



# LA5318V

## Voltage-Dividing Voltage Generator for Multi-Voltage LCD Matrix Drive

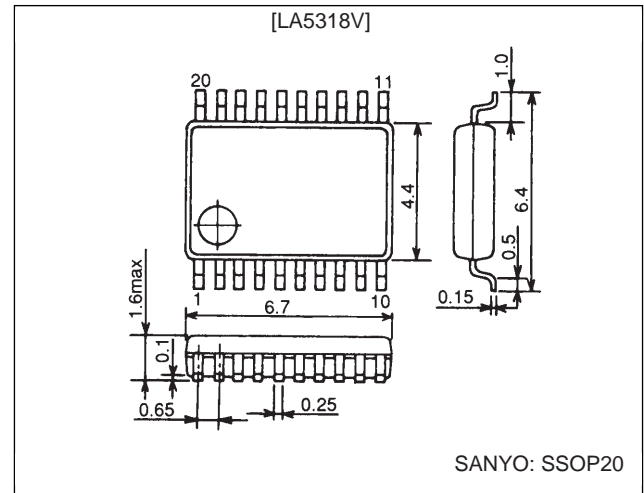
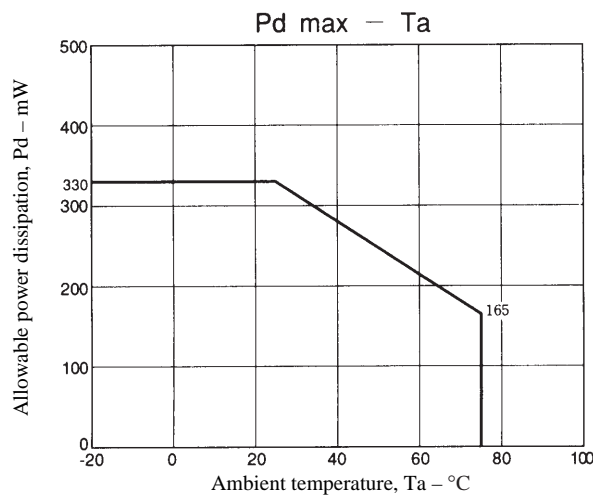
### Overview

The LA5318V is a variable voltage-dividing voltage generator IC designed for driving LCD matrixes that require multiple voltages.

### Package Dimensions

unit: mm

3179A-SSOP20



### Specifications

#### Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>EE</sub> max	V <sub>CC</sub> – V <sub>EE</sub>	36	V
Maximum output current	I <sub>OUT</sub> max	V1 to V4	Internal*	mA
Allowable power dissipation	Pd max		330	mW
Operating temperature	T <sub>opr</sub>		–20 to +75	°C
Storage temperature	T <sub>stg</sub>		–30 to +125	°C

Notes: \*The value stipulated in the conditions listed in the separate document shall be used as the maximum output current.

1. Continuous operation (without damage to the device) is guaranteed in the above ranges.
2. The output pins V1 to V4 may be shorted to the power supply or to ground for periods of up to 1 ms. (When |V<sub>CC</sub> – V<sub>EE</sub>| < 35 V)

#### Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>EE</sub>	V <sub>CC</sub> – V <sub>EE</sub>	–35.5 to –6	V
Input voltage	V <sub>REF</sub>	V <sub>CC</sub> – V <sub>REF</sub> : V <sub>REF</sub> ≥ V <sub>EE</sub>	–35 to –6	V
Input current	I <sub>INR</sub>	INR	–0.2 to 0	mA
Output current	I <sub>OUTR</sub>	OUTR	0 to 50	mA
	I <sub>OUT1,2</sub>	V1, V2	–5 to +5	mA
	I <sub>OUT3,4</sub>	V3, V4	–10 to +5	mA

Note: V<sub>CC</sub> and V<sub>EE</sub> must be set up so that |V1| and |V<sub>EE</sub> – V4| are at least 1 V.

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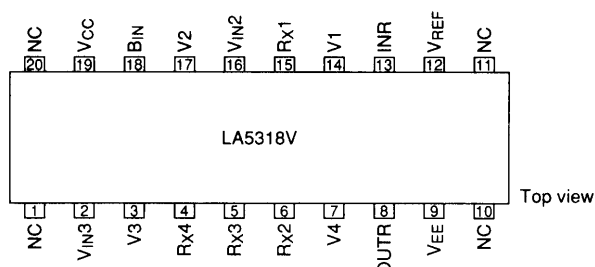
## LA5318V

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

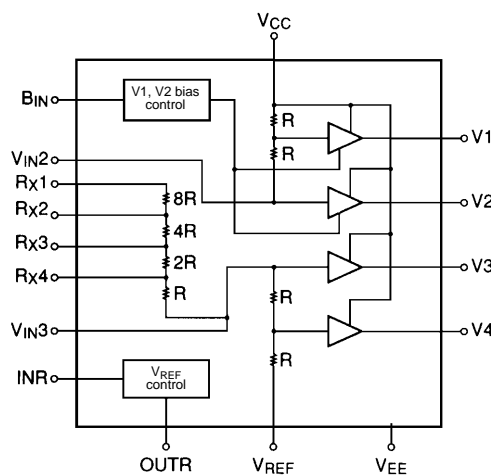
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC}, I_{EE}$	$V_{CC} - V_{EE} = -20\text{ V}$ , $R_X = 8R$ , $INR = V_{CC} : V_{CC}, V_{EE}$		0.35	0.5	mA
Output voltage ratio 1	Ra1	$V2/V1$	1.96	2.00	2.04	
Output voltage ratio 2	Ra2	$(V_{REF} - V3)/(V_{REF} - V4)$	1.96	2.00	2.04	
Output voltage ratio 3	Rb1	$V_{REF}/V1$	11.64	12.00	12.36	
Output voltage ratio 4	Rb2	$V_{REF}/V2$	5.82	6.00	6.18	
Output voltage ratio 5	Rb3	$V_{REF}/(V_{REF} - V3)$	5.82	6.00	6.18	
Output voltage ratio 3	Rb4	$V_{REF}/(V_{REF} - V4)$	11.64	12.00	12.36	
Internal resistance ratio 1	$R_{X1}$	$R_{X1} - R_{X2}$ $R_{X1} - R_{X3}$ $R_{X1} - R_{X4}$ $R_{X1} - V_{IN3}$		8		
Internal resistance ratio 2	$R_{X2}$			12		
Internal resistance ratio 3	$R_{X3}$			14		
Internal resistance ratio 4	$R_{X4}$			15		
Resistance	R	The value of R when the voltage across $R_{X4}$ and $V_{IN3}$ is 0.5 V.		30		k $\Omega$
Load regulation 1	$\Delta V1$	$+0.1\text{ mA} < I_{OUT1} < +5\text{ mA} : V1$			$\pm 20$	mV
Load regulation 2	$\Delta V2$	$+0.1\text{ mA} < I_{OUT2} < +5\text{ mA} : V2$			$\pm 20$	mV
Load regulation 3	$\Delta V3$	$+0.1\text{ mA} < I_{OUT3} < +5\text{ mA} : V3$			$\pm 20$	mV
Load regulation 4	$\Delta V4$	$+0.1\text{ mA} < I_{OUT4} < +5\text{ mA} : V4$			$\pm 20$	mV
Load regulation -1A	$-\Delta V1A$	$-0.5\text{ mA} < I_{OUT1} < -0.1\text{ mA} : V1$			$\pm 20$	mV
Load regulation -2A	$-\Delta V2A$	$-0.5\text{ mA} < I_{OUT2} < -0.1\text{ mA} : V2$			$\pm 20$	mV
Load regulation -3	$-\Delta V3$	$-10\text{ mA} < I_{OUT3} < -0.1\text{ mA} : V3$			$\pm 20$	mV
Load regulation -4	$-\Delta V4$	$-10\text{ mA} < I_{OUT4} < -0.1\text{ mA} : V4$			$\pm 20$	mV
Load regulation -1B	$-\Delta V1B$	$-5\text{ mA} < I_{OUT1} < -0.1\text{ mA}$ , $B_{IN} = \text{GND} : V1$			$\pm 20$	mV
Load regulation -2B	$-\Delta V2B$	$-5\text{ mA} < I_{OUT2} < -0.1\text{ mA}$ , $B_{IN} = \text{GND} : V2$			$\pm 20$	mV
OUTR pin saturation voltage	$V_{OUTR}$	$I_{OUT} = 20\text{ mA}$ , $V_{CC} - INR = 2.7 : \text{OUTR} - V_{EE}$			0.5	V

Note: For  $I_{OUT}$ , minus (-) indicates source current and plus (+) indicates sink current.

### Pin Assignment

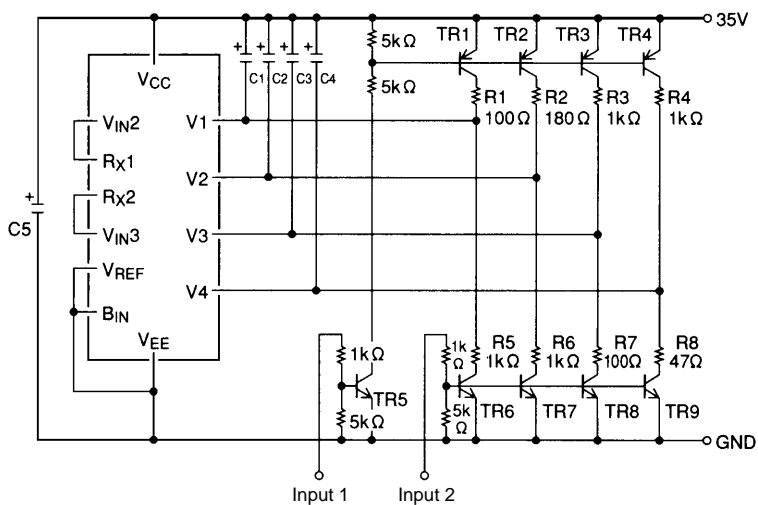


### Block Diagram



(This circuit must be used with  $V_{RX1} \geq V_{RX2} \geq V_{RX3} \geq V_{RX4}$ .)

Maximum Output Current Load Test Conditions

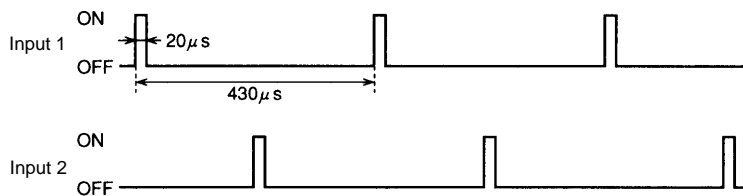


$V_{CC} - V_{EE} = 35\text{ V}$ ,  $R_X = 8R$ ,  $C1$  to  $C4 = 10\ \mu\text{F}$ ,  $C5 = 33\ \mu\text{F}$ , All resistors must be rated 1 W or higher.

TR1 to TR4; 2SA984 Rank E or F

TR5 to TR9; 2SC2274 Rank E or F

Set the output load resistors ( $R1$  to  $R8$ ) so that currents of 25 to 30 mA maximum (except for the  $V3$  and  $V4$  source sides, which can handle about 60 mA) flow in the sink and source sides when high (on state) levels are input to inputs 1 and 2.



·  $V_{REF}$  control block

Determining the TR1 drive current

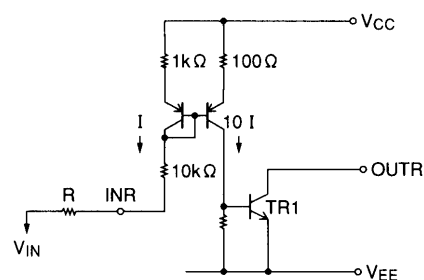
$$I = \frac{V_{CC} - V_{BE} - V_{IN}}{11\text{ k} + R}$$

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

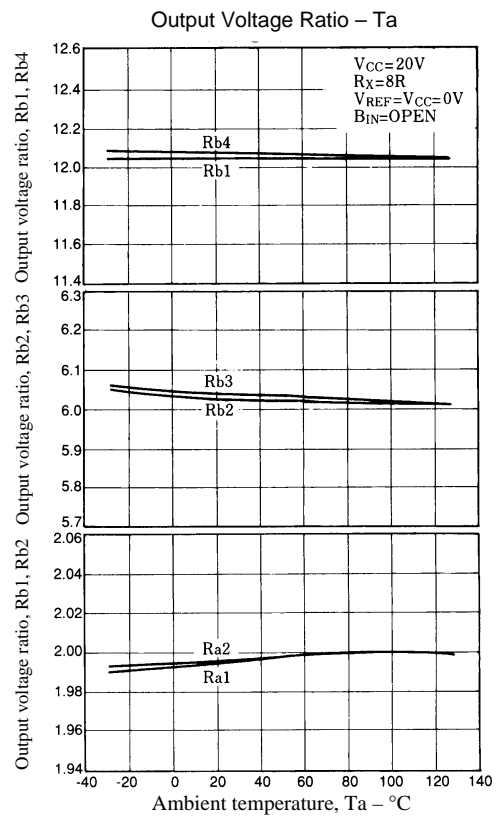
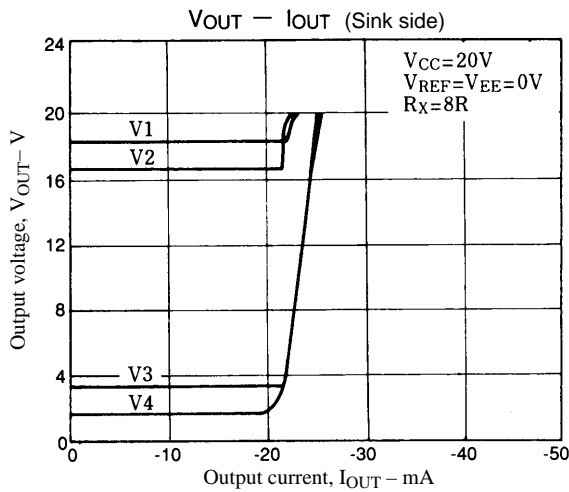
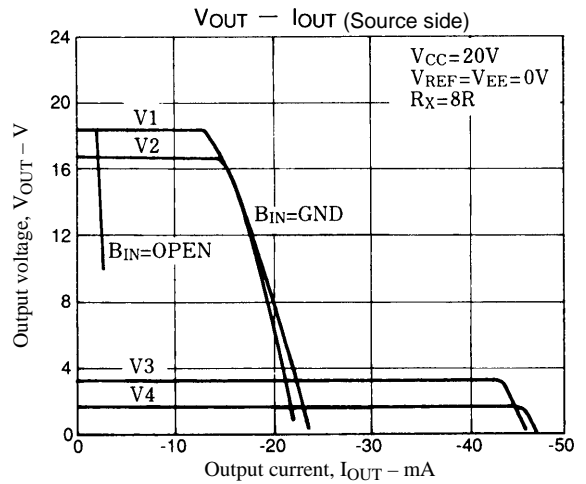
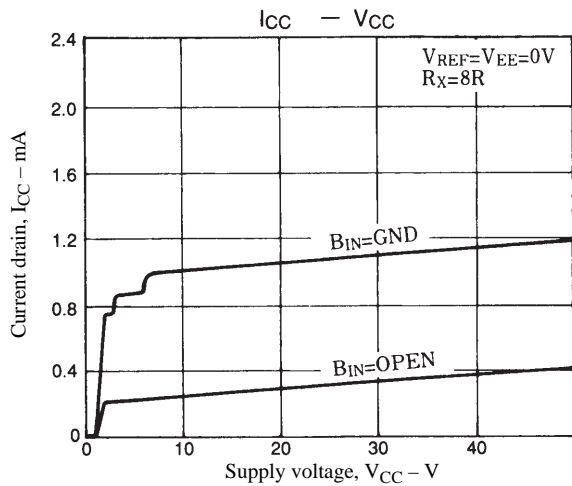
Drive current

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

Assume that the  $TR1_{hFE}$  is 50 for this calculation.



Note: Connect  $INR$  to  $V_{CC}$  when  $INR$  and  $OUTR$  are not used.



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