

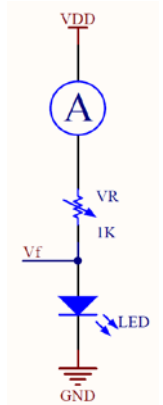
## NY3L Application Note

**Description:** Please note the settings of Sink Output Current while using NY3L series IC which enables LED to avoid unnecessary power consumption.

**Reason:** When using Q-Speech with NY3L series, the output current of Sink Output Current setting can be selected as 100%, 80%, 50% and 30%. User can select the best efficiency Sink Output Current via this application note, so that LED can achieve the best brightness (current) and not burn out easily (lumen depreciation).

**Solution:** User could know the correct setting of Output Current through the following steps.

1. First, user has to know the  $V_F$  value of the used LED. There are two kinds of LED brightness: base brightness and high brightness. The main factors are  $I_F$  and lumen, the  $I_F$  value of base brightness is about 10mA, the  $I_F$  value of high brightness is about 20mA, and when LED's current achieve  $I_F$ , the voltage drop of the LED is  $V_F$ . User can measure  $V_F$  value by using the method of the right figure. User must use an ammeter to set  $V_{DD}$  as 5V and by adjust VR to change LED's current to achieve  $I_F$ . The voltage drop of LED is  $V_F$ .



**NOTE: The VR resistance should be adjusted from high value to low value, and VR cannot be 0Ω, otherwise LED will be burned out.**

2. Aware the VDD that power supply used, the voltage of 2 AA batteries is 3V, 3 AA batteries is 4.5V.
3. Calculate I/O voltage  $V_{OL}$ ,  $V_{OL} = V_{DD} - V_F$ .
4. Search the  $I_{OL}$  correspondence table in  $V_{DD}$  and  $V_{OL}$ , and select  $I_{OL}$  value that closes to  $I_F$  value.

EX1. A  $V_F=2V$  high red brightness LED, its power takes 2 AA batteries.

$$V_{OL} = 3V - 2V = 1V$$

$$\text{LED } I_F = 20\text{mA}$$

If 100% Output Current,  $I_{OL} = 23.9 \text{ mA}$ .

If 80% Output Current,  $I_{OL} = 19.4 \text{ mA}$ .

If 50% Output Current,  $I_{OL} = 12.1 \text{ mA}$ .

If 30% Output Current,  $I_{OL} = 7.4 \text{ mA}$ .

Recommend selecting 80% Output Current.

EX2. A  $V_F=3.1V$  blue LED, its power takes 3 AA batteries.

$$V_{OL} = 4.5V - 3.1V = 1.4V$$

$$\text{LED } I_F = 20\text{mA}$$

If 100% Output Current,  $I_{OL} = 44.3 \text{ mA}$ .

If 80% Output Current,  $I_{OL} = 36.5 \text{ mA}$ .

If 50% Output Current,  $I_{OL} = 23.2 \text{ mA}$ .

If 30% Output Current,  $I_{OL} = 13.8 \text{ mA}$ .

Recommend selecting 50% Output Current.

**Table 1: Sink Output Current 100%**

The IoL correspondence table of I/O Output100% in VDD & VOL									
IoL (mA) \ VDD (V) \ VOL (V)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.6	9.2	13.7	17.7	20.4	23.8	25.0	25.8	26.3	27.0
0.7	9.9	15.1	19.2	22.1	25.2	28.2	28.7	30.8	32.6
0.8	10.3	16.2	21.1	24.3	27.6	30.3	32.4	33.3	35.5
0.9	10.5	17.0	22.3	26.3	30.6	33.8	35.0	37.6	39.8
1.0	10.6	17.6	24.0	28.4	32.6	36.0	38.5	40.0	43.3
1.1	10.8	18.1	24.7	29.7	34.4	38.7	41.4	42.9	46.7
1.2	10.9	18.5	25.4	31.3	36.3	41.0	43.5	46.0	49.8
1.3	10.9	18.8	26.0	32.3	38.4	43.0	46.8	49.1	52.7
1.4	11.1	18.8	26.4	33.2	39.5	44.3	48.8	51.7	55.7
1.5	11.1	19.1	27.0	33.8	40.3	45.8	50.0	53.1	58.5
1.6	11.2	19.1	27.2	34.4	41.4	47.5	52.4	55.2	60.5
1.7	11.2	19.3	27.4	35.0	42.0	48.4	53.2	56.5	61.6
1.8	11.4	19.3	27.5	35.1	42.6	49.5	54.6	58.3	62.9
1.9	11.4	19.4	27.5	35.3	42.9	50.9	56.3	60.5	64.1
2.0	11.4	19.4	27.5	35.3	43.6	51.3	57.0	61.4	65.7
2.1		19.4	27.5	35.4	43.7	51.9	58.7	62.5	66.8
2.2		19.3	27.6	35.4	43.9	52.5	59.2	63.3	67.9
2.3		19.4	27.6	35.4	44.0	52.9	59.9	64.3	69.7
2.4		19.4	27.6	35.5	44.1	52.9	59.9	65.2	70.9
2.5		19.4	27.6	35.5	44.1	53.3	60.2	66.0	71.6
2.6			27.7	35.4	44.2	53.4	60.5	66.5	72.2
2.7			27.7	35.4	44.2	53.4	60.7	66.8	72.8
2.8			27.7	35.5	44.3	53.5	60.8	66.9	73.1
2.9			27.7	35.5	44.4	53.5	60.7	67.0	73.3
3.0			27.7	35.7	44.4	53.6	60.8	67.1	73.5
3.1				35.7	44.6	53.6	60.9	67.2	73.8
3.2				35.7	44.7	53.5	61.0	67.3	74.0
3.3				35.7	44.6	53.6	60.9	67.4	74.1
3.4				35.7	44.8	53.7	61.1	67.5	74.2
3.5				35.7	45.0	53.8	61.0	67.7	74.4
3.6					45.2	53.8	61.1	67.9	74.6
3.7					45.4	53.7	61.0	68.0	74.8
3.8					45.5	53.8	61.2	68.3	74.9
3.9					45.5	54.1	61.1	68.5	75.0
4.0					45.5	54.3	61.3	68.6	75.1

**Table 2: Sink Output Current 80%**

The IOl correspondence table of I/O Output 80% in VDD & VOL									
IOl (mA) \ VDD (V) \ VOL (V)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.6	7.3	11.1	14.1	16.4	18.8	19.8	20.8	21.5	22.1
0.7	7.8	12.2	15.3	17.9	20.3	22.5	23.4	24.5	25.7
0.8	8.2	13.2	16.7	19.6	22.1	24.8	26.5	27.6	29.0
0.9	8.4	13.8	18.1	21.1	24.0	27.5	28.9	30.7	31.9
1.0	8.6	14.3	19.5	22.6	25.7	30.0	31.7	33.4	35.0
1.1	8.6	14.6	20.0	23.9	27.0	31.2	33.8	35.6	37.9
1.2	8.7	14.9	20.5	25.3	28.9	33.1	36.0	37.7	40.4
1.3	8.8	15.0	21.0	26.3	30.3	35.0	38.0	39.8	42.6
1.4	8.9	15.2	21.4	27.2	32.2	36.5	39.8	42.2	45.1
1.5	9.0	15.4	21.9	27.8	33.1	37.8	41.5	43.7	47.0
1.6	9.0	15.5	22.1	28.3	33.6	38.8	43.1	45.4	48.9
1.7	9.1	15.6	22.3	28.6	34.2	39.4	43.9	46.8	50.3
1.8	9.4	15.7	22.4	28.8	34.6	40.0	45.0	47.9	51.4
1.9	9.7	15.8	22.5	29.0	35.1	40.9	45.9	49.4	52.8
2.0	9.7	15.9	22.5	29.2	35.6	41.5	46.8	50.2	54.0
2.1		16.0	22.7	29.4	35.7	42.0	47.6	51.2	55.2
2.2		16.3	22.8	29.5	35.8	42.4	48.1	52.2	56.1
2.3		16.4	23.0	29.7	36.1	42.6	48.6	53.0	57.3
2.4		16.6	23.1	29.8	36.2	42.9	48.9	53.7	58.3
2.5		16.6	23.2	29.9	36.3	43.4	49.2	54.4	59.2
2.6			23.4	30.0	36.6	43.6	49.4	54.7	59.8
2.7			23.7	30.0	36.8	43.7	49.6	55.2	60.1
2.8			24.0	30.1	36.9	43.8	49.8	55.3	60.5
2.9			24.0	30.2	37.0	44.0	49.9	55.5	60.8
3.0			24.0	30.3	37.1	44.0	49.9	55.6	61.1
3.1				30.4	37.2	44.1	50.1	55.7	61.1
3.2				30.6	37.3	44.2	50.2	56.0	61.3
3.3				30.7	37.4	44.3	50.3	56.1	61.6
3.4				30.7	37.5	44.4	50.5	56.2	61.8
3.5				30.7	37.7	44.8	50.6	56.4	61.9
3.6					37.9	44.9	50.6	56.5	62.2
3.7					38.1	45.0	50.6	56.4	62.4
3.8					38.2	45.1	50.7	56.6	62.5
3.9					38.2	45.3	50.8	56.6	62.3
4.0					38.2	45.3	50.9	56.7	62.3

**Table 3: Sink Output Current 50%**

The IOL correspondence table of I/O Output 50% in VDD & VOL									
IOL (mA) \ VDD (V) \ VOL (V)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.6	4.5	6.8	8.5	10.1	11.6	12.2	12.9	13.6	14.0
0.7	4.9	7.5	9.5	11.4	12.6	13.8	14.5	15.2	16.0
0.8	5.1	8.1	10.5	12.7	13.8	15.4	16.5	17.5	18.2
0.9	5.2	8.5	11.4	13.7	15.0	17.1	18.1	19.2	19.6
1.0	5.3	8.8	12.3	14.5	16.3	18.8	19.8	21.1	21.7
1.1	5.3	9.0	12.4	15.3	17.0	19.7	21.4	22.6	23.6
1.2	5.4	9.3	12.8	16.0	18.2	20.8	23.0	23.9	25.0
1.3	5.4	9.3	13.1	16.5	19.0	22.5	24.1	25.0	26.4
1.4	5.5	9.4	13.3	16.9	20.2	23.2	25.4	26.6	28.0
1.5	5.6	9.6	13.5	17.3	20.6	24.0	26.5	27.5	29.1
1.6	5.7	9.6	13.9	17.9	20.8	24.6	27.2	28.6	30.4
1.7	5.7	9.6	13.9	18.1	21.3	25.0	27.6	29.7	31.6
1.8	6.0	9.7	14.0	18.2	21.5	25.2	28.4	30.3	32.4
1.9	6.6	9.8	14.0	18.3	22.0	25.9	28.8	31.3	33.5
2.0	6.6	9.9	14.0	18.4	22.4	26.3	29.6	31.8	34.2
2.1		10.2	14.2	18.5	22.5	26.6	29.9	32.2	35.2
2.2		10.5	14.3	18.5	22.6	26.7	30.2	33.0	35.7
2.3		10.8	14.4	18.6	22.8	26.8	30.5	33.5	36.0
2.4		11.1	14.6	18.7	23.0	26.9	30.8	33.7	36.4
2.5		11.1	14.7	18.8	23.1	27.1	31.0	34.1	37.1
2.6			15.0	19.0	23.3	27.3	31.2	34.3	37.6
2.7			15.5	19.0	23.6	27.3	31.3	34.7	37.7
2.8			15.9	19.1	23.7	27.4	31.4	34.8	38.1
2.9			15.9	19.2	23.7	27.5	31.5	34.9	38.2
3.0			15.9	19.3	23.7	27.5	31.5	34.8	38.4
3.1				19.4	23.8	27.7	31.6	34.9	38.3
3.2				19.6	23.8	27.8	31.7	35.2	38.4
3.3				19.8	23.9	28.0	31.7	35.3	38.7
3.4				19.8	23.9	28.1	31.8	35.4	39.0
3.5				19.8	24.1	28.6	31.9	35.5	38.9
3.6					24.3	28.8	31.9	35.6	39.0
3.7					24.5	29.1	32.1	35.5	39.1
3.8					24.7	29.2	32.1	35.6	39.1
3.9					24.8	29.3	32.2	35.5	38.9
4.0					24.8	29.3	32.3	35.6	38.7

**Table 4: Sink Output Current 30%**

The IOL correspondence table of I/O Output 30% in VDD & VOL									
IOL (mA) \ VDD (V) \ VOL (V)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
0.6	2.8	4.3	5.4	6.3	7.0	7.5	7.9	8.1	8.4
0.7	2.9	4.7	5.8	6.7	7.7	8.6	9.0	9.2	9.5
0.8	3.1	5.1	6.2	7.1	8.3	9.6	10.2	10.6	11.0
0.9	3.2	5.3	6.8	7.6	8.8	10.5	11.2	11.7	12.2
1.0	3.3	5.5	7.4	8.2	9.4	11.4	12.2	12.9	13.4
1.1	3.3	5.6	7.6	8.8	9.9	11.7	12.8	13.6	14.5
1.2	3.3	5.6	7.8	9.5	10.7	12.5	13.6	14.3	15.5
1.3	3.4	5.7	8.0	10.0	11.2	13.0	14.2	15.0	16.3
1.4	3.4	5.8	8.2	10.5	12.2	13.8	14.9	16.0	17.2
1.5	3.4	5.8	8.4	10.7	12.8	14.4	15.8	16.7	17.9
1.6	3.4	5.9	8.4	10.8	12.9	14.6	16.5	17.4	18.6
1.7	3.5	6.0	8.5	10.8	13.1	14.8	16.9	17.9	19.1
1.8	3.5	6.0	8.6	10.9	13.2	15.0	17.2	18.2	19.5
1.9	3.5	6.1	8.7	11.0	13.4	15.2	17.5	18.6	20.1
2.0	3.5	6.1	8.7	11.2	13.5	15.5	17.8	19.0	20.5
2.1		6.1	8.8	11.3	13.6	15.7	18.0	19.5	20.9
2.2		6.2	8.8	11.5	13.6	15.9	18.2	19.9	21.3
2.3		6.2	8.9	11.6	13.7	16.0	18.4	20.2	21.9
2.4		6.2	8.9	11.6	13.7	16.3	18.6	20.6	22.5
2.5		6.2	9.0	11.7	13.8	16.6	18.7	20.9	22.9
2.6			9.0	11.7	13.9	16.7	18.7	21.0	23.1
2.7			9.0	11.7	14.0	16.8	18.8	21.2	23.2
2.8			9.1	11.8	14.0	16.8	18.9	21.3	23.3
2.9			9.1	11.8	14.1	16.9	19.0	21.4	23.5
3.0			9.1	11.8	14.2	16.9	19.0	21.5	23.6
3.1				11.9	14.2	16.9	19.1	21.6	23.6
3.2				11.9	14.3	17.0	19.2	21.7	23.7
3.3				12.0	14.3	17.0	19.3	21.7	23.8
3.4				12.0	14.4	17.0	19.4	21.7	23.9
3.5				12.0	14.4	17.1	19.5	21.8	24.0
3.6					14.5	17.1	19.5	21.8	24.2
3.7					14.5	17.1	19.4	21.8	24.3
3.8					14.5	17.1	19.4	21.8	24.4
3.9					14.5	17.1	19.5	21.8	24.3
4.0					14.5	17.1	19.5	21.8	24.3