KOA SPEER ELECTRONICS, INC.

Heat Shock Resistors

WK73 Series and AT Terminations

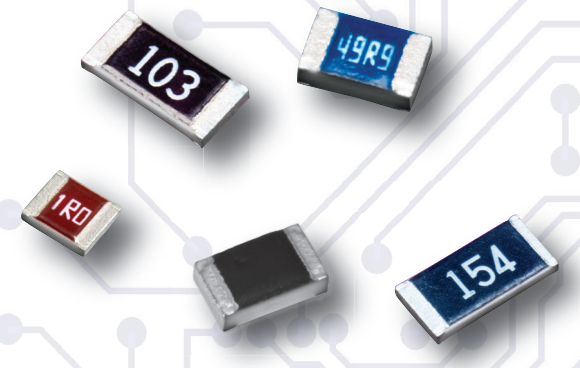
A Family of Resistors Capable of Handling More Thermal Cycles

Features

- Enhanced solder joint reliability from thermal cycles
- Suitable for high-strength solders as well as SAC (Sn-Ag-Cu) solders
- Excellent high heat resistance and weather resistance due to metal glaze resistance film
- AEC-Q200 tested

Applications

- Automotive
- Industrial
- Power Supply



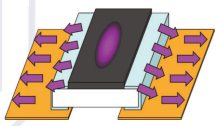
Does your existing design require high heat shock resistance?

High Solder Joint Reliability from Thermal Cycling

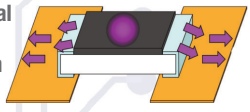
Wide Terminal	General Purpose	High Precision	High Voltage	Anti-Surge	High Temperature
WK73 (WK73R, WK73S) includes higher power versions	RK73B AT	RK73G AT	HV73V AT	SG73 AT	HSG73P **NEW** AT
WG73	RK73H AT			SG73G AT	
WU73	RK73Z AT			SG73S/P AT	

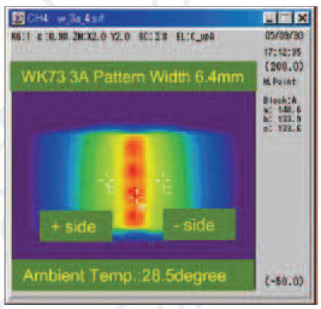
Heat Dissipation: WK73 Compared to RK73

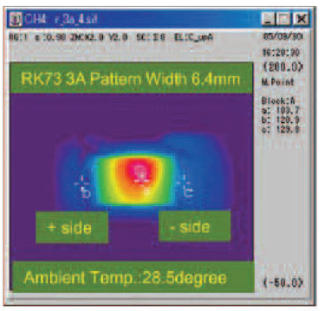
Wide Terminal Type (WK73) Heat Dissipation Image



Nominal Terminal Type (RK73) Heat Dissipation Image







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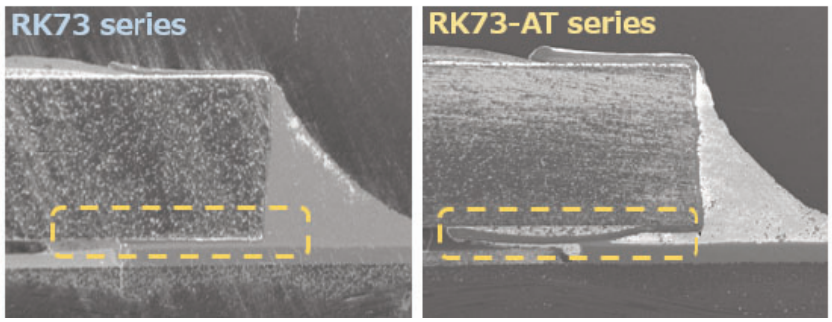
Crack Incidence in Thermal Shock Test by Solder Type: RK73 Series Compared to RK73-AT

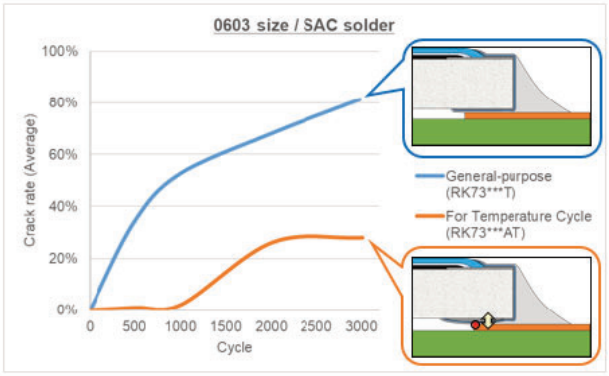


RK73-AT series is designed with a thicker bottom electrode compared to the general thick film products to suppress cracking and delamination caused by thermal shock

Temperature Cycling Test Results

Test Condition

- Product size: 0603 inch
- Test board: FR-4 t= 1.6mm
- Test condition: -55 to 155°C 30min 3,000 cycles



Market Trend of Flat Chip Resistor for Temperature Cycle

Market trend

Long life and maintenance-free

from " 10 years / 150,000 km " to " 30 years / 300,000 km "

Problem

Necessary to improve the temperature cycle resistance

Demand: from 1000cys. to 2000cys.

Counter measure

Mounting: Solder strength

From Sn3Ag0.5Cu to High-strength Solder

(crack reduction of solder itself)

Component: Stress relaxation

Material and structure to relieve the stress difference due to a difference in thermal expansion during the temperature cycle

KOA's Development

Products development that corresponds to both the High-strength Solder and SAC

Applications & Ratings

Wide Terminal Thick Film

WK73R

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73R1E	0.33W[1]	70°C	125°C	±100	—	10 -1M	10 - 1M	75V	100V	-55°C to +155°C
WK73R1J	0.5W[1]	70°C	125°C	±100	—	10 - 1M	10 - 1M	150V	200V	
WK73R2A	0.75W[1]	70°C	125°C	±100	—	20.5k - 1M	22k - 1M	200V	400V	
	1.0W[1]	70°C	125°C	±100	—	10 - 20k	10 - 20k			
WK73R2B	0.75W	70°C	125°C	±100	10 - 1M	10 - 1M	10 - 1M	200V	400V	
	1.0W[1]	70°C	115°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k			
WK73R2H	1.0W	70°C	125°C	±100	—	10 - 430k	10 - 430k	200V	400V	
				±200	—	432k - 1M	470k - 1M			
WK73R3A	1.5W	70°C	125°C	±100	—	10 - 330k	10 - 330k	200V	400V	
				±200	—	332k - 1M	360k - 1M			
	2.0W[1]	70°C	115°C	±100	—	10 - 330k	10 - 330k			
				±200	—	332k - 1M	360k - 1M			

WK73R (High Power)

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73R2B15	1.5W	70°C	95°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k	200V	400V	-55°C to +155°C
WK73R2H2	2.0W	70°C	95°C	±100	—	10 - 430k	10 - 430k	200V	400V	
				±200	—	432k - 1M	470k - 1M			
WK73R3A3	3.0W	70°C	95°C	±100	—	10 - 330k	10 - 330k	200V	400V	
				±200	—	332k - 1M	360k - 1M			

Wide Terminal Current Sense

WK73S

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Operating Temp. Range
WK73S2A	1.0W[1]	70°C	125°C	±100	—	1 - 9.76	1 - 9.1	-55°C to +155°C
				0~+200	—	30m - 976m	30m - 910m	
				0~+300	—	20m - 29.4m	20m - 27m	
WK73S2B	0.75W	70°C	125°C	±100	430m - 9.76	430m - 9.76	430m - 9.1	
				±200	—	30m - 422m	30m - 390m	
				±800	—	—	10m - 27m	
	1.0W[1]	70°C	115°C	±100	430m - 9.76	430m - 9.76	430m - 9.1	
				±200	—	30m - 422m	30m - 390m	
				±800	—	—	10m - 27m	
WK73S2H	1.0W	70°C	125°C	±100	—	220m - 9.76	220m - 9.1	
				±200	—	27m - 215m	27m - 200m	
				±800	—	—	10m - 24m	
WK73S3A	1.5W	70°C	125°C	±100	—	360m - 9.76	360m - 9.1	
				±200	—	33m - 357m	33m - 330m	
				±300	—	22m - 32.4m	22m - 30m	
				±800	—	—	10m - 20m	
	2.0W[1]	70°C	115°C	±100	—	360m - 9.76	360m - 9.1	
				±200	—	33m - 357m	33m - 330m	
				±300	—	22m - 32.4m	22m - 30m	
				±800	—	—	10m - 20m	

Applications & Ratings

Wide Terminal Current Sense

WK73S (High Power)

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) D±0.5% E-24/E-96	Resistance Range (Ω) F±1% E-24/E-96	Resistance Range (Ω) J±5% E-24	Operating Temp. Range
WK73S2B15	1.5W	70°C	95°C	±100	430m - 9.76	430m - 9.76	430m - 9.1	-55°C to +155°C
				±200	—	30m - 422m	30m - 390m	
				±800	—	—	10m - 27m	
WK73S2H2	2.0W[1]	70°C	95°C	±100	—	220m - 9.76	220m - 9.1	
				±200	—	27m - 215m	27m - 200m	
				±800	—	—	10m - 24m	
WK73S3A3	3.0W	70°C	95°C	±100	—	360m - 9.76	360m - 9.1	
				±200	—	33m - 357m	33m - 330m	
				±300	—	22m - 32.4m	22m - 30m	
				±800	—	—	10m - 20m	

Wide Terminal High Pulse/Surge

WG73

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) K±10% E-12	Resistance Range (Ω) M±20% E-12	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
WG732B	1.0W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG732H	1.5W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG733A	2.0W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C

Thick Film Current Sense Low T.C.R

WU73

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10^{-6}/K)	Resistance Range (Ω) E-24, 25m, 50m	Resistance Tolerance	Operating Temperature Range
WU732B	1.0W	70°C	115°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		
WU732B15	1.5W	70°C	95°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		

Applications & Ratings

General Purpose

RK73B-AT & RK73H-AT

Part Designation	Size	Power Rating	Resistance Range RK73H D±0.5%	RK73H F±1%	RK73B G±2%	RK73B J±5%	TCR (X 10⁻⁶/K)
RK73H1J AT RK73B1J AT	0603	0.1W	1.02kΩ - 1MΩ	1.02kΩ - 1MΩ	1.1kΩ - 1MΩ	1.1kΩ - 10MΩ	±100 (H1J), ±200 (B1J)
			—	1.02kΩ - 10MΩ	—	11MΩ - 22MΩ	±200 (H1J) ±400(B1J)
		0.125W	10kΩ - 1KΩ	10kΩ - 1KΩ	—	—	±100 (H1J)
			—	1Ω - 9.76Ω	1Ω - 1kΩ	1Ω - 1kΩ	±200 (H1J, B1J)
RK73H2A AT RK73B2A AT	0805	0.25W	10Ω - 1MΩ	10Ω - 1MΩ	—	—	±100 (H2A)
			—	1Ω - 9.76Ω	1Ω - 1MΩ	1Ω - 1MΩ	±200 (H2A, B2A)
			—	1.02MΩ - 10MΩ	1.1MΩ - 10MΩ	1.1MΩ - 10MΩ	±400 (H2A, B2A)
RK73H2B AT RK73B2B AT	1206	0.25W	10Ω - 1MΩ	10Ω - 1MΩ	—	—	±100 (H2A)
			—	1Ω - 9.76Ω 1.02MΩ-5Ω, 6MΩ	1Ω -5.6MΩ	1Ω -5.6MΩ	±200 (H2A, B2A)
			—	5.62MΩ - 10MΩ	6.2MΩ - 10MΩ	6.2MΩ - 22MΩ	±400 (H2A, B2A)

RK73Z-AT

Part Designation	Size	Resistance Range	Maximum Continuous Current @70°C	Maximum Overload Current @70°C (for <1 sec.)
RK73Z1J AT	0603	50mΩ max.	1A	2A
RK73Z2A AT	0805	50mΩ max.	2A	5A
RK73ZB AT	1206	50mΩ max.	2A	10A

High Precision

RK73G-AT

Part Designation	Size	Power Rating	Resistance Range C±0.25%	Resistance Range D±0.5%	Resistance Range F±1%	TCR (X 10⁻⁶/K)
RK73G1J AT	0603	0.1W	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	±50
RK73G2A AT	0805	0.125W	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	±50
RK73G2B AT	1206	0.25W	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	±50

High Voltage

HV73V-AT

Part Designation	Size	Power Rating	Resistance Range D±0.25%	Resistance Range F±1%	Resistance Range G±2%	Resistance Range J±5%	TCR (X 10⁻⁶/K)
HV73V1J AT	0603	0.1W	—	10kΩ - 10MΩ	10kΩ - 10MΩ	10kΩ - 10MΩ	±100
HV73V2A AT	0805	0.25W	100kΩ - 1MΩ	100kΩ - 10MΩ	100kΩ - 10MΩ	100kΩ - 10MΩ	±100
			—	—	—	11MΩ - 51MΩ	±200
HV73V2B AT	1206	0.33W	100kΩ - 1MΩ	100kΩ - 10MΩ	100kΩ - 10MΩ	100kΩ - 10MΩ	±100
			—	—	—	11MΩ - 51MΩ	±200

Applications & Ratings

High Pulse/Surge

SG73-AT

Part Designation	Size	Power Rating	Resistance Range	TCR (X 10^{-6}/K)
SG731J AT	0603	0.1W	1Ω - 8.2Ω	±400
			10Ω - 1MΩ	±200
SG732A AT	0805	0.125W	1Ω - 8.2Ω	±400
			10Ω - 1MΩ	±200
SG732B AT	1206	0.33W	1Ω - 8.2Ω	±400
			10Ω - 1MΩ	±200

High Precision Pulse Power

SG73G-AT

Part Designation	Size	Power Rating	Resistance Range	TCR (X 10^{-6}/K)
SG73G1J AT	0603	0.2W 0.33W	10Ω - 1MΩ	±50
SG73G2A AT	0805	0.25W 0.5W	10Ω - 1MΩ	±50
SG73G2B AT	1206	0.33W 0.5W	10Ω - 1MΩ	±50

Low T.C.R. Pulse Power

SG73P-AT

Part Designation	Size	Power Rating	Resistance Range			TCR (X 10^{-6}/K)
			D±0.25%	F±1%	G±2%, J±5%	
SG73P1J AT	0603	0.2W	510Ω - 576kΩ	510Ω - 576kΩ	510Ω - 576kΩ	±100
			10Ω - 499Ω 590kΩ - 1MΩ	1Ω - 499Ω 590kΩ - 1MΩ	1Ω - 470Ω 620kΩ - 10MΩ	
		0.33W	510Ω - 576kΩ	510Ω - 576kΩ	510Ω - 576kΩ	±100
			10Ω - 499Ω 590kΩ - 1MΩ	1Ω - 499Ω 590kΩ - 1MΩ	1Ω - 470Ω 620kΩ - 10MΩ	
SG73P2A AT	0805	0.25W	100Ω - 100kΩ	100Ω - 100kΩ	100Ω - 100kΩ	±100
			10Ω - 97.6Ω 102kΩ - 1MΩ	1Ω - 97.6Ω 102kΩ - 1MΩ	1Ω - 91Ω 110kΩ - 1MΩ	±200
		0.5W	100Ω - 100kΩ	100Ω - 100kΩ	100Ω - 100kΩ	±100
			10Ω - 97.6Ω 102kΩ - 1MΩ	10Ω - 97.6Ω 102kΩ - 1MΩ	1Ω - 91Ω 110kΩ - 1MΩ	±200
SG73P2B AT	1206	0.33W	300Ω - 1MΩ	300Ω - 1MΩ	300Ω - 1MΩ	±100
			10Ω - 294Ω	1Ω - 294Ω	1Ω - 270Ω 1.2MΩ - 10MΩ	±200
		0.75W	300Ω - 1MΩ	300Ω - 1MΩ	300Ω - 1MΩ	±100
			10Ω - 294Ω	1Ω - 294Ω	1Ω - 270Ω 1.2MΩ - 10MΩ	±200

Applications & Ratings

High Voltage Surge

SG73S-AT

Part Designation	Size	Power Rating	Resistance Range			TCR (X 10^{-6}/K)
			D±0.25%	F±1%	G±2%, J±5%	
SG73S1J AT	0603	0.2W	510Ω - 576kΩ	510Ω - 576kΩ	510Ω - 576kΩ	±100
			10Ω - 499Ω 590kΩ - 1MΩ	1Ω - 499Ω 590kΩ - 1MΩ	1Ω - 470Ω 620kΩ - 10MΩ	
		0.33W	510Ω - 576kΩ	510Ω - 576kΩ	510Ω - 576kΩ	±100
			10Ω - 499Ω 590kΩ - 1MΩ	1Ω - 499Ω 590kΩ - 1MΩ	1Ω - 470Ω 620kΩ - 10MΩ	
SG73S2A AT	0805	0.25W 0.5W	10Ω - 1MΩ	1Ω - 1MΩ	1Ω - 10MΩ	±200
SG73S2B AT	1206	0.33W 0.75W	10Ω - 1MΩ	1Ω - 1MΩ	1Ω - 10MΩ	±200

High Temperature

HSG73P-AT

Part Designation	Power Rating	Rated Ambient Temp.		Rated Term. Part Temp.		T.C.R. (x10^{-6}/K) Max.	Resistance Range		Maximum Working Voltage	Maximum Overload Voltage
		Term. Surf. Material: T (Sn plating)	Term. Surf. Material: G (Au plating)	Term. Surf. Material: T (Sn plating)	Term. Surf. Material: G (Au plating)		F: ±1% E24	J: ±5% E24		
HSG73P1E AT (0402)	0.125W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	75V	100V
	0.2W*1	70°C	—	105°C	—					
HSG73P1J AT (0603)	0.2W	70°C	70°C	135°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	150V	200V
	0.33W*1	70°C	—	125°C	—					
HSG73P2A AT (0805)	0.25W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	200V	400V
	0.5W*1	70°C	—	100°C	—					
HSG73P2B AT (1206)	0.33W	70°C	70°C	125°C	—	±200	10Ω~1MΩ	1Ω~10MΩ	200V	400V
	0.75W*1	70°C	—	105°C	—					