TPS2546 / TPS2546Q1 Production Silicon Checklist

ABSTRACT

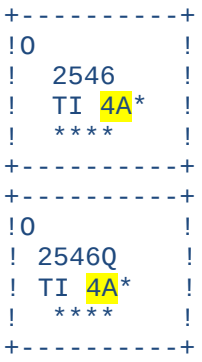
TI has discovered a bug with TPS2546 and TPS2546Q1 load detect feature. The bug is related to /STATUS pin being triggered when TPS2546/Q1 is programmed in SDP2 mode (1110) and a USB device is attached to the TPS2546/Q1 port.

This bug has no affect in systems (like most notebooks and desktops) where only one TPS2546 device is used. Even in systems where multiple TPS2546/Q1 devices are installed the bug will impact only those systems that implements port power management (PPM) feature in CDP/SDP2 mode as described in the datasheet (visit www.ti.com to download latest version). PPM implementation in DCP_Auto mode or in CDP/SDP1 mode is not affected by this bug.

Important:

TI fixed the SDP2 mode bug (outlined in this document) in all TPS2546 and TPS2546Q1 devices manufactured after October 31st 2014.

This bug only affects TPS2546 and TPS2546Q1 parts that were manufactured ***before*** October 31st 2014. Customers can easily verify if the part they are using is affected by this bug, by inspecting top-side marking on the part.



Parts that have the bug fixed will have date code 4B* or higher (i.e. 4B, 4C, 51, etc).
In the heighted alphanumeric character, the number represents the year of manufacture, hence 4 is year 201**4** and a 5 means 201**5** and so on). The second character is a HEX for the month (1 = January, 2 = February.. A = October etc.).

When in doubt please contact your local TI sales office.

Silicon Bug: /STATUS Output is Active in SDP2 Mode

Description: Refer to device truth table (Table 2 and Table 3 in TPS2546 and TPS2546-Q100 datasheet respectively). As shown in the table below, there are two SDP modes that the device can be programmed to via the CTL pin setting, SDP1 and SDP2. Key difference between SDP1 and SDP2 mode is presence or absence of discharge event. Transition from CDP to SDP2 does not involve a discharge event, whereas from CDP to SDP1 the device will initiate a discharge.

In either SDP1 or SDP2 mode /STATUS output is deactivated (OFF), however the silicon bug discovered makes the /STATUS output active in SDP**2** mode when a USB device is attached.

CTL1	CTL2	CTL3	ILIM_SEL	MODE	CURRENT LIMIT SETTING	STATUS OUTPUT (Active low)	COMMENT
0	0	0	0	Discharge	N/A	OFF	OUT held low
0	0	0	1	Discharge	N/A	OFF	
0	0	1	0	DCP_Auto	ILIM_HI	OFF	Data lines disconnected
0	0	1	1	DCP_Auto	I_{OS_PW} and ILIM_HI(1)	DCP load present(2)	Data lines disconnected and Load Detect function active
0	1	0	0	SDP1	ILIM_LO	OFF	Data lines connected
0	1	0	1	SDP1	ILIM_HI	OFF	
0	1	1	0	DCP_Auto	ILIM_HI	OFF	Data lines disconnected
0	1	1	1	DCP_Auto	ILIM_HI	DCP load present(3)	Data lines disconnected and Load Detect function active
1	0	0	0	DCP_Shorted	ILIM_LO	OFF	Device forced to stay in DCP BC1.2 charging mode
1	0	0	1	DCP_Shorted	ILIM_HI	OFF	
1	0	1	0	DCP / Divider1	ILIM_LO	OFF	Device forced to stay in DCP Divider1 charging mode
1	0	1	1	DCP / Divider1	ILIM_HI	OFF	
1	1	0	0	SDP1	ILIM_LO	OFF	Data lines connected
1	1	0	1	SDP1	ILIM_HI	OFF	
1	1	1	0	SDP2(4)	ILIM_LO	OFF	
1	1	1	1	CDP(5)	ILIM_HI	CDP load present(5)	Data lines connected and Load detect active

(1) The TPS2546-Q1 current-limit (I_{OS}) automatically switches between I_{OS_PW} and the value set by ILIM_HI according to the *Load Detection – Power Wake* functionality.
(2) The DCP load present is governed by the *Load Detection – Power Wake* limits.
(3) The DCP load present is governed by the *Load Detection – Non-Power Wake* limits.
(4) OUT does not discharge when changing between 1111 and 1110.
(5) The CDP load present is governed by the *Load Detection – Non-Power Wake* limits and BC1.2 primary detection.

BUG: /STATUS is asserted in SDP2

Application Impact:

SDP2 /STATUS bug will render implementation of port power management, PPM (refer to device datasheet) problematic in CDP mode. ***PPM when used in DCP_Auto mode or when device is configured to go to SDP1 mode (from CDP mode during a PPM event) the device will work as defined in the datasheet.***

To illustrate the bug refer to Figure 1 where Port 1 and Port 2 are both configured as CDP ports (1111) with no USB device attached. Assume a USB device capable of drawing load current >700 mA is connected to Port 1. TPS2546/Q1 attached to this port (#1) will assert its /STATUS output low. This will force ILIM_SEL on #2 TPS2546 to go low, thereby changing its operating state from 1111 (CDP) to 1110 (SDP2).

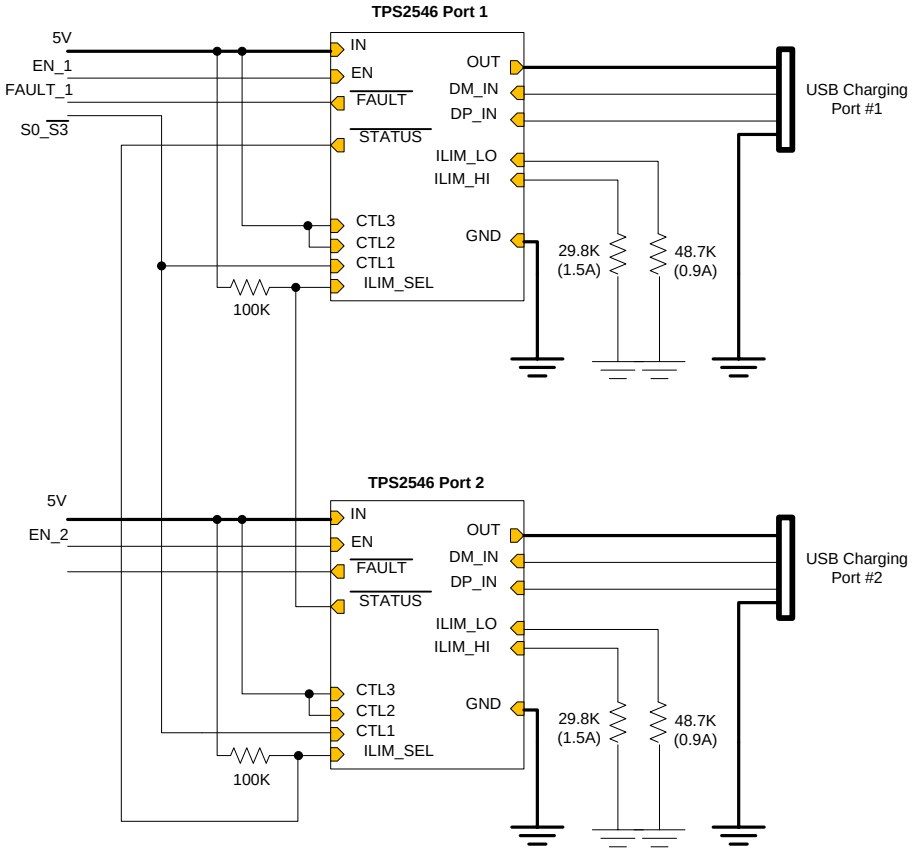


Figure 1. Port Power Management Implementation

Now if another USB device is attached to Port #2, the SDP2 bug in the #2 TPS2546/Q1 will erroneously assert its /STATUS output low thereby forcing port 1 to SDP2 mode (1111 → 1110) from CDP mode.

This is an undesired operation for PPM as USB device connected to port 1 will be switched to lower charging current (set by ILIM_LO) when it requested for higher current set by ILIM_HI.

Work around:

Use device PPM feature in DCP_Auto mode or when using in CDP mode the second device will need to be programmed to go to SDP1 mode as shown below. There is no workaround to use PPM in CDP mode with SDP2

Table 1. Port Power Management Valid and Invalid Transitions

CTL1	CTL2	CTL3	ILIM_SEL	MODE	CURRENT LIMIT SETTING	STATUS OUTPUT (Active low)	COMMENT
0	0	0	0	Discharge	N/A	OFF	OUT held low
0	0	0	1	Discharge	N/A	OFF	
0	0	1	0	DCP_Auto	ILIM_HI	OFF	Data lines disconnected
0	0	1	1	DCP_Auto	I_{OS_PW} and ILIM_HI(1)	DCP load present(2)	Data lines disconnected and Load Detect function active
0	1	0	0	SDP1	ILIM_LO	OFF	Data lines connected
0	1	0	1	SDP1	ILIM_HI	OFF	
0	1	1	0	DCP_Auto	ILIM_HI	OFF	Data lines disconnected
0	1	1	1	DCP_Auto	ILIM_HI	DCP load present(3)	Data lines disconnected and Load Detect function active
1	0	0	0	DCP_Shorted	ILIM_LO	OFF	Device forced to stay in DCP BC1.2 charging mode
1	0	0	1	DCP_Shorted	ILIM_HI	OFF	
1	0	1	0	DCP / Divider1	ILIM_LO	OFF	Device forced to stay in DCP Divider1 charging mode
1	0	1	1	DCP / Divider1	ILIM_HI	OFF	
1	1	0	0	SDP1	ILIM_LO	OFF	Data lines connected
1	1	0	1	SDP1	ILIM_HI	OFF	
1	1	1	0	SDP2(4)	ILIM_LO	OFF	
1	1	1	1	CDP(4)	ILIM_HI	CDP load present(5)	Data lines connected and Load detect active

Resolution:

TI has fixed the SDP2 bug in silicon, see first page of this document for details.

Impacted Device:

Device	Package	Top-Side Marking
TPS2546	QFN16	2546
TPS2546Q1	QFN16	2546Q

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