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ISO-9001:2000

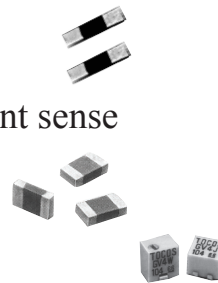
*veteran owned  
small business*

## ***Resistive Products***

### ***Surface Mount***



- Arrays
- Low ohm current sense
- Test points
- Thick film
- Thin film
- Trimming Potentiometers



### ***Leaded***

- Carbon Film
- Metal Film



## ***Value Added Services***

- Exact-count continuous cut tape with or without leaders
- Exact-count production ready reels with leads and tails
- Engineering design kits, standard or customized

Same Day  
Shipping



## ***Authorized Distributor***



**TOCOS<sup>®</sup>** AMERICA INC.

1320 W. McCoy Lane,  
Santa Maria, CA 93454



## ***Resistive Product Index***

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# Garrett's value-added services

## Packaging Options

### Component Packaging Options

Exact-count partial reels with leads & tails, pick & place ready

Exact count tape with or without leaders

Full factory reels

Bulk parts stripped from tape and double bagged



**\* Each package includes a bar coded label with:** manufacturer's part and lot numbers, date code, description, quantities, your internal reference and PO numbers.

### Free Reeling or Leaders for surface mount products

500 units or more free reeling for: resistors, resistor arrays, ceramic capacitors, inductors, ferrite beads, diodes, transistors, fuses, thermistors, varistors

250 units or more free reeling for: trimming potentiometers, tantalum capacitors, niobium oxide capacitors, MosFETS

## Engineering Design Kits

### Choose a kit to fit your needs

- Stock Kits contain all standard values in a series
- Prime Value Kits contain commonly used values in a series
- Custom Kits contain only the values you choose within a series
- Project Kits contain any mix of standard components



### Kits Packaging Options

Parts are provided in plastic boxes or baggies, in bulk or cut tape form

Components are stored in sturdy plastic cases, convenient notebooks or cabinets with drawers

Reel kits are available for quantities of 100 pieces or more and stored in bins



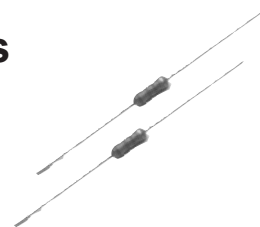


SPEER ELECTRONICS, INC.

## Leaded Resistors

### CF1/4 & MF1/4 Series Specifications

- Carbon or Metal film
- Wide range of value in stock
- RoHS compliant



| Metal Film             | Carbon Film             |
|------------------------|-------------------------|
| Tolerance: 1%          | Tolerance: 5%           |
| Value Range: 10Ω - 1MΩ | Value Range: 00Ω - 22MΩ |
| Power Rating: 1/4 W    | Power Rating: 1/4 W     |
| Series: MF1/4D         | Series: CF1/4           |

#### Part Number Determination

| CF1/4C103J                                    |                                                           |                                                                       |                  |                                                                                         |                                |                                                                                                                  |                                                           |
|-----------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| MF1/4DC1002F                                  |                                                           |                                                                       |                  |                                                                                         |                                |                                                                                                                  |                                                           |
| CF                                            | 1/4                                                       |                                                                       | C                |                                                                                         |                                | 103                                                                                                              | J                                                         |
| MF                                            | 1/4                                                       | D                                                                     | C                |                                                                                         |                                | 1002                                                                                                             | F                                                         |
| SERIES                                        | POWER RATING                                              | TEMPERATURE COEFFICIENT                                               | TERMINATION      | TAPING & FORMING                                                                        | PACKAGING                      | RESISTANCE                                                                                                       | TOLERANCE                                                 |
| CF=Carbon Film<br>Leaded Resistor             | For CF:<br>S1/4=1/4W<br>1/4=1/4W<br>1/2=1/2W<br>S1/2=1/2W | For CF:<br>Blank                                                      | L=SnPb<br>C=SnCu | Blank=Straight<br>leads, Bulk<br><br>T52-Straight<br>leads, 52mm<br>end-to end,<br>Tape | Blank=Bulk<br>A=Ammo<br>R=Reel | For CF:<br>2 Significant<br>digits + 1<br>multiplier<br><br>For MF:<br>3 Significant<br>digits + 1<br>multiplier | B=±0.1%<br>C=±0.25%<br>D=±0.5%<br>F=±1%<br>G=±2%<br>J=±5% |
| MF=Precision<br>Metal Film Leaded<br>Resistor | For MF:<br>1/4=1/4W<br>1/2=1/2W<br>1=1W                   | For MF:<br>E=±25ppm/°C<br>C=±50ppm/°C<br>D=±100ppm/°C<br>L=±200ppm/°C |                  |                                                                                         |                                |                                                                                                                  |                                                           |

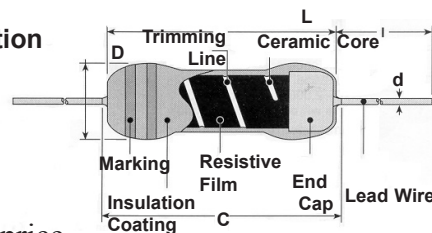
#### Electrical Characteristics

| Series | Power Rating @ 70°C | Minimum Dielectric Withstanding Voltage | T.C.R. (ppm/°C)                                       | Resistance Range E-24                                 | Resistance Range E-96 | Absolute Maximum Working Voltage | Absolute Maximum Overload Voltage |
|--------|---------------------|-----------------------------------------|-------------------------------------------------------|-------------------------------------------------------|-----------------------|----------------------------------|-----------------------------------|
| CF1/4  | 1/4W                | 500V                                    | +350 to -450<br>0 to -700<br>0 to -1000<br>0 to -1300 | 1.0 - 100K<br>110K - 330K<br>360K - 1M<br>1.1M - 5.1M |                       | 300V                             | 600V                              |
| MF1/4  |                     |                                         | ±100                                                  |                                                       | 10-1M                 | 250V                             | 500V                              |

#### Package Dimensions (in/mm)

| Series | L                   | C (max.)     | D                    | d (nom.)    | l                     |
|--------|---------------------|--------------|----------------------|-------------|-----------------------|
| CF1/4  | .240±0.2<br>6.1±0.5 | .280<br>7.1  | 0.91±0.12<br>2.3±0.3 | .024<br>0.6 | .787 min<br>20.0 min  |
| MF1/4  | .374<br>9.5         | .437<br>11.1 | .138±0.16<br>3.5±0.4 |             | 1.18±.118<br>30.0±3.0 |

#### Construction



See price list booklet for current price

#### Leaded Resistors

KOA CF1/4 Series: 000Ω (Z25YC BULK) through 22MΩ (CF1/4C226J BULK)

KOA MF1/4 Series: 10.0Ω (MF1/4DC10R0F TAPE) through 1MΩ (MF1/4DC1004F TAPE)

### Engineering Design Kits Available

See Garrett Kit Catalog

## Surface Mount Low Ohm Current Sense Resistors



| <br>SPEER ELECTRONICS, INC. | Power                                                                                                           | Lo-Ohm Thick Film                                                                                                     | Metal Alloy                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                                                                                                              | Power rating: 1W, 2W, 3W<br>Resistance range: .005Ω - 1Ω<br>Tolerance: 1%<br>Series: SL                         | Power rating: 3/4W:2010, 1W:2512<br>Resistance range: 0.10Ω - 0.75Ω<br>Tolerance: 1%<br>Series: SR73                  | Power rating: 1/2W:1206, 1W:2010,<br>1W:2512, 2W:2512<br>Resistance range: .001Ω - 0.01Ω<br>Tolerance: 1%<br>Series: TLR |
| Description                                                                                                  | Ideal for power applications:<br>• Motor application<br>• Instrumentation and battery packs<br>• Power supplies | Designed for current sensing applications:<br>• Computer<br>• HDD<br>• Cellular and motor circuit<br>• Power supplies | Suitable for large detecting current:<br>• Current detecting for CPU<br>• DC/DC dividers<br>• Inverter power supply      |



|  | Power Metal Strip                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | Power rating: 1/4W:1206, 1/2W:2010, 1W:2512<br>Resistance range: .002Ω - 0.5Ω<br>Tolerance: 1%<br>Series: WSL                                                                 |
| Description                                                                         | Ideal for all types of power current sensing,<br>voltage division and pulse applications:<br>• Switching and linear power supplies<br>• Instrumentation<br>• Power amplifiers |

See price list booklet for current price

### Surface Mount Low Ohm Current Sense Resistors

KOA SL Series: .005Ω (SL1LTE5L00F) through 0.332Ω (SL3LTER332F)

KOA SR73 Series: .1Ω (SR732HTTER100F) through 0.75Ω (SR732HTTER750F)

KOA TLR Series: .002Ω (TLR2BDTD2L00F75) through .01Ω (TLR3AWDTE10L0F)

VISHAY-DALE WSL Series: .005Ω (WSL12065L00FEB) through 0.5Ω (WSL2512R5000FEB)

**Engineering Design Kits Available**  
**See Garrett Kit Catalog**



# WSL Series Surface Mount Current Sense Resistors



## Specifications

### Part Number Determination

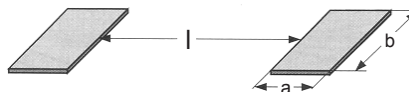
| WSL2010.01FR79                               |                              |                                         |                           |                                                             |
|----------------------------------------------|------------------------------|-----------------------------------------|---------------------------|-------------------------------------------------------------|
| WSL                                          | 2010                         | .01                                     | F                         | R79                                                         |
| SERIES                                       | SIZE                         | RESISTANCE                              | TOLERANCE                 | PACKAGING                                                   |
| Power Metal Strip Resistors, Low Ohmic Value | 0805<br>1206<br>2010<br>2512 | .005=.005ohm<br>.01=.01ohm<br>.50=.5ohm | D=±0.5%<br>F=±1%<br>J=±5% | B43=Bulk<br>R79=1000/Reel<br>R86=4000/Reel<br>RT1=5000/Reel |

| WSL2010R0100FEB                              |                              |                                                           |                           |                                                                                                                                                                                               |
|----------------------------------------------|------------------------------|-----------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WSL                                          | 2010                         | R0100                                                     | F                         | EB                                                                                                                                                                                            |
| SERIES                                       | SIZE                         | RESISTANCE                                                | TOLERANCE                 | LEAD FREE PACKAGING                                                                                                                                                                           |
| Power Metal Strip Resistors, Low Ohmic Value | 0805<br>1206<br>2010<br>2512 | L=Miliohm<br>R=Decimal<br>1L000=0.001ohm<br>R0100=0.01ohm | D=±0.5%<br>F=±1%<br>J=±5% | EA=Lead (Pb)-Free, Tape & Reel<br>EB=Lead (Pb) Free, 1K tape & Reel<br>EK=Lead (Pb)-Free, Bulk<br>TA=Tin/Lead, Tape & Reel (R86)<br>TG=Tin/Lead, Tape & Reel (RT1)<br>BA=Tin/Lead, Bulk (B43) |

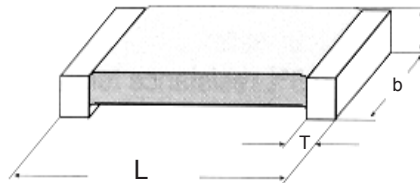
### Land Pattern (in/mm)

| Series   | a             | b             | l             |
|----------|---------------|---------------|---------------|
| WSL-1206 | 0.050<br>1.27 | 0.070<br>1.78 | 0.055<br>1.40 |
| WSL-2010 | 0.055<br>1.40 | 0.120<br>3.05 | 0.130<br>3.30 |
| WSL-2512 | 0.065<br>1.65 | 0.145<br>3.68 | 0.160<br>4.06 |



### Package Dimensions (in/mm)

| Series   | L                         | W                         | H                          | T                          |
|----------|---------------------------|---------------------------|----------------------------|----------------------------|
| WSL-1206 | 0.126±0.010<br>3.2±0.254  | 0.063±0.01<br>1.6±0.254   | 0.025±0.010<br>0.635±0.254 | 0.020±0.01<br>0.508±0.254  |
| WSL-2010 | 0.200±0.010<br>5.08±0.254 | 0.100±0.010<br>2.54±0.254 | 0.025±0.010<br>0.635±0.254 | 0.020±0.010<br>0.508±0.254 |
| WSL-2512 | 0.250±0.010<br>6.35±0.254 | 0.125±0.010<br>3.18±0.254 | 0.025±0.010<br>0.635±0.254 | 0.030±0.010<br>0.762±0.254 |





# SL Series Surface Mount Molded Current Sense Resistors



## Specifications

### Part Number Determination

| SL1LTE20L0F |                                  |                  |                                                                                                   |                                                                                                                                                                                                                                                                                           |                                        |
|-------------|----------------------------------|------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| SL          | 1                                | L                | TE                                                                                                | 20L0                                                                                                                                                                                                                                                                                      | F                                      |
| Type        | Size                             | Termination      | Packaging                                                                                         | Nominal Resistance                                                                                                                                                                                                                                                                        | Tolerance                              |
| SL          | 1=1 Watt<br>2=2 Watt<br>3=3 Watt | L: SnPb<br>T: Sn | SL1<br>TE: 7" embossed plastic<br>SL2, SL3<br>TE: 10" embossed plastic<br><br>(1,000 pieces/reel) | ±5%: 2 significant figures + 1 multiplier<br>"R" indicates decimal on value <10Ω<br><br>±1%: 3 significant figures + 1 multiplier<br>"R" indicates decimal on value <100Ω<br><br>All values less than 0.1Ω (100mΩ) are<br>expressed in mΩ with "L" as decimal<br>Example: 20mΩ, 1% = 20L0 | D: ±0.5%<br>F: ±1%<br>G: ±2%<br>J: ±5% |

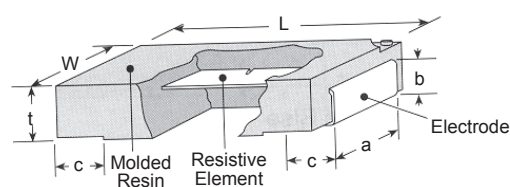
### Electrical Characteristics

| Series | Power Rating | T.C.R.<br>(ppm/°C)<br>Max.       | Resistance Range | Resistance Tolerance | Absolute Maximum Working Voltage | Absolute Maximum Overload Voltage | Operating Temperature Range |
|--------|--------------|----------------------------------|------------------|----------------------|----------------------------------|-----------------------------------|-----------------------------|
| SL1    | 1W           | ±180: R=<14.7mΩ<br>±100: R=>15mΩ | 5mΩ - 1MΩ        | E-96 (F:±1%)         | 200V                             | 400V                              | -55°C ~ +180°C              |
| SL2    | 2W           | ±180: R=<10.7mΩ<br>±100: R=>11mΩ | 5mΩ - 1MΩ        | E-96 (F:±1%)         | 500V                             | 1000V                             |                             |
| SL3    | 3W           | ±180: R=<10.7mΩ<br>±100: R=>11mΩ | 5mΩ - 100mΩ      | E-96 (F:±1%)         | √ P•R                            | √ P•R                             |                             |

### Package Dimensions (in/mm)

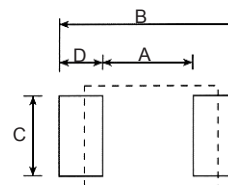
| Series | L                       | W                      | t                      | a                      | b                      | c                      |
|--------|-------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| SL1    | .248±.012<br>(6.3±0.3)  | .122±.008<br>(3.1±0.2) | .075±.008<br>(1.9±0.2) | .094±.008<br>(2.4±0.2) | .047±.012<br>(1.2±0.3) | .047±.012<br>(1.2±0.3) |
| SL2    | .453±.012<br>(11.5±0.3) | .276±.008<br>(7.0±0.2) | .098±.008<br>(2.5±0.2) | .197±.008<br>(5.0±0.2) | .067±.02<br>(1.7±0.5)  | .102±.02<br>(2.6±0.5)  |
| SL3    | .453±.012<br>(11.5±0.3) | .276±.008<br>(7.0±0.2) | .098±.008<br>(2.5±0.2) | .197±.008<br>(5.0±0.2) | .067±.02<br>(1.7±0.5)  | .102±.02<br>(2.6±0.5)  |

### Construction



### Land Pattern (mm)

| Series   | A   | B    | C   | D   |
|----------|-----|------|-----|-----|
| SL1      | 4.6 | 8.0  | 3.0 | 1.7 |
| SL2, SL3 | 8.0 | 15.0 | 4.0 | 3.5 |





## SR73 Series Surface Mount Thick Film Current Sense Resistors



### Specifications

#### Part Number Determination

| SR73HTTER100F |                                                                           |                       |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                        |                                        |
|---------------|---------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| SR73          | 2H                                                                        | T                     | TE                                                                                                                                                                                                                 | R100                                                                                                                                                                                                                                                                                   | F                                      |
| Type          | Power Rating                                                              | Termination           | Packaging                                                                                                                                                                                                          | Nominal Resistance                                                                                                                                                                                                                                                                     | Tolerance                              |
| SR73          | 1E=1/16W<br>1J=1/10W<br>2A=1/8W<br>2B=1/4W<br>2E=1/2W<br>2H=3/4W<br>3A=1W | L: SnPb (3A)<br>T: Sn | TP: 2mm pitch punched paper (1E, 1J)<br>TD: 7" paper tape (1J, 2A, 2B, 2E)<br>TDD: 10" paper tape (1J, 2A, 2B, 2E)<br>TE: 7" punched plastic (2A, 2B, 2E, 2H, 3A)<br>TED: 10" punched plastic (2A, 2B, 2E, 2H, 3A) | ±5%: 2 significant figures + 1 multiplier<br>"R" indicates decimal on value <10Ω<br><br>±1%: 3 significant figures + 1 multiplier<br>"R" indicates decimal on value <100Ω<br><br>All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal<br>Example: 20mΩ, 1% = 20L0 | D: ±0.5%<br>F: ±1%<br>G: ±2%<br>J: ±5% |

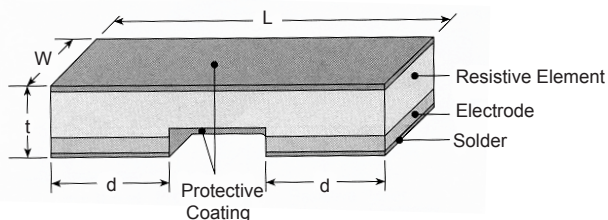
#### Electrical Characteristics

| Series | T.C.R.<br>(ppm/°C)<br>Max. | Resistance<br>Range | Absolute<br>Maximum<br>Working Voltage | Maximum<br>Overload Voltage<br>(5 Secs. Max) | Operating<br>Temperature<br>Range |
|--------|----------------------------|---------------------|----------------------------------------|----------------------------------------------|-----------------------------------|
| SR732H | ±100                       | 0.1Ω - 10Ω          | 2.73V                                  | 6.84V                                        | -55°C ~ +180°C                    |
| SR733A | ±100                       | 0.1Ω - 10Ω          | 3.16V                                  | 7.90V                                        |                                   |

#### Package Dimensions (in/mm)

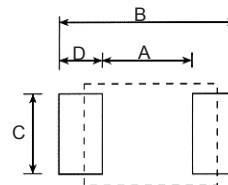
| Series       | L                        | W                        | c                       | d                                                                                        | t                       |
|--------------|--------------------------|--------------------------|-------------------------|------------------------------------------------------------------------------------------|-------------------------|
| 2H<br>(2010) | 0.197±0.008<br>(5.0±0.2) | 0.098±0.008<br>(2.5±0.2) | 0.02±0.012<br>(0.5±0.3) | 0.016 <sup>+0.008</sup> <sub>-0.004</sub><br>(0.40 <sup>+0.200</sup> <sub>-0.100</sub> ) | 0.24±0.004<br>(0.6±0.1) |
| 3A<br>(2512) | 0.248±0.008<br>(6.3±0.2) | 0.122±0.008<br>(3.1±0.2) |                         |                                                                                          |                         |

#### Construction



#### Land Pattern (mm)

| Series | Size | A   | B   | C   | D   |
|--------|------|-----|-----|-----|-----|
| SR732H | 2010 | 3.5 | 6.3 | 2.3 | 1.4 |
| SR733A | 2512 | 4.6 | 8.0 | 3.0 | 1.7 |





# TLR Series Surface Mount Metal Plate Current Sense Resistors



## Specifications

### Part Number Determination

| TLR3ALTE2L00F75 |                                     |                                                |                                                                                                                                                                   |                                             |                  |                                               |
|-----------------|-------------------------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|-----------------------------------------------|
| TLR             | 3A                                  | L                                              | TE                                                                                                                                                                | 2L00                                        | F                | 75                                            |
| Type            | Power Rating                        | Termination                                    | Packaging                                                                                                                                                         | Nominal Resistance                          | Tolerance        | T.C.R.                                        |
| TLR             | 2B=0.5W<br>2H=1W<br>3A=1W<br>3AW=2W | L: SnPb (3A)<br>D: SnAgCu<br>(2B, 2H, 3A, 3AW) | TE: 7" 8mm pitch<br>embossed plastic<br>(3A, 3AW: 2,000 pcs/reel)<br>(2H: 4,000 pcs/reel)<br>TD: 4mm pitch punched paper<br>(2B only: 5,000 pcs/reel)<br>BK: Bulk | F: 4 digits<br>J: 3 digits<br>Ex: 2L00: 2mΩ | F: ±1%<br>J: ±5% | 75=75ppm/°C<br>Nil=150ppm/°C<br>Nil=200ppm/°C |

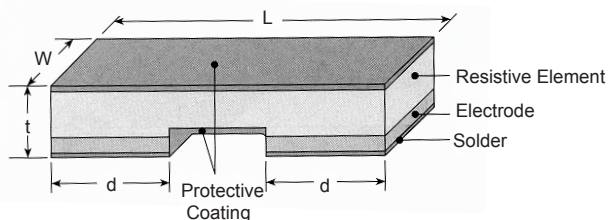
### Electrical Characteristics

| Series | Power Rating @ 70°C | T.C.R. (ppm/°C) Max. | Standard Resistance                     | Resistance Tolerance | Absolute Maximum Working Voltage | Rated Ambient Temperature | Operating Temperature Range |
|--------|---------------------|----------------------|-----------------------------------------|----------------------|----------------------------------|---------------------------|-----------------------------|
| TLR2B  | 1/2W (.5W)          | ±150                 | 2mΩ - 6mΩ, 8mΩ, 10mΩ - 16mΩ, 18mΩ, 20mΩ | F: ±1%, J: ±5%       | √ P·R                            | +70°C                     | -65°C ~ +150°C              |
| TLR2H  | 1W                  | ±150                 | 2mΩ - 8mΩ                               | F: ±1%, J: ±5%       | √ P·R                            | +70°C                     | -65°C ~ +150°C              |
| TLR3A  | 1W                  | ±150                 | 1mΩ, 2mΩ                                | F: ±1%, J: ±5%       | √ P·R                            | +70°C                     | -65°C ~ +170°C              |
|        |                     | ±200                 | 3mΩ, 4mΩ                                |                      |                                  |                           |                             |
| TLR3AW | 2W                  | ±150                 | 2mΩ - 3mΩ                               | F: ±1%, J: ±5%       | √ P·R                            | +70°C                     | -65°C ~ +155°C              |
|        |                     |                      | 4mΩ - 8mΩ                               |                      |                                  |                           | -65°C ~ +170°C              |

### Package Dimensions (in/mm)

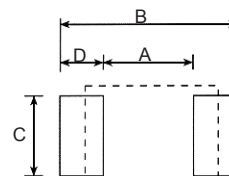
| Series | Resistance                              | L                        | W                        | d                        | t                        |
|--------|-----------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| TLR2B  | 2mΩ - 6mΩ, 8mΩ, 10mΩ - 16mΩ, 18mΩ, 20mΩ | .126±.008<br>(3.20±0.20) | .063±.008<br>(1.60±0.20) | 0.20±.008<br>(0.50±0.20) | .024±.008<br>(0.60±0.20) |
| TLR2H  | 2mΩ - 6mΩ                               | .200±.008<br>(5.00±0.20) | .100±.008<br>(2.50±0.20) | 0.60±.008<br>(1.50±0.20) | .024±.008<br>(0.60±0.20) |
|        | 7mΩ - 8mΩ                               |                          |                          | 0.20±.008<br>(0.50±0.20) |                          |
| TLR3A  | 1mΩ                                     | 0.25±.01<br>(6.35±0.25)  | 0.125±.01<br>(3.18±0.25) | .087±.01<br>(2.20±0.25)  | .024±.01<br>(0.62±0.25)  |
|        | 2mΩ                                     |                          |                          | 0.47±.01<br>(1.20±0.25)  |                          |
|        | 3mΩ                                     |                          |                          | 0.73±.01<br>(1.85±0.25)  |                          |
|        | 4mΩ                                     |                          |                          | 0.47±.01<br>(1.20±0.25)  |                          |
| TLR3AW | 2mΩ - 4mΩ                               | .25±.01<br>(6.35±0.25)   | .125±.01<br>(3.18±0.25)  | .087±.01<br>(2.20±0.25)  | .024±.01<br>(0.60±0.25)  |
|        | 5mΩ - 8mΩ                               |                          |                          | 0.47±.01<br>(1.20±0.25)  |                          |

### Construction



### Land Pattern (mm)

| Series | Resistance | A    | B    | C    | D    |
|--------|------------|------|------|------|------|
| TLR2B  |            | 1.4  | 4.0  | 1.8  | 1.3  |
| TLR2H  | 2mΩ - 6mΩ  | 1.3  | 6.1  | 3.0  | 2.4  |
|        | 7mΩ, 8mΩ   | 3.3  | 6.1  | 3.0  | 1.4  |
| TLR3A  | 1mΩ        | 1.95 | 7.55 | 3.83 | 3.05 |
|        | 2mΩ        | 3.45 | 7.55 | 3.83 | 2.05 |
|        | 3mΩ        | 2.15 | 7.55 | 3.83 | 2.70 |
|        | 4mΩ        | 3.45 | 7.55 | 3.83 | 2.05 |
| TLR3AW | 2mΩ - 4mΩ  | 1.45 | 7.55 | 3.83 | 3.05 |
|        | 5mΩ - 8mΩ  | 3.45 | 7.55 | 3.83 | 2.05 |





## Surface Mount Resistor Arrays

- *Less board space than individual resistors*
- *Isolated resistor elements*
- *RoHS compliant*



### CN Series Specifications

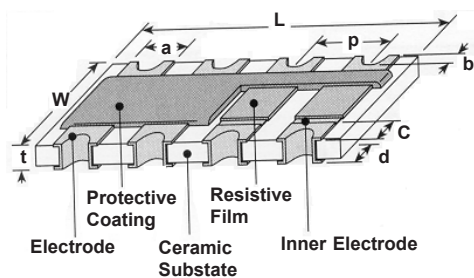
#### Part Number Determination

| CN1J4TTD101J                                                        |                               |             |                                      |                                                                                                              |                                                                                                                 |                         |
|---------------------------------------------------------------------|-------------------------------|-------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------|
| CN                                                                  | 1J                            | 4           | T                                    | TD                                                                                                           | 101                                                                                                             | J                       |
| SERIES                                                              | SIZE                          | ELEMENTS    | TERMINATION                          | PACKAGING                                                                                                    | RESISTANCE                                                                                                      | TOLERANCE               |
| Resistor Array:<br>Concave<br>Termination<br>with Square<br>Corners | 1J=0603<br>2A=0805<br>2B=1206 | 2<br>4<br>8 | L=SnPb (Tin Lead)<br>T=Sn (100% Tin) | TD=7" paper tape<br>TDD=10" paper tape<br>TE=7" embossed<br>plastic tape<br>TED=10" embossed<br>plastic tape | For 2% / 5%:<br>2 Significant digits<br>+ 1 multiplier<br><br>For 1%:<br>3 Significant digits<br>+ 1 multiplier | F=±1%<br>G=±2%<br>J=±5% |

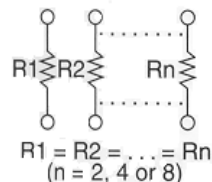
#### Package Dimensions

|        | L         | W         | C         | d         | t         | a         | b    | p    |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|------|------|
| inches | .126±.008 | .063±.006 | 0.12±.006 | 0.16±.006 | .024±.004 | .020±.006 | .006 | .031 |
| mm     | 3.2±0.2   | 1.6±0.15  | 0.3±0.15  | 0.4±0.15  | 0.6±0.1   | 0.5±0.15  | .015 | 0.8  |

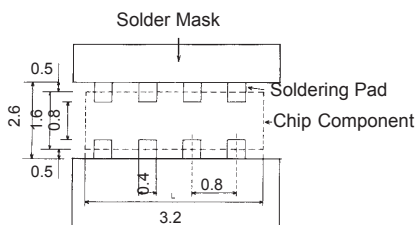
#### Construction



#### Circuit Schematic



#### Land Pattern (mm)



See price list booklet for current price

#### Surface Mount Resistor Arrays

KOA 00Ω (CNZ1J4TTD) through 1.0MΩ (CN1J4TTD105J)

**Engineering Design Kits Available**  
**See Garrett Kit Catalog**



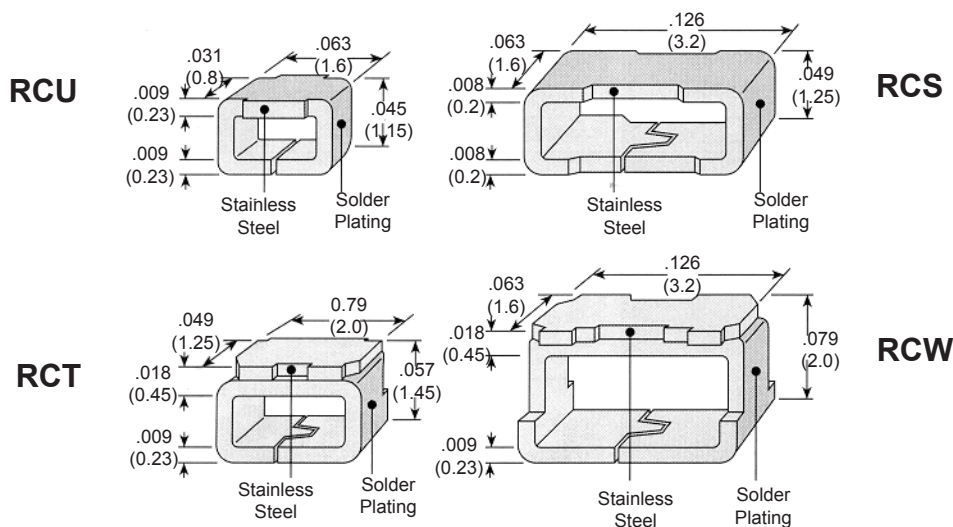
## Surface Mount Test Points

### RC Series Specifications

#### Part Number Determination

| RCUCTE                                       |                      |                                                                                                          |
|----------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------|
| RCU                                          | C                    | TE                                                                                                       |
| TYPE/SIZE                                    | TERMINATION MATERIAL | PACKAGING                                                                                                |
| RCU=0603<br>RCT=0805<br>RCS=1206<br>RCW=1206 | L=SnPb<br>C=SnCu     | TE=7" Embossed plastic (2,000/reel)<br>TED=10" Embossed plastic (5,000/reel)<br>RCW not available in TED |

#### Construction and Package Dimensions inches (mm)



Note: Top surfaces of RCT and RCW are not solderable.

See price list booklet for current price

#### Surface Mount RC Series Test Points

KOA case size 0603 (RCUCTE) through 1206 (RCWCTE)

## Surface Mount Thick Film Resistors

- Case sizes 01005, 0201, 0402, 0603, 0805, 1206, 2512
- 5% and 1% tolerance
- Wide range of value in stock
- RoHS compliant



| Case Size | Dale          |  SPEER ELECTRONICS, INC. |
|-----------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 01005     |                                                                                                | Tolerance: 5%<br>Value Range: E24 10Ω - 1MΩ                                                                |
| 0201      | Tolerance: 1%<br>Value Range: E96 Selected value                                               | Tolerance: 1%<br>Value Range: E96 Selected value<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ        |
| 0402      | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ | Tolerance: 1%<br>Value Range: E96 1Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ              |
| 0603      | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ | Tolerance: 1%<br>Value Range: E96 1Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ              |
| 0805      | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ             |
| 1206      | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ<br><br>Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ             |
| 1210      |                                                                                                | Tolerance: 1%<br>Value Range: E96 10Ω - 1MΩ                                                                |
| 2512      |                                                                                                | Tolerance: 5%<br>Value Range: E24 1Ω - 10MΩ                                                                |

**Engineering Design Kits Available**  
**See Garrett Kit Catalog**

See price list booklet for current price

**Surface Mount Thick Film Resistors**

**Case size 01005 5%**

KOA 10 $\Omega$  (RK73B1FTTC100J) through 1.0M $\Omega$  (RK73B1FTTC105J)

**Case size 0201 1%**

KOA 10 $\Omega$  (RK73H1HTTC10R0F) through 1.0M $\Omega$  (RK73H1HTTC1004F)

VISHAY-DALE 49.9 $\Omega$  (CRCW020149R9RFKED) through 1.0M $\Omega$  (CRCW02011M00FKED)

**Case size 0201 5%**

KOA 00 $\Omega$  (RK73Z1HTTC) through 10M $\Omega$  (RK73B1HTTC106J)

**Case size 0402 1%**

KOA 1 $\Omega$  (RK73H1ETTP1R00F) through 10M $\Omega$  (RK73H1ETTP1005F)

VISHAY-DALE 10 $\Omega$  (CRCW040210R0FKED) through 1.0M $\Omega$  (CRCW04021M00FKED)

**Case size 0402 5%**

KOA 00 $\Omega$  (RK73Z1ETTP) through 10M $\Omega$  (RK73B1ETTP106J)

VISHAY-DALE 00 $\Omega$  (CRCW04020000Z0ED) through 10M $\Omega$  (CRCW040210M0JNED)

**Case size 0603 1%**

KOA 1 $\Omega$  (RK73H1JTDD1R00F) through 10M $\Omega$  (RK73H1JTDD1005F)

VISHAY-DALE 10 $\Omega$  (CRCW060310R0FKEA) through 1.0M $\Omega$  (CRCW06031M00FKEA)

**Case size 0603 5%**

KOA 00 $\Omega$  (RK73Z1JTDD) through 22M $\Omega$  (RK73B1JTDD226J)

VISHAY-DALE 00 $\Omega$  (CRCW06030000Z0EA) through 10M $\Omega$  (CRCW060310M0JNEA)

**Case size 0805 1%**

KOA 1 $\Omega$  (RK73H2ATTD1R00F) through 10M $\Omega$  (RK73H2ATTD1005F)

VISHAY-DALE 10 $\Omega$  (CRCW080510R0FKEA) through 1.0M $\Omega$  (CRCW08051M00FKEA)

**Case size 0805 5%**

KOA 00 $\Omega$  (RK73Z2ATTD) through 22M $\Omega$  (RK73B2ATTD226J)

VISHAY-DALE 00 $\Omega$  (CRCW06030000Z0EA) through 10M $\Omega$  (CRCW080510M0JNEA)

**Case size 1206 1%**

KOA 1 $\Omega$  (RK73H2BTDD1R00F) through 1.0M $\Omega$  (RK73H2BTDD1004F)

VISHAY-DALE 10 $\Omega$  (CRCW120610R0FKEA) through 1.0M $\Omega$  (CRCW12061M00FKEA)

**Case size 1206 5%**

KOA 00 $\Omega$  (RK73Z2BTDD) through 22M $\Omega$  (RK73B2BTDD226J)

VISHAY-DALE 00 $\Omega$  (CRCW12060000Z0EA) through 10M $\Omega$  (CRCW120610M0JNEA)

**Case size 1210 1%**

KOA 10 $\Omega$  (RK73H2ETDD10R0F) through 1.0M $\Omega$  (RK73H2ETDD1004F)

**Case size 2512 5%**

KOA 00 $\Omega$  (RK73Z3ATTE) through 1.0M $\Omega$  (RK73B3ATTE105J)



Date

## Surface Mount Thick Film Resistors

## CRCW Series Specifications



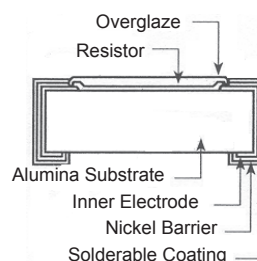
## Part Number Determination

| CRCW060310K0FKEA                            |                                                          |                                      |                |                        |                                                                                                                          |                                                                                                               |
|---------------------------------------------|----------------------------------------------------------|--------------------------------------|----------------|------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| CRCW                                        | 0603                                                     | 10K0                                 | F              | K                      | EA                                                                                                                       |                                                                                                               |
| SERIES                                      | SIZE                                                     | RESISTANCE                           | TOLERANCE      | TEMP COEFFICIENT       | PACKAGING                                                                                                                |                                                                                                               |
| Thick Film,<br>Rectangular<br>Chip Resistor | 0201 1210<br>0402 1218<br>0603 2010<br>0805 2512<br>1206 | R=Decimal<br>K=Thousand<br>M=Million | F=±1%<br>J=±5% | K=±100ppm<br>N=±200ppm | EA=5K Paper Tape<br>EB=10K Paper Tape<br>EC=20K Paper Tape<br>ED=10K Paper Tape<br>EE=50K Paper Tape<br>EF=4K Paper Tape | EG=2K Paper Tape<br>EH=4K Paper Tape<br>EI=5K Paper Tape<br>EK=4K Paper Tape<br>EL=20K Paper Tape<br>EY= Bulk |

## Electrical Characteristics

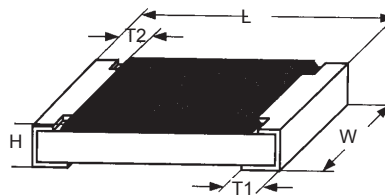
| Case Size | Power Rating | Max. Operating Voltage | Resistance        | Temperature Coefficient |           | Zero Ohm Jumper          | Marking Code |
|-----------|--------------|------------------------|-------------------|-------------------------|-----------|--------------------------|--------------|
|           |              |                        |                   | 100ppm/°C               | 200ppm/°C |                          |              |
| 0201 1%   | 1/20W        | 30V                    | 47-1M<br>E24, E96 | 49.9-1M                 |           |                          | Not Marked   |
| 0402 5%   | 1/16W        | 50V                    | 1.0-10M<br>E24    |                         | 1.0-10M   | .05 ohm Max              | Not Marked   |
| 0402 1%   | 1/16W        | 50V                    | 100-1M<br>E96     | 10-1M                   |           |                          | Not Marked   |
| 0603 5%   | 1/10W        | 50V                    | 1.0-10M<br>E24    |                         | 1.0-10M   | .05 ohm Max<br>1 AMP Max | 3 digits     |
| 0603 1%   | 1/10W        | 50V                    | 10-1M<br>E96      | 10-1M                   |           |                          | 4 digits     |
| 0805 5%   | 1/8 W        | 100V                   | 1.0-10M<br>E24    |                         | 1.0-10M   | .05 ohm Max<br>1 AMP Max | 3 digits     |
| 0805 1%   | 1/8 W        | 100V                   | 10-1M<br>E96      | 10-1M                   |           |                          | 4 digits     |
| 1206 5%   | 1/4W         | 200V                   | 1.0-10M<br>E24    |                         | 1.0-10M   | .05 ohm Max<br>2AMP Max  | 3 digits     |
| 1206 1%   | 1/4W         | 200V                   | 10-1M<br>E96      | 10-1M                   |           |                          | 4 digits     |

## Construction



## Package Dimensions (mm)

| Case Size | L              | W         | H         | T1            | T2             |
|-----------|----------------|-----------|-----------|---------------|----------------|
| 0201      | 0.6±0.05       | 0.3±0.05  | 0.23±0.05 | 0.15±0.05     | 0.15+0.05-0.10 |
| 0402      | 1.0±0.05       | 0.5±0.05  | 0.35±0.05 | 0.25±0.05     | 0.2±0.1        |
| 0603      | 1.55+0.10-0.05 | 0.85±0.1  | 0.45±0.05 | 0.3±0.2       | 0.3±0.2        |
| 0805      | 2.0+0.20-0.10  | 1.25±0.15 | 0.45±0.05 | 0.3+0.20-0.10 | 0.3±0.2        |
| 1206      | 3.2+0.10-0.20  | 1.6±0.15  | 0.55±0.05 | 0.45±0.2      | 0.4±0.2        |



## Land Pattern (mm)

| Case Size   | a    | b    | l    |
|-------------|------|------|------|
| 0201 Reflow | 0.28 | 0.43 | 0.23 |
| 0402 Reflow | 0.4  | 0.6  | 0.5  |
| 0603 Reflow | 0.5  | 0.9  | 1.0  |
| 0603 Wave   | 0.9  | 0.9  | 1.0  |
| 0805 Reflow | 0.7  | 1.3  | 1.2  |
| 0805 Wave   | 0.9  | 1.3  | 1.3  |
| 1206 Reflow | 0.9  | 1.7  | 2.0  |
| 1206 Wave   | 1.1  | 1.7  | 2.3  |





# Surface Mount Thick Film Resistors

## RK73 Series Specifications



### Part Number Determination

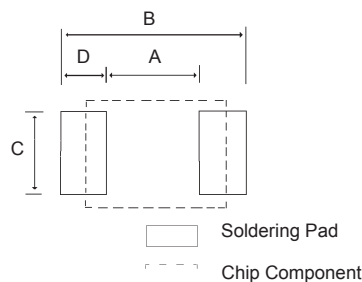
| RK73B2BLTD102J                                 |                                                                                                  |                                                                                                             |                                                                                                                                                                                                                                                                  |                                                                                                                                            |                                                        |
|------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| RK73B                                          | 2B                                                                                               | L                                                                                                           | TD                                                                                                                                                                                                                                                               | 102                                                                                                                                        | J                                                      |
| SERIES                                         | SIZE                                                                                             | TERMINATION                                                                                                 | PACKAGING                                                                                                                                                                                                                                                        | RESISTANCE                                                                                                                                 | TOLERANCE                                              |
| RK73B=Genl Purp<br>2% / 5% Thick Film Resistor | 1F=01005<br>1H=0201<br>1E=0402<br>1J=0603<br>2A=0805<br>2B=1206<br>2E=1210<br>2H=2010<br>3A=2512 | X=AgPd**<br>G=Au*<br>L=SnPb<br>(Tin/Lead)<br>T=Sn<br>(100% Tin)<br><br>**=1J, 2A, 2B only<br>*=1E & 1J only | TC=2mm pitch, punched paper (0201)<br>TB=2mm pitch, pressed paper (01005)<br>TP=2mm pitch, punch paper (0402 & 0603)<br>TD=7" paper tape (0805, 1206 & 1210)<br>TDD=10" paper tape<br>TE=7" embossed plastic tape (2010 & 2512)<br>TED=10" embossed plastic tape | For 2%/5%=<br>2 significant digits +<br>1 multiplier<br><br>For 0.5%/1%=<br>3 significant digits +<br>1 multiplier<br><br>For jumper=blank | D=±0.5%<br>F=±1%<br>G=±2%<br>J=±5%<br>For Jumper=Blank |

### Electrical Characteristics

| Series                         | RK73B1F<br>(01005) |         | RK73B1H<br>RK73Z<br>(0201) |        | RK73H1E<br>RK73B1E<br>RK73Z<br>(0402) |                       |     | RK73H1J<br>RK73B1J<br>RK73Z<br>(0603) |                       |         | RK73H2A<br>RK73B2A<br>RK73Z<br>(0805) |          |           | RK73H2B<br>RK73B2B<br>RK73Z<br>(1206) |                        |          | RK73H2E<br>RK73B2E<br>RK73Z<br>(1210) |                        |           | RK73B2H<br>RK73Z<br>(2010) |          | RK73B3A<br>RK73Z<br>(2512) |     |  |  |  |
|--------------------------------|--------------------|---------|----------------------------|--------|---------------------------------------|-----------------------|-----|---------------------------------------|-----------------------|---------|---------------------------------------|----------|-----------|---------------------------------------|------------------------|----------|---------------------------------------|------------------------|-----------|----------------------------|----------|----------------------------|-----|--|--|--|
| Power Rating @ 70°C            | 1/32W              |         | 1/20W                      |        | 1/16W                                 |                       |     | 1/10W                                 |                       |         | 1/8W                                  |          |           | 1/4W                                  |                        |          | 1/2W<br>1/3W                          |                        |           | 3/4W                       |          | 1W                         |     |  |  |  |
| T.C.R.<br>(ppm/°C)<br>Max.     | 250                | 300     | 400                        | 200    | 100                                   | 200                   | 400 | 100                                   | 200                   | 400     | 100                                   | 200      | 400       | 100                                   | 200                    | 400      | 100                                   | 200                    | 400       | 200                        | 400      | 200                        | 400 |  |  |  |
| Resistance Range<br>E24 5% (Ω) | 6.8K-1M            | 10-6.2K | 1.0-9.1                    | 10-10M |                                       | 1.0-10M               |     |                                       | 1.0-10M               | 11M-22M |                                       | 1.0-1M   | 1.1M-22M  | 1.0-5.6M                              | 6.2M-22M               |          | 10-5.6M                               |                        | 1.0-5.6M  | 6.2M-22M                   | 1.0-5.6M | 6.2M-22M                   |     |  |  |  |
| Resistance Range<br>E96 1% (Ω) |                    |         |                            | 10-1M  | 10-1M                                 | 1.0-9.76<br>1.02M-10M |     | 10-1M                                 | 1.0-9.76<br>1.02M-10M |         | 10-1M                                 | 1.0-9.76 | 1.02M-10M | 10-1M                                 | 1.0-9.76<br>1.02M-5.6M | 5.6M-10M | 10-1M                                 | 1.0-9.76<br>1.02M-5.6M | 5.62M-10M |                            |          |                            |     |  |  |  |
| Absolute Max Working Volt      | 15V                |         | 25V                        |        | 50V                                   |                       |     |                                       |                       |         | 150V                                  |          |           | 200V                                  |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Absolute Max Overload Volt     | 30V                |         | 50V                        |        | 100V                                  |                       |     |                                       |                       |         | 300V                                  |          |           | 400V                                  |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Operating Temp Range           | -55 ~ +125°C       |         | -55 ~ +125°C               |        | -55 ~ +155°C                          |                       |     |                                       |                       |         |                                       |          |           |                                       |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Zero ohm Jumper                |                    |         |                            |        |                                       |                       |     |                                       |                       |         |                                       |          |           |                                       |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Max Continuous Current @ 70°C  | N/A                |         | 0.5A                       |        | 1.0 Amps                              |                       |     |                                       |                       |         | 2.0 Amps                              |          |           |                                       |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Max Surge Current @ 70°C       | N/A                |         | 1.0A                       |        | 2 Amp Max for < 1 second              |                       |     |                                       |                       |         | 5 Amp Max for < 1 second              |          |           | 10 Amp Max for < 1 second             |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Max Resistance                 | N/A                |         | 50MΩ                       |        |                                       |                       |     |                                       |                       |         |                                       |          |           |                                       |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |
| Operating Temp. Range          | N/A                |         | -55° ~ +125°C              |        |                                       |                       |     |                                       |                       |         |                                       |          |           |                                       |                        |          |                                       |                        |           |                            |          |                            |     |  |  |  |

### Land Pattern (mm)

| Size Code  | Component Size | A    | B    | C    | D     |
|------------|----------------|------|------|------|-------|
| 1F (01005) | 0.4x0.02       | 0.12 | 0.48 | 0.18 | 0.18  |
| 1H (0201)  | 0.6X0.3        | 0.25 | 0.7  | 0.3  | 0.225 |
| 1E (0402)  | 1.0X0.5        | 0.5  | 1.5  | 0.6  | 0.5   |
| 1J (0603)  | 1.6X0.8        | 1.0  | 2.0  | 0.6  | 0.5   |
| 2A (0805)  | 2.0X1.25       | 1.3  | 2.5  | 1.05 | 0.6   |
| 2B (1206)  | 3.2X1.6        | 2.2  | 4.0  | 1.4  | 0.9   |
| 2E (1210)  | 3.2X2.5        | 2.2  | 4.0  | 2.3  | 0.9   |
| 2H (2010)  | 5.0X2.5        | 3.3  | 6.1  | 2.3  | 1.4   |
| 3A (2512)  | 6.4X3.2        | 4.6  | 8.0  | 3.0  | 1.7   |



## Surface Mount Ultra Precision Thin Film Resistors

- Case sizes 0402, 0603, 0805, 1206
- 0.1% tolerance
- Wide range of value in stock
- RoHS compliant



| Case Size | BCC  VISHAY | DALE  VISHAY | KOA  SPEER ELECTRONICS, INC. | TFT  Thin Film Technology Corp. |
|-----------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 0402      | Tolerance: 0.1%<br>Value Range: E96<br>150Ω - 100KΩ<br>Series: MCS0402                       |                                                                                               | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: RN731E                                          |                                                                                                                    |
| 0603      | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: 2312-201                      | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: TNPW0603                       | Tolerance: 0.1%<br>Value Range: E96<br>15Ω - 150KΩ<br>Series: RN731J                                           |                                                                                                                    |
| 0805      | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: 2312-241                      | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: TNPW0805                       | Tolerance: 0.1%<br>Value Range: E96<br>15Ω - 1MΩ<br>Series: RN732A                                             | Tolerance: 0.1%<br>Value Range: E96<br>0.1% - 100Ω - 1MΩ<br>Series: CR0805E                                        |
| 1206      |                                                                                              | Tolerance: 0.1%<br>Value Range: E96<br>100Ω - 100KΩ<br>Series: TNPW1206                       | Tolerance: 0.1%<br>Value Range: E96<br>15Ω - 1MΩ<br>Series: RN732B                                             |                                                                                                                    |

See price list booklet for current price

### Surface Mount Thin Film Resistors

#### Case size 0402 0.1%

BCC-VISHAY 150Ω (MCS04020D1500BE100) through 100KΩ (MCS04020D1003BE100)  
KOA 100Ω (RN731ETTPK1000B25) through 100KΩ (RN731ETTPK1003B25)

#### Case size 0603 0.1%

BCC-VISHAY 100Ω (2312-201-71001) through 511KΩ (2312-201-75114)  
DALE-VISHAY 10Ω (TNPW060310R0BEEN) through 332KΩ (TNPW0603332KBEEN)  
KOA 15Ω (RN731JTDDK15R0B25) through 150KΩ (RN731JTDDK1503B25)  
THIN FILM TECH 100Ω (CR0603E1000B-T5) through 100KΩ (CR0603E1003B-T5)

#### Case size 0805 0.1%

BCC-VISHAY 100Ω (2312-241-71001) through 100KΩ (2312-241-71004)  
DALE-VISHAY 100Ω (TNPW0805100RBEEN) through 100KΩ (TNPW0805100KBEEN)  
KOA 15Ω (RN732ATDDK15R0B25) through 1.0MΩ (RN732ATDDK1004B25)  
THIN FILM TECH 100Ω (CR0805E1000B) through 1.0MΩ (CR0805E1004B)

#### Case size 1206 0.1%

DALE-VISHAY 100Ω (TNPW1206100RBEEN) through 332KΩ (TNPW12063323BT-9)  
KOA 100Ω (RN732BTDDK1000B25) through 100KΩ (RN732BTDDK1003B25)

**Engineering Design Kits Available**  
**See Garrett Kit Catalog**



# Surface Mount Thin Film Resistors

## 2312 Series Specifications



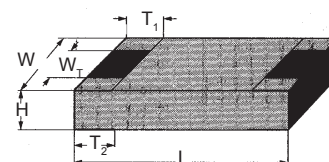
### Part Number Determination

| 2312-241-76193     |                                                       |                     |                      |                                                        |
|--------------------|-------------------------------------------------------|---------------------|----------------------|--------------------------------------------------------|
| 2312               | 241                                                   | 7                   | 619                  | 3                                                      |
| SERIES             | SIZE & TEMP COEF                                      | TOLERANCE           | RESISTANCE VALUE     | RESISTANCE DECADE                                      |
| Thin Film Resistor | 261=0402, 25ppm<br>262=0402, 15ppm<br>263=0402, 10ppm |                     |                      |                                                        |
|                    | 201=0603, 25ppm<br>202=0603, 15ppm<br>203=0603, 10ppm | 6=±0.25%<br>7=±0.1% | 3 Significant digits | 1=100 - 976<br>2=1K - 9.76K<br>3=10K - 97.6K<br>4=100K |
|                    | 241=0805, 25ppm<br>242=0805, 15ppm<br>243=0805, 10ppm |                     |                      |                                                        |

| MCS04020D1003BE100       |                              |                   |                                           |                                                                                                                                                                                                                                                                        |                     |                                                                                                       |                                 |
|--------------------------|------------------------------|-------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------|---------------------------------|
| MCS                      | 0402                         | 0                 | D                                         | 1003                                                                                                                                                                                                                                                                   | B                   | E1                                                                                                    | 00                              |
| SERIES                   | SIZE                         | SPECIAL CHARACTER | TC                                        | RESISTANCE VALUE                                                                                                                                                                                                                                                       | TOLERANCE           | PACKAGING                                                                                             | SPECIAL                         |
| MCS<br>MCT<br>MCU<br>MCA | 0402<br>0603<br>0805<br>1206 | 0 = neutral       | F=±10 ppm/K<br>E=±15 ppm/K<br>D=±25 ppm/K | 3 digits value<br>1 digit multiplier<br><br>MULTIPLIER<br>7=*10 <sup>-3</sup> 2=*10 <sup>2</sup><br>8=*10 <sup>-2</sup> 3=*10 <sup>3</sup><br>9=*10 <sup>-1</sup> 4=*10 <sup>4</sup><br>0=*10 <sup>0</sup> 5=*10 <sup>5</sup><br>1=*10 <sup>1</sup> 6=*10 <sup>6</sup> | B=±0.1%<br>C=±0.25% | E1=1K reel<br>E0=10K reel (0402 only)<br><br>P1=1K reel<br>P5=5K reel<br>PW=20K reel (0603,0805,1206) | up to 2 digits<br>00 = standard |

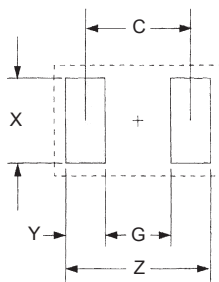
### Package Dimensions (mm)

| Series   |         | H               | L          | WT        | W          | T1             | T2             | Mass (mg) |
|----------|---------|-----------------|------------|-----------|------------|----------------|----------------|-----------|
| 2312-261 | MCS0402 | 0.32 ±0.05      | 1.0 ±0.05  | >75% of W | 0.5 ±0.05  | 0.2 +0.1/-0.15 | 0.2 ±0.1       | 0.6       |
| 2312-201 | MCT0603 | 0.45 +0.1/-0.05 | 1.55 ±0.05 | >75% of W | 0.85 ±0.1  | 0.3 +0.15/-0.2 | 0.3 +0.15/-0.2 | 1.9       |
| 2312-241 | MCU0805 | 0.45 +0.1/0.05  | 2.0 ±0.1   | >75% of W | 1.25 ±0.15 | 0.4 +0.1/-0.2  | 0.4 +0.1/-0.2  | 4.6       |

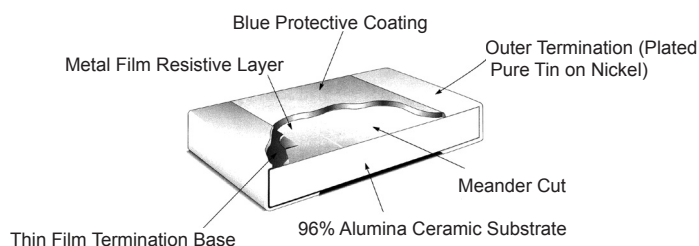


### Land Pattern (mm)

| Case Size | 0603 | 0805 |
|-----------|------|------|
| EIA Size  | 1608 | 2012 |
| Z         | 2.80 | 3.20 |
| G         | 0.60 | 0.60 |
| X         | 1.00 | 1.50 |
| Y         | 1.10 | 1.30 |
| C         | 1.70 | 1.90 |



### Construction





# Surface Mount Thin Film Resistors

## TNPW Series Specifications



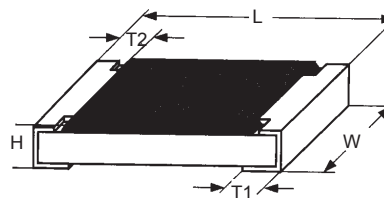
### Part Number Determination

| TNPW12061002BT-9                     |                                                      |                                     |                                         |                                               |
|--------------------------------------|------------------------------------------------------|-------------------------------------|-----------------------------------------|-----------------------------------------------|
| TNPW                                 | 1206                                                 | 1002                                | B                                       | T-9                                           |
| SERIES                               | SIZE                                                 | RESISTANCE                          | TOLERANCE                               | TEMPERATURE COEFFICIENT                       |
| Thin Film, Rectangular Chip Resistor | 0402<br>0603<br>0805<br>1206<br>1210<br>2010<br>2512 | 3 Significant digits + 1 multiplier | B=±0.1%<br>C=±0.25%<br>D=±0.5%<br>F=±1% | T1=±100ppm/°C<br>T2=±50ppm/°C<br>T9=±25ppm/°C |

| TNPW12061K32BEEN                     |                                      |                                                  |                             |                                              |                                                                                                                                                  |
|--------------------------------------|--------------------------------------|--------------------------------------------------|-----------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| TNPW                                 | 1206                                 | 1K32                                             | B                           | E                                            | EN                                                                                                                                               |
| SERIES                               | SIZE                                 | RESISTANCE                                       | TOLERANCE                   | TEMPERATURE COEFFICIENT                      | LEAD FREE PACKAGING                                                                                                                              |
| Thin Film, Rectangular Chip Resistor | 0402<br>0603<br>0805<br>1206<br>1210 | 4 digits<br>R=decimal<br>K=thousand<br>M-million | B=±0.1%<br>D=±0.5%<br>F=±1% | H=±50ppm<br>E=±25ppm<br>X=±15ppm<br>Y=±10ppm | EA=5K Paper Tape<br>EC=20K Paper Tape<br>ED=10K Paper Tape<br>EF=4K Blister Tape<br>EG=2K Blister Tape<br>EN=1K Paper Tape<br>EY=1K Blister Tape |

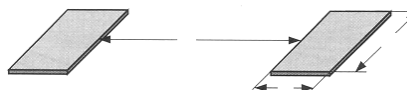
### Package Dimensions (mm)

| Series   | L        | W        | H         | T1       | T2       |
|----------|----------|----------|-----------|----------|----------|
| TNPW0603 | 1.6±0.1  | 0.85±0.1 | 0.45±0.1  | 0.3±0.20 | 0.3±0.20 |
| TNPW0805 | 2.0±0.2  | 1.24±0.2 | 0.4±0.1   | 0.4±0.25 | 0.4±0.25 |
| TNPW1206 | 3.2±0.15 | 1.6±0.15 | 0.61±0.15 | 0.5±0.25 | 0.5±0.25 |



### Land Pattern (mm)

| Case Size   | a   | b   | l   |
|-------------|-----|-----|-----|
| 0603 Reflow | 0.5 | 0.9 | 1.0 |
| 0603 Wave   | 0.9 | 0.9 | 1.0 |
| 0805 Reflow | 0.7 | 1.3 | 1.2 |
| 0805 Wave   | 0.9 | 1.3 | 1.3 |
| 1206 Reflow | 0.9 | 1.7 | 2.0 |
| 1206 Wave   | 1.1 | 1.7 | 2.3 |





# Surface Mount Thin Film Resistors

## RN73 Series Specifications



### Part Number Determination

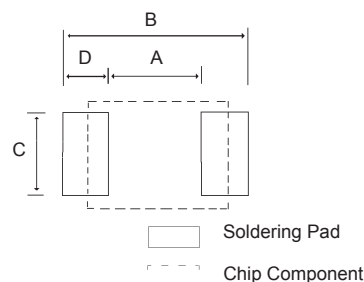
| RN732ATTDK1002B25                  |                                                     |                                      |                                                                                                                                                                                                     |                                     |                                                     |                                                                          |
|------------------------------------|-----------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------|
| RN73                               | 2A                                                  | T                                    | TDK                                                                                                                                                                                                 | 1002                                | B                                                   | 25                                                                       |
| SERIES                             | SIZE                                                | TERMINATION                          | PACKAGING                                                                                                                                                                                           | RESISTANCE                          | TOLERANCE                                           | TEMPERATURE COEFFICIENT                                                  |
| Ultra Precision Thin Film Resistor | 1E=0402<br>1J=0603<br>2A=0805<br>2B=1206<br>2E=1210 | L=SnPb (Tin/Lead)<br>T=Sn (100% Tin) | TP=2mm pitch, punch paper (0402 & 0603 only)<br>TD=7" paper tape (5000/reel)<br>TDK=7" paper tape (1000/reel)<br>TDD=10" paper tape<br>TE=7" embossed plastic tape<br>TED=10" embossed plastic tape | 3 significant digits + 1 multiplier | A=±0.05%<br>B=±0.1%<br>C=±0.25%<br>D=±0.5%<br>F=±1% | 05=5ppm/°C<br>10=10ppm/°C<br>25=25ppm/°C<br>50=50ppm/°C<br>100=100ppm/°C |

### Electrical Characteristics

| Part Series Size | Power Rating @ 70°C | TCR (ppm/°C) | Resistance Range E-96 | Working Voltage max | Overload Voltage max | Operating Temp Range |
|------------------|---------------------|--------------|-----------------------|---------------------|----------------------|----------------------|
| RN731E (0402)    | 1/16W               | ±25          | 100Ω-100KΩ            | 25V                 | 50V                  | -55°C +125°C         |
| RN731J (0603)    | 1/16W               |              | 15Ω-150KΩ             | 50V                 | 100V                 |                      |
| RN732A (0805)    | 1/10W               |              | 15Ω-1MΩ               | 100V                | 200V                 |                      |
| RN732B (1206)    | 1/8W                |              | 15Ω-1MΩ               | 150V                | 300V                 |                      |

### Land Pattern (mm)

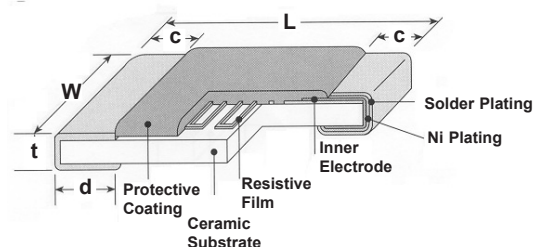
| Size Code | Component Size | A   | B   | C   | D   |
|-----------|----------------|-----|-----|-----|-----|
| 1E (0402) | 1.0X0.5        | 0.5 | 1.5 | 0.6 | 0.5 |
| 1J (0603) | 1.6X0.8        | 0.8 | 2.6 | 0.8 | 0.9 |
| 2A (0805) | 2.0X1.25       | 1.2 | 3.0 | 1.2 | 0.9 |
| 2B (1206) | 3.2X1.6        | 2.2 | 4.2 | 1.5 | 1.0 |



### Package Dimensions (in/mm)

| Size Code | L                                | W                       | c                      | d                                | t                        |
|-----------|----------------------------------|-------------------------|------------------------|----------------------------------|--------------------------|
| 1E (0402) | .039±.004-.002<br>(1.0±0.1-0.05) | .021±.002<br>(0.5±0.05) | .008±.004<br>(0.2±0.1) | .01±.002-.004<br>(0.25±0.05-0.1) | .014±.002<br>(0.35±0.05) |
| 1J (0603) | .063±.008<br>(1.6±.02)           | .031±.004<br>(0.8±0.1)  | .012±.004<br>(0.3±0.1) | .012±.004<br>(0.3±0.1)           | .018±.004<br>(0.45±0.1)  |
| 2A (0805) | .079±.008<br>(2.0±0.2)           | .049±.004<br>(1.25±0.1) | .016±.008<br>(0.4±0.2) | .012±.008-.004<br>(0.3±0.2-0.1)  | .02±.004<br>(0.5±0.1)    |
| 2B (1206) | .126±.008<br>(3.2±0.2)           | .063±.008<br>(1.6±0.2)  | .02±.012<br>(0.5±0.2)  | .016±.008-.004<br>(0.4±0.2-0.1)  | .024±.004<br>(0.6±0.1)   |

### Construction





## Surface Mount Thin Film Resistors

### CR Series Specifications

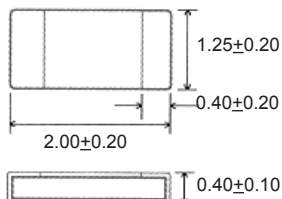


#### Part Number Determination - 0805 0.1%

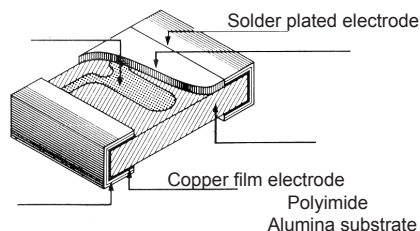
| RR1220P1152B - OLD PART NUMBER |                                                                                                |                                            |                                                                                                              |                   |                                       |
|--------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------|
| RR                             | 1220                                                                                           | P                                          | 1152                                                                                                         | B                 | C                                     |
| SERIES                         | CASE SIZE                                                                                      | TEMPERATURE COEFFICIENT                    | RESISTANCE                                                                                                   | TOLERANCE         | Termination                           |
| RR                             | 0306=0201<br>0510=0402<br>0816=0603<br>1220=0805*<br>1632=1206<br>2632=1210<br><br>*stock item | P=±25ppm/°C<br>Q=±50ppm/°C<br>R=±100ppm/°C | 2 Significant digits + 1 multiplier for E24 values<br><br>3 Significant digits + 1 multiplier for E96 values | B=±0.1%<br>D=±0.5 | Blank=Std Termination<br>C= Lead Free |

| CR0805E1152B - NEW PART NUMBER |                              |                                                                         |                                                                                                              |                                            |                                                                    |
|--------------------------------|------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------|
| CR                             | 0805                         | E                                                                       | 1152                                                                                                         | B                                          | T1                                                                 |
| SERIES                         | CASE SIZE                    | TEMPERATURE COEFFICIENT                                                 | RESISTANCE                                                                                                   | TOLERANCE                                  | Packaging                                                          |
| CR                             | 0402<br>0603<br>0805<br>1206 | M=±5ppm/°C<br>Y=±10ppm/°C<br>E=±25ppm/°C<br>Q=±50ppm/°C<br>R=±100ppm/°C | 2 Significant digits + 1 multiplier for E24 values<br><br>3 Significant digits + 1 multiplier for E96 values | Q=±0.02%<br>A=±0.05%<br>B=±0.1%<br>D=±0.5% | T1=1000 Piece Reel<br>T5=5,000 Piece Reel<br>T10=10,000 Piece Reel |

#### Package Dimensions (mm)



#### Construction



# TOCOS<sup>®</sup> AMERICA INC.

## Surface Mount Trimming Potentiometers

- Sealed cermet trimmers, (sealed to withstand immersion cleaning processes)
- Meets EIA, EIAJ, IPC, VECI standard SMD trimmer design
- Wide range of values and configurations in stock
- RoHS compliant

| Series | Size   | Turns | Configuration     | Page |
|--------|--------|-------|-------------------|------|
| G32    | 3mm sq | 1     | Gull-Wing, J-Hook |      |
| G43    | 4mm sq | 1     | Gull-Wing, J-Hook |      |
| GV4    | 4mm sq | 12    | J-Hook            |      |

See price list booklet for current price

### Surface Mount Trimming Potentiometers

TOCOS G32 Series: 50 $\Omega$  (G32BTB500M) through 2.0M $\Omega$  (G32ATB205M)

TOCOS G43 Series: 100 $\Omega$  (G43BTB101M) through 2.0M $\Omega$  (G43BTB205M)

TOCOS GV4 Series: 10 $\Omega$  (GV4WTB100-K) through 2.0M $\Omega$  (GV4WTB205-K)

**Engineering Design Kits Available**  
**See Garrett Kit Catalog**

# TOCOS<sup>®</sup> AMERICA INC. Surface Mount Trimming Potentiometers

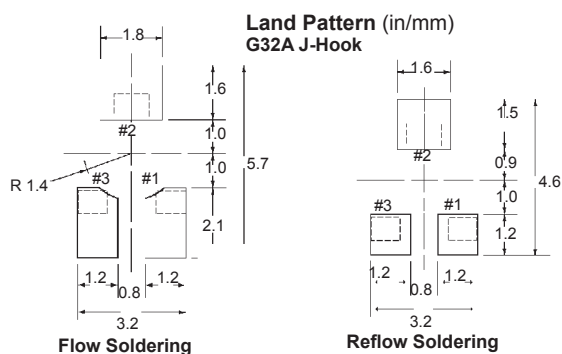
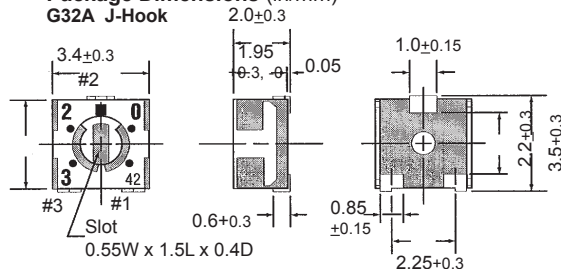


## G32 Series Specifications

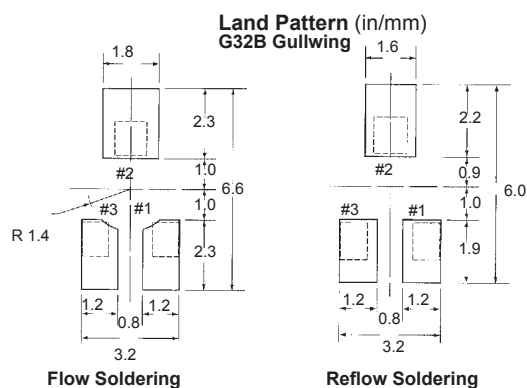
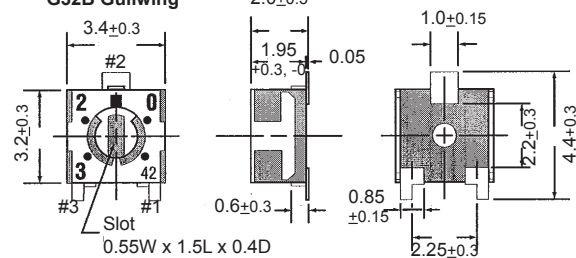
### Part Number Determination

| G32ATB102M                            |                                                       |                         |                             |                  |                                                                              |           |
|---------------------------------------|-------------------------------------------------------|-------------------------|-----------------------------|------------------|------------------------------------------------------------------------------|-----------|
| G32                                   | 1                                                     | A                       | T                           | B                | 102                                                                          | M         |
| SERIES                                | ADJUSTMENT SLOT                                       | TERMINATION STYLE       | PACKAGING                   | RESISTANCE TAPER | RESISTANCE                                                                   | TOLERANCE |
| G32=3mm Sq.<br>1-Turn, RoHS Compliant | 1=Cross-Slot<br>Automatic Adjust<br>Blank=Single-Slot | A=J-Hook<br>B=Gull-Wing | T=Tape & Reel<br>Blank=Bulk | B=Linear         | 2 Significant Digits + Multiplier<br><br>100=10ohm<br>102=1Kohm<br>105=1Mohm | M=±20%    |

**Package Dimensions (in/mm)**  
**G32A J-Hook**



**Package Dimensions (in/mm)**  
**G32B Gullwing**



**Schematic**



**Value/ Part Number Code**

| Value (ohms) | 50  | 100 | 200 | 500 | 1K  | 2K  | 5K  | 10K | 20K | 50K | 100K | 200K | 500K | 1M  | 2M  |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|
| Part # code  | 500 | 101 | 201 | 501 | 102 | 202 | 502 | 103 | 203 | 503 | 104  | 204  | 504  | 105 | 205 |

# TOCOS<sup>®</sup> AMERICA INC. Surface Mount Trimming Potentiometers



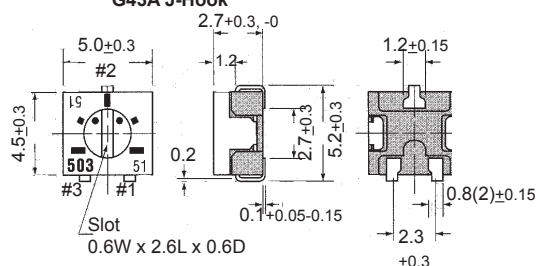
## G43 Series Specifications

### Part Number Determination

| G43ATB102M                            |                                                       |                         |                             |                  |                                                                              |           |
|---------------------------------------|-------------------------------------------------------|-------------------------|-----------------------------|------------------|------------------------------------------------------------------------------|-----------|
| G43                                   | 1                                                     | A                       | T                           | B                | 102                                                                          | M         |
| SERIES                                | ADJUSTMENT SLOT                                       | TERMINATION STYLE       | PACKAGING                   | RESISTANCE TAPER | RESISTANCE                                                                   | TOLERANCE |
| G43=4mm Sq.<br>1-Turn, RoHS Compliant | 1=Cross-Slot<br>Automatic Adjust<br>Blank=Single-Slot | A=J-Hook<br>B=Gull-Wing | T=Tape & Reel<br>Blank=Bulk | B=Linear         | 2 Significant Digits + Multiplier<br><br>100=10ohm<br>102=1Kohm<br>105=1Mohm | M=±20%    |

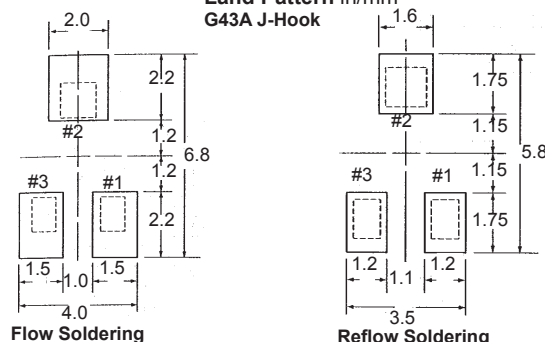
### Package Dimensions in/mm

#### G43A J-Hook



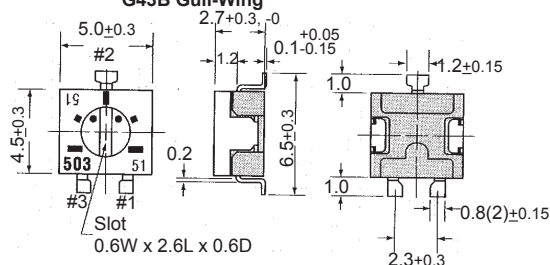
### Land Pattern in/mm

#### G43A J-Hook



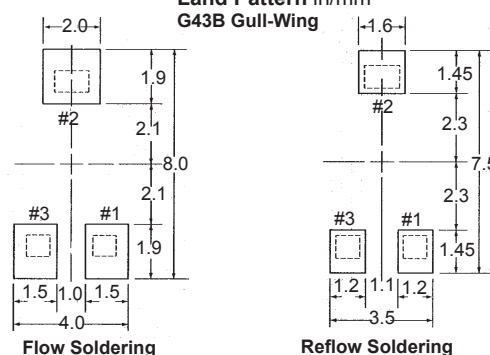
### Package Dimensions in/mm

#### G43B Gull-Wing



### Land Pattern in/mm

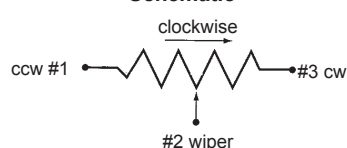
#### G43B Gull-Wing



### Standard Markings Outside Positions



### Schematic



### Value/ Part Number Code

| Value (ohms) | 100 | 200 | 500 | 1K  | 2K  | 5K  | 10K | 20K | 50K | 100K | 200K | 500K | 1M  | 2M  |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|
| Part # code  | 101 | 201 | 501 | 102 | 202 | 502 | 103 | 203 | 503 | 104  | 204  | 504  | 105 | 205 |

# TOCOS<sup>®</sup> AMERICA INC. Surface Mount Trimming Potentiometers

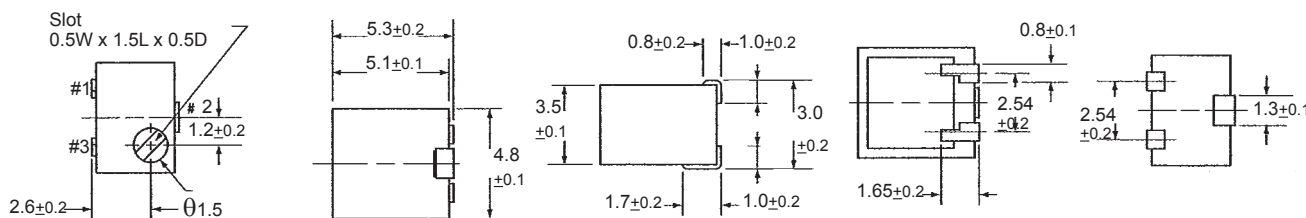


## GV4 Series Specifications

### Part Number Determination

| GV4WTB102K              |                                                                           |                             |                  |                                                                              |           |
|-------------------------|---------------------------------------------------------------------------|-----------------------------|------------------|------------------------------------------------------------------------------|-----------|
| GV4                     | W                                                                         | T                           | B                | 102                                                                          | K         |
| SERIES                  | TERMINATION STYLE                                                         | PACKAGING                   | RESISTANCE TAPER | RESISTANCE                                                                   | TOLERANCE |
| GV4=4mm Sq. Multi-Turn, | W=J-Hook, Top Adjust<br>J=J-Hook, Side Adjust<br>G=Gull-Wing, Side Adjust | T=Tape & Reel<br>Blank=Bulk | B=Linear         | 2 Significant Digits + Multiplier<br><br>100=10ohm<br>102=1Kohm<br>105=1Mohm | K=±10%    |

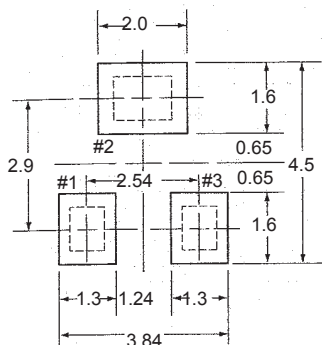
### Package Dimensions (in/mm)



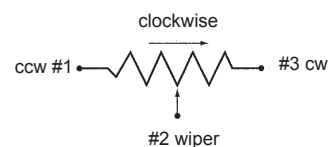
### Electrical Characteristics

| Part No.   | Maximum Input Ratings |                       |
|------------|-----------------------|-----------------------|
|            | Maximum Wiper Current | Maximum Input Voltage |
| GV4WTB100K | 100.00                | 1.00                  |
| GV4WTB200K | 100.00                | 2.00                  |
| GV4WTB500K | 70.7                  | 3.53                  |
| GV4WTB101K | 50.0                  | 5.00                  |
| GV4WTB201K | 35.4                  | 7.07                  |
| GV4WTB501K | 22.4                  | 11.18                 |
| GV4WTB102K | 15.8                  | 15.80                 |
| G4VWTB202K | 11.2                  | 22.36                 |
| GV4WTB502K | 7.07                  | 35.35                 |
| GV4WTB103K | 5.00                  | 50.00                 |
| GV4WTB203K | 3.54                  | 70.70                 |
| GV4WTB503K | 2.24                  | 111.8                 |
| GV4WTB104K | 1.58                  | 158.11                |
| GV4WTB204K | 1.00                  | 223.60                |
| GV4WTB504K | .40                   | 300.00                |
| GV4WTB105K | .20                   | 300.00                |
| GV4WTB205K | .10                   | 300.00                |

### Land Pattern (in/mm)



### Schematic



### Value/ Part Number Code

| Value (ohms) | 10  | 20  | 50  | 100 | 200 | 500 | 1K  | 2K  | 5K  | 10K | 20K | 50K | 100K | 200K | 500K | 1M  | 2M  |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|
| Part # code  | 100 | 200 | 500 | 101 | 201 | 501 | 102 | 202 | 502 | 103 | 203 | 503 | 104  | 204  | 504  | 105 | 205 |