

### Features

- ONS SLIC
- Variants
  - 1 Germany
  - 3 UK
  - 7 North America
- Transformerless 2W to 4W conversion
- Battery Feed to line
- Off-Hook and dial pulse detection
- Tip and Ring ground over-current protection
- Power Denial
- Integral Ringing Amplifier
- Programmable Loop Current
- Wide  $V_{BAT}$  Operating Range

### Applications

Line Interface for

- PABX
- Pair Gain Systems
- Satellite Communication Systems
- Key Telephone Systems
- Marine Systems
- Cordless Local Loop

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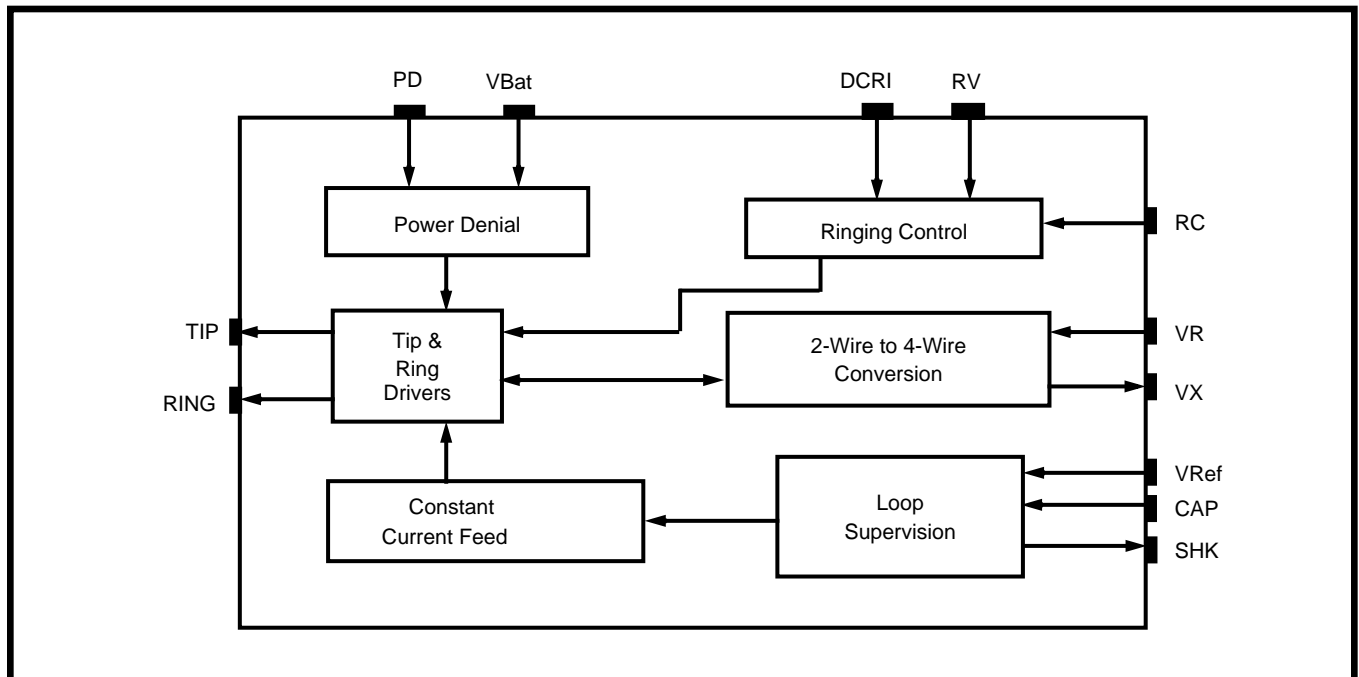
#### Ordering Information

MH88615-1	20 Pin SIL Package
MH88615-3	20 Pin SIL Package
MH88615-7	20 Pin SIL Package

**0°C to 70°C**

### Description

The Mitel MH88615 ONS SLIC provides a complete interface between a switching system and a subscriber loop. The functions provided by the MH88615 include battery feed and integral ringing amplifier feed to the subscriber line, 2W to 4W conversion current feed, off-hook and dial pulse detection. The device is fabricated as a thick film hybrid in a 20 pin single-in-line package.



**Figure 1 - Block Diagram**

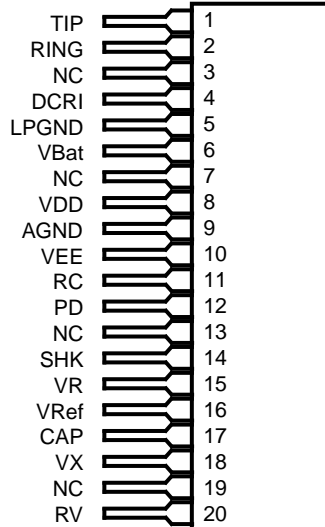


Figure 2 - Pin Description

## Pin Description

Pin #	Name	Description
1	TIP	<b>Tip Lead.</b> Connects to the “Tip” lead of subscriber line.
2	RING	<b>Ring Lead.</b> Connects to the “Ring” lead of subscriber line.
3	NC	<b>No Connection.</b> This pin may be used for internal connections.
4	DCRI	<b>DC Ringing Voltage Input.</b> A continuous 120 Vdc is applied to this pin. This voltage is the positive supply rail for the internal ringing amplifier for subscriber line.
5	LPGND	<b>Battery Ground.</b> $V_{Bat}$ return path for subscriber line. Connects to the systems’s energy dumping ground.
6	VBat	<b>Battery Voltage.</b> Battery supply feed for subscriber line. Typically -48Vdc is applied to this pin.
7	NC	<b>No Connection.</b> This pin may be used for internal connections.
8	VDD	<b>Positive Supply Voltage.</b> +5V dc supply rail.
9	AGND	<b>Analogue Ground.</b> $V_{DD}$ and $V_{EE}$ return path.
10	VEE	<b>Negative Supply Voltage.</b> -5V dc supply rail.
11	RC	<b>Ringing Control.</b> This input enables the ringing voltage feed to Tip and Ring for subscriber line.
12	PD	<b>Power Denial.</b> A logic high will isolate the battery voltage for Tip and Ring.
13	NC	<b>No Connection.</b> This pin may be used for internal connections.
14	SHK	<b>Switch Hook Detect.</b> A logic high indicates when subscriber line has gone off-hook.
15	VR	<b>Receive Signal.</b> This is the 4 wire analogue signal received at subscriber’s set.
16	VRef	<b>Reference Voltage.</b> A dc reference voltage is applied to this pin to set the constant current feed to subscriber line. This pin may also be grounded for normal 25mA loop current.
17	CAP	<b>Ring Trip Filter Capacitor.</b> A capacitor is normally connected from this pin to ground and filters out low frequency ringing signals, preventing false off-hook conditions.
18	VX	<b>Transmit Signal.</b> This is the 4 wire analogue signal transmitted from subscriber’s set.
19	NC	<b>No Connection.</b> This pin may be used for internal connections.
20	RV	<b>Ringing Voltage.</b> 1.5 Vrms signal is injected to this pin.

## Functional Description

The Mitel MH88615 ONS SLIC provides a complete interface between a switching system and a subscriber loop. The functions provided by the MH88615 include battery feed and integral ringing amplifier feed to the subscriber line, 2W to 4W conversion, constant current feed, off-hook and dial pulse detection. The device is fabricated as a thick film hybrid in a 20 pin single-in-line package.

The MH88615 is intended for applications where low cost and basic functionality is important. The MH88615 features an integral ringing amplifier which enables a system designer to provide typically 60 Vrms ringing without having to generate a high voltage, high current ac signal.

The SLIC uses a transformerless 2-4 wire converter which can be connected to a CODEC to interface the 2 wire subscriber loop to a TDM (time division multiplex) PCM (pulse code modulation) digital link.

Powering of the subscriber line is provided through precision battery feed resistors on the hybrid. The thick film hybrid circuit also contains control, signalling and status circuits which combine to provide a complete functional solution. A power denial facility is provided which isolates the Battery Feed from Tip and Ring.

The MH88615 is designed to meet German regulatory approvals, UK regulatory approvals (BS6305), and capable of meeting the approvals for the USA (FCC Part 68/EIA 464).

## Constant Current Feed

The loop current is programmed by the dc reference voltage applied to  $V_{Ref}$ .

## Switch Hook Detection

When the dc current exceeds an internal threshold level, the switch hook output (SHK) will go high. If the loop resistance is so high that  $V_{Bat}$  can no longer supply the required loop current, the output SHK will go low. This indicates that the loop resistance is too high and the line is on hook.

## DC Loop Current Limit

Under Tip or Ring ground conditions the loop current is nominally limited to 42mA.

## Power Denial

A logic high voltage applied to the power denial input effectively removes the battery voltage from the loop driver circuitry. The resulting loop current is negligible and power consumption is minimised. The power denial function is useful for disabling a loop which may have a ground fault.

The SLIC is capable of detecting and indicating off-hook and unbalanced conditions as well as inhibiting ringing while in power denial.

## Input and Network Impedance

The Input and Network Balance Impedances are defined by the variant type on the MH88615.

### MH88615-1 Germany

$$Z_{in} = 220\Omega + (820\Omega//115nF)$$

$$Z_{net} = 220\Omega + (820\Omega//115nF)$$

### MH88615-3 UK

$$Z_{in} = 370\Omega + (620\Omega//310nF)$$

$$Z_{net} = 300\Omega + (1000\Omega//220nF)$$

### MH88615-7 North America

$$Z_{in} = 600\Omega$$

$$Z_{net} = 350\Omega (1k\Omega//210nF)$$

## Ringing Amplifier

The MH88615 incorporates an integral ringing amplifier. A nominal 1.5Vrms ac signal is applied to the RV pin and this produces a ringing signal of typically 60 Vrms. This should ensure that the SLIC can support a REN of 5.

## Transmit Gain

Transmit gain (Tip-Ring to  $V_x$ ) is fixed at 0.dB. A dcbias on the ac input signal does not effect the ringing signal.

## Receive Gain

Receive Gain (VR to TIP-RING) is fixed at 0dB.

For correct gain, the SLIC input impedance must match the line impedance

**Absolute Maximum Ratings\***- Voltages are with respect to AGND.

	Parameter	Symbol	Min	Max	Units	Comments
1	Supply Voltages	$V_{Bat}$	0.3	65	V	With respect LPGND
		$V_{DD}$	-0.3	6	V	
		$V_{EE}$	0.3	-6	V	With respect LPGND
		$V_{DCRI}$	-0.3	140	V	
2	Storage Temperature	$T_S$	-55	125	°C	

\* Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

**Recommended Operating Conditions**

	Characteristics	Sym	Min	Typ*	Max	Units	Comments
1	Supply Voltages	$V_{Bat}$	-20	-48	-60	V	
		$V_{DD}$	4.75	5.0	5.25	V	
		$V_{EE}$	-4.75	-5.0	-5.25	V	
		$V_{DCRI}$	0	48	130	V	
2	Operating Temperature	$T_{OP}$	0	20	70	°C	
3	AC Ring Generator Voltage Frequency	$V_R$		60	90	$V_{RMS}$	$V_{BAT} = -48V$
		$F_R$	17		68	Hz	

\* Typical figures are at 25°C with nominal  $\pm 5V$  supplied and are for design aid only.

**DC Electrical Characteristics\***

	Characteristics	Sym	Min	Typ	Max	Units	Test Comments
1	Supply Current	$I_{DD}$			10	mA	PD on
		$I_{EE}$			5	mA	
		$I_{Bat}$			2.5	mA	
2	Power Consumption	PC			150 1700	mW mW	Standby Active
3	Constant Current Line Feed	$I_{Loop}$	23	25	27	mA	$V_{Ref} = AGND$
4	Adjustable Loop Current Range	$I_{Loop}$	18		30	mA	
5	Maximum Operating Loop Resistance	$R_{Loop}$	1200			$\Omega$	$V_{Bat} = -48V @$ $I_{Loop} = 18mA,$ $R_{Loop} = \text{includes telephone set}$
6	Ring Ground Over-Current				42	mA	
7	Off-Hook Detect Output Low Voltage Output High Voltage	$V_{OL}$			0.4	V	Active High Logic
		$V_{OH}$	2.7			V	
8	Off-Hook Detect Output Low Current Output High Current	$I_{OL}$			4	mA	
		$I_{OH}$			-400	$\mu A$	
9	RC, PD Control Input Input Low Voltage Input High Voltage	$V_{OL}$			0.7	V	Active High Logic
		$V_{OH}$	2.0			V	
10	RC, PD Control Input Input Low Current Input High Voltage	$I_{IL}$			-500	$\mu A$	
		$I_{IH}$			500	$\mu A$	

\* -48V and are for design aid only

**AC Electrical Characteristics\***

	Characteristics	Sym	Min	Typ <sup>‡</sup>	Max	Units	Test Comments
1	Ring voltage	$V_R$ $F_R$	17	38	68	Vrms Hz	Superimposed on $V_{Bat} = -48V$ . $RV = 1.5$ Vrms
2	Ring Trip Detect Time			100		ms	
3	Input Impedance at VR		47	100		k $\Omega$	
4	Output Impedance at Vx			10		$\Omega$	
5	Gain 2-wire to Vx		-0.25	0	0.25	dB	
6	Frequency Response 2-wire to Vx		-0.15	0	0.15	dB	Relative to 1kHz 300Hz to 3.4 kHz
7	Gain Vr to 2-wire		-0.25	0	0.25	dB	
8	Frequency Response Vr to 2-wire		-0.15	0	0.15	dB	Relative to 1kHz 300 Hz to 3.4 kHz
9	Total Harmonic Distortion	THD			0.5	%	
10	Common Mode Rejection Ratio	CMRR	50			dB	
11	Idle Channel Noise	Nc			12	dBrnC	
12	Power Supply Rejection Ratio at 2-Wire or VX	PSRR	25			dB	Ripple 0.1V 1kHz @ $V_{DD}$

\* Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

‡ Typical figures are at 25°C and are for design aid only.

Note 1: All of the above test conditions use a test source impedance which matches the device's impedance.

Note 2: THD is measured with "A Weight" filter.

**AC Electrical Characteristics\*- MH88615-1**

	Characteristics	Sym	Min	Typ	Max	Units	Test Comments
1	Ringer Equivalence	REN	5				1 REN= 8000 $\Omega$ @ 25 Hz
2	Return Loss	RL	20			dB	200 Hz - 500 Hz
			24			dB	500 Hz - 2.5 kHz
			20			dB	2.5kHz - 3.4 kHz
3	Transhybrid Loss	THL	24			dB	300 Hz - 3.4 kHz
4	Longitudinal to Metallic Balance		32			dB	50 Hz - 300 Hz
			54			dB	300 Hz - 4 kHz

\* Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

Note: Return Loss reference impedance are defined by variant type.

Transhybrid Loss is measured when terminated with network impedance.

**AC Electrical Characteristics\*- MH88615-3**

	Characteristics	Sym	Min	Typ	Max	Units	Test Comments
1	Ringer Equivalence	REN	4				4 REN= 2200 $\Omega$ @ 25 Hz
2	Return Loss	RL	20			dB	300 Hz - 3.4 kHz
3	Transhybrid Loss	THL	20			dB	300 Hz - 3.4 kHz
4	Longitudinal to Metallic Balance		52			dB	300 Hz - 3.4 kHz

\* Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

Note: Return Loss reference impedance are defined by variant type.

Transhybrid Loss is measured when terminated with network impedance.

AC Electrical Characteristics\*- MH88615-7

	Characteristics	Sym	Min	Typ	Max	Units	Test Comments
1	Ringer Equivalence	REN	5				1 REN= 5000Ω @ 30 Hz
2	Return Loss	RL	24			dB	300 Hz - 3.4 kHz
3	Transhybrid Loss	THL	20			dB	300 Hz - 3.4 kHz
4	Longitudinal to Metallic Balance		52			dB	300 Hz - 3.4 kHz

\* Exceeding these values may cause permanent damage. Functional operation under these conditions is not implied.

Note: Return Loss reference impedance are defined by variant type.  
 Transhybrid Loss is measured when terminated with network impedance.

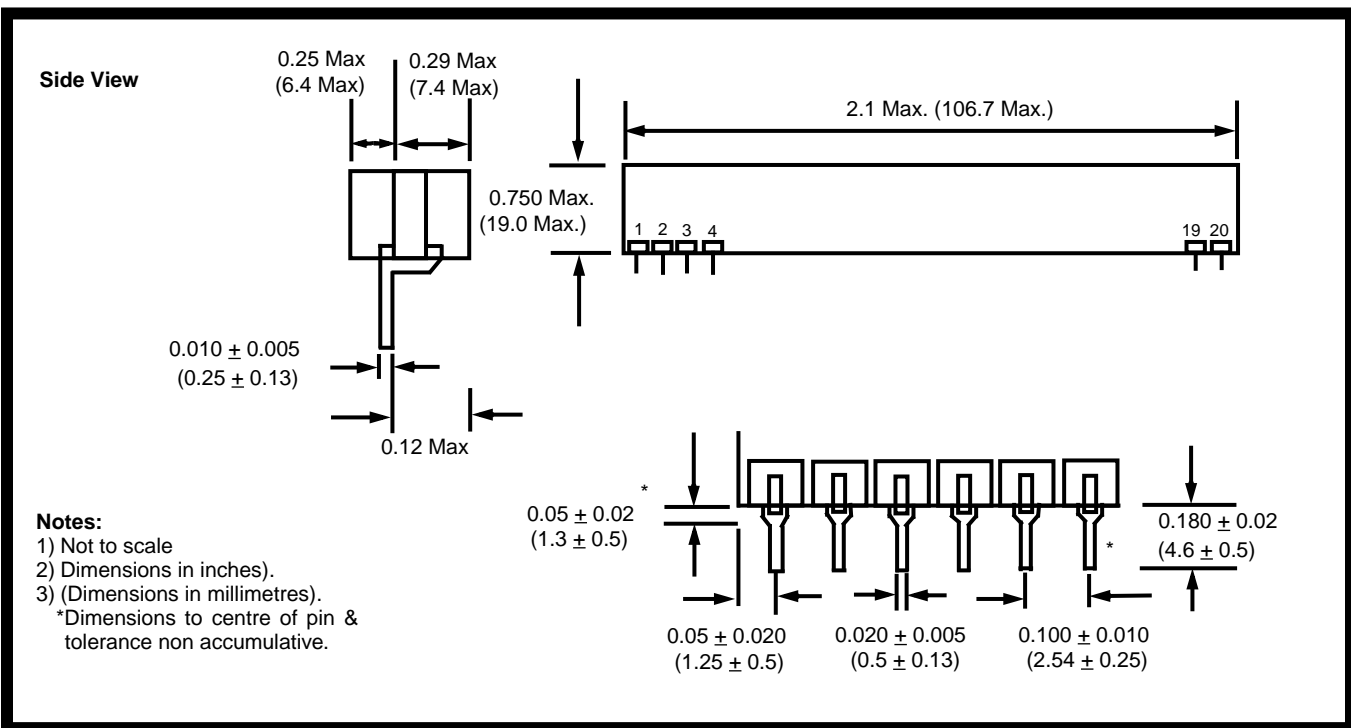


Figure 3 - Mechanical Data