

Contents

S-DE96A0 - Transmission module

1. Specification of the module S-DE96A0	2
1.1 Description of transmission module S-DE96A0	3
1.2 RF technology of the module S-DE96A0	4
1.3 Circuit diagrams, component plot, layout, bill of material for module S-DE96A0	5

1. Specification of transmission module S-DE96A0

Frequency: 902MHz - 928MHz

Power supply: 5.4V_{DC} to 9 V_{DC}

Licence:

Application: Radio equipment for commercial and industrial remote control and telemetering

Radiated
transmitter power: <10mW; 50 Ohm

HF modulation: FM

Type of
transmission: F 1 D

Channel spacing: 25 kHz

1.1 The transmission module S-DE96A0

The module S-DE96A0 is a single PCB solution, on which the RF transmitter, AF section and data processing are integrated.

A data interface exists that reads in binary data via an 8-bit-wide bus. This binary data is processed in an FPGA (Field Programmable Gate Array) and passed via a D/A converter as an FSK signal to CCITT V.23 to the RF unit.

After switch-on of the transmitter the FPGA reads in the frequency programmed once by NBB and thereby permits initialisation of the synthesizer. Once the latter has been initialised, data transmission commences.

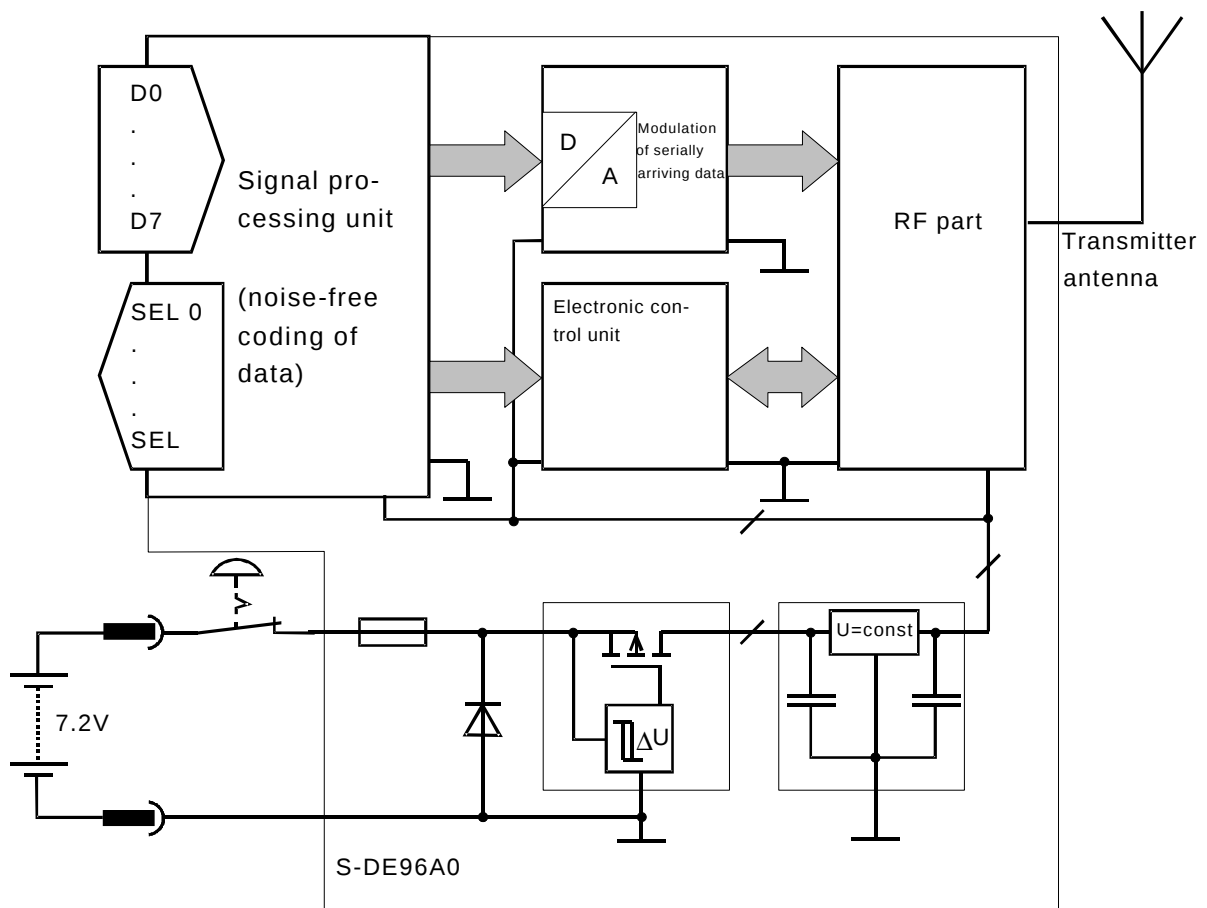


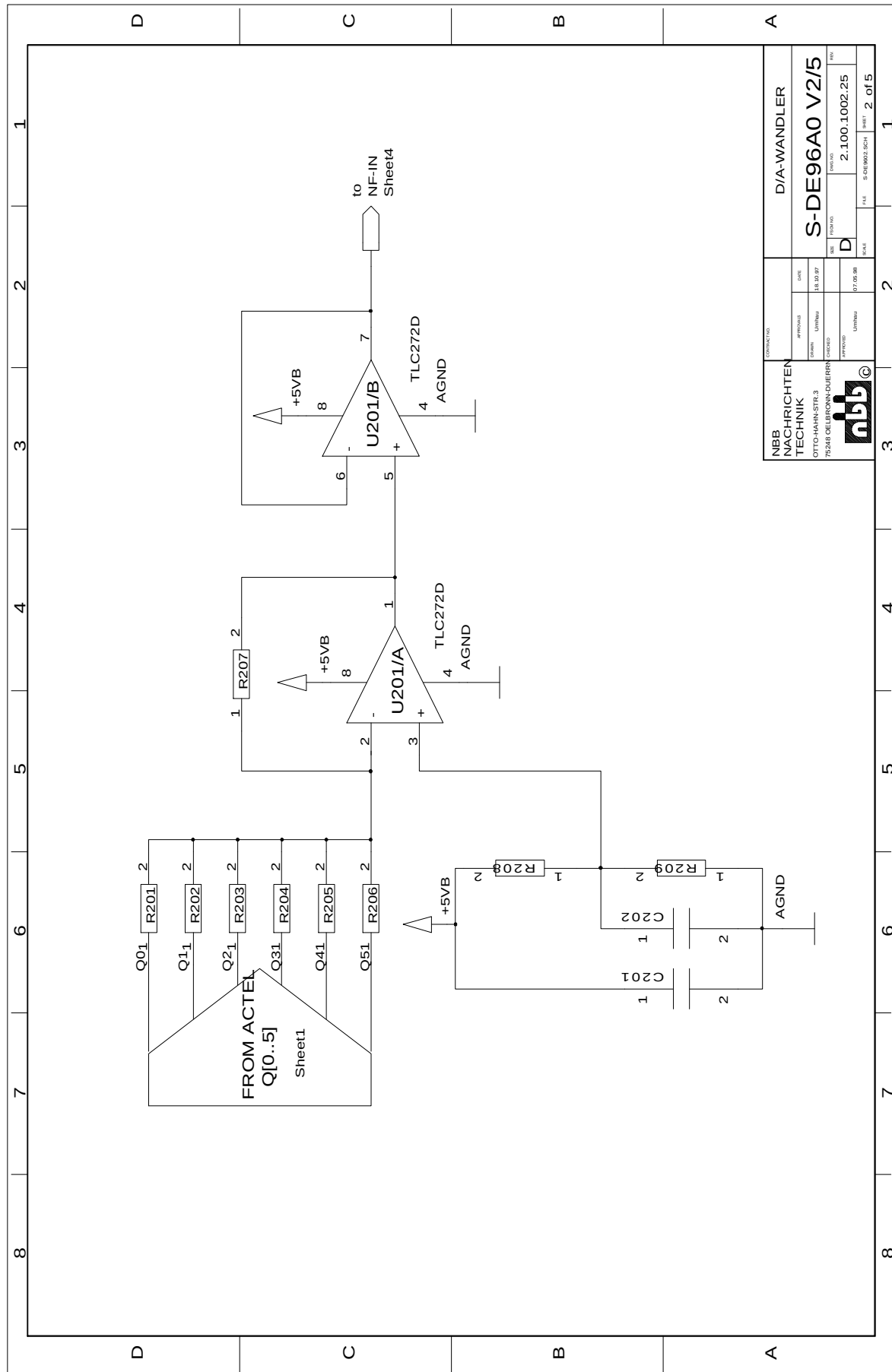
Fig. 1.1.1: Block diagram S-DE96A0

1.2 RF circuitry of module S-DE96A0

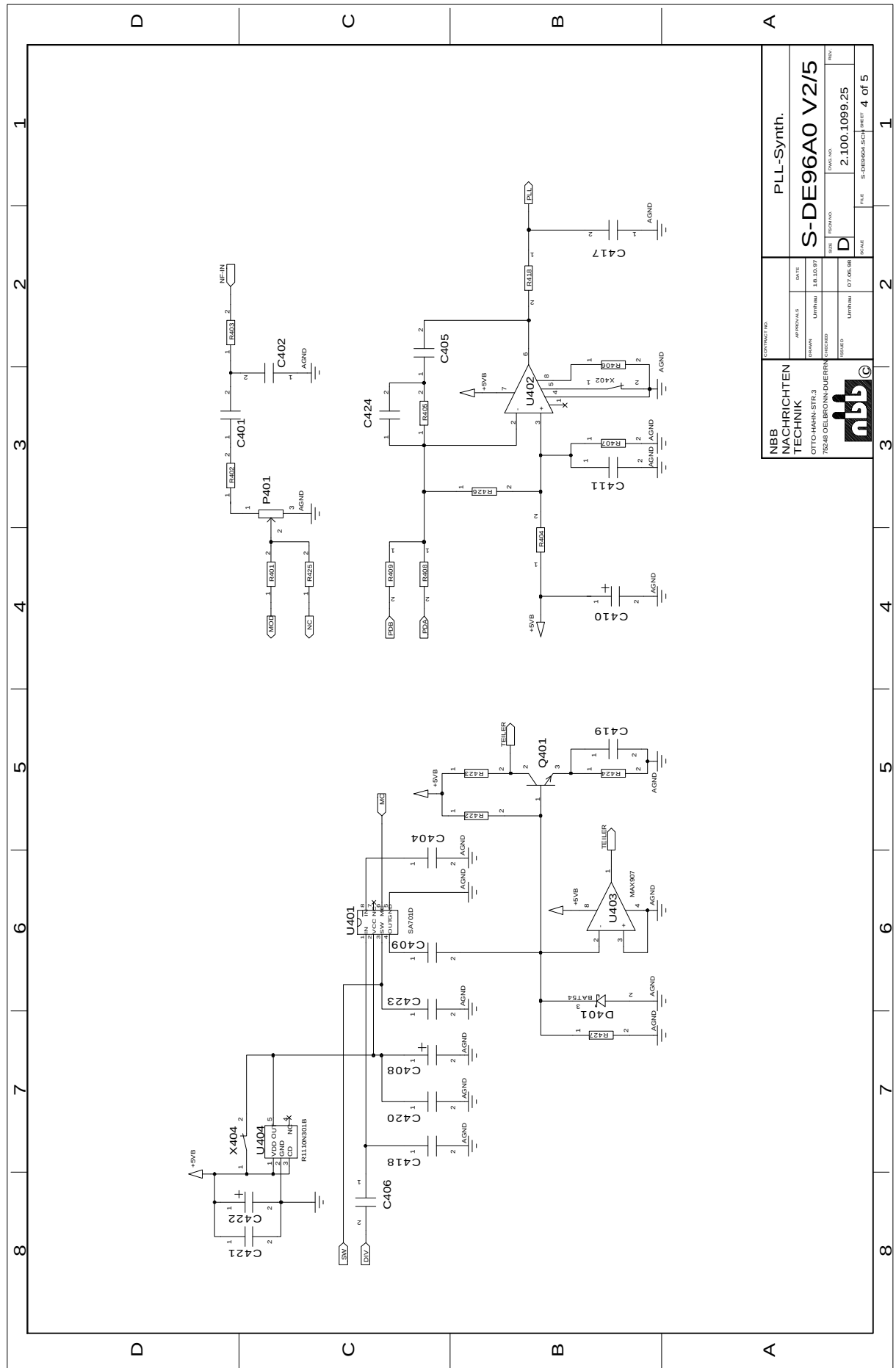
When the transmitter is switched on, or when there is a positive or negative pulse at the reset input of the PLL module from the FPGA ACT42MX09 or ACT42MX16, it automatically reads out 8 times 4 bits from the EEPROM 28C256. The EEPROM only remains energized until all the data has been read out (to save power). The data corresponds to a frequency and is used by the PLL module as information for programming its own scaler. Since the scaler of the PLL IC's only functions up to a maximum of 10 MHz, an RF prescaler (U3) is needed which has a division ratio of 64/128 up to approx. 1000 MHz. The RF power for the prescaler is tapped from the output of LO1 over a coupling conductor. The RF that has now been scaled down to the reference frequency of 20 kHz (= channel increment) is compared with the signal that has also been scaled down from the reference frequency of 12.8 MHz and any deviation (coarse and fine) is fed to an integrator which produces the control supply for the variable capacitance diode in the voltage-controlled RF oscillator.

The RF oscillator is of the harmonic type and is isolated from the now 2-stage amplifier by an extra filter. This is necessary in order to minimize the feedback between aerial and oscillator and to suppress the remaining harmonics. And, of course, no pre-stage, mixer, SAW, LO2 or demodulator module are needed in the transmitter. The modulation, on the other hand, is produced at the duplex variable capacitance diode in the oscillator.

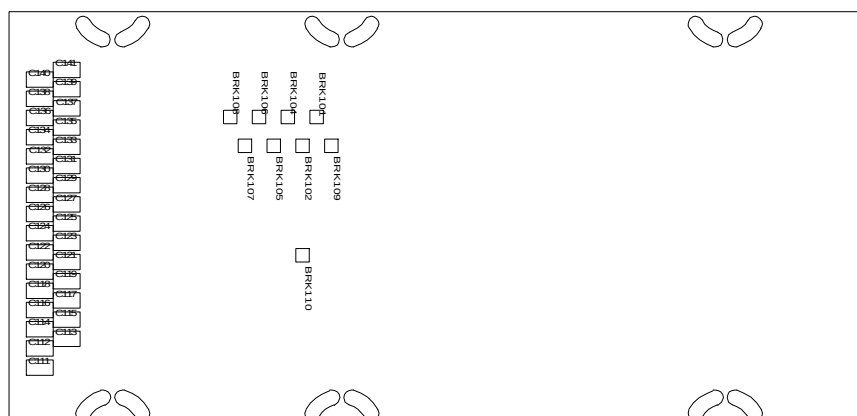
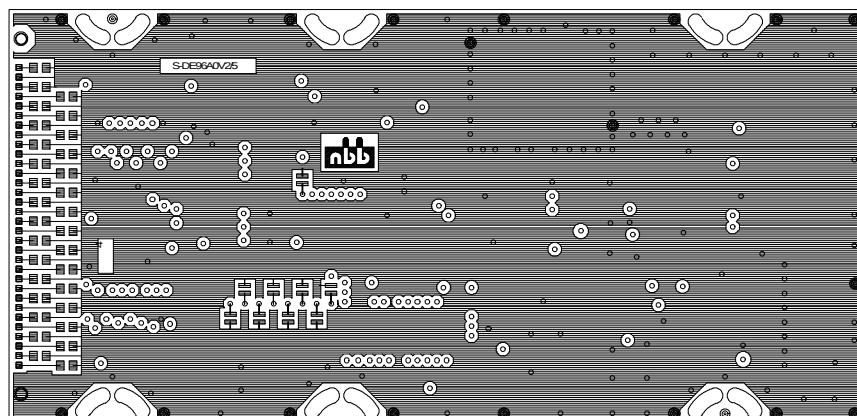
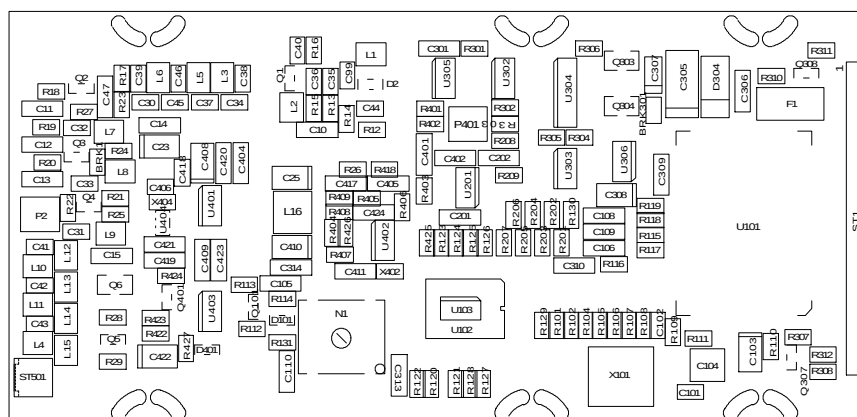
1.3 Circuit diagrams, component plot, layout, bill of material for module S-DE96A0



NBB NACHRICHTEN TECHNIK OTTO-HAHN-STR. 3 75348 DELBRUNN-DUEERN		D/A-WANDLER S-DE96A0 V2/5	
DATE	DATE	DATE	DATE
18.10.97	18.10.97	18.10.97	18.10.97
DESIGNED	DESIGNED	DESIGNED	DESIGNED
2.100.1002.25	2.100.1002.25	2.100.1002.25	2.100.1002.25
REV	REV	REV	REV
D	D	D	D
DATE	DATE	DATE	DATE
07.08.98	07.08.98	07.08.98	07.08.98
DATE	DATE	DATE	DATE
07.08.98	07.08.98	07.08.98	07.08.98
DATE	DATE	DATE	DATE
07.08.98	07.08.98	07.08.98	07.08.98



NBB NACHRICHTEN TECHNIK		PLL-Synth.	
OTTO-HAHN-STR.3 78248 OELBRONN-LOUERN		S-DE96A0 V2/5	
DATE	DATE	DATE	DATE
1.8.10.97	1.8.10.97	1.8.10.97	1.8.10.97
DESIGNED	DESIGNED	DESIGNED	DESIGNED
07.08.98	07.08.98	07.08.98	07.08.98
FILE	FILE	FILE	FILE
S-DE96A0	S-DE96A0	S-DE96A0	S-DE96A0
4 of 5	4 of 5	4 of 5	4 of 5



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%*****
%
%   Program   :   PC-FORM VERSION 8.6
%   Date      :   Jan 19 2000
%   Time      :   11:41:05 AM
%   File In   :   s-de96a0.xnl
%   File Out  :   s-de96a0.mat
%   Format    :   P-CAD MATERIALS LIST
%
%*****

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ITEM	SQTY	PQTY	COMP-NAME	REFERENCE-DESIGNATOR	DESCRIPTION
----	----	----	-----	-----	-----
1	9	9	rh0805	R104 R105 R106 R107 R101 R108 R102 R129 R130	GEH=0805 LAGER=3.980.1058 WERT=100k
2	1	1	rh0805	R109	GEH=0805 LAGER=3.980.1022 REM=n.b. WERT=1M
3	2	2	rh0805	R206 R401	GEH=0805 LAGER=3.980.1015 WERT=10k
4	3	3	rh0805	R202 R208 R209	GEH=0805 LAGER=3.980.1075 WERT=160k
5	1	1	rh0805	R203	GEH=0805 LAGER=3.980.1074 WERT=80k6
6	2	2	rh0805	R204 R403	GEH=0805 LAGER=3.980.1073 WERT=39k2
7	1	1	rh0805	R205	GEH=0805 LAGER=3.980.1072 WERT=20k5
8	1	1	rh0805	R201	GEH=0805 LAGER=3.980.1076 WERT=324k
9	1	1	rh0805	R207	GEH=0805 LAGER=3.980.1071 WERT=4k99
10	1	1	rh0805	R310	GEH=0805 LAGER=3.980.1018 WERT=47k
11	1	1	rh0805	R311	GEH=0805 LAGER=3.980.1077 WERT=820R
12	1	1	rh0805	R308	GEH=0805 LAGER=3.980.1077

					WERT=820R
13	2	2	rh0805	R307 R312	GEH=0805 LAGER=3.980.1058 WERT=100k
14	1	1	rh0805	R405	GEH=0805 L915=3.980.1144 W915=3.3k
15	1	1	rh0805	R402	GEH=0805 LAGER=3.980.1019 WERT=68k
16	1	1	rh0805	R425	GEH=0805 LAGER=3.980.1050 REM=n.b. WERT=0R
17	2	2	cv0805	C102 C101	GEH=0805 LAGER=3.500.1009 REM=n.b. WERT=47pF
18	1	1	cv0805	C406	GEH=0805 LAGER=3.500.1042 WERT=1pF
19	1	1	cv0805	C418	GEH=0805 LAGER=3.500.1047 REM=n.b. WERT=18pF
20	4	4	cv0805	C38 C39 C99 C46	GEH=0805 L915=3.500.xxxx REM915=n.b. W915=?
21	1	1	cv0805	C40	GEH=0805 L915=3.500.1049 W915=10pF
22	2	2	cv0805	C41 C43	GEH=0805 L915=3.500.1044 W915=3.9pF
23	1	1	cv0805	C42	GEH=0805 L915=3.500.1005 W915=3.3pF
24	1	1	cv0805	C44	GEH=0805 LAGER=3.500.1003 WERT=0.68pF
25	1	1	rv0805	R111	GEH=0805 LAGER=3.980.1077 REM=n.b. WERT=820R
26	2	2	rv0805	R110 R12	GEH=0805 LAGER=3.980.1015 WERT=10k
27	2	2	rv0805	R119 R117	GEH=0805 LAGER=3.980.1050

									WERT=0R
28	5	5	rv0805	R118 R116 R115 R112 R422					GEH=0805 LAGER=3.980.1058 REM=n.b. WERT=100k
29	2	2	rv0805	R113 R423					GEH=0805 LAGER=3.980.1080 REM=n.b. WERT=1k
30	2	2	rv0805	R114 R424					GEH=0805 LAGER=3.980.1062 REM=n.b. WERT=51R
31	2	2	rv0805	R131 R427					GEH=0805 LAGER=3.980.1091 REM=HANDB. WERT=33k2
32	1	1	rv0805	R302					GEH=0805 LAGER=3.980.1067 WERT=32k4
33	1	1	rv0805	R301					GEH=0805 LAGER=3.980.1066 WERT=374k
34	1	1	rv0805	R306					GEH=0805 LAGER=3.980.1058 WERT=100k
35	1	1	rv0805	R305					GEH=0805 LAGER=3.980.1070 WERT=261k
36	1	1	rv0805	R304					GEH=0805 LAGER=3.980.1069 WERT=5k9
37	1	1	rv0805	R303					GEH=0805 LAGER=3.980.1068 WERT=26k7
38	1	1	rv0805	R409					GEH=0805 L915=3.980.1089 W915=2.2k
39	1	1	rv0805	R408					GEH=0805 LAGER=3.980.1xxx REM=n.b. WERT=xxxx
40	2	2	rv0805	R404 R407					GEH=0805 L915=3.980.1080 W915=1k
41	1	1	rv0805	R406					GEH=0805 REM915=n.b.
42	1	1	rv0805	R426					GEH=0805 L915=3.980.xxxx REM915=n.b. W915=n.b.

43	1	1	rv0805	R418	GEH=0805 L915=3.980.1016 W915=12k
44	5	5	rv0805	R27 R15 R19 R20 R24	GEH=0805 L915=3.980.xxxx REM915=n.b. W915=n.b.
45	3	3	rv0805	R13 R23 R25	GEH=0805 L915=3.980.1013 W915=1.5k
46	3	3	rv0805	R14 R17 R21	GEH=0805 L915=3.980.1088 W915=680R
47	2	2	rv0805	R16 R18	GEH=0805 L915=3.980.1086 W915=100R
48	1	1	rv0805	R22	GEH=0805 LAGER=3.980.1011 WERT=22R
49	1	1	rv0805	R26	GEH=0805 LAGER=3.980.1022 WERT=1M
50	1	1	rv0805	R29	GEH=0805 LAGER=3.980.1077 REM915=n.b. WERT=820R
51	1	1	rv0805	R28	GEH=0805 LAGER=3.980.1058 REM915=n.b. WERT=100k
52	1	1	xtal2	X101	GEH=HC-52/U(SMD) LAGER=3.650.1000 REM=n.b. WERT=6.00MHz
53	31	31	ch0603	C112 C114 C111 C118 C120 C122 C124 C126 C128 C130 C132 C134 C136 C138 C140 C113 C115 C117 C119 C121 C123 C125 C127 C129 C131 C133 C135 C137 C139 C141 C116	GEH=0603 KON=kon LAGER=3.500.1xxx REM=n.b.
54	1	1	28c04	U102	GEH=PLCC32 LAGER=3.380.1102 WERT=28C256
55	9	9	brk	BRK101 BRK104 BRK105 BRK106 BRK107 BRK108 BRK102 BRK109 BRK110	GEH=LOETBRUECKE
56	1	1	brk	BRK301	GEH=0805 LAGER=n.b. WERT=n.b.

57	2	2	brk	X404 BRK1	GEH=0805 LAGER=3.980.1050 WERT=0R
58	1	1	brk	X402	GEH=0805 REM915=n.b.
59	32	1	32127smd	ST1 ST1	LAGER=3.580.1002
60	5	5	cvsmmd	C108 C109 C106 C105 C419	GEH=1206 LAGER=3.500.1035 REM=n.b. WERT=10nF
61	1	1	cvsmmd	C110	GEH=1206 LAGER=3.500.1035 WERT=10nF
62	7	7	cvsmmd	C201 C202 C313 C310 C309 C306 C314	GEH=1206 LAGER=3.500.1013 WERT=100nF
63	1	1	cvsmmd	C301	GEH=1206 LAGER=3.500.1013 WERT=100nF
64	10	10	cvsmmd	C409 C404 C421 C423 C420 C10 C11 C13 C14 C15	GEH=1206 LAGER=3.500.1014 WERT=1nF
65	1	1	cvsmmd	C411	GEH=1206 LAGER=3.500.1086 WERT=1uF
66	1	1	cvsmmd	C47	GEH=1206 L915=3.500.xxxx REM915=n.b. W915=?
67	1	1	cvsmmd	C12	GEH=1206 L915=3.980.xxxx REM915=n.b. W915=?
68	2	1	max907d	U403 U403	GEH=SOIC8 LAGER=3.380.1056 WERT=MAX907
69	7	7	cv49mcb	C103 C308 C410 C422 C408 C25 C23	GEH=MCB LAGER=3.500.1011 WERT=4.7uF/16V
70	1	1	ctrim	C104	GEH=MUR LAGER=3.500.1015 REM=n.b. WERT=30pF
71	1	1	93c46	U103	GEH=SOIC8 LAGER=3.380.1096 REM=n.b. WERT=93C46

72	2	2	bfr93a	Q101 Q401	GEH=S0T23 LAGER=3.940.1000 REM=n.b. WERT=BFR93A
73	1	1	bfr93a	Q1	GEH=S0T23 LAGER=3.940.1000 WERT=BFR93A
74	1	1	bfr93a	Q2	GEH=S0T23 L915=3.940.1020 W915=BFR183
75	1	1	bfr93a	Q3	GEH=S0T23 L915=3.940.xxxx REM915=n.b. W915=?
76	1	1	bfr93a	Q4	GEH=S0T23 L915=3.940.1021 W915=BFR193
77	2	2	bat54	D101 D401	LAGER=3.190.1016 REM=n.b. WERT=BAT54
78	1	1	act2x100	U101	GEH=PQFP100 LAGER=3.380.1094 WERT=42MX09
79	7	7	rv0603	R121 R123 R124 R125 R126 R127 R120	GEH=0805 LAGER=3.980.1049 REM=n.b. WERT=22k
80	2	2	rv0603	R122 R128	GEH=0805 LAGER=3.980.1050 REM=n.b. WERT=0R
81	1	1	tcxo	N1	LAGER=3.650.1007 REM=Handbestueckt
82	2	1	tlc272d	U201 U201	GEH=S0IC8 LAGER=3.380.1014 WERT=TLC272D
83	1	1	cv49mcd	C305	GEH=MCD LAGER=3.500.1041 WERT=47uF/16V
84	1	1	ref43d	U305	GEH=S0IC8 LAGER=3.380.1029(n.b.) WERT=REF43D
85	1	1	bc80x	Q308	LAGER=3.940.1001 WERT=BC807-25
86	1	1	bc80x	Q307	LAGER=3.940.1001 WERT=BC807-25
87	4	2	tlc2717	U302 U303 U302 U303	GEH=S0IC8 LAGER=3.380.1026 WERT=TLC27L7
88	1	1	fusesmd	F1	GEH=SMD

					LAGER=3.860.1005 WERT=1A
89	2	2	bst120	Q303 Q304	GEH=SOT89 LAGER=3.940.1005 WERT=BST120
90	1	1	bst120	Q6	GEH=SOT89 LAGER=3.940.1005 REM915=n.b. WERT=BST120
91	1	1	sm6txxx	D304	LAGER=3.190.1009 WERT=SM6T12A
92	4	1	c4093b	U304 U304 U304 U304	GEH=SOIC14 LAGER=3.380.1033 WERT=CD4093B
93	2	2	hole	H301 H302	GEH=BOHRUNG
94	1	1	tl750l05	U306	GEH=SOIC8 LAGER=3.670.1004 WERT=TL750L05CD
95	1	1	cv49mca	C307	GEH=MCA LAGER=3.500.1038 WERT=1uF/16V
96	2	2	ttrmpotv	P401 P2	GEH=ST4A LAGER=3.980.1023 WERT=500R
97	1	1	chsmd	C405	GEH=1206 LAGER=3.500.1086 WERT=1uF
98	1	1	chsmd	C417	GEH=1206 LAGER=3.500.1035 WERT=10nF
99	2	2	chsmd	C402 C401	GEH=1206 LAGER=3.500.1014 WERT=1nF
100	1	1	chsmd	C424	GEH=1206 LAGER=3.500.1013 WERT=100nF
101	1	1	r1110nxb	U404	LAGER=3.670.1xxx REM=n.b. WERT=R1110N301B
102	1	1	sa701d	U401	GEH=SOIC8 LAGER=3.380.1083 WERT=SA701D
103	1	1	lm4250h	U402	GEH=SOIC8 L915=3.380.1105 W915=TLC4501A
104	1	1	bc81x	Q5	LAGER=3.940.1002 REM915=n.b. WERT=BC817-25
105	2	2	ch0805	C30 C35	GEH=0805

					L915=3.500.1052 W915=8.2pF
106	2	2	ch0805	C31 C32	GEH=0805 L915=3.500.1071 W915=1.8pF
107	1	1	ch0805	C33	GEH=0805 L915=3.980.1050 W915=0R
108	1	1	ch0805	C34	GEH=0805 L915=3.500.1042 W915=1pF
109	1	1	ch0805	C36	GEH=0805 L915=3.500.1049 W915=10pF
110	1	1	ch0805	C37	GEH=0805 L915=3.500.1003 W915=0.68pF
111	1	1	ch0805	C45	GEH=0805 LAGER=3.500.1042 WERT=1pF
112	2	1	dosc	D2 D2	GEH=SOT43 LAGER=3.190.1004 WERT=BBY62
113	1	1	lvsmc	L1	GEH=IND-A L915=3.200.1037 W915=18nH
114	2	2	lvsmc	L2 L9	GEH=IND-A L915=3.200.1044 W915=10nH
115	2	2	lvsmc	L3 L5	GEH=IND-A L915=3.200.1045 W915=12nH
116	3	3	lvsmc	L4 L7 L10	GEH=IND-A L915=3.200.1047 W915=6.8nH
117	1	1	lvsmc	L6	GEH=IND-A L915=3.200.1046 W915=4.7nH
118	1	1	lvsmc	L8	GEH=IND-A L915=3.200.xxxx REM915=n.b.
119	1	1	lvsmc	L11	GEH=IND-A L915=3.200.1049 W915=8.2nH
120	2	2	lhcsmc	L12 L15	GEH=IND-A L915=3.200.1036 W915=15nH
121	2	2	lhcsmc	L13 L14	GEH=IND-A L915=3.200.1037

					W915=18nH
122	1	1	neosida	L16	GEH=A LAGER=3.200.1000 WERT=1mH
123	1	1	mcxsmd	ST501	GEH=82MMCX-S50-0-51 LAGER=3.960.1001