MSB

0.1 0 0 0 1 1 1 1 0 1 1 0 0 1 0 LSB

$\dfrac{1}{2^{-15}}$

Q-15 | -2^0 | 2^{-1} | 2^{-2} | 2^{-3} | 2^{-4} | 2^{-5} | 2^{-6} | 2^{-7} | 2^{-8} | 2^{-9} | 2^{-10} | 2^{-11} | 2^{-12} | 2^{-13} | 2^{-14} | 2^{-15} |

Implied binary point

MSB
Q-3 | 0 | 1 | 0 | 0 |

1.01110000100110...

1.0111000010011110...

Number	Product	Carry
-0.560123×2	1.120246	1 (MSB)
0.120246×2	0.240492	0
0.240492×2	0.480984	0
0.480984×2	0.961968	0
0.961968×2	1.923936	1
0.923936×2	1.847872	1
0.847872×2	1.695744	1
0.695744×2	1.391488	1
0.391488×2	0.782976	0
0.782976×2	1.565952	1
0.565952×2	1.131904	1
0.131904×2	0.263808	0
0.263808×2	0.527616	0
0.527616×2	1.055232	1
0.055232×2	0.110464	0 (LSB)

$2^{-15} = 0.0000305^{17}$

$-(1 \times 2^{-3} + 1 \times 2^{-5} + 1(2^{-9}) + 2^{-10} 2 + 2^{-11} - 2^{-12} - 2^{-13}$
$+ 2^{-14}$

$= -0.1600952$

$2^{-1} 2^{-2} 2^{-5}$ 2^{-9}
1 0 1 1 1 0 0 0 0 0 1 0 $\Rightarrow$ 0.0010100011110

$$Value = Mantissa \times 2^{exponent}$$

0.560120

↳ 0.1000111101100010

0.560123 = 0.1000111101100010

0.560123 − 0.560120 = 0.000003 < $\overset{-15}{2}$

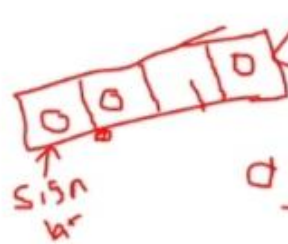0.00003051

$$0.560123 \times 2^{15} =$$

0.25 ⇒ Q.3

0.25×2 = 0.50 ⇒ 0

1 → 0

0.25 × 2 = 2 ⓐ ↓

010

0.25 × 0.25

010

Sign bit

Floating point representation

4 bit exponent   12 bit mantissa

| -2^3 | 2^2 | 2^1 | 2^0 | -2^0 | 2^{-1} | 2^{-2} | 2^{-3} | 2^{-4} | 2^{-5} | 2^{-6} | 2^{-7} | 2^{-8} | 2^{-9} | 2^{-10} | 2^{-11} |
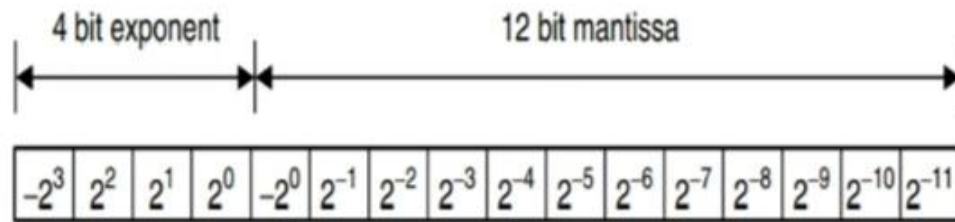
Most negative number $= (1.00000000000)_2 \cdot 2^{0111_2} = (-1) \times 2^7 = -128.0$

Most positive number $= (0.11111111111)_2 \cdot 2^{0111_2} = \left(1 - 2^{-11}\right) \times 2^7 = 127.9375.$

The smallest positive number is given by

Smallest positive number $= (0.00000000001)_2 \cdot 2^{1000_2} = \left(2^{-11}\right) \times 2^{-8} = 2^{-19}.$