

**LA7289****VCR Audio Signal Record and Playback Processor****Overview**

The LA7289 includes on chip all functions required for the record and playback of VCR audio signals and achieves complete adjustment-free operation by the adoption of an automatic record bias current adjustment circuit. In addition, the inclusion of a switching circuit for switching between tuner and line input in addition to the circuits provided by earlier ICs makes the LA7289 truly optimal for audio VCR products.

**Functions**

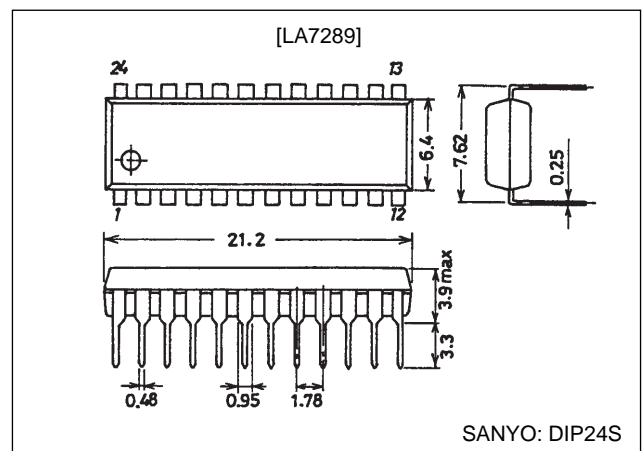
- Equalizer amplifier
- Ripple filter
- Record/playback switching circuit
- Muting
- SP/LP/EP switching circuit
- Record amplifier
- ALC
- Tape head switching circuit
- Automatic record bias adjustment circuit
- Input switching circuit (line/tuner)

**Features**

- Adjustment-free record bias current (automatic adjustment circuit adopted)
- Built-in record bias oscillator circuit power supply switch
- Record equalizer choke coil no longer required
- Playback amplifier input noise voltage: 1.0  $\mu\text{V}$  rms
- Value of the ALC detector capacitor reduced (to 3.3  $\mu\text{F}$ )
- Built-in high-voltage head switching circuit
- Supply voltage: supports both 9 and 12-V operation
- Built-in input switching circuit (for the line and tuner inputs)

**Package Dimensions**

unit: mm

**3067-DIP24S****Specifications****Maximum Ratings at  $T_a = 25^\circ\text{C}$** 

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		14	V
Pin 2 input voltage	$V_{IN2}$	DC	$\pm 45$	Vp-p
Pin 2 input current	$I_{IN2}$		$\pm 1.5$	mA
Allowable power dissipation	$P_d$ max	$T_a \leq 65^\circ\text{C}$	500	mW
Operating temperature	$T_{opr}$		-10 to +65	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

**Operating Conditions at  $T_a = 25^\circ\text{C}$** 

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		9, 12	V
Allowable operating voltage range	$V_{CCOP}$		8.5 to 12.5	V

**SANYO Electric Co., Ltd. Semiconductor Business Headquarters**

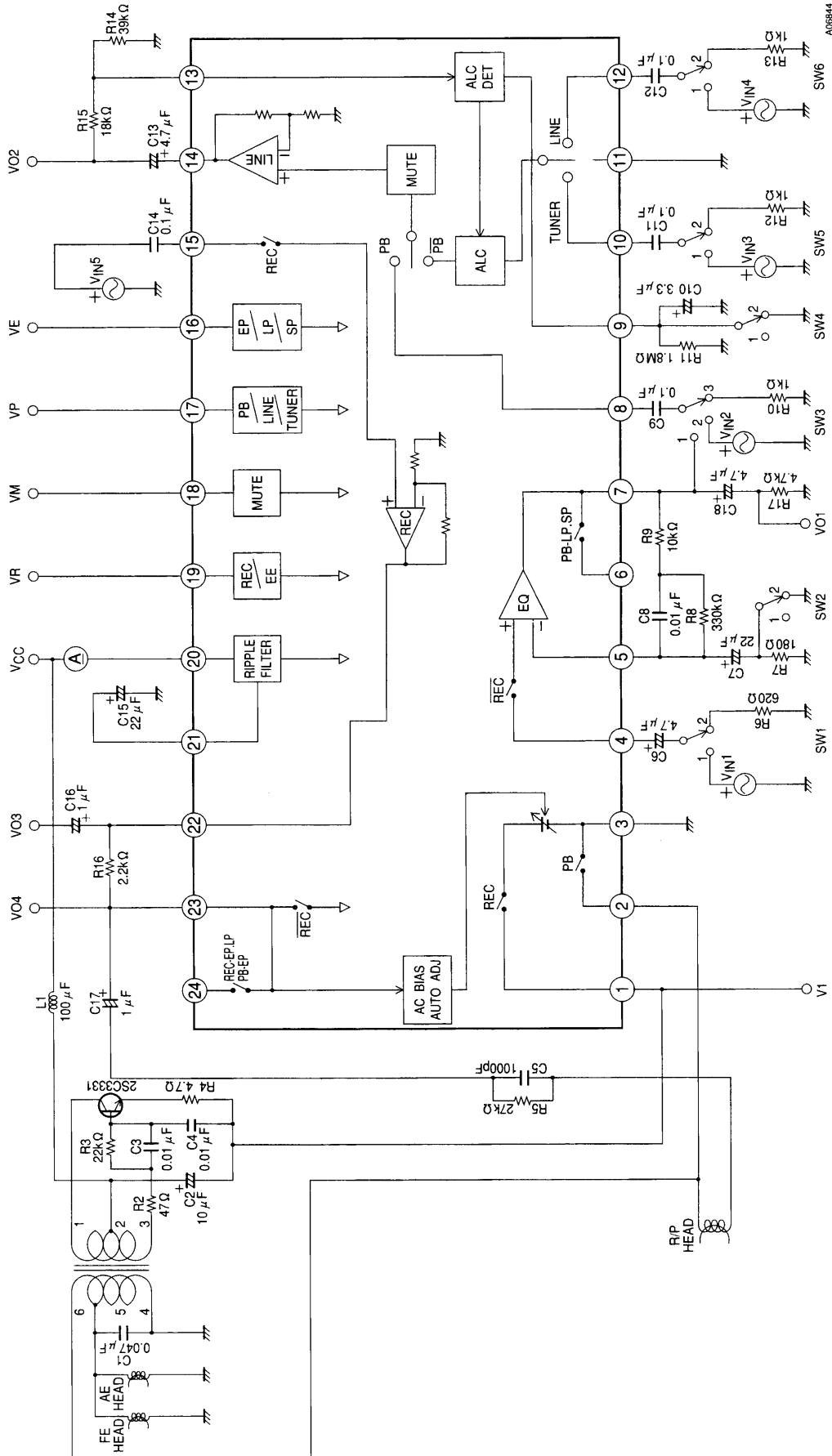
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

LA7289

Electrical Characteristics at Ta = 25°C, VCC = 12 V, f = 1 kHz, 0 dBV = 1.0 Vrms

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain (EE)	I <sub>CCE</sub>	No signal	10.0	12.5	15.0	mA
Current drain (playback)	I <sub>CCP</sub>	No signal	11.2	14.0	16.8	mA
Current drain (record)	I <sub>CCR</sub>	No signal	9.6	12.0	14.4	mA
[Equalizer amplifier]						
Open-circuit voltage gain	V <sub>G<sub>OE</sub></sub>	V <sub>O</sub> = -6dBV	58.4	64.4	-	dB
Input noise voltage	V <sub>NIE</sub>	Rg = 620 Ω, DIN audio filter	-	1.0	1.8	μVrms
[Line Amplifier]						
Voltage gain (PB input)	V <sub>G<sub>LP</sub></sub>	V <sub>O</sub> = -6dBV	20.1	20.6	21.1	dB
Voltage gain (LINE input)	V <sub>G<sub>LL</sub></sub>	V <sub>O</sub> = -6dBV	20.1	20.6	21.1	dB
Voltage gain (TUNER input)	V <sub>G<sub>LT</sub></sub>	V <sub>O</sub> = -6dBV	20.1	20.6	21.1	dB
Harmonic distortion	THD <sub>L</sub>	V <sub>O</sub> = -6dBV	-	0.05	0.3	%
Output noise voltage	V <sub>NOL</sub>	Rg = 620 Ω, DIN audio filter	-	-75	-69	dBV
Maximum output voltage	V <sub>OML</sub>	THD = 1%	1.7	2.5	-	Vrms
Output voltage when ALC operating	V <sub>OA</sub>	V <sub>IN</sub> = -25dBV	-7	-6	-5	dBV
ALC effect	ALC	V <sub>IN</sub> = -25dBV to -5dBV	-	1	3	dB
Total harmonic distortion when ALC operating	THD <sub>A</sub>	V <sub>IN</sub> = -25dBV	-	0.05	0.6	%
[Record Amplifier]						
Voltage gain	V <sub>G<sub>CR</sub></sub>	V <sub>O</sub> = -6dBV	13.5	14.0	14.5	dB
Harmonic distortion	THD <sub>R</sub>	V <sub>O</sub> = -6dBV	-	0.05	0.3	%
Maximum output voltage	V <sub>OMR</sub>	THD = 1%	1.7	2.5	-	Vrms
[REC/EE Switching Circuit]						
Record mode hold voltage	V <sub>RR</sub>	The pin 19 DC voltage	3.6	-	6.0	V
EE mode hold voltage	V <sub>RE</sub>	The pin 19 DC voltage	0	-	1	V
[Muting Circuit]						
On state hold voltage	V <sub>MON</sub>	The pin 18 DC voltage	3.6	-	6.0	V
Off state hold voltage	V <sub>MOFF</sub>	The pin 18 DC voltage	0	-	1	V
Muting attenuation (PB, LINE, TUNER)	M <sub>P</sub> , M <sub>L</sub> , M <sub>T</sub>		80	90	-	dB
[PB, LINE, TUNER Switching Circuit]						
PB mode hold voltage	V <sub>LP</sub>	The pin 17 DC voltage	3.6	-	6.0	V
LINE mode hold voltage	V <sub>LL</sub>	The pin 17 DC voltage	1.8	-	2.6	V
TUNER mode hold voltage	V <sub>LT</sub>	The pin 17 DC voltage	0	-	1.0	V
[EP, LP, SP Switching Circuit]						
EP mode hold voltage	V <sub>EE</sub>	The pin 16 DC voltage	3.6	-	6.0	V
LP mode hold voltage	V <sub>EL</sub>	The pin 16 DC voltage	1.8	-	2.6	V
SP mode hold voltage	V <sub>EE</sub>	The pin 16 DC voltage	0	-	0.8	V
[Switching Circuit]						
Pin 2 on resistance	R <sub>ON2</sub>	I <sub>1</sub> = ±1 mA	-	10	30	Ω
Pin 2 input voltage	V <sub>IN2</sub>	Ta = 65°C, f = 70 kHz (sin), I <sub>LK</sub> = 10 μA	-	-	±45	V
[Record Bias Automatic Adjustment Circuit]						
Record bias current	I <sub>B</sub>		220	245	270	μA
Pin 1 output control range	V <sub>1</sub>		2.0	4.0	6.0	V

Test Circuit



A06844

## Switching Operations

Test item (signal)	SW1	SW2	SW3	SW4	SW5	SW6	V <sub>M</sub>	V <sub>P</sub>	V <sub>R</sub>	Input	Measurement
I <sub>CCE</sub>	2	1	3	2	2	2	GND	GND	GND	-	I <sub>0</sub>
I <sub>CCP</sub>	2	1	3	2	2	2	GND	5 V	GND	-	I <sub>0</sub>
I <sub>CCR</sub>	2	1	3	2	2	2	GND	GND	5 V	-	I <sub>0</sub>
V <sub>GOE</sub>	1	2	3	2	2	2	GND	5 V	GND	V <sub>IN1</sub>	V <sub>O1</sub>
V <sub>NIE</sub>	2	1	3	2	2	2	GND	5 V	GND	-	V <sub>O1</sub>
V <sub>GLP, THD<sub>L</sub>, V<sub>OML</sub></sub>	2	1	2	2	2	2	GND	5 V	GND	V <sub>IN2</sub>	V <sub>O2</sub>
V <sub>GLL</sub>	2	1	3	2	2	1	GND	2 V	GND	V <sub>IN4</sub>	V <sub>O2</sub>
V <sub>GLT</sub>	2	1	3	2	1	2	GND	GND	GND	V <sub>IN3</sub>	V <sub>O2</sub>
V <sub>NOL</sub>	2	1	3	2	2	2	GND	GND	GND	-	V <sub>O2</sub>
V <sub>OA, ALC, THD<sub>A</sub></sub>	2	1	3	1	1	2	GND	GND	GND	V <sub>IN3</sub>	V <sub>O2</sub>
V <sub>GCR, THD<sub>R</sub>, V<sub>OMR</sub></sub>	2	1	3	2	2	2	GND	GND	5 V	V <sub>IN5</sub>	V <sub>O3</sub>
M <sub>P</sub>	1	1	1	2	2	2	5 V	5 V	GND	V <sub>IN1</sub>	V <sub>O2</sub>
M <sub>L</sub>	2	1	3	2	2	1	5 V	2 V	GND	V <sub>IN4</sub>	V <sub>O2</sub>
M <sub>T</sub>	2	1	3	2	1	2	5 V	GND	GND	V <sub>IN3</sub>	V <sub>O2</sub>
I <sub>B</sub>	2	1	1	2	2	2	GND	GND	5 V	-	V <sub>O4</sub>
V1	2	1	1	2	2	2	GND	GND	5 V	-	V1

## Head Coil Specifications

### 1. Application circuit 1 (Series erase head type)

- R/P Head      58 kΩ ± 15 % (f = 70 kHz)
- AE Head      34 Ω ± 20 % (f = 70 kHz)
- FE Head      80 Ω ± 15 % (f = 70 kHz)
- Oscillator coil test number: 15419A, Model no. 7QM3

Pin No.	3 - 2	2 - 1	6 - 5	5 - 4
Line type	2UEW-0.09	2UEW-0.09	2UEW-0.09	2UEW-0.09
Total windings	32T	20T	176T	29T

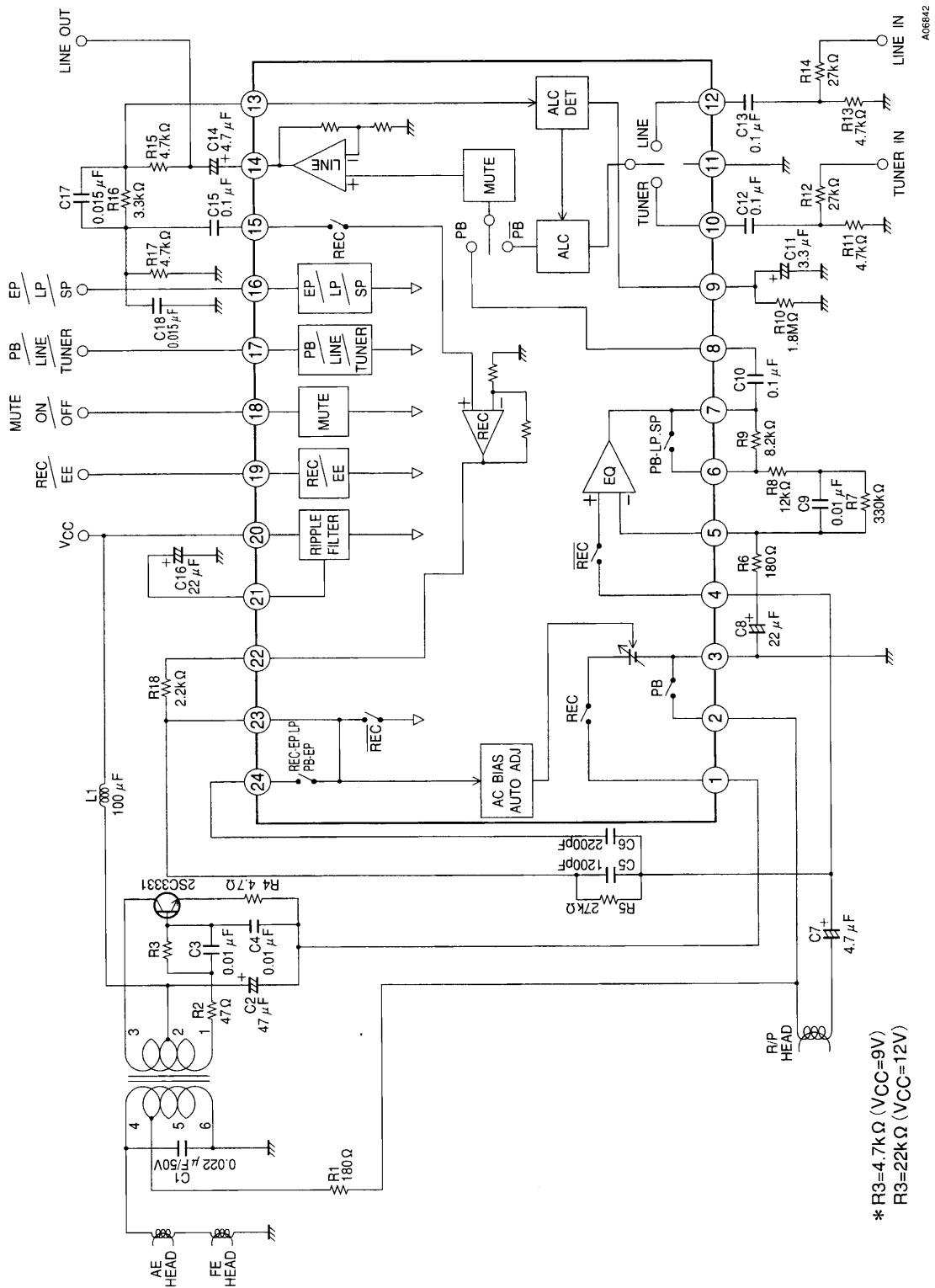
### 2 Application circuit 2 (Parallel erase head type)

- R/P Head      58 kΩ ± 15 % (f = 70 kHz)
- AE Head      180 Ω ± 20 % (f = 70 kHz)
- FE Head      80 Ω ± 15 % (f = 70 kHz)
- Oscillator coil test number: 15415A, Model no. 7QM3

Pin No.	3 - 2	2 - 1	4 - 5	5 - 6
Line type	2UEW-0.10	2UEW-0.10	2UEW-0.10	2UEW-0.10
Total windings	10T	22T	104T	22T

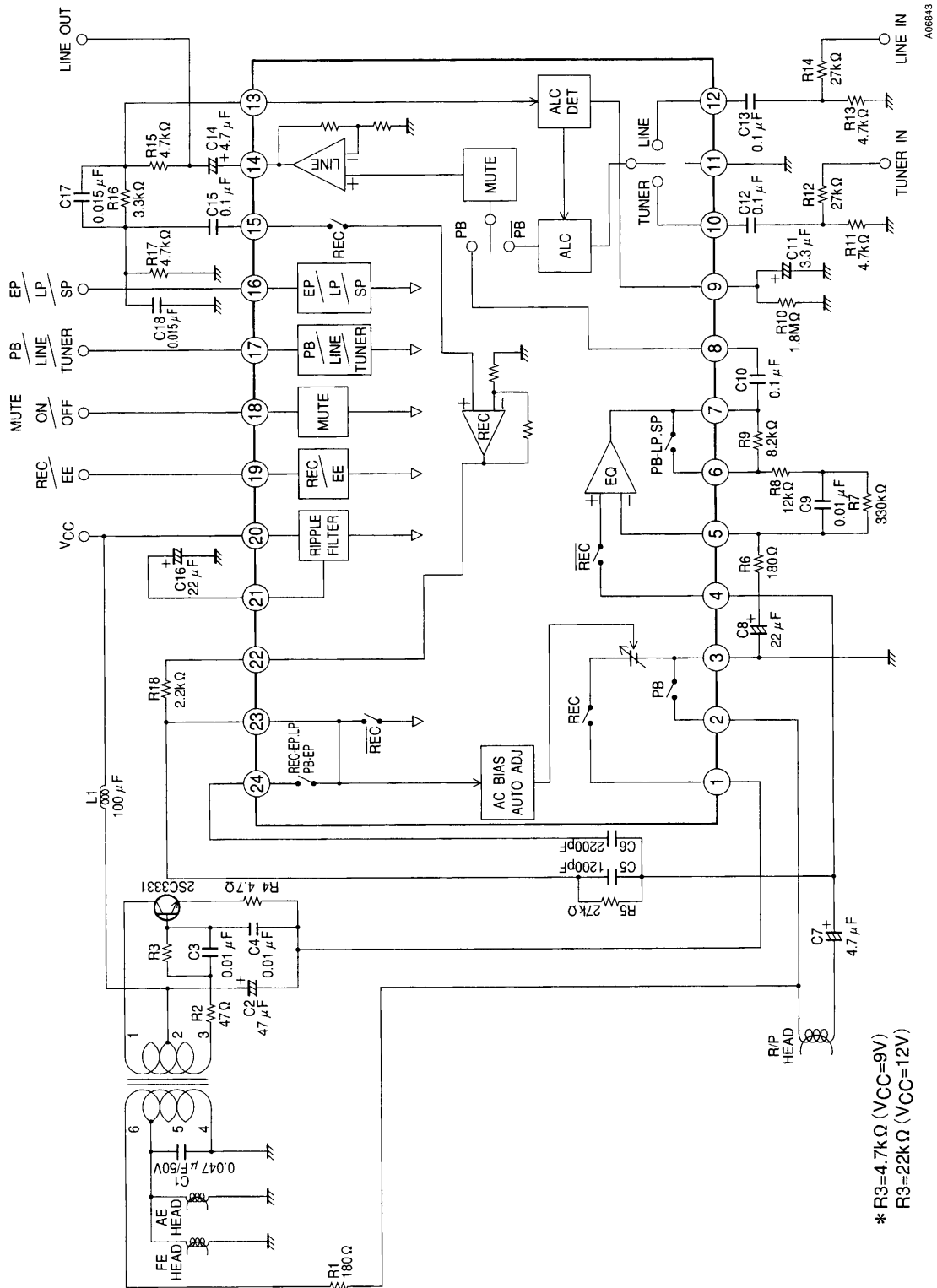
For more information contact: Tokyo Parts Industries Co., Ltd.  
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Application circuit 1 (Series erase head type)



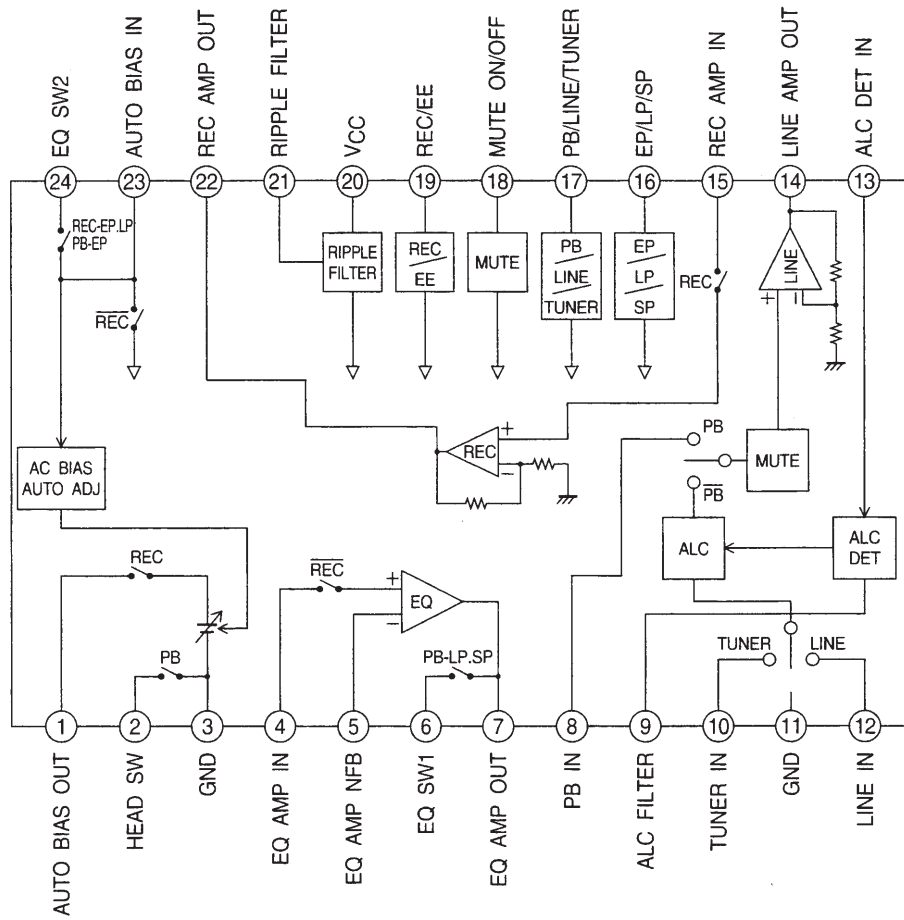
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Application Circuit 2 (Parallel erase head type)



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Block Diagram



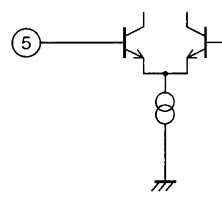
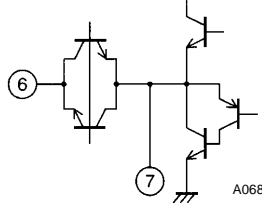
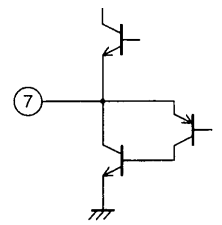
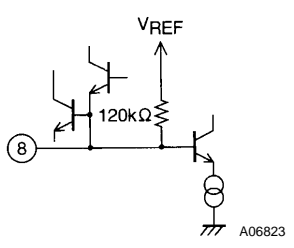
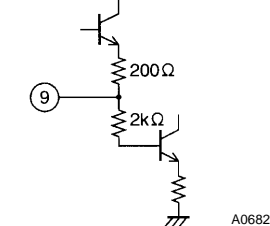
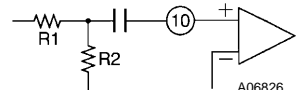
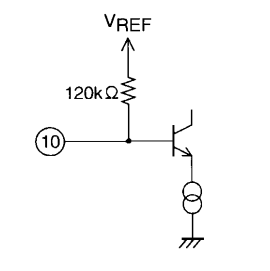
Pin Functions

Pin No.	Function	Function description	Internal circuit
1	Record bias automatic control output	EE, playback → V <sub>CC</sub> Record → Control voltage	<p style="text-align: right;">A06818</p>
2	Head switch (high voltage)	Playback → On Record, EE → Off On resistance → 10 Ω (typical) Withstand voltage when off → ±45 V (f = 70 kHz)	
3	GND	Ground used for the pin 2 head switching circuit and the EQ amplifier.	
4	EQ amplifier input	Inputs the playback from the head with an input impedance of 120 kΩ (typical).	<p style="text-align: right;">A06819</p>

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## LA7289

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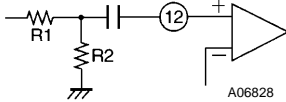
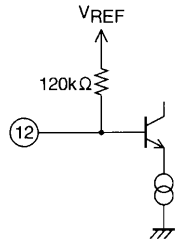
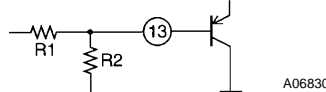
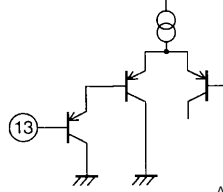
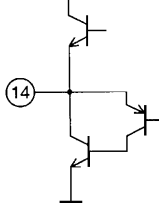
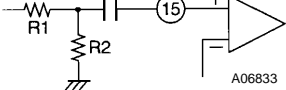
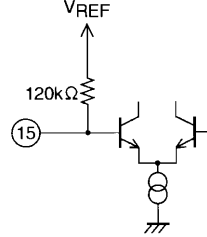
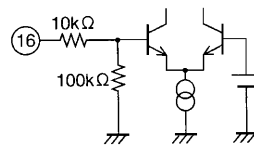
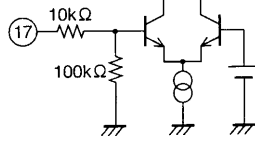
Pin No.	Function	Function description	Internal circuit
5	EQ AMP NFB	Negative feedback for the EQ amplifier.	
6	EQ switch 1	Switches the playback EQ amplifier high-frequency voltage gain. LP, SP → On EP → Off On resistance → 20 Ω (typical)	
7	EQ amplifier output	Output impedance → 50 Ω (typical)	
8	Line amplifier playback input	Inputs the playback signal from the EP amplifier. Since pin 8 has the high input impedance of 120 kΩ, a 0.1 μF ceramic capacitor can be used as the coupling capacitor.	
9	ALC FILTER	Detection is performed using the capacitor connected between this pin and ground. The attack and recovery times are determined by the time constant of the RC circuit connected to this pin.	
10	Line amplifier tuner input	Inputs the EE and record signal.  The reference input is set by the resistors R1 and R2. The amplifier gain is fixed at 21.0 dB. Since pin 10 has the high input impedance of 120 kΩ, a 0.1 μF ceramic capacitor can be used as the coupling capacitor.	
11	GND	Ground for all the circuit blocks except the pin 2 head switching circuit and the EQ amplifier.	

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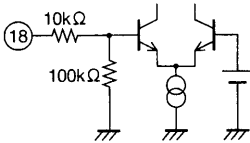
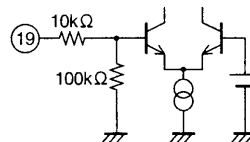
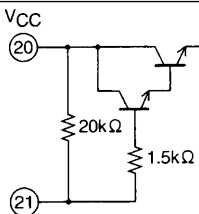
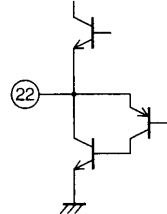
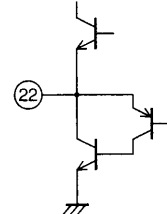
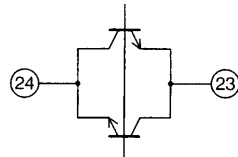
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Pin No.	Function	Function description	Internal circuit												
12	Line amplifier line input	<p>Inputs the EE and record signals.</p>  <p>The reference input is set by the resistors R1 and R2. The amplifier gain is fixed at 21.0 dB. Since pin 12 has the high input impedance of 120 k<math>\Omega</math>, a 0.1 <math>\mu</math>F ceramic capacitor can be used as the coupling capacitor.</p>	 <p style="text-align: right;">A06827</p>												
13	ALC detector input	 <p>Inputs the line amplifier output signal. The ALC level is determined by the resistors R1 and R2.</p>	 <p style="text-align: right;">A06829</p>												
14	Line amplifier output	Output impedance $\rightarrow$ 50 $\Omega$ (typical)	 <p style="text-align: right;">A06831</p>												
15	Record amplifier input	<p>Inputs the record signal from the line amplifier.</p>  <p>The record current is set by the resistors R1 and R2. Since pin 15 has the high input impedance of 120 k<math>\Omega</math>, a 0.1 <math>\mu</math>F ceramic capacitor can be used as the coupling capacitor.</p>	 <p style="text-align: right;">A06832</p>												
16	EP/LP/SP control	<p>If the pin 16 voltage is:</p> <p>3.0 to 6.0 V: EP mode            1.8 to 2.6 V: LP mode            0.0 to 0.8 V: SP mode.</p> <p>Switch on state pin numbers:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>REC</th> <th>PB</th> </tr> </thead> <tbody> <tr> <td>EP</td> <td>24</td> <td>24</td> </tr> <tr> <td>LP</td> <td>24, 6</td> <td>6</td> </tr> <tr> <td>SP</td> <td>6</td> <td>6</td> </tr> </tbody> </table>		REC	PB	EP	24	24	LP	24, 6	6	SP	6	6	 <p style="text-align: right;">A06834</p>
	REC	PB													
EP	24	24													
LP	24, 6	6													
SP	6	6													
17	PB/LINE/TUNER control	<p>If the pin 17 voltage is:</p> <p>3.6 to 6.0 V: PB mode            1.8 to 2.6 V: LINE mode            0.0 to 1.0 V: TUNER mode.</p>	 <p style="text-align: right;">A06835</p>												

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Pin No.	Function	Function description	Internal circuit												
18	Muting control	When the pin 18 voltage is: 3.6 to 6.0 V: Muting will be on. 0.0 to 1.5 V: Muting will be off.	 <p style="text-align: right;">A06836</p>												
19	Record/EE control	When the pin 19 voltage is: 3.0 to 6.0 V: Record mode 0.0 to 1.0 V: EE mode	 <p style="text-align: right;">A06837</p>												
20	Power supply ( $V_{CC}$ )	$V_{CC}$ max = 14 V $V_{CC}$ = 8.5 V to 12.5 V													
21	Ripple filter	Connect an electrolytic capacitor between this pin and ground to remove ripple from the power supply.	 <p style="text-align: right;">A06838</p>												
22	Record amplifier output	Output impedance → 50 Ω (typical)	 <p style="text-align: right;">A06839</p>												
23	Record bias automatic control input and playback switch	EE and playback modes → On Record mode → Off On resistance → 20 Ω (typical)	 <p style="text-align: right;">A06840</p>												
24	EQ switch 2	This pin switches the high-band peaking frequency in record and playback modes. <table border="1" style="margin: 10px auto;"> <tr> <td></td> <td>REC</td> <td>PB</td> </tr> <tr> <td>EP</td> <td>On</td> <td>On</td> </tr> <tr> <td>LP</td> <td>On</td> <td>Off</td> </tr> <tr> <td>SP</td> <td>Off</td> <td>Off</td> </tr> </table> On resistance: 30 Ω (typical)		REC	PB	EP	On	On	LP	On	Off	SP	Off	Off	 <p style="text-align: right;">A06841</p>
	REC	PB													
EP	On	On													
LP	On	Off													
SP	Off	Off													

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