Norden Logic

NL024		Datasheet
Rev 1.0.0	Date: 15.01.2020	

Product History		
Version	Rev. Date	Description
1.0.0	January 2020	Controller NL024

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Introduction

The tiny NL024 is part of a new generation of powerful ARM based multi-head 58mm and 80mm thermal printer controllers designed and supplied by Norden Logic.

The NL024 supports a wide range of input voltage - from 7V to 26V, high speed printing with high speed print heads. This controller adds support for auto-cutters for popular thermal head offerings.

The controllers shine with their tiny size, huge RAM and Flash memory, real-time head temperature control, real-time paper-out monitor, custom fonts, user definable flash storage and a big selection of built-in language fonts. The NL024 can be switched between 58mm and 80mm print head support. NL024 is designed following printer head manufacturer's strobe control line specifications, for long print head life, faster heating time, clear print and reduced print current. The NL024 uses the industry standard ESC/POS control commands. The initial release of the NL024 supports directly 8-bit, UTF8 and UTF16 characters as well as Chinese and Japanese. 170 languages and more.

Features

- Auto-cutter support
- Thermal heads： 58mm & 80mm
- Supply voltage： 7V~26V；
- Print speed： 80mm/second --7.2V normal head
- Print speed： 200mm/second --24V (high speed head)
- Languages: 170 and more
- Grayscale： 8 level
- Font Attributes： Double width, Double height, Bold, Italic, Reverse, Underline, Normal
- 1D Barcode： UPC-A, UPC-E, EAN-13, EAN-8, CODE39, CODE93, ITF25, CODABAR, CODE128-A
- 2D Barcode： QR etc via POS GS v command
- Software API： ESC/POS (C libraries provided)
- UART interface：Flow Control: RTS, XON/XOFF
- Built-in: Overheat monitor, Paper-out monitor,
- Operating temperature：-40°C~+85°C
- Storage temperature： -50°C~+125°C

User Interface

- UART interface
- print stepper motor drive interface
- cutter stepper motor drive interface
- 6 individual STB lines
- TH thermal monitor line
- PHE paper-out monitor line
- CUT_PHE cut position monitor line
- Flash storage
- Selectable Print Head support

NL024 Controller

Application

- Medical device
- Taxi meter
- Calculator
- Handheld pos
- Tank meter
- Mobile pos
- Industrial meters
- Cash register
- Sticker printer

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1. Description

The Norden Logic NL024 is a thermal printer head controller designed to control thermal heads with auto-cutters, supports 7V~26V power ranges, 58mm and 80mm thermal print heads. Typical manufacturers supported are Seiko, Fujitsu, Samsung, ALPS, PRT and others. The controller is designed to interface with a host controller via the UART interface. The NL024 exposes many properties which can be set via the industry standard ESC/POS programming interface. A comprehensive ESC/POS command interface document is available as well as C library source files with all supported commands and a command test software application - to make integration fast and easy. Also available are our Printer EVK boards - evaluation boards ready to print.

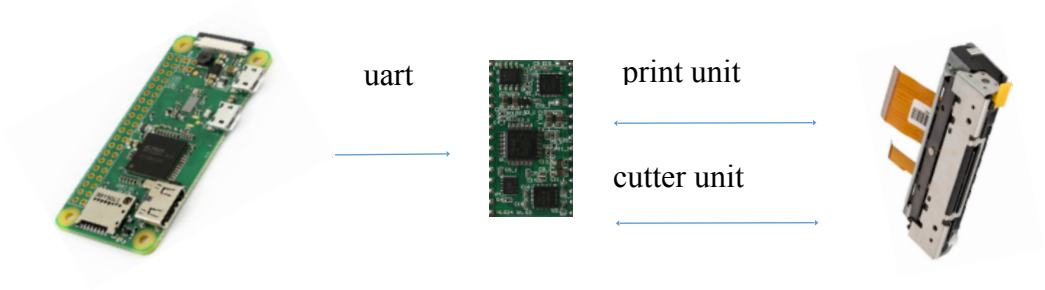

Figure1 application diagram

- A host controls by sending ESC/POS API commands to the NL024 via the UART control lines RX/TX
- The NL024 in turn controls the thermal head via dedicated control lines
- The NL024 controls also the auto-cutter of the print heads (via ESC commands)
- The NL024 can be delivered in consumer grade or industrial grade

The NL024 diagram is as below:

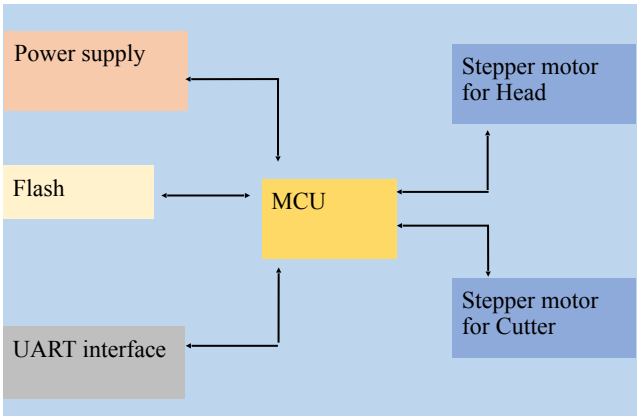

Figure2 NL024 diagram

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2. Overview

The NL024 supports a variety of print heads available on the market. Many heads are compatible designs and feature the exact same characteristics. As we can not list all heads on the market we have put a table together with the type we currently support. More are added and if your head is not listed, please contact us.

table1 support heads

Type	PN	Voltage	STB line	Connector	Cutter	Company
58mm	PT486F08401	7.2V	6	30pin head	YES	PRT
58mm	FTP628MCL401	7.2V	6	30pin head	YES	Fujitsu
80mm	PT723F08401	7.2V	5	30pin head	YES	PRT
80mm	FTP638MCL401	7.2V	5	30pin head	YES	Fujitsu
80mm	PT723F24401	24V	4	30pin head	YES	PRT
80mm	FTP637MCL403	24V	4	30pin head	YES	Fujitsu

NL024 attributes:

table2 function overview

Print method	dot lines - thermal print
Print density	8dots/mm
Print point	384dots/ line for 58mm heads, 576dots/line for 80mm heads
Print width	58mm heads and 80mm heads
Print speed	80mm/sec (7.2V) - 200mm/sec (24V)
Print character (fonts)	Latin: 8x16, 12x24 dots DoubleByte: 16x16, 24x24 dots Over 170 combined possible languages
Auto-cutter	Modes: full cut and partial cut
Print head Voltages	7.2V - 24V
BMP print	Vertical print
	NV bitmap print (4MB storage) or custom fonts (*on request)
1D barcode	UPCA, UPCE, EAN13, EAN8, CODE39 ITF25, CODABAR, CODE93, CODE128A
2D barcode	High speed printing e.g. QR via GS v print command
UART buffer	8K Bytes
Paper-out detection	Yes
Over-heat monitor	Yes
Dimension	19.0 x 37.3 x 2.6mm

The auto-cutter supports two cut types: full cut and partial cut.

Partial cut operation: the paper is still connected with a tab
Full cut operation: the paper is cut off from the role

Figure3 cut type

3. Pin descriptions

NL024 pinout see figure4：

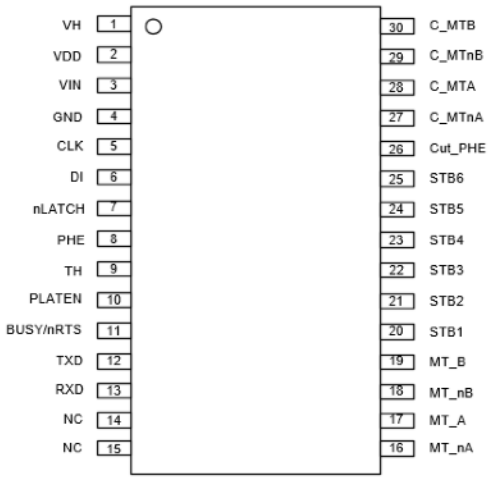

Figure4 NL024 pinout

The table 3 below describes the NL024 pinout in detail:

Table3 NL024 pinout

Name	Pin	Direction	Type	Descriptions
VH	1	OUT	Power	Power line connect to external head
VDD	2	IN	Power	3.3V power supply digital power supply
VIN	3	IN	Power	Power supply for head and stepper motor
GND	4	IN	Power	Power GND
CLK	5	Out	For heads	Clock output to head
DI	6	Out	For heads	Data In
nLATCH	7	Out	For heads	Latch signal
PHE	8	IN	For heads	Paper out detect pin , connects to PHE pin of head
TH	9	IN	For heads	Temperature monitor pin
PLATEN	10	IN	For heads	Platen monitor pin
BUSY/nRTS	11	Out	Power	nRTS=0, NL024 is ready nRTS=1, NL024 is busy, don't send data to chip
TXD	12	Out	For host	NL023 UART sending (connect to host RX pin)
RXD	13	IN	For host	NL023 UART receiving (connect to host TX pin)
NC	14	NC	NC	
NC	15	NC	NC	
MT_nA	16	Out	For motor	Stepmotor nA
MT_A	17	Out	For motor	Stepmotor A
MT_nB	18	Out	For motor	Stepmotor nB
MT_B	19	Out	For motor	Stepmotor B
STB1	20	Out	For heads	Thermal head energizing control signal
STB2	21	Out	For heads	Thermal head energizing control signal
STB3	22	Out	For heads	Thermal head energizing control signal
STB4	23	Out	For heads	Thermal head energizing control signal
STB5	24	Out	For heads	Thermal head energizing control signal
STB6	25	Out	For heads	Thermal head energizing control signal
Cut_PHE	26	IN	For host	Cut position monitor pin
C_MTnA	27	Out	For Mortor	Cut Stepmotor nA
C_MTA	28	Out	For Mortor	Cut Stepmotor A
C_MTnB	29	Out	For Mortor	Cut Stepmotor nB
C_MTB	30	Out	For Mortor	Cut Stepmotor B

4.Electrical characteristics

NL024 electrical characteristics in table 4:

table 4 electrical characteristics

Symbol	Parameter	Conditions	Min	Typical	Max	Unit
VIN	supply voltage	To=25°C	7		26	V
VH	print voltage for thermal head	To=25°C	7		26	V
Is	static current	VH=7.2V VH=24V		32mA		
I_H	print current				6A@24V	A
VDD	VDD		3.2	3.3	3.4	V
V_{IH}	logic supply	VDD=3.3V	0.7VDD	-	-	V
V_{IL}		VDD=3.3V			0.3VDD	V
V_{OH}		VDD=3.3V	VDD-0.4			V
V_{OL}		VDD=3.3V			0.4	V
I_{OH}		VDD=3.3V	8			mA
Fclk				2		Mhz
Im	step motor current		-	0.5	-	A
To	operation temperature		-40		+85	°C
Ts	storage temperature		-50		+125	°C
Tj	solder joint temperature				250	°C
t_J	soldering time				3	s

5. Package characteristics

Figure 5 shows the package outline:

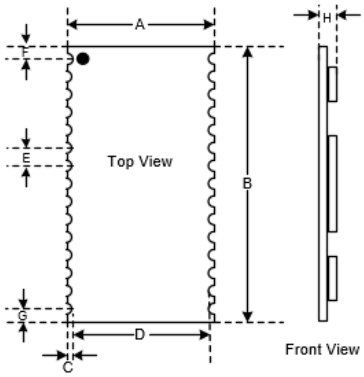

Figure5 package outline

Table 5 lists the mechanical dimensions in mm:

table5 mechanical dimensions

Symbol	A	B	C	D	E	F	G	H
Max	19.05	37.34	0.76	17.53	2.54	0.89	0.89	2.6

Figure 6 shows the recommended layout pattern:

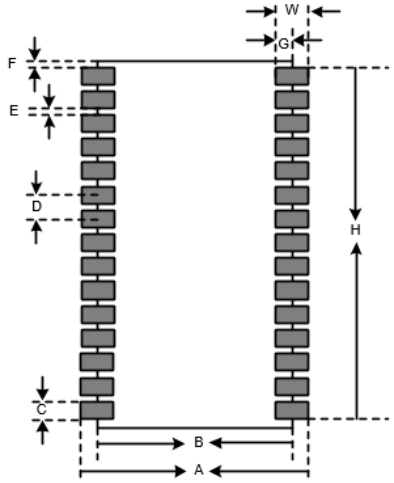

Figure6 recommended layout pattern

Table 6 show the layout dimensions in mm:

table6 layout dimensions

Symbol	A	B	C	D	E	F	G	W	H
Max	21.08	19.05	1.52	2.54	1.00	0.5	1.51	2.03	37.08

6. Application circuit

NL024 is designed to work with 58mm and 80mm print heads. Below we show a sample application of the NL024 connected to a 80mm Fujitsu FTP637MCL403 or compatible head. For some thermal heads, VIN and VH will be around 24V. In the drawing J1 is connected with thermal head connector and J2 show the connection to the auto-cutter and P2 shows the connection to host UART pin.

When the thermal head voltage of VH requires a voltage value around 24V then the voltage rating of the capacitors: C10, C11, C12 must be above 30V.

See figure 7 below:

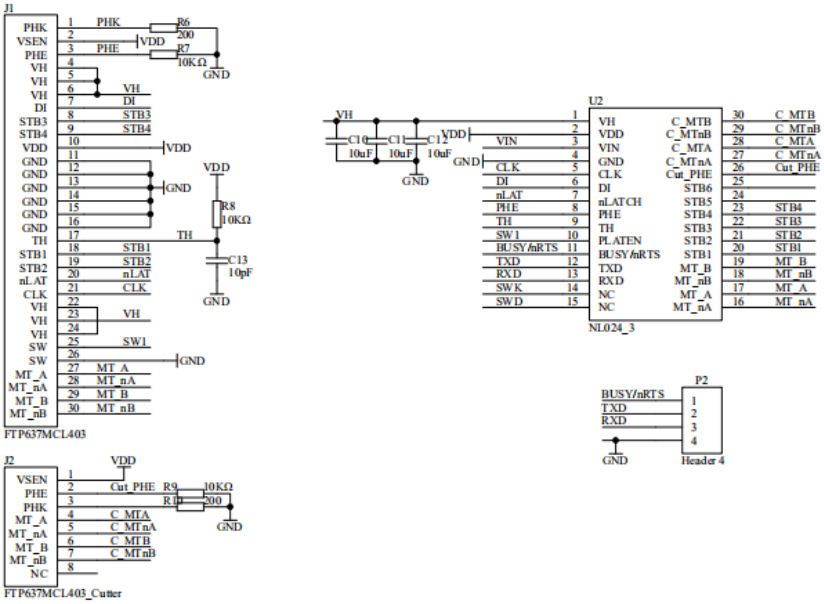

Figure7 NL024 connect to FTP637MCL403