



High Input Voltage LDO Linear Regulators

GENERAL DESCRIPTION

The PW6513 series is a high accuracy, high input voltage low quiescent current, high speed, and low dropout linear regulator with high ripple rejection. The input voltage is up to 40V and load current is up to 300mA at $V_{OUT} = 5V$ & $V_{IN} = 7V$. The device is manufactured with BCD process. The PW6513 offers over-current limit, soft start and over temperature protection to ensure the device working in well conditions

The PW6513 regulators is available in standard SOT89-3L packages. Standard products are Pb-free and Halogen-free.

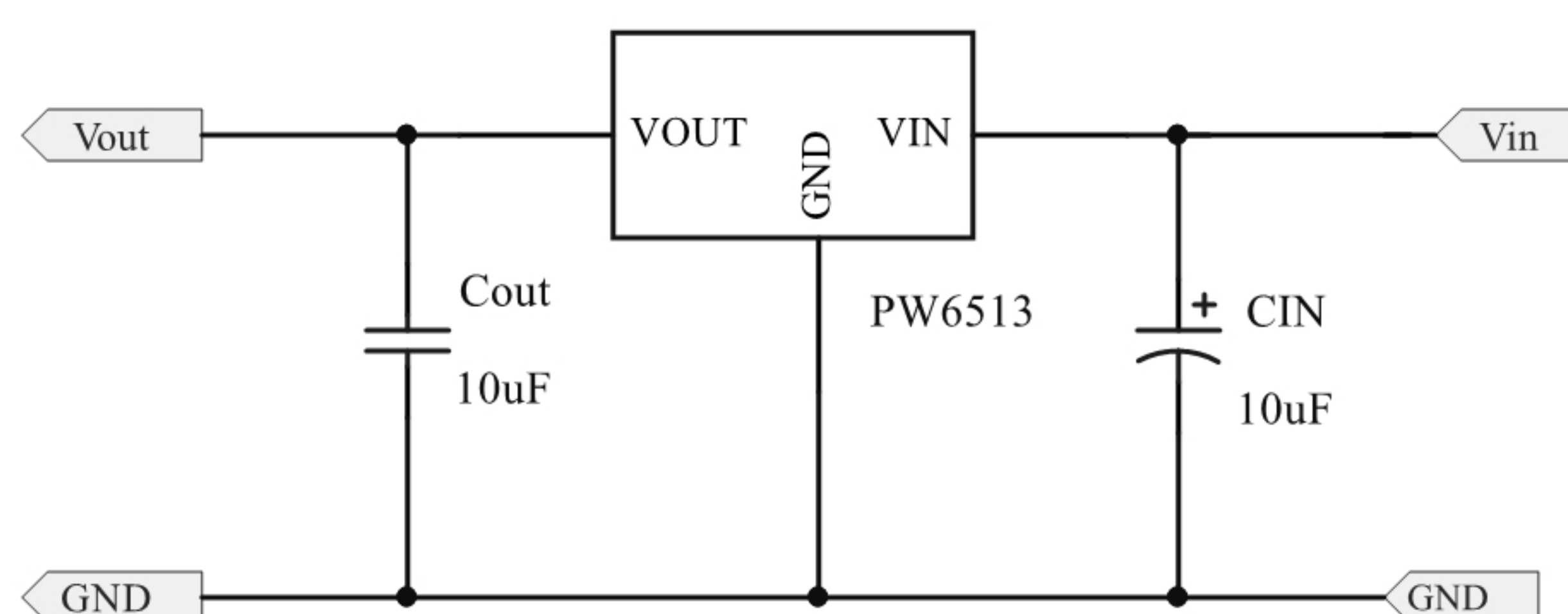
FEATURES

- Input voltage: 4.75V~40V
- Output voltage: 1.8V~5.7V
- Output accuracy: $< \pm 2\%$
- Output current: 150mA (Typ.)
- Up to 300mA @ $V_{IN} = 7V$, $V_{OUT} = 5V$,
- PSRR: 60dB @ 100Hz
- Dropout voltage: 600mV @ $I_{OUT} = 100mA$
- Quiescent current: 4.2 μA @ $V_{IN} = 12V$ (Typ.)
- ESD HBM: 8KV
- Recommend capacitor: 10 μF

APPLICATIONS

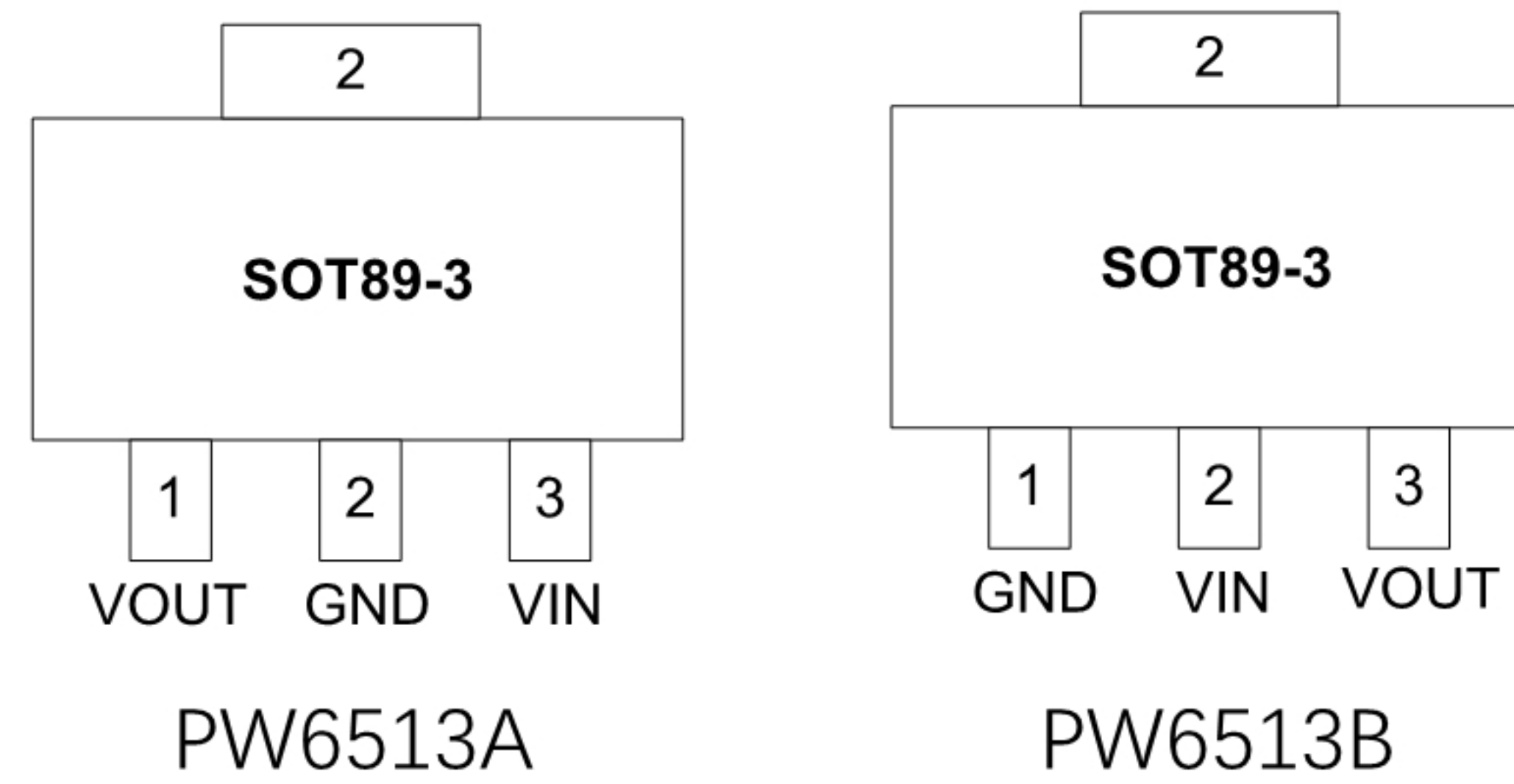
- Smart electric meter
- In-car entertainment
- Electric bicycle

TYPICAL APPLICATION CIRCUIT

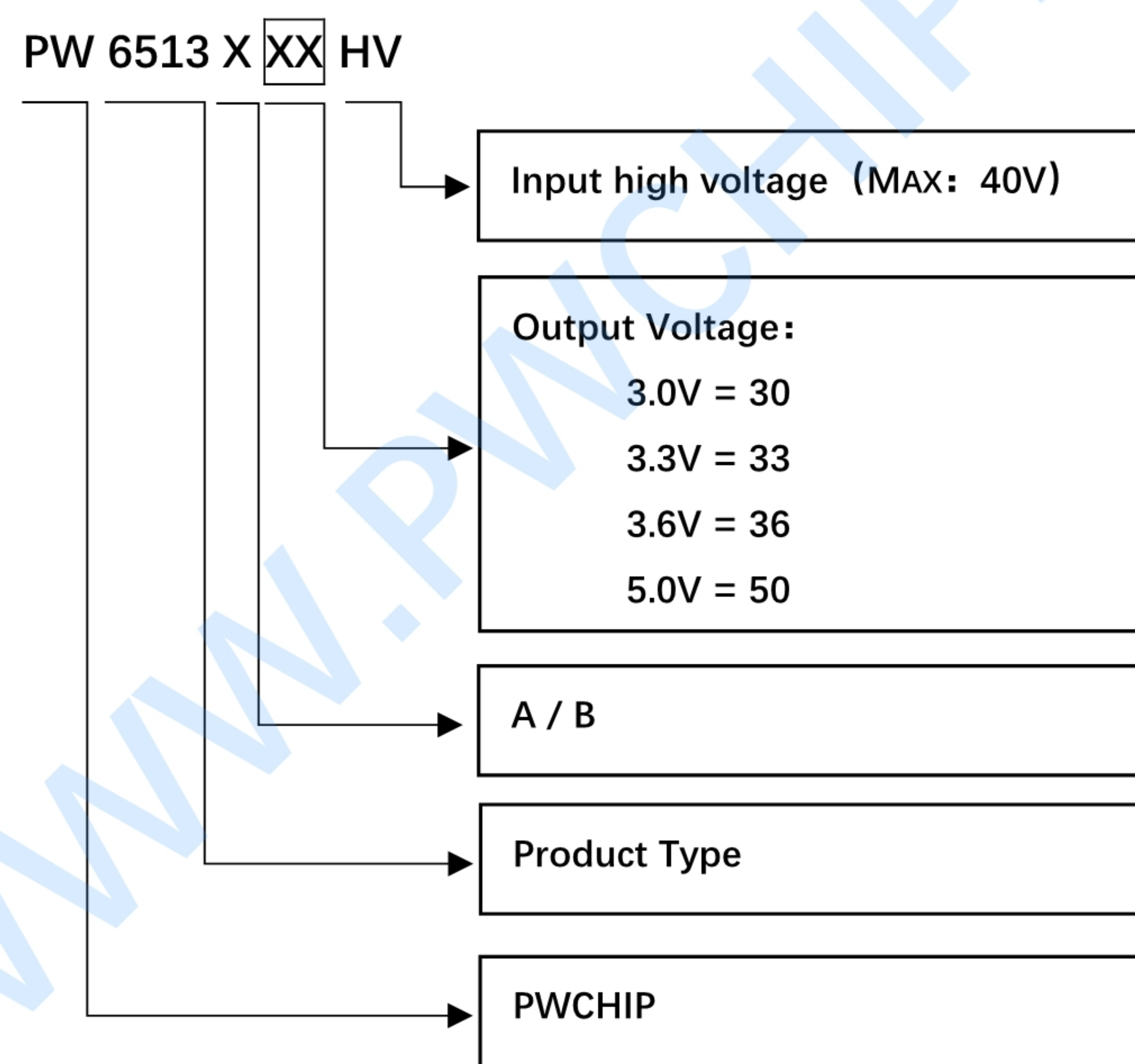




PIN ASSIGNMENT/DESCRIPTION



Pin Name	Functions
VOUT	Output
GND	Ground
VIN	Input



RECOMMENDED OPERATING RANGE

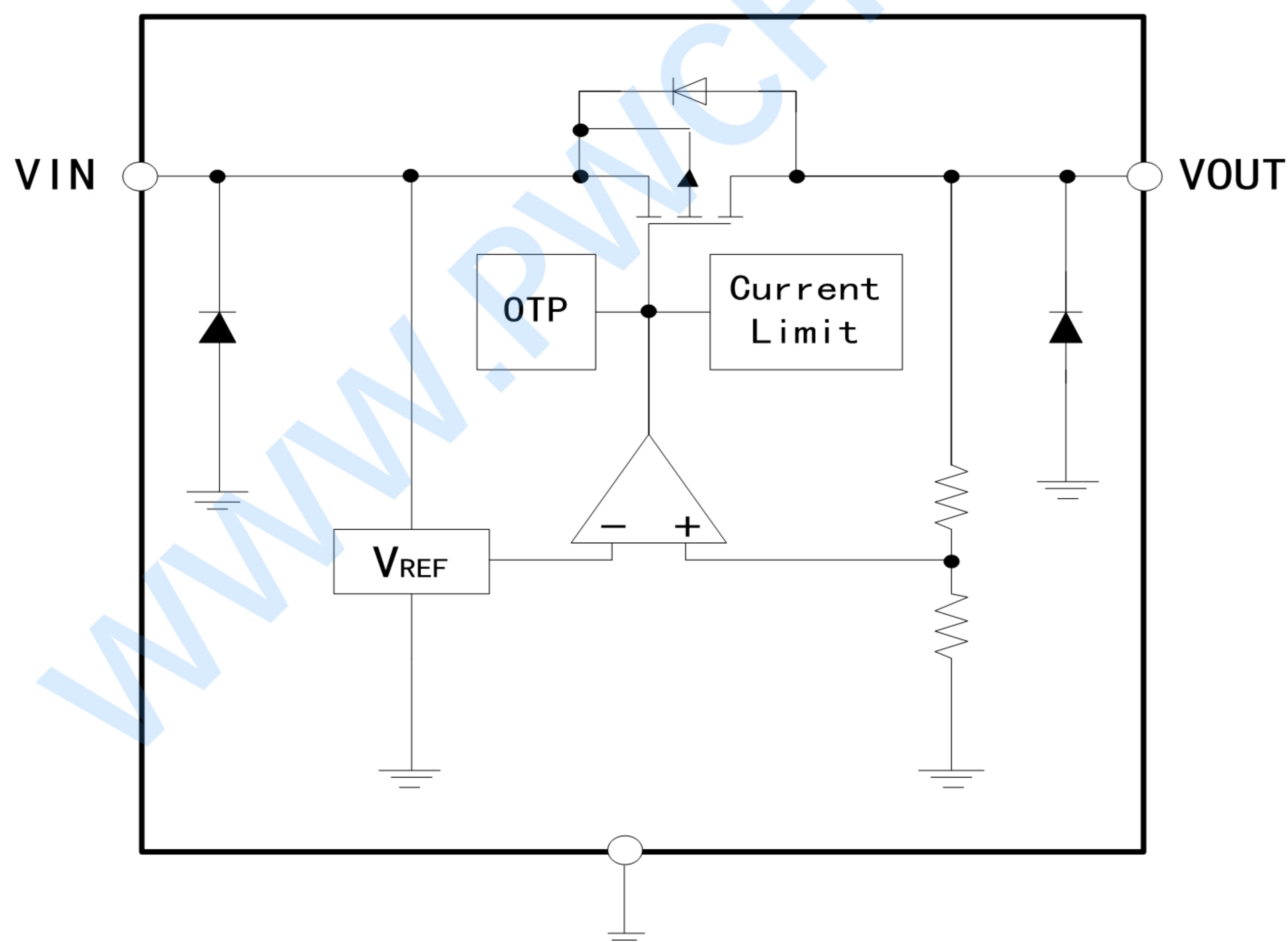
SYMBOL	ITEMS	VALUE	UNIT
VIN	VIN Supply Voltage	4.75 to 40	V
RθJA	Thermal Resistance on PCB	45	°C/W
TOPT	Operating Temperature	-40 to +105	°C

Absolute Maximum Ratings (note)

SYMBOL	ITEMS	VALUE	UNIT
V _{IN}	Input Voltage	-0.3~45	V
V _{OUT}	Output Voltage	-0.3~6.5	V
P _{DMAX}	Power Dissipation	OTP limited	W
T _J	Junction Temperature	-40~150	°C
T _{stg}	Storage Temperature	-55 to 150	°C
T _{solder}	Package Lead Soldering Temperature (10s)	260	°C
ESD MM	Machine Mode	200	V
ESD HBM	Human Body Mode	8000	V

Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

SIMPLIFIED BLOCK DIAGRAM





ELECTRICAL CHARACTERISTICS

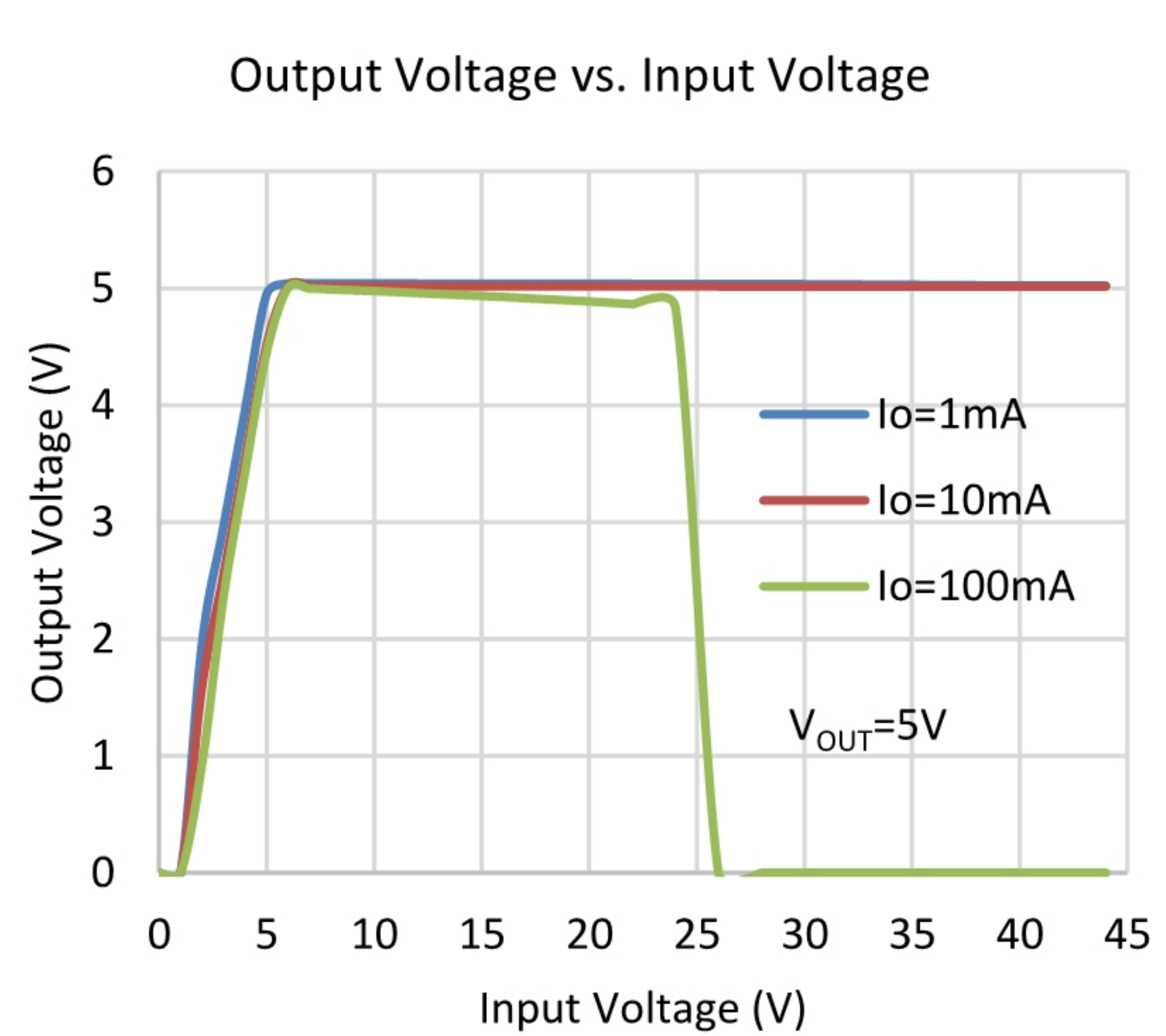
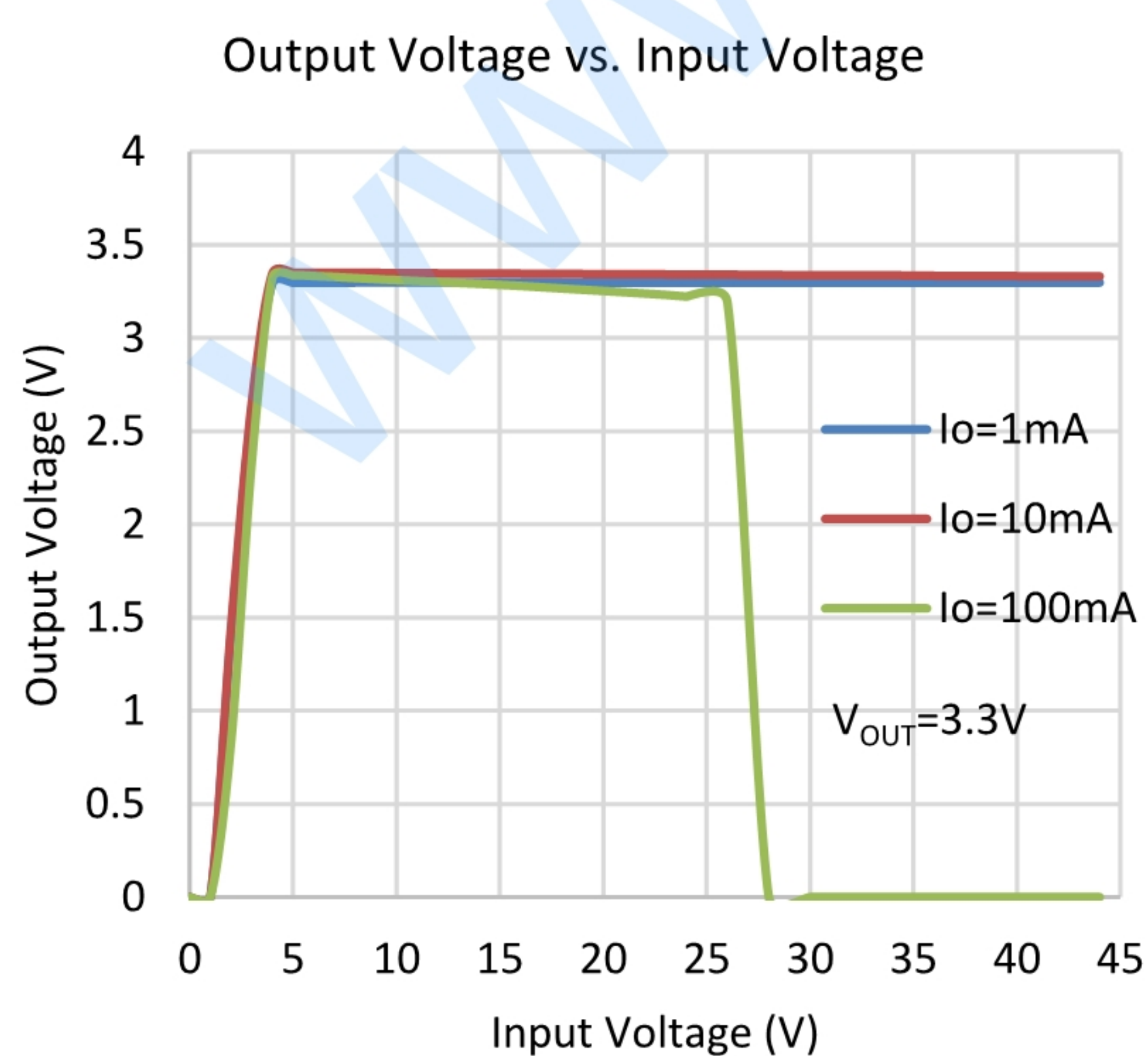
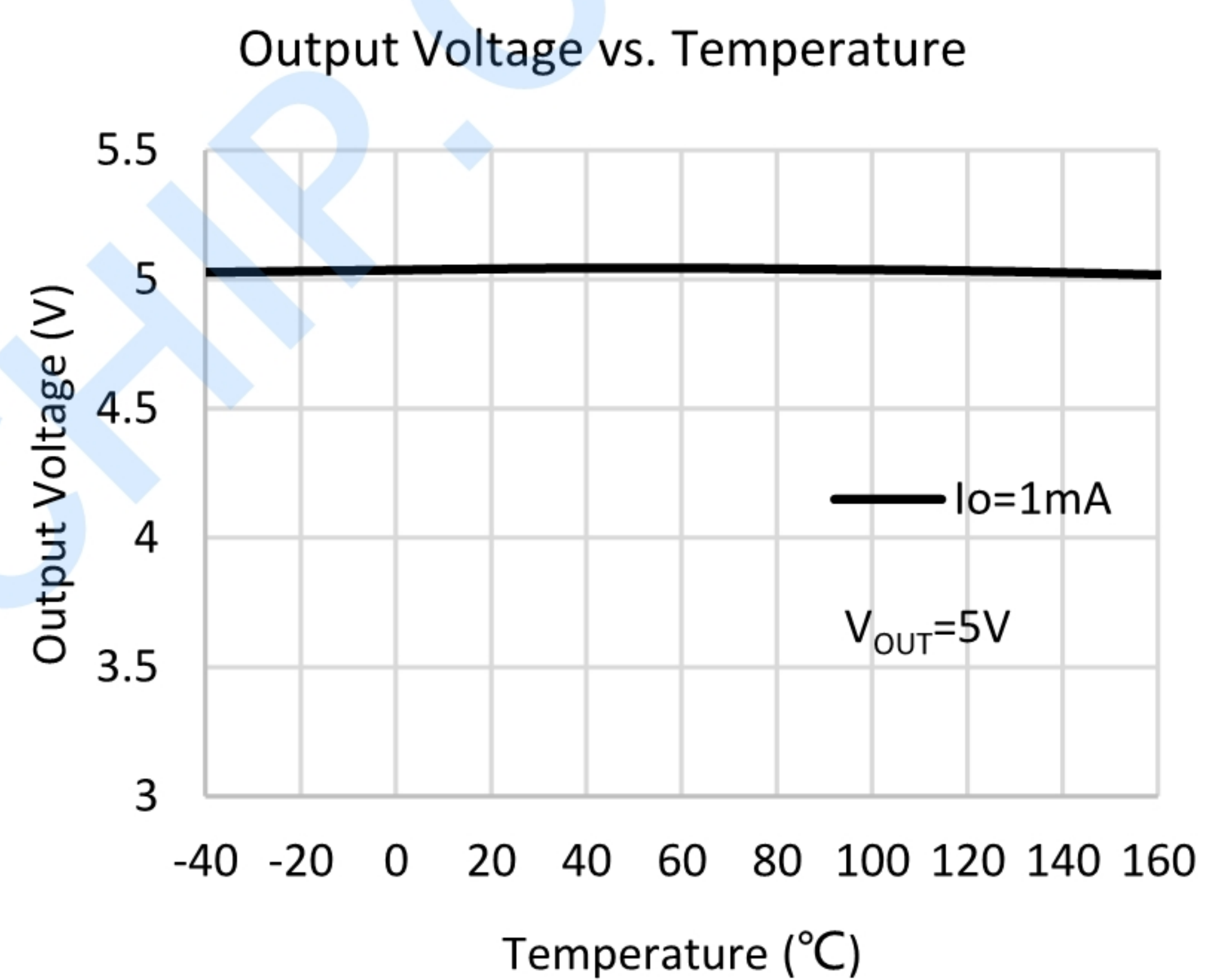
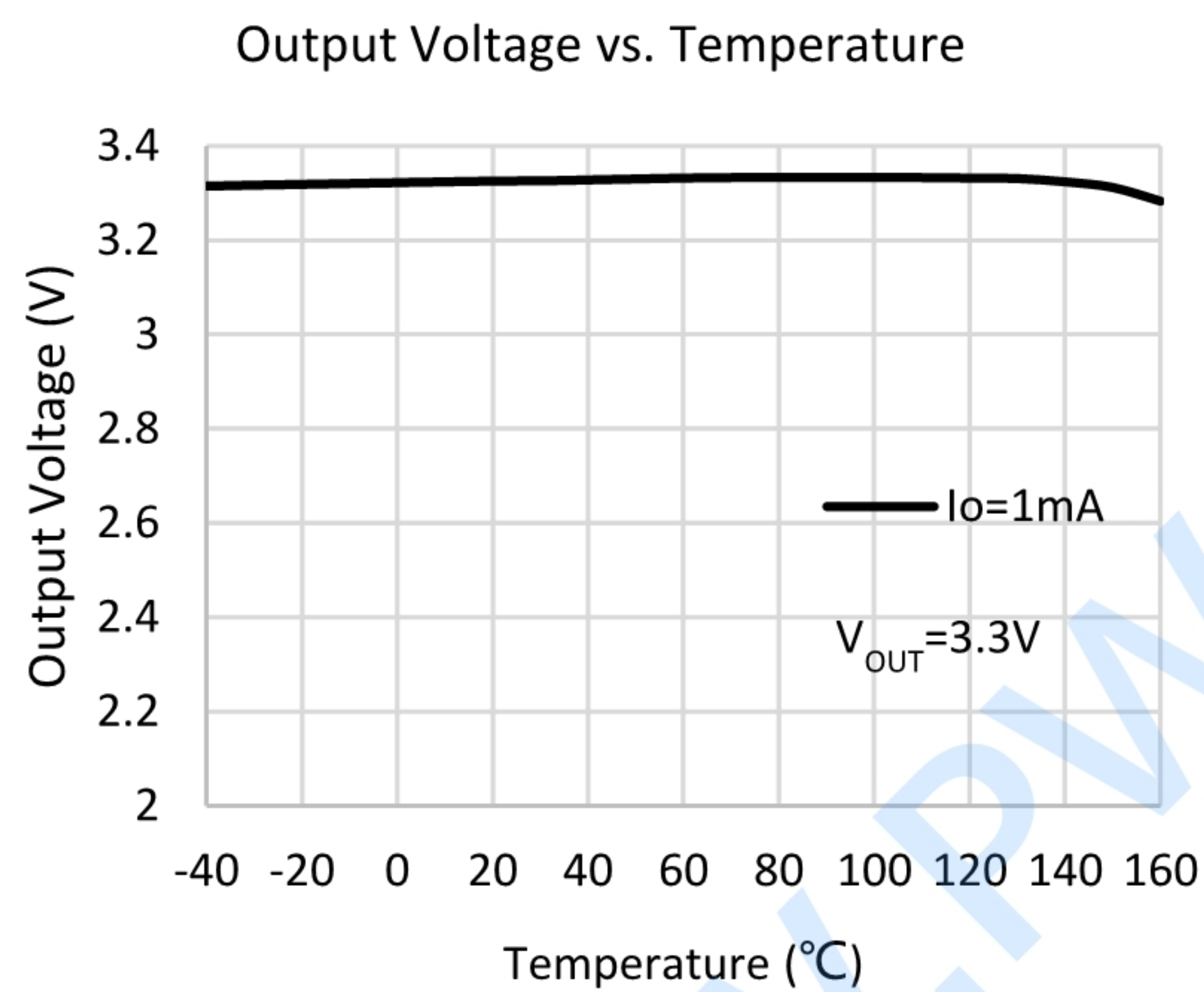
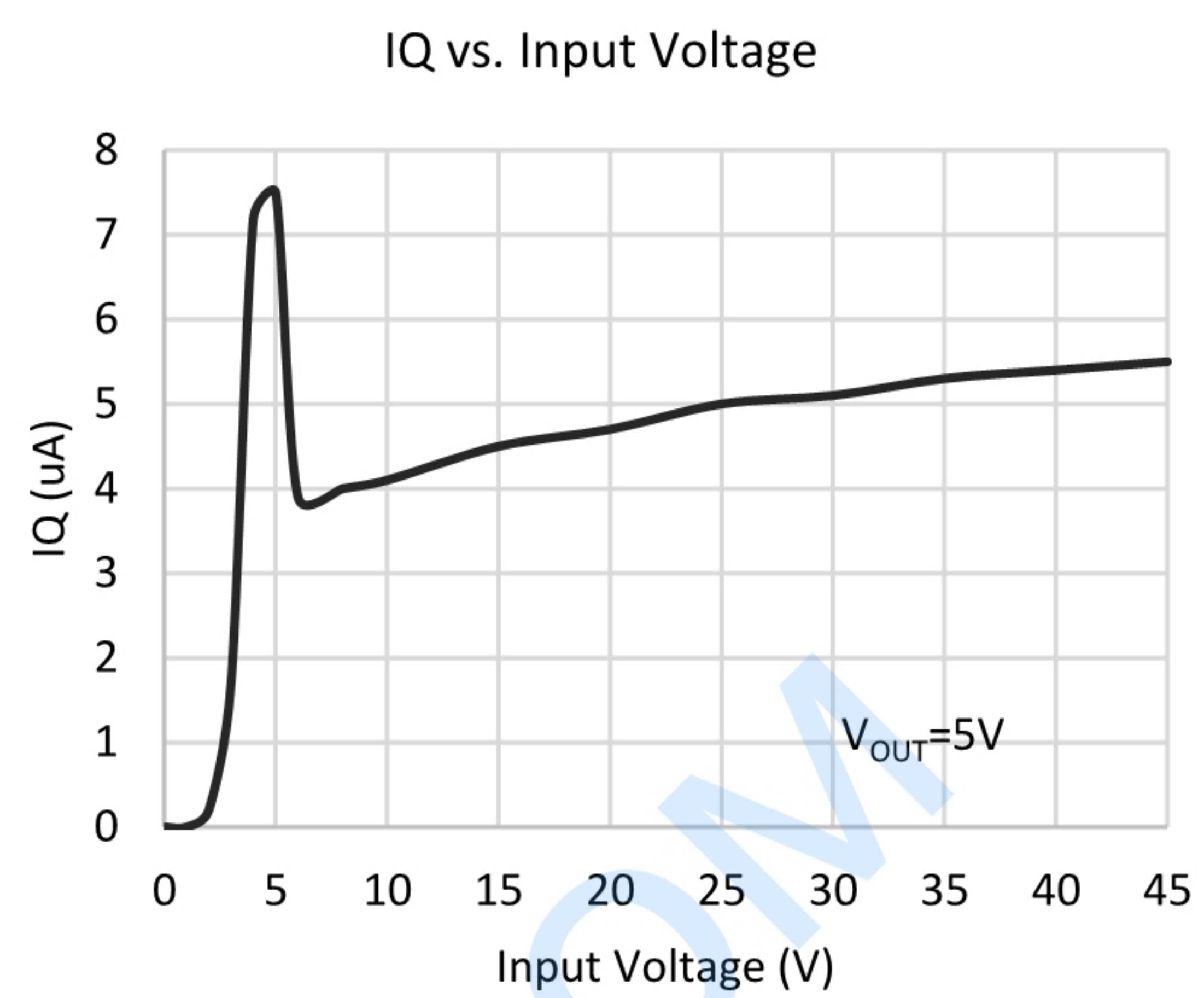
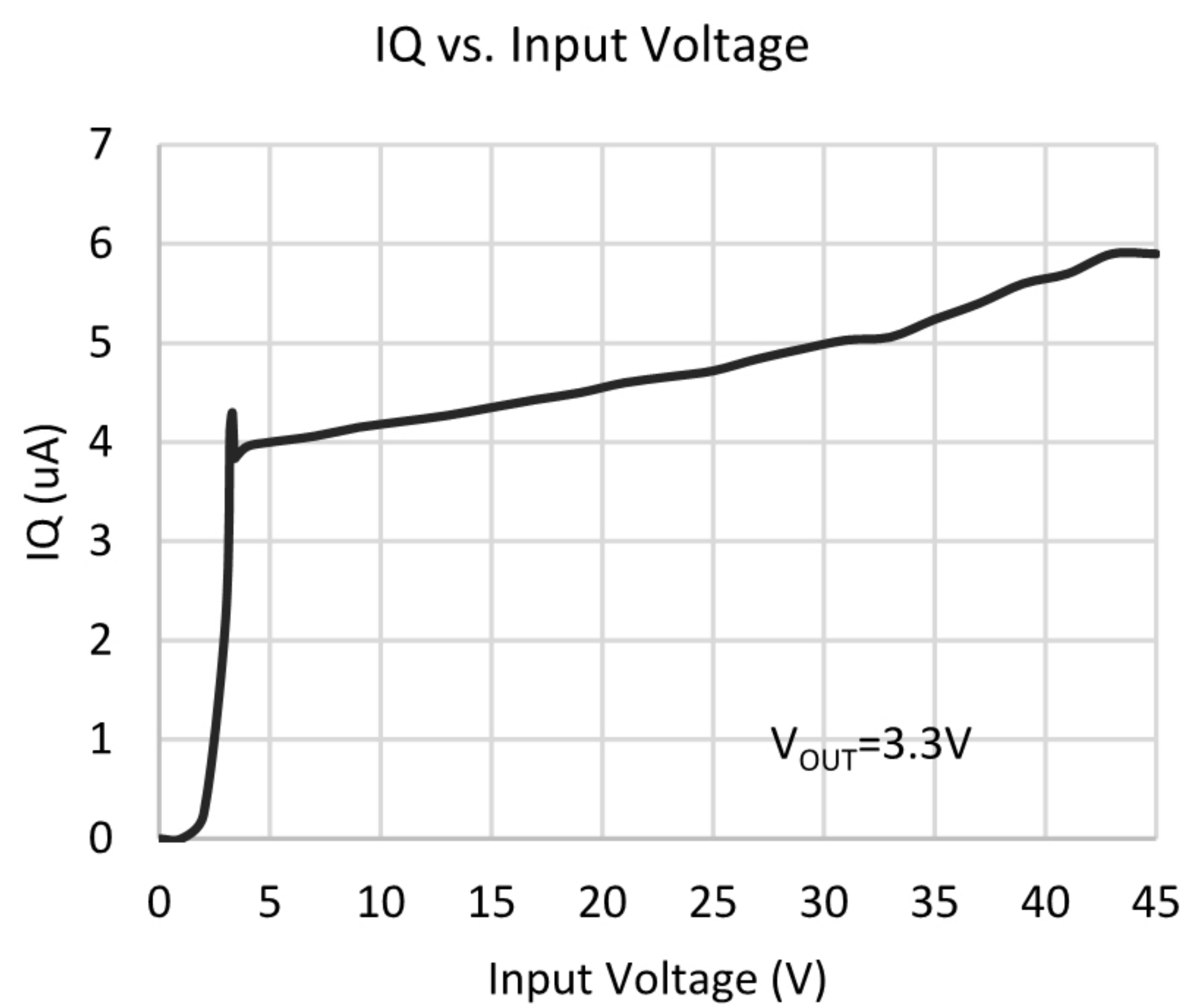
The following specifications apply for $V_{IN} = 12V$, $T_A = 25^{\circ}C$, $C_{IN} = C_{OUT} = 10\mu F$, unless specified otherwise.

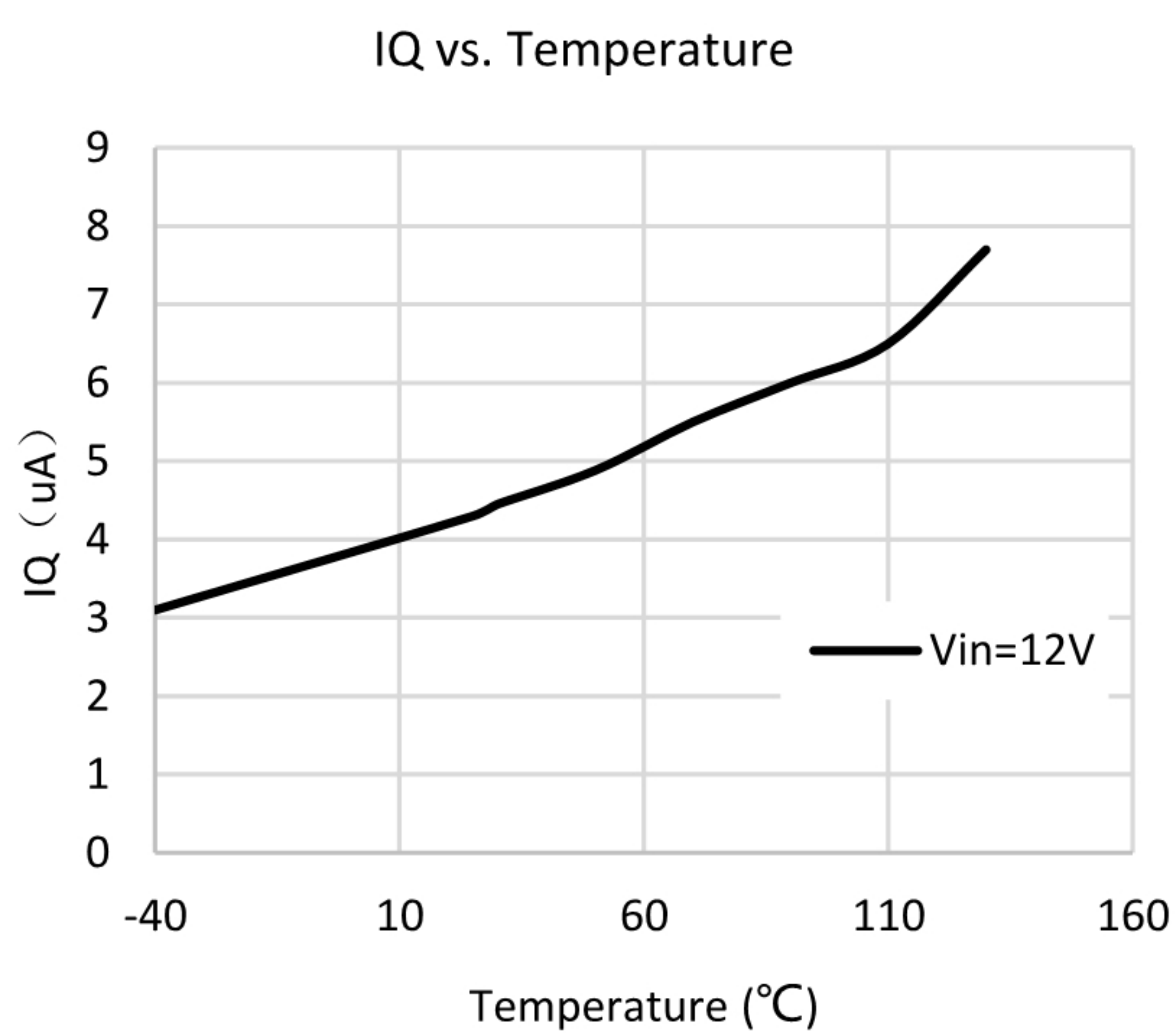
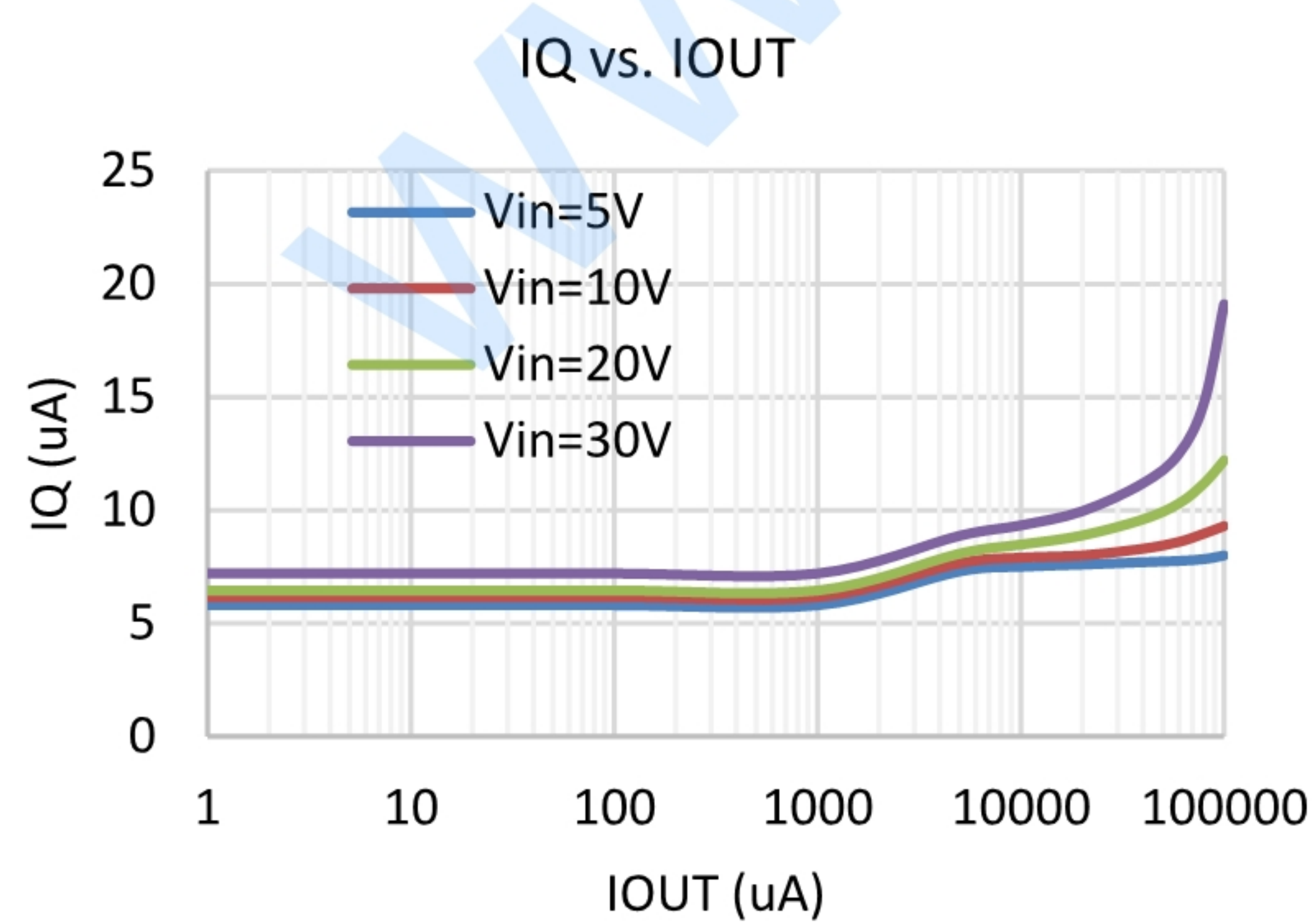
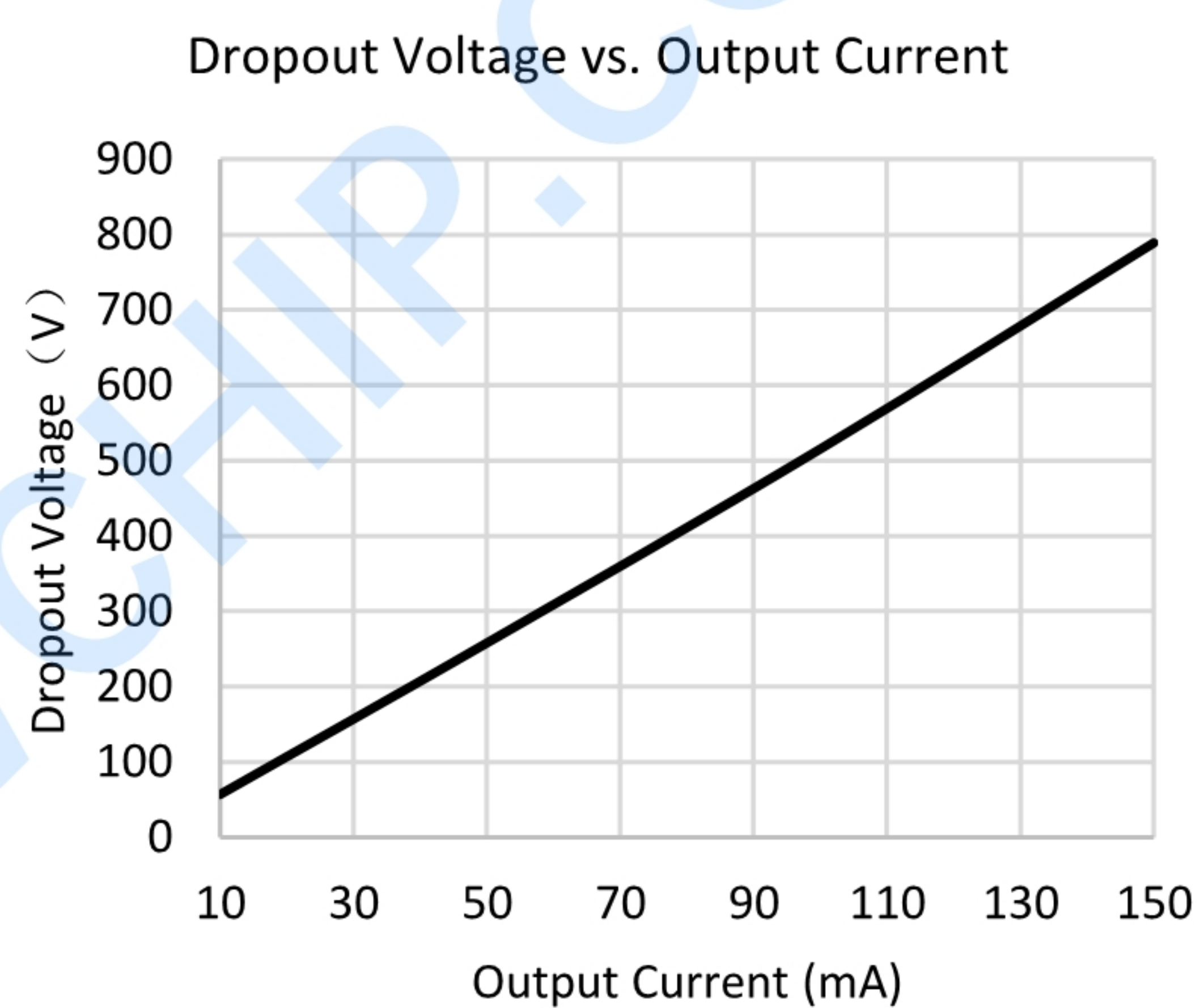
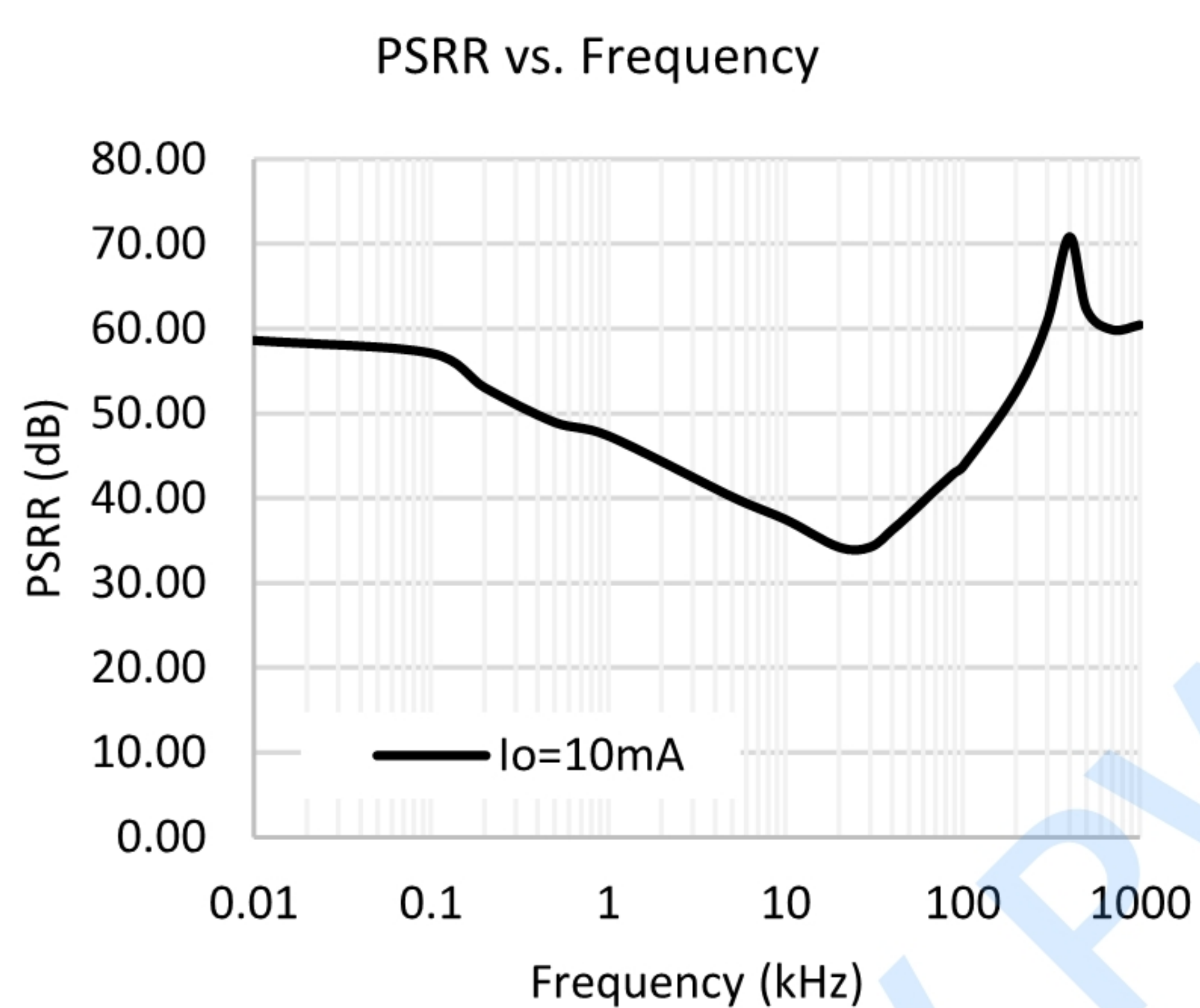
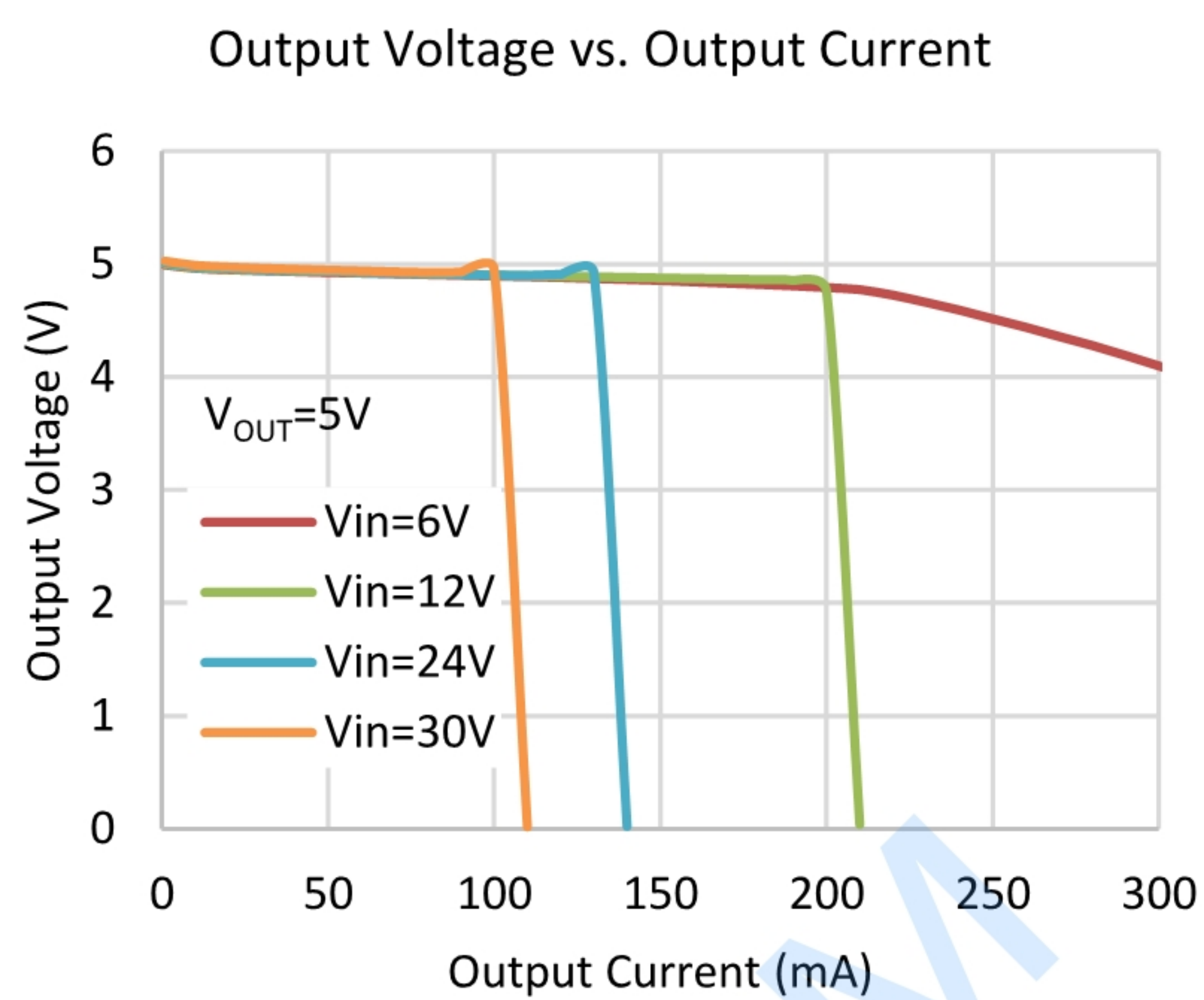
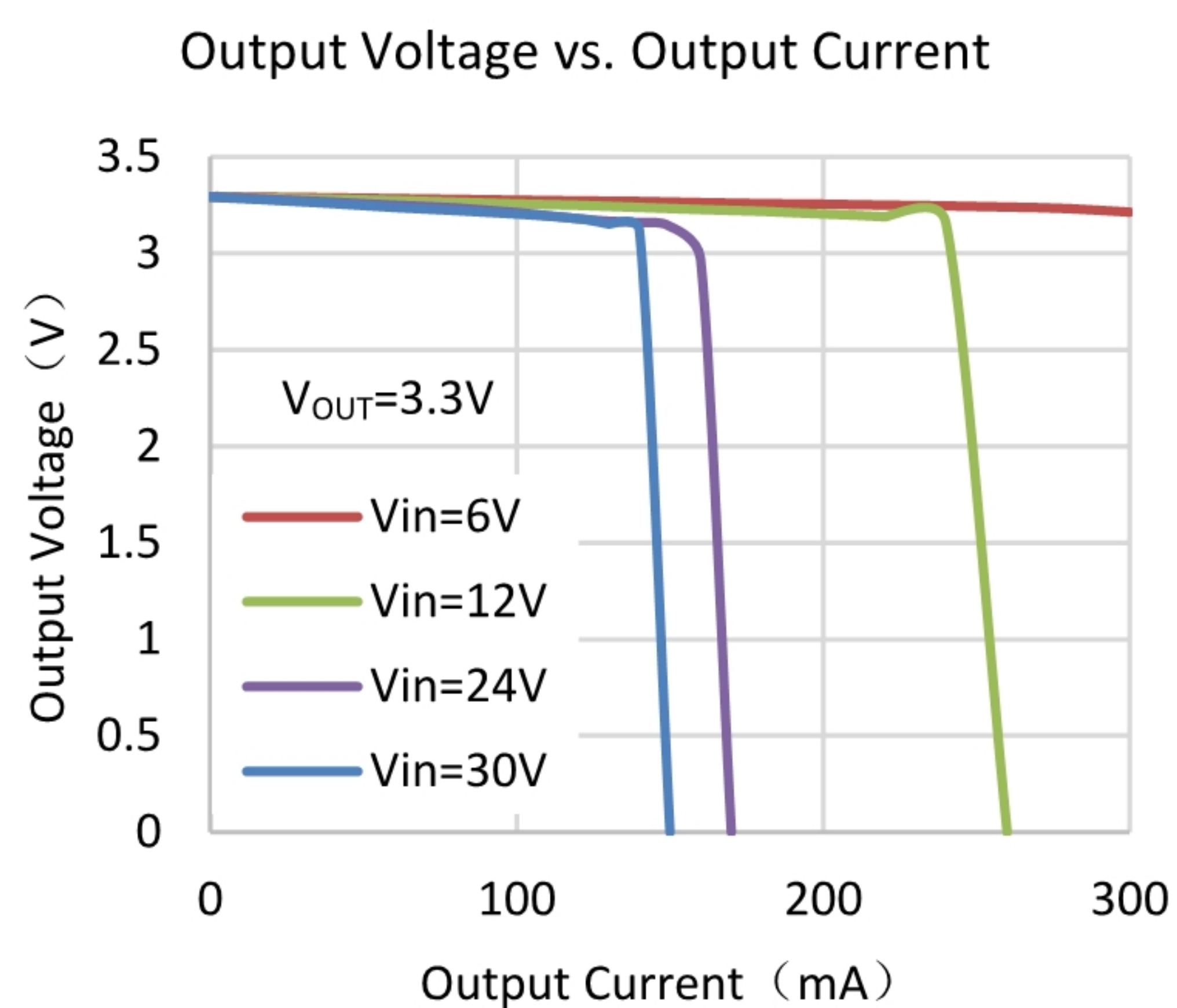
SYMBOL	ITEMS	CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}	Input Range	$I_{OUT} = 10mA$	4.75		40	V
V_{OUT}	Output Range	$I_{OUT} = 10mA$	$V_{OUT} \times 0.98$	V_{OUT}	$V_{OUT} \times 1.02$	V
ΔV_{OUT}	Output Voltage	$V_{IN} = 12V, I_{OUT} = 10mA$	4.9	5	5.1	V
			3.234	3.3	3.366	V
			2.94	3.0	3.06	V
I_Q	Quiescent Current	$V_{IN} = 7V, I_{OUT} = 0$		4	6	μA
		$V_{IN} = 24V, I_{OUT} = 0$		4.6	6.7	μA
		$V_{IN} = 40V, I_{OUT} = 0$		5.4	8.2	μA
I_{OUT_PK}	Maximum Output Current	$V_{IN} - V_{OUT} = 4V$, $R_L = 1\Omega$		500	550	mA
V_{DROP}	Dropout Voltage	$I_{OUT} = 10mA$		60	90	mV
		$I_{OUT} = 100mA$		600	900	mV
ΔV_{LINE}	Line Regulation	$V_{IN} = 7 \sim 24V, V_{OUT} = 5V, I_{OUT} = 1mA$		0.02	0.03	%/V
		$V_{IN} = 7 \sim 45V, V_{OUT} = 5V, I_{OUT} = 1mA$		0.08	0.1	%/V
ΔV_{LOAD}	Load Regulation	$V_{IN} = 7V, I_{OUT} = 1 \sim 100mA$		19	37	mV
I_{SHORT}	Short Current	V_{OUT} Short to GND with 1Ω (1ms pulse), $V_{IN} = 12V$		180		mA
PSRR	Power Supply Rejection Rate	$V_{IN} = 10V$, $V_{PP} = 0.5V$, $I_{OUT} = 1mA$	$F = 100Hz$	60		dB
			$F = 1kHz$	50		dB
			$F = 10kHz$	40		dB
e_{NO}	Output Noise Voltage	10Hz to 100kHz, $C_{OUT} = 10\mu F, I_{OUT} = 10mA$		± 100		μV_{RMS}
T_{SD}	Thermal Shutdown Protection	$V_{IN} = 12V, I_{OUT} = 1mA$		165		$^{\circ}C$
$\Delta V_O / \Delta T$	Temperature Coefficient			± 0.5		mV/ $^{\circ}C$



TYPICAL PERFORMANCE CHARACTERISTICS

$C_{IN} = 10\mu F$, $C_{OUT} = 10\mu F$, $T_{OPT} = 25^{\circ}C$, unless specified otherwise. (SOT89-3 Package)





APPLICATION INFORMATION

INPUT CAPACITOR

An input capacitor of 10 μ F is required between the VIN and GND pin. The capacitor shall be placed as close as possible to VIN pin, and the use of electrolytic capacitors is recommended. The tolerance and temperature coefficient must be considered in order to ensure the capacitor work within the operation range over the full range of temperature and operating conditions.

OUTPUT CAPACITOR

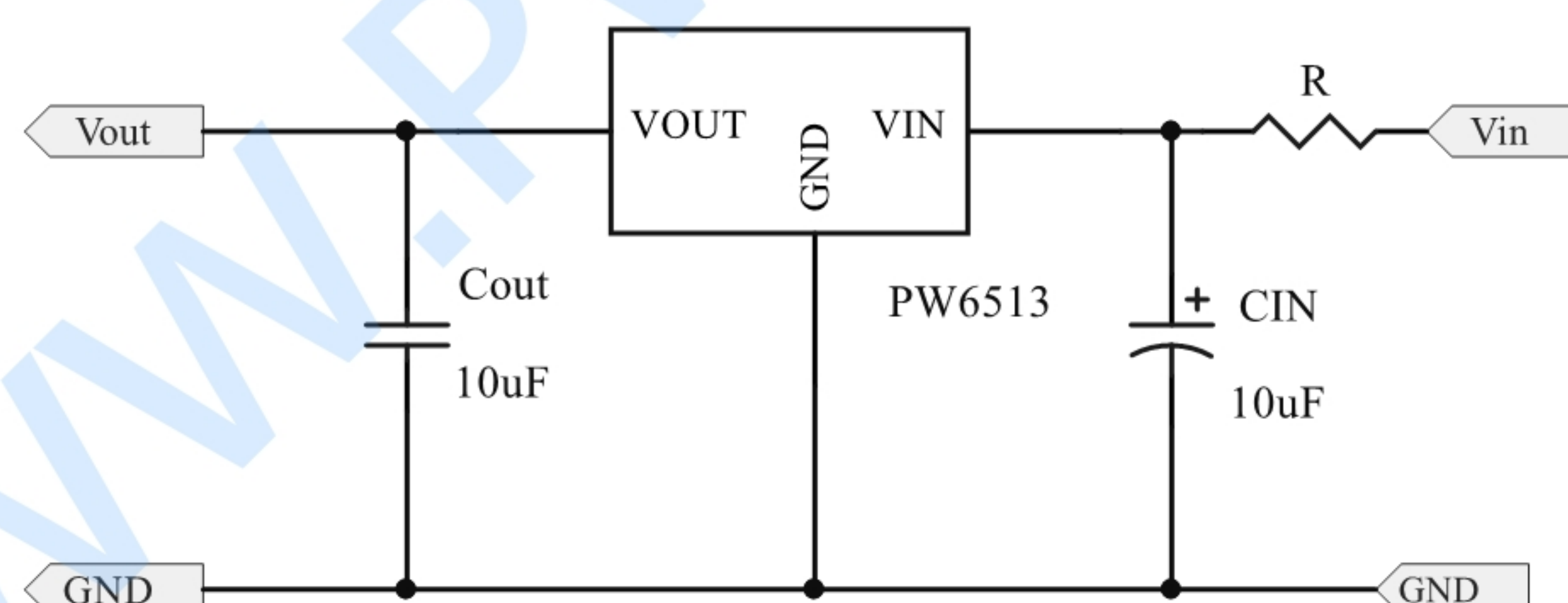
In applications, it is important to select the output capacitor for stable operation. The minimum capacitance for stable and correct operation is 1 μ F. The capacitance tolerance should be $\pm 30\%$ or better over the operation temperature range. The recommended capacitor type is MLCC.

NO-LOAD STABILITY

The PW6513 will remain stable and in regulation with no external load. This is especially important in CMOS RAM keep-alive applications.

TYPICAL CIRCUIT

The following figure shows a typical application circuit for the PW6513 devices. The value of external components shall be chosen carefully, depending on the application. In plugging application, because the overshoot caused by the insertion and withdrawal of power on the chip may damage the chip, it is recommended that VIN be less than 30V and the input voltage spike should not exceed 45V.



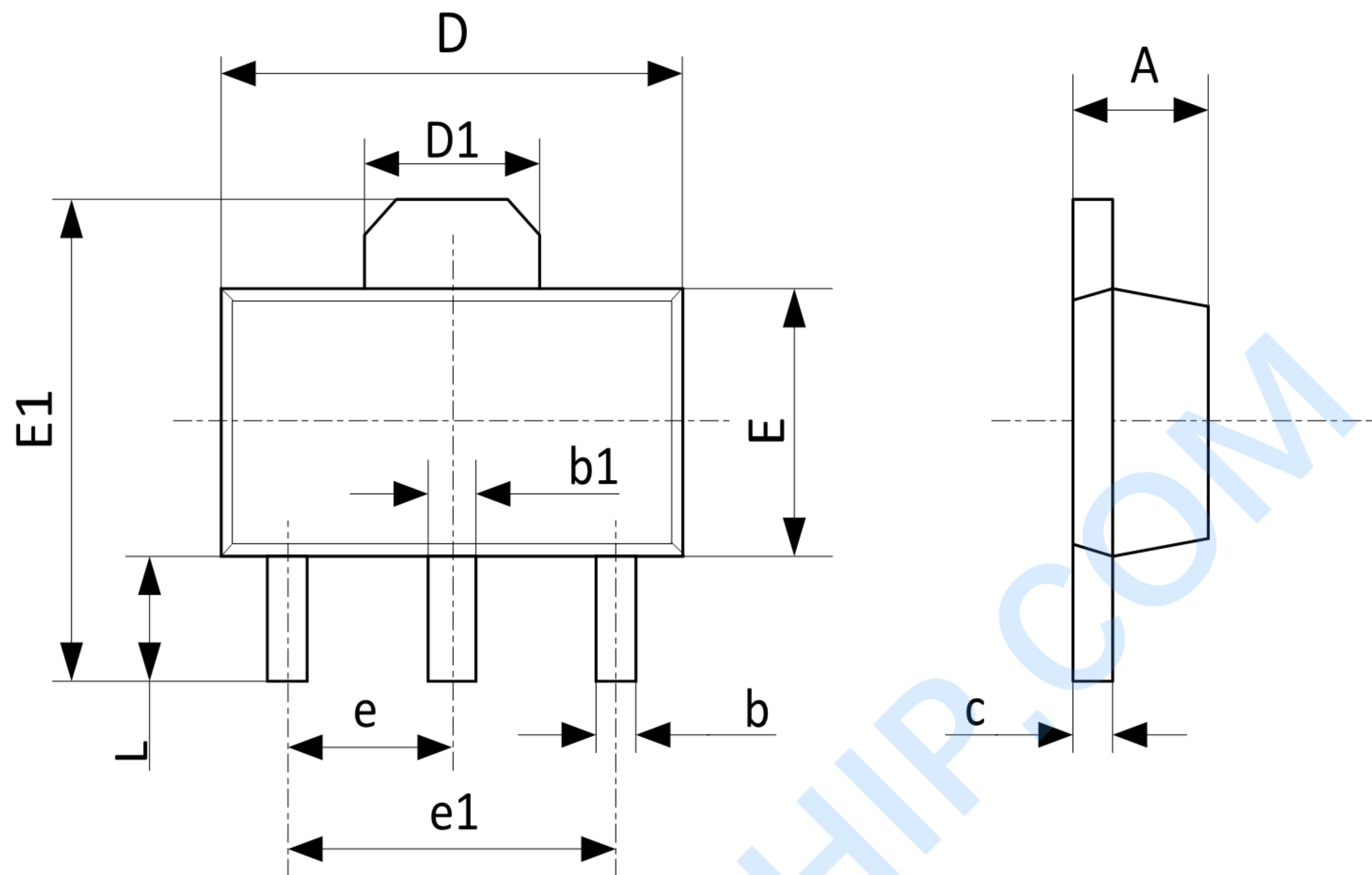
In plugging application, it is suggested that R, C1 are selected as following:

1. C1=10 μ F ~ 100 μ F electrolytic capacitor with maximum voltage greater than 50V, R=0;
2. C1=1 μ F ~ 10 μ F MLCC with maximum voltage greater than 50V and R=2 Ω in the type of 1206 - the resistor shall be carefully chosen to make sure enough margin to sustain the surge current during plugging.



PACKAGE DESCRIPTION

SOT89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.45	1.65	0.057	0.065
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047



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