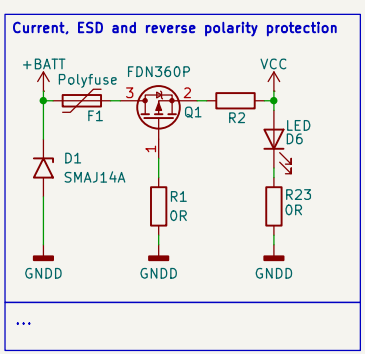
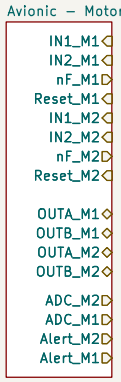
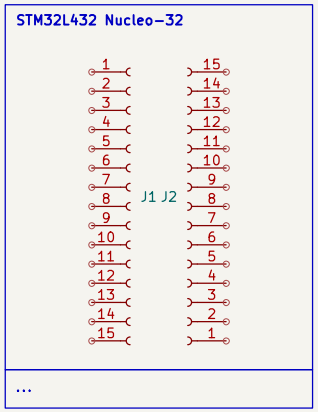
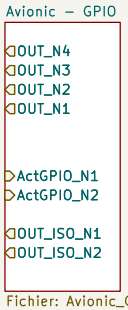




Fichier: Avionic_Motor.kicad_sch





Fichier: Avionic_GPIO.kicad_sch

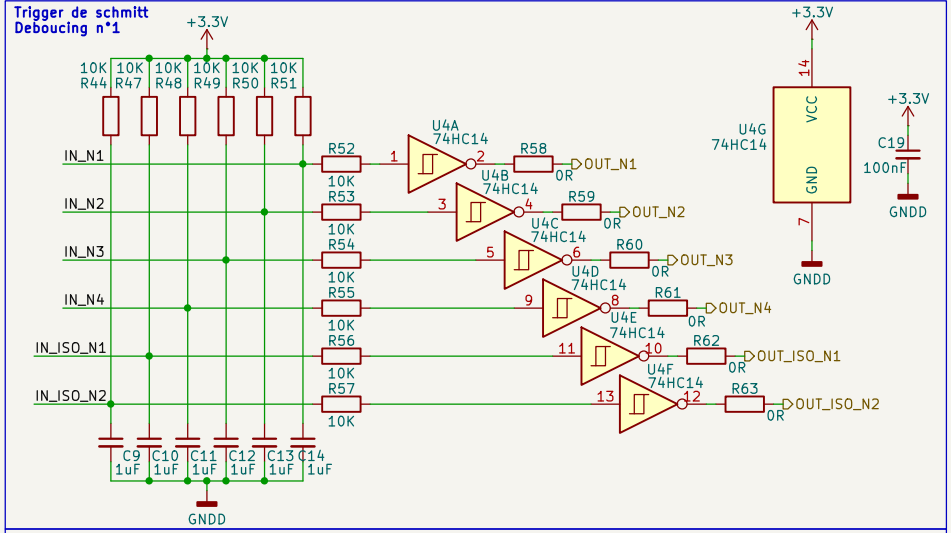
Project : Experiment Rocket Sirius
Auteur : Paul Miailhe
Club : PICAS

Sheet: /
File: MotorShield.kicad_sch

Title: MotorShield controller main sheet

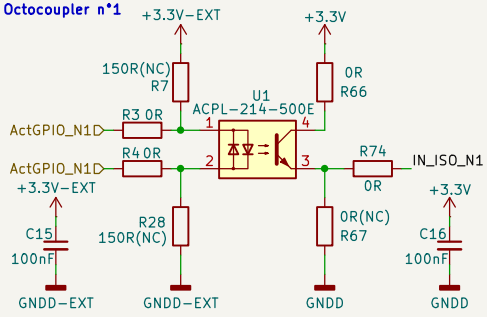
Size: A4	Date: 2024-06-09	**Rev: V°1**
KiCad E.D.A. 8.0.1		Id: 1/3

Trigger de schmitt Debouncing n°1



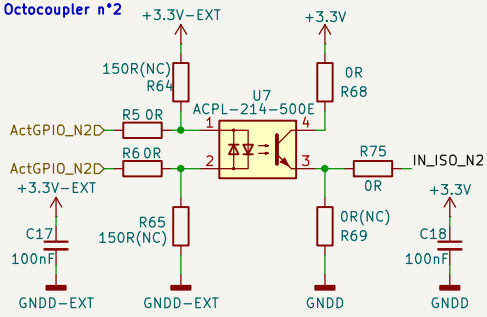
Hex Schmitt-Trigger Inverter High-Performance Silicon-Gate CMOS :
- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0 A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- ESD Performance: HBM 2000 V; Machine Model 200 V
- Chip Complexity: 60 FETs or 15 Equivalent Gates
- These are Pb-Free Devices

Octocoupler n°1



ACPL-214 AC Input, Half-Pitch Phototransistor Optocoupler Data Sheet
- Current transfer ratio (CTR: min. 20% at IF = ±5mA, VCC = 5V)
- High input-output isolation voltage (VISO = 3,000VRMS)
- Non-saturated Response time (tr: typ. 2µs at VCC = 10V, IC = 2mA, RL= 100Ω)
- CMR 10 kV/µs (typical)

Octocoupler n°2



ACPL-214 AC Input, Half-Pitch Phototransistor Optocoupler Data Sheet
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- Non-saturated Response time (tr: typ. 2µs at VCC = 10V, IC = 2mA, RL= 100Ω)
- CMR 10 kV/µs (typical)

Hex Schmitt-Trigger Inverter (74HC14):
- High-performance silicon-gate CMOS device.
- Outputs can interface with LSTTL, CMOS, NMOS, and TTL.
- Operating voltage range: 2.0V to 6.0V.
- High noise immunity and low input current.
- In compliance with JEDEC standards.
- ESD performance up to 2000V.
- Low complexity with approximately 60 FETs or 15 equivalent gates.

Optocouplers (ACPL-214):
- High-gain phototransistor optocouplers.
- Provides high output isolation voltage (VISO = 3000 VRMS).
- Current transfer ratio: typically 20% at IF = 5mA, VCE = 5V.
- Non-saturated response time: typically 2µs at VCC = 10V, IC = 2mA.
- Common-mode transient immunity of 10 kV/µs.

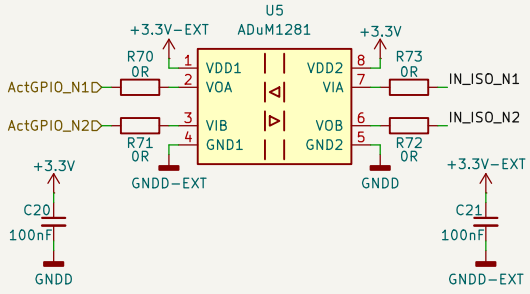
Data Converter Isolator (ADuM1281):
- Dual-channel digital isolators.
- Operating with a supply voltage of 3.3V.

Capable of data rates up to 100 Mbps (NRZ).
- Low propagation delay (23ns).
- High temperature operation up to 125°C.

High common-mode transient immunity: >25 kV/µs.

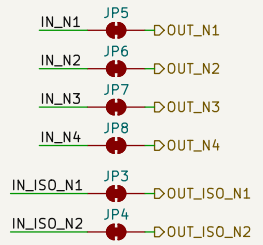
Bridge Configuration (JP5):
- Configurable jumper to allow different functionalities.
- Prevents asset conflicts by configuring as either input or output.

Data converter isolator



3kV rms, Default High, Dual-Channel Digital Isolators (1/1 Channel Directionality)
- Up to 100 Mbps data rate (NRZ)
- Low propagation delay: 23 ns typical
- Low dynamic power consumption
- Bidirectional communication
- 3.3 V to 5 V level translation
- High temperature operation: 125°C
- High common-mode transient immunity: >25 kV/µs

Bridge



Jumper to activate functionalities: one input or one output to prevent asset conflicts.

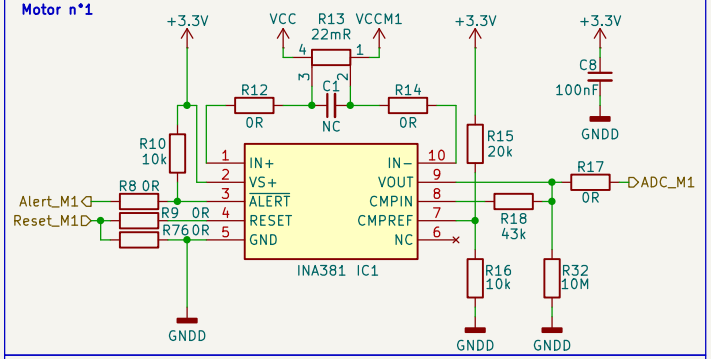
Project : Experiment Rocket Sirius
Auteur : Paul Miailhe
Club : PICAS

Sheet: /Avionic - GPIO/
File: Avionic_GPIO.kicad_sch

Title: GPIO sheet

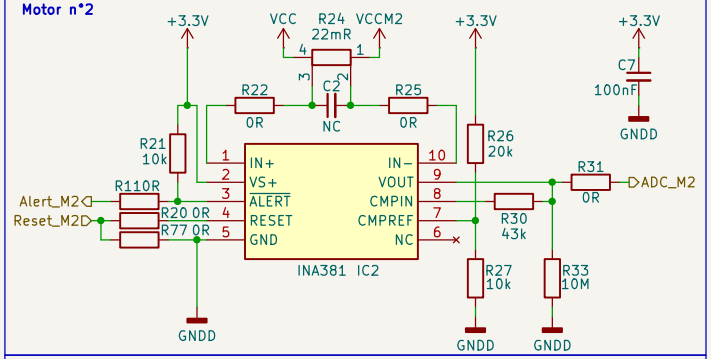
Size: A4	Date: 2024-06-09	**Rev: V°1**
KiCad E.D.A. 8.0.1		Id: 3/3

Overcurrent event detection circuit
Motor n°1



INA381 26-V, High-Speed, Current Sense Amplifier With Integrated Comparator
- Imput Iload motor: Imin : 10mA ; Imax : 3A
- Overcurrent Conditions: Ioc_th : 1A ; Irelease_TH : 800mA
- Supply: Vs : 3.3V
- The Rshunt value given 50V/V gain : Rshunt = 3.3V / (50V/V x 3A) = 22mΩ
- voltage at the current shunt monitor output for the overcurrent threshold : Vref : 1A x 22mΩ x 50V/V = 1.1V
- R2 = ((3.3V/1.1V)-1A)x R1 : R1 = 10kΩ ; R2 = 20kΩ
- Rhyst = (1.1V -(800mA x 22mΩ x 50V/V+50mV))/4uA = 43kΩ

Overcurrent event detection circuit
Motor n°2



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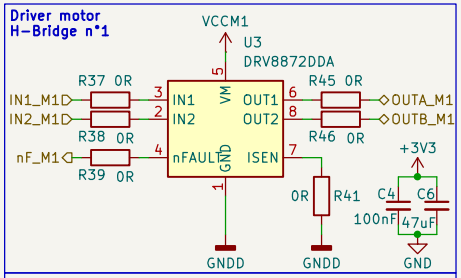
- Rhyst = (1.1V -(800mA x 22mΩ x 50V/V+50mV))/4uA = 43kΩ

INA381A and INA381B – Overcurrent Event Detection Circuits (Motor 1 and Motor 2):
– These are high-speed current sense amplifiers with integrated comparators.
– Capable of handling input load currents ranging from 10 mA to 3 A.
– Overcurrent conditions are defined by thresholds, such as Iload = 1 A with a release point of 800 mA.
– The devices operate at 3.3V supply voltage.
– The design includes a shunt resistor with a value of 22 mΩ and specific voltage output settings for overcurrent detection.

DRV8872 – Brushed DC Motor Driver With Fault Reporting (PWM Control) (Motor 1 and Motor 2):
– Handles currents up to 3.6 A.
– Supports a wide operating voltage range from 6.5V to 45V.
– Integrates various protection features, including undervoltage lockout (UVLO), overcurrent protection (OCP), and thermal shutdown (TSD).
– Provides automatic fault recovery and includes a fault status output pin.
– Operates in both low-power standby mode and regular mode, with the ability to control motor direction and speed via PWM input.

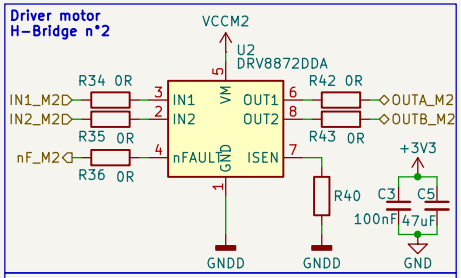
Motor Direction LED Indicators (Motor 1 and Motor 2):
– Simple circuits with LEDs and resistors to indicate motor direction.
– Allows for visual confirmation of motor rotation without the need to connect the motor itself.
– Provides an easy way to test and verify the motor control logic in the circuit.

Driver motor
H-Bridge n°1



DRV8872 3.6-A Brushed DC Motor Driver With Fault Reporting (PWM Control) :
- Extended operating voltage from 6.5 V to 45 V
- 3.6 A Peak current
- PWM control interface
- Integrated current regulation
- Low-power standby mode
- Fault status output pin
- Integrated protection features : UVLO, OCP, TSD
- Automatic fault recovery

Driver motor
H-Bridge n°2



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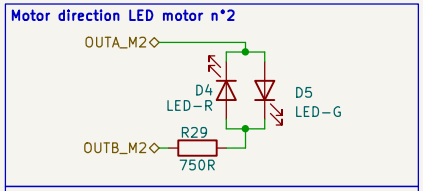
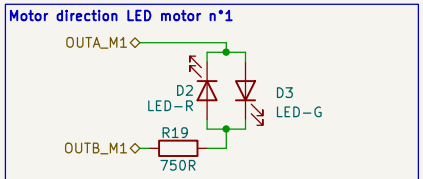
- PWM control interface
- Integrated current regulation
- Low-power standby mode
- Fault status output pin
- Integrated protection features : UVLO, OCP, TSD
- Automatic fault recovery

Motor direction LED motor n°2



- Allows you to see the rotation of the DC motor
- Avoiding the need to connect the motor for testing.

Motor direction LED motor n°1



- Allows you to see the rotation of the DC motor
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Project : Experiment Rocket Sirius
Auteur : Paul Miailhe
Club : PICAS

Sheet: /Avionic – Motor/
File: Avionic_Motor.kicad_sch

Title: Motor control and driver sheet

Size: A4	Date: 2024-06-09	**Rev: V°1**
KiCad E.D.A. 8.0.1		Id: 4/3