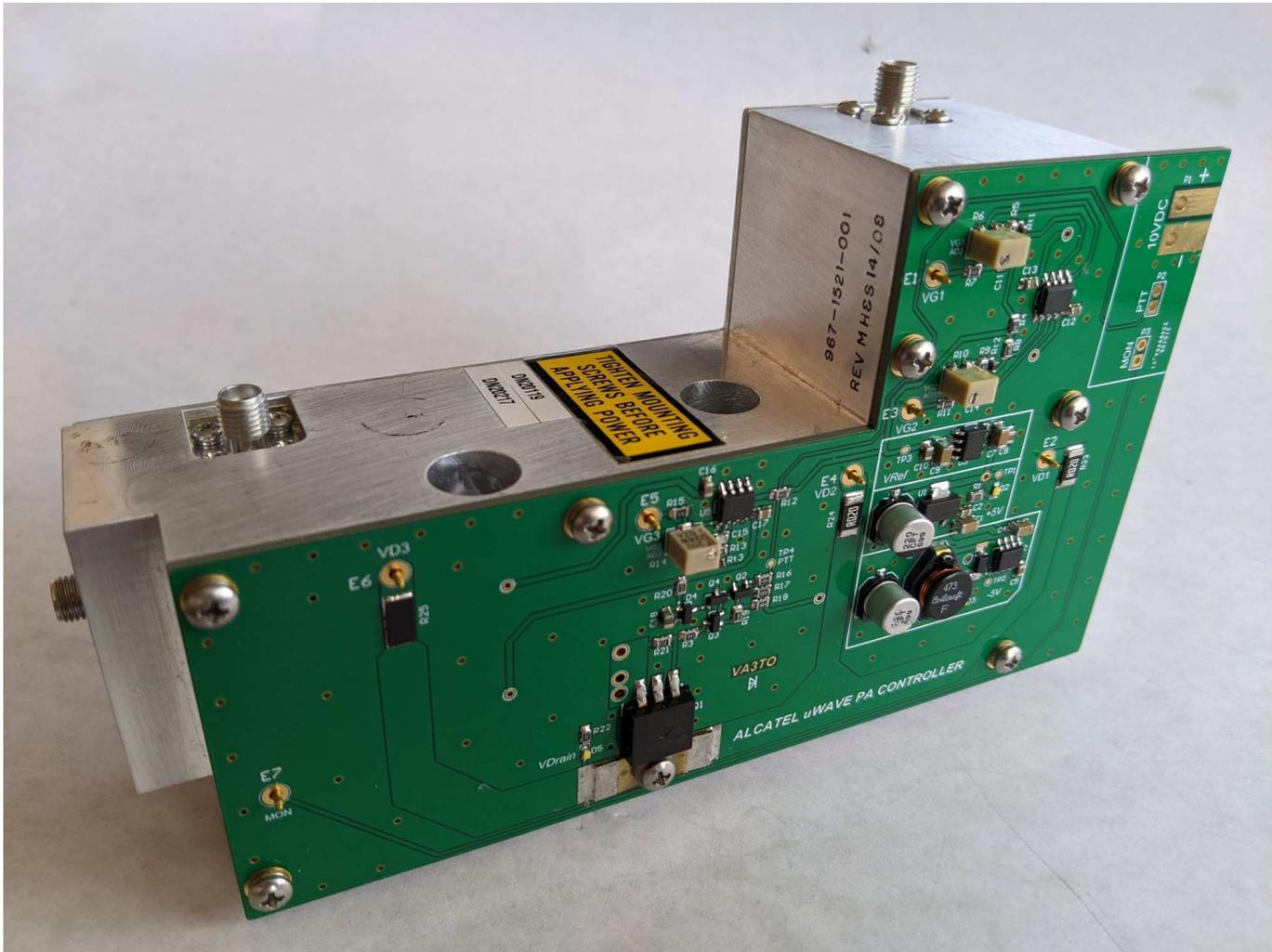


Bias Supply/ Control Board for Alcatel MDR-8000 Amplifiers

Hugh Duff VA3TO March 2021

This board was designed specifically to replace the much larger and complex original bias/control board for the 3DH04136 series of X-band amplifiers out of surplus Alcatel MDR-8000 systems.



There are a couple of tasks required to prepare the board for installation.

1. During the board design most of the non-ground vias were strategically placed over existing holes in the 3DH04136 PA block except for the 3 shown in Figure 1-1. These require dimpling the aluminum block with the tip of a drill to prevent the via from shorting to ground. Place the board against the PA block and use a pin to scribe the location of the holes through the vias on the board.

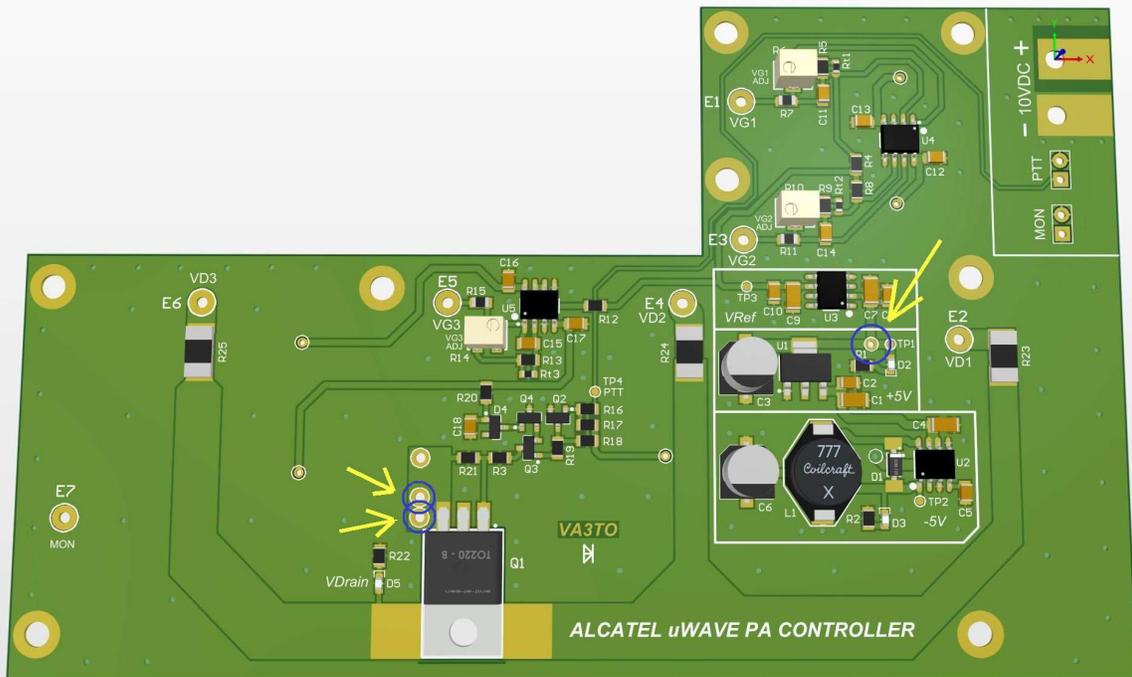


FIGURE 1-1

** Note – Rev.A has four holes to feed DC to the switching FET. Be sure to dimple the aluminum block on the additional hole to avoid shorting to ground.

Remove the board and use the tip of a 1/4" drill to make shallow holes large enough to clear the annular ring of the non-ground vias as shown in Figure 1-2.

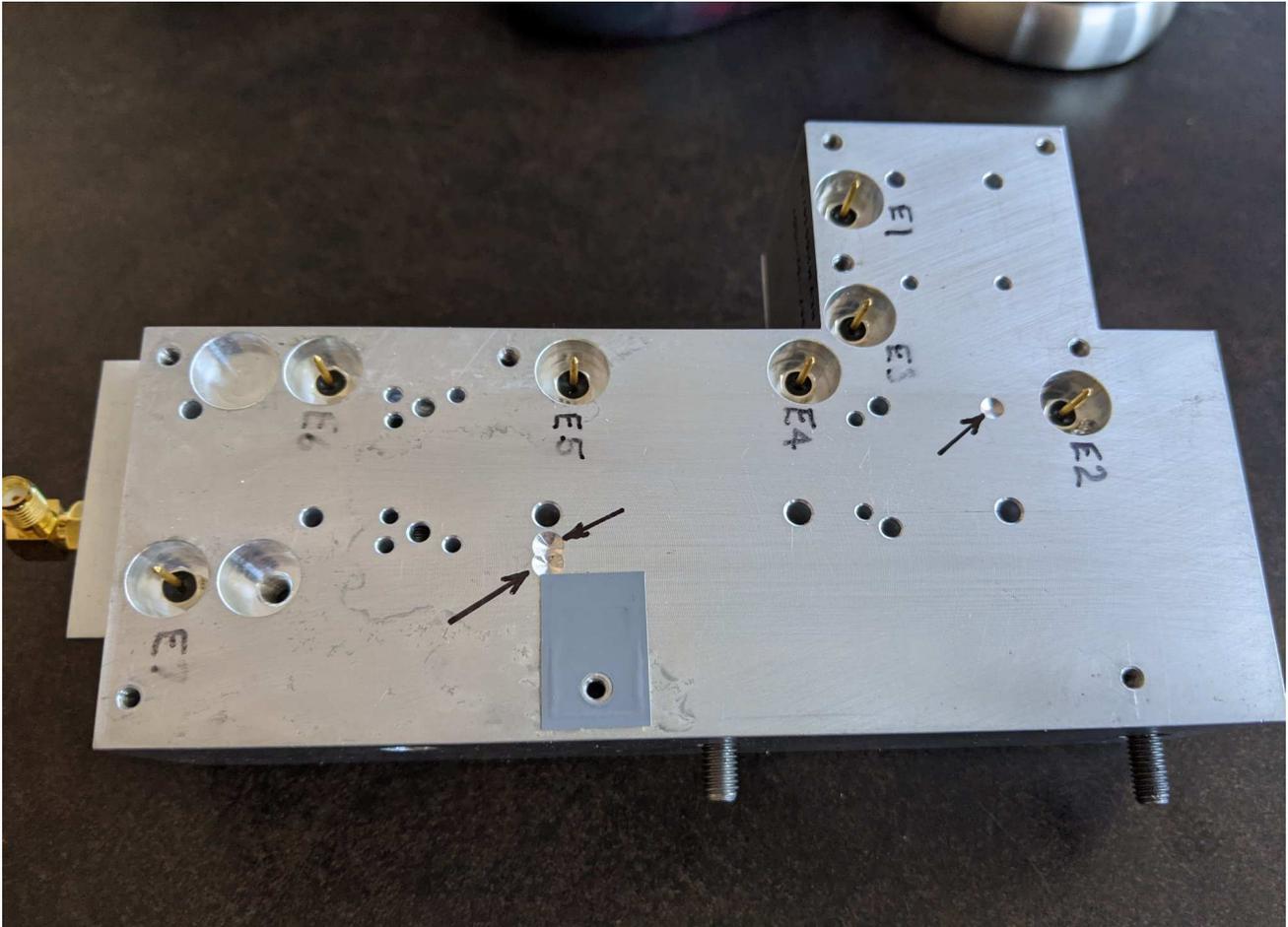


FIGURE 1-2

2. Install the switching FET with the board mounted for proper alignment of the TO-220 heatsink tab. The drain tab of the FET is hot (not ground) so it needs to be insulated from the heatsink block. Place an insulator pad on the PA block where the switching FET will be installed. Trim off the narrower part of the leads of the FET to the point where they get wider. Fabricate a buss bar out of brass, copper or tin to straddle the tab on the switching FET. Drill a hole in the buss bar just big enough to clear the o.d. of the shoulder insulator as seen in Figure 2-1. This supplies 10V from the switching FET to the 3 amplifier Drains.

Install the FET into the opening on the board with the brass buss bar and shoulder insulator in place as shown in Figure 2-1. Install the screw and tighten. The sides of the brass bar will tend to bend up as the screw is tightened. If you're fussy like me then you can bend the bar on both sides to have a gullwing profile. Solder the leads of the FET to the board. Temporarily remove the shoulder insulator (so it doesn't melt), use a countersunk 4-40 screw through the buss bar and FET tab to centre everything, tighten then solder the brass bar to the pc board on both sides of the tab. Let the buss bar cool down then re-install the shoulder insulator using a pan head screw. Use an ohmmeter to verify that the tab of the FET is not making contact with the PA block (ground).

Solder PA pins E1 to E7 to the board.

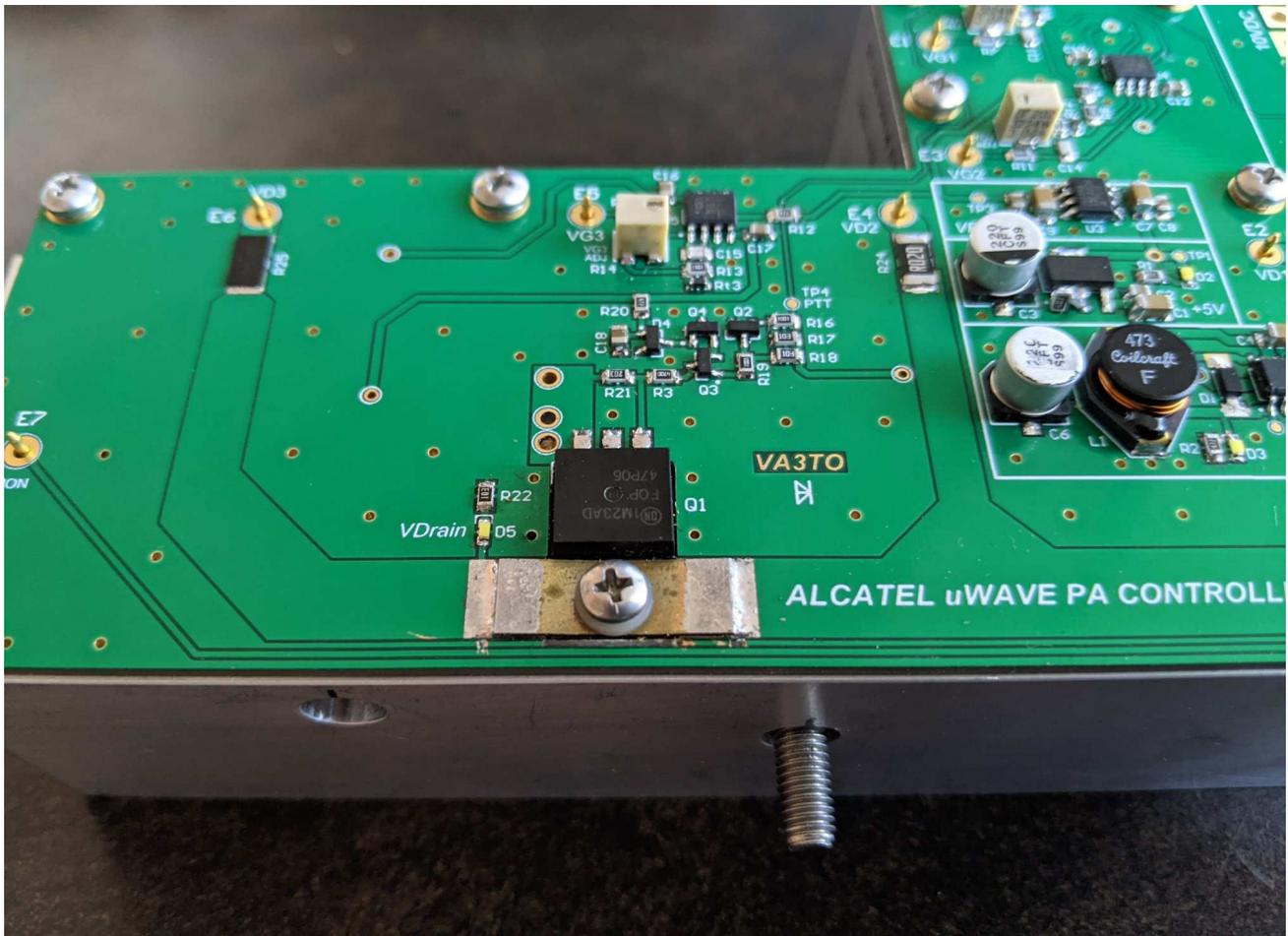


FIGURE 2-1

3. If you have the original Alcatel bias board and are able to measure and record the bias settings for your particular PA block then set them accordingly on the new board. If not then Bias currents for all 3 devices needs to be set as follows.

Be sure to perform this step with the PA block mounted to a suitable heatsink. Temporarily solder short wires (i.e. discarded resistor leads) to both sides of the drain resistors R23, R24 and R25 in order to measure the current using a voltmeter.

Be sure to set all 3 multi-turn bias set pots fully clockwise. We want the FET bias voltages to be pinched-off at the start.

Apply 10VDC with at least 8 Amps to the power input of the board. Short the PTT input to ground. The Vdrain LED should illuminate. With the 0.020 ohm drain resistors you should see 20mV per Ampere.

Adjust R6 for 900mA across R23. (E1 reads approx. -0.348V for my amplifier)

Adjust R10 for 2.2A across R24. (E3 reads approx. -0.458V for my amplifier)

For amplifiers using a -12F device as the final, adjust R14 for 3.6A across R25.

For amplifiers using a -15F device as the final, adjust R14 for 4.0A across R25.

(E5 reads approx. -1.840V for my amplifier using a -15 device.)

Note that some PAs may require changes to the gain resistors around the gate voltage op-amps in order to provide the correct range of bias voltages. The default values used here have worked for most of the 3DH04136 Alcatel PA blocks that this board has been used on.

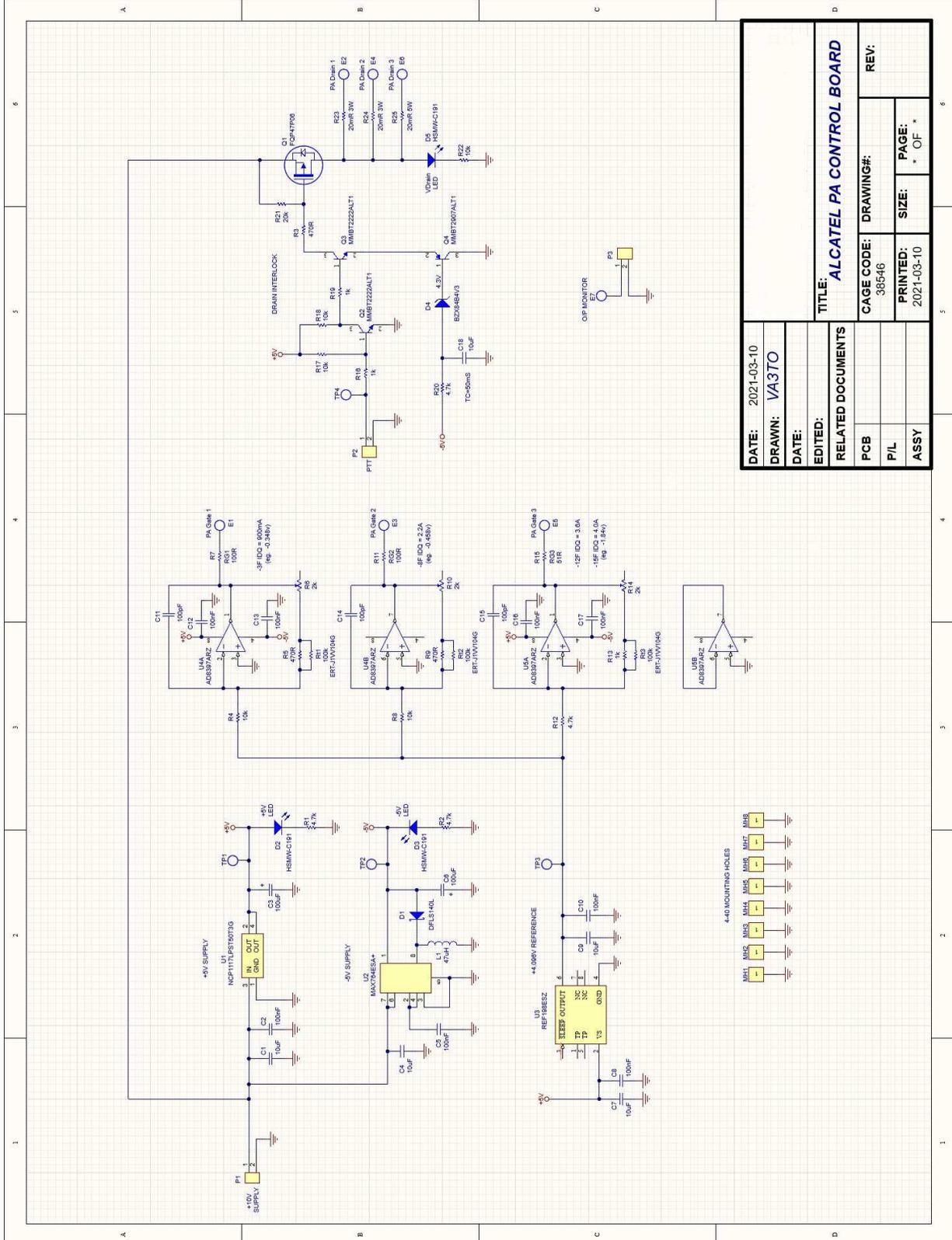
Snowflaking the PA strip is recommended for optimal performance since these PAs were designed to work a little higher in frequency. With a little time and effort you can improve the gain and output power.

This board should also work with 3DH03218 series amplifiers for 5.7 GHz however the PA block will need to be dimpled to avoid the non-ground vias from shorting to ground since the existing holes in the 3218 blocks differ from those in the 4136 blocks. The gain resistors around the gate voltage op-amps may also need to be altered accordingly.

PARTS LIST

1	Designator	Description	Part Number
2	C1, C4, C7, C9	Cap, 10u, 25V, 10%, X7R, 1206	12063C106KAT2A
3	C2, C5, C8, C10, C12, C13, C16, C17	Cap, 100n, 50V, 5%, X7R, 0805	08055C104JAT2A
4	C3, C6	Cap, Aluminum, 100uF, 35V, 20%, 6.3x8mm, NIC	NACK101M35V6.3X8TR13F
5	C11, C14, C15	Cap, 100p, 100V, 5%, C0G, 0805	08051A101JAT2A
6	C18	Cap, 10u, 16V, 10%, X5R, 0805	0805YD106KAT2A
7	D1	Diode, Schottky, 150mA, 100V, 150mW, SOD-123	DFLS140L
8	D2, D3, D5	Diode, LED, White, 20mA, 0603, Avago	HSMW-C191
9	D4	Diode, Zener, 4.3V, Single, SOT23, On Semi	BZX84B4V3
10	L1	Inductor, 47uH, 1.6A, SMD, Bourns	PM3340-470M-RC
11	L1 Alternate	Inductor, 47uH, 1.8A, SMD, Coilcraft	DO3316P-473MLB
12	Q1	MosFet, P-Chan, 100V, 9.2A, DPak, Vishay	FQP47P06
13	Q2, Q3	Transistor, NPN, 40V, 600mA, SOT23, ON Semi	MMBT2222ALT1
14	Q4	Transistor, PNP, 60V, 600mA, SOT23, ON Semi	MMBT2907ALT1
15	R13, R16, R19	Res, 1K, 1%, 125mW, Thick Film, 0805	CRCW08051K00FKEA
16	R3,R5,R9	Res, 470R, 5%, 125mW, Thick Film, 0805	CRCW0805470RJNEA
17	R4, R8, R17, R18, R22	Res, 10K, 1%, 125mW, Thick Film, 0805	CRCW080510K0FKEA
18	R6, R10, R14	Pot, 2K, 10%, 250mW, 4.8mm x 3.5mm SMT, Bourns	3224W-1-202E
19	R7, R11	Res, 100R, 5%, 125mW, Thick Film, 0805	CRCW0805100RJNEA
20	R15	Res, 51R, 5%, 125mW, Thick Film, 0805	CRCW0805051R0JNEA
21	R21	Res, 20K, 5%, 125mW, Thick Film, 0805	CRCW080520K0JNEB
22	R1,R2,R12,R20	Res, 4.7K, 1%, 125mW, Thick Film, 0805	CRCW08054K70FKEA
23	R23, R24	Res, 0.02 ohm, 1%, 3W, 2512	CSRL3-0R02F8
24	R25	Res, 0.02 ohm, 1%, 5W, 2512	TLRH3APTTE20L0F
25	Rt1, Rt2, Rt3	Res, 100K, Thermistor, 0603	ERT-J1VV104G
26	U1	IC Linear Regulator 5V 1A SOT223	NCP1117LPST50T3G
27	U2	Inverting Switching Regulator, -5V, 260mA	MAX764ESA+
28	U3	Voltage Reference, SOIC8	REF198ESZ
29	U4, U5	OP AMP, Dual Hi Current, 8397, SOIC8	AD8397ARZ

SCHEMATIC



DATE: 2021-03-10		DRAWN: VA370	
DATE:		DATE:	
EDITED:		EDITED:	
RELATED DOCUMENTS			
PCB	CAGE CODE:	DRAWING#:	REV:
P/L	38546		
ASSY	PRINTED:	SIZE:	PAGE:
	2021-03-10	* OF *	*

TITLE: **ALCATEL PA CONTROL BOARD**

