



**Product Family:** 2-Terminal Current Sense Resistors

**Part Number Series:** WEL-Series

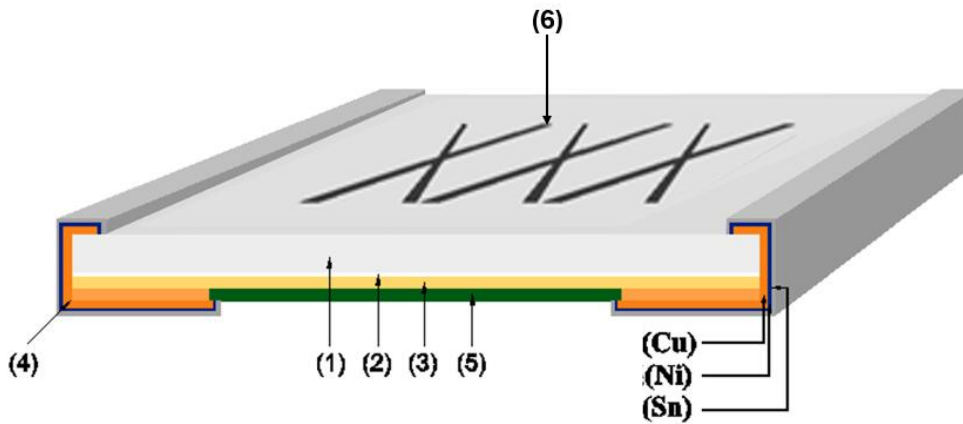


		<p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>Alumina Ceramic</li> <li>Metal foil resistive element</li> <li>Epoxy-resin overcoat</li> <li>100% matte tin over Ni terminations</li> <li>Two-code</li> <li>Three-code</li> <li>WEL1206/2010/Four-code</li> </ul> <p><b>Features:</b></p> <ul style="list-style-type: none"> <li>TCR down to <math>\pm 50\text{ppm}/^\circ\text{C}</math></li> <li>Halogen Free and Beryllium Free</li> <li>RoHS complainant and Pb free</li> <li>AEC-Q200 qualified</li> </ul>
<p>WEL0603-Series    WEL0805-Series</p> <p>WEL1206/2010/2512-Series</p>		

**Description:**

These low ohm current sense resistors are designed for tight resistance tolerance, low noise, long-term stability and high heat dissipation capability in a small package. This series is ideal for use in power management modules, motor control circuits and automotive applications.

**Product Construction**



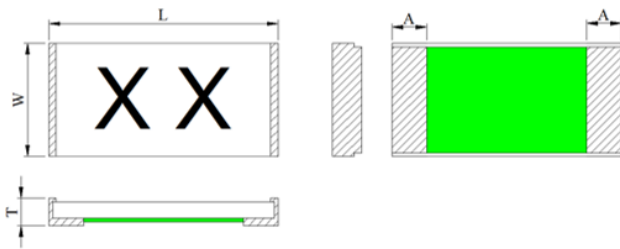
Number	Description
1	Alumina Ceramic
2	epoxy
3	Cu - alloy
4	Sn , Ni , Cu
5	Flame-retardant epoxy, meets UL94 V-0 requirements (green)
6	Epoxy resin

Three-code; WEL1206/2010/Four-code.

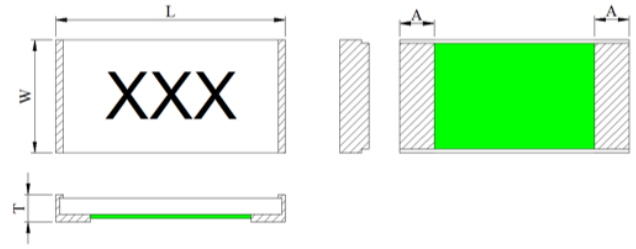
**Part Numbering: Ex: WEL1206MR010FA-T5**

Series Name	English Size(metric size)	Material	Resistance Value	Resistance Tolerance	Product code	Packaging
WEL	0603(0816) 0805(1220) 1206(1632) 2010(2550) 2512(3264)	M	R010=10mΩ R005=5mΩ	D=±0.5% F=±1.0%	A= Automotive	-T4 = 4,000 -T5 = 5,000

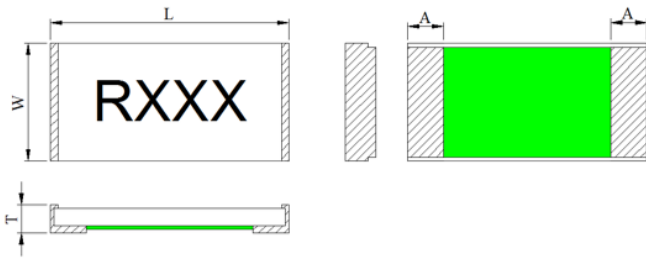
**Product Dimensions**



0603-Series-A



0805-Series-A



1206/2010/2512-Series-A

Unit: inches (mm)

Dimension (Metric)	Resistance Range	Material	W	L	T	A
WEL0603(0816)	5mΩ(A)	M	0.035±0.008 (0.90±0.20)	0.067±0.008 (1.70±0.20)	0.026±0.006 (0.65±0.15)	0.020±0.008 (0.50±0.20)
	6~9mΩ(A)					0.016±0.008 (0.40±0.20)
	10~60mΩ(A)					
WEL0805(1220)	3mΩ(A)	M	0.053±0.008 (1.35±0.20)	0.083±0.008 (2.10±0.20)	0.026±0.008 (0.65±0.20)	0.026±0.008 (0.65±0.20)
	4~7mΩ(A)					0.020±0.008 (0.50±0.20)
	8~30mΩ(A)					
	31~100mΩ(A)	C				
WEL1206(1632)	3mΩ(A)	M	0.067±0.008 (1.70±0.20)	0.130±0.008 (3.30±0.20)	0.026±0.008 (0.65±0.20)	0.047±0.012 (1.20±0.30)
	4~8mΩ(A)					0.027±0.012 (0.68±0.30)
	9~30mΩ(A)					
	31~70mΩ(A)	C				

WEL2010(2550)	3mΩ(A)	M	0.102±0.008 (2.60±0.20)	0.201±0.008 (5.10±0.20)	0.026±0.008 (0.65±0.20)	0.083±0.012 (2.10±0.30)
	4~9mΩ(A)					0.028±0.012 (0.70±0.30)
	10~30mΩ(A)					
	31~50mΩ(A)	C				
WEL2512(3264)	3mΩ(A)	M	0.126±0.012 (3.20±0.30)	0.252±0.012 (6.40±0.30)	0.026±0.008 (0.65±0.20)	0.102±0.012 (2.60±0.30)
	4~9mΩ(A)					0.041±0.012 (1.05±0.30)
	10~30mΩ(A)					
	31~50mΩ(A)	C				

## Electrical Specifications

Type	WEL0603		
Metric Size (mm)	0816		
Material	M		
Power Rating (W)	0.5、0.3		0.3
Resistance Range (mΩ)	5~9	10~30	31~60
Resistance Tolerance % (code)	±1.0 (F)		±0.5 (D)/±1.0 (F)
TCR ppm/°C	±75		±50
Operating Temp. Range(°C)	-55~+155		

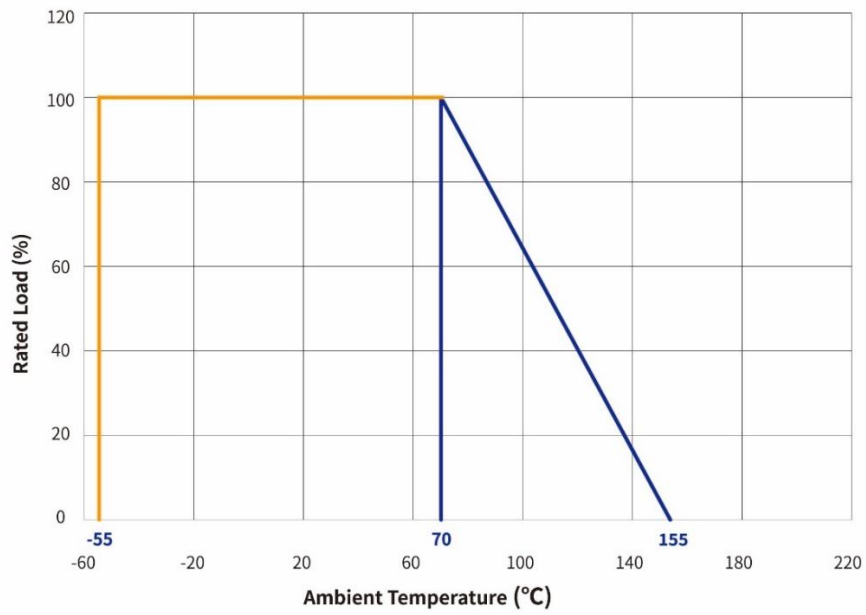
Type	WEL0805		
Metric Size (mm)	1220		
Material	M	C	
Power Rating (W)	0.75、0.5		0.5
Resistance Range (mΩ)	3	4~30	31~50 51~100
Resistance Tolerance % (code)	±1.0 (F)		±0.5 (D)/±1.0 (F)
TCR ppm/°C	±75		±50
Operating Temp. Range(°C)	-55~+155		-55~+170

Type	WEL1206			
Metric Size (mm)	1632			
Material	M		C	
Power Rating (W)	1.0, 0.75			0.75
Resistance Range (mΩ)	3	4~30	31~50	51~70
Resistance Tolerance % (code)	±1.0 (F)	±0.5 (D)/±1.0 (F)		
TCR ppm/°C	±75	±50		
Operating Temp. Range(°C)	-55~+155		-55~+170	

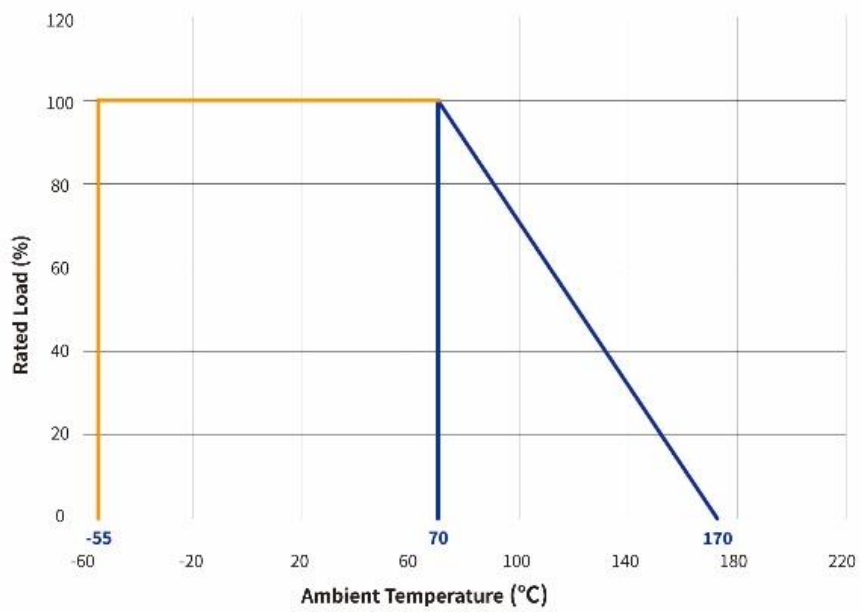
Type	WEL2010			
Metric Size (mm)	2550			
Material	M		C	
Power Rating (W)	1.5			
Resistance Range (mΩ)	3~9	10~30	31~50	
Resistance Tolerance % (code)	±1.0 (F)	±0.5 (D)/±1.0 (F)		
TCR ppm/°C	±100	±50		
Operating Temp. Range(°C)	-55~+155		-55~+170	

Type	WEL2512			
Metric Size (mm)	3264			
Material	M		C	
Power Rating (W)	2.0			
Resistance Range (mΩ)	3	4~30	31~50	
Resistance Tolerance % (code)	±1.0 (F)	±0.5 (D)/±1.0 (F)		
TCR ppm/°C	±75	±50		
Operating Temp. Range(°C)	-55~+155		-55~+170	

## Power Derating Curve



STE-M-Series-A(S)



STE-C-Series-A

## Reliability Specifications

### Electrical Characteristics

Test Item	Test Method	Specification
Resistance Data IEC60115-1 4.5	Resistance data at 25°C.	Must meet datasheet requirements
TCR Data IEC60115-1 4.8	Tested at 25°C and 125°C, $TCR = (R_b - R_a) / R_a \times 1 / (T_b - T_a) \times 10^6$ .	Must meet datasheet requirements

### Mechanical Characteristics

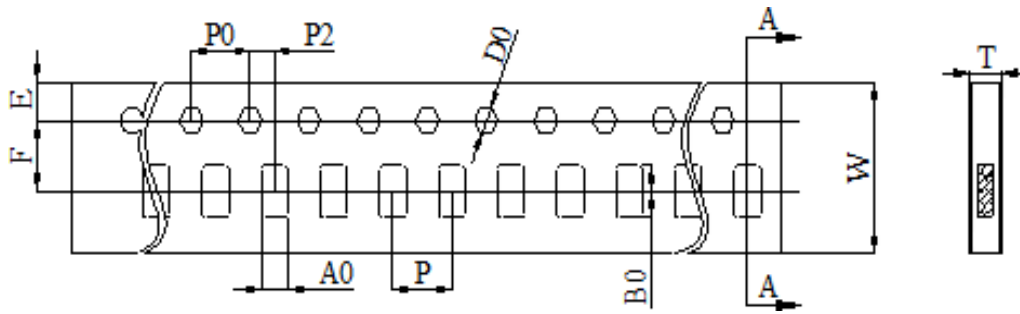
Test Item	Test Method	Specification
Substrate Bending AEC Q200-005	90 mm span between fulcrums 2 mm bend 60 seconds minimum holding time	$\Delta R \leq \pm 1.0\%$
Mechanical Shock MIL-STD-202 Method 213 Condition C	Peak value:100g;Normal duration:6ms; Half-sine;Velocity change(Vi)fi/sec:12.3, 3 shocks each of 6 directions, totals 18 shocks.	$\Delta R \leq \pm 1.0\%$
Vibration MIL-STD-202 Method 204	5g <sup>3</sup> s for 20 min. , 12 cycles each of 3 orientations . Test from 10-2000Hz.	$\Delta R \leq \pm 1.0\%$
Terminal Strength AEC Q200-006	F = 17.7N , t = 60±1sec.	$\Delta R \leq \pm 1.0\%$

### Environmental Characteristics

Test Item	Test Method	Specification
High Temp. Exposure MIL-STD-202 Method 108	Test Temperature: +155°C±2°C ,Test period: 1,000 hours .	$\Delta R \leq \pm 1.0\%$
Biased Humidity MIL-STD-202 Method 103	85°C/85%RH ; 10% of rated power, 1000h	$\Delta R \leq \pm 1.0\%$
Thermal Shock JESD22-A-104	-55°C 15min. → R.T. 1min. → +155°C 15min. → R.T. 1min. Repeat 1000 cycles as follows.	$\Delta R \leq \pm 1.0\%$
Operational Life MIL-STD-202 Method 108	100% rated power ; T = 70±2°C ; t = 90min ON , 30min OFF , 1000h	$\Delta R \leq \pm 1.0\%$
Resistance to Solder Heat MIL-STD-202 Method 210	Condition K, time above 217°C, 60s – 150s, 3 times	$\Delta R \leq \pm 1.0\%$
Solderability J-STD-002	Dip into solder at T = 245±5°C ,t = 5+0/-0.5sec.	The covered area >95%
Resistance to Solvents MIL-STD-202 Method 215	Add Aqueous wash chemical-OKEM Clean or equivalent, at normal temperature 3 minutes in isopropyl.	Without mechanical damage and distinct damage in appearance
ESD AEC Q200-002	HBM, 150pF , 2k ohms , Repetition: 5 times Component Classification : 5C (25KV)	$\Delta R \leq \pm 1.0\%$

<b>Flammability UL94</b>	UL94 V-0	-
<b>Flame Retardance AEC Q200-001</b>	32VDC(500ADC)	No fire Won't explode The temperature is greater than 350°C for no more than 10 seconds.

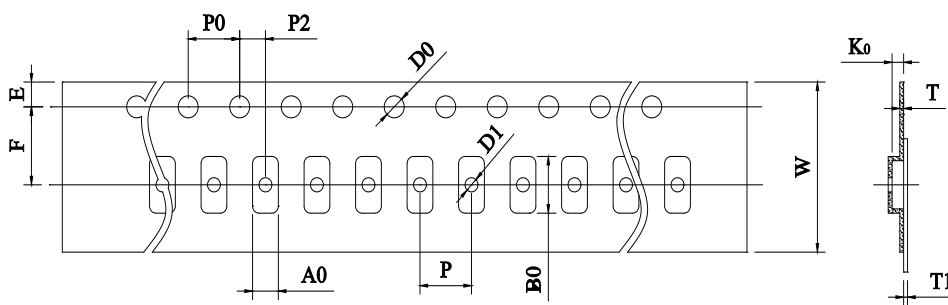
### Paper Tape Dimensions



Unit: mm

Size	W	P0	P	P2	A0	B0	D0	F	E	T
<b>0603</b>	8.00 ±0.30	4.00 ±0.10	4.00 ±0.10	2.00 ±0.10	1.10 ±0.10	1.90 ±0.10	1.50 ±0.10	3.50 ±0.10	1.75 ±0.10	0.75 ±0.10
<b>0805</b>	8.00 ±0.30	4.00 ±0.10	4.00 ±0.10	2.00 ±0.10	1.55 ±0.10	2.30 ±0.10	1.50 ±0.10	3.50 ±0.10	1.75 ±0.10	0.87 ±0.10
<b>1206</b>	8.00 ±0.30	4.00 ±0.10	4.00 ±0.10	2.00 ±0.10	2.05 ±0.20	3.65 ±0.20	1.50 ±0.10	3.50 ±0.10	1.75 ±0.10	0.87 ±0.10

### Plastic Tape Dimensions

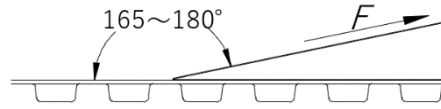


Unit: mm

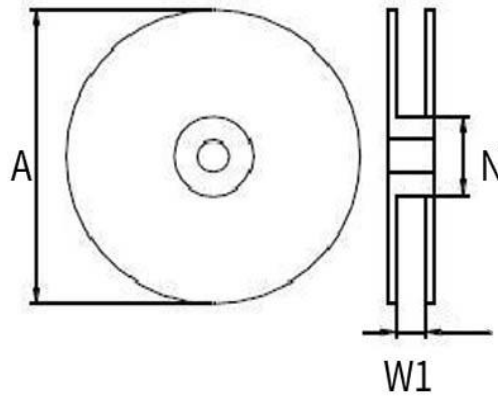
Size	W	P0	P	P2	A0	B0	D0	F	E	T	T1	K0
<b>2010</b>	12.00 ±0.30	4.00 ±0.10	4.00 ±0.10	2.00 ±0.10	2.85 ±0.20	5.45 ±0.20	1.50 ±0.10	5.50 ±0.10	1.75 ±0.10	0.25 ±0.10	Max. 0.10	0.80 ±0.20
<b>2512</b>	12.00 ±0.30	4.00 ±0.10	4.00 ±0.10	2.00 ±0.10	3.40 ±0.20	6.75 ±0.20	1.50 ±0.10	5.50 ±0.10	1.75 ±0.10	0.25 ±0.10	Max. 0.10	1.00 ±0.20

### Peeling Strength of Seal Tape

F = Peeling Strength: 0.1 – 1.0N (10 - 100gf)



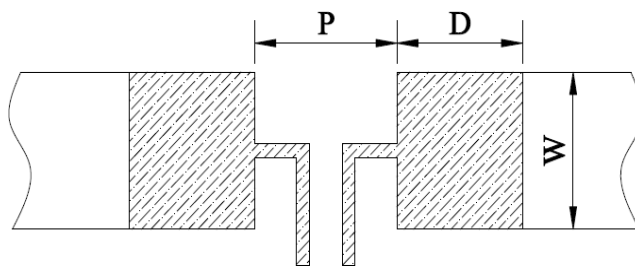
### Reel Dimensions



Unit: mm

Size	0603	0805	1206	2010	2512
Quantity	5,000 pcs/reel			4,000 pcs/reel	
A	178 ± 5.00				
N	60.0 ± 2.00				
W1	9.00 ± 1.00			13.0 ± 1.00	

### Recommended Land Pattern



Unit: mm

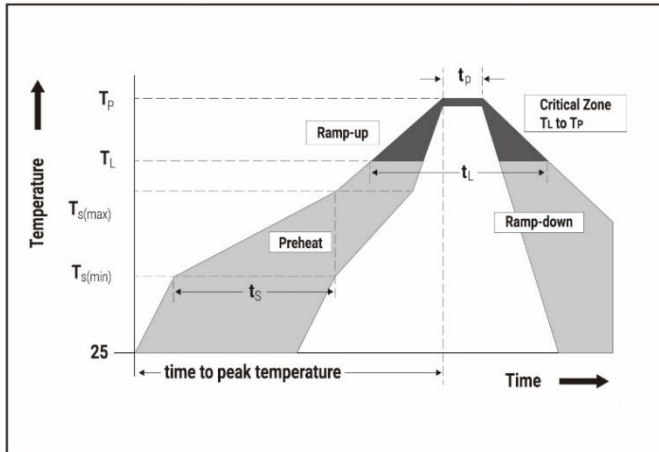
Size	Resistance Range	P	W	D
0603	5mΩ	0.50	0.92	1.35
	6~60mΩ	0.60		1.30
0805	3mΩ	0.50	1.44	1.55
	4~100mΩ	0.80		1.40
1206	3mΩ	0.60	1.84	2.10
	4~70mΩ	1.20		1.80

2010	3mΩ	0.70	2.88	3.65
	4~50mΩ	2.70		2.65

2512	3mΩ	0.90	3.57	4.20
	4~50mΩ	3.10		3.10

## Soldering Profile

Soldering Parameters-Wave Soldering



Profile Feature	Pb-Free Assembly
<b>Average Ramp-Up Rate (Tsmax to Tp)</b>	3 °C / second max
<b>Preheat</b>	
Temperature Minimum (Tsmin)	150 °C
Temperature Maximum (Tsmax)	200 °C
Time (Tsmin to Tsmax)	60-180 seconds
<b>Time maintained above</b>	
Temperature Minimum (TL)	217 °C
Time (tL)	60-150 seconds
<b>Peak Temperature (Tp)</b>	260 +0 °C
<b>Time within 5 °C of Actual Peak Temperature (tp)</b>	20-40 seconds
<b>Ramp-Down Rate</b>	6 °C / second Maximum
<b>Time 25 °C to Peak Temperature</b>	8 minutes Maximum

Rework temperature (hot air equipment) : 350°C, 3~5seconds

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

## Storage Conditions

### Environment Conditions:

Products should be stored under the following environmental conditions.

- Temperature: +5 to +40°C
- Humidity: 10%~75% relative humidity
- Under airtight can store 2 years.
- 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.