SGS-THOMSON MICROELECTRONICS

TEA5704

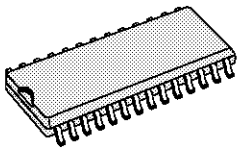
ADVANCED 4-HEAD PLAY-BACK AND RECORD AMPLIFIER FOR VCR

PLAY-BACK MODE

- LOW NOISE AND WIDE BAND AMPLIFIERS FOR 4 HEADS
- AUTOMATIC OFFSET CANCELLATION BETWEEN THE 2 SELECTED HEADS
- ONE PLAY-BACK OUTPUT WITHOUT AGC
- TWO PLAY-BACK OUTPUTS INCLUDING AGC (PHASE AND OPPOSITE PHASE)
- RECORD AMPLIFIER INHIBITION AND RECORD OUTPUT GROUNDED
- OUTPUT FOR TRACKING VIDEO INFORMATION (TRIV)
- SHORT PLAY/LONG PLAY ENVELOPE COMPARATOR

RECORD MODE

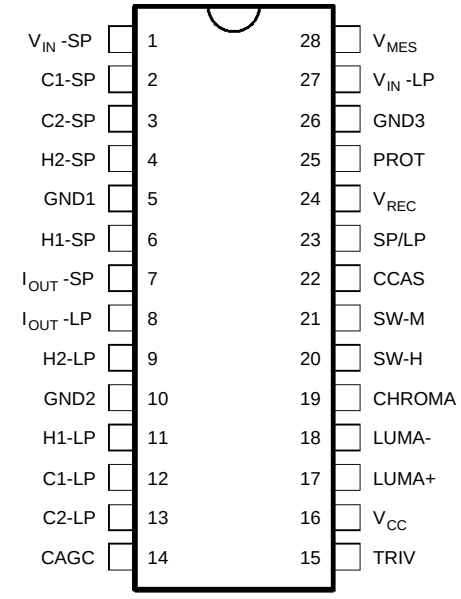
- TWO INTEGRATED I/I CONVERTERS WITH ACCURATE CONTROL OF TRANSCONDUCTANCE
- AUTOMATIC PLAY-BACK/RECORD SWITCHING BY SCANNING OF RECORD SUPPLY
- PLAY-BACK LOOP INHIBITION
- RECORD AMPLIFIERS WITH AUTOMATIC PROTECTION AGAINST SHORT CIRCUIT



SO28 LARGE
(Plastic Micropackage)

ORDER CODE : TEA5704

PIN CONNECTIONS

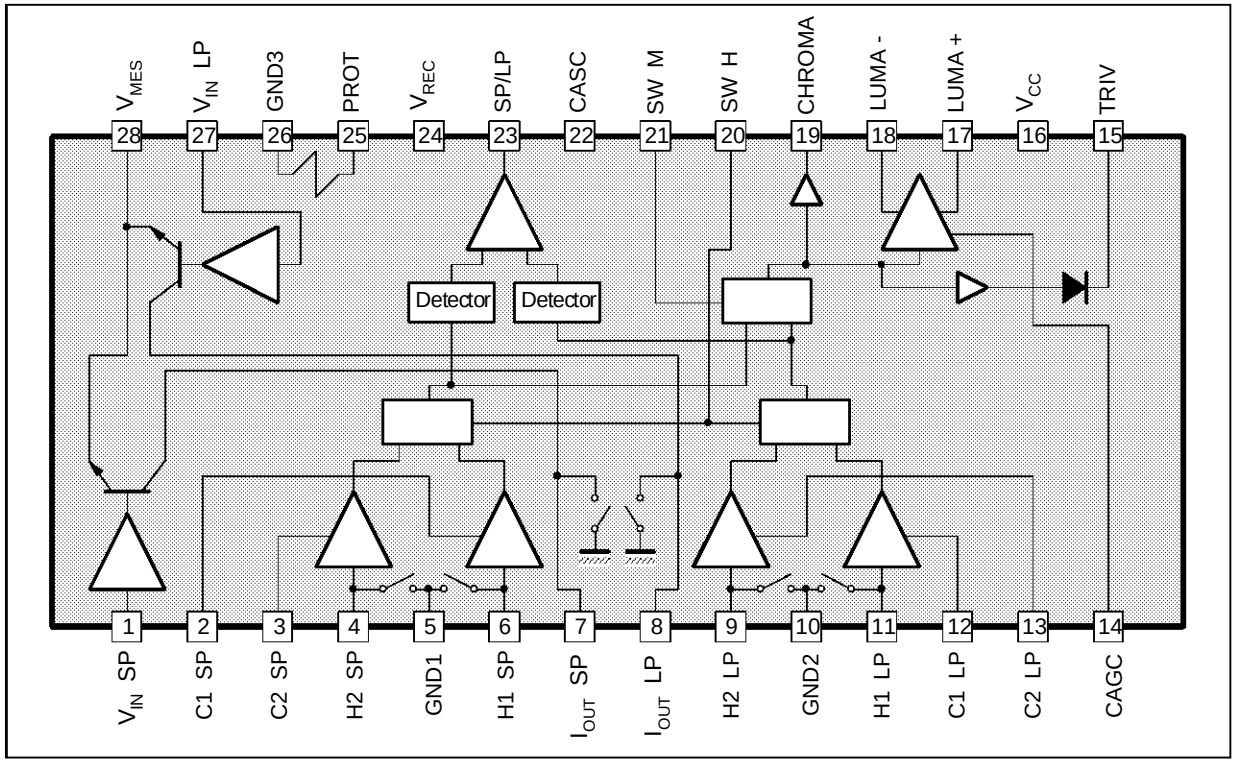


5704-01.EPS

DESCRIPTION

The TEA5704 is an advanced four head record and play-back amplifier for VCR.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

TEA5704 is intended for 4 heads VCR applications. It includes all the electrical functions necessary to achieve play-back and record processing for VHS and S-VHS applications (10MHz bandwidth).

High performance technology allows very low noise levels (current and voltage), which are frequency dependant in all the frequency range. In play-back mode a special feature suppresses the DC offset when switching two channels. Optimized play-back output stage gives to the TEA5704 large capability to drive directly a coaxial cable in order to reduce number of external components.

Three play-back outputs are availabe : one, dedicated to Chroma processing, is a 60dB voltage amplifier output, the two others, dedicated to Luma processing, are phase opposite signals with a constant AC output level of 200mV_{PP} at 3.8MHz signal.

A tracking information for video signal (TRIV) is Luma amplitude proportional and allows automatic phase correction.

An automatic scanning of record supply voltage permits TEA5704 automatically switching either in play-back or in record mode. The switching threshold voltage is fixed to a value which forbids high current peaking through the heads.

During play-back mode, record output is grounded via an internal transistor and during record mode preamplifiers are turned off.

There is one output current for two recording heads, the DC current and the AC characteristics can be very precisely controlled with accurate external resistors. If recommended resistances are used, a $\pm$ 5% transconductance accuracy is guaranteed.

Feedback loop gains of SP channel and LP channel can be different.

The recording amplifiers include a protection system which protexts the IC and the application board against overheating in case of short circuit on the recording transconductance components.

A particular feature is the SP/LP envelope comparator and detector. This system can be used in search mode, still mode, slow mode... The output signal is an output current feeding a capacitor. When the input signals are too low, the output is forced high (corresponding to SP Signal amplitude greater than the LP one) by an hysteresys comparator. This output is high in record mode.

TEA5704 is fully protected against ESD.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltage	6	V
V_{REC}	Power Supply Voltage Record	15	V
T_J	Junction Temperature	+150	^oC

5704-01.TBL

THERMAL DATA

Symbol	Parameter		Value	Unit
$R_{th\ (j-a)}$	Junction-ambient Thermal Resistance	Typ.	70	$^oC/W$

5704-02.TBL

ELECTRICAL OPERATING CHARACTERISTICS ($T_A = 25^oC$ unless otherwise specified)

Power Consumption

Parameter		Play-Back		Record (1)	
		Typ.	Max.	Typ.	Max.
V_{CC}		60mA	75mA	40mA	55mA
V_{REC}		0mA	0mA	45mA	55mA
Total Consumption (2)	V_{CC} = 5V, V_{REC} = 9V	300mW		600mW	
	V_{CC} = 5.25V, V_{REC} = 9.45V		375mW		750mW

5704-03.TBL

Notes : 1. R1 = 5.6Ω
2. Taking in account only the consumption through the IC.
A great care should be taken to the maximum power consumption : V_{REC} can be increased to 12.6V if the DC current flowing through the head is reduced. This can be done by increasing R1 value. V_{REC} can be reduced as long as voltage on Pins

Play-back Mode (V_{CC} = 5V, no load on Pins CHROMA, LUMA+, LUMA-.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CC1}	Supply Current		45	60	75	mA
V_{CC}	Supply Voltage		4.75	5	5.25	V
CHROMA OUTPUT (no AGC)						
G_{PB}	Pre-amplification Gain	Sinus wave 600 kHz 400mV$_{PP}$ on output Input on Pin H1-SP or H2-SP, H1-LP or H2-LP	57	60	63	dB
ΔG_{PB1}	Difference of Output Signal on Pin CHROMA between Channel 1 and Channel 2 in SP Mode	Sinus wave 600kHz 0.4mV$_{PP}$ on inputs H1-SP and H2-SP			1.2	dB
ΔG_{PB2}	Difference of Output Signal on Pin CHROMA between Channel 1 and Channel 2 in LP Mode	Sinus wave 600kHz 0.4mV$_{PP}$ on inputs H1-LP and H2-LP			1.2	dB
e_N	Equivalent Input Voltage Noise Level	Input grounded via switching transistor on Pins H1-SP, H2-SP, H1-LP, H2-LP, F = 600kHz		0.6	0.85	$nV/\sqrt{Hz}$
i_N	Equivalent Input Current Noise	Pins H1-SP, H2-SP, H1-LP, H2-LP		2	2.8	$pA/\sqrt{Hz}$
CRT	Crosstalk	Sinus wave 3.8MHz 400µV$_{PP}$, All switches combinated			-40	dB
F_{LCPB1} F_{HCPB1}	Bandwidth Cut-off Frequency	-3dB attenuation 50Ω in parallel on the input, 0dB at 600kHz Low High	 8		0.1	MHz MHz

5704-04.TBL

ELECTRICAL OPERATING CHARACTERISTICS (T_A = 25°C unless otherwise specified) (continued)
Play-back Mode (V_{CC} = 5V, no load on Pins CHROMA, LUMA+, LUMA-.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
CHROMA OUTPUT (no AGC) (continued)						
C_{IN}	Input Capacitance Pins H1-SP, H2-SP, H1-LP, H2-LP	At 5MHz		30	40	pF
R_{IN}	Pre-amplifier Input Resistance Pins H1-SP, H2-SP, H1-LP, H2-LP	At 3.8MHz	400	600	900	Ω
Z_{CPB}	Output ImpedancePin CHROMA	Sinus wave 600kHz 400µV_{PP} on input		30	50	Ω
V_{DCPB1}	DC Level at Play-back Output on Pin CHROMA		1	1.4	2	V
ΔV_{DCSP} ΔV_{DCLP}	Head Switch Offset Pin CHROMA				100 100	mV mV
SH_{PB1}	Second Harmonic Play-back Output Pin CHROMA	Sinus wave 3.8MHz 400µV_{PP} on input with load 500Ω//100pF		-45	-40	dB
LUMA+, LUMA- OUTPUTS (with AGC)						
Z_{LPB}	Output Impedance	DC		30	50	Ω
V_{DCPB2}	DC Level		0.8	1.4	2	V
F_{LCPB2} F_{HCPB2}	Bandwidth Cut-off Frequency	-3dB attenuation 50Ω in parallel on the input, AGC locked, 0dB at 3.8MHz Low High	 10	 12	0.1	 MHz MHz
V_{LPB}	Output Amplitude	Input signal 200µV_{PP} at 3.8MHz on Pins H1-SP, H2-SP, H1-LP, H2-LP	140	200	270	mV_{PP}
ΔV_{LPB}	AGC Control Sensitivity	Input signal 200µV_{PP} at +6dB or -5dB on Pins H1-SP, H2-SP, H1-LP, H2-LP	-2		+1	dB
SH_{PB2}	Second Harmonic Play-back Output	Input Signal 3.8MHz 400µV_{PP} on Pins H1-SP, H2-SP, H1-LP, H2-LP with load 500Ω//100pF		-42	-35	dB
CAGC						
I+	Positive Output Current	Input Signal 3.8MHz 200µV_{PP} on H1-SP	15	30	45	µA
I-	Negative Output Current	Input Signal 3.8MHz 200µV_{PP} on H1-SP	-45	-30	-15	µA
	Capacitance		4.7			nF
TRIV						
R_{TRIV}	Downloading Resistance		20	40	80	kΩ
V_{TRIV1} V_{TRIV2}	Output Level	V_{CHROMA} = 600mV_{PP} at 3.8MHz V_{CHROMA} = 400mV_{PP} at 3.8MHz V_{CHROMA} = 100mV_{PP} at 3.8MHz V_{CHROMA} = 0mV_{PP}	 3.2 0.2	 3.5 1.6 0.4	4.5 3.8	V V V V
G_{TRIV1} G_{TRIV2}	Gain	V_{CHROMA} = 300, 400mV_{PP} at 3.8MHz V_{CHROMA} = 50, 100mV_{PP} at 3.8MHz	2	3 12	4	V/V_{PP} V/V_{PP}
SP/LP ENVELOPE DETECTOR						
	Capacitance on Pin SP/LP			1		nF
V_{DETH} V_{DETL}	Comparator Output Voltage, SP Selected (High Level)	High Level Low Level	4 0	4.6 0.4	5 1	V V
I_{DET+}	Current Output on Pin SP/LP	200mVPP on Pins H1-SP or H2-SP		100	150	µA
I_{DET-}	Current Output on Pin SP/LP	200mVPP on Pins H1-LP or H2-LP	-150	-100		µA
	Sensitivity 1	30µV_{PP} to 600mV_{PP} on SP, LP short circuited	4			V
	Sensitivity 2	30µV_{PP} to 600mV_{PP} on LP, SP short circuited			1	V

5704-05.TBL

ELECTRICAL OPERATING CHARACTERISTICS ($T_A = 25^oC$ unless otherwise specified) (continued)

Record Mode

V_{REC} = 9V, V_{CC} = 5V, Load resistor 50Ω on Pin I_{OUT}-SP, I_{OUT}-LP

Transconductance network defined by :

R1 = 5.6Ω, 1%	Pins PROT/V_{MES}
R2-SP = 2kΩ, 1%	Pins V_{MES}/V_{IN}-SP
R2-LP = 1.5kΩ, 1%	Pins V_{MES}/V_{IN}-SP
R3-SP = 1.5kΩ, 1%	Pin V_{IN}- SP
R3-LP = 1.5kΩ, 1%	Pin V_{IN}- LP

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{REC} I_{CC2}	Current Supply	V_{REC} = 9V V_{CC} = 5V		45 40	55 55	mA mA
I_{max}	Max. Record Current on SP or LP Current Amplifier	3.8MHz	65			mA_{PP}
TR	Transconductance	V_{IN}-SP = 300mV_{PP} V_{IN}-LP = 300mV_{PP}	180 150	230 180	280 210	mA/V mA/V
SH_{REC}	Second Harmonic	Output Current, 60mA_{PP} at 3.8MHz at Pin I_{OUT}-SP at Pin I_{OUT}-LP		 -50 -50	 -38 -38	 dB dB
F_{LCREC1} F_{HCREC1}	Bandwidth Cut-off Frequency Pin I_{OUT}-SP	-3dB attenuation Output current 60mA_{PP} Low High	 10		 0.1	 MHz MHz
	DC Level at Pin SP-LP		4			V
F_{LCREC2} F_{HCREC2}	Bandwidth Cut-off Frequency Pin I_{OUT}-SP	-3dB attenuation, 0dB at 3.8MHz Output current 60mA_{PP} Low High	 10		 0.1	 MHz MHz
I_{PROT}	Maximum Input Current on Pin PROT	5V on Pin V_{MES}	150	250	400	mA
V_{SAT}	Maximum Saturation Voltage on Pin V_{MES}	Input current 80mA		50	150	mV
	Input Resistance on Pins V_{IN}-LP, V_{IN}-SP	Equivalent value of R3 resistor	500	700	900	Ω

5704-06.TBL

Switching Levels

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SWHH}	Head Selection Pin SW-H	Head number 1 in SP mode, 2 in LP mode (high level)	2.4		V_{CC}	V
V_{SWHL}		Head number 2 in SP mode, 1 in LP mode (low level)	0		1.5	V
I_{SWHH}		Input current (high level)		20	50	µA
I_{SWHL}		Output current (low level)		20	50	µA
V_{SWMH}	Mode Selection Pin SW-M (Record mode and play-back mode)	LP Mode (high level)	2.4		5	V
V_{SWML}		SP mode (low level)	0		1.5	V
I_{SWMH}		Input current (high level)		20	50	µA
I_{SWML}		Output current (low level)		20	50	µA
t_{ON}	Selection Pin SW-H or SW-M Transient Response	Delay time selection ON (output signal appears on Pin CHROMA)		250	1000	ns
t_{OFF}		Delay time selection OFF (output signal disappears on Pin CHROMA)		250	1000	ns

5704-07.TBL

ELECTRICAL OPERATING CHARACTERISTICS (T_A = 25°C unless otherwise specified) (continued)

Switching Levels (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TH1}	Inhibition Threshold for Switching from Play-back to record on Pin V_{REC}	V_{CC} = 5V	0.15	0.3	0.5	V
V_{TH2}	Inhibition Threshold Hysteresis for Switching from Record to Play-back on Pin V_{REC}	V_{CC} = 5V		80		mV
t_1	Transient Response of Record Scanning on Pin V_{REC}	Delay from play-back to record (signal disappears on Pin CHROMA)		30		µs
t_2		Delay from record to play-back (signal appears on Pin CHROMA)		35*		ms
t_3		Delay from play-back to record (signal appears on Pin I_{OUT}-SP, I_{OUT}-LP)		0.2		ms
t_4		Delay from record to play-back (signal disappears on Pin I_{OUT}-SP, I_{OUT}-LP)		8*		ms

5704-08.TBL

* Depending on capacitance on Pin V_{REC}.

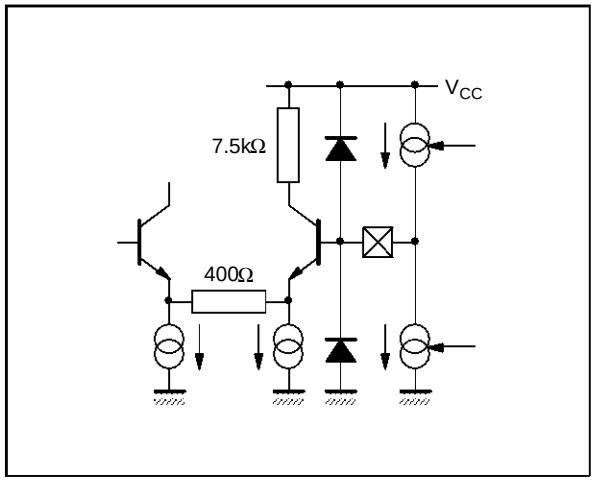
Power Supply

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Positive Supply Voltage Pin V_{CC}		4.75	5	5.25	V
V_{REC}	Record Voltage Pin V_{REC}		4.75	9	12.6	V
SVR	Supply Voltage Rejection	0.5mV_{PP} on Pin V_{CC} 75µV_{PP} on Pin H1-SP, H2-SP, H1-LP, H2-LP Measurement on Pin Chroma	15	20		dB

5704-09.TBL

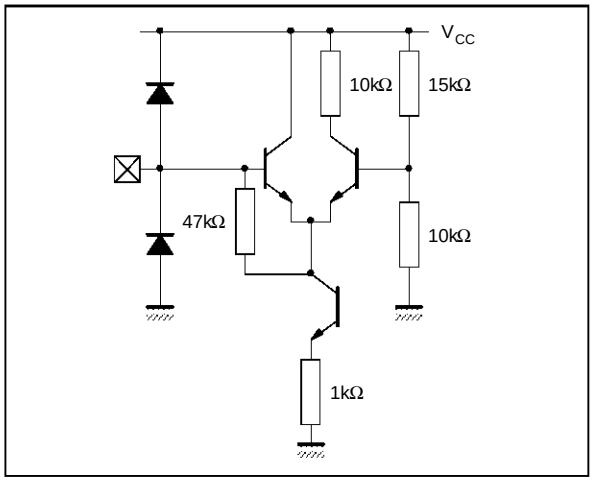
INPUT/OUTPUTS EQUIVALENT INTERNAL DIAGRAM

Pins : C1-SP, C2-SP, C1-LP, C2-LP



5704-03.EPS

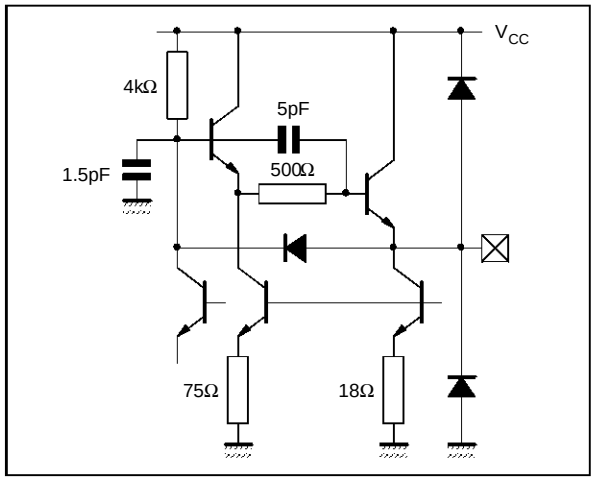
Pins : SW-H, SW-M



5704-04.EPS

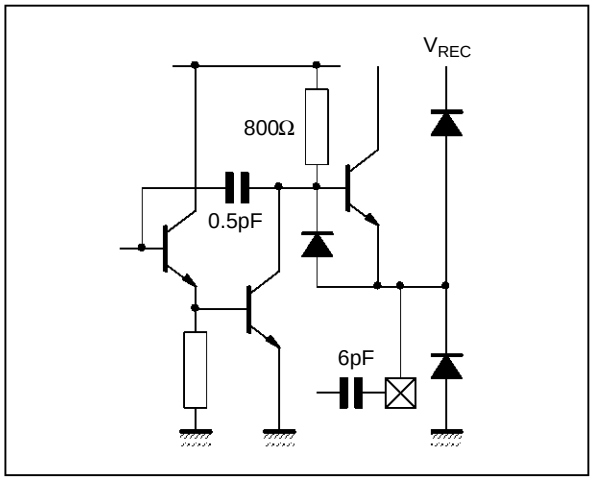
INPUT/OUTPUTS EQUIVALENT INTERNAL DIAGRAM (continued)

Pins : Chroma, Luma+, Luma-



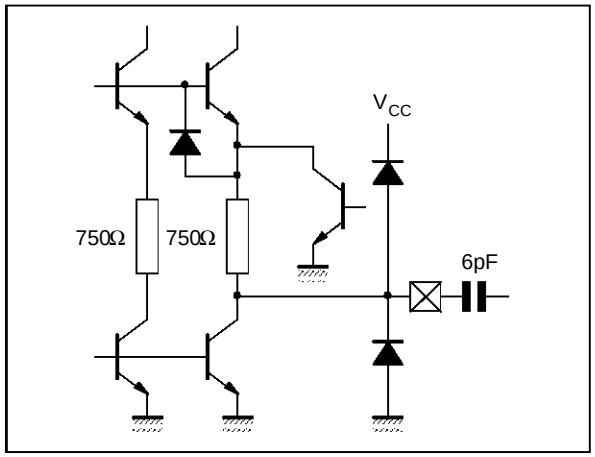
5704-05.EPS

Pin : V_{MES}



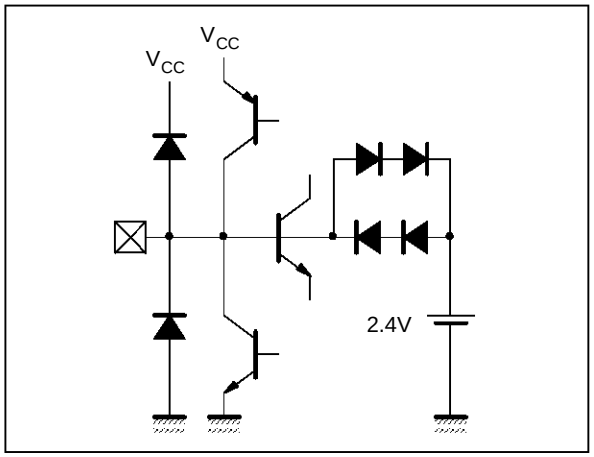
5704-06.EPS

Pin : V_{IN}-SP, V_{IN}-LP



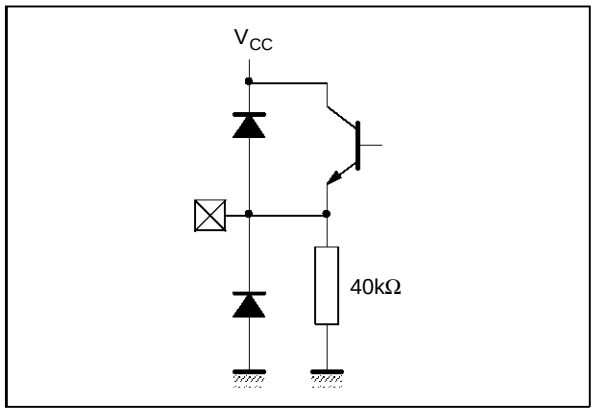
5704-07.EPS

Pin : CAGC



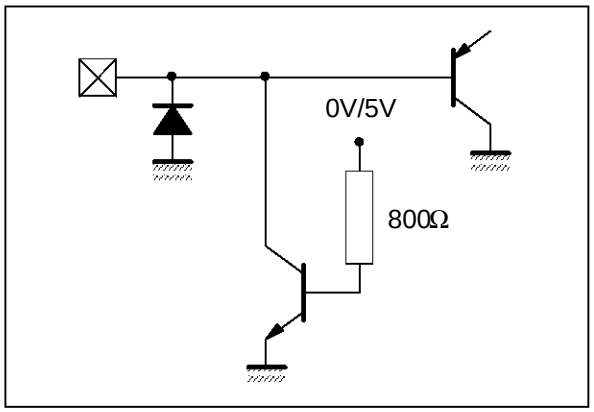
5704-08.EPS

Pin : TRIV



5704-09.EPS

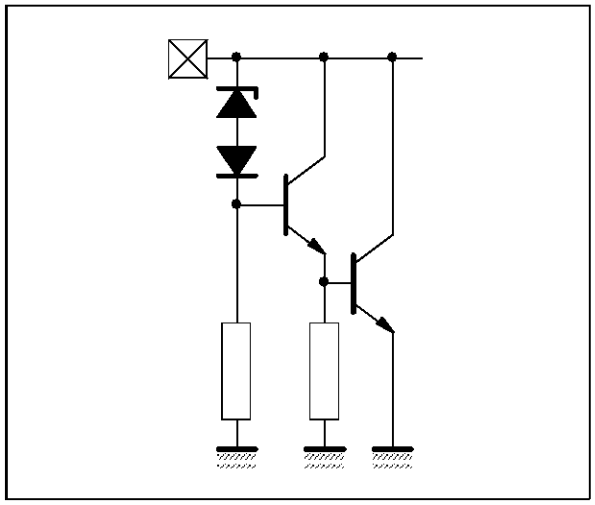
Pin : PROT



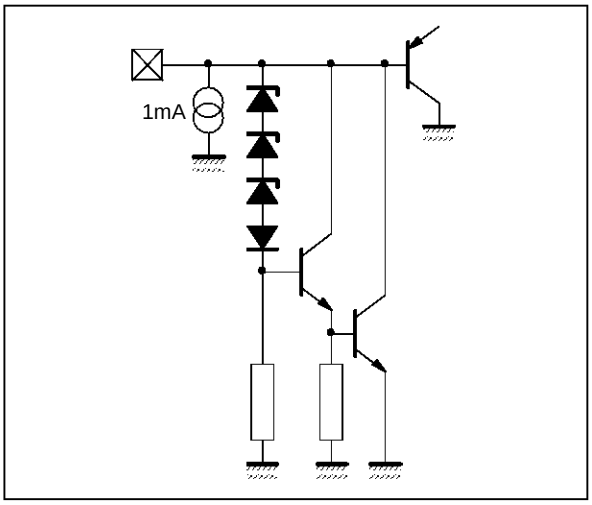
5704-10.EPS

INPUT/OUTPUTS EQUIVALENT INTERNAL DIAGRAM (continued)

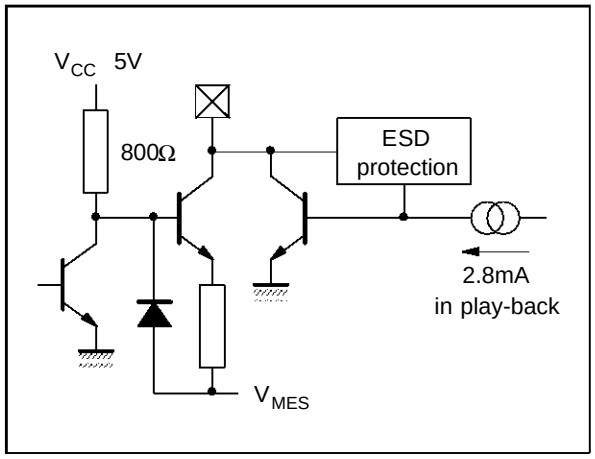
Pin : V_{CC}



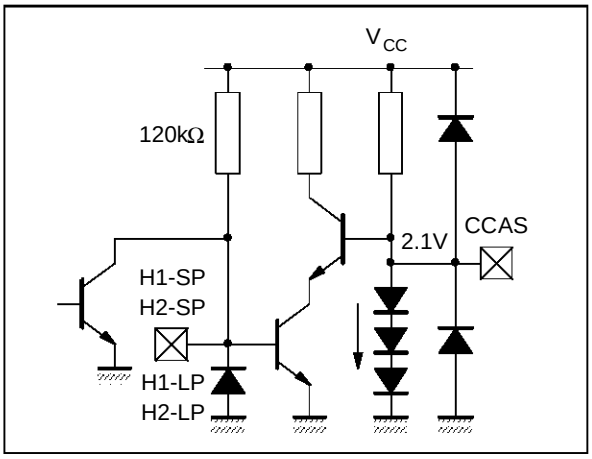
Pin : V_{REC}



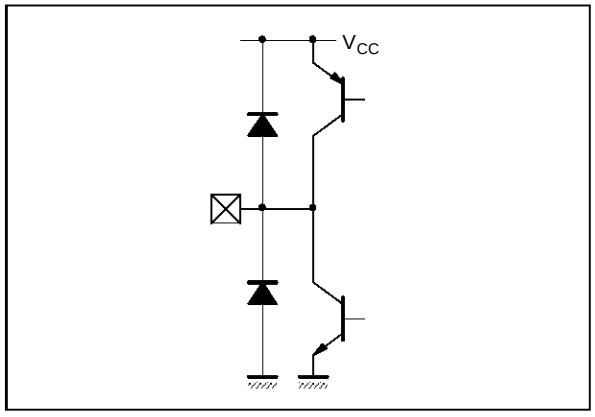
Pin : I_{OUT}-SP, I_{OUT}-LP



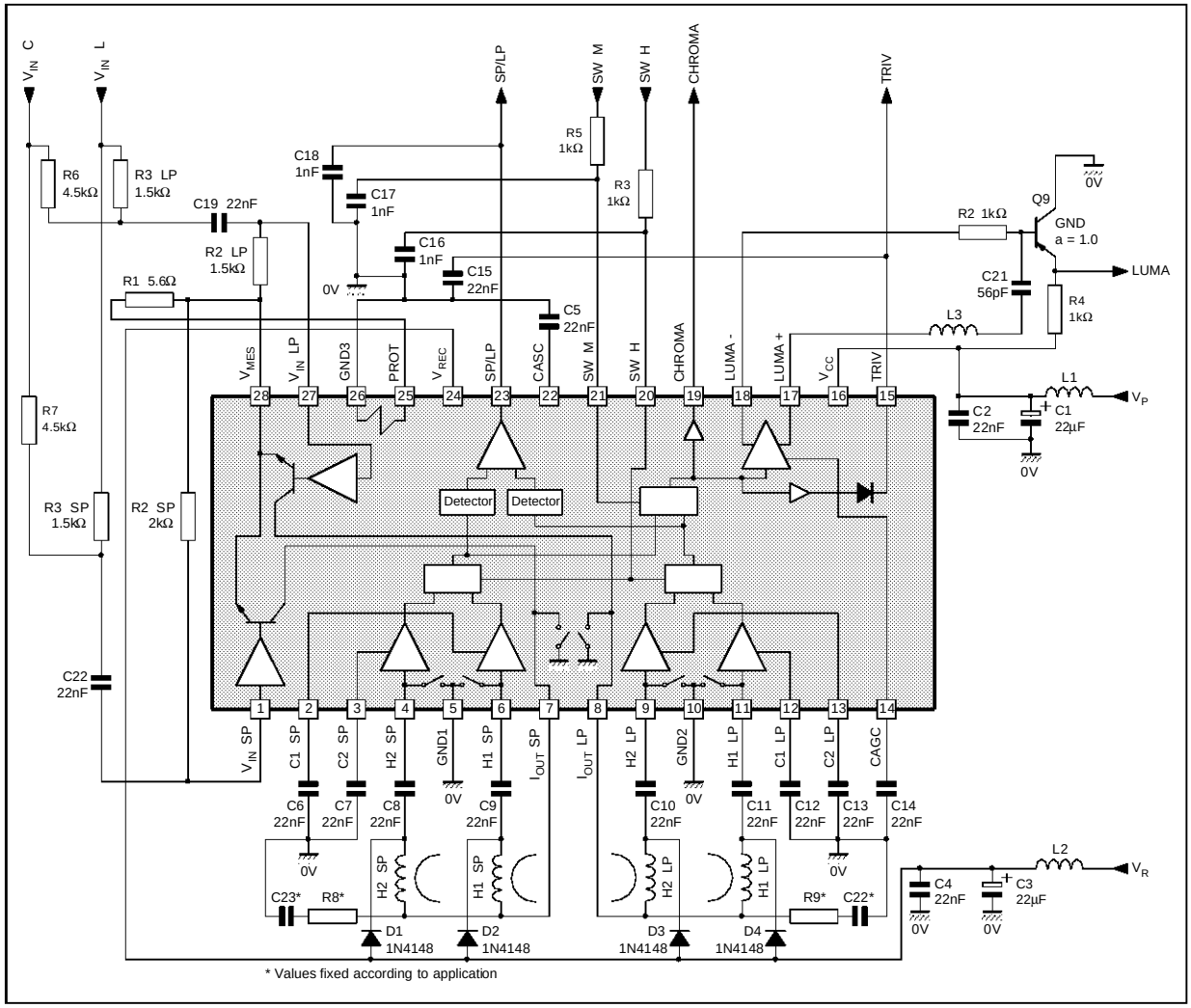
Pins : CCAS, H1-SP, H2-SP, H1-LP, H2-LP



Pin : SP/LP

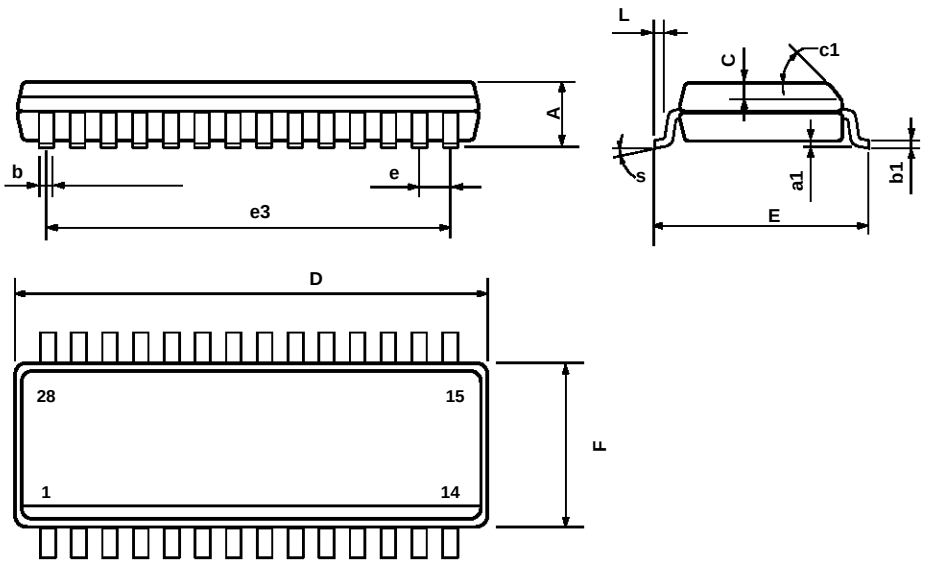


APPLICATION DIAGRAM



PACKAGE MECHANICAL DATA

28 PINS - PLASTIC MICROPACKAGE



PM-SO28.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
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^o (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^o (max.)					

SO28.TBL