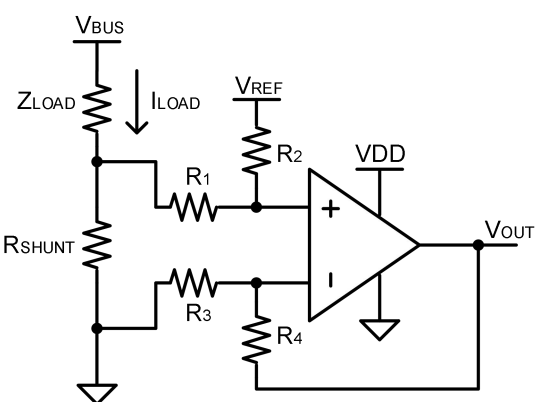


GT8441 GT8442 GT8444

36V, 10-MHz, Rail-to-Rail Output CMOS Operational Amplifiers

1 Features	2 Application
• Supply Voltage: 3.2 V to 36 V • Differential Input Voltage Range to Supply Rail, can Work as Comparator • Input Rail to $-V_s$ • Fast Response: – Bandwidth: 10 MHz – Slew Rate: 20 V/μs • High PSRR+: 80 dB at 100 KHz • Offset Voltage: 1 mV Maximum at 25°C • Operating Temperature Range: -40°C to 125°C	• Digital Servo Control Loops • Machine and Motion Control Devices • Photodiode Pre-Amp • Industrial Process Control • Temperature Measurements • Strain Gage Amplifier • Medical Instrumentation
3 Description	Circuit Diagram
The GT844X is a series of the newest high-supply voltage amplifiers with low offset, low power, and stable high-frequency response. The GT844X incorporates proprietary and patented design techniques to achieve excellent AC performance with 10-MHz bandwidth and 20 V/μs slew rate. The combination of features makes these devices optimal for industrial control, motor control, and other applications requiring robust amplifiers with high immunity to power supply noise.	 $V_{OUT} = (I_{LOAD} \times R_{SHUNT}) \times \left(\frac{R_2}{R_1}\right) + V_{REF}$ When $R_3 = R_1$, $R_2 = R_4$, $R_{SHUNT} \ll R_1$

4 Device Summary, Pin and Packages

Table 4-1. Device Summary⁽¹⁾

Serial Name	Part Name	Package	Body Size (Nom)	Marking ⁽²⁾	MSL ⁽³⁾	Package Qty
GT8441	GT8441S5	SOT23-5	2.90mm×1.60mm×1.10mm	GT8441 XXXXXX	3	Tape and Reel,3000
GT8442	GT8442P8	SOP8	6.00mm×3.90mm×1.75mm	GT8442 XXXXXXXX	3	Tape and Reel,4000
	GT8442M8	MSOP8	3.00mm×3.00mm×1.10mm	GT8442 XXXXXXXX	3	Tape and Reel,4000
GT8444	GT8444TD	TSSOP14	5.00mm×4.40mm×1.20mm	GT8444 XXXXXXXX	3	Tape and Reel,4000
	GT8444PD	SOP14	8.65mm×3.90mm×1.75mm	GT8444 XXXXXXXX	3	Tape and Reel,4000

(1) For all available packages, please contact product sales.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

(4) "XXXXXX" in Marking will be appeared as the batch code.

4 Device Summary, Pin and Packages(Continued)

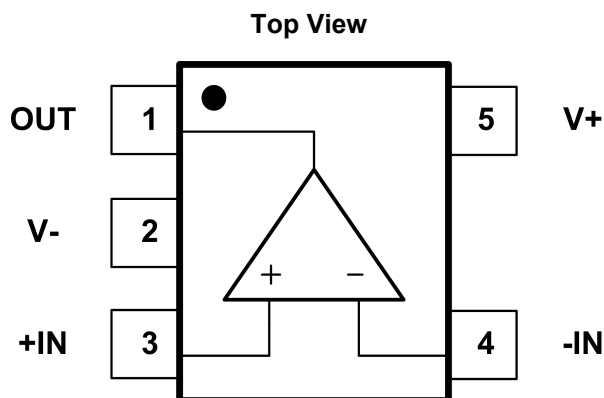


Fig.4-1. GT8441: S5(SOT23-5) Package

Table 4-2 Pin Definition

Name	Pin	I/O	Description
	S5		
-IN	4	I	Negative (inverting) input
+IN	3	I	Positive(noninverting) input
OUT	1	O	Output
V-	2	-	Negative (lowest) power supply
V+	5	-	Positive (highest) power supply

* It is suggested to leave the unconnected pins floating.

4 Device Summary, Pin and Packages(Continued)

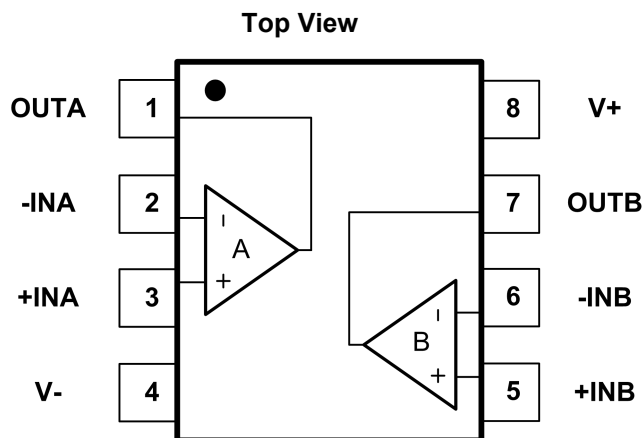


Fig.4-2. GT8442: P8(SOP8) Package
GT8442: M8(MSOP8) Package

Table 4-3 Pin Definition

Name	Pin	I/O	Description
	P8 M8		
-INA	2	I	Inverting input, channel A
+INA	3	I	Noninverting input, channel A
-INB	6	I	Inverting input, channel B
+INB	5	I	Noninverting input, channel B
OUTA	1	O	Output, channel A
OUTB	7	O	Output, channel B
V-	4	-	Negative (lowest) power supply
V+	8	-	Positive (highest) power supply

* It is suggested to leave the unconnected pins floating.

4 Device Summary, Pin and Packages(Continued)

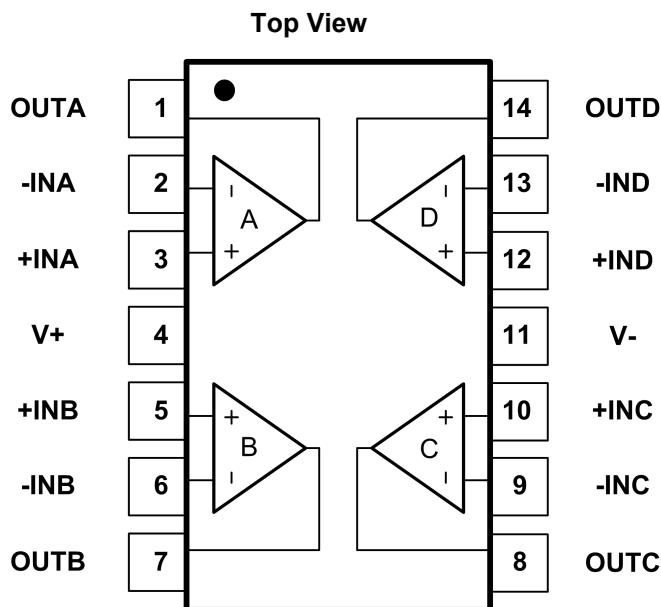


Fig.4-3. GT8444: PD(SOP14) Package
GT8444: TD(TSSOP14) Package

Table 4-4 Pin Definition

Name	Pin	I/O	Description
	PD TD		
-INA	2	I	Inverting input, channel A
+INA	3	I	Noninverting input, channel A
-INB	6	I	Inverting input, channel B
+INB	5	I	Noninverting input, channel B
-INC	9	I	Inverting input, channel C
+INC	10	I	Noninverting input, channel C
-IND	13	I	Inverting input, channel D
+IND	12	I	Noninverting input, channel D
OUTA	1	O	Output, channel A
OUTB	7	O	Output, channel B
OUTC	8	O	Output, channel C
OUTD	14	O	Output, channel D
V-	11	-	Negative (lowest) power supply
V+	4	-	Positive (highest) power supply

* It is suggested to leave the unconnected pins floating.

5 Voltage, Temperature, ESD and Thermal Ratings

5.1 Absolute Maximum Ratings ⁽¹⁾⁽²⁾

Parameters	Min	Max	Unit
Supply Voltage, $V_s=(V^+)-(V^-)$		38	V
Select Input Voltage	$(-V_s)-0.3$	$(+V_s)+0.3$	V
Maximum Junction Temperature	-55	150	°C
Storage Temperature Range	-55	150	°C

(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 0.3V beyond the supply rails should be current-limited to 10mA or less.

5.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic discharge	Human-Body Model (HBM) ⁽¹⁾	7 K	V
		Charged-Device Model (CDM) ⁽²⁾	2 K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage, $V_s=(V^+)-(V^-)$	3.2(±1.6)	36(±18)	V
TA	Operating temperature	-40	125	°C

6 Electrical Specifications

$V_{CC}=5.0V$, $V_{CM}=V_{CC}/2$, and $R_L=100k\Omega$, FULL= $-40^{\circ}C$ to $+125^{\circ}C$, Typical values are at $T_A=+25^{\circ}C$. (unless otherwise noted)

Parameter	Symbol	Condition	GT8441 GT8442 GT8444			
			Min	Typ	Max	Unit
Offset Voltage						
Input Offset Voltage	V _{OS}	V _{CM} =VS/2	-2	±0.3	2	mV
Input Offset Voltage Average Drift	V _{OS} TC			2		μV/°C
Power-Supply Rejection Ratio	PSRR	V _S =+2.5V to +5.5V, V _{CM} =0	90	120		dB
Input Bias Current						
Input Bias Current	I _B	V _{CM} =VS/2		250		pA
Input Offset Current	I _{OS}	V _{CM} =VS/2		250		pA
Noise Performance						
Input Voltage Noise	enp-p	f=0.1Hz to 10Hz		2		μV _{RMS}
Input Voltage Noise Density	en	f=1KHz		25		nV/√Hz
Input Voltage Range						
Common-Mode Voltage Range	V _{CM}		(V-)		(V+) -1.5	V
Common-Mode Rejection Ratio	CMRR	V _{CM} = 2 V to 34 V	90	125		dB
Open-Loop Gain						
Open-Loop Voltage Gain	A _{OL}	RL=100KΩ, VO=0.3V to 4.7V, TA=-40°C to 125°C	95	120		dB
Dynamic Performance						
Slew Rate	SR	G=+1		20		V/μs
Gain-Bandwidth Product	GBW			10		MHz
Overload Recovery Time				100		μs
Output Characteristics						
Output Voltage High	V _{OH}	RL=100 KΩ to VS/2		5	15	mV
		RL=10 KΩ to VS/2		50	80	mV
Output Voltage Low	V _{OL}	RL=100 KΩ to VS/2		5	10	mV
		RL=10 KΩ to VS/2		40	50	mV
Short-Circuit Current	ISC			35		mA
Power Supply						
Operating Voltage Range	V _S		3.2		36	V
Quiescent Current/ Amplifier	I _Q			1.5	2.5	mA

7 Typical Characteristics

All test conditions: $V_{DD} = 36\text{ V}$, $R_L = 10\text{ k}\Omega$, unless otherwise noted.

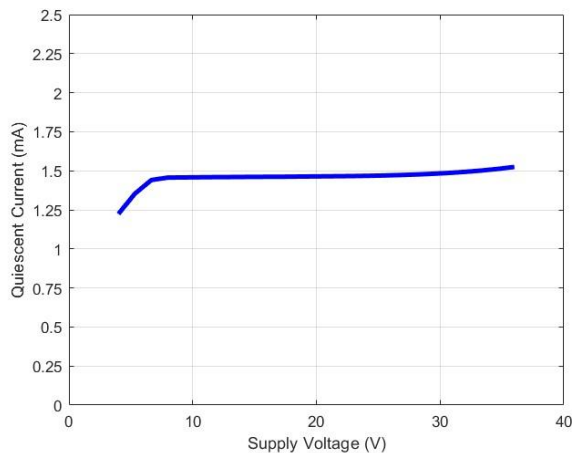


Fig.7-1. Quiescent Current vs. Supply Voltage, 1 Channel OPA

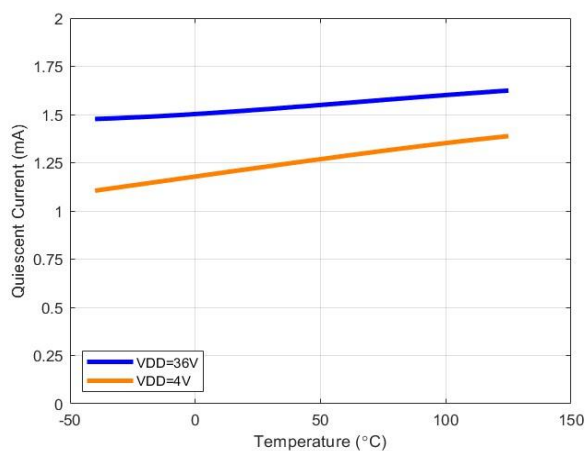


Fig.7-2. Quiescent Current vs. Temperature, 1-Channel OPA

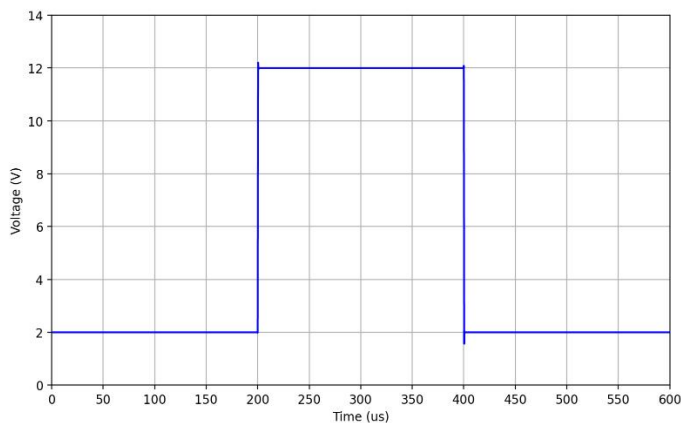


Fig.7-3. 12-V Signal Step Response

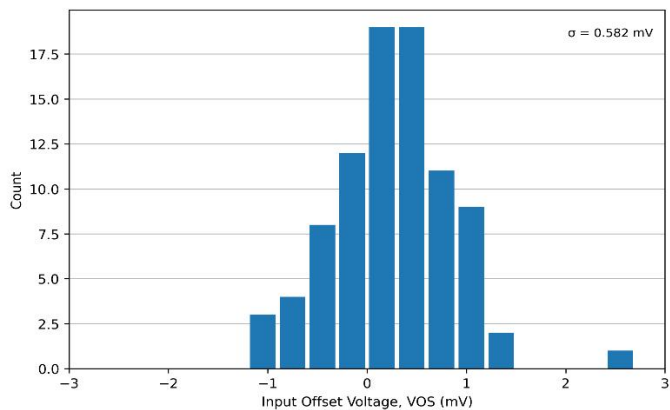
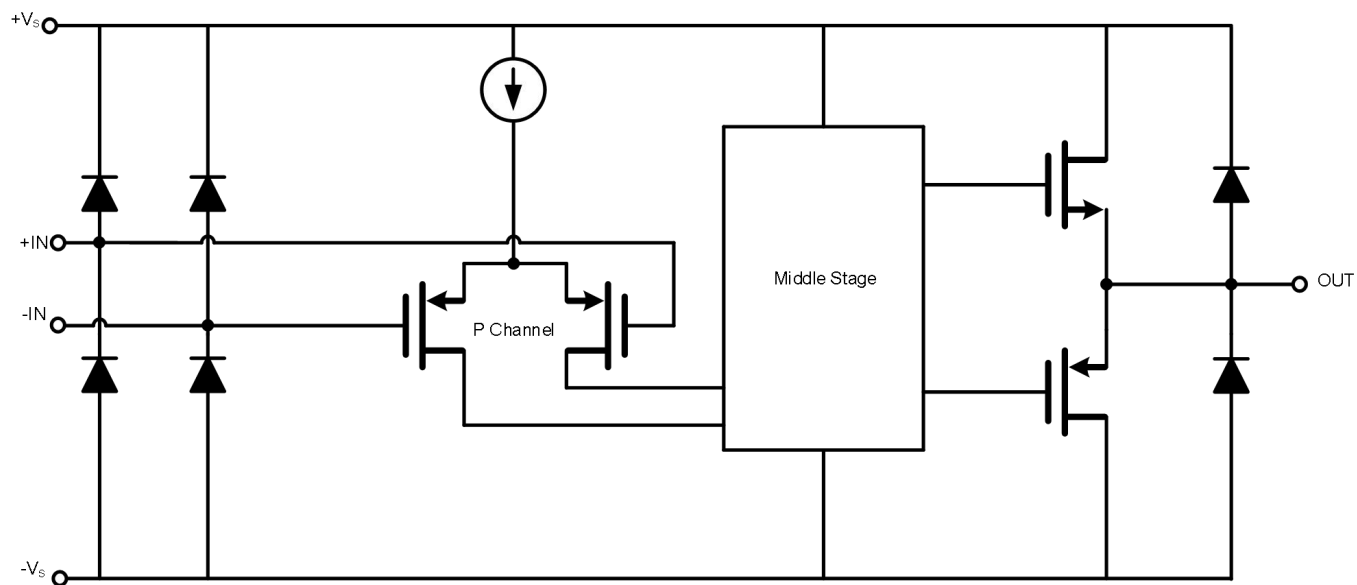


Fig.7-4. Input Offset Voltage Distribution

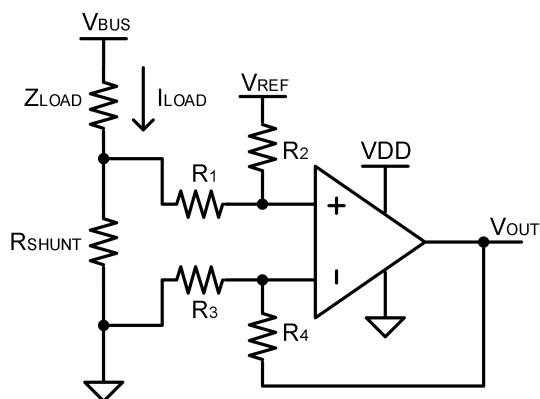
Functional Block Diagram



9 Application Note

The GT844X is a series of the newest high-supply voltage amplifiers with low offset, low power, and stable high-frequency response. The GT844X incorporates proprietary and patented design techniques to achieve excellent AC performance with 10-MHz bandwidth and 20 V/ μ s slew rate.

The combination of features makes these devices optimal for industrial control, motor control, and other applications requiring robust amplifiers with high immunity to power supply noise.



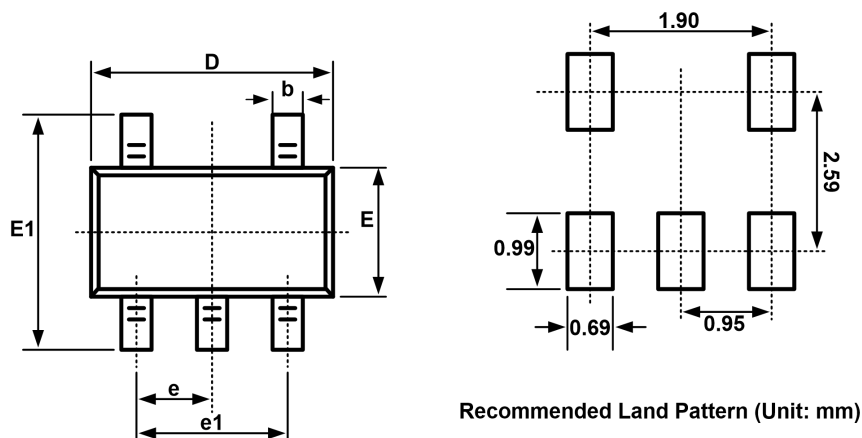
$$V_{OUT} = (I_{LOAD} \times R_{SHUNT}) \times \left(\frac{R2}{R1}\right) + V_{REF}$$

When $R3 = R1$, $R2 = R4$, $R_{SHUNT} \ll R1$

Fig.9-1. Typical Application Circuit

10 Package Outline Dimension

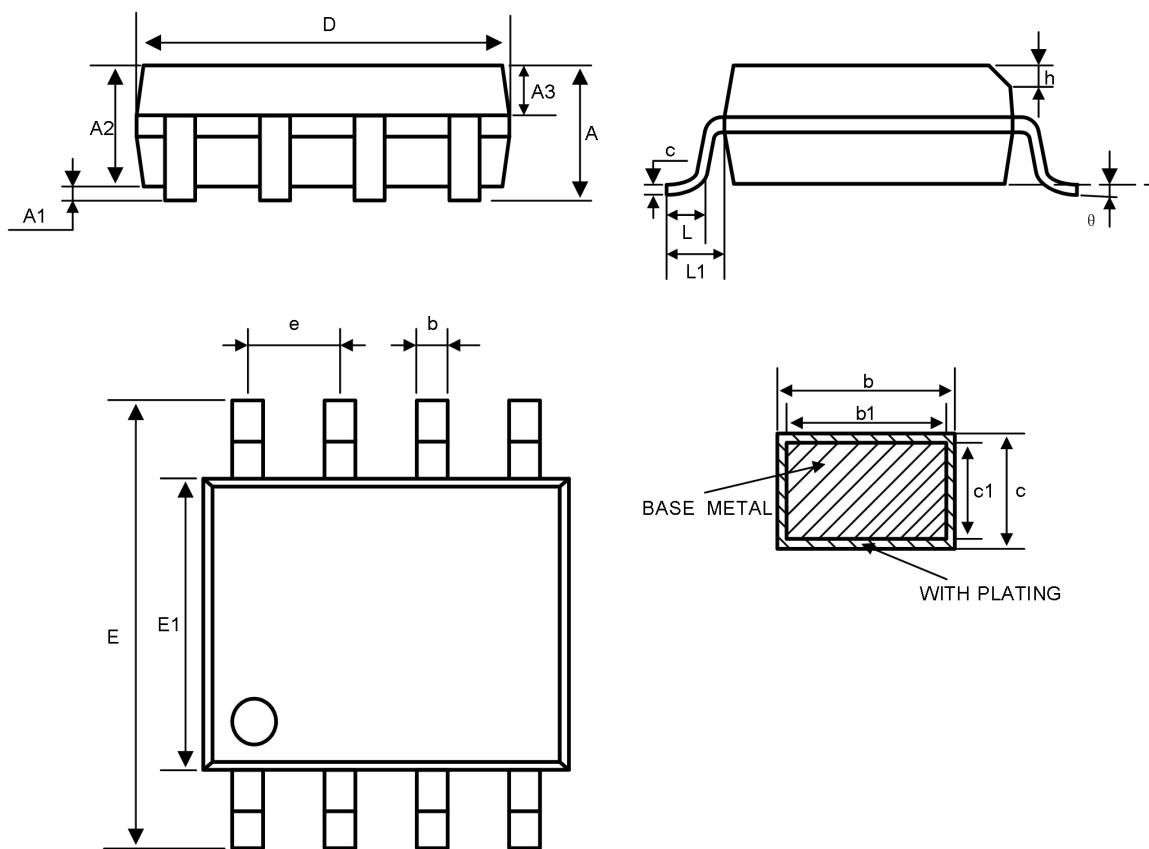
SOT23-5



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	0.500	0.012	0.020
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	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

10 Package Outline Dimension(Continued)

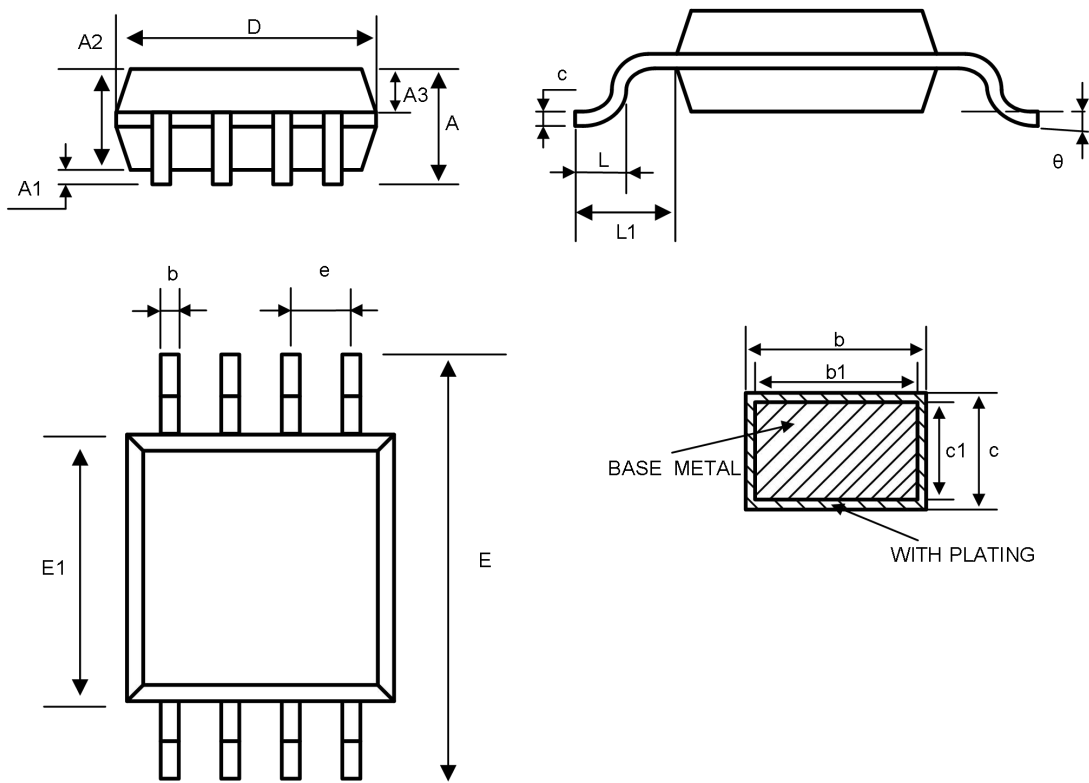
SOP8



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	1.75	—	—	0.069
A1	0.10	—	0.225	0.004	—	0.009
A2	1.30	1.40	1.50	0.051	0.055	0.059
A3	0.60	0.65	0.70	0.024	0.026	0.028
b	0.39	—	0.47	0.015	—	0.019
b1	0.38	0.41	0.44	0.015	0.016	0.017
c	0.20	—	0.24	0.008	—	0.009
c1	0.19	0.20	0.21	0.007	0.008	0.008
D	4.80	4.90	5.00	0.189	0.193	0.197
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27BSC			0.05BSC		
h	0.25	—	0.50	0.010	—	0.020
L	0.50	—	0.80	0.020	—	0.031
L1	1.05REF			0.041REF		
θ	0	—	8°	0	—	8°

10 Package Outline Dimension(Continued)

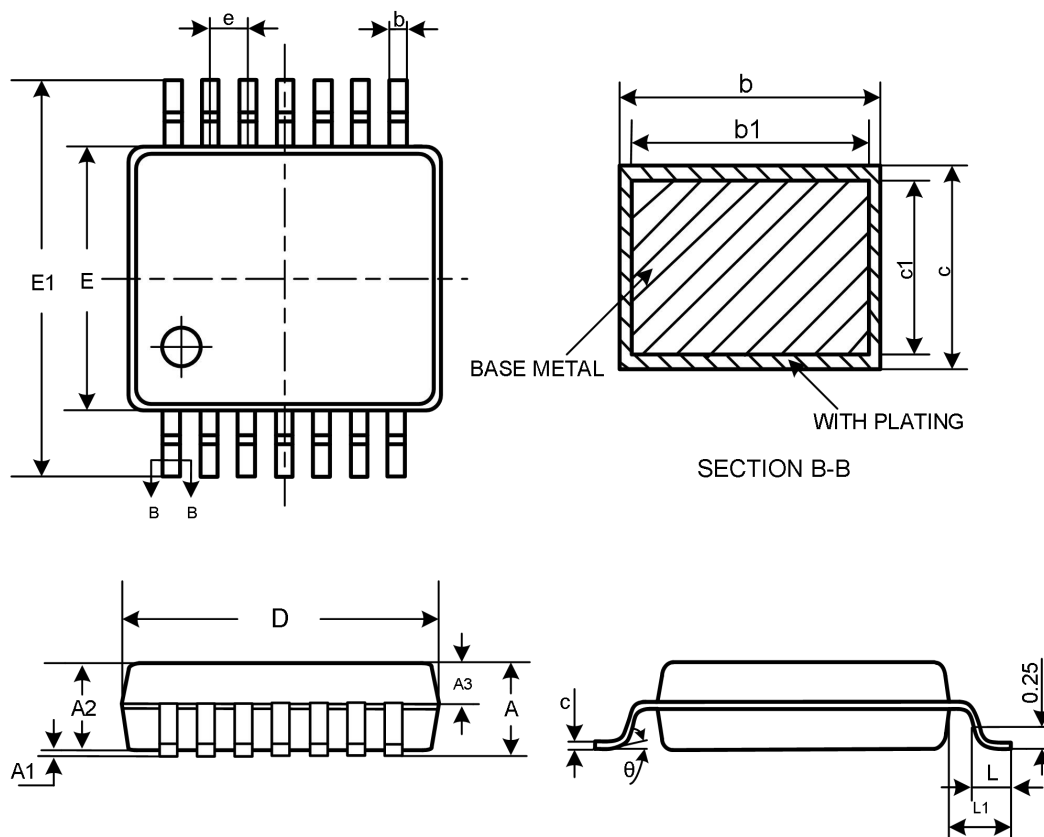
MSOP8



Symbol	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
A3	0.30	0.35	0.40	0.012	0.014	0.016
b	0.28	—	0.36	0.011	—	0.014
b1	0.27	0.30	0.33	0.011	0.012	0.013
c	0.15	—	0.19	0.006	—	0.007
c1	0.14	0.15	0.16	0.006	0.006	0.006
D	2.90	3.00	3.10	0.114	0.118	0.122
E	4.70	4.90	5.10	0.185	0.193	0.201
E1	2.90	3.00	3.10	0.114	0.118	0.122
e	0.65BSC			0.026BSC		
L	0.40	—	0.70	0.016	—	0.028
L1	0.95REF			0.037REF		
θ	0	—	8°	0	—	8°

10 Package Outline Dimension(Continued)

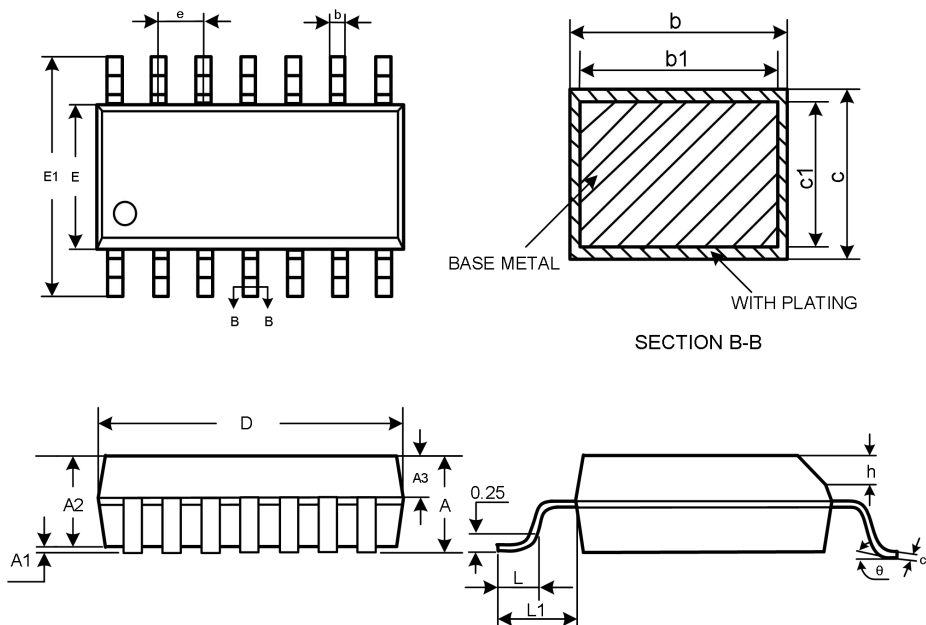
TSSOP14



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min	Nom	Max	Min	Nom	Max
A	—	—	1.20	—	—	0.047
A1	0.05	—	0.15	0.002	—	0.006
A2	0.90	1.00	1.05	0.035	0.039	0.041
A3	0.39	0.44	0.49	0.015	0.017	0.019
b	0.20	—	0.28	0.008	—	0.011
b1	0.19	0.22	0.25	0.007	0.009	0.010
c	0.13	—	0.17	0.005	—	0.007
c1	0.12	0.13	0.14	0.005	0.005	0.006
D	4.90	5.00	5.10	0.193	0.197	0.201
E	4.30	4.40	4.50	0.169	0.173	0.177
E1	6.20	6.40	6.60	0.244	0.252	0.260
e	0.65BSC			0.026BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00BCS			0.039BSC		
θ	0	—	8°	0	—	8°

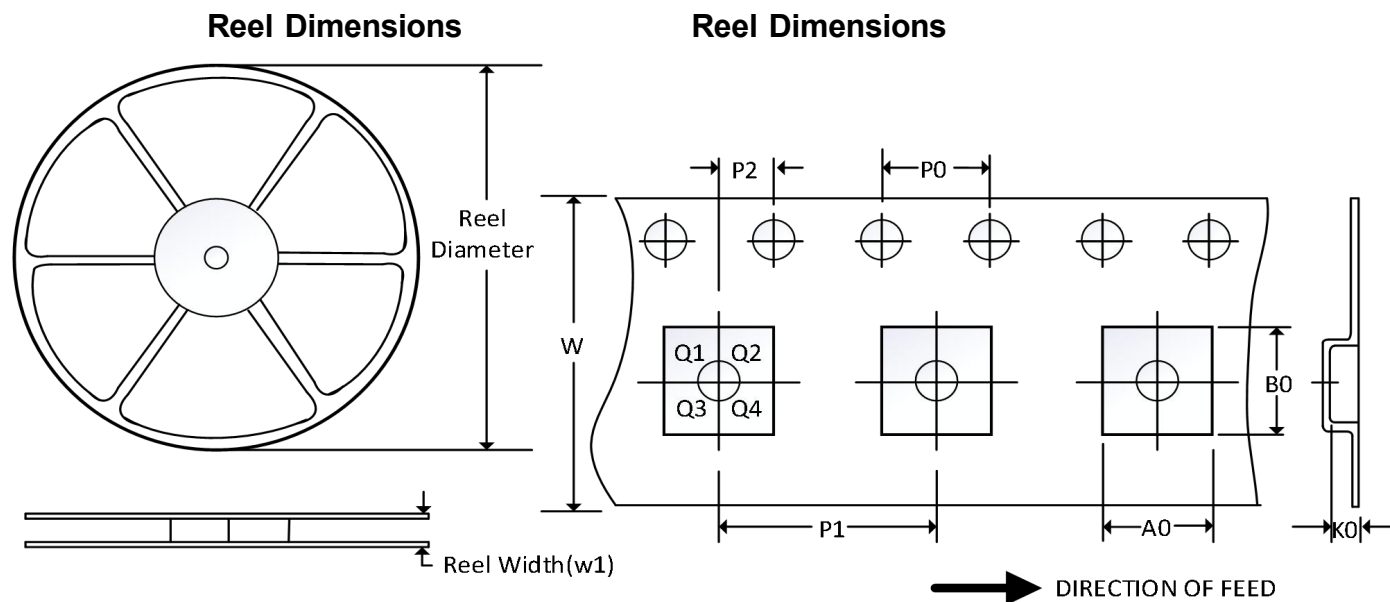
10 Package Outline Dimension(Continued)

SOP14



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min	Nom	Max	Min	Nom	Max
A	—	—	1.75	—	—	0.069
A1	0.10	—	0.225	0.004	—	0.009
A2	1.30	1.40	1.50	0.051	0.055	0.059
A3	0.60	0.65	0.70	0.024	0.026	0.028
b	0.39	—	0.47	0.015	—	0.019
b1	0.38	0.41	0.44	0.015	0.016	0.017
c	0.20	—	0.24	0.008	—	0.009
c1	0.19	0.20	0.21	0.007	0.008	0.008
D	8.55	8.65	8.75	0.337	0.341	0.344
E1	5.80	6.00	6.20	0.228	0.236	0.244
E	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27BSC			0.05BSC		
h	0.25	—	0.50	0.010	—	0.020
L	0.50	—	0.80	0.020	—	0.031
L1	1.05REF			0.041REF		
θ	0	—	8°	0	—	8°

11 Tape and Reel Information



NOTE: The picture is only for reference. Please make the object as the standard.

Key Parameter List of Tape and Reel

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOP8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
MSOP8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
SOP14	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP14	13"	12.4	6.95	5.60	1.20	4.0	8.0	2.0	12.0	Q1

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.