

Single/Dual/Quad Channel, RRIO 10 MHz Amplifier

■ Features

- AEC-Q100 qualified
 - Device ambient temperature: $-40^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$
 - Device junction temperature: $-40^{\circ}\text{C} \leq T_J \leq 150^{\circ}\text{C}$
- Wide supply range: 2.5 V to 5.5 V or ± 1.25 V to ± 2.75 V
- Rail-to-rail input and output
- Wide bandwidth: 10 MHz typical at $V_{CC} = 5$ V
- Low input offset voltage: 0.5 mV typical
- Input offset voltage drift: $5 \mu\text{V}/^{\circ}\text{C}$ typical over operating temperature range
- Low total harmonic distortion: 0.04% typical at $V_{CC} = 5$ V
- Low supply current: 620 μA typical per channel at $V_{CC} = 5$ V
- Slew rate: 6.5 V/ μs typical

■ Applications

- Automotive and transportation
- Portable equipment
- Active filters
- Data acquisition
- Portable equipment
- Test equipment
- Process control

■ Package Information

Part Number	Package	Body Size
DIA20721	SOT23-5	2.9 mm × 1.6 mm
DIA20722	MSOP-8	3 mm × 3 mm
	SOIC-8	4.9 mm × 3.9 mm
DIA20724	SOP-14	8.65 mm × 3.9 mm
	TSSOP-14	5 mm × 4.4 mm

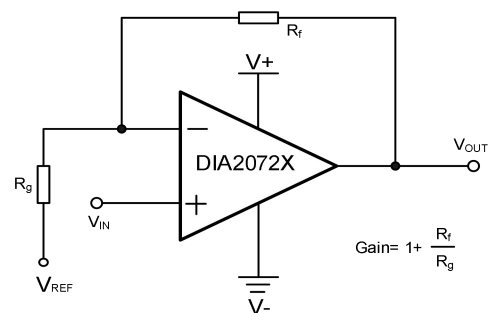
■ Description

The DIA2072X devices are low power, high precision CMOS operational amplifiers for automotive applications. It provides rail-to-rail input and output operation from a range of 2.5 V to 5.5 V at both single-supply and split-supply operation.

These amplifiers operate at single power supply or dual power supply and offer 10 MHz bandwidth, slew rate of 6.5 V/ μs and only 620 μA of quiescent current per channel. The DIA2072X offer low input offset voltage of 0.5 mV and low input offset voltage drift of 5 $\mu\text{V}/^{\circ}\text{C}$.

The DIA2072X family is available in standard package such as SOT23-5, MSOP-8, SOIC-8, SOP-14 and TSSOP-14. It is specified over ambient temperature range of -40°C to 125°C . The DIA2072X provides an excellent choice for high-quality systems.

■ Simplified Schematic



Non-Inverting Amplifier

■ Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T _A	Package	
DIA20721ST5	A2AYW	1	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIA20722MP8	DIA2072 YYWW XZ	1	Green	-40 to 125°C	MSOP8	Tape & Reel, 3000
DIA20722SO8	DIA2072 YYWW XZ	1	Green	-40 to 125°C	SOIC8	Tape & Reel, 2500
DIA20724SO14	DIA2074 YYWW XZ	3	Green	-40 to 125°C	SOP14	Tape & Reel, 2500
DIA20724TP14	DIA2074 YYWW XZ	3	Green	-40 to 125°C	TSSOP14	Tape & Reel, 2500

If you encounter any issue in the process of using the device, please contact our customer service at marketing@dioo.com or phone us at (+86)-21-62116882. If you have any improvement suggestions regarding the datasheet, we encourage you to contact our technical writing team at docs@dioo.com. Your feedback is invaluable for us to provide a better user experience.

Table of Contents

1. Pin Assignment and Functions	1
2. Absolute Maximum Ratings	2
3. Recommend Operating Conditions	2
4. ESD Ratings	2
5. Electrical Characteristics	3
6. Typical Characteristics	4
7. Application Information	6
8. Physical Dimensions	7
8.1. SOT23-5	7
8.2. SOIC8	8
8.3. MSOP8	9
8.4. TSSOP-14	10
8.5. SOP-14	11

List of Figures

Figure 1. SOT23-5 (Top view)	1
Figure 2. MSOP8/SOIC8 (Top view)	1
Figure 3. SOP-14/TSSOP-14 (Top view)	1
Figure 4. Supply current vs. Supply voltage per channel	4
Figure 5. Supply current vs. Temperature	4
Figure 6. I_{source} vs. Output voltage	4
Figure 7. I_{sink} vs. Output voltage	4
Figure 8. Input offset voltage vs. Temperature	4
Figure 9. Input offset voltage vs. Supply voltage	4
Figure 10. Input offset voltage vs. Common voltage	5
Figure 11. Large-signal response	5
Figure 12. Typical application circuit	6

List of Tables

Table 1. Pin description	1
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1. Pin Assignment and Functions

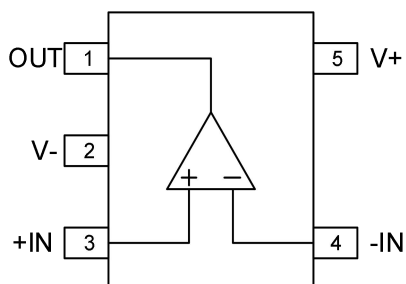


Figure 1. SOT23-5 (Top view)

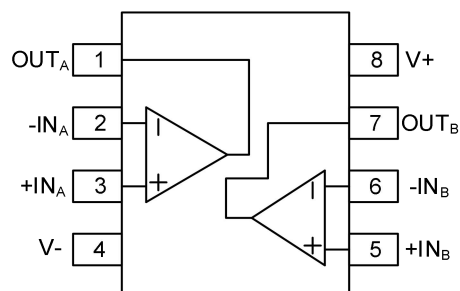


Figure 2. MSOP8/SOIC8 (Top view)

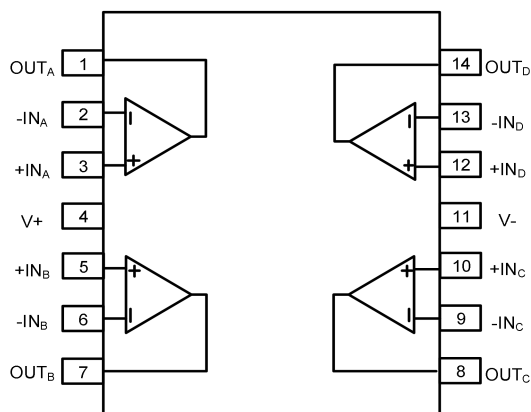


Figure 3. SOP-14/TSSOP-14 (Top view)

Table 1. Pin description

Pin Name	Description
V+	Positive supply
V-	Negative supply
+IN _X (+IN _A , +IN _B , +IN _C , +IN _D)	Positive input (channel A, B, C, D)
-IN _X (-IN _A , -IN _B , -IN _C , -IN _D)	Negative input (channel A, B, C, D)
OUT _X (OUT _A , OUT _B , OUT _C , OUT _D)	Output (channel A, B, C, D)

2. Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

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

3. Recommend Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage	2.5 to 5.5	V
V_{IN}	Input voltage	0 to 5	V
T_A	Operating temperature range	-40 to 125	°C

4. ESD Ratings

When a statically-charged person or object touches an electrostatic discharge sensitive device, the electrostatic charge might be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage might occur to the device due to localized overheating.

Model	Metric	Value	Unit
Human-body model (HBM)	AEC-Q100-002	±8	kV
Charged device model (CDM)	AEC-Q100-011	±2	kV

5. Electrical Characteristics

The values are obtained under these conditions unless otherwise specified: $V_{CC} = \pm 1.25 \text{ V to } \pm 2.75 \text{ V}$ ($V_{CC} = 2.5 \text{ V to } 5.5 \text{ V}$), $V_{CM} = V_{CC} / 2$, $R_L = 600 \ \Omega$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Input characteristics						
V _{OS}	Input offset voltage	-40°C ≤ T _A ≤ 125°C, V _{CC} = 2.5 V to 5.5 V	-5	0.5	5	mV
I _B	Input bias current	V _{CC} = 2.5 V to 5 V		20		pA
V _{CM}	Common mode voltage range		(V-) - 0.1		(V+) + 0.1	V
CMRR	Common mode rejection ratio	-40°C ≤ T _A ≤ 125°C, V _{CM} = (V-)-0.1 to (V+) + 0.1, V _{CC} = 5 V		85		dB
ΔV _{OS} /ΔT	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 _{CC} = 5 V		80		mA
Power supply						
PSRR	Power supply rejection ratio			80		dB
I _S	Supply current per channel/amp	V _{CC} = 5 V, -40°C ≤ T _A ≤ 125°C	320	620	1000	μA
		V _{CC} = 2.5 V, -40°C ≤ T _A ≤ 125°C	260	590	830	
Dynamic performance						
GBP	Gain bandwidth product			10.0		MHz
SR	Slew rate	G = 1, 2 V output step		6.5		V/μs
t _s	Settling 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 _{CC} = V _{IN} × Gain		90		ns
Noise performance						
THD	Total harmonic distortion	f = 10 kHz, 2 V output step, R _L = 600 Ω, V _{CC} = 5 V		0.04		%
e _n	Voltage noise density	f = 1 kHz, V _{CC} = 5 V		90		nV/√Hz
		f = 10 kHz, V _{CC} = 5 V		35		

Note:

(1) Specifications subject to change without notice.

6. Typical Characteristics

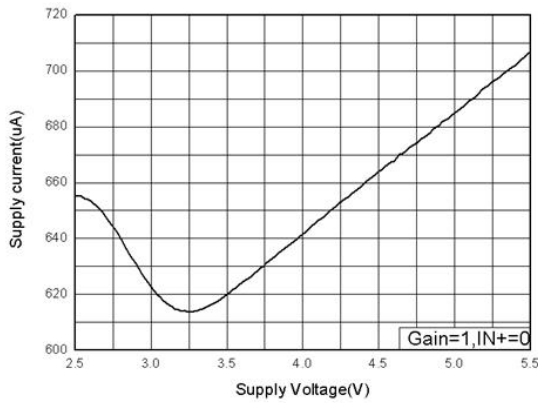


Figure 4. Supply current vs. Supply voltage per channel

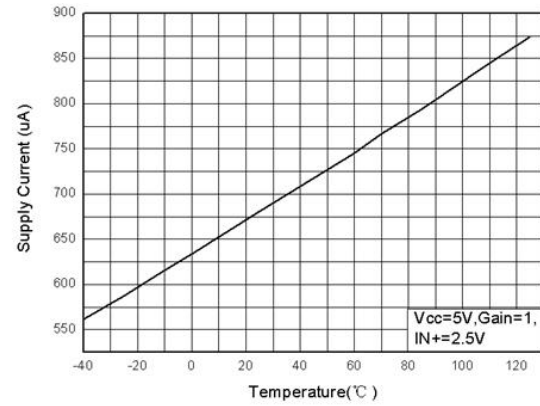


Figure 5. Supply current vs. Temperature

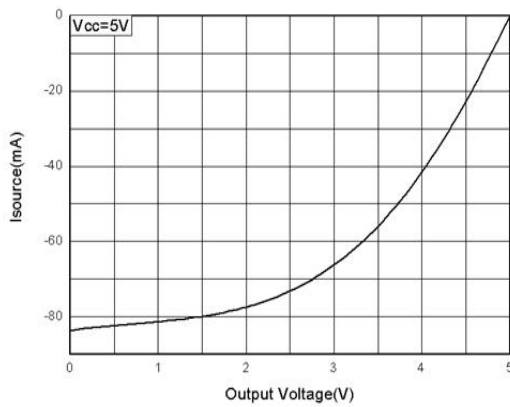


Figure 6. I_{source} vs. Output voltage

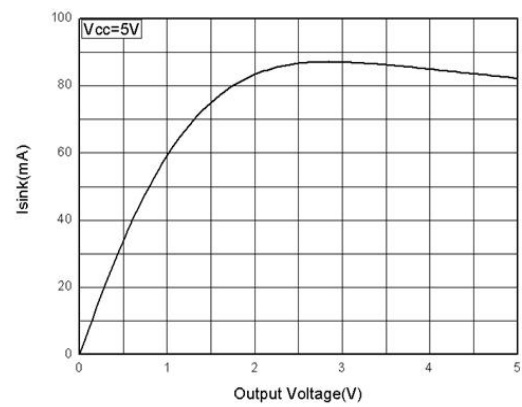


Figure 7. I_{sink} vs. Output voltage

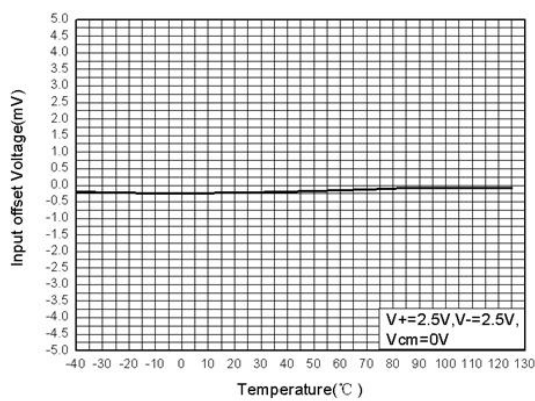


Figure 8. Input offset voltage vs. Temperature

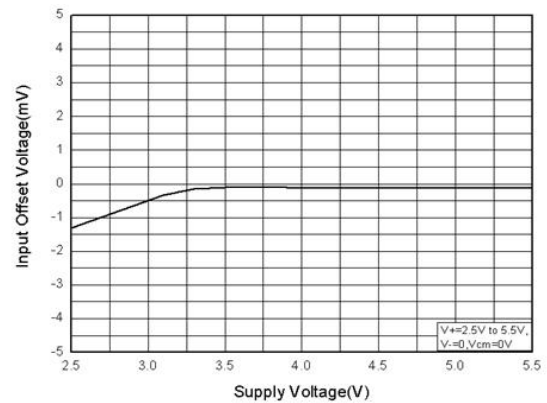


Figure 9. Input offset voltage vs. Supply voltage

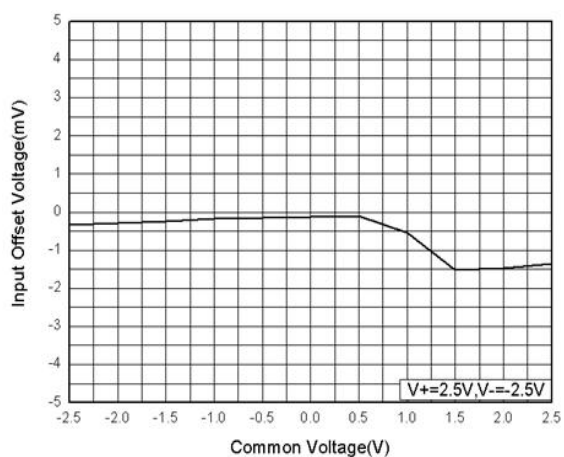
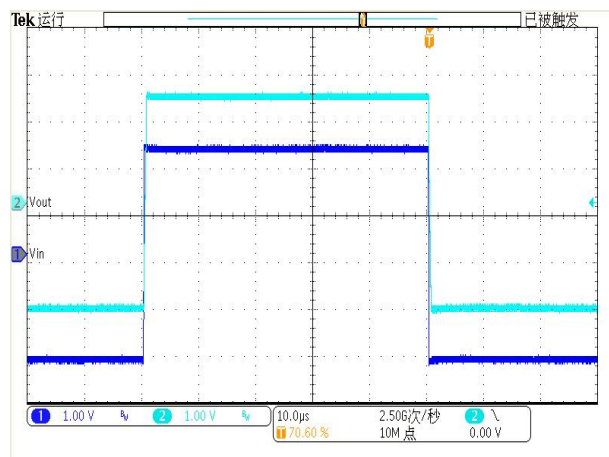


Figure 10. Input offset voltage vs. Common voltage

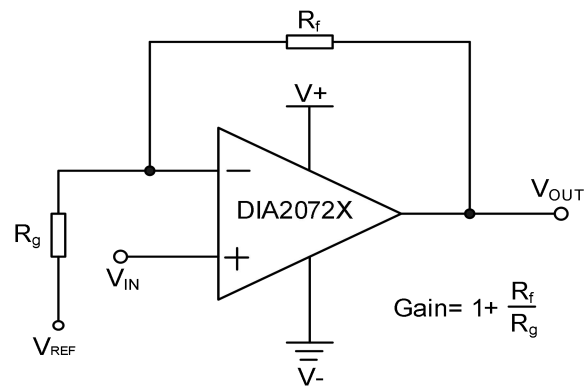


($V_+ = 5\text{ V}$, $R_L = 1\text{ M}\Omega$)

Figure 11. Large-signal response

7. Application Information

Important notice: Validation and testing are the most reliable ways to confirm system functionality. The application information is not part of the specification and is for reference purposes only.

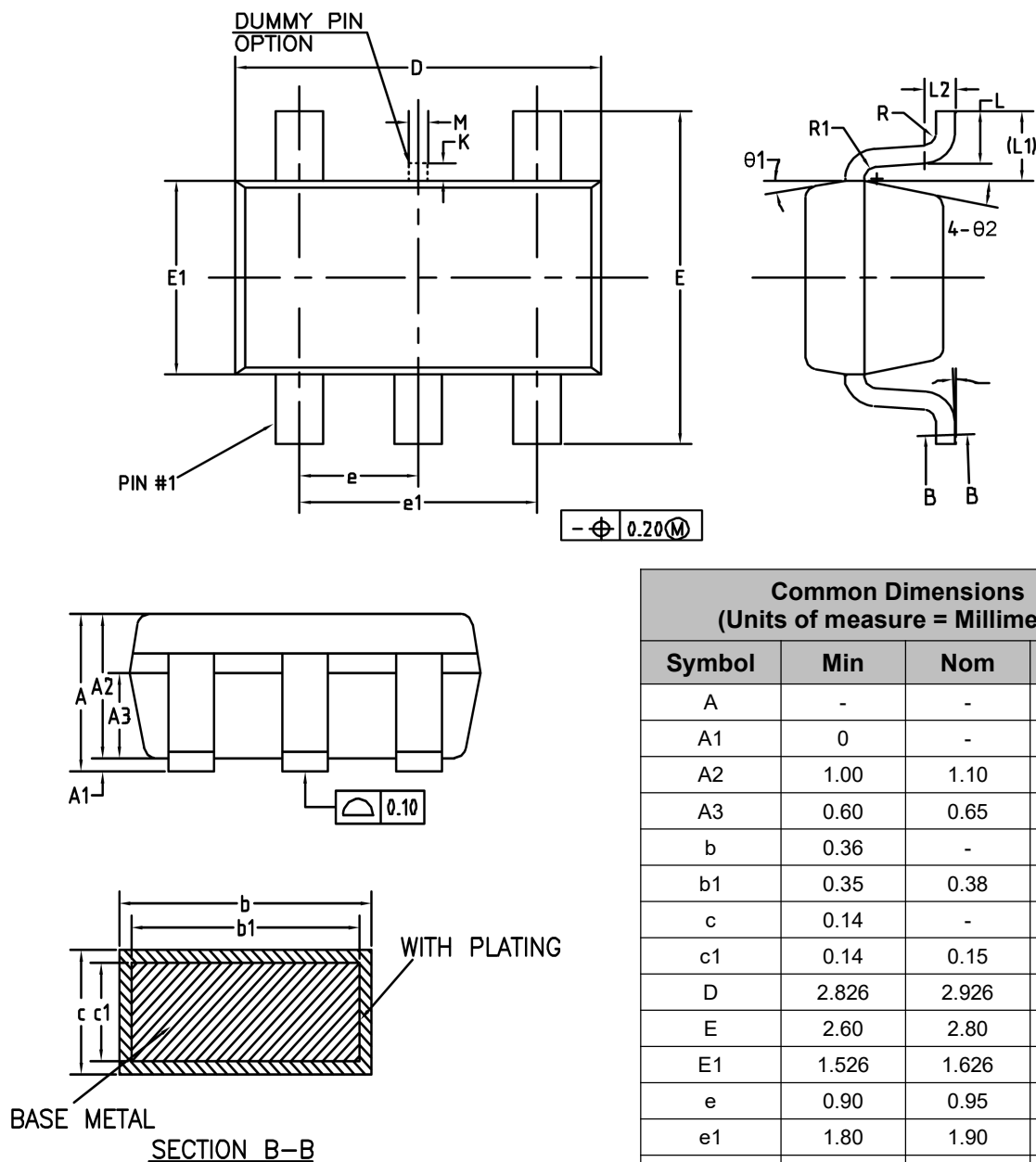


Non-Inverting Amplifier

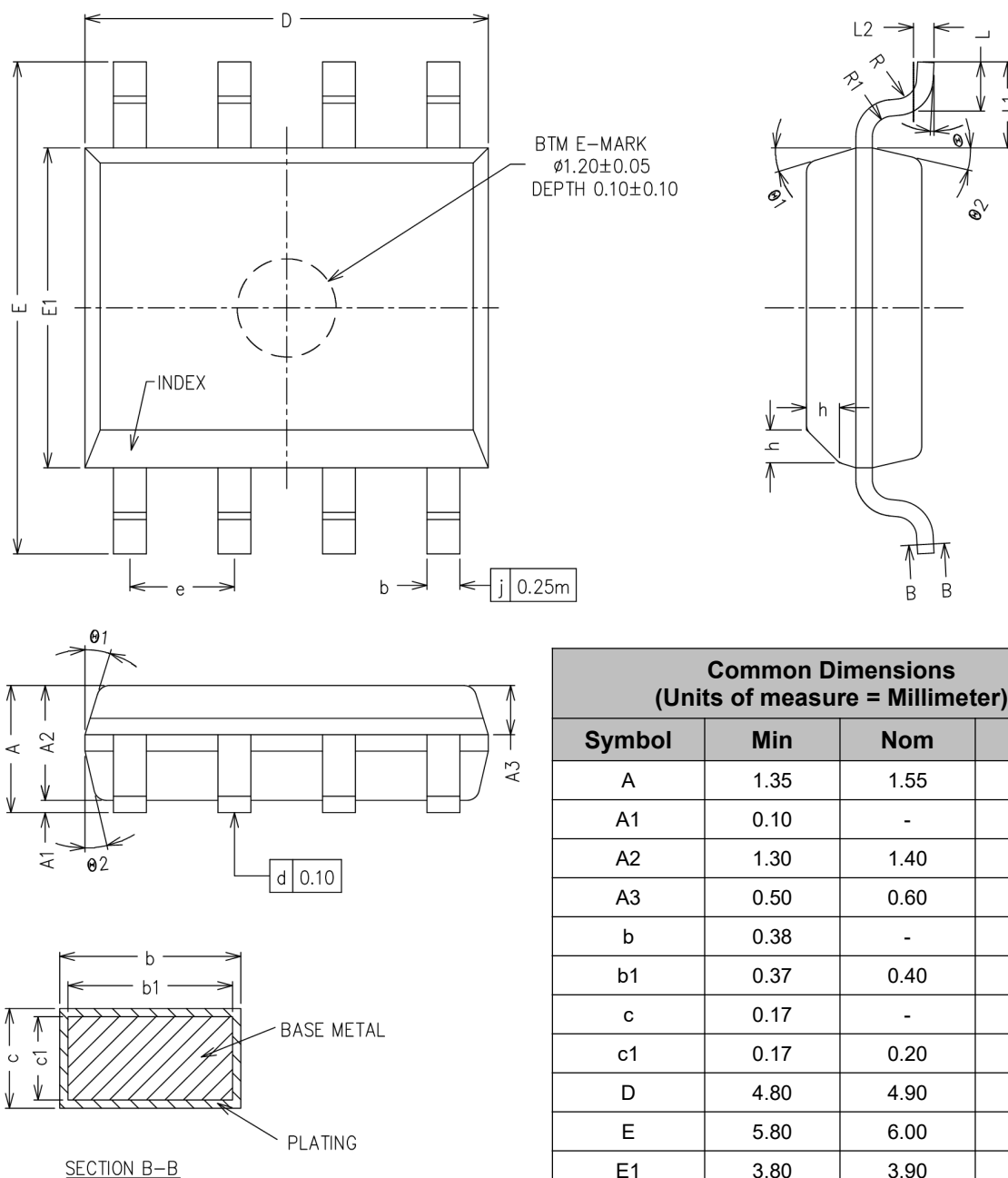
Figure 12. Typical application circuit

8. Physical Dimensions

8.1. SOT23-5

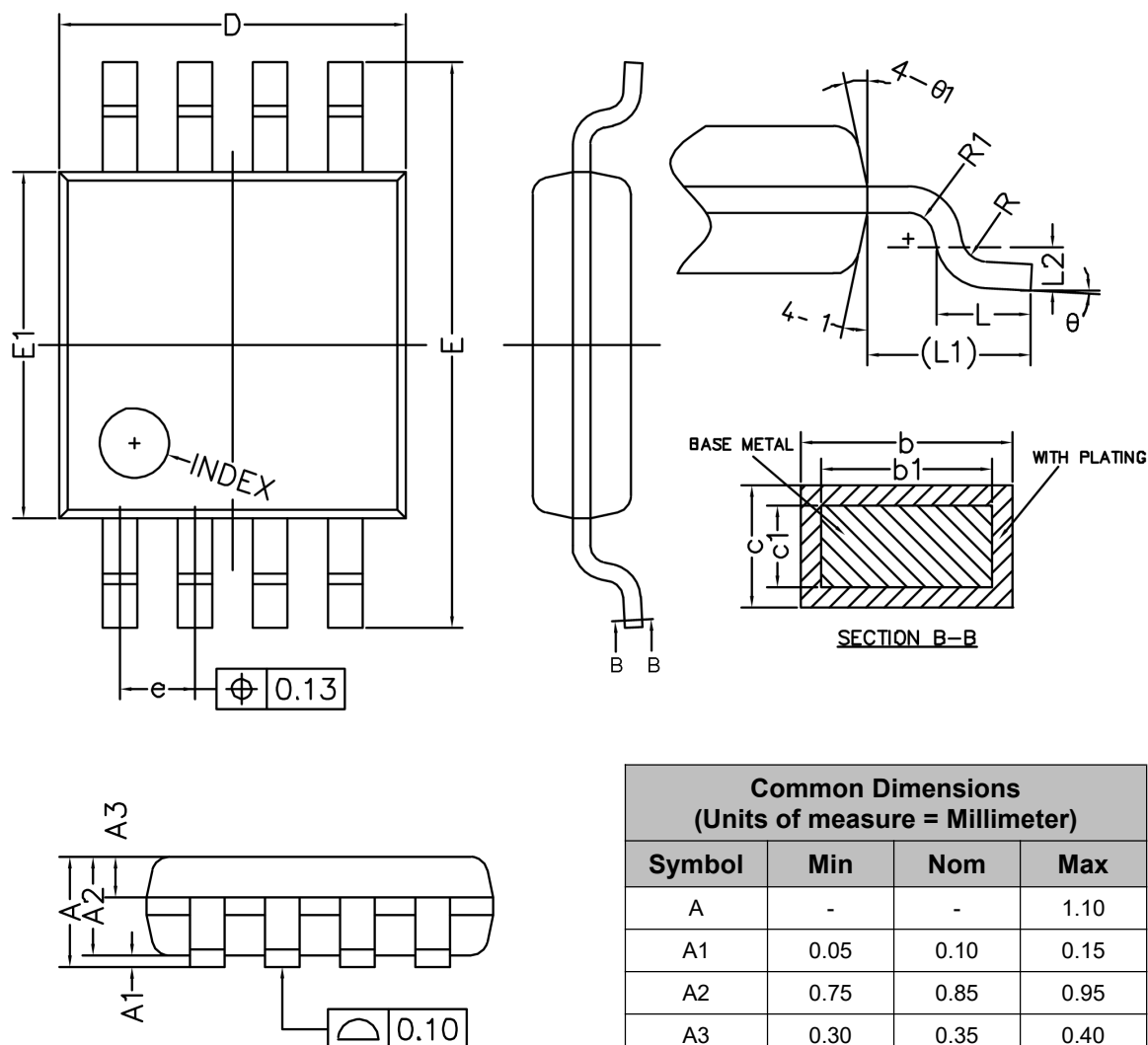


8.2. SOIC8

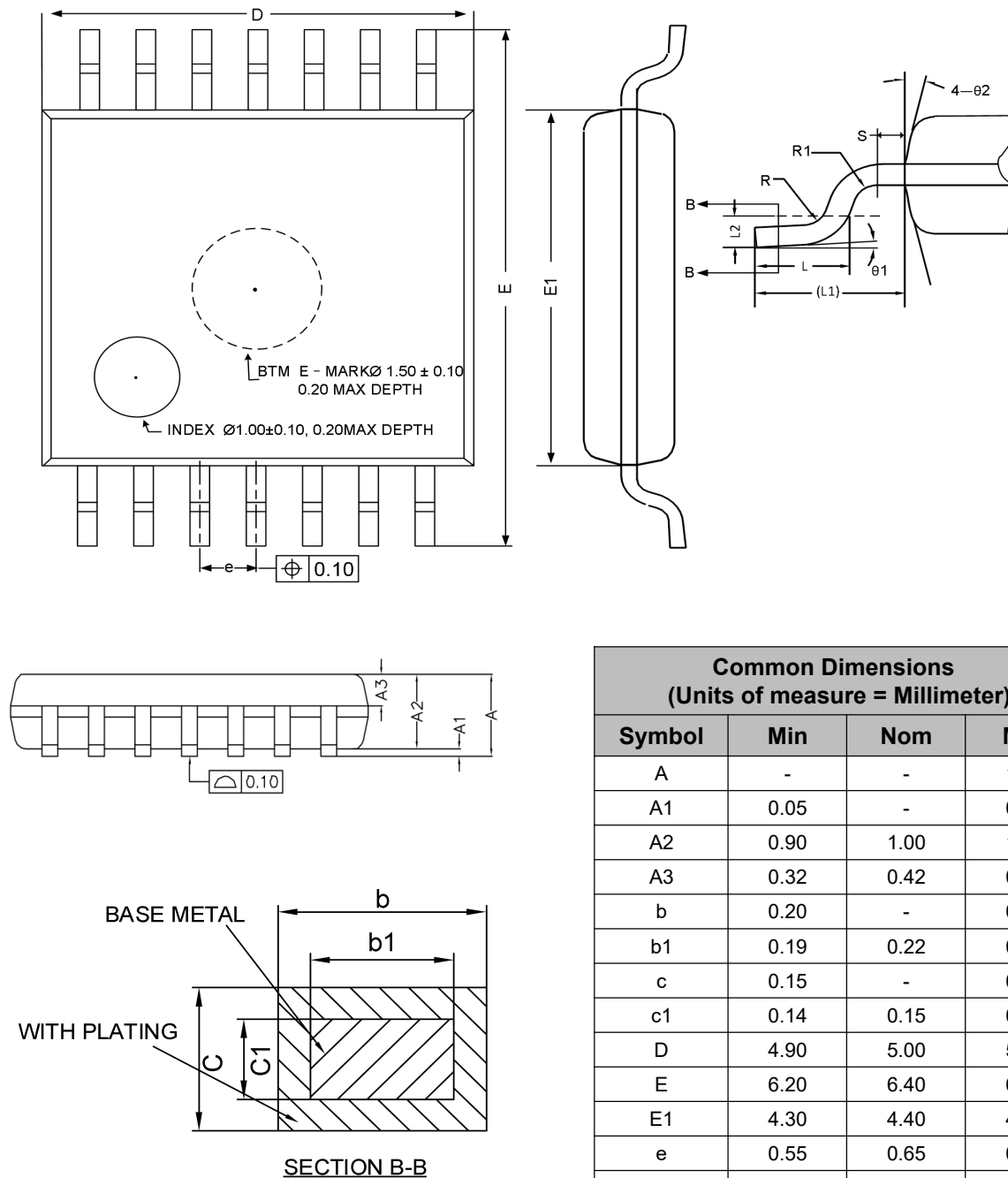


Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.55	1.75
A1	0.10	-	0.25
A2	1.30	1.40	1.50
A3	0.50	0.60	0.70
b	0.38	-	0.47
b1	0.37	0.40	0.43
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1	1.04 REF		
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°

8.3. MSOP8

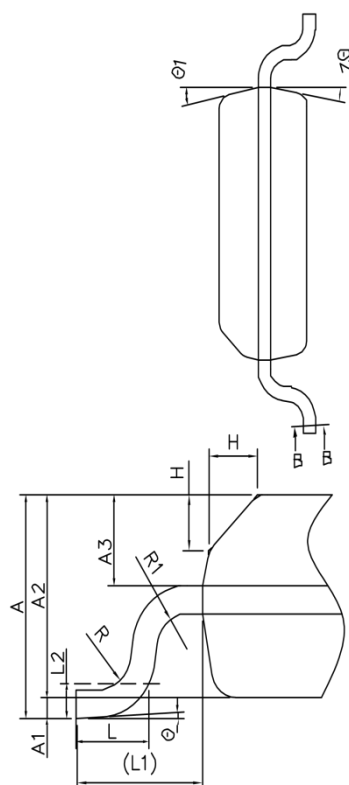
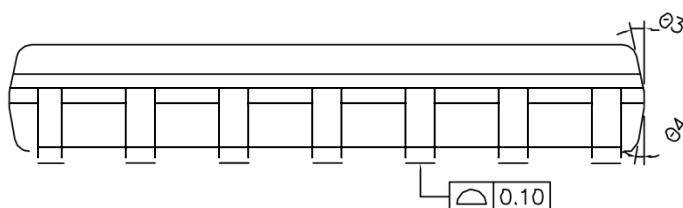
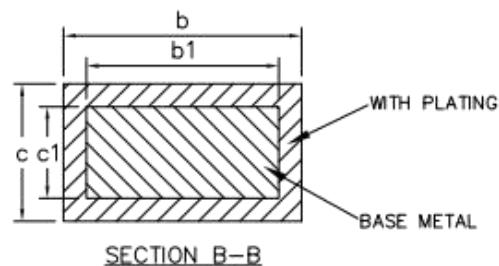
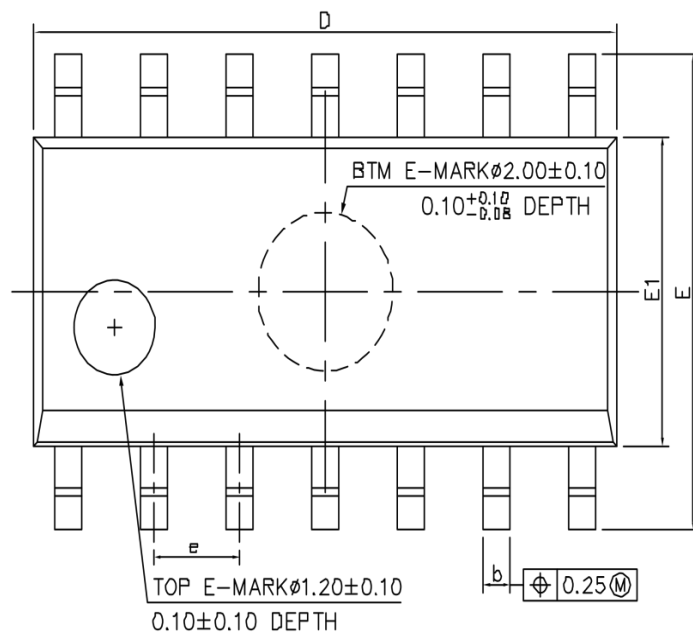


8.4. TSSOP-14



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	0.32	0.42	0.52
b	0.20	-	0.29
b1	0.19	0.22	0.25
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	4.90	5.00	5.10
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.55	0.65	0.75
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°

8.5. SOP-14



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.75
A1	0.10	0.15	0.25
A2	1.35	1.45	1.55
A3	0.55	0.65	0.75
b	0.36	-	0.51
b1	0.35	0.40	0.45
c	0.18	-	0.25
c1	0.17	0.20	0.23
D	8.55	8.65	8.75
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.22	1.27	1.32
H	0.30	0.40	0.50
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ1	10°	12°	14°
θ2	8°	10°	12°
θ3	10°	12°	14°
θ4	8°	10°	12°

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