

PG150-C03

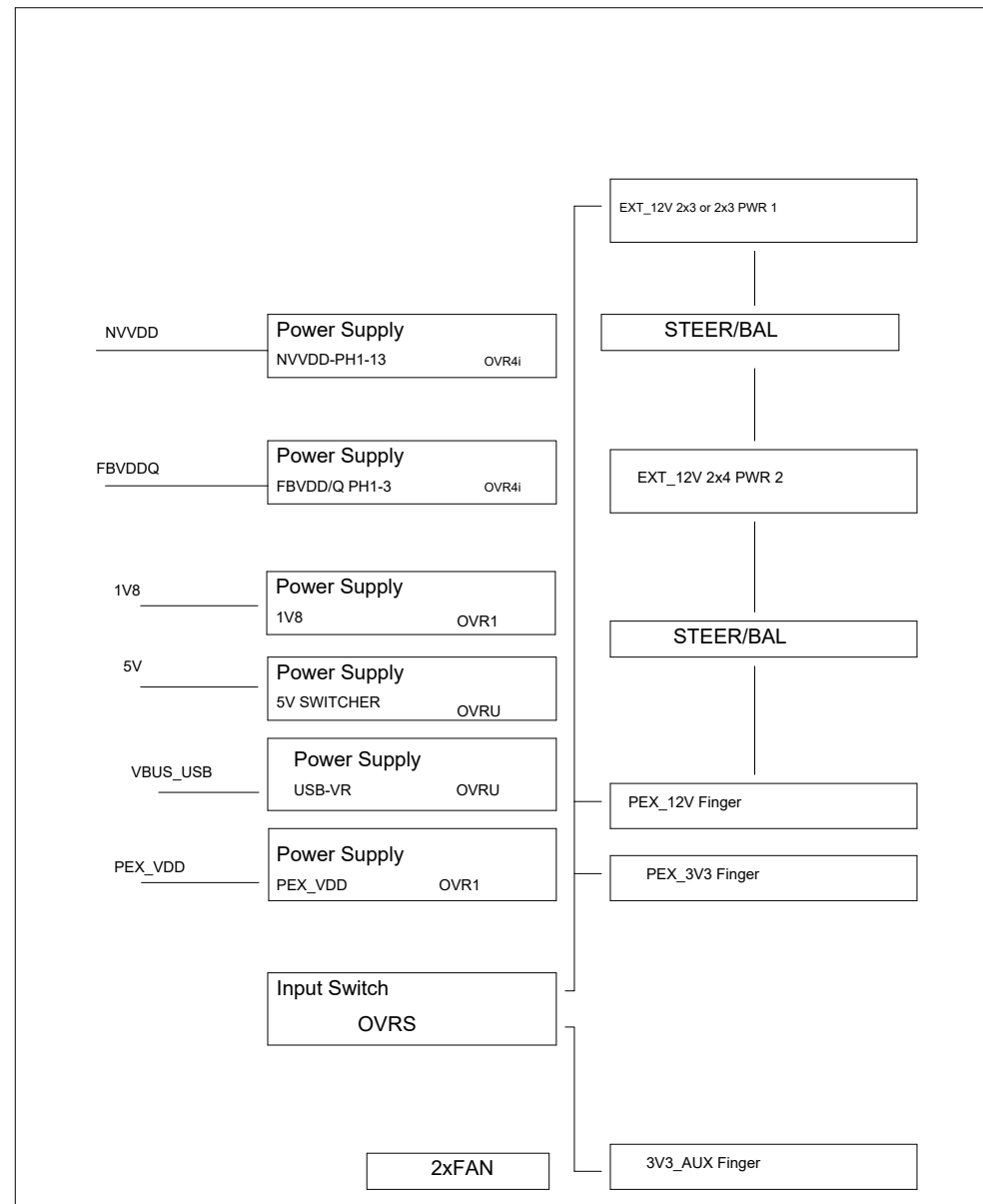
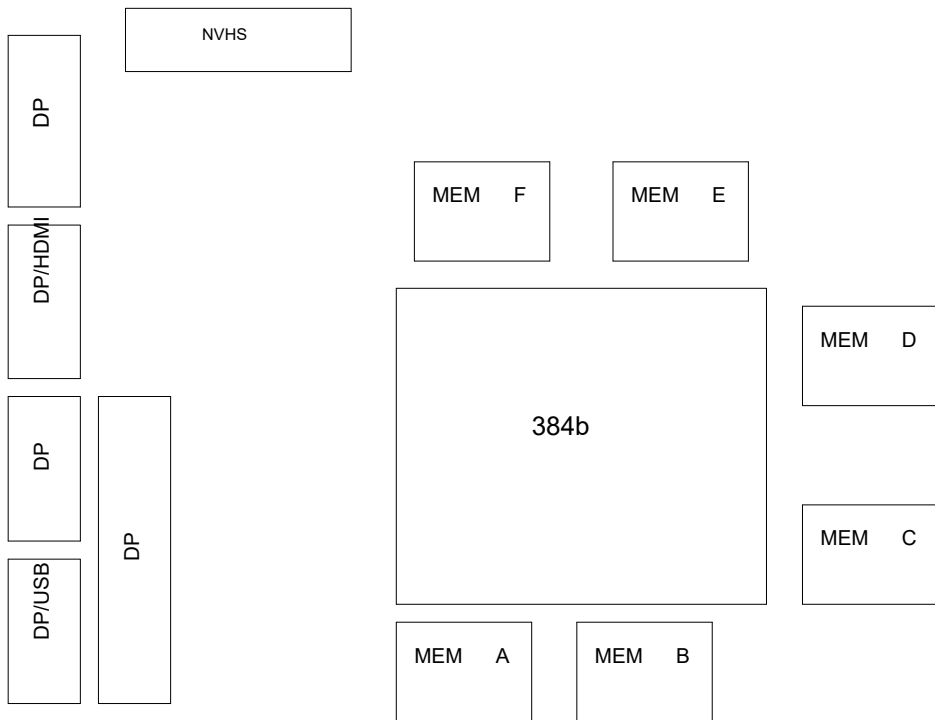
384b GDDR6 x16

TALL DP + DP + DP + HDMI/DP + USB

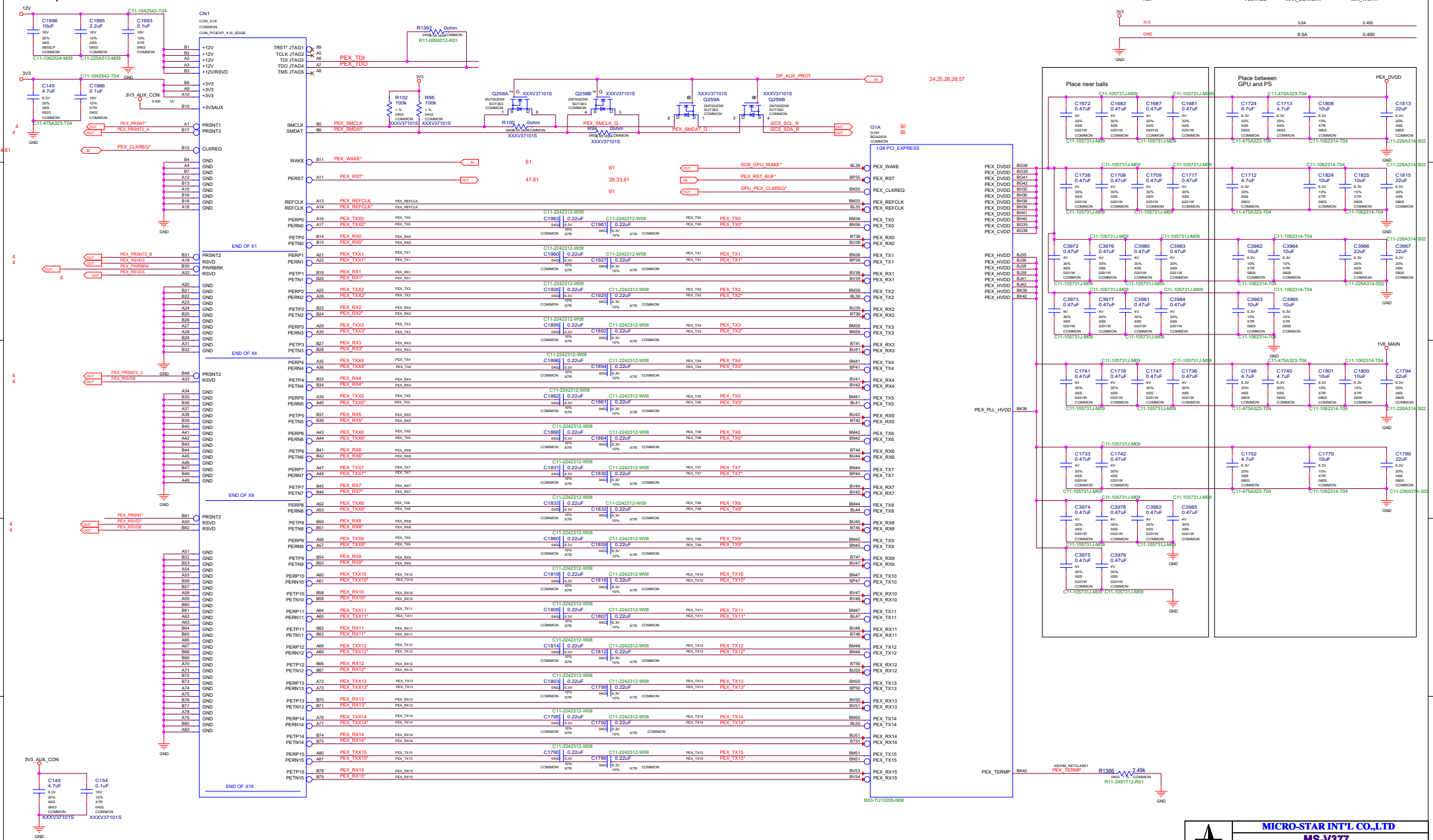
TABLE OF CONTENTS

Page	Description	Page	Description	Page	Description
1	Table of Contents	26	IFPF USB	51	PS: INPUT SWITCH_RTD3 USB
2	BLOCK DIAGRAM	27	IFPC HDMI/DP	52	PS: INPUT SWITCH RAIL BALANCE
3	PCI EXPRESS	28	IFPD DP	53	PS: DISCRETE STEERING
4	PCIE TERM	29	NVHS X16	54	PS: Input, filtering, and Monitoring
5	MEMORY: GPU PARTITION A/B	30	MISC: THERMAL, JTAG, GPIO, STEREO	55	PS: Current Sterring, Hot Unplug
6	MEMORY: FBA PARTITION[31:0]	31	MISC: ROM, STRAPS	56	PS: Prefilter
7	MEMORY: FBA PARTITION[63:32]	32	MISC: XTAL, PLL	57	Sequence: 5V, 1V8, NV3V3 EN
8	MEMORY: FBB PARTITION[31:0]	33	MISC: USB PPC	58	Sequence: NV, PEX, FB EN
9	MEMORY: FBB PARTITION[63:32]	34	PS: USB_C VR	59	Sequence: PCIE Voltage Monitor
10	MEMORY: GPU PARTITION C/D	35	PS: 5V	60	Sequence: Discharge
11	MEMORY: FBC PARTITION[31:0]	36	PS: PEXVDD 1V8 Rail	61	Sequence: MISC
12	MEMORY: FBC PARTITION[63:32]	37	PS: FBVDD Controller	62	MISC: FAN & LED1
13	MEMORY: FBD PARTITION[31:0]	38	PS: FBVDD Controller OVR3	63	MISCL: LED 2
14	MEMORY: FBD PARTITION[63:32]	39	PS: FBVDD Phase 1, 2	64	MCU ZERO POWER IDLE
15	MEMORY: GPU PARTITION E/F	40	PS: FBVDD Phase 3	65	MECH
16	MEMORY: FBE PARTITION[31:0]	41	PS: NVVDD Controller_OVR8	66	VR Thermal Protection
17	MEMORY: FBE PARTITION[63:32]	42	PS: NVVDD Phase 1		
18	MEMORY: FBF PARTITION[31:0]	43	PS: NVVDD Phase 2		
19	MEMORY: FBF PARTITION[63:32]	44	PS: NVVDD Phase 3, 4		
20	GPU PWR AND GND	45	PS: NVVDD Phase 5		
21	GPU PWR, GND and NCs	46	PS: NVVDD Phase 7, 8		
22	GPU DECOUPLING	47	PS: NVVDD Phase 9, 10		
23	GPU DECOUPLING 2	48	PS: NVVDD Phase 11, 12		
24	IFPA/B DP	49	PS: NVVDD Phase 13, 14		
25	IFPE DP	50	PS: INPUT SWITCH_RTD3		

Block Diagram



PCI Express



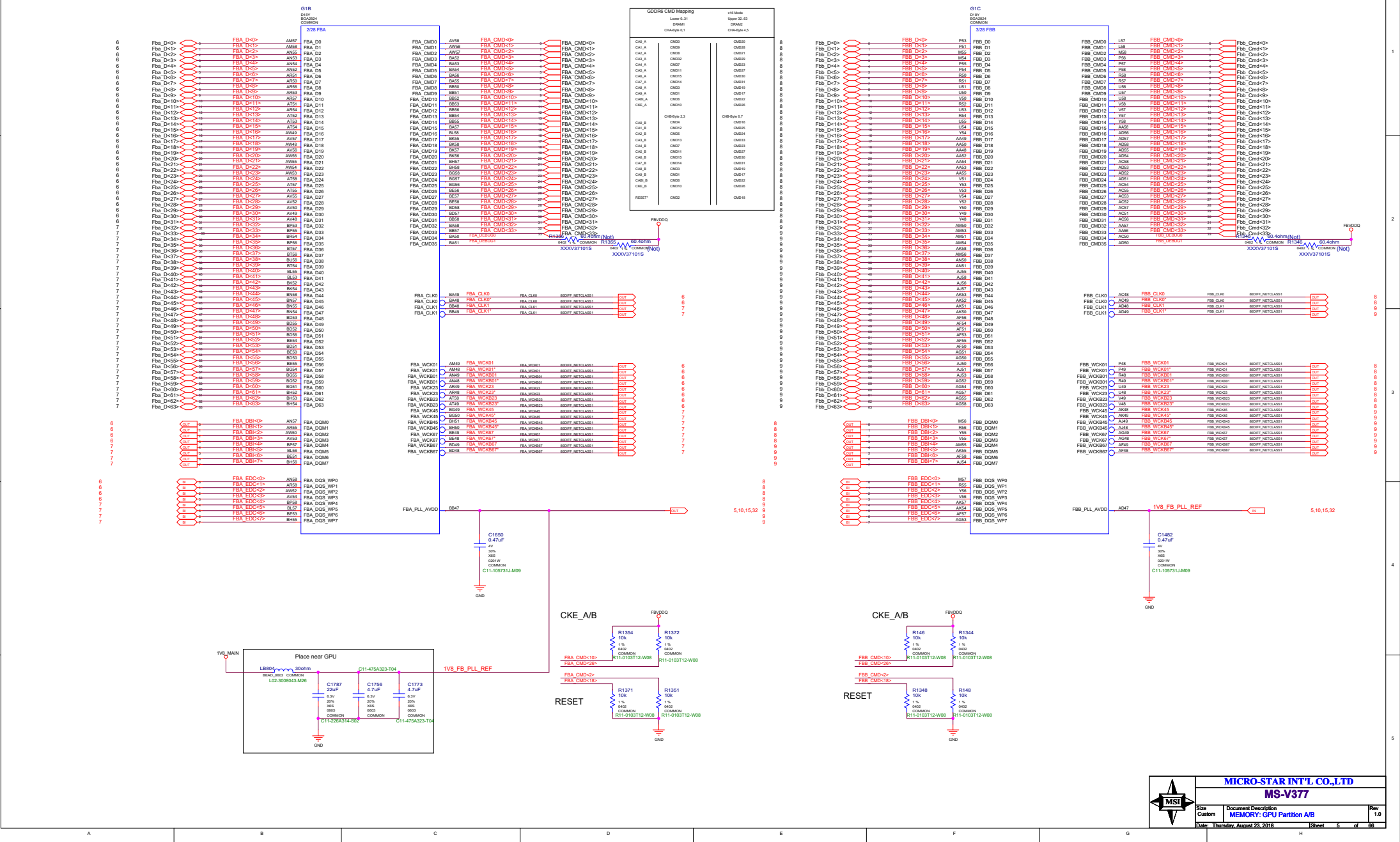
MICRO-STAR INT'L CO.,LTD
MS-V377

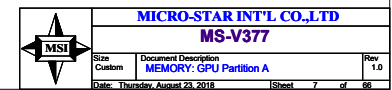
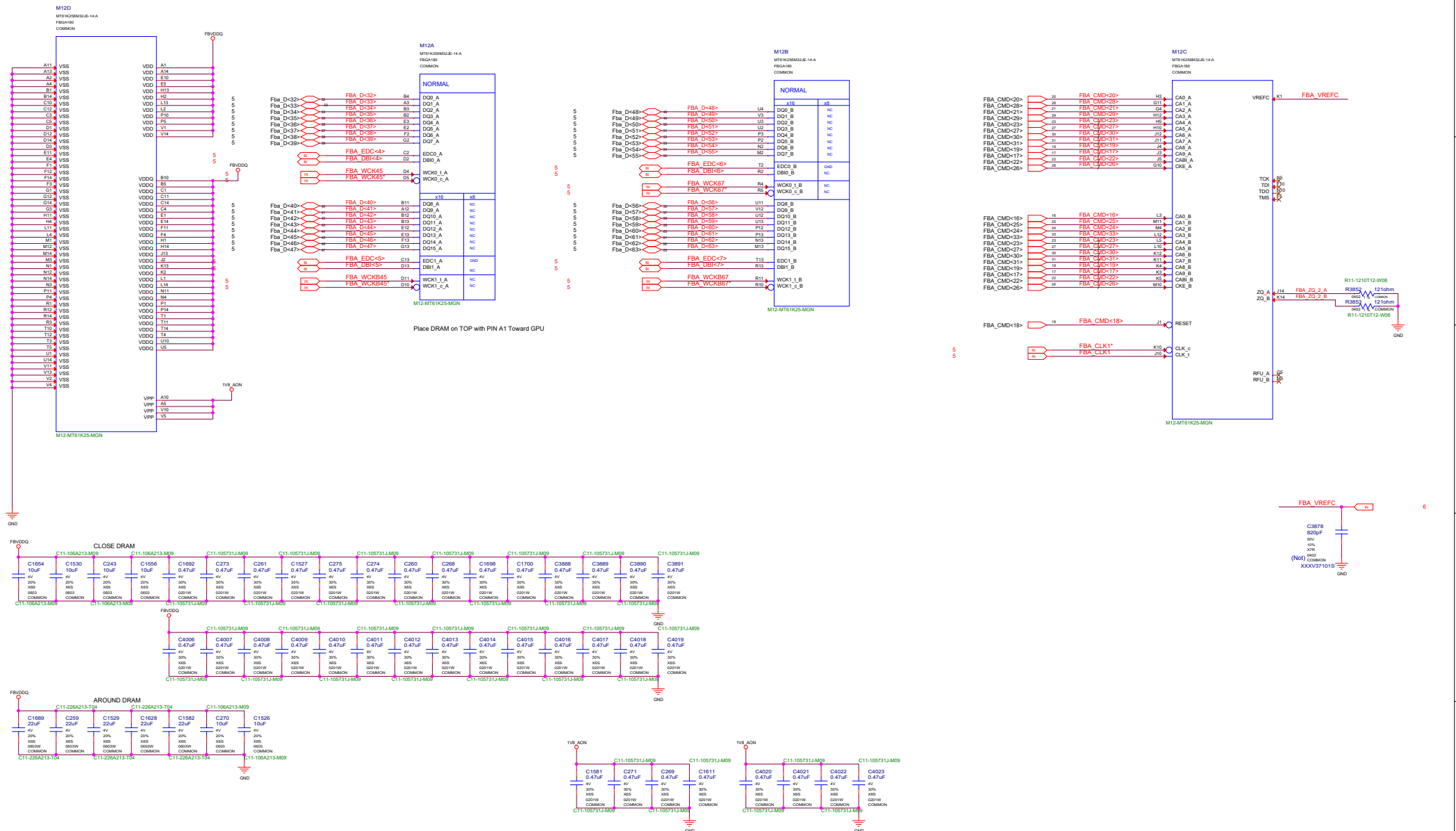
Size Custom	Document Description MEMORY: GPU Partition A/B	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 3 of 66

PCI TERM

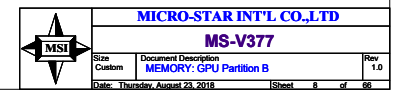
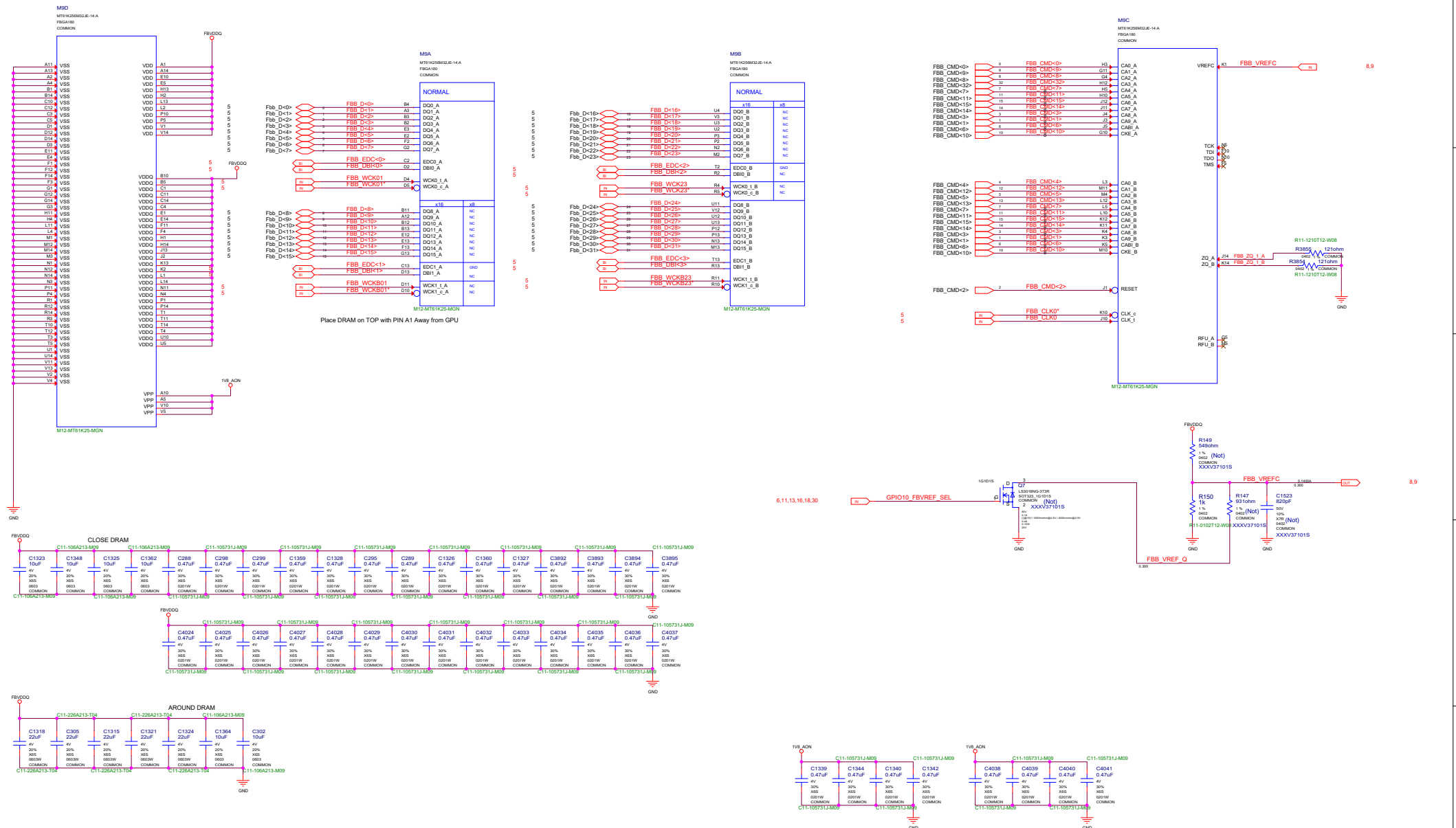


MEMORY: GPU Partition A/B

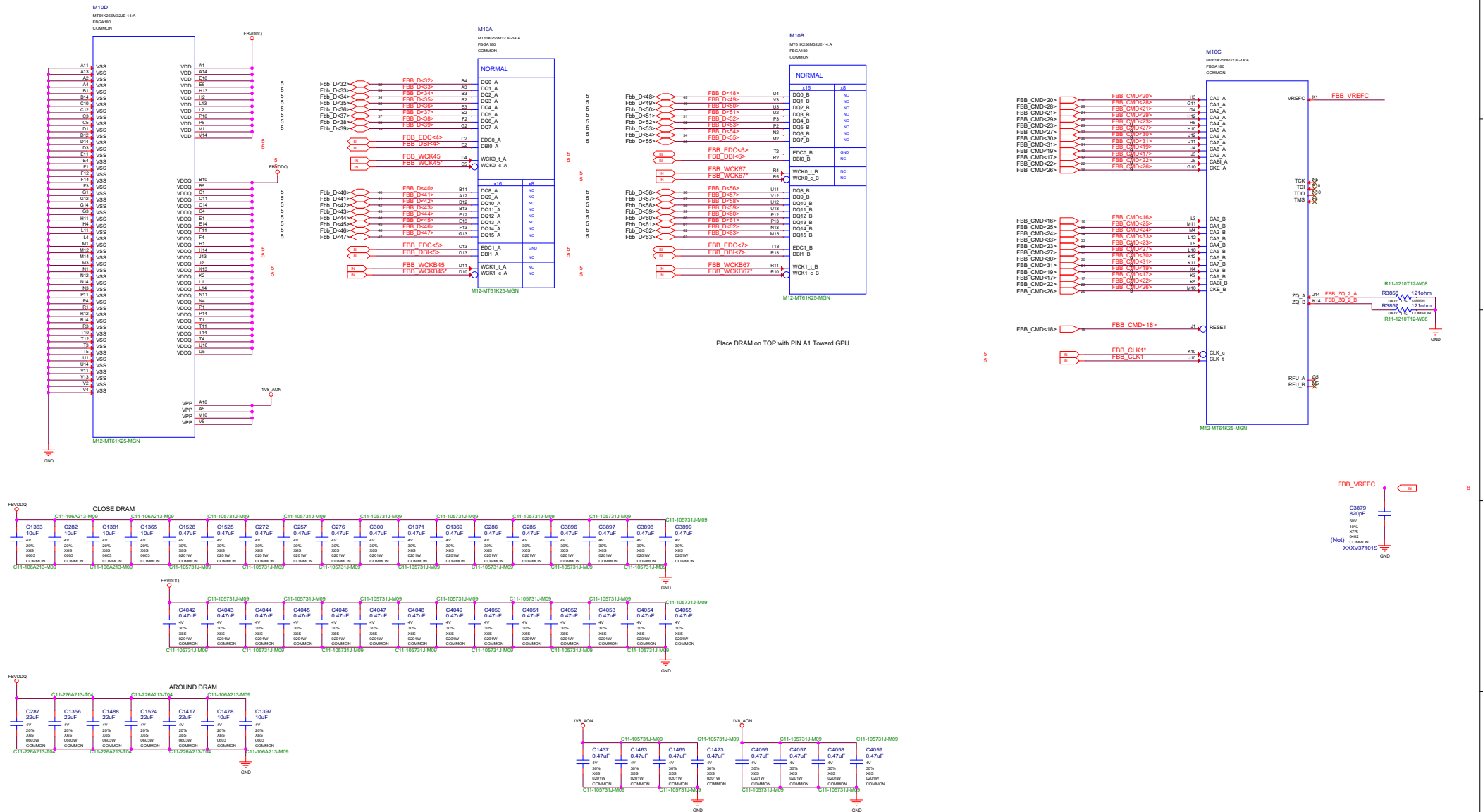




MEMORY: FBB Partition 31..0



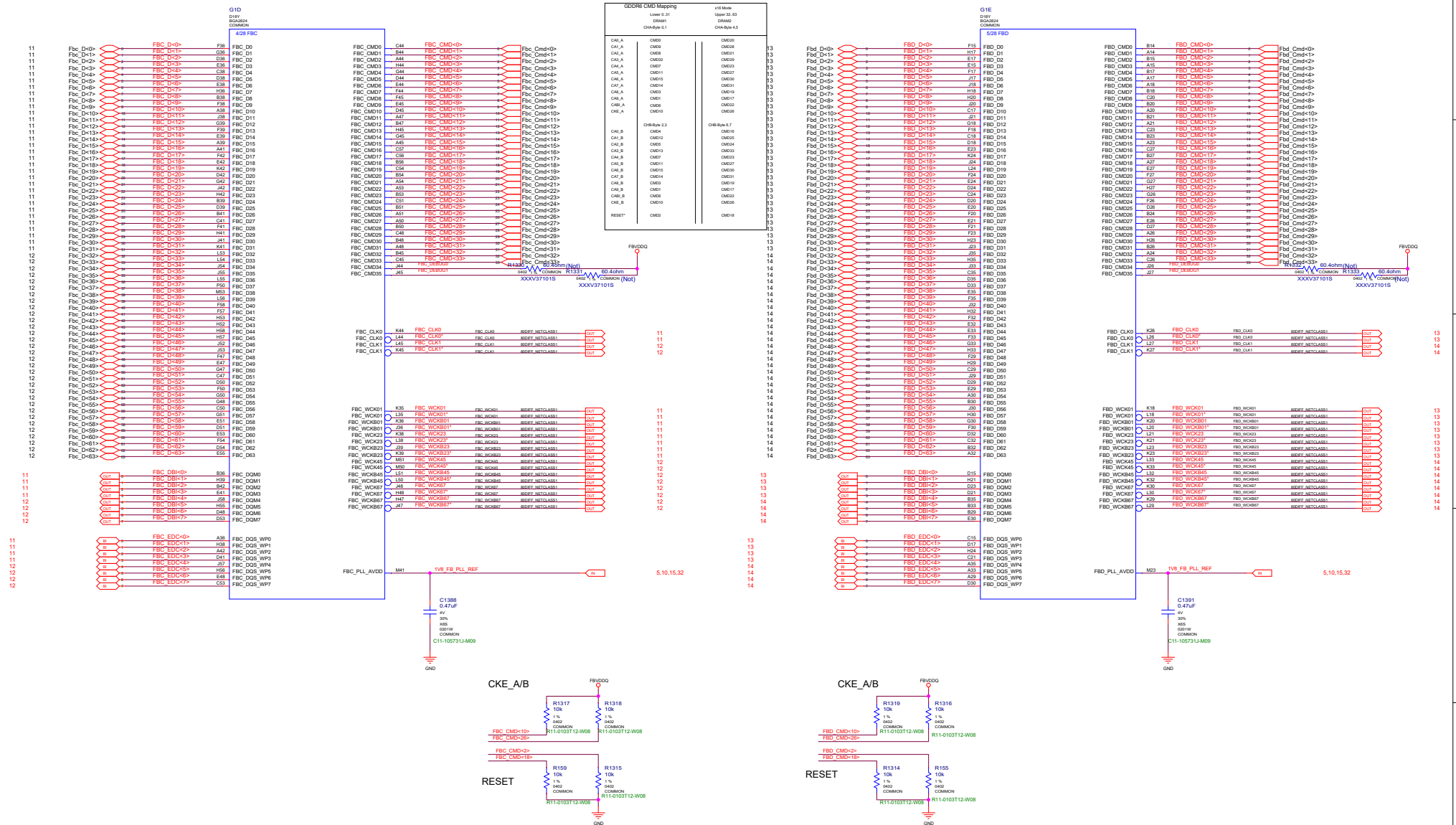
MEMORY: FBB Partition 63..32



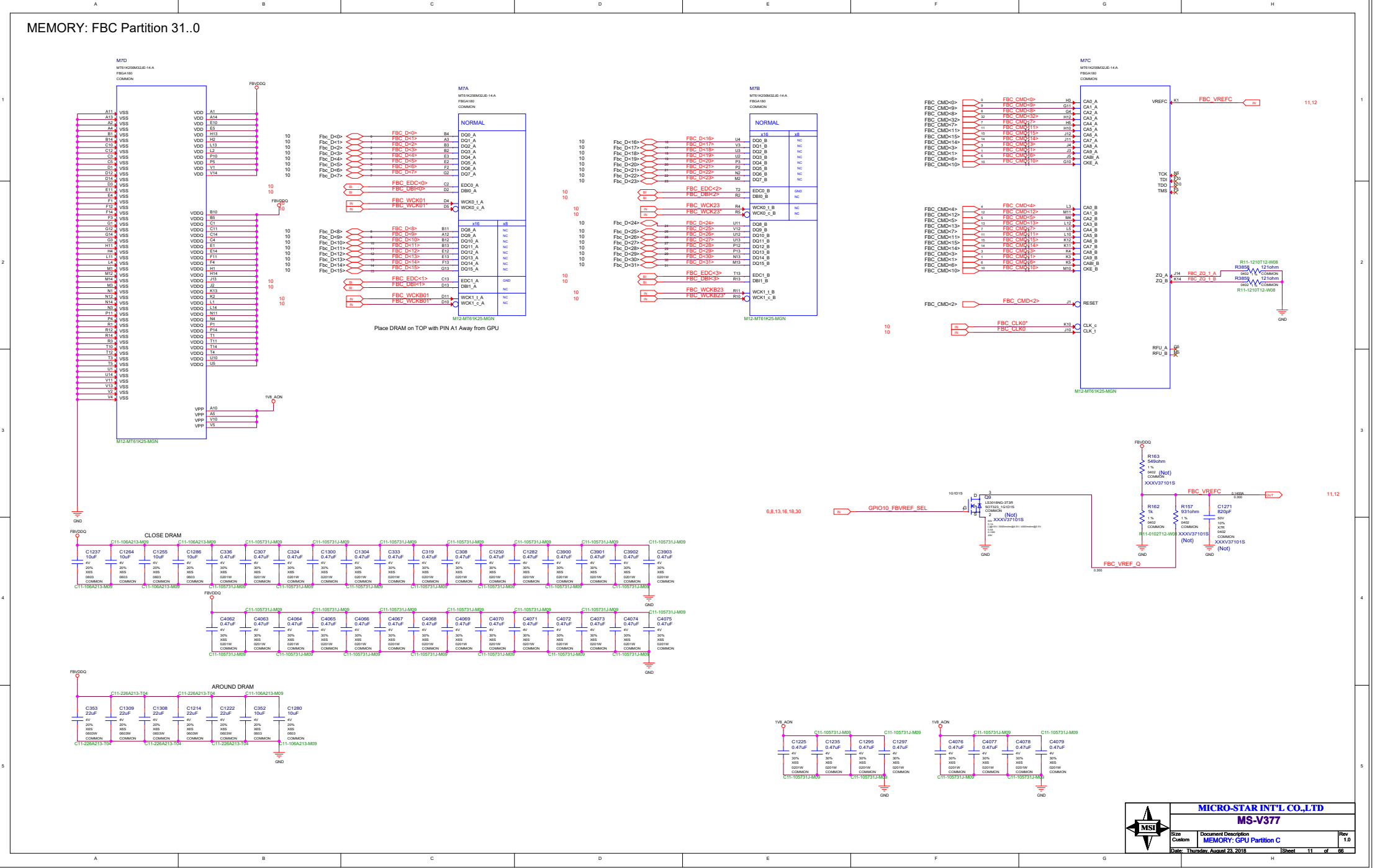
MICRO-STAR INT'L CO.,LTD
MS-V377

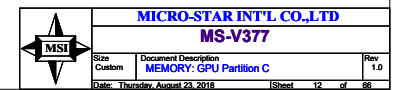
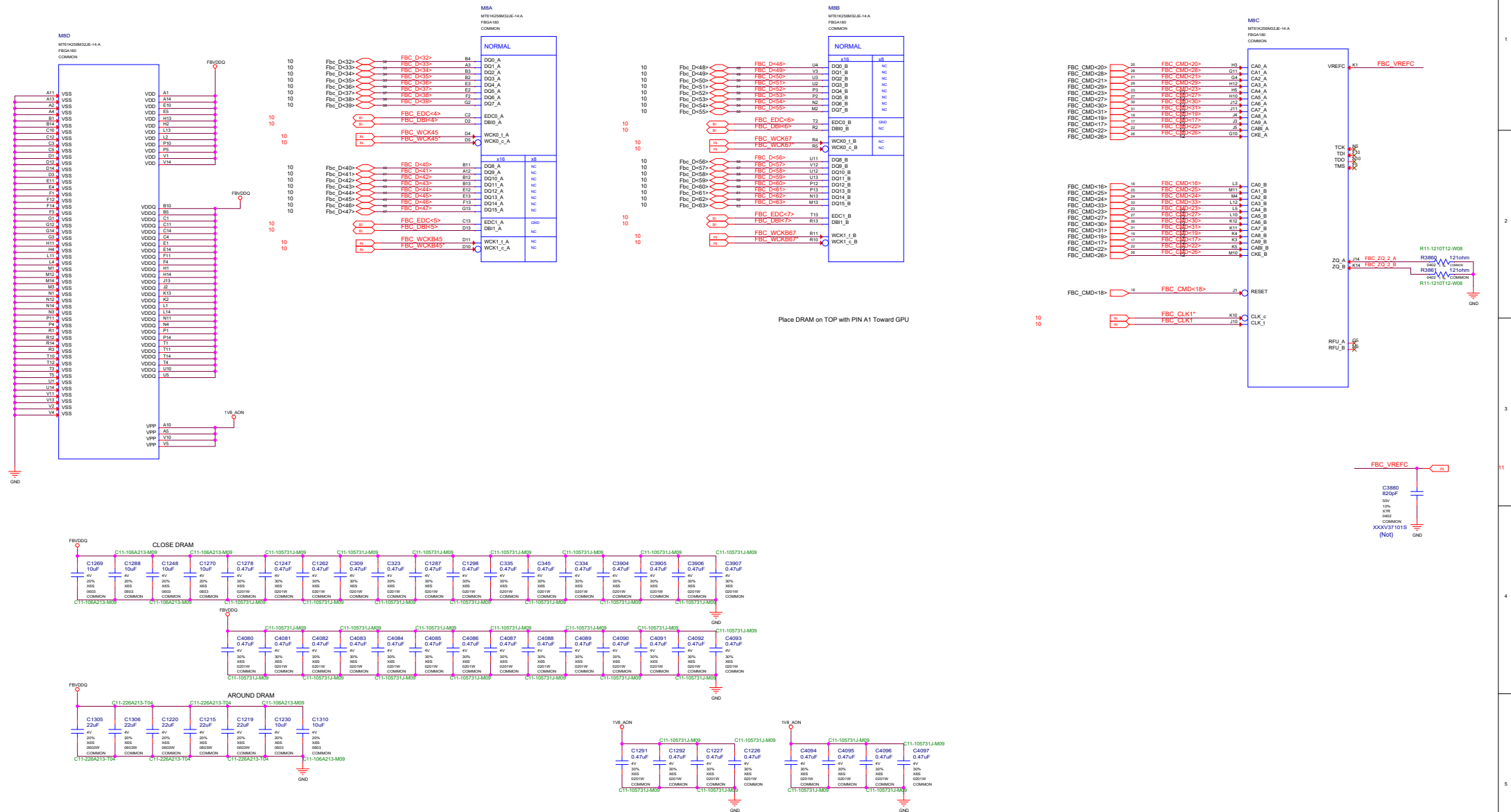
Size Custom	Document Description MEMORY: GPU Partition B	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 9 of 66

MEMORY: GPU Partition C/D

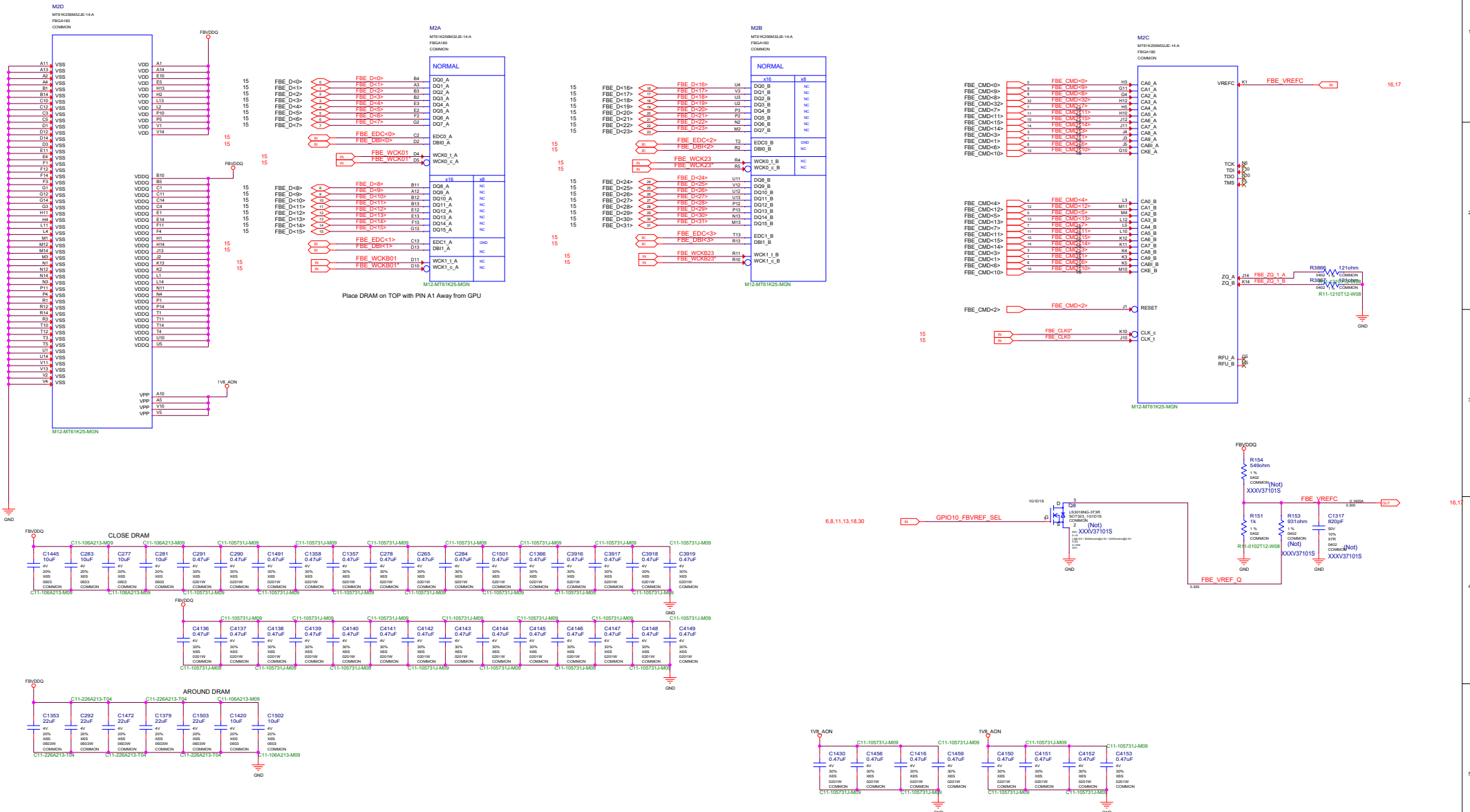


MEMORY: FBC Partition 31..0





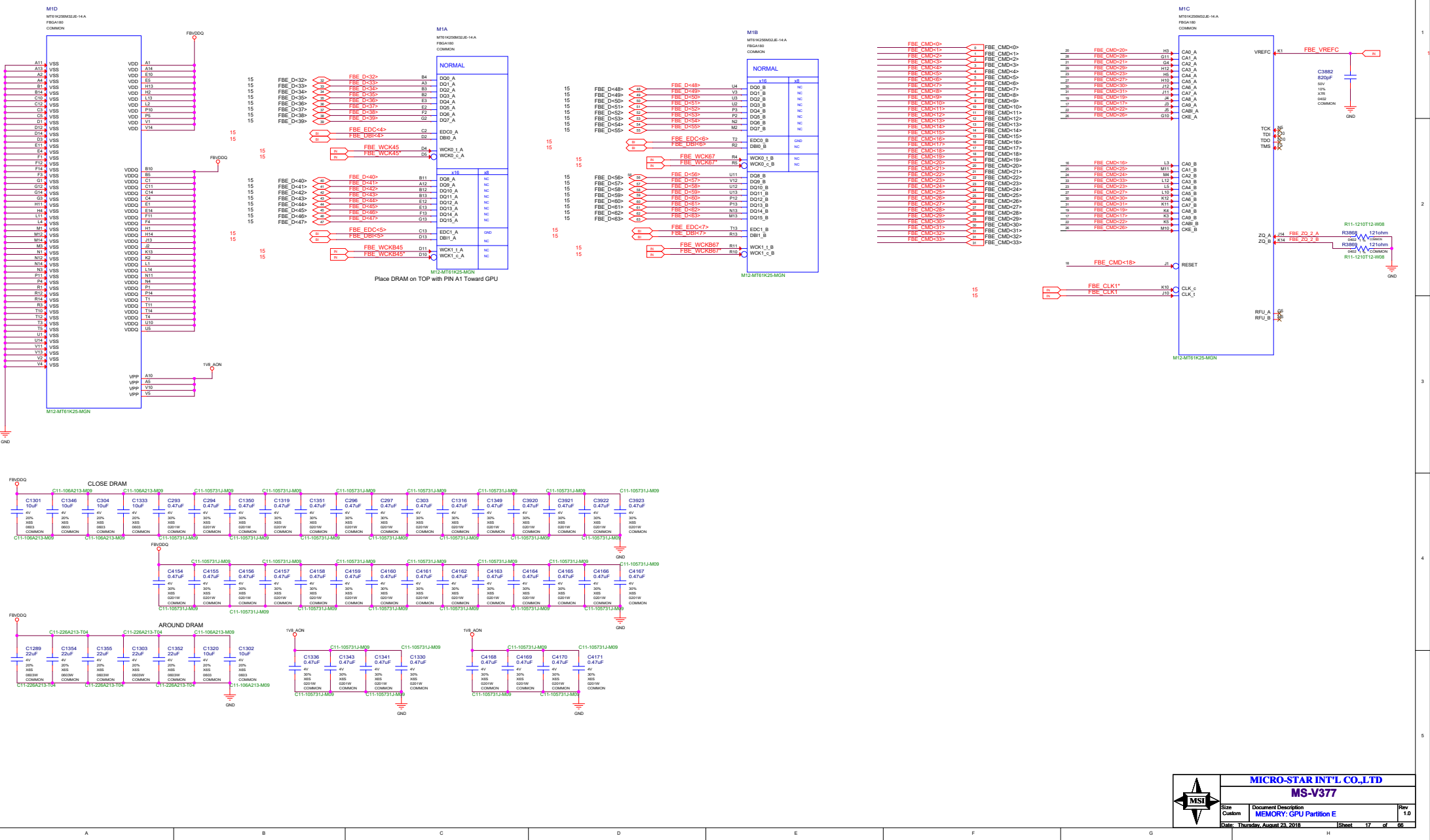
MEMORY: FBE Partition 31..0



MICRO-STAR INT'L CO.,LTD
MS-V377

Size Custom	Document Description MEMORY: GPU Partition E/F	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 16 of 66

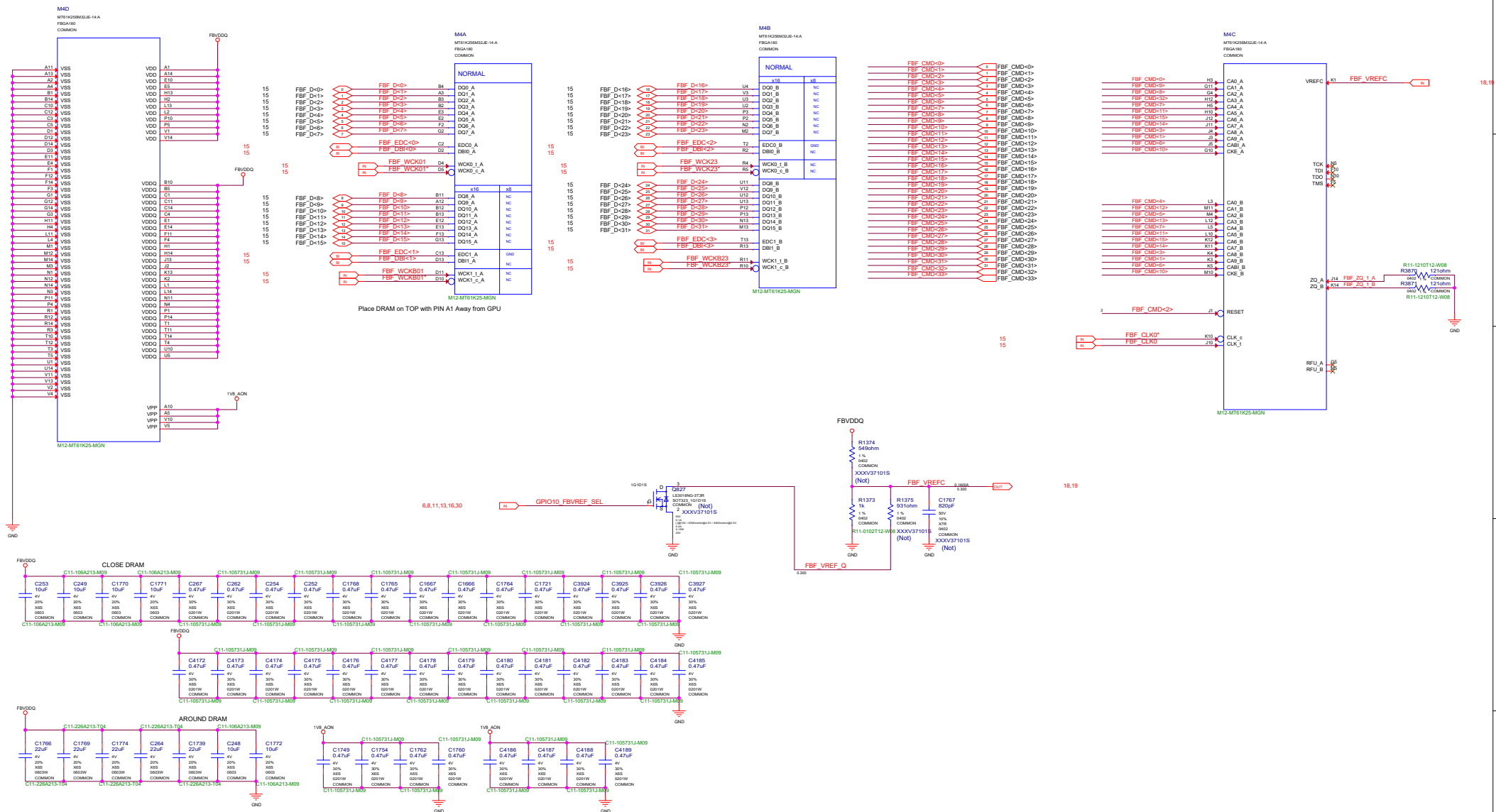
MEMORY: FBE Partition 63..32



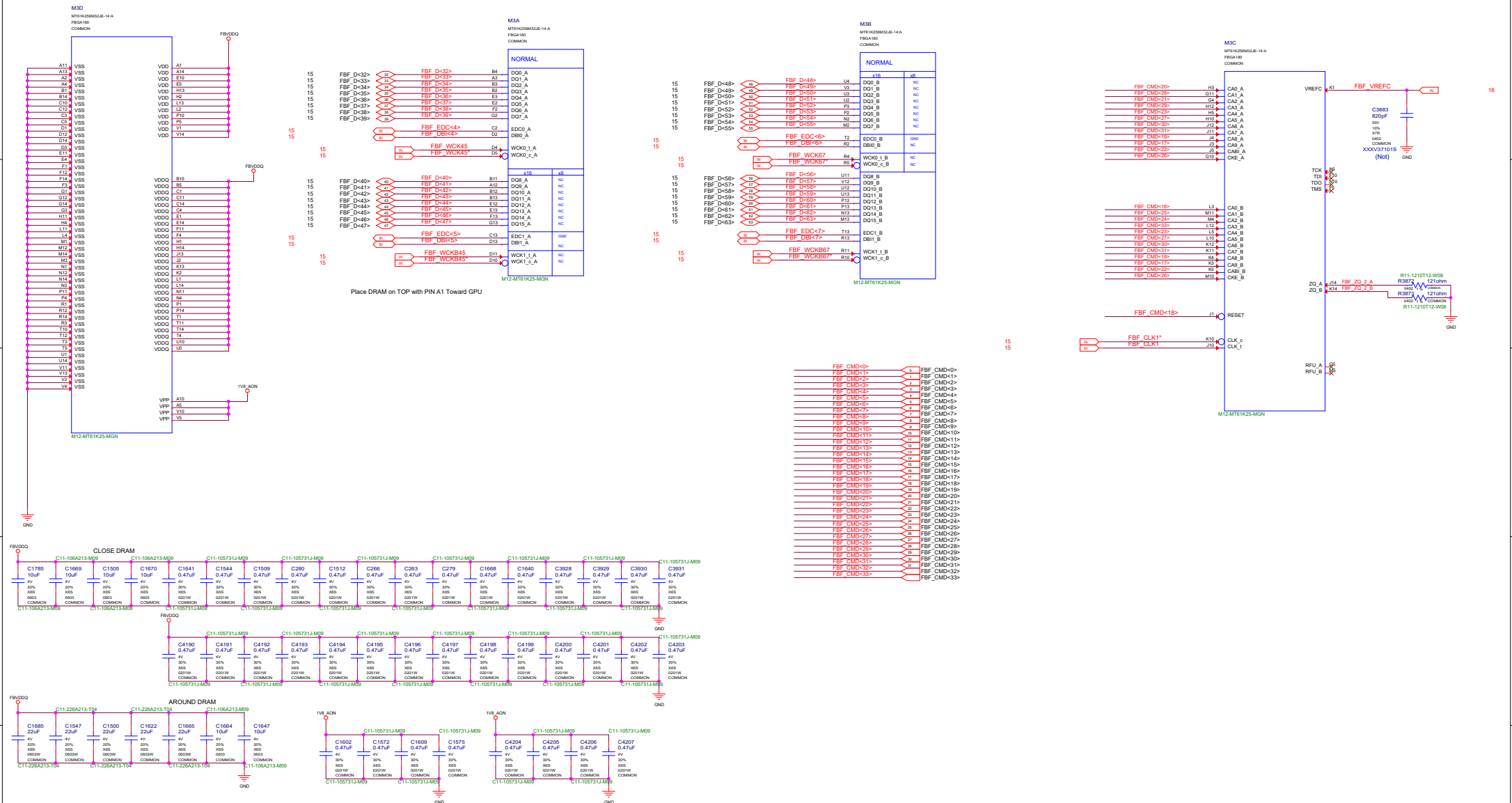
MICRO-STAR INT'L CO.,LTD
MS-V377

Size Custom	Document Description MEMORY: GPU Partition E	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 17 of 66

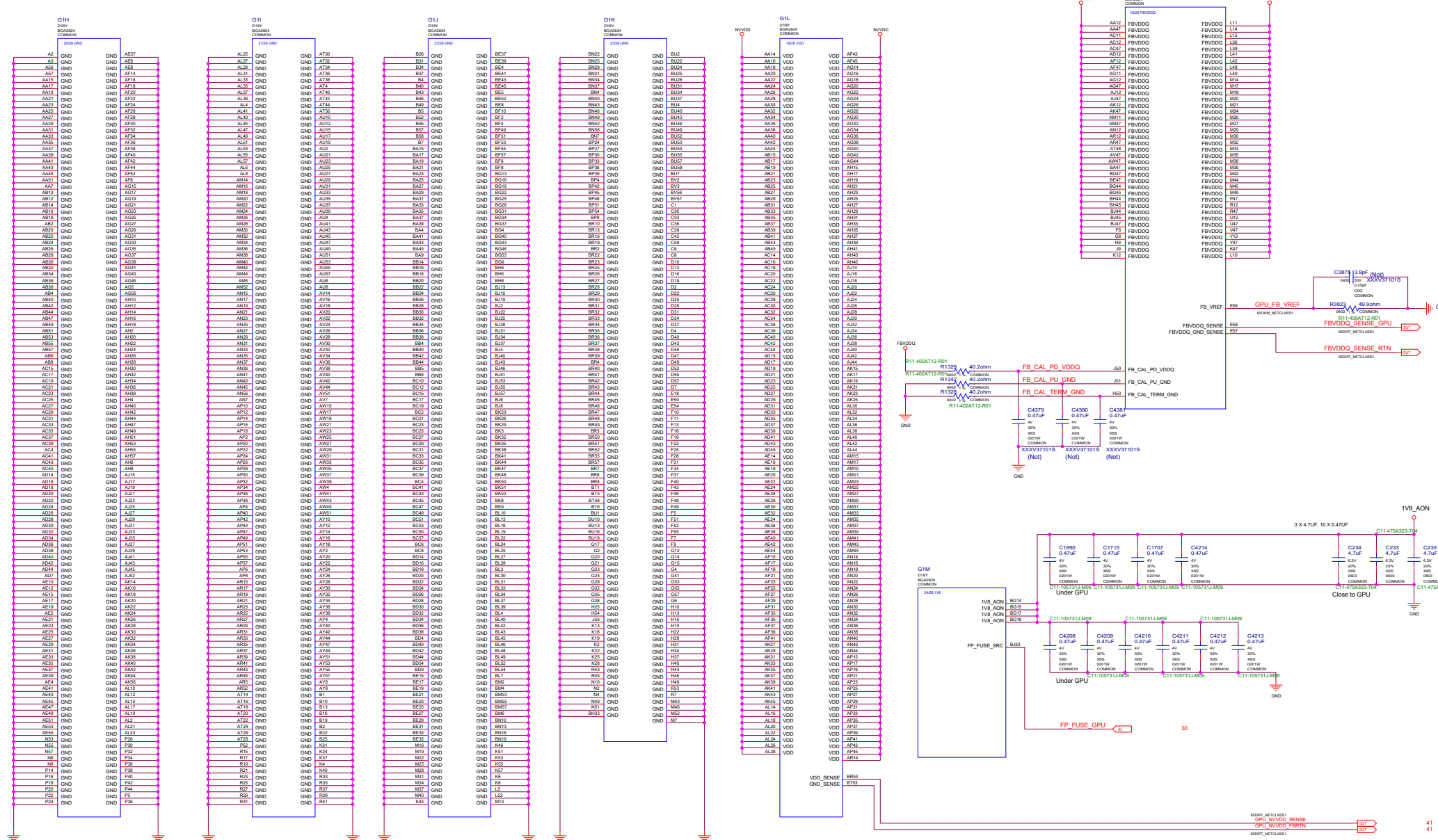
MEMORY: FBF Partition 31..0



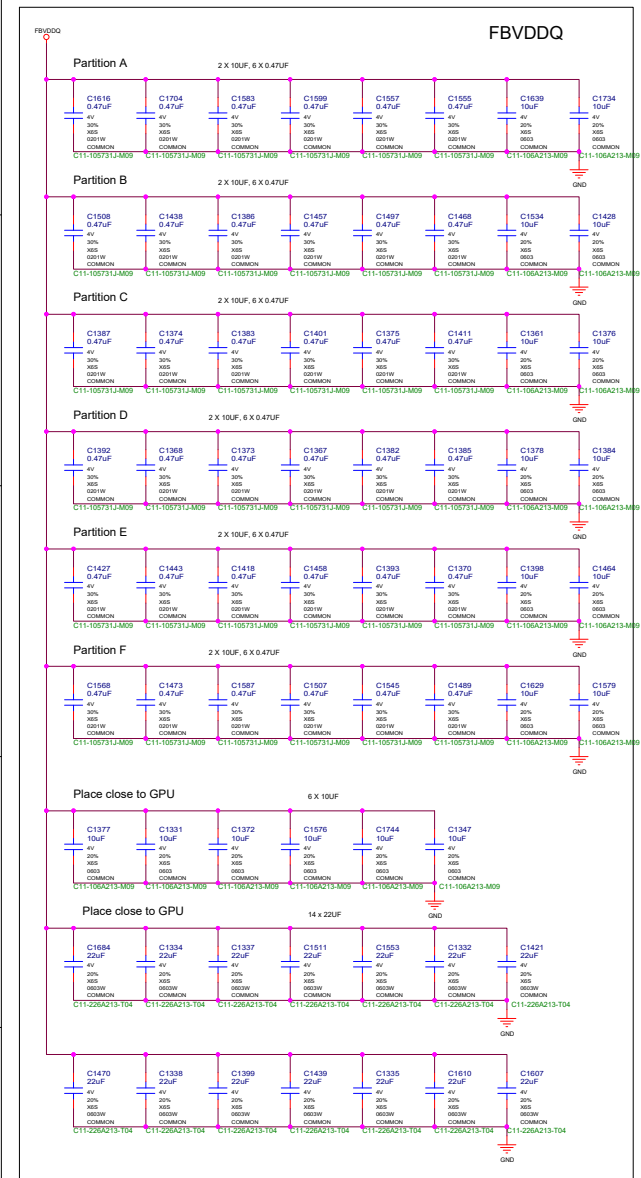
MEMORY: FBF Partition 63..32



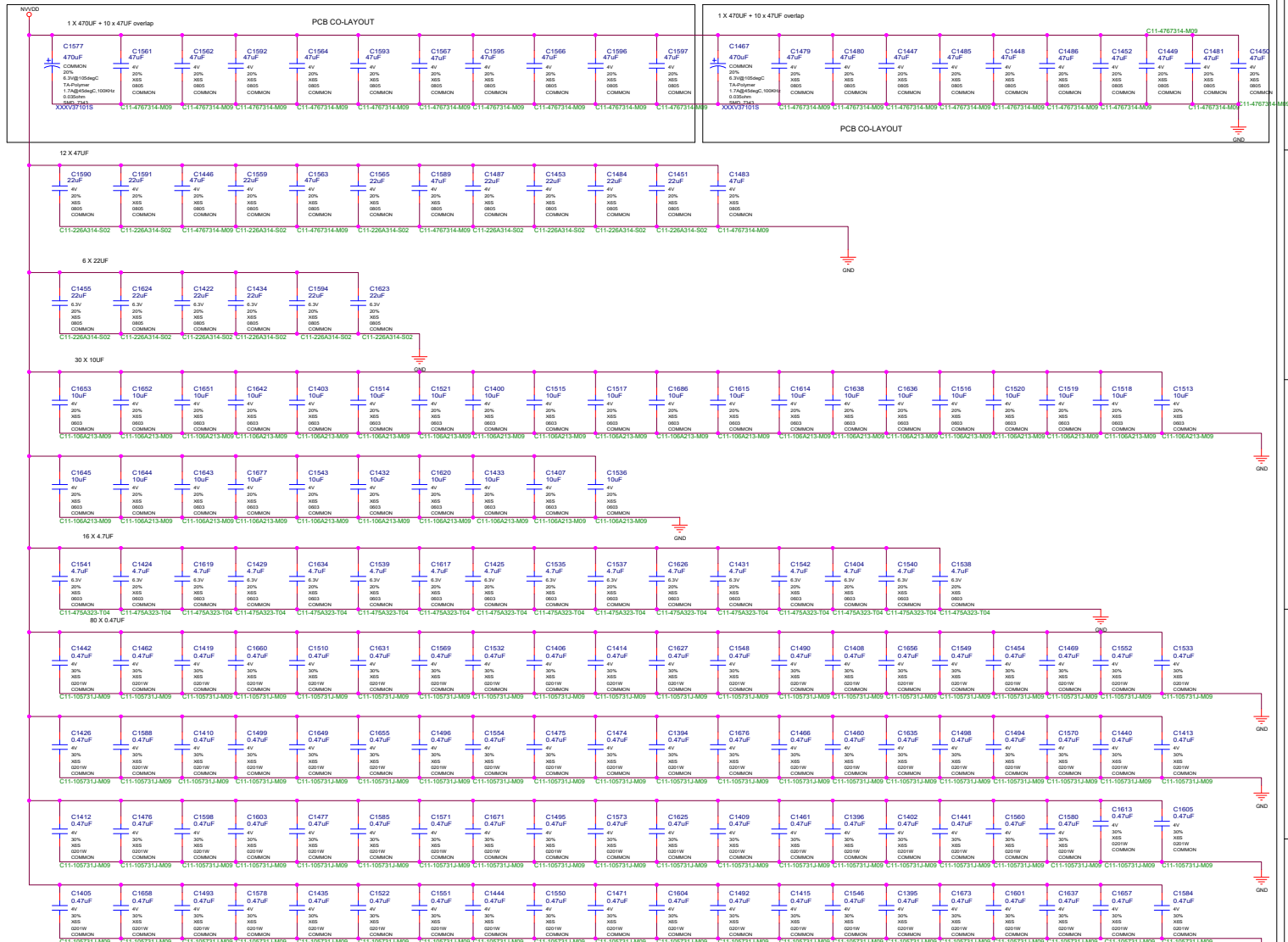
GPU PWR and GND



GPU Decoupling



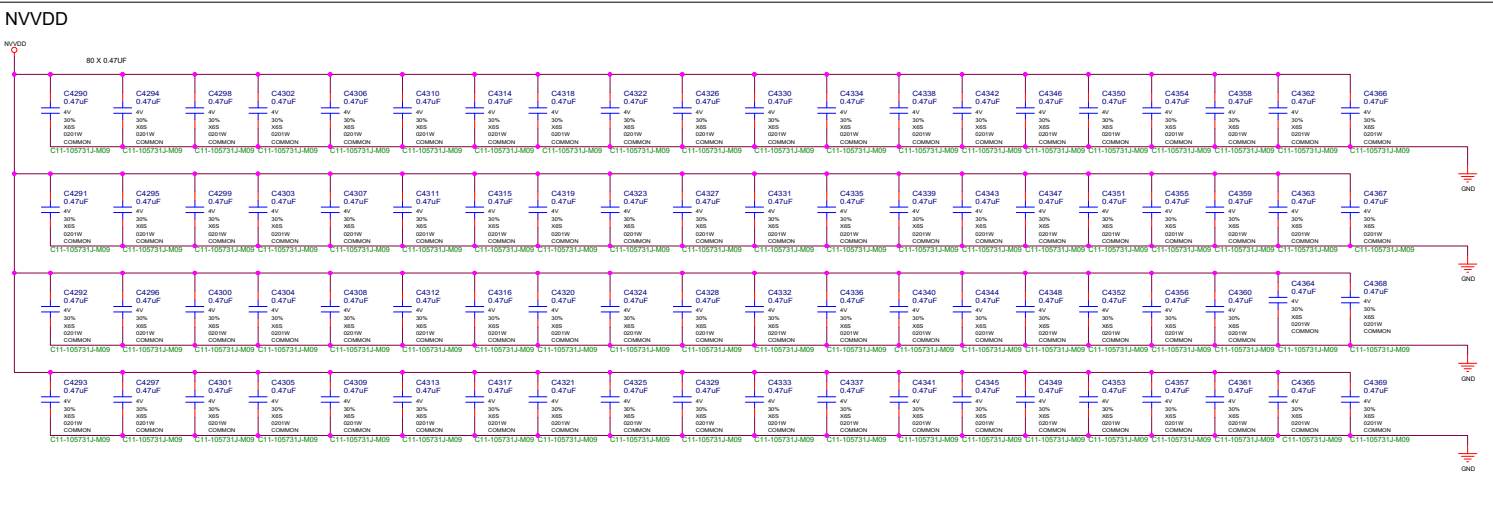
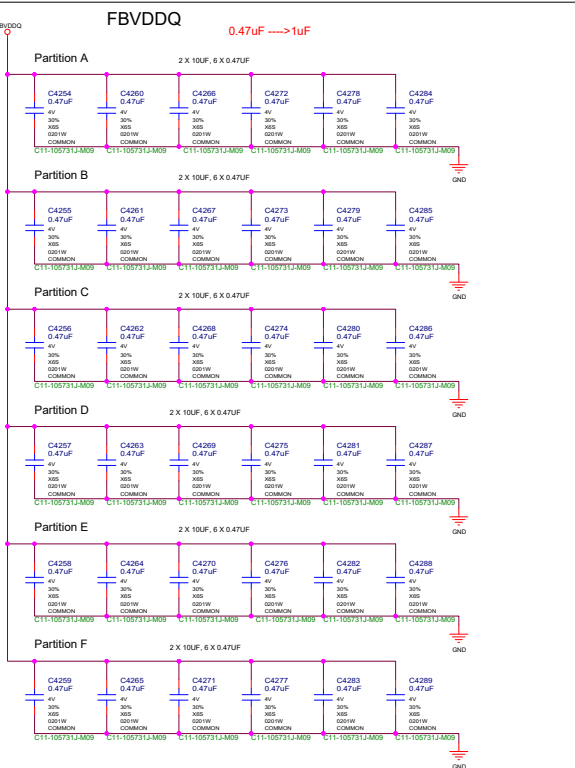
NVVDD



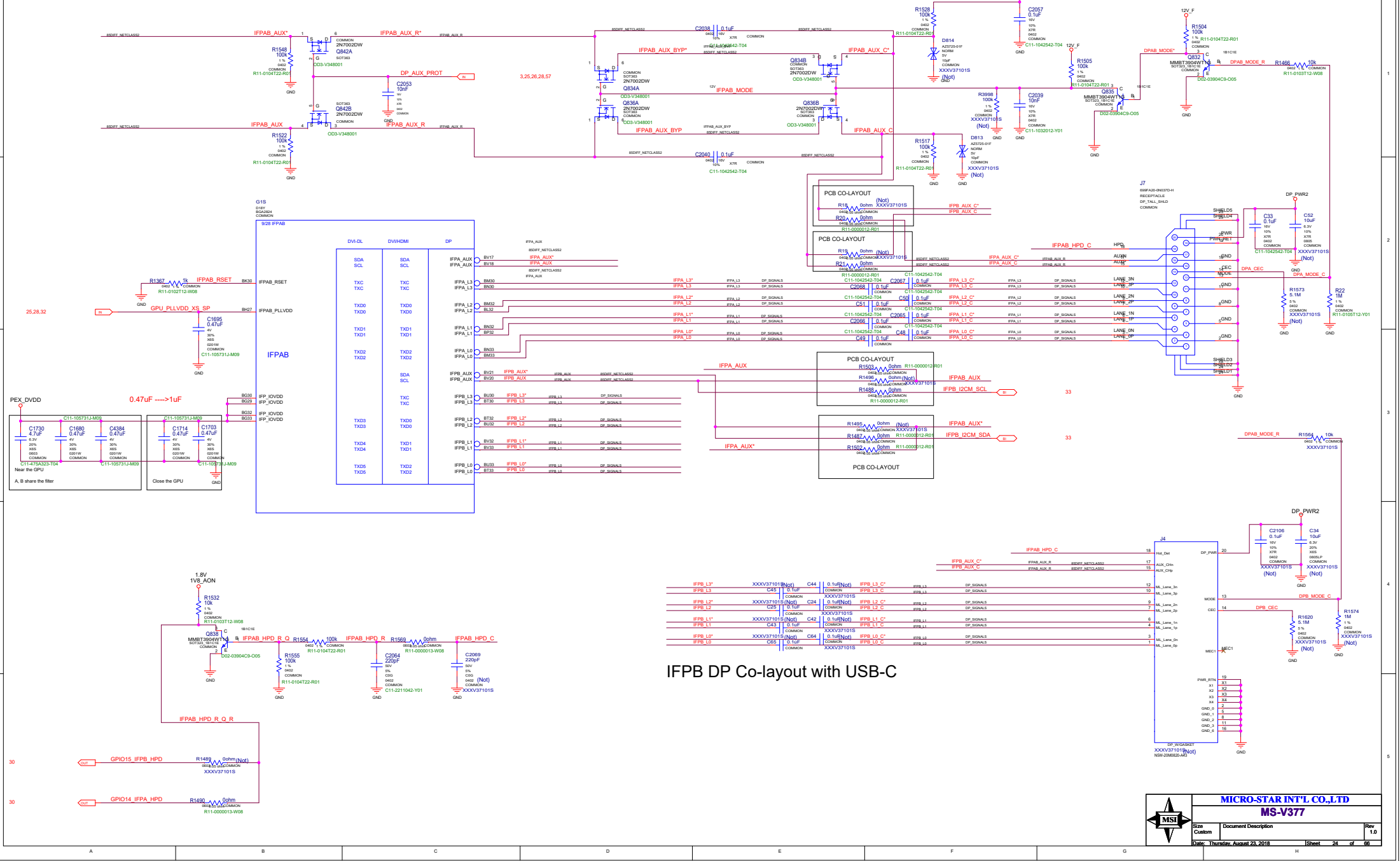
MICRO-STAR INT'L CO., LTD
MS-V377

Size: Custom
Doc: Description
Date: Thursday, August 23, 2018
Sheet: 22 of 66
Rev: 1.0

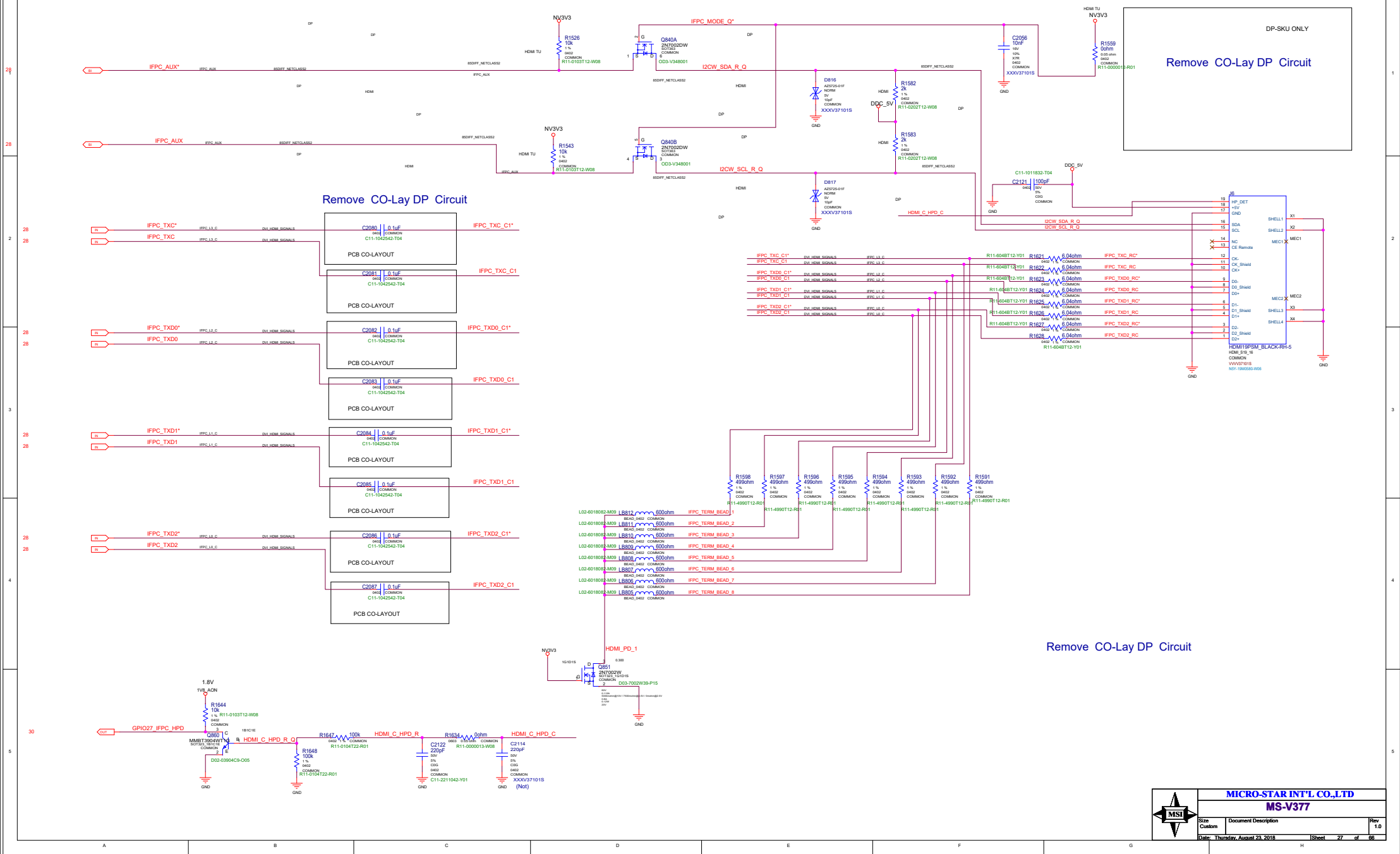
GPU Decoupling

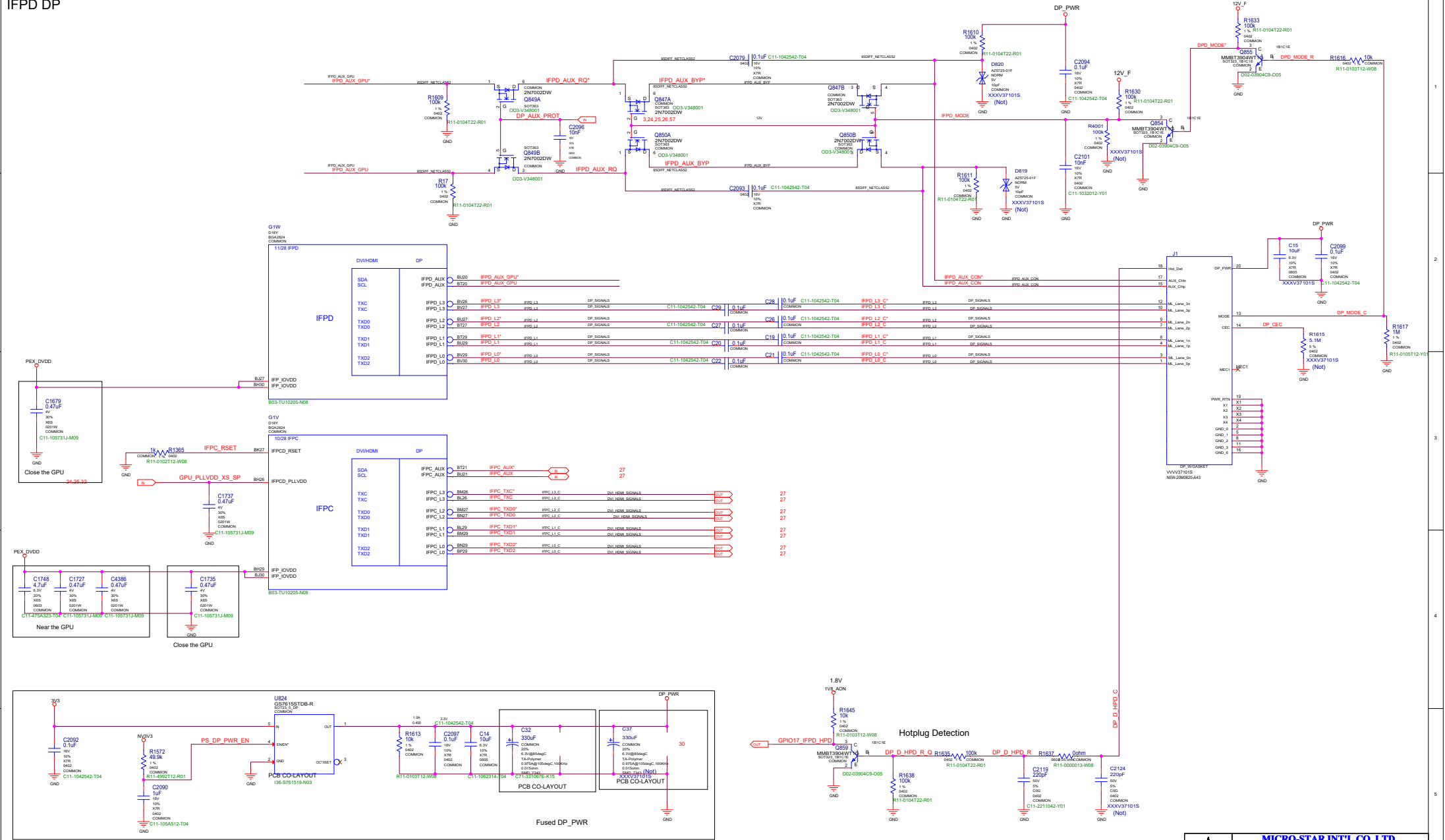


IFPAB TALL-DP



IFPC HDMI 2.0/DP





NVHS Interface and FRAME LOCK



MICRO-STAR INT'L CO.,LTD
MS-V377

Size Custom	Document Description	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 29 of 66

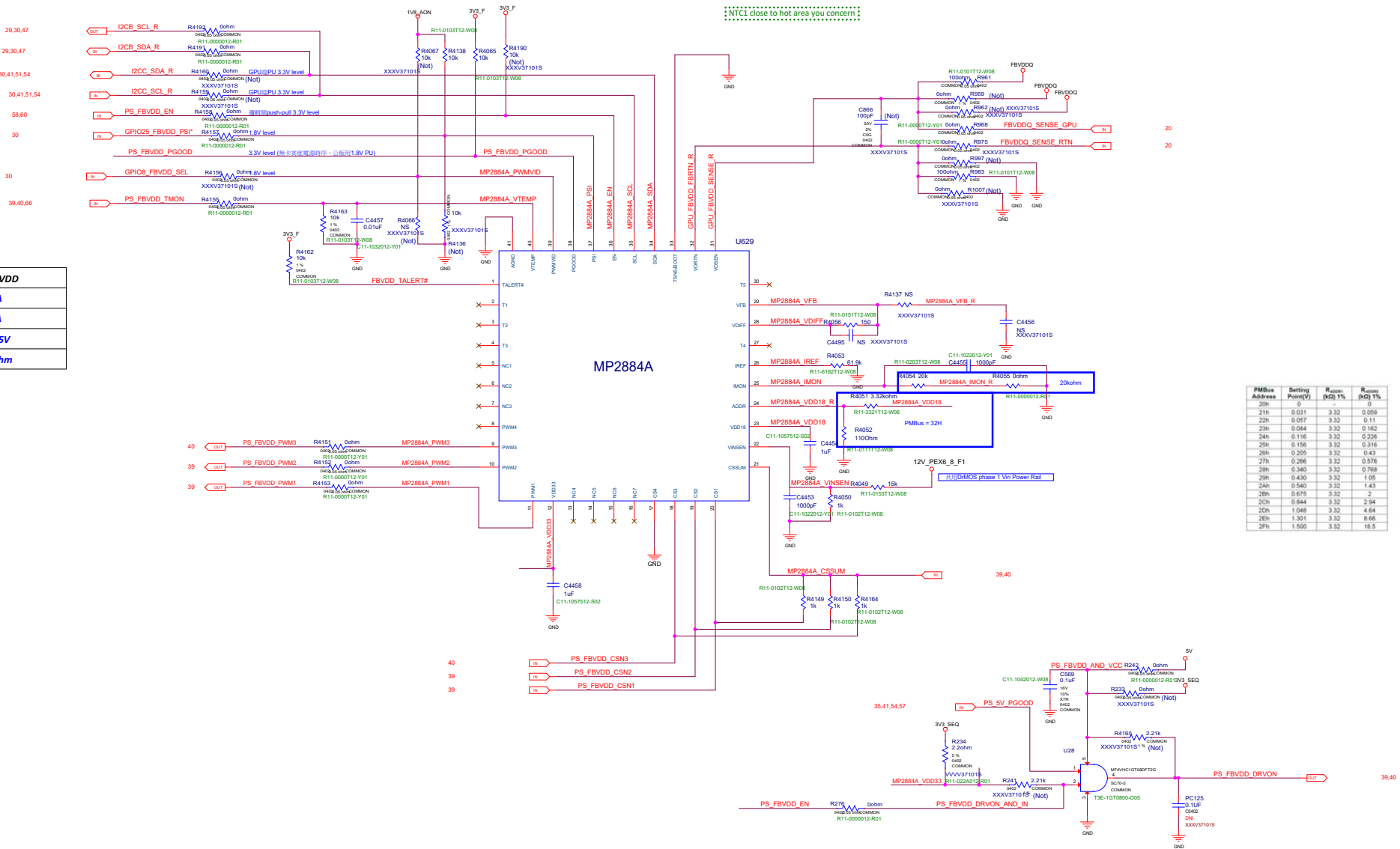
PS: FBVDD Controller

<i>EN Type</i>	<i>R3</i>
<i>Open Drain</i>	<i>10k</i>
<i>Push Pull</i>	<i>NS</i>

<i>PSI</i>	<i>Mode</i>
<i>High</i>	<i>High Phase Count</i>
<i>Hi-Z</i>	<i>Auto Power Mode</i>
<i>Low</i>	<i>Low Phase Count</i>

PWMVID	Vout
High	VID in 24h
Hi-Z	VID in 21h
Low	VID in 1fh

	+NVVDD
TDC	??A
IccMax	??A
Vboot	1.35V
Load Line	0mohm



PMBus Address	Setting Point(V)	R _{DS(on)} (mΩ) 1%	R _{DS(on)} (mΩ) 1%
20h	0	-	0
21h	0.031	3.32	0.059
22h	0.057	3.32	0.11
23h	0.084	3.32	0.162
24h	0.116	3.32	0.226
25h	0.156	3.32	0.316
26h	0.205	3.32	0.43
27h	0.266	3.32	0.576
28h	0.340	3.32	0.768
29h	0.430	3.32	1.05
2Ah	0.540	3.32	1.43
2Bh	0.675	3.32	1.94
2Ch	0.844	3.32	2.94
2Dh	1.048	3.32	4.64
2Eh	1.301	3.32	8.66
2Fh	1.500	3.32	16.5

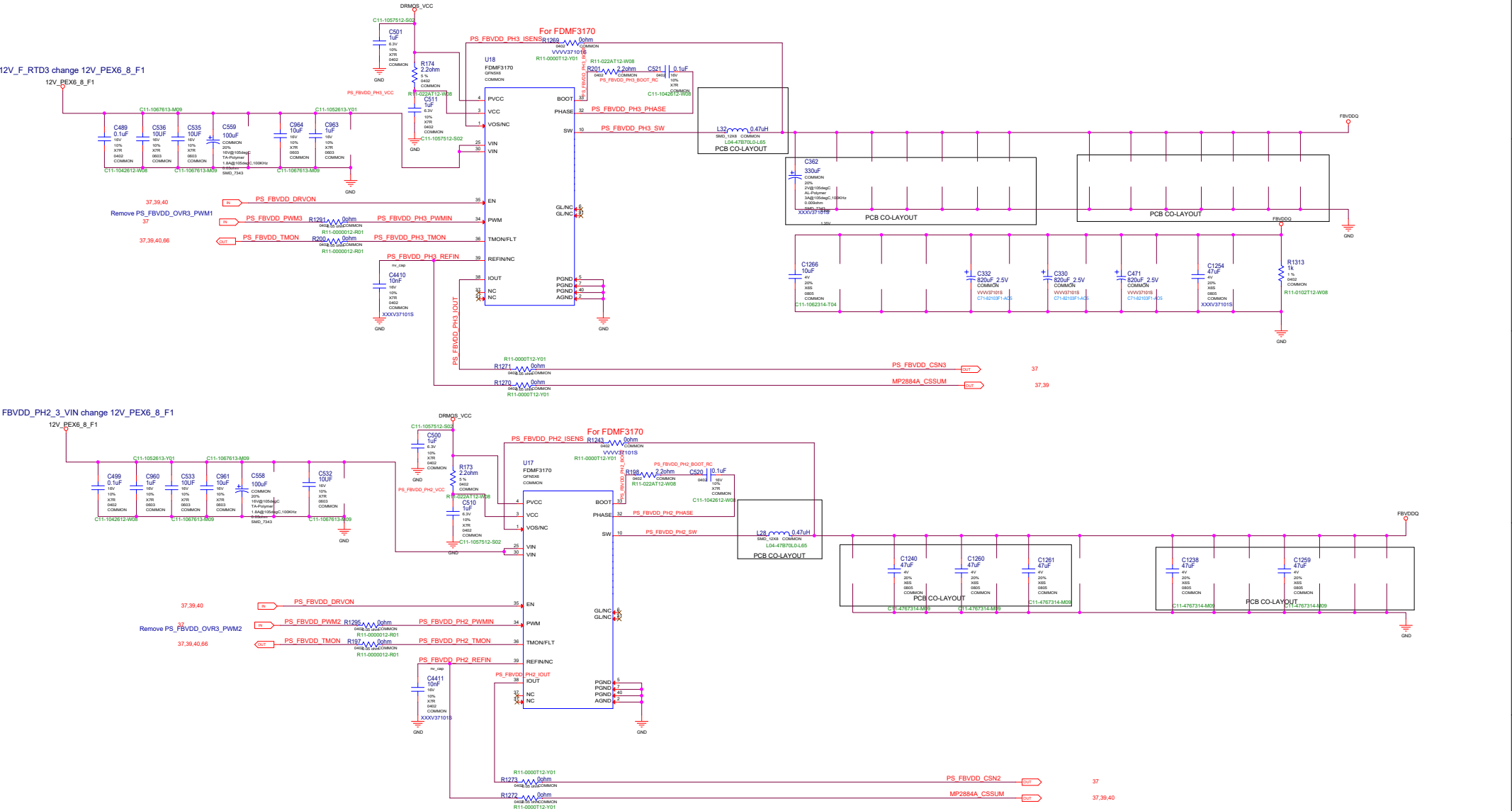


PS: FBVDD Controller OVR3



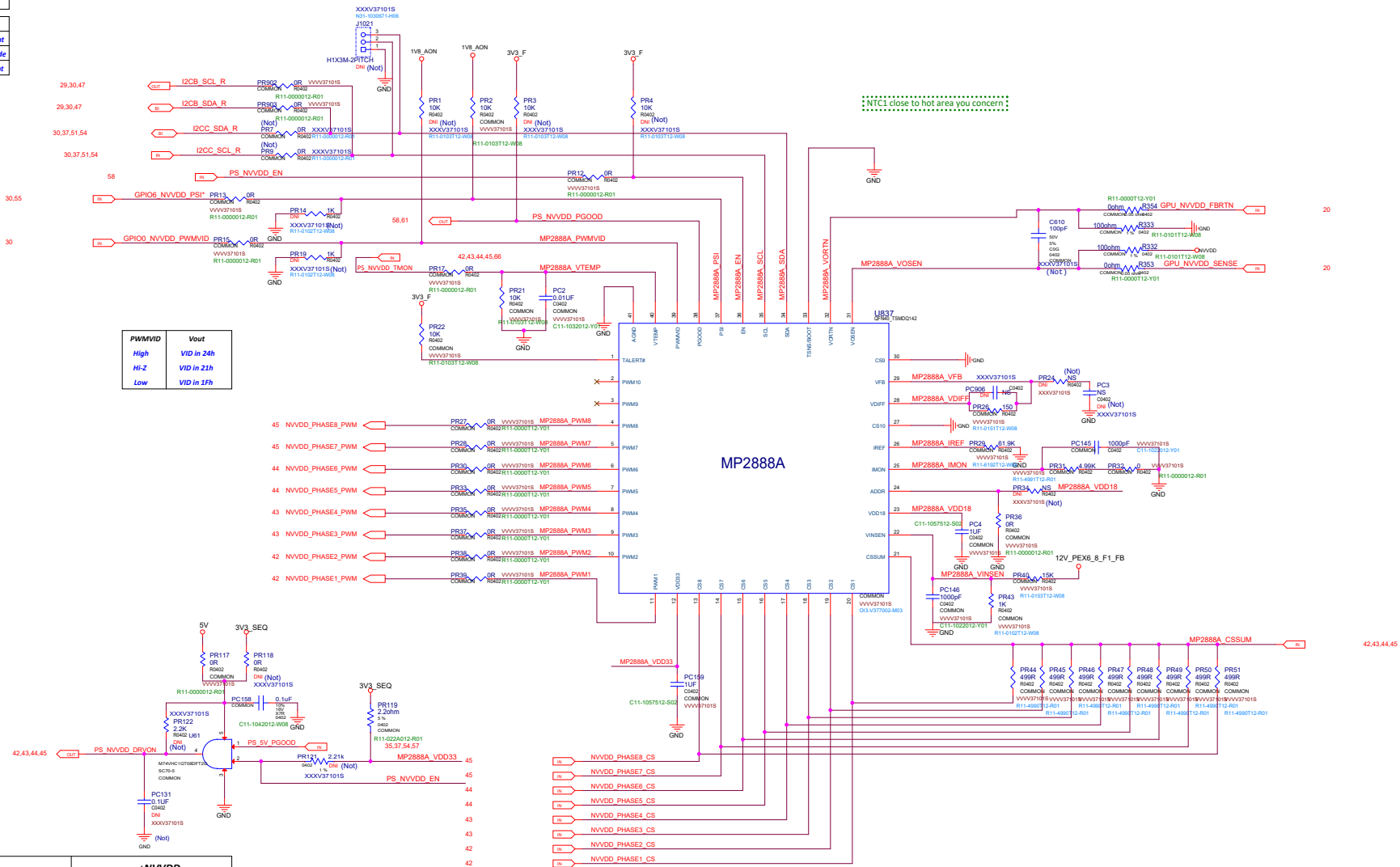
MICRO-STAR INT'L CO.,LTD		
MS-V377		
Size	Document Description	Rev
Custom		1.0
Date: Tuesday, August 21, 2018		Sheet 38 of 66

PS: FBVDD PH2,3



<i>EN Type</i>	<i>R3</i>
<i>Open Drain</i>	<i>10k</i>
<i>Push Pull</i>	<i>NS</i>

PSI	Mode
High	High Phase Count
Hi-Z	Auto Power Mode
Low	Low Phase Count



	+NVVDD
TDC	200A
IccMax	330A
Vboot	0.8V
Load Line	0mohm

PMU Address	Setting Point(V)	Rates (KQ) 1%	Rates (KQ) 1%
20h	0	-	0
21h	0.031	3.32	0.059
22h	0.057	3.32	0.11
23h	0.084	3.32	0.162
24h	0.116	3.32	0.226
25h	0.156	3.32	0.318
26h	0.205	3.32	0.43
27h	0.266	3.32	0.576
28h	0.340	3.32	0.768
29h	0.430	3.32	1.05
2Ah	0.540	3.32	1.43
2Bh	0.675	3.32	2
2Ch	0.844	3.32	2.94
2Dh	1.048	3.32	3.88
2Eh	1.301	3.32	8.66
2Fh	1.500	3.32	16.8

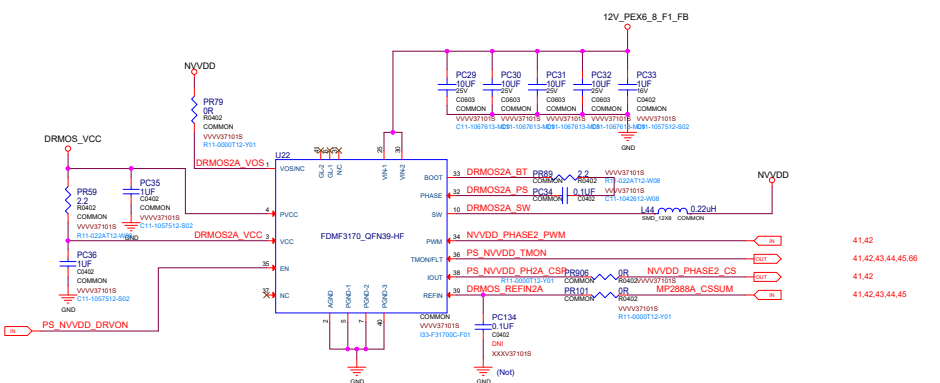
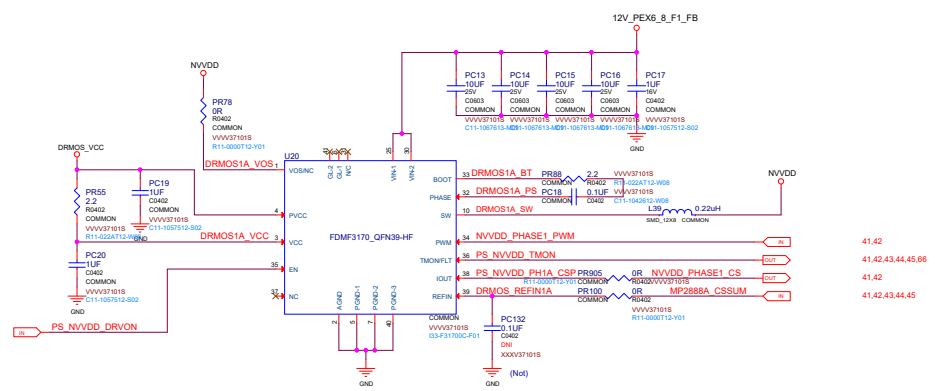
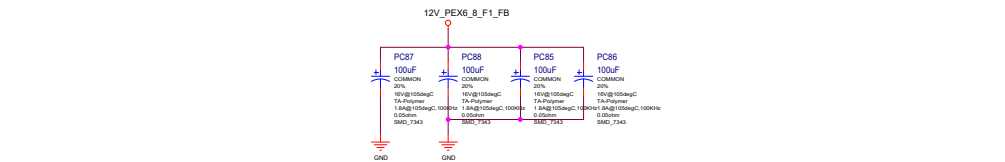
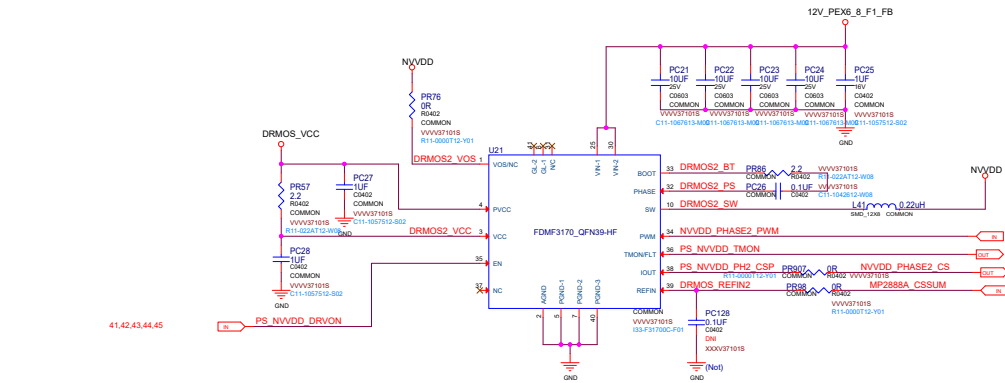
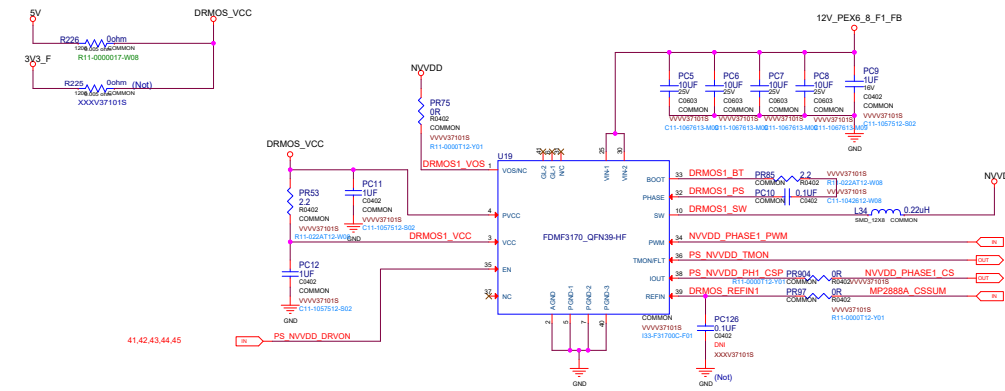


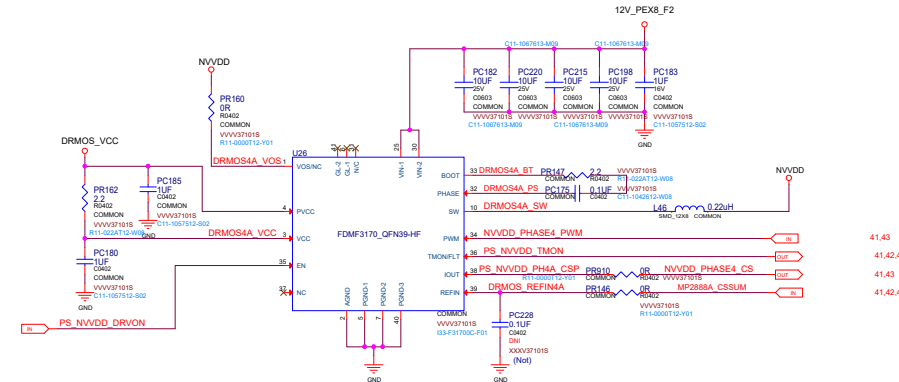
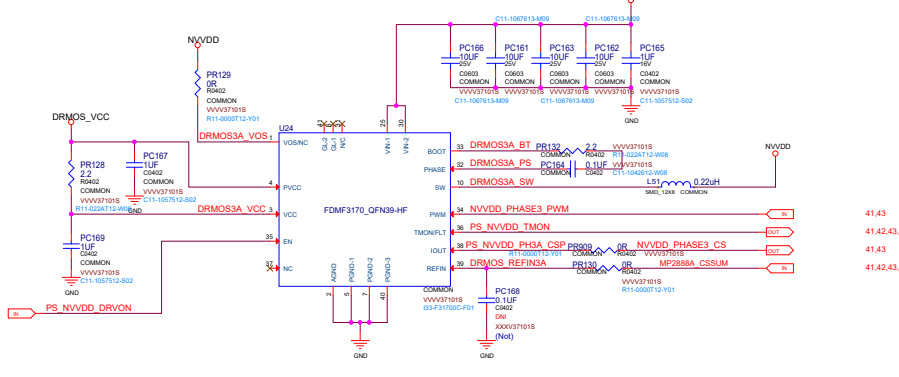
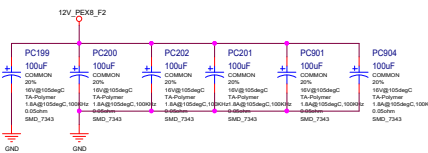
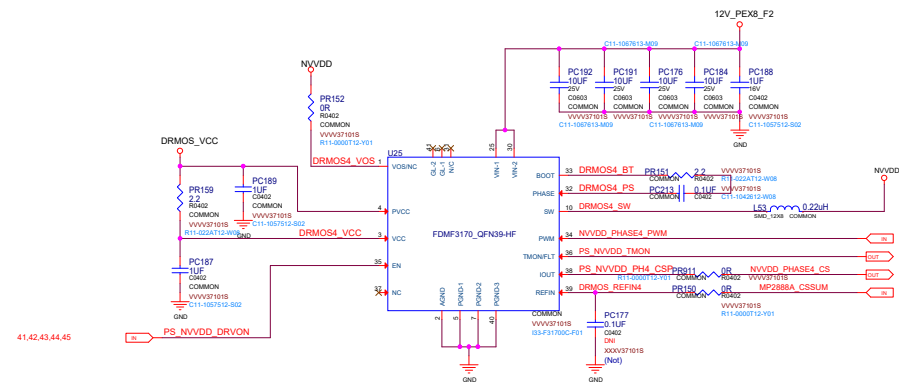
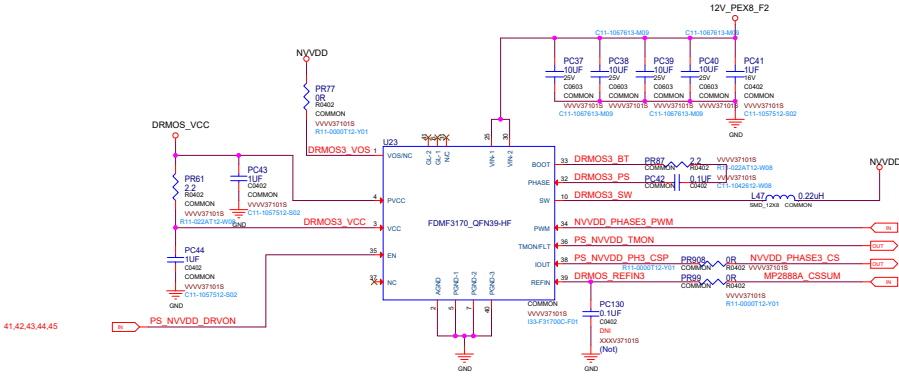
MICRO-STAR INT'L CO.,LTD

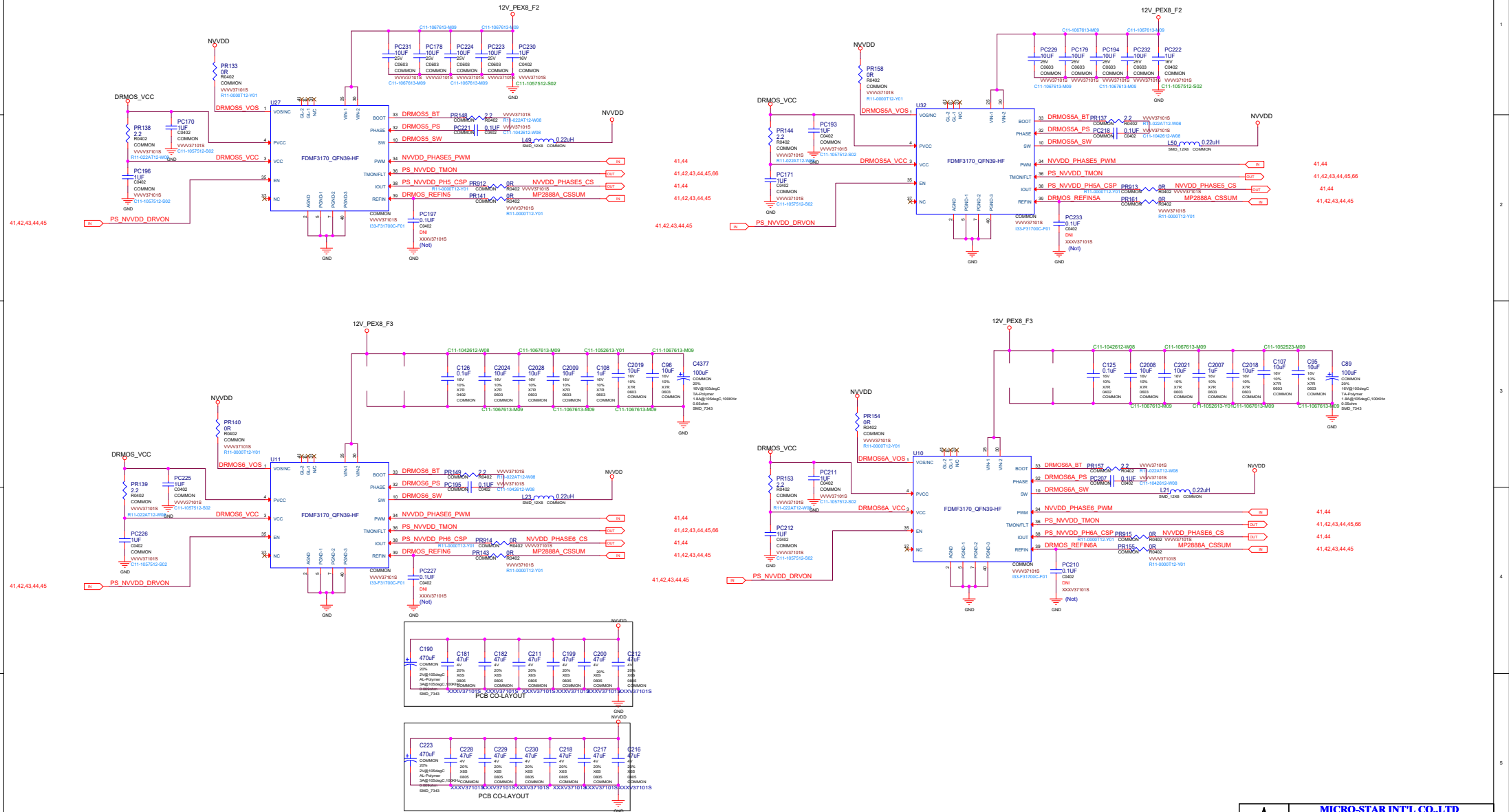
MS-V377

Size Custom	Document Description PS: NVDD - MP2888A	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 41 of 88

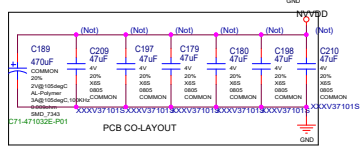
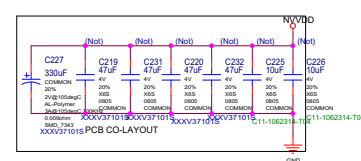
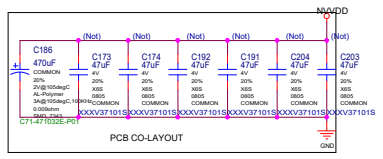
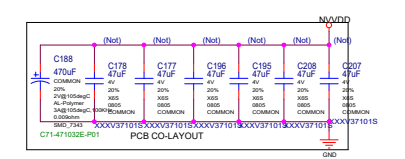
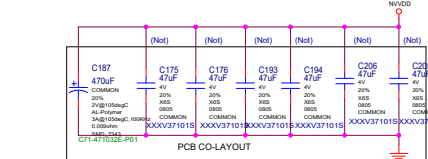
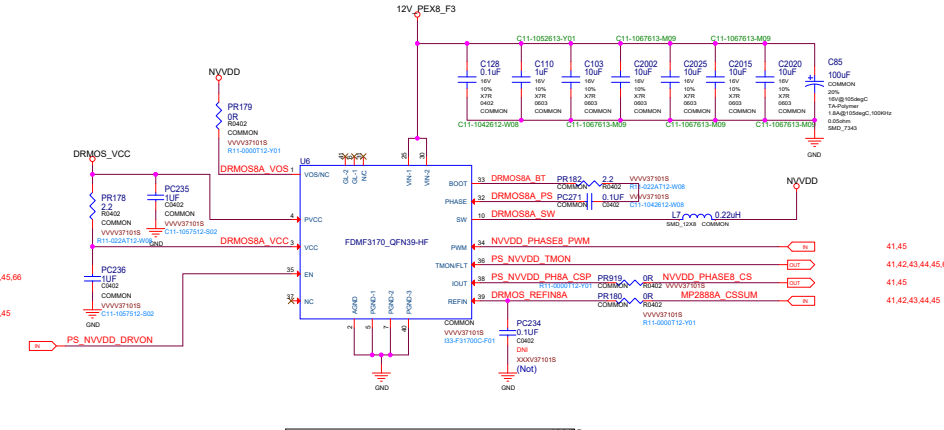
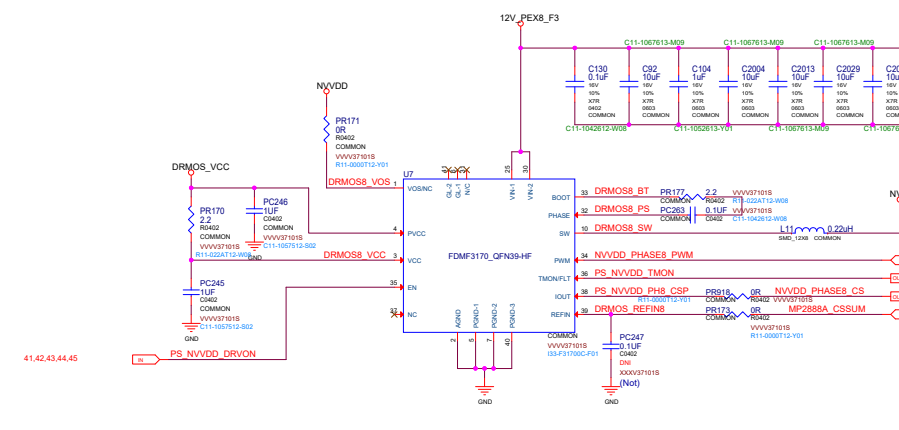
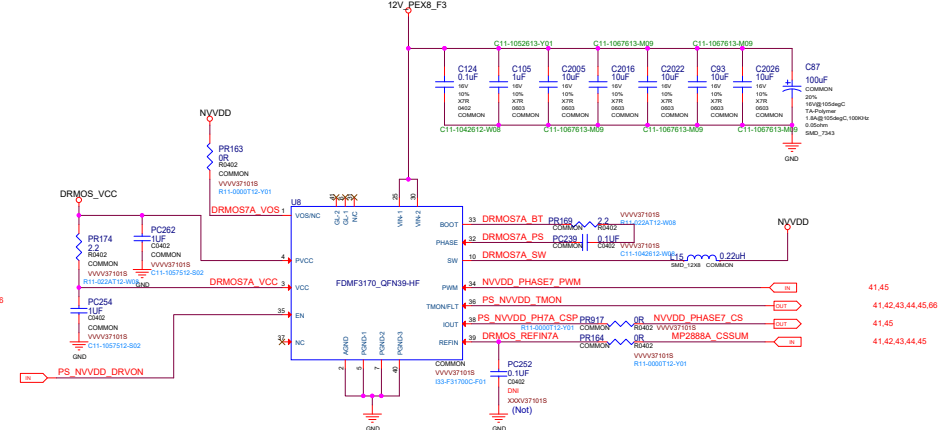
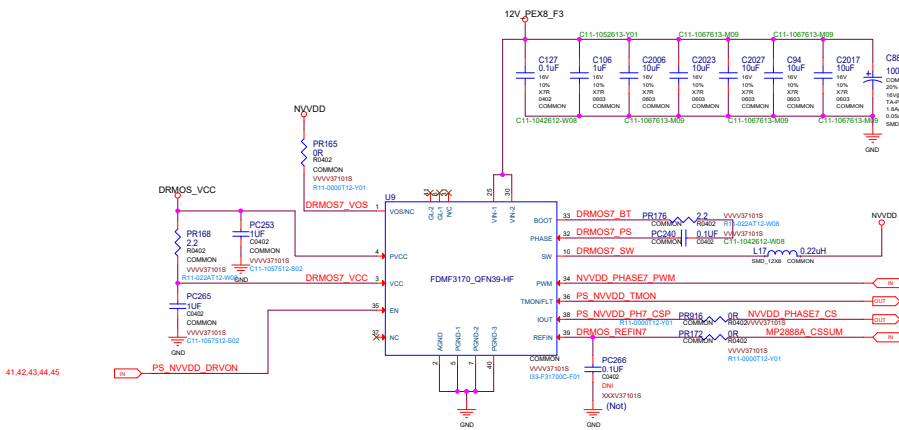
PS: NVVDD Phase 1~4

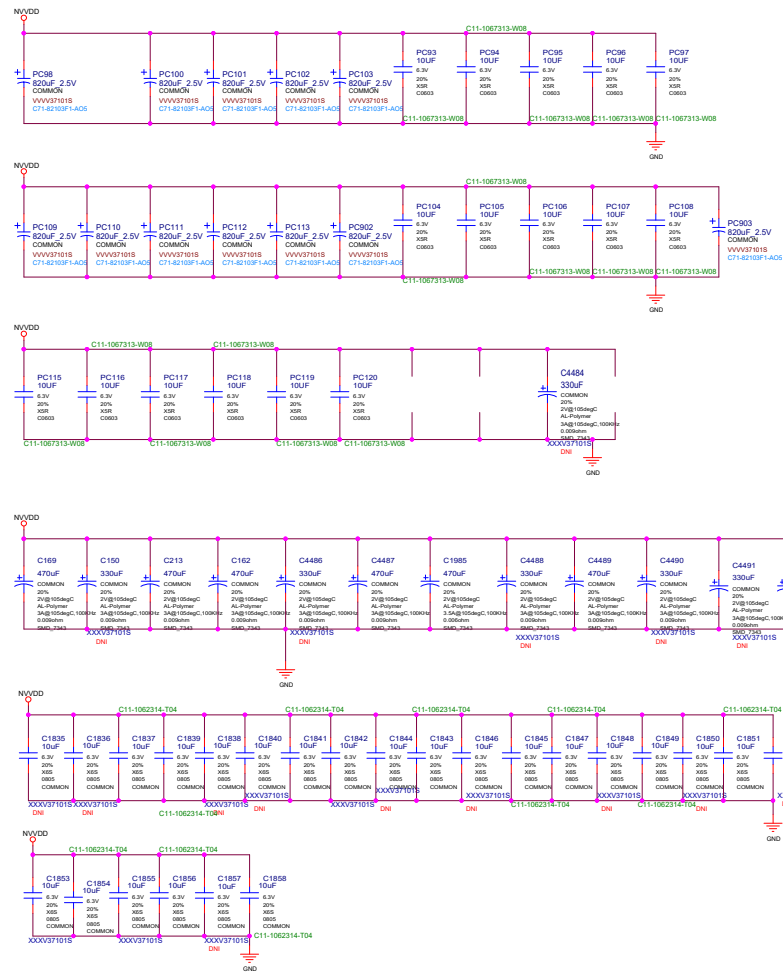


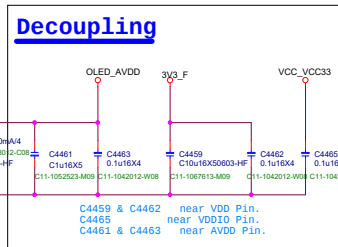
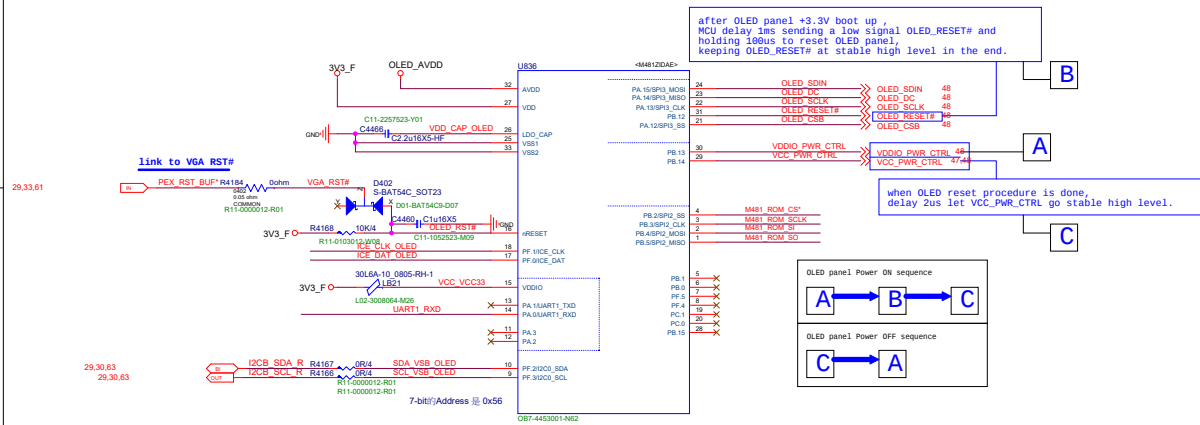




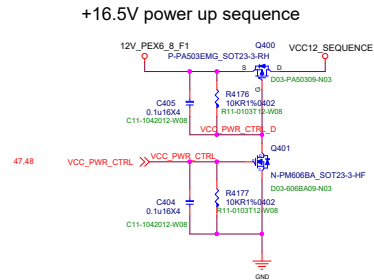
PS: NVDD Phase 13~16







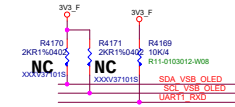
MPS1542 BUCK BOOST FOR OLED POWER 12Vin 16.5Vout



PIN FUNCTIONS

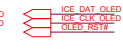
Pin #	Name	Description
1	COMP	Compensation Pin. Connect a capacitor and resistor in series to ground for loop stability.
2	FB	Feedback Input. Reference voltage is 1.25V. Connect a resistor divider to this pin.
3	EN	Regulator On/Off Control Input. A high input at EN turns on the converter, and a low input turns it off. When not used, connect EN to the input source (through a 100kΩ pull-up resistor if V_{IN} is 6V) for automatic startup. EN cannot be left floating.

I2C and UART Reserve

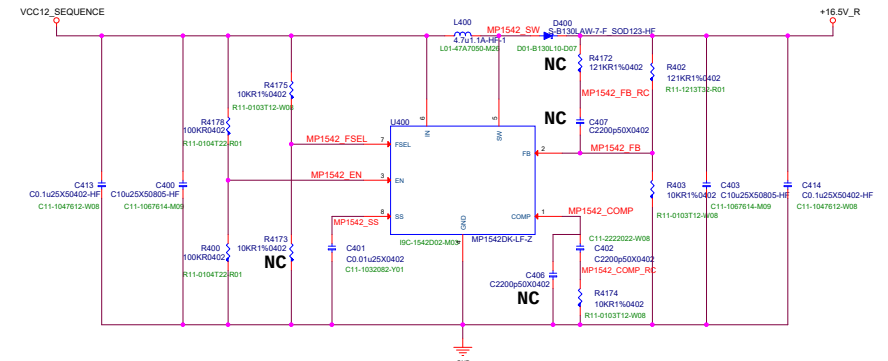
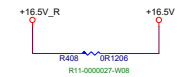
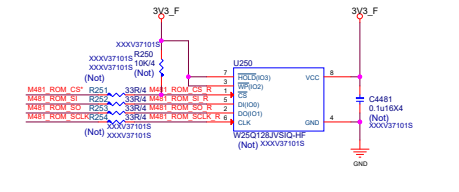


```
pull high I2C don't leave it floating,
once R23 + R24 removed
pull high UART Rx don't leave it floating
```

FW update



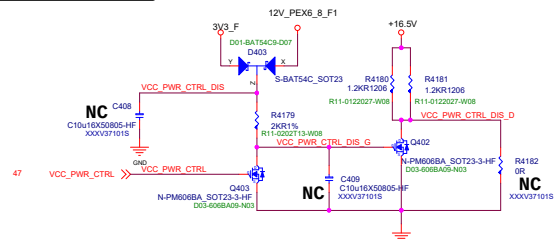
External 3.3V SPI ROM,128M(16Mx8bit)



MICRO-STAR INT'L CO.,LTD
MS-V377

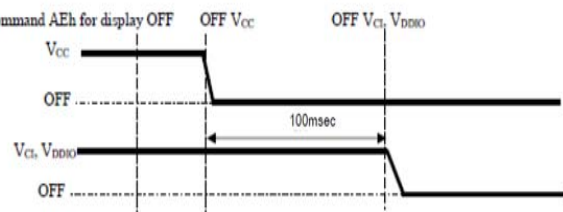
Size Custom	Document Description	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 47 of 66

+16.5V Discharge



100mS time interval is counting from 2 voltages rating 10% to 45% or lower level.

Power OFF / Display OFF Sequence

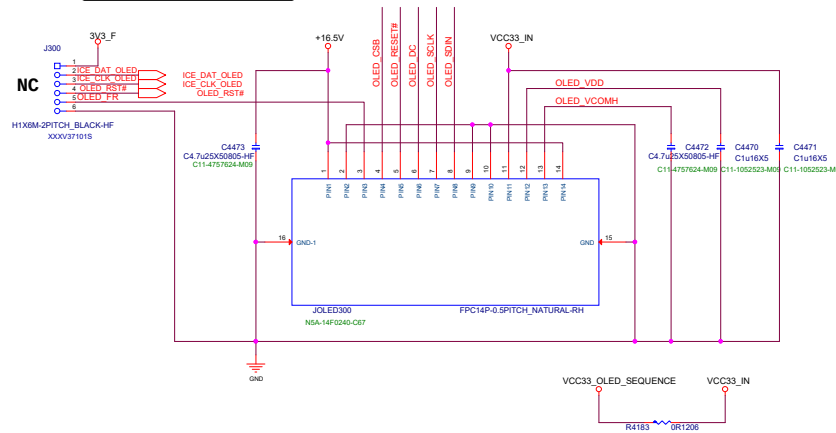


12-2) 入力端子名称 Pin Assignment

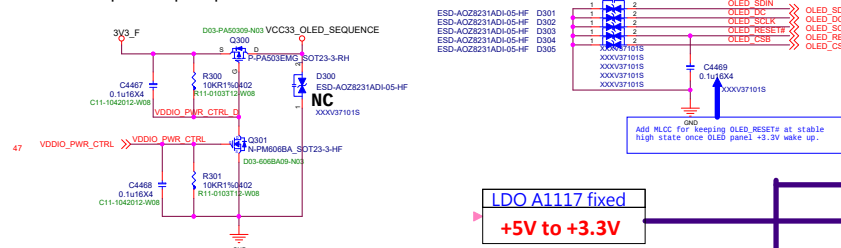
I: Input, O: Output, P: Power

PIN No.	名称 Pin Name	機能 Function Description	I/O
1	VCC	OLED駆動電源 OLED Driving Voltage	P
2	AGND	グラウンド Analog Ground	P
3	FR	同期信号 Synchronization Signal	O
4	CSB	チップセレクト Chip Select	I
5	RSTB	リセット Reset	I
6	DC	データ/コマンド選択 Data/Command Selection	I
7	SCLK	シリアルクロック Serial Clock	I
8	SDIN	データ Data Input	I
9	GND	グラウンド Ground Pin	P
10	AGND	グラウンド Analog Ground	P
11	VCI	ロジック電源 Logic Power Voltage	P
12	VDD	コア電源 Core Voltage	P
13	VCOMH	COMH 電源 COMH Voltage	P
14	VCC	OLED駆動電源 OLED Driving Voltage	P

OLED housing



+3.3V power up sequence



LDO A1117 fixed

+5V to +3.3V

BOOST Circuit

+12V to +16.5V

MCU NUC481

OLED controller

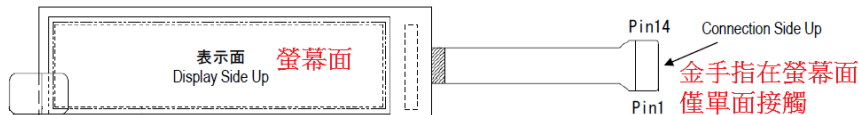
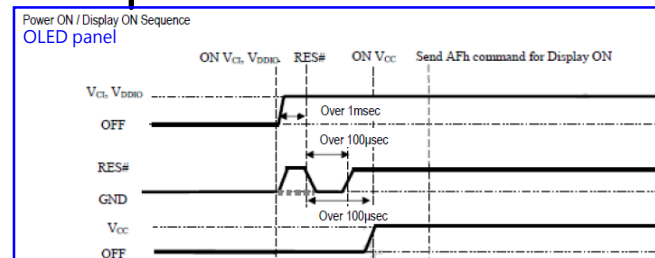
VDDIO for UART

OLED panel

VCC 52mA (max.)

VDD/VCI uA

1. after OLED panel +3.3V boot up , delay 1ms sending a low signal OLED_RESET# and holding 100us to reset OLED panel, keeping OLED_RESET# at stable high level in the end.
2. when OLED reset procedure is done, delay 2us let VCC_PWR_CTRL go stable high level.



形名 Type No. ELW2106AA



PS: INPUT SWITCH RTD3

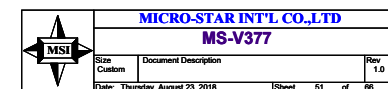
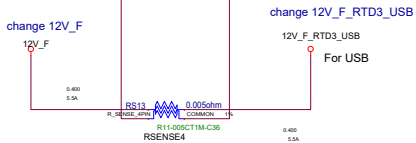
AND GATE LOGIC FOR P-BOARD			
GPIO1	GPIO29	SWITCH	VOUT
0	0	0	12V_F
0	1	0	12V_F
1	0	0	12V_F
1	1	1	3V3A

Remove 12V_F_RTD3 circuit

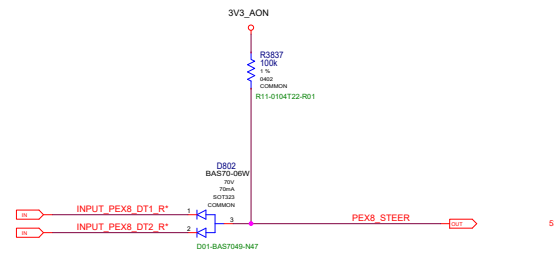
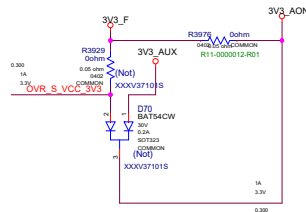
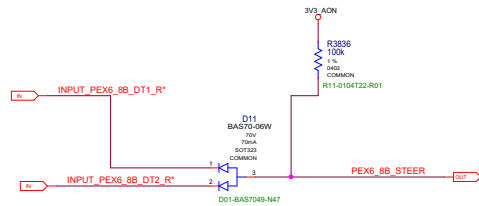
AND GATE LOGIC FOR P-BOARD			
GPIO1	GPIO29	SWITCH	VOUT
0	0	0	3V3
0	1	0	3V3
1	0	0	3V3
1	1	1	3V3A

Remove 3V3_RTD3 circuit

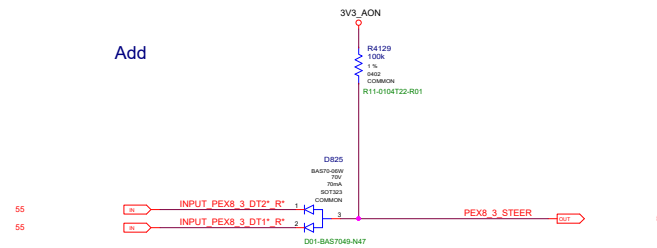




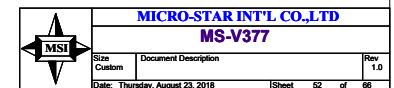
PS: Input Switch Rail Balance



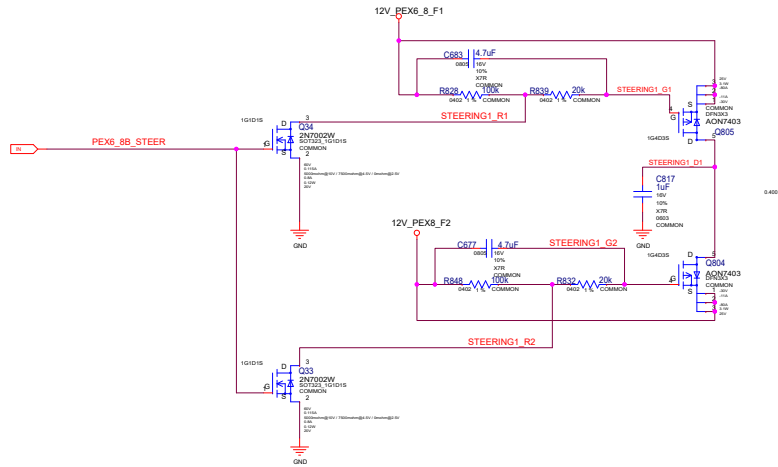
Add



Remove NVVDD VIN change circuit

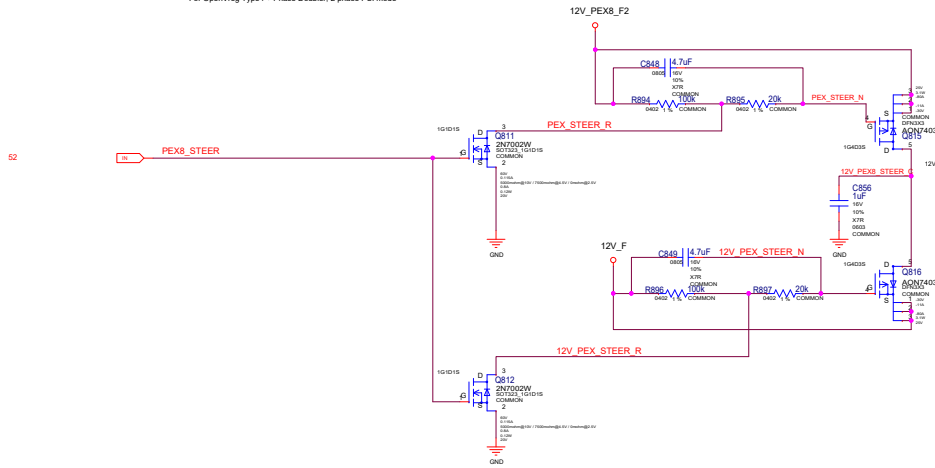


12V CURRENT STEERING (UNDER POWER BOOT):
GUIDES CURRENT FROM PEX EDGE TO PEX 6/8 PIN INPUT AREA

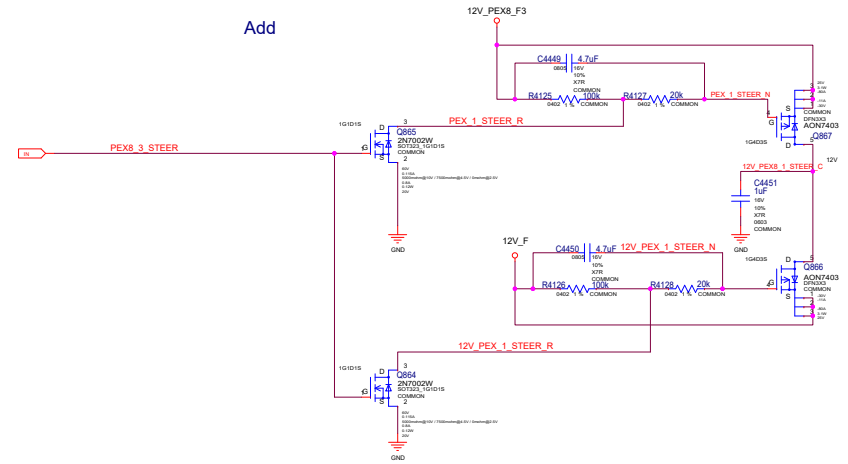


12V CURRENT STEERING (UNDER POWER BOOT):
GUIDES CURRENT FROM PEX EDGE TO PEX 8 PIN INPUT AREA

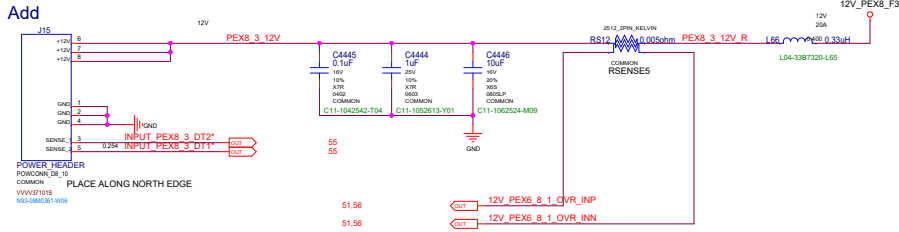
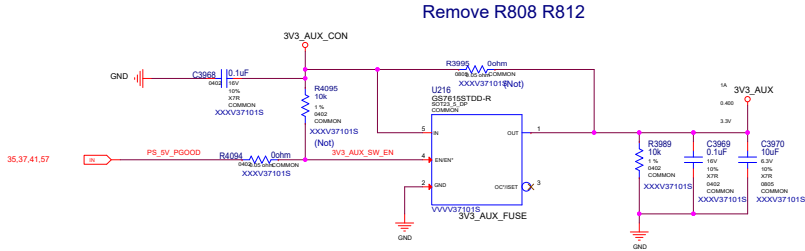
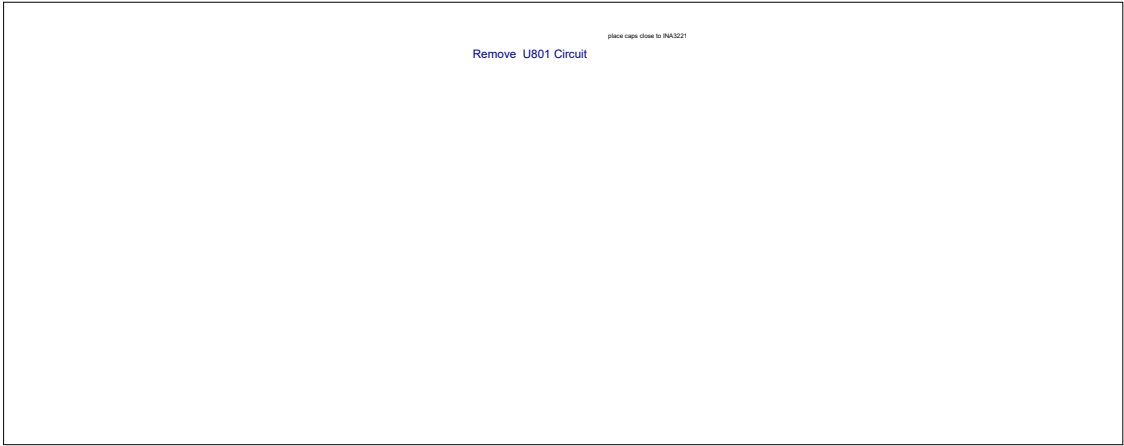
For OpenVing Type4 + Phase Doubler, 2 phase PSI mode



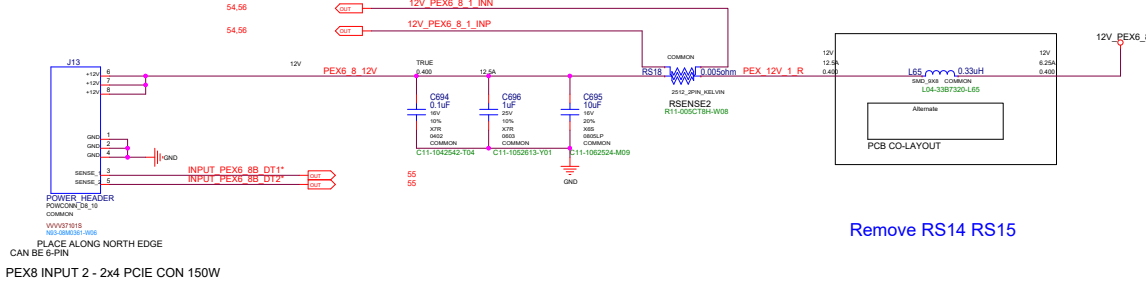
Add



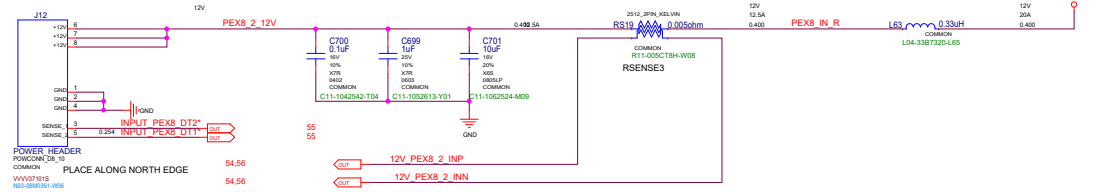
PS: Inputs, Filtering, and Monitoring



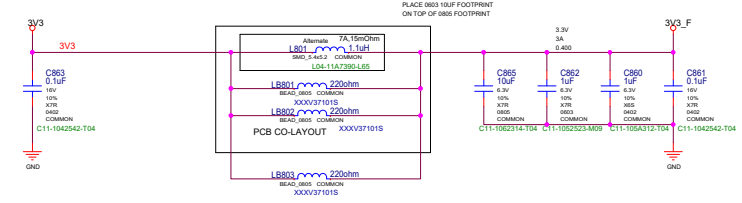
PEX8 INPUT 1 - 2x3 PCIE CON 75W



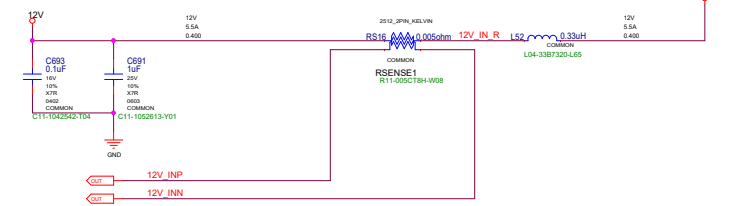
PEX8 INPUT 2 - 2x4 PCIE CON 150W



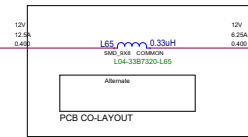
PEX 3V3 INPUT - 10W



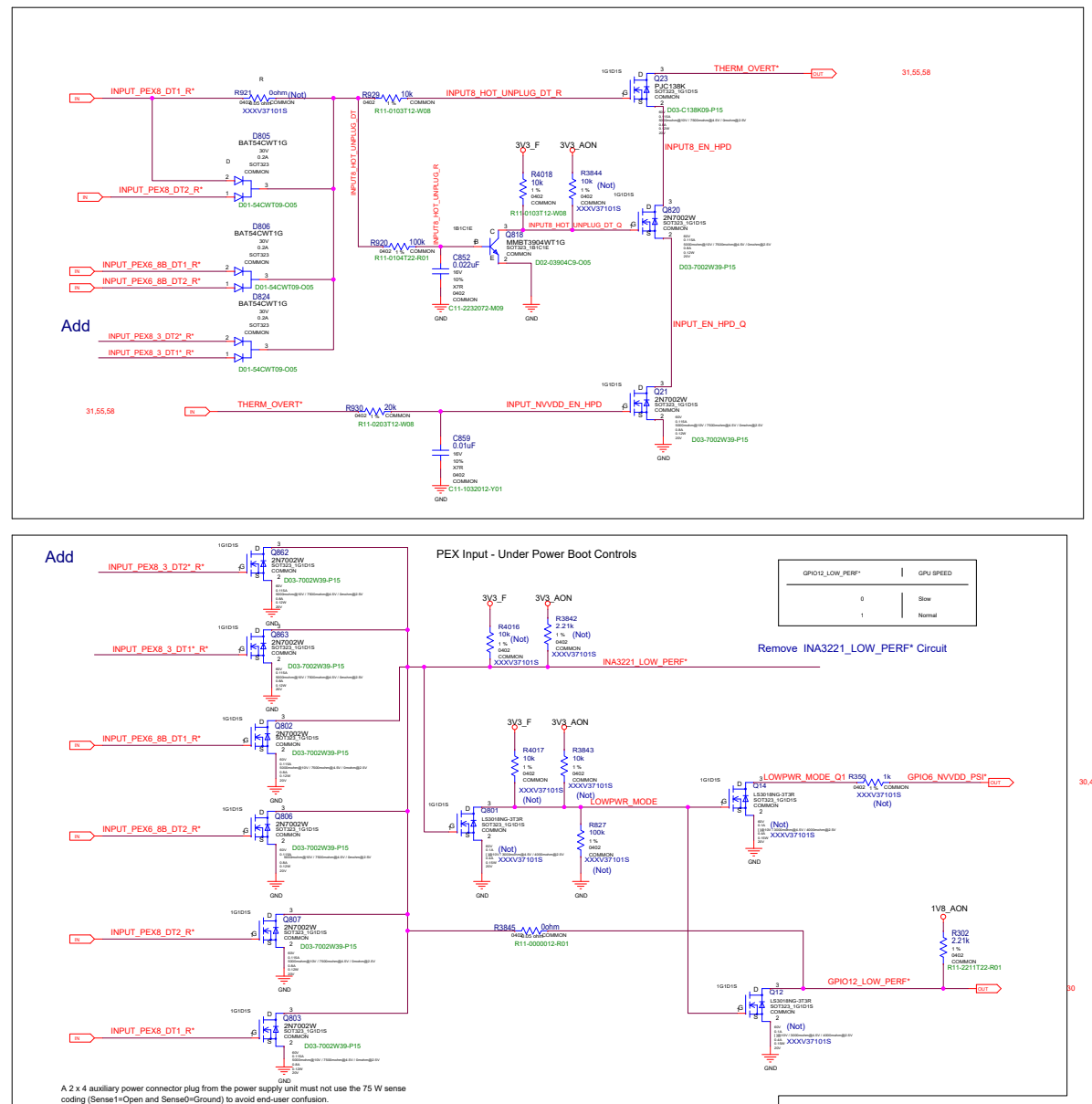
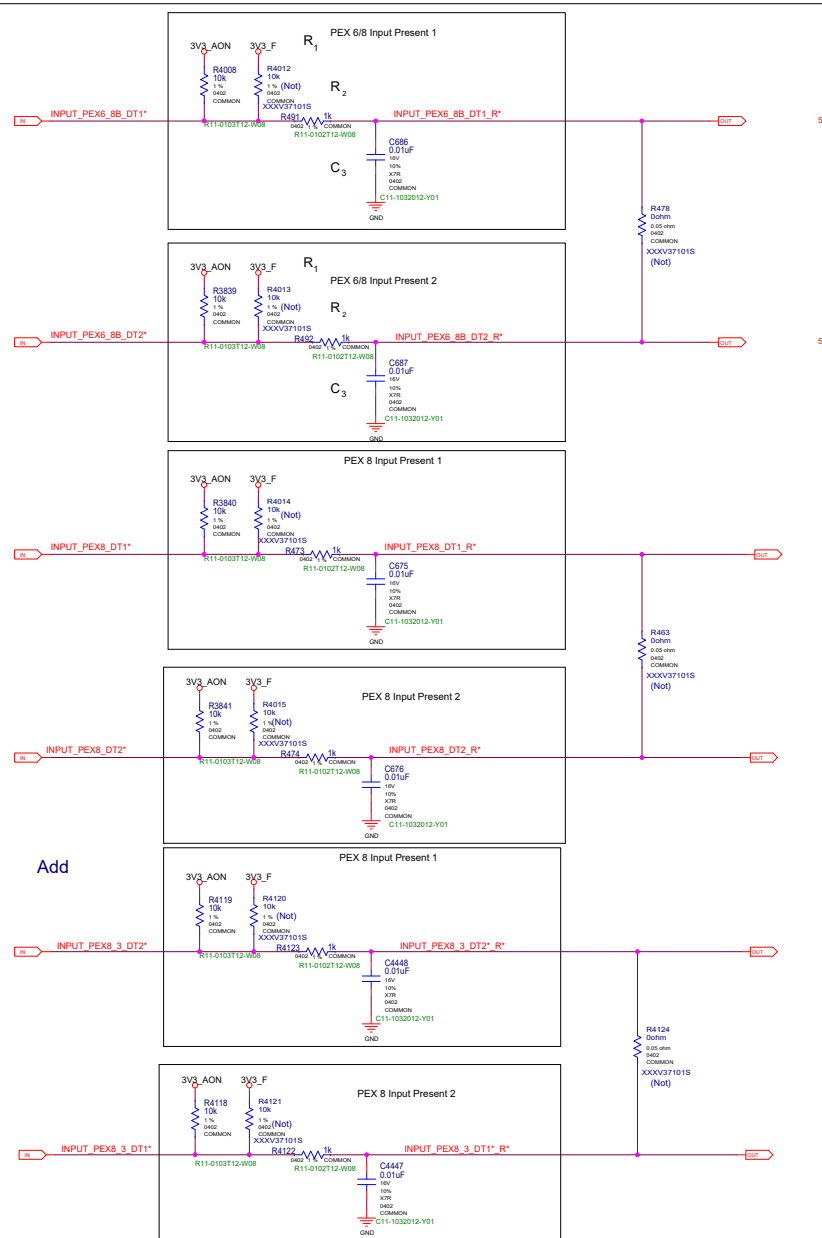
PEX 12V INPUT - 66W



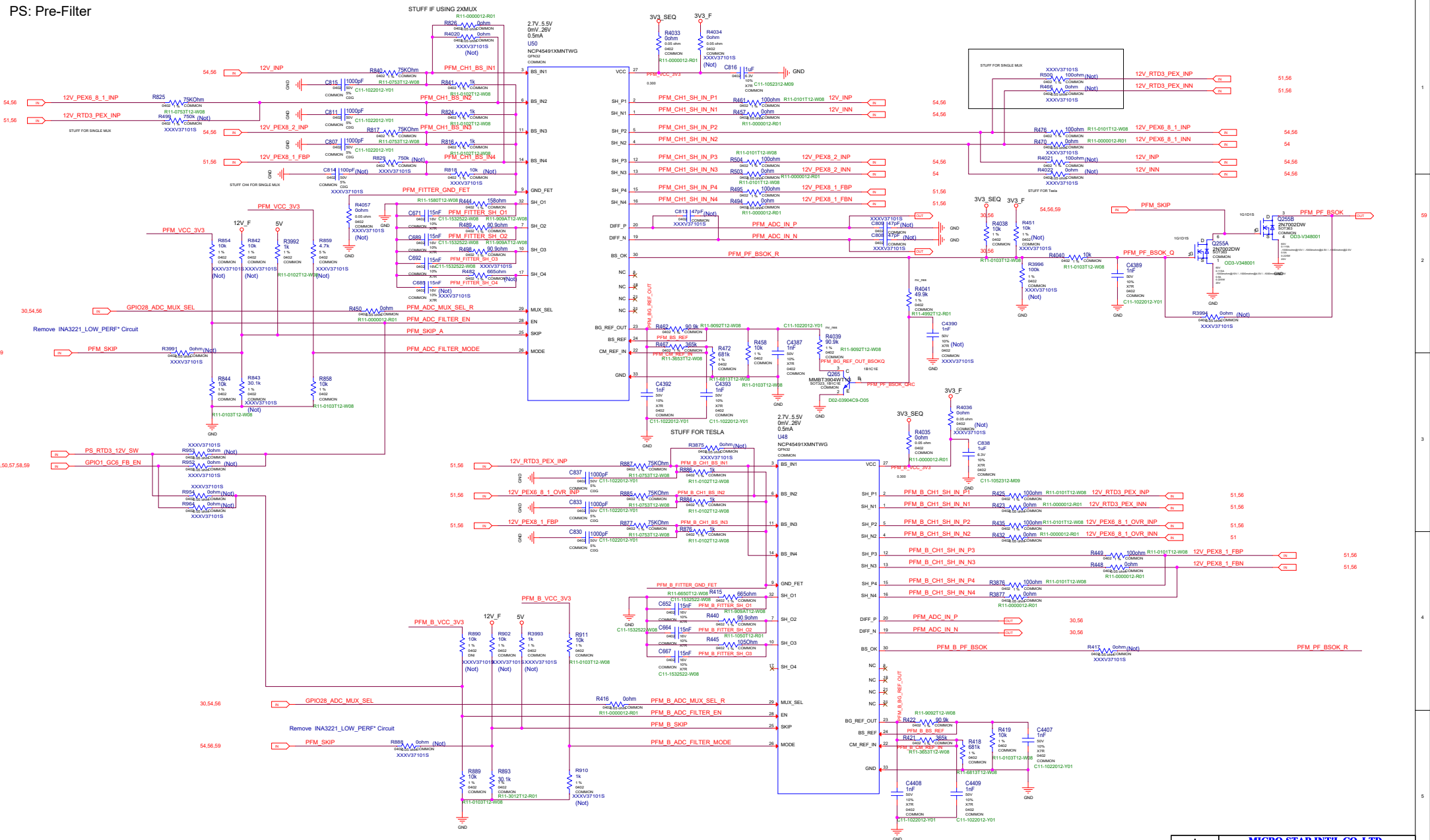
Remove RS14 RS15



PS: 12V Current Steering & Hot Unplug Detect



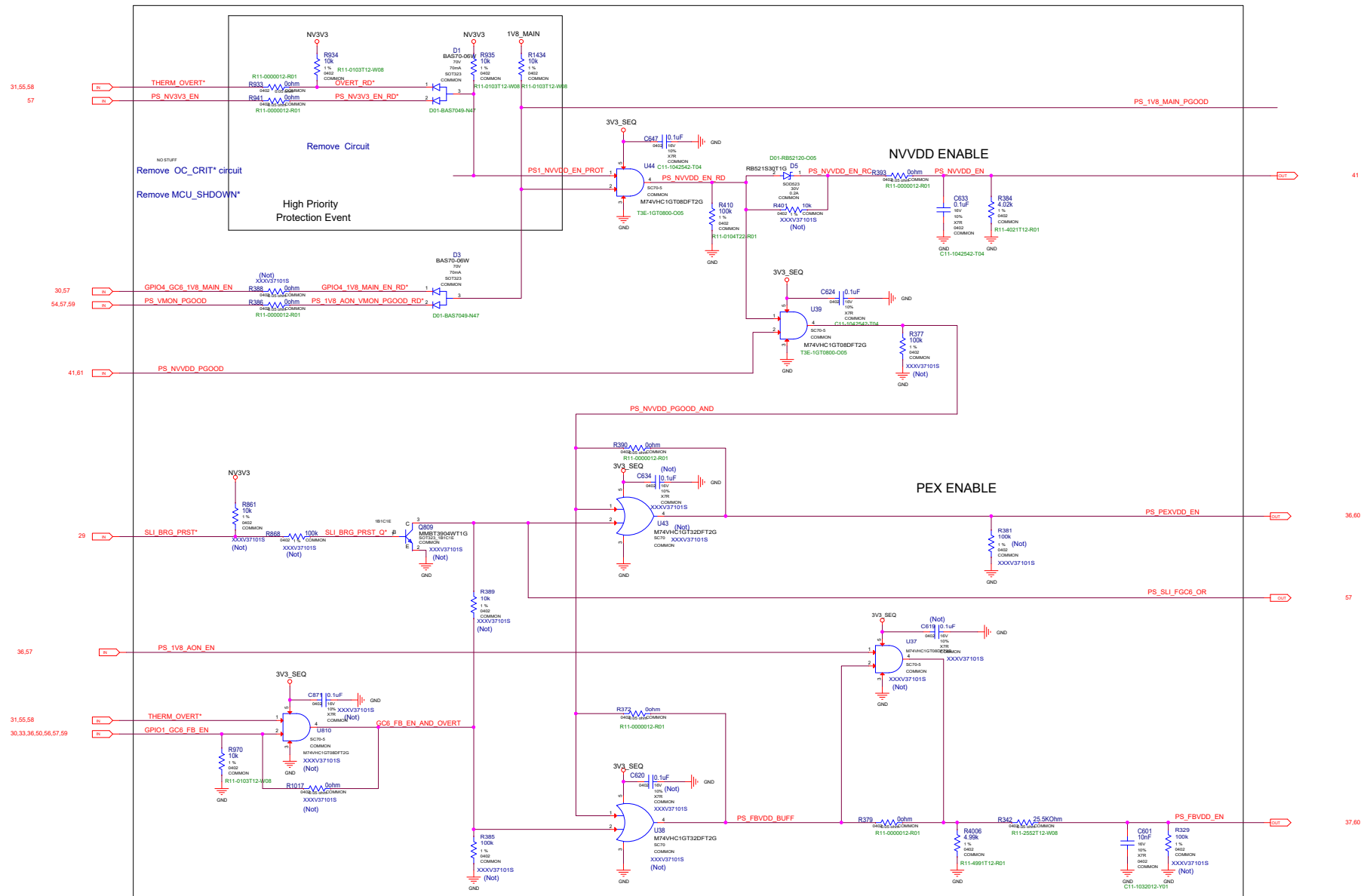
PS: Pre-Filter

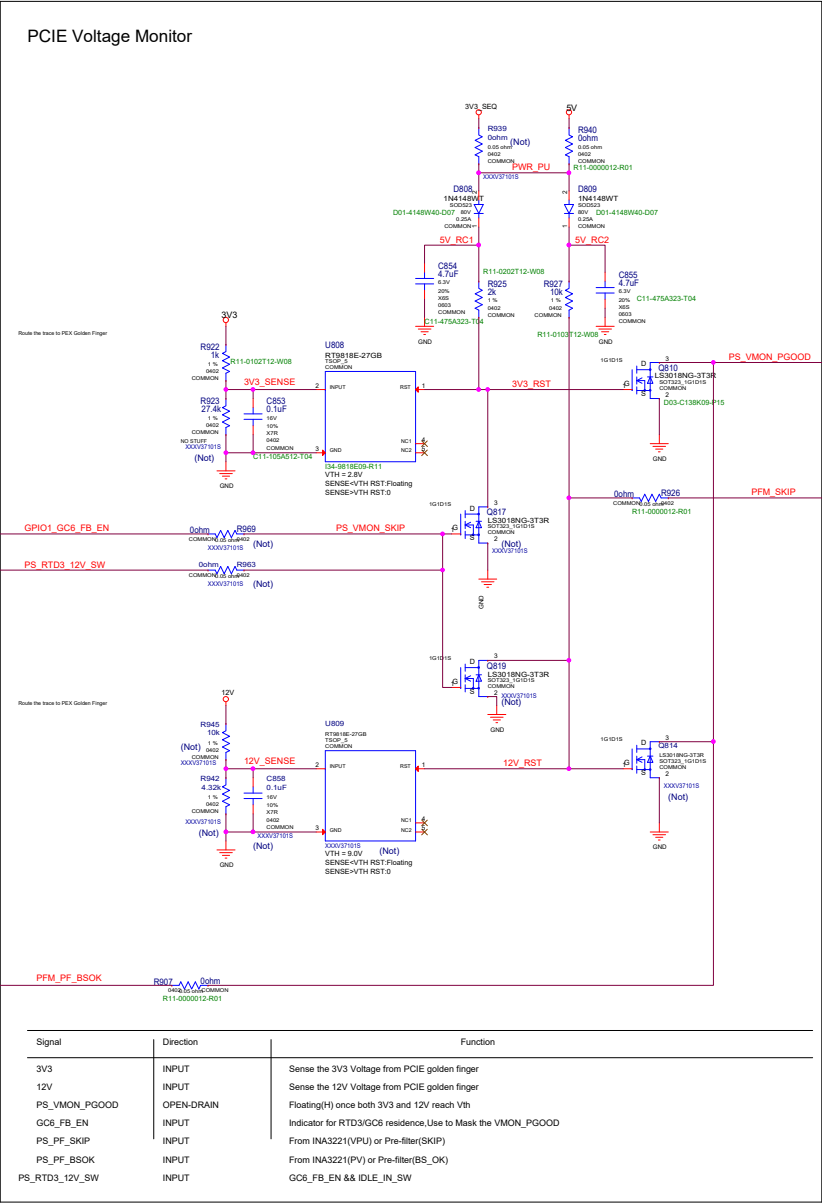


MICRO-STAR INT'L CO.,LTD
MS-V377

Size Custom	Document Description	Rev 1.0
Date: Thursday, August 23, 2018		Sheet 56 of 66

SEQUENCE:NV,PEX,FB ENABLE





BOM Configuration

OPTIONS	PEX3V3_SENSE	PEX12V_SENSE	OTHER_12V_SENSE
Use Pre-Filter	Pre-Filter NO STUFF U12 NO STUFF Q3,Q5 NO STUFF D15	Pre-Filter NO STUFF U13 NO STUFF Q4	Pre-Filter
Use INA3221	Voltage_Monitor	INA3221 NO STUFF U12 NO STUFF Q4	INA3221
NO INA3221 NO Pre-Filter	Voltage_Monitor	Voltage_Monitor	N/A

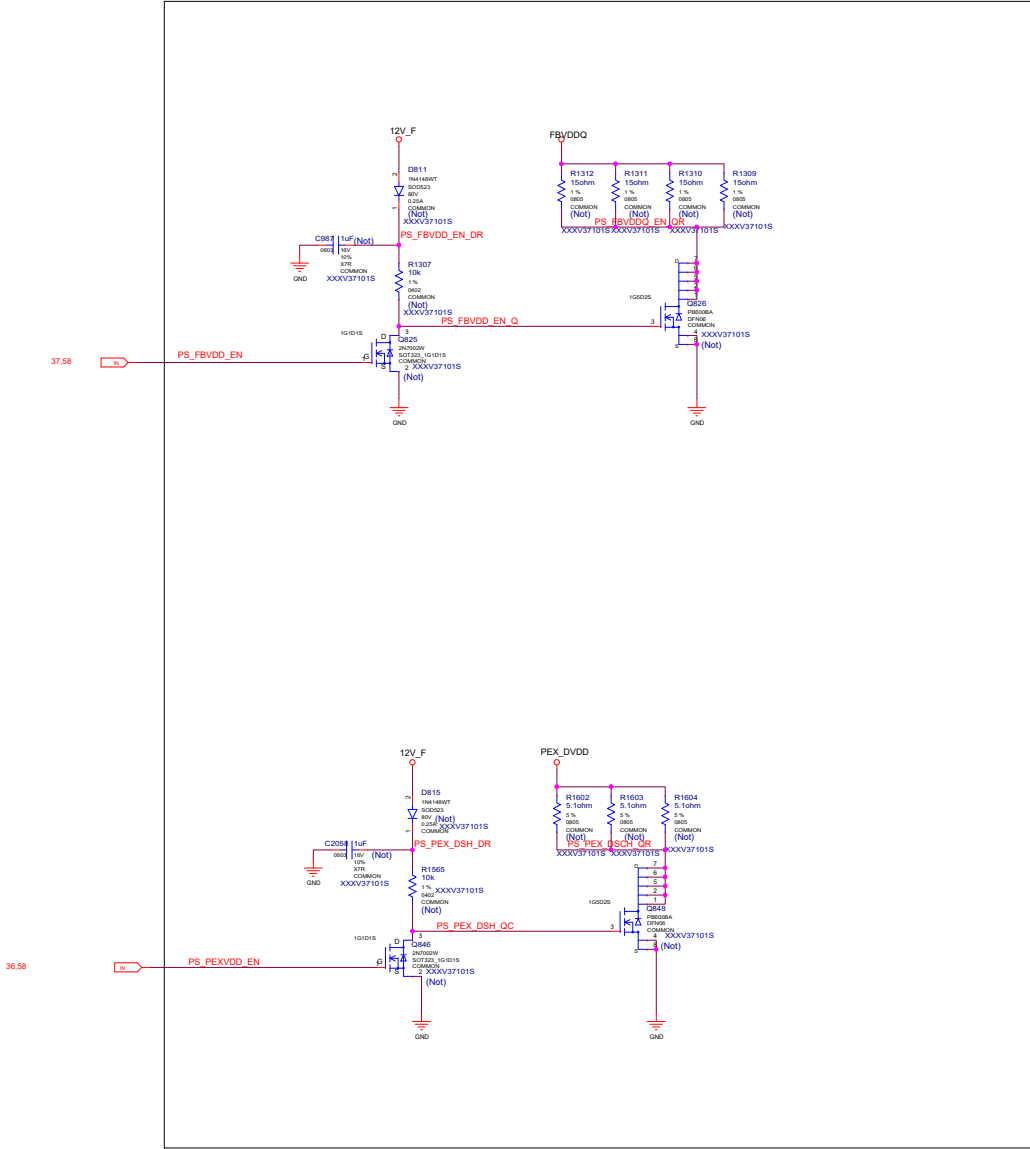
Power Supply

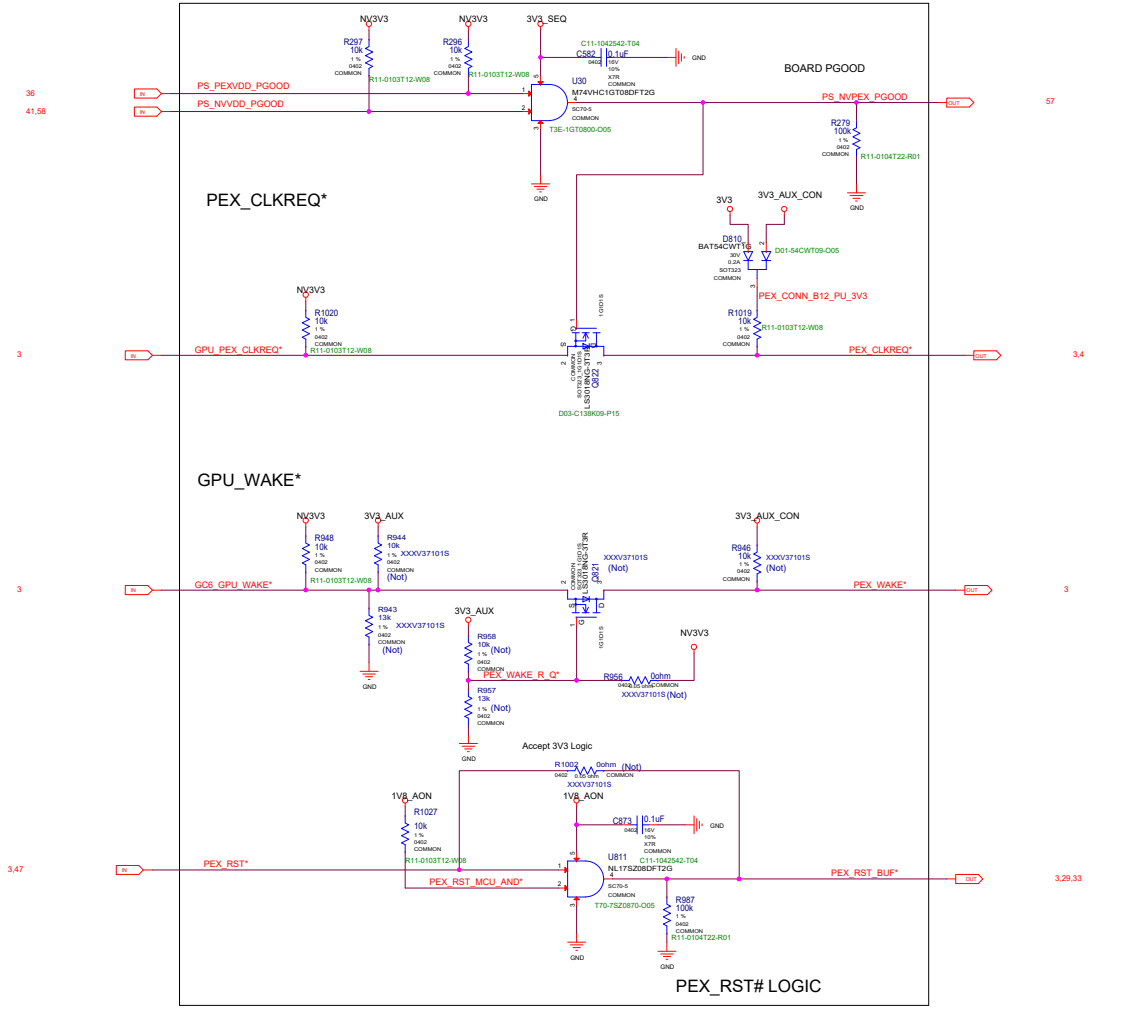
INA3221:3V3_SEQ

Pre_Filter(ADC_MUX):3V3(PEX)

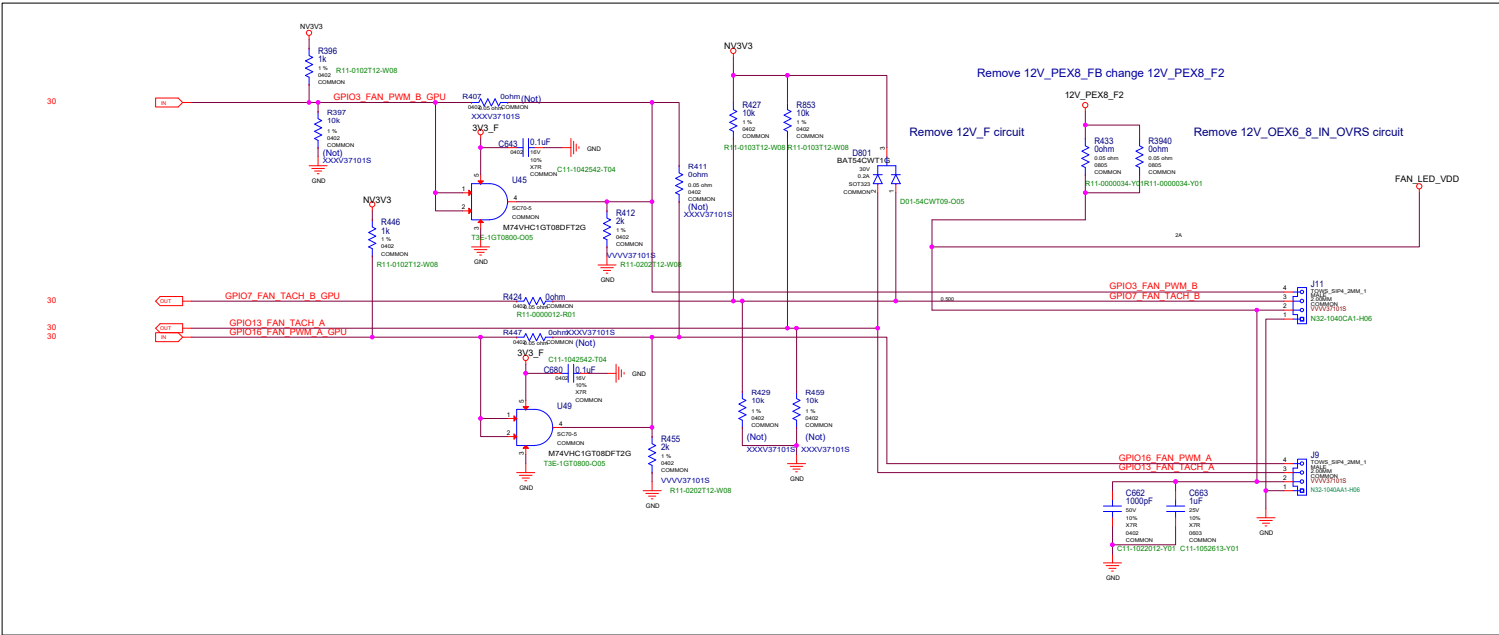
Dual Pre-Filter case:

Only use the Primary Pre-Filter to sense 3V3PEX
and All Input 12Vs





MISC: FAN

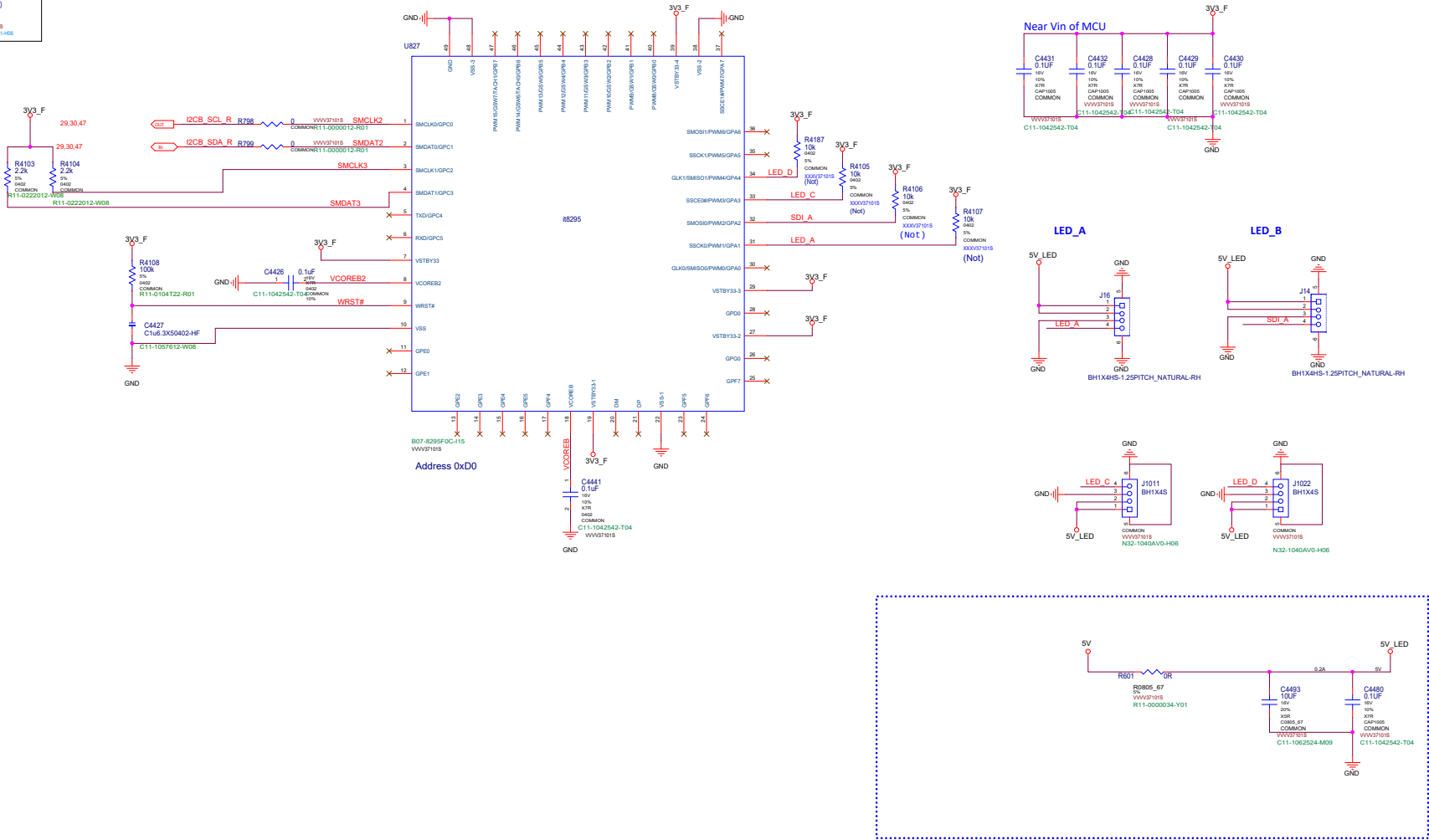
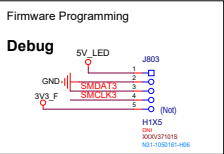


LED BOOST

Remove LED BOOST



MISC: LED2 LED_CONTROLLER_IT8295



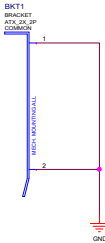
ZERO IDLE POWER MCU



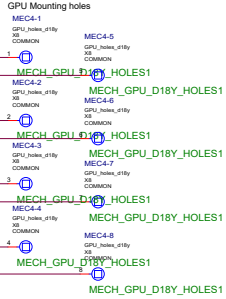
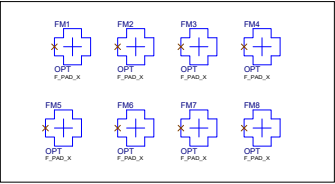
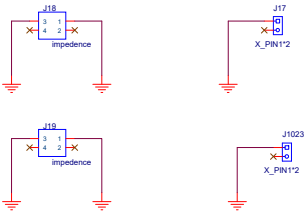
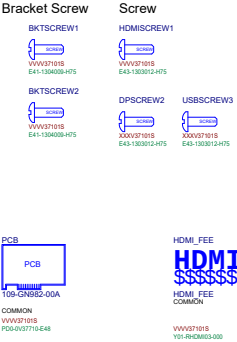
MICRO-STAR INT'L CO.,LTD		
MS-V377		
Size	Document Description	Rev
Custom		1.0
Date: Tuesday, August 21, 2018		Sheet 64 of 66

Mechanical: Bracket/Thermal Solution

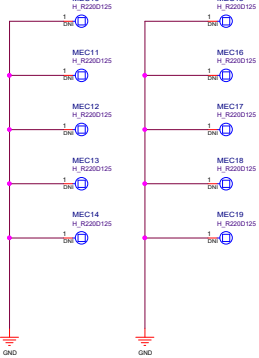
Brackets:



Bracket Screw



Mechanical Holes Symbol



VR THERMAL PROTECTION

41,42,43,44,45

IN

PS_NVVDD_TMON

R313

0ohm

0404 0.0000012 R01

R11-0000012 R01

37,39,40

IN

PS_FBVDD_TMON

R341

0ohm

0404 0.0000012 R01

R11-0000012 R01



MICRO-STAR INT'L CO.,LTD		
MS-V377		
Size	Document Description	Rev
Custom	VR THERMAL PROTECTION	1.0
Date: Thursday, August 23, 2018		Sheet 08 of 08