LM1876 - Overture Audio Power Amplifier Series Dual 20-Watt Audio Power Amplifier with Mute and Standby Modes

Features

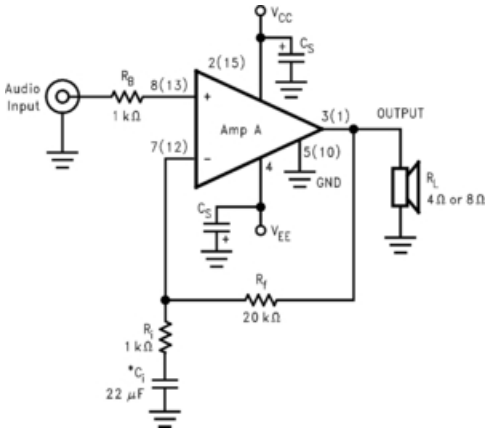
- SPiKe protection
- Minimal amount of external components necessary
- Quiet fade-in/out mute mode
- Standby-mode
- Isolated 15-lead TO-220 package
- Non-Isolated 15-lead TO-220 package
- Wide supply range 20V - 64V

Key Specification

	THD+N at 1kHz at 2 x 15W continuous average	
	output power into 4Ω or 8Ω:	0.1% (max)
	THD+N at 1kHz at continuous average	
	output power of 2 x 20W into 8Ω:	0.009% (typ)
	Standby current:	4.2mA (typ)

Typical Application

click for larger image

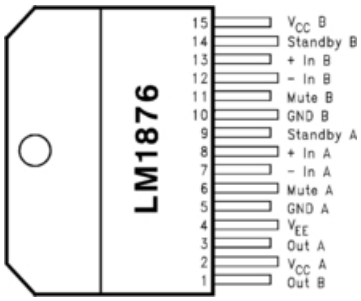


Parametric Table

Power@ 4Ohms, 1% THD	23 Watt
Power@ 8Ohms, 1% THD	20 Watt
Power@ 4Ohms, 10% THD	29 Watt
Power@ 8Ohms, 10% THD	26 Watt
THD	0.08 %
Channels	2 Channels
THD Conditions	Po=15W @ Vs=20V
PSRR Conditions	Undefined

Connection Diagram

click for larger image



SNR Conditions	Undefined

Typical Performance

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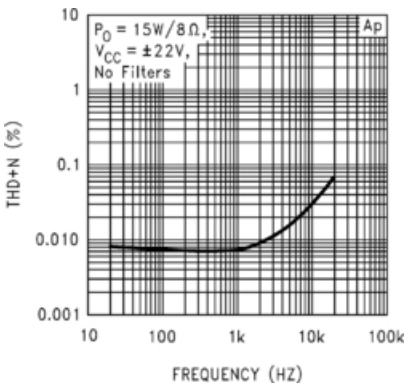

Applications

- High-end stereo TVs
- Component stereo
- Compact stereo

Datasheet

RoHS Compliance Information
LM1876 Overture Audio Power Amplifier Series Dual 20W Audio Power Amplifier with Mute and Standby Modes
LM1876 Overture Audio Power Amplifier Series Dual 20W Audio Power Amplifier with Mute and Standby Modes (**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						
LM1876T	TO-220	15	STD	1	NA	RoHS	N/A	Full production		N/A				rail of 20	NSUZXYTTE# LM1876T
			NOPB	1	NA			6 weeks	500						
LM1876TF	ISOLATED TO220	15	STD	1	NA	RoHS	N/A	Full production		N/A				rail of 20	NSUZXYTTE# LM1876TF
			NOPB	1	NA			6 weeks	1000						

General Description

The LM1876 is a stereo audio amplifier capable of delivering typically 20W per channel of continuous average output power into a 4Ω or 8Ω load with less than 0.1% THD+N.

Each amplifier has an independent smooth transition fade-in/out mute and a power conserving standby mode which can be controlled by external logic.

The performance of the LM1876, utilizing its Self Peak Instantaneous Temperature (°Ke) (**SPiKe**™) protection circuitry, places 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 safeguarded at the output against overvoltage, undervoltage, overloads, including thermal runaway and instantaneous temperature peaks.

Reliability Metrics

Part Number	Process	EFR Reject	EFR Sample Size	PPM *	LTA Rejects	LTA Device Hours	FITS	MTTF (Hours)
LM1876T	HV700	0	13580	0	0	1222500	3	346887713
LM1876TF	HV700	0	13580	0	0	1222500	3	346887713

National Semiconductor

LM1876 *Overture*™ Audio Power Amplifier Series Dual 20W Audio Power Amplifier with Mute and Standby Modes

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Dual 20W Audio Power Amplifier with Mute and Standby Modes

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Key Specifications

- THD+N at 1kHz at 2 x 15W continuous average output power into 4Ω or 8Ω: 0.1% (max)
- THD+N at 1kHz at continuous average output power of 2 x 20W into 8Ω: 0.009% (typ)
- Standby current: 4.2mA (typ)

Features

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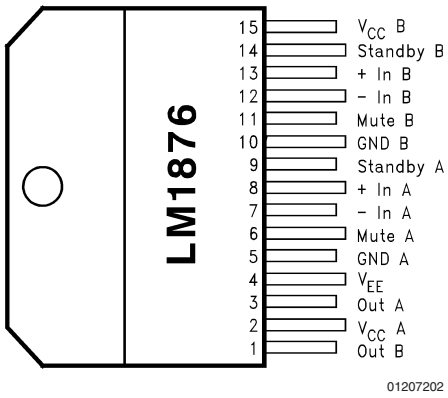
- Minimal amount of external components necessary
- Quiet fade-in/out mute mode
- Standby-mode
- Isolated 15-lead TO-220 package
- Non-Isolated 15-lead TO-220 package
- Wide supply range 20V - 64V

Applications

- High-end stereo TVs
- Component stereo
- Compact stereo

Connection Diagram

Plastic Package



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Top View
Isolated Package
Order Number LM1876TF
See NS Package Number TF15B
Non-Isolated Package
Order Number LM1876T
See NS Package Number TA15A

SPiKe™ Protection and **Overture™** are trademarks of National Semiconductor Corporation.

 DS012072

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 $\|V_{CC}\| + \|V_{EE}\|$ (No Input)	64V
Supply Voltage $\|V_{CC}\| + \|V_{EE}\|$ (with Input)	64V
Common Mode Input Voltage	(V_{CC} or V_{EE}) and $\|V_{CC}\| + \|V_{EE}\| \leq$ 54V
Differential Input Voltage	54V
Output Current	Internally Limited
Power Dissipation (Note 6)	62.5W
ESD Susceptability (Note 7)	2000V
Junction Temperature (Note 8)	150˚C
Thermal Resistance	
Isolated TF-Package	
θ_{JC}	2˚C/W
Non-Isolated T-Package	
θ_{JC}	1˚C/W
Soldering Information	
TF Package (10 sec.)	260˚C
Storage Temperature	−40˚C to +150˚C

Operating Ratings (Notes 4, 5)

Temperature Range	
$T_{MIN} \leq T_A \leq T_{MAX}$	−20˚C ≤ T_A ≤ +85˚C
Supply Voltage $\|V_{CC}\| + \|V_{EE}\|$ (Note 1)	20V to 64V

Electrical Characteristics (Notes 4, 5)

The following specifications apply for V_{CC} = +22V, V_{EE} = −22V with R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25˚C.

Symbol	Parameter	Conditions	LM1876		Units (Limits)
			Typical (Note 9)	Limit (Note 10)	
$\|V_{CC}\| + \|V_{EE}\|$	Power Supply Voltage (Note 11)	GND − V_{EE} ≥ 9V		20 64	V (min) V (max)
P_O (Note 3)	Output Power (Continuous Average)	THD + N = 0.1% (max), f = 1 kHz			
		$\|V_{CC}\| = \|V_{EE}\|$ = 22V, R_L = 8Ω	20	15	W/ch (min)
		$\|V_{CC}\| = \|V_{EE}\|$ = 20V, R_L = 4Ω (Note 13)	22	15	W/ch (min)
THD + N	Total Harmonic Distortion Plus Noise	15 W/ch, R_L = 8Ω	0.08		%
		15 W/ch, R_L = 4Ω, $\|V_{CC}\| = \|V_{EE}\|$ = 20V	0.1		%
		20 Hz ≤ f ≤ 20 kHz, A_V = 26 dB			
X_{talk}	Channel Separation	f = 1 kHz, V_O = 10.9 Vrms	80		dB
SR (Note 3)	Slew Rate	V_{IN} = 1.414 Vrms, t_{rise} = 2 ns	18	12	V/µs (min)
I_{total} (Note 2)	Total Quiescent Power Supply Current	Both Amplifiers V_{CM} = 0V, V_O = 0V, I_O = 0 mA			
		Standby: Off	50	80	mA (max)
		Standby: On	4.2	6	mA (max)
V_{OS} (Note 2)	Input Offset Voltage	V_{CM} = 0V, I_O = 0 mA	2.0	15	mV (max)
I_B	Input Bias Current	V_{CM} = 0V, I_O = 0 mA	0.2	0.5	µA (max)
I_{OS}	Input Offset Current	V_{CM} = 0V, I_O = 0 mA	0.002	0.2	µA (max)
I_O	Output Current Limit	$\|V_{CC}\| = \|V_{EE}\|$ = 10V, t_{ON} = 10 ms, V_O = 0V	3.5	2.9	Apk (min)
V_{OD} (Note 2)	Output Dropout Voltage (Note 12)	$\|V_{CC} - V_O\|$, V_{CC} = 20V, I_O = +100 mA	1.8	2.3	V (max)
		$\|V_O - V_{EE}\|$, V_{EE} = −20V, I_O = −100 mA	2.5	3.2	V (max)
PSRR (Note 2)	Power Supply Rejection Ratio	V_{CC} = 25V to 10V, V_{EE} = −25V, V_{CM} = 0V, I_O = 0 mA	115	85	dB (min)
		V_{CC} = 25V, V_{EE} = −25V to −10V, V_{CM} = 0V, I_O = 0 mA	110	85	dB (min)

Electrical Characteristics (Notes 4, 5) (Continued)

The following specifications apply for V_{CC} = +22V, V_{EE} = −22V with R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25˚C.

Symbol	Parameter	Conditions	LM1876		Units (Limits)
			Typical (Note 9)	Limit (Note 10)	
CMRR (Note 2)	Common Mode Rejection Ratio	V_{CC} = 35V to 10V, V_{EE} = −10V to −35V, V_{CM} = 10V to −10V, I_O = 0 mA	110	80	dB (min)
A_{VOL} (Note 2)	Open Loop Voltage Gain	R_L = 2 kΩ, Δ V_O = 20 V	110	90	dB (min)
GBWP	Gain Bandwidth Product	f_O = 100 kHz, V_{IN} = 50 mVrms	7.5	5	MHz (min)
e_{IN} (Note 3)	Input Noise	IHF—A Weighting Filter R_{IN} = 600Ω (Input Referred)	2.0	8	μV (max)
SNR	Signal-to-Noise Ratio	P_O = 1W, A—Weighted, Measured at 1 kHz, R_S = 25Ω P_O = 15W, A—Weighted Measured at 1 kHz, R_S = 25Ω	98 108		dB dB
A_M	Mute Attenuation	Pin 6,11 at 2.5V	115	80	dB (min)
Standby Pin					
V_{IL}	Standby Low Input Voltage	Not in Standby Mode		0.8	V (max)
V_{IH}	Standby High Input Voltage	In Standby Mode	2.0	2.5	V (min)
Mute pin					
V_{IL}	Mute Low Input Voltage	Outputs Not Muted		0.8	V (max)
V_{IH}	Mute High Input Voltage	Outputs Muted	2.0	2.5	V (min)

Note 1: Operation is guaranteed up to 64V, however, distortion may be introduced from **SPiKe** Protection Circuitry if proper thermal considerations are not taken into account. Refer to the Application Information section for a complete explanation.

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 pins (5, 10), 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 θ_{JC} = 2˚C/W (junction to case) for the TF package and θ_{JC} = 1˚C/W for the T package. Refer to the section Determining the Correct Heat Sink in the Application Information section.

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

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

Note 9: Typicals are measured at 25˚C and represent the parametric norm.

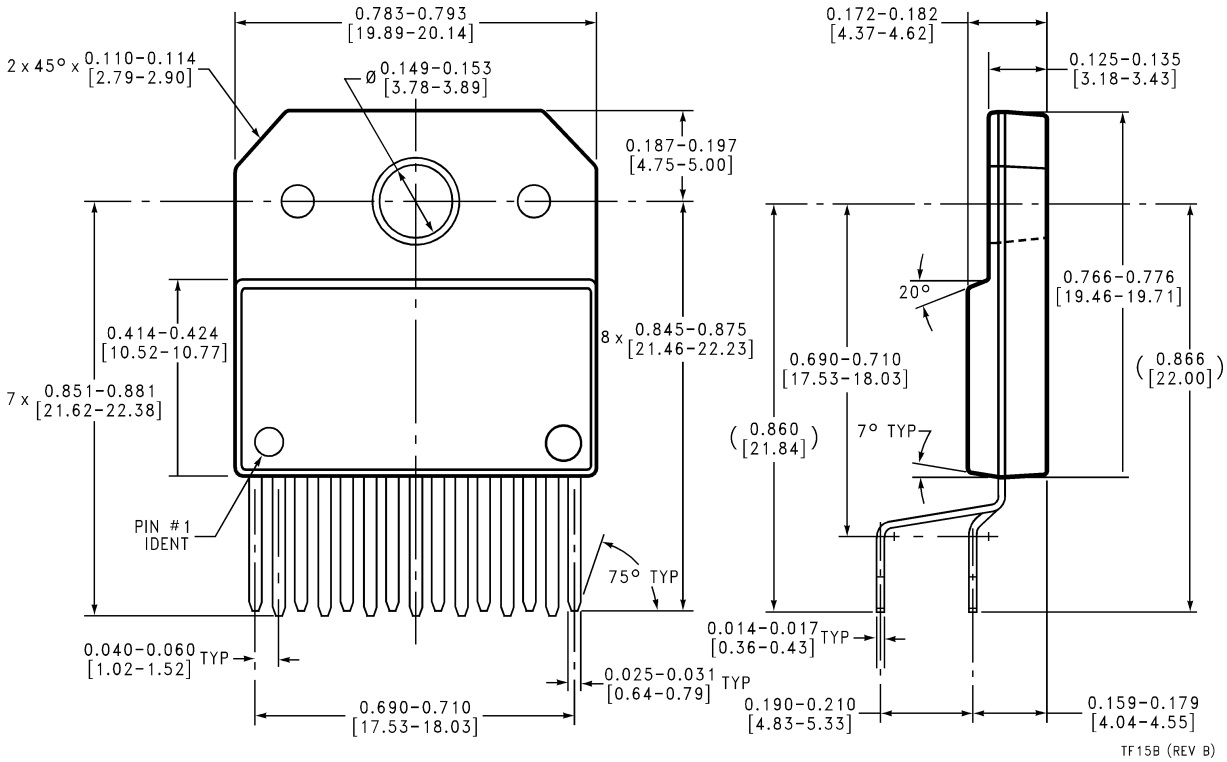
Note 10: Limits are guarantees that all parts are tested in production to meet the stated values.

Note 11: V_{EE} must have at least −9V at its pin with reference to ground in order for the under-voltage protection circuitry to be disabled. In addition, the voltage differential between V_{CC} and V_{EE} must be greater than 14V.

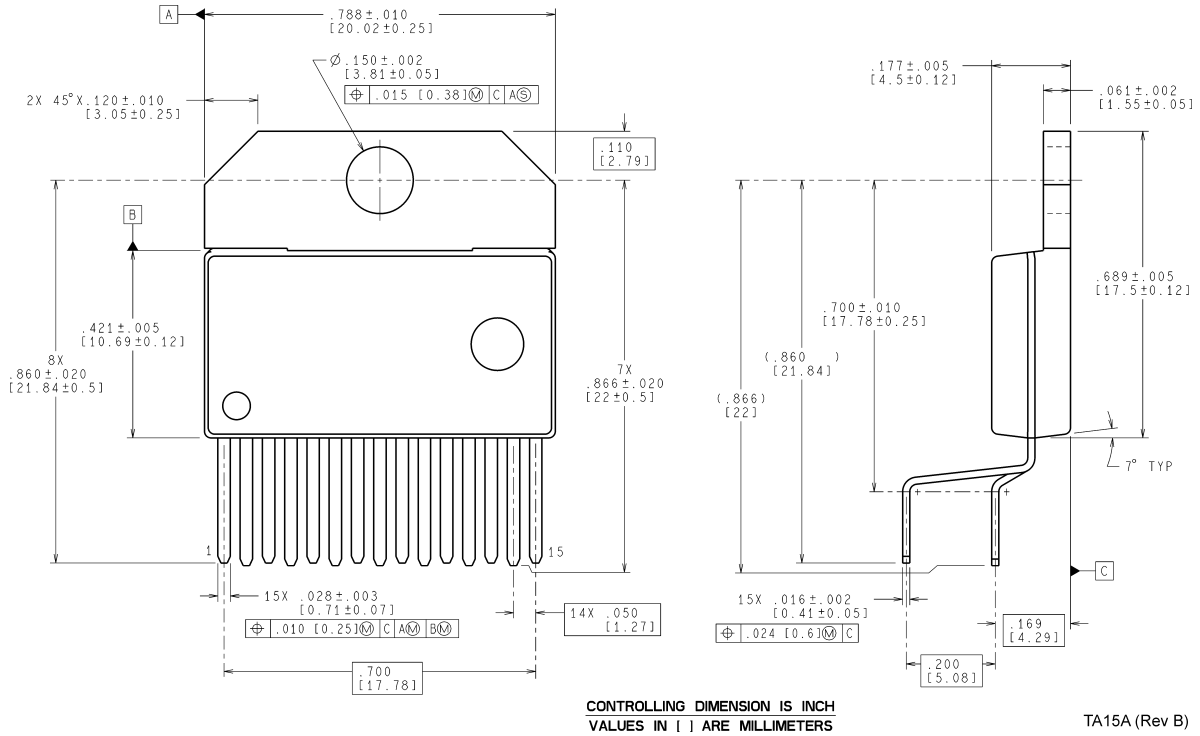
Note 12: The output dropout voltage, V_{OD}, is the supply voltage minus the clipping voltage. Refer to the Clipping Voltage vs. Supply Voltage graph in the Typical Performance Characteristics section.

Note 13: For a 4Ω load, and with ±20V supplies, the LM1876 can deliver typically 22W of continuous average output power with less than 0.1% (THD + N). With supplies above ±20V, the LM1876 cannot deliver more than 22W into a 4Ω due to current limiting of the output transistors. Thus, increasing the power supply above ±20V will only increase the internal power dissipation, not the possible output power. Increased power dissipation will require a larger heat sink as explained in the Application Information section.

Physical Dimensions inches (millimeters) unless otherwise noted



Isolated TO-220 15-Lead Package
Order Number LM1876TF
NS Package Number TF15B



Non-Isolated TO-220 15-Lead Package
Order Number LM1876T
NS Package Number TA15A