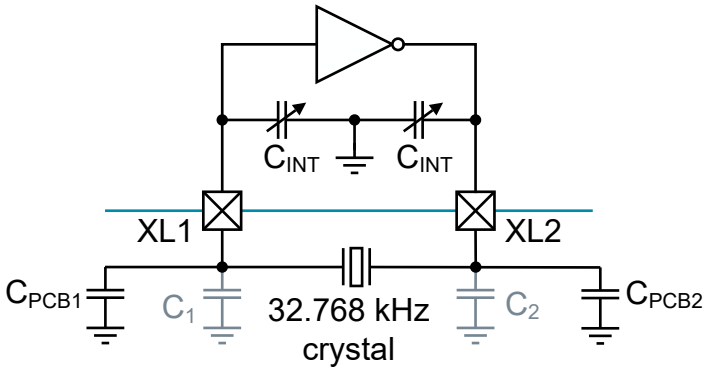

Figure 18: Circuit diagram of the low-frequency crystal oscillator

The device can be used with external capacitors C1 and C2 or the built-in configurable internal capacitors C_{INT}.

When using internal capacitors, the load capacitance (CL) is the total capacitance seen by the crystal across its terminals. It is calculated by the following equation.

$$CL = \frac{(C1' \cdot C2')}{(C1' + C2')}$$

$$C1' = C_{INT} + C_{pcb1}$$
$$C2' = C_{INT} + C_{pcb2}$$

Figure 19: Load capacitance equation for internal capacitors

C_{INT} is the value of the internal capacitors. C_{pcb1} and C_{pcb2} are stray capacitance on the PCB.

The internal capacitors must be configured before starting the low-frequency crystal oscillator (LFXO). To enable the internal capacitors, determine the correct field for OSCILLATORS.XOSC32KI.INTCAP using the following equation.

```
INTCAP = round( (2*CAPACITANCE - 12) * (FICR->XOSC32KTRIM.SLOPE + 0.765625 * 512)/512 +
 FICR->XOSC32KTRIM.OFFSET/64 )
```

The equation has the following variables:

- `CAPACITANCE` is the desired capacitor value in pF, holding any value between 3 pF and 18 pF in 0.65 pF steps.
- `FICR->XOSC32KTRIM` are factory trim values which are device specific.

When LFXO starts, it will use the internal capacitor together with the external crystal.

5.5.2.1 Using external capacitors

When using external capacitors, the load capacitance (CL) is the total capacitance seen by the crystal across its terminals. It is calculated by the following equation.

$$CL = \frac{(C1' \cdot C2')}{(C1' + C2')}$$

$$C1' = C1 + C_{pcb1} + C_{pin}$$
$$C2' = C2 + C_{pcb2} + C_{pin}$$

Figure 20: Load capacitance equation for external capacitors