General Purpose, 1MHz, Micro-Power CMOS Op-Amps

Description

TP321/358 are general purpose single, dual and quad CMOS op-amps with low offset, high frequency response, low power, low supply voltage, and rail-to-rail inputs and outputs.

The TP321/358 are unity gain stable with a constant 1MHz gain-bandwidth product, 1V/μs slew rate while consuming only 45μA of supply current per amplifier. The rail-to-rail input and output characteristics allow the full power-supply voltage to be used for signal range.

This combination of features makes the TP321/358 superior and cost-effective among RRIO CMOS op-amps. The TP321/358 are ideal choices for battery-powered applications because they minimize errors due to power supply voltage variations over the lifetime of the battery and maintain high CMRR even for a rail-to-rail input op-amp.

Features

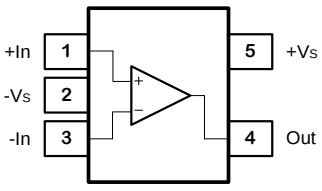
- General Purpose, Low Cost
- Gain Bandwidth Product: 1MHz
- Low Quiescent Current: 45μA/Amplifier
- Offset Voltage: 5.0mV Maximum
- Offset Voltage Temperature Drift: 2uV/℃
- Input Bias Current: 10pA
- CMRR/PSRR: 90dB
- Unity Gain Stable
- Rail-to-Rail Input and Output
- No Phase Reversal for Overdriven Inputs
- Supply Voltage Ran ge: 2.1V to 6.0V
- Operati on Range: –40℃ to 125℃
- ESD Rating :
  8kV – HBM, 2kV – CDM and 500V – MM
- Popular Type Package

Applications

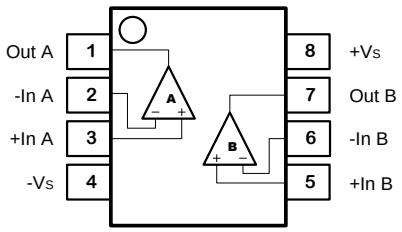
- Audio Output
- Battery and Power Supply Control
- Smoke/Gas/Environment Sensors
- Medical Equipment
- Portable Instruments and Mobile Device
- Active Filters
- Piezo Electrical Transducer Amplifier
- Sensor Interface
- ASIC Input or Output Amplifier

Pin Configuration (Top View)

TP321
SOT23-5



TP358
SOP-8



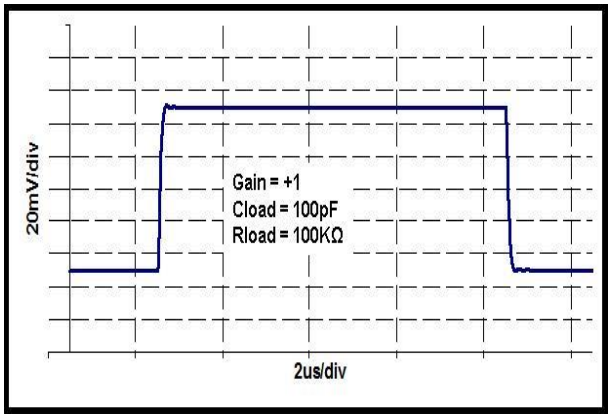
5V Electrical Characteristics

The denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 27° C. V_{SUPPLY} = 5V, V_{CM} = V_{OUT} = V_{SUPPLY}/2, R_L = 100KΩ, C_L =100pF

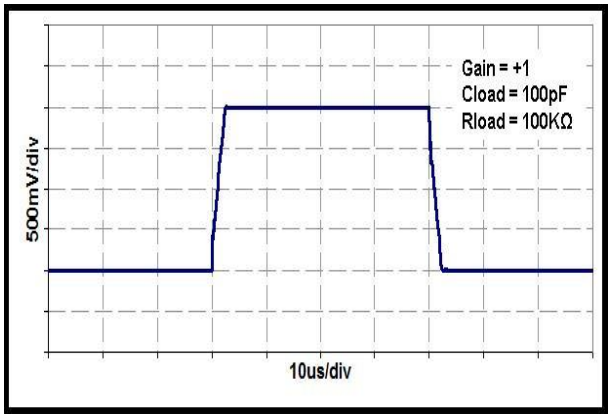
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage	V_{CM} = V_{SUPPLY}/2	-5.0	±0.8	+5.0	mV
V_{OS} TC	Input Offset Voltage Drift			2		μV/°C
I_B	Input Bias Current			10		pA
I_{OS}	Input Offset Current			1.0		pA
e_n	Input Voltage Noise Density	f = 1kHz f = 10kHz		45 29		nV/√Hz
R_{IN}	Input Resistance		>100			GΩ
C_{IN}	Input Capacitance	Differential Common Mode		1.5 3.0		pF
CMRR	Common Mode Rejection Ratio	V_{CM} = 0.1V to 4.9V	80	90		dB
V_{CM}	Common-mode Input Voltage Range		-0.1		5.1	V
PSRR	Power Supply Rejection Ratio		80	90		dB
A_{VOL}	Open-Loop Large Signal Gain	V_{OUT} = 2.5V, R_{LOAD} = 100kΩ	80	97		dB
		V_{OUT} = 0.1V to 4.9V, R_{LOAD} = 100kΩ	72	95		
V_{OL}	Output Swing from Supply Rail	R_{LOAD} = 100kΩ		5		mV
I_{SC}	Output Short-Circuit Current	Sink or source current		40		mA
I_Q	Quiescent Current per Amplifier			45	87	μA
PM	Phase Margin	R_{LOAD} = 100kΩ, C_{LOAD} = 100pF		63		°
GM	Gain Margin	R_{LOAD} = 100kΩ, C_{LOAD} = 100pF		-15		dB
GBWP	Gain-Bandwidth Product	f = 1kHz		1.0		MHz
t_S	Settling Time, 1.5V to 3.5V, Unity Gain Settling Time, 2.45V to 2.55V, Unity Gain	0.1% 0.01% 0.1% 0.01%		2.3 2.8 0.33 0.38		μs
SR	Slew Rate	A_V = 1, V_{OUT} = 1.5V to 3.5V, C_{LOAD} = 100pF, R_{LOAD} = 100kΩ		1.0		V/μs
THD+N	Total Harmonic Distortion and Noise	f=1kHz, A_V=1, R_L=100kΩ, V_{OUT} = $2V_{PP}$ f=10kHz, A_V=1, R_L=100kΩ, V_{OUT} = $2V_{PP}$		-105 -90		dB

Typical Performance Characteristics

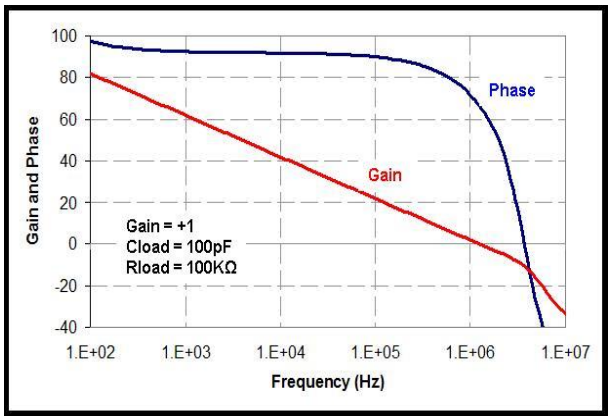
Small-Signal Step Response, 100mV Step



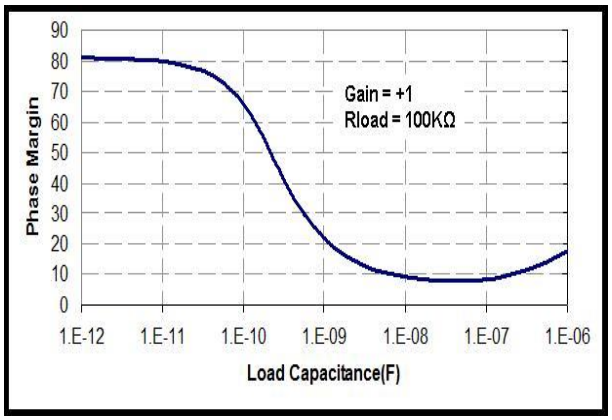
Large-Signal Step Response, 2V Step



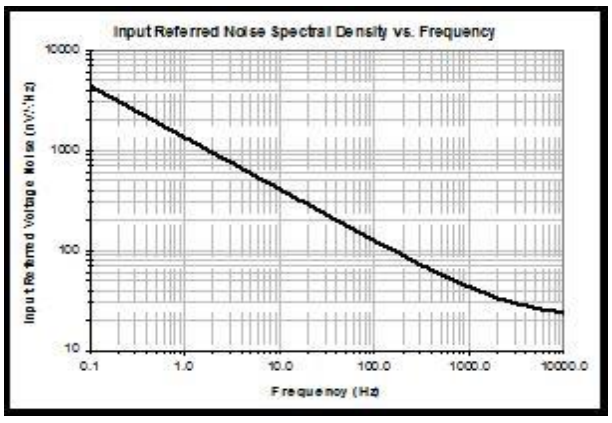
Open-Loop Gain and Phase



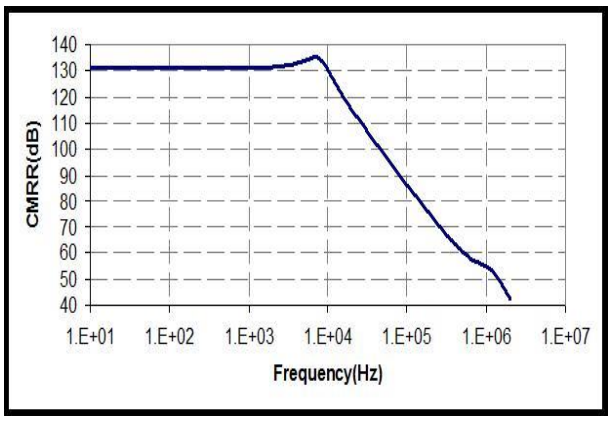
Phase Margin vs. C_{LOAD} (Stable for Any C_{LOAD})



Input Voltage Noise Spectral Density

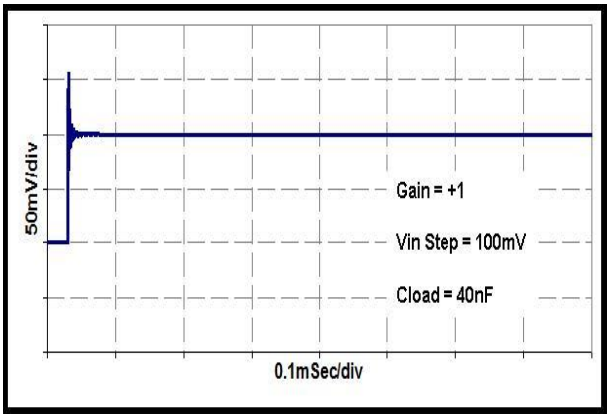


Common-Mode Rejection Ratio

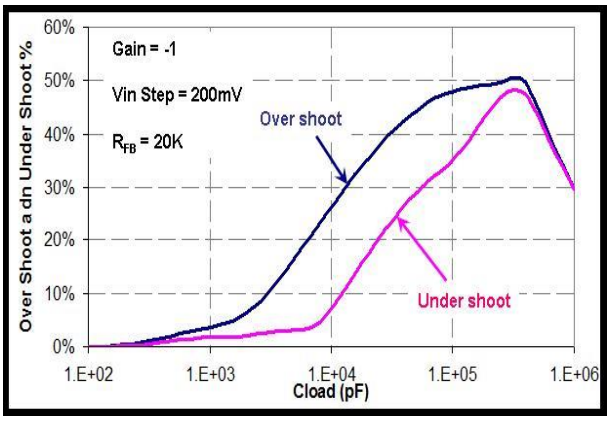


Typical Performance Characteristics

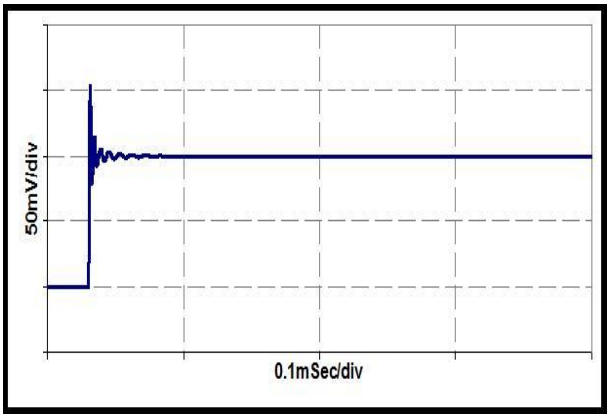
Over-Shoot Voltage, C_{LOAD} = 40nF, Gain = +1



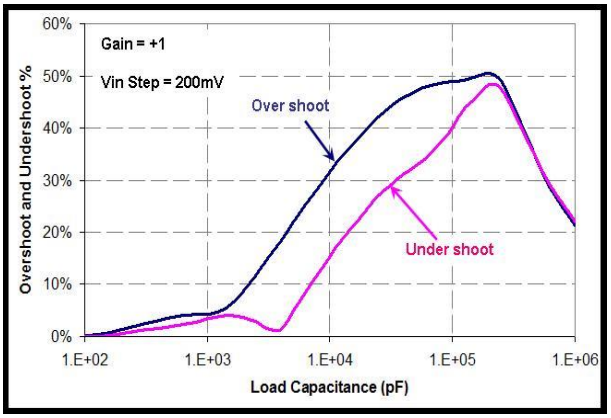
Over-Shoot % vs. C_{LOAD}, Gain = -1, RFB = 20kΩ



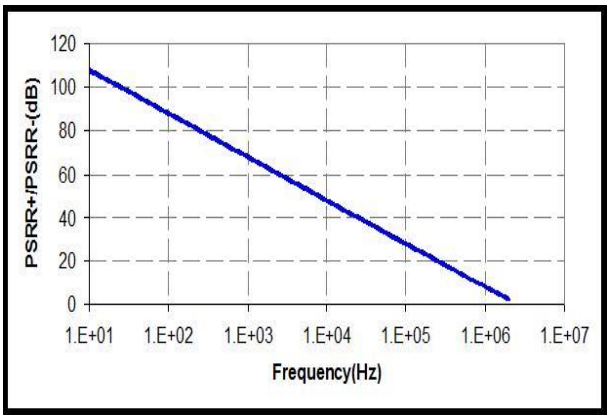
Over-Shoot Voltage, C_{LOAD}=40nF, Gain= -1, RFB=100kΩ



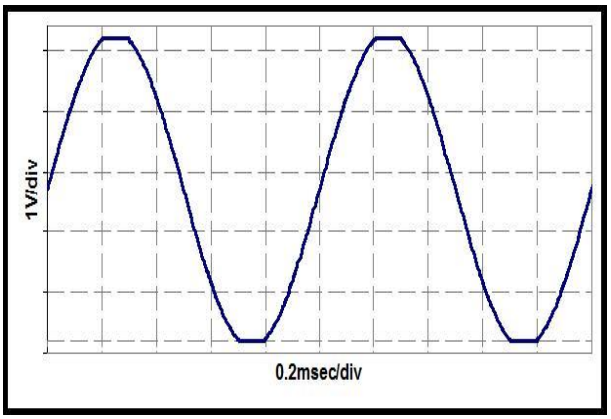
Small-Signal Over-Shoot % vs. C_{LOAD}, Gain = +1



Power-Supply Rejection Ratio

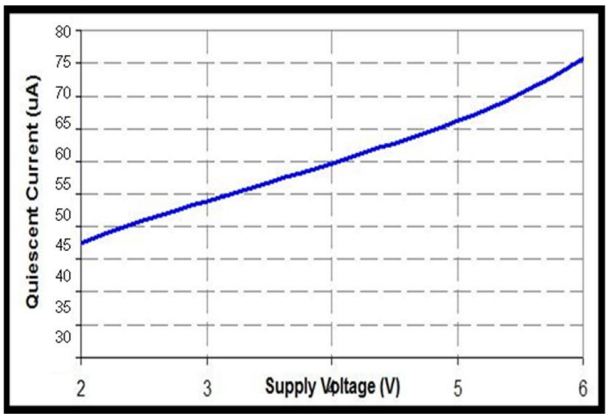


V_{IN} = -0.2V to 5.7V, No Phase Reversal

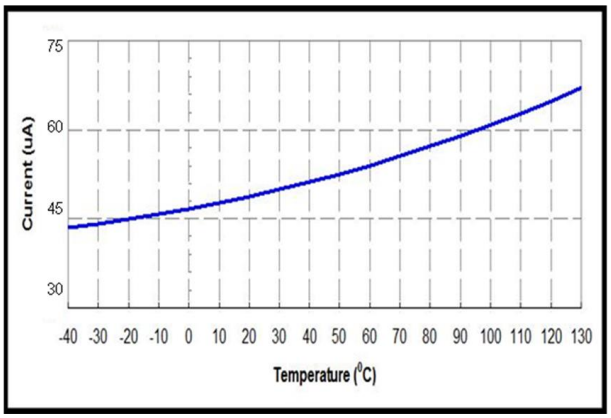


Typical Performance Characteristics

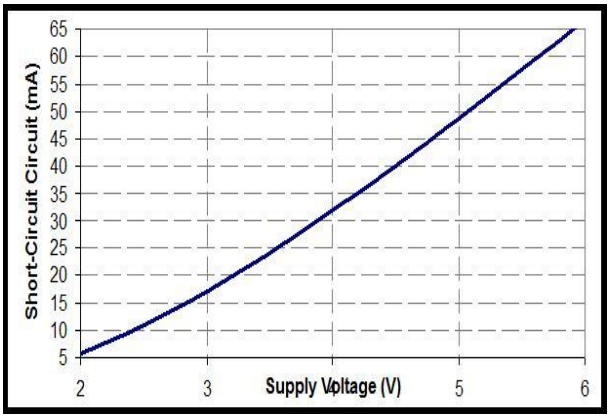
Quiescent Supply Current vs. Supply Voltage



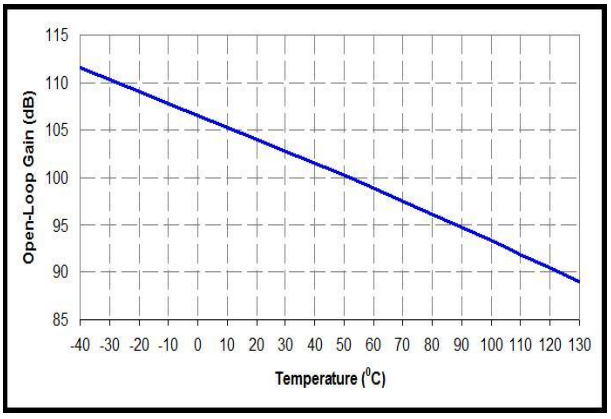
Quiescent Supply Current vs. Temperature



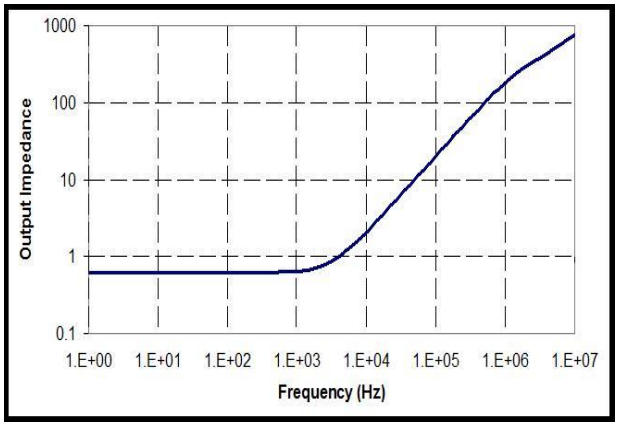
Short-Circuit Current vs. Supply Voltage



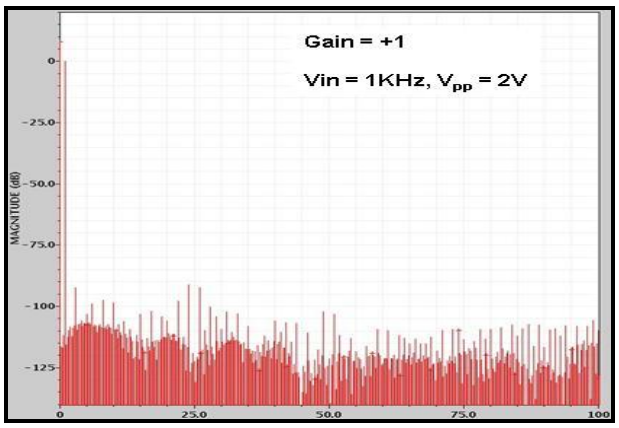
Open-Loop Gain vs. Temperature



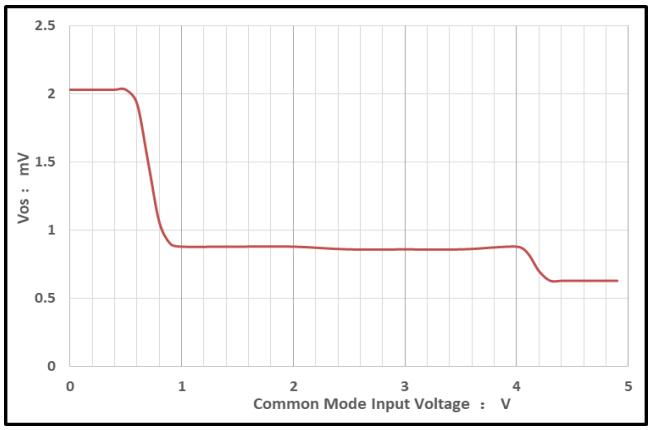
Closed-Loop Output Impedance vs. Frequency



THD+Noise, Gain = +1, V_{IN} = 1kHz, V_{PP} = 2V

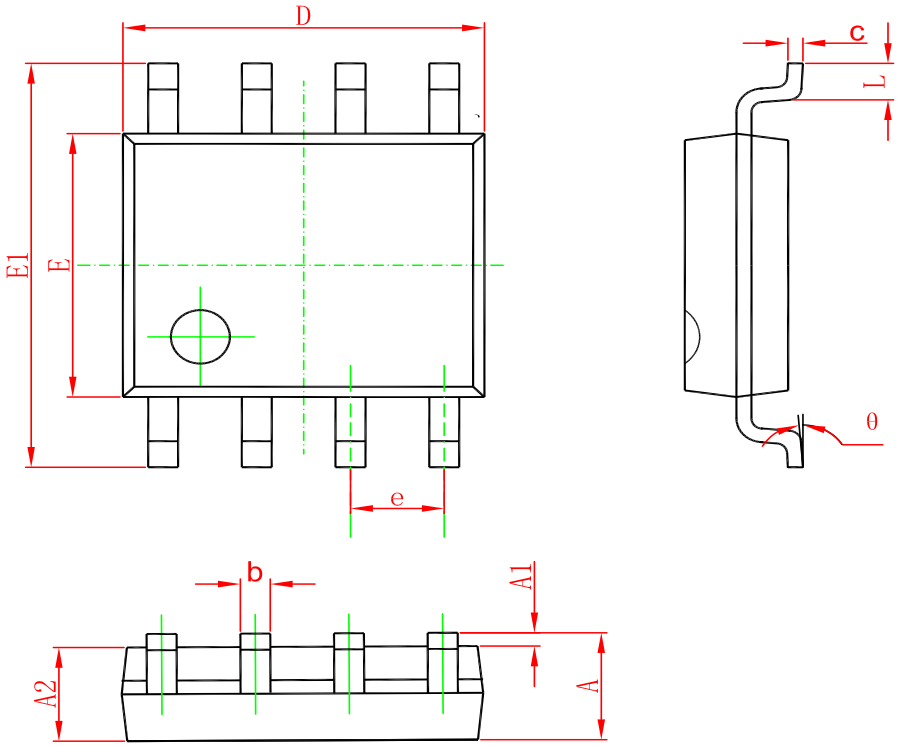


Vos vs. Common Mode Input Voltage



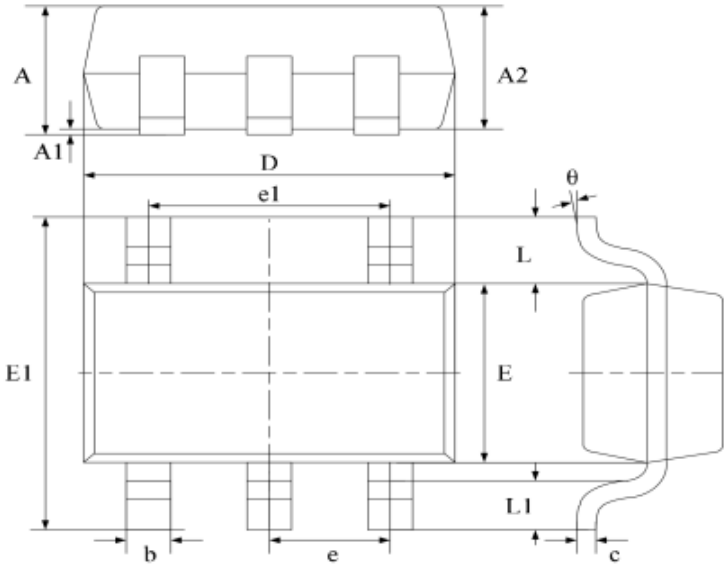
Package Dimension

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	0.170	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	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOT23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.040	1.350	0.042	0.055
A1	0.040	0.150	0.002	0.006
A2	1.000	1.200	0.041	0.049
b	0.380	0.480	0.015	0.020
c	0.110	0.210	0.004	0.009
D	2.720	3.120	0.111	0.127
E	1.400	1.800	0.057	0.073
E1	2.600	3.000	0.106	0.122
e	0.950 typ.		0.037 typ.	
e1	1.900 typ.		0.078 typ.	
L	0.700 ref.		0.028 ref.	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW TP358-SR	SOP-8	2500	Tape and reel	TP358
UMW TP321-TR	SOT23-5	3000	Tape and reel	AT4YW U