DIO1713

CMOS Low Voltage, 4 Ω Quad, SPST Switches

Features

- 1.8 V to 5.5 V single supply
- Low on resistance (2.5 Ω Typ)
- Low on resistance flatness
- -3 dB bandwidth > 200 MHz
- Rail-to-rail operation
- 16-lead TSSOP and SOIC packages
- Fast switching times:
  t_{ON} = 16 ns, t_{OFF} = 10 ns
- Typical power consumption (<0.01 μW)
- TTL/CMOS compatible
- Qualified for automotive applications

Descriptions

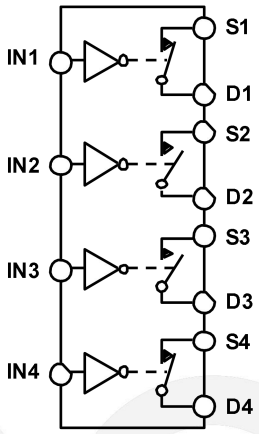
The DIO1713 is a monolithic CMOS device containing four independently selectable switches. The switch is designed on an advanced sub-micron process that provide low power dissipation yet give high switching speed, low on resistance, low leakage currents, and high bandwidth.

They are designed to operate from a single 1.8 V to 5.5 V supply, making them ideal for use in battery-powered instruments. Fast switching times and high bandwidth make the parts suitable for switching USB 1.1 data signals and video signals.

Applications

- USB 1.1 signal switching circuits
- Cell phones
- PDAs
- Battery-powered systems
- Communication systems
- Sample hold systems
- Audio signal routing
- Video switching
- Mechanical reed relay replacement

Block Diagram



Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO1713SO16	DIO1713	Green	-40 to +105°C	SOIC-16	Tape & Reel, 2500
DIO1713TP16	DIO1713	Green	-40 to +105°C	TSSOP-16	Tape & Reel, 2500

Pin Assignment

SOIC-16/TSSOP-16

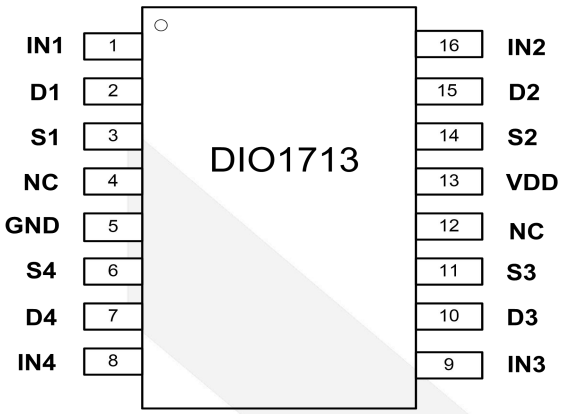


Figure 1. Top View

Pin Descriptions

Pin Name	Description
IN1	Digital Control Input. Its logic state controls the status of the Switch S1-D1.
D1	Drain Pin. Can be used as input or output.
S1	Source Pin. Can be used as input or output.
NC	Not internally connected.
GND	The most negative power supply pin.
S4	Source Pin. Can be used as input or output.
D4	Drain Pin. Can be used as input or output.
IN4	Digital Control Input. Its logic state controls the status of the Switch S4-D4.
IN3	Digital Control Input. Its logic state controls the status of the Switch S3-D3.
D3	Drain Pin. Can be used as input or output.
S3	Source Pin. Can be used as input or output.
NC	Not internally connected.
VDD	The most positive power supply pin.
S2	Source Pin. Can be used as input or output.
D2	Drain Pin. Can be used as input or output.
IN2	Digital Control Input. Its logic state controls the status of the Switch S2-D2.

Truth Table

Logic	Switch 1,4	Switch 2,3
0	Off	On
1	On	Off

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			Rating	Unit
VDD to GND			-0.3 to +6	V
Analog, Digital Inputs			-0.3 to V_{DD}+0.3 Or 30mA, whichever occurs first	V
Continuous Current, S or D			30	mA
Peak Current, S or D			100	mA
Operating Temperature Range			-40 to +105	°C
Storage Temperature Range			-65 to +150	°C
Junction Temperature			150	°C
Power Dissipation	TSSOP-16		430	mW
Thermal Impedance	TSSOP-16	Θ_{JA}	150	°C/W
		Θ_{JC}	27	°C/W
Power Dissipation	SOIC-16		520	mW
Thermal Impedance	SOIC-16	Θ_{JA}	125	°C/W
		Θ_{JC}	42	°C/W
ESD	HBM		7.5	kV

Electrical Characteristics

V_{DD} = +5 V ± 10%, GND = 0 V. All typical value is at -40°C to 105°C, unless otherwise specified.

Parameter	Conditions	Temp. (°C)	Min	Typ	Max	Unit
Analog Switch						
Analog Signal Range		-40 to +105	0		V_{DD}	V
On Resistance (R_{ON})	V_S = 0 V to V_{DD}, I_S = -10 mA	25		2.5	4	Ω
		-40 to +105			4.5	
On Resistance Match Between Channels ($\triangle R_{ON}$)	V_S = 0 V to V_{DD}, I_S = -10 mA	-40 to +105		0.05	0.3	Ω
On Resistance ($R_{FLAT(ON)}$)	V_S = 0 V to V_{DD}, I_S = -10 mA	25		0.5		Ω
		-40 to +105			1.0	
Leakage Currents						
Source Off Leakage I_S (Off)	V_{DD} = +5.5 V, V_S = 4.5 V/1 V, V_D = 1 V/4.5 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Drain Off Leakage I_D (Off)	V_{DD} = +5.5 V, V_S = 4.5 V/1 V, V_D = 1 V/4.5 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Channel On Leakage I_D,I_S (On)	V_{DD} = +5.5 V, V_S = V_D = 1 V or 4.5 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Digital Inputs						
Input High Voltage, V_{INH}		-40 to +105	4			V
Input Low Voltage, V_{INL}		-40 to +105			0.4	V
Input Current, I_{INL} or I_{INH}	V_{IN} = V_{INL} or V_{INH}	25		0.005		μA
		-40 to +105			±0.1	
Dynamic Characteristics						
t_{ON}	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V	25		11		ns
		-40 to +105			16	
t_{OFF}	R_L = 300 Ω, C_L = 35 pF, V_S = 3 V	25		6		ns
		-40 to +105			10	
Charge Injection	V_S = 2 V, R_S = 0 Ω, C_L = 1 nF	25		3		pC
Off Isolation	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-58		dB
	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	25		-78		
Channel-to-Channel Crosstalk	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-90		dB
Bandwidth -3dB	R_L = 50 Ω, C_L = 5 pF	25		200		MHz
C_S		25		10		pF
C_D		25		10		pF
C_D, C_S (On)		25		22		pF
Power Requirements						
I_{DD}	V_{DD} = +5.5 V, Digital inputs = 0 V or 5V	25		0.001		μA
		-40 to +105			1.0	

Electrical Characteristics

V_{DD} = +3 V ± 10%, GND = 0 V. All typical value is at -40°C to 105°C, unless otherwise specified.

Parameter	Conditions	Temp (°C)	Min	Typ	Max	Unit
Analog Switch						
Analog Signal Range		-40 to +105	0		V_{DD}	V
On Resistance (R_{ON})	V_S = 0 V to V_{DD}, I_S = -10 mA	25		5	5.5	Ω
		-40 to +105			8	
On Resistance Match Between Channels ($\triangle R_{ON}$)	V_S = 0 V to V_{DD}, I_S = -10 mA	25		0.1		Ω
		-40 to +105			0.3	
On Resistance ($R_{FLAT(ON)}$)	V_S = 0 V to V_{DD}, I_S = -10 mA	-40 to +105		2.5		Ω
Leakage Currents						
Source Off Leakage I_S (Off)	V_{DD} = +3.3 V, V_S = 3 V/1 V, V_D = 1 V/3 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Drain Off Leakage I_D (Off)	V_{DD} = +3.3 V, V_S = 3 V/1 V, V_D = 1 V/3 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Channel On Leakage I_D,I_S (On)	V_{DD} = +3.3 V, V_S = V_D = 1 V or 3 V	25		±0.01	±0.1	nA
		-40 to +105			±0.2	
Digital Inputs						
Input High Voltage, V_{INH}		-40 to +105	2.4			V
Input Low Voltage, V_{INL}		-40 to +105			0.3	V
Input Current, I_{INL} or I_{INH}	V_{IN} = V_{INL} or V_{INH}	25		0.005		μA
		-40 to +105			±0.1	
Dynamic Characteristics						
t_{ON}	R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		13		ns
		-40 to +105			20	
t_{OFF}	R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		7		ns
		-40 to +105			12	
Charge Injection	V_S = 1.5 V, R_S = 0 Ω, C_L = 1 nF	25		3		pC
Off Isolation	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-58		dB
	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	25		-78		
Channel-to-Channel Crosstalk	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-90		dB
Bandwidth -3dB	R_L = 50 Ω, C_L = 5 pF	25		200		MHz
C_S		25		10		pF
C_D		25		10		pF
C_D, C_S (On)		25		22		pF
Power Requirements						
I_{DD}	V_{DD} = +3.3 V, Digital inputs = 0 V or 3 V	25		0.001		μA
		-40 to +105			1.0	

Test Circuits

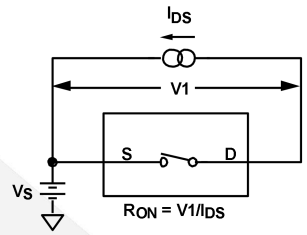


Figure 2. On Resistance

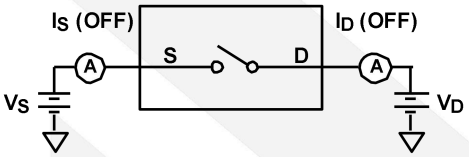


Figure 3. Off Leakage

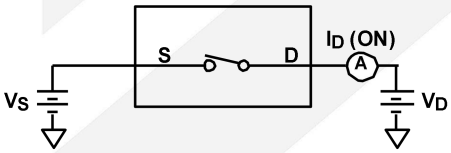


Figure 4. On Leakage

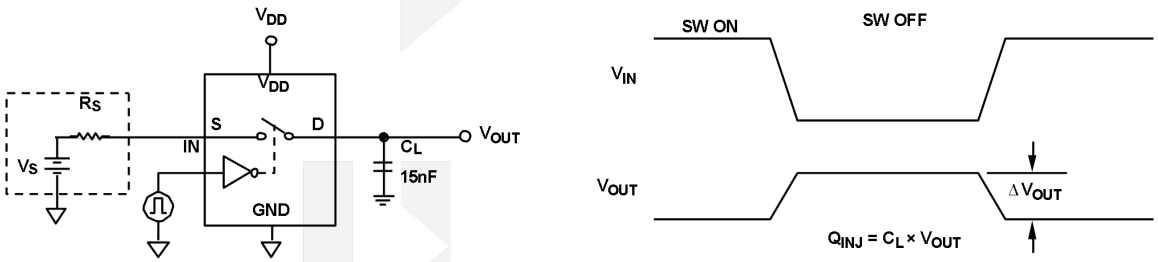


Figure 5. Charge Injection

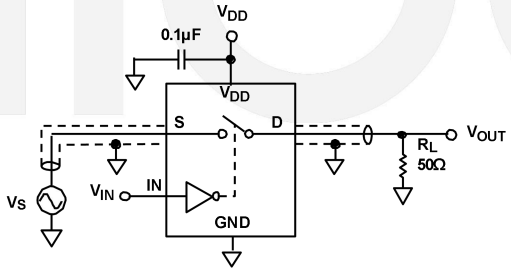


Figure 6. Off Isolation

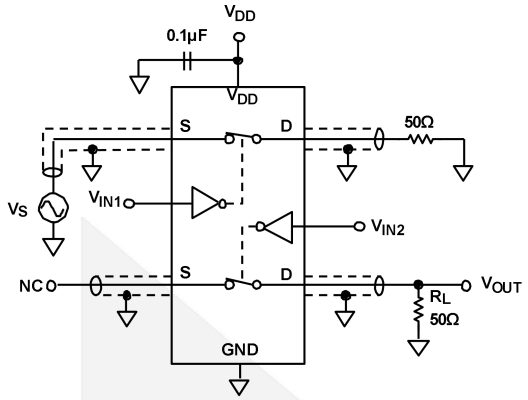


Figure 7. Channel-to Channel Crosstalk

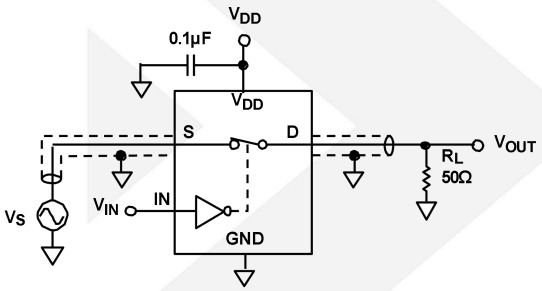
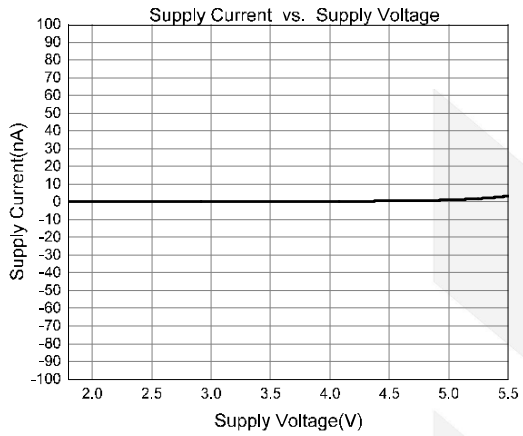


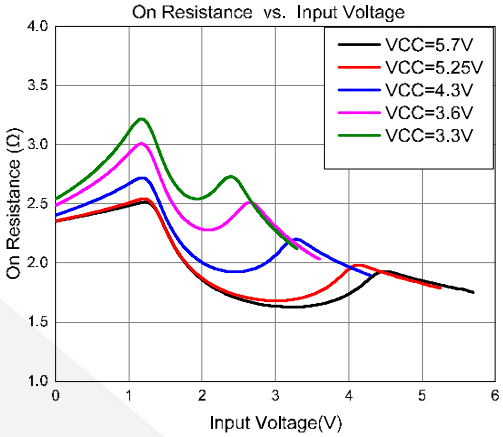
Figure 8. Bandwidth

Typical Performance Characteristics

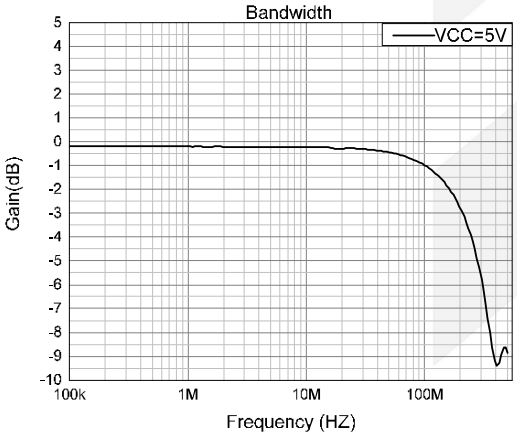
I_{DD} vs. V_{DD}



On Resistance vs. V_{DD}



Bandwidth



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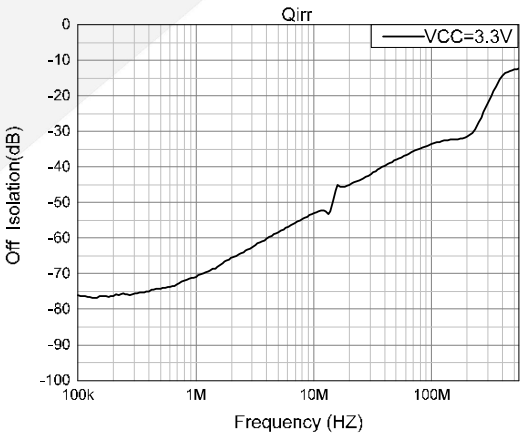
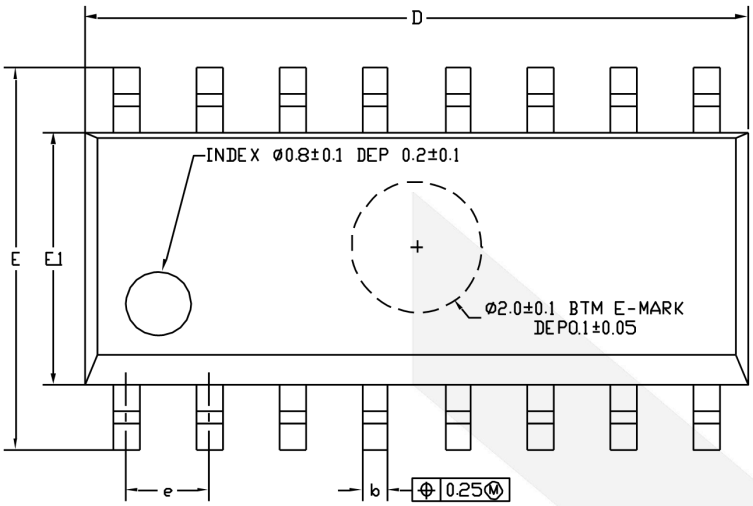
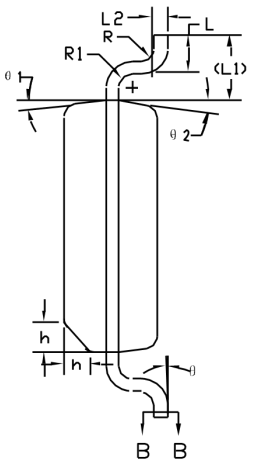
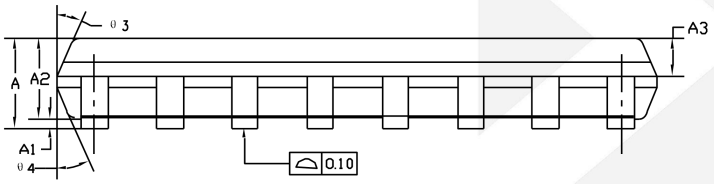
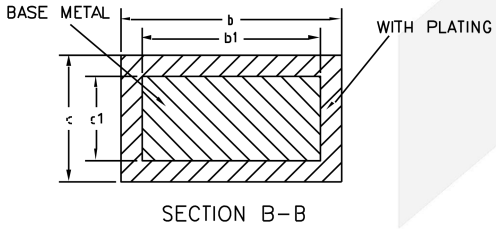


Physical Dimensions: SOIC-16





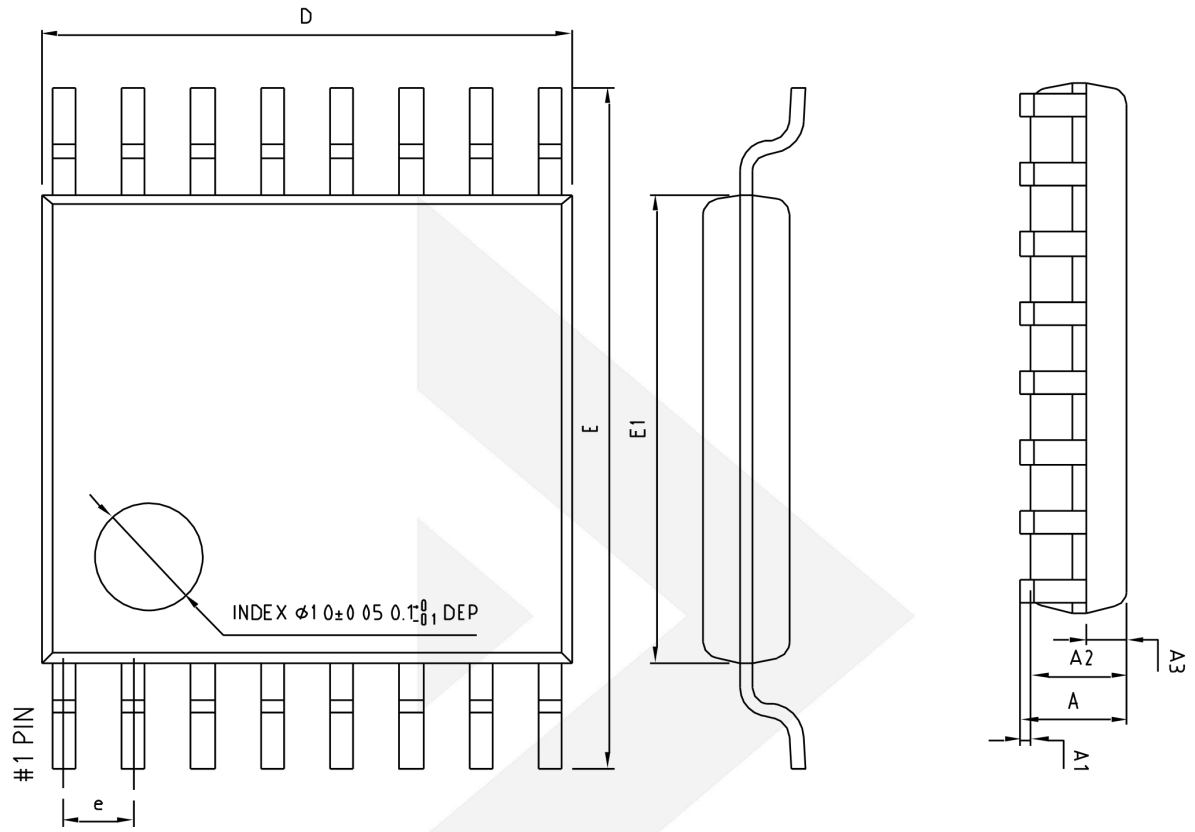


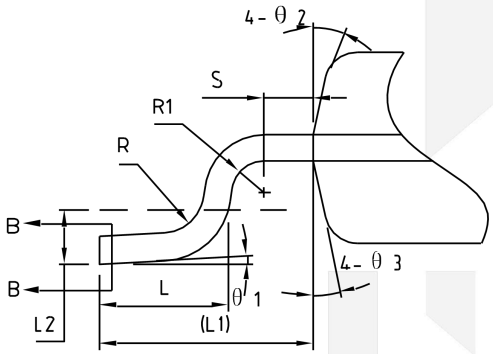


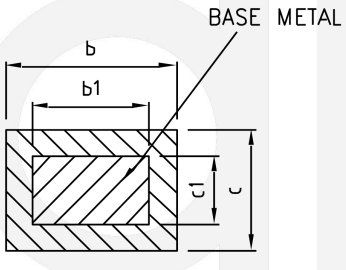
SECTION B–B

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	-	0.51
b1	0.35	0.40	0.45
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	9.80	9.90	10.06
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°
Θ1	6°	8°	10°
Θ2	6°	8°	10°
Θ3	5°	7°	9°
Θ4	5°	7°	9°

Physical Dimensions: TSSOP-16







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 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.