

**SANYO**

No.4145

**LA5318M****Variable Divided Voltage Generator  
for LCD Use****Overview**

The LA5318M is a variable divided voltage generator IC for multiple drive of LCD matrix.

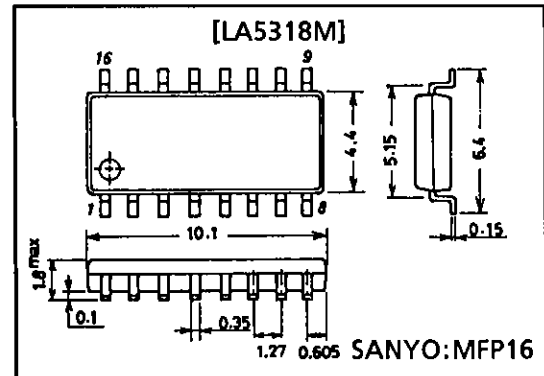
**Features**

- Power supply for variable bias LCD division drive (1/5 to 1/19 bias available by built-in resistances)
- Four operational amplifiers to deliver 5 voltage outputs
- Low current drain (0.35 mA typ)
- V1, V2 output current source side variable pin
- Output on/off function  $V_{REF}$  control pins
- Miniflat package

**Package Dimensions**

unit : mm

3035A-MFP16

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

				Unit
Maximum supply voltage	$V_{EE\max}$	$V_{CC} - V_{EE}$	36	V
Maximum output current	$I_{OUT\max}$	V1 to V4	Internal *	mA
Allowable power dissipation	$P_{d\max}$		330	mW
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-30 to +135	$^\circ\text{C}$

- Note: 1. Continuous operation (nonbreakdown) is guaranteed when operated at the maximum ratings shown above.  
 2. \*The maximum output current is a value specified under the conditions otherwise specified separately.  
 3. Output pins V1 to V4 to  $V_{CC}$ , GND short circuit not lasting more than 1ms is acceptable. ( $|V_{CC} - V_{EE}| < 35\text{V}$ )

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

				Unit
Supply voltage	$V_{EE}$	$V_{REF} \geq V_{EE}$	-35.5 to -6	V
Input voltage	$V_{REF}$		-35 to -6	V
Input current	$I_{INR}$		-0.2 to 0	mA
Output current	$I_{OUTR}$		0 to +50	mA
	$I_{OUT1,2}$		-5 to +5	mA
	$I_{OUT3,4}$		-10 to +5	mA

Note: 4. Set  $V_{CC}$  and  $V_{EE}$  so that  $|V1|$  and  $|V_{EE} - V4|$  become 1V or greater.

# LA5318M

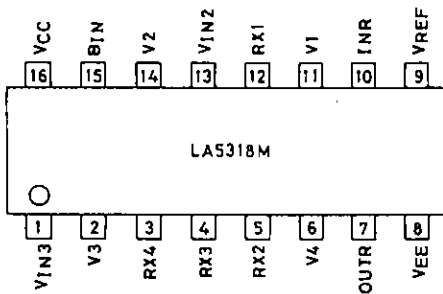
**Operating Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} - V_{EE} = 20\text{V}$ ,  $V_{REF} = V_{EE}$ ,  $R_X = 8R$ ,  $B_{IN} = \text{Open}$

				min	typ	max	Unit
Current drain	$I_{CC}, I_{EE}$	$V_{CC} - V_{EE} = 20\text{V}, R_X = 8R,$ $INR = V_{CC}$			0.35	0.5	mA
Output voltage ratio	1	Ra1	$V_2/V_1$	1.96	2.00	2.04	-
	2	Ra2	$(V_{REF} - V_3) / (V_{REF} - V_4)$	1.96	2.00	2.04	-
	3	Rb1	$V_{REF} / V_1$	11.64	12.00	12.36	-
	4	Rb2	$V_{REF} / V_2$	5.82	6.00	6.18	-
	5	Rb3	$V_{REF} / (V_{REF} - V_3)$	5.82	6.00	6.18	-
	6	Rb4	$V_{REF} / (V_{REF} - V_4)$	11.64	12.00	12.36	-
Internal resistance ratio	1	$R_{X1}$	$R_{X1} - R_{X2}^*$		8		-
	2	$R_{X2}$	$R_{X2} - R_{X3}^*$		12		-
	3	$R_{X3}$	$R_{X3} - R_{X4}^*$		14		-
	4	$R_{X4}$	$R_{X4} - V_{IN3}^*$		15		-
Resistance		R	R value when 0.5V is applied across $R_{X4}$ and $V_{IN3}$		30		k $\Omega$
Load regulation	1	$\Delta V_1$	$+0.1\text{mA} < I_{OUT1} < +5\text{mA}$			$\pm 20$	mV
	2	$\Delta V_2$	$+0.1\text{mA} < I_{OUT2} < +5\text{mA}$			$\pm 20$	mV
	3	$\Delta V_3$	$+0.1\text{mA} < I_{OUT3} < +5\text{mA}$			$\pm 20$	mV
	4	$\Delta V_4$	$+0.1\text{mA} < I_{OUT4} < +5\text{mA}$			$\pm 20$	mV
	-1A	$-\Delta V_{1A}$	$-0.5\text{mA} < I_{OUT1} < -0.1\text{mA}$			$\pm 20$	mV
	-2A	$-\Delta V_{2A}$	$-0.5\text{mA} < I_{OUT2} < -0.1\text{mA}$			$\pm 20$	mV
	-3	$-\Delta V_3$	$-10\text{mA} < I_{OUT3} < -0.1\text{mA}$			$\pm 20$	mV
	-4	$-\Delta V_4$	$-10\text{mA} < I_{OUT4} < -0.1\text{mA}$			$\pm 20$	mV
	-1B	$-\Delta V_{1B}$	$-5\text{mA} < I_{OUT1} < -0.1\text{mA}, B_{IN} = \text{GND}$			$\pm 20$	mV
	-2B	$-\Delta V_{2B}$	$-5\text{mA} < I_{OUT2} < -0.1\text{mA}, B_{IN} = \text{GND}$			$\pm 20$	mV
OUTR saturation voltage	$V_{OUTR}$	$I_{OUT} = 20\text{mA}, V_{CC} - INR = 2.7\text{V}$			0.5	V	

(Source  $I_{OUT}$  is negative(-) and sink  $I_{OUT}$  is positive(+).)

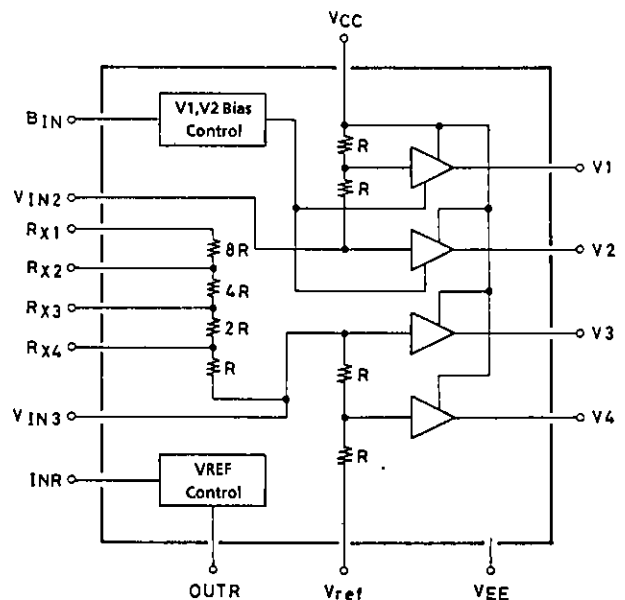
Note\*: Referenced to R between  $R_{X4}$  and  $V_{IN3}$

## Pin Assignment



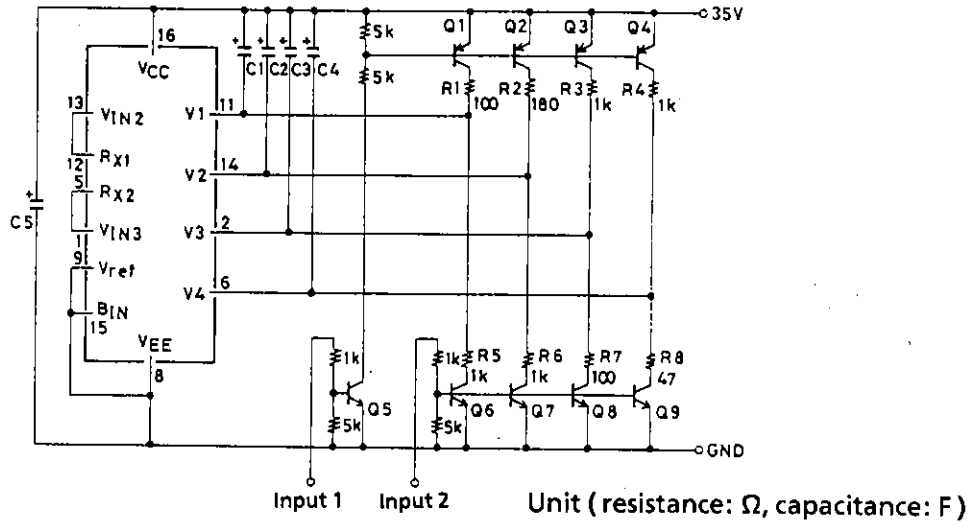
Top view

## Block Diagram



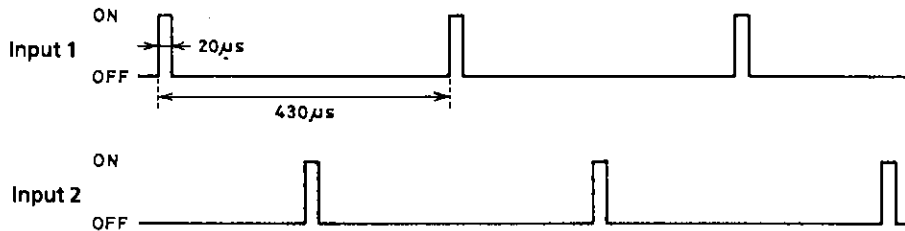
Note: Use the IC so that  $V_{RX1} \geq V_{RX2} \geq V_{RX3} \geq V_{RX4}$  must be obeyed.

Maximum Output Current Load Test Conditions



$V_{CC} - V_{EE} = 35V$   $R_X = 8R$   $C1$  to  $C4 = 10\mu F$   $C5 = 33\mu F$   $R; 1W$  or more  
 $Q1$  to  $4; 2SA984$  E or F rank  
 $Q5$  to  $9; 2SC2274$  E or F rank

Output load resistances  $R1$  to  $R8$  are set in order that current of 25 to 30 mA max. ( $V3, V4$  source side: about 60 mA) are supplied to both source and sink sides when an on-level input is applied to the inputs 1 or 2.



$V_{REF}$  Control Block

How to calculate the  $Q1$  drive current

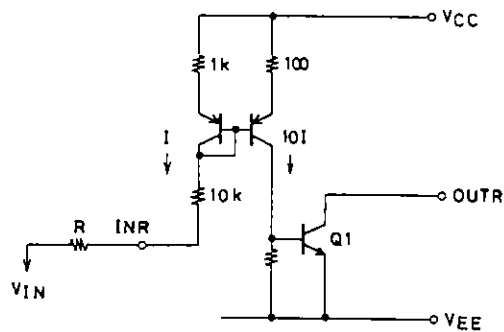
$$I = \frac{V_{CC} - V_{BE} - V_{IN}}{11k + R}$$

( $V_{BE} \approx 0.7V$ )

Drive current

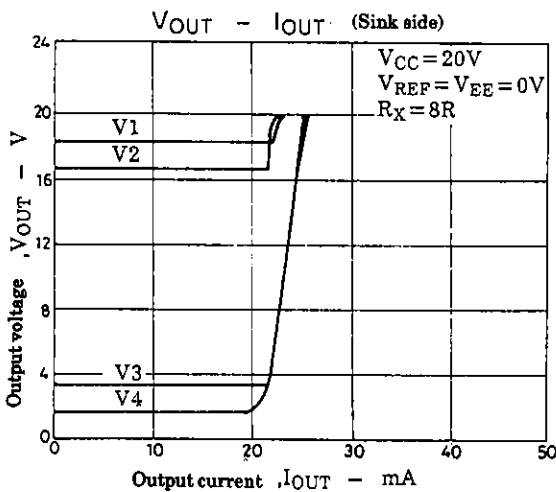
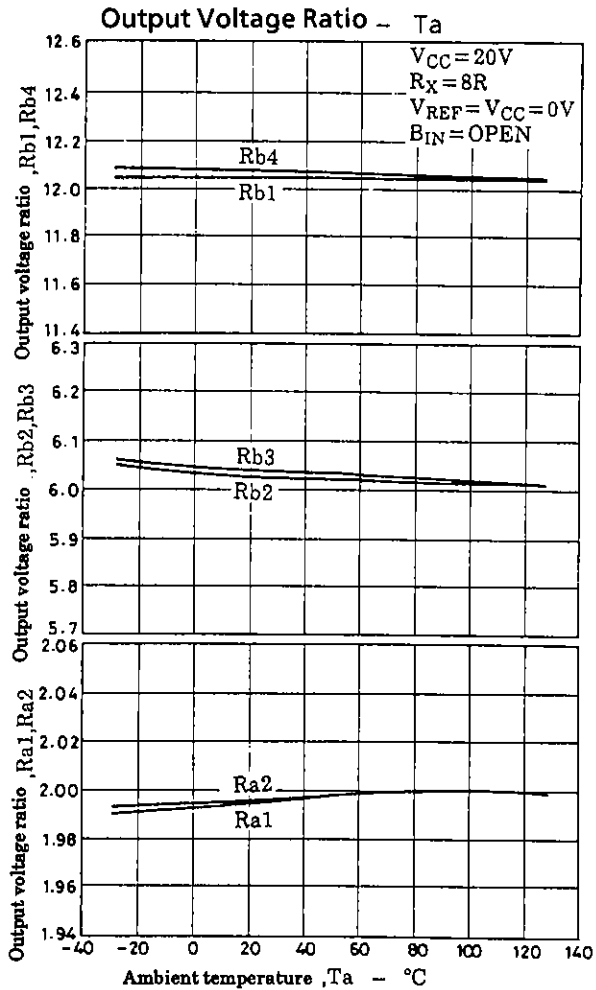
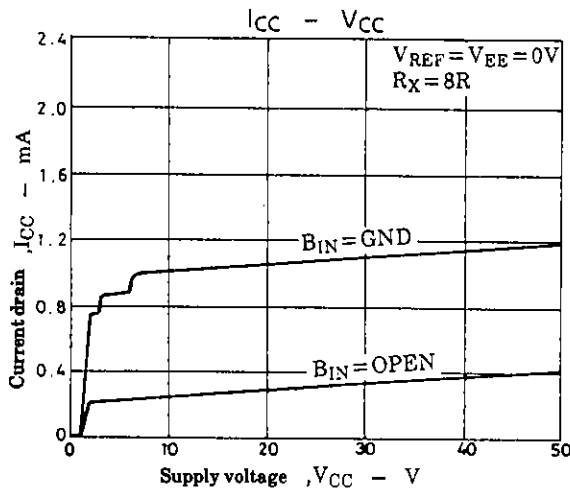
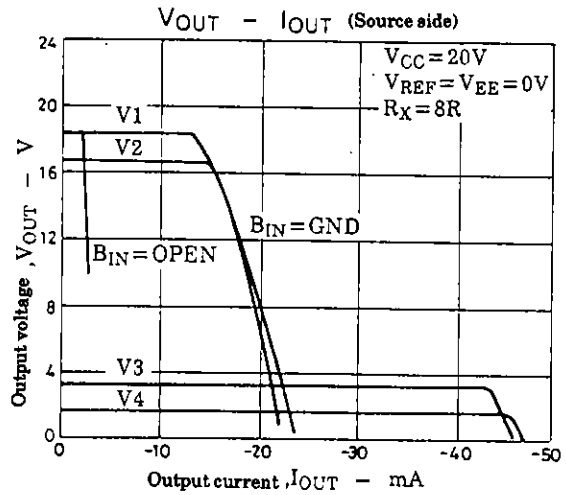
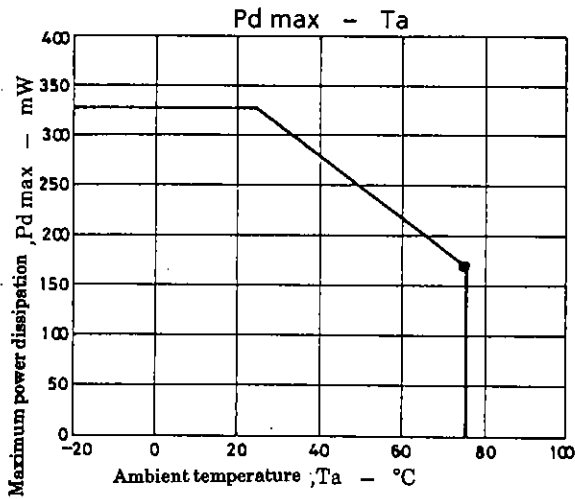
$$I_O \approx 10I = \frac{V_{CC} - 0.7 - V_{IN}}{11k + R} \times 10$$

$Q1$   $h_{FE}$  is assumed to be 50.



Unit (resistance:  $\Omega$ )

\*Set  $V_{CC} = INR$  when  $INR$  and  $OUTR$  are not used.



■ No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.

■ Anyone purchasing any products described or contained herein for an above-mentioned use shall:

- ① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use;
- ② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.

■ 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 June, 1996. Specifications and information herein are subject to change without notice.