




Thin Film Technology Corp.

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

**Part Number Series:** D1WEL Series Short Electrode

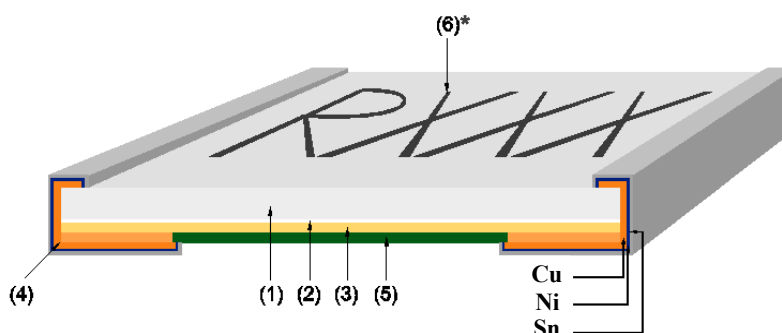


	<p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>• High purity alumina substrate</li> <li>• Metal foil resistive element</li> <li>• Epoxy-resin overcoat</li> <li>• Wrap around electrodes</li> <li>• 100% matte tin over Ni terminations</li> <li>• RoHS complainant and Pb free</li> </ul>	<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>• Resistances from <math>1\text{m}\Omega</math> ~ <math>700\text{m}\Omega</math></li> <li>• Optimal linearity in I/V conversion</li> <li>• High volume production suitable for commercial and special applications</li> <li>• Competitive pricing</li> <li>• Moisture Sensitivity Level=1</li> </ul>
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**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.

**Product Construction:**



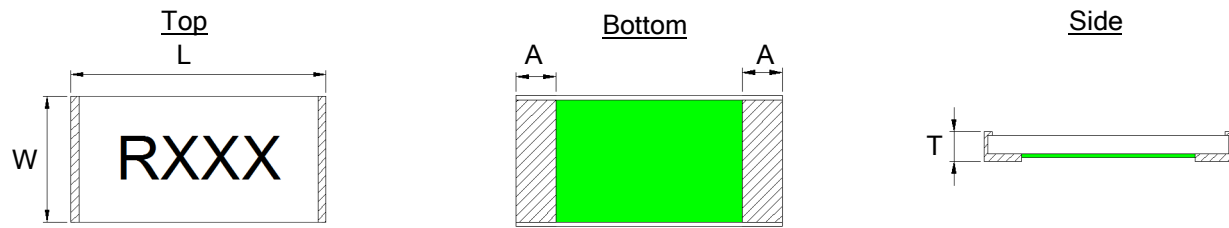
Number	Description
1	Substrate (Alumina Ceramic)
2	Adhesion Layer (Epoxy)
3	Resistive Element (Cu Alloy Foil)
4	Terminal Electrode (Cu, Ni, Sn)
5	Protective Coating (Flame-retardant epoxy, UL-94-V0)
6	Marking* (Flame-retardant epoxy, UL-94-V0)

\* Note: Marking is 2 digits (XX) for 0603 case size, 3 digits (XXX) for 0805, and 4 digits (RXXX) for all other case sizes.

**Part Numbering:** Ex: D1WEL0805MR010F-T5

Series Name	English Size	Material	Resistance Value	Resistance Tolerance	T&R Packaging Quantity
D1WEL	(refer to "type" in electrical tables)	M	Use 2 digit code for 0603, 3 digit code for 0805, and 4 digit code for all other cases. "R" denotes decimal position as necessary Ex. R010 = $10\text{m}\Omega$ R100 = $100\text{m}\Omega$	D = $\pm 0.5\%$ * F = $\pm 1.0\%$ (refer to tables)	-T1 = 1,000 -T2 = 2,000 -T4 = 4,000 -T5 = 5,000 (refer to tables)

\* Note:  $\pm 0.5\%$  (D) tolerance is not available for all resistance values. See electrical specifications table.

**Product Dimensions:**

All dimensions shown in inches, mm in parentheses.

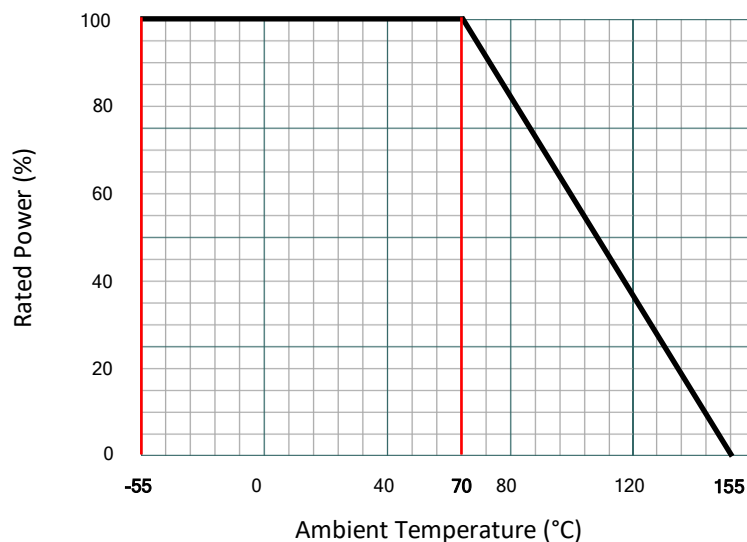
Dimension (Metric)	Resistance Range	Material	L	W	A	T
D1WEL0603 (1608)	5m $\Omega$	M	$0.067 \pm 0.008$ (1.70 $\pm$ 0.20)	$0.035 \pm 0.008$ (0.90 $\pm$ 0.20)	$0.020 \pm 0.008$ (0.50 $\pm$ 0.20)	$0.026 \pm 0.006$ (0.65 $\pm$ 0.15)
	6m $\Omega$ ~100m $\Omega$				$0.016 \pm 0.008$ (0.40 $\pm$ 0.20)	
D1WEL0805 (2012)	3m $\Omega$		$0.083 \pm 0.008$ (2.10 $\pm$ 0.20)	$0.053 \pm 0.008$ (1.35 $\pm$ 0.20)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)
	4m $\Omega$ ~500m $\Omega$				$0.020 \pm 0.008$ (0.50 $\pm$ 0.20)	
D1WEL1206 (3216)	3m $\Omega$		$0.130 \pm 0.008$ (3.30 $\pm$ 0.20)	$0.067 \pm 0.008$ (1.70 $\pm$ 0.20)	$0.047 \pm 0.012$ (1.20 $\pm$ 0.30)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)
	4m $\Omega$ ~700m $\Omega$				$0.027 \pm 0.012$ (0.68 $\pm$ 0.30)	
D1WEL2010 (5025)	2m $\Omega$ ~3m $\Omega$		$0.201 \pm 0.008$ (5.10 $\pm$ 0.20)	$0.102 \pm 0.008$ (2.60 $\pm$ 0.20)	$0.083 \pm 0.012$ (2.10 $\pm$ 0.30)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)
	4m $\Omega$ ~700m $\Omega$				$0.028 \pm 0.012$ (0.70 $\pm$ 0.30)	
D1WEL2512 (6432)	2m $\Omega$ *		$0.252 \pm 0.012$ (6.40 $\pm$ 0.30)	$0.126 \pm 0.012$ (3.20 $\pm$ 0.30)	$0.650 \pm 0.012$ (1.65 $\pm$ 0.30)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)
	2m $\Omega$				$0.110 \pm 0.012$ (2.80 $\pm$ 0.30)	
	3m $\Omega$				$0.102 \pm 0.012$ (2.60 $\pm$ 0.30)	
	4m $\Omega$ ~700m $\Omega$				$0.041 \pm 0.012$ (1.05 $\pm$ 0.30)	
D1WEL4320 (11050)	2m $\Omega$	$0.437 \pm 0.012$ (11.1 $\pm$ 0.30)	$0.201 \pm 0.012$ (5.10 $\pm$ 0.30)	$0.193 \pm 0.012$ (4.90 $\pm$ 0.30)	$0.026 \pm 0.008$ (0.65 $\pm$ 0.20)	
	3m $\Omega$			$0.179 \pm 0.012$ (4.55 $\pm$ 0.30)		
	4m $\Omega$ ~100m $\Omega$			$0.093 \pm 0.012$ (2.36 $\pm$ 0.30)		
D1WEL4527 (11470)	2m $\Omega$	$0.457 \pm 0.039$ (11.6 $\pm$ 1.00)	$0.279 \pm 0.039$ (7.10 $\pm$ 1.00)	$0.197 \pm 0.016$ (5.00 $\pm$ 0.40)	$0.026 \pm 0.012$ (0.65 $\pm$ 0.30)	
	3m $\Omega$ ~100m $\Omega$			$0.106 \pm 0.016$ (2.70 $\pm$ 0.40)		

\* Note: 2m $\Omega$ \* available in special and regular designs.

**Electrical Specifications:**

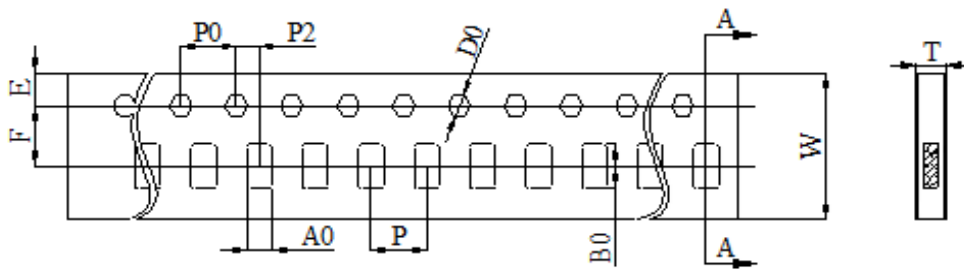
Type	D1WEL0603		D1WEL0805		D1WEL1206		D1WEL2010	
Metric Size	1608		2012		3216		5025	
Power Rating	1/2W		3/4W		1W		1 1/2W	
Resistance Range (mΩ)	5~9	10~100	3	4~500	3	4~700	2~9	10~700
Resistance Tolerance % (code)	±1.0(F)	±0.5(D) ±1.0(F)	±1.0(F)	±0.5(D) ±1.0(F)	±1.0(F)	±0.5(D) ±1.0(F)	±1.0(F)	±0.5(D) ±1.0(F)
TCR ppm/°C	±75	±50	±75	±50	±75	±50	±100	±50
Operating Temp. Range	-55°C~+155°C							
Rated Voltage	$\sqrt{(\text{Power} \times \text{Resistance})}$							
Packaging (code)	5,000 pcs/reel (-T5)						4,000 pcs/reel (-T4)	

Type	D1WEL2512		D1WEL4320		D1WEL4527	
Metric Size	6432		11050		11470	
Power Rating	2W		3W		4W	
Resistance Range (mΩ)	2~3	4~700	2~9	10~100	2~9	10~100
Resistance Tolerance % (code)	±1.0(F)	±0.5(D) ±1.0(F)	±1.0(F)	±0.5(D) ±1.0(F)	±1.0(F)	±0.5(D) ±1.0(F)
TCR ppm/°C	±75	±50	±100	±50	±100	±50
Operating Temp. Range	-55°C~+155°C					
Rated Voltage	$\sqrt{(\text{Power} \times \text{Resistance})}$					
Packaging (code)	4,000 pcs/reel (-T4)		2,000 pcs/reel (-T2)		1,000 pcs/reel (-T1)	

**Power Derating Curve:**

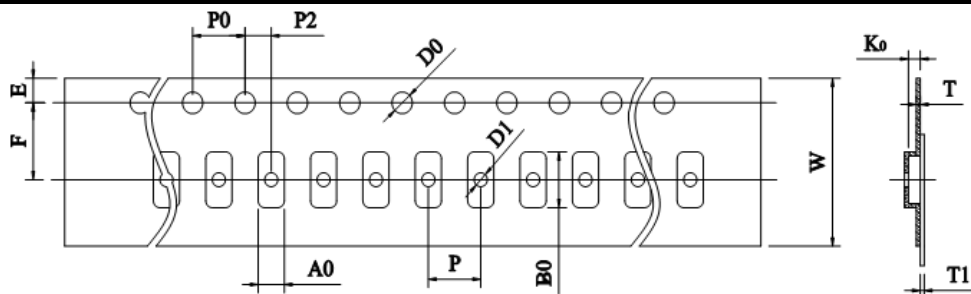
**Reliability Specifications:**

Test	Procedure	Specification
<b>Short Time Overload</b> JIS-C-5201, 4.13	Applied voltage: 2.5X rated power. Test duration: 5 seconds Test Temperature: 25 ±2°C	±(1.0%+0.5mΩ)
<b>High Temperature Exposure</b> IEC60115-1 4.25	Test Temperature: +155 ±2°C Test period: 1,000 hours	±(1.0%+0.5mΩ)
<b>Low Temp. Storage</b> IEC60115-1 4.25	Test Temperature: -55 ±2°C Test period: 1,000 hours	±(1.0%+0.5mΩ)
<b>Moisture Load Life</b> IEC60115-1 4.25	Test Temperature: 60°C ±2°C Applied voltage: 95% rated voltage Test period: 1,000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF	±(2.0%+0.5mΩ)
<b>Thermal Shock</b> IEC60115-1 4.19	-55°C 30min. → R.T. 3min. → +155°C 30min. → R.T. 3min, 100 Cycles	±(1.0%+0.5mΩ)
<b>Load life at 70°C</b> IEC60115-1 4.25	Test Condition: 70°C ±2°C Test period: 90 min ON, 30 min OFF, 1,000 hours	±(2.0%+0.5mΩ)
<b>Solderability</b> IEC60115-1 4.17	Dipped into molten solder for 3 ±1 seconds at 245 ±5°C	Coverage of >95%
<b>Resistance To Solder Heat</b> IEC60115-1 4.18	Parts are subjected to 3 reflow cycles	±(1.0%+0.5mΩ)
<b>Mechanical Shock</b> IEC60115-1 4.21	Force: 100g Test Duration: 6 milliseconds	±(1.0%+0.5mΩ)
<b>Substrate Bending</b> IEC60115-1 4.33	90mm span between fulcrums 2mm bend Glass-Epoxy test board Thickness: 1.6mm	±(1.0%+0.5mΩ)

**Paper Tape Dimensions:**

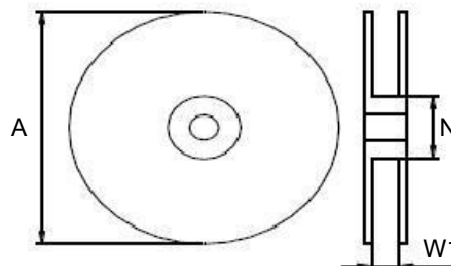
All dimensions in mm.

Size	W	P0	P	P2	A0	B0	D0	F	E	T
0603	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
0805	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
1206	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:**

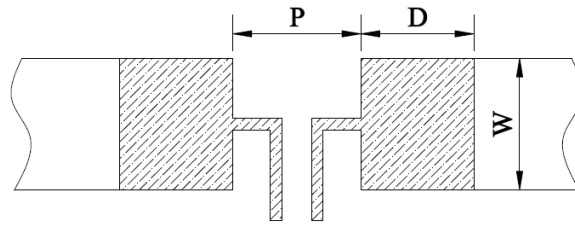
All dimensions in mm.

Size	W	P0	P	P2	A0	B0	D0	F	E	T	T1	K0	
2010	12.0 ±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	
2512					3.40 ±0.20	6.75 ±0.20						1.00 ±0.20	
4320	24.0 ±0.30		8.00 ±0.10		5.50 ±0.20	11.5 ±0.20		11.5 ±0.10				0.30 ±0.10	0.90 ±0.20
4527			12.0 ±0.10		7.50 ±0.20	12.0 ±0.20							

**Reel Dimensions:**

All dimensions in mm.

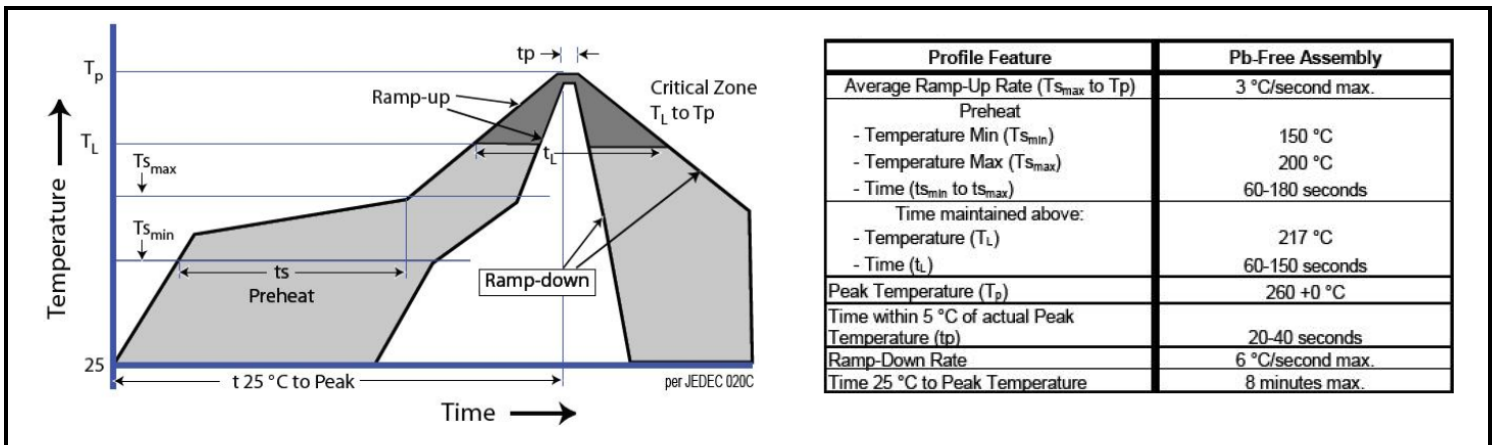
Size	0603	0805	1206	2010	2512	4320	4527
Quantity	5,000 pcs/reel			4,000 pcs/reel		2,000 pcs/reel	1,000 pcs/reel
A	178 ±5.00						
N	60.0 ±2.00						
W1	9.00 ±1.00			13.0 ±1.00		24.5 ±1.00	

**Recommended Land Pattern:**

All dimensions in mm.

Size	Resistance Range	P	W	D
0603	5mΩ	0.50	0.92	1.35
	6mΩ~100mΩ	0.60		1.30
0805	3mΩ	0.50	1.44	1.55
	4mΩ~500mΩ	0.80		1.40
1206	3mΩ	0.60	1.84	2.10
	4mΩ~700mΩ	1.20		1.80
2010	2mΩ~3mΩ	0.70	2.88	3.65
	4mΩ~700mΩ	2.70		2.65
2512	2mΩ*	1.60	3.57	3.85
	2mΩ	0.60		4.35
	3mΩ	0.90		4.20
	4mΩ~700mΩ	3.10		3.10
4320	2mΩ	1.10	5.75	6.45
	3mΩ	1.70		6.15
	4mΩ~100mΩ	5.00		4.50
4527	2mΩ	1.20	8.05	6.65
	3mΩ~100mΩ	5.20		4.65

\* Note: 2mΩ\* available in special and regular designs.

**Soldering Profile:****Storage Conditions:****Environment Conditions:**

Products should be stored under the following environmental conditions.

- Temperature: +5 to +35°C
- Humidity: 45 to 85% relative humidity
- 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.