

## Advanced Ceramic Heaters

### ULTRAMIC™ 600

Watlow's ULTRAMIC™ 600 heaters are designed for thermal applications where the high performance of an advanced ceramic heater is required to ensure optimal effectiveness of the equipment and process.

ULTRAMIC 600 heaters are constructed of aluminum nitride (AlN) and incorporate a thermally matched proprietary heating element that provides maximum performance in challenging applications. AlN is especially suitable for applications requiring a clean, non-contaminating heat source. Additionally, the excellent geometric stability ensures consistent part-to-part thermal contact during heating cycles.

Watlow AlN heaters can operate up to 600°C with an ultra-fast ramp rate of up to 150°C per second depending on the application, heater design and process parameters. In addition to excellent thermal characteristics, the ULTRAMIC 600 has high electrical isolation and typically provides superior chemical resistance as compared to traditional metal heaters.

#### Features and Benefits

##### Robust AlN ceramic

- Creates a homogeneous assembly for atmospheric and vacuum applications
- Provides durable heater construction and thermal transfer necessary for high temperature and long heater life
- Permits the design of a high watt density, fast responding, heater in a very small package
- Geometrically stable due to low coefficient of thermal expansion (CTE)
- Process temperatures up to 600°C (1112°F) depending on application parameters



#### Rapid prototyping

- Finite Element Analysis (FEA) provides rapid 'virtual prototyping' of heater performance prior to the manufacturing process
- Custom prototypes can be delivered in weeks rather than months with innovative design and manufacturing practices

#### Superior electrical performance

- Low leakage current
- Breakdown voltage >2000V<sub>rms</sub>(dc)

#### High thermal conductivity

- Makes for an ultra-fast temperature ramp rate of up to 150°C (270°F) per second (depending on application parameters)
- Allows for quick cool-down
- Provides extremely uniform temperatures over the heaters surface

#### Thermocouple integrated into assembly (patent pending)

- Bonded assembly process ensures reliability of heater/sensor interface
- Optimized temperature sensing improves accuracy
- High response rate in ramping applications

#### UL® and CE agency compliance (pending)

- Designed to meet global safety standards

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### Applications and Technical Data

#### Application Examples

##### Semiconductor Equipment

Eutectic die bonding equipment is used in the attachment of lead wires to the die before packaging of the IC. Optimum bonding is achieved by ramping the solder and lead temperature through the eutectic state. Watlow's ULTRAMIC 600 heater is ideal for this application because a temperature ramp of up to 150°C per second can be achieved while also achieving a fast cool down in preparation for processing the next device.

- Temperature ramp rate to 150°C (270°F) per sec
- Vacuum holes and grooves
- Surface flatness 0.05 mm (0.001 in.)
- Surface finish <0.8 µm (32 µ-in.)

##### Analytical Instrumentation

Mass spectrometers are used to determine the presence of trace chemicals in industrial, environmental and clinical applications. With detection capabilities into the part-per-trillion levels, cleanliness is of paramount concern. For use with ion sources, the chemical compatibility, low porosity and fine surface finish make the ULTRAMIC 600 an excellent choice where contamination of the sample is of concern.

- Process temperatures to 600°C (1112°F)
- Chemical compatibility
- High dielectric strength
- Small size and light weight

### Configurations and Dimensions

#### Maximum Dimensions 4032 mm<sup>2</sup> (6.25 in<sup>2</sup>)

	Length	Width	Thickness	Aspect Ratio
<b>Flat Square</b>	Min: 8 mm (0.314 in.) Max: 63.5 mm (2.5 in.)		Min: 2 mm (0.078 in.) Max: 5 mm (0.196 in.)	1
<b>Rectangular</b>	Max: 100 mm (3.94 in.)	Min: 4 mm (0.157 in.)	Min: 2 mm (0.078 in.) Max: 5 mm (0.196 in.)	<10
	Inside Diameter (I.D.)	Outside Diameter (O.D.)	Thickness	Ring Wall Thickness
<b>Ring</b>	Min: 3 mm (0.118 in.)	Max: O.D. 75 mm (2.95 in.)	Min: 2 mm (0.078 in.) Max: 5 mm (0.196 in.)	Minimum wall thickness: 3 mm (0.118 in.)

#### Surface Finish

Flatness	Parallelism	Surface Roughness (Ra)	Straight Groove Custom Feature	Hole Size Round Diameter
<0.05 mm (0.002 in.)	<0.05 mm (0.002 in.)	<0.8 µm (32 µ-in.)	Depth: 0.20 - 0.5 mm (0.019 in.) Width: 0.75 - 2 mm (0.078 in.)	Min: 1 mm (0.039 in.) Max: Outer edge 3 mm (0.118 in.)

#### Electrical Properties

Voltage	Leakage Current	Dielectric Constant	Dielectric Strength
24 to 480V	<0.1mA	8.9	15KV/mm

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##### Mounting Guidelines

- Temperature <200°C (392°F): bond with high-temperature epoxy adhesive
- Temperature >200°C (392°F): screw hole can be provided (recommend insulation buffer such as mica spacer)
- Clamp using single or multiple-point fasteners

##### Optional Thermocouple

- Bonded bare wire Type K thermocouple with ceramic insulation for <400°C (752°F)
- Drilled hole can be provided for installing a sheathed thermocouple for <600°C (1112°F)

##### Lead Wire and Terminations

- Power terminals exit locations - extended from side on square and rectangular shapes and from the top on the ring shapes
- Flexible lead extension
- Teflon® insulated silver-plated copper lead extension
- Lead extension length - standard length 305 mm (12 in.)

##### How to Order

To order your standard ULTRAMIC 600 heater, please specify Watlow code number.

If our standard units do not meet your application needs, Watlow can rapidly manufacture the ULTRAMIC 600 to your special requirements. For made-to-order units, please consult the factory.

##### Availability

Standard heaters are available for shipment in seven business days or less. While normally customized for the application, these products enable a development engineer to quickly and easily acquire a test sample to determine its suitability in the application.

Custom configurations involving grooves, holes, product size or surface finishes are routinely manufactured to meet the exact requirements of the design engineer. Delivery is dependent on complexity of order. Please consult factory.

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### Standard Product Ordering Information

Code Number	Size	Watts	W/in <sup>2</sup>	(W/cm <sup>2</sup> )	Voltage V~(ac)
<b>Square ①</b> CER-1-01-00002	25 mm x 25 mm x 2.5 mm (0.98 in. x 0.98 in. x 0.1 in.)	967	1000	(155.04)	240
CER-1-01-00006	50 mm x 50 mm x 2.5 mm (1.97 in. x 1.97 in. x 0.1 in.)	1938	500	(77.52)	240
CER-1-01-00093	25 mm x 25 mm x 2.5 mm (0.98 in. x 0.98 in. x 0.1 in.)	150	150	(24)	120
CER-1-01-00097	19 mm x 19 mm x 2.5 mm (0.75 in. x 0.75 in. x 0.1 in.)	200	100	(16)	120
<b>Rectangular ①</b> CER-1-01-00001	25 mm x 15 mm x 2.5 mm (0.98 in. x 0.6 in. x 0.1 in.)	580	1000	(155.04)	120
CER-1-01-00003	50 mm x 10 mm x 2.5 mm (1.97 in. x 0.39 in. x 0.1 in.)	582	750	(116.28)	120
CER-1-01-00004	50 mm x 10 mm x 2.5 mm (1.97 in. x 0.39 in. x 0.1 in.)	770	1000	(155.04)	240
CER-1-01-00005	50 mm x 25 mm x 2.5 mm (1.97 in. x 0.98 in. x 0.1 in.)	1453	750	(116.28)	240
CER-1-01-00007	75 mm x 25 mm x 2.5 mm (2.95 in. x 0.98 in. x 0.1 in.)	1455	500	(77.52)	240
CER-1-01-00098	25 mm x 15 mm x 2.5 mm (0.98 in. x 0.6 in. x 0.1 in.)	180	150	(24)	120
CER-1-01-00105	50 mm x 25 mm x 2.5 mm (1.97 in. x 0.98 in. x 0.1 in.)	100	50	(8)	120
<b>Ring ②</b> CER-1-02-00001	38 mm O.D./29 mm I.D. (1.50 in. O.D./1.14 in. I.D.)	733	1000	(155.04)	120
CER-1-02-00002	77.5 mm O.D./59 mm I.D. (3.05 in. O.D./2.32 in. I.D.)	770	250	(38.76)	240

① Leads exit short side

② Leads exit top

Standard configurations include:

- Power lead wires with Teflon® insulation 305 mm (12 in.)
- Bonded Type K thermocouple with 305 mm (12 in.) glass fiber insulated lead extension
- Surface finish (Ra) <0.8 µm (32 µ-in.)

Teflon® is a registered trademark of E.I. du Pont Nemours & Company.