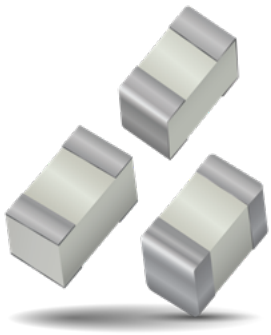
Q Bridge Thermal Conductor



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-andplace 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)

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

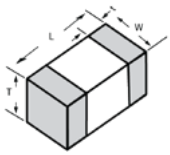
Termination
T = Tin/Nickel Finish
Y = Silver Palladium (Non-Mag)
S = Silver over Nickel Termination
J = 60Sn/40Pb Solder Plated over Nickel

Style
W = Edge Wrap
E = No Wrap

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.

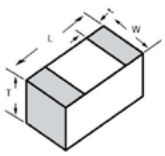
MECHANICAL CONFIGURATIONS

Edge Wrap (W)



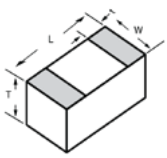
Case Size: 0302-1111

Partial Wrap (W)



Case Size: 2010-3737

No Wrap (E)



Case Size: 0302-3737

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

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

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

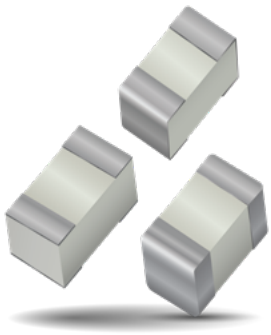
Note: Thermal conductivity is normalized to chip size. All values are approximate. Consult factory for extended thermal conductivity options.

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

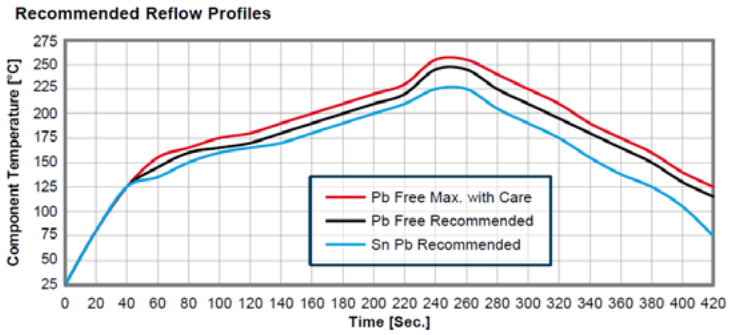
S & T Termination Option

- Best Use Attachment Method: Solder

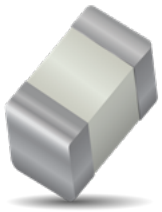
Y Termination Option

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

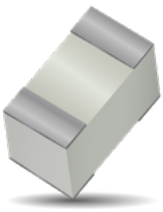
RECOMMENDED SOLDER PROFILE



WRAP STYLE OPTIONS



Edge Wrap: Option W

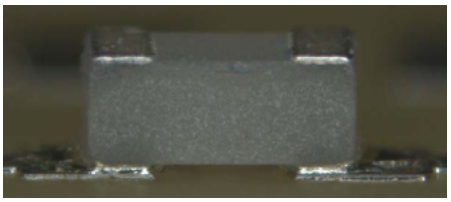


No Wrap: Option E

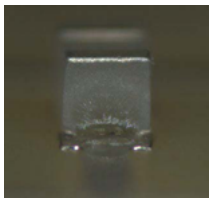
RECOMMENDED SOLDER PROFILE: S & T TERMINATION

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

QB0603A25ES: S TERMINATION, NON-WRAP

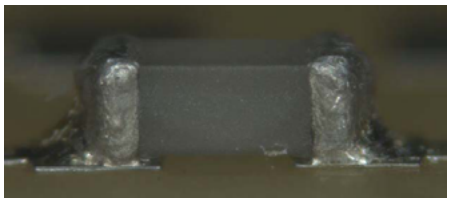


FRONT VIEW



SIDE VIEW

QB0603A25WT: T TERMINATION, EDGE WRAP



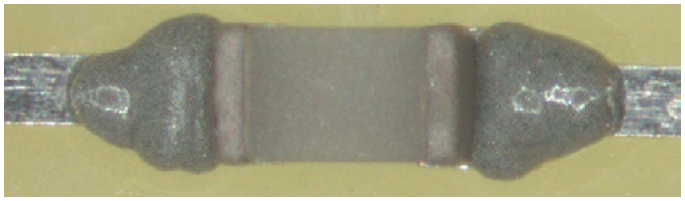
FRONT VIEW

SIDE VIEW

RECOMMENDED SOLDER PROFILE: Y TERMINATION, EDGE WRAP

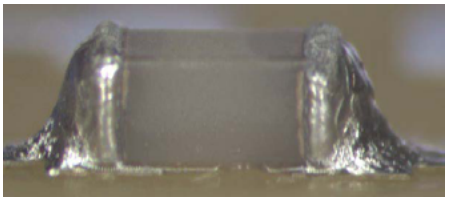
- Mounted and Soldered Using 96.5% Sn, 3.0% Ag, 0.5% Cu Solder
- Additional Solder was Used

QB0603A25WY: BEFORE REFLOW



TOP VIEW

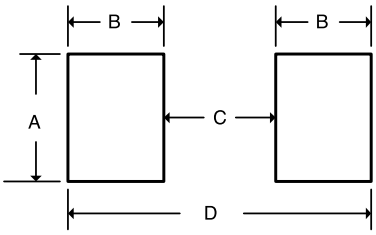
QB0603A25WY: AFTER REFLOW



FRONT VIEW

SIDE VIEW

SUGGESTED FOOTPRINT



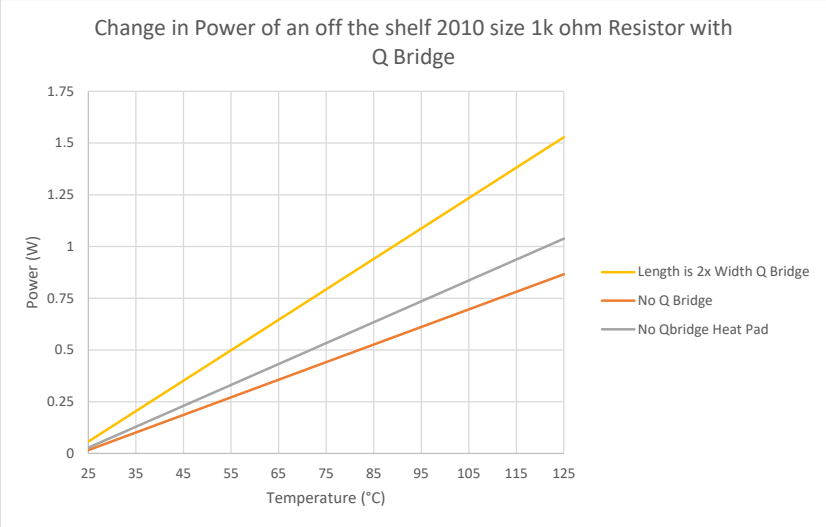
Case Size	A Min.	B Min.	C Min.	D Min.
0302	0.0216 (0.55)	0.02 (0.51)	0.01 (0.25)	0.05 (1.27)
0402	0.0216 (0.55)	0.02 (0.51)	0.0197 (0.50)	0.06 (1.52)
0505	0.0512 (1.3)	0.0275 (0.7)	0.02 (0.5)	0.075 (1.9)
0603	0.0315 (0.8)	0.0275 (0.7)	0.0275 (0.7)	0.0825 (2.1)
0805	0.0512 (1.3)	0.039 (1)	0.039 (1)	0.118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

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

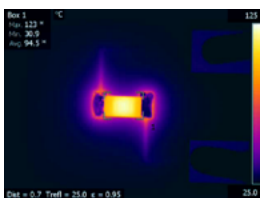
RECOMMENDED Q BRIDGE SIZING

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.

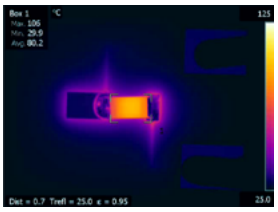
MEASURED Q BRIDGE PERFORMANCE



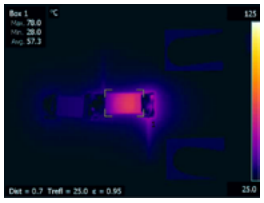
Test performed at room temperature (25C) with resistor mounted on test board as baseline, using a metal pad heat sync of the same board space required for a Q Bridge, and the Q Bridge that matches the footprint of the resistor itself



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