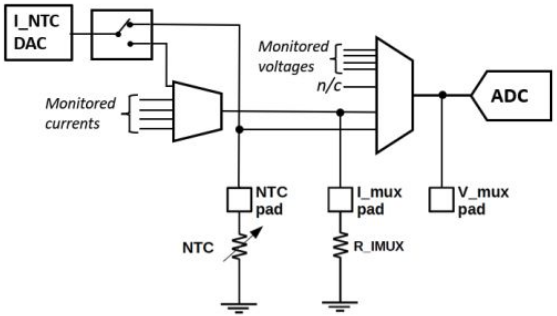
# External NTC calibration RD53B SCC Rev 1.4




## Ext NTC (Negative Temperature Coefficient Thermistor)

A wire bond pad sources a known current that is sent to an external NTC for silicon detector **temperature measurement.**

$R = (Vmux2 - Vmux30) / ((Imux9 - Vmux30)/10k)$

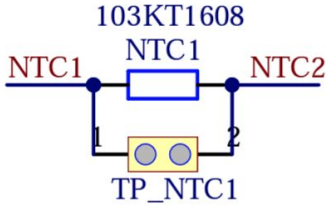
$T = 1/(A + B\ lnR + C\ (lnR)^3)$ Steinhart–Hart equation

A, B, C taken from "NtcCalPar" in chip config.

| | |
|---|---|
| Vmux 2 | NTC_PAD voltage |
| Imux 9 | NTC_PAD current |
| Vmux 30 | GND |

## Ext Ext NTC

Use an external multimeter to directly measure resistance of NTC.




| Imux 9 (V) | Vmux 3 (V) | Vmux 30 (V) | R Ext RTC (Ω) | R Ext Ext RTC (Ω) | T Ext RTC (℃) | T Ext Ext RTC (℃) |
|---|---|---|---|---|---|---|
| 0.42768 | 0.38984 | 0.003153 | 9108.65504431991 | 5040.5 | 27.43 | 43.98 |

Kehang Bai (UO)

# MOS temperature sensor RD53B SCC Rev 1.4

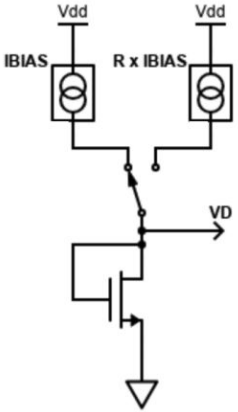
## Transistor Sensor

The voltage $V_D$ across a diode shows a Complementary-To-Absolute Temperature variation.

$$\Delta V_D = V_D(R \times I_{bias}) - V_D(I_{bias}) = N_f \times k_B T / q \times \ln(R)$$

Proportional-To-Absolute Temperature

ideality factor (1 for an ideal diode)




Absolute temperature: $T = \Delta V_D \times q / (N_f \times k_B \times \ln(R))$ R=15 fixed

## Measurement link to instructions link to Yarr code

- Collect readings from **Vmux 14** (ana. sldo), **16** (dig. sldo), and **18** (center).
- Set bias selection switch "**MonSensSldoDigSelBias**" to **0** (**1**) for **IBAIS** (**R×IBIAS**).
- For each value (**0-15**) of the dynamic element matching bits "**MonSensSldoDigDem**", measure $V_D$ through Vmux and take average.

Kehang Bai (UO)