High PSRR Low Noise 300mA LDO

General Description

The ET523XX family are the 300mA LDO with auto discharge function, it uses an advanced CMOS process and a PMOSFET pass device to achieve high power supply rejection ratio (PSRR), low noise, low dropout, low ground current, fast start-up and excellent output accuracy.

The ET523XX family are stable with a 1.0μF ceramic output capacitor, uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response.

The ET523XX family offered in a small SOT23-5 or DFN4 package, which are ideal for small form factor portable equipment.

Features

- Wide Input Voltage Range from 1.7V to 5.5V
- Up to 300mA Load Current
- Standard Fixed Output Voltage Options: 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V and etc
- Other Output Voltage Requirement Range:1.2V to 3.3V ,0.05V step.
- Very Low I_Q is 50μA typical
- Low Dropout is Typical 265mV@2.8V at 300mA Load
- Very High PSRR: 75dB at 1KHz
- Very Low Noise is 70uVrms at 2.8V Output
- Excellent Load/Line Transient Response
- With Auto-discharge Function
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET523XX	SOT23-5	Tape and Reel, 3K/Reel	3
ET523XXYB	DFN4 (1mm × 1mm)	Tape and Reel, 10K/Reel	1

Applications

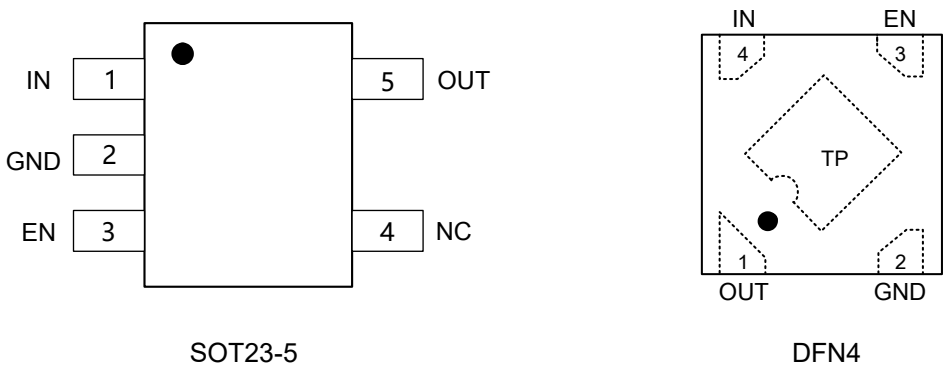
- Smart Phones and Cellular Phones
- Digital Still Cameras
- Portable Instruments

Device information

ET 523 XX (YB)

XX Output Voltage	
XX	Fixed Output X.XV

Pin Configuration



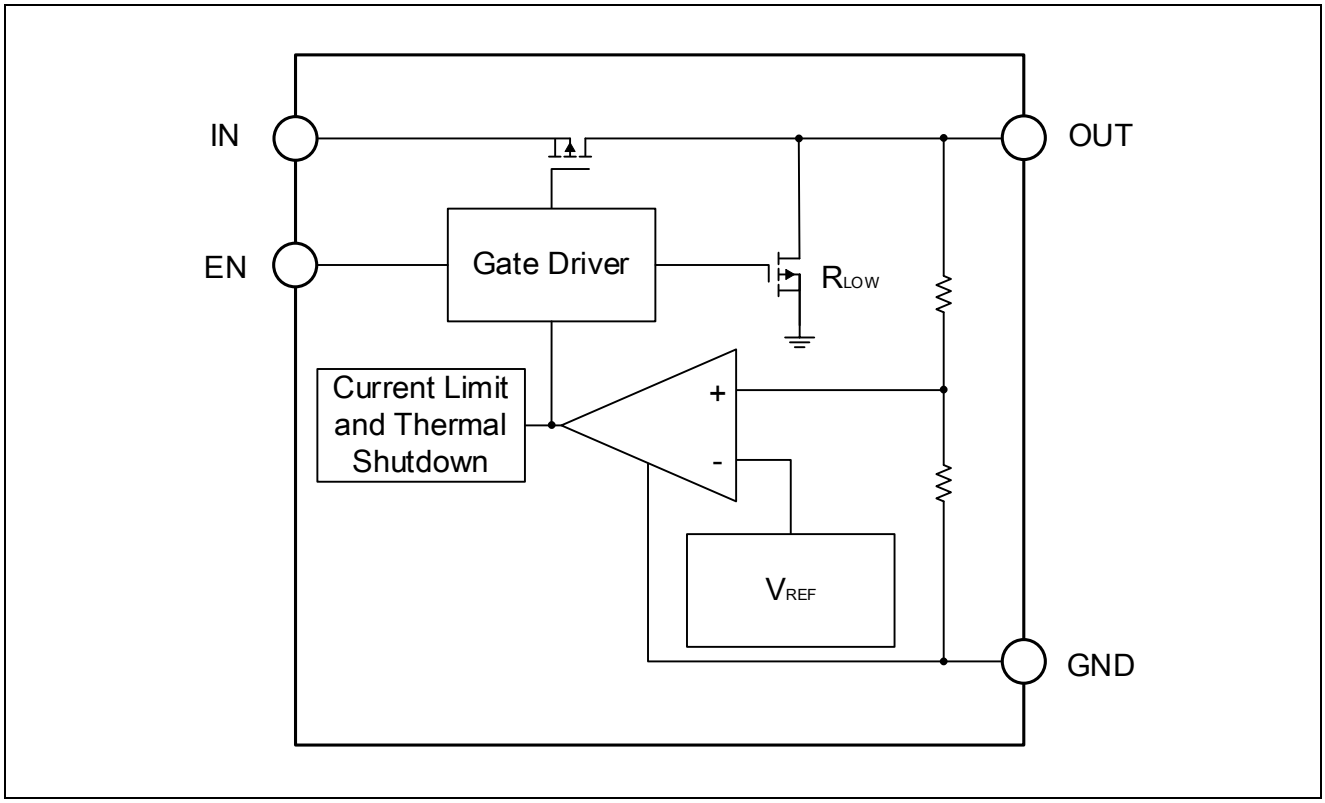
SOT23-5 DFN4

Top View

Pin Function

Pin No.		Pin Name	Pin Function
DFN4	SOT23-5		
1	5	OUT	Output Pin. A low-ESR capacitor should be connected to this pin to GND.
2	2	GND	Ground Pin.
3	3	EN	Enable Control Input Pin, Active High. Do not leave EN floating
4	1	IN	Supply Input Pin. Must be closely decoupled to GND with a ceramic capacitor
	4	NC	No Connection.
TP		Thermal Pad	Thermal Pad for DFN4 (1mm × 1mm) Package, Connect to GND or Leave Floating. Do not connect to any potential other than GND.

Block Diagram



Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between V_{IN} and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both V_{IN} and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 0.47μF or larger, the effective capacitance needs to take the DC-Bias characteristic, tolerance and temperature into consideration, and temperature characteristics is X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

ON/OFF Input Operation

The ET523XX is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to IN pin to keep the regulator output on at all time.

Ultra-Fast Start-up

After enabled, the ET523XX is able to provide full power in as little as tens of microseconds, typically 60μs. This feature will help load circuitry move in and out of standby mode in real time, eventually extend battery life for mobile phones and other portable devices.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin, the current limit protection will be triggered and clamp the output current to approximately 500mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal Shutdown Protection

Thermal protection disables the output when the junction temperature rises to approximately +155°C, allowing the device to cool down. When the junction temperature reduces to approximately +130°C the output circuitry is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

Absolute Maximum Ratings

Symbol	Parameters (Items)	Value	Unit
V_{IN}	IN Voltage	-0.3 to 6.5	V
V_{EN}	Input Voltage (EN Pin)	-0.3 to V_{IN} + 0.3	V
V_{OUT}	Output Voltage	-0.3 to V_{IN} + 0.3	V
I_{MAX}	Maximum Load Current	500	mA
V_{ESD}	Human Body Model (JEDEC JS-001)	±4000	V
	Charged Device Model (JEDEC JS-002)	±1500	
$R_{\theta JA}$	Junction-to-ambient Thermal Resistance (SOT23-5)	250	°C/W
	Junction-to-ambient Thermal Resistance (DFN4)	250	
T_J	Operating Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-65 to 150	°C
T_{SLOD}	Lead Temperature (Soldering, 10 sec)	300	°C

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.7 to 5.5	V
I_{OUT}	Output Current	0 to 300	mA
T_A	Operating Ambient Temperature	-40 to 85	°C
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

Electrical Characteristics[1]

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Operation Range		1.7		5.5	V
V_{DROP}	Dropout Voltage[2]	V_{OUT} = 1.2V, I_{OUT} = 300mA			500	mV
		V_{OUT} = 1.5V, I_{OUT} = 300mA		400	470	mV
		V_{OUT} = 1.8V, I_{OUT} = 300mA		275	430	mV
		V_{OUT} = 2.5V, I_{OUT} = 300mA		270	420	mV
		V_{OUT} = 2.8V, I_{OUT} = 300mA		265	400	mV
		V_{OUT} = 3.0V, I_{OUT} = 300mA		250	380	mV
		V_{OUT} = 3.3V, I_{OUT} = 300mA		250	380	mV
I_{Q_ON}	DC Supply Quiescent Current	Active Mode: V_{EN} = V_{IN}		50	90	μA
I_{Q_OFF}	DC Supply Shutdown Current	V_{EN} = 0V		0.01	1	μA
V_{OUT}	Regulated Output Voltage	I_{OUT} = 1mA, -40°C ≤ T_A ≤ 85°C	-2		2	%
Reg_{LINE}	Output Voltage Line Regulation	V_{IN} = V_{OUT} + 1V to 5.5V, I_{OUT} = 10mA		0.03	0.2	%/V
Reg_{LOAD}	Output Voltage Load Regulation	I_{OUT} from 0mA to 300mA		15	40	mV
t_{ON}	Soft-start Time	From Enable to Power On		60		μs
I_{LIMIT}	Current Limit	R_{LOAD} = 1Ω	330			mA
I_{SHORT}	Short Current Limit	V_{OUT} = 0V		60		mA
PSRR[3]	Power Supply Rejection Ratio	f = 1kHz, C_{OUT} = 1μF, I_{OUT} = 20mA		75		dB
		f = 10kHz, C_{OUT}=1μF, I_{OUT} = 30mA		65		dB
e_N[3]	Output Noise	10Hz to 100kHz, I_{OUT} = 200mA, V_{OUT} = 2.8V, C_{OUT} = 1μF		70		$μV_{RMS}$
		10Hz to 100kHz, I_{OUT} = 200mA, V_{OUT} = 1.8V, C_{OUT} = 1μF		42		
V_{ENL}	EN Low Threshold				0.4	V
V_{ENH}	EN High Threshold		1.2			V
I_{EN}	EN Pin Input Current	V_{EN} = 0V		0	0.1	μA
R_{PD}	EN pull-down resistance		0.7	1	1.3	MΩ
R_{DIS}	Output Resistance of Auto Discharge at Off State	EN = 0V, V_{IN} = 5V		70		Ω

Electrical Characteristics(Continued)[1]

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
T_{SD}[3]	Over-temperature Shutdown Threshold	T_J Rising		155		°C
T_{HYS}[3]	Over-temperature Shutdown Hysteresis	T_J Falling from Shutdown		20		°C

Notes:

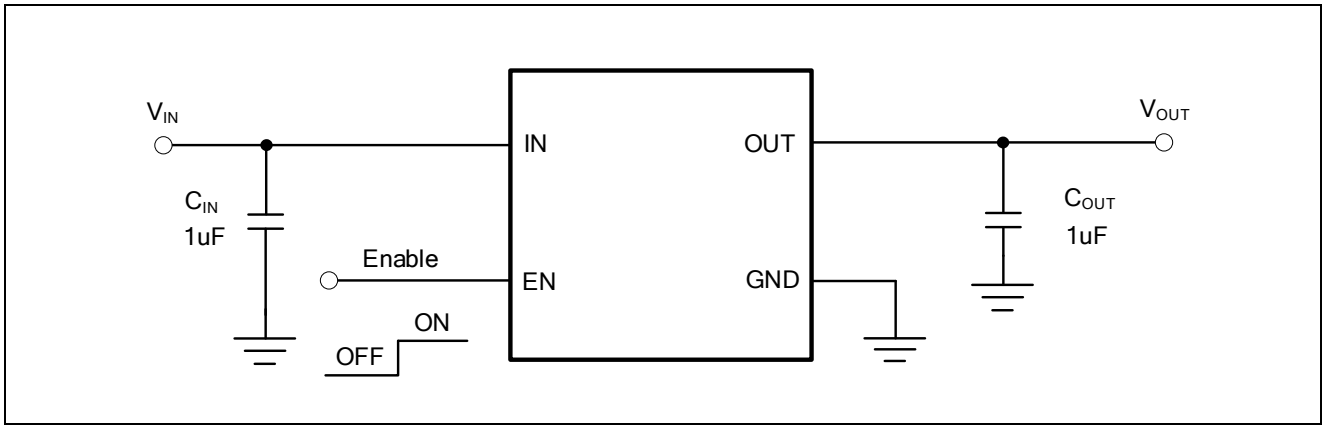
1: Production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.

2: The minimum operating voltage is 1.7V. The calculation formula is as follows:

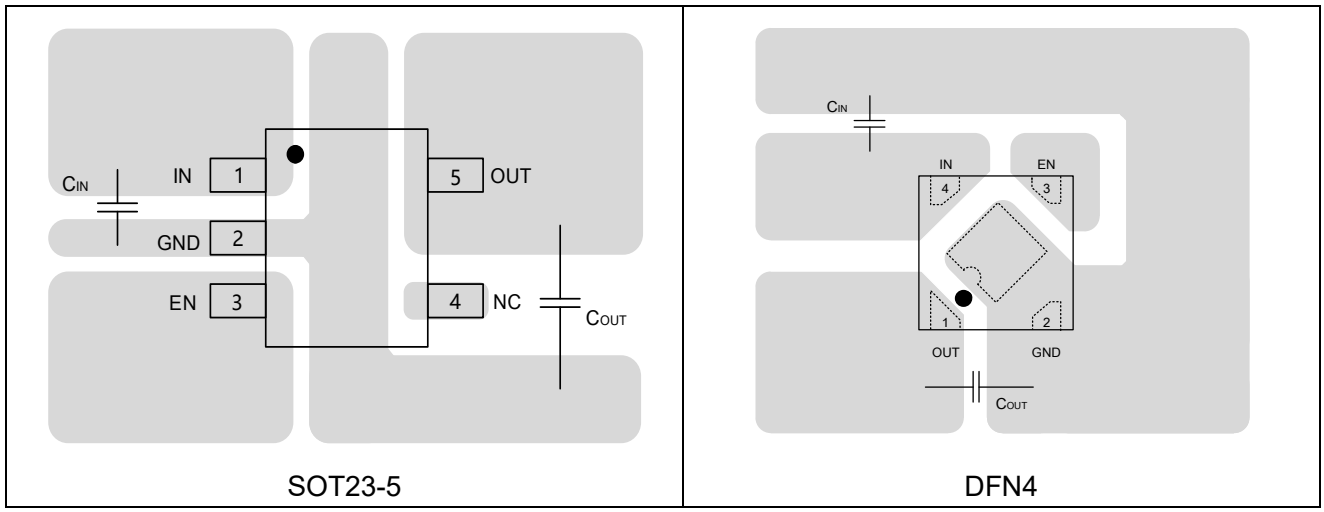
$$V_{DROP} = V_{IN(min)} - V_{OUT}$$

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

Application Circuits

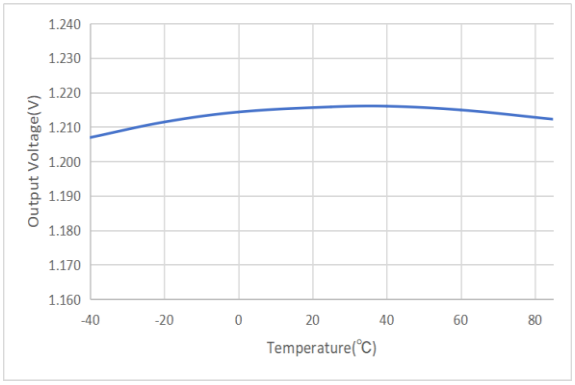


PCB Layout Guide

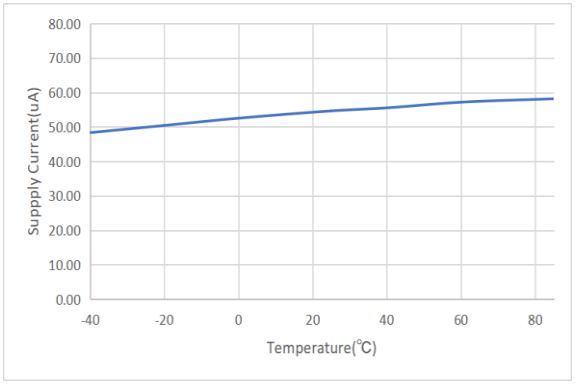


Typical Characteristics

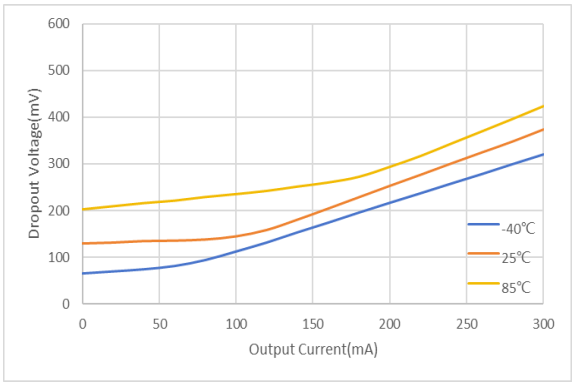
(V_{IN} = 2.2V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



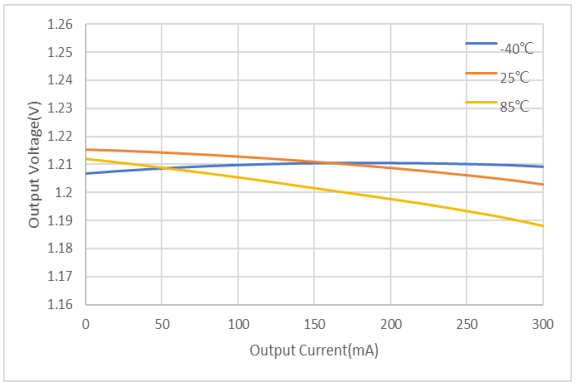
Output Voltage VS Temperature



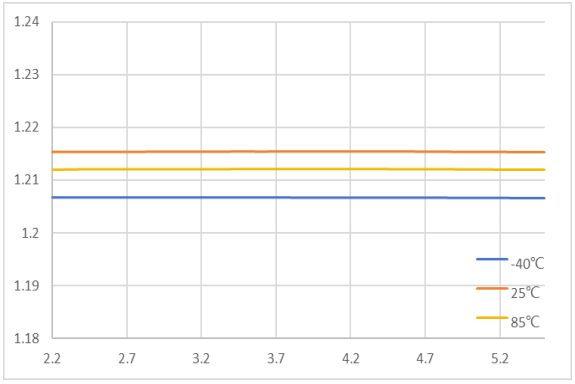
Supply Current VS Temperature



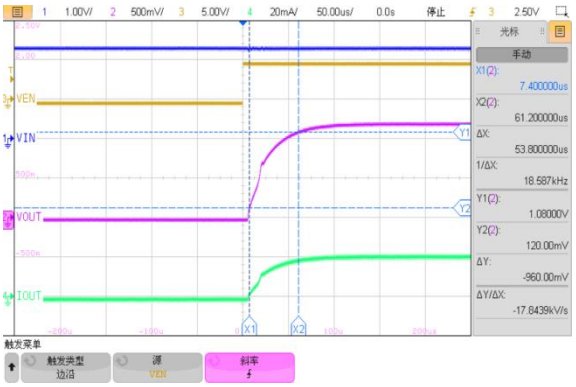
Dropout Voltage VS Output Current



Output Voltage VS Output Current



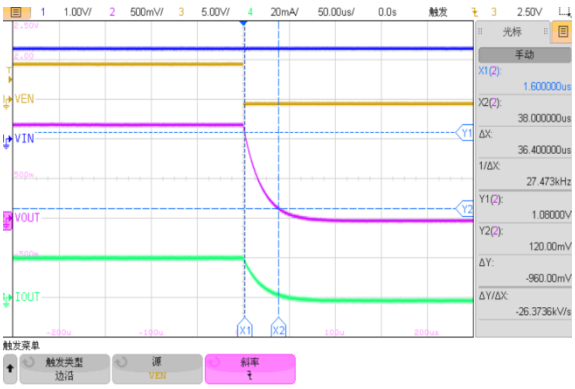
Output Voltage VS Input Voltage



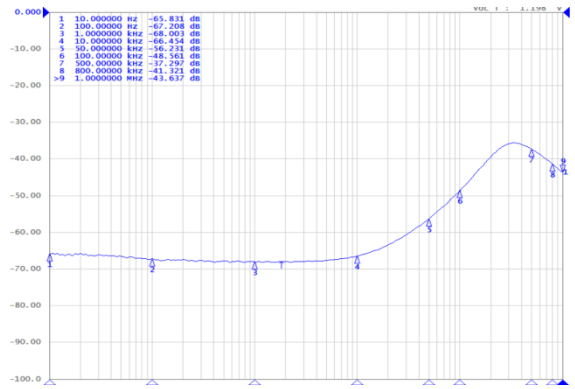
T_{ON} (I_{OUT} = 20mA)

Typical Characteristics(Continued)

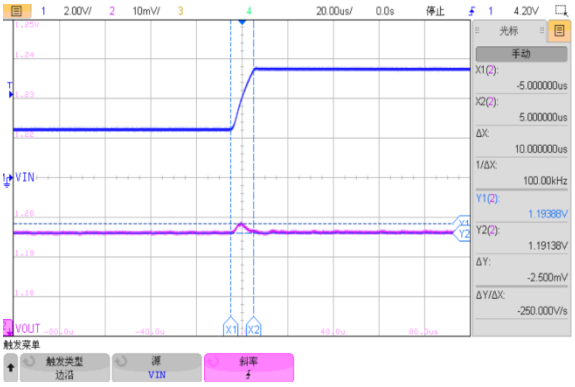
(V_{IN} = 2.2V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



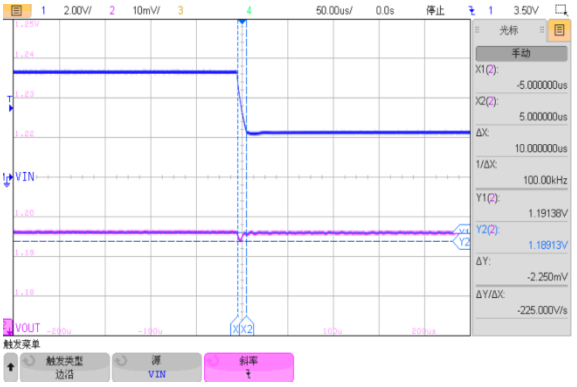
T_{OFF} (I_{OUT} = 20mA)



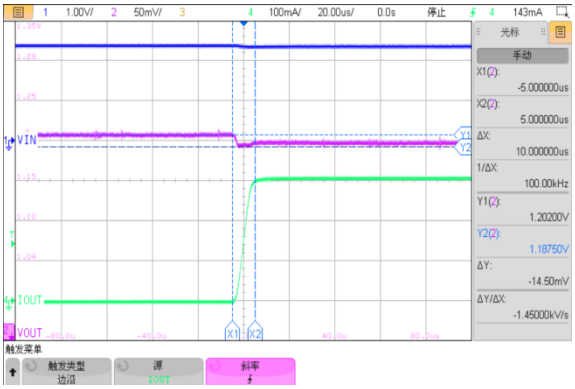
PSRR (I_{OUT} = 20mA)



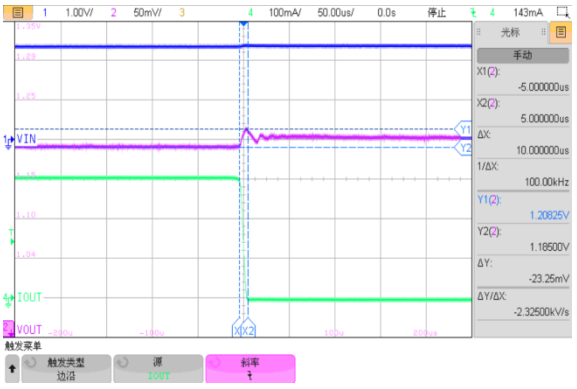
Input Transient(2.2~5.5V, t = 10us, 1mA)



Input Transient(5.5~2.2V, t = 10us, 1mA)



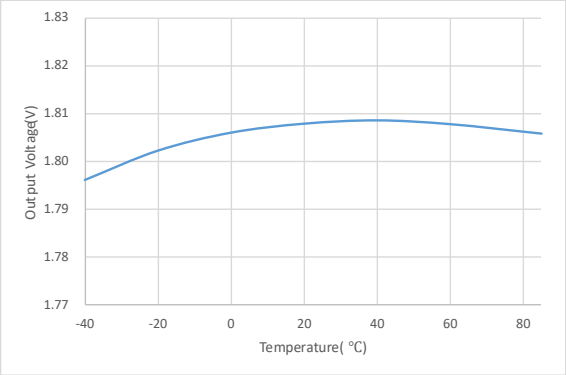
Load Transient(1mA~300mA, t = 10us)



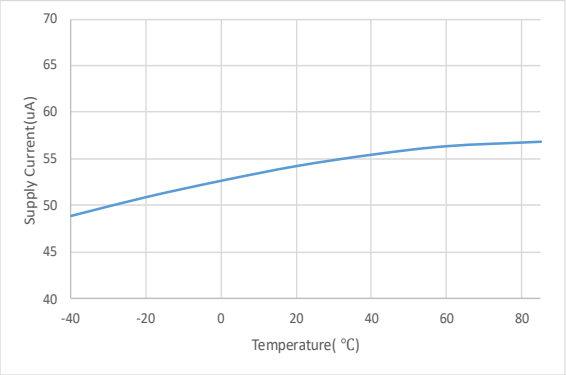
Load Transient(300mA~1mA, t = 10us)

Typical Characteristics(Continued)

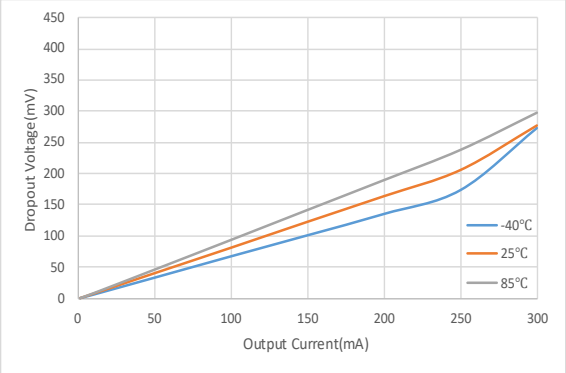
(V_{IN} = 2.8V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



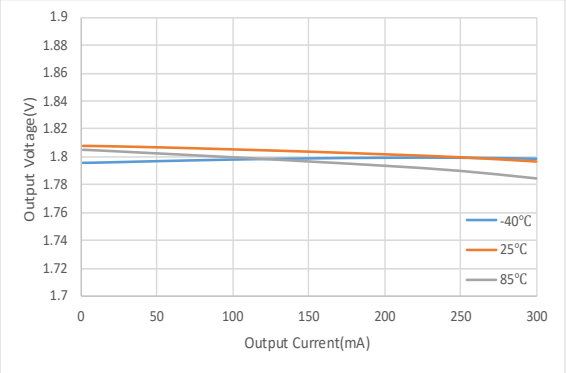
Output Voltage VS Temperature



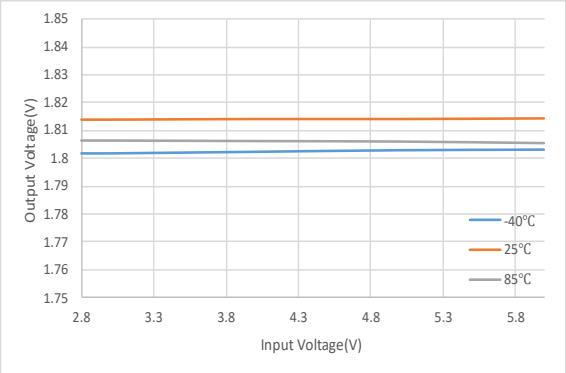
Supply Current VS Temperature



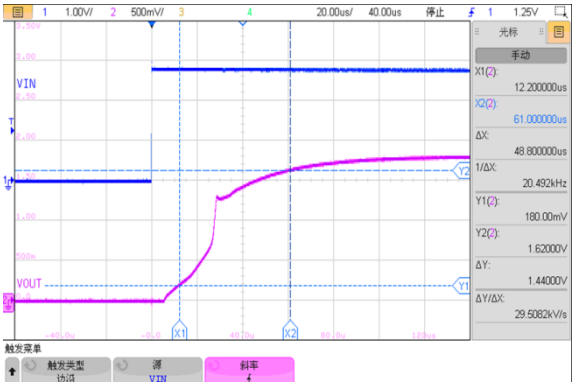
Dropout Voltage VS Output Current



Output Voltage VS Output Current



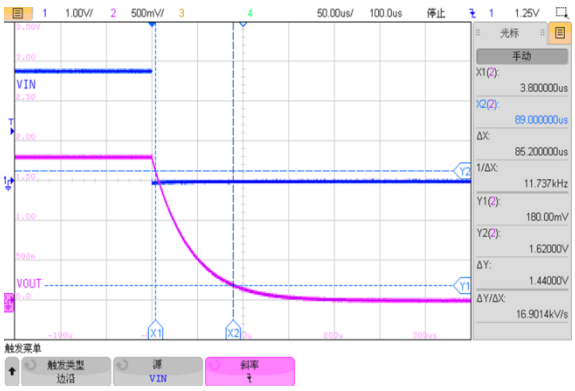
Output Voltage VS Input Voltage



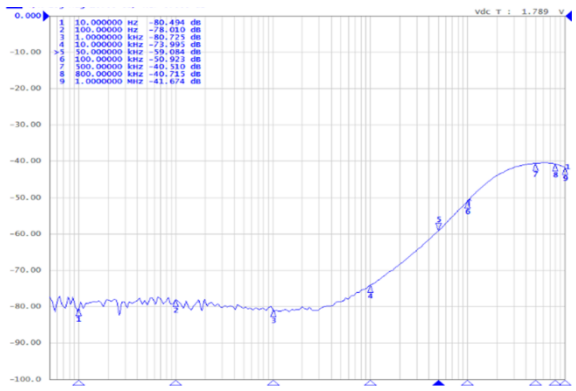
T_{ON} (I_{OUT} = 30mA)

Typical Characteristics(Continued)

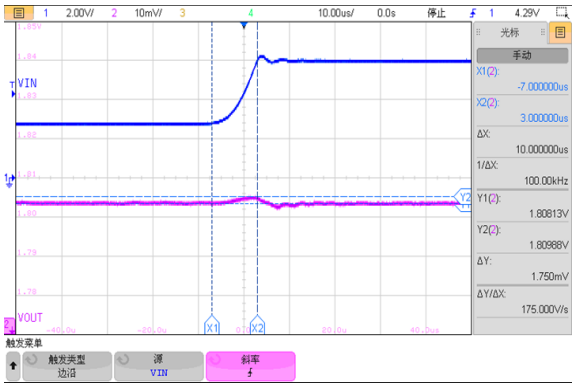
(V_{IN} = 2.8V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



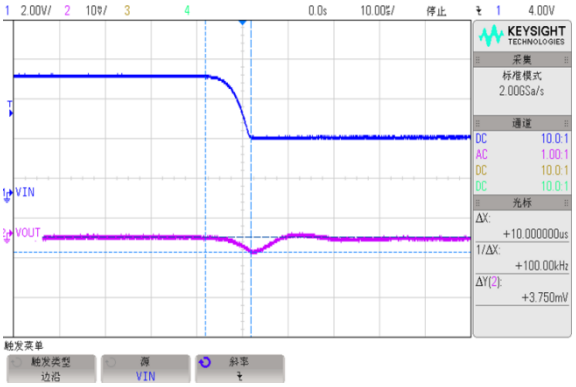
T_{OFF} (I_{OUT} = 30mA)



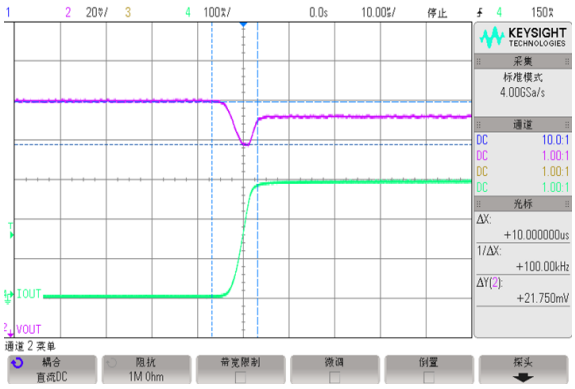
PSRR (I_{OUT} = 20mA)



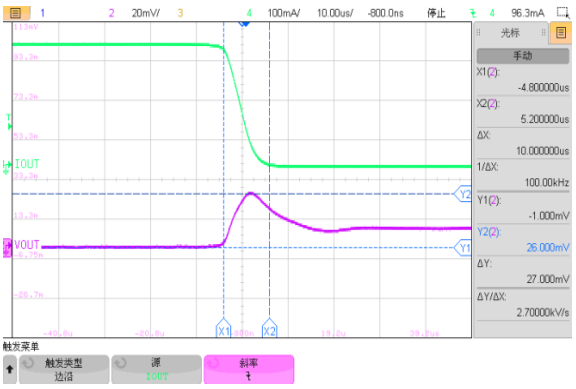
Input Transient(2.8~6V, t = 10us, 1mA)



Input Transient(6~2.8V, t = 10us, 1mA)



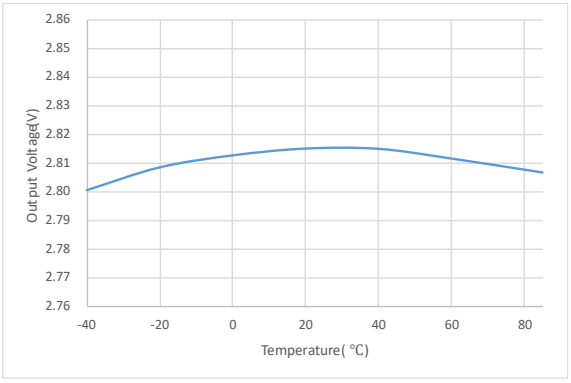
Load Transient(1mA~300mA, t = 10us)



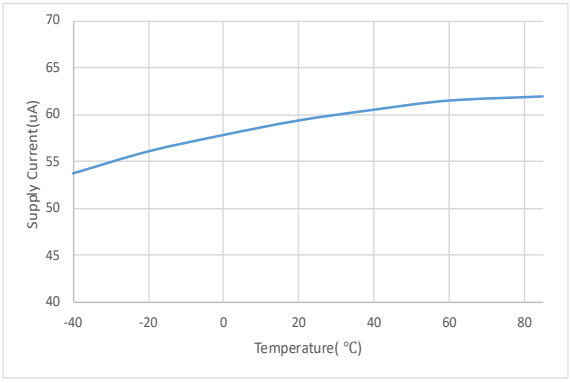
Load Transient(300mA~1mA, t = 10us)

Typical Characteristics(Continued)

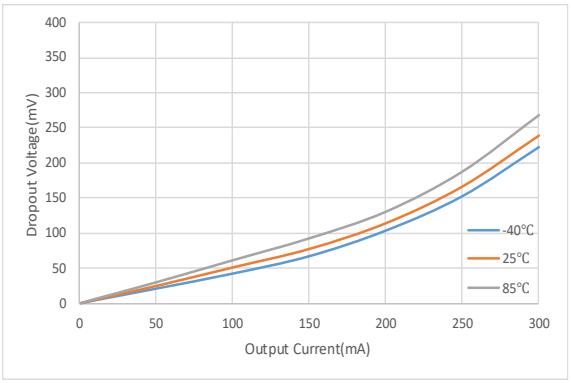
(V_{IN} = 3.8V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



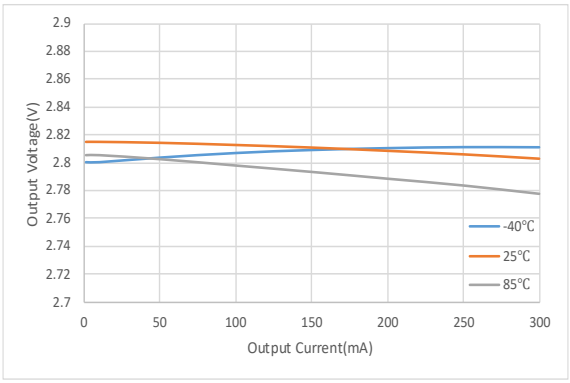
Output Voltage VS Temperature



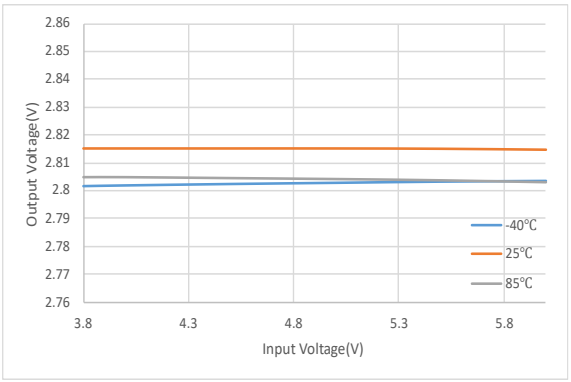
Supply Current VS Temperature



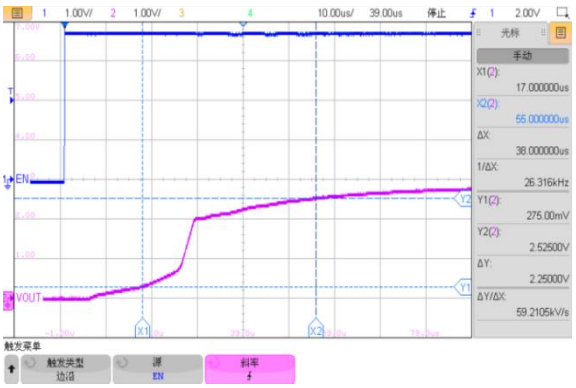
Dropout Voltage VS Output Current



Output Voltage VS Output Current



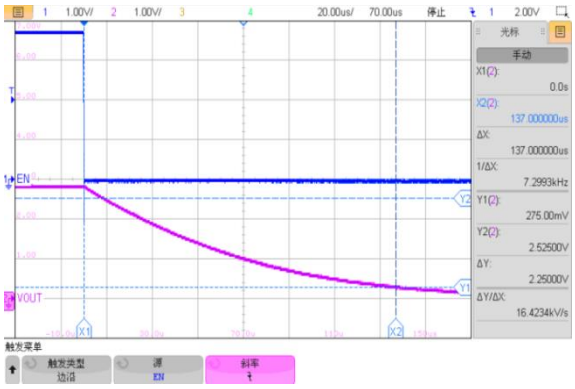
Output Voltage VS Input Voltage



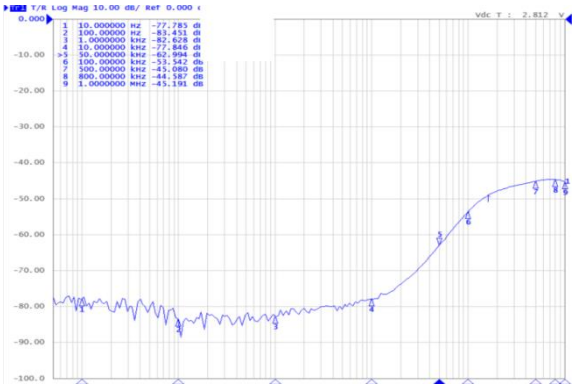
T_{ON} (I_{OUT} = 20mA)

Typical Characteristics(Continued)

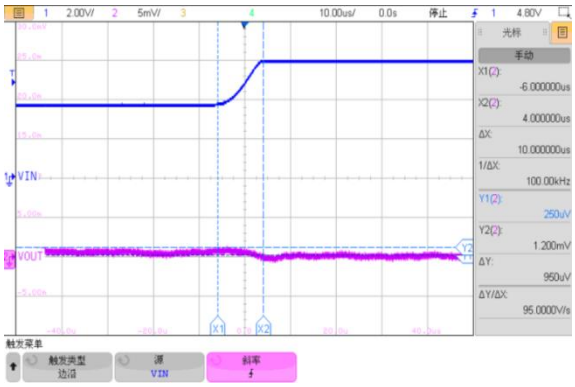
(V_{IN} = 3.8V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



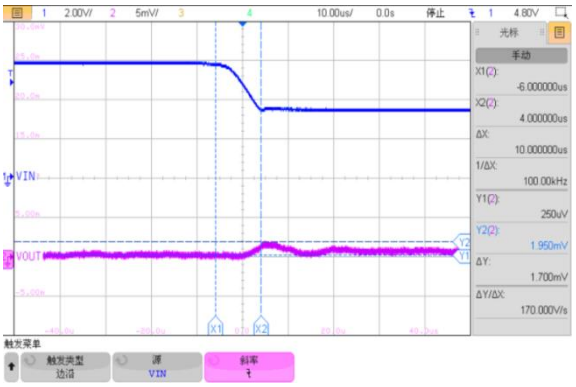
T_{OFF} (I_{OUT} = 20mA)



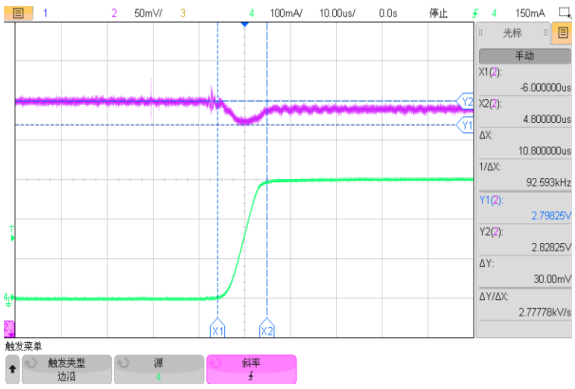
PSRR (I_{OUT} = 20mA)



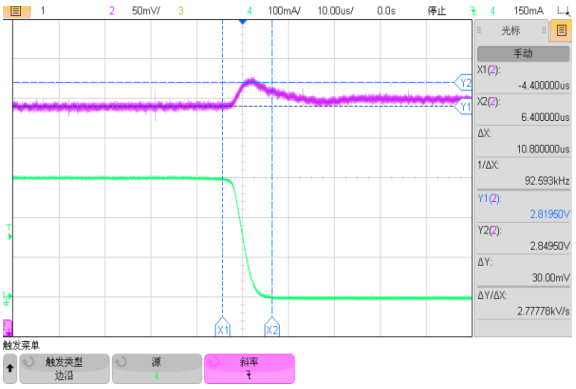
Input Transient(3.8~6V, t = 10us, 1mA)



Input Transient(6~3.8V, t = 10us, 1mA)



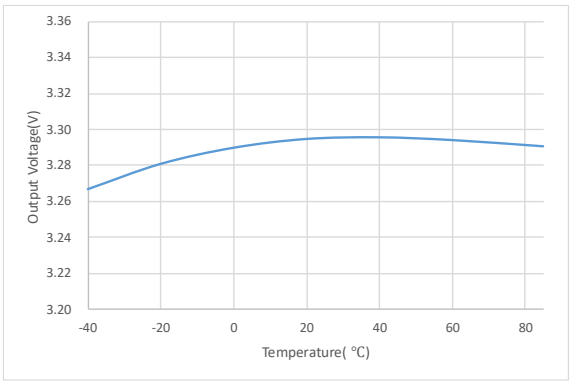
Load Transient(1mA~300mA, t = 10us)



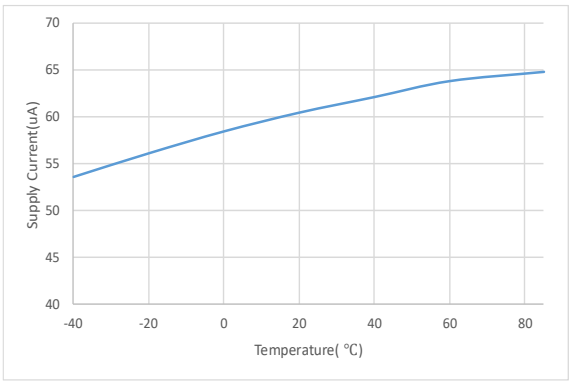
Load Transient(300mA~1mA, t = 10us)

Typical Characteristics(Continued)

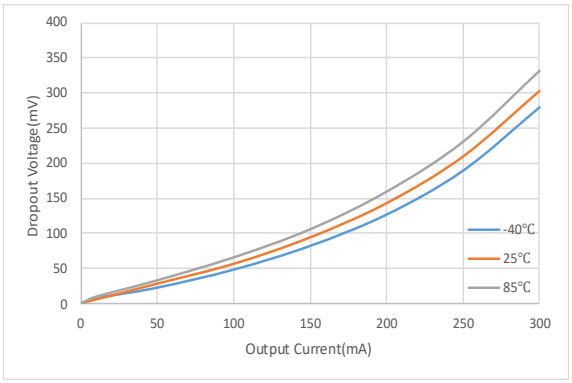
(V_{IN} = 4.3V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



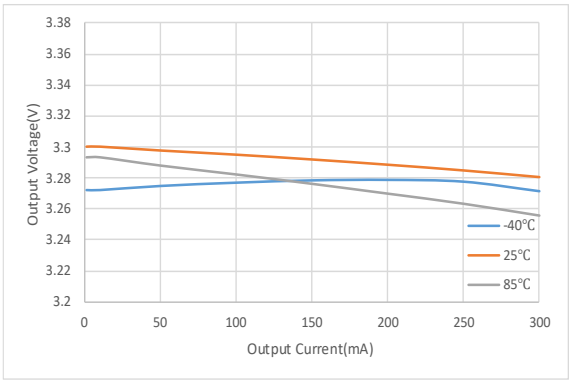
Output Voltage VS Temperature



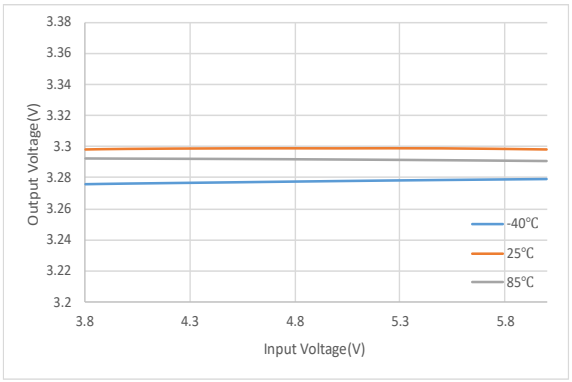
Supply Current VS Temperature



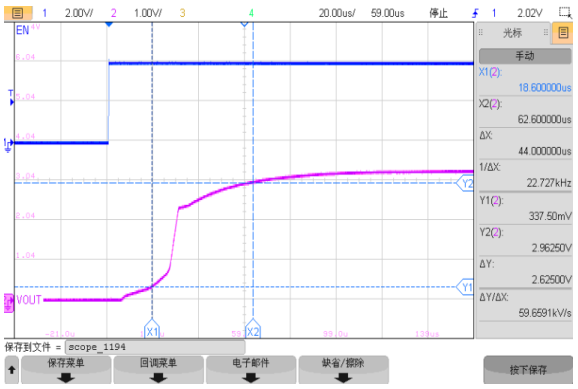
Dropout Voltage VS Output Current



Output Voltage VS Output Current



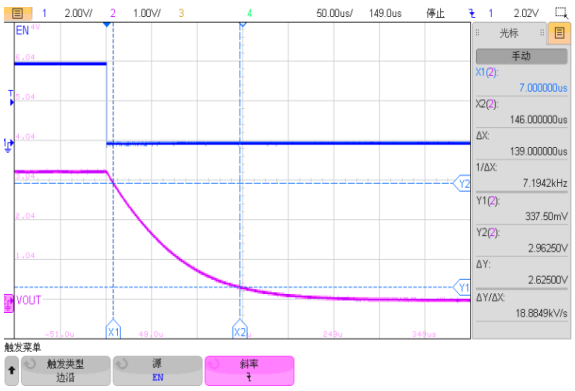
Output Voltage VS Input Voltage



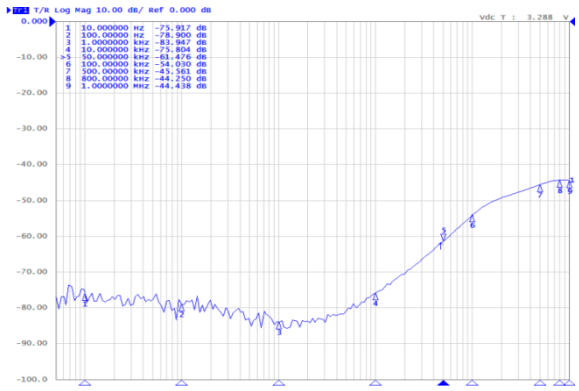
T_{ON} (I_{OUT} = 20mA)

Typical Characteristics(Continued)

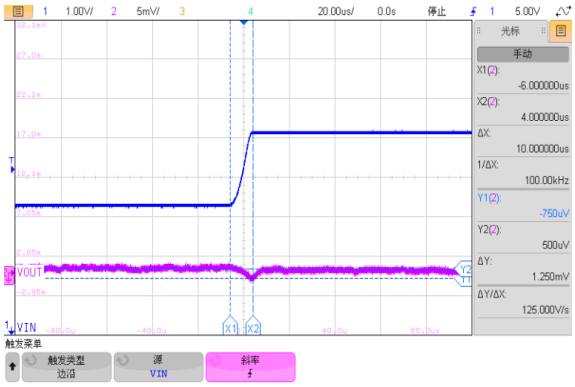
(V_{IN} = 4.3V, I_{OUT} = 1mA, C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF, T_A = -40°C~85°C)



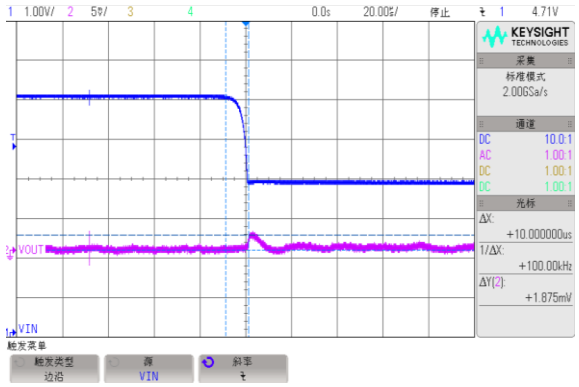
T_{OFF} (I_{OUT} = 20mA)



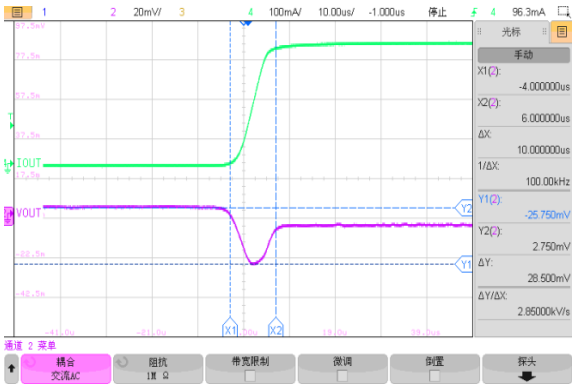
PSRR (I_{OUT} = 20mA)



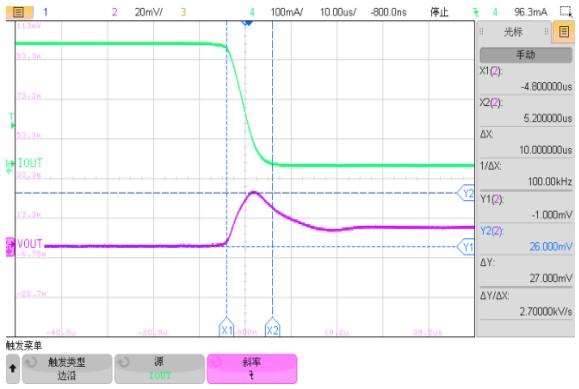
Input Transient(4.3~6V, t = 10us, 1mA)



Input Transient(6~4.3V, t = 10us, 1mA)



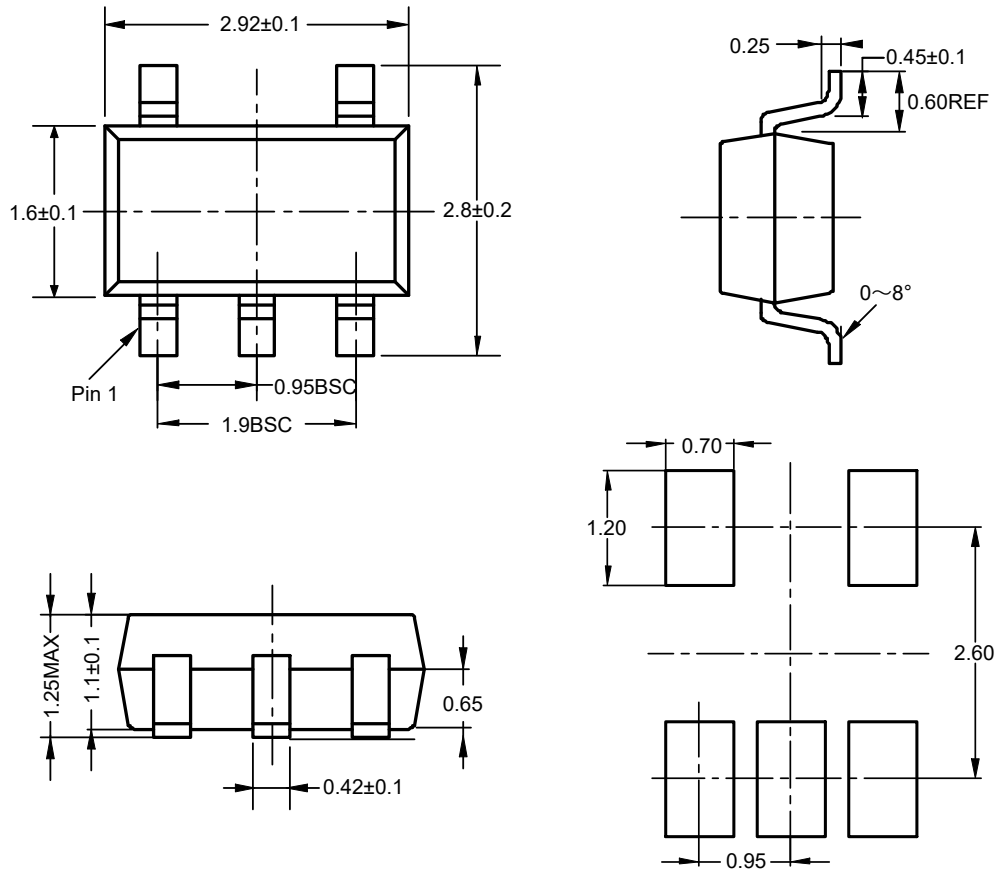
Load Transient(1mA~300mA, t = 10us)



Load Transient(300mA~1mA, t = 10us)

Package Dimension

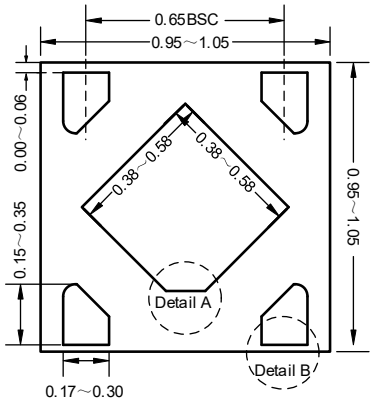
SOT23-5

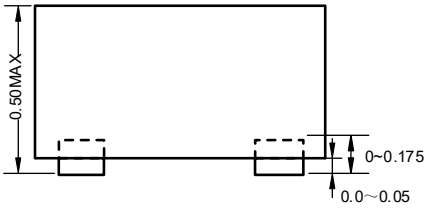


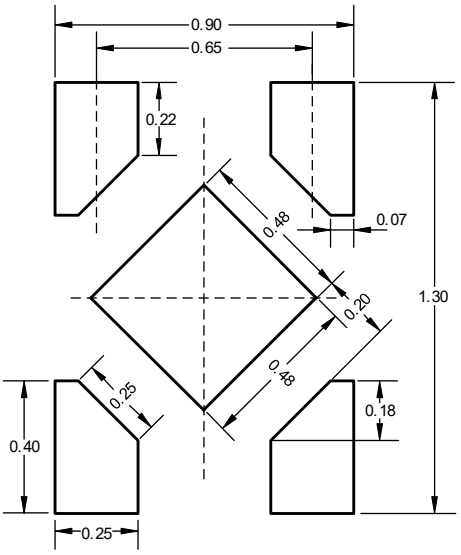
Recommended Land Pattern

Unit: mm

DFN4

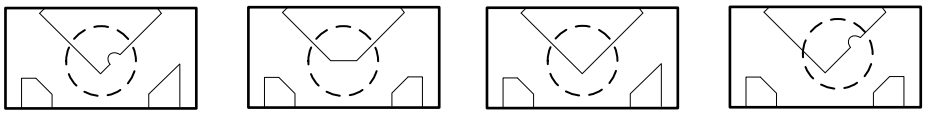






Recommended Land Pattern

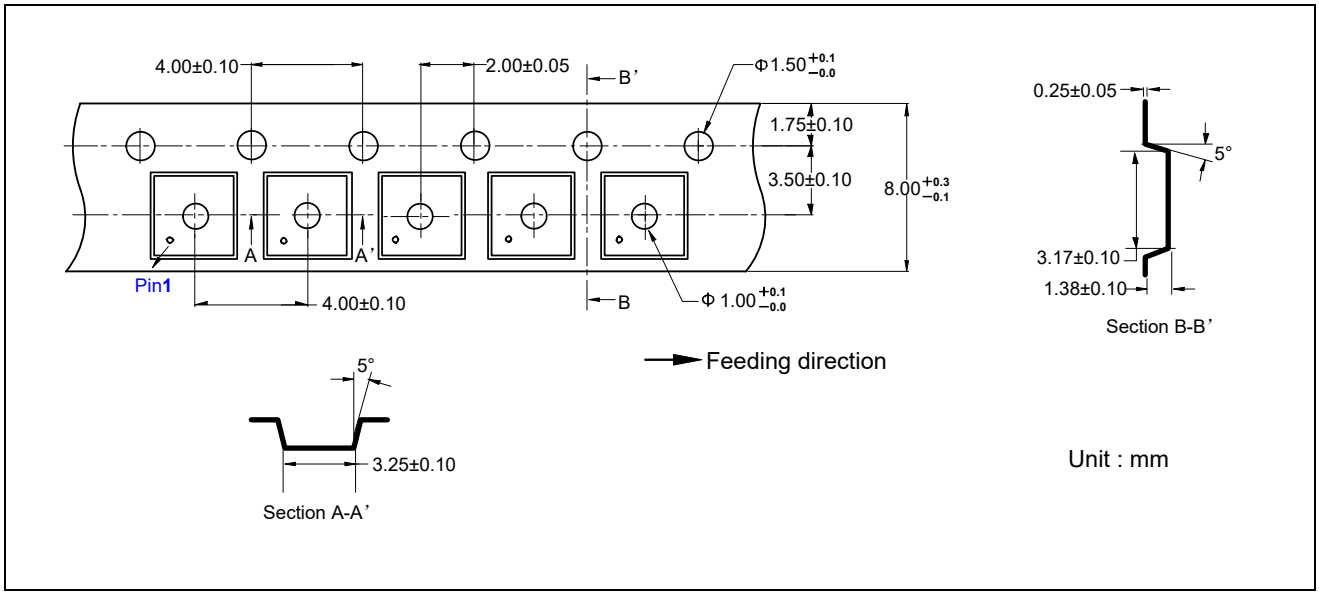
Detail A&B shape



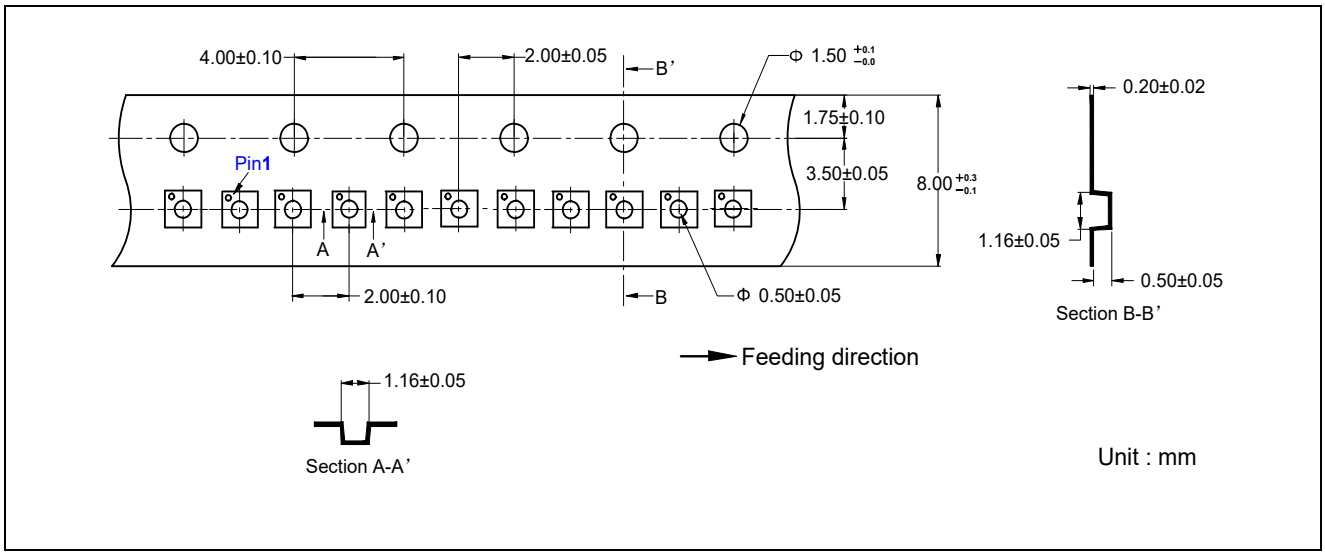
Unit: mm

Tape Information

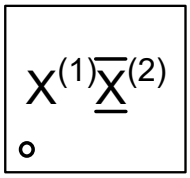
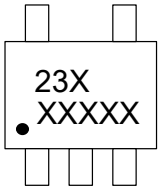
SOT23-5



DFN4



Marking

DFN4	SOT23-5
	
X(1) = Track Number X(2) = V_{OUT} Version	23X - Part No. (X=V_{OUT} Version) XXXXX - Tracking No.

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2020-07-08	Original Version	Wangp	Liuxm	Liujy
1.0	2025-10-02	Official Version	Yangxx	Liuxm	Liujy
1.1	2025-01-23	Add 1.2V Output	Yangxx	Liuxm	Liujy
1.2	2025-04-01	Add POD B Shape	Wangp	Liuxm	Liujy
1.3	2025-05-30	Add SOT23-5 package	Yangxx	Liuxm	Liujy
1.4	2025-10-25	Update device information	Shib	Liuxm	Liujy
1.5	2026-03-19	Add 1.5V, 2.5V Vdrop	Yangxx	Liuxm	Liujy