
TOSHIBA Silicon Monolithic Bi-Polar Digital Integrated Circuit

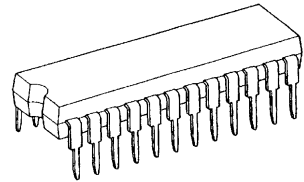
TD62708N

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.

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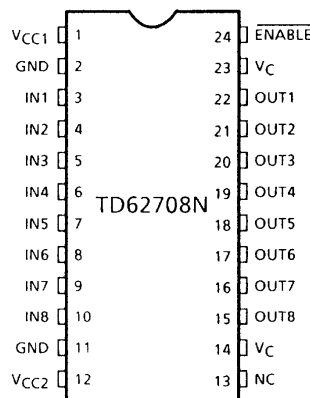


Weight SDIP24-P-300: 1.2g (Typ.)

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

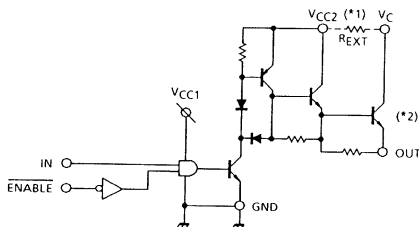
PIN CONNECTION:



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SCHEMATICS (EACH DRIVER)

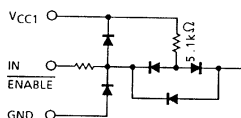


FUNCTION

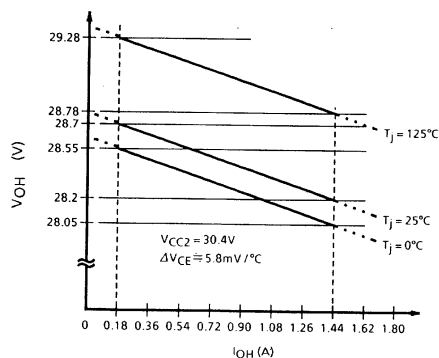
IN	ENABLE	OUT
H	L	ON
L	L	OFF
Don't Care	H	OFF

- (*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 V_{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.

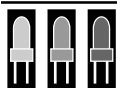
INPUT CIRCUIT : IN, $\overline{ENABLE}$



(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.



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MAXIMUM RATINGS (Ta = 25°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
Janction Temperature	T _j	150	°C
Operating Temperature	T _{opr}	-40~85	°C
Storage Temperature	T _{stg}	-55~150	°C

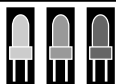
(Note 1) 1.8A / ch (32μs, Duty ≤ 76%), Each Channel should not be switched on at same time.

(Note 2) When mounting the device on the PC board, and the temperature exceeds 25°C, derate to 14.2mW/°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} = 5.0V	2.4	—	V _{CC}	V
	V _{IN} (L)	V _{IN} = L, V _{CC1} = 5.0V	0	—	0.4	V
	V _{EN} (H)	V _{EN} = H, V _{CC1} = 5.0V	2.4	—	V _{CC}	V
	V _{EN} (L)	V _{EN} = L, V _{CC1} = 5.0V	0	—	0.4	V
Operating Temperature	T _{opr}	—	0	—	70	°C

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



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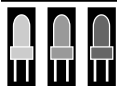
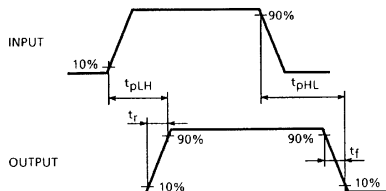
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ELECTRICAL CHARACTERISTICS (Ta = 0~70°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	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	
	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	
Input Voltage	V_{INH}	—	$V_{CC1} = 5.0V$	2.0	—	$V_{CC} + 0.4$	V
	V_{INL}		$V_{CC1} = 5.0V$	GND - 0.4	—	0.8	
	V_{ENH}		$V_{CC1} = 5.0V$	2.0	—	$V_{CC} + 0.4$	
	V_{ENL}		$V_{CC1} = 5.0V$	GND - 0.4	—	0.8	
Output Voltage	V_{OH1}	—	$I_{OH} = 1.44A$	$V_{CC2} = 30V$	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	μs
	t_{pLH2}			$I_{OUT} = 1.44A$	—	0.2	
	t_{pHL1}			$I_{OUT} = 0.18A$	—	1.0	
	t_{pHL2}			$I_{OUT} = 1.44A$	—	1.5	
Time Rise	t_{r1}	—	$V_{CC1} = V_{IN} = 4.5V$ $V_{CC2} = 30V$	$I_{OUT} = 0.18A$	—	0.05	
	t_{r2}			$I_{OUT} = 1.44A$	—	0.1	
Time Fall	t_{f1}			$I_{OUT} = 0.18A$	—	0.3	
	t_{f2}			$I_{OUT} = 1.44A$	—	0.3	

AC TEST CIRCUIT



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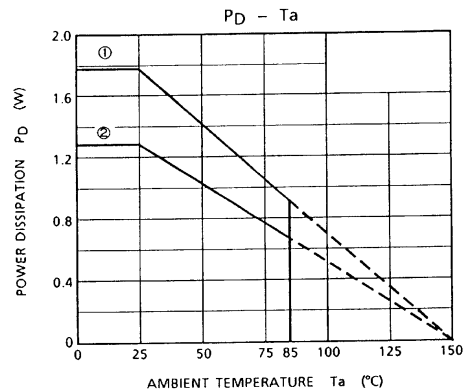
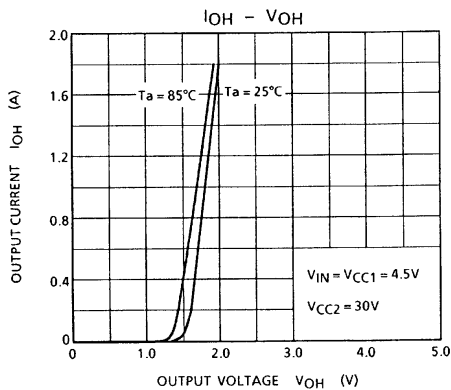
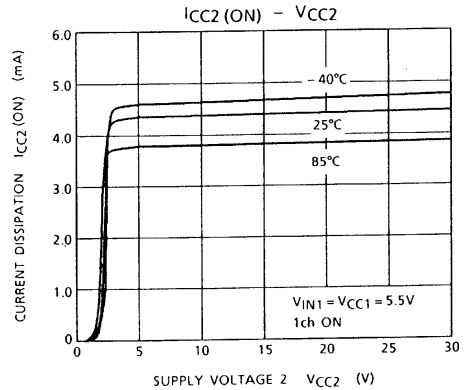
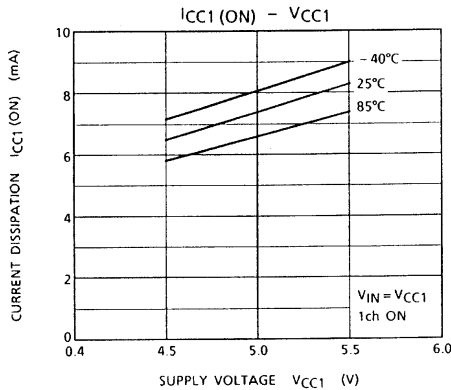
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- Thermal calculation

Where, power dissipation = $(V_{CC1} \times I_{CC1}) + (V_{CC2} \times I_{CC2} \times \text{ch} \times \text{Duty}) + (V_{OH} \times I_{OH} \times \text{ch} \times \text{Duty})$
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 : $V_{CC1} = 5\text{V}$ ($I_{CC1} = \text{approx. } 8\text{mA}$), $V_{CC2} = 30\text{V}$ ($I_{CC2} = \text{approx. } 5\text{mA}$), 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%.



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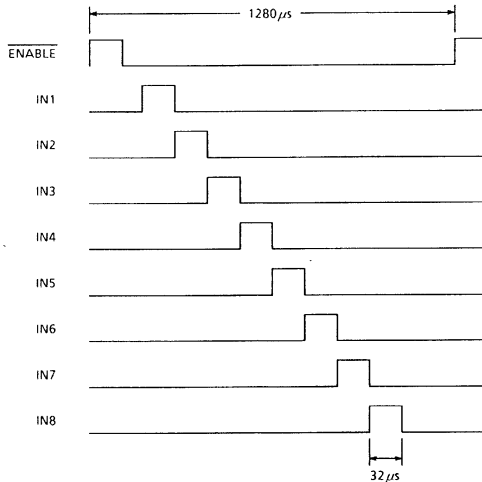
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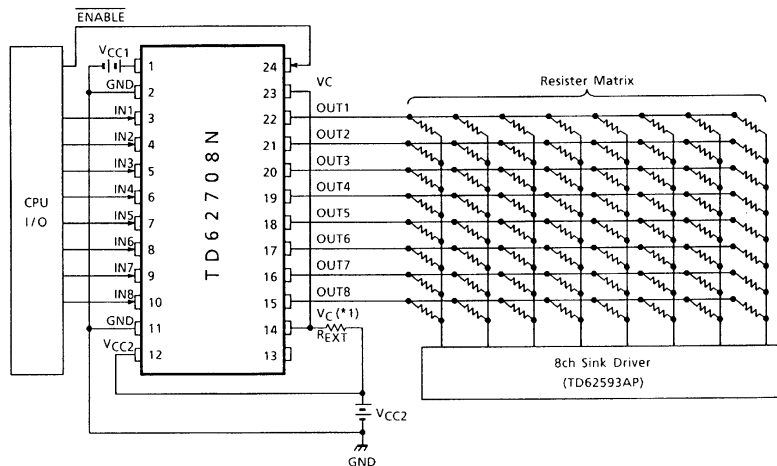
- Duty (when duty = 20%)

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

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



APPLICATION CIRCUIT



(Note 1) TOSHIBA recommends external resistor R_{EXT} (approx. $0.9\Omega / 2W$) be connected between VCC2 and VC.