



# LC4120NV

## LCD Power Supply Switching IC

### Overview

The LC4120NV is an LCD power supply switching IC that provides 3 input channels and 6 output channels. It is fabricated in an 80-V high-voltage CMOS process and features low power dissipation, high speed, and a low output impedance. This IC is optimal for switching the row driver LCD drive voltage in a wide range of LCD products.

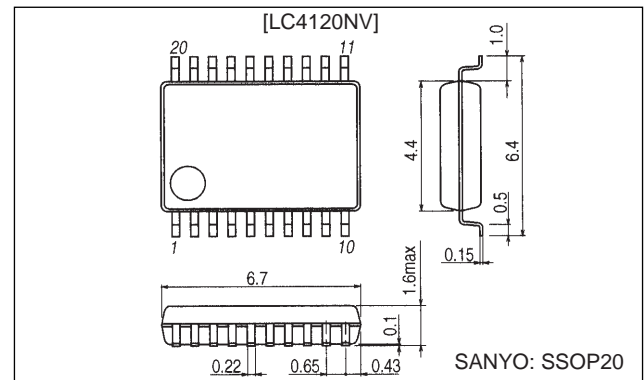
### Features

- 3 input channels/6 output channels
- Logic voltage: 2.7 to 5.5 V
- Output voltage: 80 V (maximum)
- Output impedance: 110Ω (maximum)  
(When  $V_{HA} - V_{LA} = 60$  V)
- Output delay time: 0.5 μs (maximum)
- Operating temperature: -20 to 75°C
- Package: 20-pin SSOP

### Package Dimensions

unit: mm

#### 3179A-SSOP20



### Specifications

**Absolute Maximum Ratings** (The following conditions must hold at all times:  $V_{HA} \geq V_{HB} > V_{DD} > V_{SS} > V_{LB} \geq V_{LA}$ )

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD \text{ max}}$	$V_{DD}$	-0.3 to +7.0	V
	$V_{HA, B} - V_{LA, B}$	$V_{HA, B} / V_{LA, B}$	-0.3 to +85	V
	$V_{HA} / V_{HB}$	$V_{HA} / V_{HB}$	-0.3 to +45.0	V
	$V_{LA} / V_{LB}$	$V_{LA} / V_{LB}$	-40.0 to +0.3	V
Input voltage	$V_{IN}$	S1 to S3	-0.3 to $V_{DD} + 0.3$	V
Operating temperature	$T_{opr}$		-20 to +75	°C
Storage temperature	$T_{stg}$		-40 to +125	°C

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## Electrical Characteristics

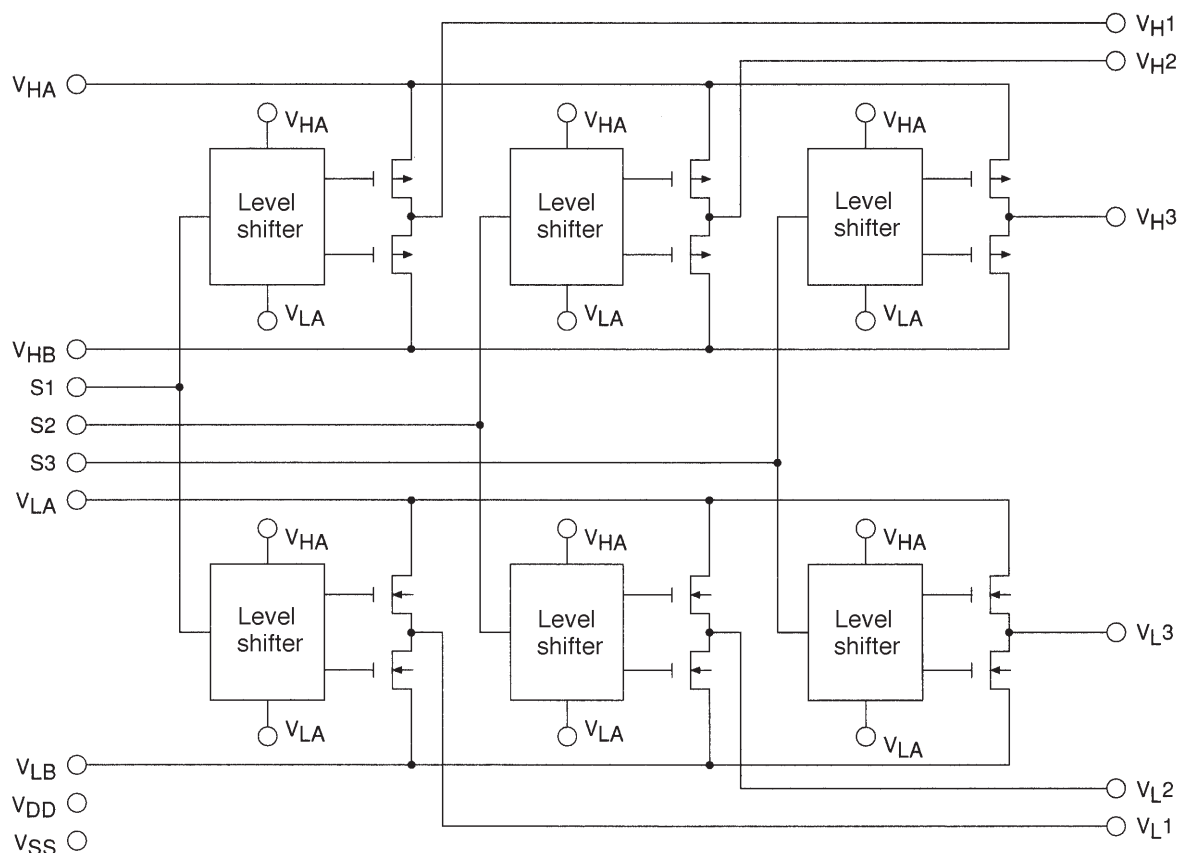
**DC Characteristics at  $T_a = -20$  to  $75^\circ\text{C}$ ,  $V_{SS} = 0\text{ V}$ ,  $V_{DD} = 2.7$  to  $5.5\text{ V}$  unless otherwise specified**

(The following conditions must hold at all times:  $V_{HA} \geq V_{HB} > V_{DD} > V_{SS} > V_{LB} \geq V_{LA}$ .)

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating voltage	$V_{DD}$	$V_{DD}$	2.7	5.0	5.5	V
	$V_{HA, B} - V_{LA, B}$	$V_{HA, B}, V_{LA, B}$	40.0		80.0	V
	$V_{HA}, V_{HB}$	$V_{HA}, V_{HB}$	20.0		42.5	V
	$V_{LA}, V_{LB}$	$V_{LA}, V_{LB}$	-37.5		-20.0	V
Potential difference	$V_{HA} - V_{HB}$	$V_{HA}, V_{HB}$	0		5.0	V
	$V_{LA} - V_{LB}$	$V_{LA}, V_{LB}$	0		5.0	V
Input high-level voltage	$V_{IH}$	S1 to S3	$V_{DD} \times 0.8$		$V_{DD}$	V
Input low-level voltage	$V_{IL}$	S1 to S3	0		$V_{DD} \times 0.2$	V
Output high-level voltage	$R_{OHA}$	$V_{OUT} = V_{HA} - 0.5 : V_{H1}$ to $V_{H3} *1$		70	110	$\Omega$
	$R_{OHB}$	$V_{OUT} = V_{HB} - 0.5 : V_{H1}$ to $V_{H3} *1$		70	110	$\Omega$
Output low-level voltage	$R_{OLA}$	$V_{OUT} = V_{LA} + 0.5 : V_{L1}$ to $V_{L3} *2$		70	110	$\Omega$
	$R_{OLB}$	$V_{OUT} = V_{LB} + 0.5 : V_{L1}$ to $V_{L3} *2$		70	110	$\Omega$
Current drain	$I_{DDOPE}$	$f = 40\text{ kHz}$ , Input signals operating *3			80	$\mu\text{A}$
	$I_{HOPE}$	$f = 40\text{ kHz}$ , Input signals operating *3			600	$\mu\text{A}$
	$I_{HLEAK}$	$f = 40\text{ kHz}$ , Input signals stopped *3	-10		+10	$\mu\text{A}$

Notes: 1.  $V_{HA} - V_{LA} = 60\text{ V}$ ,  $V_{HA} - V_{HB} = 1.0\text{ V}$   
 2.  $V_{HA} - V_{LA} = 60\text{ V}$ ,  $V_{LA} - V_{LB} = 1.0\text{ V}$   
 3.  $V_{HA} - V_{LA} = 60\text{ V}$ ,  $V_{HA} - V_{HB} = V_{LA} - V_{LB} = 1.0\text{ V}$

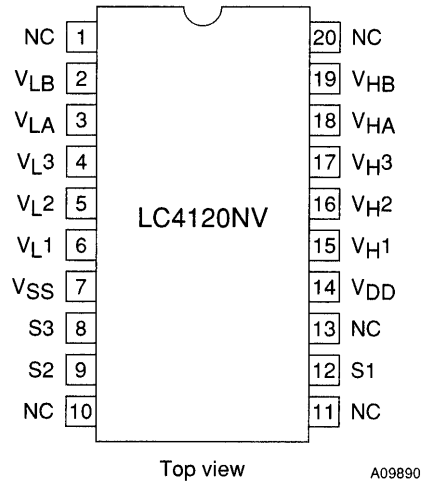
## Block Diagram



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## LC4120NV

### Pin Assignment



### Pin Functions

Pin	I/O	Function	Signal voltage
V <sub>H1</sub>	O	High-voltage output 1	V <sub>HA</sub> /V <sub>HB</sub>
V <sub>H2</sub>	O	High-voltage output 2	V <sub>HA</sub> /V <sub>HB</sub>
V <sub>H3</sub>	O	High-voltage output 3	V <sub>HA</sub> /V <sub>HB</sub>
V <sub>L1</sub>	O	Low-voltage output 1	V <sub>LA</sub> /V <sub>LB</sub>
V <sub>L2</sub>	O	Low-voltage output 2	V <sub>LA</sub> /V <sub>LB</sub>
V <sub>L3</sub>	O	Low-voltage output 3	V <sub>LA</sub> /V <sub>LB</sub>
S1	I	Logic input 1	V <sub>DD</sub> /V <sub>SS</sub>
S2	I	Logic input 2	V <sub>DD</sub> /V <sub>SS</sub>
S3	I	Logic input 3	V <sub>DD</sub> /V <sub>SS</sub>
V <sub>HA</sub>		High-voltage power supply A	
V <sub>HB</sub>		High-voltage power supply B	
V <sub>LA</sub>		Low-voltage power supply A	
V <sub>LB</sub>		Low-voltage power supply B	
V <sub>DD</sub>		Logic system power supply	
V <sub>SS</sub>		Logic system ground	

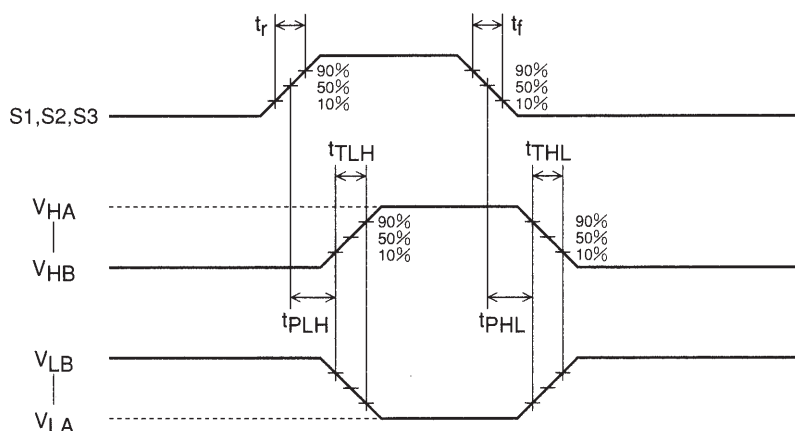
### Truth Table

Input signal	Output	
	V <sub>Hn</sub>	V <sub>Ln</sub>
H	V <sub>HA</sub>	V <sub>LA</sub>
L	V <sub>HB</sub>	V <sub>LB</sub>

(n = 1, 2, 3)

## LC4120NV

### AC Characteristics



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**Conditions 1** at  $T_a = -20$  to  $75^\circ\text{C}$ ,  $V_{SS} = 0$  V,  $V_{DD} = 2.7$  to  $5.5$  V,  $V_{HA} = 42.5$  V,  $V_{HB} = 37.5$  V,  $V_{LA} = -37.5$  V,  $V_{LB} = -32.5$  V,  $C_L = 50$  pF, unless otherwise specified

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output rise time	$t_{TLH}$			80	160	ns
Output fall time	$t_{THL}$			80	160	ns
High-level transmission delay time	$t_{PLH}$			200	500	ns
Low-level transmission delay time	$t_{PHL}$			200	500	ns
Input rise and fall times	$t_r/t_f$				30	ns

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