ET631XX - Ultra-Low IQ 150mA LDO

General Description

The ET631XX series of CMOS low dropout regulators are designed specifically for portable battery-powered applications which require ultra-low quiescent current. The ultra-low consumption of type 0.6uA ensures long battery life and dynamic transient boost feature improves device transient response for wireless communication applications.

The device is available in small 1×1mm DFN4 or SOT23-5 packages.

Features

- Operating Input Voltage Range From 2.2V to 5.5V
- Output Voltage Range From 1.1V to 3.6V (0.05V Steps)
- Ultra-Low Quiescent Current Typical 0.6uA
- Low Dropout is Typical 240mV at 150mA@V_{OUT}=1.8V
- High Output Voltage Accuracy ±1%
- Stable with Ceramic Capacitors 1uF
- Over-Current Protection
- Thermal Shutdown Protection
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant
- Package Information:

Part No.	Package	MSL
ET631XXYB	DFN4 (1×1)	Level 1
ET631XXB	SOT23-5	Level 3

Applications

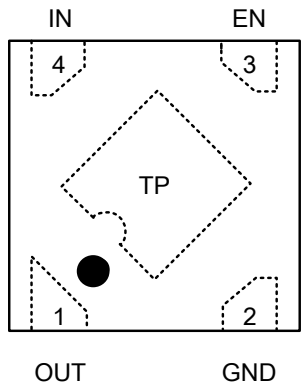
- Battery Powered Equipments
- Portable Communication Equipments
- Cameras, Image Sensors and Camcorders
- Label Information

Device Information

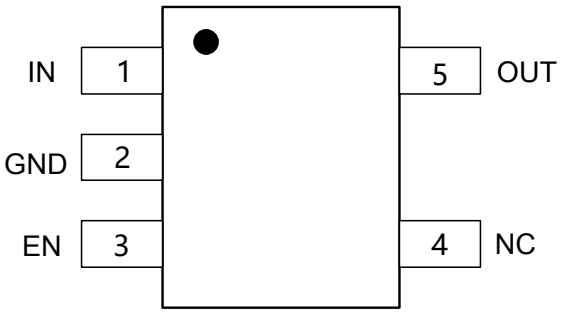
ET 631 XX X B

XX Output Voltage		**X** Package		**B** Auto-Discharging Function	
Fixed	1.1~3.6V (0.05V Steps)	/	SOT23-5	B	With Auto-discharge
		Y	DFN4(1×1)		

Pin Configuration



DFN4 (Top View)

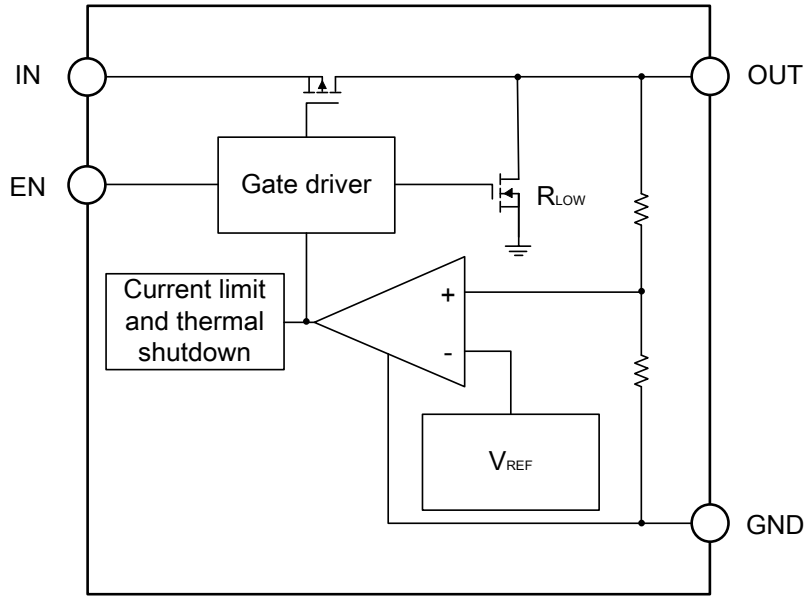


SOT23-5 (Top View)

Pin Function

Pin NO.		Symbol	Pin Description
DFN4	SOT23-5		
1	5	OUT	Output Pin
2	2	GND	Power Supply Ground
3	3	EN	Chip Enable Pin (Active “H”)
4	1	IN	Power Supply Input Voltage
TP	4	Thermal Pad / NC	Thermal pad for DFN4(1×1) package, connect to GND or leave floating. Do not connect to any potential other than GND. NC for SOT23-5 no connection.

Block Diagram



Functional Description

General

The ET631XX is a high performance 150mA Linear Regulator with Ultra Low I_Q. This device delivers low Noise and high Power Supply Rejection Ratio with excellent dynamic performance due to employing the Dynamic Quiescent Current adjustment which assure ultra low I_Q consumption at no-load state. These parameters make this device very suitable for various battery powered applications.

Input Capacitor

It is recommended to connect at least a 1μF Ceramic X5R or X7R capacitor between IN and GND pins of the device. This capacitor will provide a low impedance path for any unwanted AC signals or Noise superimposed onto constant Input Voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Higher capacitance and lower ESR Capacitors will improve the overall line transient response.

Output Capacitor

The ET631XX does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended.

There is recommended connect the output capacitor as close as possible to the output pin of the regulator.

ON/OFF Input Operation

The ET631XX uses the EN pin to enable /disable its device and to activate /deactivate the active discharge function at devices with this feature. If the EN pin voltage is pulled below 0.4V the device is guaranteed to be disable. The active discharge transistor at the devices with Active Discharge Feature is activated and the output voltage VOUT is pulled to GND through an internal circuitry with effective resistance about 45Ω.

If the EN pin voltage is higher than 1.2V the device is guaranteed to be enabled. The internal active discharge circuitry is switched off and the desired output voltage is available at output pin. In case the Enable function is not required the EN pin should be connected directly to input pin.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to approximately 300mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal shutdown Protection

When the die temperature exceeds the Thermal Shutdown point (TSD = 155°C typical) the device goes to disabled state and the output voltage is not delivered until the die temperature decreases to 150°C. The Thermal Shutdown feature provides a protection from a catastrophic device failure at accidental overheating. This protection is not intended to be used as a substitute for proper heat sinking.

Power Dissipation and Heat sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the ET631XX device can handle is given by:

$$P_{D(MAX)} = \frac{\left[T_{J(MAX)} - T_A\right]}{R_{\theta JA}} \qquad \text{(eq. 1)}$$

Absolute Maximum Ratings

Symbol	Parameters (Items)	Value	Unit
V_{IN}	IN Voltage[(1)]	-0.3 to 6.0	V
V_{EN}	Input Voltage (EN Pin)	-0.3 to 6.0	V
V_{OUT}	Output Voltage	-0.3 to V_{IN}+0.3	V
T_J	Operating Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-55 to 150	°C
V_{ESD}	Human Body Model (JESD22-A114)	±4000	V
	Charged Device Model (JESD22-C101)	±1500	
I_{LU}	Latch up Current Maximum Rating (JESD78E)	±200	mA

Note1: Refer to ELECTRICAL CHARACTERISTIS and APPLICATION INFORMATION for safe operating area.

Thermal Characteristics

Symbol	Package	Parameters	Value	Unit
$R_{\theta JA}$	DFN4	Thermal Resistance, Junction-to-Air	312	°C/W
	SOT23-5		312	
P_{DMAX}	DFN4	Power Dissipation	400	mW
	SOT23-5		400	

Recommended Operating Conditions

Symbol	Parameters	Rating	Unit
V_{IN}	Input Voltage	2.2 to 5.5	V
I_{OUT}	Output Current	0 to 150	mA
T_A	Operating Ambient Temperature	-40 to 85	ºC
C_{IN}	Effective Input Ceramic Capacitor Value	0.47 to 4.7	μF
C_{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 4.7	μF
ESR	Input and Output Capacitor Equivalent Series Resistance (ESR)	5 to 100	mΩ

Electrical Characteristics

VOLTAGE VERSION 1.1V

(V_{IN}=2.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) (2)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	1.085	1.1	1.115	V
		-40°C≤T_A≤85°C	1.070	1.1	1.130	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=2.5V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=2.5V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA (3) (5)			1100	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.5V+200mVVpp Modulation, I_{OUT}=150mA(4)		55		dB
e_N	Output Noise	V_{IN}=2.5V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF(4)		55		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising(4)		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown(4)		25		°C

VOLTAGE VERSION 1.2V

(V_{IN}=2.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) (2)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	1.185	1.2	1.215	V
		-40°C≤T_A≤85°C	1.170	1.2	1.230	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=2.5V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=2.5V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA (3) (5)			1000	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.5V+200mVVpp Modulation, I_{OUT}=150mA(4)		55		dB
e_N	Output Noise	V_{IN}=2.5V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF(4)		55		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising(4)		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown(4)		25		°C

VOLTAGE VERSION 1.5V

(V_{IN}=2.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) (2)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	1.485	1.5	1.515	V
		-40°C≤T_A≤85°C	1.470	1.5	1.530	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=2.5V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=2.5V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA (3) (5)			700	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.5V+200mVVpp Modulation, I_{OUT}=150mA(4)		55		dB
e_N	Output Noise	V_{IN}=2.5V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF(4)		60		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising(4)		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown(4)		25		°C

VOLTAGE VERSION 1.8V

(V_{IN}=2.8V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) [2]

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	1.782	1.8	1.818	V
		-40°C≤T_A≤85°C	1.764	1.8	1.836	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=2.8V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=2.8V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA [3]		240	340	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=2.8V+200mVVpp Modulation, I_{OUT}=150mA[4]		55		dB
e_N	Output Noise	V_{IN}=2.8V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF[4]		70		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising[4]		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown[4]		20		°C

VOLTAGE VERSION 2.5V

(V_{IN}=3.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) (2)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	2.475	2.5	2.525	V
		-40°C≤T_A≤85°C	2.450	2.5	2.550	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=3.5V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=3.5V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA (3)		180	280	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=3.5V+200mVVpp Modulation, I_{OUT}=150mA(4)		45		dB
e_N	Output Noise	V_{IN}=3.5V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF(4)		85		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising(4)		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown(4)		20		°C

VOLTAGE VERSION 2.8V

(V_{IN}=3.8V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) [2]

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	2.772	2.8	2.828	V
		-40°C≤T_A≤85°C	2.744	2.8	2.856	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=3.8V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=3.8V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA [3]		170	270	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=3.8V+200mVVpp Modulation, I_{OUT}=150mA[4]		45		dB
e_N	Output Noise	V_{IN}=3.8V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF[4]		90		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising[4]		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown[4]		20		°C

VOLTAGE VERSION 3.0V

(V_{IN}=4.0V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) [2]

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	2.970	3.0	3.030	V
		-40°C≤T_A≤85°C	2.940	3.0	3.060	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=4.0V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=4.0V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA [3]		170	270	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=4.0V+200mVVpp Modulation, I_{OUT}=150mA[4]		45		dB
e_N	Output Noise	V_{IN}=4.0V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF[4]		93		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising[4]		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown[4]		20		°C

VOLTAGE VERSION 3.3V

(V_{IN}=4.3V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.) [2]

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.2		5.5	V
V_{OUT}	Regulated Output Voltage	T_A=25°C	3.267	3.3	3.333	V
		-40°C≤T_A≤85°C	3.234	3.3	3.366	
ΔV_{OUT}	Output Voltage Line Regulation	V_{IN}=4.3V to 5.5V, I_{OUT}=1mA		0.05	0.20	%/V
	Output Voltage Load Regulation	I_{OUT} from 1mA to 150mA, V_{IN}=4.3V		5	20	mV
V_{DROP}	Dropout Voltage	I_{OUT}=150mA [3]		160	260	mV
I_{LIMIT}	Current Limit	T_A=25°C	200	400	600	mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V	70	170	270	mA
I_{Q_ON}	Input Quiescent Current	Active mode: V_{EN}=V_{IN} I_{OUT}=0mA		0.6	0.9	μA
I_{Q_OFF}	Input Shutdown Current	V_{EN}=0V, T_A=25°C		0.1	0.5	μA
V_{IH}	EN High Threshold	V_{IN}=2.2V to 5.5V, V_{EN} rising until the output is enabled	1.2			V
V_{IL}	EN Low Threshold	V_{IN}=2.2V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
I_{EN}	EN Pin Input Current	V_{EN}≤V_{IN}≤5.5V		20	200	nA
PSRR	Power Supply Rejection Ratio	f=1kHz, V_{IN}=4.3V+200mVVpp Modulation, I_{OUT}=150mA[4]		45		dB
e_N	Output Noise	V_{IN}=4.3V, f=10Hz to 100kHz, I_{OUT}=1mA, C_{OUT}=1μF[4]		95		μV_{RMS}
R_{LOW}	Output resistance of auto discharge at off state	EN=0V, V_{IN}=4V, I_{OUT}=10mA	15	45	90	Ω
T_{TSD}	Over-temperature Shutdown Threshold	T_J rising[4]		155		°C
T_{HYS}	Over-temperature Shutdown Hysteresis	T_J falling from shutdown[4]		20		°C

Note2: Here V_{IN} means internal circuit can work normal. If V_{IN}<V_{OUT}, Output voltage follow V_{IN} (I_{OUT}=1mA), circuit is safety.

Note3: V_{DROP} FT test method: Test the V_{OUT} voltage at V_{SET}+$V_{DROPMAX}$ with 150mA output current.

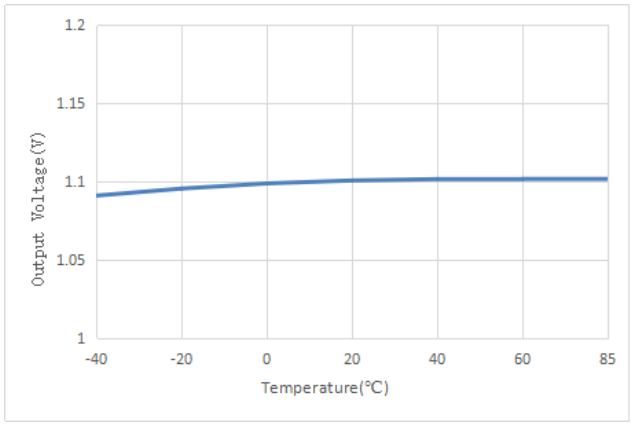
Note4: Guaranteed by design and characterization. Not a FT item.

Note5: The minimum operating voltage is 2.2V. V_{DROP}=$V_{IN(MIN)}$-V_{OUT}.

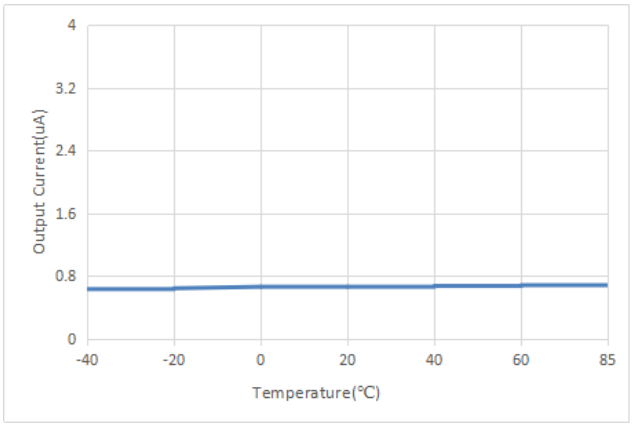
Typical Characteristics

(1) VOLTAGE VERSION 1.1V

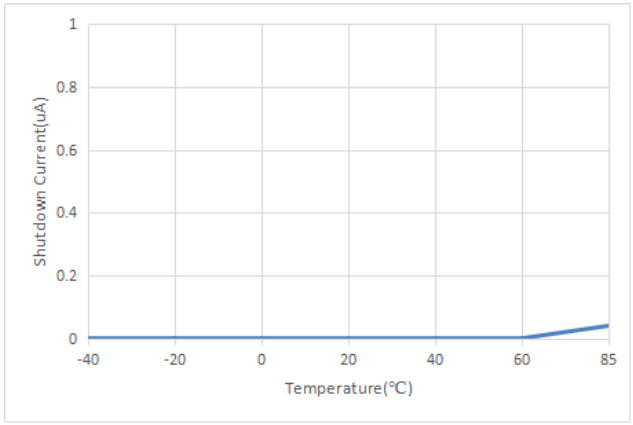
(V_{IN}=2.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



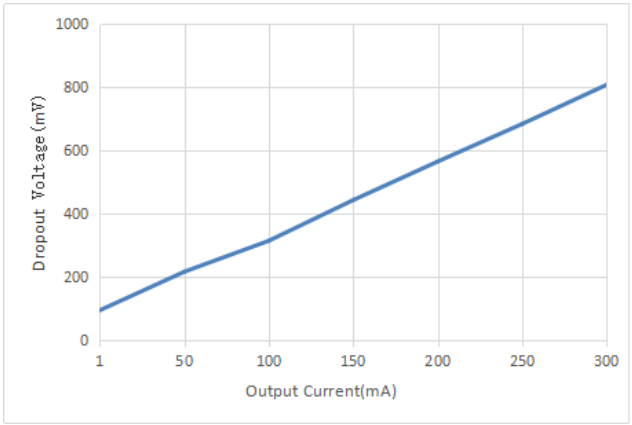
Output Voltage VS Temperature



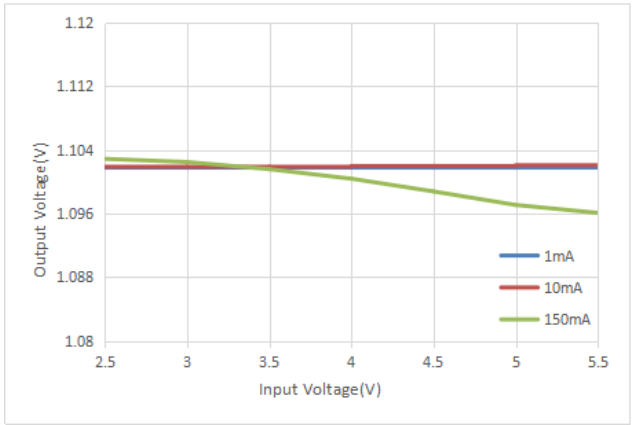
Supply Current VS Temperature



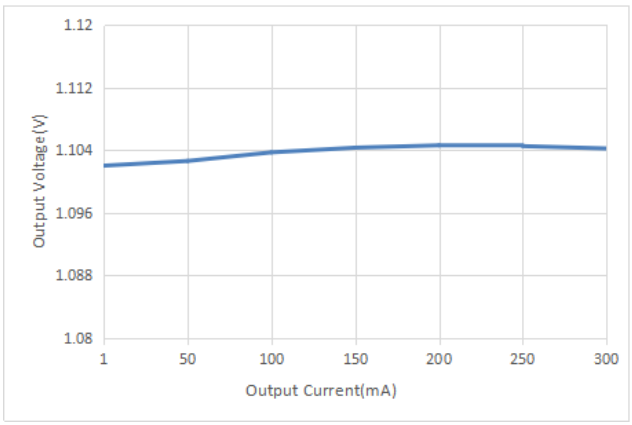
Shutdown Current VS Temperature



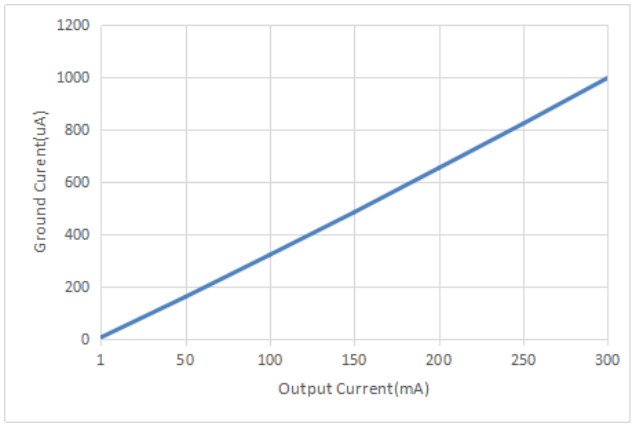
Dropout Voltage VS Output Current



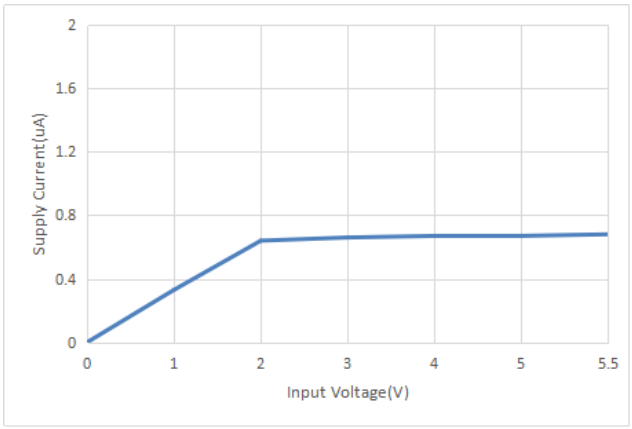
Output Voltage VS Input Voltage



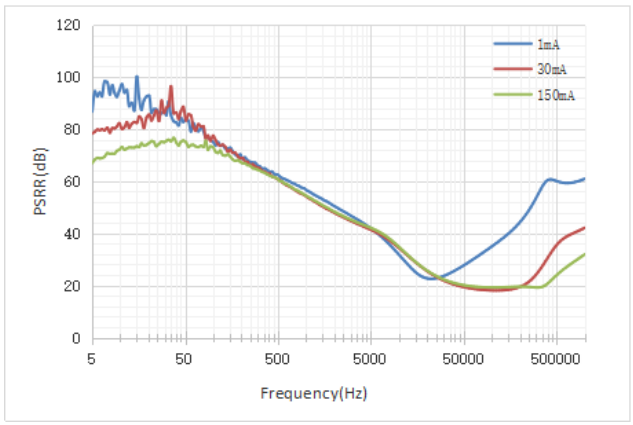
Output Voltage VS Output Current



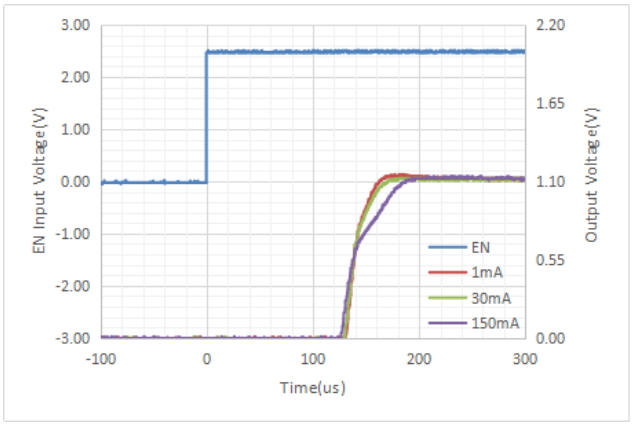
Ground Current VS Output Current



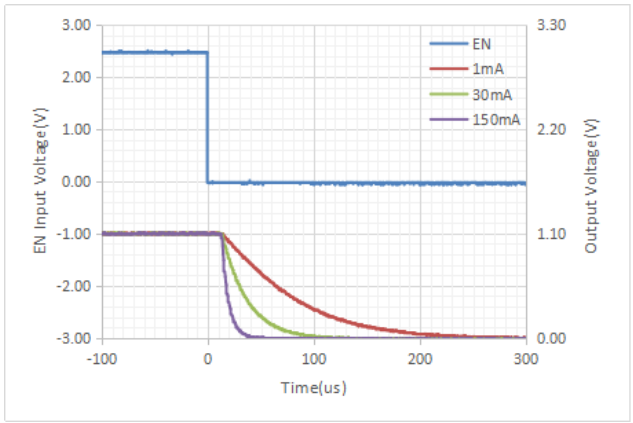
Supply Current VS Input Voltage



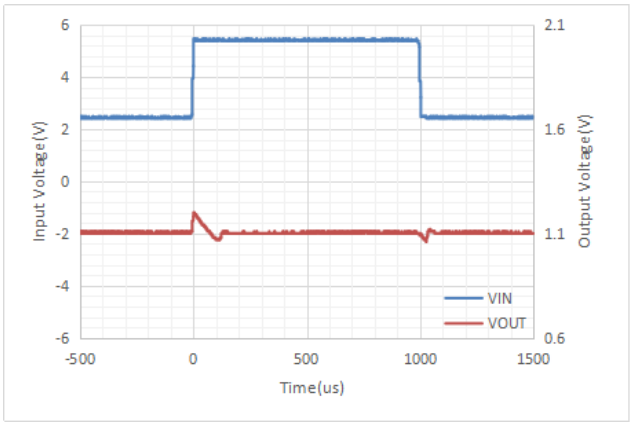
PSRR VS Output Current



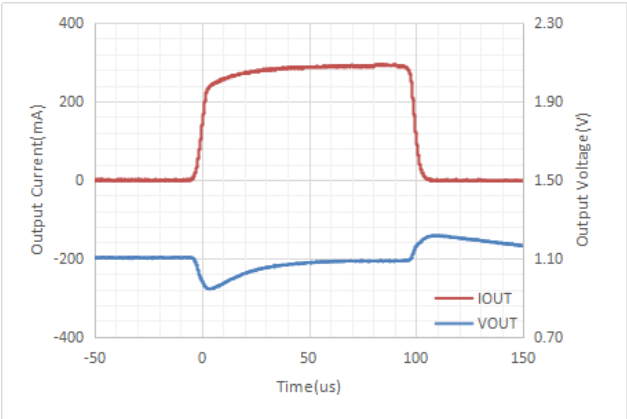
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage



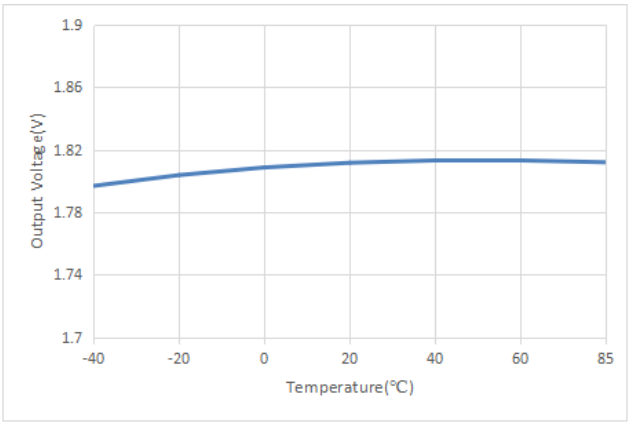
Line Transient Response



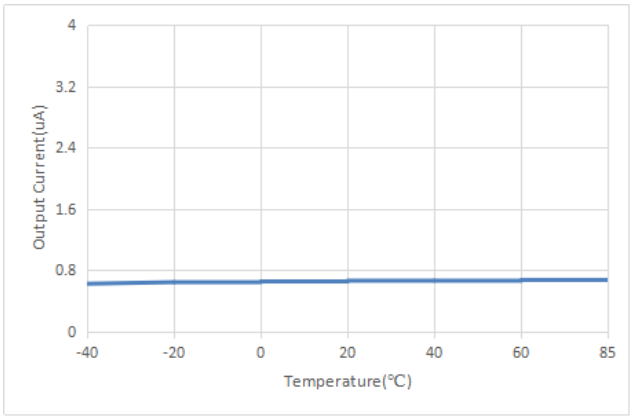
Load Transient Response

(2) VOLTAGE VERSION 1.8V

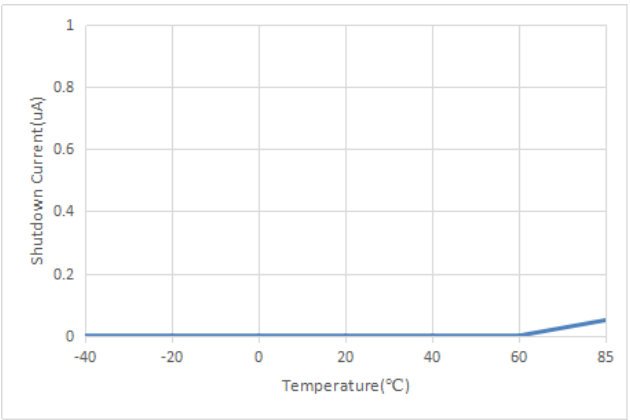
(V_{IN}=2.8V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



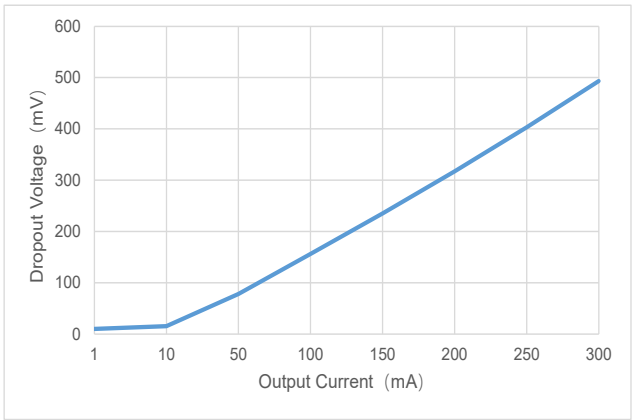
Output Voltage VS Temperature



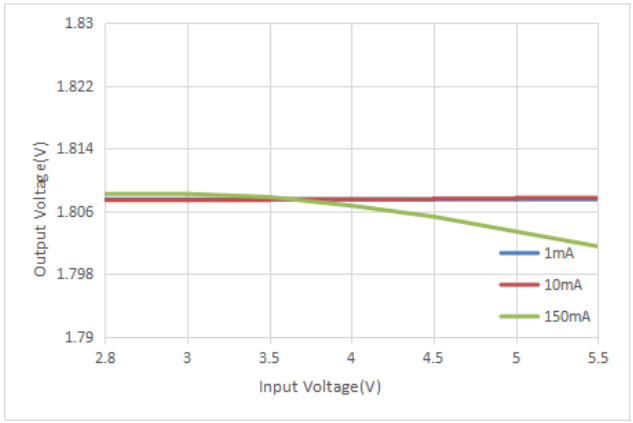
Supply Current VS Temperature



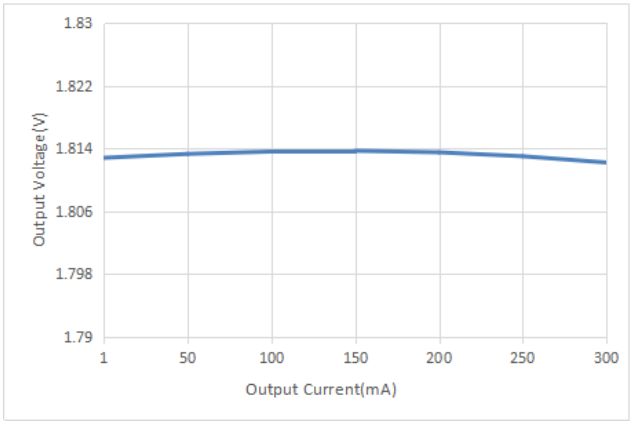
Shutdown Current VS Temperature



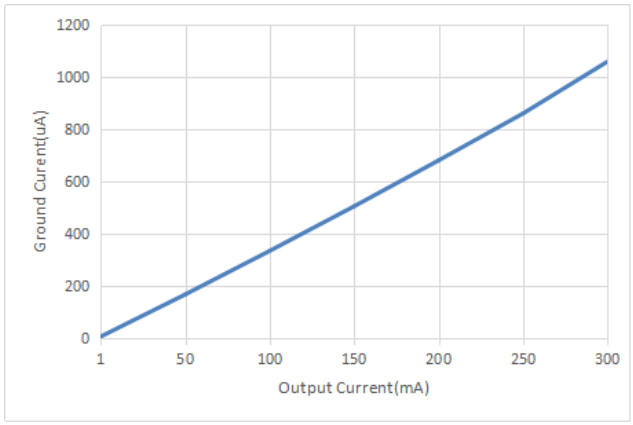
Dropout Voltage VS Output Current



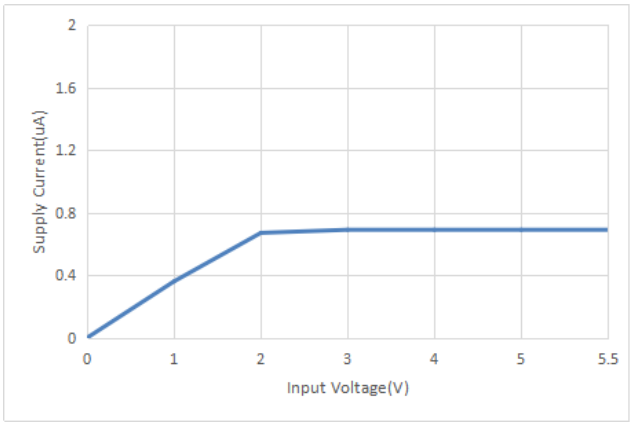
Output Voltage VS Input Voltage



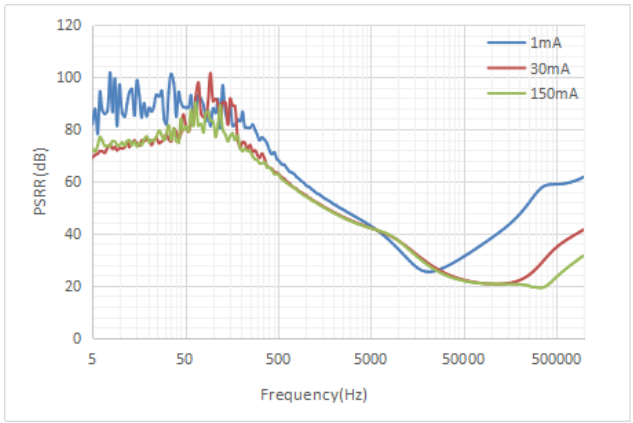
Output Voltage VS Output Current



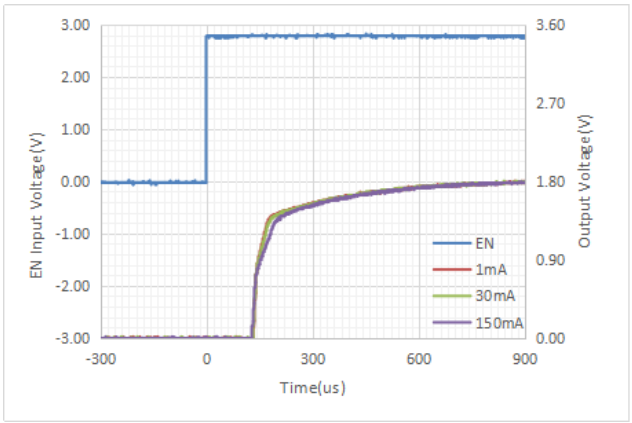
Ground Current VS Output Current



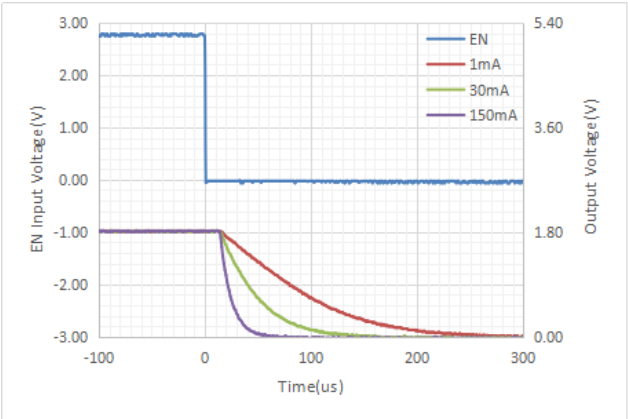
Supply Current VS Input Voltage



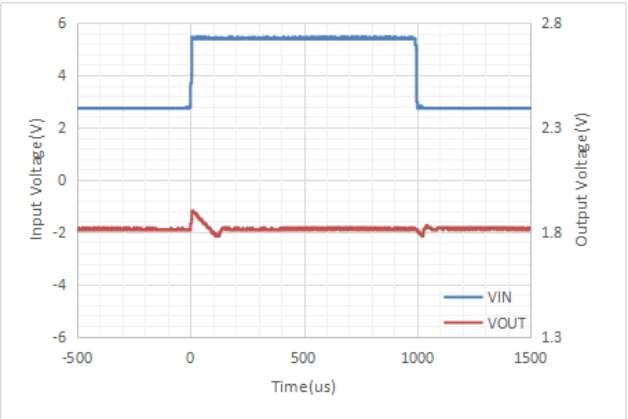
PSRR VS Output Current



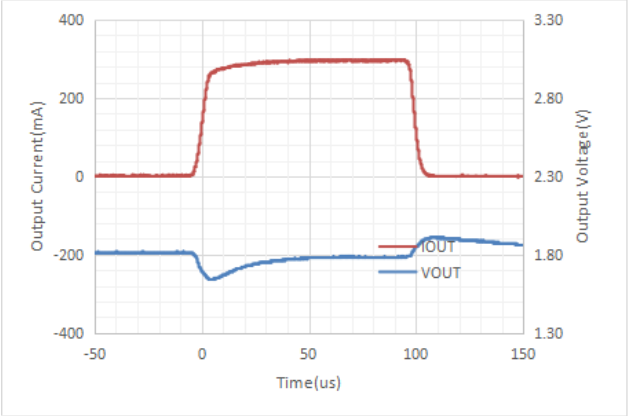
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage



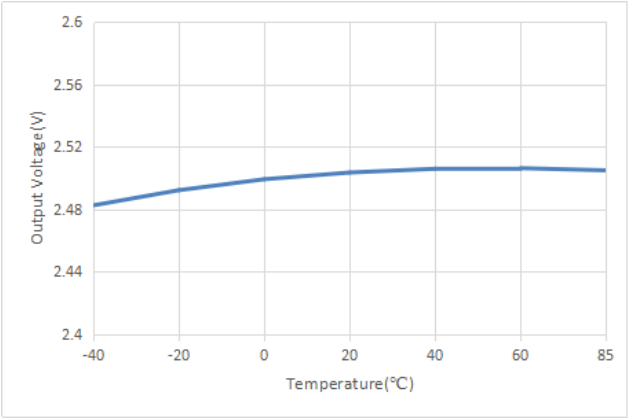
Line Transient Response



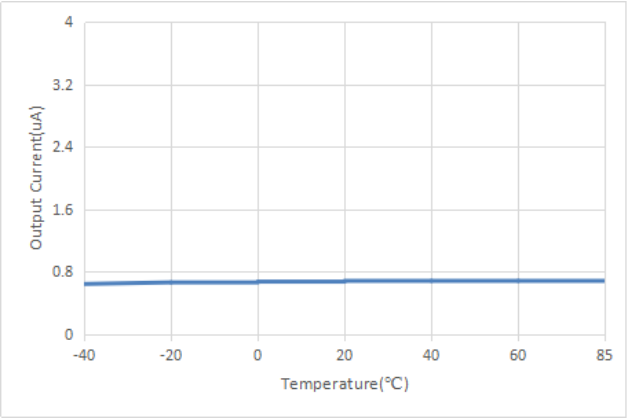
Load Transient Response

(3) VOLTAGE VERSION 2.5V

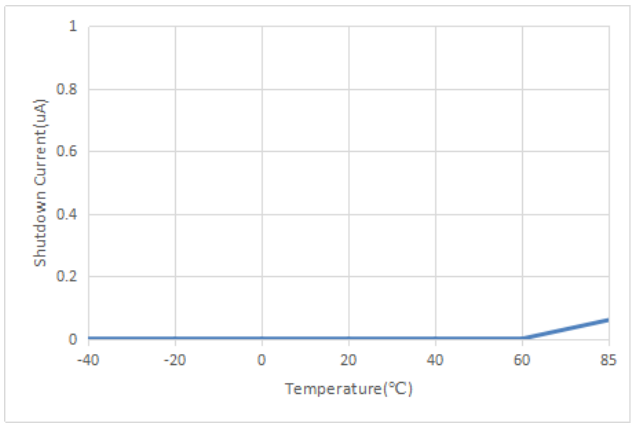
(V_{IN}=3.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



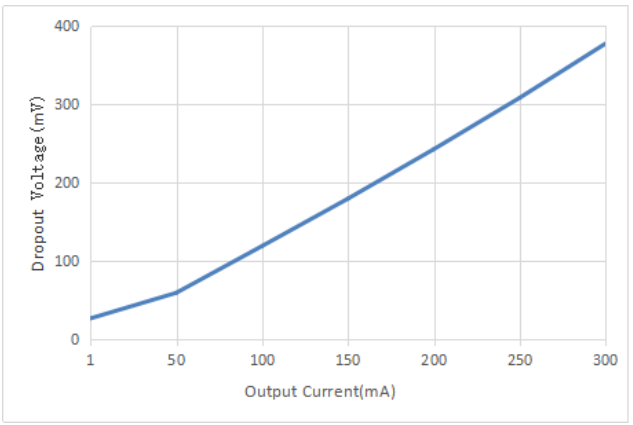
Output Voltage VS Temperature



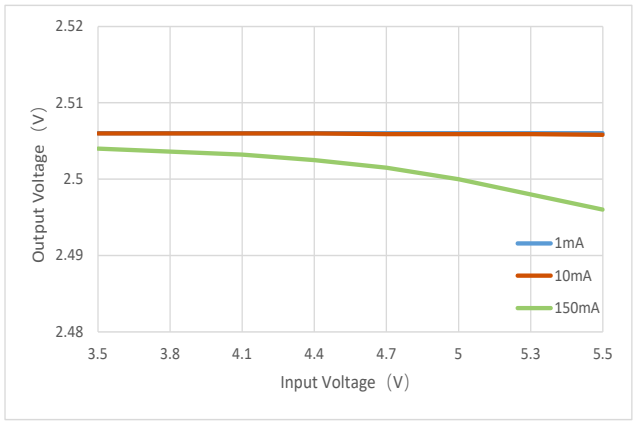
Supply Current VS Temperature



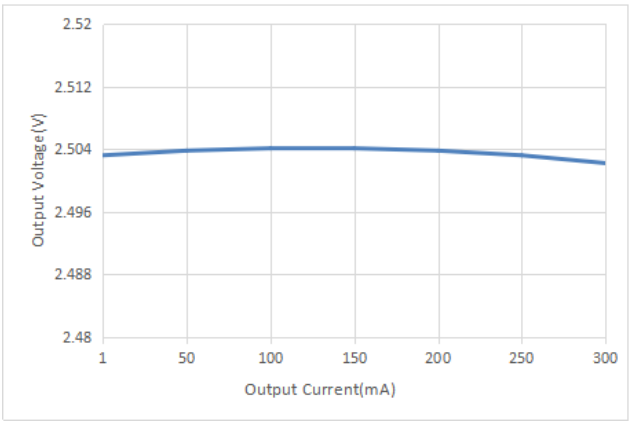
Shutdown Current VS Temperature



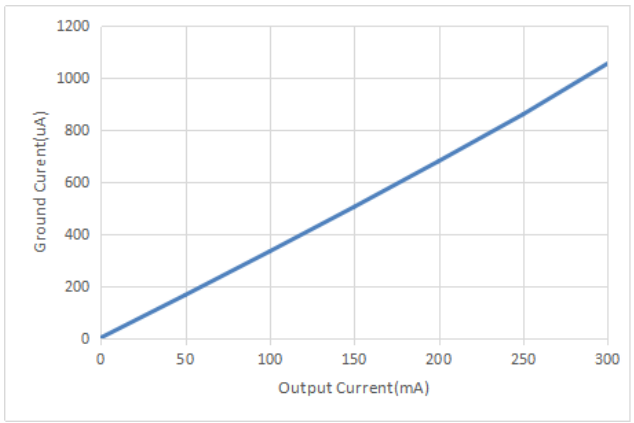
Dropout Voltage VS Output Current



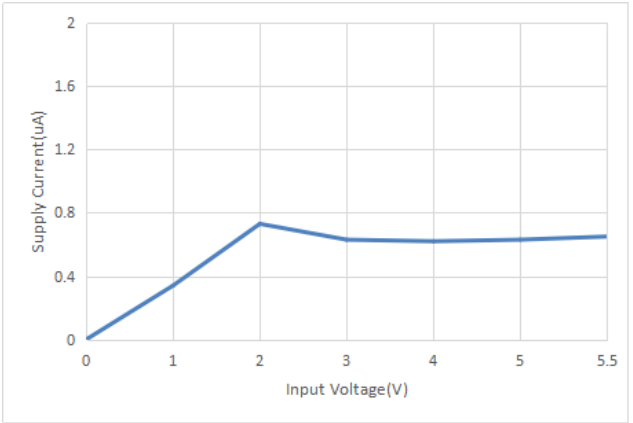
Output Voltage VS Input Voltage



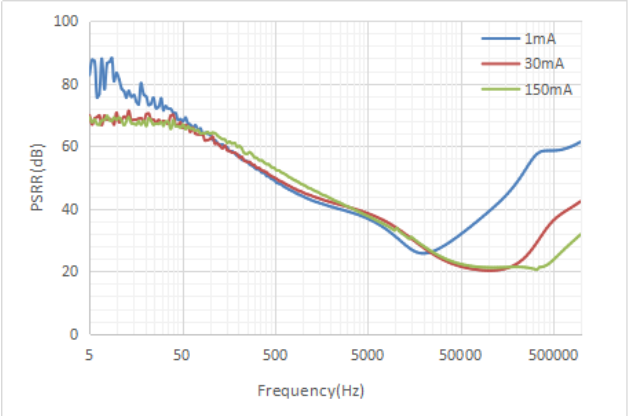
Output Voltage VS Output Current



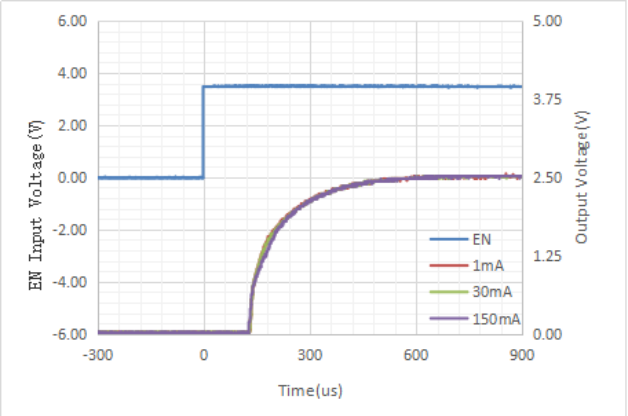
Ground Current VS Output Current



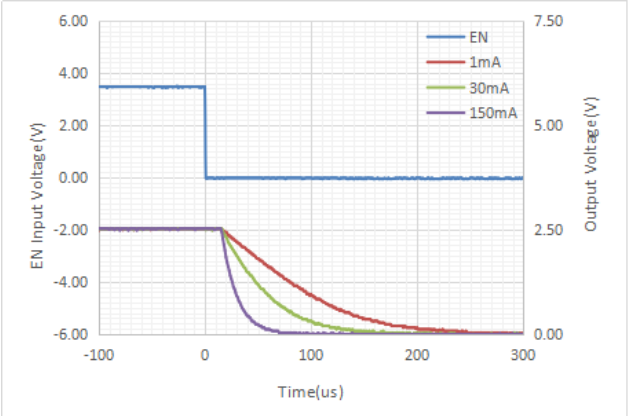
Supply Current VS Input Voltage



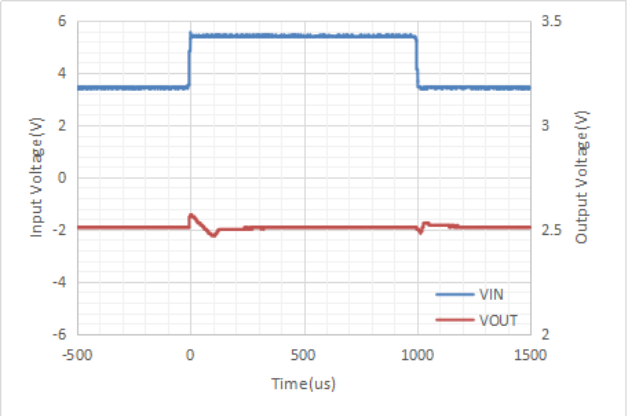
PSRR VS Output Current



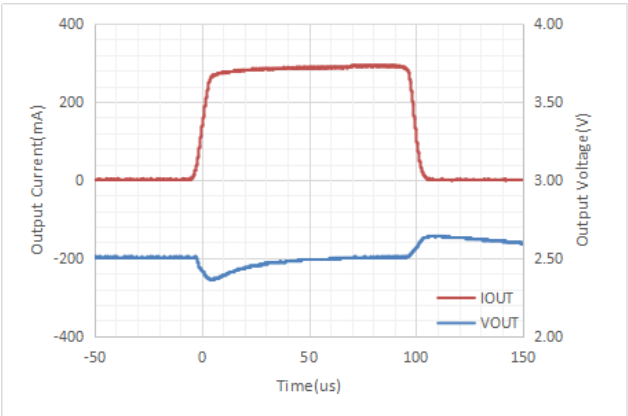
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage



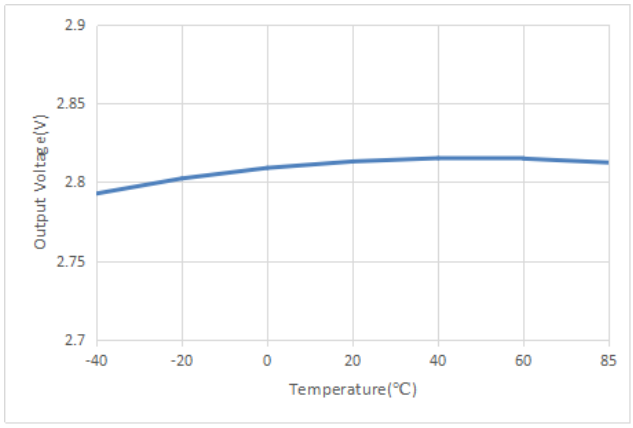
Line Transient Response



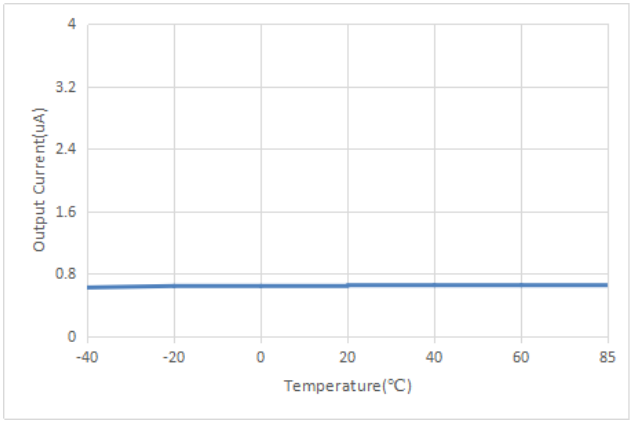
Load Transient Response

(4) VOLTAGE VERSION 2.8V

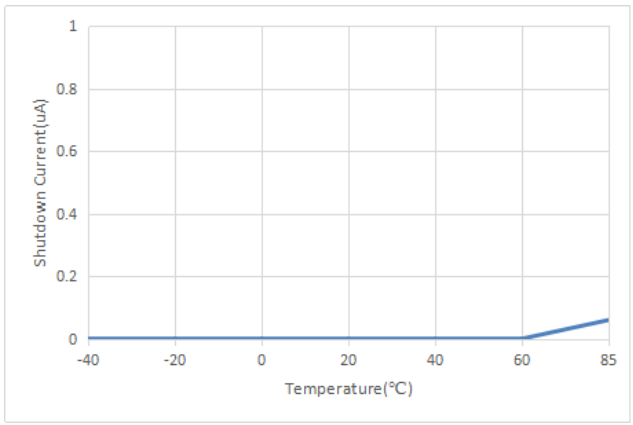
(V_{IN}=3.8V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



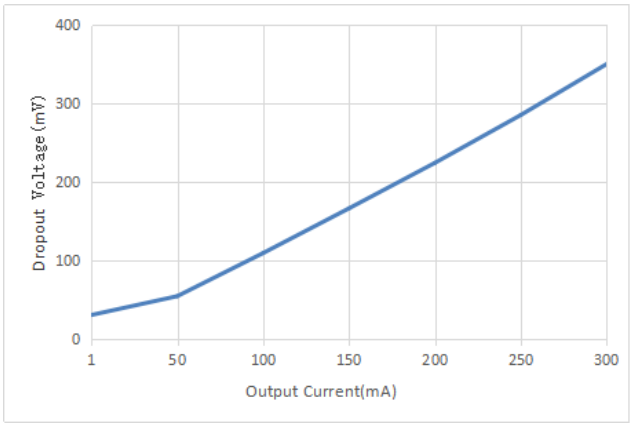
Output Voltage VS Temperature



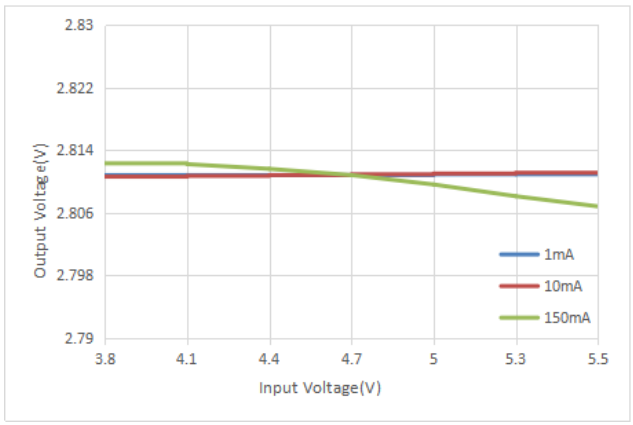
Supply Current VS Temperature



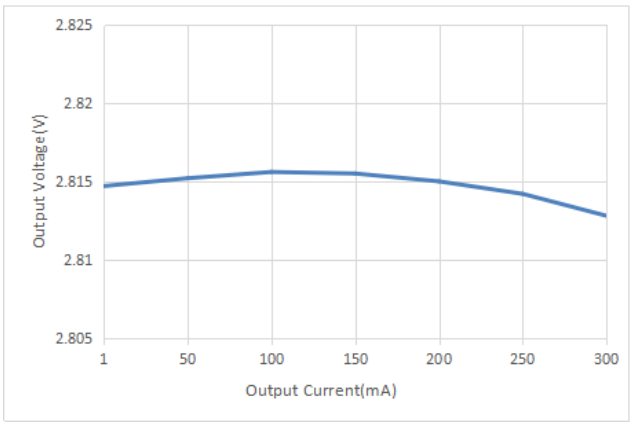
Shutdown Current VS Temperature



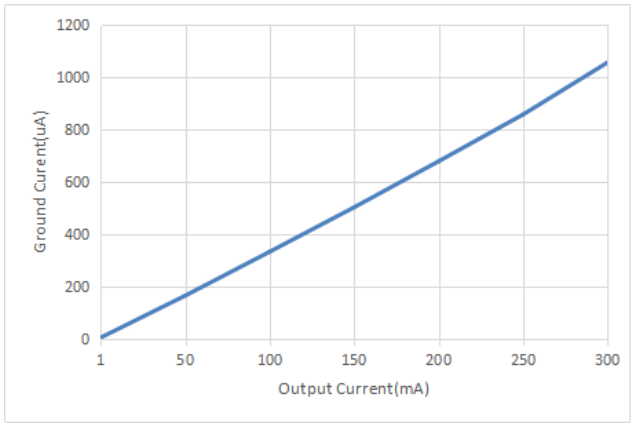
Dropout Voltage VS Output Current



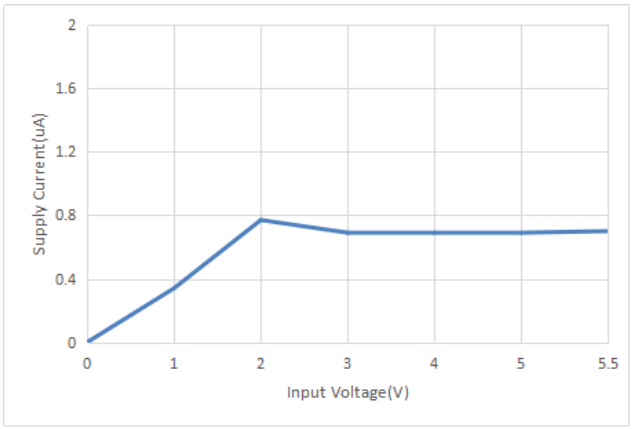
Output Voltage VS Input Voltage



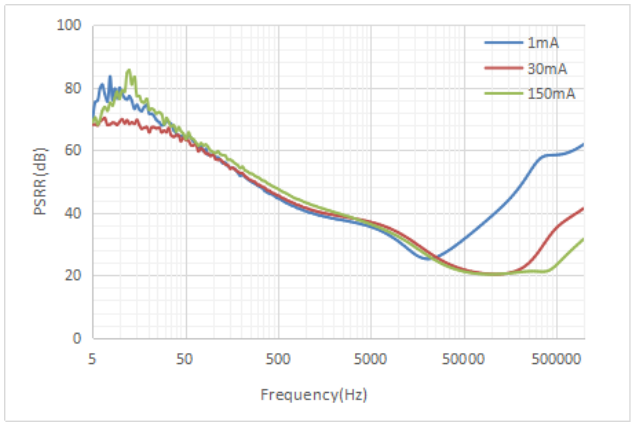
Output Voltage VS Output Current



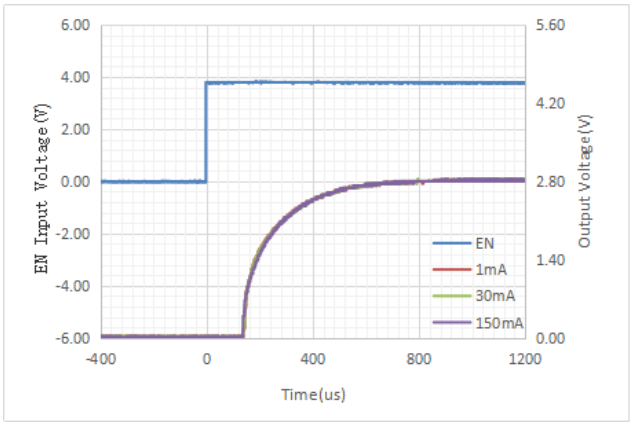
Ground Current VS Output Current



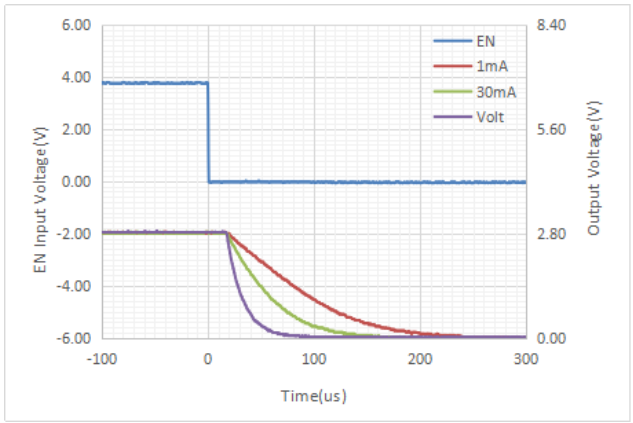
Supply Current VS Input Voltage



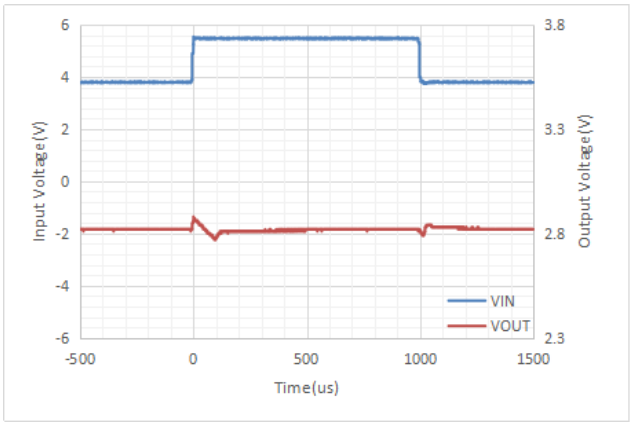
PSRR VS Output Current



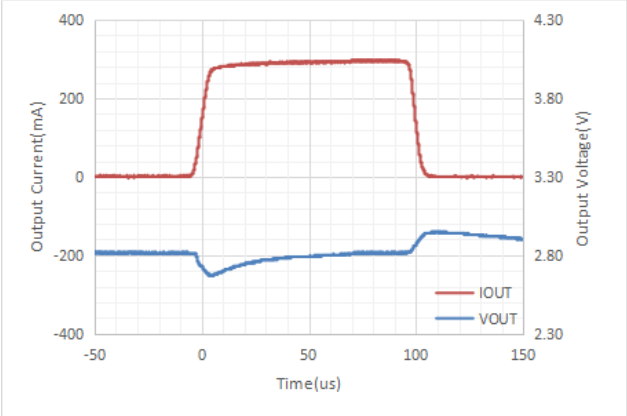
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage



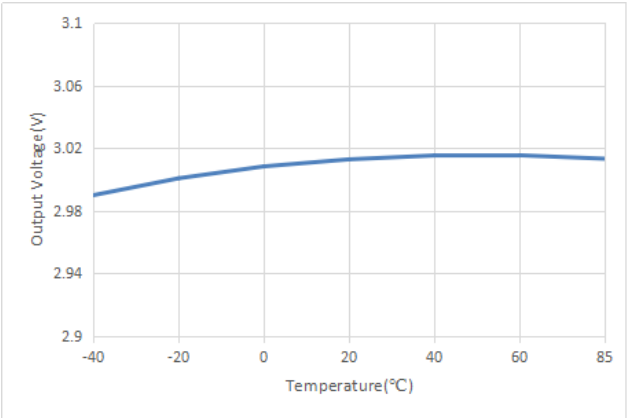
Line Transient Response



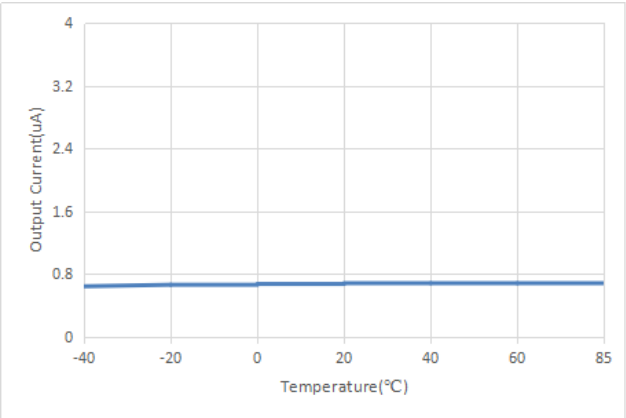
Load Transient Response

(5) VOLTAGE VERSION 3.0V

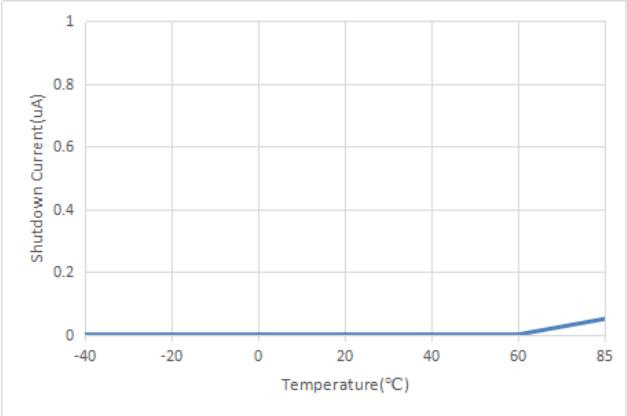
(V_{IN}=4.0V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



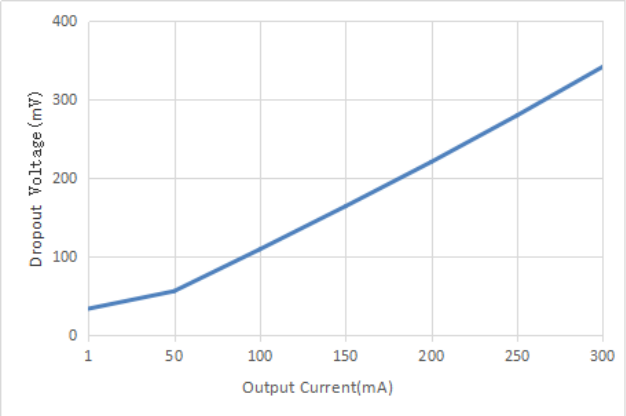
Output Voltage VS Temperature



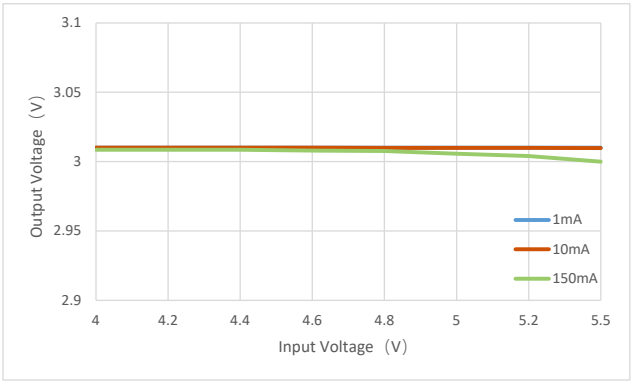
Supply Current VS Temperature



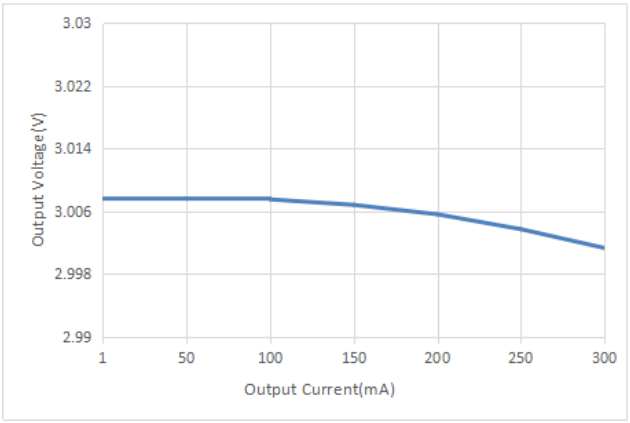
Shutdown Current VS Temperature



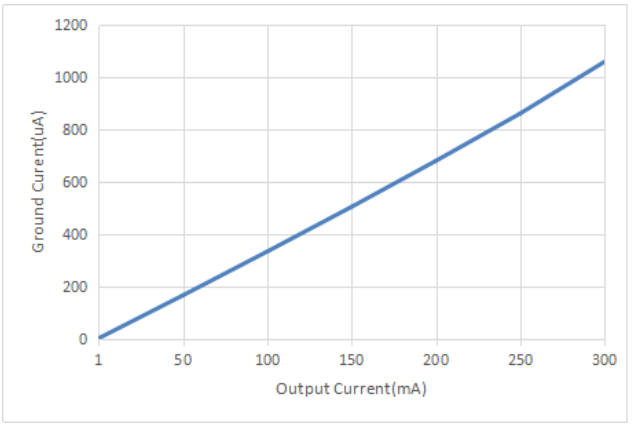
Dropout Voltage VS Output Current



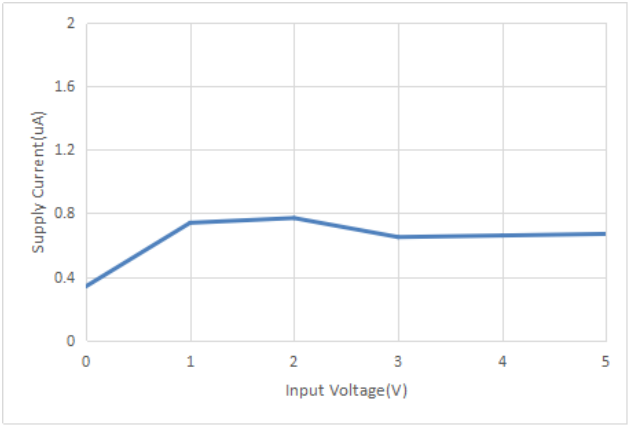
Output Voltage VS Input Voltage



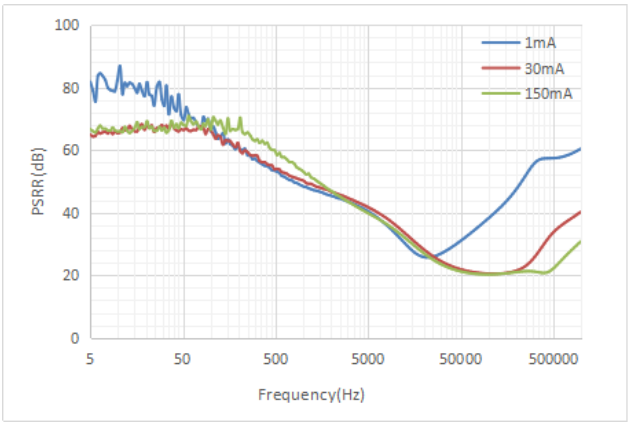
Output Voltage VS Output Current



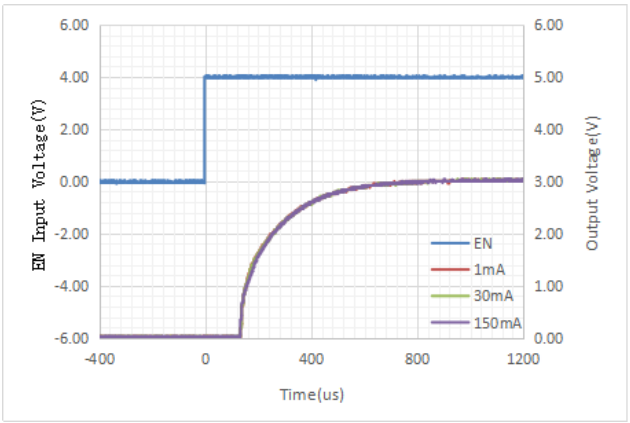
Ground Current VS Output Current



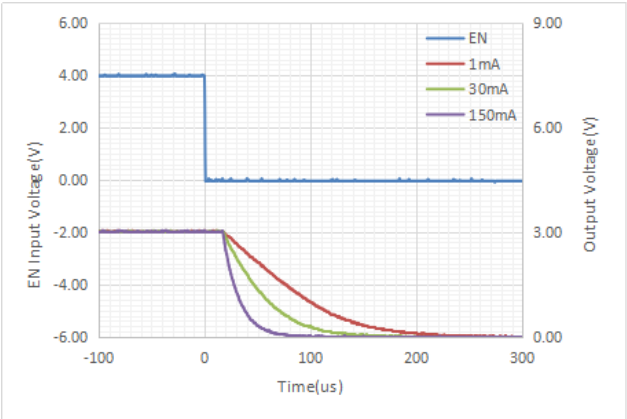
Supply Current VS Input Voltage



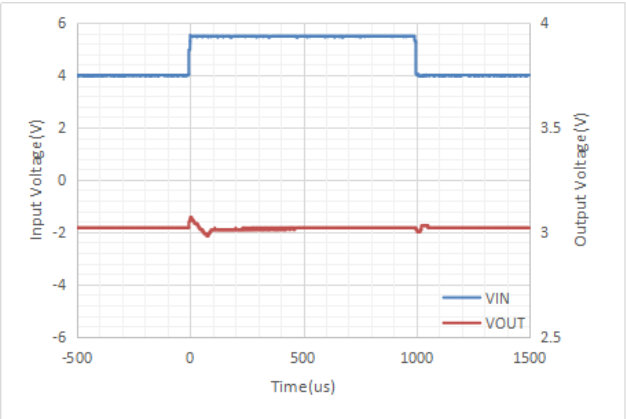
PSRR VS Output Current



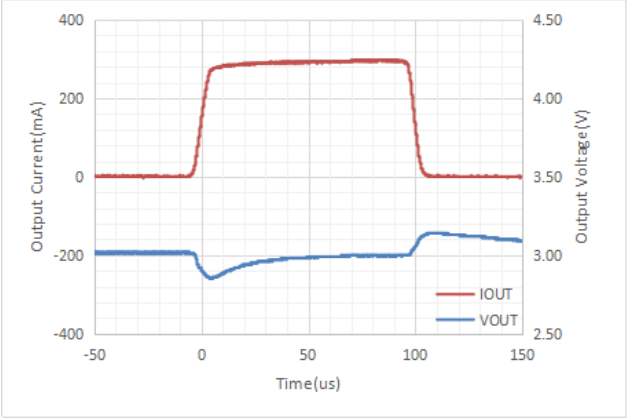
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage



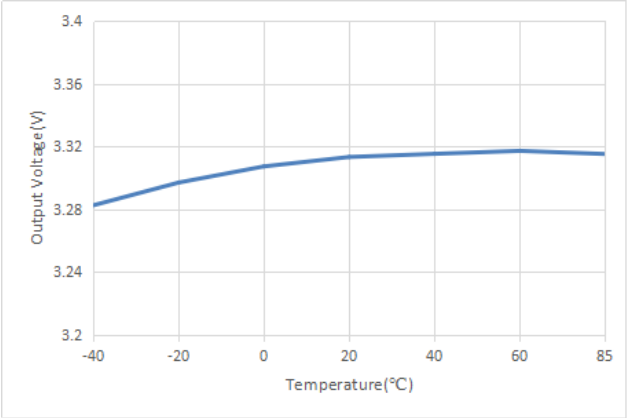
Line Transient Response



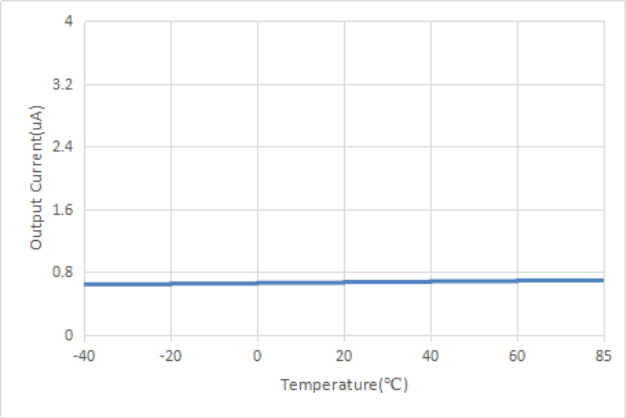
Load Transient Response

(6) VOLTAGE VERSION 3.3V

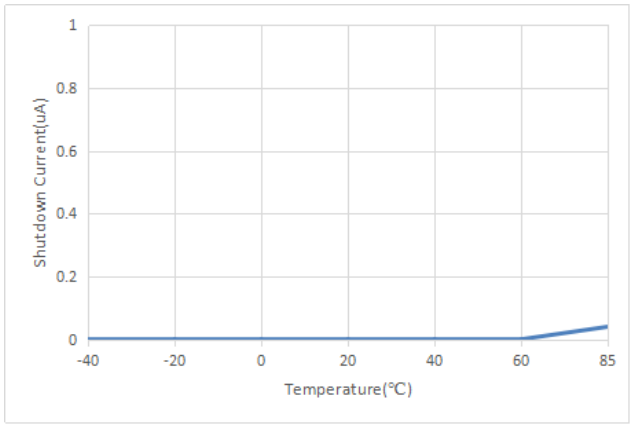
(V_{IN}=4.3V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=+25°C.)



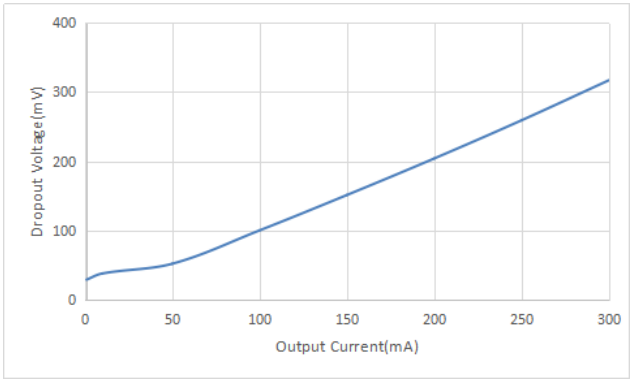
Output Voltage VS Temperature



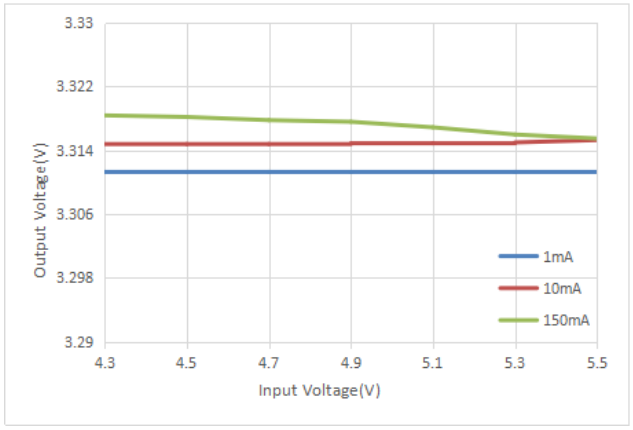
Supply Current VS Temperature



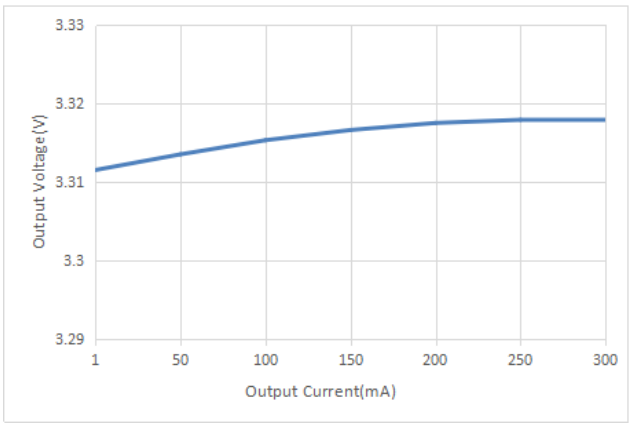
Shutdown Current VS Temperature



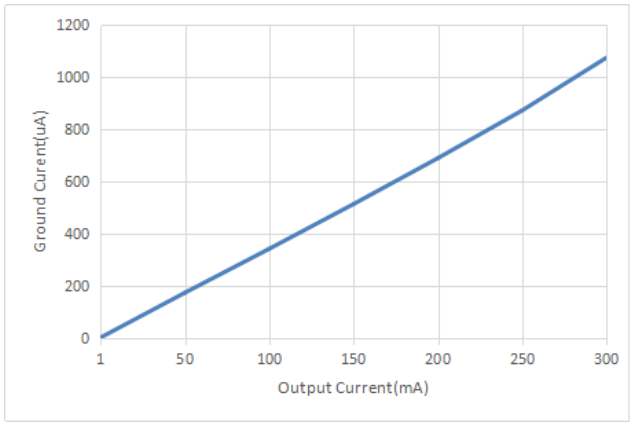
Dropout Voltage VS Output Current



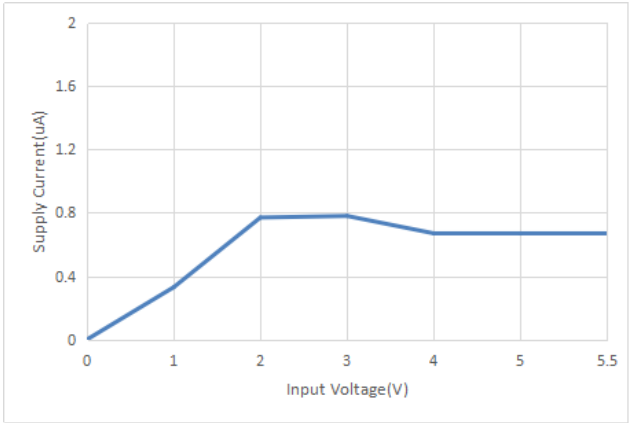
Output Voltage VS Input Voltage



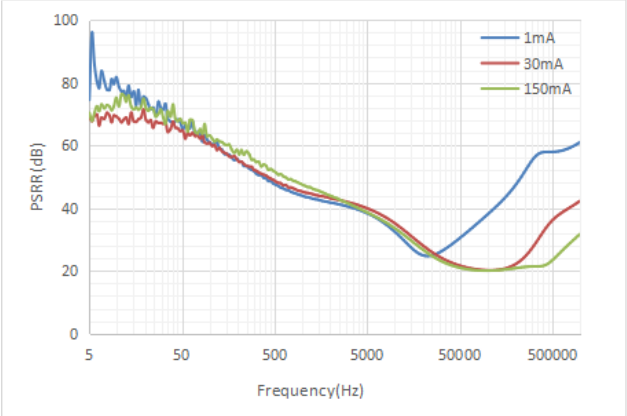
Output Voltage VS Output Current



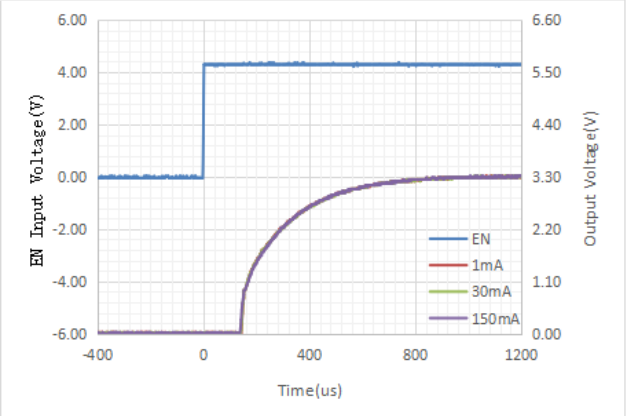
Ground Current VS Output Current



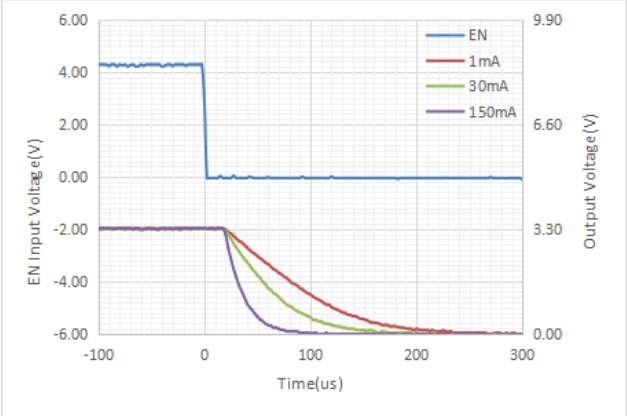
Supply Current VS Input Voltage



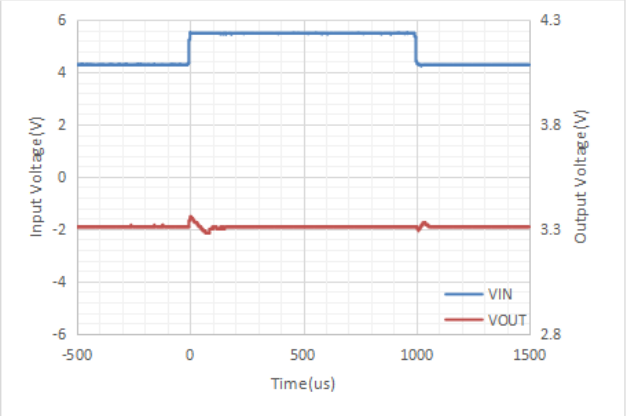
PSRR VS Output Current



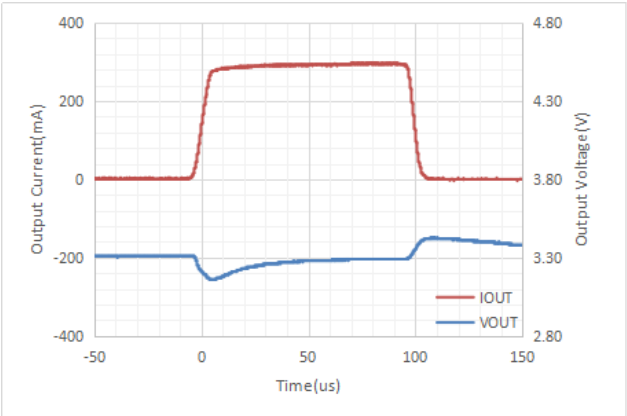
Turn On Speed VS EN Voltage



Turn Off Speed VS EN Voltage

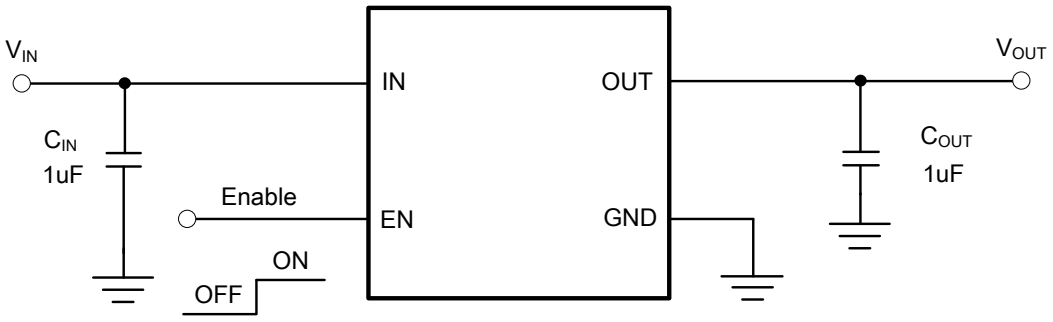


Line Transient Response

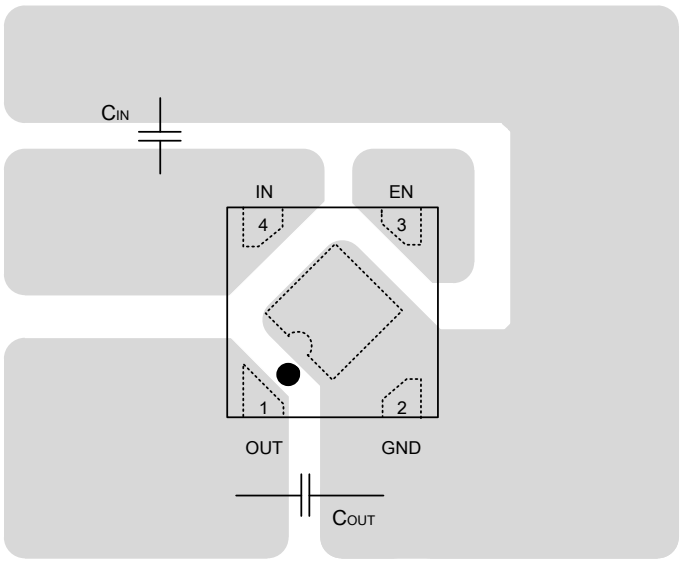


Load Transient Response

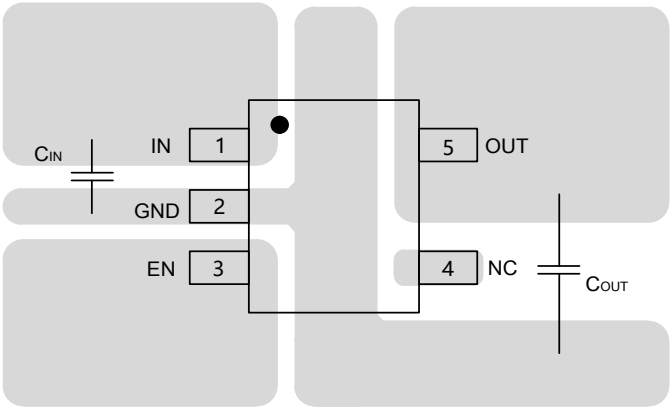
Application Circuits



PCB Layout Guide



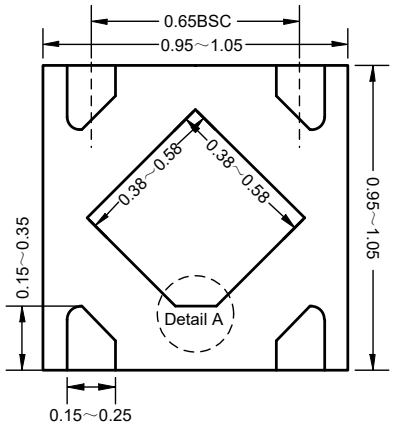
ET631XXYB

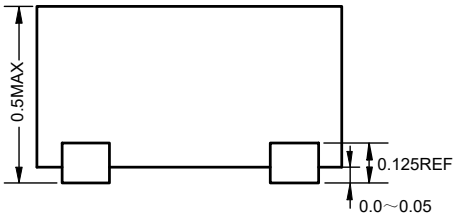


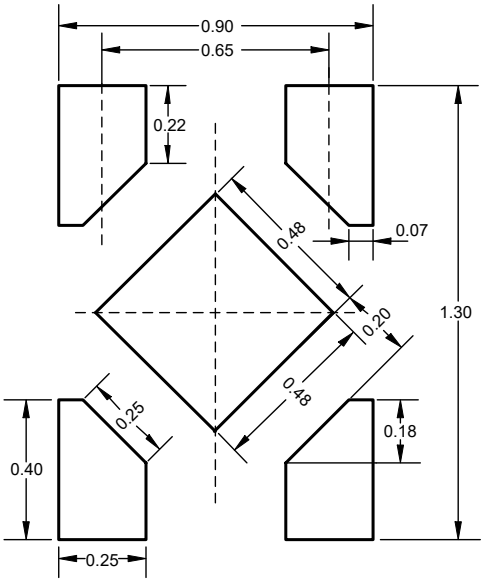
ET631XXB

Package Dimension

DFN4

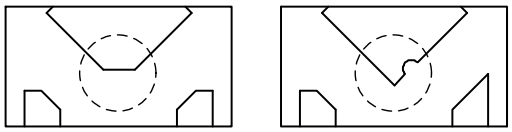






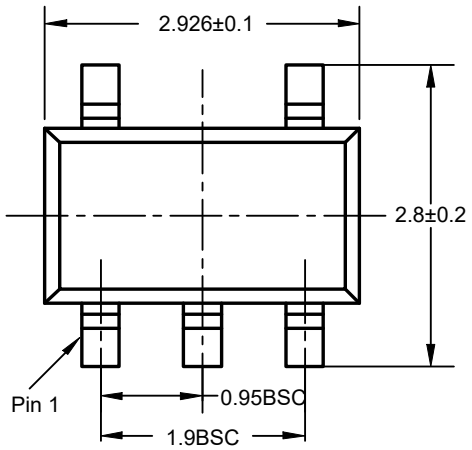
Recommended Land Pattern

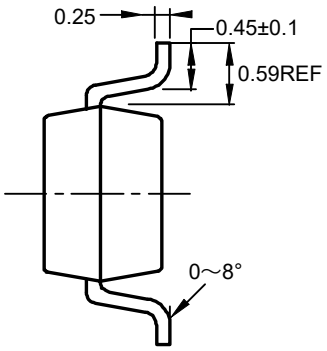
Detail A: (PIN1 shape)

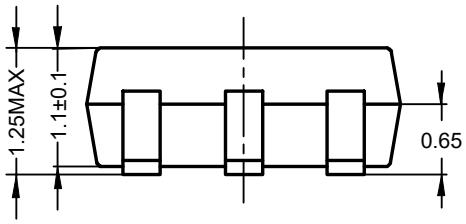


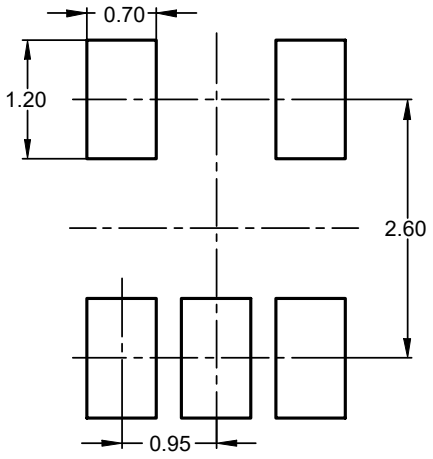
Unit: mm

SOT23-5









Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2019-01-11	Original Version	Liuxm	Liuxm	Zhujl
1.1	2019-09-26	Add the upper and lower limit of some parameters in EC table	Liuxm	Liuxm	Zhujl
1.2	2019-10-22	Add PSRR and typical characteristic graph	Liuxm	Liuxm	Liujy
1.3	2020-03-13	Document check and formalize	Liuxm	Liuxm	Liujy
1.4	2020-03-30	Update dropout voltage graph	Liuxm	Liuxm	Liujy
1.5	2022-8-8	Update Typeset	Yang Xiao Xu	Liuxm	Yang Xiao Xu
1.6	2022-12-13	Add SOT23-5	Shibo	Liuxm	Yang Xiao Xu
1.7	2023-10-10	Update package picture	Shibo	Liuxm	Liujy