GS61008P Material Considerations:

Current total height: 0.515mm

* Dieletric:
  + Materials Considerations:
    - What it surrounds (~3 surrounding layers and 1 top layer over the die, all with even thicknesses):
      * Mechanical die attach: 0.01 mm
      * GaN-on-Si die: .3 mm
      * Vias: Thickness not important
    - Total thickness of dielectric fill: .31mm
    - FR4 High-TG
      * Datasheets For consideration from different companies:
        + [de12f19bbbc3710cf42206ad9f8957bd.pdf](https://datasheet.datasheetarchive.com/originals/crawler/circuitboards.com/de12f19bbbc3710cf42206ad9f8957bd.pdf)
        + [PCB Material Default Values – FR4](https://www.multi-circuit-boards.eu/fileadmin/user_upload/downloads/leiterplatten_design-hilfe/e_multi_cb_material-standard-values.pdf)
        + [RO4000 (RO4350B RO4003C) Series High Frequency Circuit Materials Data Sheet](https://pcbwayfile.s3.us-west-2.amazonaws.com/web/230612/RO4000%20Laminates%20RO4003C%20and%20RO4350B%20-%20Data%20Sheet.pdf)
      * Type: Rogers R04003/R04350B
        + Thickness: .10mm to 1.52mm (**MINIMUM THICKNESS FITS!):**
        + Data Sheet: [RO4000 (RO4350B RO4003C) Series High Frequency Circuit Materials Data Sheet](https://pcbwayfile.s3.us-west-2.amazonaws.com/web/230612/RO4000%20Laminates%20RO4003C%20and%20RO4350B%20-%20Data%20Sheet.pdf)
    - Polymide:
      * Polymides vs FR4: [What is the Difference between FR4 and Polyimide PCB](https://www.mclpcb.com/blog/polyimide-pcb-material-information-fr4-vs-polyimide-pcb/)
      * Type: All-Polyimide Double-Sided Copper-Clad Laminate
        + Source: [Pyralux® AP](https://www.dupont.com/electronics-industrial/pyralux-ap.html)
        + Datasheet: [Pyralux® AP All-Polyimide Double-Sided Copper-Clad Laminate](https://www.dupont.com/content/dam/electronics/amer/us/en/electronics/public/documents/en/EI-10124-Pyralux-AP-Data-Sheet.pdf)
        + Datasheet: [e\_dupont\_pyralux-ap-polyimid\_www.multi-circuit-boards.eu.pdf](https://www.multi-circuit-boards.eu/fileadmin/pdf/leiterplatten_material/e_dupont_pyralux-ap-polyimid_www.multi-circuit-boards.eu.pdf)
        + Thickness: On paper, whatever size we need (**MIN THICKNESS FITS!)**
      * Type: Panasonic Laminate R-5775
        + Source/DataSheet: <https://industrial.panasonic.com/content/data/EM/PDF/ipcdatasheet_R-5775.pdf>

Another similar one: [R-5775(G)/R-5775(G) | Panasonic Industrial Devices](https://na.industrial.panasonic.com/products/electronic-materials/circuit-board-materials/lineup/megtron-series/series/127603/model/144668)

* + - * + Thickness: On paper, whatever size we need (**MIN THICKNESS FITS!)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item | Material | Dk | Td | Tg | CTE | Electrical Strength |
| Rogers Flame-Retardant Glass | FR-4 (High Temp) | 4.38 | 414 C | 280 C | 42 ppm/C | 675 V/mil |
| Kingshold KB-6160C | FR-4 (Normal Temp) | 4.58 | 305 C | 130 C | 58 ppm/C | 1041.43 V/mil |
| Rogers RO4003C LoPro | FR-4 (Copper Clad) | 3.5 | 425 C | 280 C | 46 ppm/C | 780 V/mil |
| Arlon EMB HF-50 | Polymide, Ceramix | N/A | N/A | 260 C | 26 ppm/C | 1000 V/mil |

The Rogers R04003 would be our best choice due to its high frequency performance with it having the lowest Dk. It also has good thermal stability with 425C Td and 280C Tg.

References for table:

<https://s3-us-west-2.amazonaws.com/static.seeed.cc/fusion/file/Seeed+KB6160+FR4+Laminates+Datasheet.pdf>

<https://www.rogerscorp.com/advanced-electronics-solutions/ro4000-series-laminates/ro4000-lopro-laminates>

<https://www.arlonemd.com/wp-content/uploads/2021/11/HF-50.pdf>

* Soldermask:
  + Type: Solder Mask Defined (SMD)
    - Solder mask best practices: [GaN Designs Schematic & Recommended Layout | GaN 1st Time Right |EPC](https://epc-co.com/epc/design-support/gan-first-time-right/schematic-and-layout)
    - Thickness: 25um (1 mil)
    - Material: 97.5Sn / 2.5%Ag
    - Source: [How2AppNote008 - Designing PCB Footprint eGaN FETs ICs.pdf](https://epc-co.com/epc/Portals/0/epc/documents/application-notes/How2AppNote008%20-%20Designing%20PCB%20Footprint%20eGaN%20FETs%20ICs.pdf)

[PCB Material Search | Northwest Engineering Solutions (Portland, OR)](https://www.nwengineeringllc.com/pcb-material-search/?page=1&material=FR-4&stype=High+Temp#box-1711514136)

[PCB Materials Datasheets | Northwest Engineering Solutions (Portland, OR)](https://www.nwengineeringllc.com/resources/pcb-materials-datasheets.php)

[RO4000 (RO4350B RO4003C) Series High Frequency Circuit Materials Data Sheet](https://pcbwayfile.s3.us-west-2.amazonaws.com/web/230612/RO4000%20Laminates%20RO4003C%20and%20RO4350B%20-%20Data%20Sheet.pdf)