DIO3203

3:1-USB 2.0 High-Speed/UART/ Audio Switch

Features

- Low R_{ON} audio/USB/UART switch
- Low USB C_{ON}: 6.8 pF
- -1.4 V negative signal swing capable
- USB switch -3 dB bandwidth: 720 MHz
- High crosstalk and off-isolation
- Voltage supply operation: 2.7 V to 5.5 V
- 5.5 V tolerance on COM pin
- Green packaged: TQFN-16 and DQFN-12
- 4 kV HBM ESD rating and 2 kV CDM ESD rating

Applications

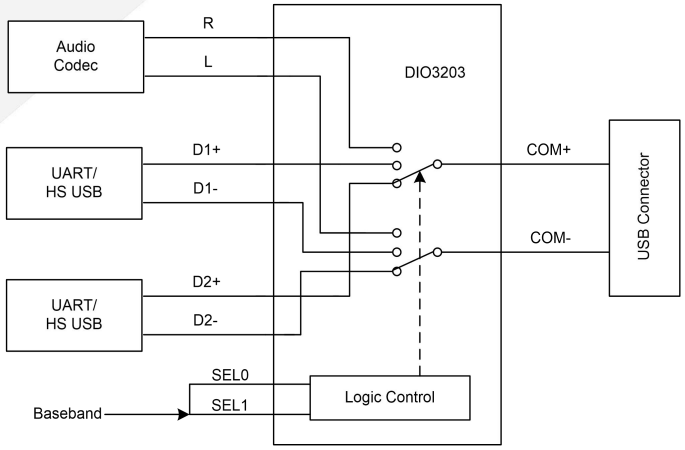
- Cell phones
- PDAs and MP3s
- Portable instrumentation
- Battery powered communications
- Computer peripherals

Descriptions

The DIO3203 is a SP3T (Single Pole/Triple Throw) switch which combines low distortion audio, UART channel and accurate USB 2.0 high-speed data signal switching in the same low voltage device. This architecture is designed to allow negative signal passing as low as -1.4 V below ground.

It is available in TQFN-16 and DQFN-12 packages and operates over a temperature range of -40°C to 85°C.

Block Diagram



Ordering Information

Part Number	Top Marking	RoHS	T_A	Package	
DIO3203LP16	D3203	Green	-40 to +85°C	TQFN 3*3-16	Tape & Reel, 5000
DIO3203LN12	YWHB	Green	-40 to +85°C	DQFN 1.8*1.8-12	Tape & Reel, 3000

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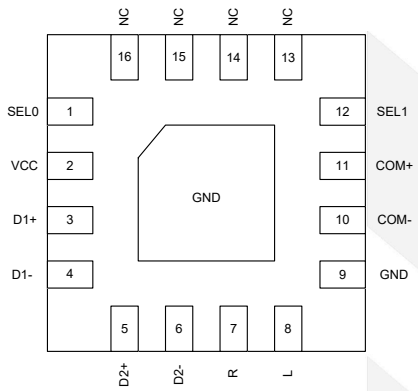
Pin Assignment

TQFN-16



DQFN-12

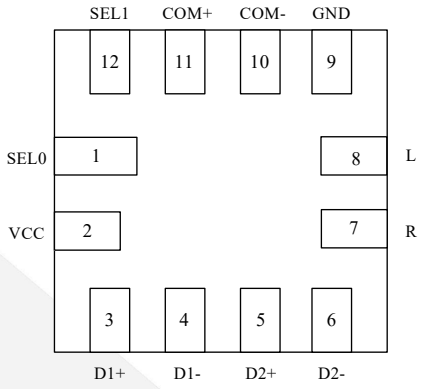


Figure 1. Top View

Pin Descriptions

Pin Name	Direction	Description
VCC	P	Power supply
GND	P	Ground
D1+	I/O	HS/UART channel 1 D+ signal
D1-	I/O	HS/UART channel 1 D- signal
D2+	I/O	HS/UART channel 2 D+ signal
D2-	I/O	HS/UART channel 2 D- signal
R	I/O	Right audio signal
L	I/O	Left audio signal
COM+	I/O	COM+ Signal, and share D1+, D2+, R
COM-	I/O	COM- Signal, and share D1-, D2-, L
SEL0/SEL1	I	Switch selection pins

Truth Table

SEL 1	SEL 0	D1+, D1-	D2+, D2-	R, L
0	0	OFF	OFF	OFF
0	1	ON	OFF	OFF
1	0	OFF	ON	OFF
1	1	OFF	OFF	ON

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Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-0.5	6.0	V
V_{SW}	USB/UART input I/O voltage	-0.5	6.0	V
	Audio input I/O voltage	-2.0	6.0	
	Other channels	-0.5	6.0	
I_{IK}	DC input diode current	-50		mA
I_{SW}	USB/UART I/O current		50	mA
	Audio I/O current		60	
	Other channels		50	
I_{PEAK}	I/O peak current		150	mA
T_{STG}	Storage temperature	-65	150	°C
ESD	HBM, JEDEC: JESD22-A114		4	kV
	CDM, JEDEC: JESD22-C101		2	

Recommend Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the data sheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	2.7	5.5	V
V_{SW}	USB/UART I/O voltage	0	5	V
	Audio I/O voltage	-1.4	V_{CC}	V
T_A	Operating temperature	-40	85	°C

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DC Electrical Characteristics

All typical value are at T_A = 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	Temp (°C)	Min	Typ	Max	Unit
V_{IH}	Input voltage high		3.2 to 5	full	1.5			V
V_{IL}	Input voltage low		3.2 to 5	full			0.6	V
I_{IN}	Control input leakage	V_{SW} = 0 to V_{CC}	5	full	-1		1	μA
I_{OZ}	Off state leakage	0 ≤ Dn, COM ≤ 5 V	5	full	-2		2	μA
I_{OFF}	Power-off leakage current (All I/O ports)	V_{SW} = 0 V to 5 V, V_{CC} = 0 V	0	full			10	μA
R_{ONUSB}	HS USB switch on resistance	V_{SW} = 0.4 V, I_{ON} = 8 mA	3.2 to 5	full		3.5	6	Ω
T_{BBM}	Break-before-make		3.2 to 5	full		190		μs
$R_{ONAUDIO}$	Audio switch on resistance	V_{SW} = -0.8 V, 0.8 V, I_{ON} = 30 mA	3.2 to 5	full		1.6	3	Ω
R_{FLAT}	Audio R_{ON} flatness	V_{SW} = -0.8 V, 0.8 V, I_{ON} = 30 mA	5	full		0.4		Ω
R_{TERM}	Internal termination RES.		3.2 to 5	full		1		kΩ
I_{CCSL}	Battery supply sleep mode average current	Static current SEL = 0	3.2 to 5	full			1	μA
I_{CC}	Battery supply active mode average current	V_{CC} = 5 V	5	full		72	110	μA
I_{CCT}	Increase in I_{CC} current per control voltage and V_{CC}	V_{CNTRL} = 2.8 V, V_{CC} = 5 V	3.2 to 5	full		5	10	μA
		V_{CNTRL} = 1.8 V, V_{CC} = 5 V	3.2 to 5	full		11	15	μA

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AC Electrical Characteristics

All typical value are for V_{CC} = 5 V at 25°C unless otherwise specified.

Symbol	Parameter		Conditions	V_{CC}(V)	Temp (°C)	Min	Typ	Max	Unit
OIRR	Audio rejection R/L to COM ±		R_L = 32 Ω, f = 20 kHz	5	25°C		-100		dB
	USB rejection Dn± to COM ±		R_L = 50 Ω, f = 1 MHz				-85		
			R_L = 50 Ω, f = 240 MHz				-36		
Xtalk	Active Channel COM+ to COM-	Audio	R_L = 32 Ω, f = 20 kHz	5	25°C		-95		dB
		USB/ UART	R_L = 50 Ω, f = 1 MHz				-75		
			R_L = 50 Ω, f = 240 MHz				-36		
BW	HS USB channel -3 dB bandwidth		R_L = 50 Ω, C_L = 0 pF	5	25°C		720		MHz
			R_L = 50 Ω, C_L = 5 pF				550		MHz
THD+N	Audio channel total harmonic distortion+noise		20 Hz to 20 kHz, R_L = 16 Ω, 1.6 V_{PP} input	5	25°C		0.3		%
			20 Hz to 20 kHz, R_L = 32 Ω, 1.6 V_{PP} input				0.5		

Capacitance

Symbol	Parameter	Conditions	Temp (°C)	Min	Typ	Max	Unit
C_{IN}	Control pin input capacitance	V_{CC} = 0 V	25°C		1.5		pF
C_{ON}	USB Mode on capacitance	V_{CC} = 5 V, f = 1 MHz	25°C		6.8		
C_{OFF}	USB mode off capacitance	V_{CC} = 5 V	25°C		4.0		

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Applications Design Guide

The DIO3203 is specially designed for mobile product applications housed in ultra-small QFN package. Internal regulated negative supply ensures up to -1.4 V negative signal handling capability independent of V_{CC} supply. For example, under V_{CC} at 2.8 V or 4.2 V battery supply, the audio channel can take up to -1.4 V negative audio inputs, which is a strong competitive edge over other solutions in the market.

At system design level, we recommend:

1 Each time, when switch to audio channel from USB channel, always turn ON the audio switch channel before applying the audio signal to L/R pins. Minimum of 10 ms interval is recommended.

2 For reliable USB channel communications with minimum interference, under USB mode, audio signals should be disconnected at the same time with no active audio signal at L/R pins.

3 Always place minimum 0.1 uF bypass capacitors close to the DIO3203 V_{CC} supply pins.

4 Always place DIO3203 as close as possible to the input/output of USB controllers to minimize the signal edge distortion.

5 Minimize the trace length difference between D+ and D- lines for best jitter performance.

Eye Pattern Compliance

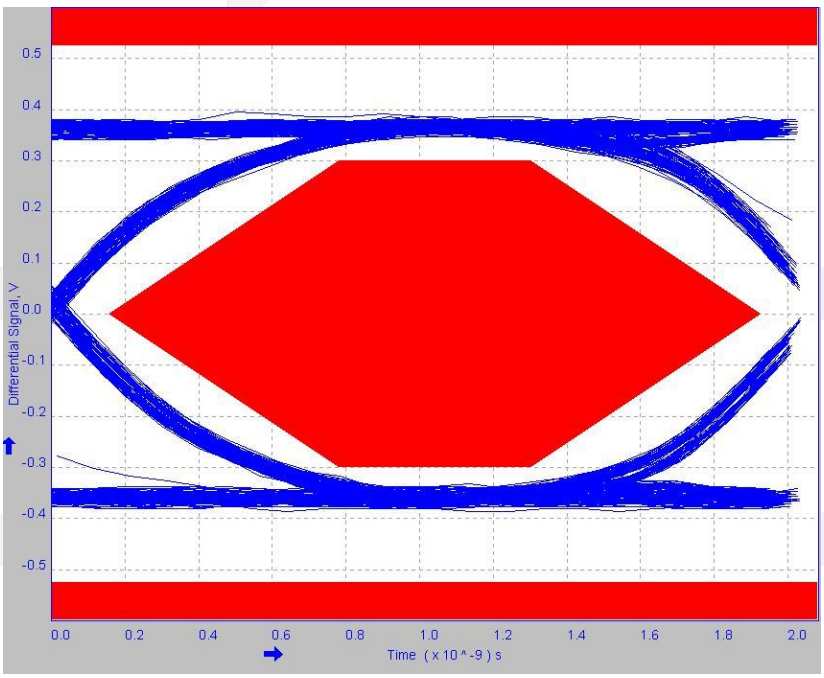

Figure 2. Eye pattern 480 MHz USB signal with switch

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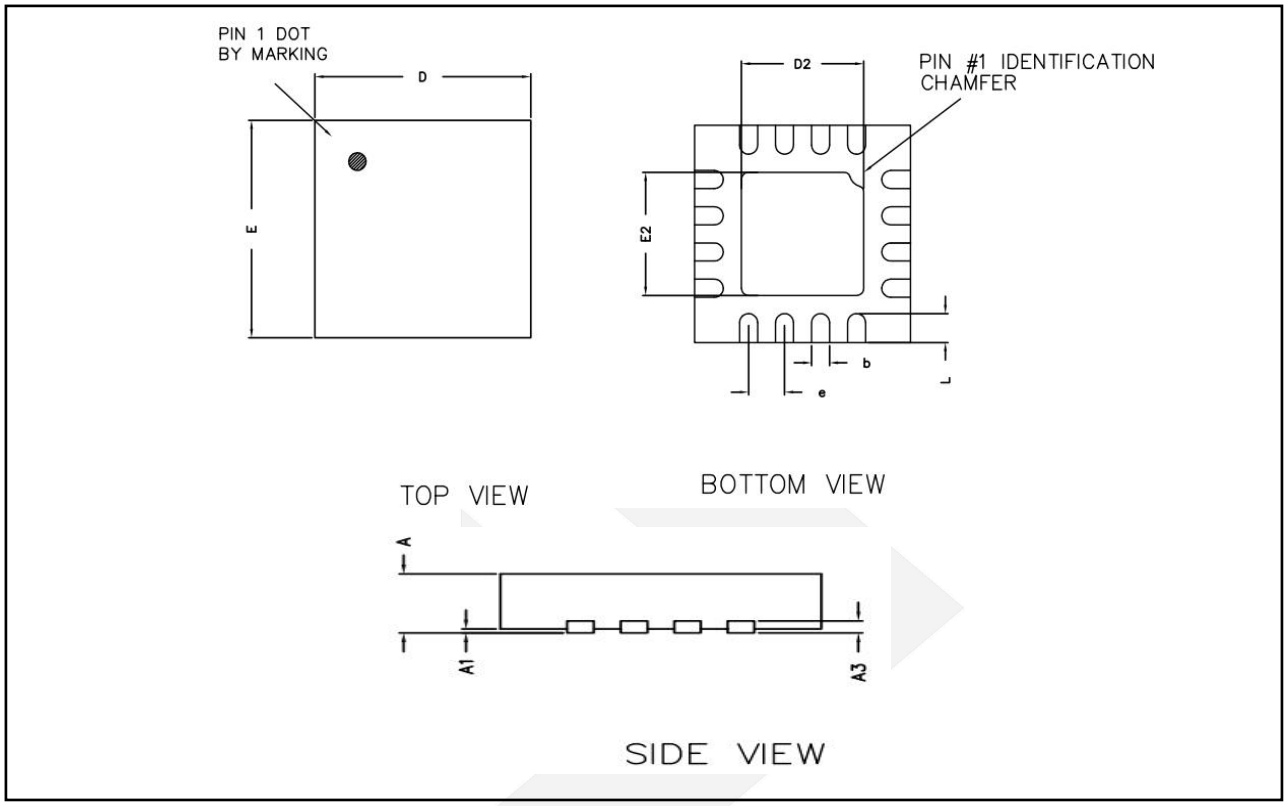
Physical Dimensions: TQFN-16



Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Typ**	**Max**
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3		0.2 REF	
D	2.95	3.00	3.05
E	2.95	3.00	3.05
b	0.18	0.25	0.30
L	0.30	0.40	0.50
D2	1.55	1.70	1.80
E2	1.55	1.70	1.80
e		0.50 BSC	

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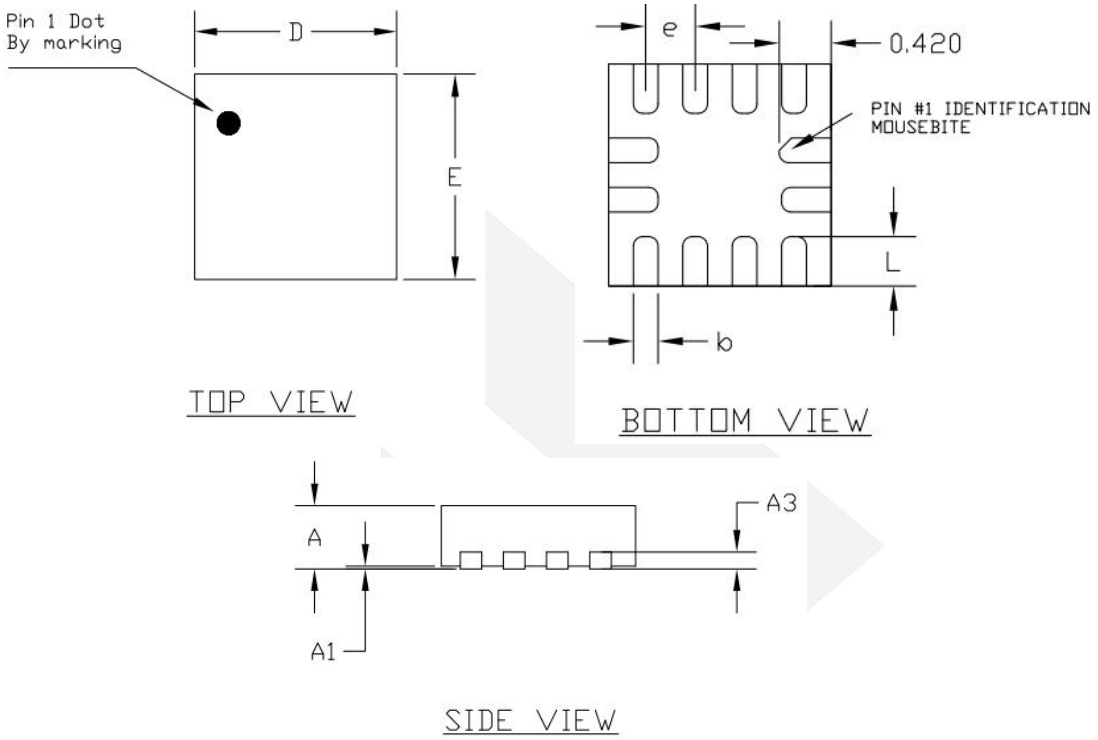
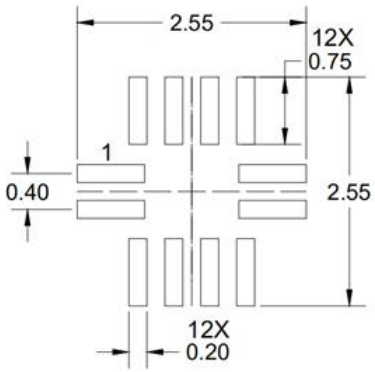
Physical Dimensions: DQFN-12





RECOMMENDED LAND PATTERN

Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Typ**	**Max**
A	0.50	0.55	0.60
A1	0.00	-	0.05
A3	0.15 REF		
D	1.75	1.8	1.85
E	1.75	1.8	1.85
L	0.35	0.40	0.45
b	0.15	0.20	0.25
e	0.40 BSC		

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