Ordering number:ENN494F

Monolithic Linear IC

LA3160

2-Channel Preamplifier For Car Stereo

Features

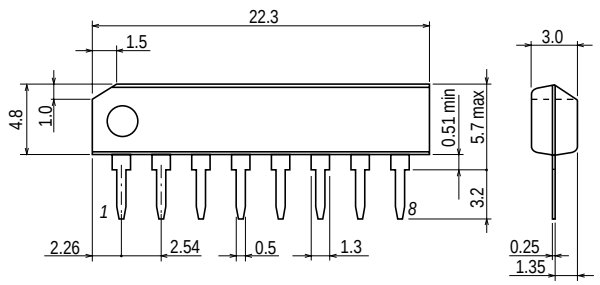
- Two preamplifiers on chip.
- Fewer peripheral parts.
- Low noise.
- 8-pin SIP package facilitating easy mounting.

Package Dimensions

unit:mm

3016B-SIP8

[LA3160]



SANYO : SIP8

Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	V_{CC} max		18	V
Allowable Power Dissipation	Pd max		200	mW
Operating Temperature	Topr		–20 to +75	˚C
Storage Temperature	Tstg		–40 to +125	˚C

Recommended Operating Conditions at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V_{CC}		9	V
Load Resistance	R_L		10k	Ω

Operating Conditions at Ta = 25˚C, V_{CC}=9V, R_L=10kΩ, Rg=600Ω, f=1kHz, NAB

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current Dissipation	I_{CC}			4	6	mA
Voltage Gain	VG	Closed loop		35		dB
		Open loop, V_O=0.77V	76	80		dB
Output Voltage	V_O	THD=1%	1.1	1.8		V
Total Harmonic Distortion	THD	V_O=0.5V		0.1	0.3	%
Input Resistance	r_i		70k	100k		Ω
Equivalent Input Noise Voltage	V_{NI}	Rg=2.2kΩ		1.25	2.0	μV
Crosstalk	CT		–50	–65		dB

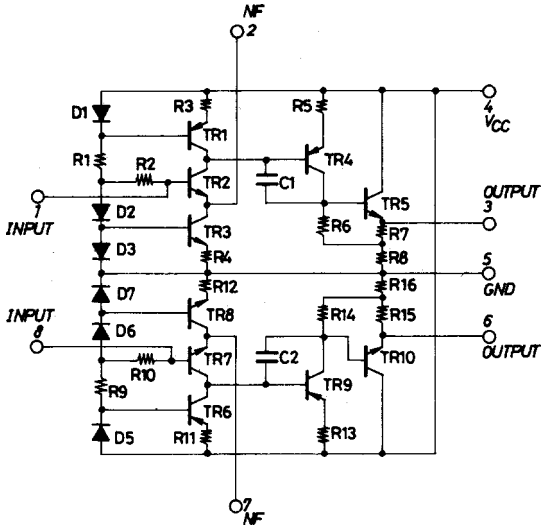
■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges,or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

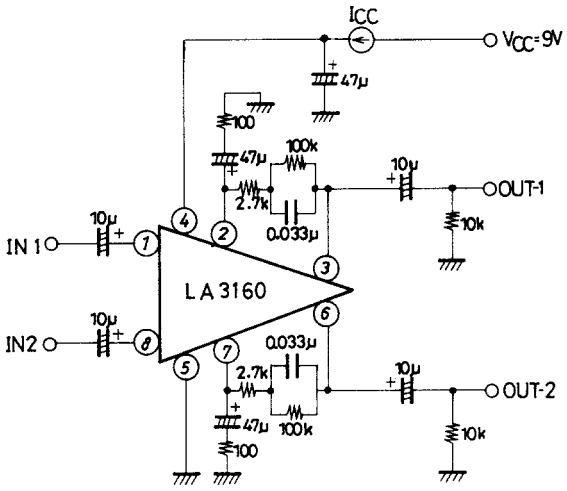
SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

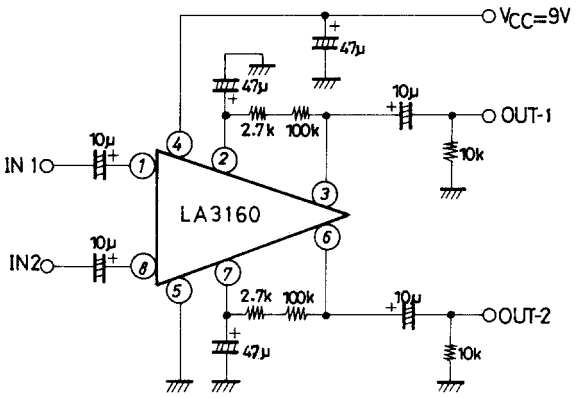
Equivalent Circuit Block Diagram



Test Circuit1 : V_O, VG, THD, I_{CC}, r_i

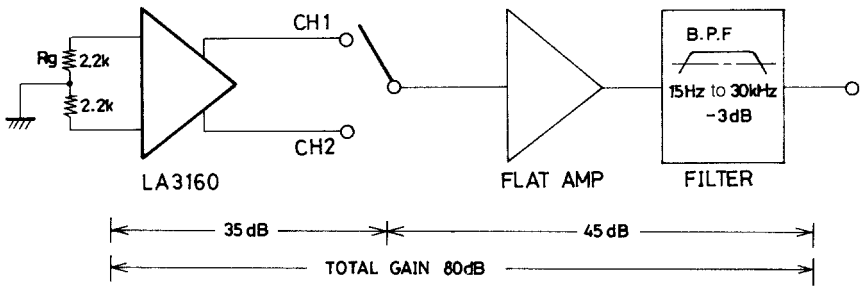


Test Circuit2 : VG_O

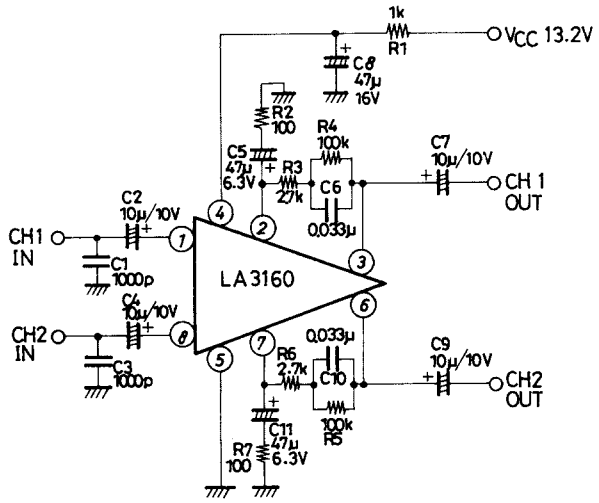


Unit (resistance: Ω, capacitance: F)

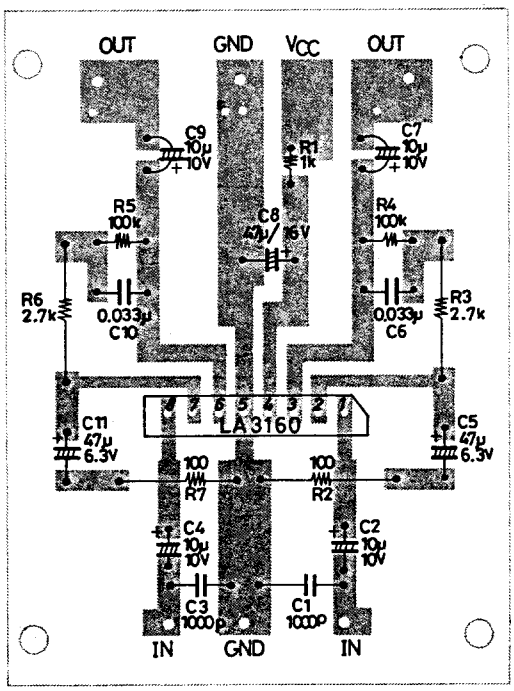
Test Circuit3 : Noise



Sample Application Circuit 1 : Preamplifier for Car Stereo



Unit (resistance: Ω, capacitance: F)



Sample Printed Circuit Pattern
(Cu-foiled area, 67×50mm²)

Function of External Parts

C_2, C_4 are input coupling capacitors. In NAB equalizer amplifier, the gain at low frequencies is high and 1/f noise inside the IC is emphasized as output noise. Therefore, if the reactance of capacitor at low frequencies is increased, the dependence of 1/f noise on the signal source resistance causes the output noise voltage to deteriorate, and the value of reactance must be made small enough as compared with the signal source resistance. C_2, C_4 also influence the operation start time and the adequate value of these capacitors is 10µF. (Since C_2, C_4 of less than 4.7µF make the operation start time longer, use C2, C4 of 4.7µF or more).

C_5, C_{11} are NF capacitors. The lower cut-off frequency depends on the value of these capacitors.

If the lower cut-off frequency is taken as f_L :

$$C5\ (C11) = 1/2\pi \cdot f_L \cdot R2\ (R7)$$

If the value of this capacitor is made larger, the operation start time of amplifier is more delayed. The adequate value of capacitor is 47µF.

The frequency characteristic of the equalizer amplifier depends on C_6 and R_4, R_3 (C_{10} and R_5, R_6).

The time constants to obtain the standard NAB characteristic are as shown below.

Tape speed	9.5cm/s	4.75cm/s
C6 (R3 + R4)	3180µs	1590µs
R3 C6	90µs	120µs

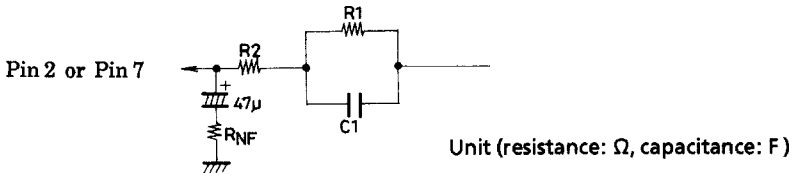
C_8 is bias capacitor for the power line. C_8 of 47µF is inserted at a point as close to the power supply pin (pin 4) as possible.

C_1, C_3 are for preventing radio interference in the strong electric field, interference attributable to engine noise, and blocking oscillation at the time of large amplitude operation. The adequate value of C_1, C_3 is approximately 1000pF.

C_7, C_9 are output coupling capacitors. The adequate value of C_7, C_9 is 10µF

NAB element and determination of gain

Since the DC feedback is provided by R_1, R_2 of NAB element, which brings about DC output potential at pins 3, 6, it is impossible to change the value of R_1, R_2 of NAB element greatly. Therefore, when determining the gain, change R_{NF} with R_1, R_2, C_1 (NAB element) kept constant.



(1) How to obtain R_{NF}

Impedance Z of NAB element is

$$Z = \frac{1}{1/R1+j\omega C1} + R2$$

$$= (R1+R2)\left\{\frac{1+j\omega C1\ \{R1R2/\ (R1+R2)\}}{1+j\omega C1R1}\right\}$$

For a general negative feedback amplifier circuit, $A=Ao/(1+Ao\beta)$ applies, and $Z=A \cdot R_{NF}$ is obtained under conditions of $Ao>>A$, $A>>1$ ($\beta=R_{NF}/(R_{NF}+Z)$, Ao=open-loop gain, A=feedback gain.
Therefore, we can use an approximation of $R_{NF}=Z/A$.

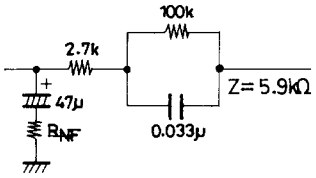
A= (VG for 1kHz) times, (Set R_1, R_2 at approximately 100kΩ)

Each time constant of NAB characteristic.

Tape speed	9.5cm/s	4.75cm/s
T1 C1, R1	3180μs	1590μs
T2 C1 (R1//R2)	90μs	120μs

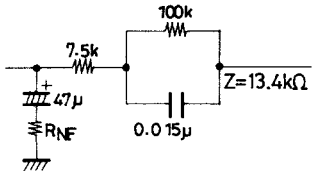
(2) Examples of NAB Constants

(a) Tape speed : 9.5cm/s for an 8-track recorder (Z, AG : at f=1kHz)



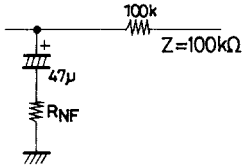
VG	30	35	40	dB
R_{NF}	180	100	56	Ω

(b) Tape speed : 4.75cm/s for a cassette tape recorder

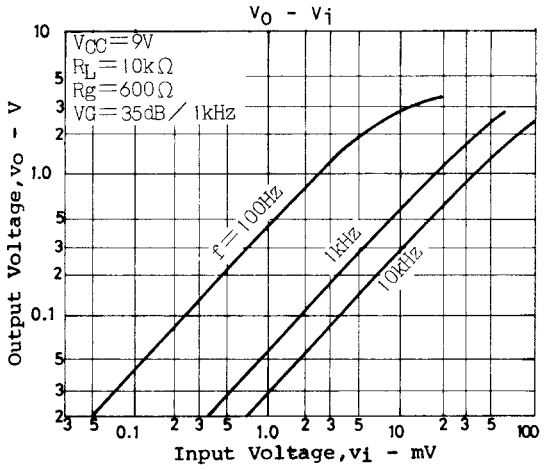


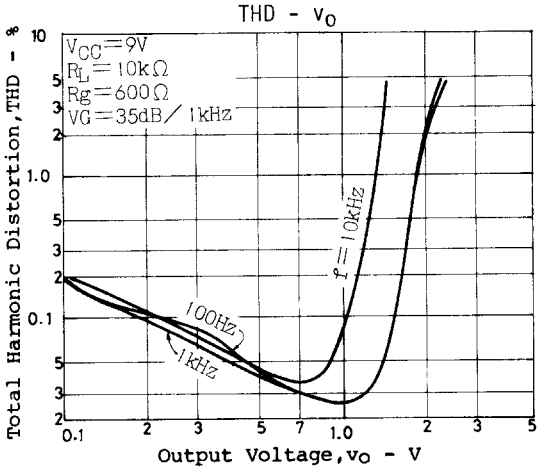
VG	30	35	40	dB
R_{NF}	440	240	130	Ω

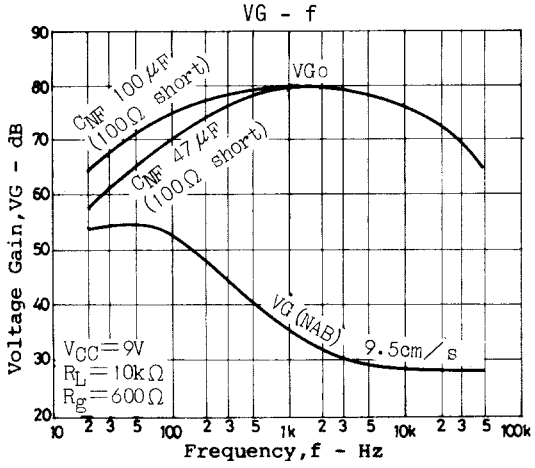
(c) Flat amplifier

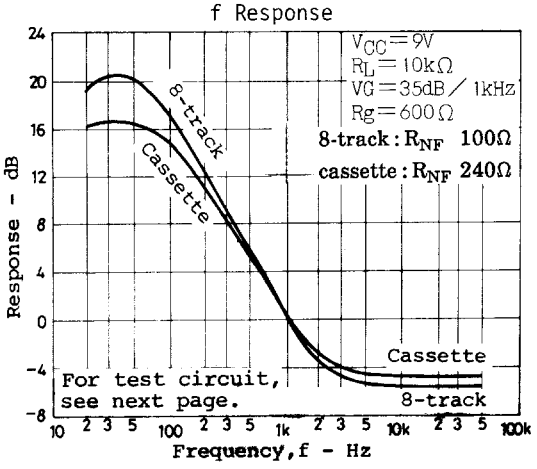


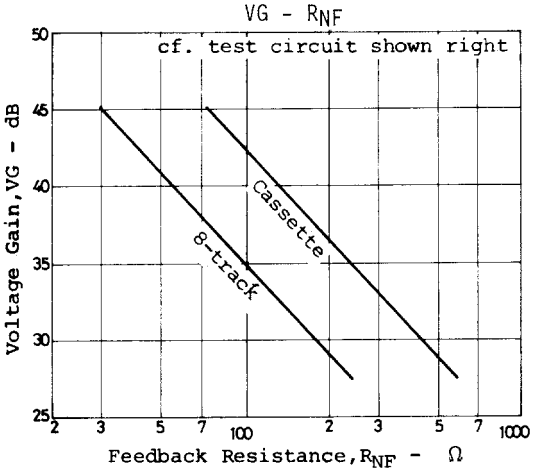
VG	30	35	40	dB
R_{NF}	3.2k	1.8k	1k	kΩ



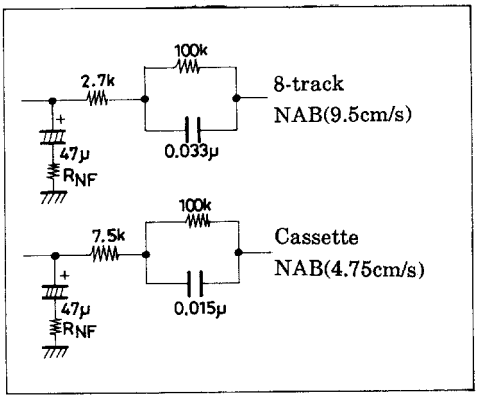


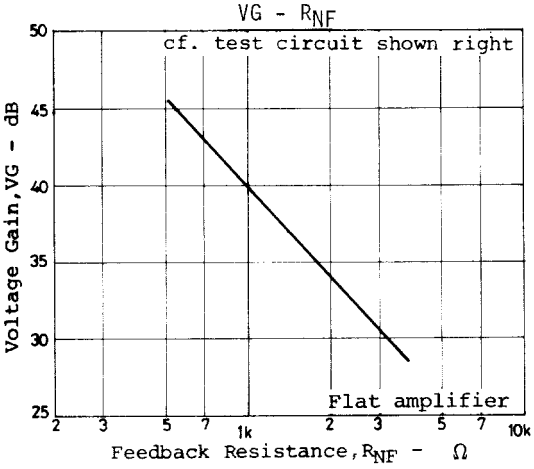




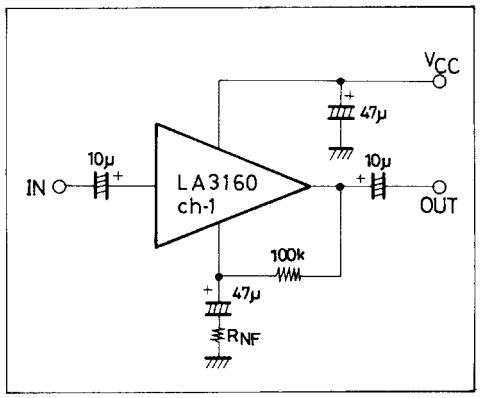


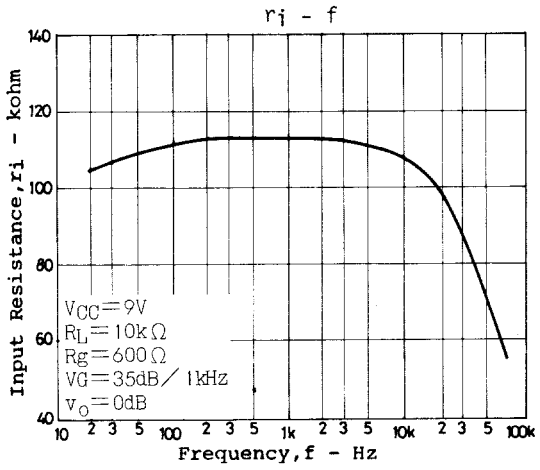
Test Circuit 1

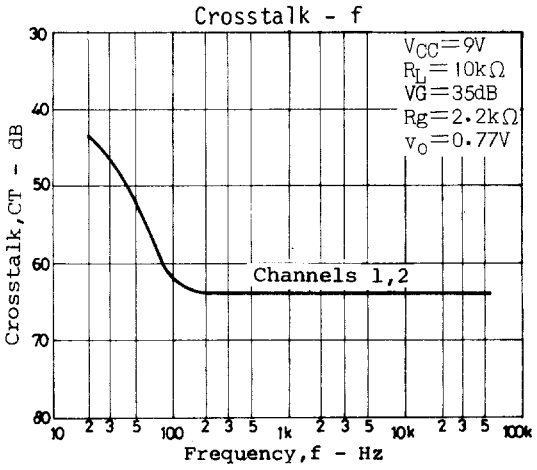


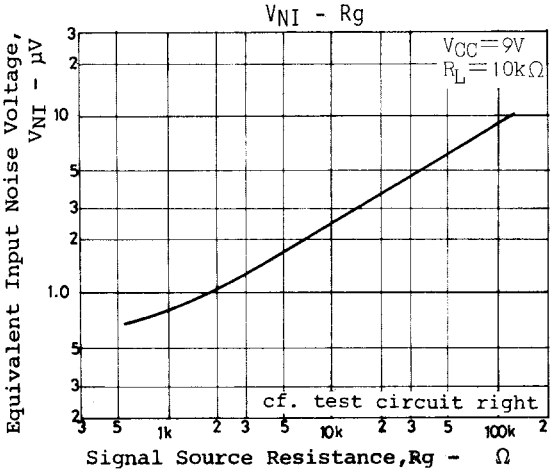


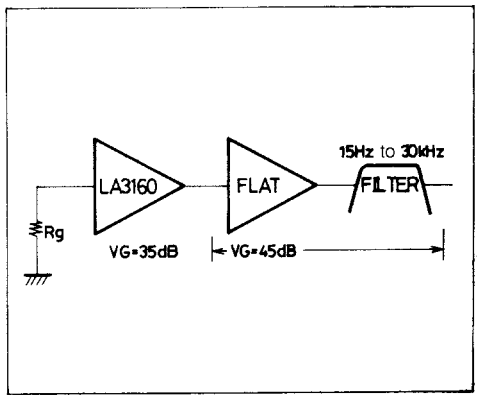
Test Circuit 2



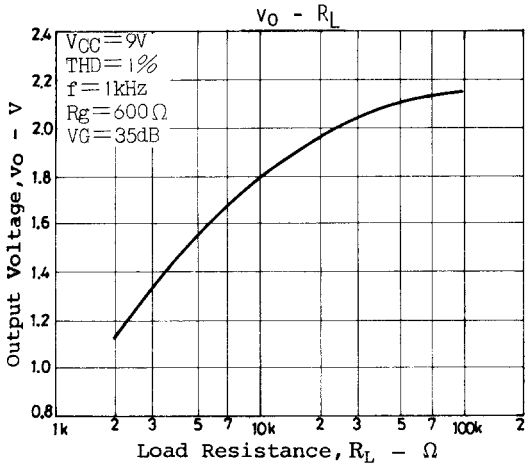


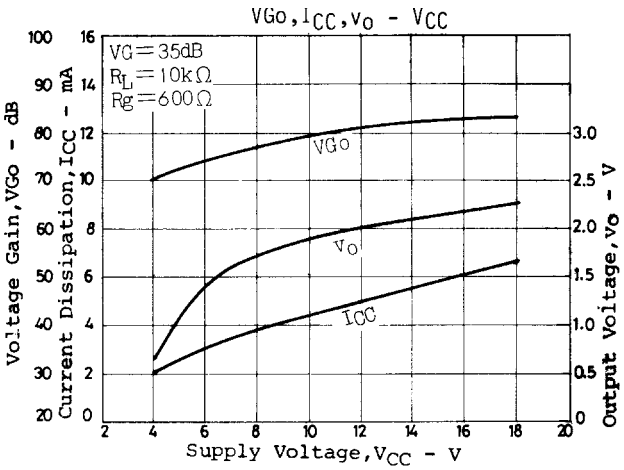


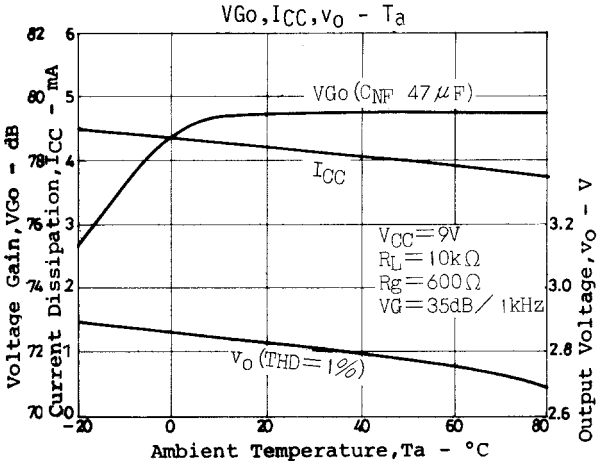




Unit (resistance: Ω, capacitance: F)







Proper cares in using IC

1. Maximum Rating
   If the IC is used in the vicinity of the maximum rating, even a slight variation in conditions may cause the maximum rating to be exceeded, thereby leading to a breakdown. Allow an ample margin of variation for supply voltage, etc. and use the IC in the range where the maximum rating is not exceed.
2. Short between pins
   If the supply voltage is applied when the space between pins is shorted, a breakdown or deterioration may occur. When installing the IC on the board or applying the supply voltage, make sure that the space between pins is not shorted with solder, etc.
3. Breakdown of IC attributable to inverted insertion
   If the IC is inserted inversely and operated, the IC may suffer from something unusual, thereby leading to a breakdown or deterioration of the IC. When installing the IC on the board or operating the IC, check the marked surface of IC.

Proper cares to be taken for obtaining optimum operation of IC

· Set DC resistance of R_1, R_2 of NAB element at approximately 100kΩ.
· Determine the gain by changing RNF without chaging NAB constant (Refer to Examples of NAB constant.).
· Supply voltage characteristics are sufficiently considered, but supply voltage is recommended to be between 5V to 18V.

- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products(including technical data,services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of January, 2000. Specifications and information herein are subject to change without notice.

This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.