



### FEATURES:

- AEC-Q200 certified/qualified
- Highly reliable multilayer electrode construction
- Special construction to prevent sulfuration in a sulfur containing environment
- Compatible with all soldering process
- 100% CCD inspection



### PART NUMBER STRUCTURE

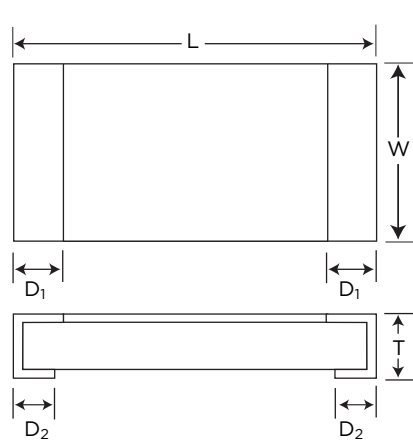
AGCR Series	0603 - Size	Q Power Rating	K TCR	- Resistance Value	F Resistance Tolerance	T Packaging						
	0201 0402 0603 0805 1206 1210 2010 2512	N = 1/20W P = 1/16W Q = 1/10W R = 1/8W T = 1/4W Y = 1/3W V = 1/2W W = 3/4W X = 1W 2X = 2W	K = ±100ppm/°C L = ±200ppm/°C	<table border="1"> <tr> <td>3 DIGIT (J TOL.)</td> <td>2R2=2.2Ω 103=10KΩ</td> </tr> <tr> <td>4 DIGIT (D &amp; F TOL.)</td> <td>10R2=10.2Ω 1002=10KΩ</td> </tr> <tr> <td>Jumper</td> <td>3 zeros</td> </tr> </table>	3 DIGIT (J TOL.)	2R2=2.2Ω 103=10KΩ	4 DIGIT (D & F TOL.)	10R2=10.2Ω 1002=10KΩ	Jumper	3 zeros	D = ±0.50% F = ±1% J = ±5%	T = Tape & Reel
3 DIGIT (J TOL.)	2R2=2.2Ω 103=10KΩ											
4 DIGIT (D & F TOL.)	10R2=10.2Ω 1002=10KΩ											
Jumper	3 zeros											

Example P/N: AGCR0603-QK-1002FT

Standard Termination is 100% matte Tin over Nickel.

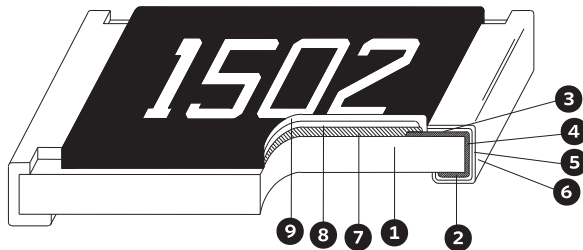
### DIMENSIONS

Unit: inches (mm)



SIZE	L	W	T	D <sub>1</sub>	D <sub>2</sub>	WEIGHT (g) (1000pcs)
0201	0.024±0.012 (0.60±0.30)	0.012±0.012 (0.30±0.03)	0.009±0.001 (0.23±0.03)	0.005±0.002 (0.15±0.05)	0.005±0.002 (0.15±0.05)	0.150
0402	0.040±0.002 (1.00±0.05)	0.020±0.002 (0.50±0.05)	0.014±0.002 (0.35±0.05)	0.008±0.004 (0.20±0.10)	0.008±0.004 (0.20±0.10)	0.620
0603	0.063±0.004 (1.60±0.10)	0.031±0.004 (0.80±0.10)	0.017±0.004 (0.45±0.10)	0.012±0.008 (0.30±0.20)	0.012±0.008 (0.30±0.20)	2.042
0805	0.079±0.004 (2.00±0.10)	0.049±0.004 (1.25±0.10)	0.020±0.004 (0.50±0.10)	0.014±0.008 (0.35±0.20)	0.016±0.010 (0.40±0.20)	4.368
1206	0.122±0.004 (3.10±0.10)	0.061±0.004 (1.55±0.10)	0.022±0.004 (0.55±0.10)	0.020±0.010 (0.50±0.25)	0.020±0.008 (0.50±0.20)	8.947
1210	0.122±0.004 (3.10±0.10)	0.102±0.006 (2.60±0.15)	0.022±0.004 (0.55±0.10)	0.020±0.010 (0.50±0.25)	0.020±0.008 (0.50±0.20)	15.959
2010	0.196±0.004 (5.00±0.10)	0.098±0.006 (2.50±0.15)	0.022±0.004 (0.55±0.10)	0.024±0.010 (0.60±0.25)	0.020±0.008 (0.50±0.20)	24.241
2512	0.250±0.004 (6.35±0.10)	0.122±0.006 (3.10±0.15)	0.022±0.004 (0.55±0.10)	0.024±0.010 (0.60±0.25)	0.020±0.008 (0.50±0.20)	39.448

### STRUCTURE



1	Alumina Substrate	6	External Electrode
2	Bottom Electrode	7	Resistor Layer
3	Top Electrode	8	Overcoat
4	Edge Electrode	9	Marking
5	Barrier Layer		

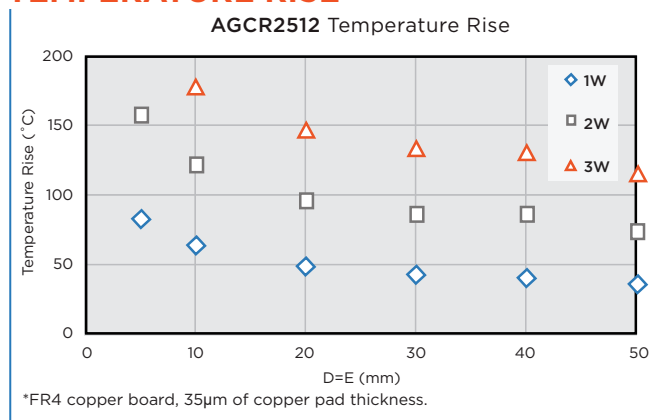
### ELECTRICAL SPECIFICATION & RANGE

	SIZE	0201		0402		0603		0805	
	Power Rating at 70°C (W)	0.05W (1/20W)	0.063W (1/16W)	0.125W (1/8W)	0.10W (1/10W)	0.25W (1/4W)	0.125W (1/8W)	0.333W (1/3W)	
	Zero Ohm(Jumper) Current Rating	1A	1A		1A		2A		
	Max. Working Voltage	25V	50V		75V		150V		
	Max. Overload Voltage	50V	100V		150V		300V		
	Operating Temp. Range	-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C	
Tol.	TCR	Resistance Range		Resistance Range		Resistance Range		Resistance Range	
±0.5% (D)	±100ppm	-	-	10Ω-1MΩ	-	10Ω-1MΩ	-	10Ω-1MΩ	
	±200ppm	-	-	-	-	-	-	-	
±1% (F)	±100ppm	-	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	
	±200ppm	1Ω-10MΩ	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	
±5% (J)	±100ppm	-	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	
	±200ppm	0Ω, 1Ω-10MΩ	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	

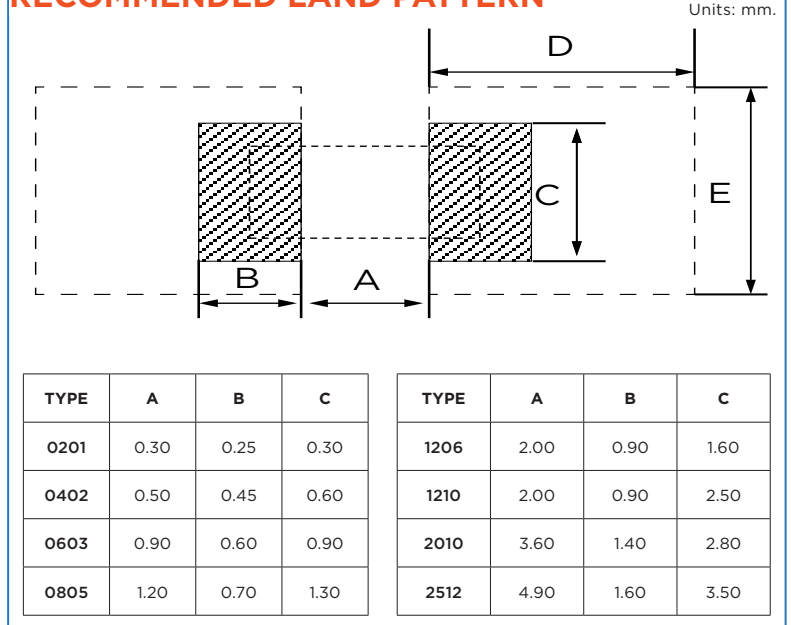
	SIZE	1206		1210	2010		2512	
	Power Rating at 70°C (W)	0.25W (1/4W)	0.50W (1/2W)	0.50W (1/2W)	0.75W (3/4W)	1.0W (1W)	1.0W (1W)	2.0W (2W)
	Zero Ohm(Jumper) Current Rating	2A		2.5A	3.5A		4A	
	Max. Working Voltage	200V		200V	200V		250V	
	Max. Overload Voltage	400V		400V	400V		500V	
	Operating Temp. Range	-55°C to +155°C		-55°C to +155°C	-55°C to +155°C		-55°C to +155°C	
Tol.	TCR	Resistance Range		Resistance Range	Resistance Range		Resistance Range	
±0.5% (D)	±100ppm	-	10Ω-1MΩ	-	-	10Ω-1MΩ	-	10Ω-1MΩ
	±200ppm	-	-	-	-	-	-	-
±1% (F)	±100ppm	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ
	±200ppm	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω
±5% (J)	±100ppm	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ	10Ω-1MΩ
	±200ppm	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω	0Ω, 1Ω-9.76Ω 1.02MΩ-10MΩ	1Ω-9.76Ω

**NOTE:** Operating Voltage =  $(P \cdot R)^{1/2}$  or Max. overload voltage listed above, whichever is lower.  
 Overload Voltage =  $2.5 \cdot (P \cdot R)^{1/2}$  or Max. overload voltage listed above, whichever is lower.

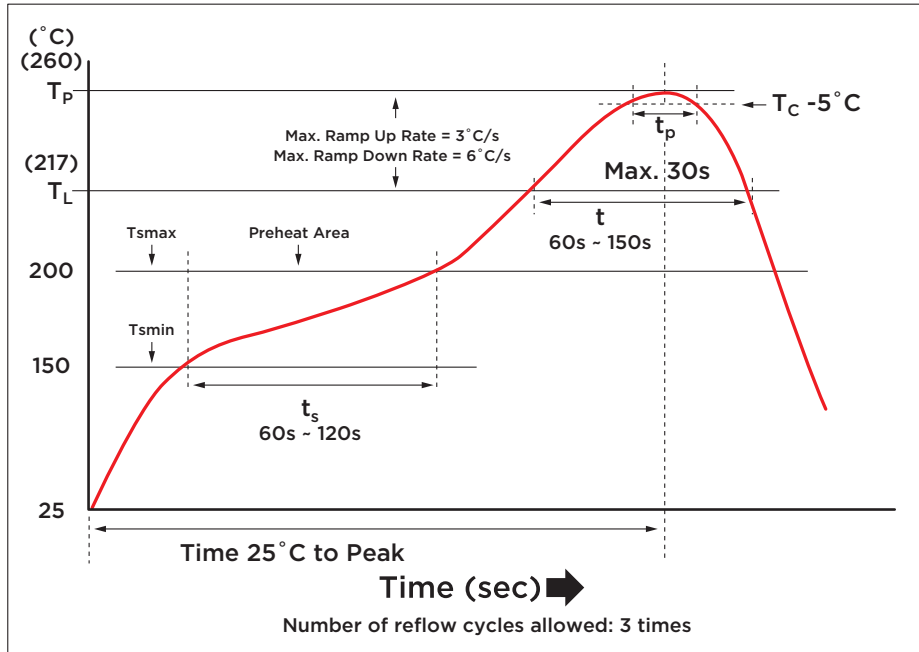
### TEMPERATURE RISE



### RECOMMENDED LAND PATTERN



### SOLDERING CONDITION



### REFLOW PROFILES

PROFILE FEATURE	Pb-FREE ASSEMBLY
<b>PREHEAT</b> Min. Temperature (T <sub>smin</sub> ) Max Temperature (T <sub>smax</sub> ) Preheating time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )"	150 °C 200 °C 60-120 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3 °C/second max.
Liquidous temperature (T <sub>L</sub> ) Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	217 °C 60-150 seconds
Min. Peak temperature (T <sub>p min</sub> )	235°C
Max. Peak temperature (T <sub>p max</sub> )	260°C
Time (t <sub>p</sub> ) within 5 °C of the specified classification temperature (T <sub>c</sub> )	30 seconds max.
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

### MARKING

No Marking for 0201/0402  
Jumper for all: Letter O

1% for 0805/0612/1206/1210/  
2010/2512: 4 digits marking

Example:

RESISTANCE	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
MARKING	1000	2201	1002	4992	1003

5% for 0603/0805/0612/1206/1210/2010/2512: 3 digit s marking in E24

Example: 101 =100Ω 102 =1KΩ (1st and 2nd are E24 code and 3rd code is multiplier)

E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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1% for 0603(E24): 3 digits marking in E24, When the E24 and E96 are the same resistance, this marking in E96

Example: 01A= 100Ω 05C=11KΩ 123=12KΩ 273=27KΩ

1% for 0603(E96): 3 digits marking in E96

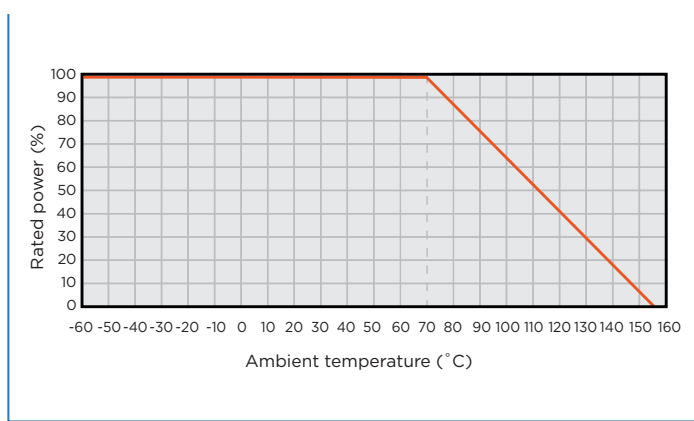
Example: 14C=13K7Ω 13C=13K3Ω 68B=4K99Ω 68X=49.9Ω



### MARKING TABLE

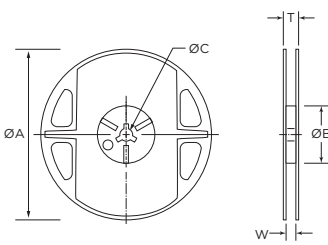
CODE	E96	CODE	E96	CODE	E96	CODE	E96		
01	100	25	178	49	316	73	562		
02	102	26	182	50	324	74	576		
03	105	27	187	51	332	75	590		
04	107	28	191	52	340	76	604		
05	110	29	196	53	348	77	619		
06	113	30	200	54	357	78	634		
07	115	31	205	55	365	79	649		
08	118	32	210	56	374	80	665		
09	121	33	215	57	383	81	681		
10	124	34	221	58	392	82	698		
11	127	35	226	59	402	83	715		
12	130	36	232	60	412	84	732		
13	133	37	237	61	422	85	750		
14	137	38	243	62	432	86	768		
15	140	39	249	63	442	87	787		
16	143	40	255	64	453	88	806		
17	147	41	261	65	464	89	825		
18	150	42	267	66	475	90	845		
19	154	43	274	67	487	91	866		
20	158	44	280	68	499	92	887		
21	162	45	287	69	511	93	909		
22	165	46	294	70	523	94	931		
23	169	47	301	71	536	95	953		
24	174	48	309	72	549	96	976		
Code	A	B	C	D	E	F	G	X	Y
Multiplier	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>-1</sup>	10 <sup>-1</sup>

### DERATING CURVE



### REEL SPECIFICATIONS

Unit: mm

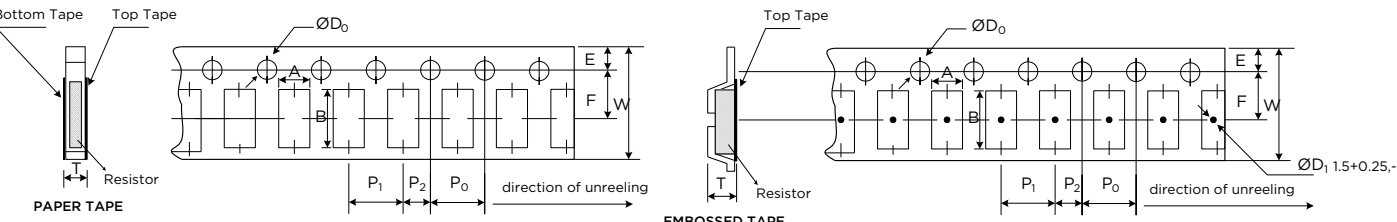


Minimum of 30 empty pockets at the beginning of reel, 65 minimum empty pockets at the end.

TYPE	Ø A	ØB	ØC	W	T	PAPER TAPE (EA)	EMBOSSED (EA)	TAPE WIDTH	REEL Ø
0201 0402	178.0±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5	10,000	-	8mm	7 inch
0603 0805 1206 1210	178.0±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5	5,000	-	8mm	7 inch
2010 2512	178.0±1.5	60+1/-0	13.0±0.5	13.0±0.5	15.5±0.5	-	4,000	12mm	7 inch

### TAPE SPECIFICATIONS

Units: mm.



TAPE	SIZE (inches)	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ØD <sub>0</sub>	T
Paper	0201	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
	0402	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
	0603	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
	0805	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
	1206	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
	1210	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
Embossed	2010	2.8±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 <sup>±0</sup>
	2512	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 <sup>±0</sup>

### ENVIRONMENTAL CHARACTERISTICS

TEST	REQUIREMENT			TEST METHOD
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JISC-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>10G			JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	MIL-STD-202 Method 108 Condition D Steady State T <sub>A</sub> =125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	MIL-STD-202 Method 103 1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	MIL-STD-202 Method 108 at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	AEC-Q200-005 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			JIS-C-5201-1 4.17 IEC-60115-1 4.17 J-STD-002 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 210 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%			JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 213 <b>Wave Form:</b> Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000Hz
ESD	±(3%+0.05Ω)			AEC-Q200-002 Human body model 0201: 0.5KV 0402 /0603: 1KV 0805 and above: 2KV
Resistance to solvents	No visible damage on appearance and marking.			MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No breakages			AEC-Q200-006 Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching of the pinewood board			UL-94 V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	ΔR±1%	<50mΩ		EIA-977 (Condition A) 60±2°C, no power rating for 500 hrs.

RCWV (Rated continuous working voltage) = √(P\*R) or Max operating voltage whichever is lower

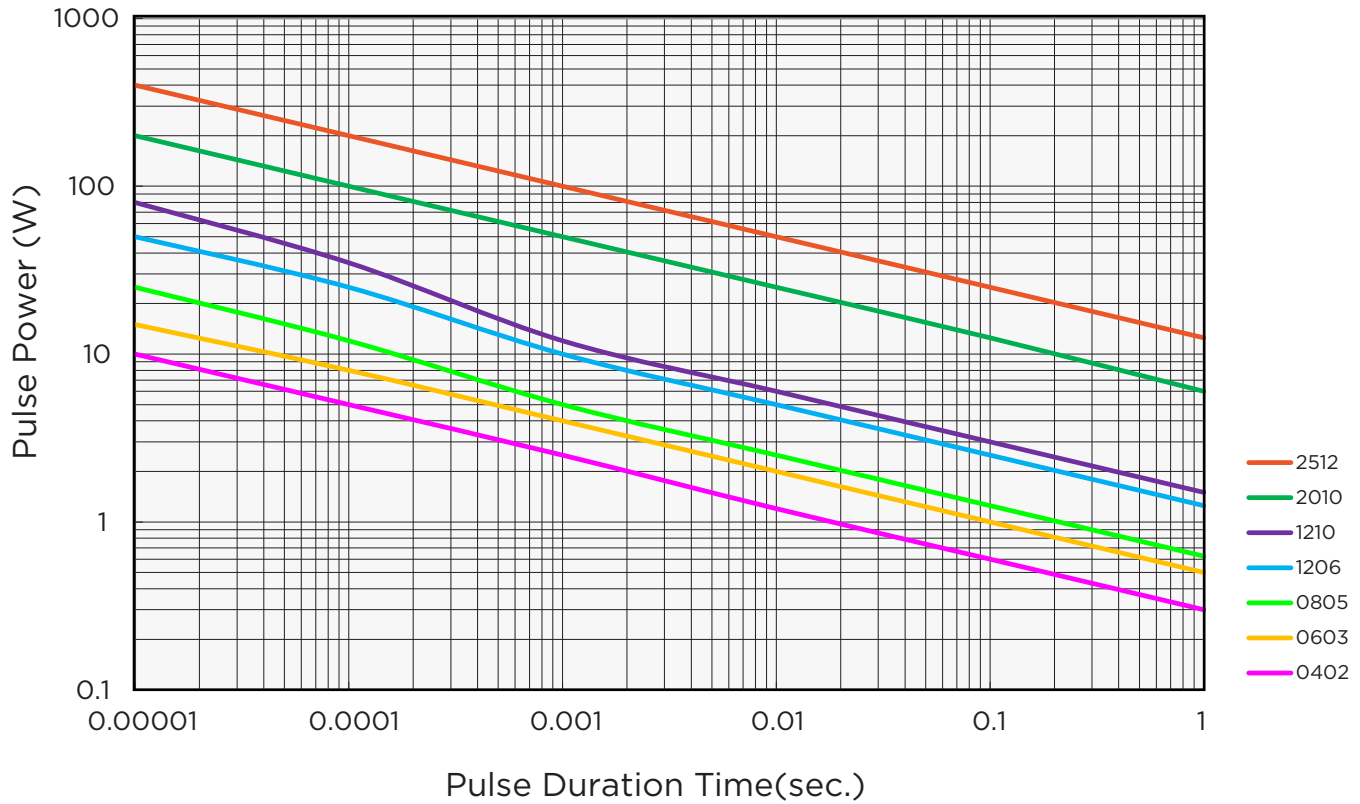
**Storage Temperature:** 15-28°C; **Humidity** < 80%RH

**Shelf Life:** 2 years from production date.

### PULSE WITHSTANDING CAPACITY

The limit of acceptance was a shift in resistance of less than 1% from the initial value.  
 The power applied was subject to the restrictions of the maximum permissible impulse voltage.

#### AGCR SERIES SINGLE PULSE



**Note:** The limit of the applicable voltage is the max. overload voltage. Please consult us about the resistance characteristic when pulse is applied continuously. This data is a reference value, please be sure to test the products on the actual circuit before you use them.