

DESIGN RULES OF ALUMINUM OXIDE (AL OXIDE) SUBSTRATE AND PCB

Geometric Data

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|--|---|----------------------------|
| Maximum PCB size, mm | 290x450 | |
| Minimum PCB size, mm | 10x10 | 8x8 |
| Thickness of aluminum base, mm | 0.35, 1.0, 1.5, 3.0 ±10% | 0.35, 1.0, 1.5, 3.0 ±5% |
| Thickness of oxide (Al ₂ O ₃) layer, μm | from 10 to 70 ±5 | from 3 to 150 ±5 |
| Thickness of copper layer, μm | from 1 to 35 ±10% | from 35 to 100 μm ±10% |
| Thickness of solder mask layer, μm | 20±5 | 40±5 |
| Tolerance of overall PCB thickness | Depends on thicknesses and quantity of layers, but no more than 10% | – |
| Technological edges of panel-up, mm | 5 | w/o edges |



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Mechanical Treatment

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|---------------------------------------|--|-------------------------------|
| Minimum diameter of pin-hole, mm | 0.6 | 0.5 |
| Maximum diameter of pin-hole, mm | Ø5 | Ø6 |
| Chamfer formation | no | On request, but no more Ø6 mm |
| Hole tolerance, mm | No more than 12th quality, but no less than ±0.05 for non-metallized holes | ±0.1 for metallized vias |
| Milling diameter, mm | Ø2 for thicknesses 1 & 1.5 mm; Ø1 for thickness 0.38 mm | Ø1 for thickness 1 & 1.5 mm |
| In-depth milling, mm | No | ±0.3 |
| Minimum size of tab while milling, mm | 0.7 | — |



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| <i>Parameter</i> | | <i>Standard value</i> | <i>Limit value</i> |
|--|----------------|--|---|
| Thicknesses of PCBs for scribing, mm | | 1.0, 1.5, 3.0 | – |
| Minimum gap between scribing lines, mm | | 5 | 4 |
| Minimum thickness of residual bulk while milling, mm | | 0.5±0.1 | 0.3±0.1 |
| Angle of sharpening of milling disk, ° | | 30 | – |
| Tolerance for overall PCB dimensions | While scribing | No more 12 th quality, not less than ±0.4 | No more 12 th quality, no less than ±0.3 |
| | While milling | No more 12 th quality, not less than ±0.2 | No more 9 th quality, not less than ±0.1 |



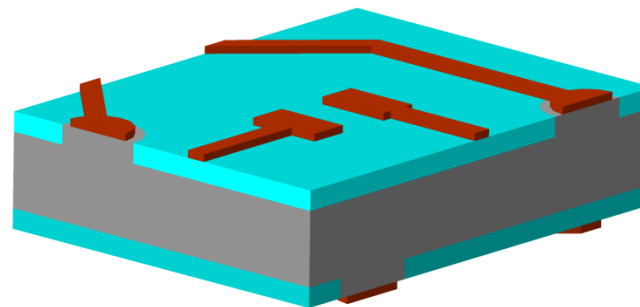
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Oxide (Al₂O₃) Layer Pattern

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|--|-----------------------|--------------------|
| Minimum gap between PCB contour and oxide, mm | 0.3 | 0.2 |
| Minimum size of isolated oxide area, mm | 5 | 2,5 |
| Minimum gap between oxide elements, mm | 4 | 1 |
| Guaranteed size of copper conductor overlap of oxide layer, mm | 0.5 | 0.3 |
| Radius of rounded corners of oxide elements, mm | 0.8 | 0.5 |



DESIGN RULES

AL OXIDE
GEN. 1.0 - 3.0
SUBSTRATE

Version 1.0/2018



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Copper Layer Pattern

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|--|--|--|
| Minimum distance between PCB contour and conductive pattern elements, mm | 1 | 0.6 |
| Minimum conductor/gap, mm | 0.2/0.2 with thickness of Cu up to 35 μm ; 0.3/0.3 with thickness of Cu more than 65 μm | 0.15/0.15 with thickness of Cu up to 35 μm ; 0.25/0.25 with thickness of Cu more than 65 μm |
| Minimum size of contacting pad, mm | – | Hole diameter +0.8 (guaranteed band 0.4) |
| Radius of rounded corners of copper pattern, mm | 0.1 | 0.05 |
| Tolerance of final diameter vias, mm | +0.15 | – |



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Solder Mask

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|---|---------------------------------|--------------------|
| Colour of solder mask | Snow-white, white, black, green | Other on request |
| Minimum gap between PCB contour and solder mask, mm | 0.4 | 0.3 |
| Minimum gap between solder mask and contacting pads, mm | 0.2 | 0.1 |
| Minimum width of solder mask bulk, mm | 0.25 | 0.15 |
| Minimum overlap of copper pattern layout by solder mask, mm | 0.2 | 0.1 |

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Marking

| <i>Parameter</i> | <i>Standard value</i> | <i>Limit value</i> |
|-----------------------------------|--|--|
| Colour of marking | Extrication into oxide (grey – oxide colour) | Snow-white, white, black, green, others on request |
| Minimum width of marking line, mm | 0.3 | 0.25 |
| Minimum height of symbol, mm | 2 | 1.3 |

Finish Coatings

| <i>Parameter</i> | <i>Standard value</i> |
|--|---|
| Immersion silver, μm | Not regulated (0.25 ± 0.05), thickness proves solderability |
| Immersion gold with chemical nickel (ENIG), thickness, μm | Ni: 3-6 μm Au: 0.05-0.125 μm |
| ENEPIG | On request Ni: 5-7 μm Pd: $\geq 0.15 \mu\text{m}$ Au: 0.05 – 0.08 μm |



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