MATERION

DESIGN GUIDE

Beryllium Oxide Design Guide

This general design guide is intended to outline the parameters having cost impact on beryllium oxide ceramics. As process economics pertaining to other ceramics do not necessarily apply to beryllia, a different set of design rules is necessary.

Overall Size

As a general rule, larger parts are more costly per unit area than smaller parts. Designing with the smallest part outline consistent with your needs will minimize cost. Consequently, an arrayed approach will often cost substantially more than utilizing small individual pieces, at least as far as the ceramic cost is concerned. As-fired thickness of the beryllia ceramic is dictated by process limitations. Lowest cost is achieved by designing to the thickness ranges specified in the table below. Thinner substrates are available, but additional machining operations are required.

Example	Cost Effective As-Fired Thickness
0.250" square	0.025" - 0.030"
0.750" square	0.030" - 0.040"
1" square	0.040" - 0.050"
2" square	0.040" - 0.060"
3" square	0.040" - 0.060"
4" square	0.040" - 0.060"
4.5" square	0.040" - 0.060"

Shape

In general, shapes which can be completely described as a silhouette are the least costly to produce. Blind holes, steps and dome shapes are examples of parts that are more costly to press. Tooling to produce many shapes is available. A one-time tooling charge may be required, but this charge is normally small and will not significantly impact part cost.

Tolerances

As-fired X-Y tolerances are typically ± 1% and thickness tolerance is typically ± 2% in all dimensions, as-fired tolerances are no less than 0.003". As-fired flatness is typically 0.004". Tighter tolerances are achievable, but are obtained with additional machining processes resulting in increased costs.

Specification

All ceramics are listed in Materion Ceramic's production specification CDDP-10.

Metallization and Plating

Molybdenum-manganese is the most commonly used metallization on beryllia. This MoMn metallization can be subsequently plated, most often with nickel and sometimes gold, silver and copper. Virtually any screen printable MoMn pattern is attained economically. Allowing 0.020" pullback from the edge of the ceramic minimizes costs. In regards to the pattern, allowing a minimum of 0.010 conductor lines and spaced result in lowest cost. Through-hole and side metalizing significantly increase the cost Nickel, gold, silver and copper-plated parts present a different set of cost parameters. The particular pattern has a significant impact upon costs. In general, isolated pads of unequal area will increase the cost.

Health & Safety Note:

Handling beryllium oxide ceramics in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Safety Data Sheet (SDS) before working with this material. For additional information on safe handling practices or technical data on beryllium, contact Materion Ceramics at +1 520.746.0251.

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