

TOSHIBA Bi-CMOS Constant Current Interface Driver



TB62708N

16 Bit Constant Current LED Source Driver with Shift Register and Latch Functions

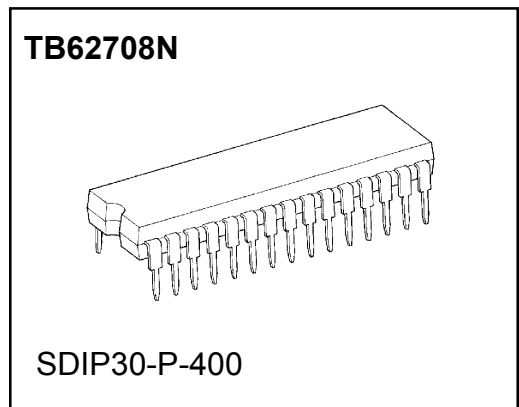
Product Description:

The TB62708N is specifically designed for LED display applications. The Bi-CMOS device has 16 Bi-polar constant current output source channels and includes CMOS shift register and latch functions.

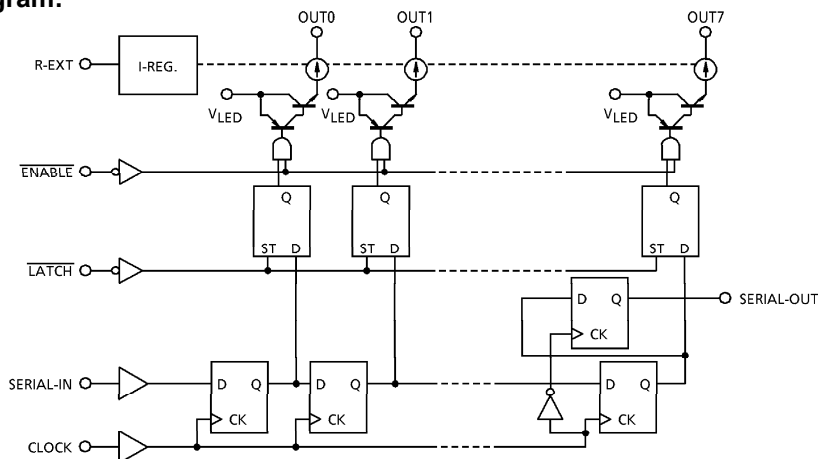
The LED drive current is programmed by the installation of a single resistor per device. Current is programmable from 5-90mA and is held constant across all 16 source outputs effectively compensating for the inherent circuit and component variables which affect the brightness of the LEDs.

Features:

- Current Source Device
- 16 Constant Current Output Channels
- Current Programmable from 5-90mA
- 5V CMOS Compatible Inputs
- 15MHz Max Clock Frequency (Cascade)



Block Diagram:



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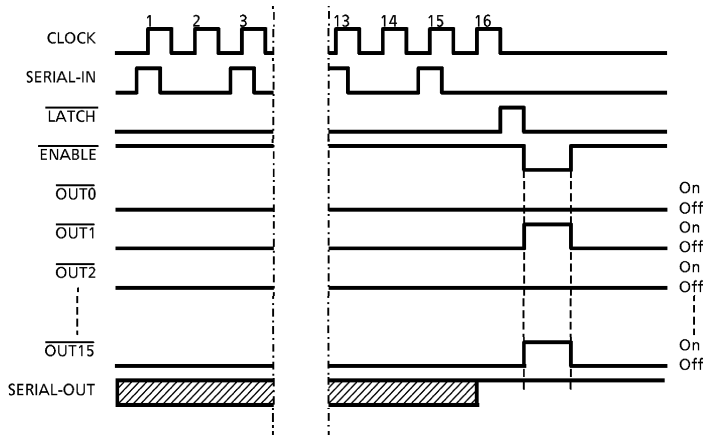
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Timing Diagram:



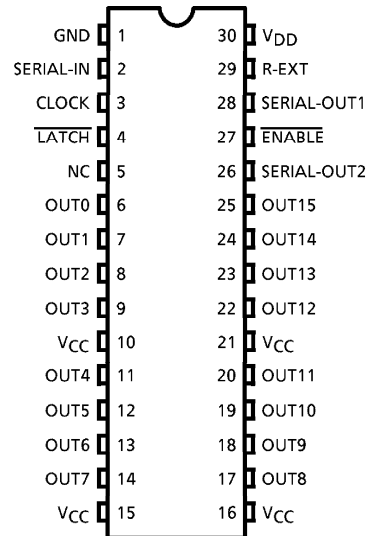
Latches are:

1. Level Sensitive
2. Not edge sensitive
3. Not clock synchronous
4. Passing Data when $\overline{\text{LATCH}}$ is H
5. Hold Data when $\overline{\text{LATCH}}$ is L

All Outputs are OFF when $\overline{\text{ENABLE}}$ is H and ON when $\overline{\text{ENABLE}}$ is L.

Terminal Description & Pin Out:

| PIN No. | PIN NAME | FUNCTION |
|---------------------------|------------|---------------------------------------|
| 1 | GND | GND terminal |
| 2 | SERIAL-IN | Serial Data Input terminal |
| 3 | CLOCK | Clock Input terminal |
| 4 | LATCH | Latch Input Terminal |
| 6-9,11-14, 17-20,22-25 | OUT0-15 | Output terminals |
| 27 | ENABLE | Output Enable Input Terminal |
| 28 | SERIAL-OUT | Serial Data Out Terminal |
| 29 | R-EXT | Constant Current Programming |
| 30 | VDD | 5V Supply voltage terminal |
| 10,15,16,21 | VLED | 0-17V Supply voltage terminal for LED |



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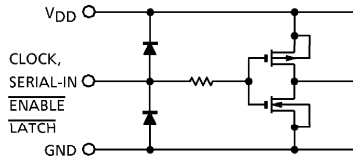
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Truth Table:

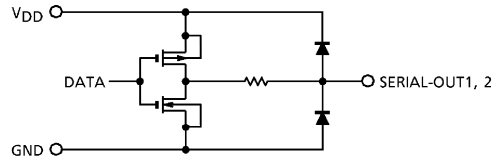
| CLOCK | LATCH | ENABLE | SERIAL-IN | OUT0 | OUT7 | OUT15 | SERIAL-OUT2 |
|---------|-------|--------|-----------|-----------------------|------|-------|-------------|
| UP | H | L | Dn | Dn | Dn-7 | Dn-15 | Dn-16 |
| DOWN | H | L | Dn | Dn | Dn-7 | Dn-15 | Dn-15 |
| UP | L | L | Dn+1 | No Change (data hold) | | | No Change |
| DOWN | L | L | Dn+1 | No Change (data hold) | | | Dn-14 |
| No Edge | H | L | Dn+1 | Dn+1 | Dn-6 | Dn-14 | No Change |
| No Edge | X | H | Dn+1 | Off | | | No Change |

Equivalent Circuit of Inputs and Outputs:

1. ENABLE, LATCH, CLOCK & SERIAL-IN terminal



2. SERIAL-OUT terminal



Maximum Ratings:

| CHARACTER | SYMBOL | RATING | UNIT |
|------------------------|--------|--|------|
| Supply Voltage | VDD | +7.0 | V |
| Supply Voltage for LED | VCC | +17.0 | V |
| Output Voltage | VCE | -0.4~+17.0 | V |
| Output Current | IOUT | -90 | mA |
| Input Voltage | VIN | -0.4~VDD + 0.4 | V |
| GND Terminal Current | IGND | 1440 | mA |
| Clock Frequency | FCLK | 15 | MHz |
| Power Dissipation | PD | 2.08 (ON PCB, Ta=25°C) 1.56 (FREE AIR, Ta=25°C) | W |
| Operating Temperature | Topr | -40~+85 | °C |
| Storage Temperature | Tstg | -55~+150 | °C |

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Constant Current Interface Driver

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Recommended Operating Condition:

| CHARACTERISTIC | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------|-----------|-------------------|--------|------|---------|------|
| Supply Voltage | VDD | | 4.5 | 5.0 | 5.5 | V |
| Supply Voltage for LED | VCC | | — | — | 17 | V |
| Output Voltage | VOUT | | — | — | -17 | V |
| Output Current | IOUT | DC 1 Circuit | -5 | — | -78 | mA |
| | IOH | SERIAL-OUT | — | — | 1.0 | mA |
| | IOL | SERIAL-OUT | — | — | -1.0 | mA |
| Input Voltage | VIH | | 0.7VDD | — | VDD+0.3 | V |
| | VIL | | -0.3 | — | 0.3VDD | V |
| LATCH Pulse Width | tw LAT | VDD=4.5 ~ 5.5V | 100 | — | — | ns |
| CLOCK Pulse Width | tw CLK | | 50 | — | — | ns |
| ENABLE Pulse Width | tw EN | | 1000 | — | — | ns |
| Set-up Time | tsetup(D) | | 50 | — | — | ns |
| Hold Time | thold(D) | | 30 | — | — | ns |
| Clock Frequency | FCLK | Cascade Operation | — | — | 10.0 | MHz |
| Power Dissipation | PD | ON PCB, Ta=85°C | — | — | 1.08 | W |

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Electrical Characteristics:

| CHARACTERISTIC | | SYMBOL | TEST CIR-CUIT | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|--------------|---------------------|---------------|--|--------------------|------|--------------------|-------|
| Input Voltage | "H" level | V _{IH} | — | — | 0.7V _{DD} | — | V _{DD} | V |
| | "L" level | V _{IL} | — | — | GND | — | 0.3V _{DD} | |
| Output Leakage Current | | I _{LEAK} | — | V _{LED} =17.0V | — | — | -10 | μA |
| Output Voltage | SERIAL-OUT | V _{OL} | — | I _{OL} =+1.0mA | — | — | 0.4 | V |
| | | V _{OH} | — | I _{OH} =-1.0mA | 4.6 | — | — | V |
| Output Current 1 | | I _{OL1} | — | V _{OUT} =V _{CC} -2 REXT=360Ω | -66.3 | -78 | -89.7 | mA |
| | Current Skew | ΔI _{OL1} | — | V _{OUT} =V _{CC} -2 REXT=360Ω | — | ±1.5 | ±6.0 | % |
| Supply Voltage Regulation | | % / V _{DD} | — | REXT=360Ω Ta=-40~+85°C | — | 1.5 | 5.0 | % / V |
| Supply Current | IDD (off) 1 | — | — | REXT=OPEN OUT0~15=off | — | 0.6 | 1.2 | mA |
| | IDD (on) | — | — | REXT=360Ω, DATA="H" OUT0~15=on | — | 10.0 | 15.0 | |
| | ICC(off) | — | — | REXT=360Ω, ALL DATA="L" OUT0~15=off | — | 1 | 2 | |
| | ICC(on) | — | — | REXT=360Ω, ALL DATA="H" OUT0~15=on | — | 1260 | — | |

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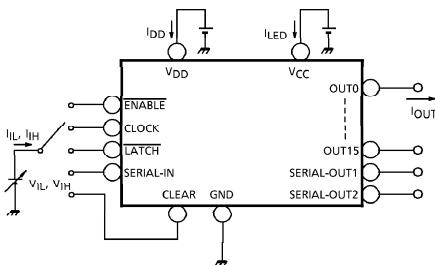
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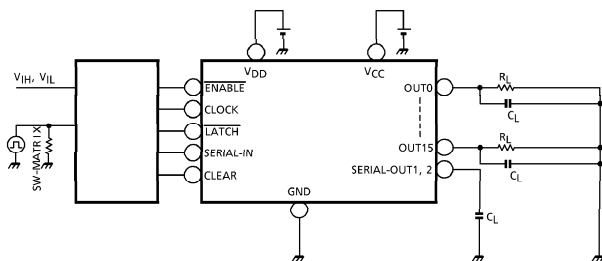
Switching Characteristics:

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | | | | |
|-------------------------------------|-------------|------------|---|---|---|---|---|-----|-----|-----|----|
| Propagation Delay Time ("L" to "H") | CLK-SOUT | tpLH | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | — | 30 | 70 | ns | | | | |
| | CLK-OUTn | | | — | 200 | 500 | | | | | |
| | LATCH-OUTn | | | — | 200 | 500 | | | | | |
| | ENABLE-OUTn | | | — | 200 | 500 | | | | | |
| Propagation Delay Time ("H" to "L") | CLK-OUTn | tpHL | | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | — | 200 | 500 | ns | | | |
| | LATCH-OUTn | | | | — | 200 | 500 | | | | |
| | ENABLE-OUTn | | | | — | 200 | 500 | | | | |
| | CLK-SOUT | | | | — | 30 | 70 | | | | |
| Pulse Width | CLK | tw CLK,CLK | | | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | — | 20 | 30 | ns | | |
| | LATCH | tw LAT,LAT | | | | — | 10 | 25 | | | |
| Latch Set Up Time | | tsetup LAT | | | | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | — | 25 | 50 | ns | |
| Latch Hold Time | | thold LAT | | | | | — | 0 | 15 | ns | |
| Maximum Clock Rise Time | | tr | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | | | | — | — | 10 | μs | |
| Maximum Clock Fall Time | | tf | | | | | — | — | 10 | | |
| Maximum Output Rise Time | | tor | | | | | {CLK,LATCH & ENABLE to tpLH & tpHL : 50% to 50%} VDD = 5.0V,VCC=17.0V VOUT=VCC-2.0V VIH = VDD VIL = GND REXT = 360Ω RL = 300Ω | 150 | 300 | 600 | ns |
| Maximum Output Fall Time | | tof | | | | | | 150 | 300 | 600 | ns |

DC Characteristic Test Circuit:



AC Characteristic Test Circuit:



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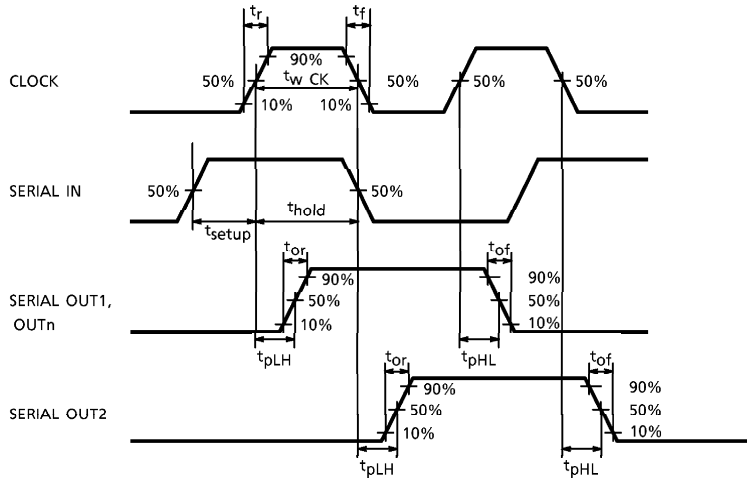
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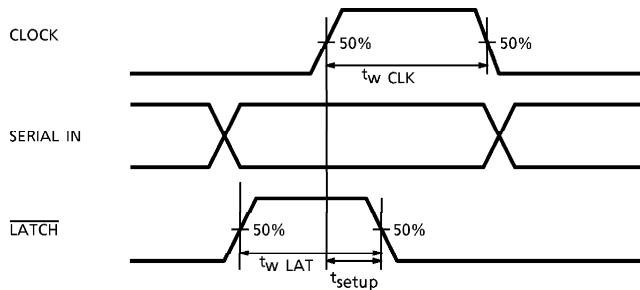
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Timing Wave Form:

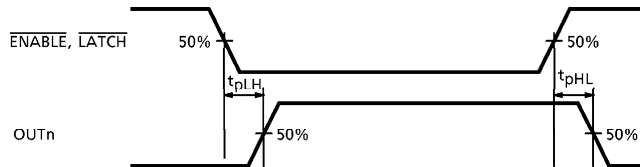
1. CLOCK-SERIAL OUT, OUT_n



2. CLOCK-LATCH



3. ENABLE, LATCH-OUT_n



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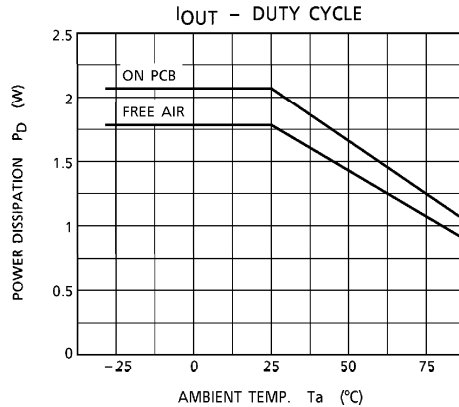
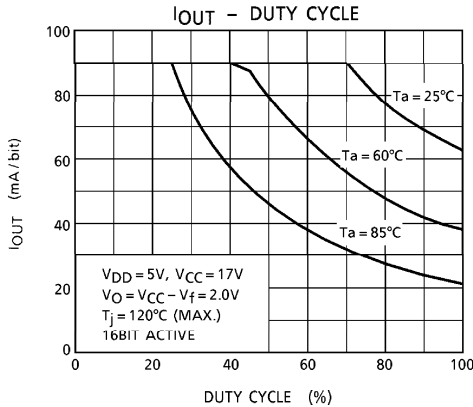
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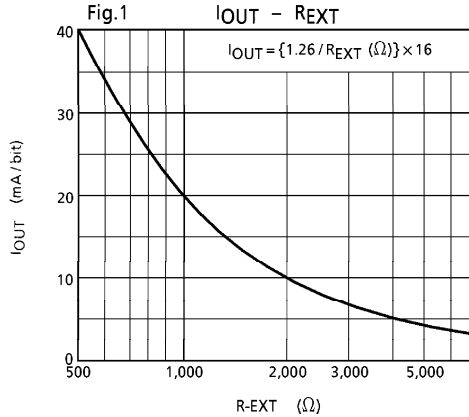
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Graphs:



Current Programming Resistor Selection::



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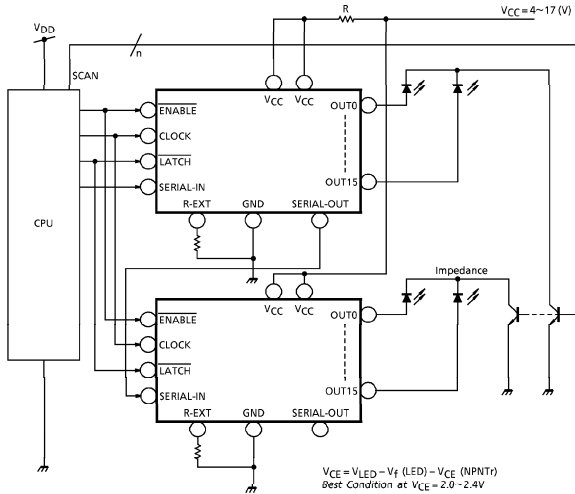
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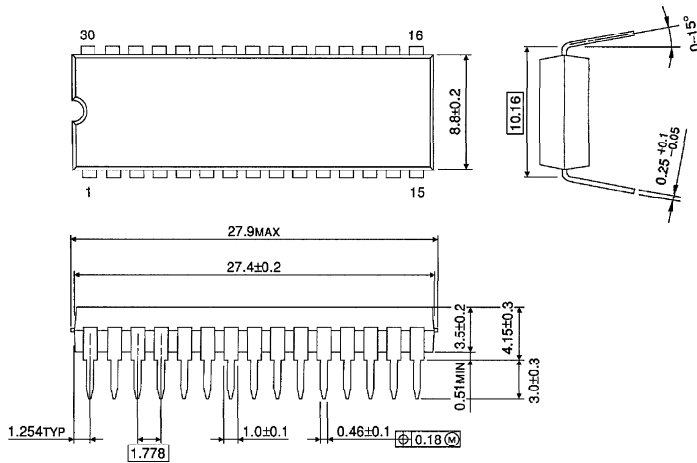
Application Circuit:



Outline Drawing:

SDIP30-P-400-1.78

Unit : mm



Weight : 1.99g (Typ.)

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