

500nA I_Q, 300mA Low-Dropout Linear Regulator

1.Description

The FLD0503 ultra-low quiescent current regulator features low dropout voltage and low current in the standby mode. With less than 500nA quiescent current at no load, the FLD0503 is ideally suited for standby micro-control-unit systems, especially for always-on applications like portable, and other battery operated systems. The FLD0503 retains all of the features that are common to low dropout regulators including a low dropout PMOS pass device, short circuit protection, and thermal shutdown.

The FLD0503 has a 6V maximum operating voltage limit, a 0°C to 100°C operating temperature range, and $\pm 2\%$ output voltage tolerance over the entire output current, input voltage, and temperature range. The FLD0503 is available in SOT-89-3L, SOT23-5, and DFN1X1 surface mount packages.

2.Features

- VIN Range up to 6V
- Output Voltage Tolerances of $\pm 2\%$ Over the Temperature Range
- Output Current of 300mA, Supports 450mA peak Output
- Ultra Low Quiescent Current (I_Q = 500nA)
- Dropout Voltage Typically 400mV at I_{OUT} = 300mA
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limit
- Ceramic Capacitor Stable

3.Applications

- Portable, Battery Powered Equipment
- Ultra Low Power Microcontroller
- Notebook computers

4.Order Information

Mode	VOUT(V)	Package	Ordering Number	Packing Option
FLD0503-1.2	1.2	SOT23-3	FLD0503-1.2YSOT233G/TR	Tape and Reel,3000
	1.2	SOT23-5	FLD0503-1.2YSOT235G/TR	Tape and Reel,3000
	1.2	SOT-89-3L	FLD0503-1.2YSOT893G/TR	Tape and Reel,1000
	1.2	DFN1X1-4L	FLD0503-1.2YDFN1X1G/TR	Tape and Reel,3000
FLD0503-2.2	2.2	SOT23-3	FLD0503-2.2YSOT233G/TR	Tape and Reel,3000
	2.2	SOT23-5	FLD0503-2.2YSOT235G/TR	Tape and Reel,3000
	2.2	SOT-89-3L	FLD0503-2.2YSOT893G/TR	Tape and Reel,1000
	2.2	DFN1X1-4L	FLD0503-2.2YDFN1X1G/TR	Tape and Reel,3000
FLD0503-2.5	2.5	SOT23-3	FLD0503-2.5YSOT233G/TR	Tape and Reel,3000
	2.5	SOT23-5	FLD0503-2.5YSOT235G/TR	Tape and Reel,3000
	2.5	SOT-89-3L	FLD0503-2.5YSOT893G/TR	Tape and Reel,1000
	2.5	DFN1X1-4L	FLD0503-2.5YDFN1X1G/TR	Tape and Reel,3000
FLD0503-2.8	2.8	SOT23-3	FLD0503-2.8YSOT233G/TR	Tape and Reel,3000
	2.8	SOT23-5	FLD0503-2.8YSOT235G/TR	Tape and Reel,3000
	2.8	SOT-89-3L	FLD0503-2.8YSOT893G/TR	Tape and Reel,1000
	2.8	DFN1X1-4L	FLD0503-2.8YDFN1X1G/TR	Tape and Reel,3000
FLD0503-3.3	3.3	SOT23-3	FLD0503-3.3YSOT233G/TR	Tape and Reel,3000
	3.3	SOT23-5	FLD0503-3.3YSOT235G/TR	Tape and Reel,3000
	3.3	SOT-89-3L	FLD0503-3.3YSOT893G/TR	Tape and Reel,1000
	3.3	DFN1X1-4L	FLD0503-3.3YDFN1X1G/TR	Tape and Reel,3000

5. Typical Application

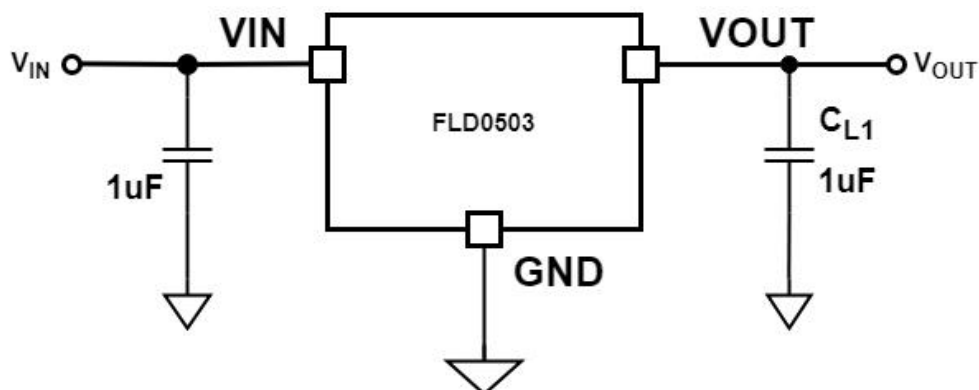


Figure 1. Typical Application for FLD0503

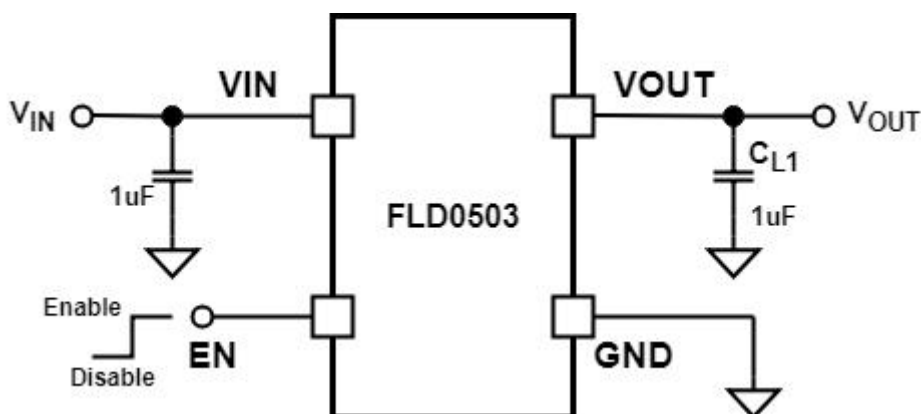


Figure 2. Typical Application for FLD0503

6.Pin Configuration

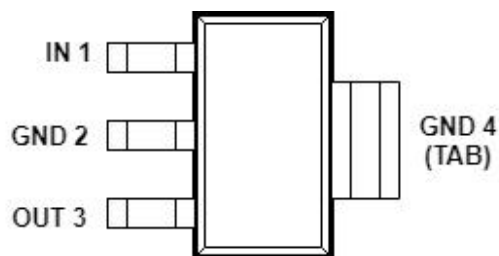


Figure 3. Pin Assignment of FLD0503 Package SOT-89-

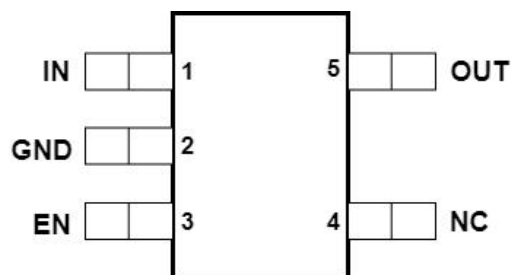


Figure 4. Pin Assignment of FLD0503 Package SOT23-5

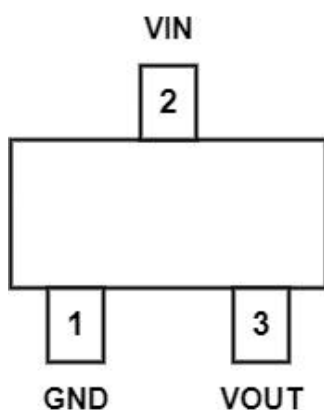


Figure 5. Pin Assignment of FLD0503 Package SOT23-3

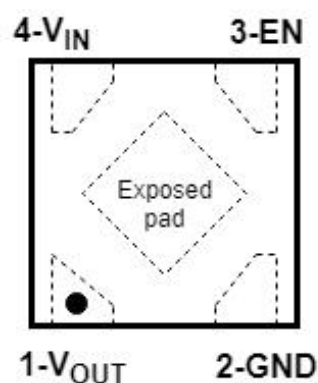


Figure 6. Pin Assignment of FLD0503 Package DFN1X1

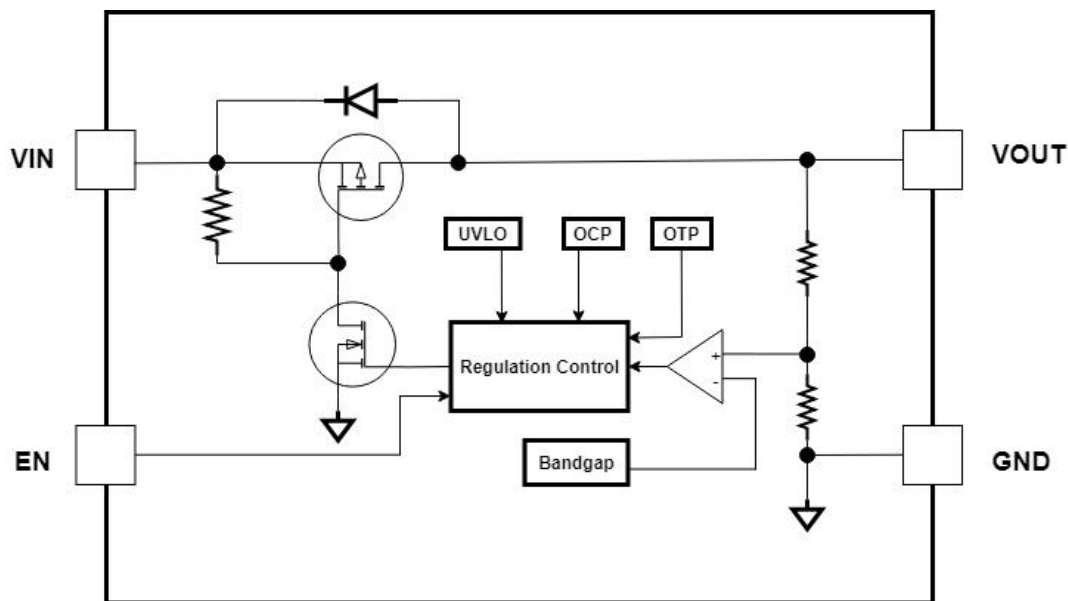
7.Pin Description

Pin Name	Pin No.SOT-89-3L	Pin No.SOT23-5	Pin No.SOT23-3	Pin No.DFN1X1	Pin Function
VOUT	3	5	2	1	Output Voltage Pin
GND	2,4	2	1	2	Ground
VIN	1	1	3	4	Input Voltage pin
EN	--	3	--	3	Enable

8.Absolute Maximum Ratings

- VIN-----0.3V to +6.5V
- Junction Temperature -----125℃
- Lead Temperature (Soldering, 10 sec.) -----300℃
- Storage Temperature-----65℃ to 150℃

9.Functional Block Diagram



10.Electrical Characteristics

($V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 1mA$, $C_{IN} = C_{OUT} = 1\mu F$, $T_J = 25^\circ C$, unless otherwise specified)

Paramter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	ΔV_{OUT}		-2%		2%	V
Line Regulation	ΔV_{LINE}	$V_{IN} = V_{OUT} + 1V$ to 5.5V		20	50	mV
Load Regulation	ΔV_{LOAD}	$I_{OUT} = 1mA$ to 150mA		13	25	mV
		$I_{OUT} = 1mA$ to 300mA		25	40	
Dropout Voltage	V_{DROP}	$I_{OUT} = 100mA$, $V_{OUT} = 3.3V$		130		mV
		$I_{OUT} = 300mA$, $V_{OUT} = 3.3V$		400		mV
Quiescent Current	I_Q	$T_J = 25^\circ C$		0.5	1	μA
Current Limit	I_{CL}		360	560		mA
Enable high level	V_{ENHI}		0.6			V
Enable low level	V_{ENLO}				0.2	V
Power-supply rejection ratio	PSRR	$f = 1kHz$		60		dB
Thermal Shutdown	T_{SD}			150		$^\circ C$
Thermal Shutdown Hy	T_{SDHY}			20		$^\circ C$

11. Typical Characteristics

$V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 1mA$, $V_{OUT} = 3.3V$, $C_{IN} = C_{OUT} = 1\mu F$, $T_J = 25^\circ C$, unless otherwise specified

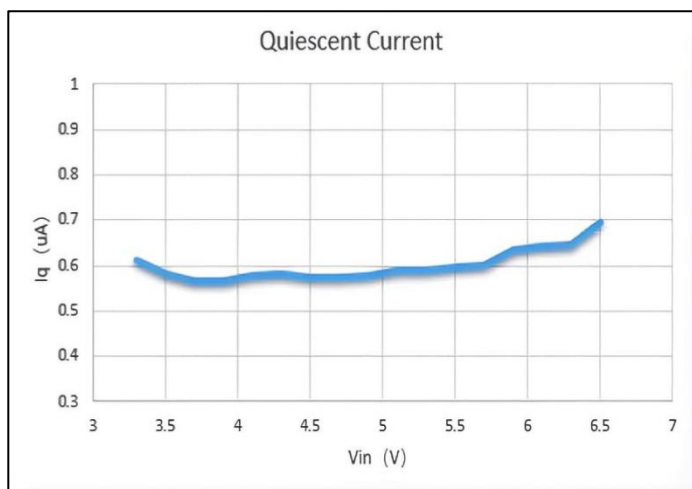


Fig 1. I_q vs V_{IN} ($I_{OUT} = 0mA$)

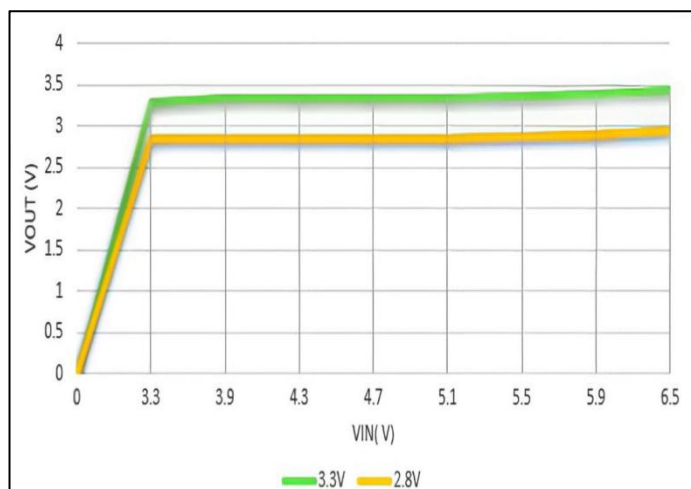


Fig 2. V_{OUT} vs V_{IN} ($I_{OUT} = 1mA$)

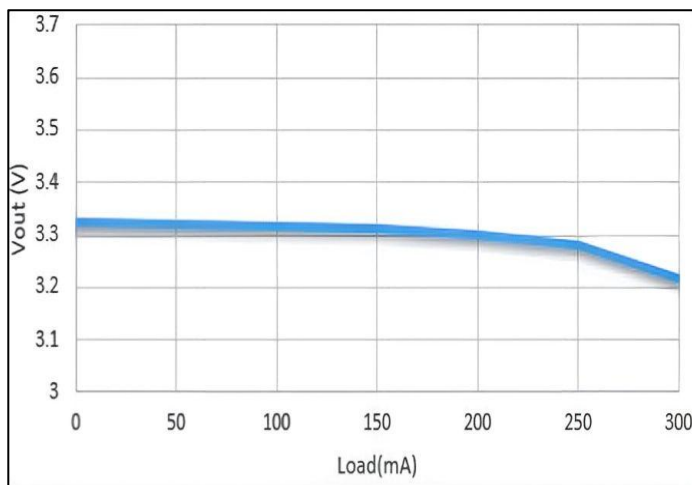


Fig 3. V_{OUT} vs Load

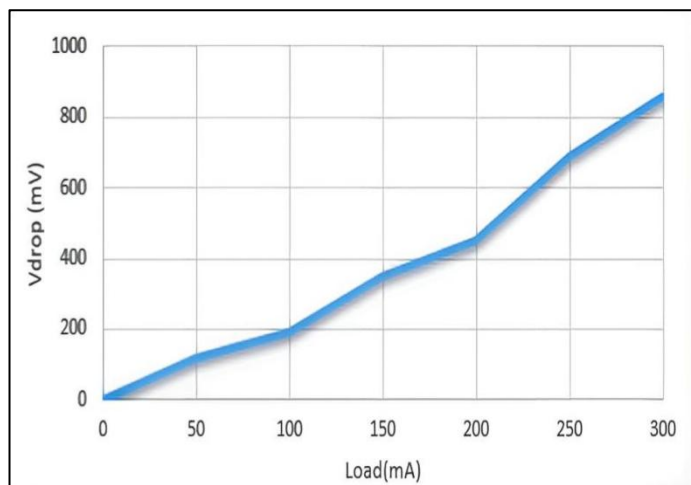


Fig 4. V_{DROP} vs Load

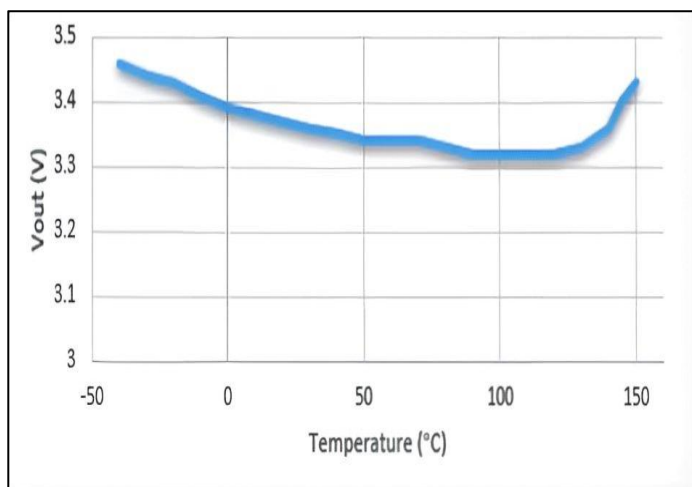


Fig 5. V_{OUT} vs Temperature ($I_{OUT} = 1mA$)

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12. Operating Waveforms

$V_{IN}=5V, V_{OUT}=3.3V, T_A=25^{\circ}C, I_{OUT}=300mA$, unless otherwise specified

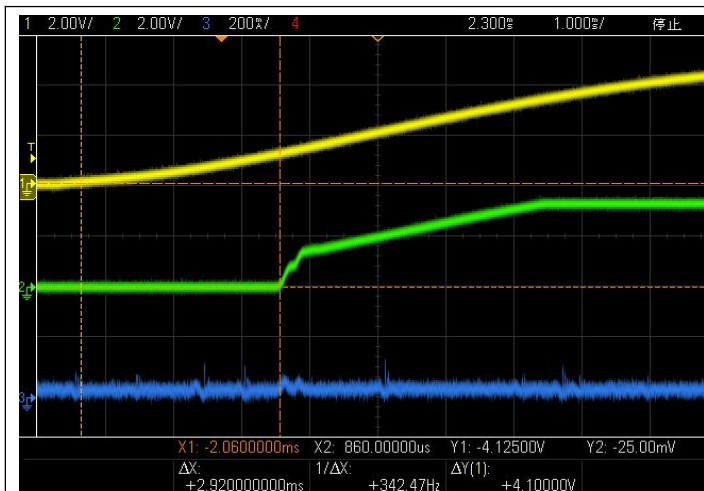


Fig 1. VIN Power ON($I_{OUT}=0mA$)

CH1: $V_{IN}, 2V/Div, DC$; CH2: $V_{OUT}, 2V/Div, DC$

CH3: $I_{OUT}, 200mA/Div, DC$; TIME:1ms/Div

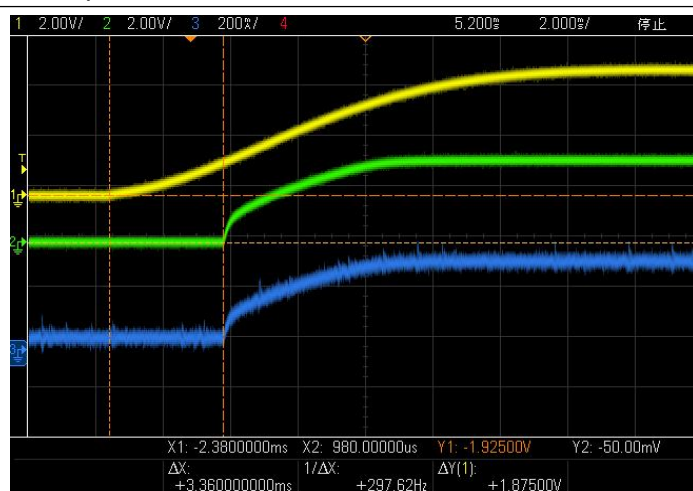


Fig 2. VIN Power ON($I_{OUT}=300mA$)

CH1: $V_{IN}, 2V/Div, DC$; CH2: $V_{OUT}, 2V/Div, DC$

CH3: $I_{OUT}, 200mA/Div, DC$; TIME:2ms/Div

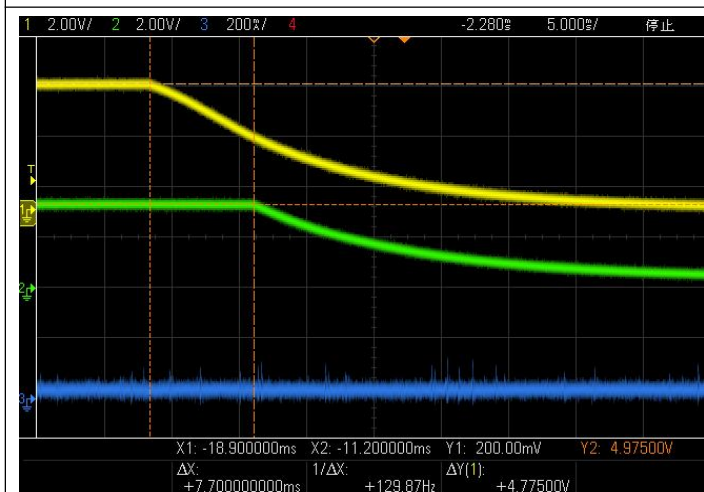


Fig 3. VIN Power OFF($I_{OUT}=0mA$)

CH1: $V_{IN}, 2V/Div, DC$; CH2: $V_{OUT}, 2V/Div, DC$

CH3: $I_{OUT}, 200mA/Div, DC$; TIME:5ms/Div

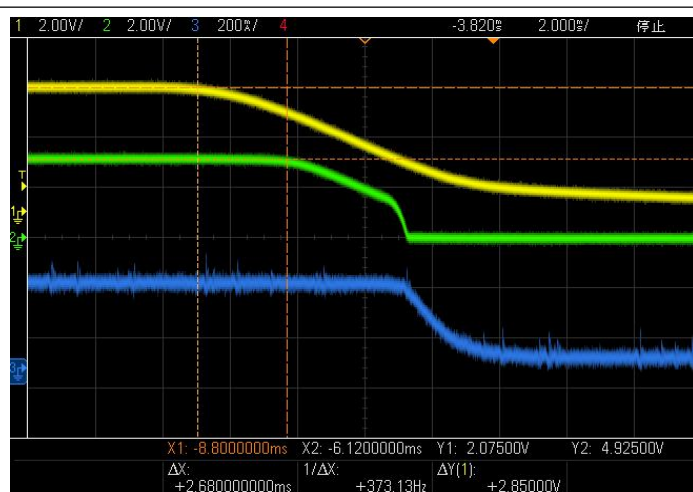


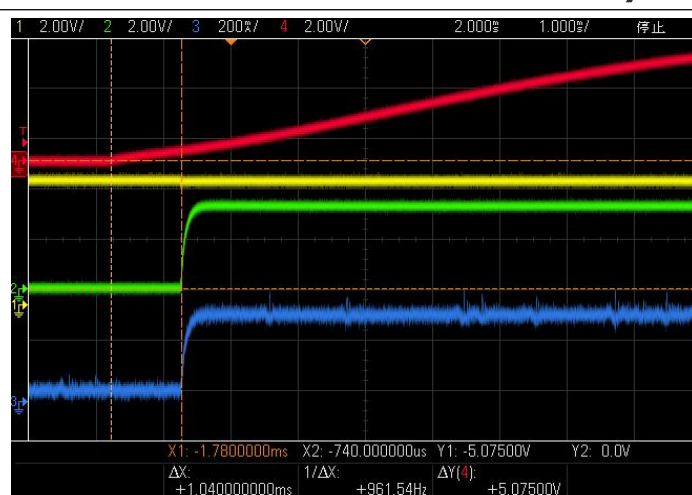
Fig 4. VIN Power OFF($I_{OUT}=300mA$)

CH1: $V_{IN}, 2V/Div, DC$; CH2: $V_{OUT}, 2V/Div, DC$

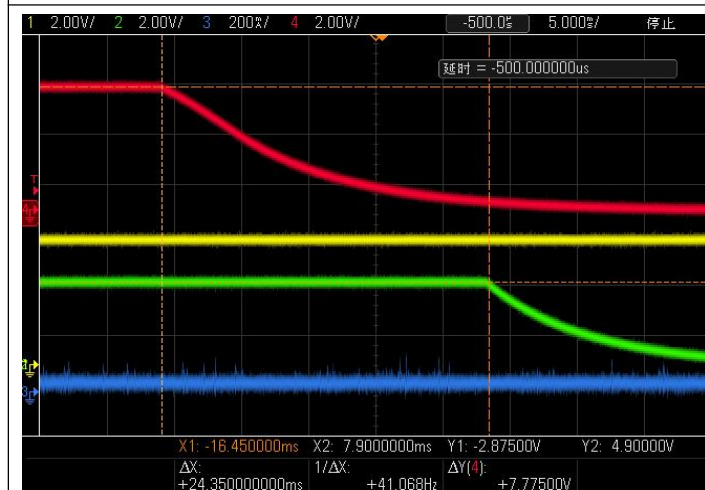
CH3: $I_{OUT}, 200mA/Div, DC$; TIME:2ms/Div

Fig 5. EN Power ON($I_{OUT}=0mA$)

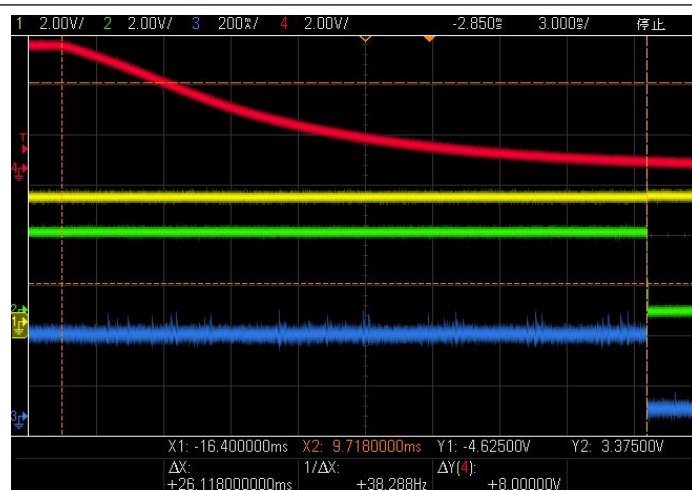
CH1: V_{IN} , 2V/Div, DC; CH2: V_{OUT} , 2V/Div, DC
CH3: I_{OUT} , 200mA/Div, DC; CH4: EN, 2V/Div, DC
TIME: 1ms/Div

Fig 6. EN Power ON($I_{OUT}=300mA$)

CH1: V_{IN} , 2V/Div, DC; CH2: V_{OUT} , 2V/Div, DC
CH3: I_{OUT} , 200mA/Div, DC; CH4: EN, 2V/Div, DC
TIME: 1ms/Div

Fig 7. EN Power OFF($I_{OUT}=0mA$)

CH1: V_{IN} , 2V/Div, DC; CH2: V_{OUT} , 2V/Div, DC
CH3: I_{OUT} , 200mA/Div, DC; CH4: EN, 2V/Div, DC
TIME: 5ms/Div

Fig 8. EN Power OFF($I_{OUT}=300mA$)

CH1: V_{IN} , 2V/Div, DC; CH2: V_{OUT} , 2V/Div, DC
CH3: I_{OUT} , 200mA/Div, DC; CH4: EN, 2V/Div, DC
TIME: 3ms/Div

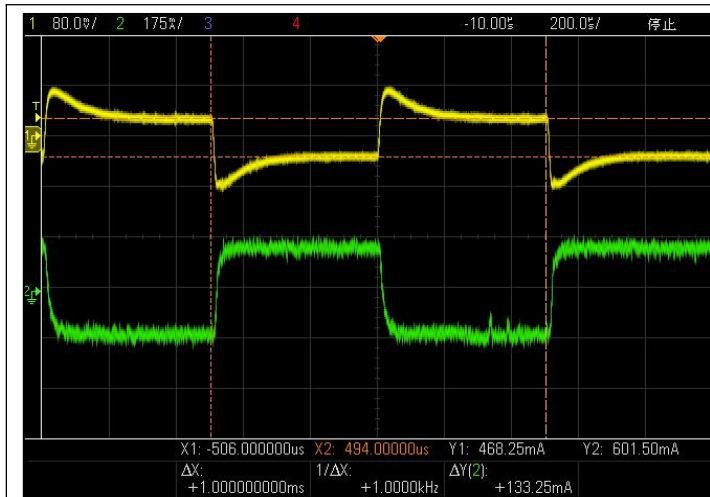
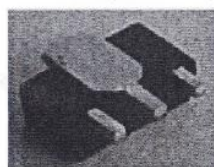
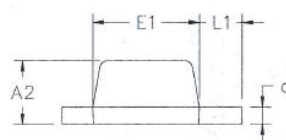
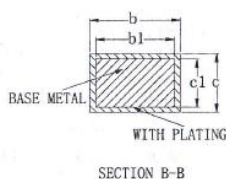
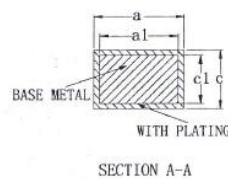
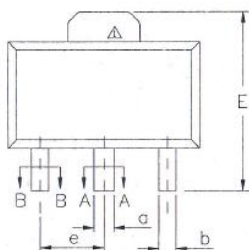
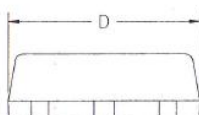
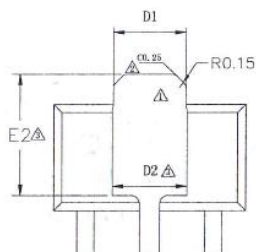


Fig 9. Load Transient (1mA to 300mA)

13.Package Outline Dimensions(All dimensions in mm.)

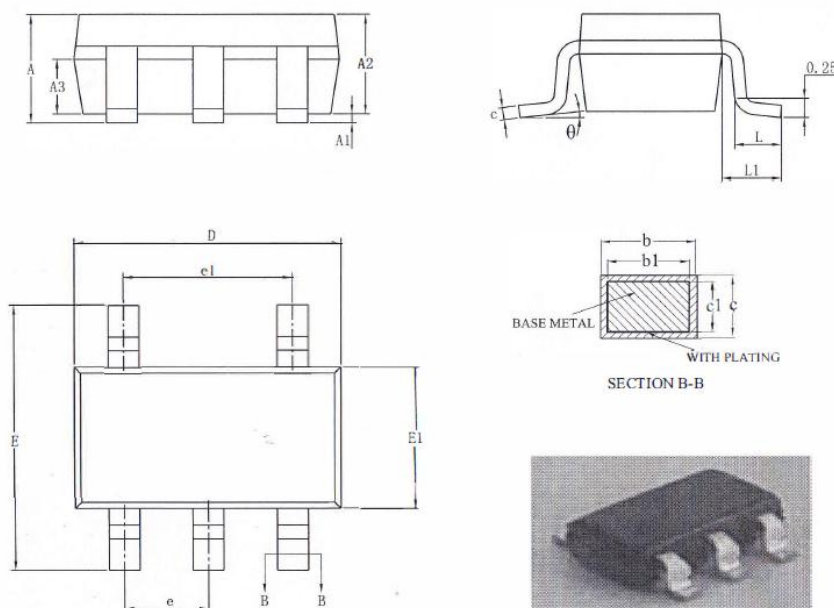
(1) Package Type: SOT-89-3L



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A2	1.40	1.50	1.60
b	0.38	—	0.46
b1	0.37	0.40	0.43
c	0.38	—	0.42
c1	0.37	0.38	0.39
a	0.46	—	0.56
a1	0.45	0.48	0.51
D	4.40	4.50	4.60
D1	1.62	—	1.83
E	3.95	—	4.25
E1	2.40	2.50	2.60
e	1.50BSC		
L1	0.89	—	1.20

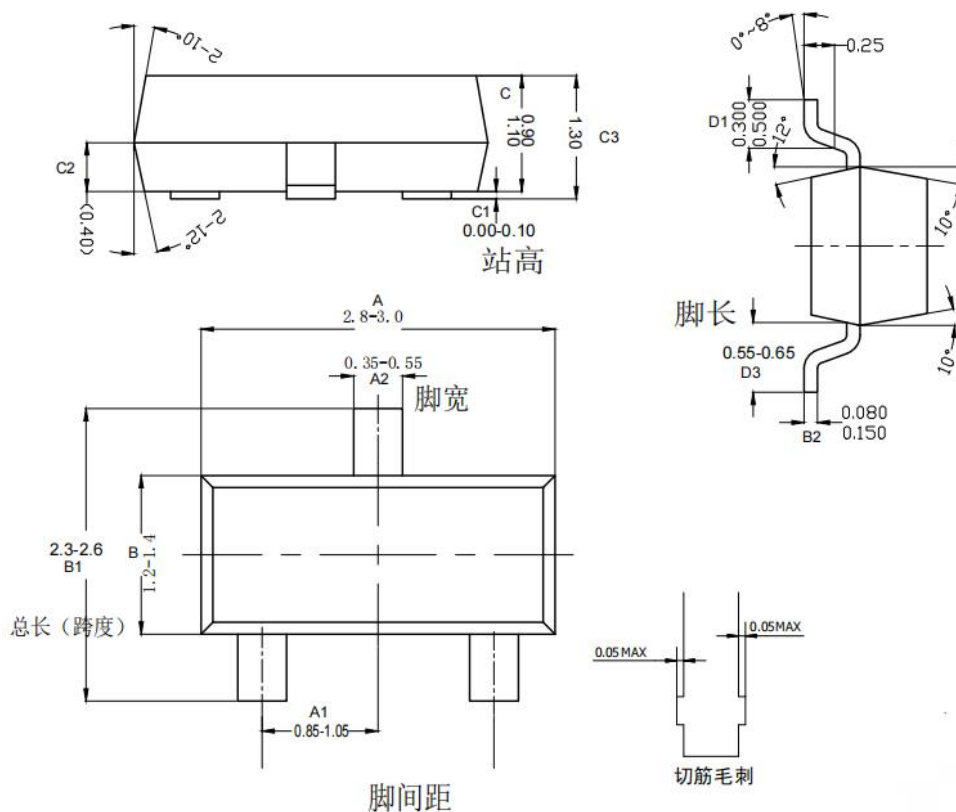
L/P Size (mm)	△ D2	△ E2
66. 9*63	1.75REF	2.84REF

(2) Package Type: SOT23-5



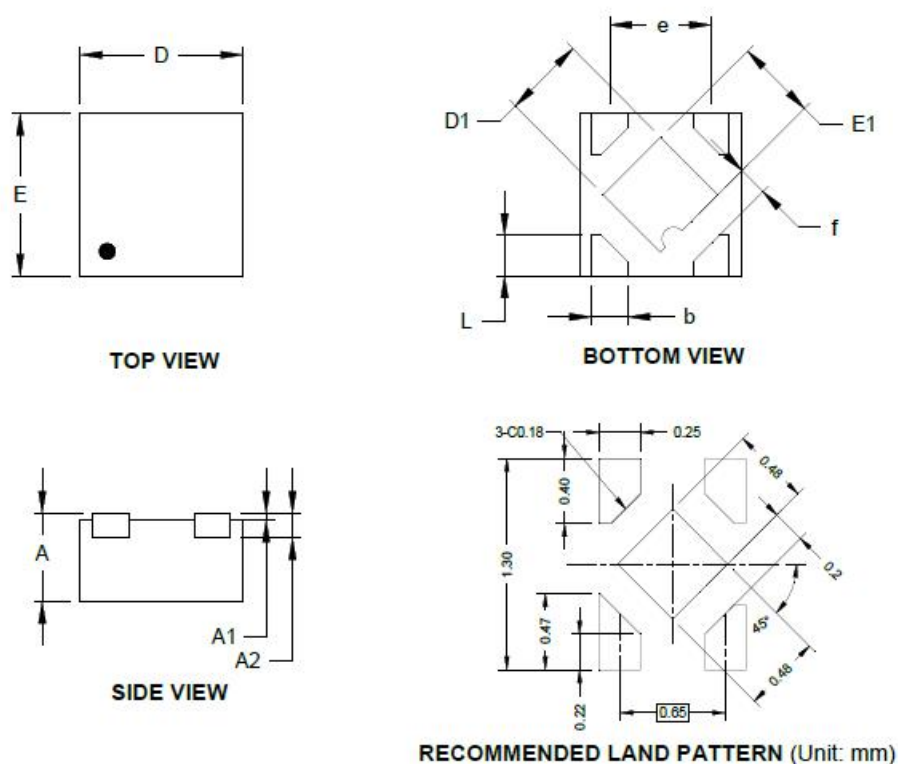
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	—	0.41
b1	0.32	0.35	0.38
c	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
L1	0.60REF		
θ	0	—	8°

(3) Package Type: SOT23-3



COMMON DIMENSIONS UNITS: MEASURE=MILLIMETER			
SYMBOL	MIN	NOM	MAX
A	2.80	2.90	3.0
A1	0.85	0.95	1.05
A2	0.35	0.45	0.55
B	1.20	1.3	1.4
B1	2.3	2.45	2.6
B2	0.08	0.115	0.15
C	0.90	1.0	1.10
C1	0.00	0.05	0.10
C2	0.35	0.4	0.45
C3	1.30MAX		
D1	0.3	0.4	0.5
D2	0.25TYP		
D3	0.45	0.55	0.65

(4) Package Type: DFN1X1



Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	0.550	0.600
A1	0.000		0.050
A2	0.152 REF		
D	0.950	1.000	1.050
D1	0.450	0.500	0.550
E	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.175	0.225	0.275
e	0.625 BSC		
f	0.195 REF		
L	0.200	0.250	0.300

14.Important Notice And Disclaimer

- We reserves the right to change the instruction manual without prior notice.
- Any semiconductor product has a certain possibility of failure or malfunction under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design and overall manufacturing to avoid potential failure risks that may cause personal injury or property damage.
- The improvement of product quality is endless, our company will be dedicated to provide customers with better products.

15.Version Modification Record

Version Number	Revision
first edition	
V1.0	1. Update the Important Notice And Disclaimer on page 12.
V1.1	2. Update the Order Information on page 4.