Simplifying Pressure Calculation using MPL115A with simple Microprocessors

(See Freescale Semiconductor Application Note AN3785, Page 18)

The line `siPcomp = etc` has a typo that causes the calculation to fail due to a wrong cast. Working from `lt3` it is possible to do the arithmetic using just shifts and adds (32-bit integer). `lt3` is 8192 (13 bits shifted left) too large so the conversion equation is:

\[
\text{pressure} = \frac{65 \times \text{lt3} + 50 \times 1023 \times 8192}{1023 \times 8192}
\]

Add rounding:

\[
\text{pressure} = \frac{65 \times \text{lt3} + 101 \times 1023 \times 4096}{2046 \times 4096}
\]

Multiply top and bottom by 1024/1023 to make the denominator a binary power:

\[
\text{pressure} = \frac{65 \times \text{lt3} \times \frac{1024}{1023} + 101 \times 1023 \times 4096 \times \frac{1024}{1023}}{2046 \times 4096 \times \frac{1024}{1023}}
\]

\[
\text{pressure} = \frac{65 \times \text{lt3} \times \frac{1025}{1025} + 101 \times 1024 \times 4096}{2048 \times 4096}
\]

Substitute 1025/1025 for 1024/1023 (0.95 PPM less than required value):

\[
\text{pressure} = \frac{65 \times \text{lt3} \times \frac{1025}{1024} + 101 \times 1024 \times 4096}{2048 \times 4096} = \frac{65 \times \text{lt3} \times \frac{1025}{1024} + 423624704}{8388608}
\]

Algorithm:

\[
\text{lt3} = \text{lt3} + (\text{lt3} << 6)
\]

Multiply `lt3` by 65

\[
\text{lt3} = \text{lt3} + (\text{lt3} >> 10)
\]

Add `lt3/1024` to give `lt3*1025/1024`

\[
\text{lt3} = (\text{lt3} + 423624704) >> 23
\]

Final Rounded Result in kPa

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