STS Adapter Board (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.
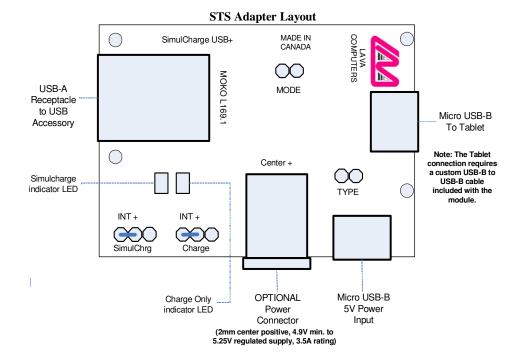
In Charge-Only Mode, the tablet charges at the highest rate permitted by the tablet; however no USB accessories are supported. Charge-Only Mode is useful when recovering a tablet, which has a fully depleted battery.

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

USB-A Receptacle to USB Accessory

SimulCharge USB+

MADE IN CANADA

MODE

LAVA COMPUTERS

MOKO L169.1

Micro USB-B To Tablet

Note: The Tablet connection requires a custom USB-B to USB-B cable included with the module.

Simulcharge indicator LED

Center +

TYPE

INT +   INT +
SimulChrg   Charge

Charge Only indicator LED

OPTIONAL Power Connector
(2mm center positive, 4.9V min. to 5.25V regulated supply, 3.5A rating)

Micro USB-B 5V Power Input

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

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.
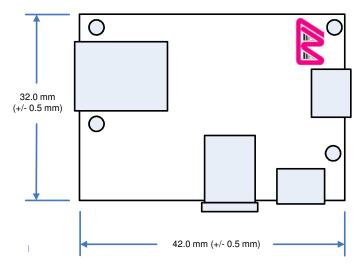
The 2-pin headers allow the TYPE, MODE, and LEDs to be extended via a wire harness to user provided components. Soldering to the pins is not recommended as excessive heat could damage the board. Unauthorized soldering to the pins or any other point on the STS board does violate LAVA's manufacturer warranty.

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:

Dimensions of the STS Adapter Board

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 receptacle protrudes 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 (EST).

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History:

Document Revision	Date	Change
A01	May 25, 2016	Initial document. Information extracted from the STS Product Family – User Manual – A04.