



# BCT4350

## USB 3.1 SuperSpeed 10 Gbps Switch

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#### GENERAL DESCRIPTION

The BCT4350 is a 2:1 data switch for USB SuperSpeed Gen1 and Gen2, 5 Gbps and 10 Gbps data. It is targeted at the mobile device market and for use in Type-C applications where a reversible cable requires a switch.

The BCT4350 data switch offers superior performance various high speed data transmission protocols:

- USB 3.1 SuperSpeed (Gen 2), 10 Gbps
- PCI Express, Gen 3
- SATA
- Fibre Channel
- Display Port 1.3


#### FEATURES

- 10GHz Typical Bandwidth
- USB 3.1 SuperSpeed 5 Gbps and 10 Gbps Switch
- -1.0 dB Typical Insertion Loss at 2.5 GHz
- Low Active Power of 12μA Typical
- Low Shutdown Power of < 1μA Max.
- 2 kV HBM ESD Protection
- TQFN2.5x4.5-20L Package
- Wide VCC Operating Range, 1.5 V-5.0 V

#### APPLICATIONS

- Smart phones
- Tablets
- Notebooks

#### ORDERING INFORMATION

Order Number	Package Type	Temperature Range	Marking	QTY/Reel
BCT4350EGP-TR	TQFN4.5x2.5-20L	-40°C to +85°C	 4350 XXXXX	4000

Mark Note: "XXXXX" in Marking will be appeared as the batch code.

### BLOCK DIAGRAM

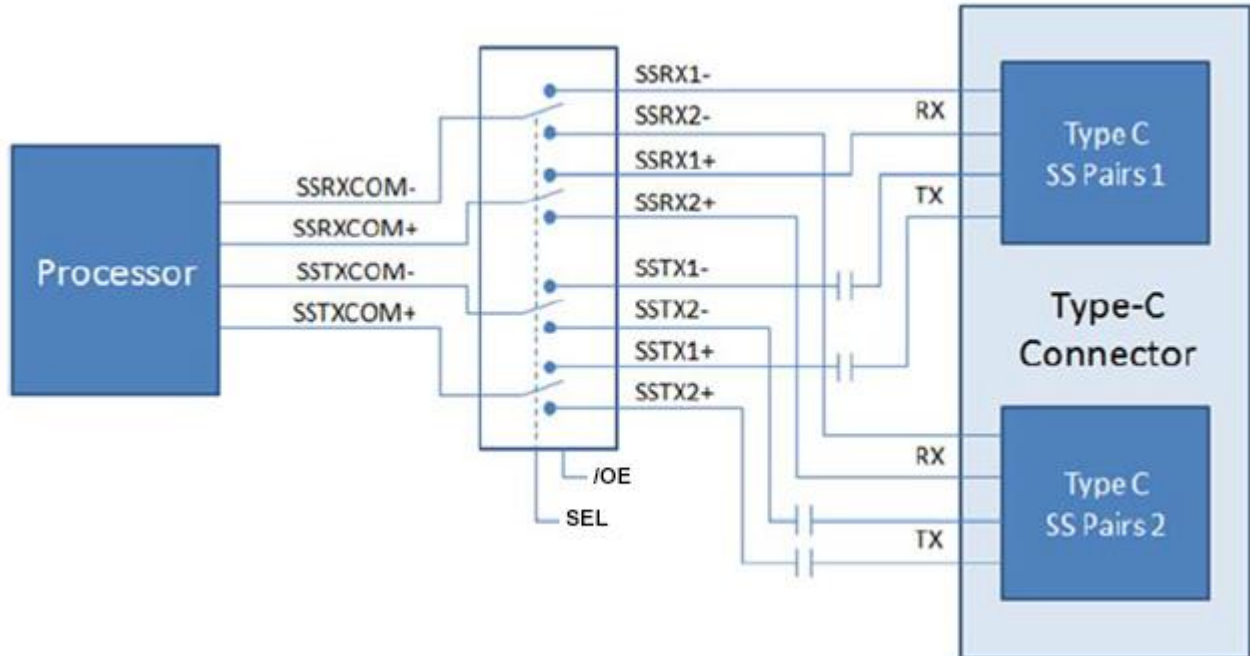


Figure1. Block Diagram

### PIN CONFIGURATION (Top View)

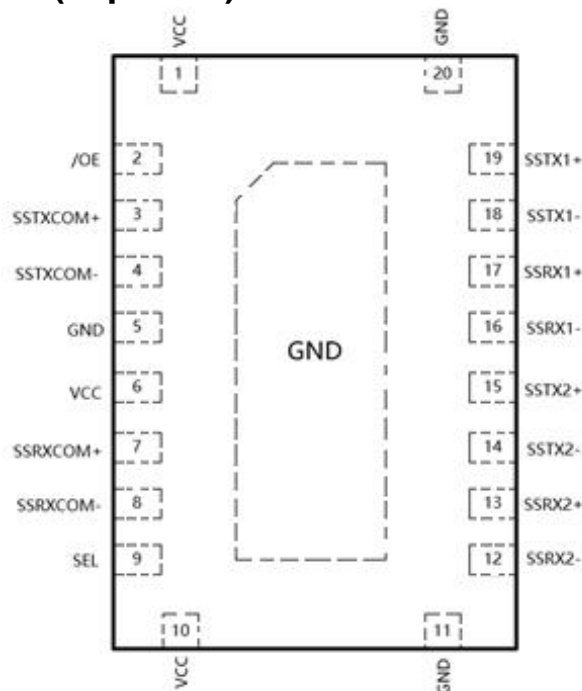


Figure2. Pin Assignment



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### PIN DESCRIPTIONS

Pin #	Name	Type	Description
1	VCC	VCC	Device Power
2	/OE	Input	Output Enable (0=Switches Enabled, 1=Switches Disabled)
3	SSTXCOM+	SW	SuperSpeed TX+ Common
4	SSTXCOM-	SW	SuperSpeed TX- Common
5	GND	GND	Ground
6	VCC	VCC	Device Power
7	SSRXCOM+	SW	SuperSpeed RX+ Common
8	SSRXCOM-	SW	SuperSpeed RX- Common
9	SEL	Input	Switch Select (0=SW1, 1=SW2)
10	VCC	VCC	Device Power
11	GND	GND	Ground
12	SSRX2-	SW	SuperSpeed RX2-
13	SSRX2+	SW	SuperSpeed RX2+
14	SSTX2-	SW	SuperSpeed TX2-
15	SSTX2+	SW	SuperSpeed TX2+
16	SSRX1-	SW	SuperSpeed RX1-
17	SSRX1+	SW	SuperSpeed RX1+
18	SSTX1-	SW	SuperSpeed TX1-
19	SSTX1+	SW	SuperSpeed TX1+
20	GND	GND	Ground

### TRUTH TABLE

SEL	/OE	Function
LOW	LOW	Port 1 is Active
HIGH	LOW	Port 2 is Active
X	HIGH	All Ports High Impedance

### TYPICAL APPLICATION CIRCUIT

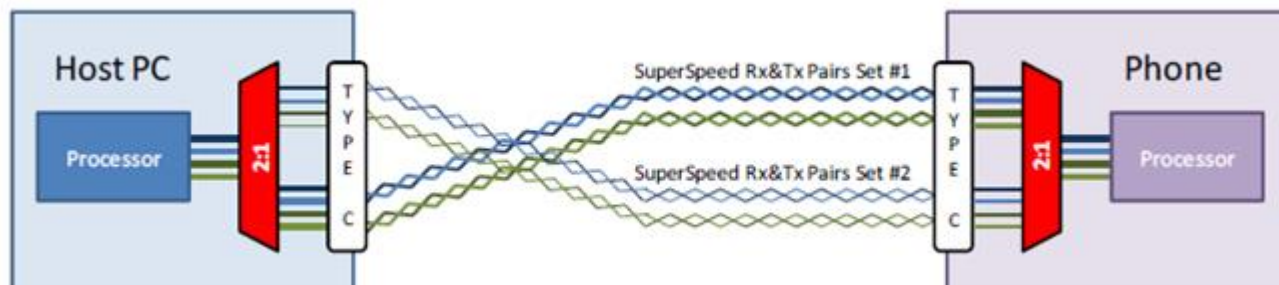


Figure 3. Typical Application

### ABSOLUTE MAXIMUM RATINGS

Supply Voltage ( $V_{CC}$ )	-0.5V to +6.0V
DC Input Voltage (SEL, /OE) <sup>(1)</sup>	-0.5V to $V_{CC}$
DC Switch I/O Voltage	-0.3V to 2.1V
DC Input Diode Current	-50mA
DC Output Current	25mA
Storage Temperature Range	-65°C to +150°C
Junction Temperature	150°C
Operating Temperature Range	-40°C to +85°C
Lead Temperature (Soldering, 10 sec)	260°C
ESD Susceptibility	
All Pins	2KV

### CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. Broadchip recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Broadchip reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact Broadchip sales office to get the latest datasheet.

### RECOMMENDED OPERATING CONDITONS

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.

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	1.5	5.0	V
$V_{CTRL}$	Control Input Voltage(SEL, /OE) <sup>(2)</sup>	0	5.0	V
$V_{SW}$	Switch I/O Voltage	0	2.0	V
$T_A$	Operating Temperature	-40	+85	°C

#### Notes:

1. The input and output negative ratings maybe exceed if the input and output diode current ratings are observed.
2. The control input must be held HIGH or LOW; it must not float.

### DC ELECTRICAL CHARACTERISTICS

(All typical values are  $T_A = 25^\circ\text{C}$ , unless otherwise specified.)

PARAMETER	SYM	CONDITIONS	$V_{CC}$ (V)	MIN	TYP	MAX	UNITS
Control Input Leakage (SEL, /OE)	$I_{IN}$	$V_{CTRL}=0$ to $V_{CC}$	1.5 to 5.0	-1		1	$\mu\text{A}$
Input Voltage High (SEL, /OE)	$V_{IH}$		1.5 to 5.0	1.5			V
Input Voltage Low (SEL, /OE)	$V_{IL}$		1.5 to 5.0			0.4	V
Off leakage Current of Open Data Paths	$I_{OZ}$	$0.0 \leq V_{SW} \leq 2.0$ V	5.0	-1		1	$\mu\text{A}$
On leakage Current of Close Data Paths	$I_{CL}$	$0.0 \leq V_{SW} \leq 2.0$ V	5.0	-1		1	$\mu\text{A}$
Power-Off Leakage Current	$I_{OFF}$	$0.0 \leq V_{SW} \leq 2.0$ V	0	-1		1	$\mu\text{A}$
Switch On Resistance	$R_{ON}$	$V_{SW}=0\text{V}$ , $I_{SW}=8\text{mA}$ , /OE=0V, SEL= $V_{CC}$ or 0V	1.5		5.4	8.0	$\Omega$
On Resistance Matching Between Channels	$\Delta R_{ON}$	$V_{SW}=0\text{V}$ , $I_{SW}=8\text{mA}$ ,	1.5		0.1		$\Omega$
Flatness for On Resistance	$\Delta R_{ONF}$	$0.0 \leq V_{SW} \leq 2.0$ V, $I_{SW}=8\text{mA}$ ,	1.5		0.9		$\Omega$
Quiescent Hi-Z Supply Current	$I_{CCZ}$	$V_{/OE}=V_{CC}$ , $V_{SEL}=0\text{V}$ or $V_{CC}$ , $I_{OUT}=0$	5.0			1	$\mu\text{A}$
Quiescent Supply Current	$I_{CC}$	$V_{/OE}=0\text{V}$ , $V_{SEL}=0\text{V}$ or $V_{CC}$ , $I_{OUT}=0$	5.0		12	30	$\mu\text{A}$
Increase in $I_{CC}$ Current Per Control Voltage and $V_{CC}$	$I_{CCT}$	$V_{SEL, /OE}=1.5\text{V}$	5.0		5	15	$\mu\text{A}$

### AC ELECTRICAL CHARACTERISTICS

(All values are for  $V_{CC}=3.6V$  at  $T_A=25^{\circ}C$  unless otherwise specified.)

PARAMETER	SYM	CONDITIONS	$V_{CC}$ (V)	MIN	TYP	MAX	UNITS
Turn-On Time SEL to Output	$t_{ON}$	$R_L=50\Omega$ , $V_{SW}=0$ to $0.6V$	1.5 to 5.0		350	700	ns
Turn-Off Time SEL to Output	$t_{OFF}$	$R_L=50\Omega$ , $V_{SW}=0$ to $0.6V$	1.5 to 5.0		125	300	ns
Enable Turn-On Time, /OE to Output	$t_{EN}$	$R_L=50\Omega$ , $V_{SW}=0$ to $0.6V$	1.5 to 5.0		60	150	us
Disable Turn-off Time, /OE to Output	$t_{DIS}$	$R_L=50\Omega$ , $V_{SW}=0$ to $0.6V$	1.5 to 5.0		35	240	ns
Propagation Delay	$t_{PD}$	$R_L=50\Omega$	1.5 to 5.0		60		ps
Break-Before-Make Time	$t_{BBM}$	$R_L=50\Omega$ , $V_{SW}=0.6V$	3.6	100		350	ns
Differential Off Isolation <sup>(1)</sup>	$DO_{IRR}$	$V_S=0dBm$ , $f=2.5GHz$ , $R_L=50\Omega$	3.6		-28		dB
Differential Crosstalk <sup>(1)</sup>	$DX_{TALK}$	$V_S=0dBm$ , $f=2.5GHz$ , $R_L=50\Omega$	3.6		-44		dB
Differential Insertion Loss	DIL	$V_S=0dBm$ , $f=2.5GHz$ $R_L=50\Omega$ $f=5.0GHz$	3.6		-1.0 -1.9		dB
Differential -3dB Bandwidth <sup>(1)</sup>	BW	$V_S=0dBm$ , $R_L=50\Omega$ , $C_L=0pF$	3.6		10		GHz
Control Pin Input Capacitance <sup>(1)</sup>	$C_{IN}$	$V_{CC}=0V$ , $f=1MHz$	0		2.7		pF
Output On Capacitance <sup>(1)</sup>	$C_{ON}$	/OE=0V, $f=1MHz$	3.3		0.5		
Output Off Capacitance <sup>(1)</sup>	$C_{OFF}$	/OE=3.3V, $f=1MHz$	3.3		0.4		

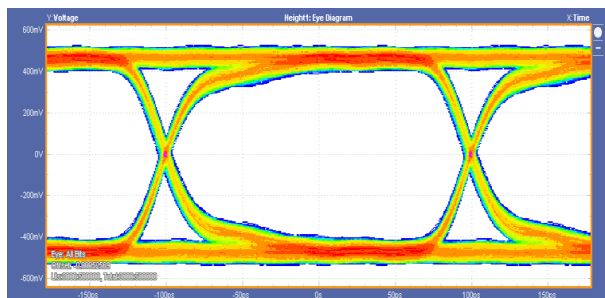
**Note:**

1. Guaranteed by characterization.

### EYE DIAGRAMS

(All plots below are for VDD = 3.6 V and TA = 25°C)

Before Switch



After Switch

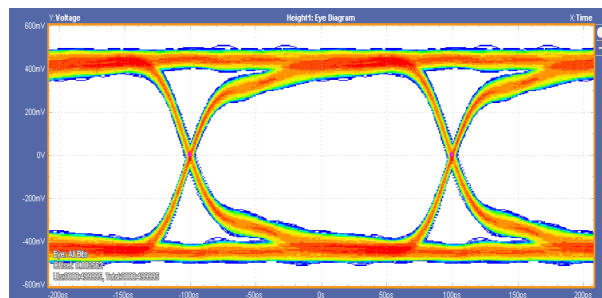
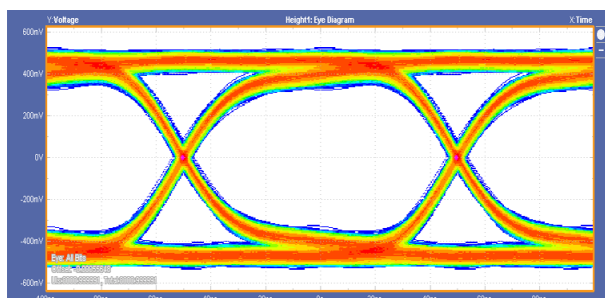


Figure 4. 5 Gbps Eye Diagram with Eye Mask

Before Switch



After Switch

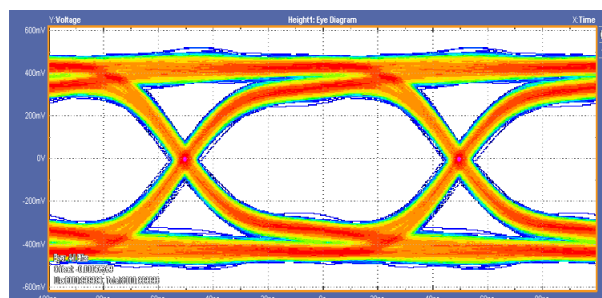
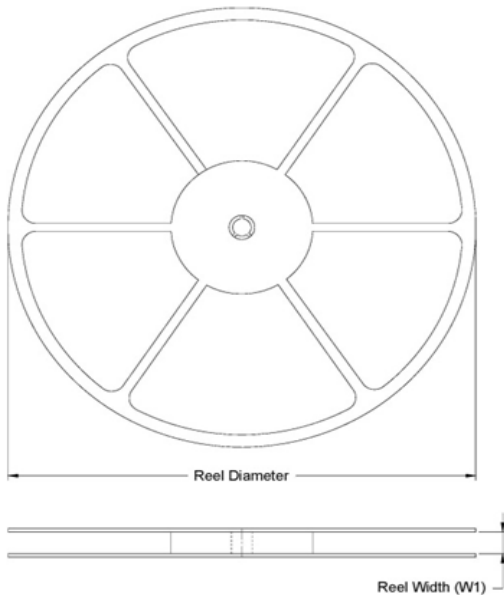


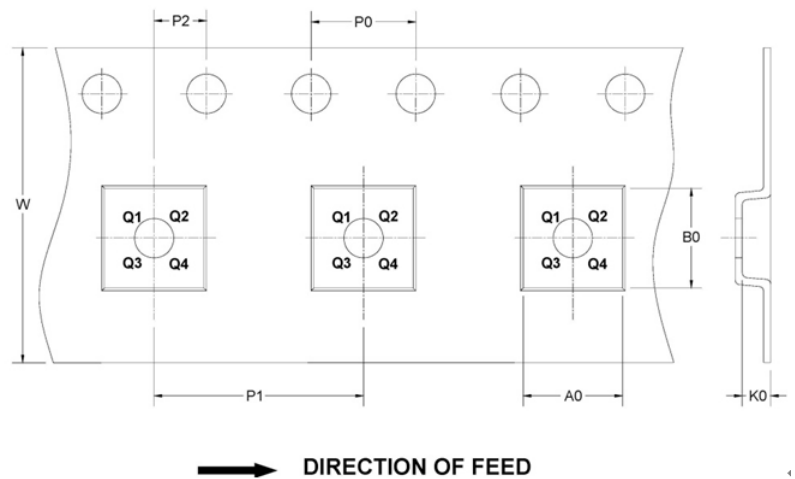
Figure 5. 10 Gbps Eye Diagram with Eye Mask

### TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



### KEY PARAMETER LIST OF TAPE AND REEL

Device Name	Package Type	Reel Diameter	Unit: mm								Pin 1 Quadrant	Reel QTY
			Reel Width W1	A0	B0	K0	P0	P1	P2	W		
BCT4350EGP-TR	TQFN 4.5x2.5-20L	13	330	2.8	4.8	1.1	4	8	2	12	Q1	4000



Figure 1 consists of three mechanical drawings of a package:

- (a) TOP VIEW:** A rectangular layout with dimensions A, B, C, D, E, and F. A callout points to a corner feature labeled "PIN 1 CORNER".
- (b) SIDE VIEW:** A cross-sectional view showing the package profile. Dimensions A1, A2, and A3 are indicated. A callout points to the "SEATING PLANE".
- (c) BOTTOM VIEW:** A detailed view of the underside of the package. It shows various pads and dimensions: D2, E2, 10, 11, 12, 19, 20, 20X(k), 20X(L), and 20X(b). Callouts include "EXPOSED DIE ATTACH PAD" and "PIN 1 I.D.".

Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	0.8	0.85	0.9
A1	0	0.02	0.05
A2	---	0.65	---
A3	0.203REF		
b	0.2	0.25	0.3
D	2.5(BSC)		
E	4.5(BSC)		
e	0.5(BSC)		
D2	0.7	0.8	0.9
E2	2.7	2.8	2.9
L	0.35	0.4	0.45
K	0.45REF		
aaa	0.1		
ccc	0.1		
eee	0.05		
bbb	0.1		
fff	0.1		

TQFN4.5x2.5-20L Surface Mount Package

### NOTES

- 1.REFER TO JEDEC MO-220;
- 2.COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD;
- 3.BAN TO USE THE LEVEL 1 ENVIRONMENT-RELATED SUBSTANCES OF JCET PRESCRIBING;
- 4.FINISH: Cu/EP • Sn8~20s