High PSRR Low Noise 300mA LDO

General Description

The MX517XXYB 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 MX517XXYB 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 MX517XXYB family offered in a small SOT23-5 and DFN4 package, which are ideal for small form factor portable equipment .

The MX517XXYB family are available in standard fixed output voltages of 0.8V(MX51708YB), 1.0V(MX51710YB), 1.1V(MX51711YB), 1.2V (MX51712YB), 1.5V (MX51715YB), 1.8V (MX51718YB), 2.5V (MX51725YB), 2.8 (MX51728YB), 3.0V (MX51730YB), 3.3V (MX51733YB) .

Features

- Wide Input Voltage Range from 1.9V to 5.5V
- Up to 300mA Load Current
- Standard Fixed Output Voltage Options:0.8V,1.0V,1.1V,1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V and 3.3V etc
- Very Low I_Q is 45μA typical
- Low Dropout is typical 200mV@2.8V at 300mA Load
- Very High PSRR: 75dB at 1KHz
- Very Low Noise is 40uVrms at 1.2V output
- Excellent Load/Line Transient Response
- Part No. and Package

Part No.	Package
MX517XXYB	DFN4

Applications

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

Label Information

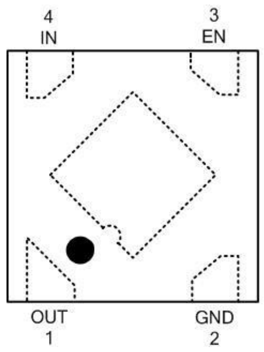
MX 517 XX X B

Auto-discharging function
B: Auto-discharging available
Empty: Auto-discharging not equipped

Package
Y: DFN4 (1x1)

Output Voltage
Output Voltage X.XV

Pin Configuration

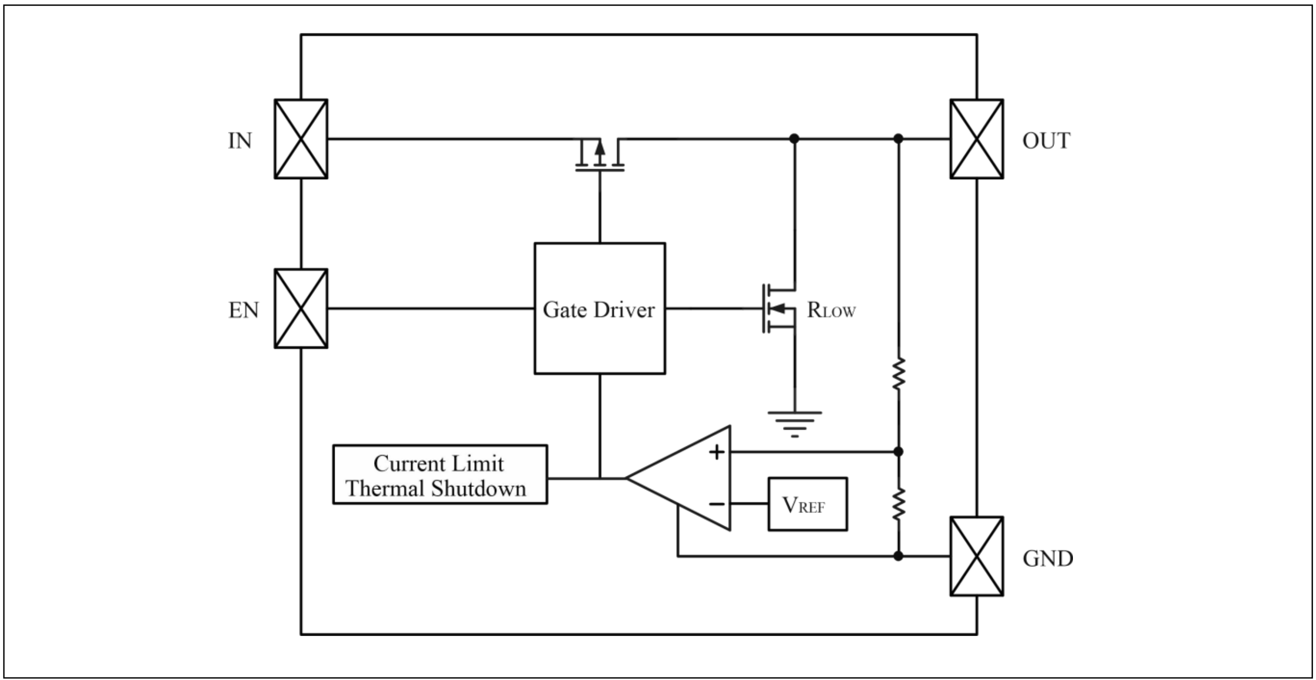


DFN4(1x1)
Top View

Pin Function

Pin No.	Pin Name	Pin Function
1	OUT	Output pin.
2	GND	Ground.
3	EN	Enable control input, active high.
4	IN	Supply input pin.

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 from 0.47μF to 4.7μF, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ, 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 MX517XXYB 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 MX517XXYB is able to provide full power in as little as tens of microseconds, typically 80μs. 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

Parameter		Rating	Unit
IN Voltage		-0.3 to 6.5	V
Other Pin Voltage		-0.3 to V_{IN}+0.3	V
Maximum Load Current		500	mA
Maximum Power Consumption	DFN4(1x1)	400	mW
	SOT23-5	400	mW
ESD	Human Body Model (JEDEC JS-001)	±4000	V
	Charged Device Model(JESD22-C101)	±1500	V
$R_{θJA}$	Junction-to-ambient thermal resistance	250	°C/W
Operating Junction Temperature		-40 to 125	℃
Storage Temperature		-65 to 150	℃
Lead Temperature (Soldering, 10 sec)		300	℃

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.9 to 5.5	V
I_{OUT}	Output Current	0 to 300	mA
Ta	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

(V_{IN}= V_{EN} =V_{OUT}+1V, T_A = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Operation Range	V_{IN}		1.9		5.5	V
Dropout Voltage	V_{DROP}(Note1)	V_{OUT} = 0.8V, I_{OUT} = 300mA (Note1)			1100	mV
		V_{OUT} = 1.0V, I_{OUT} = 300mA (Note1)			900	mV
		V_{OUT} = 1.1V, I_{OUT} = 300mA (Note1)			800	mV
		V_{OUT} = 1.2V, I_{OUT} = 300mA (Note1)			700	mV
		V_{OUT} = 1.5V, I_{OUT} = 300mA		400	600	mV
		V_{OUT} = 1.8V, I_{OUT} = 300mA		300	550	mV
		V_{OUT} = 2.5V, I_{OUT} = 300mA		220	450	mV
		V_{OUT} = 2.8V, I_{OUT} = 300mA		200	400	mV
		V_{OUT} = 3.0V, I_{OUT} = 300mA		190	380	mV
		V_{OUT} = 3.3V, I_{OUT} = 300mA		180	350	mV
DC Supply Quiescent Current	I_{Q_ON}	Active mode: V_{EN}=V_{IN}		45	70	μA
DC Supply Shutdown Current	$I_{Q\ OFF}$	V_{EN}=0V		0.01	1	μA
Regulated Output Voltage	V_{OUT}	I_{OUT}=1mA, -40°C≤T_A≤85°C	-2		2	%
Output Voltage Line Regulation		V_{IN} = V_{OUT} +1V to 5.5V, I_{OUT} = 10mA		0.03	0.2	%/V
Output Voltage Load Regulation		I_{OUT} from 0mA to 300mA		20	40	mV
Soft-start Time	T_S	From enable to power on		80		μs
Current Limit	I_{LIMIT}	R_{LOAD}=1Ω	300			mA
Short Current Limit	I_{SHORT}	V_{OUT}=0V		70		mA
Power Supply Rejection Ratio	PSRR	f=1kHz, C_{OUT}=1μF, I_{OUT}=20mA		75		dB
		f=10kHz, C_{OUT}=1μF, I_{OUT}=30mA		65		dB
Output Noise	e_N	10Hz to 100kHz, I_{OUT} =200mA,V_{OUT}=2.8V, C_{OUT} = 1μF		60		μV_{RMS}
		10Hz to 100kHz, I_{OUT} =200mA,V_{OUT}=1.2V, C_{OUT} = 1μF		40		
EN Low Threshold	V_{IL}				0.3	V
EN High Threshold	V_{IH}		1.2			V

EN Pin Input Current	I_{EN}	V_{EN} = 0V		0	0.1	μA
EN pull-down resistance	R_{PD}		0.8	1	1.3	MΩ
Output resistance of auto discharge at off state	R_{LOW}	EN=0V,V_{IN}=4V		80		Ω
Over-temperature Shutdown Threshold	T_{TSD}	T_J rising		155		℃
Over-temperature Shutdown Hysteresis	T_{HYS}	T_J falling from shutdown		20		℃

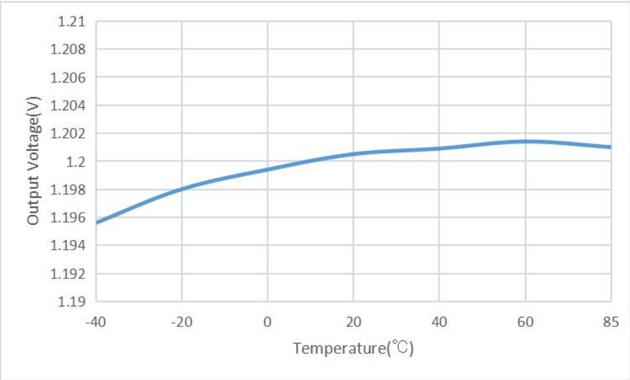
Note: Production test at +25℃. Specifications over the temperature range are guaranteed by design and characterization.

Note1:The minimum operating voltage is 1.9V.V_{DROP}=V_{IN}(min)-V_{OUT}。

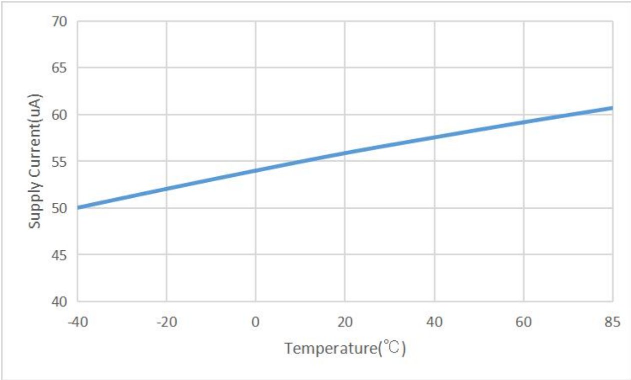
Typical Characteristics

(1) VOLTAGE VERSION 1.2 V

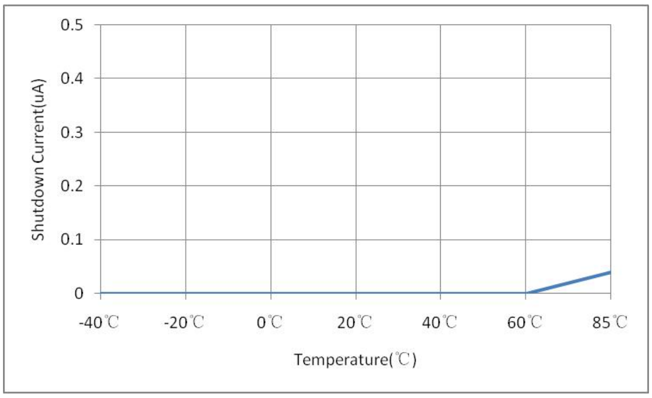
(V_{IN} = 2.2V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = +25°C.)



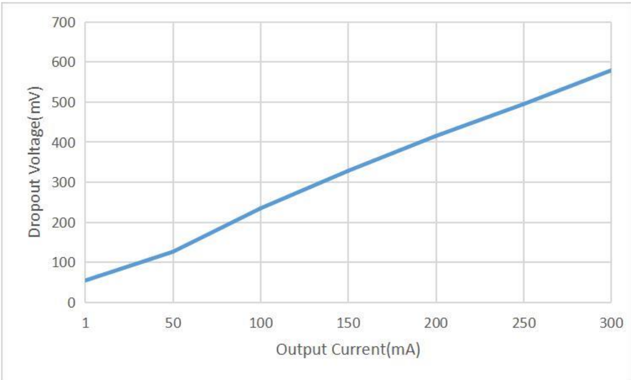
Output Voltage VS Temperature



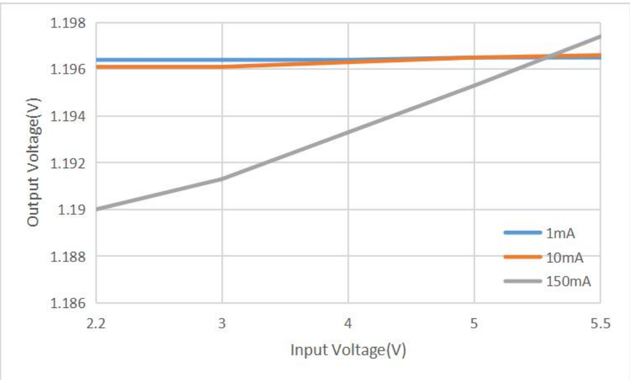
Supply Current VS Temperature



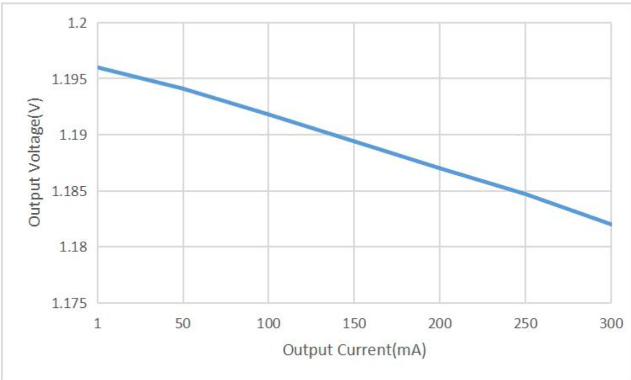
Shutdown Current VS Temperature



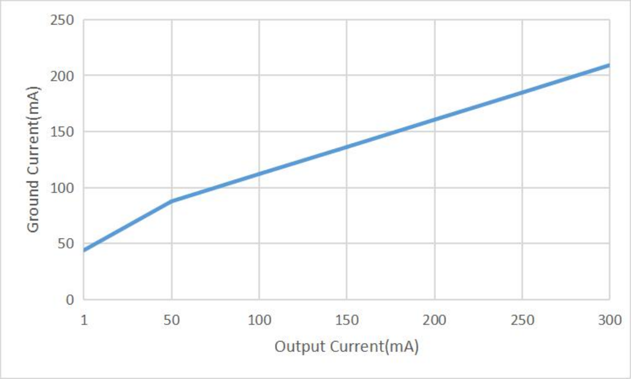
Dropout Voltage VS Output Current



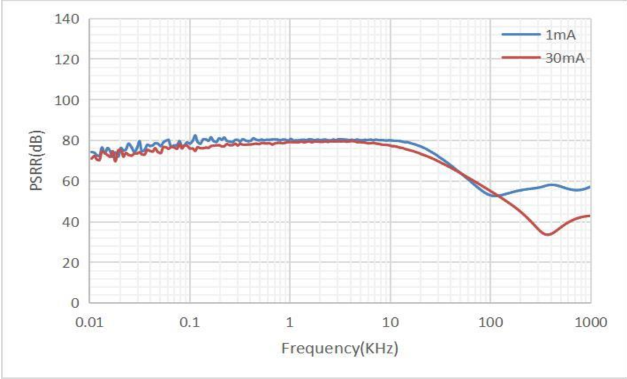
Output Voltage VS Input Voltage



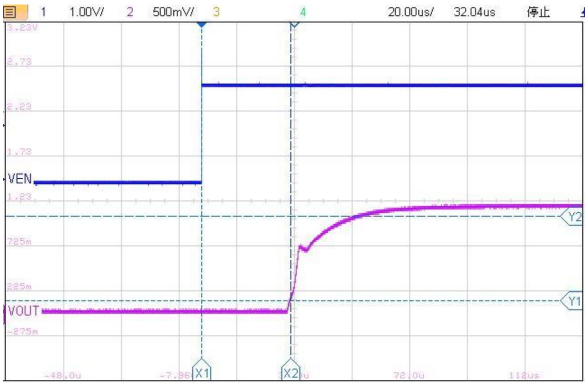
Output Voltage VS Output Current



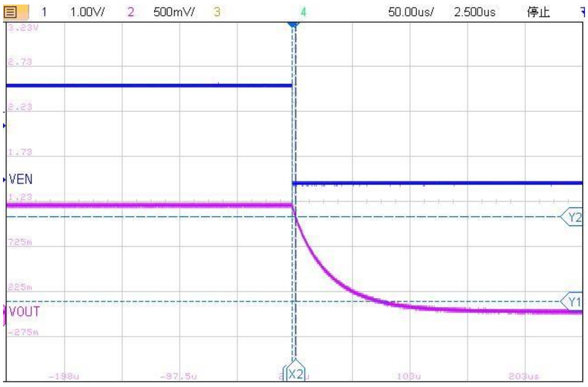
Ground Current VS Output Current



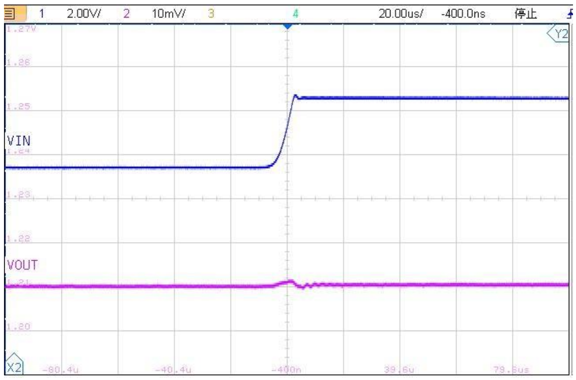
PSRR VS Output Current



Turn On Speed VS EN Voltage (I_{OUT}=30mA)

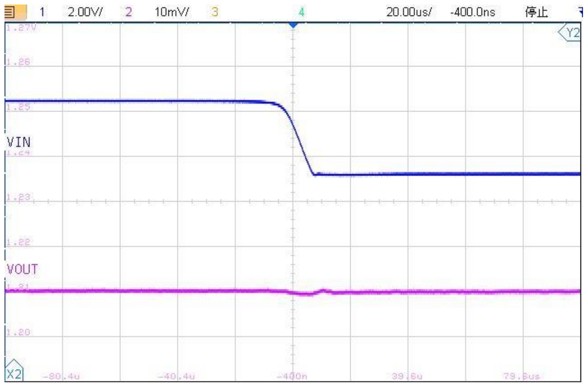


Turn Off Speed VS EN Voltage (I_{OUT}=30mA)



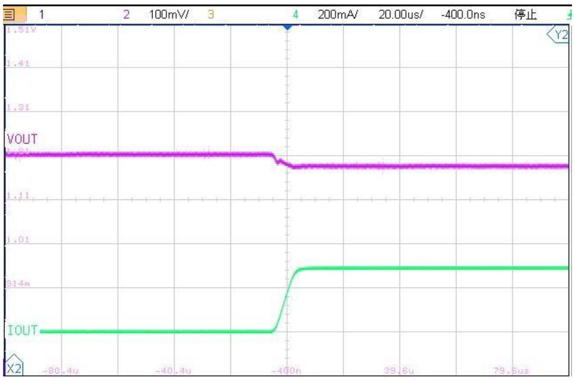
Line Transient Response

VIN=2.2V~5.5V, VOUT=1.2V, IOUT=1mA

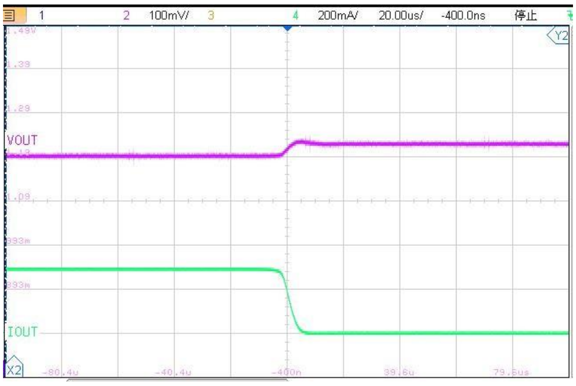


Line Transient Response

VIN=5.5V~2.2V, VOUT=1.2V, IOUT=1mA



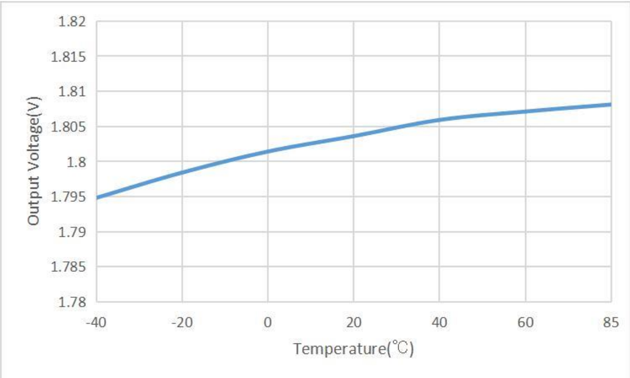
Load Transient Response
VIN=2.2V, VOUT=1.2V, IOUT=1mA~300mA



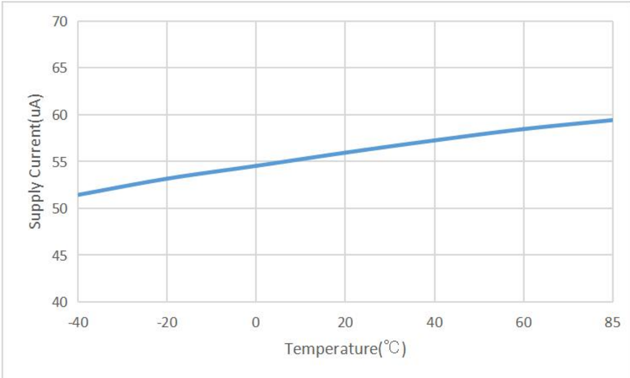
Load Transient Response
VIN=2.2V, VOUT=1.2V, IOUT=300mA~1mA

(2) VOLTAGE VERSION 1.8 V

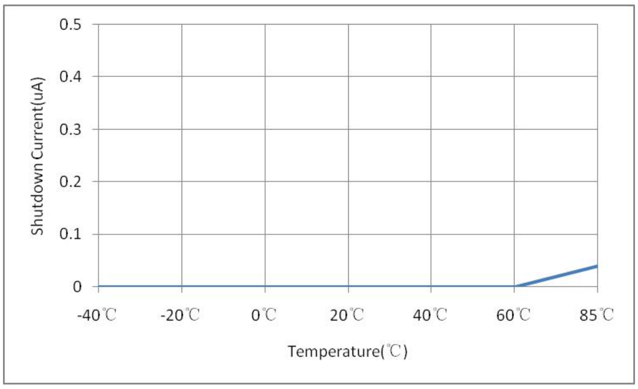
(V_{IN} = 2.8V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0µF, unless otherwise noted. Typical values are at T_A = +25°C.)



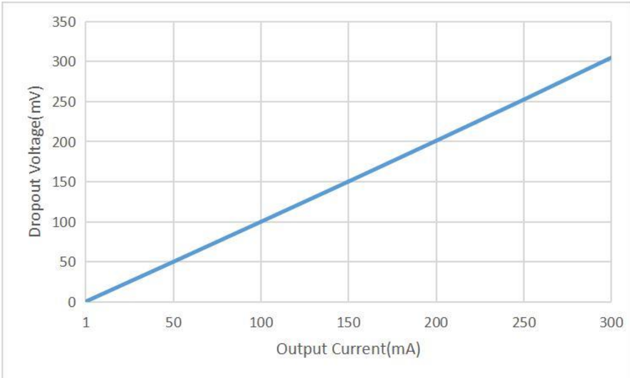
Output Voltage VS Temperature



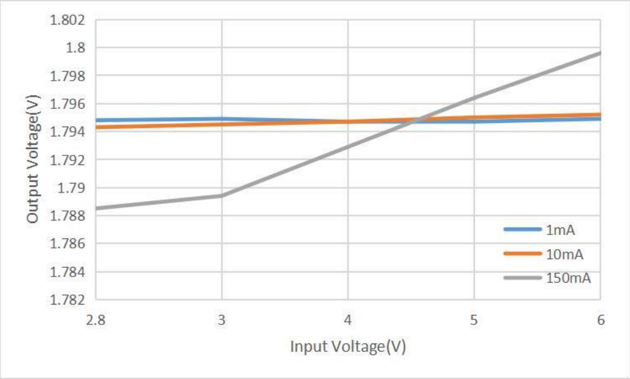
Supply Current VS Temperature



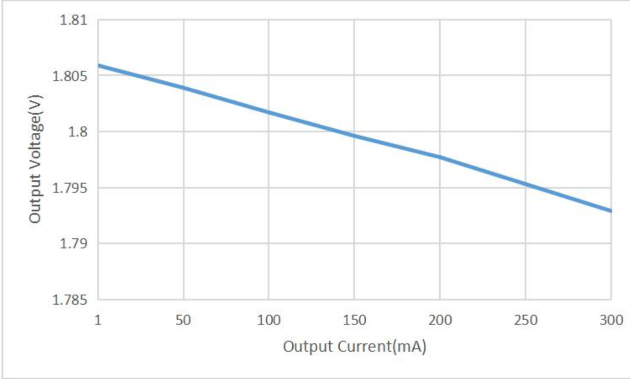
Shutdown Current VS Temperature



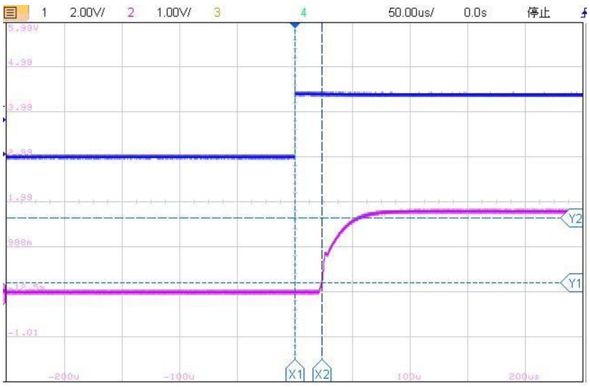
Dropout Voltage VS Output Current



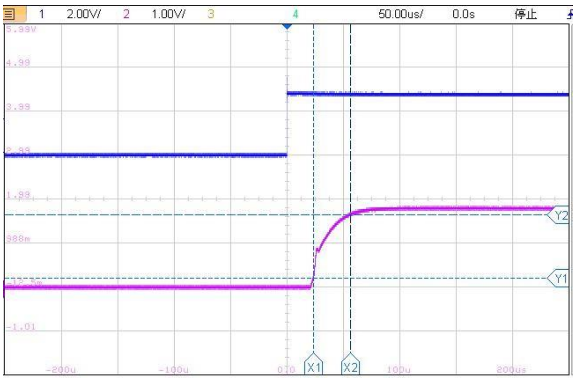
Output Voltage VS Input Voltage



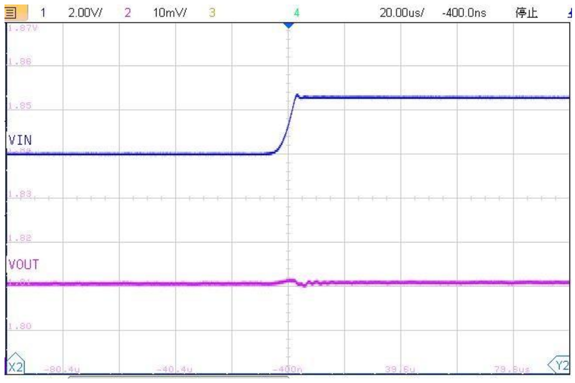
Output Voltage VS Output Current



Turn On Speed VS EN Voltage (I_{OUT}=30mA)

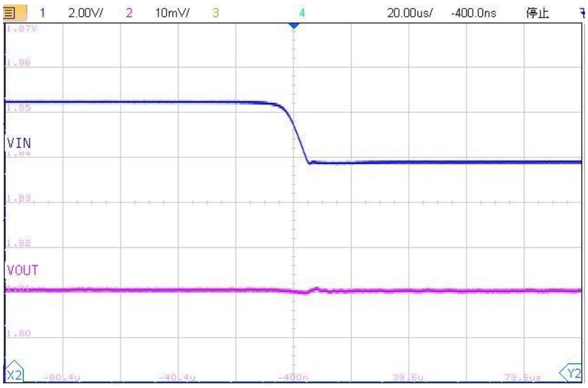


Turn Off Speed VS EN Voltage (I_{OUT}=30mA)



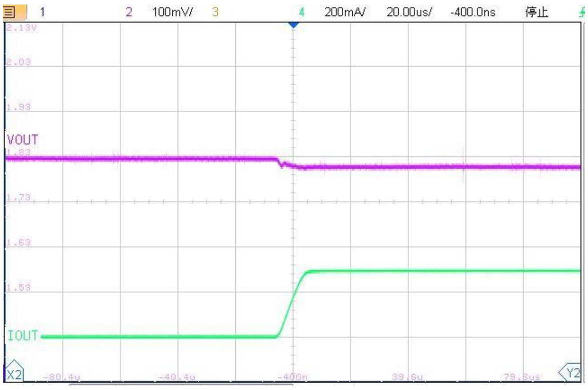
Line Transient Response

VIN=2.8V~5.5V, VOUT=1.8V, IOUT=1mA

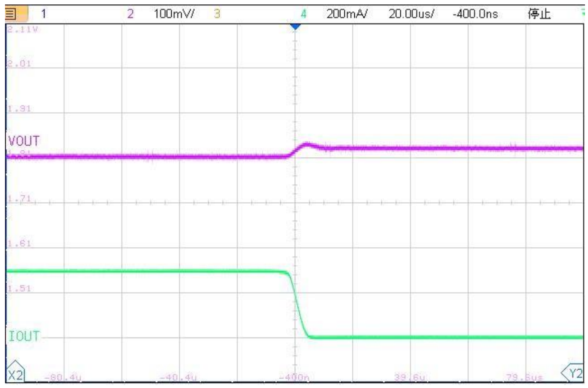


Line Transient Response

VIN=5.5V~2.8V, VOUT=1.8V, IOUT=1mA



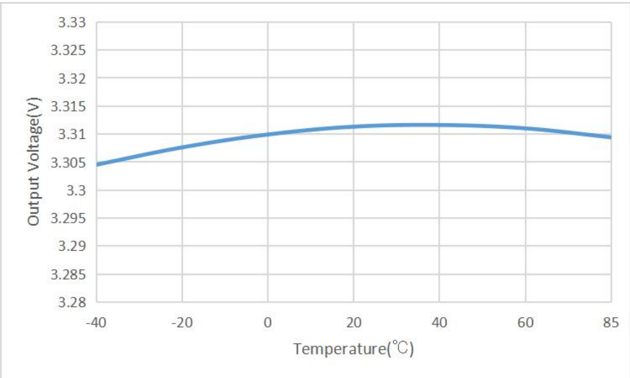
Load Transient Response
VIN=2.8V, VOUT=1.8V, IOUT=1mA~300mA



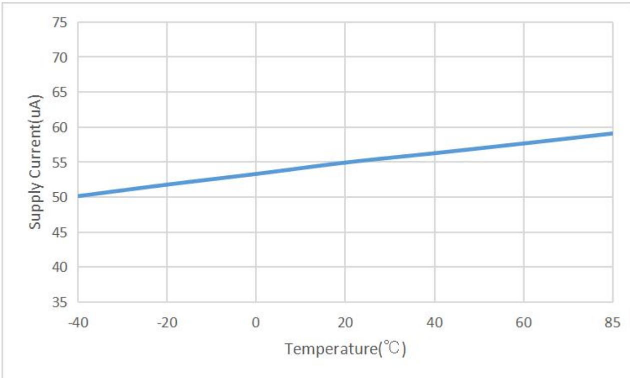
Load Transient Response
VIN=2.8V, VOUT=1.8V, IOUT=300mA~1mA

(3) VOLTAGE VERSION 3.3 V

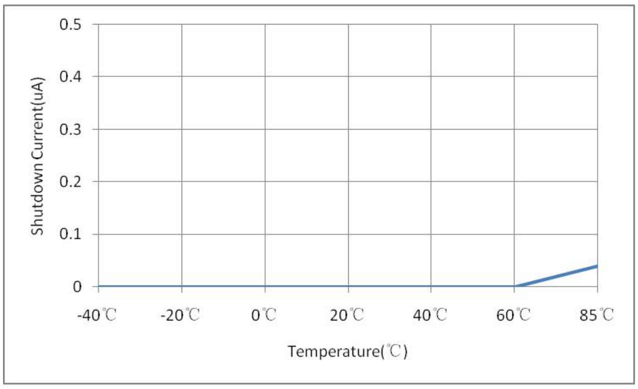
(V_{IN} = 3.3V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = +25°C.)



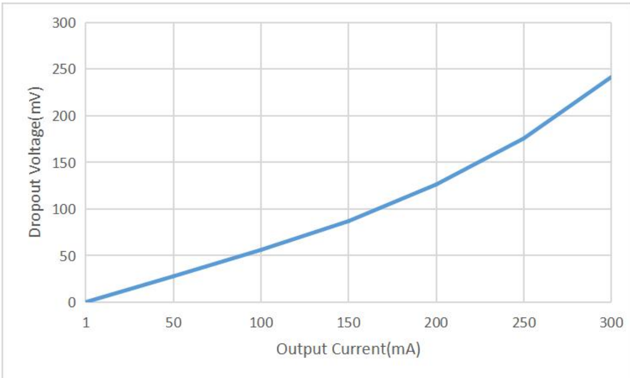
Output Voltage VS Temperature



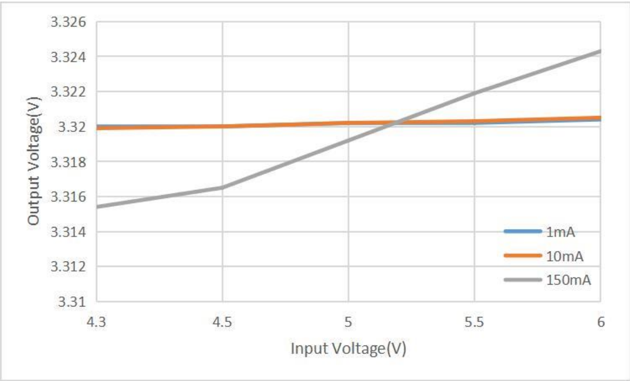
Supply Current VS Temperature



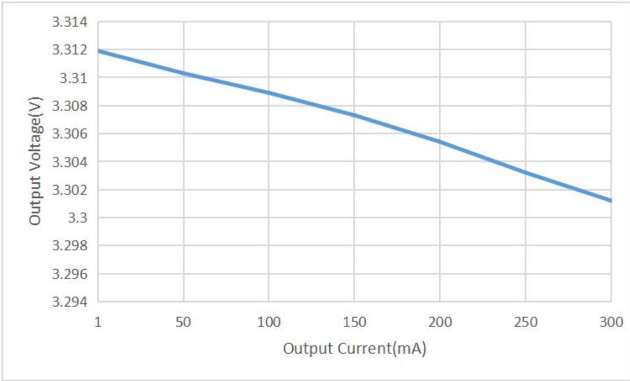
Shutdown Current VS Temperature



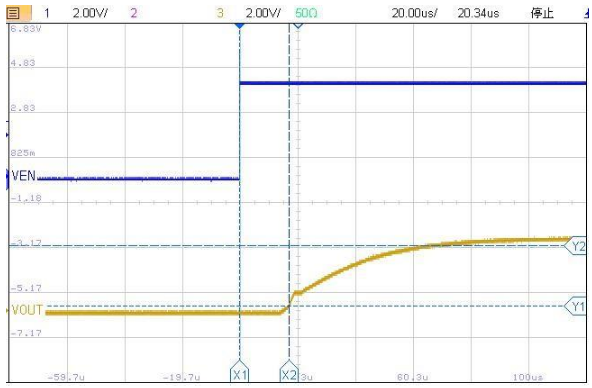
Dropout Voltage VS Output Current



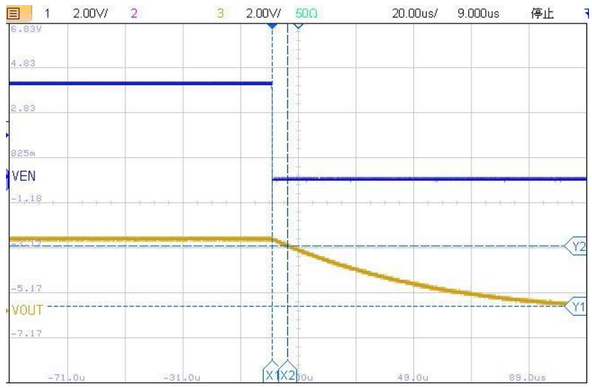
Output Voltage VS Input Voltage



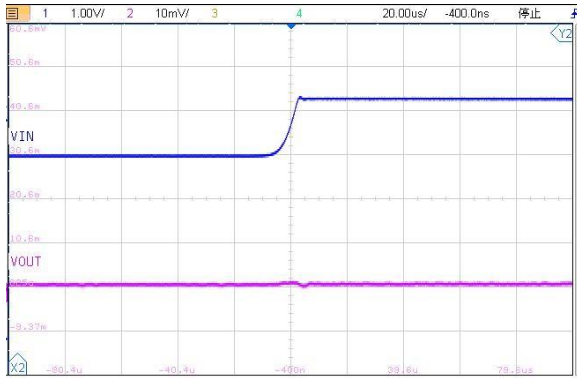
Output Voltage VS Output Current



Turn On Speed VS EN Voltage (I_{OUT}=30mA)

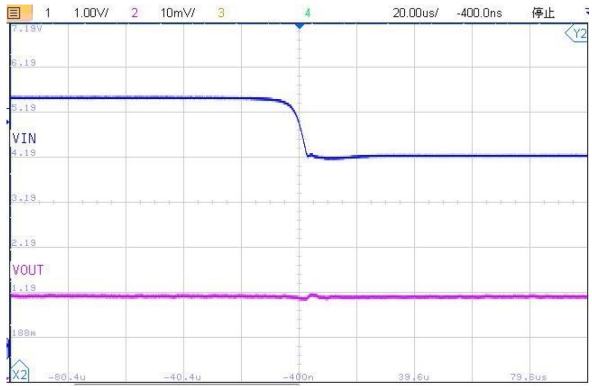


Turn Off Speed VS EN Voltage (I_{OUT}=30mA)



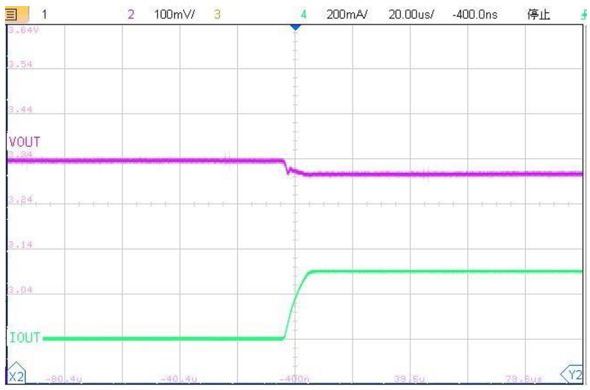
Line Transient Response

VIN=4.3V~5.5V, VOUT=3.3V, IOUT=1mA

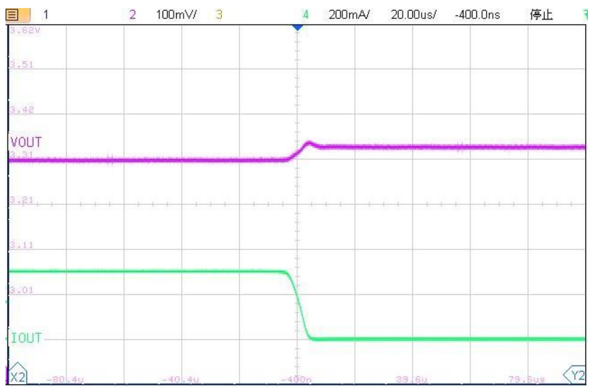


Line Transient Response

VIN=5.5V~4.3V, VOUT=3.3V, IOUT=1mA

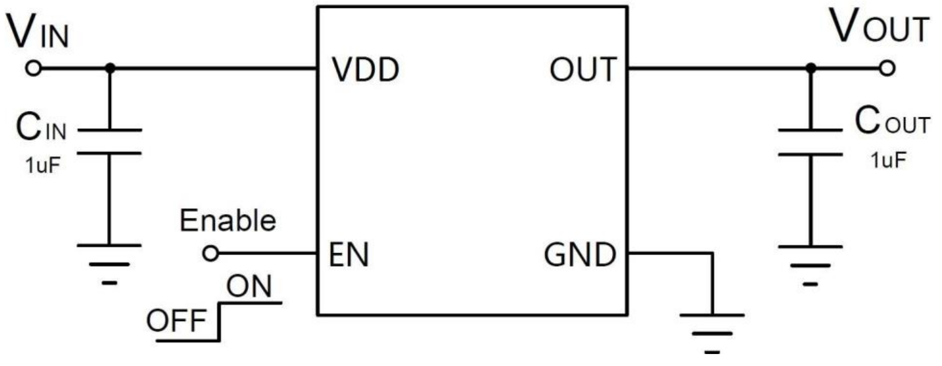


Load Transient Response
VIN=4.3V, VOUT=3.3V, IOUT=1mA~300mA



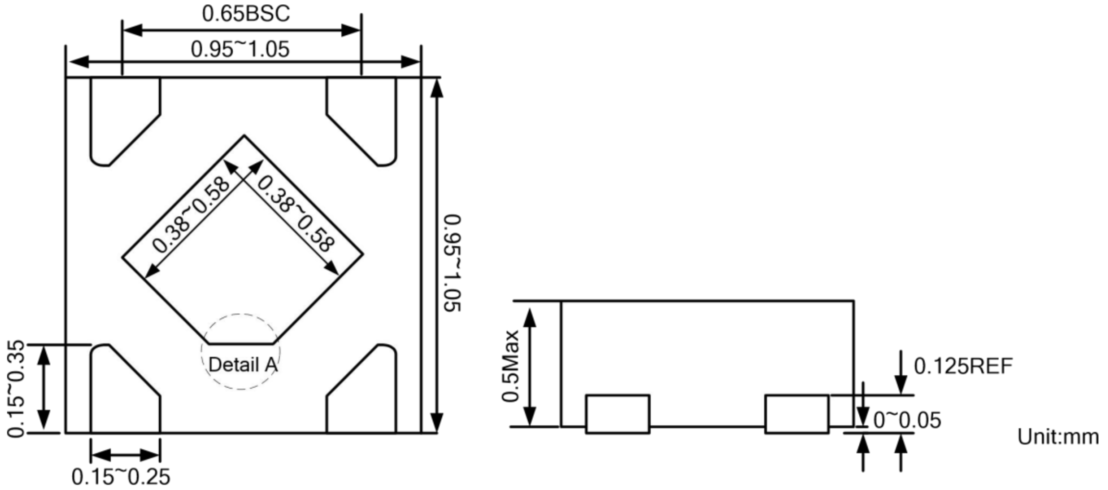
Load Transient Response
VIN=4.3V, VOUT=3.3V, IOUT=300mA~1mA

Application Circuits



Package Dimension

DFN4（1*1）



Detail A: (PIN1 shape)