SGS-THOMSON MICROELECTRONICS

STV5728

4-HEAD VIDEO AND 2-HEADS HIFI AUDIO PLAYBACK AND RECORD AMPLIFIER FOR VCR

- ONE 5V POWER SUPPLY
- PLAYBACK/RECORD MODE SELECTION THROUGH A LOGIC INPUT
- PINNING COMPATIBLE WITH STV5725 AND STV5727
- SO28 PACKAGE

PLAYBACK MODE

- LOW NOISE AND WIDE BAND AMPLIFIERS FOR 4 VIDEO HEADS
- AUTOMATIC OFFSET CANCELLATION BETWEEN THE 2 SELECTED HEADS
- ONE PLAYBACK OUTPUT WITH AGC
- ONE PLAYBACK OUTPUT (60dB CONSTANT GAIN)
- ONE OUTPUT FOR AUTOMATIC VIDEO TRACKING
- SP/LP ENVELOPE COMPARATOR OUTPUT
- LOW NOISE AMPLIFIERS FOR 2 HIFI HEADS
- HIFI OUTPUT GAIN (70dB)

RECORD MODE

- TRANSCONDUCTANCE AMPLIFIER FOR VIDEO
- AGC AMPLIFIER FOR HIFI

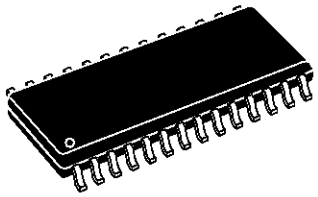
DESCRIPTION

STV5728 is intended for 4 heads VCR applications with HIFI. It includes all the electrical functions necessary to achieve play-back and record processing.

Record or Playback Mode can be selected through SWR Pin. SWH allows to select the video head input (H1SP or H2SP, H1LP or H2LP), while SWM will select the mode SP or LP. The SWFMH will select the FM input heads in Playback and will mute the HIFI record amplifier in Record Mode.

Playback Mode (Video)

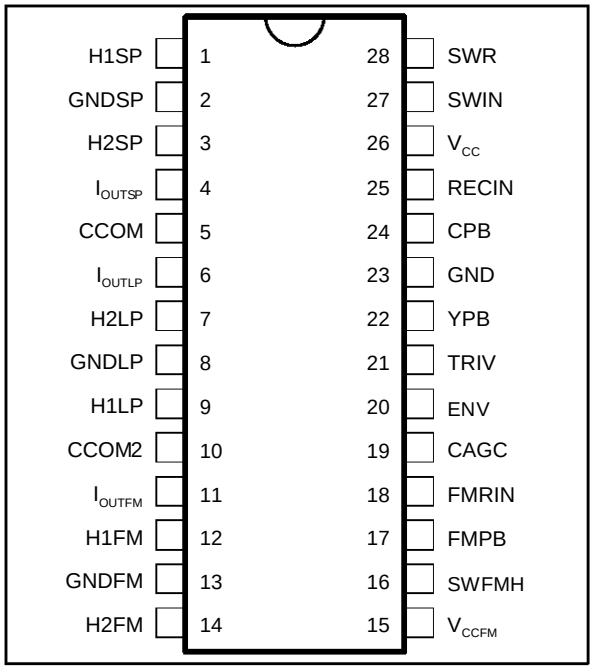
Signals applied on H1SP, H2SP, H1LP and H2LP input pins will be amplified by 60dB voltage gain. I_{OUTSP} and I_{OUTLP} Pins are AC short-circuited to ground. The input signal can be selected through SWH and SWM inputs and the corresponding output signal will be available on Pin CPB. The offset voltage between the two selected heads is automatically cancelled after 32 switching head cycles. A constant output signal will be available on Pin YPB thanks to an AGC function (Automatic Gain Control). The time constant of the AGC is determined by the capacitor value connected to CAGC Pin. For Automatic Tracking, a signal which is a function of the selected input signal amplitude is present on Pin TRIV. For Trick Mode, a signal resulting from the comparison of the input signal amplitude is available on ENVC Pin.



SO28
(Plastic Package)

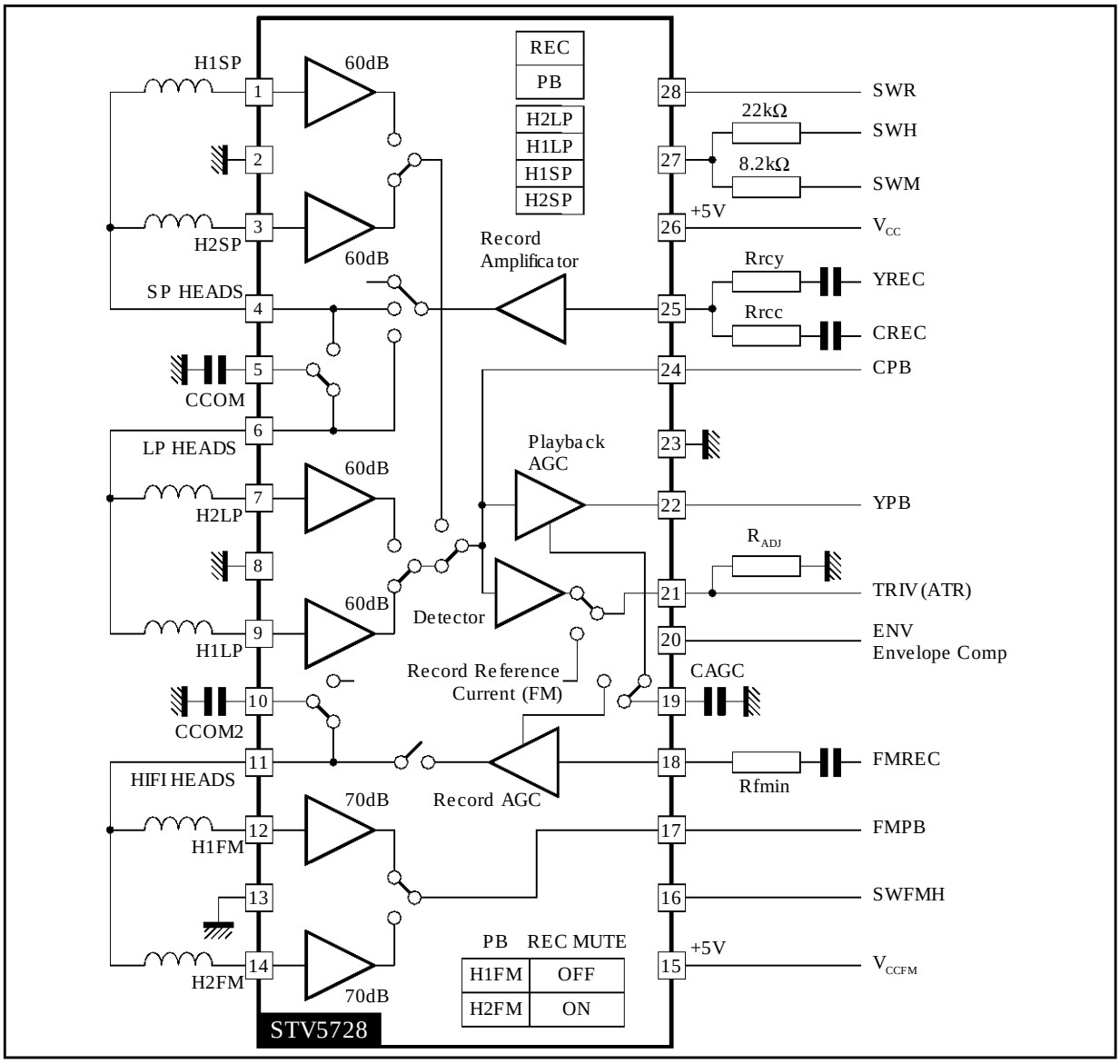
ORDER CODE : STV5728

PIN CONNECTIONS



5728-01.EPS

BLOCK DIAGRAM



5728-02.EPS

FUNCTIONAL DESCRIPTION

Record Mode (Video)

The current input applied on RECIN Pin is amplified through a transconductance amplifier. Special care has been taken to speed up commutation from Playback to Record and from Record to Playback, avoiding spikes through the loads (the rotary transformers). The recording current level in LP mode is 0.9 time the value of SP one.

Playback Mode (FM HIFI)

Signals applied on H1FM and H2FM input Pins will be amplified by 70dB voltage gain. I_{OUTFM} Pin is AC short-circuited to ground by CCOM1. The input signal can be selected through SWFMH input and the corresponding output signal will be available on Pin FMPB.

Record Mode (HIFI)

The current input applied on FMRIN Pin is amplified through an Automatic Gain Control amplifier. The recording level can be adjusted thanks to the R_{ADJ} resistance connected to TRIV Pin. Special care has been taken to speed up commutation from Playback to Record and from Record to Playback, avoiding spikes through the loads (the rotary transformers).

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltage	6	V
T_j	Junction Temperature	150	°C
T_{oper}	Operating Temperature	0, +70	°C

5728-01.TBL

THERMAL DATA

Symbol	Parameter		Value	Unit
$R_{th\ (j-a)}$	Junction-ambient Thermal Resistance (IC solded on the PC board)	Max.	75	°C/W

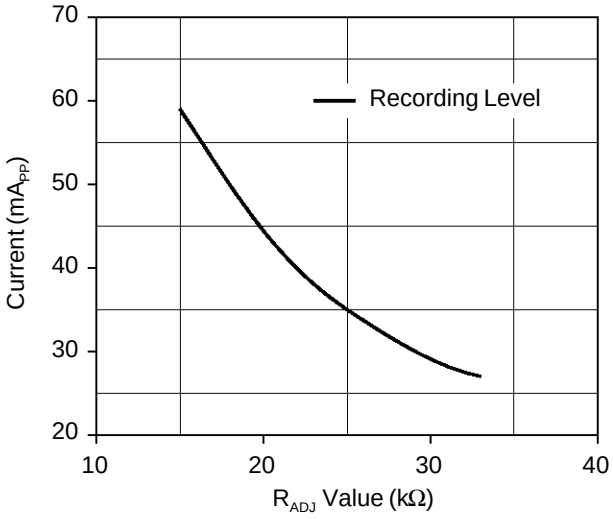
5728-02.TBL

RECOMMENDED OPERATING CHARACTERISTICS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Power Supply	4.75	5	5.25	V
V_{CCFM}	FM HIFI Power Supply	4.75	5	5.25	V
CAGC	AGC Time Constant	4.7	22		nF
CCOM	Decoupling Capacitor	4.7	470		nF
CCOM1	Decoupling Capacitor	4.7	470		nF
R_{ADJ}	Record Current Adjustment Resistor	15	22	33	kΩ

5728-03.TBL

Figure 1 : FM Record Current Amplifier ; Record Current Adjustment Curve



5728-03.EPS

A certain ratio must be kept between R_{ADJ} and R_{FMIN} to insure maximum performances with an average FM recording input voltage around 170mV$_{PP}$. Some examples are given in the following tables. If the average input voltage is higher (or lower), the R_{FMRIN} value must be increased (decreased) proportionnaly.

SET-UP	R_{ADJ}	R_{FMRIN}
(1)	15kΩ	1kΩ
(2)	22kΩ	1.5kΩ
(3)	33kΩ	2kΩ

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, unless otherwise specified)

Playback Mode

V_{CC} = 5V, no load on YPB and CPB Pins, R_{ADJ} = 22kΩ, after 32 SWH (SWitching Head) cycles.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
PLAYBACK AMPLIFIER						
I_{CC1}	Supply Current		40	48	53	mA
GPB	Playback Gain	Sinewave 600kHz, 0.4mV$_{PP}$ on inputs	58	60	62	dB
EN	Equivalent Voltage Noise	Input grounded via I_{OUT} Pin @ 600kHz, BW = 10kHz	0.5	0.6	0.7	$\frac{nV}{\sqrt{Hz}}$
IN	Equivalent Input Current	Input open @ 6MHz, BW = 10kHz	1.4	2	2.6	$\frac{pA}{\sqrt{Hz}}$
CRT1	Crosstalk Between SP Channels (or LP Channels)	Sinewave @ 4MHz, 0.4mV$_{PP}$		-41	-39	dB
CRT2	Crosstalk	Sinewave @ 600kHz, 0.4mV$_{PP}$		-50		dB
CRT3	Crosstalk Between SP1 and LP2 Channels (or SP2 to LP1 Channels)	Sinewave @ 6MHz, 0.4mV$_{PP}$		-60	-50	dB
RPBSW	Playback Switch on Resistor	@ 6MHz	0.8	2.5	18	Ω
BWLCF	Attenuation @ 100kHz	Reference level @ 600kHz	-1	0	1	dB
BWHCF	Attenuation @ 8MHz	Reference level @ 4MHz	-3	1	0	dB
C_{IN}	Input Capacitance	@ 6MHz	22	27	32	pF
R_{IN}	Input Resistance	@ 6MHz	500	730	950	Ω
ZCPB	Output Resistance	DC	5	14	50	Ω
VDCPB1	DC Level on Pin CPB		1.35	1.75	2.15	V
DVDC	Head Switch Offset		-200	0	200	mV
SHPB1	2nd Harmonic	Sinuswave @ 4MHz, 0.4mV$_{PP}$		-43	-37	dB
PLAYBACK AGC FUNCTION						
ZYPB	Output Impedance @ YPB		5	14	50	Ω
VDCPB2	DC Level @ YPB		1.15	1.45	1.85	V
BWLCF2	Attenuation @ 100kHz	Reference @ 4MHz, PB AGC locked	-1	0	1	dB
BWHCF2	Attenuation @ 8MHz	Reference @ 4MHz, PB AGC locked	-3	-1	1	dB
VLPB	Output Amplitude	Sinuswave @ 4MHz, 0.4mV$_{PP}$ on input	160	200	250	mV$_{PP}$
SHPB2	Second Harmonic	Sinuswave @ 4MHz, 0.4mV$_{PP}$ on input		-44	-40	dB
IPB+	CAGC Sink Current		50	100	150	µA
IPB-	CAGC Source Current		-150	-100	-50	µA
DVLP	AGC Sensitivity	Sinuswave @ 4MHz, 0.2mV$_{PP}$ on input, -5dB and +6dB	-1	0	1	dB
TRIV FUNCTION						
VTRIV0	Output Level (1)	SP mode, V_{cpb} = 0mV$_{PP}$ @ 4MHz	0.05	0.28	0.7	V
VTRIV4	Output Level (4)	LP mode, V_{cpb} = 600mV$_{PP}$ @ 4MHz		4.1		V
VTRIV5	Output Level (5)	SP mode, V_{cpb} = 100mV$_{PP}$ @ 4MHz		1.33		V
VTRIV6	Output Level (6)	SP mode, V_{cpb} = 200mV$_{PP}$ @ 4MHz		2.27		V
VTRIV7	Output Level (7)	LP mode, V_{cpb} = 100mV$_{PP}$ @ 4MHz	1.4	1.8	2.2	V
VTRIV8	Output Level (8)	LP mode, V_{cpb} = 200mV$_{PP}$ @ 4MHz		3.11		V
VTRIV9	Output Level (9)	SP mode, V_{cpb} = 300mV$_{PP}$ @ 4MHz		2.95		V
VTRIV10	Output Level (10)	SP mode, V_{cpb} = 600mV$_{PP}$ @ 4MHz		3.85		V
FTRIV1	Response Lower Frequency, Attenuation @ 1MHz	Reference : SP mode, V_{cpb} = 100mV$_{PP}$ @ 4MHz		-6		dB
FTRIV2	Response Higher Frequency, Attenuation @ 8MHz	Reference : SP mode, V_{cpb} = 100mV$_{PP}$ @ 4MHz		-1		dB

5728-04.TBL

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, unless otherwise specified) (continued)
Playback Mode (continued)
V_{CC} = 5V, no load on YPB and CPB Pins, R_{ADJ} = 22kΩ

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
SP/LP ENVELOPE DETECTOR						
R_{OH}	Output Resistance @ ENVC	Sinewave 600µV_{PP} @ 4 MHz on H2SP	0.65	1.6	2.8	kΩ
R_{OL}	Output Resistance @ ENVC	Sinewave 600µV_{PP} @ 4 MHz on H1LP	0.65	1.6	2.8	kΩ
VENVCH	Output Level		4		5	V
VENVCL	Output Level		0		1	V
SENS1	Sensibility	100µV_{PP} to 600µV_{PP} @ LP input pins			1	V
SENS2	Sensibility	100µV_{PP} to 600µV_{PP} @ SP input pins	4			V
PLAYBACK AMPLIFIER (HIFI)						
I_{CCFM1}	Supply Current		24	28	32	mA
GPBFM	Playback Gain	Sinewave 1.6MHz, 0.2mV_{PP} on inputs	66	70	74	dB
ENFM	Equivalent Voltage Noise	Input grounded via I_{OUT} Pin @ 600kHz, BW = 10kHz	0.4	0.5	0.6	$\frac{nV}{\sqrt{Hz}}$
INFM	Equivalent Input Current	Input open @ 1.6MHz, BW = 10kHz	2.4	3.5	5	$\frac{pA}{\sqrt{Hz}}$
CRTFM1	Crosstalk	Sinewave @ 1.6MHz, 0.2mV_{PP}		-45	-40	dB
RPBFMSW	Playback Switch on Resistor	@ 6MHz	1.1	2.4	5	Ω
BWFMLCF	Attenuation @ 1MHz	Reference level @ 1.6MHz	-1	0	1	dB
BWFMHCF	Attenuation @ 2MHz	Reference level @ 1.6MHz	-1	0	1	dB
C_{INFM}	Input Capacitance	@ 1.6MHz		35		pF
R_{INFM}	Input Resistance	@ 1.6MHz	100	550	1000	Ω
ZCPBFM	Output Resistance	DC	5	24	50	Ω
VDCPBFM	DC Level on Pin YFMPB		1.4	1.8	2.5	V
DVDCFM	Head Switch Offset		-200	0	200	mV
SHPBFM1	2nd Harmonic	Sinuswave @ 1.6MHz, 0.2mV_{PP}		-45	-40	dB
VMAXFM	Maximum Output Voltage	Sinuswave @ 1.6MHz, 2nd harmonic < -35dB	2			V_{PP}

5728-05.TBL

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, unless otherwise specified) (continued)

Record Mode

V_{CC} = 5V, V_{CCFM} = 5V, R_{ADJ} = 22kΩ, SWR = 5V, CCOM = 470nF, CCOM1 = 470nF, RRCY = 2.2kΩ, RRCC = 8.2kΩ, RFMIN = 1.5kΩ, SWFMH = 5V, SWM = 0V (SP Mode).
Load 10µH//1kΩ for each simulated head.
Damping network of 1nF/620Ω connected between each record output and Ground.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
RECORD AMPLIFIER (Video)						
I_{CC2}	Current Supply		60	74	86	mA
IHA0	DC Current through I_{OUTSP} or I_{OUTLP}		27	42	54	mA
IHA2	2nd Harmonic	VRCY = 300mV$_{PP}$ @ 4MHz		-49	-40	dB
IMAX	Maximum Current	@ 4MHz, 2nd harmonic < 35dB	35			mA$_{PP}$
BWRECL	Attenuation at 100kHz	Reference level @ 600kHz	-1	0	1	dB
BWRECH	Attenuation at 8MHz	Reference level @ 4MHz	-2	0	1	dB
TRSP	Transconductance SP	V_{IN} = 300mV$_{PP}$ @ 4MHz	66	70	74	mA/V
TRLP	Transconductance LP	V_{IN} = 300mV$_{PP}$ @ 4MHz, SWM = 5V	60	64	68	mA/V
RSAT	Output Stage Resistance	@ 4MHz	5	11	20	Ω
TRR	Transconductance Ratio	TRSP / TRLP	0.8	1	1.2	dB
RIOUT	Impedance on I_{OUTSP} (I_{OUTLP})	ΔV = 1V	40	100	300	kΩ
VTRIVR	Voltage on TRIV Pin		2	2.4	2.8	V
RECORD AMPLIFIER (FM HIFI)						
I_{CCFM2}	Current Supply		48	76	104	mA
IHFM0	DC Current through I_{OUT}		26	49	72	mA
IHFM1	Fundamental	VFMREC = 170mV$_{PP}$ @ 1.6MHz	32	37	42	mA$_{PP}$
IHFM2	2nd Harmonic	VRCY = 170mV$_{PP}$ @ 1.6MHz	-52	-46	-40	dB
BWRECL	Attenuation at 1MHz	Reference level @ 1.6MHz, AGC locked	-1	0	1	dB
BWFMRH	Attenuation at 2MHz	Reference level @ 1.6MHz, AGC locked	-1	0	1	dB
DVLRFM	record AGC Sensibility	V_{IN} = 170mV$_{PP}$ ±3dB @ 1.6MHz	-1	0	1	dB
RSATFM	Output Stage Resistance	I = 10mA	7	15	50	Ω
ATT1	mute	V_{IN} = 300mV$_{PP}$ @ F = 4MHz	40	60		dB
RIOUTFM	Impedance on I_{OUTFM}	ΔV = 1V	6	36	72	kΩ
IREC+	CAGC Sink Current		50	100	150	µA
IREC-	CAGC Source Current		-150	-100	-50	µA

5728-06.TBL

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, unless otherwise specified) (continued)

Record Mode (continued)

V_{CC} = 5V, V_{CCFM} = 5V, R_{ADJ} = 22kΩ, SWR = 5V, CCOM = 470nF, CCOM1 = 470nF, RRCY = 2.2kΩ, RRCC = 8.2kΩ, RFMIN = 1.5kΩ, SWFMH = 5V, SWM = 0V (SP Mode).

Load 10µH//1kΩ for each simulated head.

Damping network of 1nF/620Ω connected between each record output and Ground.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
SWITCHING LEVELS (Video)						
VSWIN1	SWIN Input Threshold	Selects head H2SP	0		0.4	V
VSWIN2	SWIN Input Threshold	Selects head H1SP	1		2.2	V
VSWIN3	SWIN Input Threshold	Selects head H1LP	2.8		4	V
VSWIN4	SWIN Input Threshold	Selects head H2LP	4.6		5	V
ISWIN1	VSWIN = 0V	Input current	-1	-0.5	-0.1	µA
ISWIN2	VSWIN = 1.5V	Input current	0.1	0.4	2	µA
ISWIN3	VSWIN = 3.5V	Input current	0.1	0.4	2	µA
ISWIN4	VSWIN = 5V	Input current	0.1	0.5	2	µA
VSWRH	SWR Input Threshold	Selects record mode	3.5		5	V
VSWRL	SWR Input Threshold	Selects playback mode	0		1.5	V
ISWRH	VSWR = 5V	Input current	0	0.1	5	µA
ISWRL	VSWR = 0V	Input current	-10	-5	-0.5	µA
T_{ON}	Switching Delay	Signal appears on CPB			500	ns
T1	Delay from Playback to Record : Signal Disappears on Pin CPB			1		µs
T2	Delay from Record to Playback : Signal Appears on Pin CPB			800		µs
T3	Delay from Playback to Record : Signal Appears on Pin I_{OUTSP} or I_{OUTLP}			20		µs
T4	Delay from Record to Playback : Signal Disappears on Pin I_{OUTSP} or I_{OUTLP}			1		µs
SWITCHING LEVELS (Video)						
VFMH	SWFMH Input Threshold		3.5		5	V
VFML	SWFMH Input Threshold		0		1.5	V
T_{ONFM}	Switching Delay	Signal appears on FMPB			500	ns
T1FM	Delay from Playback to Record : Signal Disappears on Pin FMPB		0		5	µs
T2FM	Delay from Record to Playback : Signal Appears on Pin FMPB			400		µs
T3FM	Delay from Playback to Record : Signal Appears on Pin I_{OUTFM}			20		µs
T4FM	Delay from Record to Playback : Signal Disappears on Pin I_{OUTFM}			1		µs
ISWFMHH	VSWFMR = 5V	Input current	0	0.1	5	µA
ISWFMHL	VSWFMH = 0V	Input current	-10	-5	-0.5	µA

5728-07.TBL

INPUTS/OUTPUTS EQUIVALENT INTERNAL DIAGRAMS

Figure 1

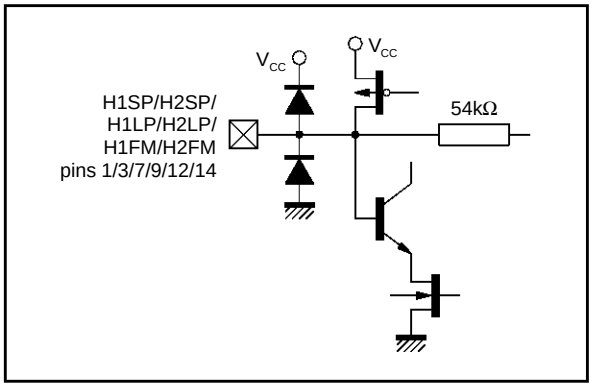


Figure 2

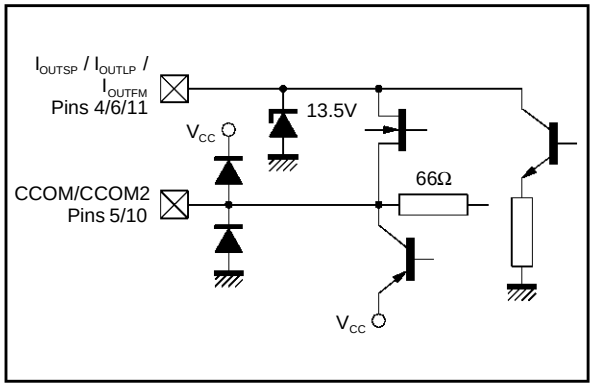


Figure 3

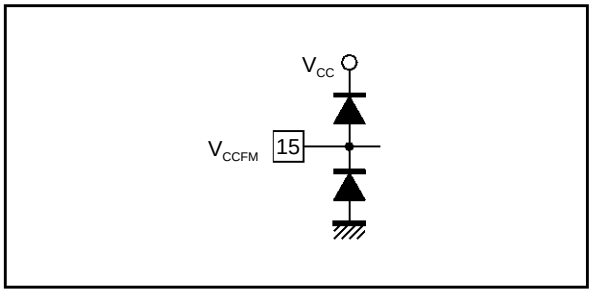


Figure 4

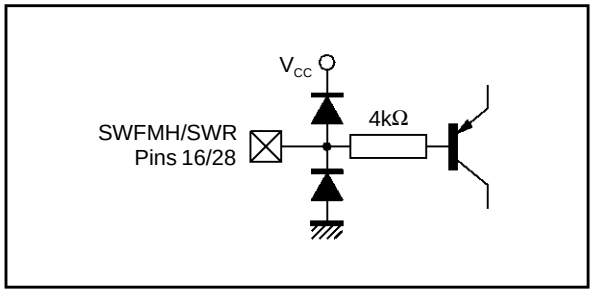


Figure 5

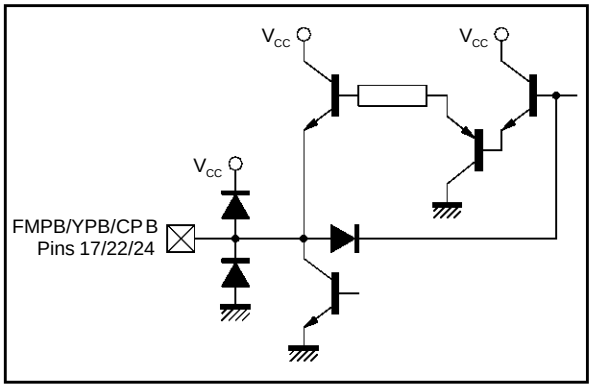
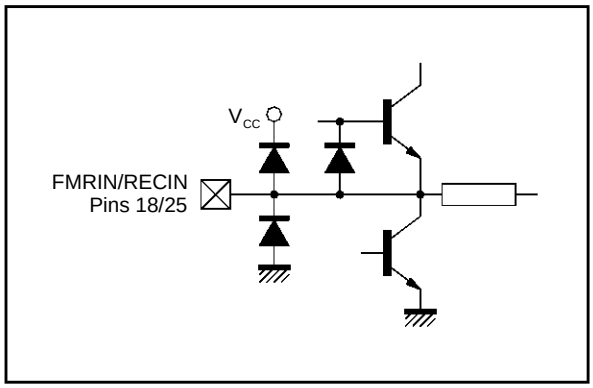


Figure 6



INPUTS/OUTPUTS EQUIVALENT INTERNAL DIAGRAMS (continued)

Figure 7

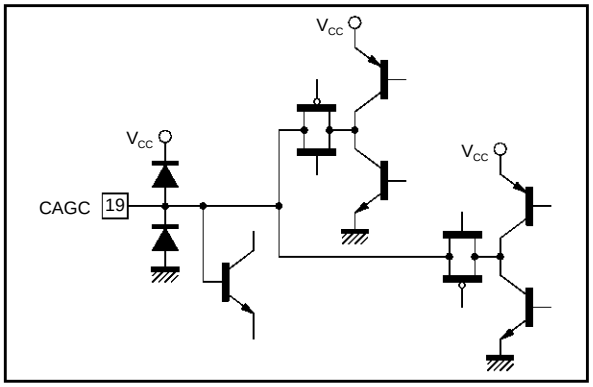


Figure 8

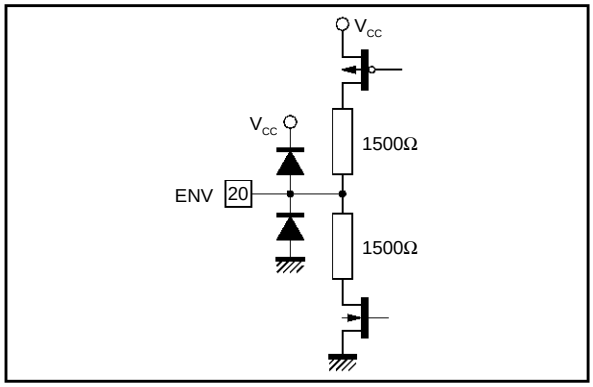


Figure 9

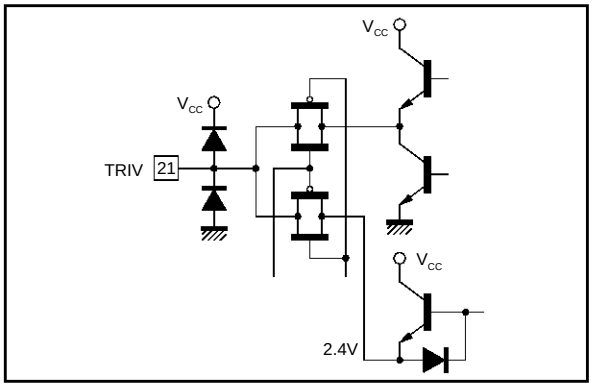
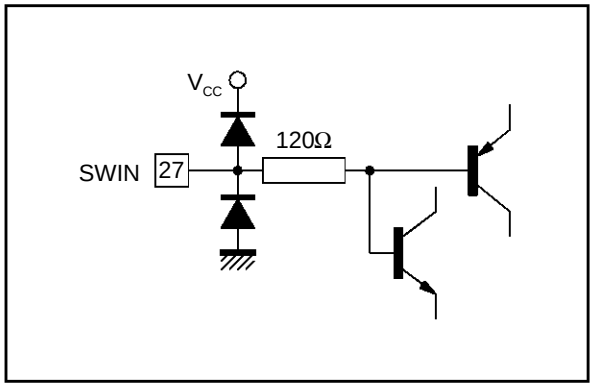
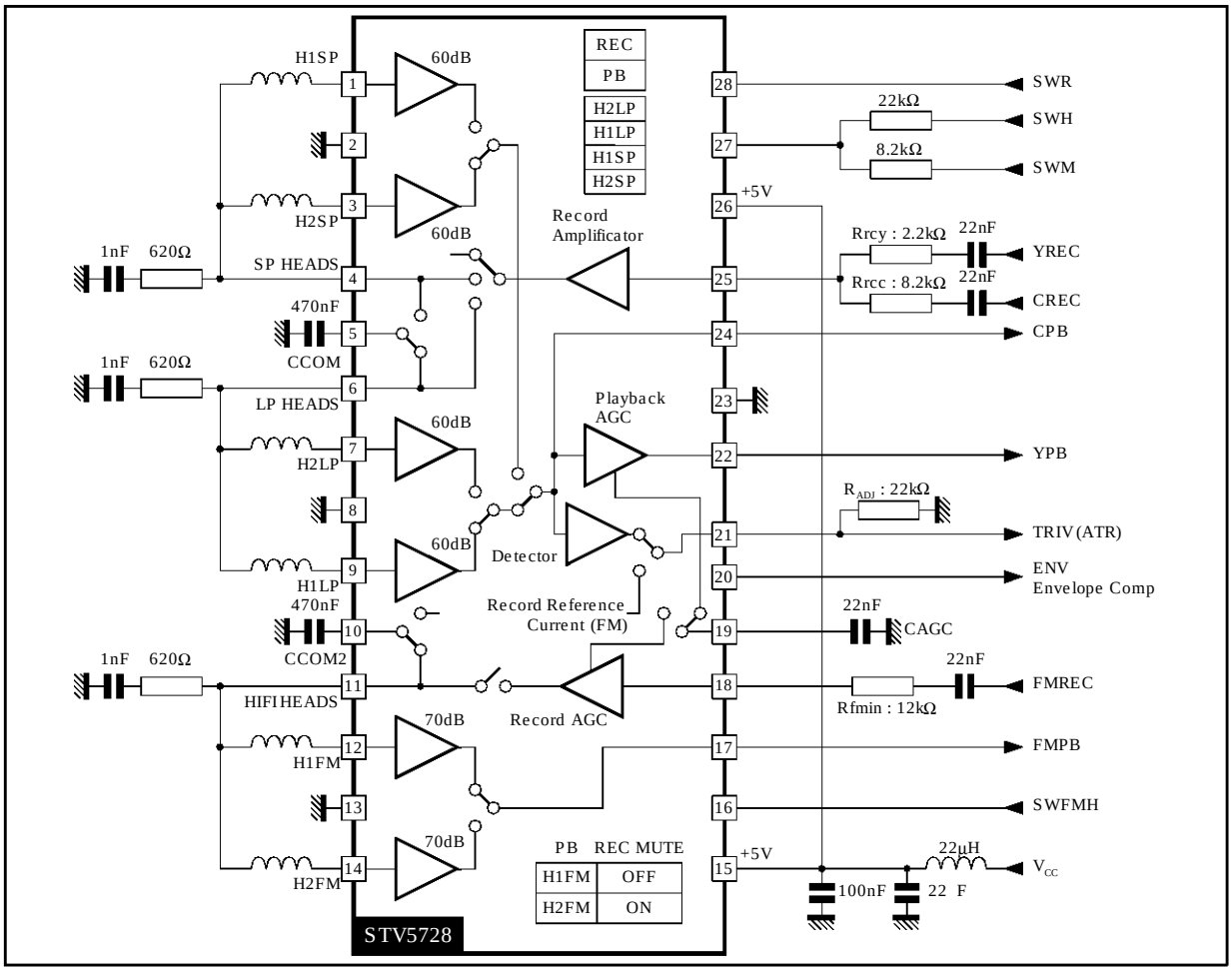


Figure 10



TYPICAL APPLICATION



SWITCH TABLE (Video)

SWR	SWM	SWH	Channel	ENVC
L (PB)	L	L	H2SP	HIGH if LP < SP
		H	H1SP	
	H	L	H1LP	LOW if LP > SP
		H	H2LP	
H (REC)	L	L	SP	
		H		
	H	L	LP	
		H		

5728-08.TBL

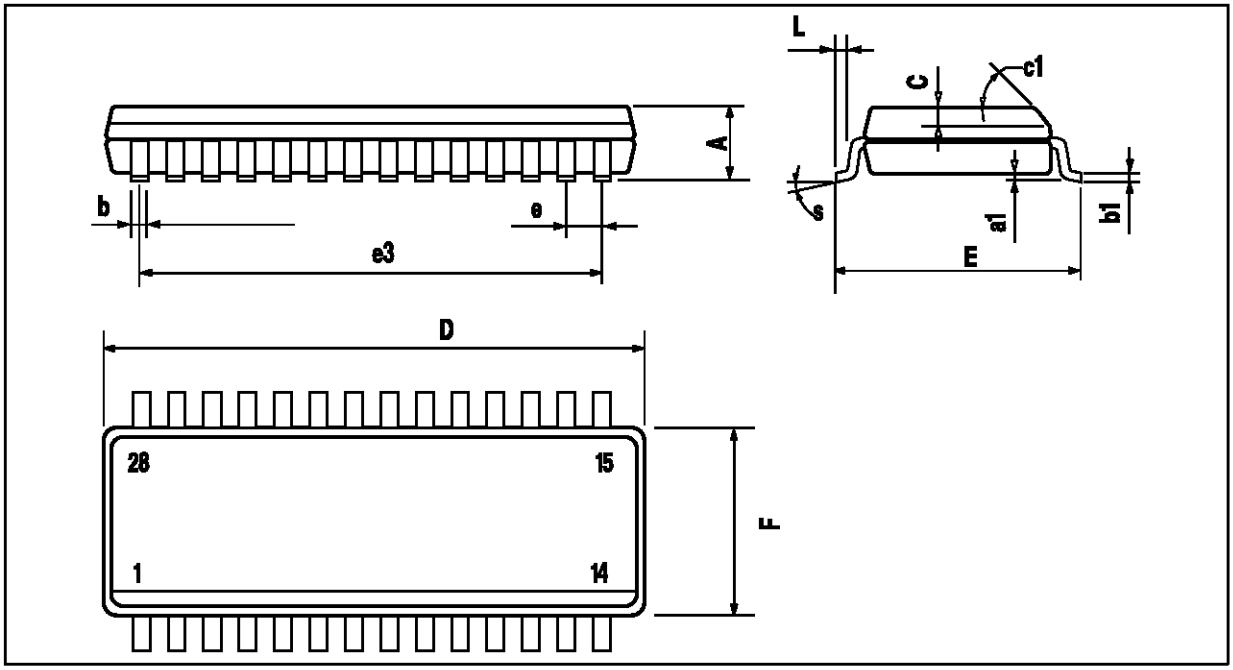
SWITCH TABLE (FM HIFI)

SWR	SWFMH	Channel	Record Mute
L	L	H2FM	
	H	H1FM	
H	L		ON
	H		OFF

5728-09.TBL

PACKAGE MECHANICAL DATA

28 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO28.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			2.65			0.104
a1	0.1		0.2	0.004		0.0078
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1	45° (Typ.)					
D	17.7		18.1	0.697		0.713
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		16.51			0.65	
F	7.4		7.6	0.291		0.299
L	0.4		1.27	0.016		0.050
S	8° (Max.)					

SO28C.TBL