Voltage Detector (Reset IC) Series

Setting for Output Pull-up Resistance

In this application note, we consider methods for setting the pull-up resistor values of Reset ICs with an open drain or open collector output.

Pull-up resistor value: recommended setting range for each product

Table 1 shows the recommended setting ranges for each product that is listed in the data sheet.
These pull-up voltages are assumed to be within the output voltage range of the products.
To judge whether a pull-up resistor value is reasonable or not under a specific condition, the following estimation method can be used.

Table 1. Recommended values for pull-up

Type	Series name	Min RL [Ω]	Max RL [Ω]
Standard	BU48xx (VDET=0.9V~1.4V)	10k	1M
	BU48xx (VDET=1.5V~4.8V)	100k	1M
	BD48xx / 48E,K,Lxx	10k	1M
Adjustable delay	BU42xx (VDET=0.9V~1.4V)	50k	1M
	BU42xx (VDET=1.5V~4.8V)	100k	1M
	BD52xx	10k	1M
	BD52Exx/52xx-2C	50k	1M
Fixed delay	BD45xx/45Exx	50k	1M
Bipolar	BD47xx	2k	470k
Overvoltage detection	BD71L4L-1	10k	1M

Note: the recommended resistor value is a standard.
Check carefully under actual conditions.

Estimation of VOL for pull-up resistance/voltage setting

Procedures for VOL calculation

1. Check the power supply voltage VDD2 on the receiving side (microcomputer, etc.) and the output pull-up resistance RL, and calculate the required output current from VDD2/RL = IOL.
2. Estimate the maximum value of VOL from the IOL–VOL characteristic of the Reset IC.
(Confirm the following conditions: for the power supply voltage of the Reset IC, VDD, check the minimum power supply voltage with which you want to maintain the L output; for the temperature, check the high temperature side where VOL reaches maximum.)
3. Check if the specification for the “L” level input voltage on the receiving side (microcomputer, etc.) is satisfied.

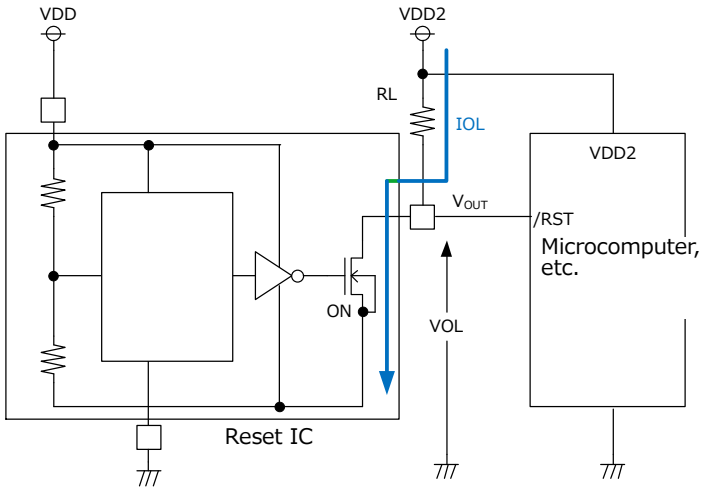

Figure 1. Output current path and connection to rear stage of open drain output Reset IC

Calculation example

Open drain output type Reset IC (power supply VDD):	BD48xx
Microcomputer power supply voltage at steady state:	VDD2 = 5 V
“L” level input voltage of output connection destination:	VIL < 0.5 V
Pull-up resistance:	RL = 10kΩ
Detection voltage:	VDD = VDET = 3 V
VDD with which you want to maintain the reset L:	1.5 V (Min) (refer to the figure for a lower VDD condition when no figure is applicable)

(1) Calculate the output current from the pull-up resistance and voltage.

Output current IOL = VDD2/RL = 5 V/10kΩ = 500 μA

(2) Based on the IOL-VOL data, estimate the VOL that is generated when a current estimated in (1) is supplied to the output.

Refer to the figure for VDD = 1.5 V. From the figure, it can be read that VOL at high temperature (105°C) is 0.12 V. Allow for a variation by a factor of 2.

Namely, set VOL = 0.24 V.

(3) Confirm that VOL satisfies VIL < 0.5 V for the “L” level input voltage of the output destination.

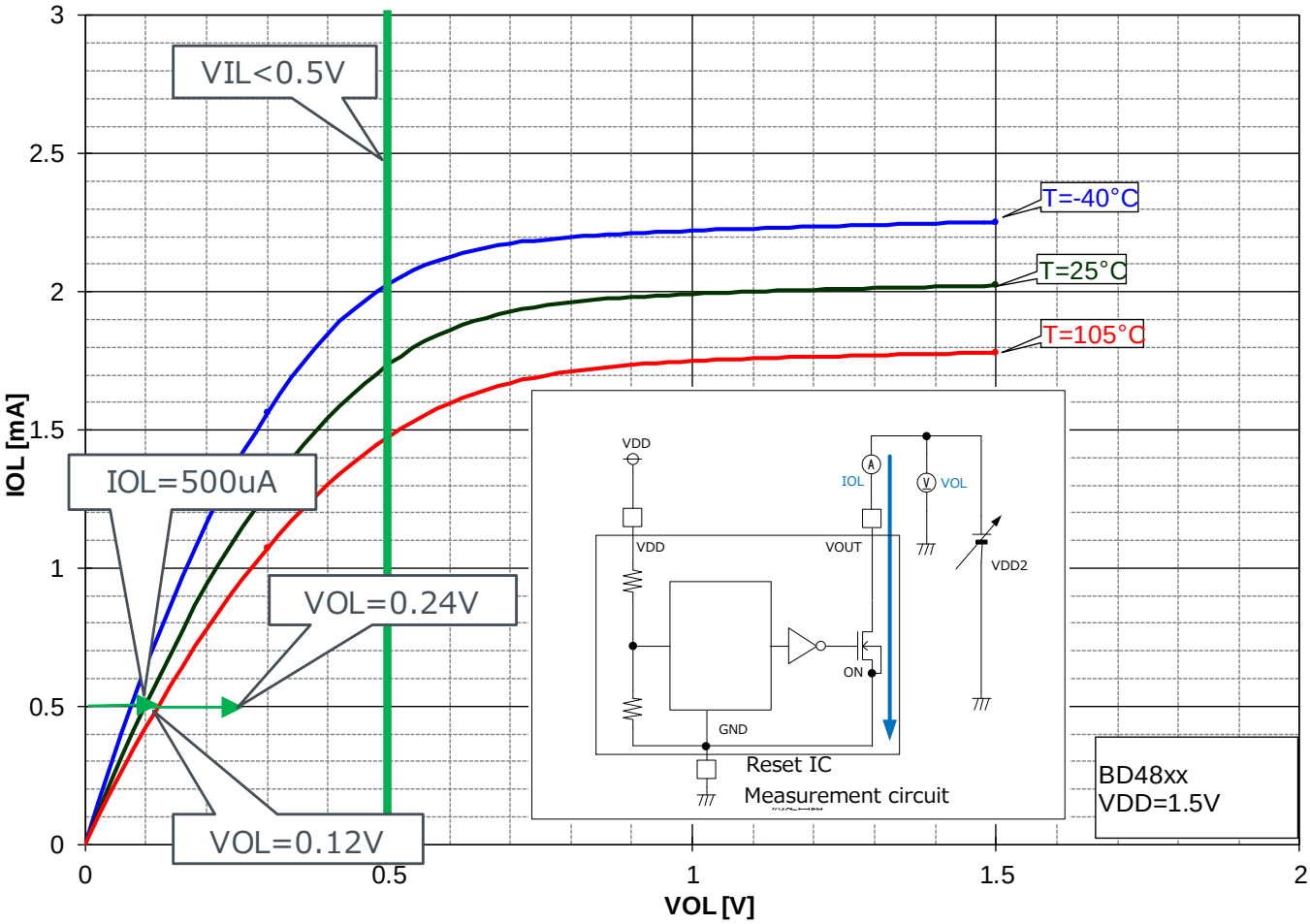

Figure 2. Output current IOL–output voltage VOL characteristic of open drain Reset IC

Reference data for the IOL−VOL characteristic is shown in the following pages. Refer to the data for the estimation.

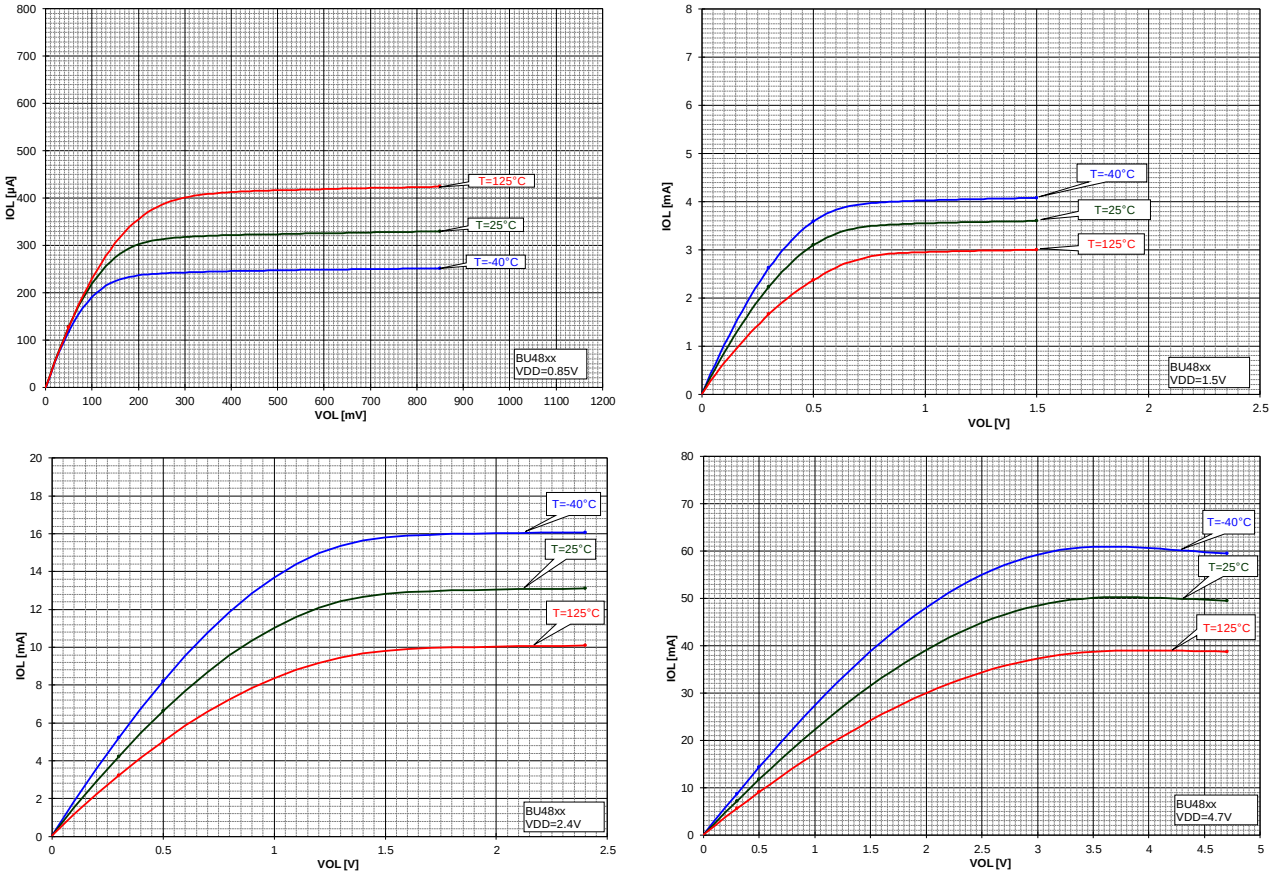

Figure 3. BU48xx output current–output voltage characteristic (VDD = 0.85/1.5/2.4/4.7 [V])

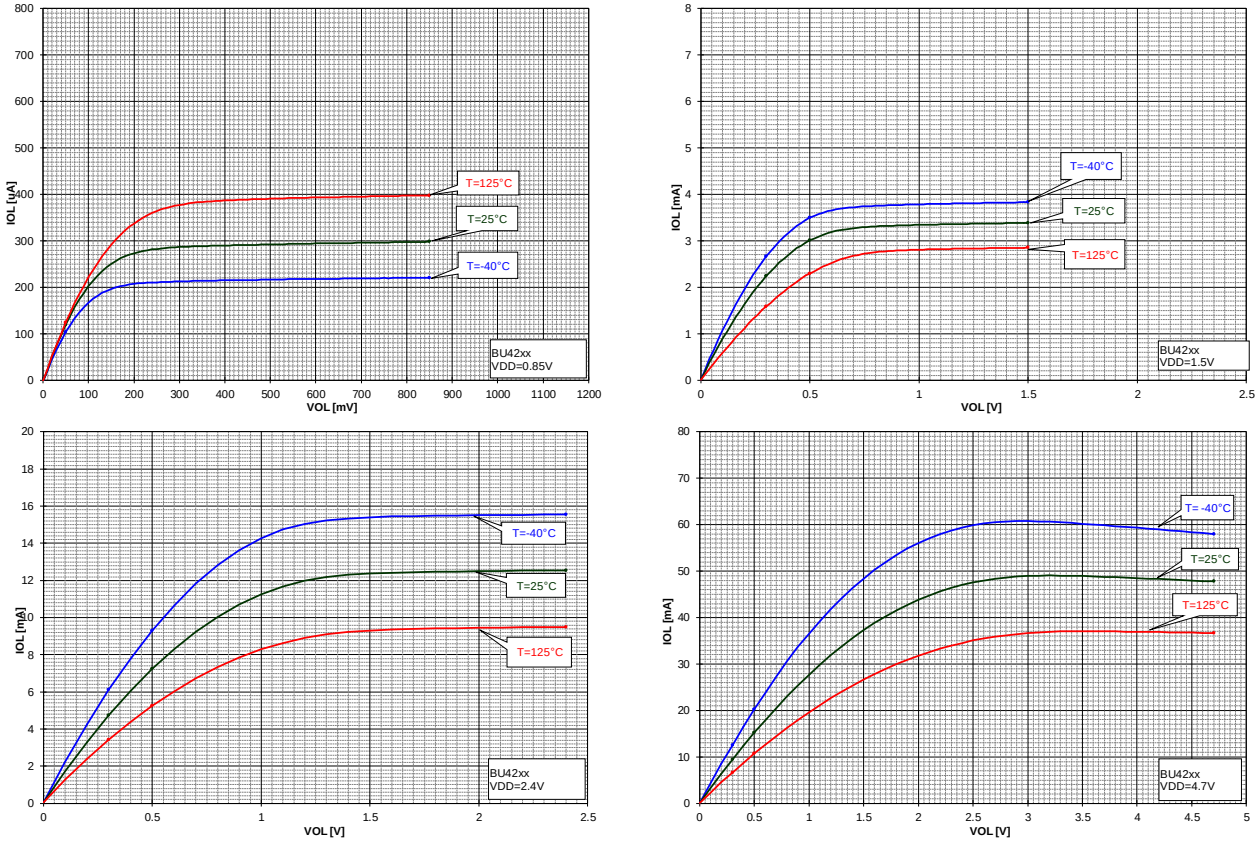

Figure 4. BU42xx output current–output voltage characteristic (VDD = 0.85/1.5/2.4/4.7 [V])

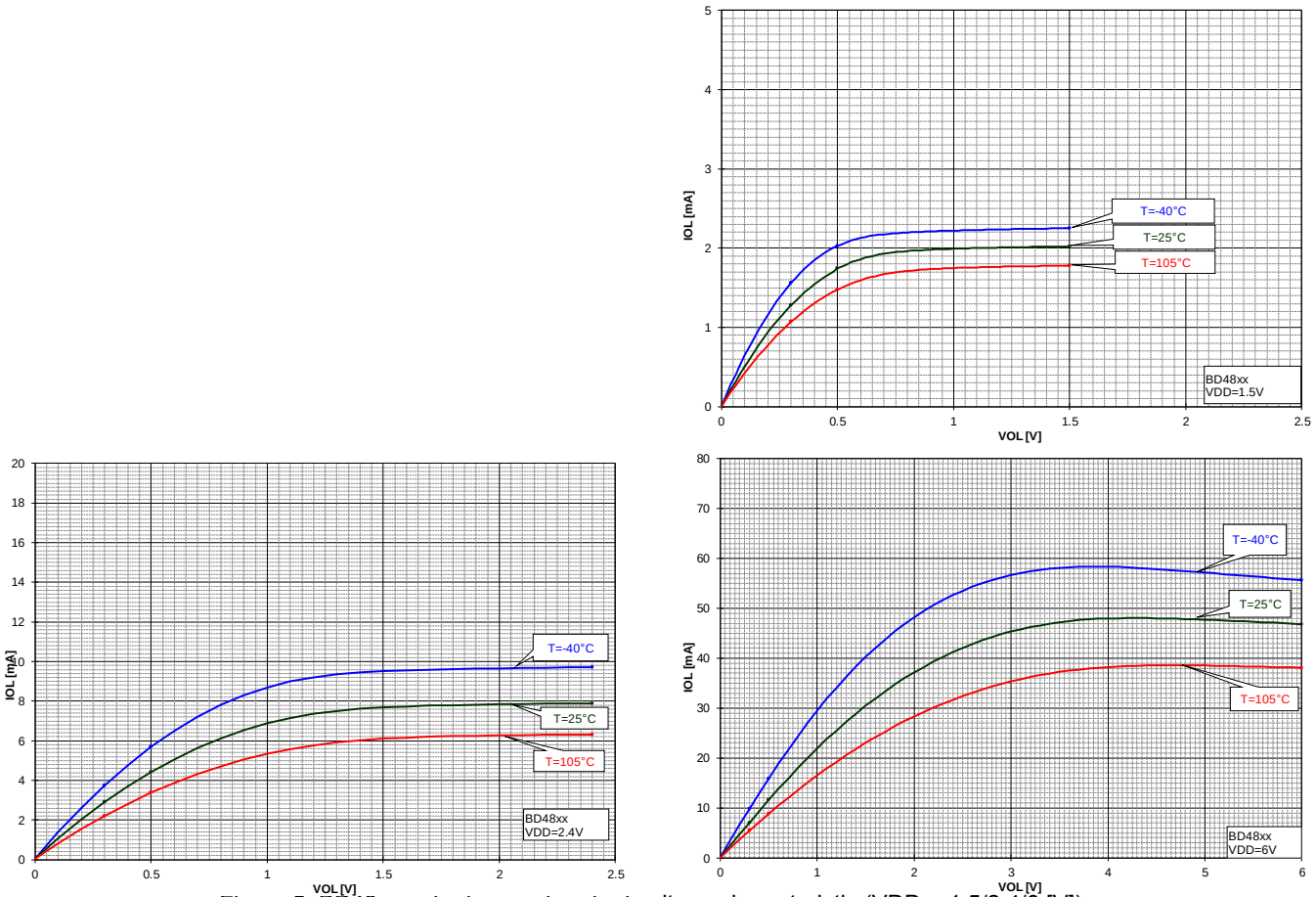

Figure 5. BD48xx output current–output voltage characteristic (VDD = 1.5/2.4/6 [V])

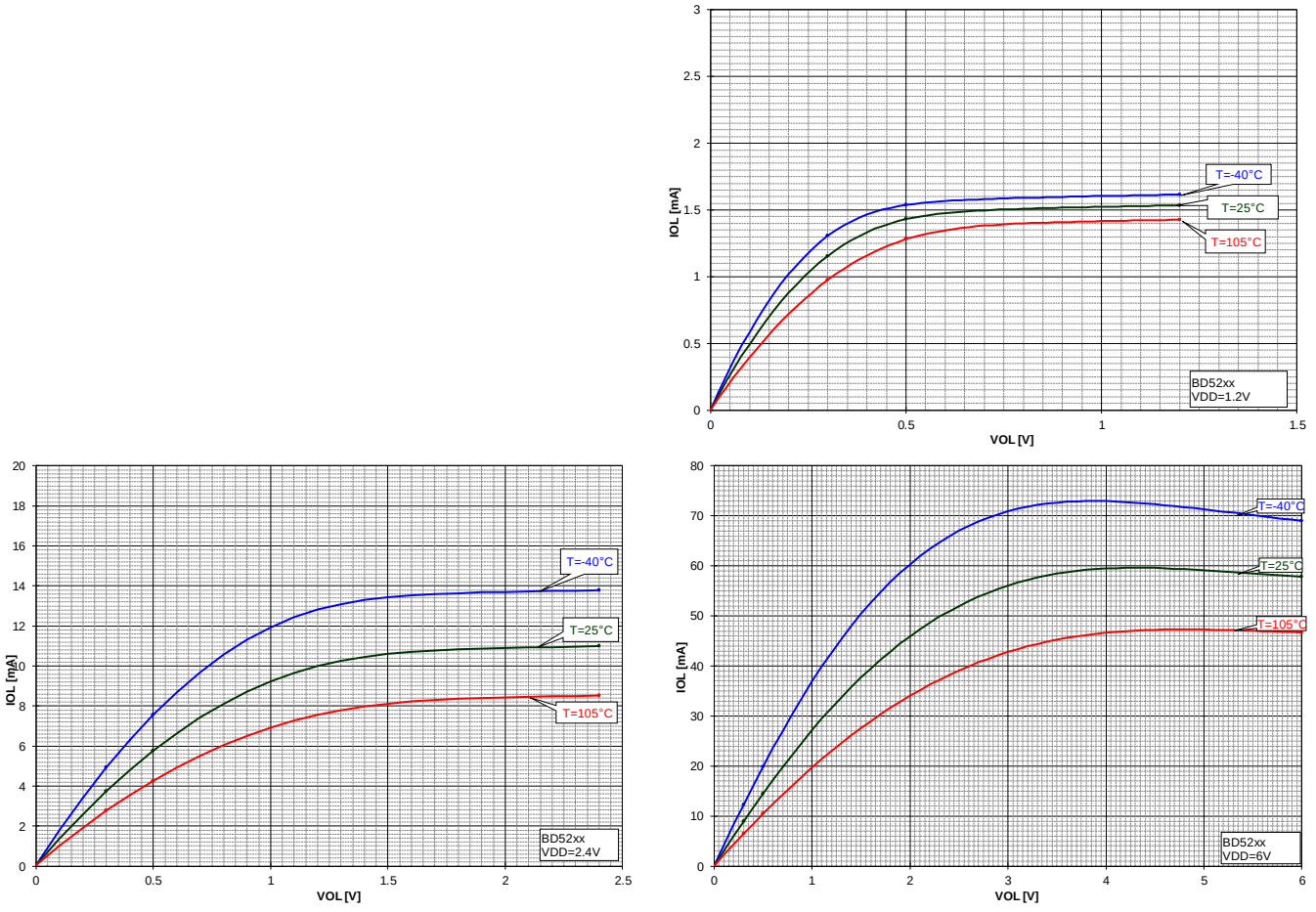

Figure 6. BD52xx output current–output voltage characteristic (VDD = 1.2/2.4/6 [V])

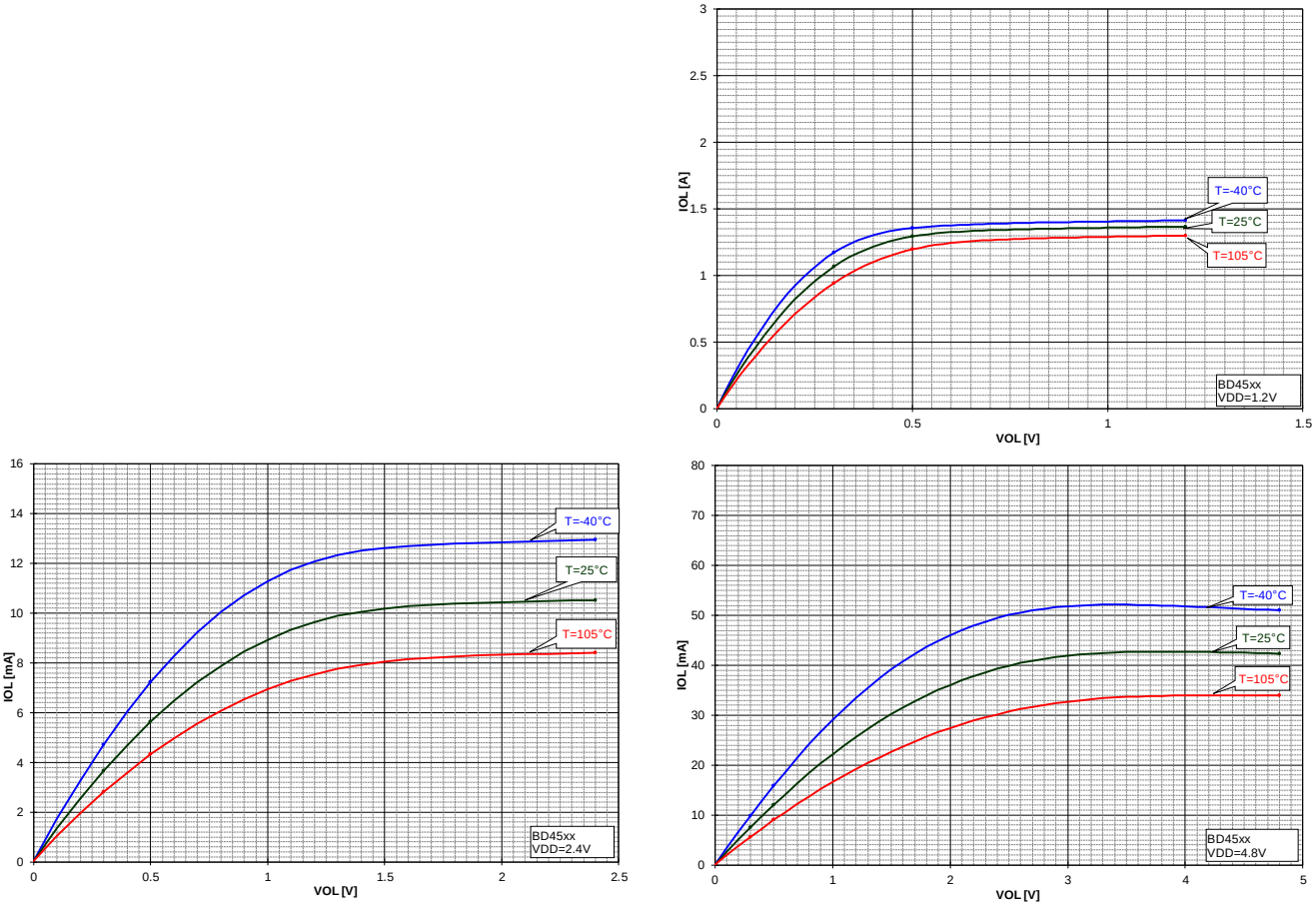

Figure 7. BD45xx output current–output voltage characteristic (VDD = 1.2/2.4/4.8 [V])

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