KOME

AS Anti-Surge Thick Film Chip Resistors

Anti-surge thick film chip resistors · AEC-Q200 qualified

Features

- Anti-surge thick film chip resistors manufactured by KOME
- Superior anti-surge voltage performance
- Suitable for both wave and reflow soldering
- AEC-Q200 qualified
- Applications: AV adapters, LCD back-light camera strobe etc. ⑤
- Compliant with the RoHS directive
- Meets the halogen-free requirement

CASE SIZES	POWER RATING	RESISTANCE	OPERATING TEMP.
0402 – 2512	1/8W – 2W	1Ω – 10MΩ	-55°C ~ 155°C

Part number

AS06	K	4	102	J	T	-LF
1 · Product type 1206	2 · TCR code Based on spec.	3 · Total characters No. of characters	4 · Resistance 1KΩ (E-24)	5 · Tolerance ±5%	6 · Packaging Tape & reel	7 · Other Lead free

Ordering example: AS06K4102JT-LF; positions 1–7 as numbered in the tables below. Notes: 1 → ①; 2, 5 → ③; 3, 4 → ②; 6, 7 → ④.

1 · Product type

Type	Size
AS02	0402
AS03	0603
AS05	0805
AS06	1206
AS07	1210
AS10	2010
AS12	2512

2 · TCR code

K	Based on spec.

3 · Total characters

Number of total characters (102=1000=4)

4 · Resistance value

E-24	Significant figures + number of zeros
E-96	No. of characters + significant figures + number of zeros
Examples	
E-24	1R0 = 1.0Ω, 103 = 10KΩ
E-96	5 1002 = 10KΩ
E-96	5 1003 = 100KΩ
	Letter R = decimal point

5 · Tolerance

J	±5%
K	±10%
M	±20%

6 · Packaging

T	Tape & reel
C	Bulk

7 · Other

-LF	Lead free

Marking

AS02: because of the very small size of the resistor body, there is no marking on the body.

±5%, ±10% and ±20% tolerance products (E-24 series): 3 characters. The 1st and 2nd characters are the significant figures of the resistance value; the last character is the power of ten.

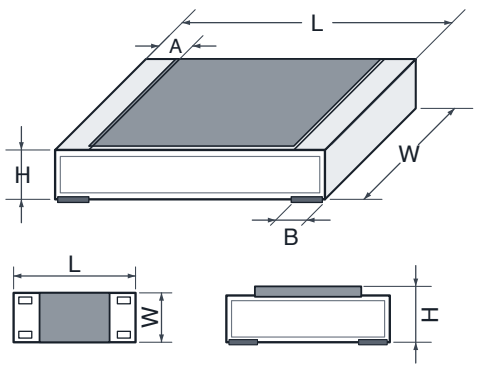
333 → 33KΩ

±5%, ±10% and ±20% tolerance, below 10Ω: marked as shown; the letter “R” is the decimal point.

2R2 → 2.2Ω

Dimensions

Type	Dimension (mm)				
	L	W	H	A	B
AS02 (0402)	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
AS03 (0603)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
AS05 (0805)	2.00±0.15	1.25 +0.15/-0.10	0.55±0.10	0.40±0.20	0.40±0.20
AS06 (1206)	3.10±0.15	1.55 +0.15/-0.10	0.55±0.10	0.45±0.20	0.45±0.20
AS07 (1210)	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
AS10 (2010)	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
AS12 (2512)	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20



Resistance range

Type	Power rating at 70°C	Resistance range		
		±5%	±10%	±20%
AS02	1/8W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS03	1/4W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS05	1/2W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS06	0.6W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS07	3/4W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS10	1.5W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
AS12	2W	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ

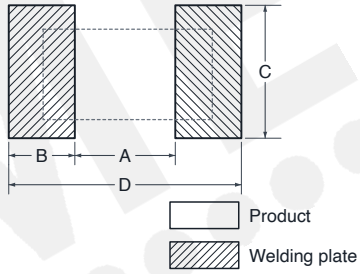
Ratings

Type	Max. working voltage	Max. overload voltage	Dielectric withstanding voltage	Operating temperature
AS02	50V	100V	—	-55°C~155°C
AS03	75V	150V	300V	-55°C~155°C
AS05	150V	300V	500V	-55°C~155°C
AS06	200V	400V	500V	-55°C~155°C
AS07	200V	500V	500V	-55°C~155°C
AS10	400V	800V	500V	-55°C~155°C
AS12	500V	1000V	500V	-55°C~155°C

Recommended soldering pad

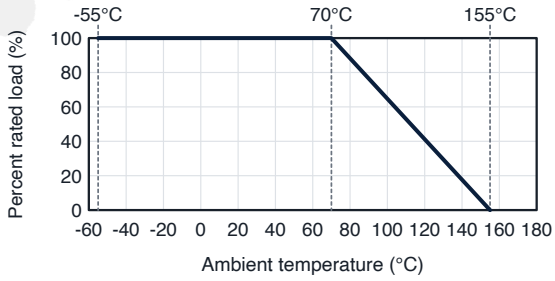
No pad size is given for AS02 on the original sheet.

Type	Dimension (mm)			
	A	B	C	D
AS03	0.8±0.05	0.65±0.05	0.8±0.05	2.4±0.05
AS05	1.0±0.1	1.0±0.1	1.4±0.1	3.0±0.1
AS06	2.0±0.1	1.1±0.1	1.8±0.1	4.2±0.1
AS07	2.0±0.1	1.1±0.1	3.0±0.1	4.2±0.1
AS10	3.6±0.1	1.4±0.1	3.0±0.1	6.4±0.1
AS12	4.9±0.1	1.35±0.1	3.7±0.1	7.6±0.1



Derating curve

The power rating applies to continuous load at ambient temperatures from -55 to 155°C. It is constant from -55 to 70°C and derates to zero as the temperature rises from 70 to 155°C.



Voltage rating

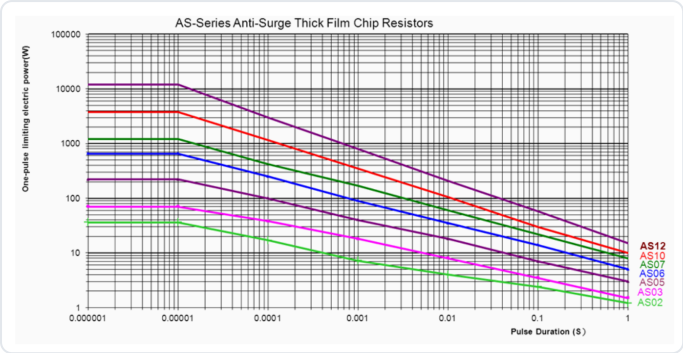
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula ⑥:

$$\sqrt{P}$$

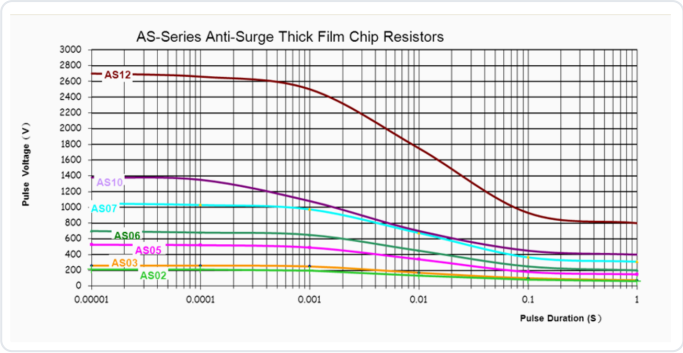
RCWV formula as printed (excerpt of the original sheet)

where RCWV = rated continuous working voltage (V), P = power rating (W), R = nominal resistance (Ω). In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value. The overload voltage is 2.5 times RCWV or the max. overload voltage, whichever is lower.

One-pulse limiting electric power



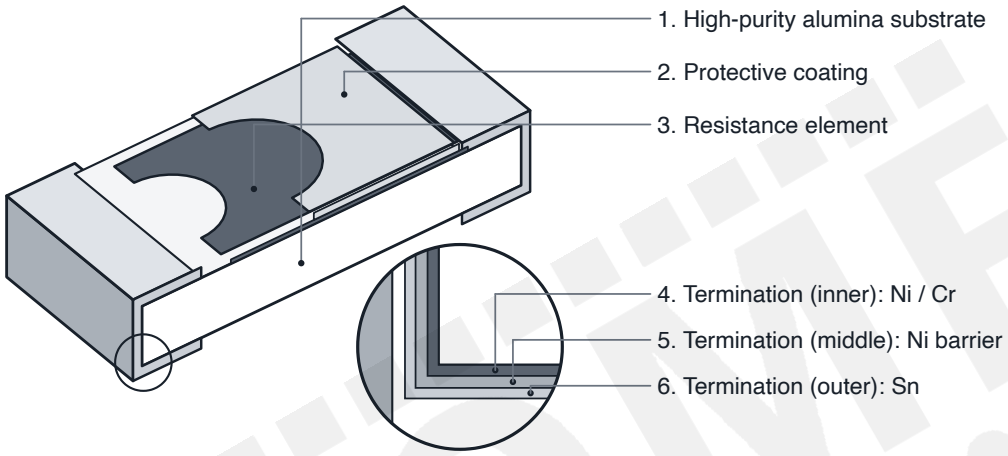
Curve of pulse duration (excerpt of the original sheet)



Pulse voltage limit (excerpt of the original sheet)

Manufacturer curves reproduced from the original sheet; values are not re-plotted.

Structure



Performance specification

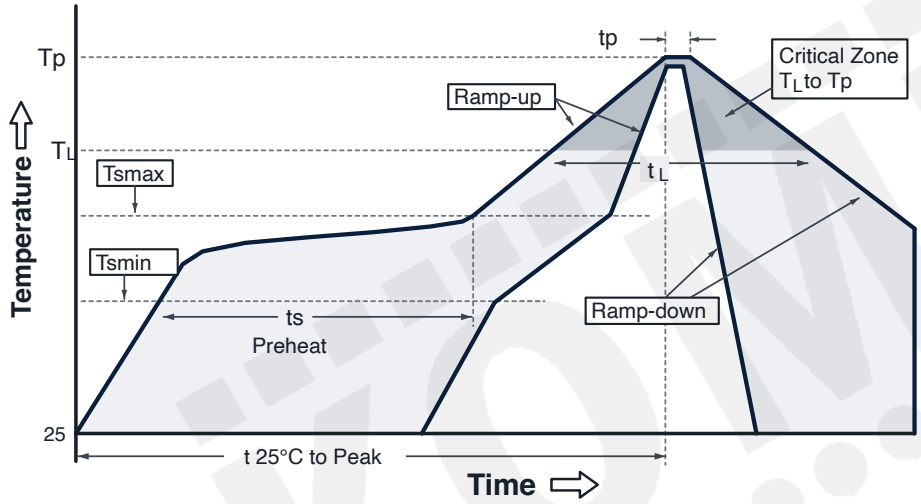
Characteristic	Limits	Ref. standards	Test methods
Operational life	±(3.0%+0.1Ω)	MIL-STD-202	125°C, at 36% of operating power, 1000 h (1.5 hours “ON”, 0.5 hour “OFF”).
Electrical characterization (TCR)	1Ω≤R≤10Ω: ±400PPM/°C 10Ω<R≤10M: ±100PPM/°C ⑦	GB/T 5729 4.8 JIS-C-5201 4.8 IEC60115-1 4.8	Natural resistance change per degree Celsius: $(R_2–R_1) / (R_1(t_2–t_1)) \times 10^6$ (PPM/°C) R_1: resistance value at room temperature (t_1); R_2: resistance at test temperature (t_2); t_1: +25°C or specified room temperature; t_2: test temperature (-55°C or 125°C).
Short-time overload	±(1.0%+0.1Ω)	GB/T 5729 4.13 JIS-C-5201 4.13 IEC60115-1 4.13	Permanent resistance change after applying 2.5 times RCWV or the max. overload voltage, whichever is less, for 5 seconds.
External visual	No mechanical damage	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.
Physical dimension	See Dimensions	JESD22 MH Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: user and supplier specification. Electrical test not required.
Resistance to solvent	Marking unsmeared	MIL-STD-202 Method 215	Note: add aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	Not broken	JIS-C-6429	Force of 1.8kg for 60 seconds.
High temperature exposure (storage)	±(3.0%+0.1Ω)	MIL-STD-202 Method 108	1000 hrs at T=155°C, unpowered. Measurement at 24±2 hours after test conclusion.
Temperature cycling	±(1.0%+0.05Ω)	JESD22 Method JA-104	1000 cycles (-55°C to +155°C). Measurement at 24±2 hours after test conclusion.
Biased humidity	±(3.0%+0.1Ω)	MIL-STD-202 Method 103	1000 hours, 85°C, 85%RH. Note: specified conditions: 10% of operating power. Measurement at 24±2 hours after test conclusion.
Mechanical shock	±(1.0%+0.1Ω)	MIL-STD-202 Method 213	Wave form: tolerance for half-sine shock pulse. Peak value is 100g's. Normal duration (D) is 6 ⑧.

Characteristic	Limits	Ref. standards	Test methods
Vibration	±(1.0%+0.1Ω)	MIL-STD-202 Method 204	5g's for 20 min., 12 cycles each of 3 orientations. Note: use 8"×5" PCB. 031" thick ⑨, 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2' ⑨ from any secure point. Test from 10-2000Hz.
ESD	±(3.0%+0.1Ω)	AEC-Q200-002	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500V, ±1KV, ±2KV, ±4KV, ±8KV. The electrometer reading shall be within ±10% for voltages from 500V to ≤800V ⑧.
Solderability	95% coverage min.	J-STD-002	For both leaded and SMD parts. Electrical test not required. Magnification 50X. Conditions: a) Method B: 4 hrs at 155°C dry heat, then dip in a bath at 245±3°C, 5±0.5s. b) Method D: at 260±3°C, 30±0.5s.
Board flex	±(1%+0.05Ω)	JIS-C-6429	2mm (min)
Resistance to soldering heat	±(1%+0.05Ω)	MIL-STD-202 Method 210	Condition B, no pre-heat of samples. Dip the resistor into a solder bath at a temperature of 260°C±5°C and hold it for 10±1 seconds.

Soldering conditions

The profiles below are recommendations; please adjust them to the actual application.

Recommended reflow soldering profile (solder: Sn96.5 / Ag3 / Cu0.5)



Profile feature		Lead (Pb)-free solder
Preheat	Temperature min. (Ts_{min})	150°C
	Temperature max. (Ts_{max})	200°C
	Time (Ts_{min} to Ts_{max}) (ts)	60-120 seconds
Average ramp-up rate (Ts_{max} to Tp)		3°C/second max.
Time maintained above	Temperature (T_L)	217°C
	Time (t_L)	60-150 seconds
Peak temperature (Tp)		260°C
Time within [see excerpt] of actual peak temperature (tp)² ⑩		10 seconds
Ramp-down rate		6°C/second max.
Time 25°C to peak temperature		8 minutes max.

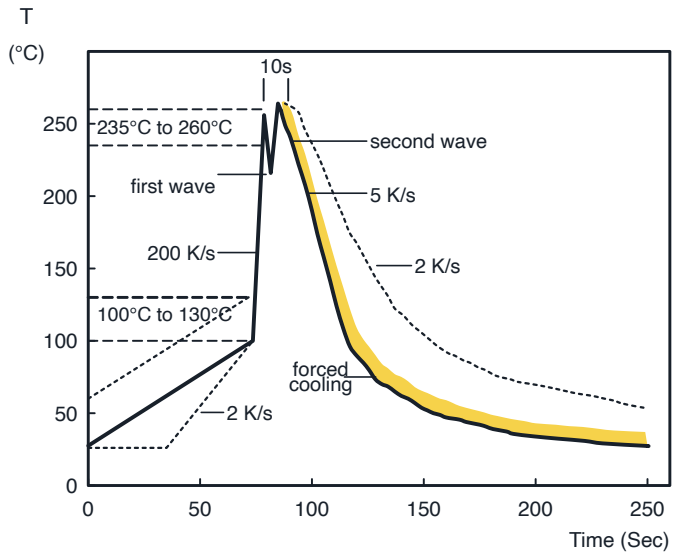
Number of reflow cycles allowed: 2.

To avoid discoloration of the chip terminal electrodes, please use an N_2 reflow furnace.

Time within 0℃ of actual peak Temperature (tp)^2	10 seconds

Peak-temperature row as printed ⑩ (excerpt of the original sheet)

Recommended wave soldering profile (applies to 0603 and larger sizes)

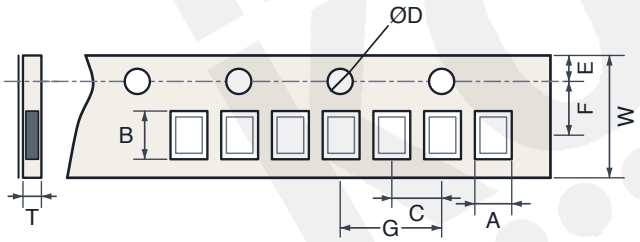


Packing

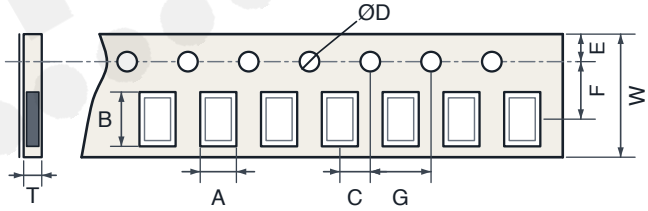
Paper taping (unit: mm) ⑫

Type	A	B	C		E	F	G	W	T
	±0.10	±0.10	±0.05		±0.1	±0.05	±0.1	±0.2	±0.05
AS02	0.65	1.20	2.00	1.50	1.75	3.50	4.00	8.00	0.42

Type	A	B	C		E	F	G	W	T
	±0.2	±0.2	±0.05		±0.1	±0.05	±0.1	±0.2	±0.10
AS03	1.10	1.90	2.00	1.50	1.75	3.50	4.00	8.00	0.67
AS05	1.65	2.40	2.00	1.50	1.75	3.50	4.00	8.00	0.81
AS06	2.00	3.60	2.00	1.50	1.75	3.50	4.00	8.00	0.81
AS07	2.80	3.50	2.00	1.50	1.75	3.50	4.00	8.00	0.75



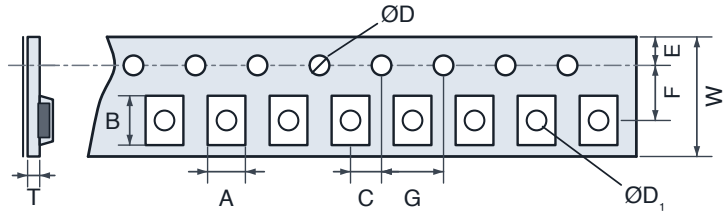
Paper taping, AS02



Paper taping, AS03 to AS07

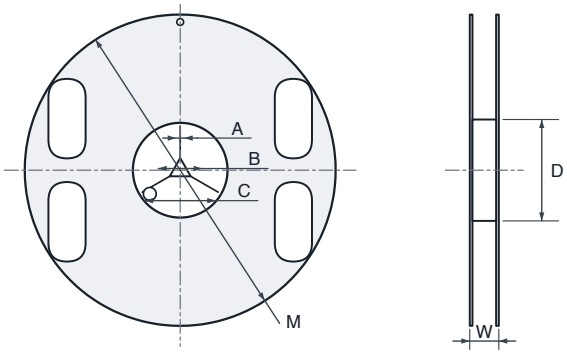
Plastic taping (unit: mm) ⑫

Type	A	B	C			E	F	G	W	T
	±0.2	±0.2	±0.05			±0.1	±0.05	±0.1	±0.2	±0.1
AS10	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
AS12	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00



Reel (unit: mm)

Type	Taping	Qty/reel	A	B	C	D	M	W
			±0.5	±0.5	±0.5	±1	±2	±1
AS02	Paper	10,000 pcs	2.0	13.0	21.0	60.0	178.0	10.0
AS03	Paper	5000 pcs	2.0	13.0	21.0	60.0	178.0	10.0
AS05	Paper	5000 pcs	2.0	13.0	21.0	60.0	178.0	10.0
AS06	Paper	5000 pcs	2.0	13.0	21.0	60.0	178.0	10.0
AS07	Paper	5000 pcs	2.0	13.0	21.0	60.0	178.0	10.0
AS10	Embossed	4000 pcs	2.0	13.0	21.0	60.0	178.0	13.8
AS12	Embossed	4000 pcs	2.0	13.0	21.0	60.0	178.0	13.8



Reel, front and side view

Notes on storage and use

- KOME AL ⑪ recommends storing the products in a warehouse at a temperature between 15 and 35°C and a humidity between 25 and 75%RH. Even under these recommended storage conditions, the solderability of products stored for over 1 year will be degraded.
- Cartons must be placed in the direction indicated on the carton; otherwise the reel or wire will be deformed.
- The following storage conditions are inappropriate: a. storage in a high-electrostatic environment; b. storage in direct sunshine, rain, snow or condensation; c. exposure to sea wind or corrosive gases, such as Cl_2, H_2S, NH_3, SO_2, NO_2, etc.

Notes

① Product type: the code list in the part number system (2.1) gives AS02, AS05, AS06, AS07, AS10 and AS12 as examples; AS03 is not in that list but appears in the ordering table and in the dimension, resistance range, ratings, pad, taping and reel tables, so it is kept — subject to manufacturer confirmation.

② Part number format: the positions follow the KOME RC series ordering code (RC 05 K 5 103 J T LF); the original AS sheet uses a different format (example AS0606J0103T5E: wattage, packing-quantity and special-feature codes), which is not reproduced. Total characters = number of digits of the resistance value written out in ohms (102 = 1000 → 4). Position 4 uses the same E-24 / E-96 description and examples as the KOME RC sheet; note that the AS resistance range table covers ±5%, ±10% and ±20% (E-24) only — subject to manufacturer confirmation.

③ TCR code: the original AS sheet has no TCR code table, so only K (based on spec.) is listed; the TCR limits are under Performance specification. Tolerance codes J, K, M are from the AS ordering table; the AS part number system also lists D ±0.5%, F ±1% and G ±2% — subject to manufacturer confirmation.

④ Packaging: T = tape & reel and C = bulk as listed on the AS sheet; its packing-quantity codes (4 = 4000 pcs AS10/AS12, 5 = 5000 pcs AS03–AS07, C = 10000 pcs AS02) are not part of this format, see Reel under Packing. The suffix is written "-LF" (with hyphen) as in the example; the RC sheet prints "LF" — subject to manufacturer confirmation.

⑤ Applications are printed "AV adapters，LCD back-light camera strobe etc." and are kept as printed — subject to manufacturer confirmation.

⑥ The original shows only √P; the full RCWV equation is incomplete. It is shown as an excerpt of the original and not completed here — subject to manufacturer confirmation.

⑦ TCR limit printed "10Ω<R≤10M" without a unit after 10M — subject to manufacturer confirmation.

⑧ Mechanical shock: "Normal duration (D) is 6" has no unit; ESD: the test levels go up to ±8KV, but the electrometer tolerance is stated for voltages "from 500V to ≤800V" — subject to manufacturer confirmation.

⑨ Vibration: the board thickness is printed "PCB. 031" thick" and the mounting distance "within 2'" (single prime) — subject to manufacturer confirmation.

⑩ Reflow table: the temperature tolerance in the row "Time within … of actual peak temperature (tp)" is printed with characters separated and offset, so it is shown as an excerpt of the original; the superscript "2" has no corresponding footnote on the original — subject to manufacturer confirmation.

⑪ The notes begin "KOME AL recommend …"; "AL" is kept as printed. The original also numbers both Soldering Condition and Packing as section 13 (sub-sections 13.1–13.2 used twice) — subject to manufacturer confirmation.

⑫ Taping tables: one column header in the paper-taping tables and two column headers in the plastic-taping table are blank on the original (value 1.50 in each); the headers are left blank here — subject to manufacturer confirmation.

⑬ Record (revision history) on the original: version 2 (Sep. 26, 2023) and version 3 (Feb. 19, 2024) modify the ESD test on page 6, but the ESD test is on page 5 of the current sheet — subject to manufacturer confirmation.