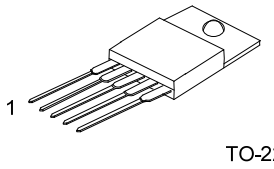
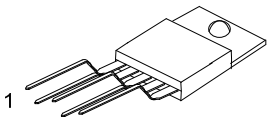
TDA2050

*LINEAR INTEGRATED CIRCUIT*

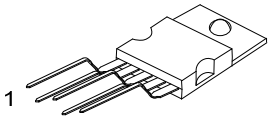
# 32W HI-FI AUDIO POWER AMPLIFIER




TO-220-5




TO-220B




TO-220B1

## ■ DESCRIPTION

The UTC **TDA2050** is a monolithic integrated circuit with high power capability and is designed to use as an class AB audio amplifier. It can deliver typically 50W music power into 4Ω load over 1 sec at $V_S$=22.5V, f = 1KHz.

The device is most suitable for both Hi-Fi and high class TV sets on the strength of its high supply voltage and very low harmonic and crossover distortion.

## ■ FEATURES

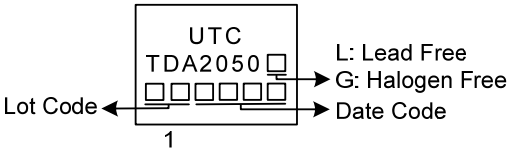
* High output power (50W Music Power IEC 268.3 Rules)
* High operating supply voltage (50V)
* Single or split supply operations
* Very low distortion
* Short circuit protection (OUT to GND)
* Thermal shutdown

## ■ ORDERING INFORMATION

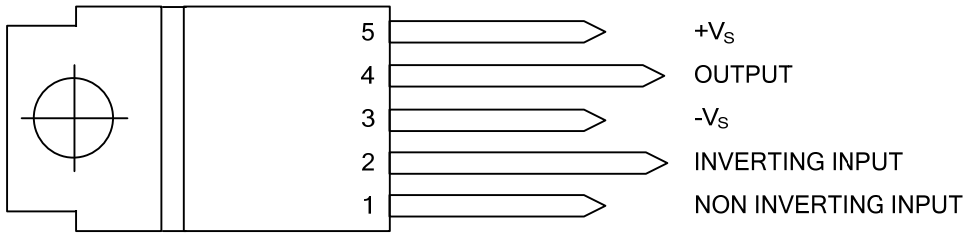
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| TDA2050L-TA5-T | TDA2050G-TA5-T | TO-220-5 | Tube |
| TDA2050L-TB5-T | TDA2050G-TB5-T | TO-220B | Tube |
| TDA2050L-TB51-T | TDA2050G-TB51-T | TO-220B1 | Tube |

| | |
|---|---|
| TDA2050G-TA5-T<br>(1) Packing Type<br>(2) Package Type<br>(3) Green Package | (1) T: Tube<br>(2) TA5: TO-220-5, TB5: TO-220B, TB51: TO-220B1<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

## ■ MARKING

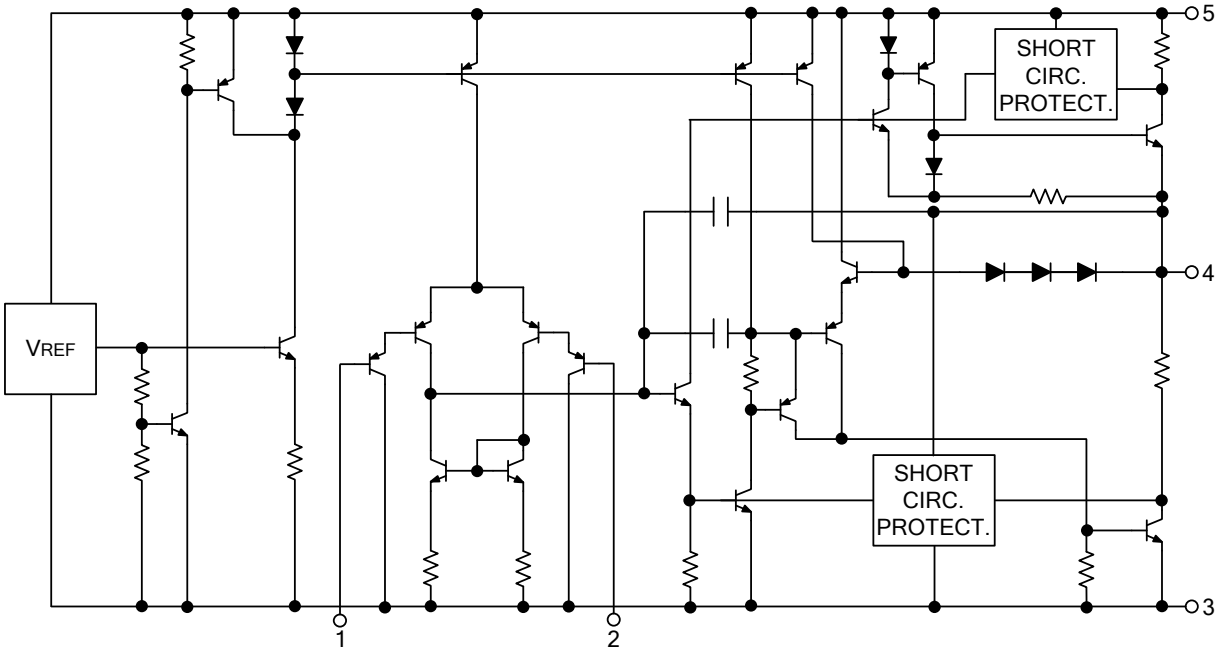


## ■ PIN CONFIGURATION




*TAB CONNECTED TO PIN 3

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V_S$ | ±25 | V |
| Input Voltage | $V_{IN}$ | $V_S$ | V |
| Differential Input Voltage | $V_{IN(DIFF)}$ | ±15 | V |
| Output Peak Current (internally limited) | $I_{OUT}$ | 5 | A |
| Power Dissipation $T_C$= 75°C | $P_D$ | 25 | W |
| Junction Temperature | $T_J$ | +150 | °C |
| Storage Temperature | $T_{STG}$ | -40 ~ +150 | °C |

Note: 1. 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.

## ■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Thermal Resistance junction-case | $\theta_{JC}$ | 3 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS

(Refer to the Test Circuit, $V_S$ = ±18V, $T_A$= 25°C, f = 1 kHz, unless otherwise specified.)

| PARAMETER | | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Supply Voltage | | $V_S$ | | | ±4.5 | | ±25 | V |
| Quiescent Drain Current | | $I_D$ | $V_S$=±4.5V | | | 18 | 50 | mA |
| | | | $V_S$=±25V | | | 21 | 90 | |
| Input Bias Current | | $I_B$ | $V_S$=±22V | | | 0.4 | 0.5 | μA |
| Input Offset Voltage | | $V_{IN(OS)}$ | $V_S$=±22V | | | | ±15 | mV |
| Input Offset Current | | $I_{IN(OS)}$ | $V_S$=±22V | | | | ±200 | nA |
| RMS Output Power | D = 0.5% | $P_O$ | $R_L$=4Ω | | 24 | 27 | | W |
| | | | $R_L$=8Ω | | | 18 | | |
| | | | $R_L$=8Ω, $V_S$=±22V | | 22 | 25 | | |
| | D = 10% | | $R_L$=4Ω | | | 35 | | |
| | | | $R_L$=8Ω | | | 22 | | |
| | | | $R_L$=8Ω, $V_S$=±22V | | | 32 | | |
| Music Power IEC268.3 RULES | | | D=10%, T=1s, $V_S$=±22.5V, $R_L$=4Ω | | | 50 | | |
| Total Harmonic Distortion | | THD | $R_L$=4Ω | f=1kHz, $P_O$=0.1~24W | | 0.03 | 0.5 | % |
| | | | | f =100Hz~10kHz, $P_O$=0.1~18W | | | 0.5 | |
| | | | $R_L$=8Ω, $V_S$=±22V | f=1kHz, $P_O$=0.1~20W | | 0.02 | | |
| | | | | f=100Hz~10kHz, $P_O$=0.1~15W | | | 0.5 | |
| Slew Rate | | SR | | | 5 | 8 | | V/μs |
| Open Loop Voltage Gain | | $G_V$ | | | | 80 | | dB |
| Closed Loop Voltage Gain | | $G_V$ | | | 30 | 30.5 | 31 | dB |
| Power Bandwidth (-3dB) | | $B_W$ | $R_L$=4Ω, $V_{IN}$=200mV | | 20 ~ 80000 | | | Hz |
| Total Input Noise | | $e_N$ | Curve A<br>B=22Hz~22kHz | | | 4<br>5 | 10 | μV |
| Input Resistance (pin 1) | | $R_{IN}$ | | | 500 | | | kΩ |
| Supply Voltage Rejection | | SVR | $R_S$=22KΩ, f=100Hz, $V_{RIPPLE}$=0.5Vrms | | | 45 | | dB |
| Efficiency | | η | $P_O$=28W, $R_L$=4Ω | | | 65 | | % |
| | | | $P_O$=25W, $R_L$=8Ω, $V_S$=±22V | | | 67 | | |

## ■ TYPICAL APPLICATION CIRCUIT

**FOR SPLIT SUPPLY APPLICATION SUGGESTIONS**

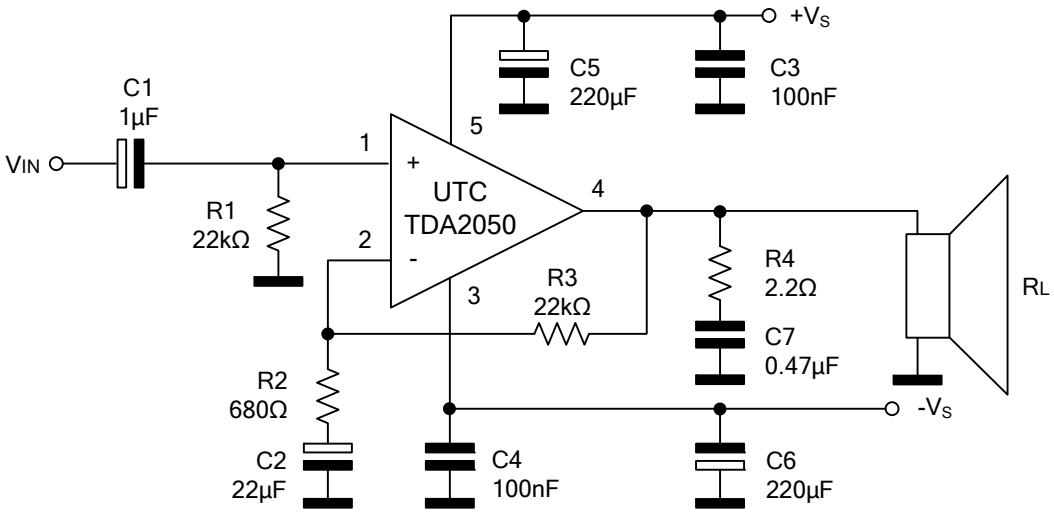



**Figure.1 Split Supply Typical Application Circuit**

The following table demonstrates the recommended values of the external components are those shown on above circuit. Different values can be used.

| COMPONENT | PURPOSE | RECOMMENDED VALUE | | |
|---|---|---|---|---|
| | | TYPICAL | LARGER | SMALLER |
| R1 | Input Impedance | 22kΩ | Increase of Input Impedance | Decrease of Input Impedance |
| R2 | Feedback Resistor | 680Ω | Decrease of Gain* | Increase of Gain |
| R3 | | 22kΩ | Increase of Gain | Decrease of Gain* |
| R4 | Frequency Stability | 2.2Ω | Danger of Oscillations | |
| C1 | Input Decoupling DC | 1µF | | Higher Low-frequency cut-off |
| C2 | Inverting Input DC Decoupling | 22µF | Increase of Switch ON/OFF Noise | Higher Low-frequency cut-off |
| C3, C4 | Supply Voltage Bypass | 100nF | | Danger of Oscillations |
| C5, C6 | Supply Voltage Bypass | 220µF | | Danger of Oscillations |
| C7 | Frequency Stability | 0.47µF | | Danger of Oscillations |

* The gain must be higher than 24dB

## ■ TYPICAL APPLICATION CIRCUIT(CONT.)

**FOR SINGLE SUPPLY APPLICATION SUGGESTIONS**

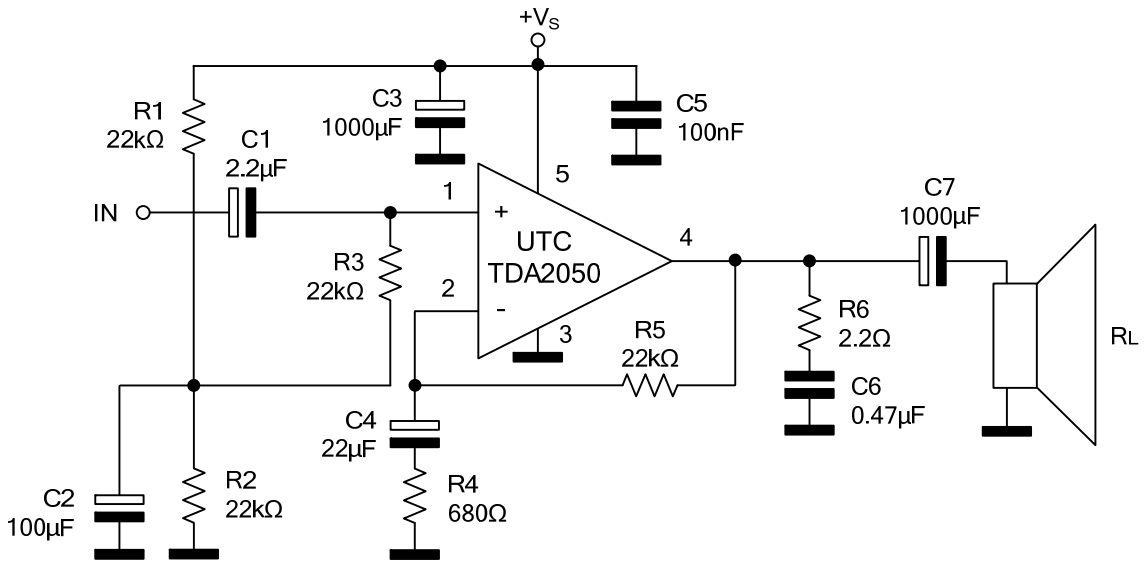



**Figure.2 Single Supply Typical Application Circuit**

The following table demonstrates the recommended values of the external components are those shown on above circuit. Different values can be used.

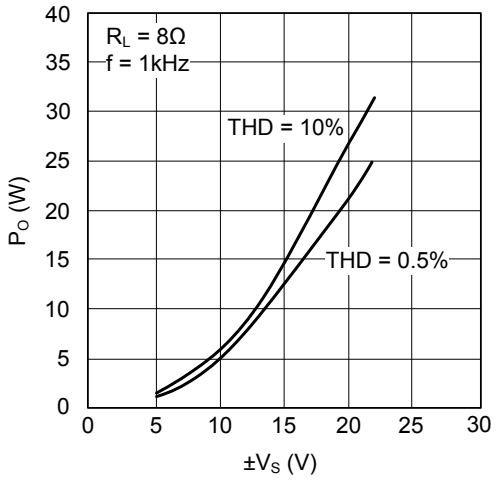
| COMPONENT | PURPOSE | RECOMMENDED VALUE | | |
|---|---|---|---|---|
| | | TYPICAL | LARGER | SMALLER |
| R1, R2, R3 | Biasing Resistor | 22kΩ | | |
| R4 | Feedback Resistor | 680Ω | Decrease of Gain* | Increase of Gain |
| R5 | | 22kΩ | Increase of Gain | Decrease of Gain* |
| R6 | Frequency Stability | 2.2Ω | Danger of Oscillations | |
| C1 | Non-Inverting Input Decoupling DC | 2.2μF | | Higher Low-frequency cut-off |
| C2 | Supply Voltage Rejection | 100μF | Worse Turn-off Transient<br>Worse Turn-on Delay | |
| C3 | Supply Voltage Bypass | 1000μF | | Danger of Oscillations<br>Worse of Turn-off Transient |
| C4 | Inverting Input DC Decoupling | 22μF | Increase of Switch ON/OFF | Higher Low-frequency cut-off |
| C5 | Supply Voltage Bypass | 100nF | | Danger of Oscillations |
| C6 | Frequency Stability | 0.47μF | | Danger of Oscillations |
| C7 | Output DC Decoupling | 1000μF | | Higher Low-frequency cut-off |

* The gain must be higher than 24dB

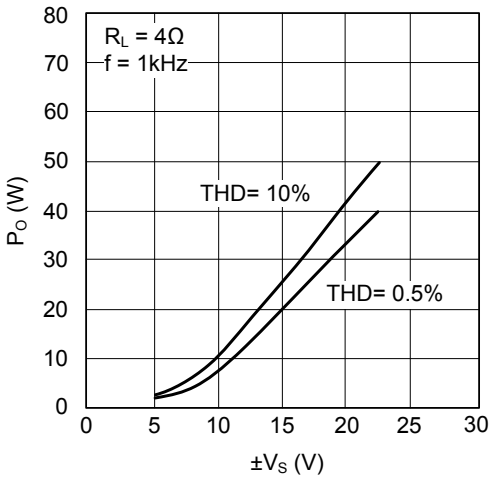
Note: If the supply voltage is lower than 40V and the load is 8Ω (or more), a lower value of C2(i.e. 22μF) can be used. C7 can be larger than 1000μF only if the supply voltage does not exceed 40V.

## ■ TYPICAL CHARACTERISTICS (Split Supply Test Circuit, unless otherwise specified)

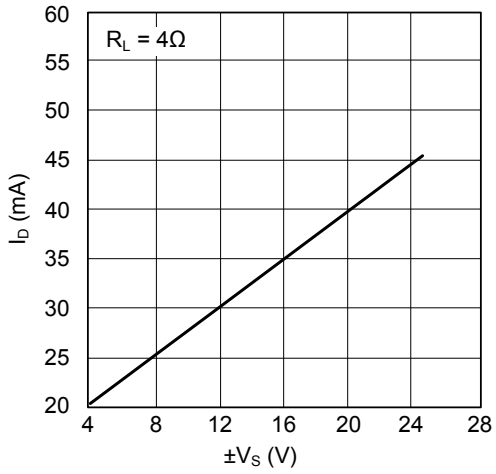
Output Power vs. Supply Voltage



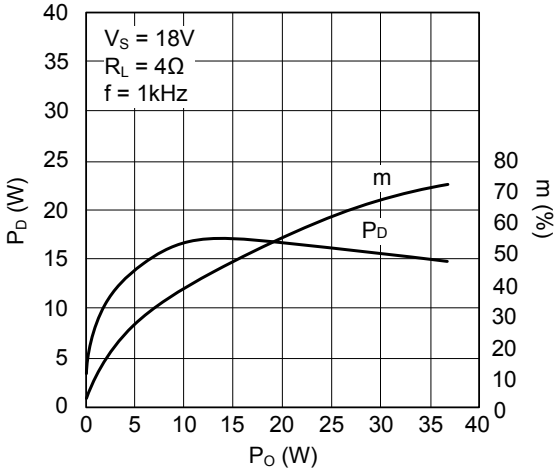

Output Power vs. Supply Voltage



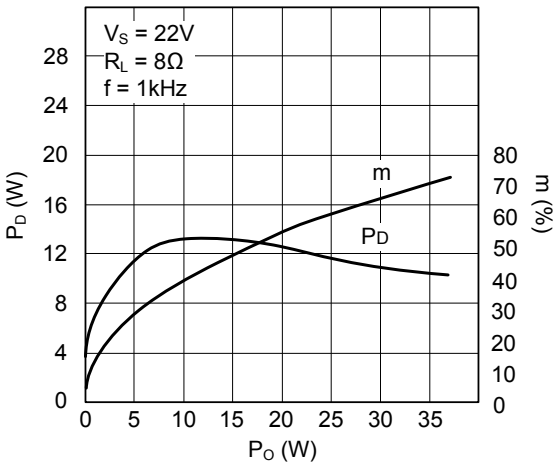

Quiescent Current vs. Supply Voltage




Total Power Dissipation and Efficiency vs. Output Power




Total Power Dissipation and Efficiency vs. Output Power




Maximum Allowable Power Dissipation vs. Ambient Temperature