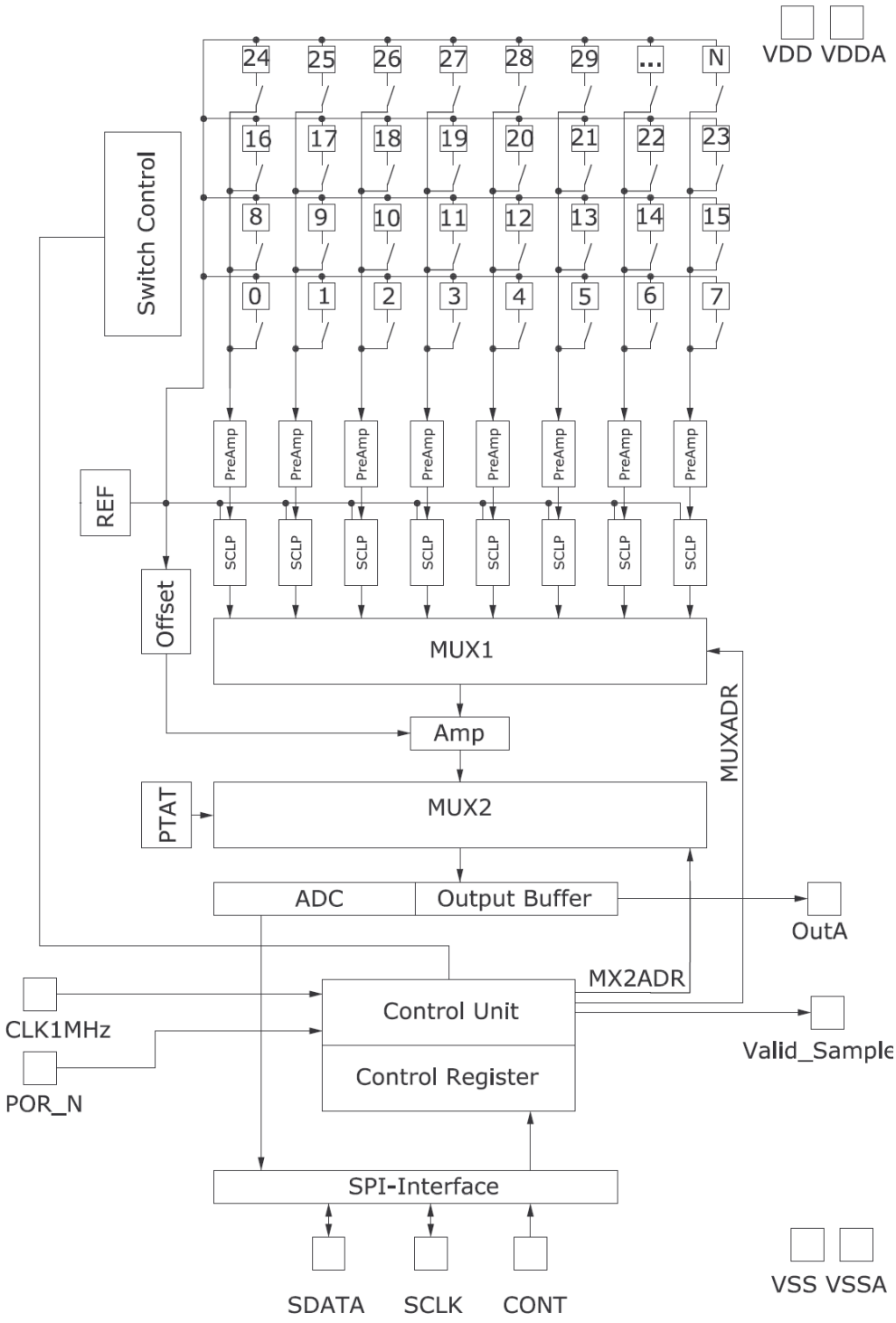
## Principal Schematic for HTPA8x8:



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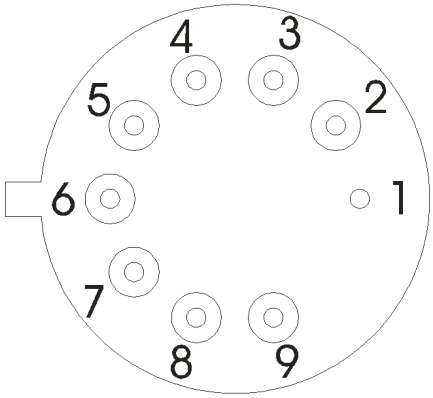
## Pin Assignment in TO39 – Bottom View:




Connect all reference voltages via 100 nF capacitors to VSS.

| **Pin Assignment 8x8** | | | |
|---|---|---|---|
| Pin | Name | Description | Type |
| 1 | VSS | Negative power supply voltage | Power |
| 2 | VDD | Positive power supply voltage | Power |
| 3 | OUT_A | Analog Output | Analog Output |
| 4 | VCM_C | Common mode voltage | Reference Voltage* |
| 5 | DATA_IO | Data input/output for SPI | Digital Input/Output |
| 6 | CONT | Control Pin for SPI | Digital Input |
| 7 | SCLK_IO | Clock input/output for SPI | Digital Input/Output |
| 8 | VSAM | Valid sample | Digital Output |
| 9 | CLK_1MHZ | Master clock | Digital Input |

*) Connect via 100 nF to VSS



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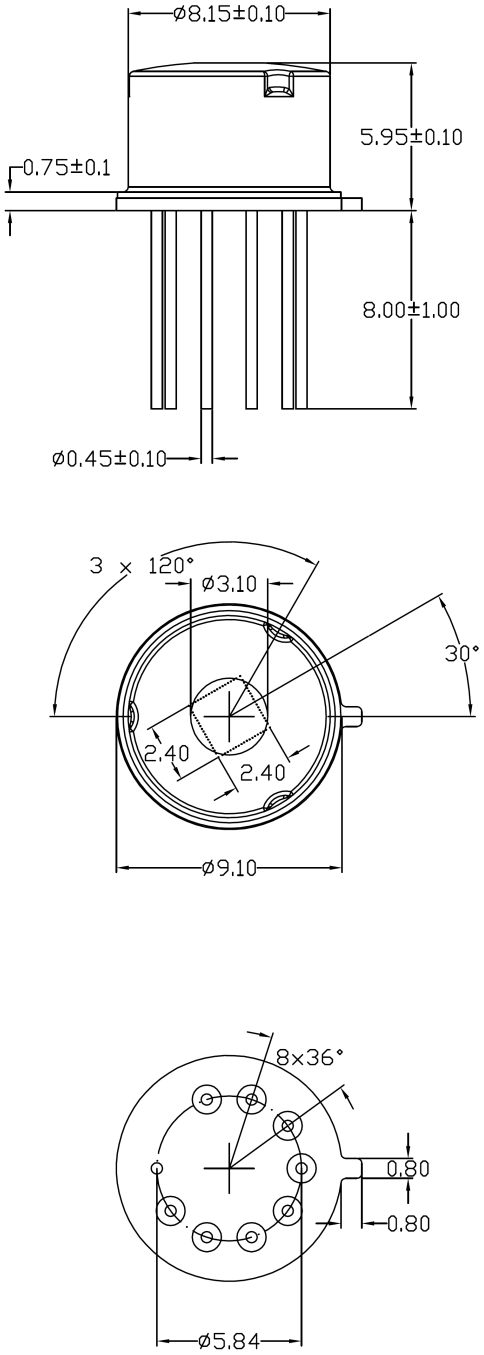
## Outer Dimensions:

**HTPA8x8L2.85 in TO39 (single Silicon Lens, focal length 2.85 mm):**



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## Internal Register Map 8x8:

| Num | Name | Function | Notes |
|---|---|---|---|
| 0 | R | Reset | 1: Mux-Pixel-Counter on reset |
| '(2:1) | OPCTL(1:0) | Selection of operating point<br>Reference choice at SCLP | 00: VrefN<br>01: CM<br>10: VrefP |
| '(9:3) | MA(6:0) | Adress for static pixel selection | |
| 10 | AIM | Adress Increment Mode | 0: adress = MA<br>1: auto adress inrement |
| 11 | AMP | Amplification | 1: high amplification |
| 14 | SDL | SCLK Divider Low | different clock dividers for operating SCLK<br>SCLK = MCLK / 2, 4, 8 |
| 15 | SDH | SCLK Divider High | |

## Characteristics:

Common Specifications:

- Number of Thermocouples 80
- Technology n-poly/p-poly Si
- Element Resistance approx. 80 kOhms
- Sensitivity approx. 75 V/W without optics and filter
- Thermal Pixeltime constant <4 ms
- MUX preamplifier noise approx. 30 $nV/\sqrt{Hz}$
- Pixel + amplifier noise approx. 50 $nV/\sqrt{Hz}$
- Digital Interface SPI
- Analog Output Yes
- 2 point selectable Gains 2640x / 7920 x

- Pitch 300 µm
- Absorber size 220 µm
- Max. Framerate 100 Hz
  (without Averaging)
- 4 internal Amps + MUX
- 64 sensitive elements

Optical characteristics:

- Focal length: 2.85mm (“L” equals the focal length of the lens)
- F-Number: 0.9
- Field of view: 45.6°
- lens coating: AR-Coating; average reflectance per surface
  < 3% for 8µm < λ < 11,5µm
  Environment acc. for MIL-C-48497



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# Electric Specifications:

## Absolute Maximum Ratings:

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | -0.5 | | 6 | V |
| Voltage at All inputs and outputs | $V_{IO}$ | | -0.5 | | $V_{CC}$+0.5 | V |
| Storage Temperature | $T_{STG}$ | | -30 | | 125 | Deg. C |

## Operating Conditions:

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 4.5 | | 5.5 | V |
| Operation Temperature | $T_A$ | | 0 | | 85 | Deg. C |
| ESD-Protection | | Human body model<br>100pF + 1k5Ohm | 1.5 | | | kV |

## Electrical Characteristics

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| **Digital Input** | | | | | | |
| Frequency of MCLK | MCLK | | 100k | 1M | TBD | Hz |
| Input voltage high | $V_{IH}$ | | Vdd-1.2 | | | V |
| Input voltage low | $V_{IL}$ | | | | 1.2 | V |
| Operating Frequency | $f_{OP}$ | CLK_1MHz | 100k | 1M | TBD | Hz |
| **PTAT** | | | | | | |
| Temperature range | | | 0 | | 85 | Deg. C |
| PTAT value@ -20°C | | | | TBD | | V |
| PTAT value@100°C | | | | TBD | | V |
| **Signal Processing** | | | | | | |
| First amplifier stage gain | G0 | | TBD | 880 | TBD | V/V |
| Second amplifier stage gain | G1 | AMPL=0 | TBD | 3 | TBD | V/V |
| Second amplifier stage gain | G1 | AMPL=1 | TBD | 9 | TBD | V/V |
| Analog path Output ripple | $V_{PPSENS}$ | CLK_1MHz | 65 | 91 | 120 | mV |
| Temp. coefficient Thermopile path output voltage | $TCO_{OUTA}$ | | TBD | - | TBD | mV/K |
| **VoltageReference** | | | | | | |
| VREF_1225 | $V_{REF}$ | $V_{CC}$=5V, $T_{amb}$=25°C | 1.2 | 1.225 | 1.25 | V |
| Temp. coeff. of $V_{REF}$ | $TC_{REF}$ | | 35 | 100 | 156 | ppm/K |



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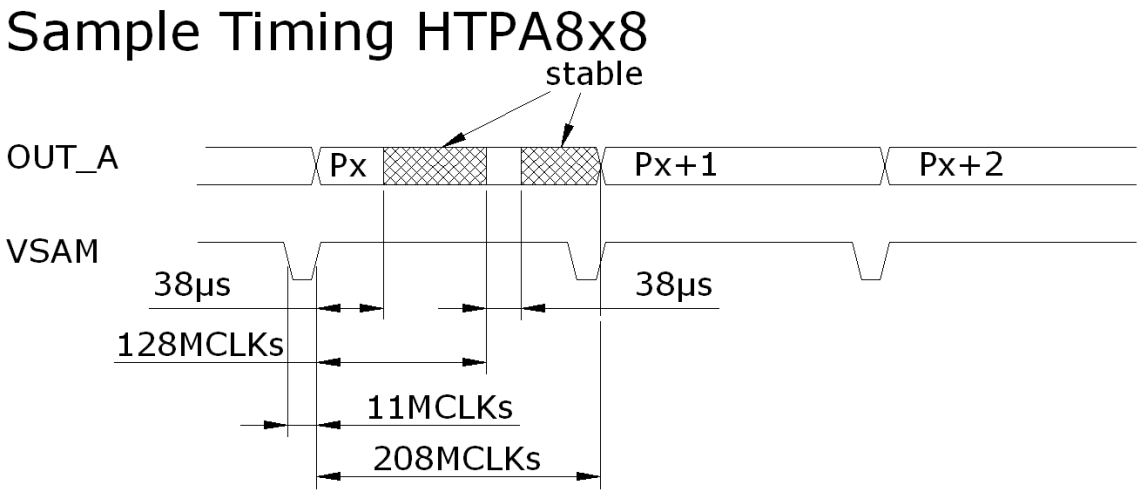
**Electrical Characteristics (continued)**

| Parameter | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| **Analog Output** | | | | | | |
| Output voltage swing | $V_{OUTA}$ | load 10kOhm | 0.5 | | $V_{CC}$-0.8 | V |
| Power supply rejection ratio | $P_{SRR}$ | AMPL=0 VDD<5V | -16 | | | dB |
| Output current limit | $I_{OUTA}$ | OUT_A | 0.15 | | | mA |
| **General Parameters** | | | | | | |
| Overall current consumption | $I_{DD}$ | CLK_1MHz=1MHz 25° C | 4.5 | 4.8 | 5.3 | mA |
| Start up time | $T_{POR}$ | Power On to first VSAM transition | | | 805 | cycles |

## Timings HTPA8x8:




For the HTPA 8x8 every analogous voltage has 2 stable domains, as shown above.



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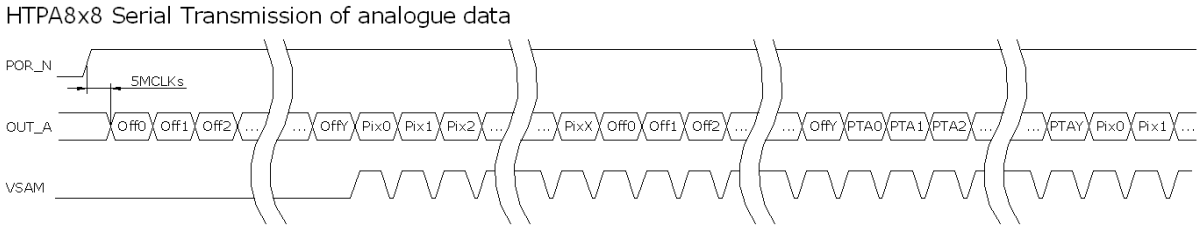
## Serial Transmission:




| | |
|---|---|
| Off0…OffY | Electric offset of amplifier 0 to amplifier Y |
| Pix0…PixX | Amplified pixel voltage of Pixel0 to PixelX |
| PTA0…PTAY | PTAT-Signal |

Constants for array types:

Type 8x8:
Y=3
X=63

The numeration of the pixels is in all cases line by line.



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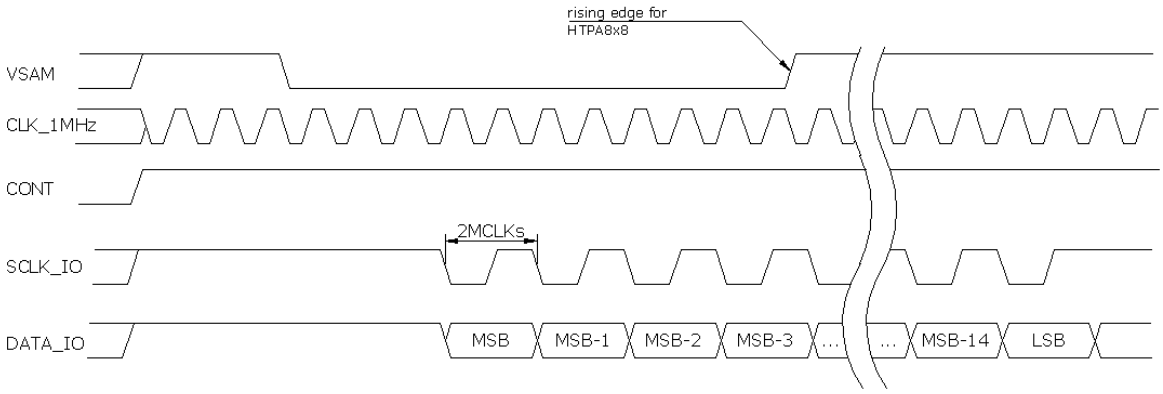
**SPI Communication:**

Data sampled at rising edge of SCLK, MSB first.
In case of ASIC as master device the frequency of the SCLK_IO is equal to the frequency of MCLK/2.

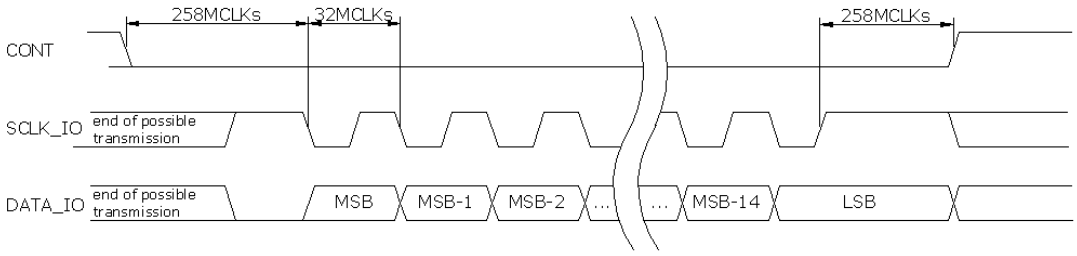
HTPA8x8:
The four MSB's signify the row address of the current pixel, the other bits describe the ADC-result. The ADC result has a large offset and therefore is not accurate. However, it might be used for movement detection or other applications, which not require absolute temperature measurments.

The output drivers for SCLK_IO and DATA_IO are enabled by CONT.
If CONT is low the data can be written serially from external controller through DATA_IO. In that case the external controller has to wait a minimum delay time, until SCLK_IO and DATA_IO output drivers are disabled. After programming, the positive slope of CONT stores the contents, when the number of SCLK-pulses is equal 16. While the output driver of the ASIC is disabled a weak pull up ensures that the SCLK_IO pin is at high level. To execute a reset command, the µC has to write a logical "1" to the R-Bit in to configuration and afterwards a "0" into the R-bit, which requires two write cycles in this special case.

Serial Read from ASIC




Serial Write to ASIC



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