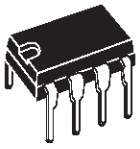
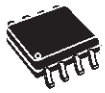
TSH10

140MHz BANDWIDTH LOW NOISE SINGLE OPERATIONAL AMPLIFIER

- LOW NOISE : 6nV/√Hz
- GAIN BANDWIDTH PRODUCT : 140MHz
- UNITY GAIN STABLE
- SLEW RATE : 150V/µs
- STANDARD PIN OUT



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

DESCRIPTION

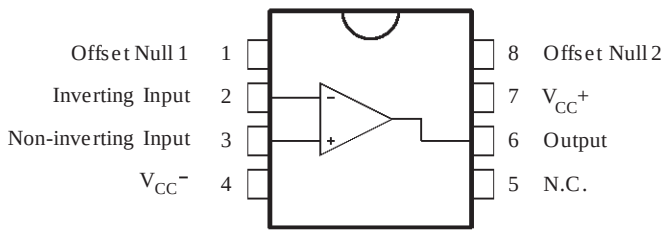
The TSH10 is a low cost wide bandwidth single operational amplifier featuring low input noise of 6nV/√Hz. Other features as unity gain stability, fast settling time and high linearity make it suitable for any application requiring speed and precision as high resolution video or DAC buffer.

ORDER CODES

Part Number	Temperature Range	Package	
		N	D
TSH10I	-40°C, 125°C	•	•

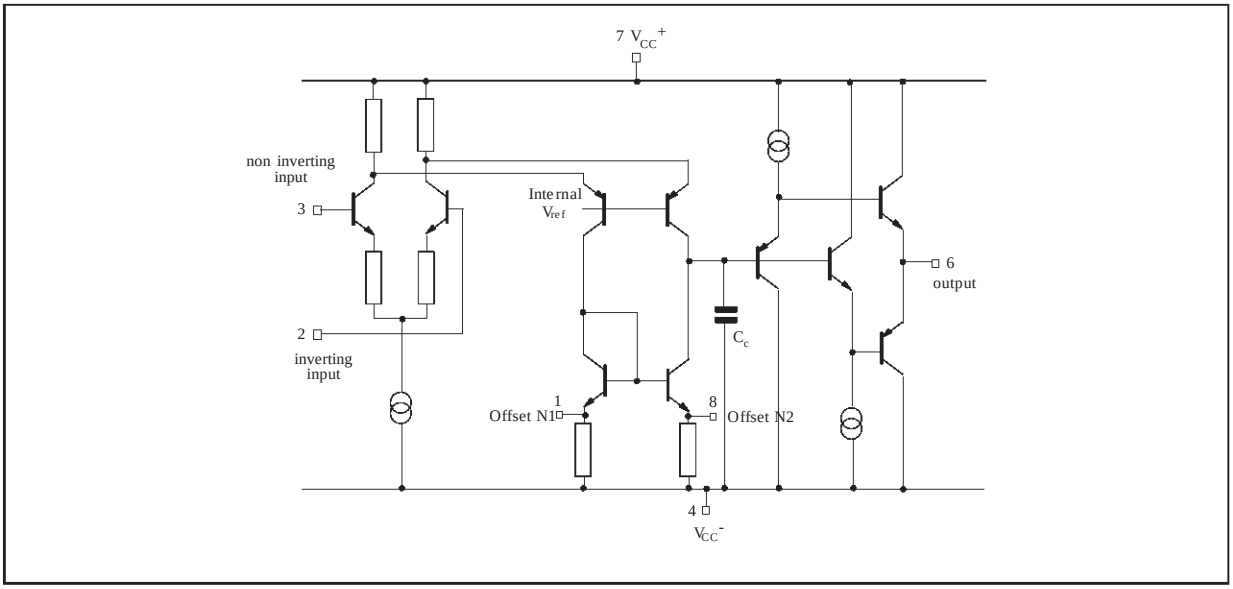
TSH10-01.TBL

PIN CONNECTIONS (top view)



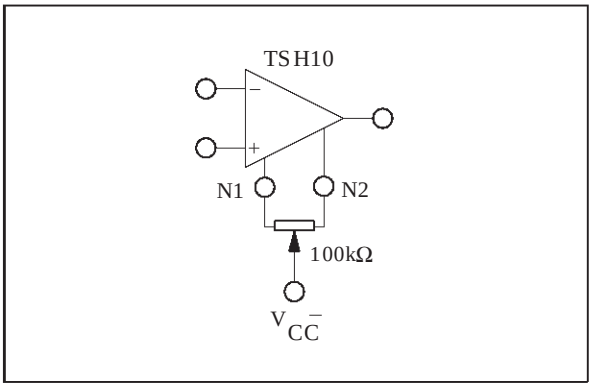
TSH10-01.EPS

SCHEMATIC DIAGRAM



TSH10-02.EPS

INPUT OFFSET VOLTAGE NULL CIRCUIT



TSH10-03.EPS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage		±7	V
V_{id}	Differential Input Voltage		±5	V
V_i	Input Voltage Range		±5	V
I_{in}	Current On Inputs Current On Offset Null Pins		±50 ±20	mA
T_{oper}	Operating Free-Air Temperature Range	TSH10C TSH10I TSH10M	0 to +70 -40 to +105 -55 to +125	°C
T_{stg}	Storage Temperature Range		-65 to 150	°C

TSH10-02.TBL

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	±3 to ±6	V
V_{ic}	Common Mode Input Voltage Range	V_{CC}^- +2 to V_{CC}^+ -1	V

TSH10-03.TBL

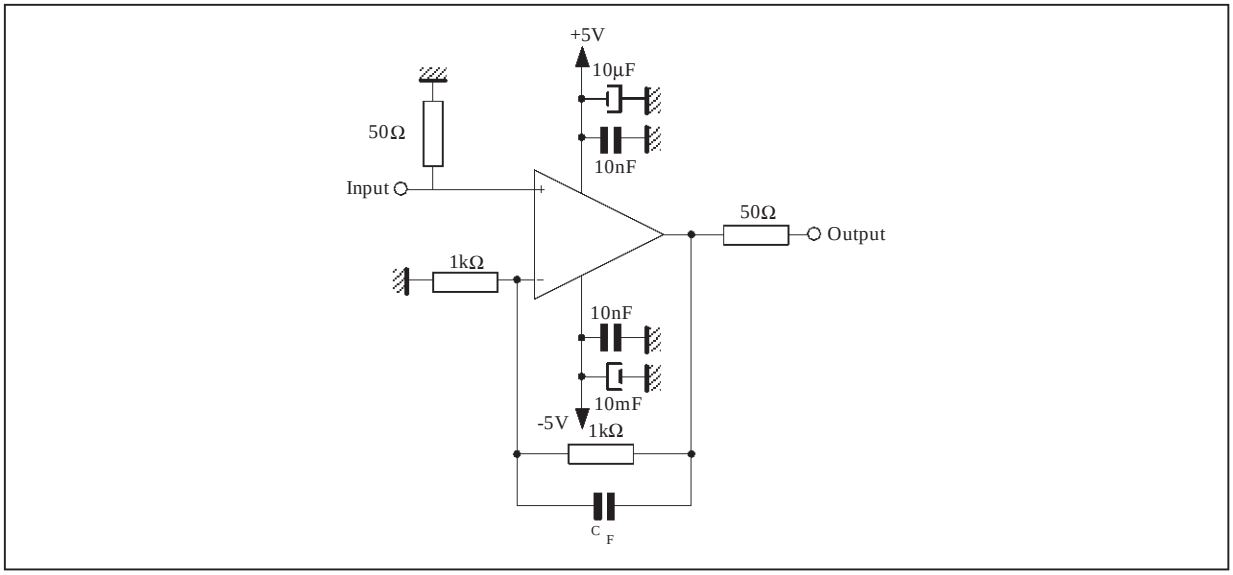
ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 5V$, $T_{amb} = 25^oC$ (unless otherwise specified)

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage			1	10	mV
DV_{io}	Input Offset Voltage Drift $T_{min} \le T_{amb} \le T_{max}$			20		$\mu V/^oC$
I_{ib}	Input Bias Current			5	30	µA
I_{io}	Input Offset Current			0.1	10	µA
I_{CC}	Supply Current, no load	$V_{CC} = \pm 5V$		20	40	mA
A_{vd}	Large Signal Voltage Gain $V_o = \pm 2.5V$	$R_L = 100\Omega$	200	800		V/V
V_{icm}	Input Common Mode Voltage Range		-3 to +4	-3.5 to +4.5		V
CMR	Common Mode Rejection Ratio	$V_{ic} = V_{icm\ min.}$	55	100		dB
SVR	Supply Voltage Rejection Ratio $V_{CC} = \pm 5V$ to $\pm 3V$		45	70		dB
V_o	Output Voltage	$R_L = 100\Omega$	± 2.5	+3.5 -3.7		V
I_o	Output Short Circuit Current $V_{id} = \pm 1V$, $V_o = 0V$			± 70		mA
GBP	Gain Bandwidth Product $A_{VCL} = 100$, $R_L = 100\Omega$, f = 7.5MHz			140		MHz
SR	Slew Rate $V_{in} = \pm 2V$, $A_{VCL} = 1$, $R_L = 100\Omega$			150		V/µs
e_n	Equivalent Input Voltage Noise	f = 1MHz		6		$\frac{nV}{\sqrt{Hz}}$
$\varnothing m$	Phase Margin $A_{VM} = 1$, $R_L = 100\Omega$, $C_L = 15pF$			40		Degrees

TSH10-04.TBL

EVALUATION CIRCUIT



PRINTED CIRCUIT LAYOUT

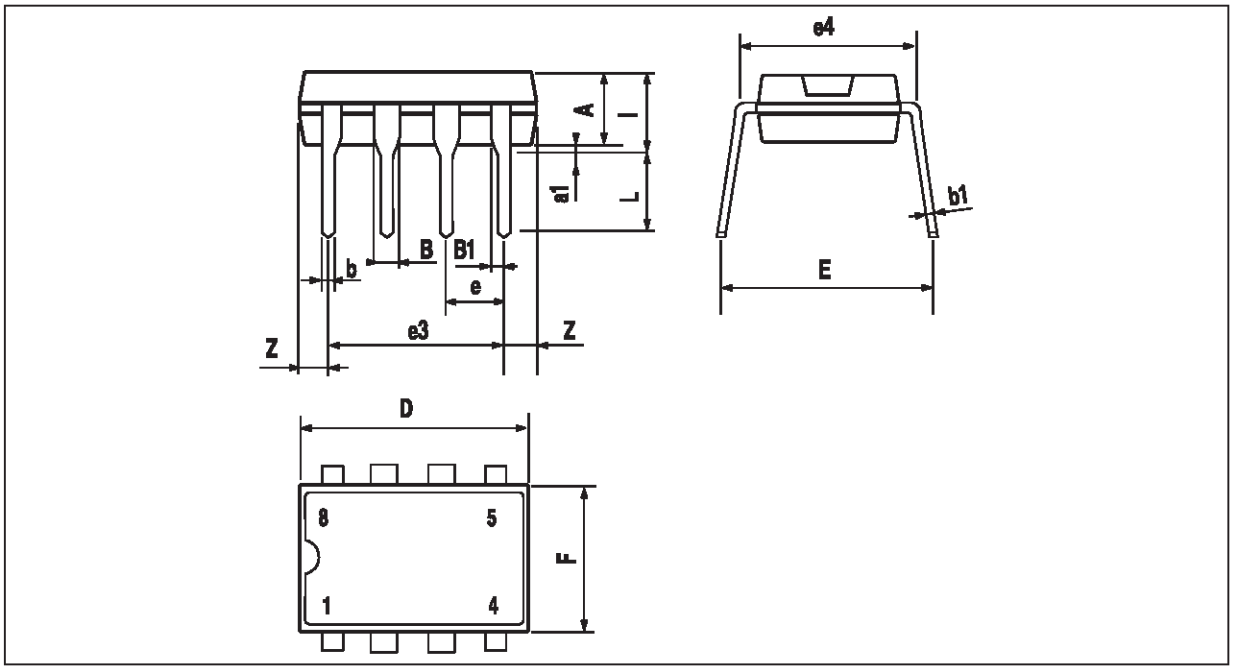
As for any high frequency device, a few rules must be observed when designing the PCB to get the best performances from this high speed op amp.

From the most to the least important points :

- Each power supply lead has to be bypassed to ground with a 10nF ceramic capacitor very close to the device and a 10µF tantalum capacitor.
- To provide low inductance and low resistance common return, use a ground plane or common point return for power and signal.
- All leads must be wide and as short as possible especially for op amp inputs. This is in order to decrease parasitic capacitance and inductance.
- Use small resistor values to decrease time constant with parasitic capacitance. Be aware on TSH10 device of the I_{io} error and input noise currents with high feedback resistor values.
- Choose component sizes as small as possible (SMD).
- On output, decrease capacitor load so as to avoid circuit stability being degraded which may cause oscillation. You can also add a serial resistor in order to minimise its influence.
- One can add in parallel with feedback resistor a few pF ceramic capacitor C_F adjusted to optimize the settling time.

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP



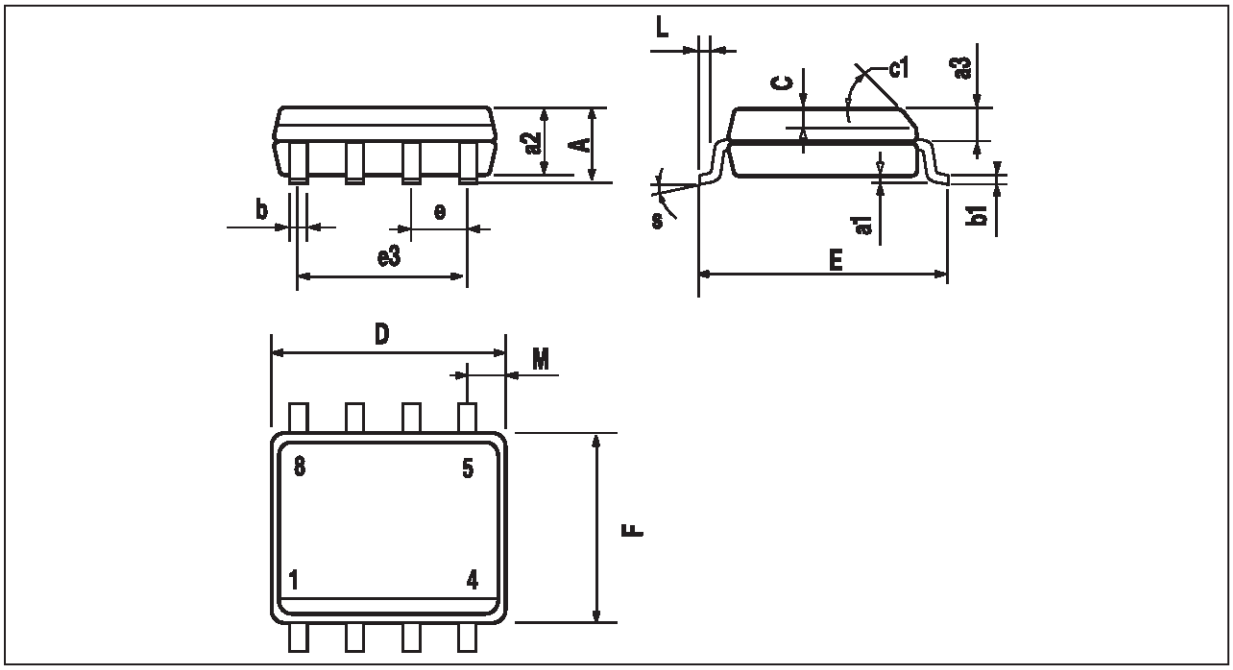
PM-DIP8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

SO8.TBL

ORDER CODE :