Cisco Catalyst ESS-9300-10X Embedded Switch Hardware Technical Guide

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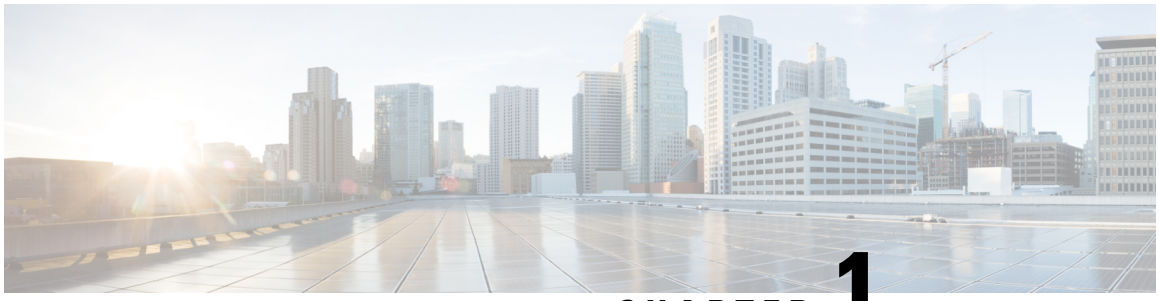


CHAPTER 1

Product Overview

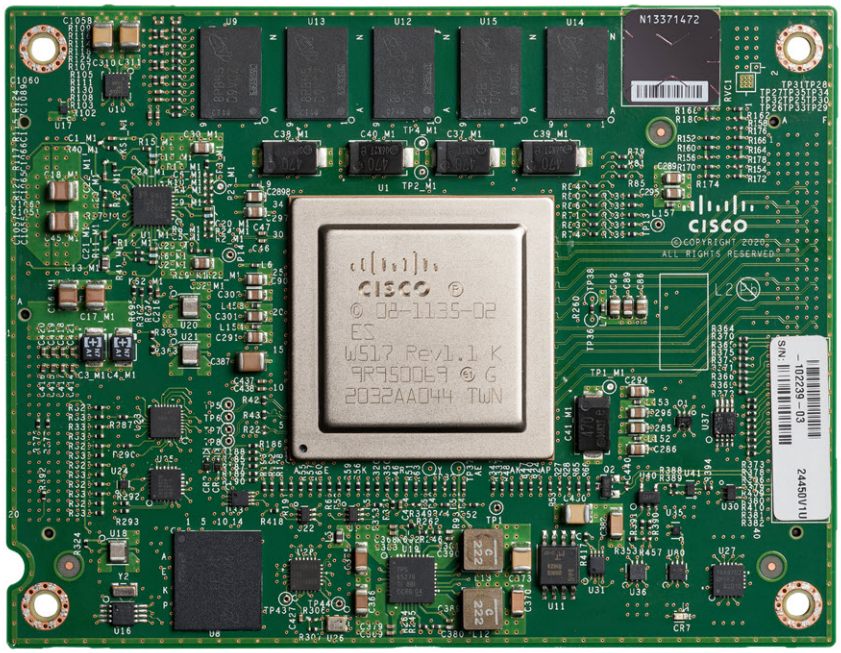
This chapter contains the following sections:

Cisco Embedded Service 9300 Series Switches Overview

This hardware technical guide provides a product description, specifications, and compliance information for the Cisco Embedded Service 9300 Series Switches.

Note The documentation set for this product strives to use bias-free language. For purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. Exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

The Cisco ESS 9300 is a Small Form Factor (SFF) embedded Ethernet switch card. The compact design simplifies integration and offers the system integrator the ability to use the Cisco ESS 9300 in a wide variety of applications. The Cisco ESS 9300 consists of one switch card. There are no cooling plates sold with it. It is up to the system integrator to design a thermal solution. The ESS-9300-10X-E board supports up to 10 ports of 10 GE fiber. Thermal power is 35 Watts.



Note Refer to the Cisco ESS 9300 data sheet for a complete list of available product IDs.

Audience

This guide is for the system integrator who is integrating the Cisco ESS 9300 into a custom end product.

General Description

The ESS-9300 is a ruggedized 10GigE Embedded platform for tactical, outdoor, and mobile installations. Some of the key hardware features are:

- Small Form Factor
- 10 Optical 10G
- Software: IOS-XE, Network Essentials and Network Advantage
- Industrial temperature: -40°C to +85°C
- ARM Quad-Core A53
- 4GB DDR4 DRAM memory capacity with ECC
- 2.5GB User Accessible Flash
- 3.3V and 5V power input
- Anti-counterfeit chip and Secure Boot

- RTC with customer provided power backup
- Push Button that supports the Zeroize feature
- Two alarm inputs and One alarm output
- Two USB 2.0 Host interface for USB Flash Memory Device, one can be converted to SDHC
- One USB 2.0 Console Interface.
- One RS-232 Console Interface.

Board Layout and Dimensions

The following pictures show the Board Layout. The dimensions are 4.331 in X 3.346 in (110mm X 85mm).

Figure 1: Top View

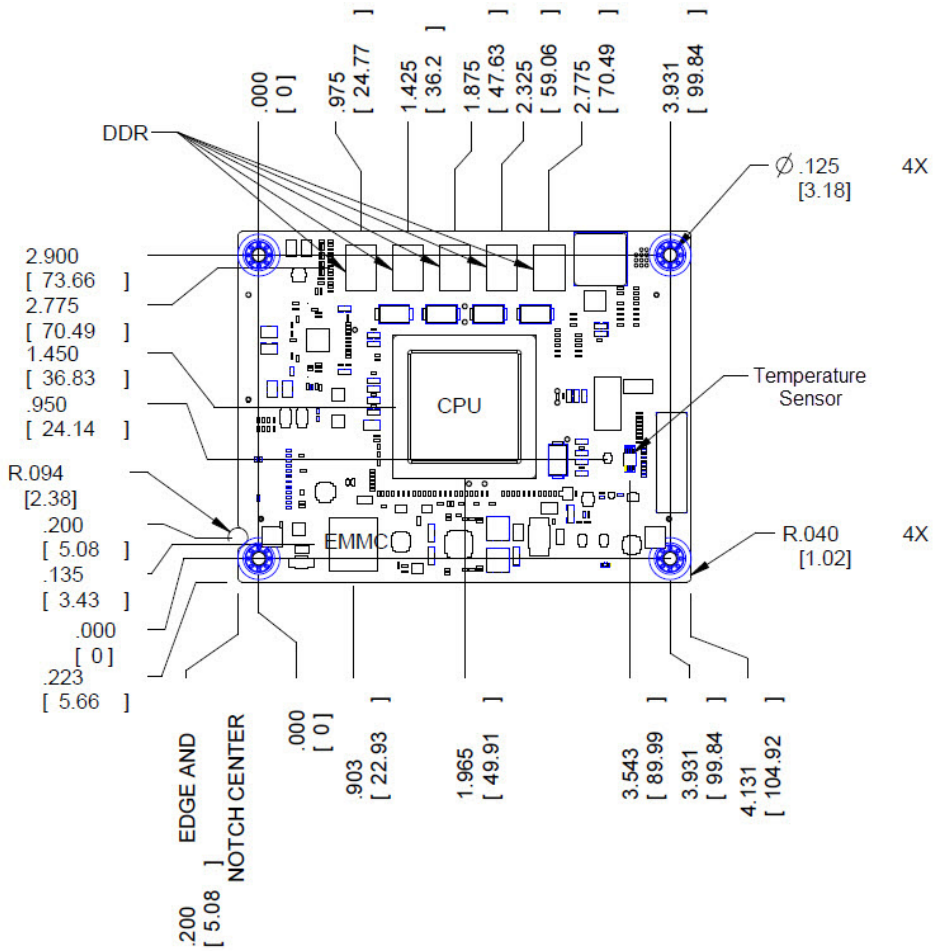


Figure 2: Side View

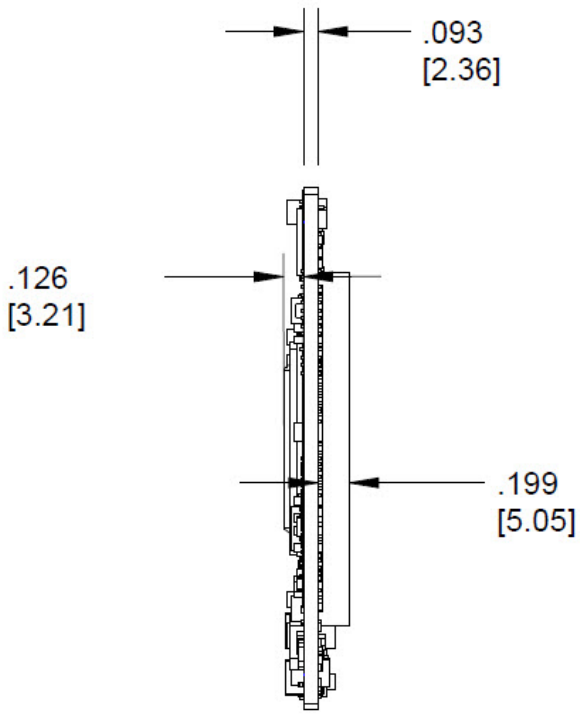
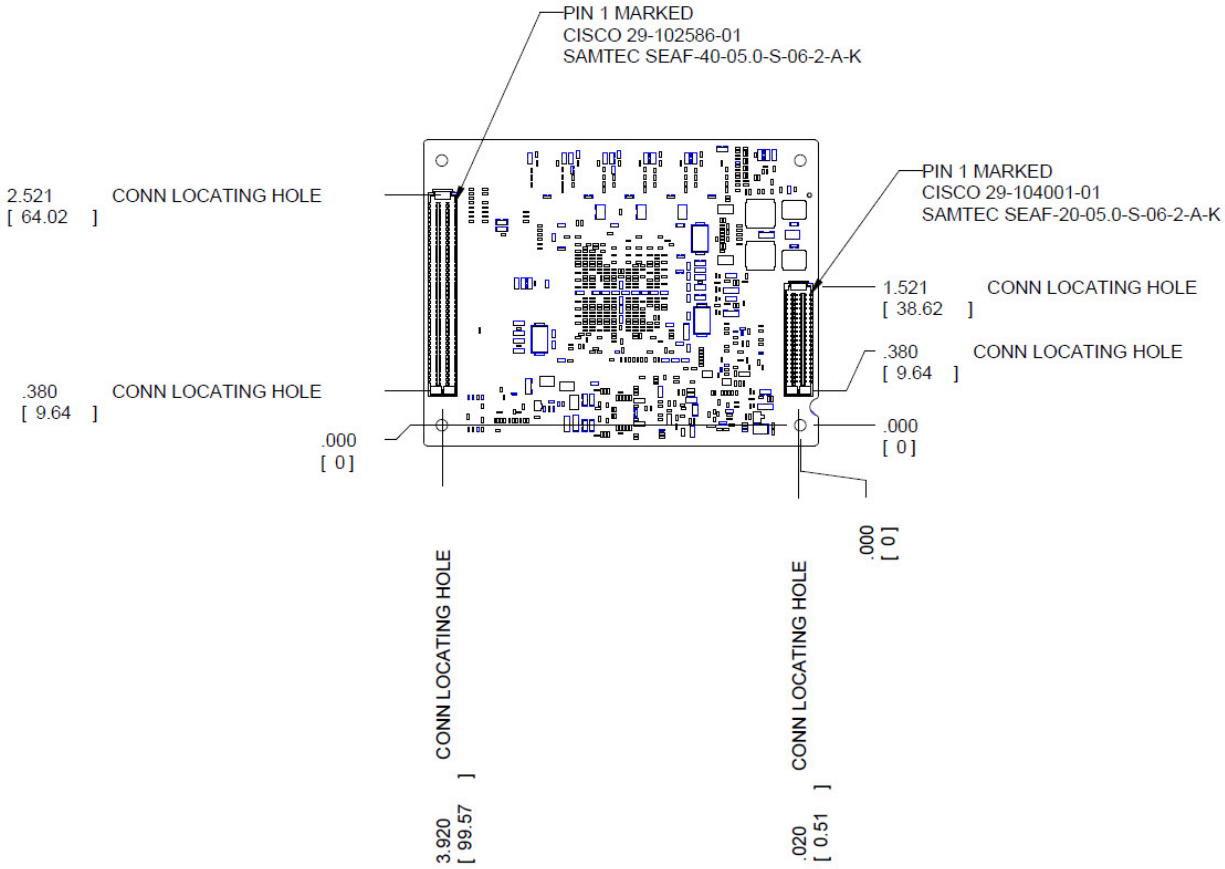
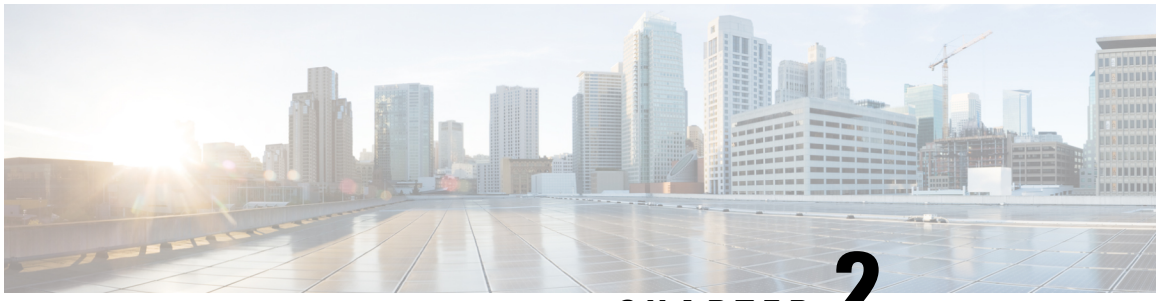


Figure 3: Bottom View





CHAPTER 2

Interface Connectors

This chapter contains the following sections:

Interface Connectors

The board has two connectors that provide power and interface connections to external devices. All of the connectors belong to the SEARAY® Connector Series from SAMTEC.

Board to Board Connectors

Depending on the mating connector selected by the integrator, a stacking height from 7 mm to 18mm (not all increments are supported). The following table lists the board connectors, and the mating connector options that are available to achieve specific stacking heights below.

Note Contact your local Samtec sales representatives for specific Samtec part numbers.

Table 1: SEAM Mating Height

SEAM Lead Style	-05.0 SEAF Lead Style
-02.0	7mm
-03.0	8mm
-03.5	8.5mm
-07.0	12mm
-09.0	14mm

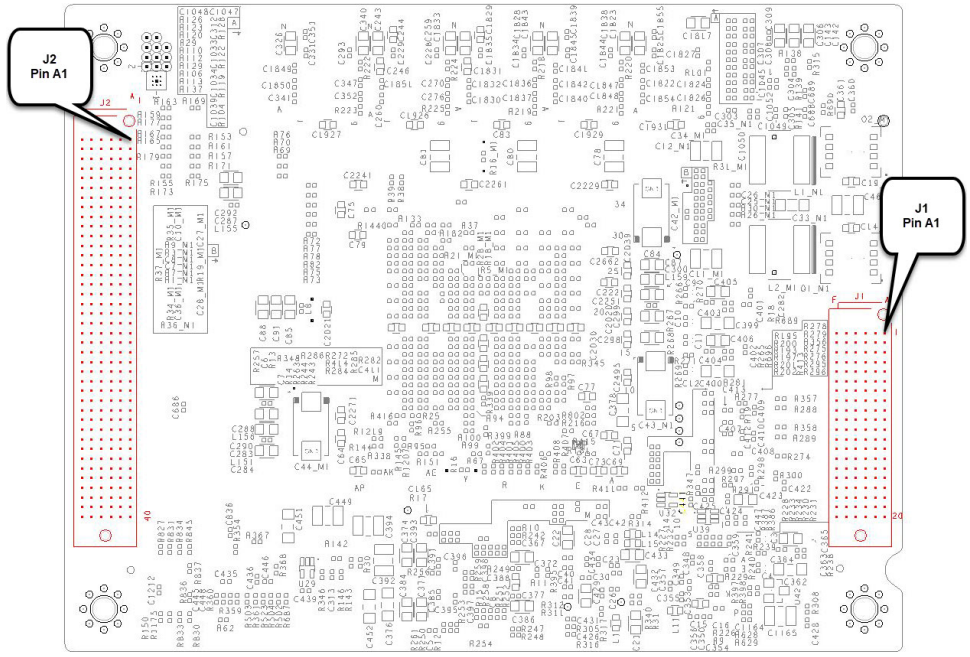
SEAM Lead Style	-05.0 SEAF Lead Style
-11.0	16mm

Board Interface Connectors (I/O and Network Interface)

The board I/O connectors are SAMTEC SEAF-20-05.0-S-06-2-A-K 120-pin (J1) and SAMTEC SEAF-40-05.0-S-06-2-A-K 240-pin (J2) connectors respectively.

The following figures show the J1 and J2 connectors as well as the pin 1 designations.

Figure 4: Interface Connectors Bottom Side View



ESS-9300 I/O Connector (J1)

Table 2: I/O Connector (J1)

PIN #	Row A	Row B	Row C	Row D	Row E	Row F
1	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE
2	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE
3	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE	P5V_MODULE
4	GND	GND	GND	GND	GND	GND

PIN #	Row A	Row B	Row C	Row D	Row E	Row F
5	P3_3V_MODULE	P3_3V_MODULE	P3_3V_MODULE	P3_3V_MODULE	P3_3V_MODULE	P3_3V_MODULE
6	GND	GND	GND	RSVD	GND	GND
7	GND	GND	GND	RSVD	RSVD	RSVD
8	CLK_156M25_P	RSVD	RSVD	RSVD	RSVD	RSVD
9	CLK_156M25_N	RSVD	RSVD	RSVD	RSVD	RSVD
10	GND	GND	GND	RSVD	GND	GND
11	GND	GPIO_RST_L	P3_3V_RTC	RSVD	GND	GND
12	GND	IOEXP_INT_L	GND	RSVD	GND	CLK_125M_P
13	RSVD	GND	CNS_RJ45_TXD_L	GND	GND	CLK_125M_N
14	RSVD	I2C_GPIO_SCL	CNS_RJ45_RTS_L	LED_SH_DIN	GND	GND
15	GND	I2C_GPIO_SDA	CNS_RJ45_RXD_L	LED_SH_CLK	RSVD	GND
16	RSVD	GND	CNS_RJ45_CTS_L	LED_SH_EN_L	RSVD	RSVD
17	RSVD	I2C_MUX_SCL	GND	LED_SH_LATCH	RSVD	RSVD
18	GND	I2C_MUX_SDA	USB_CONSOLE_P	PUSH_BUTTON_	GND	GND
19	RSVD	GND	USB_CONSOLE_N	GND	RSVD	RSVD
20	RSVD	I2C_MUX_RST_L	P5V_USB_CONSOLE	RT_DBG_PPS	RSVD	RSVD

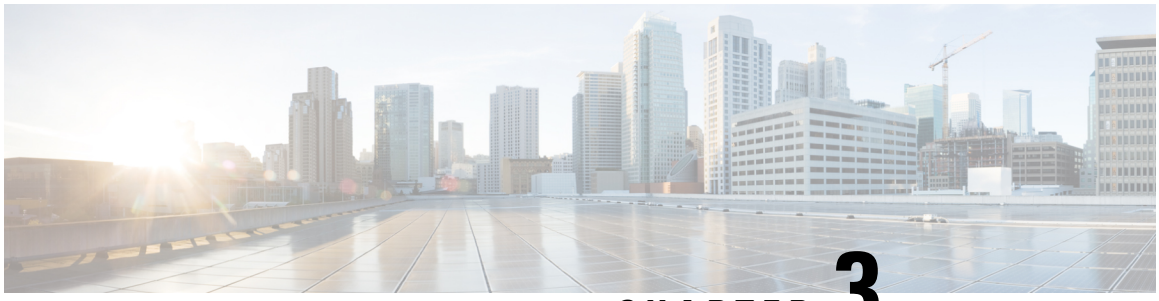
ESS-9300 I/O Connector (J2)

Table 3: Board I/O Connector (J2)

Pin #	Row A	Row B	Row C	Row D	Row E	Row F
1	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD
2	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD
3	GND	RSVD	RSVD	RSVD	GND	RSVD
4	GND	RSVD	GND	GND	GND	RSVD
5	TE1_1_TXDATA_P	GND	TE1_2_TXDATA_P	GND	TE1_1_RXDATA_P	GND
6	TE1_1_TXDATA_N	GND	TE1_2_TXDATA_N	GND	TE1_1_RXDATA_N	GND

Pin #	Row A	Row B	Row C	Row D	Row E	Row F
7	GND	TE1_3_TXDATA_P	GND	TE1_2_RXDATA_P	GND	TE1_3_RXDAT
8	GND	TE1_3_TXDATA_N	GND	TE1_2_RXDATA_N	GND	TE1_3_RXDAT
9	TE1_4_TXDATA_P	GND	TE1_5_TXDATA_P	GND	TE1_4_RXDATA_P	GND
10	TE1_4_TXDATA_N	GND	TE1_5_TXDATA_N	GND	TE1_4_RXDATA_N	GND
11	GND	TE1_6_TXDATA_P	GND	TE1_5_RXDATA_P	GND	TE1_6_RXDAT
12	GND	TE1_6_TXDATA_N	GND	TE1_5_RXDATA_N	GND	TE1_6_RXDAT
13	TE1_7_TXDATA_P	GND	TE1_8_TXDATA_P	GND	TE1_7_RXDATA_P	GND
14	TE1_7_TXDATA_N	GND	TE1_8_TXDATA_N	GND	TE1_7_RXDATA_N	GND
15	GND	TE1_9_TXDATA_P	GND	TE1_8_RXDATA_P	GND	TE1_9_RXDAT
16	GND	TE1_9_TXDATA_N	GND	TE1_8_RXDATA_N	GND	TE1_9_RXDAT
17	TE1_10_TXDATA_P	GND	RSVD	GND	TE1_10_RXDATA_P	GND
18	TE1_10_TXDATA_N	GND	RSVD	GND	TE1_10_RXDATA_N	GND
19	GND	RSVD	GND	RSVD	GND	RSVD
20	GND	RSVD	GND	RSVD	GND	RSVD
21	SFP_TE1_1_PRES_L	GND	SFP_TE1_5_PRES_L	GND	GND	GND
22	SFP_TE1_2_PRES_L	GND	SFP_TE1_6_PRES_L	GND	GND	GND
23	GND	SFP_TE1_3_PRES_L	GND	SFP_TE1_7_PRES_L	SFP_TE1_9_PRES_L	SFP_TE1_10_P
24	RSVD	SFP_TE1_4_PRES_L	RSVD	SFP_TE1_8_PRES_L	GND	GND
25	RSVD	GND	RSVD	GND	MGMT_PORT_RXDATA_P	MGMT_PORT_
26	GND	RSVD	GND	RSVD	MGMT_PORT_RXDATA_N	MGMT_PORT_
27	USB1_A_FAULT_L	RSVD	GND	RSVD	GND	GND
28	USB1_A_PWR_EN	GND	DCA_PWR_GOOD	GND	MGMT_PHY_RST_L	GND
29	GND	USB2_A_FAULT_L	DCB_PWR_GOOD	GND	GND	GND
30	USB1_A_D_P	USB2_A_PWR_EN	DYING_GASP_L	GND	MDIO_MGMT_PHY	GND
31	USB1_A_D_N	GND	RSVD	GND	MDC_MGMT_PHY	GND
32	GND	USB2_A_D_P	GND	GND	GND	GND
33	GND	USB2_A_D_N	RSVD	GND	GND	RSVD

Pin #	Row A	Row B	Row C	Row D	Row E	Row F
34	GND	GND	RSVD	GND	GND	GND
35	GND	GND	RSVD	GND	RSVD	RSVD
36	RSVD	GND	GND	TEMP_SENSOR_N	RSVD	RSVD
37	RSVD	GND	RSVD	TEMP_SENSOR_P	GND	RSVD
38	GND	RSVD	RSVD	GND	RSVD	GND
39	GND	RSVD	RSVD	RSVD	RSVD	RSVD
40	RESET_HOLD_OFF_L	GND	RSVD	RSVD	RSVD	RSVD



CHAPTER 3

Implementation Options

This chapter contains the following sections:

Module I/O Description

The following table provides details on the I/O signals.

Table 4: I/O Signals

IO Name	Description	Direction	I/O Standard	Notes
CLK_156M25_*	156.25MHz reference clock	Out	LDVS	If unused terminate with 100 ohm resistor
I2C_*_SDA	I2C data	In/Out	3.3V Open-drain	Pullup on Cisco card
I2C_*_SCL	I2C clock	In/Out	3.3V Open-drain	Pullup on Cisco card
I2C_MUX_RST_L	I2C mux reset	Out	3.3V	Resets the I2C mux
P3_3V_RTC	Backup power for real time clock	In	3.3V	—
CNS_RJ45_TXD_L	RS-232 console	Out	RS-232 Compliant	RS-232 console port
CNS_RJ45_RTS_L	RS-232 console	Out	RS-232 Compliant	RS-232 console port

IO Name	Description	Direction	I/O Standard	Notes
CNS_RJ45_RXD_L	RS-232 console	In	RS-232 Compliant	RS-232 console port
CNS_RJ45_CTS_L	RS-232 console	In	RS-232 Compliant	RS-232 console port
USB_CONSOLE_[P/N]	USB console	Bi	USB 2.0 Compliant	USB 2.0 console port
LED_SH_DIN	Shift chain data	Out	3.3V	
LED_SH_CLK	Shift chain clock	Out	3.3V	
LED_SH_EN_L	Shift chain enable low	Out	3.3V	Pullup on Cisco card
LED_SH_LATCH	Shift chain latch	Out	3.3V	
PUSH_BUTTON_L	Push button	In	3.3V	Pullup on Cisco card
TE1_[1-10]_TXDATA_[P/N]	XFI 10G tx data	Out	LVDS	—
TE1_[1-10]_RXDATA_[P/N]	XFI 10G rx data	In	LVDS	—
SFP_TE1_[1-10]_PRES_L	SFP present low	In	3.3V	Signal indicating the presence of the SFP
USB1_[1-2]_FAULT_L	USB power fault detected	In	3.3V	Pullup on Cisco card
USB1_[1-2]_PWR_EN	Turn on the USB 5V power	Out	3.3V	Pullup on Cisco card
USB1_[1-2]_D_[P/N]	USB for SD or USB Type A	Bi	USB 2.0 Compliant	—
RESET_HOLD_OFF_L	Keeps the Cisco card in reset	In	3.3V	This signal holds the Cisco card in reset until the integrator card is ready.
DC[A-B]_PWR_GOOD	DC power is good or either A or B supply	In	3.3V	High indicates the DC input is good. Pullup on Cisco card.
DYING_GASP_L	Indicates the power supplies are starting to fail	In	3.3V	The supplies must hold up the power until the dying gasp messages can be sent out.
TEMP_SENSOR_[P/N]	Transistor temperature sensor on the Cisco card	Out	N/A	These signals can be used for the integrator to monitor the temperature of the Cisco card.
MGMT_PHY_RXDATA	SGMII signal for management PHY	Out	LVDS	—
MGMT_PHY_TXDATA	SGMII signal for management PHY	In	LVDS	—
MGMT_PHY_RST_L	Management phy reset	Out	3.3V	Pull low if no management phy is populated

IO Name	Description	Direction	I/O Standard	Notes
MDIO_MGMT_PHY	Management phy MDIO signal	Bi	3.3V	MDIO bus, MDIO_MGMT_PHY needs a pullup
MDC_MGMT_PHY	Management phy MDC signal	Out	3.3V	—

Note In the above table, LVDS stands for Low-Voltage Differential Signaling. For further information see the TIA/EIA-644 technical standard.

Block Diagrams

The system integrator can find block diagrams that represents how the ESS board connects into their system located here:

ESS9300 Block Diagram

Power Signals

Table 5: Power Signals

Signal Name	Description	Direction	I/O Standard	Notes
P5V_MODULE	+5V power for Cisco card	In	PWR	See Board Electrical Power Consumption, on page 26
P3_3V_MODULE	+3.3V power for Cisco card	In	PWR	See Board Electrical Power Consumption, on page 26
P3_3V RTC	+3.3V for real time clock hold up	In	PWR	See Board Electrical Power Consumption, on page 26
GND	Reference ground	—	PWR	—

LED Definitions

LED functionality is provided by a dedicated controller for driving an LED shift chain for driving the LEDs on the integrator board. You can select any combination of LEDs to implement. You are not required to implement all of the LEDs but must implement the shift chain up to the last LED needed.

LED	Color	Description
System	Off	System is not powered on.
	Flashing Green	Power on tests in progress.
	Solid Green	System is operating normally.
	Flashing Yellow	System is receiving power but is not functioning properly.
	Yellow	System fault detected.
DC-A/B	Off	Power is not present on the circuit, or the system is not powered up.
	Solid Green	Power is present on the associated circuit.
	Solid Red	Power is not present on the associated circuit, and the switch is configured for dual-input power.
Alarm Out	Off	Alarm Out is not configured.
	Solid Green	Alarm Out is configured, no alarm detected.
	Flashing Red	Switch has detected a major alarm.
	Solid Red	Switch has detected a minor alarm.
Alarm In	Off	Alarm In is not configured.
	Solid Green	Alarm In is configured, no alarm detected.
	Flashing Red	Switch has detected a major alarm.
	Solid Red	Switch has detected a minor alarm.
Under Temperature	Red	The system is under temperature and is warming up.
Port	Off	No link or the port was administratively shut down.
	Solid Green	Link is present, no activity.
	Flashing Green	Link is healthy, with activity.
	Alternating Green/Yellow	Link faulty or an error.
	Solid Yellow	Port is disabled.
Console	Off	USB cable or Blue-tooth dongle not connected.
	Solid Green	USB console is active.
	Flashing Green	Blue-tooth dongle is active.
Zeroize	Off	Normal operation.
	Flashing Green	Zeroization procedure has been initiated.
	Solid Yellow	Zeroization procedure has completed; switch is about to reboot.
	Solid Green	Zeroization procedure has completed.

Board LED Register Bits

The following table provides a listing of the Board LED register bits for the system integrator.

Table 6: LED Shift Chain

GPIO Position	Carrier
0 (First bit out of the Cisco card)	TE1/12 Green
1	TE1/12 Yellow
2	TE1/11 Green
3	TE1/11 Yellow
4	TE1/10 Green
5	TE1/10 Yellow
6	TE1/9 Green
7	TE1/9 Yellow
8	TE1/8 Green
9	TE1/8 Yellow
10	TE1/7 Green
11	TE1/7 Yellow
12	TE1/6 Green
13	TE1/6 Yellow
14	TE1/5 Green
15	TE1/5 Yellow
16	TE1/4 Green
17	TE1/4 Yellow
18	TE1/3 Green
19	TE1/3 Yellow
20	TE1/2 Green
21	TE1/2 Yellow
22	TE1/1 Green
23	TE1/1 Yellow
24	USB console Green

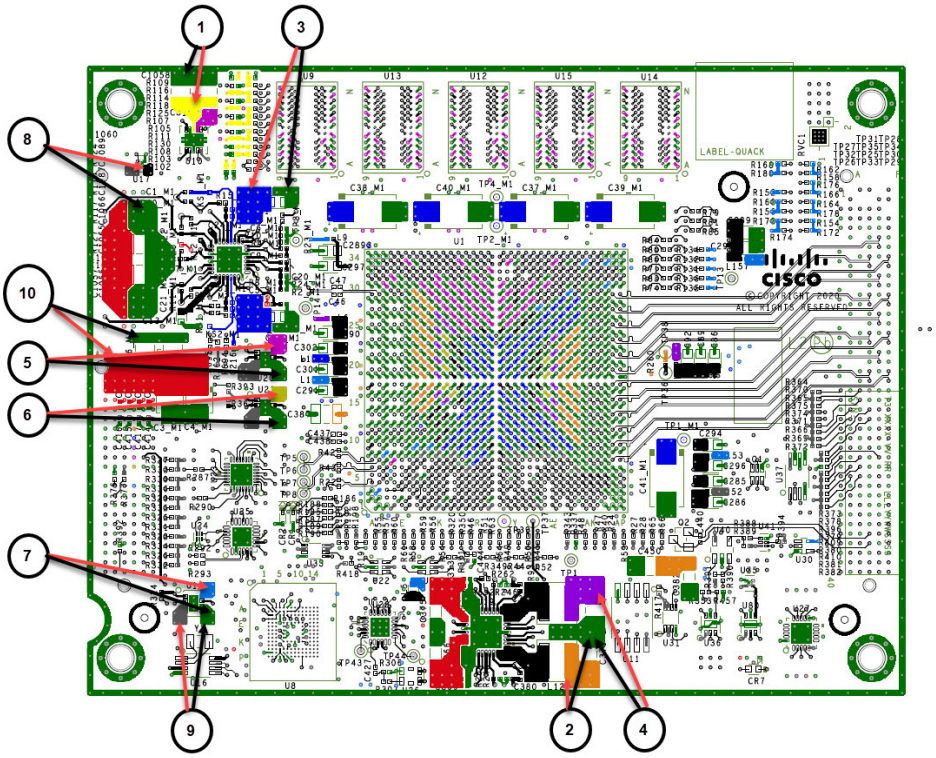
GPIO Position	Carrier
25	Under temperature Red
26	Alarm IN 2 Green
27	Alarm IN 2 Red
28	Alarm IN 1 Green
29	Alarm IN 1 Red
30	Alarm Out Green
31	Alarm Out Red
32	DC-B Green
33	DC-B Red
34	DC-A Green
35	DC-A Red
36	ZEROIZE Green
37	ZEROIZE Yellow
38	SYSTEM Green
39 (Last bit out of shift chain)	SYSTEM Yellow

Module Voltage Test Points

The following figure shows voltage test points on the board with descriptions in the following table.

Note Red lines are Positive, Black lines are Ground.

Figure 5: Voltage Test Points



Test Point	Location	Location Color	Voltage
1	C311	Yellow	0.60V
2	C370	Orange	0.80V
3	C30_M1	Blue	0.85V
4	C373	Purple	0.90V
5	Surface trace	Pink	1.20V
6	Surface trace	Light Yellow	1.20V (VDDH)
7	Surface trace	Light Blue	1.80V
8	Surface trace	Dark Green	2.50V
9	Surface trace	Brown	3.30V
10	C16_M1	Red	5.0V

Mechanical and Environmental Testing

The tests listed in the following tables were successfully executed on the Cisco ESS9300 using Cisco passive cooling design. These tests used a representative enclosure that conforms to the mounting and thermal mechanisms. Because this type of testing is highly dependent on factors such as the test enclosure design, the thermal solution, the front panel connectors, and the mounting, the following test results should only be used as a reference.

Table 7: Temperature

High and Low Temperature Cycle Stress (Operational)	High Temperature: 74°C (165°F) Low Temperature: -40°C (-40°F) Reference: MIL-STD-810F, Method 501.4, Procedure II and Method 502.4, Procedure II; SAE J1455 (Rev AUG94), Section 4.1.3
Thermal Shock (Non-Operational)	High Temperature: 85°C (185 °F) Low Temperature: -40°C (-40 °F) Cycle: 2 hours high temperature, 2 hours low temperature Test Period: 2 hour pre-soak at low temperature, followed by 5 cycles Repetition: 5 test periods Reference: MIL-STD-810F, Method 503.4; SAE J1455 (Rev AUG94), Section 4.1.3.2
High Temperature Component Thermal Test (Operational)	Method: Thermocouples on all critical/hot components at board level. Bring temperature of top center surface of thermal plate to 85°C (185 °F) and allow it to stabilize. Ensure that all components are within manufacturer thermal specifications.

Table 8: Altitude

Low Pressure/Altitude (Operational)	Altitude: 4.6km (15,000ft) Equivalent Absolute Pressure: 57.2 kPa (8.3 lbf/in2) Temperature: -40°C (-40°F) to 74°C (165°F) Altitude Ramp Rate: 10m/s (max) Temperature Ramp Rate: 1.5°C (min) to 4.5°C (max) Reference: MIL-STD 810F, Method 500.4, Procedure II; SAE J1455 (Rev AUG94), Section 4.1.3.1

Operational Altitude	Altitude: 12.2km (40,000ft) Equivalent Absolute Pressure: 18.6kPa (2.7lbf/in2) Temperature: -40C (-40F) to 25C (77F)
Low Pressure/Altitude (Non-Operational)	Altitude: 12.2km (40,000 ft) Equivalent Absolute Pressure: 18.6kPa (2.7lbf/in2) Temperature: -40°C (-40°F) to 85°C (185°F) Altitude Ramp Rate: 10m/s (max) Temperature Ramp Rate: 1.5°C (min) to 4.5°C (max) Reference: MIL-STD-810F, Method 500.4; SAE J1455 (Rev AUG94), Section 4.1.3.1

Table 9: Humidity

Temperature & Humidity Cycle Stress (Non-Operational; Energized)	Humidity: 95% +/- 5% RH Pressure: 103.4 kPa (15 lbf in2) Temperature: -40°C (-40°F) to 65°C (149°F) Cycle: One, 24 hour cycle Reference: SAE J1455 (Rev AUG94), Section 4.2.3
Active Temperature/Humidity 10 Day Soak (Non-Operational; Energized)	Temperature: -40°C (-40°F) to 65 °C (149 °F) Humidity: 95% +/- 5% RH Cycle: Ramp from 25°C to 0°C over 75 minute period, dwell at 0°C for 240 minutes, ramp to 65°C over 120 minute period, dwell at 65°C for 240 minutes (95% +/- 5% RH), ramp to 25°C over 45 minute period, dwell at 25°C for 120 minutes (50% +/- 5% RH) Repetition: 20 total cycles (10 days total) Reference: MIL-STD-810F, Method 507.4; SAE J1211 (Rev NOV78), Section 4.2.2; SAE J1455 (Rev AUG94), Section 4.2.3

Table 10: Vibration and Shock

Random Vibration (Operational)	Acceleration: 1.04g rms vertical, 0.204g rms transverse, 0.740g rms longitudinal Duration: 2 hours per axis Test orientation: 3 axes Reference: MIL-STD-810F, Method 514.5, Category 4

Crash Hazard Shock (Non-Operational)	Acceleration: 75G Duration: 8-13ms Test orientation: 3 axes (positive and negative) Number of shocks: 2 shocks in each direction, 12 shocks total Reference: MIL-STD-810F, Method 516.5, Procedure V
Functional Shock (Operational)	Acceleration: 40G Duration: 15-23ms Test orientation: All 6 faces, in 3 perpendicular axes Reference: MIL-STD-810F, Method 516.5, Procedure I
Bench handling shock (tip) (Operational)	Test orientation: All four edges of each face to form 10° angle with bench top Reference: MIL-STD-810F, Method 516.5, Procedure VI

Overtemperature Detection

The board has a temperature sensor mounted on the edge of the board that should be thermally attached to the Customer Designed Conduction Plate. When the temperature sensor detects a temperature exceeding the threshold of 203°F (96°C), the overtemperature LED will illuminate.

The digital temperature sensor measures the temperature of the Customer Designed Conduction Plate, not the local ambient temperature. The product datasheet states the board will operate as long as the conduction plate is in the range of -40C to +85C. The alarms are set accordingly, and the high temperature alarm thresholds are set as follows:

- Minor alarm at +80C the Customer Designed Conduction Plate temperature is close to the rated thermal limit of the unit, and will notify the user. The components are still within the specification, so there is no degradation to the long term reliability of the system.
- Major alarm at +90C the Customer Designed Conduction Plate temperature is over the rated thermal limit of the unit, and will notify the user. This will impact the long term reliability of the system.
- Critical alarm at +96C the Customer Designed Conduction Plate temperature is way over the rated thermal limit of the unit, and will notify the user. This will impact the long term reliability of the system. For the Critical Alarm threshold to be reached, it means that the ambient temperature of the system will be exceeded. Hardware failure is immanent, and the failure time will depend upon your installation. Depending on the severity at this point, the failure may be temporary or permanent.

Caution IOS will never shut down a device because the temperature exceeds the specification. Cisco does not guarantee the functionality, nor the long term reliability of a device operating beyond Cisco specifications, but lets the device continue operating until some piece of hardware physically shuts down. Operating outside of the temperature specifications will void the product warranty.

The status of the temperature sensors can be reported from the Cisco ESS-9300 IOS CLI:

```
Switch# show environment all
ALARM CONTACT 1
   Status:      not asserted
   Description: external alarm contact 1
   Severity:    minor
   Trigger:     closed
ALARM CONTACT 2
   Status:      not asserted
   Description: external alarm contact 2
   Severity:    minor
   Trigger:     closed
Supervisor Temperature Value: 51 C
Temperature State: GREEN
System Temperature thresholds
------------------------------
Minor Threshold    : 80 C (Yellow)
Major Threshold    : 90 C (Red)
Critical Threshold : 96 C
Shutdown Threshold : 105 C
Pwr Supply         Type     Status
-------------------------------------
POWER SUPPLY-A      DC      OK
POWER SUPPLY-B      DC      OK
```

Thermal Design Considerations

The following sections outline the methods for dealing with thermal issues and the mounting options involving the Customer Designed Conduction Plate.

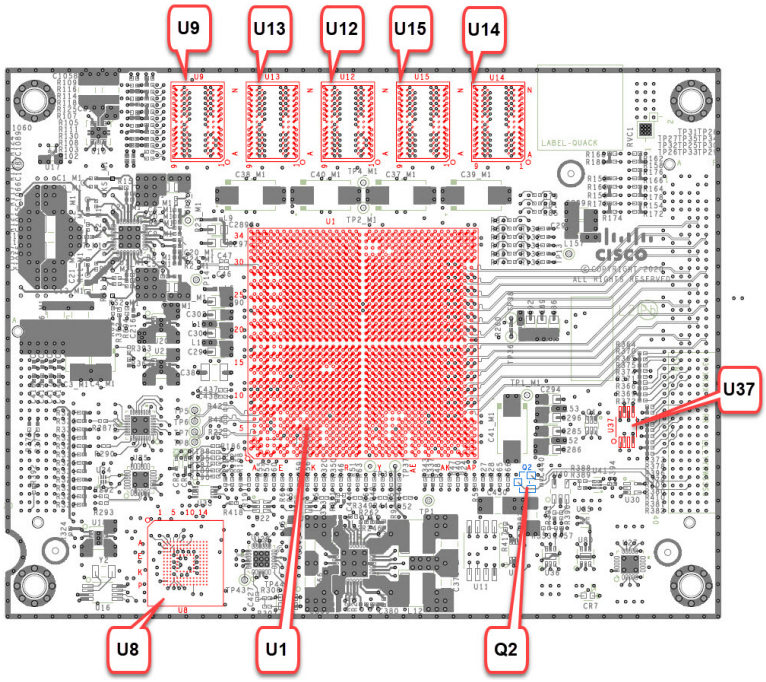
As the ESS9300 is intended for use in extreme environments, industrial temperature rated components are used.

As a general rule, the thermal plate of the card needs to make contact with an adequate thermal mass to draw heat away from the card. This can be done in a number of ways.

The important note is that the Customer Designed Conduction Plate temperature, as measured at the center of the top surface of the conduction plate, must not exceed 85°C. As long as this requirement is satisfied, all of the card's components will be within a safe operating temperature range on the high temperature side.

Note The area in the following figure noted by the red square is the 45A power supply and needs some additional cooling.

Figure 6: Thermally Significant Components of Cisco ESS-9300



Note Cisco uses the following TIMs at each REFDES:

The U1, U9, U12, U13, U14, U15, U8, and other items in the figure above use the Chomerics GEL30. U1 uses a Fujipoly 32x32, 150Xr-PE thermal pad.

Samtec has 3D models, footprints, and schematic symbols for their connectors here:

https://www.samtec.com/connectors/high-speed-board-to-board/high-density-arrays/searay

RefDes	Thermal Design Power (in W)	Allowable junction temp (in °C)	Allowable case temp (in °C)	Package Type	Theta Jc (in °C/W)	Theta Jb (in °C/W)
U1	33	115	—	FCTEBGA1155	—	-
U9, U12, U13, U14, U15	0.2 Each	—	95	FBGA96	3.0	—
U8	1	—	—	FBGA153	—	—
U37	—	—	—	MSOP8	—	—

Note Q2 is a NPN transistor that can be used by the system integrator to read the temperature of the cooling plate for their use.

Validating a Thermal Solution

To validate a thermal solution, monitor the thermal sensor of the Cisco ESS 9300 cards in a thermal chamber set to the desired maximum ambient operating temperature and with traffic running.

The temperature sensor should make contact with the Customer Designed Conduction Plate using thermal interface material. The temperature of the sensors should be less than 90.5C. The **show environment all** command can be executed from the IOS prompt to monitor the thermal sensor temperatures.

```
Switch# show environment all
ALARM CONTACT 1
   Status:      not asserted
   Description: external alarm contact 1
   Severity:    minor
```

Product Specifications

The following tables list the product specifications for the Cisco ESS 9300.

Table 11: Interface Support

Item	Description
ESS-9300	10 ports of 1 or 10 GE fiber (XFI)

Table 12: Memory

Item	Description
DRAM	4GB
SPI Flash	16MB
eMMC Flash	7 GB, 2.5 GB user accessible

Table 13: Hardware Specifications

Item	Description
Input voltages	+5Vdc (+/- 5%) and +3.3Vdc (+/- 3%)
Total Power	Thermal Power = 35W Max Power = 43W
Mass	88 grams (3.10 ounces)

Note For Environmental Specifications, please see the Mechanical and Environmental Testing section for complete specifications.

Power Requirements

The board requires +5 VDC and +3.3 VDC to operate. Board Electrical Power Consumption, on page 26 lists the DC power requirements.

The ESS-9300 can display a POWER GOOD status for two Power Inputs via the DC-A-GOOD and DC-B-GOOD signals. If these signals are not used, connect DC-A-GOOD to 3.3 V and DC-B-GOOD to ground through a 1k resistor.

Note There is no specific voltage sequence requirement for the 5V and 3.3V power inputs. They can ramp up in any order.

Dying Gasp

If the switch is configured, and the feature is enabled, in the case of a temporary power outage, the switch will send a Dying Gasp packet. If the power recovers, the switch will continue to operate normally. See more about Dying Gasp in the ESS9300 Software Configuration Guide .

Board Electrical Power Consumption

Table 14: Power Requirements

Voltage Rail	Tolerance	Typical Current (A)	Maximum Current (A)
5V	+/- 3%	N/A	7.0A
3.3V	+/- 3%	N/A	2.0A
P3_3V RTC	+10% / -60%	0.4uA	0.7uA

SD Support

There is one Cisco SD card that has been tested and is recommended, the SD-IE-4GB. If the end user or system integrator chooses to use a 3rd party device, it may work for their application and to their satisfaction. However, the end user or system integrator is solely responsible for testing and ensuring proper operation.

The following message displays when a different SD card is installed:

```
WARNING: Non-IT SD flash detected. Use of this card during normal operation can impact and
severely degrade performance of the system. Please use supported SD flash cards only.
```

You can find Cisco's policy on Third Party Components here:

https://www.cisco.com/c/en/us/products/warranties/warranty-doc-c99-740959.html#_Toc3320258

SFP Support

The following table lists the specific SFP transceivers and their characteristics.

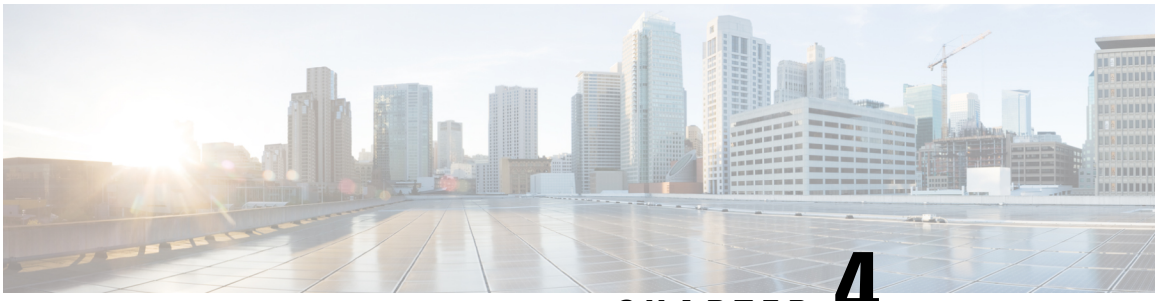
Note LRM optics are not supported since the SFP is direct driven from the Cisco ASIC.

Supported SFP and SFP+ Modules

Table 15: Supported Modules

Part Number	Specification	SFP Type	Max Distance	Cable Type	Temp Range	DOM Support
GLC-SX-MM-RGD=	1000BASE-SX	GE	550m	MMF	IND	Yes
GLC-LX-SM-RGD=	1000BASE-LX/LH	GE	550m/10km	MMF/SMF	IND	Yes
GLC-SX-MMD=	1000BASE-SX	GE	550m	MMF	EXT	Yes
GLC-LH-SMD=	1000BASE-LX/LH	GE	550m/10km	MMF/SMF	EXT	Yes
GLC-BX-D=	1000BASE-BX10	GE	10km	SMF	COM	Yes
GLC-BX-U=	1000BASE-BX10	GE	10km	SMF	COM	Yes
GLC-ZX-SM-RGD	1000BASE-ZX	GE	Approx. 70km	SMF	IND	Yes
GLC-EX-SMD=	1000BASE-EX	GE	40km	SMF	EXT	Yes
SFP-GE-S=	1000BASE-SX	GE	550m	MMF	EXT	Yes
GLC-SX-MM=	1000BASE-SX	GE	550m	MMF	COM	No
GLC-T-RGD=	1000BASE-T	GE	100m	Copper	IND	N/A
GLC-LH-SM=	1000BASE-LX/LH	GE	550m/10km	MMF/SMF	COM	No
GLC-TE=	1000BASE-T	GE	100m	Copper	EXT	N/A
GLC-T=	1000BASE-T	GE	100m	Copper	COM	N/A
CWDM-SFP-xxxx= (8 freq)	CWDM 1000BASE-X	GE	—	SMF	COM	Yes
DWDM-SFP-xxxx= (40 freq)	DWDM 1000BASE-X	GE	—	SMF	COM	Yes

Part Number	Specification	SFP Type	Max Distance	Cable Type	Temp Range	DOM Support
SFP-10G-BXD-I=	10GBASE-BX10	10GE	10km	SMF	IND	Yes
SFP-10G-BXU-I=	10GBASE-BX10	10GE	10km	SMF	IND	Yes
SFP-10G-SR-X=	10GBASE-SR	10GE	400m	MMF	EXT	Yes
SFP-10G-LR-X=	10GBASE-LR	10GE	10km	SMF	EXT	Yes
SFP-10G-SR=	10GBASE-SR	10GE	400m	MMF	COM	Yes
SFP-10G-LR=	10GBASE-LR	10GE	10km	SMF	COM	Yes
SFP-H10GB-CUxM=	10G Passive Twinax	10GE	1m/3m/5m	Twinax	COM	N/A
SFP-H10GB-ACUxM=	10G Active Twinax	10GE	7m/10m	Twinax	COM	N/A
SFP-10G-T-X *	10GBASE-T	10GE	Up to 30 meters	Cat6A/Cat7	EXT	NA



CHAPTER 4

Device Zeroization and Recovery

This chapter contains the following sections:

Device Zeroization

Zeroization consists of erasing any and all potentially sensitive information in the switch securely and followed by sanitize operation. This includes erasure of Main memory, license, logs, cache memories, IOS-XE packages, system configs, and other memories containing packet data, NVRAM, and Flash memory.

The process of zeroization is launched upon the initiation of a user command and a subsequent trigger.

Note Ensure that you are familiar with the Emergency Recovery Installation, on page 33 procedure **BEFORE** attempting to test the Zeroize feature.

On the ESS9300, the Push Button is used exclusively for triggering the Zeroization process. This process will zeroize and erase switch configuration files, or the entire flash file system, depending on the option provided under **service declassify**.

The Zeroization process starts as soon as the Push Button is pressed. The CLI command, **service declassify**, is used to set the desired action in response to the Push Button press. To prevent accidental erasure of the system configuration/image, the default setting is set to **no service declassify**.

Caution Zeroization does NOT erase removable media such as SD Card and USB Storage. This media must be removed from the system and erased or destroyed using procedures that are outside the scope of this document.

Push Button

There is no actual button on the ESS9300, and the system integrator must configure their platform with a Push Button. Reset on an ESS9300 does not cause the device to reboot, but initiates the configured level of zeroization.

Zeroization can be triggered by the Push Button, or software-triggered by a privilege 15 user with console access. There is no remote access for security reasons.

The Zeroization process starts as soon as the Push Button is pressed.

Important Notice about Zeroization

eMMC is a managed NAND. This means that the embedded switch system does not interact with the flash memory directly. The flash controller presents a block-style interface to the system, and it handles the flash management (analogous to the Flash Translation Layer). The embedded switch cannot access the raw flash directly.

The JEDEC standard has commands that are supposed to remove data from the raw flash. In Cisco's implementation, the "Erase" and "Sanitize" commands are used. The eMMC standard JESD84-B51 defines "Sanitize" as follows:

"The Sanitize operation is a feature ... that is used to remove data from the device according to Secure Removal Type. The use of the Sanitize operation requires the device to physically remove data from the unmapped user address space"

After the sanitize operation is completed, no data *should exist* in the unmapped host address space.

Caution Zeroize does a very thorough wipe of all non-protected parts of the eMMC flash using the best technology designed by the flash manufacturer today and can do so using the push of a button without the need for a console, ssh, or management session of any kind. It is the integrator's and end user's responsibility to determine the suitability regardless of the CLI keyword used to enable the feature.

Caution Note: While Cisco IOS and Cisco IOS-XE use the command line text of "declassify" in the command line interface (CLI) to enable the zeroize feature, in no way does this represent any specific endorsement or acknowledgment of a Government approved flash erasure methodology.

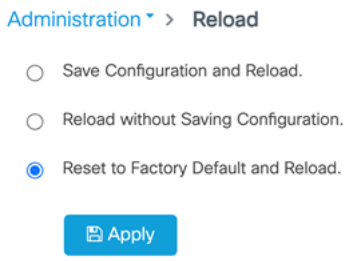
Caution Declassification procedures are unique to each Government organization. Cisco solely provides the technical detail of the erasure operation here, not the policy distinction or any specific recommendation per classification.

Caution Please refer to your respective Government Agency policies, procedures, and recommendations for the handling of sensitive data to see if this procedure meets with those requirements.

WARNING!

The CLI **service declassify erase-all** is literally a **software self-destruct mechanism** intended for defense and intelligence environments that attempts to wipe clean, all of the writable non-volatile storage on the device to clear the device configuration, other stored configurations and all security credentials including any additional license keys.

Please do not use this feature in lieu of doing a **write erase** from the CLI or from the Administration page, Reload option of the WebUI. Invoke the reload with the **Reset to Factory Default and Reload** option and click **Apply**. See the following figure.



If **service declassify erase-all** is invoked, after restoring the IOS-XE image and device configuration, you must re-license the device using the standard Cisco Smart Licensing procedures which ultimately require a Cisco Smart Account and access to the internet or a satellite license server.

Zeroization Details

When zeroization is triggered from the Push Button, the following occurs:

- wipe persistent storage devices
- set flag to wipe RAM for bootloader, reload
- bootloader checks flags, wipes RAM

Tasks performed by IOS-XE

1. Shutdown interfaces and flash the zeroization LED.
2. Clear data path related memory from ASIC.
3. Set rommon variable for bootloader to trigger the RAM erasure.
4. Calls system_reload API to reload the device.

Tasks Performed By Bootloader

After system_reload is triggered from IOS-XE, control transfers to Bootloader. When Bootloader sees the zeroization triggers, it performs a secure erase and sanitization of all the unlocked eMMC partitions through secure erase opcodes & sanitize opcodes. The erased and sanitized areas are:

- Crash info: This has the system crash info file.
- ROMMON Variables: System vars, including user defined vars are erased.
- License & License Backup: System license files are stored here.
- OBFL: IOS-XE OBFL failure logs are stored here.

- Optional keys: Some optional keys are installed here, which are sanitized.
- Flash: is the partition where all the system configuration files, systems data and other user data are stored.

Note If a power cycle happens during zeroization, the bootloader would start zeroization over again since the rommon variable for zeroization is still present.

The following message appears on the console when reset has been triggered:

```
System Bootstrap, Version 1.4(DEV) [vandvisw-vandvisw 113], DEVELOPMENT SOFTWARE
Copyright (c) 1994-2019 by cisco Systems, Inc.
Compiled at Mon Jun 3 10:56:19 2019 by vandvisw
ESS-9300-CON-K9 platform with 4194304 Kbytes of main memory
MCU Version - Bootloader: 8, App: 10
MCU is in application mode.
Reset button push detected
```

Command Line Interface

There are two levels of zeroization actions, erase-nvram and erase-all. The following CLI shows the options:

```
switch(config)#service declassify ?
erase-nvram    Enable erasure of switch configuration as zeroization action. Default is no
 erasure.
erase-all      Enable erasure of both flash and nvram file systems as part of zeroization.
 Default is no erasure
```

Zeroization Trigger

Zeroization can be triggered by either software or by the push button. In either case, there are a series of commands that need to be entered.

```
switch#config terminal
switch(config)#service declassify {erase-nvram | erase-all}
```

To confirm if the feature is enabled:

```
switch#show declassify

Declassify facility: Enabled=Yes  In Progress=No
                     Erase flash=Yes  Erase nvram=Yes
  Declassify Console and Aux Ports
  Shutdown Interfaces
  Reload system
```

To remove the feature, use the following command:

```
switch(config)#no service declassify
```

To Trigger Zeroization

To trigger the zeroization from the command line:

```
switch#declassify trigger
```

To trigger the zeroization from the push button, press and hold the button for 4+ seconds. When the system auto reloads, it will come up in ROMMON mode: "$$" with bootflash: wiped clean.

Emergency Recovery Installation

The following procedure supports the Cisco ESS3300 and the Cisco ESS9300.

Note There is different terminology used when referring to the reset button depending on the product. The IE3x00 switches call this the Express Setup switch. Other products may refer to this as the Factory Default Switch. In either case, the functionality is the same.

If the other recovery methods fail, the switch has a trap door method that you can use in order to recover the system. You must have a terminal that is connected to port Gi1/3 of the switch that runs a TFTP server. Download a valid image file from CCO and store it in the root of the TFTP server.

It is likely that the switch is stuck at the **switch**: prompt. However, if you are in a boot loop, you can use the Express Setup switch on the front of the switch in order to break the cycle: hold the button for approximately <TBD> seconds, and the switch breaks the cycle and stops at the **switch**: prompt.

Complete these steps in order to perform an emergency recovery:

Step 1: Boot the emergency install image.

```
switch: switch: boot emgy0:<image-name>.SPA.bin
Booting golden bootloader...
Initializing disk drivers...
Initializing file systems...
**********************************************************
* Rom Monitor for ESS3300                                *
* Copyright (c) 2017-2018 by Cisco Systems, Inc.         *
* All rights reserved.                                   *
**********************************************************
* Version:  1.1.1
* Compiled: Sun 01-Jul-18 22:17 [RELEASE SOFTWARE]
* Boot Partition: qspi-golden-bootloader
* Reset Reason: Soft Reset
Loading "emgy0:ess3x00-universalk9.17.04.01.SPA.bin" to memory...
Verifying image "emgy0:ess3x00-universalk9.17.04.01.SPA.bin"...
Image passed digital signature verification
Checking for Bootloader upgrade...
Bootloader upgrade not required
SUP PL (profile: 1) configuration done successfully
<...>
Press RETURN to get started!
Switch>
```

Step 2: Configure an IP address on the switch. Additional details on IP configuration can be found here

```
switch(config-if)# ip address <ip-address> <subnet-mask>
```

Step 3: Ping the terminal that contains the TFTP server in order to test the connectivity:

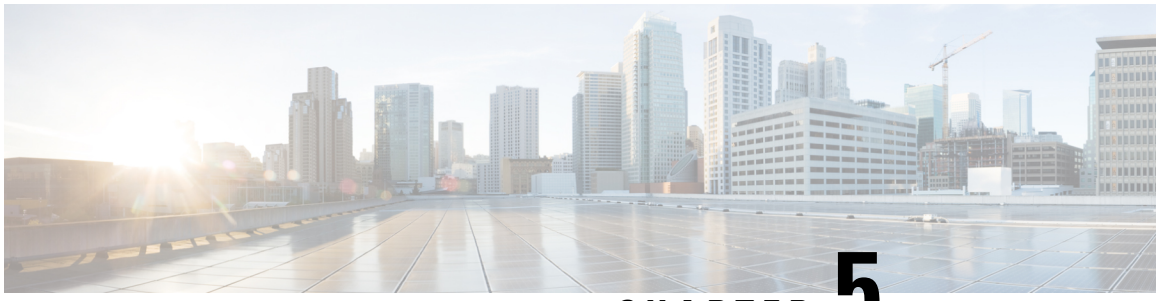
```
switch> ping 192.168.2.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

Step 4: Copy the image via tftp

```
switch> copy tftp: //location/directory/<bundle_name> flash:
<...>
```

Step 5: Restart the system.



CHAPTER 5

Appendix

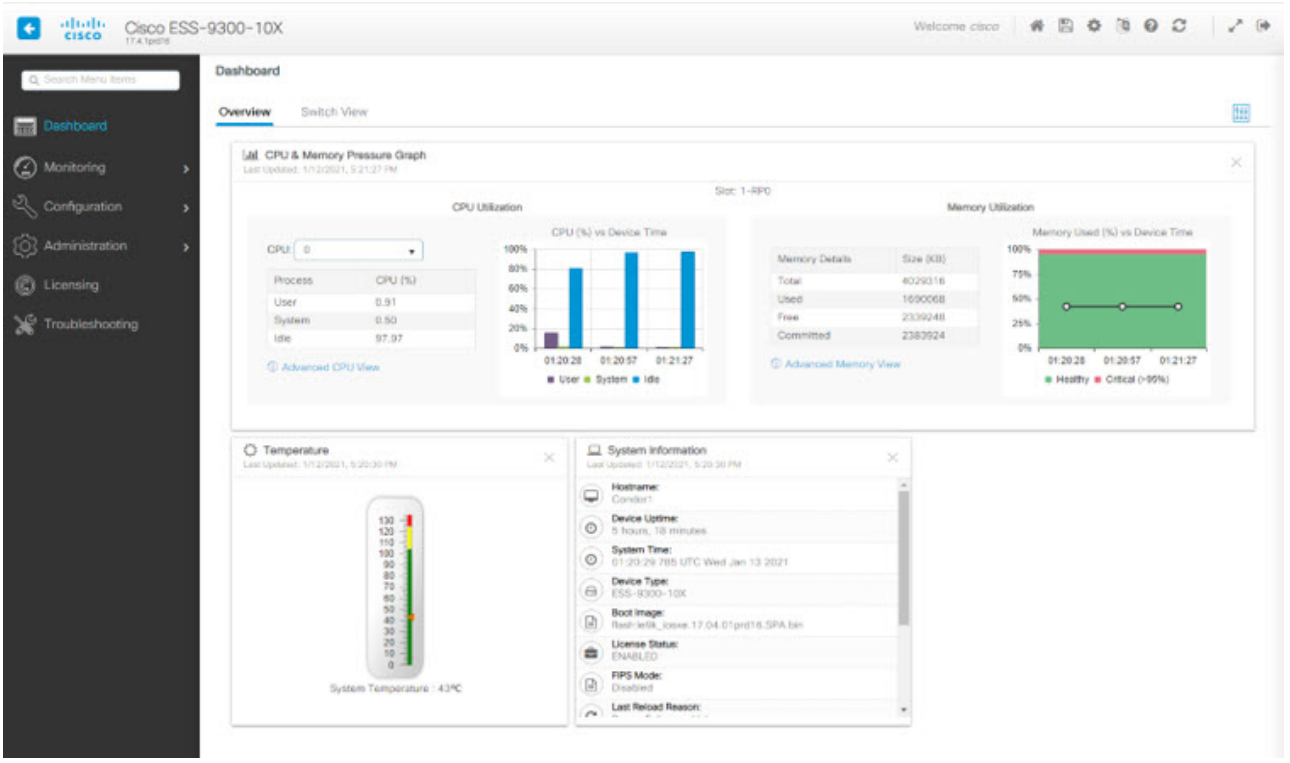
This chapter contains the following sections:

Web User Interface

The Cisco IOS-XE operating system provides a graphical user interface for monitoring and configuration of your device. The WebUI needs to be enabled before it can be used. Use these commands to enable it:

```
username admin privilege 15 password 0 ess9300
ip http server
ip http authentication local
ip http secure-server
```

When launched, the initial display is a dashboard that looks similar to the following example:



Compliance and Safety Information

The ESS 9300 was installed in a representative chassis, tested, and shown to meet the standards listed in the following tables. Individual results will depend on final implementation. Formal compliance testing must be performed by the system integrator in a fully assembled product.

Specification	Description
Safety	UL 60950-1 Recognized Component (R/C) CSA22.2 No. 60950-1 EN60950-1 IEC60950-1 IEC62368-1 2nd Ed. EN62368-1 UL 62368-1 Recognized Component (R/C) CSA C22.2 No. 62368-1

Specification	Description
Emissions	EN 55022 / CISPR 22 EN 55032 / CISPR 32 FCC Part 15 Subpart B ICES 003 for class A device
Immunity	EN 55024 EN 55035 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-4-11 IEC 61000-4-8 IEC 61000-4-10 IEC 61000-4-16 IEC 61000-4-18
MIL Compliance **Note** In Progress	CE101 CE102 CS101 CS109 CS114 CS115 CS116 CS117 CS118 RE101 RE102 RS101 RS103 RS105

Restriction of Hazardous Substances (RoHS)

RoHS is directive being adopted worldwide that restricts certain limits of the following materials from certain manufactured products:

- Lead (Pb): < 1000 ppm
- Mercury (Hg): < 100 ppm
- Cadmium (Cd): < 100 ppm
- Hexavalent Chromium: (Cr VI) < 1000 ppm
- Polybrominated Biphenyls (PBB): < 1000 ppm
- Polybrominated Diphenyl Ethers (PBDE): < 1000 ppm

Cisco products fall under RoHS Category 3, Computing & Communications Equipment. Cisco products must be RoHS-certified prior to being shipped/imported to the following RoHS countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

Related Documentation

- ESS9300 Software Configuration Guide
- ESS9300 Documentation Landing Page

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