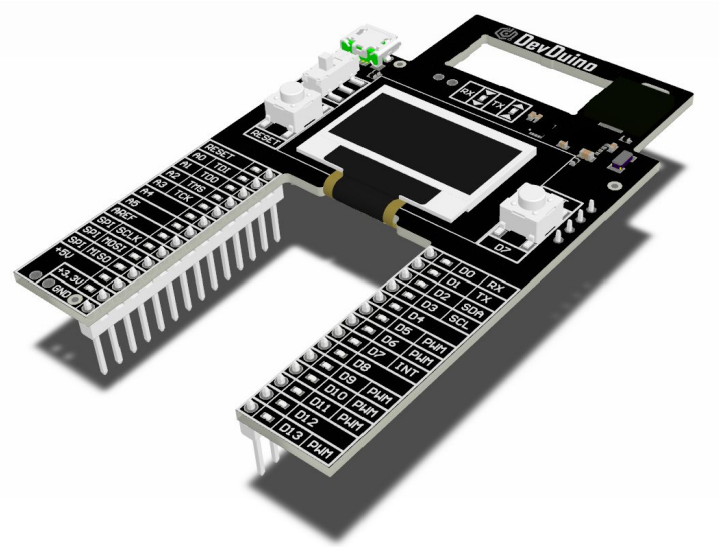
Dev Duino
Development Platform



MAIN FEATURES

+ ATMEGA32u4 Microcontroller
  - 16 MHz 8-bit AVR
  - 32KB FLASH
  - 2.5KB SRAM
  - 1KB EEPROM
  - 12-channel 10-bit A/D-converter
+ 1.3" 128x64 OLED Display I2C controlled
+ REAL TIME CLOCK with Backup BATTERY
+ MICRO SD Interface
+ TEMPERATURE & HUMIDITY Sensor
+ STATUS LEDs on all signals
+ Power SWITCH and int PUSH-BUTTON
+ BLUETOOTH HC06/05 Connector
+ 0.28" VOLTMETER Slot
+ BREADBOARD Compatible
+ Breadboard LEDs for NIGHTTIME
+ ARDUINO Compatible
+ ROHS Compliant

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REVISION HISTORY

0.9	June 2017	First Release
1.0	Nov. 2017	Piezo Buzzer added
.....	.....	.....
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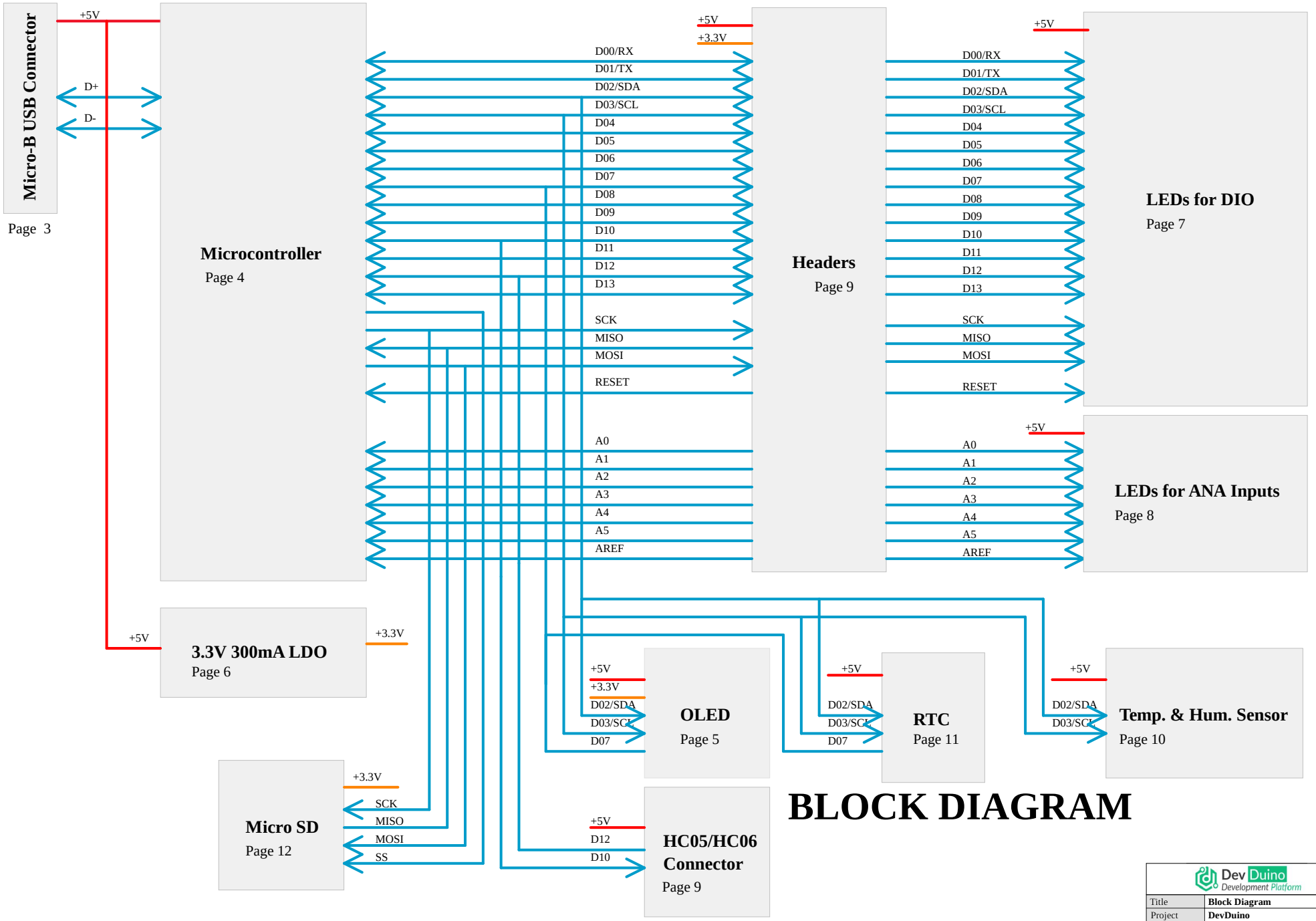
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DevDuino
Development Platform
Title: Block Diagram
Project: DevDuino
Designed by: Alexandre Pailhoux
Revision: 1.0
Date: June 30th, 2017
Licence: CC BY-NC-SA
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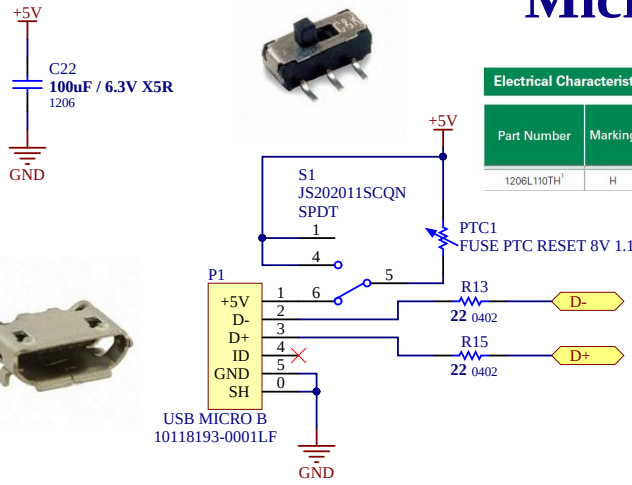
Micro-B USB Connector



Electrical Characteristics

Part Number	Marking	I_{hold} (A)	I_{trip} (A)	V_{max} (Vdc)	I_{max} (A)	P_d typ. (W)	Maximum Time To Trip		Resistance		Agency Approvals	
							Current (A)	Time (Sec.)	R_{min} (Ω)	R_{1max} (Ω)		
1206L110TH[1]	H	1.10	2.20	8	100	0.8	8.00	0.10	0.040	0.210	X	X

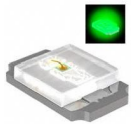
2.2.8 D-

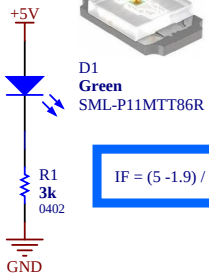
USB Full speed / Low Speed Negative Data Upstream Port. Should be connected to the USB D- connector pin with a serial 22Ω resistor.

2.2.9 D+

USB Full speed / Low Speed Positive Data Upstream Port. Should be connected to the USB D+ connector pin with a serial 22Ω resistor.

5V Status LED





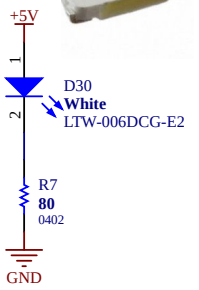
IF = (5 -1.9) / 3k = 1mA

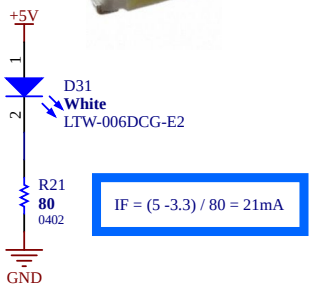
■ Specifications

Part No.	Chip Structure		Absolute Maximum Ratings (Ta=25ºC) Power Dissipation P_D(mW)	Forward Current I_F(mA)	Peak Forward Current I_{FP}(mA)	Reverse Voltage V_R(V)	Operating Temp. T_{opr}(ºC)	Storage Temp. T_{stg}(ºC)	Electrical and Optical Characteristics (Ta=25ºC) Forward Voltage V_F Typ. (V)	I_F (mA)	Reverse Current I_R Max. (μA)	V_R (V)	Dominant Wavelength λ_D Min.*2 (nm)	Typ. (nm)	Max.*2 (nm)	I_F (mA)	Luminous Intensity I_V Min. (mcd)	Typ. (mcd)	I_F (mA)
SML-P11VT(R)	AlGaInP	Red	50	20	100*1	5	-40~+85	-40~+100	1.8	1	10	5	622	626	632	1	1.6	4.0	1
SML-P11UT(R)													616	621	626		1.0	2.5	
SML-P11DT(R)		Orange	52						1.9				601	605	609		4.0	7.3	
SML-P11YT(R)		Yellow											583	586	591			7.6	
SML-P11MT(R)			54										566	569	574		1.0	2.1	

*1 : Duty 1/10, 1kHz *2 : Measurment tolerance : ±1nm

Nighttime LEDs





IF = (5 -3.3) / 80 = 21mA

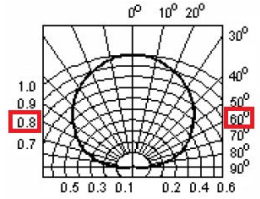


Fig.6 Spatial Distribution

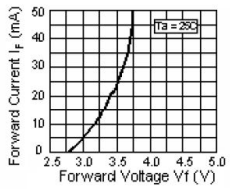


Fig.2 Forward Current vs. Forward Voltage

DevDuino Development Platform			
Title	**USB + 5V and DarkEnv LEDs**		
Project	**DevDuino**		
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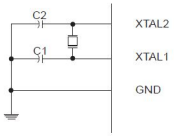
Microcontroller

Figure 6-2. Crystal Oscillator Connections



The Low Power Oscillator can operate in three different modes, each optimized for a specific frequency range. The operating mode is selected by the fuses CKSEL[3..1] as shown in this table.

Table 6-3. Low Power Crystal Oscillator Operating Modes

Frequency Range[1] [MHz]	CKSEL3..1	Recommended Range for Capacitors C1 and C2 [pF]
0.4 - 0.9	100[2]	–
0.9 - 3.0	101	12 - 22
3.0 - 8.0	110	12 - 22
8.0 - 16.0	111	12 - 22

Notes:
1. This option should not be used with crystals, only with ceramic resonators.
2. If 8 MHz frequency exceeds the specification of the device (depends on VCC), the CKDIV8 Fuse can be programmed in order to divide the internal frequency by 8. It must be ensured that the resulting divided clock meets the frequency specification of the device.

V_{RST}	$\overline{\text{RESET}}$ Pin Threshold Voltage		$0.2V_{CC}$		$0.85V_{CC}$	V
t_{RST}	Minimum pulse width on $\overline{\text{RESET}}$ Pin	5V, 25°C		400		ns

Title	**ATMEGA32u4**		
Project	**DevDuino**		
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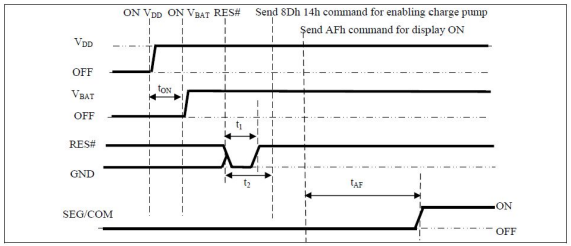
OLED Display 1.3" 128x64

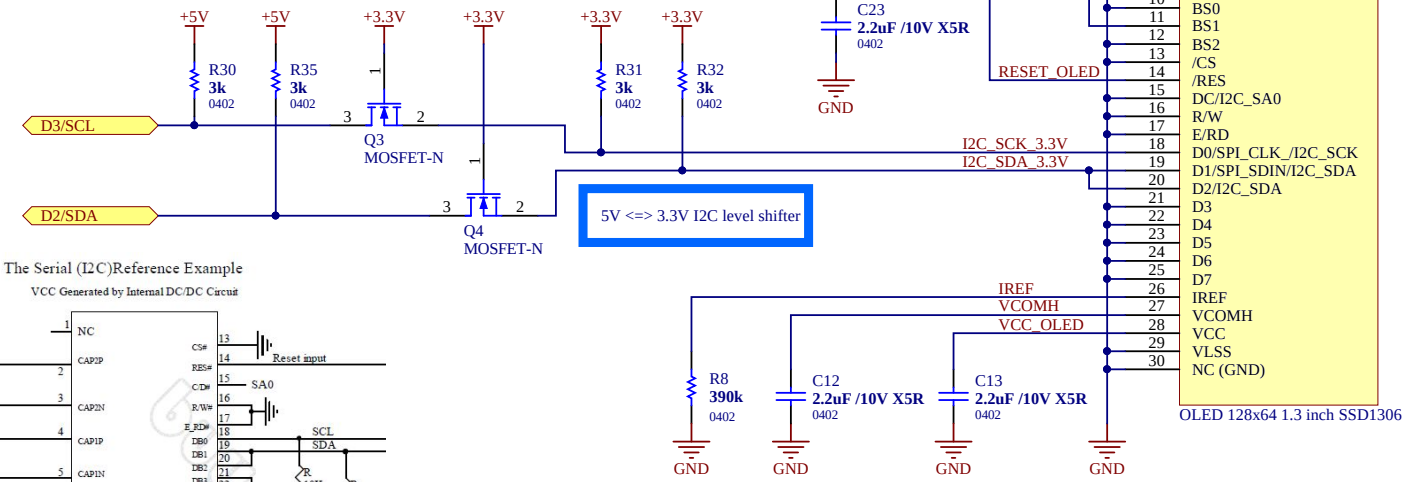
8.9.2 Power ON and OFF sequence with Charge Pump Application

Power ON sequence:

1. Power ON V_{DD}
2. Wait for t_{ON}. Power ON V_{BAT} (1), (2) (where Minimum t_{ON} = 0ms)
3. After V_{BAT} become stable, set RES# pin LOW (logic low) for at least 3us (t_1) (3) and then HIGH (logic high).
4. After set RES# pin LOW (logic low), wait for at least 3us (t_2). Then input commands with below sequence:
   a. 8Dh 14h for enabling charge pump
   b. AFh for display ON
5. SEG/COM will be ON after 100ms (t_{AF}).

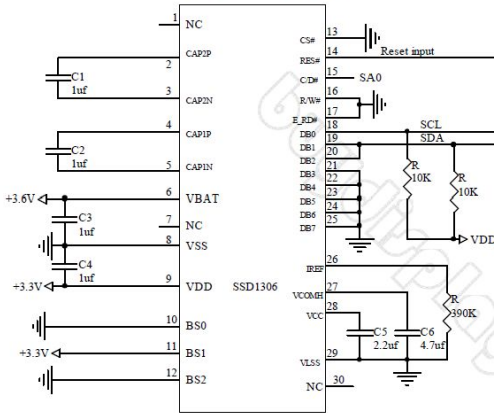
Figure 8-18 : The Power ON sequence with Charge Pump Application





The Serial (I2C)Reference Example

VCC Generated by Internal DC/DC Circuit



Title	**SSD1306 OLED Display**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
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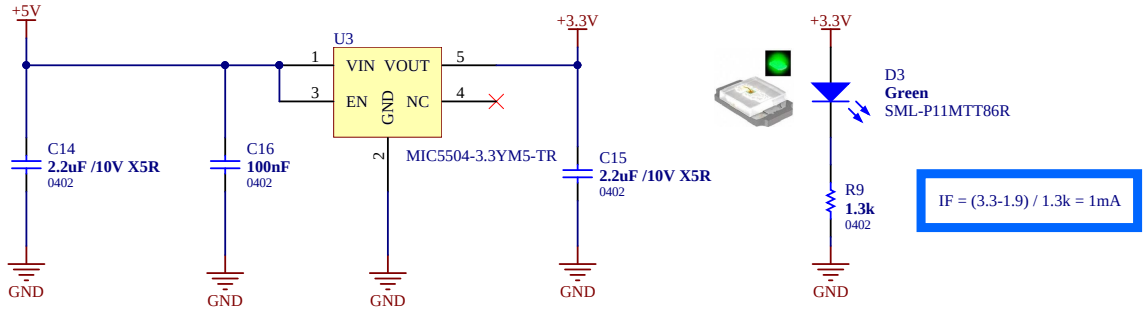
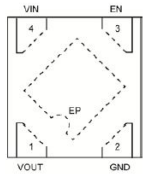
+3.3V LDO

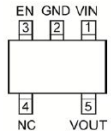
Features

- Input voltage range: 2.5V to 5.5V
- Fixed output voltages from 1.0V to 3.3V
- 300mA guaranteed output current
- High output accuracy (±2%)
- Low quiescent current: 38µA
- Stable with 1µF ceramic output capacitors
- Low dropout voltage: 160mV @ 300mA
- Output discharge circuit: MIC5502, MIC5504
- Internal enable pull-down: MIC5503, MIC5504
- Thermal-shutdown and current-limit protection
- 4-lead 1.0mm × 1.0mm Thin DFN package
- MIC5504 5-pin SOT23 package





4-Pin 1mm × 1mm Thin DFN (MT)
(Top View)



5-Pin SOT23 (M5)
(Top View)

Pin Description

Pin Name	Pin Number Thin DFN-4	Pin Number SOT23-5	Pin Function
VOUT	1	5	Output Voltage. When disabled the MIC5502 and MIC5504 switches in an internal 25Ω load to discharge the external capacitors.
GND	2	2	Ground
EN	3	3	Enable Input: Active High. High = ON; Low = OFF. For MIC5501 and MIC5502 do not leave floating. MIC5503 and MIC5504 have an internal pull-down and this pin may be left floating.
VIN	4	1	Supply Input.
NC	-	4	No Connection. Pin is not internally connected.
ePad	EP	-	Exposed Heatsink Pad. Connect to GND for best thermal performance.

DevDuino Development Platform			
Title	**3.3V LDO**		
Project	**DevDuino**		
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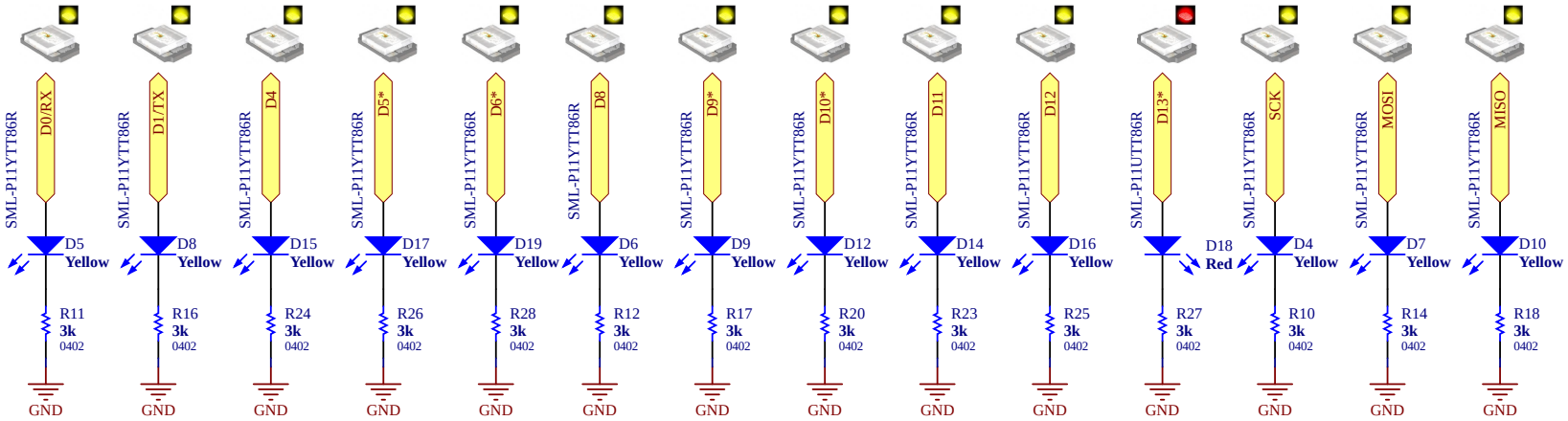
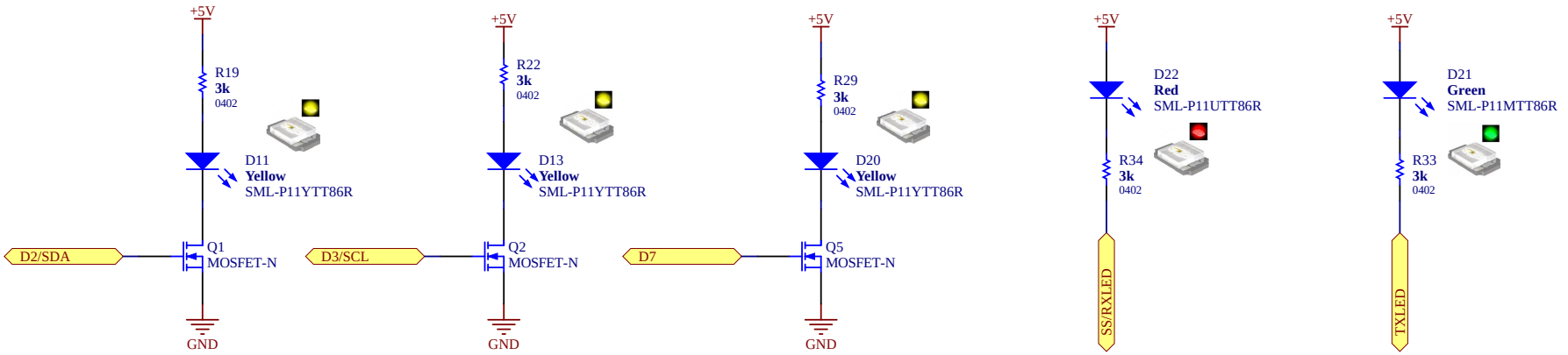


DIGITAL I/O LEDs



■ Specifications

Part No.	Chip Structure	Emitting color	Absolute Maximum Ratings (Ta=25°C) Power Dissipation P_D(mW)	Forward Current I_F(mA)	Peak Forward Current I_{FP}(mA)	Reverse Voltage V_R(V)	Operating Temp. T_{opr}(°C)	Storage Temp. T_{stg}(°C)	Electrical and Optical Characteristics (Ta=25°C) Forward Voltage V_F Typ. (V)	I_F (mA)	Reverse Current I_R Max. (μA)	V_R (V)	Dominant Wavelength λ_D Min.*2 (nm)	Typ. (nm)	Max.*2 (nm)	I_F (mA)	Luminous Intensity I_V Min. (mcd)	Typ. (mcd)	I_F (mA)
SML-P11VT(R)	AlGaInP	Red	50	20	100*1	5	-40~+85	-40~+100	1.8	1	10	5	622	626	632	1	1.6	4.0	1
SML-P11UT(R)													616	621	626		1.0	2.5	
SML-P11DT(R)		Orange	52						1.9				601	605	609		4.0	7.3	
SML-P11YT(R)		Yellow											583	586	591			7.6	
SML-P11MT(R)		Yellowish green	54										566	569	574		1.0	2.1	

*1 : Duty 1/10, 1kHz *2 : Measurement tolerance : ±1nm

IF = (5 -1.9) / 3k = 1mA

DevDuino Development Platform			
Title	**DIO LEDs**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
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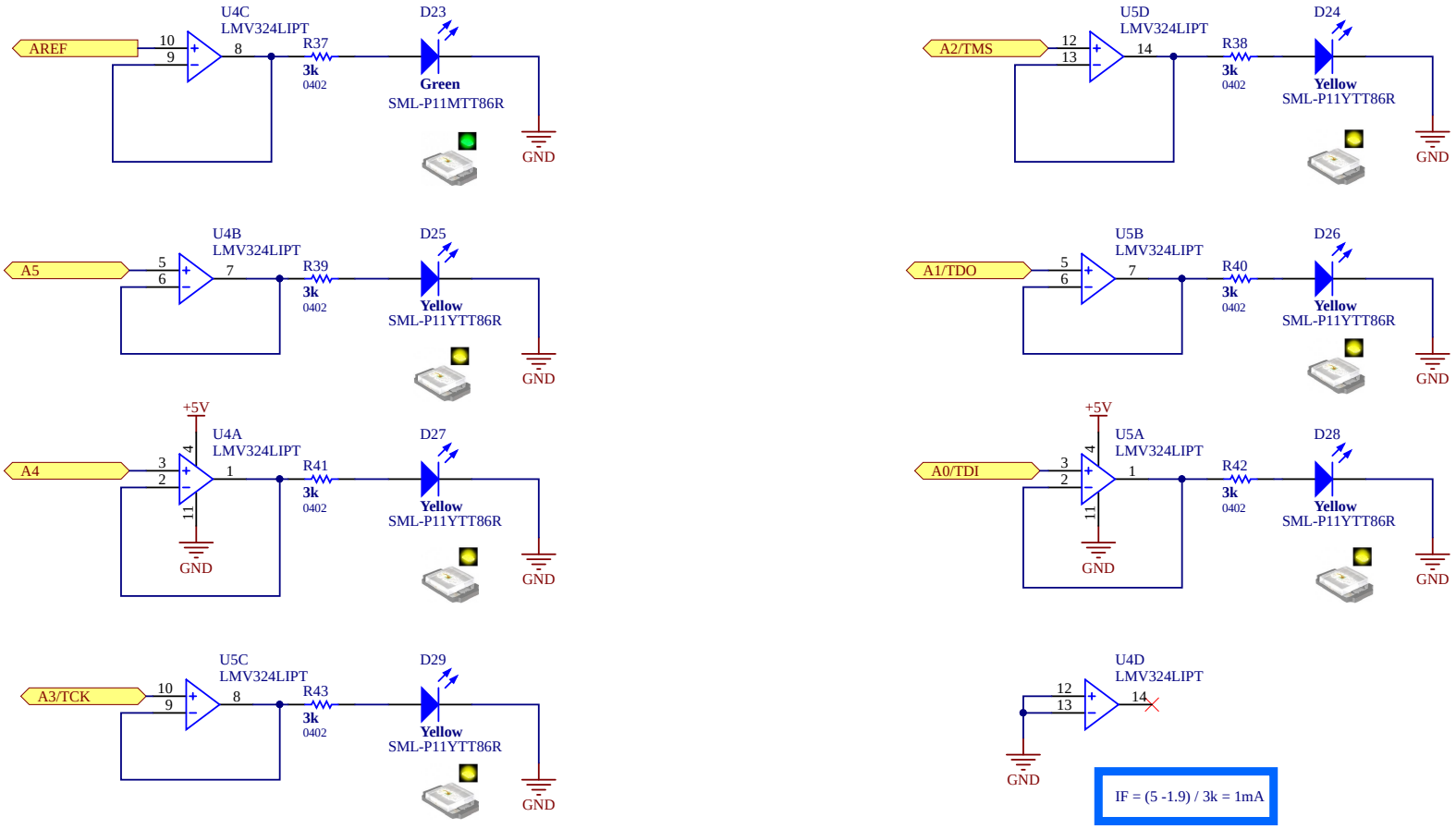
BUFFERED ANALOG INPUT LEDs



■ **Specifications**

Part No.	Chip Structure		Absolute Maximum Ratings (Ta=25°C) Power Dissipation P_D(mW)	Forward Current I_F(mA)	Peak Forward Current I_{FP}(mA)	Reverse Voltage V_R(V)	Operating Temp. T_{opr}(°C)	Storage Temp. T_{stg}(°C)	Electrical and Optical Characteristics (Ta=25°C) Forward Voltage V_F Typ. (V)	I_F (mA)	Reverse Current I_R Max. (μA)	V_R (V)	Dominant Wavelength λ_D Min.*2 (nm)	Typ. (nm)	Max.*2 (nm)	I_F (mA)	Luminous Intensity I_V Min. (mcd)	Typ. (mcd)	I_F (mA)
SML-P11VT(R)	AlGaInP	Red	50	20	100*1	5	-40~+85	-40~+100	1.8	1	10	5	622	626	632	1	1.6	4.0	1
SML-P11UT(R)													616	621	626		1.0	2.5	
SML-P11DT(R)		Orange	52						1.9				601	605	609		4.0	7.3	
SML-P11YT(R)		Yellow											583	586	591			7.6	
SML-P11MT(R)			54										566	569	574		1.0	2.1	

*1 : Duty 1/10, 1kHz *2 : Measurment tolerance : ±1nm

Title	**ANA LEDs**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
Revision	**1.0**	Date	**June 30th, 2017**
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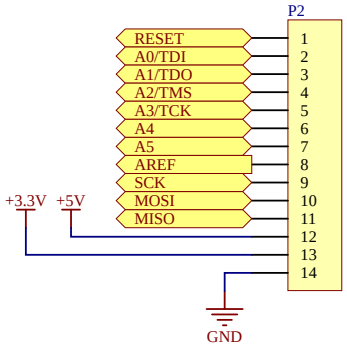
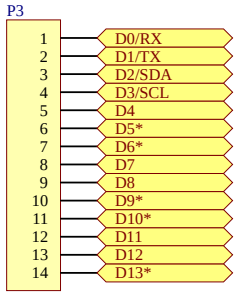
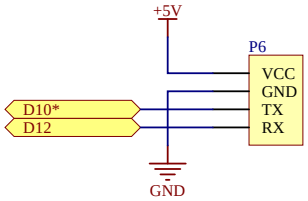
Headers



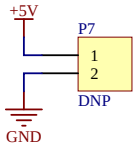
Left Side



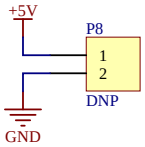
Right Side



For BT Connector



For Voltmeter



For Power Rails

DevDuino Development Platform			
Title	**Headers and Connectors**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
Revision	**1.0**	Date	**June 30th, 2017**
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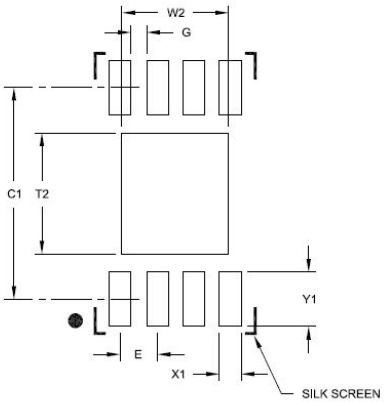
Temperature Sensor

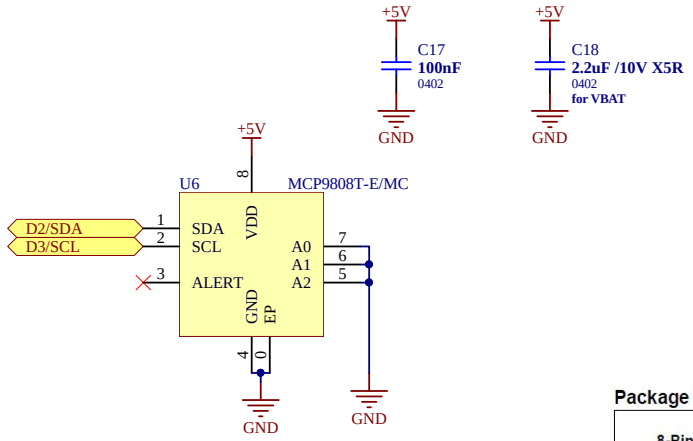
Features

- Accuracy:
  - ±0.25 (typical) from -40°C to +125°C
  - ±0.5°C (maximum) from -20°C to 100°C
  - ±1°C (maximum) from -40°C to +125°C
- User-Selectable Measurement Resolution:
  - +0.5°C, +0.25°C, +0.125°C, +0.0625°C
- User-Programmable Temperature Limits:
  - Temperature Window Limit
  - Critical Temperature Limit
- User-Programmable Temperature Alert Output
- Operating Voltage Range: 2.7V to 5.5V
- Operating Current: 200 µA (typical)
- Shutdown Current: 0.1 µA (typical)
- 2-wire Interface: I²C™/SMBus Compatible
- Available Packages: 2x3 DFN-8, MSOP-8



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		0.50 BSC	
Optional Center Pad Width	W2			1.45
Optional Center Pad Length	T2			1.75
Contact Pad Spacing	C1		2.90	
Contact Pad Width (X8)	X1			0.30
Contact Pad Length (X8)	Y1			0.75
Distance Between Pads	G	0.20		

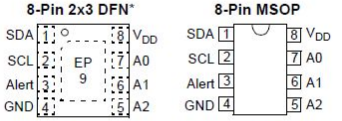


6.1 Layout Considerations

The MCP9808 does not require any additional components besides the master controller in order to measure temperature. However, it is recommended that a decoupling capacitor of 0.1 µF to 1 µF be used between the V_{DD} and GND pins. A high-frequency ceramic capacitor is recommended. It is necessary for the capacitor to be located as close as possible to the power and ground pins of the device in order to provide effective noise protection.

In addition, good PCB layout is key for better thermal conduction from the PCB temperature to the sensor die. For good temperature sensitivity, add a ground layer under the device pins, as shown in Figure 6-1.

Package Types



* Includes Exposed Thermal Pad (EP); see Table 3-1.

DevDuino Development Platform			
Title	**Temperature sensor**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
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- higher than some mA it is recommended to add an RC network on the V_{DD} pin, as shown in Figure 37:[5]

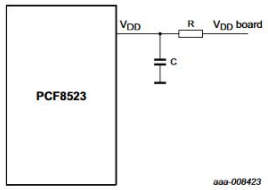


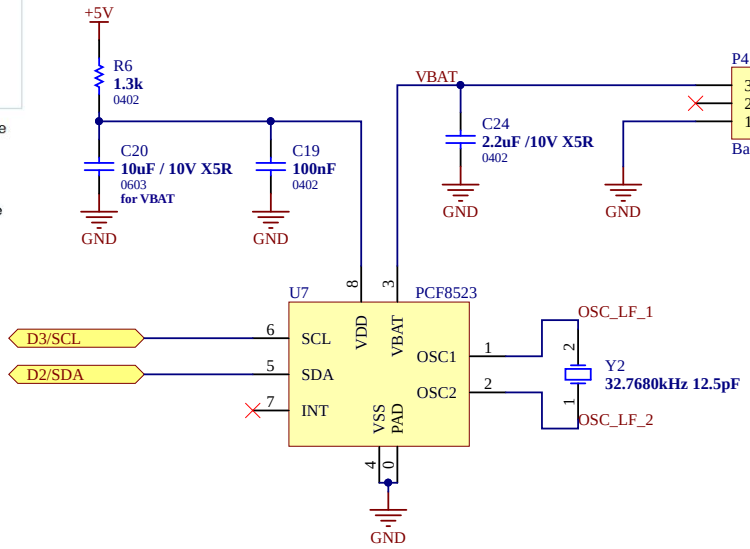
Fig 37. RC network on pin V_{DD}

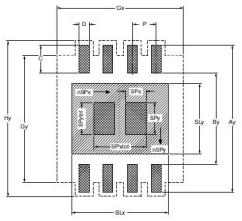
A series resistor of 1 kΩ and a capacitor of 3.3 µF assure the proper functionality of the battery switch-over even with very fast V_{DD} slope.

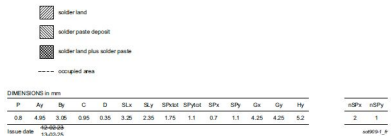
Note that:

- it is not suggested to assemble a series resistor higher than 2.2 kΩ because of the associated voltage drop
- lower values of capacitors are possible, depending on the V_{DD} slope in the application.

Real Time Clock

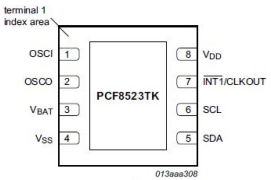






2. Features and benefits

- Provides year, month, day, weekday, hours, minutes, and seconds based on a 32.768 kHz quartz crystal
- Resolution: seconds to years
- Clock operating voltage: 1.0 V to 5.5 V
- Low backup current: typical 150 nA at V_{DD} = 3.0 V and T_{amb} = 25 °C
- 2 line bidirectional 1 MHz Fast-mode Plus (Fm+) I^2C interface, read D1h, write D0h[2]
- Battery backup input pin and switch-over circuit
- Freely programmable timer and alarm with interrupt capability
- Selectable integrated oscillator load capacitors for C_L = 7 pF or C_L = 12.5 pF
- Oscillator stop detection function
- Internal Power-On Reset (POR)
- Open-drain interrupt or clock output pins
- Programmable offset register for frequency adjustment



For mechanical details, see Figure 40 on page 57.

Fig 3. Pin configuration for HVSON8 (PCF8523TK)

DevDuino Development Platform			
Title	**RTC**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
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Micro SD Interface

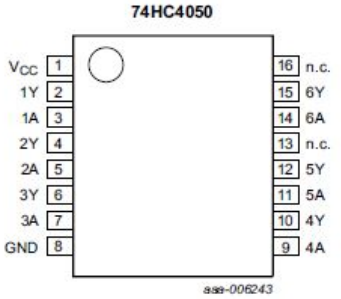
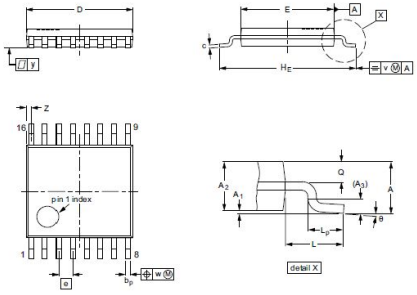
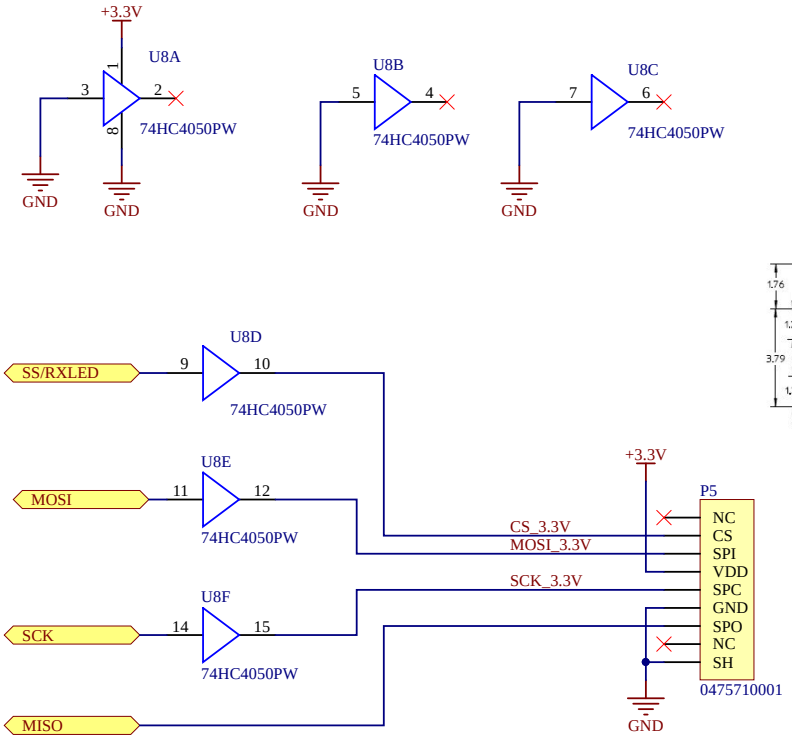
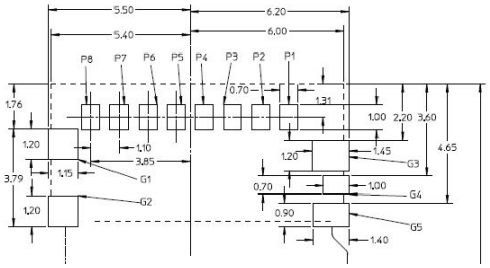


Fig 5. Pin configuration SSOP16 and TSSOP16







DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Title	**MicroSD**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
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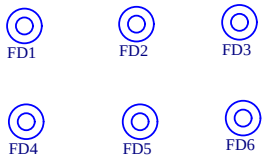
FIDUCIALS



FIDUCIAL MARK DESIGN SPECIFICATIONS

2.1. Shape

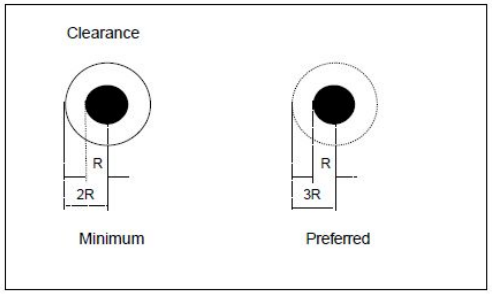
The optimal fiducial mark is a solid filled circle.

2.2. Size

The minimum diameter of the fiducial mark should be 1mm (0.040 in). The maximum diameter of the fiducial should be 3mm (0.120 in). Fiducial marks on the same PCB should not vary in size by more than 25 microns (0.001 in).

2.3. Clearance

A clear area devoid of any other circuit features or markings should be maintained around the fiducial mark. The size of the clear area should be equal to the radius of the mark. A preferred clearance around the mark is equal to the mark diameter.



DevDuino Development Platform			
Title	**Manufacturing Requirements**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
Revision	**1.0**	Date	**June 30th, 2017**
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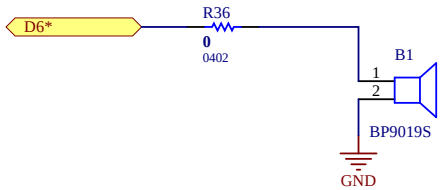
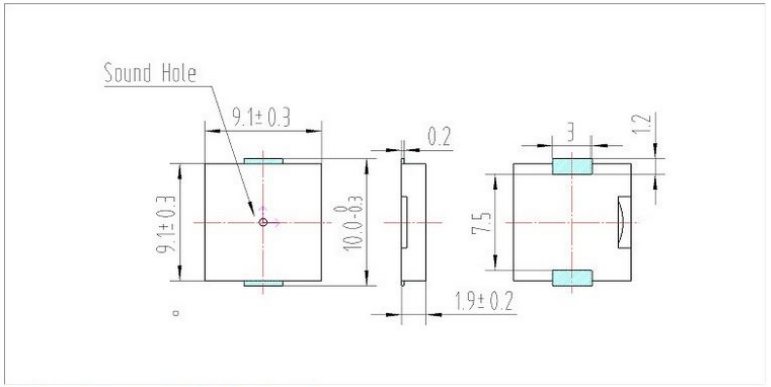
BUZZER





*Unit: mm; Tolerance: ±0.3mmExcept Specified

*Housing Material: Black LCP
*Terminal plate: 2 soldering pads, tin Plating Brass

3. Piezoelectric Buzzer Model Details

Piezoelectric buzzer Reliability Test

After any following tests the part shall meet specifications without any degradation in appearance and performance except SPL. SPL shall not deviate more than -10 dB from the initial value

1	Resonant Frequency	4000±500Hz
2	Operating Voltage	1~20 Vp-p
3	Rated Current	Max.1mA ,at 4KHz 50% duty Square Wave 1.5Vp-p
4	Sound Output at 10cm	Min. 65dB,at 4KHz 50% duty Square Wave 1.5Vp-p
5	Capacitance	9000±30%pF at 1KHz
6	Operating Temperature	-30℃~+70℃
7	Store Temperature	-40℃~+85℃
8	Net Weight	Approx 0.2g
9	RoHS	Yes

DevDuino Development Platform			
Title	**Buzzer**		
Project	**DevDuino**		
Designed by	**Alexandre Pailhoux**		
Revision	**1.0**	Date	**June 30th, 2017**
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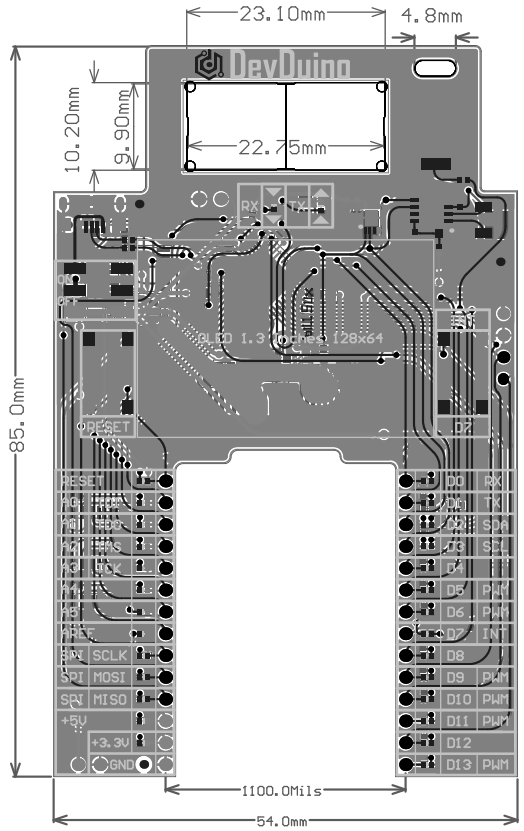
23.10mm
4.8mm
10.20mm
9.90mm
22.75mm
85.0mm
1100.0Mils
54.0mm
DevDuino
RX
TX
RESET
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
SCLK
MOSI
MISO
+5V
+3.3V
GND
PWM
INT
SCL
SDA