

# AX06 Grove&5V Specification

## 1 Description

Grove&5V leaf is a connector leaf for Seeed Studio Grove Series. All 4 pins connectors are Grove compatible connectors which is communicated with MCU leaf via UART, I2C, Analog IO, Digital IO. Grove power supply (5.0V) is generated from leaf 3V power supply by a boost converter IC.

To save power consumption, Grove power supply can be turned on/off by the I2C IO expander.

ConnectorPin	CableColor	UART	I2C	Analog in	Digital in
1	Yellow	RX	SCL	Analog in1	Digital in1
2	White	TX	SDA	Analog in2	Digital in2
3	Red	VCC	VCC	VCC	VCC
4	Black	GND	GND	GND	GND

## 2 Leaf specification

### 2.1 Block diagram

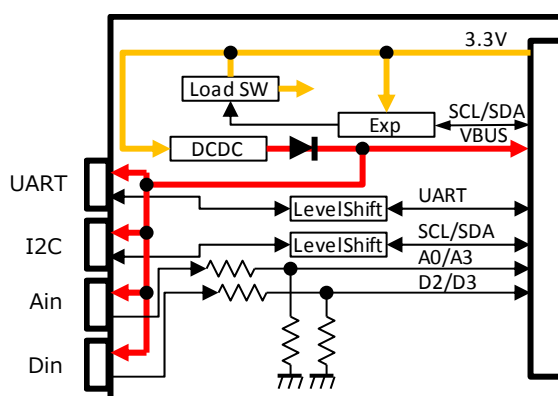


Figure.2.1 Block diagram

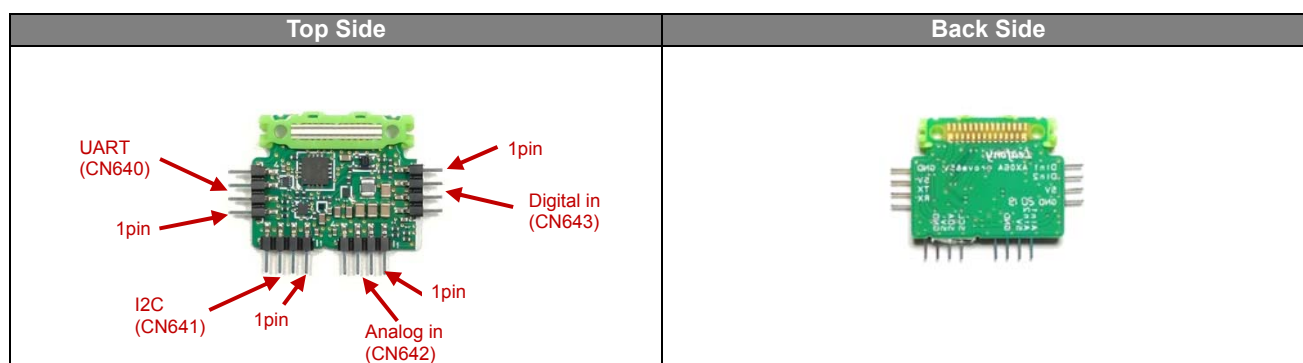
### 2.2 Power supply specification

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vin	Input Voltage	—		3.3V	
Vout	Output Voltage	—	4.9V	5V	5.1V
Idd	Operating current	Active(Grove disconnected)	-	1mA	-
		Sleep	-	1uA	-

### 2.3 Main parts

Reference No.	Part name	Part number	Vendor name	note
IC641	Level Shifter	LSF0102DQER	Texas Instruments	—
IC640	I2C Level Shifter	TCA9509RVHR	Texas Instruments	—
IC644	Boost converter IC	TPS61099YFFR	Texas Instruments	—
IC642	I2C Expander	PCA9557RGVR	Texas Instruments	—
IC643	Load Switch	XC8102AA01NR-G	TOREX	—

## 2.4 Appearance



## 2.5 Pin assignment

Name	Function
A2	TXD : UART TX
A1	RXD : UART RX
SCL	I2C Clock
SDA	I2C Data
A0	Analog in1
A3	Analog in2
D8	Digital in1
D9	Digital in2
3V3	3.3V input
VBUS	5V output
GND	GND

## 3 Level Shifter (LSF0102DQER) Specifications

### 3.1 Description

Item	Description
Type	Bidirectional Multi-Voltage Level Translator
Channel	2
IO	5V Tolerant

### 3.2 Electrical characteristics

#### 3.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40°C to +125°C
Maximum Operation Voltage	7.0V

#### 3.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd(Vref_A/Vref_B)	Supply Voltage	—	0V	-	5V
Idd	Supply current	Vref_B=Ven=5.5V, Vref_A=4.5V or 1V, IO=0, Vi=Vdd or GND	-	1uA	-

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### 3.3 Link destination of data sheet

<http://www.tij.co.jp/product/jp/LSF0102/description>

## 4 I2C Level Shifter (TCA9509RVHR) Specifications

### 4.1 Description

Item	Description
Type	Bidirectional Level Translator
Channel	2
IO	5.5V Tolerant

### 4.2 Electrical characteristics

#### 4.2.1 Absolute Maximum Ratings

Parameter	Value
Operating temperature	-40°C to +125°C
Maximum operation voltage	6.0V

#### 4.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
VccA	Supply voltage	—	0.9V	-	5.5V
VccB	Supply voltage	—	2.7V	-	5.5V
IccA	Supply current	All port A Static high	0.25mA	0.45mA	0.9mA
		All port A Static low	1.25mA	-	-
IccB	Supply current	All port B Static high	0.5mA	0.9mA	1.1mA

### 4.3 Link destination of data sheet

<http://www.tij.co.jp/product/jp/tca9509>

## 5 I2C Expander (PCA9557RGVR) Specifications

### 5.1 Description

Item	Description
Type	Parallel Port Expander
GIO Port	8Port
IO	5V Tolerant
Interfaces	I2C

### 5.2 Electrical characteristics

#### 5.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40°C to +85°C
Maximum Operation Voltage	6.0V

## 5.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	2.3V	-	5.5V
Idd	Operating mode	3.6V 100kHz	-	1uA	4uA
	Standby mode	3.6V Vi=Vcc or GND, Io=0	-	0.25uA	0.9uA

## 5.3 Link destination of data sheet

<http://www.tij.co.jp/product/jp/PCA9557/>

## 6 Register

Name	D7	D6	D5	D4	D3	D2	D1	D0
Control Register	0	0	0	0	0	0	B1	B0

### Control Register Field Descriptions

B1	B0	REGISTER
0	0	Input Port
0	1	Output Port
1	0	Polarity Inversion
1	1	Configuration

Name	Control	D7	D6	D5	D4	D3	D2	D1	D0
Input Port	00h	I7	I6	I5	I4	I3	I2	I1	I0

### Input Port Register Field Descriptions

Field	Description
I[7:0]	The input port register (register 0) reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by the configuration register. It only acts on read operation. Writes to these registers have no effect. The default value, X, is determined by the externally applied logic level. Before a read operation, a write transmission is sent with the command byte to signal the I2C device that the input port register will be accessed next.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Output Port	01h	O7	O6	O5	O4	O3	O2	O1	O0

### Output Port Register Field Descriptions

Field	Description
O[7:0]	The output port register (register 1) shows the outgoing logic levels of the pins defined as outputs by the configuration register. Bit values in this register have no effect on pins defined as inputs. In turn, reads from this register reflect the value that is in the flip-flop controlling the output selection, not the actual pin value.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Polarity Inversion	02h	N7	N6	N5	N4	N3	N2	N1	N0

## Polarity Inversion Register Field Descriptions

Field	Description
N[3:0]	The polarity inversion register (register 2) allows polarity inversion of pins defined as inputs by the configuration register. If a bit in this register is set (written with 1), the corresponding port pin's polarity is inverted. If a bit in this register is cleared (written with a 0), the corresponding port pin's original polarity is retained.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Configuration	03h	C7	C6	C5	C4	C3	C2	C1	C0

## Configuration Register Field Descriptions

Field	Description
C[7:0]	The configuration register (register 3) configures the directions of the I/O pins. If a bit in this register is set to 1, the corresponding port pin is enabled as an input with high impedance output driver. If a bit in this register is cleared to 0, the corresponding port pin is enabled as an output.

## 7 Load Switch(XC8102AA01NR-G) Specifications

### 7.1 Description

Item	Description
Protection Circuits	Over-current protection and Fold-back protection circuit equipped

### 7.2 Electrical characteristics

#### 7.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40°C to +85°C
Maximum Operation Voltage	6.5V

#### 7.2.2 Specification

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	1.2V	-	6.0V
Ron	ON resistance	2.9V	-	0.35Ω	0.475Ω
Ilim	Current limitation	VIN ≥ 2.9V, VOUT = VIN - 0.8V	400mA	480mA	-
Ishort	Short-circuit current	VCE=VIN, VOUT=0V	-	30mA	75mA
Idd	Operating mode	4.0V	-	3.8uA	6.5uA
	Standby mode	6V	-	0.01uA	0.10uA

### 7.3 Link destination of data sheet

<https://www.torex.co.jp/products/load-switches/series/?name=xc8102>

### 7.4 Power saving control

Grove power supply can be turned on/off by the I2C IO expander.

## 8 Revision history

Rev A1.0: First edition, August 2019