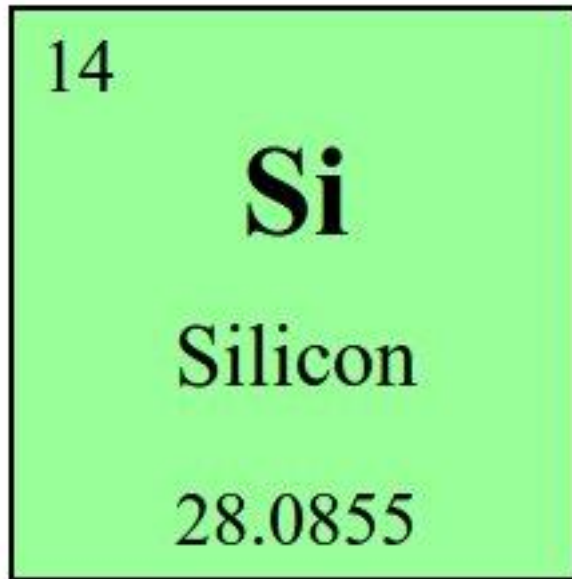


Silicon – The Stuff that Chips are made of

The Element Silicon



Atomic Number: 14

Atomic Weight: 28.0855

Melting Point: 1687 K (1414°C or 2577°F)

Boiling Point: 3538 K (3265°C or 5909°F)

Density: 2.3296 grams per cubic centimeter


Phase at Room Temperature: Solid

Element Classification: Semi-metal

Period Number: 3 **Group Number:** 14

Silicon in the Periodic Table

| Group | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
|--------|----------------------|-----------------------|-----------------------|----------------------------|--------------------------|-------------------------|------------------------|-----------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|------------------------|---------------------------|--------------------------|---------------------------|--------------------------|--------|
| | Alkali metals | Alkaline earth metals | | | | | | | | | | | | | Pnictogens | Chalcogens | Halogens | Noble gases | |
| Period | Hydrogen | | | | | | | | | | | | | | | | | | Helium |
| 1 | 1 H | | | | | | | | | | | | | | | | | 2 He | |
| 2 | Lithium 3 Li | Beryllium 4 Be | | | | | | | | | | | Boron 5 B | Carbon 6 C | Nitrogen 7 N | Oxygen 8 O | Fluorine 9 F | Neon 10 Ne | |
| 3 | Sodium 11 Na | Magnesium 12 Mg | | | | | | | | | | | Aluminium 13 Al | Silicon 14 Si | Phosphorus 15 P | Sulfur 16 S | Chlorine 17 Cl | Argon 18 Ar | |
| 4 | Potassium 19 K | Calcium 20 Ca | Scandium 21 Sc | Titanium 22 Ti | Vanadium 23 V | Chromium 24 Cr | Manganese 25 Mn | Iron 26 Fe | Cobalt 27 Co | Nickel 28 Ni | Copper 29 Cu | Zinc 30 Zn | Gallium 31 Ga | Germanium 32 Ge | Arsenic 33 As | Selenium 34 Se | Bromine 35 Br | Krypton 36 Kr | |
| 5 | Rubidium 37 Rb | Strontium 38 Sr | Yttrium 39 Y | Zirconium 40 Zr | Niobium 41 Nb | Molybdenum 42 Mo | Technetium 43 Tc | Ruthenium 44 Ru | Rhodium 45 Rh | Palladium 46 Pd | Silver 47 Ag | Cadmium 48 Cd | Indium 49 In | Tin 50 Sn | Antimony 51 Sb | Tellurium 52 Te | Iodine 53 I | Xenon 54 Xe | |
| 6 | Caesium 55 Cs | Barium 56 Ba | * | Hafnium 72 Hf | Tantalum 73 Ta | Tungsten 74 W | Rhenium 75 Re | Osmium 76 Os | Iridium 77 Ir | Platinum 78 Pt | Gold 79 Au | Mercury 80 Hg | Thallium 81 Tl | Lead 82 Pb | Bismuth 83 Bi | Polonium 84 Po | Astatine 85 At | Radon 86 Rn | |
| 7 | Francium 87 Fr | Radium 88 Ra | ** | Rutherfordium 104 Rf | Dubnium 105 Db | Seaborgium 106 Sg | Bohrium 107 Bh | Hassium 108 Hs | Meitnerium 109 Mt | Darmstadtium 110 Ds | Roentgenium 111 Rg | Copernicium 112 Cn | Ununtrium 113 Uut | Flerovium 114 Fl | Ununpentium 115 Uup | Livermorium 116 Lv | Ununseptium 117 Uus | Ununoctium 118 Uuo | |
| | * Lanthanides | | Lanthanum 57 La | Cerium 58 Ce | Praseodymium 59 Pr | Neodymium 60 Nd | Promethium 61 Pm | Samarium 62 Sm | Europium 63 Eu | Gadolinium 64 Gd | Terbium 65 Tb | Dysprosium 66 Dy | Holmium 67 Ho | Erbium 68 Er | Thulium 69 Tm | Ytterbium 70 Yb | Lutetium 71 Lu | | |
| | ** Actinides | | Actinium 89 Ac | Thorium 90 Th | Protactinium 91 Pa | Uranium 92 U | Neptunium 93 Np | Plutonium 94 Pu | Americium 95 Am | Curium 96 Cm | Berkelium 97 Bk | Californium 98 Cf | Einsteinium 99 Es | Fermium 100 Fm | Mendelevium 101 Md | Nobelium 102 No | Lawrencium 103 Lr | | |

This is an 18-column periodic table layout, which has come to be referred to as the **common** or **standard form**, on account of its popularity. It is also sometimes referred to as the *long form*, in comparison to the *short form* or *Mendeleev-style* , which omits groups 3-12 by placing their elements into the main groups. The *wide periodic table* incorporates the lanthanides and the actinides, rather than separating them from the main body of the table. The *extended periodic table* adds the 8th and 9th periods, including the superactinides.

| | | | | | | | | | | |
|--|----------------------|------------------------|-----------|------------------|------------|-----------|---------------------|-------------------|-----------|-----------------------------|
| Color of the atomic number shows state of matter (at 0 °C and 1 atm): | black=Solid | green=Liquid | red=Gas | grey=Unknown | | | | | | |
| Border shows natural occurrence of the element: | Primordial | From decay | Synthetic | | | | | | | |
| | Metal | | | | | Nonmetal | | | | |
| Alkali metal | Alkaline earth metal | Inner transition metal | | Transition metal | Poor metal | Metalloid | Polyatomic nonmetal | Diatomic nonmetal | Noble gas | Unknown chemical properties |
| | | Lanthanide | Actinide | | | | | | | |

From Sand to Crystal

Purified Polysilicon Chip



Natural sources of Silicon:
Quartz, Jasper, Flint, Sand, etc.

Crystal Growth



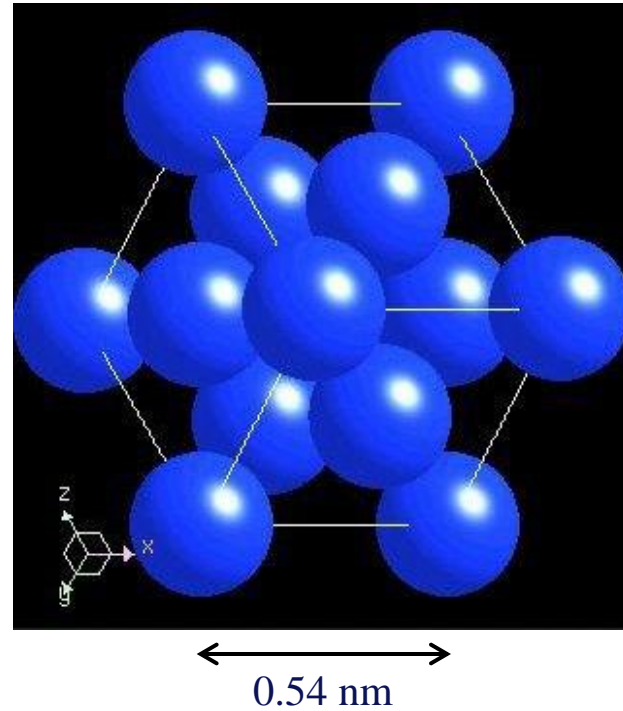
Czochralski Process

Silicon Crystal Structure

Silicon Ingot

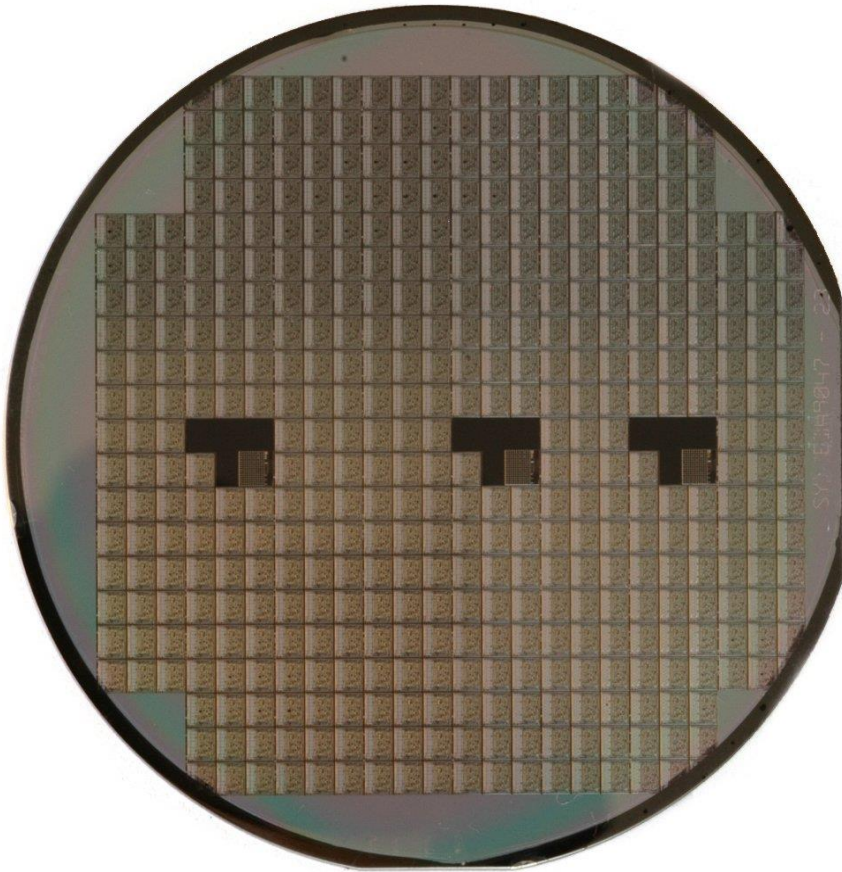


Crystal Lattice
Diamond Structure



From Wafer to Chips

Patterned Silicon Wafer



Final Microchip

