


**SANYO Semiconductors**

# DATA SHEET

An ON Semiconductor Company

## LA42031 — Monolithic Linear IC Audio Output for TV application 5W Monaural Power Amplifier

### Overview

LA42031 is 5W monaural AF power amplifier intended for televisions.

### Functions

- 3W Monaural ( $V_{CC} = 9V$ ,  $R_L = 8\Omega$ , THD = 10%).
- 5W Monaural ( $V_{CC} = 11V$ ,  $R_L = 8\Omega$ , THD = 10%).
- Built-in standby function.
- Built-in mute function.
- Built-in various protection circuit (short to  $V_{CC}$ /short to ground/load shorting/overheating).

### Specifications

**Maximum Ratings** at  $T_a = 25^\circ\text{C}$

| Parameter                    | Symbol              | Conditions                 | Ratings     | Unit               |
|------------------------------|---------------------|----------------------------|-------------|--------------------|
| Maximum supply voltage       | $V_{CC\text{ max}}$ | No signal                  | 16          | V                  |
| Allowable power dissipation  | $P_d\text{ max}$    | Infinitely large heat sink | 15          | W                  |
| Maximum junction temperature | $T_j\text{ max}$    |                            | 150         | $^\circ\text{C}$   |
| Thermal resistance           | $\theta_{jc}$       |                            | 3           | $^\circ\text{C/W}$ |
| Operating temperature        | $T_{opr}$           |                            | -25 to +75  | $^\circ\text{C}$   |
| Storage temperature          | $T_{stg}$           |                            | -40 to +150 | $^\circ\text{C}$   |

**Operating Conditions** at  $T_a = 25^\circ\text{C}$

| Parameter                                | Symbol             | Conditions | Ratings   | Unit     |
|------------------------------------------|--------------------|------------|-----------|----------|
| Recommended supply voltage               | $V_{CC}$           |            | 9         | V        |
| Recommended load resistance              | $R_L$              |            | 8         | $\Omega$ |
| Allowable operating supply voltage range | $V_{CC\text{ op}}$ |            | 5.5 to 15 | V        |

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# LA42031

**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 9\text{V}$ ,  $R_L = 8\Omega$ ,  $f = 1\text{kHz}$ ,  $R_g = 600\Omega$

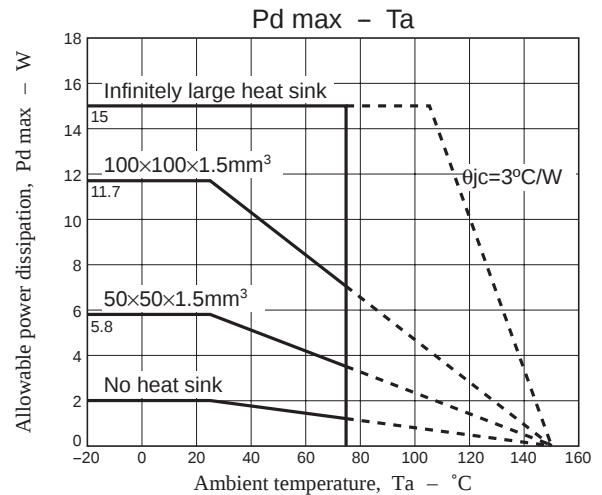
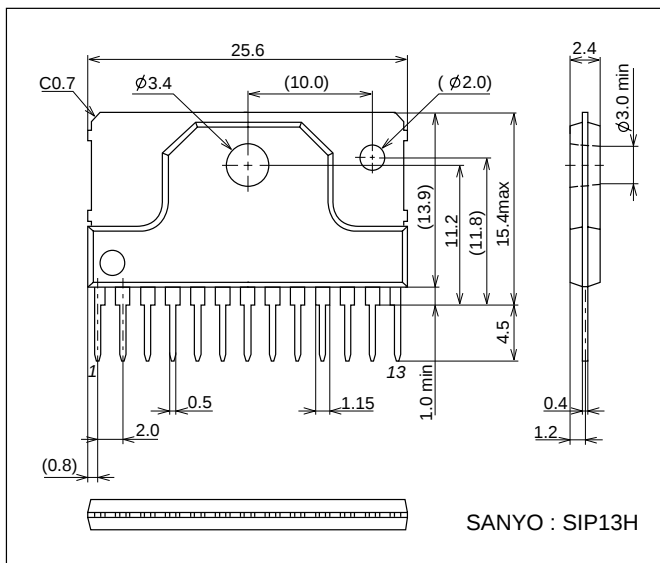
| Parameter                       | Symbol     | Conditions                                                 | Ratings |      |     | Unit             |
|---------------------------------|------------|------------------------------------------------------------|---------|------|-----|------------------|
|                                 |            |                                                            | min     | typ  | max |                  |
| Standby current                 | $I_{st}$   | Amplifier OFF                                              |         | 0    | 10  | $\mu\text{A}$    |
| Quiescent current               | $I_{CCO}$  | $R_g = 0$ , $R_L = \text{OPEN}$                            | 25      | 45   | 90  | mA               |
| Output power                    | $P_{O1}$   | THD = 10%                                                  | 2       | 3    |     | W                |
|                                 | $P_{O2}$   | $V_{CC} = 11\text{V}$ , THD = 10%                          |         | 5    |     | W                |
| Total harmonic distortion       | THD        | $P_O = 1\text{W}$                                          |         | 0.06 | 0.2 | %                |
| Voltage gain                    | VG         | $V_O = 0\text{dBm}$                                        | 33      | 35   | 37  | dB               |
| Output noise voltage            | $V_{NO}$   | $R_g = 0$ , BPF = 20Hz to 20kHz                            |         | 0.2  | 0.4 | mVrms            |
| Ripple rejection ratio          | SVRR       | $R_g = 0$ , $f_R = 100\text{Hz}$ , $V_{CCR} = 0\text{dBm}$ | 40      | 50   |     | dB               |
| Mute attenuation value          | ATT        | $V_O = 1\text{Vrms}$ , BPF = 20Hz to 20kHz                 | 80      | 90   |     | dB               |
| Mute control voltage (pin 6)    | $V_{mute}$ | Mute ON *1                                                 | 1.7     |      | 3.0 | V                |
|                                 |            | Mute OFF                                                   | 0       |      | 0.5 | V                |
| Standby control voltage (pin 5) | $V_{st}$   | Amplifier ON *1                                            | 2.5     |      | 15  | V                |
|                                 |            | Amplifier OFF                                              | 0       |      | 0.5 | V                |
| Input resistance                | $R_i$      |                                                            | 21      | 30   | 39  | $\text{k}\Omega$ |

\*1 : Note that the STANDBY pin (pin 5) and MUTE pin (pin 6) incorporate the anti-static diode and that decrease of the  $V_{CC}$  7 pin potential below that of pin 5/6 causes the current to flow through the diode.

## Package Dimensions

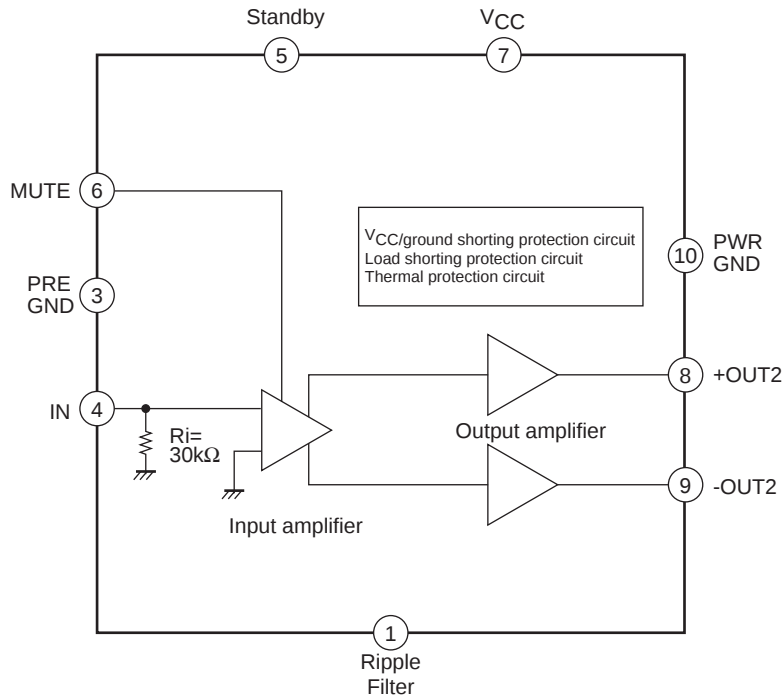
unit : mm (typ)

3107B

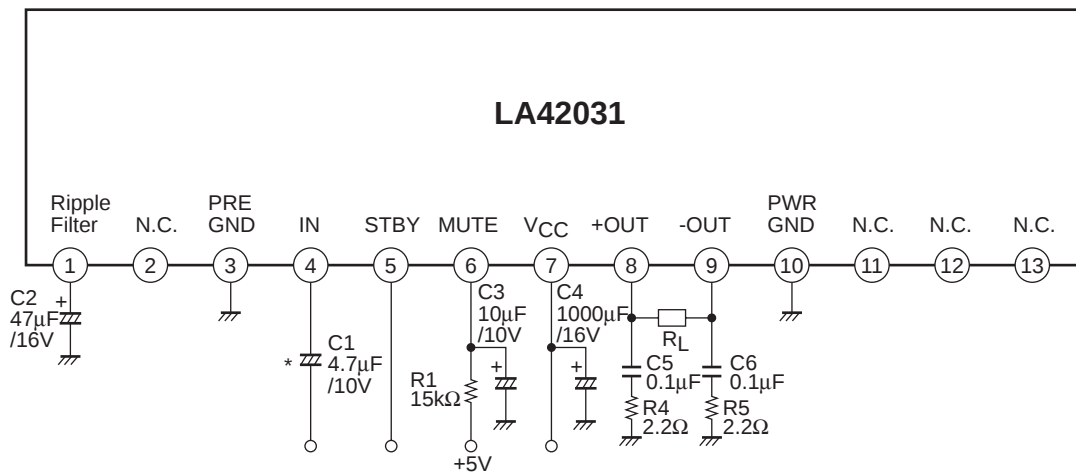


# LA42031

## Block Diagram



## Test Circuit



\* LA42031 employs the zero-bias type input circuit, with the input pin potential being nearly zero (about 0.01V). Accordingly, the polarity must be determined according to the DC potential of a circuit connected to the previous stage of LA42031.

## External Components

- C1 : The input coupling capacitors, for which 4.7 $\mu$ F or less is recommended. LA42031 employs the zero-bias type input circuit, with the input pin potential being nearly zero (about 0.01V). Accordingly, the polarity must be determined according to the DC potential of a circuit connected to the previous stage of LA42031.
- C2 : Capacitor for starting time of the ripple filter and amplifier, for which 47 $\mu$ F is recommended.
- C3, R1 : Capacitor and resistor for mute. C3 is necessary even when the mute function is not used.
- C4 : Power capacitor.
- C5, C6 : Capacitor and resistor for oscillation prevention. For C5, C6, the polyester film capacitor with superior temperature characteristics (Mylar capacitor) is recommended. Use R2, R3 of 2.2 $\Omega$  along with the capacitor.

### 1. Mute function (pin 6)

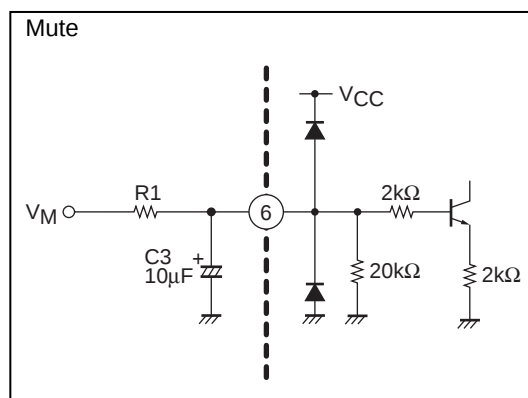
With the pin 6 voltage of 1.7V (minimum) or more, the mute function is turned ON.

Set the  $V_M$  application voltage so that the pin 6 voltage becomes. 1.7V or more.

The mute time constant is determined by R1 and C3. Determine the constant after careful review because it is related to the pop sound at mute ON/OFF.

C3 is necessary even when the mute function is not used because it is related to the pop sound when the amplifier is turned ON.

Note that the MUTE pin (pin 6) incorporates the anti-static diode and that decrease of the  $V_{CC}$  pin 7 potential below that of pin 6 causes the current to flow through the diode.



### 2. Standby function (pin 5)

The amplifier is turned ON when the voltage of 2.5V (minimum) or more is applied to pin 5.

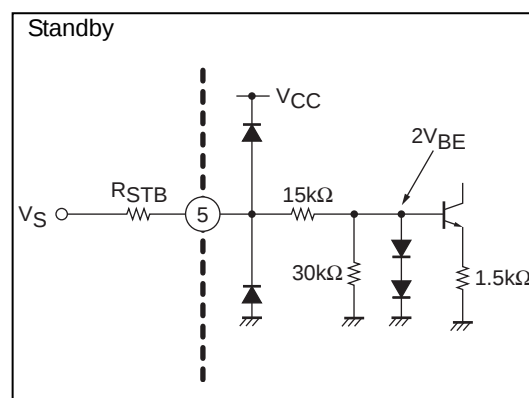
#### Pin 5 control voltage

| Pin 5 voltage | Amplifier | Standby |
|---------------|-----------|---------|
| 0 to 0.5      | OFF       | ON      |
| 2.5 to 15     | ON        | OFF     |

To suppress the inrush current to pin 5 when the  $V_{STB}$  application voltage is high, insert the control resistor ( $R_{STB}$ ).

Example : To suppress the pin 5 inrush current to 500 $\mu$ A or less

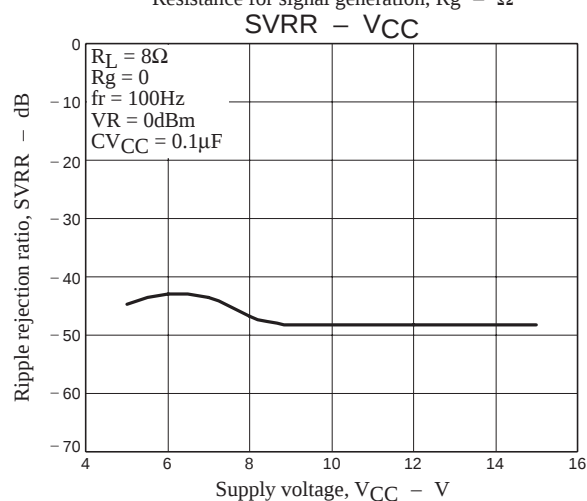
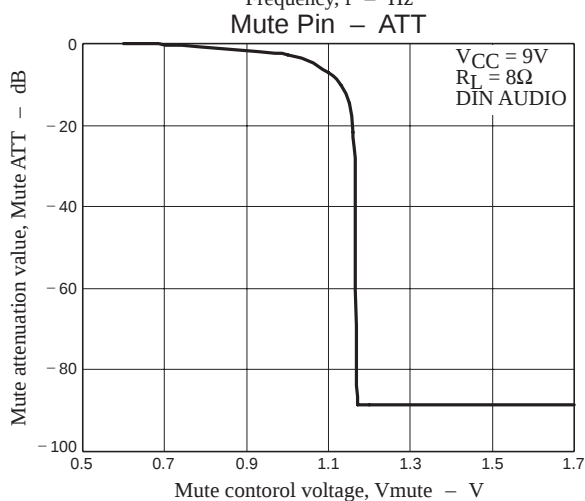
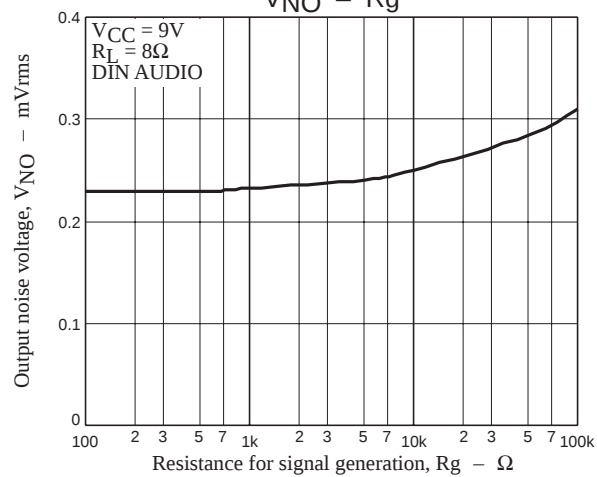
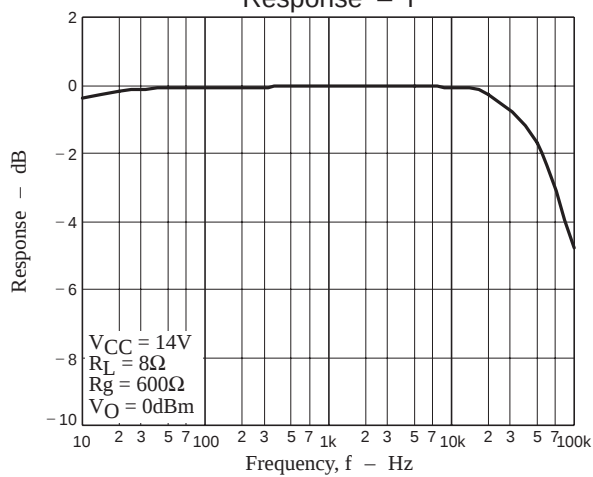
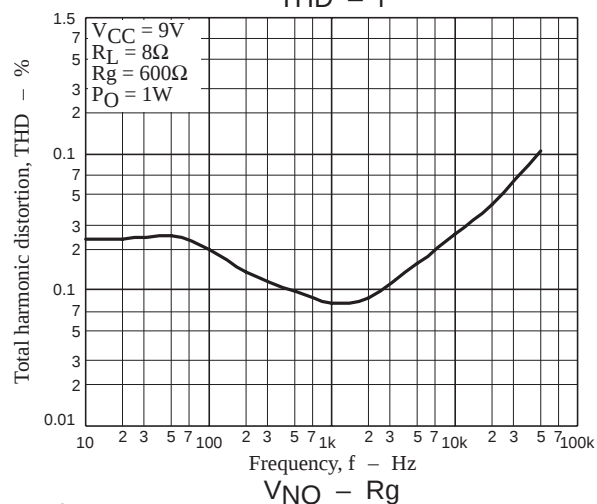
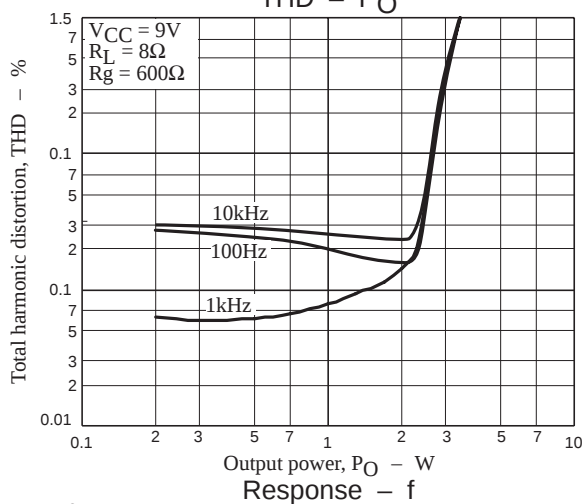
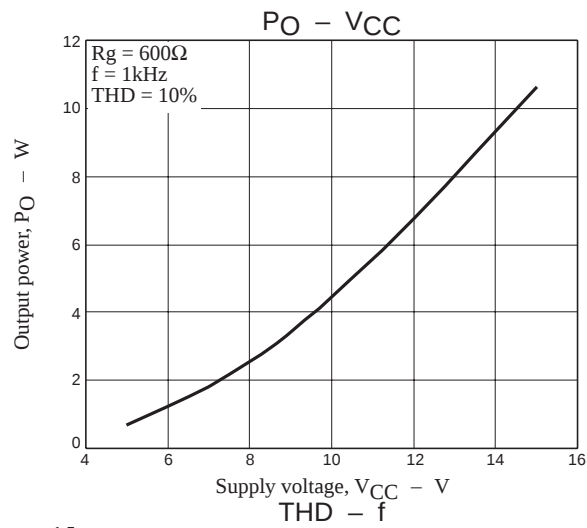
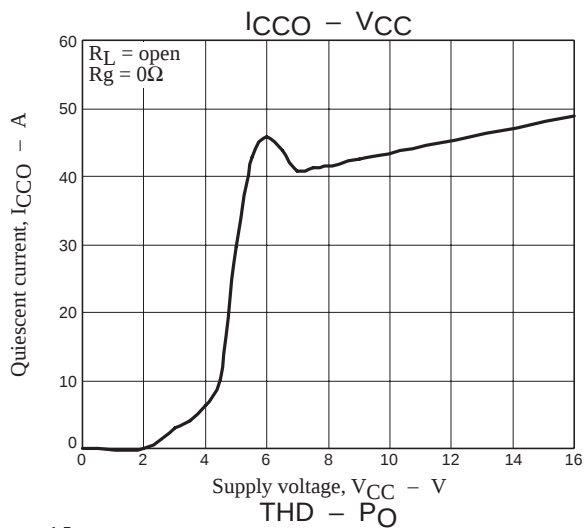
$$R_{STB} = \frac{\text{Applied voltage (V}_{STB}) - 2V_{BE} \text{ (About 1.4V)}}{500\mu\text{A}} - 15\text{k}\Omega$$

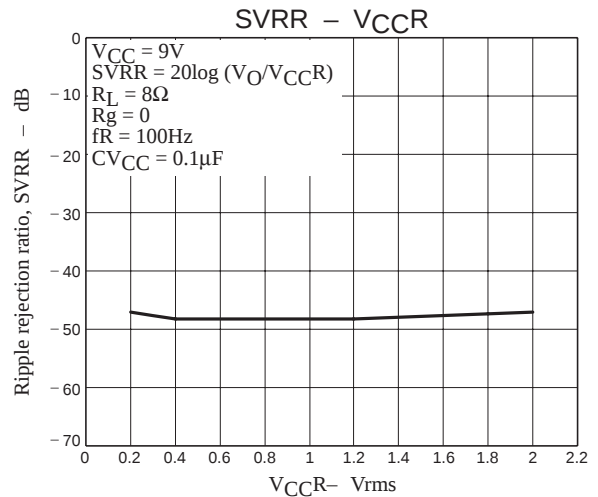
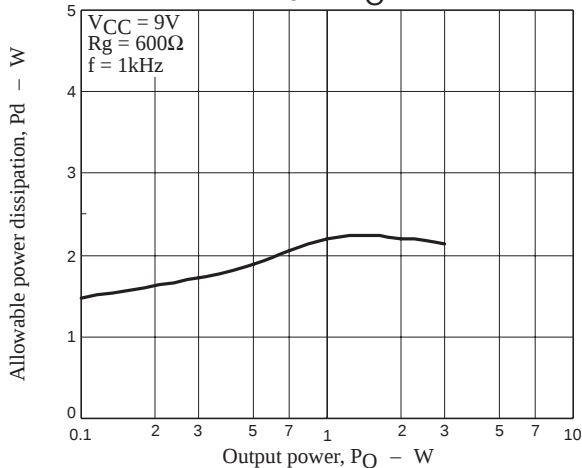
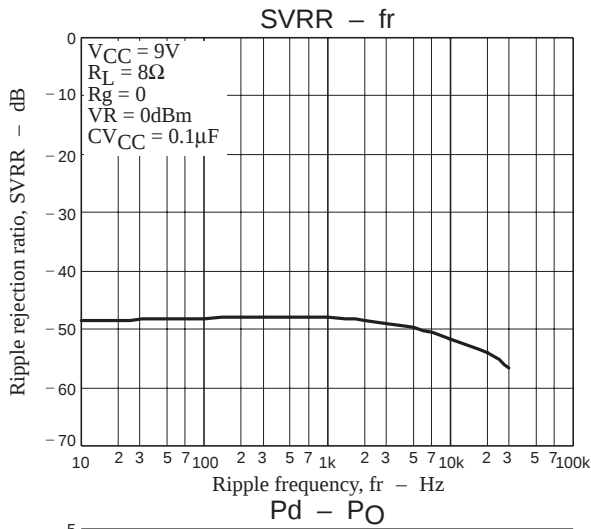


Note that the standby pin (pin 5) incorporates the anti-electrostatic diode, allowing the current to flow through the diode when the potential of  $V_{CC}$  pin 7 decreases below that of pin 5.

### Cautions for us

1. Short-circuit (power-output short-circuit), ground fault (GND-output short-circuit), and load short-circuit protective circuits are incorporated. They are activated in case of abnormal connection.  
These circuits remain active while such abnormal connection continues and is reset automatically when the abnormality is removed.  
In certain conditions, the protective circuits may be locked and continue to be active even when the abnormality is removed. In this case, either enter the standby mode or turn OFF the power supply.
2. The thermal protection circuit is incorporated and is activated when the junction temperature ( $T_j$ ) rises to about 160°C or more. The output is controlled to return gradually to the attenuated state.
3. When the product is used near the maximum rating, even the slightest change in the condition may cause exceeding of the maximum rating, resulting possibly in breakdown. Take the sufficient margin for the supply voltage, etc. and always use the product within a range never exceeding the maximum rating.





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