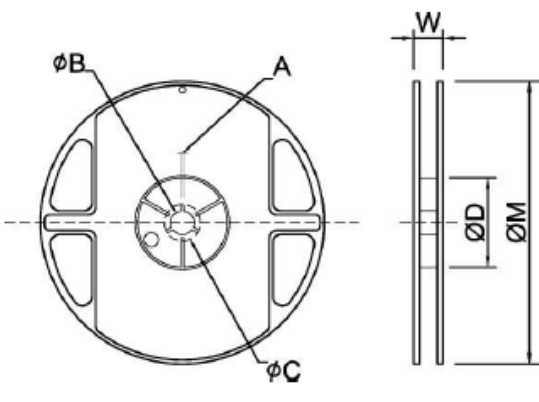
Type	A	B	W	E	F	G	H	T	ΦD	P
KN0201	0.40 ±0.05	0.70 ±0.05	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.45 ±0.10	1.50 +0.10/-0	2.00 ±0.10
KN0402	0.70 ±0.10	1.20 ±0.10	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.45 ±0.10	1.50 +0.10/-0	2.00 ±0.10
KN0603	1.05 ±0.20	1.80 ±0.20	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.60 ±0.10	1.50 +0.10/-0	4.00 ±0.10
KN0805	1.55 ±0.20	2.30 ±0.20	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.75 ±0.10	1.50 +0.10/-0	4.00 ±0.10
KN1206	1.90 ±0.20	3.50 ±0.20	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.75 ±0.10	1.50 +0.10/-0	4.00 ±0.10
KN1210	2.85 ±0.20	3.50 ±0.20	8.00 ±0.20	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.75 ±0.10	1.50 +0.10/-0	4.00 ±0.10

Plastic Tape Dimensions:

All dimensions in mm.

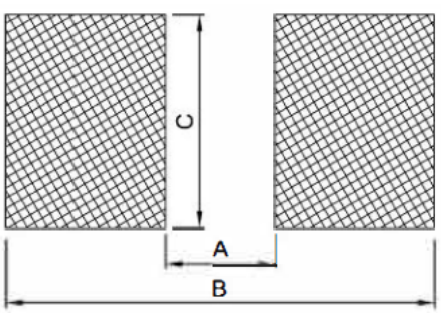
Type	A	B	W	E	F	G	H	T	ΦD	ΦD1	T1	P
KN2010	2.80 ±0.20	5.60 ±0.20	12.0 ±0.10	1.75 ±0.10	5.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.23 ±0.10	1.50 +0.10/-0	1.50 ±0.10	0.85 ±0.15	4.00 ±0.10
KN2512	3.40 ±0.20	6.70 ±0.20	12.0 ±0.10	1.75 ±0.10	5.50 ±0.05	4.00 ±0.10	2.00 ±0.05	0.23 ±0.10	1.50 +0.10/-0	1.50 ±0.10	0.85 ±0.15	4.00 ±0.10

Reel Dimensions:

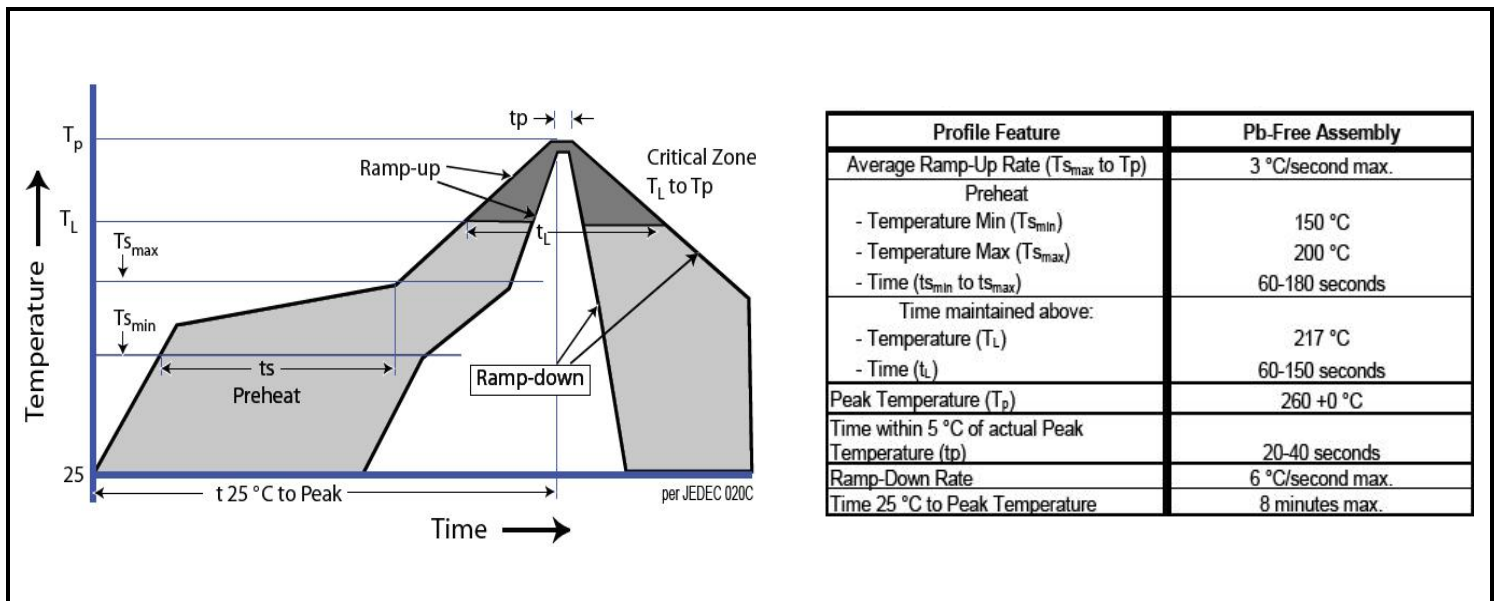
	Type	A	ΦB	ΦC	ΦD	W	ΦM
	KN0201	2.00 ± 0.50	13.5 ± 1.00	21.0 ± 1.00	60.0 ± 1.00	11.5 ± 2.00	178 ± 2.00
	KN0402						
	KN0603						
	KN0805						
	KN1206						
	KN1210						
	KN2010					16.0 ± 2.00	
KN2512							

All dimensions in mm.

Recommended Land Pattern:

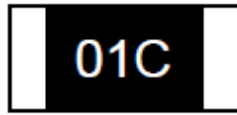
	Type	A	B	C
	KN0201	0.25	0.85	0.35
	KN0402	0.50	1.60	0.70
	KN0603	0.80	2.40	1.00
	KN0805	1.30	2.90	1.40
	KN1206	2.20	4.20	1.70
	KN1210	2.00	4.40	2.70
	KN2010	3.80	6.60	2.70
KN2512	4.90	8.10	3.40	

All dimensions in mm.

Soldering Profile:

Marking Information:

0201 ~ 0402: no marking



0603: 3 digits code



0805~2512: 4 digits code

Standard E96 Values and 0603 Resistance Codes

R-Value	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147	150	154	158	162	165	169	174
Code	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
R-Value	178	182	187	191	196	200	205	210	215	221	226	232	237	243	249	255	261	267	274	280	287	294	301	309
Code	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
R-Value	316	324	332	340	348	357	365	374	383	392	402	412	422	432	442	453	464	475	487	499	511	523	536	549
Code	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
R-Value	562	576	590	604	619	634	649	665	681	698	715	732	750	768	787	806	825	845	866	887	909	931	953	976
Code	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

E96 Multiplier Code for 0603

Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}
Code	A	B	C	D	E	F	G	H	X	Y	Z

Examples of E96 Multiplier Code for 0603

R-Value	10.2K Ω	33.2 Ω	7.5 Ω	11 Ω	130 Ω	2K Ω	10K Ω	150K Ω
Code	02C	51X	85Y	05X	12A	30B	01C	18D

Examples of E24 Resistance Codes for 0603

R-Value	4.7 Ω	33 Ω	470 Ω	5.6K Ω	62K Ω	680K Ω
Code	4R7	330	471	562	623	684

Examples of 4 Digit Resistance Codes for 0805 ~ 2512

R-Value	5.6 Ω	10 Ω	22.6 Ω	100 Ω	1.1K Ω	10K Ω	332K Ω	1M Ω
Code	5R60	10R0	22R6	1000	1101	1002	3323	1004

Storage Conditions:**Environment Conditions:**

Products should be stored under the following environmental conditions.

- Temperature: +5 to +35°C
- Humidity: 45 to 85% relative humidity
- Do not keep products in environments where they may be subject to particulate contamination or harmful gases such as sulfuric acid or hydrogen chloride as it may cause oxidization on electrodes, resulting in poor solderability.
- Products should be stored in a space that does not expose it to high temperatures, vibration, or direct sunlight.
- Products should be stored in the original airtight packaging until use.