

TL4810BI, TL4810B VACUUM FLUORESCENT DISPLAY DRIVERS

D2715, DECEMBER 1984—REVISED OCTOBER 1989

- Each Device Drives 10 Lines
- 60-V Output Voltage Rating
- 40-mA Output Source Current
- High-Speed Serially-Shifted Data Input
- CMOS-Compatible Inputs
- Latches on All Driver Outputs
- Improved Direct Replacement for UCN4810A and TL4810A

description

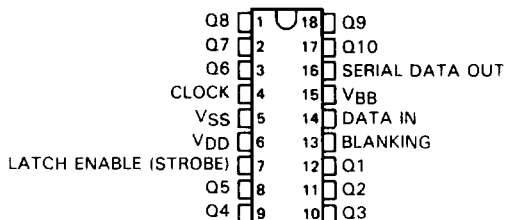
The TL4810BI and TL4810B are monolithic BIFET[†] integrated circuits designed to drive a dot matrix or segmented vacuum fluorescent display (VFD). These devices feature a serial data output to cascade additional devices for large display arrays.

A 10-bit data word is serially loaded into the shift register on the positive-going transitions of the clock. Parallel data is transferred to the output buffers through a 10-bit D-type latch while LATCH ENABLE is high and is latched when LATCH ENABLE is low. When BLANKING is high, all outputs are low.

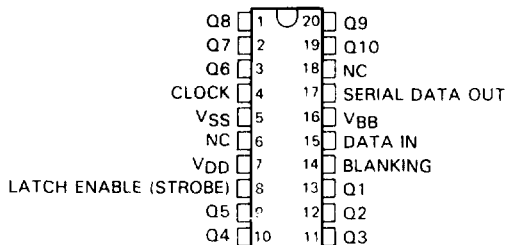
Outputs are totem-pole structures formed by n-p-n emitter-follower and double-diffused MOS (DMOS) transistors with output voltage ratings of 70 V and 40 mA source-current capability. All inputs are compatible with CMOS and TTL levels, but each requires the addition of a pull-up resistor to V_{DD} when driven by TTL logic.

The TL4810BI is characterized for operation from -40°C to 85°C. The TL4810B is characterized for operation from 0°C to 70°C.

N PACKAGE (TOP VIEW)



DW SMALL OUTLINE PACKAGE (TOP VIEW)



NC--No internal connection

[†] BIFET—Bipolar, Double-Diffused, N-Channel and P-Channel MOS transistors on 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.

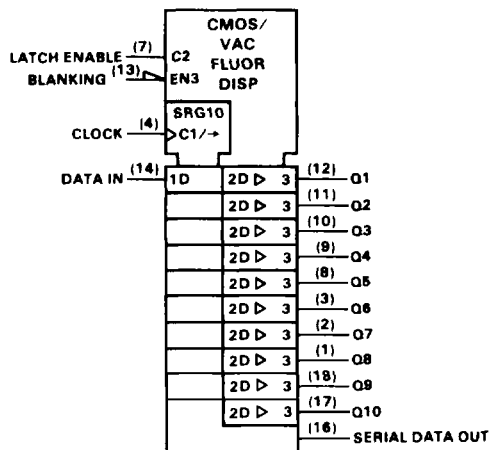
TEXAS
INSTRUMENTS

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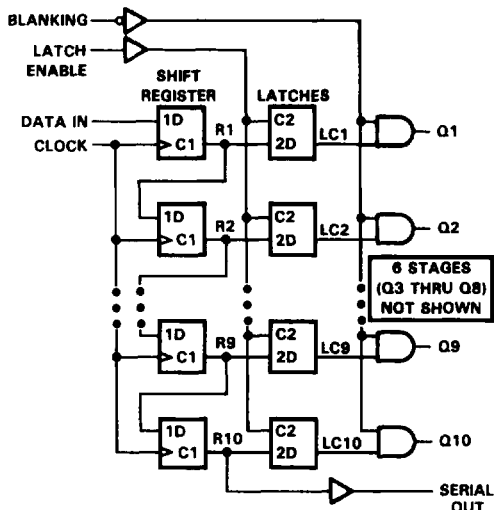
logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the N package.

logic diagram (positive logic)



FUNCTION TABLE

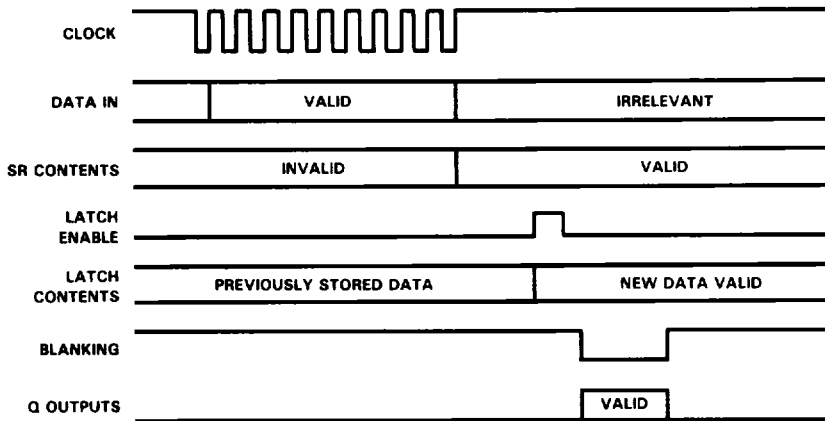
FUNCTION	CONTROL INPUTS			SHIFT REGISTERS R1 THRU R10‡	LATCHES LC1 THRU LC10	OUTPUTS	
	CLOCK	LATCH ENABLE	BLANK- ING			SERIAL	Q1 THRU Q10
LOAD	↑	X	X	Load and shift†	Determined by LATCH ENABLE§	R10	Determined by BLANKING
LATCH	X	L	X	As determined above	Stored data	R10	Determined by BLANKING
BLANK	X	X	H	As determined above	Determined by LATCH ENABLE§	R10	All L
	X	X	L				LC1 thru LC10 respectively

H = high level, L = low level, X = irrelevant, ↑ = low-to-high-level transition.

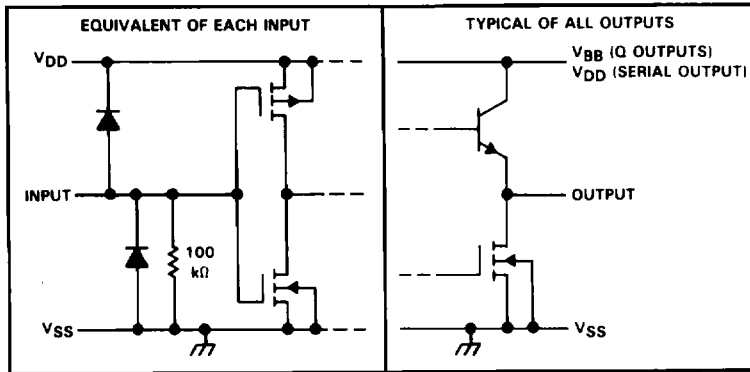
‡ Register R10 takes on the state of R9, R9 takes on the state of R8 . . . R2 takes on the state of R1, and R1 takes on the state of the data input.

§ New data enter the latches while LATCH ENABLE is high. These data are stored while LATCH ENABLE is low.

typical operating sequence



schematics of inputs and outputs



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

Logic supply voltage, V_{DD} (see Note 1)	18 V
Driver supply voltage, V_{BB}	70 V
Output voltage	70 V
Input voltage	-0.3 V to $V_{DD} + 0.3$ V
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range: TL4810BI	-40°C to 85°C
TL4810B	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: Voltage values are with respect to V_{SS} .

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
DW	1125 mW	9.0 mW/°C	720 mW	585 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

recommended operating conditions

PARAMETER		TL4810BI			TL4810B			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{DD}		4.75		15.75	4.75		15.75	V
Supply voltage, V_{BB}		5		60	5		60	V
Supply voltage, V_{SS}			0			0		V
High-level input voltage, V_{IH}	for $V_{DD} = 5$ V	3.5		5.3	3.5		5.3	V
	for $V_{DD} = 15$ V	13.5		15.3	13.5		15.3	
Low-level input voltage, V_{IL}		-0.3†		0.8	-0.3†		0.8	V
Continuous high-level output current, I_{OH}				-25			-25	mA
Operating free-air temperature, T_A		-40		85	0		70	°C

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

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VACUUM FLUORESCENT DISPLAY DRIVERS

electrical characteristics over recommended operating free-air temperature range, $V_{DD} = 5\text{ V to }15\text{ V}$, $V_{BB} = 60\text{ V}$, $V_{SS} = 0$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†	TL4810BI			TL4810B			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{OH} High-level output voltage	Q outputs	$I_{OH} = -25\text{ mA}$	57.5	58		57.5	58		V
	Serial output	$V_{DD} = 5\text{ V}$, $I_{OH} = -100\text{ }\mu\text{A}$	4	4.5		4	4.5		
		$V_{DD} = 15\text{ V}$, $I_{OH} = -100\text{ }\mu\text{A}$	14	14.7		14	14.7		
V_{OL} Low-level output voltage	Q outputs	$I_{OH} = 1\text{ }\mu\text{A}$, BLANKING at V_{DD}		0.5	1		0.5	1	V
	Serial output	$V_{DD} = 5\text{ V}$, $I_{OL} = 100\text{ }\mu\text{A}$		0.05	0.1		0.05	0.1	
		$V_{DD} = 15\text{ V}$, $I_{OL} = 100\text{ }\mu\text{A}$		0.02	0.1		0.02	0.1	
I_{OL} Low-level Q output current (pull-down current)		$V_O = 60\text{ V}$, BLANKING at V_{DD} , $T_A = \text{MIN to }70^\circ\text{C}$	2.5	3.7		2.5	3.7		mA
		$V_O = 80\text{ V}$, BLANKING at V_{DD} , $T_A = 85^\circ\text{C}$	2						
$I_{O(off)}$ Off-state output current		$V_O = 0$, BLANKING at V_{DD} , $T_A = \text{MAX}$		-1	-15		-1	-15	μA
I_H High-level input current		$V_I = V_{DD}$		30	50		30	50	μA
I_{BB} Supply current from V_{BB}		All outputs low		0.5	1		0.5	1	mA
		All outputs high, $T_A = 0^\circ\text{C to MAX}$		2.7	4		2.7	4	
		All outputs high, $T_A = -40^\circ\text{C}$			5				
I_{DD} Supply current from V_{DD}		All inputs at 0 V, $V_{DD} = 5\text{ V}$		10	50		10	50	μA
		One Q output high, $V_{DD} = 15\text{ V}$		10	100		10	100	
		All inputs at 0 V, $V_{DD} = 5\text{ V}$		10	50		10	50	
		All outputs low, $V_{DD} = 15\text{ V}$		10	100		10	100	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $T_A = 25^\circ\text{C}$, except for I_Q .

timing requirements over recommended operating free-air temperature range

PARAMETER		$V_{DD} = 5\text{ V}$		$V_{DD} = 15\text{ V}$		UNIT
		MIN	MAX	MIN	MAX	
$t_w(\text{CKH})$	Pulse duration, CLOCK high	250		50		ns
$t_w(\text{LEH})$	Pulse duration, LATCH ENABLE high	250		50		ns
$t_{su}(\text{D})$	Setup time, DATA IN before CLOCK†	125		25		ns
$t_h(\text{D})$	Hold time, DATA IN after CLOCK†	125		25		ns
$t_{CKH-LEH}$	Delay time, CLOCK† to LATCH ENABLE high	125		25		ns

switching characteristics, $V_{BB} = 60\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER					UNIT
		MIN	TYP	MAX	
t_{pd}	Propagation delay time, LATCH ENABLE to output	$V_{DD} = 5\text{ V}$	1		μs
		$V_{DD} = 15\text{ V}$	0.5		

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PARAMETER MEASUREMENT INFORMATION

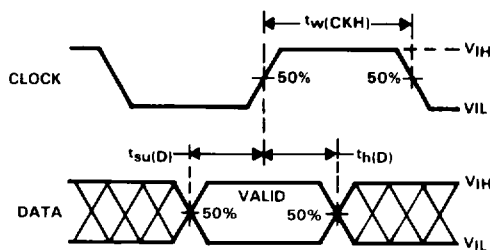


FIGURE 1. INPUT TIMING

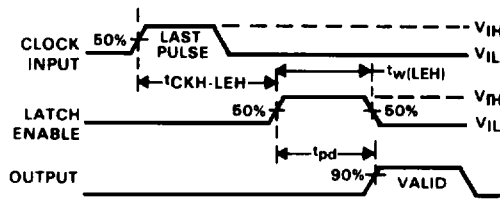


FIGURE 2. OUTPUT SWITCHING TIMES

THERMAL INFORMATION

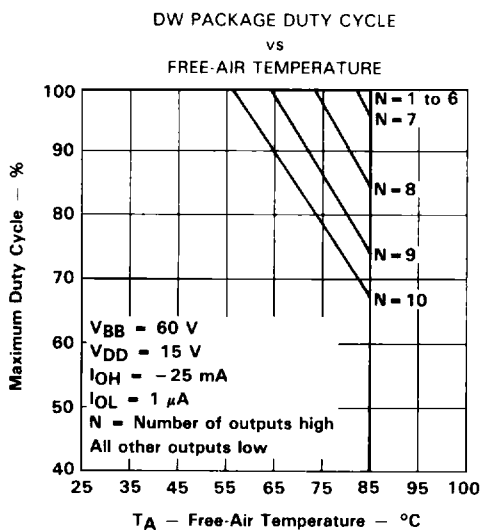


FIGURE 3

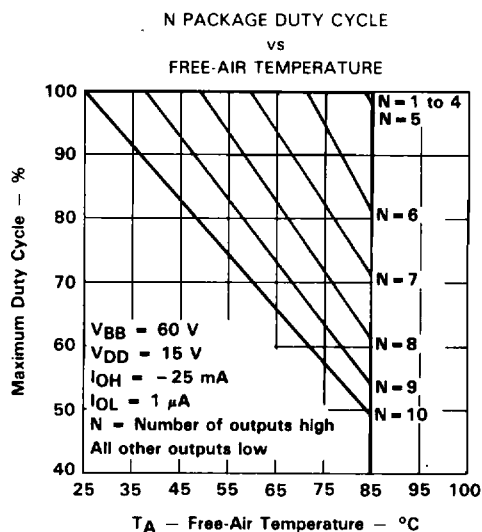


FIGURE 4