AN3528
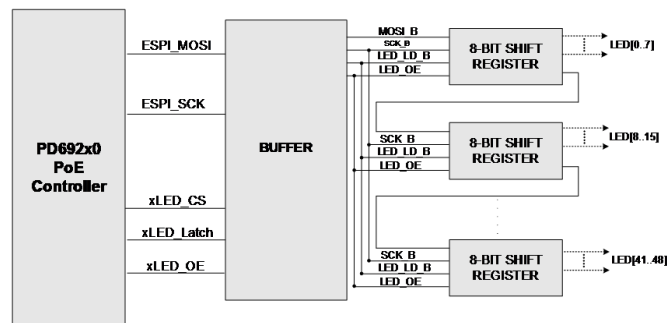
BT PoE LED Stream Interface

Introduction

The LED stream feature supports IEEE 802.3bt PoE port status LEDs for products based on the Microchip PD69200, PD69210 or PD69220 PoE controllers. The LED stream is a serial bit stream between the PoE Controller, dedicated circuit, and the LED, as shown in the following figure.

The shift registers in the dedicated circuit extract the ports LEDs status out of the stream. Up to 48 logical ports are supported.

Figure 1. LED Interface Application

Table of Contents

1. Description

The LED Stream feature is software configurable by individual mask 0x20. See the *PD692x0 Serial Communication Protocol User Guide* for more information.

Mask 0x20 comprises three LED parameters:

- LED Stream Type: select one of the three serial stream types.
  - 0: LED Stream Disabled—Port indication is disabled.
  - 1: Unicolor LED Stream—Single color led indication is transmitted per logical port.
  - 2: Bicolor LED Stream—Dual color indication is transmitted per logical port.

The following table lists a set of commands that sets the LED stream types.

Table 1-1. Set Individual Mask 0x20

1	2	3	4	5	6	7	8
KEY	ECHO	DATA	DATA	DATA	DATA	DATA	DATA
Command (0x00)	##	Global (0x07)	Individual_Mask (0x56)	Mask Key# (0x20)	Data (0/1/2)	N	N
9	10	11	12	13	14	15	
DATA	DATA	DATA	DATA	DATA	CSum H	CSum L	
N	N	N	N	N	##	##	

Figure 1-1. Set Individual Mask

[0] KEY	[1] ECHO	[2] SUB	[3] SUB1	[4] SUB2	[5] DATA	[6] DATA	[7] DATA	[8] DATA	[9] DATA	[10] DATA	[11] DATA	[12] DATA
0x00	##	0x07	0x56	Val	Val	0x4E	0x4E	0x4E	0x4E	0x4E	0x4E	0x4E
Command		Global	Individual_Mask	Mask Key Number	En/Dis	N	N	N	N	N	N	N

2. LED Stream Operational Modes

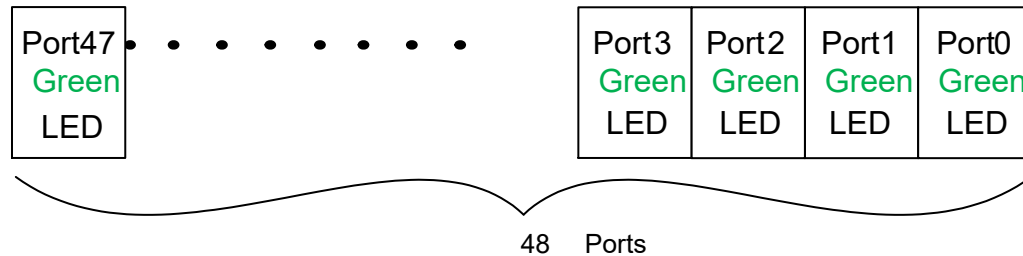The serial bit of the LED Stream has three operation modes configured via the LED Stream type.

The two modes are: Unicolor and Bicolor.

2.1 Unicolor Indication Mode

Logical port status is indicated by a single color per port LED, typically in green.

The LED stream communication data structure is as follow:

Figure 2-1. Unicolor Indication

Port47		Port3	Port2	Port1	Port0
Green	• • • • • • • •	Green	Green	Green	Green
LED		LED	LED	LED	LED

48   Ports

The stream data contains 48 bits – a single bit per each logical port.

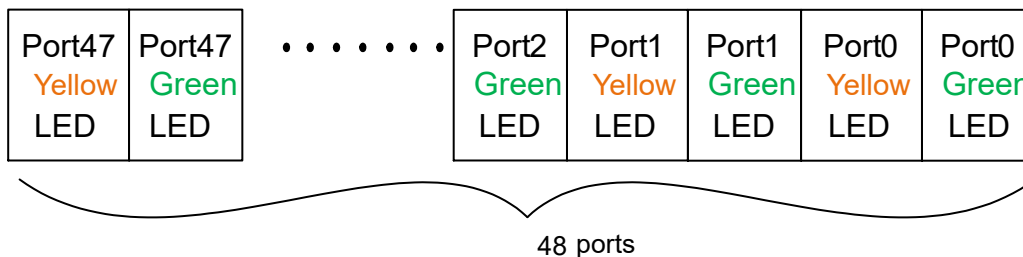Port#47 data is transmitted first and port #0 data is transmitted last.

LEDs indication, corresponding to the logical port status, is described in Table 1-1.

2.2 Bicolor Indication Mode

Port status is indicated by bicolored LED per each logical port, typically in green and yellow).

The LED stream serial data structure is as follows.

Figure 2-2. Bicolor Indication

Port47	Port47		Port2	Port1	Port1	Port0	Port0
Yellow	Green	• • • • • • •	Green	Yellow	Green	Yellow	Green
LED	LED		LED	LED	LED	LED	LED

48 ports

The serial LED stream supports 48 ports. The ports LEDs state is sent sequentially to all ports, two bits per logical port, giving a total of 96 bits.

Port #47 data is transmitted first and port #0 data is transmitted last.

LEDs indication, corresponding to the logical port status, is described in Table 1-1.

3.   Detailed Schematics

Figure 2-1 describes the detailed schematics of the LED stream application for unicolored indication with 24 ports and bicolored indication with 12 ports. The schematic is based on the block diagram shown in Figure 1.

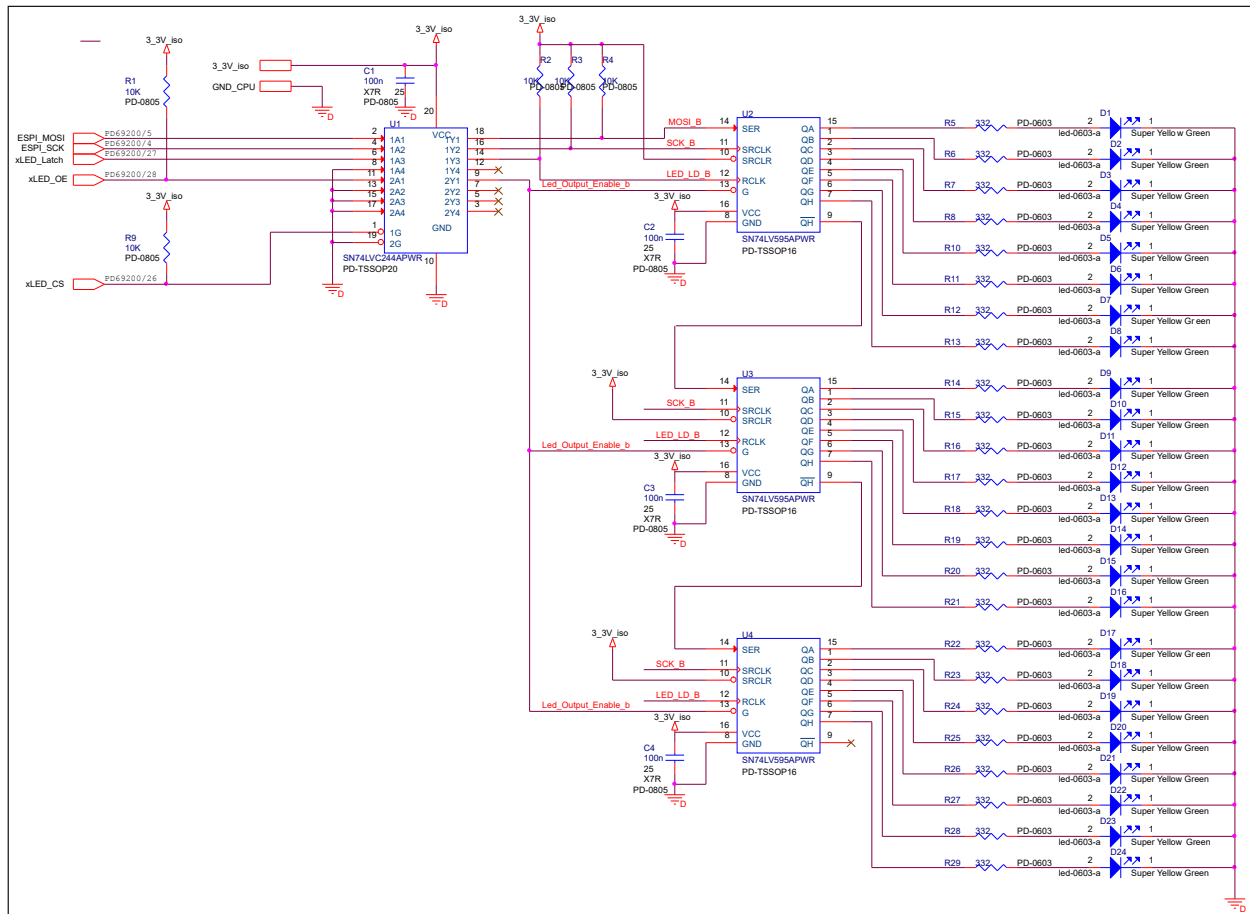| Value	Status	Comments	Port Led Bicolor	Port Led Unicolor	Remark
0x06	Port is OFF: Main supply voltage is high.	Main voltage is higher than the maximum voltage limit.	OFF	OFF	"SYS OK led" blinks
0x07	Port is OFF: Main supply voltage is low.	Main voltage is lower than the minimum voltage limit.	OFF	OFF	"SYS OK led" blinks
0x08	Port is OFF: The disable all ports pin is active.	Hardware pin disables all ports.	OFF	OFF	
0x0C	Port is OFF: Non-existing port number.	Fewer ports are available than the maximum number of ports that the Controller can support. Unavailable ports are considered 'OFF', currently not used.	OFF	OFF	
0x11	Port is yet to be undefined.	Port is not mapped to physical port or port is in unknown state or PD69200 fail to communicate with PD69208 device allocated for this port.	OFF	OFF	
0x12	Port is OFF: Internal hardware fault.	Port does not respond. Hardware fault, system initialization or PD69200 lost communication with PD69208 device allocated for this port. (Part of refresh function).	Blinks green	Blinks	
0x1A	Port is OFF: User settings.	User command set port to OFF.	OFF	OFF	
0x1B	Port is OFF: Detection is in process.	Interim state during line detection. Status will change after detection process is completed.	OFF	OFF	
0x1C	Port is OFF: Non-802.3AF/AT powered device.	Non-standard PD connected.	Blinks green	Blinks	Blinking can be disabled by mask 0x30.

Value	Status	Comments	Port Led Bicolor	Port Led Unicolor	Remark
	..........continued				
0x1E	Port is OFF: Underload state.	Underload state according to 802.3AF/AT (current is below Imin).	Blinks green	Blinks	
0x1F	Port is OFF: Overload state.	Overload state according to 802.3AF/AT (current is above Icut). OR (PM3 != 0 and (PD class report > user predefined power value)).	Blinks green	Blinks	
0x20	Port is OFF: Power budget exceeded.	Power Management function shuts down port, due to lack of power. Port is shut down or remains off.	Blinks green	Blinks	
0x24	Port is OFF: Voltage injection into the port.	Port fails due to voltage being applied to the port from the external source.	Blinks green	Blinks	
0x25	Port is OFF: Improper Capacitor Detection results or Detection values indicating short.	Fail due to out-of-range capacitor value or Fail due to detected short value (When mask 0x04 is set).	Blinks green	Blinks	Blinking can be disabled by mask 0x30
0x26	Port is OFF: Discharged load.	Port fails due to system voltage supply through other port. Check other port for status 0x24. This error is linked with mask 0x1F enable.	Blinks green	Blinks	
0x34	Port is OFF: Short condition.	Short condition was detected.	Blinks green	Blinks	
0x35	Port is OFF: Over temperature at the port.	Port temperature protection mechanism was activated.	Blinks green	Blinks	
0x36	Port is OFF: Device is too hot.	The die temperature is above safe operating value.	Blinks green	Blinks	
0x3C	Power Management-Static.	Calculated power > power limit.	Blinks green	Blinks	

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Value	Status	Comments	Port Led Bicolor	Port Led Unicolor	Remark
0x3D	Power Management-Static –ovl	Port Power up was denied due to (PD class report power > user predefined power value). Note: Power denied counter will advance.	Blinks green	Blinks	
0x41	Power denied: Hardware power limit.	Port was not turned on due to hardware power limit (PD class power > Hardware class limit) Example: PoH PD over M device port.	Blinks green	Blinks	
0x43	Port is OFF: Class Error.	Illegal class	Blinks green	Blinks	
0x80	2P Port delivering Legacy.	Legacy PD was detected using 2P matrix in BT mode	Yellow ON	ON	
0x81	2P Port delivering IEEE.	802.3BT-compliant PD was detected using 2P matrix	Yellow ON	ON	
0x82	4P Port that deliver only 2 Pair non IEEE.	Signature failure on Alt-B, allowing power only on Alt-A (Non IEEE or Legacy PD).	Yellow ON	ON	
0x83	4P Port delivering 2P non IEEE.	Legacy PD was detected using 4P matrix in BT mode and power as 2Pair	Yellow ON	ON	
0x84	4P Port delivering 4P non IEEE.	Legacy PD was detected using 4P matrix in BT mode and power as 4Pair	Green ON	ON	
0x85	4P Port delivering 2P IEEE SSPD.	802.3BT- SSPD was detected using 4P matrix and operate as 2P if requested class =< 4	Yellow ON	ON	
0x86	4P Port delivering 4P IEEE SSPD.	802.3BT- SSPD was detected using 4P matrix and operate as 4P if requested class > 4	Green ON	ON	

..........continued

Value	Status	Comments	Port Led Bicolor	Port Led Unicolor	Remark
0x87	4P Port delivering 2P IEEE DSPD in1st phase.	802.3BT- DSPD was detected using 4P matrix and operate as 2P due to 4pair candidate validation in two cycles.	Green ON	ON	
0x88	4P Port delivering 2P IEEE DSPD.	802.3BT- DSPD was detected using 4P matrix and operate as 2P	Yellow ON	ON	
0x89	4P Port delivering 4P IEEE DSPD	802.3BT- DSPD was detected using 4P matrix and operate as 4P	Green ON	ON	
0x90	Force Power BT 2P	Port matrix 2P and delivers power due to force power command	Yellow ON	ON	
0x91	Force Power BT 4P	Port matrix 4P and delivers power on both pair sets due to force power command	Green ON	ON	
0xA0	Force Power BT Error	Force power command was set, one of the port pair sets stop delivering power, from at least one reason out of various reasons (System related, Device related, port related or Pair set related)	Blinks green	Blinks	
0xA7	Connection Check Error	This error will be reported only in 4 pair port when invalid connection check signature was detected and the port will not proceed to the next step. In such case detection fail counter will be incremented.	Blinks green	Blinks	Blinking can be disabled by mask 0x30
0xA8	Open	Port is not connected	OFF	OFF	

Figure 3-1. Bicolored LED Stream Interface with PD692x0

The following table lists the bill of material for LED Stream Interface, Bicolored.

Table 3-1. Bill of Material for LED Stream Interface, Bicolored

Qty	Reference	Footprint	Description	Manufacturer	Manufacture P/N
4	C1, C2, C3, C4	PD-0805	CAP CRM 100nF 25V 5%++X7R 0805 SMT	AVX	08053C104JAT2A
12	D1, D3, D5, D7, D9, D11, D13, D15, D17, D19, D21, D23	LED-0603	LED Green 100-130o 20-40mcd h=1 0603 SMD	Everlight	19-21-SYGCS530E1TR8
12	D2, D4, D6, D8, D10, D12, D14, D16, D18, D20, D22, D24 *	LED-0603	LED Yellow 100-130o 30-80mcd h=1 0603 SMD	Everlight	19-21UYC/S530-A2/TR8
5	R1, R2, R3, R4, R9	PD-0805	RES 10K 125mW 1%++0805 SMT MTL FLM	EPCOS	B54102-A2103-F60
24	R5, R6, R7, R8, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29	PD-0805	RES 332R 62.5mW 1%0603 SMT MTL FLM	Vishay	CRCW0603 332RFKEA
1	U1	PD-TSSOP20	IC DRV bufferTri state 3.3V TSSOP-20 SMT	Texas Instruments	SN74LVC244APWR

..........continued

Qty	Reference	Footprint	Description	Manufacturer	Manufacture P/N
3	U2, U3, U4	PD-TSSOP16	IC 8-BIT SHFT REG TRI-ST16-TSSOP	Texas Instruments	SN74LV595APWR

4. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	06/2020	Initial Release

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