AmP72XX Evaluation Board

AmP7220BEB, AmP7202BEB

Features

- Demonstrates PMIC functionality in an On-Demand AmP8DB6 IC
  - One DrMOS Buck Regulator
  - One 10A Synchronous Buck Regulator
  - One 6A Synchronous Buck Regulator
  - Two LDOs (AmP7220BEB) or two Load Switches (AmP7202BEB)
  - Four 0.2A auxiliary LDOs: 1.2V, 1.8V, 2.5V, 3.3V
  - Sequencing
- WebAmP™ Tool Downloads Configuration Files:
  - .HAX file to configure the device directly
  - .HEX file (Intel HEX) to program on-board flash

Description

The AmP7220BEB and AmP7202BEB are ready to use Evaluation Boards to evaluate the Dual-Buck, DrMOS, LDO and LDSW Power Components when configured in the AmP8DB6 PMIC.

Optionally, the Bucks may be modified as needed by the WebAmP tool and downloaded over the USB cable. The .HAX file downloads to the AmP8DB6 On-Demand PMIC while the .HEX file downloads to the flash memory. Functionality may be extended using On-Demand WebAmP tools. For additional information, please check the following link: https://www.andapt.com/docs

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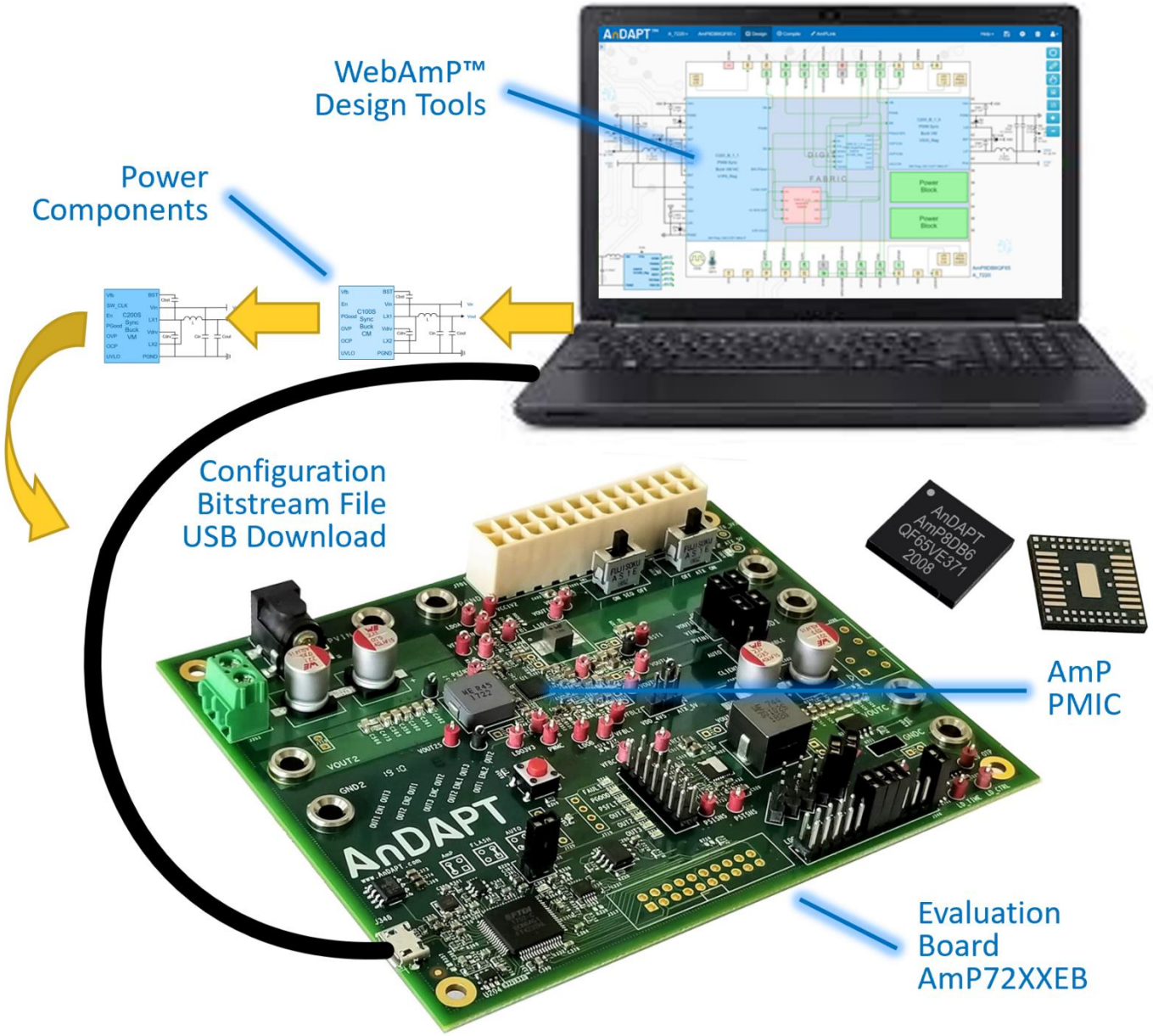
Application of Evaluation Board



Getting Started: Power Up

Step 1. Set jumpers to the default FLASH-to-PMIC and PMIC-is-HOST configurations highlighted in green on the Jumper Selection Table. Set switch SW1 RIGHT (off) as shown below.

Step 2. Connect 12V power supply to PV_{IN} Plug.

Step 3. Turn ON board by switching SW1 LEFT (on).

Step 4. Measure buck output voltages on the V_{OUT} and and V_C terminals. (1.2V default).

To change parameters:

Step 5. Open WebAMP tool from AnDAPT web site

Step 6, Import default design: AmP7220BEB_1PhDrMOS_syncBuck2x_LDO2x.json

Step 7 Modify buck output voltages on V_{OUT} and V_C

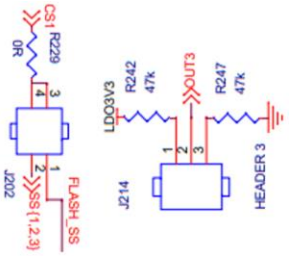
Step 8 Set jumpers to USB-to-PMIC and PMIC-is-CLIENT configurations as shown the Jumper Table. Use USB cable to program new V_{OUT1}, V_{OUT2}, and V_{OUTC}.

Jumper Selection Table for J202 and J214

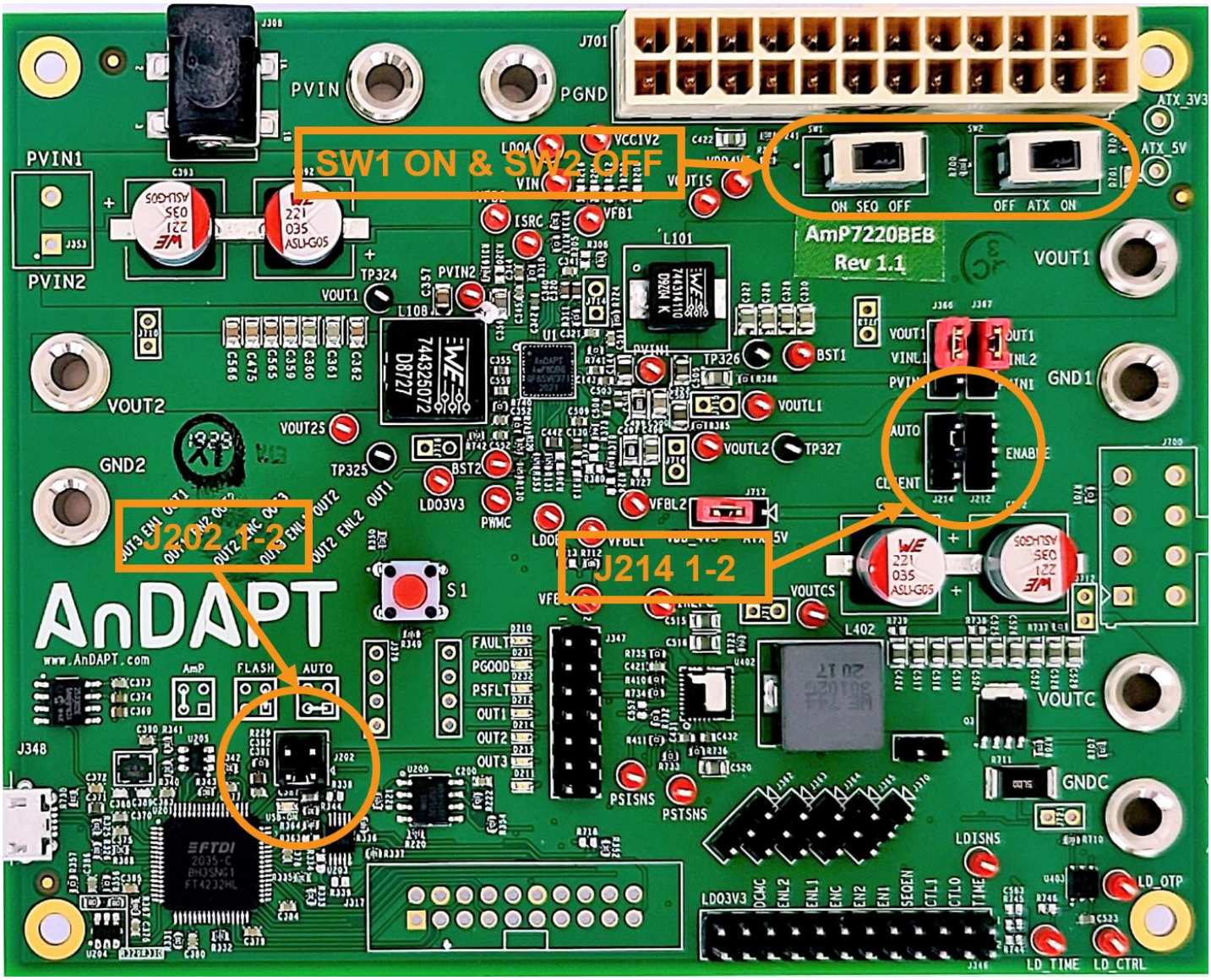
Function	Header	Jumper	Operation
Chip Select	J202	2-4	USB to PMIC
		1-3	USB to FLASH
		1-2	FLASH to PMIC*
Mode	J214	1-2	PMIC is HOST*
		2-3	PMIC is CLIENT

*for FLASH to AmP, use AmP is HOST

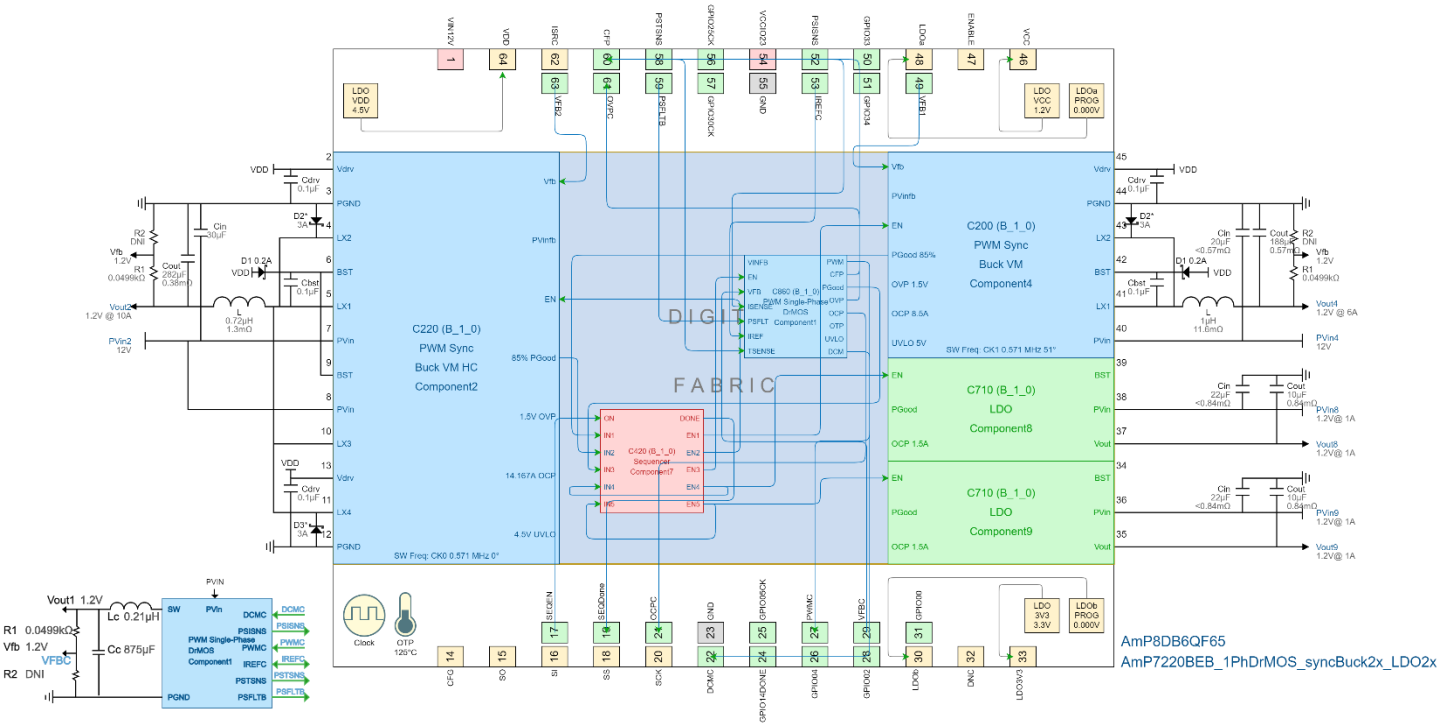
Schematic view of Jumper Pins



PMIC Power Up Jumper and Switch Settings



WebAmP™ AmP7220BEB_1PhDrMOS_syncBuck2x_LDO2x.json Design Example A

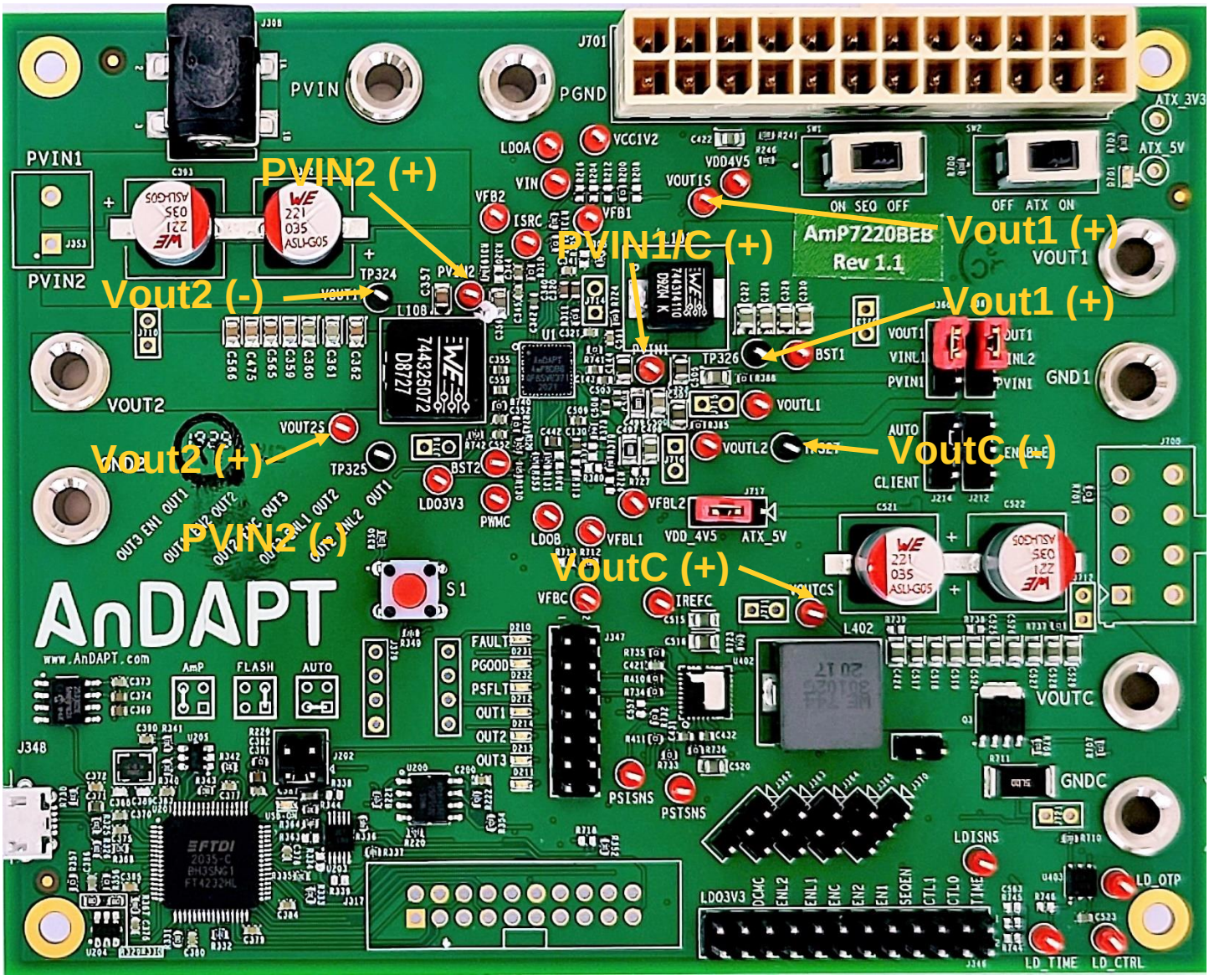


Measuring Board Performance

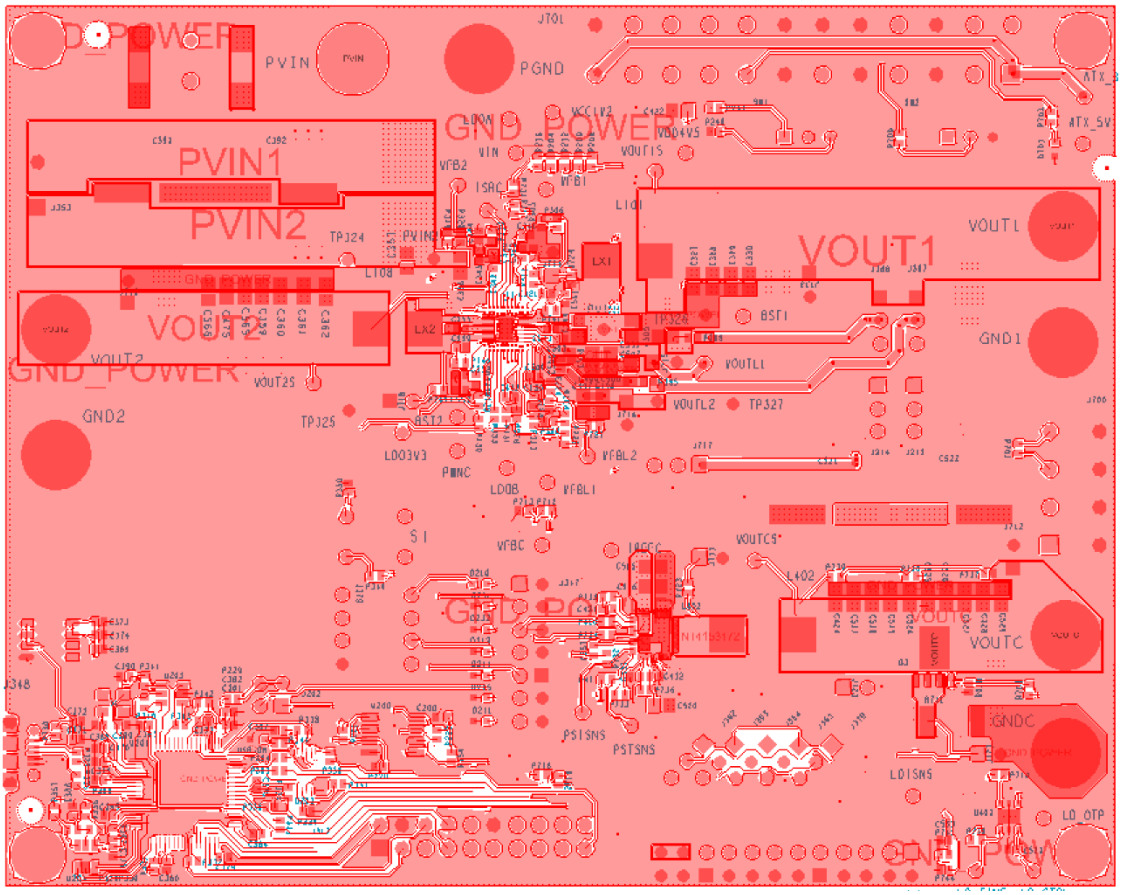
There are various performance measurements that are typically made on an evaluation board. Many of these measurements require careful measurements with key test points that are often different for various measurements, for example the best place to sense Vout for ripple or transient is different from the point used to measure efficiency.

Efficiency Instrumentation

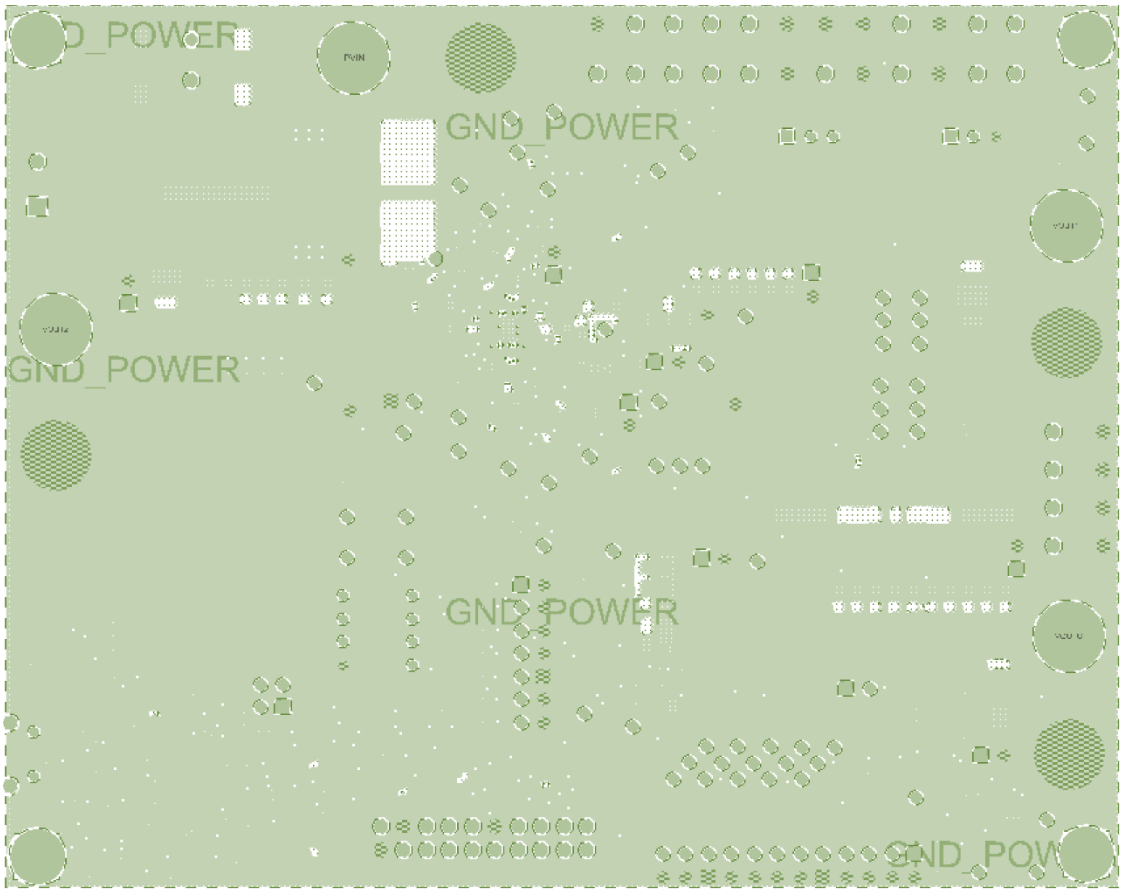
In order to measure efficiency on the AmP72XX Eval Board, care must be taken to appropriately sense the voltages. The Eval Board has included test points to measure efficiency for each of the switching regulators: the 6 Amp Buck regulator (Vout1), the 10 Amp Buck regulator (Vout2), and the 30A DrMOS based Buck Regulator (VoutC). The figure below shows the test points.



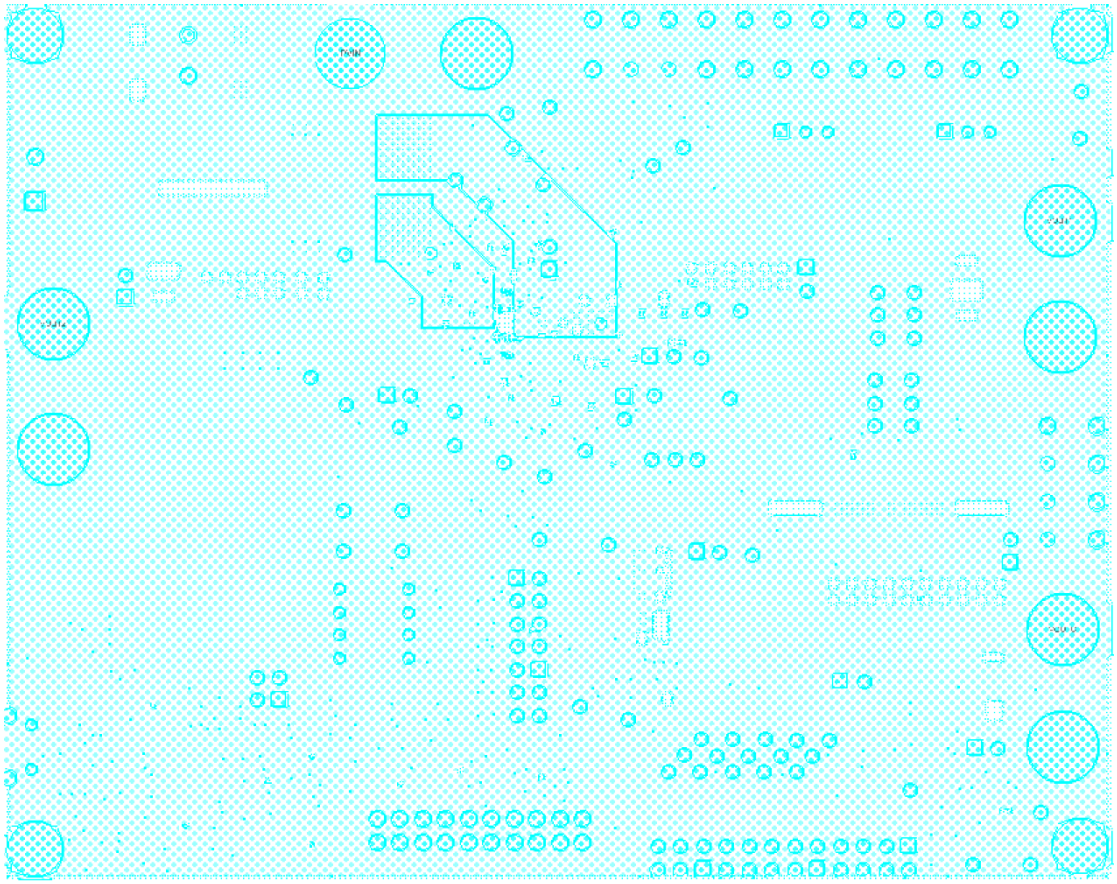
PCB Top Layer with Silk Screen



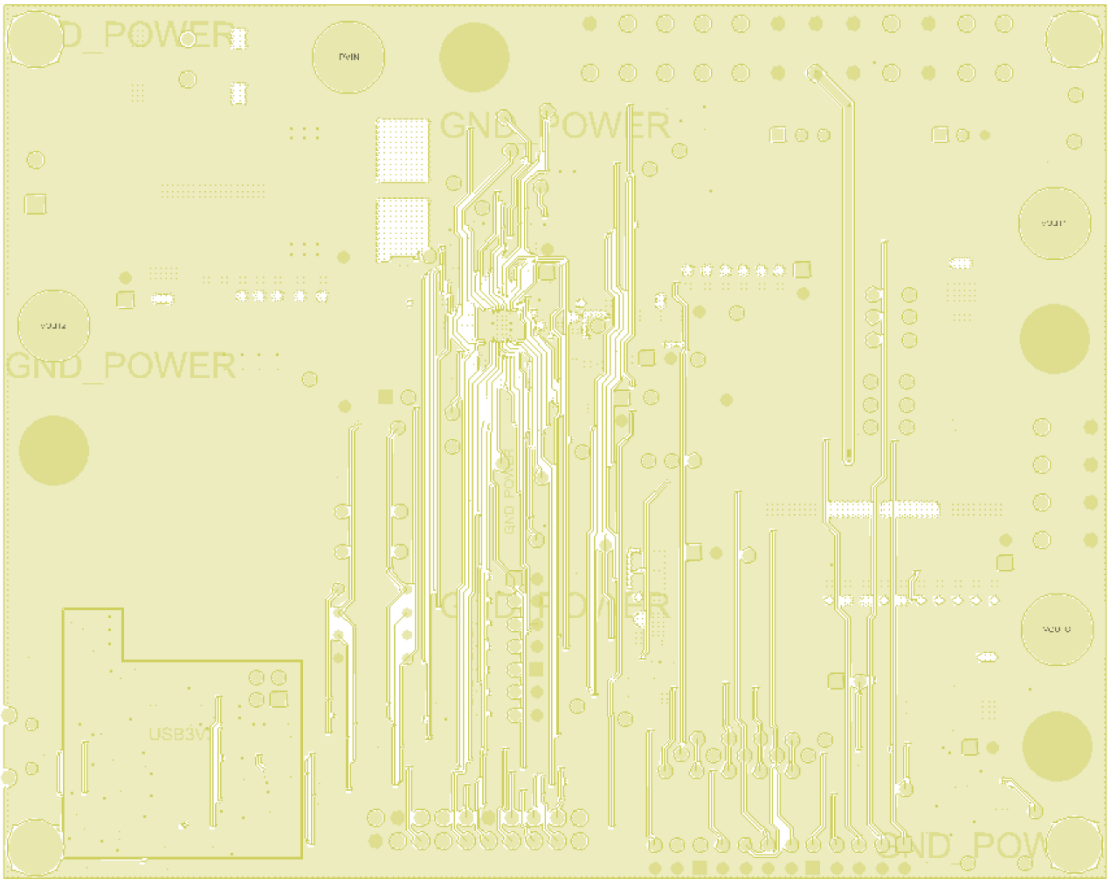
PCB Layer 2 GND



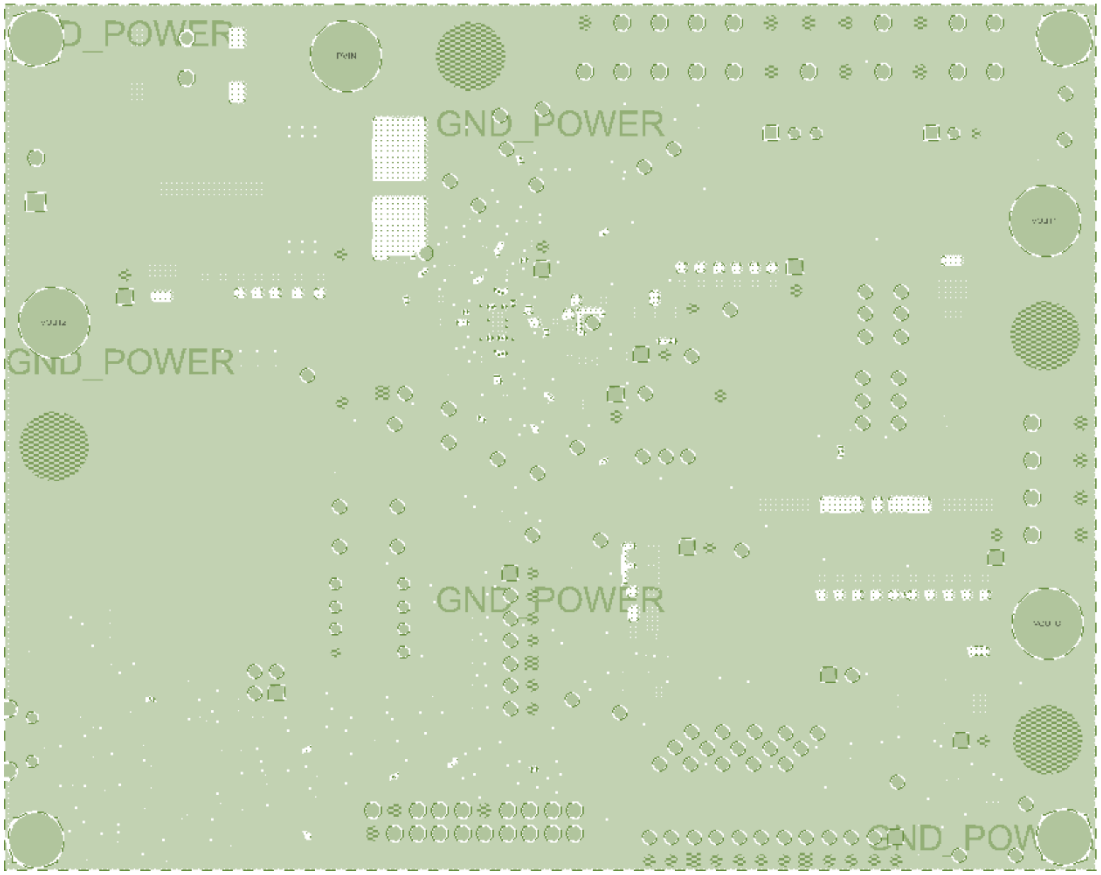
PCB Layer 3 PVIN



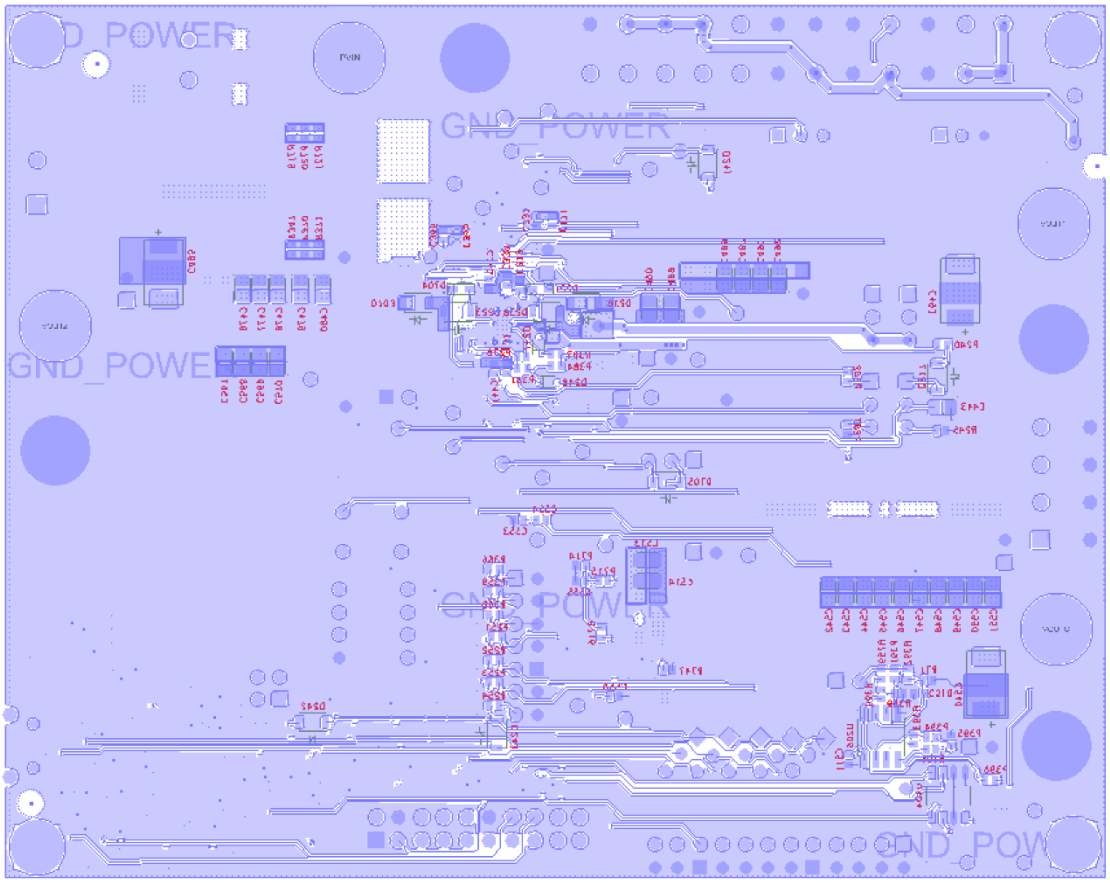
PCB Layer 4



PCB Layer GND2



PCB Bottom Layer with Silk Screen



Bill of Materials

Item	Qty	Reference	Value	Manufacturer
1	82	ATX_5V,ATX_3V3,C171,R204,	DNI	
		R208,R212,R216,D238,D241,		
		D243,D247,D248,R305,J317,		
		R320,C331,R338,R339,C339,		
		C365,C366,R369,		
		R374,R378,R380,R381,R384, R387		
		C441, C443, C477,C478,C479,		
		C480,C487,C488,C489,C490,		
		C491,C492,C493,C495,C540,		
		C553,C554,C555,C557,C558,		
		C563,C567,C568,C569,C570,		
		J700,D705,J710,J711,J712,		
		R713,J713,R714,J714,R715,		
		J715,R716,J716,R718,J718,		
		J719,J720,J721,R726,R727,		
		R739,R744,R745,R746,		
		R747, R313, R334, R363, R240,R738,		
2	29	VOUTL1,VOUT1S,VFBL1,VFB1,	TP_RED	36-5000-ND
		PVIN1,BST1,VOUTL2,VOUT2S,		
		VFBL2,VFB2,PVIN2,BST2,		
		VCC1V2,LDO3V3,VDD4V5,		
		VOUTCS,VIN,VFBC,PWMC,		
		PSTSNS,PSISNS,LD_TIME,		
		LD_OTP,LD_CTRL,LDOB,LDOA,		
		LDISNS,ISRC,IREFC		
3	12	C130,C131,C319,C320,C340,	10u	490-7202-1-ND (0603)
		C342,C343,C369,C371,C374,		https://www.digikey.com/products/en?keywords=490-7202-1-ND
		C382,C442		
4	9	C143,C355,C431,C432,	1u	490-12321-1-ND
		C503,C506,C508,C509,		
		C523		
4.1	1	C422,	CAP CER 0.1uF 50V X7R 0805	732-8080-1-ND Wurth P/N: 885012207098
5	11	C144,C353,C356,C357,	22u	490-10749-1-ND
		C505,C507,C513,C514,		
		C515,C516,C520		
5.1	2	C497, C499	3KOhm resistor	0805 1% resistor, any supplier
6	26	C200,C321,C341,C345,C352,	CAP CER 0.1uF 50V X7R 0603	732-8013-2-ND Wurth P/N: 885012206095
		C370,C372,C373,C375,C376,		
		C377,C378,C379,C380,C381,		
		C383,C384,C385,C386,C387,		
		C390,C421,C510,C511,C552,		

		C561		
7	34	C327,C328,C329,C330,C359,	CAP CER 47uF 6.3V X5R 0805	732-7617-2-ND Wurth P/N: 885012107006
		C360,C361,C362,C424,C498,		
		C500,C517,C518,C519,C524,		
		C525,C526,C527,C528,C529,		
		C542,C543,C544,C545,C546,		
		C547,C548,C549,C550,C551,		
		C565,C566, C475, C476		
8	1	C344	CAP CER 4.7UF 25V X5R 0603	490-7203-1-ND
9	2	C388,C389	27p	399-1054-6-ND
10	4	C392,C393,C521,C522	CAP 220 uF 20% 35 V	732-8513-1-ND Wurth P/N: 865080553014
11	1	C559	CAP CER 0.22uF 25V X5R 0603	732-7916-1-ND Wurth P/N: 885012106019
12	1	D210	LED-RED	732-4978-6-ND Wurth P/N: 150060RS75000
13	8	D211,D212,D214,D215,D231,	LED-GREEN	732-4971-6-ND Wurth P/N: 150060GS75000
		D232,D701,USB-ON		
14	2	D217,D242	DNI	
15	3	D218,D223,D703	3A	DB2W40300LDKR-ND
16	2	D221,D704	200mA	RB521S30T5GOSCT-ND
17	8	VOUT1,GND1,VOUT2,GND2,	BANANA-4MM	BKCT2224-ND
		VOUTC,PVIN,PGND,GNDC		
18	1	J202	HEADER 2X2	732-5294-ND Wurth P/N: 61300421121
19	10	J212,J214,J362,J363,J364,	HEADER 3	732-5316-ND Wurth P/N: 61300311121
		J365,J366,J367,J370,J717		
20	1	J308	CONN JACK PWR	732-5933-6-ND Wurth P/N: 694108106102
21	1	J346	HEADER 12X2	S2012EC-20-ND
22	1	J347	HEADER 7X2	S2012EC-20-ND
23	1	J348	USB_CONN	609-4618-6-ND
24	1	J353	DNI	277-1667-ND
25	1	J701	CON24B	A127799-ND
26	1	L101	FIXED IND 1.1UH 15A 3.15 MOHM	732-1157-1-ND Wurth P/N: 744314110
27	1	L108	FIXED IND 720nH 22A 1.3 MOHM SMD	732-1165-1-ND Wurth P/N: 744325072
28	1	L402	FIXED IND 250nH 38A 0.32 MOHM	732-2999-1-ND Wurth P/N: 744301025
29	1	Q3	BUK7Y10-30B.115	1727-4602-1-ND
30	1	RT1	47k/B=4131K	490-18159-1-ND
31	4	R129,R130,R131,R353	34R	0603 1% resistor, any supplier
32	27	R200,R229,R310,R311,R347, R356,R357,	0R	0603 1% resistor, any supplier
		R370,R371,,R385,		
		R388,R410,R411,R701,R717,		

		R719,R720,R721,R732,R733,		
		R734,R735,R736,R740,		
		R741,R743, R737,		
33	5	R220,R221,R222,R247,R354	47k	0603 1% resistor, any supplier
34	11	R241,R246,R331,R343, R367,R395,R700,R708,R710, R329,R330	1k	0603 1% resistor, any supplier
35	19	R242,R251,R252,R253,R254,R333,	10k	0603 1% resistor, any supplier
		R335,R340,R341,R342,		
		R344,R350,R352,R359,R360,		
		R366,R368,R703,R731		
36	4	R306,R319,R373,R379	2k21	0603 1% resistor, any supplier
37	4	R325,R326,R707,R730	10R	0603 1% resistor, any supplier
38	1	R349	2k2	0603 1% resistor, any supplier
39	3	R336,R337,R364	68R	0603 1% resistor, any supplier
39.1	1	R332	220R	0603 1% resistor, any supplier
40	1	R389	3k	0603 1% resistor, any supplier
41	2	R245, R390	100k	0603 1% resistor, any supplier
42	2	R391,R392	33k	0603 1% resistor, any supplier
43	2	R393,R706	100R	0603 1% resistor, any supplier
44	1	R394	19k	0603 1% resistor, any supplier
45	1	R396	150R	0603 1% resistor, any supplier
46	1	R711	5m	RHM.005AUCT-ND
47	1	R712	49R9	0603 1% resistor, any supplier
48	3	R723,R724,R742	953R	0603 1% resistor, any supplier
49	2	SW1,SW2	AS1E-2M-10-Z	563-1582-ND
50	1	S1	1825910-7	450-1804-ND
51	4	TP324,TP325,TP326,TP327	TP_BLACK	36-5001-ND
52	1	U1	AMP8DSQF65	
53	1	U200	AT25DF512C	1265-1114-6-ND
54	1	U201	FT4232HL-Reel	768-1026-1-ND
55	1	U202	MCP1725	MCP1725-3302E/SN-ND
56	1	U203	TS3USB30E	296-25495-1-ND
57	1	U204	SN74LVC2G07	296-13494-1-ND
58	1	U205	93LC46BT-I/OT	93LC46BT-I/OTCT-ND
59	1	U206	TSH82	497-6781-1-ND
60	1	U402	SiC645A	SIC645ALR-T1-GE3-ND AnDAPT supply
61	1	U403	LM5112SDX	LM5112SDX/NOPBCT-ND
62	1	U404	DNI	DS1050Z-001+ND
63	1	X1	12MHz	1253-1168-1-ND
64	1	J725	2-pin HEADER - 2POS 2.54MM	732-5315-ND Wurth P/N: 61300211121

Additional Resources

- AmP Platform Datasheet
- AmPLink Configuration and Control

Revision History

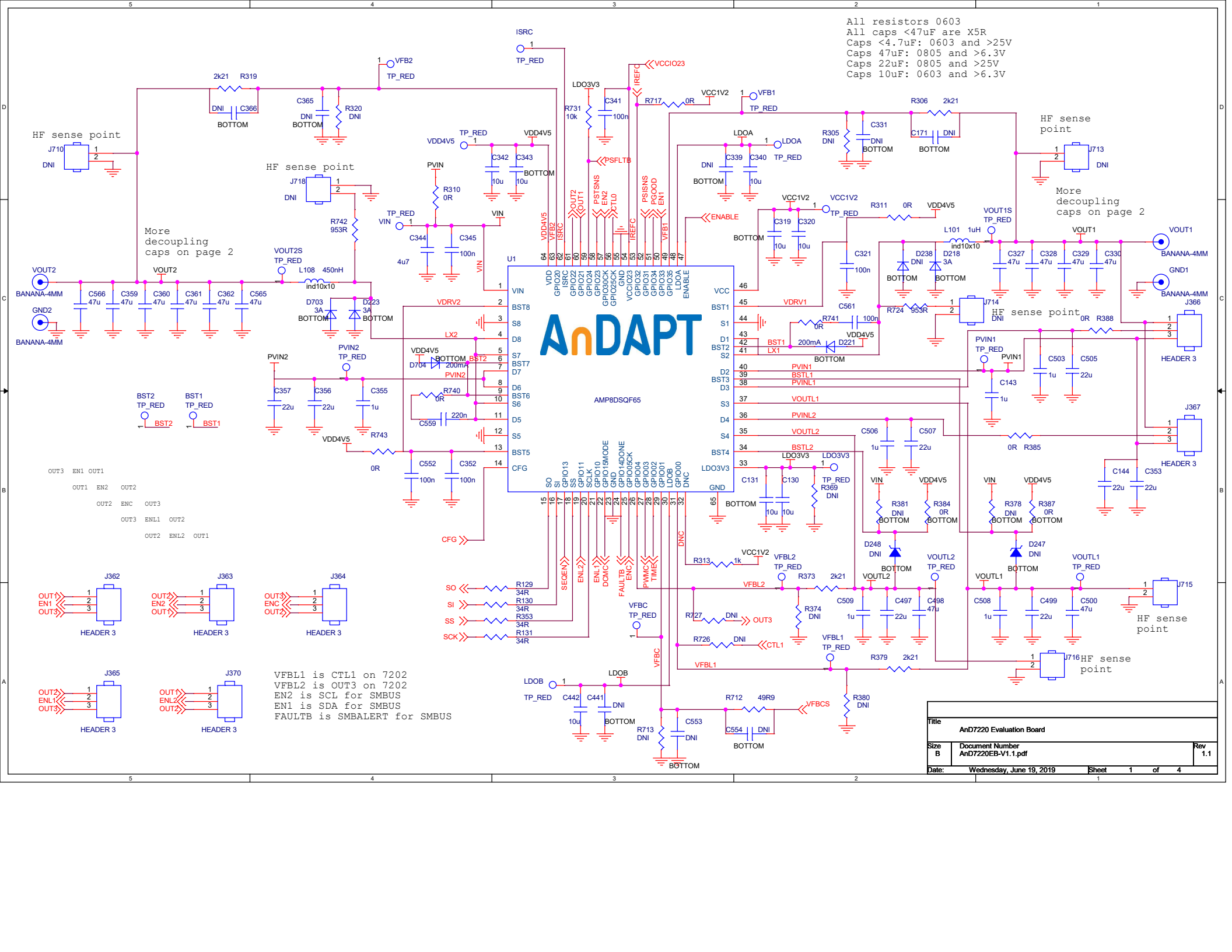
Date	Revision
02/21/2022	Added Measuring Board Performance and searchable schematic
06/06/2021	Updated Getting Started: Step 8
06/01/2021	Updated Getting Started: Power Up with default design
07/17/2020	Schematic, PCB Layers and BoM updated to V1.1
04/01/2019	Changed MASTER, SLAVE to HOST, CLIENT
04/01/2019	Initial

AnDAPT

On-Demand Power Management

https://www.andapt.com

Trademarks


All resistors 0603
All caps <47uF are X5R
Caps <4.7uF: 0603 and >25V
Caps 47uF: 0805 and >6.3V
Caps 22uF: 0805 and >25V
Caps 10uF: 0603 and >6.3V
HF sense point
More decoupling caps on page 2
AnDAPT
AMP8DSQF65
U1
VFBL1 is CTL1 on 7202
VFBL2 is OUT3 on 7202
EN2 is SCL for SMBUS
EN1 is SDA for SMBUS
FAULTB is SMBALERT for SMBUS
Title
AnD7220 Evaluation Board
Document Number
AnD7220EB-V1.1.pdf
Rev
1.1
Size
B
Date:
Wednesday, June 19, 2019
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1
of
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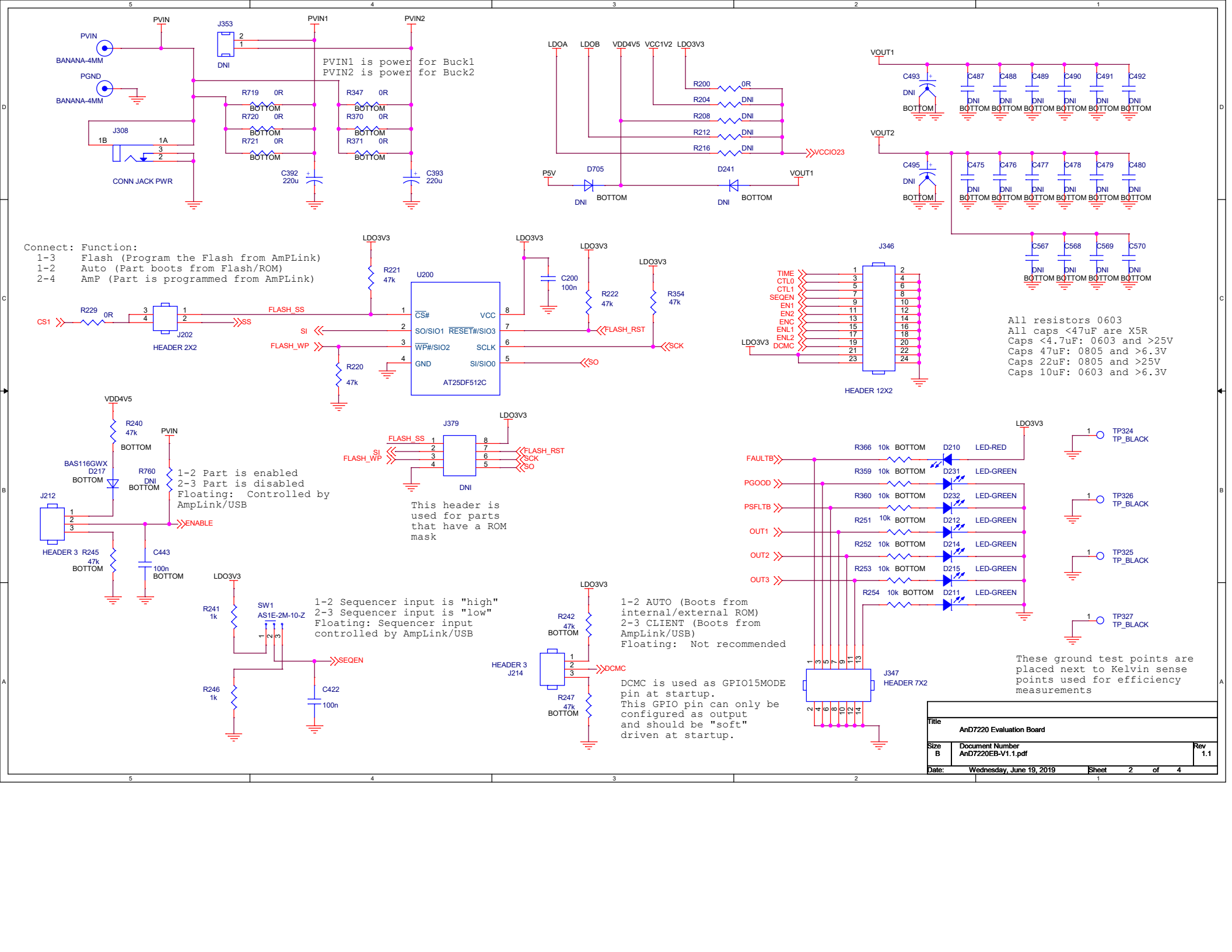
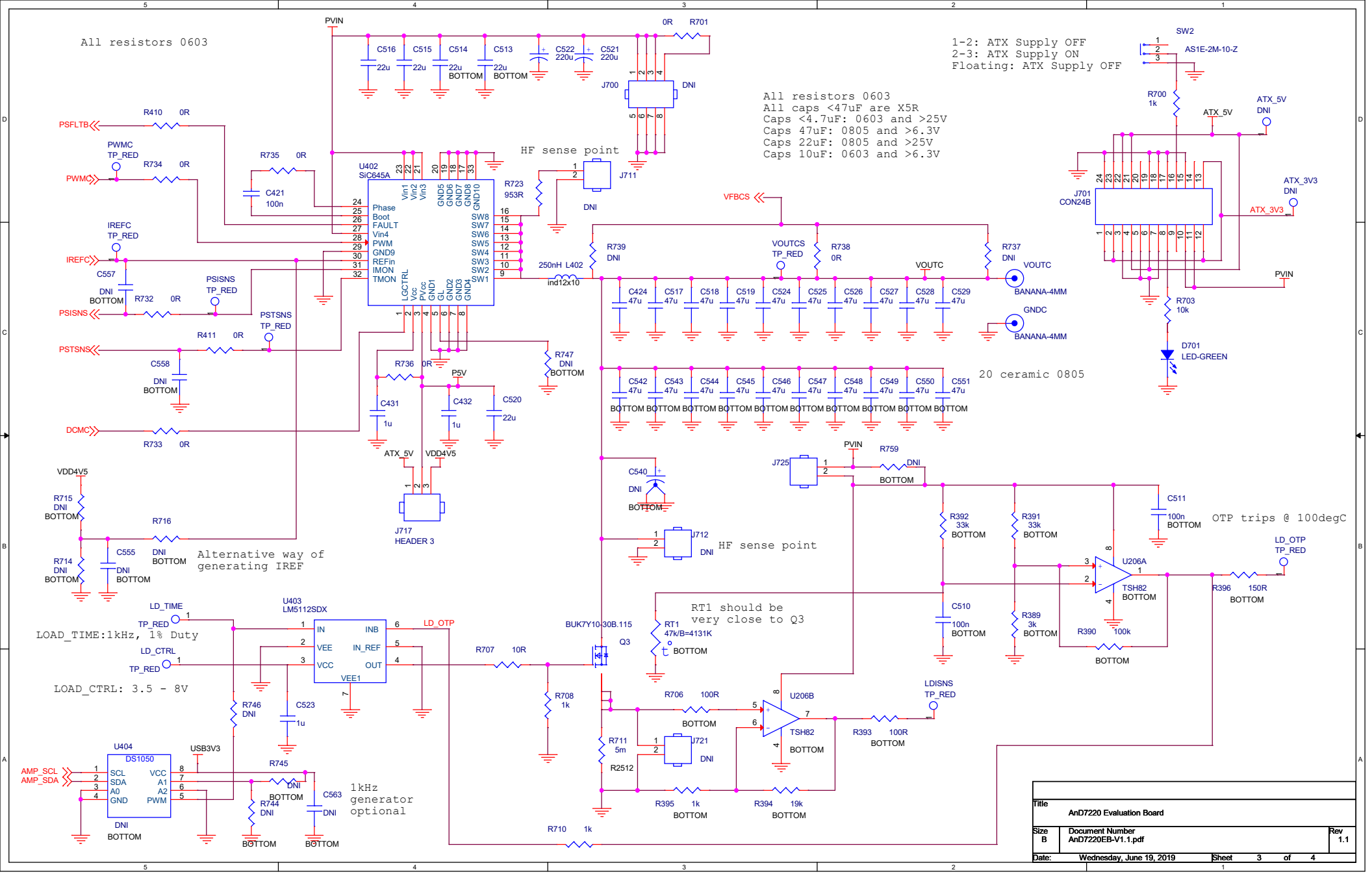

PVIN
BANANA-4MM
PGND
BANANA-4MM
J308
1B
1A
CONN JACK PWR
J353
DNI
PVIN1
PVIN2
PVIN1 is power for Buck1
PVIN2 is power for Buck2
R719 0R
R720 0R
R721 0R
R347 0R
R370 0R
R371 0R
BOTTOM
C392 220u
C393 220u
LDOA
LDOB
VDD4V5
VCC1V2
LDO3V3
R200 0R
R204 DNI
R208 DNI
R212 DNI
R216 DNI
VCCIO23
P5V
D705
D241
VOUT1
VOUT2
C493
C487
C488
C489
C490
C491
C492
C495
C475
C476
C477
C478
C479
C480
C567
C568
C569
C570
Connect: Function:
1-3 Flash (Program the Flash from AmPLink)
1-2 Auto (Part boots from Flash/ROM)
2-4 AmP (Part is programmed from AmPLink)
CS1
R229 0R
J202
HEADER 2X2
FLASH_SS
SI
FLASH_WP
R221 47k
R220 47k
U200
CS#
SO/SIO1
WP#/SIO2
GND
VCC
RESET#/SIO3
SCLK
SI/SIO0
AT25DF512C
C200 100n
R222 47k
R354 47k
FLASH_RST
SCK
SO
J346
TIME
CTL0
CTL1
SEQEN
EN1
EN2
ENC
ENL1
ENL2
DCMC
HEADER 12X2
All resistors 0603
All caps <47uF are X5R
Caps <4.7uF: 0603 and >25V
Caps 47uF: 0805 and >6.3V
Caps 47uF: 0805 and >25V
Caps 10uF: 0603 and >6.3V
VDD4V5
R240 47k
BAS116GWX
D217
R760 DNI
J212
HEADER 3
R245 47k
C443 100n
ENABLE
1-2 Part is enabled
2-3 Part is disabled
Floating: Controlled by AmpLink/USB
J379
DNI
This header is used for parts that have a ROM mask
R241 1k
SW1
AS1E-2M-10-Z
R246 1k
C422 100n
SEQEN
1-2 Sequencer input is "high"
2-3 Sequencer input is "low"
Floating: Sequencer input controlled by AmpLink/USB
R242 47k
R247 47k
HEADER 3
J214
DCMC
1-2 AUTO (Boots from internal/external ROM)
2-3 CLIENT (Boots from AmpLink/USB)
Floating: Not recommended
DCMC is used as GPIO15MODE pin at startup.
This GPIO pin can only be configured as output and should be "soft" driven at startup.
FAULTB
PGOOD
PSFLTB
OUT1
OUT2
OUT3
R366 10k
R359 10k
R360 10k
R251 10k
R252 10k
R253 10k
R254 10k
D210 LED-RED
D231 LED-GREEN
D232 LED-GREEN
D212 LED-GREEN
D214 LED-GREEN
D215 LED-GREEN
D211 LED-GREEN
J347
HEADER 7X2
TP324 TP_BLACK
TP326 TP_BLACK
TP325 TP_BLACK
TP327 TP_BLACK
These ground test points are placed next to Kelvin sense points used for efficiency measurements
Title
AnD7220 Evaluation Board
Size B
Document Number AnD7220EB-V1.1.pdf
Rev 1.1
Date: Wednesday, June 19, 2019
Sheet 2 of 4


All resistors 0603
1-2: ATX Supply OFF
2-3: ATX Supply ON
Floating: ATX Supply OFF
All resistors 0603
All caps <47uF are X5R
Caps <4.7uF: 0603 and >25V
Caps 47uF: 0805 and >6.3V
Caps 22uF: 0805 and >25V
Caps 10uF: 0603 and >6.3V
HF sense point
20 ceramic 0805
OTP trips @ 100degC
Alternative way of generating IREF
RT1 should be very close to Q3
LOAD_TIME:1kHz, 1% Duty
LOAD_CTRL: 3.5 - 8V
1kHz generator optional
Title
AnD7220 Evaluation Board
Size B
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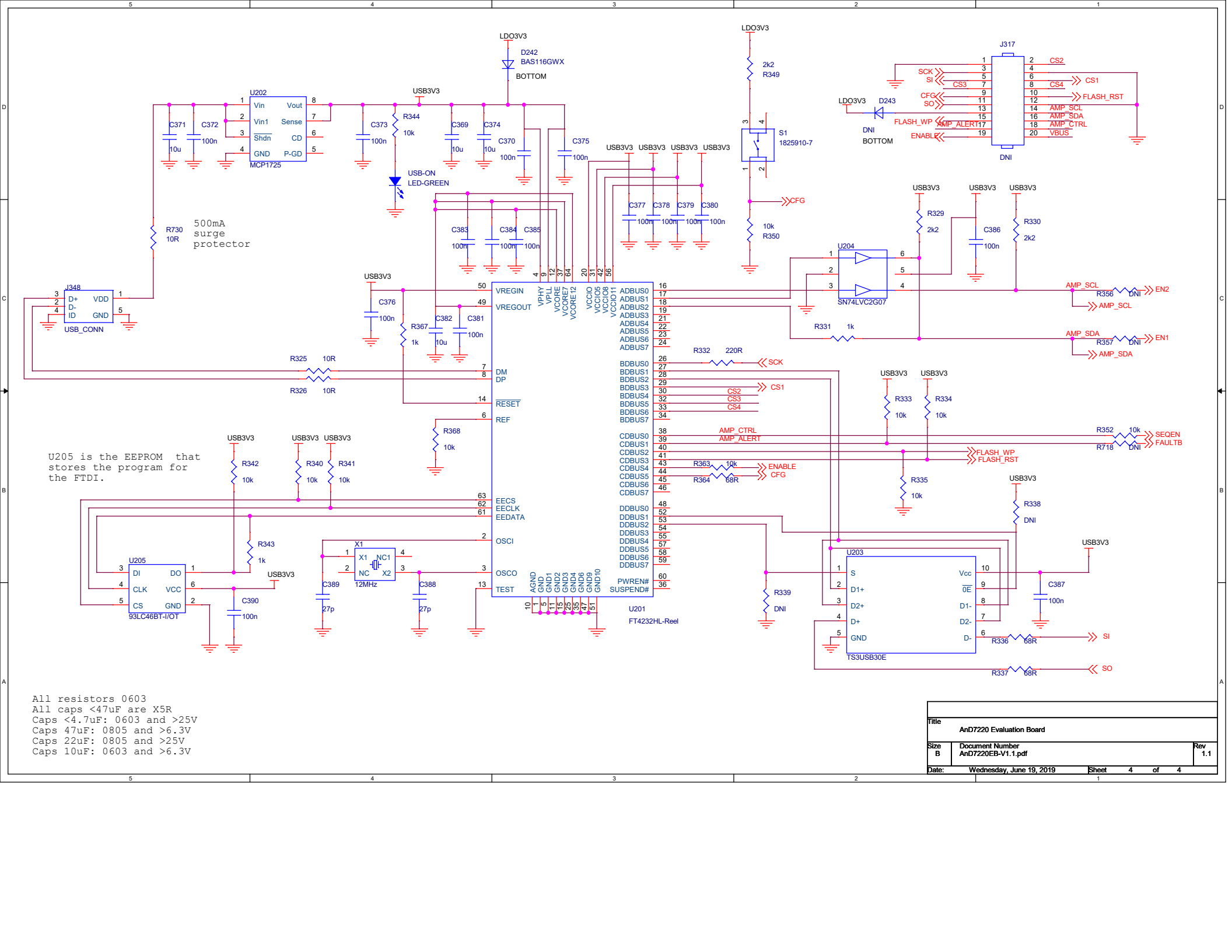
Sheet 3 of 4


U205 is the EEPROM that stores the program for the FTDI.
500mA surge protector
All resistors 0603
All caps <47uF are X5R
Caps <4.7uF: 0603 and >25V
Caps 47uF: 0805 and >6.3V
Caps 22uF: 0805 and >25V
Caps 10uF: 0603 and >6.3V
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AnD7220 Evaluation Board
Size B
Document Number AnD7220EB-V1.1.pdf
Rev 1.1
Date: Wednesday, June 19, 2019
Sheet 4 of 4
U202
MCP1725
J348
USB_CONN
D242
BAS116GWX
BOTTOM
USB-ON
LED-GREEN
R730
10R
U205
93LC46BT-I/OT
X1
12MHz
U201
FT4232HL-Reel
J317
D243
DNI
S1
1825910-7
U204
SN74LVC2G07
U203
TS3USB30E
LDO3V3
USB3V3
CFG
ENABLE
FLASH_WP
FLASH_RST
AMP_SCL
AMP_SDA
AMP_CTRL
AMP_ALERT
SCK
SI
SO
CS1
CS2
CS3
CS4
EN1
EN2
SEQEN
FAULTB
VBUS