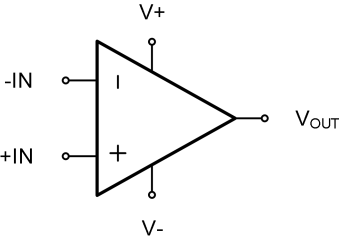


## GTV321 GTV358 GTV324

### Low-Voltage, Low-power, Rail-to-Rail I/O CMOS Op Amps

1 Features	2 Application
<ul style="list-style-type: none"> <li>- High gain bandwidth: 1 MHz</li> <li>- Rail-to-rail input and output</li> <li>- Low supply current: 90 <math>\mu</math>A/amplifier at 5 V</li> <li>- Input voltage range: -0.1 V to +5.6 V with <math>V_S=5.5</math> V</li> <li>- Supply range: +2.5 V to +5.5 V</li> <li>- Operation temperature range: -40°C to +125°C</li> </ul>	<ul style="list-style-type: none"> <li>- Sensors</li> <li>- Photodiode amplification</li> <li>- Active filters</li> <li>- Test equipment</li> <li>- Driving A/D converters</li> </ul>

3 Description	Circuit Diagram
<p>The GTV3XX families of products offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (1MHz) and slew rate of 0.7V/us. The op-amps are unity gain stable and feature an ultra-low input bias current.</p> <p>The devices are ideal for sensor interfaces, active filters and portable applications. The GTV3XX families of operational amplifiers are specified at the temperature range of -40°C to +125°C under single or dual power supplies of 2.5V to 5.5V.</p>	

**4 Revision History**

<b>Revision</b>	<b>Date</b>	<b>Note</b>
Rev. A1.0	2023. 06. 09	Original Version
Rev. A1.1	2023. 09. 01	Added DFN
Rev. A1.2	2023. 12. 15	1.Updated Package Qty 2.Added Tape and Reel Information
Rev. A1.3	2023. 12. 26	1.Added Marking 2.Added MSL
Rev. A1.4	2024. 01. 26	Updated Part Name

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

**5 Device Summary, Pin and Packages**
**Table. 5-1. Device Summary<sup>(1)</sup>**

Serial Name	Part Name	Package	Body Size (Nom)	Marking <sup>(2)</sup>	MSL <sup>(3)</sup>	Package Qty
GTV321	GTV321C5	SC70-5	2.10mm×1.25mm×1.00mm	GTV321 XXXXX	3	Tape and Reel,3000
	GTV321S5	SOT23-5	2.90mm×1.60mm×1.10mm	GTV321 XXXXX	3	Tape and Reel,3000
	GTV321BC5	SC70-5	2.10mm×1.25mm×1.00mm	GTV321 XXXXX	3	Tape and Reel,3000
	GTV321BS5	SOT23-5	2.90mm×1.60mm×1.10mm	GTV321 XXXXX	3	Tape and Reel,3000
	GTV321M8	MSOP8	3.00mm×3.00mm×1.10mm	GTV321 XXXXXXXX	3	Tape and Reel,4000
	GTV321P8	SOP8	6.00mm×3.90mm×1.75mm	GTV321 XXXXXXXX	3	Tape and Reel,4000
GTV358	GTV358F8	DFN2*2-8L	2.00mm×2.00mm×0.75mm	GTV358 XXXX	3	Tape and Reel,3000
	GTV358A8	DFN3*3-8L	3.00mm×3.00mm×0.75mm	GTV358 XXXXX	3	Tape and Reel,5000
	GTV358M8	MSOP8	3.00mm×3.00mm×1.10mm	GTV358 XXXXXXXX	3	Tape and Reel,4000
	GTV358T8	TSSOP8	3.00mm×4.40mm×1.10mm	GTV358 XXXXXXXX	3	Tape and Reel,4000
	GTV358P8	SOP8	6.00mm×3.90mm×1.75mm	GTV358 XXXXXXXX	3	Tape and Reel,4000
GTV324	GTV324TD	TSSOP14	5.00mm×4.40mm×1.20mm	GTV324 XXXXXXXX	3	Tape and Reel,4000
	GTV324PD	SOP14	8.65mm×3.90mm×1.75mm	GTV324 XXXXXXXX	3	Tape and Reel,4000

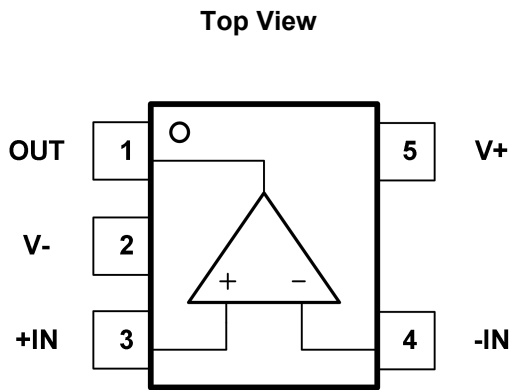
(1) For all available packages, please contact product sales.

(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.

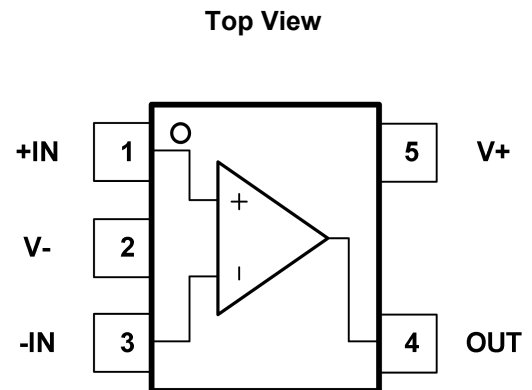
(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

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

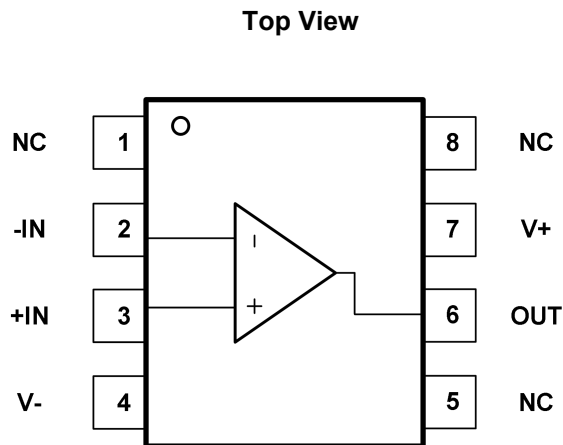
FAE: 13148878879

**5 Device Summary, Pin and Packages(continued)**


**Fig.5-1. GTV321: C5 (SC70-5) Package  
GTV321: S5 (SOT23-5) Package**



**Fig.5-2. GTV321: BC5 (SC70-5) Package  
GTV321: BS5 (SOT23-5) Package**



**Fig.5-3. GTV321: M8 (MSOP8) Package  
GTV321: P8 (SOP8) Package**

**Table. 5-2. Pin Definition**

Name	Pin			I/O	Description
	C5 S5	BC5 BS5	M8 P8		
-IN	4	3	2	I	Inverting input
+IN	3	1	3	I	Noninverting input
NC	-	-	1,5,8	-	No internal connection (can be left floating)
OUT	1	4	6	O	Output
V-	2	2	4	-	Negative (lowest) supply or ground (for single-supply operation)
V+	5	5	7	-	Positive (highest) supply

\* It is suggested to leave the unconnected pins floating.

5 Device Summary, Pin and Packages(continued)

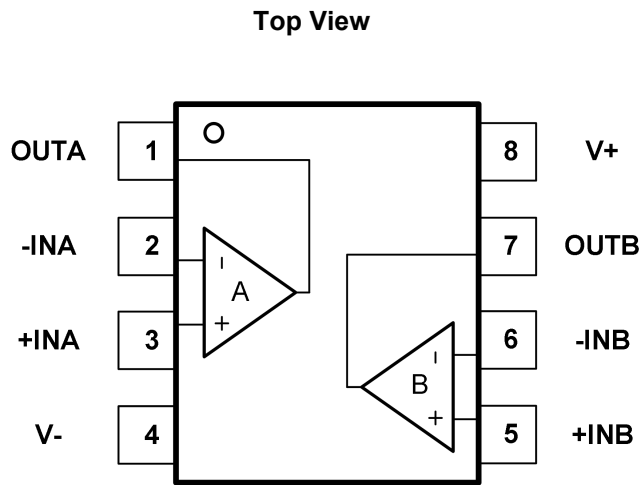


Fig.5-4.GTV358: M8(MSOP8) Package  
 GTV358: T8(TSSOP8) Package  
 GTV358: P8(SOP8) Package

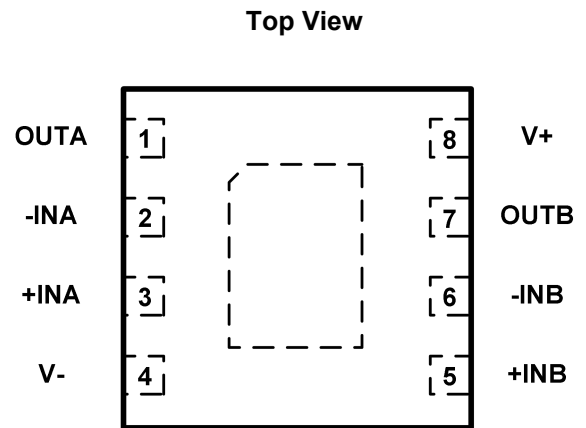
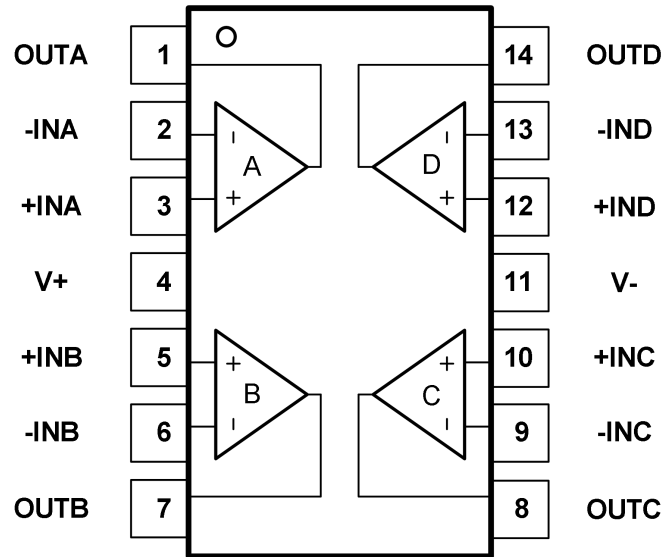


Fig.5-5. GTV358: F8(DFN2\*2-8) Package  
 GTV358: A8(DFN3\*3-8) Package

Table. 5-3. Pin Definition

Name	Pin				I/O	Description
	F8	A8	M8	T8 P8		
-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) supply or ground (for single-supply operation)
V+			8		-	Positive (highest) supply

\* It is suggested to leave the unconnected pins floating.

**5 Device Summary, Pin and Packages(continued)**
**Top View**


**Fig.5-6. GTV324: TD (TSSOP14) Package  
GTV324: PD (SOP14) Package**

**Table. 5-4. Pin Definition**

Pin		I/O	Description
Name	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) supply or ground (for single-supply operation)
V+	4	-	Positive (highest) supply

\* It is suggested to leave the unconnected pins floating.

## 6 Voltage, Temperature, ESD and Thermal ratings

### 6.1 Absolute Maximum Ratings

Parameters	Min.	Max.	Unit
Supply Voltage $V_s=(V^+)-(V^-)$		6.5	V
Select Input Voltage	(V <sup>-</sup> )-0.5	(V <sup>+</sup> )+0.5	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.

### 6.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic discharge	Human-body model (HBM)	3.5 K	V
		Charged-device model (CDM)	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.

### 6.3 Recommended Operating Conditions

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

Symbol	Parameters	Min.	Max.	Unit
Supply Voltage $V_s=(V^+)-(V^-)$	Single-supply	2.5	5.5	V
	Dual-supply	±1.25	±2.75	
TA	Operating temperature	-40	125	°C

### 6.4 Thermal Information

Package Type	$\theta_{JA}$	$\theta_{JC}$	Unit
SC70-5	400	150	°C/W
SOT23-5	250	81	°C/W
DFN2*2-8L	100	60	°C/W
DFN3*3-8L	NA	NA	°C/W
MSOP8	210	45	°C/W
TSSOP8	191	44	°C/W
SOP8(SOIC-8)	158	43	°C/W
TSSOP14	180	35	°C/W
SOP14(SOIC-14)	120	36	°C/W

## 7 Electrical Specifications

$V_{CC}=5.0V$ ,  $V_{cm}=V_{CC}/2$ ,  $V_o=V_{CC}/2$ , and  $R_L=10k\Omega$ , FULL= $-40^{\circ}C$  to  $+125^{\circ}C$ , Typical values are at  $T_A=+25^{\circ}C$ . (unless otherwise noted)

Parameters	Symbol	Conditions	$V_{CC}$	$T_A$	Min.	Typ.	Max.	Unit
<b>OFFSET VOLTAGE</b>								
Input offset voltage	$V_{os}$		5V	$+25^{\circ}C$	-4	$\pm 1$	4	mV
Input offset voltage average drift	$V_{os\ TC}$	$-40^{\circ}C$ to $+125^{\circ}C$	5V			$\pm 0.22$		$\mu V/^{\circ}C$
Power-supply rejection ratio	PSRR	$-40^{\circ}C$ to $+125^{\circ}C$	5V	FULL	74	120		dB
<b>INPUT VOLTAGE RANGE</b>								
Common-mode voltage range	$V_{cm}$		5.5V	$+25^{\circ}C$	-0.1		5.6	V
Common-mode rejection ratio	CMRR	$V_{CM}=-0.1V$ to $5.1V$	5V	FULL	85	130		dB
<b>INPUT BIAS CURRENT</b>								
Input bias current	$I_B$		5V	$+25^{\circ}C$		30		pA
Input offset current	$I_{os}$		5V	$+25^{\circ}C$		2		pA
<b>INPUT CAPACITOR</b>								
Differential Input capacitor	$C_{ID}$		5V	$+25^{\circ}C$		7.7		pF
Common-Mode Input capacitor	$C_{IC}$		5V	$+25^{\circ}C$		9		pF
<b>NOISE</b>								
Total harmonic distortion + noise	THD+N	$A_v=1, f=1kHz, V_{out}=1V_{pp}$	5.5V	$+25^{\circ}C$		0.003		%
Input voltage noise(rms)	$E_N$	$f=0.1Hz$ to $10Hz$	5V	$+25^{\circ}C$		2.2		$\mu V_{rms}$
Input voltage noise density	$e_N$	$f=1kHz$	5V	$+25^{\circ}C$		35		$nV/\sqrt{Hz}$
Input current noise density	$I_n$	$f=1kHz$	5V	$+25^{\circ}C$		23		$fA/\sqrt{Hz}$
<b>OPEN-LOOP GAIN</b>								
Open-loop voltage gain	AOL		5V	$+25^{\circ}C$	85	120		dB
<b>FREQUENCY RESPONSE</b>								
Gain bandwidth product	GBP		5V	$+25^{\circ}C$		1		MHz
Phase margin	PM		5V	$+25^{\circ}C$		60		$^{\circ}$
Gain margin	GM		5V	$+25^{\circ}C$		12		dB
Slew rate	SR	$A_v=1, V_{out}=1.5V$ to $3.5V, C_{load}=60pF, R_{load}=2K\Omega$	5V	$+25^{\circ}C$		0.7		$V/\mu s$
Settling time,0.1%	$t_s$	$A_v=1, 2V$ step, $C_{load}=60pF, R_{load}=2K\Omega$	5V	$+25^{\circ}C$		3.5		$\mu s$
<b>OUTPUT</b>								
Output swing from rail	$V_o$	$R_L=10k\Omega$	5V	$+25^{\circ}C$		5	15	mV
Output current	$I_{out}$		5V	$+25^{\circ}C$		70		mA
<b>POWER SUPPLY</b>								
Quiescent current/amplifier	$I_Q$		5V	$+25^{\circ}C$		90	150	$\mu A$



### 8 Typical Characteristics

$V_{cc}=5.0V$ ,  $V_{cm}=V_{cc}/2$ ,  $V_o=V_{cc}/2$ , and  $R_L=10k\Omega$ , FULL= $-40^{\circ}C$  to  $+125^{\circ}C$ , Typical values are at  $T_A=+25^{\circ}C$ . (unless otherwise noted)

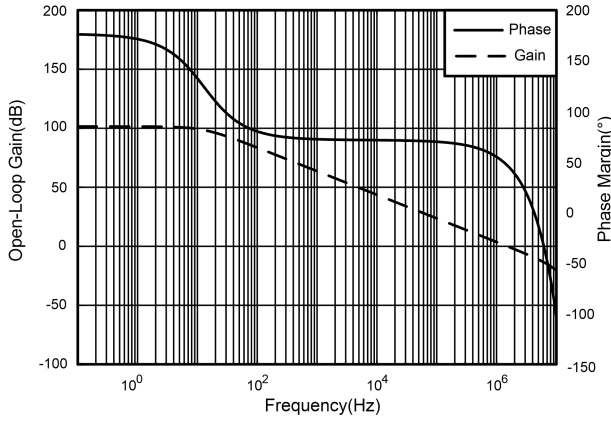


Fig.8-1. Open-Loop Gain and Phase vs Frequency

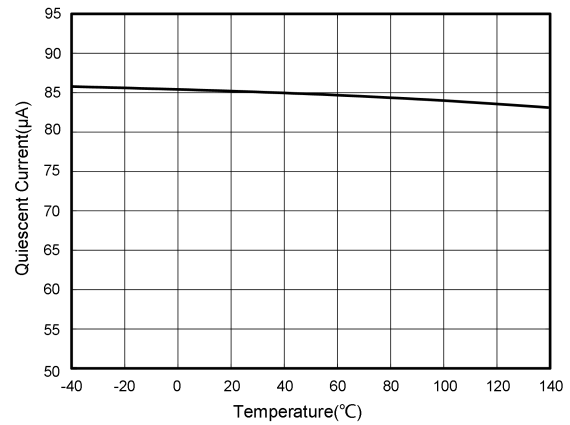


Fig.8-2. Quiescent Current vs Temperature

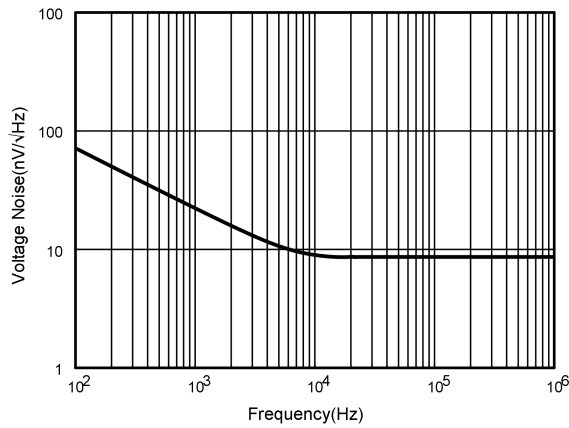


Fig.8-3. Voltage Noise vs Frequency

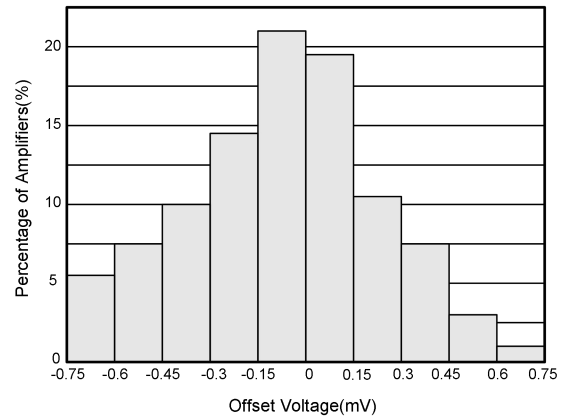


Fig.8-4. Offset Voltage Production Distribution

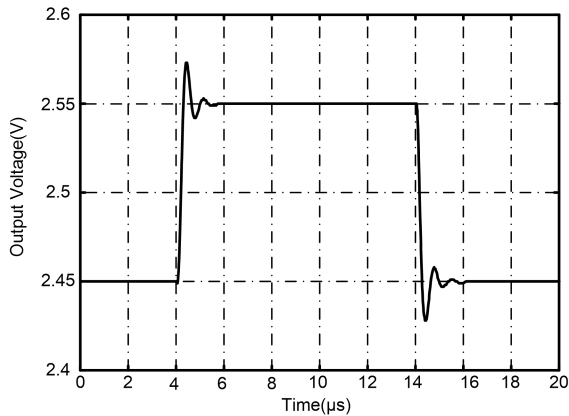


Fig.8-5. Small-Signal Step Response

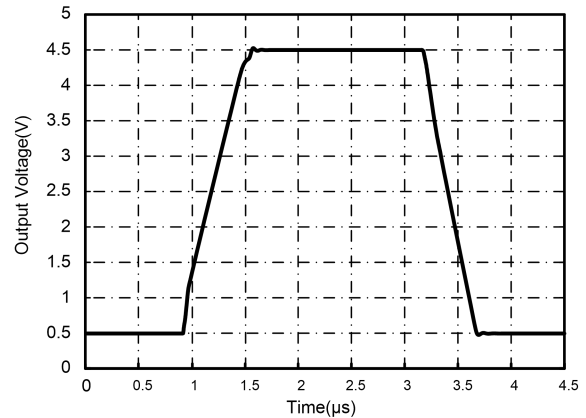


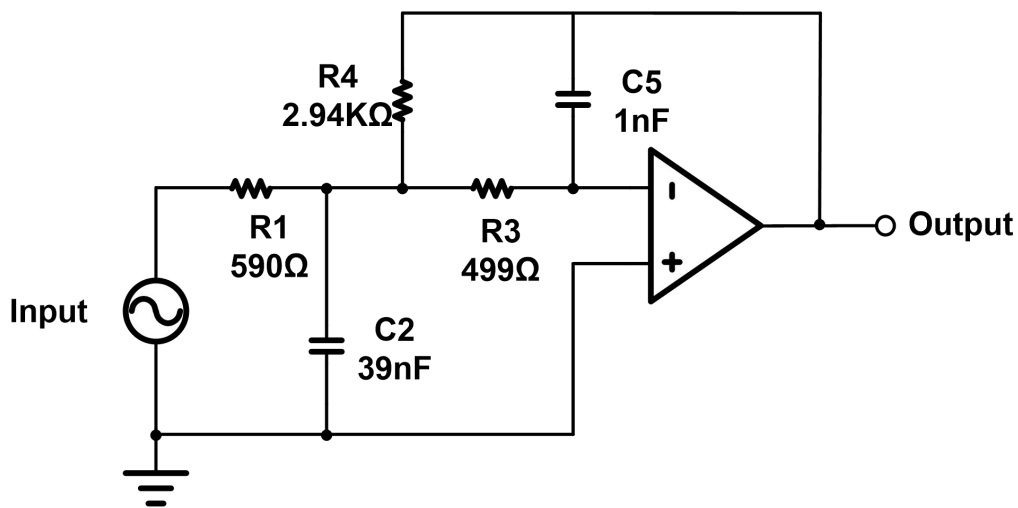
Fig.8-6. Large-Signal Step Response

## 9 Detailed Description

The GTV3XX families of products are rail-to-rail operational amplifiers that can be run from a single-supply voltage 2.5V to 5.5V ( $\pm 1.25V$  to  $\pm 2.75V$ ). Supply voltages higher than 6.5V (absolute maximum) can permanently damage the amplifier. Rail-to-rail input and output swing significantly increases dynamic range, especially in low-supply applications.

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1 $\mu F$  capacitor closely across the supply pins. These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI susceptibility.

## 10 Application Note

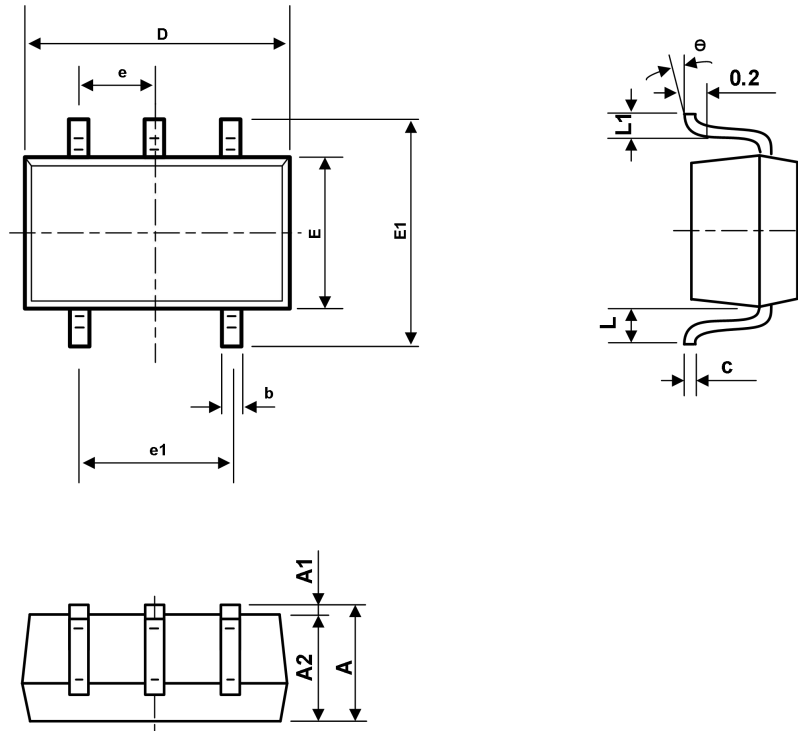


**Fig.10-1. 25-kHz Low-pass Filter**

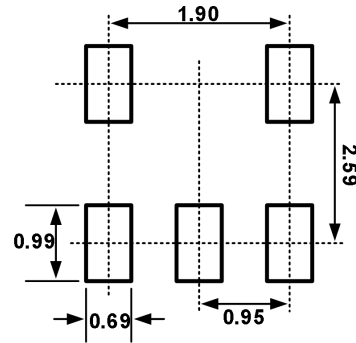
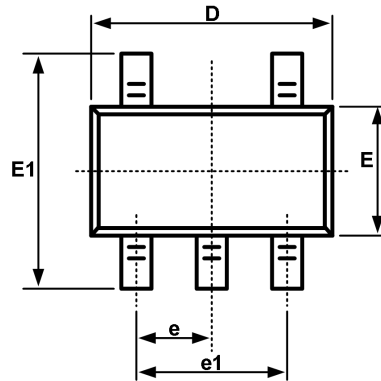
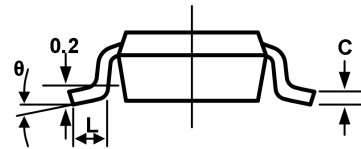
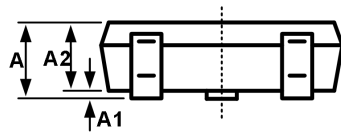
Low-pass filters are commonly employed in signal processing applications to reduce noise and prevent aliasing. The GTV3XX families of products devices are ideally suited to construct high-speed, high-precision active filters. Fig.10-1 shows a second-order, low-pass filter commonly encountered in signal processing applications.

Use the following parameters for this design example:

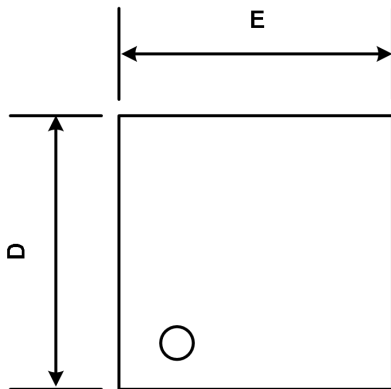
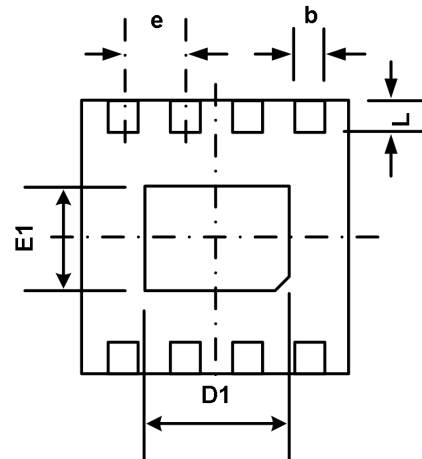
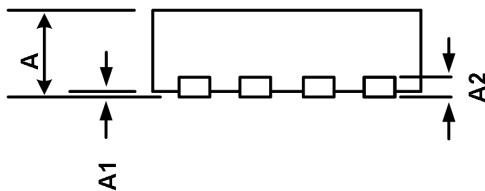
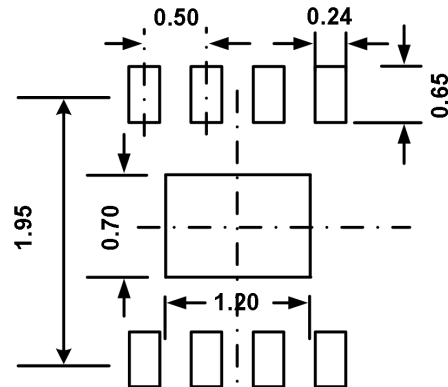
- Gain=5V/V (inverting gain)
- Low-pass cutoff frequency=25kHz
- Second-order Chebyshev filter response with 3-dB gain peaking in the passband.

**11 Package Outline Dimension**
**SC70-5**


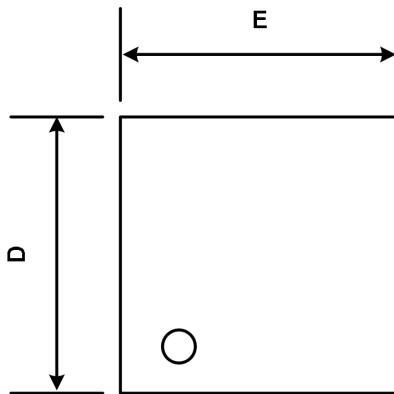
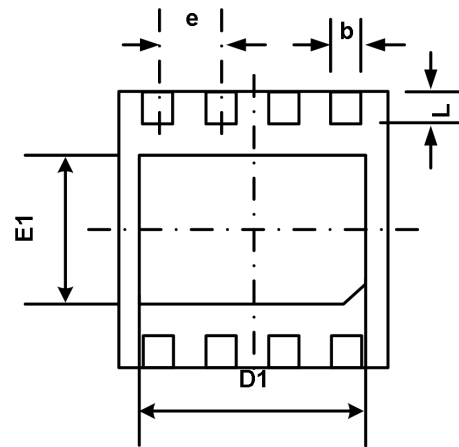
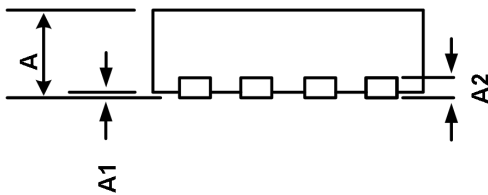
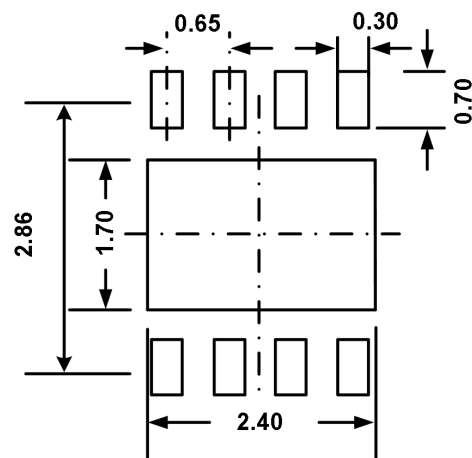
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

**11 Package Outline Dimension(continued)**
**SOT23-5**

**Recommended Land Pattern (Unit: mm)**


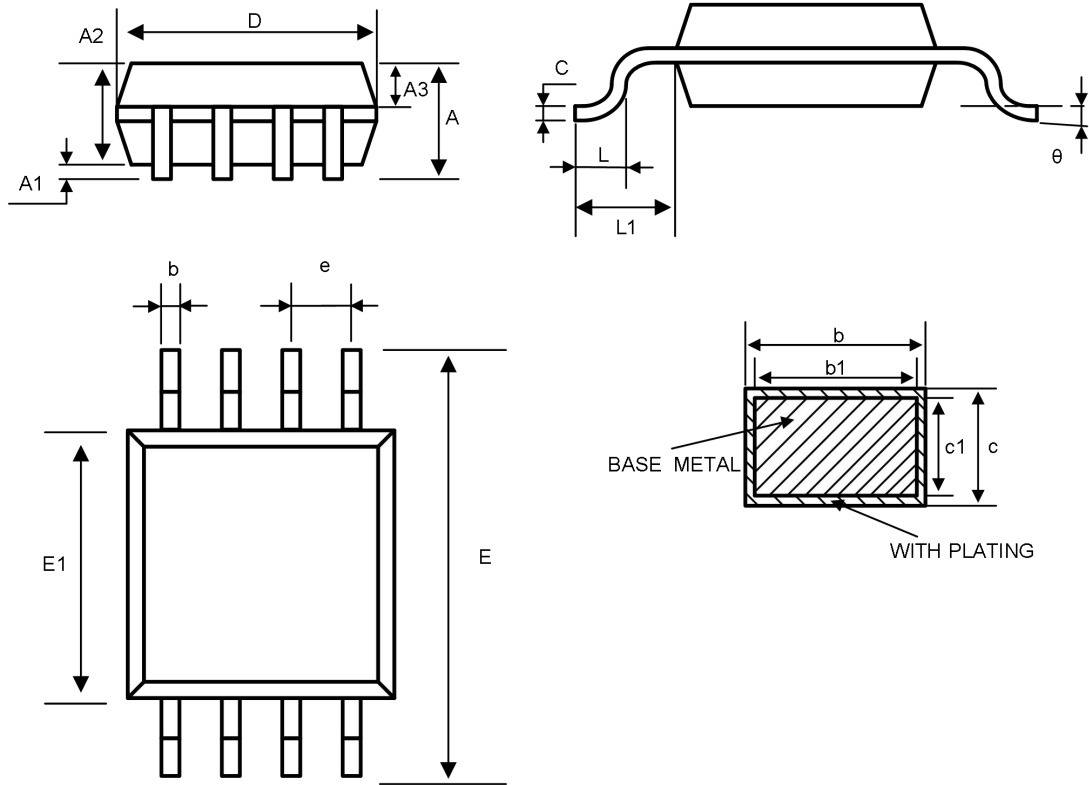
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
L1	0.600REF		0.024REF	
θ	0°	8°	0°	8°

**11 Package Outline Dimension(continued)**
**DFN2\*2-8L**

**TOP VIEW**

**BOTTOM VIEW**

**SIDE VIEW**

**RECOMMENDED LAND PATTERN(unit:mm)**

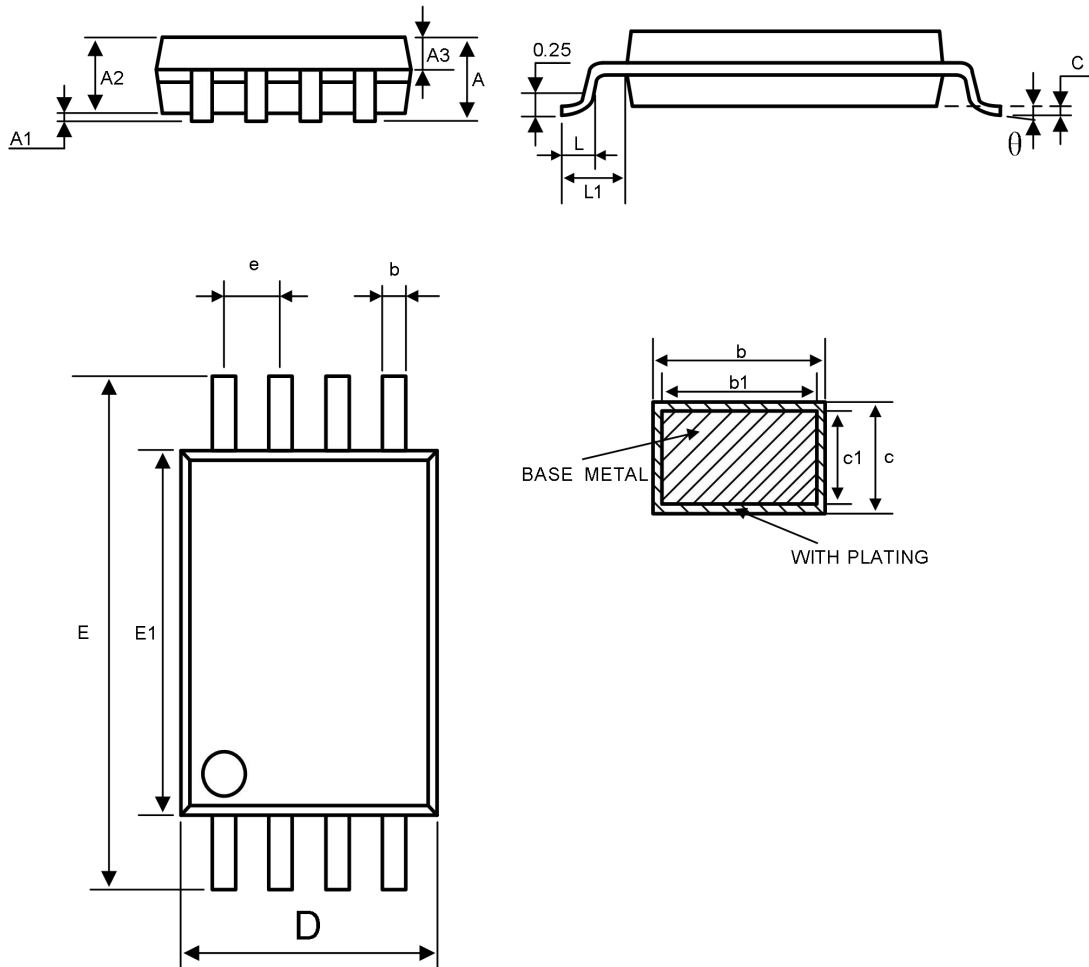
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203(TYP)		0.035(TYP)	
b	0.180	0.300	0.007	0.012
D	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.600	0.800	0.024	0.031
e	0.500(TYP)		0.020TYP	
L	0.250	0.450	0.010	0.018

**11 Package Outline Dimension(continued)**
**DFN3\*3-8L**

**TOP VIEW**

**BOTTOM VIEW**

**SIDE VIEW**

**RECOMMENDED LAND PATTERN(unit: mm)**

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203		0.008	
b	0.250	0.350	0.010	0.014
D	2.900	3.100	0.114	0.122
D1	2.350	2.450	0.093	0.096
E	2.900	3.100	0.114	0.122
E1	1.650	1.750	0.065	0.069
e	0.650(TYP)		0.026TYP	
L	0.370	0.470	0.015	0.019

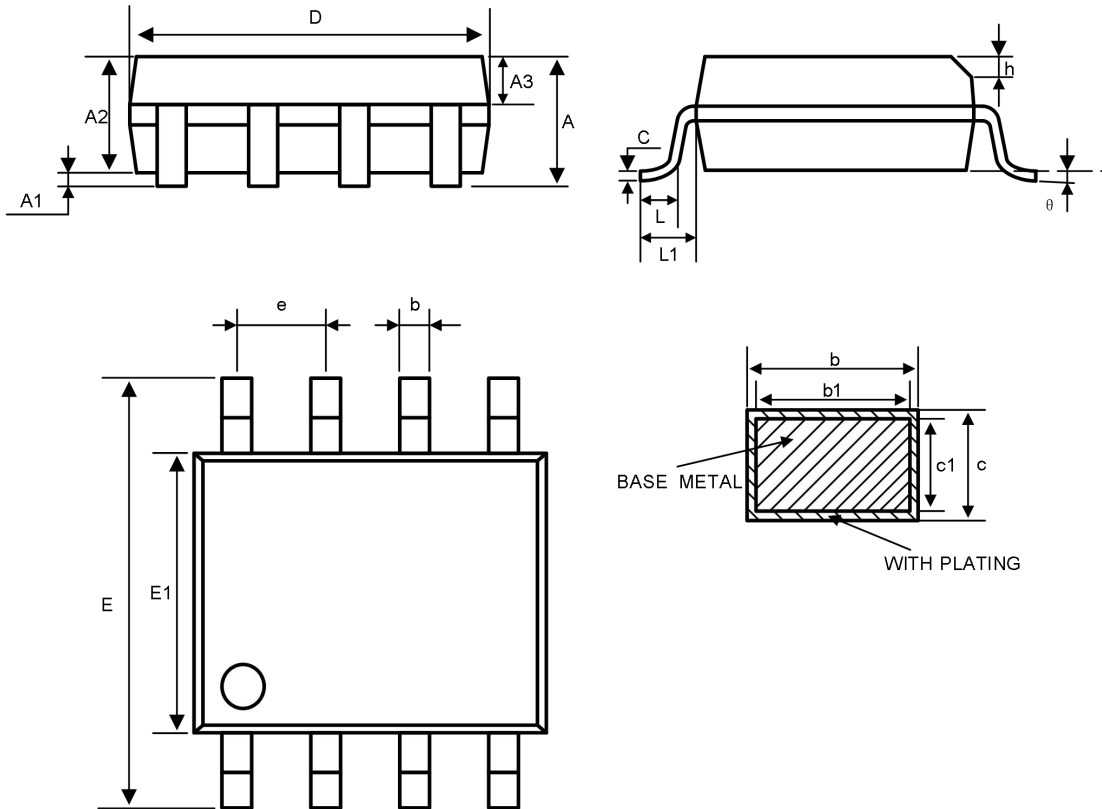
**11 Package Outline Dimension(continued)**
**MSOP8**


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		
$\theta$	0	—	8°	0	—	8°

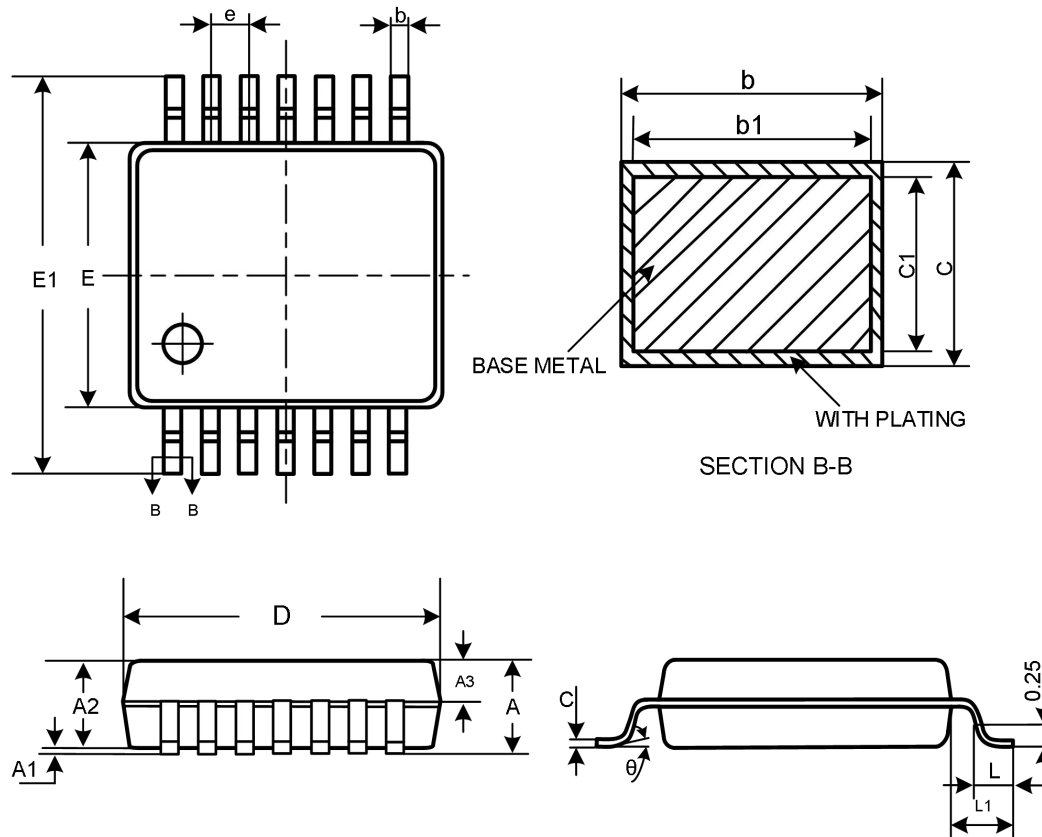
**11 Package Outline Dimension(continued)**
**TSSOP8**


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	2.90	3.00	3.10	0.114	0.118	0.122
E1	4.30	4.40	4.50	0.169	0.173	0.177
E	6.20	6.40	6.60	0.244	0.251	0.260
e	0.65BSC			0.026BSC		
L	0.45	—	0.75	0.018	—	0.030
L1	1.00REF			0.039REF		
$\theta$	0	—	8°	0	—	8°

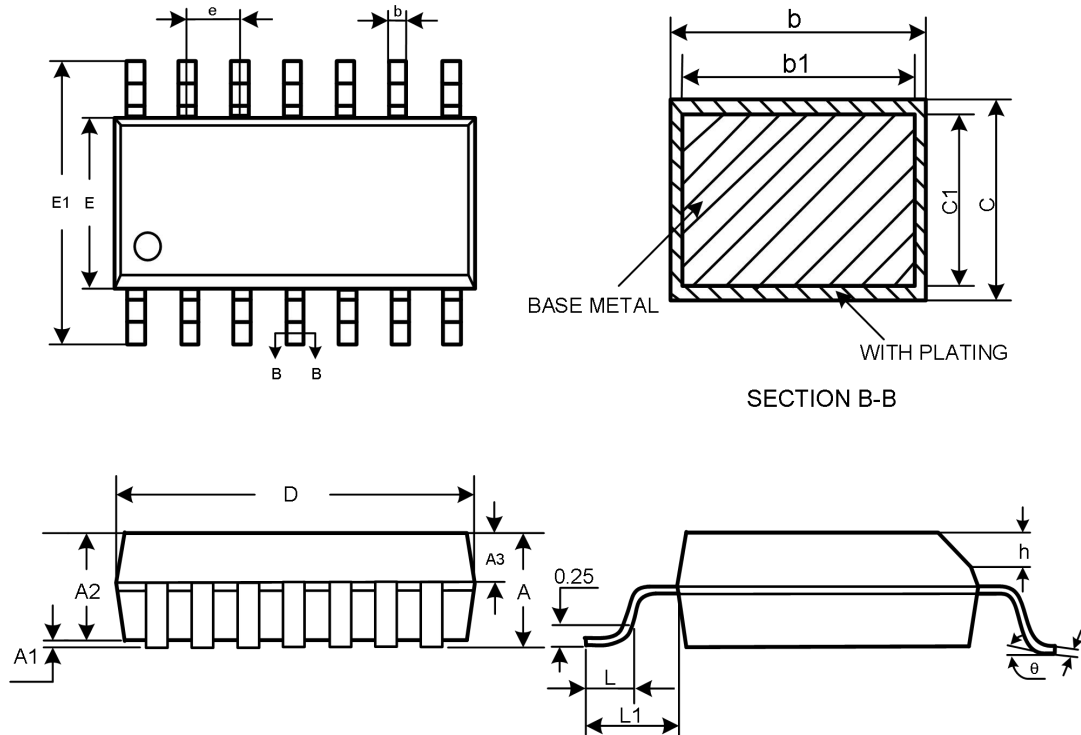


**11 Package Outline Dimension(continued)**
**SOP8**


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	—	0.21	0.008	—	0.008
c1	4.80	4.90	5.00	0.189	0.193	0.197
D	5.80	6.00	6.20	0.228	0.236	0.244
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		
theta	0	—	8°	0	—	8°

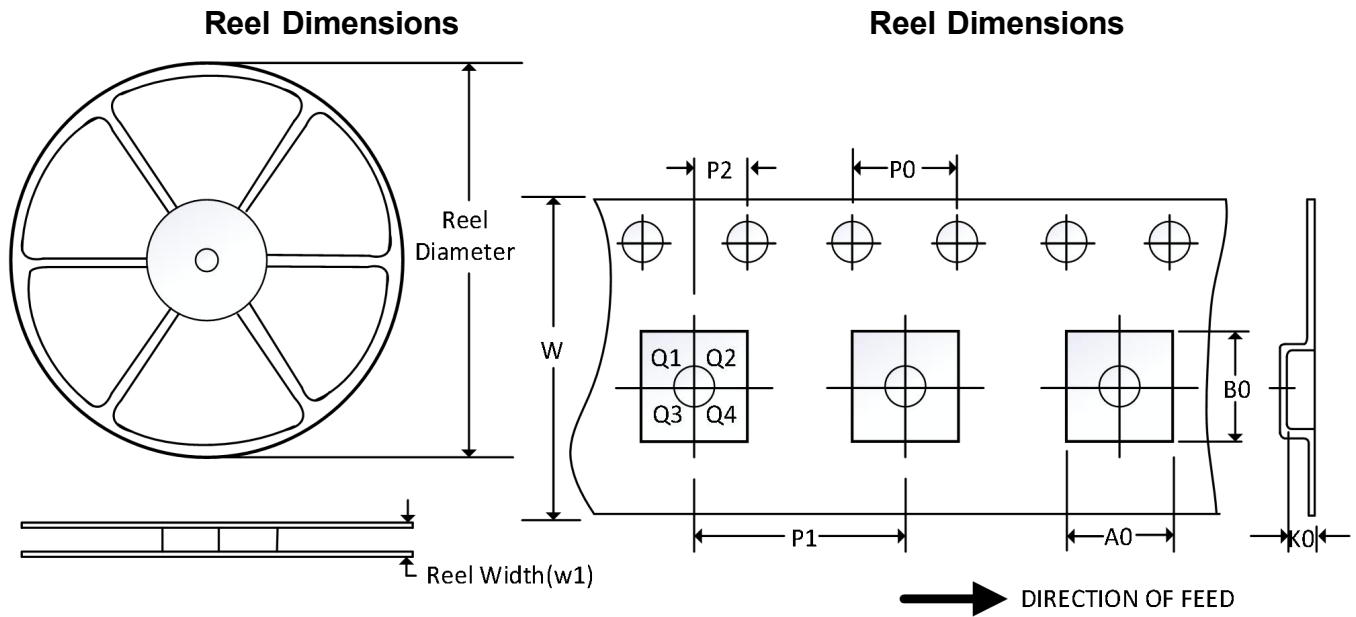
**11 Package Outline Dimension(continued)**
**TSSOP14**


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
E1	4.30	4.40	4.50	0.169	0.173	0.177
E	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		
$\theta$	0	—	8°	0	—	8°

**11 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	0.20	—	0.24
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
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°

## 12 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
SC70-5	7"	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
DFN2*2-8L	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q2
DFN3*3-8L	13"	12.4	3.35	3.35	1.13	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
TSSOP8	13"	12.4	6.90	3.45	1.65	4.0	8.0	2.0	12.0	Q1
SOIC-8 (SOP8)	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
TSSOP-14	13"	12.4	6.95	5.60	1.20	4.0	8.0	2.0	12.0	Q1
SOIC-14 (SOP14)	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1

NOTE:

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