| Name | Address | Default | Description |
| --- | --- | --- | --- |
| **TCA9539** | **0x74** |  | **I2C Bridge** |
| Input Port Register | 0x00, 0x01 |  | Not used |
| Output Port Register for pins P0-P7 | 0x02 | 0xFF | [7:0]  [7] 1: 2.5VDD enable 0: 2.5VDD disable  [6] 1: PD enable 0: PD disable  [5] 1: BG enable 0: BG disable  [4] 1: BF enable 0: BF disable  [3] 1: LA enable 0: LA disable  [2] 1: DRV enable 0: DRV disable  [1] 1: LED enable 0: LED disable  [0] 1: TIA enable 0: TIA disable |
| Output Port Register for pins P8-P15 | 0x03 | 0xFF | [7:0]  [7] A0\_AN3 DAC/ADC address  [6] A0\_AN2 DAC/ADC address  [5] A0\_AN1 DAC/ADC address  [4] A0\_AN0 DAC/ADC address  [7:4] 0001 U22 selected,  0010 U25 selected,  0100 U27 selected,  1000 U28 selected  [3] ARST (normal 1) , reset on 1 to zero transition  [2] RESETB (normal 1), reset on 1 to zero transition  [1] 1: LED enable 0: LED disable  [0] 1: 1.8VDD enable 0: 1.8VDD disable |
| Polarity Registers | 0x04, 0x05 | 0x00 | Not used |
| Configuration Register for pins P0-P7 | 0x06 | 0xFF | [7:0]  0xFF P0-P7 configured as Inputs  Set to 0x00 for P0-P7 to configure as outputs |
| Configuration Register for pins P8-P15 | 0x07 | 0xFF | [7:0]  0xFF P8-P15 configured as Inputs  Set to 0x00 for P8-P15 as outputs |
| **AD5593 (DAC)** | **0x11** |  | **ADC/DAC I2C controlled, 0x10-inactive address**  **Active 0x11 address is chosen by setting bits [7:4] of TCA9539** |
| U22 sets ALL voltages for ASIC | 0x11 |  | Write bits [7:4] to “0001” for chip select |
| I2C transaction for DAC |  | 4 bytes | [7:0] [7:0] [7:0] [7:0] : i2C address, Pointer Byte, MSB byte, LSB byte |
| Configuring DAC(U22) | 0x11 |  | 0x11 I2C address  0x05 Pointer byte: ”DAC pin configuration”  0x00 MSB are all zeros  0xFF make all U22 as DAC outputs |
| Configuring DAC(U22) | 0x11 |  | 0x11 I2C address  0x0b Pointer byte: ”Power-down/reference control”  0x02 Bit 9 of control register (data sheet p.30)  0x00 all channel is in normal operating mode (not powered down) |
| Configuring DAC(U22) | 0x11 |  | 0x11 I2C address  0x03 Pointer byte: ”General purpose control register”  [0x00 All zeros  0x10 Set DAC output to 2\*Vref |
| Write value to DAC | 0x11 |  | 0x11 I2C address  Pointer byte:  [D07] 0  [D06] 0  [D05] 0  [D04] 1 [D15:D12] ”DAC write” p.23 Table 10  [D03] 0  [D02] 0  [D01] 0  [D00] 0 “ [D03:D00] DAC address  DAC data register [15:0]  [D15]: 1 always 1  [14:12] DAC address (3bits)  [11:0] 12 bit DAC data value |
| Write to TIA | 0x11 |  | [0x11] [0x10] [0x85] [0xca] 5CA is 12 bit DAC value data sets 1.8V |
| Write to DRV |  |  | [0x11] [0x11] [0x93] [0x41] 341 is 12 bit DAC value data sets 1.0V |
| Write to LA |  |  | [0x11] [0x12] [0xa3] [0x41] 341 is 12 bit DAC value data sets 1.0V |
| Write to BF |  |  | [0x11] [0x13] [0xb3] [0x41] 341 is 12 bit DAC value data sets 1.0V |
| Write to BG |  |  | [0x11] [0x14] [0xc5] [0xca] 5CA is 12 bit DAC value data sets 1.8V |
| Write to PD |  |  | [0x11] [0x15] [0xda] [0xa0] AA0 is 12 bit DAC value data sets 3.3V |
| Write to 2.5VDD |  |  | [0x11] [0x16] [0xe8] [0x10] 810 is 12 bit DAC value data sets 2.5V |
| Write to 1.8VDD |  |  | [0x11] [0x17] [0xf5] [0xca] 5CA is 12 bit DAC value data sets 1.8V |
|  |  |  |  |
| **AD5593 (ADC) U27** | **0x11** |  | **ADC/DAC I2C controlled, 0x10-inactive address**  **Active 0x11 address is chosen by setting bits [7:4] of TCA9539** |
| Enable reference |  |  | [0x11] [0x0b] [0x02] [0x00] |
| Set pins as ADC |  |  | [0x11] [0x04] [0x00] [0xff] |
| Set pins as ADC |  |  | [0x11] [0x10] [0x00] [0xff] |
| ADC register, 0xff includes |  |  | [0x11] [0x40] |
|  |  |  |  |
| **AD5272** | **0x2F** |  | **Digital POT I2C controlled** |
| Unlock |  |  | [0x2f] [0x1c] [0x03] |
| Write to wiper |  |  | [0x2f] [0x07] [0xff] |

I2C Commands to initialize power supplies (DAC operation):

|  |  |
| --- | --- |
| Command | Description |
| i2cset -y 1 0x74 0x06 0x00 | Set P0-P07 as outputs |
| i2cset -y 1 0x74 0x07 0x00 | Set P08-P15 as outputs |
| i2cset -y 1 0x74 0x02 0x00 | Turn off all power supplies |
| i2cset -y 1 0x74 0x03 0x0c | Turn off power supplies, address, but set resets to 1 |
| i2cset -y 1 0x74 0x03 0x1c | Choose address 0x11 for U22 (chip select), AO\_AN0 = 1, to address U25 0x74 0x03 0x2c AO\_AN1 = 1  to address U27 0x74 0x03 0x4c AO\_AN2 = 1  to address U28 0x74 0x03 0x8c AO\_AN3 = 1 |
| i2cset -y 1 0x11 0x05 0x00 0xff i | Make all outputs to DAC outputs |
| i2cset -y 1 0x11 0x0b 0x02 0x00 i | Enable VREF |
| i2cset -y 1 0x11 0x03 0x00 0x10 i | Set to 2VREF |
|  |  |
|  |  |

Turn TIA on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x10 0x85 0xca i | Write to DAC 0 to set TIA to 1.8V 12bit data 0x05CA sets 1.8 volt |
| i2cset -y 1 0x74 0x02 0x01 | Enable TIA power supply flip bit P00 |
| i2cset -y 1 0x74 0x02 0x00 | Disable TIA power supply |

Turn LEDon/off:

|  |  |
| --- | --- |
| LED power supply is set by POT |  |
| i2cset -y 1 0x74 0x02 0x02 | Enable LED power supply flip bit P01 |
| i2cset -y 1 0x74 0x02 0x00 | Disable LED power supply |

Turn DRV on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x11 0x93 0x41 i | Write to DAC 1 to set DRV to 1.0V 12bit data 0x0341 sets 1.0 volt |
| i2cset -y 1 0x74 0x02 0x04 | Enable DRV power supply flip bit P02 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn LA on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x12 0xa3 0x41 i | Write to DAC 2 to set LA to 1.0V 12bit data 0x0341 sets 1.0 volt |
| i2cset -y 1 0x74 0x02 0x08 | Enable DRV power supply flip bit P03 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn BF on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x13 0xb3 0x41 i | Write to DAC 3 to set BF to 1.0V 12bit data 0x0341 sets 1.0 volt |
| i2cset -y 1 0x74 0x02 0x10 | Enable DRV power supply flip bit P04 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn BG on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x14 0xc5 0xca i | Write to DAC 4 to set BG to 1.8V 12bit data 0x05CA sets 1.8 volt |
| i2cset -y 1 0x74 0x02 0x20 | Enable DRV power supply flip bit P05 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn PD on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x15 0xda 0xa0 i | Write to DAC 5 to set PD to 3.3V 12bit data 0x0AA0 sets 3.3 volt |
| i2cset -y 1 0x74 0x02 0x40 | Enable DRV power supply flip bit P06 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn 2.5 VDD on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x16 0xe8 0x10 i | Write to DAC 6 to set VDD to 2.5V 12bit data 0x0810 sets 3.3 volt |
| i2cset -y 1 0x74 0x02 0x80 | Enable DRV power supply flip bit P07 |
| i2cset -y 1 0x74 0x02 0x00 | Disable DRV power supply |

Turn 1.8 VDD on/off:

|  |  |
| --- | --- |
| i2cset -y 1 0x11 0x17 0xf5 0xca i | Write to DAC 7 to set 1.8VDD to 1.8V 12bit data 0x05CA sets 1.8volt |
| i2cset -y 1 0x74 0x03 0x1D | Enable DRV power supply flip bit P10 |
| i2cset -y 1 0x74 0x03 0x1C | Disable DRV power supply |

SET VLED using Digital POT:

|  |  |
| --- | --- |
| Command | Description |
| i2cset -y 1 0x2f 0x1c 0x03 | unlock |
| i2cset -y 1 0x2f 0x07 0xff | 0x2f – slave address  16 bit data register  [D15:14] unused need to be set to 0  [D15] : 0  [D14] : 0  [D13:10] command bits: “0001” Write to RDAC  [D13] : 0  [D12] : 0  [D11] : 0  [D10] : 1  [D09:0] 10 bit data  [D09] :  [D08]  [D07]  [D06]  [D05]  [D04]  [D03]  [D02]  [D01]  [D00] |
|  |  |

ADC (Voltage Monitoring U25):

|  |  |
| --- | --- |
| Command | Description |
| i2cset -y 1 0x74 0x03 0x2f | Set address A0\_AN1 = 1 to talk to U25 |
| i2cset -y 1 0x11 0x0b 0x02 0x00 i | Enable reference |
| i2cset -y 1 0x11 0x04 0x00 0xff i | Set all pins as ADC |
| i2cset -y 1 0x11 0x02 0x00 0x01 i      i2cget –y 1 0x11 0x40 w | Point to ADC register (pointer =0x02), no repeat, set single channel:  TIA channel for conversion  Read single channel and convert to voltage |
| 2cset -y 1 0x11 0x02 0x00 0x02 i  I2cget –y 1 0x11 0x40 w | VDD\_DRV channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x04 i  i2c get –y 1 0x11 0x40 w | VDD\_LA channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x08 i  i2cget –y 1 0x11 0x40 w | VDD\_BF channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x10 i  i2cget –y 0x11 0x40 w | VDD\_BG channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x20 i  i2cget –y 0x11 0x40 w | VDD\_PD channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x40 i  i2cget –y 0x11 0x40 w | VDD\_2.5V channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x80 i  i2cget –y 0x11 0x40 w | VDD\_1.8V channel for conversion  Read |

ADC (Current Monitoring U27):

|  |  |
| --- | --- |
| Command | Description |
| i2cset -y 1 0x74 0x03 0x4f | Set address A0\_AN2 = 1 to talk to U27 |
| i2cset -y 1 0x11 0x0b 0x02 0x00 i | Enable reference |
| i2cset -y 1 0x11 0x04 0x00 0xff i | Set all pins as ADC |
| i2cset -y 1 0x11 0x02 0x00 0x01 i      i2cget –y 1 0x11 0x40 w | Point to ADC register (pointer =0x02), no repeat, set single channel:  I\_TIA channel for conversion  Read single channel and convert to voltage |
| 2cset -y 1 0x11 0x02 0x00 0x02 i  I2cget –y 1 0x11 0x40 w | I\_DRV channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x04 i  i2c get –y 1 0x11 0x40 w | I\_LA channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x08 i  i2cget –y 1 0x11 0x40 w | I\_BF channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x10 i  i2cget –y 0x11 0x40 w | I\_BG channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x20 i  i2cget –y 0x11 0x40 w | I\_PD channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x40 i  i2cget –y 0x11 0x40 w | I\_2.5V channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x80 i  i2cget –y 0x11 0x40 w | I\_1.8V channel for conversion  Read |

ADC (Current Monitoring U28):

|  |  |
| --- | --- |
| Command | Description |
| i2cset -y 1 0x74 0x03 0x8f | Set address A0\_AN2 = 1 to talk to U27 |
| i2cset -y 1 0x11 0x0b 0x02 0x00 i | Enable reference |
| i2cset -y 1 0x11 0x04 0x00 0x38 i | Set pins IO5 IO4 IO3 as ADC, other pins are not ADC |
| i2cset -y 1 0x11 0x02 0x00 0x08 i      i2cget –y 1 0x11 0x40 w | Point to ADC register (pointer =0x02), no repeat, set single channel:  ADC\_LED channel for conversion  Read single channel and convert to voltage |
| 2cset -y 1 0x11 0x02 0x00 0x10 i  I2cget –y 1 0x11 0x40 w | I\_12 channel for conversion  Read |
| i2cset -y 1 0x11 0x02 0x00 0x20 i  i2c get –y 1 0x11 0x40 w | I\_LED channel for conversion  Read |