

# DIO3166

## Low On-Resistance, Low THD Analog Switch

### Features

- 5.5V tolerant on control pin
- Voltage operation: 1.65V to 5.5V
- Low on resistance:  $1\Omega @ V_{CC}=4.2V$
- Excellent on resistance matching
- Low total harmonic distortion (THD)
- Low charge injection
- Low power consumption
- Green or rohs packaged: SC70-5, SOT23-5
- 1.5KV CDM ESD rating, 8kV HBM ESD

### Descriptions

The DIO3166 is a low power, single pole single throw analog switch, which is designed to operate from a single 1.65V to 5.5V supply.

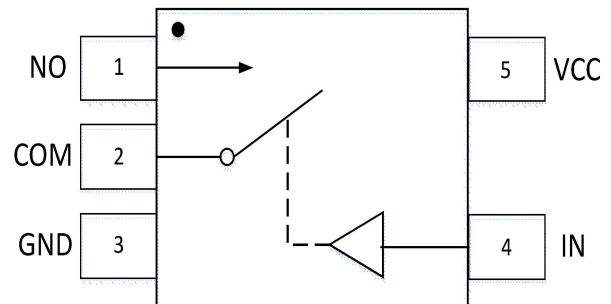
DIO3166 has low on resistance, excellent on resistance matching and very low total harmonic distortion performance to prevent signal distortion during signals transferring. All these features make DIO3166 suitable for portable audio applications.

DIO3166 is available in two type package: SC70-5, SOT23-5.

### Applications

- Cell phones
- PDAs and MP3s
- Portable instrumentation
- Battery powered communications
- Computer peripherals

### Block Diagram



### Ordering Information

Order Part Number	Top Marking		T <sub>A</sub>	Package	
DIO3166SC5	W316	Green or RoHS	-40 to +85 °C	SC70-5	Tape & Reel, 3000
DIO3166ST5	W316	Green or RoHS	-40 to +85 °C	SOT23-5	Tape & Reel, 3000

## Pin Assignment

SOT23-5/SC70-5

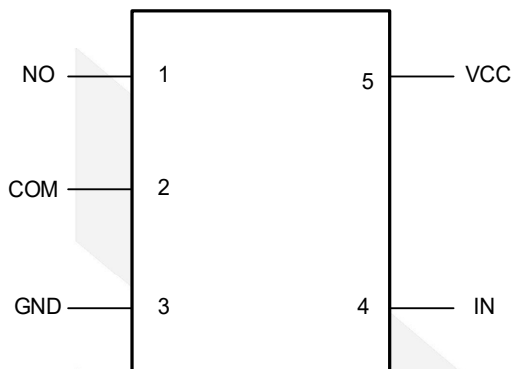


Figure 1. Top View

## Pin Descriptions

Pin Name	Description
NO	Normally open
GND	Ground
COM	Common
VCC	Power supply
IN	Control

## Truth Table

IN	COM to NO
L	OFF
H	ON



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## 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.

Parameter		Min.	Max.	Unit
Supply voltage( $V_{CC}$ )		-0.5	6.5	V
DC switch voltage( $V_{SW}$ )		-0.5	$V_{CC}+0.5$	V
DC control voltage( $V_{IN}$ )		-0.5	6.5	V
On-state switch current ( $I_{SW}$ )		-300	300	mA
On-state peak switch current ( $I_{SW}$ )		-400	400	
Continuous current through GND		-100	100	mA
Storage temperature range ( $T_{STG}$ )		-65	150	°C
SC70-5 Package ( $\theta_{JA}$ )			259	°C/W
SOT23-5 Package ( $\theta_{JA}$ )			165	
ESD	HBM, JEDEC:JESD22-A114		8	kV
	CDM, JEDEC: JESD22-C101		1.5	

## Recommend 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.

Parameter	Min.	Max.	Unit
Supply voltage ( $V_{CC}$ )	1.65	5.5	V
Control input voltage ( $V_{IN}$ )	0	5.5	V
Switch input voltage ( $V_{SW}, V_{COM}$ )	0	$V_{CC}$	V
Operating temperature ( $T_A$ )	-40	85	°C



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## Electrical Characteristics

All typical value are at  $V_{CC}=4.2V$ ;  $T_A = 25^{\circ}C$ , unless otherwise specified.

Symbol	Parameter	Conditions	Temp.	Min	Typ	Max	Unit
$V_{IH}$	Input voltage high		-40 to 85°C	1.65			V
$V_{IL}$	Input voltage low		-40 to 85°C			0.6	V
$I_{IN}$	Control input leakage	$V_{IN}=4.2V$ or $0V$ , $V_{CC}=4.2V$	25°C	-2		2	nA
			-40 to 85°C	-100		100	
$I_{NO(OFF)}$	NO, COM off leakage current See Figure 3	$V_{SW}=0.3V, 3.3V$ , $V_{COM}=3.3V, 0.3V, V_{CC}=4.2V$	25°C	-20	2	20	nA
			-40 to 85°C	-100		100	
$I_{NO(PW OFF)}$ $I_{COM(PW OFF)}$		$V_{SW}=0V$ to $4.2V$ , $V_{COM}=4.2V$ to $0V$ ; $V_{CC}=0V$	25°C	-1	0.2	1	nA
			-40 to 85°C	-20		20	
$I_{COM(ON)}$	COM on leakage current	$V_{COM}=0.3V, 3.3V, V_{SW}=0.3V, 3.3V$ , or floating, $V_{CC}=4.2V$	25°C	-20	2	20	nA
			-40 to 85°C	-100		100	
$I_{CC}$	Quiescent supply current	$V_{CC}=4.2V, V_{IN}=V_{CC}$ or GND, Switch ON or OFF	25°C		10	50	nA
			-40 to 85°C			500	
$R_{ON}$	Switch on resistance See Figure 2	$V_{CC}=4.2V, V_{SW}=1V, I_{SW}=-100mA$	25°C		1	1.5	$\Omega$
			-40 to 85°C			2.0	
$\Delta R_{ON}$	On resistance matching between channels	$V_{CC}=4.2V, V_{SW}=1V, I_{SW}=-100mA$	25°C		0.05	0.2	$\Omega$
			-40 to 85°C			0.3	
$R_{FLT(ON)}$	On resistance flatness	$V_{CC}=4.2V, V_{SWC}=1V, 3.5V$ , $I_{SW}=-100mA$	-40 to 85°C		0.8	1.2	$\Omega$
$T_{ON}$	Turn-On Time See Figure 6	$V_{SW}=1.5V$ or $0V, R_L = 50\Omega$ , $C_L = 35pF$ , See Figure 6	25°C			70	ns
$T_{OFF}$	Turn-Off Time See Figure 6	$V_{SW}=1.5V$ or $0V, R_L = 50\Omega$ , $C_L = 35pF$ , See Figure 6	25°C			10	ns
$T_{BBM}$	Break before make time	$V_{SW}=V_{CC}, R_L = 50\Omega, C_L = 35pF$	25°C			60	ns
OIRR	Off Isolation	$R_L = 50\Omega, Signal=0dBm, f=1MHz$	25°C		-55		dB
BW	-3dB bandwidth See Figure 5	$R_L = 50\Omega, Signal=0dBm$ , See Figure 5	25°C		100		MHz
THD	Total harmonic distortion	$R_L = 600\Omega, C_L=50pF$ , $f=20Hz$ to $20kHz$ , See Figure 5	25°C		0.004		%
$C_{IN}$	Control pin input capacitance	$V_{IN}=V_{CC}$ or $0V$	25°C		1.5		pF
$C_{OFF}$	OFF capacitance See Figure 4	Switch Off, $V_{SW}=V_{CC}$ or $0V$ See Figure 4	25°C		22		pF
$C_{ON}$	On capacitance See Figure 4	Switch On, $V_{COM}=V_{CC}$ or $0V$ See Figure 4	25°C		49		pF



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## Electrical Characteristics

All typical value are at  $V_{CC}=2.7V$  to  $3.6V$ ;  $T_A = 25^\circ C$ , unless otherwise specified.

Symbol	Parameter	Conditions	Temp.	Min	Typ	Max.	Unit
$V_{IH}$	Input voltage high		-40 to $85^\circ C$	1.65			V
$V_{IL}$	Input voltage low		-40 to $85^\circ C$			0.6	V
$I_{IN}$	Control input leakage	$V_{IN}=2.7V$ or $0V$ , $V_{CC}=2.7V$	$25^\circ C$	-2		2	nA
			-40 to $85^\circ C$	-100		100	
$I_{NO(OFF)}$	NO, COM off leakage current	$V_{SW}=0.3V, 3.3V$ ; $V_{COM}=3.3$ to $0.3V$ $V_{CC}=3.6V$	$25^\circ C$	-20	2	20	nA
			-40 to $85^\circ C$	-50		50	
$I_{NO(PWOFF)}$	See Figure 3	$V_{SW}=0V$ to $3.3V$ , $V_{COM}=3.3V$ to $0V$ ; $V_{CC}=0V$	$25^\circ C$	-1	0.2	1	nA
$I_{COM(PWOFF)}$			-40 to $85^\circ C$	-15		15	
$I_{COM(ON)}$	COM on leakage current	$V_{COM}=0.3V, 3.3V$ , $V_{SW}=0.3V, 3.3V$ , or floating, $V_{CC}=3.6V$	$25^\circ C$	-10	2	10	nA
			-40 to $85^\circ C$	-20		20	
$I_{CC}$	Quiescent supply current	$V_{CC}=3.6V, V_{IN}=V_{CC}$ or GND, Switch ON or OFF	$25^\circ C$		10	25	nA
			-40 to $85^\circ C$			100	
$R_{ON}$	Switch on Resistance See Figure 2	$V_{CC}=2.7V, V_{SW}=1.0V, I_{SW}=-100mA$	$25^\circ C$		1.5	2.2	$\Omega$
			-40 to $85^\circ C$			2.6	
$\Delta R_{ON}$	On resistance matching between channels	$V_{CC}=2.7V, V_{SW}=1.0V, I_{SW}=-100mA$	$25^\circ C$		0.1	0.3	$\Omega$
			-40 to $85^\circ C$			0.5	
$R_{FLT(ON)}$	On resistance flatness	$V_{CC}=2.7V, V_{SW}=1V, 2V, I_{SW}=-100mA$	-40 to $85^\circ C$		0.9	1.5	$\Omega$
$T_{ON}$	Turn-On Time See Figure 6	$V_{SW}=1.5V$ or $0V, R_L = 50\Omega, C_L = 35pF$ See Figure 6	$25^\circ C$			70	ns
$T_{OFF}$	Turn-Off Time See Figure 6	$V_{SW}=1.5V$ or $0V, R_L = 50\Omega, C_L = 35pF$ See Figure 6	$25^\circ C$			10	ns
$T_{BBM}$	Break before make time	$V_{SW}=V_{CC}, R_L = 50\Omega, C_L = 35pF$	$25^\circ C$			60	ns
OIRR	Off Isolation	$R_L = 50\Omega, \text{Signal}=0dBm, f=1MHz$	$25^\circ C$		-55		dB
BW	-3dB bandwidth See Figure 5	$R_L = 50\Omega, \text{Signal}=0dBm$ , See Figure 5	$25^\circ C$		100		MHz
THD	Total harmonic distortion	$R_L = 600\Omega, C_L=50pF$ , $f=20Hz$ to $20kHz$ See Figure 5	$25^\circ C$		0.01		%
$C_{IN}$	Control pin input capacitance	$V_{IN}=V_{CC}$ or $0V$	$25^\circ C$		1.5		pF
$C_{OFF}$	OFF capacitance See Figure 4	Switch Off, $V_{SW}=V_{CC}$ or $0V$ See Figure 4	$25^\circ C$		22		pF
$C_{ON}$	On capacitance See Figure 4	Switch On, $V_{COM}=V_{CC}$ or $0V$ See Figure 4	$25^\circ C$		49		pF

Test Diagrams

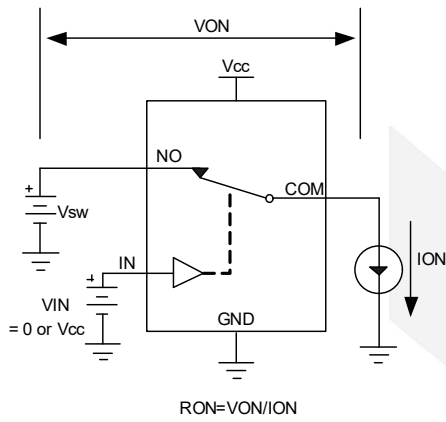


Figure 2. Switch on resistor

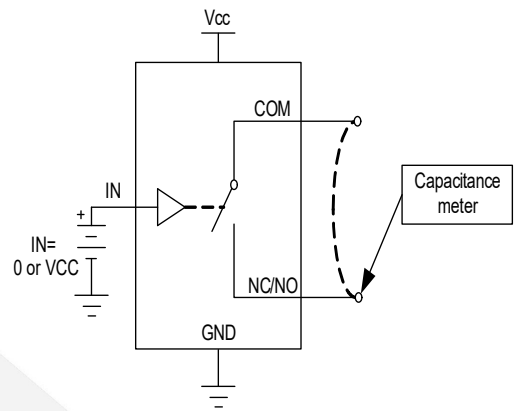


Figure 3. On/off Capacitance test

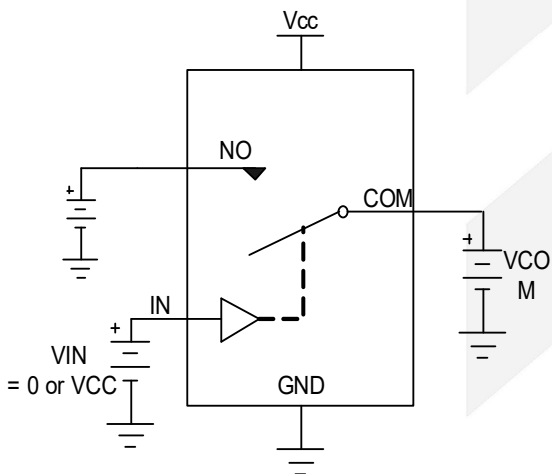


Figure 4. Switch Off Leakage

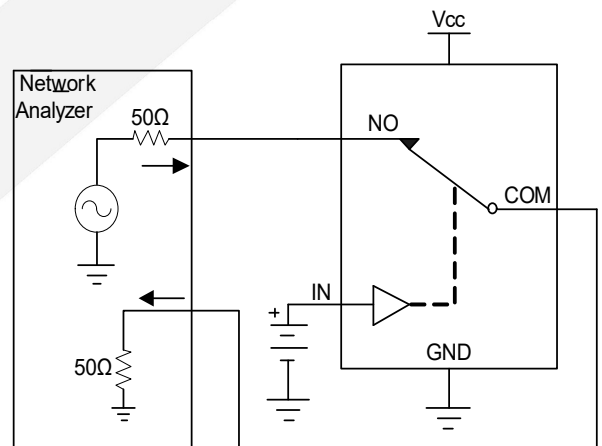


Figure 5. Bandwidth

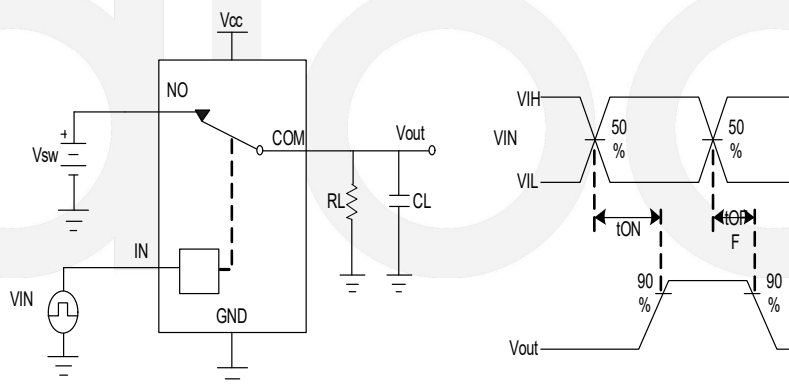
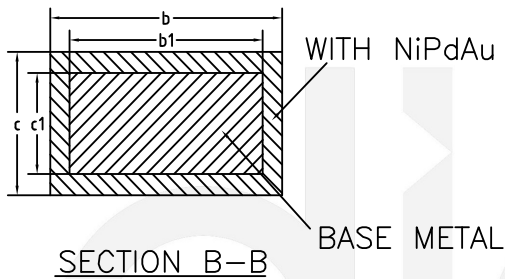
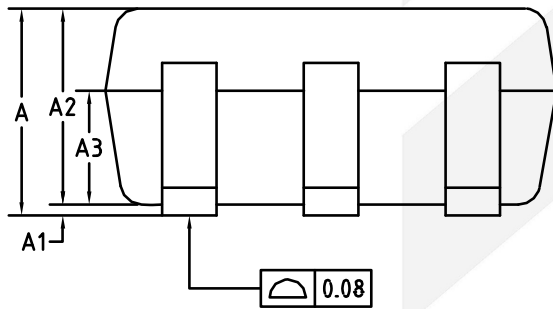
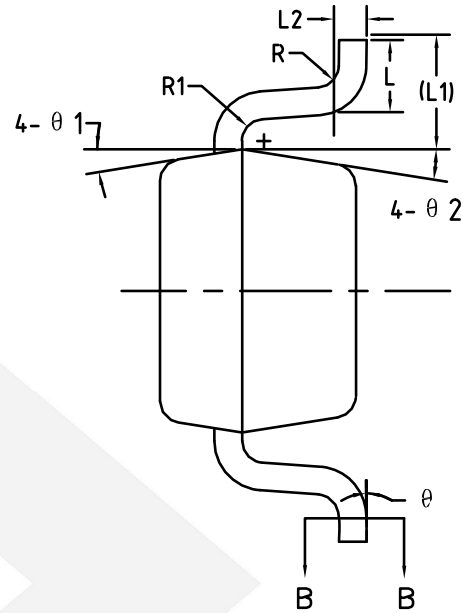
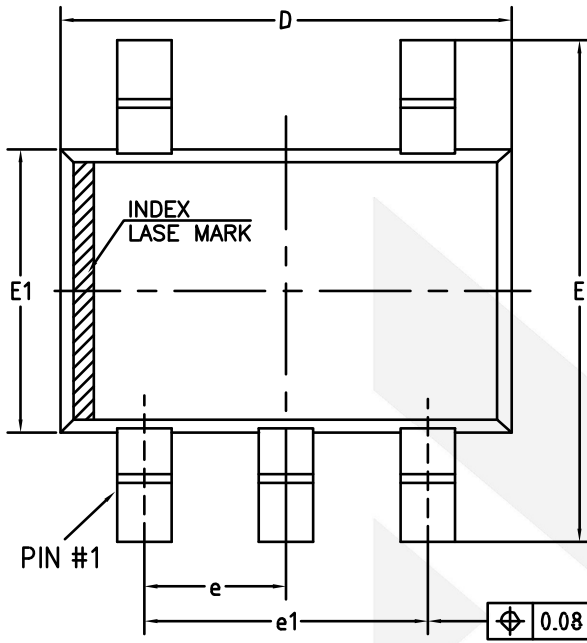


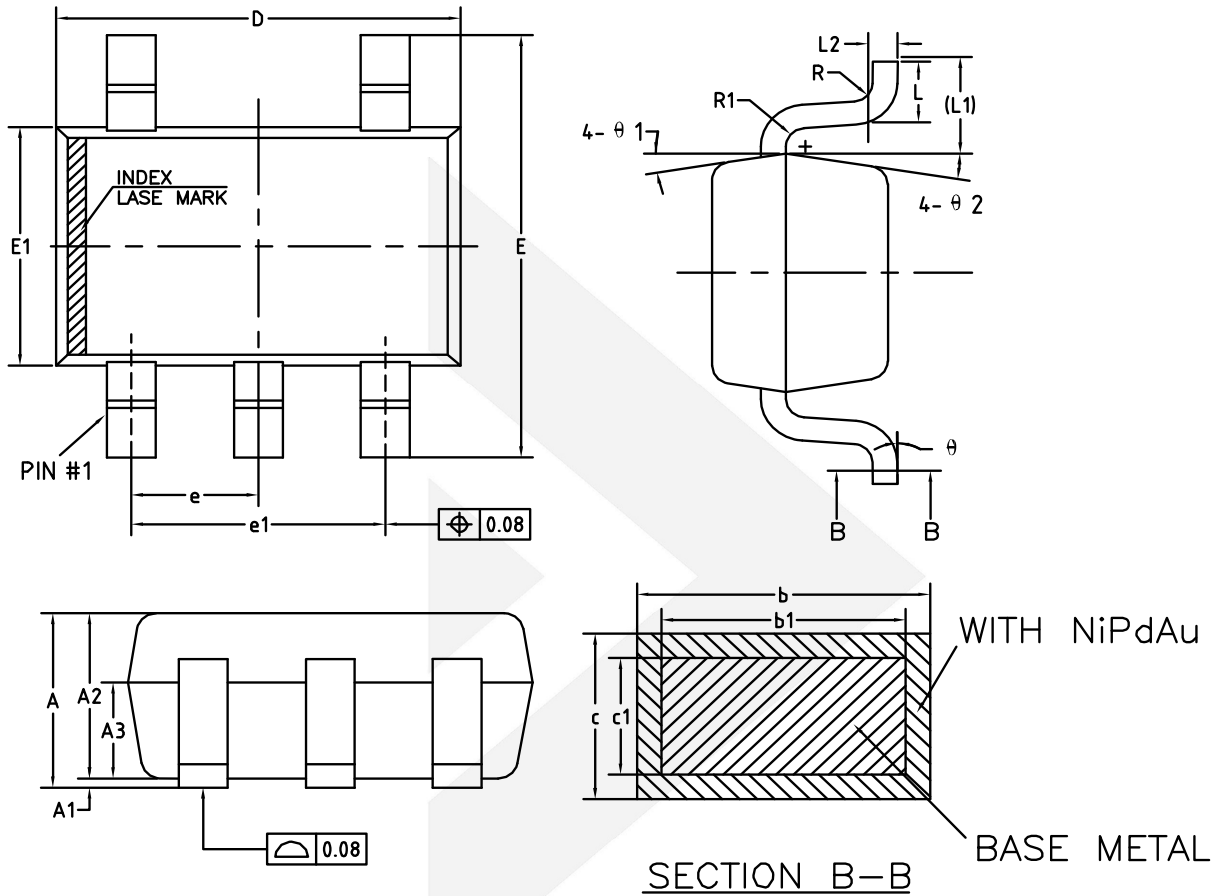
Figure 6. Turn-On/Turn-Off

## Physical Dimensions: SOT-23-5



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	-	0.50
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	0.59REF		
L2	0.25BSC		
R	0.10	-	-
R1	0.10	-	0.25
$\theta$	0°	-	8°
$\theta 1$	3°	5°	7°
$\theta 2$	6°	-	14°

## Physical Dimensions: SC70-5

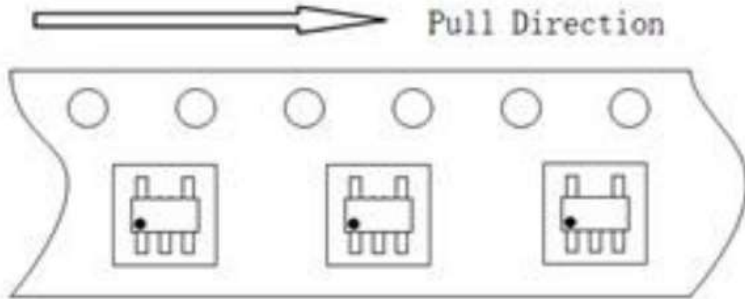


COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	MIN	NOM	MAX
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.22	-	0.29
b1	0.22	0.25	0.28
c	0.115	-	0.15
c1	0.115	0.13	0.14
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.65BSC		
e1	1.30BSC		
L	0.28	0.33	0.38
L1	0.50REF		
L2	0.15BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
θ1	6°	9°	12°
θ2	6°	9°	12°

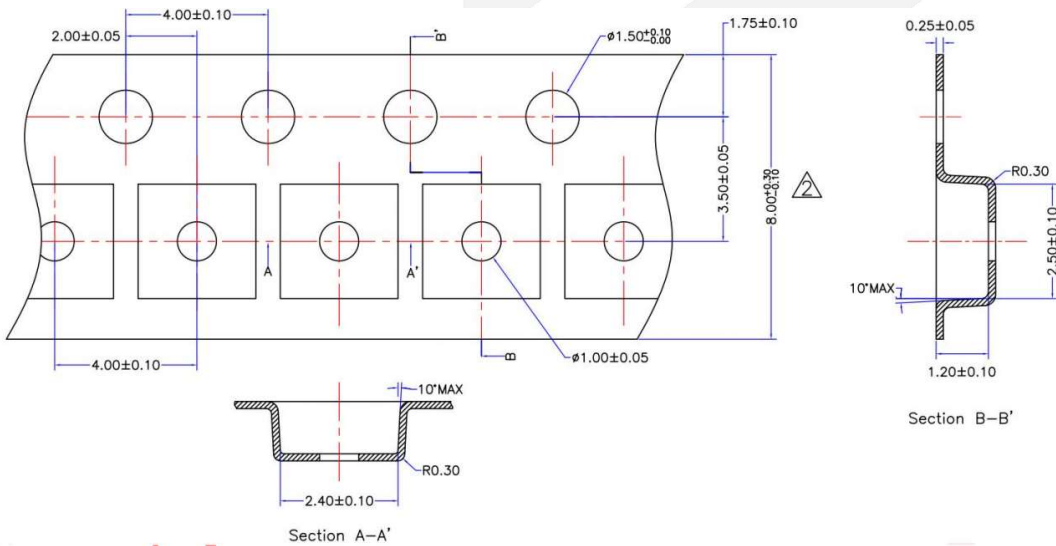


### Package Information: SC70-5

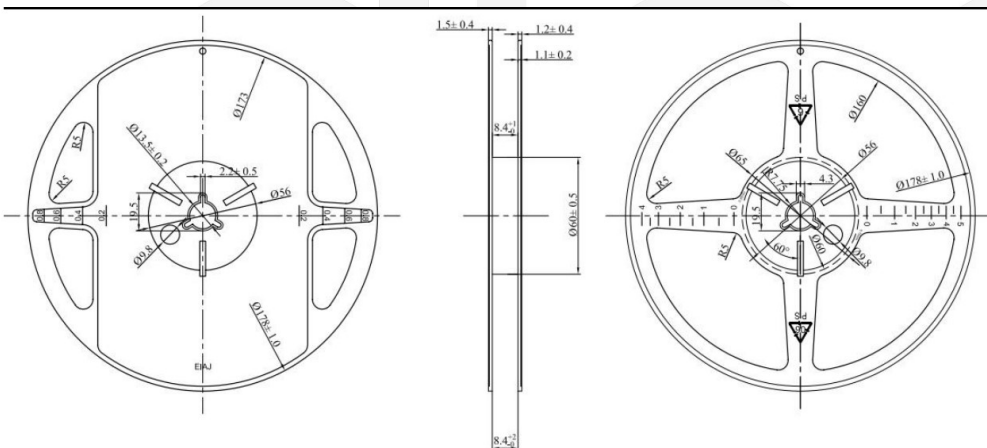
#### PIN1 ORIENTATION IN TAPE



#### TAPE DIMENSIONS (Unit in mm)



#### REEL DIMENSIONS (Unit in mm)





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Low On-Resistance, Low THD Analog Switch

## PACKAGING SPECIFICATIONS

PKG	Pcs / reel	Reel / box	Pcs / box	Box / carton	Pcs /carton
SC70-5	3000	4	12000	12	144000



## 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.

