

DIO32051/32051A/32052/32054

0.5 MHz, 24 μ A, 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 μ A 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

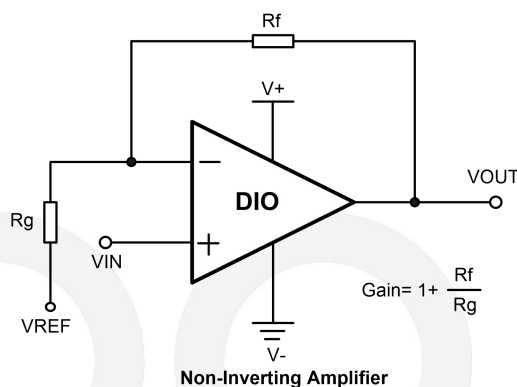
The DIO32051/32051A (single), DIO32052 (dual), DIO32054 (quad) are rail-to-rail CMOS operational amplifiers with an ultra-low offset. Features include wide input common-mode voltage range and broad output voltage swing with operating supply voltage from 2.1 V to 5.5 V. Products are fully specified over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

The DIO32051/32051A/32052/32054 series provides 0.5 MHz bandwidth and consumes an ultra-low current of 24 μ A 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

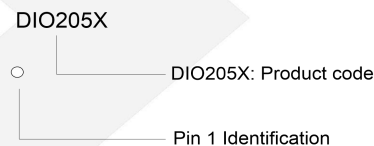
Typical Application



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

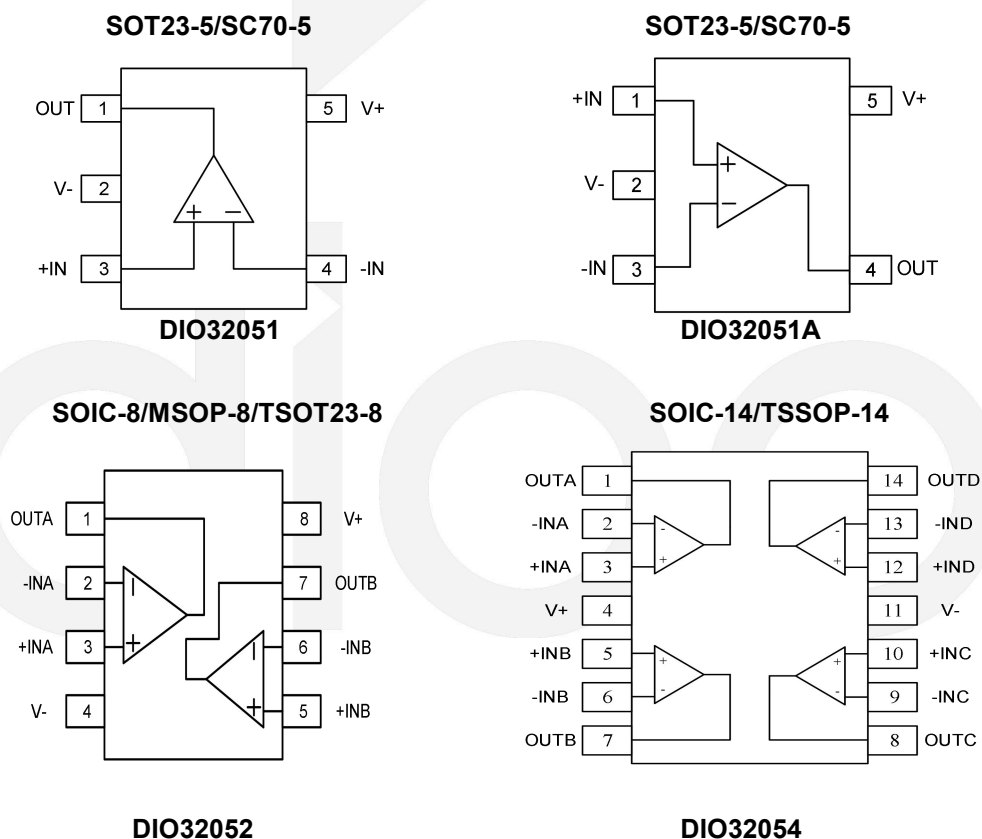


Figure 1. Pin Assignment

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

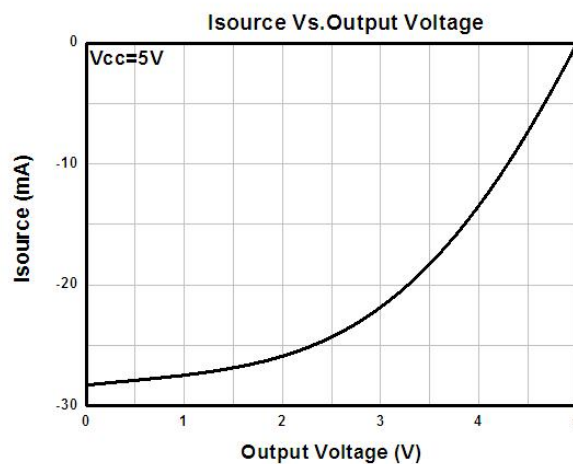
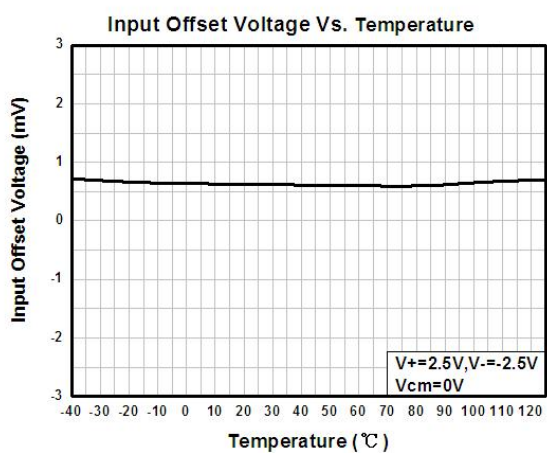
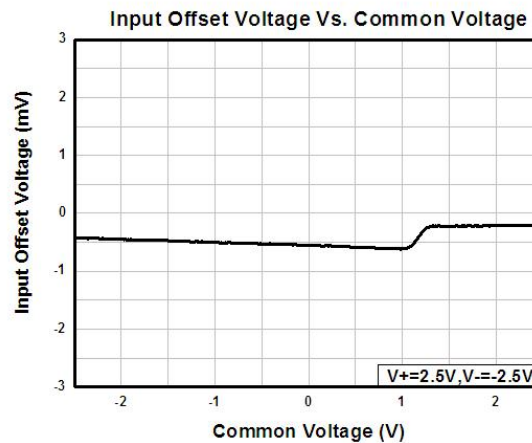
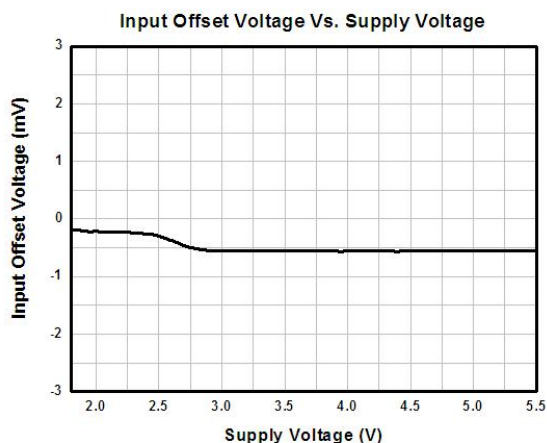
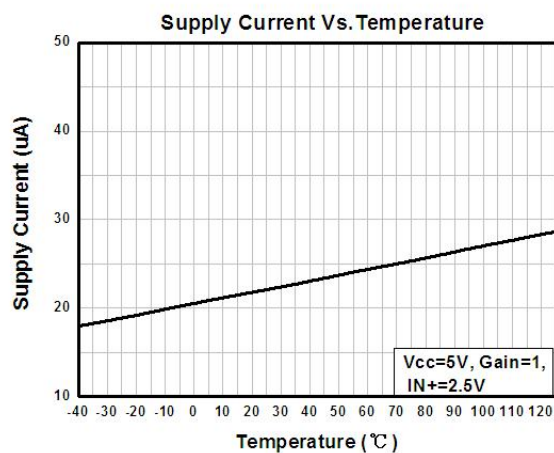
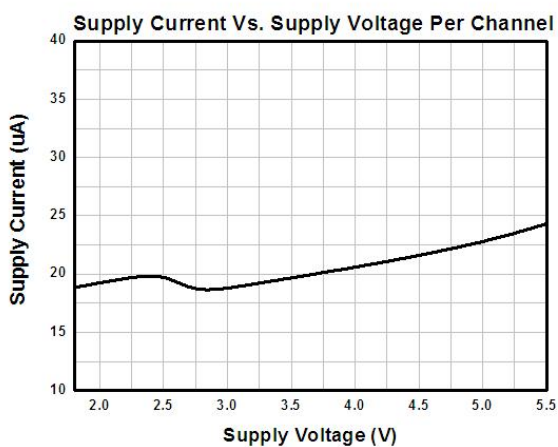
Typical value: $V_+ = 5$ V, $V_- = 0$ V, $R_L = 100$ k Ω to $V_+/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Input characteristics						
V _{OS}	Input offset voltage	-40°C ≤ T _A ≤ 125°C, V ₊ = 2.1 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.

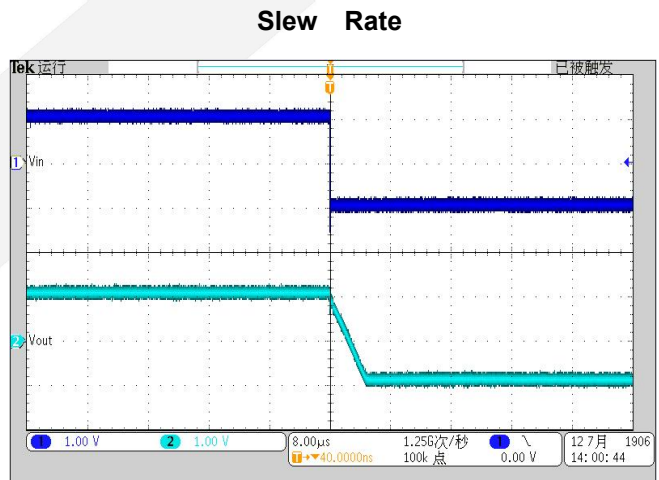
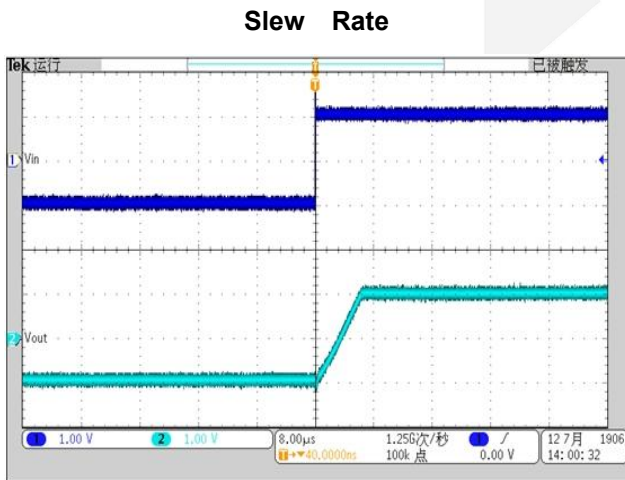
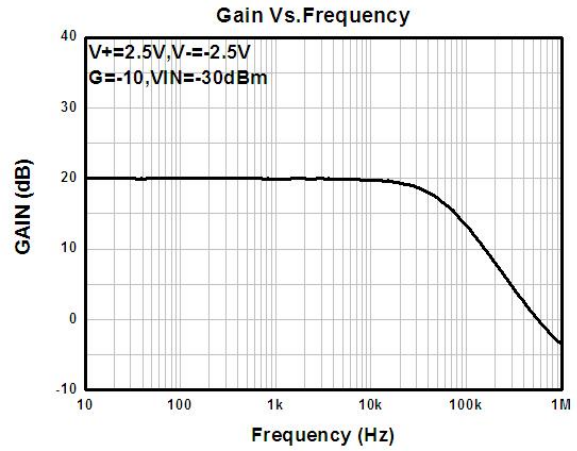
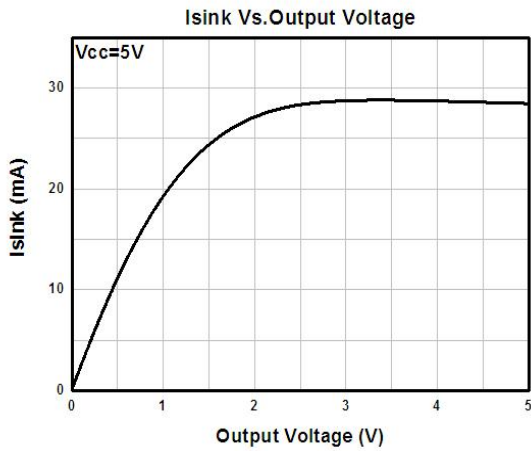
Typical Performance Characteristics

Typical value: $V_+ = 5$ V, $V_- = 0$ V, $R_L = 100$ k Ω to $V_+/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.



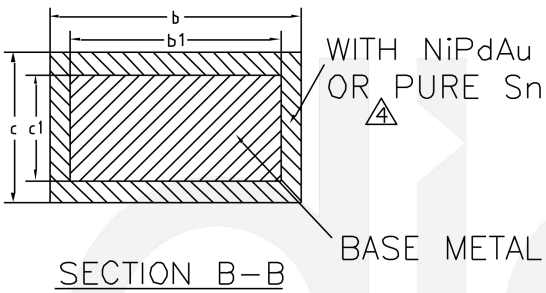
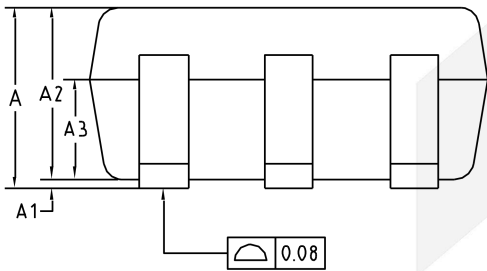
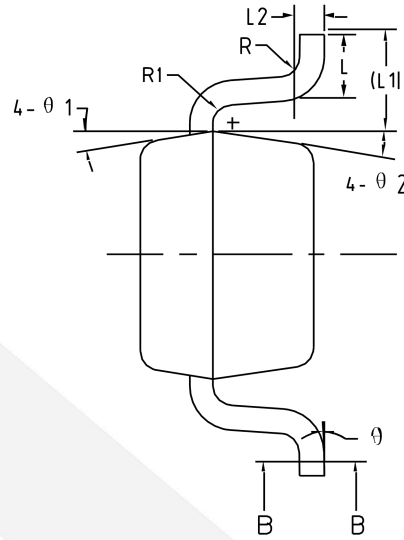
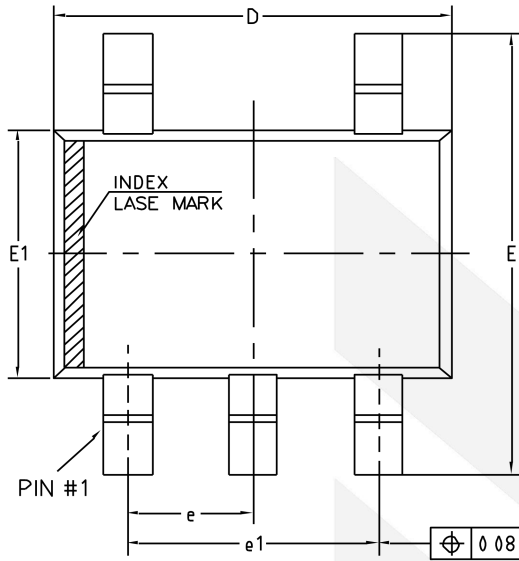
Typical Performance Characteristics

Typical value: $V_+ = 5\text{ V}$, $V_- = 0\text{ V}$, $R_L = 100\text{ k}\Omega$ to $V_+/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.



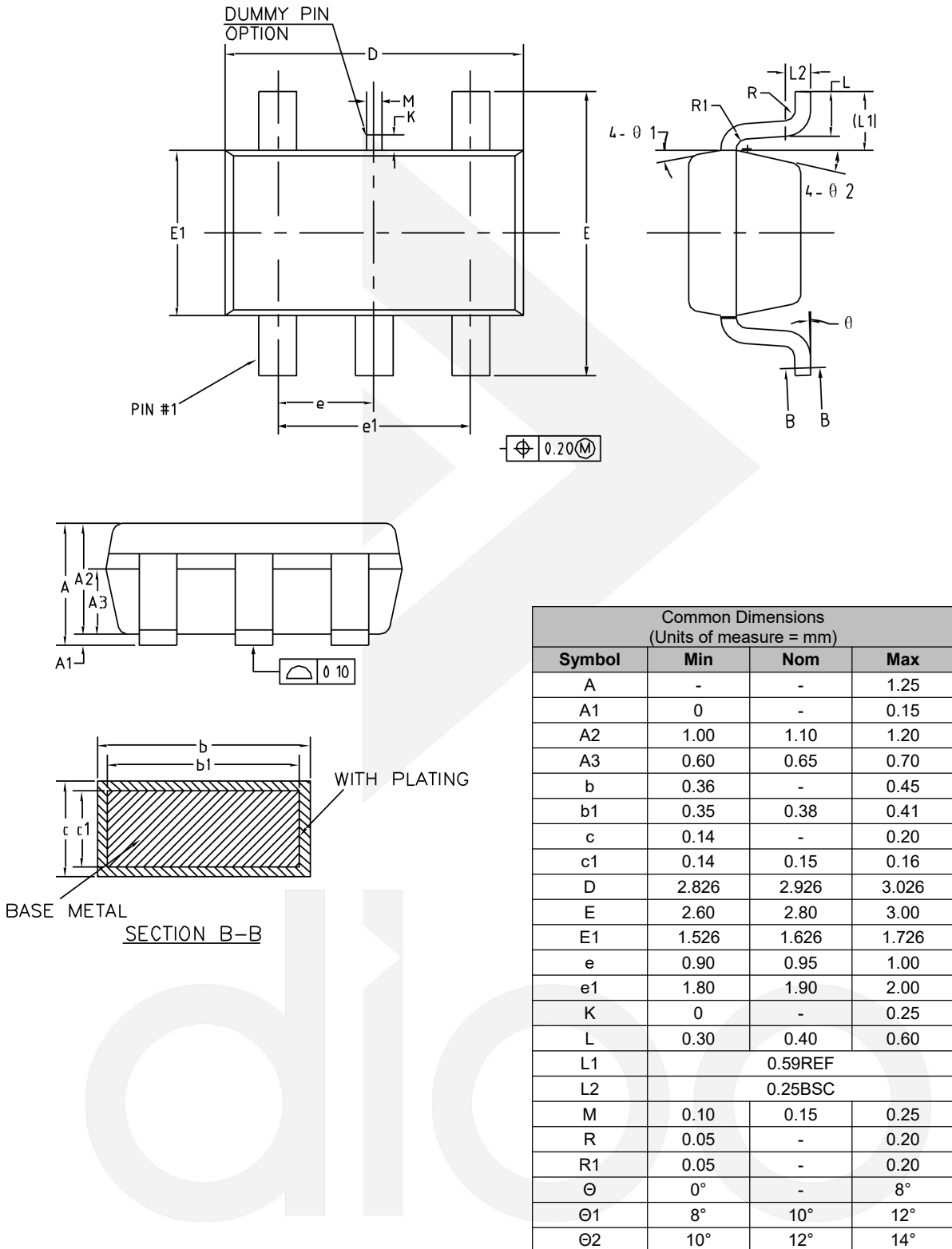
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Physical Dimensions: SC70-5

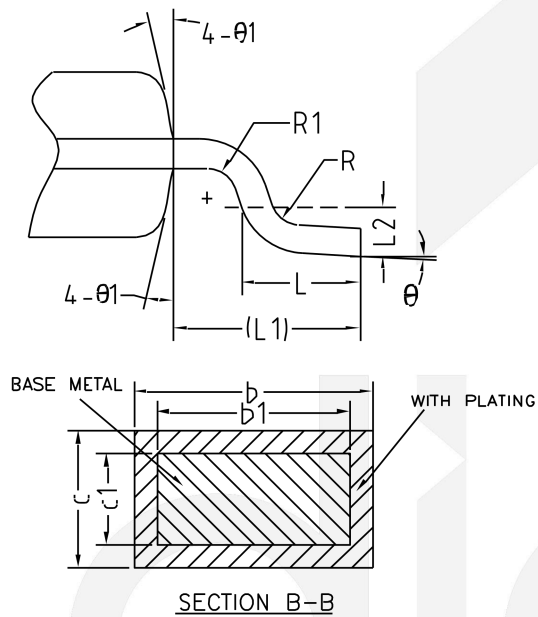
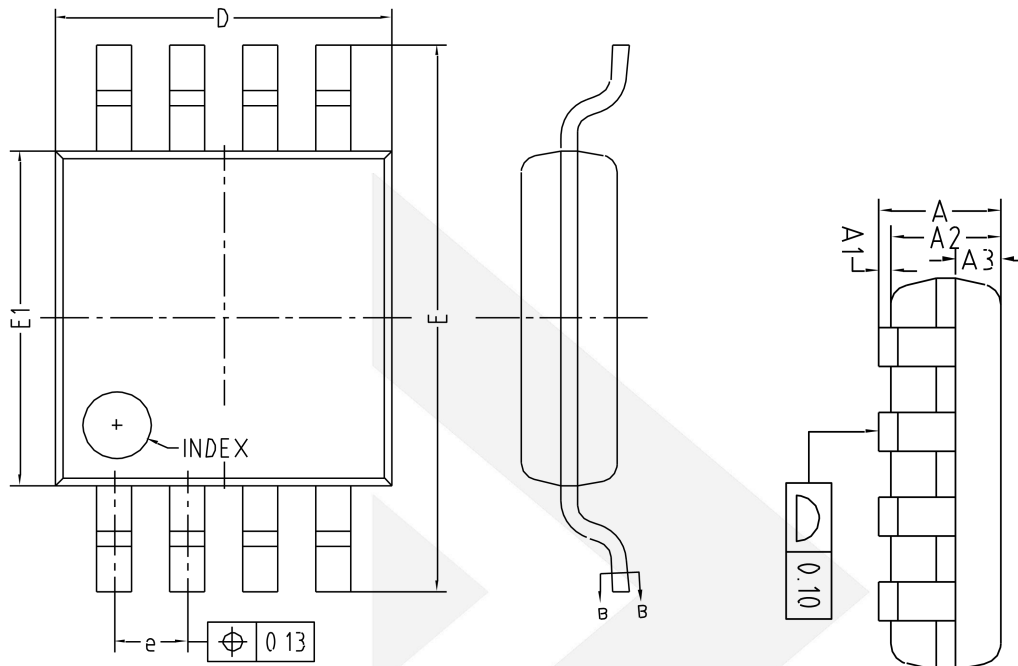


Common Dimensions (Units of measure = mm)			
Symbol	Min	Nom	Max
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.23	-	0.33
b1	0.22	0.25	0.28
c	0.12	-	0.18
c1	0.115	0.13	0.14
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.65BSC		
e1	1.30BSC		
L	0.28	0.33	0.38
L1	0.50REF		
L2	0.15BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
θ1	6°	9°	12°
θ2	6°	9°	12°

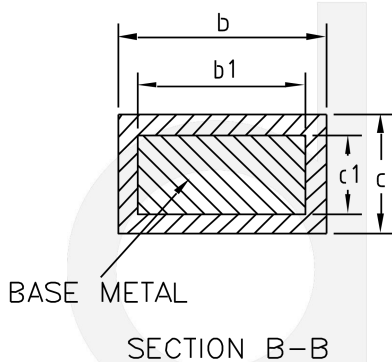
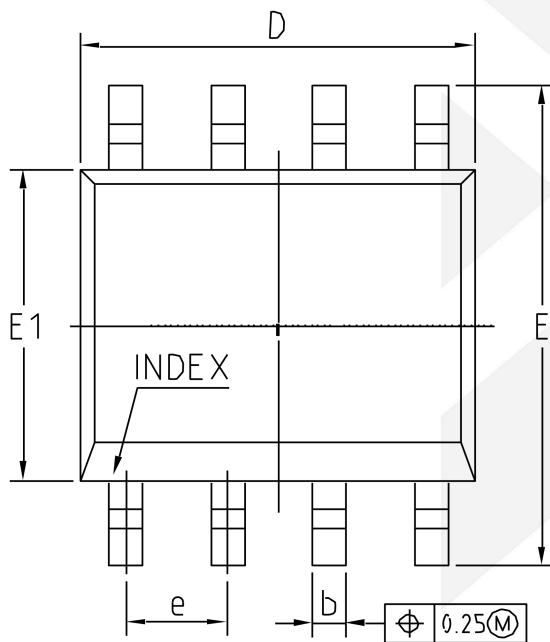
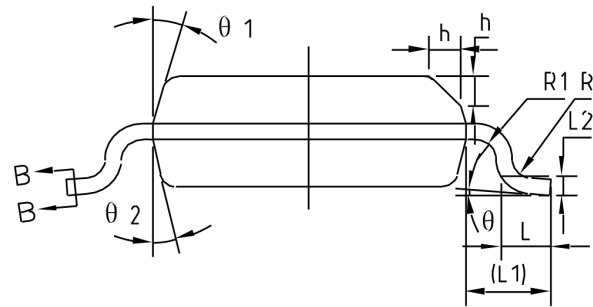
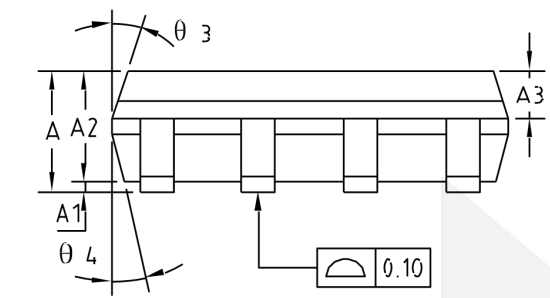
Physical Dimensions: SOT23-5



Physical Dimensions: MSOP-8

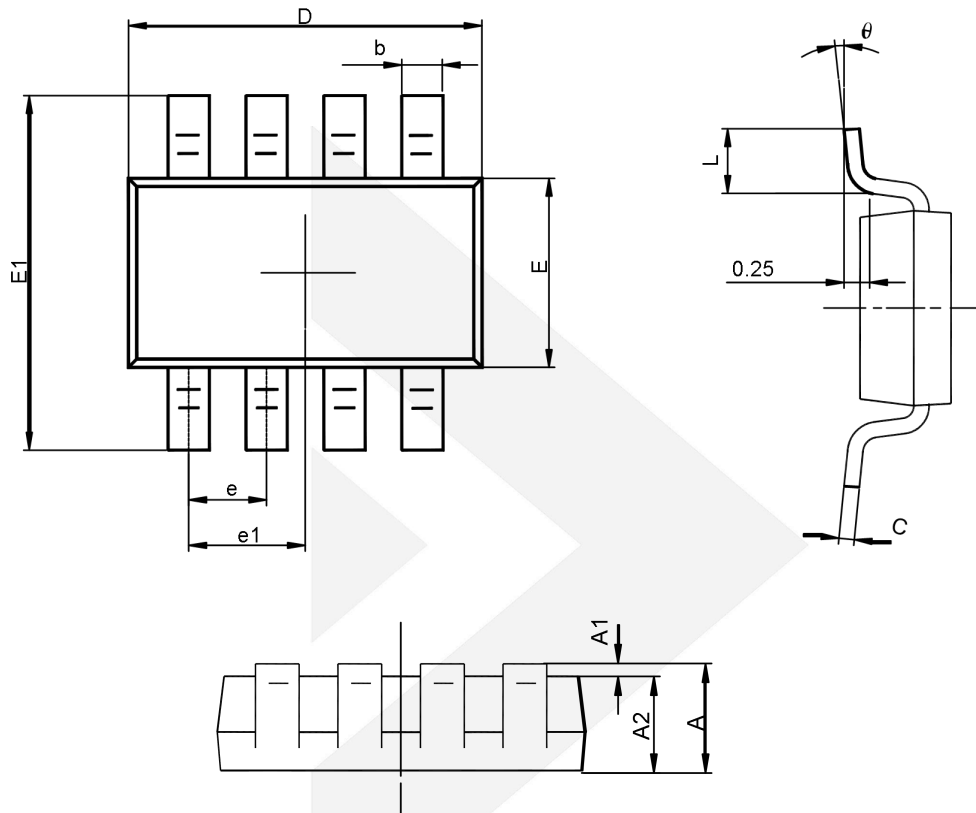


Common Dimensions (Units of measure = mm)			
Symbol	Min	Nom	Max
A	-	-	1.10
A1	0	-	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.28	-	0.37
b1	0.27	0.30	0.33
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.55	0.65	0.75
L	0.45	0.60	0.80
L1	0.95REF		
L2	0.25BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ1	9°	12°	15°

Physical Dimensions: SOIC-8


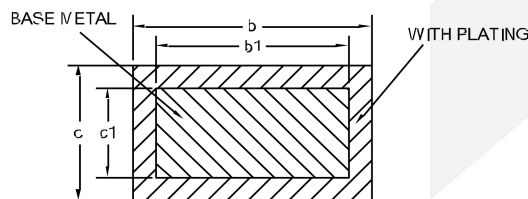
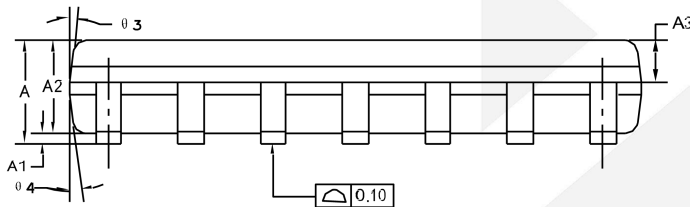
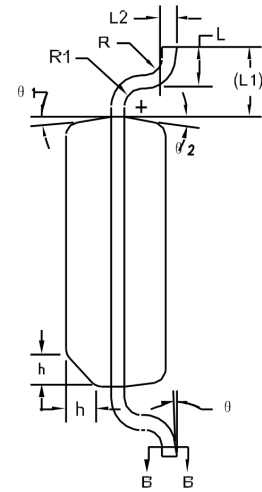
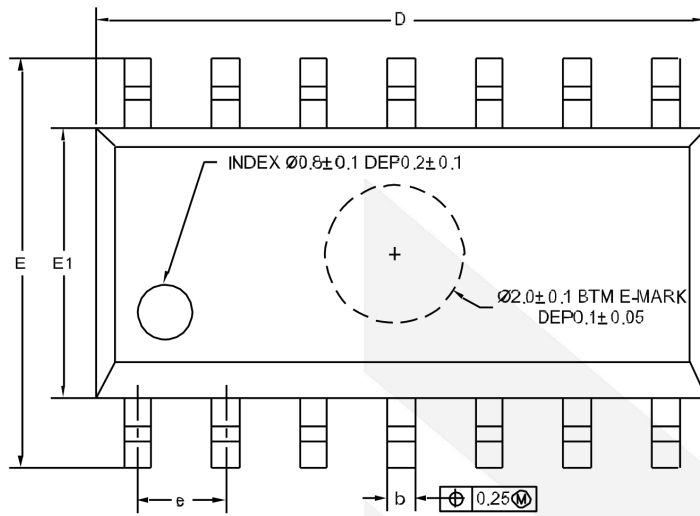
Common Dimensions (Units of measure = mm)			
Symbol	Min	Nom	Max
A	1.35	1.55	1.75
A1	0.10	0.15	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.45	0.60	0.80
L1	1.04REF		
L2	0.25BSC		
R	0.07	-	-
R1	0.07	-	-
h	0.30	0.40	0.50
θ	0°	-	8°
θ_1	15°	17°	19°
θ_2	11°	13°	15°
θ_3	15°	17°	19°
θ_4	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°

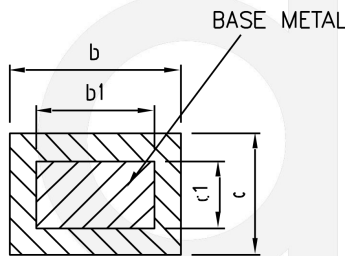
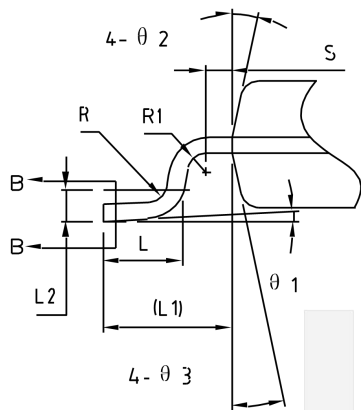
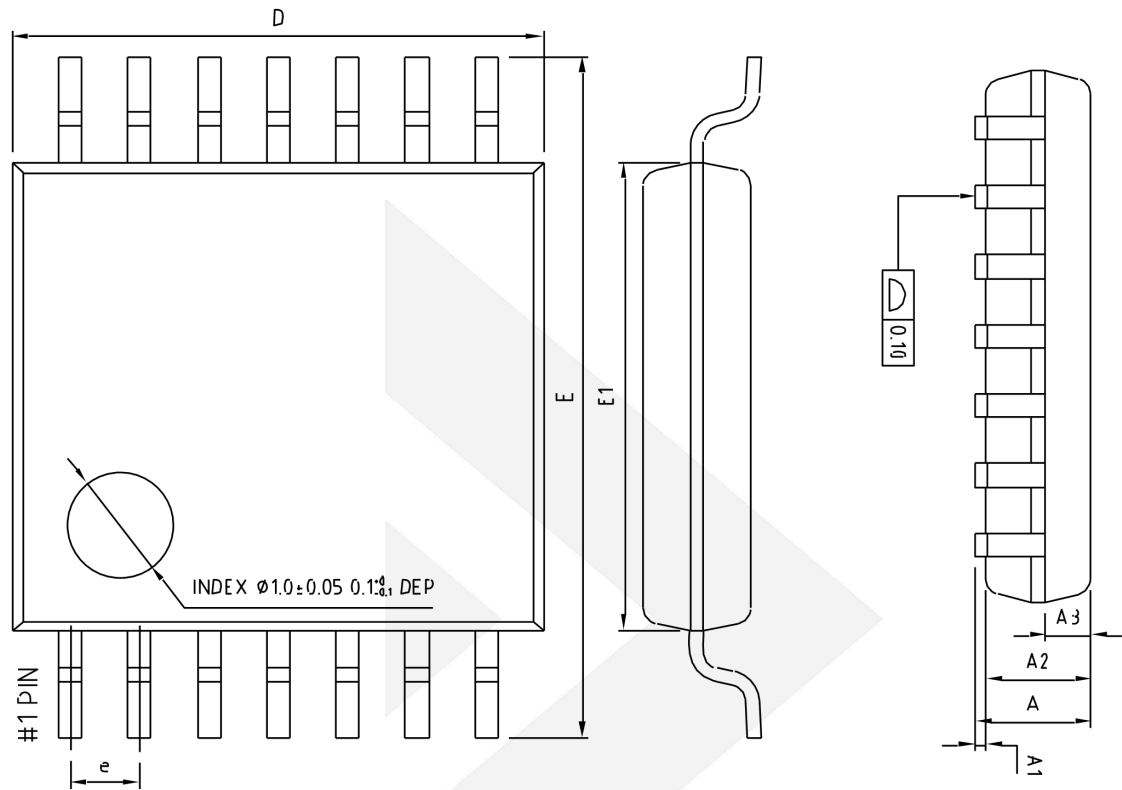
Physical Dimensions: SOIC-14



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
Ø	0°	-	8°
Ø1	6°	8°	10°
Ø2	6°	8°	10°
Ø3	5°	7°	9°
Ø4	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

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.

