

## General Description

This production 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.

This production are unity gain stable with a gain-bandwidth of 10MHz. The extended temperature range of -40 °C to +125°C over all supply voltages offers additional design flexibility.

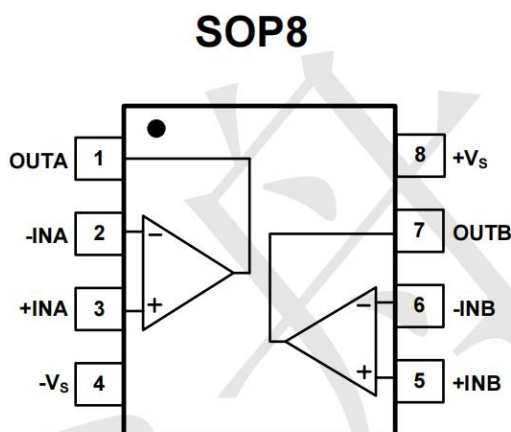
## Features

- 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 SOP8 Packages
- Shipping Qty :4000/12Inch Tape & Reel

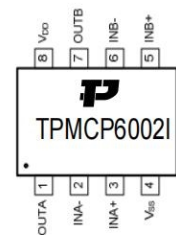
## Applications

- Portable Equipment
- Mobile Communications
- Smoke Detector
- Sensor Interface
- Medical Instrumentation

## Pin Assignments



## Marking:



## Electrical Characteristics

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, $\theta_{JA}$	130°C	
MSOP8, $\theta_{JA}$	210°C	

### Electrical Characteristics

( $V_{DD} = +5V$ ,  $V_{SS} = 0V$ ,  $V_{CM} = 0V$ ,  $V_{OUT} = V_{DD}/2$ ,  $R_L = 100K$  tied to  $V_{DD}/2$ ,  $SHDNB = V_{DD}$ ,  $T_A = -40^\circ C$  to  $+125^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .) (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	$V_{OS}$	$T_A = +25^\circ C$	-	-	$\pm 5$	mV
		$T_A = -40^\circ C$ to $+85^\circ C$	-	-	-	
		$T_A = -40^\circ C$ to $+125^\circ C$	-	-	$\pm 1.5$	
Input Offset Voltage Tempco	$\Delta V_{OS}/\Delta T$		-	$\pm 0.3$	$\pm 6$	$\mu V/^\circ C$
Input Bias Current	$I_B$	(Note 3)	-	$\pm 1$	$\pm 100$	pA
Input Offset Current	$I_{OS}$	(Note 3)	-	$\pm 1$	$\pm 100$	pA
Input Common-Mode Voltage Range	$V_{CM}$	Guaranteed by the $T_A = 25^\circ C$	-0.2	-	$V_{DD}+0.2$	V
		CMRR test $T_A = -40^\circ C$ to $+125^\circ C$	0	-	$V_{DD}0$	
Common-Mode Rejection Ratio	CMRR	$V_{SS}-0.2V \leq V_{CM} \leq V_{DD}+0.2V$ $T_A = +25^\circ C$	-	75	-	dB
		$V_{SS} \leq V_{CM} \leq 5V$ $T_A = +25^\circ C$	65	80	-	
		$V_{SS}-0.2V \leq V_{CM} \leq V_{DD}+0.2V$ $T_A = -40^\circ C$ to $+125^\circ C$	-	65	-	
Power-Supply Rejection Ratio	PSRR	$V_{DD} = +2.2V$ to $+5.5V$	75	90	-	dB
Open-Loop Voltage Gain	$A_V$	$R_L = 100k\Omega$ to $V_{DD}/2$ , $100mV \leq V_{OS} \leq V_{DD} - 125mV$	90	100	-	dB
		$R_L = 1k\Omega$ to $V_{DD}/2$ , $200mV \leq V_{OS} \leq V_{DD} - 250mV$	75	85	-	
		$R_L = 500\Omega$ to $V_{DD}/2$ , $350mV \leq V_{OS} \leq V_{DD} - 500mV$	55	65	-	
Output Voltage Swing	$V_{OUT}$	$ V_{IN+}-V_{IN-}  \geq 10mV$ $V_{DD}-V_{OH}$	-	10	35	mV
		$R_L = 10k\Omega$ to $V_{DD}/2$ $V_{OL}-V_{SS}$	-	10	30	
		$ V_{IN+}-V_{IN-}  \geq 10mV$ $V_{DD}-V_{OH}$	-	80	200	
		$R_L = 1k\Omega$ to $V_{DD}/2$ $V_{OL}-V_{SS}$	-	50	150	
		$ V_{IN+}-V_{IN-}  \geq 10mV$ $V_{DD}-V_{OH}$	-	100	350	



		$R_L = 500\Omega$ to $V_{DD}/2$ $V_{OL}-V_{SS}$		80	260	
Output Short-Circuit Current	$I_{SC}$	Sinking or Sourcing	-	$\pm 50$	-	mA
PDB Logic Low	$V_{IL}$		-	-	0.8	V
PDB Logic High	$V_{IH}$		2	-	-	V
Turn-On Time	$T_{ON}$		-	2.2	-	$\mu s$
Turn-Off Time	$T_{OFF}$		-	0.8	-	$\mu s$
Output Leakage Current	$I_{LEAK}$	Shutdown Mode (PDB = $V_{SS}$ ), $V_{OUT} = V_{SS}$ to $V_{DD}$	-	$\pm 0.001$	$\pm 1.0$	$\mu A$
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/ $\mu s$
Full Power Bandwidth		$A_V = +1V/V$	-	0.4	-	MHz
Phase Margin	$\phi_m$	$A_V = +1V/V$	-	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	-	$\mu s$
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	-	$\mu Vp-p$
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	$V_{OUT} = 2Vp-p$ , $A_V = +1V/V$ , $f = 1kHz$	-	0.0001	-	%
		$R_L = 10k\Omega$ to GND $f = 20kHz$	-	0.002	-	
		$V_{OUT} = 2Vp-p$ , $A_V = +1V/V$ , $f = 1kHz$	-	0.0002	-	
		$R_L = 1k\Omega$ to GND $f = 20kHz$	-	0.004	-	

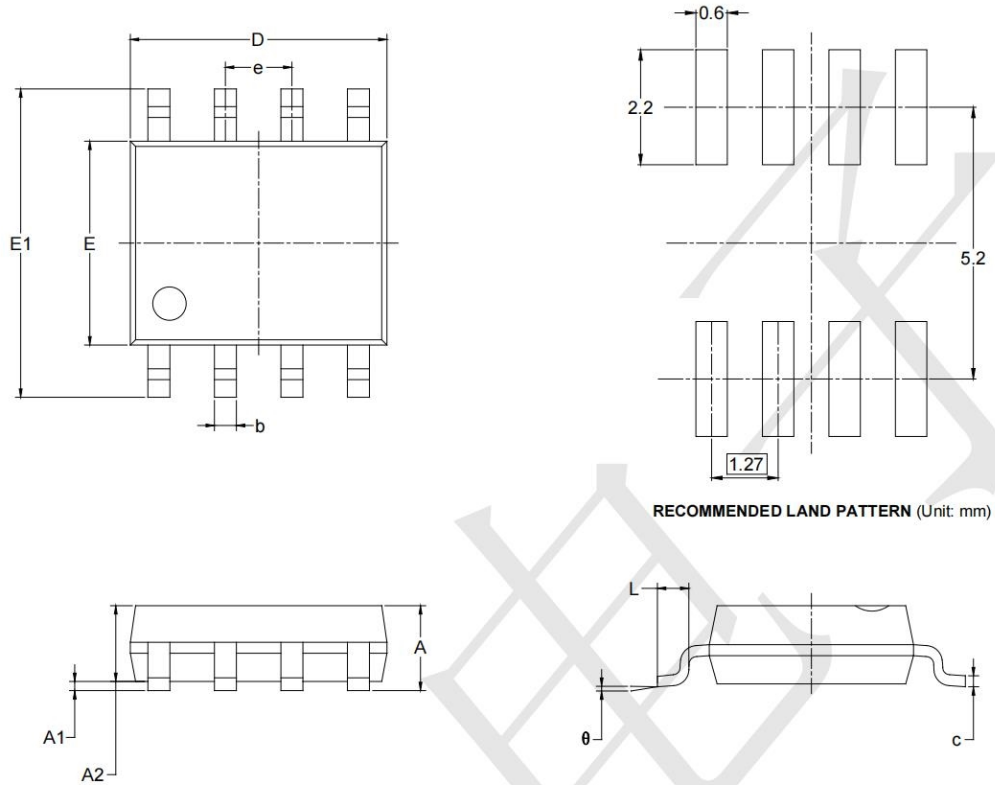
**Note 1:** All devices are 100% production tested at  $T_A = +25^\circ C$ ; all specifications over the automotive temperature range is guaranteed by design, not production tested.

**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.

**Package Information**

**SOIC-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	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°