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) at V_{DD} = 5 V ±10%
- Low on resistance flatness
- -3 dB bandwidth > 200 MHz
- Rail-to-rail operation
- 16-lead TSSOP and SOP packages
- Fast switching times at V_{DD} = 5 V ±10%: t_{ON} = 20 ns, t_{OFF} = 10 ns
- TTL/CMOS compatible
- Qualified for automotive applications

Descriptions

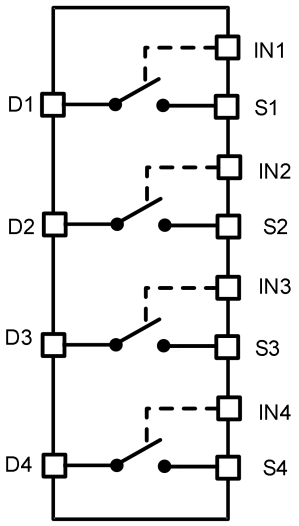
The DIO1713 is a monolithic CMOS device containing four independently selectable switches. The switch is designed on an advanced sub-micron process that provide low power dissipation yet give high switching speed, low on resistance, low leakage current, and high bandwidth.

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

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO1713CS16	DIO1713	3	Green	-40 to 105°C	SOP-16	Tape & Reel, 2500
DIO1713TP16	DIO1713	3	Green	-40 to 105°C	TSSOP-16	Tape & Reel, 2500

Pin Assignment

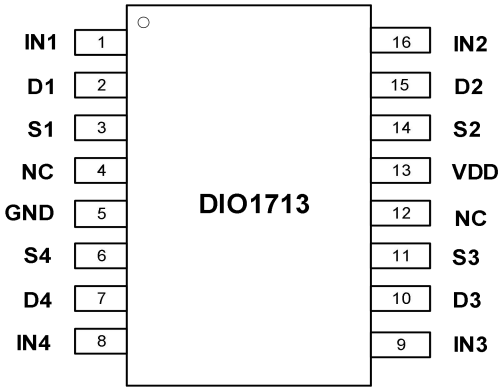


Figure 1. SOP-16/TSSOP-16 (Top view)

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	Ground 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	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.

Table 1. 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 30 mA, whichever occurs first	V
Continuous current, S or D			30	mA
Peak current, S or D			100	mA
Operating temperature tange			-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	SOP-16		520	mW
Thermal impedance	SOP-16	Θ_{JA}	125	°C/W
		Θ_{JC}	42	°C/W
ESD	HBM		±7.5	kV

Electrical Characteristics

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

Symbol	Parameter	Conditions	Temp (°C)	Min	Typ	Max	Unit
Analog switch							
	Analog signal range		-40 to 105	0		V_{DD}	V
R_{ON}	On resistance	V_S = 0 V to V_{DD}, I_S = -10 mA	25		2.5	4	Ω
			-40 to 105			4.5	
$\triangle R_{ON}$	On resistance match between channels	V_S = 0 V to V_{DD}, I_S = -10 mA	25		0.05		Ω
			-40 to 105		0.05	0.3	
$R_{FLAT(ON)}$	On resistance	V_S = 0 V to V_{DD}, I_S = -10 mA	25		0.5		Ω
			-40 to 105			1.0	
Leakage currents							
I_S (Off)	Source off leakage	V_{DD} = 5.5 V, V_S = 4.5 V/1 V, V_D = 1 V/4.5 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
I_D (Off)	Drain off leakage	V_{DD} = 5.5 V, V_S = 4.5 V/1 V, V_D = 1 V/4.5 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
I_D,I_S (On)	Channel on leakage	V_{DD} = 5.5 V, V_S = V_D = 1 V or 4.5 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
Digital inputs							
V_{INH}	Input high voltage		25	3			V
			-40 to 105	4			
V_{INL}	Input low voltage		25			1.5	V
			-40 to 105			0.4	
I_{INL} / I_{INH}	Input current	V_{IN} = V_{INL} or V_{INH}	25		±0.005		μA
			-40 to 105	-0.1		0.1	
Dynamic characteristics							
t_{ON}		R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		20		ns
			-40 to 105		30		
t_{OFF}		R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		10		ns
			-40 to 105		20		
OIRR	Off isolation	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-53		dB
		R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	25		-70		

	Channel-to-channel crosstalk	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-60		dB
BW	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 5 V	25		0.001		μA
			-40 to 105			1.0	

Electrical Characteristics

V_{DD} = 3 V ± 10%. 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
R_{ON}	On resistance	V_S = 0 V to V_{DD}, I_S = -10 mA	25		3.5		Ω
			-40 to 105			8	
△R_{ON}	On resistance match between channels	V_S = 0 V to V_{DD}, I_S = -10 mA	25		0.1		Ω
			-40 to 105			0.3	
$R_{FLAT(ON)}$	On resistance	V_S = 0 V to V_{DD}, I_S = -10 mA	25		1.5		Ω
			-40 to 105		2.5		
Leakage currents							
I_S (Off)	Source off leakage	V_{DD} = 3.3 V, V_S = 3 V/1 V, V_D = 1 V/3 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
I_D (Off)	Drain off leakage	V_{DD} = 3.3 V, V_S = 3 V/1 V, V_D = 1 V/3 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
I_D,I_S (On)	Channel on leakage	V_{DD} = 3.3 V, V_S = V_D = 1 V or 3 V	25		±0.01		μA
			-40 to 105	-0.2		0.2	
Digital inputs							
V_{INH}	Input high voltage		-40 to 105	2			V
V_{INL}	Input low voltage		-40 to 105			0.5	V

I_{INL} / I_{INH}	Input current	V_{IN} = V_{INL} or V_{INH}	25		±0.005		µA
			-40 to 105	-0.1		0.1	
Dynamic characteristics							
t_{ON}		R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		20		ns
			-40 to 105		35		
t_{OFF}		R_L = 300 Ω, C_L = 35 pF, V_S = 2 V	25		7		ns
			-40 to 105		15		
	Charge injection	V_S = 1.5 V, C_L = 1 nF	25		25		pC
OIRR	Off isolation	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-53		dB
		R_L = 50 Ω, C_L = 5 pF, f = 1 MHz	25		-70		
	Channel-to-channel crosstalk	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz	25		-60		dB
BW	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	

Note:

(1) Specifications subject to change without notice.

Test Circuits

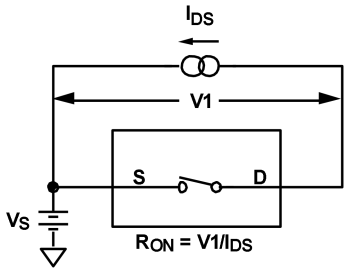


Figure 2. On resistance

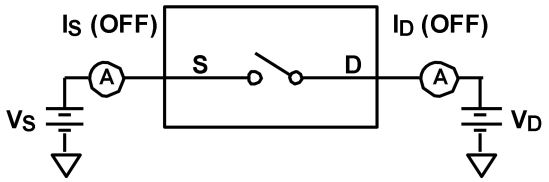


Figure 3. Off leakage

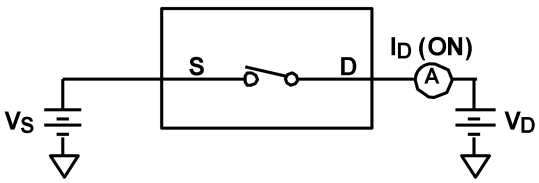


Figure 4. On leakage

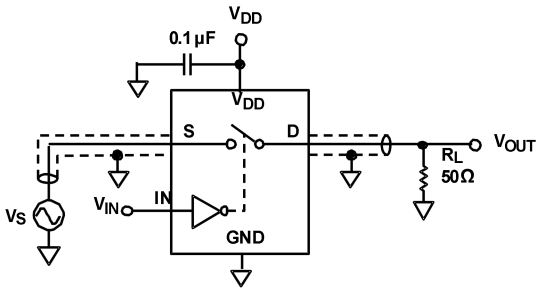
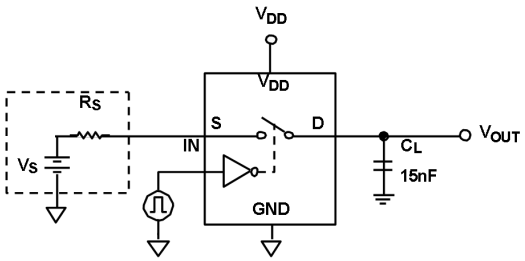


Figure 5. Off isolation



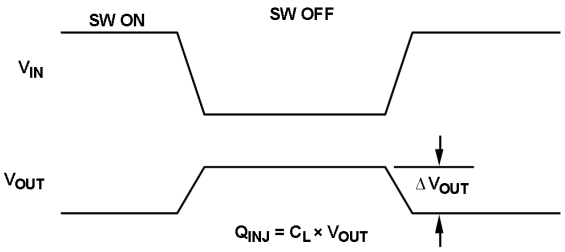


Figure 6. Charge injection

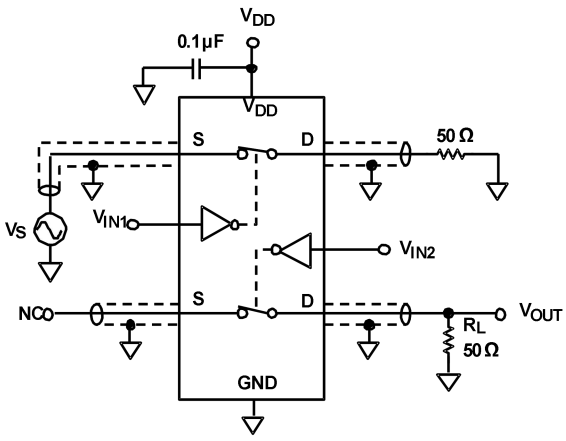


Figure 7. Channel-to channel crosstalk

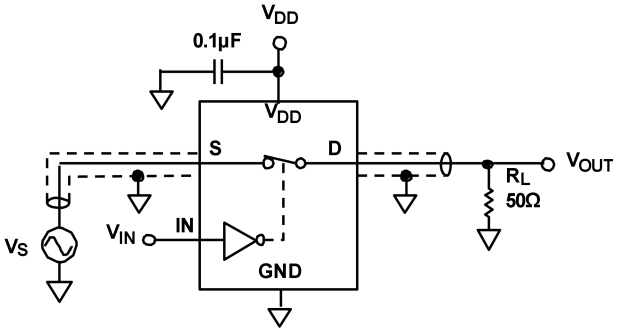


Figure 8. Bandwidth

Typical Performance Characteristics

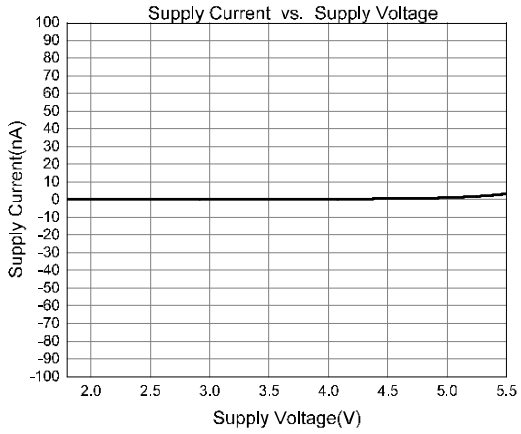


Figure 9. I_{DD} vs. V_{DD}

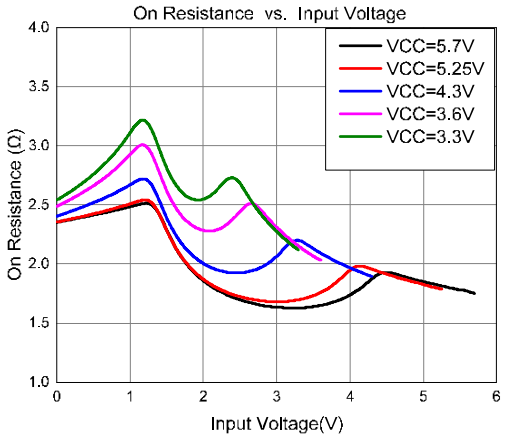


Figure 10. On resistance vs. V_{DD}

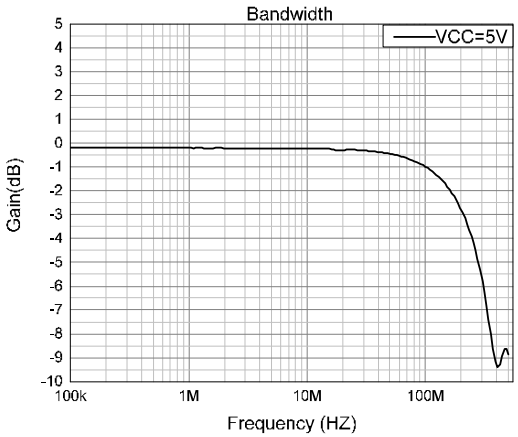


Figure 11. Bandwidth

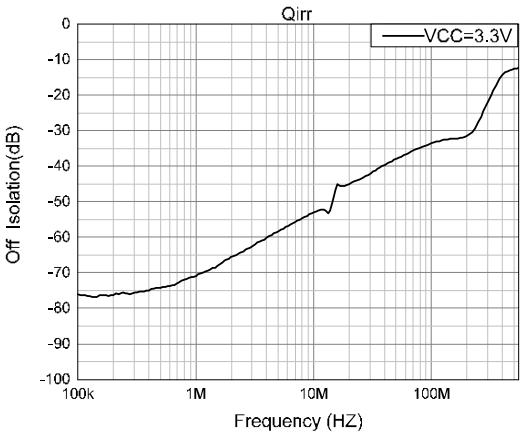
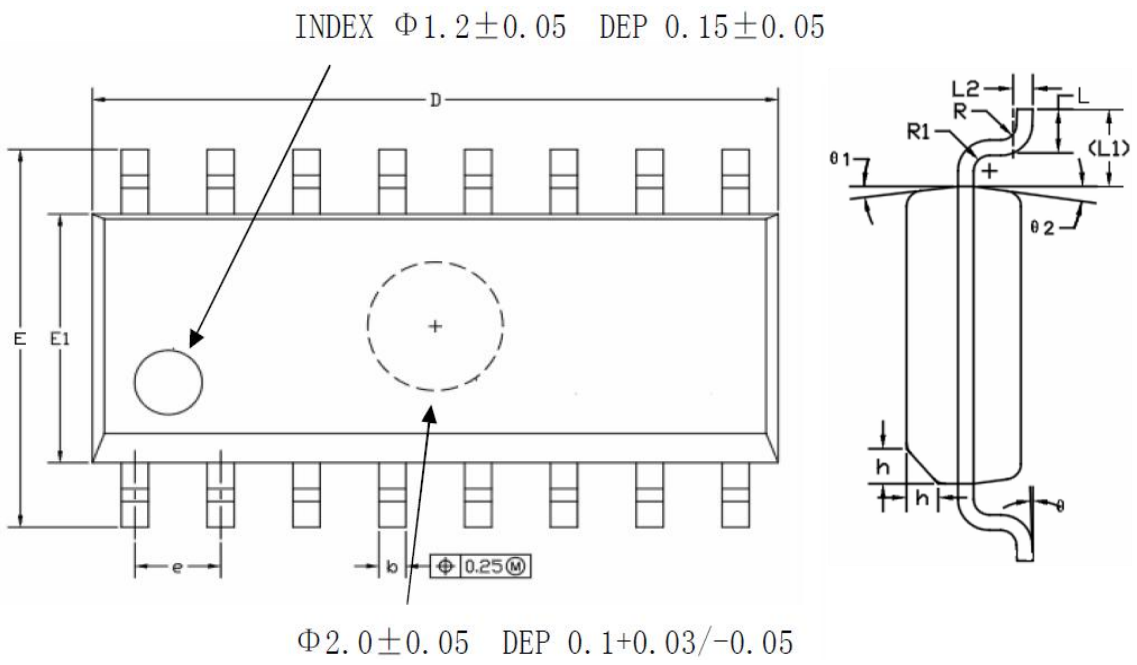
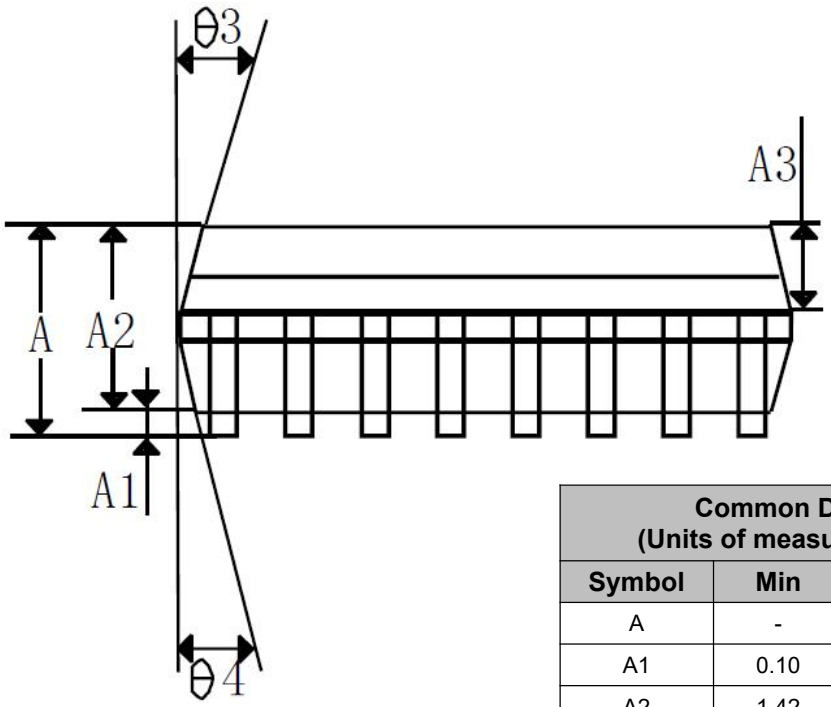


Figure 12. OIRR

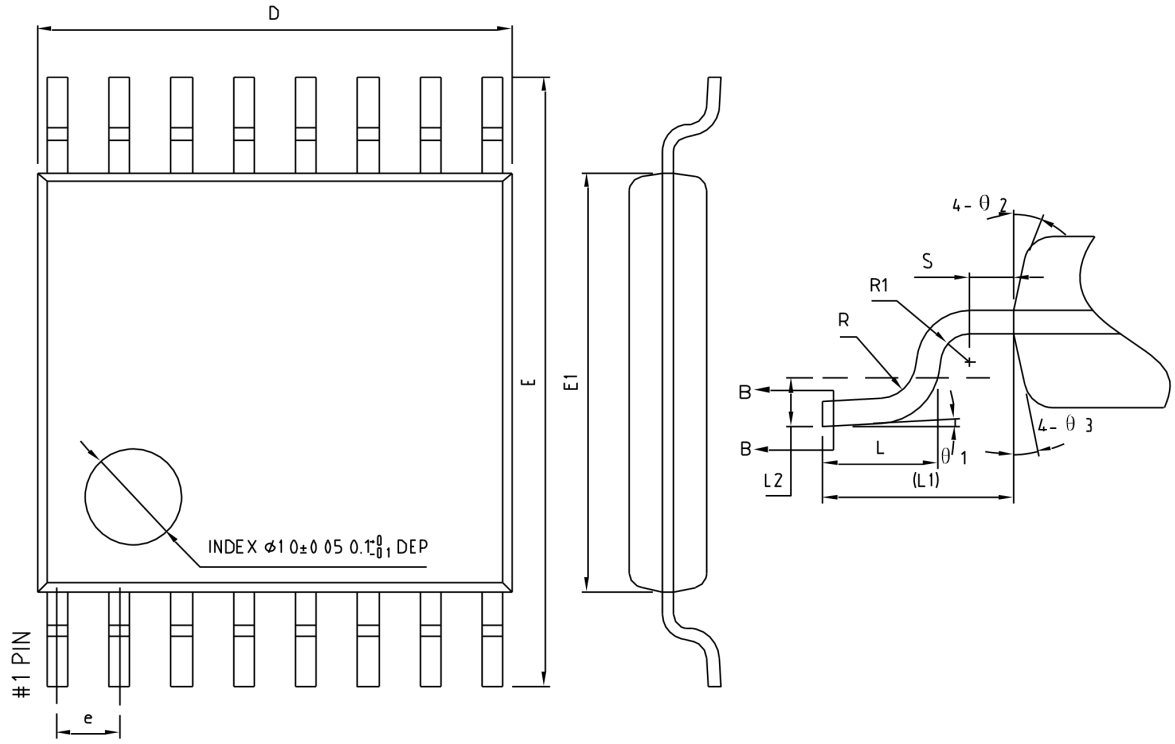
Physical Dimensions: SOP-16

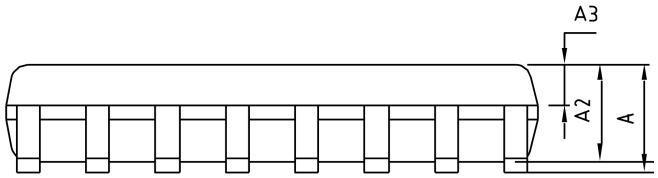


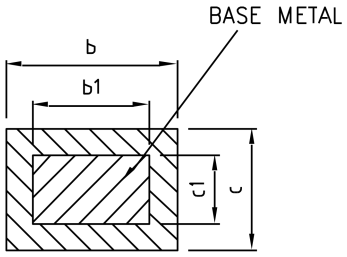


Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	-	-	1.70
A1	0.10	0.15	0.20
A2	1.42	1.45	1.48
A3	0.62	0.65	0.68
A4	0.08	0.11	0.135
D	9.85	9.90	9.95
E	5.90	6.00	6.10
E1	3.87	3.90	3.93
e	1.24	1.27	1.30
L	0.50	0.60	0.70
L1	1.050 REF		
L2	0.250 BSC		

Physical Dimensions: TSSOP-16







SECTION B–B

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	0.34	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	-	-
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.

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