DIO32051/32051A/32052/32054
0.5 MHz, 24 µA, Rail-to-Rail I/O CMOS Amplifier

Features

- Rail-to-rail input and output
- Max offset (V_{OS}):
  DIO32051/32051A/32052/32054 at ±3 mV
- Unity gain stable
- Gain bandwidth product: 0.5 MHz
- Very low input bias currents: 10 pA
- Wide supply range: 2.1 V to 5.5 V
- Input voltage range: 0 V to 5 V
- Ultra-low power: 24 µA per channel
- Compact package best for portable applications
  DIO32051: SOT23-5 and SC70-5
  DIO32051A: SOT23-5 and SC70-5
  DIO32052: SOIC-8, MSOP-8, and TSOT23-8
  DIO32054: SOIC-14 and TSSOP-14

Descriptions

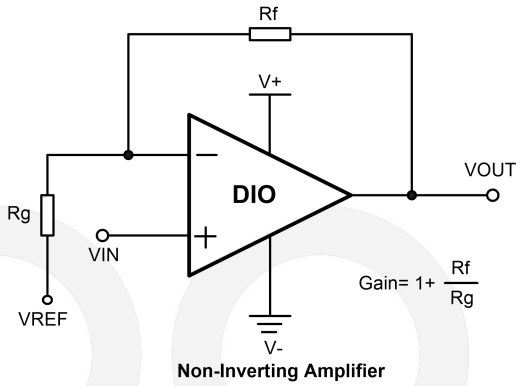
The DIO32051/32051A (single), DIO32052 (dual), DIO32054 (quad) are rail-to-rail CMOS operational amplifiers with an ultra-low offset. Features include wide input common-mode voltage range and broad output voltage swing with operating supply voltage from 2.1 V to 5.5 V. Products are fully specified over the extended -40 to +125°C temperature range.

The DIO32051/32051A/32052/32054 series provides 0.5 MHz bandwidth and consumes an ultra-low current of 24 µA per channel. Very low input bias currents of 10 pA make them ideal for integrators, photodiode amplifiers, and piezoelectric sensors.

Applications

- ASIC input or output amplifiers
- Sensor interfaces
- Piezo electric transducer amplifiers
- Medical instrumentation
- Audio output
- Portable systems
- Smoke detectors
- Notebook PCs
- Battery-powered equipment

Typical Application



Non-Inverting Amplifier

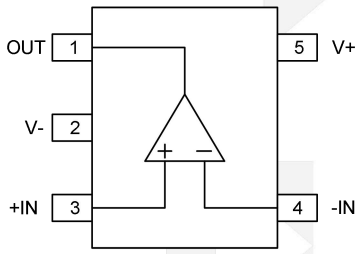
Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO32051ST5	YWXT	RoHS or Green	-40 to +125°C	SOT23-5	Tape & Reel, 3000
DIO32051SC5	YWXT	RoHS or Green	-40 to +125°C	SC70-5	Tape & Reel, 3000
DIO32051AST5	YWXU	RoHS or Green	-40 to +125°C	SOT23-5	Tape & Reel, 3000
DIO32051ASC5	YWXU	RoHS or Green	-40 to +125°C	SC70-5	Tape & Reel, 3000
DIO32052MP8	DIO2052	RoHS or Green	-40 to +125°C	MSOP-8	Tape & Reel, 3000
DIO32052SO8	DIO2052	RoHS or Green	-40 to +125°C	SOIC-8	Tape & Reel, 2500
DIO32052TST8	5BYW	RoHS or Green	-40 to +125°C	TSOT23-8	Tape & Reel, 4000
DIO32054SO14	DIO2054	RoHS or Green	-40 to +125°C	SOIC-14	Tape & Reel, 2500
DIO32054TP14	DIO2054	RoHS or Green	-40 to +125°C	TSSOP-14	Tape & Reel, 2500

Marking Definition

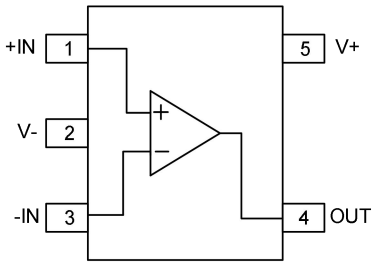
Pin Assignments

SOT23-5/SC70-5



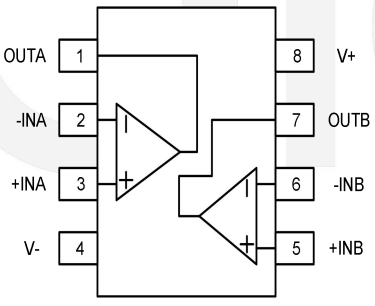
DIO32051

SOT23-5/SC70-5



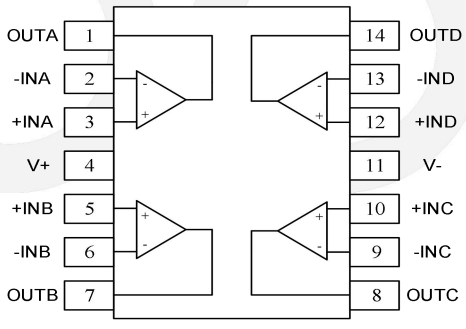
DIO32051A

SOIC-8/MSOP-8/TSOT23-8



DIO32052

SOIC-14/TSSOP-14



DIO32054

Figure 1. Pin Assignment

Pin Description

Pin name	Description
V+	Positive supply
V-	Negative supply
+INX	Positive Input
-INX	Negative Input
OUTX	Output

Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage	7	V
V_{IN}	Input voltage	(V-)-0.5 to 7	V
T_{STG}	Storage temperature range	-65 to 150	°C
T_J	Junction temperature	150	°C
T_L	Lead temperature range	260	°C
ESD	HBM, JEDEC: JESD22-A114	8	kV
	CDM, JEDEC: JESD22-C101	2	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage	2.1 to 5.5	V
V_{IN}	Input voltage	0 to V+	V
T_A	Operating temperature range	-40 to 125	°C

Electrical Characteristics

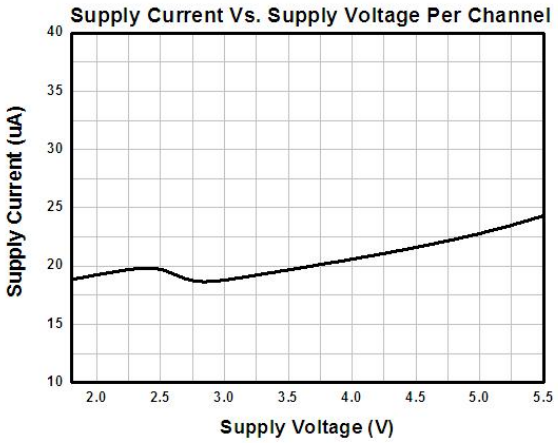
Typical value: V+ = 5 V, V- = 0 V, R_L = 100 kΩ to V+/2, T_A = 25°C, unless otherwise specified.

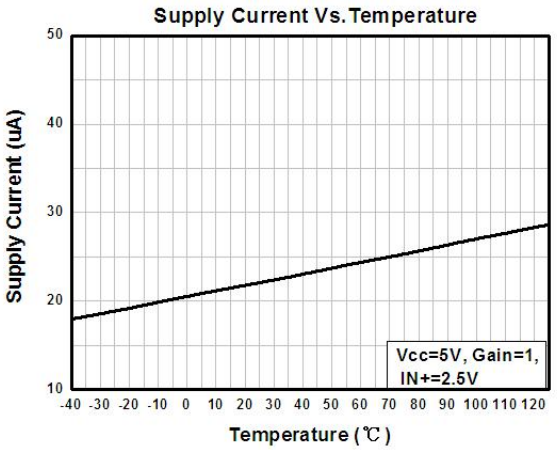
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Input characteristics						
V_{OS}	Input offset voltage	-40°C ≤ T_A ≤ 125°C, V+ = 2.1 V to 5 V	-3	0	3	mV
I_B	Input bias current	V+ = 2.1 V to 5 V		10		pA
I_{OS}	Input offset current	V+ = 2.1 V to 5 V		10		pA
V_{CM}	Common mode voltage range		0.1		(V+) +0.1	V
CMRR	Common mode rejection ratio	-40°C ≤ T_A ≤ 125°C, V_{CM} = -0.1 to (V+) + 0.1		75		dB
A_{OL}	Open loop voltage gain	R_L= 5 kΩ, V_O = 0.1 to (V+) - 0.1	80	102		dB
		R_L= 200 kΩ, V_O = 0.1 to (V+) - 0.1	100	128		
d_{VOS}/dt	Input offset voltage drift	-40°C ≤ T_A ≤ 125°C			2.5	µV/°C
Output characteristics						
V_{OH}	Output voltage high	V+ = 5 V, R_L= 100 kΩ, -40°C ≤ T_A ≤ 125°C		4.995		V
		V+ = 2.1 V, R_L= 100 kΩ, -40°C ≤ T_A ≤ 125°C		1.79		
V_{OL}	Output voltage low	V+ = 5 V, R_L = 100 kΩ, -40°C ≤T_A ≤ 125°C		5		mV
		V+ = 2.1 V, R_L = 100 kΩ, -40°C ≤ T_A ≤ 125°C		5		
I_{SC}	Output short circuit current	Source I_{SC}, V+ = 5 V		28		mA
		Sink I_{SC}, V+ = 5 V		28		
Power supply						
PSRR	Power supply rejection ration		65	85		dB
I_S	Supply current per channel/amp	-40°C ≤ T_A ≤ 125°C		24		µA
Dynamic performance						
GBP	Gain bandwidth product	R_L = 100 kΩ, C_L = 100 pF		0.5		MHz
SR	Slew rate	G = 1, 2 V output step		0.29		V/µs
t_S	Setting time	G = 1, 2 V output step		4		µs
Noise performance						
THD	Total harmonic distortion	f =10 kHz, 2 V output step, R_L = 10 kΩ		0.02		%
e_n	Voltage noise density	f = 1 kHz		66		nV/√Hz
		f = 10 kHz		54		

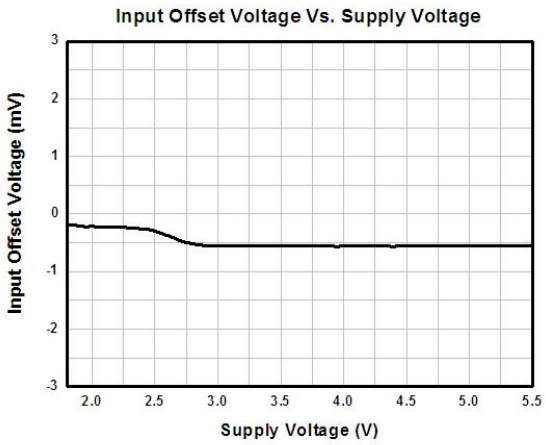
Specifications subject to change without notice.

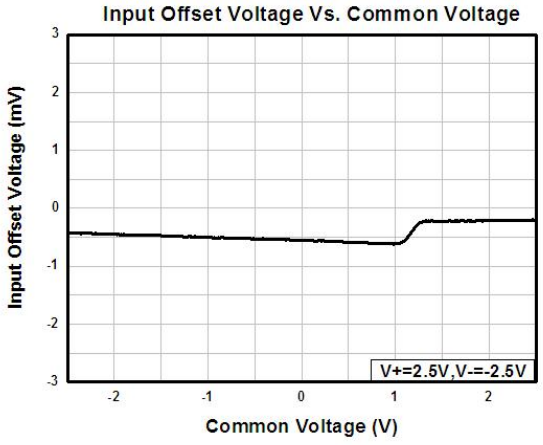
Typical Performance Characteristics

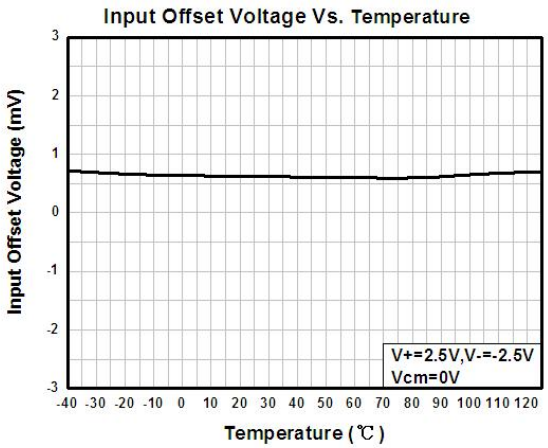
Typical value: V+ = 5 V, V- = 0 V, R_L = 100 kΩ to V+/2, T_A = 25°C, unless otherwise specified.

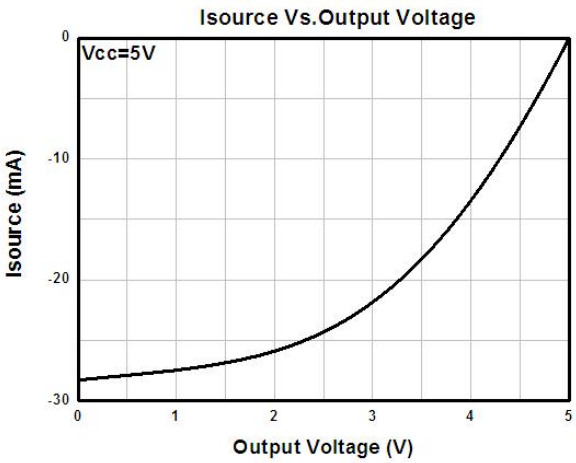






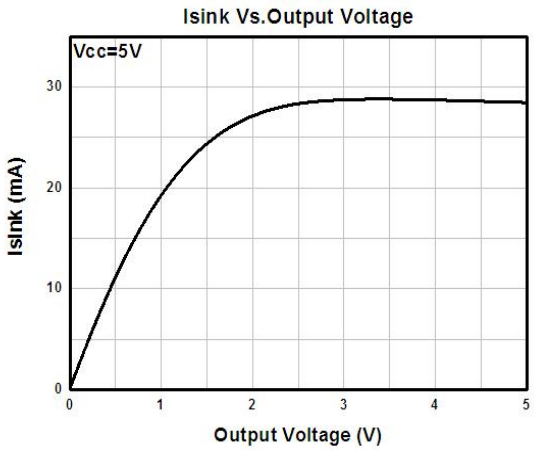


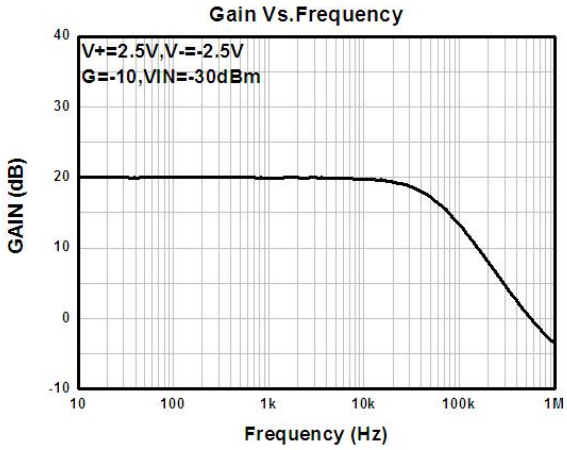




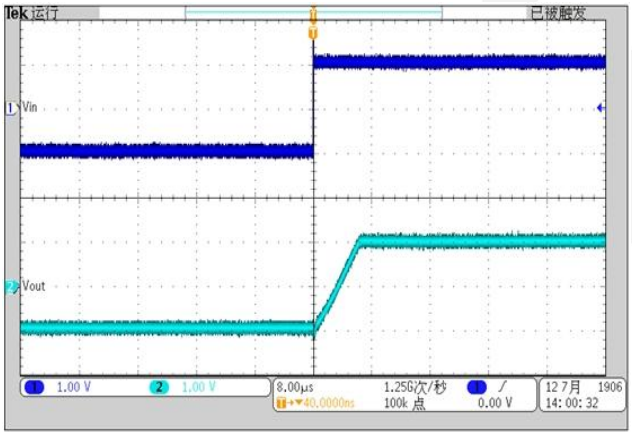
Typical Performance Characteristics

Typical value: V+ = 5 V, V- = 0 V, R_L = 100 kΩ to V+/2, T_A = 25°C, unless otherwise specified.

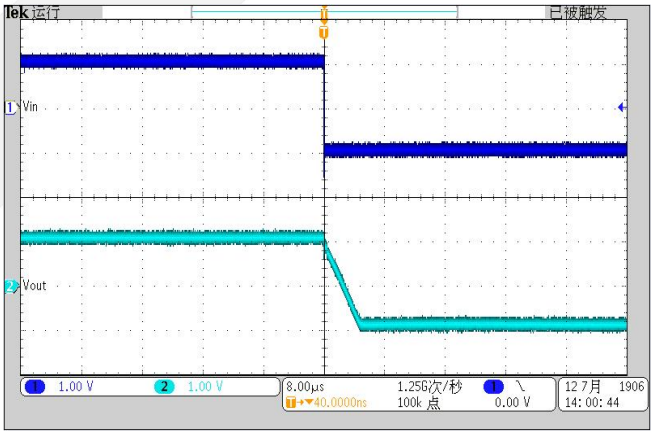




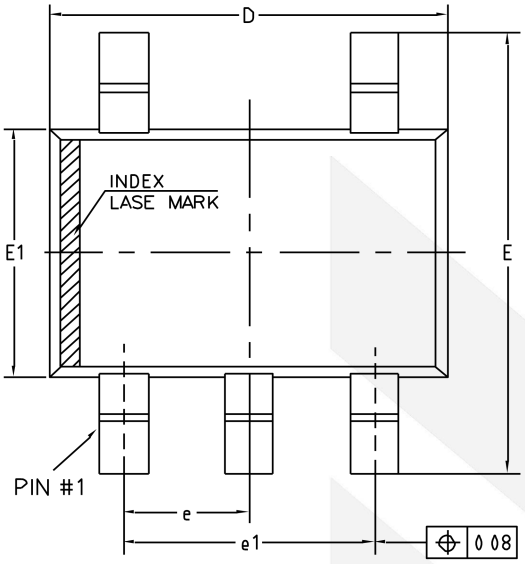
Slew Rate

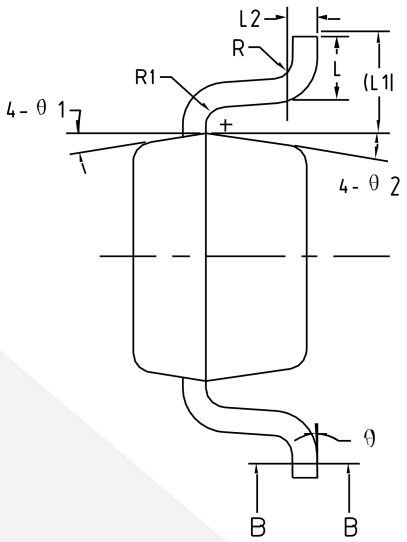


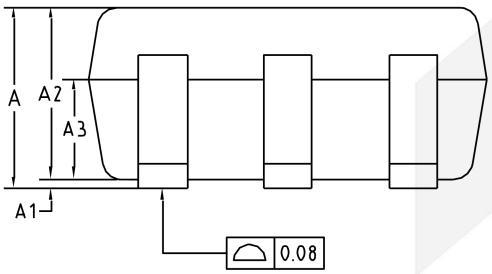
Slew Rate

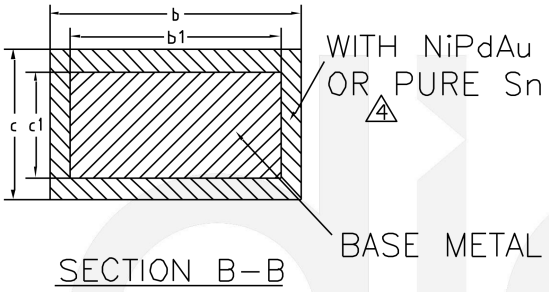


Physical Dimensions: SC70-5



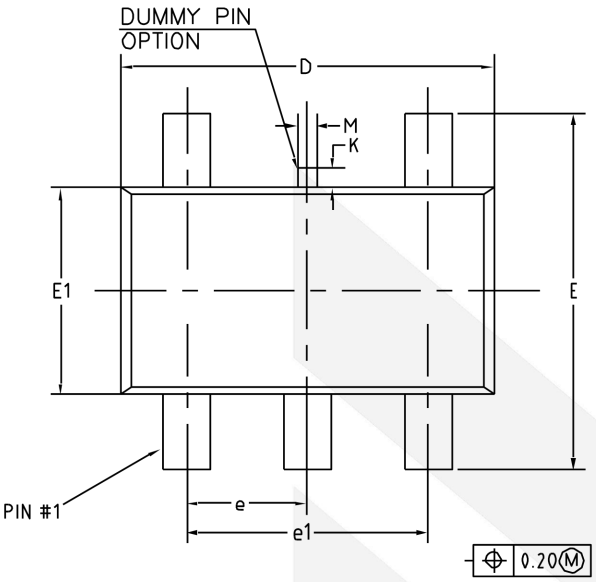


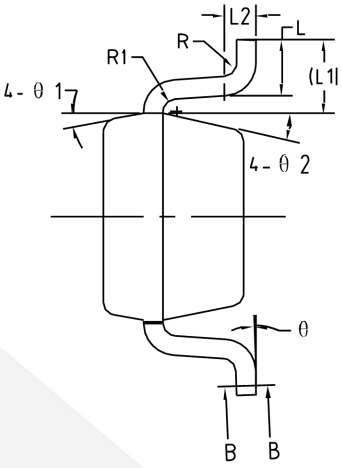


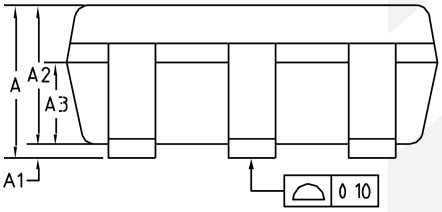


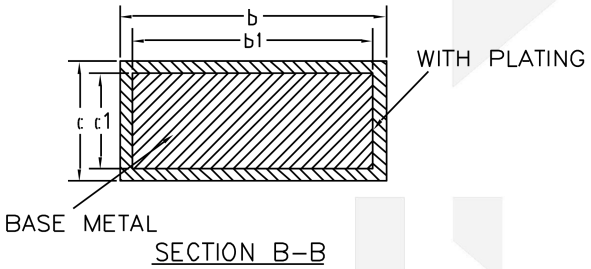
Common Dimensions (Units of measure = mm)			
Symbol	**Min**	**Nom**	**Max**
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.23	-	0.33
b1	0.22	0.25	0.28
c	0.12	-	0.18
c1	0.115	0.13	0.14
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.65BSC		
e1	1.30BSC		
L	0.28	0.33	0.38
L1	0.50REF		
L2	0.15BSC		
R	0.10	-	-
R1	0.10	-	0.25
Θ	0°	-	8°
Θ1	6°	9°	12°
Θ2	6°	9°	12°

Physical Dimensions: SOT23-5



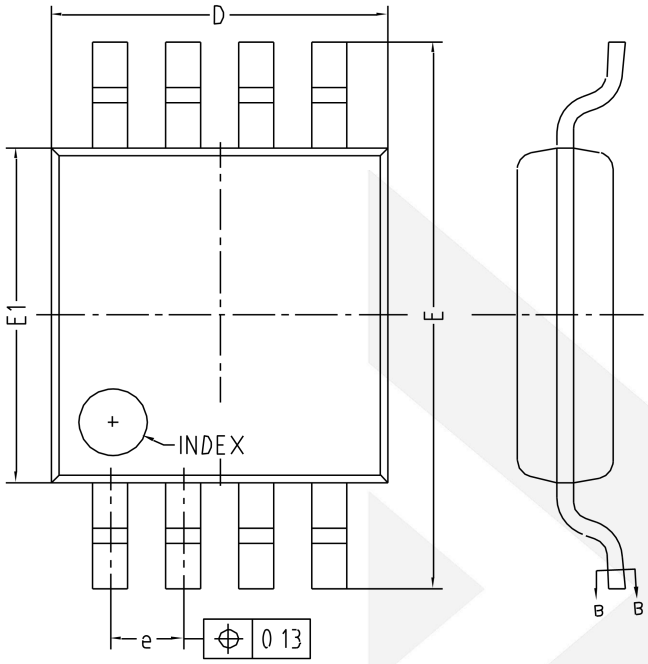


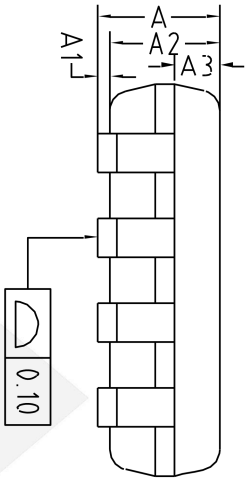


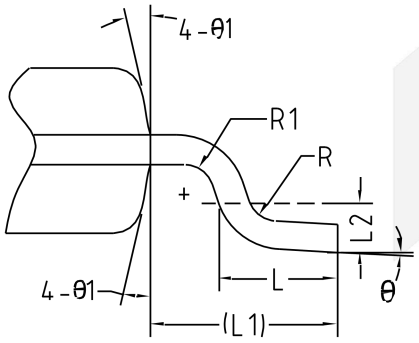


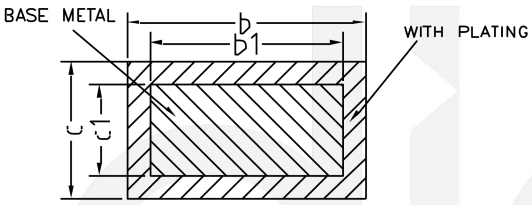
Common Dimensions (Units of measure = mm)			
Symbol	**Min**	**Nom**	**Max**
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.45
b1	0.35	0.38	0.41
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
K	0	-	0.25
L	0.30	0.40	0.60
L1		0.59REF	
L2		0.25BSC	
M	0.10	0.15	0.25
R	0.05	-	0.20
R1	0.05	-	0.20
Θ	0°	-	8°
Θ1	8°	10°	12°
Θ2	10°	12°	14°

Physical Dimensions: MSOP-8





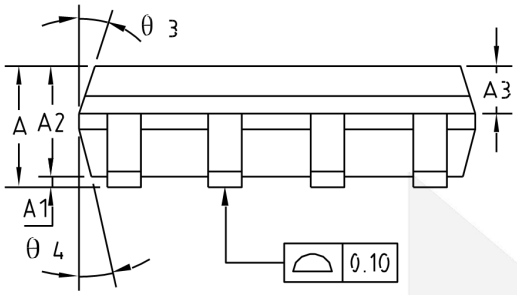


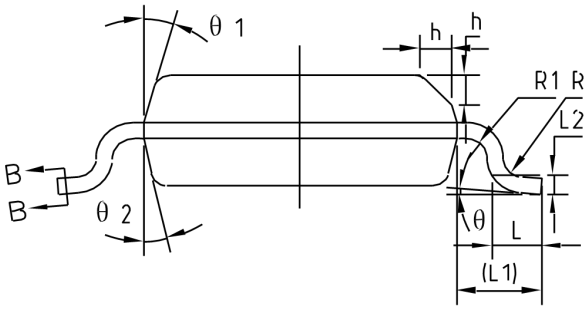


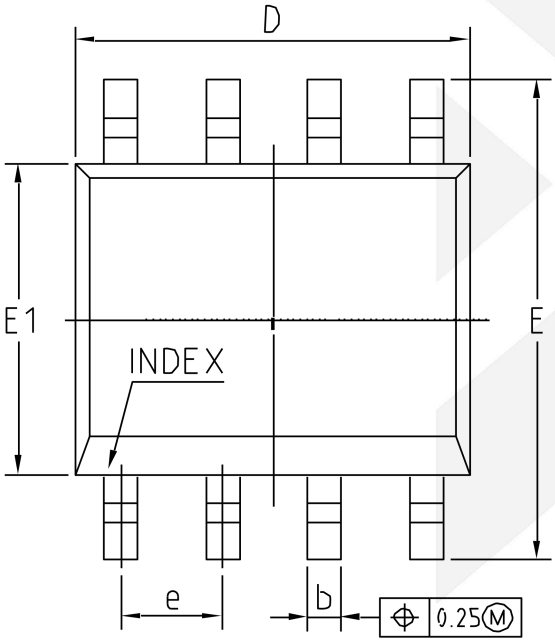
SECTION B–B

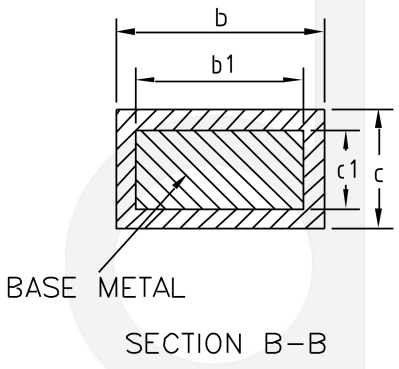
Common Dimensions (Units of measure = mm)			
Symbol	**Min**	**Nom**	**Max**
A	-	-	1.10
A1	0	-	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.28	-	0.37
b1	0.27	0.30	0.33
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.55	0.65	0.75
L	0.45	0.60	0.80
L1	0.95REF		
L2	0.25BSC		
R	0.07	-	-
R1	0.07	-	-
Θ	0°	-	8°
Θ1	9°	12°	15°

Physical Dimensions: SOIC-8



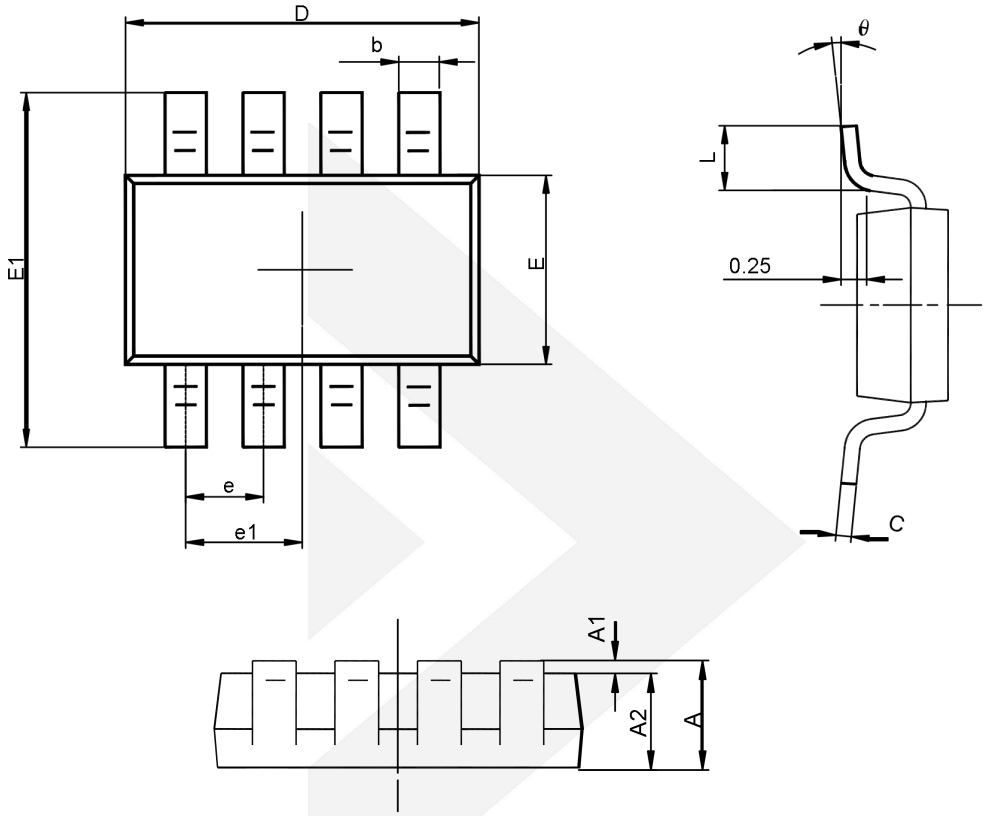






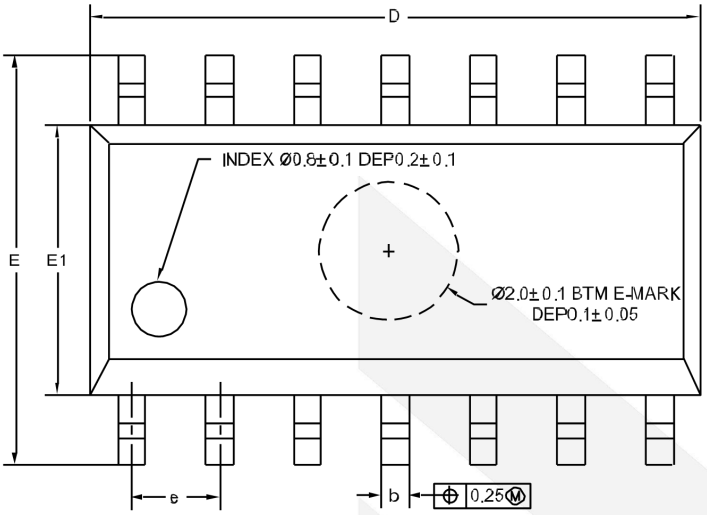
Common Dimensions (Units of measure = mm)			
Symbol	**Min**	**Nom**	**Max**
A	1.35	1.55	1.75
A1	0.10	0.15	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.45	0.60	0.80
L1	1.04REF		
L2	0.25BSC		
R	0.07	-	-
R1	0.07	-	-
h	0.30	0.40	0.50
Θ	0°	-	8°
Θ1	15°	17°	19°
Θ2	11°	13°	15°
Θ3	15°	17°	19°
Θ4	11°	13°	15°

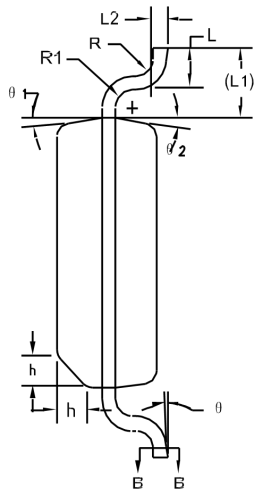
Physical Dimensions: TSOT23-8

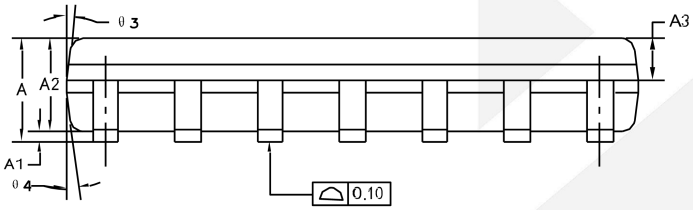


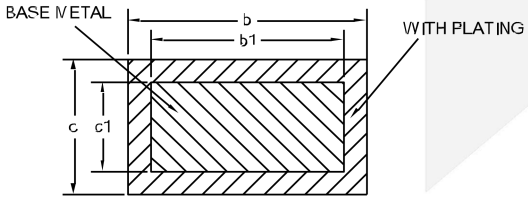
Symbol	Dimensions Millimeters	
	Min	Max
A	0.700	0.900
A1	0.000	0.100
A2	0.700	0.800
b	0.300	0.500
C	0.080	0.200
D	2.820	3.020
E	1.600	1.700
E1	2.650	2.950
e	0.65(BSC)	
e1	0.975(BSC)	
L	0.300	0.600
Θ	0°	8°

Physical Dimensions: SOIC-14





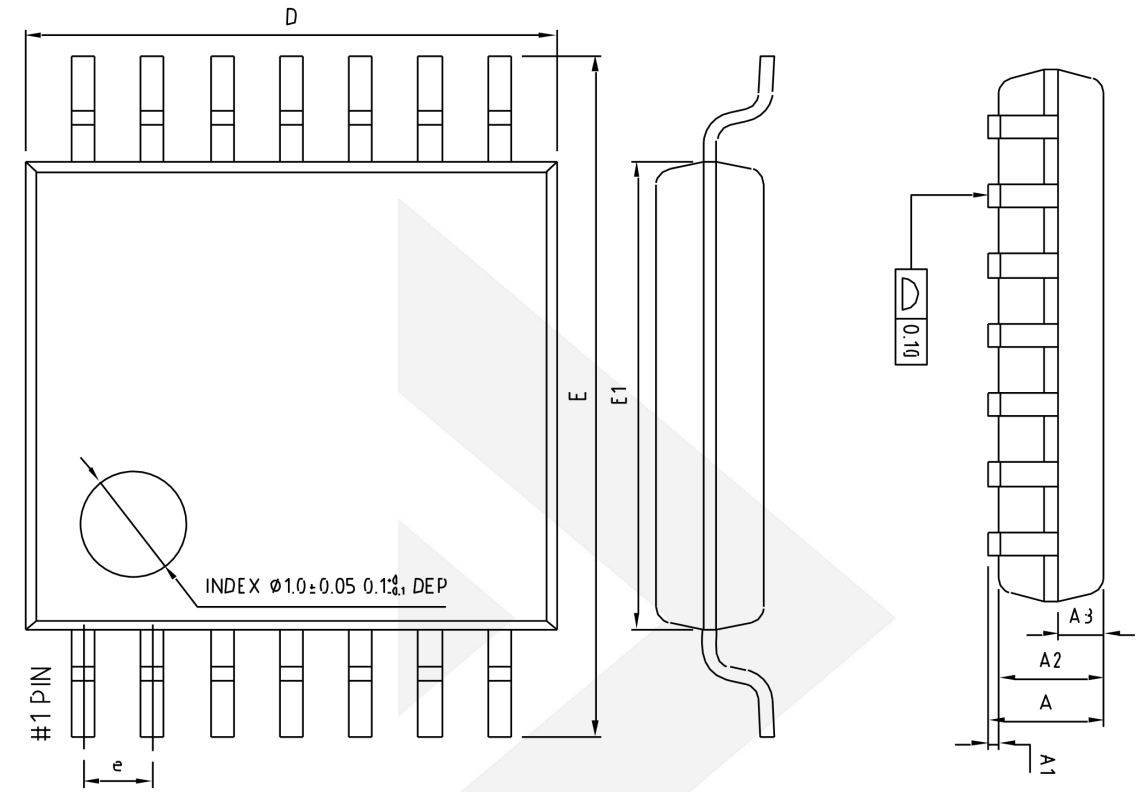


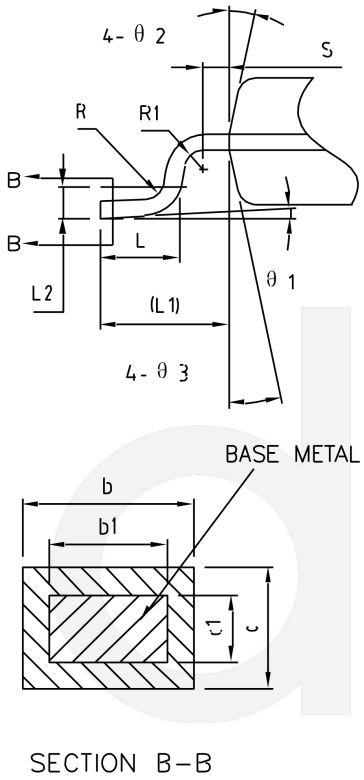


SECTION B-B

Common Dimensions (Units of Measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36	-	0.49
b1	0.35	0.40	0.45
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27Bsc		
L	0.45	0.60	0.80
L1	1.04Ref		
L2	0.25Bsc		
R	0.07	-	-
R1	0.07	-	-
h	0.30	0.40	0.50
Θ	0°	-	8°
Θ1	6°	8°	10°
Θ2	6°	8°	10°
Θ3	5°	7°	9°
Θ4	5°	7°	9°

Physical Dimensions: TSSOP-14





SECTION B–B

Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	-	-	1.20
A1	0.05	-	0.15
A2	0.90	1.00	1.05
A3	0.34	0.44	0.54
b	0.20	-	0.28
b1	0.20	0.22	0.24
c	0.10	-	0.19
c1	0.10	0.13	0.15
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e		0.65BSC	
L	0.45	0.60	0.75
L1		1.00REF	
L2		0.25BSC	
R	0.09	-	-
R1	0.09	-	-
S	0.20	-	-
θ1	0°	-	8°
θ2	10°	12°	14°
θ3	10°	12°	14°

CONTACT US

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