



LA5316M

Variable Divided Voltage Generator for LCD

Overview

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

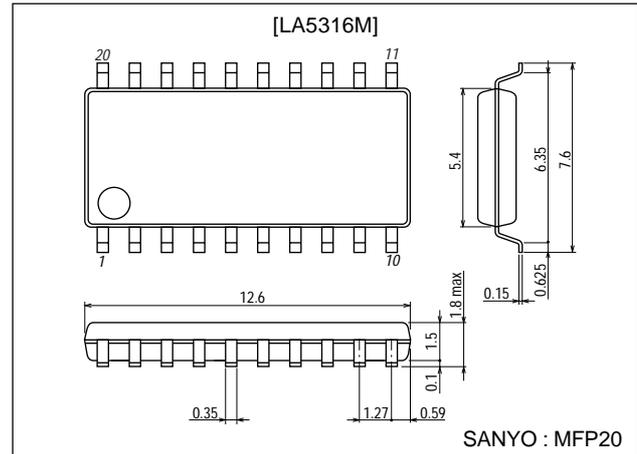
Features

- 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} .

Package Dimensions

unit:mm

3036B-MFP20



Specifications

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

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

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC \text{ op}}$	GND- V_{CC} : (When $V_1 > -1\text{V}$, I_{IN} is needed.) *	-30 to -10	V
Recommended input voltage	V_{REF}	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}	V1	-0.1 to +5	mA
	$I_{OUT2, 3}$	V2, V3	-5 to +5	mA
	$I_{OUT4, 5}$	V4, V5	-10 to +0.1	mA

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

■ 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.

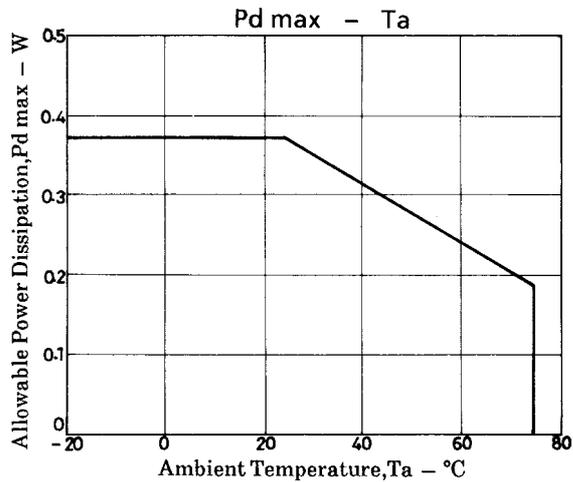
SANYO Electric Co., Ltd. Semiconductor Company

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

LA5316M

Operating 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}	$V_{IN}, GND-V_{CC}, V_{REF} : V_{CC}=V_{REF}=-16\text{V}, V_{IN}=GND, R_X=5R$			1.5	mA
Output voltage ratio 1	Ra1	$V2/V1, V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	1.96	2.00	2.04	
Output voltage ratio 2	Ra2	$(V5-V3)/(V5-V4), V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	1.96	2.00	2.04	
Output voltage ratio 3	Rb1	$V5/V1, V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	8.73	9.00	9.27	
Output voltage ratio 4	Rb2	$V5/V2, V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	4.37	4.50	4.63	
Output voltage ratio 5	Rb3	$V5/(V5-V3), V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	4.37	4.50	4.63	
Output voltage ratio 6	Rb4	$V5/(V5-V4), V_{ref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5R)$	8.73	9.00	9.27	
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	$V_{IN3}-R_X2$, Resistance ratio referenced to R across pins ⑤ and ⑥		5		
Internal resistance ratio 3	6R	$V_{IN3}-R_X3$, Resistance ratio referenced to R across pins ⑤ and ⑥		6		
Internal resistance ratio 4	7R	$V_{IN3}-R_X4$, Resistance ratio referenced to R across pins ⑤ and ⑥		7		
Internal resistance ratio 5	8R	$V_{IN3}-R_X5$, Resistance ratio referenced to R across pins ⑤ and ⑥		8		
Internal resistance ratio 6	9R	$V_{IN3}-R_X6$, Resistance ratio referenced to R across pins ⑤ and ⑥		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	$\Delta V1$	$V1 : +100\mu\text{A} < I_{OUT1} < +5\text{mA}$			20	mV
Load regulation 2	$\Delta V2$	$V2 : +100\mu\text{A} < I_{OUT2} < +5\text{mA}$			20	mV
Load regulation 3	$\Delta V3$	$V3 : +100\mu\text{A} < I_{OUT3} < +5\text{mA}$			20	mV
Load regulation 4	$-\Delta V2$	$V2 : -5\text{mA} < I_{OUT2} < -100\mu\text{A}$			20	mV
Load regulation 5	$-\Delta V3$	$V3 : -5\text{mA} < I_{OUT3} < -100\mu\text{A}$			20	mV
Load regulation 6	$-\Delta V4$	$V4 : -10\text{mA} < I_{OUT4} < -100\mu\text{A}$			20	mV
Load regulation 7	$-\Delta V5$	$V5 : -10\text{mA} < I_{OUT5} < -100\mu\text{A}$			20	mV
Regulator voltage	V_{Reg}	$GND-V_{Reg}$: 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



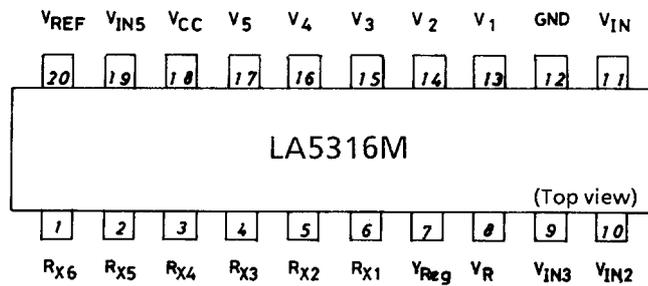
LA5316M

Pin Functions

Pin No.	Pin Name	Description	Remarks
1	R _{X6}	R _X pin	Pin 10 shorted R _X =9R
2	R _{X5}	R _X pin	Pin 10 shorted R _X =8R
3	R _{X4}	R _X pin	Pin 10 shorted R _X =7R
4	R _{X3}	R _X pin	Pin 10 shorted R _X =6R
5	R _{X2}	R _X pin	Pin 10 shorted R _X =5R
6	R _{X1}	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}	V ₃ input	
10	V _{IN2}	V ₂ input	
11	V _{IN}	V ₁ supply (+ supply)	When V ₁ > -1.0V, V _{IN} is applied. When V ₁ < -1.0V, this pin is shorted to GND.
12	GND	GND	
13	V ₁	V ₁ output	
14	V ₂	V ₂ output	
15	V ₃	V ₃ output	
16	V ₄	V ₄ output	
17	V ₅	V ₅ output	
18	V _{CC}	V _{CC} supply (-supply)	
19	V _{IN5}	V ₅ input	
20	V _{REF}	V _{REF} supply (-supply)	

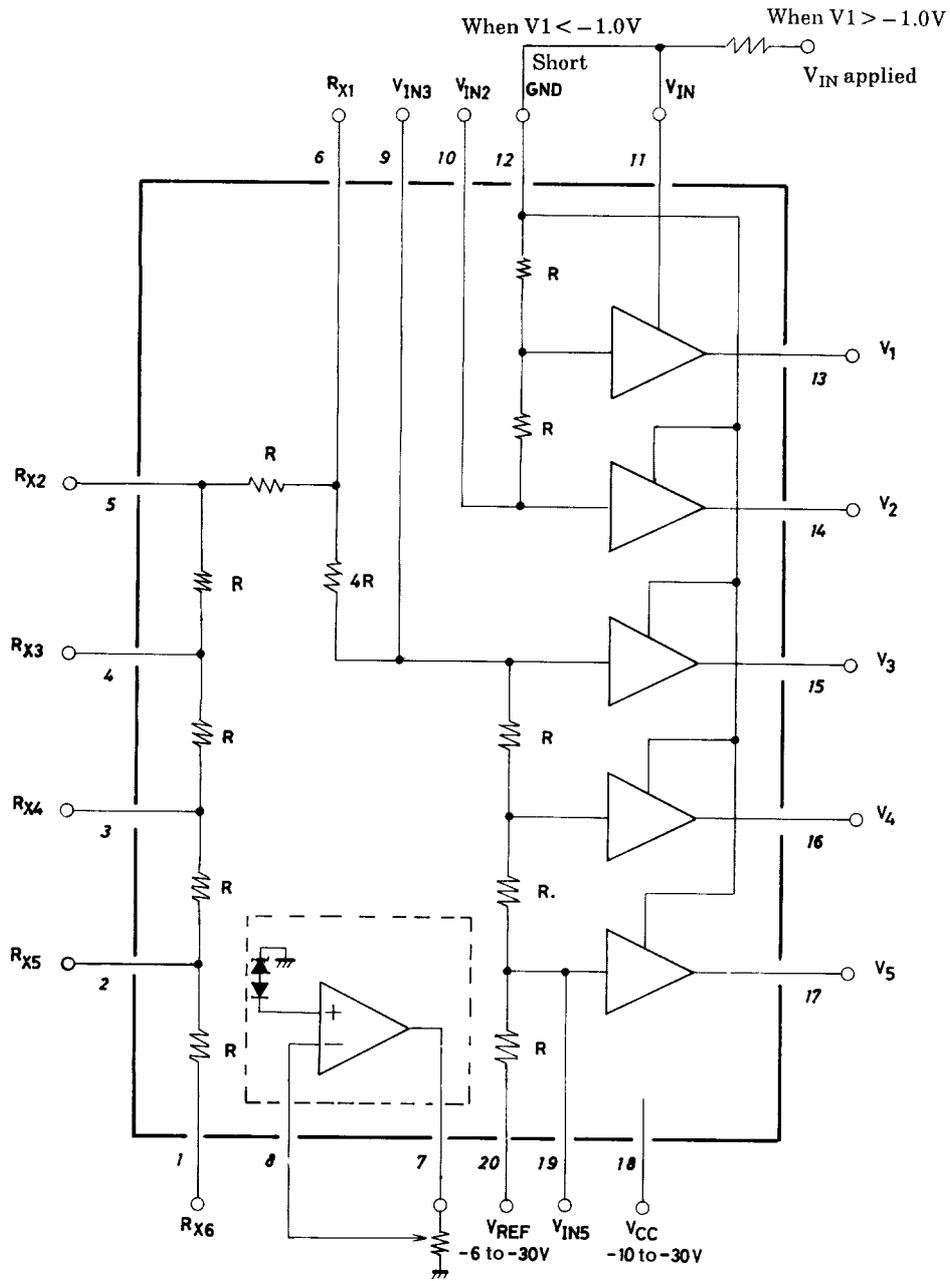
Note) Do not use the NC pin.

Pin Assingment



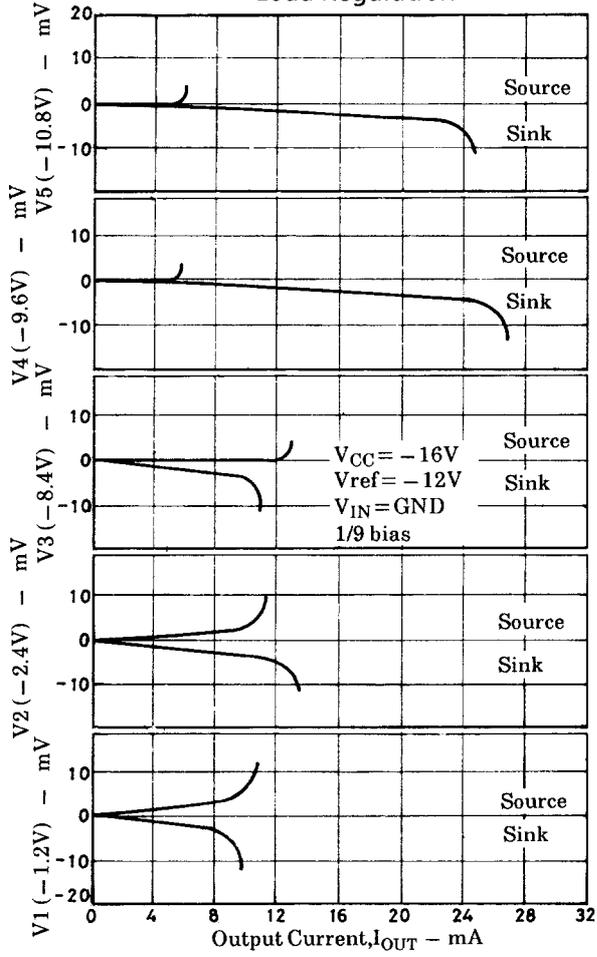
LA5316M

Equivalent Circuit Block Diagram

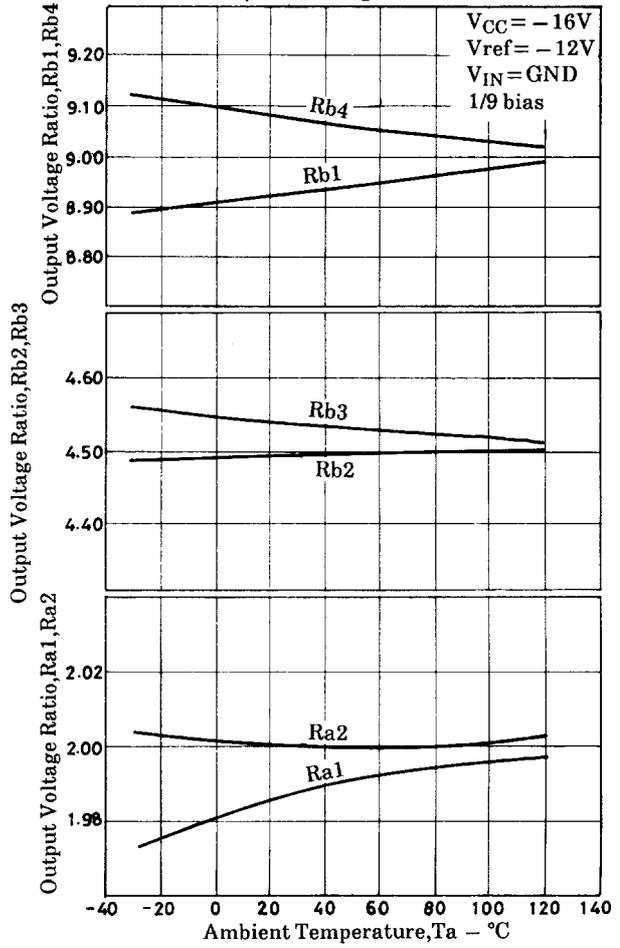


LA5316M

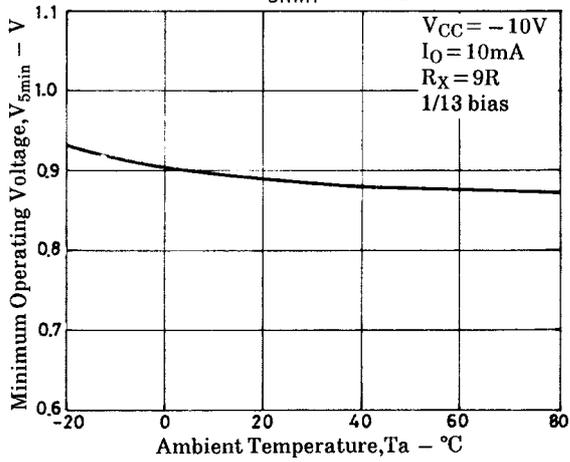
Load Regulation



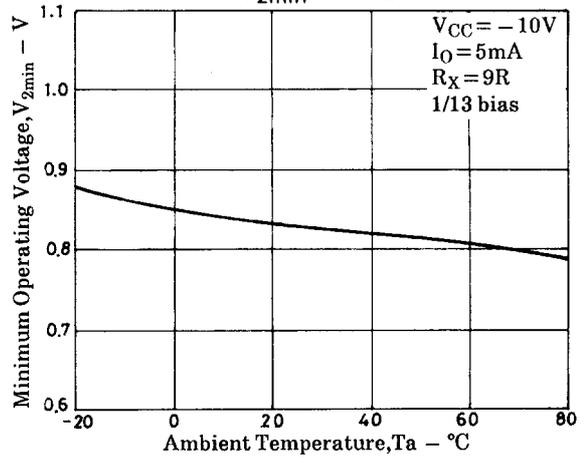
Output Voltage Ratio - T_a



$V_{5min} - T_a$



$V_{2min} - T_a$



- 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 March, 2000. Specifications and information herein are subject to change without notice.