

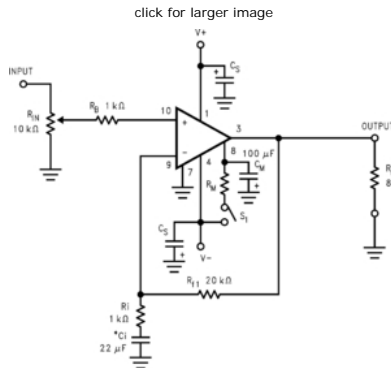


LM3876 - High-Performance 56W Audio Power Amplifier with Mute

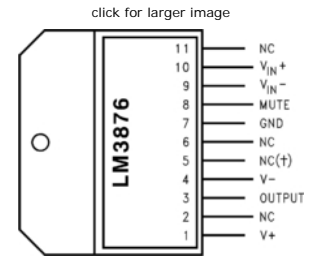
Features

- 56W continuous average output power into 8Ω
- 100W instantaneous peak output power capability
- Signal-to-Noise Ratio ≥ 95 dB(min)
- An input mute function
- Output protection from a short to ground or to the supplies via internal current limiting circuitry
- Output over-voltage protection against transients from inductive loads
- Supply under-voltage protection, not allowing internal biasing to occur when $|V_{EE}| + |V_{CC}| \leq 12V$, thus eliminating turn-on and turn-off transients
- 11-lead TO-220 package
- Wide supply range 20V - 94V

Typical Application



Connection Diagram



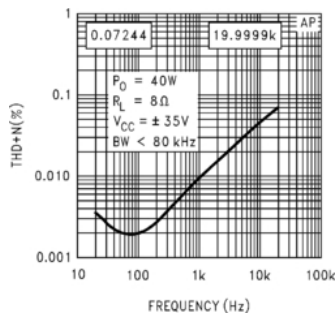
Parametric Table

Power@ 4Ohms, 1% THD	60 Watt
Power@ 8Ohms, 1% THD	45 Watt
Power@ 8Ohms, 10% THD	56 Watt
THD	0.06 %
SNR	98 dB
Channels	1 Channels
THD Conditions	Po=40W @ Vs=±35V
PSRR Conditions	Undefined
SNR Conditions	Undefined
User Supply	35 Volt
Supply Range	+24 - +84V
Mute/Shutdown	Mute
Gain Bandwidth	8 MHz
Slew Rate	11 Volts/usec
Temperature Min	-20 deg C
Temperature Max	85 deg C

Applications

- Component stereo
- Compact stereo
- Self-powered speakers
- Surround-sound amplifiers
- High-end stereo TVs

*click for larger image



RoHS Compliance Information

LM3876 Overture™ Audio Power Amplifier Series High-Performance 56W Audio Power Amplifier w/Mute
 LM3876 Overture™ Audio Power Amplifier Series High-Performance 56W Audio Power Amplifier w/Mute (**Japanese**)

Package Availability, Models

Part Number	Package							Factory Lead Time		Models	Std Pack Size	Package Marking Format
	Type	Pins	Spec.	MSL Rating	Peak Reflow	RoHS Report	CAD Symbols	Weeks	Qty			
LM3876T	TO-220	11	STD	1	NA	RoHS	N/A	Full production		N/A	rail of 20	NSUZXYTTE# LM3876T
			NOPB	1	NA			6 weeks	1000			
LM3876TF	ISOLATED TO220	11	NOPB	1	NA	RoHS	N/A	Full production		N/A	rail of 20	NSUZXYTTE# LM3876TF
								6 weeks	1000			

General Description

The LM3876 is a high-performance audio power amplifier capable of delivering 56W of continuous average power to an 8Ω load with 0.1% THD+N from 20Hz-20kHz.

The performance of the LM3876, utilizing its Self Peak Instantaneous Temperature (*Ke) (SPiKe™) protection circuitry, puts it in a class above discrete and hybrid amplifiers by providing an inherently, dynamically protected Safe Operating Area (SOA). SPiKe protection means that these parts are completely safeguarded at the output against overvoltage, undervoltage, overloads, including shorts to the supplies, thermal runaway, and instantaneous temperature peaks.

The LM3876 maintains an excellent signal-to-noise ratio of greater than 95dB (min) with a typical low noise floor of 2.0μV. It exhibits extremely low THD+N values of 0.06% at the rated output into the rated load over the audio spectrum, and provides excellent linearity with an IMD (SMPTE) typical rating of 0.004%.

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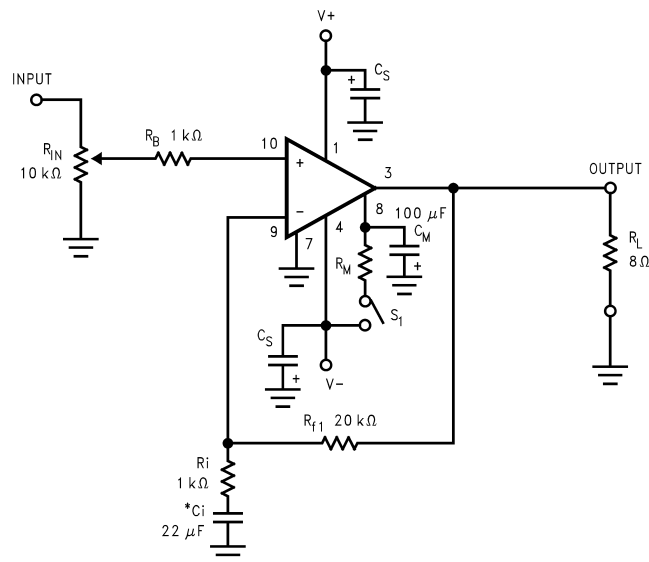
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Typical Application



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*Optional components dependent upon specific design requirements. Refer to the External Components Description section for a component functional description.

FIGURE 1. Typical Audio Amplifier Application Circuit

Overture™ and SPIKe™ Protection are trademarks of National Semiconductor Corporation.

Absolute Maximum Ratings (Notes 4,

5)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage $IV^+ + IV^-$ (No Signal)	94V
Supply Voltage $IV^+ + IV^-$ (Input Signal)	84V
Common Mode Input Voltage (V^+ or V^-) and $IV^+ + IV^- \leq 80V$	
Differential Input Voltage	60V
Output Current	Internally Limited
Power Dissipation (Note 6)	125W
ESD Susceptibility (Note 7)	3000V
Junction Temperature (Note 8)	150°C
Soldering Information	
T Package (10 seconds)	260°C

Storage Temperature -40°C to $+150^\circ\text{C}$

Thermal Resistance

 θ_{JC} 1°C/W θ_{JA} 43°C/W**Operating Ratings** (Notes 4, 5)

Temperature Range

 $T_{MIN} \leq T_A \leq T_{MAX}$ $-20^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ Supply Voltage $IV^+ + IV^-$ 24V to 84V

Note 1: Operation is guaranteed up to 84V, however, distortion may be introduced from **SPiKe** Protection Circuitry when operating above 70V if proper thermal considerations are not taken into account. Refer to the **Thermal Considerations** section for more information.

(See **SPiKe** Protection Response)**Electrical Characteristics** (Notes 4, 5)

The following specifications apply for $V^+ = +35V$, $V^- = -35V$, $I_{MUTE} = -0.5\text{ mA}$ with $R_L = 8\Omega$ unless otherwise specified. Limits apply for $T_A = 25^\circ\text{C}$.

Symbol	Parameter	Conditions	LM3876		Units (Limits)
			Typical (Note 9)	Limit (Note 10)	
$IV^+ + IV^-$	Power Supply Voltage (Note 13)	$V_{pin7} - V^- \geq 9V$	18	24 84	V (min) V (max)
A_M	Mute Attenuation	Pin 8 Open or at 0V, Mute: On Current out of Pin 8 > 0.5 mA, Mute: Off	120	80	dB (min)
P_O (Note 3)	Output Power (Continuous Average)	THD + N = 0.1% (max) $f = 1\text{ kHz}; f = 20\text{ kHz}$	56	40	W (min)
Peak P_O	Instantaneous Peak Output Power		100		W
THD + N	Total Harmonic Distortion Plus Noise	40W, $20\text{ Hz} \leq f \leq 20\text{ kHz}$ $A_V = 26\text{ dB}$	0.06		%
SR (Note 3)	Slew Rate (Note 12)	$V_{IN} = 1.2\text{ V}_{rms}$, $f = 10\text{ kHz}$, Square-Wave, $R_L = 2\text{ k}\Omega$	11	5	V/ μs (min)
I^+ (Note 2)	Total Quiescent Power Supply Current	$V_{CM} = 0V$, $V_O = 0V$, $I_o = 0A$, $I_{mute} = 0A$	30	70	mA (max)
V_{OS} (Note 2)	Input Offset Voltage	$V_{CM} = 0V$, $I_o = 0\text{ mA}$	1	15	mV (max)
I_B	Input Bias Current	$V_{CM} = 0V$, $I_o = 0\text{ mA}$	0.2	1	μA (max)
I_{OS}	Input Offset Current	$V_{CM} = 0V$, $I_o = 0\text{ mA}$	0.01	0.2	μA (max)
I_o	Output Current Limit	$IV^+ + IV^- = 12V$, $t_{ON} = 10\text{ ms}$, $V_O = 0V$	6	4	A (min)
V_{od} (Note 2)	Output Dropout Voltage (Note 14)	$IV^+ - V_O$, $V^+ = 20V$, $I_o = +100\text{ mA}$ $IV_O - V^-$, $V^- = -20V$, $I_o = -100\text{ mA}$	1.6 2.7	5 5	V (max) V (max)
PSRR (Note 2)	Power Supply Rejection Ratio	$V^+ = 40V$ to $20V$, $V^- = -40V$, $V_{CM} = 0V$, $I_o = 0\text{ mA}$ $V^+ = 40V$, $V^- = -40V$ to $-20V$, $V_{CM} = 0V$, $I_o = 0\text{ mA}$	120 120	85 85	dB (min) dB (min)
CMRR (Note 2)	Common Mode Rejection Ratio	$V^+ = 60V$ to $20V$, $V^- = -20V$ to $-60V$, $V_{CM} = 20V$ to $-20V$, $I_o = 0\text{ mA}$	120	80	dB (min)
A_{VOL} (Note 2)	Open Loop Voltage Gain	$IV^+ + IV^- = 40V$, $R_L = 2\text{ k}\Omega$, $\Delta V_O = 60V$	120	90	dB (min)

Electrical Characteristics (Notes 4, 5) (Continued)

The following specifications apply for $V^+ = +35V$, $V^- = -35V$, $I_{MUTE} = -0.5 \text{ mA}$ with $R_L = 8\Omega$ unless otherwise specified. Limits apply for $T_A = 25^\circ\text{C}$.

Symbol	Parameter	Conditions	LM3876		Units (Limits)
			Typical (Note 9)	Limit (Note 10)	
GBWP	Gain-Bandwidth Product	$ V^+ = V^- = 40V$ $f_O = 100 \text{ kHz}$, $V_{IN} = 50 \text{ mVrms}$	8	2	MHz (min)
e_{IN} (Note 3)	Input Noise	IHF—A Weighting Filter $R_{IN} = 600\Omega$ (Input Referred)	2.0	8	μV (max)
SNR	Signal-to-Noise Ratio	$P_O = 1W$, A-Weighted, Measured at 1 kHz, $R_S = 25\Omega$	98		dB
		$P_O = 40W$, A-Weighted, Measured at 1 kHz, $R_S = 25\Omega$	114		dB
		$P_{pk} = 100W$, A-Weighted, Measured at 1 kHz, $R_S = 25\Omega$	122		dB
IMD	Intermodulation Distortion Test	60 Hz, 7 kHz, 4:1 (SMPTE) 60 Hz, 7 kHz, 1:1 (SMPTE)	0.004 0.006		%

Note 2: DC Electrical Test; refer to Test Circuit #1.

Note 3: AC Electrical Test; refer to Test Circuit #2.

Note 4: All voltages are measured with respect to the GND pin (pin 7), unless otherwise specified.

Note 5: 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 guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 6: For operating at case temperatures above 25°C , the device must be derated based on a 150°C maximum junction temperature and a thermal resistance of $\theta_{JC} = 1.0^\circ\text{C/W}$ (junction to case). Refer to the Thermal Resistance figure in the Application Information section under Thermal Considerations.

Note 7: Human body model, 100 pF discharged through a 1.5 k Ω resistor.

Note 8: The operating junction temperature maximum is 150°C , however, the instantaneous Safe Operating Area temperature is 250°C .

Note 9: Typical values are measured at 25°C and represent the parametric norm.

Note 10: Limits are guaranteed to National's AOQL (Average Outgoing Quality Level).

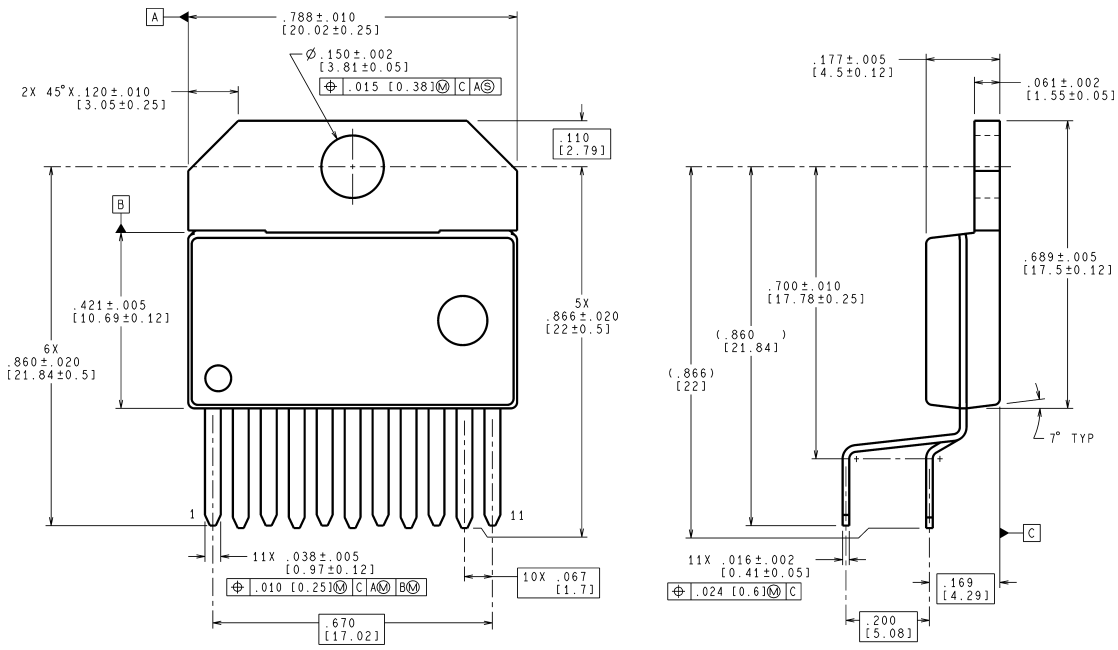
Note 11: The LM3876T package TA11B is a non-isolated package, setting the tab of the device and the heat sink at V^- potential when the LM3876 is directly mounted to the heat sink using only thermal compound. If a mica washer is used in addition to thermal compound, θ_{CS} (case to sink) is increased, but the heat sink will be isolated from V^- .

Note 12: The feedback compensation network limits the bandwidth of the closed-loop response and so the slew rate will be reduced due to the high frequency roll-off. Without feedback compensation, the slew rate is typically 16V/ μs .

Note 13: V^- must have at least $-9V$ at its pin with reference to ground in order for the under-voltage protection circuitry to be disabled.

Note 14: The output dropout voltage is the supply voltage minus the clipping voltage. Refer to the Clipping Voltage vs Supply Voltage graph in the Typical Performance Characteristics section.

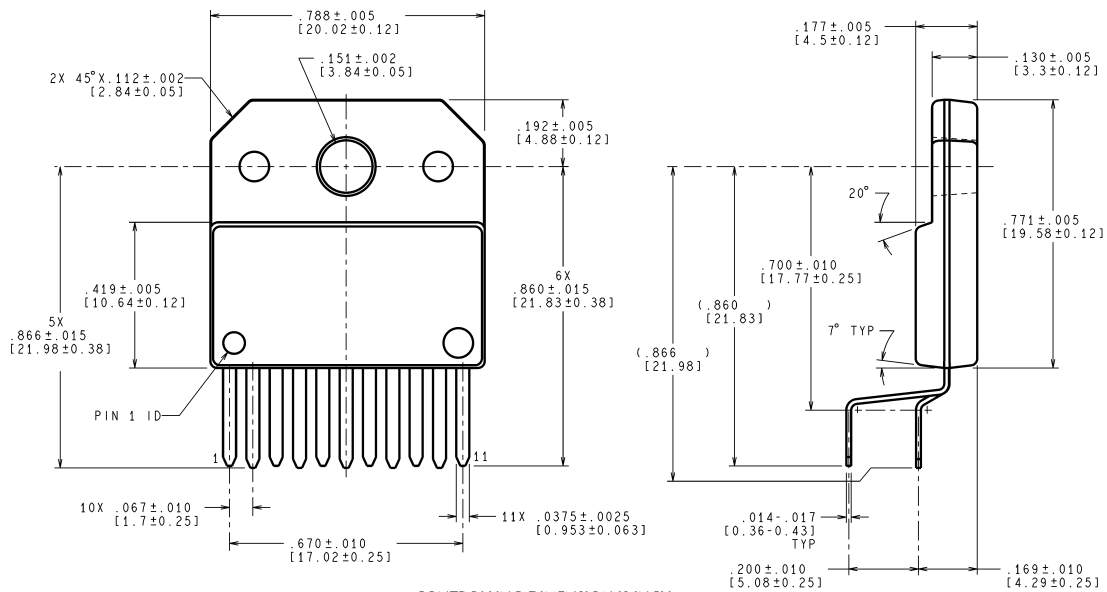
Physical Dimensions inches (millimeters) unless otherwise noted



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 VALUES IN [] ARE MILLIMETERS

TA11B (Rev B)

Order Number LM3876T
NS Package Number TA11B



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TF11B (Rev D)

Order Number LM3876TF
NS Package Number TF11B