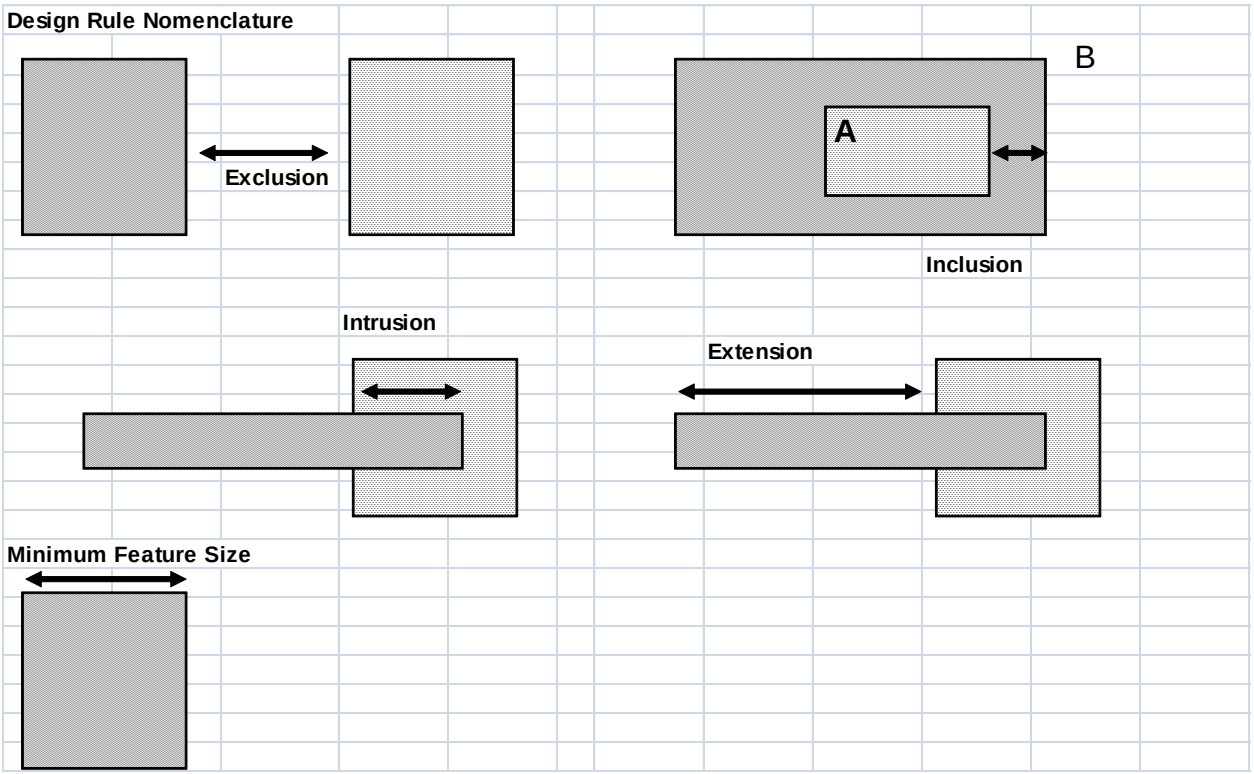
## Design Rule Nomenclature




## GDS Layer Definition

| GDS Layer No. | Description | Field | GDS Grid Resolution (um) | Overlay spec (nm) | Minimum Feature Size (um) | Mask Grade | Fill Density |
|---|---|---|---|---|---|---|---|
| 1 | Waveguide - Rib | Dark | 0.001 | N.A. | 0.180 | F | 20 to 70% |
| 2 | Waveguide - Grating Couplers | Dark | 0.005 | 60.000 | 1.000 | A | <30% |
| 3 | Waveguide - Slab | Dark | 0.005 | 60.000 | 0.400 | A | <20% |
| 4 | PD - Si P+ Implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 5 | MOD+PD - Si P++ implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 6 | MOD - Si N++ implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 7 | MOD - Si P Implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 8 | MOD - Si N Implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 9 | PD - Ge epi | Clear | 0.005 | 60.000 | 1.000 | A | <10% |
| 10 | PD - Ge N++ implant | Clear | 0.005 | 60.000 | 1.000 | A | 0 to 100% |
| 11 | Via 1 | Clear | 0.005 | 60.000 | 1.000 | A | <20% |
| 12 | Metal 1 | Dark | 0.005 | 60.000 | 1.000 | A | 20 to 50% |
| 13 | Via 2 | Clear | 0.005 | 60.000 | 2.000 | A | <20% |
| 14 | Metal 2 | Dark | 0.005 | 60.000 | 2.000 | A | 20 to 50% |
| 15 | Bond pad open | Clear | 0.005 | 60.000 | 2.000 | A | <30% |
| 16 | Deep Trench | Clear | 0.005 | 60.000 | 100.000 | A | <20% |
| 17 | Frontside Oxide Etch | Clear | 0.005 | 60.000 | 5.000 | A | <20% |

## Minimum Exclusion Rule

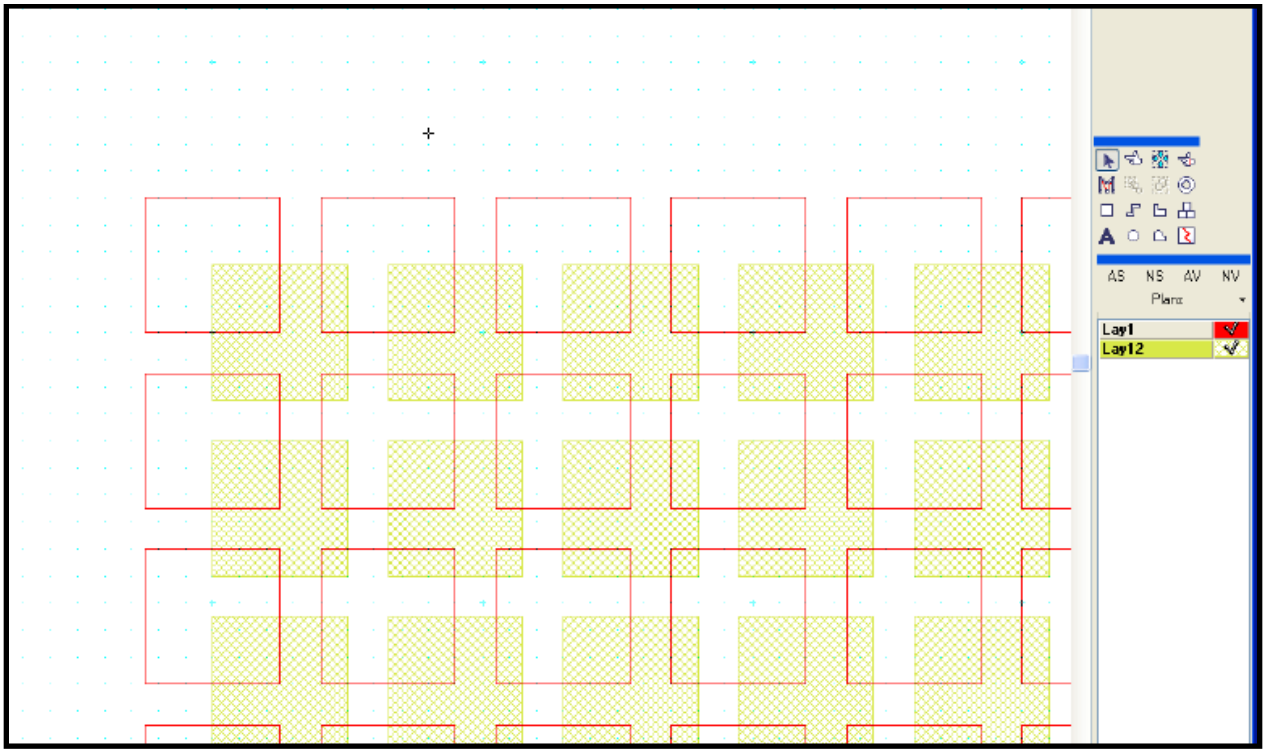
| Minimum Exclusion (Minimum separation between A and B) (um) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Waveguide - Rib | Waveguide - Grating Couplers | Waveguide - Slab | PD - Si P+ Implant | MOD+PD - Si P++ implant | MOD - Si N++ implant | MOD - Si P Implant | MOD - Si N Implant | PD - Ge epi | PD - Ge N++ implant | Via 1 | Metal 1 | Via 2 | Metal 2 | Bond pad open | Deep Trench | Frontside Oxide Etch |
| | **A \ B** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| Waveguide - Rib | **1** | 0.200 | | | | | | | | | | | | | | | 1.000 | |
| Waveguide - Grating Couplers | **2** | | 0.800 | | | | | | | | | | | | | | 1.000 | |
| Waveguide - Slab | **3** | | | 0.800 | | | | | | | | | | | | | 1.000 | |
| PD - Si P+ Implant | **4** | | | | 0.800 | | | | | | | | | | | | 1.000 | |
| MOD+PD - Si P++ implant | **5** | | | | | 0.800 | | | | 0.200 | | | | | | | 1.000 | |
| MOD - Si N++ implant | **6** | | | | | | 0.800 | | | 0.200 | | | | | | | 1.000 | |
| MOD - Si P Implant | **7** | | | | | | | 0.800 | | | | | | | | | 1.000 | |
| MOD - Si N Implant | **8** | | | | | | | | 0.800 | | | | | | | | 1.000 | |
| PD - Ge epi | **9** | | | | | 0.200 | 0.200 | | | 0.800 | | | | | | | 1.000 | |
| PD - Ge N++ implant | **10** | | | | | | | | | | 0.800 | | | | | | 1.000 | |
| Via 1 | **11** | | | | | | | | | | | 1.000 | | 2.000 | | | 1.000 | |
| Metal 1 | **12** | | | | | | | | | | | | 1.000 | | | | 1.000 | 5.000 |
| Via 2 | **13** | | | | | | | | | | | 2.000 | | 2.000 | | | 1.000 | |
| Metal 2 | **14** | | | | | | | | | | | | | | 2.000 | | 1.000 | 5.000 |
| Bond pad open | **15** | | | | | | | | | | | | | | | 2.000 | 1.000 | |
| Deep Trench | **16** | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 2.000 | 1.000 |
| Frontside Oxide Etch | **17** | | | | | | | | | | | | 5.000 | | | 5.000 | 1.000 | 2.000 |

**Mandatory rule: No other GDS layers in deep trench region.**

## Minimum Inclusion Rule

| Minimum Inclusion (B includes A, refer to nomenclature) (um) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **B** | Waveguide - Rib | Waveguide - Grating Couplers | Waveguide - Slab | PD - Si P+ Implant | MOD+PD - Si P++ implant | MOD - Si N++ implant | MOD - Si P Implant | MOD - Si N Implant | PD - Ge epi | PD - Ge N++ implant | Via 1 | Metal 1 | Via 2 | Metal 2 | Bond pad open | Deep Trench | Frontside Oxide Etch |
| **A** | **A \ B** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| Waveguide - Rib | **1** | | | | | | | | | | | | | | | | | |
| Waveguide - Grating Couplers | **2** | | | | | | | | | | | | | | | | | |
| Waveguide - Slab | **3** | | | | | | | | | | | | | | | | | |
| PD - Si P+ Implant | **4** | | | | | | | | | | | | | | | | | |
| MOD+PD - Si P++ implant | **5** | | | | | | | | | | | | | | | | | |
| MOD - Si N++ implant | **6** | | | | | | | | | | | | | | | | | |
| MOD - Si P Implant | **7** | | | | | | | | | | | | | | | | | |
| MOD - Si N Implant | **8** | | | | | | | | | | | | | | | | | |
| PD - Ge epi | **9** | 0.500 | | | | | | | | | | | | | | | | |
| PD - Ge N++ implant | **10** | | | | | | | | | 1.200 | | | | | | | | |
| Via 1 | **11** | 0.200 | | 0.200 | | 0.200 | 0.200 | | | | 0.200 | | | | | | | |
| Metal 1 | **12** | | | | | | | | | | | 0.400 | | | | | | |
| Via 2 | **13** | | | | | | | | | | | | 1.500 | | | | | |
| Metal 2 | **14** | | | | | | | | | | | | | 1.500 | | | | |
| Bond pad open | **15** | | | | | | | | | | | | | | 1.500 | | | |
| Deep Trench | **16** | | | | | | | | | | | | | | | | | |
| Frontside Oxide Etch | **17** | | | | | | | | | | | | | | | | | |

## Tiling Rules




- 5 x 5 µm squares with 1.5 µm gap for Waveguide – Rib (Layer 1), and Metal 1 (Layer 12). **Mandatory rule: Only full dummy squares i.e. No truncated squares**
- Metal 1 (Layer 12) dummy tiling is translated by 2.5um and -2.5um in x- and y- direction, respectively, of Waveguide – Rib (Layer 1).
- Tiling must be away from devices/patterns at a minimum distance of 20 µm. No tiling should be present along the nanotaper length.