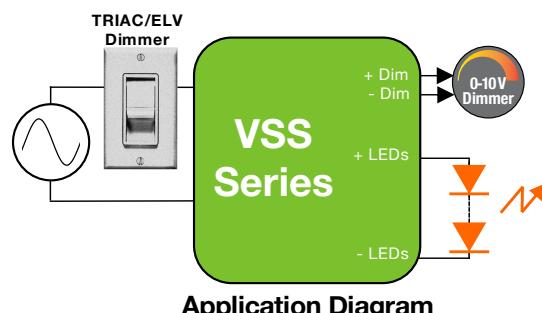
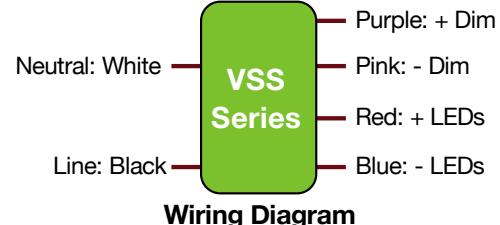


20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

Input Voltage	Max. Output Power	Efficiency	Max. Case Temperature	THD	Power Factor	Dimming Method	Dimming Range	Start-up Time
120 - 277 Vac	30 W	up to 85% typical	90°C (measured at the hot spot)	< 20%	> 0.9	Forward Phase, Reverse Phase, & 0 - 10 V	5-100% (0-10 V) 10%-100% (Phase-cut)	400 ms typical


Application Diagram

Flying Leads, Plastic Case:
 L 84 x W 40 x H 25 mm
 (L 3.30 x W 1.57 x H 0.99 in)


Wiring Diagram

FEATURES

- Same footprint as the popular ESS series
- Compatible with TRIAC (forward-phase or leading-edge), ELV (reverse-phase or trailing-edge) and 0-10 V dimmers
- IP64-rated case with silicone-based potting
- Class 2 power supply
- 90°C maximum case hot spot temperature
- Surge protection:
 - IEC61000-4-5: 2 kV line to line/2 kV line to earth
 - 2.5 kV ring wave: ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A
- Complies with ENERGY STAR®, DLC (DesignLight Consortium®), and CA Title 24 technical requirements

TYPICAL APPLICATIONS

- Strip lights
- Pendants
- Linears
- Cove Lights



Note: The VSS series is a dedicated constant voltage LED driver. Some alternative loads may have large input capacitance or other drive current demands not compatible for use with the VSS series. The performance of the VSS series must be tested and qualified thoroughly when being used to drive alternative electronic circuit loads other than LED loads.



VSS Series

VSS30 30 W
VSS20 20 W

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

1 - ORDERING INFORMATION

Part Number	Nominal Input Voltage (Vac)	Iout Min (mA)	Iout Max (mA)	Pout Max (W)	Vout Nom. (Vdc)	Open Loop (No Load) Voltage (Vdc)
VSS020W-24	120 - 277	35	700	16.8	24	25.7
VSS030W-24	120 - 277	52.5	1050	25.2	24	25.7

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

2 - INPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Input Voltage Range (Vin)	Vac	108	120, 277	300	<ul style="list-style-type: none"> The rated output voltage for each model is achieved at $V_{in} \geq 108$ Vac & at $V_{in} \geq 249$ Vac. At nominal load
Input Frequency Range	Hz	47	60	63	
Input Current (Iin)	A			0.32 A @ 120 Vac 0.14 A @ 277 Vac	
Power Factor (PF)		0.9	> 0.9		At nominal input voltage, at with nominal LED voltage and without any dimmer attached.
Inrush Current	A		Meets NEMA-410 requirements.		•At any point on the sine wave and 25°C
Leakage Current	µA			250 µA @ 120 Vac 600 µA @ 277 Vac	Measured per IEC60950-1.
Total Harmonics Distortion (THD)				20%	<ul style="list-style-type: none"> At nominal input voltage and nominal LED voltage without any dimmer. Complies with DLC (Design Light Consortium) technical requirements.
Efficiency	%	-	up to 85%	-	Measured with nominal input voltage, a full sinusoidal wave form and without any dimmer dimmer attached.
Isolation	The AC input to the main DC output is isolated and meets Class II reinforced/double insulation power supply. <input checked="" type="checkbox"/>				

3 - MAIN OUTPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Output Voltage (Vout)	Vdc		24		
Output Current (Iout)	A			VSS020W: 0.7 A VSS030W: 1.05 A	The rated output voltage for each model is achieved at $V_{in} \geq 108$ Vac & at $V_{in} \geq 249$ Vac.
Output Voltage Regulation	%	-5		5	<ul style="list-style-type: none"> At nominal AC line voltage Includes load and current set point variations.
Output Voltage Overshoot	%	-	-	10	The driver does not operate outside of the regulation requirements for more than 500 ms during power on with maximum load.
Ripple Voltage	≤ 40% of rated output voltage for each model				<ul style="list-style-type: none"> Measured at maximum load and nominal input voltage Calculated in accordance with the IES Lighting Handbook, 9th edition
Start-up Time	ms			400	<ul style="list-style-type: none"> Measured from application of AC line voltage to the time where light is visible (about 10% of rated output current) At nominal AC line voltage, at nominal LED voltage and with out any dimmer attached. Complies with California Title 24 and ENERGY STAR® luminaire specification.



VSS Series

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20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

4 - ENVIRONMENTAL CONDITIONS

	Units	Minimum	Typical	Maximum	Notes
Operating Ambient Temperature (Ta)	°C	-30		50	
Maximum Case Temperature (Tc)	°C			+90	Case temperature measured at the hot spot •tc (see label on page 13)
Storage Temperature	°C	-40		+85	
Humidity	%	5	-	95	Non-condensing
Cooling		Convection cooled			
Acoustic Noise	dBA			22	Measured at a distance of 1 foot (30 cm)
Mechanical Shock Protection	per EN60068-2-27				
Vibration Protection	per EN60068-2-6 & EN60068-2-64				
MTBF	> 200,000 hours when operated at nominal input and output conditions, and at Tc ≤ 70°C				
Lifetime	50,000 hours at Tc ≤ 70°C maximum case hot spot temperature (see hot spot •tc on label on page 13)				

5 - EMC COMPLIANCE AND SAFETY APPROVALS

EMC Compliance				
Conducted and Radiated EMI	Compliant with FCC CFR Title 47 Part 15 Class B at 120 Vac & Class A at 277 Vac			
Voltage Fluctuations & Flicker	IEC61000-3-3			
Immunity Compliance	ESD (Electrostatic Discharge)	IEC61000-4-2	6 kV contact discharge, 8 kV air discharge, level 3	
	RF Electromagnetic Field Susceptibility	IEC61000-4-3	3 V/m, 80 - 1000 MHz, 80% modulated at a distance of 3 meters	
	Electrical Fast Transient	IEC61000-4-4	± 2 kV on AC power port for 1 minute, ±1 kV on signal/control lines	
	Surge	IEC61000-4-5	± 2 kV line to line (differential mode) /± 2 kV line to common mode ground	
			ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave	
	Conducted RF Disturbances	IEC61000-4-6	3V, 0.15-80 MHz, 80% modulated	
	Voltage Dips	IEC61000-4-11	>95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods	

Safety Agency Approvals				
UL	UL8750 listed Class 2			
cUL	CAN/CSA C22.2 No. 250.13-14 LED equipment for lighting applications			

Safety					
	Units	Minimum	Typical	Maximum	Notes
Hi Pot (High Potential) or Dielectric voltage-withstand	Vdc	4242			•Insulation between the input (AC line and Neutral) and the output •Tested at the RMS voltage equivalent of 3000 Vac •Meets class II reinforced/double insulation <input type="checkbox"/>



VSS Series

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20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

■ 6 - PROTECTION FEATURES

Under-Voltage (Brownout)

The VSS series provides protection circuitry such that an application of an input voltage below the minimum stated in section 1 (Input Specification) shall not cause damage to the driver.

Short Circuit and Over Current Protection with Auto-Recovery

The VSS series is protected against short-circuit such that a short from any output to return shall not result in a fire hazard or shock hazard. The driver shall hiccup as a result of a short circuit or over current fault. Removal of the fault will return the driver to within normal operation. The driver shall recover, with no damage, from a short across the output for an indefinite period of time.

Internal Over temperature Protection

The VSS series is equipped with an internal temperature sensor on the primary power train. Failure to stay within the convection power rating will cause the driver to shut down. The main output current will be resumed when the temperature of the built-in temperature sensor cools adequately.

Output Open Load

The VSS series is not intended to be operated in a no load condition; however, a no load condition will not damage the VSS or cause a hazardous condition. The driver will remain stable and operate normally after application of a load. When the LED load is removed, the output voltage of the VSS series is limited to 7% about the output voltage of each model.

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

7 - PHASE-CUT DIMMING

The VSS series offers Tri-Mode Dimming™ compatibility with both phase-cut (reverse-phase/trailing-edge or forward-phase/leading-edge) and 0-10V dimmers. Phase-cut and 0-10V dimming cannot be used at same time. Phase-cut dimming of the driver is possible with standard TRIAC-based (forward-phase or leading-edge) dimmers or with ELV (reverse-phase/trailing-edge) dimmers that chop the AC voltage as shown in Figure 3.

During the rapid rise time of the AC voltage when the dimmer turns on, the driver does not generate any current and inrush current is controlled. During the on-time of the AC input, the driver regulates the output current based upon the conduction angle. The RMS value of the driver's output current is proportional to the on-time of the AC input voltage. When operating with an incandescent dimmer, the RMS output current varies depending upon the conduction angle and RMS value of the applied AC input voltage. Figure 4 shows the typical output current versus conduction angle at the nominal input voltage. Operation throughout this dimming range is monotonic and produces a smooth transition of light output in both directions of the dimming range.

Forward-phase (TRIAC) and reverse-phase (ELV) dimming work only at 120 Vac.

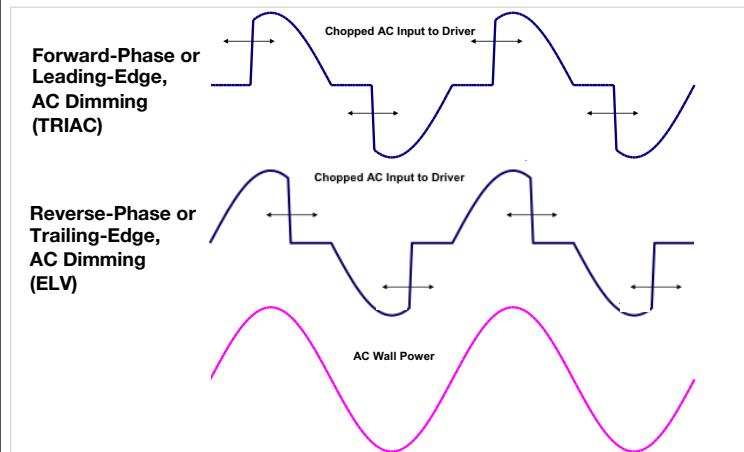


Figure 3

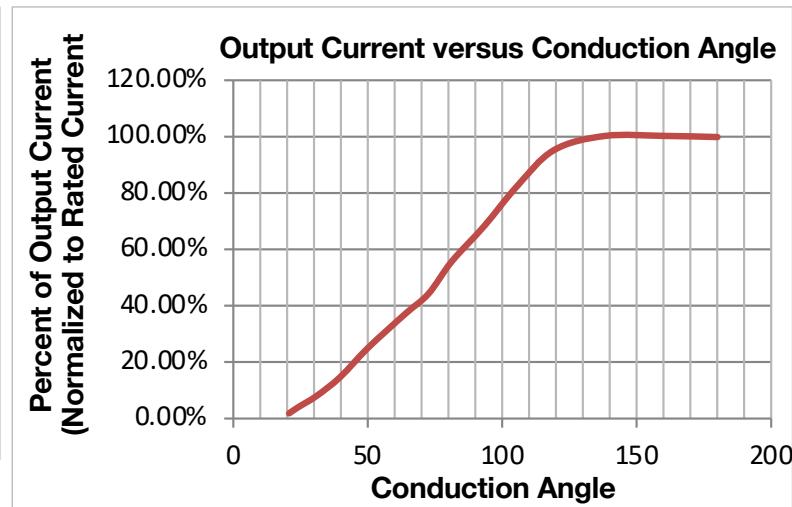


Figure 4

8 - COMPATIBLE PHASE-CUT DIMMERS

Dimming compatibility charts are available for each model on the VSS series page at: erp-power.com.

Lutron		Leviton
TRIAC	ELV	ELV
TGCL153P	DVELV303P	IPE04
DVCL153P	SELV300P	
MACL-153P	MAELV600	
DVRP-253P	MRF2S-6CL	
SCL-153P	NTELV-600	
	MA-PRO Forward	
	MA-PRO Reverse	
	RRD-6NA	
	RRD-10ND	

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

■ 9 - 0-10 V DIMMING

The VSS series operates only with 0-10V dimmers that sink current. They are not designed to operate with 0-10V control systems that source current, as used in theatrical/entertainment systems. Developed in the 1980's, the 0-10V sinking current control method is adopted by the International Electrotechnical Commission (IEC) as apart of their IEC Standard 60929 Annex E.

The method to dim the output current of the driver is done via the +Dim/-Dim Signal pins. The +Dim/-Dim Signal pins respond to a 0 to 10 V signal, delivering 5% to 100% of the output current based on the rated current for each model.

A pull-up resistor is included internal to the driver. When the +Dim wire (purple) is short circuited to the -Dim wire (pink) or to the -LED wire (black), a small amount of current may be present on the output and, in that condition, shimmering may be observed. If the +Dim input is ≤ 1 V and ≥ 0.6 V, the output current is still present, as shown in figure 5. **Please note that short circuiting the +Dim wire (purple) to the -Dim wire (pink) does not guarantee that the output current is turned off. In some models, the current may turn off when short circuiting the +Dim wire to the -Dim wire. In other models, there may be a small amount of current still present.**

If the +Dim input is > 10 V or open circuited, the output current is programmed to 100% of the rated current.

When not used, the -Dim wire (pink) and the +Dim wire (purple) can be individually capped or cut off. In this configuration, no dimming is possible, and the driver delivers 100% of its rated output current.

The maximum source current (flowing from the driver to the 0-10V dimmer) supplied by the +Dim Signal pin is ≤ 1 mA. The tolerance of the output current while being dimmed shall be $+/-8\%$ typical until down to 1 V.

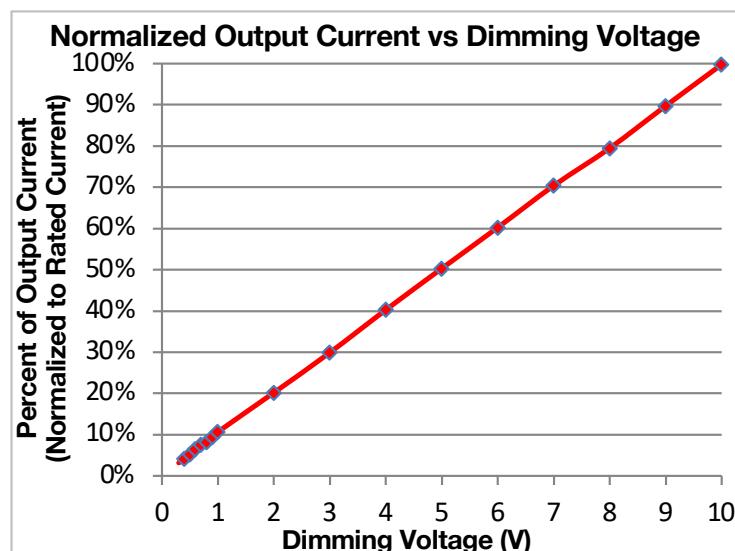


Figure 5

The linear 0-10V dimming profile is the default profile across for the VSS series. In the linear 0-10V dimming profile, shown in figure 5, 10 V = 100% of the output current and 1 V = 10 % of the output current.

The 0-10 V control circuit is isolated from the AC input and complies with applicable UL 8750 requirements, including any relevant exceptions to Supplement SF.

■ 10 - COMPATIBLE 0-10 V DIMMERS

- Lutron, Nova series (part number NFTV)
- Lutron, Diva series (part number DFTV)
- Leviton, IllumaTech series (part number IP710-DL)

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

11 - MECHANICAL DETAILS

Packaging Options: Plastic case

I/O Connections: Flying leads, 18 AWG on power leads, 22 AWG on 0-10V dimming wires, 152 mm (6 in) long, 105°C rated, stranded, stripped by approximately 9.5mm, and tinned. All the wires, on both input and output, have a 300 V insulation rating.

Ingress Protection: IP64 rated

Flammability Rating: UL94 V-0

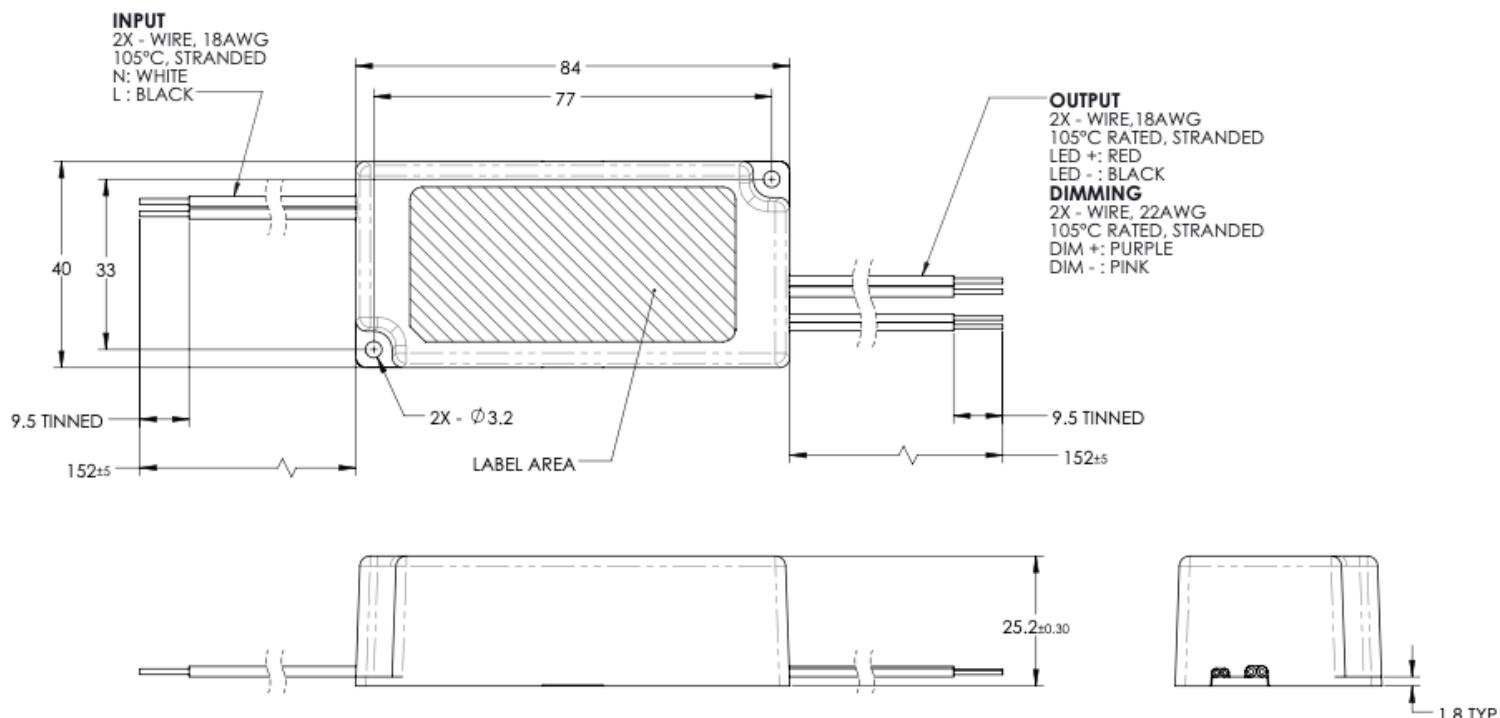
Mounting Instructions: The VSS driver case must be secured on a flat surface through the two mounting tabs, shown here below in the case outline drawings.

12 - OUTLINE DRAWINGS

Dimensions: L 84 x W 40 x H 25.2 mm (L 3.30 x W 1.57 x H 0.99 in)

Volume: 84.7 cm³ (5.16 in³)

Weight: 154 g (5.4 oz)



All dimensions are in mm

Figure 4

20 & 30 W Compact CV Class 2 LED Driver with Tri-Mode Dimming™ (TRIAC, ELV, & 0-10 V)

13 - LABELING

The VSS020W-24 is used in figure 6 as example to illustrate typical labels.

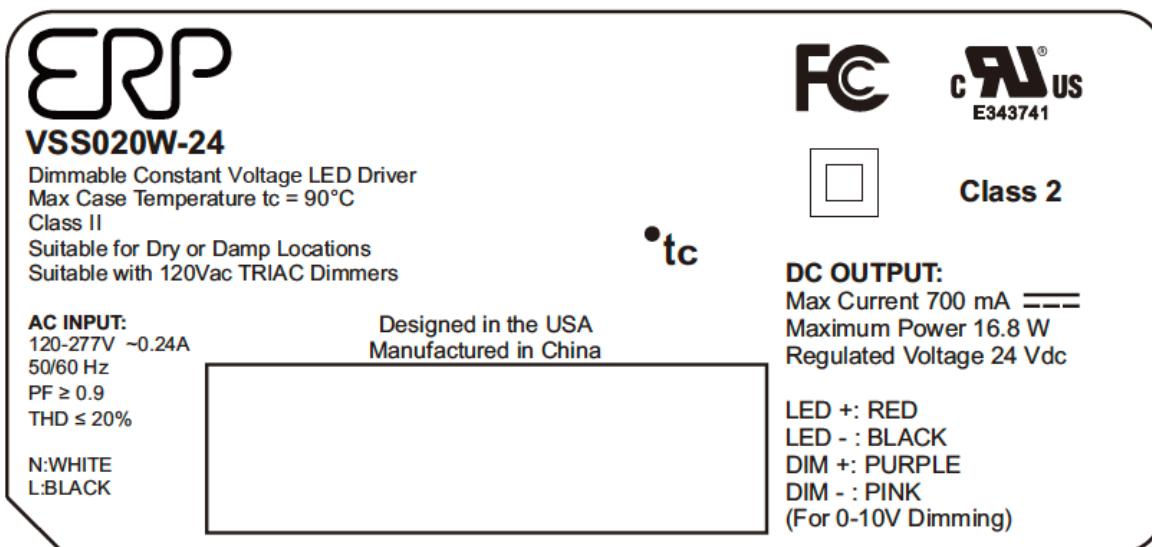


Figure 6

USA Headquarters
 Tel: +1-805-517-1300
 Fax: +1-805-517-1411
 2625 Townsgate Road, Suite 106
 Westlake Village, CA 91361, USA

CHINA Operations
 Tel: +86-756-6266298
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 Zhuhai, Guangdong, China 519060

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VSS Series

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Revision History