Projet 12 - ALIM2 / Alimentations +16V/-16V variables

Projet : TRAIN2

Info : [DIV205]

Révision : 1 du 1er avril 2001

Révision : 2 du 31 mars 2001

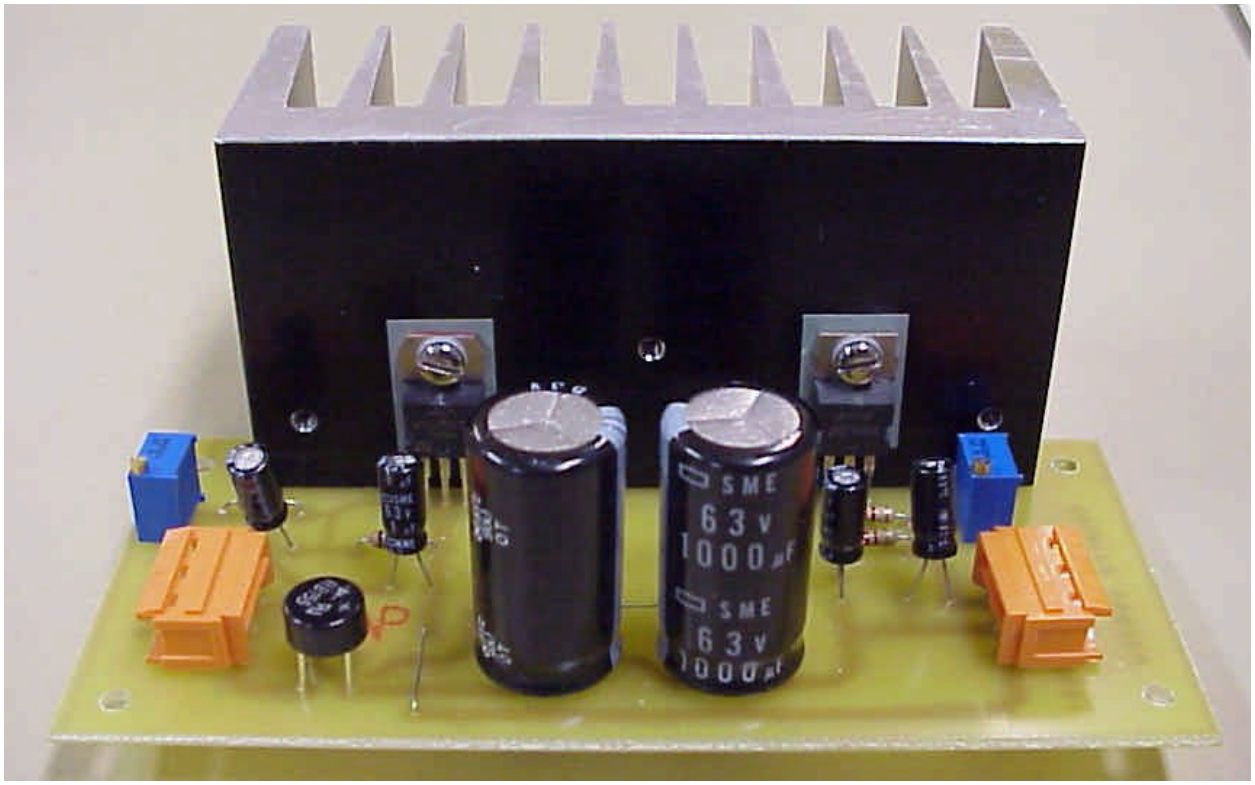


Figure 12.1. Alimentations +16V / -16V variables (images_maquettes\alim2-11.jpg).

12.1 Liste des documents

- Liste des composants.
- Prix du montage.
- Schéma électronique.
- Implantation des composants.
- Circuit imprimé coté cuivre.
- Documentations des composants.

12.2 Liste des composants

Tableau 12.1. Liste de composants (projets-train.xls / ALIM2).

No	Quantité	Référence	Désignation
1	3	C1,C4,C7	1000uF 25V
2	9	C2,C3,C5,C6,C8,C9,C11,C14,C15	100nF
3	1	C10	1uF 63V
4	1	C12	10uF
5	2	C16,C13	4700uF 63V
6	1	C17	2,2 uF 63V
7	1	C18	1uF 25V
8	3	D1,D5,D9	1A 100V
9	6	D2,D3,D4,D6,D7,D8	verte
10	4	F1,F2,F3,F4	500mA
11	3	JP1,JP3,JP5	0
12	1	JP2	9VAC
13	2	JP4,JP6	+15V
14	3	JP7,JP8,JP10	ALIM
15	1	JP9	VAC
16	1	JP11	+Vadj
17	2	RAD2,RAD1	RADIATEUR
18	3	REG1,REG2,REG3	7805
19	1	REG4	LM317
20	1	REG5	7815
21	1	REG6	7915
22	6	R1,R2,R3,R6,R8,R9	6.8k
23	1	R4	120
24	1	R5	330
25	1	R7	2K AJ
26	8	VIS1, …, VIS8	VISSERIE

12.3 Calcul du régulateur LM 217

La figure 12.11 donne le schéma de montage des régulateurs ajustables LM 117/217/317.

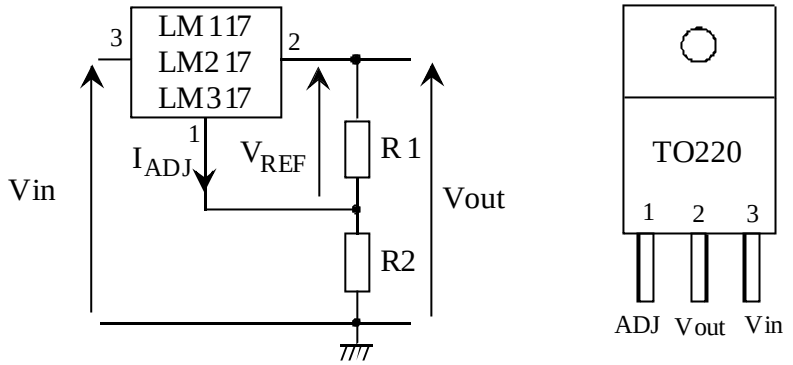


Figure 12.11. Schéma de montage du régulateur (orcad\lmp1\regul1.drw).

La valeur de V_{REF} est constante et vaut V_{REF} = 1,25 V. Le courant de polarisation du régulateur I_{ADJ} est donné à I_{ADJ} = 50 µA. On prendra une chute de tension minimal $V_{IN} - V_{OUT}$ de 3V.

Les courant dans R1 et R2 sont donnés par :

$$I_1 = \frac{V_{REF}}{R1} \text{ et } I_2 = I_1 + I_{ADJ} = \frac{V_{REF}}{R1} + I_{ADJ} = \frac{V_{OUT} - V_{REF}}{R2} \qquad (12.1)$$

On en déduit alors l'expression de la tension de sortie V_{OUT} :

$$V_{OUT} = R2 \cdot (I_1 + I_{ADJ}) + V_{REF} = \left(\frac{R2}{R1} + 1\right) \cdot V_{REF} + R2 \cdot I_{ADJ} \qquad (12.2)$$

On peut également exprimer la valeur de la résistance R2 en fonction de V_{OUT} :

$$R2 = \frac{V_{OUT} - V_{REF}}{(I_1 + I_{ADJ})} = \frac{V_{OUT} - V_{REF}}{\left(\frac{V_{REF}}{R1} + I_{ADJ}\right)} \qquad (12.3)$$

Dans les notes d'applications, on trouve deux valeurs de résistances R1 :

R1 = 120 Ω et R1 = 240 Ω

Le tableau donne la plage de variation de la résistance R2, pour R1 = 120 Ω en fonction de la tension de sortie désirée V_{OUT}, ainsi que la valeur du condensateur de filtrage.

Tableau 12.2. Calcul des régulateurs LM 117/217/317 (orcad\lmp1\regulateurs.xls).

Vout (en V)	5	9	12	15	18	20	24
R2 (en ohms)	358	740	1027	1314	1600	1791	2174
Vin mini (en V)	8	12	15	18	21	23	27
V2AC eff (en V)	**22**	**22**	**22**	**22**	**22**	**22**	**22**
Vc maxi (en V)	30,4	30,4	30,4	30,4	30,4	30,4	30,4
Iout maxi (en A)	1	1	1	1	1	1	1
C mini (en uF)	**446**	**543**	**649**	**806**	**1062**	**1349**	**2930**
P reg. (en W)	14	12	11	9	8	7	5

12.4 Allure des principaux composants

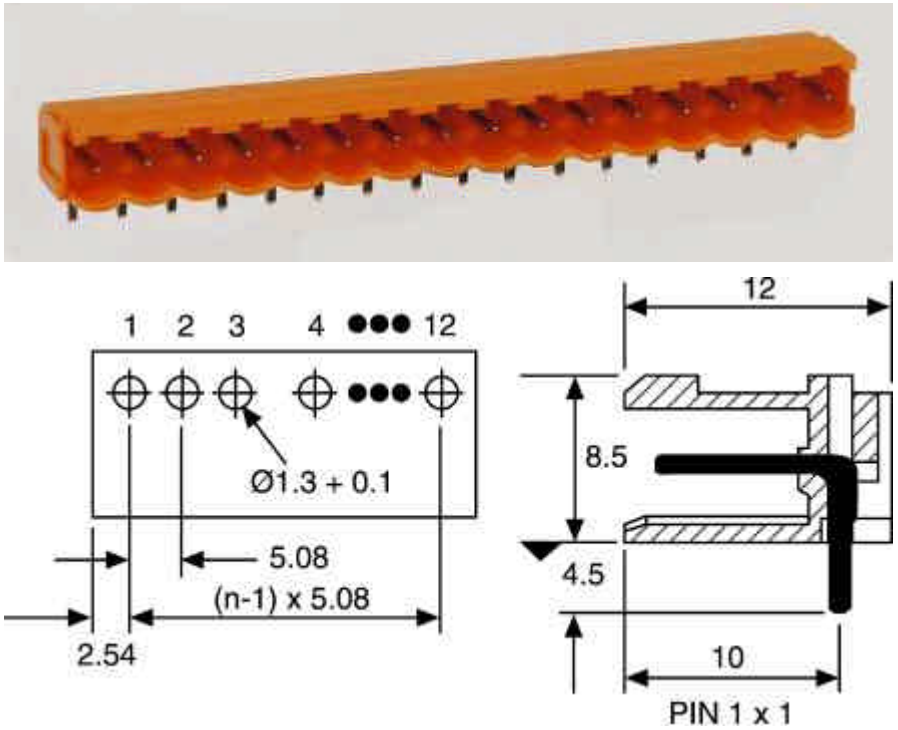


Figure 12.3. Connecteur de puissance (images-composants\weidmuller-2.jpg).

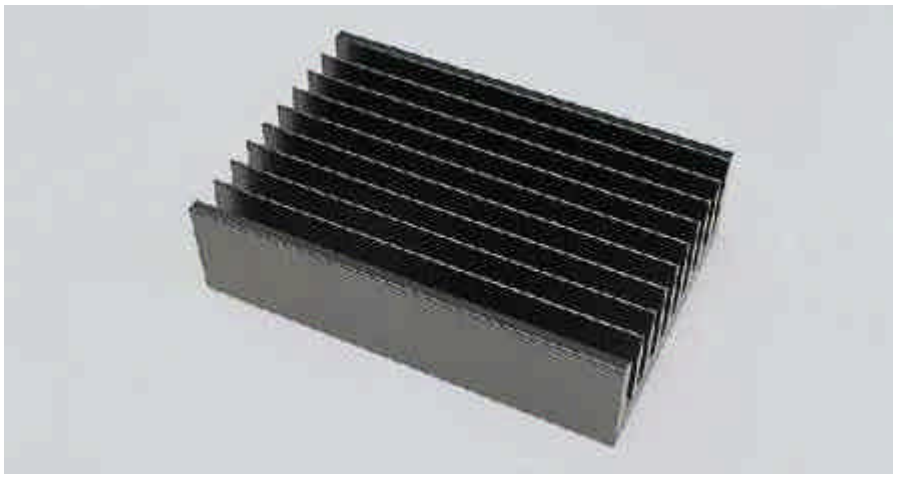
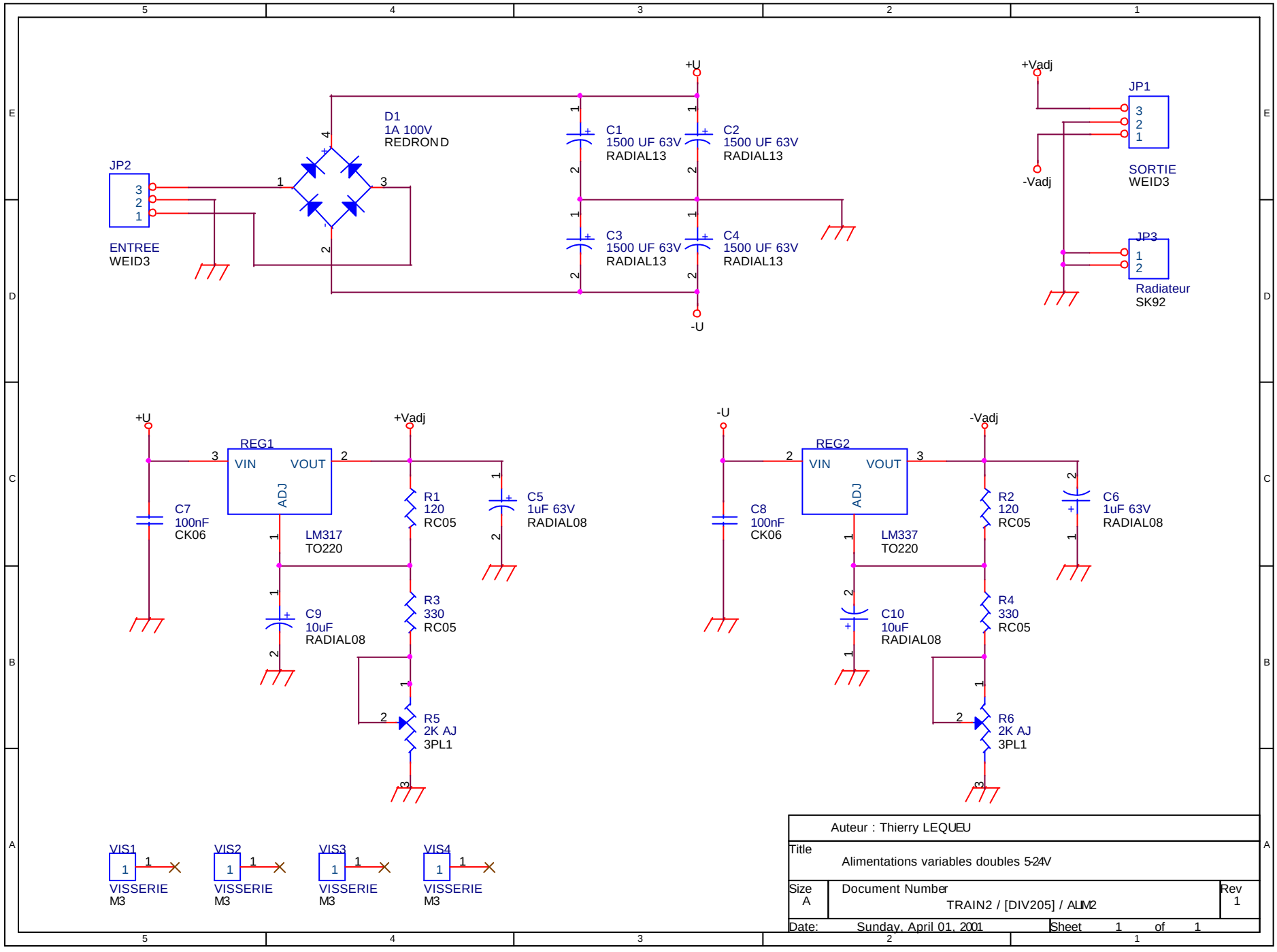
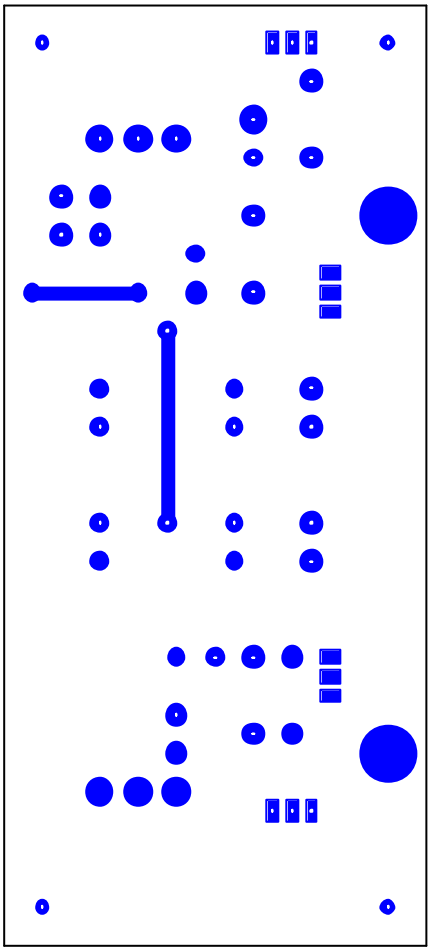
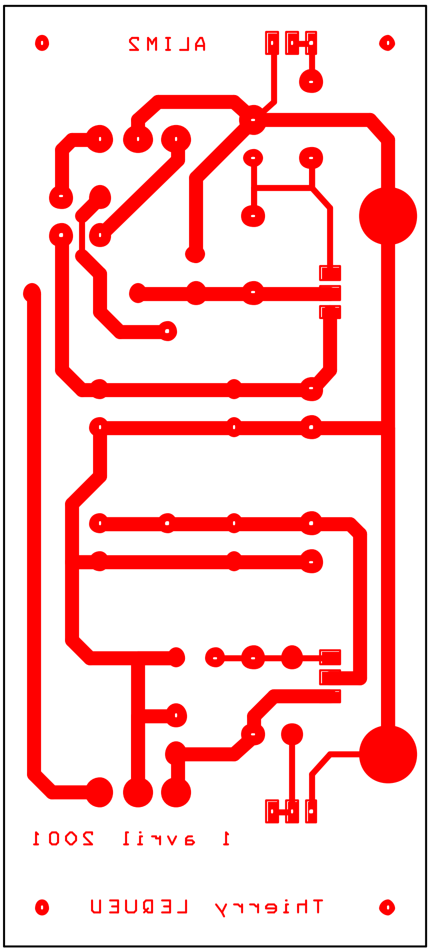
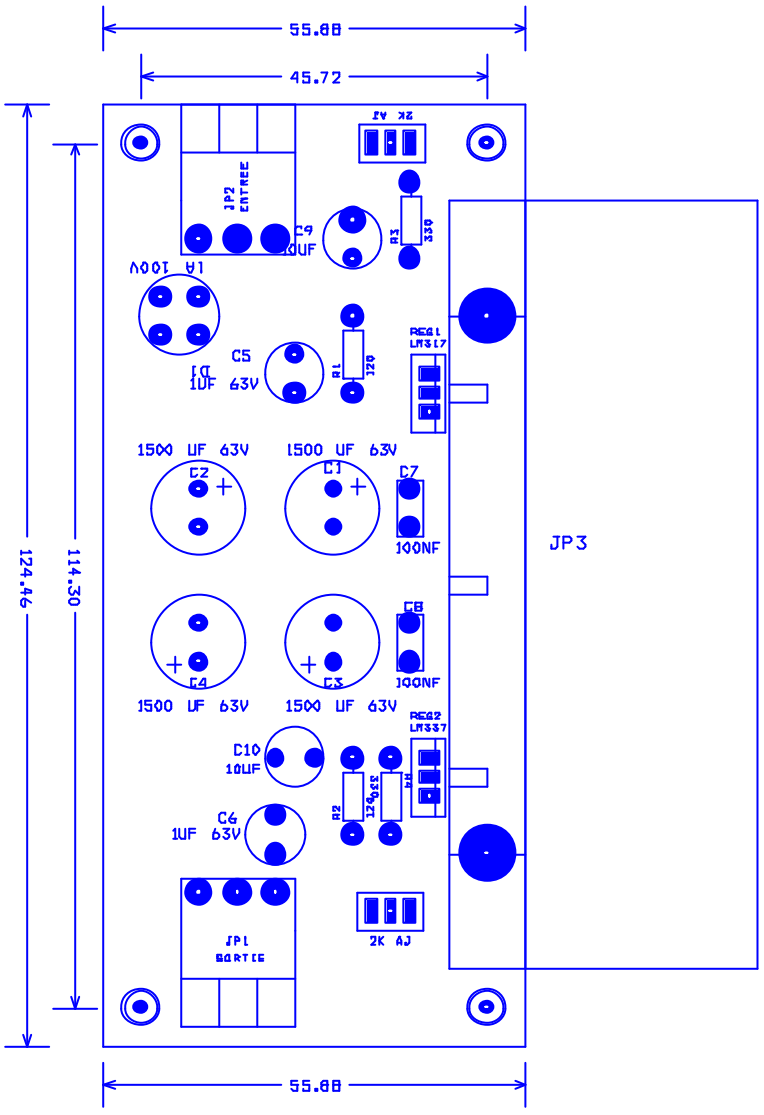


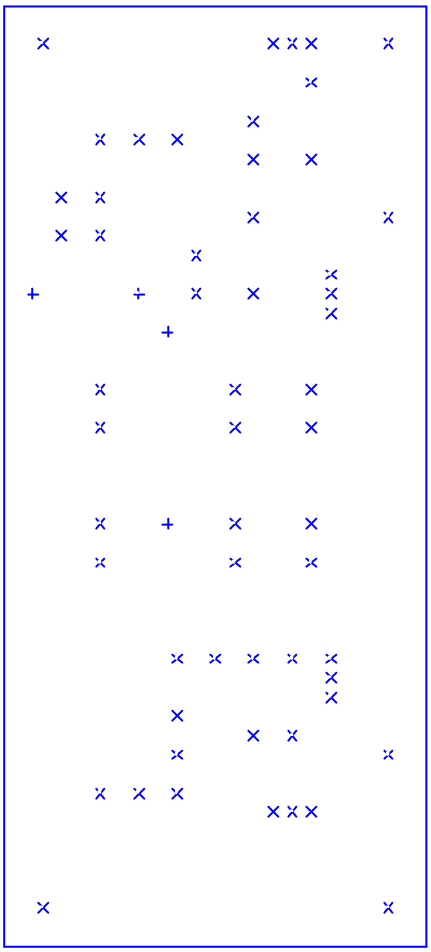
Figure 12.4. Dissipateur SK92 (images-composants\sk92.jpg).


+U
D1
1A 100V
REDRON D
JP2
3
2
1
ENTREE
WEID3
C1
1500 UF 63V
RADIAL13
C2
1500 UF 63V
RADIAL13
C3
1500 UF 63V
RADIAL13
C4
1500 UF 63V
RADIAL13
-U
+Vadj
JP1
3
2
1
SORTIE
WEID3
-Vadj
JP3
1
2
Radiateur
SK92
+U
REG1
VIN
VOUT
ADJ
LM317
TO220
+Vadj
C7
100nF
CK06
R1
120
RC05
C5
1uF 63V
RADIAL08
C9
10uF
RADIAL08
R3
330
RC05
R5
2K AJ
3PL1
-U
REG2
VIN
VOUT
ADJ
LM337
TO220
-Vadj
C8
100nF
CK06
R2
120
RC05
C6
1uF 63V
RADIAL08
C10
10uF
RADIAL08
R4
330
RC05
R6
2K AJ
3PL1
VIS1
VISSERIE
M3
VIS2
VISSERIE
M3
VIS3
VISSERIE
M3
VIS4
VISSERIE
M3
Auteur : Thierry LEQUEU
Title
Alimentations variables doubles 5-24V
Size
A
Document Number
TRAIN2 / [DIV205] / ALIM2
Rev
1
Date: Sunday, April 01, 2001
Sheet 1 of 1




ALIM2
1 avril 2001
Thierry LERUEU


55.88
45.72
124.46
114.30
55.88
JP2
ENTREE
2K AJ
C9
10UF
A3
330
1A 100V
C5
1UF 63V
A1
120
REG1
LM317
1500 UF 63V
1500 UF 63V
C2
C1
C7
100NF
JP3
C8
100NF
C4
C3
1500 UF 63V
1500 UF 63V
REG2
LM337
C10
10UF
A2
330
120
C6
1UF 63V
JP1
SORTIE
2K AJ

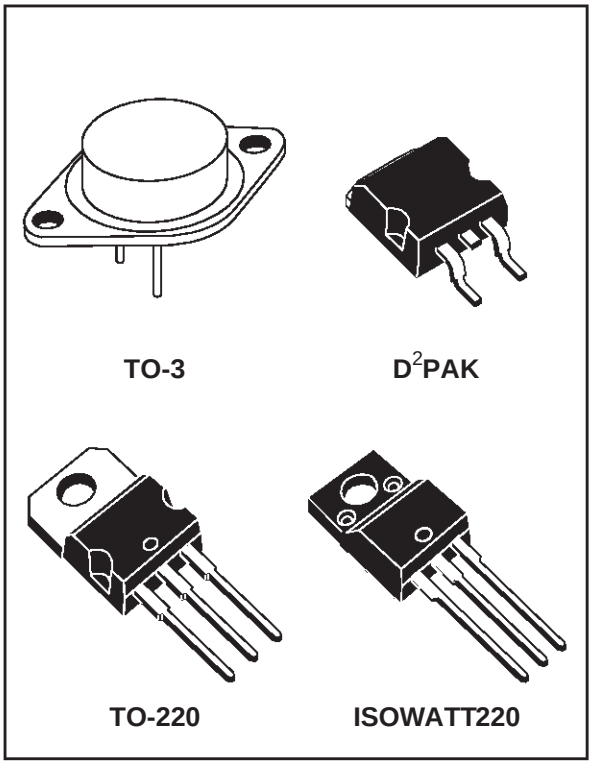


DRILL CHART				
SYM	DIAM	TOL	QTY	NOTE
×	0.508 mm		56	
+	0.711 mm		4	
TOTAL			60	

LM117/217
LM317

1.2V TO 37V VOLTAGE REGULATOR

- OUTPUT VOLTAGE RANGE : 1.2 TO 37V
- OUTPUT CURRENT IN EXCESS OF 1.5A
- 0.1% LINE AND LOAD REGULATION
- FLOATING OPERATION FOR HIGH VOLTAGES
- COMPLETE SERIES OF PROTECTIONS : CURRENT LIMITING, THERMAL SHUTDOWN AND SOA CONTROL



DESCRIPTION

The LM117/LM217/LM317 are monolithic integrated circuit in TO-220, ISOWATT220, TO-3 and D^2PAK packages intended for use as positive adjustable voltage regulators.

They are designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.2 to 37V range.

The nominal output voltage is selected by means of only a resistive divider, making the device exceptionally easy to use and eliminating the stocking of many fixed regulators.

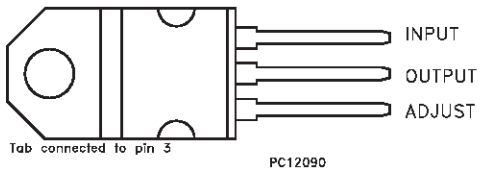
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{i-o}	Input-output Differential Voltage	40	V
I_O	Output Current	Intenrally Limited	
T_{op}	Operating Junction Temperature for: LM117 LM217 LM317	-55 to 150 -25 to 150 0 to 125	^oC ^oC ^oC
P_{tot}	Power Dissipation	Internally Limited	
T_{stg}	Storage Temperature	- 65 to 150	^oC

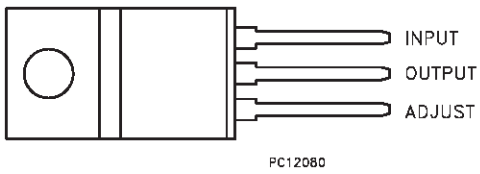
THERMAL DATA

Symbol	Parameter		TO-3	TO-220	ISOWATT220	D^2PAK	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	Max	4	3	4	3	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	35	50	60	62.5	$^oC/W$

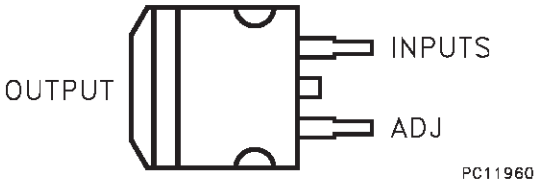
CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



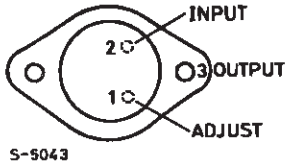
TO-220



ISOWATT220



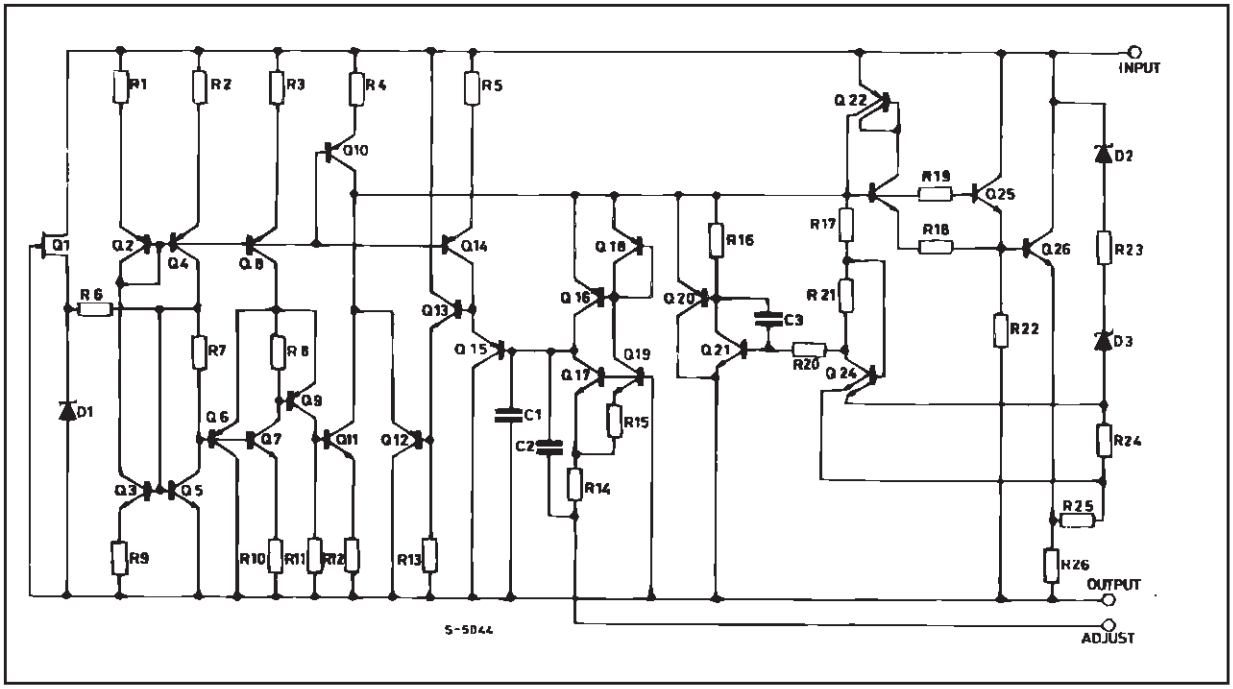
D^2PAK



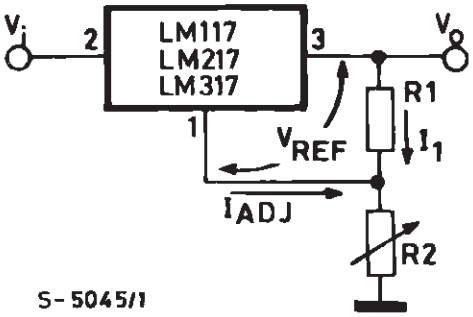
TO-3

Type	TO-3	TO-220	ISOWATT220	D^2PAK
LM117	LM117K			
LM217	LM217K	LM217T		LM217D2T
LM317	LM317K	LM317T	LM317P	LM317D2T

SCHEMATIC DIAGRAM



BASIC ADJUSTABLE REGULATOR



ELECTRICAL CHARACTERISTICS (V_i - V_o = 5 V, I_o = 500 mA, I_{MAX} = 1.5A and P_{MAX} = 20W, unless otherwise specified)

Symbol	Parameter	Test Conditions		LM117/LM217			LM317			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
ΔV_o	Line Regulation	V_i - V_o = 3 to 40 V	T_j = 25 °C		0.01	0.02		0.01	0.04	%/V
					0.02	0.05		0.02	0.07	%/V
ΔV_o	Load Regulation	$V_o \leq 5V$ I_o = 10 mA to I_{MAX}	T_j = 25 °C		5	15		5	25	mV
					20	50		20	70	mV
		$V_o \geq 5V$ I_o = 10 mA to I_{MAX}	T_j = 25 °C		0.1	0.3		0.1	0.5	%
					0.3	1		0.3	1.5	%
I_{ADJ}	Adjustment Pin Current				50	100		50	100	µA
ΔI_{ADJ}	Adjustment Pin Current	V_i - V_o = 2.5 to 40 V I_o = 10 mA to I_{MAX}			0.2	5		0.2	5	µA
V_{REF}	Reference Voltage (between pin 3 and pin 1)	V_i - V_o = 2.5 to 40 V I_o = 10 mA to I_{MAX} $P_D \leq P_{MAX}$		1.2	1.25	1.3	1.2	1.25	1.3	V
$\frac{\Delta V_o}{V_o}$	Output Voltage Temperature Stability				1			1		%
$I_{o(min)}$	Minimum Load Current	V_i - V_o = 40 V			3.5	5		3.5	10	mA
$I_{o(max)}$	Maximum Load Current	V_i - $V_o \leq$ 15 V $P_D < P_{MAX}$		1.5	2.2		1.5	2.2		A
		V_i - V_o = 40 V $P_D < P_{MAX}$ T_j = 25 °C			0.4			0.4		A
e_N	Output Noise Voltage (percentance of V_O)	B = 10Hz to 10KHz T_j = 25 °C			0.003			0.003		%
SVR	Supply Voltage Rejection (*)	T_j = 25 °C f = 120 Hz	C_{ADJ}=0		65			65		dB
			C_{ADJ}=10µF	66	80		66	80		dB

(*) CADJ is connected between pin 1 and ground.

Note:

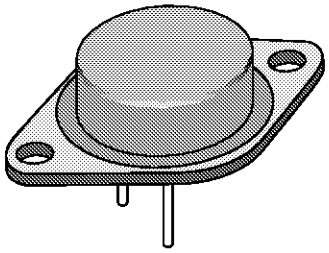
(1) Unless otherwise specified the above specs, apply over the following conditions : LM 117 T_j = – 55 to 150°C; LM 217 T_j = – 25 to 150°C ; LM 317 T_j = 0 to 125°C.

SGS-THOMSON MICROELECTRONICS

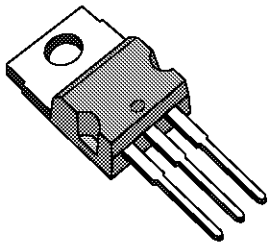
LM137/LM237 LM337

THREE-TERMINAL ADJUSTABLE NEGATIVE VOLTAGE REGULATORS

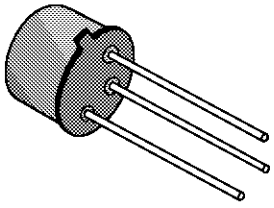
- OUTPUT VOLTAGE ADJUSTABLE DOWN TO V_{ref}
- 1.5A GUARANTEED OUTPUT CURRENT
- 0.3%/V TYPICAL LOAD REGULATION
- 0.01%/V TYPICAL LINE REGULATION
- CURRENT LIMIT CONSTANT WITH TEMPERATURE
- RIPPLE REJECTION : 77dB
- STANDARD 3-LEAD TRANSISTOR PACKAGES
- EXCELLENT THERMAL REGULATION: 0.002%/V
- 50ppm/°C TEMPERATURE COEFFICIENT



TO-3



TO-220



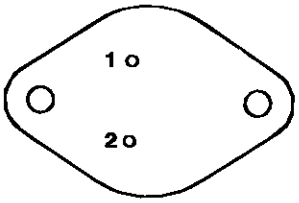
TO-39

DESCRIPTION

The LM137 series are adjustable 3-terminal negative voltage regulators capable of supplying in excess - 1.5A over a - 1.2 to - 37V output voltage range. They are exceptionally easy to use and require only two external resistors to set the output voltage. Further, both line and load regulation are better than standard fixed regulators. Also, LM137 regulators are supplied in standard transistor packages which are easily mounted and handled. In addition to higher performance than fixed regulators, the LM137 series offer full overload protection available only in integrated circuits. Included on the chip are current limit, thermal overload protection and safe area protection. All overload protection circuitry remains fully functional even if the adjustment terminal is disconnected.

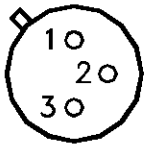
PIN CONNECTIONS

TO-3
(bottom view)



1 - Output
2 - Adj
Case is input

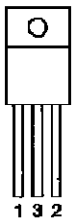
TO-39
(bottom view)



PC11220

1 - Adj
2 - Output
3 - input

TO-220
(front view)



1 - Adj
2 - Output
3 - Input

Heatsink surface connected to input

ABSOLUTE MAXIMUM RATING

Symbol	Parameter		Value	Unit
V_I - V_O	Input Output Voltage Differential		40	V
I_O	Output Current	TO-220/TO-3	1.5	A
		TO-39	0.5	
T_{oper}		LM137	-55 to 150	$_oC$
		LM237	-25 to 150	
		LM337	0 to 125	
T_{stg}			-65 to 150	$_oC$
P_{tot}			Internally Limited	W

THERMAL CHARACTERISTICS

Symbol	Parameter		Typ.	Max.	Unit
$R_{thj\text{-}case}$	Junction-case Thermal Resistance	TO-3		4	$^oC/W$
		TO-220		3	
		TO-39		15	
$R_{thj\text{-}amb}$	Junction-ambient Thermal Resistance	TO-3		35	$^oC/W$
		TO-220		70	
		TO-39		160	

ORDER CODES

PART NUMBER	TEMPERATURE RANGE	PACKAGE		
		TO-3	TO-220	TO-39
LM137	-55 to 150 ^oC	LM137K		LM137H
LM237	-25 to 150 ^oC	LM237K	LM237SP	LM237H
LM337	0 to 125 ^oC	LM337K	LM337SP	LM337H