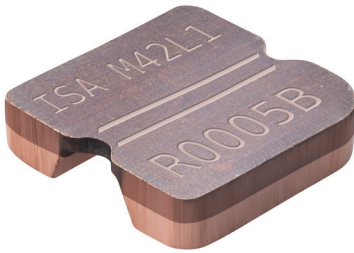




PRECISION RESISTORS



WAF // Size 1213



Features

- Constant current up to 77 A (1 mOhm)
- 3.5 W power rating at 140 °C (1 mOhm)
- Two terminal configuration
- Excellent long-term stability
- High application temperature range -65 to +175 °C
- RoHS 2011/65/EU compliant
- Max. solder temperature up to 350 °C / 30 sec
- AEC-Q200 qualified



Applications

- Current sensor for power hybrid applications
- High current applications for the automotive market
- Frequency converters
- Power modules

Technical data

Resistance values	mOhm	0.487 / 0.5 / 0.991 / 1
Material		MANGANIN® / ZERANIN®
Tolerance	%	1 / 5
Temperature coefficient (20-60 °C)	ppm/K	see table "Electrical specification"
Applicable temperature range	°C	-65 to +175
Power rating P_{140 °C}	W	up to 5
Power rating P_{70 °C}	W	up to 7
Internal heat resistance (R_{thi})	K/W	up to 7
Inductance	nH	<0.5
Stability (at rated power) deviation after 2000 h		<0.5% ($T_{max} = 140 °C$) <1.0% ($T_{max} = 175 °C$)

Ordering code

WAF - M - R001 - 1.0

.....	Tolerance
.....	Resistance value [Ohm] / „R” represents decimal point
.....	Material (MANGANIN®)
.....	Type



WAF // Size 1213

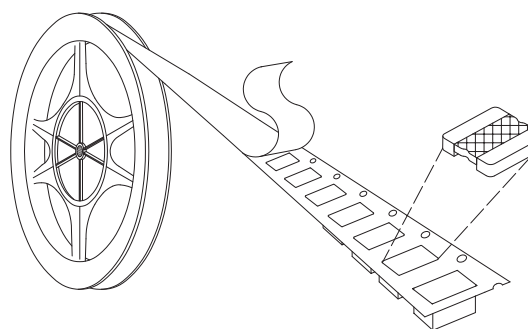
Recommended solder profile

Reflow- and IR-soldering

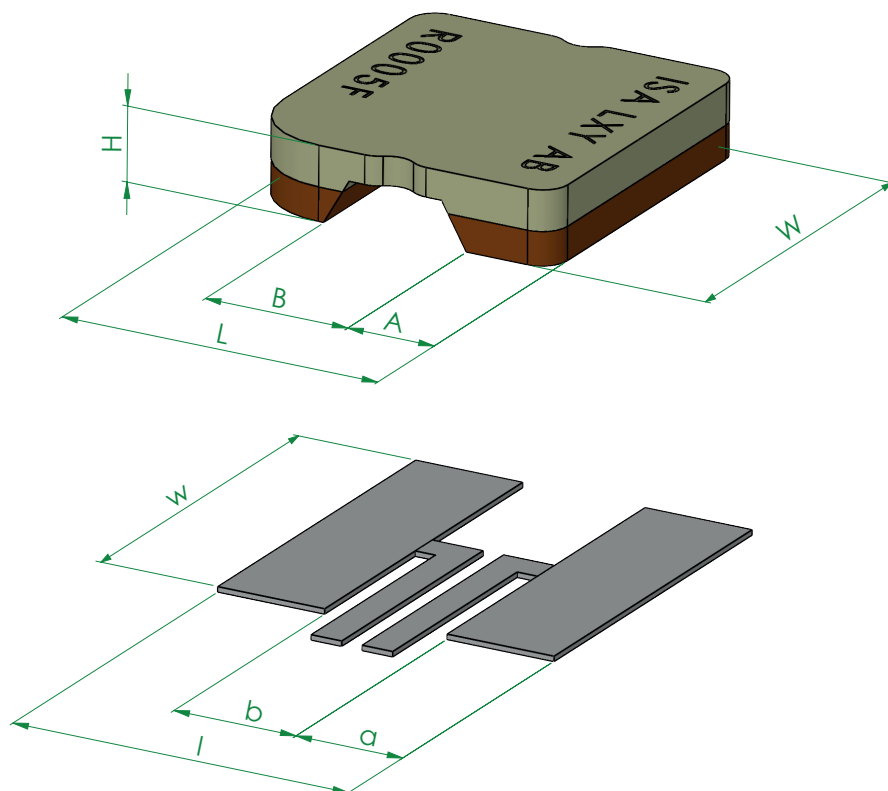
Temperature	°C	260	255	217
Time	sec	peak	40	90

Tape and reel information

Specification	DIN EN 60286-3			
Tape width	mm	12		
Parts per reel	pcs	5000		



Mechanical dimensions and pcb-layout proposal (Reflow-soldering) [mm] // Z-YL-740c



type:	L	W	H	A	B
WAF-Z-R000487-1.0	3.1 ±0.2	3.3 ±0.2	0.7 +0.2/-0.1	0.85 ±0.2	1.4 ±0.2
WAF-Z-R0005-1.0	3.1 ±0.2	3.3 ±0.2	0.7 +0.2/-0.1	0.85 ±0.2	1.4 ±0.2
WAF-M-R001-1.0	3.1 ±0.2	3.3 ±0.2	0.7 +0.2/-0.1	0.85 ±0.2	1.4 ±0.2
WAF-M-L991-1.0	3.1 ±0.2	3.3 ±0.2	0.7 +0.2/-0.1	0.85 ±0.2	1.4 ±0.2

solder pad type:	l	w	a	b
WAF	3.4	3.6	1.05	1.3



WAF // Size 1213

Electrical specification

Type	Material	Value [mΩ]	R_{thi} [K/W]	TCR [ppm/K]	$P_{70^{\circ}C^*}$ [W]	$P_{140^{\circ}C}$ [W]
WAF-Z-R000487	ZERANIN®	0.487	7	30 ± 40	7	5
WAF-Z-R0005	ZERANIN®	0.5	7	30 ± 40	7	5
WAF-M-R001	MANGANIN®	1.0	10	0 ± 40	6	3.5
WAF-M-L991	MANGANIN®	0.991	10	0 ± 40	6	3.5

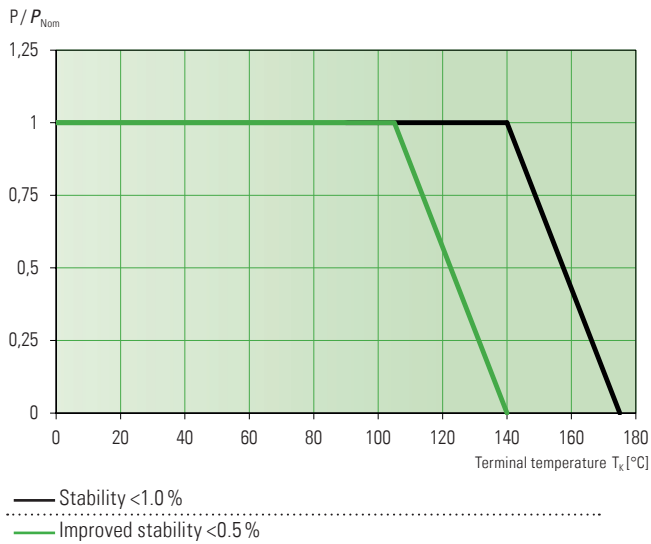
*Recommended max. power (limited by thermal conditions of the assembly)

Note

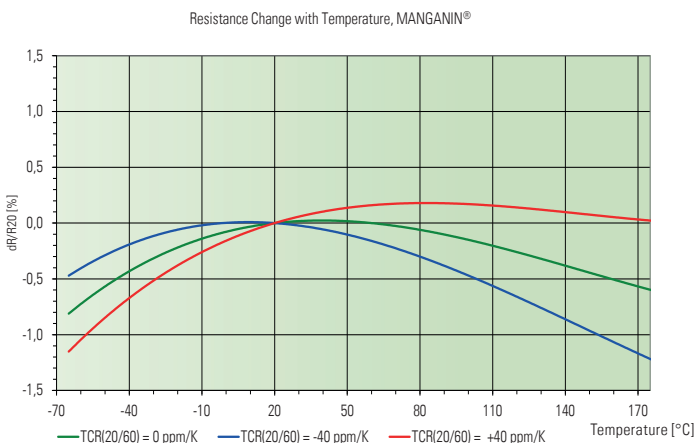
For calculation of the maximum derating terminal temperature (T_K) the following formula can be used: $T_K = T_{max} - (R_{thi} \times P)$.

Example for WAF-Z-R0005: $T_K = 175^{\circ}C - (7 K/W \times 7 W) = 126^{\circ}C$.

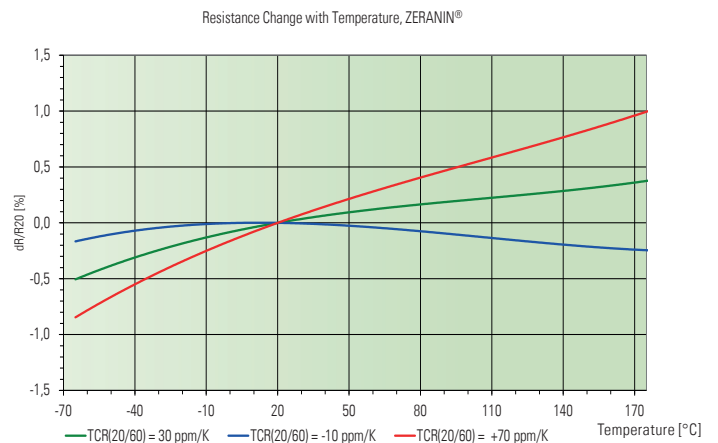
Power derating curve: 105 °C / 140 °C



Temperature dependence of the electrical resistance of MANGANIN®



Temperature dependence of the electrical resistance of ZERANIN®



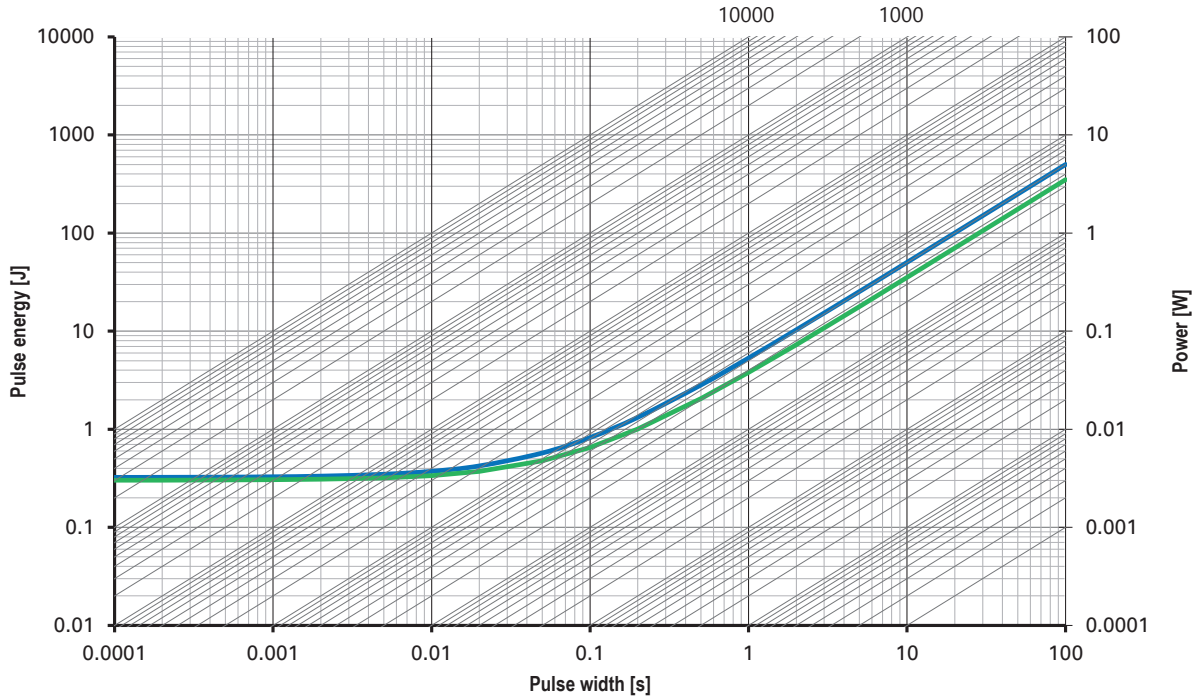


WAF // Size 1213

Maximum pulse energy respectively pulse power for permanent operation

WAF-Z-R0005 & WAF-Z-R000487 WAF-M-R001 & WAF-M-L991

Maximum pulse energy / power for continuous operation ($T_K = 140\text{ °C}$)



Specification

Parameters	Test conditions	Specified values
Temperature Cycling	2000 cycles (-65 °C to +170 °C)	±1.0 %
Low Temperature Storage and Operation	-65 °C for 250 h	±0.1 %
Resistance to Soldering Heat	260 °C for 10 sec / 8h steam aging	n.a.
Moisture Resistance	MIL-STD-202 method 106	±0.2 %
Mechanical Shock	100 g, 6 ms half sine	±0.2 %
Vibration, High Frequency	10 g, 10-2000 Hz	±0.2 %
Operational Life	2000 h, T_K max at rated power	±1.0 %, $T_K = 140\text{ °C}$ (in covered condition)
High Temperature Exposure	2000 h / 175 °C	±1.0 % (in covered condition)
Bias Humidity	+85 °C, 85 r.F., 1000 h	±0.5 %

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