Low Voltage, Low Power, AudioMite™ Class-D Audio Amplifier

PRODUCTION DATA SHEET

DESCRIPTION

The MSC-LX1790 offers a patent pending, low voltage, low power, and high efficiency amplifier for driving a hearing aid receiver. It comes with three programmable gain settings of 14dB, 20dB and 26dB.

The MSC-LX1790 also comes with three output switch resistance settings to accommodate different receivers. It is delivered in bare die form.

IMPORTANT: For the most current data, consult *MICROSEMI*'s website: **http://www.microsemi.com**

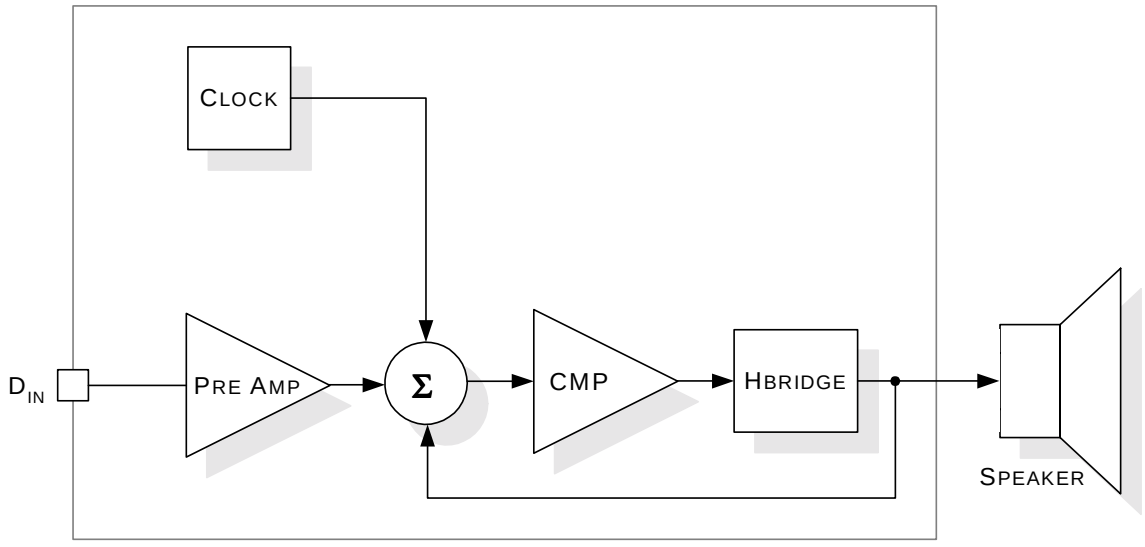
KEY FEATURES

- Low Operating Current: 100µA Typical
- Low Operating Voltage: 0.9V minimum
- 3 Gain Settings: 14, 20 & 26dB
- 3 Output Switch Resistance Settings: 48, 24 & 16 Ω
- Small Form Factor: 2.03mm^2 Bare die

APPLICATIONS

- Hearing Aid

PRODUCT HIGHLIGHT



Simplified Block Diagram

PACKAGE ORDER INFO

T_J (°C)	J Cermic Dip 14 -Pin	LM Plastic Dip 8-Pin	BD Bare Die 7-Pin
10 to 55	LX1790CJ	LX1790CLM	LX1790CBD

Rev. 1.0,2002-05-08

Microsemi
INTEGRATED PRODUCTS
5973 Avenida Encinas, Suite 101, Carlsbad 92008, Fax (760) 431-0541

LX1790

Low Voltage, Low Power, AudioMite™ Class-D Audio Amplifier

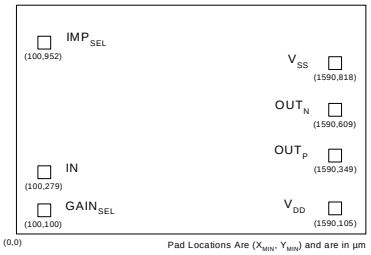
PRODUCTION DATA SHEET

ABSOLUTE MAXIMUM RATINGS

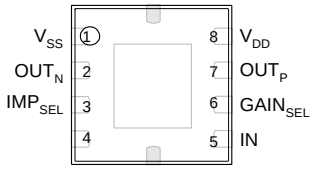
Input Logic Supply Voltage (V_{DD}) ..... -0.3V to +3.0V
Operating Temperature Range..... 10°C to 55°C

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

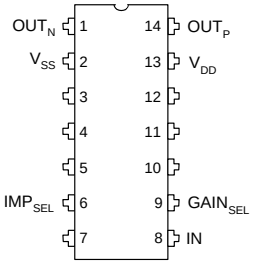
PACKAGE PIN OUT



BD
(Bottom View)



LM PACKAGE
(Top View)



J PACKAGE
(Top View)

FUNCTIONAL PIN DESCRIPTION

PIN NAME	PIN NO 8 PIN LM	PIN NO 14 PIN J	DESCRIPTION
V_{DD}	8	13	Supply Voltage
V_{SS}	1	2	Ground
IN	5	8	Analog Audio Input
OUT_P	7	14	Positive Output Voltage
OUT_N	2	1	Negative Output Voltage
$GAIN_{SEL}$	6	9	Gain Select. See Settings table below for selections.
IMP_{SEL}	3	6	Output Resistance Select. See Settings table below for selections.

SETTINGS

PIN	$GAIN_{SEL}$=VDD IMP_{SEL}=VSS	$GAIN_{SEL}$=VSS IMP_{SEL}=VDD	$GAIN_{SEL}$=Floating IMP_{SEL}=Floating
$GAIN_{SEL}$	14dB	20dB	26dB
IMP_{SEL}	16Ω	24Ω	48Ω

Microsemi
INTEGRATED PRODUCTS
5973 Avenida Encinas, Suite 101, Carlsbad 92008, Fax (760) 431-0541

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	LX1790 Min	LX1790 Typ	LX1790 Max	Units
OPERATING CONDITIONS						
Supply Voltage	V_{DD}		0.9		1.5	V
Ground	V_{SS}			0		V

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature T_A=25°C except where otherwise noted. Test conditions: V_{DD}=1.3V, V_{SS}=0V, R_{LOAD}=200Ω in Series with 60mH

Parameter	Symbol	Test Conditions	LX1790 Min	LX1790 Typ	LX1790 Max	Units
Switch Output Resistance @ Low Drive	R_{OUT-L}			48		Ω
Switch Output Resistance @ Med Drive	R_{OUT-M}			24		
Switch Output Resistance @ High Drive	R_{OUT-HI}			16	19	
Quiescent Current @ Low Drive	$IDDQ_L$			100		µA
Quiescent Current @ Med Drive	$IDDQ_M$			110		
Quiescent Current @ High Drive	$IDDQ_H$			120		
3dB Bandwidth – mid Frequency	F_{MIN}	All gain settings		40	100	Hz
3dB Bandwidth – max Frequency	F_{MAX}		20			KHz
Output Switching Frequency		F_{CLK}		200		KHz
Gain Setting 1	A_1	V_{IN} = 100mV_{RMS} @ 1KHz	12	14	16	dB
Gain Setting 2	A_2	V_{IN} = 50mV_{RMS} @ 1KHz	18	20	22	dB
Gain Setting 3	A_3	V_{IN} = 25mV_{RMS} @ 1KHz	24	26	28	dB
Power Supply Rejection Ratio	PSRR	Input Reference		45		dB
Total Harmonic Distortion @ Gain = 14dB	THD_{14}	V_{IN} = 50mV_{RMS} @ 1KHz		0.3		%
Total Harmonic Distortion @ Gain = 20dB	THD_{20}	V_{IN} = 25mV_{RMS} @ 1KHz		0.3		%
Total Harmonic Distortion @ Gain = 26bd	THD_{26}	V_{IN}=12mV_{RMS} @ 1KHz		0.3		%
Input Referred Noise	V_{N-14}	Gain = 14dB, 100Hz – 10Khz, A-Weighted		20		µV
Input Referred Noise	V_{N-20}	Gain = 20dB, 100Hz – 10Khz, A-weighted		10		µV
Input Referred Noise	V_{N-26}	Gain = 26dB, 100Hz – 10Khz, A-weighted		6		µV
Input Resistance	R_{IN-14}	Gain = 14dB		120		K Ω
Input Resistance	R_{IN-20}	Gain = 20dB		83		K Ω
Input Resistance	R_{IN-26}	Gain = 26dB		53		K Ω
Output clock frequency	F_{CLK}		140	200	300	KHz
DC Offset OutN-OutP	V_{OFF-NP}	No input signal	-5	0	5	mV

CHARTS

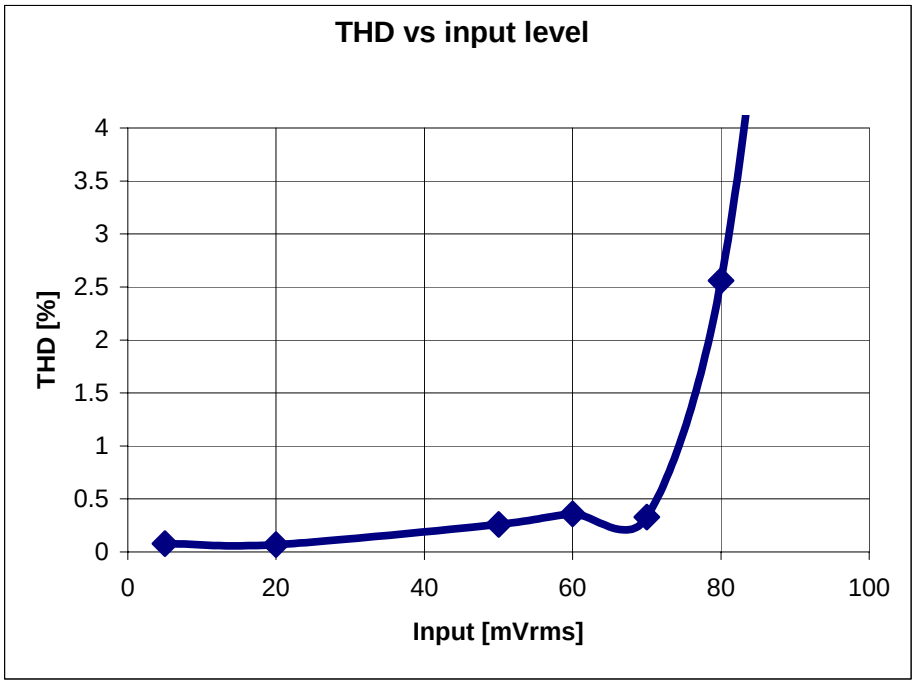


Figure 1 – THD vs. Input Level FIN = 1kHz, Gain = 20dB (Note: clip level at 90mVrms)

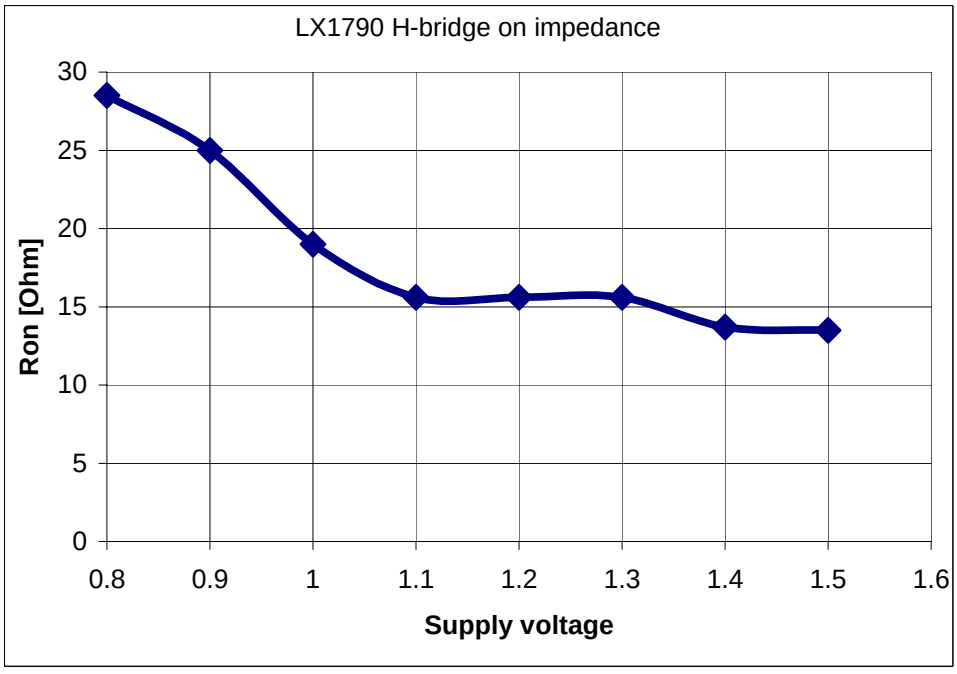
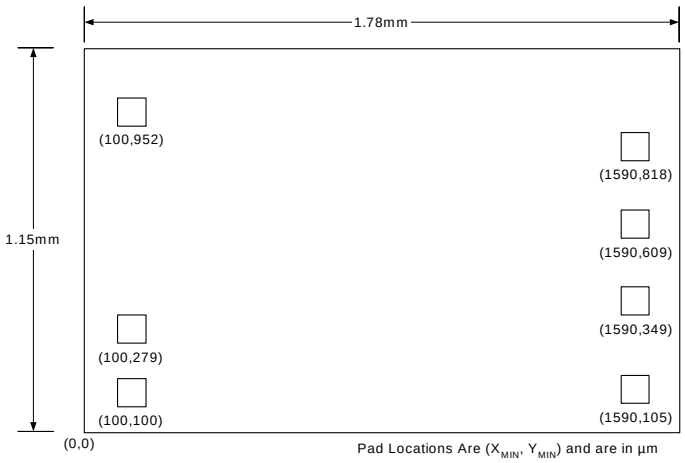


Figure 2 – H-Bridge Impedance vs. Supply Voltage (Lowest Impedance Setting)

Microsemi
INTEGRATED PRODUCTS
5973 Avenida Encinas, Suite 101, Carlsbad 92008, Fax (760) 431-0541

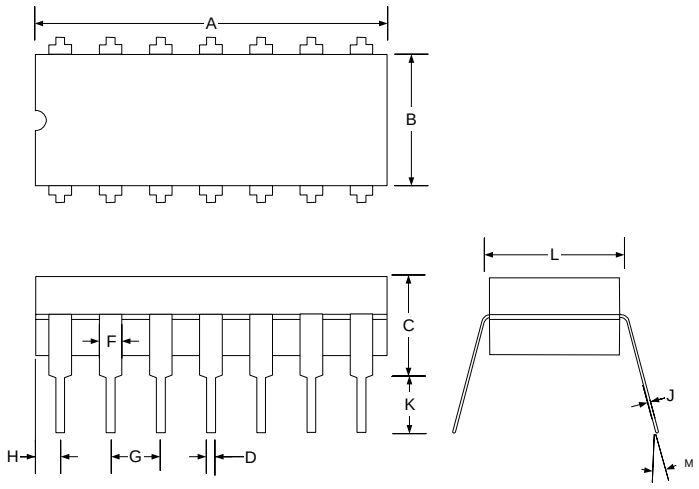
MECHANICALS

BD 7-Pin Bare Die



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
X		1.15		0.045
Y		1.78		0.070
Z	0.190	0.216	0.0075	0.0085

J 14-Pin Ceramic Dip



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.30	19.94	0.760	0.785
B	5.59	7.11	0.220	0.280
C	-	5.08	-	0.200
D	0.38	0.51	0.015	0.020
F	1.02	1.77	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	-	2.03	-	0.080
J	0.20	0.38	0.008	0.015
K	3.17	5.08	0.125	0.200
L	7.37	7.87	0.290	0.310
M	-	15°	-	15°

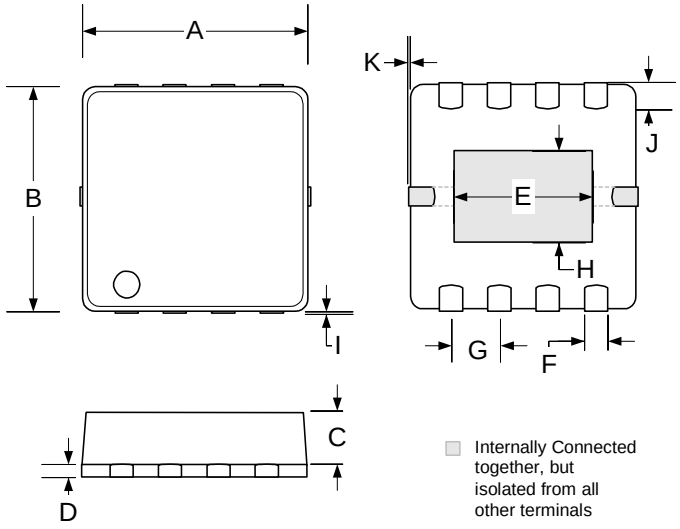
Note:

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.

Microsemi
INTEGRATED PRODUCTS
5973 Avenida Encinas, Suite 101, Carlsbad 92008, Fax (760) 431-0541

MECHANICALS

LM 8-Pin Plastic MLP-Micro Exposed Pad



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.65	0.75	0.025	0.029
D	0.15	0.25	0.005	0.009
E	1.841 BSC		0.075 BSC	
F	0.27	0.43	0.010	0.016
G	0.65 BSC		0.025 BSC	
H	1.22 BSC		0.048 BSC	
I	0	0.10	0	0.003
J	0.21	0.37	0.008	0.014
K	0	0.10	0	0.003

Note:

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.

Microsemi
INTEGRATED PRODUCTS
5973 Avenida Encinas, Suite 101, Carlsbad 92008, Fax (760) 431-0541

NOTES