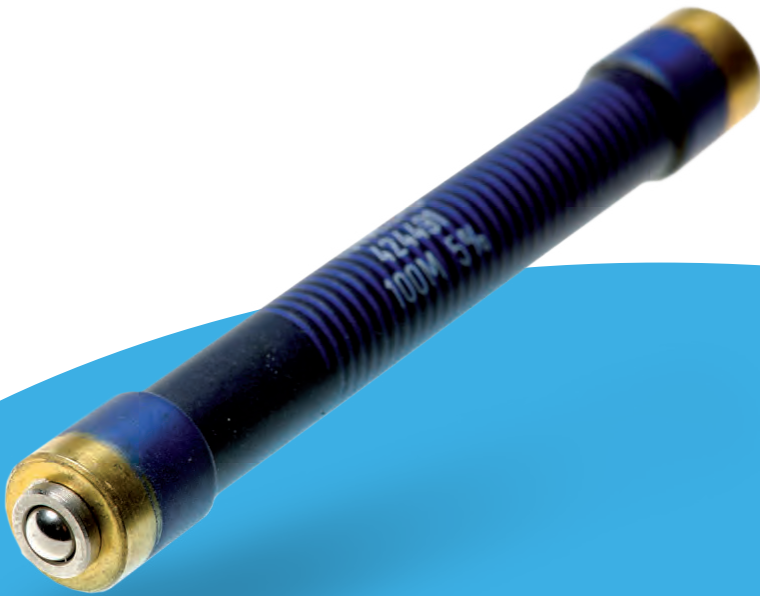


Product Data Short Form

# Resistors



**TT Electronics plc is a global electronics company.**

**Within its resistors business unit are multiple manufacturing facilities and dedicated engineering teams providing custom solutions.**

IRC and Welwyn are two market leading brands within this group, both with a 70-year track record of resistive component innovation.

TT Electronics offers the full spectrum of resistor technologies and a broad standard product range, in addition to providing custom engineered solutions.

### Medical Application

A manufacturer of portable automatic external defibrillators (AEDs) needed a compact high voltage resistor for use in the charge regulation circuit. Standard products from other sources were proving unreliable under conditions of sustained high humidity and high voltage loading. The precision and stability with time and temperature were critical as they directly impact the tight error budget for delivered energy dosage. TT Electronics engineers solved this problem with a planar resistor with optimised thick-film element design and a high integrity epoxy coating and supported the customer through their rigorous approval process.

Other innovations in this area include pulse withstanding chip resistors for monitor circuit protection and a 200J energy dump resistor based on reinforced wirewound technology to enable daily self-test diagnostic cycles.



### Aerospace Application

A designer working on an anti-ice aircraft surface heating system had to meet stringent safety requirements in the event of failure of a heating circuit. The failure mode to be mitigated was an "always on" condition, and this called for a single shot disconnection switch. TT Electronics engineers were contacted to help identify a solution, but nothing was available off the shelf. A set of potential solutions was proposed and the preferred option was a combination of self-switching resistive heater and thermal fuse. This was developed from concept into a fully qualified component within the required timescale. The compact format of the design also contributed significantly to the customer's mass reduction target.



### Consumer Application

Safety is becoming increasingly important in consumer products and a key aspect is protection against fire by the use of fusing line input resistors. With one component it is possible to reduce inrush current, protect against power line surges and give flameproof circuit opening under fault conditions. One company working in this area had a further need for fusing to be inaudible and invisible to the consumer.

TT Electronics devised a solution using a wirewound resistor with impact absorbing coating which contains the fused element without fragmenting. Other innovations include the offer of UL1412 recognised fusing resistors.



## Industrial Application

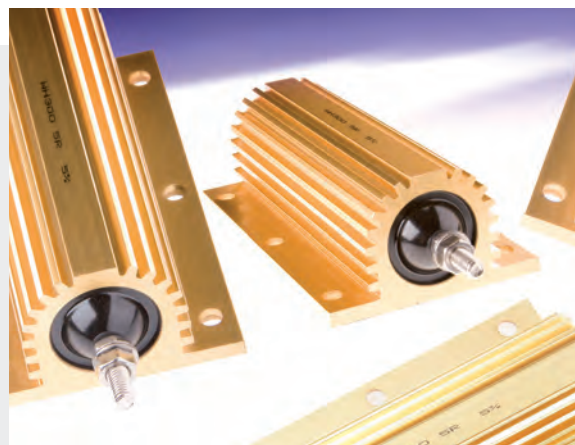
High-end industrial circuit breakers need to give reliable long-term performance under harsh conditions. In particular, transient surges caused by switching of inductive loads present a challenge. When a designer of industrial circuit breakers needed to modernise a design to SMT format, a through-hole wirewound protection resistor was proving hard to replace without filling a very large area with chip resistors. TT Electronics developed a solution whereby an axial part is leadformed and packed in blister tape. The resulting “Z-form” component can be picked, placed and reflowed as an SMT part.



## Using the Short Form

1. Choose the right technology - page 3  
Find the best resistor technology for the set of features your design needs
2. Choose the right product series - pages 3 & 4  
Use the SMT and Through Hole selector guides to identify a series which has the required ratings, precision and value range
3. Choose the right product type - pages 5 to 16  
Refer to product tables to select the correct size and link to further data

Or, if you know the product series, use the Quick Find index.



## Quick Find

Series	Page	Series	Page	Series	Page	Series	Page
1600/1900	9	LRCS	5	PR	13	WA80Z	11
3810	6	LRF	5	PTCR	15	WA84F	14
4500	6	LRF3W	5	PTS	15	WBC	14
4530	6	LRMA	5	PWC	8	WCR	16
4800	12	LRZ	15	PWP	9	WDBR	11
ASC	16	MAR	13	PWRL	6	WH	12
BCN	16	MFP	10	RC	13	WHPC	12
BPC	10	MFR	15	RCP	13	WHS	9
BPR	10	MFR4P	16	SC3	10	WHVL	8
CAR	12	MF-S	10	SMHP	11	WL4	15
CC	8	MH	7	SOT143	13	WMO-S	12
CHP	8	MHP	10	SOT23	13	WPRT	12
CR	14	OAR	5	SP20F	14	WP-S	9
CRT	16	OARS	5	SPP	14	WPYP	8
DSC	8	PCF	13	SQM	11	WRM	14
EMC	14	PCFH	13	SQP	11	WSM	12
GC	6	PCFP	13	T	8		
GCR	16	PCR	13	TD4	15		
HR	7	PFC	15	TPD	14		
HTCR	10	PFC-D	13	ULR	6		
HVC	7	PFC-HT	15	ULW	14		
HVP	7	PHVD	7	VRW	8		
LHVC	7	PHVP	7	W20	11		
LOB	5	PLO	6	W30	9		



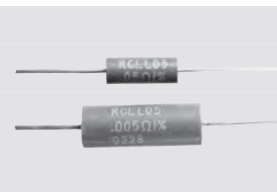


## Current Sense

### LOB Series Low Resistance Metal Element Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, Dia
LOB-1	1	0.005 - 0.1	1 - 5	-	-	9.9, 3.6
LOB-3	3	0.005 - 0.1	1 - 5	-	-	14.2, 5.3
LOB-5	5	0.005 - 0.1	1 - 5	-	-	23.4, 8.4

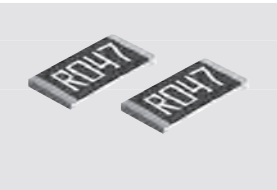
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LOB.PDF>



### LRCS Series Small Size Low Value Chip Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, w, h
0402	0.063	R05 - 1R0	1, 5	-	200 - 400	1, 0.5, 0.32
0603	0.1	R02 - 1R0	1, 5	-	200 - 600	1.6, 0.8, 0.45
0805	0.125, 0.25	R02 - 1R0	1, 5	-	200 - 600	2, 1.25, 0.55

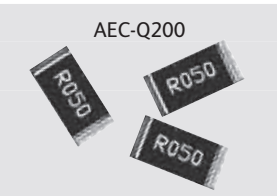
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LRCS.pdf>



### LR (F) Series Low Value Flat Chip Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
1206	0.5	0R003 - 1R	1, 2, 5	-	±100	3.2, 1.63, .8
2010	1.0	0R003 - 1R	1, 2, 5	-	±100	5.23, 2.64, .8
2512	1.5/2.0	0R003 - 1R	1, 2, 5	-	±100	6.5, 3.25, .8

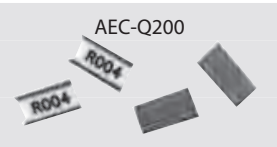
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LRC-LRF.PDF>



### LRF3W Series Low Range 3 Watt SMT Chip Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
LRF3W	3	0R003 - 1R	to ±1 %	50	±100	3.25, 6.5, 0.9

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LRF3W.PDF>



### LRMA Series Low Resistance Metal Alloy Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
M 0805	0.5	R005 - R025	1, 5	-	100	2, 1.25, 0.4
N 0815	1	R003 - R03	1, 5	-	100	2.1, 3.75, 0.5
M 1206	1	R001 - R03	1, 5	-	75, 100, 275	3.2, 1.6, 0.5
T 2010	1.5	R005 - R02	1, 5	-	75, 100, 275	5, 2.5, 0.6
M 2512	1 - 2	R0005 - R06	1, 5	-	75, 100, 275	6.4, 3.2, 0.9-2.6
T 2512	1 - 2	R001 - R05	1, 5	-	75, 100, 275	6.4, 3.2, 0.9-2.0
P 2512	3	R001 - R1	1, 5	-	75, 100, 275	6.4, 3.2, 0.9-2.0

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LRMA.PDF>



### OAR Series Open Air Sense Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
OAR-1	1	0R005 - 0.10	1, 5	-	to ±20	11.43, 1.65, 8.26
OAR-3	3	0R005 - 0.10	1, 5	-	to ±20	15.24, 1.65, 28.58
OAR-5	5	0R005 - 0.05	1, 5	-	to ±20	20.32, 1.65, 28.58

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/OAR.PDF>



### OARS / OARS-XP Series Surface Mount Sense Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
OARS1	2	0R003 to 0R050	1	-	±20	11.18, 3.175, 3.05
OARSXP	5	0R001 to 0R025	1, 5	-	±20	12, 6.4, 4.6

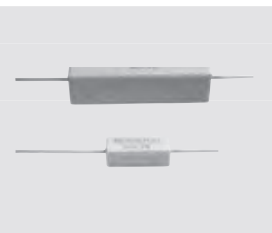
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/OARS.PDF>



### PLO Series Low Resistance Power Wirewound Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
PLO-3	3	R005 - R18	1, 2, 3, 5, 10	-	30 - 500	22.4, 7.87, 7.87
PLO-5	5	R005 - R18	1, 2, 3, 5, 10	-	30 - 500	22.4, 9.65, 8.89
PLO-7	7	R01 - R18	1, 2, 3, 5, 10	-	30 - 500	35.3, 9.65, 8.89
PLO-10	10	R01 - R18	1, 2, 3, 5, 10	-	30 - 500	47.8, 9.65, 8.89

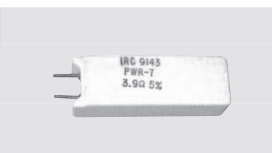
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PLO.PDF>



### PWRL Series Low Resistance Stand-up Power Wirewound Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w,
PWRL	3, 5, 7, 10	OR01 - OR18	1, 2, 3, 5, 10	-	50 - 500	25.4, 12 (3W)

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PWRL.PDF>



### ULR Series Metal Strip Current Sense Resistors Surface Mount

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
ULR1S	1	R001 - R01	1, 5	-	50	3.2, 1.6, 0.6
ULR1	1.0	R0005 - R015	1, 5	-	50, 75, 100, 150	6.4, 3.2, 1.4
ULR15S	1.5	R001 - R01	1, 5	-	50	5.1, 2.5, 0.6
ULR2	2.0	R0005 - R01	1, 5	-	50	6.4, 3.2, 1.4
ULR25	2.5	R0035 - R006	1, 5	-	50	6.4, 3.2, 1.4
ULR3	3.0	R0005 - R003	1, 5	-	50, 75, 100	6.4, 3.2, 1.4

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/ULR.PDF>



## High Value / Voltage

### 3810 Series Ultra-High Value Precision Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
3810	-	100M - 1T	10, 20	500	-500 to -3500	25, 6
3811	-	100M - 1T	1, 2, 5, 10	1000	-500 to -3500	42.9, 6
3812	-	1T - 100T	2, 5, 10	1000	-500 to -3500	48, 6

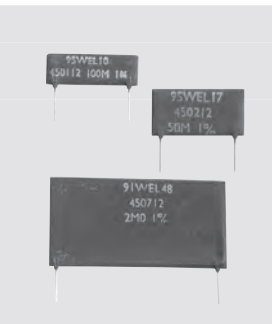
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/3810.PDF>



### 4500 Series High Voltage Planar Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
4501	1	20K - 500M	1, 2, 5	10000	100, 150	25.7, 2, 9
4502	1.7	36K - 750M	1, 2, 5	10000	100, 150	25.7, 2, 13
4503	2	36K - 750M	1, 2, 5	15000	100, 150	38.7, 2, 9
4504	3	62K - 1G	1, 2, 5	15000	100, 150	38.7, 2, 13
4505	2.8	51K - 1G	1, 2, 5	20000	100, 150	51.2, 2, 9
4506	3.6	82K - 1G	1, 2, 5	20000	100, 150	51.2, 2, 13
4507	4.5	180K - 1.5G	1, 2, 5	20000	100, 150	51.2, 2, 25.7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/4500.PDF>



### 4530 Series High Voltage Planar Dividers

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
4531	1.0	20K - 130M	1, 2, 5	6500	100	25.7, 2, 9
4532	1.7	36K - 250M	1, 2, 5	6500	100	25.7, 2, 13
4533	2.0	36K - 250M	1, 2, 5	10000	100	38.7, 2, 9
4534	3.0	62K - 450M	1, 2, 5	10000	100	38.7, 2, 13
4535	2.8	51K - 370M	1, 2, 5	15000	100	51.2, 2, 9
4536	3.6	82K - 660M	1, 2, 5	15000	100	51.2, 2, 13
4537	4.5	180K - 1.4G	1, 2, 5	15000	100	51.2, 2, 25.7

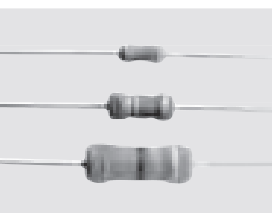
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/4530.PDF>



### GC Series High Value Thick Film Resistors

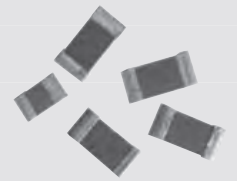
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, dia
GC55	0.25	47K - 1G	1, 2, 5	1700	100	6.2, 2.5
GC65	0.5	47K - 1G	1, 2, 5	3500	100	9, 3.6
GC70	1.0	47K - 1G	1, 2, 5	10000	100	14.5, 5.3

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/GC.PDF>



HR Series		High Value Surface Mount Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0503	-	10M - 20G	10	50	0 to -2500	1.25, .63, .5
0805	-	100M - 50G	10	100	0 to -2000	2, 1.25, .6
1005	-	100M - 50G	10	150	0 to -1500	2.5, 1.25, .7
1206	-	100M - 50G	10	200	0 to -1000	3.2, 1.6, .7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/HR.PDF>



HVC Series		High Voltage Chip Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
1206	0.3	10K - 1G0	10, 5, 2, 1, 0.5	1000	50, 100	3.2±0.4, 1.6±0.2, 0.7
2010	0.5	10K - 1G0	10, 5, 2, 1, 0.5	2000	50, 100	5.1±0.3, 2.5±0.2, 0.8
2512	1	10K - 1G0	10, 5, 2, 1, 0.5	3000	50, 100	6.5±0.3, 3.2±0.2, 0.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/HVC.PDF>

Anti-Sulphur Option



HVP Series		High Voltage Planar resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, w, h
HVP04	0.4	1K - 250M	1, 5	2000	100	10.2, 6.4, 2
HVP06	0.6	1K5 - 500M	1, 5	5000	100	12.7, 6.4, 2
HVP08	0.8	2K - 500M	1, 5	7500	100	19.1, 6.4, 2
HVP10	1	3K - 500M	1, 5	10,000	100	25.4, 6.4, 2
HVP15	1.5	4K - 750M	1, 5	15,000	100	38.1, 6.4, 2
HVP20	2	5K - 1G	1, 5	20,000	100	50.8, 6.4, 2

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/HVP.pdf>



LHVC Series		Lower Range High Voltage Chip				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, w, h
0603	0.1	100K - 10M	1, 5	200	200	1.6, 0.8, 0.45
0805	0.125	100K - 10M	1, 5	400	200	2, 1.3, 0.55
1206	0.25	100K - 10M	1, 5	500	200	3.1, 1.6, 0.55
2010	0.5	50K - 10M	1, 5	1600	200	5, 2.5, 0.55
2512	1	50K - 10M	1, 5	2000	200	6.4, 3.2, 0.55

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LHVC.pdf>



MH Series		High Voltage Metal Film Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
MH25	0.25	100K - 10M	1, 2, 5	1600	100	6.2, 2.3
MH37	0.5	100K - 1M	1, 2, 5	3500	100	9, 3.7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/MH.PDF>



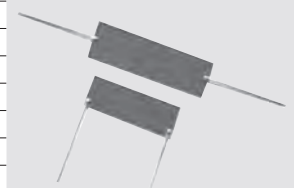
PHVD Series		Precision High Voltage Divider				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, h, w
PHVD10	0.75	1K - 7G	0.1, 0.25, 0.5, 1	10,000	25, 50	25.4, 7.6, 2.5
PHVD15	1.5	1K - 10G		15,000		38.1, 12.7, 2.5
PHVD20	2.5	1K - 20G		20,000		50.8, 15.2, 2.5
PHVD30	3.5	1K - 30G		30,000		76.2, 15.2, 2.5
PHVD40	4.5	1K - 40G		40,000		101.6, 15.2, 2.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PHVD.PDF>



PHVP Series		Precision High Voltage Planar Resistor				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, h, w
PHVP5	1	1K - 3G	0.1, 0.25, 0.5, 1	5000	15, 25, 50	12.7, 5.1, 2
PHVP7	0.8	1K - 1G		7000		20.3, 3.8, 2
PHVP7B	1	1K - 2G5		7000		20.3, 5.1, 2.5
PHVP10	1	1K - 1G5		10,000		25.4, 3.8, 2
PHVP10B	1.3	1K - 3G5		10,000		25.4, 5.1, 2.5
PHVP10C	2	1K - 7G		10,000		25.4, 7.6, 2.5
PHVP15	1.5	1K - 4G		15,000		38.1, 3.8, 2
PHVP15B	2	1K - 5G		15,000		38.1, 5.1, 2.5
PHVP15C	3	1K - 10G		15,000		38.1, 12.7, 2.5
PHVP20	2	1K - 7G		20,000		50.8, 5.1, 2
PHVP20B	3	1K - 10G	20,000	50.8, 6.4, 2.5		
PHVP20C	4.5	1K - 20G	20,000	50.8, 15.2, 2.5		
PHVP30	6.5	1K - 30G	30,000	76.2, 15.2, 3		
PHVP40	9	1K - 40G	40,000	101.6, 15.2, 3		

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PHVP.PDF>

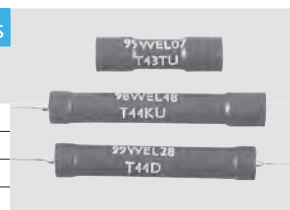




### T Series High Voltage Precision Thick Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
T43	1.5	10K - 10G	1, 2, 5	4000	25, 50, 100	25.4, 8.4
T44	3.5	10K - 50G	1, 2, 5	14000	25, 50, 100	50.8, 8.4
T48	10	33K - 50G	1, 2, 5	50000	25, 50, 100	150, 8.4

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/T.PDF>



### VRW Series High Voltage Thick Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) L, D
VRW25	0.25	100K to 30M	1, 2, 5	1600	200	6.2, 2.5
VRW37	0.5	100K to 10M	1, 2, 5	3500	200	9.0, 3.7
VRW68	1	100K - 68M	1, 2, 5	10000	200	15.5, 5

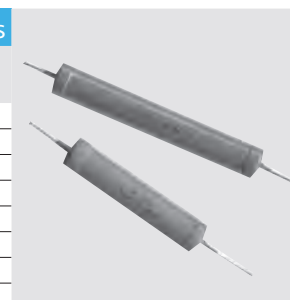
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/VRW.PDF>



### WHVL Series Precision Low Inductance High Voltage Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, dia
WHVL2	2.9	1K - 100G	0.1, 0.25, 0.5, 1	11,000	15, 25, 50	27, 8
WHVL3	3.8	1K - 100G		14,000		37, 8
WHVL5	5.6	1K - 100G		22,000		52, 8
WHVL7	7.5	1K - 100G		33,000		77, 8
WHVL10	10	1K - 100G		45,000		102, 8.3
WHVL12	12	1K - 100G		54,000		122, 8.5
WHVL15	15	1K - 100G	67,000	152, 8.5		

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WHVL.PDF>



### WPYP Series Capacitor Mount Balance/ Bleed Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) Pitch
WPYP8	10	1R0 - 82K	1, 2, 5	685	100	22
WPYP10	13	1R0 - 120K	1, 2, 5	940	100	31.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WPYP.pdf>

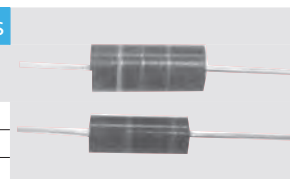


## Surge / Pulse

### CC Series Carbon Composition Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, dia
CC1	1	100R - 50K	10, 20	-	1000	15, 6
CC2	2	100R - 10K	10, 20	-	1000	18, 8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/CC.pdf>



### CHP Series Metal Glaze™ Surface Mount Power Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
CHP1/8	0.25	0R1 - 1M	1, 2, 5	200	50, 100	3.25, 1.45
CHP1/2	0.5	0R1 - 350K	1, 2, 5	300	50, 100	5.08, 2.01
CHP1	1	0R1 - 2M2	1, 2, 5	350	50, 100	6.38, 2.10
CHP2	1.33	0R1 - 2M2	1, 2, 5	500	50, 100	9.32, 2.67

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/CHP.PDF>



### DSC Series Double Sided Chip

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0805	0.25	1R0 - 1M0	0.5, 1, 2, 5	150	100 - 200	2.0, 1.25, 0.7
1206	0.33	1R0 - 4M7	0.5, 1, 2, 5	200	100 - 200	3.2, 1.6, 0.7
2010	0.75	1R0 - 4M7	0.5, 1, 2, 5	400	100 - 200	5.1, 2.5, 0.8
2512	1.5	1R0 - 4M7	0.5, 1, 2, 5	500	100 - 200	6.5, 3.2, 0.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/DSC.PDF>



### PWC Series Pulse Withstanding Chip Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0805	0.25	1R0 - 10M	0.5, 1, 2, 5	150	100 - 200	2.0, 1.25, 0.7
1206	0.33	1R0 - 10M	0.5, 1, 2, 5	200	100 - 200	3.2, 1.6, 0.7
2010	0.75	1R0 - 10M	0.5, 1, 2, 5	400	100 - 200	5.1, 2.5, 0.8
2512	1.5	1R0 - 10M	0.5, 1, 2, 5	500	100 - 200	6.5, 3.2, 0.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PWC.PDF>



PWP Series		Pulse Withstanding Planar Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
PWP04	0.4	100R – 200K	1, 5	-	±100	10.16, 2, 6.35
PWP06	0.6	100R – 200K	1, 5	-	±100	12.7, 2, 6.35
PWP08	0.8	100R – 200K	1, 5	-	±100	17.78, 2, 6.35
PWP10	1	100R – 200K	1, 5	-	±100	24.4, 2, 6.35
PWP15	1.5	100R – 200K	1, 5	-	±100	38.1, 2, 6.35
PWP20	2	100R – 200K	1, 5	-	±100	50.8, 2, 6.35

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PWP.PDF>



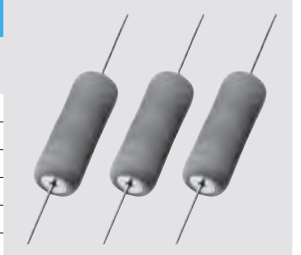
W30 Series		Flameproof Wirewound Resistor				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
W31	3	R01 – 10K	<R1: 5 ≥R1: 1, 2, 5	500	100 - 1000	13, 5.6

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/W30.PDF>



WHS Series		Wirewound High Surge Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
WHS2	2	1R0 – 330R	1, 2, 5	-	±200	9, 3.6
WHS3	3	1R0 – 330R	1, 2, 5	-	±200	14.5, 5.2
WHS5	5	1R0 – 330R	1, 2, 5	-	±200	16.5, 7
WHS7	7	1R0 – 330R	1, 2, 5	-	±200	25, 8.8
WHS10	10	2R2 – 330R	1, 2, 5	-	±200	51, 10.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WHS.PDF>



WP-S Series		Compact Flameproof Power Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
WP1S	1	R068 to 430R	<20r: 5 ≥20R: 1,2,5	50	<1R: 350 ≥1R: 200	6.2, 2.8
WP2S	2	R05 to 900R	<20r: 5 ≥20R: 1,2,5	50	<1R: 350 ≥1R: 200	9.0, 3.6
WP25S	2.5	R05 to 900R	<20r: 5 ≥20R: 1,2,5	75	<1R: 350 ≥1R: 200	12.5, 4.5
WP3S	3	R01 to 2K2	<20r: 5 ≥20R: 1,2,5	100	<1R: 350 ≥1R: 200	14.5, 5.2
WP4S	4	R01 to 10K	<R10:5 ≥R10: 1,2,5	100	<1R: 350 ≥1R: 200	13, 5.6
WP5S	5	R015 to 6K8	<20r:5 ≥20R: 1,2,5	150	<1R: 350 ≥1R: 200	16.5, 7.0

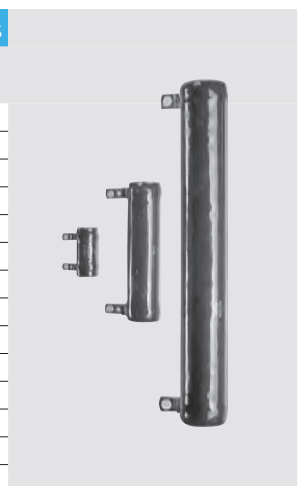
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WP-S.PDF>



## High Power

1600/1900 Series		Tubular Vitreous Enamelled Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
1601	11	1 - 15K	1, 2, 5, 10	250	75 - 200	33, 17.5
1905	16	1 - 30K	1, 2, 5, 10	450	75 - 200	56.1, 14.5
1600	16.5	1 - 56K	1, 2, 5, 10	600	75 - 200	61.5, 14.5
1602	17	1 - 43K	1, 2, 5, 10	500	75 - 200	51, 17.5
1906	22	1 - 50K	1, 2, 5, 10	700	75 - 200	64.3, 17.5
1603	25	1 - 83K	1, 2, 5, 10	850	75 - 200	74.5, 17.5
1604	35	1 - 100K	1, 2, 5, 10	1300	75 - 200	102, 17.5
1605	47	1 - 100K	1, 2, 5, 10	1100	75 - 150	89.5, 24
1908	54	1 - 100K	1, 2, 5, 10	1200	75 - 150	102, 24
1607	76	1 - 100K	1, 2, 5, 10	1300	75 - 150	102, 32
1606	91	1 - 160K	1, 2, 5, 10	2100	75 - 150	166, 24
1608	115	1 - 180K	1, 2, 5, 10	2100	75 - 150	152, 32
1609	165	1 - 250K	1, 2, 5, 10	3000	75 - 150	216, 32

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/1600-1900.PDF>



### BPC Series Planar Power Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, h, t
BPC3	3	0R1 - 200K	1, 2, 5, 10	500	100	10.2, 27.7, 2.5
BPC5	5	0R1 - 200K	1, 2, 5, 10	500	100	12.7, 27.7, 2.5
BPC7	7.5	0R1 - 200K	1, 2, 5, 10	500	100	19.1, 27.7, 2.5
BPC10	10	0R1 - 200K	1, 2, 5, 10	500	100	25.4, 27.7, 2.5

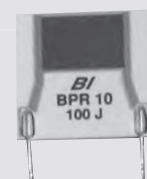
Datasheet - <http://www.bitechnologies.com/pdfs/BPC.PDF>



### BPR Series Vibration-proof Planar Power Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, h, t
BPR3	3	0R1 - 200K	1, 2, 5	500	100	12.7, 17, 6.1
BPR5	5	0R1 - 200K	1, 2, 5	500	100	12.7, 27.2, 6.1
BPR7	7	0R1 - 200K	1, 2, 5	500	100	25.4, 20.8, 6.1
BPR10	10	0R1 - 200K	1, 2, 5	500	100	25.4, 27.2, 6.1
BPR20	20	0R1 - 200K	1, 2, 5	500	100	50.8, 27.2, 6.1
BPR30	30	0R1 - 200K	1, 2, 5	500	100	53.3, 37.3, 6.1
BPR40	40	0R1 - 200K	1, 2, 5	500	100	53.3, 50.0, 6.1
BPR50	50	0R1 - 200K	1, 2, 5	500	100	53.3, 57.7, 6.1

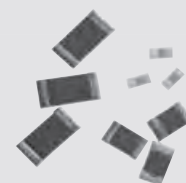
Datasheet - <http://www.bitechnologies.com/pdfs/BPR.PDF>



### HTCR Series High Temperature Chip Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, h, t
0805	0.125	1R0 - 10M	1, 5	150	100 - 200	2, 1.3, 0.5
1206	0.25	1R0 - 10M	1, 5	200	100 - 200	3.2, 1.6, 0.5
2010	0.625	1R0 - 10M	1, 5	400	100 - 200	5, 2.5, 0.65
2512	1	1R0 - 10M	1, 5	500	100 - 200	6.3, 3.2, 0.65

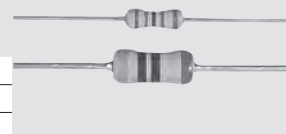
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/HTCR.PDF>



### MFP Series Flameproof Power Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
MFP1	1	0R1 - 1M	1, 2, 5	350	100, 200, 300	6.2, 2.5
MFP2	2	1R0 - 1M	1, 2, 5	350	100	10, 4

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/MFP.PDF>



### MF-S Series Power Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
MF1/2S	0.5	0R1 - 1M	1, 2, 5, 10	350	150 - 350	6.2, 2.5
MF1S	1.0	0R1 - 1M	1, 2, 5, 10	350	150 - 350	9, 3.6
MF2S	2.0	0R1 - 1M0	1, 2, 5, 10	350	150 - 350	12.5, 4.2
MF3S	3.0	0R1 - 1M0	1, 2, 5, 10	350	150 - 350	14.5, 5.3

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/MF-S.PDF>



### MHP Family Heatsink Mount Packaged Power Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Package
MHP20	20	R01 - 51K	1, 5	500	50 - 250	TO-220
MHP35	35	R01 - 51K	1, 5	500	50 - 250	TO-220
MHP50	50	R01 - 51K	1, 5	500	50 - 250	TO-220
MHP100	100	R01 - 51K	1, 5	700	50 - 250	TO-247

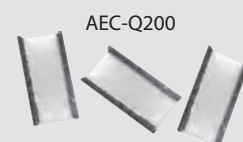
Datasheets - <http://www.bitechnologies.com/power/index.htm>



### SC3 Series High Power Chip Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
SC3	3	1R0 - 10K	1, 2, 5	50	100	3.25, 6.5,

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/SC3.PDF>



AEC-Q200

SMHP Series		TO-263 Packaged Power Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
SMHP	20	R01 - 51K	1, 5	500	50 - 250	10.3, 10.1, 4.5

Datasheet - <http://www.bitechnologies.com/pdfs/SMHP.PDF>



SQM Series		Ceramic Case Pluggable Resistor				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) h, w, d
SQM2	2	0R1 - 33K	5	150	350, 400	20, 11.5, 7.5
SQM3	3	0R1 - 56K	5	300	350, 400	25, 12.5, 8.5
SQM5	5	0R1 - 100K	5	350	350, 400	25, 12.5, 9
SQM7	7	0R1 - 200K	5	500	350, 400	38, 12.5, 9
SQM10	10	0R1 - 200K	5	750	350, 400	50, 12.5, 9

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/SQM.pdf>



SQP Series		Ceramic Case Resistors - Wirewound / Metal Oxide				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
SQP2	2	0R1-120K	5	-	350	18, 7, 7
SQP3	3	0R1-150K	5	-		22, 8, 9
SQP5	5	0R1 - 150K	5	-		22, 10, 9
SQP7	7	0R1 - 200K	5	-		35, 10, 9
SQP10	10	0R1 - 200K	5	-		49, 10, 9
SQP15	15	1R0- 200K	5	-		49, 12.5, 11.5
SQP20	20	2R0-200K	5	-		60, 14.5, 13.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/SQP.PDF>



W20 Series		Vitreous Enamelled Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
W21	3.0	0R1 - 10K	1, 2, 5	100	+75 to 200	12.7, 5.6
W215	5.0	0R1 - 15K	1, 2, 5	160	+75 to 200	22, 7
W22	7.0	0R1 - 22K	1, 2, 5	200	+75 to 200	22, 8
W23	10.5	0R15 - 60K	1, 2, 5	500	+75 to 200	38, 8
W24	14.0	0R2 - 100K	1, 2, 5	750	+75 to 200	53.5, 8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/W20.PDF>

SnPb Option  
CECC 40201-002



WA80Z Series		Cement Coated Surface Mount Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
WA83Z	2	0.05 - 900R	<0R1:5,10	50	<1R: 350 1R: 200	13.4±0.2, 3.6, 6.2
WA84Z	3	0.01 - 2K2	≥0R1:1,2,5,10	100	<1R: 350 1R: 200	18.7±0.2, 5.2, 7.0
WA85Z	5	0.015 - 6K8	1, 2, 5, 10	150	<1R: 350 1R: 200	18.7, 7.0, 7.9

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WA80Z.PDF>



WDBR Series		Ultra Low Profile Dynamic Braking Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w
WDBR1/2	300	22R - 100R	10	-	+500 - +600	31.9, 28.1
WDBR1	700	12R - 150R	10	-	+500 - +600	49.3, 35.9
WDBR2	780	12R - 150R	10	-	+500 - +600	61, 40.6
WDBR3	900	12R - 150R	10	-	+500 - +600	102, 70
WDBR5	1000	12R - 150R	10	-	+500 - +600	122, 70
WDBR7	1490	47R - 150R	10	-	+500 - +600	152, 102

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WDBR.PDF>



### WH Series Aluminium Housed Wirewound Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
WH5	10	0R01 - 10K	1, 2, 5, 10	150	50, 100	30, 17, 9
WH10	15	0R01 - 20K	1, 2, 5, 10	250	50, 100	36.5, 21, 11
WH25	25	0R01 - 44K	1, 2, 5, 10	500	50, 100	51, 28, 15
WH50	50	0R015 - 120K	1, 2, 5, 10	1250	50, 100	72.5, 30, 16
WH100	100	0R01 - 70K	1, 2, 5, 10	1900	25, 100	88, 47.5, 24.1
WH200	200	0R01 - 50K	1, 2, 5, 10	1900	25, 100	146, 72.5, 41.8
WH300	300	0R01 - 68K	1, 2, 5, 10	2500	25, 100	184, 72.5, 41.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WH.PDF>

SnPb Option  
CECC 40203-006



### WHPC Series High Power Chip

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, w, h
1206	0.5	1R - 10M	1, 5	200	100 - 200	3.1, 1.6, 0.55
0612	0.5	1R - 1M	1, 5	200	100 - 400	1.6, 3.2, 0.55
2010	1	1R - 10M	1, 5	200	100 - 200	5, 2.5, 0.55
1020	1	1R - 1M	1, 5	200	100 - 400	2.5, 5, 0.55
1218	1	1R - 1M	1, 5	200	100 - 400	3.1, 4.6, 0.55
1225	1.5	1R - 1M	1, 5	200	100 - 400	3.1, 6.3, 0.55

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WHPC.pdf>



### WMO-S Series Flameproof Metal Oxide Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
WMO1/2S	0.5	10R - 100K	5	250	350	7.5, 3
WMO1S	1.0	10R - 120K	5	350	350	10, 4.5
WMO2S	2.0	10R - 150K	5	350	350	12, 5
WMO3S	3.0	10R - 150K	5	350	350	16, 5.5
WMO5S	5.0	10R - 180K	5	500	350	26, 8.5
WMO7S	7	20R - 150K	5	750	350	32, 8.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WMO-S.PDF>



### WPRT Series Wirewound Power Radial Terminal Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
WPRT10	10	1R0 - 820R	5	-	±350	48, 10, 9
WPRT15	15	1R0 - 1K0	5	-	±350	48, 12.5, 11.5
WPRT20	20	2R0 - 1K2	5	-	±350	63, 12.5, 13.5
WPRT30	30	3R0 - 1K5	5	-	±350	75, 19, 19
WPRT40	40	6R0 - 1K5	5	-	±350	90, 19, 19
WPRT50	50	6R0 - 1K5	5	-	±350	90, 19, 19

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WPRT.PDF>

AEC-Q200



### WSM Series Moulded Surface Mount Wirewound Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
WSM1	1	0R01 - 1K	1, 2, 5, 10	100	20 - 100	7.9, 7, 3.94
WSM2	2	0R01 - 2K	1, 2, 5, 10	100	20 - 100	12, 10.5, 5.5
WSM3	3	0R01 - 3K	1, 2, 5, 10	100	20 - 200	18, 16, 6.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WSM.PDF>



## Precision

### 4800 Series Ultra Precision Bulk Metal Foil Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
4802/12/32	0.5	1R0 to 100K	0.005, 0.01	200	5	8.9, 10.2, 3.8, 7.5, 8, 2.5 9.7, 5.4, 9.7
4804	1	0R5 to 200k	0.01, 0.02, 0.05	350	5	15.2, 13.2, 3.8
4805	1.5	33R0 to 300K	0.01, 0.25, 0.5, 1	500	5	22.6, 13.2, 3.8

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/4800.PDF>



### CAR Series Ultra Precision Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
CAR5	0.25	10R0 - 3M	0.01, 0.02,	250	5, 10,	7.2, 2.5
CAR6	0.33	10R0 - 5M	0.05, 0.1,	350	15, 25,	10, 3.7
CAR7	0.5	10R0 - 10M	1.0	500	50	15.5, 5.5

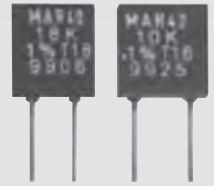
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/CAR.PDF>



**MAR 40/42 Series** Ultra Precision Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
MAR 40	0.3	20R0 - 400K	0.005, 0.01	250	2, 5	7.75, 3.3, 8.64
MAR 42			0.01, 0.25, 0.5,			

Datasheet - [http://www.welwyn-tt.com/pdf/datasheet/MAR\\_40-42.PDF](http://www.welwyn-tt.com/pdf/datasheet/MAR_40-42.PDF)

**PCF Series** Precision Surface Mount Resistor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0201	0.031	50R - 33K	0.5, 1	15	25, 50	0.6, 0.3, 0.26
0402	0.063	10R - 205K	0.01 - 0.5	25	5 - 50	1, 0.5, 0.4
0603	0.063	2R - 1M	0.01 - 0.5	50	5 - 50	1.6, 0.8, 0.55
0805	0.1	1R - 2M	0.01 - 0.5	100	5 - 50	2, 1.3, 0.65
1206	0.125	1R - 2M5	0.01 - 0.5	150	5 - 50	3.2, 1.6, 0.65
1210	0.2	1R - 2M5	0.01 - 0.5	150	5 - 50	3.2, 2.6, 0.5
2010	0.25	1R - 3M	0.01 - 0.5	150	5 - 50	4.9, 2.4, 0.65
2512	0.5	1R - 3M	0.01 - 0.5	150	5 - 50	6.3, 3.1, 0.65

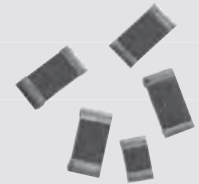
High Power (PCFH), Extended High Power (PCFX) and Passivated (PCFP) versions available

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PCF.pdf>

**PCR Series** Precision Thick Film Surface Mount Resistors

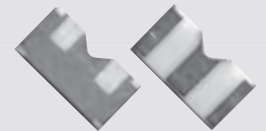
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0805	0.1	10R - 1M	0.1 - 1	100	50	2, 1.25, .6
1005	0.125	10R - 1M	0.1 - 1	150	50	2.5, 1.25, .7
1206	0.25	10R - 1M	0.1 - 1	200	50	3.2, 1.6, .7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PCR.PDF>

**PFC-D Series** Precision 1206 Resistive Dividers

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, t
PFC-D	0.25	10R - 200K	0.05, 0.1, 0.5, 1	100	25, 50, 100	3.2, 1.6, 0.6

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PFC-DIVIDER.PDF>

**PR Series** Precision Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
PR4	0.25	100R - 1M	0.1, 0.25,	250	15, 25, 50	6.2, 2.5
PR5	0.5	100R - 1M	0.5, 1	350	15, 25, 50	9, 3.6

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PR.PDF>

**RC Series** Precision Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
RC55	0.25	1R - 4M	0.05, 0.1, 0.25, 0.5	350	5, 10, 15, 25, 50, 100	7.2, 2.5
RC65	0.5	1R - 4M		350		10, 3.7
RC70	1.0	1R - 10M		500		15.5, 5.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/RC.PDF>

SnPb Option  
CECC 40101-004/804

**RCP Series** Precision Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
RC55P	0.5	1R - 4M	0.05, 0.1, 0.25, 0.5	350	5, 10, 15, 25, 50, 100	7.2, 2.5
RC65P	1.0	1R - 4M		500		10, 3.7
RC70P	1.5	1R - 10M		500		15.5, 5.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/RCP.PDF>

**SOT143 Series** 4 Pin SMT Package

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
SOT	0.25	10R - 100K	0.05	100	Track ±5	2.9, 1.3, 1

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/SOT143.pdf>

**SOT23 Series** Surface Mount Divider Network

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
SOT	0.25	10R - 200K	0.05	100	Track ±5	2.9, 1.3, 1

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/SOT23.pdf>



WBC Series		TaNSil® Wire Bondable Silicon Chip Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0202	0.25	10R - 100K	to 0.05	100	±25	0.51, 0.51
0303	0.25	10R - 100K	to 0.05	100	Track 2	0.76, 0.76

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WBC.PDF>



WRM Series		Mini Melf Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
0102	0.125	4R7 - 100K	1	150	50	2.2, 1.35
0204	0.25	R22 - 5M1	0.1, 0.25,	200	5, 15, 25, 50, 100	3.7, 1.55
0207	0.4	R16 - 10M	0.5, 1, 2, 5	250	25, 50, 100	6.1, 2.4

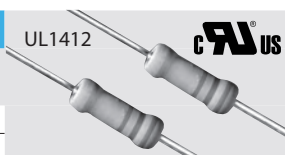
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WRM.PDF>



## Fusible

EMC Series		Pulse Withstanding Fusible Flameproof Metal Film Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
EMC2	2	4R7 - 68R	10, 20	-	100	10, 4

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/EMC.PDF>



SP20F Series		Failsafe Molded Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
SP20F	1	0R1 - 1K0	5, 10	-	±150	9.91, 3.56

Datasheet - [http://www.irctt.com/file.aspx?product\\_id=187&file\\_type=datasheet](http://www.irctt.com/file.aspx?product_id=187&file_type=datasheet)



SPP Series		Fibre Core Conformal Coated Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
SPP-1	1	0R1 - 1K2	5, 10	-	±300	10.2, 3.8
SPP-2	2	0R1 - 2K4	5, 10	-	±300	14.5, 4.3
SPP-3	3	0R1 - 2K4	5, 10	-	±300	14.5, 4.3

Datasheet - [http://www.irctt.com/file.aspx?product\\_id=48&file\\_type=datasheet](http://www.irctt.com/file.aspx?product_id=48&file_type=datasheet)



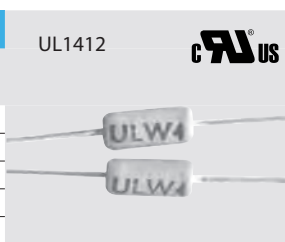
TPD Series		High Current Thermal Fuse				
Type	Rated Current (amps)	Resistance (milliohms)	Fusing Temperature (°C)	Working Voltage (volts dc)	Dim. (mm) l, w, h	
TPD	55	≤0.7	235 ±15	42	18.3, 4.7, 10.2	

[http://www.irctt.com/file.aspx?product\\_id=534&file\\_type=datasheet](http://www.irctt.com/file.aspx?product_id=534&file_type=datasheet)



ULW Series		UL1412 Wirewound Mains Input Resistor				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim. (mm) l, dia
ULW2	2	4R7 - 100R	5	-	200	9, 3.6
ULW3	3	4R7 - 100R	5	-	200	14.5, 5.2
ULW4	4	4R7 - 100R	5	-	200	13, 5.6
ULW5	5	4R7 - 100R	5	-	200	16.5, 7.2

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/ULW.pdf>



WA84F Series		Fusible Wirewound Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
WA84F	1.6	0R2 - 30R	5	100	100 - 350	14.5, 5.2

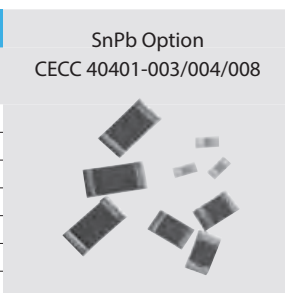
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WA84F.PDF>



## High Reliability

CR Series		Surface Mount Resistors				
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0503	0.063	1R - 10M	0.1 - 5	50	100	1.25, .63, .5
0805	0.125	1R - 100M	0.1 - 5	100	100	2, 1.25, .6
1005	0.125	1R - 100M	0.1 - 5	150	100	2.5, 1.25, .7
1206	0.25	1R - 100M	0.1 - 5	200	100	3.2, 1.6, .7
2010	0.5	1 - 1M	0.1 - 5	400	100	5.1, 2.5, .7
2512	1.0	1 - 1M	0.1 - 5	500	100	6.5, 3.2, .7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/CR.PDF>



SnPb Option  
CECC 40401-003/004/008

MFR Series Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
MFR3	0.4	1R0 - 1M	1	200	50	3.5, 1.8
MFR4	0.5	1R0 - 1M	0.5, 1	350	50	6.2, 2.5
MFR5	0.75	1R0 - 1M	0.5,	350	100 - 150	9, 3.6

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/MFR.PDF>

SnPb Option  
CECC 40101-019/803

PFC Series TaNFilm® Precision Chip Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0402	0.05	50R - 30K	0.1 - 5	75	25 - 100	1, 0.5, 0.3
0603	0.1	5R - 100K	0.02 - 5	75	10 - 100	1.6, 0.8, 0.5
0805	0.25	5R - 267K	0.02 - 5	100	10 - 100	2.1, 1.3, 0.5
1206	0.33	5R - 1M	0.02 - 5	200	10 - 100	3.2, 1.6, 0.6
1505	0.35	5R - 1M	0.02 - 5	100	25 - 100	3.9, 1.3, 0.6
2010	0.8	5R - 1M	0.02 - 5	175	25 - 100	5.2, 2.6, 0.6
2512	1	5R - 1M	0.02 - 5	200	25 - 100	6.5, 3.1, 0.6

High Temperature (PFC-HT) version available

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PFC.pdf>  
 Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PFC-HT.pdf>

SnPb Option  
Anti - Sulphur Option  
MIL-PRF-55342



## Temperature Sense

PTCR Series PTC Thermistor Chip

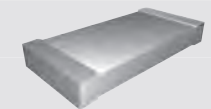
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim (mm) l, w, h
0805	0.1	10R - 400R	2, 5, 10	100	2200 - 3500	2, 1.25, 0.6
1206	0.2	10R - 800R	2, 5, 10	200	2200 - 3500	3.2, 1.6, 0.7

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/PTCR.PDF>

PTS Series Platinum Film Temperature Sensors

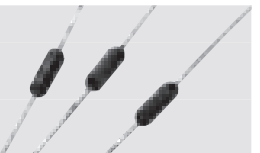
Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, t
0603	-	1K0	0.12, 0.24	-	+3850	1.6, 0.8, 0.5
0805	-	100R & 1K0	0.12, 0.24	-	+3850	2.1, 1.3, 0.5
1206	-	100R & 1K0	0.12, 0.24	-	+3850	3.2, 1.6, 0.6

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/RTD.PDF>

TD4 Series Nickel Film Temperature Sensor

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
TD4	-	20R - 1K	1.0, 2.0, 4.0	-	6000	7.2, 2.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/TD4.PDF>



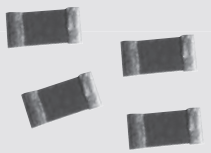
## Zero-Ohm Jumper

LRZ Series High Current Jumper Chip

Type	Current (amps)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, t
0805	15	0.003 max	-	-	-	2.0, 1.25, 0.61
1206	20	0.003 max	-	-	-	3.2, 1.25, 0.61
2010	30	0.003 max	-	-	-	5.23, 2.64, 0.74
2512	35	0.003 max	-	-	-	6.5, 3.25, 0.74

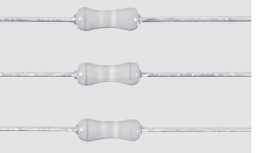
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/LRZ.pdf>

AEC-Q200

WL4 Series Jumper Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
WL4	-	0.012 max	-	-	-	6.2, 2.3
WLT	Wire link taped, 0.6 / 0.7 / 0.8mm dia x 52mm					

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WL4.PDF>





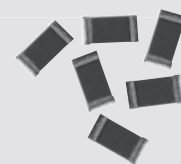
## General Purpose

### ASC Series Anti Sulphur Chip Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0402	0.063	1R0 - 10M	1	50	100 - 200	1, 0.5, 0.35
0603	0.1	1R0 - 10M	1	50	100 - 200	1.6, 0.8, 0.45
0805	0.125	1R0 - 10M	1	150	100 - 200	2, 1.25, 0.5
1206	0.25	1R0 - 10M	1	200	100 - 200	3.1, 1.55, 0.55
1210	0.33	1R0 - 10M	1	200	100 - 200	3.2, 2.6, 0.55
2010	0.625	1R0 - 10M	1	200	100 - 200	5, 2.5, 0.55
2512	1	1R0 - 10M	1	250	100 - 200	6.35, 3.2, 0.55

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/ASC.PDF>

Anti - Sulphur



### BCN Series Thick Film Chip Resistor Arrays

Type	Package Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	Array Description			Dim. (mm) l, w, h
					# Res.	Circuit	Size	
BCN062	0.063	10R - 1M0	5	12.5	2	Isolated	0302	0.8, 0.6, 0.35
BCN064	0.125	10R - 1M0	5	12.5	4	Isolated	0502	1.4, 0.6, 0.35
BCN2D	0.125	10R - 1M0	5	50	2	Isolated	0606	1.6, 1.6, 0.5
BCN10	0.25	10R - 1M0	5	25	4	Isolated	0804	2, 1, 0.36
BCN164A/AB(I)	0.25	10R - 1M0	1, 2, 5	50	4	Isolated	1206	3.2, 1.6, 0.5-0.6
BCN168RB/SB	0.25	100R - 1M0	5	25	8	Bussed	1206	3.2, 1.6, 0.5
BCN21	0.5	68R - 220K	5	25	8	Bussed	1608	4, 2.1, 0.55
BCN4D(BI)	0.5	10R - 1M0	1, 5	75	4	Isolated	2112	5.34, 3.1, 0.55
BCN318RB(I)/SB(I)	0.5	22R - 1M0	1, 2, 5	50	8	Bussed	2512	6.4, 3.1, 0.55-0.6

Datasheet - <http://www.bitechnologies.com/pdfs/bcn.pdf>

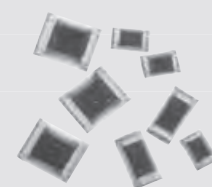
Anti - Sulphur Option



### CRT Series Trimmable Surface Mount Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0805	0.1	10R - 1M	±20	100	250	2, 1.25, .5
1206	0.125	10R - 1M	±20	200	250	3.2, 1.6, .55
1210	0.25	10R - 1M	±20	200	250	3.2, 2.6, .55

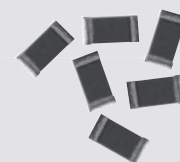
Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/CRT.PDF>



### GCR Series Glueable Chip Resistors

Type	Current (amps)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0805	0.125	1R0 - 10M	1, 5	150	100 - 200	2, 1.3, 0.5
1206	0.25	1R0 - 10M	1, 5	200	100 - 200	3.2, 1.6, 0.5
2010	0.625	1R0 - 10M	1, 5	400	100 - 200	5, 2.5, 0.65
2512	1	1R0 - 10M	1, 5	500	100 - 200	6.3, 3.2, 0.65

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/GCR.PDF>



### MFR4P Series Metal Film Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, dia
MFR4P	0.6	R22 - 1M	1, 2, 5,	250	50	6.2, 2.5

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/MFR4P.PDF>



### WCR Series General Purpose Surface Mounted Resistors

Type	Power (watts)	Res. Range (ohms)	Tolerance %	Max Volts	TCR (ppm/°C)	Dim.(mm) l, w, h
0201	0.05	10R - 1M	1	25	250	0.6, 0.3, 0.23
0402	0.1	1R - 1M	1	50	100	1, .5, .35
0603	0.063	1R - 10M	1	50	100	1.6, .8, .5
0805	0.125	1R - 10M	1	150	100	2, 1.25, .5
1206	0.25	1R - 10M	1	200	100	3.2, 1.6, .55
1210	0.25	1R - 10M	1	200	100	3.2, 2.6, 0.55
2010	0.5	1R - 10M	1	200	200	5, 2.5, .56
2512	1.0	1R - 10M	1	200	200	6.3, 3.2, .56

Datasheet - <http://www.welwyn-tt.com/pdf/datasheet/WCR.PDF>



## Colour Code for Band-marked Resistors

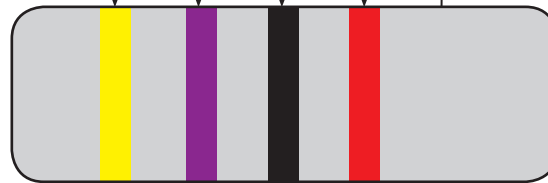
	Value 1	Value 2	Value 3	Multiplier	Tolerance	
Silver				x 0.01	10%	K
Gold				x 0.1	5%	J
Black	0	0	0	x 1		
Brown	1	1	1	x 10	1%	F
Red	2	2	2	x 100	2%	G
Orange	3	3	3	x 1K		
Yellow	4	4	4	x 10K		
Green	5	5	5	x 100K	0.5%	D
Blue	6	6	6	x 1M	0.25%	C
Violet	7	7	7	x 10M	0.1%	B
Grey	8	8	8	x 100M	0.05%	A
White	9	9	9	x 1G		
Blank					20%	M

**Example 1**  
5-Band Marking  
E24/E96 values



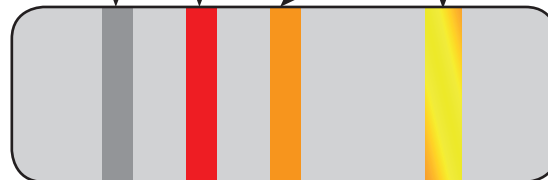
**4 7 0 x100 1% = 47K 1%**  
E.g. MFR4 E96

**Example 2**  
4-Band Marking  
E24/E96 values  
without tolerance



**4 7 0 x100 = 47K**  
E.g. WRM0204 E96

**Example 3**  
4-Band Marking  
E24 values

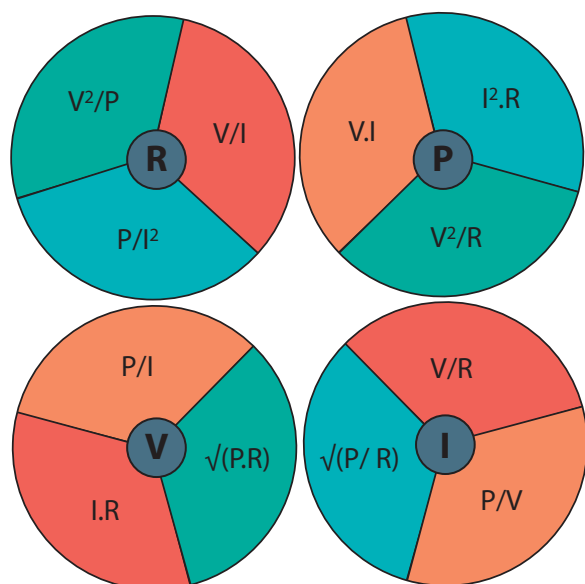


**8 2 x1K 5% = 82K 5%**  
E.g. WMO3S E24

## Further Technical Information

<b>Application Notes</b> for current sense, circuit protection, pulse and overload ratings, energy metering, lighting, medical, automotive, high voltage design and more	<a href="http://www.welwyn-tt.com/literature.asp">http://www.welwyn-tt.com/literature.asp</a>
<b>Parametric Search</b> for selection of products by parameters, package, technology and application	<a href="http://www.welwyn-tt.com/products/resistors/resistors.asp">http://www.welwyn-tt.com/products/resistors/resistors.asp</a>
<b>Calculation Tools</b> for pulse loading, temperature derating, critical resistance, capacitor bleed and more	<a href="http://www.welwyn-tt.com/products/resistors/calculation-tools.asp">http://www.welwyn-tt.com/products/resistors/calculation-tools.asp</a>
<b>Product Compliance Matrix</b> for RoHS and REACH SVHC status, termination finish, obsolescence data, SnPb availability and more	<a href="http://www.welwyn-tt.com/downloads/pbfree/rohs-compliance-matrix.pdf">http://www.welwyn-tt.com/downloads/pbfree/rohs-compliance-matrix.pdf</a>
<b>Tin Whisker Report</b> test report on tin whisker qualification of Pb-free finishes	<a href="http://www.welwyn-tt.com/downloads/pbfree/sn-whisker-report.pdf">http://www.welwyn-tt.com/downloads/pbfree/sn-whisker-report.pdf</a>

## Common Formulae



R is resistance value (ohms) P is power dissipated (watts)

V is voltage dropped (volts) I is current flowing (amps)

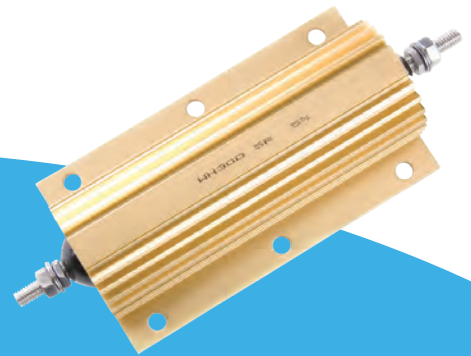
e.g.  $R = V / I$

## Preferred Values

	E192	E96	E24	E12	E6		
1	3.16	1	1	1	1	1	97
1.01	3.2	1.02	1.1	1.2	1.5	2	98
1.02	3.24	1.05	1.2	1.5	2.2	3	99
1.04	3.28	1.07	1.3	1.8	3.3	4	100
1.05	3.32	1.1	1.5	2.2	4.7	5	101
1.06	3.36	1.13	1.6	2.7	6.8	6	102
1.07	3.4	1.15	1.8	3.3	10 etc...	7	103
1.09	3.44	1.18	2	3.9		8	104
1.1	3.48	1.21	2.2	4.7		9	105
1.11	3.52	1.24	2.4	5.6		10	106
1.13	3.57	1.27	2.7	6.8		11	107
1.14	3.61	1.3	3	8.2		12	108
1.15	3.65	1.33	3.3	10 etc...		13	109
1.17	3.7	1.37	3.6			14	110
1.18	3.74	1.4	3.9			15	111
1.2	3.79	1.43	4.3			16	112
1.21	3.83	1.47	4.7			17	113
1.23	3.88	1.5	5.1			18	114
1.24	3.92	1.54	5.6			19	115
1.26	3.97	1.58	6.2			20	116
1.27	4.02	1.62	6.8			21	117
1.29	4.07	1.65	7.5			22	118
1.3	4.12	1.69	8.2			23	119
1.32	4.17	1.74	9.1			24	120
1.33	4.22	1.78	10 etc...			25	121
1.35	4.27	1.82				26	122
1.37	4.32	1.87				27	123
1.38	4.37	1.91				28	124
1.4	4.42	1.96				29	125
1.42	4.48	2				30	126
1.43	4.53	2.05				31	127
1.45	4.59	2.1				32	128
1.47	4.64	2.15				33	129
1.49	4.7	2.21				34	130
1.5	4.75	2.26				35	131
1.52	4.81	2.32				36	132
1.54	4.87	2.37				37	133
1.56	4.93	2.43				38	134
1.58	4.99	2.49				39	135
1.6	5.05	2.55				40	136
1.62	5.11	2.61				41	137
1.64	5.17	2.67				42	138
1.65	5.23	2.74				43	139
1.67	5.3	2.8				44	140
1.69	5.36	2.87				45	141
1.72	5.42	2.94				46	142
1.74	5.49	3.01				47	143
1.76	5.56	3.09				48	144
1.78	5.62	3.16				49	145
1.8	5.69	3.24				50	146
1.82	5.76	3.32				51	147
1.84	5.83	3.4				52	148
1.87	5.9	3.48				53	149
1.89	5.97	3.57				54	150
1.91	6.04	3.65				55	151
1.93	6.12	3.74				56	152
1.96	6.19	3.83				57	153
1.98	6.26	3.92				58	154
2	6.34	4.02				59	155
2.03	6.42	4.12				60	156
2.05	6.49	4.22				61	157
2.08	6.57	4.32				62	158
2.1	6.65	4.42				63	159
2.13	6.73	4.53				64	160
2.15	6.81	4.64				65	161
2.18	6.9	4.75				66	162
2.21	6.98	4.87				67	163
2.23	7.06	4.99				68	164
2.26	7.15	5.11				69	165
2.29	7.23	5.23				70	166
2.32	7.32	5.36				71	167
2.34	7.41	5.49				72	168
2.37	7.5	5.62				73	169
2.4	7.59	5.76				74	170
2.43	7.68	5.9				75	171
2.46	7.77	6.04				76	172
2.49	7.87	6.19				77	173
2.52	7.96	6.34				78	174
2.55	8.06	6.49				79	175
2.58	8.16	6.65				80	176
2.61	8.25	6.81				81	177
2.64	8.35	6.98				82	178
2.67	8.45	7.15				83	179
2.71	8.56	7.32				84	180
2.74	8.66	7.5				85	181
2.77	8.76	7.68				86	182
2.8	8.87	7.87				87	183
2.84	8.98	8.06				88	184
2.87	9.09	8.25				89	185
2.91	9.2	8.45				90	186
2.94	9.31	8.66				91	187
2.98	9.42	8.87				92	188
3.01	9.53	9.09				93	189
3.05	9.65	9.31				94	190
3.09	9.76	9.53				95	191
3.12	9.88	9.76				96	192
	10 etc...	10 etc...					

## Terms and Definitions

<b>Ambient Temperature</b>	The temperature which would be adopted by the body of the resistor under application conditions except with negligible power dissipation in the resistor.
<b>Critical Resistance</b>	The resistance value at which application of the LEV causes dissipation of the full rated power.
<b>Isolation Voltage (Voltage Proof)</b>	The maximum continuous voltage which may be applied between the resistor and a conductor in contact with its insulated body.
<b>LEV (Max Volts)</b>	The maximum continuous voltage which may be applied across a resistor whose ohmic value is greater than the critical resistance.
<b>Overload</b>	Power dissipation which exceeds the power rating for durations exceeding 0.1s.
<b>Power Rating</b>	The maximum continuous power that may be dissipated by a resistor whose ohmic value is less than the critical resistance and at a defined maximum ambient temperature.
<b>Pulse (Surge)</b>	Power dissipation which exceeds the power rating for durations less than 0.1s.
<b>Series</b>	A set of components with the same basic design features and performance and usually a range of sizes and ratings.
<b>TCR</b>	Temperature Coefficient of Resistance; the maximum magnitude of reversible ohmic value change per degree centigrade due to deviation in body temperature from a reference normally of 20°C.
<b>Tolerance</b>	The maximum allowable magnitude of deviation from nominal ohmic value measured at delivery and at room temperature.
<b>Type</b>	An individual member of a series with specified size and rating.
<b>VCR</b>	Voltage Coefficient of Resistance; the maximum reversible reduction in ohmic value per volt due to an increase in applied voltage.



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