



SILERGY

# SY6040

## Capacitor Less Direct Headphone Driver / Line driver With Charge Pump & LDO *Advanced Design Specification*

### General Description

The SY6040 is a stereo headphone drivers designed to allow the removal of the output DC blocking capacitors for reduced component count and cost. And it is composed to charge pump and LDO. The SY6040 is an ideal for small portable electronics where size and cost are critical design parameters. The SY6040 is capable of driving 18mW into a 32Ω load at 3.3V. The gain of the SY6040 is set by the Gain Control Pin. Charge pump & headphone's power is supplied by output of LDO.

### Ordering Information

SY6040 □(□□)□  
Temperature Code  
Package Code  
Optional Spec Code

Ordering Number	Package Type	Note
SY6040QDC	QFN3*3-16	----

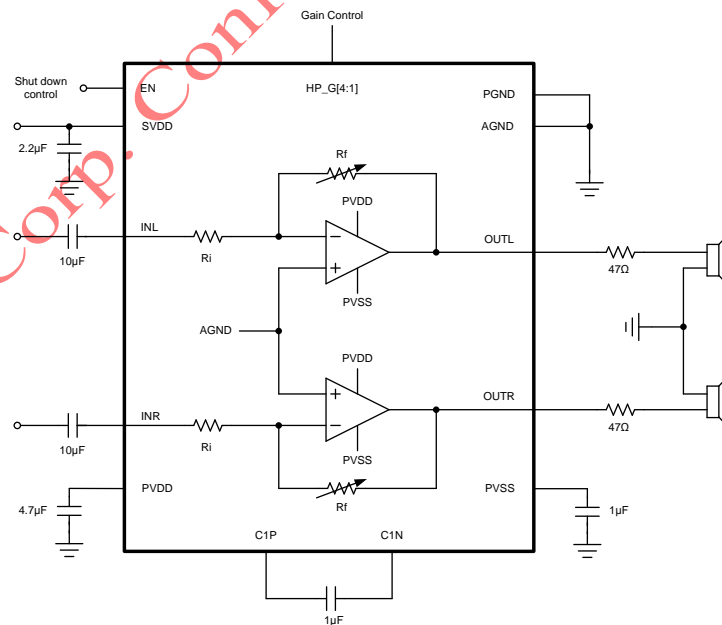
### Features

- Ground Referenced Outputs Eliminate DC Bias Voltage on Headphone Ground Pin
- No Output DC Blocking Capacitors
- Reduced Board Area
- Reduced Component Cost
- Improved THD+N Performance
- No Degradation of Low Frequency Response Due to Output Capacitors
- Built in charge pump & LDO
- Wide Power Supply Range: 2.1V-5V
- 18mW/Ch Output Power into 32Ω at 3.3V
- Short Circuit, Thermal Protection and Under Voltage Protection
- Click and Pop Suppression Circuit
- Surface Mount, QFN, 16 Pin, 3mm \* 3mm

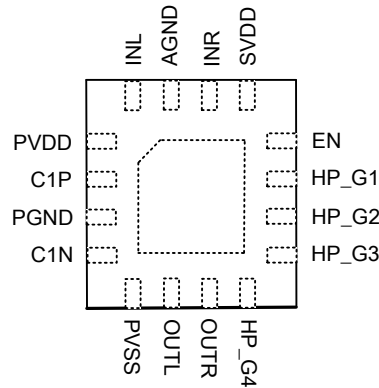
### Applications

- Notebook Computers
- CD/MP3 Player
- Smart Phones
- Cellular Phones
- PDA

### Typical Application



## Pinout (Top View)



Top Mark: cBxyz (device code: cB, x=year code, y=week code, z=lot number code)

## Pin Description

Name	No.	Description
PVDD	1	Regulator output / HP-amp positive supply
C1P	2	Charge pump flying capacitor positive terminal
PGND	3	Power ground (connect to GND)
C1N	4	Charge pump flying capacitor negative terminal
PVSS	5	Output from negative charge pump / HP-amp negative supply
OUTL	6	Left audio channel output signal
OUTR	7	Right audio channel output signal
HP_G4	8	Gain control (Pull-down resistor=10k)
HP_G3	9	Gain control (Pull-down resistor=10k)
HP_G2	10	Gain control (Pull-down resistor=10k)
HP_G1	11	Gain control (Pull-down resistor=10k)
EN	12	Enable pin, active high logic
SVDD	13	Supply voltage
INR	14	Right audio channel input signal
AGND	15	Analog ground (connect to GND)
INL	16	Left audio channel input signal

## Absolute Maximum Ratings (Note 1)

SVDD	-0.3 to 6V
Input Voltage	-0.3 to SVDD+0.3V
Junction Temperature Range	-40 °C to +150 °C
Storage Temperature Range	-65 °C to 85 °C

## Recommended Operating Conditions

SVDD	2.1 to 5.5 V
All Digital Input Pins	-0.5 to 3.6V
Ambient Temperature Range	-40 °C to 85 °C
ESD HBM	>=2000V
ESD CDM	>=500V

## Operating Characteristics

(T<sub>A</sub>=25 °C, Gain=0dB, R<sub>S</sub>=47Ω, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
High Level Output voltage	V <sub>OH</sub>	SVDD=3.3V, R <sub>L</sub> =32Ω		2.6		V
Low Level output voltage	V <sub>OL</sub>	SVDD=3.3V, R <sub>L</sub> =32Ω		-2.6		V
High Level Input current (EN)	I <sub>IH</sub>	SVDD=5.0V, V <sub>I</sub> =SVDD			1.0	μA
Low Level input current (EN)	I <sub>IL</sub>	SVDD=5.0V, V <sub>I</sub> =0V			1.0	μA
Supply Current	IDD	SVDD=2.4V, No load, EN=SVDD		6.0		mA
		SVDD=3.6V, No load, EN=SVDD		9.2		
		SVDD=5.0V, No load, EN=SVDD		9.5		

## Electrical Characteristics

(T<sub>A</sub>=25 °C, SVDD=3.3V, Gain=0dB, R<sub>S</sub>=47Ω, R<sub>L</sub>=32Ω, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Offset Voltage	V <sub>OS</sub>	SVDD=2.1V-5.5V, inputs grounded		±1.0	±8.0	mV
Power Supply Rejection ratio	PSRR	SVDD=2.1V-5.5V		-70		dB
Output Power	P <sub>O</sub>	THD=1%, SVDD=3.3V, f=1kHz		17		mW
		THD=1%, SVDD=5.0V, f=1kHz		19		
		THD=1%, SVDD=3.3V, f=1kHz, R <sub>L</sub> =16Ω		13		
Total Harmonic Distortion + Noise	THD+N	Po=10mW, f=1kHz		0.05		%
		Po=10mW, f=20Hz		0.02		
		Vo=2Vrms, R <sub>L</sub> =47kΩ, f=1kHz		0.006		
Cross Talk	CT	Po=10mW, f=1kHz		-75		dB
		Vo=2Vrms, R <sub>L</sub> =47kΩ, f=1kHz		-80		
Closed-loop voltage gain	A <sub>V</sub>	HP_G[4:1]=0		1		V/V
Gain Matching	ΔA <sub>V</sub>			1		%
Slew Rate	SR			2.2		V/μs
Noise Output Voltage	V <sub>n</sub>	A-weighted, 0dB, inputs terminated to GND, output referred		1.6		μV <sub>RMS</sub>
Charge Pump Switching frequency	F <sub>osc</sub>			1		MHz
LDO Output Voltage		SVDD=5.0V		3.3		V
Start-up Time from Shutdown				6.5		ms
Input to Output Attenuation in shutdown		EN=0V		80		dB
Input Impedance			16	20	24	kΩ

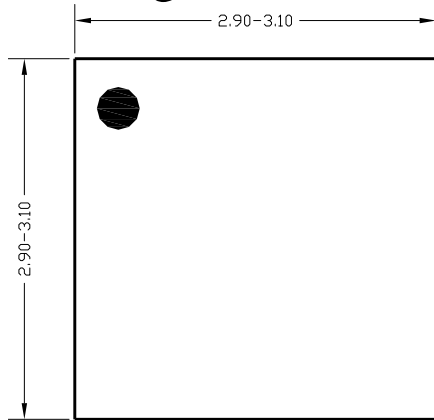


Signal-to-Noise Ratio	SNR	Po=10mW		105		dB
		VO=2Vrms, RL=47kΩ		107		
Thermal Shutdown		Threshold	140	155	165	°C
		Hysteresis		25		°C
Under Voltage Protection	UVP		1.8	1.9	2.0	V

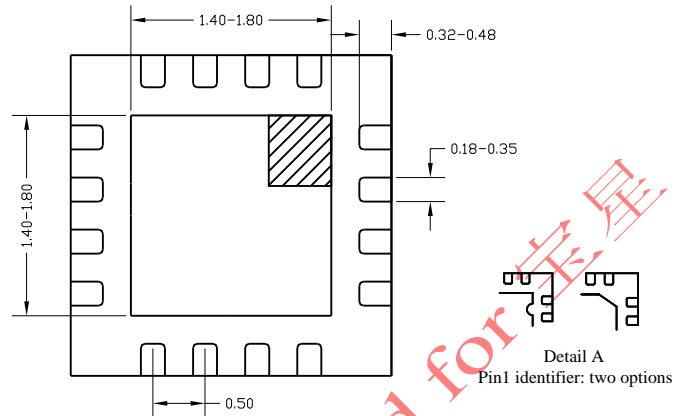
**Note 1:** Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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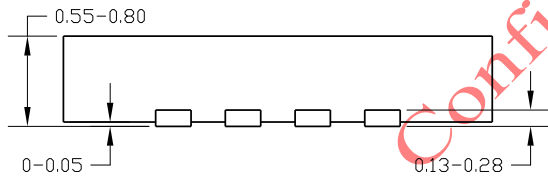
## QFN3x3-16 Package outline & PCB Layout



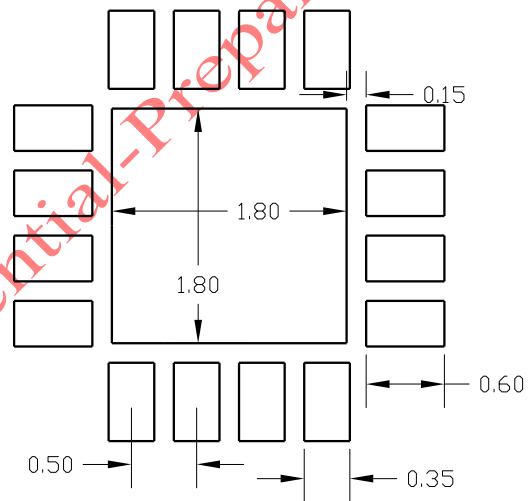
**Top View**



**Bottom View**



**Front View**



**PCB layout (Recommended)**

**Notes:** All dimension in millimeter and exclude mold flash & metal burr.