DIO20721/2/4

Single/Dual/Quad Channel, RRIO 10 MHz Amplifier

Features

- Rail-to-rail input and output
- 0.5 mV typical offset (V_{OS})
- Low distortion
- Gain bandwidth product: 10 MHz
- Wide supply range: 2.5 V to 5.5 V
- 620 µA/Amplifier typical supply current
- Slew rate: 6.5 V/µs
- DIO20721 available in SC70-5, SOT23-5
  DIO20722 available in SOIC-8, MSOP-8, DFN2*2-8,TSSOP-8 and TSOT23-8
  DIO20724 available in SOP-14, TSSOP-14

Applications

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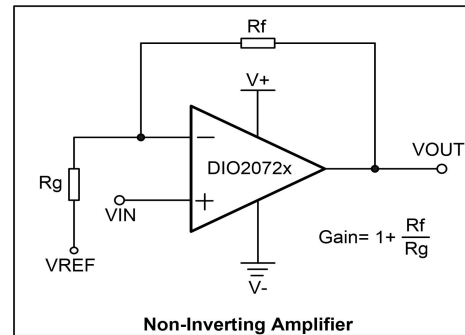- Audio and video processing
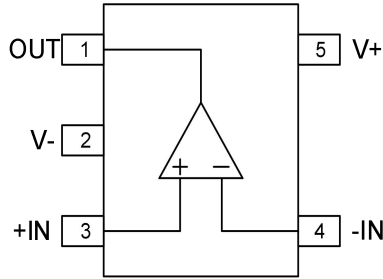
Ordering Information

Descriptions

The DIO2072x is a single/dual/quad channel, rail-to-rail I/O operational amplifier which allows low load impedance to be driven. With a 10 MHz unity-gain frequency and low noise, low distortion and high output current capability, the DIO2072x provides excellent choice for high quality systems. The input common-mode voltage range includes ground, and the typical input offset voltage is 0.5 mV. They are also capable of comfortably driving large capacitive loads.

The DIO2072x is offered in Green or RoHS package and ESD (HBM) exceeds 2 kV. It is specified over the extended -40 to 125°C.
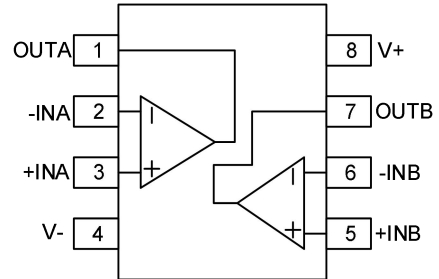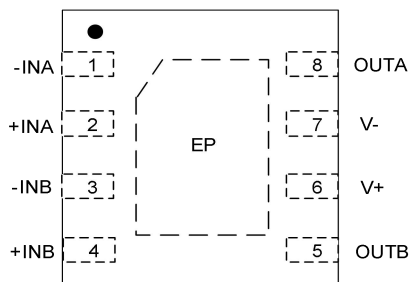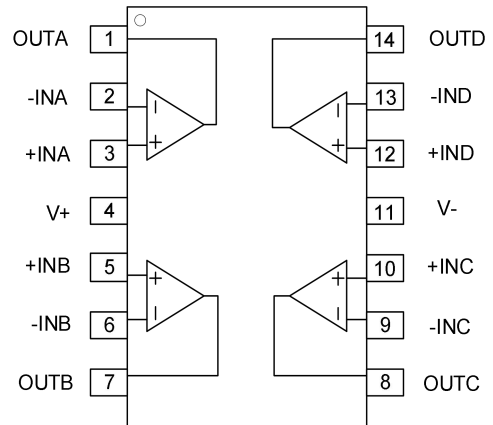
Typical Application

$$\text{Gain} = 1 + \frac{Rf}{Rg}$$

Non-Inverting Amplifier

Ordering Part No.	Top Marking	MSL	RoHS	T_A		Package
DIO20721SC5	YWXK	3	Green	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO20721ST5	YWXK	3	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO20722MP8	DIO2072	3	Green	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO20722SO8	DIO2072	3	Green	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO20722TN8	2072	3	Green	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO20722TP8	DIO2072	3	Green	-40 to 125°C	TSSOP-8	Tape & Reel, 3000
DIO20722TST8	DTYW	3	Green	-40 to 125°C	TSOT23-8	Tape & Reel, 3000
DIO20724CS14	DIO2074	3	Green	-40 to 125°C	SOP-14	Tape & Reel, 2500
DIO20724TP14	DIO2074	3	Green	-40 to 125°C	TSSOP-14	Tape & Reel, 2500

1. Pin Assignments

SC70-5/SOT23-5

MSOP-8/SOIC-8/TSSOP-8/TSOT23-8

DFN2*2-8

SOP-14/TSSOP-14

Figure 1. Top view

Pin Description

Pin Name	Description
V+	Positive supply
V-	Negative supply
+INx	Positive Input (channel x)
-INx	Negative Input (channel x)
OUTx	Output (channel x)
Thermal pad (EP)	Do not internally connect to GND. Recommend to connect to a larger ground for improved thermal performance.

Note: x = A, B, C, D.

2. 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. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Parameter		Rating	Unit
Supply voltage (maximum)		7	V
Input voltage		(V-) - 0.5 to 7	V
Storage temperature range		-65 to 150	°C
Junction temperature (maximum)		150	°C
Lead temperature range (maximum)		260	°C
ESD	HBM, JEDEC: JESD22-A114	±2	kV
	CDM, JEDEC: JESD22-C101	±1	

3. Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications.

Parameter	Rating	Unit
Supply voltage	2.5 to 5.5	V
Input voltage	0 to 5	V
Operating temperature range	-40 to 125	°C

4. Electrical Characteristics

Typical value: V+ = 5 V/2.5 V, V_{CM} = 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+ = 2.5 V to 5 V	-5.0	0.5	5.0	mV
I_B	Input bias current	V+ = 2.5 V to 5 V		20		pA
I_{OS}	Input offset current	V+ = 2.5 V to 5 V		3		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, V+ = 5 V	75	85		dB
A_{OL} [1]	Open loop voltage gain	R_L = 600 Ω, Vo = 0.1 to (V+) -0.1	100	130		dB
$\Delta V_{OS}/\Delta_T$	Input offset voltage drift	-40°C ≤ T_A ≤ 125°C		5		µV/°C
Output characteristics						
	Output voltage swing from rail	R_L = 50 kΩ, -40°C ≤ T_A ≤ 125°C		0.1		V
I_{OUT}	Output current	V+ = 5 V		80		mA
		V+ = 2.5 V		25		
	Closed loop output impedance [1]	f = 1 MHz, G = 1, V+ = 5 V		2.8		Ω
		f = 1 MHz, G = 1, V+ = 2.5 V		4.4		
Power supply						
PSRR	Power supply rejection ratio			80		dB
I_S	Supply current per channel/amp	V+ = 5 V, -40°C ≤ T_A ≤ 125°C	320	620	1000	µA
		V+ = 2.5 V, -40°C ≤ T_A ≤ 125°C	260	590	830	
Dynamic performance						
GBP	Gain bandwidth product			10		MHz
SR	Slew rate	G = 1, 2 V output step		6.5		V/µs
t_S	Setting time	G = 1, 2 V output step		0.25		µs
X_{TALK}	Channel separation	f = 1 kHz, R_L = 10 kΩ		110		dB
	Overload recovery time	V_{IN} × Gain = V+		90		ns
Noise performance						
THD	Total harmonic distortion	f = 10 kHz, 2 V output step, R_L = 600 Ω, V+ = 5 V		0.04		%
e_n	Voltage noise density	f = 1 kHz, V+ = 5 V		90		nV/√Hz
		f = 10 kHz, V+ = 5 V		35		

Note:

(1) Guaranteed by design.

(2) Specifications subject to change without notice.

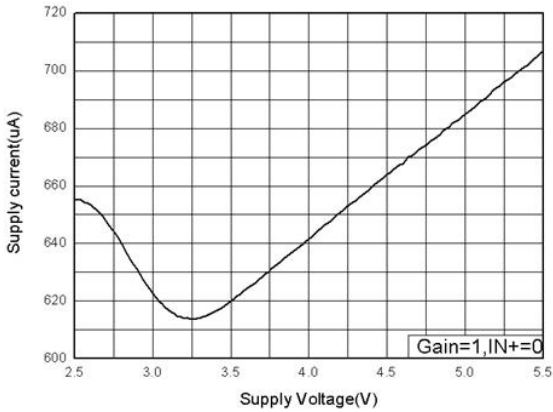# 5. Typical Performance Characteristics

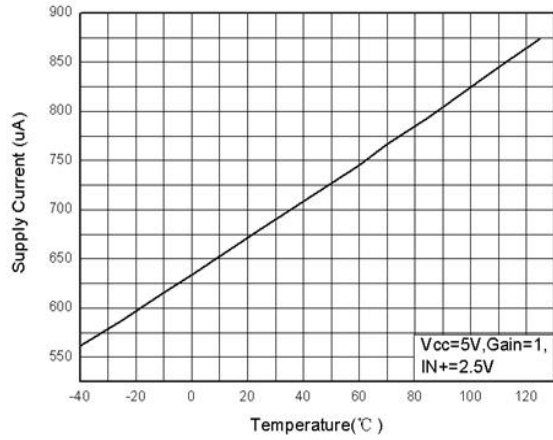*Figure 2. Supply current vs. Supply voltage per channel*

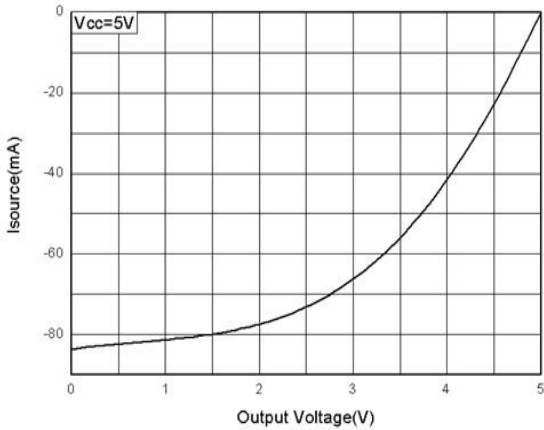*Figure 3. Supply current vs. Temperature*

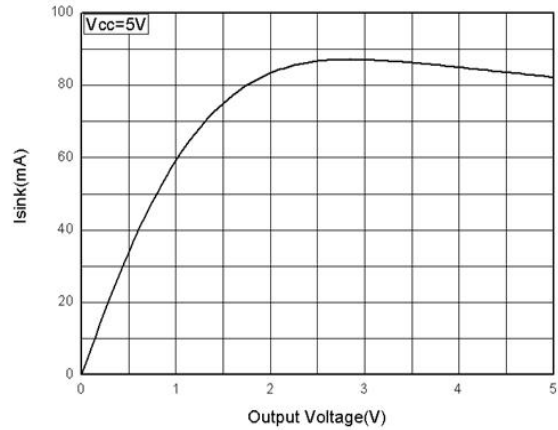*Figure 4. I_{SOURCE} vs. Output voltage*

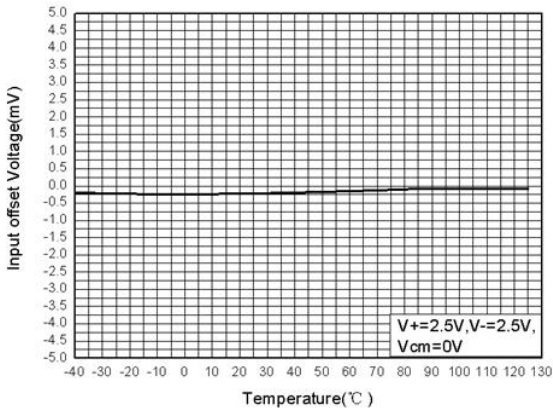
Figure 5. I_{SINK} vs. Output voltage

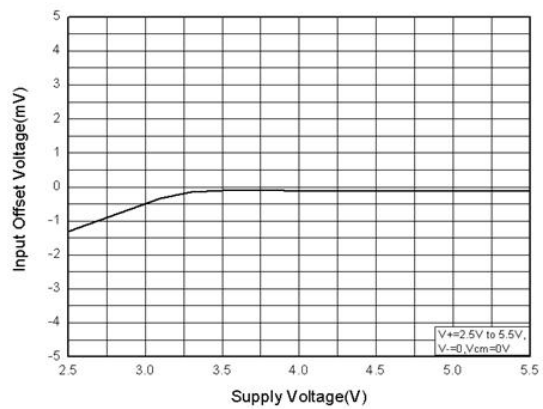*Figure 6. Input offset voltage vs. Temperature*
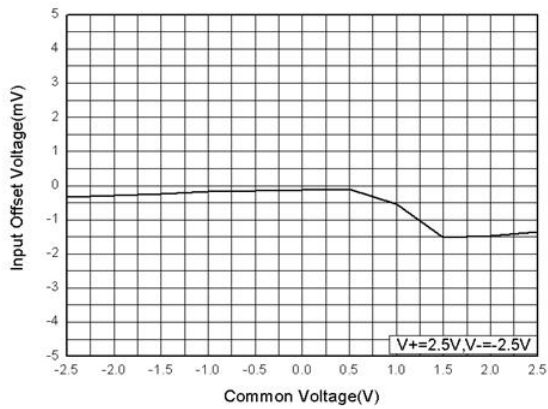

Figure 7. Input offset voltage vs. Supply voltage
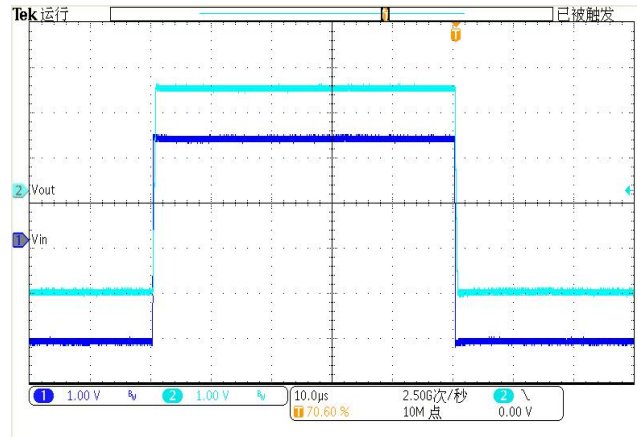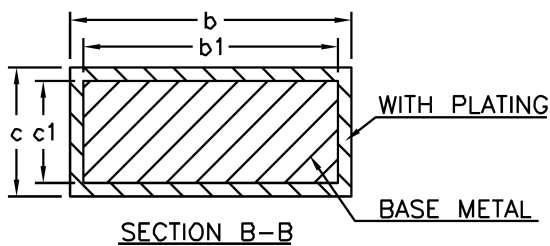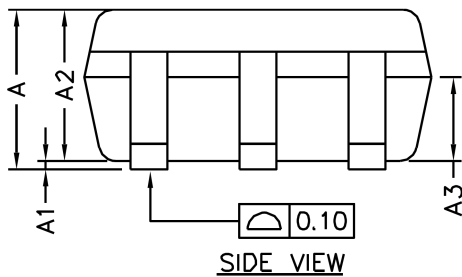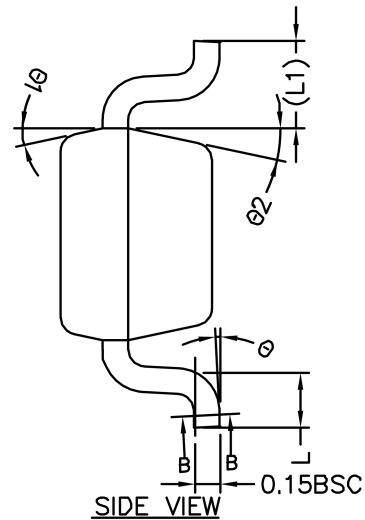
*Figure 8. Input offset voltage vs. Common voltage*

Figure 9. *Large-signal response (V+ = 5 V, R_L = 1 MΩ)*

6. Physical Dimensions

6.1. SC70-5
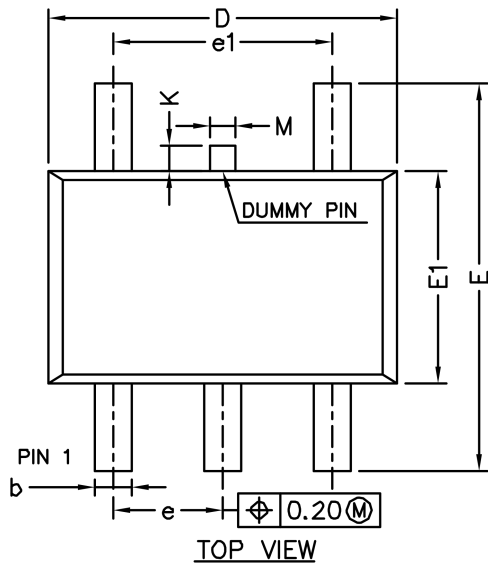
Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	0.80	-	1.10
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.40	0.50	0.60
b	0.17	-	0.30
b1	0.17	0.22	0.25
c	0.12	-	0.20
c1	0.12	0.15	0.16
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.21	1.26	1.31
e	0.60	0.65	0.70
e1	1.20	1.30	1.40
L	0.26	0.33	0.46
L1	0.52 REF		
M	0.10	0.15	0.20
K	0	-	0.20
θ	0°	-	8°
θ1	10°	12°	14°
θ2	10°	12°	14°

6.2. SOT23-5
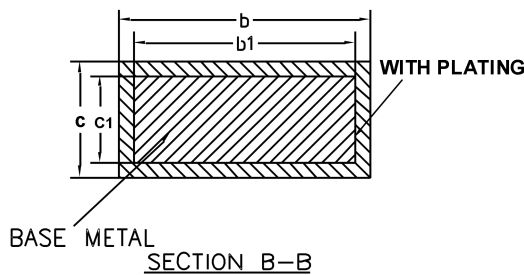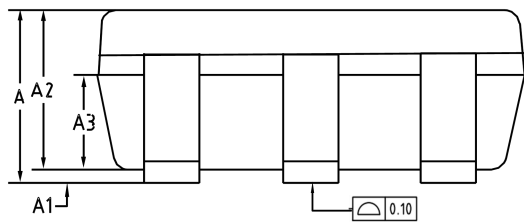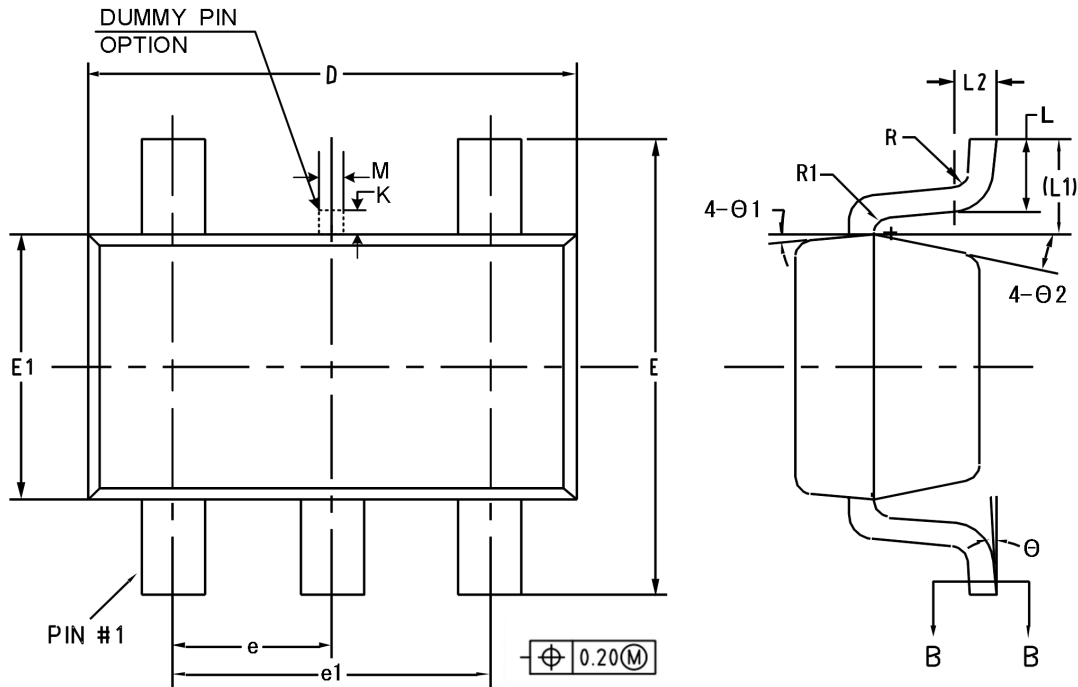
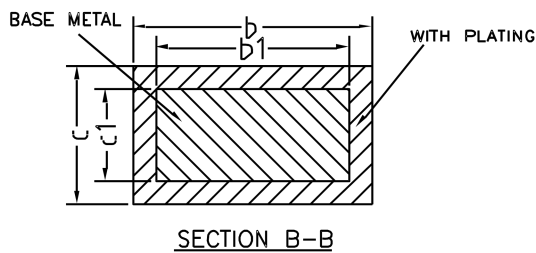| Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.45
b1	0.35	0.38	0.41
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
K	0	-	0.25
L	0.30	0.40	0.60
L1	0.59 REF		
L2	0.25 BSC		
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°

6.3. SOIC-8

INDEX

B B

θ1

θ2

θ3

θ4

BASE METAL

SECTION B-B
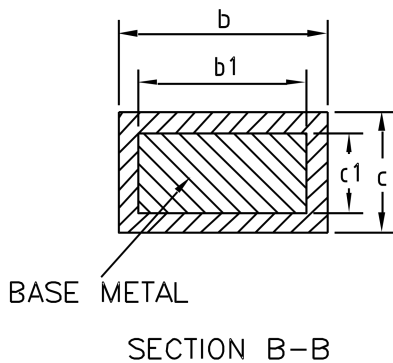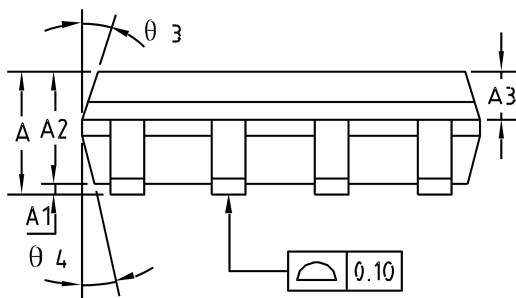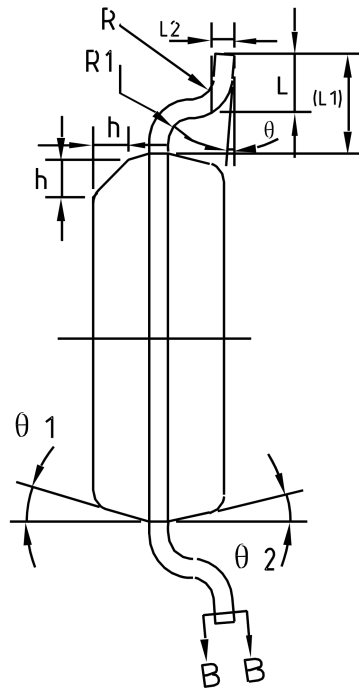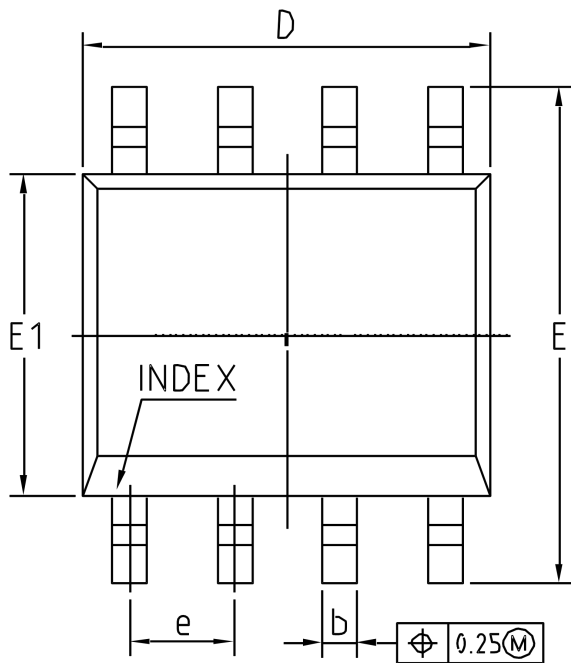
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.55	1.75
A1	0.10	0.15	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
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°

6.4. MSOP-8

SECTION B−B

Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.10
A1	0.05	0.10	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.25	-	0.38
b1	0.24	0.30	0.33
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.75	4.90	5.05
E1	2.90	3.00	3.10
e	0.55	0.65	0.75
L	0.45	0.55	0.70
L1	0.95 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ1	9°	12°	15°

6.5. DFN2*2-8

TOP VIEW

SIDE VIEW

SIDE VIEW

BOTTOM VIEW
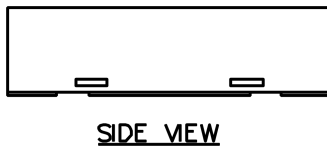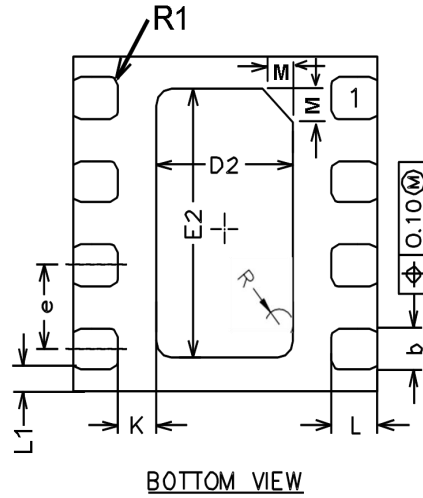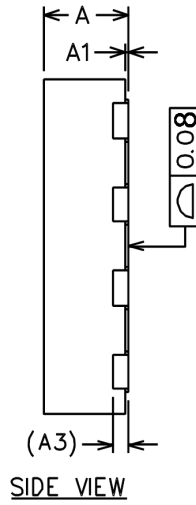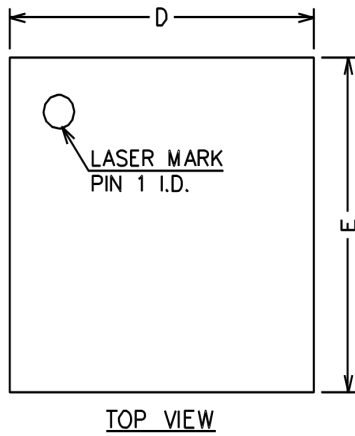
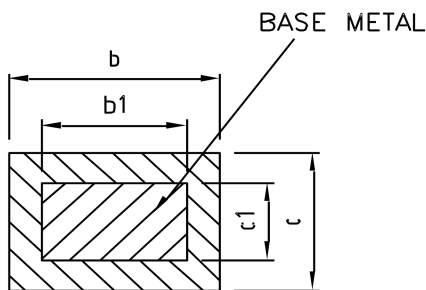| Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.50	0.55	0.65
A1	0.00	0.02	0.05
A3	0.127 REF		
b	0.20	0.25	0.30
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	0.80	0.90	1.00
E2	1.50	1.60	1.70
e	0.45	0.50	0.55
K	0.15	0.25	0.35
L	0.25	0.30	0.35
L1	0.075	0.125	0.175
M	0.20 REF		
R	0.10 REF		
R1	0.05 REF		

6.6. TSSOP-8

Common Dimensions (Units of measure = Millimeter)			
Symbol	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	2.83	2.93	3.03
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
S	0.20	-	-
θ1	0°	-	8°
θ2	10°	12°	14°
θ3	10°	12°	14°

6.7. TSOT23-8
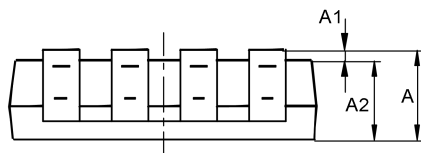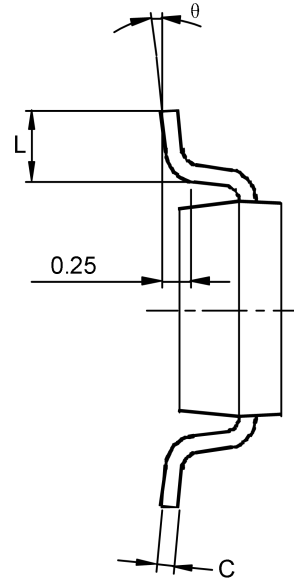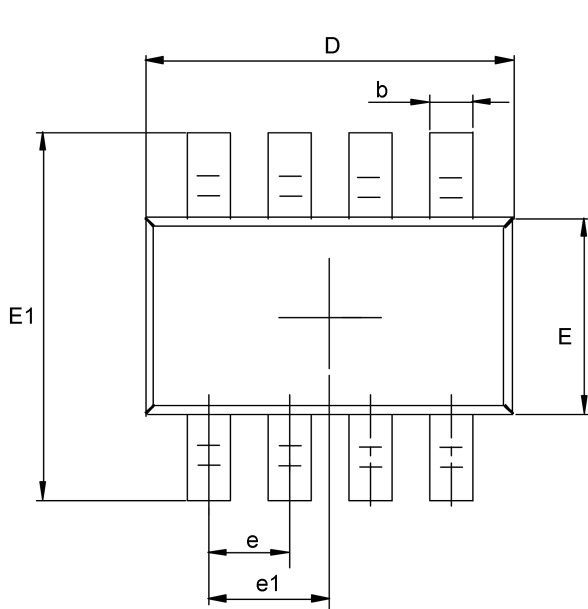
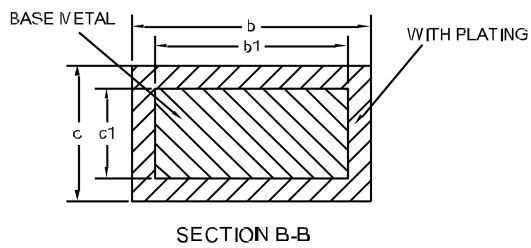| Common Dimensions (Units of measure = Millimeter)		
Symbol	Min	Max
A	0.700	0.900
A1	0.000	0.100
A2	0.700	0.800
b	0.300	0.500
c	0.080	0.200
D	2.820	3.020
E	1.600	1.700
E1	2.650	2.950
e	0.65 BSC	
e1	0.975 BSC	
L	0.300	0.600
θ	0°	8°

6.8. SOP-14

INDEX Ø0.8±0.1 DEP0.2±0.1

Ø2.0±0.1 BTM E-MARK DEP0.1±0.05

0.25 M

0.10

BASE METAL

WITH PLATING

SECTION B-B
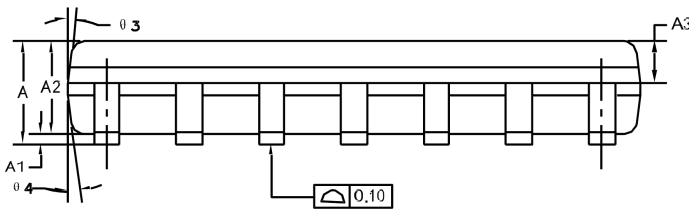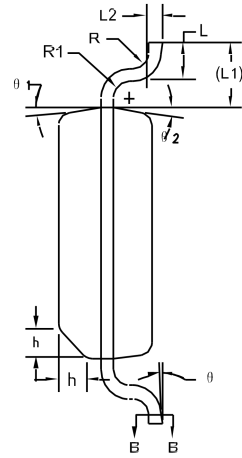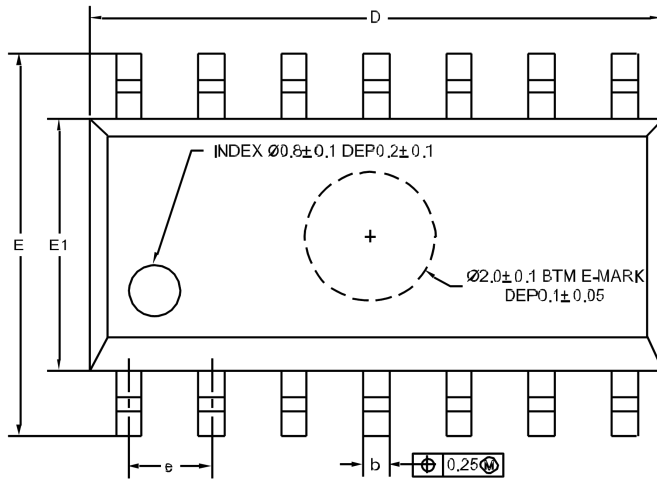
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36	-	0.49
b1	0.35	0.40	0.45
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 RFE		
L2	0.25 BSC		
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°

6.9. TSSOP-14

INDEX ∅1.0±0.05 0.1$^{+1}_{-0.1}$ DEP

#1 PIN

4-θ2

4-θ3

BASE METAL

SECTION B−B

Common Dimensions (Units of measure = Millimeter)			
Symbol	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	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
S	0.20	-	-
θ1	0°	-	8°
θ2	10°	12°	14°
θ3	10°	12°	14°

Single/Dual/Quad channel RRIO 10 MHz Amplifier

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.

For additional product information, or full datasheet, please contact with our Sales Department or Representatives.