STS Product Family
User Manual

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Revision A05

Abstract

The LAVA STS Product Family allows select Samsung Tablets to be charged while interacting with USB accessories, and enable a tablet-based kiosk or enclosure to support a variety of applications requiring:

❑ USB Host operation with simultaneous tablet charging
❑ Interaction with USB accessories
❑ Wired network operation (10/100 Ethernet)
❑ Power over Ethernet (PoE)

The STS Product Family works with out-of-the-box (unrooted) Samsung tablets, and are ideal for commercial and OEM applications.

This document describes the ports, indicators, and buttons on the STS** Products. This document describes how to test and setup a STS** device. The term STS** is used in this document to refer to a member of the STS Product Family.

Contents

Introduction

The LAVA STS Product Family allows select Samsung tablets to be charged while interacting with one or more USB accessories. The STS** products allow a Samsung tablet to operate as a USB Host while simultaneously being charged.

The STS** Products use features specific to a group of Samsung Tablets.

The compatible Samsung Tablets are noted in the System Requirements section.

STS Product Family Overview				
Product	USB Ports	Ethernet Adapter	Power over Ethernet	Description
STS-PE	-	YES	YES	Ethernet Adapter with PoE
STS-E	-	YES	-	Ethernet Adapter
STS-P2UE	2	YES	YES	2-port USB Hub & Ethernet Adapter with PoE
STS-2UE	2	YES	-	2-port USB Hub & Ethernet Adapter
STS-3U	3	-	-	3-port USB Hub
STS	1	-	-	1-port USB OEM Adapter (single board)

The term STS** is used in this document to refer to a member of the STS Product Family.

The LAVA product referred to as simply the "STS" is a 1-Port USB member of the LAVA STS Family of devices. This product is a single board OEM device. This product was formerly designated the TL002c.

System Requirements

The STS Product Family of devices is designed to use features specific to a number of Samsung tablets. The STS Product Family has compatible devices for the following Samsung tablets:

Samsung Tablet – STS Product Compatibility Matrix									
		LAVA STS Product							
Tablet Model	Samsung Tablet	STS	STS-3U	STS-E	STS-PE	STS-2UE	STS-P2UE		
SM-T330	Samsung Galaxy Tab 4 (8")	✔	✔	✔	✔	✔	✔		
SM-T530	Samsung Galaxy Tab 4 (10.1")	✔	✔	✔	✔	✔	✔		
SM-T700	Samsung Galaxy Tab S (8.4")	✔	✔	✔	✔	✔	✔		
SM-T800	Samsung Galaxy Tab S (10.5")	✔	✔	✔	✔	✔	✔		
SM-T520	Samsung Galaxy Tab Pro (10.1")	✔	✔	✔	✔	✔	✔		
SM-T900	Samsung Galaxy Tab Pro (12.2")	✔	✔	✔	✔	✔	✔		
SM-P900	Samsung Galaxy Note Pro (12.2")	✔	✔	✔	✔	✔	✔		
SM-T810	Samsung Galaxy Tab S2 (9.7") [see note 2]	✔	✔	✔	✔	✔	✔		
SM-T710	Samsung Galaxy Tab S2 (8.0") [see note 2]	✔	✔	✔	✔	✔	✔		
SM-T560	Samsung Galaxy Tab E (9.6") [see note 3]	✔	✔	✔	✔	✔	✔		
SM-P550	Samsung Galaxy Tab A with S Pen (9.7") [see note 4]	✔	✔	✔	✔	✔	✔		
SM-T550	Samsung Galaxy Tab A (9.7") [see note 4]	✔	✔	✔	✔	✔	✔		
SM-T350	Samsung Galaxy Tab A (8.0")	✔	✔	✔	✔	✔	✔		

The tablet features used by the STS** Products are not universal across the Samsung Tablet line. Variations may also occur based on world region. Samsung tailors the tablet firmware to a world region or country. Tablet versions created by Samsung for mobile carriers do not behave the same as the standard products, which requires you to test these special tablets before committing to any deployment.

STS** Power-over-Ethernet (PoE) models require a suitable Network Switch with PoE support. A non-PoE Network Switch can use a PoE Power Injector for each port to operate with a STS** PoE device. A PoE Power Injector is a common add-on available from many Network Switch vendors.

STS** models without PoE require a USB Power Supply with a Micro USB-B receptacle. The Wall/USB Charger supplied with the tablet is an ideal choice. Any USB Power Supply can be used provided it has sufficient power for the tablet and USB accessories. The original Samsung USB Charger is preferred as it incorporates voltage drop (sometimes referred to as "droop") compensation for the range of currents required by the tablet and attached accessories.

A USB Power Supply is useful for initial verification of a STS** PoE device.

The STS** to Tablet connection is made with a custom Micro USB-B to Micro USB-B 39" (100 cm) cable provided with the STS** device. This cable must not be extended, as the additional power loss in the wires will result in unreliable tablet charging and operation.

The STS (formerly TL002c) is provided with an 8" (20 cm) cable. This cable should not be extended, as the additional power loss in the wires may result in unreliable tablet charging and operation.

Note	Description
1	Please check the LAVA Web Site for updates to the STS Product Compatibility Matrix. As new tablets are introduced, the Compatibility Matrix on the web site will be updated.
2	Tab S2 requires products built after November 16, 2015.
3	Does not work with non-North American 4.x.x Android builds.
4	Requires tablet connection cable be no longer than 19" (50 cm).

Hardware Testing and Setup

Hardware Test - Out of the box unit

This section describes how to confirm a STS** device is functional and verifies interaction with a tablet.

The USB Hub feature of a STS** device requires no special setup within a tablet. STS** products with an Ethernet adapter requires some tablet setup. Please see the Hardware Setup tables for further information

The steps for initial verification include the STS** PoE devices, which will temporarily use a USB Power Supply. Devices using PoE must eventually configure a Network Switch for correct operation. Setting up a Network Switch is vendor specific. If you already have a PoE capable switch, simply plug the STS** device into the switch via an Ethernet cable in place of the "USB Power Supply" step.

The following steps assume the Tablet battery indicator icon is enabled. If the icon is not enabled, then the Battery menu must be checked to determine the charging status. The Battery menu presents the option to control the battery indicator icon.

Note: The test procedure assumes a STS (formerly TL002c) has no Type Jumper installed, and "pressing the mode button" is equivalent to shorting the Mode pins. This board-only product is described in more detail in a dedicated section of this document.

 Note: For PoE capable devices; never apply PoE power at the same time as using the Aux 5V Input.

Out Of The Box Tests - Common to all products		
Step	**Procedure**	**Observations**
1	Turn on the tablet.	The standard startup banner(s) and music are reported. A new tablet requires the standard first time setup required by the manufacturer.
2	If using a USB Power Supply that runs off a wall outlet, plug the USB Power Supply into the wall outlet. If using a battery pack, turn the battery pack on.	
3	Connect the STS** to the tablet with the custom Micro USB to Micro USB cable provided. Always verify the connector orientation before attempting to insert it into a device. Either end of the cable can be plugged into the tablet.	

4	Connect the USB Power Supply to the <u>5V Power Input</u> of the STS** device. For a PoE device, connect the USB Power Supply to the <u>Aux 5V Input</u>. This is assuming that no power through the Ethernet port is applied. Always verify the connector orientation before attempting to insert it into a device.	The Charge-Only light (green) will flash for 2 to 3 seconds. After the 2 seconds of flashing, the SimulCharge light (yellow) will be on solid, and the Charge-Only light (green) will be off. If the indicator lights show no activity, verify the power supply is plugged in and working. A tablet status message will briefly appear to report "USB connector connected" and will issue a beep. The tablet battery icon will now show a lightning bolt to indicate it is being charged
5	If the STS** Product has a USB-A receptacle, plug in a USB accessory. Possible accessories include keyboard, mouse, or memory stick.	The tablet status will report the attached accessory. The USB Power Supply will be powering the tablet and any USB accessories.

The specific hardware setup for a device can now be addressed.

The Mode button should be tested. The section specific to the Mode button describes the behavior present on your unit.

If a PoE device was tested using the "Aux 5V Input", it can now be tested with a Network Switch configured for PoE. The USB Power Supply must be removed from the "Aux 5V Input". The above test procedure allows you to confirm the device is working before dealing with Network Switch issues.

Hardware Setup - STS (formerly TL002c)

The LAVA product referred to as simply the "STS" is a 1-Port USB member of the LAVA STS Family of devices. This product is a single board OEM device and was formerly designated the TL002c.

The STS has no required setup in the tablet. The tablet battery indicator icon can be useful to have enabled, but is optional. The charging status of the tablet can always be checked in the tablet battery menu.

The STS module has two possible revisions. The method to determine which revision you have is described in the dedicated section for the STS Module. This dedicated section must be reviewed to determine how to set and use the jumpers on the board.

Hardware Setup - STS-3U

The STS-3U is a USB HUB, which has no required setup in the tablet. The tablet battery indicator icon can be useful to have enabled, but is optional. The charging status of the tablet can always be checked in the tablet battery menu.

Hardware Setup – for the STS-3U		
Step	**Procedure**	**Observations**
1	Turn on the tablet.	The standard startup banner(s) and music are reported. A new tablet requires the standard first time setup required by the manufacturer.
2	Plug the USB Power Supply into a wall outlet. If using a battery pack, turn the battery pack on.	
3	Connect the STS-3U to the tablet with the custom Micro USB to Micro USB cable provided. Always verify the connector orientation before attempting to insert it into a device. Either end of the cable can be plugged into the tablet.	
4	Connect a USB Power Supply to the <u>5V Power Input</u> of the STS-3U. Always verify the connector orientation before attempting to insert it into a device.	The Charge-Only light (green) will flash for 2 to 3 seconds, after which the SimulCharge light (yellow) will be on and the Charge-Only light (green) will be off. A tablet status message may briefly appear to report "USB connector connected" and beeps. The tablet battery icon will now show a lightning bolt to indicate it is being charged.
5	Optionally plug in a USB accessory to one of the STS-3U USB-A receptacles.	The tablet will report a connection message such as "USB mass storage connected" for a flash memory stick.
The tablet is now operating as a USB Host and is being charged by the USB Power Supply.		

Hardware Setup - STS-E and STS-2UE

The STS-E and STS-2UE have minimal setup requirements in the tablet. The tablet battery indicator icon can be useful to have enabled, but is optional. The charging status of the tablet can always be checked in the tablet battery menu.

Hardware Setup – for the STS-E and STS-2UE		
Step	**Procedure**	**Observations**
1	Turn on the tablet.	The standard startup banner(s) and music are reported. A new tablet requires the standard first time setup required by manufacturer.
2	Plug the USB Power Supply into a wall outlet. If using a battery pack, turn the battery pack on.	
3	Connect the STS** to the tablet with the custom Micro USB to Micro USB cable provided. Always verify the connector orientation before attempting to insert it into a device. Either end of the cable can be plugged into the tablet.	
4	Connect an active Ethernet cable to the RJ45 connector of the STS** device.	
5	Connect a USB Power Supply to the <u>5V Power Input</u> of the STS** device. Always verify the connector orientation before attempting to insert it into a device.	The Charge-Only light (green) will flash for 2 to 3 seconds, after which the SimulCharge light (yellow) will be on and the Charge-Only light (green) will be off. A tablet status message may briefly appear to report "USB connector connected" and beeps. The tablet battery icon will now show a lightning bolt to indicate it is being charged. The RJ45 USB Activity light (yellow) will pulse several times. It continues to pulse if Ethernet is already enabled in the tablet, else proceed to step 6. The RJ45 Link light (green) should be pulsing if the Ethernet cable is active, else resolve the Ethernet cable before proceeding.
6	Go into the tablet setup menu for Connections > More Networks > Ethernet. The Configure Ethernet menu allows you to select DHCP or a Static IP Address. Select a suitable configuration for your network.	
7	In the tablet More networks > Ethernet menu press the box for Ethernet to turn Ethernet on.	The Ethernet label and box go grey while the tablet attempts to make a network connection. The Link Indicator will be flashing as the tablet

		performs the initial interaction with the network. If using DHCP, a DHCP Server on the network assigns the IP Address for the tablet. When the Ethernet interface is ready, a check mark will appear in the select box. If a DHCP lookup fails, the check box eventually is restored from grey to black with no check mark. If DHCP does not succeed within the tablet timeout period, the tablet will make no further attempts until you press the select box again.
8	Optionally plug in a USB accessory to one of the STS** USB-A receptacles (if present).	The tablet reports a connection message such as "USB mass storage connected" for a flash memory stick.

The tablet is now operating as a USB Host and is being charged by the USB Power Supply.

Hardware Setup - STS-PE and STS-P2UE

The STS-PE and STS-P2UE have minimal setup requirements in the tablet. The tablet battery indicator icon can be useful to have enabled, but is optional. The charging status of the tablet can always be checked in the tablet battery menu. Setup of a PoE capable switch port is specific to each Network switch.

Hardware Setup – for the STS-PE and STS-P2UE		
Step	Procedure	Observations
1	Prepare the Network Switch port to be used with the STS**. Consult your Network Administrator for policies regarding PoE and DHCP setup.	
2	Turn on the tablet.	The standard startup banner(s) and music are reported. A new tablet requires the standard first time setup required by manufacturer.
3	Connect the STS** to the tablet with the custom Micro USB to Micro USB cable provided. Always verify the connector orientation before attempting to insert it into a device. Either end of the cable can be plugged into the tablet.	
4	Connect an active Ethernet cable, prepared in step1, to the RJ45 connector of the STS**.	The Charge-Only light (green) will flash for 2 to 3 seconds, after which the SimulCharge light (yellow) will be on and the Charge-Only light (green) will be off. A tablet status message may briefly appear to report "USB connector connected" and beeps. The tablet battery icon will now show a lightning bolt to indicate it is being charged. The RJ45 USB Activity light (yellow) will pulse several times. It continues to pulse if Ethernet is already enabled in the tablet, else proceed to step 6. The RJ45 Link light (green) should be pulsing if the Ethernet cable is active, else resolve the Ethernet cable before proceeding.
5	Go into the tablet setup menu for Connections > More Networks > Ethernet. The Configure Ethernet menu allows you to select DHCP or a Static IP Address. Select a suitable configuration for your network.	
6	In the tablet More networks > Ethernet menu press the box for Ethernet to turn Ethernet on.	The Ethernet label and box go grey while the tablet attempts to make a network connection. The Link Indicator will be flashing as the tablet performs the initial interaction with the network. If using DHCP, a DHCP Server on the network assigns the IP Address for the tablet.

		When the Ethernet interface is ready, a check mark will appear in the select box. If a DHCP lookup fails, the check box eventually is restored from grey to black with no check mark. If DHCP does not succeed within the tablet timeout period, the tablet will make no further attempts until you press the select box again.
7	Optionally plug in a USB accessory to one of the STS** USB-A receptacles (if present).	The tablet reports a connection message such as "USB mass storage connected" for a flash memory stick.

The tablet is now operating as a USB Host and is being charged by PoE capable Network Switch port.

Special Instructions for the Samsung Tab 4

Special Instructions for Samsung Tab 4 (8" and 10.1")		
A Samsung Tab 4 Tablet which is powered off, cannot be turned on or charged when the STS** is set to SimulCharge mode. When a powered STS** in SimulCharge mode is connected to a Tab 4 tablet which is turned off, the tablet screen may flicker every 2 or 3 seconds. This procedure assumes the battery charge icon was previously enabled. If not enabled you must go into the appropriate status screen to confirm the battery is charging. A Samsung Tab 4 which is powered off, requires the following procedure be followed: This problem occurs with all KitKat Android builds (4.4.x). The procedure should also be used for Lollipop Android build (5.x.x), even though this version sometimes allows the tablet to startup.		
Step	**Procedure**	**Observations**
1	Connect the cables and power as described in the earlier Hardware Setup procedures.	The SimulCharge light (yellow) will be on.
2	Press the STS** Mode button to place the STS** into the Charge-Only mode. See Mode button behavior in the "Ports, Indicators, and Buttons" section.	The Charge-Only light (green) will be on. The SimulCharge light (yellow) will be off. The tablet charging icon (a large battery picture) appears in the center of the. A temporary icon appears followed by one that indicates the approximate charge level.
3	Turn on the tablet.	Enjoy the power on banner(s) and music. The small battery indicator has a lighting bolt through it to show the tablet is being charged. The tablet could be left in this state to charge, however no USB devise are permitted.
4	Press the STS** Mode button to cancel Charge-Only Mode. See Mode button behavior in the "Ports, Indicators, and Buttons" section.	The SimulCharge light (yellow) will be on The Charge-Only light (green) will be off. The small battery indicator has a lighting bolt through it to show the tablet is being charged.

The Tab 4 tablet is now operating as a USB Host and can operate USB accessories.

The Tab 4 is now being charge/powered by the external power supply along with the USB accessories.

The Tab 4 tablet can be reset and it will return to the operating state. The problems only recur if the tablet is shut down or is allowed to completely discharge, while the STS** is in SimulCharge.

Tablet Charging (SimulCharge versus Charge-Only Mode)

The Samsung tablet was originally intended as a stand-alone device. When the internal battery of the tablet requires charging, it is plugged into a Wall/USB Charger for a period of time to restore the battery charge. The tablet can continue to be used while being charged. Once the battery is charged, the tablet may use the charger as a supplementary power source if the tablet is left running. It is preferred to charge a tablet with the unit off, and remove the supply once a full charge has been reached for the longest battery life.

When using a Samsung Wall/USB Charger, the tablet charges at a high rate that is tablet specific. The charge rate is also limited to the power available from the attached charger. The Samsung Wall/USB Chargers come in a number of power ratings, each matched to the original tablet requirements.

The Samsung Wall/USB Charger is equivalent to a USB Charger with a Direct Charge Port (DCP) as defined by the USB Battery Charging Specification R1.2. The STS** Products use the term Charge-Only Mode to indicate the tablet battery is being charged at the highest rate permitted by tablet, and is equivalent to a USB Charger with a Direct Charge Port (DCP).

A tablet plugged into a desktop (or laptop) PC is treated as a USB Accessory (also referred to as a USB Target). The PC operates as a USB Host Controller when the tablet is attached. The PC provides power to the tablet, but the tablet battery is being charged at a low rate. In some cases the battery may not charge.

To plug a USB accessory into a tablet, the tablet must operate as a USB Host Controller rather than a USB Accessory. The USB Standard has the On-The-Go (OTG) feature, in which the tablet detects that a USB accessory has been plugged in and automatically switches to operate as a USB Host Controller. Not all tablets support the USB OTG feature. When operating as an OTG USB Host, the tablet is expected to supply power to the attached accessories, which means power is drained from the tablet battery.

The STS** products place a Samsung tablet into the SimulCharge Mode. SimulCharge Mode informs the tablet to operate as a USB Host controller, but not to provide power for USB accessories. With SimulCharge mode active, the tablet is expecting power to be provided to it for battery charging and running the tablet. This allows the tablet to be run simultaneously while interacting with one or more USB accessories. Using SimulCharge Mode makes it practical to embed a tablet in third-party enclosures and kiosks. The charging rates during SimulCharge are specific to each tablet.

Samsung tablets operating in SimulCharge mode will limit the amount of power drawn from the external power source. If there is not enough power coming in, the tablet takes the extra from the battery, hence the battery will not be charging. The screen brightness may have to operate at less than 100% to allow the battery to charge. The application color scheme can be designed to reduce the power required. Application processes requesting too much CPU time increases the power required by the tablet. Limiting the power used from the external supply, allows the supply to be shared between the tablet and USB accessories.

Power should be applied to the STS** product after it has been attached to the tablet, to ensure proper tablet startup. If the STS** product is powered up before attaching it to the tablet, the tablet may not enter USB Host mode or may not enable battery charging.

The STS** products use charging features specific to a set of Samsung tablets identified in the System Requirements section. Simultaneous battery charging and USB Host operation are not universal among Samsung tablets. Tablet models have different features based on country/region. Custom versions created for mobile providers may have the same basic model number, but very different features.

The STS** products are expected to always be powered to keep the tablet charged, and allow operation with USB accessories.

A self-powered USB Hub can be used to offload the power required by the USB accessories from the power supply running the tablet and STS** device. A self-powered USB Hub should not draw power from the USB Host Controller, but from a dedicated supply. A self-powered USB Hub becomes the power source for the attached USB accessories.

Charge-Only Mode is important for Samsung Tab 4 (8" and 10.1") operation. If the Tab 4 is turned off, the tablet cannot be turned on or charged when SimulCharge is active. Placing the STS** in Charge-Only Mode allows the tablet to be charged, and the option to turn it on immediately. The Tab 4 battery is allowed to run down, the same problem results as the tablet having been manually turned off. This issue is unique to the Tab 4 tablet.

Charge-Only Mode is a useful temporary state for any Samsung tablet which has a severely depleted battery. These tablets may require the tablet battery be charged for several minutes in Charge-Only mode; else the tablet may simply shut down on startup, even with a power supply attached.

Ports, Indicators, and Buttons

"Mode Select" Button and Indicators

The Mode Select button is used to change the Charging Mode. SimulCharge Mode and Charge-Only Mode are described in the Tablet Charging section. The button is located on one end of the STS** case.

The active state (Charge-Only or SimulCharge) is reported on status lights on one end of the STS** case, beside the Mode Select button.

The yellow indicator is for SimulCharge Mode. The STS** Products default to SimulCharge Mode.

The green indicator is for Charge-Only Mode.

When a STS** Product is powered on, the green indicator (Charge-Only) will flash for 2 to 3 seconds.

Each product has an internal 2-pin header labeled "TYPE". Revision 1 products optionally use the "TYPE" header to set the "Mode Select" button functionality. Revision 1 products do not populate the 2-pin header; therefore treat the jumper as not installed. The Mode Button behavior is fixed on revision 2 products.

The revision 2 products have a ">" symbol in front of the product name (e.g., ">STS-PE", ">STS-E", etc.) on the device label. The device label is located on the bottom of the device case. The revision 2 products where built starting November 18, 2015.

Mode Button Behavior – Revision 2 Products	
Product Label: ">STS-E, ">STS-PE, ">STS-2UE", ">STS-P2UE", and ">STS-3U"	
Type Jumper	**Description**
Not applicable	Pressing the Charge Mode button for 5 seconds or more, places the tablet into Charge-Only Mode. The tablet remains in Charge-Only mode for about 7 minutes before automatically changing back to SimulCharge mode, even if the Charge Mode button remains held. The 7-minute Charge-Only window can be cancelled by double clicking the Charge Mode button. To click the button press for 1 second, release for 1 second and then repeat once more.
Note: For these units, the Type jumper is used to set the tablet compatibility. Note: Support of the Tab S2, E, and A require these newer devices, also see the "type" jumper section for additional information.	

Mode Button Behavior – Revision 1 Products	
Product Label: "STS-E, "STS-PE, "STS-2UE", "STS-P2UE", and "STS-3U"	
Type Jumper	**Description**
Removed	When pressing the Mode Select button for at least ¼ second then releasing it, the Mode is toggled between SimulCharge Mode and Charge-Only Mode. If the button is pressed for more than 4 seconds, the button is ignored until released then pressed again.
Installed	Holding the button in, places the unit in Charge-Only mode. Release the button, the unit is in SimulCharge mode. As the button is momentary, the unit is in SimulCharge by default.
Note: By default the pins for the Type jumper are not present on the board; hence treat as "removed". Note: For these units, the Type jumper defines the Mode Button behavior. Note: The Type jumper is sampled on power up.	

"Type" Jumper

Each product has an internal 2-pin header labeled "TYPE". The revision 2 products use the "TYPE" header to set the tablet compatibility. The revision 1 products used the "TYPE" header to set the "Mode Select" button functionality.

When present, the 2-pin header does not have a jumper in place as a manufacturing default. The revision 1 products do not have the 2-pin header populated; therefore treat the jumper as not installed.

The revision 2 products have a ">" symbol in front of the product name (e.g., ">STS-PE", ">STS-E", etc.) on the device label. The device label is located on the bottom of the device case. The revision 2 products where built starting November 18, 2015.

To access the jumper, the top of the casing must be removed, which is held in place by four Philips screws.

Type Jumper behavior – Revision 2 Products (select Tablet Compatibility)	
Product Label: ">STS-E, ">STS-PE, ">STS-2UE", ">STS-P2UE", and ">STS-3U"	
Type Jumper	**Description**
Removed	Operating with Tab S2, Tab A, and Tab E. When the device is powered on the green indicator (Charge-Only) will report a distinctive flash-flash-pause pattern for 2 to 3 seconds.
Not Installed	Operation with Tab 4, Tab Pro, Tab S. When the device is powered on the green indicator (Charge-Only) will flash on and off in a continuous pattern for 2 to 3 seconds.
Note: Support of the Tab S2, E, and A require the revision 2 products. Note: Support of the Tab 4, Tab Pro, and Tab S require the Type jumper. Note: Changes take effect when unit is powered up. Note: With jumper removed, the STS** Product is powered on the green indicator (Charge-Only) will flash on and off for 2 to 3 seconds.	

Type Jumper behavior – Revision 1 Products (select Mode Button functionality)	
Product Label: "STS-E, "STS-PE, "STS-2UE", "STS-P2UE", and "STS-3U"	
Type Jumper	**Description**
Removed	When pressing the Mode Select button for at least ¼ second then releasing it, the Mode is toggled between SimulCharge Mode and Charge-Only Mode. If the button is pressed for more than 4 seconds, the button is ignored until released then pressed again.
Installed	Holding the button in, places the unit in Charge-Only mode. Release the button, the unit is in SimulCharge mode. As the button is momentary, the unit is in SimulCharge by default.

Note: The revision 1 products are used with the Tab 4, Tab Pro, and Tab S
Note: By default the pins for the Type jumper are not present on the board,
      hence treat as "removed".
Note: For these units, the Type jumper defines the Mode Button behavior.
Note: Changes take effect when unit is powered up.
Note: When the STS** Product is powered on the green indicator (Charge-Only)
      will flash on and off in a continuous pattern for 2 to 3 seconds.	

"Micro-B USB To Tablet"

The "To Tablet" Receptacle is a standard Micro USB-B Receptacle.

The custom 39" (100 cm) cable provided with the STS** product provides the connection between the STS** and the tablet. The custom cable has a Micro USB-B connector at each end. It does not matter which end of the cable is attached to the tablet or the STS** product.

The STS** to Tablet cable must not be extended, as the additional power loss in the wires will result in unreliable tablet charging and operation.

The STS** Product Family supports an alternative OEM cabling scheme which can be discussed with a Lava Sales Representative, when lengths greater than 39" (100 cm) are required. This OEM option does not use the "Micro-B USB To Tablet" receptacle. The standard products are not shipped with this OEM option implemented.

Note: The STS (formerly TL002c) is provided with a 8" (20 cm) cable. This cable should not be extended as it may result in unreliable tablet charging and operation.

"Micro-B USB 5V Power Input"

The "5V Power Input" is a Micro USB-B Receptacle on STS** products without Power over Ethernet.

The 5V Power Input provides power for the STS** product, the tablet, and for attached USB accessories. The STS** Product will not function if power has not been applied to the 5V Power Input. The STS** products do not draw power from the tablet.

A standard USB 5V DC Power Supply is attached to the 5V Power Input. The supply need not be a Direct Charge Port (DCP) compliant device. A standard USB power supply is rated at 5 volts nominal, with a 5.25 volts maximum. The typical current rating is 2 amperes for a tablet with at least a 10-inch screen. A typical USB Power supply is rated at 10 watts (2 amperes at 5 volts DC).

The USB Power Supply provided with most Samsung tablets are rated at 5.3 volts and 2 amperes. For the cable provided by Samsung the voltage delivered to the end of the cable will typically be from 5.0 to 5.1 volts for the range of expected currents. These supplies have some compensation for wire losses.

The 5V Power Input on the STS** products can be used with external USB Battery Packs. This ability can be useful some kiosk configurations. The USB Battery Pack must be physically removed for recharging.

The voltage at this input should not be much below 5 volts. The preferred level is 5.1 to 5.25 volts.

The cable length between the Power Supply and the STS** Product must be as short as possible. The cable has power loss proportional to the cable length and wire thickness. The voltage present at the STS** receptacle will be lower than the supply output due to cable power loss. There is power loss in the cable which connects the STS** to the tablet. If the voltage at the tablet is too low, the tablet will not charge.

The USB specification defines the minimum voltage of 4.75 volts for USB accessories operating at a full unit load. When connecting a number of accessories to the tablet via an STS** device, the cable quality and length must be selected to ensure that the voltage reaching each accessory is at least 4.75 volts as a general rule. Many devices such as mice operate at a lower voltage than 4.75. A power budget must be carefully evaluated for the system if reliable operation is to be ensured.

The models with the 5V Power Input include the STS, STS-3U, STS-E, and STS-2UE.

"Micro-B USB Aux 5V Input"

The 'Aux 5V Input" is a Micro USB-B Receptacle on STS** products with PoE capability.

This input **is only** used for system testing when PoE power **is not** present. The STS** Product will be fully functional including the 10/100 Ethernet, when this power input is used.

A standard USB 5V DC Power Supply is attached to the Aux 5V Input. A standard USB power supply is rated at 5 volts nominal, with a 5.25 volts maximum. The typical current rating is 2 amperes for a tablet with at least a 10-inch screen. A typical USB Power supply is rated at 10 watts (2 amperes at 5 volts DC).

The STS** Product does not function if power has not been applied either via PoE or the Aux 5V Input.

The PoE models include the STS-PE and STS-P2UE products.

"USB-A" receptacles

A majority of the STS** products have one or more USB 2.0 ports with a standard A-type receptacle. Each receptacle allows a USB Accessory to be accessed by the tablet. Each receptacle provides power to each USB accessory.

The USB-A receptacles only function when the STS** device is powered. The STS** devices have a dedicated power input and are not intended to draw power from the tablet.

A USB Hub can be attached to the STS** USB receptacles to extend the number of accessories supported by the system. Additional USB accessories and the related cabling require a power budget be developed for the system. Power loss in the cables result in lower voltages at each device.

Using self-powered USB Hubs may be required in some systems, to offload the main supply responsible for the tablet.

The STS-E and STS-PE have no USB-A receptacles.

"ETHERNET" Port and Indicators

The ETHERNET Port is present on the STS-E and STS-2UE.

The ETHERNET Port is an IEEE 802.3 10BASE-T / 100BASE-TX compatible Fast Ethernet interface. The Ethernet port accepts a standard RJ45 connector.

The wired Ethernet option allows the enclosure developer to design for non-WiFi environments. Systems using STS-** products with Ethernet, generally disable the tablet WiFi interface.

The USB Ethernet Controller implemented in the STS** Product has standard support built into the Samsung Tablets noted in the compatibility list. Applications developed for the tablet using any network operations are automatically routed by the tablet operating system to the active network interface.

The ETHERNET Port only functions when the STS** device is powered. The STS** devices have a dedicated power input and are not intended to draw power from the tablet.

The ETHERNET Port has two status indicators labeled "USB Activity" and "Link/Activity'.

The USB Activity is a yellow indicator. The USB Activity is solid yellow when the STS** is powered and connected to the tablet. The USB Activity pulses when there is traffic between the tablet and the STS**.

The Link/Activity is a green indicator. The Link/Activity is solid green when the Ethernet Link has been established. The Link/Activity pulses when there is network traffic through the Ethernet interface. The Link/Activity indicator remains off when the tablet is not attached.

Both indicators remain off when the STS** power has not been applied.

The tablet setup and status for the ETHERNET port is located in the Connections > More networks > Ethernet menu. The Ethernet menu can only be entered when a powered Ethernet adapter is present. The standard tablet options permit the use of static address assignments or dynamic address assignments via DHCP. This menu reports if the Ethernet adapter is active as well as serving as the adapter enable.

When using DHCP the tablet attempts to fetch the addressing information from a DHCP server. If the addressing information is not located within the timeout period, the tablet makes no further attempts. The user must manually retrigger the Ethernet interface to start the DHCP process. The retrigger is a simple matter of pressing the Ethernet "box" again in the "More networks > Ethernet" menu.

When the user disables the Ethernet adapter via the Connections > More networks > Ethernet menu, the adapter remains disabled until enabled again by the user.

"PoE-ETHERNET" Port and Indicators

The "PoE-ETHERNET" port is present on the STS** products which support Power over Ethernet (PoE).

This port has all the features of the STS** ETHERNET Port, as well as the ability to receive power from the Network Cable. All power for the STS** device, tablet charging, and attached USB accessories are provided by the PoE-ETHERNET Port.

This port is attached to a Network Switch, which has been configured for PoE operation.

The PoE products are the STS-PE and STS-P2UE.

"PoE power" Indicator

The "PoE power" Indicator is a red light which reports when power is supplied to a STS** device via the PoE-ETHERNET port. The indicator is not dependant on the tablet being attached.

The "PoE power" Indicator is present only on the STS-P2UE.

"USB connect" Indicator

The "USB connect" Indicator is solid yellow when the STS** is powered and connected to the tablet. The "USB connect" Indicator pulses when there is traffic between the tablet and the STS**.

The USB Connect indicator is present only on the STS-3U.

Power over Ethernet (PoE)

Power over Ethernet (PoE) is a standard for passing electrical power through an Ethernet cable along with the network data. The STS** PoE devices always support an Ethernet adapter for wired network communications.

A number of STS** Products provide PoE support. The STS** Products with PoE can resolve the problem of getting power to the tablet and peripherals. Deploying network cabling with PoE support can be significantly cheaper than installing dedicated power lines through a facility.

The module power is provided through the Ethernet RJ-45 port. These modules require a suitable Ethernet switch with PoE support.

The STS** PoE Power Supply provides 10.4 watts of power for the tablet, the STS**, and attached USB accessories. The value of 10.4 watts allows the device to be treated as a Class 0 device by a PoE switch.

The STS** PoE Power Supply is capable of supplying 13.5 watts, however this requires the switch supply more power to the Ethernet cable than is permitted for a Class 0 device. The STS** does not prevent the attached devices from attempting to draw more than 10.4 watts. The attached tablet and USB accessories must be designed to work within the design limits.

The system designer must budget for the charging requirements of the tablet and the power required by USB accessories. The STS** products do not provide any diode protection between the module and the peripheral ports.

The STS** PoE devices does not function if power is not available from the PoE-ETHERNET interface or the Aux 5V Input. The STS** devices are not intended to draw power from the tablet. The Aux 5V Input can only be used if power is not being provided over the Ethernet cable. The Aux 5V Input is intended only for initial testing of a STS** module. The Aux 5V Input is described in a separate section of this document.

The PoE models include the STS-PE and STS-P2UE products.

STS Module (formerly TL002c)

The LAVA product referred to as simply the "STS" is a 1-Port USB member of the LAVA STS Family of devices. This product is a single board OEM device. This product was formerly designated the TL002C.

The STS has the ability to place the tablet in SimulCharge Mode or Charge-Only Mode.

This board allows select Samsung Tablets to work with USB accessories while power is being supplied to the tablet, which is referred to as SimulCharge Mode. The board defaults to SimulCharge Mode when power is applied.
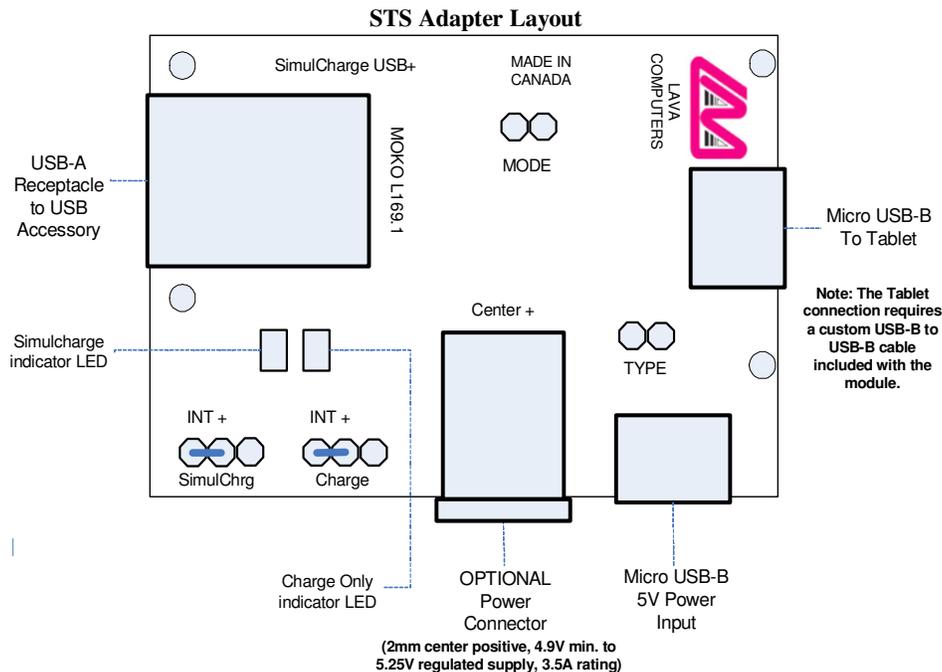
In Charge-Only Mode, the tablet charges at the highest rate permitted by the tablet; however no USB accessories are supported. Charge-Only Mode is useful when recovering a tablet, which has a fully depleted battery.

Most Samsung tablets limit the power taken in from the power supply during SimulCharge Mode, which permits the supply to be shared with USB Accessories. The limited power intake may reduce the battery charge rate and may require the tablet screen brightness to be reduced. The rules that govern SimulCharge behavior are built into the tablet.

The STS has no required setup in the tablet. The STS board should be connected to the tablet before power is connected to the STS. Reliable entry into SimulCharge Mode when the power is applied is a key feature of the STS.

The 2-pin MODE header is used to change between SimulCharge and Charge-Only Mode.

The 2-pin TYPE header usage depends on the STS revision. The revision 1 boards use the header to define the behavior of the MODE header. The revision 2 boards use the TYPE header to set the tablet model being used. There is no label on the board to differentiate the two revisions. A simple check of the startup LED behavior can confirm the board revision, as described later in this document.

STS Adapter Layout

STS Revision Identification
Remove jumpers shorting the TYPE and MODE pins. Ensure the LED jumpers are set as shown in the STS Adapter Layout. With power applied, the Charge-Only LED will flash for the first 2 to 3 seconds. If the flash pattern is continuous, the STS is revision 1. If the pattern is flash-flash-pause with several repeats, the STS is revision 2.
Note: The circuit board part number does not identify the STS revision. The circuit board will be either MOKO L169.1 or MOKO L169.2. The L169.2 board uses improved Micro USB connectors.

STS Revision 1 – TYPE and MODE pin behavior	
TYPE Jumper	**Description**
Removed	The MODE pins are set for edge sensitive operation. When shorting the MODE pins for at least ¼ second then releasing it, the mode is toggled between SimulCharge Mode and Charge-Only Mode. If the button is pressed for more than 4 seconds, the button is ignored until released then pressed again.
Installed	The MODE pins are set for level sensitive operation. Shorting the pins place the tablet in Charge-Only Mode. Not shorting the pins places the tablet in SimulCharge Mode.
The MODE pin behavior is dependant on the TYPE Jumper selection as described above.	
Note: Changes to the TYPE jumper are only sampled when the unit is powered up. Note: When the board is powered on the Charge-Only LED will flash with a continuous pattern for 2 to 3 seconds. Note: The Tab 4 can only be powered on if Charge-Only Mode is selected. Note: When a Tab 4 is turned off, it only charges if Charge-Only Mode is selected. Note: Supports operation with Tab 4, Tab Pro, Tab S, Note Pro, and Note 10.1 tablets described in the tablet adapter compatibility table on the LAVA website. The Tab S2, Tab E, and Tab A tablets require the STS revision 2.	

STS Revision 2 – TYPE and MODE pin behavior	
TYPE Jumper	**Description**
Removed	Operation set for Tab E, Tab A, and Tab S2 tablets described in the tablet adapter compatibility table on the LAVA website.
	When the device is powered on the Charge-Only LED will report a distinctive flash-flash-pause pattern for 2 to 3 seconds.
Installed	Operation set for Tab 4, Tab Pro, Tab S, Note Pro, and Note 10.1 tablets described in the tablet adapter compatibility table on the LAVA website.
	When the device is powered on the Charge-Only LED will Flash on and off in a continuous pattern for 2 to 3 seconds.
The MODE pin behavior prevents the tablet from remaining in SimulCharge Mode for an extended period of time. When power is applied the board defaults to SimulCharge mode. Shorting the MODE pins for 5 seconds or more, places the tablet into Charge-Only Mode. The tablet remains in Charge-Only Mode for about 7 minutes before automatically changing back to SimulCharge Mode, even if the MODE pins remain shorted. The 7-minute Charge-Only window can be cancelled by double clicking the MODE pins. To "click" the pin, short for 1 second, release for 1 second and then repeat once more.	
Note: Changes to the TYPE jumper are only sampled when the unit is powered up. Note: The Tab 4 can only be powered on if Charge-Only Mode is selected. Note: When a Tab 4 is turned off, it only charges if Charge-Only Mode is selected. Note: Supports operation with all tablets described in the tablet adapter compatibility table on the LAVA website provided the correct TYPE jumper selection is used.	

The STS is connected to the tablet using a custom Micro USB to Micro USB cable included with the board. Always verify the connector orientation before attempting to insert the cable into a device. Either end of the cable can be plugged into the tablet or the STS. The LAVA provided cable must not be extended.

The USB-A receptacle does not have the current limiting ability normally associated with a USB Hub. The USB-A receptacle data lines are driven directly from the tablet unlike the LAVA STS-3U, which has an integrated USB Hub.

Use of the on-board SimulCharge and Charge-Only indictor LEDs are application specific. The default jumpers shown in the diagram enable the on-board LEDs. To disable use on the on-board LEDs, remove the related jumper. An external LED can be driven from these connector blocks. The center pin on the jumper block is positive. The "right" pin as viewed on the diagram is the negative pin. A 680 ohm current limit resistor is always present. When using an external LED, the left 2 pins remain open.

Option 1: Internal LED   Option 2: External LED

External LED -

External LED +

On power up the Charge-Only LED is flashed for 2 to 3 seconds.

The board and tablet are typically powered through the Micro USB-B power input using the same USB power supply provided with the tablet. The standard Samsung USB Power Supply is rated at 5 volts and 2 amperes, which nominally provides 5.0 to 5.1 volts at the STS input. Extending the original power supply cable is not wise as the voltage reaching the STS may be too low due to cable losses.

The Optional Power Connector is a DC Barrel Power Jack with a 2-millimeter center positive pin. This connector is an OEM option, and therefore is not populated on the standard model. This jack is used in lieu of the Micro USB-B receptacle for 5V power input. The jack is rated for up to 3.5 amperes. The jack is to be connected to a regulated 5 volt DC power source.

The input voltage to the STS should be at least 5 volts for proper tablet operation. The preferred voltage at the STS input is 5.1 to 5.25 volts. The STS input voltage **must not** exceed 5.25 volts.

Due to power loss across the connecting cables, the designer must ensure that the voltage at no point in the system is too low. Power loss is an issue that applies to all USB cables in the system.

Using the Optional Power Connector allows for heaver gauge wires to the used, than are possible with a Micro USB-B connector. The heavier gauge wires have lower power loss, and therefore permit the power supply to be located farther from the board.

The power supply used to run the system is responsible for handling over current conditions.
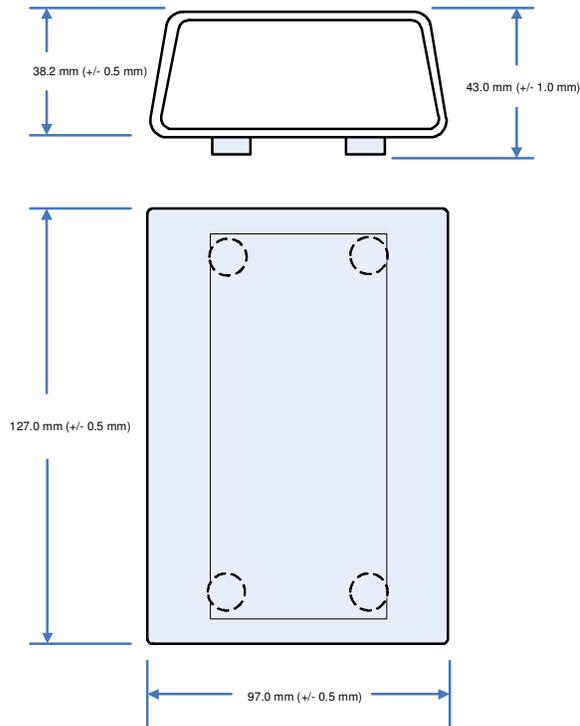
The power connectors have no protection against over voltage or reversed connections. Application of the wrong voltage can result in **immediate** damage to the board and possibly other components in the system.

The 2-pin headers allow the TYPE, MODE, and LEDs to be extended via a wire harness to user provided components. Soldering to the pins is not recommended as excessive heat could damage the board. Unauthorized soldering to the pins or any other point on the STS board does violate LAVA's manufacturer warranty.
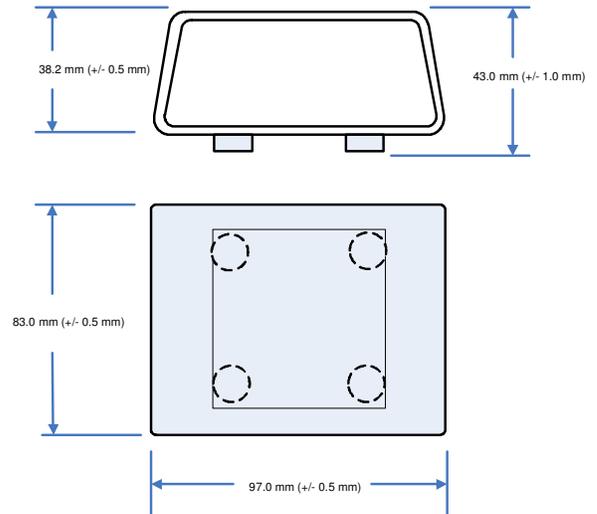
Hardware Setup – for the STS Adapter Board		
Step	**Procedure**	**Observations**
1	Turn on the tablet.	The standard startup banner(s) and music are reported. A new tablet requires the standard first time setup required by the manufacturer.
2	Plug the USB Power Supply into a wall outlet. If using a battery pack, turn the battery pack on.	
3	This step is used to determine which board revision you are working with. Remove the TYPE and MODE jumpers. Ensure the LED jumpers are set as shown in the STS Adapter Layout. Apply power to the 5V Power Input.	The Charge-Only LED will flash for 2-3 seconds.

If the pattern is continuous, the board is revision 1.

If the pattern is a flash-flash-pause repeated several time, the board is revision 2. |
| 4 | For testing of a revision 1 board, leave the MODE jumpers off, and set the TYPE jumper for desired behavior. See the "TYPE and Mode pin behavior" table for details.

For initial testing of a revision 2 board, leave the MODE jumper off, and set the TYPE jumper for the tablet being used. See the "TYPE and Mode pin behavior" table for details. | |
| 5 | Remove power from the board. | |
| 6 | Connect the STS to the tablet with the custom Micro USB to Micro USB cable provided.

Always verify the connector orientation before attempting to insert it into a device.

Either end of the cable can be plugged into the tablet. | |
| 7 | Connect a USB Power Supply to the 5V Power Input of the STS. | The Charge-Only LED will flash for 2 to 3 seconds, after which the SimulCharge LED is on and the Charge-Only LED is off.

A tablet status message may briefly report, "USB connector connected" and issue a beep.

The tablet battery icon will now show a lightning bolt to indicate it is being charged. |
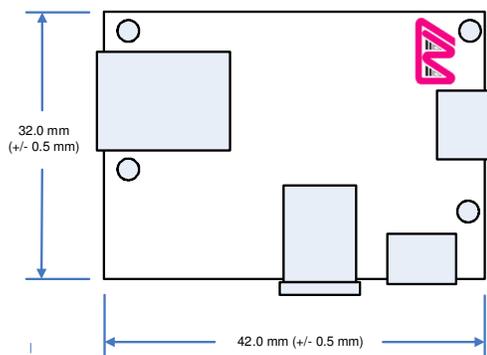| 5 | Optionally plug in a USB accessory to the STS USB-A receptacle. | The tablet will report a connection message such as "USB mass storage connected" for a flash memory stick. |
| The tablet is now operating as a USB Host and is being charged by the USB Power Supply. | | |

Dimensions

Case dimensions for the STS-P2UE:

Case dimensions for the STS-3U, STS-E, STS-PE, and STS-2UE:

38.2 mm (+/- 0.5 mm)

43.0 mm (+/- 1.0 mm)

38.2 mm (+/- 0.5 mm)

43.0 mm (+/- 1.0 mm)

127.0 mm (+/- 0.5 mm)

83.0 mm (+/- 0.5 mm)

97.0 mm (+/- 0.5 mm)

97.0 mm (+/- 0.5 mm)

Dimensions of the STS (a board only product):

32.0 mm (+/- 0.5 mm)

42.0 mm (+/- 0.5 mm)

DC Barrel Jack protrudes 2 mm (+/- 0.5 mm)

USB-A receptacle protrudes 2 mm (+/- 0.5 mm)

Micro USB-B receptacles protrude 1 mm (+/- 0.5 mm)

Approximate Height: 15 mm

Technical Support

LAVA Technical support is open from 9:00 am to 5:00 pm Monday to Friday (Eastern Time).

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History

Document Revision	Date	Change
0.10	Mar. 27, 2015	Draft document.
0.11	Apr. 07, 2015	Draft document, minor editorial changes.
A00	Apr.22, 2015	Initial Release, minor editorial changes.
A01	Apr.28, 2015	Changed SM-T850 to SM-T800 in compatibility table.
A02	Jul. 9, 2015	Minor editorial changes.
A03	Apr.15,2016	Added new Mode button and Type jumper behavior. Added new tablets supported. Revised Tablet Charging section. Dropped STS-2UE+ and STS-P2UE+ descriptions. Revised startup procedures so the tablet is connected to the STS** before power is applied.
A04	Apr.19,2016	Updated description of devices supported in the Mode Select button and Type Jumper sections.
A05	Jun.21,2016	Updated the STS section. The "revision 2" description of the TYPE jumper now refers to the jumper being "removed" or "installed".