



## UA8888S

## LINEAR INTEGRATED CIRCUIT

### 5-CHANNEL BTL DRIVER FOR DVD PLAYER

#### DESCRIPTION

The UTC **UA8888S** is a 5-channel BTL driver IC for DVD player. It is developed to driving the motors and actuators and consists of two independent precision voltage regulators with adjustable range from 1.5V~4V.

#### FEATURES

- \* Voltage-type BTL drivers:
  - two channels : actuators of tracking and focus
  - two channels : sled and spindle motors.
  - one channel : bi-direction DC motor driver for tray.
- \* Wide dynamic range:
  - 9.0V (typ.) when  $V_{CC1} = V_{CC2} = 12V$ , at  $R_L = 20\Omega$  load.
  - 4.0V (typ.) when  $V_{CC1} = 12V, V_{CC2} = 5V$ , at  $R_L = 15\Omega$  load
- \* Separating power of  $V_{CC1}$  and  $V_{CC2}$  is to improve power efficiency by a low supply voltage for tracking, focus, and spindle.
- \* Built-in level shift circuit and mute mode.
- \* Thermal shutdown protection.
- \* Differential inputs for signal addition are provided by input OPs. The output structure for dual actuator driver is two power OP Amps in bridge configuration, and one OP Amp for Sled Motor Driver.
- \* Spindle driver is a single input linear BTL driver. The output structure is two power OP Amps in bridge configuration.
- \* Tray in-out driver functions as a DC motor driver supports forward/reverse control for tray motor.
- \* Built-in regulator controllers: Adjustable range 1.5V ~ 4V



HSOP-28

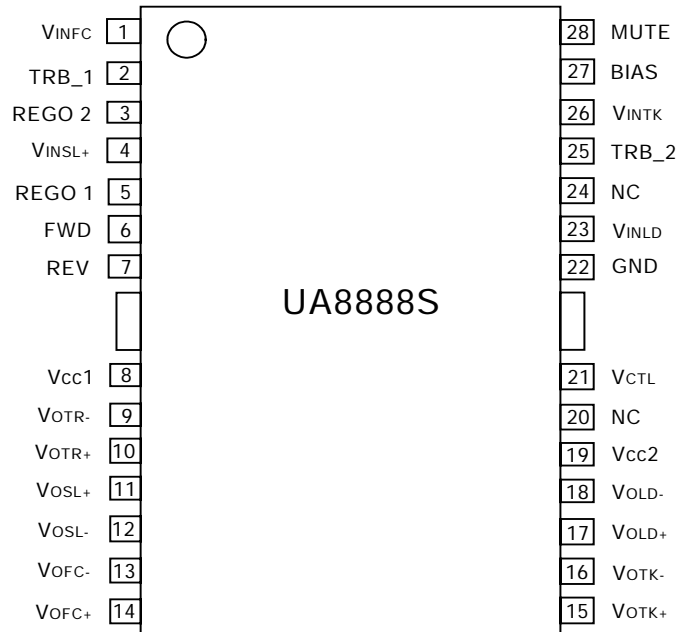
\*Pb-free plating product number: UA8888SL

#### ORDERING INFORMATION

| Ordering Number |                   | Package | Packing   |
|-----------------|-------------------|---------|-----------|
| Normal          | Lead Free Plating |         |           |
| UA8888S-SH1-R   | UA8888SL-SH1-R    | HSOP-28 | Tape Reel |
| UA8888S-SH1-T   | UA8888SL-SH1-T    | HSOP-28 | Tube      |

|  |  |
|--|--|
| <p>UA8888SL-SH1-R</p> <p>(1)Packing Type<br/>(2)Package Type<br/>(3)Lead Plating</p> | <p>(1) R: Tape Reel, T: Tube<br/>(2) SH1: HSOP-28<br/>(3) L: Lead Free Plating, Blank: Pb/Sn</p> |
|--|--|

### ■ PIN CONFIGURATION

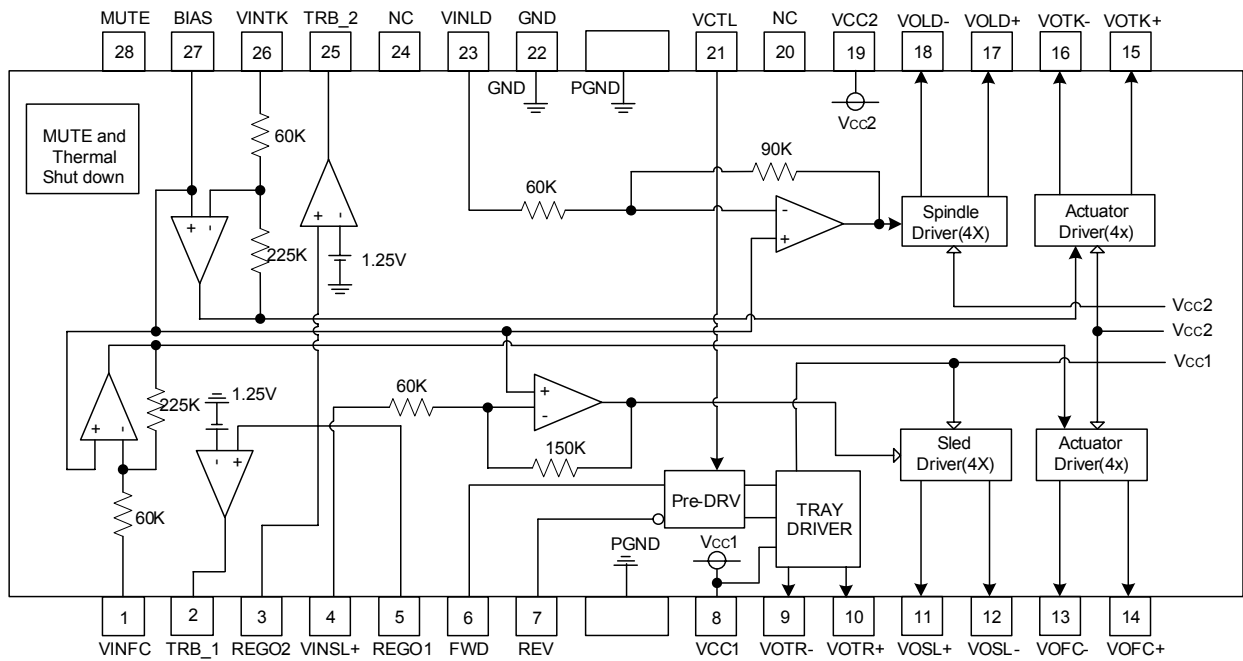


### ■ PIN DESCRIPTION

| PIN NO. | PIN NAME           | FUNCTION   |
|---------|--------------------|--|
| 1       | V <sub>INFC</sub>  | Input for focus driver   |
| 2       | TRB_1              | Connect to external transistor base                                |
| 3       | REGO2              | Regulator voltage output, connect to external transistor collector |
| 4       | V <sub>INSL+</sub> | Input for the sled driver  |
| 5       | REGO1              | Regulator voltage output, connect to external transistor collector |
| 6       | FWD                | Tray driver forward input  |
| 7       | REV                | Tray driver reverse input  |
| 8       | V <sub>CC1</sub>   | Vcc for pre-drive block and power block of sled and tray           |
| 9       | V <sub>OTR-</sub>  | Tray driver output (-)   |
| 10      | V <sub>OTR+</sub>  | Tray driver output (+)   |
| 11      | V <sub>OSL+</sub>  | Sled driver output (+)   |
| 12      | V <sub>OSL-</sub>  | Sled driver output (-)   |
| 13      | V <sub>OFc-</sub>  | Focus driver output (-)  |
| 14      | V <sub>OFc+</sub>  | Focus driver output (+)  |
| 15      | V <sub>OTK+</sub>  | Tracking driver output (+)   |
| 16      | V <sub>OTK-</sub>  | Tracking driver output (-)   |
| 17      | V <sub>OLD+</sub>  | Spindle driver output (+)  |
| 18      | V <sub>OLD-</sub>  | Spindle driver output (-)  |
| 19      | V <sub>CC2</sub>   | Vcc for power block of spindle, tracking and focus                 |
| 20      | NC                 | No Connection  |
| 21      | V <sub>CTL</sub>   | Speed control input of tray driver                                 |
| 22      | GND                | Ground   |
| 23      | V <sub>INLD</sub>  | Input for spindle driver   |
| 24      | NC                 | No Connection  |
| 25      | TRB_2              | Connect to external transistor base                                |
| 26      | V <sub>INTK</sub>  | Input for tracking driver  |
| 27      | BIAS               | Input for reference voltage  |
| 28      | MUTE               | Input for mute control   |

Notes: Symbol of + and – (output of drivers) means polarity to input pin. (Ex. if voltage of pin1 is high, pin14 is high.)

## ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATINGS (Ta=25 )

| PARAMETER                                       | SYMBOL           | RATINGS     | UNIT      |
|---|------------------|-------------|-----------|
| Supply Voltage                                  | V <sub>CC</sub>  | 15          | V         |
| Power Dissipation (Note)<br>Derating Rate Ta>25 | P <sub>D</sub>   | 1.7<br>13.6 | W<br>mW / |
| Operate Temperature                             | T <sub>OPR</sub> | -35 ~ +85   |           |
| Storage Temperature                             | T <sub>STG</sub> | -55 ~ +150  |           |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ GUARANTEED OPERATING CONDITIONS (Ta=25 )

| PARAMETER            | SYMBOL           | RATINGS              | UNIT |
|----------------------|------------------|----------------------|------|
| Power Supply Voltage | V <sub>CC1</sub> | 4.5~13.2             | V    |
|                      | V <sub>CC2</sub> | 4.5~V <sub>CC1</sub> | V    |

### ■ ELECTRICAL CHARACTERISTICS

(Ta=25 , V<sub>CC1</sub>=12V, V<sub>CC2</sub>=5V, Bias=2.5V, R<sub>L</sub>=8Ω/10Ω/20Ω/45Ω, unless otherwise specified.)

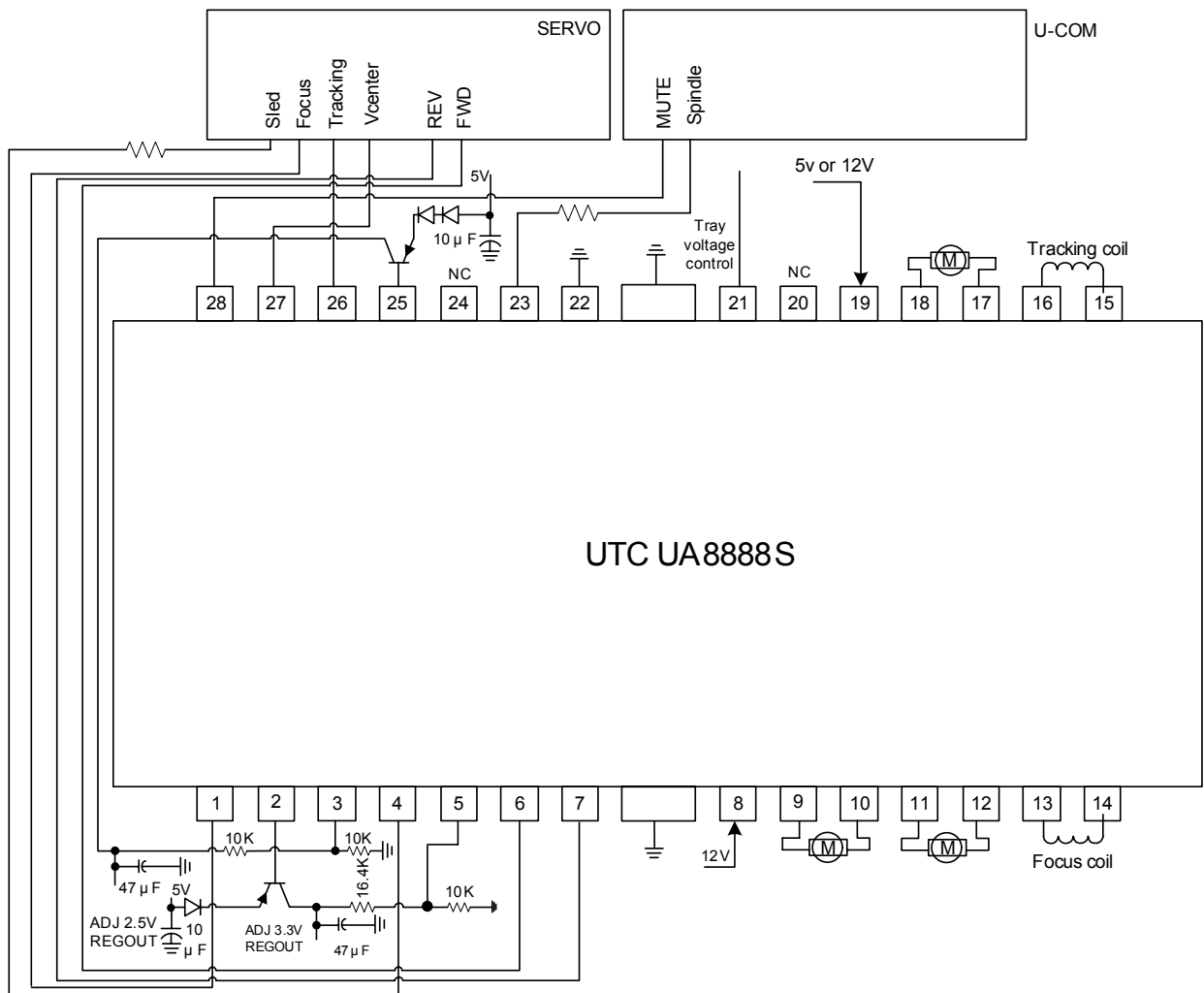
| PARAMETER                                  | SYMBOL               | TEST CONDITIONS                                    | MIN  | TYP  | MAX             | UNIT |
|--|----------------------|--|------|------|-----------------|------|
| Voltage for Mute                           | ON                   | V <sub>STON</sub>                                  | 0    |      | 0.5             | V    |
|  | OFF                  | V <sub>STOFF</sub>                                 | 2.0  |      | 5               | V    |
| Quiescent Current                          | I <sub>Q</sub>       |  |      | 25   |                 | mA   |
| <b>Actuator Drivers</b>                    |                      |  |      |      |                 |      |
| Output Offset Voltage                      | V <sub>O(OFF)</sub>  |  |      |      | ±50             | mV   |
| Maximum Output Voltage                     | V <sub>O(MAX)</sub>  | @10Ω Load  | 3.6  | 4.0  |                 | V    |
| Voltage Gain                               | G <sub>V</sub>       | V <sub>IN</sub> =Bias+0.2Vpp ac @1KHz              |      | 23.5 |                 | dB   |
| <b>Sled Motor Driver</b>                   |                      |  |      |      |                 |      |
| Output Offset Voltage                      | V <sub>O(OFF)</sub>  |  |      |      | ±100            | mV   |
| Maximum Output Voltage                     | V <sub>O(MAX)</sub>  | @20Ω Load  | 7.5  | 9.0  |                 | V    |
| Closed Loop Voltage Gain                   | G <sub>V(CL)</sub>   | V <sub>IN</sub> =Bias+0.2Vpp ac @1KHz              | 18   | 20   | 22              | dB   |
| <b>Spindle Motor Driver</b>                |                      |  |      |      |                 |      |
| Output Offset Voltage                      | V <sub>O(OFF)</sub>  |  |      |      | ±50             | mV   |
| Maximum Output Voltage                     | V <sub>O(MAX)</sub>  | @8Ω Load   |      | 3.5  |                 | V    |
| Voltage Gain                               | G <sub>V</sub>       | V <sub>IN</sub> =Bias+0.2Vpp ac @1KHz              | 13.3 | 15.5 | 17.5            | dB   |
| Gain Error by Polarity                     | G <sub>V</sub>       | V <sub>IN</sub> =Bias+0.2Vpp ac @1KHz              | 0    | 1    | 2               | dB   |
| <b>Tray Motor Driver</b>                   |                      |  |      |      |                 |      |
| Output Saturation Voltage                  | V <sub>O(SAT1)</sub> | Upper + Lower saturation<br>I <sub>L</sub> =200mA  | 0.7  | 1.1  | 1.5             | V    |
|  | V <sub>O(SAT2)</sub> | Upper + Lower saturation<br>I <sub>L</sub> =500mA  | 1.0  | 1.55 | 2.2             | V    |
| Output Saturation Voltage Between F&R      | V <sub>O(SAT1)</sub> | Output saturation voltage 1<br>between FWD and REV |      |      | 0.1             | V    |
| Output Adjustable Gain on "H" Side Voltage | G <sub>V(ADJ)</sub>  | V <sub>CTL</sub> =2V                               | 7.4  | 9.2  | 11              | dB   |
| <b>Tray Motor Driver Input Logic</b>       |                      |  |      |      |                 |      |
| Level Input Voltage                        | High                 | V <sub>I(H)</sub>                                  | 1.5  |      | V <sub>CC</sub> | V    |
|  | Low                  | V <sub>I(L)</sub>                                  | -0.3 |      | 0.5             | V    |
| High Level Input Current                   | I <sub>I(H)</sub>    | V <sub>FWD</sub> =V <sub>REV</sub> =5V             |      | 180  | 270             | μA   |
| <b>Regulator (Note 2)</b>                  |                      |  |      |      |                 |      |
| Output Voltage                             | V <sub>OUT</sub>     | I <sub>L</sub> = 500mA(Note 3)                     | 1.5  |      | 4.0             | V    |
| Output Load Differential                   | V <sub>O(DIFF)</sub> | I <sub>L</sub> = 0 ~ 500mA                         | -50  | 0    | 50              | mV   |
| Power supply Voltage Differential          | V <sub>VCC</sub>     | (V <sub>CC</sub> =4.5~8V), I <sub>L</sub> = 500mA  | -25  | 0    | 25              | mV   |

Note: 1. This device is not designed for protection against radioactive rays.

2. Based on 8550C PNP application.

3. Based on 8550D.

## TYPICAL APPLICATION CIRCUIT



### ■ OPERATION NOTES

- (1) The thermal shutdown function will be triggered while the chip junction temperature reach 150 typical, and then the output current is muted. The hysteresis is set to 25 typical, so the circuit will start up again when the chip temperature falling to 125 typical.
- (2) In case mute pin voltage is under 0.5V or NC, output current is muted except for tray motor driver. Mute pin voltage should be more than 2.0V for normal application.
- (3) Pin 27(Bias pin) should be pulled up to more than 1.2V. In case the bias pin voltage is pulled down below 0.9V(typ.), the output current is muted.
- (4) Insert the bypass capacitor (~0.1μF) between V<sub>CC</sub> pin and GND pin as close as possible.
- (5) Ground-plane wiring up to GND is performed and should tightly connect to external GND.
- (6) Pin 20 and 24 should be floated due to reserve for internal test only.
- (7) When V<sub>cc1</sub> voltage drop to below 3.8V, schematic is muted. The schematic will return to work when V<sub>cc1</sub> rise up with a hysteresis of 0.3V(typ.)

(8) Tray driver logic input:

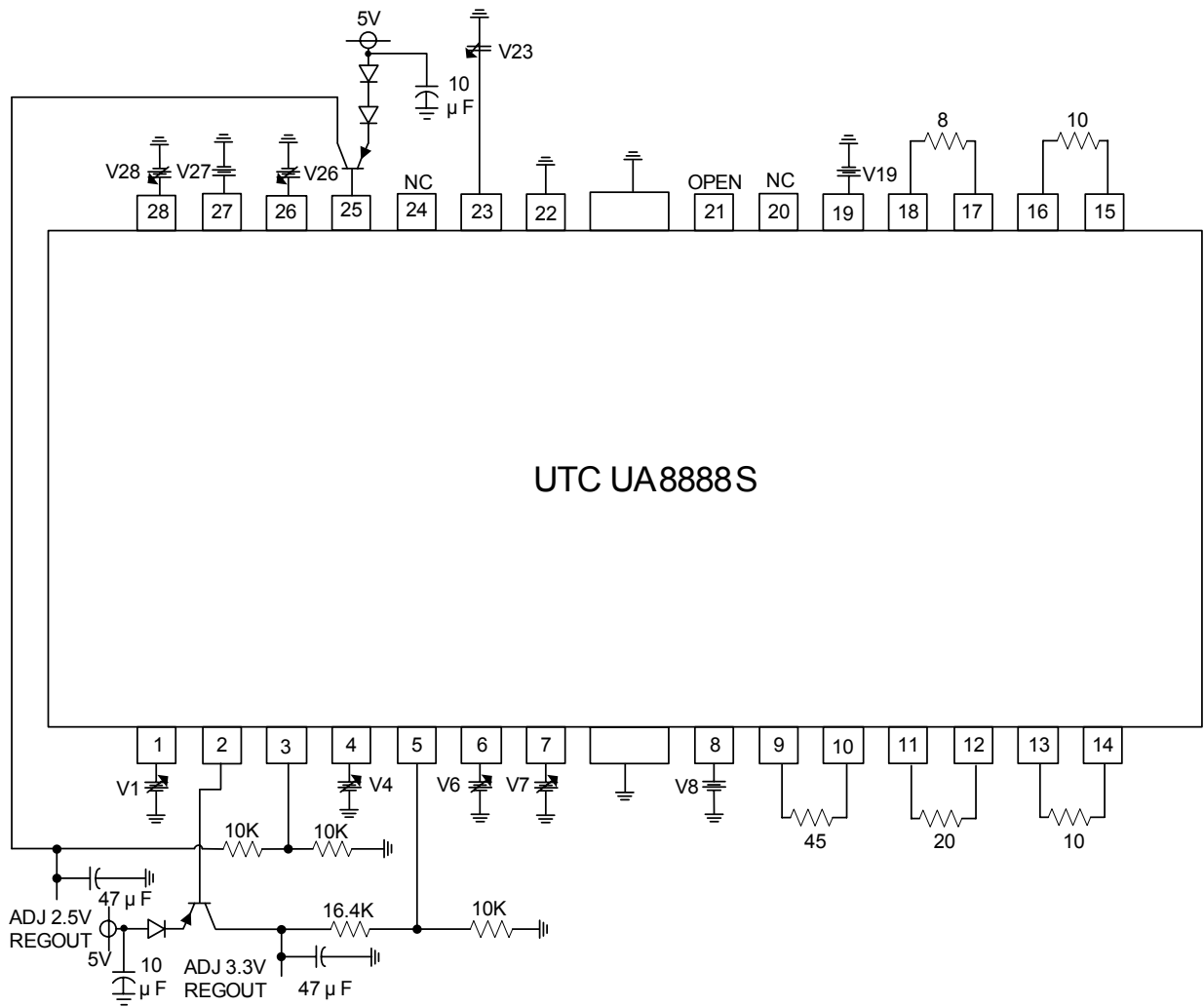
| FWD (pin6) | REV (pin7) | V <sub>OTR+</sub> (pin10) | V <sub>OTR-</sub> (pin9) | Function     |
|------------|------------|---------------------------|--------------------------|--------------|
| L          | L          | OPEN                      | OPEN                     | Open mode    |
| L          | H          | L                         | H                        | Reverse mode |
| H          | L          | H                         | L                        | Forward mode |
| H          | H          | L                         | L                        | Brake mode   |

Pin 6 and Pin 7 are designed to avoid simultaneous activation of upper and lower output transistors, however, in order to improve reliability, apply motor forward/reverse input once through open mode.

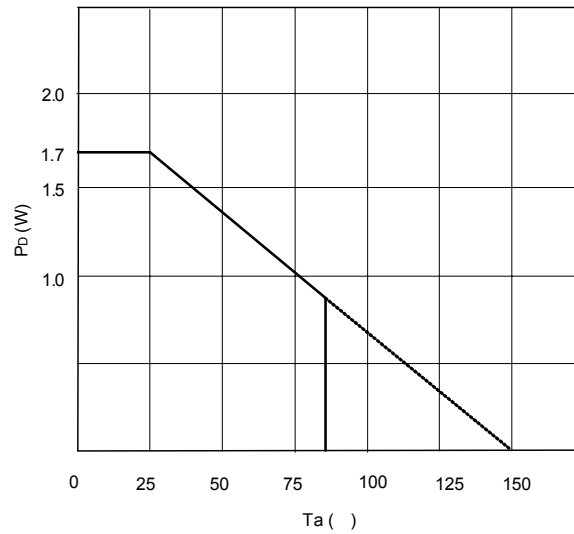
We recommend time period for open longer than 10msec.

The voltage between “H” side and “L” side output voltage is equal to three times(9.2dB Typ.) V<sub>TCL</sub> voltage(Pin21). And the “H” side and “L” side output voltage both equal to V<sub>CC</sub>/2 when in open mode and brake mode.

## ■ TESTING CIRCUIT



■ POWER DISSIPATION CURVE



- \* 70mm×70mm×1.6mm glass epoxy board.
- \* Reduced by 13.6mW / °C for operating in above 25 °C.

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