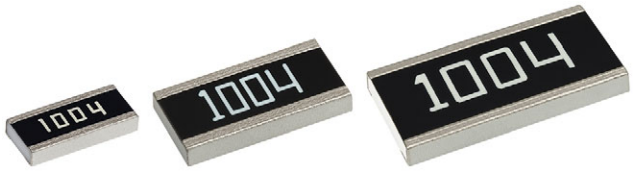
Long Side Termination Thick Film Chip Resistors



FEATURES

- Enhanced power rating
- Long side terminations
- Enhanced thermal cycling performance
- PFAS-free series
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

3D Models

RCL-T e3 resistors series are the perfect choice for most fields of power measurement electronics where reliability, stability, power dissipation, and robust design is of major concern.

Typical applications include power electronics in automotive and industrial appliances.

APPLICATIONS

- Automotive
- Industrial
- Commercial

TECHNICAL SPECIFICATIONS			
DESCRIPTION	**RCL0612-T e3**	**RCL1020-T e3**	**RCL1225-T e3**
Imperial size	0612	1020	1225
Metric size code	RR1632M	RR2550M	RR3263M
Resistance range	1 Ω to 1 MΩ		
Resistance tolerance	± 5 %; ± 1 %		
Temperature coefficient	± 200 ppm/K; ± 100 ppm/K		
Rated dissipation, P_{70} (1)	0.75 W	1.0 W	2.0 W
Operating voltage, $U_{max.}$ AC_{RMS}/DC	200 V		
Permissible film temperature, $\vartheta_{F\ max.}$ (1)	155 °C		
Operating temperature range	-55 °C to +155 °C		
Maximum overload voltage	400 V		

Note

(1) Please refer to APPLICATION INFORMATION below

APPLICATION INFORMATION

When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE / SIZE	TCR	TOLERANCE	RESISTANCE	E-SERIES
RCL0612-T e3	± 200 ppm/K	± 5 %	1 Ω to 1 MΩ	E24
	± 100 ppm/K	± 1 %		E24; E96
RCL1020-T e3	± 200 ppm/K	± 5 %		E24
	± 100 ppm/K	± 1 %		E24; E96
RCL1225-T e3	± 200 ppm/K	± 5 %		E24
	± 100 ppm/K	± 1 %		E24; E96

PACKAGING

TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS
RCL0612-T e3	EA = ET1	5000	Paper tape acc. to IEC 60286-3, Type 1a	8 mm	4 mm	Ø 180 mm / 7"
RCL1020-T e3	EF = E02	4000	Blister tape acc. to IEC 60286-3, Type 2a	12 mm		
RCL1225-T e3	EH = E82	4000				

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: RCL06121K00FKEAT

R	C	L	0	6	1	2	1	K	0	0	F	K	E	A	T

MODEL	RESISTANCE	TOLERANCE	TCR	PACKAGING	SPECIAL
RCL0612 **RCL1020** **RCL1225**	**R** = decimal **K** = thousand **M** = million	**F** = ± 1 % **J** = ± 5 %	**K** = ± 100 ppm/K **N** = ± 200 ppm/K	**EA, EF, EH**	**T** = Vishay special digit

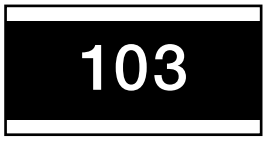
Product Description: RCL0612-T 100 1K0 1 % ET1 e3

RCL0612-T	100	1K0	1 %	ET1	e3
MODEL	TCR	RESISTANCE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
RCL0612-T **RCL1020-T** **RCL1225-T**	**± 100** ppm/K **± 200** ppm/K	**1R** = 1 Ω **10R** = 10 Ω **1K** = 1 kΩ **1M** = 1 MΩ	**± 1 %** **± 5 %**	**ET1, E02, E82**	**e3** = pure tin termination finish

MARKING

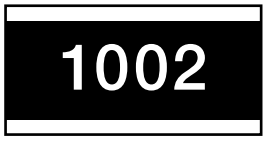
RCL0612-T to RCL1225-T components in ± 5 % tolerance:

The nominal resistance is expressed by three digits; the first two digits represent the significant figures of nominal resistance in Ω, and the third digit represents exponent for base of 10, e.g. 103 = 10 x 10^3 = 10 000 Ω = 10 kΩ



RCL0612-T to RCL1225-T components in ± 1 % tolerance:

The nominal resistance is expressed by four digits; the first three digits represent the significant figures of nominal resistance in Ω, and the the fourth digit represents exponent for base of 10, e.g. 1002 = 100 x 10^2 = 1000 Ω = 1 kΩ



DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A cermet film layer and a glass-over are deposited on a high grade (Al_2O_3) ceramic substrate with its prepared inner contacts on both sides. A special laser is used to achieve the target value by smoothly fine trimming the resistive layer without damaging the ceramics. The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure matte tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure on 100 % of the individual chip resistors. Only accepted products are laid directly into the tape in accordance with **IEC 60286-3 Type 1a and Type 2a** [(1)].

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1** [(1)]. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings, potting compounds and their processes, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system.

The resistors are RoHS-compliant, the pure matte tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years. The immunity of the plating against tin whisker growth has been proven under extensive testing.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein [(2)]
- The Global Automotive Declarable Substance List (GADSL) [(3)]
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) [(4)] for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

APPROVALS

The resistors are qualified according to AEC-Q200. (www.aecouncil.com/Documents/AEC_Q200_Rev_E_Base_Document.pdf)

RELATED PRODUCTS

The RCA-LS e3, Sulfur Resistant, Long Side Termination Thick Film Chip Resistors series is designed for harsh environment applications. For ordering RCA-LS e3 products please refer to latest edition of datasheet, www.vishay.com/ppg?20060.

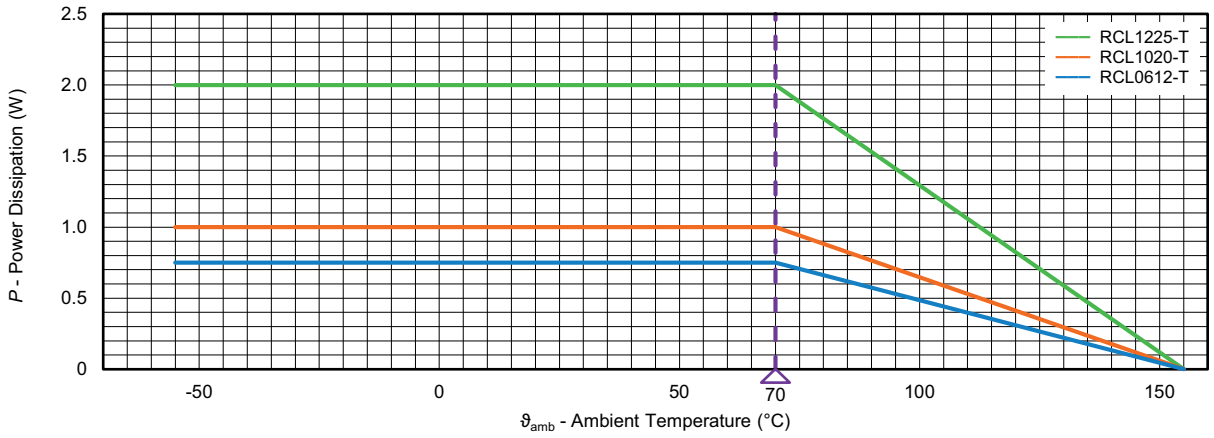
The RCL e3, Long Side Termination Thick Film Chip Resistors series can handle superior rated dissipation in comparison to RCL-T e3 series and has additional case sizes available. For ordering RCL e3, please refer to latest edition of datasheet, www.vishay.com/ppg?20046.

Notes

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents
(2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at http://std.iec.ch/iec62474
(3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org
(4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at http://echa.europa.eu/candidate-list-table

FUNCTIONAL PERFORMANCE

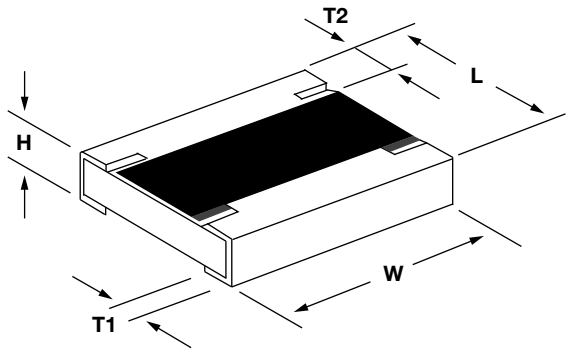
Derating



TEST PROCEDURES AND REQUIREMENTS				
TEST	**REFERENCE STANDARD**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE (ΔR)**	
		Stability for product types:	**STABILITY CLASS 1 OR BETTER**	**STABILITY CLASS 2 OR BETTER**
		RCL-T e3	1 Ω to 1 MΩ	
Initial measurements of resistance and tolerance	IEC 60115-1 6.1	-	± 1 %	± 5 %
Dielectric withstanding voltage (voltage proof)	IEC 60115-1 12.2	U = 500 V; 60 s	No flashover or breakdown	
Temperature coefficient of resistance	IEC 60115-1 6.2	At +25 °C / -55 °C and +25 °C / +155 °C	± 100 ppm/K	± 200 ppm/K
Short-term overload	IEC 60115-1 8.1	2.5 x rated voltage for 5 s	± (2 % R + 0.05 Ω)	
High temperature exposure (storage)	AEC-Q200-REV E Test 3 MIL-STD-202 Method 108	155 °C ± 5 °C; 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
Temperature cycling	AEC-Q200-REV E Test 4 JESD22-A104	1000 cycles -55 °C to +155 °C; dwell time: 15 minutes min.; transition time: 1 minute max.	± (1 % R + 0.05 Ω)	
Insulation resistance	IEC 60115-1 12.1	Applying voltage 100 V for 1 min	≥ 1 GΩ	
Humidity bias	AEC-Q200-REV E Test 7 MIL-STD-202 Method 103	(85 ± 2) °C; (85 ± 5) % RH, $U = 0.1 \times \sqrt{P_{70} \times R} \leq 100$ V; 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
High temperature operating life	AEC-Q200-REV E Test 8 MIL-STD-202 Method 108	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C, 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
Resistance to solvents	AEC-Q200-REV E Test 12 MIL-STD-202 Method 215	According to the standard method	No visible damage	
Mechanical shock	AEC-Q200-REV E Test 13 MIL-STD-202 Method 213	According to method 213 condition C; peak value: 100 g; waveform: half-sine	± (1 % R + 0.1 Ω)	
Vibration	AEC-Q200-REV E Test 14 MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations; test from 10 Hz to 2000 Hz	± (1 % R + 0.1 Ω)	
Resistance to soldering heat	AEC-Q200-REV E Test 15 MIL-STD-202 Method 210	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (0.5 % R + 0.05 Ω)	

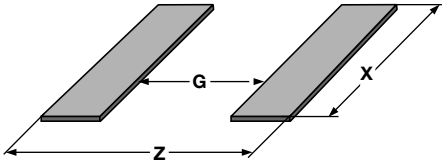
TEST PROCEDURES AND REQUIREMENTS				
TEST	REFERENCE STANDARD	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
		Stability for product types:	STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
		RCL-T e3	1 Ω to 1 MΩ	
ESD	AEC-Q200-REV E Test 17	ESD voltage: 500 V	± (1 % R + 0.1 Ω)	
Solderability	AEC-Q200-REV E Test 18 J-STD-002	Dry heat the part for 4 h ± 15 min at 155 °C; Method B1: 245 °C ± 5 °C, 5 s ± 0.5 s, lead (Pb)-free solder; Method D: 260 °C ± 5 °C, 5 s ± 0.5 s, lead (Pb)-free	Good tinning (≥ 95 % covered) no visible damage	
Flammability	AEC-Q200-REV E Test 20 IEC 60695-11-5	IEC 60695-11-5; 10 s	No burning after 30 s	
Board flex	AEC-Q200-REV E Test 21	The forces shall be applied for 60 s for a depth of 2 mm	± (0.5 % R + 0.05 Ω)	
Terminal strength	AEC-Q200-REV E Test 22	Apply 17.7 N for 60 s	± (0.5 % R + 0.05 Ω)	

DIMENSIONS



DIMENSIONS AND MASS						
TYPE / SIZE	L (mm)	W (mm)	H (mm)	T1 (mm)	T2 (mm)	MASS (mg)
RCL0612-T e3	1.60 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.35 ± 0.15	0.25 ± 0.15	12
RCL1020-T e3	2.50 ± 0.20	5.00 ± 0.20	0.55 ± 0.10	0.40 ± 0.15	0.25 ± 0.15	26.5
RCL1225-T e3	3.20 ± 0.20	6.30 ± 0.20	0.70 ± 0.10	0.80 ± 0.20	0.40 ± 0.20	54

SOLDER PAD DIMENSIONS



RECOMMENDED SOLDER PAD DIMENSIONS			
TYPE / SIZE	REFLOW SOLDERING		
	G (mm)	X (mm)	Z (mm)
RCL0612-T e3	0.6 to 0.8	3.4 to 4.0	2.0 to 2.6
RCL1020-T e3	1.0 to 1.3	5.5 to 6.0	3.5 to 4.0
RCL1225-T e3	1.0 to 1.2	6.4 to 7.0	4.4 to 5.0

REVISION HISTORY	
REVISION DATE	DESCRIPTION
27-Apr-2026	Introduction of new datasheet

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