

# ATC Q-Bridge Thermal Conductor Application Note

## Q-Bridge Basics

ATC's Q-Bridge is an elegant and simple solution for thermal management. It is designed to effectively channel heat away from critical circuit components. These devices are an excellent solution for RF PA's, hand held radios, industrial computers, block converters and other applications with stringent thermal requirements.

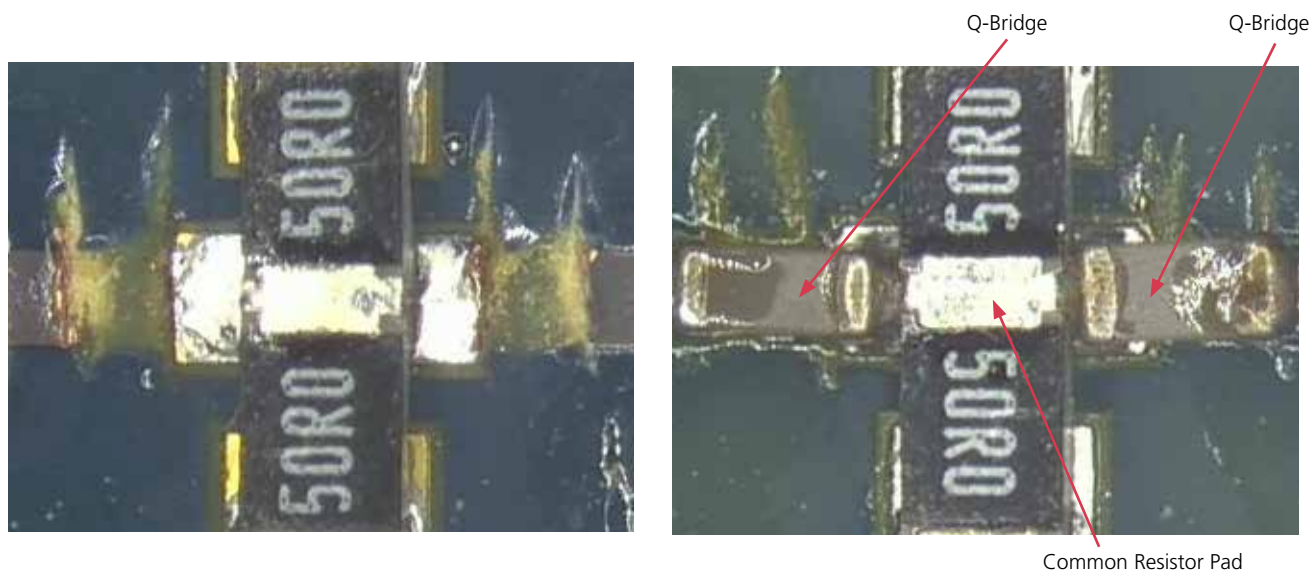
Q-Bridge employs a thicker substrate over similar competitive parts, resulting in up to 25% improvement in thermal conductivity. Q-Bridge connects heat-generating components to a thermal heat sink. This provides more effective thermal transfer resulting in an overall improvement in circuit performance and reliability. This device can bridge traces to a thermal heat sink where direct connections are otherwise impractical.

## Q-Bridge Test Results

The test results demonstrate the effectiveness of the Q-Bridge. Two 50 ohm 1/8W resistors were mounted in series on an FR4 soft board with a thickness of 1.5mm and 1/2 oz. Cu traces. Two Q-Bridge devices were mounted between the common resistor pad and the thermal heat sink as shown in figure 1. The Q-Bridge implemented in this test is an 0603 size attached to the board with SAC-305 solder

Figure 1 shows the 'Q-Bridge Thermal Test Setup'.

**Figure 1: Q-Bridge Thermal Test Setup**



The left hand image shows two resistors in series with traces cut to the thermal vias, and no Q-bridge; the right hand image shows two resistors in series, cut traces with Q-bridge on each side of the common point of the resistors connected to the thermal vias.



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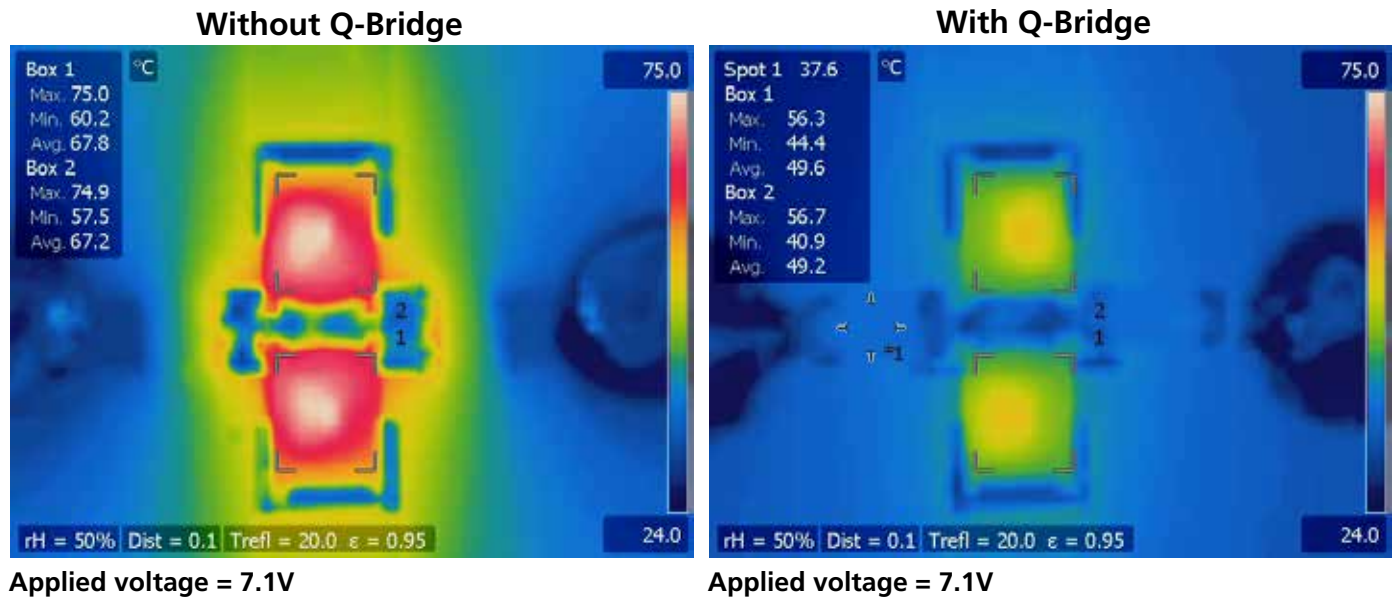
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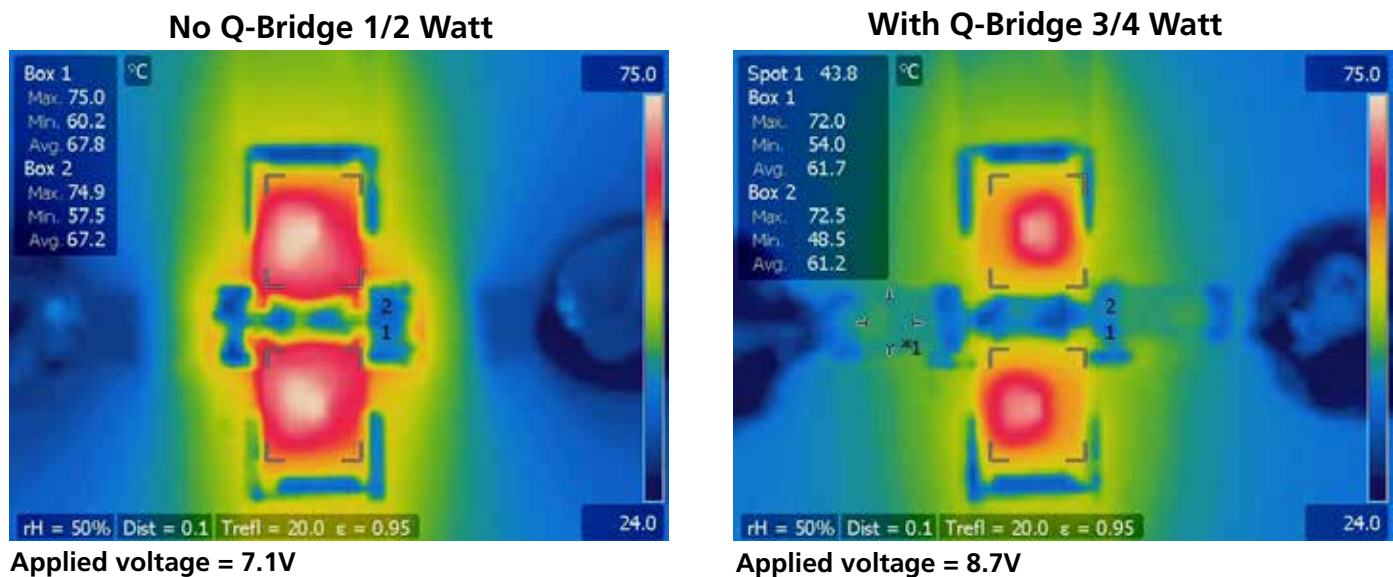
The thermal image in figure 2, on the left shows the two resistors without a Q-Bridge, with an input power of ½ watt. The associated temperatures are displayed on the thermal graph. The image on the right shows the same resistors with the same applied power and a Q-Bridge mounted between each resistor and the thermal heat sink. The results show a dramatic 18°C drop in average temperature

## Figure 2: Resistor Power Handling – 1/2 Watt



The thermal image in figure 3, on the left shows the two resistors without the Q-Bridge with an input power of ½ watt. This is the same condition as the left-hand image in figure 2. The figure on the right has a Q-Bridge for each resistor. This resulted in an increased power handling capability of ¾ watt total, which represents a dramatic increase in input power capability. It demonstrates that the resistor circuit in this test case can withstand at least ¾ watt with the Q-Bridge as compared to ½ watt without a Q-Bridge.

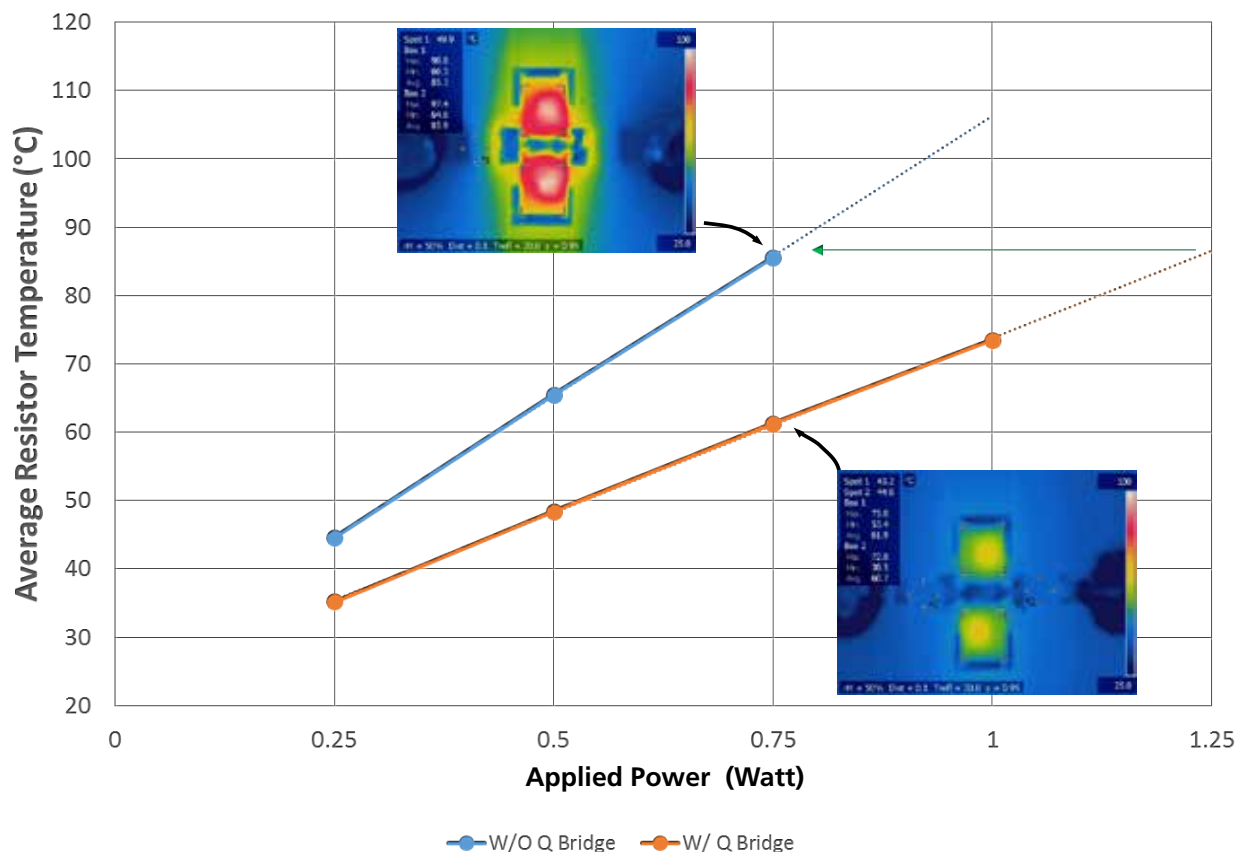
## Figure 3: Resistor Power Handling Equivalent Heating



**Q-Bridge allows circuit to handle at least 50% more power**

Figure 4 depicts the average resistor temperature vs applied power. The upper trace represents the test case without Q-Bridge while the lower trace represents the test case using the Q-Bridge. A dramatic difference between the curves is depicted.

**Figure 4: Q-Bridge Test Results**



## Test Set Up:

- Devices under Test Resistors: Two 50 ohm 0805, 1/8 Watt resistors
- Thermal Camera: FLIR model A320 with macro lens
- PCB: FR4, 1.5 mm thick, 1/2 oz Cu traces
- Solder: SAC305 Pb-free

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