



LA8604M

Narrowband FM IF Stage

Overview

The LA8604M is a narrowband FM IF stage IC that incorporates all the functional blocks for a complete IF stage, including noise filtering, making it ideal for use in cordless telephones.

The LA8604M comprises a second-stage oscillator, a mixer, an IF amplifier, an FM detector, and noise detector, amplifier and rectifier circuits. A signal level meter output which is linear over a wide dynamic range of up to 70dB is also incorporated.

The LA8604M operates from a 2.4 to 6V supply and is available in 24-pin MFPs.

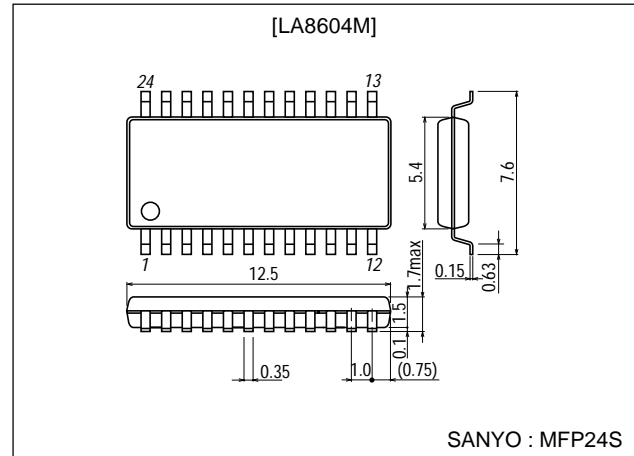
Features

- On-chip mixer, IF amplifier and limiter.
- On-chip noise filter buffer.
- 70dB (typ) signal level meter linearity.
- Signal level meter output buffer.
- 2.4 to 6V supply.
- 24-pin MFP.

Package Dimensions

unit:mm

3112A-MFP24S



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC max}		8	V
Maximum power dissipation	P _{d max}		300	mW
Operating temperature	T _{opr}		-20 to +75	°C
Storage temperature	T _{stg}		-40 to +125	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V _{CC}		3	V
Operating supply voltage range	V _{CC op}		2.4 to 6.0	V

■ 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.

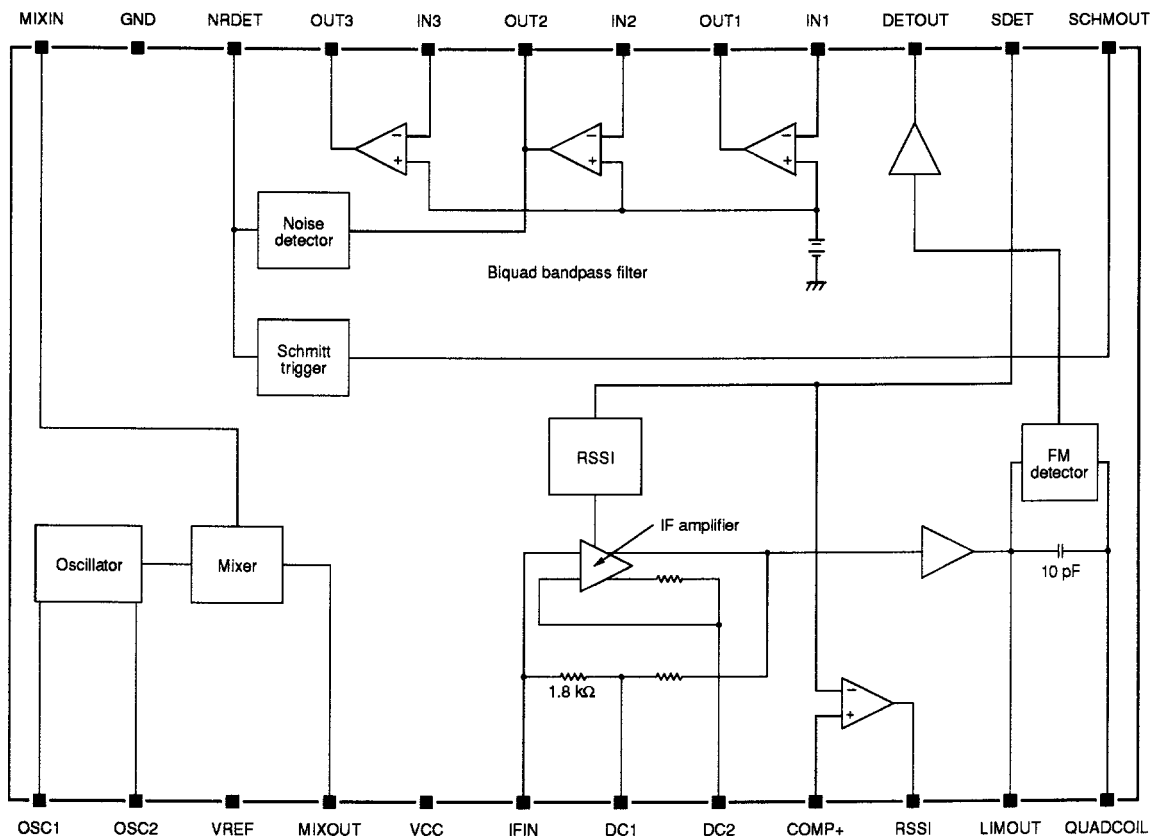
■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained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

LA8604M

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, $f_C = 21.7\text{MHz}$, $f_{\text{mod}} = 1\text{kHz}$, $\Delta f = \pm 3\text{kHz}$

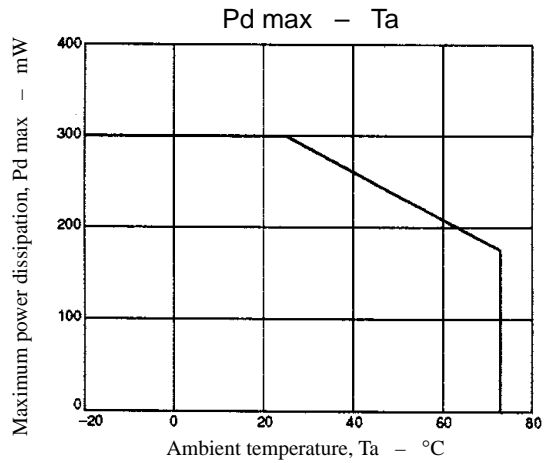
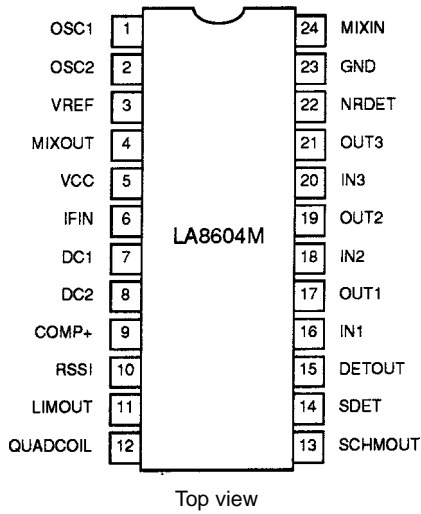
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CCO}			2.8	3.8	mA
-3dB limiting sensitivity	-3dBLS	$V_I = 80\text{dB}\mu$, -3dB input		5	11	dB μ
Demodulation output voltage	V_O	$V_I = 80\text{dB}\mu$	115	170	230	mV
Signal-to-noise ratio	S/N	$V_I = 80\text{dB}\mu$, zero modulation	54	60		dB
		$V_I = 20\text{dB}\mu$, zero modulation	20	25		dB
Amplitude modulation rejection ratio	AMR	30% AM modulation	30	40		dB
Total harmonic distortion	THD	$V_I = 80\text{dB}\mu$		0.7	2.0	%
		$V_I = 10\text{dB}\mu$	1.1	1.4		V
Noise detector output voltage	V_{ND}	$V_I = 30\text{dB}\mu$		0	0.1	V
			10	18	25	dB μ
Schmitt-trigger level	SH			1		dB
Schmitt-trigger hysteresis	SHhy					
						0.5
Schmitt-trigger output voltage	V_{SH}	$V_I = 10\text{dB}\mu$	2.8			V
		$V_I = 25\text{dB}\mu$		0.1	0.3	V
Signal meter output voltage	V_{SM}	$V_I = 5\text{dB}\mu$	0.8	1.1	1.4	V
		$V_I = 50\text{dB}\mu$	1.3	1.6	2.0	V
		$V_I = 80\text{dB}\mu$	2.8			V
RSSI output voltage	V_{RSSI}	$V_I = 5\text{dB}\mu$				V
		$V_I = 35\text{dB}\mu$			0.5	V
Mixer conversion gain	G_M			20		dB
Mixer input frequency					90	MHz
Mixer input resistance				3.6		k Ω
Mixer output resistance				1.8		k Ω
IF amplifier input resistance				1.8		k Ω
FM detector output impedance				2.4		k Ω

Block Diagram



LA8604M

Pin Assignment



Pin Functions

Number	Name	Equivalent circuit	Description
1	OSC1		Colpitts oscillator crystal connection. Nominal voltage is V_{CC} .
2	OSC2		Colpitts oscillator crystal connection. Nominal voltage is $V_{CC}-0.7V$.
3	VREF		1.2V reference voltage output.
4	MIXOUT		Mixer buffer output. Nominal voltage is $V_{CC}-0.3V$.
5	V_{CC}		Supply voltage.
6	IFIN		IF amplifier input. Nominal voltage is $V_{CC}-0.9V$.
7	DC1		IF amplifier feedback network connections. Nominal voltage is $V_{CC}-0.9V$.
8	DC2		

Continued on next page.

LA8604M

Continued from preceding page.

Number	Name	Equivalent circuit	Description
9	COMP+		RSSI comparator threshold input.
10	RSSI		Open-collector, RSSI comparator output.
11	LIMOUT		Limiter amplifier output. Nominal voltage is 0.2V.
12	QUADCOIL		Detector tuning network connection. Nominal voltage is V_{CC} .
13	SCHMOUT		Open-collector, noise comparator Schmitt-trigger output.
14	SDET		Signal strength detector output. Nominal voltage is in the range 0.1 to 1.5V.
15	DETOUT		FM detector output. Nominal voltage is 1.2V.
16	IN1		Operational amplifier 1 inverting input. Nominal voltage is 1.0V.
17	OUT1		Operational amplifier 1 output. Nominal voltage is 1.0V.
18	IN2		Operational amplifier 2 inverting input. Nominal voltage is 1.0V.
19	OUT2		Operational amplifier 2 output. Nominal voltage is 1.0V.

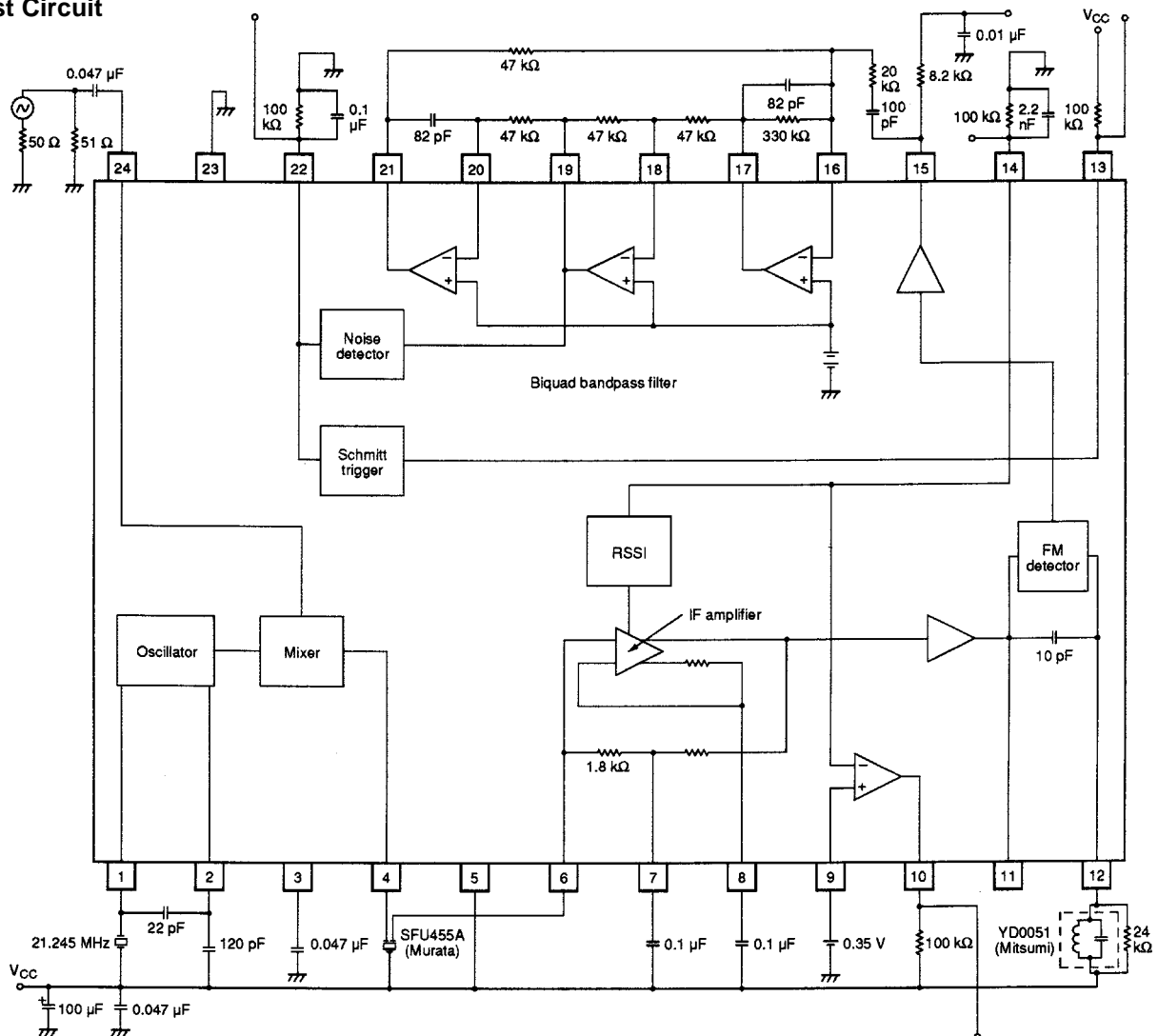
Continued on next page.

LA8604M

Continued from preceding page.

Number	Name	Equivalent circuit	Description
20	IN3		Operational amplifier 3 inverting input. Nominal voltage is 1.0V.
21	OUT3		Operational amplifier 3 output. Nominal voltage is 1.0V.
22	NRDET		Noise detector output. Nominal voltage is in the range 0 to 1.4V.
23	GND		Ground
24	MIXIN		Mixer input. Nominal voltage is 1.2V.

Test Circuit



Sample Application Circuits

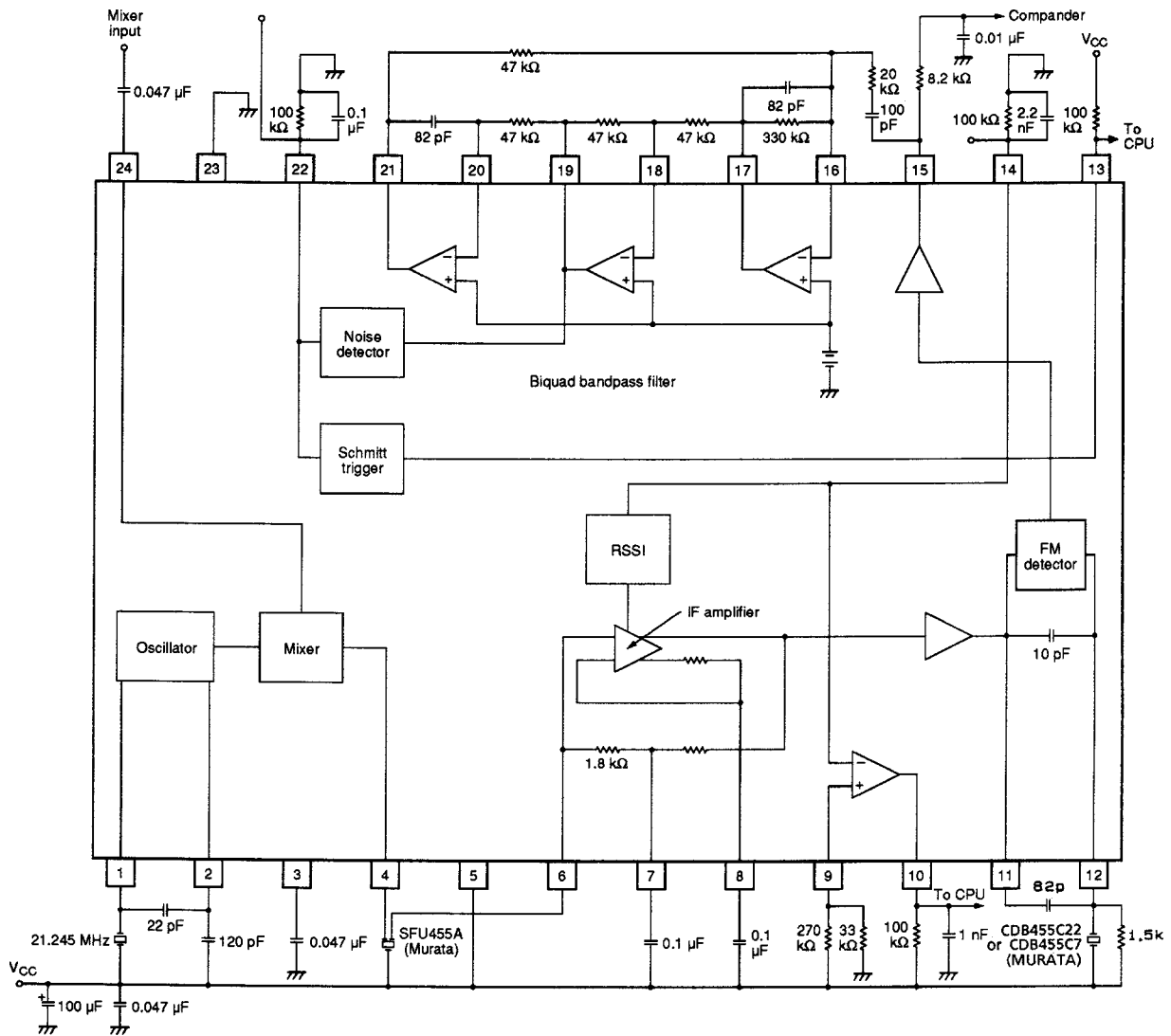


Figure 1. Crystal detector

LA8604M

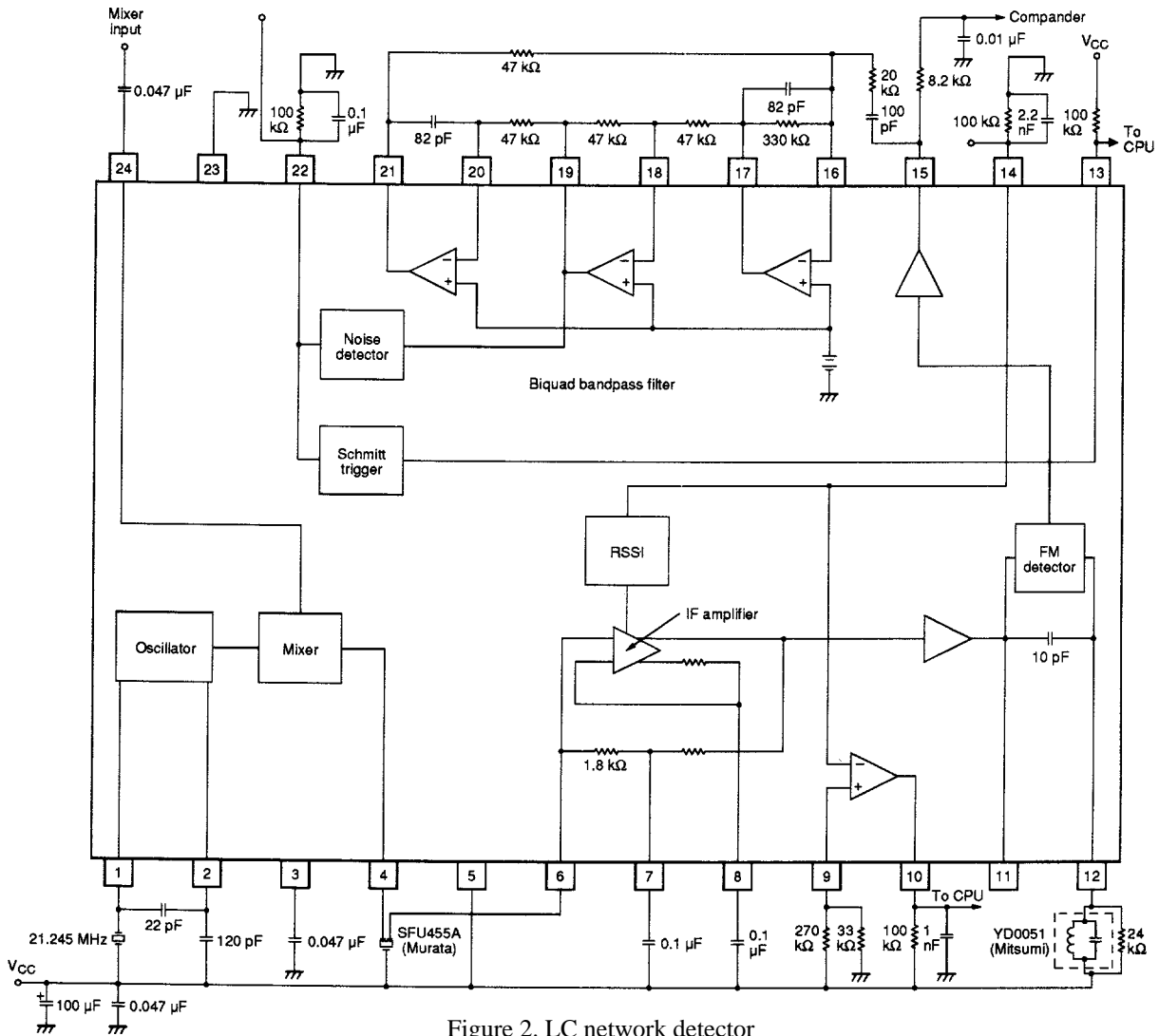


Figure 2. LC network detector

- 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 May, 2001. Specifications and information herein are subject to change without notice.