64 Bits Thermal Printer Head Driver

June 2019

GENERAL DESCRIPTION

The FS9001 is a 64-bit CMOS driver for the thermal printer head. It consists of 64 bits built-in shift registers to transfer the data, and 64 bits latches to hold the input data, and 64 high voltage output switches. In general, “H” or “L” levels can be selected for the latch and strobe control.

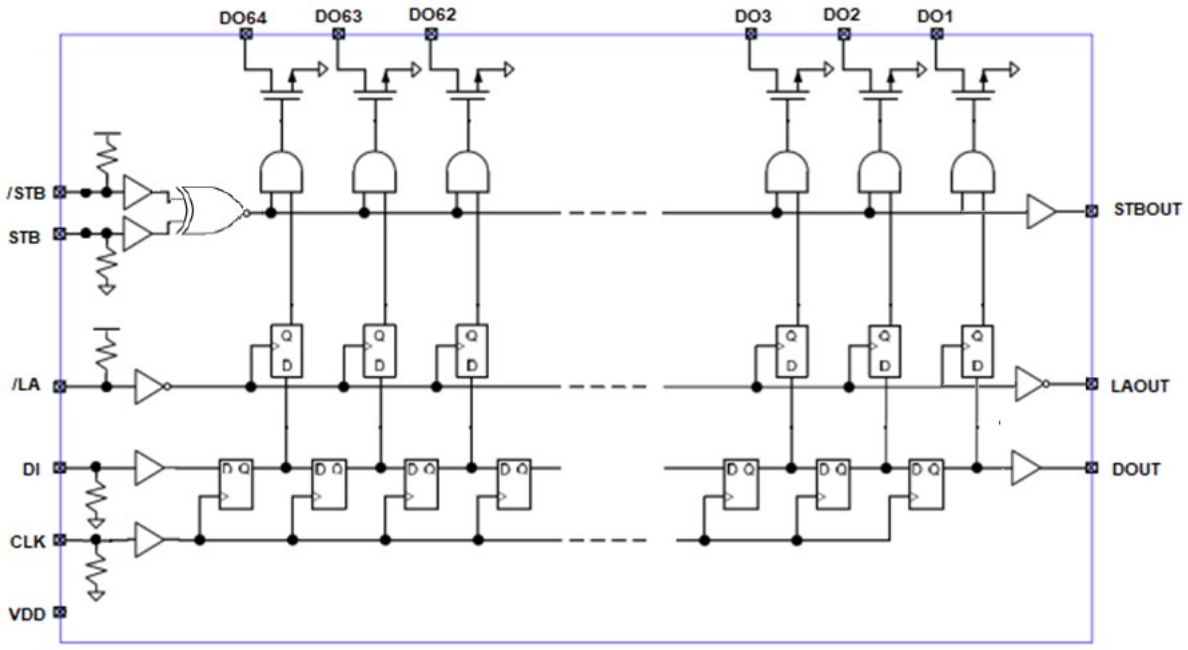
FEATURES

- Low current consumption: 1mA typ (Vdd=3.3V, FCLK 4Mhz, DI fixed low)
- High speed operation: 16 Mhz (daisy chain)
- Driver off function when supply voltage drops below a preset value
- Driver maximum output voltage: up to 40 v
- Ron (open drain resistance): 7Ω

APPLICATIONS

- Thermal printer head

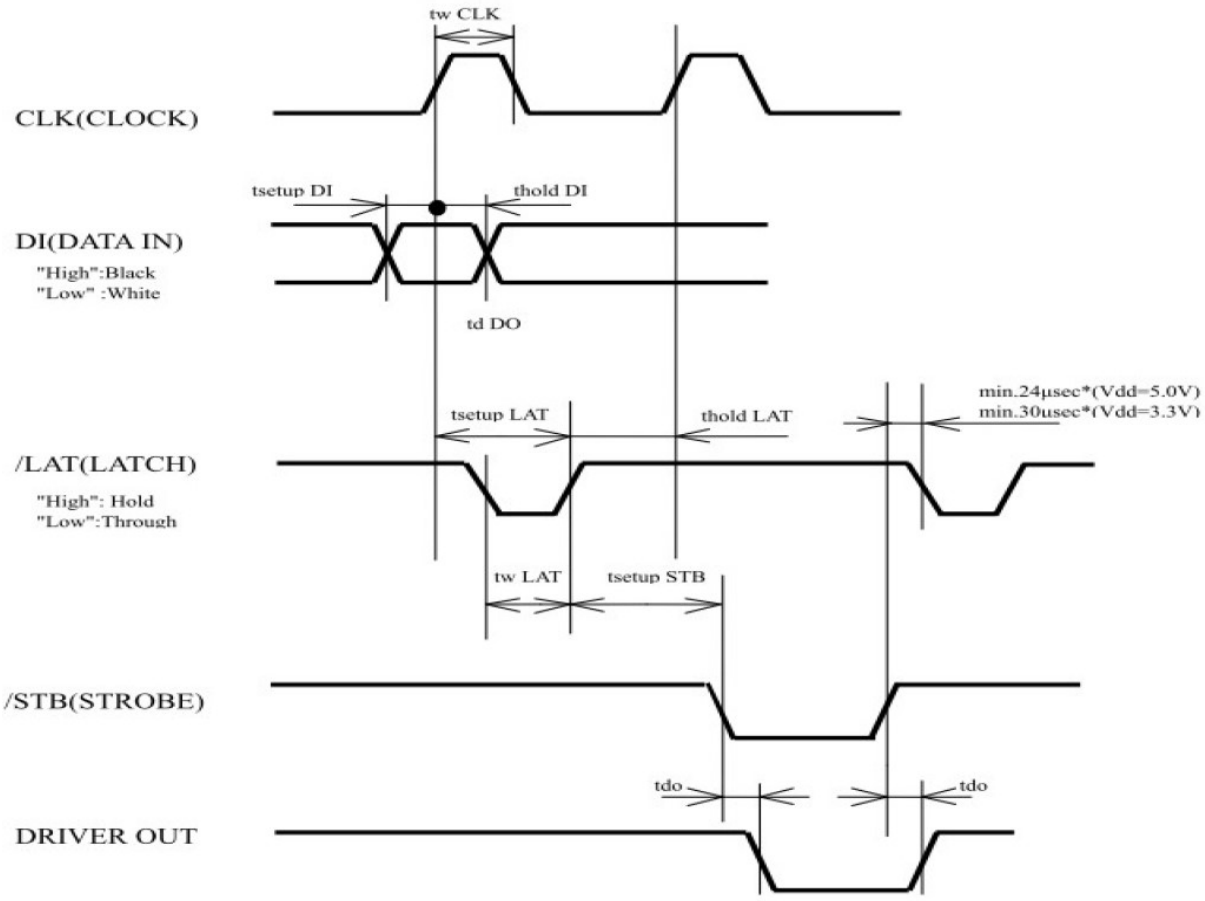
FUNCTIONAL BLOCK DIAGRAM



Operation Description

During normal operation, 64-bit shift register reads the data from the input, DI, on the rising edge of the CLK input. The operation of latch circuit depends on the level of /LAT; it only reads the data from the shift registers when its level is LOW, and it holds the data of the shift register when the level is HIGH.

The latched data enables the respective output when /STB is LOW and STB is HIGH. The driver output transistor turns on when its corresponding latch register data is HIGH, and off when LOW. Turning /STB HIGH or STB LOW will also turn all driver output transistors off.



Pin Information

PAD Name	I/O	Description
DI	I	Serial data input for 64-bit shift register
DOUT	O	Serial data output for 64-bit shift register
CLK	I	Clock input
/LAT	I	Data latch signal control : a. When LAT_B="H" : holds the preceding data When LAT_B="L" : reads the data of the shift register b. LAT_B : pull-up resistor is built-in.
LAT_OUT	O	Latch output
/STB	I	Data enable signal control : a. When STB ="H" &STB_B="L" : outputs the latch data to driver Other case : disable the output b. STB_B : pull-up resistor is built-in. STB: pull-down resistor is built-in.
STB	I	
STB_OUT	O	STB output
Vdd		Positive power supply for logic function (2.7V~5.25V)
GND		Ground for logic function and driver
DO1-DO64	O	Driver outputs (open-drained NMOS)

ABSOLUTE MAXIMUM RATINGS

DO1,DO2…DO64 to GND Voltage	-0.3V ~ 45V
/STB, STB, /LA,, DI, CLK, Vdd, STB_OUT, LA_OUT, DOUT, to GND Voltage	-0.3V ~ 6V
Operation frequency	16 MHz
Operating temperature range, T_A	-40°C~85°C
Storage temperature range, T_{STG}	-55°~+150°C

Note:
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

Test condition is T_A = 25°C, V_{DD} = 3.3V, unless otherwise specified.

Item	Symbol	Min.	Typ.	Max.	Unit
Voltage at open Drain	VH			40	V
Logic voltage	Vdd	2.7	3.3	5.5	V
Max open Drain sturated Resistance	Ron		7		Ohms
Logic current (FDI=fCLK/2, FCLK= 6MHZ)	Idd			50	mA
Input voltage (High)	VIH	0.8*Vdd		Vdd	V
Input voltage (Low)	VIL	0		0.2*Vdd	V
Data input current (DI) High	I_{IH} DI			0.1	uA
STB (High)	I_{IH} STB			40	uA
/STB (Low)	I_{IL} /STB			40	uA
Clock input current (High)	I_{IH} CLK			0.1	uA
Latch input current (Low)	I_{IL} /LAT			40	uA
Clock frequency	F_{CLK}			16	MHz
Clock width	T_W CLK	30			ns
Data setup time	T_{setup} DI	15			ns
Data hold time	T_{hold} DI	15			ns
Latch width	T_W LAT	40			ns
Latch Setup time	T_{setup} LAT	60			ns
Latch Hold time	T_{hold} LAT	30			ns
STB setup time	T_{setup} STB	300			ns
Driver out delay time	Tdo			24	us
Under-voltage lockout (DOx disabled)	UVLO	1.5	2	2.5	V

Pad Coordinates

(The origin of the coordinates axes is the center of the chip) unit: (um)

PAD NO.	Name	x	y	PAD NO.	Name	x	y	PAD NO.	Name	x	y
1	LA_OUT	-2646.20	55.00	32	DO_24	-674.76	41.8	63	DO_55	1619.24	41.8
2	LA_B	-2562.70	-131.00	33	DO_25	-600.76	41.8	64	DO_56	1693.24	41.8
3	STB_B	2489.10	-131.00	34	DO_26	-526.76	41.8	65	DO_57	1767.24	41.8
4	DO_1_TEXT	-2646.28	138	35	DO_27	-452.76	41.8	66	DO_58	1841.24	41.8
5	STB	2563.10	-131.00	36	DO_28	-378.76	41.8	67	DO_59	1915.24	41.8
6	VDD	-2487.70	-131.00	37	DO_29	-304.76	41.8	68	DO_60	1989.24	41.8
7	DI	-2636.70	-131.00	38	DO_30	-230.76	41.8	69	DO_61	2063.24	41.8
8	FCLK	2415.10	-131.00	39	DO_31	-156.76	41.8	70	DO_62	2137.24	41.8
9	DO_1	-2376.76	41.8	40	DO_32	-82.76	41.8	71	DO_63	2211.24	41.8
10	DO_2	-2302.76	41.8	41	DO_33	-8.76	41.8	72	DO_64	2285.24	41.8
11	DO_3	-2228.76	41.8	42	DO_34	65.24	41.8	73	DO_64_TEXT	2520.39	138
12	DO_4	-2154.76	41.8	43	DO_35	139.24	41.8	74	STBOUT	2646.60	11.01
13	DO_5	-2080.76	41.8	44	DO_36	213.24	41.8	75	DOUT64	2637.10	-131.00
14	DO_6	-2006.76	41.8	45	DO_37	287.24	41.8	76	GND	-2098.34	-166.65
15	DO_7	-1932.76	41.8	46	DO_38	361.24	41.8	77	GND	-1506.34	-166.65
16	DO_8	-1858.76	41.8	47	DO_39	435.24	41.8	78	GND	-914.34	-166.65
17	DO_9	-1784.76	41.8	48	DO_40	509.24	41.8	79	GND	-322.34	-166.65
18	DO_10	-1710.76	41.8	49	DO_41	583.24	41.8	80	GND	269.66	-166.65
19	DO_11	-1636.76	41.8	50	DO_42	657.24	41.8	81	GND	861.66	-166.65
20	DO_12	-1562.76	41.8	51	Dout_43	731.24	41.8	82	GND	1453.66	-166.65
21	DO_13	-1488.76	41.8	52	DO_44	805.24	41.8	83	GND	2045.66	-166.65
22	DO_14	-1414.76	41.8	53	DO_45	879.24	41.8				
23	DO_15	-1340.76	41.8	54	DO_46	953.24	41.8				
24	DO_16	-1266.76	41.8	55	DO_47	1027.24	41.8				
25	DO_17	-1192.76	41.8	56	DO_48	1101.24	41.8				
26	DO_18	-1118.76	41.8	57	DO_49	1175.24	41.8				
27	DO_19	-1044.76	41.8	58	DO_50	1249.24	41.8				
28	DO_20	-970.76	41.8	59	DO_51	1323.24	41.8				
29	DO_21	-896.76	41.8	60	DO_52	1397.24	41.8				
30	DO_22	-822.76	41.8	61	DO_53	1471.24	41.8				
31	DO_23	-748.76	41.8	62	DO_54	1545.24	41.8				

Dimension and Package Information

Packaging: PAD locations of 64 bits chip driver as shown. The die size is 5400um*405um, PAD size is 65um*65um，and the pad pitch is 74um, die thickness 300um.