100kHz, 670nA, Non-Unity Gain, Rail-to-Rail I/O CMOS Operational Amplifier

1. Description

MCP6142 offers low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (100kHz) and slew rate of 30V/ms. The op-amps are stable for gains ≥ 10 and feature an ultra-low input bias current.

The devices are ideal for sensor interfaces, active filters and portable applications. MCP6142 are specified at the full temperature range of −40°C to +125°C under single or dual power supplies of 1.4V to 5.5V.

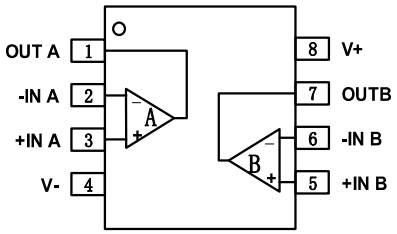
2. Features

- Gain bandwidth:100khz
- Rail-to-rail input and output 1mv typical V_{OS}
- Input voltage range: -0.1v to +5.6v with vs = 5.5v
- Supply range: +1.4v to +5.5v
- Stable for gains ≥ 10
- Specified up to +125°c

3. Application

- Sensors
- Photodiode amplification
- Wearable products
- Temperature measurement
- Battery powered system

4. Pin Configurations



MCP6142

Note: NC indicates no internal connection

5. Ordering Information

Type Number	Package Type	Packing	Notes
MCP6142T-E/SN	SOIC-8	Tape & Reel	
MCP6142T-E/MS	MSOP-8	Tape & Reel	

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

6. Absolute Maximum Ratings (1)

Parameter	Condition	Min	Typ	Max	Unit
Supply Voltage, V+ to V-			7.0		V
Input Terminals, Voltage		-0.5		0.5	V
Input Terminals, Current			±10		mA
Storage Temperature		-65		150	°C
Operating Temperature		-40		125	°C
Junction Temperature			150		°C
Package Thermal Resistance @T_A = +25°C	SOIC-8, MSOP-8		150		°C/W
Lead Temperature (Soldering, 10s)			260		°C
ESD Susceptibility	HBM		5000		V
	MM		400		

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

(2) Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

7. Electrical Characteristics

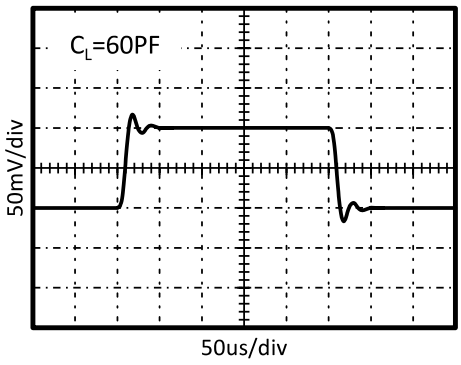
(At T_A = +25°C, Vs=5.0V, R_L = 1MΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UINTS
POWER SUPPLY						
V_S	Operating Voltage Range		1.4		5.5	V
I_Q	Quiescent Current/Amplifier			670	1500	nA
PSRR	Power-Supply Rejection Ratio	V_S=1.4V to 5.5V, V_{CM}=(V-)+0.5V	60	70		dB
INPUT						
Vos	Input Offset Voltage	V_{CM}=V_S/2		1	5	mV
$\Delta V_{OS}/\Delta T_A$	Input Offset Voltage Drift	V_{CM}=V_S/2, -40°C ≤ T_A ≤125°C		2.3		μV/°C
I_B	Input Bias Current			1	10	pA
I_{OS}	Input Offset Current			1	10	pA
V_{CM}	Common-Mode Voltage Range	V_S= 5.5V	-0.1		5.6	V
CMRR	Common-Mode Rejection Ratio	V_S= 5.5V, V_{CM}=-0.1V to 4V	63	75		dB
		V_S= 5.5V, V_{CM}=-0.1V to 5.6V	58	70		dB
OUTPUT						
AOL	Open-Loop Voltage Gain	Vs=1.4V, R_L=50KΩ, Vo=Vs-0.1V	62	80		dB
		Vs=5.0V, R_L=50kΩ, Vo=Vs-0.1V	65	85		dB
	Output Swing from Rail	R_L=50KΩ		5		mV
I_{OUT}	Output Short-Circuit Current			30		mA
FREQUENCY RESPONSE						
SR	Slew Rate			30		V/ms
GBP	Gain-Bandwidth Product			100		kHz
PM	Phase Margin			60		°
NOISE						
e_{np-p}	Input Voltage Noise	f=0.1 Hz to 10 Hz		2.4		μVpp
e_n	Input Voltage Noise Density	f=1 kHz		160		nV/ √Hz

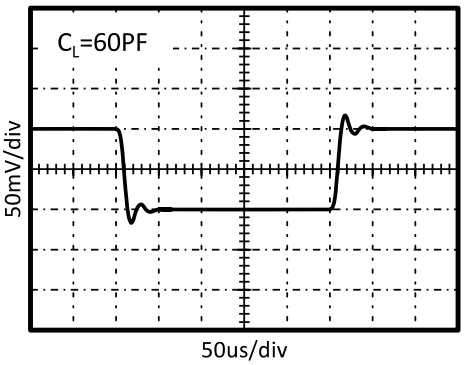
8. Typical Characteristics

(At T_A = +25°C, Vs=5.0V, R_L = 1MΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.)

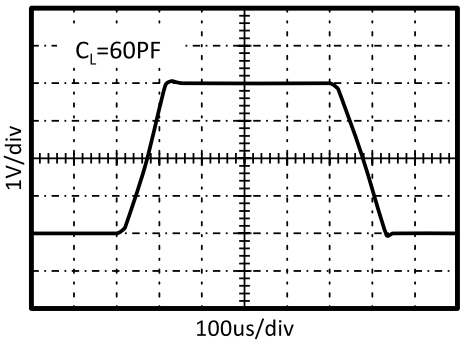
SMALL−SIGNAL STEP RESPONSE



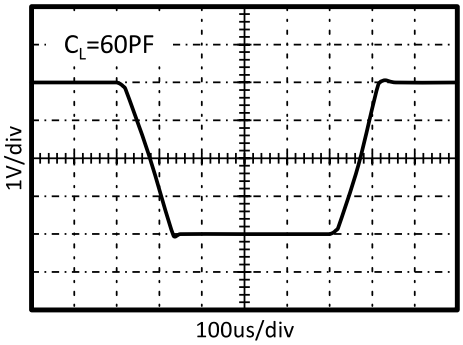
SMALL−SIGNAL STEP RESPONSE



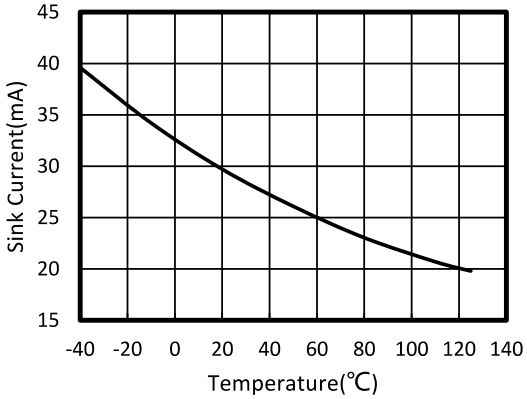
LARGE−SIGNAL STEP RESPONSE



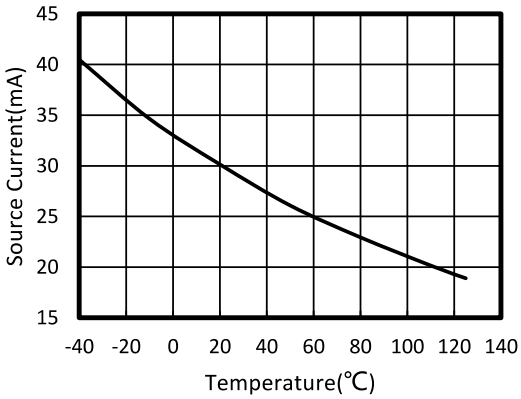
LARGE−SIGNAL STEP RESPONSE



SINK CURRENT vs TEMPERATURE

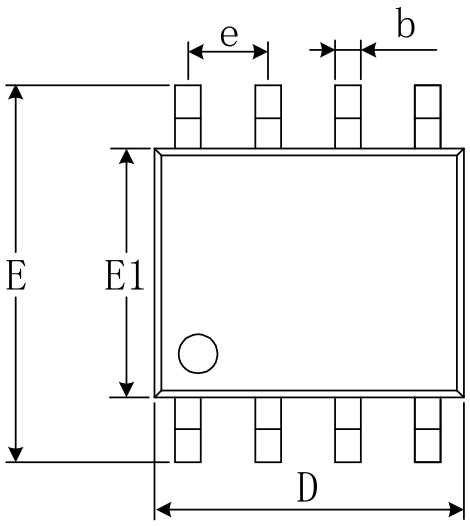


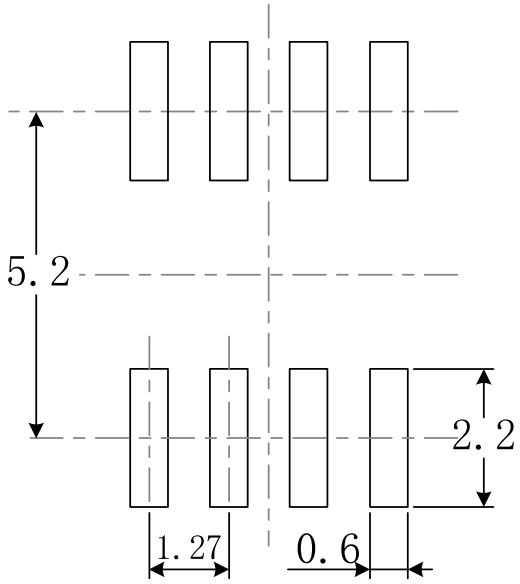
SOURCE CURRENT vs TEMPERATURE



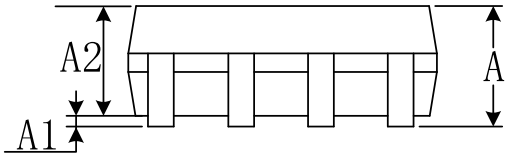
9. Package Outlines

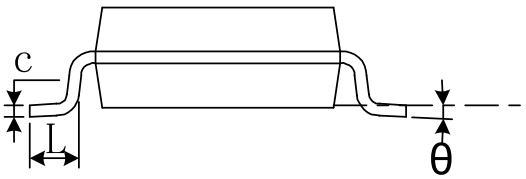
9.1. SOIC-8 (SOP-8)





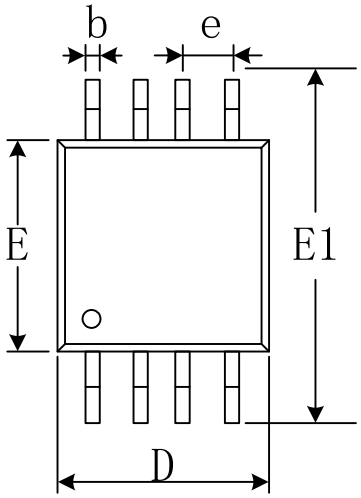
RECOMMENDED LAND PATTERN (Unit: mm)

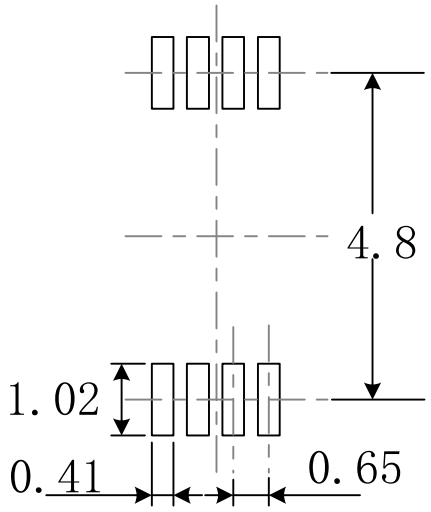




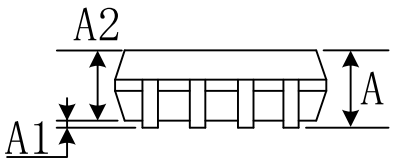
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

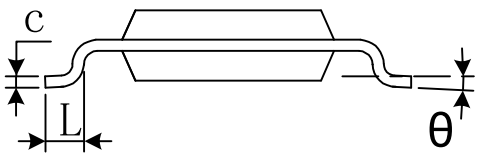
9.2. MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

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