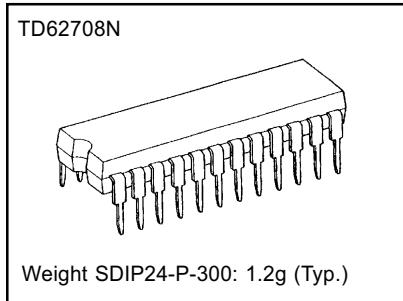

TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

8CH High Current Source Driver

Product Description:

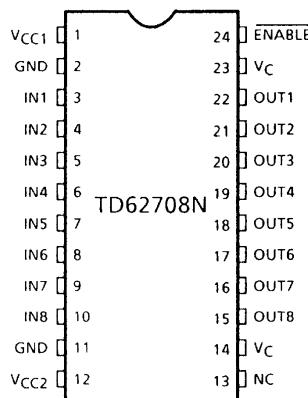
This product is comprised of eight source current output stages and ENABLE inputs which can gate the outputs. It features a large output source current of 1.8A and minimized output voltage change vs. output current change. These features make the device optimum for driving the matrix of ink jet printer heads, LEDs, and the scan side of resistor matrixes. Before using this device, note the thermal conditions for usage.



Features:

- Input terminal: High Active
- ENABLE terminal: Low input output active mode
- Output current: $I_{OUT} = 1.8A$ (MAX)
- A little change of output voltage:
 $\Delta V_{OH1} \leq 0.45V$
(at $I_{OH} = 0.18A \sim 1.44A$)
- Package type: DIP24N
- Input compatible with TTL, 5V CMOS

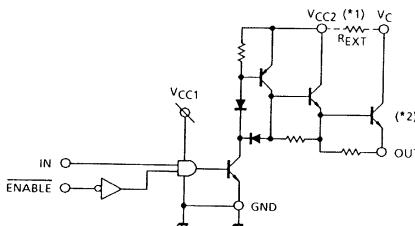
PIN CONNECTION:



TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

SCHEMATICS (EACH DRIVER)



FUNCTION

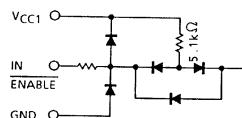
IN	ENABLE	OUT
H	L	ON
L	L	OFF
Don't Care	H	OFF

(*)1 For normal use, connect V_{CC2} and V_C .

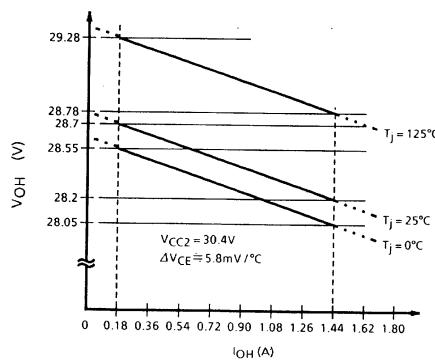
For applications whose thermal conditions are more demanding, TOSHIBA recommends an external resistor (R_{EXT} : approx. $0.9\Omega / 2W$) be connected between V_{CC2} and V_C .

(*)2 When connecting an external resistor between BV_{CC2} and V_C , to avoid parasitic sub currents, set the voltage between V_C and OUT as 0.3V or more. Set the external resistor value so that the voltage between V_C and OUT is 0.3V or more at the maximum temperature of the operating temperature range.

INPUT CIRCUIT : IN, \overline{ENABLE}



(Note) Since the states of the input pins (pins 3 to 10) are the same as those at high-level input, set the pins for unused channels to GND.



- Output voltage (Temperature characteristic)
Output Voltage (V_{OH}) has a Temperature Characteristic of $5.8mV/^\circ C$, care must be taken to keep Junction Temp (T_j) within safety Limits.

TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage 1	V_{CC1}	-0.5~7.0	V
Supply Voltage 2	V_{CC2}	-0.5~40	
Output Current	I_{OUT}	1.8 (Note)	A
Input Voltage	V_{IN}	-0.5~7.0	V
Input Current	I_{IN}	± 4.0	mA
Power Dissipation	P_D	1.47	W
Junction Temperature	T_j	150	$^\circ\text{C}$
Operating Temperature	T_{opr}	-40~85	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55~150	$^\circ\text{C}$

(Note 1) 1.8A / ch ($32\mu\text{s}$, Duty $\leq 76\%$), Each Channel should not be switched on at same time.

(Note 2) When mounting the device on the PC board, and the temperature exceeds 25°C , derate to $14.2\text{mW}/^\circ\text{C}$.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage 1	V_{CC1}	—	4.5	5.0	5.5	V
Supply Voltage 2	V_{CC2}	—	—	—	30	
Output Current	I_{OH} (Note)	—	—	—	1.44	A
Input Voltage	V_{IN} (H)	$V_{IN} = H, V_{CC1} = 5.0\text{V}$	2.4	—	V_{CC}	V
	V_{IN} (L)	$V_{IN} = L, V_{CC1} = 5.0\text{V}$	0	—	0.4	V
	V_{EN} (H)	$V_{EN} = H, V_{CC1} = 5.0\text{V}$	2.4	—	V_{CC}	V
	V_{EN} (L)	$V_{EN} = L, V_{CC1} = 5.0\text{V}$	0	—	0.4	V
Operating Temperature	T_{opr}	—	0	—	70	$^\circ\text{C}$

(Note) Each Channel should not be switched on at same time.



5 Hemlock Street • Latham, New York 12110
Toll Free: (888) 4LED-ICS • Fax: (518) 786-6599

All specifications subject to change.

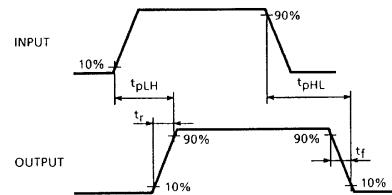
TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

ELECTRICAL CHARACTERISTICS ($T_a = 0 \sim 70^\circ C$)

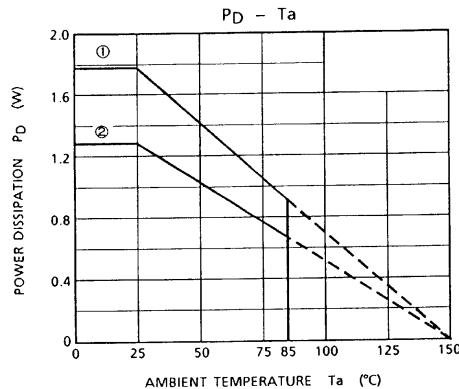
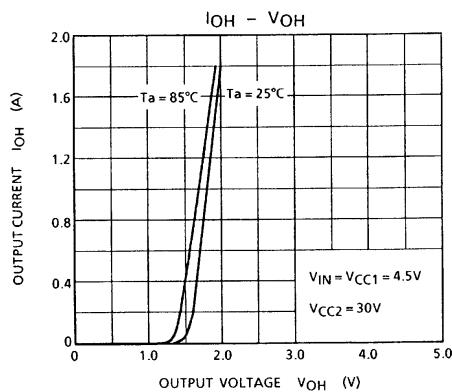
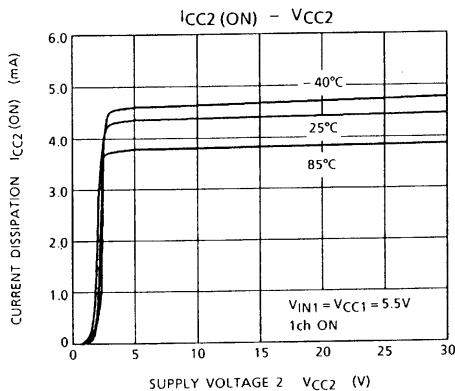
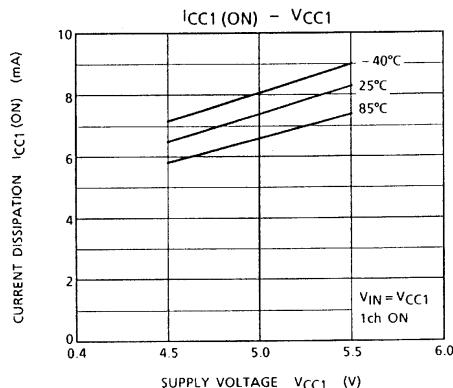
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Leakage Current	I_{L1}	—	$V_{CC1} = 7.0V, IN = L, EN = H$	—	—	100	μA
	I_{L2}		$V_{CC2} = 30V, IN = L, EN = H$	—	—	100	
	I_{L3}		$V_C = 30V, IN = L, EN = H$	—	—	100	
Input Current	I_{IN1}	—	$V_{CC1} = 5.0V, V_{IN} = 5.0V$	—	0	10	μA
	I_{IN2}		$V_{CC1} = 5.0V, V_{IN} = 0V$	0.55	0.8	1.1	mA
	I_{EN1}		$V_{CC1} = 5.0V, V_{EN} = 5.0V$	—	0	10	μA
	I_{EN2}		$V_{CC1} = 5.0V, V_{EN} = 0V$	0.55	0.8	1.1	mA
Input Voltage	V_{INH}	—	$V_{CC1} = 5.0V$	2.0	—	$V_{CC} + 0.4$	V
	V_{INL}		$V_{CC1} = 5.0V$	GND	—	0.8	
	V_{ENH}		$V_{CC1} = 5.0V$	2.0	—	$V_{CC} + 0.4$	
	V_{ENL}		$V_{CC1} = 5.0V$	GND	—	0.8	
Output Voltage	V_{OH1}	—	$I_{OH} = 1.44A$	27.0	27.5	—	V
	V_{OH2}		$I_{OH} = 0.18A$	27.5	28.0	—	
Change Of Output Voltage	ΔV_{OH1}	—	$V_{OH1} - V_{OH2} (T_j = 25^\circ C)$	—	0.3	0.45	V
Output Voltage Temperature Characteristic	ΔV_{CE2}	—	$V_{OH} (T_j = 105^\circ C) - V_{OH} (T_j = 25^\circ C)$ $I_{OH} = 0.18A$	—	0.5	—	V
Propagation Delay Time	t_{PLH1}	—	$V_{CC1} = V_{IN} = 4.5V$ $V_{CC2} = 30V$	$I_{OUT} = 0.18A$	—	0.1	1.0
	t_{PLH2}			$I_{OUT} = 1.44A$	—	0.2	1.0
	t_{PHL1}			$I_{OUT} = 0.18A$	—	1.0	3.5
	t_{PHL2}			$I_{OUT} = 1.44A$	—	1.5	3.5
Time Rise	t_r1	—	$V_{CC1} = V_{IN} = 4.5V$ $V_{CC2} = 30V$	$I_{OUT} = 0.18A$	—	0.05	0.5
	t_r2			$I_{OUT} = 1.44A$	—	0.1	0.5
Time Fall	t_f1	—	$V_{CC1} = V_{IN} = 4.5V$ $V_{CC2} = 30V$	$I_{OUT} = 0.18A$	—	0.3	2.0
	t_f2			$I_{OUT} = 1.44A$	—	0.3	2.0

AC TEST CIRCUIT



TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N



5 Hemlock Street • Latham, New York 12110
Toll Free: (888) 4LED-ICS • Fax: (518) 786-6599

All specifications subject to change.

TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

- Thermal calculation

Where, power dissipation = $(V_{CC1} \times I_{CC1}) + (V_{CC2} \times I_{CC2} \times ch \times Duty) + (V_{OH} \times I_{OH} \times ch \times Duty)$
and the transient thermal resistance of DIP24N ($R + h$) = $70^{\circ}\text{C} / \text{W}$, the junction temperature (T_j) is :

$$T_j(\text{MAX}) \geq (P_D \times R + h) + T_a(\text{MAX}) \dots \dots \text{expression (A)}$$

Conditions : $V_{CC1} = 5\text{V}$ (I_{CC1} = approx. 8mA), $V_{CC2} = 30\text{V}$ (I_{CC2} = approx. 5mA), 1ch on
 $V_{OH} = \text{approx. } 2.0\text{V}$, $I_{OH} = 1.44\text{A}$,
 $T_j(\text{MAX}) = 120^{\circ}\text{C}$, ambient temperature (MAX) : $T_a = 70^{\circ}\text{C}$

- (1) When V_{CC2} and V_C are connected :

Due to expression (a), for designs without cooling fins, duty = approx. 20% is required, as the following calculation shows :

$$\begin{aligned} P_D &= (5\text{V} \times 8\text{mA}) + (30\text{V} \times 5\text{mA} \times 1\text{ch} \times 0.2) + (2.0\text{V} \times 1.44\text{A} \times 1\text{ch} \times 0.2) \\ &= 40\text{mW} + 30\text{mW} + 576\text{mW} \\ &= 646\text{mW} \end{aligned}$$

$$T_j(\text{MAX}) \geq (646\text{mW} \times 70^{\circ}\text{C} / \text{W}) + 70^{\circ}\text{C} = \text{approx. } 115^{\circ}\text{C} \dots \dots \text{OK}$$

- (2) When an external resistor ($R_{EXT} = 0.9\Omega$) is connected between V_{CC2} and V_C :

Change the above condition :

$$\begin{aligned} V_{OH} &= 2.0\text{V} - (0.9\Omega \times 1.44\text{A}) \\ &= 0.7\text{V} \end{aligned}$$

P_D when substituted in expression (a) :

$$\begin{aligned} P_D &= (5\text{V} \times 8\text{mA}) + (30\text{V} \times 5\text{mA} \times 1 \times 0.2) + (0.7\text{V} \times 1.44\text{A} \times 1 \times 0.2) \\ &= 40\text{mW} + 30\text{mW} + 202\text{mW} \\ &= 272\text{mW} \end{aligned}$$

$$T_j(\text{MAX}) \geq (272\text{mW} \times 70^{\circ}\text{C} / \text{W}) + 70^{\circ}\text{C} = \text{approx. } 89^{\circ}\text{C}$$

when $T_j(\text{MAX}) = 120^{\circ}\text{C}$
: (calculation omitted)

Duty can be approx. 58%.

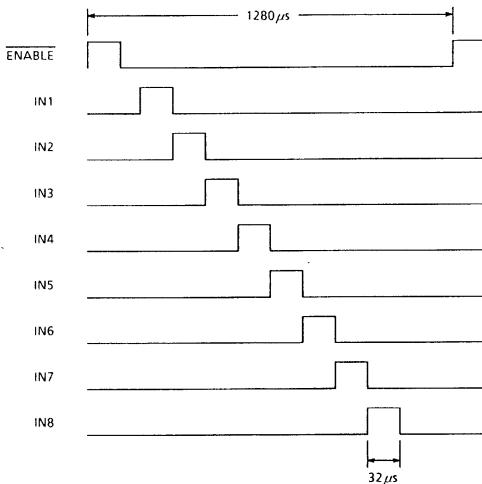
TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

TD62708N

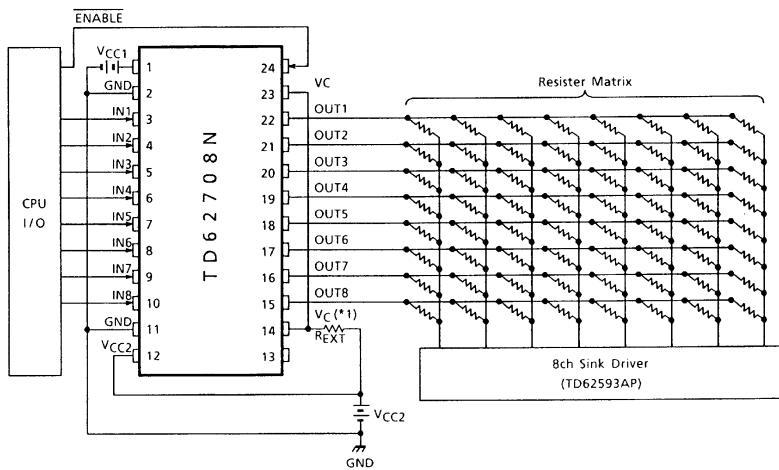
- Duty (when duty = 20%)

Condition : pulse width = $32\mu s$ (cycle = $1280\mu s$)

$$\text{Duty} = (32\mu s \times 8\text{ch}) \div 1280\mu s = 20\%$$



APPLICATION CIRCUIT



(Note 1) TOSHIBA recommends external resistor R_{EXT} (approx. $0.9\Omega / 2W$) be connected between V_{CC2} and V_C.