CBTL06GP213

Second-generation high performance general purpose switch

Rev. 3.1 — 13 December 2016 Product data sheet

1. General description

The CBTL06GP213 is a six-channel (‘hex’) multiplexer for DisplayPort, HDMI and PCI Express applications at Generation 2 (‘Gen2’) speeds. It provides four differential channels capable of 1 : 2 switching or 2 : 1 multiplexing bidirectional, AC-coupled PCI Express, DisplayPort signals, USB3 SuperSpeed or DC coupled TMDS signals, using high-bandwidth pass-gate technology. It provides support for high common-mode/bias voltage on the high-speed differential channels. Additionally, it provides for switching/multiplexing of the Hot Plug Detect signal as well as the AUX or DDC (Display Data Channel) signals, for a total of six channels on the display side. The AUX and DDC channels provide a four-position multiplexer such that an additional level of multiplexing can be accomplished when AUX and DDC I/Os are on separate pins of the display source device.

The CBTL06GP213 is designed for Gen2 speeds, supporting 5.0 Gbit/s for PCI Express, 5.4 Gbit/s for DisplayPort or 6 Gbit/s for HDMI 2.0. It consumes 490 μA current (typical) in operational mode and provides a shutdown function to support battery-powered applications.

A typical application of CBTL06GP213 is on applications where one of two GPU display sources must be selected to connect to a display sink device or connector. A controller chip selects which path to use by setting a select signal HIGH or LOW. Due to the non-directional nature of the signal paths (which use high-bandwidth pass gate technology), the CBTL06GP213 can also be used in the reverse topology, for example, to connect one display source device to one of two display sink devices or connectors.

2. Features and benefits

- 1 : 2 switching or 2 : 1 multiplexing of DisplayPort (v1.2 - 5.4 Gbit/s) PCI Express (v2.0 - 5.0 Gbit/s) signals, USB3 SuperSpeed or HDMI 2.0 (6 Gbit/s) TMDS signals
  - 4 high-speed differential channels with 2 : 1 muxing/switching for DisplayPort or PCI Express or HDMI signals
  - 1 channel with 4 : 1 or 4 : 2 muxing/switching for AUX at 1 Mbit/s or DDC signals, USB2 signals
  - 1 channel with 2 : 1 muxing/switching for single-ended HPD signal
- High-bandwidth analog pass-gate technology
- Supports high-speed signal switching over a wide common-mode range and differential swing
- R_{ON} on DP high-speed channels: 7 Ω

- Low insertion loss:
  - –0.9 dB at 100 MHz
  - –1.1 dB at 1.35 GHz
  - –1.3 dB at 2.7 GHz
- –3 dB bandwidth at 9.5 GHz
- Low crosstalk: –32 dB at 2.7 GHz
- Low off-state isolation: –23 dB at 2.7 GHz
- Low return loss: –19 dB at 2.7 GHz
- Very low intra-pair skew (5 ps typical)
- Very low inter-pair skew (< 80 ps)
- Switch/multiplexer position select CMOS input
- Shutdown mode CMOS input
- Supports backdrive protection
- Single 3.3 V power supply
- Operation current of 490 μA typical, shut-down current 10 μA maximum
- ESD 2 kV HBM, 500 V CDM
- Available in 5 mm × 5 mm, 0.5 mm ball pitch TFBGA50 package

3. Applications

- Motherboard applications requiring DisplayPort, HDMI, PCI Express, and USB switching/multiplexing
- Docking stations
- Notebook computers
- Chip sets requiring flexible allocation of PCI Express or DisplayPort I/O pins to board connectors

4. Ordering information

Table 1. Ordering information

Type number	Topside marking	Solder process	Package		
			Name	Description	Version
CBTL06GP213EE[1]	GP213	Pb-free (SnAgCu solder compound)	TFBGA50	plastic thin fine-pitch ball grid array package; 50 balls; body 5 × 5 × 0.8 mm[2]	SOT1345-1

[1] Industrial temperature range.

[2] Total height including solder balls after printed circuit board mounting = 1.15 mm.

For more information on product marking, refer to www.nxp.com/products/related/package-markings.html.

4.1 Ordering options

Table 2. Ordering options

Type number	Orderable part number	Package	Packing method	Minimum order quantity	Temperature
CBTL06GP213EE	CBTL06GP213EEJ	TFBGA50	Reel 13” Q1/T1 *standard mark SMD	3000	T_{amb} = –40 °C to +105 °C

5. Functional diagram

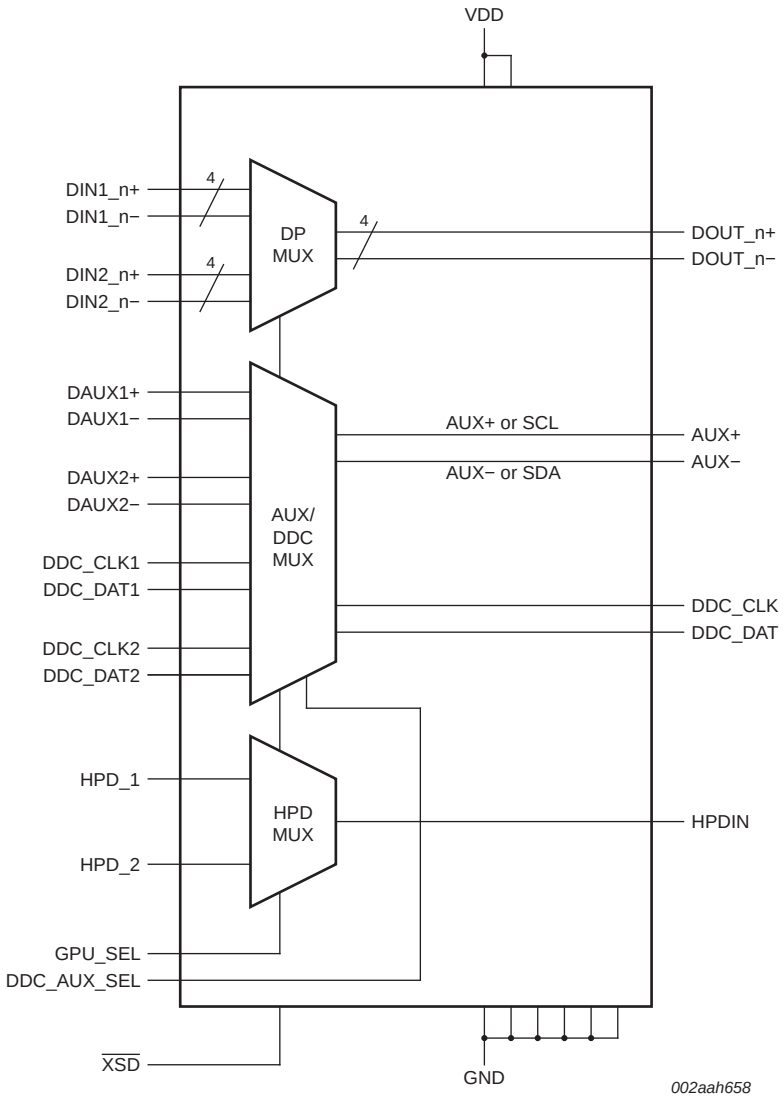


Fig 1. Functional diagram

6. Pinning information

6.1 Pinning

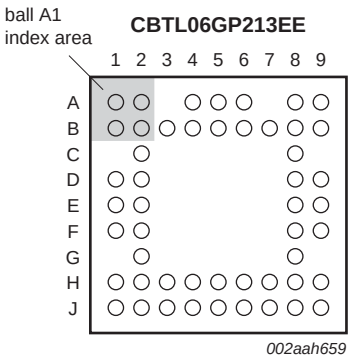


Fig 2. Pin configuration for TFBGA50

	1	2	3	4	5	6	7	8	9
A	GPU_SEL	VDD		DIN1_0−	DIN1_1−	DIN1_2−		DIN1_3+	DIN1_3−
B	DOUT_0−	DOUT_0+	GND	DIN1_0+	DIN1_1+	DIN1_2+	$\overline{XSD}$	DIN2_0+	DIN2_0−
C		DDC_AUX_SEL						GND	
D	DOUT_1−	DOUT_1+						DIN2_1+	DIN2_1−
E	DOUT_2−	DOUT_2+						DIN2_2+	DIN2_2−
F	DOUT_3−	DOUT_3+						DIN2_3+	DIN2_3−
G		GND						GND	
H	AUX−	AUX+	HPD_2	GND	DDC_CLK2	DAUX2+	GND	DDC_CLK1	DAUX1+
J	HPDIN	HPD_1	DDC_CLK	VDD	DDC_DAT2	DAUX2−	DDC_DAT	DDC_DAT1	DAUX1−

002aah660

Transparent top view

Fig 3. Ball mapping

6.2 Pin description

Table 3. Pin description

Symbol	Ball	Type	Description
GPU_SEL	A1	3.3 V CMOS single-ended input	Selects between two multiplexer/switch paths. When HIGH, path 2 left-side is connected to its corresponding right-side I/O. When LOW, path 1 left-side is connected to its corresponding right-side I/O. Refer to Table 6 for switch connection details.
DDC_AUX_SEL	C2	3.3 V CMOS single-ended input	Tri-level select pin. Selects between DDC and AUX paths. When HIGH, the AUX+ and AUX– I/Os are connected to appropriate DDC terminals. When LOW, the AUX+ and AUX– I/Os are connected to their appropriate AUX terminals. When MID, AUX and DDC terminals are connected to the AUX+/– and DDC_CLK/DAT I/Os respectively. Refer to Table 6 for switch connection details.
$\overline{\text{XSD}}$	B7	3.3 V CMOS single-ended input	Shutdown pin. Should be driven HIGH or connected to VDD for normal operation. When LOW, all paths are switched off (non-conducting high-impedance state) and supply current consumption is minimized.
DIN1_0+	B4	differential I/O	Four high-speed differential pairs for DisplayPort, PCI Express or HDMI, USB3 signals, path 1, left-side.
DIN1_0–	A4	differential I/O	
DIN1_1+	B5	differential I/O	
DIN1_1–	A5	differential I/O	
DIN1_2+	B6	differential I/O	
DIN1_2–	A6	differential I/O	
DIN1_3+	A8	differential I/O	
DIN1_3–	A9	differential I/O	
DIN2_0+	B8	differential I/O	Four high-speed differential pairs for DisplayPort, PCI Express or HDMI, USB3 signals, path 2, left-side.
DIN2_0–	B9	differential I/O	
DIN2_1+	D8	differential I/O	
DIN2_1–	D9	differential I/O	
DIN2_2+	E8	differential I/O	
DIN2_2–	E9	differential I/O	
DIN2_3+	F8	differential I/O	
DIN2_3–	F9	differential I/O	
DOUT_0+	B2	differential I/O	Four high-speed differential pairs for DisplayPort, PCI Express or HDMI, USB3 signals, right-side.
DOUT_0–	B1	differential I/O	
DOUT_1+	D2	differential I/O	
DOUT_1–	D1	differential I/O	
DOUT_2+	E2	differential I/O	
DOUT_2–	E1	differential I/O	
DOUT_3+	F2	differential I/O	
DOUT_3–	F1	differential I/O	
DAUX1+	H9	differential I/O	High-speed differential pair for AUX signals, path 1, left-side.
DAUX1–	J9	differential I/O	

Table 3. Pin description *...continued*

Symbol	Ball	Type	Description
DAUX2+	H6	differential I/O	High-speed differential pair for AUX signals, path 2, left-side.
DAUX2−	J6	differential I/O	
DDC_CLK	J3	differential I/O	Pair of single-ended terminals for DDC clock and data signals, right-side.
DDC_DAT	J7	differential I/O	
DDC_CLK1	H8	differential I/O	Pair of single-ended terminals for DDC clock and data signals, path 1, left-side.
DDC_DAT1	J8	differential I/O	
DDC_CLK2	H5	differential I/O	Pair of single-ended terminals for DDC clock and data signals, path 2, left-side.
DDC_DAT2	J5	differential I/O	
AUX+	H2	differential I/O	High-speed differential pair for AUX or single-ended DDC signals, right-side.
AUX−	H1	differential I/O	
HPD_1	J2	single-ended I/O	Single ended channel for the HPD signal, path 1, left-side.
HPD_2	H3	single-ended I/O	Single ended channel for the HPD signal, path 2, left-side.
HPDIN	J1	single-ended I/O	Single ended channel for the HPD signal, right-side.
VDD	A2, J4	power supply	3.3 V power supply.
GND	B3, C8, G2, G8, H4, H7	ground	Ground.

7. Functional description

Refer to Figure 1 “Functional diagram”.

The CBTL06GP213 uses a 3.3 V power supply. All main signal paths are implemented using high-bandwidth pass-gate technology and are non-directional. No clock or reset signal is needed for the multiplexer to function.

The switch position for the main channels is selected using the select signal GPU_SEL. Additionally, the signal DDC_AUX_SEL selects between AUX and DDC positions for the DDC / AUX channel. The detailed operation is described in Section 7.1.

7.1 Multiplexer/switch select functions

The internal multiplexer switch position is controlled by two logic inputs GPU_SEL and DDC_AUX_SEL as described below.

Table 4. Multiplexer/switch select control for DIN and DOUT channels

GPU_SEL	DIN1_n	DIN2_n
0	active; connected to DOUT_n	high-impedance
1	high-impedance	active; connected to DOUT_n

Table 5. Multiplexer/switch select control for HPD channel

GPU_SEL	HPD1	HPD2
0	active; connected to HPDIN	high-impedance
1	high-impedance	active; connected to HPDIN

Table 6. Multiplexer/switch select control for DDC and AUX channels

DDC_AUX_SEL	GPU_SEL	DAUX1	DAUX2	DDC1	DDC2
LOW	LOW	active; connected to AUX	high-Z	high-Z	high-Z
LOW	HIGH	high-Z	active; connected to AUX	high-Z	high-Z
HIGH	LOW	high-Z	high-Z	active; connected to AUX	high-Z
HIGH	HIGH	high-Z	high-Z	high-Z	active; connected to AUX
MID	LOW	active; connected to AUX	high-Z	active; connected to DDC	high-Z
MID	HIGH	high-Z	active; connected to AUX	high-Z	active; connected to DDC

The voltage thresholds for the different pin settings — LOW, MID and HIGH — are given in Table 14.

7.2 Shutdown function

The CBTL06GP213 provides a shutdown function to minimize power consumption when the application is not active but CBTL06GP213 can remain powered. Pin $\overline{\text{XSD}}$ (active LOW) puts all channels in off mode (non-conducting high-impedance state) while reducing current consumption to near-zero.

Table 7. Shutdown function

$\overline{\text{XSD}}$	State
0	shutdown
1	active

8. Limiting values

Table 8. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	supply voltage		–0.3	+4.6	V
V_I	input voltage	DDC_AUX_SEL, GPU_SEL, $\overline{XSD}$, DINx_n, DOUT_n	–0.3	+4.0	V
		AUX1, AUX2, AUX, DDC1, DDC2, DDC, HPD	–0.3	+6.0	V
T_{stg}	storage temperature		–65	+150	°C
V_{ESD}	electrostatic discharge voltage	HBM [1]	-	2000	V
		CDM [2]	-	500	V

[1] Human Body Model: ANSI/ESDAJEDEC JDS-001-2012 (Revision of ANSI/ESDA/JECEC JS-001-2011), ESDA/JEDEC Joint standard for ESD sensitivity testing, Human Body Model - Component level; Electrostatic Discharge Association, Rome, NY, USA; JEDEC Solid State Technology Association, Arlington, VA, USA.

[2] Charged Device Model: JESD22-C101E December 2009 (Revision of JESD22-C101D, October 2008), standard for ESD sensitivity testing, Charged Device Model - Component level; JEDEC Solid State Technology Association, Arlington, VA, USA.

9. Recommended operating conditions

Table 9. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DD}	supply voltage		3.0	3.3	3.6	V
V_I	input voltage	DDC_AUX_SEL, GPU_SEL, $\overline{XSD}$	–0.3	-	V_{DD} + 0.3	V
		DINx_n, DOUT_n	–0.3	-	+4.0	V
		AUX1, AUX2, AUX, DDC1, DDC2, DDC, HPD	–0.3	-	+5.5	V
T_{amb}	ambient temperature	operating in free air	–40	-	+105	°C

10. Characteristics

10.1 General characteristics

Table 10. General characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{DD}	supply current	operating mode ($\overline{XSD}$ = HIGH)	-	490	-	µA
		shutdown mode ($\overline{XSD}$ = LOW)	-	-	15	µA
P_{cons}	power consumption	operating mode ($\overline{XSD}$ = HIGH)	-	1.6	-	mW
$t_{startup}$	start-up time	supply voltage valid or $\overline{XSD}$ going HIGH to channel specified operating characteristics	-	-	5	ms
t_{rcfg}	reconfiguration time	GPU_SEL or DDC_AUX_SEL state change to channel specified operating characteristics	-	-	10	µs

10.2 DisplayPort channel characteristics

Table 11. DisplayPort channel characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_I	input voltage		–0.3	-	+4.0	V
V_{IC}	common-mode input voltage		0	-	3.6	V
V_{ID}	differential input voltage	peak-to-peak	-	-	+1.4	V
R_{ON}	ON resistance	V_{DD} = 3.3 V; I_I = 20 mA				
		V_{IC} = 0 V to 2 V	-	7	10	Ω
		V_{IC} = 2 V to 3.6 V	-	8	10	Ω
DDIL	differential insertion loss	channel is ON; f ≤ 100 MHz	-	–0.9	-	dB
		channel is ON; f = 1.35 GHz	-	–1.1	-	dB
		channel is ON; f = 2.7 GHz	-	–1.3	-	dB
		channel is OFF; f = 2.7 GHz	-	–23	-	dB
DDRL	differential return loss	f = 100 MHz	-	–22	-	dB
		f = 1.35 GHz	-	–21	-	dB
		f = 2.7 GHz	-	–19	-	dB
DDNEXT	differential near-end crosstalk	adjacent channels are ON				
		f = 100 MHz	-	–50	-	dB
		f = 2.7 GHz	-	–32	-	dB
B	bandwidth	–3.0 dB intercept	-	9.5	-	GHz
t_{PD}	propagation delay	from left-side port to right-side port or vice versa	-	80	-	ps
$t_{sk(dif)}$	differential skew time	intra-pair	-	5	8	ps
t_{sk}	skew time	inter-pair	-	-	80	ps
I_{LIH}	HIGH-level input leakage current	V_{DD} = 3.3 V; V_I = 4.0 V	-	-	10	μA
		V_{DD} = 0 V; V_I = 4.0 V	-	-	10	μA
I_{LIL}	LOW-level input leakage current	V_{DD} = 3.3 V; V_I = GND	-	-	10	μA

All S-parameter measurements are with respect to 100 Ω differential impedance reference, 50 Ω single-ended impedance reference. DDIL and DDRL measurements are with Common-mode voltage of 3 V.

10.3 AUX and DDC ports

Table 12. AUX and DDC port characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_I	input voltage		–0.3	-	+5.5	V
$V_{bias(DC)}$	bias voltage (DC)	AUX	0	-	3.3	V
$V_{i(dif)}$	differential input voltage	AUX; single-ended swing	-	-	0.7	V
R_{ON}	ON resistance	AUX path; V_{DD} = 3.3 V; I_I = 20 mA				
		V_{IC} = 0 V to 3.3 V	-	4.7	-	Ω
		V_{IC} = 3.3 V to 5.25 V	-	6.5	-	Ω
		DDC path; V_{DD} = 3.3 V; I_I = 20 mA				
		V_{IC} = 0 V to 3.3 V	-	6.5	-	Ω
		V_{IC} = 3.3 V to 5.25 V	-	8.5	-	Ω
DDIL	differential insertion loss	on AUX/DDC ports				
		channel is ON; f ≤ 100 MHz	-	–0.7	-	dB
		channel is ON; f = 240 MHz	-	–1.0	-	dB
		channel is ON; f = 720 MHz	-	–1.2	-	dB
		channel is OFF; f = 240 MHz	-	–38	-	dB
DDRL	differential return loss	on AUX/DDC ports				
		f = 100 MHz	-	–21	-	dB
		f = 240 MHz	-	–16	-	dB
		f = 720 MHz	-	–12	-	dB
t_{PD}	propagation delay	from left-side port to right-side port or vice versa [1]	-	80	-	ps
$t_{sk(dif)}$	differential skew time	intra-pair skew on AUX	-	10	-	ps
I_{LIH}	HIGH-level input leakage current	V_{DD} = 3.3 V; V_I = 4.0 V	-	-	–10	µA
I_{LIL}	LOW-level input leakage current	V_{DD} = 3.3 V; V_I = GND	-	-	+10	µA

[1] Time from DDC/AUX input changing state to AUX output changing state. Includes DDC/AUX rise/fall time.

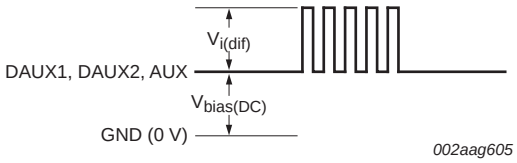


Fig 4. DAUX1, DAUX2 and AUX input voltage waveform

All S-parameter measurements are with respect to 100 Ω differential impedance reference and 50 Ω single-ended impedance reference.

10.4 HPDIN input, HPD_x outputs

Table 13. HPD input and output characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_I	input voltage		–0.3	-	+5.5	V
R_{ON}	ON resistance	V_{DD} = 3.3 V; I_I = 20 mA				
		V_{IC} = 0 V to 3.3 V	-	5	-	Ω
		V_{IC} = 3.3 V to 5.5 V	-	6.5	-	Ω
I_{LIH}	HIGH-level input leakage current	V_{DD} = 3.3 V; V_I = 4.0 V	-	-	–10	μA
I_{LIL}	LOW-level input leakage current	V_{DD} = 3.3 V; V_I = GND	-	-	+10	μA
t_{PD}	propagation delay	from HPDIN to HPD_x or vice versa [1]	-	100	-	ps

[1] Time from HPDIN changing state to HPD_x changing state. Includes HPD rise/fall time.

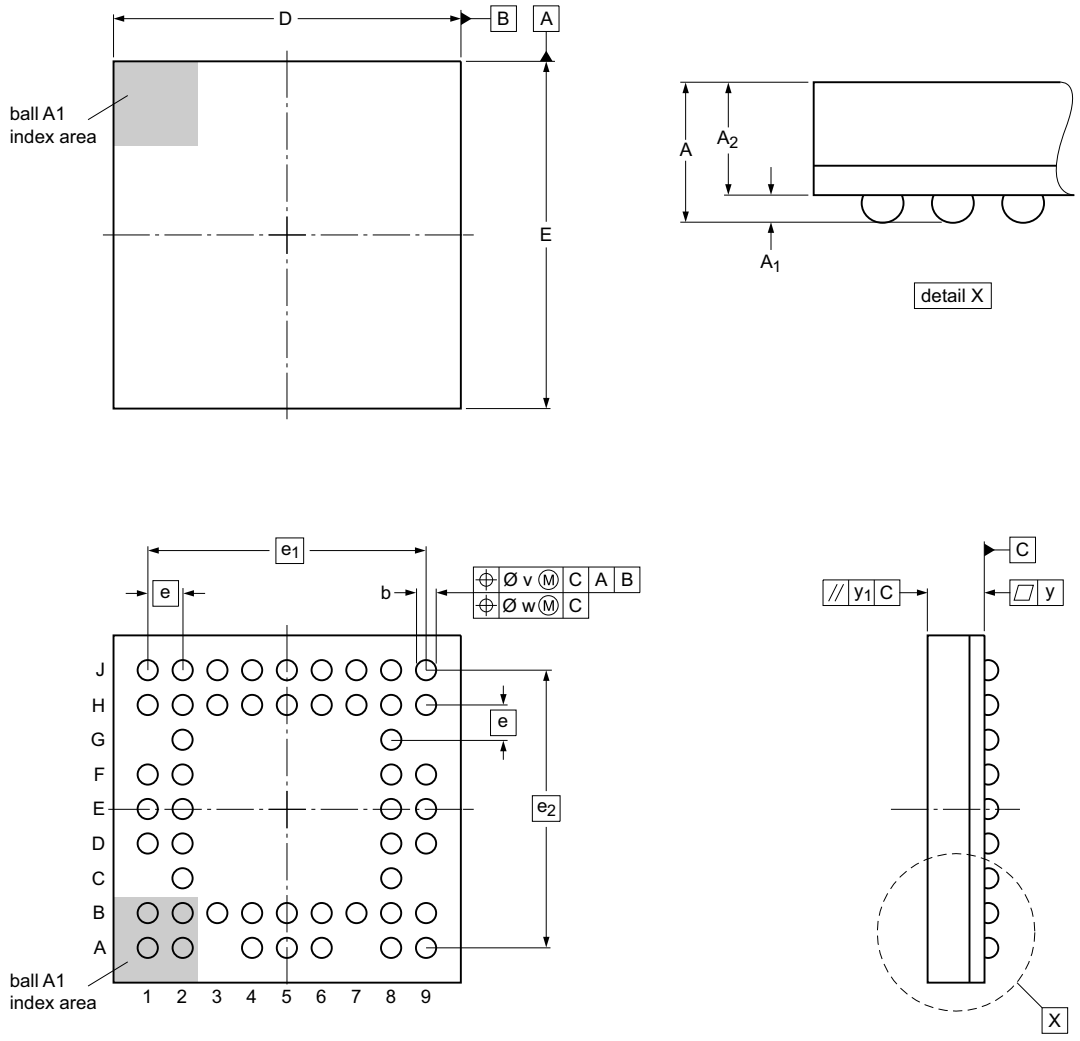
10.5 GPU_SEL, DDC_AUX_SEL, $\overline{\text{XSD}}$ inputs

Table 14. GPU_SEL, DDC_AUX_SEL, $\overline{\text{XSD}}$ input characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_I	input voltage	HIGH-level; GPU_SEL, DDC_AUX_SEL, $\overline{\text{XSD}}$	0.7 × V_{DD}	-	-	V
		MID-level; DDC_AUX_SEL	0.45 × V_{DD}	-	0.55 × V_{DD}	V
		LOW-level; GPU_SEL, DDC_AUX_SEL, $\overline{\text{XSD}}$	-	-	0.2 × V_{DD}	V
I_{LI}	input leakage current	HIGH-level; V_{DD} = 3.3 V; HIGH-level V_I = 3.6 V	-	-	–10	μA
		MID-level; V_{DD} = 3.3 V; MID-level V_I = 0.55 × V_{DD}	-	-	–10	μA
		LOW-level; V_{DD} = 3.3 V; LOW-level V_I = GND	-	-	+10	μA

11. Package outline

TFBGA50: plastic thin fine-pitch ball grid array package; 50 balls; **SOT1345-1**



Dimensions (mm are the original dimensions)

Unit		A	A_1	A_2	b	D	E	e	e_1	e_2	v	w	y	y_1
mm	max	1.15	0.25	0.90	0.35	5.1	5.1	0.5	4.0	4.0	0.15	0.05	0.08	0.1
	nom	1.00	0.20	0.80	0.30	5.0	5.0							
	min	0.90	0.15	0.75	0.25	4.9	4.9							

sot1345-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1345-1		MO-195				~~13-01-22~~ 13-01-28

Fig 5. Package outline TFBGA50 (SOT1345-1)

12. Soldering of SMD packages

This text provides a very brief insight into a complex technology. A more in-depth account of soldering ICs can be found in Application Note *AN10365 "Surface mount reflow soldering description"*.

12.1 Introduction to soldering

Soldering is one of the most common methods through which packages are attached to Printed Circuit Boards (PCBs), to form electrical circuits. The soldered joint provides both the mechanical and the electrical connection. There is no single soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and Surface Mount Devices (SMDs) are mixed on one printed wiring board; however, it is not suitable for fine pitch SMDs. Reflow soldering is ideal for the small pitches and high densities that come with increased miniaturization.

12.2 Wave and reflow soldering

Wave soldering is a joining technology in which the joints are made by solder coming from a standing wave of liquid solder. The wave soldering process is suitable for the following:

- Through-hole components
- Leaded or leadless SMDs, which are glued to the surface of the printed circuit board

Not all SMDs can be wave soldered. Packages with solder balls, and some leadless packages which have solder lands underneath the body, cannot be wave soldered. Also, leaded SMDs with leads having a pitch smaller than ~0.6 mm cannot be wave soldered, due to an increased probability of bridging.

The reflow soldering process involves applying solder paste to a board, followed by component placement and exposure to a temperature profile. Leaded packages, packages with solder balls, and leadless packages are all reflow solderable.

Key characteristics in both wave and reflow soldering are:

- Board specifications, including the board finish, solder masks and vias
- Package footprints, including solder thieves and orientation
- The moisture sensitivity level of the packages
- Package placement
- Inspection and repair
- Lead-free soldering versus SnPb soldering

12.3 Wave soldering

Key characteristics in wave soldering are:

- Process issues, such as application of adhesive and flux, clinching of leads, board transport, the solder wave parameters, and the time during which components are exposed to the wave
- Solder bath specifications, including temperature and impurities

12.4 Reflow soldering

Key characteristics in reflow soldering are:

- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 6) than a SnPb process, thus reducing the process window
- Solder paste printing issues including smearing, release, and adjusting the process window for a mix of large and small components on one board
- Reflow temperature profile; this profile includes preheat, reflow (in which the board is heated to the peak temperature) and cooling down. It is imperative that the peak temperature is high enough for the solder to make reliable solder joints (a solder paste characteristic). In addition, the peak temperature must be low enough that the packages and/or boards are not damaged. The peak temperature of the package depends on package thickness and volume and is classified in accordance with Table 15 and 16

Table 15. SnPb eutectic process (from J-STD-020D)

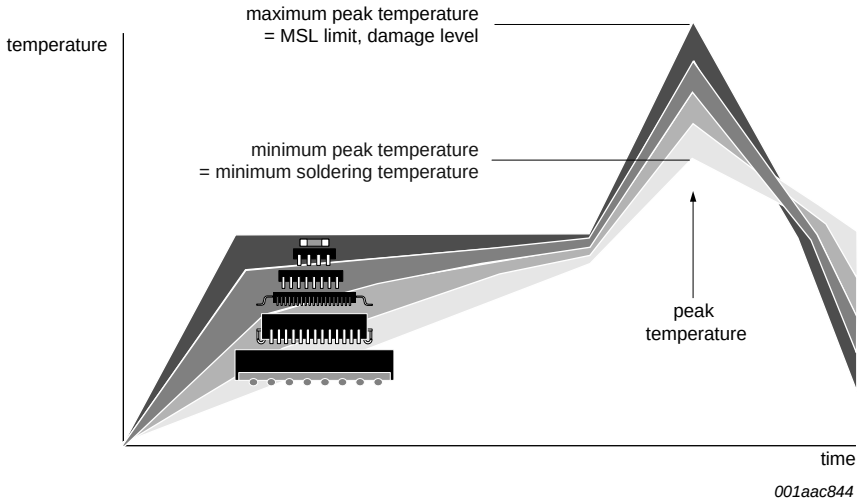
Package thickness (mm)	Package reflow temperature (°C)	
	Volume (mm^3)	
	< 350	≥ 350
< 2.5	235	220
≥ 2.5	220	220

Table 16. Lead-free process (from J-STD-020D)

Package thickness (mm)	Package reflow temperature (°C)		
	Volume (mm^3)		
	< 350	350 to 2000	> 2000
< 1.6	260	260	260
1.6 to 2.5	260	250	245
> 2.5	250	245	245

Moisture sensitivity precautions, as indicated on the packing, must be respected at all times.

Studies have shown that small packages reach higher temperatures during reflow soldering, see Figure 6.



MSL: Moisture Sensitivity Level

Fig 6. Temperature profiles for large and small components

For further information on temperature profiles, refer to Application Note *AN10365 "Surface mount reflow soldering description"*.

13. Abbreviations

Table 17. Abbreviations

Acronym	Description
AUX	Auxiliary channel (in DisplayPort definition)
DDC	Display Data Channel
DVI	Digital Video Interface
GPU	Graphics Processor Unit
HDMI	High-Definition Multimedia Interface
HPD	Hot Plug Detect
PCB	Printed-Circuit Board
PCIe	PCI Express

14. Revision history

Table 18. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
CBTL06GP213 v.3.1	20161213	Product data sheet	-	CBTL06GP213 v.3
Modifications:	• Section 1 and Section 2: Updated HDMI spec from 1.4b to 2.0			
CBTL06GP213 v.3	20140627	Product data sheet	-	CBTL06GP213 v.2
CBTL06GP213 v.2	20140217	Product data sheet	-	CBTL06GP213 v.1
CBTL06GP213 v.1	20130830	Product data sheet	-	-

15. Legal information

15.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

15.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

15.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

15.4 Licenses

Purchase of NXP ICs with HDMI technology

Use of an NXP IC with HDMI technology in equipment that complies with the HDMI standard requires a license from HDMI Licensing LLC, 1060 E. Arques Avenue Suite 100, Sunnyvale CA 94085, USA, e-mail: admin@hdmi.org.

15.5 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

16. Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

17. Contents

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 13 December 2016
Document identifier: CBTL06GP213

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

NXP:

CBTL06GP213EEJ CBTL06GP213EE