

Transition From USB 3.0 Hub To USB 3.1 Hub

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ABSTRACT

The application report provides instructions on how to transition an application that is currently using a USB 3.0 TUSB8041RGC hub to the TUSB8041A/42/43/44 RGC family of USB 3.1 generation 1 hubs.

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1 Introduction

The following are functional differences:

- TUSB8041 – USB 2.1 and USB 3.0 compliant, 4-port hub
- TUSB8041A – USB 2.1 and USB 3.1 generation 1 compliant, 4-port hub
- TUSB8042 – USB 2.1 and USB 3.1 generation 1 compliant, 4-port hub, with additional charging modes
- TUSB8043 – USB 2.1 and USB 3.1 generation 1 compliant, 4-port hub, with an HID programming interface and additional charging modes
- TUSB8044 – USB 2.1 and USB 3.1 generation 1 compliant, 4-port hub, with an HID programming interface, USB 2.0 Billboard support, and additional charging modes
- Default I²C master bus speed:
 - TUSB8042/43/44 – I²C master bus speed is 400 kHz
 - TUSB8041 and TUSB8041A – I²C master bus speed is 100 kHz
- USB 2.0 only ports:
 - TUSB8042/43/44 – Can report exposed USB ports as USB 2.0 only
 - TUSB8041 and TUSB8041A – Feature not available, all exposed USB ports reported as USB 3.x

[Table 1](#) lists the USB product IDs.

Table 1. USB Product IDs

Product ID	TUSB8041	TUSB8041A	TUSB8042	TUSB8043	TUSB8044
USB 3.x	0x8140	0x8140	0x8240	0x8340	0x8440
USB 2.x	0x8142	0x8142	0x8242	0x8342	0x8442

2 Changes

2.1 Pin Function Changes

Table 2 lists the pin function changes.

Table 2. Pin Function Changes

Change	TUSB8041 and TUSB8041A	TUSB8042 and TUSB8043	TUSB8044	
Pin 40	FULLPWRMGMTz: full power management enable	The value of the pin is sampled at the deassertion of reset to set the power switch control follows: 0 = Power switching and overcurrent inputs supported. 1 = Power switching and overcurrent inputs not supported. Full power management is the ability to control power to the downstream ports of the TUSB8041 using PWRCTL[4:1]/BATEN[4:1].	The value of the pin is sampled at the deassertion of reset to set the power switch control follows: 0 = Power switching and overcurrent inputs supported. 1 = Power switching and overcurrent inputs not supported. Full power management is the ability to control power to the downstream ports of the TUSB8042/43 using PWRCTL[4:1]/BATEN[4:1].	If SMBus is selected and battery charging is disabled, then the value of the pin is sampled at the deassertion of reset to set the power switch control: SMBus master can override this function later. 0 = Power switching and overcurrent inputs supported. 1 = Power switching and overcurrent inputs not supported.
	SMBA1: SMBus address bit 1	When SMBus mode is enabled using SMBUSz, this pin sets the value of the SMBus slave address bit 1.	When SMBus mode is enabled using SMBUSz, this pin sets the value of the SMBus slave address bit 1.	N/A
	SS_UP: SuperSpeed USB connection status upstream port	After reset, this signal indicates the SuperSpeed USB connection status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a SuperSpeed USB capable port.	After reset, this signal indicates the SuperSpeed USB connection status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a SuperSpeed USB capable port.	If SMBus is selected then after reset, this signal indicates the SuperSpeed USB connection status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a SuperSpeed USB capable port.
	FULLAUTOz	N/A	If BATENx = 1 on any port, full power management must be enabled so the value of the terminal is sampled at the deassertion to initialize the value of the FULLAUTOz bit. When AUTOENz = 0 and FULLAUTOz = 0: all ACP modes are supported. When AUTOENz = 0 and FULLAUTOz = 1: only highest current ACP mode is used in auto mode.	If SMBus is selected and battery charging is enabled on any port, the sampled state of this pin sets or clears the FullAutoEn bit in the Device Configuration Register 3. SMBus master can override ² the register later.
	BBbmConfigured0: billboard configured 0	N/A	N/A	When configured for IC mode, this pin along with BBbmConfigured1 directly controls the bmConfigured field in the Billboard Capability descriptor. If SMBus is selected, the bmConfigured[0] field is determined by a register.

Table 2. Pin Function Changes (continued)

Change	TUSB8041 and TUSB8041A	TUSB8042 and TUSB8043	TUSB8044	
Pin 42	GANGED: ganged operation enable	The value of the pin is sampled at the deassertion of reset to set the power switch and overcurrent detection mode as follows: 0 = Individual power control supported when power switching is enabled. 1 = Power control gangs supported when power switching is enabled.	The value of the pin is sampled at the deassertion of reset to set the power switch and overcurrent detection mode as follows: 0 = Individual power control supported when power switching is enabled. 1 = Power control gangs supported when power switching is enabled.	If SMBus is selected, Billboard enable is controlled by a register. The value of the pin is sampled at the deassertion of reset to set the power switch and overcurrent detection mode as follows: 0 = Individual port power control supported. 1 = Ganged port power control supported. SMBus master can override the register later.
	SMBA2: SMBus Address bit 2	When SMBus mode is enabled using SMBUSz, this pin sets the value of the SMBus slave address bit 2.	When SMBus mode is enabled using SMBUSz, this pin sets the value of the SMBus slave address bit 2.	N/A
	HS_UP: HS connection status upstream port	After reset, this signal indicates the High-speed USB connection status of the upstream port if enabled through the stsOutputEn bit in Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a High-speed USB capable port.	After reset, this signal indicates the High-speed USB connection status of the upstream port if enabled through the stsOutputEn bit in Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a High-speed USB capable port.	If SMBus is selected then after reset, this signal indicates the High-speed USB connection status of the upstream port if enabled through the stsOutputEn bit in Additional Feature Configuration register. When enabled, a value of 1 indicates the upstream port is connected to a High-speed USB capable port.
	BBEN: (I ² C mode) Billboard Enable	N/A	N/A	When high, the billboard device is enabled and presented to system. When low, the billboard device is disabled.
Pin 45	AUTOENz: Automatic Charge Mode Enable	The value of the pin is sampled at the deassertion of reset to determine if automatic mode is enabled as follows: 0 = Automatic mode is enabled on ports that are enabled for battery charging when the hub is unconnected. CDP is not supported on port 1 when operating in automatic mode. 1 = Automatic mode is disabled. This value is also used to set the autoEnz bit in the Battery Charging Support register.	The value of the pin is sampled at the deassertion of reset to determine if automatic mode is enabled as follows: 0 = Automatic mode is enabled on ports that are enabled for battery charging when the hub is unconnected. CDP is not supported on port 1 when operating in automatic mode. 1 = Automatic mode is disabled. This value is also used to set the autoEnz bit in the Battery Charging Support register.	If SMBus is selected, the sampled value of this pin sets or clears the autoEnz bit in the Battery Charging Support register. SMBus master can at a later time override the register.
	HS_SUSPEND: HS Suspend Status	After reset, this signal indicates the High-speed USB Suspend status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the connection is suspended.	After reset, this signal indicates the High-speed USB Suspend status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the connection is suspended.	If SMBus is selected then after reset, this signal indicates the High-speed USB Suspend status of the upstream port if enabled through the stsOutputEn bit in the Additional Feature Configuration register. When enabled, a value of 1 indicates the connection is suspended.
	BBbmConfigured 1: Billboard Configured 0	N/A	N/A	When configured for I ² C mode, this pin along with BBbmConfigured0 directly controls the bmConfigured field in the Billboard Capability descriptor. If SMBus is selected, the bmConfigured[1] field is determined by a register.

2.2 Battery Charging Changes

Table 3 lists the battery charging changes.

Table 3. Battery Charging Changes

Charging Mode	TUSB8041	TUSB8041A	TUSB8042 and TUSB8043	TUSB8044
CDP	CDP not supported on port 1 with auto mode enabled	CDP supported on all ports in all charging modes	CDP supported on all ports in all charging modes	CDP supported on all ports in all charging modes
DCP	DCP Resistance and Capacitance Tests fail	USB BC 1.2 Tests Pass	USB BC 1.2 Tests Pass	USB BC 1.2 Tests Pass
ACP modes	Enabled using the AutoMode pin, either ACP1 or ACP2 support is selected by the register or OTP	Enabled using the AutoMode pin, either ACP1 or ACP2 support is selected by the register or OTP	Enabled using AutoMode and FullAuto pins, or selected by the register or OTP – up to ACP1, ACP2, and ACP3 supported	ACP1, ACP2, and ACP3 enabled by default, can be disabled by the register.
Galaxy mode	N/A	N/A	Enabled using AutoMode and FullAuto pins or selected by the register or OTP	Enabled by default, can be disabled by the register or OTP.

2.3 Layout Changes

Table 4 lists the layout changes.

Table 4. Layout Changes

TUSB8041, TUSB8041A, and TUSB8042	TUSB8043	TUSB8044
Set pins 40, 42, 45 as needed	Set pins 40, 42, 45 as needed	Set pins 40, 42, 45 as needed – may need to be routed to PD controller for Billboard support.
SCL/SMBCLK and SDA/SMBDAT unconnected, routed to I ² C EEPROM or SMBUS host.	SCL/SMBCLK and SDA/SMBDAT unconnected, routed to I ² C EEPROM or SMBUS host or routed to any I ² C EEPROM to be addressed by HID interface	SCL/SMBCLK and SDA/SMBDAT unconnected, routed to I ² C EEPROM or SMBUS host or routed to any I ² C EEPROM to be addressed by HID interface

2.4 Register Changes

Table 5 lists the register changes.

Table 5. Register Changes

Address	TUSB8041	TUSB8041A	TUSB8042 / TUSB8043	TUSB8044
0x03h and 0x04h	Product ID	Product ID	Product ID	Product ID
0x0Ah	DPORT ECR and CPD options	DPORT ECR and CPD options removed	DPORT ECR and CPD options removed	DPORT ECR and CPD options removed
0x25h	N/A	N/A	USB 2.0 only hub, I ² C speed selection, charging mode selection	USB 2.0 only hub, I ² C speed selection, charging mode selection
0x26h	N/A	N/A	USB 2.0 only ports selection	USB 2.0 only ports selection
0x27h and 0x28h	N/A	N/A	N/A	Billboard SVID
0x29h and 0x2Ah	N/A	N/A	N/A	Billboard PID
0x28h	N/A	N/A	N/A	Billboard configuration
0x2Ch	N/A	N/A	N/A	Billboard string 1 length
0x2Dh	N/A	N/A	N/A	Billboard string 2 length
0x100	N/A	N/A	N/A	String 1, String 2

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