ET515DXXYB - Dual Low Noise 150mA LDO

General Description

The ET515DXXYB family of low-dropout (LDO), low-power linear regulators offers very high power supply rejection ratio (PSRR) while maintaining very low 40μA×2 ground current. The family uses an advanced CMOS process and a PMOSFET pass device to achieve fast start-up, very low noise, excellent transient response, and excellent PSRR performance. The ET515DXXYB is stable with a 1.0μF ceramic output capacitor, and uses a precision voltage reference and feedback loop to achieve a worst-case accuracy of 2% over all load, line, process, and temperature variations. It is offered in a small DFN6(1.2×1.2) package.

Features

- Wide Input Voltage Range: 1.6 V to 5.5V
- Standard Fixed Output Voltage Options: 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V and 3.6V
- Other Output Voltage Options Available on Request
- Very Low IQ: 40μA*2
- Ultra Low Dropout: 250mV at 150mA Load @ V_{OUT}=2.5V
- Very High PSRR: 70dB at 1kHz
- Excellent Load/Line Transient Response
- Line Regulation: 0.03% typical
- Package Information:

Part No.	Package	MSL
ET515DXXYB	DFN6 (1.2×1.2)	Level 1

Applications

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

Device Information

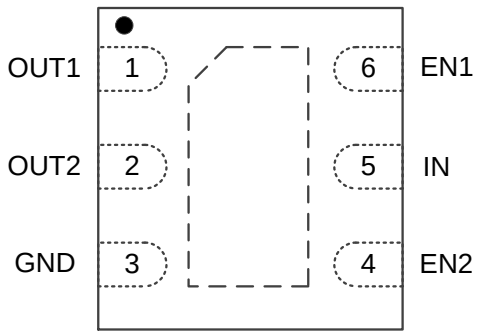
ET 515D XX Y B

XX Output Voltage		Y Package		B Auto-Discharging Function
XX	First **X**：OUT1 output voltage Second **X**：OUT2 output voltage	Y	DFN6(1.2×1.2)	B：Auto-discharging available

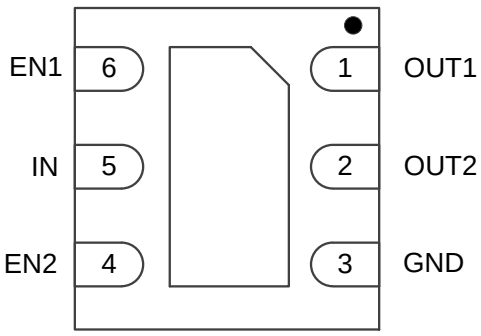
VOUT1 /VOUT2 Marking Name

VOUT1 / VOUT2	Name / Marking	V_{OUT}
XX Example: ET515D**DE** is VOUT1=2.8V VOUT2=3.3V	A	1.2V
	B	1.5V
	C	1.8V
	F	2.5V
	D	2.8V
	G	3.0V
	E	3.3V
	R	3.6V

Pin Configuration



Top View

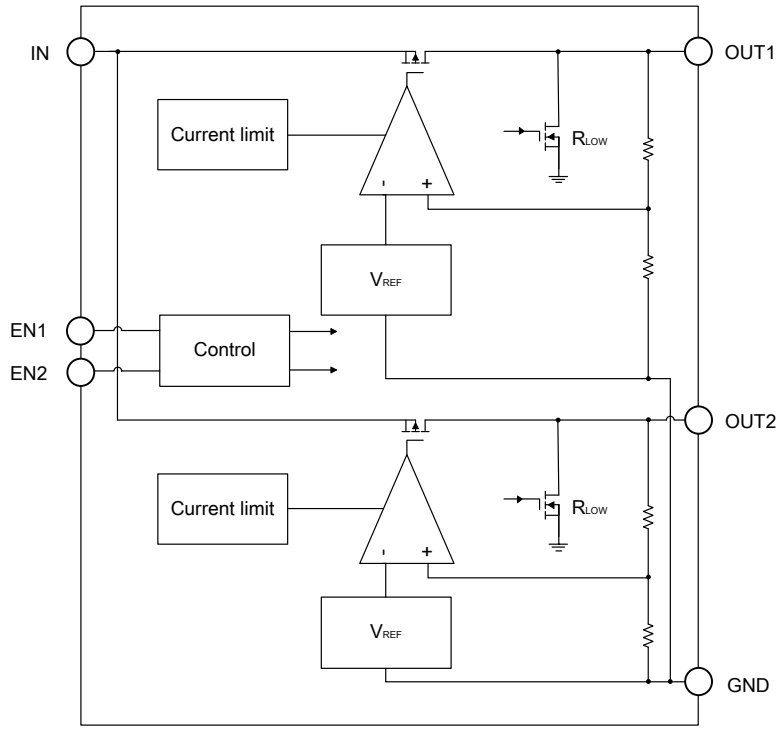


Bottom View

Pin Function

Pin No.	Pin Name	Pin Function
1	OUT1	Output pin. A 1μF low-ESR capacitor should be connected to this pin to ground.
2	OUT2	Output pin. A 1μF low-ESR capacitor should be connected to this pin to ground.
3	GND	Ground
4	EN2	OUT2 enable control input, active high. Do not leave EN2 floating
5	IN	Supply input pin. Must be closely with a 1μF or greater ceramic capacitor
6	EN1	OUT1 enable control input, active high. Do not leave EN1 floating
-	Thermal Pad	Thermal pad for DFN6(1.2×1.2) package, connect to GND or leave floating. Do not connect to any potential other than GND

Block Diagram



ET515DXXYB (with auto-discharge)

Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between VIN 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 VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from 1μF to 2.2μF, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot and overshoot. Place output capacitor as close as possible to OUT and GND pins.

ON/OFF Input Operation

The ET515DXXYB 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.

High PSRR and Low Noise

RF circuits such as LNA (low-noise amplifier), up/down-converter, mixer, PLL, VCO, and IF stage, require low noise and high PSRR LDOs. The temperature-compensated crystal oscillator circuit requires very high PSRR

at RF power amplifier burst frequency. For instance, minimum 65dB PSRR at 217Hz is recommended for the GSM handsets.

In order to provide good audio quality, the audio power supply for hand-free, game, and multimedia applications in cellular phones, require low-noise and high PSRR at audio frequency range (20Hz-20kHz).

The ET515DXXYB, with PSRR of 70dB at 1kHz, is suitable for most of these applications that require high PSRR and low noise.

Fast Transient Response

The ET515DXXYB's fast transient response from 0 to 150mA can provides stable voltage supply for fast changing load.

Low Quiescent Current

The ET515DXXYB, consuming only around 40μA*2 for all input range and output loading, provides great power saving in portable and low power applications.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin is short-circuit to GND, the current limit protection will be triggered and clamp the output current to approximately 250mA to prevent over-current and to protect the regulator from damage due to overheating.

Absolute Maximum Ratings

Symbol	Parameters (Items)	Value	Unit
V_{IN}	IN Voltage	-0.3 to 6	V
$V_{EN1/2}$	Input Voltage (EN Pin)	-0.3 to V_{IN}+0.3	V
$V_{OUT1/2}$	Output Voltage	-0.3 to V_{IN}+0.3	V
I_{MAX}	Maximum Load Current	180	mA
$R_{\theta JA}$	Junction-to-ambient thermal resistance	220	°C/W
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

Electrical Characteristics(1)

(V_{IN}=$V_{EN1/2}$=V_{OUT}+1V, T_A=25°C unless otherwise noted)

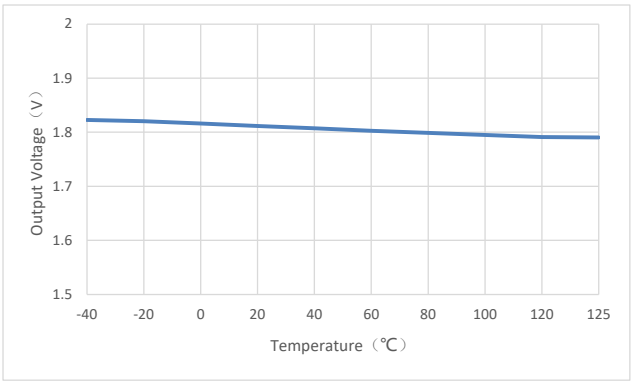
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		1.6		5.5	V
V_{DROP}	Dropout Voltage	V_{OUT}≥2.5V, I_{OUT}=150mA		250	300	mV
I_{Q_ON}	Input Quiescent Current	Active mode: $V_{EN1/2}$=V_{IN}		40*2	60*2	μA
$I_{Q\ OFF}$	Input Shutdown Current	$V_{EN1/2}$=0V		0.01*2	1*2	μA
V_{OUT}	Regulated Output Voltage	I_{OUT}=1mA	-2		2	%
Δ V_{OUT}/ (Δ T*V_{OUT})	Output Voltage Temperature Characteristics	I_{OUT}=20mA, -40°C≤T_A≤85°C		±50		ppm/ °C
ΔVOUT	Output Voltage Line Regulation	V_{IN}=V_{OUT}+1V to 5.5V, I_{OUT}=10mA			0.4	%
	Output Voltage Load Regulation	I_{OUT} from 0mA to 150mA			0.6	%
I_{LIMIT}	Current Limit	R_{LOAD}=1Ω	160			mA
I_{SHORT}	Short Current Limit	V_{OUT}=0V		40		mA
PSRR	Power Supply Rejection Ratio	f=1kHz, C_{OUT}=1μF, I_{OUT}=20mA		70		dB
e_N	Output Noise	10Hz to 100kHz, I_{OUT}=1mA,		60		$μV_{RMS}$
R_{PD}	EN1/2 pull-down resistance			1		MΩ
I_{EN}	EN Pin Input Current				0.1	μA
R_{LOW}	Output resistance of auto discharge at off state	$V_{EN1/2}$=0V, V_{IN}=4V, I_{OUT}=10mA		40		Ω
V_{IL}	EN Low Threshold	V_{IN}=1.6V to 5.5V, V_{EN} falling until the output is disabled			0.4	V
V_{IH}	EN High Threshold	V_{IN}=1.6V to 5.5V, V_{EN} rising until the output is enabled	1.0			V

Note1: Specifications over the temperature range are guaranteed by design and characterization.

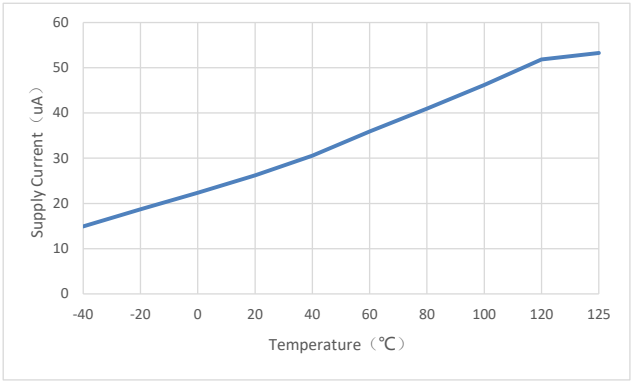
Typical Characteristics

(1) VOLTAGE VERSION 1.8 V

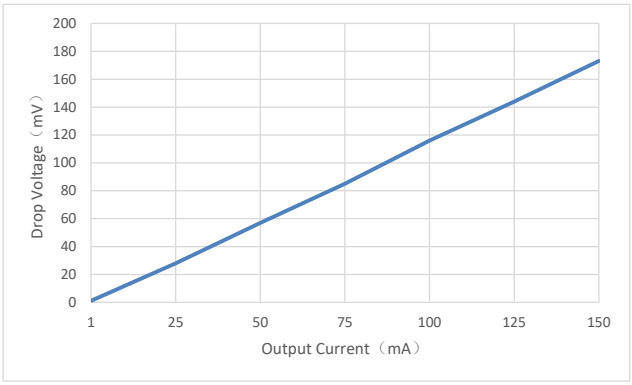
(V_{IN}=2.8V; I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=25°C.)



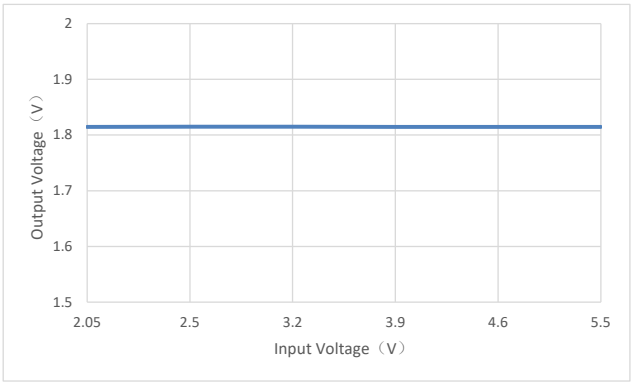
Output Voltage VS Temperature



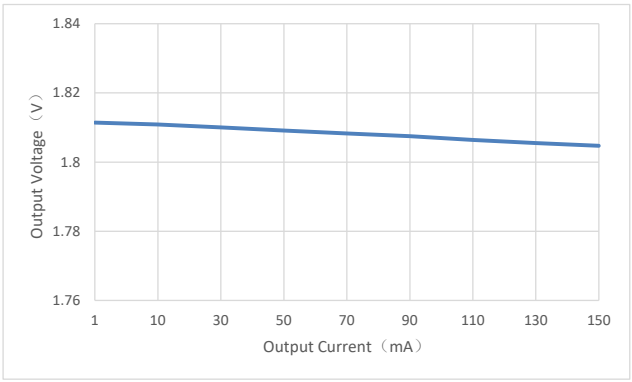
Supply Current VS Temperature



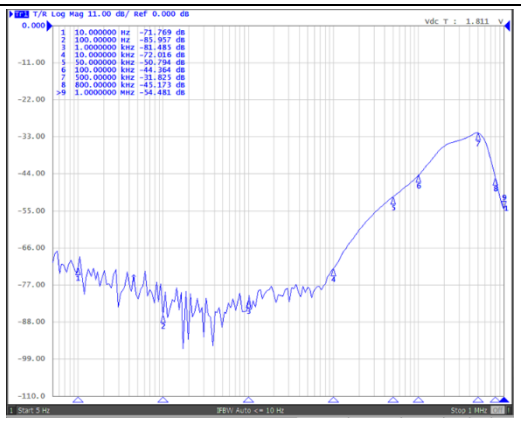
Dropout Voltage VS Output Current



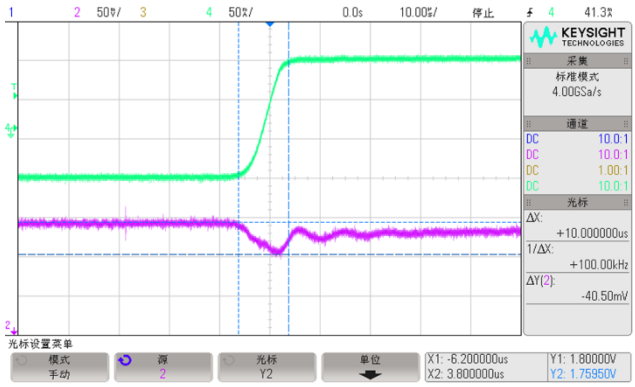
Output Voltage VS Input Voltage



Output Voltage VS Output Current

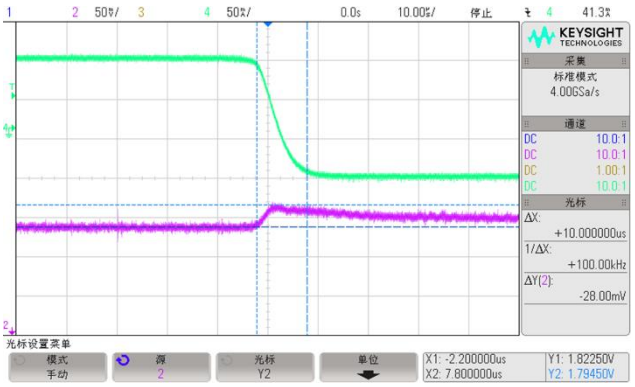


PSRR



Load Transient Response

I_{OUT}=1mA~150mA

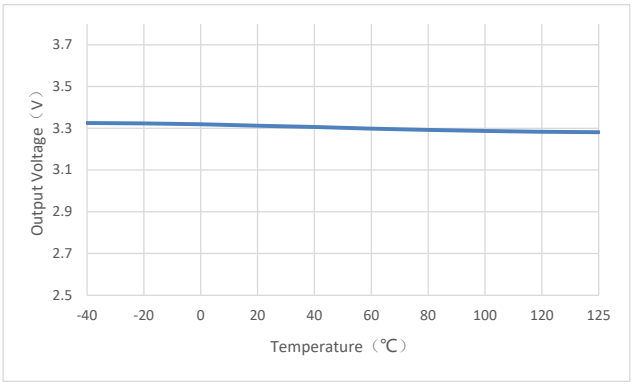


Load Transient Response

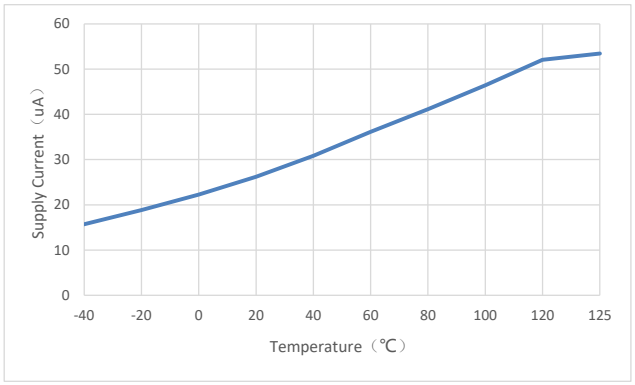
I_{OUT}=150mA~1mA

(2) VOLTAGE VERSION 3.3 V

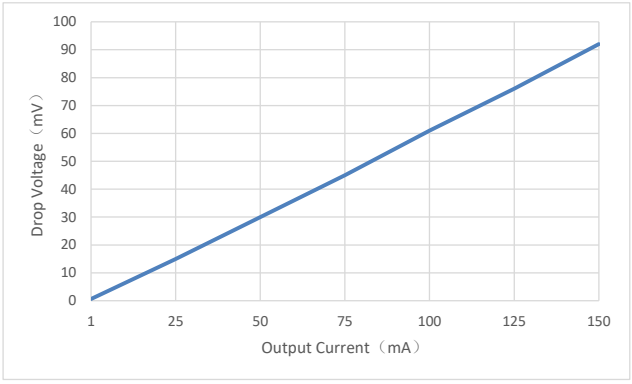
(V_{IN}=4.3V; I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, unless otherwise noted. Typical values are at T_A=25°C.)



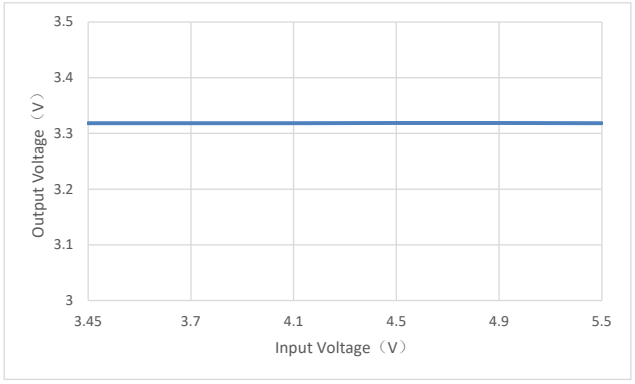
Output Voltage VS Temperature



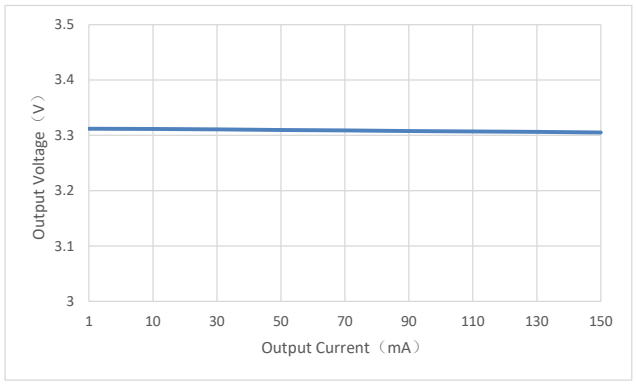
Supply Current VS Temperature



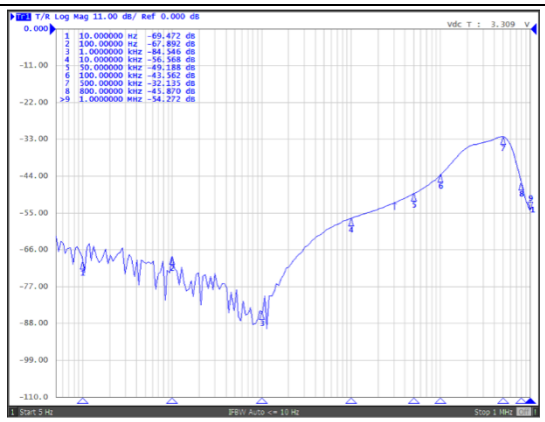
Dropout Voltage VS Output Current



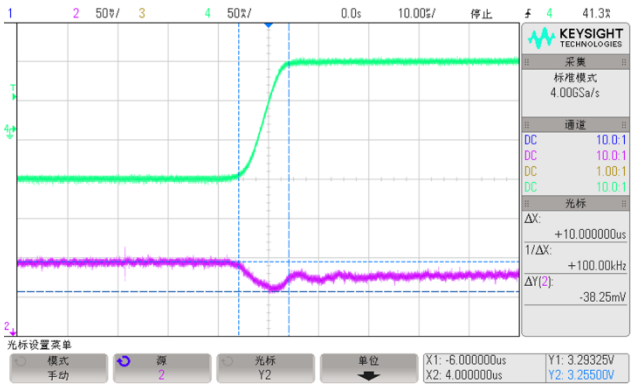
Output Voltage VS Input Voltage



Output Voltage VS Output Current

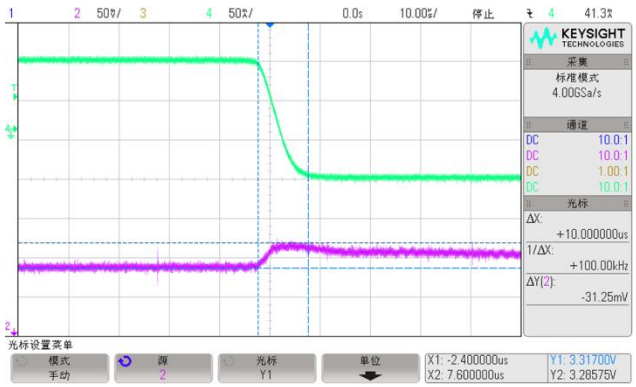


PSRR



Load Transient Response

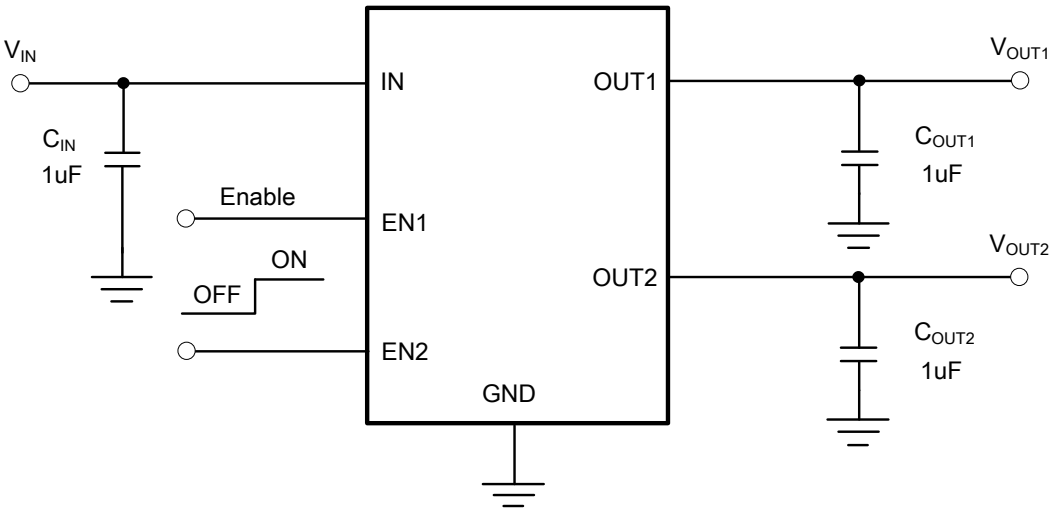
I_{OUT}=1mA~150mA



Load Transient Response

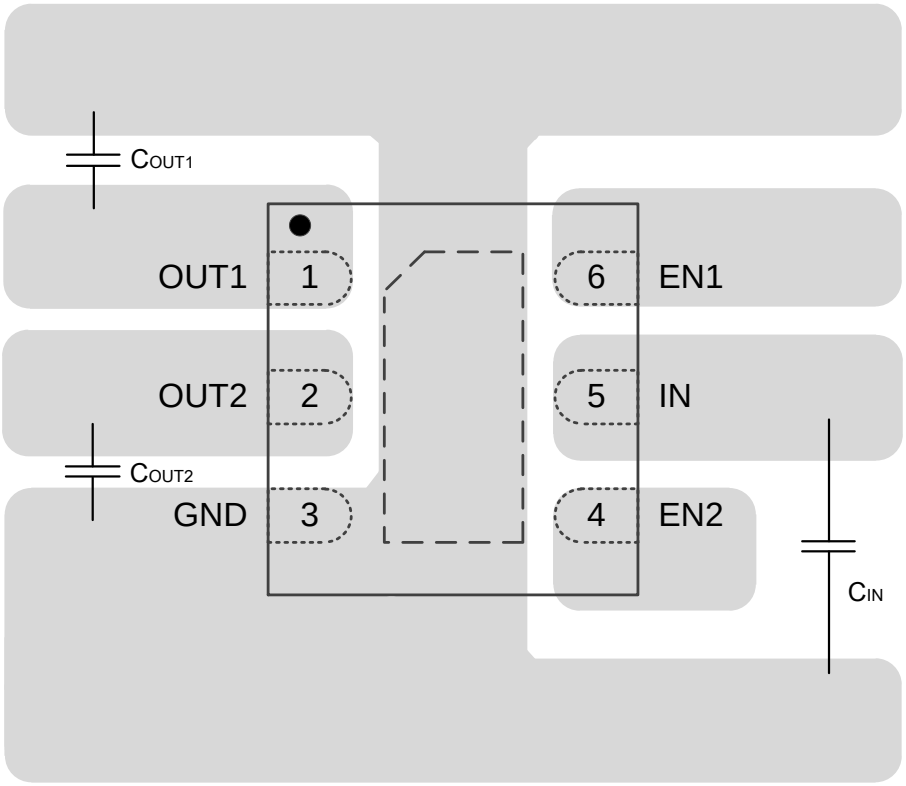
I_{OUT}=150mA~1mA

Application Circuits



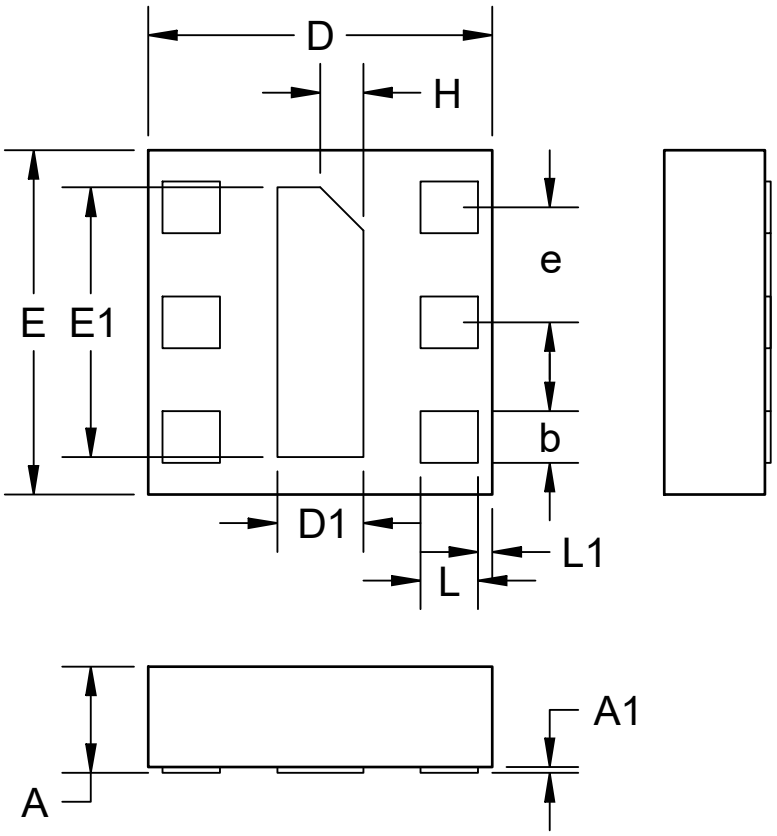
PCB Layout Guide

DFN6



Package Dimension

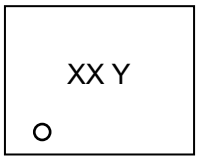
DFN6



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0	0.02	0.05
b	0.13	0.18	0.23
D	1.10	1.20	1.30
D1	0.25	0.30	0.35
E	1.10	1.20	1.30
E1	0.89	0.94	0.99
e	0.30	0.40	0.50
L	0.15	0.20	0.25
L1	0	0.05	0.10
H	0.15REF		

Marking



XX = Part Number

Y = Lot Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-03-23	Original Version	Zhao Cheng Gong	Zhao Cheng Gong	Zhujl
1.1	2022-12-12	Update Typeset	Yang Xiao Xu	Chenhui	Yang Xiao Xu