mmWave Detection Platform

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File: Index Page.kicad_sch

●Version Control Instructions – Version[Sch1.Sch2.PCB1]:
(1) Sch1, Sch2: Schematic version
(2) PCB1: PCB version
*Schematic file does not show PCB version –[PCB1]

*Example:
=>Schematic file: mmWave detection platform Version[1.0]
(1) Schematic version = 1.0
=>PCB file: mmWave detection platform Version[1.0.1]
(1) Schematic version corresponding to PCB = 1.0
(2) PCB version = 1

PWR_FLAG
GND

H1 Mounting Hole–M2.5 NI
H2 Mounting Hole–M2.5 NI
H3 Mounting Hole–M2.5 NI
H4 Mounting Hole–M2.5 NI

PSU:Input_12V
Vin_+12V
12V@3A(Max),36W
Connectors
[J1] DC Barrel Jack
File: PSU:Input_12V.kicad_sch

PSU:Vcc–OS–5V
Vin_+12V Vout_+5V
Vcc–OS–5V 5V@3A(Max), 15W
File: PSU:BUCK–00_12Vto5V.kicad_sch

PSU:Vcc–RADAR–5V
Vin_+12V Vout_+5V
Vcc–RADAR–5V 5V@3A(Max), 15W
File: PSU:BUCK–00_12Vto5V.kicad_sch

*Output total 15.25W(Max)
*Default one–time programmable (OTP) settings(Software).

PSU:PMIC–RADAR [I2C]
Vcc–RADAR–5V
Vbuck–in_+5V
Vana_+5V
PMIC_INT_N
PMIC_I2C_SCL
PMIC_I2C_SCL
*OS–I2C–0 [SLAVE–01]
Vbuck–out–0_+3.3VD Vcc–PMIC–3.3V 3.3v@1.5A(Max), 4.95W
Vbuck–out–1_+1.2VD Vcc–PMIC–1.2V 1.2V@1.5A(Max), 1.8W
Vbuck–out–2_+1.0VD Vcc–PMIC–1.0V 1.0V@4A (Max), 4W
Vbuck–out–3_+1.8VD Vcc–PMIC–1.8V 1.8V@2.5A(Max), 4.5W
PMIC_CLK
NI R6 RADAR_PMIC–CLKOUT
R0603 0R(Ohm)/1%
PMIC_PGOOD
LED Indicator_RADAR_PMIC_PGOOD_GREEN
File: PSU:PMIC–00_BUCKx4_5Vto3.3、1.8、1.2、1.0V [I2C].kicad_sch.kicad_sch

PSU:PMIC to RADAR–LC filter
Vcc–PMIC–3.3V Vcc–RADAR–3.3V Vcc–RADAR–3.3V
Vcc–PMIC–1.2V Vcc–RADAR–1.2V Vcc–RADAR–1.2V
Vcc–PMIC–1.0V Vcc–RADAR–1.0V_RF1 Vcc–RADAR–1.0V_RF1
Vcc–RADAR–1.0V_RF2 Vcc–RADAR–1.0V_RF2
Vcc–RADAR–1.0V_RF2_VOUT–PAD Vcc–RADAR–1.0V_RF2_VOUT–PA
Vcc–PMIC–1.8V Vcc–RADAR–1.8V
Vcc–RADAR–1.8V_BB Vcc–RADAR–1.8V_BB
Vcc–RADAR–1.8V_VCLK Vcc–RADAR–1.8V_VCLK
Vcc–RADAR–1.8V_VCO Vcc–RADAR–1.8V_VCO
File: PSU:PMIC to RADAR–LC filter.kicad_sch

PSUs–OS

OS

OS:CM4_IO
Vcc–OS–5V Vcc–OS–5V
Vcc–OS–3.3V Vcc–OS–3.3V 3.3V@600mA(Max), 1.98W
LED_PWR_ND LED Indicator_OS–PWR_RED
LED_ACT_N LED Indicator_OS–ACT_GREEN
GPIO16_DOD LED Indicator_OS–WIFI_BLUE
GPIO17_DOD LED Indicator_OS–BT_BLUE
RESET_N
RPIBOOT_N
EEPROM_WP_N
WL_Disable_N
BT_Disable_N
Vin_+12V Vin_+12V
Vcc–OS–3.3V Vin_+3.3V
*OS–I2C–0 [MASTER]
GPIO045_I2C–0_SCL *I2C–0_S–00_SCL
GPIO044_I2C–0_SDA *I2C–0_S–00_SDA
*I2C–0_S–01_SCL *OS–I2C–0 [SLAVE–01]
*I2C–0_S–01_SDA
Connectors
[J2A] ComputeModule4 Module1–A
EXT_RESET_Status_ND RADAR_RESET_N_1_N
GPIO18_DOD RADAR_RESET_N_2_P
*OS–SPI–0 [MASTER]
GPIO11_SPI–0_SCLKD
GPIO08_SPI–0_CE0_ND
GPIO10_SPI–0_MOSID
GPIO09_SPI–0_MISOD
*Failsafe application. (Optional)
GPIO4_DI NI R1 PMIC_INT_N R0603 0R(Ohm)/1%
GPIO5_DI NI R2 RADAR_NERROR_OUT_N R0603 0R(Ohm)/1%
GPIO19_DI/DO NI R3 RADAR_SPI_HOST_INTR/GPIO_12 R0603 0R(Ohm)/1%
*Default:DI, Active H *Default:[RADAR_SPI_HOST_INTR].DO, Active H
File: OS:CM4_IO.kicad_sch

OS:LED Indicator
Vin_+5V Vcc–OS–5V
Vin_+3.3V Vcc–OS–3.3V
LED_PWR_N
LED_ACT_N
GPIO16_DO
GPIO17_DO
File: OS:LED Indicator.kicad_sch

OS:System Setting–Jumper
Connectors
[J3] Jumpers
RESET_N
RPIBOOT_N
EEPROM_WP_N
WL_Disable_N
BT_Disable_N
File: OS:System Setting–Jumper.kicad_sch

OS:FAN [I2C]
Vin_+12V Vin_+12V
Vcc–OS–3.3V Vin_+3.3V
Connectors
[J4] FAN–OS
*OS–I2C–0 [MASTER]
GPIO045_I2C–0_SCL *I2C–0_S–00_SCL
GPIO044_I2C–0_SDA *I2C–0_S–00_SDA
I2C_SCL I2C_SCL
I2C_SDA I2C_SDA
*OS–I2C–0 [SLAVE–00]
File: OS:FAN [I2C].kicad_sch

OS:CM4_HighSpeed
*USB–0
CM4_USB–0_P
CM4_USB–0_N
CM4_USB_OTG_N
Connectors
[J2B] ComputeModule4 Module1–B
File: OS:CM4_HighSpeed.kicad_sch

OS:Software Burning & Update USB [USB]
CM4_USB_D_P *USB–0
CM4_USB_D_N
CM4_USB_OTG_N_SET
Connectors
[J5] USB2.0 Micro Type–B (Micro–USB) (For Burning eMMC)
File: OS:Software Burning & Update USB [USB].kicad_sch

PSUs–RADAR

RADAR

RADAR:FAN & Heat Sink plates
Vin_+12V Vin_+12V
Connectors
[J6] FAN–RADAR
File: RADAR:FAN & Heat Sink plates.kicad_sch

RADAR:LED Indicator
Vcc–RADAR–5V Vin_+5V
LED Indicator_RADAR_PMIC_PGOOD_GREEN PMIC_PGOOD
LED Indicator_2105_ECI_SUSPEND_N_GREEN 2105_ECI_SUSPEND_N
LED Indicator_2105_SCI_SUSPEND_N_GREEN 2105_SCI_SUSPEND_N
File: RADAR:LED Indicator.kicad_sch

RADAR:IWR6843AOP–POWER
Vcc–RADAR–3.3V Vcc–RADAR–3.3V
Vcc–RADAR–1.2V Vcc–RADAR–1.2V
Vcc–RADAR–1.0V_RF1 Vcc–RADAR–1.0V_RF1
Vcc–RADAR–1.0V_RF2 Vcc–RADAR–1.0V_RF2
Vcc–RADAR–1.0V_RF2_VOUT–PA Vcc–RADAR–1.0V_RF2_VOUT–PA
Vcc–RADAR–1.8V Vcc–RADAR–1.8V
Vcc–RADAR–1.8V_BB Vcc–RADAR–1.8V_BB
Vcc–RADAR–1.8V_VCLK Vcc–RADAR–1.8V_VCLK
Vcc–RADAR–1.8V_VCO Vcc–RADAR–1.8V_VCO
File: RADAR:IWR6843AOP–POWER.kicad_sch

RADAR:RESET CONTROL
Vcc–RADAR–3.3V Vin_+3.3V
RADAR_RESET_N_1_N R4 RADAR_RESET_N_1_N R0603 0R(Ohm)/1%
RADAR_RESET_N_2_P R5 RADAR_RESET_N_2_P R0603 0R(Ohm)/1%
RADAR_RESET_N_EN RADAR_RESET_N_EN
File: RADAR:RESET CONTROL.kicad_sch

Voltage Shifter:SPI Communication [SPI]
3.3v@27uA(Max)+0.99mA(Max) Vcc–OS–3.3V VCCA
3.3v@27uA(Max) Vcc–RADAR–3.3V VCCB
OS_SPI–0_SCLK A1_IN B1_OUT RADAR_SPI–A_CLK
OS_SPI–0_CE0_N A2_IN B2_OUT RADAR_SPI–A_CS_N
OS_SPI–0_MOSI A3_IN B3_OUT RADAR_SPI–A_MOSI
OS_SPI–0_MISO A4_OUT B4_IN RADAR_SPI–A_MISO
File: Voltage Shifter:SPI Communication [SPI].kicad_sch

RADAR:Software Burning & Update USB [USB]
Vcc–RADAR–3.3V Vin_+3.3V
2105_ECI_RX RADAR_UART–Debug_TX
2105_ECI_TX RADAR_UART–Debug_RX
LED Indicator_2105_ECI_SUSPEND_N_GREEN 2105_ECI_SUSPEND_N 2105_SCI_RX–1 RADAR_UART–LOGGER_TX_MSS
LED Indicator_2105_SCI_SUSPEND_N_GREEN 2105_SCI_SUSPEND_N 2105_SCI_RX–2 RADAR_UART–LOGGER_TX_BSS
Connectors
[J7] USB2.0 Micro Type–B (Micro–USB) (For Burning RADAR)
File: RADAR:Software Burning & Update USB [USB].kicad_sch

RADAR:IWR6843AOP–IO.HighSpeed
Vcc–RADAR–3.3V Vcc–RADAR–3.3V
*RADAR_JTAG
RADAR_JTAG–TCK
RADAR_JTAG–TMS
RADAR_JTAG–TDI
RADAR_JTAG–TDO_SOP–0
RADAR_SYNC–OUT_SOP–1
RADAR_PMIC–CLKOUT/SOP–2
RADAR_RESET_N_EN RADAR_RESET_N
RADAR_NERROR_OUT_N RADAR_NERROR_OUT_N
*Default:[RADAR_SPI_HOST_INTR].DO, Active H
RADAR_SPI_HOST_INTR/GPIO_12 RADAR_SPI_HOST_INTR/GPIO_12
RADAR_SPI_HOST_INTR/GPIO_12
*RADAR_QSPI [MASTER]
RADAR_QSPI–CLK
RADAR_QSPI–CS_N
RADAR_QSPI–DATA–IO–0
RADAR_QSPI–DATA–IO–1
RADAR_QSPI–DATA–IO–2
RADAR_QSPI–DATA–IO–3
RADAR_UART–Debug_TX *RADAR_UART–Debug
RADAR_UART–Debug_RX
RADAR_UART–LOGGER_TX_MSS *RADAR_UART–LOGGER
RADAR_UART–LOGGER_TX_BSS
*RADAR_I2C–0 [MASTER]
RADAR_I2C–0_SCL
RADAR_I2C–0_SDA
RADAR_EEPROM_WC_ND
File: RADAR:IWR6843AOP–IO.HighSpeed.kicad_sch

RADAR:JTAG [TI–14PIN]
Vcc–RADAR–3.3V Vin_+3.3V
Connectors
[J8] JTAG [TI–14PIN]
RADAR_JTAG–TCK
RADAR_JTAG–TMS
RADAR_JTAG–TDI
RADAR_JTAG–TDO
File: RADAR:JTAG [TI–14PIN].kicad_sch

RADAR:SOP configuration
Vcc–RADAR–3.3V Vin_+3.3V
Connectors
[J9] RADAR: SOP configuration
RADAR_SOP–0
RADAR_SOP–1
RADAR_SOP–2
RADAR_PMIC–CLKOUT
File: RADAR:SOP configuration.kicad_sch

RADAR:FLASH Memory [QSPI]
Vcc–RADAR–3.3V Vin_+3.3V
RADAR_QSPI–CLK
RADAR_QSPI–CS_N
RADAR_QSPI–DATA–IO–0
RADAR_QSPI–DATA–IO–1
RADAR_QSPI–DATA–IO–2
RADAR_QSPI–DATA–IO–3
*RADAR_QSPI [SLAVE]
File: RADAR:FLASH Memory [QSPI].kicad_sch

RADAR:EEPROM [I2C]
Vcc–RADAR–3.3V Vin_+3.3V
I2C_SCL *RADAR_I2C–0
I2C_SDA [SLAVE–00]
EEPROM_WC_N
File: RADAR:EEPROM [I2C].kicad_sch

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Title: mmWave detection platform

Size: A2	Date: 2023–09–01	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 0/24

*PSUs-OS

Symbol LIB -CHECK Pass
Peripheral Loop CKT -CHECK Pass
Footprint LIB-CHECK Pass

*OS

Symbol LIB -CHECK Pass
Peripheral Loop CKT -CHECK Pass
Footprint LIB-CHECK Pass

*PSUs-RADAR

COMP.的規格依照EVM的為主(BGA比較難DEBUG)
Symbol LIB -CHECK Pass
Peripheral Loop CKT -CHECK Pass
Footprint LIB-CHECK Pass

*RADAR

COMP.的規格依照EVM的為主(BGA比較難DEBUG)
Symbol LIB -CHECK Pass
Peripheral Loop CKT -CHECK Pass
Footprint LIB-CHECK Pass

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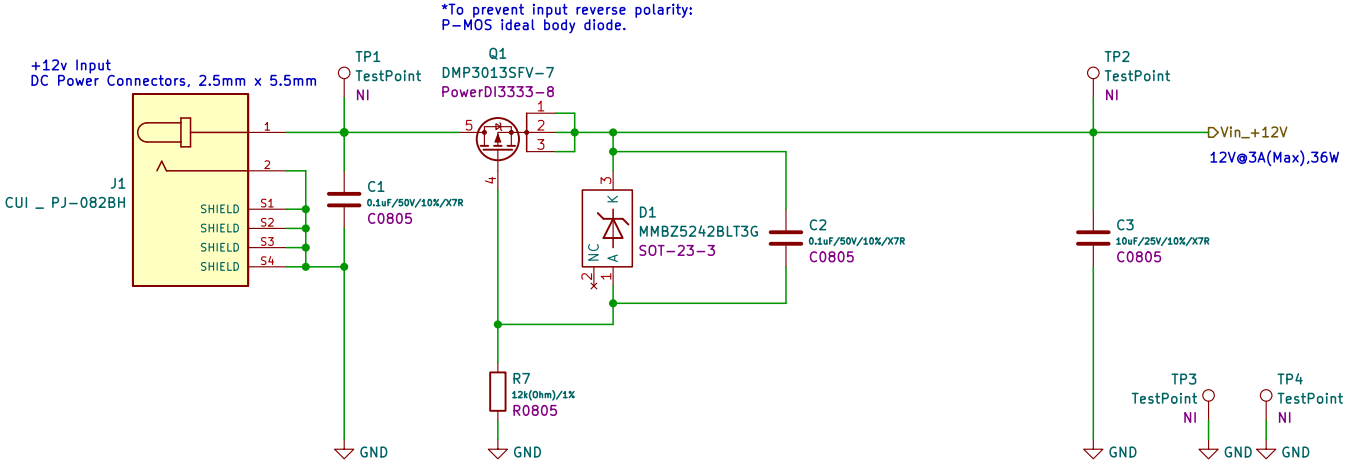
Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 1/24

External power input



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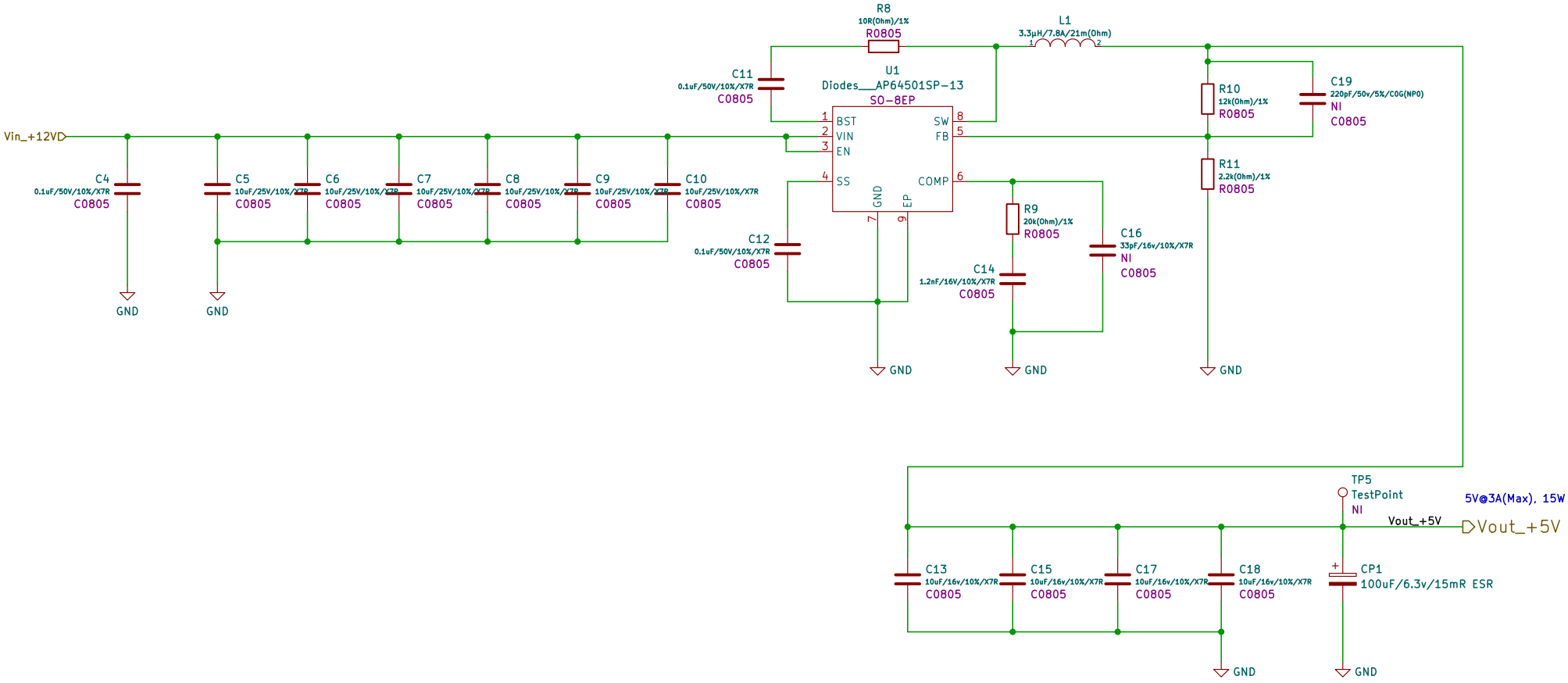
Sheet: /PSU:Input_12V/
File: PSU:Input_12V.kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 2/24

BUCK-00 [12v to 5v]

[Input:7.5V~28V @>20W]
[Output:+5v @3A(MAX), 15w(MAX)]



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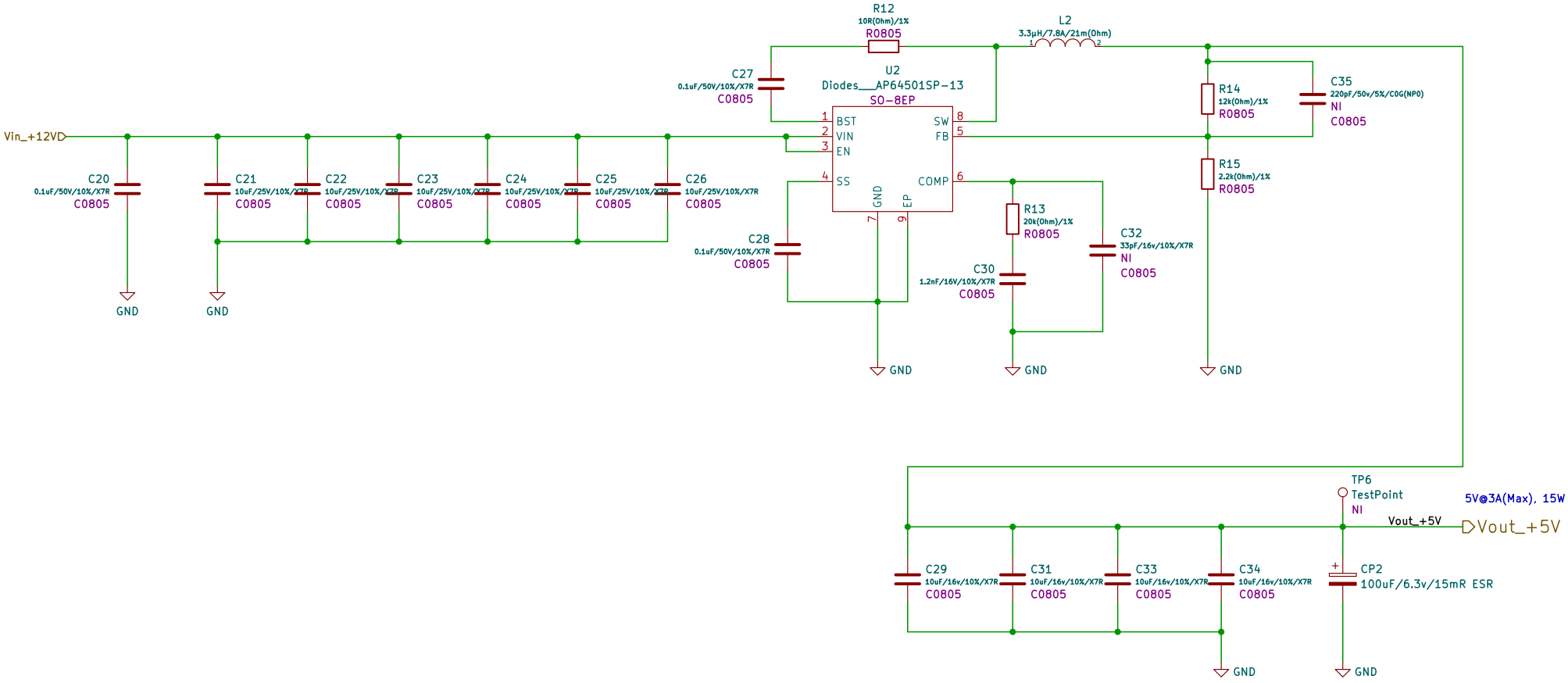
Sheet: /PSU:Vcc-OS-5V/
File: PSU:BUCK-00_12Vto5V.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 3/24

BUCK-00 [12v to 5v]

[Input:7.5V~28V @>20W]
[Output:+5v @3A(MAX), 15w(MAX)]



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Sheet: /PSU:Vcc-RADAR-5V/
File: PSU:BUCK-00_12Vto5V.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 4/24

ComputeModule4 Module1-A

J2A
RaspberryPi___ComputeModule4-CM4_Interface
Used 2pcs [DF40C-100DS-0.4V]
Hirose

GPIO

2	GND	GND	1
4	Ethernet_Pair1_P	Ethernet_Pair3_P	3
6	Ethernet_Pair1_N	Ethernet_Pair3_N	5
8	GND	GND	7
10	Ethernet_Pair0_N	Ethernet_Pair2_N	9
12	Ethernet_Pair0_P	Ethernet_Pair2_P	11
14	GND	GND	13
16	Ethernet_SYNC_IN(1.8v)	Ethernet_nLED3(3.3v)	15
18	Ethernet_SYNC_OUT(1.8v)	Ethernet_nLED2(3.3v)	17
20	EEPROM_nWP	Ethernet_nLED1(3.3v)	19
22	GND	Pi_LED_nActivity	21
24	GPIO26	GND	23
26	GPIO19	GPIO21	25
28	GPIO13	GPIO20	27
30	GPIO6	GPIO16	29
32	GND	GPIO12	31
34	GPIO5	GND	33
36	GPIO0(ID_SD)	GPIO1(ID_SC)	35
38	GPIO11	GPIO7	37
40	GPIO9	GPIO8	39
42	GND	GPIO25	41
44	GPIO10	GND	43
46	GPIO22	GPIO24	45
48	GPIO27	GPIO23	47
50	GPIO17	GPIO18	49
52	GND	GPIO15	51
54	GPIO4	GND	53
56	GPIO3	GPIO14	55
58	GPIO2	SD_CLK	57
60	GND	GND	59
62	SD_CMD	SD_DAT3	61
64	SD_DAT5	SD_DAT0	63
66	GND	GND	65
68	SD_DAT4	SD_DAT1	67
70	SD_DAT7	SD_DAT2	69
72	SD_DAT6	GND	71
74	GND	SD_VDD_Override	73
76	Reserved	SD_PWR_ON	75
78	GPIO_VREF(1.8v/3.3v_Input)	+5v_(Input)	77
80	SCL0(GPIO45)	+5v_(Input)	79
82	SDA0(GPIO44)	+5v_(Input)	81
84	+3.3v_(Output) 600mA Max	+5v_(Input)	83
86	+3.3v_(Output)	+5v_(Input)	85
88	+1.8v_(Output) 600mA Max	+5v_(Input)	87
90	+1.8v_(Output)	WL_nDisable	89
92	RUN_PG	BT_nDisable	91
94	AnalogIP1	nRPIBOOT	93
96	AnalogIP0	PI_LED_nPWR	95
98	GND	Camera_GPIO	97
100	nEXTRST	Global_EN	99

SD signals are only available on modules without eMMC

EEPROM_WP_N — EEPROM_WP_N
*CM4 EEPROM write protect, Active Low.

*Default:DI, Active H — GPIO19_DI/DO

*SPI-0
GPIO11_SPI-0_SCLK — GPIO11
GPIO9_SPI-0_MISO — GPIO9
GPIO10_SPI-0_MOSI — GPIO10

#OS #CM4
[SPI Sample Rate Setting]:
SCLK = *Core Clock / *CDIV
*Core Clock 預設為250MHz
*CDIV :
如果 CDIV 設置為 0, 則將設為 65536。
除值必須是 2 的倍數。(若設向下捨去)
[SPI Sample Rate Range]:
=>30.5KHzKHz(250MHz/ 2^13(8192) ")~125MHz(250MHz/" 2 ")
(The lowest SPI clock frequency with a 250 MHz system clock is 30.5 KHz.)

GPIO17_DO — GPIO17
GPIO4_DI — GPIO4
GPIO3
GPIO2

*CM4 GPIO Reference Voltage Setting.
GPIO_VREF — GPIO_VREF

*I2C-0
GPIO45_I2C-0_SCL — SCL0
GPIO44_I2C-0_SDA — SDA0

3.3v@600mA(Max) Vcc-OS-3.3V — Vcc-OS-3.3V
Vcc-OS-1.8V — Vcc-OS-1.8V

RESET_N — RESET_N
*CM4 RESET Eable, Active Low, OD(Open-Drain).

EXT_RESET_Status_N — EXT_RESET_Status_N
*CM4 RESET Status External Output("H"=>CM4_3.3V), Active Low, PP(Push-Pull).

GND

*CM4 System Status Diagnosis LED Indicator driver.
LED_ACT_N — LED_ACT_N

GPIO21
GPIO20
GPIO16 — GPIO16_DO
GPIO12
GPIO1
GPIO7
GPIO8 — GPIO8_SPI-0_CE0_N *SPI-0
GPIO25
GPIO24
GPIO23
GPIO18 — GPIO18_DO
GPIO15
GPIO14

Vcc-OS-5V — Vcc-OS-5V

WL_Disable_N — WL_Disable_N *CM4 WIFI Module Disable, Active Low.
BT_Disable_N — BT_Disable_N *CM4 Bluetooth Module Disable, Active Low.
RPIBOOT_N — RPIBOOT_N *CM4 eMMC Boot Disable, Active Low.
LED_PWR_N — LED_PWR_N *CM4 PSU LED Indicator driver.
GLOBAL_EN_N — *CM4 PSU Chip Disable, Active Low.(*CM4 Internal 100K pull up to CM4_5V)

GPIO Reference Voltage Setting

Vcc-OS-3.3V — R27 R0603 0R(Ohm)/1% — GPIO_VREF
Vcc-OS-1.8V — NI R28 R0603 0R(Ohm)/1%

I => HW Enable
NI => HW Disable

*GPIO
●可使用的GPIO:28個 (GPIO-0~GPIO-27。)
●供電:GPIO_VREF (必須由 CM4 正確啟動供電。)
連接到來自 CM4 的 +1.8v 用於 +1.8v 信號 GPIO。
連接到來自 CM4 的 +3.3v 用於 +3.3v 信號 GPIO。
●GPIO上拉/下拉電阻設置範圍:
+3.3V => 33~47~73 (Ohm)
+1.8V => 18~47~73 (Ohm)
●電流負載限制:28 個 GPIO 引腳上的負載總計保持在 50mA 以下。
●GPIO上拉/下拉電阻-CM4默認設置:
1) Internal 1.8K pull up to GPIO_VREF => GPIO-2、GPIO-3
2) Internal 1.8K pull up to CM4_3.3V => GPIO-44、GPIO-45

*GPIO Pull-up/Pull-down Resistor.

GPIO_VREF
R20 47k(Ohm)/1% R0603 — GPIO4_DI
R21 47k(Ohm)/1% R0603 — GPIO5_DI
NI R22 47k(Ohm)/1% R0603 — GPIO19_DI/DO
R23 47k(Ohm)/1% R0603 — GPIO16_DO
R24 47k(Ohm)/1% R0603 — GPIO17_DO
R25 47k(Ohm)/1% R0603 — GPIO18_DO
R26 47k(Ohm)/1% R0603 — GPIO19_DI/DO *Default:DI, Active H
GND

*I2C Pull-up Resistor.

Vcc-OS-3.3V
NI R16 R0805 2.2k(Ohm)/1% — GPIO45_I2C-0_SCL
NI R17 R0805 2.2k(Ohm)/1% — GPIO44_I2C-0_SDA
*CM4 Internal 1.8K pull up to CM4_3.3V

*SPI Pull-up Resistor.

GPIO_VREF
R18 R0603 1k(Ohm)/1% — GPIO11_SPI-0_SCLK
R19 R0603 100k(Ohm)/1% — GPIO8_SPI-0_CE0_N

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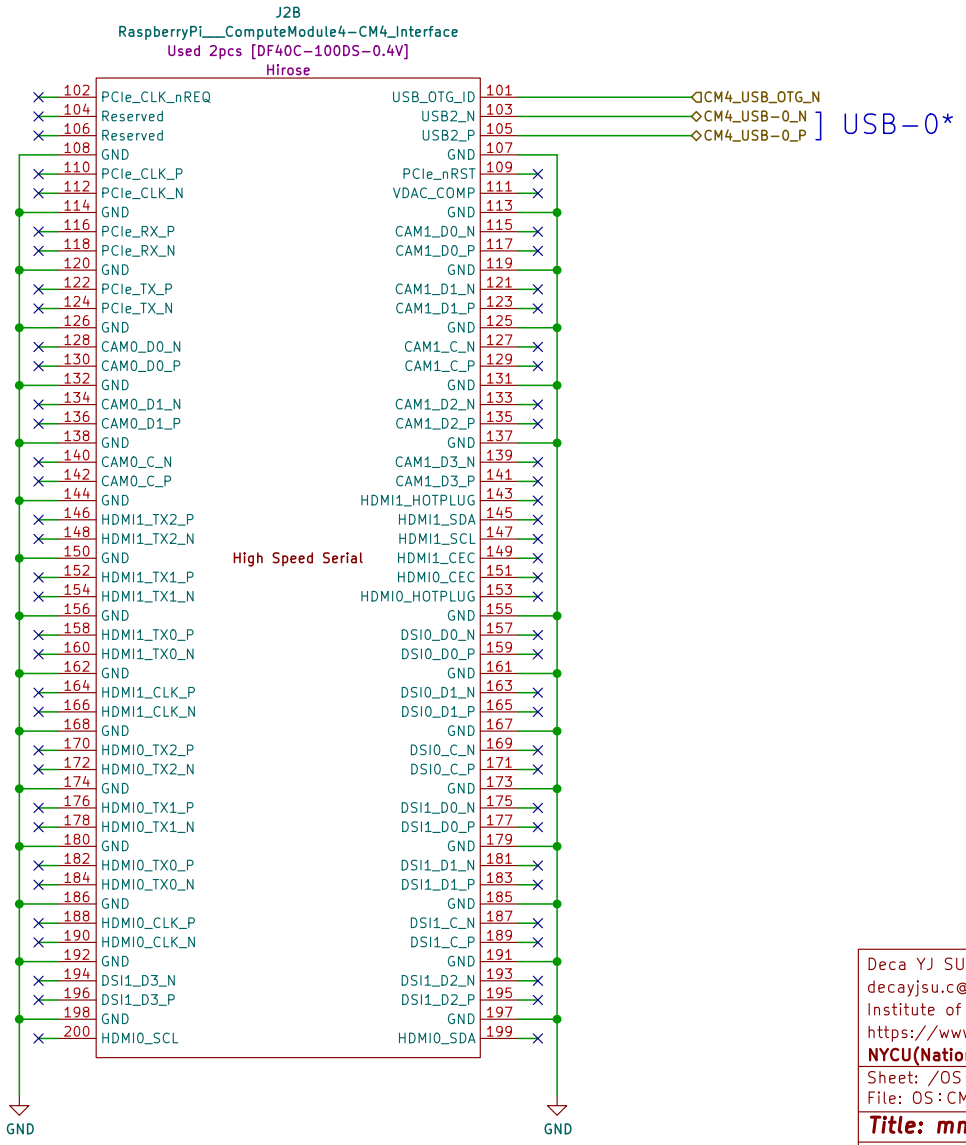
Sheet: /OS:CM4_IO/
File: OS:CM4_IO.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	Rev: 1.1
KiCad E.D.A. kicad (6.0.5)		Id: 5/24

ComputeModule4 Module1—B



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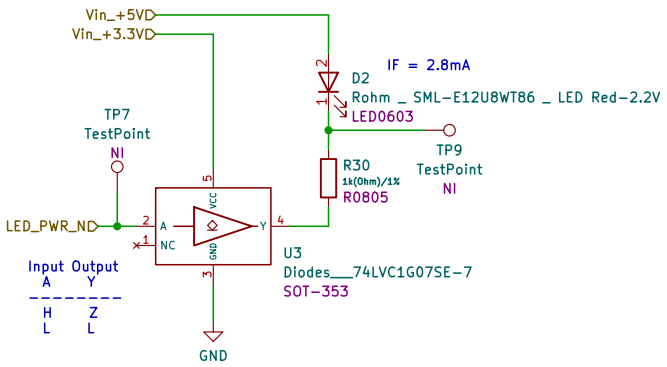
Sheet: /OS:CM4_HighSpeed/
File: OS:CM4_HighSpeed.kicad_sch

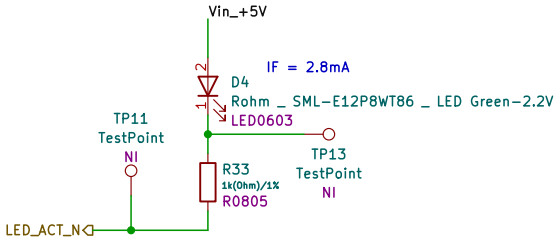
Title: mmWave detection platform

Size: A4	Date: 2023—08—15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 6/24

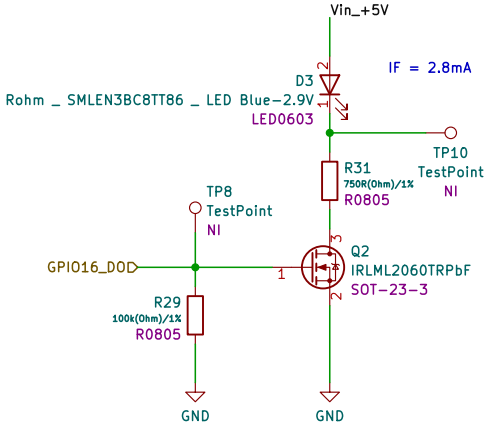
LED Indicator_OS-PWR (RED)



LED Indicator_OS-ACT (GREEN)



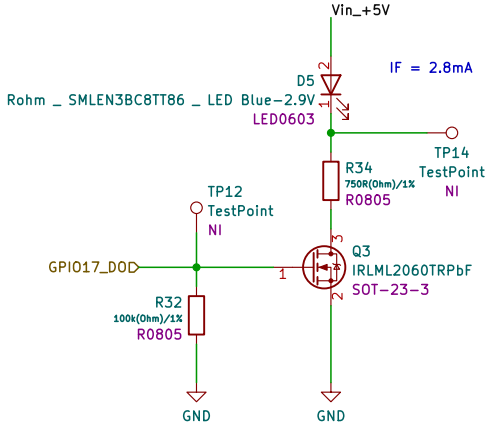
LED Indicator_OS-WIFI (BLUE)



*Setting [GPIO16] to [Digital Output]

[GPIO16_DO] = "H" => LED "ON"
[GPIO16_DO] = "L" => LED "OFF"

LED Indicator_OS-BT (BLUE)



*Setting [GPIO17] to [Digital Output]

[GPIO17_DO] = "H" => LED "ON"
[GPIO17_DO] = "L" => LED "OFF"

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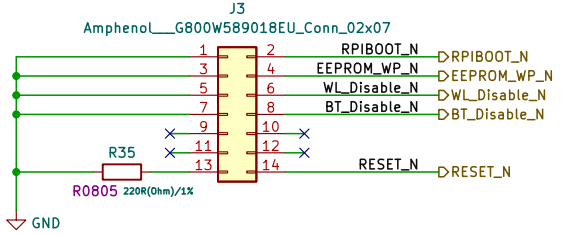
Sheet: /OS:LED Indicator/
File: OS:LED Indicator.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 7/24

OS：System Setting－Jumper



Jumper Pins 1－2 => For Jumper to Disable eMMC Boot.
Jumper Pins 3－4 => For Jumper to Disable writing to EEPROM.
Jumper Pins 5－6 => For Jumper to Disable WIFI Module.
Jumper Pins 7－8 => For Jumper to Disable Bluetooth Module.

Jumper Pins 13－14 => For Jumper to Reset CM4.

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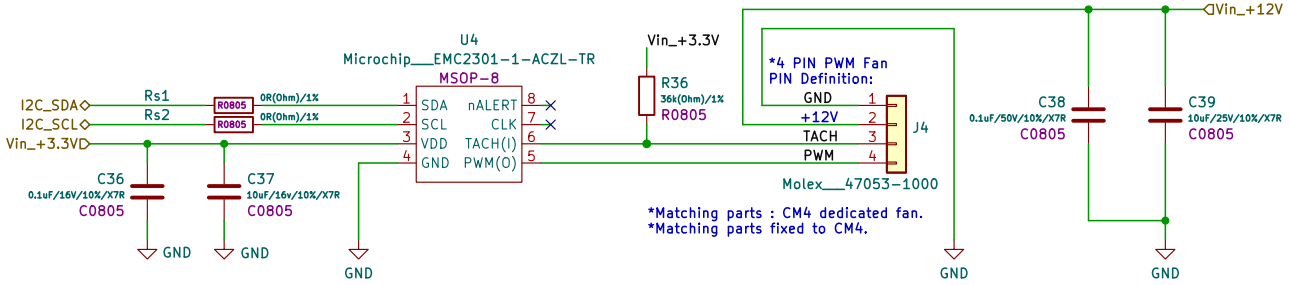
Sheet: /OS：System Setting－Jumper/
File: OS：System Setting－Jumper.kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023－08－15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 8/24

FAN Controler:OS-12V-PWM-4P



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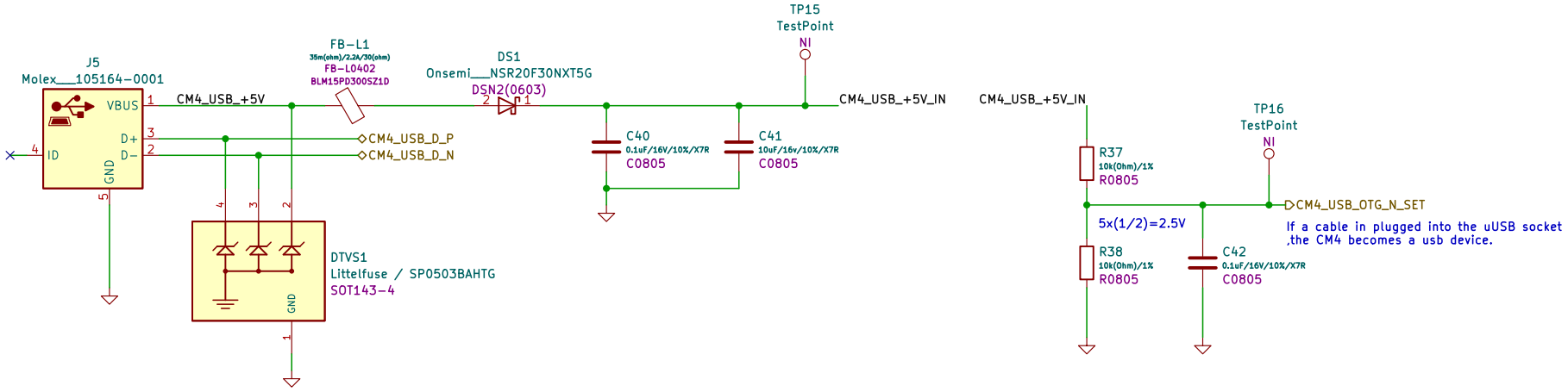
Sheet: /OS:FAN [I2C]/
File: OS:FAN [I2C].kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 9/24

SW Burning USB (For Burning eMMC)



SW burning requirements (for burning eMMC on CM4) :
*Only for CM4 with eMMC.

(1) Jumper: CM4-「RPIBOOT_N」 short to GND, for disable eMMC Boot.
(2) Connect PC and SW Burning USB (USB2.0 Micro Type-B[Micro-USB]) through USB cable.
(3) Supply DC12V to the motherboard.
(4) Run [RPiboot.exe] on the PC to burn the software.

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Sheet: /OS：Software Burning & Update USB [USB]/
File: OS：Software Burning & Update USB [USB].kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 10/24

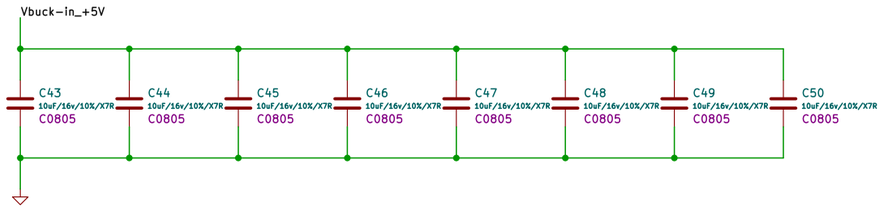
PMIC-00:BUCK x 4
[5V to 3.3、1.8、1.2、1.0V]

[Input:5V@3A(Max), 15W]
[Output total 15.25W(Max)]

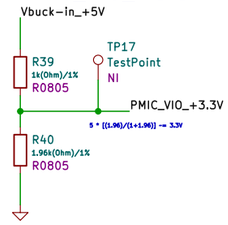
*Default one-time programmable (OTP) settings(Software).
[Buck-0]:3.3v@1.5A(Max), 4.95W, For RADAR I/O
[Buck-1]:1.2V@1.5A(Max), 1.8W , For RADAR Digital
[Buck-2]:1.0V@4A (Max), 4W , For RADAR RF(With ferrite filter)
[Buck-3]:1.8V@2.5A(Max), 4.5W , For RADAR RF(With ferrite filter)

*Layout Placement:TOP、PWR1、PWR2

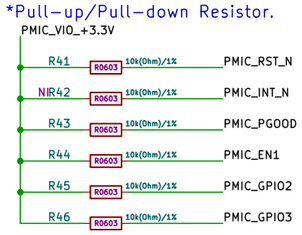
*DECOUPLING CAPS

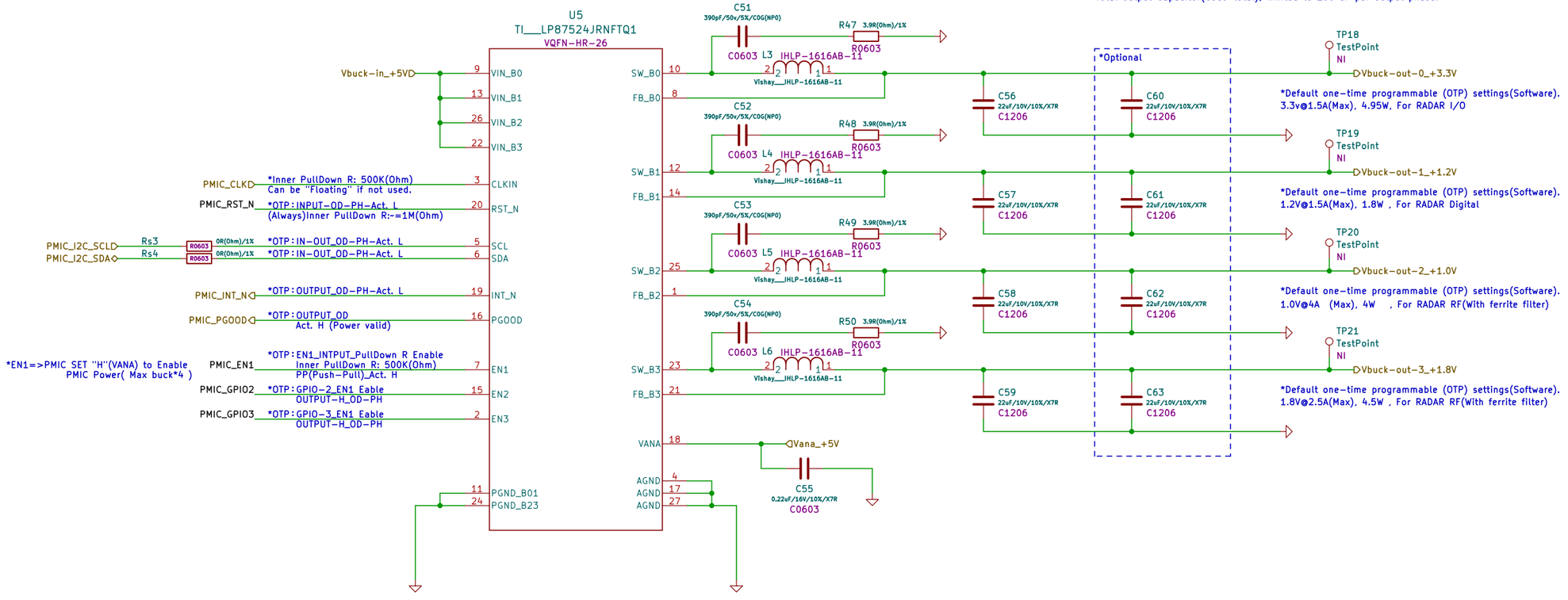


*PMIC_VIO_+3.3V



*Pull-up/Pull-down Resistor.





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Sheet: /PSU:PMIC-RADAR [I2C]/
File: PSU:PMIC-00_BUCKx4_5Vto3.3、1.8、1.2、1.0V [I2C].kicad_sch.kicad_sch

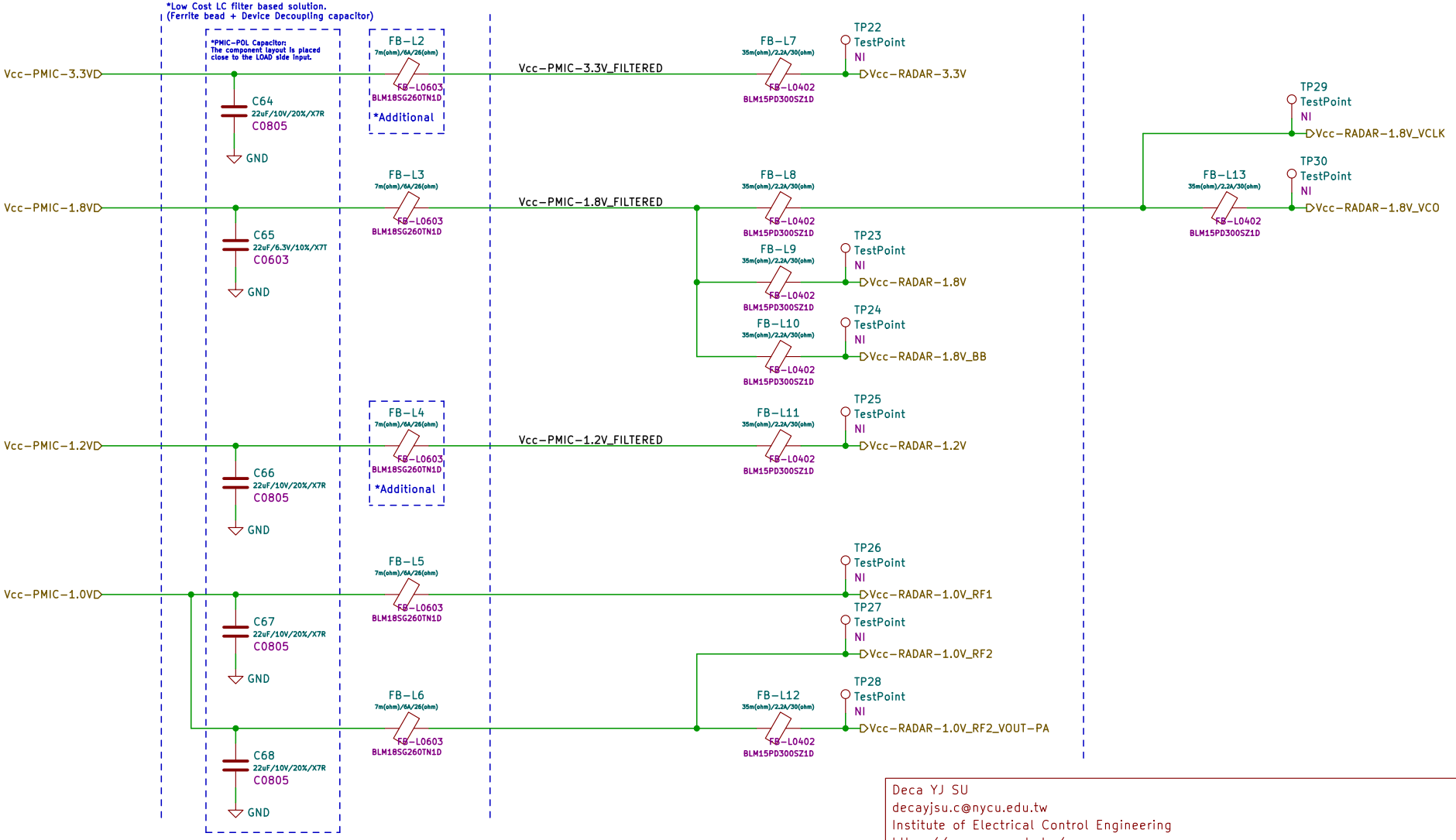
Title: mmWave detection platform

Size: A3	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 11/24

PSU：PMIC–RADAR–LC filter

*For the cost sensitive use cases, a low cost LC filter (Ferrite bead + Device Decoupling capacitor) based solution could be used, which would effectively replace the LDOs on the 1.8 V and 1.0 V rails.

*This approach would have performance and the system level trade–off.



*Layout Placement：BOTTOM、PWR1、PWR2

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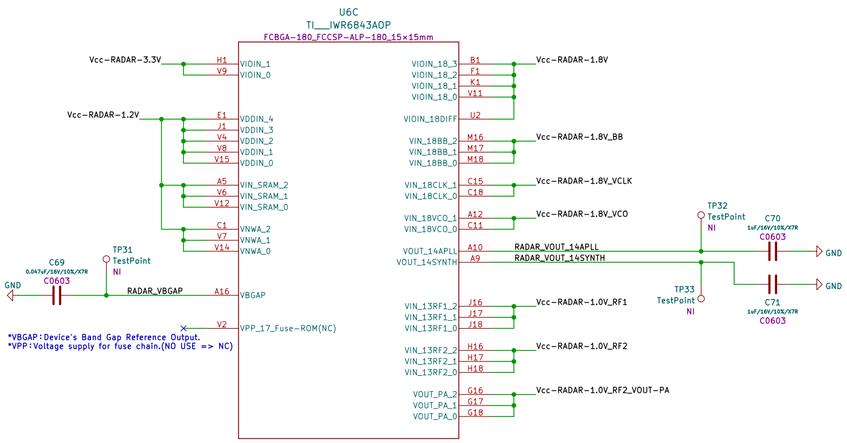
Sheet: /PSU：PMIC to RADAR–LC filter/
File: PSU：PMIC to RADAR–LC filter.kicad_sch

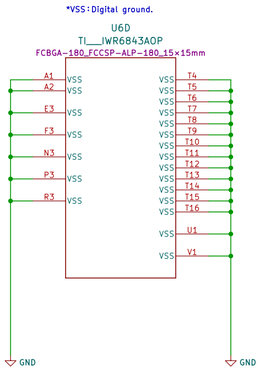
Title: mmWave detection platform

Size: A4	Date: 2023–08–15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 12/24

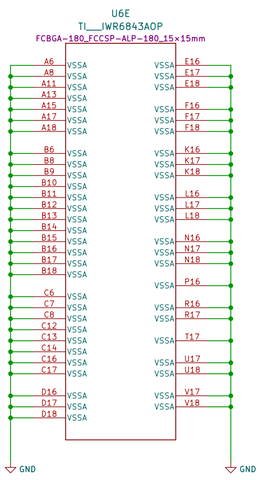
RADAR:IWR6843AOP-POWER *Layout Placement:TOP(BGA IC)、BOTTOM(RC)



*VSS:Digital ground.



*VSSA:Analog ground.



#PMIC

*Default one-time programmable (OTP) settings(Software).
[Buck-0]:3.3v@1.5A(Max), 4.95W, For RADAR I/O
[Buck-1]:1.2V@1.5A(Max), 1.8W , For RADAR Digital
[Buck-2]:1.0V@4A (Max), 4W , For RADAR RF(With ferrite filter)
[Buck-3]:1.8V@2.5A(Max), 4.5W , For RADAR RF(With ferrite filter)

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Sheet: /RADAR:IWR6843AOP-POWER/
File: RADAR:IWR6843AOP-POWER.kicad_sch

Title: mmWave detection platform

Size: A2	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 13/24

RADAR：IWR6843AOP-IO、HighSpeed

*RESET
IWR6843AOP具有[NRESET]、[WARM_RESET] 2種RESET。

在TI IWR6843AOP 器件矽勘誤表中指出使用[WARM_RESET]會有問題
#MSS#41
Issuing WARM_RESET can Cause Bootloader Failure
Which Results in Failure to Load the Application From Serial Flash.

=>故建議使用 NRESET 而不是WARM_RESET。
不使用WARM_RESET，因是漏極開路引腳，仍需要一個Weak pull up 至3.3V。.

U6A
TI___IWR6843AOP
FCBGA-180_FCCSP-ALP-180_15×15mm

TP34 TestPoint NI *Reference clock output.
RADAR_CLKP A7 CLKP
RADAR_CLKM B7 CLKM
RADAR_OSC_CLKOUT A14 OSC_CLKOUT
RADAR_RESET_N U11 RESET_N
RADAR_WARM_RESET_N *OD U13 WARM_RESET

*[RADAR_RESET_N]主被動控制：
1) 被動控制：OS Reset後，RADAR跟著Reset。
2) 主動控制：OS透過GPIO-DO控制RADAR Reset。

*JTAG
RADAR_JTAG-TCK T3 JTAG_TCK
RADAR_JTAG-TMS U8 JTAG_TMS
RADAR_JTAG-TDI U9 JTAG_TDI
RADAR_JTAG-TDO_SOP-0 U10 JTAG_TDO/SOP[0]

U12 SYNC_IN
RADAR_SYNC-OUT_SOP-1 M3 SYNC_OUT/SOP[1]

V13 MCU_CLKOUT
RADAR_PMIC-CLKOUT/SOP-2 V10 PMIC_CLKOUT/SOP[2]

U14 NERROR_IN
RADAR_NERROR_OUT_N *OD U15 NERROR_OUT

QSPI_CLK H2 RADAR_QSPI_CLK
QSPI_CS_N J2 RADAR_QSPI_CS_N
QSPI[0] H3 RADAR_QSPI-DATA-IO-0
QSPI[1] G2 RADAR_QSPI-DATA-I-1
QSPI[2] J3 RADAR_QSPI-DATA-I-2
QSPI[3] K2 RADAR_QSPI-DATA-I-3
*QSPI [MASTER]

*Default：[RADAR_SPI_HOST_INTR],DO, Active H
SPI_HOST_INTR B2 RADAR_SPI_HOST_INTR/GPIO_12

SPI-A_CLK D2 RADAR_SPI-A_CLK
SPI-A_CS_N C2 RADAR_SPI-A_CS_N
SPI-A_MISO D1 RADAR_SPI-A_MISO
SPI-A_MOSI F2 RADAR_SPI-A_MOSI
*SPI-A [SLAVE]

SPI-B_CLK E2 RADAR_UART-LOGGER_TX_MSS
SPI-B_CS_N/QSPI_CLK_EXT D3 RADAR_UART-LOGGER_TX_BSS
*UART-LOGGER
SPI-B_MISO/I2C_SCL G3 RADAR_I2C-0_SCL
SPI-B_MOSI/I2C_SDA G1 RADAR_I2C-0_SDA
*I2C-0 [MASTER]

*MSS = Main Sub-System (Customer Programmed)
*BSS = Radio Processor Sub-System (TI Programmed)

RS232_TX U16 RADAR_UART-Debug_TX
RS232_RX V16 RADAR_UART-Debug_RX
*UART-Debug

U6B
TI___IWR6843AOP
FCBGA-180_FCCSP-ALP-180_15×15mm

RADAR_EEPROM_WC_N M2 GPIO_0
L3 GPIO_1
K3 GPIO_2

U7 GPIO_31/DP0
U6 GPIO_32/DP1
V5 GPIO_33/DP2
U5 GPIO_34/DP3
V3 GPIO_35/DP4
M1 GPIO_36/DP5
L2 GPIO_37/DP6
L1 GPIO_38/DP7
C3 GPIO_39/DP8
B3 GPIO_40/DP9
C4 GPIO_41/DP10
A3 GPIO_42/DP11
B4 GPIO_43/DP12
A4 GPIO_44/DP13
C5 GPIO_45/DP14
B5 GPIO_46/DP15

U3 GPIO_47/DMM_CLK
U4 DMM_SYNC

LVDS_CLKP R1
LVDS_CLKM R2
LVDS_FRCLKP T1
LVDS_FRCLKM T2
LVDS_TXP[0] N2
LVDS_TXM[0] N1
LVDS_TXP[1] P2
LVDS_TXM[1] P1

GPADC_1 P18
GPADC_2 P17
GPADC_3 R18
GPADC_4 T18
GPADC_5 C9
GPADC_6 C10

*Pull-up/Pull-down Resistor.

Vcc-RADAR-3.3V
TP35 TestPoint NI RADAR_RESET_N
C119 0.1uF/16V/10%/X7R C0805
GND

R51 R0603 10k(Ohm)/1%
R52 R0603 10k(Ohm)/1% RADAR_WARM_RESET_N
NI R53 R0603 10k(Ohm)/1% RADAR_NERROR_OUT_N
R54 R0603 1k(Ohm)/1% RADAR_SPI-A_CLK
R55 R0603 100k(Ohm)/1% RADAR_SPI-A_CS_N
R56 R0603 10k(Ohm)/1% RADAR_I2C-0_SCL
R57 R0603 10k(Ohm)/1% RADAR_I2C-0_SDA
NI R58 R0603 10k(Ohm)/1% RADAR_EEPROM_WC_N
R59 R0603 100k(Ohm)/1% RADAR_UART-Debug_TX
R60 R0603 100k(Ohm)/1% RADAR_UART-Debug_RX
R61 R0603 100k(Ohm)/1% RADAR_UART-LOGGER_TX_MSS
R62 R0603 100k(Ohm)/1% RADAR_UART-LOGGER_TX_BSS

NI R63 R0603 10k(Ohm)/1% RADAR_SPI_HOST_INTR/GPIO_12
R64 R0603 10k(Ohm)/1%
GND
*Default：[RADAR_SPI_HOST_INTR],DO, Active H

*40MHz CRYSTAL

*Layout Placement：As close as possible to the main application IC.

Y1
40MHZ/8PF
CX2016DB40000D0FLJCC
RADAR_CLKP
RADAR_CLKM
1 3 2 4 GND GND
CX2016DB
C117 4.7pF/50V/0.05pF(1%)/C0G(NP0) C0603
C118 4.7pF/50V/0.05pF(1%)/C0G(NP0) C0603
GND GND GND

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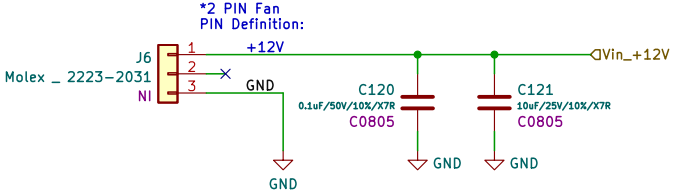
Sheet: /RADAR：IWR6843AOP-IO、HighSpeed/
File: RADAR：IWR6843AOP-IO、HighSpeed.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 14/24

FAN:RADAR-12V-3P



*Matching parts :

[MPN] SUNON / EE40101S2-1000U-999

DC Fan, 40x40x10mm, 12VDC, 0.82W, 23dBA, 6100RPM, Wire Leads - 2

*Matching parts fixed to case.

Heat Sink plates:RADAR

M1
Heat_Sink_plates_for_ANTENNA_IC.
NI

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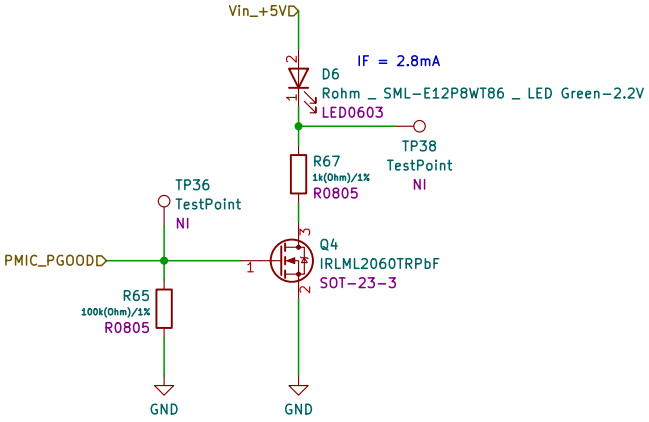
Sheet: /RADAR:FAN & Heat Sink plates/
File: RADAR:FAN & Heat Sink plates.kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 15/24

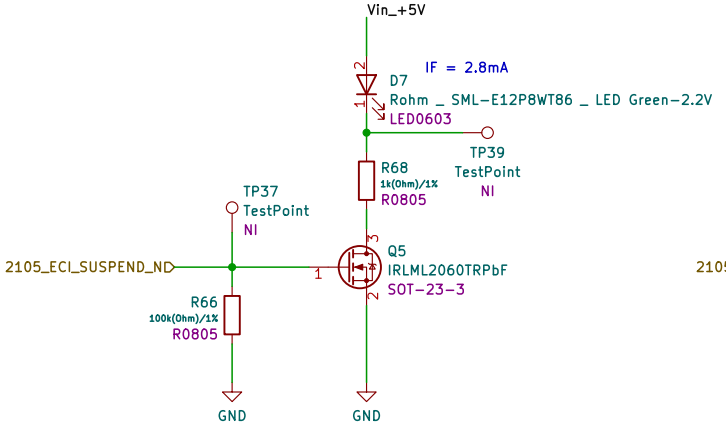
LED Indicator_RADAR_PMIC_PGOOD (GREEN)



*Setting [PMIC_PGOOD] to [Digital Output]

[PMIC_PGOOD] = "H" => LED "ON"
[PMIC_PGOOD] = "L" => LED "OFF"

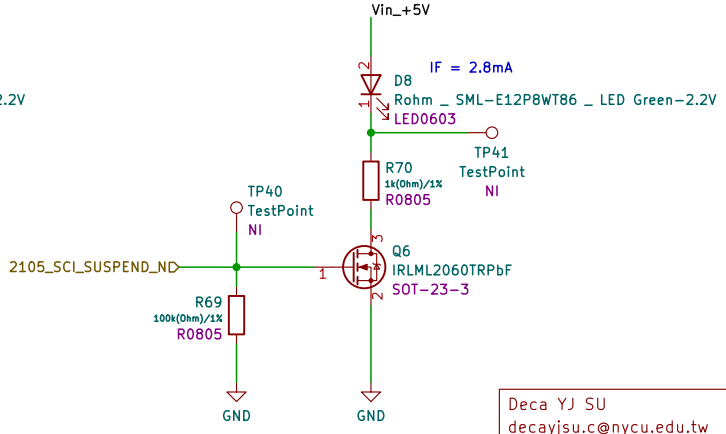
LED Indicator_2105_ECI_SUSPEND_N (GREEN)



*Setting [2105_ECI_SUSPEND_N] to [Digital Output]

[2105_ECI_SUSPEND_N] = "H" => LED "ON"
[2105_ECI_SUSPEND_N] = "L" => LED "OFF"

LED Indicator_2105_SCI_SUSPEND_N (GREEN)



*Setting [2105_SCI_SUSPEND_N] to [Digital Output]

[2105_SCI_SUSPEND_N] = "H" => LED "ON"
[2105_SCI_SUSPEND_N] = "L" => LED "OFF"

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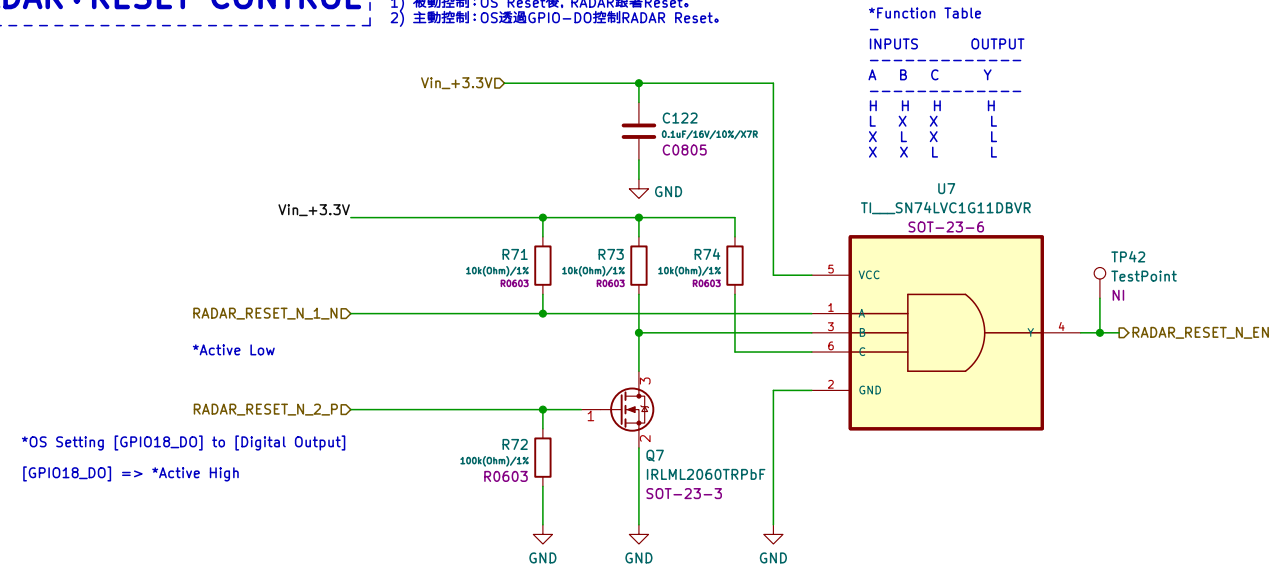
Sheet: /RADAR:LED Indicator/
File: RADAR:LED Indicator.kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 16/24

RADAR：RESET CONTROL

*主被動控制：
1) 被動控制：OS Reset後，RADAR跟著Reset。
2) 主動控制：OS透過GPIO-DO控制RADAR Reset。



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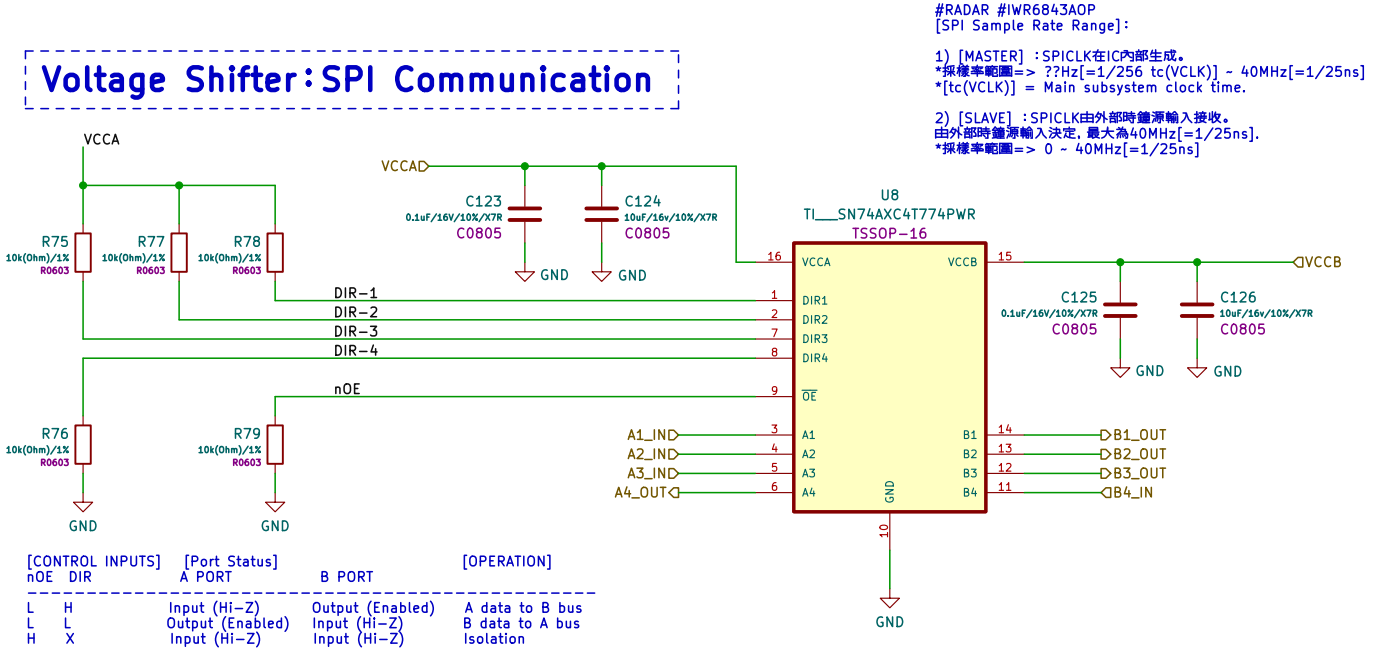
Sheet: /RADAR：RESET CONTROL/
File: RADAR：RESET CONTROL.kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 17/24

Voltage Shifter：SPI Communication



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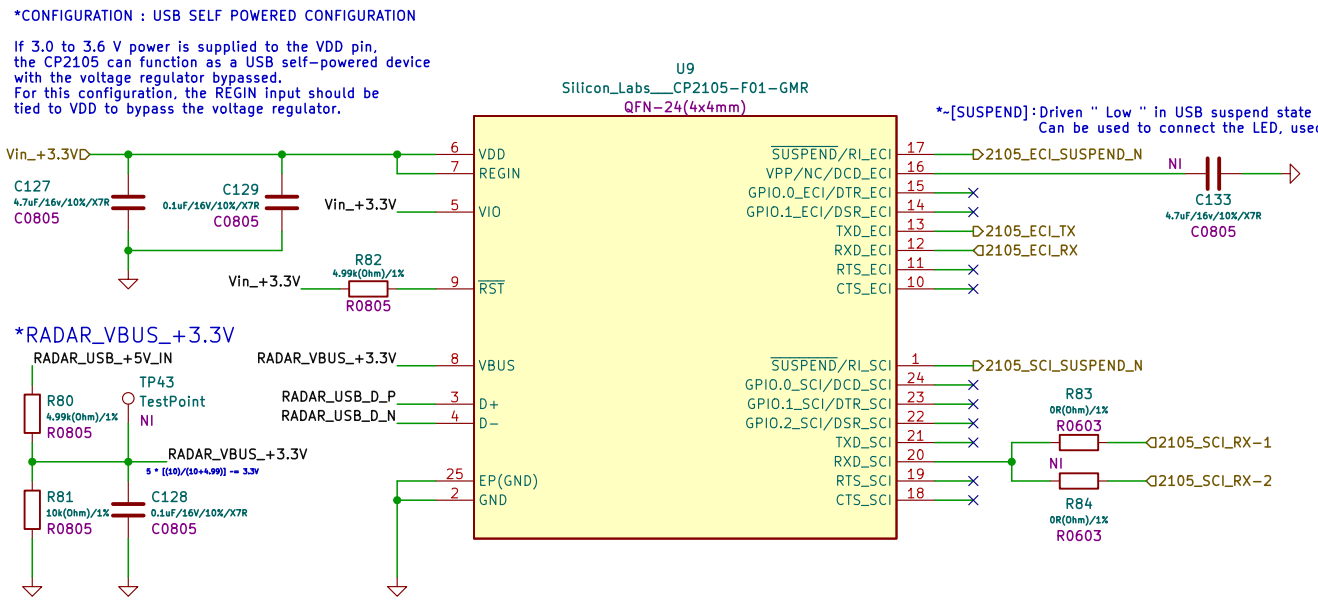
Sheet: /Voltage Shifter：SPI Communication [SPI]/
File: Voltage Shifter：SPI Communication [SPI].kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 18/24

RADAR：Software Burning & Update USB [USB]



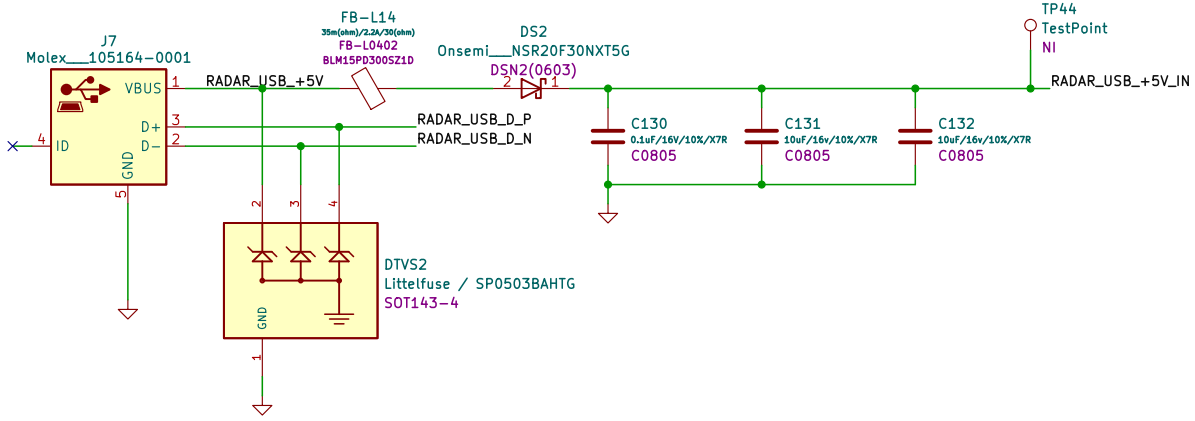


Table 14. Default GPIO, UART, and Suspend Configuration Data

Name	Value
GPIO.0_ECI/DTR_ECI	GPIO Input
GPIO.1_ECI/DSR_ECI	GPIO Input
GPIO.0_SCI/DCD_SCI	GPIO Input
GPIO.1_SCI/DTR_SCI	GPIO Input
GPIO.2_SCI/DSR_SCI	GPIO Input
Flush_Buffers	Flush ECI and SCI TX and RX FIFO on open
$\overline{\text{SUSPEND}}$/RI_ECI	Push-pull, Active-Low
$\overline{\text{SUSPEND}}$/RI_SCI	Push-pull, Active-Low
RS-485 Level	Active-High

Table 13. Default USB Configuration Data

Name	Value
Vendor ID	10C4h
Product ID	EA70h
Power Descriptor (Attributes)	80h (Bus-powered)
Power Descriptor (Max. Power)	32h (100 mA)
Release Number	0100h (Release Version 01.00)
Serial String	Unique 8 character ASCII string (16 characters maximum)
Product Description String	“CP2105 USB to UART Bridge Controller” (47 characters maximum)
ECI Interface String	“Enhanced COM Port” (32 characters maximum)
ECI Operating Mode	GPIO mode
SCI Interface String	“Standard COM Port” (32 characters maximum)
SCI Operating Mode	GPIO mode

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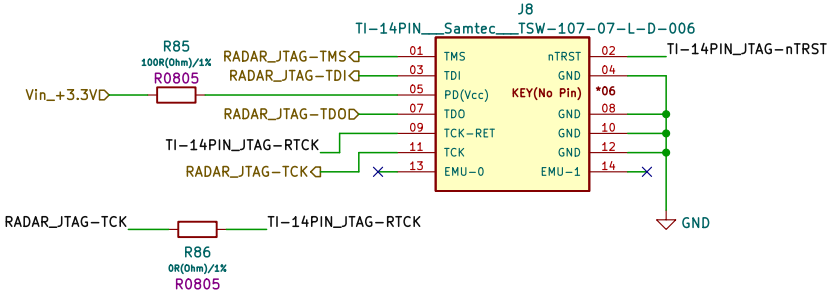
Sheet: /RADAR：Software Burning & Update USB [USB]/
File: RADAR：Software Burning & Update USB [USB].kicad_sch

Title: mmWave detection platform

Size: A4	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 19/24

RADAR:JTAG [TI-14PIN]

*TI-14PIN definition
KEY : Fool-proof design.
PD(Vcc) : Detect whether the target PCB is connected completely.
nTRST : Test reset input, controlled by the emulator, active low.
TCK : Test clock input, output to IC by the emulator.
TCK-RET : TCK test clock returns to the emulator.
TMS : Test mode selection, controlled by the emulator.
EMU-0 : Emulation mode selection. (not every application IC has this function)
EMU-1 : Emulation mode selection. (not every application IC has this function)
TDI : Test data input, output to IC by the emulator.
TDO : Test clock output, output from IC to emulator.



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Sheet: /RADAR:JTAG [TI-14PIN]/
File: RADAR:JTAG [TI-14PIN].kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 20/24

RADAR:SOP configuration

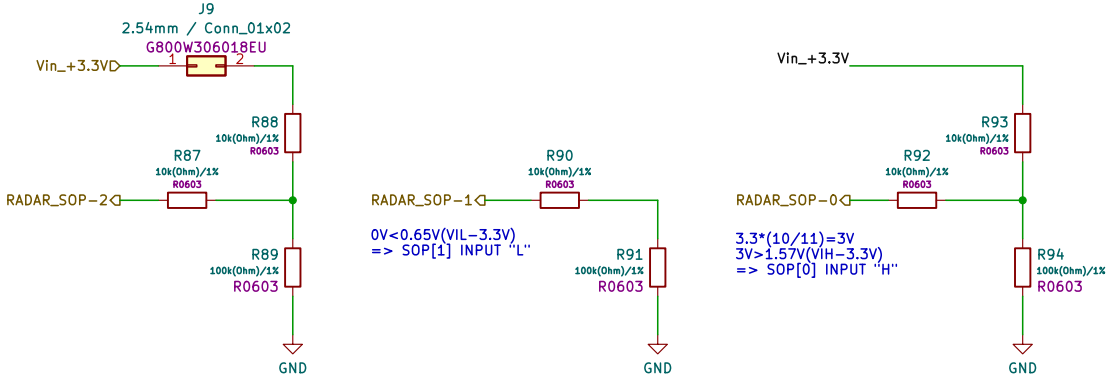
SOP2	SOP1	SOP0	Bootloader mode and operation
0	0	1	Functional Mode This mode is used to read the image from the onboard serial flash. The image is loaded into the internal RAM and executes it.
1	0	1	Flashing Mode This mode is used to write the image to the onboard serial flash. The image is accepted over UART, and loads it to the serial flash connected to the QSPI port.

*SOP[2:0]
(1.8V Mode)
VIL = 0.45V (MIN)
VIH = 0.96V (MAX)

(3.3V Mode)
VIL = 0.65V (MIN)
VIH = 1.57V (MAX)

*SOP configuration

J9 = ON => 3.3*(10/11)=3V , 3V>1.57V(VIH-3.3V) => SOP[2] INPUT "H" / Flashing Mode
J9 = OFF => 0V<0.65V(VIL-3.3V) => SOP[2] INPUT "L" / Functional Mode



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Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
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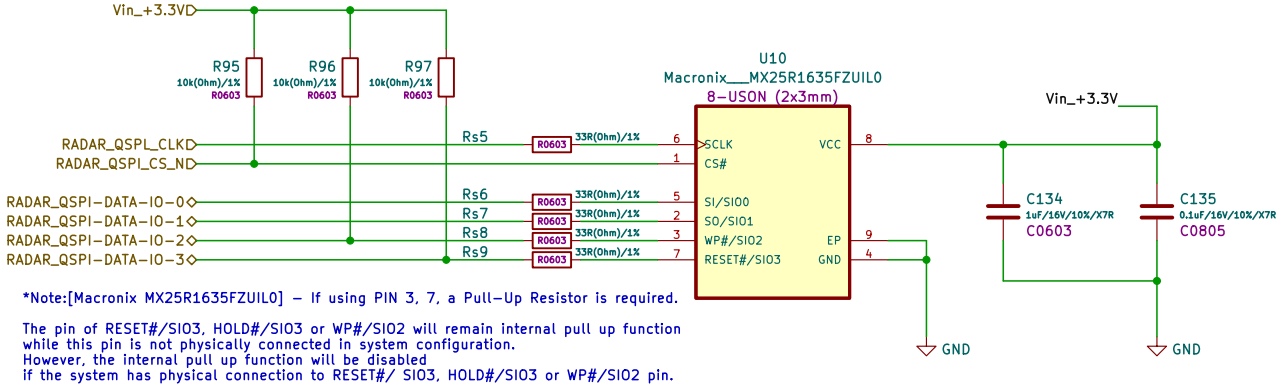
RADAR:FLASH Memory [QSPI]



*Note:[Macronix MX25R1635FZUIL0] – If using PIN 3, 7, a Pull-Up Resistor is required.

The pin of RESET#/SIO3, HOLD#/SIO3 or WP#/SIO2 will remain internal pull up function while this pin is not physically connected in system configuration.
However, the internal pull up function will be disabled
if the system has physical connection to RESET#/ SIO3, HOLD#/SIO3 or WP#/SIO2 pin.

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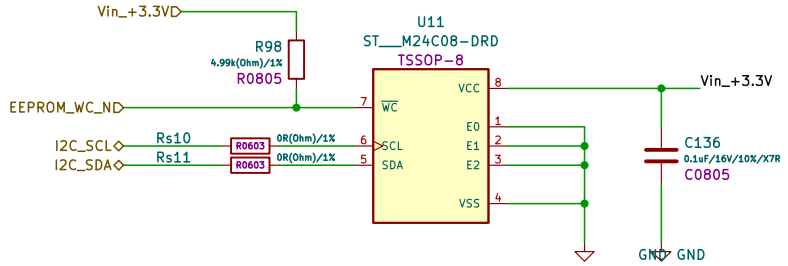
File: RADAR:FLASH Memory [QSPI].kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 22/24

RADAR:EEPROM [I2C]



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Sheet: /RADAR:EEPROM [I2C]/
File: RADAR:EEPROM [I2C].kicad_sch

Title: mmWave detection platform

Size: A5	Date: 2023-08-15	**Rev: 1.1**
KiCad E.D.A. kicad (6.0.5)		Id: 23/24