

Features

- Single-Supply Operation from +2.2V ~ +5.5V
- Rail-to-Rail Input / Output
- Gain-Bandwidth Product: 10MHz (Typ.)
- Low Input Bias Current: 10pA (Typ.)
- Low Offset Voltage: 5mV (Max.)
- Quiescent Current: 800µA per Amplifier (Typ.)
- Operating Temperature: -40°C ~ +125°C
- Available in SOT23-5 SC70-5 and SOP8 MSOP8

Applications

- Portable Equipment
- Mobile Communications
- Smoke Detector
- Sensor Interface
- Medical Instrumentation
- Battery-Powered Instruments
- Handheld Test Equipment

General Description

The TPV721/22 is wideband, low-noise, low-distortion dual operational amplifier, that offer rail-to-rail inputs/outputs and single-supply operation down to 2.2V. They draw 1.6mA of quiescent supply current while featuring ultra-low distortion (0.0002% THD+N), as well as low input voltage-noise density (15nV/√Hz) and low input current-noise density (0.5fA/√Hz).

These features make the devices an ideal choice for applications that require low distortion and/or low noise.

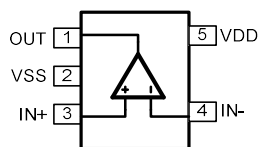
These amplifiers have inputs and outputs which swing rail-to-rail and their input common-mode voltage range includes ground.

The maximum input offset of these amplifiers is less than 5mV. The TPV721/22 are unity-gain stable with a gain-bandwidth product of 10MHz. The TPV721/22 is available in SOT23-5 SC70-5 and SOP8 MSOP8 packages

The extended temperature range of -40°C to +125°C over all supply voltages offers additional design flexibility.

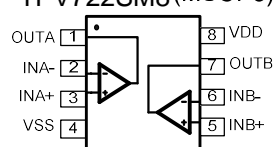
Pin Assignments

TPV721S5 (SOT23-5)
TPV721C5 (SC70-5)



SOT23-5/SC70-5

TPV722S8 (SOP8)
TPV722SM8 (MSOP8)



SOP8/MSOP8



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TPV721/22 Series

10MHZ,CMOS Rail-to-Rail Operational Amplifier

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Package/Ordering Information

Order Number	Channel	Package Description	Package Option
TPV721S5	Single	SOT23-5	Tape and Reel 3000
TPV721C5	Single	SC70-5	Tape and Reel 3000
TPV722S8	Dual	SOP8	Tape and Reel 2500
TPV722M8	Dual	MSOP8	Tape and Reel 2500

Absolute Maximum Ratings

Condition	Min	Max
Power Supply Voltage (V_{DD} to V_{SS})	-0.5V	+7V
Analog Input Voltage ($IN+$ or $IN-$)	$V_{SS}-0.5V$	$V_{DD}+0.5V$
PDB Input Voltage	$V_{SS}-0.5V$	+7V
Operating Temperature Range	-40°C	+125°C
Junction Temperature	+150°C	
Storage Temperature Range	-65°C	+150°C
Lead Temperature (soldering, 10sec)	+300°C	
Package Thermal Resistance ($T_A=+25^\circ C$)		
SOP8, θ_{JA}	130°C	
MSOP8, θ_{JA}	210°C	

Note: Stress greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions outside those indicated in the operational sections of this specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

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Electrical Characteristics (T_A=25°C unless otherwise noted)

(V_{DD} = +5V, V_{SS} = 0V, V_{CM} = 0V, V_{OUT} = V_{DD}/2, R_L=100K tied to V_{DD}/2, SHDNB = V_{DD}, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at T_A = +25°C.) (Notes 1)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply-Voltage Range	V _{DD}	Guaranteed by the PSRR test	2.2	-	5.5	V
Quiescent Supply Current (per Amplifier)	I _{DD}	V _{DD} = 3V	-	0.8	-	mA
		V _{DD} = 5V	-	0.8	1.2	
Input Offset Voltage	V _{OS}	T _A = +25°C	-	-	±5	mV
		T _A = -40°C to +85°C	-	-	-	
		T _A = -40°C to +125°C	-	-	±1.5	
Input Offset Voltage Tempco	ΔV _{OS} /ΔT		-	±0.3	±6	μV/°C
Input Bias Current	I _B	(Note 3)	-	±1	±100	pA
Input Offset Current	I _{OS}	(Note 3)	-	±1	±100	pA
Input Common-Mode Voltage Range	V _{CM}	Guaranteed by the T _A = 25°C	-0.2	-	V _{DD} +0.2	V
		CMRR test T _A = -40°C to +125°C	0	-	V _{DD} 0	
Common-Mode Rejection Ratio	CMRR	V _{SS} -0.2V≤V _{CM} ≤V _{DD} +0.2V T _A = +25°C	-	75	-	dB
		V _{SS} ≤V _{CM} ≤5V T _A = +25°C	65	80	-	
		V _{SS} -0.2V≤V _{CM} ≤V _{DD} +0.2V T _A = -40°C to +125°C	-	65	-	
Power-Supply Rejection Ratio	PSRR	V _{DD} = +2.2V to +5.5V	75	90	-	dB
Open-Loop Voltage Gain	A _v	R _L =100kΩ to V _{DD} /2, 100mV≤V _O ≤V _{DD} -125mV	90	100	-	dB
		R _L =1kΩ to V _{DD} /2, 200mV≤V _O ≤V _{DD} -250mV	75	85	-	
		R _L =500Ω to V _{DD} /2, 350mV≤V _O ≤V _{DD} -500mV	55	65	-	
Output Voltage Swing	V _{OUT}	V _{IN+} -V _{IN-} ≥ 10mV V _{DD} -V _{OH}	-	10	35	mV
		R _L = 10kΩ to V _{DD} /2 V _{OL} -V _{SS}	-	10	30	
		V _{IN+} -V _{IN-} ≥ 10mV V _{DD} -V _{OH}	-	80	200	
		R _L = 1kΩ to V _{DD} /2 V _{OL} -V _{SS}	-	50	150	
		V _{IN+} -V _{IN-} ≥ 10mV V _{DD} -V _{OH}	-	100	350	



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		$R_L = 500\Omega$ to $V_{DD}/2$ $V_{OL} = V_{SS}$		80	260	
Output Short-Circuit Current	I_{SC}	Sinking or Sourcing	-	± 50	-	mA
PDB Logic Low	V_{IL}		-	-	0.8	V
PDB Logic High	V_{IH}		2	-	-	V
Turn-On Time	T_{ON}		-	2.2	-	μs
Turn-Off Time	T_{OFF}		-	0.8	-	μs
Output Leakage Current	I_{LEAK}	Shutdown Mode (PDB = V_{SS}), $V_{OUT} = V_{SS}$ to V_{DD}	-	± 0.001	± 1.0	μA
Input Capacitance	C_{IN}			10		pF
Gain Bandwidth Product	GBW	$A_V = +1V/V$	-	10	-	MHz
Slew Rate	SR	$A_V = +1V/V$	-	4.5	-	V/ μs
Full Power Bandwidth		$A_V = +1V/V$	-	0.4	-	MHz
Phase Margin	ϕ_m	$A_V = +1V/V$	-	55	-	deg
Gain Margin	G_m	$A_V = +1V/V$	-	12	-	dB
Settling Time	t_s	To 0.01%, $V_{OUT} = 2V$ step $A_V = +1V/V$	-	1	-	μs
Capacitive-Load Stability	C_{LOAD}	No sustained oscillations. $A_V = +1V/V$	-	200	-	pF
Peak-to-Peak Input Noise Voltage (Note 5)	$e_n(p-p)$	$f = 0.1Hz$ to 10Hz	-	5	-	μV_{p-p}
Input Voltage Noise Density	e_n	$f = 10Hz$	-	60	-	nV/ \sqrt{Hz}
		$f = 1kHz$	-	30	-	
		$f = 30kHz$	-	15	-	
Input Current Noise Density	i_n	$f = 1kHz$				fA/ \sqrt{Hz}
Total Harmonic Distortion plus Noise	THD+N	$V_{OUT} = 2V_{p-p}$, $A_V = +1V/V$, $f = 1kHz$	-	0.0001	-	%
		$R_L = 10k\Omega$ to GND $f = 20kHz$	-	0.002	-	
		$V_{OUT} = 2V_{p-p}$, $A_V = +1V/V$, $f = 1kHz$	-	0.0002	-	
		$R_L = 1k\Omega$ to GND $f = 20kHz$	-	0.004	-	

Note 1: All devices are 100% production tested at $T_A = +25^\circ C$; all specifications over the automotive temperature range is guaranteed by design, not production tested.

Note 2: Parameter is guaranteed by design.

Note 3: Peak-to-peak input noise voltage is defined as six times RMS value of input noise voltage.

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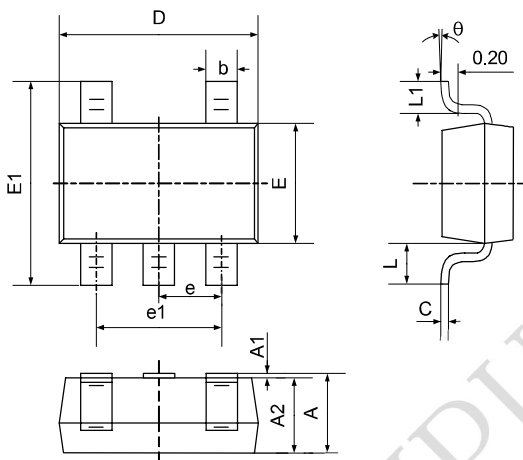
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Package Information

SOT23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°



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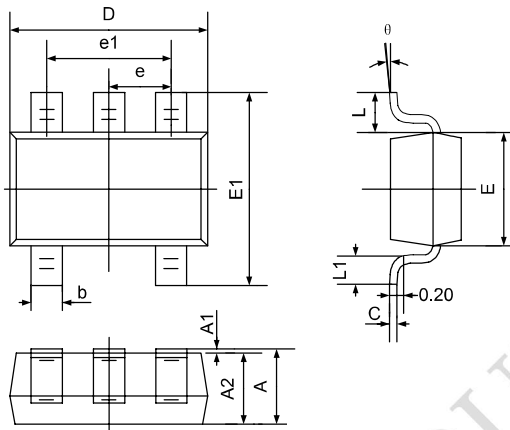
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SOT353/SC70-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°

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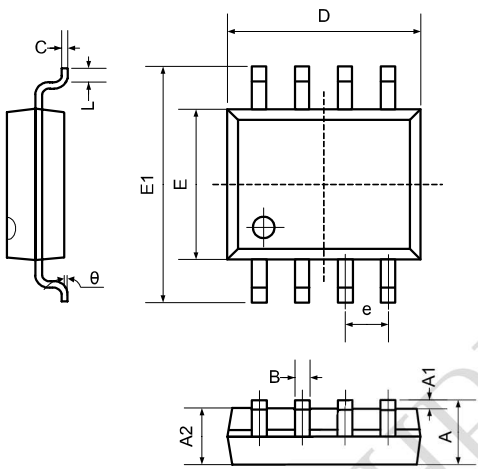
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SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°



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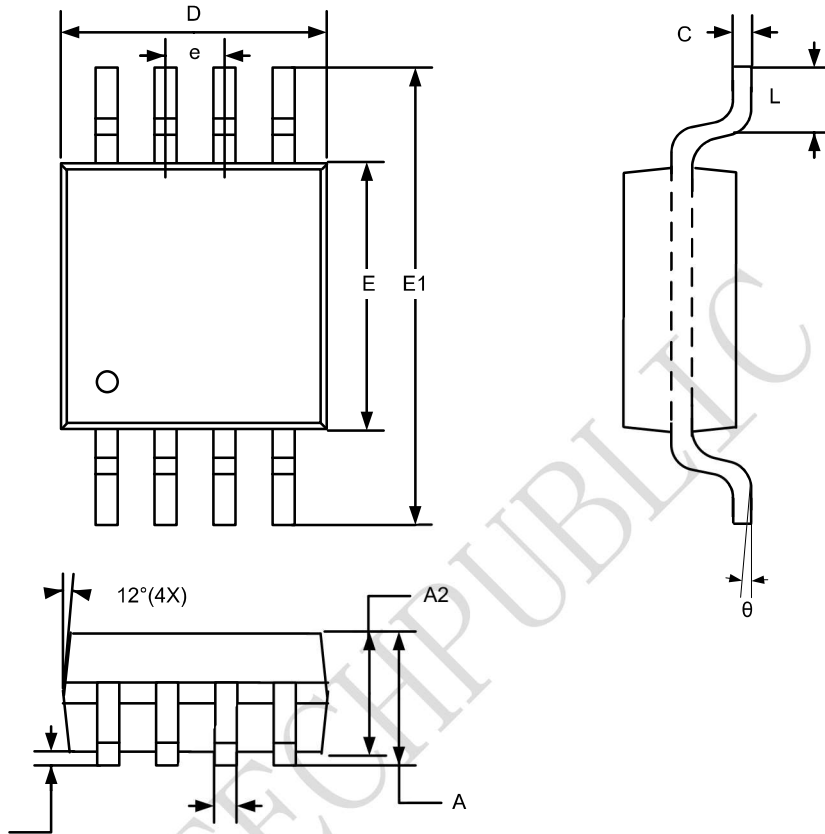
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MSOP8



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	--	--	1.10	--	--	0.043
A1	0.05	--	0.15	0.002	--	0.006
A2	0.75	0.85	0.95	0.030	0.033	0.037
b	0.25	--	0.40	0.010	--	0.016
C	0.13	--	0.23	0.005	--	0.009
D	2.90	3.00	3.10	0.114	0.118	0.122
E	2.90	3.00	3.10	0.114	0.118	0.122
E1	4.90 BSC			0.193 BSC		
e	0.65 BSC			0.026 BSC		
L	--	--	0.55	--	--	0.022
θ	0	--	7°	0	--	7°

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