

LM4875 Boomer® Audio Power Amplifier Series 750 mW Audio Power Amplifier with DC Volume Control and Headphone Switch

 Check for Samples: [LM4875](#)

FEATURES

- Precision DC Voltage Volume Control
- Headphone Amplifier Mode
- “Click and Pop” Suppression
- Shutdown Control When Volume Control Pin Is Low
- Thermal Shutdown Protection

APPLICATIONS

- GSM Phones and Accessories, DECT, Office Phones
- Hand Held Radio
- Other Portable Audio Devices

KEY SPECIFICATIONS

- P_O at 1.0% THD+N Into 8Ω; 750 mW (typ)
- P_O at 10% THD+N Into 8Ω; 1 W (typ)
- Shutdown Current; 0.7μA(typ)
- Supply Voltage Range; 2.7V to 5.5 V

TYPICAL APPLICATION

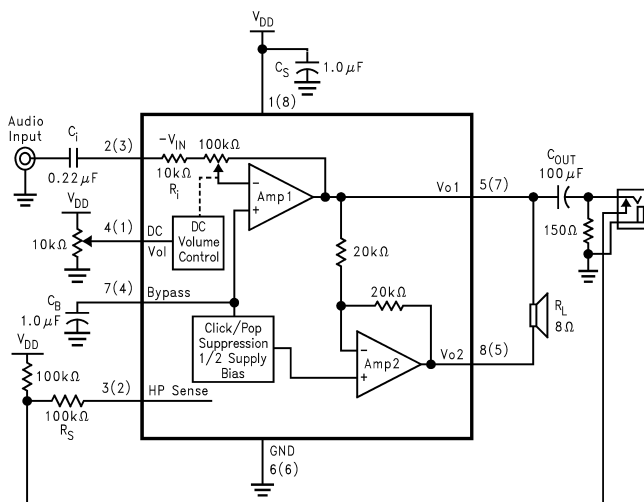


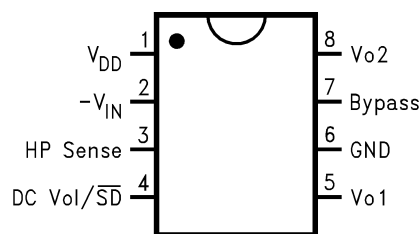
Figure 1. Typical Audio Amplifier Application Circuit

DESCRIPTION

The LM4875 is a mono bridged audio power amplifier with DC voltage volume control. The LM4875 is capable of delivering 750mW of continuous average power into an 8Ω load with less than 1% THD when powered by a 5V power supply. Switching between bridged speaker mode and headphone (single ended) mode is accomplished using the headphone sense pin. To conserve power in portable applications, the LM4875's micropower shutdown mode ($I_Q = 0.7\mu A$, typ) is activated when less than 300mV is applied to the DC Vol/SD pin.

Boomer audio power amplifiers are designed specifically to provide high power audio output while maintaining high fidelity. They require few external components and operate on low supply voltages.

CONNECTION DIAGRAM



**Small Outline Package (SOIC)
Mini Small Outline Package (VSSOP)
Top View
See Package Number D, DGK**



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾⁽²⁾

| | | |
|-----------------------------------|-----------------------|--------------------------|
| Supply Voltage | | 6.0V |
| Storage Temperature | | -65°C to +150°C |
| Input Voltage | | -0.3V to $V_{DD} + 0.3V$ |
| Power Dissipation ⁽³⁾ | | Internally Limited |
| ESD Susceptibility ⁽⁴⁾ | | 2000V |
| ESD Susceptibility ⁽⁵⁾ | | 200V |
| Junction Temperature | | 150°C |
| Soldering Information | Vapor Phase (60 sec.) | 215°C |
| | Infrared (15 sec.) | 220°C |
| Thermal Resistance | θ_{JC} (D) | 35°C/W |
| | θ_{JA} (D) | 150°C/W |
| | θ_{JC} (DGK) | 56°C/W |
| | θ_{JA} (DGK) | 190°C/W |

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not ensure specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions that ensure specific performance limits. This assumes that the device operates within the Operating Ratings. Specifications are not ensured for parameters where no limit is given. The typical value, however, is a good indication of device performance.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
- (3) The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{JMAX} , θ_{JA} , and the ambient temperature T_A . The maximum allowable power dissipation is $P_{DMAX} = (T_{JMAX} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower. For the LM4875M, $T_{JMAX} = 150^\circ\text{C}$.
- (4) Human body model, 100pF discharged through a 1.5k Ω resistor.
- (5) Machine Model, 220pF–240pF discharged through all pins.

OPERATING RATINGS

| | | |
|-------------------|---------------------------------|---|
| Temperature Range | $T_{MIN} \leq T_A \leq T_{MAX}$ | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ |
| Supply Voltage | | $2.7V \leq V_{DD} \leq 5.5V$ |

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾

The following specifications apply for $V_{DD} = 5V$, unless otherwise specified. Limits apply for $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | LM4875 | | | |
|-----------------------|-----------------------------------|---|--------------------|------------------------|--------------------|---------|
| | | | Min ⁽³⁾ | Typical ⁽⁴⁾ | Max ⁽³⁾ | Units |
| V_{DD} | Supply Voltage | | 2.7 | | 5.5 | V |
| I_{DD} | Quiescent Power Supply Current | $V_{IN} = 0V, I_O = 0A, HP\ Sense = 0V$ | | 4 | 7 | mA |
| | | $V_{IN} = 0V, I_O = 0A, HP\ Sense = 5V$ | | 3.5 | 6 | mA |
| I_{SD} | Shutdown Current | $V_{PIN4} \leq 0.3V$ | | 0.7 | | μA |
| V_{OS} | Output Offset Voltage | $V_{IN} = 0V$ | | 5 | 50 | mV |
| P_O | Output Power | THD = 1% (max), HP Sense < 0.8V, f = 1kHz, $R_L = 8\Omega$ | 500 | 750 | | mW |
| | | THD = 10% (max), HP Sense < 0.8V, f = 1kHz, $R_L = 8\Omega$ | | 1.0 | | W |
| | | THD + N = 1%, HP Sense > 4V, f = 1kHz, $R_L = 32\Omega$ | | 80 | | mW |
| | | THD = 10%, HP Sense > 4V, f = 1kHz, $R_L = 32\Omega$ | | 110 | | mW |
| THD+N | Total Harmonic Distortion + Noise | $P_O = 300\ mW_{rms}, f = 20Hz-20kHz, R_L = 8\Omega$ | | 0.6 | | % |
| PSRR | Power Supply Rejection Ratio | $V_{RIPPLE} = 200mV_{rms}, R_L = 8\Omega, C_B = 1.0\ \mu F, f = 1kHz$ | | 50 | | dB |
| Gain _{RANGE} | Single-Ended Gain Range | Gain with $V_{PIN4} \geq 4.0V, (80\% \text{ of } V_{DD})$ | 18.8 | 20 | | dB |
| | | Gain with $V_{PIN4} \leq 0.9V, (20\% \text{ of } V_{DD})$ | -70 | -72 | | dB |
| V_{IH} | HP Sense High Input Voltage | | 4 | | | V |
| V_{IL} | HP Sense Low Input Voltage | | | | 0.8 | V |

- (1) All voltages are measured with respect to the ground pin, unless otherwise specified.
- (2) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not ensure specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions that ensure specific performance limits. This assumes that the device operates within the Operating Ratings. Specifications are not ensured for parameters where no limit is given. The typical value, however, is a good indication of device performance.
- (3) Limits are ensured to AOQL (Average Outgoing Quality Level).
- (4) Typicals are measured at $25^\circ C$ and represent the parametric norm.

EXTERNAL COMPONENTS DESCRIPTION

(Figure 1)

| Components | | Functional Description |
|------------|-------|--|
| 1. | C_i | Input coupling capacitor blocks DC voltage at the amplifier's input terminals. It also creates a highpass filter with the internal R_i that produces an $f_c = 1/(2\pi R_i C_i)$ ($10k\Omega \leq R_i \leq 100k\Omega$). Refer to the APPLICATION INFORMATION section, PROPERLY SELECTING EXTERNAL COMPONENTS , for an explanation of determining the value of C_i . |
| 2. | C_S | The supply bypass capacitor. Refer to the POWER SUPPLY BYPASSING section for information about properly placing, and selecting the value of, this capacitor. |
| 3. | C_B | The capacitor, C_B , filters the half-supply voltage present on the BYPASS pin. Refer to the APPLICATION INFORMATION Section, PROPERLY SELECTING EXTERNAL COMPONENTS , for information concerning proper placement and selecting C_B 's value. |

TYPICAL PERFORMANCE CHARACTERISTICS

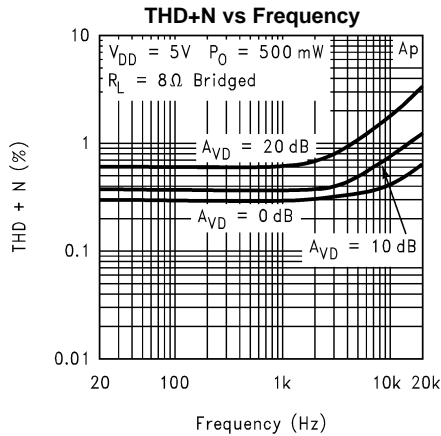


Figure 2.

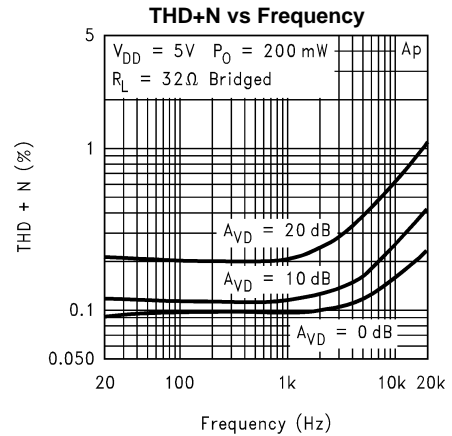


Figure 3.

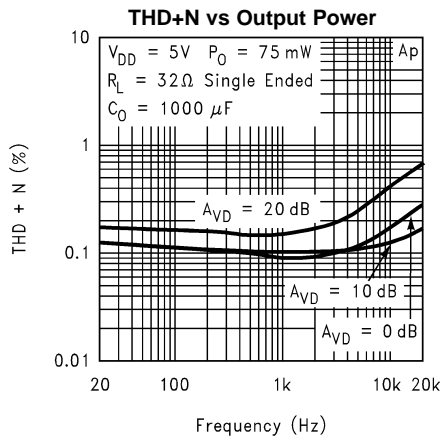


Figure 4.

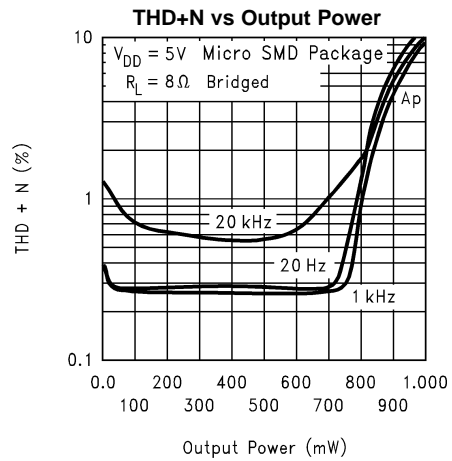


Figure 5.

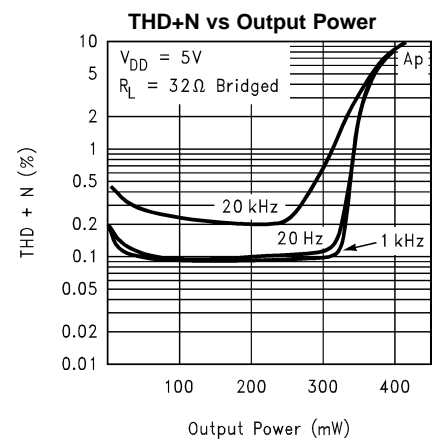


Figure 6.

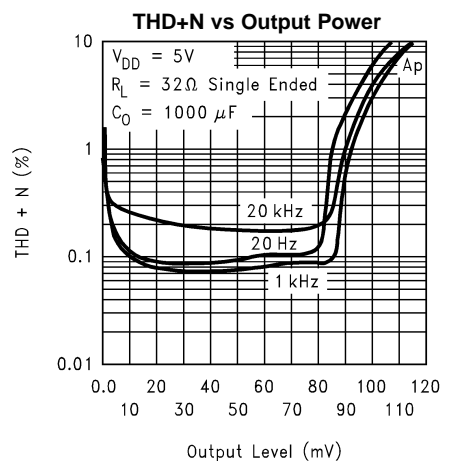
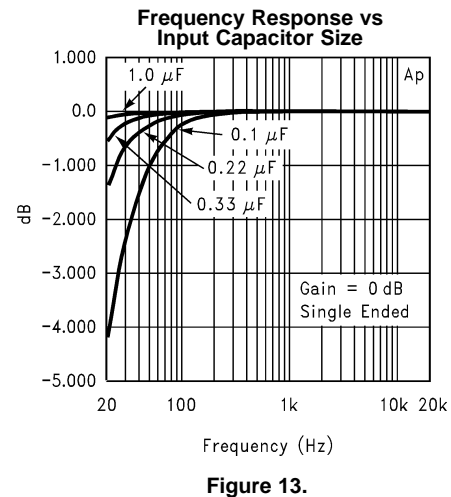
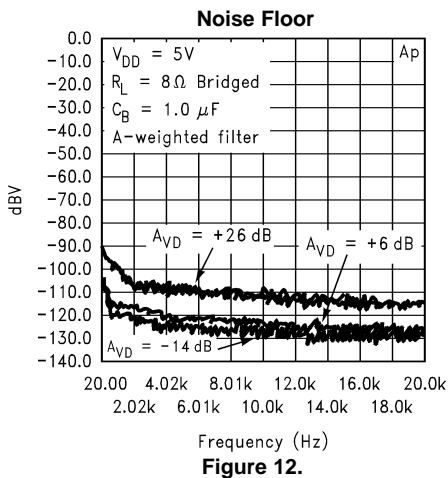
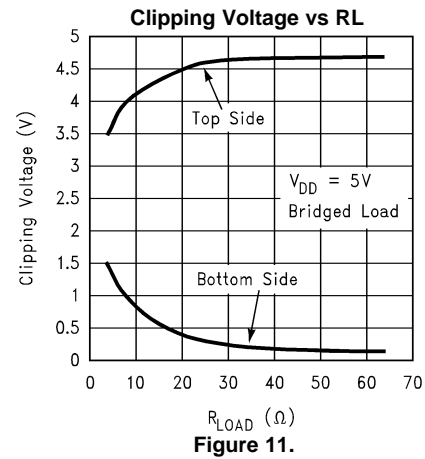
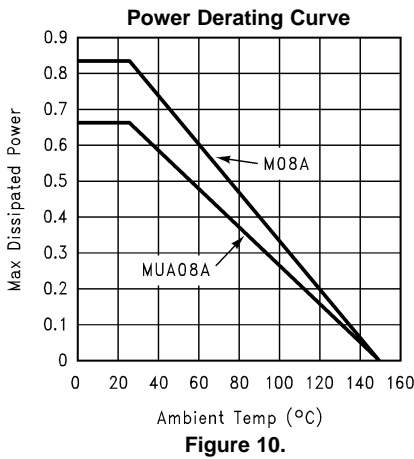
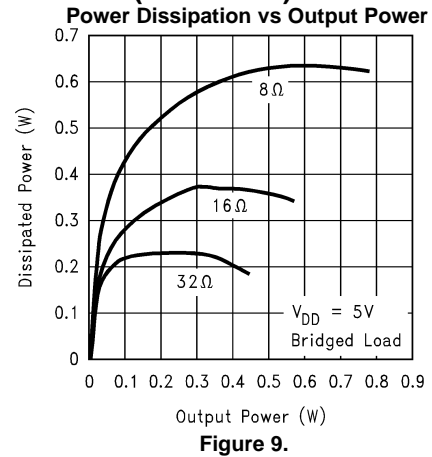
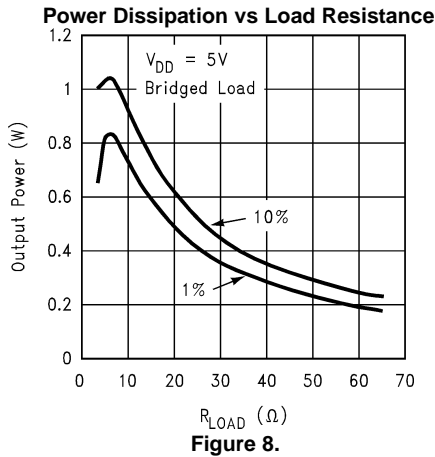


Figure 7.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

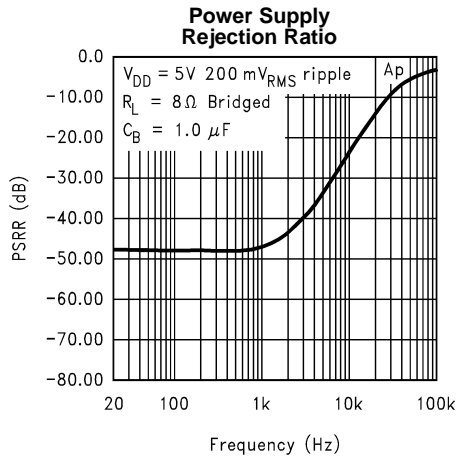


Figure 14.

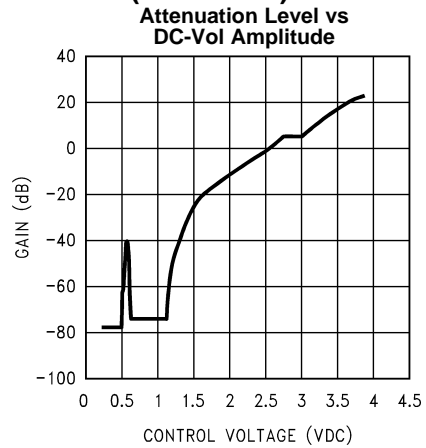


Figure 15.

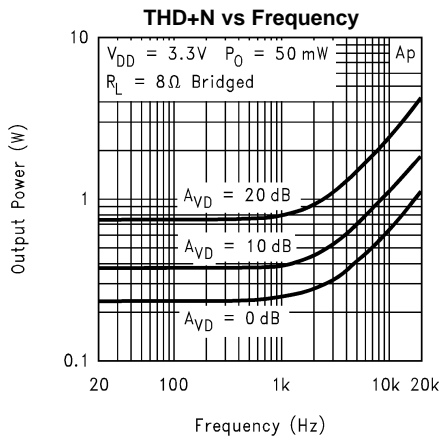


Figure 16.

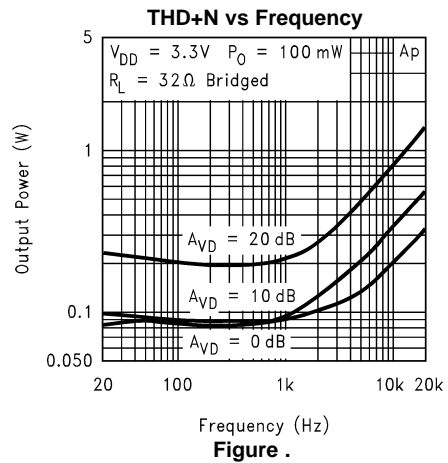


Figure .

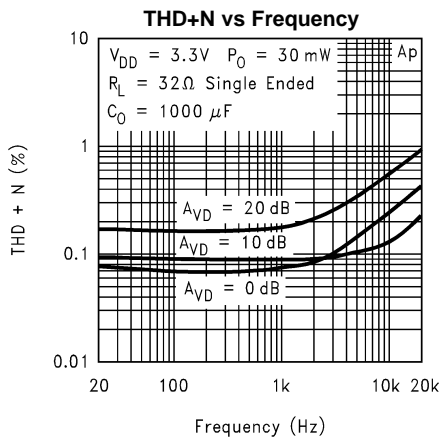


Figure 17.

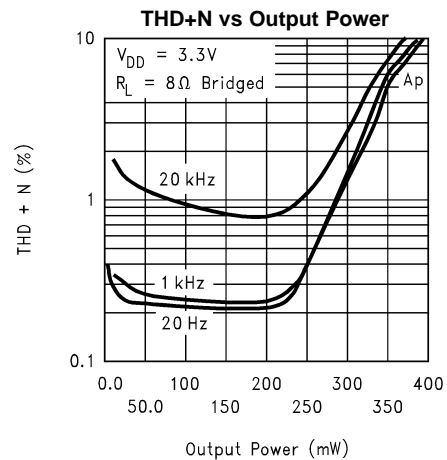


Figure 18.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

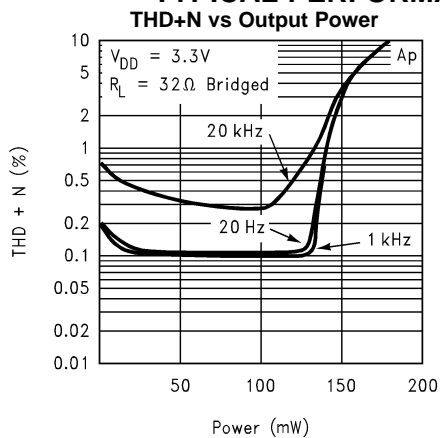


Figure 19.

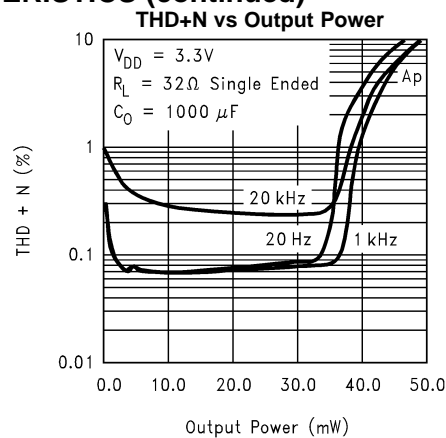


Figure 20.

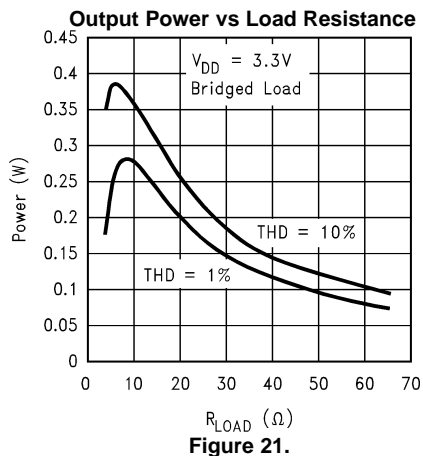


Figure 21.

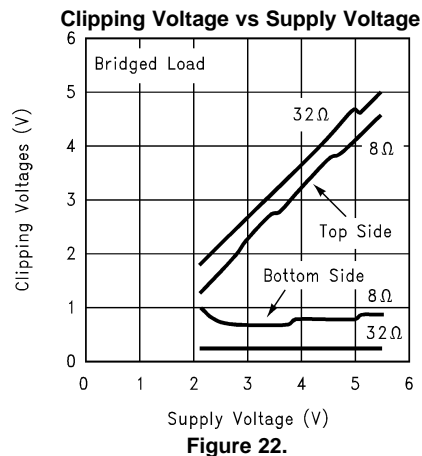


Figure 22.

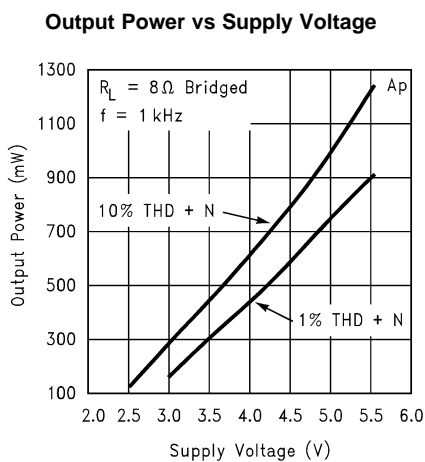


Figure 23.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

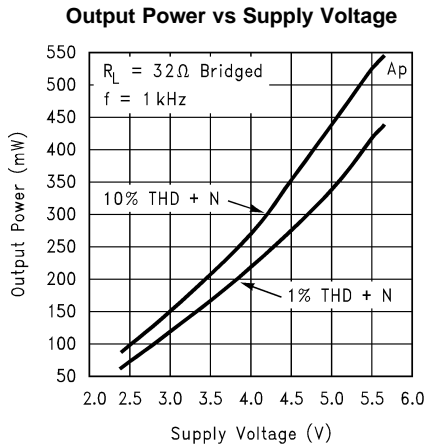


Figure 24.

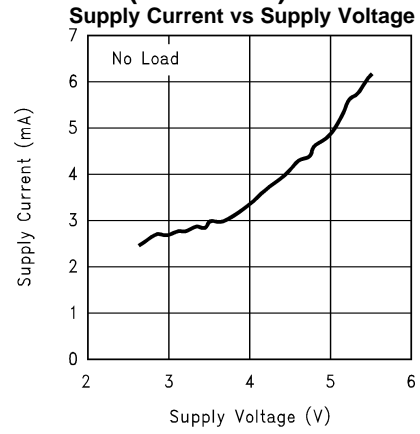


Figure 25.

APPLICATION INFORMATION

BRIDGE CONFIGURATION EXPLANATION

As shown in [Figure 1](#), the LM4875 consists of two operational amplifiers internally. An external DC voltage sets the closed-loop gain of the first amplifier, whereas two internal 20kΩ resistors set the second amplifier's gain at -1. The LM4875 can be used to drive a speaker connected between the two amplifier outputs or a monaural headphone connected between V_{O1} and GND.

[Figure 1](#) shows that the output of Amp1 serves as the input to Amp2. This results in both amplifiers producing signals that are identical in magnitude, but 180° out of phase.

Taking advantage of this phase difference, a load placed between V_{O1} and V_{O2} is driven differentially (commonly referred to as “bridge mode”). This mode is different from single-ended driven loads that are connected between a single amplifier's output and ground.

Bridge mode has a distinct advantage over the single-ended configuration: its differential drive to the load doubles the output swing for a specified supply voltage. This results in four times the output power when compared to a single-ended amplifier under the same conditions. This increase in attainable output assumes that the amplifier is not current limited or the output signal is not clipped.

Another advantage of the differential bridge output is no net DC voltage across load. This results from biasing V_{O1} and V_{O2} at half-supply. This eliminates the coupling capacitor that single supply, single-ended amplifiers require. Eliminating an output coupling capacitor in a single-ended configuration forces a single supply amplifier's half-supply bias voltage across the load. The current flow created by the half-supply bias voltage increases internal IC power dissipation and may permanently damage loads such as speakers.

POWER DISSIPATION

Power dissipation is a major concern when designing a successful bridged or single-ended amplifier. [Equation 1](#) states the maximum power dissipation point for a single-ended amplifier operating at a given supply voltage and driving a specified output load.

$$P_{DMAX} = (V_{DD})^2 / (2\pi^2 R_L) \quad \text{Single-Ended} \quad (1)$$

However, a direct consequence of the increased power delivered to the load by a bridge amplifier is an increase in internal power dissipation point for a bridge amplifier operating at the same given conditions.

$$P_{DMAX} = 4 * (V_{DD})^2 / (2\pi^2 R_L) \quad \text{Bridge Mode} \quad (2)$$

The LM4875 has two operational amplifiers in one package and the maximum internal power dissipation is 4 times that of a single-ended amplifier. However, even with this substantial increase in power dissipation, the LM4875 does not require heatsinking. From [Equation 2](#), assuming a 5V power supply and an 8Ω load, the maximum power dissipation point is 633 mW. The maximum power dissipation point obtained from [Equation 2](#) must not be greater than the power dissipation that results from [Equation 3](#):

$$P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA} \quad (3)$$

For the SOIC package, $\theta_{JA} = 150^\circ\text{C/W}$. The VSSOP package has a 190°C/W θ_{JA} . $T_{JMAX} = 150^\circ\text{C}$ for the LM4875. For a given ambient temperature T_A , [Equation 3](#) can be used to find the maximum internal power dissipation supported by the IC packaging. If the result of [Equation 2](#) is greater than that of [Equation 3](#), then either decrease the supply voltage, increase the load impedance, or reduce the ambient temperature. For a typical application using the SOIC packaged LM4875, a 5V power supply, and an 8Ω load, the maximum ambient temperature that does not violate the maximum junction temperature is approximately 55°C. The maximum ambient temperature for the VSSOP package with the same conditions is approximately 30°C. These results further assume that a device is a surface mount part operating around the maximum power dissipation point. Since internal power dissipation is a function of output power, higher ambient temperatures are allowed as output power decreases. Refer to the [TYPICAL PERFORMANCE CHARACTERISTICS](#) curves for power dissipation information at lower output power levels.

POWER SUPPLY BYPASSING

As with any power amplifier, proper supply bypassing is critical for low noise performance and high power supply rejection. The capacitors connected to the bypass and power supply pins should be placed as close to the LM4875 as possible. The capacitor connected between the bypass pin and ground improves the internal bias voltage's stability, producing improved PSRR. The improvements to PSRR increase as the bypass pin capacitor value increases. Typical applications employ a 5V regulator with 10 μ F and a 0.1 μ F filter capacitors that aid in supply stability. Their presence, however does not eliminate the need for bypassing the supply nodes of the LM4875. The selection of bypass capacitor values, especially C_B , depends on desired PSRR requirements, click and pop performance (as explained in the section, [PROPERLY SELECTING EXTERNAL COMPONENTS](#)), system cost, and size constraints.

DC VOLTAGE VOLUME CONTROL

The LM4875's internal volume control is controlled by the DC voltage applied its DC Vol/ \overline{SD} pin (pin 4). The volume control's input range is from GND to V_{DD} . A graph showing a typical volume response versus input control voltage is shown in the [TYPICAL PERFORMANCE CHARACTERISTICS](#) section. The DC Vol/ \overline{SD} pin also functions as the control pin for the LM4875's micropower shutdown feature. See the [MUTE AND SHUTDOWN FUNCTION](#) section for more information.

Like all volume controls, the Lm4875's internal volume control is set while listening to an amplified signal that is applied to an external speaker. The actual voltage applied to the DC Vol/ \overline{SD} pin is a result of the volume a listener desires. As such, the volume control is designed for use in a feedback system that includes human ears and preferences. This feedback system operates quite well without the need for accurate gain. The user simply sets the volume to the desired level as determined by their ear, without regard to the actual DC voltage that produces the volume. Therefore, the accuracy of the volume control is not critical, as long as volume changes monotonically and step size is small enough to reach a desired volume that is not too loud or too soft. Since gain accuracy is not critical, there may be a volume variation from part-to-part even with the same applied DC control voltage. The gain of a given LM4875 can be set with a fixed external voltage, but another LM4875 may require a different control voltage to achieve the same gain. [Figure 26](#) is a curve showing the volume variation of seven typical LM4875s as the voltage applied to the DC Vol/ \overline{SD} pin is varied. For gains between -20dB and +16dB, the typical part-to-part variation is typically ± 1 dB for a given control voltage.

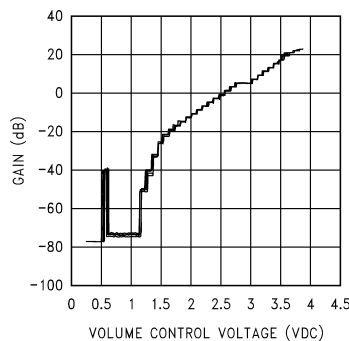


Figure 26. Typical Part-to-Part Gain Variation as a Function of DC-Vol Control Voltage

MUTE AND SHUTDOWN FUNCTION

The LM4875's mute and shutdown functions are controlled through the DC Vol/ \overline{SD} pin. Mute is activated by applying a voltage in the range of 500mV to 1V. A typical attenuation of 75dB is achieved while mute is active. The LM4875's micropower shutdown mode turns off the amplifier's bias circuitry. The micropower shutdown mode is activated by applying less than 300mV_{DC} to the DC Vol/ \overline{SD} pin. When shutdown is active, the supply current is reduced to 0.7 μ A (typ). A degree of uncertainty exists when the voltage applied to the DC Vol/ \overline{SD} pin is in the range of 300mV to 500mV. The LM4875 can be in mute, still fully powered, or in micropower shutdown and fully muted. In mute mode, the LM4875 draws the typical quiescent supply current. The DC Vol/ \overline{SD} pin should be tied to GND for best shutdown mode performance. As the DC Vol/ \overline{SD} is increased above 0.5V the amplifier will follow the attenuation curve in [TYPICAL PERFORMANCE CHARACTERISTICS](#).

HP-Sense FUNCTION

Applying a voltage between 4V and V_{CC} to the LM4875's HP-Sense headphone control pin turns off Amp2 and mutes a bridged-connected load. Quiescent current consumption is reduced when the IC is in this single-ended mode.

Figure 27 shows the implementation of the LM4875's headphone control function. With no headphones connected to the headphone jack, the R1-R2 voltage divider sets the voltage applied to the HP-Sense pin (pin 3) at approximately 50mV. This 50mV enables the LM4875 and places it in bridged mode operation.

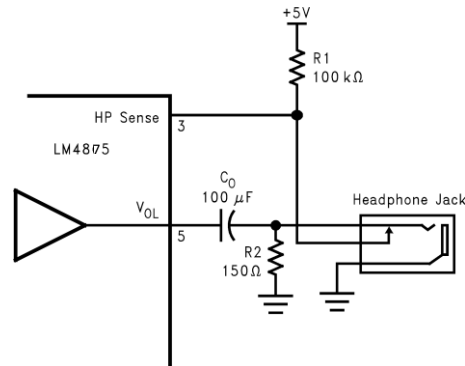


Figure 27. Headphone Circuit

While the LM4875 operates in bridged mode, the DC potential across the load is essentially 0V. Since the HP-Sense threshold is set at 4V, even in an ideal situation, the output swing cannot cause a false single-ended trigger. Connecting headphones to the headphone jack disconnects the headphone jack contact pin from V_{O1} and allows R1 to pull the HP Sense pin up to V_{CC} . This enables the headphone function, turns off Amp2, and mutes the bridged speaker. The amplifier then drives the headphones, whose impedance is in parallel with resistor R2. Resistor R2 has negligible effect on output drive capability since the typical impedance of headphones is 32Ω. The output coupling capacitor blocks the amplifier's half supply DC voltage, protecting the headphones.

A microprocessor or a switch can replace the headphone jack contact pin. When a microprocessor or switch applies a voltage greater than 4V to the HP Sense pin, a bridge-connected speaker is muted and Amp1 drives the headphones.

PROPERLY SELECTING EXTERNAL COMPONENTS

Optimizing the LM4875's performance requires properly selecting external components. Though the LM4875 operates well when using external components having wide tolerances, the best performance is achieved by optimizing component values.

Input Capacitor Value Selection

Amplification of the lowest audio frequencies requires high value input coupling capacitors. These high value capacitors can be expensive and may compromise space efficiency in portable designs. In many cases, however, the speakers used in portable systems, whether internal or external, have little ability to reproduce signals below 150Hz. In application 5 using speakers with this limited frequency response, a large input capacitor will offer little improvement in system performance.

Figure 1 shows that the nominal input impedance (R_{IN}) is 10kΩ at maximum volume and 110kΩ at minimum volume. Together, the input capacitor, C_i , and R_{IN} , produce a -3dB high pass filter cutoff frequency that is found using Equation 4.

$$f_{-3\text{ dB}} = \frac{1}{2\pi R_{IN} C_i} \quad (4)$$

As the volume changes from minimum to maximum, R_{IN} decrease from 110k Ω to 10k Ω . Equation 4 reveals that the -3dB frequency will increase as the volume increases. The nominal value of C_i for lowest desired frequency response should be calculated with $R_{IN} = 10k\Omega$. As an example when using a speaker with a low frequency limit of 150Hz, C_i , using Equation 4 is 0.1 μ F. The 0.22 μ F C_i shown in Figure 1 is optimized for a speaker whose response extends down to 75Hz.

Bypass Capacitor Value Selection

Besides minimizing the input capacitor size, careful consideration should be paid to value of the bypass capacitor C_B . Since C_B determines how fast the LM4875 turns on, its value is the most critical when minimizing turn-on pops. The slower the LM4875's outputs ramp to their quiescent DC voltage (nominally $V_{DD}/2$), the smaller the turn-on pop. Choosing C_B equal to 1.0 μ F, along with a small value of C_i (in the range of 0.1 μ F to 0.39 μ F), produces a clickless and popless shutdown function. Choosing C_i as small as possible helps minimize clicks and pops.

CLICK AND POP CIRCUITRY

The LM4875 contains circuitry that minimizes turn-on and shutdown transients or "clicks and pops". For this discussion, turn-on refers to either applying the power supply voltage or when the shutdown mode is deactivated. While the power supply is ramping to its final value, the LM4875's internal amplifiers are configured as unity gain buffers. An internal current source changes the voltage of the bypass pin in a controlled, linear manner. Ideally, the input and outputs track the voltage applied to the bypass pin. The gain of the internal amplifiers remains unity until the voltage on the bypass pin reaches 1/2 V_{DD} . As soon as the voltage on the bypass pin is stable, the device becomes fully operational and the gain is set by the external voltage applied to the DC Vol/SD pin.

Although the bypass pin current cannot be modified, changing the size of C_B alters the device's turn-on time and the magnitude of "clicks and pops". Increasing the value of C_B reduces the magnitude of turn-on pops. However, this presents a tradeoff: as the size of C_B increases, the turn-on time increases. There is a linear relationship between the size of C_B and the turn-on time. Shown below are some typical turn-on times for various values of C_B :

| C_B | T_{ON} |
|--------------|----------|
| 0.01 μ F | 3ms |
| 0.1 μ F | 30ms |
| 0.22 μ F | 65ms |
| 0.47 μ F | 135ms |
| 1.0 μ F | 280ms |

In order eliminate "clicks and pops", all capacitors must be discharged before turn-on. Rapidly switching V_{DD} may not allow the capacitors to fully discharge, which may cause "clicks and pops". In a single-ended configuration, the output coupling capacitor, C_{OUT} , is of particular concern. This capacitor discharges through an internal 20k Ω resistor. Depending on the size of C_{OUT} , the time constant can be relatively large. To reduce transients in single-ended mode, an external 1k Ω - 5k Ω resistor can be placed in parallel with the internal 20k Ω resistor. The tradeoff for using this resistor is increased quiescent current.

RECOMMENDED PRINTED CIRCUIT BOARD LAYOUT

Figure 28 through Figure 30 show the recommended two-layer PC board layout that is optimized for the SOIC-8 packaged LM4875 and associated external components. Figure 31 through Figure 33 show the recommended two-layer PC board layout for the VSSOP packaged LM4875. Both layouts are designed for use with an external 5V supply, 8 Ω speakers, and 8 Ω - 32 Ω headphones. The schematic for both recommended PC board layouts is Figure 1.

Both circuit boards are easy to use. Apply a 5V supply voltage and ground to the board's V_{DD} and GND pads, respectively. Connect a speaker with an 8 Ω minimum impedance between the board's -OUT and +OUT pads. For headphone use, the layout has provisions for a headphone jack, J1. When a jack is connected as shown, inserting a headphone plug automatically switches off the external speaker.

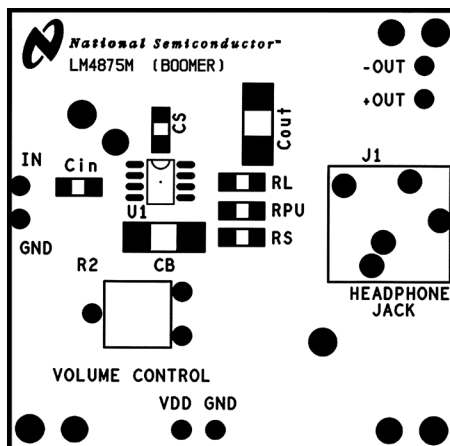


Figure 28. Recommended SOIC PC Board Layout: Component Side Silkscreen

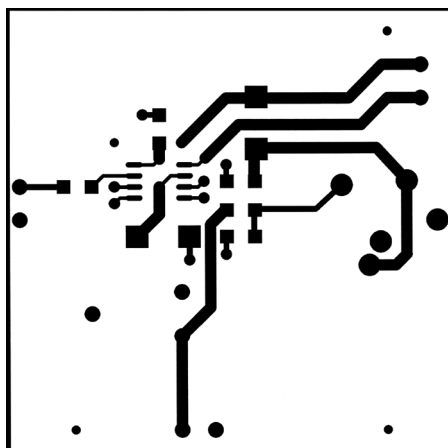


Figure 29. Recommended SOIC PC Board Layout: Component Side Layout

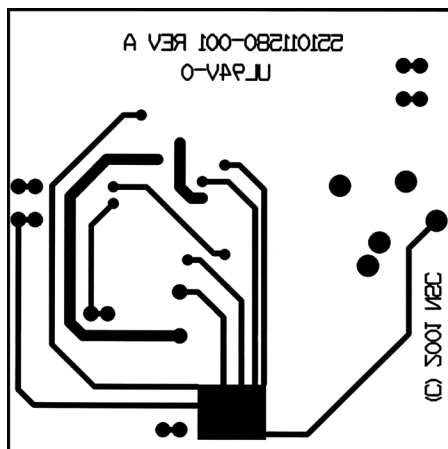


Figure 30. Recommended SOIC PC Board Layout: Bottom Side Layout

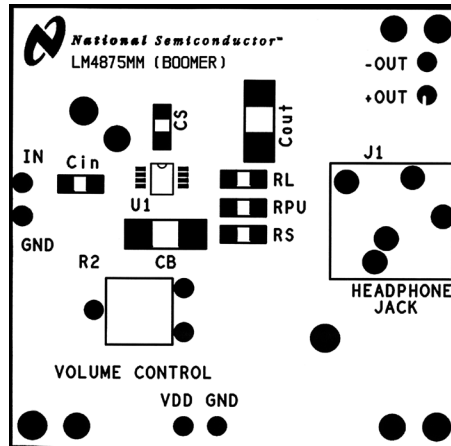


Figure 31. Recommended VSSOP PC Board Layout: Component Side Silkscreen

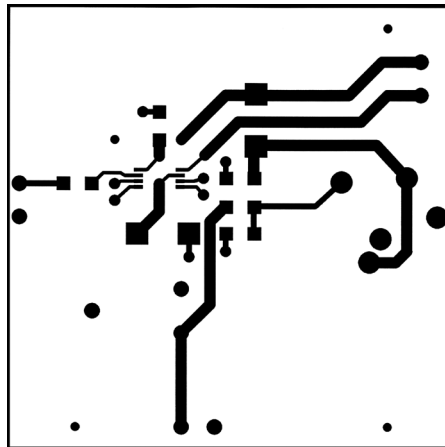


Figure 32. Recommended VSSOP PC Board Layout: Component Side Layout

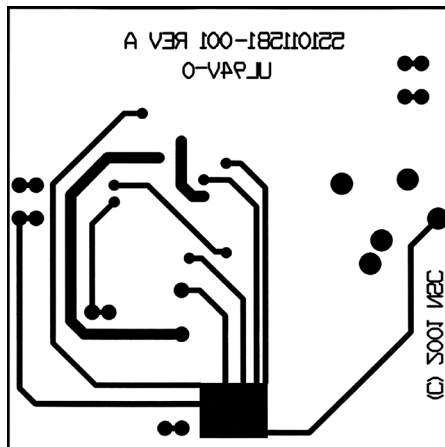


Figure 33. Recommended VSSOP PC Board Layout: Bottom Side Layout

REVISION HISTORY

| Changes from Revision B (May 2013) to Revision C | Page |
|--|-----------------|
| <hr/> <ul style="list-style-type: none">• Changed layout of National Data Sheet to TI format | <hr/> 14 |

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Top-Side Markings (4) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| LM4875M/NOPB | ACTIVE | SOIC | D | 8 | 95 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -40 to 85 | LM48 75M | Samples |
| LM4875MM/NOPB | ACTIVE | VSSOP | DGK | 8 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -40 to 85 | G75 | Samples |
| LM4875MX/NOPB | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -40 to 85 | LM48 75M | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| LM4875MM/NOPB | VSSOP | DGK | 8 | 1000 | 178.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM4875MX/NOPB | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.5 | 5.4 | 2.0 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| LM4875MM/NOPB | VSSOP | DGK | 8 | 1000 | 210.0 | 185.0 | 35.0 |
| LM4875MX/NOPB | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

| | |
|------------------------------|--|
| Audio | www.ti.com/audio |
| Amplifiers | amplifier.ti.com |
| Data Converters | dataconverter.ti.com |
| DLP® Products | www.dlp.com |
| DSP | dsp.ti.com |
| Clocks and Timers | www.ti.com/clocks |
| Interface | interface.ti.com |
| Logic | logic.ti.com |
| Power Mgmt | power.ti.com |
| Microcontrollers | microcontroller.ti.com |
| RFID | www.ti-rfid.com |
| OMAP Applications Processors | www.ti.com/omap |
| Wireless Connectivity | www.ti.com/wirelessconnectivity |

Applications

| | |
|-------------------------------|--|
| Automotive and Transportation | www.ti.com/automotive |
| Communications and Telecom | www.ti.com/communications |
| Computers and Peripherals | www.ti.com/computers |
| Consumer Electronics | www.ti.com/consumer-apps |
| Energy and Lighting | www.ti.com/energy |
| Industrial | www.ti.com/industrial |
| Medical | www.ti.com/medical |
| Security | www.ti.com/security |
| Space, Avionics and Defense | www.ti.com/space-avionics-defense |
| Video and Imaging | www.ti.com/video |

TI E2E Community

e2e.ti.com