

new product
information

LX1725

15W+15W Stereo Class-D Amplifier
Filterless 30W Mono in BTL

New Product Information and Sales Kit

Manufactured by:

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Garden, CA**

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www.Microsemi.com

More than solutions – enabling possibilities

INTRODUCTION

CONFIDENTIAL INFORMATION

This new product introduction guide is intended for use only by Microsemi's sales people and authorized representatives and distributors. This material can be adapted for customer presentations, but the sales strategy and summary [pricing, availability, etc.] is confidential and should be shown to customers

DESCRIPTION

The Microsemi LX1725 is part of a new generation of fully integrated stereo class-D amplifiers from Microsemi. The fully integrated half-bridge output for each channel works with both split and single power supply operation. The outputs can be bridged to run in BTL (Bridge Tied Load) mode. In BTL mode, 3-level modulation is used which allow operation without an L-C filter to reduce system cost and area. The LX1725 has >90% efficiency, with typical output power up to 15W+15W in stereo, and 30W BTL into a 4Ω load with less than 1% THD+N. The amplifier operates over a wide supply voltage range of ±6V to ±15V split supply or 12V to 30V single supply, and consumes a very little quiescent current. The LX1725 features Mute and Standby modes, over-current protection, POP-free turn-on and turn-off, under-voltage lockout, over-voltage protection and over-temperature protection. All built-in protection modes allow automatic recovery when the fault condition has been cleared. The gain is pin selectable between 14 / 20 / 26dB to accommodate different signal source amplitudes. Several LX1725s can be easily synchronized together to prevent beat frequency interference in multi-channel applications. The LX1725 comes in a MLPQ 32 pin package with a 7mmx7mm small outline surface mount.

OSCILLATOR

LX1725 has a fixed PWM modulation frequency, but it is programmable by using an external capacitor connected to C_{OSC} pin to GND. The switching frequency is approximately 235KHz with capacitor's value 220pF. With the capacitor value given, the switching frequency can be calculated as follows:

$$F_{OSC} = 52000 / C_{OSC}$$

F_{OSC} in KHz, and C_{OSC} in pF.

The suggested switching frequency is 250KHz



SYNCHRONIZATION

Two or more LX1725 oscillators can be configured for synchronous operation. One unit, the master, is programmed for the desired frequency with C_{OSC} as usual, also with the MASTER pin tied to V5V. The SYNC pin and the C_{OSC} pin of the slave units should be tied to the SYNC pin and the C_{OSC} pin of the master unit respectively. The MASTER pin of slave components is tied to GND. In this configuration, the SYNC pins of the slave units begin receiving instead of transmitting clock pulses. Also, the C_{OSC} pins quit driving the PWM capacitor in the slave units. Note that for optimum performance, all slave units should be located as close to the master unit as possible (Figure 1).

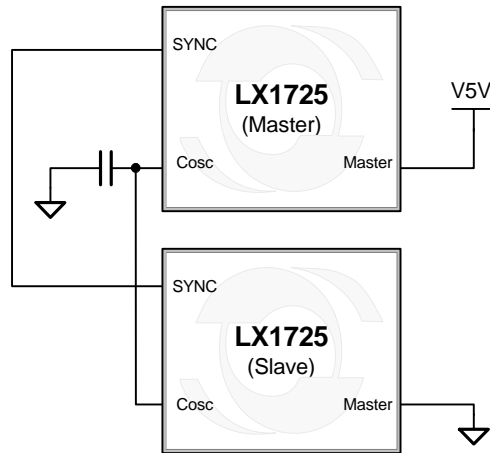


Figure 1 – Two Devices Synchronized Block Diagram

POWER ON RESET (POR)

At start up or upon recovery from a fault condition, an internal “hiccup” counter counts 65536 clock cycles before allowing the outputs to begin switching. See the POR timing sequence in Figure 2.

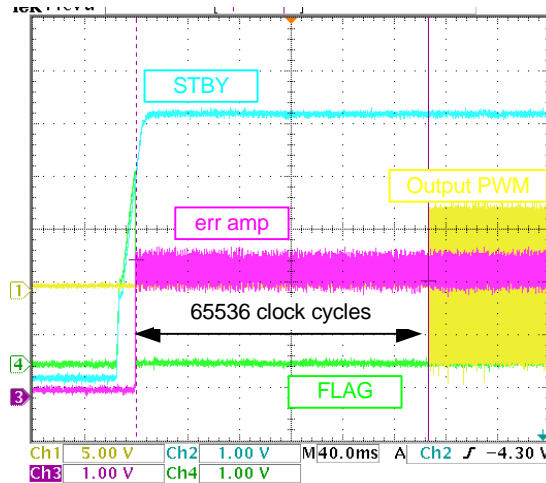


Figure 2 – Power-On-Reset Timing Sequence

The MASTER pin, as mentioned in **SYNCHRONIZATION**, is for multi devices operation. It is also a Quad-level control pin with three thresholds to enable Master/Slave and the “Quick” test mode. Quick



mode forces the internal 65536 clock counter to be bypassed in order to speed-up production testing; this is usually for factory production test purposes.

<u>V @ Master</u>	<u>Mode</u>
< V5V/4	Slave, Normal Mode
< V5V/2, V5V/4	Slave, Quick mode
< 3*V5V/4, >V5V/2	Master, Quick mode
> 3*V5V/4	Master, Normal mode

GAIN SELECTION/MUTE

The channel gain can be programmed between 26dB and 20dB by setting the HIGAIN pin to V5V or to GND. The MUTE pin is a Tri-level control pin for test purposes. When this pin is set to greater than V5V/2, the audio signal path is muted. For voltages between V5V/4 and V5V/2, the audio gain will be reduced by 6dB. This allows the “Low Gain” mode to be tested. For voltages less than V5V/4, the normal gain is in place (Figure 3).

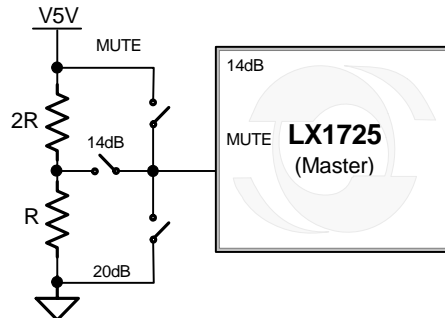


FIGURE 3 – Gain Selection Block Diagram

STAND BY

Forcing the STBY pin high puts the LX1725 into a zero current sleep mode. The outputs enter a high impedance mode and all internal bias circuits are disabled.

OVER CURRENT LIMIT

The LX1725 has built-in over circuit protection. The circuit works by monitoring the voltage drop across whichever power FET is active. When this voltage is greater than a certain threshold, an over-current condition is assumed. If this condition occurs during five consecutive clock cycles, then the output transistors are immediately disabled. The hiccup counter then counts 65536 clock cycles before allowing the outputs to begin switching again. During this period the FLAG pin goes to HIGH to indicate a system fault. A “hiccup” condition will be clearly audible if a speaker is connected to the outputs. The threshold for the over-current condition is set to 3.75A.

The over current circuit hiccup protection can be disabled by pulling the RILIM pin to V5V.



UNDER VOLTAGE LOCK-OUT (UVLO)

If the voltage drops below $\pm 5V$ under dual supply operation or 10V under single supply operation, the under voltage lock out circuit is activated and the LX1725 will enter the standby mode. This switch-off will be silent and without pop noise. It will be recovered when the supply voltage rises above the threshold level.

The FLAG pin will go logic HIGH to indicate the system fault. A similar circuit monitors V5V with a threshold of 4V.

THERMAL PROTECTION

When the junction temperature exceeds $125^{\circ}C$, the gain is reduced by 6dB (gain fold back) to reduce the output power and on-chip power dissipation., when the temperature drops below $110^{\circ}C$ the gain will returns to normal. When the temperature exceeds $155^{\circ}C$ the outputs are shut off to force the output current to zero. Again, when the temperature drops below $130^{\circ}C$ the outputs are allowed to switch and normal operation resumes.

AUDIO INPUT

For a high common mode rejection ratio and a maximum flexibility in the application, the audio inputs are fully differential. By connecting the inputs anti-parallel the phase of one of the channels can be inverted, so that a load can be connected between the two output filters. In this case the system operates as a mono BTL amplifier and with the same loudspeaker impedance an approximately four times higher output power can be obtained. The input configuration for a mono BTL application is illustrated in Figure 6. In the stereo single-ended configuration it is also recommended to connect the two differential inputs in anti-phase. This has advantages for the current handling of the power supply at low signal frequencies.

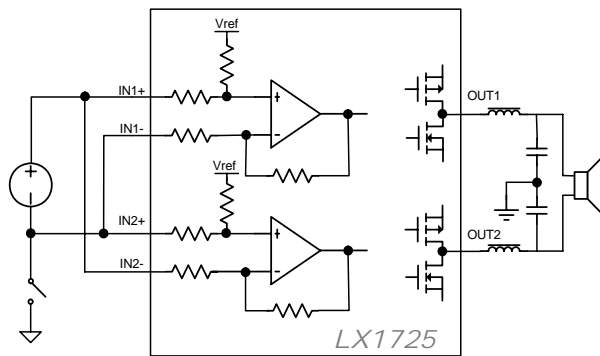


Figure 4 – Audio Input Block Diagram

KEY PRODUCT INFORMATION

BLOCK DIAGRAM

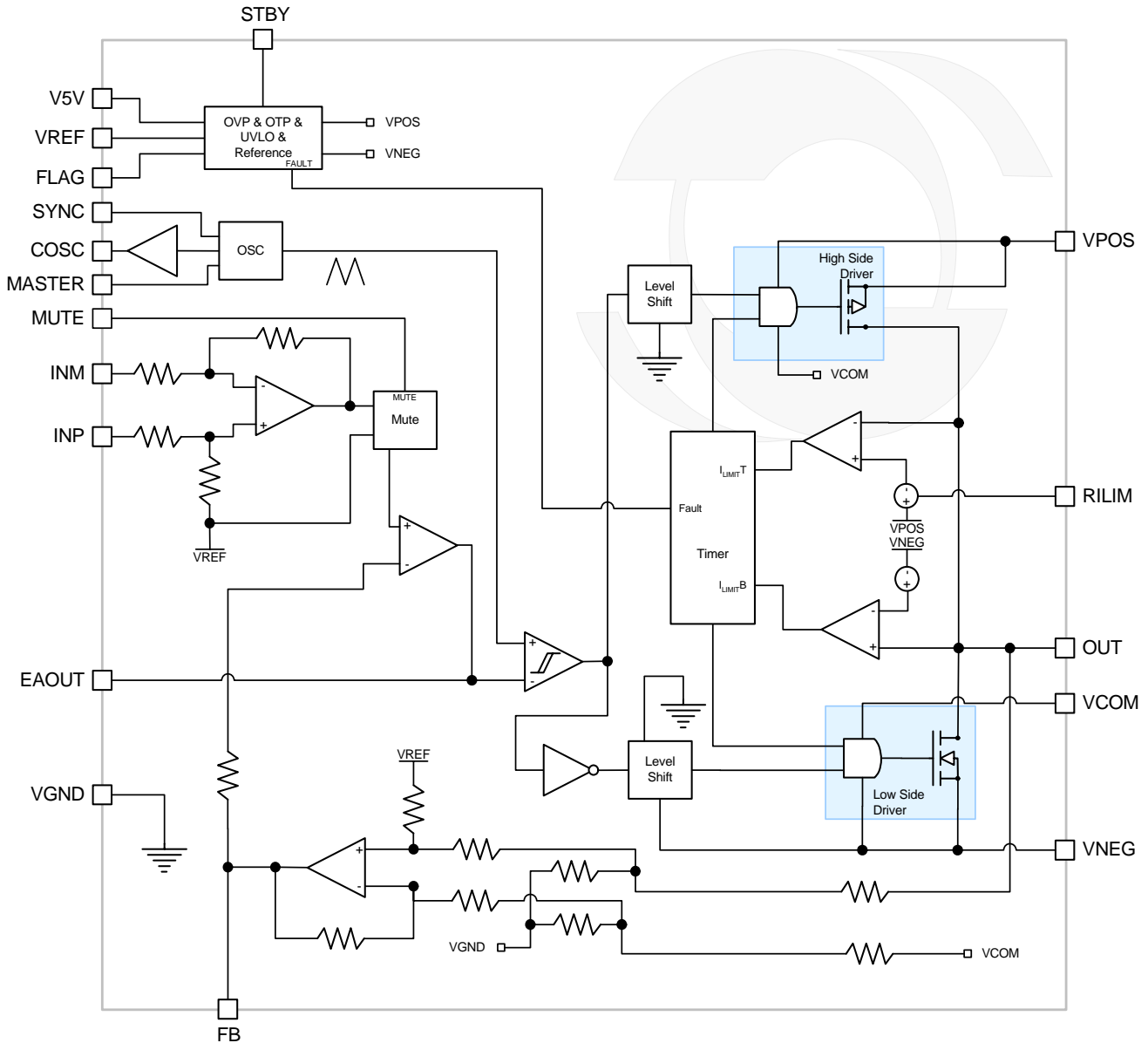


Figure 5 – Simplified Block Diagram (half of the circuit)



KEY FEATURES

- 12Wx2 @ 4Ω THD+N<1% 16Wx2 @ 4Ω THD+N<10%
- 25W BTL @ 8Ω THD+N<1% 32W BTL @ 8Ω THD+N<10%
- High Efficiency: >90% @8Ω
- Full Audio Band: 20Hz~20KHz
- Low Distortion:
 - <0.1% @1KHz, 8Ω
 - <0.4% @20~20KHz, 8Ω
- High Signal-to-Noise Ratio: >85dB non A-Weighted
- Split/Single Power Supply
- Wide Supply Voltage Range: ±6V ~ ±15V or 12V ~ 30V
- Low Quiescent Current <20mA
- Turn ON/OFF POP Free
- STANDBY/MUTE Feature
- Programmable Gain 14/20/26dB
- Built-in Over Current Protection
- Built-in Under Voltage Lockout
- Thermal Shut Down
- Power Limiting Based on Die Temperature (gain fold back)
- Synchronization



TYPICAL APPLICATION

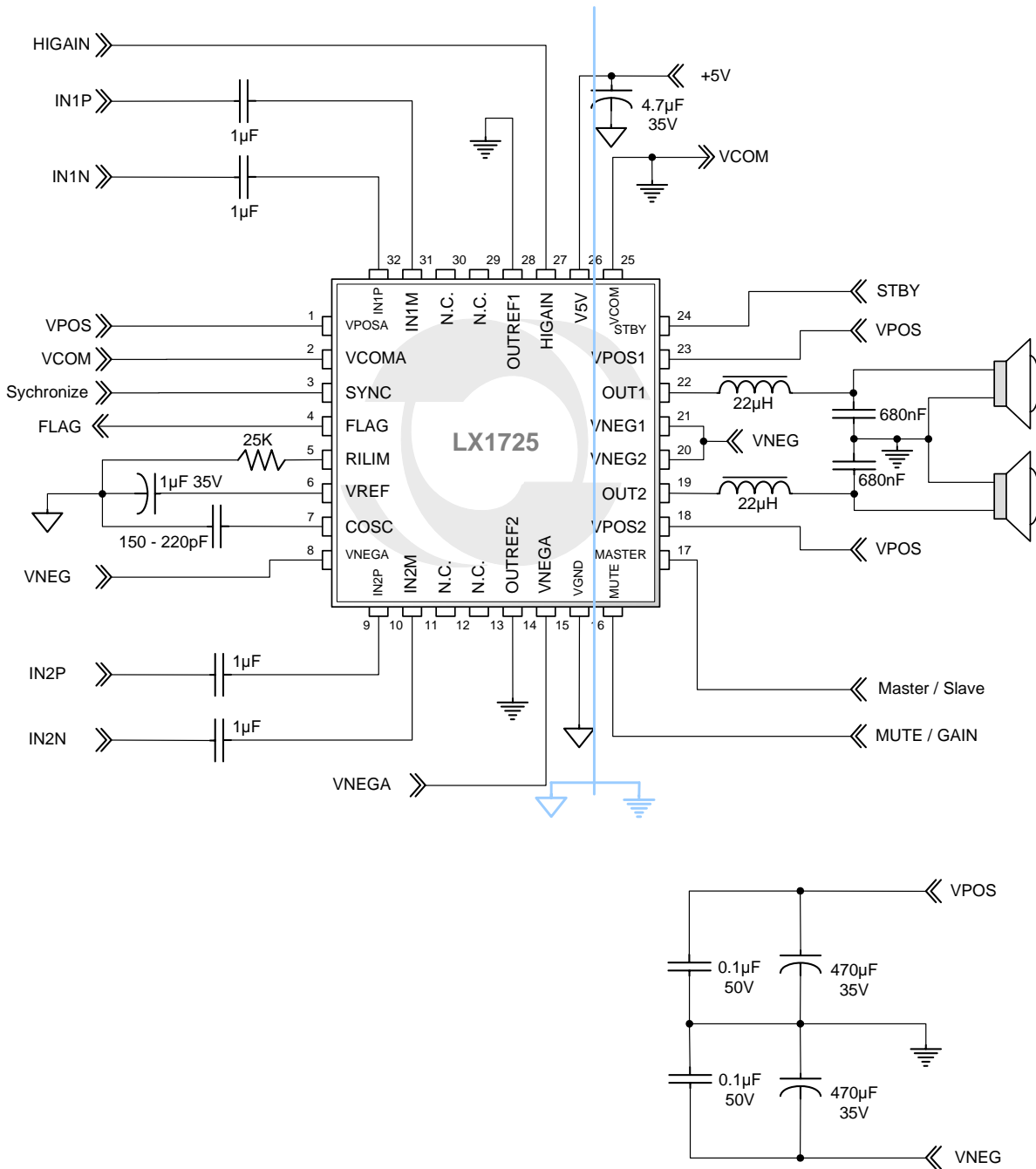


Figure 6 – Application Schematic (Stereo, Split Supply)



LX1725ILQ 15W+15W Stereo Class-D Amplifier Filterless 30W in BTL

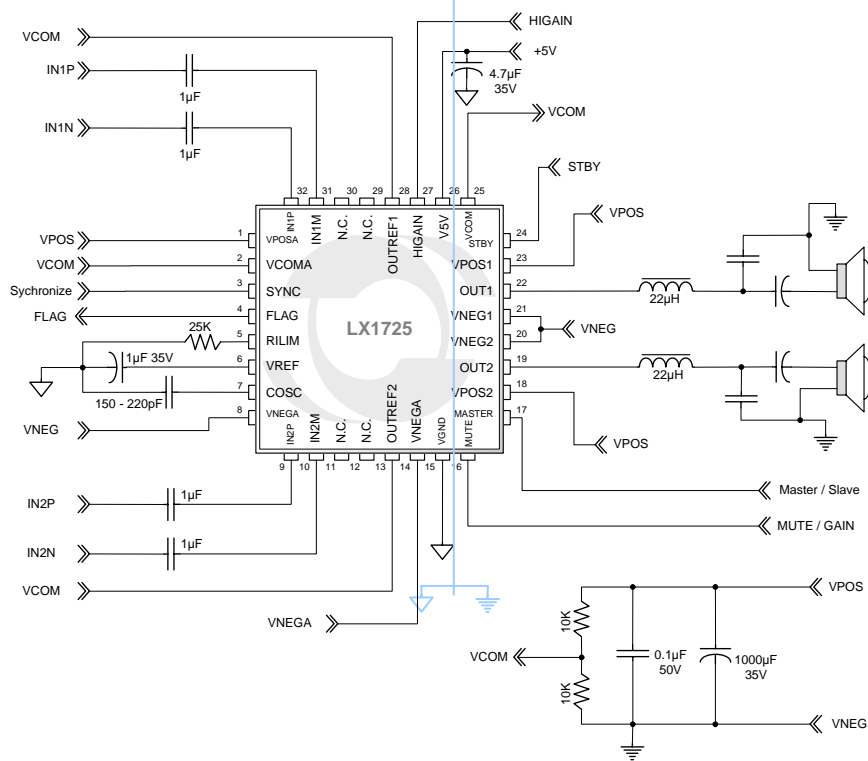


Figure 7 – Application Schematic (Stereo, Single Supply)

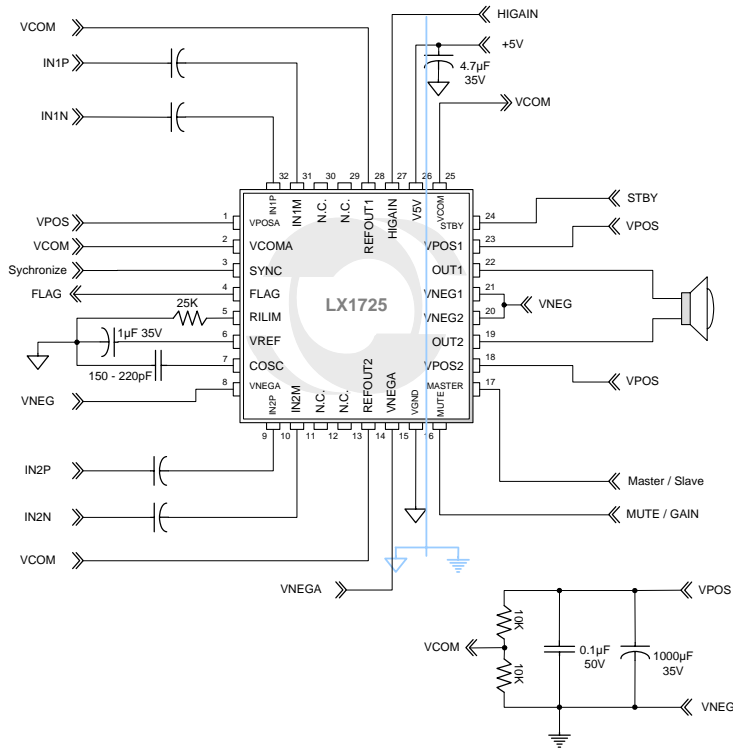


Figure 8 – Application Schematic (BTL, Single/Dual Supplies)



New Product Information and Sales Kit

APPLICATIONS

- LCD TV, PDP TV Sets
- CD/DVD Combo Player
- Combo DVD 5.1 Amplifier
- Home Theater System
- Computer Speaker System
- Game Machine

COMPETITIVE ANALYSIS

LX1725ILQ

Name	Part NO.	CH	Output Power	Supply Voltage	Load (min)	THD+N	I _{qq}	DC Vol.	Pkg	Ext. Parts
TI	TPA3002D2	Stereo	9Wx2	8.5~14V	8ohm	0.06%	16mA	YES	48HTQFP 9x9x1.0mm	26
	TPA3004D2	Stereo	12Wx2	8.5~18V	4ohm	0.1%	16mA	YES	48HTQFP 9x9x1.0mm	26
	TPA3008D2	Stereo	10Wx2	8.5~18V	8ohm	0.1%	11mA	NO	48HTQFP 9x9x1.0mm	24
Maxim	MAX9704	Stereo	15Wx2	10~25V	8ohm	0.07%	24mA	NO	32-TQFN 7x7x0.8mm	10
Tripath	TA2021	Stereo	20Wx2	8.5~14.6	4ohm	0.03%	5.5mA	NO	PSOP36	38
	TA2024	Stereo	15Wx2	8.5~13.2	4ohm	0.04%	5.5mA	NO	PSOP36	38
MPS	MP7720*	Mono	20W	7.5~24V	4ohm	0.06%	2mA	NO	SOIC8	14**
	MP7510*	Mono	18W	12~25V	4ohm	0.07%	2mA	NO	SOIC8	14**
Philips	TDA8925	Stereo	15Wx2	±7.5~ ±30	8ohm	<0.1%	25mA	NO	SOT243(TH) SOT547(TH)	>50
AD	AD1992	Stereo	10Wx2	8~20V	6OHM	0.005%	19mA	NO	LFCSP64	39
MSC	LX1725	Stereo	15Wx2	±6V ~ 15V 12V ~ 30V	4ohm	<0.1%	< 20mA	NO	MLPQ-32 7x7x.9mm	< 15

*-- MPS parts need LC filters for output low pass filter

** -- Components single channel requires



SALES STRATEGY

Target Market

- TV Sets
 - LCD TV 26"+ size requires 10~15W stereo output
 - PDP TV, usually size 40"+
 - DLP and Projection TV may require class-D solution
- Wireless speaker set, requires battery operated and 20~30W range

Advantage Over Competitors

- Both single and dual supply operation: 12V~30V or $\pm 6V \sim \pm 15V$;
- Single-ended output requires only half LC filters;
- Less external components: only 12~15 capacitors needed depended on the configurations
- Low quiescent current: only 15~20mA
- Higher efficiency >90% @8ohm load;
- Smaller form factor: only 7mmx7mmx0.9mm
- Synchronization can be configured as 2.1 easily
- Bridgeable to 30W mono output, good for wireless application

Eligible for Registration



New Product Information and Sales Kit

General Knowledge About LX1725

- What's the supply voltage range – $\pm 6V \sim \pm 15V$ or $+12V \sim +30V$
- How much quiescent current – $15mA \sim 20mA$ typical
- What's the output configuration:
 - Single-Ended (SE) Stereo output;
 - Bridge-Tied-Load (BTL) mono output;
- What's the input configuration – Differential (vs. Single-Ended)
- What's maximum output power @ $\pm 12V$ or $24V$:
 - Stereo 8OHM: $7W \times 2$, 1% THD+N; $9W \times 2$, 10% THD+N
 - Stereo 4OHM: $12W \times 2$, 1% THD+N; $16W \times 2$, 10% THD+N
 - BTL 8OHM: 25W, 1% THD+N; 32W, 10% THD+N
- Can LX1725 be configured as filterless – YES, with BTL mono output only
- Can LX1725 be synchronized – YES, one is master, others are slave with same SW freq.
- How to configure LX1725 as 2.1 – LX1725 x2, with 10~15W stereo and 30W BTL
- How many protections LX1725 has:
Over-current, Over-Voltage, UVLO, Thermal shut down ($150^{\circ}C$) and Gain -6dB ($125^{\circ}C$)
- How many external components – capacitors x12; inductors x2; resistor x1
- How many gain steps does LX1725 has – 14dB/20dB/26dB
- Does LX1725 have “MUTE” and “ENABLE” function – YES
- What's the LX1725 package – MLPQ 32 Leads, 7mmx7mmx0.9mm
- What's temperature range: $-40^{\circ}C \sim +85^{\circ}C$
- Is LX1725 package Pb-Free – YES, 100%



SUMMARY

Pricing

Device	Package	Industrial (-40 to 125°C)	
		DC	1000+
LX1725ILQ	MLPQ-32	\$4.30	Consult Factory

Note:

Availability

Samples: YES
Production: YES

Options

Packages: NONE

Temperature: NONE

Technical Support

Datasheet: See www.microsemi.com, Key Word: LX1725
Application Note: See www.microsemi.com, AN-35
Evaluation Board: LX1725S EVAL. KIT (Single Supply);
LX1725D EVAL. KIT (Dual Supply)

Factory Contacts

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