SP80FA / SP80FB

Functional description for switch mode powersupply SP80FA & SP80FB

Theory of function

SP80FA-board:
AC-power is coming in to terminal P1, passing interference filter L1, L2 and then reaching RE1 and R5.

In some variants the on-off switch is located directly after terminal P1, in other variants it is connected to CP5-CP7, controlling the soft start relay RE1. When the on-off switch turns in position CP5-CP6, soft start resistor R5 gives power to mains rectifier D1.

The voltage is rectified by D1 and filtered by C8, C9 and C1, C2 (SP80FB). This gives 310V DC to the transformer.

SP80FB-board:
Current generator R17, D4, Q5, R16, R10 charge C9 until D3 conduct at 15V. Q8 work as under voltage protection for the +15V voltage by turning U1:3 to 5V if U1:15 drops below 14V.

When U1:2 (under voltage protect) reach 3V soft start capacitor C10 (U1:8) is released, witch slowly increase the pulse width of U1:12.

The PWM-controller U1:12 controls the switch Q1-Q3 to give the correct output voltage at terminal CP17, CP19 (SP80FA). When the switch Q1-Q3 is closed, current flows trough transformer, storing energy. Because of the voltage polarity, diode D3, D4 (SP80FA) are reverse-biased, thus no voltage present at the load. When the switch is open, the transformer reverses polarity because of the collapsing magnetic field, forward-biasing diode D3, D4 and inducing a current flow into the capacitors C12, C14 (SP80FA).

If U1:3 (over voltage protect) goes above 3V the pulses on pin 12 stops immediately. This occurs if the main voltage is too high, or the voltage across snubber capacitor C5 is too high.

The reversed voltage is sensed by a winding in the transformer and rectified by diode D8. The PWM-controller adjust the on-time of the switch, by comparing the voltage across C14 (U1:17) with an internal reference (U1:16), to give the right rail voltage across the capacitors C12, C14 (SP80FA). The voltage can be adjusted by potentiometer VR2.

The maximum current in the transformer is sensed over the resistor R6-R8. The voltage across R6-R8 is compared (U1:6) with a reference-voltage, set by VR3, witch make it possible to adjust the maximum output power from the power supply. Normally VR3 is in maximum position, but if something has to be repaired in the amplifier, VR3 is used for "slow starting" the amplifier.

SP80FA-board:
Immediately when Q1-Q3 (SP80FB) turn on, D2 rectify the pulse from the transformer (CP11, CP12). The DC voltage across C7 activates RE1 witch short soft start resistor R5.

To turn off the amplifier the on-off switch is set in position CP6-CP7. This disconnects R5, and open RE1, turning the amplifier off.

Repairing instructions

REQUIRED MEASUREMENT EQUIPMENT:
-Audio generator
-Dummy load, 16 ohm
-Digital voltmeter
-Variac 0-280V, 6A
-50Mhz oscilloscope, ex. Tek 2225 with 100x probe ex. Tek P6009
-Isolation transformer for the mains, 1:1

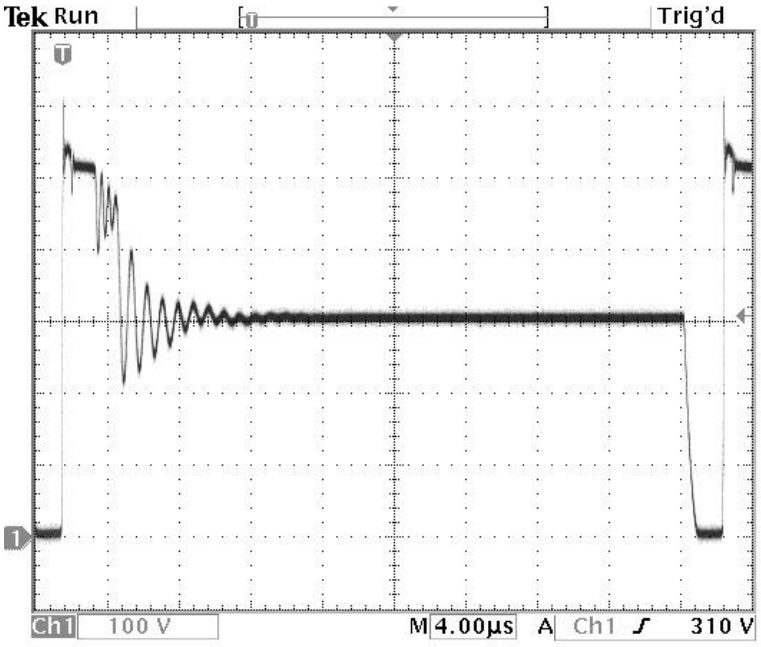
1) Turn VR3 (SP80FB) fully counter clockwise.
2) Change FU1 (SP80FA).
3) Increase the main voltage slowly by the variac.
4) Measure the voltage across C8 and C9 (SP80FA).
   a) No voltage: -change R5 (SP80FA).
   b) The current increases quickly:
      -check D1 (SP80FA).

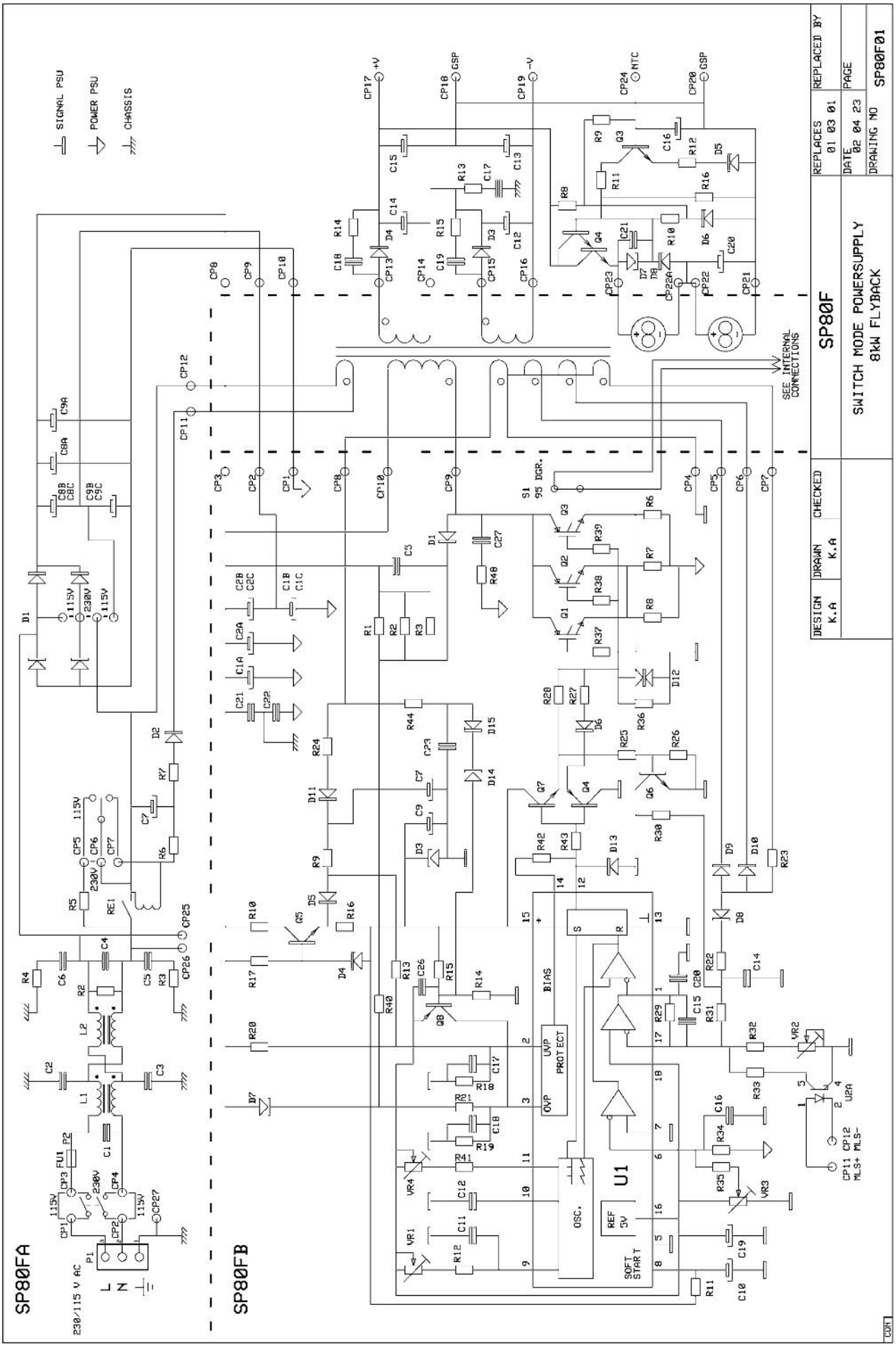
-check Q1, Q2, Q3 (SP80FB).

It is now possible to increase the voltage across C8 and C9 (SP80FA) to approx. 300V without current inrush.
Measure across Q1 (SP80FB) collector and emitter with an oscilloscope. This oscilloscope should be connected to mains power with an isolation transformer.

7) Turn VR3 slowly clockwise until a pulse is visible on the scope. The frequency is approx. 27 kHz (see figure1). If the graph is seen, go to item 9).
8) If only narrow spikes is seen, check the following components.
   a) D3, D4 (SP80FA) or the output circuits.
   b) D1, C5, R1 (SP80FA) -makes U1 go into over voltage protection.
   c) U1 -the output will remain low all the time.
9) Turn VR3 fully clockwise:
   a) Check the output voltage on C12, C14 (SP80FA). Adjust with VR2.
   b) Check the soft start circuit by turning the main switch on and off and look at the oscilloscope.
   c) Increase the power by applying an audio signal to the amplifier and turn up the gain controls. -The pulse width will increase.
   d) Check the over/ under voltage protection circuits by turning the variac up to 280 VAC and down to 130 VAC. (No load)

Fig. 1




SP80FA
SP80FB
SIGNAL PSU
POWER PSU
CHASSIS
SP80F
SWITCH MODE POWERSUPPLY
8kW FLYBACK
DESIGN K.A
DRAWN K.A
CHECKED
REPLACES 01 03 01
DATE 02 04 23
DRAWING NO SP80F01
REPLACED BY
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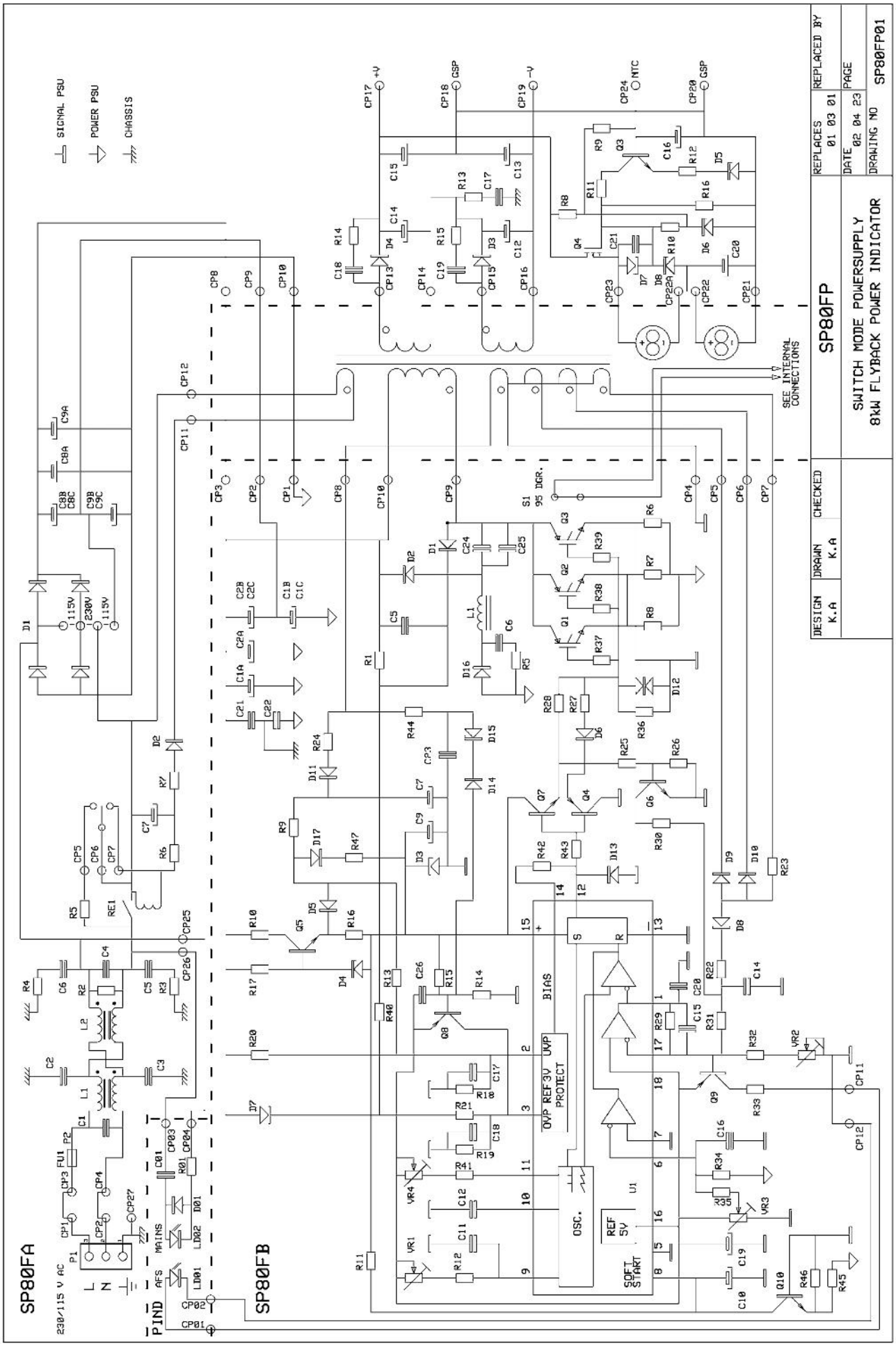
SEE INTERNAL CONNECTIONS
230/115 V AC
U1
SOFT START
OSC.
REF 5V
BIAS
UVP PROTECT
OVP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POWER PSU
CHASSIS
SP80FP
SWITCH MODE POWERSUPPLY
8kW FLYBACK POWER INDICATOR
SP80FP01
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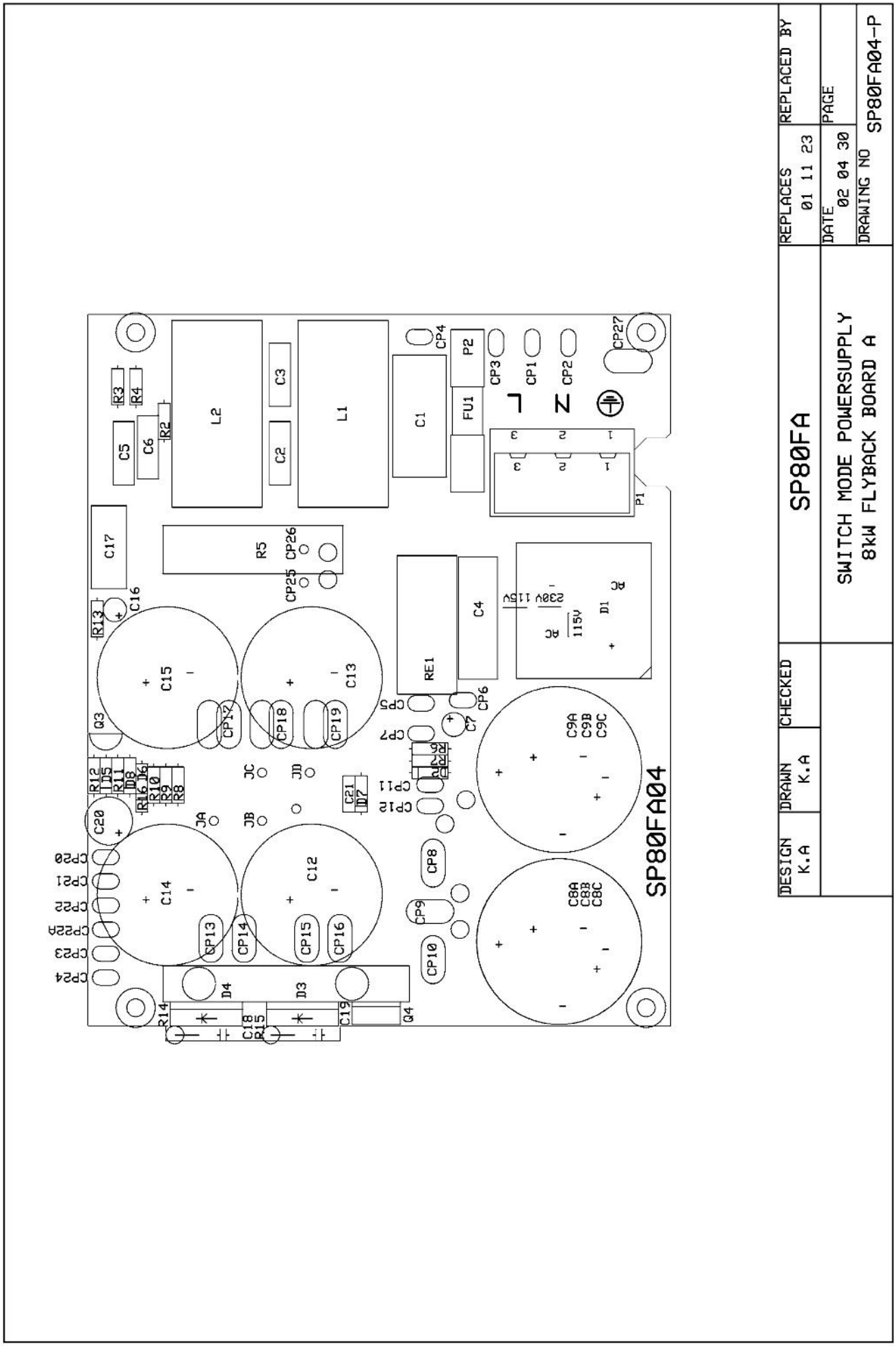
SP80FB
230/115 V AC
MAINS
AFS
PIND
SEE INTERNAL CONNECTIONS
OSC.
REF 5V
SOFT START
OVP REF3V UVP PROTECT
BIAS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DESIGN K.A
DRAWN K.A
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DATE 02 04 30
DRAWING NO SP80FA04-P
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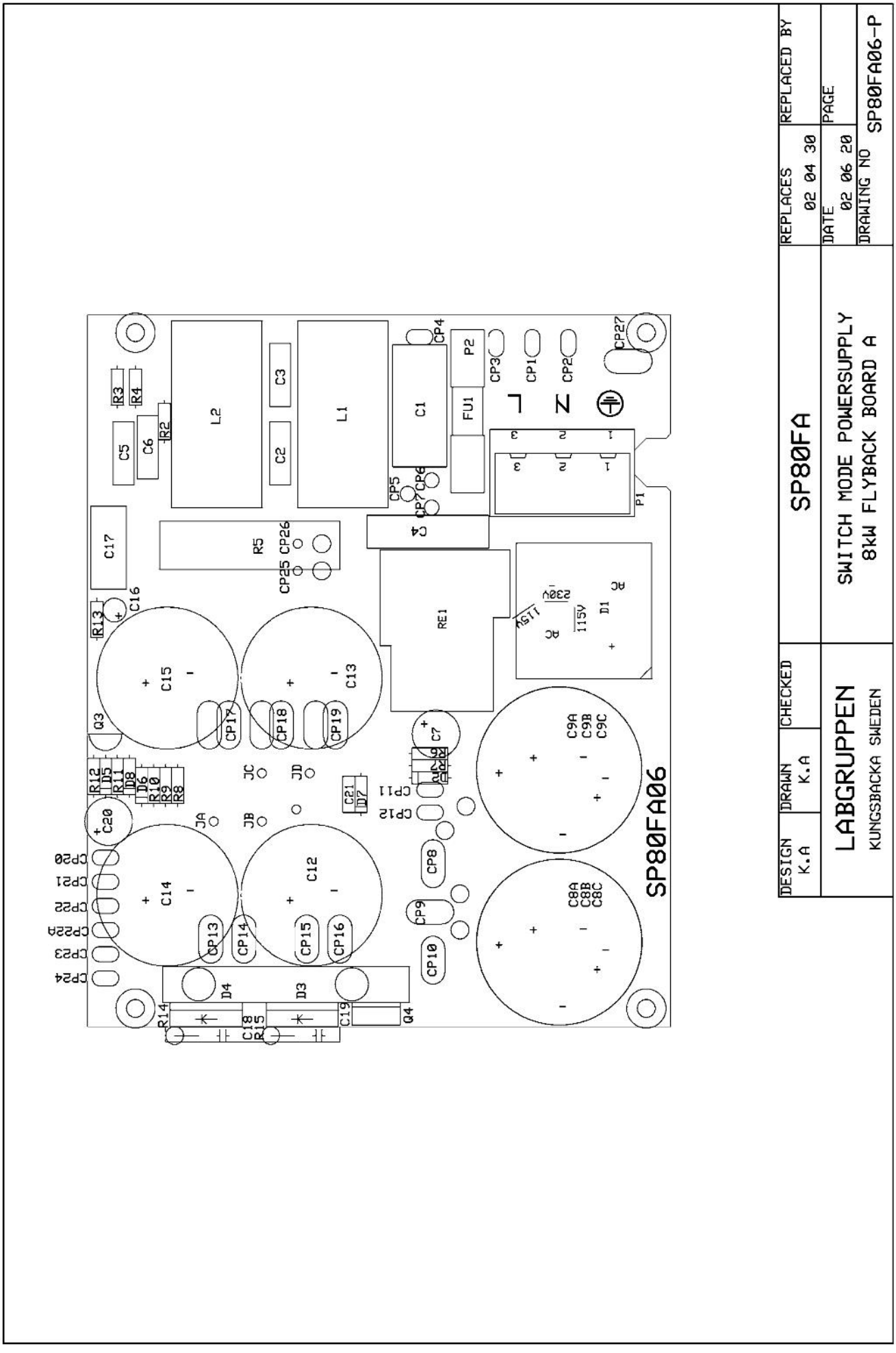
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LABGRUPPEN
KUNGSBACKA SWEDEN
DESIGN K.A
DRAWN K.A
CHECKED
REPLACES 02 04 30
DATE 02 06 20
DRAWING NO SP80FA06-P
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PAGE

Component list for SP80FA - rev 06

⚠ - Safety critical component. Should only be replaced with the specified type.

	Position	Partnumber	Description	Comment	Side
⚠	C1	u47X22.5	Capacitor 470n X2 metallized propylene 22.5mm		Top
⚠	C2		Variant dependent, see separate list		Top
⚠	C3		Variant dependent, see separate list		Top
⚠	C4	u22X22.5	Capacitor 220n X2 metallized propylene 22.5mm		Top
⚠	C5		Variant dependent, see separate list		Top
⚠	C6		Variant dependent, see separate list		Top
	C7	100u50V	Capacitor electrolytic 100u 50V 5mm		Top
	C8A		Variant dependent, see separate list		Top
	C8B		Variant dependent, see separate list		Top
	C8C		Variant dependent, see separate list		Top
	C9A		Variant dependent, see separate list		Top
	C9B		Variant dependent, see separate list		Top
	C9C		Variant dependent, see separate list		Top
	C12		Variant dependent, see separate list		Top
	C13		Variant dependent, see separate list		Top
	C14		Variant dependent, see separate list		Top
	C15		Variant dependent, see separate list		Top
	C16	22u50V	Capacitor electrolytic 22u 50V 5mm		Top
⚠	C17	2u2100VMMK15	Capacitor polyester 2u2 100V MMK 15mm		Top
	C18		Variant dependent, see separate list		Top
	C19		Variant dependent, see separate list		Top
	C20	100u50V	Capacitor electrolytic 100u 50V 5mm		Top
	C21		Variant dependent, see separate list		Top
⚠	D1	GBPC35-06	Diode bridge GBPC35-06		Top
	D2	BYV26C	Diode power switch BYV26C		Top
	D3	STTA3006PI	Diode power STTA3006PI standing		Top
	D4	STTA3006PI	Diode power STTA3006PI standing		Top
	D5	5V6.4W2%	Diode zener 5V6 .4W 2%		Top
	D6	62V.4W2%	Diode zener 62V .4W 2%	May have different value	Top
	D7		Variant dependent, see separate list		Top
	D8		Variant dependent, see separate list		Top
⚠	FU1		Variant dependent, see separate list		Top
	JMPR 230V		Variant dependent, see separate list		Top
	JMPR 1 115V		Variant dependent, see separate list		Top
	JMPR 2 115V		Variant dependent, see separate list		Top
	JMPR JB-JC	R04M1.2	Resistor jumper 0R 4modules D1.2mm		Top
	JMPR CP1-CP3		Variant dependent, see separate list		Top
⚠	JMPR CP2-CP4		Variant dependent, see separate list		Top
	JMPR CP5-CP6		Variant dependent, see separate list		Top
⚠	L1		Variant dependent, see separate list		Top
⚠	L2		Variant dependent, see separate list		Top
⚠	P1	TBPC3P4M8	Terminal bloc PCB 3pole 4module 8mm2		Top
	P2	FCPC5x20-6.3x32	Fuse clip combi PCB 5x20 and 6.3x32 mm fuse (2pcs)		Top
	Q3	BC546	Transistor bipolar signal BC546		Top
	Q4		Variant dependent, see separate list		Top
	R2	1M.7W1%	Resistor Metal Film 1M.7W1%		Top
	R3	33R.25W5%	Resistor Carbon Film 33R.25W5%		Top
	R4	33R.25W5%	Resistor Carbon Film 33R.25W5%		Top
⚠	R5		Variant dependent, see separate list		Top

	Position	Partnumber	Description	Comment	Side
	R6	33R.25W5%	Resistor Carbon Film 33R.25W5%		Top
	R7	2R21W5%	Resistor metal film 2R2 1W 5%		Top
	R8		Variant dependent, see separate list	May have different value	Top
	R9		Variant dependent, see separate list	May have different value	Top
	R10	39K.7W1%	Resistor Metal Film 39K.7W1%	May have different value	Top
	R11	18K.7W1%	Resistor Metal Film 18K.7W1%	May have different value	Top
	R12	4K7.7W1%	Resistor Metal Film 4K7.7W1%	May have different value	Top
	R13	4R7.25W5%	Resistor Carbon Film 4R7.25W5%		Top
	R14		Variant dependent, see separate list		Top
	R15		Variant dependent, see separate list		Top
	R16	-	Not used	May have different value	Top
⚠	RE1	PCSPNO40A18V	Relay PCB SPNO 40A 18V	May have different value	Top

Variant specific components for 230V versions - rev 06

	Position	SP80FA-4x6-2	SP80FA-2x13-2	SP80FA-2x17-2	SP80FA-2x32-2
⚠	C2	1n5Y10	1n5Y10	1n5Y10	1n5Y10
⚠	C3	1n5Y10	1n5Y10	1n5Y10	1n5Y10
⚠	C5	1n5Y10	1n5Y10	1n5Y10	1n5Y10
⚠	C6	1n5Y10	1n5Y10	1n5Y10	1n5Y10
	C8A	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	-
	C8B	-	-	-	1500u200V35x504TSI
	C8C	-	-	-	-
	C9A	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	-
	C9B	-	-	-	1500u200V35x504TSI
	C9C	-	-	-	-
	C12	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C13	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C14	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C15	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C18	4n7400VMFKT5	4n7400VMFKT5	-	-
	C19	4n7400VMFKT5	4n7400VMFKT5	-	-
	C21	-	-	680p400VK20005%5	680p400VK20005%5
	D7	-	-	15V.4W5%	15V.4W5%
	D8	-	-	39V.4W2%	39V.4W2%
⚠	FU1	T10AH250-5x20	T10AH250-5x20	T10AH250-5x20	T15AH250-6.3x32
	JMPR 230V	R02M.8	R02M.8	R02M.8	R02M.8
	JMPR 1 115V	-	-	-	-
	JMPR 2 115V	-	-	-	-
	JMPR CP1-CP3	-	-	-	R03M.8
⚠	JMPR CP2-CP4	-	-	-	AWG16BLU300VVW1
	JMPR CP5-CP6	R02M.8	R02M.8	R02M.8	-

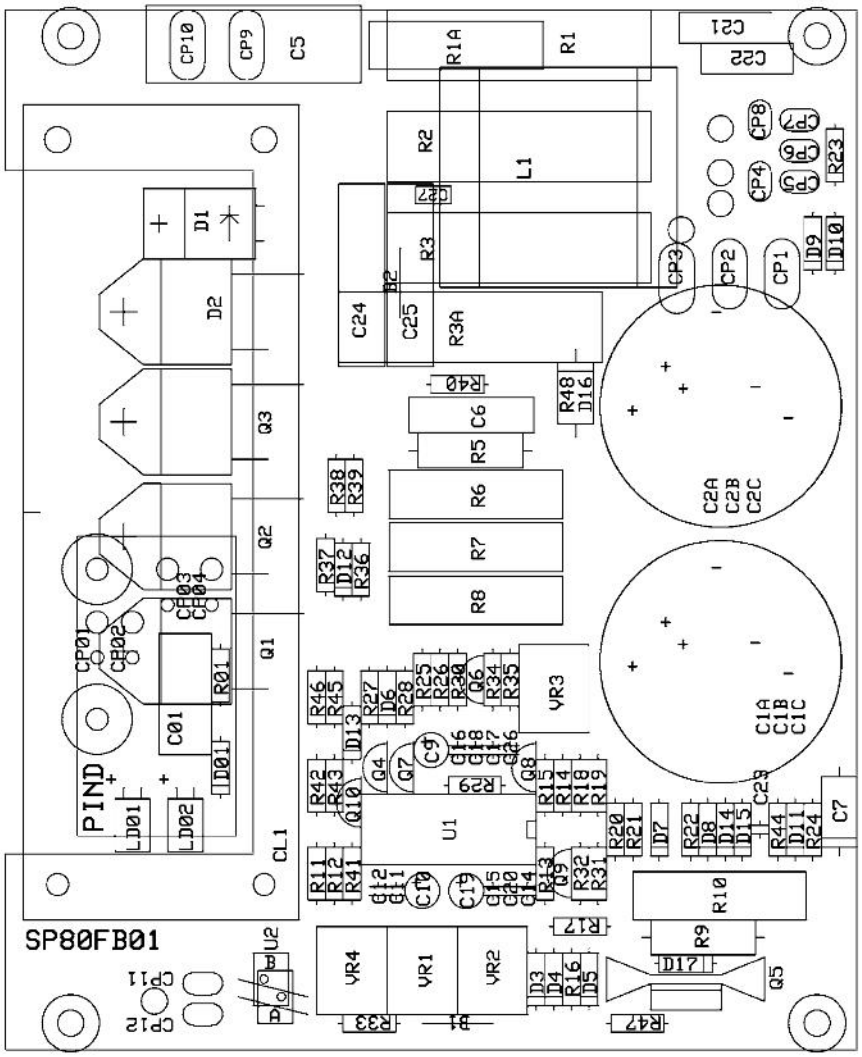
	Position	SP80FA-4x6-2	SP80FA-2x13-2	SP80FA-2x17-2	SP80FA-2x32-2
⚠	L1	2x3m7H8A-LAB	2x3m7H8A-LAB	2x3m7H8A-LAB	2x4m7H16A-LAB
⚠	L2	2x3m7H8A-LAB	2x3m7H8A-LAB	2x3m7H8A-LAB	2x4m7H16A-LAB
	Q4	TIP132	TIP132	IRF730	IRF730
⚠	R5	47R9W5%17MSO5	47R9W5%17MSO5	47R9W5%17MSO5	47R9W5%17MSO5
	R8	4K7.7W1%	8K2.7W1%	27K.7W1%SO5	27K.7W1%SO5
	R9	1M.7W1%	150K.25W5%	180K.7W1%	180K.7W1%
	R14	2R22W5%2MST	2R22W5%2MST	-	-
	R15	2R22W5%2MST	2R22W5%2MST	-	-

Variant specific components for 115V versions - rev 06

	Position	SP80FA-4x6-2U	SP80FA-2x13-2U	SP80FA-2x17-2U	SP80FA-2x32-2U
⚠	C2	2n2Y10	2n2Y10	2n2Y10	2n2Y10
⚠	C3	2n2Y10	2n2Y10	2n2Y10	2n2Y10
⚠	C5	2n2Y10	2n2Y10	2n2Y10	2n2Y10
⚠	C6	2n2Y10	2n2Y10	2n2Y10	2n2Y10
	C8A	-	-	-	-
	C8B	1500u200V35x504TSI	1500u200V35x504TSI	1500u200V35x504TSI	-
	C8C	-	-	-	2200u200V35x55
	C9A	-	-	-	-
	C9B	1500u200V35x504TSI	1500u200V35x504TSI	1500u200V35x504TSI	-
	C9C	-	-	-	2200u200V35x55
	C12	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C13	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C14	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C15	3900u100V30x45	3900u100V30x45	1800u160V30x50	1800u160V30x50
	C18	4n7400VMFKT5	4n7400VMFKT5	-	-
	C19	4n7400VMFKT5	4n7400VMFKT5	-	-
	C21	-	-	680p400VK20005%5	680p400VK20005%5
	D7	-	-	15V.4W5%	15V.4W5%
	D8	-	-	39V.4W2%	39V.4W2%
⚠	FU1	T20AH250-6.3x32	T20AH250-6.3x32	T20AH250-6.3x32	T30AH125-6.3x32
	JMPR 230V	-	-	-	-
	JMPR 1 115V	R02M.8	R02M.8	R02M.8	R02M.8
	JMPR 2 115V	R02M.8	R02M.8	R02M.8	R02M.8
	JMPR CP1-CP3	R03M.8	R03M.8	R03M.8	R03M.8
⚠	JMPR CP2-CP4	AWG16BLU300VVW1	AWG16BLU300VVW1	AWG16BLU300VVW1	AWG16BLU300VVW1
	JMPR CP5-CP6	-	-	-	-
⚠	L1	2x4m7H16A-LAB	2x4m7H16A-LAB	2x4m7H16A-LAB	2x2mH32A-LAB
⚠	L2	2x4m7H16A-LAB	2x4m7H16A-LAB	2x4m7H16A-LAB	2x2mH32A-LAB
	Q4	TIP132	TIP132	IRF730	IRF730
⚠	R5	22R9W5%17MSO5	22R9W5%17MSO5	22R9W5%17MSO5	22R9W5%17MSO5
	R8	4K7.7W1%	8K2.7W1%	27K.7W1%SO5	27K.7W1%SO5
	R9	1M.7W1%	150K.25W5%	180K.7W1%	180K.7W1%
	R14	2R22W5%2MST	2R22W5%2MST	-	-
	R15	2R22W5%2MST	2R22W5%2MST	-	-

Description for variant dependent components

Partnumber	Description
1500u200V35x504TSI	Cap. electrolytic 1500u 200V 35x50mm 4 terminals snap in
150K.25W5%	Resistor Carbon Film 150K.25W5%
15V.4W5%	Diode zener 15V .4W 5%
1800u160V30x50	Capacitor electrolytic 1800u 160V 30x50mm snap in
180K.7W1%	Resistor Metal Film 180K.7W1%
1M.7W1%	Resistor Metal Film 1M.7W1%
1n5Y10	Capacitor 1n5 Y2 metallized paper 10mm
2200u200V35x55	Capacitor electrolytic 2200u 200V 35x45mm snap in
220u385V35x55PW	Cap. electrolytic 220u 385V 35x55mm printed wiring terminals
22R9W5%17MSO5	Resistor wirewound 22R 9W 5% 17modules 5mm stand off
27K.7W1%SO5	Resistor Metal Film 27K.7W1% 5mm stand off
2n2Y10	Capacitor 2n2 Y2 metallized paper 10mm
2R22W5%2MST	Resistor metal film 2R2 2W 5% 2modules standing
2x2mH32A-LAB	Supression choke 2x2mH 32A 2x18 varv 1.8mm LAB. Rev01
2x3m7H8A-LAB	Supression choke 2x3m7H 8A 2x21 varv 1mm LAB. Rev01
2x4m7H16A-LAB	Supression choke 2x4m7H 16A 2x24 varv 1.25mm LAB. Rev01
3900u100V30x45	Capacitor electrolytic 3900u 100V 30x45mm snap in
39V.4W2%	Diode zener 39V .4W 2%
47R9W5%17MSO5	Resistor wirewound 47R 9W 5% 17modules 5mm stand off
4K7.7W1%	Resistor Metal Film 4K7.7W1%
4n7400VMFKT5	Capacitor polyester metal foil 4n7 400V MFKT 5mm
680p400VK20005%5	Capacitor ceramic 680p 400V K2000 5% 5mm
8K2.7W1%	Resistor Metal Film 8K2.7W1%
AWG16BLU300VVW1	Cable AWG16 Blue UL style 1569 VW1
IRF730	Transistor MOS power IRF730
R02M.8	Resistor jumper 0R 2modules D.8mm
R03M.8	Resistor jumper 0R 3modules D.8mm
T10AH250-5x20	Fuse slow blow 10A 250V 1500A IR 5x20mm
T15AH250-6.3x32	Fuse slow blow 15A 250V 1500A IR 6.3x32mm
T20AH250-6.3x32	Fuse slow blow 20A 250V 10000A IR 6.3x32mm
T30AH125-6.3x32	Fuse slow blow 30A 125V 400A IR 6.3x32mm
TIP132	Transistor bipolar power TIP132



DESIGN	DRAWN	CHECKED		REPLACES	REPLACED BY
K.A	K.A		SP80FB	01 11 23	
			SWITCH MODE POWERSUPPLY 8kW FLYBACK BOARD B	DATE 02 04 23	PAGE
				DRAWING NO	SP80FB01-P

Component list for PIND, SP80FB - rev 01A

⚠ - Safety critical component. Should only be replaced with the specified type.

	Position	Partnumber	Description	Comment	Side
	C01		Variant dependent, see separate list		Top
	C1A		Variant dependent, see separate list		Top
	C1B		Variant dependent, see separate list		Top
	C1C		Variant dependent, see separate list		Top
	C2A		Variant dependent, see separate list		Top
	C2B		Variant dependent, see separate list		Top
	C2C		Variant dependent, see separate list		Top
⚠	C5	u68X27.5	Capacitor 680n X2 metallized propylene 27.5mm		Top
	C6		Variant dependent, see separate list		Top
	C7	10u63V6x10A	Capacitor electrolytic 10u 63V 6x10mm axial		Top
	C9	10u50V	Capacitor electrolytic 10u 50V 5mm		Top
	C10	22u50V	Capacitor electrolytic 22u 50V 5mm		Top
	C11	470p200VNP05%5	Capacitor ceramic 470p 200V NP0 5% 5mm		Top
	C12	1n250VMMK5	Capacitor polyester 1n 250V MMK 5mm		Top
	C14	10n250VMMK5	Capacitor polyester 10n 250V MMK 5mm		Top
	C15	330p200VNP05%5	Capacitor ceramic 330p 200V NP0 5% 5mm		Top
	C16	330p200VNP05%5	Capacitor ceramic 330p 200V NP0 5% 5mm		Top
	C17	-	Not used		Top
	C18	1n250VMMK5	Capacitor polyester 1n 250V MMK 5mm		Top
	C19	10u50V	Capacitor electrolytic 10u 50V 5mm		Top
	C20	-	Not used		Top
⚠	C21		Variant dependent, see separate list		Top
⚠	C22		Variant dependent, see separate list		Top
	C23	1n250VMMK5	Capacitor polyester 1n 250V MMK 5mm		Top
⚠	C24		Variant dependent, see separate list		Top
⚠	C25		Variant dependent, see separate list		Top
	C26	1n250VMMK5	Capacitor polyester 1n 250V MMK 5mm		Top
	C27		Variant dependent, see separate list		Top
	D01		Variant dependent, see separate list		Top
	D1	BYT12PI1000LY	Diode power BYT12PI1000 lying		Bot.
	D2		Variant dependent, see separate list		Bot.
	D3	15V1.3W5%	Diode zener 15V 1.3W 5%		Top
	D4	5V6.4W2%	Diode zener 5V6 .4W 2%		Top
	D5	1N4148	Diode signal 1N4148		Top
	D6	BYV26C	Diode power switch BYV26C		Top
	D7	1N4004	Diode power 1N4004		Top
	D8	1N4148	Diode signal 1N4148		Top
	D9	1N4148	Diode signal 1N4148		Top
	D10	1N4148	Diode signal 1N4148		Top
	D11	BYV26C	Diode power switch BYV26C		Top
	D12	BZW06P15B	Diode transient voltage suppression BZW06P15B		Top
	D13	BAT85	Diode signal BAT85		Top
	D14	1N4148	Diode signal 1N4148		Top
	D15		Variant dependent, see separate list		Top
	D16		Variant dependent, see separate list		Top
	D17		Variant dependent, see separate list		Top
⚠	L1		Variant dependent, see separate list		Top
	LD01		Variant dependent, see separate list		Top
	LD02		Variant dependent, see separate list		Top
	Q1	-	Not used	May have different value	Bot.

	Position	Partnumber	Description	Comment	Side
	Q2	SGW25N120LY	Transistor IGBT power SGW25N120 lying	May have different value	Bot.
	Q3	SGW25N120LY	Transistor IGBT power SGW25N120 lying	May have different value	Bot.
	Q4	BC327	Transistor bipolar signal BC327		Top
	Q5	TIP50	Transistor bipolar power TIP50		Top
	Q6	BC547B	Transistor bipolar signal BC547B		Top
	Q7	R01M.6 (b-e)	Resistor jumper 0R 1module D.6mm		Top
	Q8	BC557B	Transistor bipolar signal BC557B		Top
	Q9		Variant dependent, see separate list		Top
	Q10		Variant dependent, see separate list		Top
	R01		Variant dependent, see separate list		Top
	R1		Variant dependent, see separate list		Top
	R1A	-	Not used		Top
	R2		Variant dependent, see separate list		Top
	R3		Variant dependent, see separate list		Top
	R3A	-	Not used		Top
	R5		Variant dependent, see separate list		Top
	R6	R104W10%SO5	Resistor wirewound R10 4W 10% 5mm stand off		Top
	R7	R104W10%SO5	Resistor wirewound R10 4W 10% 5mm stand off		Top
	R8	R104W10%SO5	Resistor wirewound R10 4W 10% 5mm stand off		Top
	R9		Variant dependent, see separate list		Top
	R10	4K77W5%10MSO5	Resistor wirewound 4K7 7W 5% 10modules 5mm stand off		Top
	R11	680K.25W5%	Resistor Carbon Film 680K.25W5%		Top
	R12	33K.7W1%	Resistor Metal Film 33K.7W1%		Top
	R13	270K.7W1%	Resistor Metal Film 270K.7W1%		Top
	R14	10K.7W1%	Resistor Metal Film 10K.7W1%		Top
	R15	18K.7W1%	Resistor Metal Film 18K.7W1%		Top
	R16	180R.7W1%	Resistor Metal Film 180R.7W1%		Top
	R17	120K2W5%SO5	Resistor metal film 120K 2W 5% 5mm stand off		Top
	R18	10K.7W1%	Resistor Metal Film 10K.7W1%		Top
	R19		Variant dependent, see separate list		Top
	R20	432K1W1%	Resistor Metal Film 432K 1W 1%		Top
	R21	750K.7W1%	Resistor Metal Film 750K.7W1%		Top
	R22	4R7.25W5%	Resistor Carbon Film 4R7.25W5%		Top
	R23		Variant dependent, see separate list		Top
	R24	4R7.25W5%	Resistor Carbon Film 4R7.25W5%		Top
	R25	15K.7W1%	Resistor Metal Film 15K.7W1%		Top
	R26	1K.7W1%	Resistor Metal Film 1K.7W1%		Top
	R27		Variant dependent, see separate list		Top
	R28	82R.25W5%	Resistor Carbon Film 82R.25W5%		Top
	R29	4M7.25W5%	Resistor Carbon Film 4M7.25W5%		Top
	R30		Variant dependent, see separate list		Top
	R31	220K.7W1%	Resistor Metal Film 220K.7W1%		Top
	R32		Variant dependent, see separate list		Top
	R33		Variant dependent, see separate list		Top
	R34		Variant dependent, see separate list		Top
	R35		Variant dependent, see separate list		Top
	R36	15K.7W1%	Resistor Metal Film 15K.7W1%		Top
	R37		Variant dependent, see separate list		Top
	R38		Variant dependent, see separate list		Top
	R39		Variant dependent, see separate list		Top
	R40		Variant dependent, see separate list		Top
	R41	18K.7W1%	Resistor Metal Film 18K.7W1%		Top
	R42	-	Not used		Top

	Position	Partnumber	Description	Comment	Side
	R43	R04M.6	Resistor jumper 0R 4modules D.6mm		Top
	R44		Variant dependent, see separate list		Top
	R45		Variant dependent, see separate list		Top
	R46		Variant dependent, see separate list		Top
	R47		Variant dependent, see separate list		Top
	R48		Variant dependent, see separate list		Top
⚠	S1	TP1-0-5A3x8x21	Thermal protector Single Pole Single Trough on - off 5A 3x8x21mm		Bot.
	U1	UC3851	IC PWM UC3851		Top
⚠	U2A		Variant dependent, see separate list	May have different value	Top
	U2B		Variant dependent, see separate list		Top
	VR1	VR10KLY2X3M	Trimpotentiometer 10K lying 2x3modules		Top
	VR2	VR22KLY2X3M	Trimpotentiometer 22K lying 2x3modules		Top
	VR3	VR10KLY2X3M	Trimpotentiometer 10K lying 2x3modules		Top
	VR4	15K.7W1%	Resistor Metal Film 15K.7W1%		Top

Variant specific components for 230V versions - rev 01A

	Position	SP80FB-4x6-2	SP80FB-2x11-2	SP80FB-2x13-2	SP80FB-2x17-2	SP80FB-2x32-2
	C01	-	-	-	-	100n400VMMK15
	C1A	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	-
	C1B	-	-	-	-	1500u200V35x504 TSI
	C1C	-	-	-	-	-
	C2A	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	220u385V35x55PW	-
	C2B	-	-	-	-	1500u200V35x504 TSI
	C2C	-	-	-	-	-
	C6	-	-	-	-	1n1250VMKP15
⚠	C21	1n5Y10	1n5Y10	1n5Y10	1n5Y10	1n5Y10
⚠	C22	1n5Y10	1n5Y10	1n5Y10	1n5Y10	1n5Y10
⚠	C24	-	-	-	-	22n1000VMKP22.5
⚠	C25	-	-	-	-	22n1000VMKP22.5
	C27	100p1600VFKP15	100p1600VFKP15	100p1600VFKP15	100p1600VFKP15	-
	D01	-	-	-	-	1N4148
	D2	-	-	-	-	STTA1512PILY
	D15	43V.4W2%	43V.4W2%	39V.4W2%	43V.4W2%	43V.4W2%
	D16	-	-	-	-	BYM26E
	D17	-	-	-	-	1N4148
⚠	L1	-	-	-	-	400uHEFD30_LAB
	LD01	-	-	-	-	LYEL2.5x5LY
	LD02	-	-	-	-	LGRN2.5x5LY
	Q9	R01M.6 (b-c)	-	R01M.6 (b-c)	-	BC557B
	Q10	-	-	-	-	BC547B
	R01	-	-	-	-	4K7.7W1%
	R1	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	33K9W5%17MSO5
	R2	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	-
	R3	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	-
	R5	-	-	-	-	330R2W5%SO5
	R9	1K52W5%SO5	1K52W5%SO5	1K52W5%SO5	1K52W5%SO5	1K3W5%SO5
	R19	5K62.7W1%	5K62.7W1%	5K62.7W1%	5K62.7W1%	5K9.7W1%
	R23	8K2.7W1%	6K8.7W1%	6K8.7W1%	6K8.7W1%	6K8.7W1%

	Position	SP80FB-4x6-2	SP80FB-2x11-2	SP80FB-2x13-2	SP80FB-2x17-2	SP80FB-2x32-2
	R27	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	R04M.6
	R30	56K.7W1%	56K.7W1%	56K.7W1%	56K.7W1%	180K.7W1%
	R32	133K.7W1%	88K7.7W1%	169K.7W1%	88K7.7W1%	88K7.7W1%
	R33	270K.7W1%	-	330K.7W1%	-	1K.7W1%
	R34	2K2.7W1%	2K2.7W1%	2K2.7W1%	2K2.7W1%	2K4.7W1%
	R35	4K7.7W1%	4K7.7W1%	4K7.7W1%	4K7.7W1%	3K3.7W1%
	R37	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R38	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R39	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R40	1M.7W1%	1M.7W1%	1M.7W1%	1M.7W1%	1M2.7W1%
	R44	470R.25W5%	470R.25W5%	470R.25W5%	470R.25W5%	560R.25W5%
	R45	-	-	-	-	698R.7W1%
	R46	-	-	-	-	196R.7W1%
	R47	-	-	-	-	820R.25W5%
	R48	2R22W5%SO5	2R22W5%SO5	2R22W5%SO5	2R22W5%SO5	-
⚠	U2A	TCET1102G	-	TCET1102G	-	R04M.6 (2-4)
	U2B	-	-	-	-	R04M.6 (1-5)

Variant specific components for 115V versions - rev 01A

	Position	SP80FB-4x6-2U	SP80FB-2x11-2U	SP80FB-2x13-2U	SP80FB-2x17-2U	SP80FB-2x32-2U
	C01	-	-	-	-	220n250VMMK15
	C1A	-	-	-	-	-
	C1B	1500u200V35x504 TSI	1500u200V35x504 TSI	1500u200V35x504 TSI	1500u200V35x504 TSI	-
	C1C	-	-	-	-	2200u200V35x55
	C2A	-	-	-	-	-
	C2B	1500u200V35x504 TSI	1500u200V35x504 TSI	1500u200V35x504 TSI	1500u200V35x504 TSI	-
	C2C	-	-	-	-	2200u200V35x55
	C6	-	-	-	-	1n1250VMKP15
⚠	C21	2n2Y10	2n2Y10	2n2Y10	2n2Y10	2n2Y10
⚠	C22	2n2Y10	2n2Y10	2n2Y10	2n2Y10	2n2Y10
⚠	C24	-	-	-	-	22n1000VMKP22.5
⚠	C25	-	-	-	-	22n1000VMKP22.5
	C27	100p1600VFKP15	100p1600VFKP15	100p1600VFKP15	100p1600VFKP15	-
	D01	-	-	-	-	1N4148
	D2	-	-	-	-	STTA1512PILY
	D15	43V.4W2%	43V.4W2%	39V.4W2%	43V.4W2%	43V.4W2%
	D16	-	-	-	-	BYM26E
	D17	-	-	-	-	1N4148
⚠	L1	-	-	-	-	400uHEFD30_LAB
	LD01	-	-	-	-	LYEL2.5x5LY
	LD02	-	-	-	-	LGRN2.5x5LY
	Q9	R01M.6 (b-c)	-	R01M.6 (b-c)	-	BC557B
	Q10	-	-	-	-	BC547B
	R01	-	-	-	-	4K7.7W1%
	R1	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	33K9W5%17MSO5
	R2	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	-
	R3	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	18K9W5%17MSO5	-
	R5	-	-	-	-	330R2W5%SO5

	Position	SP80FB-4x6-2U	SP80FB-2x11-2U	SP80FB-2x13-2U	SP80FB-2x17-2U	SP80FB-2x32-2U
	R9	1K52W5%SO5	1K52W5%SO5	1K52W5%SO5	1K52W5%SO5	1K3W5%SO5
	R19	5K62.7W1%	5K62.7W1%	5K62.7W1%	5K62.7W1%	5K9.7W1%
	R23	8K2.7W1%	6K8.7W1%	6K8.7W1%	6K8.7W1%	6K8.7W1%
	R27	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	R04M.6
	R30	56K.7W1%	56K.7W1%	56K.7W1%	56K.7W1%	180K.7W1%
	R32	133K.7W1%	88K7.7W1%	169K.7W1%	88K7.7W1%	88K7.7W1%
	R33	270K.7W1%	-	330K.7W1%	-	1K.7W1%
	R34	2K2.7W1%	2K2.7W1%	2K2.7W1%	2K2.7W1%	2K4.7W1%
	R35	4K7.7W1%	4K7.7W1%	4K7.7W1%	4K7.7W1%	3K3.7W1%
	R37	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R38	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R39	4R7.25W5%	4R7.25W5%	4R7.25W5%	4R7.25W5%	2R2.25W5%
	R40	1M.7W1%	1M.7W1%	1M.7W1%	1M.7W1%	1M2.7W1%
	R44	470R.25W5%	470R.25W5%	470R.25W5%	470R.25W5%	560R.25W5%
	R45	-	-	-	-	698R.7W1%
	R46	-	-	-	-	196R.7W1%
	R47	-	-	-	-	820R.25W5%
	R48	2R22W5%SO5	2R22W5%SO5	2R22W5%SO5	2R22W5%SO5	-
⚠	U2A	TCET1102G	-	TCET1102G	-	R04M.6 (2-4)
	U2B	-	-	-	-	R04M.6 (1-5)

Description for variant dependent components

Partnumber	Description
100n400VMMK15	Capacitor polyester 100n 400V MMK 15mm
100p1600VFKP15	Capacitor polypropylene 100p 1600V FKP 15mm
133K.7W1%	Resistor Metal Film 133K.7W1%
1500u200V35x504TSI	Cap. electrolytic 1500u 200V 35x50mm 4 terminals snap in
169K.7W1%	Resistor Metal Film 169K.7W1%
180K.7W1%	Resistor Metal Film 180K.7W1%
18K9W5%17MSO5	Resistor wirewound 18K 9W 5% 17modules 5mm stand off
196R.7W1%	Resistor Metal Film 196R.7W1%
1K.7W1%	Resistor Metal Film 1K.7W1%
1K3W5%SO5	Resistor metal film 1K 3W 5% 5mm stand off
1K52W5%SO5	Resistor metal film 1K5 2W 5% 5mm stand off
1M.7W1%	Resistor Metal Film 1M.7W1%
1M2.7W1%	Resistor Metal Film 1M2.7W1%
1n1250VMKP15	Capacitor polypropylene 1n 1250V MKP 15mm
1N4148	Diode signal 1N4148
1n5Y10	Capacitor 1n5 Y2 metallized paper 10mm
2200u200V35x55	Capacitor electrolytic 2200u 200V 35x45mm snap in
220n250VMMK15	Capacitor polyester 220n 250V MMK 15mm
220u385V35x55PW	Cap. electrolytic 220u 385V 35x55mm printed wiring terminals
22n1000VMKP22.5	Capacitor polypropylene 22n 1000V MKP 22.5mm
270K.7W1%	Resistor Metal Film 270K.7W1%
2K2.7W1%	Resistor Metal Film 2K2.7W1%
2K4.7W1%	Resistor Metal Film 2K4.7W1%
2n2Y10	Capacitor 2n2 Y2 metallized paper 10mm
2R2.25W5%	Resistor Carbon Film 2R2.25W5%
2R22W5%SO5	Resistor metal film 2R2 2W 5% 5mm stand off
330K.7W1%	Resistor Metal Film 330K.7W1%

330R2W5%SO5	Resistor metal film 330R 2W 5% 5mm stand off
33K9W5%17MSO5	Resistor wirewound 33K 9W 5% 17modules 5mm stand off
39V.4W2%	Diode zener 39V .4W 2%
3K3.7W1%	Resistor Metal Film 3K3.7W1%
400uHEFD30_LAB	Inductor 400uH EFD30 LAB.GRUPPEN Rev 01
43V.4W2%	Diode zener 43V .4W 2%
470R.25W5%	Resistor Carbon Film 470R.25W5%
4K7.7W1%	Resistor Metal Film 4K7.7W1%
4R7.25W5%	Resistor Carbon Film 4R7.25W5%
560R.25W5%	Resistor Carbon Film 560R.25W5%
56K.7W1%	Resistor Metal Film 56K.7W1%
5K62.7W1%	Resistor Metal Film 5K62.7W1%
5K9.7W1%	Resistor Metal Film 5K9.7W1%
698R.7W1%	Resistor Metal Film 698R.7W1%
6K8.7W1%	Resistor Metal Film 6K8.7W1%
820R.25W5%	Resistor Carbon Film 820R.25W5%
88K7.7W1%	Resistor Metal Film 88K7.7W1%
8K2.7W1%	Resistor Metal Film 8K2.7W1%
BC547B	Transistor bipolar signal BC547B
BC557B	Transistor bipolar signal BC557B
BYM26E	Diode power switch BYM26E
LGRN2.5x5LY	Diode LED Green 2.5x5mm lying
LYEL2.5x5LY	Diode LED Yellow 2.5x5mm lying
R01M.6 (b-c)	Resistor jumper 0R 1module D.6mm
R04M.6	Resistor jumper 0R 4modules D.6mm
R04M.6 (1-5)	Resistor jumper 0R 4modules D.6mm
R04M.6 (2-4)	Resistor jumper 0R 4modules D.6mm
STTA1512PILY	Diode power STTA1512PI lying
TCET1102G	IC photocoupler TCET1102G