

# LT8718 --- Product Brief

## RGB to DP with Type-C

### Features

- **TTL Input**
  - Support up to 24-bit RGB/YUV & BT656/BT1120 Input
  - Support SDR and DDR Data Sampling
  - Support Resolution up to 4Kx2K@30Hz for RGB
  - Support Resolution up to 4Kx2K@60Hz for YUV420
- **DP Transmitter**
  - Compliant to VESA DP1.2 and eDP1.4 Standard
  - Support Two Lanes with 1.62Gbps (RBR), 2.7Gbps (HBR) or 5.4Gbps (HBR2) Data Rate
  - Data Lane and Polarity Swapping
  - Support HDCP1.3 Encryption
  - Support up to 24-bit RGB/YUV Data Format
  - Support Resolution up to 4Kx2K@30Hz for RGB
  - Support Resolution up to 4Kx2K@60Hz for YUV420
  - Build-in Pattern Generation
  - Support Hot-Plug Detect
  - Support Backlight Control for Screen Application
  - Optional SSC 0.5% Down-Spreading Output
  - Configurable and Power-on-Calibrated Output Swing for Optimized EMI
  - Internal Rterm Calibration with Less than 5% Error
- **USB Type-C**
  - Compatible with USB3.1 Gen1, USB Type-C R1.0, DP Alt Mode V1.0 and USB PD R2.0
  - 3 Data Roles Supported: DFP, UFP and DRP
  - 2 Power Roles Supported: Source and Sink
  - USB PD-PHY (Tx/Rx) and BMC Encoding/Decoding
  - USB PD Protocol Control by Software
  - Bi-directional Differential Passive Switch for USB3.1 Gen1 SS signal with less than 2.5-dB Insertion Loss, Controlled by Internal or External CC logic module
  - USB Full-Featured, Orientation & Role Detection
  - 3-level Current Ability Advertise (Host Mode) or Detection (Device Mode) for Type-C Power: USB

Default, 1.5A@5V, 3A@5V

- SBU Data Path Control for DP Alt Mode
- OCP Control for External VBUS Power Switch
- Dead Battery Supports (Sink Mode) When No Power Applied

- **Audio Input**

- Support SPDIF and up to 8-CH I2S Audio Input

- **Miscellaneous**

- 1.8V/3.3V Dual Supply Power
- External 25MHz Crystal Reference Clock
- Temperature Range: -40°C ~ +85°C
- Packaged in 10mm x 10mm QFN88

### Description

The Lontium LT8718 is RGB to DP converter with internal Type-C Alternate Mode switch and PD controller.

The input supports both normal 24-bit RGB/YUV and BT656/BT1120 mode under SDR or DDR sampling. The maximum resolution is up to 4K 30Hz for RGB input & 4K 60Hz for YUV420 input.

LT8718 converts the input TTL video data stream to a 4-lane DP1.2 or eDP1.4 compliant output, supporting RBR(1.62Gbps), HBR(2.7Gbps) and HBR2(5.4Gbps) link speeds. The build-in optional SSC function reduces EMI effect on EMI-concerned system application.

In order to be adaptable to the latest USB Type-C ecosystem, LT8718 integrates a high performance bi-directional passive differential switch controlled by CC logic and PD management unit to relieve mobile system design complexity and BOM cost. The switch function is compliant with VESA DP Alternate Mode on USB Type-C Standard.

The LT8718 is fabricated in advanced CMOS process and implemented in a small outline 10mmx10mm QFN88 (LT8718-Q88). This package is RoHS compliant and specified to operate from -40°C to +85°C.

## Application

- Mobile systems
- Cellular handsets
- Digital video cameras
- Digital still cameras
- Tablet PC, Notebook PC
- Car Display and Camera System

## Block Diagram

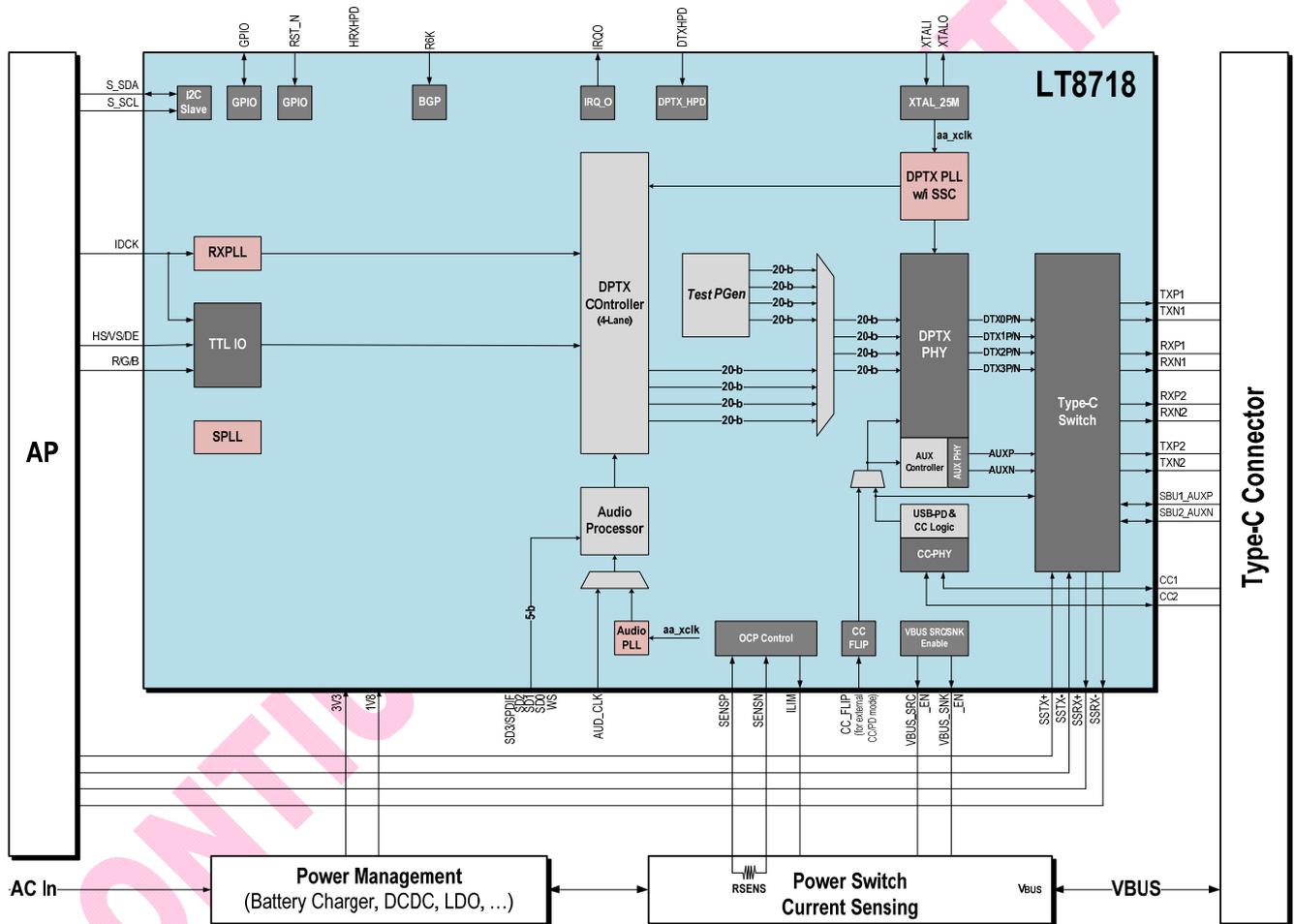
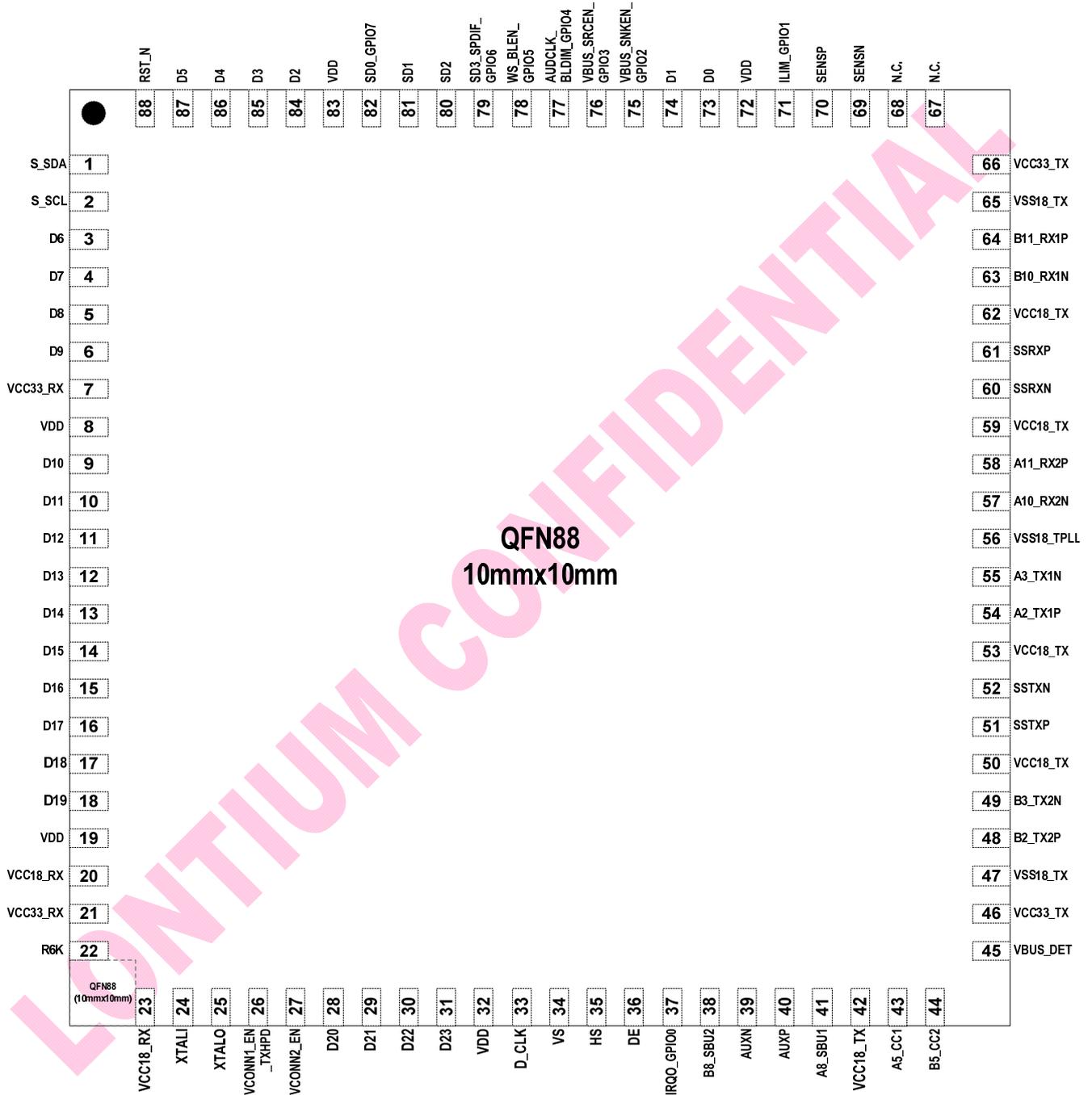


Fig1 Typical Application and System Diagrams

# Pin Diagram



## Pin Definition

Pin No.	Pin Name	Pin Description
1	S_SDA	<b>I2C Serial Data Input/Output</b> It serves as the serial port data IO slave for register access. Supports 1.8/3.3V CMOS logic.
2	S_SCL	<b>I2C Serial Clock Input</b> It serves as the serial port data clock slave for register access. Supports 1.8/3.3V CMOS logic.
3	D6	<b>RGB Data Input Bit-6</b> RGB data GPI input with internal 100K pull-down resistor.
4	D7	<b>RGB Data Input Bit-7</b> RGB data GPI input with internal 100K pull-down resistor.
5	D8	<b>RGB Data Input Bit-8</b> RGB data GPI input with internal 100K pull-down resistor.
6	D9	<b>RGB Data Input Bit-9</b> RGB data GPI input with internal 100K pull-down resistor.
7	VCC33_RX	<b>Analog 3.3V Power</b> 3.3V power for analog
8	VDD	<b>Digital core 1.8V Power</b> 1.8V power for digital core
9	D10	<b>RGB Data Input Bit-10</b> RGB data GPI input with internal 100K pull-down resistor.
10	D11	<b>RGB Data Input Bit-11</b> RGB data GPI input with internal 100K pull-down resistor.
11	D12	<b>RGB Data Input Bit-12</b> RGB data GPI input with internal 100K pull-down resistor.
12	D13	<b>RGB Data Input Bit-13</b> RGB data GPI input with internal 100K pull-down resistor.
13	D14	<b>RGB Data Input Bit-14</b> RGB data GPI input with internal 100K pull-down resistor.
14	D15	<b>RGB Data Input Bit-15</b> RGB data GPI input with internal 100K pull-down resistor.
15	D16	<b>RGB Data Input Bit-16</b> RGB data GPI input with internal 100K pull-down resistor.
16	D17	<b>RGB Data Input Bit-17</b> RGB data GPI input with internal 100K pull-down resistor.
17	D18	<b>RGB Data Input Bit-18</b> RGB data GPI input with internal 100K pull-down resistor.

Pin No.	Pin Name	Pin Description
18	D19	<b>RGB Data Input Bit-19</b> RGB data GPI input with internal 100K pull-down resistor.
19	VDD	<b>Digital core 1.8V Power</b> 1.8V power for digital core
20	VCC18_RX	<b>Analog 1.8V Power</b> 1.8V power for analog
21	VCC33_RX	<b>Analog 3.3V Power</b> 3.3V power for analog
22	R6K	<b>BandGap External Resistor</b> External 6K resistor for setting internal reference current.
23	VCC18_RX	<b>Analog 1.8V Power</b> 1.8V power for analog
24	XTALI	<b>Crystal Clock Input</b> A crystal oscillator should be attached between this pin and XTALO. However, a CMOS 1.8V compatible clock signal can also be connected to this pin as reference clock of LT8718
25	XTALO	<b>Crystal Clock Output</b> A crystal oscillator should be attached between this pin and XTALI. If XTALI is used as reference clock input, this pin must be floating.
26	VCONN1_EN_ TXHPD	<b>TYPE-C VCONN Power Control</b> In default, this pin is configured as GPIO to control an external power switch for VCONN1 on CC1 <b>DPTX HPD Input</b> This pin can also be configured as DPTX hot-plug detect input.
27	VCONN2_EN	<b>TYPE-C VCONN Power Control</b> In default, this pin is configured as GPIO to control an external power switch for VCONN2 on CC2 <b>CC Flip Control Input</b> This pin can also be configured as internal TYPE-C switch flip control input when external CC logic is used.
28	D20	<b>RGB Data Input Bit-20</b> RGB data GPI input with internal 100K pull-down resistor.
29	D21	<b>RGB Data Input Bit-21</b> RGB data GPI input with internal 100K pull-down resistor.
30	D22	<b>RGB Data Input Bit-22</b> RGB data GPI input with internal 100K pull-down resistor.
31	D23	<b>RGB Data Input Bit-23</b> RGB data GPI input with internal 100K pull-down resistor.
32	VDD	<b>Digital core 1.8V Power</b> 1.8V power for digital core

Pin No.	Pin Name	Pin Description
33	D_CLK	<b>RGB Pixel Clock Input</b> RGB clock GPI input with internal 100K pull-down resistor .
34	VS	<b>Vertical Sync Input</b> GPI input with internal 100K pull-down resistor.
35	HS	<b>Horizontal Sync Input</b> GPI input with internal 100K pull-down resistor.
36	DE	<b>Data Active Input</b> GPI input with internal 100K pull-down resistor.
37	IRQO_GPIO0	<b>Interrupt Request Output</b> In default, this pin is configured as interrupt request (IRQ) output. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output. <i>Note: this IO always works in standby power domain.</i>
38	B8_SBU2	<b>TYPE-C SBU2</b> Sideband Use Channel-2. An AC coupling capacitor is connected between this pin and AUXN.
39	AUXN	<b>DPTX AUX Channel Negative In/Out</b> Negative in/out of AUX channel in DP mode. An AC coupling capacitor is connected between this pin and B8_SBU2.
40	AUXP	<b>DPTX AUX Channel Positive In/Out</b> Positive in/out of AUX channel in DP mode. An AC coupling capacitor is connected between this pin and A8_SBU1.
41	A8_SBU1	<b>TYPE-C SBU1</b> Sideband Use Channel-1. An AC coupling capacitor is connected between this pin and AUXP.
42	VCC18_TX	<b>Analog 1.8V Power</b> 1.8V power for analog.
43	A5_CC1	<b>TYPE-C Connector Configure Channel-1</b> TYPE-C CC1 or VCONN1
44	B5_CC2	<b>TYPE-C Connector Configure Channel-2</b> TYPE-C CC2 or VCONN2
45	VBUS_DET	<b>TYPE-C VBUS Power Detect Input</b> VBUS voltage detection input in TYPE-C UFP mode
46	VCC33_TX	<b>Analog 3.3V Power</b> 3.3V power for analog
47	VSS18_TX	<b>Analog 1.8V Ground</b> 1.8V ground for analog
48	B2_TX2P	<b>TYPE-C Connector Positive Output</b> TYPE-C positive output of polarity swappable differential pairs up to 5.4Gb/s.

Pin No.	Pin Name	Pin Description
49	B3_TX2N	<b>TYPE-C Connector Negative Output</b> TYPE-C negative output of polarity swappable differential pairs up to 5.4Gb/s.
50	VCC18_TX	<b>Analog 1.8V Power</b> 1.8V power for analog.
51	SSTXP	<b>USB3.1 Positive Input</b> USB3.1 Gen1 SSTX positive input of differential pairs up to 5.4Gb/s.
52	SSTXN	<b>USB3.1 Negative Input</b> USB3.1 Gen1 SSRX negative input of differential pairs up to 5.4Gb/s.
53	VCC18_TX	<b>Analog 1.8V Power</b> 1.8V power for analog.
54	A2_TX1P	<b>TYPE-C Connector Positive Output</b> TYPE-C positive output of polarity swappable differential pairs up to 5.4Gb/s.
55	A3_TX1N	<b>TYPE-C Connector Negative Output</b> TYPE-C negative output of polarity swappable differential pairs up to 5.4Gb/s.
56	VSS18_TX	<b>Analog 1.8V Ground</b> 1.8V ground for analog
57	A10_RX2N	<b>TYPE-C Connector Negative Input/Output</b> TYPE-C negative in/out of polarity swappable differential pairs up to 5.4Gb/s.
58	A11_RX2P	<b>TYPE-C Connector Positive Output</b> TYPE-C positive in/out of polarity swappable differential pairs up to 5.4Gb/s.
59	VCC18_TX	<b>Analog 1.8V Power</b> 1.8V power for analog.
60	SSRXN	<b>USB3.1 Negative Input</b> USB3.1 Gen1 SSRX negative input of differential pairs up to 5.4Gb/s.
61	SSRXP	<b>USB3.1 Positive Input</b> USB3.1 Gen1 SSRX positive input of differential pairs up to 5.4Gb/s.
62	VCC18_TX	<b>Analog 1.8V Power</b> 1.8V power for analog.
63	B10_RX1N	<b>TYPE-C Connector Negative Input/Output</b> TYPE-C negative in/out of polarity swappable differential pairs up to 5.4Gb/s.
64	B11_RX1P	<b>TYPE-C Connector Positive Output</b> TYPE-C positive in/out of polarity swappable differential pairs up to 5.4Gb/s.
65	VSS18_TX	<b>Analog 1.8V Ground</b> 1.8V ground for analog
66	VCC33_TX	<b>Analog 3.3V Power</b> 3.3V power for analog
67	N.C.	No Connect
68	N.C.	No Connect

Pin No.	Pin Name	Pin Description
69	SENSN	<b>OCP Sense Negative Input</b> Negative sense for external high voltage power path current sense resistance. Short pin to VBUS when unused.
70	SENSP	<b>OCP Sense Positive Input</b> Positive sense for external high voltage power path current sense resistance. Short pin to VBUS when unused.
71	ILIM_GPIO1	<b>OCP State Output</b> Over current state GPIO output. When no over-current, this pin outputs 0; when over-current happens, this pin outputs 1. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
72	VDD	<b>Digital core 1.8V Power</b> 1.8V power for digital core
73	D0	<b>RGB Data Input Bit-0</b> RGB data GPI input with internal 100K pull-down resistor.
74	D1	<b>RGB Data Input Bit-1</b> RGB data GPI input with internal 100K pull-down resistor.
75	VBUS_SNKEN_GPIO2	<b>VBUS Sinking Enable Output</b> External VBUS power switch control output in TYPE-C SNK Power Role. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
76	VBUS_SRCEN_GPIO3	<b>VBUS Sourcing Enable Output</b> External VBUS power switch control output in TYPE-C SRC Power Role. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
77	AUDCLK_BLDIM_GPIO4	<b>I2S Audio Clock Input</b> In default, this pin is configured as I2S clock input. <b>eDP Backlight Control DIM</b> This pin can also be configured as eDP backlight control dim output <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
78	WS_BLEN_GPIO5	<b>I2S Audio Word Select Input</b> In default, this pin is configured to I2S channel select input. <b>eDP Backlight Control Enable</b> This pin can also be configured as eDP backlight control enable output <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.

Pin No.	Pin Name	Pin Description
79	SD3_SPDIF_ GPIO6	<b>I2S Serial Audio Data Input</b> In default, this pin is configured to I2S serial audio data input Bit-3. <b>SPDIF Audio Signal Input</b> This pin can also be configured as SPDIF audio data input. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
80	SD2	<b>I2S Serial Audio Data Input</b> In default, this pin is configured to I2S serial audio data input Bit-2.
81	SD1	<b>I2S Serial Audio Data Input</b> In default, this pin is configured to I2S serial audio data input Bit-1.
82	SD0_GPIO7	<b>I2S Serial Audio Data Input</b> In default, this pin is configured to I2S serial audio data input Bit-0. <b>Digital Test Signal Output</b> When this pin is configured as GPIO, it serves as digital test signal output.
83	VDD	<b>Digital core 1.8V Power</b> 1.8V power for digital core
84	D2	<b>RGB Data Input Bit-2</b> RGB data GPI input with internal 100K pull-down resistor.
85	D3	<b>RGB Data Input Bit-3</b> RGB data GPI input with internal 100K pull-down resistor.
86	D4	<b>RGB Data Input Bit-4</b> RGB data GPI input with internal 100K pull-down resistor.
87	D5	<b>RGB Data Input Bit-5</b> RGB data GPI input with internal 100K pull-down resistor.
88	RST_N	<b>Hardware Reset Input</b> Chip reset signal. Active LOW.
89	#EPAD	EPAD

## Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
LT8718-Q88	-40°C to 85°C	10mmx10mm QFN88	Tape and Reel

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