

STM32L562E-DK

MB1373

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U_MB1373_TOP
MB1373_TOP.SchDoc

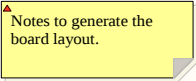


Legend

General comment such as function title, configuration, ...

Text to be added to silkscreen.

Warning text.



Open Platform License Agreement

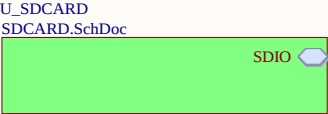
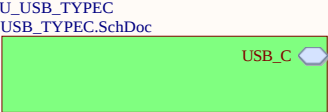
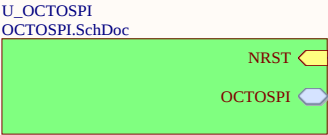
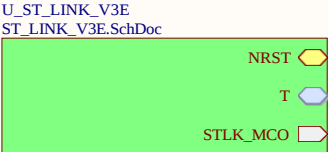
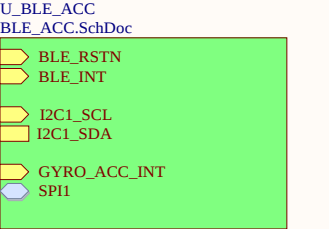
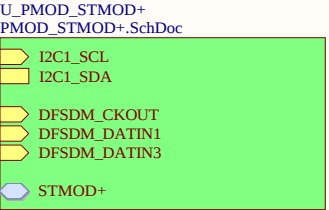
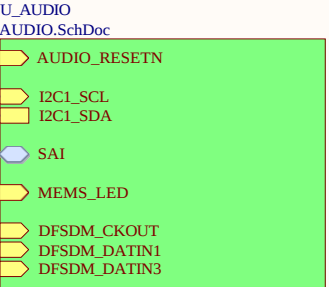
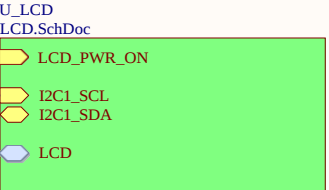
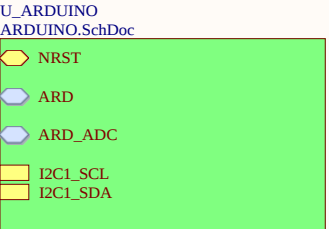
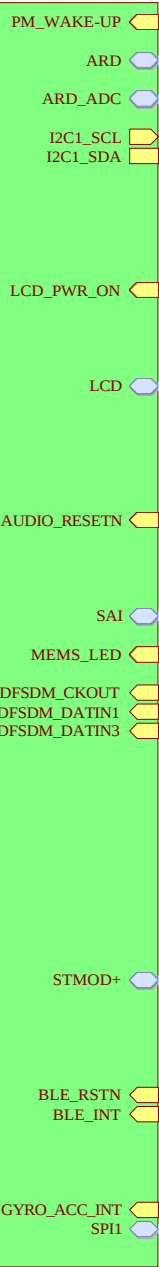
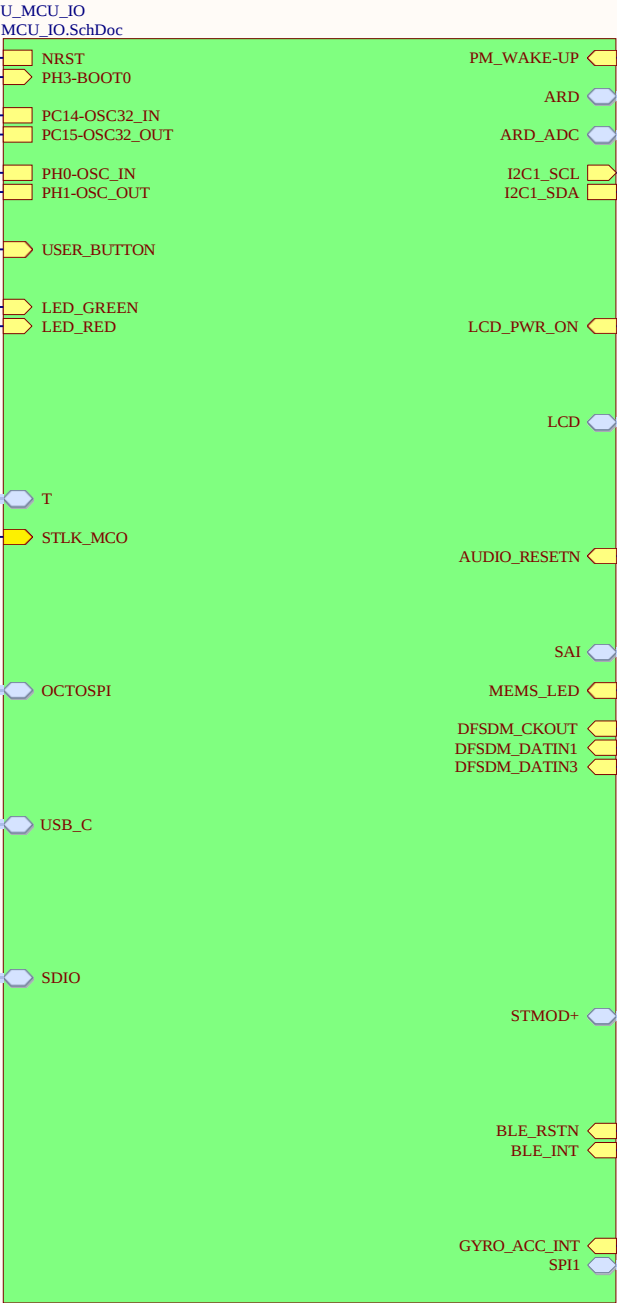
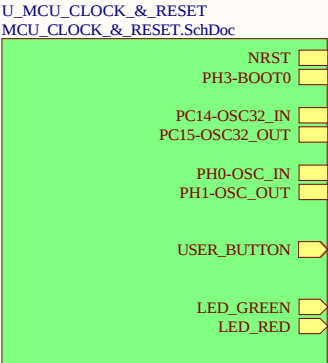
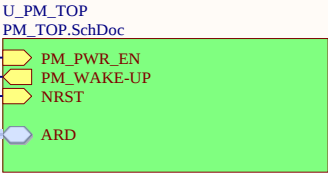
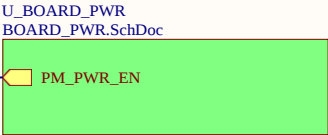
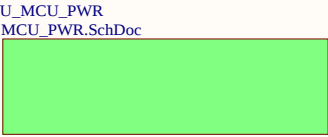
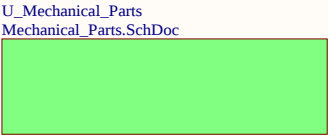
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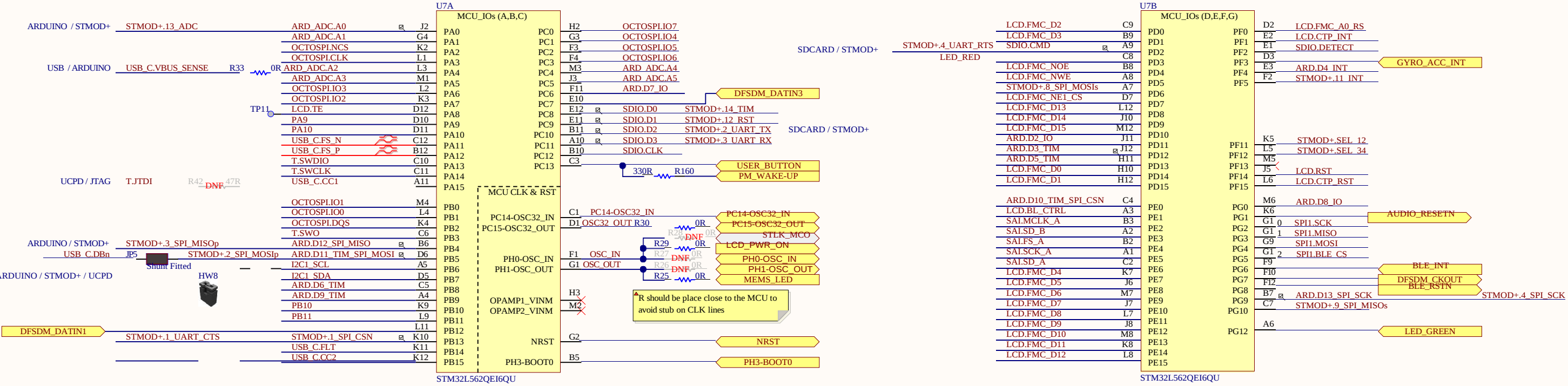
The complete Open Platform License Agreement can be found on www.st.com/opla.

Title: MB1373_Overview		
Project: STM32L562E-DK		
Variant: L562QEQ		
Revision: C -01		Reference: MB1373
Size: A4	Date: 14-JUNE-2019	Sheet: 1 of 21





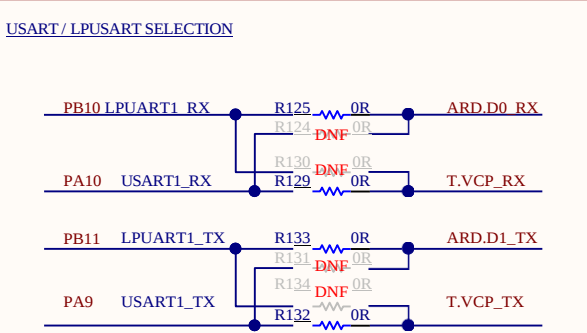
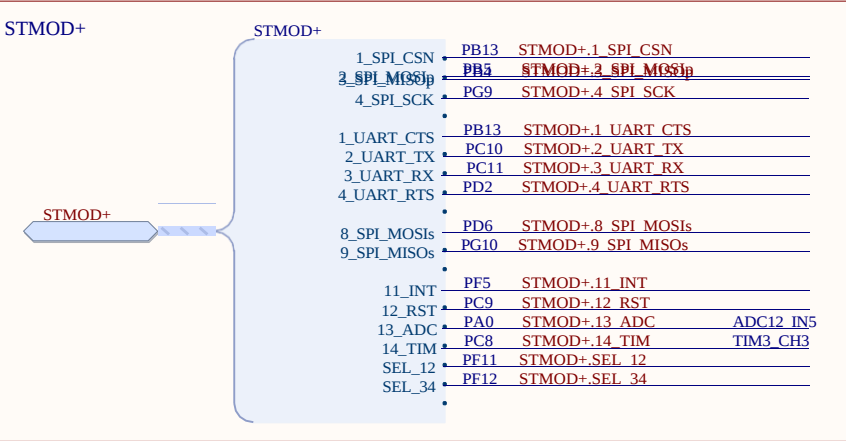
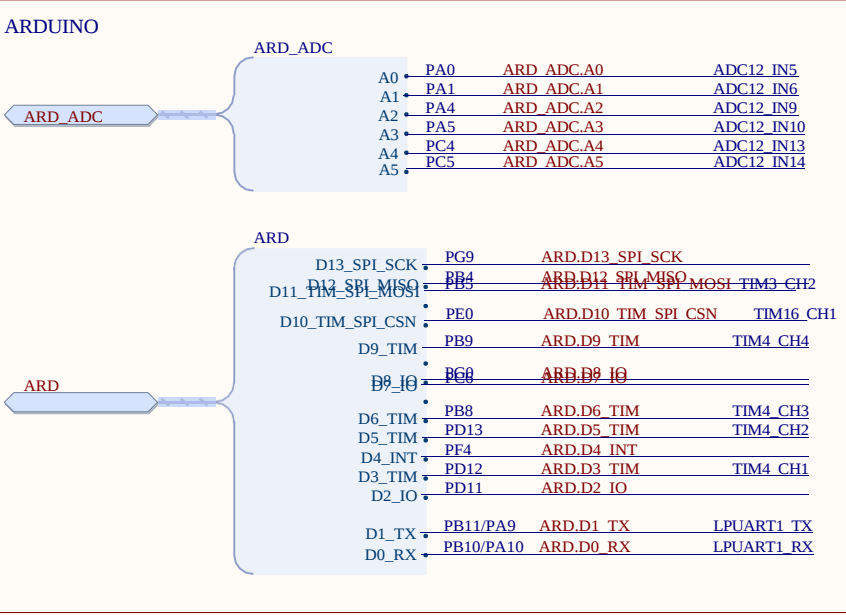
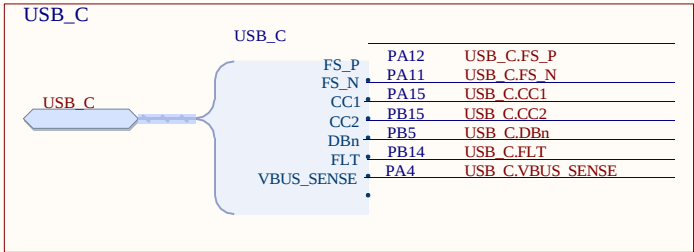
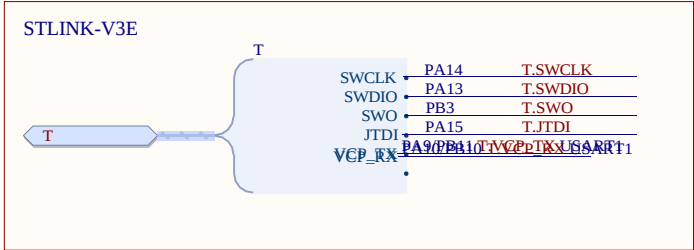
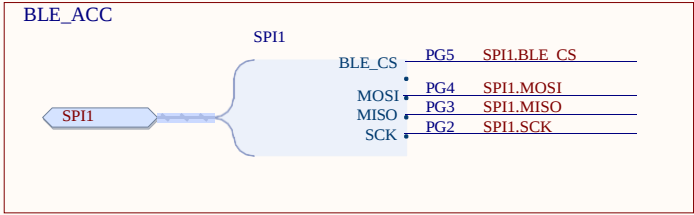
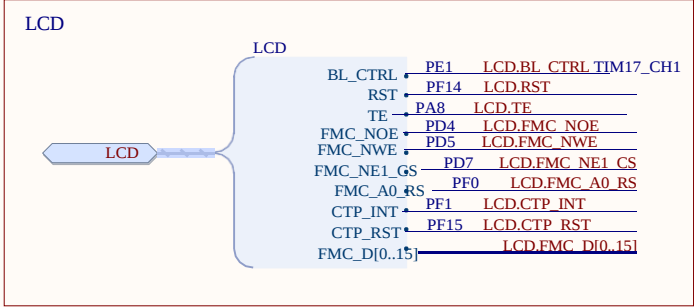
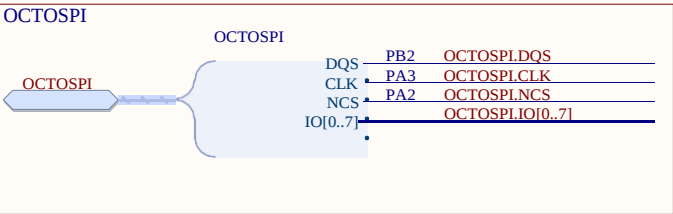
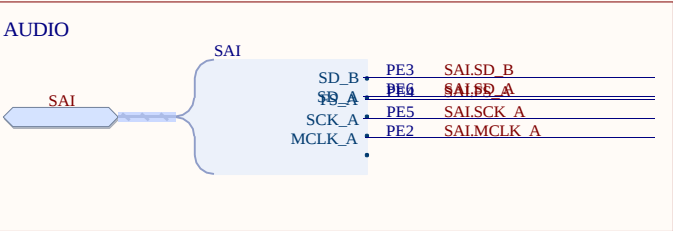
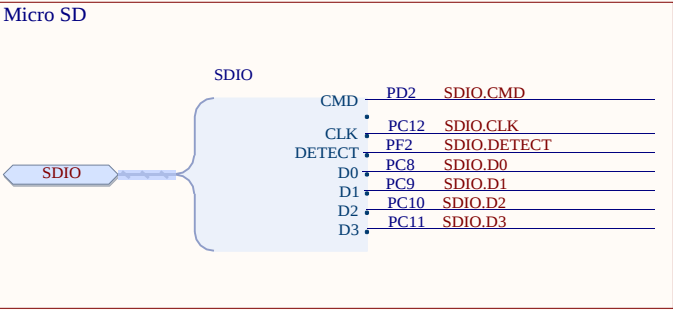
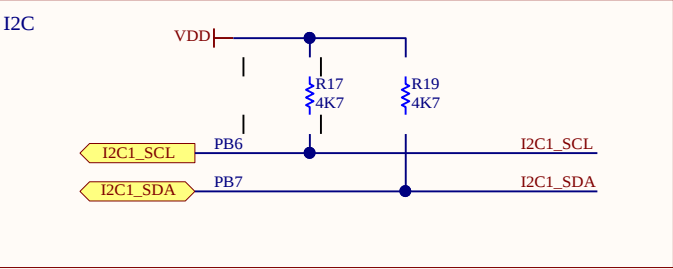
STM32L5xx MCU I/Os



I2C address:
AUDIO CODEC: CS42L51: Read 0x95 / Write 0x94 (AD0=0)
LCD-TOUCH-PANEL: Read 0xXX / Write 0xXX
GYRO-ACC: LSM6DSL: Read 0xD5 / Write 0xD4

IT TABLE

INT1 - PF1 - LCD-TOUCH-PANEL
INT2 - PF2 - SDCARD-DETECT
INT3 - PF3 - GYRO-ACCELEROMETER
INT4 - PF4 - ARDUINO
INT5 - PF5 - PMOD/STMOD+
INT11 - PD11 - Power Measurement / ARD.D2_IO
INT12 - PD12 - Power Measurement / ARD.D3_TIM
INT13 - PC13 - USER_BUTTON or ENERGY METER WAKE-UP



LIMITATIONS : IO SHARED / EXCLUSIF

Please refer to the User Manual for more detail

PA4 EXCLUSIF BETWEEN ARDUINO and UCPD
PA0 EXCLUSIF BETWEEN ARDUINO and STMOD+
PA15 EXCLUSIF BETWEEN UCPD and JTAG
PB5 SHARED BETWEEN ARDUINO and STMOD+ and EXCLUSIF WITH UCPD

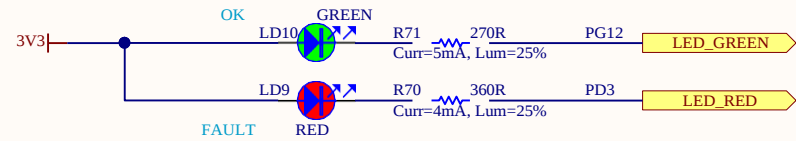
PC8 EXCLUSIF BETWEEN SDCARD and STMOD+
PC9 EXCLUSIF BETWEEN SDCARD and STMOD+
PC10 EXCLUSIF BETWEEN SDCARD and STMOD+
PC11 EXCLUSIF BETWEEN SDCARD and STMOD+
PD2 EXCLUSIF BETWEEN SDCARD and STMOD+

I2C1 (PB6/PB7) SHARED BETWEEN :
CTP, AUDIO CODEC, GYRO, ARDUINO, STMOD+

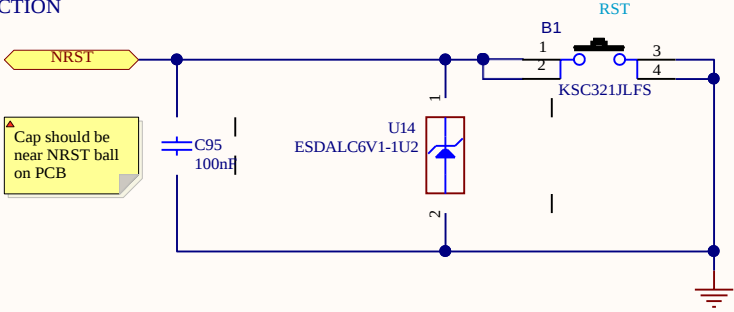
DFSDM (PB12, PG7, PC7) SHARED BETWEEN
ON BOARD MEMS, EXT-MEMS-MODULE, STMOD+

SPI3 (PB4, PB5, PG9) SHARED BETWEEN :
ARDUINO AND STMOD+

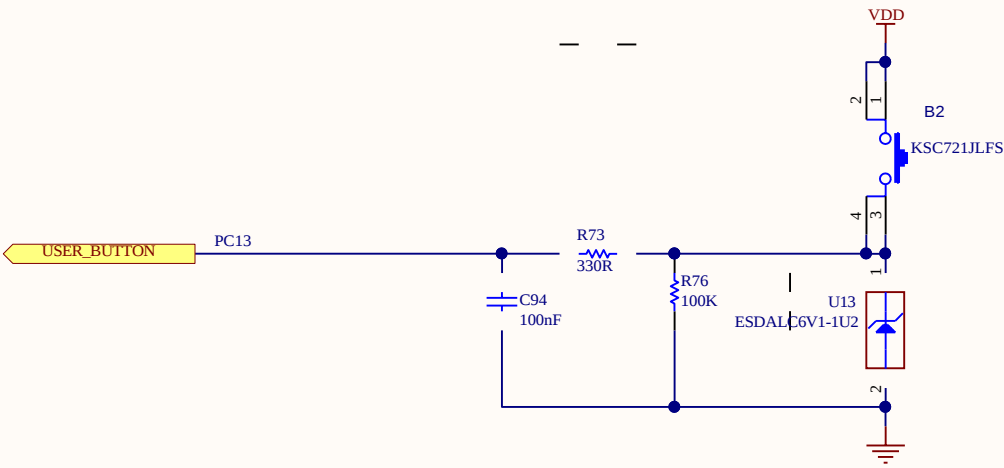
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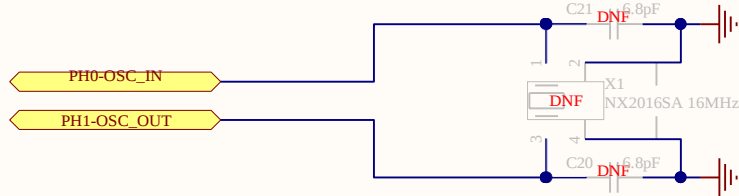
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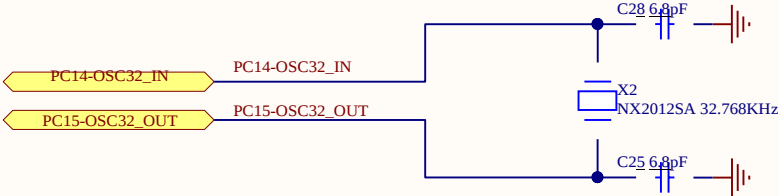
USERBUTTON



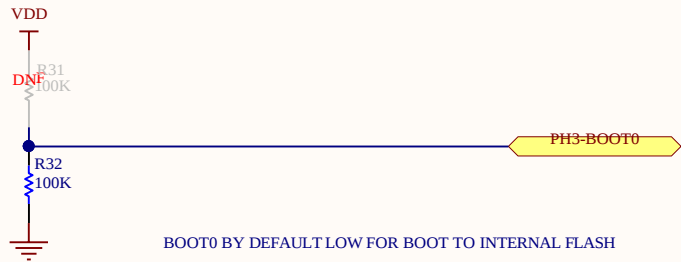
EXTERNAL HSE CLK



EXTERNAL LSE CLK



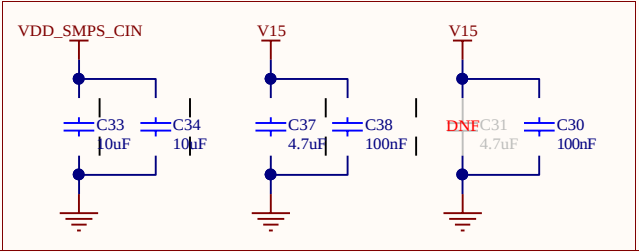
PH3_BOOT0



STM32L5xx MCU PWR

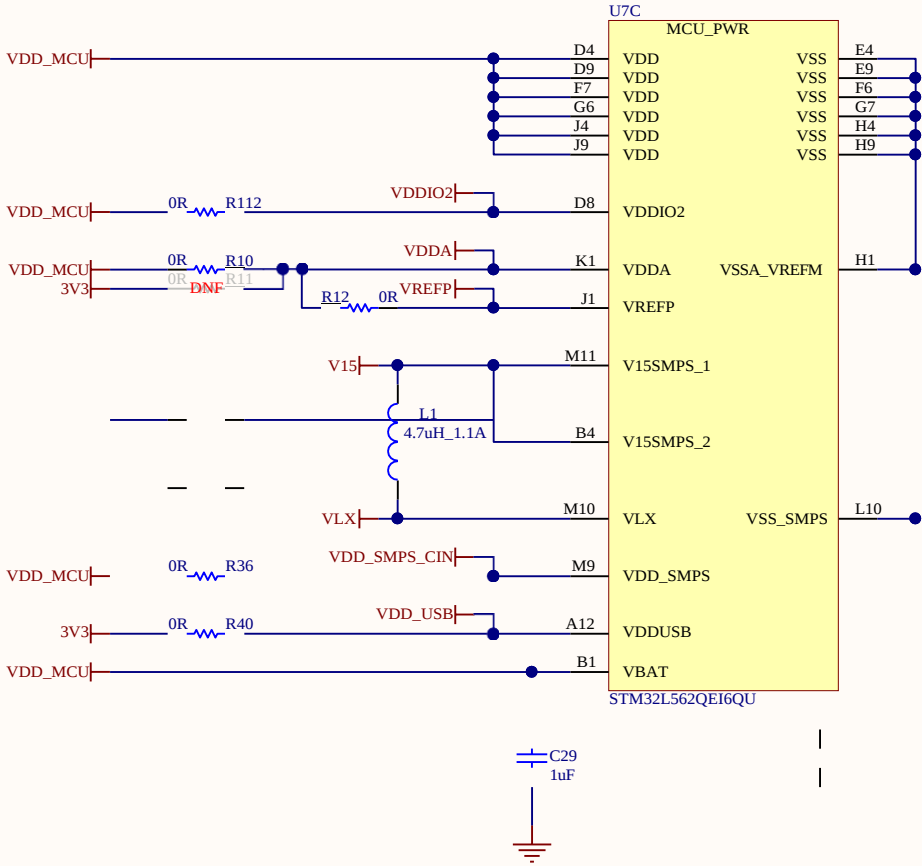
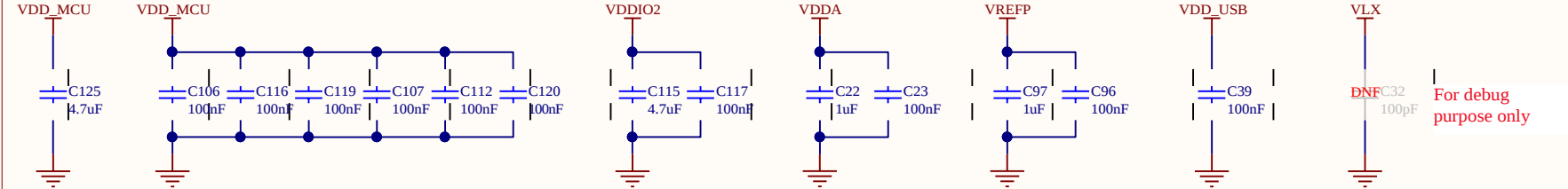
Operating range: 1V71<VDD<3V6
Operating range: 1V08<VDDIO2<3V6 (only for IOG[15:2])
Operating range: 1V55<VBAT<3V6
Operating range: 1V62<VDDA<3V6
Operating range: 1V62<VREF<3V6 (depend of VDDA)
Operating range: 3V0<VDDUSB<3V6
Operating range: 1V71<VDD_SMPS<3V6

"CIN" and "V15" capacitors should be as closed as possible to the MCU associated pad.
V15 4.7µF should be place near Lxx. Or 1 couple of capacitors per pad (4.7µF / 100nF).

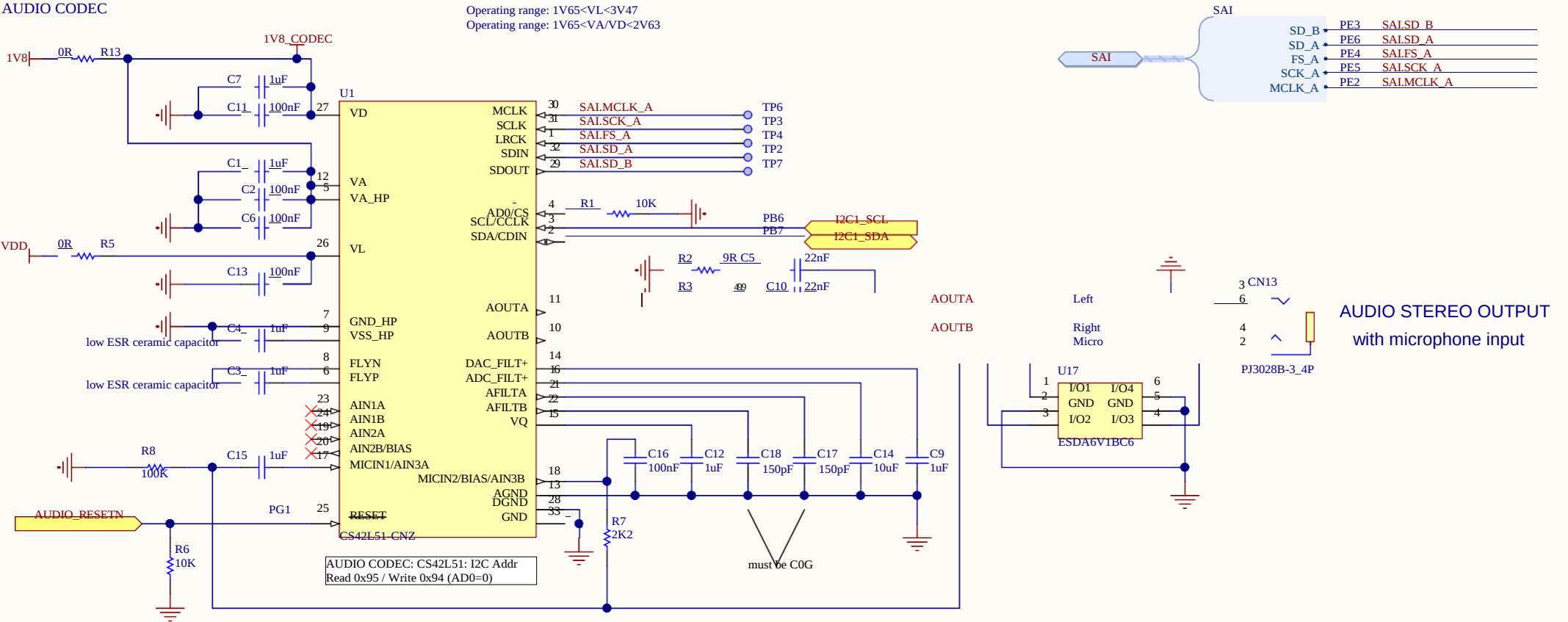


MCU DECAPS

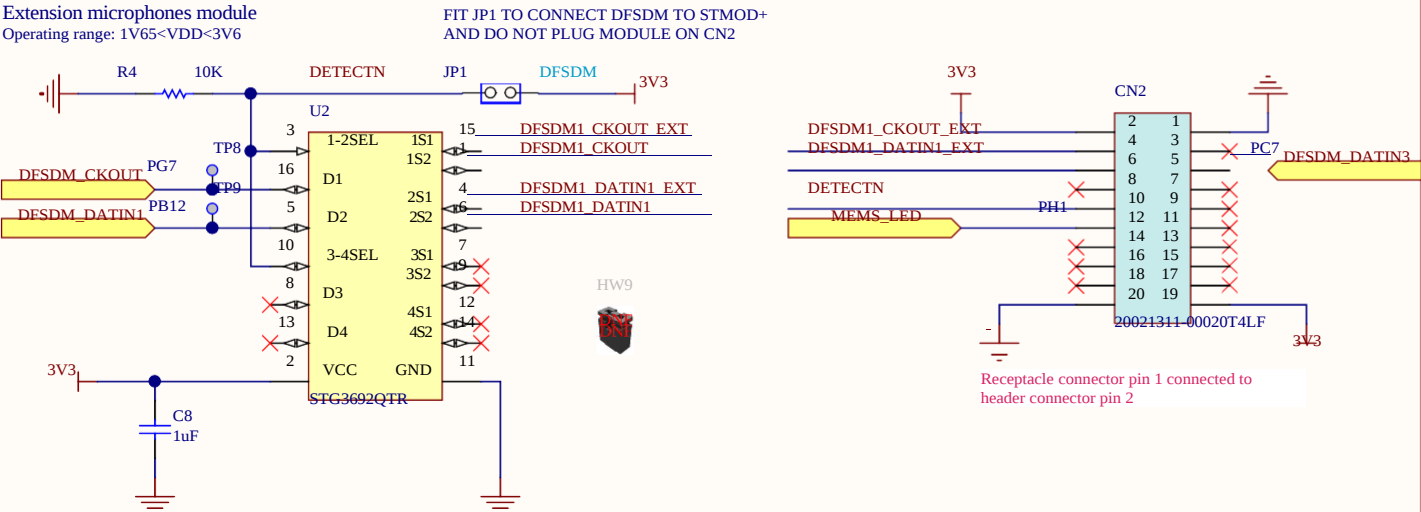
Ceramic capacitor (Low ESR, ESR<1ohm)



AUDIO CODEC

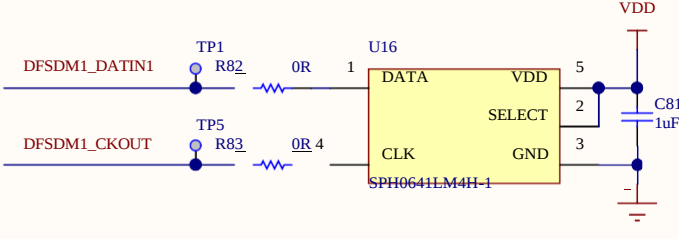


Extension microphones module
Operating range: 1V65<VDD<3V6



MEMS

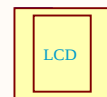
Operating range: 1V62<VDD<3V6



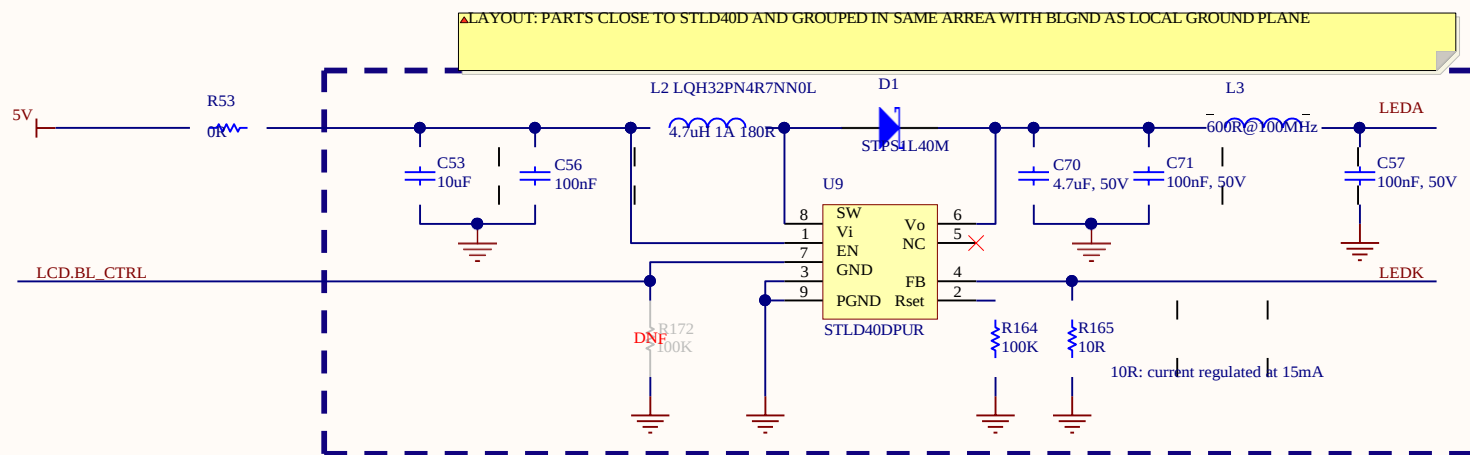
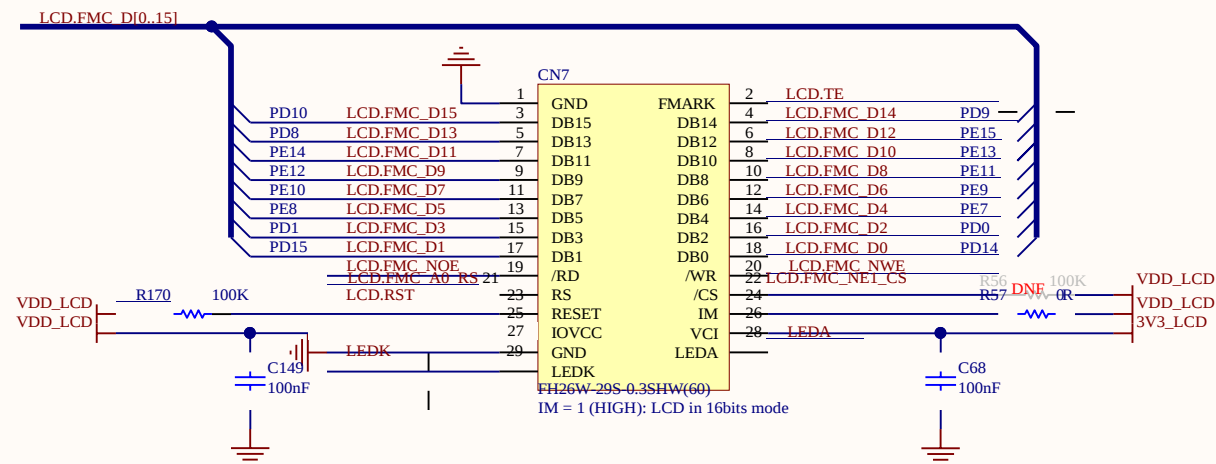
LIMITATION :

Some DFSDM signals are multiplexed with STMOD+, Ext-MEMS Module and on board Microphone.
In case STMOD+ SHIELD is plugged, Ext-MEMS Module should be disconnected, and Jumper JP1 should be set to connect DFSDM signals to STMOD+ module.

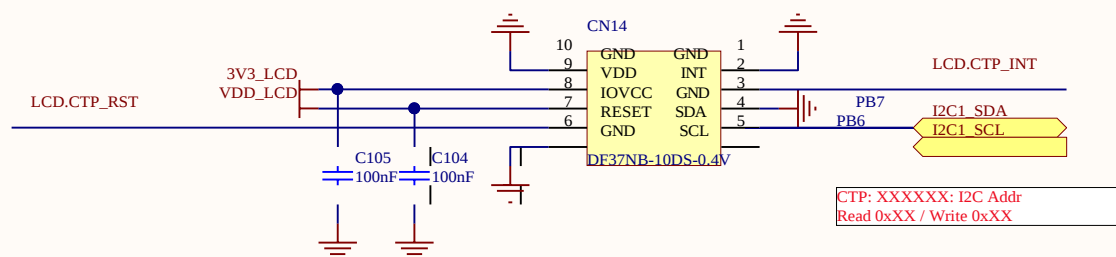
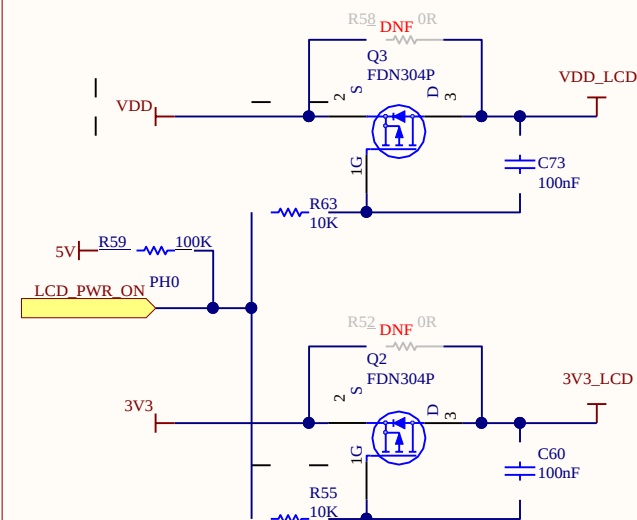
Operating range: $1V65 < IOVCC < 3V3$
Operating range: $2V4 < VCI < 3V3$



FRD154BP2902-D-CTQ



Operating range: $2V_4 < V_{DD} < 3V_3$
Operating range: $1V_{65} < I_{OVCC} < 3V_3$

CTP: XXXXXX: I2C Addr
Read 0xXX / Write 0xXX[illegible]

Project: STM32L562E-DK

Variant: L562QEQ

Revision: C -01

Size: A4

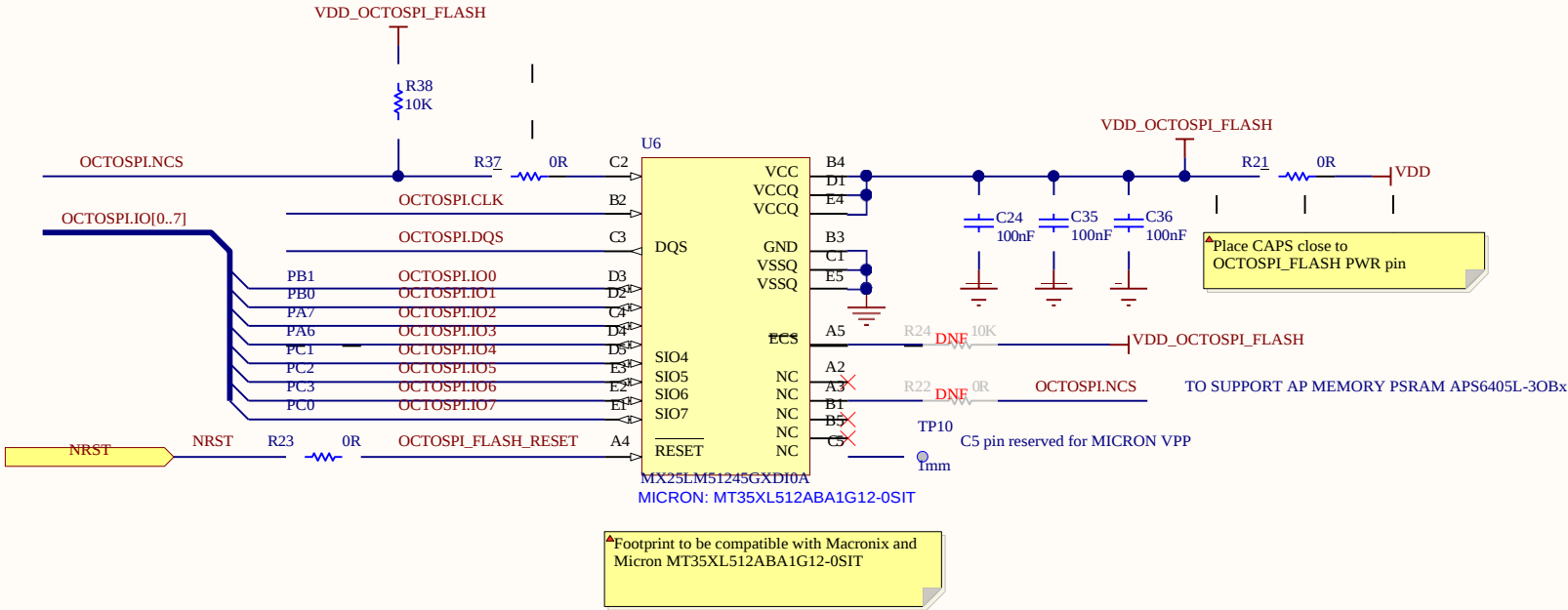
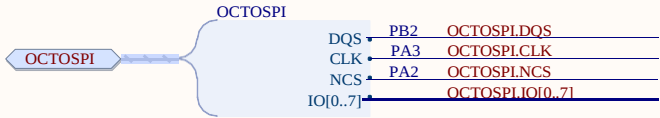
Date: 14-JUNE-2019

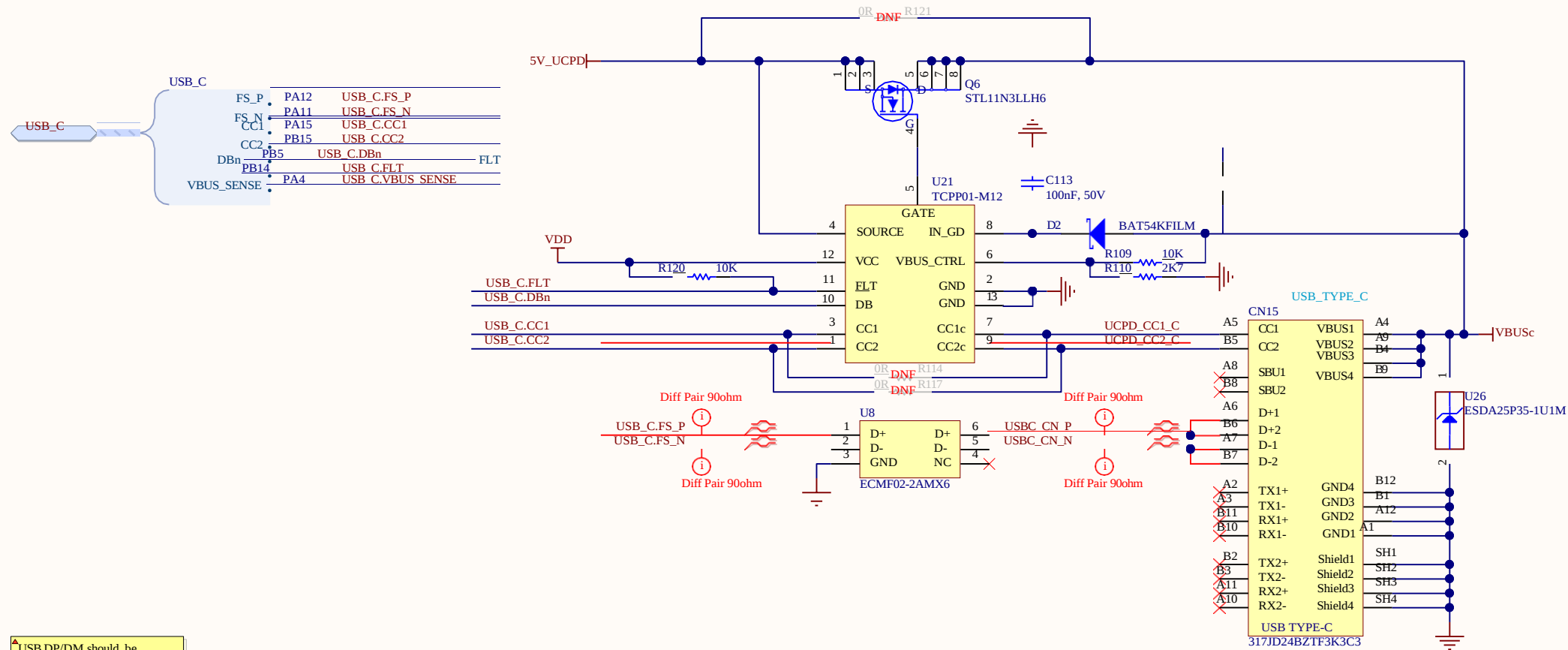
Reference: [MB1373](#)

Sheet: 7 of 21



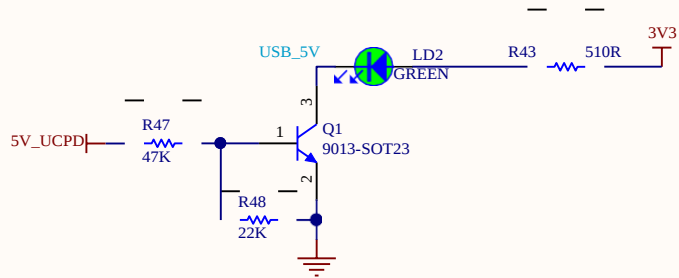
life.augmented



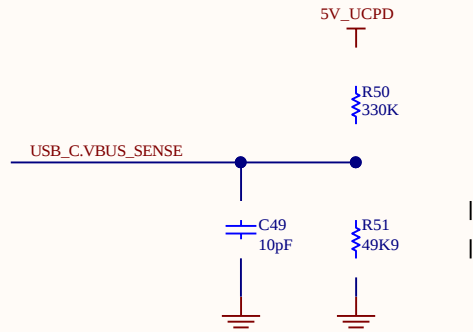


USB DP/DM should be routed in 90 ohm diff +/- 10%

5V_USB_LED



VBUS SENSE

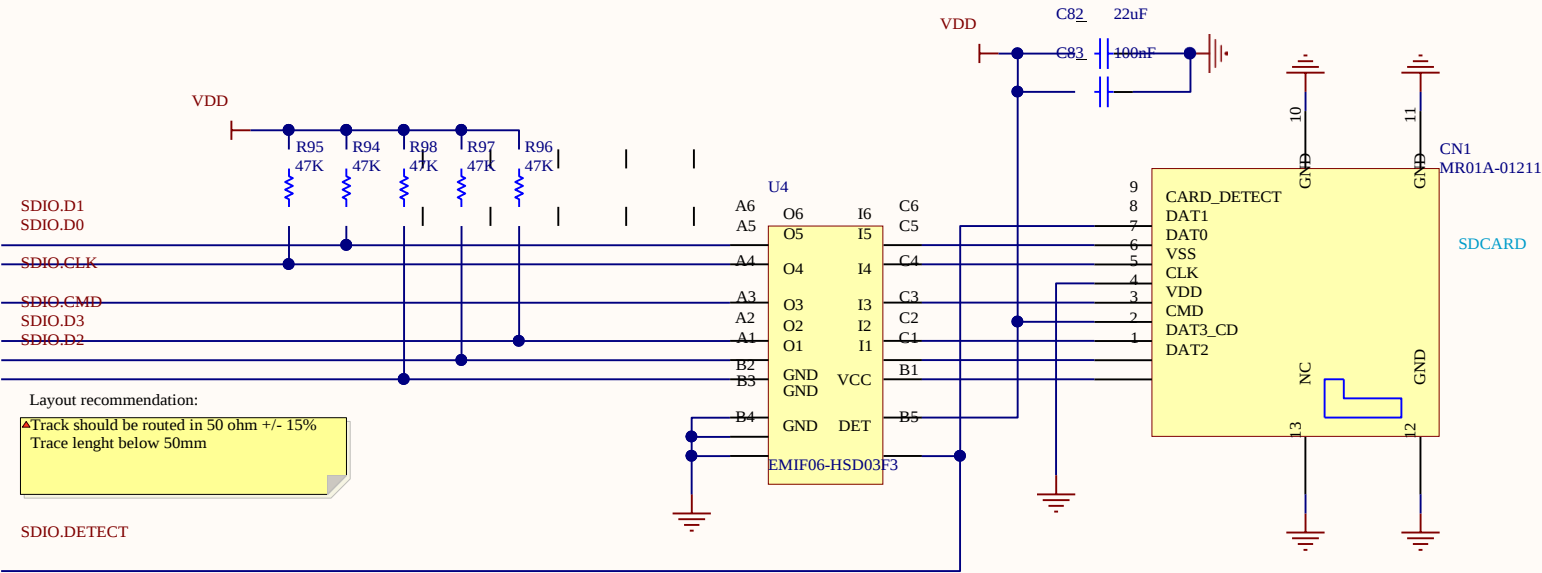
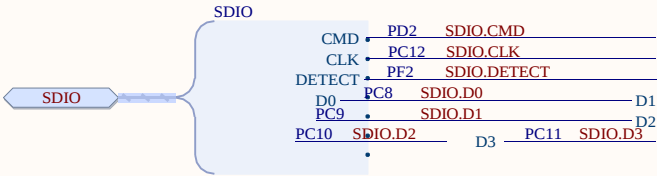


LIMITATION :

Some UCPD signals are multiplexed with ARDUINO: DBn / VBUS_SENSE
In case ARDUINO SHIELD is plugged, UCPD signals can be disconnected.
User need to check that multiplexed signals are not used on both features simultaneously.

Some ARDUINO signals are multiplexed with JTAG: CC1
In case JTDI is used, USB TYPE C should be disconnected.
User need to check that multiplexed signals are not used on both features

SDCARD
Operating range: 2V7<VDD<3V6

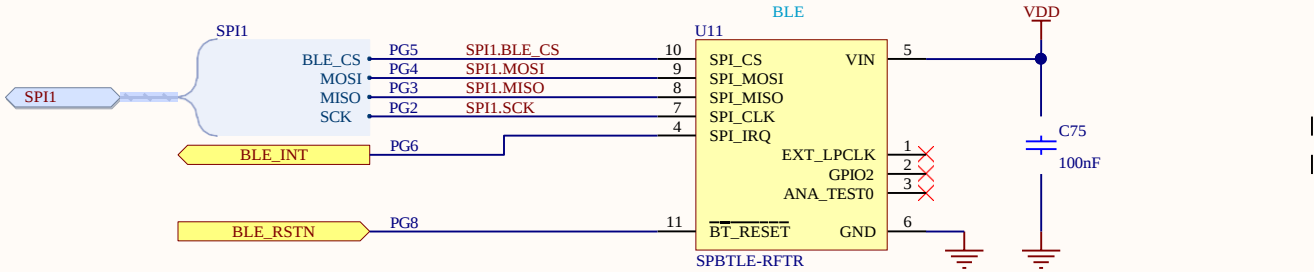


LIMITATION :

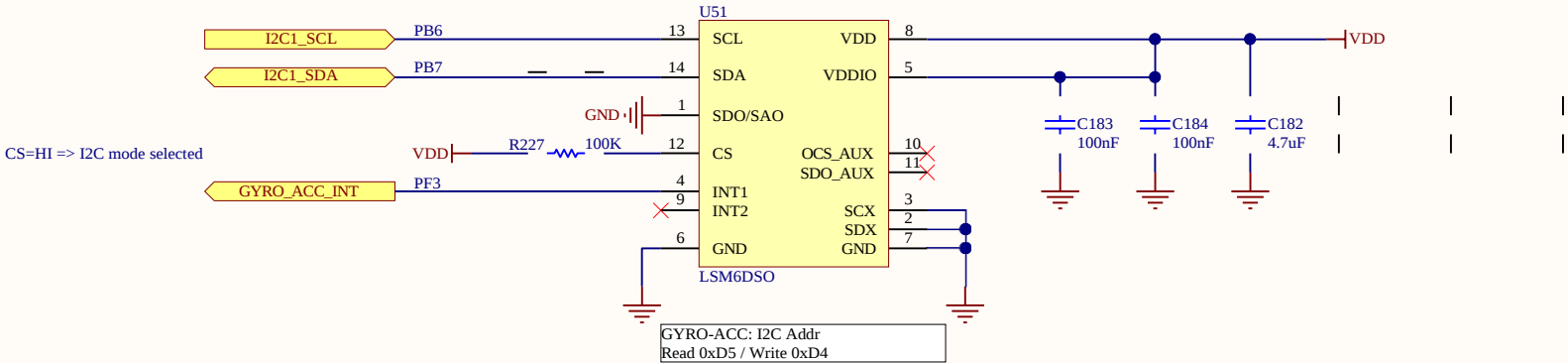
Some SDCARD signals are multiplexed with PMOD / STMOD+
In case SDCARD is plugged, PMOD / STMOD+ signals can be disconnected.
Or user need to check that multiplexed signals are not used on both features simultaneously.

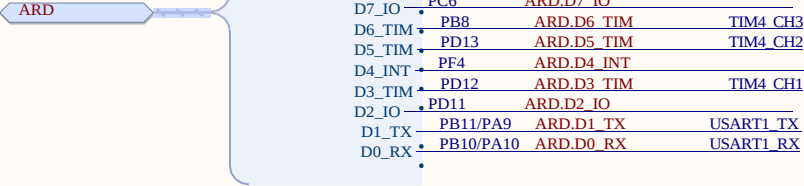
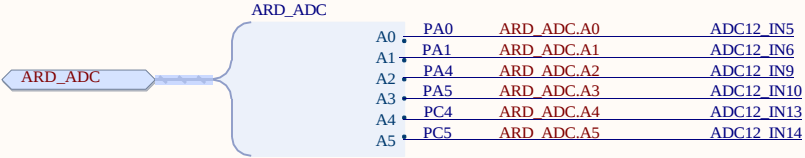


BLE
Operating range: 1V7<VDD<3V6



3D ACCELEROMETER & GYROSCOPE
Operating range: 1V7<VDD<3V6
Operating range: 1V62<VDDIO<3V6



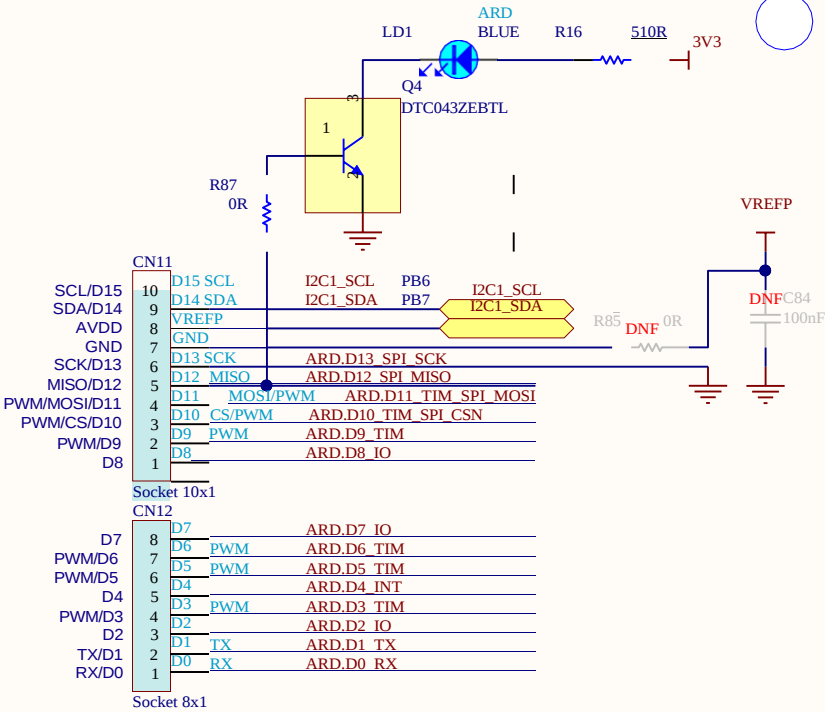
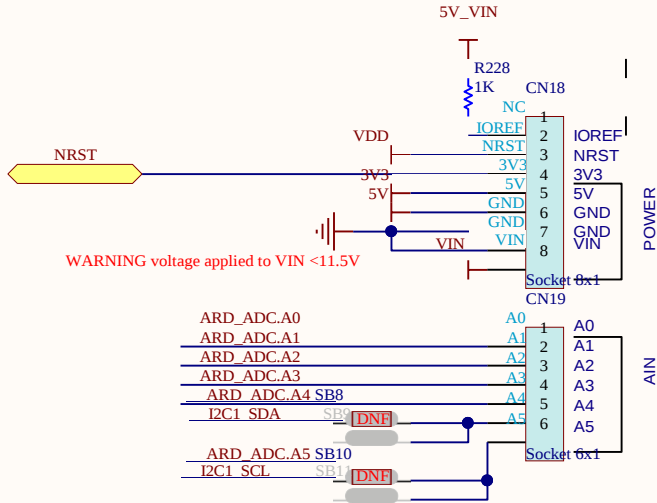


LIMITATION :

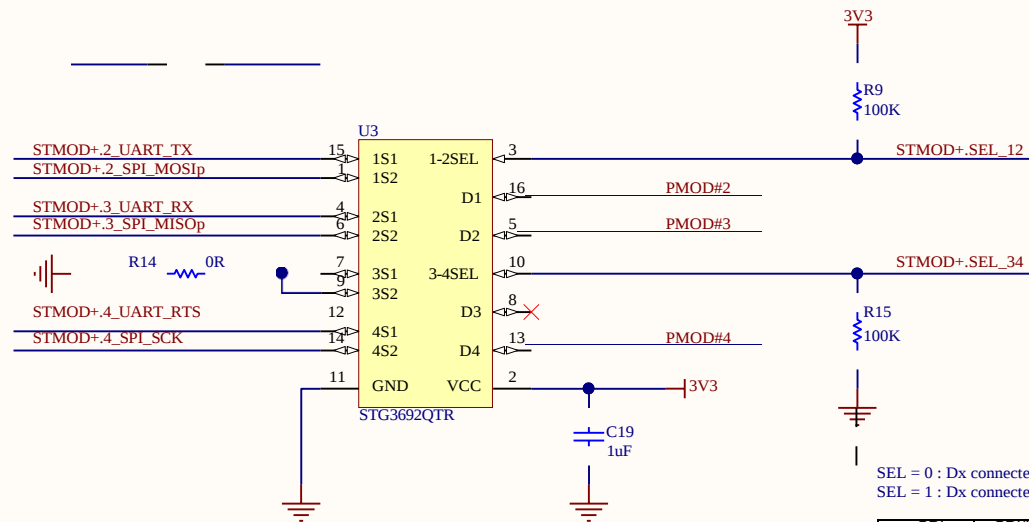
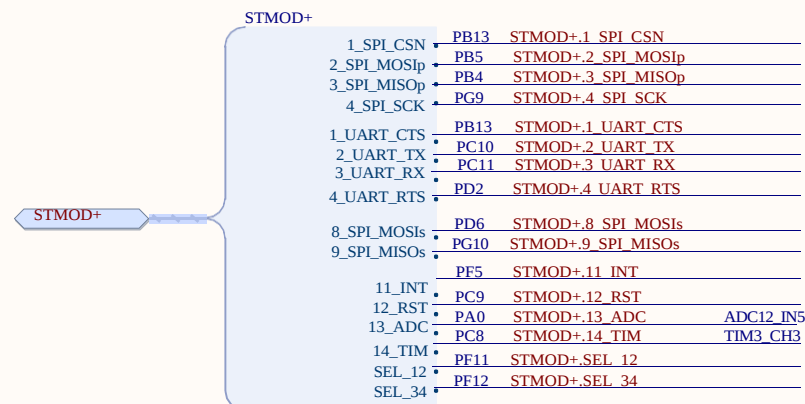
Some ARDUINO signals are multiplexed with UCPD: A2/D11
In case ARDUINO SHIELD is plugged, UCPD signals must be disconnected.
User need to check that multiplexed signals are not used on both features simultaneously.

Some ARDUINO signals are multiplexed with STMOD+ signals: A0
In case ARDUINO SHIELD is plugged, STMOD+ must be disconnected.
User need to check that multiplexed signals are not used on both features simultaneously.

SPI_MISO, SPI_MOSI and SPI_SCLK can be used simultaneously.

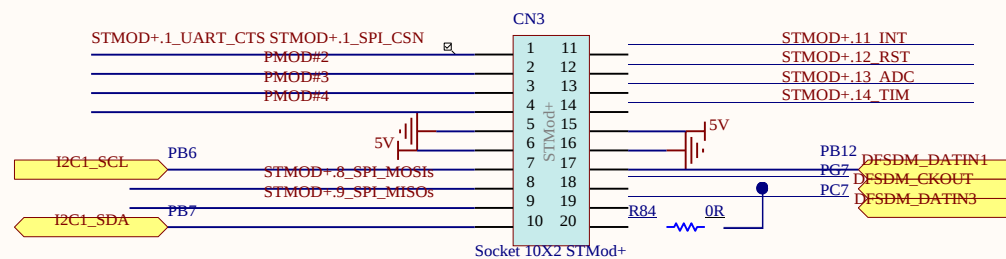


PMOD / STMOD+ SWITCH



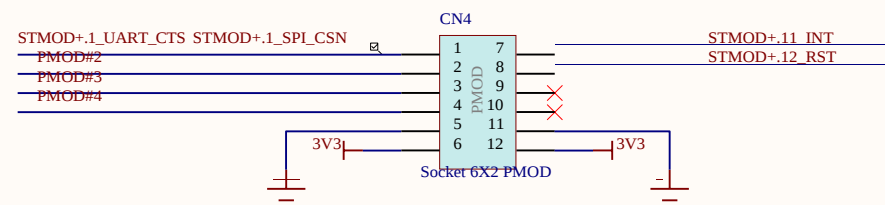
	SPI	SPI/UART (*)	UART
STMOD+ 1-2SEL	0	1 (*)	1
STMOD+ 3-4SEL	0	0 (*)	1
PMOD#1	NSS	NSS	CTS
PMOD#2	MOSIp	TX	TX
PMOD#3	MISOp	RX	RX
PMOD#4	SCK	SCK	RTS

STMOD+



IF DFSDM IS USED ON STMOD+ MODULE
FIT JP1 TO CONNECT DFSDM TO STMOD+
AND DO NOT PLUG MODULE ON CN2

PMOD



LIMITATION :

Some SDCARD signals are multiplexed with PMOD / STMOD+
In case SDCARD is plugged, PMOD / STMOD+ signals can be disconnected.
Or user need to check that multiplexed signals are not used on both features simultaneously.

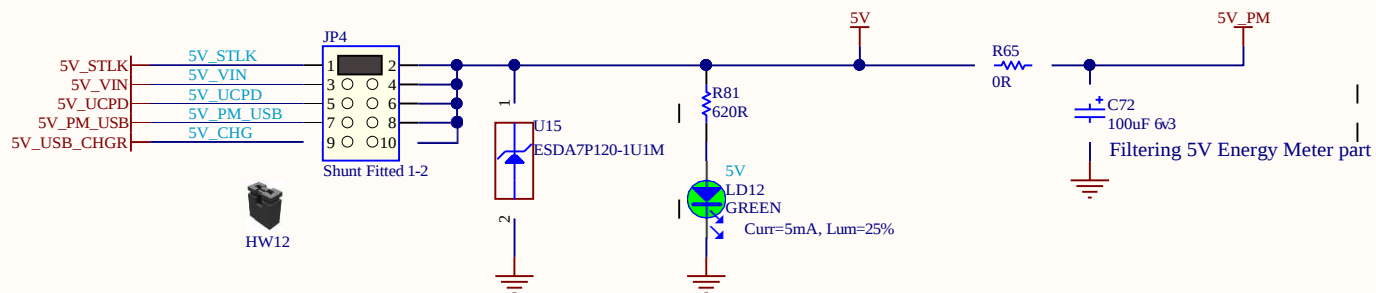
Some ARDUINO signals are multiplexed with PMOD / STMOD+ signals:
In case ARDUINO SHIELD is plugged, STMOD+ must be disconnected.
User need to check that multiplexed signals are not used on both features simultaneously.

SPI_MISO, SPI_MOSI and SPI_SCLK can be used simultaneously.

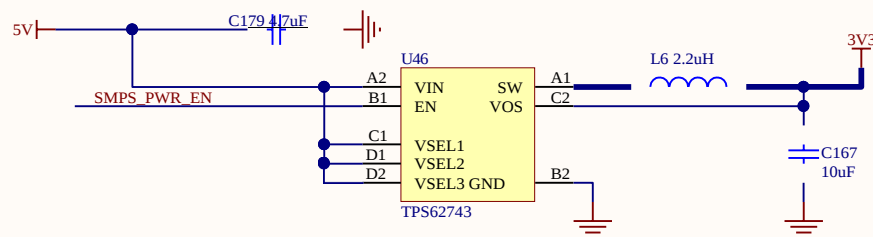
Title: PMOD_STMOD1		
Project: STM32L562E-DK		
Variant: L562QEQ		
Revision: C-01		Reference: MB1373
Size: A4	Date: 14-JUNE-2019	Sheet: 13 of 21



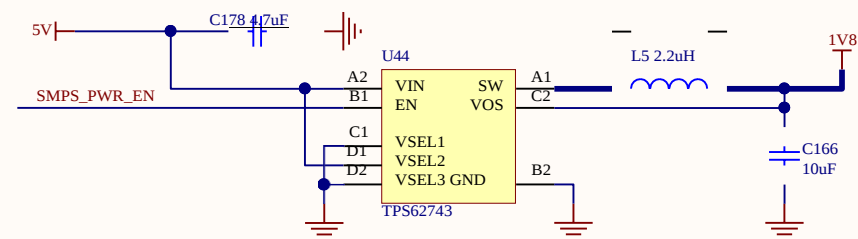
5V PWR SOURCE SELECTION



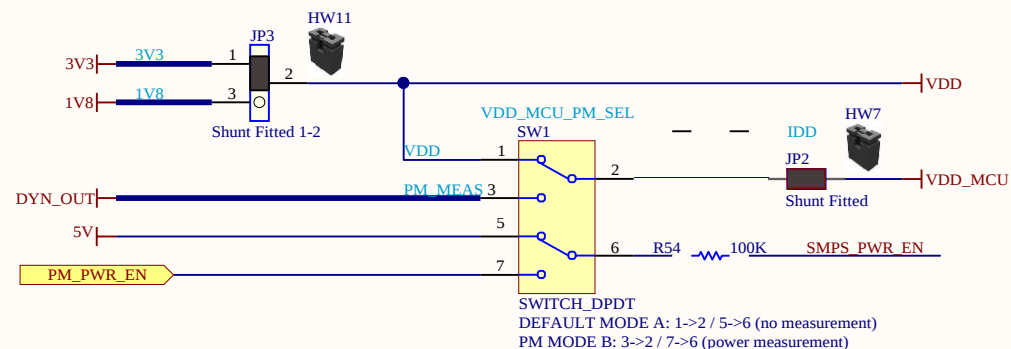
3V3 PWR SOURCE: 3V3 / 300mA



1V8 PWR SOURCE: 1V8 / 300mA

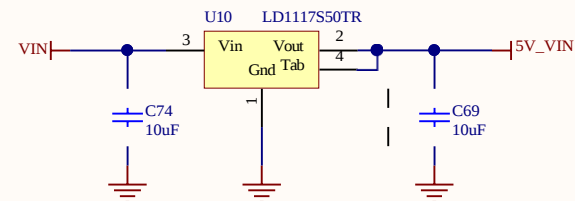


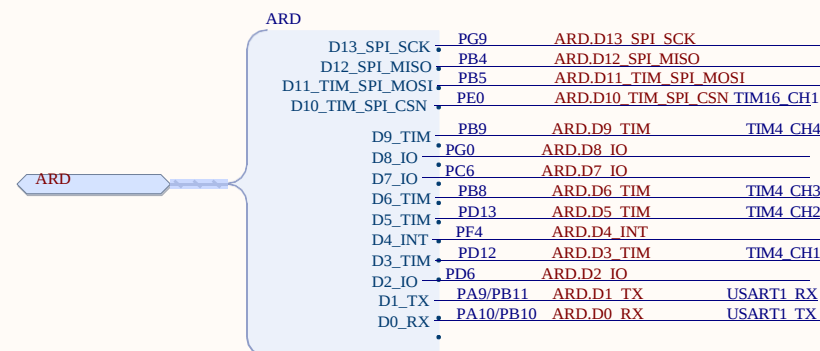
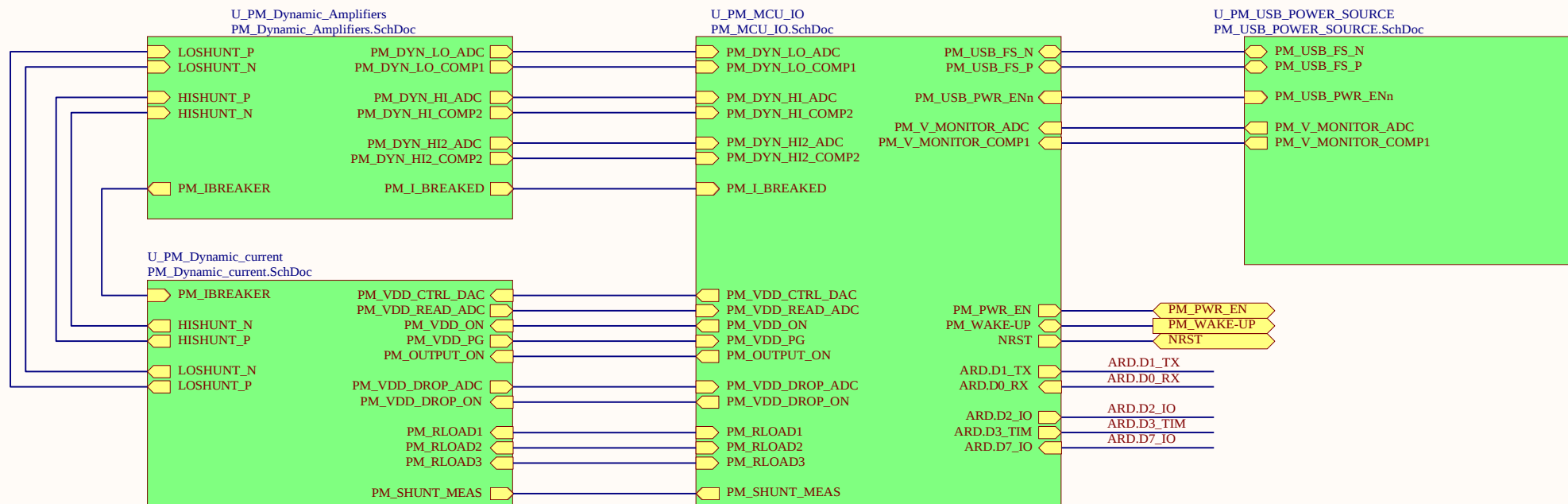
VDDPWR SOURCE SELECTION: 1V8/3V3/DYN_OUT



DYN_OUT is the supply used for current measurement
When DYN_OUT is used, VDD should be align for IO compatibility 1V8 / 3V3
When DYN_OUT is used on CN20 (external power measurement) SW1 should be set in mode A

VIN FROM ARDUINO up to 12V: OUTPUT 5V / Up to 800mA (depend of VIN)





PATENT PENDING

Title: PM_TOP

Project: STM32L562E-DK

Variant: L562QE

Revision: C -01

Reference: MB1373

Size: A4

Date: 14-JUNE-2019

Sheet: 16 of 21



EM_MCU_IO

High state enables the VDD regulator
Reads Power Good of VDD regulator
High state disables HI current voltage loop
AC1 output controls output voltage VDD
Do not connect here: DAC2 Output, see note*
ADC1,2_IN11 measures VDD
Low state enables the Dynamic Output

PM_USB_FS_DIFF_PAIR

COMP1_OUT is DYN_LO_OVRCR
ADC1,2 IN16 reads VDD-DROP_DAC
COMP1_INP monitors output supply voltage

COMP2_INP detects overcurrent on HI2 (DYN)
PB5= COMP2_OUT to target MCU: HI or HI2 overcurrent (DYN)
COMP2_INP detects overcurrent on HI (DYN)

I2C bus to TEMP sensors
Temperature alert from temperature sensors

3 TP For Debug Purpose

Dynamic current HI: ADC1,2,3_IN1
Dynamic current LO: ADC1,2,3_IN2
Dynamic current HI2: ADC1,2,3_IN3
Vmonitor: ADC1,2,3_IN4

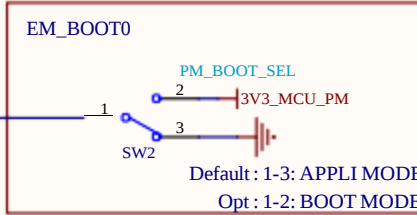
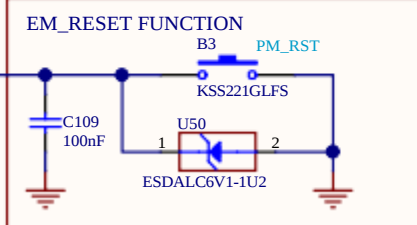
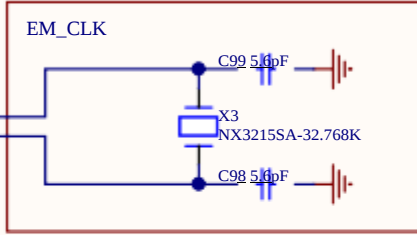
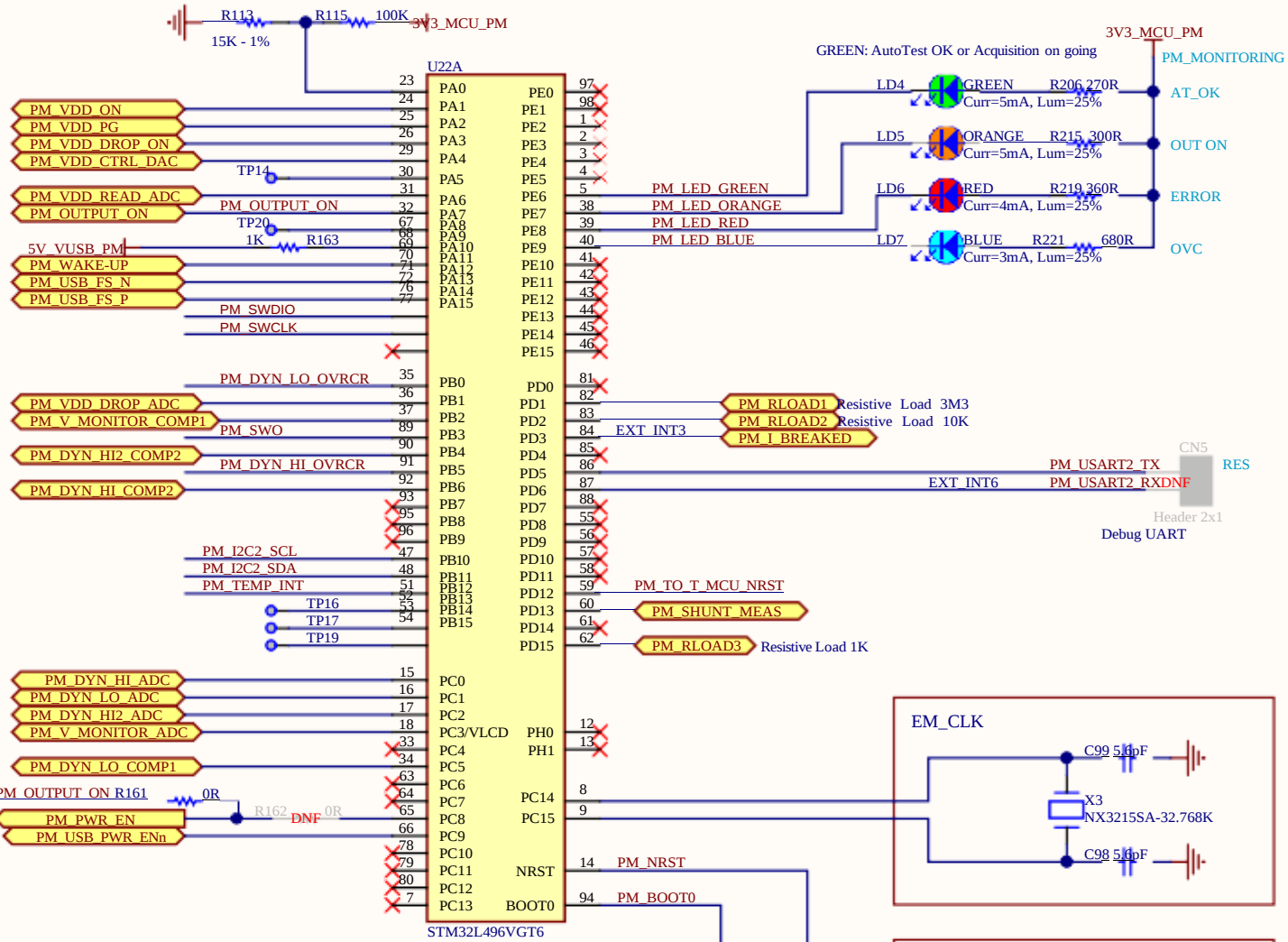
COMP1_INP: threshold on DYN_LO

ENABLE DK SMPS for POWER SEQUENCING
Power switch to supply board from USB

Note * regarding PA5:

- In DYN mode: PA5 is the DAC2 output used as reference INM of COMP1 for overcurrent on DYN_HI and DYN_HI2
- In STAT mode: PA5 = DAC2 is connected internally to INP of COMP1 to monitor V_MONITOR

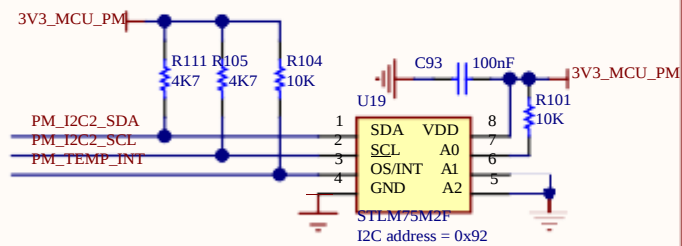
GPIOs interrupt vectors:
EXTI0
EXTI1
EXTI2
EXTI3: PD3 I_BREAKED
EXTI4
EXTI6 : PD6 interrupt input from Arduino connector pin D1
EXTI12 : PB12 interrupt input for Temperature sensor



SPDT slider in position B:
 BOOT0 High AND nBOOT1 High = boot from System Flash Memory
 BOOT0 High AND nBOOT1 Low = boot from RAM

SPDT slider in position A:
BOOT0 Low = boot from Flash memory

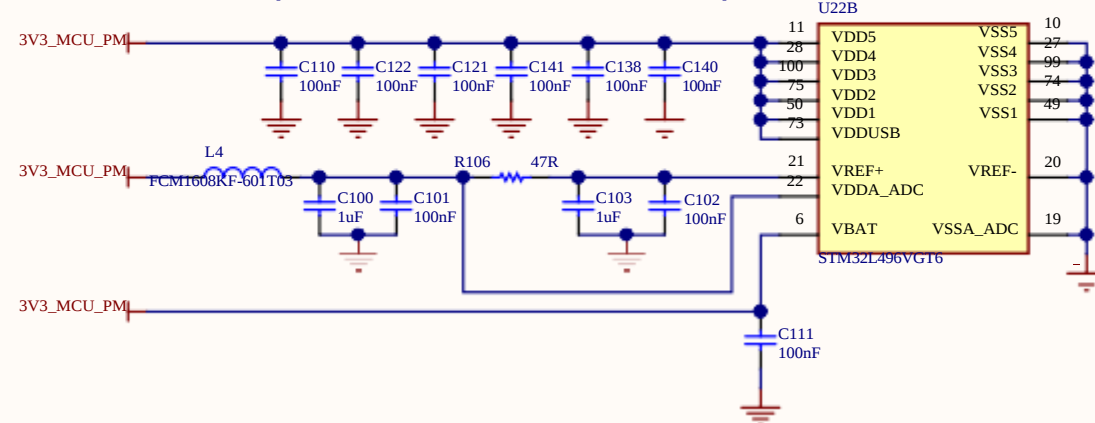
TEMPERATURE SENSOR



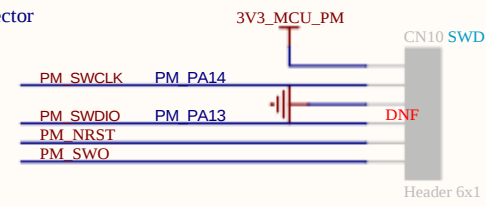
TEMP sensor should be placed close to the TARGET MCU

PM_MCU_DECAPS

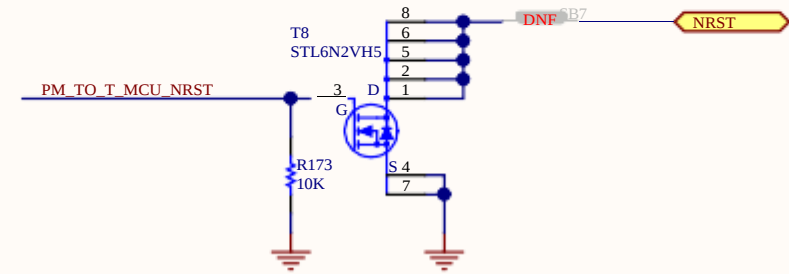
Each capacitor close to VDD1, VDD2, VDD3, VDD4, VDD5, VDDUSB pins



Programming and debug connector

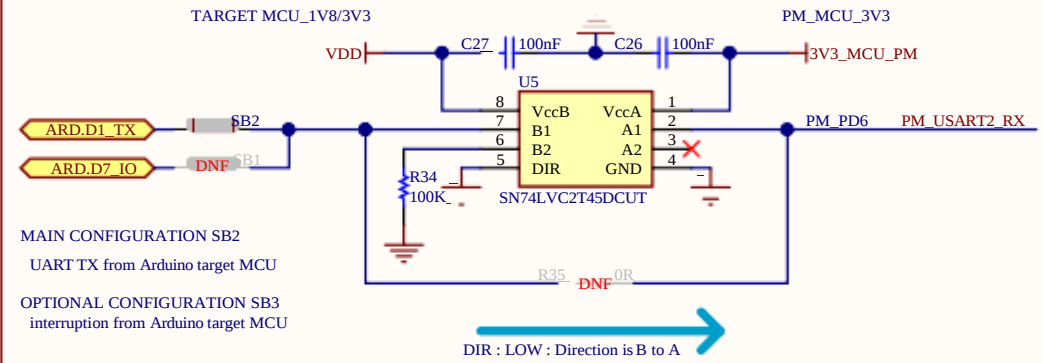


TARGETMCURESET

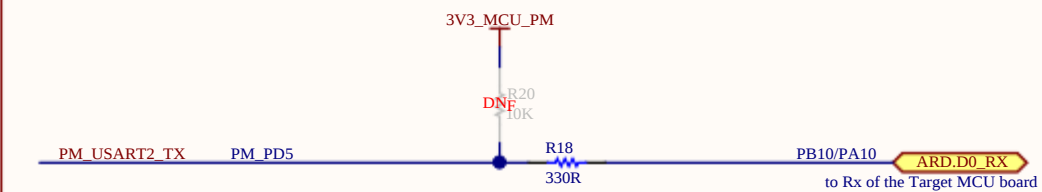


UARTLINK BETWEEN PM AND TARGET MCU

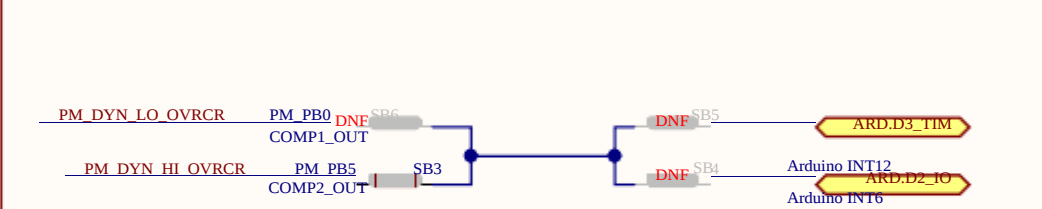
TARGET TX to PM RX: need LS for 1V8 mode



TARGET RX from PM TX: No need LS for 1V8 mode



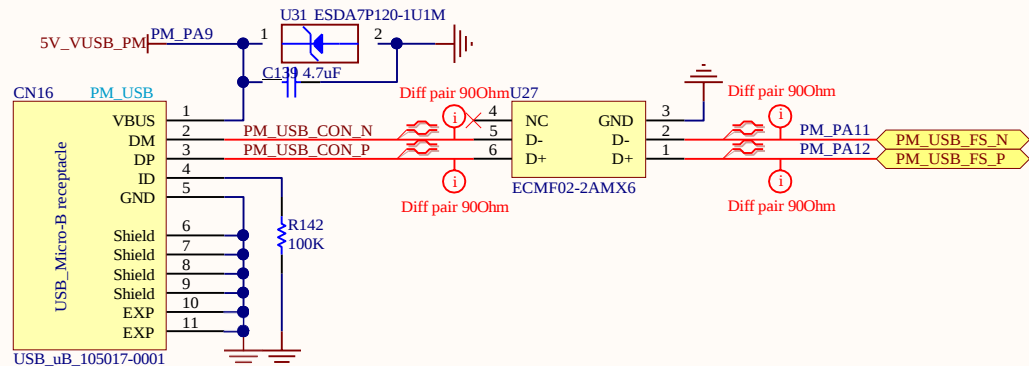
IT to target MCU for Overconsumption Detection



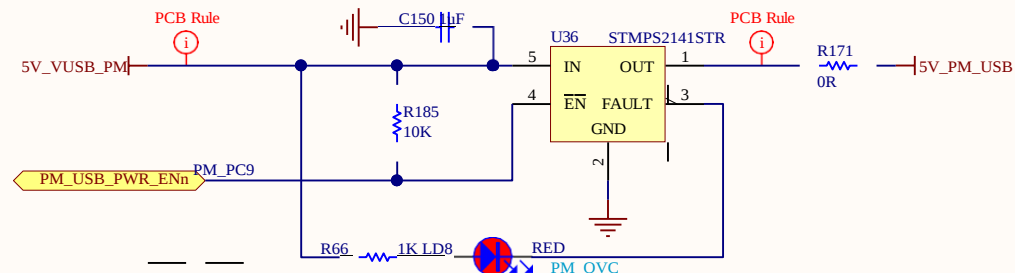
DYN_HI and DYN_HI2 overcurrent
COMP2_OUT is DYN_HI_OVRCR
OR
from analog watchdog from ADCs of HI_ADC and LO_ADC

PATENT PENDING

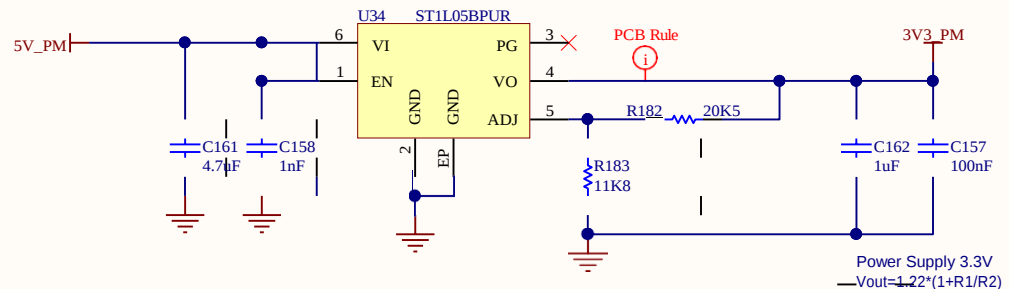
PM USB CONNECTOR



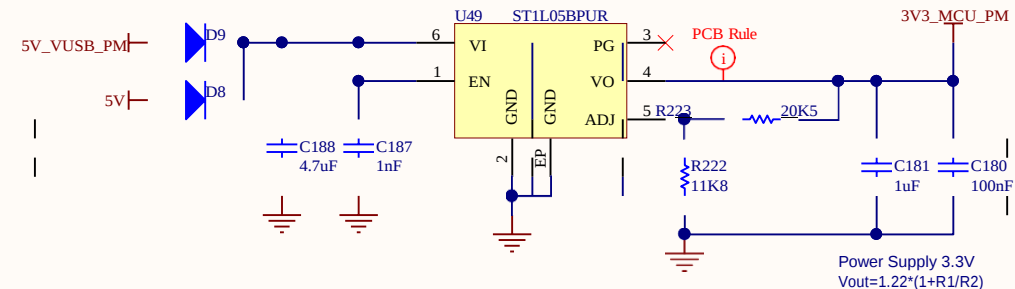
PM USB 5V POWER SWITCH: 5V / 500mA



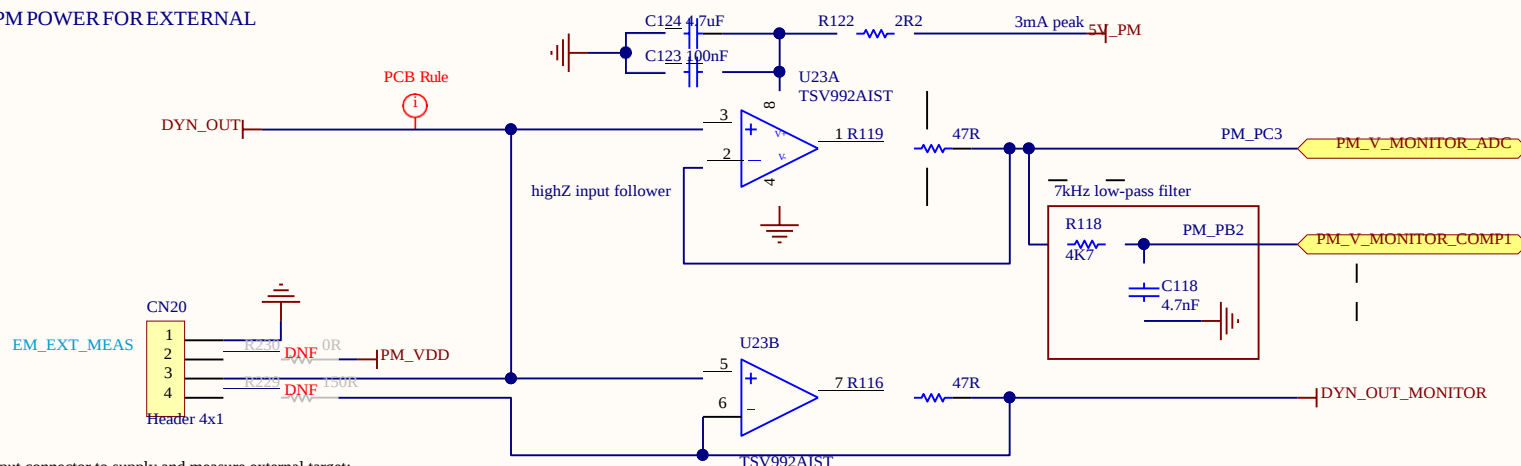
PM POWER: 3V3 / 1A3



PM POWER: 3V3 / 1A3



PM POWER FOR EXTERNAL



Output connector to supply and measure external target:

- PIN 1: GND
- PIN 2: Voltage source, current is not measured, it is not a copy of our output voltage
- PIN 3: Output with current measurement
- PIN 4: Output voltage copy with 150R protection serial resistor, current is not measured

Power supply details:

5V_VUSB_PM: 5V directly from PM USB connector,

5V_PM: 5V supply from USB power switch output

3V3_MCU_PM: supplies the PM MCU STM32L4 only, independently of the other parts of the board.

This is available as soon as one of the 5V source is present. It is supposed to drain less than 100mA on VUSB.

3V3_PM: 3V3 for the other part of PM part excepting the STM32L4

PM_VDD: output of the programmable regulator for Power Measurement.

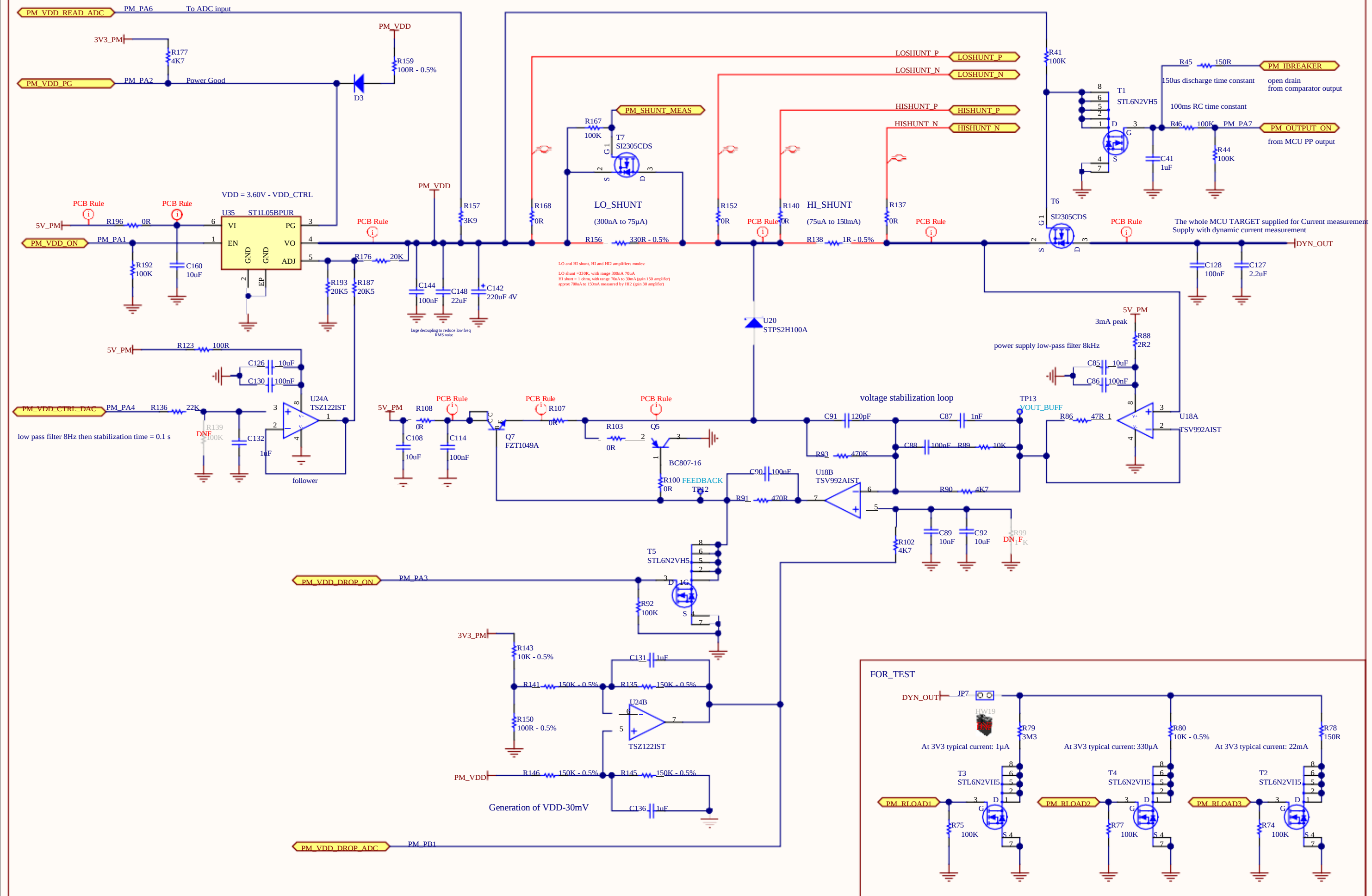
PM_VDD give DYN_OUT to supplies the target MCU and make current measurement

PATENT PENDING

Title: PM_USB_POWER_SOURCE			
Project: STM32L562E-DK			
Variant: L562QEQ			
Revision: C-01			
Size: A4		Reference: MB1373	Sheet: 18 of 21
Date: 14-JUNE-2019		Site: augmented	



PM DYNAMIC CURRENT MEASUREMENT

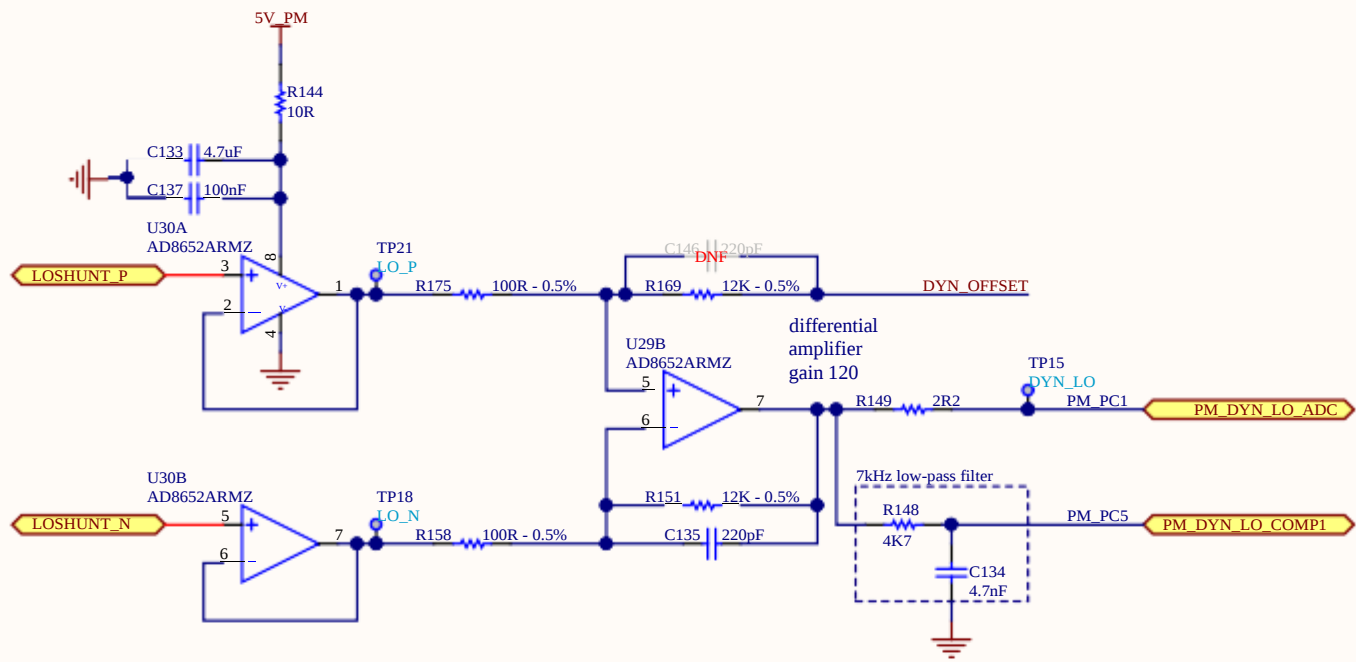


PATENT PENDING

Title: PM_Dynamic_cur rent		
Project: STM32L562E-DK		
Variant: L562QEQ		
Revision: C-01	Size: A3	

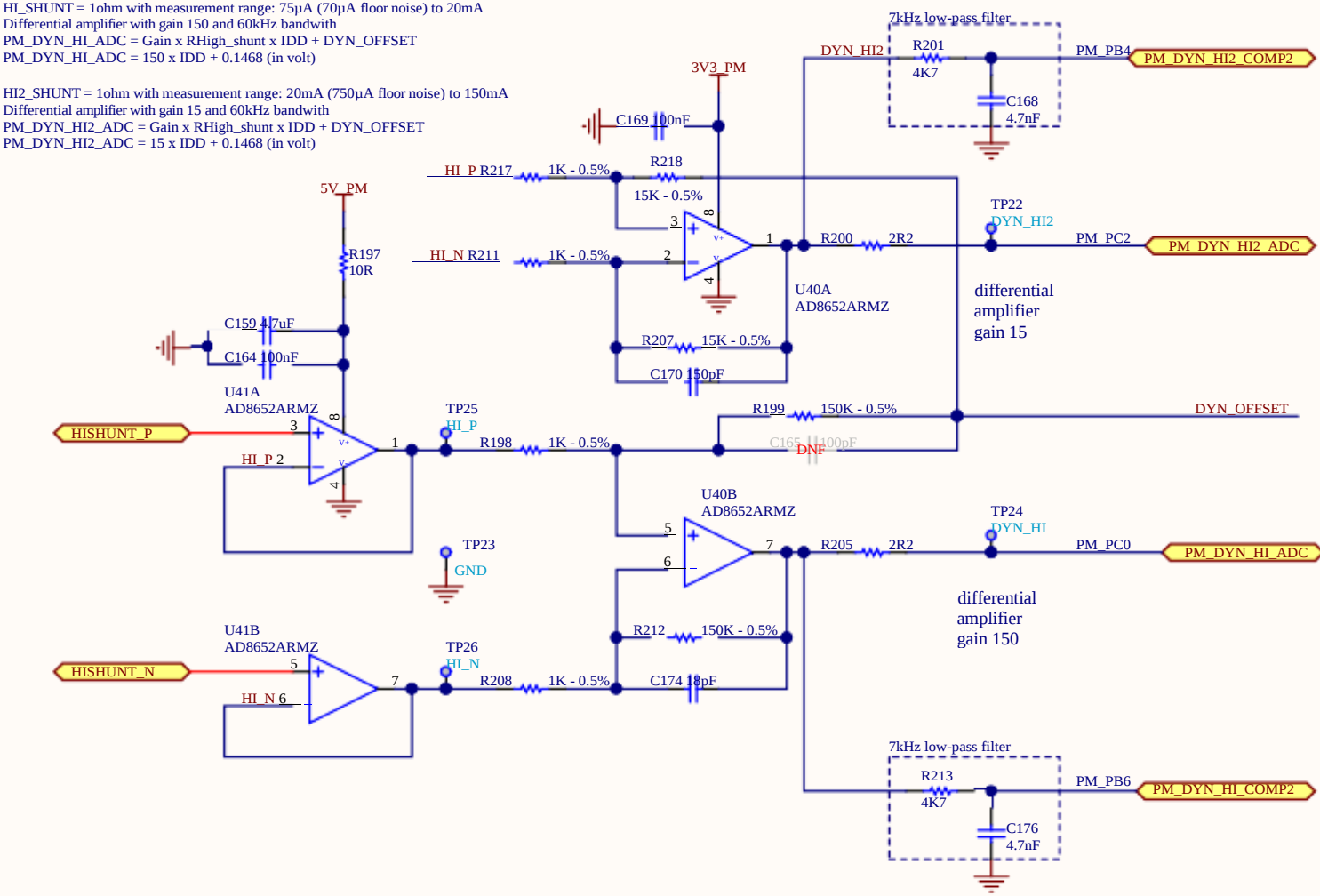
LOW CURRENT RANGE MEASUREMENTS

LO_SHUNT = 330ohm with measurement range: 300nA (300nA floor noise) to 75µA
Differential amplifier with gain 120 and 60kHz bandwidth
PM_DYN_LO_ADC = Gain x Rlow_shunt x IDD + DYN_OFFSET
PM_DYN_LO_ADC = 39600 x IDD + 0.1468 (in volt)



HIGH CURRENT RANGE MEASUREMENTS

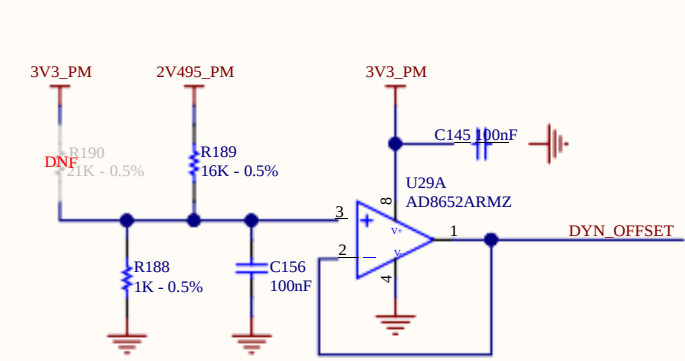
HI_SHUNT = 1ohm with measurement range: 75µA (70µA floor noise) to 20mA
Differential amplifier with gain 15 and 60kHz bandwidth
PM_DYN_HI_ADC = Gain x RHigh_shunt x IDD + DYN_OFFSET
PM_DYN_HI_ADC = 150 x IDD + 0.1468 (in volt)



DC OFFSET GENERATOR

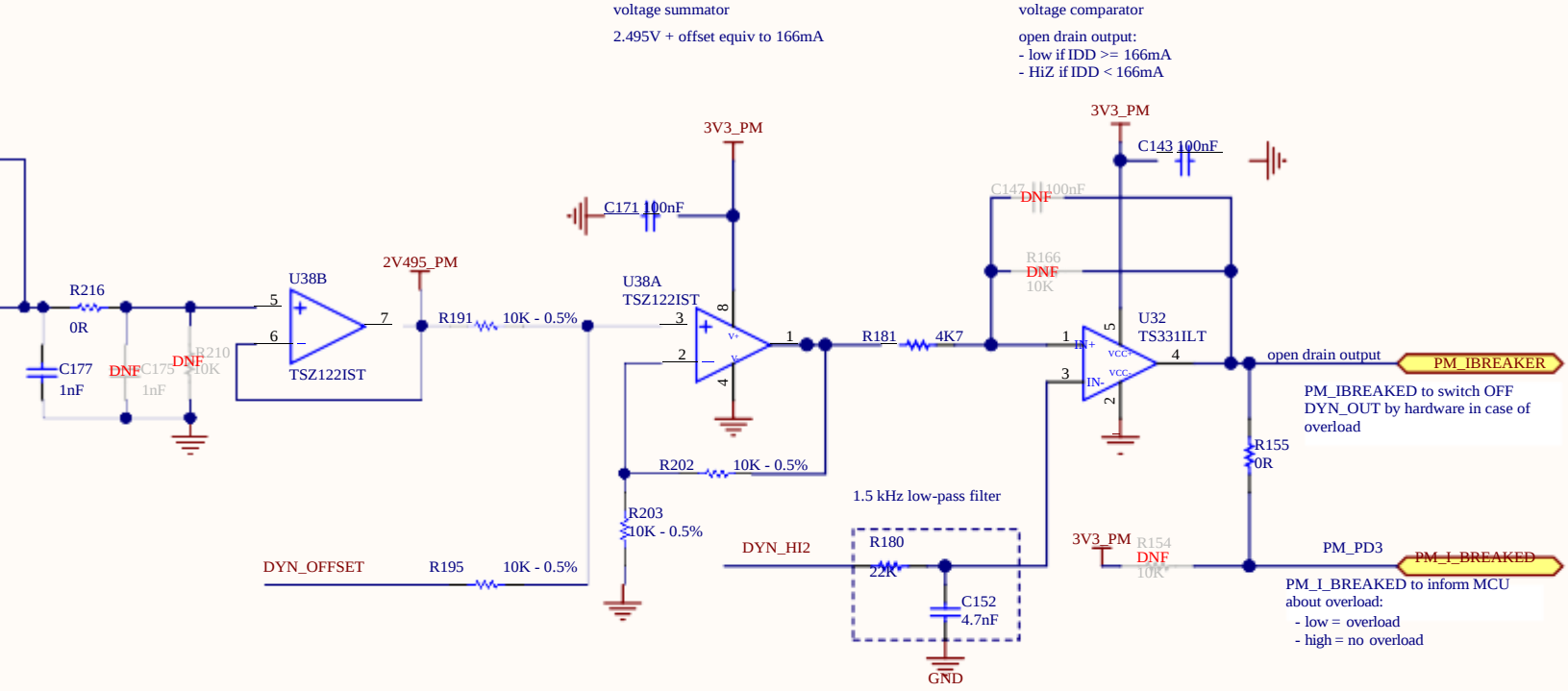
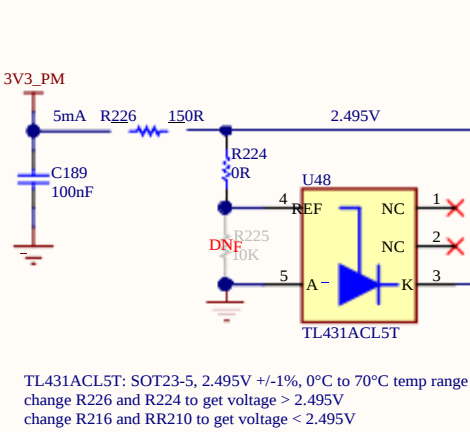
DYN_OFFSET = 146.8mV

DYN_OFFSET used to compensate input offset of DYN_LO and DYN_HI OpAmp
assumption: AD8652 Vio = 0.3mV max; 3xVio/gain = 3x0.3x150=135mV offset voltage min



CIRCUIT BREAKER

166mA overload and short circuit protection



PATENT PENDING

HW1

BOARD QR CODE

QR code

HW2

BOARD CPN

Board CPN

HW10

PCB

MB1373C

HW5

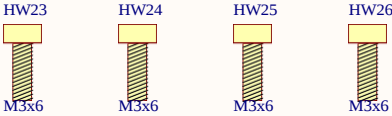
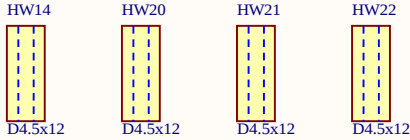
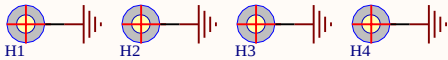
LOGO ST

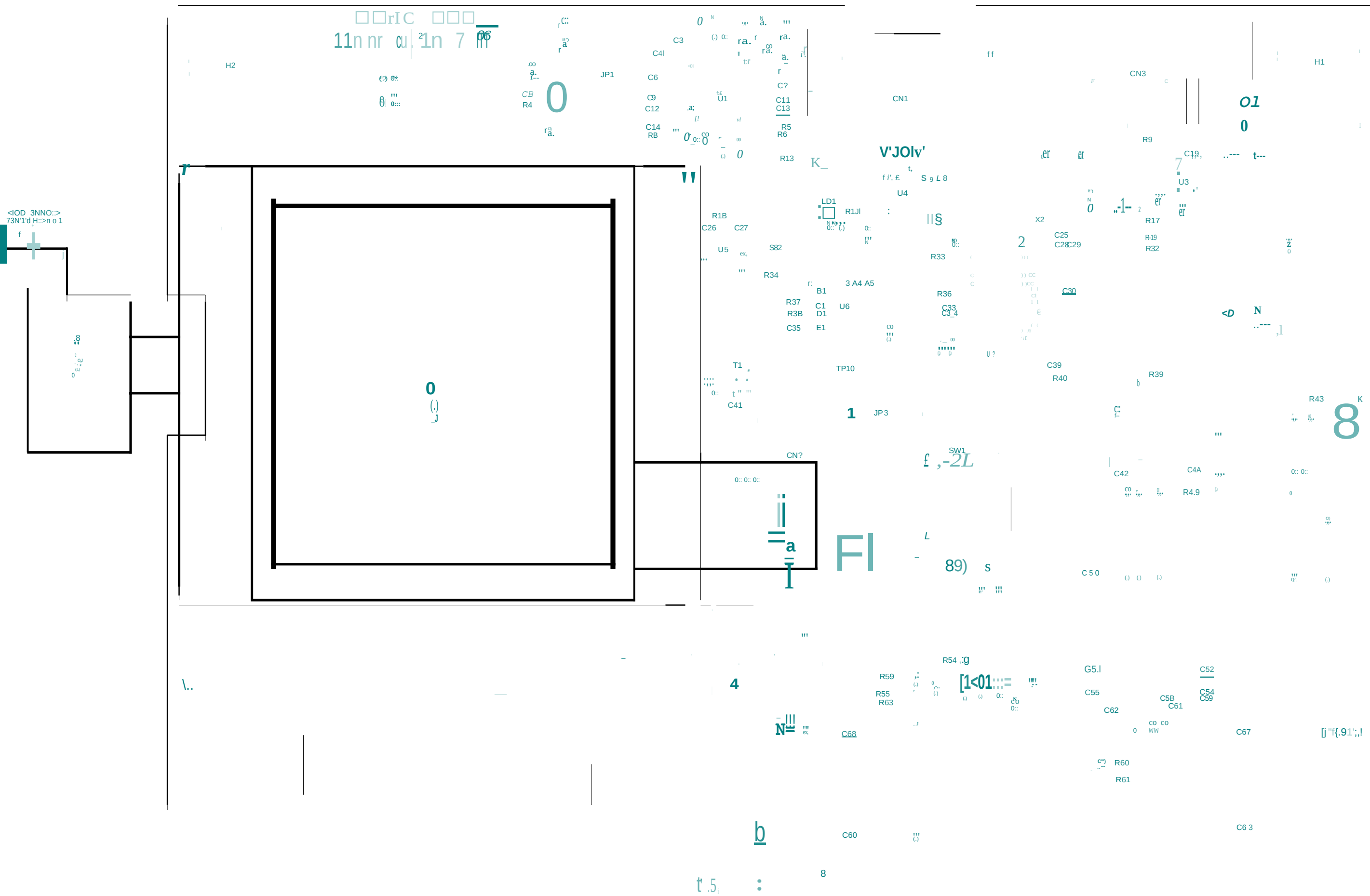
HW3

LOGO CE

HW4

LOGO ROHS





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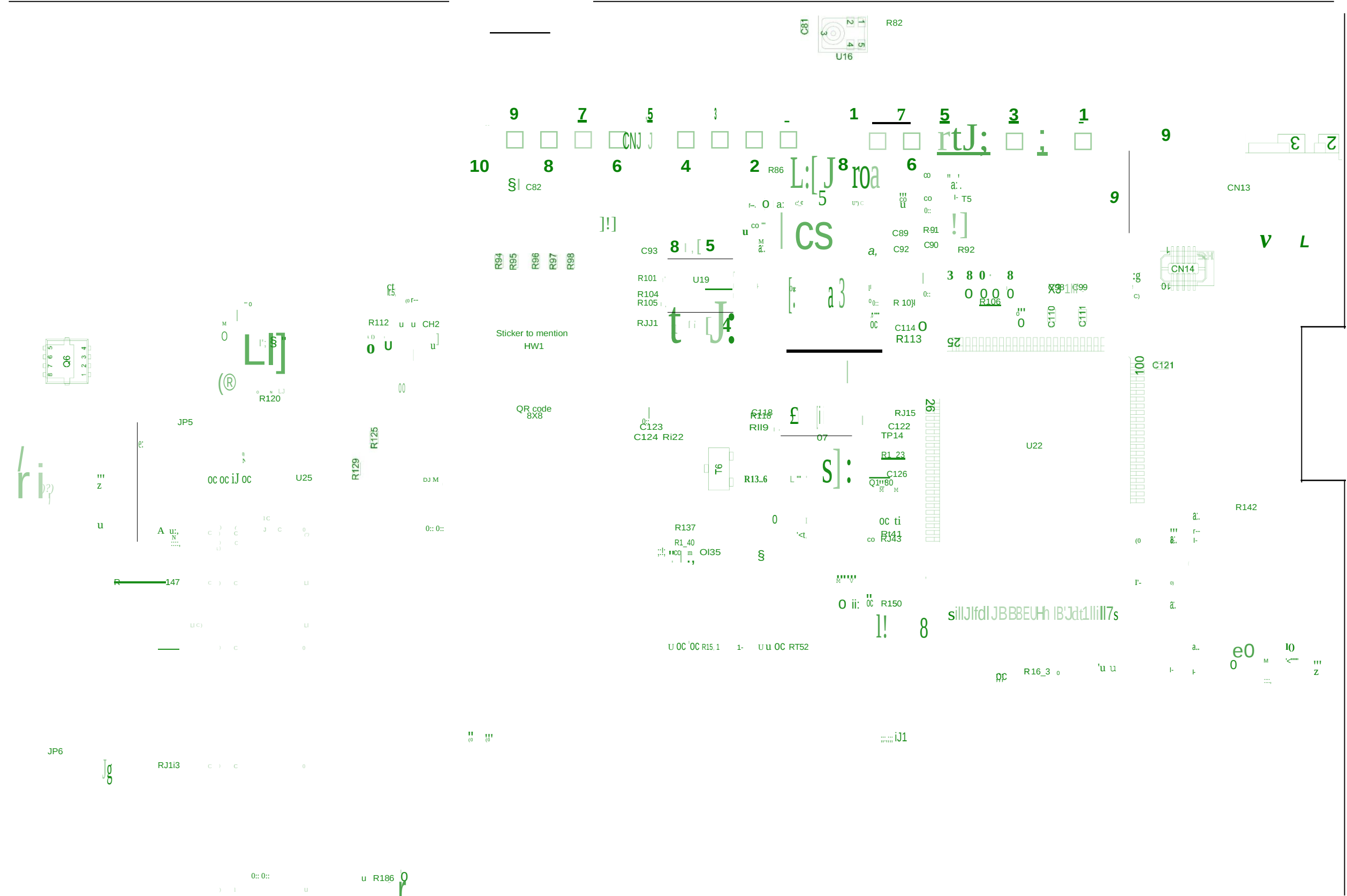
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Project: STM32L562E-DK		®
Layer: M14-Top Assembly	Gerber: .GM14	
Variant: L562QEQ	Ref: MB1373	
Date: 19-JUN-14	Rev:C	



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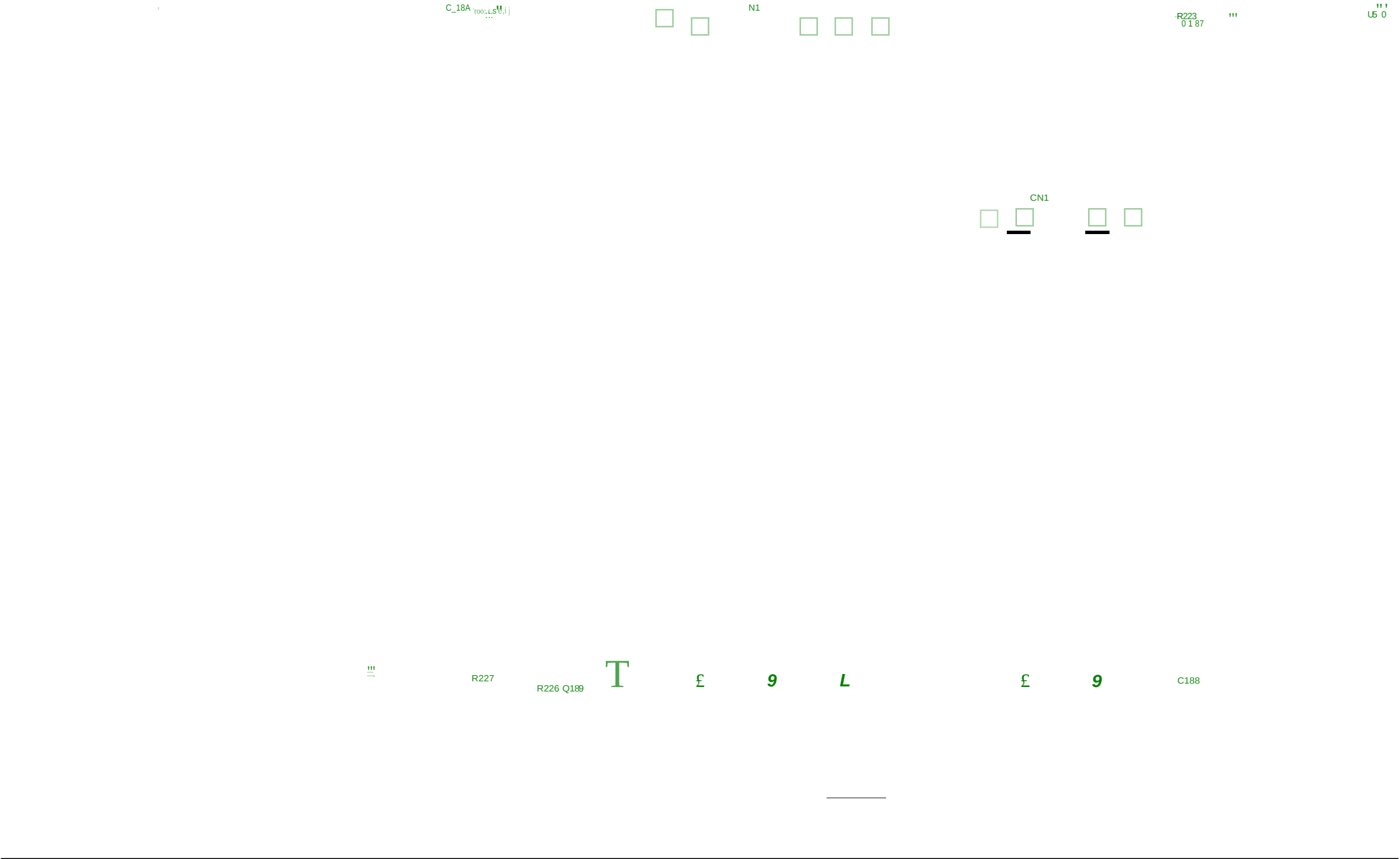
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Project: STM32L562E-DK		
Layer: M15-Bottom Assembly	Gerber:.GM15	
Variant: L562QEQ	Ref: MB1373	
Date: 19-JUN-14	Rev:C	

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HW2

Sticker to mention board CPN code

