



SANYO Semiconductors

DATA SHEET

LA5316M

Monolithic Linear IC
For LCD Use
Variable Divided Voltage Generator

Overview

The LA5316M is a variable divided voltage generator IC for multiple drive of LCD matrix.

Features

- Power supply for variable bias LCD drive (1/5 to 1/13 bias available by on-chip resistances).
- 5 operational amplifiers to deliver 5 voltage outputs.
- Low current drain (1.5mA max).
- Miniflat package.
- On-chip variable voltage regulator for V_{REF} .

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$	GND-VCC	-35 to 0	V
Maximum output current	$I_{OUT\ max}$	V1, V2, V3, V4, V5	15	mA
Allowable power dissipation	$P_d\ max$		370	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-30 to +125	$^\circ\text{C}$

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application" intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment, etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer or who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. 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 Semiconductor Co., Ltd.

www.semiconductor-sanyo.com/network

LA5316M

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC\text{ op}}$	$\text{GND}-V_{CC}$: (When $V_1 > -1\text{V}$, I_{IN} is needed.)*	-30 to -10	V
Recommended input voltage	V_{REF}	$\text{GND}-V_{REF}$: $V_{REF} \geq V_{CC}^*$	-30 to -6	V
Recommended input current	I_{IN}	V_{IN} : $V_1 > -1\text{V}$, current source of I_{IN} : 1V or greater relative to GND	0.2 to 3	mA
Recommended output current	I_{OUT1}	V_1	-0.1 to +5	mA
	$I_{OUT2, 3}$	V_2, V_3	-5 to +5	mA
	$I_{OUT4, 5}$	V_4, V_5	-10 to +0.1	mA

Note * Set V_{CC} , V_{REF} so that $|V_2|$, $|V_{CC}-V_5|$ become 1V or greater.

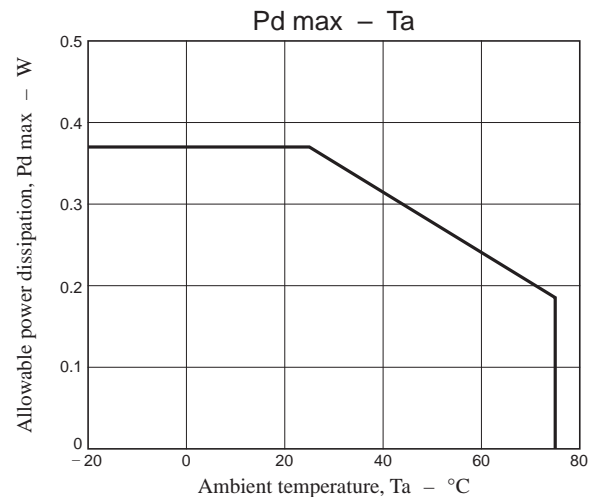
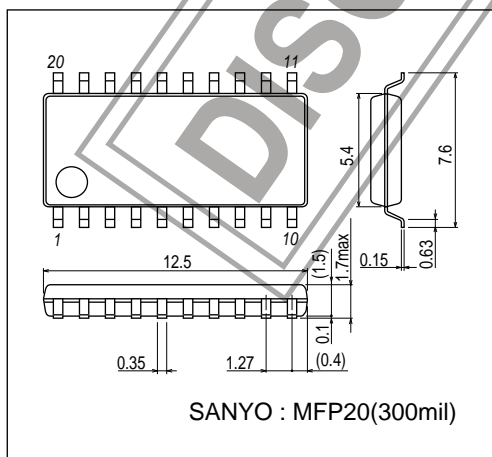
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = -16\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I_{CC}	$V_{IN}, \text{GND}-V_{CC}, V_{REF} : V_{CC} = V_{REF} = -16\text{V}$, $V_{IN} = \text{GND}, R_X = 5\text{R}$			1.5	mA
Output voltage ratio 1	R_{a1}	V_2/V_1	1.96	2.00	2.04	
Output voltage ratio 2	R_{a2}	$(V_5-V_3)/(V_5-V_4)$				
Output voltage ratio 3	R_{b1}	V_5/V_1				
Output voltage ratio 4	R_{b2}	V_5/V_2				
Output voltage ratio 5	R_{b3}	$V_5/(V_5-V_3)$				
Output voltage ratio 6	R_{b4}	$V_5/(V_5-V_4)$				
Internal resistance ratio 1	4R	$V_{IN3}-R_X1$	Resistance ratio referenced to R across pins 5 and 6			4
Internal resistance ratio 2	5R	$V_{IN3}-R_X2$				5
Internal resistance ratio 3	6R	$V_{IN3}-R_X3$				6
Internal resistance ratio 4	7R	$V_{IN3}-R_X4$				7
Internal resistance ratio 5	8R	$V_{IN3}-R_X5$				8
Internal resistance ratio 6	9R	$V_{IN3}-R_X6$				9
Resistance	R	R_X1-R_X2 : R value when 0.5V is applied across pins 5 and 6		20		k Ω
Load regulation 1	ΔV_1	$V_1 : +100\mu\text{A} < I_{OUT1} < +5\text{mA}$			20	mV
Load regulation 2	ΔV_2	$V_2 : +100\mu\text{A} < I_{OUT2} < +5\text{mA}$			20	mV
Load regulation 3	ΔV_3	$V_3 : +100\mu\text{A} < I_{OUT3} < +5\text{mA}$			20	mV
Load regulation 4	$-\Delta V_2$	$V_2 : -5\text{mA} < I_{OUT2} < -100\mu\text{A}$			20	mV
Load regulation 5	$-\Delta V_3$	$V_3 : -5\text{mA} < I_{OUT3} < -100\mu\text{A}$			20	mV
Load regulation 6	$-\Delta V_4$	$V_4 : -10\text{mA} < I_{OUT4} < -100\mu\text{A}$			20	mV
Load regulation 7	$-\Delta V_5$	$V_5 : -10\text{mA} < I_{OUT5} < -100\mu\text{A}$			20	mV
Regulator voltage	V_{Reg}	$\text{GND}-V_{Reg}$: Pins 7 and 8 shorted	-6.5	-6.2	-5.9	V
V_{Reg} load regulation	ΔV_{Reg}	$V_{Reg} : -5\text{mA} < I_O < +1\text{mA}$			50	mV

Package Dimensions

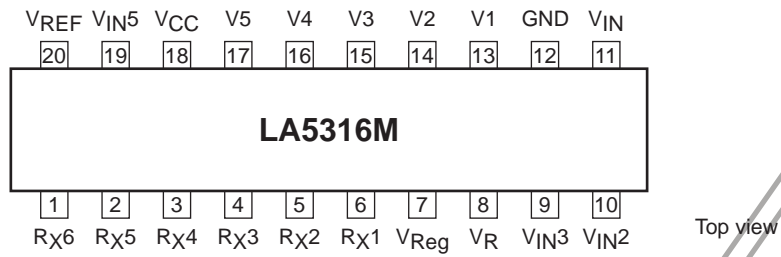
unit : mm (typ)

3036C



LA5316M

Pin Assingment

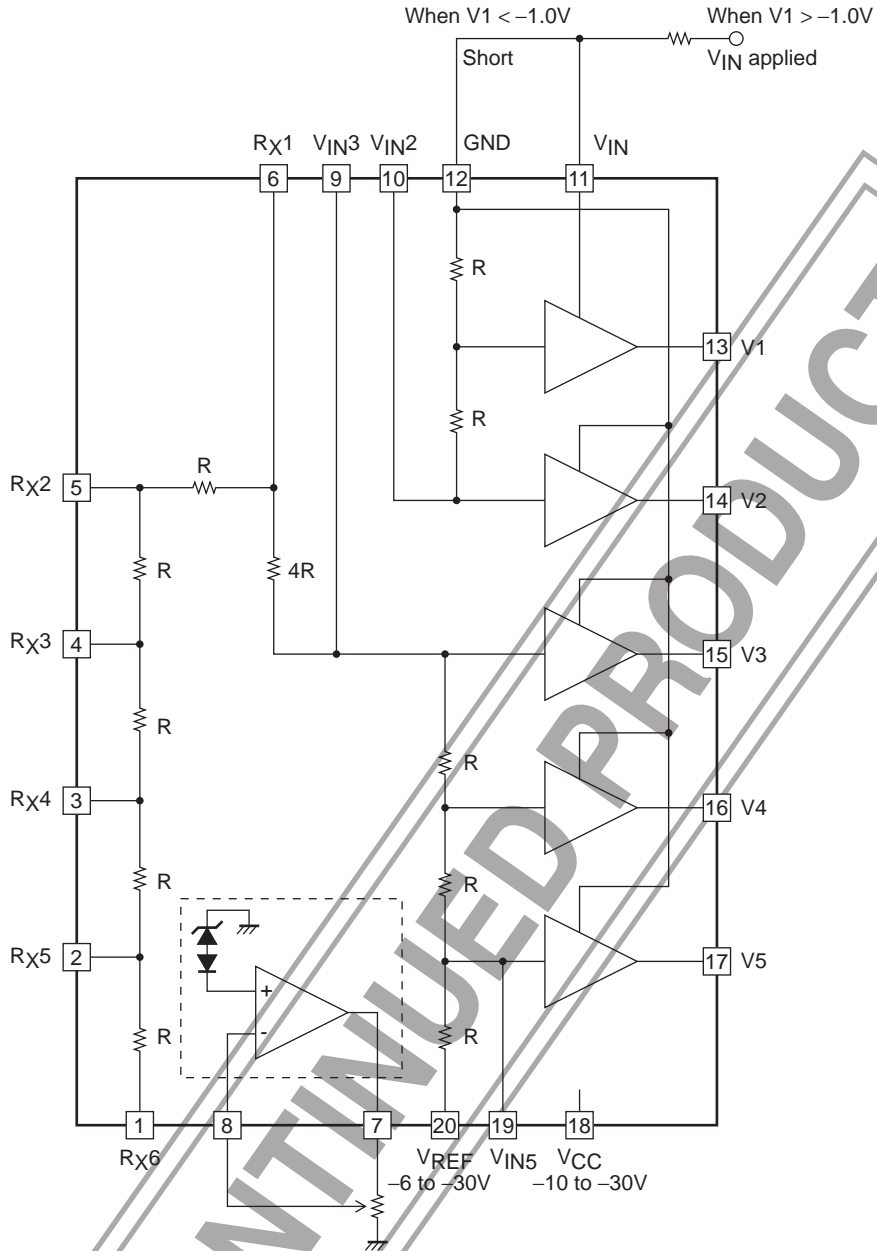


Pin Functions

Pin No.	Pin Name	Description	Remarks
1	R _X 6	R _X pin	Pin 10 shorted R _X = 9R
2	R _X 5	R _X pin	Pin 10 shorted R _X = 8R
3	R _X 4	R _X pin	Pin 10 shorted R _X = 7R
4	R _X 3	R _X pin	Pin 10 shorted R _X = 6R
5	R _X 2	R _X pin	Pin 10 shorted R _X = 5R
6	R _X 1	R _X pin	Pin 10 shorted R _X = 4R
7	V _{Reg}	V _{Reg} output	For supplying V _{REF}
8	V _R	V _{Reg} operational amplifier V _{IN-}	
9	V _{IN3}	V3 input	
10	V _{IN2}	V2 input	
11	V _{IN}	V1 supply (+ supply)	When V1 > -1.0V, V _{IN} is applied. When V1 < -1.0V, this pin is shorted to GND.
12	GND	GND	
13	V1	V1 output	
14	V2	V2 output	
15	V3	V3 output	
16	V4	V4 output	
17	V5	V5 output	
18	V _{CC}	V _{CC} supply (- supply)	
19	V _{IN5}	V5 input	
20	V _{REF}	V _{REF} supply (- supply)	

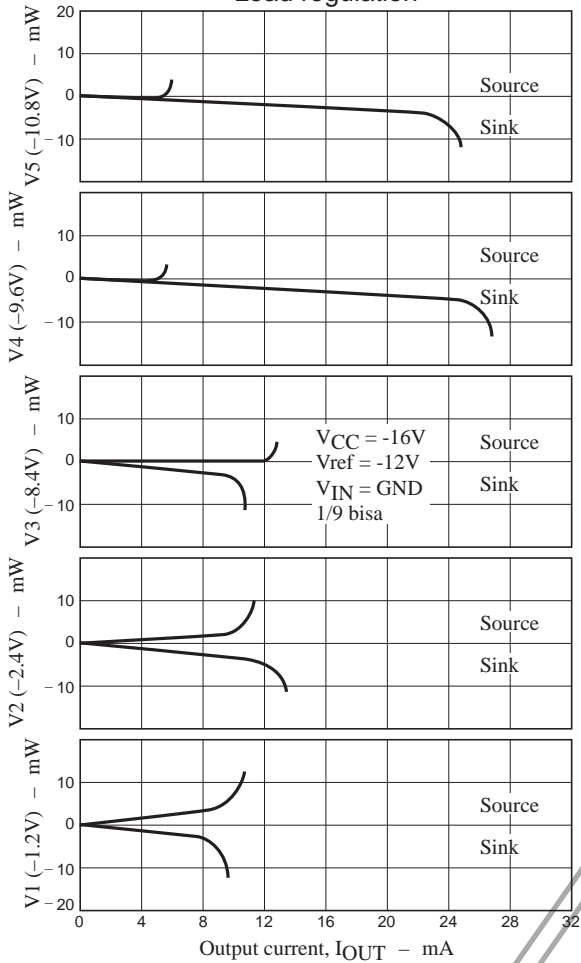
LA5316M

Block Diagram

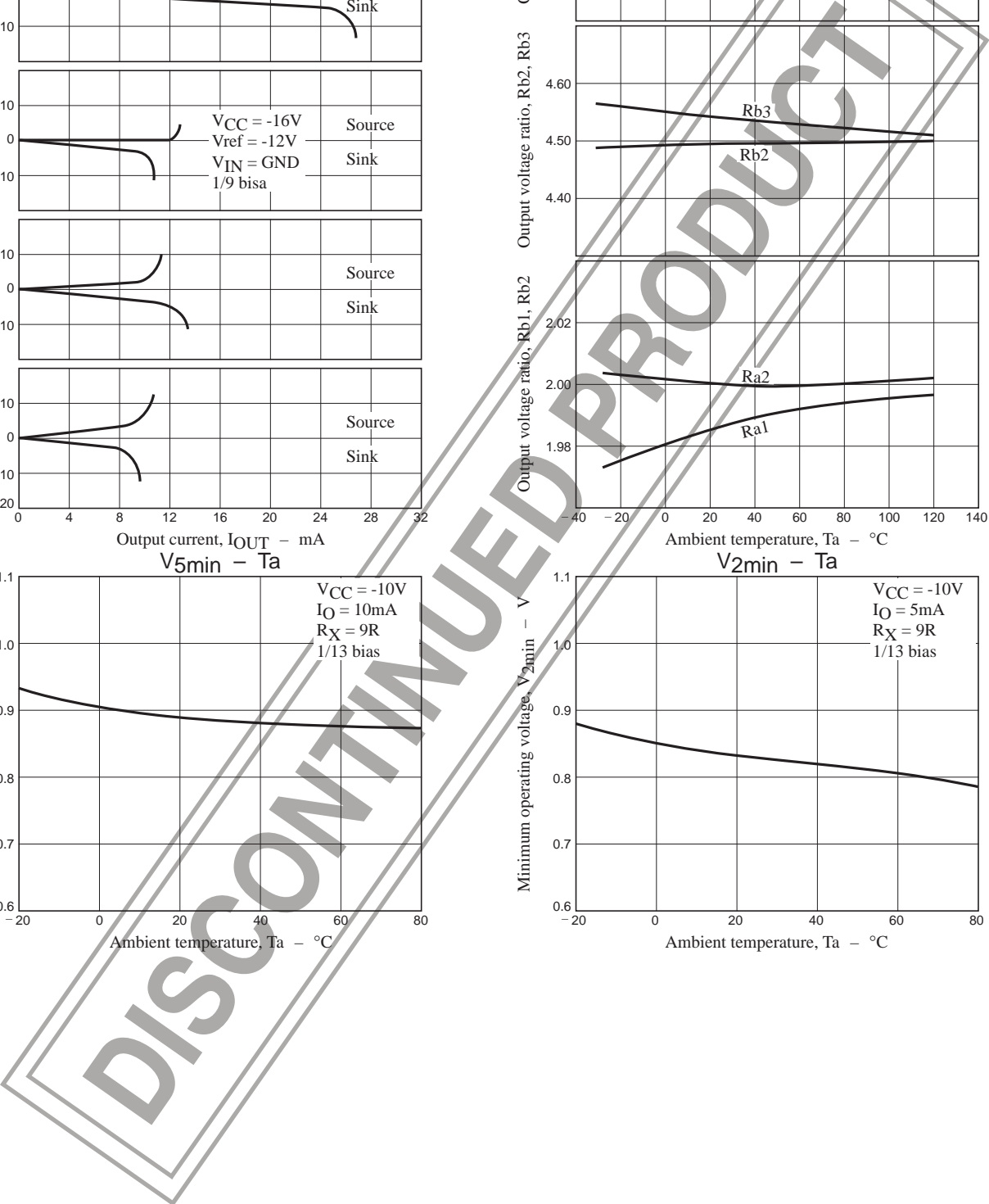
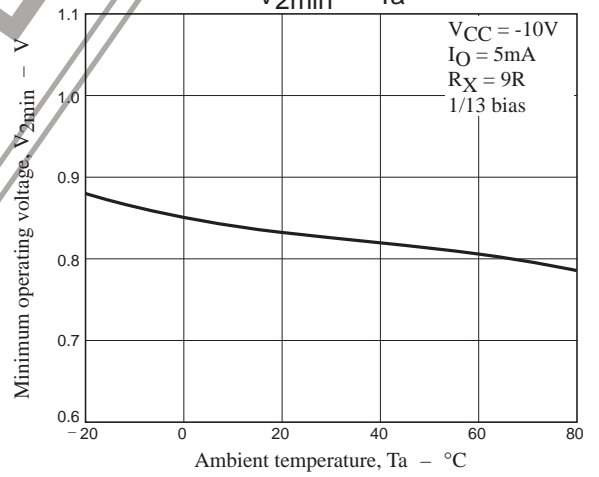
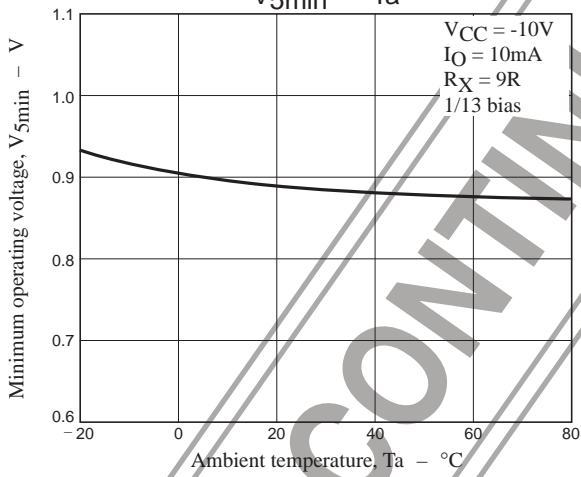
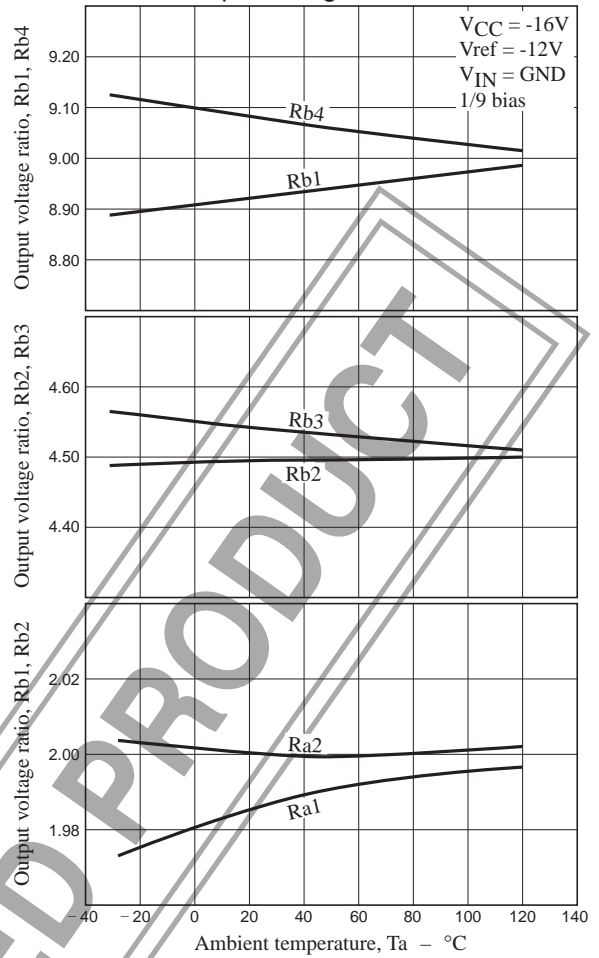


DISCONTINUED PRODUCT

Load regulation



Output voltage ratio - T_a



VALUED PRODUCT

- SANYO Semiconductor Co.,Ltd. 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 Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents 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 Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require 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 consent of SANYO Semiconductor 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 Semiconductor Co.,Ltd. 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.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of September, 2008. Specifications and information herein are subject to change without notice.