



SPECIFICATIONS

3 IN 1 MODULATOR, TUNER, IF BLOCK

MODEL SATM1-US2-S
(115-V-D025AS)

SANYO TUNER INDUSTRIES CO., LTD.

TUNER ENGINEERING SECTION

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APPROVED	CHECKED	WRITTEN
		Jul. 30, '99 <i>[Signature]</i>

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1. GENERAL

1-1 Summary

This unit has RF modulator, tuner and VIF circuits in a case.

1-2 Receiving channels and system

USA 181 channels

System	NTSC-M
VHF Low Band	2 ~ B CH
VHF High Band	C ~ W+11 CH
UHF Band	W+12 ~ 69 CH

1-3 Modulator output channels

CH SW Open	3 CH
CH SW GND	4 CH

1-4 Input , output impedance

ANT input impedance	75 Ω unbalanced
ANT output impedance	75 Ω unbalanced

1-5 Permissible maximum voltage

+B	+ 5.5 V
MB. CONTROL	+ 6.0 V
BT	+31.0 V

1-6 Normal voltage

+B	+ 5 V \pm 5 %
MB, CONTROL	+ 5 V \pm 5 %
BT	+30 V \pm 5 %

1-7 Voltage for guaranteeing electrical specification

+B (MB. CONTROL)	+ 5 V \pm 0.1 V
BT	+30 V \pm 0.1 V

1-8 Temperature

Operating temperature	-10 to +60 °C
Storage temperature	-20 to +70 °C

1-9 Humidity

Operating humidity	35 to 85 % RH
Storage humidity	10 to 90 % RH

1-10 Intermediate frequencies

Picture carrier	45.75 MHz
Sound carrier	41.25 MHz

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1-11 Current consumption

	TYP	MAX
+B	150 mA	200 mA
MB	35 mA	50 mA
CONTROL	350 μ A	700 μ A
BT	2.0 mA	5.0 mA

1-12 Terminals

Number	Terminal	Function
1	AUDIO IN	MOD AUDIO INPUT
2	CH. SW	CHANNEL SWITCH (OPEN/GND)
3	MB	MOD. +B (+5V)
4	CONTROL	MOD OUTPUT ON/OFF (+5V/0V)
5	VIDEO IN	MOD VIDEO INPUT
6		
7	N. C.	(RF AGC TP)
8	N. C.	---
9	N. C.	---
10	CLOCK	CLOCK SIGNAL INPUT
11	DATA	DATA SIGNAL INPUT
12		
13	+B	+B (+5V)
14	X' TAL	3.58 MHz INPUT
15	BT	TUNING (+30V)
16	N. C.	(TU-TP)
17	IF OUT	IF OUTPUT
18	AUDIO OUT	AUDIO OUTPUT
19	N. C.	---
20	AFT	AFT OUTPUT
21	VIDEO OUT	VIDEO OUTPUT
22		

1-13 PLL data input signal level(clock, data)

High level input voltage	3.0 to 5.5V
Low level input voltage	1.5V MAX

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(RF MODULATOR SECTION)

2. RF MODULATOR OUTPUT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
2-1	V. S. W. R.		2	3		ANT out (MOD.ON) 60 ~ 72 MHz 0 ~ (fp-4.6) MHz, (fp+7.4) ~ 1000 MHz fp ~ (fp+4.5) MHz Video in : None Video in : 3.58 MHz, 0.4 Vp-p Measure the level of fp + 920 KHz
2-2	Picture carrier frequency	-150	fp	150	KHz	
2-3	Sound carrier frequency	-0.007	fp+4.5	0.007	MHz	
2-4	Picture level	63.5	66.5	69.5	dB μ	
2-5	P/S ratio	17	15	13	dB	
2-6	Spurious level without pass band			36	dB μ	
2-7	Spurious level within pass band			65	dB	
2-8	920 KHz beat		65	-55	dB	
2-9	Terminal leakage		47	54	dB μ	

3. RF MODULATOR VIDEO CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
3-1	Video in impedance	0.7	1.0	1.3	K Ω	0 ~ 4.2 MHz (unbalance) Video in : 1 Vp-p S/(V+S) 0.5 ~ 4.2 MHz (1 MHz base) Video in : 1 Vp-p, stair step chroma 20 IRE
3-2	Video modulation	70	77	84	%	
3-3	Sync ratio	27.5	28.5	29.0	%	
3-4	Video frequency characteristics	-2.5	0	2	dB	
3-5	DG		1	7	%	
3-6	DP		1	7	deg	
3-7	Video S/N ratio	45	48		dB	
3-8	Maximum modulation	87	93	99	%	

4. RF MODULATOR AUDIO CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
4-1	Audio in impedance	10			K Ω	50 Hz ~ 10 KHz (unbalance) Audio in : -6.5 dBs, 1 KHz (± 25 KHz deviation : 100 %) 50 Hz ~ 10 KHz (1 KHz base) Audio in : -6.5 dBs, 1 KHz Audio in : -6.5 dBs, 1 KHz Video in : 1 Vp-p, color bar
4-2	Modulation	64	80	96	%	
4-3	Audio frequency characteristics	-3	-0.5	3	dB	
4-4	Distortion		0.3	1	%	
4-5	Audio S/N ratio	48	60		dB	
4-6	Audio buzz	45	55		dB	
4-7	Maximum modulation	128	160	192	%	

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5. SW CIRCUITS CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
5-1	V. S. W. R.			4.5		ANT out (MOD. OFF) 54 ~ 810 MHz
5-2	Insertion loss			6	dB	ANT in - ANT out (MOD. OFF) 54 ~ 810 MHz
5-3	Separation	60	65		dB	ANT in - ANT out (MOD. ON) 60 ~ 72 MHz
5-4	ANT in terminal leakage voltage		0	9.5	dB μ	
5-5	2nd harmonics inter modulation	55	64		dB	
5-6	Cross modulation	55	62		dB	

6. RF MODULATOR THERMAL STABILITY CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
6-1	Video modulation	- 4		4	%	0 ~ 60 °C (25 °C standard)
6-2	Sound modulation	-10		10	%	
6-3	Picture carrier frequency	-80		80	KHz	
6-4	Sound carrier frequency	-12		12	KHz	
6-5	Video output level	-2		2	dB μ	
6-6	P/S ratio	-2.5		2.5	dB	

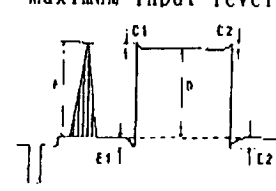
7. RF MODULATOR STABILITY

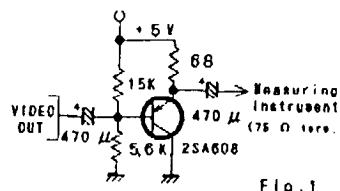
	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
7-1	Video carrier frequency rise up time	-50		50	KHz	at 3 sec rater
7-2	Audio carrier frequency rise up time	- 3		3	KHz	at 10 sec rater
7-3	Video carrier frequency shift by vcc drift	-10		10	KHz	MB \pm 0.3V shift
7-4	Audio carrier frequency shift by vcc drift	- 2		2	KHz	MB \pm 0.3V shift

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(I F SECTION)

8. IF OUT CHARACTERISTICS

	ITEMS		SPECIFICATION				MEASUREMENT TERMS
			MIN	TYP	MAX	UNIT	
8-1	Sensitivity	VHF		50	56	dB μ (open)	B. P. F (100 Hz ~ 4 MHz) Except sync. and chroma signal
		CATV, UHF		53	59		
8-2	Video S/N ratio	VHF	45	46		dB	Note : In case of item 1, 2, 5, 6, 7, 8 and 9, the following additional circuit is to be connected between video out terminal and the measuring instrument. See Fig. 1
		CATV, UHF	43	45			
8-3	Maximum input	VHF	100			dB μ (open)	
		CATV, UHF	100				
8-4	Video output level		0.8	1	1.2	Vp-p	
8-5	Sync ratio		26	28.6	30	%	Sync ratio 28.57 % standard
8-6	burst ratio		16	25	38	%	burst ratio 28.57 % standard
8-7	Video frequency characteristics						
		1 MHz	-1.5	0	1.5	dB	JIS C-6101 (500 KHz standard)
		2 MHz	-2	0	2		
		3 MHz	-3.5	-1	2.5		
		3.58 MHz	-4	1.5	2		
		4.2 MHz		12	6		
8-8	DP		-8	5	8	deg	10 steps staircase signal 87.5 % MOD. burst standard (Except 10th step)
8-9	DG		-8	5	8	%	As the above.
8-10	C/L delay		-100	0	100	nsec	Group delay 0.5 MHz versus 3.58 \pm 0.5 MHz
8-11	AGC flatness		-1	0	1	dB	Sensitivity level to maximum input level
8-12	Bar pulse response			5	13	%	C1/D C2/D E1/D E2/D
8-13	AGC speed		70	90	110	%	F/D 
			100	300	400	Hz	

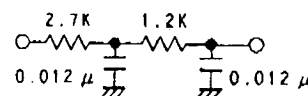


※ ANT in input level 79 dB μ (75 Ω OPEN) except 8-1, 8-3, 8-11, P/S=10 dB

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9. IF AUDIO OUT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
9-1	Audio output level	262	370	522	mVrms	400 Hz 100 % MOD. 47 KΩ load under the black burst.
9-2	Audio frequency characteristics					
	20 Hz	-3	0	3	dB	400 Hz 30 % MOD. Under the black burst.
	10 KHz	-6				
9-3	Audio distortion		0.5	2.0	%	1 KHz 100 % MOD. Under the black burst.
9-4	Audio S/N	48	50		dB	Black burst, 400 Hz, 60 % MOD.
9-5	Audio sensitivity					
	VHF		30	36	dBμ	S/N 30 dB
	CATV, UHF		30	40		
9-6	Buzz		10	50	mVp-p	Split color bar signal P/S
	H-Sweep			50		10 dB Video sweep 0.5 ~ 4 MHz
	V-Sweep			50		(Audio non MOD.)



10. AFT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
10-1	AFT center voltage	1.8	2.3	2.8	V	10 steps staircase at US 12 CH
10-2	AFT alignment accuracy	50		50	KHz	Alignment center : 2.5V
10-3	AFT output voltage			1.0	V	
	MIN V					
	MAX V	4.0				

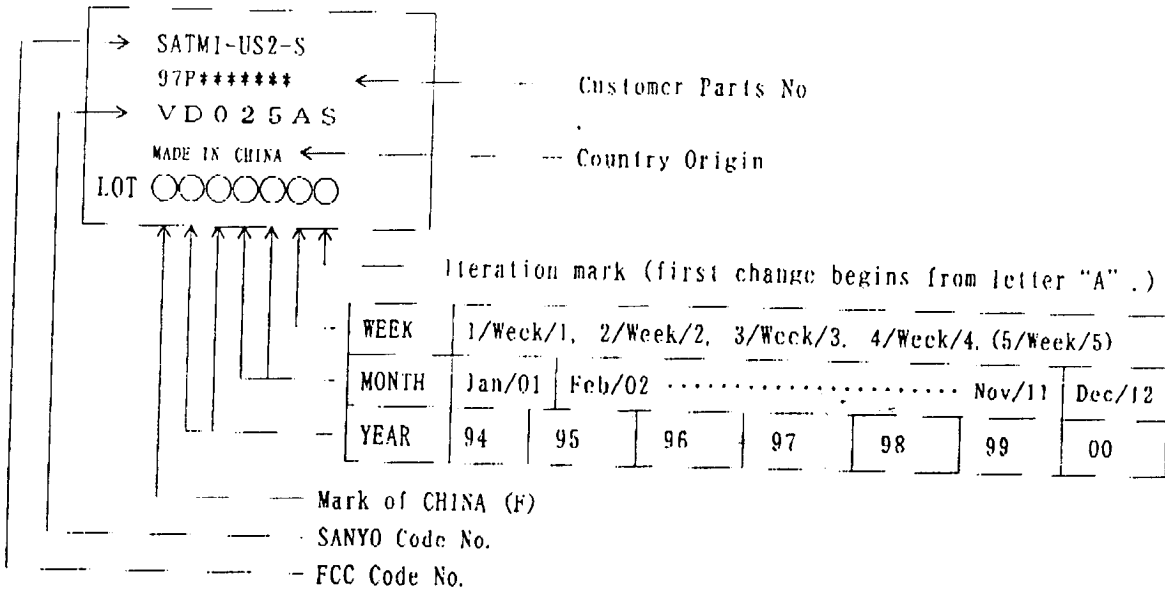
※ ANT is input level 79 dBμ (75 Ω open) except 9-5. P/S=10 dB

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1 1. IF THERMAL CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
11-1	Video output level	-10		10	%	Difference between the measurement value in the standard condition and the value measured in the temperature range of -5 °C to 60 °C
11-2	Burst ratio	-10		10	%	
11-3	Sync ratio	-10		10	%	
11-4	Video S/N	-3		3	dB	
11-5	Video sensitivity	-4		4	dB	
11-6	Audio output level	-2		2	dB	
11-7	Audio S/N	-3		3	dB	
11-8	Audio sensilivity	-4		4	dB	
11-9	AFT center voltage	-2		2	V	

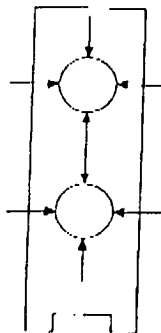
1 2. LABEL MARKINGS



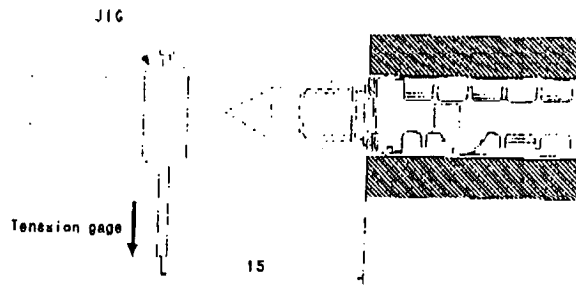
1 3. F CONNECTION STRENGTH

Inclination 3 degree MAX
Tensile 7 Kg X 5 times

F conn. strength (8 direction)



MEASUREMENT TERMS



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(TUNER SECTION)

14. TUNER CHARACTERISTICS

14-1 Tuning voltage range

VHF

0.5 ~ 30 V

UHF

0.5 ~ 30 V

Frequency synthesizer minimum voltage 0.5 V

14-2 Power gain

VHF

MIN 25 dB

UHF

MIN 24 dB

14-3 Noise figure

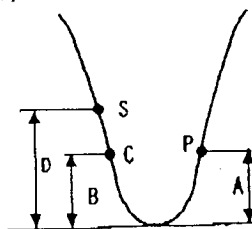
VHF

14 dB MAX

CATV, UHF

14 dB MAX

14-4 IF response (ANT-IF)



+B 5 at 11 CH

A : 0 ~ 2 dB

B : 0 ~ 5 dB

D : 2 ~ 7 dB

14-5 Power gain deviation between channels

VHF

12 dB MAX. TYP 6 dB

UHF

14 dB MAX. TYP 6 dB

14-6 AGC gain reduction

VHF

40 dB MIN

UHF

35 dB MIN

14-7 Image rejection ratio

CH 2 ~ 13

60(50) dB MIN

CH J ~ W+11

50(40) dB MIN

CH W+12 ~ 69

50(40) dB MIN

() ; AGC Range 0 ~ -30 dB

14-8 IF rejection ratio

CH 2 ~ B

50(45) dB MIN

CH C ~ W+11

60(50) dB MIN

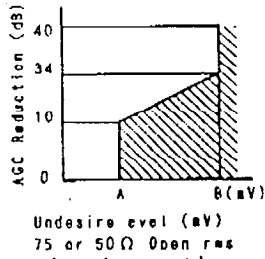
CH W+12 ~ 69

70(40) dB MIN

() ; AGC Range 0 ~ -30 dB

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14-9 1% cross modulation



VHF	A :	5 mV
	B :	70 mV
CATV	A :	3 mV
	B :	70 mV
UHF	A :	5 mV
	B :	50 mV

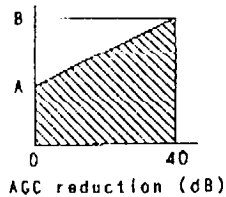
14-10 FM rejection ratio

CH 7 ~ 13
CH 5

60 dB MIN
40 dB MIN (*1)

*1. Des : 5 CH (77.25 MHz) 60 dBμ 75Ω open
Und : 89.1 MHz
s/i = 30 dB
Rej = s/i + (-D/U)

14-11 Input signal level at 10 % distortion



VHF	A :	3 mV
(75Ω open rms)	B :	300 mV
UHF	A :	3 mV
(50Ω open rms)	B :	300 mV

14-12 VHF, UHF rejection ratio

VHF
UHF

70 dB MIN
-50 dB MIN

14-13 1/2 IF harmonic rejection ratio

UHF

45 dB MIN

14-14 Inter modulation

VHF

50 dB MIN

14-15 Drift of oscillation frequency

By ± 1 % change of 4B voltage

VHF
UHF

±250 KHz MAX
±250 KHz MAX

By ± 25 °C change from 25 °C

CH 2 ~ 13
CH J ~ W+11
CH W+12 ~ G9

±1000 KHz MAX
±3000 KHz MAX
±3000 KHz MAX

14-16 Local oscillator voltage on the aerial input terminals

300 MHz MAX
300 ~ 1000 MHz
1000 ~ 1694 MHz

34 dBμ V MAX
50 dBμ V MAX
51.8 dBμ V MAX

USA CHANNEL FREQUENCY TABLE (181CH) P13

P I F = 45.75 MHz
 C I F = 42.17 MHz
 S I F = 41.25 MHz

UNIT: MHz

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
VHF Low	2	55.25	59.75	101
	3	61.25	65.75	107
	4	67.25	71.75	113
	5	77.25	81.75	123
	6	83.25	87.75	129
	A-6	85.25	89.75	131
	A-5	91.25	95.75	137
	A-4	97.25	101.75	143
	A-3	103.25	107.75	149
	A-2	109.25	113.75	155
	A-1	115.25	119.75	161
	A	121.25	125.75	167
	B	127.25	131.75	173
	VHF High	C	133.25	137.75
D		139.25	143.75	185
E		145.25	149.75	191
F		151.25	155.75	197
G		157.25	161.75	203
H		163.25	167.75	209
I		169.25	173.75	215
6		175.25	179.75	221
8		181.25	185.75	227
9		187.25	191.75	233
10		193.25	197.75	239
11		199.25	203.75	245
12		205.25	209.75	251
13		211.25	215.75	257
J		217.25	221.75	263
K		223.25	227.75	269
L		229.25	233.75	275
M		235.25	239.75	281
N		241.25	245.75	287
O		247.25	251.75	293
P		253.25	257.75	299
Q		259.25	263.75	305
R		265.25	269.75	311
S		271.25	275.75	317
T		277.25	281.75	323
U		283.25	287.75	329
V		289.25	293.75	335
W		295.25	299.75	341
W+1		301.25	305.75	347
W+2		307.25	311.75	353
W+3	313.25	317.75	359	
W+4	319.25	323.75	365	
W+5	325.25	329.75	371	
W+6	331.25	335.75	377	
W+7	337.25	341.75	383	
W+8	343.25	347.75	389	
W+9	349.25	353.75	395	
W+10	355.25	359.75	401	

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
UHF	W+11	361.25	365.75	407
	W+12	367.25	371.75	413
	W+13	373.25	377.75	419
	W+14	379.25	383.75	425
	W+15	385.25	389.75	431
	W+16	391.25	395.75	437
	W+17	397.25	401.75	443
	W+18	403.25	407.75	449
	W+19	409.25	413.75	455
	W+20	415.25	419.75	461
	W+21	421.25	425.75	467
	W+22	427.25	431.75	473
	W+23	433.25	437.75	479
	W+24	439.25	443.75	485
	W+25	445.25	449.75	491
	W+26	451.25	455.75	497
	W+27	457.25	461.75	503
	W+28	463.25	467.75	509
	W+29	469.25	473.75	515
	14	471.25	475.75	517
	15	477.25	481.75	523
	16	483.25	487.75	529
	17	489.25	493.75	535
	18	495.25	499.75	541
	19	501.25	505.75	547
	20	507.25	511.75	553
	21	513.25	517.75	559
	22	519.25	523.75	565
	23	525.25	529.75	571
	24	531.25	535.75	577
	25	537.25	541.75	583
	26	543.25	547.75	589
	27	549.25	553.75	595
	28	555.25	559.75	601
	29	561.25	565.75	607
	30	567.25	571.75	613
	31	573.25	577.75	619
	32	579.25	583.75	625
	33	585.25	589.75	631
	34	591.25	595.75	637
	35	597.25	601.75	643
	36	603.25	607.75	649
	37	609.25	613.75	655
	38	615.25	619.75	661
	39	621.25	625.75	667
40	627.25	631.75	673	
41	633.25	637.75	679	
42	639.25	643.75	685	
43	645.25	649.75	691	
44	651.25	655.75	697	
45	657.25	661.75	703	

USA CHANNEL FREQUENCY TABLE (181CH) P14

P IF=45.75MHz
 C IF=42.17MHz
 S IF=41.25MHz

UNIT: MHz

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
UHF	46	663.25	667.75	709
	47	669.25	673.75	715
	48	675.25	679.75	721
	49	681.25	685.75	727
	50	687.25	691.75	733
	51	693.25	697.75	739
	52	699.25	703.75	745
	53	705.25	709.75	751
	54	711.25	715.75	757
	55	717.25	721.75	763
	56	723.25	727.75	769
	57	729.25	733.75	775
	58	735.25	739.75	781
	59	741.25	745.75	787
	60	747.25	751.75	793
	61	753.25	757.75	799
	62	759.25	763.75	805
	63	765.25	769.75	811
	64	771.25	775.75	817
65	777.25	781.75	823	
66	783.25	787.75	829	
67	789.25	793.75	835	
68	795.25	799.75	841	
69	801.25	805.75	847	

US/NTSC TMI Semiconductor used

Model name: SATMI-US2-S

Part Number: 97P*****

Maker Model: 3AE4F1VD005AS

Section	Item	Location	Material
Mod Section	MOD IC	IC001	LA7161NM, LA7161V (SANYO), AN3117SA (MATSUSHITA), HA11560FP (HITACHI)
	SW TR	Q001, Q002	2SC4774 (ROHM), 2SC4265 (HITACHI)
TUNER Section	MOPLL IC	IC101	CXA3135AN, CXA3085AN, CXA3250AN, CXA3252AN (SONY),
	TR	Q101	3SK300 (HITACHI), 3SK223, 3SK235 (NEC), SMM4R01 (MATSUSHITA) BB304M, BB305M (HITACHI)
	TR	Q102	S594T (TELEFUNKEN), 3SK224 (NEC), SMM4R02 (MATSUSHITA), BB101M, BB501M (HITACHI)
	TR	Q103	2SC4081 (ROHM),
	Diode	D101, D102 D103, D104 D106, D107	MA2S357 (MATSUSHITA), 1T403M-20, 1T408M-20 (SONY), HVU363A (HITACHI), BB664 (SIEMENS)
		D113, D115 D117, D118 D119, D120	MA2S077 (MATSUSHITA), HVC277 (HITACHI), 1T403M-20 (SONY)
	D108, D109 D110, D111 D112,	HVC306A, HVC306B (HITACHI), 1T408 (SONY)	
	D116,	HVC202A9 (HITACHI), 1T402M-20 (SONY), BB555 (SIEMENS)	
VIF Section	VIF IC	IC301	LA75675M, LA7567NM, LA7567BM, LA75505 (SANYO), M52342AFP, M52766FP, M52767FP (MITSUBISHI)
	SAW Filter	XF301	M1864M, M1866M, M1867M (SIEMENS), TSF5221P, TSF5232P (SANYO)
	CERAMIC Filter	XF302	SFSH4. 5MDB, SFSH4. 5MNEB2, SFSH4. 5MC, SFSR4. 5MC (MURATA), EFCS4R5YS5 (MATSUSHITA)
	CERAMIC Trap	XF303	TPS4. 5MB2, TPSR4. 5MB2, TPS4. 5MC (MURATA), EFCS4R5MW5C, EFCS4R5MW5 (MATSUSHITA)

SANYO Tuner Industries Co., Ltd.