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LCD Resources:
*Choosing a Cover Glass for
Your Display*

Choosing a Cover Glass for Your Display

The top layer of a display module is made of a cover glass which allows the liquid crystal or LED light to shine through and create a visible image. The cover glass acts as a protective layer to the internal display properties. Cover glass can be customized based on the intended display application.



Cover glass can come in a variety of materials and strengths. Some common options for cover glass materials are Gorilla Glass, Dragontrail glass, and soda lime glass. The strength of the material is often correlated with scratch resistance. Additional processes such as heat and chemical strengthening can be used to fortify the cover glass.

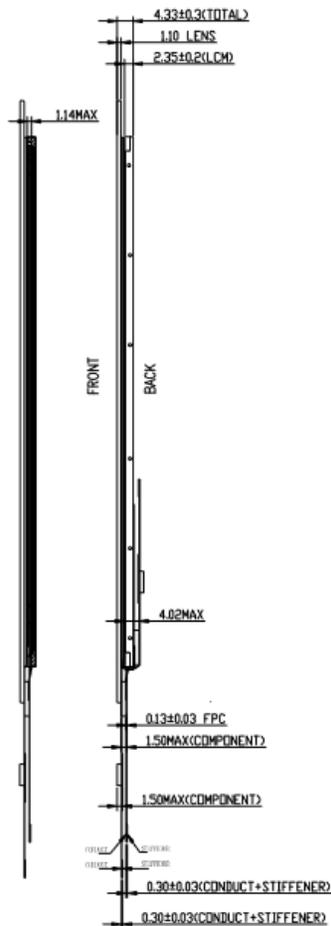
The strength of the cover glass is measured by the mineral hardness and determines the scratch resistance of the material. Glass, the standard material used for LCD cover glass, has a hardness rating in the range of 5-7 Mohs. Measures can be taken to increase this rating depending on the required application. Certain medical and industrial applications require a level 7 hardness rating to be considered a safety glass.

LCD cover glass can be customized for any application. Customizations can include strengthening, water proofing, temperature shielding, and optical enhancements. Different materials can be added to the glass substrate to strengthen the material and prevent scratching of the surface. The cover glass can also incorporate special features and printing options. This resource will discuss the options for choosing the best cover glass for your display and application.

Cover Glass Material

As the name implies, cover glass is made of a glass substrate. Depending on the application, cover glass can be strengthened to be more durable. Cover glass can be made of different types of glass substrates which have unique strengths and material properties.

The type of cover glass material used is up to the designer and can be changed for the intended application. Each glass type has different features, advantages, and prices.



Soda Lime glass is the most common material used and has the features of standard glass that you typically see used in windows. This type of glass is strong and cost efficient. The soda lime glass, like other glasses, can range in thickness. The cover glass thickness is specified as the lens width for each display.

Another type of cover glass material is known as Gorilla Glass. Gorilla Glass is a thin, yet strong, light weight material. Gorilla Glass is both scratch resistant and damage resistant. Typical applications for Gorilla Glass include smart watches, kiosks, smart phones, and tablets. Gorilla Glass can also be used for industrial and military applications where durability of the display is essential.

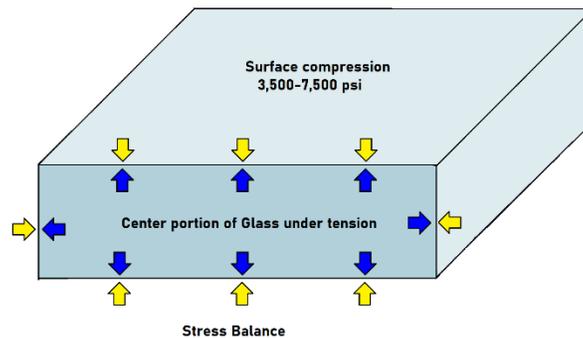
Dragontrail glass, or Dragon glass, is a type of cover glass that is treated with chemicals and heat to improve the strength of the material. The glass material is combined with strengthening particles and heated to a liquid. This process of chemical and heat strengthening makes this type of cover glass scratch proof and highly durable. This type of cover glass is six times as strong as the standard soda lime glass.

Heat Strengthened Glass

Heat tempered glass is a particular process that involves heating the display glass to a liquid at a high temperature. Liquidizing the glass at a high temperature strengthens the glass because the molecules get realigned into a more stable pattern. Heat tempered glass is four times stronger than regular untreated glass.

It is important to note that heat tempered glass is a different type of display glass than heat treated glass. Heat treated glass is at least two times stronger than untreated glass. Heat treated glass and heat tempered glass can both still be broken in the right conditions. The difference is that heat treated glass will break into large and sharp shards while heat tempered glass will fragment or crack.

Heat Strengthened Glass

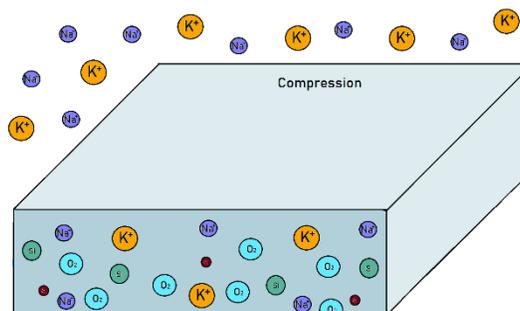


Heat tempered glass is typically referred to as safety glass. The heat treated glass is not considered safety glass by most industry standards. Tempered glass cannot be cut once processed and treated. Heat tempered glass is used in industries such as automotive and industrial for its safety features.

Chemically Strengthened Glass

Chemically strengthened glass is strengthened through the process of chemical bonding. The glass is submerged in chemicals at a high heat which enables ions to bond to voids in the glass. The chemical process adds potassium bonds in the place of the original sodium bonds during this chemical reaction. This process strengthens the glass while maintaining the clarity of the glass.

Chemically Strengthened Glass



Chemically strengthened glass has the benefit of maintaining optical clarity during the strengthening process and is just as strong as heat tempered glass. This differs from heat treated glass which can cause subtle distortions to the glass surface. The chemically treated glass be cut or drilled after the treatment process while heat treated glass cannot.

Glass Hardness Scale

The Mohs hardness scale is a way to measure the hardness of a mineral. The hardness defines the scratch resistance of the mineral. This is useful for describing the hardness of different LCD glasses for creating scratch resistant displays. Glass will typically be measured at a hardness level of 5-7 Mohs. Certain cover glass materials will have a higher hardness scale and thus be more scratch resistant.

Soda Lime glass is chemically treated and is a great option for LCDs that do not require extra protection of the glass. A standard soda lime glass for an LCD will have a hardness rated at about 5Mohs. This type of glass is not fragile and will have a standard amount of durability, but it is not rated as an extra strength display glass.

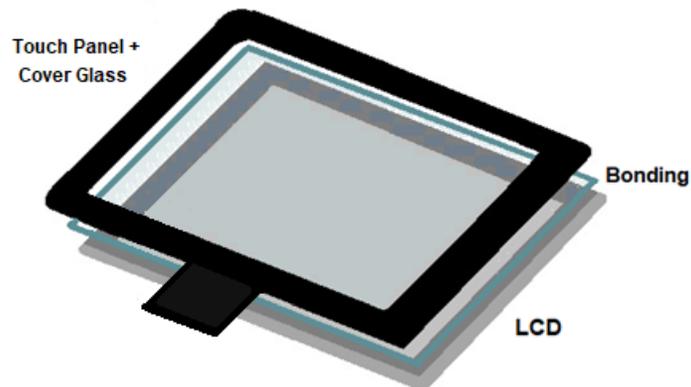
Gorilla Glass is chemically strengthened which provides more damage resistance than standard untreated glass. Gorilla Glass is common in portable electronic devices because it is made of thin and light weight material. Gorilla Glass can also be crack resistant which is ideal for handheld devices. Gorilla Glass has a hardness rating of 7Mohs. The minimum thickness of Gorilla Glass is 0.4 mm.

Dragontrail glass is similar to Gorilla Glass in that it is strengthened through chemical hardening. The harness rating of Dragontrail glass is 7Mohs, which is equivalent to the Gorilla Glass. With this hardness rating, Dragon glass is scratch resistant. The Dragon glass can be thin and durable with a minimum thickness of 1.1mm.

Bonding Type

The cover glass of a display is fixed to the LCD with tape or with an OCA bonding material. OCA bonding is an optical clear adhesive that holds the touch panel, cover glass, and LCD together. The adhesive is clear and will dry without smudging the glass of the display.

The OCA bonding is applied in a thin layer of approximately 0.005"-0.008" around the bond line. This type of bonding is good for thin materials such as cover glass and touchscreens. OCA bonding is applied as a sheet to create a uniform bond across the surface of the cover glass.



Tape is another option for bonding the cover glass to the display. Tape is used around the edges of the cover glass or touch panel to hold it in place. The tape used is strong enough to maintain the bond throughout the lifetime of the display.

Special Features and Optical Coatings

Special features and optical coatings can be included on the cover glass of the display. Optical coating enhances specific optical characteristics desired by certain applications. Optical coating can also provide moisture protection and dust prevention. There are a broad range of optical coating options available such as the following.:

- Anti-glare coating
- Anti-reflective coating
- Highly reflective coating
- Semi-reflective coating
- Polarization coating
- UV and Infrared coating
- Conductive coating
- Fingerprint resistant coating

Optical coatings can increase the durability of the display. The optical coating acts as a protective layer to the internal circuitry and liquid crystal of the display. The coating acts as a sealant for the display to prevent moisture or dust from entering the enclosure. The cover glass can have an extra layer of protection with the use of an optical coating.

The optical coating can add protection against external elements and would be recommended for outdoor display applications. The sealing effect of the optical coating will protect the display from harsh conditions while incorporating the desired visual effects. For example, an outdoor display in full sunlight could greatly benefit from an anti-reflective optical coating on the cover glass.

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- (2) monitor failures and their consequences, and
- (3) lessen the likelihood of failures that might cause harm and take appropriate actions.

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