DEVELOPMENT REFERENCE GUIDE

LDVFMA1+LDVMTRA1

DOCUMENT NO. : LDVFMA1MTRA1-A1

YANTAI ELECTRICIAN

DECEMBER 15, 2021

Lithium Battery Voltage:
Normal voltage: 3.7V, 3.7V*4S(Serial)=14.8V
Full-charge voltage: 4.2V, 4.2V*4S(Serial)=16.8V

The MP2326 is a fully integrated, high-efficiency,synchronous, step-down, switch-mode converterwith only a 40μA quiescent current.
3.9V to 19V Operating Input Range ,4A Output Current

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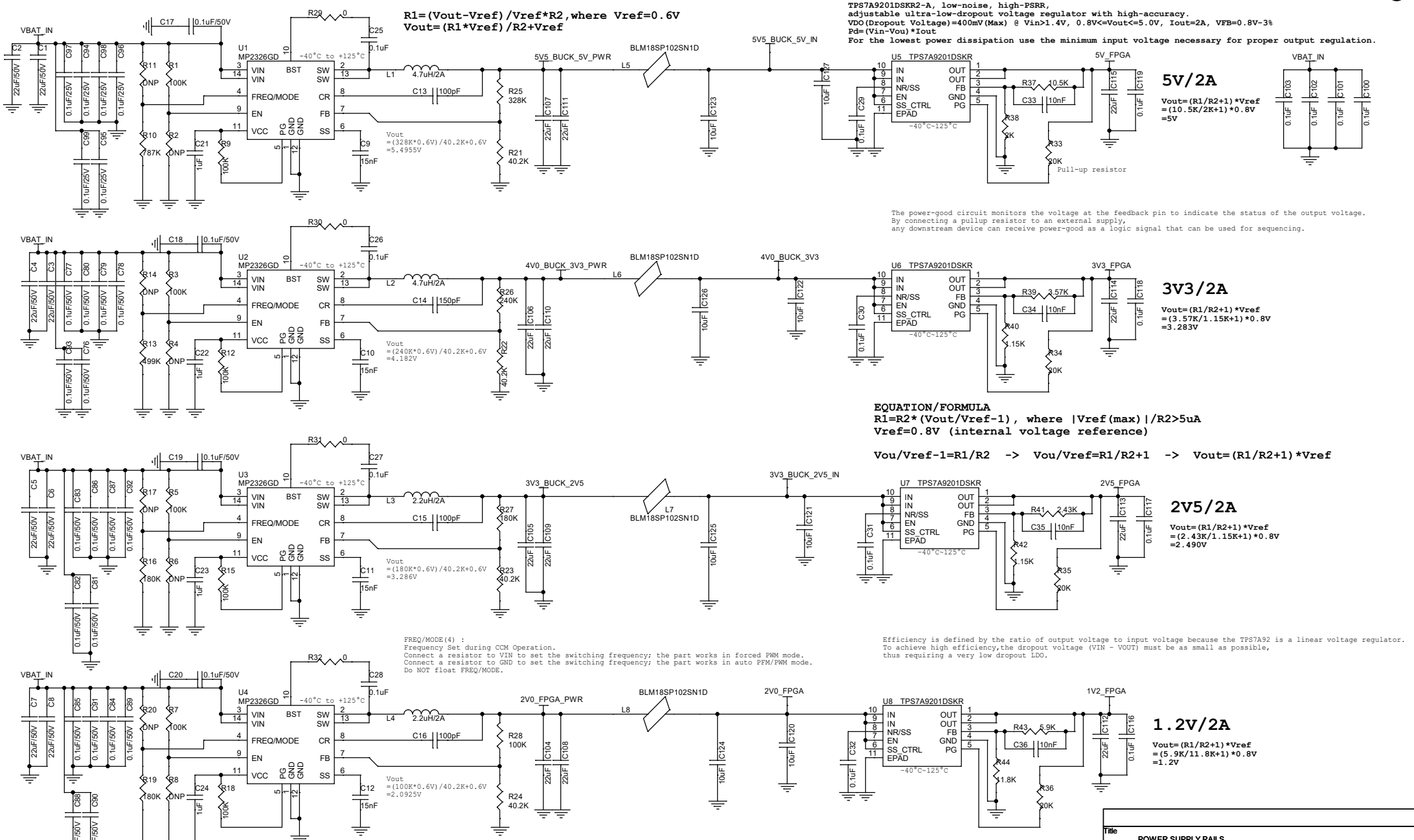

Title	POWER SUPPLY RAILS
Size	A3
Document Number	LDVFMA121DEC15
Rev	A1
	ZHANGSHAOYAN 13522296239
Date:	Thursday, December 16, 2021
Sheet	1 of 1

500mA, Ultra Low Dropout,Low Power, RF Linear Regulators
P=(5V-3.3V)*500mA=0.85W

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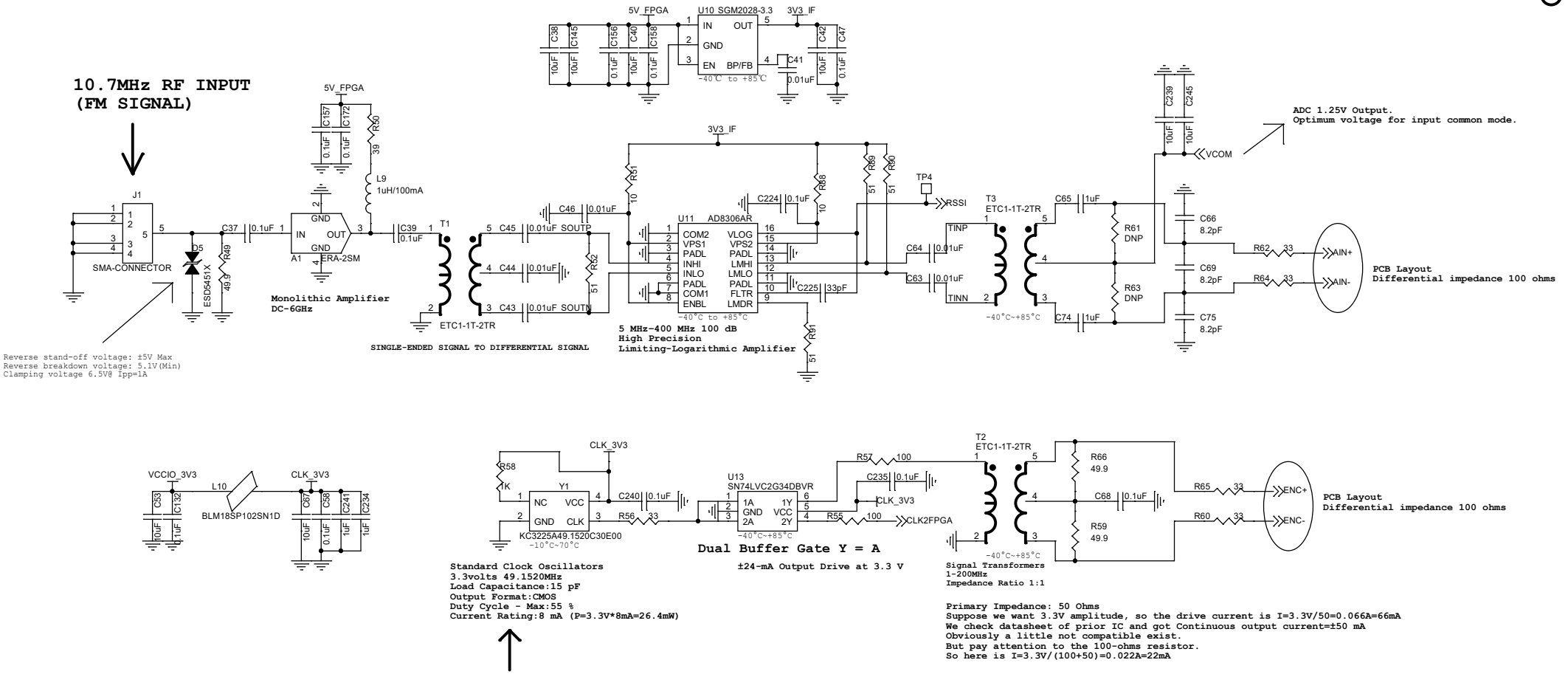


Standard Clock Oscillators
3.3volts 49.1520MHz
Load Capacitance:15 pF
Output Format:CMOS
Duty Cycle - Max:55 %
Current Rating:8 mA (P=3.3V*8mA=26.4mW)

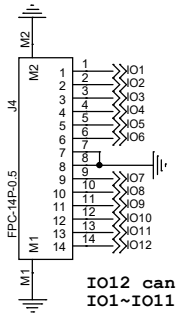
Dual Buffer Gate Y = A

±24-mA Output Drive at 3.3 V

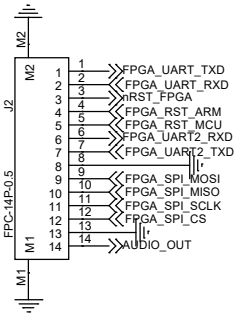
Signal Transformers
1-200MHz
Impedance Ratio 1:1

Primary Impedance: 50 Ohms
Suppose we want 3.3V amplitude, so the drive current is I=3.3V/50=0.066A=66mA
We check datasheet of prior IC and got Continuous output current=±50 mA
Obviously a little not compatible exist.
But pay attention to the 100-ohms resistor.
So here is I=3.3V/(100+50)=0.022A=22mA

Incorrect footprint fixup in next release!!!



IO12 can only be used as input (global clock input pin).
IO1~IO11 no direction limited.

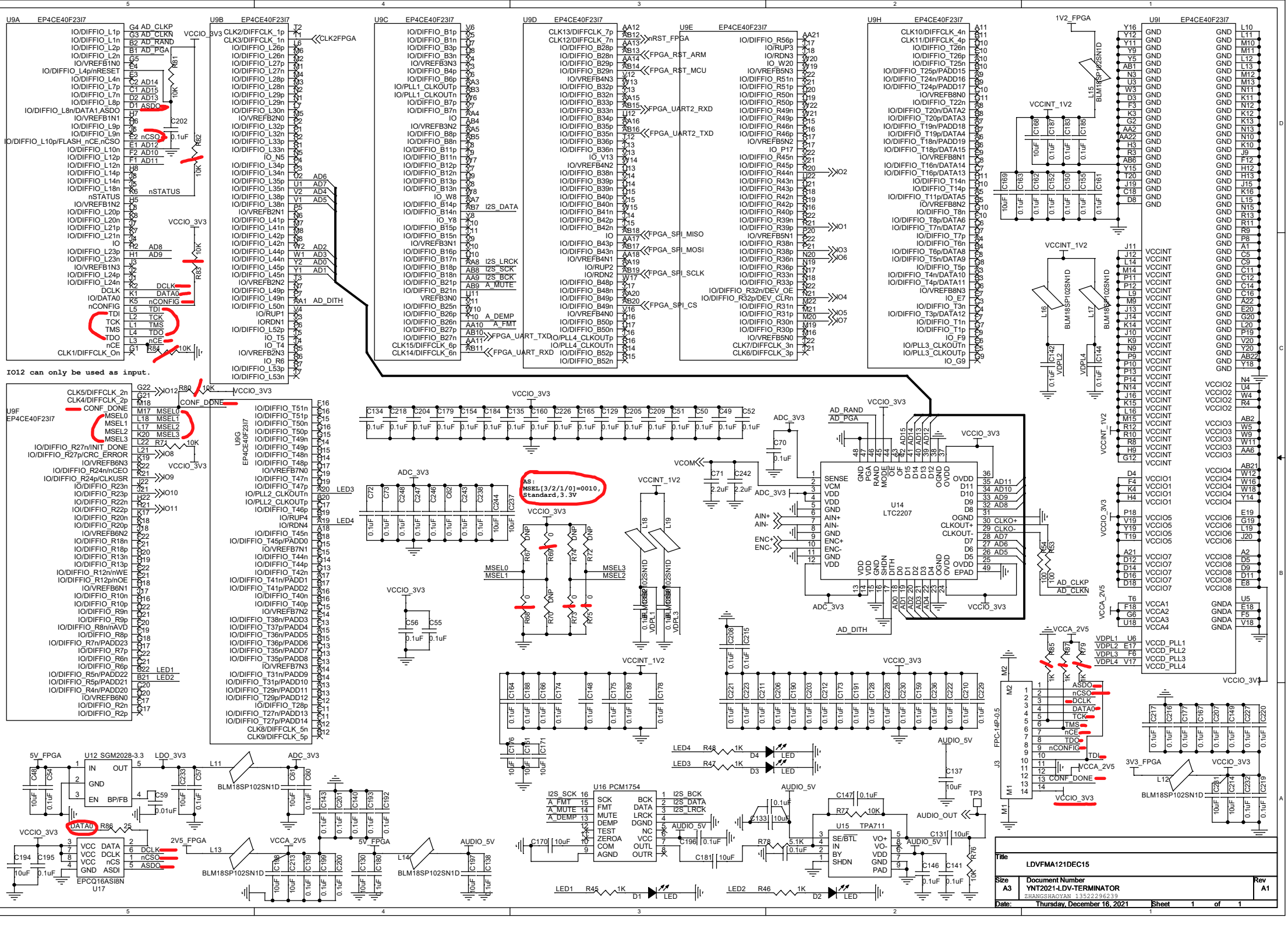


FPGA_UART/FPGA_UART2 can be used to communicate with MCU/MPU.
MCU/MPU pulls down nRST_FPGA to reset entire FPGA logic.
FPGA pulls down FPGA_RST_MCU/ FPGA_RST_ARM to launch MCU/MPU reset.
FPGA_SPI offers SPI communication between MCU/MPU and FPGA.
AUDIO_OUT passes analog audio signal to MPU for back-end processing.

USE M3 SCREW TO FIXED BOARD.

TP2 TP1

Title: FM INPUT		
Size: A3	Document Number: LDVFMA121DEC15 ZHANGSHAOYAN 13522296239	Rev: A1
Date: Thursday, December 16, 2021	Sheet 1 of 1	


U9A EP4CE40F23I7
U9B EP4CE40F23I7
U9C EP4CE40F23I7
U9D EP4CE40F23I7
U9E EP4CE40F23I7
U9H EP4CE40F23I7
U9I EP4CE40F23I7
IO12 can only be used as input.
U9F EP4CE40F23I7
U9G EP4CE40F23I7
CONF_DONE
nSTATUS
nCONFIG
DCLK
DATA0
ASDO
nCSO
TDI
TCK
TMS
TDO
nCE
VCCIO_3V3
CLK2FPGA
FPGA_RST_ARM
FPGA_RST_MCU
FPGA_UART2_RXD
FPGA_UART2_TXD
FPGA_SPI_MISO
FPGA_SPI_MOSI
FPGA_SPI_SCLK
FPGA_SPI_CS
FPGA_UART_TXD
FPGA_UART_RXD
I2S_DATA
I2S_LRCK
I2S_SCK
I2S_BCK
A_MUTE
A_DEMP
A_FMT
AD_DITH
MSEL0
MSEL1
MSEL2
MSEL3
LED1
LED2
LED3
LED4
1V2_FPGA
2V5_FPGA
5V_FPGA
3V3_FPGA
VCCA_2V5
VCCINT_1V2
ADC_3V3
AUDIO_5V
AD_RAND
AD_PGA
AD_CLKP
AD_CLKN
U14 LTC2207
U15 TPA711
U16 PCM1754
U12 SGM2028-3.3
U17 EPCQ16ASI8N
BLM18SP102SN1D
FPC-14P-0.5
AS: MSEL[3/2/1/0]=0010, Standard,3.3V
Title
LDVFMA121DEC15
Size A3
Document Number YNT2021-LDV-TERMINATOR
ZHANGSHAOYAN 13522296239
Rev A1
Date: Thursday, December 16, 2021
Sheet 1 of 1

3-CH PT100 Temperature Sensor (ADC)
4-CH DC Motor Drivers with Encoder and Current(ADC)
2-CH Stepper Motor Driver

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Imin,minimum cathode current for regulation: 0.4mA~1mA
1mA<(Vcc-Vout)/R3<100mA
(3.3V-2.5V)/1mA=800-Ohms
(3.3V-2.5V)/560-Ohms=1.428mA

2.5VRef

U17 MCP6001T-I/OT
Rail-to-Rail Input/Output

PT100x3

PT100,100-OHMS@0°C
2.5V/(1K+0)=0.0025A
3-CH*0.0025A=0.0075A=7.5mA

LOW-TO-HIGH POR

U4
STM32F103VET6
72MHz,512KBytes Flash,64kBytes RAM,LQFP100

SERIAL WIRE DEBUG
4 PINS

EXTERNAL PULL-UP

BOOT1=X,BOOT0=0: boot from User Flash Memory
BOOT1=0,BOOT0=1: boot from System memory
BOOT1=1,BOOT0=1: boot from SRAM

DECOUPLING CAPACITORS

5V-3.3V LDO

U21 SGM2028-3.3

SYSTEM STATUS INDICATOR

LIMIT SWITCH INPUT

U24 SN74LVC2G34DBVR
U23 SN74LVC2G34DBVR

Reverse stand-off voltage: ±5V Max

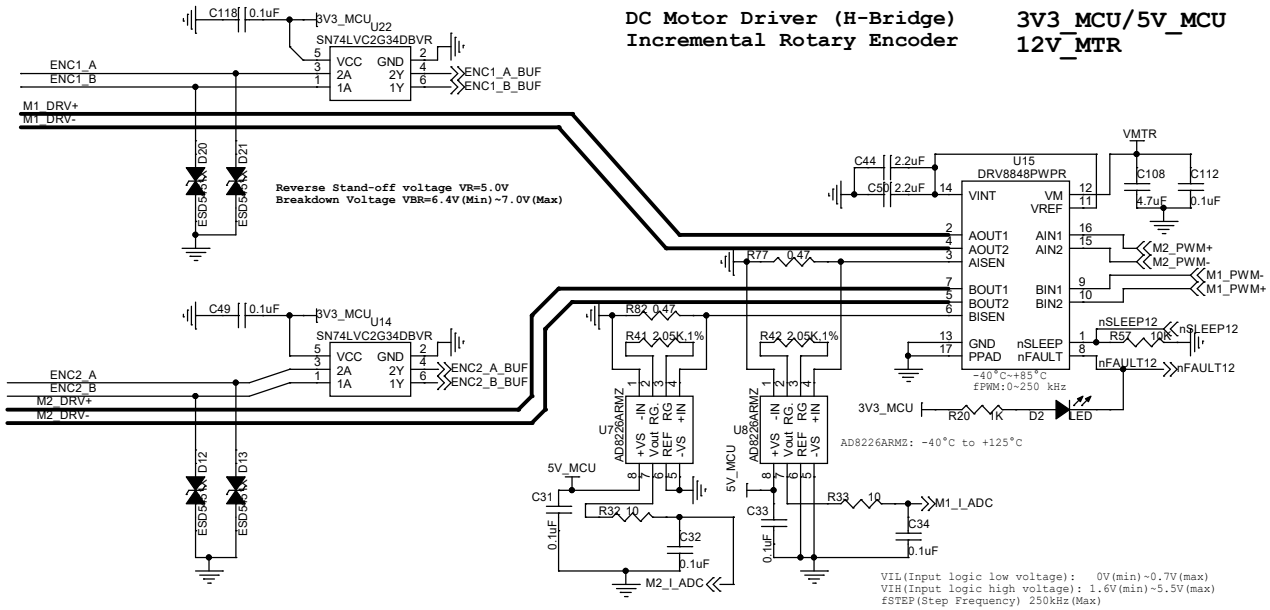
Maximum tpd of 4.1 ns at 3.3 V
1S=10^3mS=10^6uS=10^9nS
1S/4.1nS=10^9nS/4.1nS=243902439Hz=243MHz

M3 SCREW THROUGH HOLE INSTALLATION

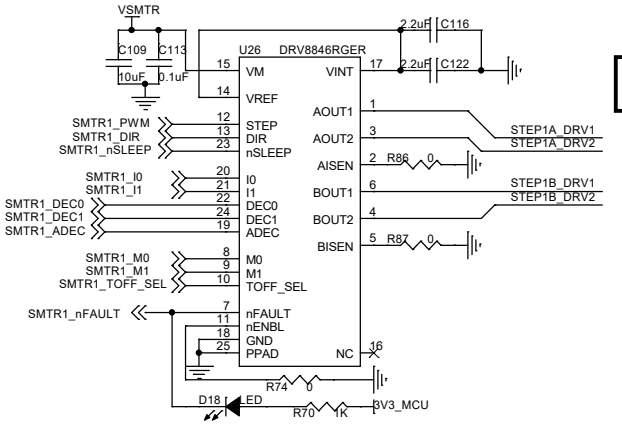
Title	STM32_CORE	
Size A3	Document Number LDVMTRA121	Rev A1
	YTELECTRICIAN 13522296239	
Date: Thursday, December 16, 2021	Sheet 1 of 4	

DC Motor Driver (H-Bridge)
Incremental Rotary Encoder

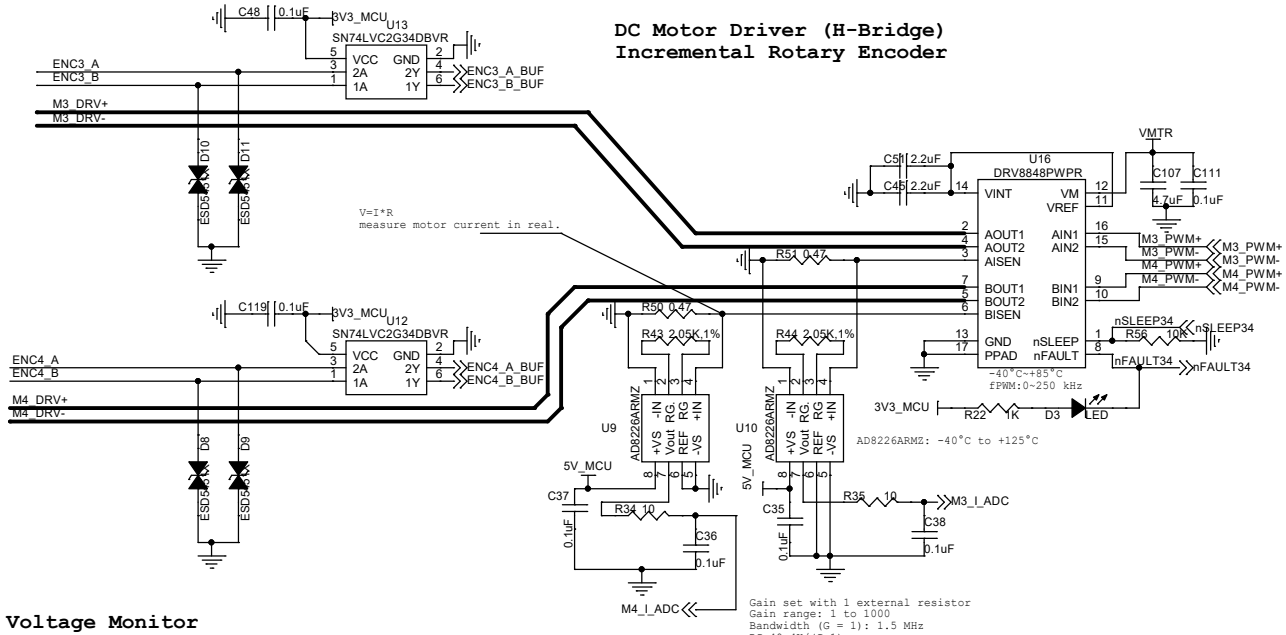
3V3_MCU/5V_MCU
12V_MTR



VIL(Input logic low voltage): 0V(min)~0.7V(max)
VIH(Input logic high voltage): 1.6V(min)~5.5V(max)
fSTEP(Step Frequency) 250kHz(Max)



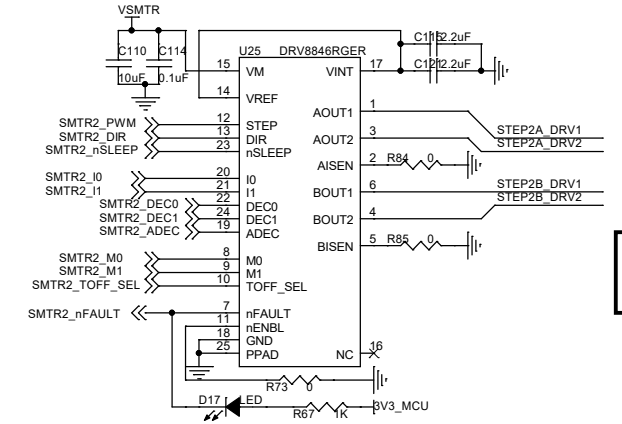
DC Motor Driver (H-Bridge)
Incremental Rotary Encoder



Gain set with 1 external resistor
Gain range: 1 to 1000
Bandwidth (G = 1): 1.5 MHz
RG=49.4K/(G-1)

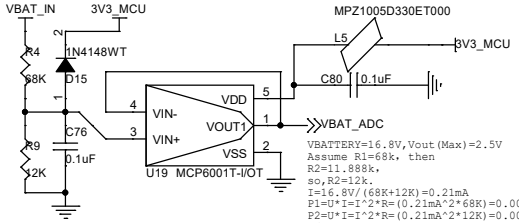
VM,Power supply voltage range, 4V(min)~18V(max)
fPWM,Applied STEP signal,0(min)~250kHz(max)
IFS,Motor full-scale current per H-bridge,0(min)~1.4A(max)
TA,Operating ambient temperature,-40°C~85°C

VIL,input logic low voltage, 0(min)~0.7V(max)
VIH,input logic hight voltage, 1.6V(min)~5.5V(max)

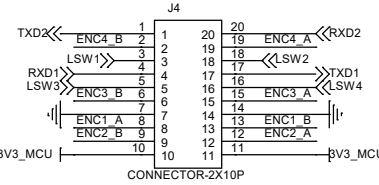


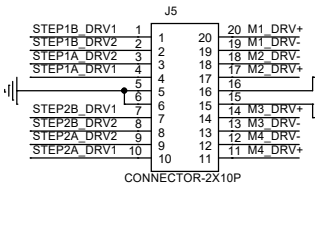
Main Voltage Monitor

Vout=R2/(R1+R2)*VBATTERY

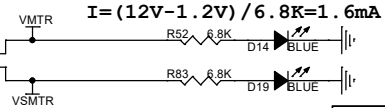


VBATTERY=16.8V,Vout(Max)=2.5V
Assume R1=68k, then
R2=11.888k,
so,R2=12k.
I=16.8V/(68K+12K)=0.21mA
P1=U*I=I^2*R=(0.21mA^2*68K)=0.0029988W~=3mW
P2=U*I=I^2*R=(0.21mA^2*12K)=0.0005292W~=0.53mW
1/16W=0.0625W=62.5mW





I=(12V-1.2V)/6.8K=1.6mA



Title	STM32_MOTOR	
Size A3	Document Number LDVMTRA121	Rev A1
	YTELECTRICIAN 13522296239	
Date: Thursday, December 16, 2021	Sheet 2 of 4	

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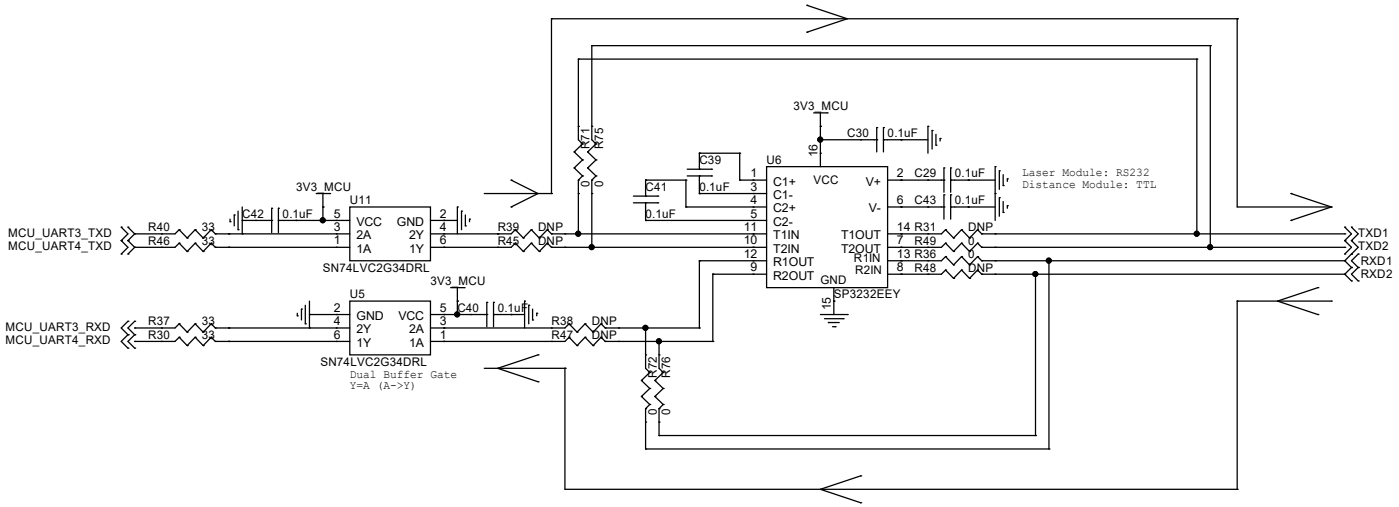
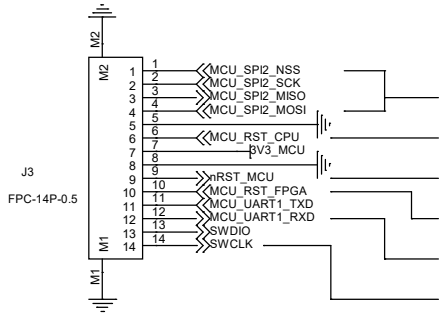
When use TTL bypass RS232





CPU or FPGA communicate with MCU via SPI interface.

MCU output pin to reset CPU.

Peripheral sub system output pin to reset MCU.

MCU output pin to reset FPGA.

CPU or FPGA communicate with MCU via UART interface.

SWD(Serial Wire Debug) Interface

Title: TTL/RS232		
Size: A3	Document Number: LDVMTRA121 YTELECTRICIAN 13522296239	Rev: A1
Date: Thursday, December 16, 2021	Sheet 3 of 4	

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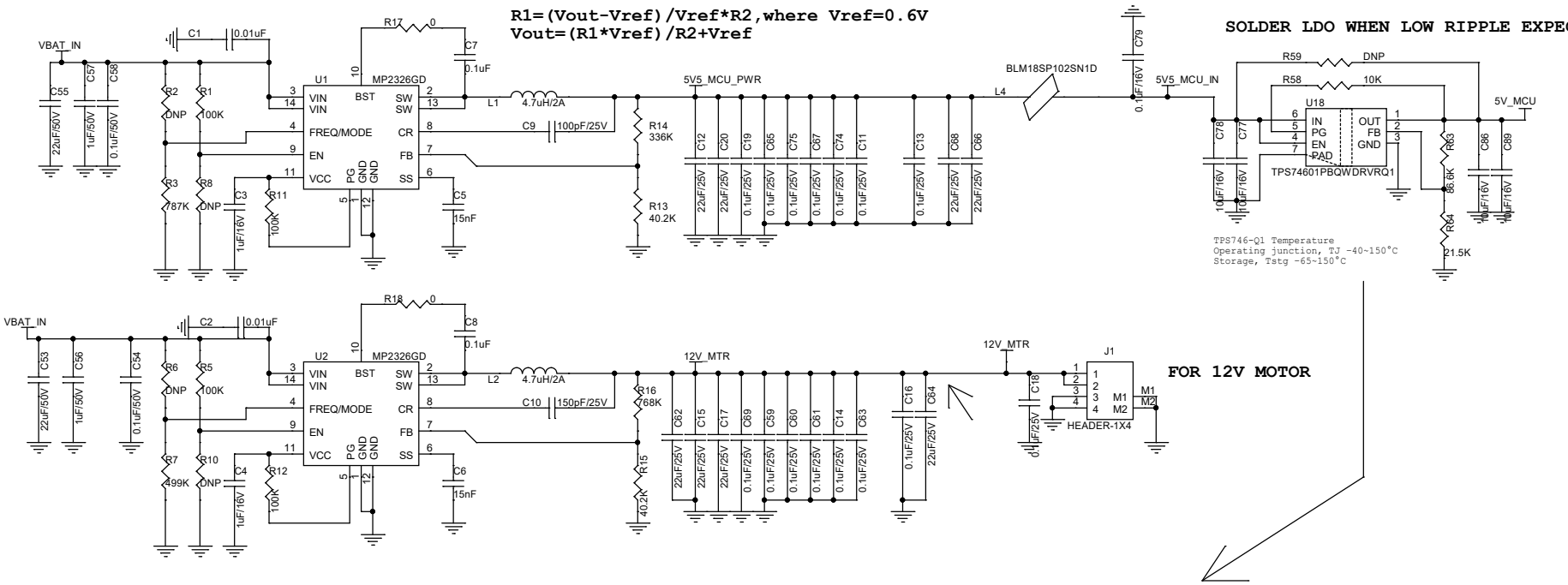
Lithium Battery Voltage:
Normal voltage: 3.7V, 3.7V*4S(Serial)=14.8V
Full-charge voltage: 4.2V, 4.2V*4S(Serial)=16.8V

The MP2326 is a fully integrated, high-efficiency,synchronous, step-down, switch-mode converterwith only a 40μA quiescent current.
3.9V to 19V Operating Input Range ,4A Output Current



R1=(Vout-Vref)/Vref*R2
It is recommended to choose a value within 5k to 100k for R2.
Where VREF is 0.6V, typically.

The TPS746-Q1 is a 1-A, ultra-low-dropout regulator (LDO) with power-good functionality.
VOUT = VFB × (1 + R1 / R2)
VDO Dropout voltage
TEST CONDITIONS: IOUT = 1 A, VOUT = 0.95 x VOUT(NOM) , 3.3 V ≤ VOUT ≤ 5.5 V
VDO=160(min)~265(max)mV

Without LDO
Vout=(294K*0.6V)/40.2K+0.6V=4.988V

With LDO
Expect Vout=5.6V, let R2=40.2K, then
R1=(5.6-0.6)/0.6*R2=335k

No standard 335k values in EIA TABLES
so fetch the nearest values 332k/336k

Verification
R1=(vout-Vref)/Ref*r2
(Vout-Vref)/vref=R1/R2
Vout=R1/R2*Vref+Vref
Vout=5.555(332k)
Vout=5.6149(336k)

Expect Vout=12V, let R2=40.2K, then
R1=(12-0.6)/0.6*R2=763.8k

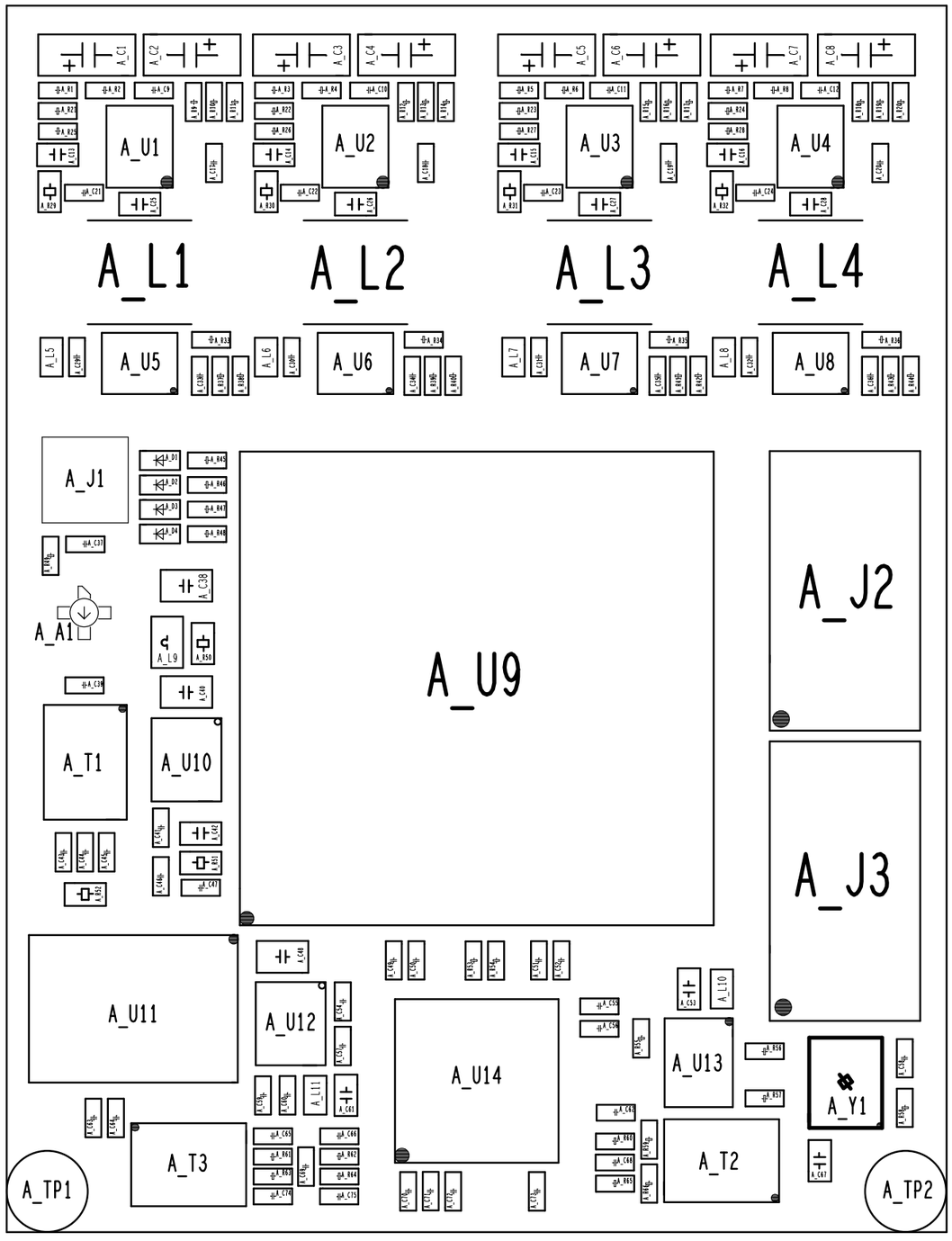
No standard 763.8k values in EIA TABLES
so fetch the nearest values 768k

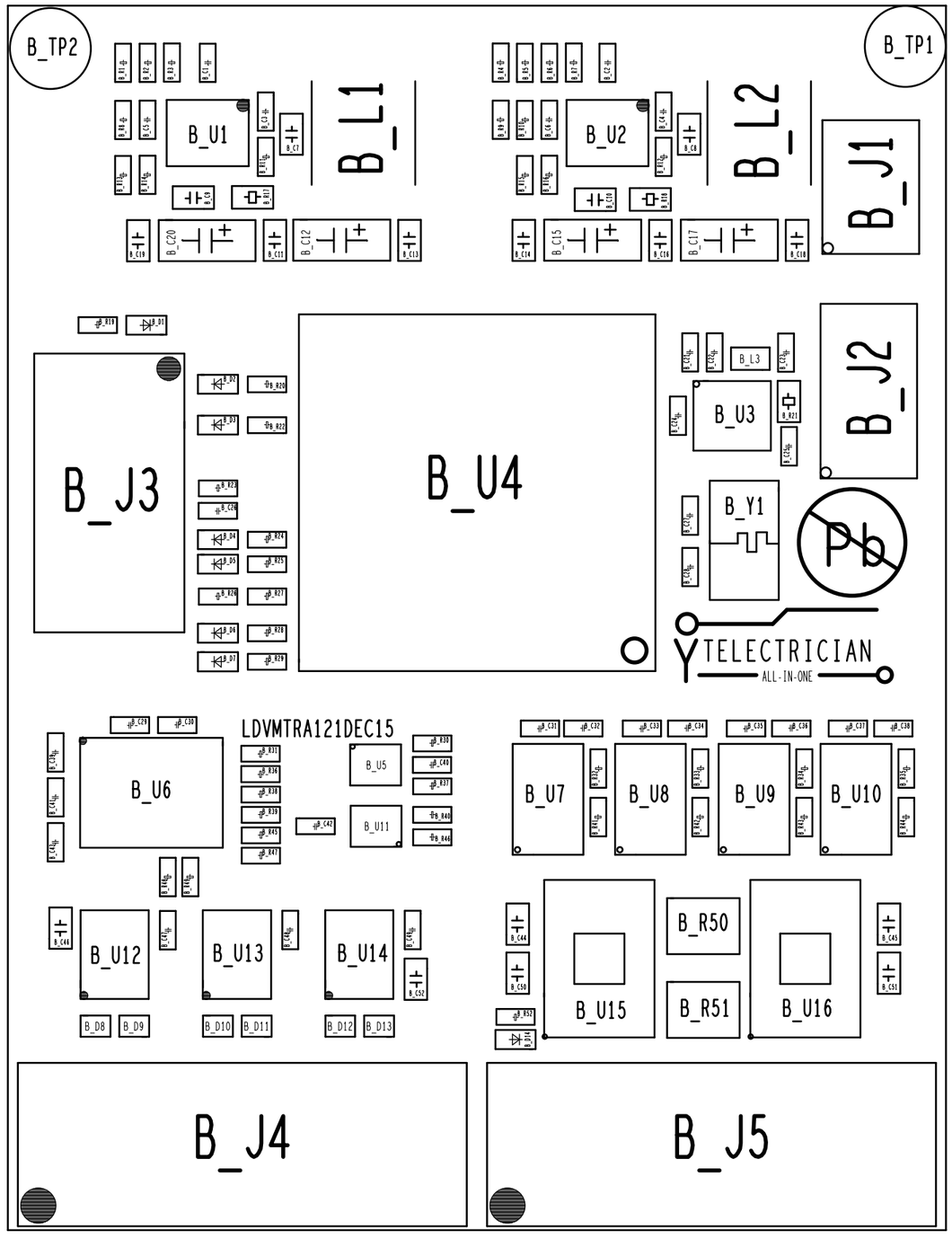
Verification
R1=(vout-Vref)/Ref*r2
(Vout-Vref)/vref=R1/R2
Vout=R1/R2*Vref+Vref
Vout=12.063V

According the datasheet,VFB=-0.3V(min)~2.0V(max)
Here let VFB=1V, so we have
5V=1V*(1+R1/R2)
calculate
R1/R2=4
we check resistor values from Standard Electronic Decade Value Tables
Assume R1=86.6K then
R2=86.6K/4=21.65K
so the nearest value from table is 21.5K.

Verification
VFB=R2/(R1+R2)*Vout=21.5K/(86.6K+21.5K)*5V=0.1999*5V=0.9995V~=1V
Vout=1V*(1+86.6K/21.5K)=5.0279V

Title: POWER SUPPLY		
Size: A3	Document Number: LDVMTRA121 YTELECTRICIAN 13522296239	Rev: A1
Date: Thursday, December 16, 2021	Sheet 1 of 1	


A_L1
A_L2
A_L3
A_L4
A_U1
A_U2
A_U3
A_U4
A_U5
A_U6
A_U7
A_U8
A_J1
A_J2
A_J3
A_U9
A_A1
A_T1
A_U10
A_U11
A_U12
A_U14
A_U13
A_T2
A_T3
A_Y1
A_TP1
A_TP2


B_TP1
B_TP2
B_L1
B_L2
B_J1
B_J2
B_J3
B_U4
B_U1
B_U2
B_U3
B_Y1
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LDVMTRA121DEC15
B_U6
B_U5
B_U11
B_U7
B_U8
B_U9
B_U10
B_U12
B_U13
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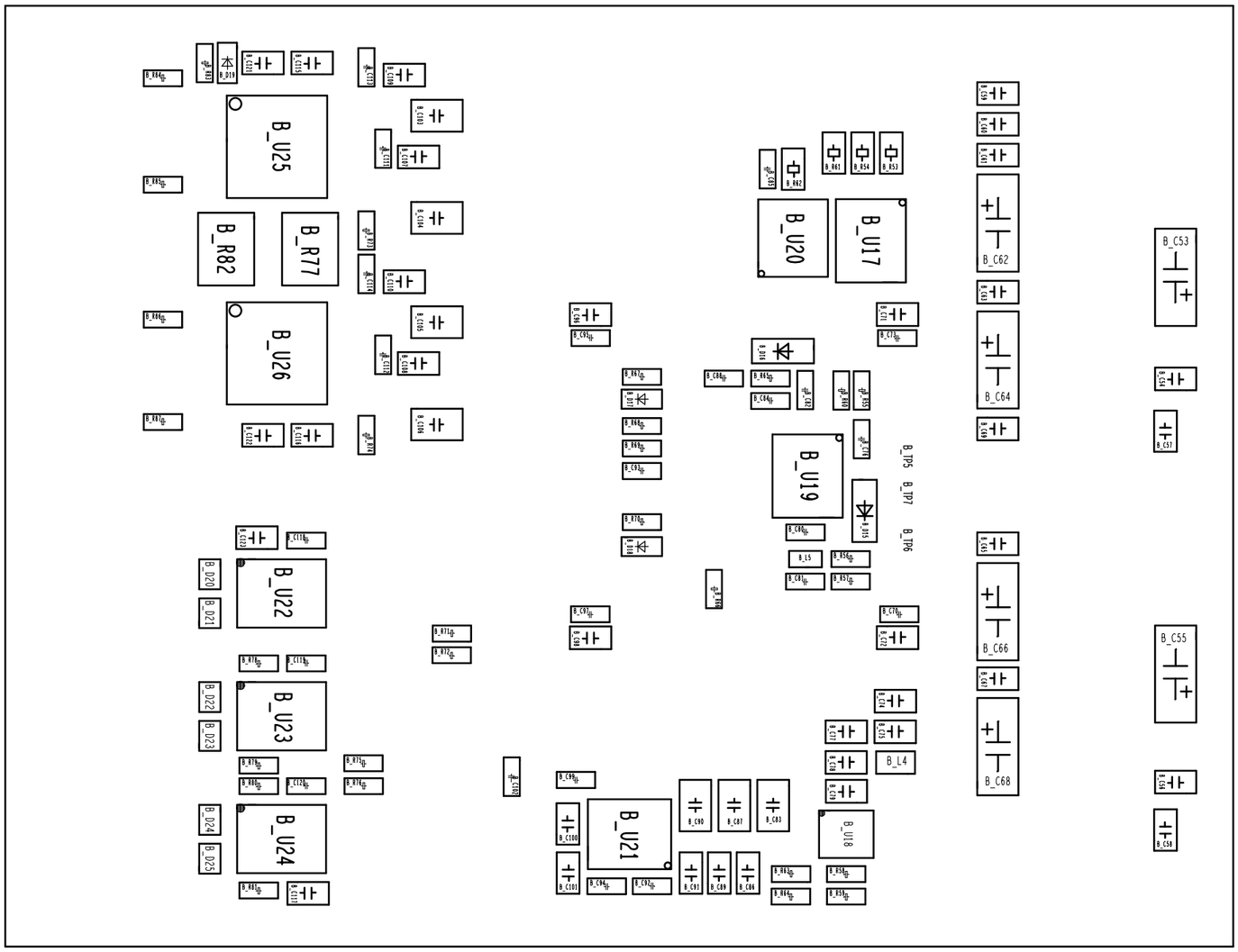
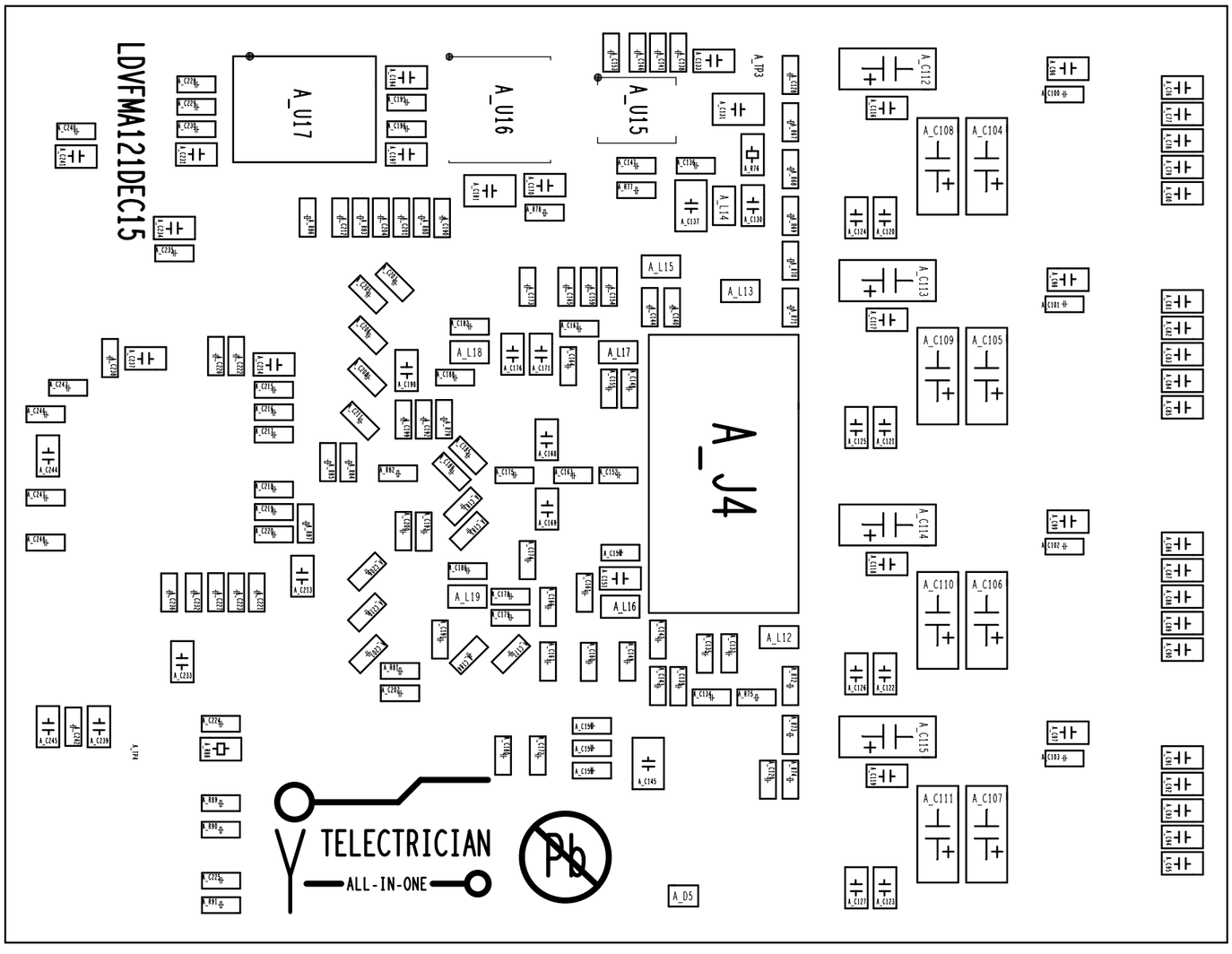
B_U16
B_R50
B_R51
B_J4
B_J5


B_C53
B_C54
B_C57
B_C55
B_C58
B_C62
B_C64
B_C66
B_C68
B_U17
B_U20
B_U19
B_U18
B_U21
B_L4
B_TP5
B_TP7
B_TP6
B_U25
B_R82
B_R77
B_U26
B_U22
B_U23
B_U24


LDVFMA121DEC15
A_U17
A_U16
A_U15
A_J4
A_TP3
A_L15
A_L13
A_L18
A_L17
A_L19
A_L16
A_L12
A_L14
A_C112
A_C108
A_C104
A_C100
A_C113
A_C109
A_C105
A_C101
A_C114
A_C110
A_C106
A_C102
A_C115
A_C111
A_C107
A_C103
A_D5
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Bill Of Materials --- FM					
Item	Quantity	Reference	Part	PCBFootprint	Details
1	1	A1	ERA-2SM	ERA-2SM	Surface Mount Monolithic Amplifier DC-6GHz
2	8	C1,C2,C3,C4,C5,C6,C7,C8	22uF/50V	C1206	CAPACITOR SMD 1206 50V ±10%
3	4	C9,C10,C11,C12	15nF	C0402	CAPACITOR SMD 0402 16V ±10%
4	3	C13,C15,C16	100pF	C0603	CAPACITOR SMD 0603 25V ±10%
5	1	C14	150pF	C0603	CAPACITOR SMD 0603 25V ±10%
6	4	C17,C18,C19,C20	0.1uF/50V	C0402	CAPACITOR SMD 0402 50V ±10%
7	6	C21,C22,C23,C24,C65,C74	1uF	C0402	CAPACITOR SMD 0402 16V ±10%
8	4	C25,C26,C27,C28	0.1uF	C0603	CAPACITOR SMD 0603 25V ±10%
9	116	C29,C30,C31,C32,C37,C39,C47,C49,C50,C51,C52,C54,C55,C56,C57,C58,C60,C62,C68,C70,C72,C73,C128,C129,C132,C134,C135,C136,C138,C139,C140,C141,C142,C143,C144,C146,C147,C148,C149,C150,C152,C153,C154,C155,C156,C157,C158,C159,C160,C161,C162,C163,C164,C165,C166,C167,C172,C173,C174,C175,C177,C178,C179,C180,C182,C183,C184,C185,C186,C187,C188,C189,C190,C191,C192,C193,C195,C196,C199,C200,C201,C202,C203,C204,C205,C206,C207,C208,C209,C210,C211,C212,C215,C216,C217,C218,C219,C220,C221,C222,C223,C224,C226,C227,C228,C229,C230,C232,C235,C236,C238,C240,C243,C246,C247,C248	0.1uF	C0402	CAPACITOR SMD 0402 16V ±10%
10	4	C33,C34,C35,C36	10nF	C0402	CAPACITOR SMD 0402 16V ±10%
11	7	C38,C40,C48,C131,C137,C145,C181	10uF	C0805	CAPACITOR SMD 0805 16V ±10%
12	8	C41,C43,C44,C45,C46,C59,C63,C64	0.01uF	C0402	CAPACITOR SMD 0402 16V ±10%
13	3	C42,C237,C244	10uF	C0603	CAPACITOR SMD 0603 10V ±10%
14	28	C53,C61,C67,C120,C121,C122,C123,C124,C125,C126,C127,C130,C133,C151,C168,C169,C170,C171,C176,C194,C197,C198,C213,C214,C231,C233,C239,C245	10uF	C0603	CAPACITOR SMD 0603 16V ±10%
15	3	C66,C69,C75	8.2pF	C0402	CAPACITOR SMD 0402 16V ±10%
16	2	C71,C242	2.2uF	C0402	CAPACITOR SMD 0402 16V ±10%
17	18	C76,C77,C78,C79,C80,C81,C82,C83,C84,C85,C86,C87,C88,C89,C90,C91,C92,C93	0.1uF/50V	C0603	CAPACITOR SMD 0603 50V ±10%
18	6	C94,C95,C96,C97,C98,C99	0.1uF/25V	C0603	CAPACITOR SMD 0603 50V ±10%
19	4	C100,C101,C102,C103	0.1uF	C0402	CAPACITOR SMD 0402 50V ±10%
20	12	C104,C105,C106,C107,C108,C109,C110,C111,C112,C113,C114,C115	22uF	C1206	CAPACITOR SMD 1206 16V ±10%

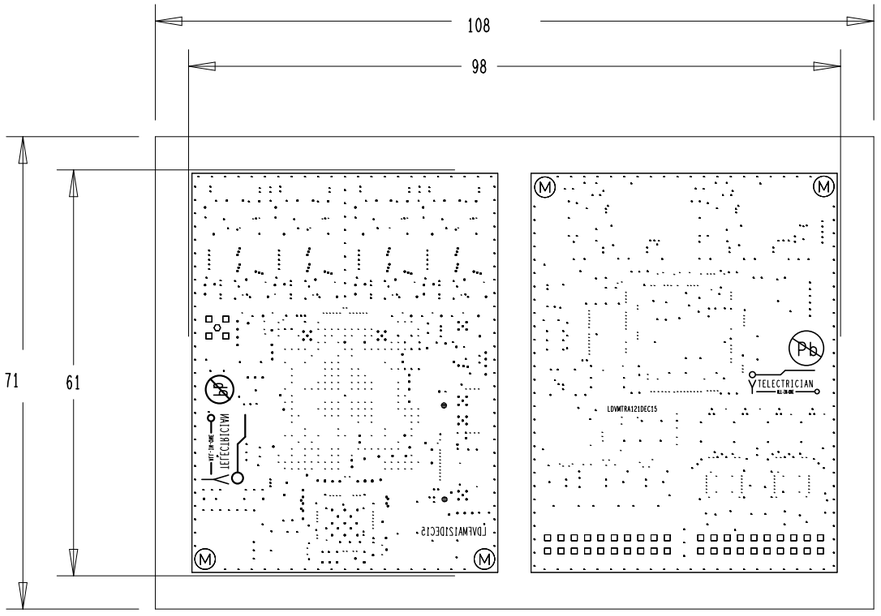
21	4	、	0.1uF	C0603	CAPACITOR SMD 0402 16V ±10%
22	1	C225	33pF	C0402	CAPACITOR SMD 0402 16V ±10%
23	2	C234,C241	1uF	C0603	CAPACITOR SMD 0603 16V ±10%
24	4	D1,D2,D3,D4	LED	LED0402	LED SMD 0402 BLUE COLOR
25	1	J1	SMA-CONNECTOR	SMA	SMA FEMALE CONNECTOR
26	3	J2,J3,J4	FPC-14P-0.5	FPC-14P-0D5	FPC 14PINS 0.5MM HORIZONTAL CONNECTOR
27	2	L1,L2	4.7uH/2A	CD54-IND-2P	INDUCTOR SMD CD54 SERIES 2A CURRENT
28	2	L3,L4	2.2uH/2A	CD54-IND-2P	INDUCTOR SMD CD54 SERIES 2A CURRENT
29	14	L5,L6,L7,L8,L10,L11,L12, L13,L14,L15,L16,L17,L18,L19	BLM18SP102SN1D	FB0603	Ferrite Beads 0603 1kOhms@100MHz 25% 1.2A
30	1	L9	1uH/100mA	L0805	INDUCTOR SMD 0805
31	9	R1,R3,R5,R7,R9,R12, R15,R18,R28	100K	R0402	RESISTOR SMD 0402 ±1% 1/16W
32	14	R2,R4,R6,R8,R11,R14, R17,R20,R61,R63,R67, R70,R72,R74	DNP	R0402	DNP(DO NOT PLACE)
33	1	R10	787K	R0402	RESISTOR SMD 0402 ±1% 1/16W
34	1	R13	499K	R0402	RESISTOR SMD 0402 ±1% 1/16W
35	3	R16,R19,R27	180K	R0402	RESISTOR SMD 0402 ±1% 1/16W
36	4	R21,R22,R23,R24	40.2K	R0402	RESISTOR SMD 0402 ±1% 1/16W
37	1	R25	328K	R0402	RESISTOR SMD 0402 ±1% 1/16W
38	1	R26	240K	R0402	RESISTOR SMD 0402 ±1% 1/16W
39	4	R29,R30,R31,R32	0	R0603	RESISTOR SMD 0603 ±5% 1/10W
40	4	R33,R34,R35,R36	20K	R0402	RESISTOR SMD 0402 ±1% 1/16W
41	1	R37	10.5K	R0402	RESISTOR SMD 0402 ±1% 1/16W
42	1	R38	2K	R0402	RESISTOR SMD 0402 ±1% 1/16W
43	1	R39	3.57K	R0402	RESISTOR SMD 0402 ±1% 1/16W
44	2	R40,R42	1.15K	R0402	RESISTOR SMD 0402 ±1% 1/16W
45	1	R41	2.43K	R0402	RESISTOR SMD 0402 ±1% 1/16W
46	1	R43	5.9K	R0402	RESISTOR SMD 0402 ±1% 1/16W
47	1	R44	11.8K	R0402	RESISTOR SMD 0402 ±1% 1/16W
48	8	R45,R46,R47,R48,R58,R79, R85,R87	1K	R0402	RESISTOR SMD 0402 ±1% 1/16W
49	3	R49,R59,R66	49.9	R0402	RESISTOR SMD 0402 ±1% 1/16W
50	1	R50	39	R0603	RESISTOR SMD 0603 ±5% 1/10W
51	2	R51,R88	10	R0603	RESISTOR SMD 0603 ±5% 1/10W
52	1	R52	51	R0603	RESISTOR SMD 0603 ±5% 1/10W
53	4	R53,R54,R55,R57	100	R0402	RESISTOR SMD 0402 ±1% 1/16W
54	5	R56,R60,R62,R64,R65	33	R0402	RESISTOR SMD 0402 ±1% 1/16W
55	4	R68,R69,R73,R75	0	R0402	RESISTOR SMD 0402 ±1% 1/16W
56	7	R71,R77,R80,R81,R82, R83,R84	10K	R0402	RESISTOR SMD 0402 ±1% 1/16W
57	1	R76	10K	R0603	RESISTOR SMD 0603 ±5% 1/10W
58	1	R78	5.1K	R0402	RESISTOR SMD 0402 ±1% 1/16W
59	1	R86	25	R0402	RESISTOR SMD 0402 ±1% 1/16W
60	3	R89,R90,R91	51	R0402	RESISTOR SMD 0402 ±1% 1/16W
61	2	TP1,TP2	T POINT R	SCREW-M3	M3 SCREW
62	2	TP3,TP4	T POINT S	TP_SMD_CIR_1D2	TEST POINT
63	3	T1,T2,T3	ETC1-1T-2TR	SM-22	Audio Transformers / Signal Transformers 1-200MHz IL 1.5dB Impedance Ratio 1:1
64	4	U1,U2,U3,U4	MP2326GD	QFN-14	19V, 4A, 40μA IQ, Step-Down Converter
65	4	U5,U6,U7,U8	TPS7A9201DSKR	WSON-10	2-A, low-noise, high-PSRR, adjustable ultra-low-dropout voltage regulator

66	1	U9	EP4CE40F23I7	FBGA-484	Altera FPGAs (Field Programmable Gate Array)
67	2	U10,U12	SGM2028-3.3	SOT-23-5	500mA, Ultra Low Dropout,Low Power, RF Linear Regulators
68	1	U11	AD8306AR	SO-16	Logarithmic Amplifiers 100 dB-range 10nA-1mA
69	1	U13	SN74LVC2G34DBVR	SOT-23-6	Dual Buffer Gate Y=A
70	1	U14	LTC2207	QFN-48	16-Bit, 105Msps ADC
71	1	U15	TPA711	MSOP-8-PAD	700-mW, mono, analog input, Class-AB audio amplifier
72	1	U16	PCM1754	SSOP-16	stereo audio digital-to-analog converter (DAC)
73	1	U17	EPCQ16ASI8N	SO-8	FPGA Configuration Flash Memory
74	1	Y1	KC3225A49.1520C30E00	TSX-3225-4P	Standard Clock Oscillators 3.3volts 49.1520MHz 3.2x2.5mm CMOS Output Format

Bill Of Materials --- MOTOR					
Item	Quantity	Reference	Part	PCBFootprint	Details
1	2	C1,C2	0.01uF	C0402	CAPACITOR SMD 0402 0.01uF 50V ±10%
2	2	C3,C4	1uF/16V	C0402	CAPACITOR SMD 0402 1uF 16V ±10%
3	2	C5,C6	15nF	C0402	CAPACITOR SMD 0402 15nF 25V ±10%
4	2	C7,C8	0.1uF	C0603	CAPACITOR SMD 0603 0.1uF 50V ±10%
5	1	C9	100pF/25V	C0603	CAPACITOR SMD 0603 100pF 25V ±10%
6	1	C10	150pF/25V	C0603	CAPACITOR SMD 0603 150pF 25V ±10%
7	15	C11,C13,C14,C16,C18,C19, C59,C60,C61,C63,C65,C67, C69,C74,C75	0.1uF/25V	C0603	CAPACITOR SMD 0603 0.1uF 25V ±10%
8	8	C12,C15,C17,C20,C62,C64, C66,C68	22uF/25V	C1206	CAPACITOR SMD 1206 22uF 25V ±10%
9	2	C21,C22	0.1uF/10V	C0402	CAPACITOR SMD 0402 0.1uF 10V ±10%
10	29	C23,C24,C25,C26,C30, C32,C34,C36,C38,C40, C42,C47,C48,C49,C70, C73,C81,C82,C84,C85, C88,C93,C94,C95,C97, C102,C118,C119,C120	0.1uF	C0402	CAPACITOR SMD 0402 0.1uF 10V ±10%
11	2	C27,C28	22pF/10V	C0402	CAPACITOR SMD 0402 22pF 10V ±10%
12	6	C29,C39,C41,C43,C111,C112	0.1uF	C0402	CAPACITOR SMD 0402 0.1uF 25V ±10%
13	7	C31,C33,C35,C37,C76, C80,C92	0.1uF	C0402	CAPACITOR SMD 0402 0.1uF 16V ±10%
14	8	C44,C45,C50,C51,C115, C116,C121,C122	2.2uF	C0603	CAPACITOR SMD 0603 2.2uF 25V ±10%
15	8	C46,C52,C71,C72,C96, C98,C117,C123	10uF	C0603	CAPACITOR SMD 0603 10uF 10V ±10%
16	2	C53,C55	22uF/50V	C1206	CAPACITOR SMD 1206 22uF 50V ±10%
17	2	C54,C58	0.1uF/50V	C0603	CAPACITOR SMD 0603 0.1uF 50V ±10%
18	2	C56,C57	1uF/50V	C0603	CAPACITOR SMD 0603 1uF 50V ±10%
19	4	C77,C78,C86,C89	10uF/16V	C0603	CAPACITOR SMD 0603 10uF 16V ±10%
20	1	C79	0.1uF/16V	C0603	CAPACITOR SMD 0603 0.1uF 16V ±10%
21	7	C83,C87,C90,C103,C104, C105,C106	10uF/16V	C0805	CAPACITOR SMD 0805 10uF 16V ±10%
22	1	C91	1uF	C0603	CAPACITOR SMD 0603 1uF 16V ±10%
23	1	C99	0.01uF	C0402	CAPACITOR SMD 0402 0.01uF 10V ±10%
24	2	C100,C101	1uF	C0603	CAPACITOR SMD 0603 1uF 10V ±10%
25	2	C107,C108	4.7uF	C0603	CAPACITOR SMD 0603 4.7uF 25V ±10%
26	2	C109,C110	10uF	C0603	CAPACITOR SMD 0603 10uF 25V ±10%
27	2	C113,C114	0.1uF	C0402	CAPACITOR SMD 0603 0.1uF 25V ±10%
28	3	D1,D14,D19	BLUE	LED0402	LED SMD 0402 GREEN COLOR
29	4	D2,D3,D17,D18	LED	LED0402	LED SMD 0402 RED COLOR
30	4	D4,D5,D6,D7	LED	LED0402	LED SMD 0402 BLUE COLOR
31	12	D8,D9,D10,D11,D12,D13, D20,D21,D22,D23,D24,D25	ESD5451X	DF1006	Bi-directional TVS Reverse stand-off voltage:±5V Max
32	2	D15,D16	1N4148WT	SOD-523F	HIGH SPEED SWITCHING DIODES

33	1	J1	HEADER-1X4	SH1D0-SMD-VER-4P	SH1.0MM SMD VERTICAL INSTALLATION 4PINS CONNECTOR
34	1	J2	HEADER1x6	SH1D0-SMD-VER-6P	SH1.0MM SMD VERTICAL INSTALLATION 6PINS CONNECTOR
35	1	J3	FPC-14P-0.5	FPC-14P-0D5	FPC 14PINS 0.5MM HORIZONTAL CONNECTOR
36	2	J4,J5	CONNECTOR-2X10P	PHB2D0MM-2X10P-VER	PHB2.0mm 2X10PINS VERTICAL INSTALLATION CONNECTOR
37	2	L1,L2	4.7uH/2A	CD54-IND-2P	INDUCTOR SMD CD54 SERIES 4.7uH 2A
38	2	L3,L4	BLM18SP102SN1D	FB0603	Ferrite Beads 0603 1000ohm 25% 1.2A
39	1	L5	MPZ1005D330ET000	FB0402	33 Ohms @ 100 MHz 1 Power Line Ferrite Bead 0402 (1005 Metric) 800mA 180mOhm
40	4	R1,R5,R11,R12	100K	R0402	RESISTOR SMD 0402 100K ±5% 1/16W
41	13	R2,R6,R8,R10,R31,R38, R39,R45,R47,R48,R59, R60,R69	DNP	R0402	DO NOT PLACE
42	1	R3	787K	R0402	RESISTOR SMD 0402 787K ±5% 1/16W
43	1	R4	68K	R0402	RESISTOR SMD 0402 68K ±1% 1/16W
44	1	R7	499K	R0402	RESISTOR SMD 0402 499K ±5% 1/16W
45	1	R9	12K	R0402	RESISTOR SMD 0402 12K ±1% 1/16W
46	2	R13,R15	40.2K	R0402	RESISTOR SMD 0402 40.2K ±5% 1/16W
47	1	R14	336K	R0402	RESISTOR SMD 0402 294K ±5% 1/16W
48	1	R16	768K	R0402	RESISTOR SMD 0402 768K ±5% 1/16W
49	2	R17,R18	0	R0603	RESISTOR SMD 0603 0 ±5% 1/10W
50	1	R19	4.7K	R0402	RESISTOR SMD 0402 4K7 ±5% 1/16W
51	8	R20,R22,R24,R25, R28,R29,R67,R70	1K	R0402	RESISTOR SMD 0402 1K ±5% 1/16W
52	2	R21,R62	560	R0603	RESISTOR SMD 0603 560 ±5% 1/10W
53	10	R23,R26,R27,R58,R65, R66,R78,R79,R80,R81	10K	R0402	RESISTOR SMD 0402 10K ±5% 1/16W
54	4	R30,R37,R40,R46	33	R0402	RESISTOR SMD 0402 33 ±5% 1/16W
55	4	R32,R33,R34,R35	10	R0402	RESISTOR SMD 0402 10 ±5% 1/16W
56	14	R36,R49,R55,R68,R71, R72,R73,R74,R75,R76, R84,R85,R86,R87	0	R0402	RESISTOR SMD 0402 0 ±5% 1/16W
57	4	R41,R42,R43,R44	2.05K,1%	R0402	RESISTOR SMD 0402 2.05K ±1% 1/16W
58	4	R50,R51,R77,R82	0.47	R3216	RESISTOR SMD 3216 0.47 ±1% 1/4W
59	2	R52,R83	6.8K	R0402	RESISTOR SMD 0402 6K8 ±5% 1/16W
60	3	R53,R54,R61	1K,1%	R0603	RESISTOR SMD 0603 1K ±1% 1/10W
61	2	R56,R57	10K	R0402	RESISTOR SMD 0402 1K ±5% 1/16W
62	1	R63	86.6K	R0402	RESISTOR SMD 0402 86.6K ±1% 1/16W
63	1	R64	21.5K	R0402	RESISTOR SMD 0402 21.5K ±1% 1/16W
64	2	TP1,TP2	T POINT R	SCREW-M3	M3 SCREW
65	3	TP5,TP6,TP7	T POINT R	TP_SMD_CIR_1D0	TEST POINT
66	2	U1,U2	MP2326GD	QFN-14	Buck Switching Regulator IC Positive Adjustable
67	2	U3,U20	TL431AIDBZT	SOT-23-3	Voltage References Adjustable Precision Shunt Regulator
68	1	U4	STM32F103VET6	LQFP-100	72MHz 512KBytes Flash 64kBytes RAM LQFP100 ARM CORTEX-M3
69	2	U5,U11	SN74LVC2G34DRL	SOT-6	Buffer, Non-Inverting 2 Element 1 Bit per Element Push-Pull Output
70	1	U6	SP3232EEY	TSSOP-16	RS-232 Transceivers
71	4	U7,U8,U9,U10	AD8226ARMZ	MSOP-8	Analog Devices Instrumentation Amplifiers
72	6	U12,U13,U14,U22,U23,U24	SN74LVC2G34DBVR	SOT-23-6	Buffer, Non-Inverting 2 Element 1 Bit per Element Push-Pull Output
73	2	U15,U16	DRV8848PWPR	HTSSOP-16	Bipolar Motor Driver Power MOSFET PWM 16-HTSSOP
74	2	U17,U19	MCP6001T-I/OT	SOT-23-5	Microchip Technology Operational Amplifiers
75	1	U18	TPS74601PBQWDRVRQ1	WSON-6	LDO Voltage Regulators Automotive 1-A, low-IQ, high-PSRR, low-dropout (LDO) voltage regulator with power good
76	1	U21	SGM2028-3.3	SOT-23-5	LDO Regulator Pos 3.3V 500mA 5-Pin SOT-23 T/R

77	2	U25,U26	DRV8846RGER	VQFN-24	highly-integrated stepper motor driver
78	1	Y1	8MHz	CRY5032	SMD CRYSTAL 8.0MHz 2PINS 5032



SMT MARKERx12 LOCATED ON FOUR EDGES OF PCB

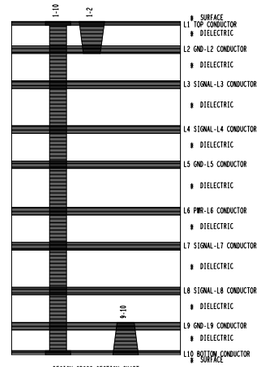
TELECTRICIAN
ALL-IN-ONE

DRILL LEGEND TABLES

DRILL CHART: TOP to GND-L2			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	FINISHED_SIZE	PLATED	QTY
·	0.2	PLATED	85

DRILL CHART: GND-L9 to BOTTOM			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	FINISHED_SIZE	PLATED	QTY
·	0.15	PLATED	1
·	0.2	PLATED	132

DRILL CHART: TOP to BOTTOM			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	FINISHED_SIZE	PLATED	QTY
·	0.15	PLATED	463
·	0.2	PLATED	725
□	0.9	PLATED	44
○	1.0	PLATED	1
Ⓜ	3.2	NON-PLATED	4



DESIGN CROSS-SECTION CHART
TOTAL THICKNESS 1.565 MM

IN GOD WE TRUST, NO BUGS INDEFINITELY.

ALL QUESTIONS PLEASE CALL +8613522296239(YANTAI ELECTRICIAN)

LDVMTRA121DEC15=LDV+MOTOR+A1(REVISION)+21(YEAR)+DEC(DECEMBER)+15(DAY)

LDVFMA121DEC15=LDV+FM DEMODULATION+A1(REVISION)+21(YEAR)+DEC(DECEMBER)+15(DAY)