

SN55563A, SN55564A ELECTROLUMINESCENT ROW DRIVERS

D3313, OCTOBER 1989

- Each Device Drives 34 Electrodes
- Selectable Open-Source or Open-Drain Output
- Outputs Rated at 225 V
- Output Current Capability:
- 90 mA to 150 mA
- CMOS-Compatible Inputs
- Very Low Steady-State Power Consumption

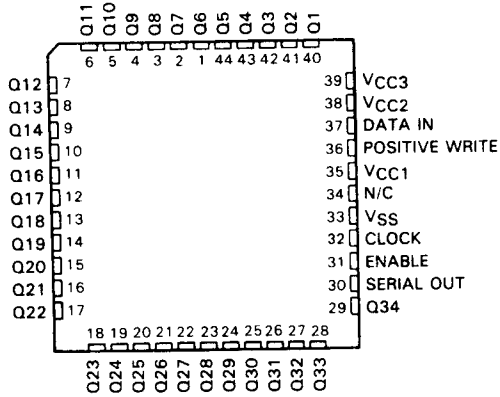
description

The SN55563A and SN55564A are monolithic BIDFET[†] integrated circuits designed to drive the row electrodes of an electroluminescent display. All inputs are CMOS compatible. If the Positive Write input is high, the Q outputs act like open-source outputs and output data is not inverted with respect to input data. If the Positive Write input is low, the Q outputs act like open-drain outputs and output data is inverted with respect to input data. The SN55564A output sequence has been reversed from the SN55563A for ease in printed circuit board layout.

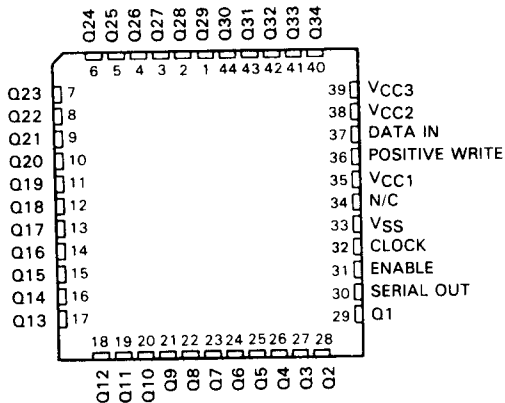
Typically, composite VCC2, VCC3, and VSS signals are externally generated by a high-voltage switching circuit. Serial data is entered into the shift register on the high-to-low transition of the clock input. A high Enable input allows those outputs with a high in their associated register to be turned on, causing the corresponding row to be connected to VCC2 when Positive Write is high or to VSS when Positive Write is low. VCC3 may be tied to VCC2 or held 5 to 15 V above VCC2 for better V_{OH} characteristics. The Serial Output from the shift register may be used to cascade additional devices. This output is not affected by the Enable or Positive Write inputs.

The SN55563A and SN55564A are characterized for operation over the full military operating temperature range of -55°C to 125°C.

SN55563A . . . FJ PACKAGE
(TOP VIEW)



SN55564A . . . FJ PACKAGE
(TOP VIEW)



NC—No internal connection

[†]BIDFET-Bipolar, double-diffused, N-channel and P-channel MOS transistors on the same chip — Patented Process

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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INSTRUMENTS

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LOAD FUNCTION TABLE

FUNCTION	CONTROL INPUTS			SHIFT REGISTER R1 THRU R34	OUTPUTS	
	CLOCK	ENABLE	POSITIVE WRITE		SERIAL	Q1 THRU Q34
LOAD	↓ No↓	X X	X X	Load and Shift† No Change	R34 R34	Determined by Enable and Positive Write Determined by Enable and Positive Write

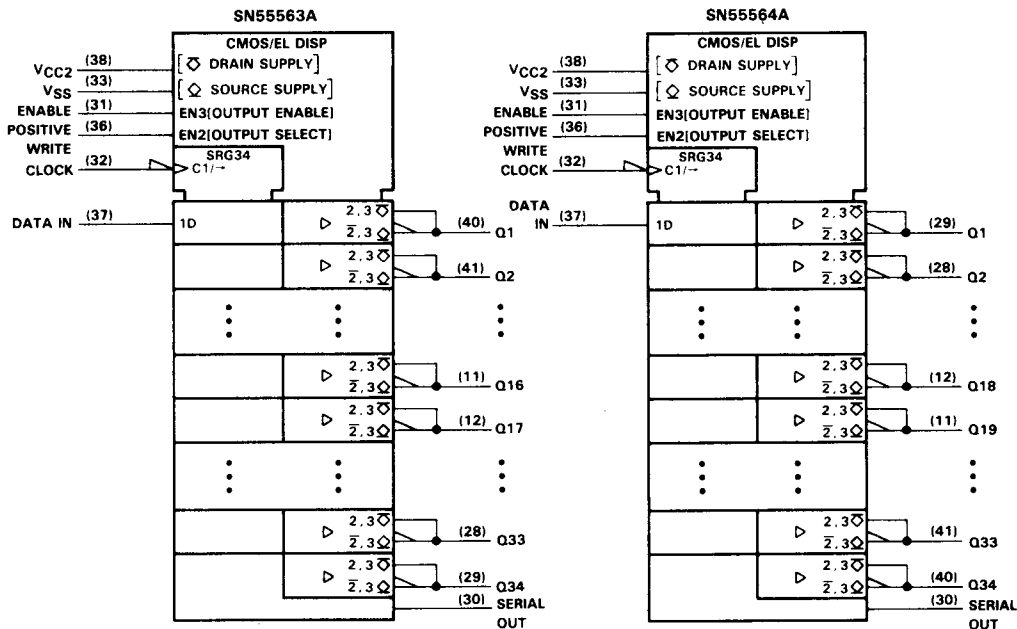
† Register R34 takes on the state of R33, R33 takes on the state of R32, . . . R2 takes on the state of R1, R1 takes on the state of the data input.

OUTPUT CONTROL FUNCTION TABLE

FUNCTION	CONTROL INPUTS			SHIFT REGISTER CONTENTS Rn FOR R1 THRU R34 (Determined Above)	OUTPUTS	
	CLOCK	ENABLE	POSITIVE WRITE		SERIAL	Q1 THRU Q34
OUTPUT CONTROL	X	L	X	X	R34	High-Impedance
	X	H	H	H	R34	H
	X	H	L	H	R34	L
	X	X	X	L	R34	High-Impedance

H = high, L = low, X = irrelevant, ↓ = high-to-low transition

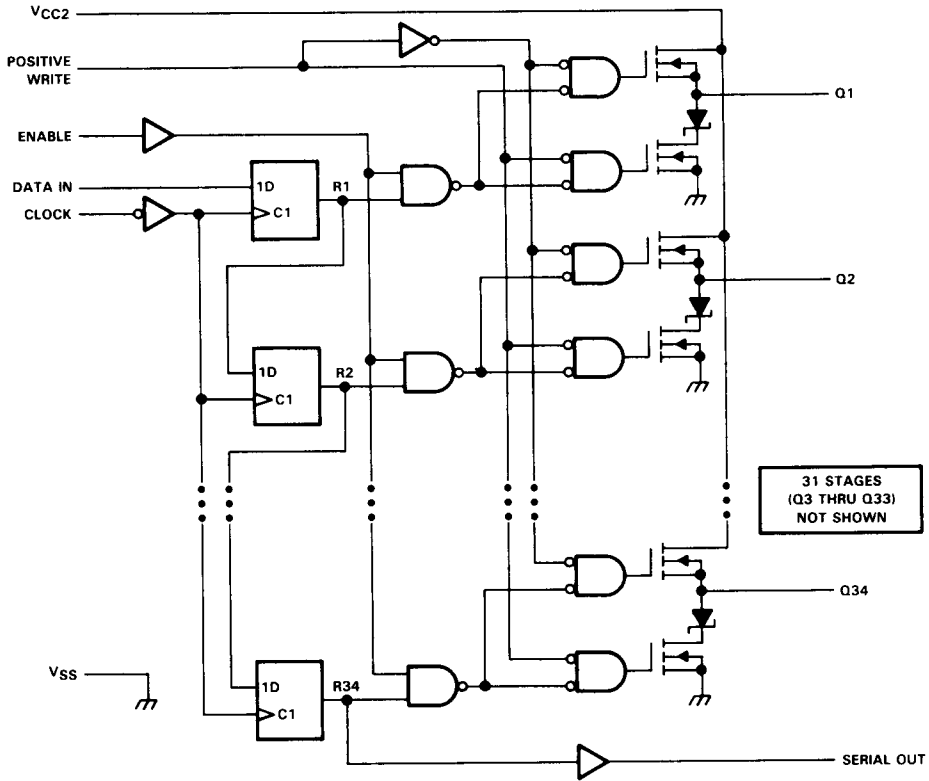
logic symbols‡



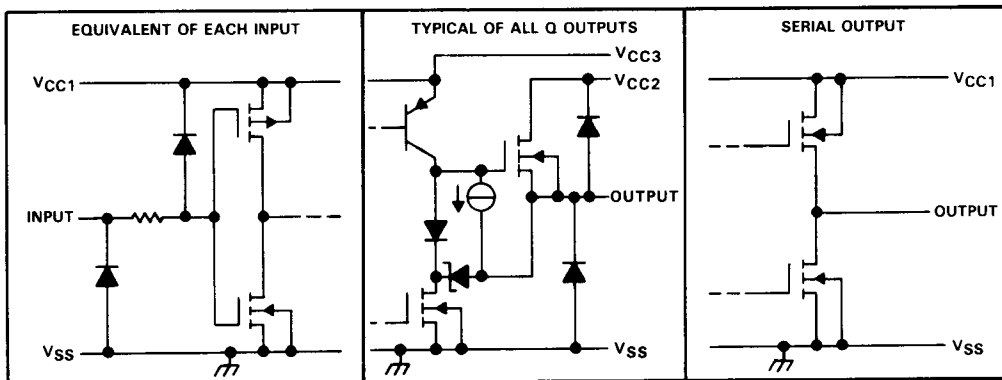
‡ These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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logic diagram (positive logic)

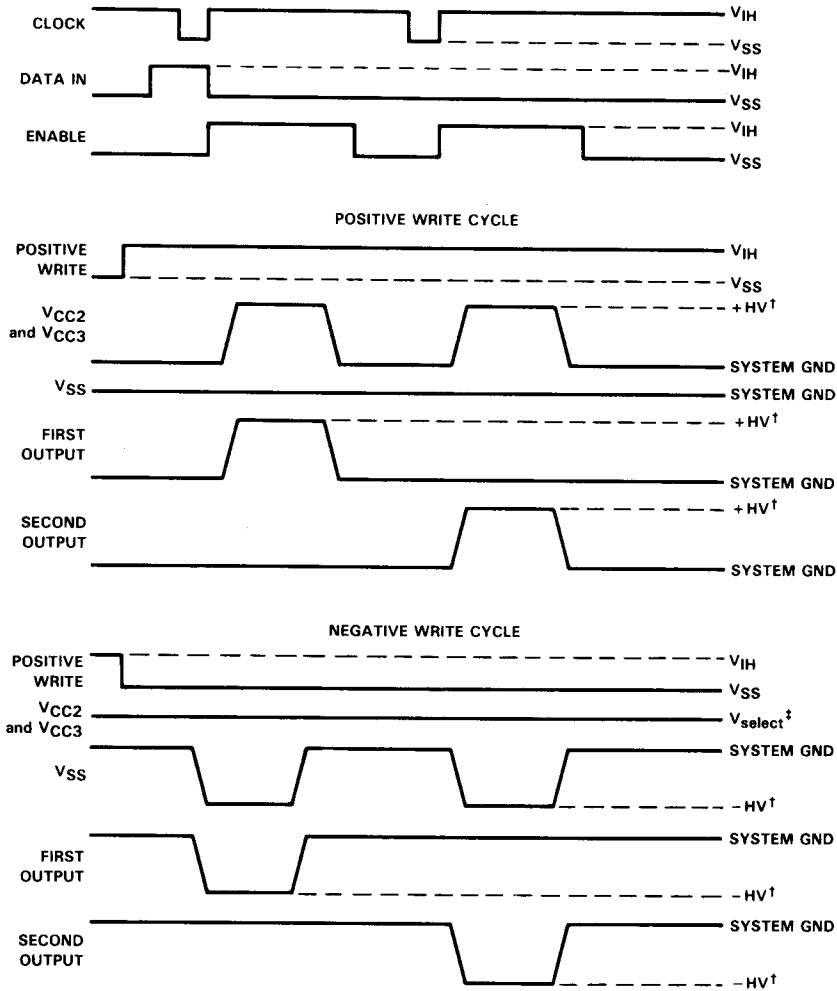


schematics of inputs and outputs



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typical operating sequence



$^\dagger HV$ = high voltage

$^\ddagger V_{select}$ is a voltage level between V_{CC2} of the column driver and V_{SS} .

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC1} (see Note 1)	15 V
Supply voltage, V_{CC2}	230 V
Supply voltage, V_{CC3}	230 V
Supply voltage, V_{SS}	-230 V
Input voltage	-0.3 V to $V_{CC1} + 0.3$ V
Continuous total power dissipation at (or below) 25°C free-air temperature (see Note 2)	1825 mW
Operating free-air temperature range	-55°C to 125°C
Storage temperature range	-65°C to 150°C
Case temperature for 10 seconds	260°C

- NOTES: 1. Voltage values are with respect to V_{SS} .
 2. For operation above 25°C free-air temperature, derate 365 mW at 125°C at the rate of 14.6 mW/°C.

recommended operating conditions (see Figure 1 and Figure 2)

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC1}	10.8	12	13.2	V
Supply voltage, V_{CC2}	$V_{CC3} - 15$		V_{CC3}	V
Supply voltage, V_{CC3}	0		225	V
Supply voltage, V_{SS}	0		-225	V
High-level input voltage, V_{IH}	0.75 V_{CC1}		$V_{CC1} + 0.3$	V
Low-level input voltage, V_{IL} [†]	-0.3		0.25 V_{CC1}	V
High-level output current, I_{OH}			-90	mA
Low-level output current, I_{OL}			150	mA
Output clamp current, I_{OK}			±150	mA
Clock frequency, f_{clock}			1	MHz
Pulse duration, Clock high or low, t_{wCLK}	125			ns
Setup time, data high or low before clock \downarrow , t_{su1}	100			ns
Setup time, Clock low before $V_{CC2}\uparrow$ or $V_{SS}\downarrow$, t_{su2}	300 [‡]			ns
Setup time, Enable high before $V_{CC2}\uparrow$ or $V_{SS}\downarrow$, t_{su3}	300 [‡]			ns
Setup time, Positive Write high or low before $V_{CC2}\uparrow$ or $V_{SS}\downarrow$, t_{su4}	300 [‡]			ns
Hold time, data high or low after clock \downarrow , t_{h1}	100			ns
Hold time, Clock high after $V_{CC2}\downarrow$ or $V_{SS}\uparrow$, t_{h2}	300 [‡]			ns
Hold time, Enable high after $V_{CC2}\downarrow$ or $V_{SS}\uparrow$, t_{h3}	0 [‡]			ns
Hold time, Positive Write after $V_{CC2}\downarrow$ or $V_{SS}\uparrow$, t_{h4}	0 [‡]			ns
Hold time, Enable low between successive $V_{CC2}\uparrow$, t_{h5}	12 [‡]			μs
Hold time, Enable low between successive $V_{SS}\downarrow$, t_{h6}	300 [‡]			ns
Operating free-air temperature, T_A	-55		125	°C

[†]The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic voltage levels only.

[‡]These minimum recommendations are not tested during manufacturing. Performance is dependent on application voltage and temperature and must be validated by the user.

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electrical characteristics over recommended operating ranges of V_{CC1} and free-air temperature range, $V_{CC2} = 225\text{ V}$, $V_{CC3} = 225\text{ V}$, $V_{SS} = 0$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
$I_{O(off)}$	Off-state Q output current	$V_O = 225\text{ V}$		150	μA
		$V_O = 0$		-150	
V_{OH}	High-level output voltage	Q outputs	$I_O = -70\text{ mA}$, $V_{CC1} = 12\text{ V}$	$V_{CC2} - 40$	V
		Serial Out	$I_O = -90\text{ mA}$, $V_{CC1} = 12\text{ V}$	$V_{CC2} - 45$	
V_{OL}	Low-level output voltage	Q outputs	$I_O = 150\text{ mA}$	30	V
		Serial Out	$I_O = 100\ \mu\text{A}$	1	
I_{IH}	High-level input current	$V_{IH} = V_{CC1}$		100	μA
I_{IL}	Low-level input current	$V_{IL} = 0$		-100	μA
I_{CC1}	Supply current from V_{CC1}	One Q output high		4	mA
		All Q outputs low or high impedance		2	
I_{CC3}	Supply current from V_{CC3}^\dagger	One Q output high, $V_{CC1} = 12\text{ V}$		10	mA
		All Q outputs low or high impedance, $V_{CC1} = 12\text{ V}$		200	

switching characteristics over recommended operating range of V_{CC1} , $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high level serial output from clock	$C_L = 50\text{ pF}$ to V_{SS} . See Figures 3 and 4	400	ns
t_{PHL}	Propagation delay time, high-to-low level serial output from clock		400	ns

$^\dagger I_{CC3}$ is measured with V_{CC2} and V_{CC3} shorted together.

PARAMETER MEASUREMENT INFORMATION

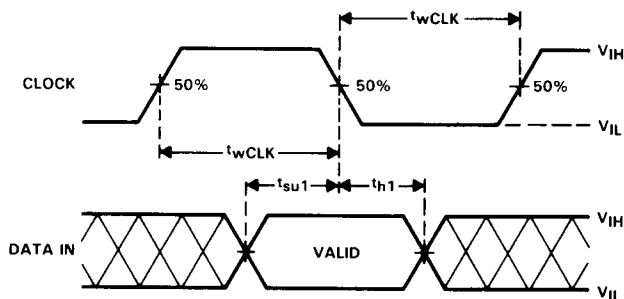
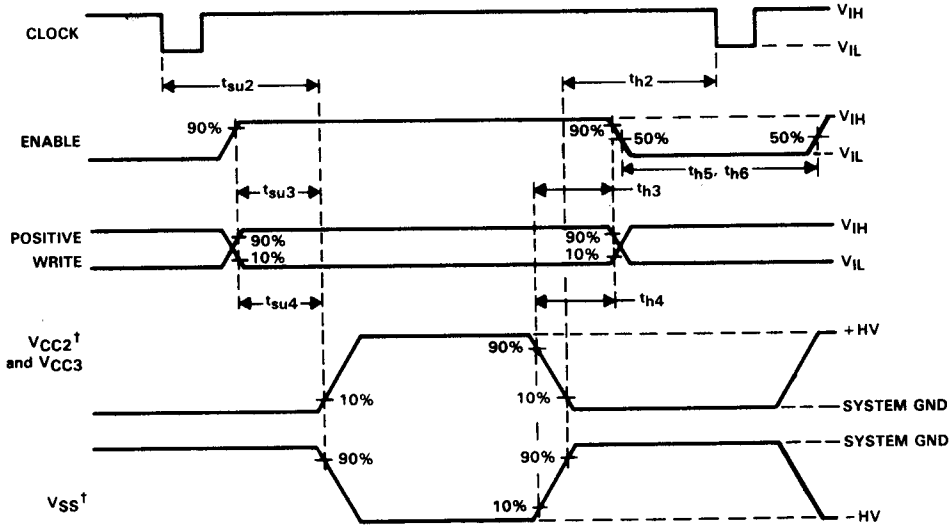


FIGURE 1. INPUT TIMING VOLTAGE WAVEFORMS

PARAMETER MEASUREMENT INFORMATION



†Timing waveforms are with respect to V_{CC2} or V_{SS} , as appropriate.

FIGURE 2. CONTROL INPUT TIMING VOLTAGE WAVEFORMS

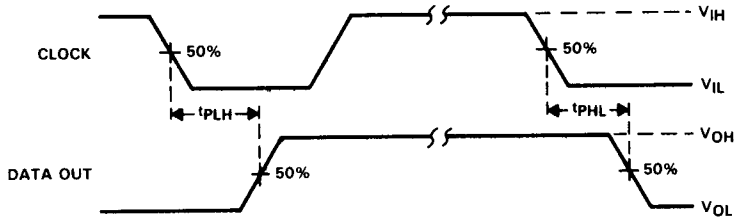
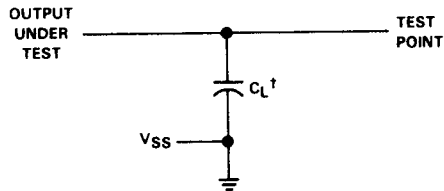


FIGURE 3. VOLTAGE WAVEFORMS FOR PROPAGATION DELAY TIMES, CLOCK TO DATA OUT



† C_L includes probe and jig capacitance.

FIGURE 4. LOAD CIRCUIT