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

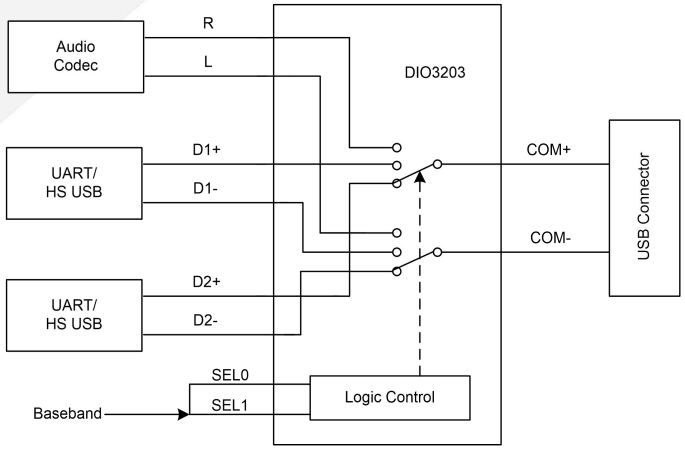
- Cell phones
- PDAs and MP3s
- Portable instrumentation
- Battery powered communications
- Computer peripherals

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

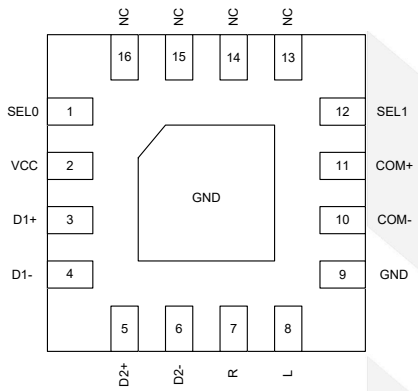


Ordering Information

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

Pin Assignment

TQFN-16



DQFN-12

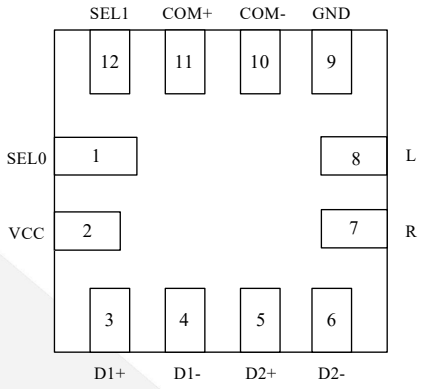


Figure 1. Top View

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

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

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

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		

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

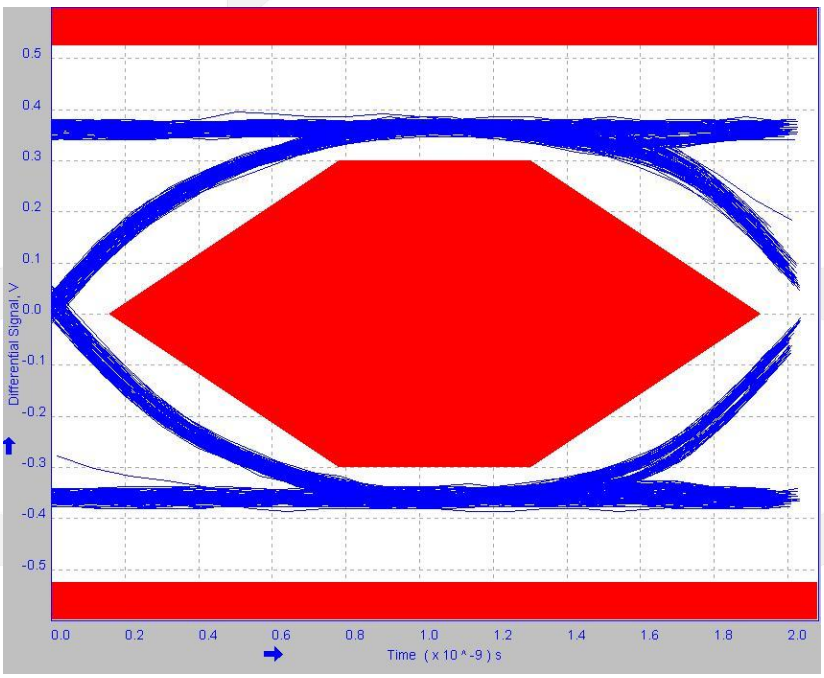
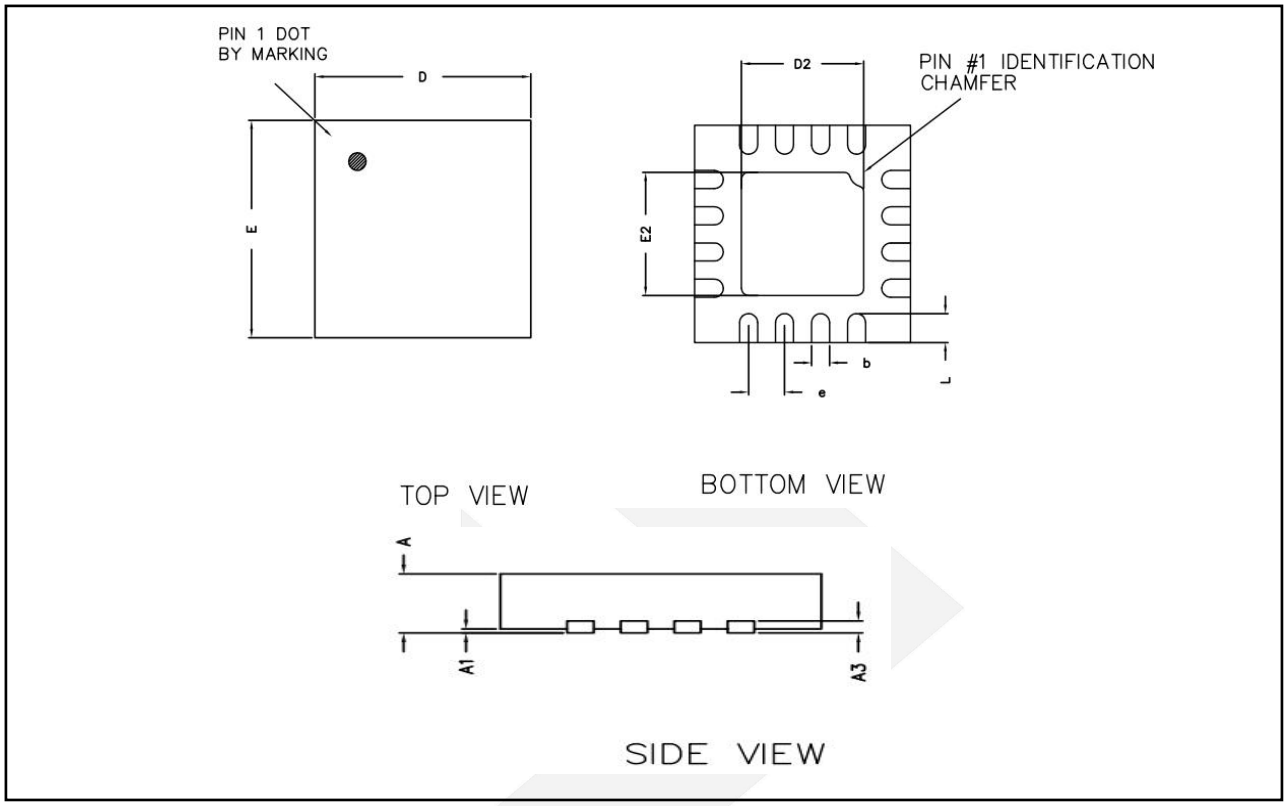


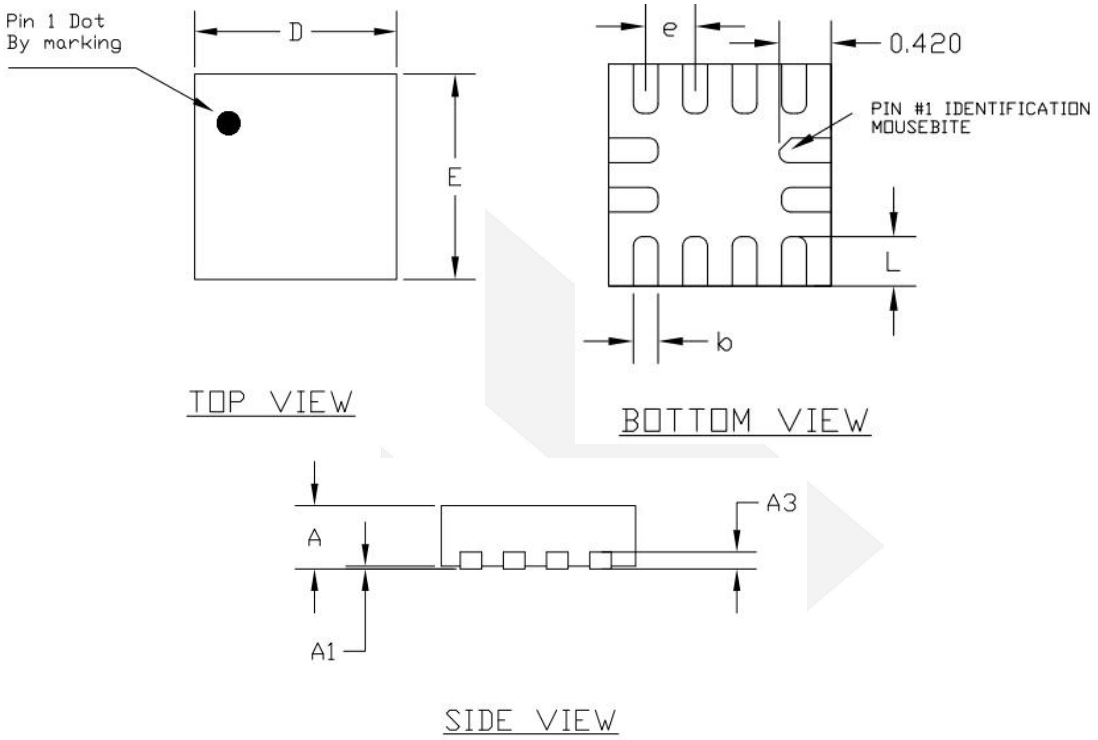
Figure 2. Eye pattern 480 MHz USB signal with switch

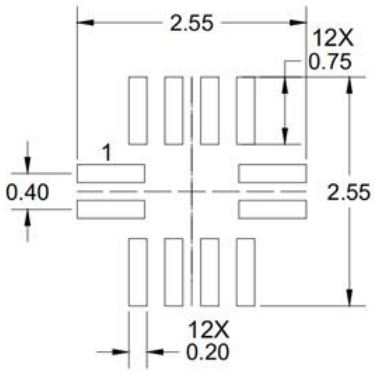
Physical Dimensions: TQFN-16



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	

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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