

Features

- Supply Voltage: 2.5V to 5.5V
- Low Supply Current: 80µA per channel
- Positive Offset Voltage: +1mV to +4mV
- Offset Voltage Temperature Drift: 2 µV/°C
- High Output Capability: 100mA
- Rail to Rail Input and Output
- Bandwidth: 1 MHz
- Slew Rate: 0.7V/µs
- Excellent EMI Suppress Performance
- Low Noise: 35 nV/√Hz at 1kHz
- -40°C to 125°C Operation Temperature Range

Applications

- Active Filters, ASIC Input or Output Amplifier
- Sensor Interface
- Smoke/Gas/Environment Sensors
- Portable Instruments and Mobile Device

Description

The LMV321B/358B/324B series are CMOS dual, and quad RRIO op-amps with low offset, low power and stable high frequency response. They incorporate 3PEAK's proprietary and patented design techniques to achieve very good AC performance with 1MHz bandwidth, 0.7V/µs slew rate and low distortion while drawing only 80µA of quiescent current per amplifier. The input common-mode voltage range extends 100mV beyond V₋ and V₊, and the outputs swing rail-to-rail. The LMV321B/358B/324B family can be used as plug-in replacements for many commercially available op-amps to reduce power and improve input/output range and performance. The combination of features makes the LMV321B/358B/324B ideal choices for motor control and portable audio amplification, sound ports, and other consumer Audio. The LMV321B/358B/324B Op-amp is very stable, and it is capable of driving heavy capacitive loads such as those found in LCDs. The ability to swing rail-to-rail at the inputs and outputs enables designers to buffer CMOS DACs, ASICs, or other wide output swing devices in single-supply systems.

Pin Configuration

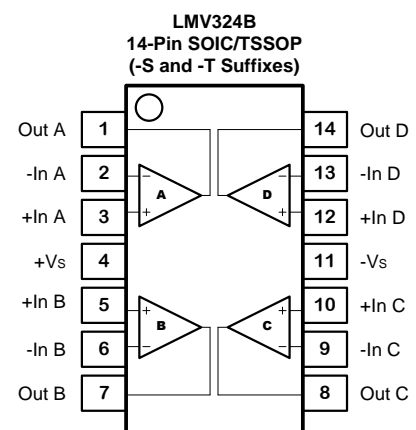
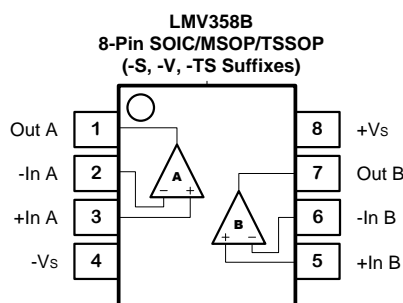
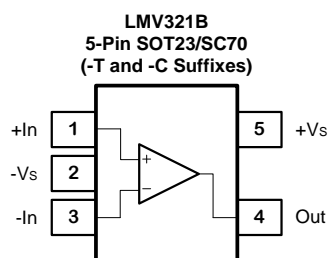


Table of Contents

Features	1
Applications	1
Description	1
Pin Configuration	1
Table of Contents	2
Revision History	3
Order Information	3
Absolute Maximum Ratings ^{Note 1}	4
ESD Rating	4
Thermal Information	4
Electrical Characteristics	5
Typical Performance Characteristics	6
Tape and Reel Information	9
Package Outline Dimensions	10
SOT353 (SC70-5)	10
SOT23-5	11
SOP8	12
TSSOP8	13
MSOP8	14
SOP14	15
TSSOP14	16
IMPORTANT NOTICE AND DISCLAIMER	17

Revision History

Date	Revision	Notes
2018/3/30	Rev.Pre	Pre-Release Version
2018/5/30	Rev.0	First Release to Market Version
2023/4/26	Rev.A.0	<p>The following updates are all about the new datasheet formats or typo, the actual product remains unchanged.</p> <p>Updated to new format of package dimensions.</p> <p>Updated package name.</p> <p>Updated tape and reel information.</p> <p>Updated MSL information of LMV321B-CR: MSL 1 -> MSL 3.</p>

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
LMV321B-TR	-40 to 125°C	SOT23-5	21BXX ^{Note 2}	3	Tape and Reel, 3000
LMV321B-CR	-40 to 125°C	SOT353 (SC70-5)	21BXX ^{Note 2}	3	Tape and Reel, 3000
LMV358B-SR	-40 to 125°C	SOP8	V358B XXXX ^{Note 3}	3	Tape and Reel, 4000
LMV358B-TSR	-40 to 125°C	TSSOP8	V358B XXXX ^{Note 3}	3	Tape and Reel, 3000
LMV358B-VR	-40 to 125°C	MSOP8	V358B XXXX ^{Note 3}	3	Tape and Reel, 3000
LMV324B-SR	-40 to 125°C	SOP14	V324B XXXX ^{Note 3}	3	Tape and Reel, 2500
LMV324B-TR	-40 to 125°C	TSSOP14	V324B XXXX ^{Note 3}	3	Tape and Reel, 3000

Note 1: The sample will be ready in 1 month.

Note 2: XX is the date code.

Note 3: XXXX is date code.

Absolute Maximum Ratings ^{Note 1}

Parameters	Rating
Supply Voltage, (+V _S)– (-V _S)	6 V
Input Voltage	(-V _S) – 0.3 to (+V _S) + 0.3
Differential Input Voltage	±6V
Input Current: +IN, –IN ^{Note 2}	±10mA
Output Short-Circuit Duration ^{Note 3}	Infinite
Maximum Junction Temperature	150°C
Operating Temperature Range	–40 to 125°C
Storage Temperature Range	–65 to 150°C
Lead Temperature (Soldering, 10 sec)	260°C

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300mV beyond the power supply, the input current should be limited to less than 10mA.

Note 3: A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

ESD Rating

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	8	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	2	kV

Thermal Information

Package Type	θ _{JA}	θ _{JC}	Unit
SOT353(SC70-5)	400		°C/W
SOT23-5	250	81	°C/W
SOP8	158	43	°C/W
TSSOP8	191	44	°C/W
MSOP8	210	45	°C/W
SOP14	120	36	°C/W
TSSOP14	180	35	°C/W

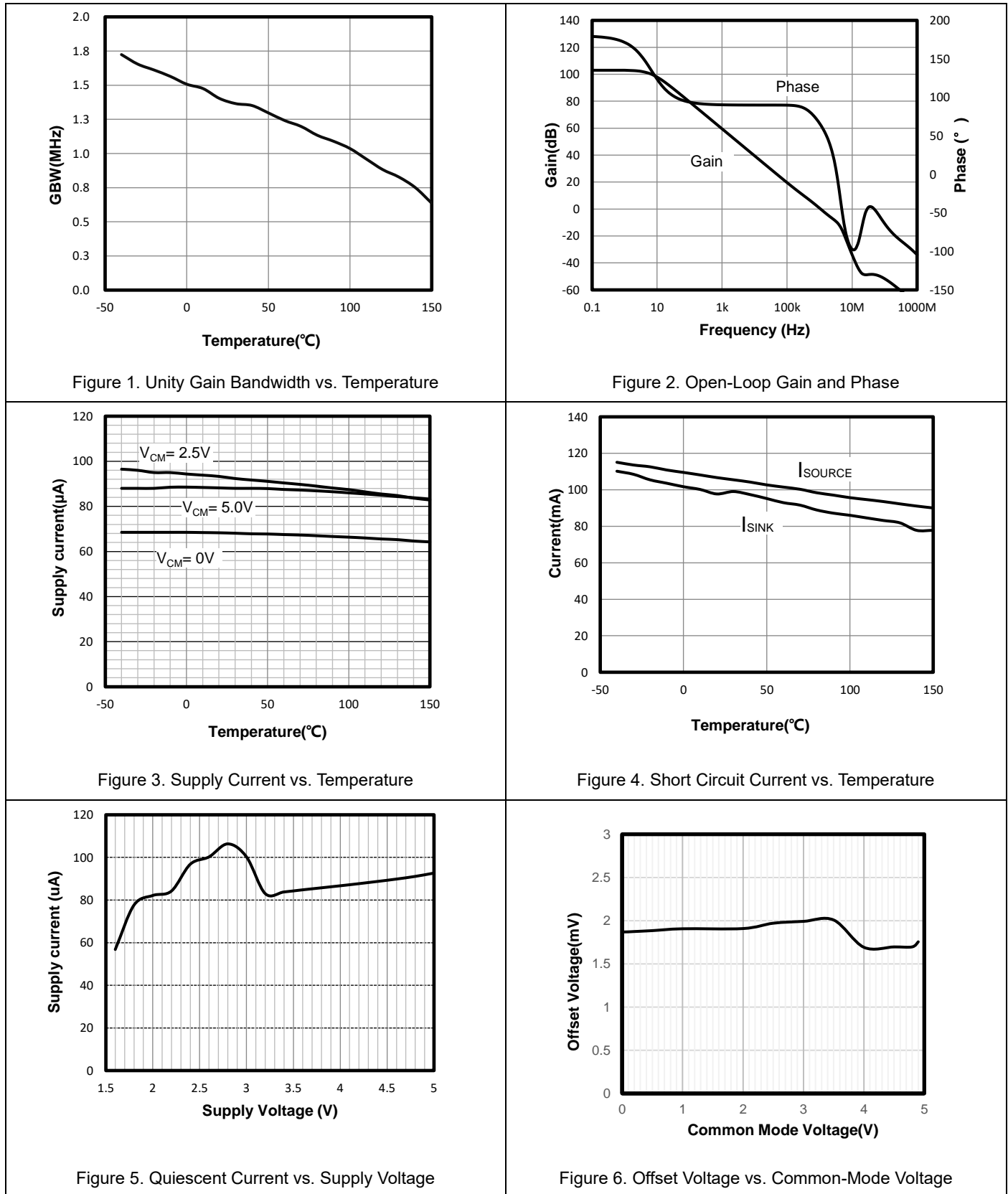
Electrical Characteristics

All test condition is $V_S = 5V$, $T_A = 25^\circ C$, $R_L = 2k\Omega$, $C_L = 100pF$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power Supply						
V_S	Supply Voltage Range		2.5		5.5	V
I_Q	Quiescent Current per Amplifier			80	130	μA
PSRR	Power Supply Rejection Ratio		70	75		dB
Input Characteristics						
V_{OS}	Input Offset Voltage	$V_{CM} = 0V$ to $3V$	+1	+2	+4	mV
$V_{OS\ TC}$	Input Offset Voltage Drift	$T_A = -40^\circ C$ to $125^\circ C$		2		$\mu V/^\circ C$
I_B	Input Bias Current	$T_A = 25^\circ C$		1		pA
		$T_A = 85^\circ C$		25		pA
I_{OS}	Input Offset Current			1		pA
C_{IN}	Input Capacitance	Differential Mode		8		pF
		Common Mode		7		pF
A_V	Open-loop Voltage Gain	$R_{LOAD} = 10k\Omega$	85	110		dB
V_{CMR}	Common-mode Input Voltage Range		(V-) - 0.1		(V+) + 0.1	V
CMRR	Common Mode Rejection Ratio	$V_{CM} = 0V$ to $3V$	65	85		dB
Xtalk	Channel Separation	$f = 1kHz$, $R_L = 2k\Omega$		110		dB
Output Characteristics						
V_{OH}, V_{OL}	Maximum Output Voltage Swing	$R_{LOAD} = 10k\Omega$		3	15	mV
I_{SC}	Output Short-Circuit Current		90	100		mA
AC Specifications						
GBW	Gain-Bandwidth Product			1		MHz
SR	Slew Rate	$A_V = 1$, $V_{OUT} = 1.5V$ to $3.5V$, $C_{LOAD} = 60pF$, $R_{LOAD} = 1k\Omega$		0.7		V/ μs
t_s	Settling Time, 0.1%	$A_V = 1$, 2V Step, $C_{LOAD} = 60pF$, $R_{LOAD} = 1k\Omega$		3.5		μs
	Settling Time, 0.01%			4.8		μs
PM	Phase Margin	$R_{LOAD} = 1k\Omega$, $C_{LOAD} = 60pF$		60		$^\circ$
GM	Gain Margin	$R_{LOAD} = 1k\Omega$, $C_{LOAD} = 60pF$		15		dB
Noise Performance						
E_N	Input Voltage Noise	$f = 0.1Hz$ to $10Hz$		3		μV_{RMS}
e_N	Input Voltage Noise Density	$f = 1kHz$		35		nV/ \sqrt{Hz}
i_N	Input Current Noise	$f = 1kHz$		2		fA/ \sqrt{Hz}
THD+N	Total Harmonic Distortion and Noise	$f = 1kHz$, $A_V = 1$, $R_L = 2k\Omega$, $V_{OUT} = 1V_{p-p}$		0.003		%

Typical Performance Characteristics

$V_s = 5V$, $V_{CM} = 2.5V$, $R_L = \text{Open}$, unless otherwise specified.



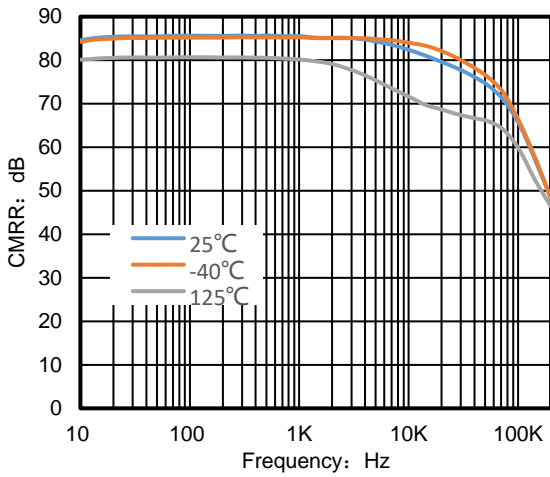


Figure 7. CMRR vs. Frequency

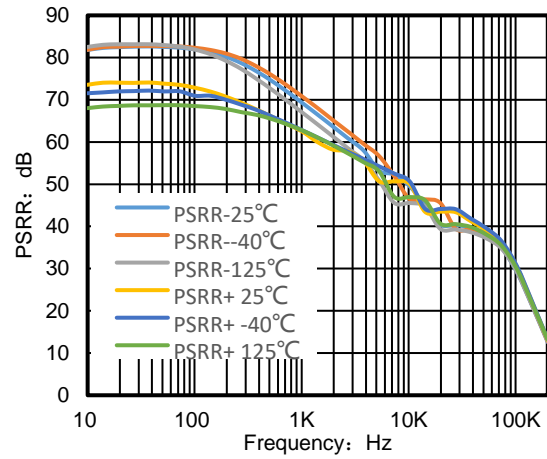


Figure 8. PSRR vs. Frequency

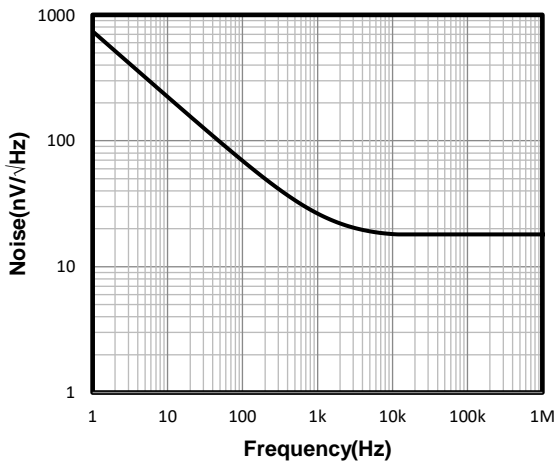


Figure 9. Input Voltage Noise Spectral Density

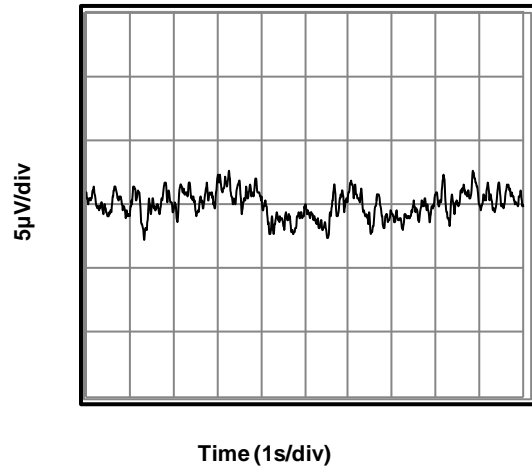


Figure 10. 0.1 Hz to 10 Hz Input Voltage Noise

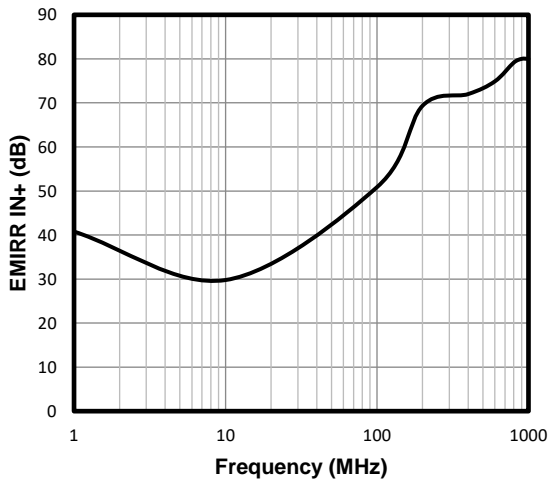


Figure 11. EMIRR IN+ vs. Frequency

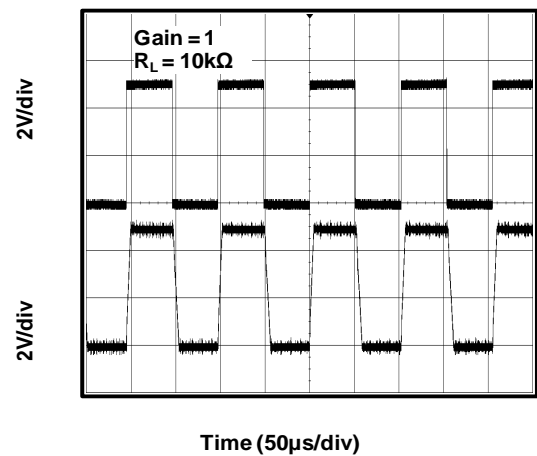
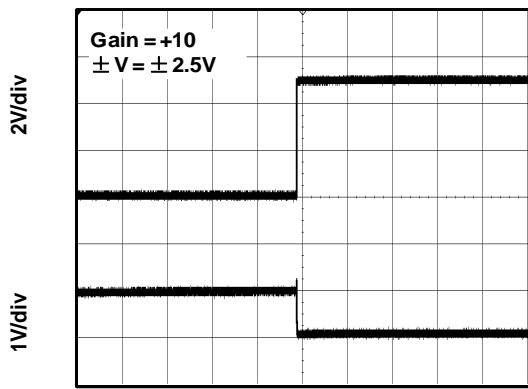
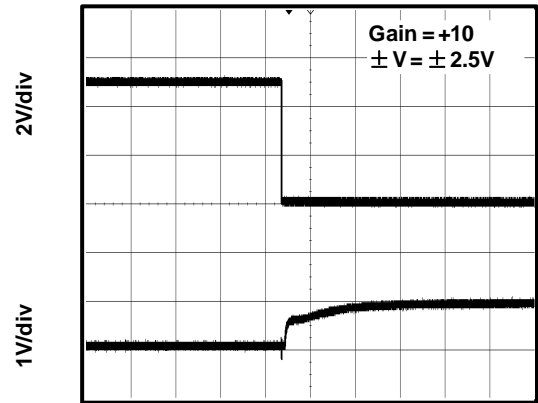


Figure 12. Large-Scale Step Response



Time (50μs/div)

Figure 13. Negative Over-Voltage Recovery



Time (50μs/div)

Figure 14. Positive Over-Voltage Recovery

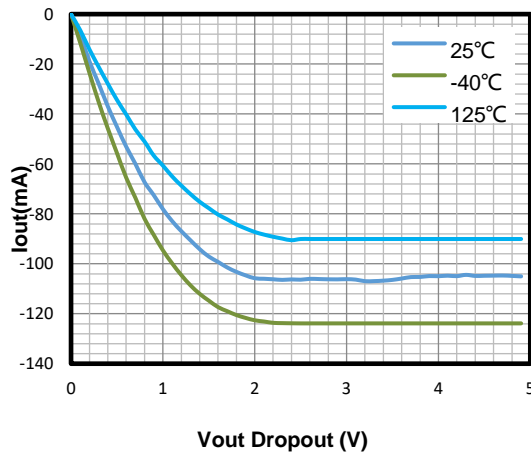


Figure 15. Negative Output Swing vs. Load Current

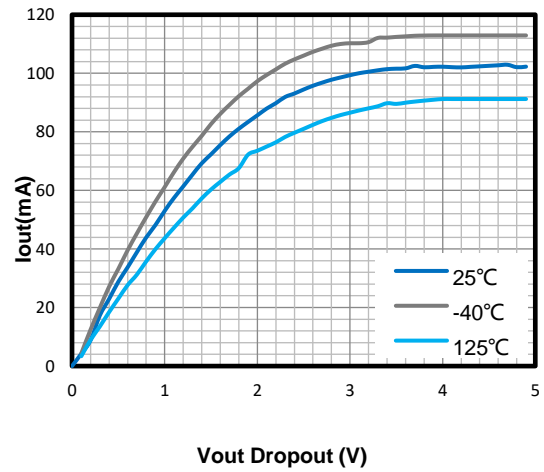
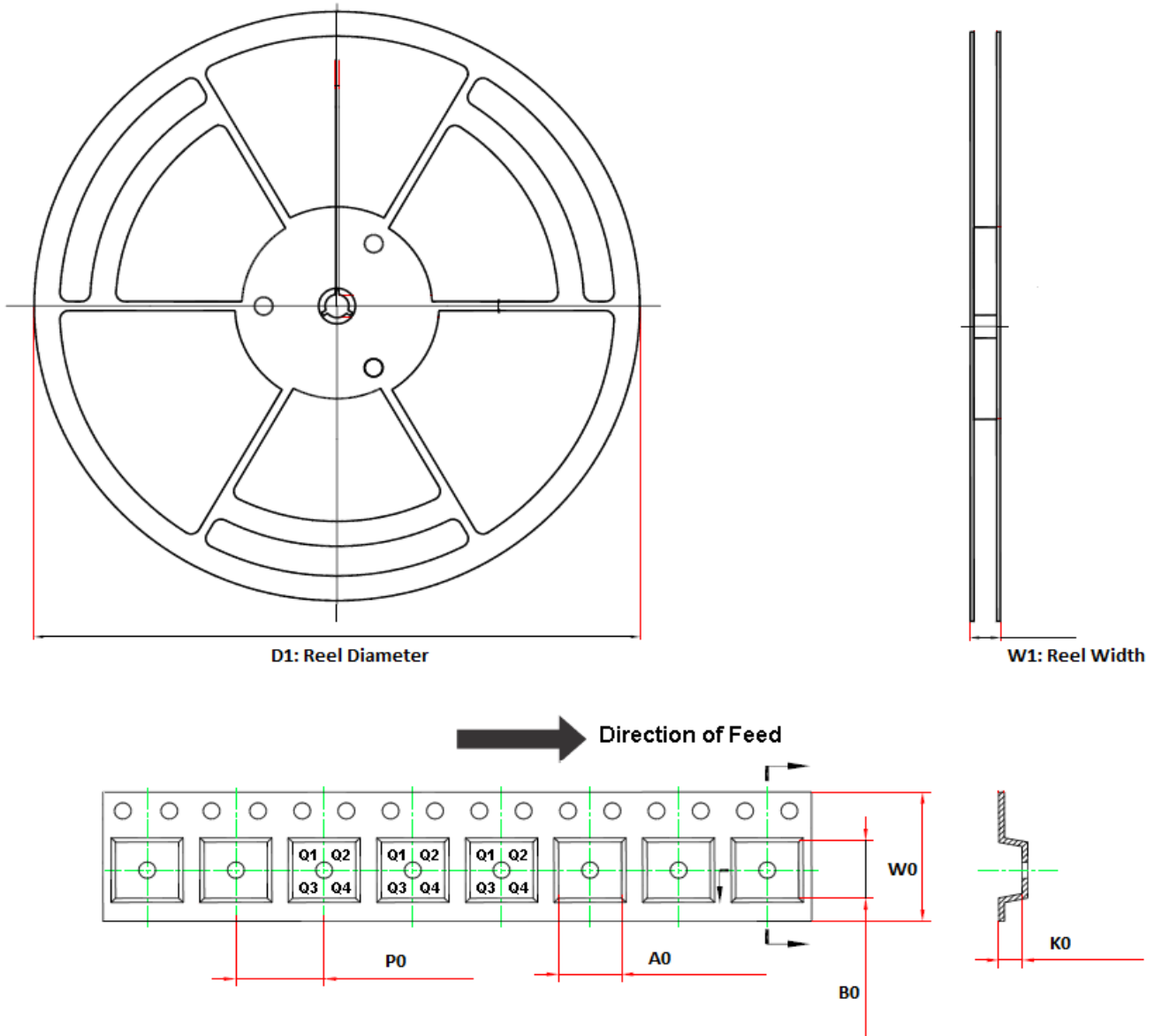


Figure 16. Positive Output Swing vs. Load Current

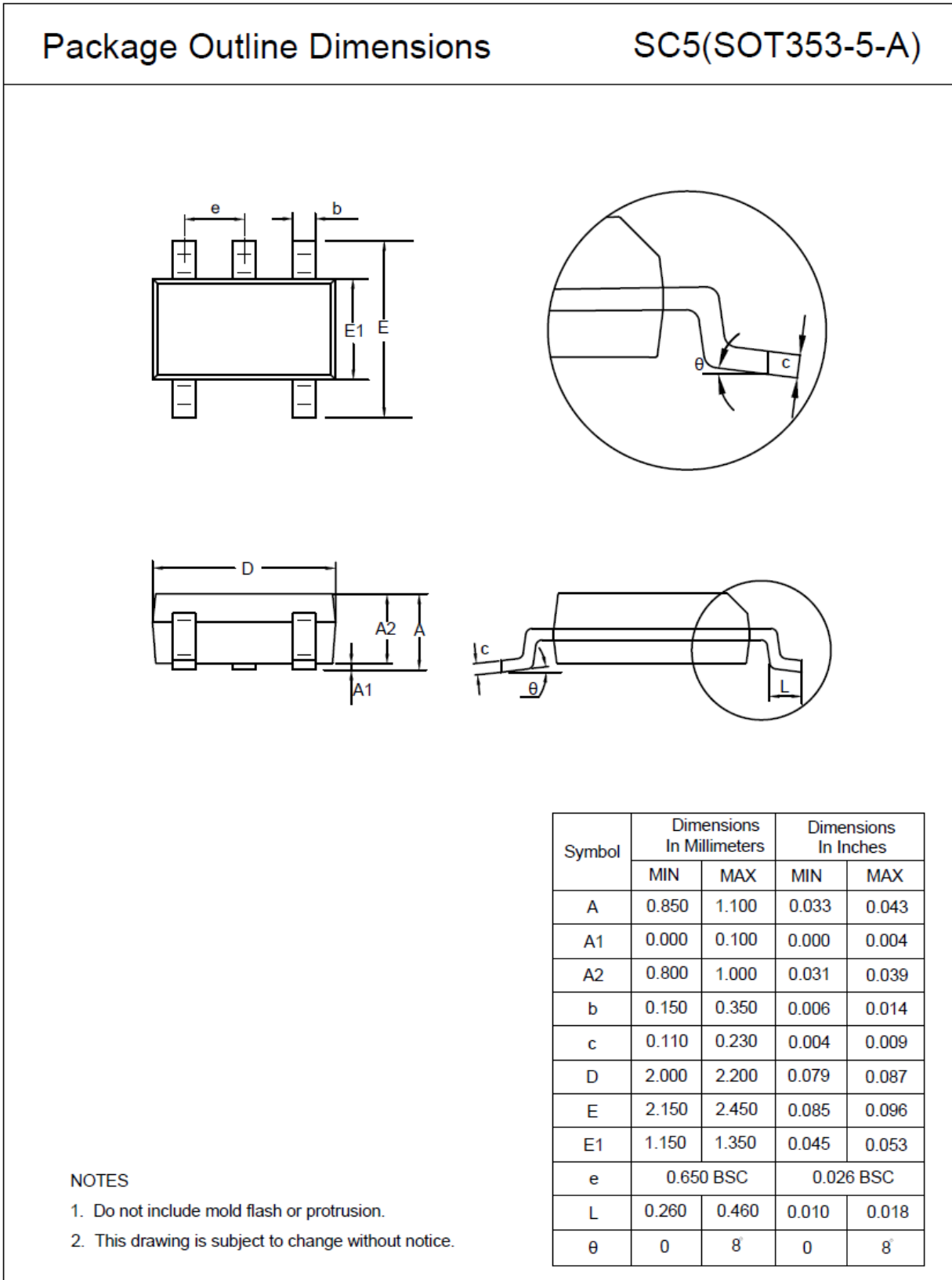
Tape and Reel Information



Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
LMV321B-CR	SOT353	178.0	12.3	2.4	2.5	1.2	4.0	8.0	Q3
LMV321B-TR	SOT23-5	179.0	12.0	3.3	3.2	1.4	4.0	8.0	Q3
LMV358B-SR	SOP8	330.0	17.6	6.5	5.4	2.0	8.0	12.0	Q1
LMV358B-VR	MSOP8	330.0	17.6	5.2	3.3	1.5	8.0	12.0	Q1
LMV358B-TSR	TSSOP8	330.0	17.6	6.8	3.3	1.2	8.0	12.0	Q1
LMV324B-SR	SOP14	330.0	21.6	6.5	9.0	2.1	8.0	16.0	Q1
LMV324B-TR	TSSOP14	330.0	17.6	6.8	5.5	1.2	8.0	12.0	Q1

Package Outline Dimensions

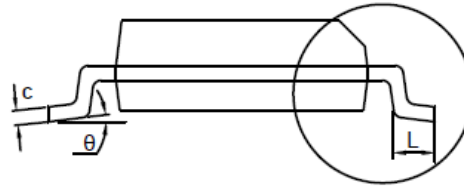
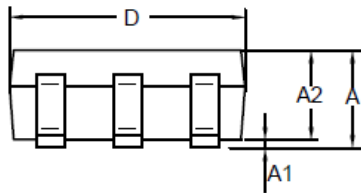
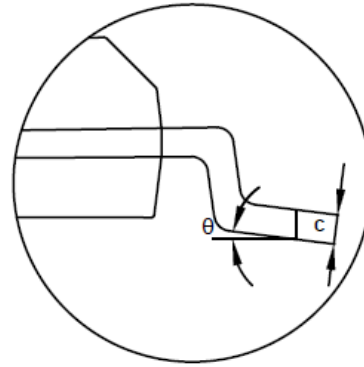
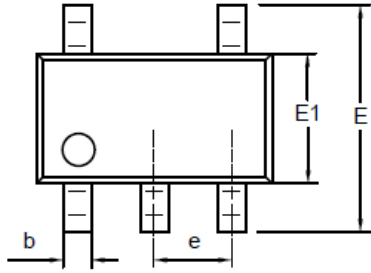
SOT353 (SC70-5)



SOT23-5

Package Outline Dimensions

S5T(SOT23-5-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

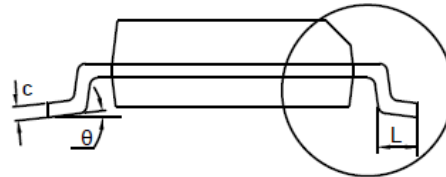
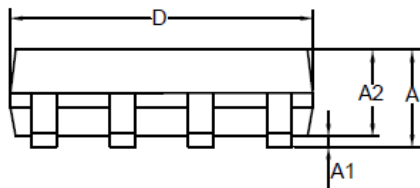
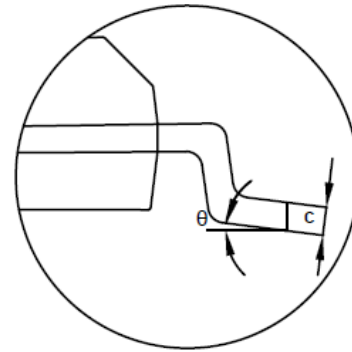
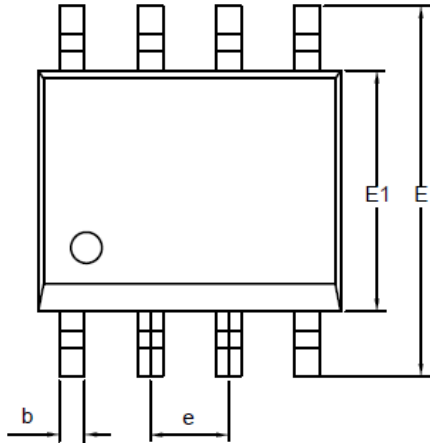
NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

SOP8

Package Outline Dimensions

SO1(SOP-8-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.550	0.049	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC	
L	0.400	1.000	0.016	0.039
θ	0	8°	0	8°

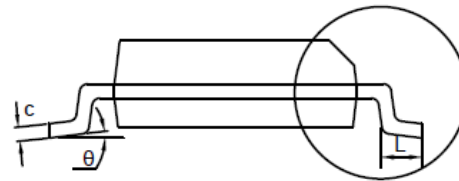
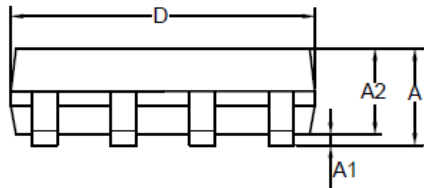
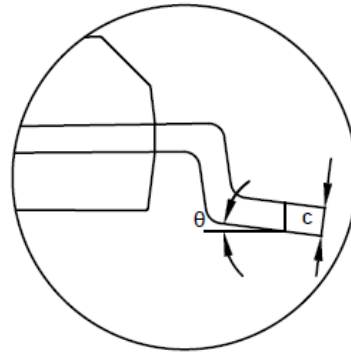
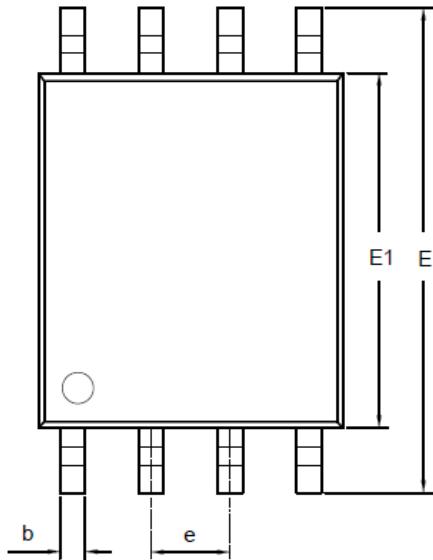
NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

TSSOP8

Package Outline Dimensions

TS1(TSSOP-8-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.200	0.035	0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	2.900	3.100	0.114	0.122
E	6.200	6.600	0.244	0.260
E1	4.300	4.500	0.169	0.177
e	0.650 BSC		0.026 BSC	
L	0.450	0.750	0.018	0.030
θ	0	8°	0	8°

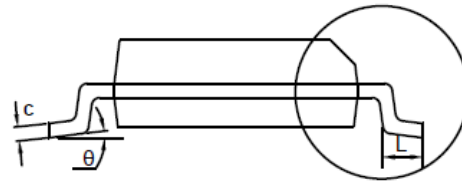
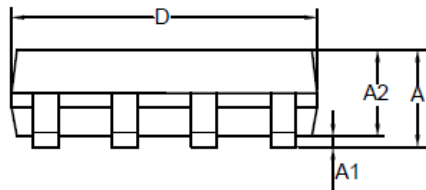
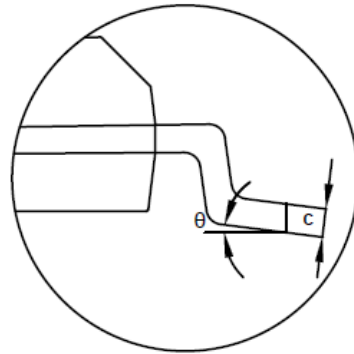
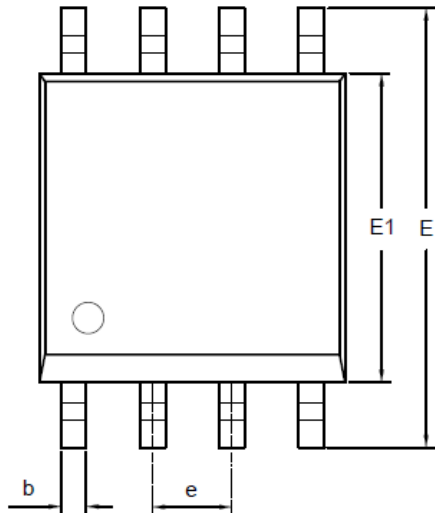
NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

MSOP8

Package Outline Dimensions

VS1(MSOP-8-A)

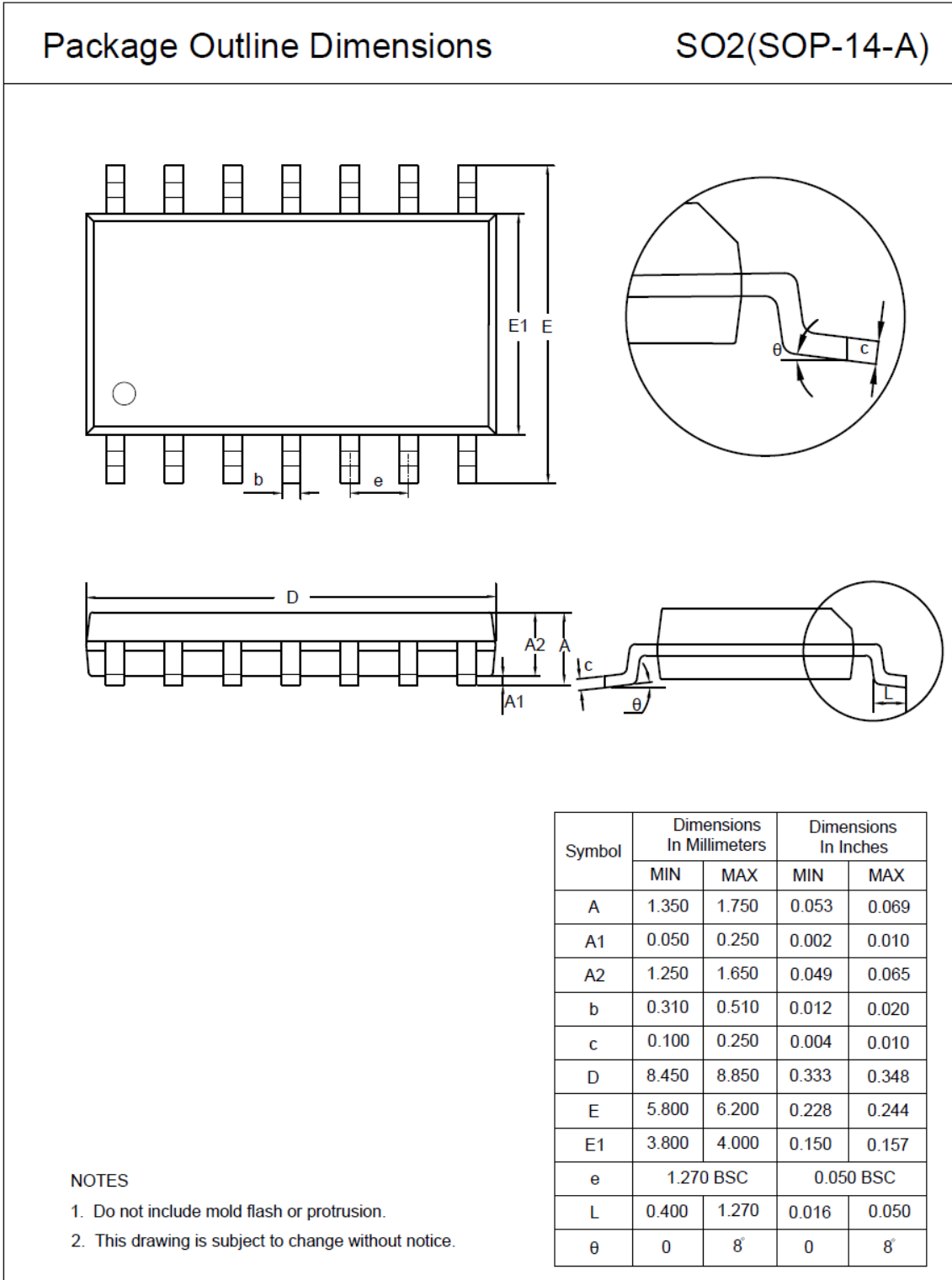


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.050	0.150	0.002	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	4.700	5.100	0.185	0.201
E1	2.900	3.100	0.114	0.122
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

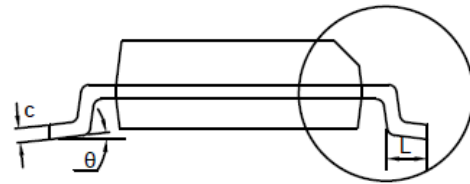
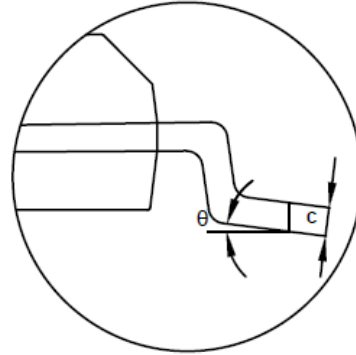
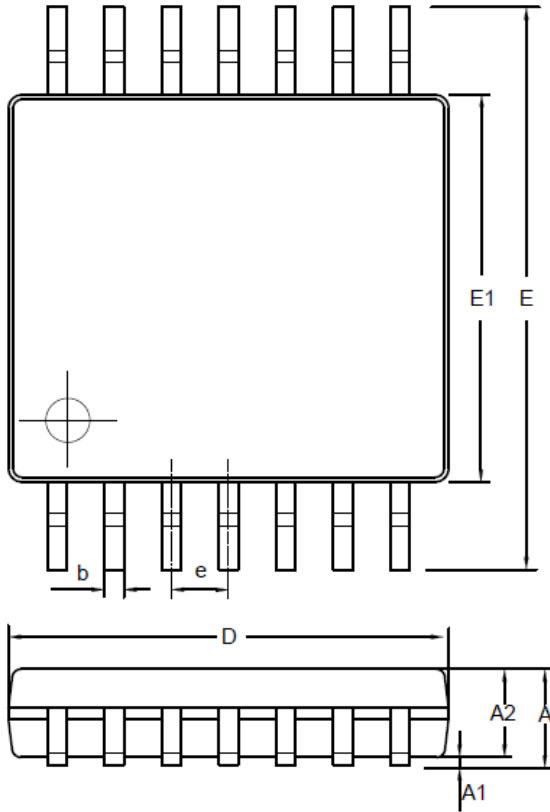
SOP14



TSSOP14

Package Outline Dimensions

TS2(TSSOP-14-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.200	0.035	0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	6.200	6.600	0.244	0.260
E1	4.300	4.500	0.169	0.177
e	0.650 BSC		0.026 BSC	
L	0.450	0.750	0.018	0.030
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

IMPORTANT NOTICE AND DISCLAIMER

Copyright© 3PEAK 2012-2023. All rights reserved.

Trademarks. Any of the 思瑞浦 or 3PEAK trade names, trademarks, graphic marks, and domain names contained in this document /material are the property of 3PEAK. You may NOT reproduce, modify, publish, transmit or distribute any Trademark without the prior written consent of 3PEAK.

Performance Information. Performance tests or performance range contained in this document/material are either results of design simulation or actual tests conducted under designated testing environment. Any variation in testing environment or simulation environment, including but not limited to testing method, testing process or testing temperature, may affect actual performance of the product.

Disclaimer. 3PEAK provides technical and reliability data (including data sheets), design resources (including reference designs), application or other design recommendations, networking tools, security information and other resources "As Is". 3PEAK makes no warranty as to the absence of defects, and makes no warranties of any kind, express or implied, including without limitation, implied warranties as to merchantability, fitness for a particular purpose or non-infringement of any third-party's intellectual property rights. Unless otherwise specified in writing, products supplied by 3PEAK are not designed to be used in any life-threatening scenarios, including critical medical applications, automotive safety-critical systems, aviation, aerospace, or any situations where failure could result in bodily harm, loss of life, or significant property damage. 3PEAK disclaims all liability for any such unauthorized use.