

Excellent Integrated System Limited

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

Apex Microtechnology PA75CC

For any questions, you can email us directly: <u>sales@integrated-circuit.com</u>







RoHS

Dual Power Operational Amplifiers

FEATURES

- RoHS COMPLIANT
- LOW COST
- WIDE BANDWIDTH 1.1 Mhz
- HIGH OUTPUT CURRENT 2.5A (Combined)
- WIDE COMMON MODE RANGE Includes negative supply • WIDE SUPPLY VOLTAGE RANGE Single supply: 5V to 40V
- Split supplies: \pm 2.5V to \pm 20V
- LOW QUIESCIENT CURRENT
- VERY LOW DISTORTION

APPLICATIONS

- HALF AND FULL BRIDGE MOTOR DRIVERS
- AUDIO POWER AMPLIFIER
- IDEAL FOR SINGLE SUPPLY SYSTEMS 5V Peripherals, 12V Automotive, 28V Avionic

PACKAGING OPTIONS

- 7 TO-220 Plastic Package (PA75CD)
- 7 TO-220 with Staggered Lead Form (PA75CX)
- 7 DDPAK Surface Mount Package (PA75CC)

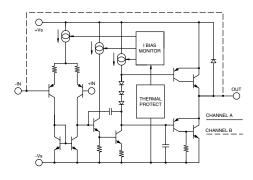
DESCRIPTION

The amplifier design consists of dual power op amp on a single monolithic die. Side B of the dual monolithic is configured as a unity gain buffer to increase the current capability of the master side A. The use of two PA75 amplifiers provides a cost-effective solution to applications where multiple amplifiers are required or a bridge configuration is needed. Very low harmonic distortion of .02% THD and low I_{Ω} makes the PA75 a good solution for power audio applications.

The PA75 is available in three standard package designs. The surface mount version of the PA75, the PA75CC, is an industry standard non-hermetic plastic 7-pin DDPAK. The through hole version of the PA75, the PA75CD and PA75CX, are industry standard non-hermetic plastic 7-pin TO-220 packages. The PA75CX is staggered lead formed and offers standard 100 mil spacing. This allows for easier PC board layout. (Please refer to the CX lead form package drawing for dimension of the PA75CX).

The monolithic amplifier is directly attached to the metal tabs of the PA75CC, PA75CD, and PA75CX. The metal tabs of the packages are directly tied to -Vs.

EQUIVALENT SCHEMATIC ONE CHANNEL







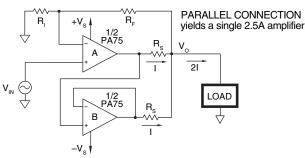
PACKAGE STYLE CC

7 PIN T0220 **STAGGERED LEADS** PACKAGE STYLE CX

7 PIN T0220 PACKAGE STYLE CD

TYPICAL APPLICATION

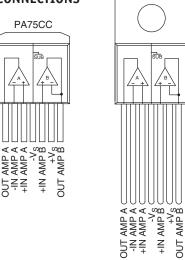
Ref: APPLICATION NOTES 8, 20, 26

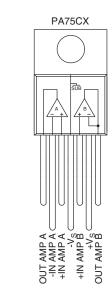


Combining the power op amp (master channel A) and the unity gain buffer (slave channel B) in a parallel connection yields a single 2.5A amplifier. RI and RF can set up channel A for the required gain for the overall circuit. Small values of Rs (sense resistors) are used on the outputs to improve current sharing characteristics. The master amplifier can be configured in inverting or non-inverting gain configurations.

PA75CD

EXTERNAL CONNECTIONS





www.apexanalog.com

Copyright © Apex Microtechnology, Inc. 2012 (All Rights Reserved)

OCT 2012 PA75U REVH



Distributor of Apex Microtechnology: Excellent Integrated System Limited Datasheet of PA75CC - IC OPAMP POWER 1.4MHZ 7DDPAK Contact us: sales@integrated-circuit.com Website: www.integrated-circuit.com

PA75



ABSOLUTE MAXIMUM RATINGS	SUPPLY VOLTAGE, total OUTPUT CURRENT POWER DISSIPATION, internal, (per amplifier) POWER DISSIPATION, internal (both amplifiers) INPUT VOLTAGE, differential INPUT VOLTAGE, common mode JUNCTION TEMPERATURE, max ¹ TEMPERATURE, pin solder—10 sec max TEMPERATURE RANGE, storage OPERATING TEMPERATURE RANGE, case		5V to 40V SOA 19.5W 28.6W $\pm V_{S}$ $+V_{S}, -V_{S}$ =0.5V 150°C 220°C -55°C to 150°C -40°C to 125°C		
SPECIFICATIONS PARAMETER	TEST CONDITIONS ²	MIN	ТҮР	МАХ	UNITS
INPUT OFFSET VOLTAGE, initial OFFSET VOLTAGE, vs. temperature BIAS CURRENT, initial COMMON MODE RANGE COMMON MODE REJECTION, DC POWER SUPPLY REJECTION CHANNEL SEPARATION INPUT NOISE VOLTAGE	Full temperature range Full temperature range Full temperature range Full temperature range $I_{OUT} = 500mA, f = 1 kHz$ $R_{S} = 100\Omega, f = 1 to 100kHz$	V _S 60 60 50	1 20 100 90 90 68 22	15 500 +V _S –1.3	mV μV/°C NA V dB dB dB nV/√Hz
GAIN OPEN LOOP GAIN GAIN BANDWIDTH PRODUCT PHASE MARGIN POWER BANDWIDTH	Full temperature range $A_V = 40dB$ Full temperature range, $R_L = 2K\Omega$, $C_L = 100pF$ $V_{O(P-P)} = 28V$	89 0.9	100 1.4 65 13.6		dB MHz ° kHz
OUTPUT CURRENT, peak SLEW RATE VOLTAGE SWING VOLTAGE SWING HARMONIC DISTORTION	Full Temperature Range, $I_0 = 100mA$ Full Temperature Range, $I_0 = 1A$ $A_V = 1$, $R_2 = 50\Omega$, $V_0 = .5V_{RMS}$, $f = 1kHz$	1 V _S - 1.1 V _S - 1.8	1.4 V _S 8 V _S - 1.4 .02	1.5	A V/µs V V %
POWER SUPPLY VOLTAGE, V _{SS} ³ CURRENT, quiescent, total		5	30 8	40 10	V mA
THERMAL RESISTANCE,DC junction to case (single) RESISTANCE,AC junction to case (single) RESISTANCE,DC junction to case (both) RESISTANCE,AC junction to case (both) RESISTANCE,junction to air (CD,CX) RESISTANCE,junction to air (CC) ⁴ TEMPERATURE RANGE,case	Meets full range specifications	-25	5.84 4.38 3.97 2.98 60 27	6.42 4.81 4.36 3.27 85	°C/W °C/W °C/W °C/W °C/W °C/W °C

NOTES: 1. Long term operation at the maximum junction temperature will result in reduced product life. Derate internal power dissipation to achieve high MTTF.

 Unless otherwise noted, the following conditions apply: ±V_S = ±15V, T_C = 25°C.
 +V_S and -V_S denote the positive and negative supply rail respectively. V_{SS} denotes the total rail-to-rail supply voltage.
 Heat tab attached to 3/32" FR-4 board with 2oz. copper. Topside copper area (heat tab directly attached) = 1000 sq. mm, backside copper area = 2500 sq. mm, board area = 2500 sq. mm.



Distributor of Apex Microtechnology: Excellent Integrated System Limited Datasheet of PA75CC - IC OPAMP POWER 1.4MHZ 7DDPAK Contact us: sales@integrated-circuit.com Website: www.integrated-circuit.com



PA75

TYPICAL PERFORMANCE GRAPHS QUIESCENT CURRENT **BIAS CURRENT OFFSET VOLTAGE** 24 160 3 NORMALIZED BIAS CURRENT, IB (mA) 2.5 NORMALIZED OFFSET VOLTAGE, V_{0.8} (mV) .0 5.0 1 5.1 5 .0 2.0 2 TOTAL SUPPLY VOLTAGE, $V_{\rm s}$ (V) 00 20 120 2 CASE TEMPERATURE, $T_{_{ m C}}$ 16 80 1.5 12 40 1 8 0 0.5 4 40 0 -0.5 -100 0 L -100 0 -80 -100 150 -50 150 1.5 0.7 0.9 1.1 1.3 1.5 1.7 1.9 -50 0 50 0 50 100 TEMPERATURE, T_c (°C) NORMALIZED QUIESCENT CURRENT, Io (mA) CASE TEMPERATURE, T_c (°C) PHASE MARGIN vs. OUTPUT LOAD CAPACITANCE **VOLTAGE GAIN & PHASE vs. FREQUENCY OUTPUT VOLTAGE SWING** 2 VOLTAGE DROP FROM SUPPLY, (V) $+V_{s} = +15V$ $-V_{s} = -15V$ $R_{L} = 2K$ 1.8 65 60 90 1.6 PHASE MARGIN, Φ (°) $A_v = -100$ 1.4 55 40 100 (₀) ф 1.2 GAIN, A (dB) 110 HASE 1 20 45 0.8 0.6 +V_s = +15V 35 0 120 0.4 -V [°] = -15V Ř, = 2K 0.2 ___130 10K -20 0 25 0.0 0.4 0.8 1.2 1.6 2.0 OUTPUT LOAD CAPACITANCE, C_L (nF) 0.0 10 100 1K 0.3 0.5 0.7 0.9 2.0 1 0.1 OUTPUT CURRENT, I° (A) FREQUENCY, f (KHz) PULSE RESPONSE **PULSE RESPONSE** 10 10 8 8 S 6 +V_s = +15V OUTPUT VOLTAGE, V_o (V) $V_{s} = +15V$ 6 $A_{v}^{0} = +1$ $A_{v} = +1$ OUTPUT VOLTAGE, V_{\odot} 4 4 V_{IN} = 10Vp V_{IN} = 10Vp 2 2 0 0 -2 -2 ς = −15V -V_s = -15V -4 -4 Ř₁ = 20 = 1kHz f -6 -6 20kHz -8 -8 -10 -10 0 10 20 30 40 50 60 70 0 200 400 600 800 1000 1200 1400 TIME, t (µs) TIME, t (µs)



Distributor of Apex Microtechnology: Excellent Integrated System Limited Datasheet of PA75CC - IC OPAMP POWER 1.4MHZ 7DDPAK Contact us: sales@integrated-circuit.com Website: www.integrated-circuit.com

PA75

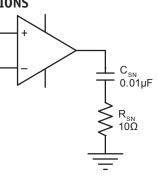


GENERAL

Please read Application Note 1 "General Operating Considerations" which covers stability, supplies, heatsinking, mounting, SOA interpretation, and specification interpretation. Visit www. apexanalog.com for design tools that help automate tasks such as calculations for stability, internal power dissipation, heatsink selection; Apex Microtechnology's complete Application Notes library; Technical Seminar Workbook; and Evaluation Kits.

STABILITY CONSIDERATIONS

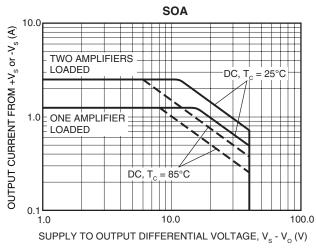
All monolithic power op amps use output stage topologies that present special stability problems. This is primarily due to noncomplementary (both devices are NPN) output stages with a mismatch in gain and phase response for different polarities of output current. It is dif-



ficult for the op amp manufacturer to optimize compensation for all operating conditions. For applications with load current exceeding 300ma, oscillation may appear. The oscillation may occur only with the output voltage swing at the negative or positive half cycle. Under most operating and load conditions acceptable stability can be achieved by providing a series RC snubber network connected from the output to ground. The recommended component values of the network are, $R_{\rm SN}$ = 10 Ω and $C_{\rm SN}$ = 0.01 μ F. Please refer to Application Note 1 for further details.

SAFE OPERATING AREA (SOA)

The SOA curves combine the effect of all limits for this power op amp. For a given application, the direction and magnitude of the output current should be calculated or measured and checked against the SOA curves. This is simple for resistive loads but more complex for reactive and EMF generating loads.

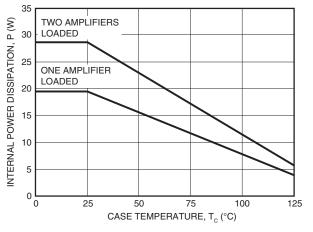


THERMAL CONSIDERATIONS

The PA75CD and CX have a large exposed copper heat tab to which the monolithic is directly attached. The PA75CD and CX may require a thermal washer, which is electrically insulating since the tab is directly tied to -VS. This can result in a thermal impedance RCS of up to 1° C/W or greater.

The PA75CC has a large exposed integrated copper heatslug to which the monolithic is directly attached. The solder connection of the heatslug to a minimum of 1 square inch foil area of the printed circuit board will result in thermal performance of 25° C/W junction to air rating of the PA75CC. Solder connection to an area of 1 to 2 square inches of foil is required for minimal power applications

Where the PA75CC is used in higher power applications, it is necessary to use surface mount techniques of heatsinking. Surface mount techniques include the use of a surface mount fan in combination with a surface mount heatsink on the backside of the FR4/ PC board with through hole thermal vias. Other highly thermal conductive substrate board materials are available for maximum heat sinking.



POWER DERATING

MOUNTING PRECAUTIONS

- Always use a heat sink. Even unloaded the PA75 can dissipate up to .4 watts.
- 2. Avoid bending the leads. Such action can lead to internal damage.
- 3. Always fasten the tab of the CD and CX package to the heat sink before the leads are soldered to fixed terminals.
- Strain relief must be provided if there is any probability of axial stress to the leads.





PA75

NEED TECHNICAL HELP? CONTACT APEX SUPPORT!

For all Apex Microtechnology product questions and inquiries, call toll free 800-546-2739 in North America. For inquiries via email, please contact apex.support@apexanalog.com. International customers can also request support by contacting their local Apex Microtechnology Sales Representative.

To find the one nearest to you, go to www.apexanalog.com

IMPORTANT NOTICE

Apex Microtechnology, Inc. has made every effort to insure the accuracy of the content contained in this document. However, the information is subject to change without notice and is provided "AS IS" without warranty of any kind (expressed or implied). Apex Microtechnology reserves the right to make changes without further notice to any specifications or products mentioned herein to improve reliability. This document is the property of Apex Microtechnology and by furnishing this information, Apex Microtechnology grants no license, expressed or implied under any patents, mask work rights, copyrights, trademarks, trade secrets or other intellectual property rights. Apex Microtechnology owns the copyright associated with the information contained herein and gives consent for copies to be made of the information only for use within your organization with respect to Apex Microtechnology integrated circuits or other products of Apex Microtechnology. This consent does not extend to other copying such as copying for general distribution, advertising or promotional purposes, or for creating any work for resale.

APEX MICROTECHNOLOGY PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN PRODUCTS USED FOR LIFE SUPPORT, AUTOMOTIVE SAFETY, SECURITY DEVICES, OR OTHER CRITICAL APPLICATIONS. PRODUCTS IN SUCH APPLICATIONS ARE UNDER-STOOD TO BE FULLY AT THE CUSTOMER OR THE CUSTOMER'S RISK.

Apex Microtechnology, Apex and Apex Precision Power are trademarks of Apex Microtechnolgy, Inc. All other corporate names noted herein may be trademarks of their respective holders.