SLDS012B – D2472, MARCH 1983 – REVISED APRIL 1993

- **Controls 32 Electrodes**
- **100-V Totem-Pole Outputs**
- **Low Standby Power Consumption**
- **All Outputs Contain Sink and Source Clamp Diodes**
- **15-mA Steady-State Output Current**
- **Rugged DMOS Outputs**
- **CMOS Inputs**
- **Direct Replacement for SN75501C**

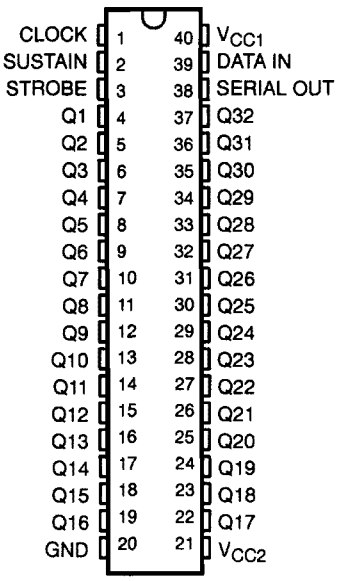
description

The SN55501E, SN65501E, and SN75501E are monolithic BIDFET† integrated circuits designed to provide the serial-to-parallel conversion and level translation of data in a matrix-addressable display. The device inputs are diode-clamped CMOS inputs.

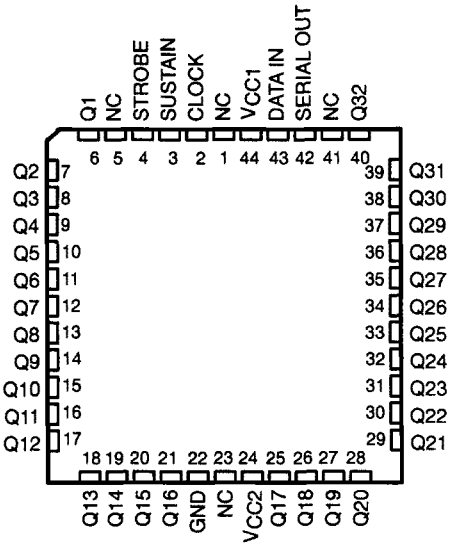
The Q outputs of these drivers are normally high and can be switched either selectively or together. Any output whose associated register bit (in the internal 32-bit serial register) contains a low switches low when STROBE is low if SUSTAIN is high. All other outputs remain high. When SUSTAIN is low, all outputs switch low independently of the data or strobe inputs. This feature can be used to generate a portion of the SUSTAIN pulse required in the operation of an ac plasma display. The internal level-shift circuits provide additional drive during the times that the outputs switch high to facilitate fast rise times while maintaining low standby power consumption. All outputs contain clamp diodes to the V_{CC2} and GND supply inputs.

The SN55501E is characterized for operation over the full military temperature range of −55°C to 125°C. The SN65501E is characterized for operation from −40°C to 85°C. The SN75501E is characterized for operation from 0°C to 70°C.

SN55501E . . . J PACKAGE
SN65501E, SN75501E . . . N PACKAGE
(TOP VIEW)



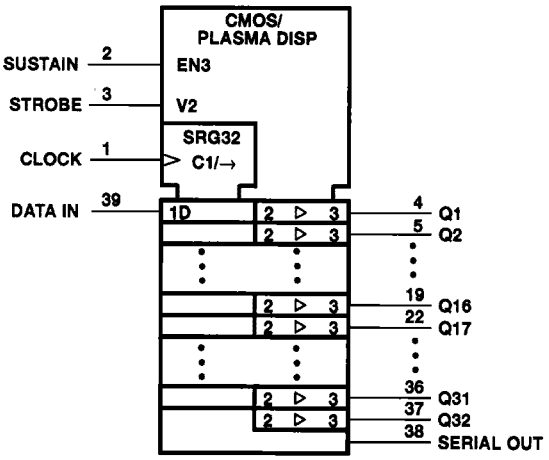
SN55501E . . . FD OR FJ PACKAGE
SN65501E, SN75501E . . . FN PACKAGE
(TOP VIEW)



NC – No internal connection

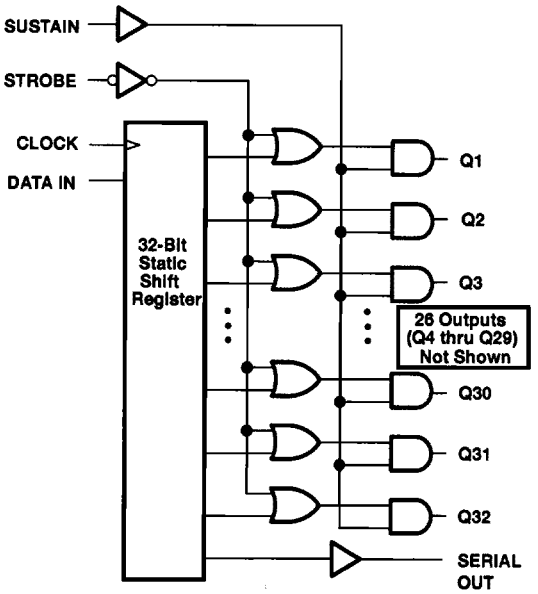
†BIDFET – Bipolar, double-diffused, N-channel and P-channel MOS transistors on same chip. This is a patented process.

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the J and N packages.

functional block diagram (positive logic)

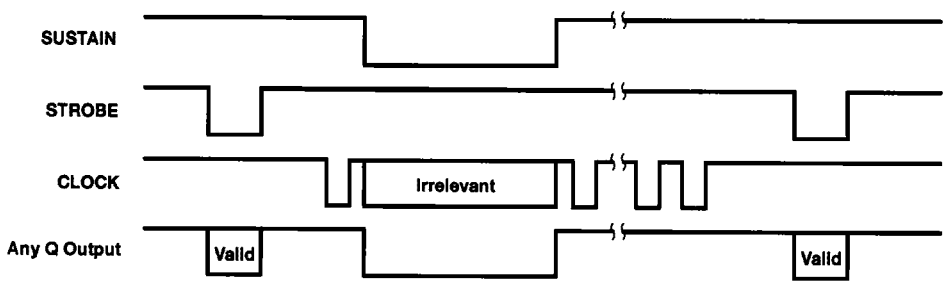


FUNCTION TABLE

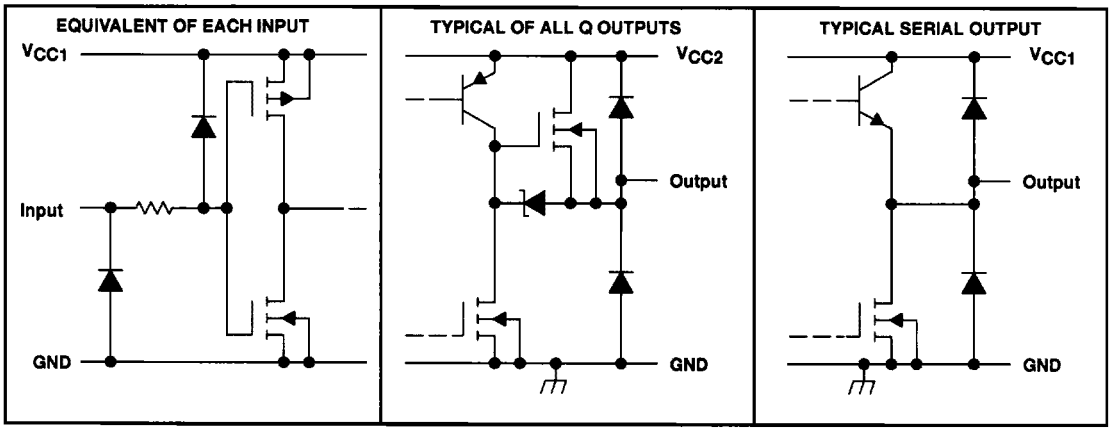
FUNCTION	INPUTS				OUTPUTS						
	DATA	CLOCK	STROBE	SUSTAIN	SHIFT REGISTERS R1	SHIFT REGISTERS R2	SHIFT REGISTERS R3 . . . R32	SERIAL DATA	Q1	Q2	Q3 . . . Q32
Load	H	↑	H	H	H	$R1_n$	$R2_n$ . . . $R31_n$	$R32_n$	H	H	H . . . H
	L	↑	H	H	L	$R1_n$	$R2_n$ . . . $R31_n$	$R32_n$	H	H	H . . . H
Strobe	X	X	H	H	$R1_n$	$R2_n$	$R3_n$ . . . $R32_n$	$R32_n$	H	H	H . . . H
	X	H	L	H	$R1_n$	$R2_n$	$R3_n$ . . . $R32_n$	$R32_n$	R1	R2	R3 . . . R32
Sustain	X	X	X	L	$R1_n$	$R2_n$	$R3_n$ . . . $R32_n$	$R32_n$	L	L	L . . . L

H = high level, L = low level, X = irrelevant, ↑ = low-to-high-level transition.
R1 . . . R32 = levels currently at internal outputs of shift registers one through thirty-two, respectively.
$R1_n$ . . . $R32_n$ = levels at shift-register outputs R1 through R32 respectively, before the most recent ↑ transition at the CLOCK input.

typical operating sequence



schematics of inputs and outputs



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} ..... 100 V
Input voltage range ..... V_{CC1} to 0.3 V
Continuous total power dissipation ..... See Dissipation Rating Table
Operating free-air temperature range, T_A: SN55501E ..... −55°C to 125°C
SN65501E ..... −40°C to 85°C
SN75501E ..... 0°C to 70°C
Storage temperature range ..... −65°C to 150°C
Case temperature for 10 seconds: FD, FJ, or FN package ..... 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: N package ..... 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package ..... 300°C

NOTE 1: All voltage values are with respect to network ground terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING	$T_A = 125°C$ POWER RATING
FD or FJ	1825 mW	14.6 mW/°C	1168 mW	949 mW	365 mW
FN	1775 mW	14.2 mW/°C	1136 mW	923 mW	—
J	3050 mW	24.4 mW/°C	1952 mW	1586 mW	610 mW
N	1275 mW	10.2 mW/°C	816 mW	663 mW	—

recommended operating conditions

			MIN	NOM	MAX	UNIT
Supply voltage, V_{CC1}			10.8	12	13.2	V
Supply voltage, V_{CC2}			0		100	V
High-level input voltage, V_{IH}			0.75 V_{CC1}			V
Low-level input voltage, V_{IL}					0.25 V_{CC1}	V
High-level Q output clamp current, I_{OKH}					20	mA
Low-level Q output clamp current, I_{OKL}					−20	mA
Clock frequency at (or below) 25°C junction temperature , f_{clock} (see Note 2)			0		8	MHz
Duration of high or low clock pulse, t_w			62			ns
Setup time, t_{su}	Data inputs before CLOCK↑		20			ns
Hold time, t_h	Data inputs after CLOCK↑		50			ns
	STROBE high after CLOCK↑		150			
	STROBE high after SUSTAIN↑		250			
Operating free-air temperature, T_A		SN55501E	−55		125	°C
		SN65501E	−40		85	
		SN75501E	0		70	
Operating case temperature, T_C		SN55501E			125	°C

NOTE 2: See Figure 3 for maximum clock frequency when devices are operated in cascade or for operation above T_J = 25°C.

electrical characteristics over recommended operating free-air temperature range

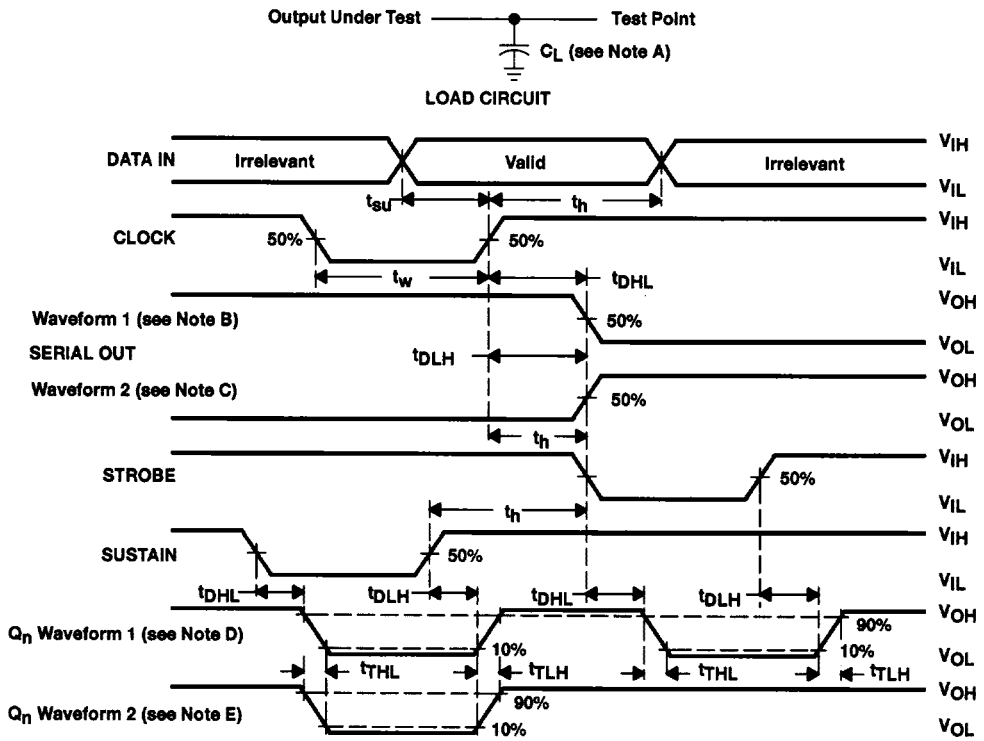
PARAMETER			TEST CONDITIONS		SN55501E, SN65501E			SN75501E			UNIT
					MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}	Input clamp voltage		V_{CC1} = 12 V,	I_I = 12 mA		−1	−1.5		−1	−1.5	V
V_{OH}	High-level output voltage	Q outputs	V_{CC1} = 13.2 V, V_{CC2} = 100 V	I_{OH} = −1 mA	94	97.5		95	97.5		V
				I_{OH} = −10 mA	92	94.5		93	94.5		
				I_{OH} = −15 mA	90	93.5		91	93.5		
		SERIAL OUT	V_{CC1} = 10.8 V,	I_{OH} = −100 µA	9	10		9	10		
V_{OL}	Low-level output voltage	Q outputs	V_{CC1} = 13.2 V, V_{CC2} = 100 V	I_{OL} = 1 mA		0.85	2		0.85	2	V
				I_{OL} = 10 mA		2	4		2	4	
				I_{OL} = 15 mA		2.75	5		2.75	5	
		SERIAL OUT	V_{CC1} = 10.8 V,	I_{OL} = 100 µA		0.1	1		0.1	1	
V_{OK}	Output clamp voltage	Q outputs	V_{CC2} = 0	I_{OK} = 20 mA		1	2.5		1	2.5	V
				I_{OK} = −20 mA		−1.2	−2.5		−1.2	−2.5	
I_{IH}	High-level input current		V_{CC1} = 13.2 V, V_{CC2} = 100 V	V_{IH} = V_{IH}min,			1			1	µA
I_{IL}	Low-level input current		V_{CC1} = 13.2 V, V_{CC2} = 100 V	V_{IL} = V_{IL}max,			−1			−1	µA
I_{CC1}	Supply current from V_{CC1}		V_{CC1} = 13.2 V,	V_{CC2} = 100 V		0.05	1		0.05	1	mA
I_{CC2}	Supply current from V_{CC2}		V_{CC2} = 100 V			1	5		1	3	mA

† Typical values are at V_{CC1} = 12 V, T_A = 25°C.

switching characteristics, V_{CC1} = 12 V, V_{CC2} = 100 V, T_A = 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{DHL}	Delay time, high-to-low-level outputs	STROBE to Q outputs	C_L = 30 pF			250	ns
		SUSTAIN to Q outputs	C_L = 30 pF			250	
		CLOCK to SERIAL OUT	C_L = 20 pF			147	
t_{DLH}	Delay time, low-to-high-level outputs	STROBE to Q outputs	C_L = 30 pF			450	ns
		SUSTAIN to Q outputs	C_L = 30 pF			450	
		CLOCK to SERIAL OUT	C_L = 20 pF			147	
t_{THL}	Transition time, high-to-low-level Q output		C_L = 30 pF			200	ns
t_{TLH}	Transition time, low-to-high-level Q output		C_L = 30 pF			300	ns

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.
B. SERIAL OUT waveform for internal conditions such that a low is registered in R32.
C. SERIAL OUT waveform for internal conditions such that a high is registered in R32.
D. Q_n output with a low stored in associated register R_n.
E. Q_n output with a high stored in associated register R_n.

Figure 1. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

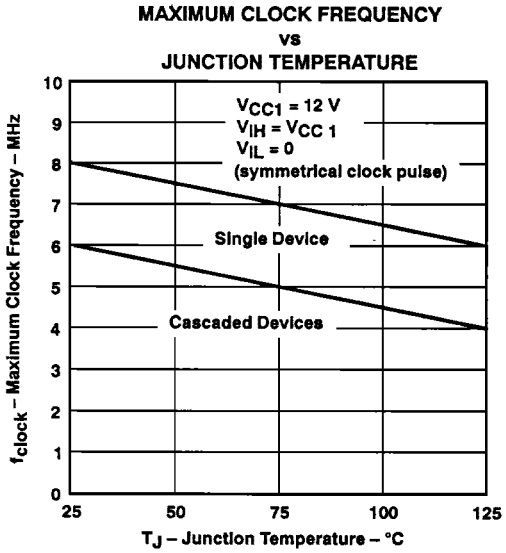


Figure 2

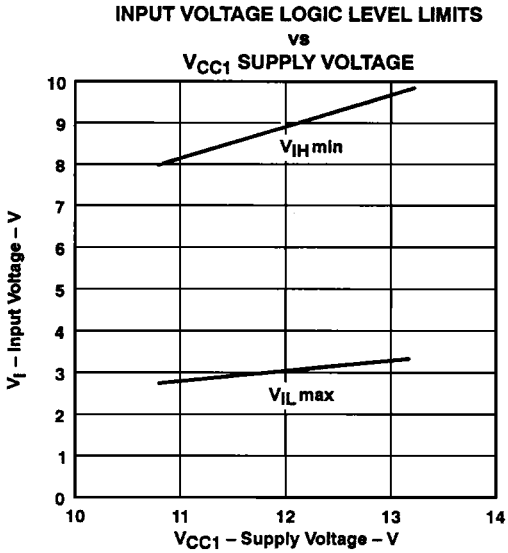


Figure 3

THERMAL CHARACTERISTICS

junction temperature formula

$$T_J = T_A + P_D R_\theta$$

where:

T_J = virtual junction temperature
T_A = free-air temperature
P_D = average device power dissipation
R_θ = thermal resistance (junction-to-air, $R_{\theta JA}$, or junction-to-case, $R_{\theta JC}$)

PACKAGE	$R_{\theta JA}$	$R_{\theta JC}$
FD or FJ	68°C/W	20°C/W
FN	70°C/W	22°C/W
J	45°C/W	12°C/W
N	100°C/W	27°C/W