AM5726 MPU Temperature Sensor – Complete Analysis & Debug Documentation

Initial Situation

MPU temperature fluctuates between approx. 36 °C and 43 °C.

Raw values from register 0x4A00232C show significant jumps.

On the BeagleBoard, raw values appear more stable.

Objective: Identify the cause of the fluctuations.

Clock Analysis (PRCM)

SYS_CLK = 20 MHz (correct, matches board oscillator).

WKUPAON source = SYS_CLK (correct).

Thermal clock = 1.25 MHz (within specification 1–2 MHz).

Temperature Raw Register

Bits	Function
9:0	BGAP_DTEMP_MPU (10-bit ADC)
10	BGAP_EOCZ_MPU
11	BGAP_TMPSOFF_MPU

Only bits 9:0 are evaluated.

DVFS Test

```
echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
```

CPU runs at fixed 1.5 GHz. DVFS excluded, fluctuations remain.

DTEMP FIFO Analysis

Register	Address
DTEMP_MPU_0	0x4A0023C0
DTEMP_MPU_1	0x4A0023C4
DTEMP_MPU_2	0x4A0023C8
DTEMP_MPU_3	0x4A0023CC

DTEMP_MPU_4	0x4A0023D0

```
19:14:32 RAW=694 D0=694 D1=694 D2=745 D3=698 D4=720
19:14:32 RAW=751 D0=751 D1=694 D2=745 D3=698 D4=720
```

D0 = newest sample, D1–D4 = older samples.

FIFO shift visible, RAW ≈ D0.

No register or ADC issue. Real temperature values.

Physical Interpretation

ADC Code	Temperature
~670	~35 °C
~745	~43 °C

Temperature delta approx. 8 °C.

Cause: Cortex-A15 hotspot, fast thermal response, idle/wakeup cycles, interrupt load.

Conclusion

Area	Status
SYS_CLK	Correct
Divider	Correct
Bandgap	Correct
DVFS	Excluded
FIFO	Confirmed
ADC	Correct
Cause	Real junction temperature variation

The system is technically functioning correctly.

Final Debug Script

```
RAW_ADDR=0x4A00232C
D0=0x4A0023C0
D1=0x4A0023C4
D2=0x4A0023C8
D3=0x4A0023CC
D4=0x4A0023D0

while true; do
 raw_hex=$(devmem2 $RAW_ADDR 2>/dev/null | awk '/Read at address/ {print $NF}')
 raw_val=$((16#${raw_hex#0x}))
 raw_code=$((raw_val & 0x3ff))
 for A in $D0 $D1 $D2 $D3 $D4; do
  hex=$(devmem2 $A 2>/dev/null | awk '/Read at address/ {print $NF}')
  val=$((16#${hex#0x}))
  printf "%4d " $((val & 0x3ff))
 done | {
```

```
  read d0 d1 d2 d3 d4
  printf "%s RAW=%4d D0=%4d D1=%4d D2=%4d D3=%4d D4=%4d
"   "$(date +%H:%M:%S)" "$raw_code" "$d0" "$d1" "$d2" "$d3" "$d4"
 }
 sleep 0.2
done
```