

Solar Cell Coverglasses

Designed and manufactured to provide radiation protection

Qioptiq

- Design and manufacture of radiation-stable Coverglasses
- Over 40 years of Space Heritage
- Space Qualified
- Choice of glass types (CMX, CMG, CMO)
- Worlds leading manufacturer
- Bespoke solutions

Minimum Coverglass Transmission specifications with 0.10mm thick CMX, CMG and CMO glass types

| | | 350 - 400nm | 400 - 450nm | 450 - 700nm | 600 - 800nm | 650 - 900nm | 450 - 1100nm | 900 - 1800nm | IR Cut-off | Min Emittance | Front Surface Resistance |
|------------|------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|------------|---------------|--------------------------|
| CMX | Uncoated | 73.5 | 91.5 | 94.0 | 95.0 | 95.0 | 95.0 | 95.0 | | 0.88 | |
| CMG | | 83.5 | 92.5 | 94.5 | 95.0 | 95.0 | 95.0 | 95.0 | | 0.88 | |
| CMO | | 88.0 | 94.0 | 94.5 | 95.0 | 95.0 | 95.0 | 95.0 | | 0.88 | |
| CMX | AR | 73.5 | 93.0 | 96.5 | 97.5 | 97.5 | 96.5 | 96.5 | | 0.88 | |
| CMG | | 83.5 | 94.0 | 97.0 | 97.5 | 97.5 | 96.5 | 96.5 | | 0.88 | |
| CMO | | 88.0 | 95.5 | 97.0 | 97.5 | 97.5 | 96.5 | 96.5 | | 0.88 | |
| CMX | Conductive | 73.5 | 94.0 | 96.5 | 97.0 | 97.0 | 96.5 | 96.0 | | 0.86 | <10M Ohms |
| CMG | AR | 83.5 | 95.0 | 97.0 | 97.0 | 97.0 | 96.5 | 96.0 | | 0.86 | <10M Ohms |
| CMO | | 88.0 | 96.0 | 97.0 | 97.0 | 97.0 | 96.5 | 96.0 | | 0.86 | <10M Ohms |
| CMX | Conductive | 71.0 | 89.0 | 94.0 | 95.0 | 95.0 | 94.5 | 94.5 | | 0.84 | <5K Ohms |
| CMG | | 80.0 | 89.0 | 94.0 | 95.0 | 95.0 | 94.5 | 94.5 | | 0.84 | <5K Ohms |
| CMO | | 80.0 | 89.0 | 94.0 | 95.0 | 95.0 | 94.5 | 94.5 | | 0.84 | <5K Ohms |
| CMX | UV Reflector | 73.5 | 92.0 | 96.0 | 96.5 | 96.5 | 96.0 | 94.0 | | 0.86 | |
| CMG | | 83.5 | 93.0 | 96.5 | 96.5 | 96.5 | 96.0 | 94.0 | | 0.86 | |
| CMO | | 88.0 | 94.5 | 96.5 | 96.5 | 96.5 | 96.0 | 94.0 | | 0.86 | |
| CMX | AR/IRR Silicon | 73.5 | 89.0 | 96.0 | 96.0 | 96.0 | 95.0 | | 1165+/- | 0.86 | |
| CMG | Blue Red Silicon | 83.5 | 90.0 | 96.0 | 96.0 | 96.0 | 95.0 | | 50nm | 0.86 | |
| CMO | | 88.0 | 92.0 | 96.0 | 96.0 | 96.0 | 95.0 | | | 0.86 | |
| CMX | UVR/IRR | 73.5 | 92.0 | 96.5 | 96.5 | 96.5 | 95.0 | | 1315+/- | 0.86 | |
| CMG | Triple Junction | 83.5 | 93.0 | 96.5 | 96.5 | 96.5 | 95.0 | | 35nm | 0.86 | |
| CMO | (PS 703) | 88.0 | 88.0 | 96.5 | 96.5 | 96.5 | 95.0 | | | 0.86 | |

1. All spectral data measured at normal incidence in 1.43 matching index
2. Tolerances on specification values are available from relevant product specifications
3. Spectral data is for 0.10mm/0.004" coverglasses, please refer to relevant specification for spectral performance of other thicknesses.

Mechanical Properties

| | |
|------------------------------|--|
| Thickness: | 0.050mm to 0.50mm / 0.002" to 0.02" Special thicknesses on request |
| Tolerancing: | LxW ± 0.05mm / 0.002" |
| Surface Finish: | As drawn to: MIL-PRF-13830B, 80/50 scratch dig |
| Parallelism: | 0.05mm per 20mm |
| Perpendicularity: | 90° ± 0° 30' |
| Coating: | Uncoated area, masked by coating tooling, shall not exceed 1% of the total coverglass area |
| Edge Quality: | Chemically etched for strength enhancement |
| Toughening: | CMX and CMG glass can be chemically toughened if required |
| Humidity Resistance: | 98% ± 2% relative humidity for 72 hours @ 50°C ± 20°C |
| Adhesion: | Using cellulose tape to MIL-M-13508 |
| Abrasion: | 20 strokes with 6mm pencil type eraser to MIL-E-12397 loaded to 10N |
| Radiation Resistance: | UV exposure, electron, low energy proton, high energy proton - please refer to relevant specifications |
| Thermal Cycling: | Details on request |

Physical Properties

| | CMX | CMG | CMO |
|---------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Density: | 2.60 ± 0.02g cm ³ | 2.54 ± 0.02g cm ³ | 2.54 ± 0.02g cm ³ |
| Thermal Expansion Coefficient: | | | |
| Average over range -100°C to 100°C | 6.0 ± 0.75 x 10 ⁻⁶ /°C | 5.5 ± 0.75 x 10 ⁻⁶ /°C | 5.5 ± 0.75 x 10 ⁻⁶ /°C |
| Average over range -100°C to 200°C | 6.5 ± 0.75 x 10 ⁻⁶ /°C | 6.0 ± 0.75 x 10 ⁻⁶ /°C | 6.0 ± 0.75 x 10 ⁻⁶ /°C |
| Average over range +30°C to 200°C | 7.0 ± 0.75 x 10 ⁻⁶ /°C | 6.5 ± 0.75 x 10 ⁻⁶ /°C | 6.5 ± 0.75 x 10 ⁻⁶ /°C |
| Youngs Modulus: | 75.0 ± 2 GNm ⁻² | 77.0 ± 2 GNm ⁻² | 70 ± 2 GNm ⁻² |
| Poissons Ratio: | 0.21 ± 0.05 | 0.20 ± 0.05 | 0.22 ± 0.05 |
| Bulk Resistivity: | | | |
| At 20°C | 11.5 ± 1 log ohm meter | 13.5 ± 1 log ohm meter | 16.0 ± 1 log ohm meter |
| At 60°C | 10.0 ± 1 log ohm meter | 11.5 ± 1 log ohm meter | 14.0 ± 1 log ohm meter |
| Refractive Index: | 1.524 – 1.530 | 1.513 – 1.519 | 1.510 – 1.516 |

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