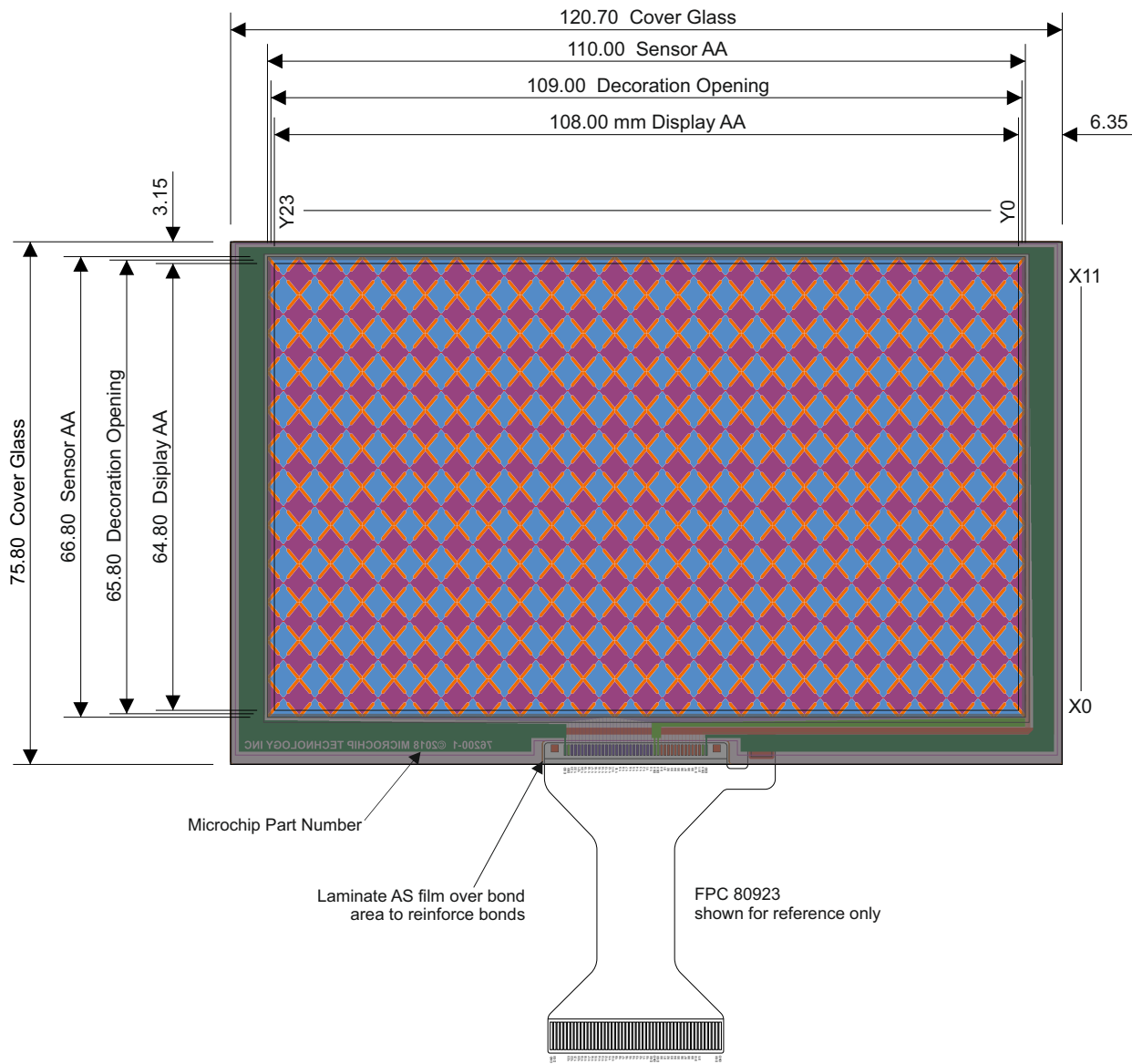




| Touchscreen Build Stack |                             |                |
|-------------------------|-----------------------------|----------------|
|                         | Material                    | Thickness (mm) |
| Cover Glass             | Dragontrail glass           | 1.10           |
| Decoration              | Decoration print            | 0.02           |
| ITO (X & Y)             | ITO 55±10 Ohm/sq            | -              |
| Metal                   | Metal tracking 0.4 Ohm/sq   | -              |
| Insulator               | Insulator                   | -              |
| Metal Crossover         | Metal Crossover 0.4 Ohm/sq  | -              |
| Protection Layer        | Insulator                   | 0.003          |
| OCA                     | OCA                         | 0.25           |
| PET                     | PET film                    | 0.125          |
| Shield ITO              | ITO 75±15 Ohm/sq            | -              |
| ASF                     | Silver tracking 0.15 Ohm/sq | -              |
| Silver                  | Anti-splinter film          | 0.079          |
| ACF                     | Touchscreen Thickness       | 1.577          |
| Air gap                 | Air                         | 0.3            |
| Display Module          | Display module              | -              |
|                         | Hot Bar Bond Heatseal / ACF | 0.005          |
|                         | FPC Tail                    | 0.09           |

| Material Specifications  |                                     |                 |                                                     |                                  |
|--------------------------|-------------------------------------|-----------------|-----------------------------------------------------|----------------------------------|
|                          | Material                            | Thickness       | Specification                                       | design rules                     |
| Main ITO                 | ITO                                 | 0.03um          | 55 Ohms/sq ± 15 ohms                                | Minimum track / gap = 30um ± 10% |
| Insulator                | Insulator                           | 1.25um ± 0.25um | Er = 3.60                                           |                                  |
| Metal crossovers         | Metal                               | 0.3um           | 0.4 Ohms/sq ± 10%                                   | Minimum track width 12um         |
| Metal tracks             | Metal                               | 0.3um           | 0.4 Ohms/sq ± 10%                                   | track / gap = 30um ± 10%         |
| Protection Layer         | Insulator                           | 3um ± 0.25um    | Er = 3.60                                           |                                  |
| OCA                      | Optically clear adhesive            | 0.25mm ± 10%    | Er = 4.60                                           |                                  |
| PET                      | PET film                            | 0.125mm ± 10%   | Er = 3.00                                           |                                  |
| Shield ITO               | ITO                                 | 0.03um          | 75 Ohms/sq ± 15 ohms                                |                                  |
| Silver tracks            | Silver                              | 8um ± 10%       | 0.15 Ohms/sq ± 10%                                  | Minimum track width 500um        |
| Anti-splinter film       | PET/OCA                             | 0.079mm ± 10%   | Er = 3.00                                           |                                  |
| FPC interconnect         | ACF / ACP / ACA                     | <20um           | Pad contact resistance <1 Ohm, Peel strength >5N/cm | Pads 0.20 x 1.8mm on 0.4mm pitch |
| Alignment Tolerances     |                                     |                 |                                                     |                                  |
|                          | Layer to Layer Alignment            | ± 15um          |                                                     |                                  |
|                          | Print to Edge of Glass              | ± 400um         |                                                     |                                  |
|                          | Metal to ITO                        | ± 15um          |                                                     |                                  |
| Assumptions              |                                     |                 |                                                     |                                  |
| Cover Glass              | Gorilla Glass or similar            | 1.10mm ± 10%    | Er = 7.37                                           |                                  |
| Decoration               | Black Pantone EC non-conductive ink | 20um ± 5um      | Er = 3                                              |                                  |
| Gap to display           | Air or OCA                          | 0.30mm ± 10%    | Er = 1.01 for air or ~3 for OCA                     |                                  |
| Performance Calculations |                                     |                 |                                                     |                                  |
|                          | Max charge time @ 99.3% charge      | 1.82us          |                                                     |                                  |
|                          | Worst case touch separation in X    | 11.69mm         |                                                     |                                  |
|                          | Worst case touch separation in Y    | 9.63mm          |                                                     |                                  |

Artwork drawn as viewed from Touch Side

Edges of cover glass to be polished with no sharp corners

All dimensions are in millimeters. If In Doubt Please Ask.

| Layers (top to bottom)      |  |
|-----------------------------|--|
| Cover glass                 |  |
| ITO Pattern 55 ohm/sq       |  |
| Insulator                   |  |
| Metal crossovers 0.4 ohm/sq |  |
| Metal tracks 0.4 ohm/sq     |  |
| Protection layer            |  |
| OCA                         |  |
| PET Film                    |  |
| ITO Shield 75 ohm/sq        |  |
| Silver track 0.15 ohm/sq    |  |
| Anti-splinter film          |  |

Crossover Detail

Insulator thickness = 1.25um

Under track width = 70um

ITO resistance = 55 Ohm/sq ±10%

Crossover track width = 12um

Crossover metal track resistance = 0.4 Ohm/sq

Crossover track resistive length = 200 um

|     |                         |     |     |               |
|-----|-------------------------|-----|-----|---------------|
| 2   | ITO shield layers added | N/A | PFC | 18th Oct 2018 |
| 1   | First Issue             | N/A | YT  | 5th Sep 2018  |
| Iss | Notes                   | ECN | Drn | Date          |

|                                                        |                  |                   |             |
|--------------------------------------------------------|------------------|-------------------|-------------|
| Title: 5" ITO on Glass TS<br>Single Diamond G2 24Y 12X |                  | Project: mXT288UD |             |
| Number: 76200                                          |                  | CAD Check:        | Engr Check: |
| Filename: 76200.cdr                                    |                  | Approved:         |             |
| Sheet 1 of 1                                           | Drawn: Yona Tsai |                   |             |

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All components and materials used must be RoHS compliant as described in European Parliament Directive 2002/95/EC