

# SLIC L3000N/L3092 PERFORMANCE ANALYSIS WITH -24V BATTERY

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## INTRODUCTION

This technical note describes the L3000N/L3092 SLIC performances when used with a battery voltage of -24V. All the main characteristics are analyzed and compared with the results obtained with a standard battery voltage of -48V.

The following data were obtained from a typical device in order to have an idea on how DC characteristic, power consumption, ringing voltage and AC performances are influenced by a reduced battery voltage.

## POWER CONSUMPTION

Table 1 shows the L3000N-L3092 current consumption with two batteries combination  $V_{B-} = -48V$ ;  $V_{B+} = 72V$  and  $V_{B-} = -24V$ ;  $V_{B+} = +50V$ . The measurements are made in the different operating modes (Power Down; Stand-by; Conversion with  $I_L = 0$ ;  $I_L = 40mA$  and Ringing without AC Line Load (Ringing Equivalent Number REN = 0).

**Table 1:** SLIC Typical Current Consumption with Different Battery Voltages.

	Current Consumption (mA)			
	-48V	+72V	-24V	+60V
PW - DOWN	0	0	0	0
SBY ( $I_L = 0$ )	1.93	0	1.9	0
CVS ( $I_L = 0$ )	4.91	-	4.4	0
CVS ( $I_L = 40mA$ )	52.2	-	50	0
RING (0 REN)	13.4	10.8	10.0	7.9

## DC CHARACTERISTICS

In fig 1 you can see the typical DC characteristics for the two battery voltages: feeding resistance was set to  $2 \times 200\Omega$  (RFS =  $200\Omega$ ).

The typical current value versus loop resistance is given by:

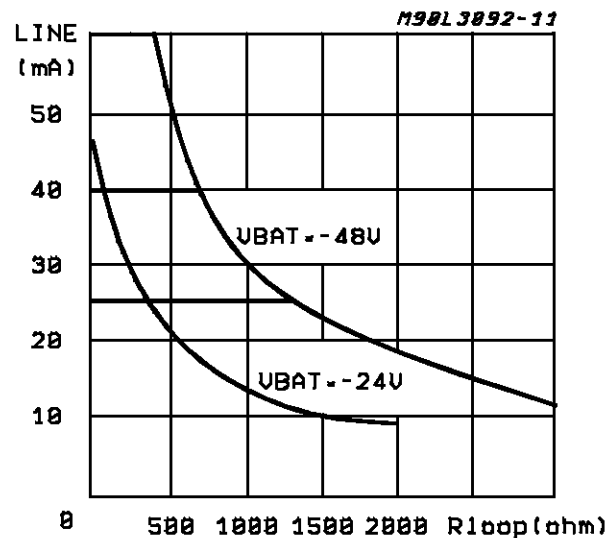
$$I_L = I_{lim} \quad \text{for } R_L < \frac{|V_{B-}| - 5V}{I_{lim}} - 2RFS$$

$$I_L = \frac{|V_{B-}| - 5V}{R_L + 2RFS} \quad \text{for } R_L > \frac{|V_{B-}| - 5V}{I_{lim}} - 2RFS$$

Where RFS represents the resistance of each

side of the traditional feeding system (most common values for RFS are 200, 400 and  $500\Omega$ ).

**Figure 1:** L3000N/L3092 DC Characteristic with a  $2 \times 200\Omega$  Feeding Resistance.



## MAXIMUM LOOP LENGTH

Two are the parameters influenced by line length increment: the first is the DC line current and the second is the maximum AC signal that can be sent without distortion (THD = 1%). Here below are shown the typical maximum loop resistance values and the relative line current in correspondence of which distortion is still less than 1% for +4dBm (1.23 VRMS) AC signals. The SLIC feeding resistance is set  $2 \times 200\Omega$ .

$V_{B-} = -48V$	$V_{B-} = -24V$
$R_{max.} = 2200\Omega$	$R_{max.} = 940\Omega$
$I_L = 16.61mA$	$I_L = 14.47mA$

## ON/OFF HOOK CURRENT THRESHOLDS

Here below are reported the typical values of the DC current thresholds used by the SLIC to detect the ON hook and OFF hook line conditions.

## APPLICATION NOTE

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$V_{B-} = -48V$

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ON/OFF Hook commutation

IL = 8.10mA VL = 40.58V RL = 5K $\Omega$

OFF/ON Hook commutation.

IL = 5.91mA VL = 41.30V RL = 7K $\Omega$

$V_{B-} = -24V$

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ON/OFF Hook commutation

IL = 8.10mA VL = 16.52V RL = 2K $\Omega$

OFF/ON Hook commutation.

IL = 5.82mA VL = 17.44V RL = 3K $\Omega$

$V_{B-} = -24V$

### AC PERFORMANCES

All the AC performances: TXgain, RX gain, Return Loss, Transhybrid Loss and Longitudinal Balance were measured and no significative variations were found changing from  $-48V$  to  $-24V$  of battery voltage.

GRX, GTX and THL variation were inside 0.03dB; RL inside .07dB and longitudinal balance inside .9dB.

### RINGING PERFORMANCES

L3000N/L3092 SLIC injects directly the ringing signal into the line. The ringing signal has a DC

component superimposed with the AC one.

The maximum ringing amplitude that can be obtained by L3000N without distortion depends on the total battery voltage available:

Let:

$$\begin{aligned} VBT &= |VB+| + |VB-| \\ VRING &= 0.58VBT - 8.6 \text{ (Vrms)} \\ VDCRING &= 0.1736VBT + 0.75 \text{ (V)} \end{aligned} \quad (1)$$

EX:

$$\begin{aligned} VB+ &= 72V; VB- = -48V \\ VRING &= 0.58 \times 120 - 8.6 = 61 \text{Vrms} \\ VDCRING &= 21.6V \\ VB+ &= 50V; VB- = -24V \\ VRING &= 0.58 \times 74 - 8.6 = 34.3 \text{Vrms} \\ VDCRING &= 13.6V \end{aligned}$$

From eq. (1):

$$VBT = (VRING + 8.6)/0.58$$

### CONCLUSIONS

The measurements carried on show that it is possible to make the SLIC working also with reduced battery voltage (down to  $-24V$ ) without any degradation in terms of AC performances.

It should be noted that with  $-24$  battery voltage you can get good performances up to 950 $\Omega$  of loop length. In case you need higher line currents you can increase the battery voltage of the amount you need, optimizing in this way power dissipation.

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