

Service Manual

Color Television

CHASSIS : CP-185L and CP-185G



Specification

Version	Pal multi system
TV Standard	PAL-SECAM B/G, D/K, H, I/I (NTSC : AV Only)
Sound system	Mono
Power consumption	* 1 Speaker 14":49W / 20":60W / 21" 68W * 2Speaker 14":57W / 20":64W / 21":74W
Speaker	3W 8 Ohm o 7.5W 8 Ohm
Teletext system	Option
Aerial Input	75 Ohm unbalanced
Channel coverage	off-air channels, S-cable channels and hyperband
Tuning system	Ferquency synthesiser tuning system
Visual screen size	14":34cm 20":48cm 21":51cm
Channel indication	On screen display
Program selection	100 Programmes
Auxiliary Outpup Terminal	RCA jack : Audio input and Vidio input ERUO SCART Jack : Audio/Video and R/G/B input. Sloe and fast switching, SVHsin Audio - Video jack on front of cabinet in common connection with EURO-SCART Headphone jack on front of cabinet
Remote control	R-40A10 (None teletext) → AAA Battery type R-40A01 (With teletext) → AAA Battery type R-44C05 (With teletext) → AA Battery type

Caution

: In this Manual, some parts can be changed for improving. their performance without notice in the parts list. So, if you need the latest parts information, please refer to PPL(Parts Price List)in Service Information Center(<http://svc.dwe.co.kr>)

DAEWOO ELECTRONICS Corp.

[http : //svc.dwe.co.kr](http://svc.dwe.co.kr)

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APPENDIX (Appendix is provide only by internet [<http://svc.dwe.co.kr>])

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SAFETY INSTRUCTION

WARNING : Only competent service personnel may carry out work involving the testing or repair of this equipment

X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not exceed the specified limit. The nominal value of the high voltage of this receiver is 22-23 kV (14") or 24-26 kV (20"-21") at max beam current. The high voltage must not, under any circumstances, exceed 27.5 kV (14", 20"), 29KV (21"). Each time a receiver requires servicing, the high voltage should be checked. It is important to use an accurate and reliable high voltage meter.).
2. The only source of X-RAY Radiation in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.

■ SAFETY PRECAUTION

1. Potentials of high voltage are present when this receiver is operating. Operation of the receiver outside the cabinet or with the back cover removed involves a shock hazard from the receiver.
 - 1) Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment.
 - 2) Discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled.
2. If any Fuse in this TV receiver is blown, replace it with the FUSE specified in the Replacement Parts List.
3. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor body 10 mm away from the circuit board.
4. Keep wires away from high voltage or high temperature components.
5. This receiver must operate under AC 230 volts, 50 Hz. NEVER connect to a DC supply of any other voltage or frequency.

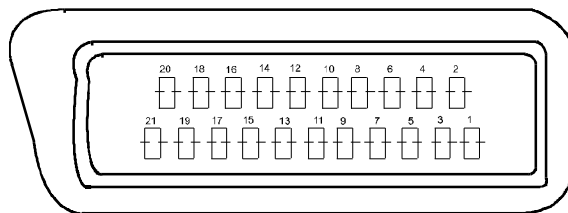
■ PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this equipment have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-RAY RADIATION protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements, electrical components having such features are identified by designated symbol on the parts list. Before replacing any of these components, read the parts list in this manual carefully. The use of substitutes replacement parts which do not have the same safety characteristics as specified in the parts list may create X-RAY Radiation.

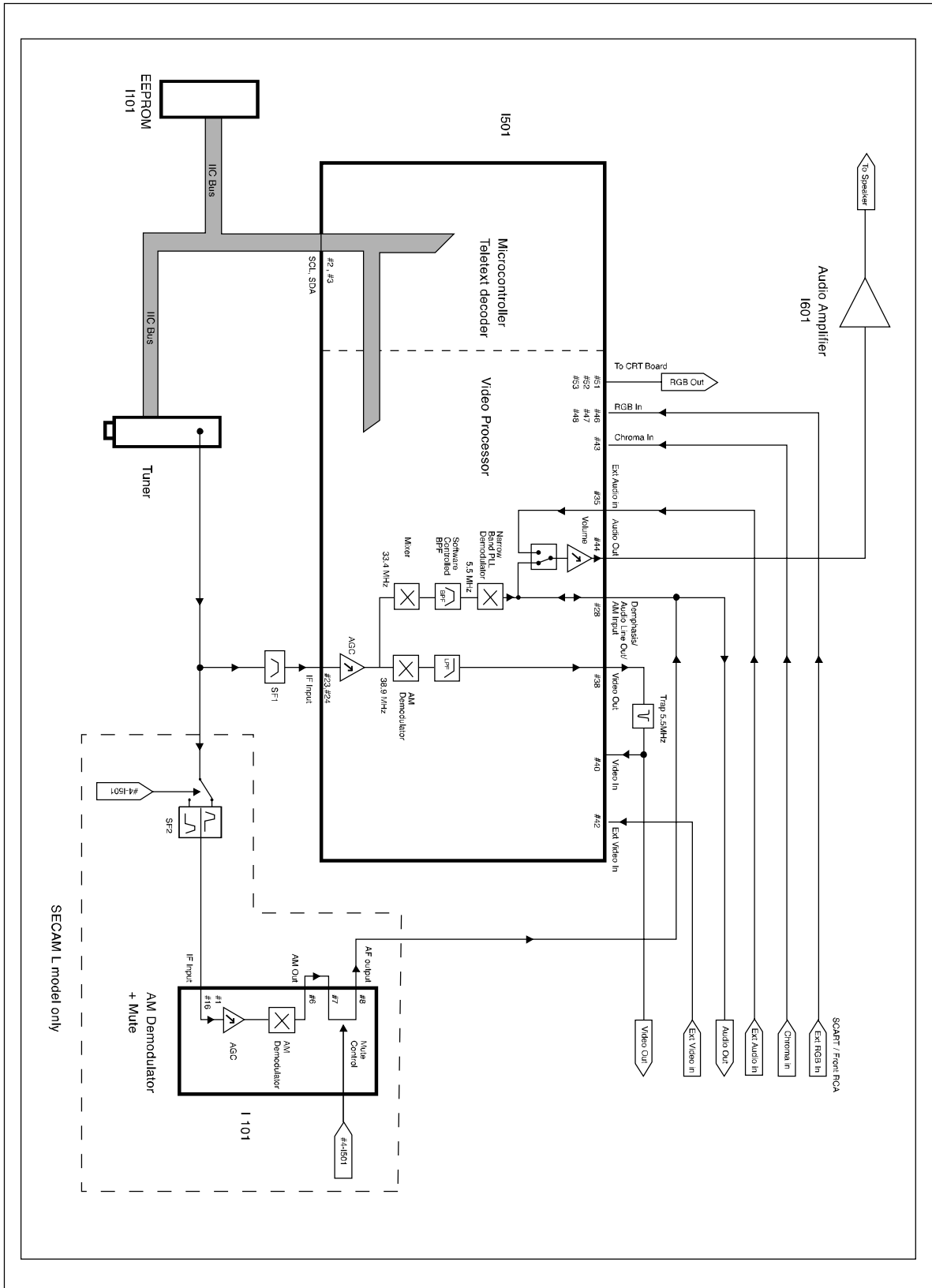
SPECIFICATIONS

21Pin EURO-SCART

PIN	SIGNAL DESCRIPTION	MATCHING VALUE
1	Audio Output Right	0.5 Vrms, Impedance < 1k Ω , (RF 54% Mod)
2	Audio Input Right	0.5Vrms, Impedance > 10k Ω
3	Audio Output Left	0.5 Vrms, Impedance < 1k Ω , (RF 54% Mod)
4	Audio Earth	
5	Blue Earth	
6	Audio Input Left	0.5Vrms, Impedance > 10k Ω
7	Blue Input	0.7Vpp + 0.1V, Impedance 75 Ω
8	Slow Switching	TV : 0 to 2V, AV : 4.5 to 12V, Impedance > 10k Ω
9	Green Earth	
10	N.C	
11	Green Input	0.7Vpp + 0.1V, Impedance 75 Ω
12	N.C	
13	Red Earth	
14	Blanking Earth	
15	Red Input Chroma Input	0.7Vpp \pm 0.1V, Impedance 75 Ω \pm 3dB for a luminance signal of 1 Vpp
16	Fast Switching	0 to 0.4V : Logic "0", 1 to 3V : Logic "1", Impedance 75 Ω
17	Video Out Earth	
18	Video In Earth	
19	Video Output	1 Vpp \pm 3dB, Impedance 75 Ω
20	Video Input	1 Vpp \pm 3dB, Impedance 75 Ω
21	Common Earth	



CIRCUIT BLOCK DIAGRAM



ALIGNMENT INSTRUCTIONS

Microcontroller configuration : Service mode

To switch the TV set into service mode please see instruction below.

- 1 - Select pr. number 91
- 2 - Adjust sharpness to minimum and exit all menu.
- 3 - Quickly press the key sequence : **RED - GREEN - menu**

To exit SERVICE menu press **menu** key or **Std By** key.

In Service Mode press "**OK**" to the microcontroller i.e. the I2C bus is free and the set can be controlled by external equipment.

Press "**OK**" again to allow the microcontroller to control the set again

Microcontroller configuration :

Tuner Option

Option	Tuner maker
DW	DAEWOO / SAMSUNG
PHI	LIPS (tuner internal AGC)
PH2	PHILIPS (Video processor AGC)

TV set Alignment

1 - G2 alignment

- Set TV in NORMAL I mode
- TV in AV mode without video signal ? Black screen.
- TV preset with WP Red, WP Green and WP Blue equal to 32.
- TV preset with Black R, Black G equal to 8.
- Adjust screen volume (on FBT) such that the highest cathode cut-off voltage measured on CRT board, is Vcut-off 5V

Screen size	Vcut-off
14"	115V
20" & 21"	125V

2 - White balance

- Select a dark picture and adjust Black G and Black R to the desired colour temperature.
- Select a bright picture and adjust WP Red, WP Green, WP Blue to the desired colour temperature.

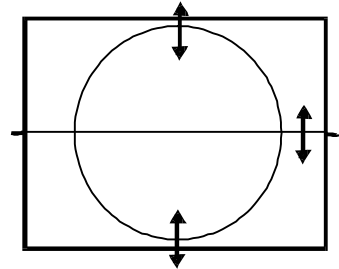
ALIGNMENT INSTRUCTIONS

3 - Focus

- Adjust the Focus volume (on FBT) to have the best resolution on screen.

4 - Vertical geometry

- Adjust the Vertical Amplitude, Shift, S-Correction and Slope to compensate for vertical distortion



5 - Horizontal picture centering

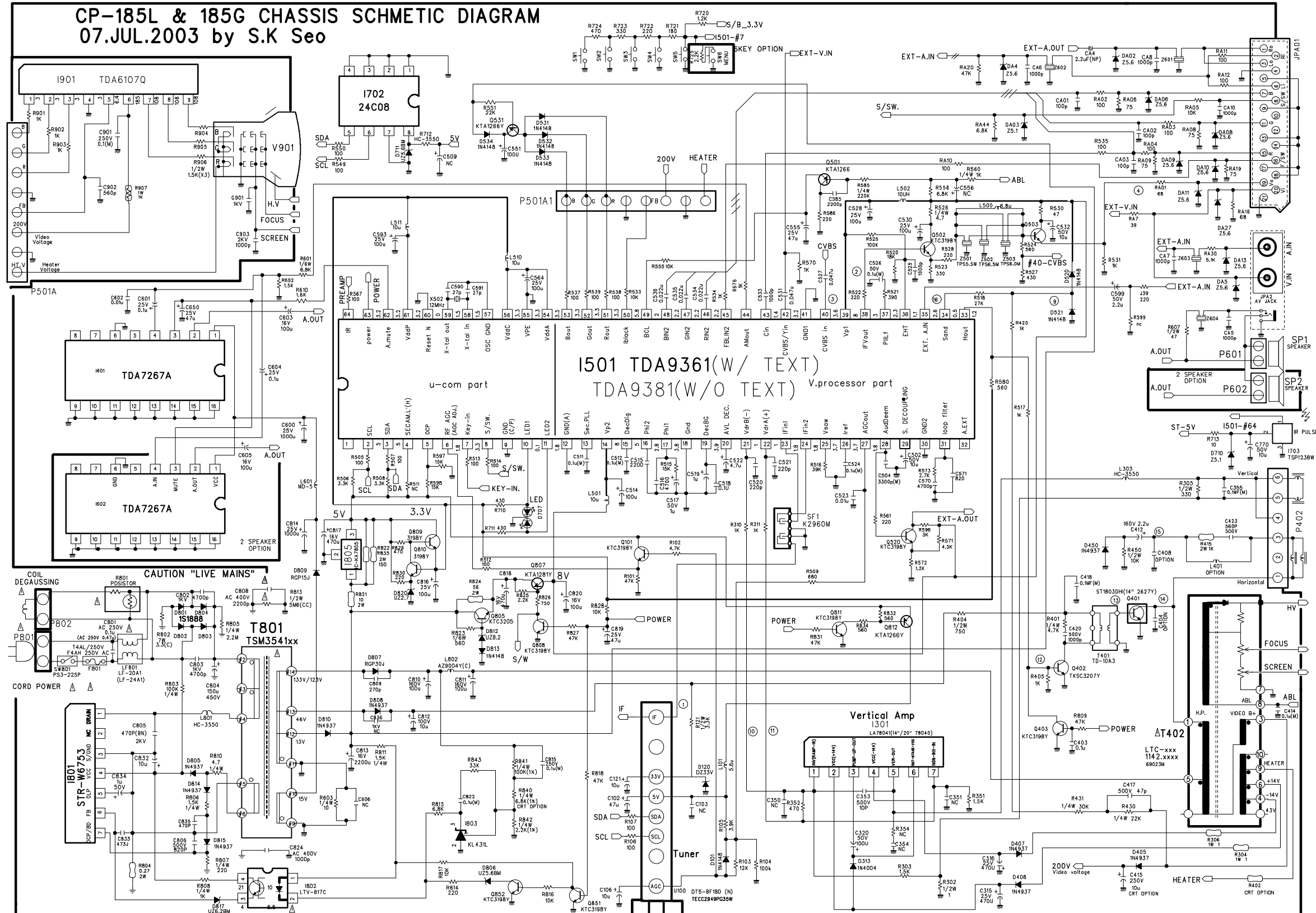
- Adjust H Shift to have the picture in the center of the screen.

7 - AGC

- Adjust the antenna signal level to $68\text{dB V} \pm 2$ for Daewoo tuner ($63\text{dB V} \pm 1$ for Philips tuner)
- Set RF AGC to 0.
- Increase RF AGC level and stop when the level on pin 6 of I501 goes below 2.5 Vdc

SCHEMATIC DIAGRAM

CP-185L & 185G CHASSIS SCHEMATIC DIAGRAM
07.JUL.2003 by S.K Seo



NOTE:

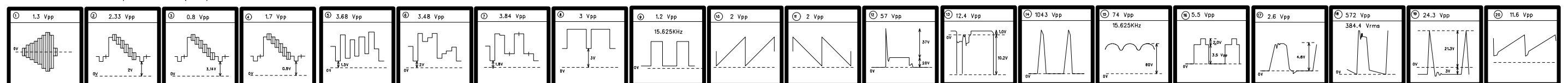
1. RESISTANCE IS SHOWN IN OHM. K=1000, M=1000000
2. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITOR VALUES ARE EXPRESSED IN μF
3. VOLTAGES READ WITH "VTVM" FROM POINT INDICATED TO CHASSIS GROUND USING A COLOR BAR SIGNAL WITH ALL CONTROLS AT NORMAL LINE 230V AC VOLTAGE. READINGS SHOWN ARE NORMAL VALUES AND MAY VARY $\pm 20\%$ EXCEPT H.V
4. THIS CIRCUIT DIAGRAM IS A STANDARD ONE CIRCUIT PRINTED MAY BE SUBJECT TO CHANGE FOR PRODUCT IMPROVEMENT WITHOUT PRIOR NOTICE

WARNING:
BEFORE SERVICING THE CHASSIS, READ "X-RAY RADIATION", "SAFETY PRECAUTION", AND "PRODUCT SAFETY NOTICE" IN SERVICE MANUAL

CAUTION TO SERVICE TECHNICIANS:
BEFORE RETURNING THE RECEIVER TO CUSTOMER, LEAKAGE CURRENT OR
RESISTANCE MEASUREMENTS SHOULD BE PERFORMED TO DETERMINE THAT
EXPOSED PARTS ARE PROPERLY INSULATED FROM THE SUPPLY CIRCUIT.

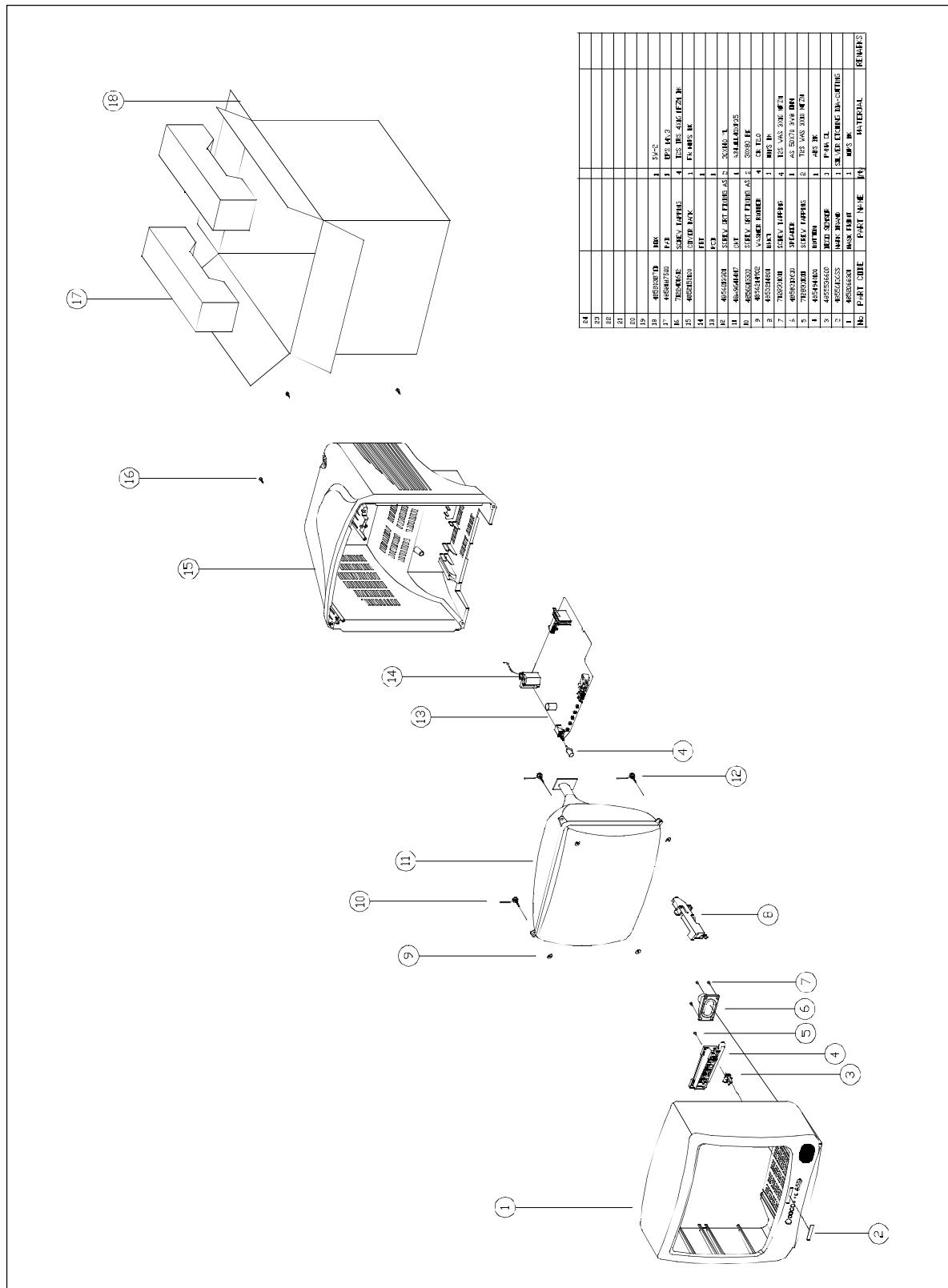
* WAVEFORMS

TEST CONDITIONS : PAL-B/G COLOR BAR (NOR.1)

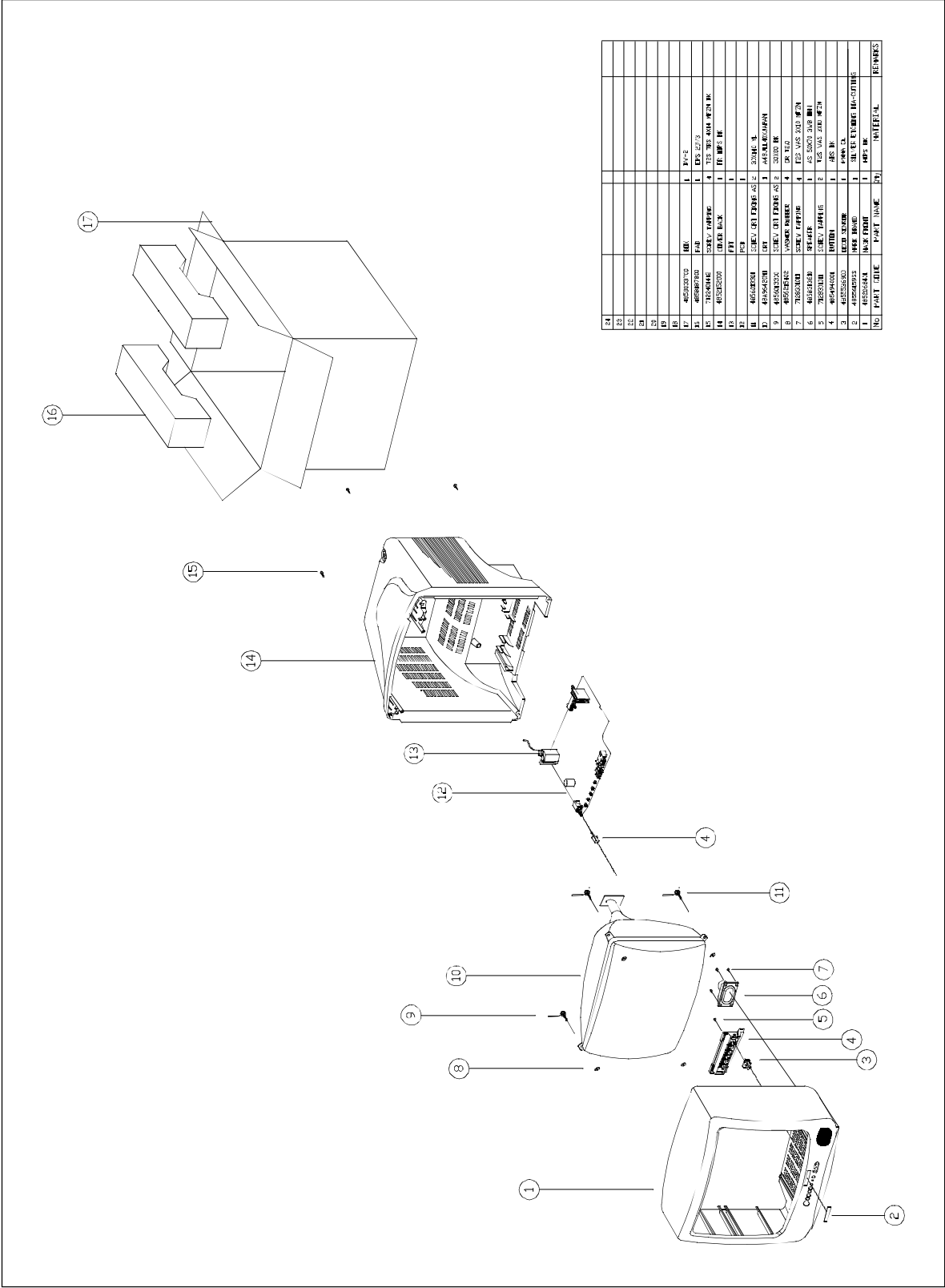


EXPLODED VIEW

1. 14V3

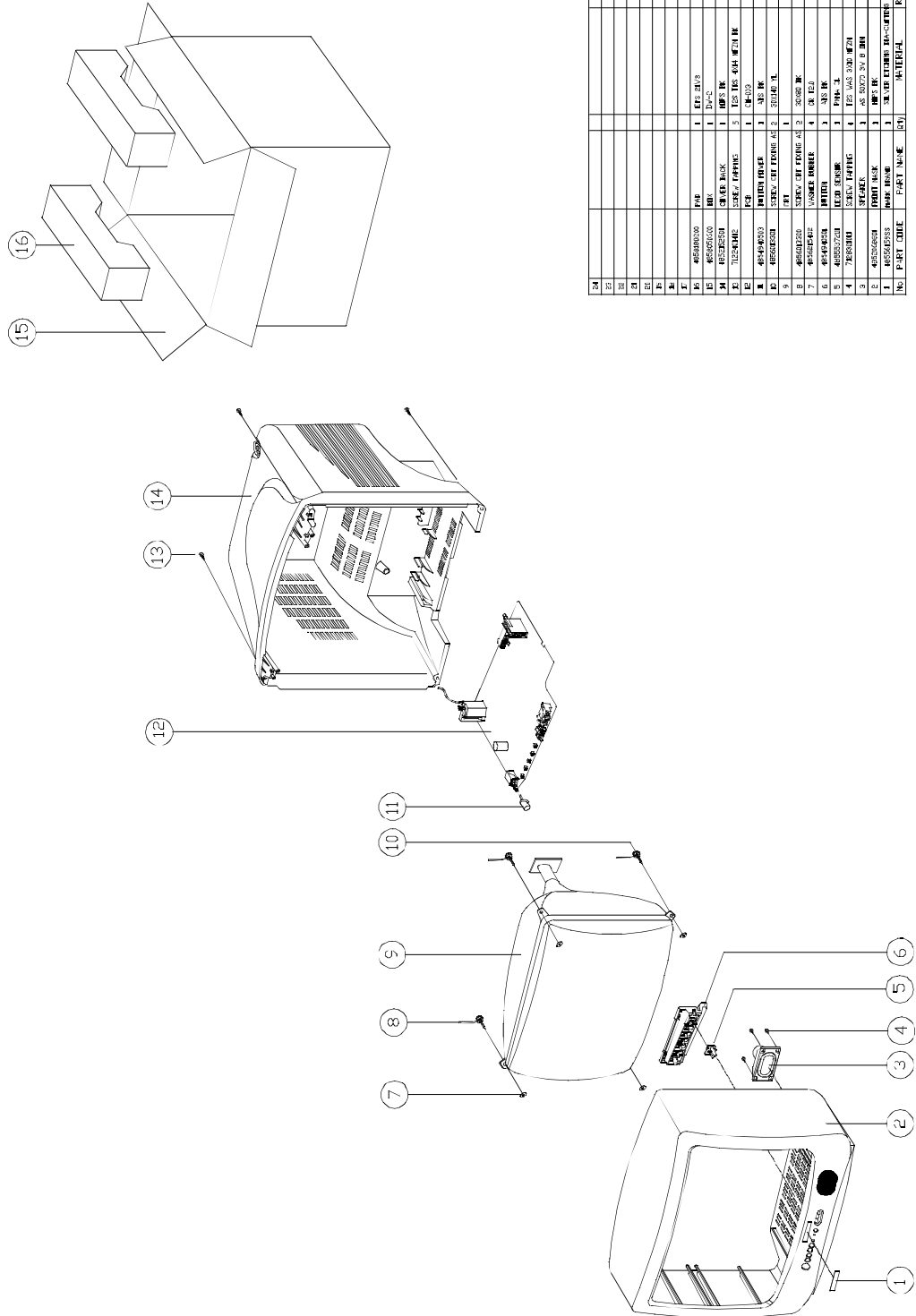


2. 20V3



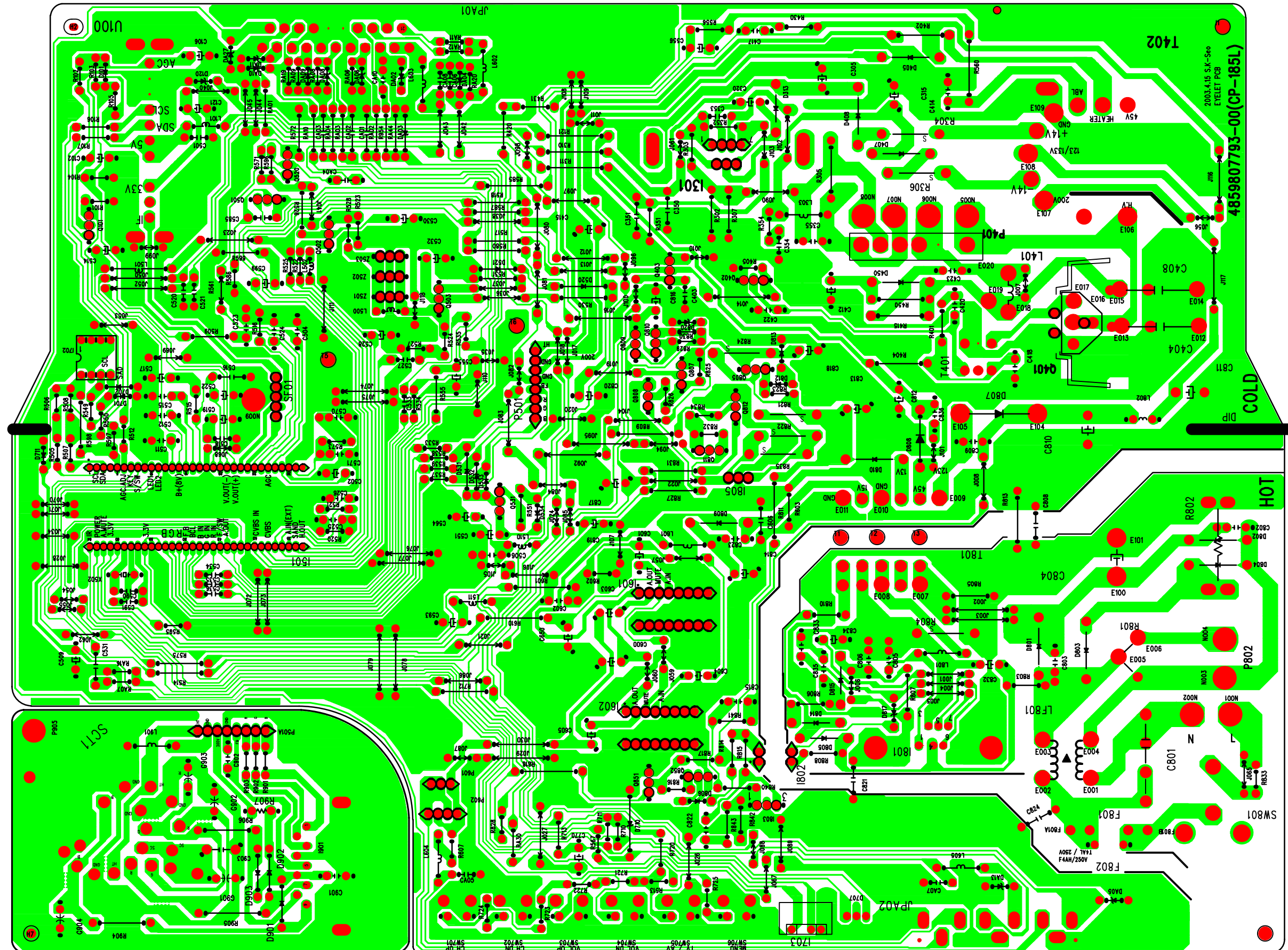
EXPLODED VIEW

3. 21V3



No.	PART CODE	PART NAME	QTY	MATERIAL	REMARKS
1	40500000	MAIN BODY	1	ABS	
2	40500001	CONTROL PANEL	1	ABS	
3	40500002	DISPLAY	1	ABS	
4	40500003	KEYPAD	1	ABS	
5	40500004	SPEAKER	1	ABS	
6	40500005	MICROPHONE	1	ABS	
7	40500006	CAMERA	1	ABS	
8	40500007	LENS	1	ABS	
9	40500008	SENSOR	1	ABS	
10	40500009	MOTOR	1	ABS	
11	40500010	FAN	1	ABS	
12	40500011	POWER SUPPLY	1	ABS	
13	40500012	BATTERY	1	ABS	
14	40500013	CHARGING DOCK	1	ABS	
15	40500014	EXTERNAL MODULE A	1	ABS	
16	40500015	EXTERNAL MODULE B	1	ABS	

PRINTED CIRCUIT BOARD



ELECTRICAL PARTS LIST

Caution In this Manual, some parts can be changed for improving, their performance without notice in the parts list. So, if you need the latest parts information, please refer to PPL(Prats Price List) in Service information Center (<http://svc.dwe.co.kr>)

Caution △ is a recommendable part for stock.

Ⓡ is safety component, so it must be used the same component.

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
ZZ100	48B3740A01	TRANSMITTER REMOCON	R-40A01	Ⓡ
ZZ110	PTACPWD434	ACCESSORY AS	DTA-20V1MZ	
00100	4850Q00910	BATTERY	R03/NN	
00200	48586002E2	MANUAL INSTRUCTION	ENGLISH,ARABIC	
M821	4858213801	BAG INSTRUCTION	L.D.P.E T0.05X250X400	
ZZ120	PTBCSHD753	COVER BACK AS	DTB-21D4T	
M211	4852156721	COVER BACK	HIPS(CORE A2,B1)	
M541	4855415800	SPEC PLATE	150ART P/E FILM (C/TV)	
M781	4857817610	CLOTH BLACK	FELT 300X20X0.7	
ZZ130	PTPKCPD753	PACKING AS	DTB-21D4T	
10	6520010100	STAPLE PIN	AUTO W65	
M801	4858057500	BOX CARTON	DW-3	
M811	4858194100	PAD	EPS	
M821	4858211801	BAG P.E	L.D.P.E T0.03X1300X1100	
ZZ131	48519A5310	CRT GROUND NET	2101S-1015-1P	
ZZ132	58G0000147	COIL DEGAUSSING	DC-21SF	△ !
ZZ140	PTCACAD753	CABINET AS	DTB-21D4T	
M201A	4856013300	SCREW CRT FIXING	30X80 BK	
M201B	4856215402	WASHER RUBBER	CR T2.0	
M201C	4856013302	SCREW CRT FIXING	30X190 BK	
M211A	7172401412	SCREW TAPPTITE	TT2 TRS 4X14 MFZN BK	
M211B	4855930901	DECO TERM	PVC CL T0.2	
M211D	7172401412	SCREW TAPPTITE	TT2 TRS 4X14 MFZN BK	
M591	4855933901	DECO WOOFER	HIPS GY	
M591A	7172401212	SCREW TAPPTITE	TT2 TRS 4X12 MFZNBK	
M681	4856812001	TIE CABLE	NYLON66 DA100	
SP01A	7172401212	SCREW TAPPTITE	TT2 TRS 4X12 MFZNBK	
SP02A	7172401212	SCREW TAPPTITE	TT2 TRS 4X12 MFZNBK	
V901	PSRTPWD002	CRT AS	A51EHW135X01(PHILIPS)	Ⓡ △
ZRT10	4859637160	CRT	A51EHW135X01	
ZZ200	PTFMSJD753	MASK FRONT AS	DTB-21D4T	
M191	4854946301	BUTTON	ABS BK	
M191A	7178301011	SCREW TAPPTITE	TT2 WAS 3X10 MFZN	
M201	4852074601	MASK FRONT	HIPS BK	
M231	4851114411	PANEL CONTROL ASSY	2326711+4857101+6717900	
M251	4852540801	GRILL R	EGI T0.8	
M252	4852540701	GRILL L	EGI T0.8	
M531	4855313201	DECO COVER	HIPS GY	
M531A	7178300811	SCREW TAPPTITE	TT2 WAS 3X8 MFZN	
M561	4855617500	MARK BRAND	CU AU+ABS BK	
ZZ210	PTSPPWD753	SPEAKER AS	DTB-21D4T	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
P602A	4850704S31	CONNECTOR	YH025-04+YRT205+ULW800400	
SP01	4858310810	SPEAKER	SP-58126F01	®
SP02	4858310810	SPEAKER	SP-58126F01	®
ZZ290	PTMPMSD753	PCB MAIN MANUAL AS	DTB-21D4T	
10	2193102005	SOLDER BAR	SN:PB=63:47 S63S-1320	
30	2291050616	FLUX SOLDER	JS-64T3	
40	2291050301	FLUX SOLVENT	IM-1000	
C404	CMYH3C822J	C MYLAR	1.6KV BUP 8200PF J	
C408	CMYE2D624J	C MYLAR	200V PU 0.62MF J	
C801	CL1UC3474M	C LINE ACROSS	0.47MF 1J(UCVSNDF/SV)+Q/O	
C804	CEYN2W151P	C ELECTRO	450V LHS 150MF (25X40)	®
C808	CH1BFE222M	C CERA AC	U/C/V AC400V 2200PF	® ▲
C824	CH1HFE102M	C CERA AC	4.0KV 1000PF E DG	® ▲
D707	4858900002	HOLDER LED ASSY	LH-3P	
D807	DRGP30J -	DIODE	RGP30J	
I301	PTD2SW7100	HEAT SINK ASSY	1LA78041 + 7174300811	
00001	1LA78041	IC VERTICAL	LA78041	
0000A	4857027100	HEAT SINK	SPCC T1.0+SN	
0000B	7174300811	SCREW TAPPTITE	TT2 RND 3X8 MFZN	
I501	1DW3613EB6	IC MICOM	DW9361/N2/3-EB6	®
I601	1TDA7267A-	IC AMP	TDA7267A	®
I602	1TDA7267A-	IC AMP	TDA7267A	®
I702	1AT24C08PC	IC	AT24C08-10PC	®
I703	1TS0P1238W	IC PREAMP	TS0P1238W1	
I801	PTM2SW4600	HEAT SINK ASSY	1STRW6753- + 7174300811	
00001	1STRW6753-	IC POWER	STR-W6753	®
0000A	4857024600	HEAT SINK	AL EX B/K	
0000B	7174300811	SCREW TAPPTITE	TT2 RND 3X8 MFZN	
I802	1LTV817C	IC PHOTO COUPLER	LTV-817C	
I805	1KA7805 -	IC REGULATOR	KA7805	
I901	PTC3SW1100	HEAT SINK ASSY	1TDA6107Q- + 7174300811	
00001	1TDA6107Q-	IC VIDEO AMP	TDA6107Q	®
0000A	4857031100	HEAT SINK	A1050P-H24 T2.0	
0000B	7174300811	SCREW TAPPTITE	TT2 RND 3X8 MFZN	
JPA01	4859200401	SOCKET RGB	YRS21-R1	
JPA02	4859109950	JACK PIN BOARD	PH-JB-9710A	
L401	58H0000020	COIL H-LINEARITY	L-76(76.5UH)	
LF801	5PLF24A1	FILTER LINE	LF-24A1	® ▲
M682	4856812001	TIE CABLE	NYLON66 DA100	
P401	4859240120	CONN WAFER	YFW500-06	
P501	4850708N08	CONNECTOR	BIC-08T-25T+C-20T+ULW=400	
P801	4859903110	CORD POWER AS	KKP-419J-H03VVH2+H0U=2200	
A000	4859903511	CORD POWER	CW4232 H03VVH2-F=2250	
Q401	PTJ2SW7200	HEAT SINK ASSY	TST1803DH- + 7174301011	
00001	TST1803DH-	TR HORI	ST1803DHI	®

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
0000A	4857027200	HEAT SINK	AL T1.0	
0000B	7174301011	SCREW TAPPTITE	TT2 RND 3X10 MFZN	
R801	DDC7R0M290	POSISTOR	ECPCD7R0M290	Ⓡ ⚠
R802	RX07B339JP	R CEMENT	7W 3.3 OHM J BEN 15MM 4P	
SCT1	4859303530	SOCKET CRT	PCS629-03C	Ⓡ ⚠
SF01	5PK2960M	FILTER SAW	K2960M	
SW801	5S40101143	SW POWER PUSH	PS3-22SP (P.C.B)	
T401	50D10A3 -	TRANS DRIVE	TD-10A3	
T402	50H0000256	FBT	FFA69023M	Ⓡ ⚠
T801	50M3541B6-	TRANS SMPS	TSM-3541B6	Ⓡ ⚠
U100	4859721530	TUNER VARACTOR	DT5-BF18D N	
ZZ200	PTMPJ0D753	PCB MAIN (RHU) AS	DTB-21D4T	
C305	CEXF1E471V	C ELECTRO	25V RSS 470MF (10X16) TP	
C315	CEXF1E471V	C ELECTRO	25V RSS 470MF (10X16) TP	
C415	CEXF2E100V	C ELECTRO	250V RSS 10MF (10X20) TP	
C600	CEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP	
C805	CBXB3D471K	C CERA SEMI	2KV BL(N) 470PF K (T)	
C810	CEXF2C101V	C ELECTRO	160V RSS 100MF (16X25) TP	
C811	CEXF2C101V	C ELECTRO	160V RSS 100MF (16X25) TP	
C813	CEXF1C222V	C ELECTRO	16V RSS 2200MF (16X31.5) TP	
C814	CEXF1E102V	C ELECTRO	25V RSS 1000MF (13X20) TP	
C817	CEXF1C471V	C ELECTRO	16V RSS 470MF (8X12)TP	
C818	CEXF1C471V	C ELECTRO	16V RSS 470MF (8X12)TP	
C820	CEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP	
C903	CCXB3D102K	C CERA	2KV B 1000PF K (TAPPING)	
F802	5FWML4022L	FUSE	WIDE TL 250V 4A CASE	Ⓡ ⚠
ZZ200	PTMPJBD753	PCB MAIN M-10 AS	DTB-21D4T	
10	2TM18006BE	TAPE MASKING	6.2X500	
E001	4856310300	EYE LET	BSR T0.2 (R1.6)	
E002	4856310300	EYE LET	BSR T0.2 (R1.6)	
E003	4856310300	EYE LET	BSR T0.2 (R1.6)	
E004	4856310300	EYE LET	BSR T0.2 (R1.6)	
E005	4856310300	EYE LET	BSR T0.2 (R1.6)	
E006	4856310300	EYE LET	BSR T0.2 (R1.6)	
E007	4856310300	EYE LET	BSR T0.2 (R1.6)	
E008	4856310300	EYE LET	BSR T0.2 (R1.6)	
E009	4856310300	EYE LET	BSR T0.2 (R1.6)	
E010	4856310300	EYE LET	BSR T0.2 (R1.6)	
E011	4856310300	EYE LET	BSR T0.2 (R1.6)	
E012	4856310300	EYE LET	BSR T0.2 (R1.6)	
E013	4856310300	EYE LET	BSR T0.2 (R1.6)	
E014	4856310300	EYE LET	BSR T0.2 (R1.6)	
E015	4856310300	EYE LET	BSR T0.2 (R1.6)	
E016	4856310300	EYE LET	BSR T0.2 (R1.6)	
E017	4856310300	EYE LET	BSR T0.2 (R1.6)	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
E018	4856310300	EYE LET	BSR T0.2 (R1.6)	
E019	4856310300	EYE LET	BSR T0.2 (R1.6)	
E020	4856310300	EYE LET	BSR T0.2 (R1.6)	
E100	4856310600	EYE LET	BSR T0.2 (R2.3)	
E101	4856310600	EYE LET	BSR T0.2 (R2.3)	
E104	4856310600	EYE LET	BSR T0.2 (R2.3)	
E105	4856310600	EYE LET	BSR T0.2 (R2.3)	
E106	4856310600	EYE LET	BSR T0.2 (R2.3)	
E107	4856310600	EYE LET	BSR T0.2 (R2.3)	
E108	4856310600	EYE LET	BSR T0.2 (R2.3)	
E109	4856310600	EYE LET	BSR T0.2 (R2.3)	
N001	4857417500	TERM PIN	DA-IB0214(D2.3/DY PIN)	
N002	4857417500	TERM PIN	DA-IB0214(D2.3/DY PIN)	
N003	4857417500	TERM PIN	DA-IB0214(D2.3/DY PIN)	
N004	4857417500	TERM PIN	DA-IB0214(D2.3/DY PIN)	
P602	485923172S	CONN WAFER	YW025-04 (STICK)	
R304	RS01Z109J-	R M-OXIDE FILM	1W 1 OHM J (TAPPING)	
R306	RS01Z109J-	R M-OXIDE FILM	1W 1 OHM J (TAPPING)	
R402	RS01Z249J-	R M-OXIDE FILM	1W 2.4 OHM J (TAPPING)	
R415	RS02Z102JS	R M-OXIDE FILM	2W 1K OHM J SMALL	
R804	RS02Z278JS	R M-OXIDE FILM	2W 0.27 OHM J SMALL	
R821	RS02Z100JS	R M-OXIDE FILM	2W 10 OHM J SMALL	
R822	RS02Z151JS	R M-OXIDE FILM	2W 150 OHM J SMALL	
R824	RS02Z101JS	R M-OXIDE FILM	2W 100 OHM J SMALL	
R835	RS02Z151JS	R M-OXIDE FILM	2W 150 OHM J SMALL	
ZZ200	PTMPJRD753	PCB MAIN RADIAL AS	DTB-21D4T	
C102	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C106	CEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP	
C121	CEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP	
C320	CEXF1H101V	C ELECTRO	50V RSS 100MF (8X11.5) TP	
C355	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C412	CEXF2C229V	C ELECTRO	160V RSS 2.2MF (8X11.5)TP	
C414	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C417	CXSL2H470J	C CERA	500V SL 47PF J (TAPPING)	
C418	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C420	CCXB1H102K	C CERA	50V B 1000PF K (TAPPING)	
C423	CCXB2H561K	C CERA	500V B 560PF K (TAPPING)	
C502	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C504	CMXM2A332J	C MYLAR	100V 3300PF J (TP)	
C509	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C511	CMXL1J104J	C MYLAR	63V MEU 0.1MF J	
C512	CMXL1J104J	C MYLAR	63V MEU 0.1MF J	
C514	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C517	CEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP	
C519	CEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
C522	CEXF1H479V	C ELECTRO	50V RSS 4.7MF (5X11) TP	
C523	CCXF1H103Z	C CERA	50V F 0.01MF Z (TAPPING)	
C524	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C525	CCXB1H102K	C CERA	50V B 1000PF K (TAPPING)	
C526	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C528	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C530	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C532	CEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP	
C551	CEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP	
C555	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C564	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C570	CCXB1H472K	C CERA	50V B 4700PF K (TAPPING)	
C593	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C599	CEXF1H229V	C ELECTRO	50V RSS 2.2MF (5X11) TP	
C601	CEXF1H108V	C ELECTRO	50V RSS 0.1MF (5X11) TP	
C602	CCXF1H103Z	C CERA	50V F 0.01MF Z (TAPPING)	
C603	CEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP	
C604	CEXF1H108V	C ELECTRO	50V RSS 0.1MF (5X11) TP	
C605	CEXF1C101V	C ELECTRO	16V RSS 100MF (6.3X11) TP	
C650	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C770	CEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP	
C802	CCXF3A472Z	C CERA	1KV F 4700PF Z (T)	
C803	CCXF3A472Z	C CERA	1KV F 4700PF Z (T)	
C806	CCXB1H821K	C CERA	50V B 820PF K (TAPPING)	
C809	CCXB3A271K	C CERA	1KV B 270PF K (TAPPING)	
C812	CEXF2A100V	C ELECTRO	100V RSS 10MF (6.3X11) TP	
C815	CMXL2E104K	C MYLAR	250V MEU 0.1MF K	
C816	CEXF1E101V	C ELECTRO	25V RSS 100MF (6.3X11) TP	
C819	CEXF1E470V	C ELECTRO	25V RSS 47MF (5X11) TP	
C822	CMXM2A104J	C MYLAR	100V 0.1MF J (TP)	
C832	CEXF1H100V	C ELECTRO	50V RSS 10MF (5X11) TP	
C833	CMXM2A473J	C MYLAR	100V 0.047MF J (TP)	
C834	CEXF1H109V	C ELECTRO	50V RSS 1MF (5X11) TP	
C835	CCXB2H471K	C CERA	500V B 470PF K (TAPPING)	
C901	CMXL2E104K	C MYLAR	250V MEU 0.1MF K	
C902	CCXB1H561K	C CERA	50V B 560PF K (TAPPING)	
CA04	CEXD1H229F	C ELECTRO	50V RND 2.2MF (5X11) TP	
CA10	CCXF1H103Z	C CERA	50V F 0.01MF Z (TAPPING)	
G901	4SG0DX0001	SPARK GAP	SSG-102-A1(1.0KV) TAP	
G902	4SG0DX0001	SPARK GAP	SSG-102-A1(1.0KV) TAP	
G903	4SG0DX0001	SPARK GAP	SSG-102-A1(1.0KV) TAP	
G904	4SG0DX0001	SPARK GAP	SSG-102-A1(1.0KV) TAP	
I803	1KA431L -	IC	KA431L	
L802	58CX430599	COIL CHOKE	AZ-9004Y 940K TP	
Q101	TKTC3198Y-	TR	KTC3198Y	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
Q402	TKTC3207	TR	KTC3207 (TP)	
Q403	TKTC3198Y-	TR	KTC3198Y	
Q501	TKTA1266Y-	TR	KTA1266Y (TP)	
Q502	TKTC3198Y-	TR	KTC3198Y	
Q503	TKTC3198Y-	TR	KTC3198Y	
Q520	TKTC3198Y-	TR	KTC3198Y	
Q531	TKTA1266Y-	TR	KTA1266Y (TP)	
Q805	TKTC3205Y-	TR	KTC3205Y (TP)	
Q807	TKTA1281Y-	TR	KTA1281Y	
Q808	TKTC3198Y-	TR	KTC3198Y	
Q809	TKTC3198Y-	TR	KTC3198Y	
Q810	TKTC3198Y-	TR	KTC3198Y	
Q811	TKTA1266Y-	TR	KTA1266Y (TP)	
Q812	TKTC3198Y-	TR	KTC3198Y	
Q851	TKTC3198Y-	TR	KTC3198Y	
Q852	TKTC3198Y-	TR	KTC3198Y	
R907	RN01B102JS	R METAL FILM	1W 1K OHM J SMALL	
SW701	5S50101090	SW TACT	THVH472GCA	
SW702	5S50101090	SW TACT	THVH472GCA	
SW703	5S50101090	SW TACT	THVH472GCA	
SW704	5S50101090	SW TACT	THVH472GCA	
SW705	5S50101090	SW TACT	THVH472GCA	
SW706	5S50101090	SW TACT	THVH472GCA	
X502	5XEX12R00E	CRYSTAL QUARTZ	HC-49/U 12.000MHZ 30PPM TP	
Z501	5PXXT5R5MB	FILTER CERA	XT 5.5MB-TP	
Z502	5PXXT6R5MB	FILTER CERA	XT 6.5MB-TP	
Z503	5PXXT6R0MB	FILTER CERA	XT 6.0MB-TP	
ZZ200	PTMPJAD753	PCB MAIN AXIAL AS	DTB-21D4T	
10	2TM14006LB	TAPE MASKING	3M #232 6.0X2000M	
20	2TM10006LB	TAPE MASKING	3M #232-MAP-C 6.2X2000M	
A001	4859807793	PCB MAIN	246X330	
C353	CZCH1H100J	C CERA	50V CH 10PF J	
C403	CBZF1H104Z	C CERA SEMI	50V F 0.1MF Z	
C501	CCZF1H103Z	C CERA	50V F 0.01MF Z	
C515	CBZR1C222M	C CERA	16V Y5R 2200PF M (AXIAL)	
C516	CBZR1C472M	C CERA	16V Y5R 4700PF M (AXIAL)	
C518	CBZF1H104Z	C CERA SEMI	50V F 0.1MF Z	
C520	CCZB1H221K	C CERA	50V B 220PF K (AXIAL)	
C521	CCZB1H221K	C CERA	50V B 220PF K (AXIAL)	
C527	CCZF1H473Z	C CERA	50V F 0.047MF Z	
C531	CCZF1H473Z	C CERA	50V F 0.047MF Z	
C533	CCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
C534	CCZF1H223Z	C CERA	50V F 0.022MF Z	
C535	CCZF1H223Z	C CERA	50V F 0.022MF Z	
C536	CCZF1H223Z	C CERA	50V F 0.022MF Z	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
C571	CCZB1H821K	C CERA	50V B 820PF K AXIAL	
C585	CBZR1C222M	C CERA	16V Y5R 2200PF M (AXIAL)	
C590	CZCH1H270J	C CERA	CH 50V 27PF J AXL 52MM	
C591	CZCH1H270J	C CERA	CH 50V 27PF J AXL 52MM	
C606	CBZF1H104Z	C CERA SEMI	50V F 0.1MF Z	
CA01	CCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
CA02	CCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
CA03	CCZB1H101K	C CERA	50V B 100PF K (AXIAL)	
CA05	CCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
CA06	CCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
CA07	CCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
CA08	CCZB1H102K	C CERA	50V B 1000PF K (AXIAL)	
D101	D1N4148 -	DIODE	1N4148 (TAPPING)	
D120	DUZ33B	DIODE ZENER	UZ-33B	
D313	D1N4004S	DIODE	1N4004S	
D405	D1N4937G	DIODE	1N4937G (TAPPING)	
D407	D1N4937G	DIODE	1N4937G (TAPPING)	
D408	D1N4937G	DIODE	1N4937G (TAPPING)	
D450	D1N4937G	DIODE	1N4937G (TAPPING)	
D520	D1N4148 -	DIODE	1N4148 (TAPPING)	
D521	D1N4148 -	DIODE	1N4148 (TAPPING)	
D531	D1N4148 -	DIODE	1N4148 (TAPPING)	
D532	D1N4148 -	DIODE	1N4148 (TAPPING)	
D533	D1N4148 -	DIODE	1N4148 (TAPPING)	
D534	D1N4148 -	DIODE	1N4148 (TAPPING)	
D701	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
D702	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
D710	DUZ5R1B -	DIODE ZENER	UZ-5.1B	
D711	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
D801	DLT2A05G	DIODE	LT2A05G (TP)	
D802	DLT2A05G	DIODE	LT2A05G (TP)	
D803	DLT2A05G	DIODE	LT2A05G (TP)	
D804	DLT2A05G	DIODE	LT2A05G (TP)	
D805	D1N4937G	DIODE	1N4937G (TAPPING)	
D806	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
D808	D1N4937G	DIODE	1N4937G (TAPPING)	
D809	DRGP15J -	DIODE	RGP15J	
D810	D1N4937G	DIODE	1N4937G (TAPPING)	
D812	DUZ8R2BM	DIODE ZENER	UZ-8.2BM	
D813	D1N4148 -	DIODE	1N4148 (TAPPING)	
D814	D1N4937G	DIODE	1N4937G (TAPPING)	
D815	D1N4937G	DIODE	1N4937G (TAPPING)	
D817	DUZ6R2BM	DIODE ZENER	UZ-6.2BM	
D820	DUZ2R7B -	DIODE ZENER	UZ-2.7B	
DA02	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
DA03	DUZ5R1B -	DIODE ZENER	UZ-5.1B	
DA04	CCZB1H271K	C CERA	50V B 270PF K	
DA05	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA06	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA08	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA09	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA10	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA11	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
DA13	CCZB1H271K	C CERA	50V B 270PF K	
DA27	DUZ5R6BM	DIODE ZENER	UZ-5.6BM	
J001	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J002	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J003	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J004	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J005	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J006	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J008	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J010	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J012	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J013	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J014	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J016	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J017	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J018	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J019	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J020	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J021	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J022	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J023	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J024	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J026	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J027	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J028	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J029	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J030	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J034	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J035	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J036	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J037	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J038	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J040	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J041	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J042	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J043	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J044	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
J045	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J050	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J052	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J053	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J054	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J055	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J056	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J057	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J059	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J060	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J061	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J062	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J065	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J067	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J068	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J069	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J070	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J071	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J072	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J073	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J074	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J075	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J076	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J077	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J078	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J079	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J080	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J081	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J082	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J083	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J084	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J085	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J086	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J087	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J088	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J089	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J090	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J092	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J094	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J095	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J096	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J097	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J098	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J099	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J100	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
J101	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J102	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J103	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J104	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J105	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J106	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J107	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J108	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J109	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J110	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J111	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J116	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J117	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
J118	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
L101	5CPZ569K02	COIL PEAKING	5.6UH K (AXIAL 3.5MM)	
L303	5MC0000100	COIL BEAD	HC-3550	
L500	5CPZ829K02	COIL PEAKING	8.2UH K (AXIAL 3.5MM)	
L501	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
L502	5CPZ100K02	COIL PEAKING	10UH K (AXIAL 3.5MM)	
L510	5CPZ100K02	COIL PEAKING	10UH K (AXIAL 3.5MM)	
L511	5CPZ100K02	COIL PEAKING	10UH K (AXIAL 3.5MM)	
L601	5MC0000100	COIL BEAD	HC-3550	
L602	5CPZ109M04	COIL PEAKING	1UH 10.5MM M (LAL04TB)	
L603	5CPZ109M04	COIL PEAKING	1UH 10.5MM M (LAL04TB)	
L604	5CPZ109M04	COIL PEAKING	1UH 10.5MM M (LAL04TB)	
L605	5CPZ109M04	COIL PEAKING	1UH 10.5MM M (LAL04TB)	
L801	5MC0000100	COIL BEAD	HC-3550	
L901	5MC0000100	COIL BEAD	HC-3550	
R101	RD-AZ473J-	R CARBON FILM	1/6 47K OHM J	
R102	RD-AZ472J-	R CARBON FILM	1/6 4.7K OHM J	
R103	RD-AZ123J-	R CARBON FILM	1/6 12K OHM J	
R104	RD-AZ104J-	R CARBON FILM	1/6 100K OHM J	
R105	RD-AZ392J-	R CARBON FILM	1/6 3.9K OHM J	
R106	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R107	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R121	RD-2Z332J-	R CARBON FILM	1/2 3.3K OHM J	
R302	RD-2Z129J-	R CARBON FILM	1/2 1.2 OHM J	
R303	RD-AZ152J-	R CARBON FILM	1/6 1.5K OHM J	
R305	RD-2Z331J-	R CARBON FILM	1/2 330 OHM J	
R310	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R311	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R351	RN-4Z1501F	R METAL FILM	1/4 1.50K OHM F	
R352	RD-AZ471J-	R CARBON FILM	1/6 470 OHM J	
R401	RD-4Z472J-	R CARBON FILM	1/4 4.7K OHM J	
R404	RD-2Z751J-	R CARBON FILM	1/2 750 OHM J	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
R405	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R420	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R430	RD-4Z223J-	R CARBON FILM	1/4 22K OHM J	
R431	RD-4Z303J-	R CARBON FILM	1/4 30K OHM J	
R450	RD-2Z103J-	R CARBON FILM	1/2 10K OHM J	
R505	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R506	RD-AZ332J-	R CARBON FILM	1/6 3.3K OHM J	
R507	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R508	RD-AZ332J-	R CARBON FILM	1/6 3.3K OHM J	
R509	RD-AZ681J-	R CARBON FILM	1/6 680 OHM J	
R512	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R513	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R514	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R515	RD-AZ153J-	R CARBON FILM	1/6 15K OHM J	
R516	RD-AZ393J-	R CARBON FILM	1/6 39K OHM J	
R517	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R518	RD-AZ273J-	R CARBON FILM	1/6 27K OHM J	
R520	RD-AZ183J-	R CARBON FILM	1/6 18K OHM J	
R521	RD-AZ391J-	R CARBON FILM	1/6 390 OHM J	
R522	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R523	RD-AZ331J-	R CARBON FILM	1/6 330 OHM J	
R524	RD-AZ561J-	R CARBON FILM	1/6 560 OHM J	
R525	RD-AZ104J-	R CARBON FILM	1/6 100K OHM J	
R526	RD-4Z479J-	R CARBON FILM	1/4 4.7 OHM J	
R527	RD-AZ431J-	R CARBON FILM	1/6 430 OHM J	
R528	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R530	RD-AZ470J-	R CARBON FILM	1/6 47 OHM J	
R531	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R533	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
R534	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R535	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R537	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R538	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R539	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R549	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R550	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R551	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
R555	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
R556	RD-AZ562J-	R CARBON FILM	1/6 5.6K OHM J	
R560	RD-4Z102J-	R CARBON FILM	1/4 1K OHM J	
R561	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R567	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
R571	RD-AZ432J-	R CARBON FILM	1/6 4.3K OHM J	
R572	RD-AZ122J-	R CARBON FILM	1/6 1.2K OHM J	
R573	RD-AZ272J-	R CARBON FILM	1/6 2.7K OHM J	

ELECTRICAL PARTS LIST

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
R575	RD-AZ511J-	R CARBON FILM	1/6 510 OHM J	
R580	RD-AZ561J-	R CARBON FILM	1/6 560 OHM J	
R585	RD-4Z224J-	R CARBON FILM	1/4 220K OHM J	
R586	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R587	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R595	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
R596	RD-AZ122J-	R CARBON FILM	1/6 1.2K OHM J	
R597	RD-AZ153J-	R CARBON FILM	1/6 15K OHM J	
R598	RD-AZ153J-	R CARBON FILM	1/6 15K OHM J	
R601	RD-AZ822J-	R CARBON FILM	1/6 8.2K OHM J	
R602	RD-AZ152J-	R CARBON FILM	1/6 1.5K OHM J	
R603	RD-4Z100J-	R CARBON FILM	1/4 10 OHM J	
R607	RD-AZ470J-	R CARBON FILM	1/6 47 OHM J	
R610	RD-AZ162J-	R CARBON FILM	1/6 1.6K OHM J	
R710	RD-AZ431J-	R CARBON FILM	1/6 430 OHM J	
R711	RD-AZ431J-	R CARBON FILM	1/6 430 OHM J	
R712	5MC0000100	COIL BEAD	HC-3550	
R713	RD-AZ100J-	R CARBON FILM	1/6 10 OHM J	
R720	RD-AZ122J-	R CARBON FILM	1/6 1.2K OHM J	
R721	RD-AZ181J-	R CARBON FILM	1/6 180 OHM J	
R722	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R723	RD-AZ331J-	R CARBON FILM	1/6 330 OHM J	
R724	RD-AZ471J-	R CARBON FILM	1/6 470 OHM J	
R725	RD-AZ222J-	R CARBON FILM	1/6 2.2K OHM J	
R803	RD-4Z104J-	R CARBON FILM	1/4 100K OHM J	
R805	RD-4Z225J-	R CARBON FILM	1/4 2.2M OHM J	
R806	RD-4Z152J-	R CARBON FILM	1/4 1.5K OHM J	
R807	RD-4Z221J-	R CARBON FILM	1/4 220 OHM J	
R808	RD-4Z102J-	R CARBON FILM	1/4 1K OHM J	
R809	RD-AZ473J-	R CARBON FILM	1/6 47K OHM J	
R810	RD-4Z479J-	R CARBON FILM	1/4 4.7 OHM J	
R811	RD-AZ152J-	R CARBON FILM	1/6 1.5K OHM J	
R813	RC-2Z565KP	R CARBON COMP	1/2 5.6M OHM K	
R814	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	
R815	RD-AZ682J-	R CARBON FILM	1/6 6.8K OHM J	
R816	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
R817	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
R818	RD-AZ473J-	R CARBON FILM	1/6 47K OHM J	
R823	RD-AZ561J-	R CARBON FILM	1/6 560 OHM J	
R825	RD-AZ222J-	R CARBON FILM	1/6 2.2K OHM J	
R826	RD-AZ751J-	R CARBON FILM	1/6 750 OHM J	
R827	RD-AZ473J-	R CARBON FILM	1/6 47K OHM J	
R828	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
R829	RD-AZ471J-	R CARBON FILM	1/6 470 OHM J	
R830	RD-AZ221J-	R CARBON FILM	1/6 220 OHM J	

LOC	PART CODE	PART NAME	DESCRIPTION	REMARK
R832	RD-AZ561J-	R CARBON FILM	1/6 560 OHM J	
R833	85801065GY	WIRE COPPER	AWG22 1/0.65 TIN COATING	
R834	RD-AZ561J-	R CARBON FILM	1/6 560 OHM J	
R840	RN-4Z6801F	R METAL FILM	1/4 6.8K OHM F	
R841	RN-4Z1003F	R METAL FILM	1/4 100K OHM F	
R842	RN-4Z2201F	R METAL FILM	1/4 2.20K OHM F	
R843	RD-AZ333J-	R CARBON FILM	1/6 33K OHM J	
R901	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R902	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R903	RD-AZ102J-	R CARBON FILM	1/6 1K OHM J	
R904	RD-2Z152J-	R CARBON FILM	1/2 1.5K OHM J	
R905	RD-2Z152J-	R CARBON FILM	1/2 1.5K OHM J	
R906	RD-2Z152J-	R CARBON FILM	1/2 1.5K OHM J	
R954	RD-AZ103J-	R CARBON FILM	1/6 10K OHM J	
RA01	RD-AZ680J-	R CARBON FILM	1/6 68 OHM J	
RA02	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA03	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA04	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA06	RD-AZ750J-	R CARBON FILM	1/6 75 OHM J	
RA07	RD-AZ390J-	R CARBON FILM	1/6 39 OHM J	
RA08	RD-AZ750J-	R CARBON FILM	1/6 75 OHM J	
RA09	RD-AZ750J-	R CARBON FILM	1/6 75 OHM J	
RA10	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA11	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA12	RD-AZ101J-	R CARBON FILM	1/6 100 OHM J	
RA16	RD-AZ680J-	R CARBON FILM	1/6 68 OHM J	
RA19	RD-AZ750J-	R CARBON FILM	1/6 75 OHM J	
RA20	RD-AZ473J-	R CARBON FILM	1/6 47K OHM J	
RA30	RD-AZ512J-	R CARBON FILM	1/6 5.1K OHM J	
RA44	RD-AZ682J-	R CARBON FILM	1/6 6.8K OHM J	

APPENDIX

FUNCTIONAL DESCRIPTION

For CP-185L/G

FUNCTIONAL DESCRIPTION OF VIDEO PROCESSOR Vision IF amplifier

The vision IF amplifier can demodulate signals with positive and negative modulation. The PLL demodulator is completely alignment-free.

The VCO of the PLL circuit is internal and the frequency is fixed to the required value by using the clock frequency of the -Controller/Teletext decoder as a reference. The setting of the various frequencies is made by the controlling software in subaddress 27H (33.9 MHz for system L-and 38.9 MHz for all other systems) Because of the internal VCO, the IF circuit has a high immunity to EMC interference.

1. IF demodulator and audio amplifier

The FM demodulator is realised as a narrow band PLL with external loop filter, which provides the necessary selectivity without using an extra band pass filter. To obtain good selectivity a linear phase detector and a constant input signal amplitude are required. For this reason the intercarrier signal is internally supplied to the demodulator via a gain controlled amplifier and AGC circuit. The nominal frequency of the demodulator is set via a gain controlled amplifier and AGC circuit. The nominal frequency of the demodulator is tuned to the required frequency (5.5 / 6.0 / 6.5 MHz) by means of a calibration circuit which uses the clock frequency of the microcontroller as a reference. Selection of the required frequency is done by the controlling software.

Video switches

The video switch has one input for an external CVBS or Y/C signal. The selected CVBS signal can be supplied to pin 38, the IF video output. The selection between both signals is realised by the controlling software in subaddress 22H.

The video ident circuit is connected to the selected signal. This ident circuit is independent of the synchronisation.

Synchronisation circuit

The IC contains separator circuits for the horizontal and vertical sync pulses and a data-slicing circuit which extracts the digital teletext data from the analogue signal.

The horizontal drive signal is obtained from an internal VCO which is running at a frequency of 25 MHz. This oscillator is stabilised to this frequency by using a 12 MHz signal coming from the reference oscillator of the -Controller/Teletext decoder.

The horizontal drive is switched on and off via the soft start/stop procedure. This function is realised by means of variation of the TON of the horizontal drive pulses.

The vertical synchronisation is realised by means of a divider circuit. The vertical ramp generator needs an external resistor and capacitor. For the vertical drive a differential output current is available. The outputs are DC coupled to the vertical output stage.

The following geometry parameters can be adjusted:

- ¥ Horizontal shift
- ¥ Vertical amplitude
- ¥ Vertical slope
- ¥ S-correction
- ¥ Vertical shift

Chroma and luminance processing

The chroma band-pass and trap circuits (including the SECAM cloche filter) are realised by means of gyrators and are tuned to the right frequency by comparing the tuning frequency with the reference frequency of the colour decoder. The luminance delay line and the delay cells for the peaking circuit are also realised with gyrators. The circuit contains a black stretcher function which corrects the black level for incoming signals which have a difference between the black level and the blanking level.

Colour decoder

The ICs can decode PAL, NTSC and SECAM signals. The PAL/NTSC decoder does not need external reference crystals but has an internal clock generator which is stabilised to the required frequency by using the 12 MHz clock signal from the reference oscillator of the -Controller/Teletext decoder.

The Automatic Colour Limiting (ACL) circuit (switchable via the ACL bit in subaddress 20H) prevents oversaturation occurring when signals with a high chroma-to-burst ratio are received. The ACL circuit is designed such that it only reduces the chroma signal and not the burst signal. This has the advantage that the colour sensitivity is not affected by this function.

SOFTWARE CONTROL

The CPU communicates with the peripheral functions using Special function Registers (SFRs) which are addressed as RAM locations. The registers for the Teletext decoder appear as normal SFRs in the -Controller memory map and are written to these functions by using a serial bus. This bus is controlled by dedicated hardware which uses a simple handshake system for software synchronisation.

For compatibility reasons and possible re-use of software blocks, the TV processor is controlled by I2C bus. The TV processor control registers cannot be read. Only the status registers can be read (Read address 8A).

The SECAM decoder contains an auto-calibrating PLL demodulator which has two references, via the divided 12 MHz reference frequency (obtained from the -Controller) which is used to tune the PLL to the desired free-running frequency and the bandgap reference to obtain the correct absolute value of the output signal. The VCO of the PLL is calibrated during each vertical blanking period, when the IC is in search or SECAM mode.

The base-band delay line (TDA 4665 function) is integrated. This delay line is also active during NTSC reception, to obtain a good suppression of cross colour effects. The demodulated colour difference signals are internally supplied to the delay line.

RGB output circuit and black-current stabilization

In the RGB control circuit the signal is controlled on contrast, brightness and saturation. The ICs have a linear input for external RGB signals. The signals for OSD and text are internally supplied to the control circuit. The output signal has an amplitude of about 2 Volts black-to-white at nominal input signals and nominal settings of the various controls.

To obtain an accurate biasing of the picture tube the 'Continuous Cathode Calibration' system has been included in these ICs. A black level off set can be made with respect to the level which is generated by the black current stabilisation system. In this way different colour temperatures can be obtained for the bright and the dark part of the picture.

The black current stabilisation system checks the output level of the 3 channels and indicates whether the black level of the highest output is in a certain window or below or above this window. This indication is read from the status byte 01 and is used for automatic adjustment of the Vg2d voltage during the production of the TV receiver.

During switch-off of the TV receiver a fixed beam current is generated by the black current control circuit. This current ensures that the picture tube capacitance is discharged. During the switch-off period the vertical deflection is placed in an overscan position so that the discharge is not visible on the screen.

2. IF

The TDA9361/TDA9381 has an alignment free IF PLL demodulator. The fully integrated oscillator is automatically calibrated, using the 12 MHz crystal as a frequency reference. The IF frequency is simply set in TV-Processor by I2C bus. The AFC information is available via I2C bus from the TV-Processor status bytes. The controlling software uses this information for tuner frequency tracking (automatic following). The AFC window is typically 125Khz wide. The minimum frequency step of the tuner is 62.5 kHz.

This AFC function is disabled when a program is tuned using the direct frequency entry or after fine tuning adjustment. Therefore it is recommended to tune a channel with the TV search function (manual or ATSS) or by using the direct channel entry to enable the Automatic Frequency Control.

For SECAM L and L' the TDA9361/TDA9381 is switched to positive modulation via I2C bus. SECAM L' transmission only occur in VHF band I and have their picture and sound carrier interchanged, compared to SECAM L and PAL B/G channels. For SECAM L the picture carrier is situated at 33.9 MHz and the AM sound carrier at 40.40 MHz. The IF PLL reference is tuned from 38.9 to 33.9 MHz, this is done via I2C Bus and the SIF filter is switched from channel 2 to channel 1; this is done by pin 4 of TDA 9361.

The tuner AGC time constant is slower for positive than for negative modulation, because the TDA9361 reduces its AGC current. To make the AGC time constant even slower an extra series resistor R103 is added. To prevent IF overload when jumping from a very strong transmitter to a weak transmitter a diode D101 has been added

The SAW filter (SF1) has a double Nyquist slope at 38.9 MHz and 33.9 MHz needed for this multistandard application. The disadvantage of this choice is that a 5.5 MHz trap filter (Z501) is needed to suppress the residual sound carrier in the video for B/G signals.

3. Source switching

Video :

The TDA9361/TDA9381 has only one external video input. The SCART video in pin (#20) is connected to the front RCA video input.

The controlling software via I2C bus selects the signal source :

- Video signal from tuner (Pin 40).
- External video.
- External SVHS from SCART.

The sound source switching is done in the video processor part and in the AM demodulator by the -Controller via I2C bus.

The video processor pin 28 has multiple functions and provides in this application bus.

- Deemphasis time constant
- Audio monitor output
- External AM input
- Deemphasis time constant : The time constant is given by the capacitor C504, needed to obtain the 54 s time time constant for standard PAL signal.
- Audio monitor output : the nominal output signal is 500 mVrms, for all standards. The signal is also internally connected through to the audio switch. This signal is not controlled by the volume setting and can be used for SCART audio output.

The signal is buffered to avoid influencing the deemphasis time constant and to adjust the output level.

- External AM input : By software the deemphasis pin can be converted into an input pin. External AM signal for SECAM L/L' is directly connected to this pin. In this configuration the FM sound is internally muted, DC level remains at 3Vdc.

An external sound signal of 500mVrms is applied to pin 35 via a coupling capacitor. The input impedance of this pin is 25k Ω typical. Switching between internal FM, external AM or external audio from SCART is controlled internally by software.

Fast R, G, B insertion : The external R, G, B insertion needs a fast switching and cannot be controlled by the software (instruction cycle of 1 sec). The fast switching pin 16 of SCART is directly connected to the TV processor pin 45 (Fast blanking input). The display is synchronised with the selected video source, i.e. to get stable R, G, B signal insertion they must be synchronised with the selected video source.

4. μ -Controller I/O pin configuration and function

The I/O pins of the μ -Controller can be configured in many ways. All port functions can be individually programmed by the controlling software.

Each I/O port pin can be individually programmed in these configurations :

Open drain

In this mode, the port can function as input and output. It requires an external pull-up resistor. The maximum allowable supply voltage for this pull up resistor is +5V.

So in this mode it is possible to interface a 5 Volt environment like I2C while the μ -Controller has a 3.3 Volt supply.

Push-Pull

The push pull mode can be used for output only. Both sinking and sourcing is active, which leads to steep slopes. The levels are 0 and Vddp, the supply voltage 3.3Volts.

High impedance

This mode can be used for input only operation of the port.

Special port for LED

Pin 10 and 11 have the same functionality as the general I/O pins but in addition, their current source and sink capacity is 8 mA instead of 4 mA. These pins are used for driving LED's via a series current limiting resistor.

μ -Controller I/O pin configuration and function table

pin	name	configuration		description
		Stand by	TV on	
1	n.u.	High impedance	High impedance	not used
2	SCL	Open Drain	Open Drain	Serial clock line
3	SDA	Open Drain	Open Drain	Serial data line
4	SECAM L'	High impedance	Push Pull / High impedance	SIF filter switching + AM/FM switching
5	OCP	High impedance	High impedance	Over Current Protection (Switch the set OFF if the voltage on this pin is <2.3V)
6	RF AGC in	High impedance	High impedance	Used during ATSS to measure 7RF signal level.
7	Key in	High impedance	High impedance	Local keyboard input
8	S/SW	High impedance	High impedance	external video switch
10	Red LED	High impedance	Open Drain	
11	Green LED	Open Drain	High impedance	
62	Audio mute	Push Pull	High impedance	

5. SECAM L/L' sound switching circuit.

The microcontroller pin 4 is a three levels output. The voltage and configuration of this port is described below :

Sound mode	Port configuration	Voltage
FM	Push Pull	Internally shorted to ground
AM L	Push Pull	Pull up to 3.3V
AM L'	High Impedance	Fixed by R511, R156, R157

In FM mode the microcontroller is internally grounded to pin 4. The TDA9830 output is muted

6. Sound amplification

The device TDA7267A is a mono audio amplifier in powerDIP package specially designed for TV application. Thanks to the fully complementary output configuration the device delivers a rail to rail voltage swing without need of bootstrap capacitors. No external heat sink is needed as the Cu ground plane of the PCB is used as heat dissipation.

7. Vertical deflection

The vertical driver circuit is a bridge configuration. The deflection coil is connected between the output amplifiers, which are driven in phase opposition. The differential input circuit is voltage driven. The input circuit is especially intended for direct connection to driver circuits which deliver symmetrical current signals, but is also suitable for asymmetrical currents. The output current of these devices is converted to voltages at the input pins via resistors R350 and R351. The differential input voltage is compared with the output current through the deflection coils measured as voltage across R302, which provides internal feed-back information. The voltage across R302 is proportional to the output current.

Flyback voltage

The flyback voltage is determined by an additional supply voltage V_{fb} . The principle of operation with two supply voltages (class G) makes it possible to fix the supply voltage V_p optimum for the scan voltage and the second supply voltage V_{fb} optimum for the flyback voltage. Using this method, very high efficiency is achieved. The supply voltage V_{fb} is almost totally available as fly-back voltage across the coil, this being possible due to the absence of a coupling capacitor.

Protection

The output circuit has protection circuits for :

- Too high die temperature
- overvoltage of output stage A

Guard circuit

The guard signal is not used by the TDA9361/ TDA9381 to blank the screen in case of a fault condition.

Damping resistor

For HF loop stability a damping resistor (R305) is connected across the deflection coil.

1. TDA9361 : TV signal processor - Teletext decoder with embedded μ -Controller. TDA9381 : TV signal processor - with embedded μ -Controller.

TV-signal Processor

- ¥ Multi-standard vision IF circuit with alignment-free PLL demodulator
- ¥ Internal (switchable) time-constant for the IF-AGC circuit
- ¥ Mono intercarrier with a selective FM-PLL demodulator which can be switched to the different FM sound frequencies (5.5 / 6.0 / 6.5 MHz)
- ¥ Source selection between 'Internal' CVBS and external CVBS or Y/C signals
- ¥ Integrated chrominance trap circuit
- ¥ Integrated luminance delay line with adjustable delay time
- ¥ Asymmetrical 'delay line type' peaking in the luminance channel
- ¥ Black stretching for non-standard luminance signals
- ¥ Integrated chroma band-pass filter with switchable centre frequency
- ¥ Only one reference (12 MHz) crystal required for the μ -Controller, Teletext and the colour decoder
- ¥ PAL / NTSC or multistandard colour decoder with automatic search system
- ¥ Internal base-band delay line
- ¥ RGB control circuit with 'Continuous Cathode Calibration', white point and black level off set adjustment so that the colour temperature of the dark and the bright parts of the screen can be chosen independently.
- ¥ Linear RGB or YUV input with fast blanking for external RGB/YUV sources. The Text/OSD signals are internally supplied from the μ -Controller/Teletext decode
- ¥ Contrast reduction possibility during mixed-mode of OSD and Text signals
- ¥ Horizontal synchronisation with two control loops and alignment-free horizontal oscillator
- ¥ Vertical count-down circuit
- ¥ Vertical driver optimised for DC-coupled vertical output stages
- ¥ Horizontal and vertical geometry processing

μ -Controller

- ¥ 80C51 μ -controller core standard instruction set and timing
- ¥ 1 μ s machine cycle
- ¥ 64Kx8-bit programmed ROM
- ¥ 3 - 12Kx8-bit Auxiliary RAM (shared with Display and Acquisition)
- ¥ Interrupt controller for individual enable/disable with two level priority
- ¥ Two 16-bit Timer/Counter registers
- ¥ watchdog timer
- ¥ Auxiliary RAM page pointer
- ¥ 16-bit Data pointer
- ¥ IDLE and Power Down (PD) mode
- ¥ 8-bit A/D converter
- ¥ 4 pins which can be programmed as general I/O pin or ADC input.

Data Capture

- ¥ Text memory 10 pages
- ¥ Inventory of transmitted Teletext pages stored in the Transmitted Page Table (TPT) and Subtitle Page Table (SPT)
- ¥ Data Capture for 525/625 line WST, VPS (PDC system A) and Wide Screen Signalling (WSS) bit decoding Automatic selection between 525 WST/625 WST
- ¥ Automatic selection between 625 WST/VPS on line 16 of VBI
- ¥ Real-time capture and decoding for WST Teletext in Hardware, to enable optimised -processor throughput
- ¥ Automatic detection of FASTEXT transmission
- ¥ Real-time packet 26 engine in Hardware for processing accented, G2 and G3 characters
- ¥ Signal quality detector for video and WST/VPS data types
- ¥ Comprehensive teletext language coverage
- ¥ Full Field and Vertical Blanking Interval (VBI) data capture of WST data

Display

- ¥ Teletext and Enhanced OSD modes
- ¥ Features of lever 1.5 WST.
- ¥ Serial and Parallel Display Attributes
- ¥ Single/Double/Quadruple Width and Height for characters
- ¥ Scrolling of display region
- ¥ Variable flash rate controlled by software
- ¥ Enhanced display features including overlining, underlining and italics
- ¥ Soft colours using CLUT with 4096 colour palette
- ¥ Globally selectable scan lines per row (9/10/13/16) and character matrix [12x10, 12x13, 12x16 (VxH)]
- ¥ Fringing (Shadow) selectable from N-S-E-W direction
- ¥ Fringe colour selectable
- ¥ Meshing of defined area
- ¥ Contrast reduction of defined area
- ¥ Cursor
- ¥ Special Graphics Characters with two planes, allowing four colours per character
- ¥ 32 software redefinable On-Screen display characters
- ¥ 4 WST Character sets (GO/G2) in single device (e.g. Latin, Cyrillic, Greek, Arabic)
- ¥ G1 Mosaic graphics, Limited G3 Line drawing characters
- ¥ WST Character sets and Closed Caption Character set in single device

Data Capture

The Data Capture section takes in the analogue Composite Video and Blanking Signal (CVBS), and from this extracts the required data, which is then decoded and stored in memory.

The extraction of the data is performed in the digital domain. The first stage is to convert the analogue CVBS signal into a digital form. This is done using an ADC sampling at 12MHz. The data and clock recovery is then performed by a Multi-Rate Video Input Processor (MuVIP). From the recovered data and clock the following data types are extracted WST Teletext (625/525), Closed Caption, VPS, WSS. The extracted data is stored in either memory (DRAM) via the Memory Interface or in SFR locations.

Data Capture Features

- Video Signal Quality detector
- Data Capture for 625 line WST
- Data Capture for 525 line WST
- Data Capture for US Closed Caption
- Data Capture for VPS data (PDC system A)
- Data Capture for Wide Screen Signalling (WSS) bit decoding
- Automatic selection between 525 WST/625WST
- Automatic selection between 625WST/VPS on line 16 of VBI
- Real-time capture and decoding for WST Teletext in Hardware, to enable optimised microprocessor throughput
- 10 pages stored On-Chip
- Inventory of transmitted Teletext pages stored in the Transmitted Page Table (TPT) and Subtitle Page Table (SPT)
- Automatic detection of FASTEXT transmission
- Real-time packet 26 engine in Hardware for processing accented, G2 and G3 characters
- Signal quality detector for WST/VPS data types
- Comprehensive Teletext language coverage
- Full Field and Vertical Blanking Interval (VBI) data capture of WST data



IC DESCRIPTION

APPENDIX

IC marking and version

Chassis	IC marking (line 3)	OSD languages	Text
CP 185	DW9361/N1/3-DE1 (note : x is the software version)	English, Russian Arabic, Melayu	English, Russian Arabic, Melayu
CP 185N/C	DW9381/N3-DE1 (note : x is the software version)	English, Russian, Arabic Melayu, Thailand, HIND	

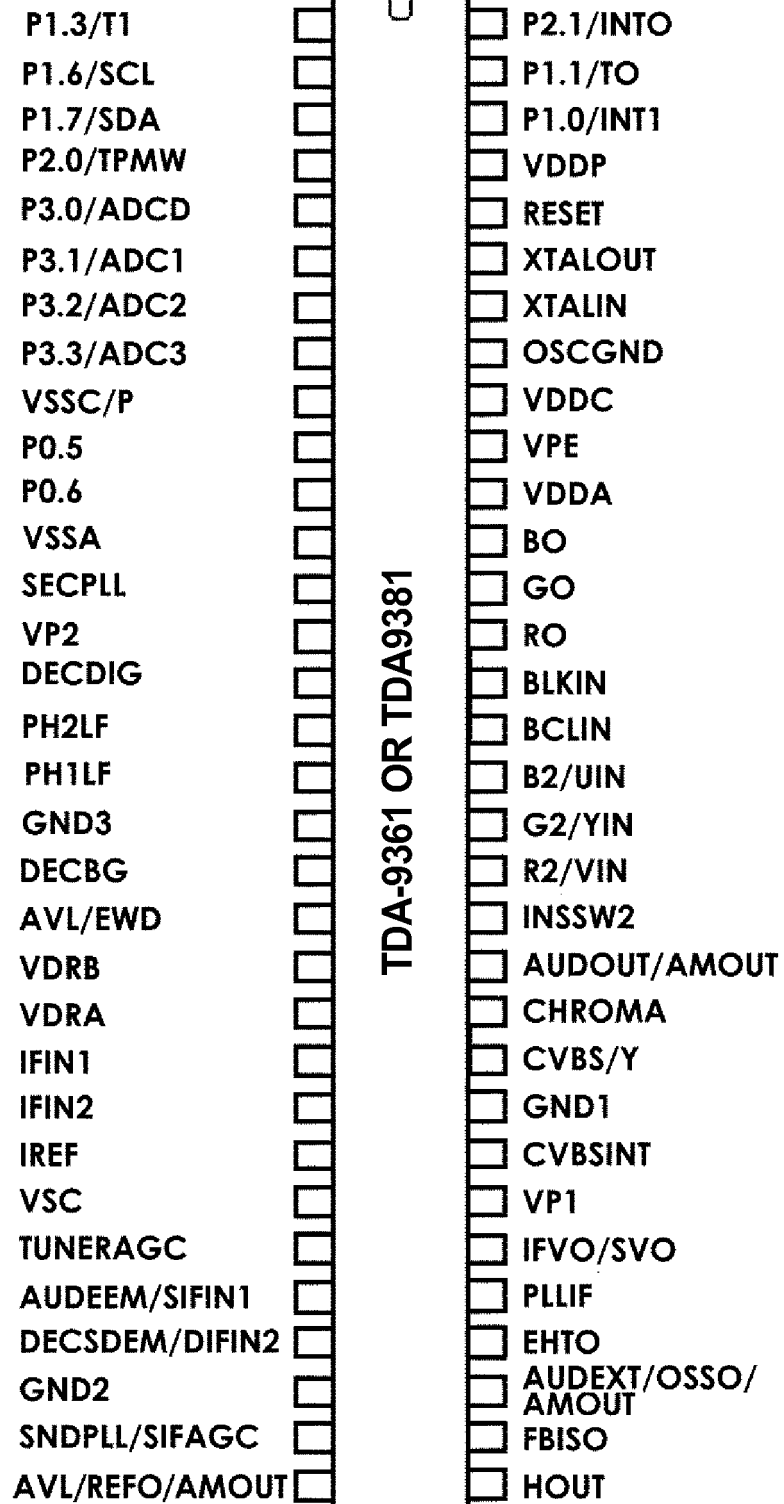
PINNING

SYMBOL	PIN	DESCRIPTION
n.u.	1	Port 1.3 Not used.
SCL	2	I2C bus clock line
SDA	3	I2C Data line
SECAM L' out	4	Port 2.0 : FM sound : PushPull Low AM SECAM L'PushPull High AM SECAM L : High Impedance
OCP	5	Port 3.0 : Over Current Protection
RF AGC in	6	ADC 1 : For program sorting in ATSS (High Impedance)
Key-in	7	ADC 2 : local key input (High impedance)
S/SW	8	ADC 3 : Scart Slow switching input
VssC/P	9	digital ground for -controller core and peripheral
LED 1	10	port 0.5 (8mA current sinking capability)
LED 2	11	port 0.6 (8mA current sinking capability)
VSSA	12	analog ground of teletext decoder and digital ground of TV processor
SEC PLL	13	SECAM PLL decoupling
VP2	14	2nd supply voltage TV-processor
DECDIG	15	decoupling digital supply of TV-processor
PH2LF	16	phase-2 filter
PH1LF	17	phase-1 filter
GND3	18	ground 3 for TV-processor
DECBG	19	bandgap decoupling
AVL	20	n.u.
VDRB	21	vertical drive B output
VDRA	22	vertical drive A output

IC DESCRIPTION

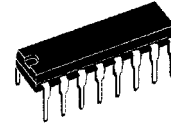
APPENDIX

SYMBOL	PIN	DESCRIPTION
IFIN1	23	IF input 1
IFIN2	24	IF input 2
IREF	25	Reference current input
VSC	26	vertical sawtooth capacitor
TUNERAGC	27	tuner AGC output
AUDEEM	28	audio deemphasis
DECSDEM	29	decoupling sound demodulator
GND2	30	ground 2 for TV processor
SNDPLL	31	narrow band PLL filter
SNDIF	32	n.u.
HOUT	33	horizontal output
FBISO	34	flyback input / sandcastle output
AUDEXT	35	external audio input
EHT0	36	EHT/Overvoltage protection
PLLIF	37	IF PLL loop filter
IFVO	38	IF video output
VP1	39	main supply voltage TV-processor
CVBSINT	40	internal CVBS input
GND1	41	ground 1 for TV-processor
CVBS/Y	42	external CVBS/Y input
CHROMA	43	chrominance input (SVHS)
AUDOUT	44	audio out
INSSW2	45	2nd RGB insertion input
R2IN	46	2nd R input
G2IN	47	2nd G input
B2IN	48	2nd B input
BCLIN	49	beam current limiter input
BLKIN	50	black current input
R0	51	RED Output
G0	52	GREEN Output
B0	53	BLUE Output
VDDA	54	analog supply of Teletext decoder and digital supply of TV-Processor (3.3V)
VPE	55	OTP programming supply
VDDC	56	digital supply to core (3.3V)
OSCGND	57	oscillator ground supply
XTALIN	58	crystal oscillator input
XTALOUT	59	crystal oscillator output
RESET	60	reset
VDDP	61	digital supply to periphery (3.3V)
Audio Mute	62	Port 1.0 : Audio mute output (PushPull)
Power	63	Port 1.1 : Power output (PushPull)
IR in	64	Interrupt input 0 : R/C Infrared input



2. TDA-7267A

- ¥ Can deliver 3w the 10% 14.5V/8%
- ¥ Internal fixed gain 32dB
- ¥ No feedback capacitor
- ¥ No boucherot cell
- ¥ Thermal protection
- ¥ Ac short circuit protection
- ¥ Svr capacitor for better ripple Rejection
- ¥ Low turn-on/off pop
- ¥ Stand-by mode



PowerDIP 8+8

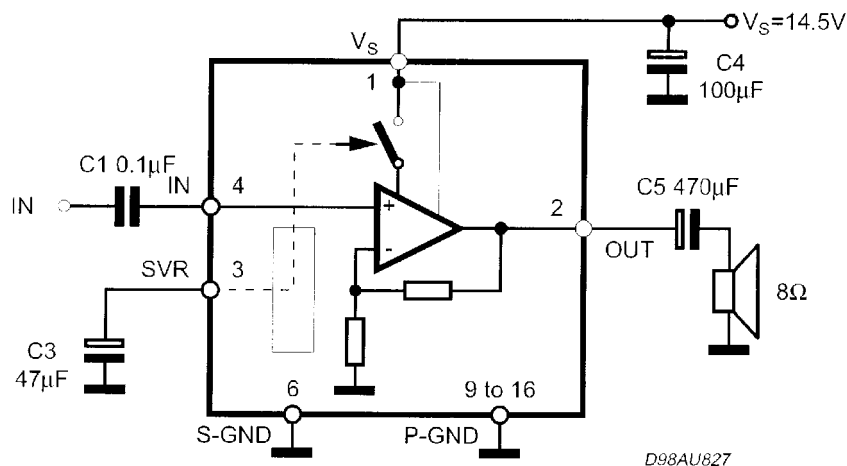
ORDERING NUMBER : TDA7267A

Decription

The device TDA7267A is a new technology Mono Audio Amplifier in Power DIP package specifically designed for TV application.

Thanks to the fully complementary output configuration the device delivers a rail to rail voltage swing without need of bootstrap capacitors.

Black Diagram



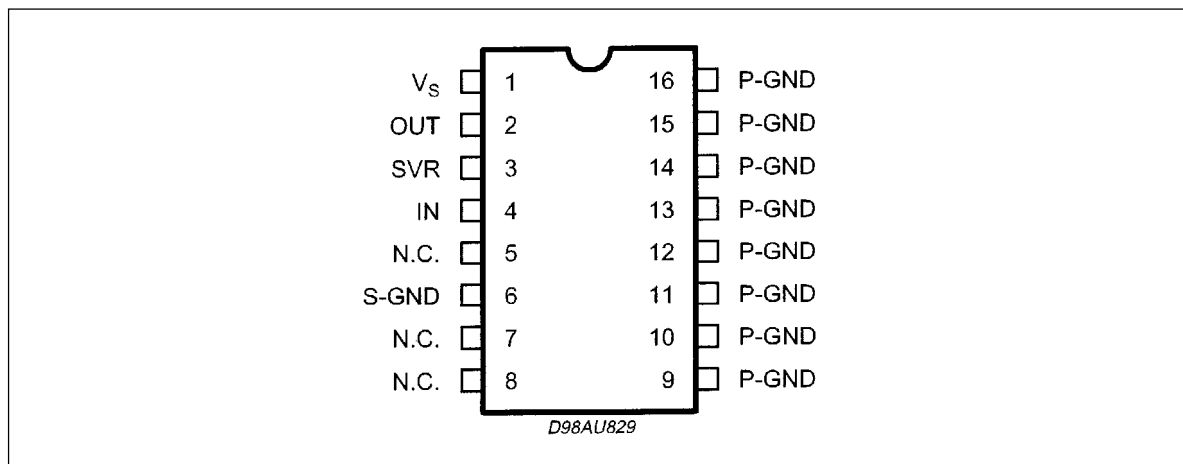
IC DESCRIPTION

APPENDIX

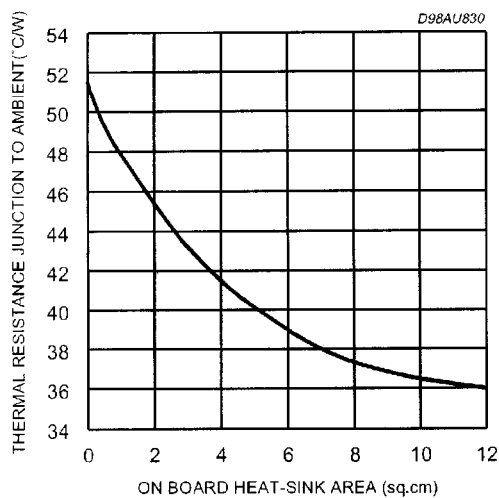
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	unit
V _s	Operating Supply Voltage	18	V
I _o	Output Put Peak Current	1.5	A
T _{op}	Operating Temperature Range	0 to 70	.C
T _i	Junction Temperature	150	.C
T _{stg}	Storage Temperature Range	-40 to 125	.C

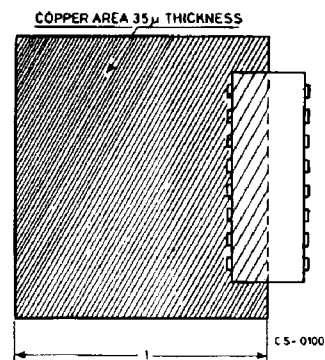
PIN CONNECTION (Top View)



R_{th} with "on Board" Square heat Sink vs. Copper Area



Example of heatsink using PC board copper



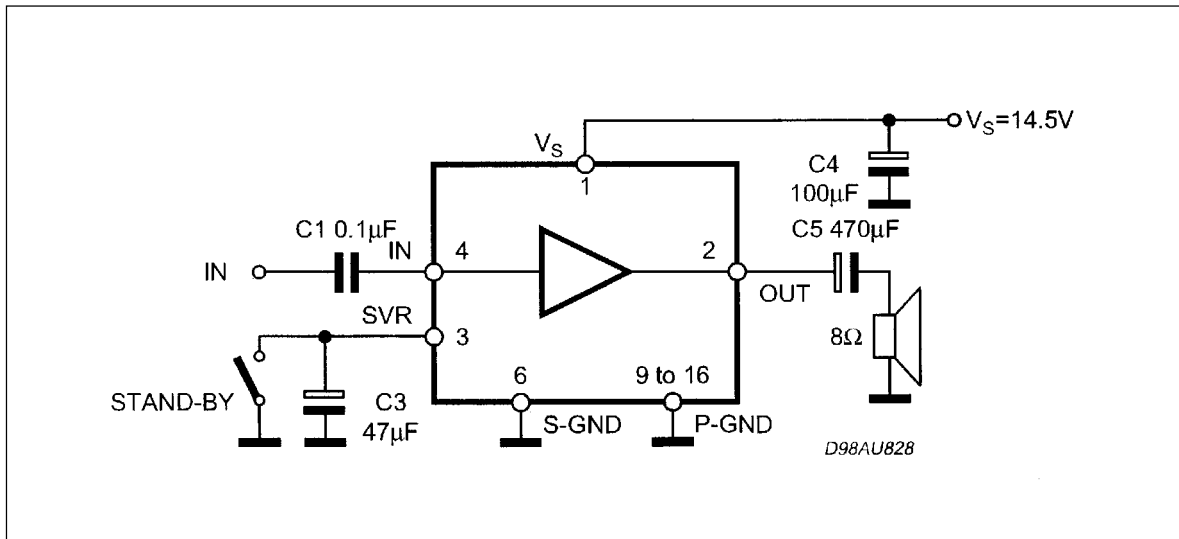
THERMAL DATA

Symbol	Parameter	Value	unit
$R_{th\ j-amb}$	Thermal Resistance junction to ambient	70	$^{\circ}C/W$
$R_{th\ j-case}$	Thermal Resistance Junction to case	15	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS (Tamb = 25...C; Vs = 14.5V; RL=8%; f=1KHz; nules otherwise specified.)

Symbol	Parameter	Value	unit
Vs	Supply Voltage Range	5	18 V
Is	Quiescent Current	23	35 mA
Isb	Stand-By Current	Pin 3 shorted to GND	0.3 mA
Vo	Quiescent Output Voltage	7.5	V
Av	voltage Gain	31	33 dB
RIN	Input Impedance	50	100 K Ω
Po	Output Power	THD = 10%	2.7 3 W
THD	Distortion	Po = 1W	0.1 0.3 %
SVR	Supply Voltage Rejection	Vripple = 150mVrms; Frippe = 1KHz	50 dB
EI	Input Noise Voltage	Rg = 10K%; BW = 20Hz to 20KHz	5 10 V
Vsb	Stand-By Enable Voltage		1 V

Figure1. Application Circuit



APPLICATION HINTS :

For 14.5V supply and 8% speaker application, its maximum power dissipation is about 1.8W.

Assumming that max ambient temperature is 70...C, the required thermal resistance of the device mounted on the PCB with a dissipating area must be equal to : $(150-70)/1.8 = 44.4...C/W$.

Junction to pin thermal resistance of the package is about 15...C/W. That means external heat sink of about 30...C/W is required.

Cu ground plane of PCB can be used as heat dissipating means.

3. LA78041

LA7841

1. Case Outline : SIP-7H Plastic Package
2. Function : Vertical Output, Vertical Drive, Pump-up and thermal protection circuits
3. Application : BUS Supported TV Display Vertical Output
4. Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Pump-up block supply voltage	+B6 max		34	V
Output block supply voltage	+B3 max		70	V
Allowable power dissipation	Pd max	With an infinite heat sink	9.0	W
Deflection output current	I2 max		-1.5 to +1.5	Ap-o
Thermal resistance	θ_{j-c}		4.0	°C/W
Operating temperature	Topr		-20 to +85	°C
Storage temperature	Tstg		-40 to +150	°C

5. Operating Conditions at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	+B6		24	V
Operating supply voltage range	+B6 op		16 to 33	V
Deflection output current	I2 p-p		to 2.2	Ap-p

6. Operating Characteristics at Ta=25°C, +B6=24V

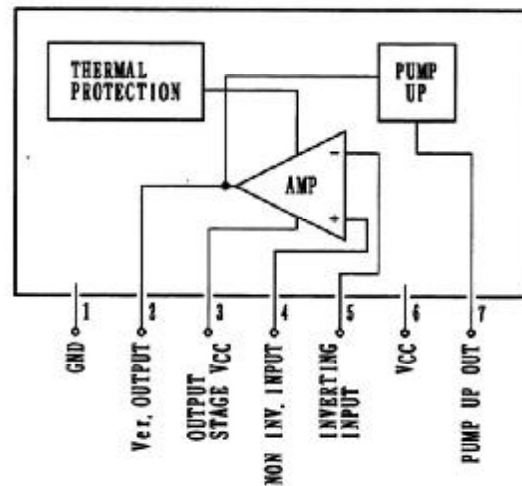
Parameter	Symbol	Conditions	min	typ	max	Unit	Test circuit
Deflection output saturation voltage (lower)	Vsat 2-1	I2=1.1A			1.5	V	1
Deflection output saturation voltage (upper)	Vsat 3-2	I2=-1.1A			3.5	V	2
Pump-up charge saturation voltage	Vsat 7-1	I7=20mA			1.8	V	3
Pump-up discharge saturation voltage	Vsat 6-7	I7=-1.1A			3.2	V	4
Idling current	IDL		35		65	mA	5
Midpoint voltage	VMID		11.0	12.0	13.0	V	5

950918KA/MH/TS
E LA0077

No. 1

Pin Connections and Functional Block Diagram

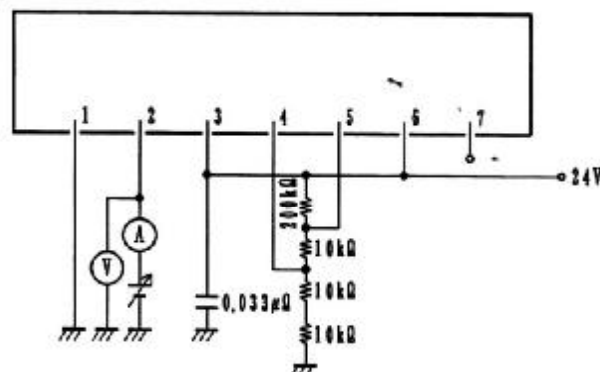
LA7841



Test Circuit

1. Output saturation voltage (lower) V_{sat} 2-1

Fig. 1



Read the reading on voltmeter (V) when ammeter (A) reads 1.1A in Fig. 1.

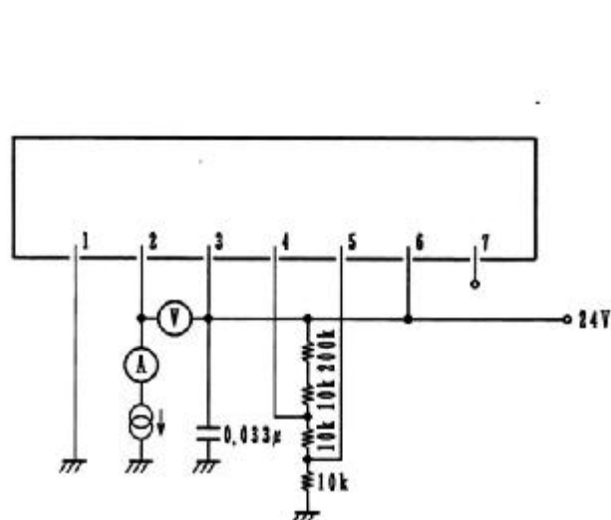
(B8-2271)

No. 2

LA7841

2. Output saturation voltage (upper) V_{sat} 3-2

Fig. 2

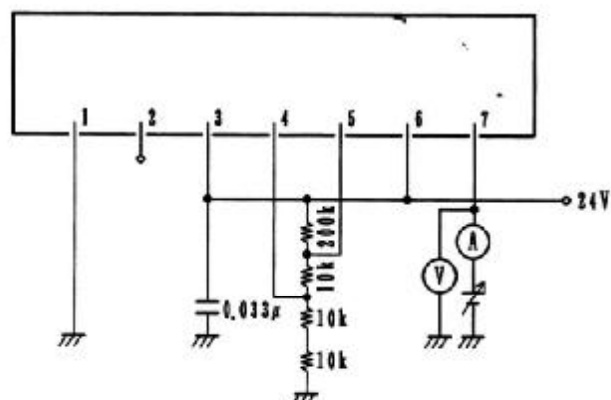


Unit
Capacitance : F
Resistance : Ω

Absorb current from pin 2 into an electronics load and read the reading on voltmeter (V) when ammeter (A) reads 1.1A in Fig. 2.

3. Pump-up charge saturation voltage V_{sat} 7-1

Fig. 3



Read the reading on voltmeter (V) when ammeter (A) reads 30mA in Fig. 3.

(B 8 - 2 2 7 1)

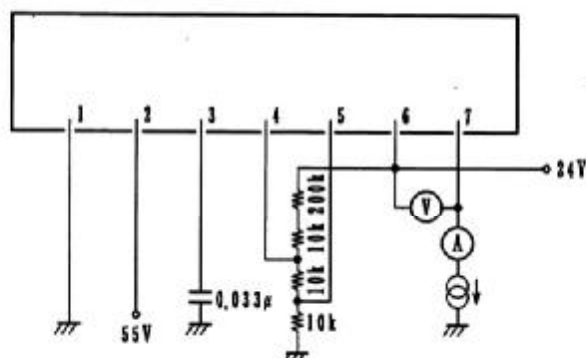
No. 3

4. Pump-up discharge saturation voltage V_{sat} 6-7

LA7841

Fig. 4

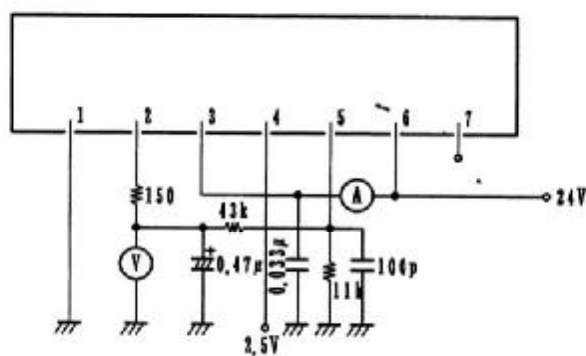
Unit
Capacitance : F
Resistance : Ω



Absorb current from pin 7 into an electronics load and read the reading on voltmeter (V) when ammeter (A) reads 1.1A in Fig. 4,

5. Idling current I_{DL}

Fig. 5



Read the reading on ammeter (A) in Fig. 5,

6. Midpoint voltage V_{MID}

Read the reading on voltmeter (V) in Fig. 5,

(B 8 - 2 2 7 1)

No. 4

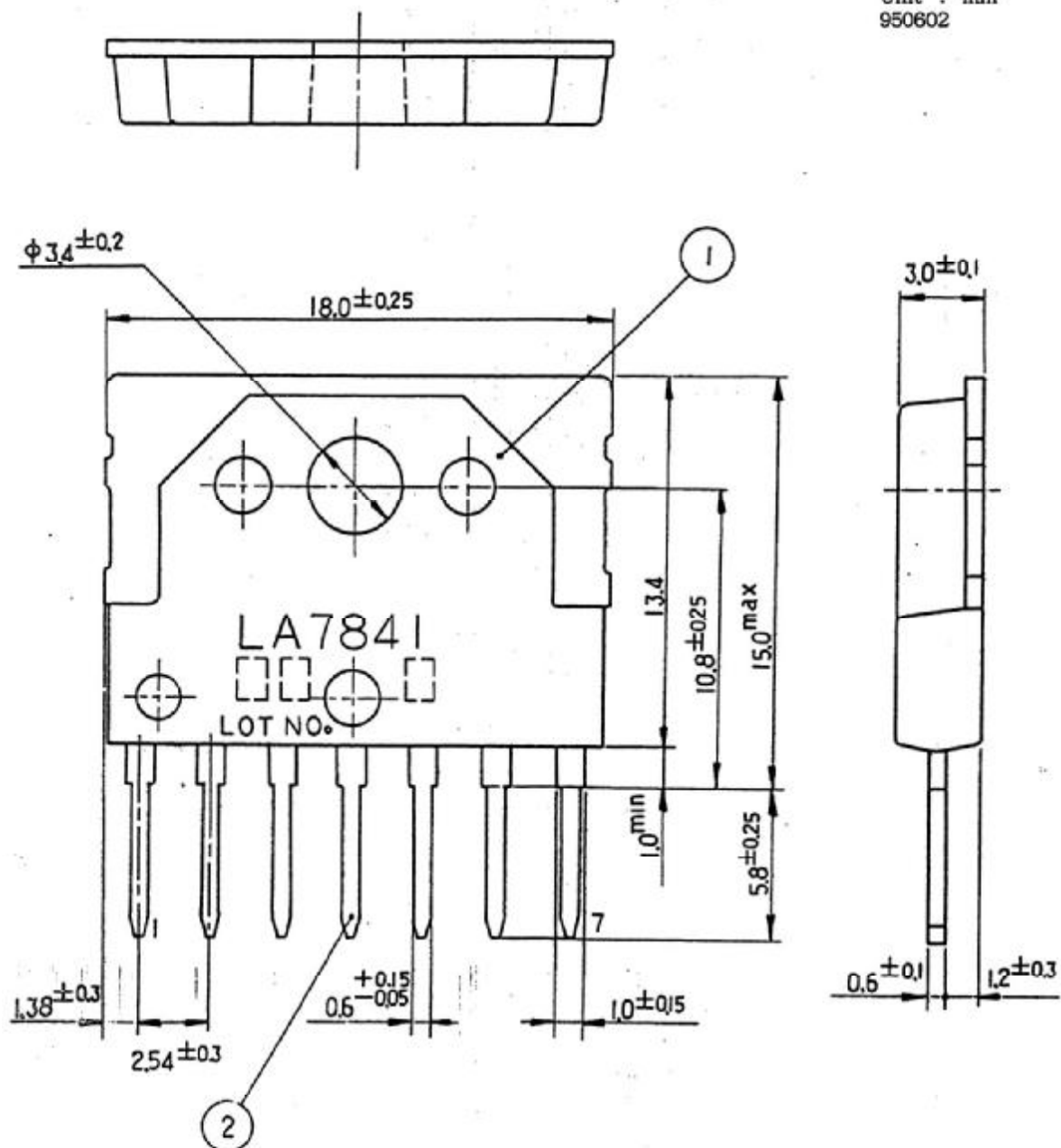
IC DESCRIPTION

APPENDIX

Case Outline Dimensions

LA7841

Scale : 5 / 1
Unit : mm
950602

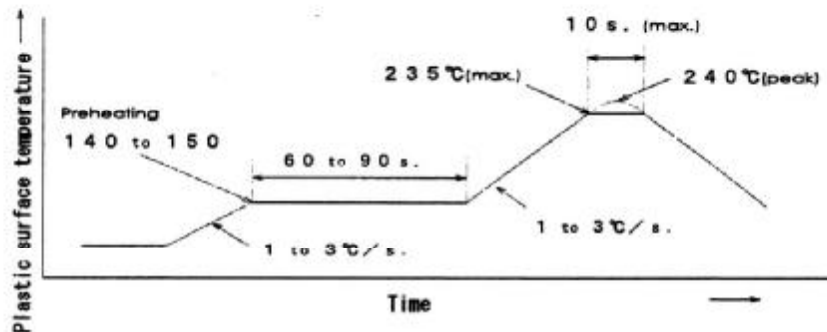


	①	②
Material	Epoxy	Copper alloy
Surface treatment	—	Tin plated (Pb mixed)

No. 5

Recommended Mounting Conditions

- I. Soldering conditions (max.) for insertion type packages
 1. Soldering iron technique
Temperature and time: 350°C, 3s.
 2. Flow soldering technique (partial heating technique)
Temperature and time: 260°C, 10s.
- II. Soldering conditions for surface mount type packages
 1. Soldering iron technique (max.)
Temperature and time: 350°C, 3s.
 2. Flow soldering technique
When using the flow soldering iron technique, contact your Sanyo sales representative beforehand.
 3. Reflow soldering technique
 - (1) Infrared reflow technique (far infrared)
 - ① Number of reflows: Once in principle
 - ② Temperature conditions



Note. When using the infrared reflow technique for soldering, if the plastic portion is allowed to stand for extended periods of time in an environment where the temperature is high, the reliability of semiconductor devices may be affected adversely. Make the soldering time as short as possible.

- III. How to handle moisture-proof packs
 1. Storage in moisture-proof packs (before unpacking) Before unpacking the moisture-proof packs, store semiconductor devices at a temperature not exceeding 30°C and a relative humidity not exceeding 70%.
 2. Storage after unpacking the moisture-proof packs
After unpacking the moisture-proof packs, store semiconductor devices at a temperature not exceeding 30°C and a relative humidity not exceeding 70% and mount them within 96 hours after unpacking unless otherwise specified.
If any semiconductor devices remain unused, store them in a dry atmosphere (example: desiccator) or be sure to dry them prior to mounting.
 3. Desiccant's humidity indicator
The desiccant in the moisture-proof packs contains a blue indicator that turns pink when the relative humidity in the packs exceeds 30% (25°C). If semiconductor devices are stored for extended periods of time or are left unused for extended periods of time after unpacking, the indicator may discolor; in such case, be sure to dry semiconductor devices prior to mounting.
 4. Drying conditions
The drying conditions for semiconductor devices are such that only semiconductor devices made to the heat-proof tray packing specification can be dried at 125°C for 24 hours. Since semiconductor devices made to other tray packing specification than above cannot be dried at 125°C, place them in heatproof containers or dry them at a low temperature (60°C, 168 hours). It should be noted that semiconductor devices made to the magazine (stick) packing specification, paper adhesive taping specification, and emboss taping specification cannot be dried.

IV. Note

1. Since each individual Type Number may require proper cares to be taken in its usages or applications, read carefully each individual data sheet, delivery specification, and other technical information.

960513KA/MH/KS/TS

(A-95H3004)

E W/I LA002 No.

4. TDA6107Q

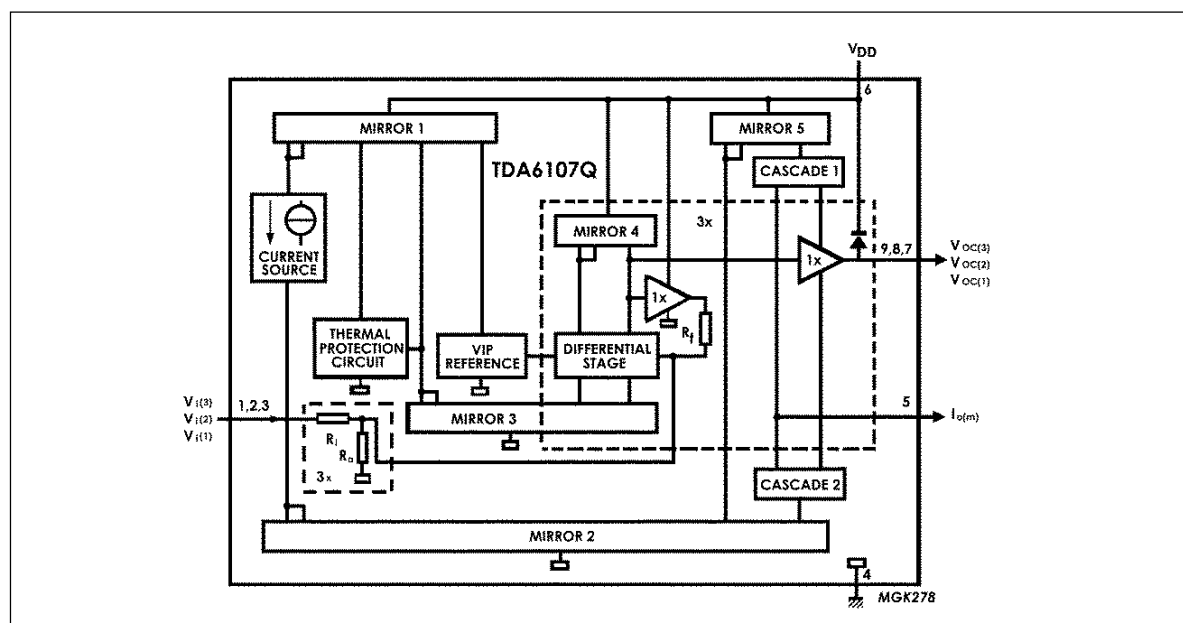
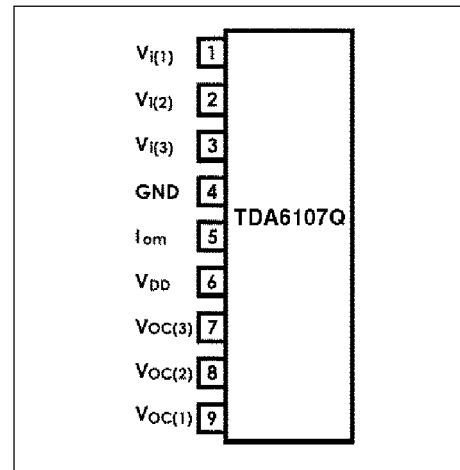
The TDA6107Q includes three video output amplifiers in one plastic DIL-Bent-SIL 9-pin medium power package, using high voltage DMOS technology, and is intended to drive the three cathodes of a colour CRT directly. To obtain maximum performance, the amplifier should be used with black-current control.

Features

- Typical bandwidth of 5.5 MHz for an output signal of 60 Vpp
- High slew rate of 900V/ s
- No external components required
- Very simple application
- Single supply voltage of 200V
- Internal reference voltage of 2.5 V
- Fixed gain of 50.
- Black-current stabilisation (BCS) circuit
- Thermal protection

Pin description

Pin	Symbol	Description
1	$V_{i(1)}$	inverting input 1
2	$V_{i(2)}$	inverting input 2
3	$V_{i(3)}$	inverting input 3
4	GND	ground (fim)
5	I_{om}	black current measurement output
6	VDD	supply voltage
7	$V_{OC(3)}$	cathode output 3
8	$V_{OC(2)}$	cathode output 2
9	$V_{OC(1)}$	cathode output 1



5. 24C08 8 Kbit EEPROM

features :

- 8 Kbit serial I2C bus EEPROM
- Single supply voltage : 4.5 V to 5.5 V
- 1 Million Erase/Write cycles (minimum)
- 40 year data retention (minimum)

Pin description

Pin No.	Name	Description
1, 2, 3	E0, E1, E2	Device address
5	SDA	Serial Data/Address Input/Output
6	SCL	Serial clock
7	WC	Write control
8	Vcc	Supply voltage
4	Vss	Ground

The memory device is compatible with the I2C memory standard. This is a two wire serial interface that uses a bi-directional data bus and serial clock. The memory carries a built-in 4-bit unique device type identifier code (1010) in accordance with the I2C bus definition.

Serial Clock (SCL)

The SCL input is used to strobe all data in and out of the memory.

Serial Data (SDA)

The SDA pin is bi-directional, and is used to transfer data in or out of the memory

6. STR-W6753

1 Introduction

The STR-W6700 series is a Hybrid IC (HIC) designed for Quasi-Resonant type Switching Mold Power Supply built-in a Power MOSFET and Control IC. At the normal operation, the HIC provides high efficiency and low noises by the Bottom-Skip Quasi-Resonant Operation, and low power consumption is also achieved by the blocking (intermittent) oscillation at stand-by mode.

The HIC adopts 6 pins full-mold package (TO220F-6L, Sanken Package Type No.: FM207) and is suitable for downsizing and standardizing of a SMPS having a limited mounting space. Furthermore, the HIC is made possible to ease circuit design with a small number of external parts, and it also makes possible to miniaturize and standardize the SMPS.

2 Features

- 1). The operation mode turns blocking oscillation by reducing output voltage at stand-by mode.
- 2). In addition to the existing Quasi-Resonant Operation, the Bottom-Skip Function is added in order to be efficient from light to medium load.
- 3). Soft-Start Operation is provided at the SMPS start-up.
- 4). Switching noise is reduced by Step-Drive Function.
- 5). Avalanche energy of the MOSFET is guaranteed.
- 6). Overcurrent Protection (OCP), Overvoltage Protection (OVP), Overload Protection (OLP), and Maximum ON-Time control circuits are incorporated.
- 7). It is possible to save the SMPS design time by utilizing the present designs and evaluation processes.

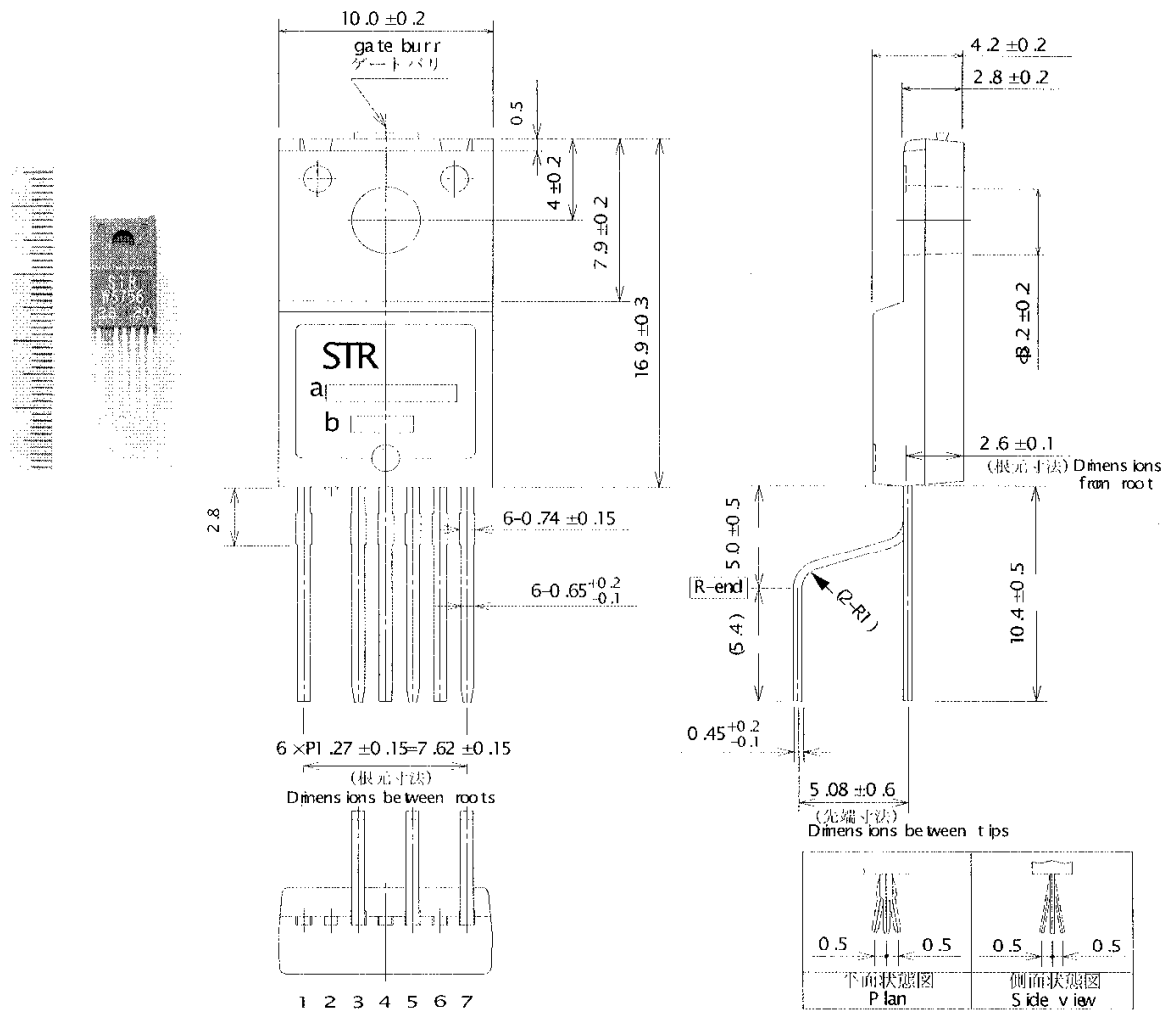
3 STR-W6700 Series Line-up

Type	MOSFET V _{DSS} [V]	R _{DS(ON)} MAX[Ω]	V _{AC} INPUT[V]	P _{out} [W] ※1	Mass- Production	Engineering Sample
STR-W6754	650	1.00 ※2	WIDE	100 ※2	2Q/2003	4Q/2002
			220	200 ※2		
STR-W6756	650	0.73 ※2	WIDE	140 ※2	2Q/2003	4Q/2002
			220	280 ※2		

※1. The listed output power represents a thermal rating value, and the peak output power can be obtained up to 120% - 140% to the thermal rating value. In case of low output power and narrow ON duty, the output power shall be lower than that of the above listed.

※2. The value is still tentative because of the underdevelopment parts.

4 Outline Drawings (LF2003)



端子的材質: Cu
Material of terminal: Cu
端子の処理: Niメッキ+半田ゲイツ
Treatment of terminal: Ni plating+solder dip
製品質量: 約2.3g
Weight: Approx. 2.3g

注記 Note

--- 部は高さ0.3mmのゲートバリ発生個所をしめす。
shows a point where 0.3mm gate burr is produced.

図番:

DWG No.:

単位: mm

Dimensions in mm

a. 品名標示 W6700
Type Number

b. ロット番号
Lot Number

第1文字 西暦年号の1桁
1st letter The last digit of year

第2文字 製造月
2nd letter Month

1 ~ 9月 アラビア数字

10月 O

11月 N

12月 D

(1 to 9 for Jan. to Sept.,
O for Oct., N for Nov., D for Dec.)

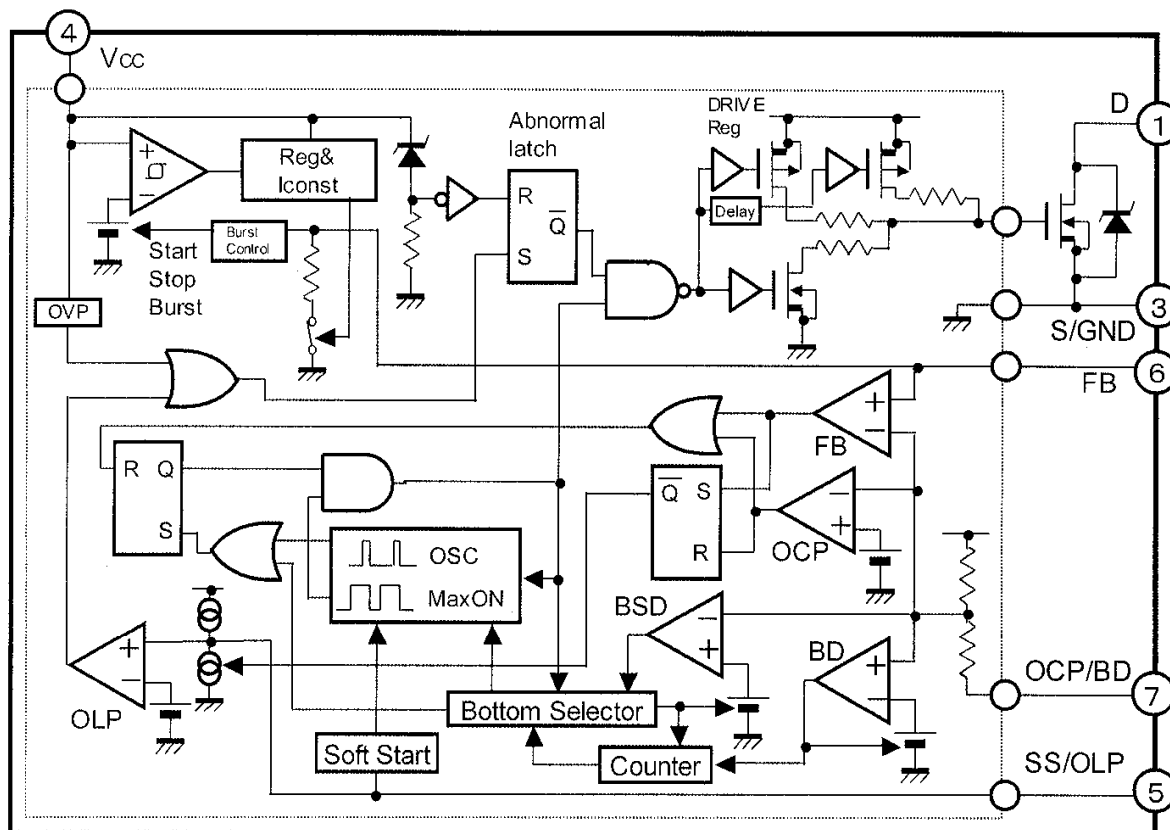
第3、4文字 製造日

3rd & 4th letter Day

01 ~ 31 アラビア数字

Arabic numerals

5 Block Diagram



Functions of Each Terminal

Terminal No.	Symbols		Terminal Descriptions	Functions
	STR-W6700 [TO220F-6L]	STR-X6700* [TO3PF-7L]		
1	D		Drain Terminal	MOSFET Drain
2	※2	S	Source/Grand Terminal	MOSFET Source and Ground
3	S/GND	GND		
4	Vcc		Power Supply Terminal	Control Circuit Power Supply Input
5	SS/OLP		Delay at Overload/Soft-Start set up Terminal	Overload Protection and Soft-Start Operation Time set up
6	FB		Feedback Terminal	Constant Voltage Control Signal Input, Blocking Oscillation Control
7	OCP/BD		Overcurrent Protection Input/Bottom Detection Terminal	Overcurrent Detection Signal Input / Bottom Detection Signal Input

※1. STR-X6700 is a HIC, which has a different package from STR-W6700.

※2. Terminated Pin (Refer to the Outline Drawings)

6 Electrical Characteristics (Example: STR-W6756)

6.1 Absolute Maximum Ratings (Ta=25°C)

Parameters	Terminal	Symbols	Ratings	Units	Conditions
Drain Current	1 - 3	IDpeak※1		A	Single Pulse
Maximum Switching Current	1 - 3	IDMAX※2		A	Ta=-20~+125°C
Avalanche Energy Capacity	1 - 3	EAS※3		mJ	Single Pulse VDD=99V, L=20mH IL= A
Control Part Power Supply Voltage	4 - 3	VCC	35	V	
SS/OLP Terminal Voltage	5 - 3	VOLPSS	-0.5~6	V	
FB Terminal Inflow Current	6 - 3	IFB	10	mA	※Under examination
FB Terminal Voltage	6 - 3	VFB	-0.5~7.5	V	
OCP/BD Terminal Voltage	7 - 3	VOCBD	-1.5~5	V	
MOS FET part Permissive Loss	1 - 3	PD1※4		W	With Indefinite Heat-sink
					Without Heat-sink
Control part Permissive Loss (MIC)	4 - 3	PD2※5		W	Regulated at Vcc x Icc
Operational Internal Frame Temperature	—	TF	-20~+125	°C	Refer to Recommended Operational Temperature
Operational Ambient Temperature	—	Top	-20~+125	°C	
Storage Temperature	—	Tstg	-40~+125	°C	
Channel Temperature	—	Tch	+150	°C	

※1. Refer to the MOSFET A.S.O. curve listed on the specification sheet.

※2. Maximum Switching Current listed on the specification sheet.

Maximum Switching Current represents Drain Current which is determined by IC internal drive voltage and MOSFET Vth.

※3. Refer to the MOSFET Tch-EAS curve listed in the specification sheet.

※4. Refer to the MOSFET Ta *PD1 curve listed in the specification.

※5. Refer to the MIC TF-PD2 curve listed in the specification sheet.

6.2 Electrical Characteristics in Power MOS FET (Ta = 25°C)

Parameters	Terminal	Symbols	Ratings			Units	Conditions
			MIN	TYP	MAX		
Drain-Source Voltage ※7	1 - 3	VDSS	650	—	—	V	※6
Drain Leakage Current	1 - 3	IDSS	—	—	300	*p3451XA	
ON Resistance ※7	1 - 3	RDS(ON)	—	—	0.73	Ω	
Switching Time	1 - 3	tf	—	—	—	Nsec	
Thermal Resistance ※7	—	θ ch-F	—	—	—	°C/W	Channel *p3451XA Frame

※6. Refer to the specifications of each product for the details.

※7. The ratings shall be different to each product. Refer to the specifications for the detail.

6.3 Electrical Characteristics (Ta = 25°C)

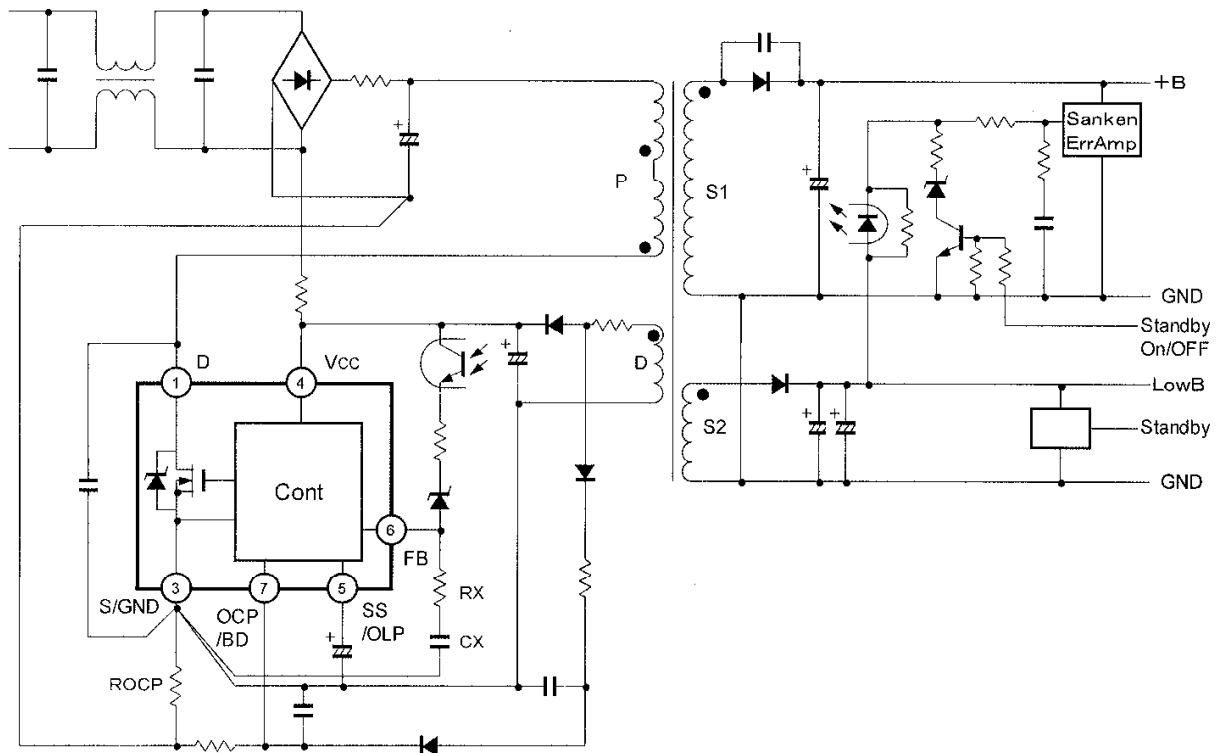
Parameters	Terminal	Symbols	Ratings			Units	Conditions
			MIN	TYP	MAX		
Power Supply Start-up Operation							
Operation Start-up Voltage	4 - 3	VCC(ON)		18.2		V	
Operation Stop Voltage	4 - 3	VCC(OFF)		9.6		V	
Operation Circuit Current	4 - 3	ICC(ON)	----	—	6	mA	
Non Operation Circuit Current	4 - 3	ICC(OFF)	—	-----	100	*p3780XA	
Oscillation Frequency	1 - 3	fOSC		22		kHz	
Soft-Start Operation Stop Voltage	5 - 3	VSSOLP(SS)		1		V	
Soft-Start Operation Charging Current	5 - 3	ISSOLP(SS)		-450		*p3780XA	
Normal Operation							
Overcurrent Detection Threshold Voltage	7 - 3	VOCPBD(LIM)		-0.95		V	
Bottom-Skip Operation Threshold Voltage 1	7 - 3	VOCPBD(BS1)		-0.66		V	
Bottom-Skip Operation Threshold Voltage 2	7 - 3	VOCPBD(BS2)		-0.44		V	
OCP/BD Terminal Outflow Current	7 - 3	IOCPBD				*p3780XA	
Quasi-Resonant Operation Threshold Voltage 1	7 - 3	VOCPBD(TH1)		0.4		V	
Quasi-Resonant Operation Threshold Voltage 2	7 - 3	VOCPBD(TH2)		0.8		V	
Minimum Quasi-Resonant Signal Input Time	7 - 3	TOFF(MIN)	—	—	1	*p3746Xs	
FB Terminal Threshold Voltage	6 - 3	VFB(OFF)		1.5		V	
FB Terminal Inflow Current (Normal Operation)	6 - 3	IFB(ON)				mA	※ 8
Stand-by Operation							
Stand-by Operation Start-up Power Supply Voltage	4 - 3	VCC(S)		11.2		V	
Stand-by Power Supply Voltage Interval	4 - 3	VCC(SK)		1.5		V	
Stand-by Non-Operational Circuit Current	4 - 3	ICC(S)		30		μA	
FB Stand-by Operation Threshold Voltage	6 - 3	VFB(S)				V	
FB Terminal Inflow Current (Stand-by)	6 - 3	IFB(S)				*p3780XA	
Minimum ON Time	1 - 3	TON(MIN)		1		*p3746Xs	
Protection Operation							
Maximum ON Time	1 - 3	TON(MAX)		34		*p3780XS	
OLP Operation Threshold Voltage	5 - 3	VSSOLP(OLP)		5		V	
OLP Operation Charging Current	5 - 3	ISSOLP(OLP)		-10		*p3780XA	
Normal Operation Discharging Current	5 - 3	ISSOLP(NOR)		40		*p3780XA	
OLP Delay Time	1 - 3	TOLP				ms	
OVP Operational Voltage	4 - 3	VCC(OVP)		27.5		V	
Latch Circuit Holding Current ※10	4 - 3	ICC(H)	-----	—	150	*p3780XA	
Latch Circuit Releasing Power Supply Voltage ※10	4 - 3	VCC(La.OFF)		7.3		V	

※8. Refer to the specifications for the details.

※9. The current rating is based on the HIC *p3746Xs, and plus(+) represents sink and minus(-) represents source.

※10. Latch circuit is the circuit operated by OVP and OLP.

7 Applicable Circuit (Example)



8 Functions of Each Terminal

8.1. Vcc Terminal (Pin 4)

8.1.1. Start-up Circuit

The start-up circuit detects Vcc terminal (No.4 pin) voltage, and makes a control IC start and stop. The power supply of the control IC (Vcc terminal input) employs a circuit as shown in Fig.1. At start-up, C3 is charged through a start-up resistor R2. The R2 value needs to be set more than the holding current of the latch circuit (150 μ A Max), which is described later, to be flown at the minimum AC input.

However, where the R2 value is too high, the current charging to C3 shall be reduced after AC input. Consequently, it takes much time to reach the operation start-up voltage, so it is required to monitor the capacity of C3 that is mentioned later simultaneously. The Vcc terminal voltage falls immediately after the control circuit starts its operation; however the voltage drop is reduced by the increase of the C3 capacity. Therefore, even if the auxiliary drive winding voltage is delayed in rising, the Vcc terminal voltage does not fall up to the operation stop voltage to maintain the start-up operation. However, with larger capacity of C3, it takes much time, after AC input, to reach the operation start since the certain time is required to charge C3. In general, SMPS performs its operation properly with the value, C3 is 10 to 47 μ F, R2 is 47k to 150k Ohm for 100V wide input, and 82K to 330K Ohm for 200V narrow input for its start up.

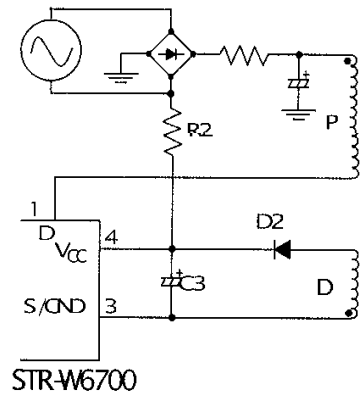


Fig.1. Start-up Circuit

As shown in Fig.2, the circuit current which makes the control circuit start is regulated at **100 μ A MAX** ($V_{cc} = 15V$, $T_a = 25^{\circ}C$), and higher value resistor R2 is applicable to the circuit. Once the Vcc terminal voltage reaches 18.2V (TYP), the control circuit starts its operation by the **Start-up Circuit**, and current consumption shall be increased. Once the Vcc terminal voltage falls and it becomes lower than the operation stop voltage **9.6V (TYP)** with the decrease of the Vcc terminal voltage, **Under Voltage Lock Out (UVLO)** circuit stops the controlling operation and returns to the start-up mode.

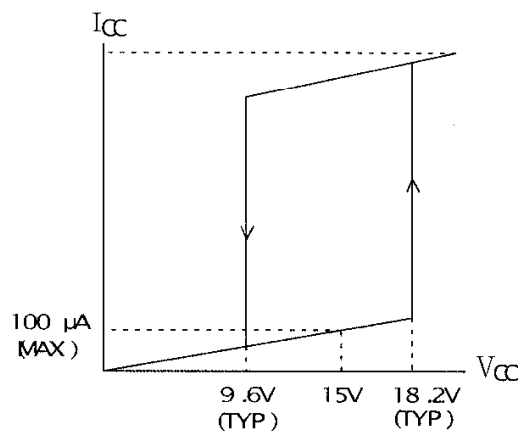


Fig.2. Vcc Terminal Vol. – Circuit Cur. Icc

8.1.2. Auxiliary/Drive Winding

After the control circuit starts its operation, the power supply is gained by rectifying and smoothing the voltage of the auxiliary winding D. Fig.3 shows the start-up voltage waveform of the Vcc Terminal. The auxiliary winding voltage does not rise up to the set voltage after the control circuit starts its operation, and the Vcc terminal voltage starts falling. However, because the operation stop voltage is set as low as **10.6V (Max)**, the auxiliary winding voltage D reaches stabilizing voltage before falling to the operation stop voltage, and the control circuit continues its operation.

The auxiliary winding voltage, at the normal power supply operation, is to be set the number of windings for both the ends voltage of C3 to be higher than the operation stop voltage [$V_{cc}(\text{OFF})$ 10.6V(MAX)] and lower than the OVP operation voltage [$V_{cc}(\text{OVP})$ 25.5V(MIN)].

Besides, in an actual power supply circuit, the Vcc terminal voltage might be varied by the value of secondary output current as shown in Fig.4. This is caused by the small circuit current of STR-W6700 itself and C3 is charged up to the peak value by the surge voltage generated instantly after the MOSFET is turned OFF.

In order to prevent this, it is effective to add a resistor having several to several tens ohms (R7) in series to a rectifier diode as shown in Fig.5. The optimum value of the additional resistor should be determined in accordance with the specs of a transformer since the Vcc terminal voltage is varied by the structure difference of transformers.

Furthermore, the variation ratio of the Vcc terminal voltage becomes worse due to an inaccurate coupling between primary and secondary windings of the transformer (the coupling between the auxiliary winding D and the stabilizing output winding for the constant voltage control). Thus, for designing the transformer, the winding position of the auxiliary winding D needs to be studied carefully.

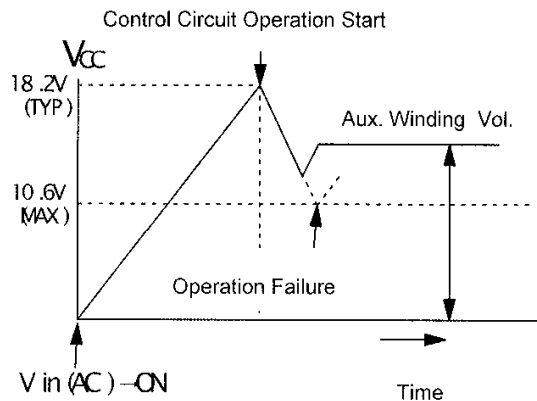


Fig.3. Waveform of Vcc Terminal Vol. at Start-up

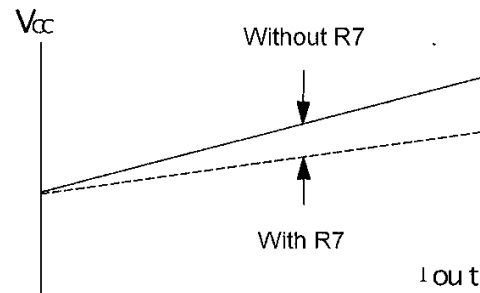


Fig.4. Output Current Iout - Vcc Terminal Vol.

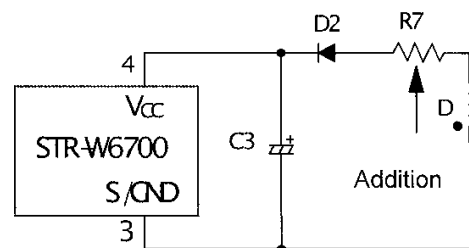


Fig.5. Auxiliary Power Supply Circuit not affected by Output Current Iout

8.1.3. Overvoltage Protection Circuit

Where the voltage exceeding 27.5V(TYP) is imposed on between Vcc and GND terminals, the OVP circuit of the control IC starts its operation and turns latch-mode, and the control IC stops its oscillation. Generally, the Vcc terminal voltage is supplied from the auxiliary winding of the transformer, and the voltage is in proportion to the output voltage; thus, the circuit also operates at that time when the overvoltage output of the secondary side comes out such as the voltage detection circuit open.

The secondary output voltage at the Overvoltage Protection circuit operation is obtained form the following formula:

$$V_{OUT} (OVP) \div \frac{V_{OUT} \text{ at Normal Operation}}{V_{CC} \text{ Terminal Voltage at Normal Operation}} \times 27.5V (TYP) \dots\dots (1)$$

8.1.4. Latch Circuit

The latch circuit is a circuit that holds the oscillator output low and stops the power supply circuit operation when OVP or OLP circuit operates. The holding current of the latch circuit is 150 μ A MAX ($T_a = 25^\circ\text{C}$) when the Vcc terminal voltage is minus 0.3V to the operation stop.

In order to avoid improper operations caused by noises, etc., the delay-time is provided with a timer circuit incorporated in the HIC, and thereafter, the latch circuit starts its operation when OVP or OLP circuit operates for more than the set time. While, the Vcc terminal voltage drops even after the latch circuit starts its operation because the constant voltage (Reg) circuit of the control circuit continues its operation with higher circuit current.

Where the Vcc terminal voltage falls lower than the operation stop voltage (9.6V(TYP)), the voltage starts rising as the circuit current becomes lower than 150 μ A ($T_a = 25^\circ\text{C}$). Where the Vcc terminal voltage reaches the operation start voltage (18.2V(TYP)), it falls as the circuit current is increased again.

Consequently, the latch circuit prevents the Vcc terminal voltage from rising abnormally by controlling the voltage between 9.6V (TYP) and 18.2V(TYP). The Fig.6 indicates the voltage waveform when the latch circuit is under operation. The latch circuit operation is cancelled by reducing the Vcc terminal voltage below 7.3V (TYP), and generally, it is restarted by AC input switch-off of the power supply.

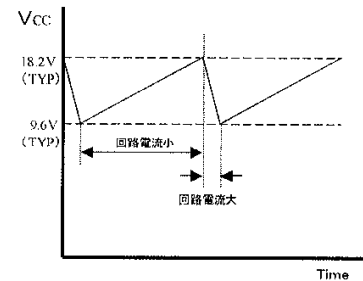


Fig.6. VCC Terminal Vol. Waveform at Latch-mode

8.2 SS/OLP Terminal (Pin 5)

The operation of SS/OLP terminal is classified as Soft-Start and Overload Protection, and the SS/OLP terminal is generally connected to a condenser having the value of 0.47 *p2501XFP2835XF

8.2.1. Soft-Start Operation at Start-up of Power Supply

At the power supply start-up, an external condenser is charged up to the threshold operating charging voltage ($V_{SSOLP(SS)}$) by the Soft-Start operating charging current ($I_{SSOLP(SS)}$) flowing from SS/OLP. The Soft-Start is provided at power supply start-up by utilizing the changing of SS/OLP terminal voltage from 0V to 1.0V. The timing chart of the Soft-Start is shown in Fig.7. Comparing the oscillation waveforms between OLP terminal voltage and the oscillation waveform of the internal control part, the Soft-Start widens the ON width. Besides, at the burst stand-by, the Soft-Start is operated every time; so, the magnetostriction noises from transformers are controlled with the increase of the drain current gradually.

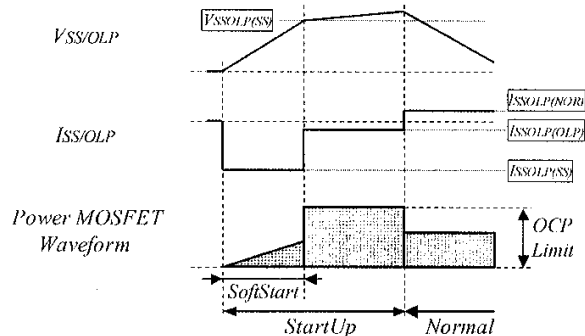


Fig.7. Soft-Start Operation

8.2.2. Overload Protection

The output characteristics of the secondary side at the time when the OCP circuit operates, due to the overload of the secondary side output, is shown in Fig.8. Where the output voltage falls below the overload mode, the auxiliary winding voltage of the primary side also falls proportionally, and the V_{cc} terminal voltage falls below shutdown voltage to stop the operation. In that case, as the circuit current is also decreased simultaneously, the V_{cc} terminal voltage rise again by the start-up resistor R_s 's charging current, and the circuit re-operates intermittently at the operation start-up voltage. However, where the transformer has lots of output windings and the coupling is not sufficient, and even if the output voltage is reduced in overload mode, the operation may not be intermittent because the primary side auxiliary winding voltage does not fall. Although the intermittent operation is not provided, the operation itself can be protected by the OLP circuit.

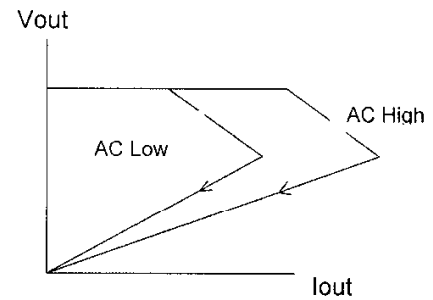


Fig.8. SMPS Output Overload Characteristics

In the overload mode (the mode in which the drain current is controlled by OCP operation), the secondary side output voltage falls. Thus, the error-amplifier and photo-coupler in secondary side need to be cut off. The STR-W6700 series recognizes the circumstances continuing OCP operation without FB signal as overload mode, and the SS/OLP terminal voltage starts rising by $I_{SSOLP(OLP)}$ as shown in Fig.9, and after the SS/OLP terminal voltage continues rising to reach $V_{SSOLP(OLP)}$ TYP 5V, the oscillation is stopped and turns the latch protection operation.

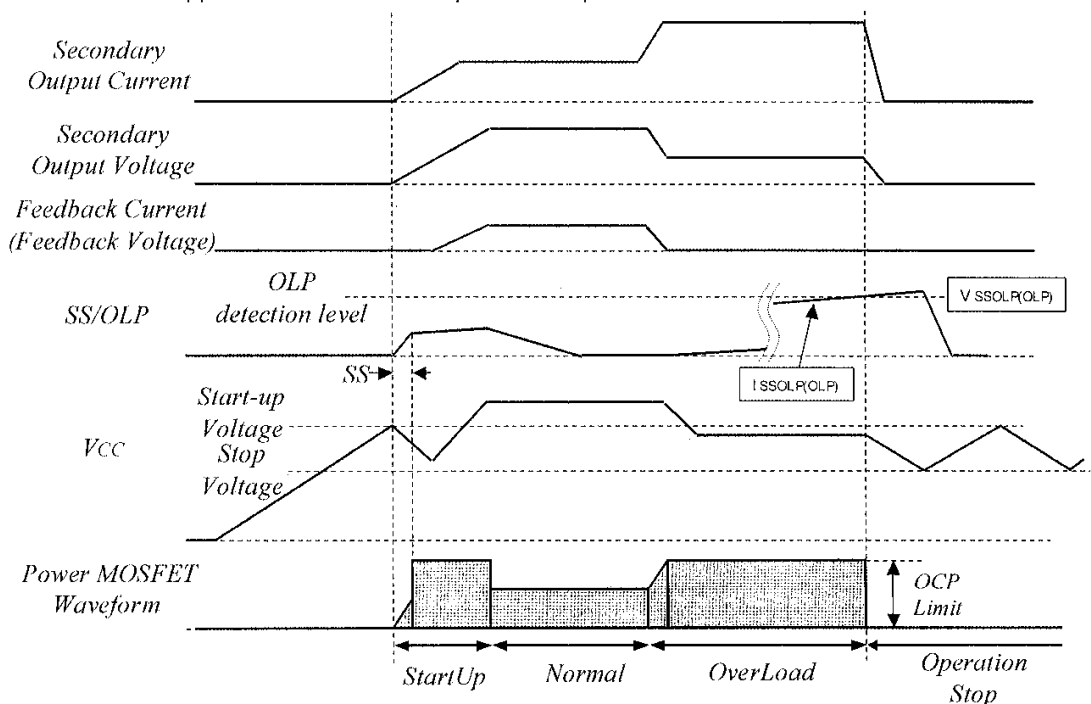


Fig.9. Timing-Chart at Overload

The time until the latch protection operation starts its operation can be calculated from the following formula since the ISSOLP(OLP) is a constant current circuit. That is,

$$C \text{ (Condenser Capacity)} \times \Delta V \text{ (Condenser Charging Voltage: approx. 5V)} = I_{SSOLP(OLP)} \times t \text{ (time)} \quad \dots\dots (2)$$

While, the ISSOLP(OLP) contains the voltage dependent characteristics on SS/OLP terminal voltage, and ISSOLP(OLP) falls when SS/OLP terminal voltage rises. The actual value does not match to the value calculated from the formula (2) completely, so it is recommended to monitor the actual load conditions. Furthermore, the power supply start-up voltage turning OCP operation is also needed to confirm.

8.2.3. Operation at Power Supply OFF

The voltage of the condenser mounted externally to SS/OLP terminal is discharged by the internal reset circuit of the HIC at power OFF. The reset circuit does not start its operation at normal operation (i.e., while the internal constant voltage circuit operates).

8.2.4. Cancellation of OLP Circuit

The OLP operation is cancelled by inserting a resistor having 47K ohms (or Zener diodes) into SS/OLP terminal at start-up or overload maintaining Soft-Start operation effectively.

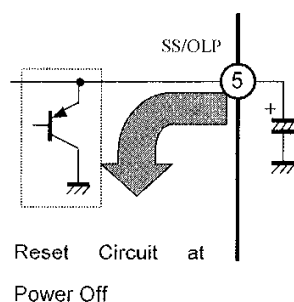


Fig.10. Reset Circuit

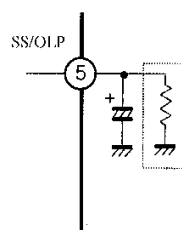


Fig.11. OLP Cancellation Circuit

8.3 FB Terminal (Pin. 6)

The operation of FB terminal is divided into normal (constant voltage control circuit operation) and stand-by operation control. Refer to item No. 8.6 for the controlling at stand-by operation.

8.3.1. Constant Voltage Control Circuit

The STR-W6700 series adopts the current mode controlling circuit for the constant voltage control, which proves its superiority in a heavy load. The MOSFET drain current peak value (\cong ON time) is varied comparing FB terminal voltage and HIC's internal VOCPM. During the OFF-time, Quasi-Resonant operation synchronized to the reset signal from a transformer is applied. While, where no reset signal is supplied from the transformer, the fixed oscillation frequency (approx. 22kHz) is applied by the HIC's internal oscillation circuit. The timing chart is shown in Fig.12, and the internal circuit diagram at the constant voltage control is shown in Fig. 13. respectively.

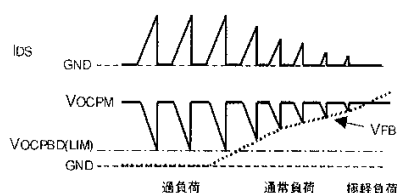


Fig.12. Constant Control Voltage

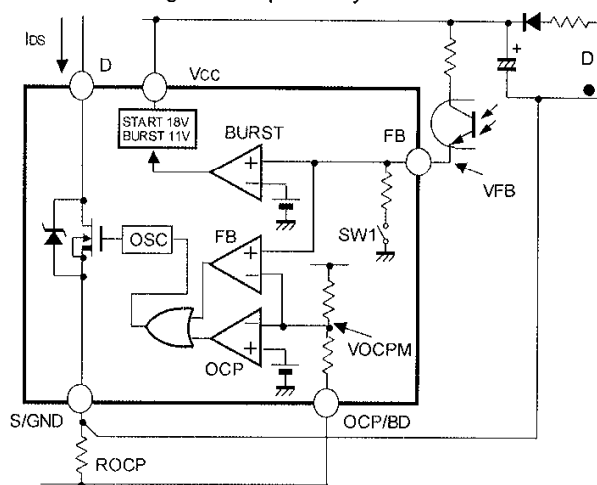


Fig.13. Constant Voltage Control Circuit (Theory)

The constant voltage controlling circuit makes the control signal (FB current) flowing from the secondary side error-amplifier input to No.6 terminal by the photo-coupler. The input FB current is transformed into Feedback voltage V_{FB} by the HIC internal resistor (SW1 is ON at normal). While, the reversed voltage waveform (V_{OCPM}) of the drain current waveform is input to the input terminal of the FB comparator. It is the current mode controlling circuit that controls the peak value of the drain current by the FB comparator.

The FB current shall be decreased to nil value at the overload in Fig.12. At that time, the drain current is controlled under the current value regulated by the Overcurrent Protection Circuit. At the transition period from the normal load to the lowest load in Fig.12, the drain current is decreased since the FB current increases and V_{FB} rises. Where the V_{FB} exceeds the FB terminal threshold voltage ($V_{FB(OFF)}$, 1.5V TYP) such as at the lowest load, the thinned-out oscillating operation starts and the HIC controls the secondary side output voltage so as not to raise the secondary side output voltage.

8.5 Quasi-Resonant and Bottom-Skip Operation

8.5.1. Quasi-Resonant Operation

The Quasi-Resonant operation is to match the timing of the MOSFET Turn-ON to the bottom point of the voltage resonant waveform after a transformer releases the energy (i.e., 1/2 cycle of the resonant-frequency).

As shown in Fig.15, the voltage resonant condenser C4 is connected between the drain and source, and the delay circuit, C10, D3, D4, and R9 are connected between the auxiliary winding D and OCP/BD terminal (Pin No.7). Where the MOSFET is turned OFF, the Quasi-Resonant signal is made of the fly-back voltage generated in the auxiliary winding, which operates BD comparator, and it provides the Quasi-Resonant operation. Due to the operation of the delay circuit, even if the energy of the transformer is released to complete, the Quasi-Resonant signal imposed on Pin No. 7 terminal does not fall immediately. This is why

the C10 is discharged by R4, and after a certain period, the voltage falls to the threshold voltage $V_{OCPBD(TH1)} \approx 0.4V$ and below. Consequently, the delay-time needs to be set by adjusting C10 monitoring the operating waveform in order to turn ON the MOSFET at that time when the V_{DS} of the MOSFET reaches the lowest point.

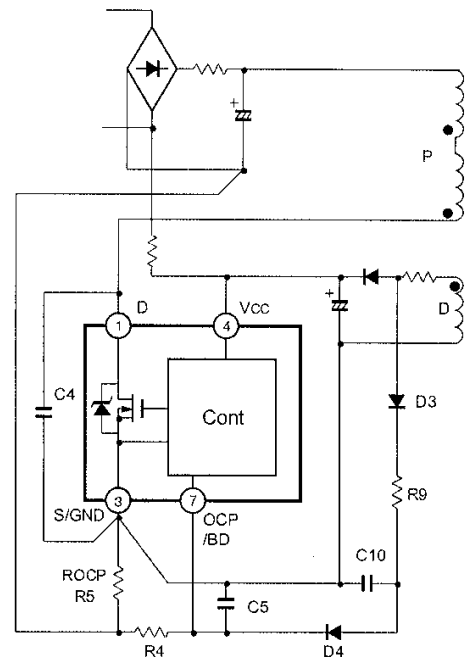


Fig.15. Quasi-Resonant and Delay Circuit

In addition to the Quasi-Resonant operation, in order to control the increase of the oscillating frequency at light to medium load, the Bottom-Skip operation widening OFF time is built-in in accordance with the load volumes. The switching timing between the Quasi-Resonant and Bottom-Skip operation is described in the item No. 8.5.2.

Where the Quasi-Resonant signal voltage imposed on OCP/BD terminal is below $V_{OCPBD(TH2)} \approx 0.8V$, the internal oscillator starts PWM operation with the fixed oscillating frequency ($\approx 22kHz$).

The PWM operation is also provided at power supply start-up or low auxiliary winding voltage such as winding-short, which lowers oscillating frequency, and the stress of the MOSFET is fairly reduced. After the Quasi-Resonant signal is over $V_{OCPBD(TH2)} \approx 0.8V$, the MOSFET remains OFF while $V_{OCPBD(TH1)} \approx 0.4V$ and more is imposed on. That is, the gap between $V_{OCPBD(TH1)}$ and $V_{OCPBD(TH2)}$ prevents the HIC from operating improperly.

While, in the setting up R9 and R4, the Quasi-Resonant signal imposed on the OCP/BD terminal needs to be 5V or below since the OCP/BD terminal voltage is maximum 5V. At the normal condition, it should be 1.5V approximately.

8.5.2. Bottom-Skip Operation (Switching from Quasi-Resonant Operation)

The basic bottom-skip operation is that the load of the secondary side is detected by the drain current value (actually OCP/BD terminal voltage), which switches to the Quasi-Resonant (at heavy load) and the Bottom-Skip operation (at light load). The timing of distinguishing is made by taking the OCP/BD terminal voltage in at start-down of the MOSFET gate voltage of the HIC. Furthermore, the number of start-down (OCP/BD terminal voltage is under $V_{OCPBD(TH1)}$) is measured, which makes the MOSFET turn ON in accordance with the mode described above.

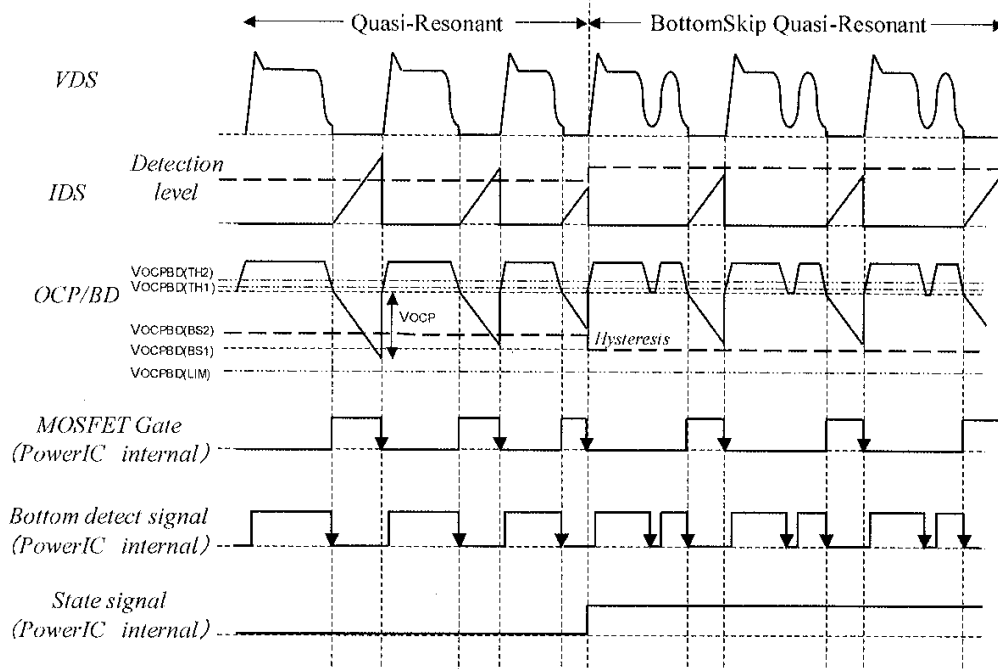


Fig.16. Bottom-Skip Quasi-Resonant Operation Timing Chart

1). Quasi-Resonant Operation ⇒ Bottom-Skip Operation

The Quasi-Resonant is operated under the mode that V_{OCP} is higher than $V_{OCPBD(BS2)}$ at the absolute rating. Where the load becomes lighter than that of the mode, the drain current falls. As the result, the mode is switched to the Bottom-Skip operation when the V_{OCP} becomes lower than $V_{OCPBD(BS2)}$ at the absolute rating, and the standard voltage is automatically changed to $V_{OCPBD(BS1)}$. Fig 16 shows the switching timing chart from the Quasi-Resonant to the Bottom-Skip operation.

2). Bottom-Skip Operation ⇒ Quasi-Resonant Operation

The Bottom-Skip is operated under the mode that V_{OCP} is lower than $V_{OCPBD(BS1)}$ at the absolute rating. Where the load becomes higher than that of the mode, the drain current rises. As the result, the mode is switched to the Quasi-Resonant operation when V_{OCP} becomes higher than $V_{OCPBD(BS1)}$ at the absolute rating, and the standard voltage is automatically changed to $V_{OCPBD(BS2)}$.

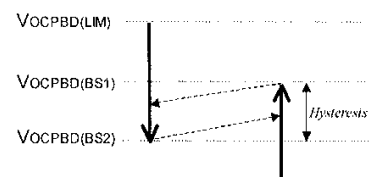


Fig.17. Operation Mode switching

Besides, the V_{OCP} is OCP/BD terminal voltage at that time when the MOSFET gate voltage starts down.

As described above, the standard voltage ($V_{OCPBD(BS1)}$, $V_{OCPBD(BS2)}$) realizing the Bottom-Skip operation provides the hysteresis operation automatically and makes it possible to have the stabilized operation. Fig.17 shows the above operation switching changing mode.

8.6 Stand-By Operation

The STR-W6700 series contains the burst-mode switching function to reduce the power dissipation at stand-by mode. At the stand-by with a remote controller, the switching mode is set in the secondary side, which makes the HIC switch to the burst-mode automatically by reducing the output voltage.

The transformer winding voltage falls reducing the output voltage by switching in the secondary side, and it reduces the primary side auxiliary winding voltage, which cuts off the power supply from the auxiliary winding to Vcc terminal (Pin No. 4), and the Vcc terminal voltage is reduced by the HIC I_{p45} dissipation current itself. Where the Vcc terminal (Pin No.4) voltage reaches the operation stop power supply voltage (9.6V TYP), the HIC stops its operation, and the dissipation current of the HIC turns circuit current ($I_{CC(S)}$) at stand-by non-operation, and with the charging to the back-up condenser through a start-up resistor, the Vcc terminal voltage (Pin No.4) rises again, and the HIC starts its operation immediately after the Vcc terminal voltage reaches the operation start-up power supply voltage. Repeating the above cycles, the HIC has the power supply continue the burst-mode.

In order to reduce the transformer I_{p45} restriction noises at the burst-mode, by lowering the voltage gap between the operation start-up power supply voltage at the stand-by and the operation stop voltage, the operation frequency is increased and switched to the mode controlling the switching current as low as possible without increasing the loss at the start-up resistor.

This switching is made by detecting that the FB terminal voltage exceeds the FB stand-by operation threshold voltage $V_{FB(S)}$, and the operation voltage width of the Vcc terminal is determined as I_{p437} power supply voltage interval 1.5V(TYP) at stand-by I_{p437} width is approximately one fifth compared to the normal operation.

In the transition period from the normal to stand-by operation, the output voltage continues falling because the HIC I_{p437} is suspended by the feedback current. Thus, it is inevitable to secure the voltage exceeding the required output voltage of secondary side in the period until the HIC starts the stand-by operation.

Meanwhile, in the transition period from the stand-by to normal operation, the output voltage continues falling because the HIC I_{p437} is suspended until the Vcc terminal voltage (Pin 4) reaches the operation start-up voltage 18V (TYP). Thus it is required to secure the voltage exceeding the required output voltage of secondary side.

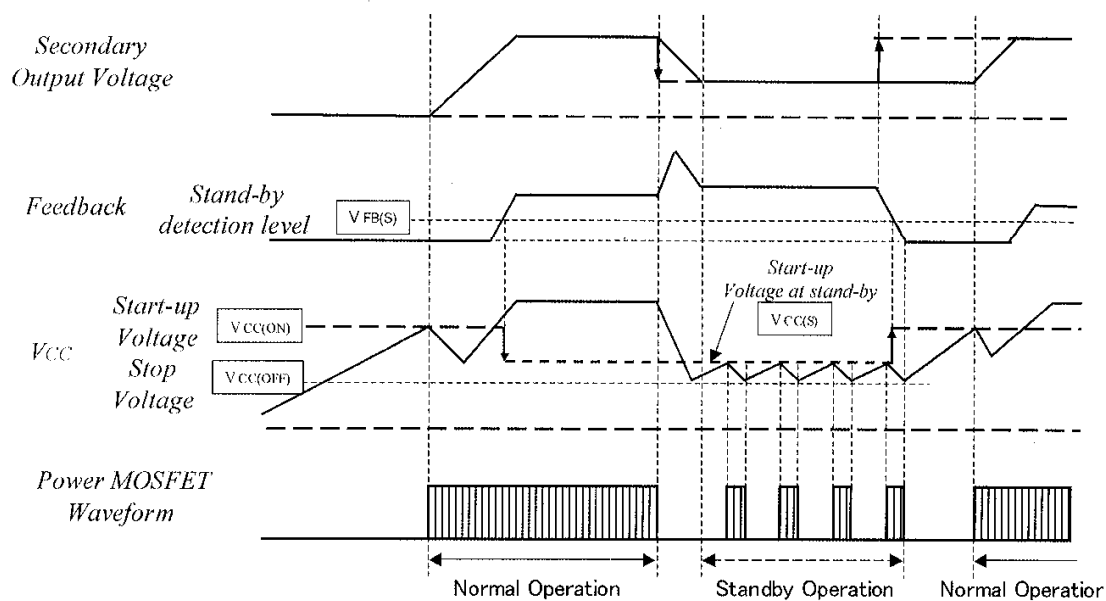


Fig.18. Timing-Chart at Operation Switching

At the stand-by mode, as mentioned above, due to the burst-mode of the HIC *p0641Xs operation, the output voltage falls since the HIC stops its operation during the oscillation stop period. While, during the stand-by operation, the intermittent operation repeating oscillation and stop through the start-up resistor is provided because the transformer *p2708Xs winding voltage supplying the power supply to the HIC is extremely decreased. Accordingly, the load except stand-by load cannot be taken out at the stand-by operation (the period of intermittent operation). Where the load excluding 'the stand-by' load is imposed on 'the transition period' from 'the stand-by' to normal operation, 'the incomplete start-up' might be occurred. Thus, for the switching to the normal mode, it is required to have the sequence (no load at stand-by should be imposed on the normal mode), and the switching needs to be made after the power supply is completely turned to the normal mode.

8.7 Step-Drive Circuit

The STR-W6700 series reduces noises at Turn-ON by adopting the step-drive circuit for the MOSFET drive circuit as shown in Fig. 19. The drive current at Turn-ON is controlled at low by RG1 first, and it makes the gate voltage increase gradually, and the gate voltage is increased rapidly through RG1 + RG2 after 0.8 *p0632Xs approximately. While, the MOSFET drive voltage adopts the constant voltage drive circuit maintained at $V_{DRM}=7.6V_{typ}$, and it is not affected to V_{CC} . The MOSFET gate electric charge is discharged rapidly through RG3 when the MOSFET is turned OFF.

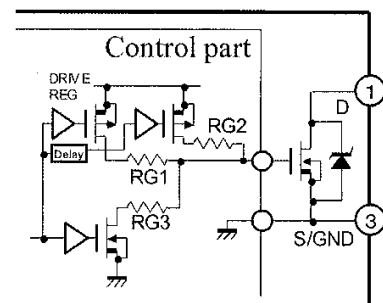


Fig.19. Step-Drive Circuit

That is, in the STR-W6700 series *p1043Xs circuit, the gate voltage imposed on the MOSFET is shifted with the two steps, which lowers the gate voltage at Turn ON and controls the surge current flowing at Turn ON, and provides the ideal drive circuit securing the sufficient gate voltage at normal drive mode.

8.8 Maximum ON Time Controlling Function

The MOSFET ON Time is controlled in the transition mode such as a low input voltage or AC input ON and OFF. The maximum ON Time is set at about 80% of the oscillation cycle ($= 1/f_{osc}$ approx. $45\mu sec$) and approximately $35\mu sec$ (TYP). While, for the design of power supply, it is also required to monitor the MOSFET ON time at maximum load and input voltage minimum.

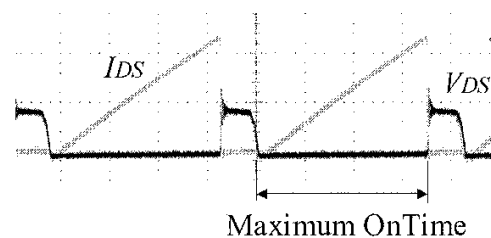


Fig.20. Maximum ON Time

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