

SANYO	No.2057B	Monolithic Linear IC
	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 OP amps to deliver 5 voltage outputs.
- Low current dissipation (1.5mA max).
- Miniflat package.
- On-chip variable voltage regulator for V_{REF} .

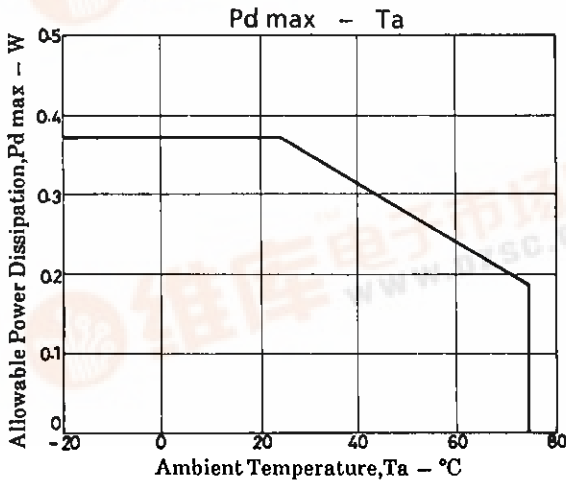
Maximum Ratings at $T_a = 25^\circ\text{C}$

				unit
Maximum Supply Voltage	V_{CC} max	GND- V_{CC}	-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	$^\circ\text{C}$

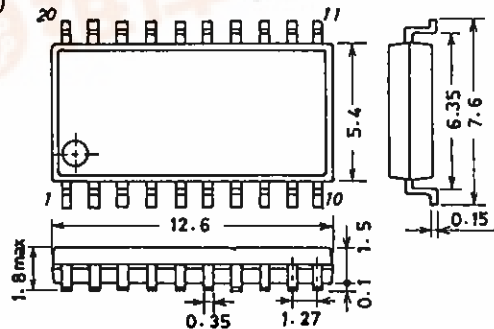
Operating Conditions at $T_a = 25^\circ\text{C}$

				unit
Supply Voltage	V_{CC} op	GND- V_{CC} : (When $V_1 > -1\text{V}$, I_{IN} is needed.) Note 1	-30 to -10	V
Recommended Input Voltage	V_{REF}	GND- V_{REF} : $V_{REF} \geq V_{CC}$ Note 1	-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 1: Set V_{CC} , V_{REF} so that $|V_2|$, $|V_{CC}-V_5|$ become 1V or greater.



Package Dimensions 3036B
(unit: mm)



SANYO: MFP20



LA5316M

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

			min	typ	max	unit
Current Dissipation	I_{CC}	$V_{IN, GND} - V_{CC}, V_{REF} : V_{CC} =$ $V_{REF} = -16\text{V}, V_{IN} = \text{GND}, R_X = 5\text{R}$				1.5 mA
Output Voltage Ratio 1	Ra1	V_2/V_1	1.96	2.00	2.04	
Output Voltage Ratio 2	Ra2	$(V_5 - V_3) / (V_5 - V_4)$	1.96	2.00	2.04	
Output Voltage Ratio 3	Rb1	V_5/V_1	8.73	9.00	9.27	
Output Voltage Ratio 4	Rb2	V_5/V_2	4.37	4.50	4.63	
Output Voltage Ratio 5	Rb3	$V_5 / (V_5 - V_3)$	4.37	4.50	4.63	
Output Voltage Ratio 6	Rb4	$V_5 / (V_5 - V_4)$	8.73	9.00	9.27	
Internal Resistance Ratio 1	4R	$V_{IN3} - R_{X1}$		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}	GND - V_{Reg} : Pins ⑦ and ⑧ shorted	-6.5	-6.2	-5.9	V
VReg Load Regulation	ΔV_{Reg}	$V_{Reg} : -5\text{mA} < I_O < +1\text{mA}$			50	mV

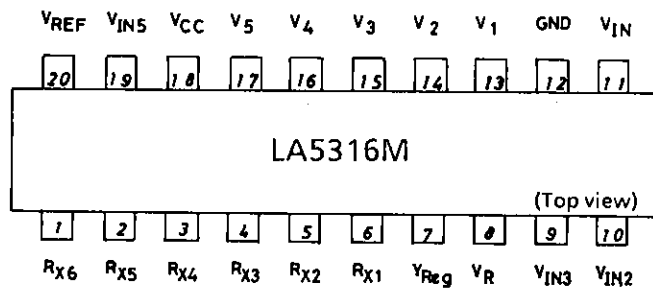
Pin Functions

Pin No.	Pin Name	Function	Remarks
1	R_{X6}	R_X pin	Pin ⑩ shorted $R_X = 9\text{R}$
2	R_{X5}	R_X pin	Pin ⑩ shorted $R_X = 8\text{R}$
3	R_{X4}	R_X pin	Pin ⑩ shorted $R_X = 7\text{R}$
4	R_{X3}	R_X pin	Pin ⑩ shorted $R_X = 6\text{R}$
5	R_{X2}	R_X pin	Pin ⑩ shorted $R_X = 5\text{R}$
6	R_{X1}	R_X pin	Pin ⑩ shorted $R_X = 4\text{R}$
7	V_{Reg}	V_{Reg} output	For supplying V_{REF}
8	V_R	V_{Reg} OP amp V_{IN-}	
9	V_{IN3}	V3 input	
10	V_{IN2}	V2 input	
11	V_{IN}	V1 supply (+ supply)	When $V_1 > -1.0\text{V}$, V_{IN} is applied. When $V_1 < -1.0\text{V}$, 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)	

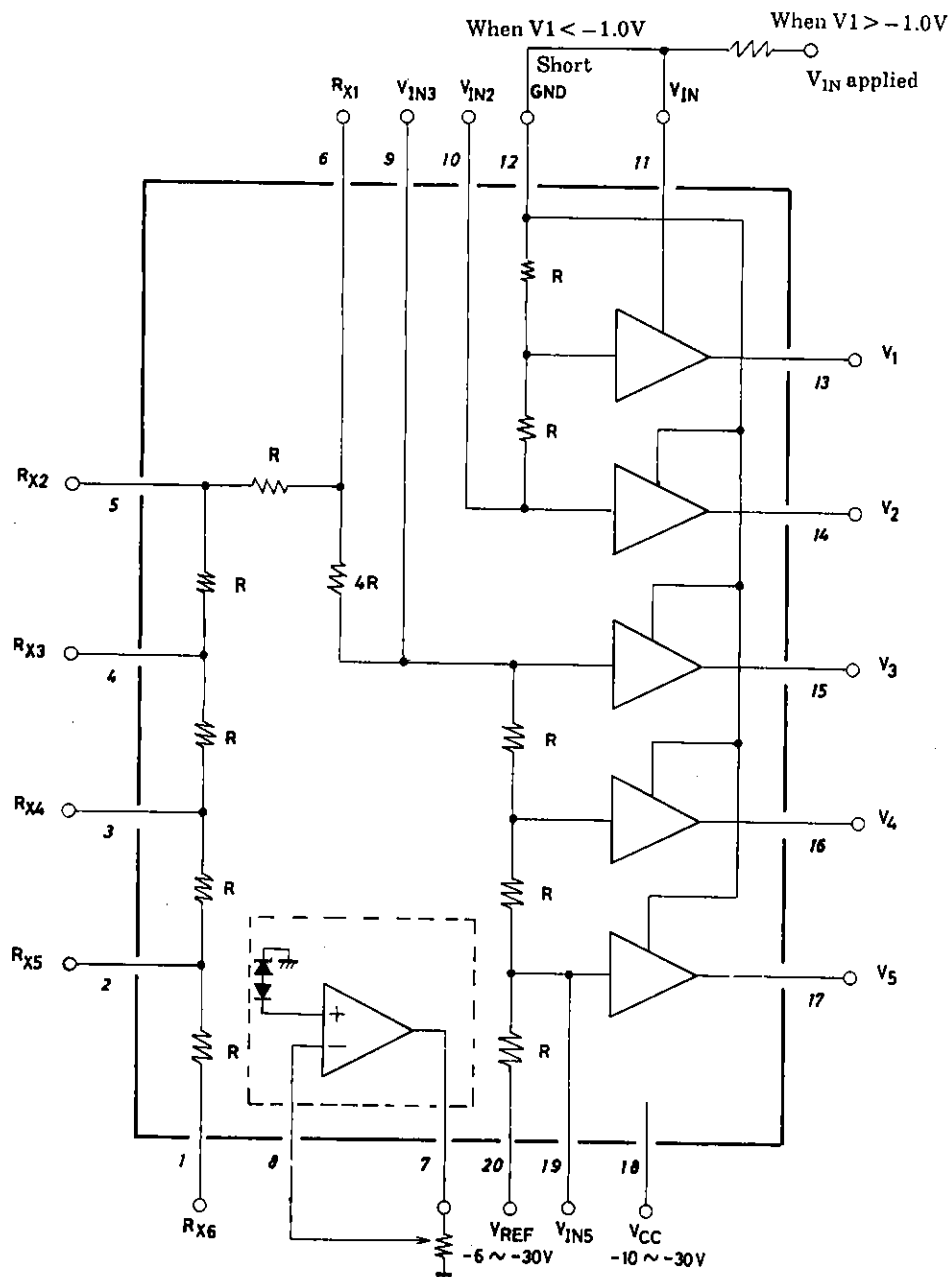
Note) Do not use the NC pin.

LA5316M

Pin Assignment

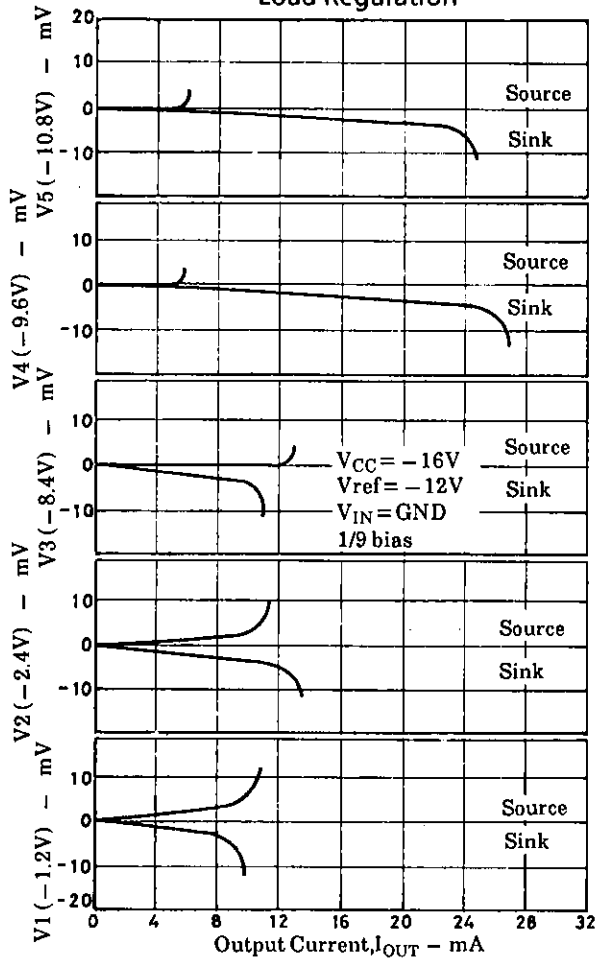


Equivalent Circuit Block Diagram

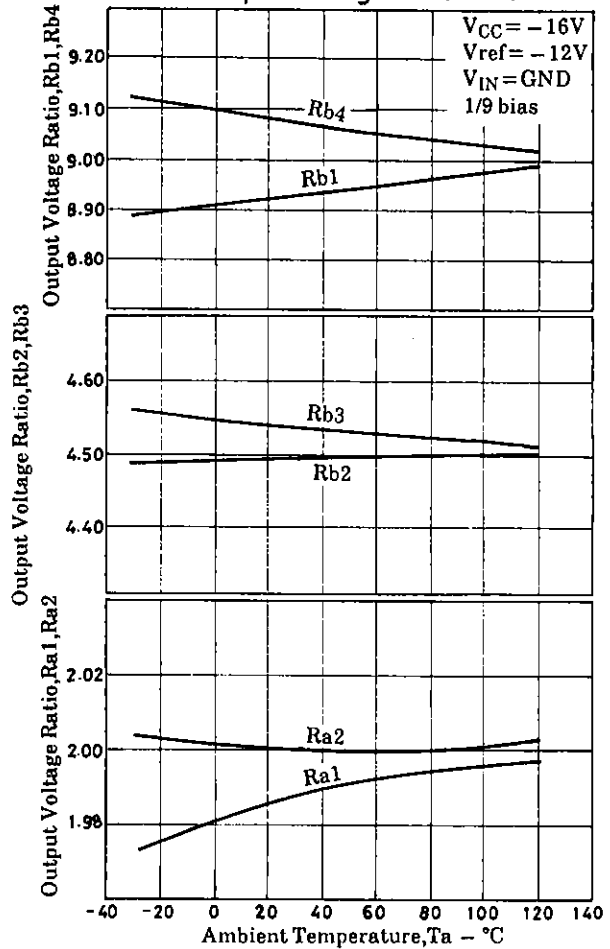


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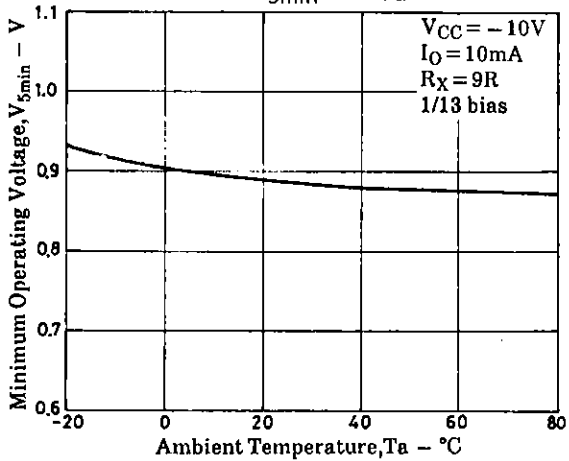
Load Regulation



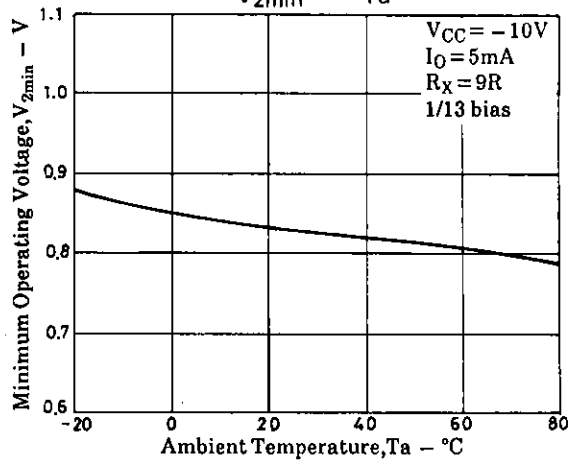
Output Voltage Ratio - T_a



$V_{5min} - T_a$



$V_{2min} - T_a$



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