

## Data Sheet

Customer:

Product: Anti-Sulfurated Thick Film Chip Resistor - AS Series (Chip)

Size: 0201/0402/0603/0805/1206/1210/2010/2512

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## Anti-Sulfurated Thick Film Chip Resistor



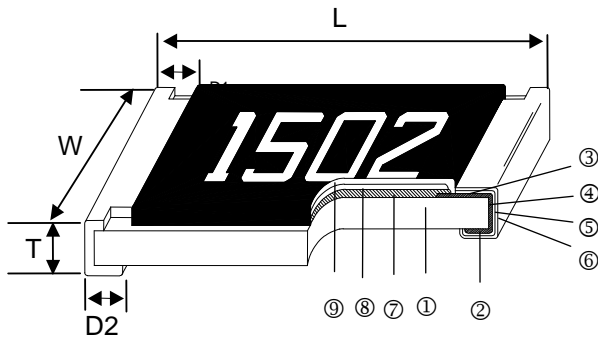
### Scope

- This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

### Features

- Special construction to prevent sulfuration in a sulfur containing environment

### Construction



### Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- High-end Multimedia Electronics
- Outdoor Electronic Applications

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

### Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
AS01(STD)	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.17±0.05	0.15±0.05	0.15
AS01(HP)	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.15
AS02(STD)	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.25±0.10	0.25±0.10	0.55
AS02(HP)	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.55
AS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.04
AS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.37
AS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.94
AS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.96
AS0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.24
AS12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.44

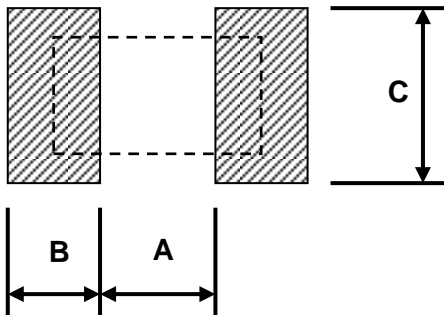
■ STD : Standard    HP : High Power

**Part Numbering**

AS	06	F	T	E		1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel K: 7" 15K/Reel	E: ±100 F: ±200 H: ±400 - : No Specified	: Standard* (See Remark) 3: 1/12W X: 1/10W W: 1/8W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W	R0R0: 0Ω 0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ

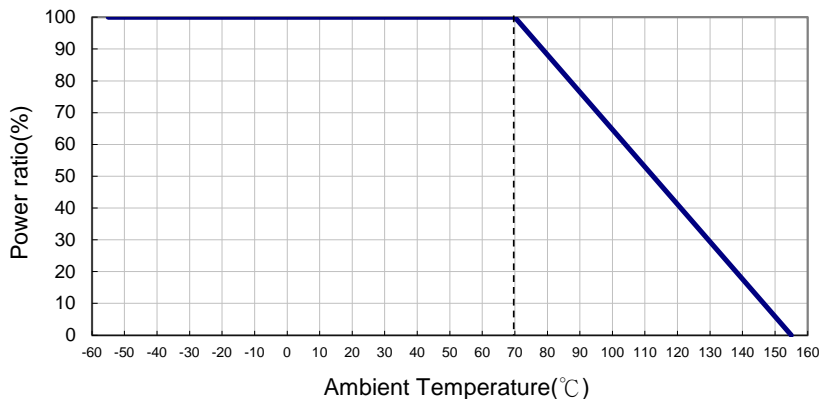
\*Remark: Standard part no need for power rating code.

**Recommend Land Pattern**

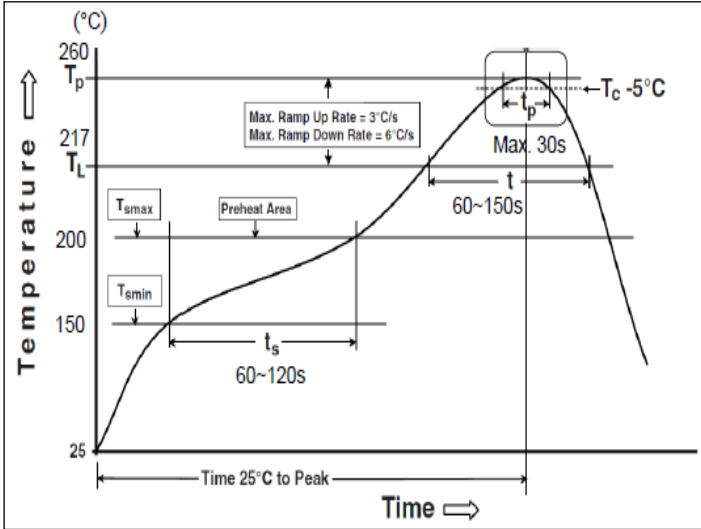


Type	A (mm)	B (mm)	C (mm)
AS01	0.30	0.25	0.30
AS02	0.50	0.45	0.60
AS03	0.90	0.60	0.90
AS05	1.20	0.70	1.30
AS06	2.00	0.90	1.60
AS10	2.00	0.90	2.80
AS0A	3.80	0.90	2.80
AS12	4.90	1.60	3.50

**Derating Curve**



**■ Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)**



Reflow Profiles		Pb-Free Assembly
Profile Feature		
<b>Preheat</b>		
Min. Temperature (T <sub>smin</sub> )		150 °C
Max Temperature (T <sub>smax</sub> )		200 °C
Preheating time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )		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> )		217 °C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>		60-150 seconds
Min. Peak temperature (T <sub>p</sub> min)		235°C
Max. Peak temperature (T <sub>p</sub> max)		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.

**■ Standard Electrical Specifications**

Item Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24,E96)	±1% (E24,E96)	±5% (E24)	
AS01 (0201)	1/20W	-55 ~ +155°C	25V	50V	-	1Ω - 9.76Ω		±400
	Jumper: 0.5A				-	10Ω - 1MΩ		±200
AS02 (0402)	1/16W		50V	100V	-	1.02MΩ - 10MΩ		±200,±400
	Jumper: 1A				-	0Ω (<50mΩ)		-
AS03 (0603)	1/10W		75V	150V	-	1Ω - 9.76Ω		±200,±400
	Jumper: 1A				-	10Ω - 1MΩ		±100,±200
AS05 (0805)	1/8W		150V	300V	-	1.02MΩ - 10MΩ		±200,±400
	Jumper: 2A				-	0Ω (<50mΩ)		-
AS06 (1206)	1/4W		200V	400V	-	1Ω - 9.76Ω		±200
	Jumper: 2A				-	10Ω - 1MΩ		±100
AS10 (1210)	1/3W		200V	400V	-	1.02MΩ - 10MΩ		±200
	Jumper: 2.5A				-	0Ω (<50mΩ)		-
AS0A (2010)	3/4W	200V	400V	-	1Ω - 9.76Ω		±200	
	Jumper: 3.5A			-	10Ω - 1MΩ		±100	
AS12 (2512)	1W	250V	500V	-	1.02MΩ - 10MΩ		±200	
	Jumper: 4A			-	0Ω (<50mΩ)		-	

**High Power Rating Electrical Specifications**

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24、E96)	±1% (E24、E96)	±5% (E24)	
AS01 (0201)	1/12W	-55 ~ +155°C	25V	50V	-	10Ω - 1MΩ		±200
AS02 (0402)	1/10W		50V	100V	-	1Ω - 9.76Ω		±200
AS03 (0603)	1/4W		75V	150V	-	10Ω - 1MΩ		±100
AS05 (0805)	1/3W		150V	300V	-	1Ω - 9.76Ω		±200
AS06 (1206)	1/2W		200V	400V	-	10Ω - 1MΩ		±100
AS10 (1210)	3/4W		200V	400V	-	1Ω - 9.76Ω		±200
AS0A (2010)	1W		200V	400V	-	10Ω - 1MΩ		±100
						10Ω - 1MΩ		±100

Operating Voltage= $\sqrt{P \cdot R}$  or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

**Environmental Characteristics**

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			<b>JIS-C-5201-1 4.8</b> <b>IEC-60115-1 4.8</b> 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	<b>JIS-C-5201-1 4.13</b> <b>IEC-60115-1 4.13</b> RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	0201,0402,0603(Standard):≥1G 0201,0402,0603(High Power) & Other sizes: ≥10G			<b>JIS-C-5201-1 4.6</b> <b>IEC-60115-1 4.6</b> Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	<b>JIS-C-5201-1 4.25</b> <b>IEC-60115-1 4.25.1</b> 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	<b>JIS-C-5201-1 4.24</b> <b>IEC-60115-1 4.24</b> 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	0201,0402,0603(Standard): ±(2.0%+0.05Ω) 0201,0402,0603(High Power) & Other sizes: ±(1.5%+0.10Ω)	0201,0402,0603: <100mΩ Other sizes: <50mΩ	<b>JIS-C-5201-1 4.23</b> <b>IEC-60115-1 4.23.2</b> at +155°C for 1000 hrs

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>JIS-C-5201-1 4.33</b> <b>IEC-60115-1 4.33</b> Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> 245±5°C for 3 seconds
Resistance to Soldering Heat	0201,0402,0603 (Standard): ±(1.0%+0.05Ω) 0201,0402,0603(High Power) & Other sizes: ±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			<b>JIS-C-5201-1 4.7</b> <b>IEC-60115-1 4.7</b> 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%			<b>JIS-C-5201-1 4.18</b> <b>IEC-60068-2-58 8.2.1</b> 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>JIS-C-5201-1 4.19</b> <b>IEC-60115-1 4.19</b> -55°C to +155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	<50mΩ	0201,0402,0603(High Power) & Other sizes: <b>ASTM-B-809-95</b> H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs
	±(5.0%+0.05Ω)	±(5.0%+0.05Ω)	<100mΩ	0201(Standard): Soaked in industrial oil with sulfur substance contained 105°C±3°C, for 500 hours 0402,0603(Standard): Soaked in industrial oil with sulfur substance contained 105°C±3°C, for 1000 hours

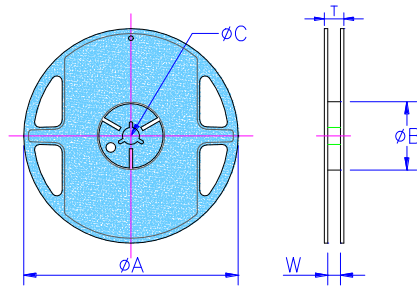
RCWV(Rated Continuous Working Voltage)=√(P\*R) or Max. Operating Voltage whichever is lower.

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

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

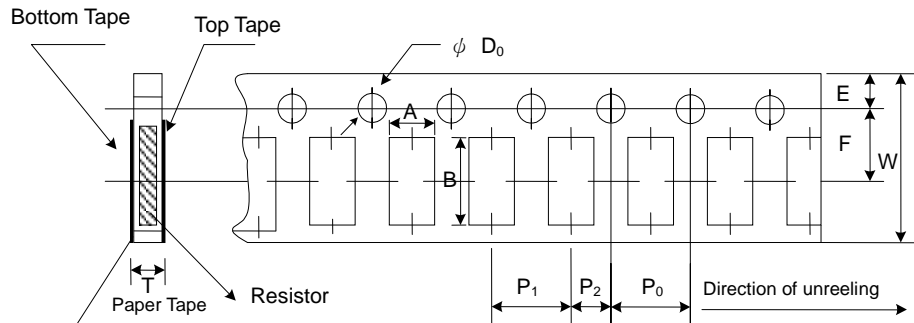
**■ Packaging**

Reel Specifications & Packaging Quantity



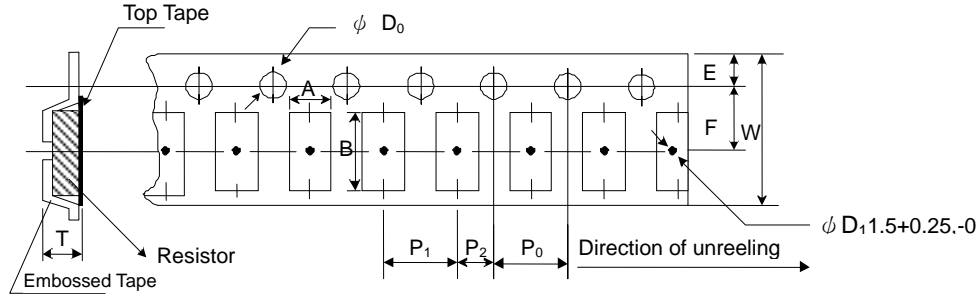
Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	
AS01(STD)	Paper	15K	7 inch	178±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	
AS02(STD)		10K							
AS03(STD)		5K							
AS01(HP) AS02(HP)	Paper	10K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
AS02(HP)		20K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS03(HP) AS05 AS06 AS10	Paper	5K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
AS05		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		AS06 AS10		20K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5
AS0A AS12	Embossed	4K	12mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.5	13.0±0.5	15.5±0.5
AS12		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	T (mm)
AS01(STD)	0.40±0.10	0.70±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50±0.10	0.42±0.20
AS02(STD)	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	2.00±0.05	1.50±0.10	0.45±0.10
AS03(STD)	1.10±0.10	1.85±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.70±0.10
AS01(HP)	0.38±0.05	0.68±0.05	8.00±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
AS02(HP)	0.65±0.10	1.15±0.10	8.00±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
AS03(HP)	1.10±0.10	1.90±0.10	8.00±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
AS05	1.60±0.10	2.40±0.20	8.00±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
AS06	1.90±0.10	3.50±0.20	8.00±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
AS10	2.90±0.10	3.50±0.20	8.00±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 Plastic Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	T (mm)
AS0A	2.80±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>
AS12	3.50±0.10	6.70±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>

**■ Marking**

No Marking for 0201 and 0402

Jumper for all: Letter "0"

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

Example:

Resistance	5.6Ω	97.6Ω	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	5R60	97R6	1000	2201	1002	4992	1003

5% for 0603/0805/1206/1210/2010/2512: 3 digits marking in E24

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

E24 code	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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0.5%、1% for 0603(STD): 3 digits marking in E24 with one short bar under marking letter.



0.5%、1% for 0603(HP): 3 digits marking in E24

0.5%、1% for 0603: 3 digits marking in E96



3 digits 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	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>-2</sup>		