

DIO236XL

Ultra Low Vos, Low Power Amplifier

Features

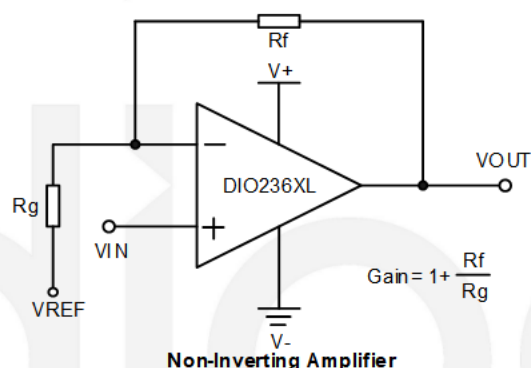
- Ultra low V_{OS} :
DIO2361LA/2LA: 10 μV (Max)
DIO2361LB/2LB: 20 μV (Max)
DIO2361L/2L: 40 μV (Max)
DIO2361LM/2LM: 65 μV (Max)
- Low power: 7.0 μA (typ.)
- Unity gain stable
- Gain bandwidth product: 110 kHz (typ.)
- Wide supply range: 1.8 V to 5.5 V
- Packages: SOT23-5, SC70-5, SOIC-8, MSOP-8, DFN2*2-8 and DFN3*3-8
- Temperature range:
-Industrial: -40°C to 85°C
-Extended: -40°C to 125°C

Descriptions

The DIO236XL is a family of ultra low V_{OS} operational amplifier, with rail-to-rail CMOS input/output and single/dual channels selectable. DIO236XL family has a gain-bandwidth product of 110 kHz (typ.), wide operating supply voltage from 1.8 V to 5.5 V and broad output voltage swing.

The DIO236XL consumes ultra low power, with each channel 7.0 μA (typ.) of bias current, which makes DIO236XL be ideal for battery powered device, temperature-sense device, etc.

Typical Applications



Applications

- Portable equipment
- Active filters
- Data acquisition
- Test equipment
- Broadband communication
- Process control
- Audio and video processing

Ordering Information

Order Part Number	Top Marking	RoHS	T _A	Package	
DIO2361LASC5	W36L	Green or RoHS	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO2361LAST5	W36L	Green or RoHS	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO2361LASO8	D2361L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2361LAMP8	D2361L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2361LBSC5	W36L	Green or RoHS	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO2361LBST5	W36L	Green or RoHS	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO2361LBSO8	D2361L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2361LBMP8	D2361L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2361LSC5	W36L	Green or RoHS	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO2361LST5	W36L	Green or RoHS	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO2361LSO8	D2361L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2361LMP8	D2361L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2361LMSC5	W36L	Green or RoHS	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO2361LMST5	W36L	Green or RoHS	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO2361LMO8	D2361L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2361LMMP8	D2361L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2362LACN8	236L	Green or RoHS	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO2362LACD8	2362L	Green or RoHS	-40 to 125°C	DFN3*3-8	Tape & Reel, 5000
DIO2362LASO8	D2362L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2362LAMP8	D2362L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2362LBCN8	236L	Green or RoHS	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO2362LBCD8	2362L	Green or RoHS	-40 to 125°C	DFN3*3-8	Tape & Reel, 5000
DIO2362LBSO8	D2362L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2362LBMP8	D2362L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2362LCN8	236L	Green or RoHS	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO2362LCD8	2362L	Green or RoHS	-40 to 125°C	DFN3*3-8	Tape & Reel, 5000
DIO2362LSO8	D2362L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2362LMP8	D2362L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO2362LMCN8	236L	Green or RoHS	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO2362LMCD8	2362L	Green or RoHS	-40 to 125°C	DFN3*3-8	Tape & Reel, 5000
DIO2362LMSO8	D2362L	Green or RoHS	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO2362LMMP8	D2362L	Green or RoHS	-40 to 125°C	MSOP-8	Tape & Reel, 3000

Ordering Information Complimentary Note

Ordering Code = Part No. + Package Code

DIO2361LA/2LA
DIO2361LB/2LB
DIO2361L/2L
DIO2361LM/2LM

SC5: stands for SC70-5
ST5: stands for SOT23-5
SO8: stands for SOIC-8
MP8: stands for MSOP-8
CN8: stands for DFN2*2-8
CD8: stands for DFN3*3-8

Pin Assignments

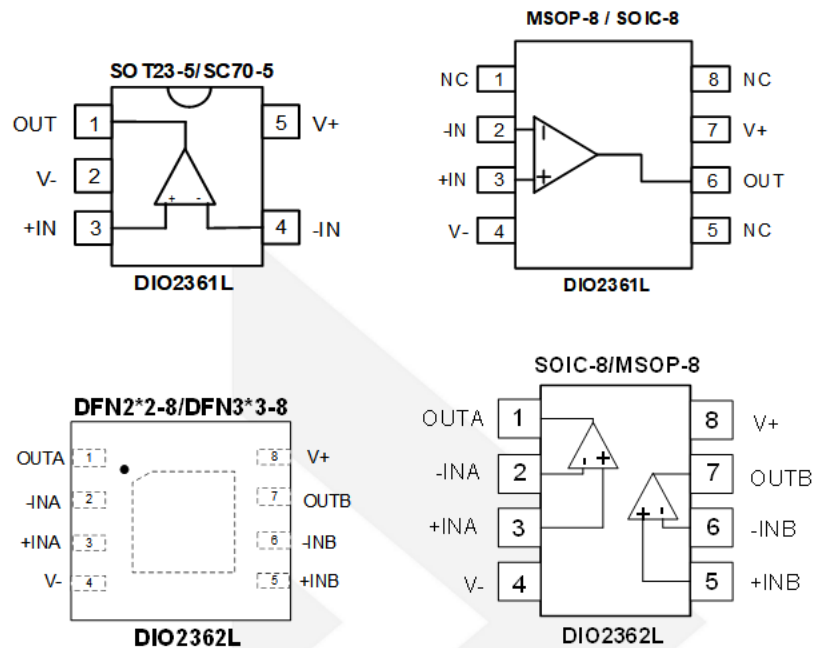


Figure 1. Top view

Pin Description

Pin name	Description
V+	Positive supply
V-	Negative supply
+INX	Positive Input
-INX	Negative Input
OUTX	Output
NC	No connect

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" 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.

Parameter		Rating	Unit
Supply voltage (V^+ – V^-)		7	V
Input voltage		(V^-)-0.3 V to (V^+)+0.3 V	V
Difference input voltage		$ V^+ - V^- $	V
Storage temperature range		-65 to 150	°C
Junction temperature		150	°C
Lead temperature range		260	°C
ESD	HBM, JEDEC: JESD22-A114	8	kV

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Parameter		Rating	Unit
Supply voltage		1.8 to 5.5	V
Input voltage		0 to 5	V
Operating temperature range		-40 to 125	°C

Electrical Characteristics

Typical value: $V^+ = 5\text{ V}$, $R_L = 1\text{ M}\Omega$ to $V^+/2$, $V_{CM} = 1/2\text{ V}^+$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Input characteristics						
V _{OS}	Input offset voltage	V ₊ = 1.8 V to 5.5 V	DIO2361LA/2LA	-10	10	μV
			DIO2361LB/2LB	-20	20	
			DIO2361L/2L	-40	40	
			DIO2361LM/2LM	-65	65	
I _B	Input bias current	V ₊ = 1.8 V to 5.5 V		10		pA
I _{OS}	Input offset current	V ₊ = 1.8 V to 5.5 V		10		pA
V _{CM}	Common mode voltage range		-0.1		(V ₊)	V
CMRR	Common mode rejection ratio	-40°C ≤ T _A ≤ 125°C		130		dB
A _{OL}	Open loop voltage gain	R _L = 50 kΩ, V _O = 0.1 to (V ₊)-0.1	80	110		dB
ΔV _{OS} /ΔT	Input offset voltage drift	-40°C ≤ T _A ≤ 125°C		0.02		μV / °C
Output characteristics						
V _{OH}	Output voltage high	R _L = 50 kΩ, -40°C ≤ T _A ≤ 125°C		4.992		V
V _{OL}	Output voltage low	R _L = 50 kΩ, -40°C ≤ T _A ≤ 125°C		8		mV
I _{SC}	Output short circuit current	Source I _{SC} , V ₊ = 5 V		34		mA
		Sink I _{SC} , V ₊ = 5 V		34		
Power supply						
PSRR	Power supply rejection ration		100			dB
I _S	Supply current per channel / amp	-40°C ≤ T _A ≤ 125°C		7	11	μA
Dynamic performance						
GBP	Gain bandwidth product	C _L = 100 pF, R _L = 1 MΩ		110		kHz
SR	Slew rate	G = 1, 2 V output step		80		V/ms
t _s	Setting time	G = 1, 2 V output step		2		ms
φ _m	Phase margin			70		Deg
t _{or}	Overload recovery time			3.9		ms
Noise performance						
THD	Total harmonic distortion	f = 1 kHz, 4 V _{PP} , R _L = 5 kΩ		0.33		%
e _n	Voltage noise density	f = 1 kHz		100		nV/√Hz

Specifications subject to change without notice.

Typical Performance Characteristics

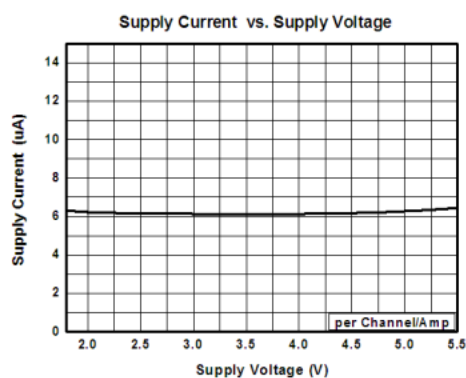


Figure 2. I_S vs. V_{CC}

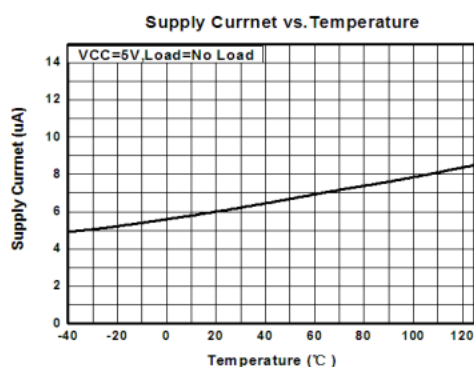


Figure 3. I_S vs. Temperature

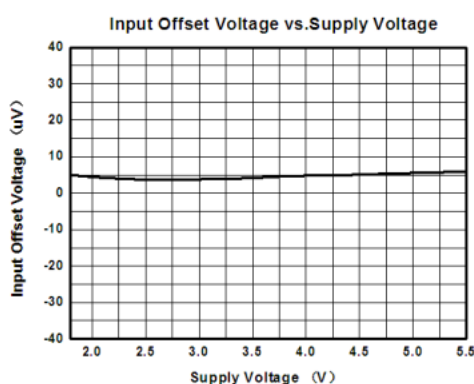


Figure 4. V_{OS} vs. V_{CC}

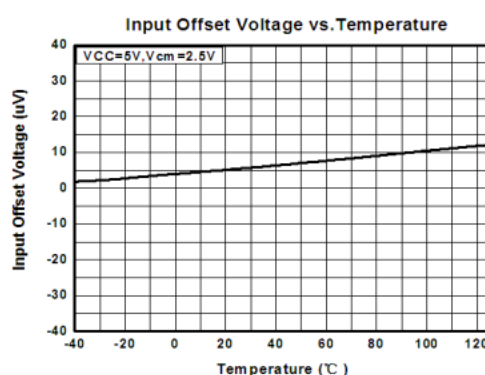


Figure 5. V_{OS} vs. Temperature

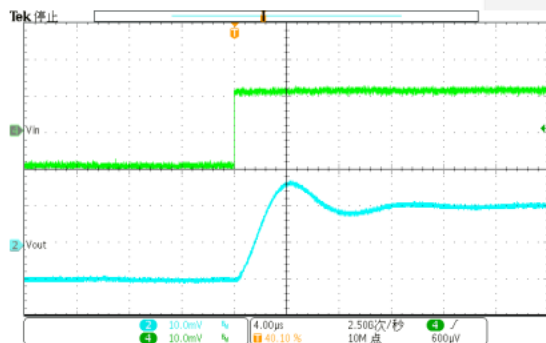


Figure 6. Small-signal response
($V_{CC} = 5\text{ V}$, $C_L = 200\text{ pF}$)

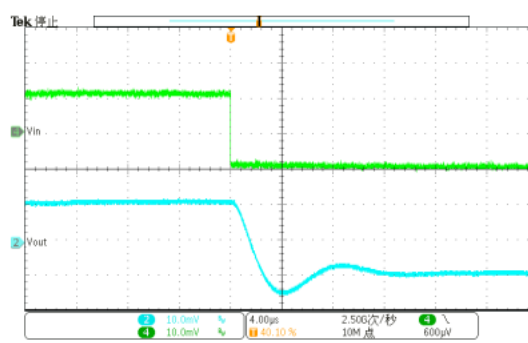


Figure 7. Small-signal response
($V_{CC} = 5\text{ V}$, $C_L = 200\text{ pF}$)

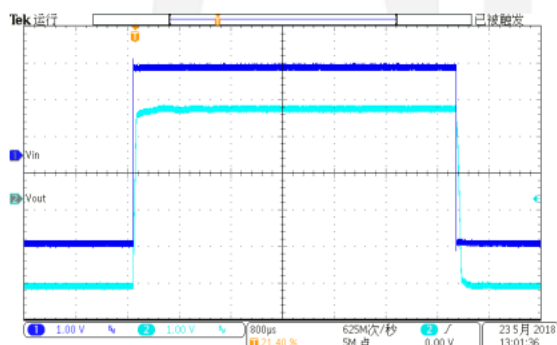
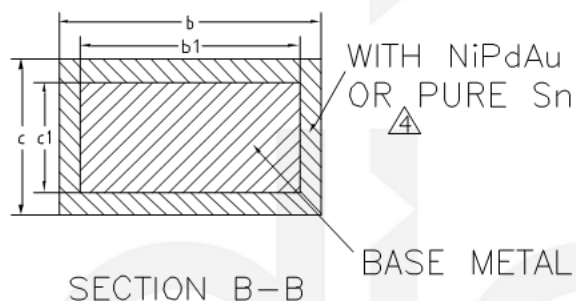
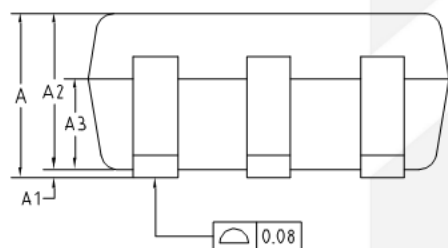
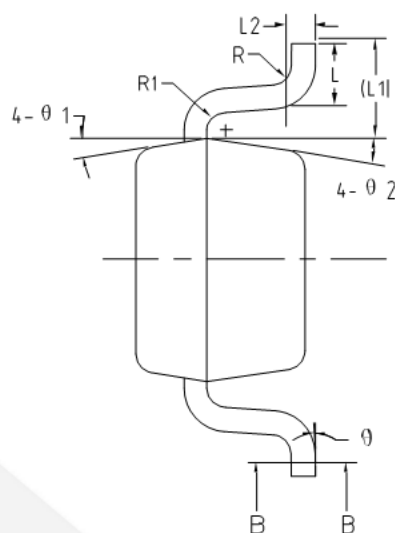
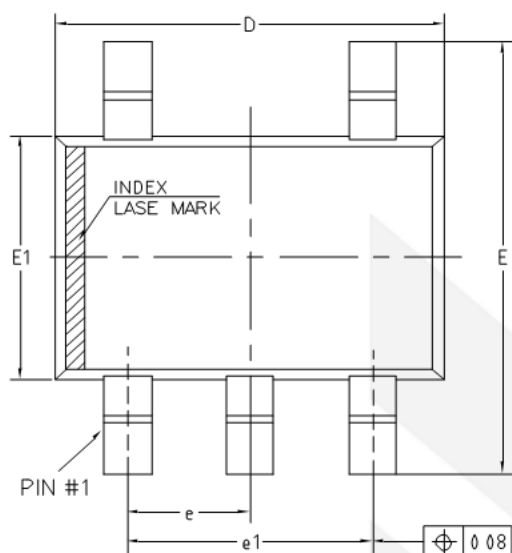


Figure 8. Large-signal response
($V_{CC} = 5\text{ V}$, $R_L = 5.1\text{ k}\Omega$)

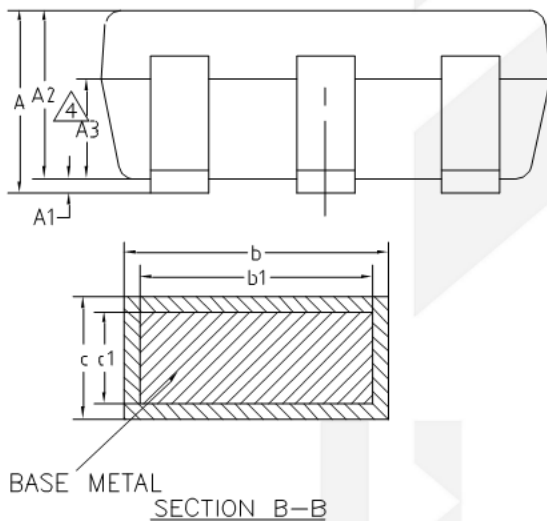
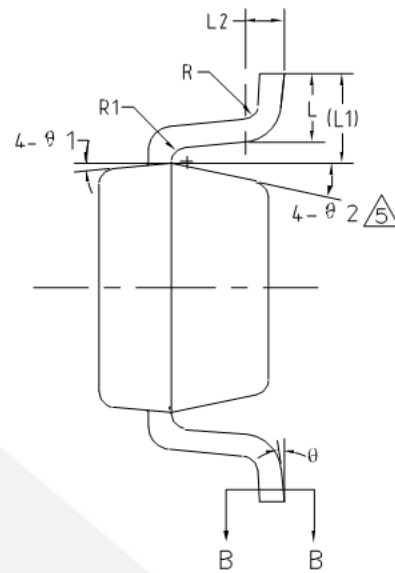
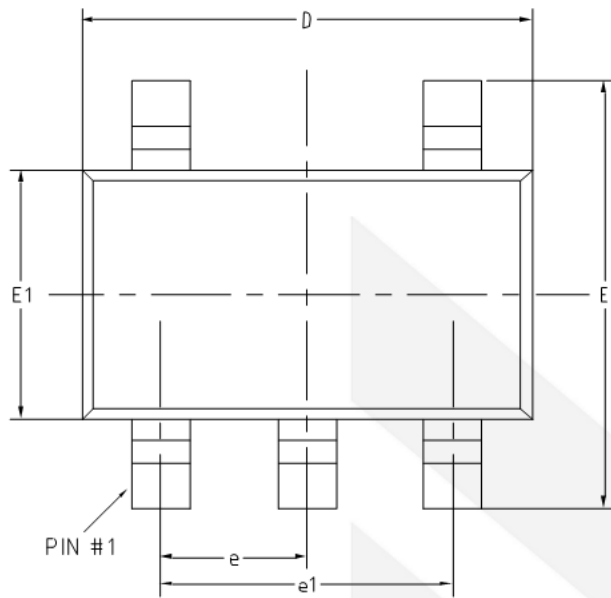
Physical Dimensions: SC70-5



Common Dimensions (Units of measure = Millimeter)			
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	0.65 BSC		
e1	1.30 BSC		
L	0.28	0.33	0.38
L1	0.50 REF		
L2	0.15 BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
θ1	6°	9°	12°
θ2	6°	9°	12°

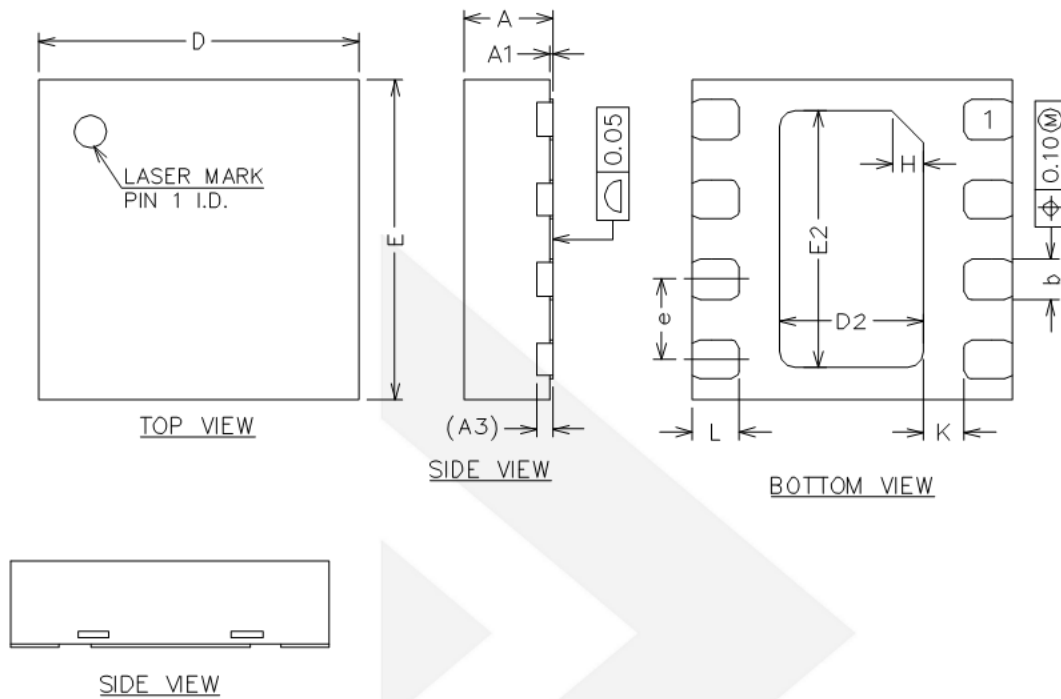
Physical Dimensions: SOT23-5

Ultra Low Vos, Low Power Amplifier



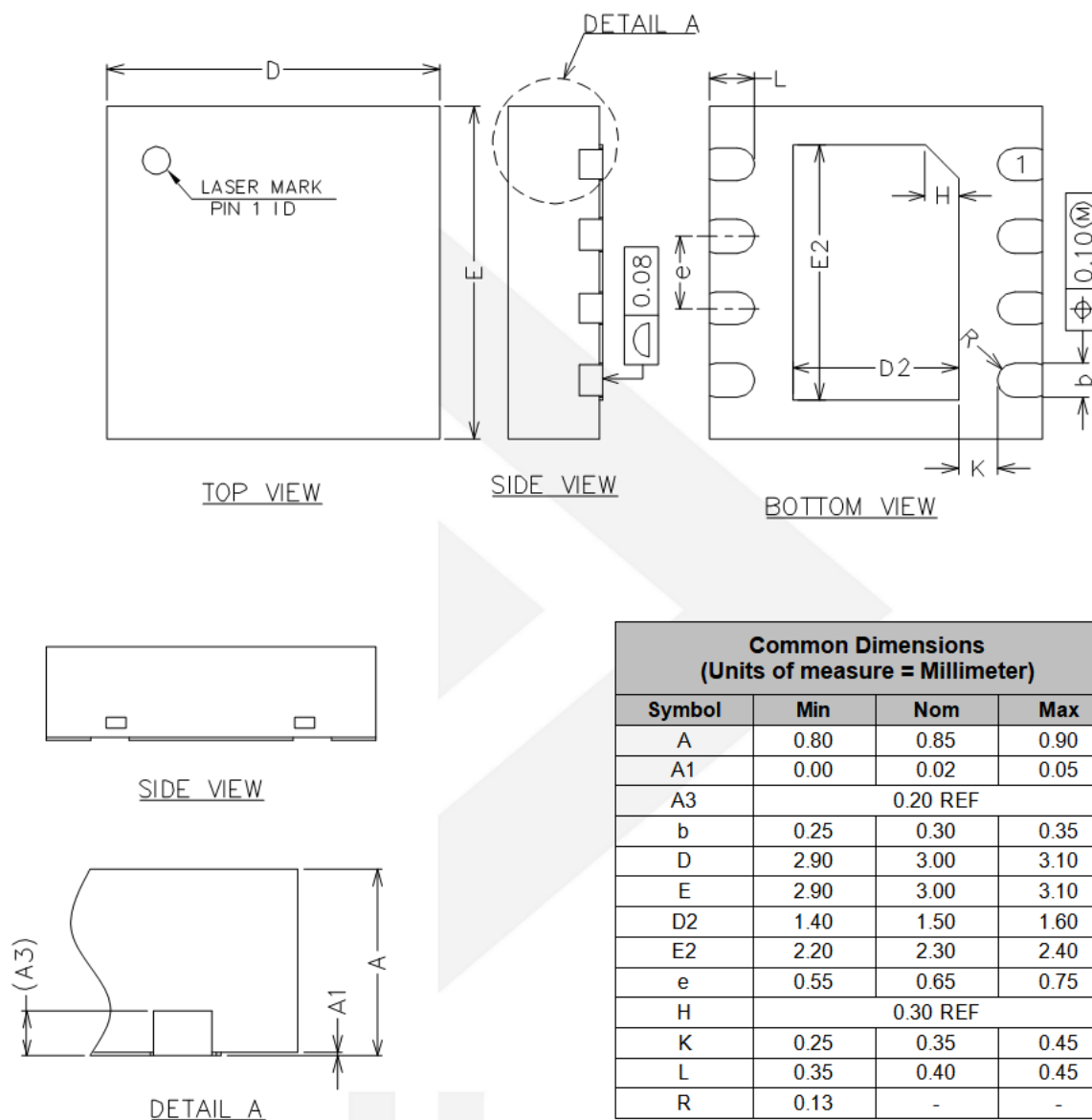
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.50
b1	0.36	0.38	0.45
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59 REF		
L2	0.25 BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
θ1	3°	5°	7°
θ2	6°	-	14°

Physical Dimensions: DFN2*2-8

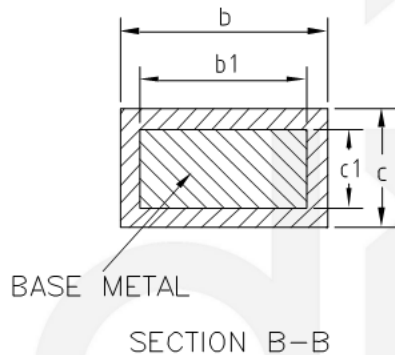
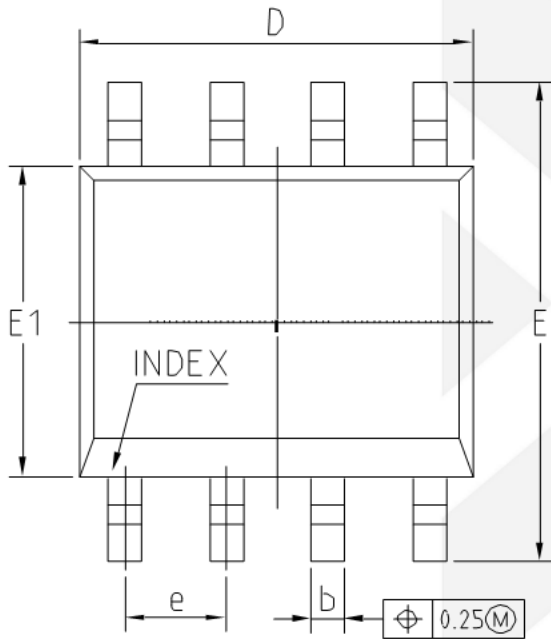
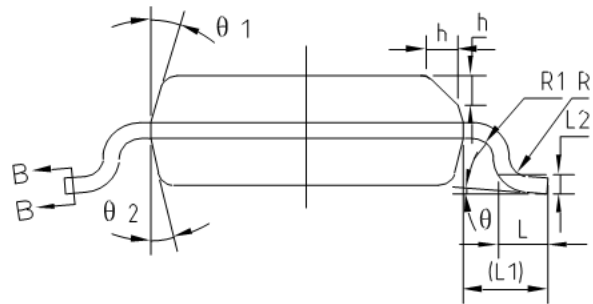
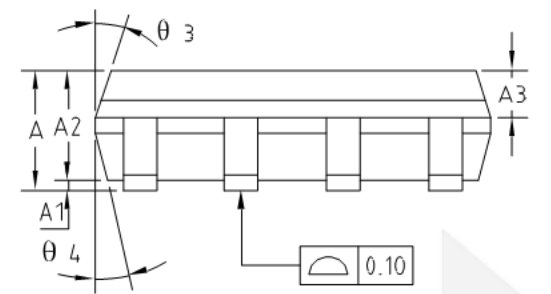


Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.50	0.55	0.65
A1	0.00	0.02	0.05
A3	0.10 REF		
b	0.20	0.25	0.30
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.80	0.90	1.00
E2	1.50	1.60	1.70
e	0.40	0.50	0.60
H	0.20 REF		
K	0.15	0.25	0.35
L	0.25	0.30	0.35

Physical Dimensions: DFN3*3-8

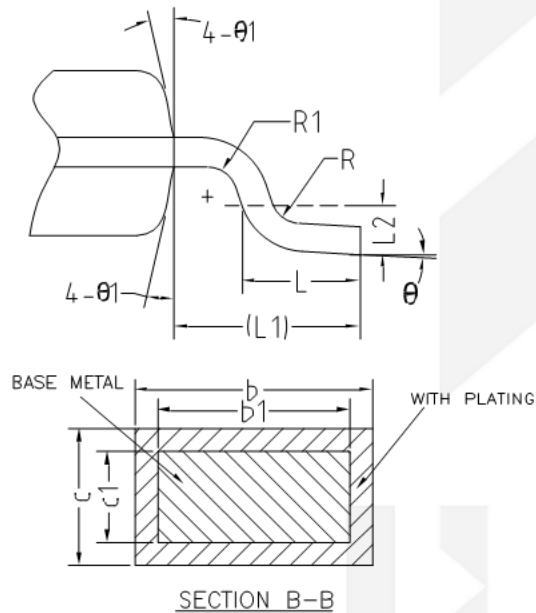
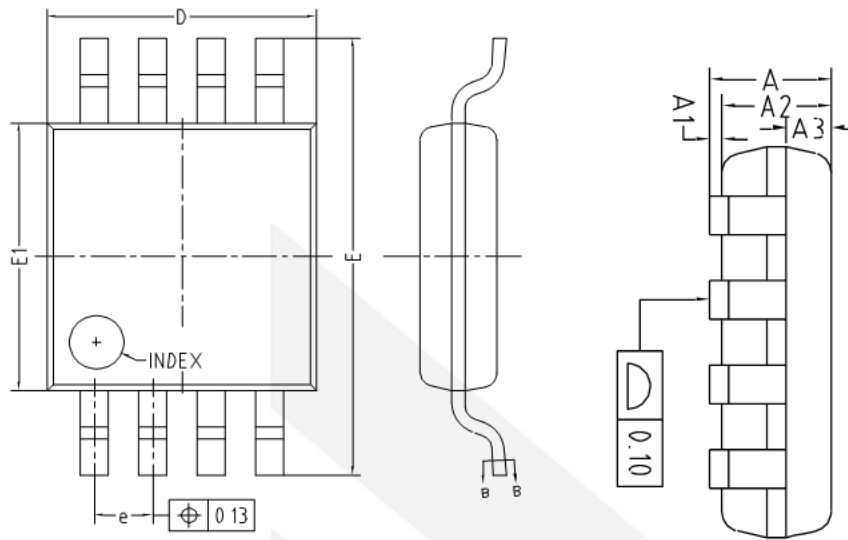


Physical Dimensions: SOIC-8



Common Dimensions (Units of measure = Millimeter)			
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	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
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: MSOP-8



Common Dimensions (Units of measure = Millimeter)			
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	0.40	0.60	0.80
L1	0.95 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ1	9°	12°	15°

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipment and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to <http://www.dioo.com> for a complete list of Dioo product families.

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