

15 Watt Sine Wave Telephone Ring Generator 15 REN@86Vrms



VP-SINE 15VA-48V

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DESCRIPTION

The VP-SINE 15VA-48V is an efficient single stage DC to AC inverter intended for use as a telephone ring generator. It uses a 4-quadrant converter topology to generate a very low harmonic sine wave output from a 48V nominal DC input supply. The output voltage of the VP-SINE 15VA-48V can be selected as 86Vrms or 75Vrms via the Output Amplitude Control Pin (OAC pin). The output frequency can be selected via the F0 and F1 logic pins as 16^{2/3}, 20, 25, 50Hz.

The unit provides very tight output load regulation allowing for long loop lengths at full load. The VP-SINE 15VA-48V is designed to form an integral component within a system.

APPLICATIONS

- PBX, PABX, DLC and Key Systems
- Wireless Local Loop Systems
- Satellite Telephone and VSAT Terminal
- VoIP Gateways
- Short & Long Loop Applications
- Rural Telephony Systems
- Remote Terminal
- Integrated Access Devices
- Test Equipment

FEATURES

- Ring amplitude 86V or 75Vrms selectable via OAC Pin
- Ring amplitude independent of load
- Other ring amplitudes available as factory option
- Low THD sine wave output
- 4 logic-selectable ring frequencies (16^{2/3}, 20, 25, 50Hz)
- Logic-level Fault/Output High Demand (OHD) indicator
- Logic-level inhibit/enable control – activates on next zero crossing of sine wave
- Ringing relay sync signal
- Inherent 4 quadrant operation (no mode switching)
- Output can be referenced to Vin+, Vin- or another DC source (restricted to +/-67V maximum)
- Typical 80% efficiency
- Very low voice band noise

ABSOLUTE MAXIMUM RATINGS*

*These are stress ratings. Exposure of the device to any of these conditions may adversely affect long-term reliability.

Proper operation other than as specified in the FUNCTIONAL/PERFORMANCE SPECIFICATIONS is not implied.

Supply Voltage	+75V
Inhibit, F0, and F1 Input Voltage	-0.5V to +5.2V
Operating Ambient Temperature	-40°C to +50°C
Storage Temperature	-40°C to +85°C
Lead Soldering Temperature (10 sec max)	+300°C

FUNCTIONAL SPECIFICATIONS

Typical at $T_A = +25^{\circ}\text{C}$, $V_{in} = 48\text{Vdc}$, Load = 470 Ω resistive, 100 μF input capacitance, OAC Pin open circuit

Parameters	Conditions	Min	Typ	Max	Units
Input Supply					
Supply Voltage (V_{in})		36.0	48.0	72.0	Vdc
Supply Voltage Ripple	100 – 120Hz, 36.0 to 72V input, @ Pout = 15W			1.0	Vp-p
Supply Current					
PSU Inhibited			4	8	mA
No Load			40	70	mA
Full Load	Load = 470 Ω , $V_{in} = 36\text{Vdc}$		480	600	mA
Input Under Voltage Protection		28	33	35.5	Vdc
Efficiency	Pout = 15W	75	83		%
Output					
Power	Continuous Loading	0		16	VA
Power Factor			1.0		Cos Φ
Output Voltage	Pout = 15W				
OAC not connected		82	86	90	
R_{OAC} between OAC & V_{in+}	270K Ω external pull up to V_{in+}	71	75	79	Vrms
Load Regulation	OREN to 15REN			2	Vrms
Output Frequency	According to F0 & F1 Setting		16 ^{2/3} , 20, 25, 50		% Hz
Frequency Accuracy	36.0 to 72.0Vdc input, Pout<15W, -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$			3	%
THD (First 40 Harmonics)	36.0 to 72.0Vdc input, Pout<15W, -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$		1.5	5	%
Inhibit Control Input	Referenced to V_{in-} terminal				
Disable Voltage V_{IH}		2.0	5.0	5.2	Vdc
Enable Voltage V_{IL}		-0.2	0	0.8	Vdc
I_{in} Sink	$V_{IH} = 5\text{V}$			50	μA
F0, F1 Control Inputs	Referenced to V_{in-} terminal				
V_{IH}		2.0	5.0	5.2	Vdc
V_{IL}		-0.2	0	0.8	Vdc
I_{in} Source	$V_{IL} = 0\text{V}$			50	μA
Fault/OHD & SYNC Outputs	Referenced to V_{in-} terminal				
V_{OH}	Output Source Current 4mA	4.0	5.0	5.2	Vdc
V_{OL}	Output Sink Current 4mA		0.15	0.3	Vdc
Inhibit Control Timing					
Time to Turn-On			2	5	s
Time to Turn-Off				35	ms
Overload Protection Response					
Time to Turn-Off			50		ms
Time to Turn-On			2	5	s
General					
Isolation Input to Chassis	At 500Vdc for 10 secs	10			M Ω
Isolation Output to Chassis	At 500Vdc for 10 secs	10			M Ω
Isolation Input to Output	At 500Vdc for 10 secs	2			M Ω
Switching Frequency			40		KHz
Environment					
Relative Humidity	Non- Condensing,	10		90	%
Ambient Temperature (T_A)	Airflow = 400LFM - load duty cycle to be controlled to the levels associated with normal telecoms telephone ring durations (consult factory for more information).	-40		+50	$^{\circ}\text{C}$

SUPPLY VOLTAGE (Vin+, Vin-)

The VP-SINE 15VA-48V operates from 36V min to 72V max. The supply may be either positive or negative ground.

Since all logic inputs are referenced to Vin-, level translators or optoisolators must be employed for applications where external logic is referenced to Vin+ (i.e. external logic ground is Vin+). The VP-SINE 15VA-48V will be damaged if directly connected to external logic that is referenced to Vin+.

It is recommended that the input supply to the VP-SINE 15VA-48V is protected with an external 2A fuse.

OUTPUT AMPLITUDE CONTROL (OAC)

The VP-SINE 15VA-48V output voltage is selectable between 2 voltage levels (86Vrms and 75Vrms nominal) via the OAC pin. Other voltage levels are available as a factory option. The OAC pin is referenced to Vin-.

The VP-SINE 15VA-48V defaults to 86Vrms if the OAC pin is connected to Vin- or left open. 75Vrms output setting is achieved by connecting OAC to Vin+, via a 270KΩ resistor, rated at 100mW minimum.

OUTPUT OFFSET

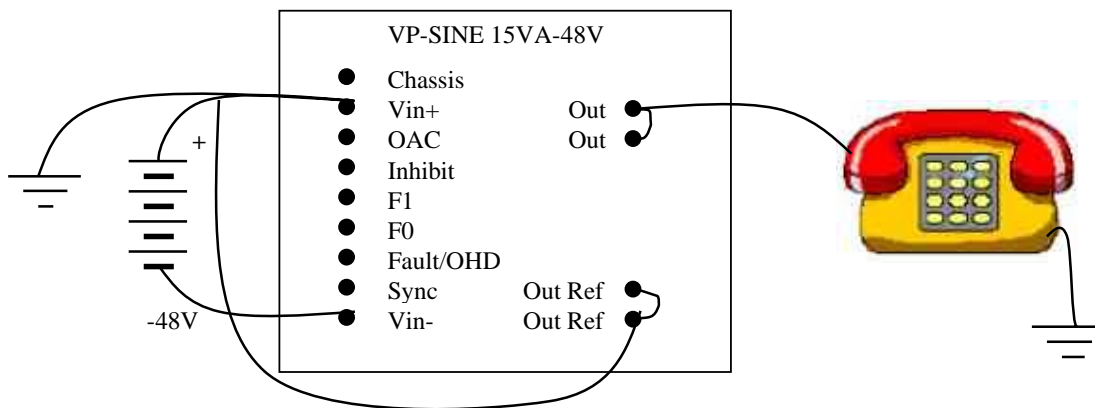
Output DC offset of the VP-SINE 15VA-48V is fixed at 0V nominal. Since the VP-SINE 15VA-48V output is floating, output offset may be achieved by externally applying a DC voltage to the OUT REF pin. This voltage may be from the 48V supplying the VP-SINE 15VA-48V, or from a second source. The externally applied DC offset must not result in the voltage difference between Vin- and OUT REF from exceeding +/-60V.

When applying a DC Offset to the output of the VP-SINE 15VA-48V, a series protection resistor should be added in each port (i.e. telephone extension). This resistor should be suitably rated and should limit the potential DC current through the VP-SINE 15VA-48V output stage, should the output be shorted. The recommended minimum values for these series resistors are proportional to the DC bias: -

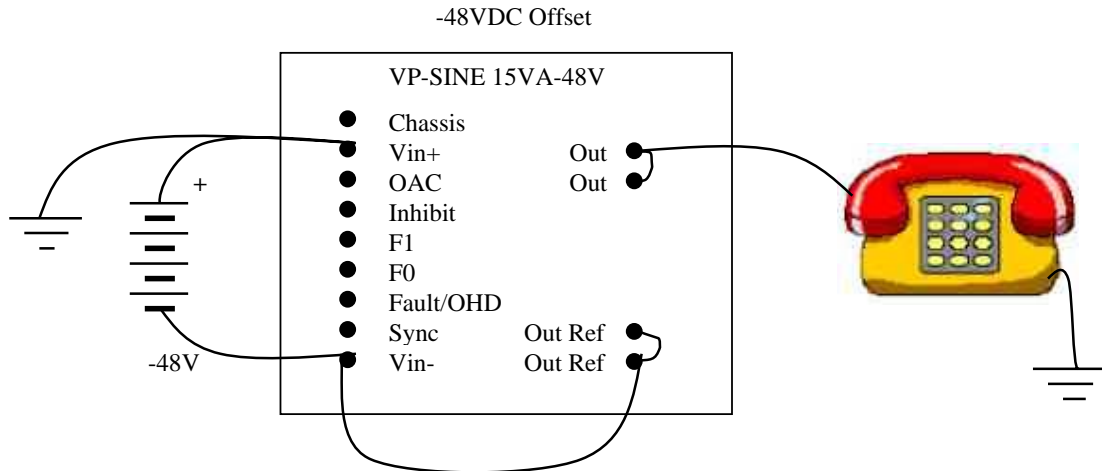
Output DC Bias Applied	Series Protection Resistor
+/-12Vdc	47Ω
+/-24Vdc	100Ω
+/-48Vdc	200Ω
+/-60Vdc	270Ω

The following diagrams show several possible configurations: -

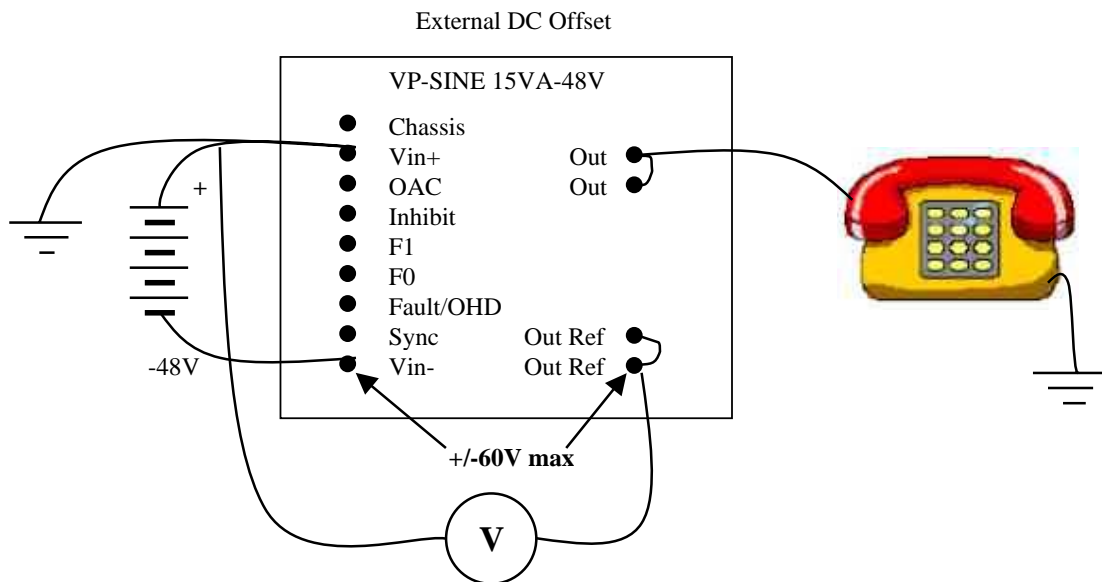
No DC Offset



Pin Out – Bottom View



Pin Out – Bottom View



OVERLOAD AND SHORT CIRCUIT PROTECTION

The VP-SINE 15VA-48V is designed to withstand a continuous short circuit on the output. It is recommended that series limiting resistors be employed in each phone line, as described in the OUTPUT OFFSET section above.

INPUT UNDER-VOLTAGE PROTECTION

The VP-SINE 15VA-48V is designed to protect itself against input voltages lower than the specified range by limiting the output power, resulting in clipping of the output waveform. In cases of very low input voltage, the VP-SINE 15VA-48V will go into a hick-up mode in order to self protect. When either of the input under-voltage protection schemes are activated, the FAULT/OHD Output will indicate a high/pulsed high output.

INPUT OVER-VOLTAGE PROTECTION

The VP-SINE 15VA-48V does not protect against abnormal high voltage being applied to its input and the user should take adequate steps to prevent damage resulting from the unit being subjected to input voltages above the specified maximum.

INHIBIT

The VP-SINE 15VA-48V output is controlled via a 5V logic signal applied to the INHIBIT Pin: -

Inhibit	Output
0	On
1	Off

When enabled, the ring signal starts immediately at 0 degrees (sine wave zero crossing). When disabled, the ringer output ceases at the next sine wave zero crossing (either 0° or 180°, whichever is next).

The INHIBIT is internally pulled low via a 100KΩ resistor, thus the output of the VP-SINE 15VA-48V defaults to the On state when the INHIBIT pin is left unconnected.

RING FREQUENCY (F0, F1)

Output ring frequency is controlled via 5V logic signals applied to the F0 and F1 inputs. These inputs have internal 100KΩ pull-up resistors, so may be driven directly from open drain outputs, open collector optoisolators, or left unconnected. The ring output frequency of the VP-SINE 15VA-48V shall vary in accordance with the following truth table: -

F1	F0	fRing
“0” or tied to Vin-	“0” or tied to Vin-	50Hz
“0” or tied to Vin-	“1” or left open	16 ^{2/3} Hz
“1” or left open	“0” or tied to Vin-	25Hz
“1” or left open	“1” or left open	20Hz

Ring frequency may be changed at any time. Changes are effected only at the next zero crossing of the sine wave.

FAULT/OHD

The FAULT or Output High Demand (OHD) Output provides an active high, 5V logic signal output, to indicate a fault condition, which may include any of the following:-

- Input supply under-voltage
- Overload
- Output short circuit
- Internal error/unit malfunctioning.

The FAULT/OHD Output may represent itself as either a continuous 5V output or a pulsed 5V Output during the fault scenario. During normal operation, this output should remain low.

In all instances, other than Internal error/unit malfunctioning, the FAULT/OHD output is de-activated when the INHIBIT line is activated (logic 1).

The main reasons for FAULT/OHD to become active are either excessive load applied to the VP-SINE 15VA-48V, or the input supply being too low. It is recommended that these points be checked before assuming an internal error/malfunction has occurred.

Internal filtering prevents spurious activation of the FAULT/OHD of the FAULT/OHD signal. For this reason, allow at least 500ms after disabling before checking to see if FAULT/OHD clears.

RING RELAY SYNC SIGNAL (SYNC)

A logic level output signal is provided for the purpose of synchronizing the opening and closing of ringing relays to coincide with the zero crossings of the ringing signal. Doing so reduces abrupt voltage changes which in turn reduces current surges and arcing. The VP-SINE 15VA-48V provides a high going signal 2.5ms before zero crossing, allowing time for control circuit delays and relay response time. The SYNC Output transitions low again near the actual zero crossing. The SYNC output coincides with 0° and 180° on the sine wave, not with the zero-volt crossing when DC output offset is employed. Thus when, for example, -48V external offset is applied, ring SYNC will occur when the sine wave crosses -48V.

SAFETY INSTRUCTIONS

1. The VP-SINE 15VA-48V is designed as integral component intended to form part of a system installed in a restricted access location. It is not designed, or intended for stand alone operation.
2. For North America, input voltage (nominal 48Vdc, tolerance 36 – 60Vdc) must be applied by an isolated DC source complying with the earthed SELV or TNV requirements of UL60950 latest edition. For other countries, input voltage (nominal 48Vdc, tolerance 36 – 72Vdc) must be supplied by an isolated DC source complying with the earthed SELV or TNV requirements of EN60950 latest edition.
3. DC input must be protected by a UL Listed fuse rated maximum T2A, 250V (slow-blow 2A, 250V fuse).
4. When applicable, protection from excessive voltage on the output should be tested in end use equipment.
5. For output voltage exceeding 80Vrms, compliance with the ringing signal requirements should be tested in end-use equipment. When the output voltage is set to less than 80Vrms, the ringing signal complies with M.2 requirements of IEC950.

MECHANICAL DETAILS

