MTBF TEST

REPORT

OF

SWITCH ADAPTER

MODEL

T1235-001

Test Type:	Parts Pridiction	Standard:	MIL-HDBK-217F	Test Date:	Dec 25th 2004
Product:	SMPS	Model:		Revision :	A

1. Test Condition :

AC Line Voltage :	115 Vac	Line Frequency :	50 Hz
Temperature:	40℃	LOAD:	12V / 2.0A

2. Summary :

2.1 Microelectronic Devices (Section 5)

$\lambda p = \langle C1 * \pi T + C2 * \pi E \rangle * \pi Q * \pi L$

= 0.2691209 Failures / 10 Hours

2.2 Discrete Semiconductors (Section 6)

$\lambda p = \lambda b * \pi E * \pi Q * \pi T$ (opto couple)

$\lambda p = \lambda b * \pi E * \pi Q * \pi C * \pi S * \pi T$ (Diode)

$\lambda p = \lambda b * \pi E * \pi Q * \pi A * \pi T$ (Si FET)

$\lambda p = \lambda b * \pi E * \pi Q * \pi T$ (LED)

= 2.360913 Failures / 10 Hours

2.3 Resistors (Section 9)

$\lambda p = \lambda b * \pi E * \pi Q * \pi P * \pi S * \pi T$

Failures / 10 Hours

)

$* \pi sR * \pi V * \pi C * \pi T$

Failures / 10 Hours

(Section 11)

$* \pi T$

Failures / 10 Hours

)

$* \pi K * \pi T$

Failures / 10 Hours

16)

$+ 13)) * \pi Q * \pi E$

/ 10 Hours

/ 10 Hours

= 1.91362

2.4 Capacitors (Section 10

$\lambda p = \lambda b * \pi E * \pi Q$

= 3.892757

2.5 Inductive Devices

$\lambda p = \lambda b * \pi E * \pi Q$

= 0.188657

2.6 Connectors (Section 15

$\lambda p = \lambda b * \pi E * \pi Q$

= 0.067193

2.7 Interconneetion Assembles (Sectior

$\lambda p = \lambda b * (N1 * \pi C + N2 * (\pi E$

= 0.040384 Failures /

2.8 Fuses (Section 22)

$\lambda p = \lambda b * \pi E$

= 0.01000 Failures /

3. Result

Total of λp (Fail/100000 Hrs)	MTBF (Hours)	
8.74	114382	

RESULT
Pass

D:趙瑞鋒 PREPARED:王貴賓

05/01/05 2005/01/03

APPROVED:周軍 05/01/06 CHECKEI

董金亞 05/0106

Input: 115V ac

Pin	πE	πQ	πT	πL	C2	C1	λP	MTBF
8	2	2	2.8043	1	0.003	0.02	0.122754	8146362.7
3	2	2	3.5675	1	0.001	0.02	0.146367	6832153.0
			Total Of This Page				0.269121	3715801.9

Microelectronic devices Ambient: 40℃

Location	Part type	P(W)	Tj℃
IC1	IC PWM ONSEMI	0.05	70.2
IC4	TL 431	0.002	74.0

mbient: 40℃ Input: 115V ac

Discrete semiconductors

LOCATION	PART TYPE	Vmax (V)	πR	π	Base data λb	πS	πT	πC	πQ	πE	Measure & Calculation Data Vop	I op/ Prat	TJ (C)	λP	MTBF
D1	DIODE-FAST	100	—	—	0.0010	0.1229	4.0660	2.0	8.0	9.0	42.2	—	71.6	0.071952	13898226.7
D2	DIODE-RECT	1000	—	—	0.0010	0.0440	4.6343	2.0	8.0	9.0	276.6	—	76.7	0.029380	34037333.6
D3	1N4148	75	—	—	0.0010	0.0085	3.7980	2.0	8.0	9.0	10.56	—	69.0	0.004667	214278914.1
D4A	DIODE-SCHOTTKY	100	—	—	0.0010	0.1229	4.4953	2.0	8.0	9.0	42.2	—	75.5	0.079549	12570862.4
BD1	BRIDGE-DIODE	600	—	—	0.0010	0.0378	4.6343	2.0	8.0	9.0	155.9	—	76.7	0.025238	39623040.3
ZD1	SMD-DIODE-ZENER	15.6	—	—	0.0010	0.0006	3.9302	2.0	8.0	9.0	0.72	—	70.3	0.000321	3113113836.0
ZD4	SMD-DIODE-ZENER	15.6	—	—	0.0010	0.8232	4.3709	2.0	8.0	9.0	14.4	—	74.4	0.518152	1929936.3
SCR1	ZEBER DIODE	—	1.0000	—	0.0022	0.1000	4.0285	—	8.0	9.0	—	—	71.4	0.063811	15671309.9
Q1	MOS-FET	600	—	4.	0.0120	—	2.2996	—	8.0	1.0	263.1	—	69.1	0.883035	1132458.4
IC2	PHOTO COUPLER	—	—	—	0.0025	—	3.6650	—	5.5	6.0	—	—	73.0	0.302364	3307275.3
LED	LED	—	—	—	0.0040	—	2.8973	—	5.5	6.0	—	—	63.2	0.382446	2614751.4
														2.360913	3452177944.5

Capacitor

Ambient: 40℃ Input: 115V ac

LOCATION	PARTS TYPE	Tmax (C)	Vmax (V)	C (uF)	Basic Data							Measure & Calculation Data				MTBF
					λb	πT	πC	πV	πsr	πQ	πE	Ta (C)	VOP (V)	S	λP	
CX1	X-Cap	100	275	0.22	0.0005	1.883	0.873	1.164	1.3	3	10	61.2	115	0.418	0.038051	2628019.5
CY1	Y-Cap	100	250	0.0033	0.0005	1.848	0.598	1.003	1.3	3	10	60.0	47.48	0.190	0.022045	45360739.1
CY3	Y-Cap	100	250	0.001	0.0005	1.903	0.537	1.000	1.3	3	10	61.9	1.81	0.007	0.020331	4918630.8
C1	E-Cap	105	400	68	0.00013	7.601	2.639	1.083	1.3	3	10	77.1	146	0.365	0.152569	655442.1
C2	CAP-CERAMIC	85	1000	0.0022	0.00200	6.209	0.577	1.002	1.3	3	10	71.1	76.6	0.077	0.279806	3573900.8
C3	E-Cap	105	50	22	0.00013	7.476	2.036	1.012	1.3	3	10	76.6	12.32	0.246	0.108101	9250615.2
C4	SMD-CAP-CER	125	50	0.1	0.00200	6.969	0.813	1.069	1.3	3	10	74.5	12.32	0.246	0.472473	2116525.0
C5	CERAMIC CAP	125	50	0.001	0.00200	5.636	0.537	1.048	1.3	3	10	68.3	10.94	0.219	0.247540	4039744.9
C13	SMD-CAP-CER	125	50	0.1	0.00200	6.784	0.813	1.021	1.3	3	10	73.7	8.23	0.165	0.438991	2277948.6
C6	CAP CER	125	100	0.00047	0.00200	5.917	0.172	1.191	1.3	3	10	69.7	43.1	0.431	0.094359	10597797.5
C7	E-Cap	105	16	1000	0.00013	6.167	4.898	4.581	1.3	3	10	70.9	12.39	0.774	0.971304	1029544.0
C8	E-Cap	105	16	1000	0.00013	6.104	4.898	4.581	1.3	3	10	70.6	12.39	0.774	0.961339	1040215.7
C9	E-Cap	105	25	100	0.00013	5.199	1.514	1.554	1.3	3	10	66.0	12.32	0.493	0.085847	11648637.0
Total of This Page															3.892757	256887.3

connector

Ambient: 40℃ Input: 115V ac

LOCATION	PARTS TYPE	PIN NO.	Basic Data					Measure & Caculation Data			MTBF
			λb	πT	πK	πQ	πE	Ta (C)	aT (C)	To (C)	λP	(Hours)
AC Inlet	2 PIN	2	0.0036	1.5785	4	2	1	51.8	0.4290	52.2290	0.045460	219997410.6
DC Outlet	2 Wire	2	0.00700	1.5524	4	2	1	50.5	0.6482	51.1482	0.021734	460011832.7
Total of This Page											0.067193	680009243.3

Input: 115V ac

	Calculation data	MTBF
πE	λP	(Hours)
1.0	0.01	100000000
s page	0.01	100000000

Total of thi

6

Ambient: 40℃

PARTS TYPE	Base d λb
T2AL250VAC	0.01

Induct

LOCA
L
L
L
LI
T

PCB

LOCA -TION	PA TY
PCB	P
PCB	P

Input: 115V ac

Basic Data			Measure & Calculation Data		MTBF (hours)
πT	πQ	πE	Ths (C)	λP	
1.7671	3	6	71	0.000954	1047981342.5
1.5182	3	6	57.4	0.000820	1219792239.7
1.5841	3	6	61.1	0.000855	1169006369.9
1.7937	3	6	72.4	0.000969	1032431276.3
1.9039	3	6	78.1	0.185059	5403682.8
Total of This Page				0.188657	4474614911.3

Ambient: 40℃

PARTS TYPE	INSULATION CLASS	TMAX (C)	λb
INDUCTOR	-----	120	0.00003
INDUCTOR	-----	120	0.00003
INDUCTOR	-----	120	0.00003
INDUCTOR	-----	120	0.00003
TRANSFOMER	-----	120	0.00540

Fuse

RTS	
PE	λ
H	0.000
H	---

Ambient: 40℃ Input: 115

Basic Data								Measure & Calculation Data							MTBF
	πC	πQ/aT	πE	CR	πLC	as	acc	N1	N2	d	h	Trise	Nf	aSMT	LC	ECF	λP/λ smt	(Hours)
017	1	2	2	----	----	----	----	30	26	----	----	----	----	----	----	----	0.026792	37324574.5
	----	7	----	0.08	1	7	6	----	----	1240	30	10	1353785.3	16922316.2	87600.0	0.23	0.013592	73575287.7
								Total of This Page									0.040384	24762576.4

Temperature rise test

Test equipment:

NO	Instrument	Manufacturer & type NO
1	Ac source	special power system MODEL: YF-6010
2	Dc load	Chroma 6314 Dc electronic load
3	Power meter	Zentech 2100 digital power meter
4	Hybrid recorder	YOKOGAWA DR130
5	CONST. TEMP&HUMI.TEST CHAMBER	CTH 060HV

Tests Conditions:

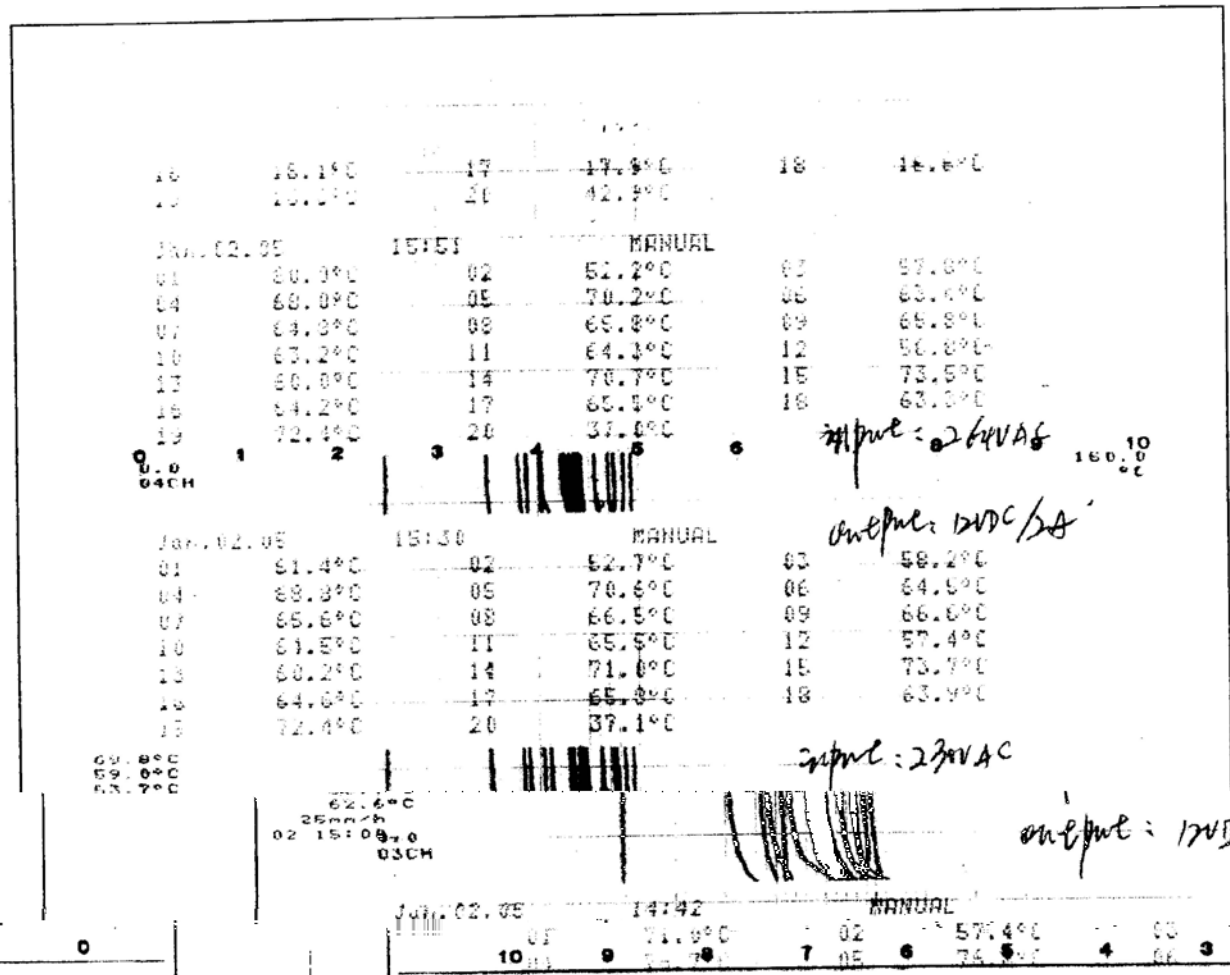
Ambient temp: 40 °C

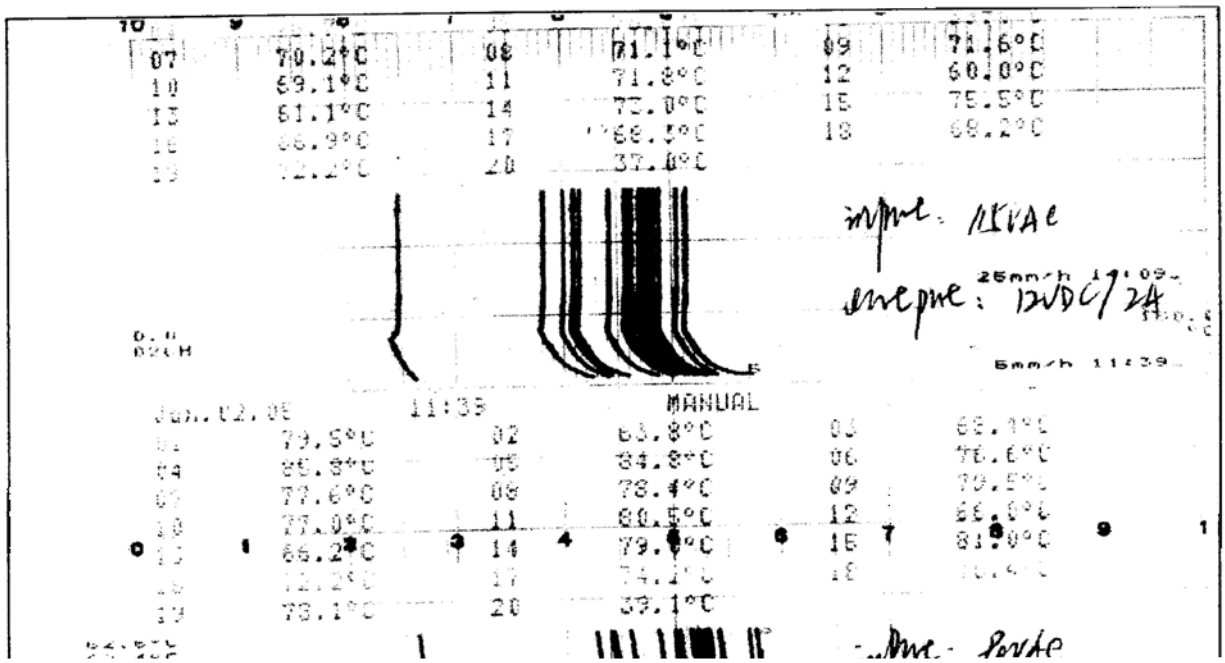
Thermal couple test on the hottest points

Output: 12VDC/2.0A

Input: 90VAC/115VAC/230VAC/264VAC

Test result: pass


MANUAL
MANUAL
MANUAL
04CH
03CH
input: 264VAC
output: 12VDC/2A
input: 230VAC
output: 12VDC/2A


07 70.2°C
08 71.1°C
09 71.6°C
10 69.1°C
11 71.8°C
12 60.0°C
13 61.1°C
14 72.0°C
15 75.5°C
16 66.9°C
17 68.5°C
18 69.2°C
19 72.2°C
20 37.0°C
MANUAL
01 79.5°C
02 63.8°C
03 68.1°C
04 65.8°C
05 84.8°C
06 76.6°C
07 72.6°C
08 78.4°C
09 79.5°C
10 77.0°C
11 68.5°C
12 66.0°C
13 66.2°C
14 79.6°C
15 81.0°C
16 73.1°C
17 74.1°C
18 76.4°C
19 73.1°C
20 39.1°C

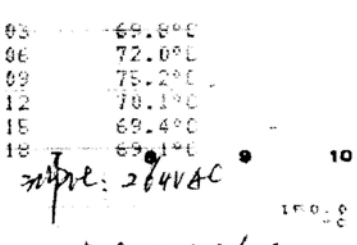
NO	Location	Part type	Measured temperatures (°C)				Calculated temperatures		
			40 °C				Top	Trat	Top/Trat
			90VAC (°C)	115VAC (°C)	230VAC (°C)	264VAC (°C)	Top max (°C)	Max rating (°C)	De-rating (%)
1	L1	INDCTOR	79.5	71.0	61.4	60.0	79.5	130	61.15%
2	L2	INDCTOR	63.8	57.4	52.7	52.2	63.8	130	49.08%
3	CY3	Y-CAP	68.4	61.9	58.2	57.8	68.4	100	68.40%
4	BD1	BRIDGE-DIODE	85.8	76.7	68.8	68.0	85.8	150	57.20%
5	LF1	INDCTOR	84.8	76.3	70.6	70.2	84.8	130	65.23%
6	D3	DIODE-SW	76.6	69.0	64.5	63.4	76.6	125	61.28%
7	IC1	IC	77.6	70.2	65.6	64.8	77.6	125	62.08%
8	C2	CAP-CERAMIC	78.4	71.1	66.5	65.8	78.4	125	62.72%
9	D1	DIODE-FAST	79.5	71.6	66.6	65.8	79.5	150	53.00%
10	Q1	MOS-FET	77.0	69.1	64.5	63.2	77.0	150	51.33%
11	R7	RES-METAL	80.5	71.8	65.5	64.3	80.5	125	64.40%
12	CY1	Y-CAP	66.0	60.0	57.4	56.8	66.0	100	66.00%
13	L3	INDCTOR	66.2	61.1	60.2	60.0	66.2	130	50.92%
14	IC2	PHOTO COUPLER	79.0	73.0	71.0	70.7	79.0	125	63.20%
15	D4A	DIODE-SCHOTTKY	81.0	75.5	73.7	73.5	81.0	150	54.00%
16	R1A	RES-SMD	72.2	66.9	64.6	64.2	72.2	125	57.76%
17	C5	CERAMIC-CAP	74.2	68.3	65.8	65.5	74.2	125	59.36%
18	R3	SMD C.F-RES	75.4	68.2	63.9	63.3	75.4	125	60.32%
19	T	X'FMR	78.1	72.2	72.4	72.4	78.1	130	60.08%
20		Ambient temp							

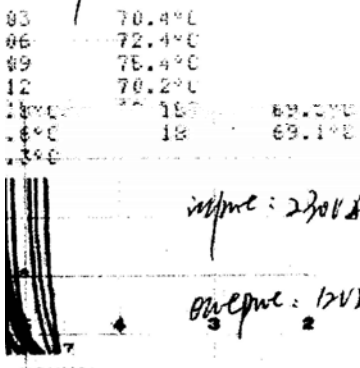
C4 1# ZD1 2# R4 3# R5 4# ZD2 5# R6 6#

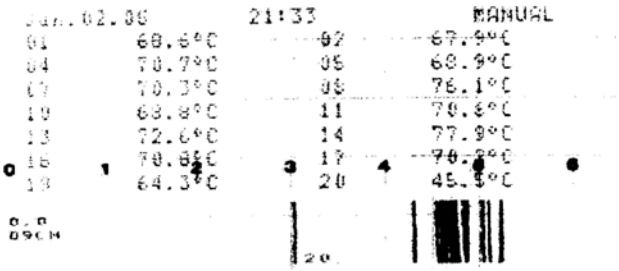
R9 10# R10 11# R7-1 7# R2A-R2D 8# R22-R27 9#

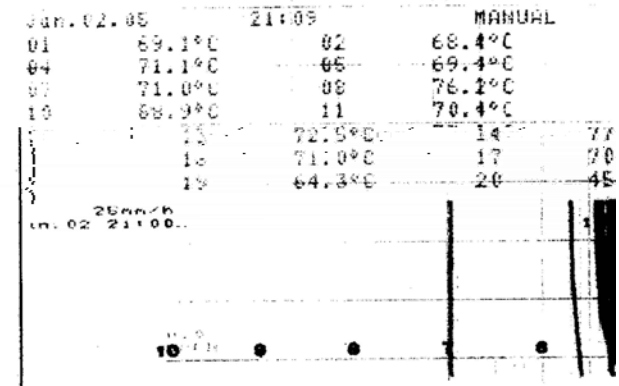
15# C3 17# R13 12# IC4 13# R8 14# C1

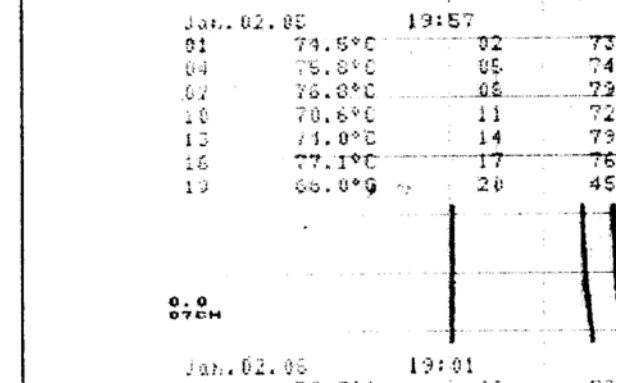
Ambient temp 20# C8 18# C9 19# C7 15#

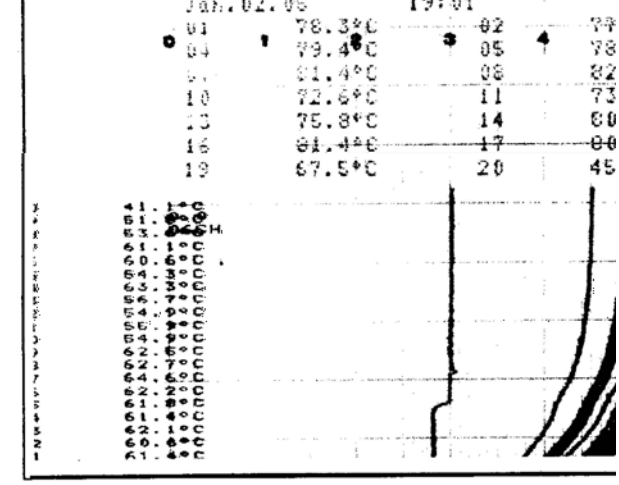












NO	Location	Part type	Measured temperatures (°C)				Calculated temperatures		
			40 °C				Top	Trat	Top/Trat
			90VAC (°C)	115VAC (°C)	230VAC (°C)	264VAC (°C)	Top max (°C)	Max rating (°C)	De-rating (%)
1	C4	SMD-CAP CER	78.3	74.5	69.1	68.6	78.3	125	62.64%
2	ZD1	SMD-ZENER DIODE	77.2	73.7	68.4	67.9	77.2	125	61.76%
3	R4	SMD C.F-RES	79.3	75.4	70.4	69.8	79.3	125	63.44%
4	R5	SMD CHIP-RES	79.4	75.8	71.1	70.7	79.4	125	63.52%
5	ZD4	SMD-ZENER DIODE	78.2	74.4	69.4	68.9	78.2	125	62.56%
6	R6	RES-SMD-CHIP	80.5	76.8	72.4	72.0	80.5	125	64.40%
7	R7-1	RES-SMD-CHIP	81.4	76.8	71.0	70.3	81.4	125	65.12%
8	R2A	SMD RES	82.9	79.8	76.2	76.1	82.9	125	66.32%
9	R2E	SMD RES	81.6	78.4	75.4	75.2	81.6	125	65.28%
10	R11	RES-SMD CHIP	72.6	70.6	68.9	68.8	72.6	125	58.08%
11	R10	SMD-CHIP-RES	73.6	72.0	70.4	70.6	73.6	125	58.88%
12	R13	RES-SMD CHIP	73.8	71.9	70.2	70.1	73.8	125	59.04%
13	IC4	SMD REG.TAP TL431	75.8	74.0	72.5	72.6	75.8	125	60.64%
14	R8	SMD C.F-RES	80.6	79.1	77.8	77.9	80.6	125	64.48%
15	C1	E-CAP	72.4	70.9	69.3	69.4	72.4	105	68.95%
16	C3	E-CAP	81.4	77.1	71.0	70.8	81.4	105	77.52%
17	C8	E-CAP	80.8	76.6	70.6	70.2	80.8	105	76.95%
18	C9	E-CAP	72.1	70.6	69.1	69.1	72.1	105	68.67%
19	C7	E-CAP	67.5	66.0	64.3	64.3	67.5	105	64.29%
20	Ambient temp								