LM3886 - High-Performance 68W Audio Power Amplifier with Mute

Features

- 68W cont. avg. output power into 4Ω at V_{CC} = ±28V
- 38W cont. avg. output power into 8Ω at V_{CC} = ±28V
- 50W cont. avg. output power into 8Ω at V_{CC} = ±35V
- 135W instantaneous peak output power capability
- Signal-to-Noise Ratio >= 92dB
- 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 $|V_{EE}| + |V_{CC}|$ <= 12V, thus eliminating turn-on and turn-off transients
- 11-lead TO-220 package
- Wide supply range 20V - 94V

Applications

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

Typical Application

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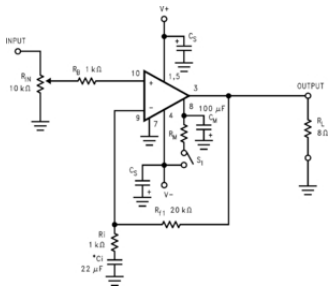

Parametric Table

Output Current	11500 mA
Offset Voltage max, 25C	10 mV
Gain Bandwidth	3 MHz
Supply Min	18 Volt
Supply Max	84 Volt
Supply Current Per Channel	50 mA
PowerWise Rating 2	16666.7 uA/MHz
Slew Rate	19 Volts/usec
Input OutputType	Not Rail to Rail
Max Input Bias Current	1000 nA
Shut down	No
Special Features	AvCl>10
Function	Op Amp
Channels	1 Channels
Temperature Min	0 deg C
Temperature Max	70 deg C

Typical Performance

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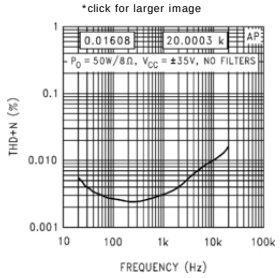

Connection Diagram

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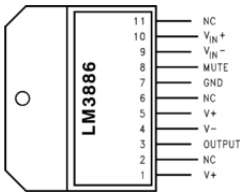

Datasheet

RoHS Compliance Information
LM3886 Overture Audio Power Amplifier Series High-Performance 68W Audio Power Amplifier w/Mute
LM3886 Overture Audio Power Amplifier Series High-Performance 68W 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						
LM3886T	TO-220	11	STD NOPB	1 1	NA NA	RoHS	N/A	Full production 6 weeks	3000	N/A				rail of 20	NSUZXYTTE# LM3886T
LM3886TF	ISOLATED TO220	11	STD NOPB	1 1	NA NA	RoHS	N/A	Full production 6 weeks	500	N/A				rail of 20	NSUZXYTTE# LM3886TF
LM3886 MDC	Unpackaged Die							Obsolete N/A	N/A	N/A				tray of N/A	-

General Description

The LM3886 is a high-performance audio power amplifier capable of delivering 68W of continuous average power to a 4Ω load and 38W into 8Ω with 0.1% THD+N from 20Hz-20kHz.

The performance of the LM3886, 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 LM3886 maintains an excellent signal-to-noise ratio of greater than 92dB with a typical low noise floor of 2.0μV. It exhibits extremely low THD+N values of 0.03% 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%.

Reliability Metrics

Part Number	Process	EFR Reject	EFR Sample Size	PPM *	LTA Rejects	LTA Device Hours	FITS	MTTF (Hours)
LM3886 MDC	HV700	0	13580	0	0	1222500	3	346887713
LM3886T	HV700	0	13580	0	0	1222500	3	346887713
LM3886TF	HV700	0	13580	0	0	1222500	3	346887713

Note: The Early Failure Rates were calculated as point estimates. The Long Term Failure Rates were calculated at 60% confidence using the Arrhenius equation at 0.7eV activation energy and derating the assumed stress temperature of 150°C to an application temperature of 55°C.

National Semiconductor

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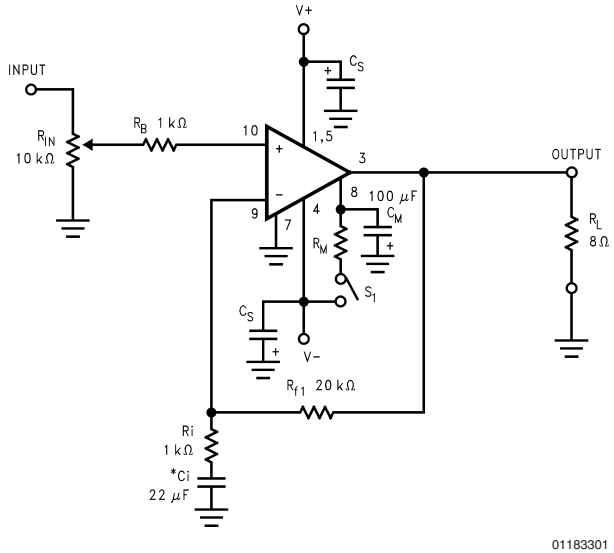


*Optional components dependent upon specific design requirements. Refer to the External Components Description section for a component functional description.

FIGURE 1. Typical Audio Amplifier Application Circuit

Absolute Maximum Ratings (Notes 6, 5)

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

Supply Voltage $\|V^+\|+\|V^-\|$ (No Signal)	94V
Supply Voltage $\|V^+\|+\|V^-\|$ (Input Signal)	84V
Common Mode Input Voltage	(V^+ or V^-) and $\|V^+\| + \|V^-\| \leq 80V$
Differential Input Voltage (Note 16)	60V
Output Current	Internally Limited
Power Dissipation (Note 7)	125W
ESD Susceptibility (Note 8)	3000V
Junction Temperature (Note 9)	150˚C
Soldering Information	
T Package (10 seconds)	260˚C
Storage Temperature	−40˚C to +150˚C
Thermal Resistance	
θ_{JC}	1˚C/W
θ_{JA}	43˚C/W

Operating Ratings (Notes 5, 6)

Temperature Range	
$T_{MIN} \leq T_A \leq T_{MAX}$	$-20˚C \leq T_A \leq +85˚C$
Supply Voltage $\|V^+\| + \|V^-\|$	20V to 84V

Electrical Characteristics (Notes 5, 6)

The following specifications apply for $V^+ = +28V$, $V^- = -28V$, $I_{MUTE} = -0.5$ mA with $R_L = 4\Omega$ unless otherwise specified. Limits apply for $T_A = 25˚C$.

Symbol	Parameter	Conditions	LM3886 Typical (Note 10)	LM3886 Limit (Note 11)	Units (Limits)
$\|V^+\| + \|V^-\|$	Power Supply Voltage (Note 14)	$V_{pin7} - V^- \geq 9V$	18	20 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	115	80	dB (min)
P_O (Note 4)	Output Power (Continuous Average)	THD + N = 0.1% (max) f = 1 kHz; f = 20 kHz $\|V^+\| = \|V^-\| = 28V$, $R_L = 4\Omega$ $\|V^+\| = \|V^-\| = 28V$, $R_L = 8\Omega$ $\|V^+\| = \|V^-\| = 35V$, $R_L = 8\Omega$	 68 38 50	 60 30	 W (min) W (min) W
Peak P_O	Instantaneous Peak Output Power		135		W
THD + N	Total Harmonic Distortion Plus Noise	60W, $R_L = 4\Omega$, 30W, $R_L = 8\Omega$, 20 Hz ≤ f ≤ 20 kHz $A_V = 26$ dB	 0.03 0.03		% %
SR (Note 4)	Slew Rate (Note 13)	$V_{IN} = 2.0$Vp-p, $t_{RISE} = 2$ ns	19	8	V/µs (min)
I^+ (Note 4)	Total Quiescent Power Supply Current	$V_{CM} = 0V$, $V_o = 0V$, $I_o = 0A$	50	85	mA (max)
V_{OS} (Note 3)	Input Offset Voltage	$V_{CM} = 0V$, $I_o = 0$ mA	1	10	mV (max)
I_B	Input Bias Current	$V_{CM} = 0V$, $I_o = 0$ mA	0.2	1	µA (max)
I_{OS}	Input Offset Current	$V_{CM} = 0V$, $I_o = 0$ mA	0.01	0.2	µA (max)
I_o	Output Current Limit	$\|V^+\| = \|V^-\| = 20V$, $t_{ON} = 10$ ms, $V_O = 0V$	11.5	7	A (min)
V_{od} (Note 3)	Output Dropout Voltage (Note 15)	$\|V^+ - V_O\|$, $V^+ = 28V$, $I_o = +100$ mA $\|V_O - V^-\|$, $V^- = -28V$, $I_o = -100$ mA	1.6 2.5	2.0 3.0	V (max) V (max)
PSRR (Note 3)	Power Supply Rejection Ratio	$V^+ = 40V$ to 20V, $V^- = -40V$, $V_{CM} = 0V$, $I_o = 0$ mA $V^+ = 40V$, $V^- = -40V$ to $-20V$, $V_{CM} = 0V$, $I_o = 0$ mA	120 105	85 85	dB (min) dB (min)

Electrical Characteristics (Notes 5, 6) (Continued)

The following specifications apply for V^+ = +28V, V^- = −28V, I_{MUTE} = −0.5 mA with R_L = 4Ω unless otherwise specified. Limits apply for T_A = 25˚C.

Symbol	Parameter	Conditions	LM3886		Units (Limits)
			Typical (Note 10)	Limit (Note 11)	
CMRR (Note 3)	Common Mode Rejection Ratio	V^+ = 60V to 20V, V^- = −20V to −60V, V_{CM} = 20V to −20V, I_o = 0 mA	110	85	dB (min)
A_{VOL} (Note 3)	Open Loop Voltage Gain	$\|V^+\| = \|V^-\|$ = 28V, R_L = 2 kΩ, ΔV_O = 40V	115	90	dB (min)
GBWP	Gain-Bandwidth Product	$\|V^+\| = \|V^-\|$ = 30V f_O = 100 kHz, V_{IN} = 50 mVrms	8	2	MHz (min)
e_{IN} (Note 4)	Input Noise	IHF—A Weighting Filter R_{IN} = 600Ω (Input Referred)	2.0	10	μV (max)
SNR	Signal-to-Noise Ratio	P_O = 1W, A-Weighted, Measured at 1 kHz, R_S = 25Ω	92.5		dB
		P_O = 60W, A-Weighted, Measured at 1 kHz, R_S = 25Ω	110		dB
IMD	Intermodulation Distortion Test	60 Hz, 7 kHz, 4:1 (SMPTE) 60 Hz, 7 kHz, 1:1 (SMPTE)	0.004 0.009		%

Note 2: Operation is guaranteed up to 84V, however, distortion may be introduced from **SPIKe** Protection Circuitry if proper thermal considerations are not taken into account. Refer to the **Thermal Considerations** section for more information. (See **SPIKe** Protection Response)

Note 3: DC Electrical Test; refer to Test Circuit #1.

Note 4: AC Electrical Test; refer to Test Circuit #2.

Note 5: All voltages are measured with respect to the GND pin (pin 7), unless otherwise specified.

Note 6: 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 7: 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} = 1.0 ˚C/W (junction to case). Refer to the Thermal Resistance figure in the Application Information section under Thermal Considerations.

Note 8: Human body model, 100 pF discharged through a 1.5 kΩ resistor.

Note 9: The operating junction temperature maximum is 150˚C, however, the instantaneous Safe Operating Area temperature is 250˚C.

Note 10: Typicals are measured at 25˚C and represent the parametric norm.

Note 11: Limits are guaranteed to National's AOQL (Average Outgoing Quality Level).

Note 12: The LM3886T package TA11B is a non-isolated package, setting the tab of the device and the heat sink at V^- potential when the LM3886 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 13: 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 larger.

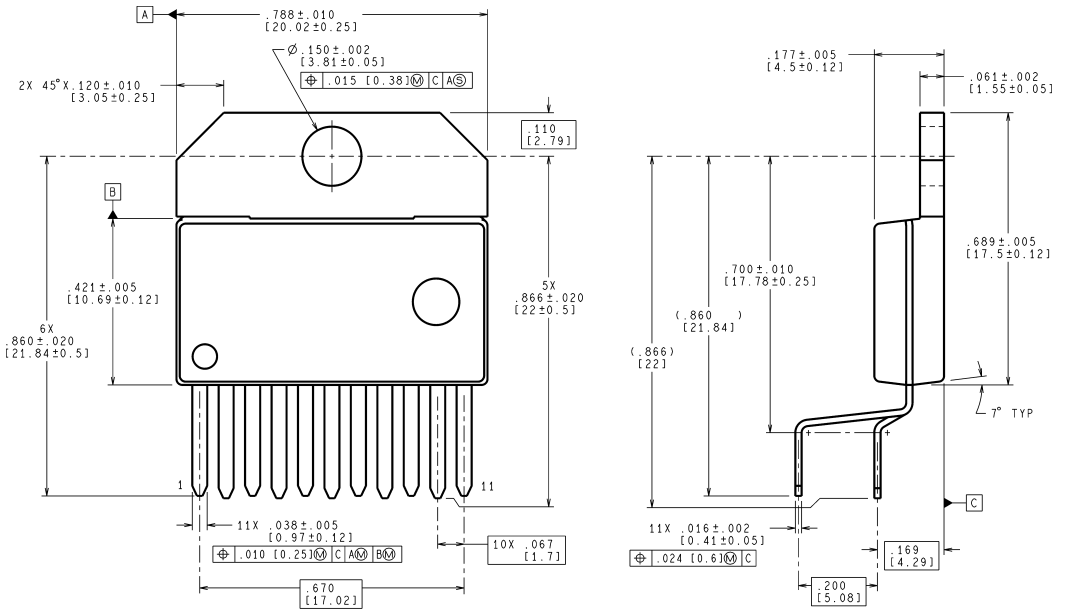
Note 14: V^- must have at least −9V at its pin with reference to ground in order for the under-voltage protection circuitry to be disabled.

Note 15: 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.

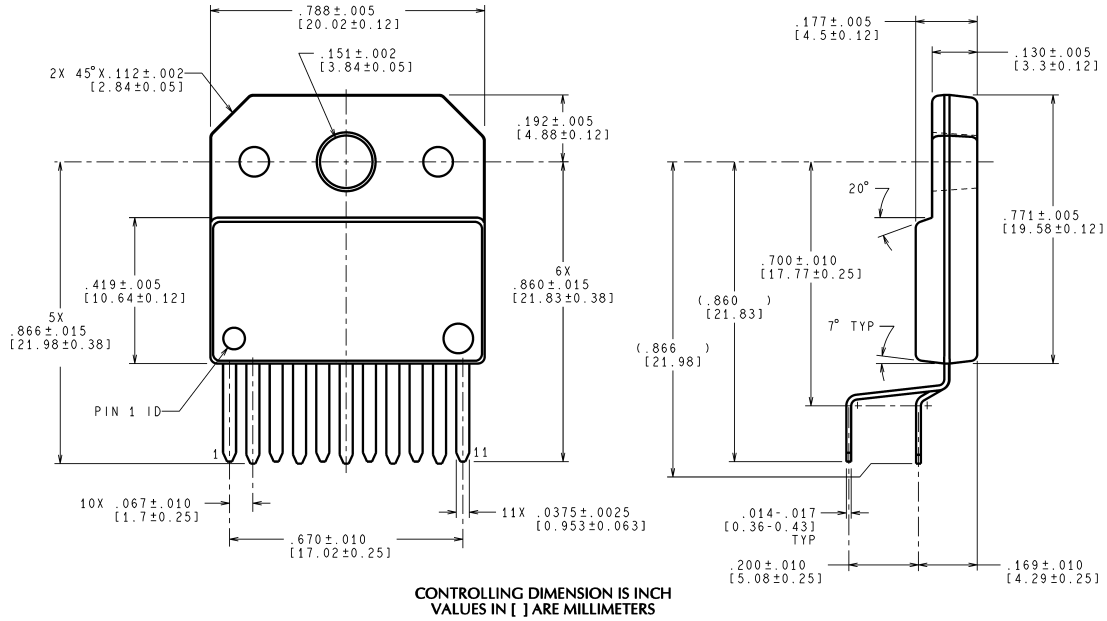
Note 16: The Differential Input Voltage Absolute Maximum Rating is based on supply voltages of V^+ = +40V and V^- = −40V.

Physical Dimensions inches (millimeters)

unless otherwise noted



Order Number LM3886T
NS Package Number TA11B



Order Number LM3886TF
NS Package Number TF11B