Data Sheet

Customer：	
Product :	Automotive Grade Metal Thin Film Chip Resistors – ARM..A Series
Size:	0402/0603/0805/1206
Issued Date:	1-Jul-24
Edition :	REV. A5

RoHS Compliant

HONG KONG HELISTO INDUSTRIAL LIMITED
香港海利斯特实业有限公司

SHENZHEN HELISTO TECHNOLOGYCOLTD
深圳市海利斯特科技有限公司

ADD:5/F., A Block, Hongdu Industrial Park, Fanshen Road, 45 Area, Baoan, Shenzhen, China
TEL:+86-755-29741555 29749555
FAX:+86-755-29742111
E-mail:donnyhai@helisto.com
www.Helisto.com

Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
1-Jul-24	1-Jul-24	1-Jul-24		
Chun	***Ben Chang***	***Ben Chang***		

Automotive Grade Metal Thin Film Chip Resistors



Features

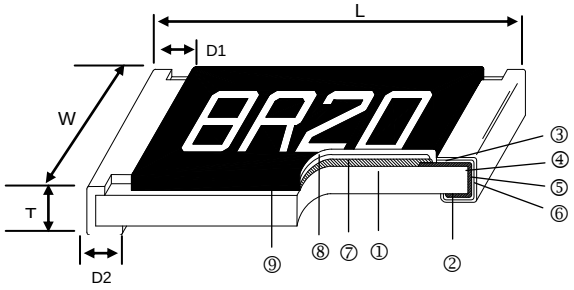
- AEC-Q200 Qualified
- High precision resistance tolerance: ±0.02%
- Low TCR down to ±5ppm/℃
- Advanced sulfur resistance verified according to ASTM B 809

Applications

- Automotive
- Telecommunication
- Medical equipment
- Industrial equipment

Industrial measurement instrumentation, industrial machines
Various sensors, medical electronics

Construction



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

Dimensions

Unit: mm

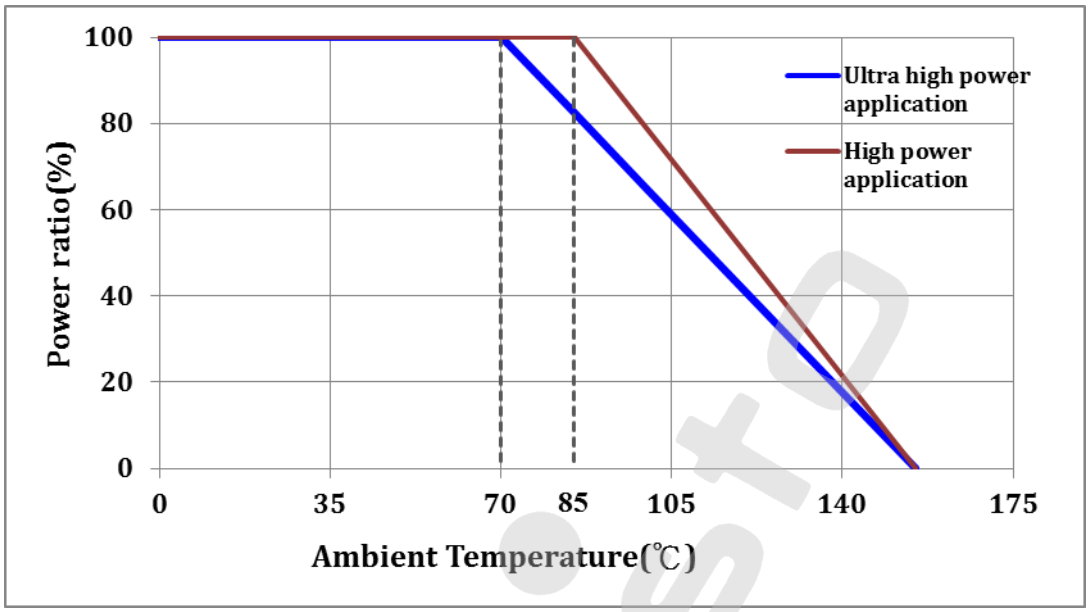
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARM02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
ARM03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
ARM05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71
ARM06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02

Part Numbering

ARM	06	F	T	C		1001	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	Q: ±0.02% A: ±0.05% B: ±0.1% D: ±0.5%	T: Taping Reel B: Bulk	S: ±5 B: ±10 C: ±25 D: ±50 E: ±100	: Standard* (See Remark) Z: 1/32W Y: 1/16W X: 1/10W M: 1/6W W: 1/8W V: 1/4W	0100: 10Ω 10R2: 10.2Ω 1000:100Ω 1001: 1KΩ 1004: 1MΩ	A: Automotive Grade NA: No Marking Automotive Grade

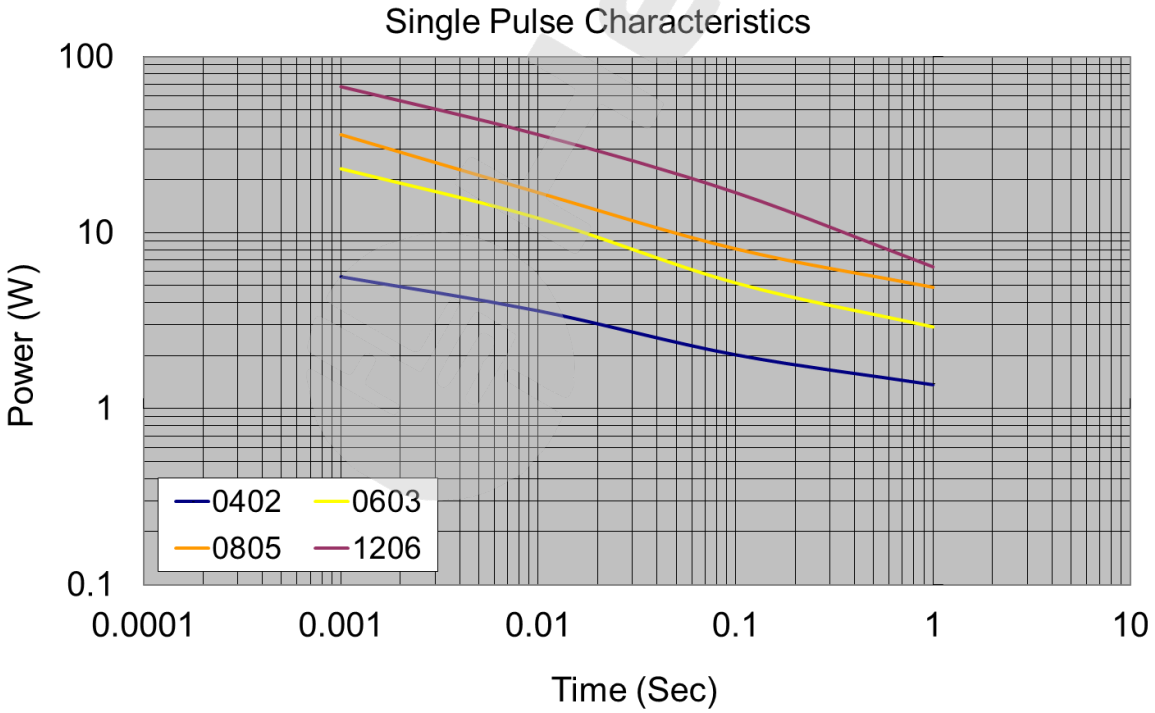
*Remark: Standard part no need for power rating code.

Derating Curve



Functional Performance

Maximum pulse power limit



■ Electrical Specifications

Item / Type	Power Rating			Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/℃)
	Standard	High	Ultra high			±0.02%	±0.05%	±0.1%	±0.5%	
ARM02 (0402)	1/32W	1/16W	1/8W	75V	100V	100Ω – 3KΩ				±5
						100Ω – 3KΩ	47Ω – 100KΩ			±10
						100Ω – 3KΩ	47Ω – 100KΩ		47Ω – 150KΩ	±25
						–	–	47Ω – 100KΩ	10Ω –150KΩ	±100
ARM03 (0603)	1/16W	1/10W	1/6W	100V	200V	100Ω – 5.1KΩ				±5
						100Ω – 5.1KΩ	47Ω – 270KΩ			±10
						100Ω – 5.1KΩ	47Ω – 270KΩ	47Ω – 332KΩ	47Ω – 1MΩ	±25
						–	–	47Ω – 332KΩ	10Ω –1MΩ	±50
ARM05 (0805)	1/10W	1/8W	1/4W	150V	300V	100Ω – 10.2KΩ				±5
						100Ω – 10.2KΩ	47Ω – 475KΩ			±10
						100Ω – 10.2KΩ	47Ω – 475KΩ	47Ω – 2.7MΩ		±25
						–	–	47Ω – 2.7MΩ	10Ω –2.7MΩ	±50
ARM06 (1206)	1/8W	1/4W	–	200V	400V	100Ω – 33.2KΩ				±5
						100Ω – 33.2KΩ	47Ω – 1MΩ			±10
						100Ω – 33.2KΩ	47Ω – 1MΩ	47Ω – 5.1MΩ		±25
						–	–	47Ω – 5.1MΩ	10Ω –5.1MΩ	±50

Operating Voltage=√(P*R) or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.
Operating Temperature Range=-55 ~ +155℃
■Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** -55℃~+125℃, 25℃ is the reference temperature
Short Time Overload	≦47Ω ΔR±0.1% ≧47Ω ΔR±0.05% for Standard and High power rating		**JIS-C-5201-1 4.13** RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
	ΔR±0.1% for Ultra high power rating		
Endurance	Standard power rating at 85℃	ΔR±0.1%	**MIL-STD-202 Method 108** RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	High power rating at 85℃	ΔR±0.25%	
	Ultra high power rating at 70℃	ΔR±0.5%	
Biased Humidity	ΔR±0.1% for Standard power rating		**MIL-STD-202 Method 103** 1000 hrs 85℃/85%RH 10% of operating power.
	ΔR±0.25% for high power rating		
	ΔR±0.5% for Ultra high power rating		
High Temperature Exposure	≦47Ω ΔR±0.25% ≧47Ω ΔR±0.1% for 0603/0805/1206 size		**MIL-STD-202 Method 108** at +155℃ for 1000 hrs
	≦47Ω ΔR±0.25% ≧47Ω ΔR±0.2% for 0402 size		
Temperature Cycling	≦47Ω ΔR±0.25% ≧47Ω ΔR±0.1%		**JESD22 Method JA-104** -55℃ to +125℃, 1000 cycles
Resistance to soldering heat	ΔR±0.1%		**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5℃ for 10 seconds
Insulation Resistance	>1000 MΩ		**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Apply 100V_{DC} for 1 minute
Bending Strength (Board Flex)	ΔR±0.1%		**JIS-C-5201-1 4.33** Bending once for 60 seconds Bending displacement: 1206 sizes: 3 mm
Solderability	95% min. coverage		**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5℃ for 3 seconds
Terminal strength	No broken		**AEC-Q200-006** Force of 1.8kg for 60 seconds.
Mechanical Shock	ΔR±0.1%		**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	ΔR±0.1%		**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	ΔR±0.5%		**AEC-Q200-002** Human body model ARM02、ARM03 0.2KV ARM05、ARM06 1KV
Resistance to solvents	Marking Unsmeared		**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.

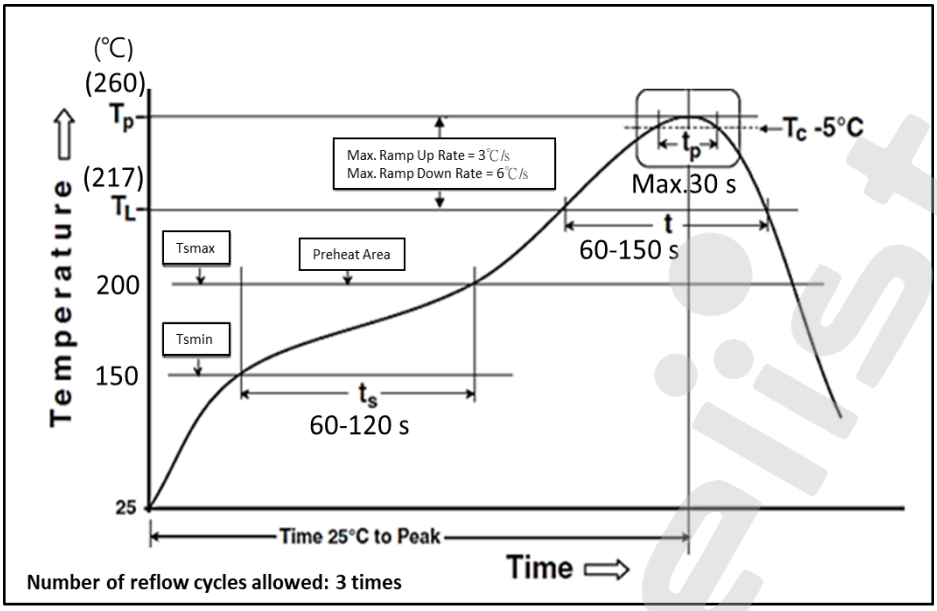
Sulfur Test	ΔR±1%	**ASTM-B-809-95 Modified** 105±2℃ no power rating for 750 hrs.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	**UL-94** V-0 or V-1 are acceptable. Electrical test not required.

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

■ **Storage Temperature: 15~28℃; Humidity < 80%RH**

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

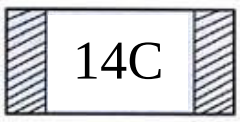
■Soldering Condition(IPC/JEDEC J-STD-020)



Reflow Profiles	
Profile Feature	**Pb-Free Assembly**
Preheat Min. Temperature (T_{smin}) Max Temperature (T_{smax}) Preheating time (t_s) from (T_{smin} to T_{smax})	 150 °C 200 °C 60-120 seconds
Ramp-up rate (T_L to Tp)	3 °C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-150 seconds
Min. Peak temperature (Tp min)	235°C
Max. Peak temperature (Tp max)	260°C
Time (tp) within 5 °C of the specified classification temperature (Tc)	30 seconds max.
Ramp-down rate (Tp to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

Marking

0603 3digit marking



3digit marking for 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	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

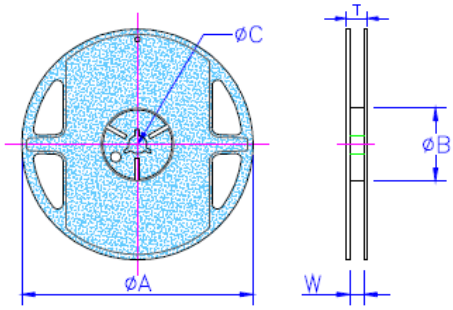
0603 3digit marking for E24 Example: 101=100Ω 102=1KΩ

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

0805~2512 4digit marking Example

Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
marking	1000	2201	1002	4992	1003

Packaging

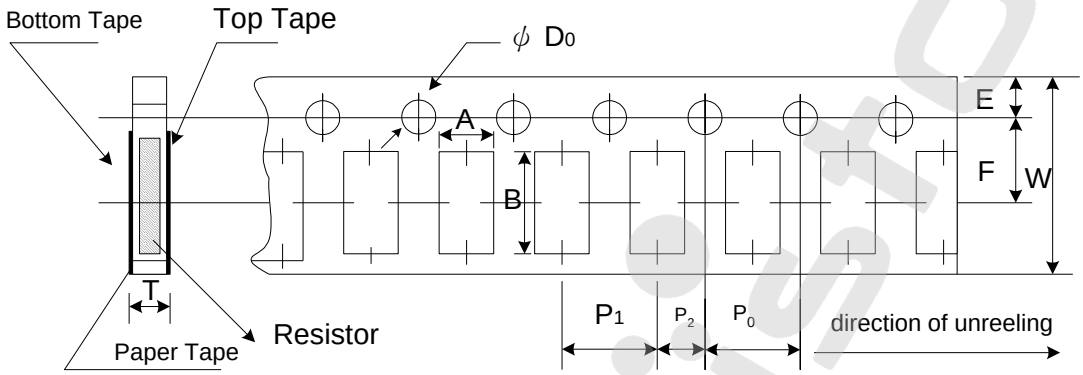


Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
ARM02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
ARM03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARM05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARM06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-

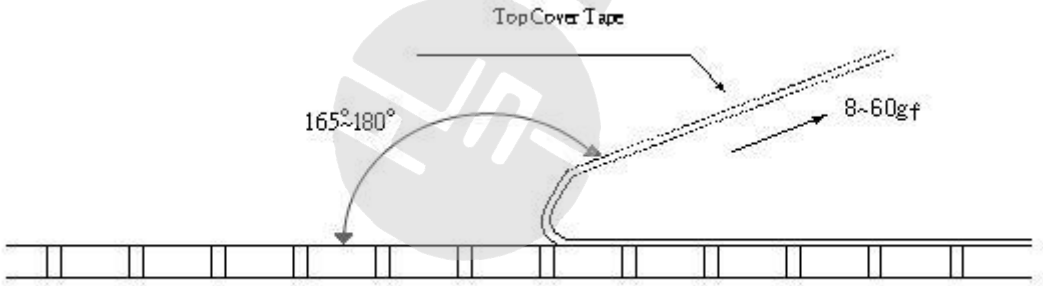
Paper Tape Specifications



Unit: mm

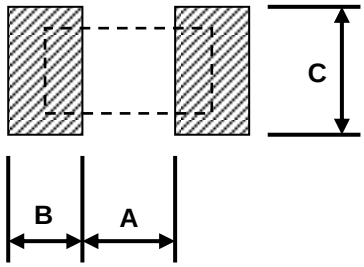
Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
ARM02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
ARM03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARM05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARM06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

■ Peel force of top cover tape
■ The peel speed shall be about 300mm/min±5%
■ The peel force of top cover tape shall be between 8gf to 60gf



Recommend Land Pattern

Unit: mm



Type	A	B	C
ARM02	0.50	0.50	0.60±0.2
ARM03	1.00	1.00	1.20±0.2
ARM05	1.20	1.40	1.65±0.2
ARM06	2.20	1.40	2.00±0.2

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A1	Jan 28 ,2022	-	- Add shelf life description. - Modify IR reflow profile to comply IPC/JEDEC J-STD-020. -Modify the Derating Curve.
Version A2	May 25 ,2022	-	- Add Part Numbering code “s” for TCR ±5 ppm product. - Add temperature for Endurance Test.
Version A3	Sep 01 ,2022	-	- Add the following contents 1. Marking Code “NA” in Part Numbering. 2. Operating Temperature Range. 3. Reflow Profiles Table.
Version A4	Aug 02 ,2023	-	1. Add 0.1% product specification for ARM02 TCR100, ARM03/05/06 TCR50ppm series. 2. Expand the resistance value range for 0.5% products. 3. Delete Safety Precautions.
Version A5	Jul 01 ,2024	-	- Modify the description in Features from “AEC-Q200 Compliance” to “AEC-Q200 Qualified”.