

PA4201-PUNK POP-UP NOISE KILLER

FEATURES

Extremely low supply current (<1 μ A)
>45dB mute attenuation
Shunt operation.
SOFT mute during normal operation.
Built-in expansion capability. Soft Mute out for driving additional channels.
Instant Power UP and Power DOWN muting.
ESD protected outputs.
2.7V to 5.5V supply operation.
Compact 2 x 2 x 0.6mm 8 lead DFN and SO-8 Package

APPLICATIONS

Cell phones
PDAs
Portable DVD Players
Portable MP3 Players
Notebook Audio
Set-top boxes
Digital Video Recorders
LCD TVs
Home Theater systems

GENERAL DESCRIPTION

PA4201 (PUNK) is a low power (ICC < 1 μ A) monolithic CMOS mixed signal device. PUNK's primary function is to control power supply transition noise in audio circuits and systems.

PUNK boasts several features that make it a "one of a kind" product on the market. Most prominent is the feature that allows the designer to implement SOFT mute on an audio line during normal operation. PUNK is an exceptional product for multi-channel devices as it is capable of expanding the SOFT mute operation into (Dolby 5.1 DTS™) systems .

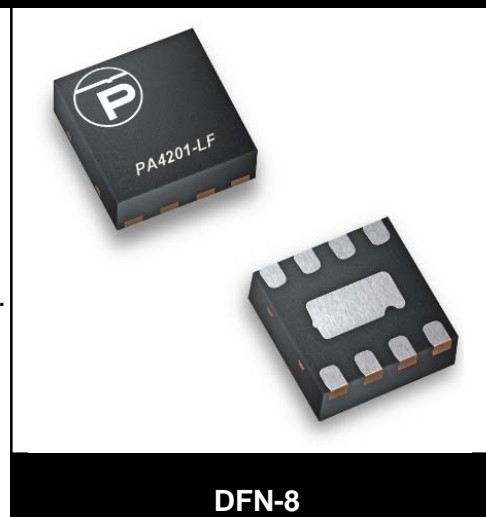
PUNK requires few external components for its operation, working from low to medium power supply voltages of 2.7V to 5.5V. As soon as a change in the power supply is detected, PUNK ensures that audio inputs to succeeding amplifiers are switched to a convenient low impedance voltage rail. This causes the amplifiers to remain silent as the power supply changes state.

PUNK operates as a passive shunt device. So the designer does not have to worry about PUNK introducing any kind of noise or distortion into the system.

While consuming less than 1 μ A of supply current PUNK provides more than 45dB of mute attenuation at the audio lines.

PUNK is equipped with ESD (Human Body Model) protection circuitry on the outputs.

PUNK is available as an 8L low profile 0.6mm DFN as well as the SO-8 package and is specified for operation over the -40 to +85 deg. C temperature range.



PA4201-PUNK POP-UP NOISE KILLER-ABSOLUTE MAXIMUM RATINGS

Sustained operation at or above the following ratings is not recommended. Catastrophic and irreversible damage will occur to the device at or above these ratings.

Symbol	Description	Rating
V_x	Voltage at any pin	-0.3 to 7.0+0.3V
I_x	Current at any pin	500mA
T_A	Ambient Temperature	150 deg. C
T_S	Storage Temperature	200 deg. C
T_{SOL}	Soldering Temperature	260 deg. C

Recommended Operating Conditions:

Unless otherwise specified, VDD=3 +/- 10%, TA = Ambient Temperature = 25 deg. C.

DC OPERATING CONDITIONS

Symbol	Parameter	Condition	Limit			Unit
			Min	Typ	Max	
V_{DD}^a	Positive Power Supply	Normal Operation	2.7		5.5	V
I_{DD}	VDD Current	Normal Operation			1	μ A
T_A	Ambient Temperature	Normal Operation	-40		85	$^{\circ}$ C
V_{OH}	Logic High O/P Voltage	IOH=100 μ A	VDD-0.1			V
V_{OL}	Logic Low O/P Voltage	IOL=-100 μ A			0.2	V
V_{IH}	Logic High I/P Voltage	I _{IH} = 1 μ A	VDD-0.3			V
V_{IL}	Logic Low I/P Voltage	I _{IL} =1 μ A			0.3	
R_{ON}	FET ON Resistance	VDD=2.7V, VDFET=0.4V		0.7	1	ohm
		VCC=5.5V, VDFET=0.4V		0.5	1	

PA4201-PUNK POP-UP NOISE KILLER

Symbol	Parameter	Condition	Limit			Unit
			Min	Typ	Max	
M_{OFFD}^b	Mute release delay	Mute Control=VIL Set by ext. RC network at RCS pin	10		300	ms
M_{STD}^b	Soft mute fall/rise time	Mute Control transitions to VIH. Set by ext. capacitor CEXT	1		300	ms
M_{PDEL}	Mute ON Delay	Power drops by 10%			5	μ S
NFETV ^c	NFET open drain volt				12	V

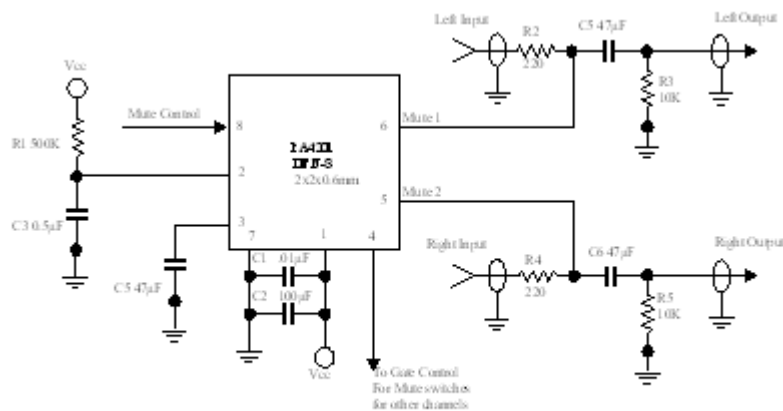
Notes:

- Power supply stabilization times have been assumed to range from 20ms to 200ms
- Two external capacitors (C1 and C2) set the delay time for mute release and soft mute
- Output switches are open drain N channel MOSFETS

PIN OUT

Pin	Name	Function
1	VCC	Positive power supply. 2.7V tp 5.5V +/-10%
2	RCS	Power On mute delay resistor-capacitor connection
3	CEXT	Soft mute delay capacitor
4	SMUTEOUT	Soft Mute OUT for multiple channels
5	MUTE1	Open Drain output of NFET 1
6	MUTE2	Open Drain output of NFET 2
7	GND	Ground
8	MUTECONT	Mute control signal from microprocessor

TYPICAL APPLICATION BLOCK DIAGRAM



PA4201-PUNK POP-UP NOISE KILLER -THEORY OF OPERATION

Startup

During Startup, the power supply ramps from 0V to VCC. This time is usually in excess of 20ms. As soon as this change in voltage is sensed, PUNK latches the Mute Controller outputs to HIGH, thus “muting” the lines. This is the Startup Operation (figure 1). The duration for which the controller outputs are latched HIGH can be controlled by an external RC circuit. When the voltage this RC pin reaches a certain threshold, the mute controller releases the lines (Gate voltage is LOW) and Normal Operation starts.

Shutdown

During Shutdown, the reverse process happens. As the power supply reaches the threshold on its way down, the mute controller again latches the outputs to HIGH, thus “muting” the lines (figure 2). This muting prevents unwanted signal spikes from getting the power amplifiers. However, for optimal performance, it is suggested to mute the lines using the MUTECONT signal before power down. This process will ensure that the pop noise involved during shutdown is diminished.

SOFT Mute

During normal operation, PUNK is in OFF state. But if there arises a situation when the audio lines need to be muted, the designer can do this by asserting the MUTECONT signal to HIGH. This will initiate a SOFT mute sequence (figure 3). When the MUTECONT signal is asserted, the mute controller gradually ramps, the control voltages in a “SOFT” fashion so as to provide a soft mute operation.

The mute delay is fully controllable by the designer by using an external capacitor at CEXT. Typical values of CEXT are between 0.1 micro F and 0.5 μ F. The reverse happens when the MUTECONT signal is released. This operation is explained in detail in the Application Circuit section.

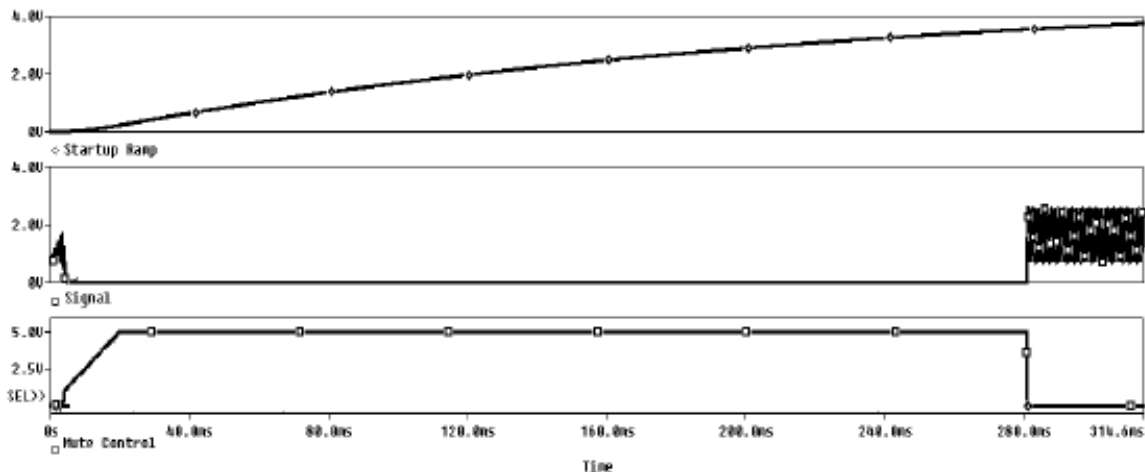
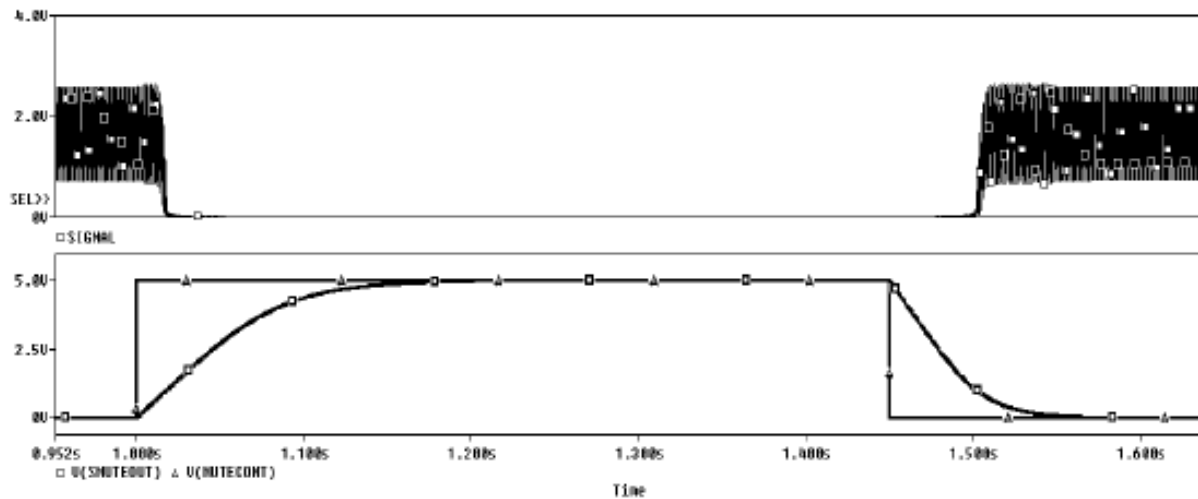
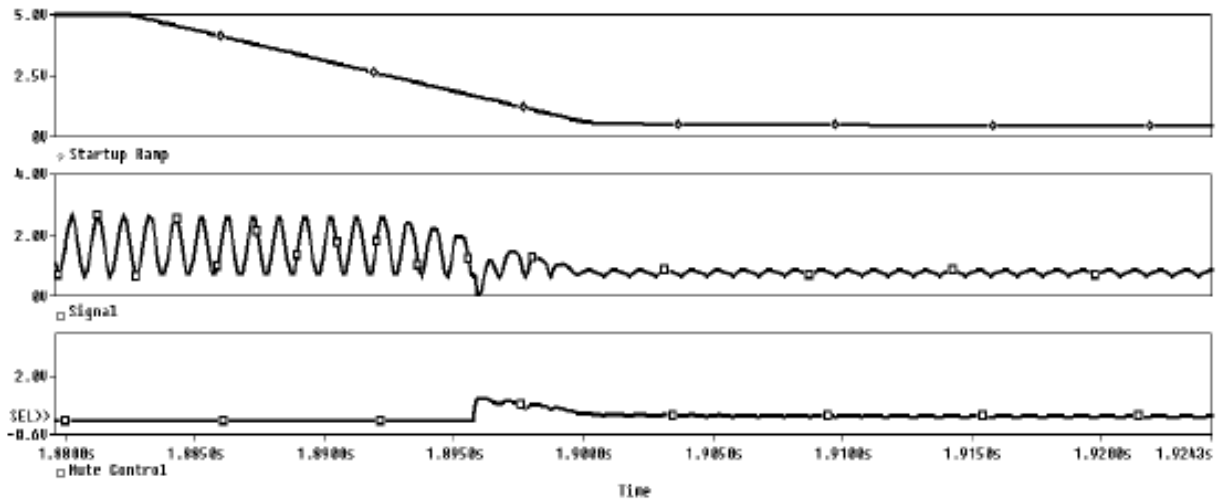


Figure 1: Startup Pop-Noise Reduction

PA4201-PUNK POP-UP NOISE KILLER



DFN-8LP PACKAGE OUTLINE & DIMENSIONS

PACKAGE OUTLINE

LAND PATTERN

PACKAGE DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
P1	1.90	2.10	0.075	0.083
P2	1.50	1.70	0.059	0.067
P3	0.50	0.60	0.020	0.024
L1	0.23	0.30	0.009	0.012
L2	0.28	0.40	0.010	0.016
L3	0.13	0.18	0.005	0.007
p	0.50	0.50	0.020	0.020
G1	0.90	1.45	0.035	0.058
G2	0.30	0.42	0.012	0.016

NOTES:

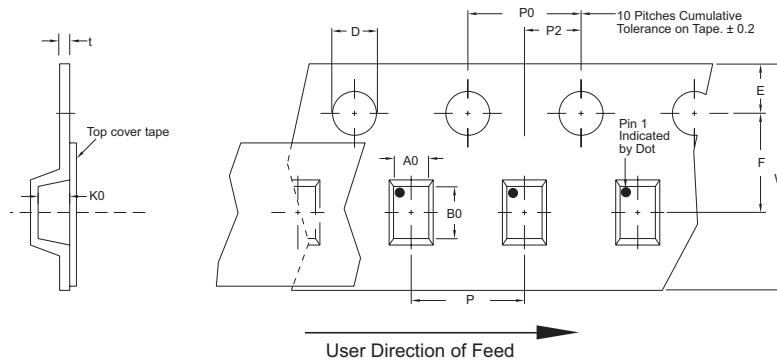
- Controlling dimensions in millimeters
- Dimension b applies to terminal and is measured between 0.25 and 0.30mm from terminal.
- Coplanarity applies to the exposed pad as well as the terminals.
- Dimension p is BSC.

TAPE & REEL ORDERING NOMENCLATURE

- Surface mount product is taped and reeled in accordance with EIA 481.
- Suffix-T71 = 7 Inch Reel - 1,000 pieces per 8mm tape.
- Suffix-T73 = 7 Inch Reel - 3,000 pieces per 8mm tape.
- Suffix - LF = Lead-Free, Pure Tin Plating.

Tape & Reel Specifications (Dimensions in millimeters)

Reel Dia.	Tape Width	A0	B0	K0	D	E	F	W	P0	P2	P	tmax
178mm (7")/330mm(13")	8mm	2.30± 0.10	2.30± 0.10	0.80 ± 0.10	1.50 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	8.00 ± 0.30	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	0.25

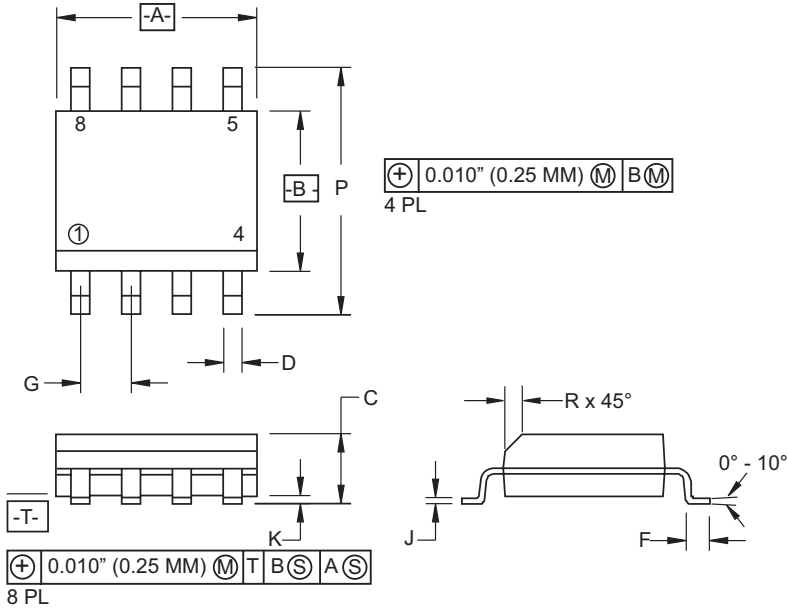


About ProTek Devices
ProTek Analog, based in Tempe, Ariz., is a division of ProTek Devices, a leading supplier of transient voltage suppression (TVS) solutions for Voice, Video and Data (V2D). ProTek Analog manufactures advanced Telecom ICs, Audio ICs, analog switches and multiplexers that work in conjunction with any host controller, EPROM, FPGA, and even Home Plug standards.

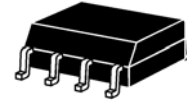
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SO-8 PACKAGE OUTLINE & DIMENSIONS

PACKAGE OUTLINE



SO-8



PACKAGE DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.250	0.016	0.049
G	1.27 BSC	1.27 BSC	0.05 BSC	0.05 BSC
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.008
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

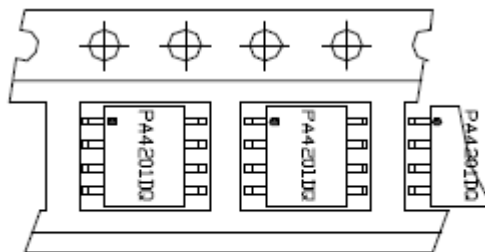
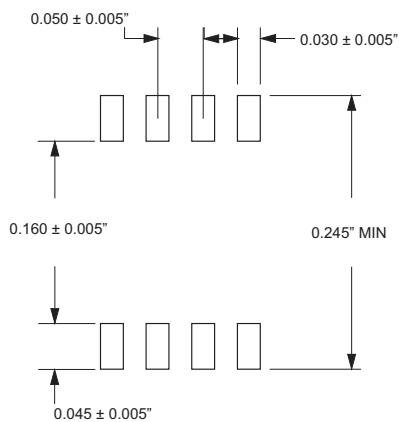
NOTES

1. - T - = Seating Plane and Datum Surface.
2. Dimensions "A" and "B" are Datum.
3. Dimensions "A" and "B" do not include mold protrusion.
4. Maximum mold protrusion is 0.015" (0.380 mm) per side.
5. Dimensioning and tolerances per ANSI Y14.5M, 1982.
6. Dimensions are exclusive of mold flash and metal burrs.

TAPE & REEL/BULK ORDERING NOMENCLATURE

1. Surface mount product is taped and reeled in accordance with EIA-481.
2. Suffix-T7 = 7 Inch Reel - 1,000 pieces per 12mm tape.
3. Suffix-T13 = 13 Inch Reel - 2,500 pieces per 12mm tape.
4. Suffix - LF = Lead-Free, Pure-Tin Plating.
5. No Suffix = Product Shipped in Tubes of 98 pcs per Tube.

MOUNTING PAD



Taped(12mm)
Orientation