

## GENERAL DESCRIPTION

KYOCERA AVX's new Q-Bridge Thermal Conductor is manufactured with the highest quality materials for reliable and repeatable performance providing a cost effective thermal management solution. These devices are constructed with Aluminum Nitride (AlN) or Beryllium Oxide (BeO) and are available in standard EIA form factors.

Q-Bridge provides the designer with the ability to manage thermal conditions by directing heat to a thermal ground plane, heat sink or any other specific thermal point of interest. The inherently low capacitance makes this device virtually transparent at RF/microwave frequencies. This device has the added benefit of offering additional layers of protection to adjacent components from hot spot thermal loads.

Q-Bridge provides the benefit of increased overall circuit reliability. KYOCERA AVX's Q-Bridge is manufactured using one-piece construction, providing a RoHS compliant SMT package that is fully compatible with high speed automated pick-and-place processing. It is available in multiple different EIA case sizes. Custom configurations are also available.

## FEATURES

- High Thermal Conductivity
- Low Thermal Resistance
- Low Capacitance
- Increases Circuit Reliability
- RoHS Compliant
- More efficient thermal management

## APPLICATIONS

- GaN Power Amplifiers
- High RF Power Amplifiers
- Filters
- Synthesizers
- Industrial Computers
- Switch Mode Power Supplies
- Pin & Laser Diodes
- LNA

## FUNCTIONAL APPLICATIONS

- Between active device and adjacent ground planes
- Specific contact pad to case
- Contact pad to contact pad
- Direct component contact to via pad or trace
- Edges fully metalized

## HOW TO ORDER

**QB 0603 A 25 W T T**

**Q-Bridge** —————

**Case Size** —————  
Please see 'Case Size' Column of Typical Characteristics Table Below

**Substrate** —————  
A = AlN  
B = BeO

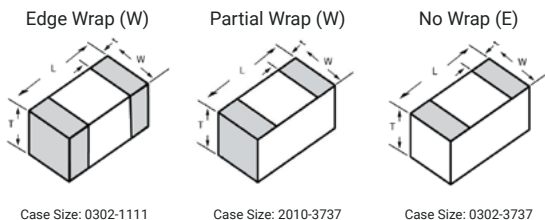
**Thickness (mils)** —————  
The above part number refers to a Q-Bridge, (EIA case size 0603), Aluminum Nitride Substrate, Thickness 25 mils., Style W, Y Termination (Silver Platinum Non-Magnetic Termination), with Tape and Reel Packaging.

**Packaging** —————  
T = 1000pcs., 7" reel  
T\500 = 500pcs., 7" reel  
C = Matrix Tray

**Termination** —————  
T = Tin/Nickel Finish  
Y = Silver Palladium (Non-Mag)  
S = Silver over Nickel Termination  
J = 60Sn/40Pb Solder Plated over Nickel

**Style** —————  
W = Edge Wrap  
E = No Wrap

## MECHANICAL CONFIGURATIONS



Note:

Non-edge wrapped style in all case sizes is supplied with S termination.  
Edge wrapped style in case sizes 0302 through 1111 is supplied with Y, T, J termination, with a full edge wrap.  
Edge wrapped style in case sizes 2010 through 3737 are supplied with S termination, with a partial edge wrap

## TERMINATION MATERIALS

| Termination Code | Termination Materials               |                    |
|------------------|-------------------------------------|--------------------|
| T                | Tin/Nickel Finish                   | RoHS Compliant     |
| Y                | Silver Palladium (Non-Mag)          | RoHS Compliant     |
| S                | Silver over Nickel Termination      | RoHS Compliant     |
| J                | 60Sn/40Pb Solder Plated over Nickel | Not RoHS Compliant |

## TYPICAL CHARACTERISTICS Inches (mm)

| Case Size | Length (L)                      | Width (W)                       | Thickness (T)         | Terminal (t)    | Voltage Rating (V) | Thermal Resistance (°C/W) |     | Thermal Conductivity (mW/°C) |     | Available Configurations |             |
|-----------|---------------------------------|---------------------------------|-----------------------|-----------------|--------------------|---------------------------|-----|------------------------------|-----|--------------------------|-------------|
|           |                                 |                                 |                       |                 |                    | AlN                       | BeO | AlN                          | BeO | Style                    | Termination |
| 0302      | 0.030 ± 0.004<br>(0.77 ± 0.102) | 0.020 ± 0.004<br>(0.51 ± 0.102) | 0.02<br>(0.51 ± .05)  | 0.01<br>(0.25)  | 100                | 19                        | 12  | 53                           | 81  | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 0402      | 0.040 ± 0.004<br>(1.02 ± 0.102) | 0.020 ± 0.004<br>(0.51 ± 0.102) | 0.02<br>(0.51 ± .05)  | 0.01<br>(0.25)  | 200                | 25                        | 16  | 40                           | 61  | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 0505      | 0.050 ± 0.006<br>(1.27 ± 0.152) | 0.050 ± 0.006<br>(1.27 ± 0.152) | 0.025<br>(0.64 ± .05) | 0.015<br>(0.38) | 250                | 10                        | 7   | 100                          | 153 | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 0603      | 0.060 ± 0.006<br>(1.52 ± 0.152) | 0.030 ± 0.006<br>(0.77 ± 0.152) | 0.025<br>(0.64 ± .05) | 0.015<br>(0.38) | 250                | 20                        | 13  | 50                           | 76  | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 0805      | 0.080 ± 0.008<br>(2.03 ± 0.203) | 0.050 ± 0.008<br>(1.27 ± 0.203) | 0.04<br>(1.02 ± .05)  | 0.02<br>(0.51)  | 250                | 10                        | 7   | 100                          | 153 | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 1005      | 0.100 ± 0.008<br>(2.54 ± 0.203) | 0.050 ± 0.008<br>(1.27 ± 0.203) | 0.04<br>(1.02 ± .05)  | 0.02<br>(0.51)  | 500                | 13                        | 8   | 77                           | 122 | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 1020      | 0.100 ± 0.008<br>(2.54 ± 0.203) | 0.200 ± 0.008<br>(5.08 ± 0.203) | 0.04<br>(1.02 ± .05)  | 0.02<br>(0.51)  | 500                | 3                         | 2   | 320                          | 508 | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 1111      | 0.110 ± 0.008<br>(2.79 ± 0.203) | 0.110 ± 0.008<br>(2.79 ± 0.203) | 0.04<br>(1.02 ± .05)  | 0.02<br>(0.51)  | 500                | 7                         | 4   | 153                          | 240 | W                        | Y, T, J     |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 2010      | .195 ± .010<br>(4.95 ± .254)    | .095 ± .010<br>(2.41 ± .254)    | 0.06<br>(1.52 ± .05)  | 0.03<br>(0.77)  | 2000               | 10                        | 6   | 100                          | 159 | W                        | S           |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 2525      | .240 ± .010<br>(6.10 ± .254)    | .250 ± .010<br>(6.35 ± .254)    | 0.06<br>(1.52 ± .05)  | 0.04<br>(1.02)  | 3000               | 4                         | 3   | 240                          | 380 | W                        | S           |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 3725      | .370 ± .010<br>(9.40 ± .254)    | .245 ± .010<br>(6.22 ± .254)    | 0.06<br>(1.52 ± .05)  | 0.05<br>(1.27)  | 4000               | 6                         | 4   | 160                          | 254 | W                        | S           |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |
| 3737      | .365 ± .010<br>(9.27 ± .254)    | .375 ± .010<br>(9.53 ± .254)    | 0.06<br>(1.52 ± .05)  | 0.05<br>(1.27)  | 4000               | 4                         | 3   | 240                          | 380 | W                        | S           |
|           |                                 |                                 |                       |                 |                    |                           |     |                              |     | E                        | S           |

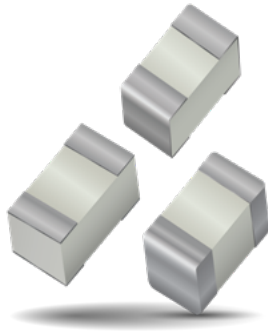
Note: Thermal conductivity is normalized to chip size. All values are approximate. Consult factory for extended thermal conductivity options.

## CAPACITANCE

| Case Size | Part Number      | Capacitance (pF) | Case Size | Part Number     | Capacitance (pF) |
|-----------|------------------|------------------|-----------|-----------------|------------------|
| 0302      | QB0302A20WY/T/J  | 0.039            | 1020      | QB1020A40WY/T/J | 0.204            |
|           | QB0302A20ES      | 0.011            |           | QB1020A40ES     | 0.121            |
|           | QB0302B20WY/T/J  | 0.028            |           | QB1020B40WY/T/J | 0.158            |
|           | QB0302B20ES      | 0.006            |           | QB1020B40ES     | 0.092            |
| 0402      | QB0402A20WY/T/J  | 0.028            | 1111      | QB1111A40WY/T/J | 0.096            |
|           | QB0402A20ES      | 0.018            |           | QB1111A40ES     | 0.042            |
|           | QB0402B20WY/T/J  | 0.025            |           | QB1111B40WY/T/J | 0.078            |
|           | QB0402B20ES      | 0.009            |           | QB1111B40ES     | 0.031            |
| 0505      | QB0505A25WY/T/J  | 0.070            | 2010      | QB2010A60WS     | 0.070            |
|           | QB0505A25ES      | 0.032            |           | QB2010A60ES     | 0.042            |
|           | QB0505B25WY/T/J  | 0.061            |           | QB2010B60WS     | 0.055            |
|           | QB0505B25ES      | 0.027            |           | QB2010B60ES     | 0.086            |
| 0603      | QB0603A25/WY/T/J | 0.035            | 2525      | QB2525A60WS     | 0.156            |
|           | QB0603A25ES      | 0.007            |           | QB2525A60ES     | 0.114            |
|           | QB0603B25WY/T/J  | 0.029            |           | QB2525B60WS     | 0.122            |
|           | QB0603B25ES      | 0.007            |           | QB2525B60ES     | 0.075            |
| 0805      | QB0805A40WY/T/J  | 0.081            | 3725      | QB3725A60WS     | 0.105            |
|           | QB0805A40ES      | 0.018            |           | QB3725A60ES     | 0.076            |
|           | QB0805B40WY/T/J  | 0.055            |           | QB3725B60WS     | 0.080            |
|           | QB0805B40ES      | 0.015            |           | QB3725B60ES     | 0.058            |
| 1005      | QB1005A40WY/T/J  | 0.046            | 3737      | QB3737A60W      | 0.164            |
|           | QB1005A40ES      | 0.008            |           | QB3737A60ES     | 0.130            |
|           | QB1005B40WY/T/J  | 0.038            |           | QB3737B60WS     | 0.126            |
|           | QB1005B40ES      | 0.007            |           | QB3737B60ES     | 0.099            |

# Q Bridge Thermal Conductor

## Application Notes



### GENERAL APPLICATION

Specific applications require certain materials for best use conditions. Non-Magnetic applications are some of the leading examples with the strictest restraints. To accommodate all designs, KYOCERA AVX's Q-Bridge offers magnetic and non-magnetic termination styles.

Additionally, the requirements for the component attachment method will differ depending on the application. Magnetic applications have less constraints and will typically use solder attachment. Nonmagnetic applications will require conductive epoxy as an alternative attachment method.

The purpose of this app note is to look at the different attachment methods for Q-Bridge's magnetic and non-magnetic termination.

### TERMINATION OPTIONS

#### Magnetic Terminations

- Silver Over Magnetic Termination (S Option)
- Tin Plated Over Nickel Over Silver Platinum (T Option)

#### Non-Magnetic Termination

- Silver Platinum: Non-Magnetic Termination (Y Option)

### RECOMMENDED ATTACHMENT

#### S & T Termination Option

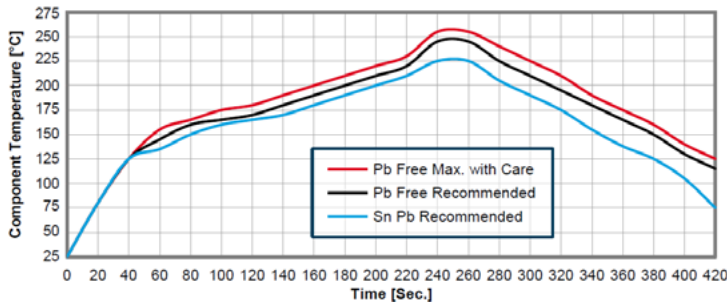
- Best Use Attachment Method: Solder

#### Y Termination Option

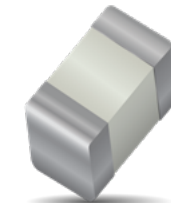
- Best Use Attachment Method: Epoxy
- Alternative Attachment: Solder (Requires Additional Solder)

### RECOMMENDED SOLDER PROFILE

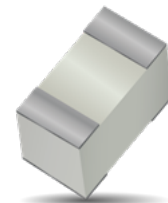
Recommended Reflow Profiles



### WRAP STYLE OPTIONS



Edge Wrap: Option W

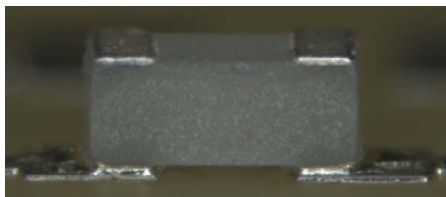


No Wrap: Option E

### RECOMMENDED SOLDER PROFILE: S & T TERMINATION

- Mounted and Soldered Using 96.5% Sn, 3.0% Ag, 0.5% Cu Solder
- Had Solder Wetting

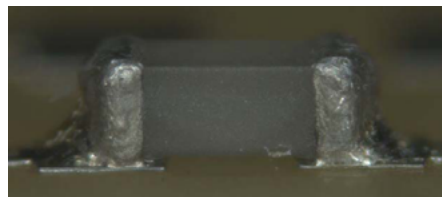
#### QB0603A25ES: S TERMINATION, NON-WRAP



FRONT VIEW

SIDE VIEW

#### QB0603A25WT: T TERMINATION, EDGE WRAP



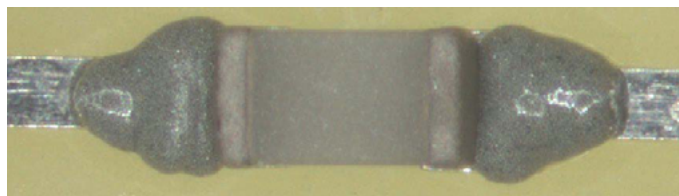
FRONT VIEW

SIDE VIEW

### RECOMMENDED SOLDER PROFILE: Y TERMINATION, EDGE WRAP

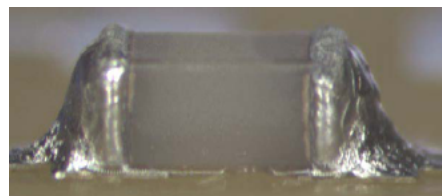
- Mounted and Soldered Using 96.5% Sn, 3.0% Ag, 0.5% Cu Solder
- Additional Solder was Used

#### QB0603A25WY: BEFORE REFLOW



TOP VIEW

#### QB0603A25WY: AFTER REFLOW



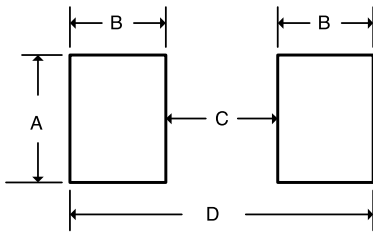
FRONT VIEW

SIDE VIEW

# Q Bridge Thermal Conductor

## Application Notes

### SUGGESTED FOOTPRINT



| Case Size | A Min.           | B Min.          | C Min.           | D Min.           |
|-----------|------------------|-----------------|------------------|------------------|
| 0302      | 0.0216<br>(0.55) | 0.02<br>(0.51)  | 0.01<br>(0.25)   | 0.05<br>(1.27)   |
| 0402      | 0.0216<br>(0.55) | 0.02<br>(0.51)  | 0.0197<br>(0.50) | 0.06<br>(1.52)   |
| 0505      | 0.0512<br>(1.3)  | 0.0275<br>(0.7) | 0.02<br>(0.5)    | 0.075<br>(1.9)   |
| 0603      | 0.0315<br>(0.8)  | 0.0275<br>(0.7) | 0.0275<br>(0.7)  | 0.0825<br>(2.1)  |
| 0805      | 0.0512<br>(1.3)  | 0.039<br>(1)    | 0.039<br>(1)     | 0.118<br>(3)     |
| 1005      | 0.0512<br>(1.3)  | 0.039<br>(1)    | 0.059<br>(1.5)   | 0.138<br>(3.5)   |
| 1020      | 0.212<br>(5.4)   | 0.039<br>(1)    | 0.059<br>(1.5)   | 0.138<br>(3.5)   |
| 1111      | 0.118<br>(3)     | 0.039<br>(1)    | 0.063<br>(1.6)   | 0.142<br>(3.6)   |
| 2010      | 0.118<br>(3)     | 0.059<br>(1.5)  | 0.126<br>(3.2)   | 0.244<br>(6.2)   |
| 2525      | 0.252<br>(6.4)   | 0.079<br>(2)    | 0.15<br>(3.81)   | 0.3075<br>(7.81) |
| 3725      | 0.252<br>(6.4)   | 0.1<br>(2.54)   | 0.266<br>(6.75)  | 0.466<br>(11.83) |
| 3737      | 0.386<br>(9.8)   | 0.1<br>(2.54)   | 0.266<br>(6.75)  | 0.466<br>(11.83) |

Recommend max filled via density for your board in the pad of the Q Bridge going to ground/heat sync

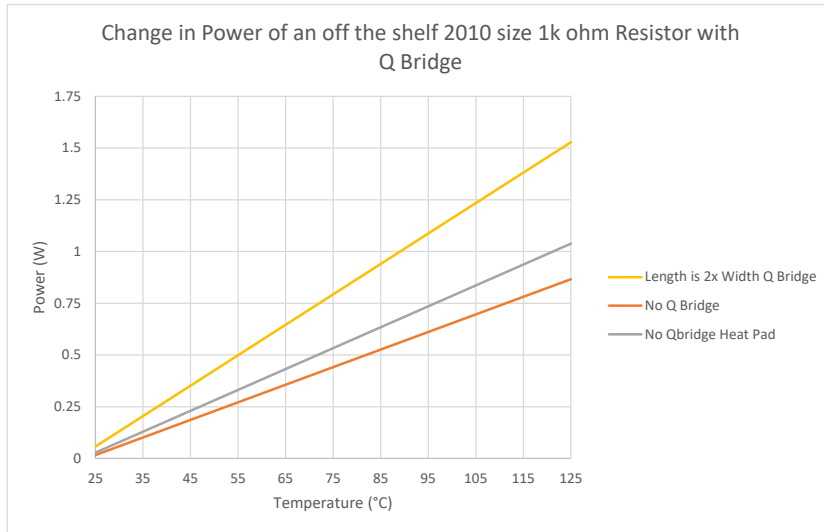
# Q Bridge Thermal Conductor

## Application Notes

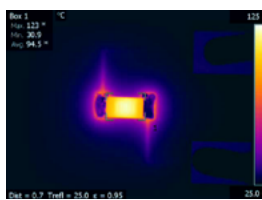
### RECOMMENDED Q BRIDGE SIZING

For optimal results in power handling we recommend using a Q Bridge that matches the component footprint that you are attempting to pull heat away from for a standard surface mount component. For a device that has pins that you are attempting to remove heat from, the suggested Q Bridge would match the width of the Q Bridge with the length of the pad for those pins.

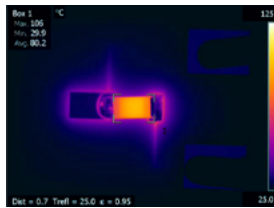
### MEASURED Q BRIDGE PERFORMANCE



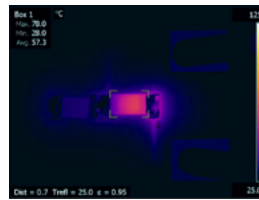
Test performed at room temperature (25C) with resistor mounted on test board as baseline, using a metal pad heat sync of the same board space required for a Q Bridge, and the Q Bridge that matches the footprint of the resistor itself



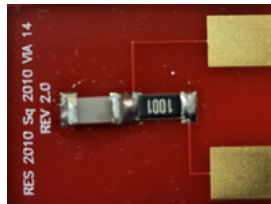
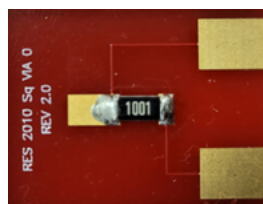
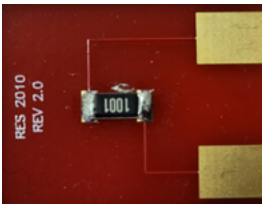
Resistor without any added heat removal, power output 841mW



Resistor with added metal heat sync, power output 841mW



Resistor with added 2010 Q Bridge, power output 841mW



# Mouser Electronics

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