



# TDA7469

## LOW VOLTAGE ANALOG AUDIO PROCESSOR WITH HEADPHONE POWER AMPLIFIER

PRODUCT PREVIEW

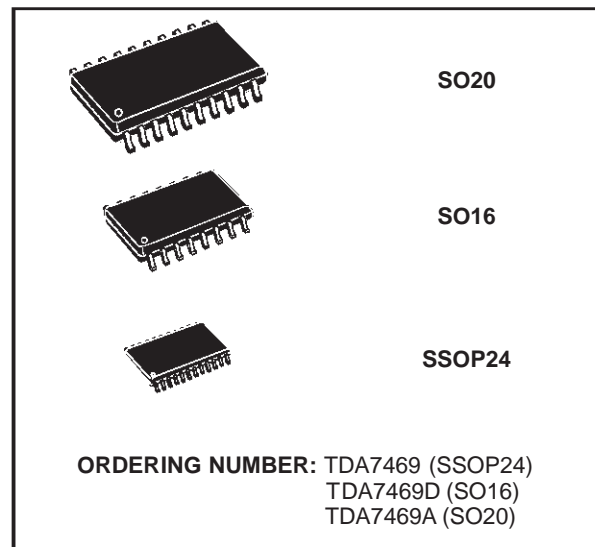
- 2 STEREO INPUT
- 1 STEREO OUTPUT
- TREBLE BOOST
- BASS CONTROL
- BASS AUTOMATIC LEVEL CONTROL
- VOLUME CONTROL IN 1dB STEPS
- MUTE
- STAND-BY FUNCTION SOFTWARE CONTROLLED
- ALL FUNCTION ARE PROGRAMMABLE VIA SERIAL BUS

### DESCRIPTION

The TDA7469 is a volume tone (bass and treble) processor for quality audio applications in Low voltage supply portable systems.

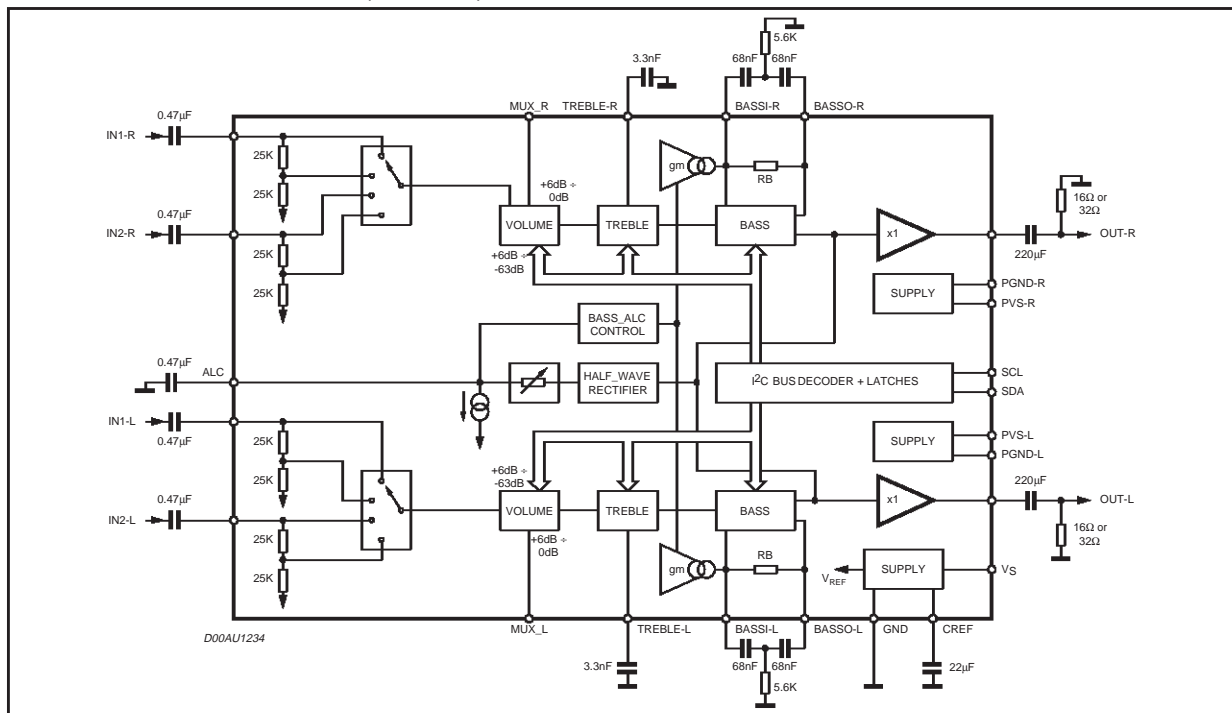
Bass ALC (Automatic Level Control) function can be adjusted by a dedicated pin. The control of all the functions is accomplished by serial bus.

The AC signal setting is obtained by resistor networks and switches combined with operational amplifiers.



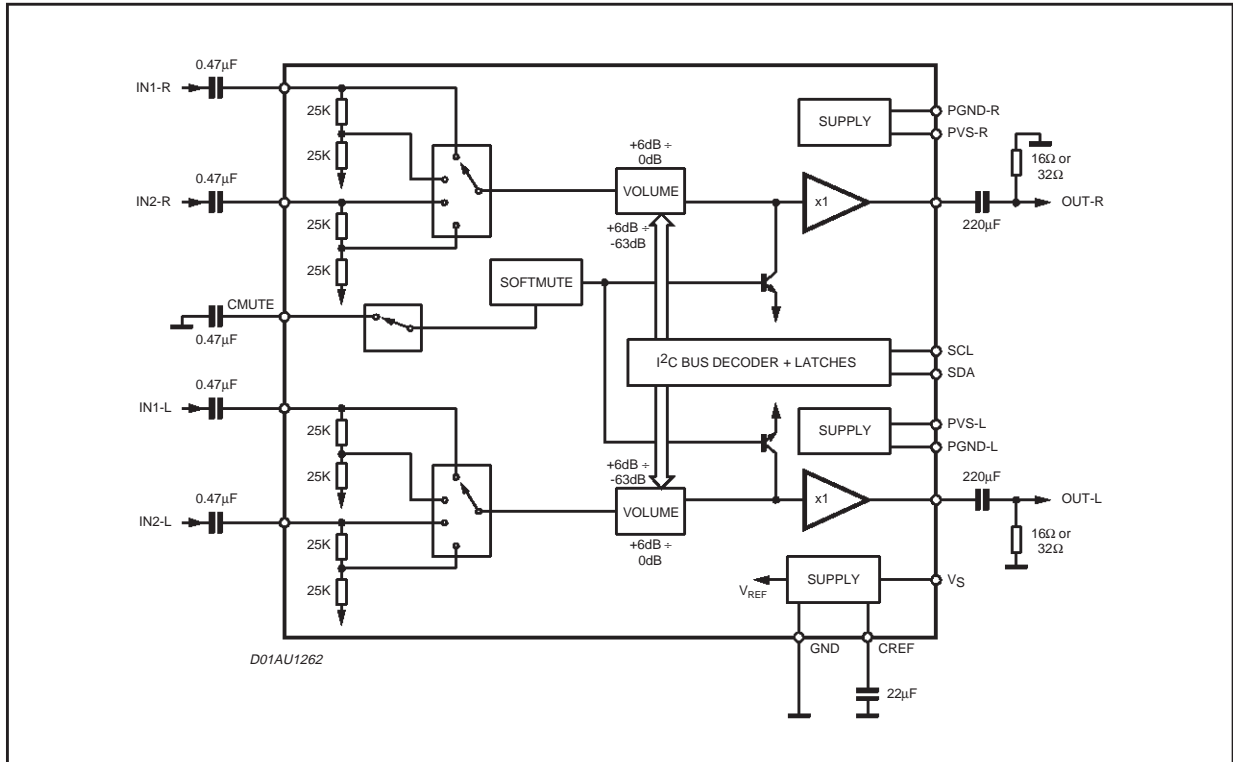
Thanks to the used BIPOLAR/CMOS Technology, Low Distortion, Low Noise and DC stepping are obtained.

### BLOCK DIAGRAM TDA7469 (SSOP24)

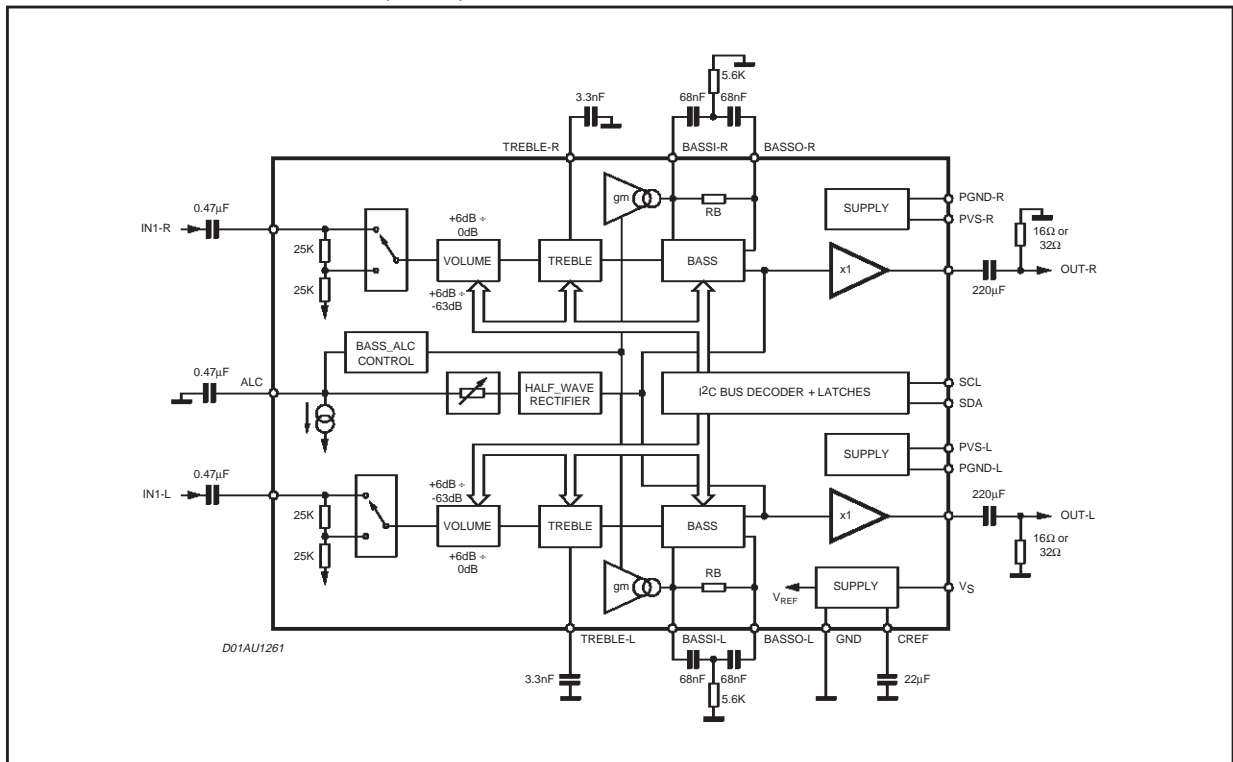


# TDA7469

## BLOCK DIAGRAM TDA7469D (SO16)



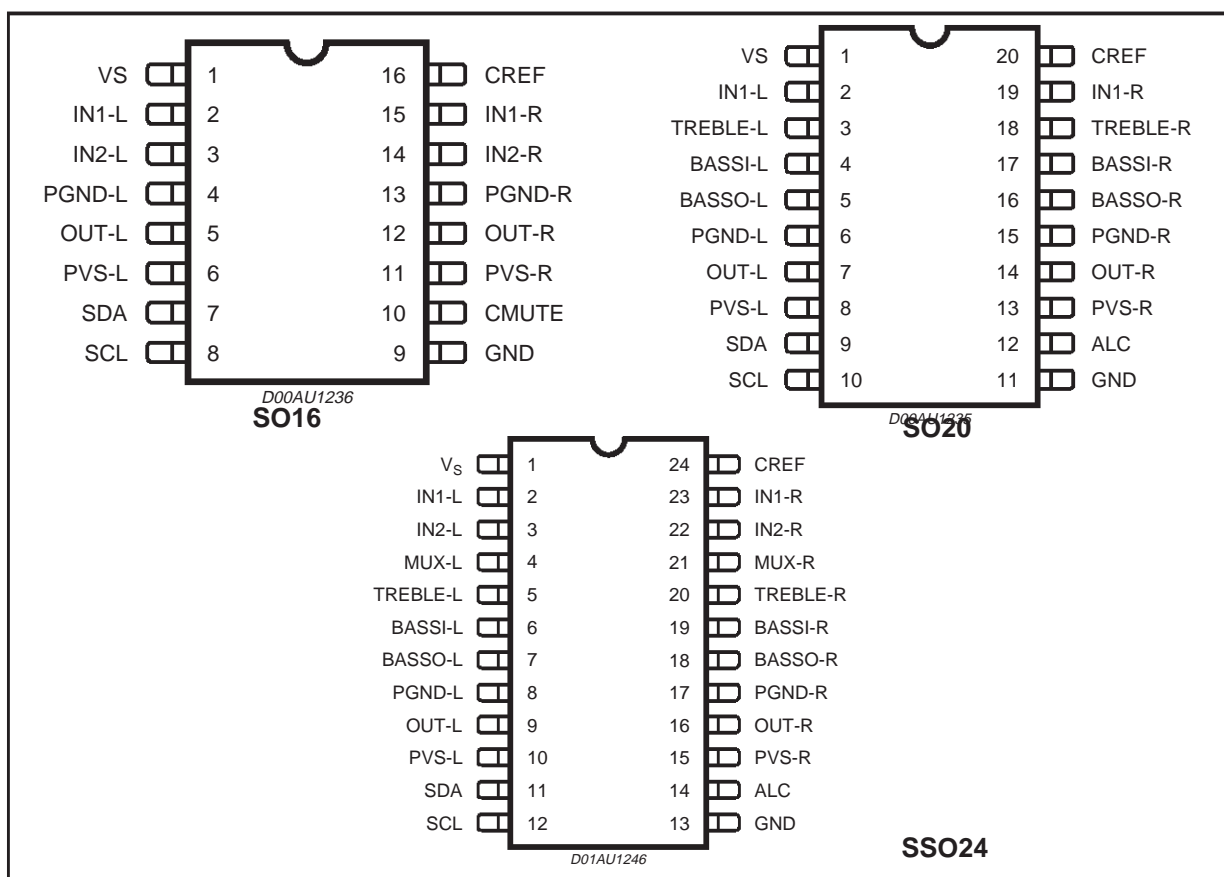
## BLOCK DIAGRAM TDA7469A (SO20)



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_S$	Operating Supply Voltage	5.5	V
$T_{amb}$	Operating Ambient Temperature	-10 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to 150	°C

## PIN CONNECTIONS



## THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th\ j-pin}$	Thermal Resistance Junction-pins	85	°C/W

## QUICK REFERENCE DATA

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_S$	Supply Voltage	1.8	2.4	5.0	V
$V_{ps}$	Power Supply Voltage	1.5	2.4	5.0	V
$P_{omax}$	Maximum output power	5	8		mW
THD	Total Harmonic Distortion $V = 0.1V_{rms}$ $f = 1KHz$		0.1	0.5	%
	Volume Control (1dB step)	-63		6	dB
	Treble Control	0		12	dB
	Bass Control	0		14	dB
	Mute Attenuation		90		dB

## TDA7469

**ELECTRICAL CHARACTERISTICS** (refer to the test circuit  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_S = 2.4\text{V}$ , all controls flat ( $G = 0\text{dB}$ ),  $f = 1\text{KHz}$ , unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>SUPPLY</b>						
$V_S$	Supply Voltage		1.8	2.4	5.0	V
$V_{PS}$	Supply Voltage		1.5	2.4	5.0	V
$I_{SQ}$	Supply Current			10		$\mu\text{A}$
$I_{PSQ}$	Quiscent Current			1		$\mu\text{A}$
$I_S$		$P_o = 0.5\text{mW} + 0.5\text{mW}$		8		mA
$I_{PS}$		$P_o = 0.5\text{mW} + 0.5\text{mW}$		15		mA
<b>INPUT STAGE</b>						
$R_{IN}$	Input Resistance		35	50	65	$\text{K}\Omega$
$A_{IN}$	Input Attenuation Range		0		6	dB
<b>VOLUME CONTROL</b>						
$C_{RANGE}$	Control Range		-63		6	dB
$A_{MAX}$	Max. Attenuation		61	63	65	dB
$A_{STEP}$	Step Resolution		0.5	1	1.5	dB
$G_{MAX}$	Max. Gain			6		dB
$G_{step}$	Step Resolution			2		dB
$R_1$	Muxout Load Resistance			10		$\text{K}\Omega$
<b>BASS CONTROL</b>						
$G_b$	Control Range	Max. Boost/on		14		dB
$R_B$	Internal Feedback Resistance		75.6	100.8	126	$\text{K}\Omega$
<b>TREBLE CONTROL</b>						
$G_t$	Control Range	Max. Boost		12		dB
$R_t$	Internal Resistance			25		$\text{K}\Omega$
<b>HEADPHONE OUTPUTS</b>						
$G_{out}$	Output Gain			0		dB
$P_{omax}$	Max Output Power	THD = 10%	5	8		mW
<b>GENERAL</b>						
$E_{NO}$	Output Noise	Outout Muted All gains = 0dB; BW = 20Hz to 20KHz flat		5 10		$\mu\text{V}$ $\mu\text{V}$
THD	Distortion	$A_v = 0$ , $V_{in} = 0.1V_{rms}$		0.1	0.5	%
$S_C$	Channel Separation Left/Right			50		dB
RR1	Ripple Rejection	$V_S$ , $f = 100\text{Hz}$		-70		dB
RR2	Ripple Rejection	PVS, $f = 100\text{Hz}$		-75		dB
	Total Tracking Error			0	1	dB
<b>BUS INPUTS</b>						
$V_{IL}$	Input Low Voltage				0.5	V
$V_{IH}$	Input High Voltage		1.9			V
$I_{IN}$	Input Current	$V_{IN} = 0.4\text{V}$	-5		5	$\mu\text{A}$
$V_O$	Output Voltage (ACK)	$I_o = 1.6\text{mA}$			0.4	V

NOTE1:

1) BASS and TREBLE response: The center frequency and the response quality can be chosen by the external circuitry.

**DATA BYTES**

Address = (HEX) 10001000

**FUNCTION SELECTION:**

The first byte (subaddress)

MSB							LSB	SUBADDRESS
D7	D6	D5	D4	D3	D2	D1	D0	
X	X	X	B	0	0	0	0	VOLUME
X	X	X	B	0	0	0	1	TREBLE & BASS
X	X	X	B	0	0	1	0	INPUT & MUTE
X	X	X	B	0	0	1	1	STAND-BY & OTHERS
X	X	X	B	0	1	0	0	BASS ALC
X	X	X	B	0	1	0	1	BASS ALC

B = 1 incremental bus; active

B = 0 no incremental bus;

X = indifferent 0,1

**VOLUME**

MSB							LSB	VOLUME
D7	D6	D5	D4	D3	D2	D1	D0	
						0	0	6
						0	1	4
						1	0	2
						1	1	0
								<b>1 dB STEPS</b>
			0	0	0			0
			0	0	1			-1
			0	1	0			-2
			0	1	1			-3
			1	0	0			-4
			1	0	1			-5
			1	1	0			-6
			1	1	1			-7
								<b>8 dB STEPS</b>
0	0	0						0
0	0	1						-8
0	1	0						-16
0	1	1						-24
1	0	0						-32
1	0	1						-40
1	1	0						-48
1	1	1						-56

VOLUME : +6 x -63dB

**TREBLE & BASS**

MSB							LSB		
D7	D6	D5	D4	D3	D2	D1	D0		
								<b>TREBLE</b>	
						0	0	12dB	
						0	1	8dB	
						1	0	4dB	
						1	1	0dB	
								<b>BASS</b>	
			0	0	0			14dB	
			0	0	1			12dB	
			0	1	0			10dB	
			0	1	1			8dB	
			1	0	0			6dB	
			1	0	1			4dB	
			1	1	0			2dB	
			1	1	1			0dB	
								<b>BASS ALC</b>	
		0						ALC: VOLUME mode	
		1						ALC: BASS mode	
	1							ALC: fc shift	
	0							ALC: fc nonshift	
1								ALC: feedback gain x2	
0								ALC: feedback gain x 1	

**INPUT SELECT & MUTE**

MSB							LSB		
D7	D6	D5	D4	D3	D2	D1	D0		
								<b>INPUT SELECT</b>	
						0	0	IN1 (0dB)	
						0	1	IN1 (-6dB)	
						1	0	IN2 (0dB)	
						1	1	IN2 (-6dB)	
								<b>MUTE</b>	
					1			Input Mute ON	
					0			Input Mute OFF	
				1				Output SoftMute ON	
				0				Output SoftMute OFF	
			1					Output Mute ON	
			0					Output Mute OFF	
								<b>HEADPHONE AMP. STAND-BY</b>	
		1						Headphone Amp. OFF	
		0						Headphone Amp. ON	

## STAND\_BY &amp; OTHERS

MSB							LSB	
D7	D6	D5	D4	D3	D2	D1	D0	
								<b>STAND-BY</b>
							1	ALL Circuits Stop
							0	ALL Circuits Work
								<b>SOFT MUTE CAPACITOR</b>
						1		Independent Capacitor
						0		Share ALC Capacitor
								<b>REFERENCE LEVEL</b>
					1			adaptive: (VDD-0.7)/2
			0	0	0			1.10V
			0	1	0			0.85V
			1	0	0			0.55V
			1	1	0			0.45V
								<b>ZEROCROSS MODE</b>
		1						ON
		0						OFF
	1							Zerocross Detect Point: Volume
	0							Zerocross Detect Point: Bass
								<b>CREF STAND-BY</b>
1								CREF Circuit Stop
0								CREF Circuit Work

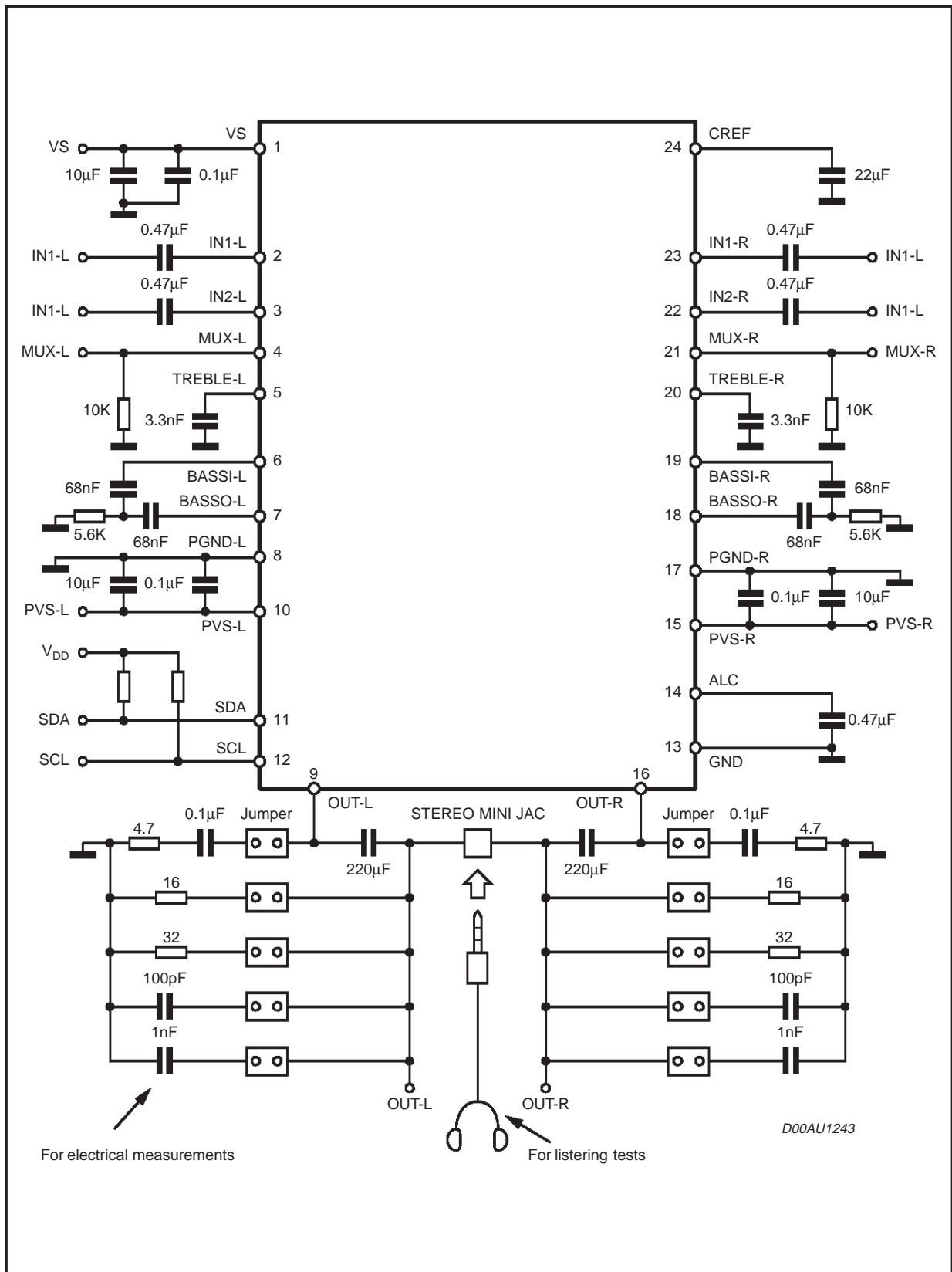
## BASS ALC

MSB							LSB	BASS ALC	
D7	D6	D5	D4	D3	D2	D1	D0		
								<b>ALC MODE</b>	
							1	ON	
							0	OFF	
								<b>DETECTOR</b>	
						1		ON	
						0		OFF	
								<b>RELEASE CURRENT CIRCUIT</b>	
					1			ON	
					0			OFF	
								<b>ATTACK TIME RESISTOR</b>	
			0	0				12.5K $\Omega$	
			0	1				25K $\Omega$	
			1	0				50K $\Omega$	
			1	1				100K $\Omega$	
								<b>THRESHOLD</b>	
	0	0						THRESHOLD1	
	0	1						THRESHOLD2	
	1	0						THRESHOLD3	
	1	1						THRESHOLD4	

## BASS ALC

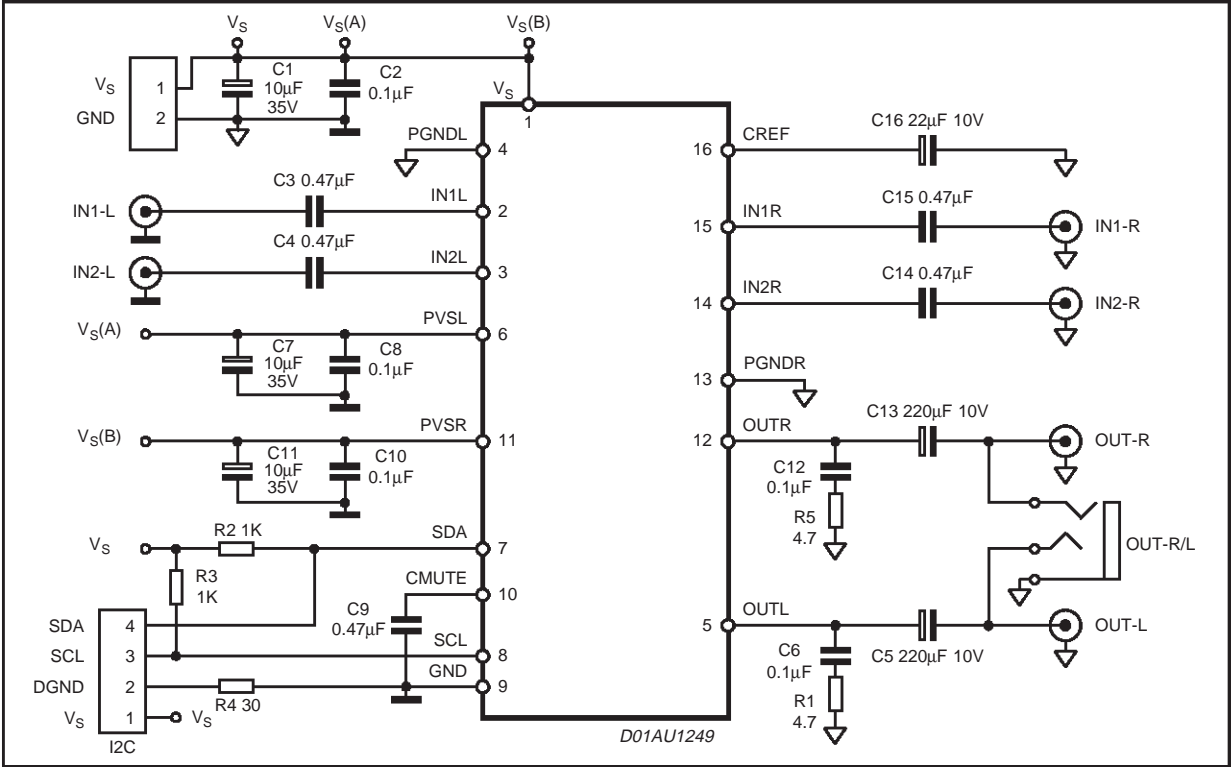
MSB							LSB	BASS ALC	
D7	D6	D5	D4	D3	D2	D1	D0		
								<b>ALC FULL FEEDBACK CURRENT</b>	
							1	ON	
							0	OFF	
								<b>BIG RELEASE CURRENT</b>	
						1		ON	
						0		OFF	

Typical Application Circuit (SSO24)

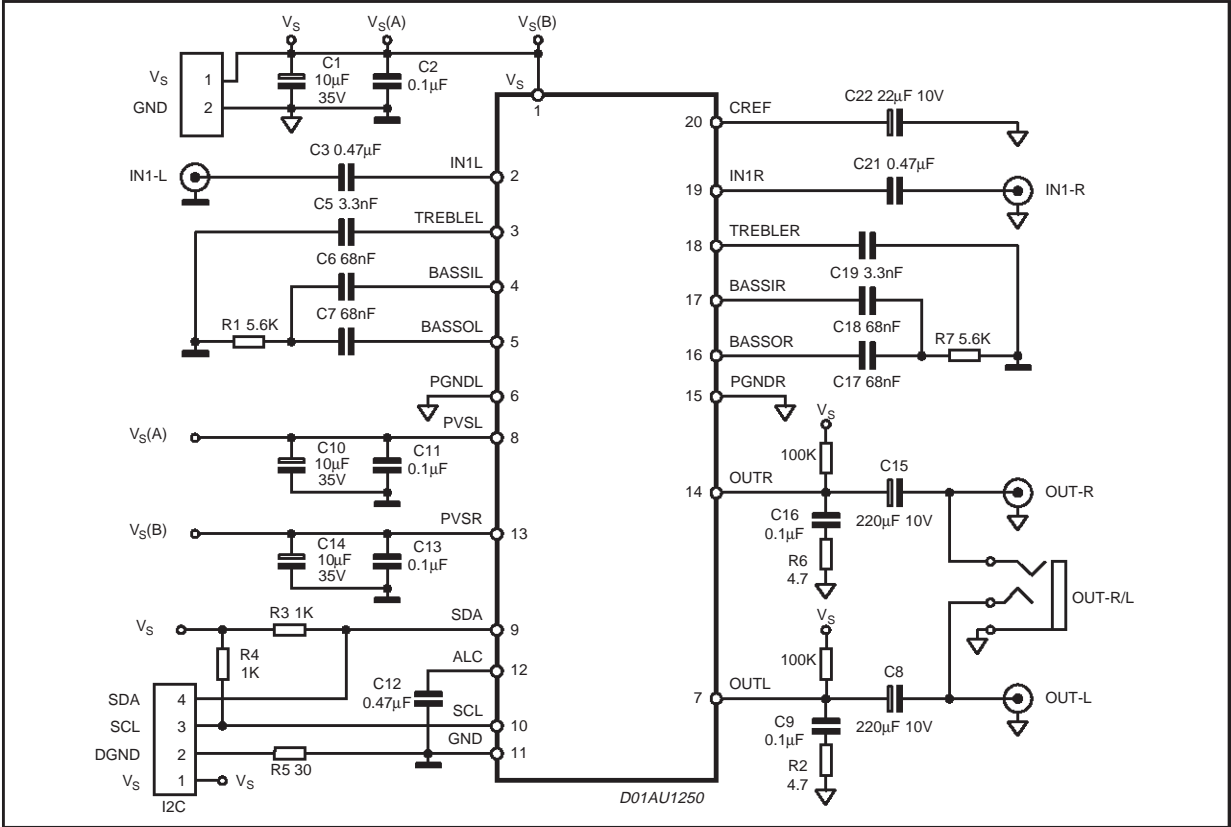




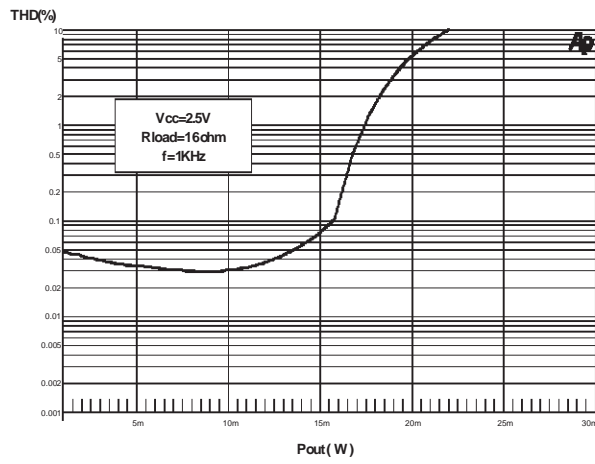
Typical Application Circuit (SO16)



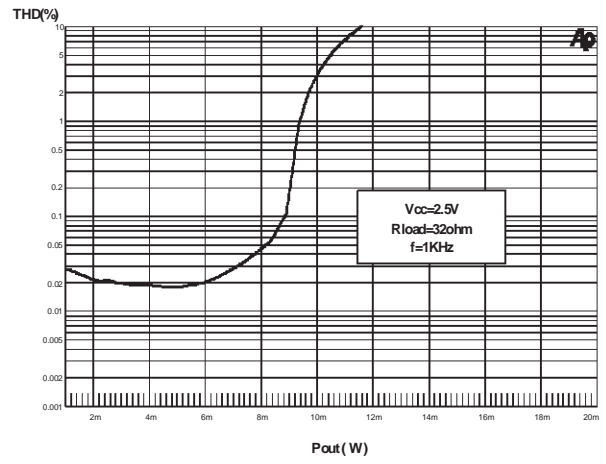
Typical Application Circuit (SO20)



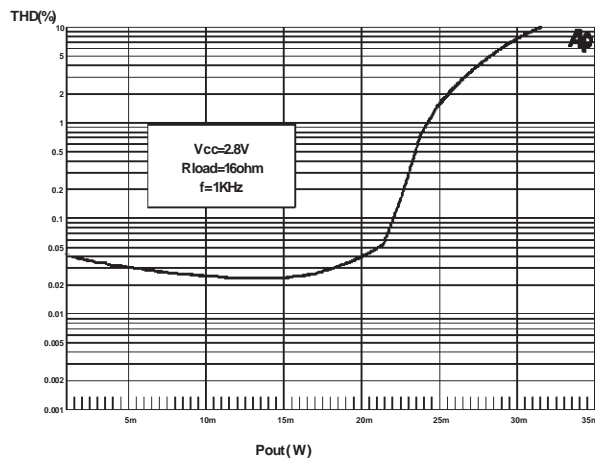
THD+Noise vs Amplitude @Vcc 2.5V, Rload 16Ω



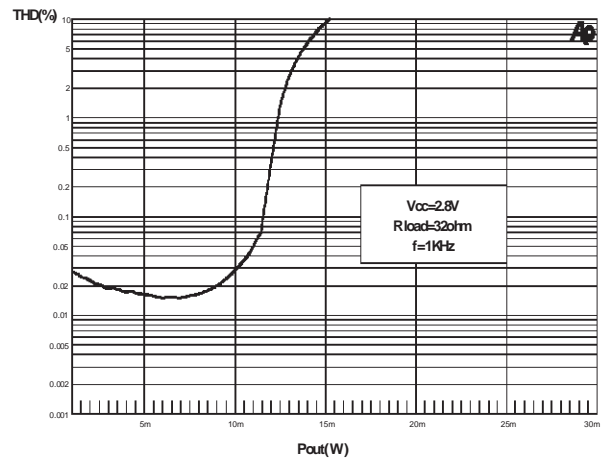
THD+Noise vs Amplitude @Vcc 2.5V, Rload 32Ω



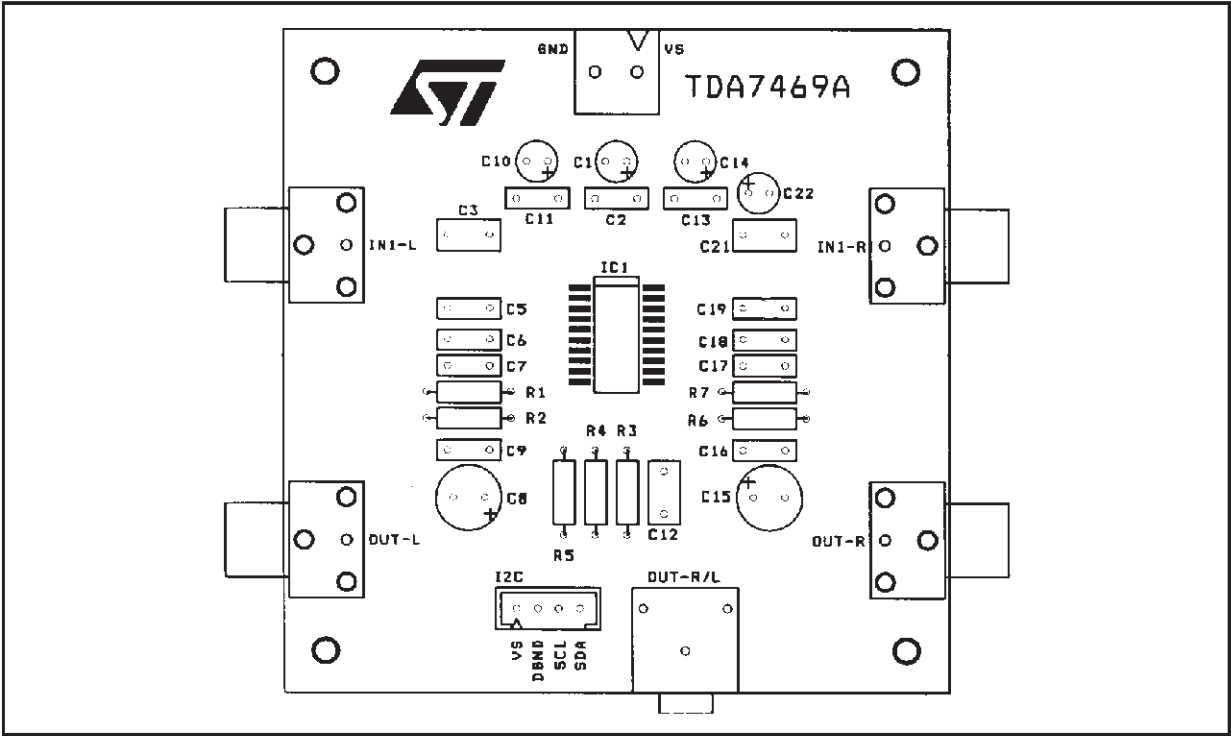
THD+Noise vs Amplitude @Vcc 2.8V, Rload 16Ω



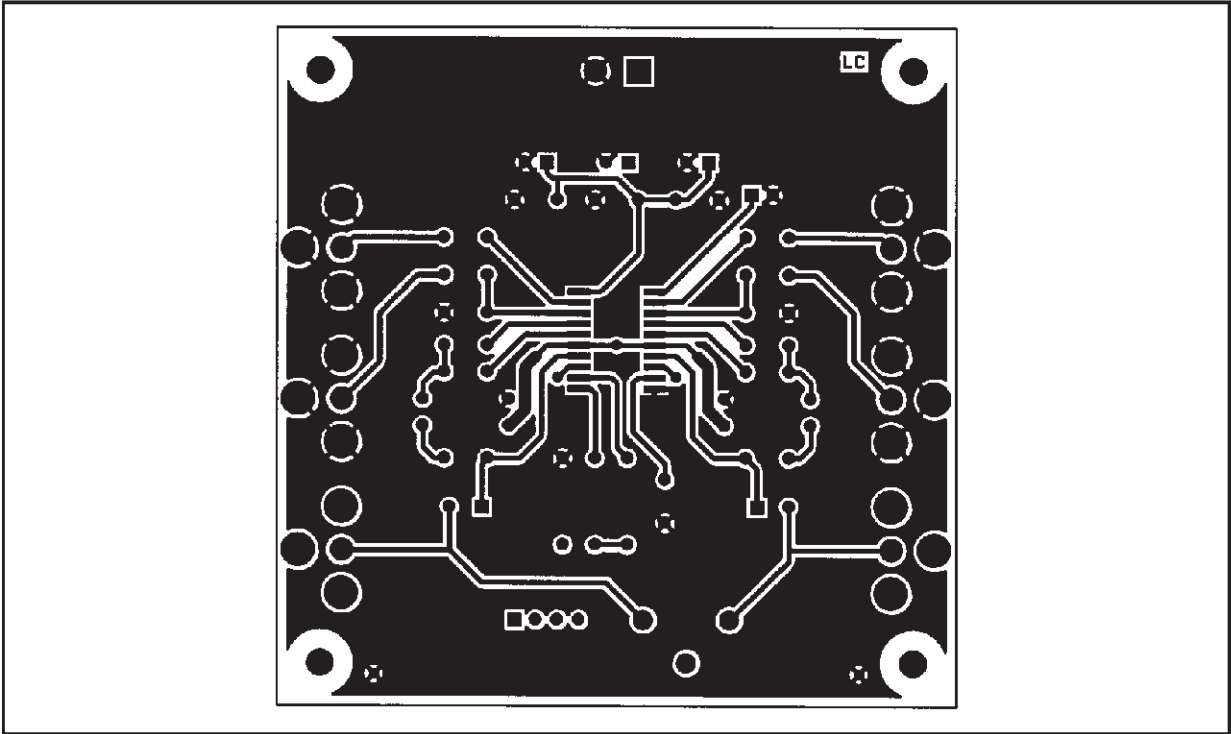
THD+Noise vs Amplitude @Vcc 2.8V, Rload 32Ω



TDA7469A Components Layout

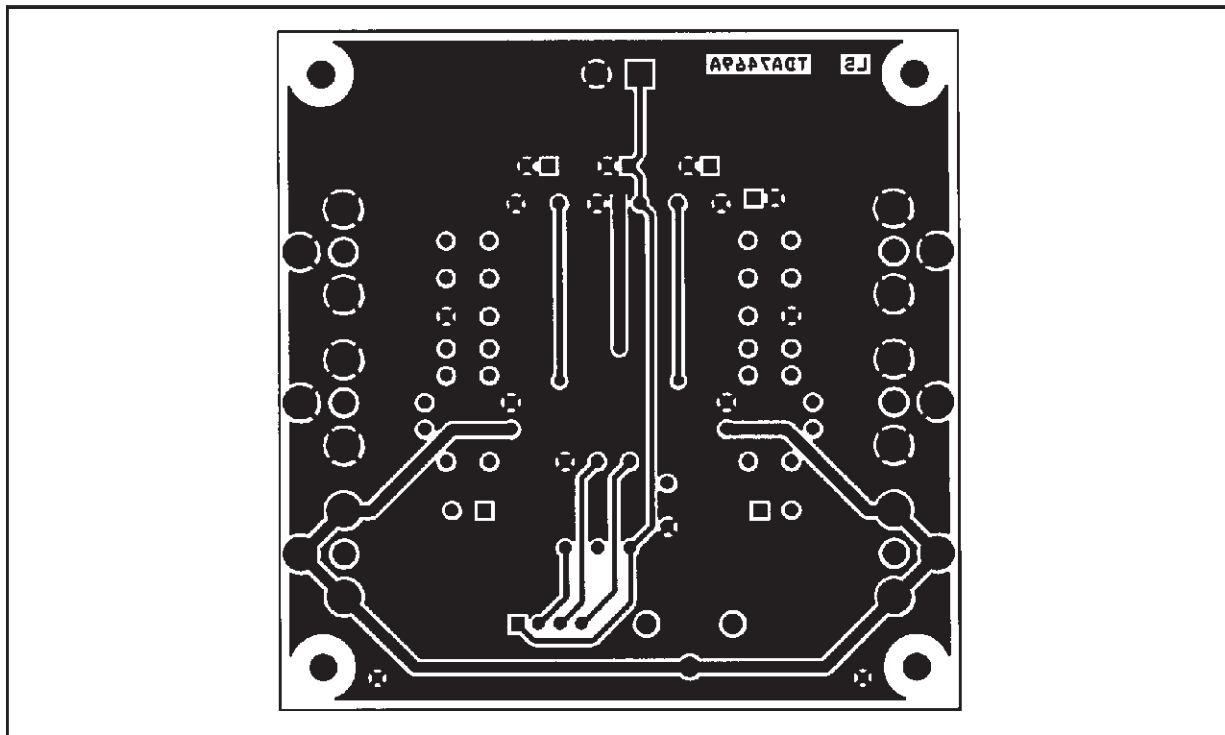


TDA7469A P.C. Board Layout (Top view)

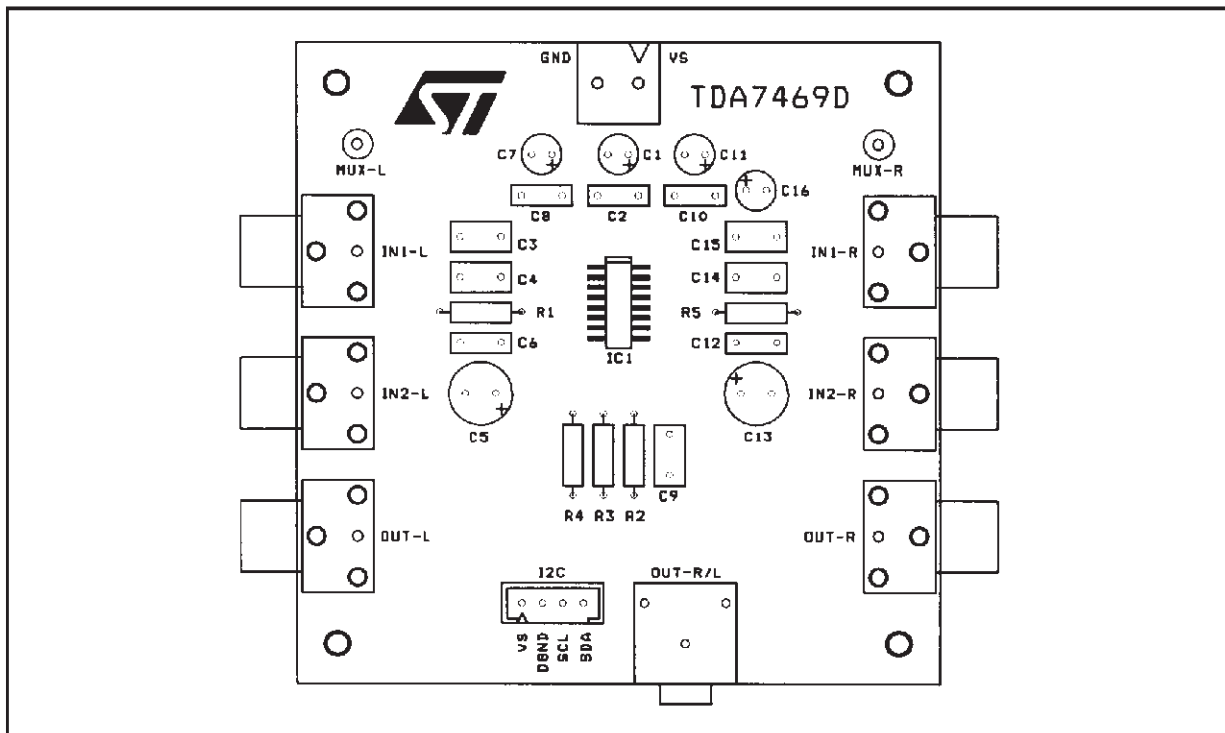


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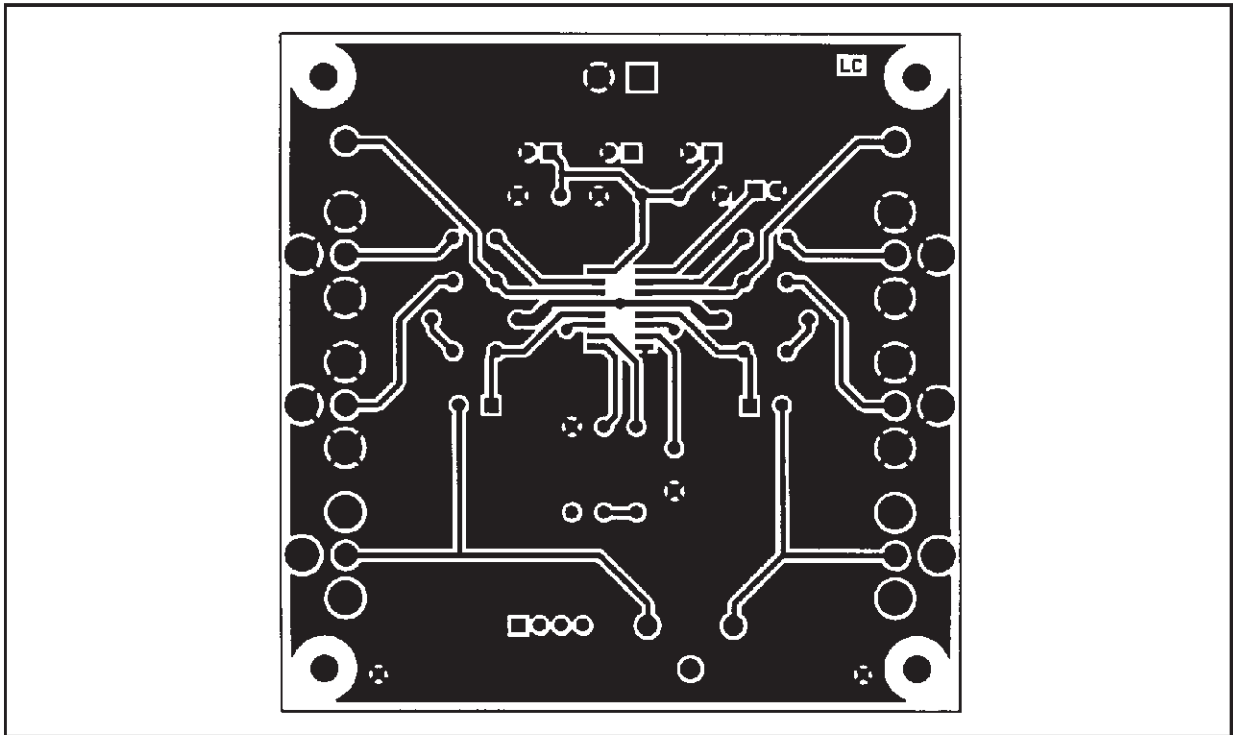
TDA7469A P. C. Board (Backside view)



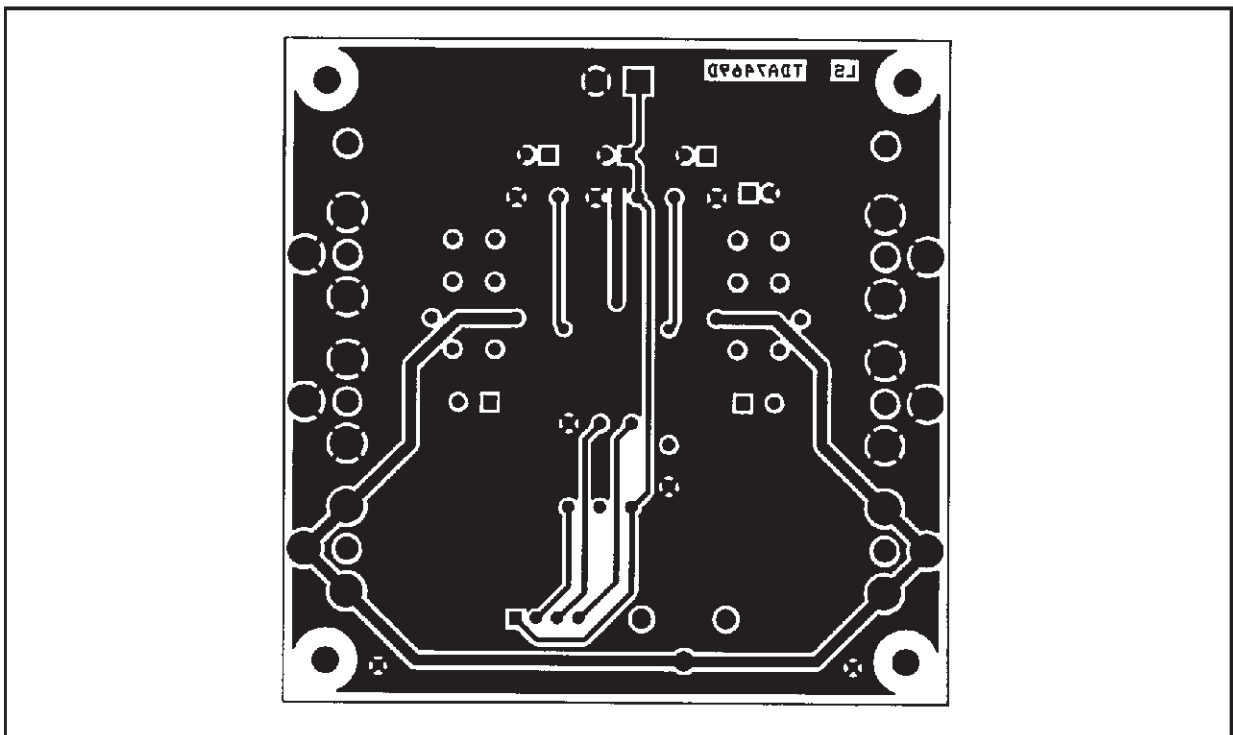
TDA7469D Components Layout



TDA7469D P. C. Board (Top View)



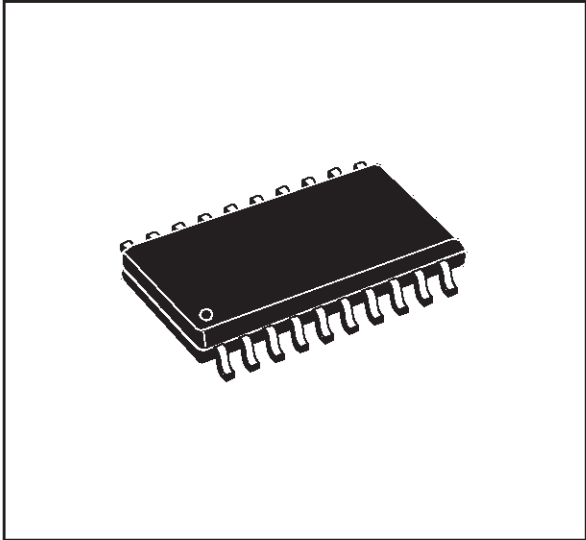
TDA7469D P. C. Board (Backside view)



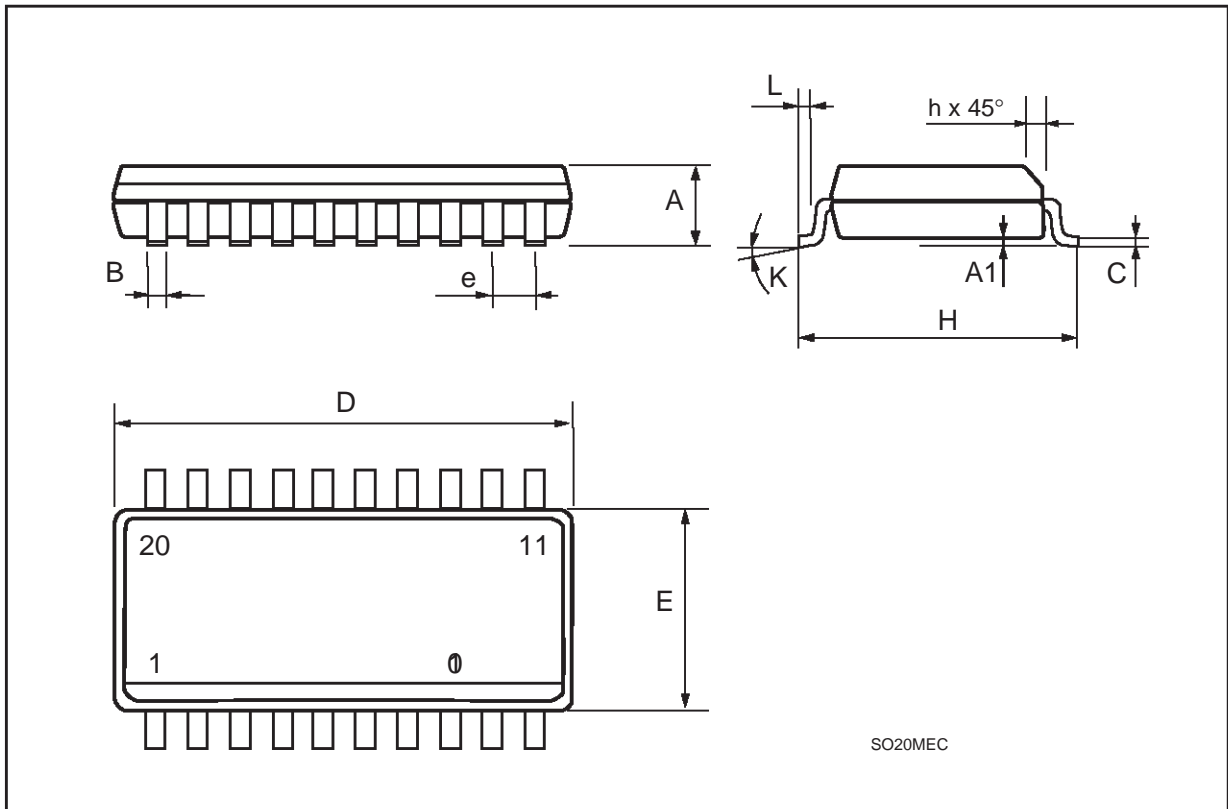


DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.1		0.3	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	12.6		13	0.496		0.512
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.4		1.27	0.016		0.050
K	0° (min.)8° (max.)					

**OUTLINE AND MECHANICAL DATA**



**SO20**

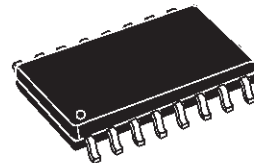


SO20MEC

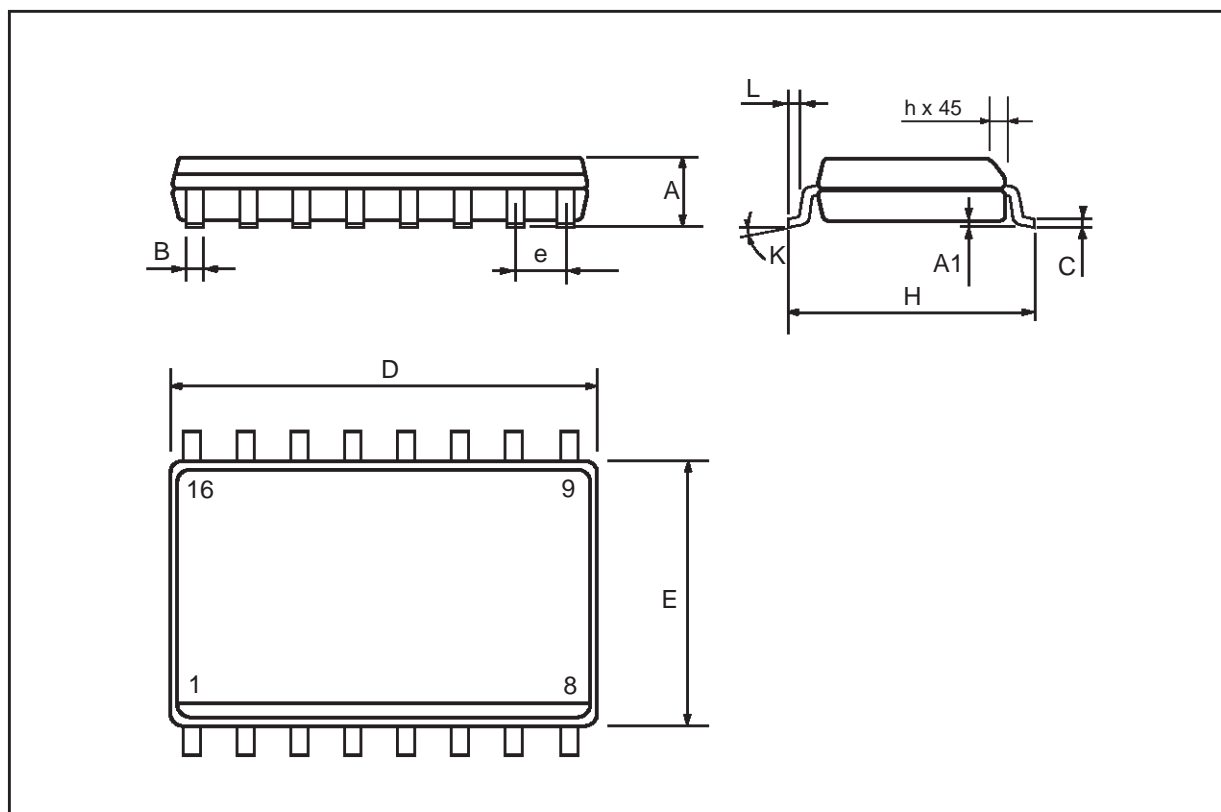
# TDA7469

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.1		0.3	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	10.1		10.5	0.398		0.413
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.4		1.27	0.016		0.050
K	0° (min.)8° (max.)					

## OUTLINE AND MECHANICAL DATA



**SO16 Wide**





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