

DIO3581/1A_3582_3584

1.4 MHz, 60 μ A, Rail-to-Rail I/O CMOS Amplifier

Features

- Rail-to-rail input and output
 - Max offset (V_{OS}): ± 3 mV
 - Unity gain stable
 - Gain bandwidth product: 1.4 MHz
 - Wide supply range: 2 V to 5.5 V
 - Input voltage range:
-0.1 V to +5.6 V with $V_+ = 5.5$ V
 - Ultra low power: 60 μ A per channel
 - Compact package best for portable applications
- DIO3581/1A: SOT23-5 and SC70-5
DIO3582: SOIC-8, MSOP-8 and DFN2*2-8
DIO3584: SOP-14 and TSSOP-14

Applications

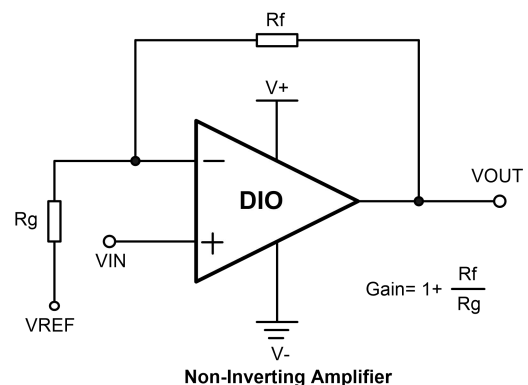
- ASIC input or output amplifiers
- Sensor interface
- Piezoelectric transducer amplifiers
- Medical instrumentation
- Audio output
- Portable systems
- Smoke detectors
- Notebook PCs
- Battery-powered equipment

Descriptions

The DIO3581/1A (single), DIO3582 (dual) and DIO3584 (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 V to 5.5 V. Products are fully specified over the extended -40 to 125°C temperature range.

The DIO3581/1A_3582_3584 provide 1.4 MHz bandwidth consuming an ultra-low current of 60 μ A per channel. They are suitable for integrators, photodiode amplifiers, and piezoelectric sensors.

Typical Application



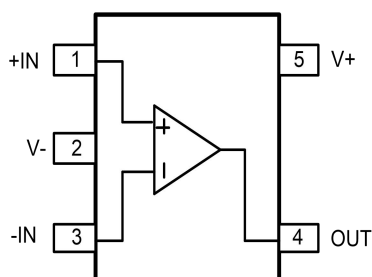
Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T _A	Package	
DIO3581ST5	YWXS	3	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO3581SC5	YWXS	3	Green	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO3581AST5	YW1A	3	Green	-40 to 125°C	SOT23-5	Tape & Reel, 3000
DIO3581ASC5	YW1A	3	Green	-40 to 125°C	SC70-5	Tape & Reel, 3000
DIO3582MP8	DIO358	3	Green	-40 to 125°C	MSOP-8	Tape & Reel, 3000
DIO3582SO8	DIO358	3	Green	-40 to 125°C	SOIC-8	Tape & Reel, 2500
DIO3582CN8	3582	3	Green	-40 to 125°C	DFN2*2-8	Tape & Reel, 3000
DIO3584TP14	DIO3584	3	Green	-40 to 125°C	TSSOP-14	Tape & Reel, 2500
DIO3584SO14	DIO3584	3	Green	-40 to 125°C	SOP-14	Tape & Reel, 2500

Pin Assignments

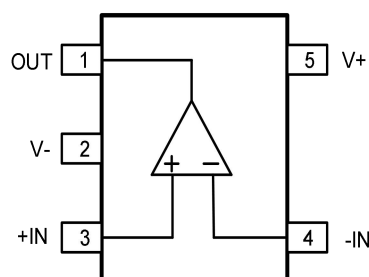
SOT23-5/SC70-5

DIO3581



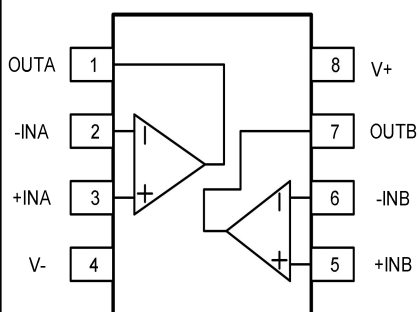
SOT23-5/SC70-5

DIO3581A



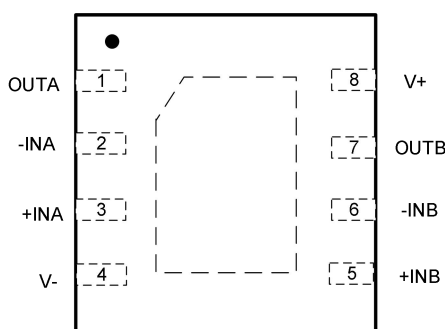
SOIC-8/MSOP-8

DIO3582



DFN2*2-8

DIO3582



TSSOP-14/SOIC-14

DIO3584

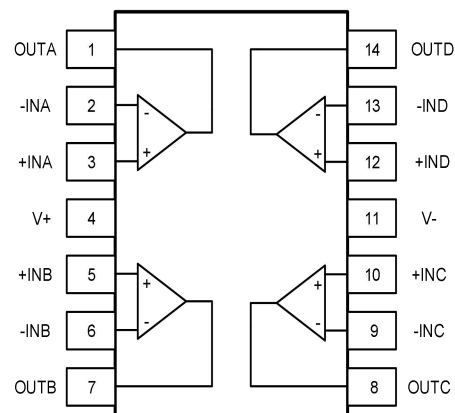


Figure 1. Pin Assignment



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}	Maximum 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	2.0 to 5.5	V
V _{IN}	Input voltage	-0.1 to (V+) + 0.1	V
T _A	Operating temperature range	-40 to 125	°C

**DIO3581/1A 3582 3584****1.4 MHz, 60 μ A, Rail-to-Rail I/O CMOS Amplifier**

Electrical Characteristics

Typical value: $V_+ = 5\text{ V}$, $R_L = 100\text{ k}\Omega$ to $V_+/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

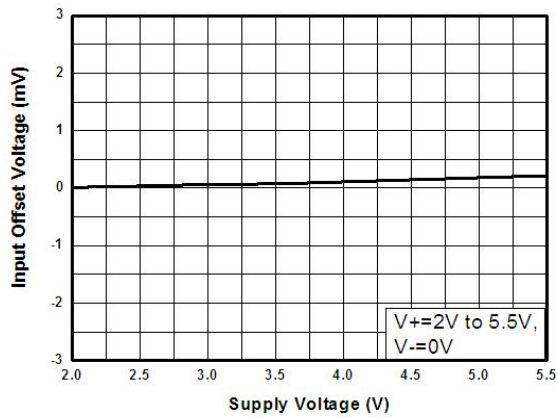
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Input characteristics						
V _{OS}	Input offset voltage	-40°C ≤ T _A ≤ 125°C, V ₊ = 2 V to 5 V	-3	0.5	3	mV
I _{OS}	Input offset current	-40°C ≤ T _A ≤ 125°C, V ₊ = 2 V to 5 V		5		pA
V _{CM}	Common mode voltage range		-0.1		(V ₊) +0.1	V
CMRR	Common mode rejection 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	100		dB
		R _L = 200 kΩ, V _O = 0.1 to (V ₊) - 0.1	90	110		
ΔV _{OS} /ΔT	Input offset voltage drift	-40°C ≤ T _A ≤ 125°C		5		μV/°C
Output characteristics						
V _{OH}	Output voltage high	R _L = 100 kΩ, -40°C ≤ T _A ≤ 125°C		4.998		V
V _{OL}	Output voltage low	R _L = 100 kΩ, -40°C ≤ T _A ≤ 125°C		2.5		mV
I _{SC}	Output short circuit current	Source I _{SC} , V ₊ = 5 V		40		mA
		Sink I _{SC} , V ₊ = 5 V		40		
Power supply						
PSRR	Power supply rejection ration			85		dB
I _S	Supply current per channel/Amp	-40°C ≤ T _A ≤ 125°C		60		μA
Dynamic performance						
GBP	Gain bandwidth product	R _L = 100 K, C _L = 100 pF		1.4		MHz
SR	Slew rate	G = 1, 2 V output step		0.6		V/μs
t _S	Settling time	G = 1, 2 V output step		2.4		μs
Noise performance						
THD	Total harmonic distortion	f = 10 kHz, 2 V output step, R _L = 10 kΩ		0.019		%
e _n	Voltage noise density	f = 1 kHz		45		nV/√Hz
		f = 10 kHz		35		

Note:

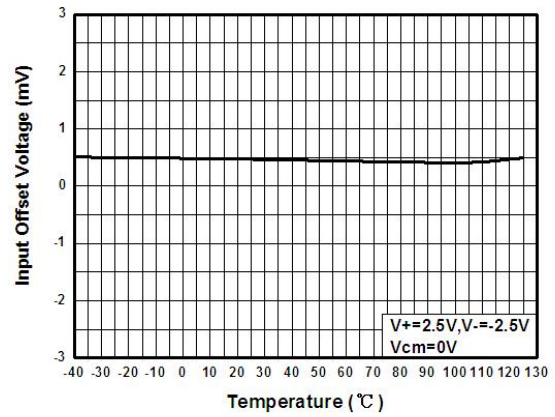
(1) Specifications subject to change without notice.

Typical Performance Characteristics

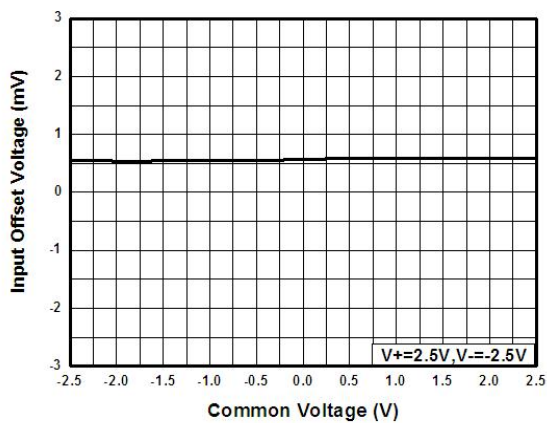
All typical value are at $V_+ = 2.5\text{ V}$, $V_- = -2.5\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise specified.



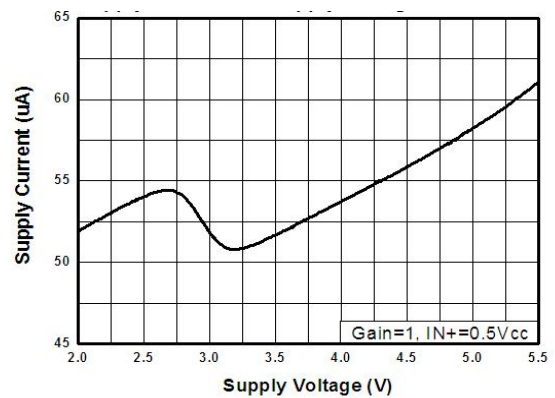
Input offset voltage vs. Supply voltage



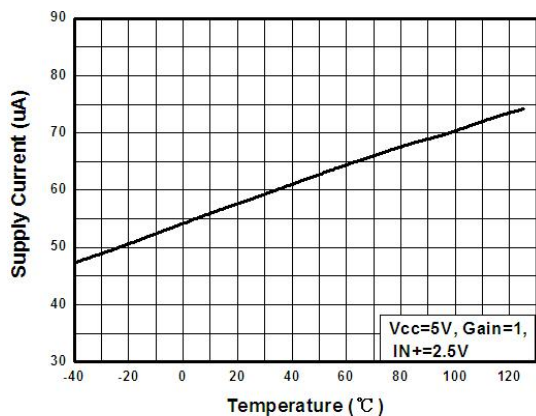
Input offset voltage vs. Temperature



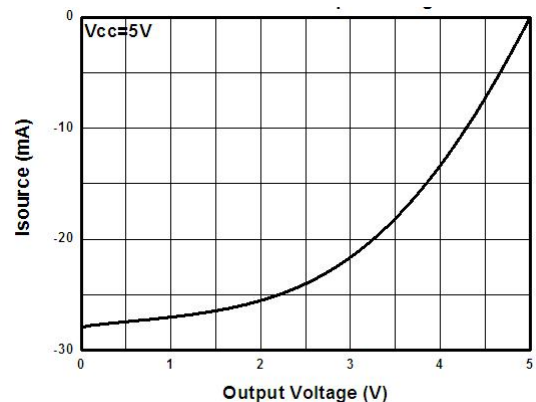
Input offset voltage vs. Common voltage



Supply current vs. Supply voltage per channel



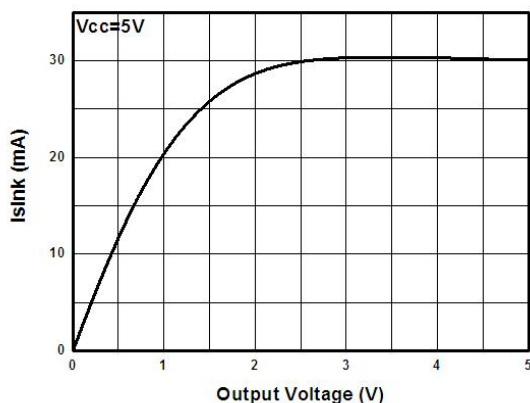
Supply current vs. Temperature



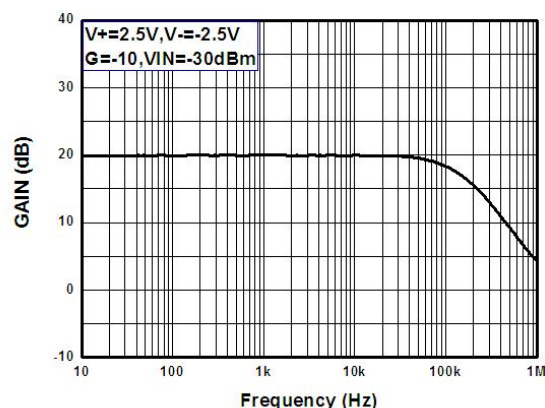
I_{SOURCE} vs. Output voltage

Typical Performance Characteristics(continued)

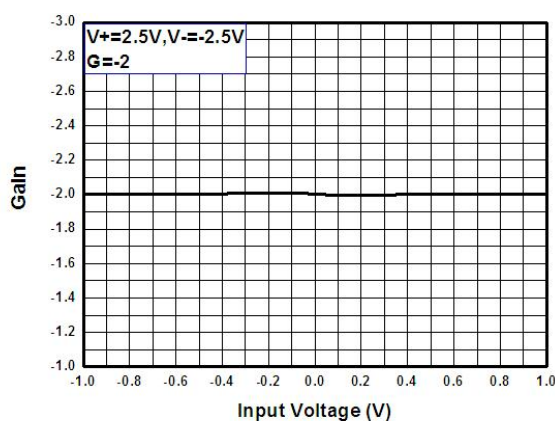
All typical value are at $V_+ = 2.5\text{ V}$, $V_- = -2.5\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise specified.



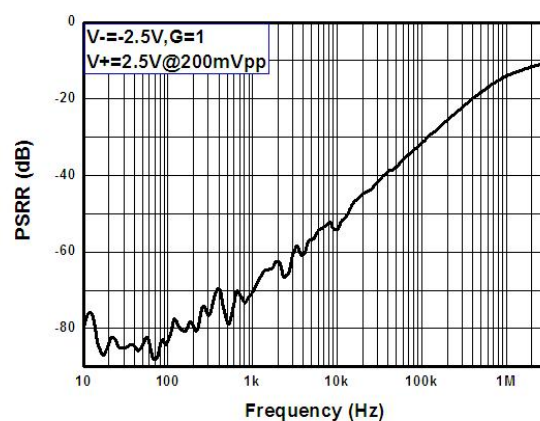
I_{SINK} vs. Output voltage



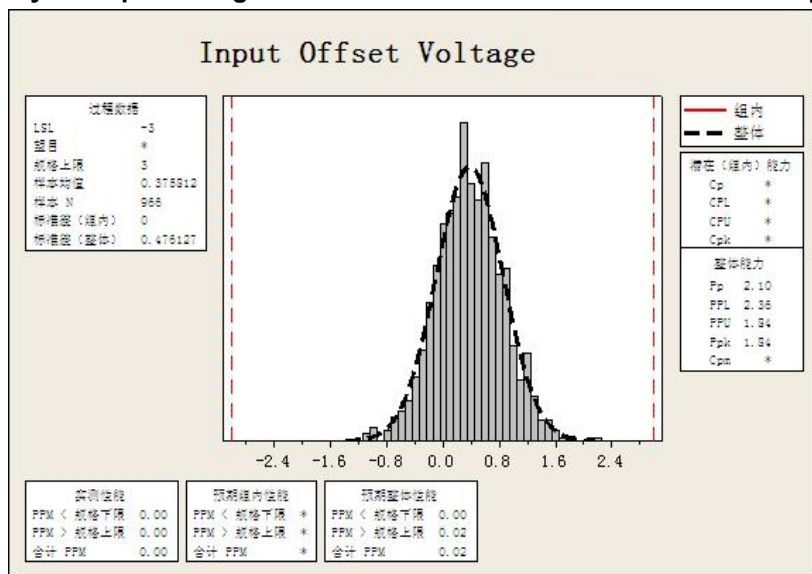
Gain vs. Frequency



Gain linearity vs. Input voltage



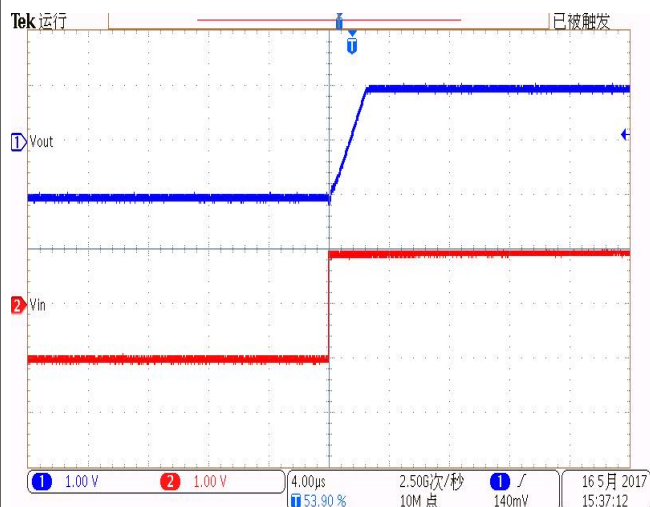
PSRR vs. Frequency



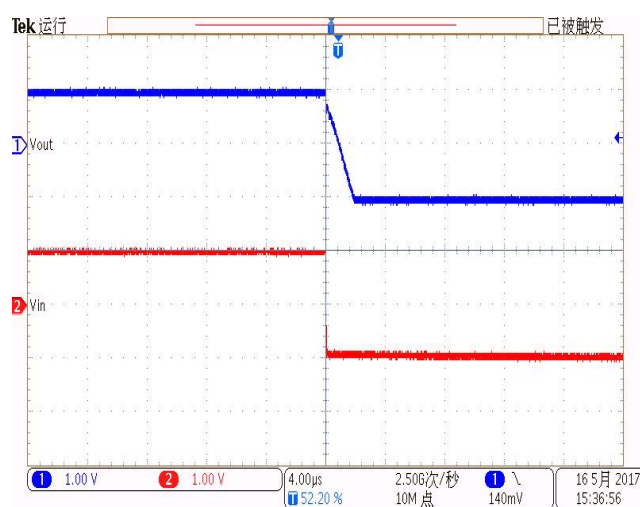
Input offset voltage statistics

Typical Performance Characteristics(continued)

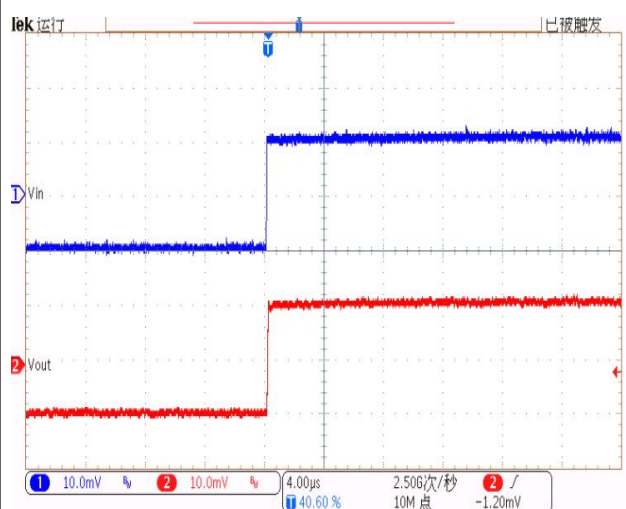
All typical value are at $V_+ = 2.5$ V, $V_- = -2.5$ V, $G = 1$, $R_L = 1$ M Ω , $T_A = 25^\circ\text{C}$, unless otherwise specified.



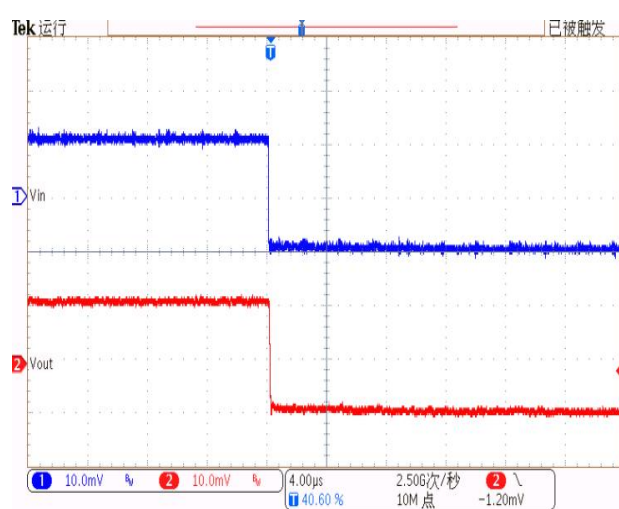
Slew rate (+)



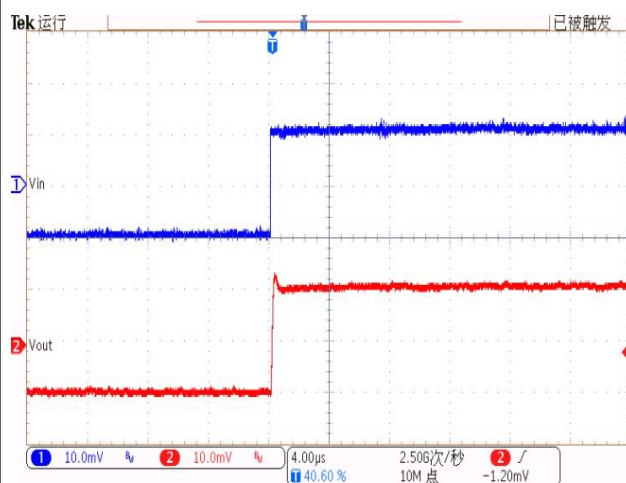
Slew rate (-)



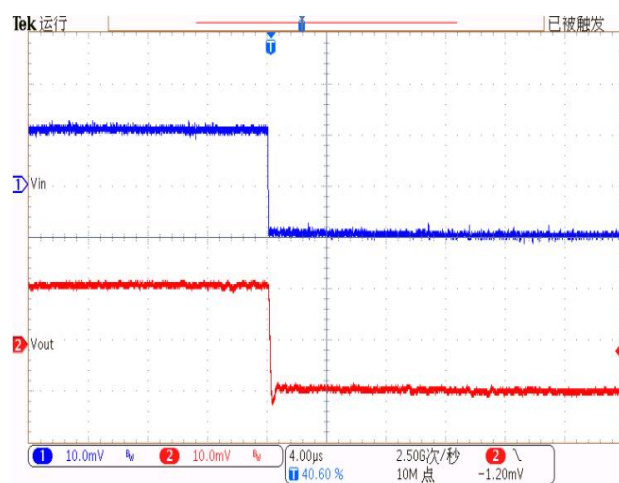
Small-signal response rise ($C_L = \text{No load}$)



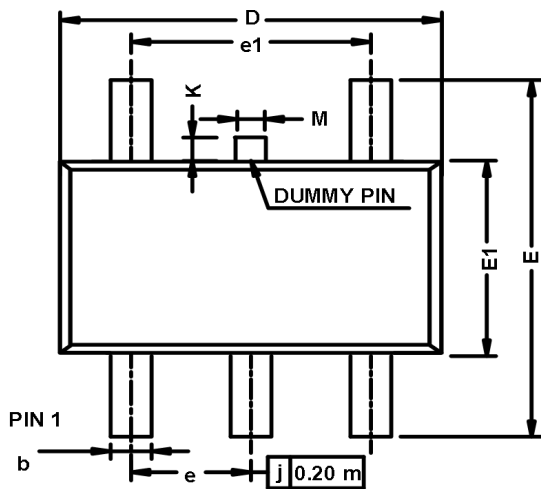
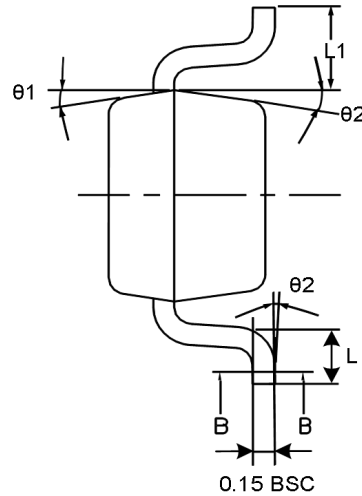
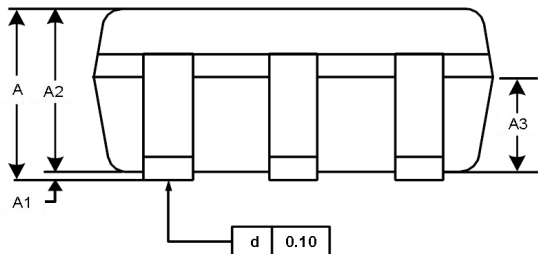
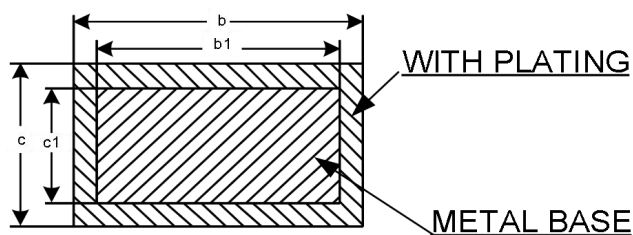
Small-signal response fall ($C_L = \text{No load}$)



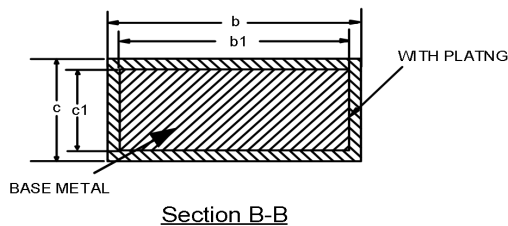
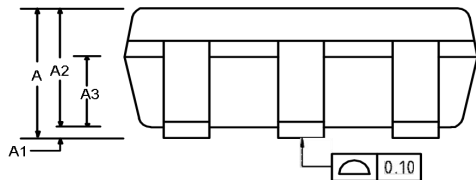
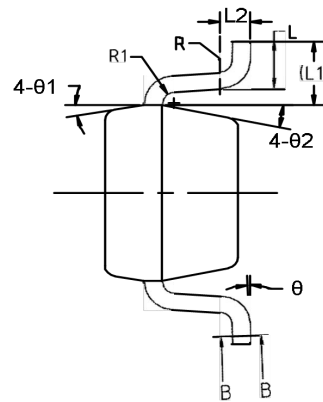
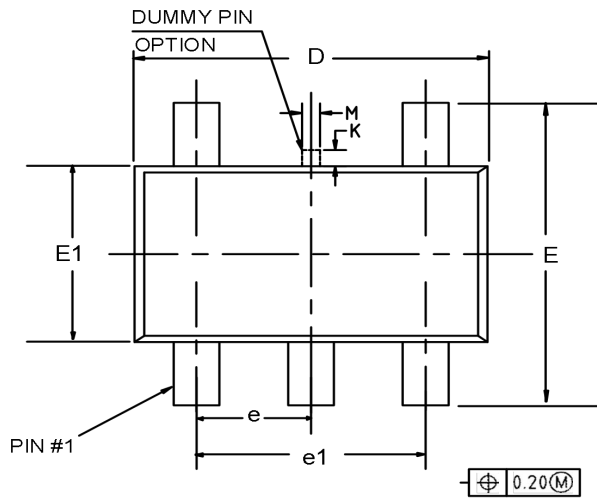
Small-signal response rise ($C_L = 200$ pF)



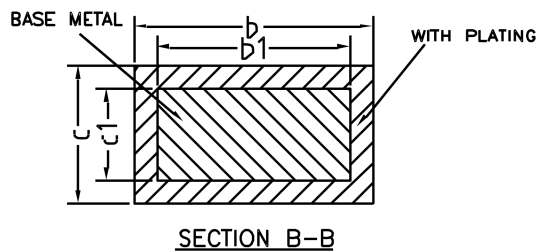
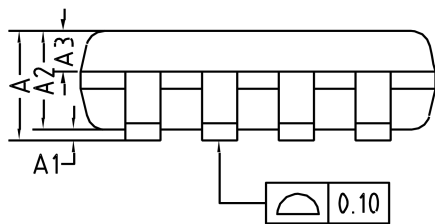
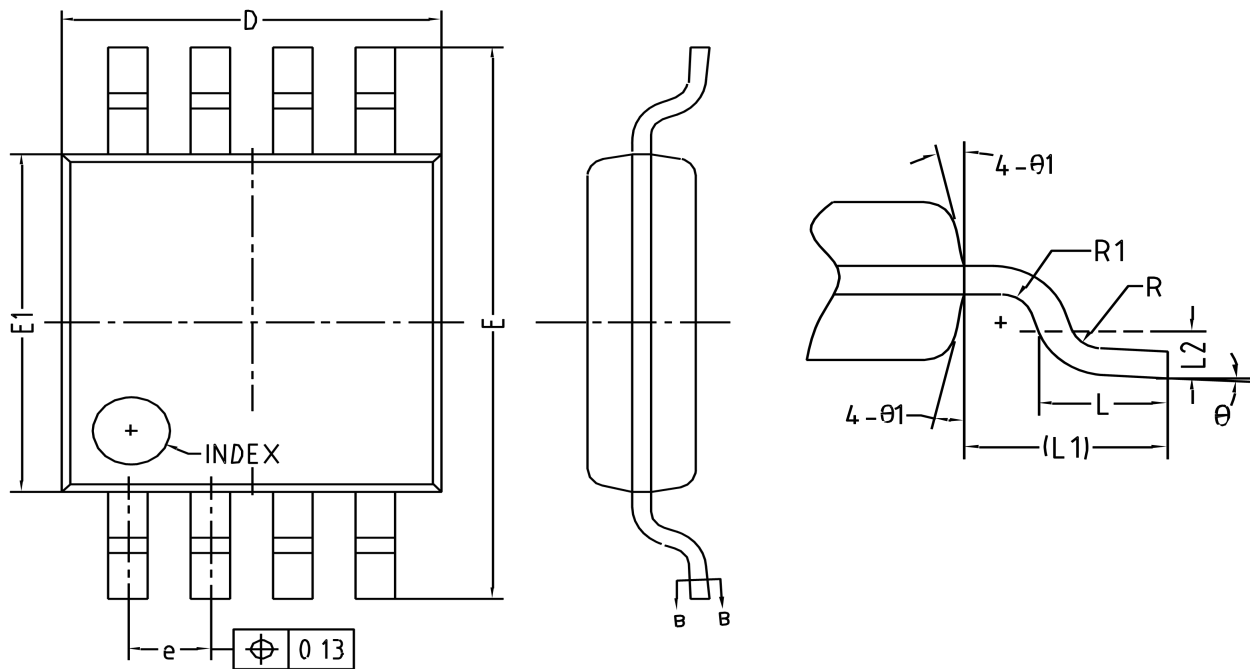
Small-signal response fall ($C_L = 200$ pF)

Physical Dimensions: SC70-5

TOP VIEW

SIDE VIEW

SIDE VIEW

SECTION B-B

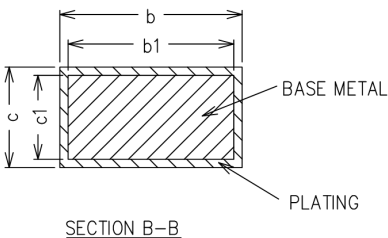
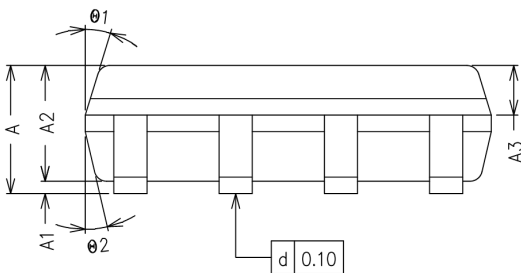
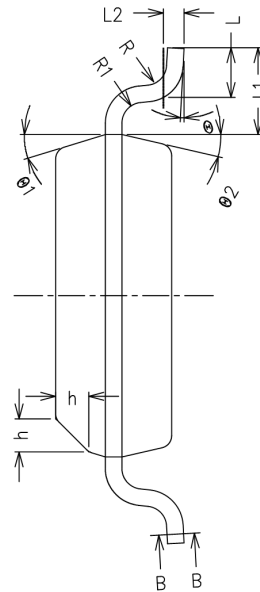
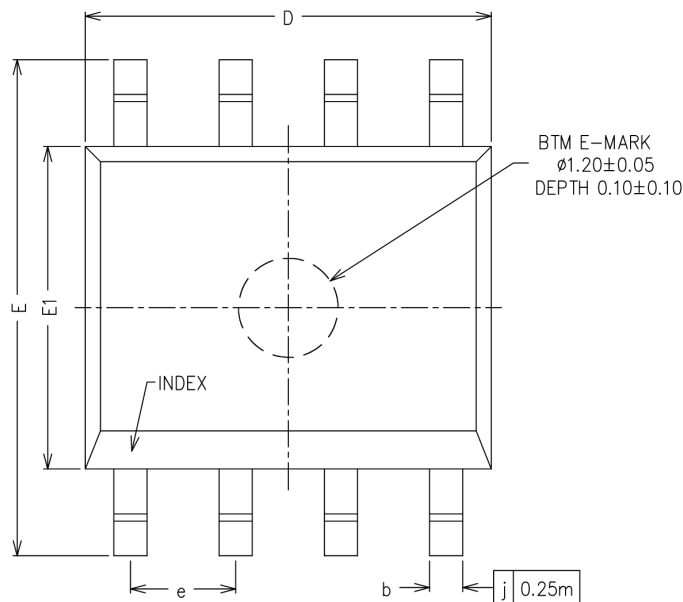
Common Dimensions (Units of measures = Millimeter)			
Symbol	Min	Nom	Max
A	0.80	-	1.10
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.40	0.50	0.60
b	0.17	-	0.30
b1	0.17	0.22	0.25
c	0.12	-	0.20
c1	0.12	0.15	0.16
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.21	1.26	1.31
e	0.60	0.65	0.70
e1	1.20	1.30	1.40
L	0.26	0.33	0.46
L1	0.52 REF		
M	0.10	0.15	0.20
K	0	-	0.20
θ	0°	-	8°
$\theta 1$	10°	12°	14°
$\theta 2$	10°	12°	14°

Physical Dimensions: SOT23-5


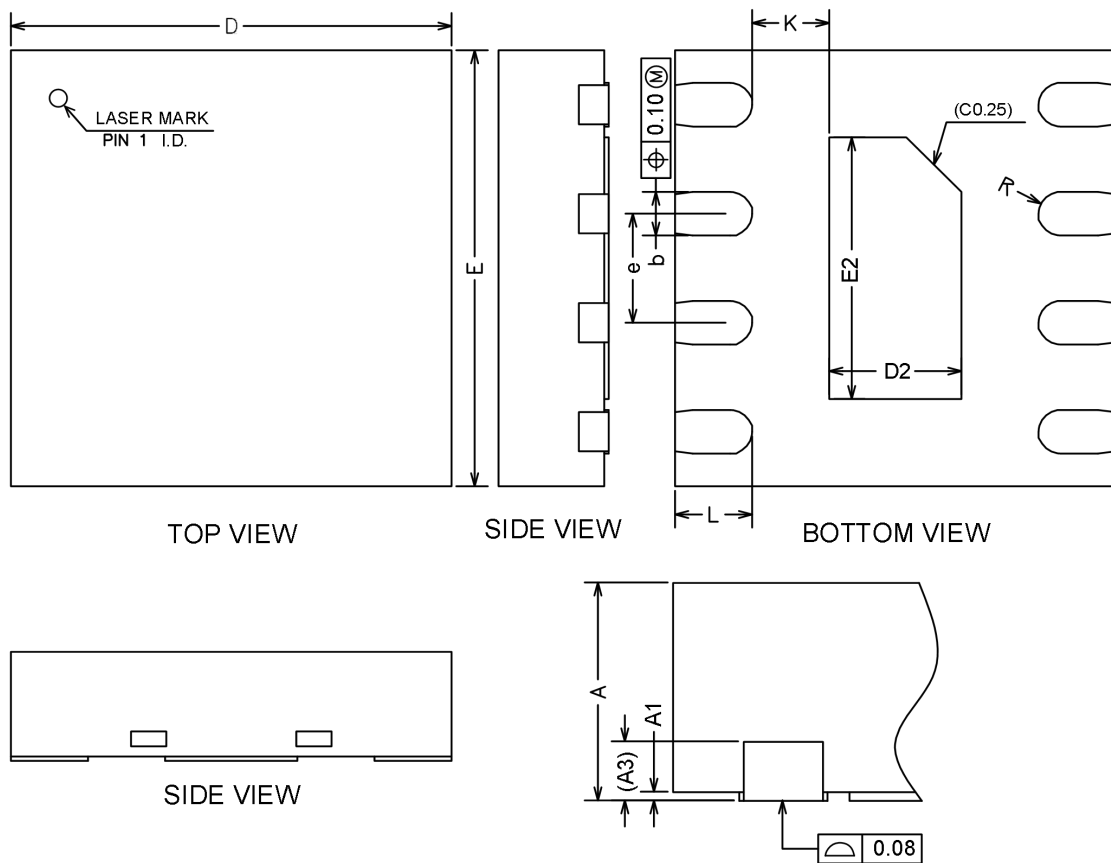
Common Dimensions (Units of measures = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.45
b1	0.35	0.38	0.41
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
K	0	-	0.25
L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

Physical Dimensions: MSOP-8


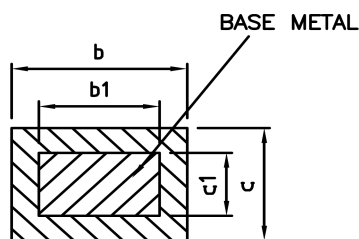
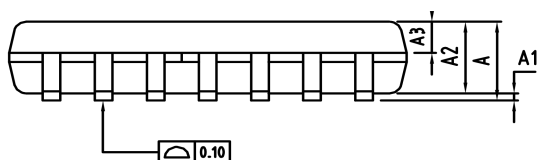
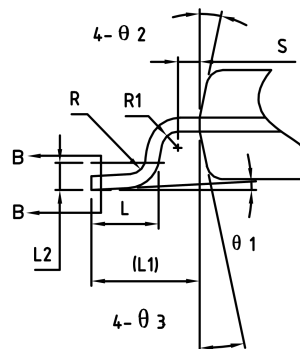
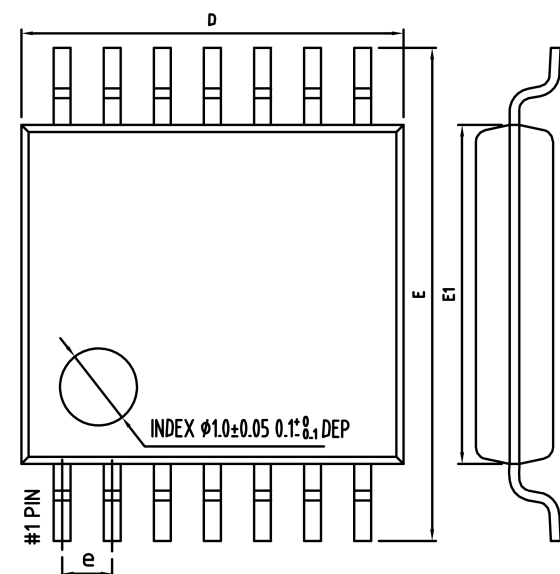
Common Dimensions (Units of measures = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.10
A1	0.05	0.10	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.25	-	0.38
b1	0.24	0.30	0.33
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.75	4.90	5.05
E1	2.90	3.00	3.10
e	0.55	0.65	0.75
L	0.40	0.55	0.70
L1	0.95 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ_1	9°	12°	15°

Physical Dimensions: SOIC-8


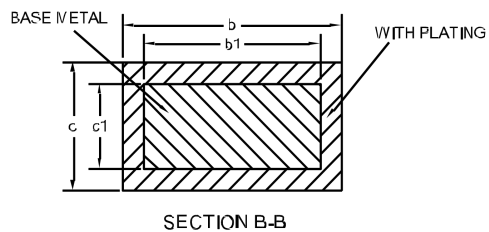
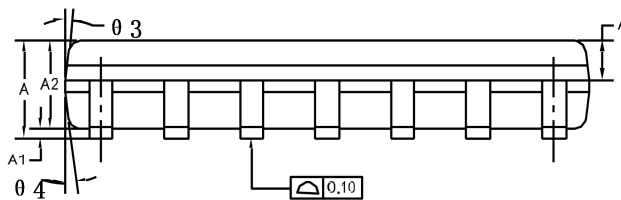
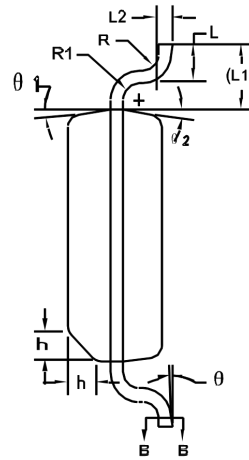
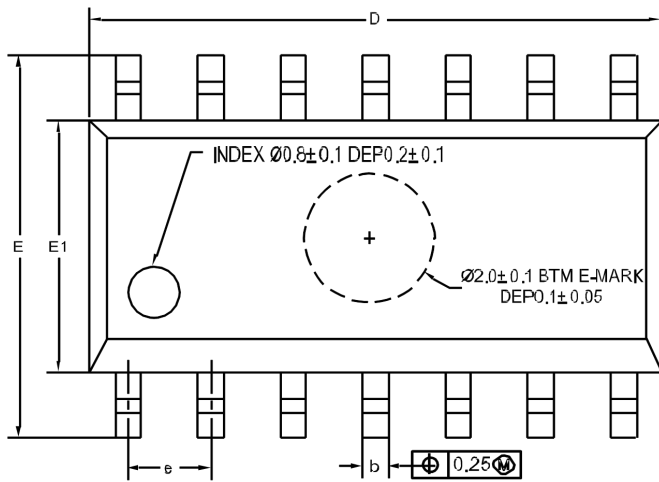
Common Dimensions (Units of measures = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.55	1.75
A1	0.10	-	0.25
A2	1.30	1.40	1.50
A3	0.50	0.60	0.70
b	0.38	-	0.47
b1	0.37	0.40	0.43
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
h	0.30	0.40	0.50
θ	0°	-	8°
$\theta 1$	15°	17°	19°
$\theta 2$	11°	13°	15°

Physical Dimensions: DFN2*2-8


Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.20 REF		
b	0.15	0.20	0.25
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.50	0.60	0.70
E2	1.10	1.20	1.30
e	0.40	0.50	0.60
K	0.20	-	-
L	0.30	0.35	0.40
R	0.09	-	-

Physical Dimensions: TSSOP-14

SECTION B-B

Common Dimensions (Units of measures = 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	-	-
$\theta 1$	0°	-	8°
$\theta 2$	10°	12°	14°
$\theta 3$	10°	12°	14°

Physical Dimensions: SOP-14


Common Dimensions (Units of measures = 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	8.45	8.65	8.85
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27 BSC		
h	0.25	-	0.50
L	0.45	0.60	0.80
L1	1.05 BSC		
θ	0°	-	8°



DIO3581/1A 3582 3584

1.4 MHz, 60 μ A, Rail-to-Rail I/O CMOS 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 phones, handheld products, laptops, medical equipment, and so on. Dioo's product families include analog signal processing and amplifying, LED drivers, and charger ICs. Go to <http://www.dioo.com> for a complete list of Dioo product families.

For additional product information or full datasheet, please contact our sales department or representatives.