THE DATASHEET OF

FS450R12KE4

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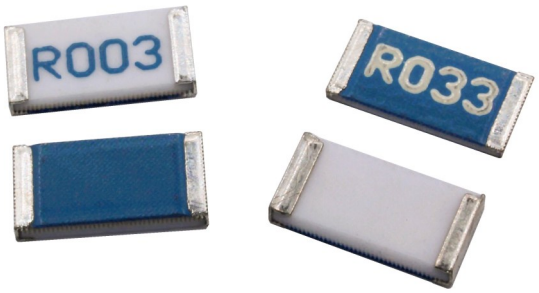
Low Value Flat Chip Resistors

LR Series



Features:

- Standard 2512, 2010 and 1206 sizes
- Resistance range down to 3mΩ
- Leach resistant plated copper wraparound terminations
- AEC-Q200 qualified
- Low thermal impedance

All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

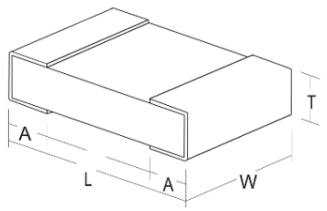
Electrical Data

		LR(F)1206	LR(F)2010	LR(F)2512
Power rating at 70°C	W	0.5	1	2
Resistance range [1]	Ω	R003 to 1R0		
Resistance tolerance [1]	%	<R01: 5, ≥R01: 1, 2, 5		
TCR	ppm/°C	≥R05: ±100, R025 – R047: <+500, <R025: <+900		
Dielectric withstand	V	200		
Standard values		E24 and integer multiples of R001 up to R01, of R005 up to R05 and of R01 preferred		
Ambient temperature range	°C	-55 to +150		
Temperature rise at rated power	°C	40	80	90
Pad / trace area [2]	mm^2	30	100	300

Note 1. Contact factory for value – tolerance combinations outside this range.
Note 2. Recommended minimum pad & adjacent trace area for each termination for rated dissipation on FR4 PCB.

Physical Data

Dimensions in mm and weight in mg					
	L	W	T max.	A	Wt. nom.
1206	3.2 ± 0.31	1.63 ± 0.2	0.8	0.6 ± 0.25	12
2010	5.23 ± 0.38	2.64 ± 0.25	0.84		38
2512	6.5 ± 0.38	3.25 ± 0.25			60



Construction

Proprietary non-noble copper-based thick-film material and organic protection are screen printed on a 96% alumina substrate. The components are laser trimmed to achieve the required resistance tolerance. LR types (>25mΩ) have conventional orientation with resistance element on the upper surface, whilst LRF types (≤25mΩ) have flip-chip orientation with the resistance element on the lower surface.

Terminations

The wrap-around terminations have an electroplated nickel barrier and matte tin or tin-lead finish. This ensures excellent leach resistance properties and solderability. Chips can withstand immersion in solder at 250°C for 90 seconds and are suitable for reflow or wave solder mounting processes.

Marking

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits. Chips are packed and mounted with marking side up. Parts are marked with the value code where this is up to four characters (e.g. “R025”). For five-character value codes the value in milliohms is marked, with “m” indicating decimal point position (e.g. “2m5” for value code R0025).

Processing

For reflow of flip-chip (LRF) parts, a solder paste thickness of not less than 100µm is recommended.

General Note
TT Electronics reserves the right to make changes in product specification without notice or liability.
All information is subject to TT Electronics’ own data and is considered accurate at time of going to print.

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Performance Data

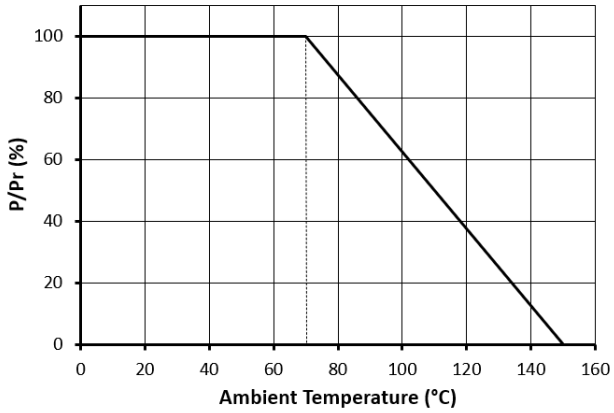
AEC-Q200 [1] Table 7 Reference	Test	Method		Maximum (add R05)	Typical (@1R0)
3	High temperature exposure	MIL-STD-202 Method 108	±ΔR%	0.5	0.2
4	Temperature cycling [2]	JESD22 Method JA-104	±ΔR%	0.25	0.1
6	Moisture resistance	MIL-STD-202 Method 106	±ΔR%	0.5	0.2
7	Biased humidity	MIL-STD-202 Method 103	±ΔR%	0.5	0.2
8	Operational life (cyclic load)	MIL-STD-202 Method 108	±ΔR%	1	0.5
14	Vibration	MIL-STD-202 Method 204	±ΔR%	0.5	0.05
15	Resistance to solder heat	MIL-STD-202 Method 210	±ΔR%	0.25	0.05
16	Thermal shock [2]	MIL-STD-202 Method 107	±ΔR%	0.25	0.1
18	Solderability	J-STD-002		>95% coverage	
21	Board flex	AEC-Q200-005	±ΔR%	0.5	0.2
22	Terminal strength	AEC-Q200-006	±ΔR%	0.25	0.1
	Short term overload	6.25 x Pr for 2s	±ΔR%	0.5	-
	Low temperature storage	-65°C for 100 hours	±ΔR%	0.5	
	Leach resistance	Solder dip at 250°C		90s minimum	

Note 1: Full AEC-Q200 qualification applies to ohmic values ≥R01

Note 2: Although 2010 and 2512 sizes have passed temperature cycling and thermal shock, it is in general not recommended that ceramic chips this large be used on FR4 in a severe temperature cycle environment due to the possibility of solder joint fatigue.

Thermal Data

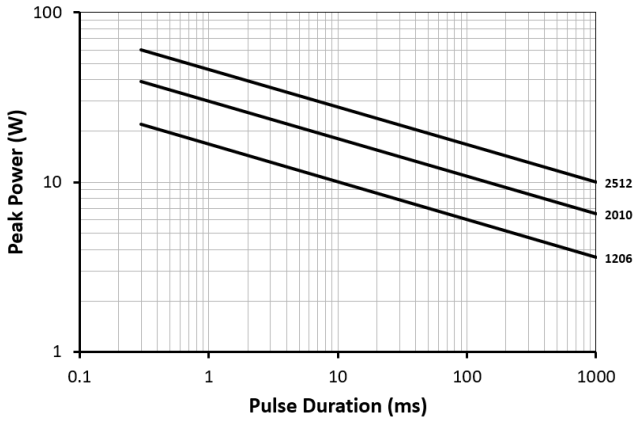
Temperature Derating



Pulse Data

Continuous Pulse Performance

(mean power ≤ rated power)



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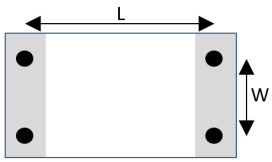
Value Measurement

LR(F) resistors are measured using 4-terminal probes on the lower side of the chip, centred on the chip and at the spacings shown below.

Probe Spacing (mm)		
	L	W
1206	2.54	0.8
2010	4.57	1.02
2512	5.84	



Packaging

LR(F) resistors are supplied taped and reeled as per IEC 286-3. For full details of tape and reel dimensions see:
https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Application-Note/PS003-Packing-of-Specialist-Chip-Resistors.pdf

Ordering Procedure

Global Part Number Example: LRF1206-R02FW (1206, 20mΩ ±1%, Pb-free)

L	R	F	1	2	0	6	-	R	0	2			F	W			
1			2					3					4	5			

1 Type	2 Size	3 Value	4 Tolerance	5 Termination & Packing		
LR = Conventional orientation (values >R025)	1206	E24 = 3-5 characters R = ohms	F = ±1%	W	Pb-free	Standard packing
	2010		G = ±2%	PB	SnPb	
LRF = Flip-chip orientation (values ≤R025)	2512		J = ±5%	T1	Pb-free	1000/reel (non-standard packing)
				T1PB	SnPb	
				Standard packing is tape & reel		
				1206 & 2010		3000/reel
				2512		1800/reel

Legacy Part Numbers

This product has a legacy part number format. This is still available for ordering, but for new designs use of the Global Part Number is recommended.

Legacy Part Number Example: LRC-LRF1206LF-01-R020-F (1206, 20mΩ ±1%, Pb-free)

L	R	C	-	L	R	F	1	2	0	6	L	F	-	0	1	-	R	0	2	0	-	F
1				2			3				4			5			6					7

1 Family	2 Model	3 Size	4 Termination	5 TCR	6 Value	7 Tolerance	Packing		
LRC	LR = Conventional orientation (values >R025)	1206	Omit for SnPb LF = Pb-free	01 = standard (±100ppm/°C values ≥R05)	E24 4 characters R = ohms	F = ±1%	Standard packing is tape & reel		
		2010				G = ±2%	Pb-free	All sizes	1000/reel
	LRF = Flip-chip orientation (values ≤R025)	2512				J = ±5%	SnPb	1206 & 2010	3000/reel
								2512	1800/reel

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