



# LA5315M

## Variable Divided Voltage Generator for LCD Use

### Overview

The LA5315M 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 internal resistances).
- 5 voltage outputs.
- Low current drain (1.5mA max).
- Miniflat package.

### Specifications

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

| Parameter                   | Symbol                | Conditions                | Ratings     | Unit             |
|-----------------------------|-----------------------|---------------------------|-------------|------------------|
| Maximum supply voltage      | $V_{CC \text{ max}}$  | $\text{GND}-V_{CC}$       | -35 to 0    | V                |
| Maximum output current      | $I_{OUT \text{ max}}$ | $V_1, V_2, V_3, V_4, V_5$ | 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 $T_a = 25^\circ\text{C}$

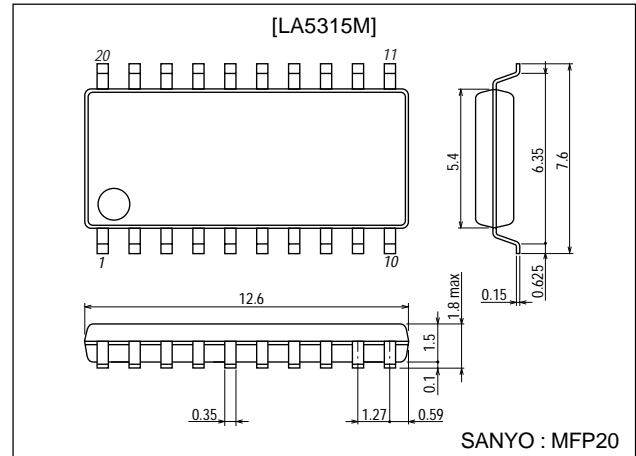
| Parameter                  | Symbol        | Conditions  | Ratings     | Unit |
|----------------------------|---------------|---|-------------|------|
| Recommended supply voltage | $V_{CC}$      | $\text{GND}-V_{CC}$ : (When $V_1 > -1\text{V}$ , $I_{IN}$ is needed.) *                         | -30 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 $I_{IN} : 1\text{V}$ 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.

### Package Dimensions

unit:mm

3036B-MFP20



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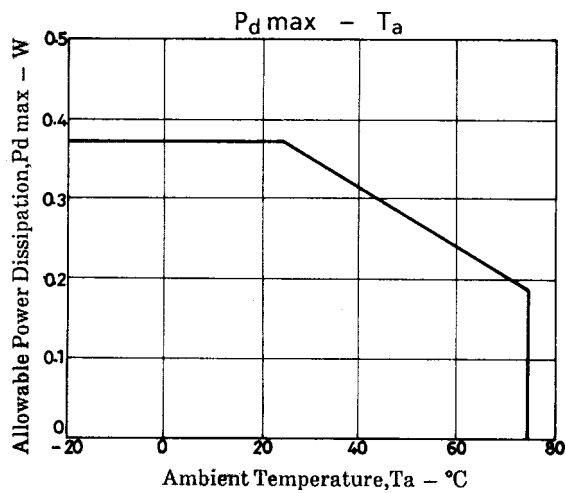
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## Operating Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = -16\text{V}$

| Parameter                   | Symbol        | Conditions  | Ratings |      |      | Unit       |
|-----------------------------|---------------|---|---------|------|------|------------|
|                             |               |   | min     | typ  | max  |            |
| Current drain               | $I_{CC}$      | $V_{IN}, \text{GND}-V_{CC}, V_{REF} : V_{CC}=V_{REF}=-16\text{V}, V_{IN}=\text{GND}, R_X=5\text{R}$   |         |      | 1.5  | mA         |
| Output voltage ratio 1      | Ra1           | $V_2/V_1$   | 1.96    | 2.00 | 2.04 |            |
| Output voltage ratio 2      | Ra2           | $(V_5-V_3)/(V_5-V_4) \text{ Vref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5\text{R})$ | 1.96    | 2.00 | 2.04 |            |
| Output voltage ratio 3      | Rb1           | $V_5/V_1 \text{ Vref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5\text{R})$             | 8.73    | 9.00 | 9.27 |            |
| Output voltage ratio 4      | Rb2           | $V_5/V_2 \text{ Vref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5\text{R})$             | 4.37    | 4.50 | 4.63 |            |
| Output voltage ratio 5      | Rb3           | $V_5/(V_5-V_3) \text{ Vref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5\text{R})$       | 4.37    | 4.50 | 4.63 |            |
| Output voltage ratio 6      | Rb4           | $V_5/(V_5-V_4) \text{ Vref}=-12\text{V}, V_{CC}=-16\text{V}, 1/9 \text{ bias } (R_X=5\text{R})$       | 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 $\Omega$ |
| Load regulation 1           | $\Delta V_1$  | $V_1 : +100\mu\text{A} < I_{OUT1} < +5\text{mA}$  |         |      | 20   | mV         |
| Load regulation 2           | $\Delta V_2$  | $V_2 : +100\mu\text{A} < I_{OUT2} < +5\text{mA}$  |         |      | 20   | mV         |
| Load regulation 3           | $\Delta V_3$  | $V_3 : +100\mu\text{A} < I_{OUT3} < +5\text{mA}$  |         |      | 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         |



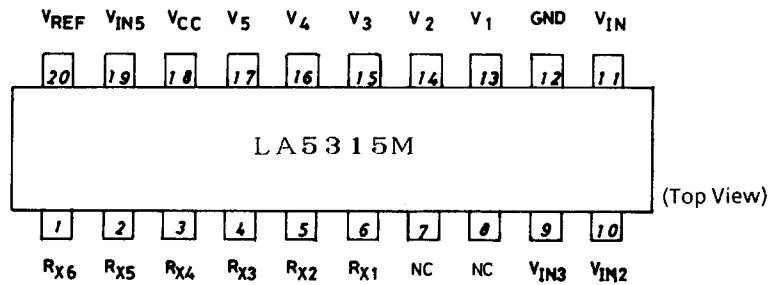
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## Pin Functions

| Pin No. | Pin Name         | Description                       | Remarks  |
|---------|------------------|-----------------------------------|--|
| 1       | R <sub>X6</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =9R   |
| 2       | R <sub>X5</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =8R   |
| 3       | R <sub>X4</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =7R   |
| 4       | R <sub>X3</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =6R   |
| 5       | R <sub>X2</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =5R   |
| 6       | R <sub>X1</sub>  | R <sub>X</sub> pin                | Pin ⑩ shorted R <sub>X</sub> =4R   |
| 7       |                  | NC                                |  |
| 8       |                  | NC                                |  |
| 9       | V <sub>IN3</sub> | V <sub>3</sub> input              |  |
| 10      | V <sub>IN2</sub> | V <sub>2</sub> input              |  |
| 11      | V <sub>IN</sub>  | V <sub>1</sub> supply (+ supply)  | When V <sub>1</sub> > -1.0V, V <sub>IN</sub> is applied.<br>When V <sub>1</sub> < -1.0V, this pin is shorted to GND. |
| 12      | GND              | GND                               |  |
| 13      | V <sub>1</sub>   | V <sub>1</sub> output             |  |
| 14      | V <sub>2</sub>   | V <sub>2</sub> output             |  |
| 15      | V <sub>3</sub>   | V <sub>3</sub> output             |  |
| 16      | V <sub>4</sub>   | V <sub>4</sub> output             |  |
| 17      | V <sub>5</sub>   | V <sub>5</sub> output             |  |
| 18      | V <sub>CC</sub>  | V <sub>CC</sub> supply (-supply)  |  |
| 19      | V <sub>IN5</sub> | V <sub>5</sub> input              |  |
| 20      | V <sub>REF</sub> | V <sub>REF</sub> supply (-supply) |  |

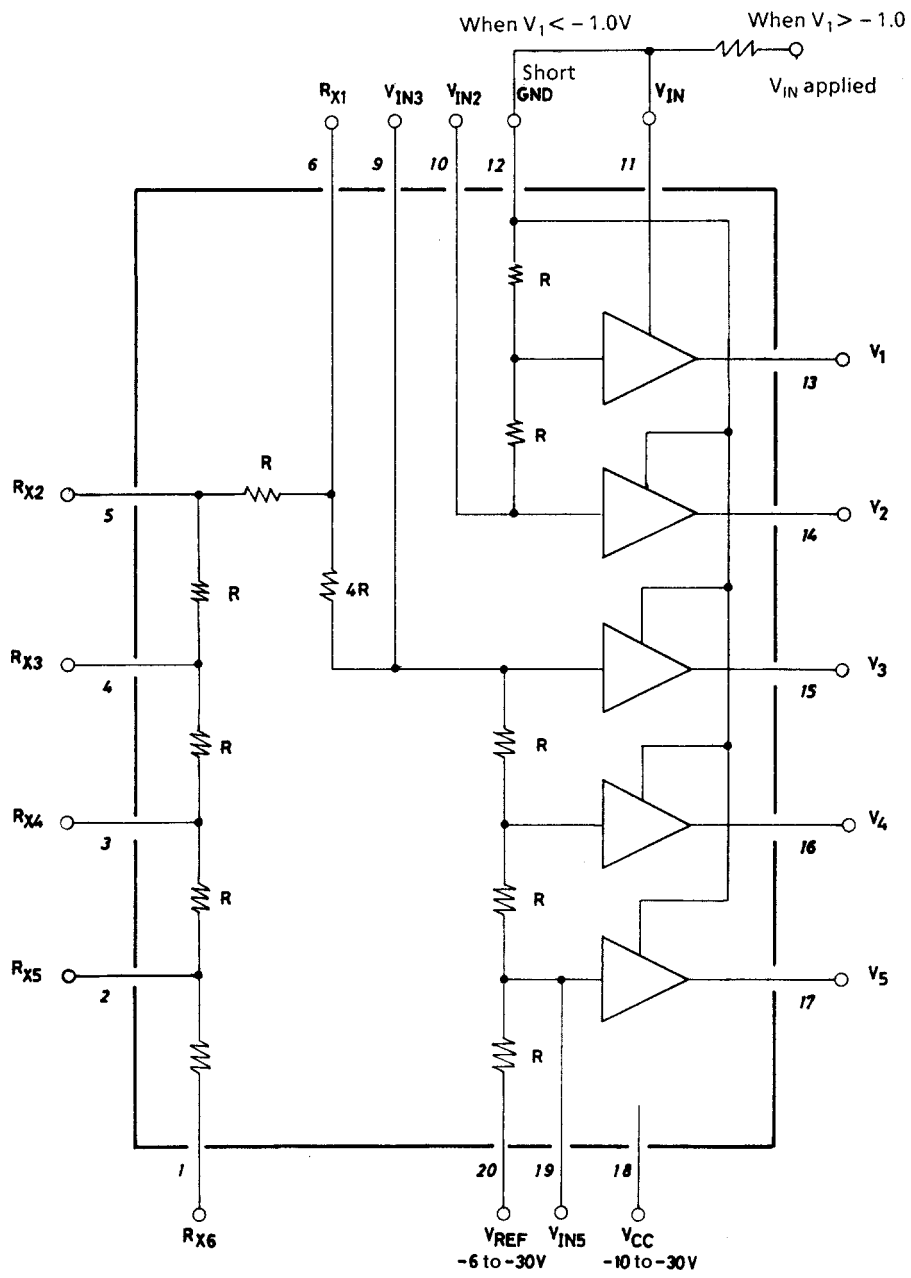
Note ) Do not use the NC pin.

## Pin Assingment

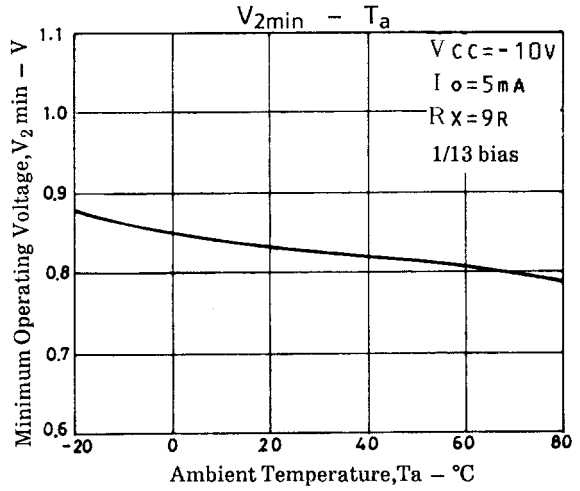
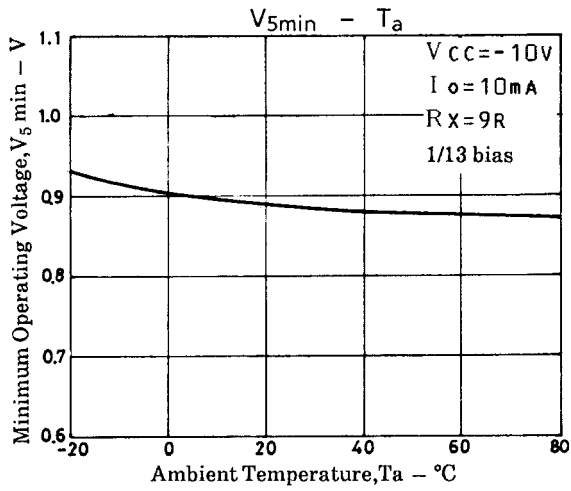
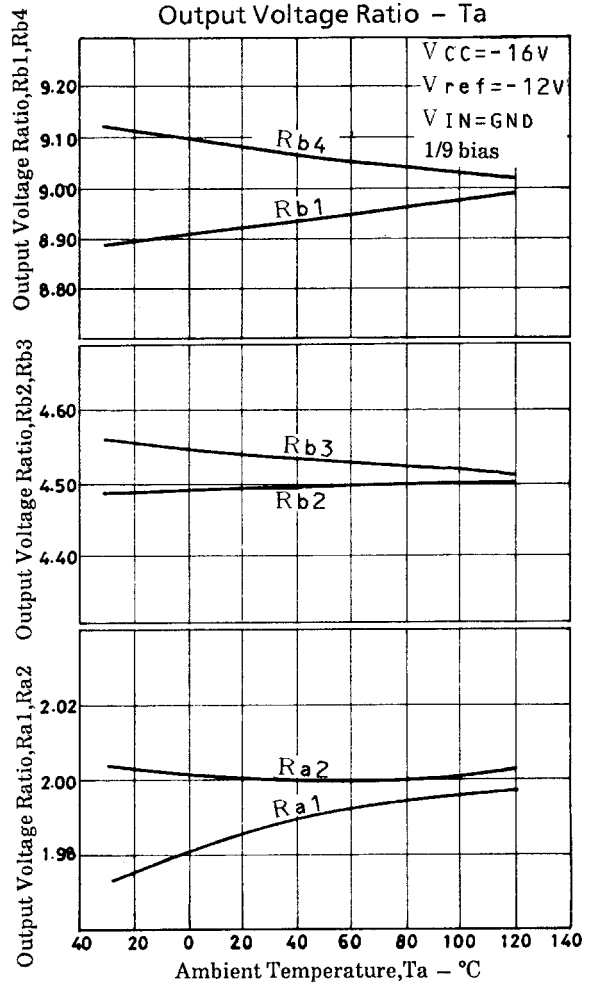
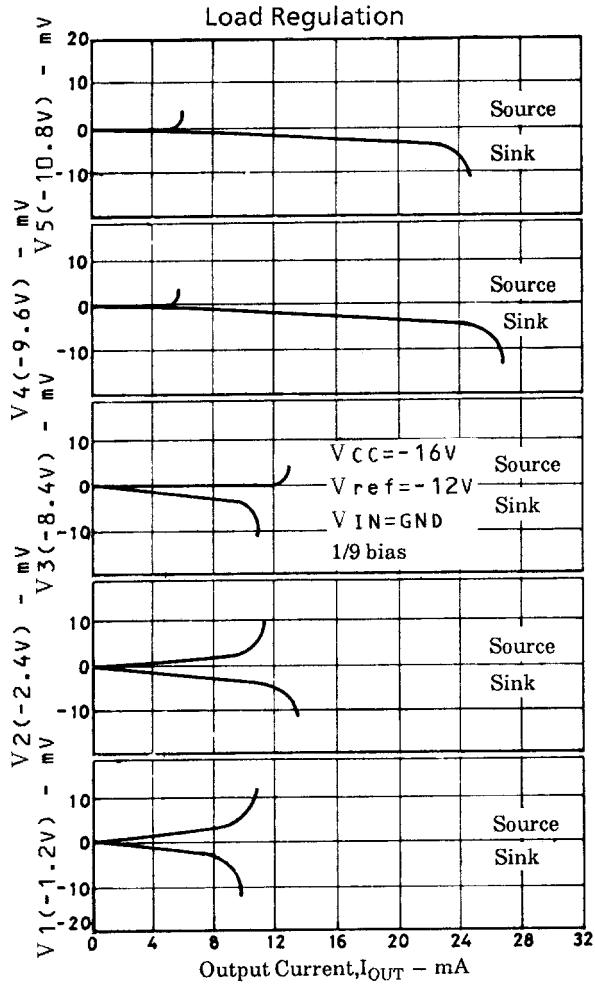


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## Equivalent Circuit Block Diagram



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