



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} .

Specifications

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

Parameter	Symbol	Conditions	Ratings	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 $T_a = 25^\circ\text{C}$

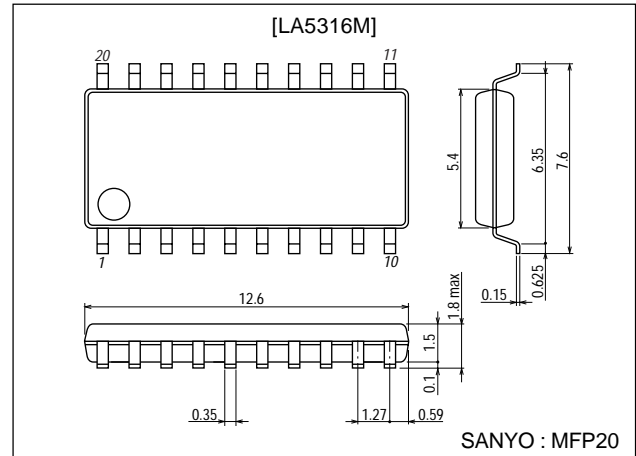
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC\ op}$	GND- V_{CC} : (When $V_1 > -1\text{V}$, I_{IN} is needed.) *	-30 to -10	V
Recommended input voltage	V_{REF}	GND- V_{REF} : $V_{REF} \geq V_{CC}$ *	-30 to -6	V
Recommended input current	I_{IN}	V_{IN} : $V_1 > -1\text{V}$, current source 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.

Package Dimensions

unit:mm

3036B-MFP20



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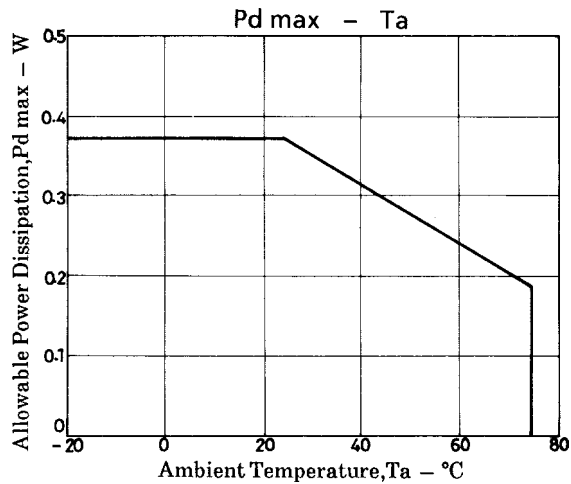
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Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = -16\text{V}$

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



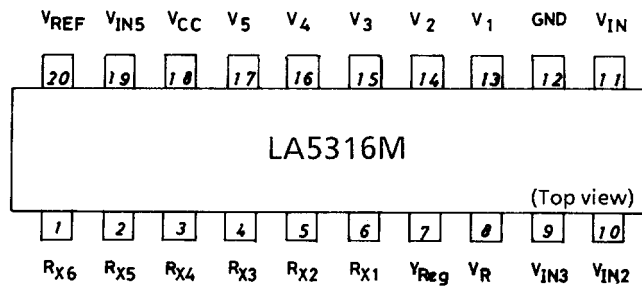
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Pin Functions

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)	

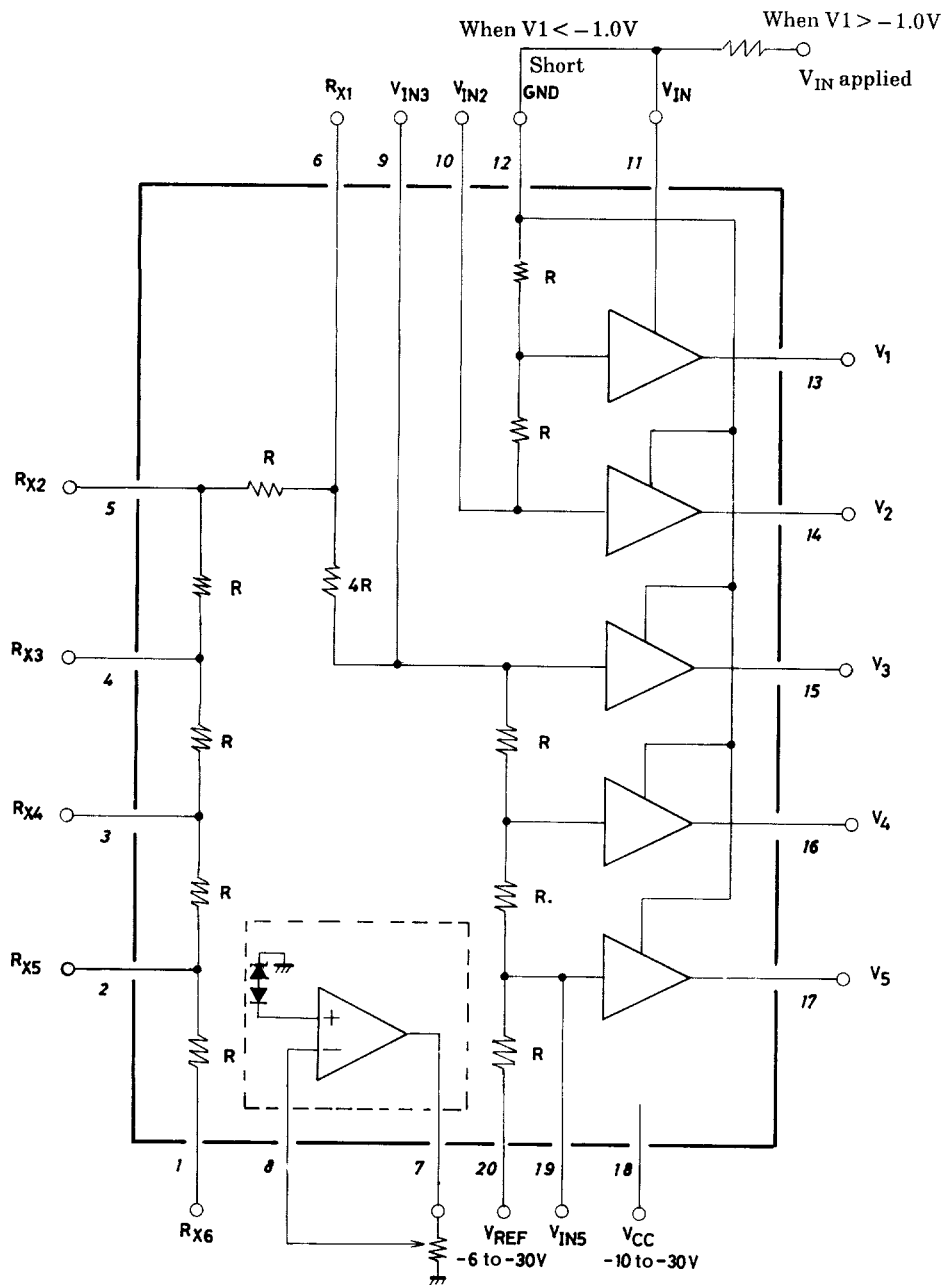
Note) Do not use the NC pin.

Pin Assingment



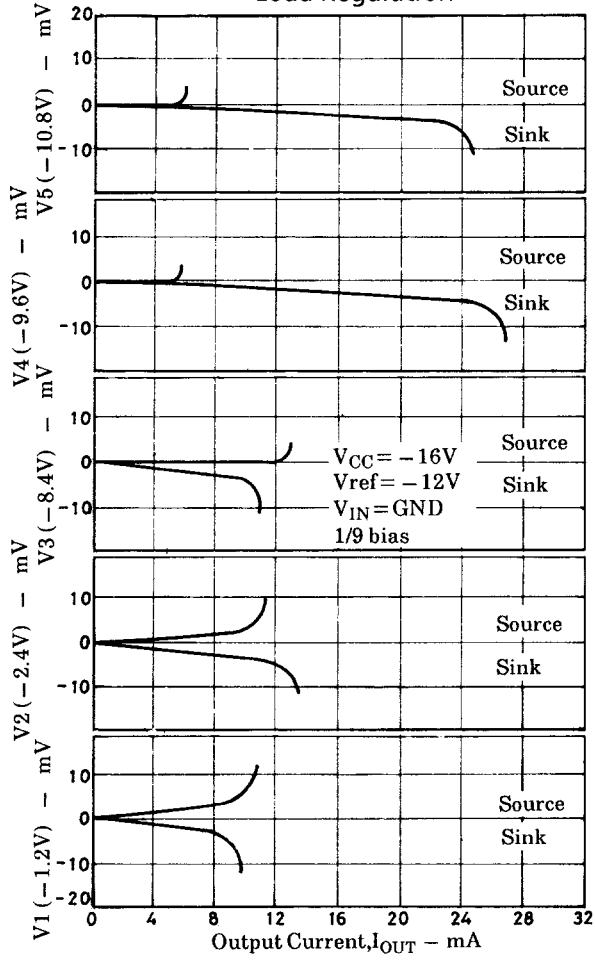
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Equivalent Circuit Block Diagram

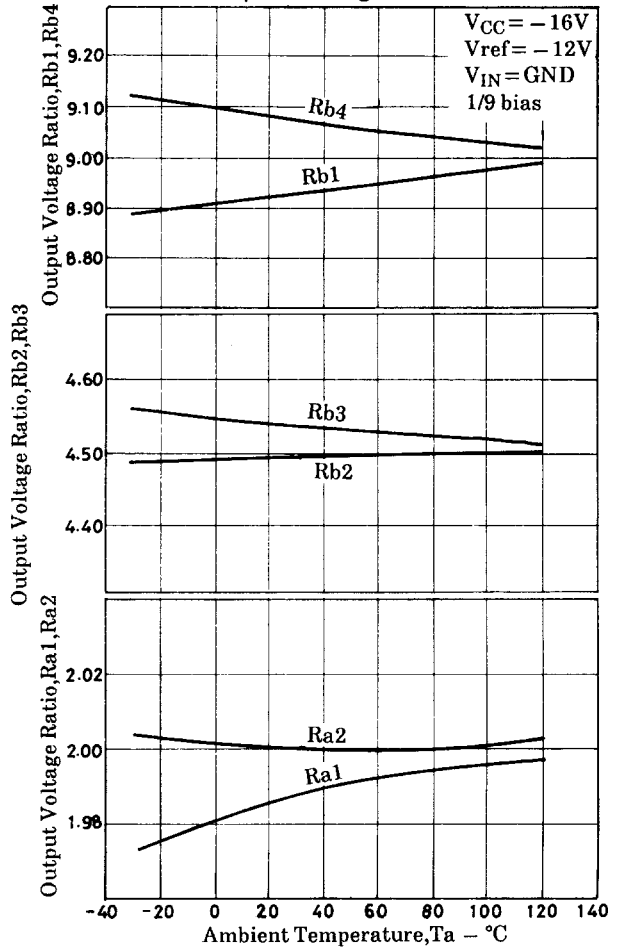


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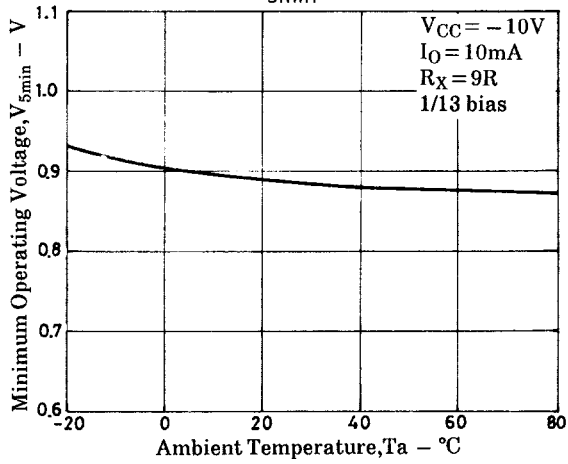
Load Regulation



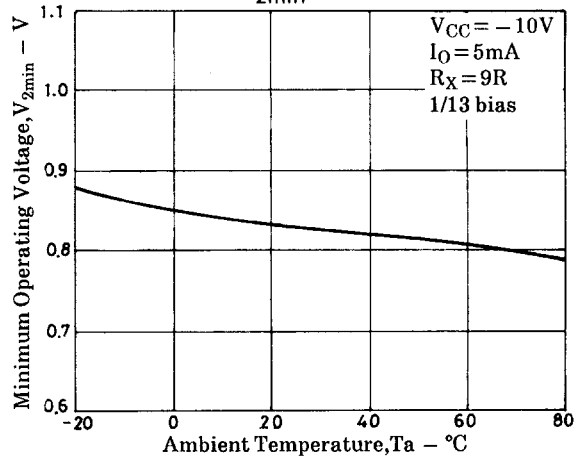
Output Voltage Ratio - T_a



V_{5min} - T_a



V_{2min} - T_a



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