200nA,500mA,Low-Dropout Voltage Regulator

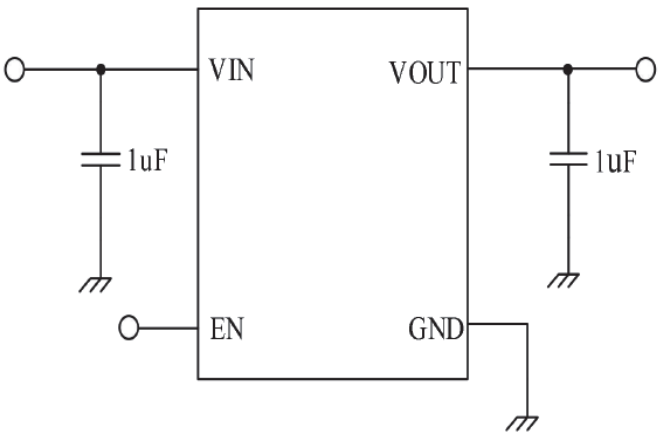
Features

- Low quiescent current : 200nA
- Wide input voltage range : 2V to 6V
- High output current : 500mA
- Low dropout voltage : 90mV at 100mA
- PSRR:60dB/1kHz
- Fixed output voltages : 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 3.6V
- Output voltage tolerance : ±1/2%
- Current limit protection
- Short circuit protection
- Thermal shutdown protection
- Available packages : SOT23-5,SOT89-3,DFN1×1, SOT23-3

Applications

- Wearable electronics
- Smoke detector and sensor
- Gas, heat and water meters
- Blood glucose meters and pulse oximeters

Typical Application



6V, Low-Dropout Voltage Regulator

Description

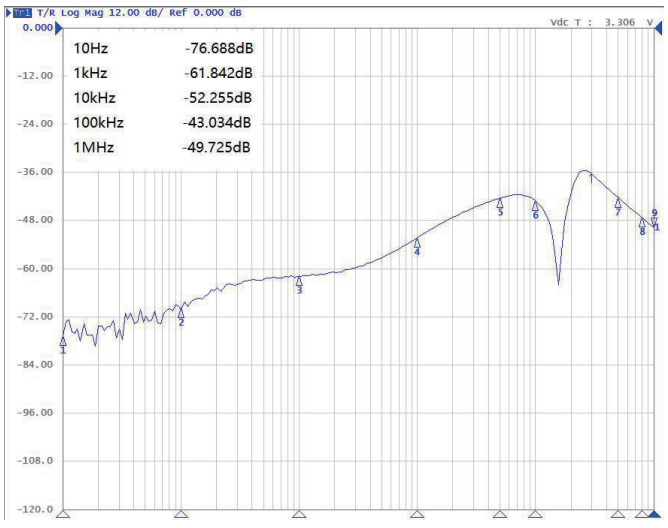
The OSU20AXX series is an ultra-small, low dropout (LDO) linear regulator that can source 500mA of output current.The OSU20AXX has fast response to input voltage transient and load current transient and ensures no overshoot voltage during OSU20AXX startup and short circuit recovery.

The OSU20AXX series has thermal shutdown, current limit, and short circuit protections for added safety.

The OSU20AXX series contains eight fixed output voltages of 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 3.6V.

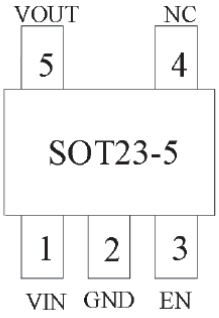
PART NUMBER	PACKAGE	BODY SIZE(NOM)
OSU20AXXA/BTG	SOT23-5	2.9mm*2.8mm
OSU20AXXA/BTS	SOT89-3	4.5mm*4.2mm
OSU20AXXA/BTN	DFN1×1	1mm*1mm
OSU20AXXA/BTE	SOT23-3	2.9mm*2.8mm

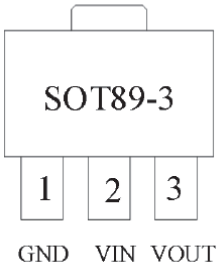
PSRR

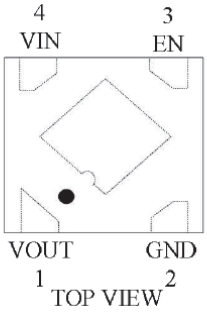


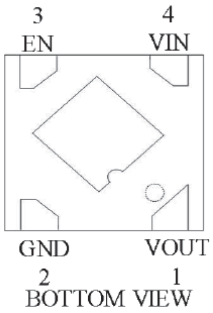
V_{IN}=4.3V,V_{OUT}=3.3V,I_{OUT}=10mA

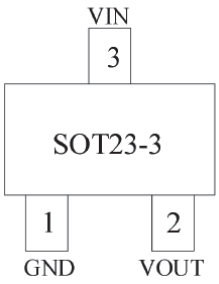
Pin Configuration and Functions











Pin Functions

Name	SOT23-5	SOT89-3	DFN1×1	SOT23-3	Description
	OSU20AXXA/BTG	OSU20AXXA/BTS	OSU20AXXA/BTN	OSU20AXXA/BTE	
VIN	1	2	4	3	Input pin
GND	2	1	2	1	Ground pin
EN	3		3		Enable pin
NC	4				No connection
VOUT	5	3	1	2	Output pin

Absolute Maximum Ratings

Parameter	Description	Min	Max	Unit
Input voltage	VIN to GND	-0.3	6	V
	VOUT to GND	-0.3	6	V
	VIN to VOUT	-0.3	6	V
	EN to GND	-0.3	6	V
Current	Peak output current	Internally limited		
Temperature	Operating temperature range	-40	125	℃
	Storage temperature	-40	150	℃
Thermal resistance (Junction to ambient)	SOT23-5,SOT23-3	200		℃/W
	SOT89-3	130		℃/W
	DFN1×1	300		℃/W
Power dissipation	SOT23-5,SOT23-3	600		mW
	SOT89-3	900		mW
	DFN1×1	400		mW

Note:

exceeding the range specified by the rated parameters will cause damage to the chip, and the working state of the chip beyond the range of rated parameters cannot be guaranteed. Exposure outside the rated parameter range will affect the reliability of the chip.

ESD Ratings

Parameter	Description	Range	Unit
V_{ESD}	Human body model(HBM)	4	KV

Note:

JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

Electrical Characteristics

(At T_A=25°C, C_{IN}=1uF, V_{IN}=V_{OUTNOM}+1V, C_{OUT}=1uF, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Operating input voltage		2	—	6	V
I_{GND}	Quiescent current	V_{IN}=5V, No load	—	200	—	nA
V_{OUT}	Output voltage	V_{IN}=5V, I_{OUT}=10mA	V_{OUTNOM} * 0.98	V_{OUTNOM}	V_{OUTNOM} * 1.02	V
I_{OUT_MAX}	Output current		500	—	—	mA
V_{DROP}	Dropout voltage (OSU20A33)	I_{OUT}=100mA , V_{IN}=V_{OUTNOM}-0.1V	—	90	—	mV
$\Delta V_{OUT}/\Delta I_{OUT}$	Load regulation	V_{IN}=V_{OUTNOM}+1V, 1mA≤I_{OUT}≤200mA	—	0.1	—	mV/mA
$\Delta V_{OUT}/\Delta V_{IN}$	Line regulation	I_{OUT}=1mA, V_{OUTNOM}+1V≤V_{IN}≤6V	—	1	—	mV/V
I_{LIMIT}	Current limit	V_{IN}=V_{OUTNOM}+1V	—	600	—	mA
I_{SHORT}	Short current		—	80	—	mA
T_{SHDN}	Thermal shutdown temperature	Shutdown, temperature increasing	—	150	—	°C
		Reset, temperature decreasing	—	120	—	
V_{ENH}	EN high level	Enabled	1.2	—	—	V
V_{ENL}	EN low level	Shutdown	—	—	0.4	V

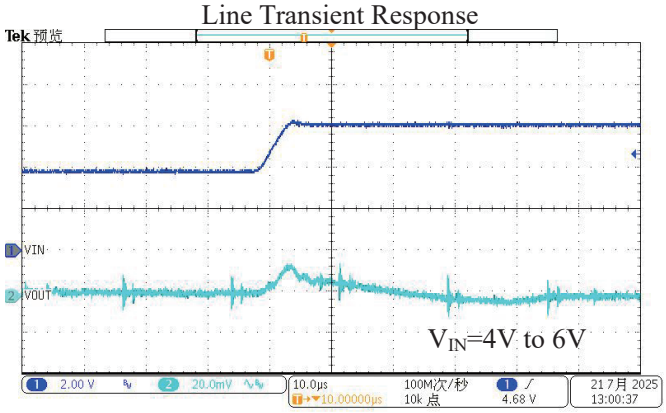
Note:

Dropout Voltage is the voltage difference between the input and the output at which the output voltage drops 2% below its nominal value.

Typical Characteristics

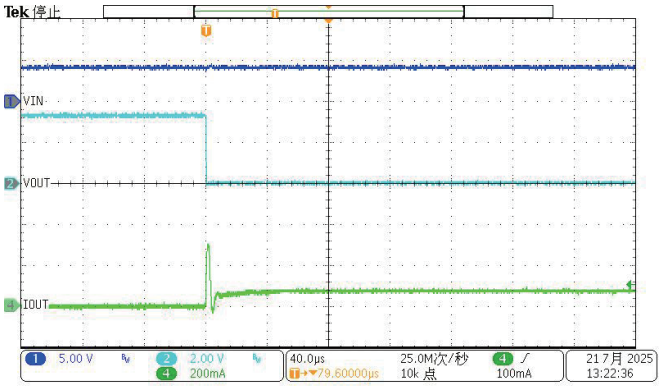
(OSU20A33,Test condition: T_A=25°C,C_{IN}=1uF,V_{IN}=4.3V,C_{OUT}=1uF unless otherwise note)

Line Transient Response



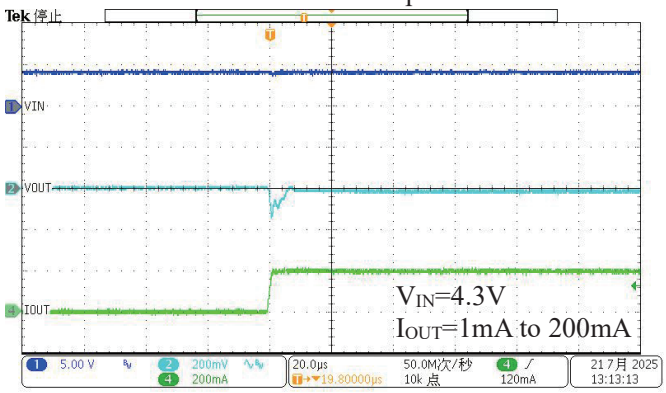
Time(10us/div)

Power-on Short Circuit



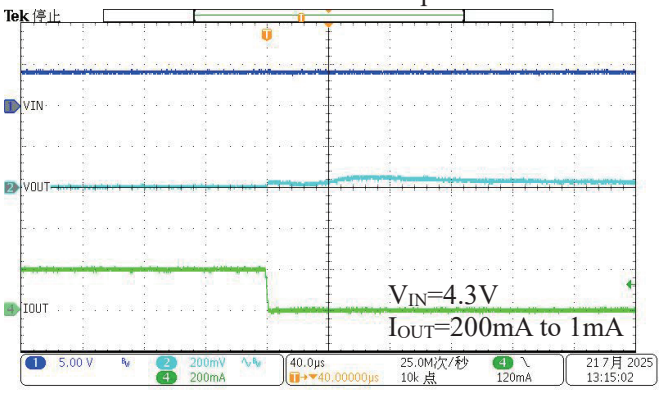
Time(40us/div)

Load Transient Response



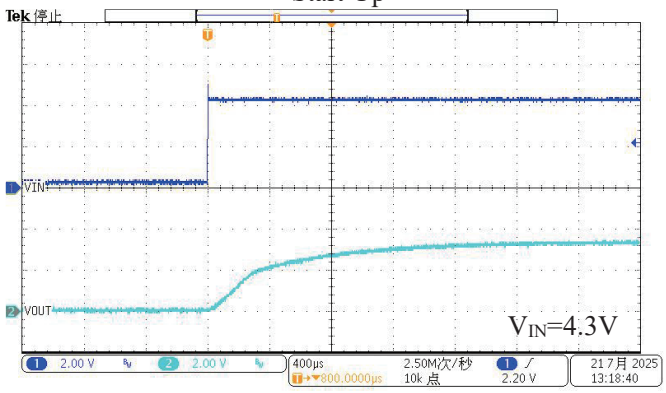
Time(20us/div)

Load Transient Response



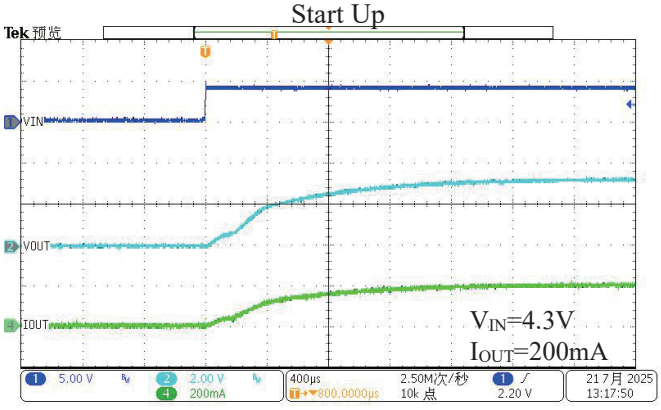
Time(40us/div)

Start Up



Time(400us/div)

Start Up

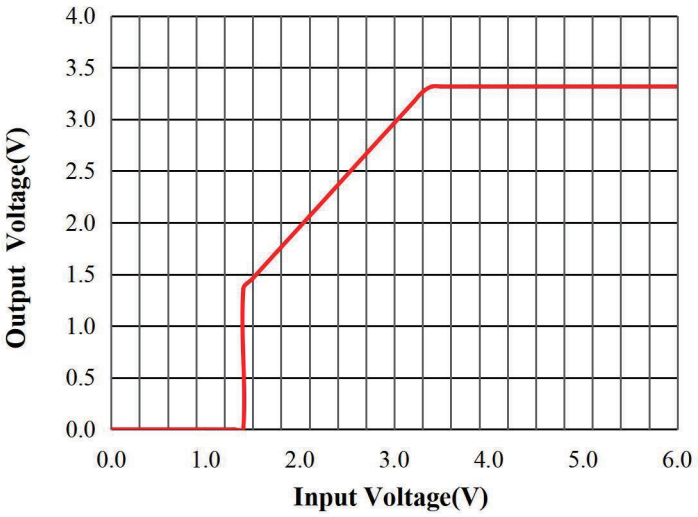


Time(400us/div)

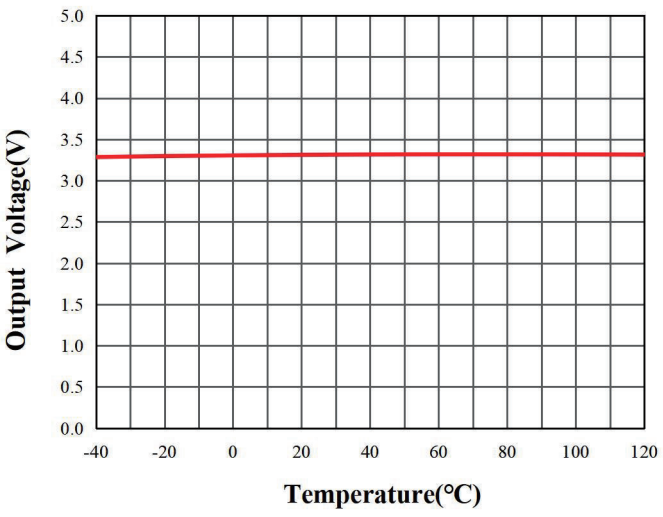
Typical Characteristics

(OSU20A33,Test Condition: T_A = 25°C,C_{IN} = 1uF,V_{IN} = V_{OUTNOM} + 1V,C_{OUT} = 1uF unless otherwise note)

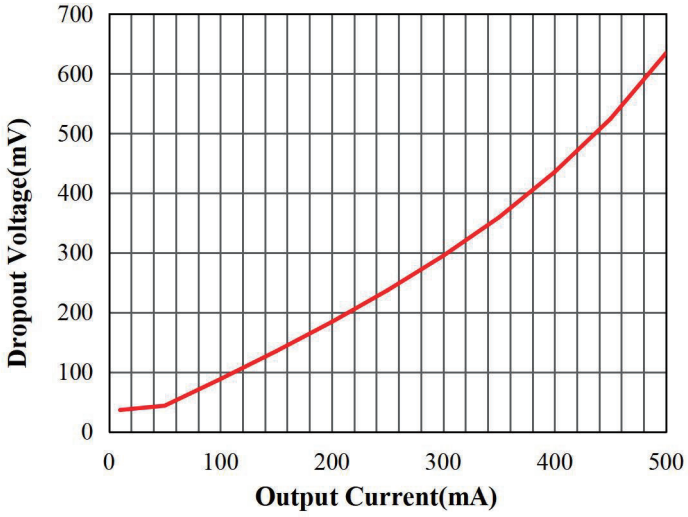
Output Voltage vs. Input Voltage (I_{OUT}= 1mA)



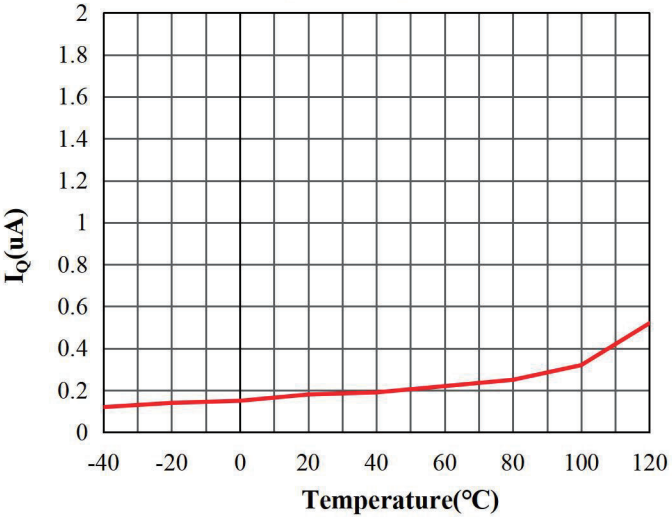
Output Voltage vs. Temperature (I_{OUT}= 1mA)



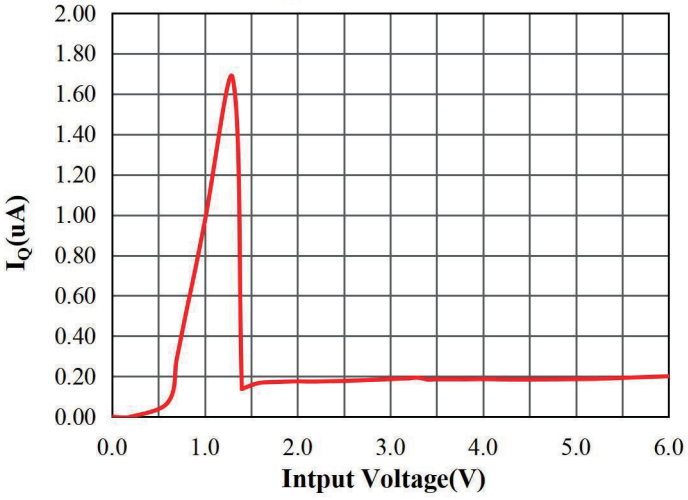
Dropout Voltage vs. Output Current



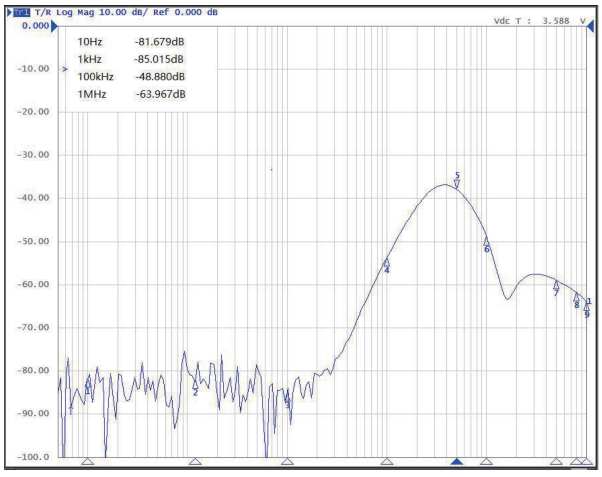
I_Q vs. Temperature



I_Q vs. Intput Voltage



PSRR vs.frequency



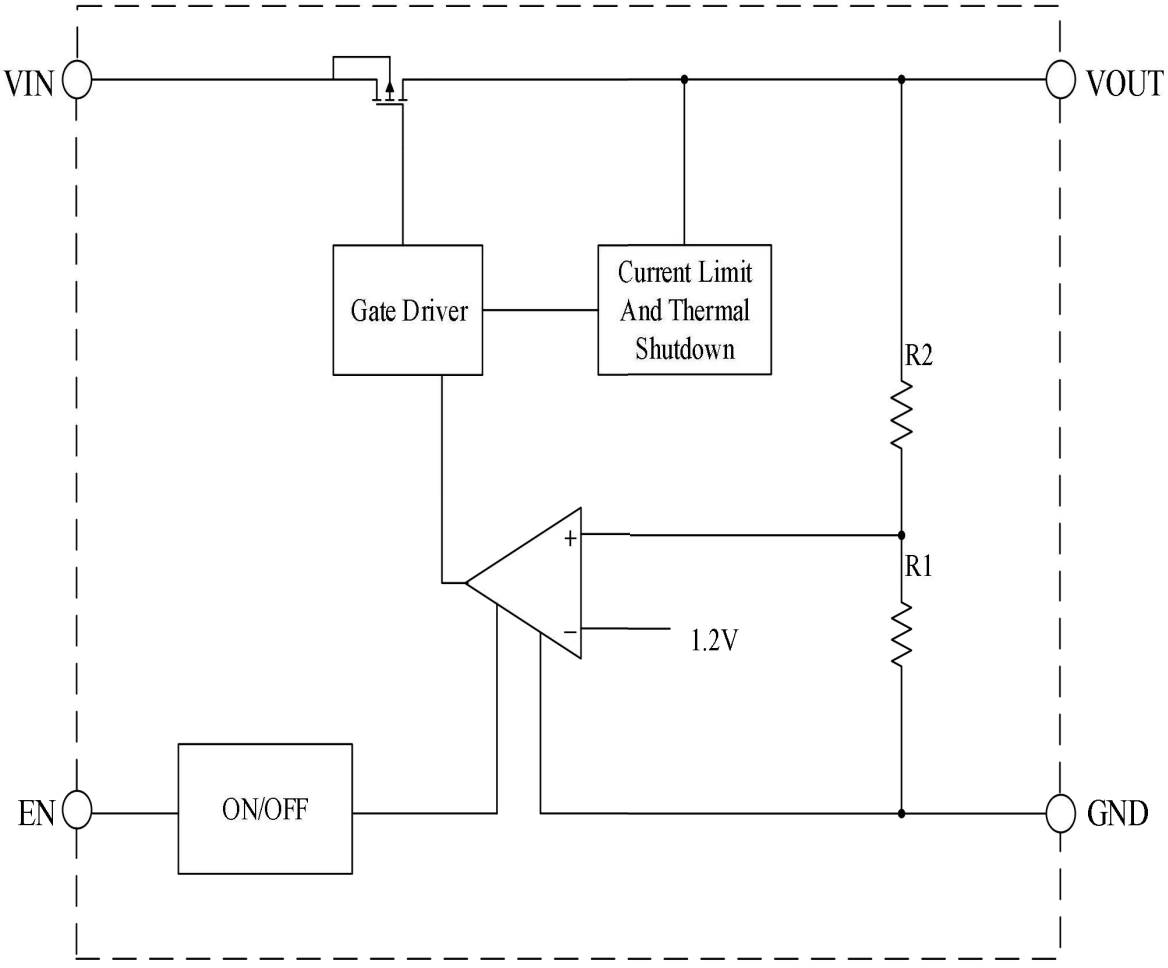
V_{IN}=4.3V,V_{OUT}=3.3V,I_{OUT}=10mA

Detailed Description

Overview

The OSU20AXX series is an ultra-small, low dropout (LDO) linear regulator that can source 500mA of output current.The OSU20AXX has fast response to input voltage transient and load current transient and ensures no overshoot voltage during OSU20AXX startup and short circuit recovery.The OSU20AXX series has thermal shutdown, current limit, and short circuit protections for added safety. The OSU20AXX series contains eight fixed output voltages of 1.2V, 1.5,1.8V,2.5V, 2.8V, 3.0V, 3.3V,3.6V.

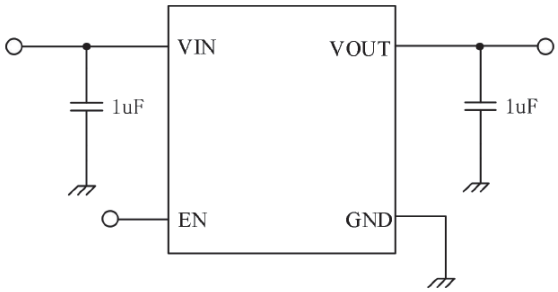
Functional Block Diagram



Functional block diagram

Input Capacitor and Output Capacitor

A 1uF 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.



For the stability of LDO, an output capacitor is required. The recommended minimum output capacitance is 1uF. It is recommended to use Ceramic capacitor with a temperature characteristic of X5R or X7R. A higher capacitance value helps to improve the transient response of the load/line. The output capacitance can be increased to maintain a lower down/overshoot. Place the output capacitor as close as possible to the VOUT and GND pins.

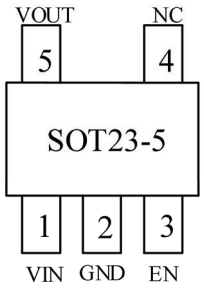
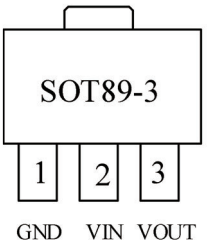
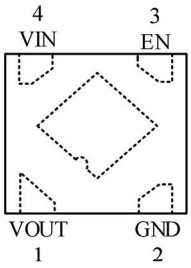
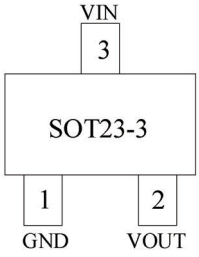
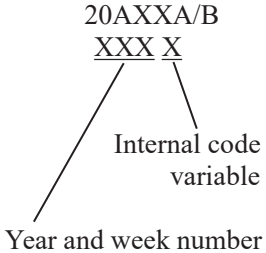
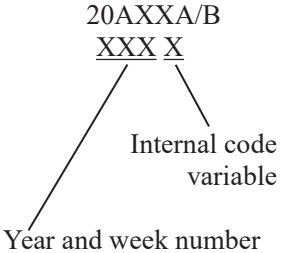
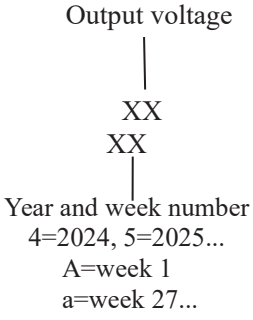
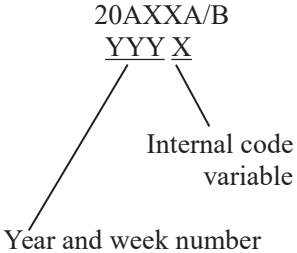
Current Limit and Short Circuit Protection

When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

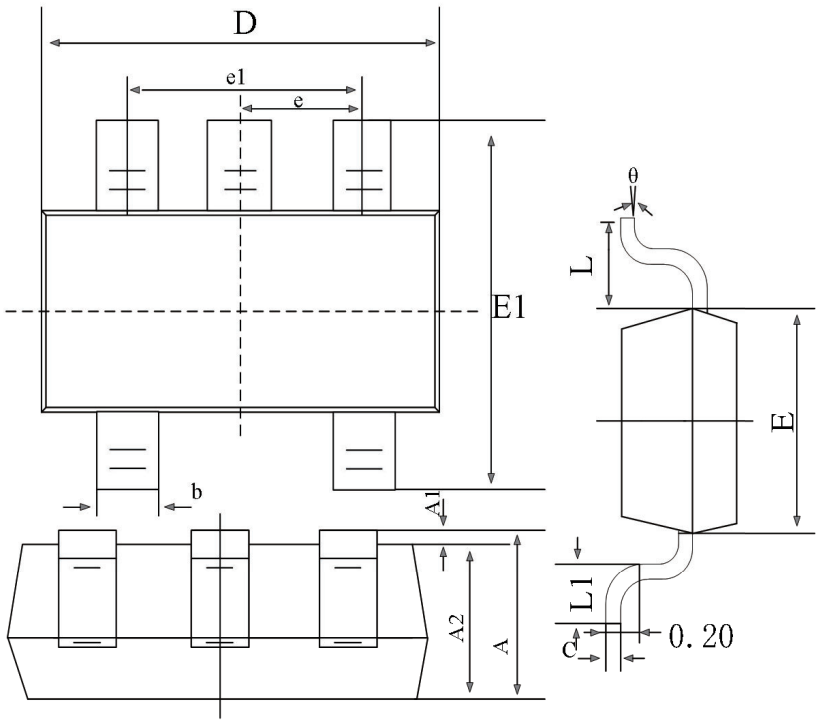
Ordering And Marking Information

OS - U20A-XX-X-XX

Company name	Product name	Output voltage	accuracy	Package
		12:1.2V 15:1.5V 18:1.8V 25:2.5V 30:3.0V 33:3.3V 36:3.6V	A:±1%(default) B:±2%(default)	TG:SOT23-5 TS:SOT89-3 TN:DFN1×1 TE:SOT23-3

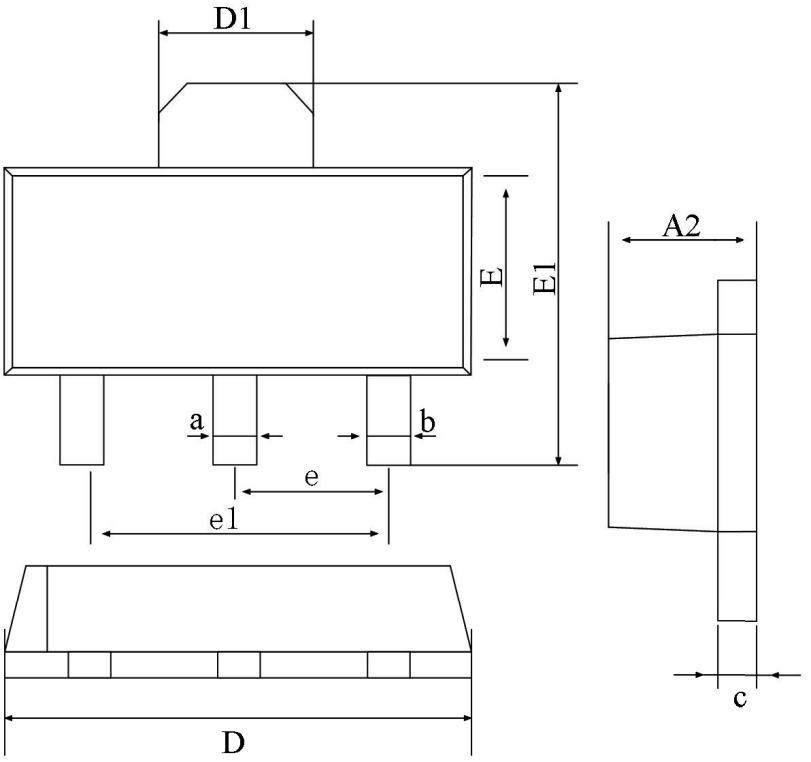
Package outline				
Minimal packaging	SOT23-5 3000pcs/Reel	SOT89-3 1000pcs/Reel	DFN1×1 10000pcs/Reel	SOT23-3 3000pcs/Reel
Marking				

Package Outline
SOT23-5



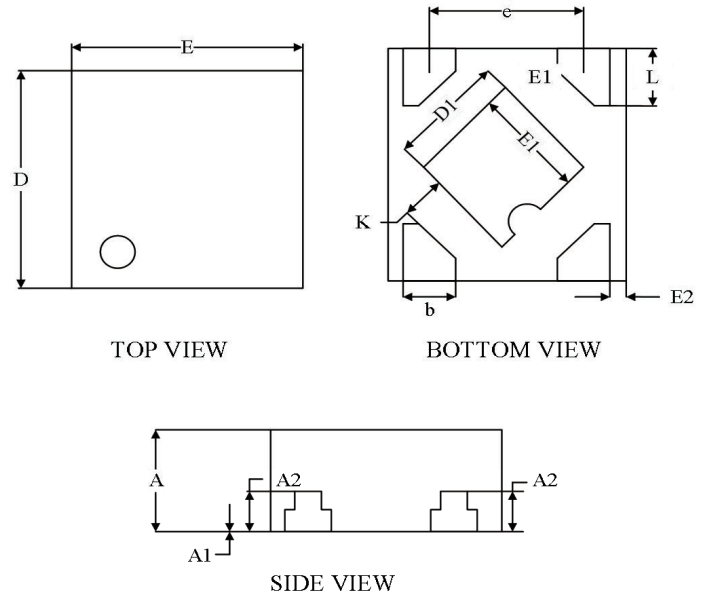
REF	Millimeter	
	Min.	Max.
A	1.05	1.25
A1	0	0.1
A2	1.05	1.15
b	0.3	0.5
c	0.1	0.2
D	2.85	3.05
E	1.5	1.7
E1	2.65	2.95
e	0.95(BSC)	
e1	1.8	2.0
L	0.3	0.6
θ	0°	8°

SOT89-3



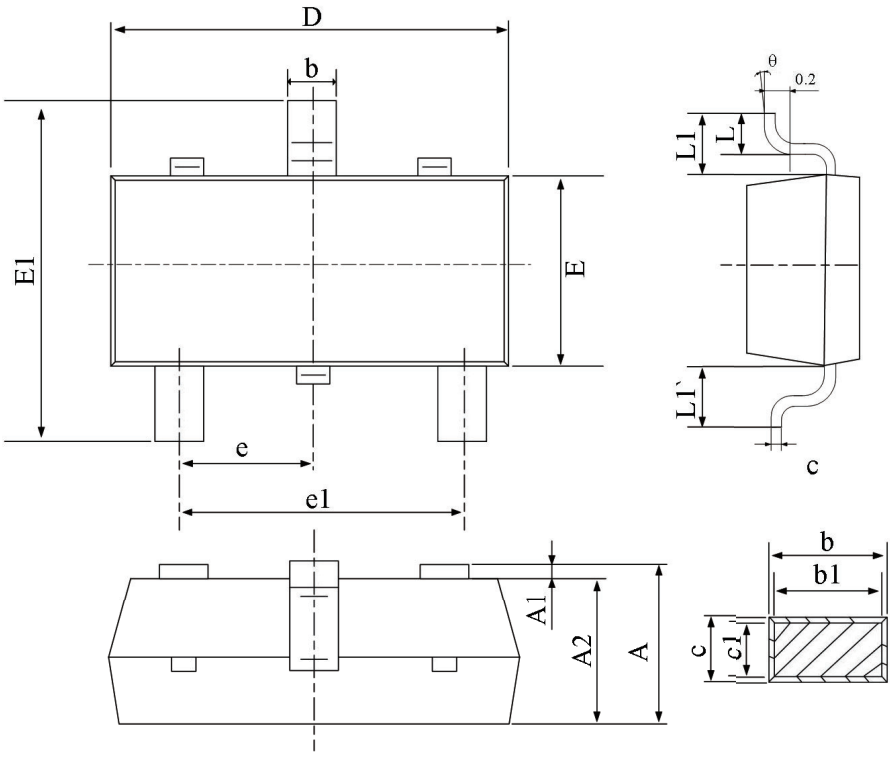
REF	Millimeter	
	Min.	Max.
A2	1.40	1.60
a	0.40	0.58
b	0.32	0.52
c	0.36	0.46
D	4.40	4.60
D1	1.60	1.80
E	2.30	2.60
E1	4.00	4.30
e	1.00	2.00
e1	2.95	3.05

DFN1×1



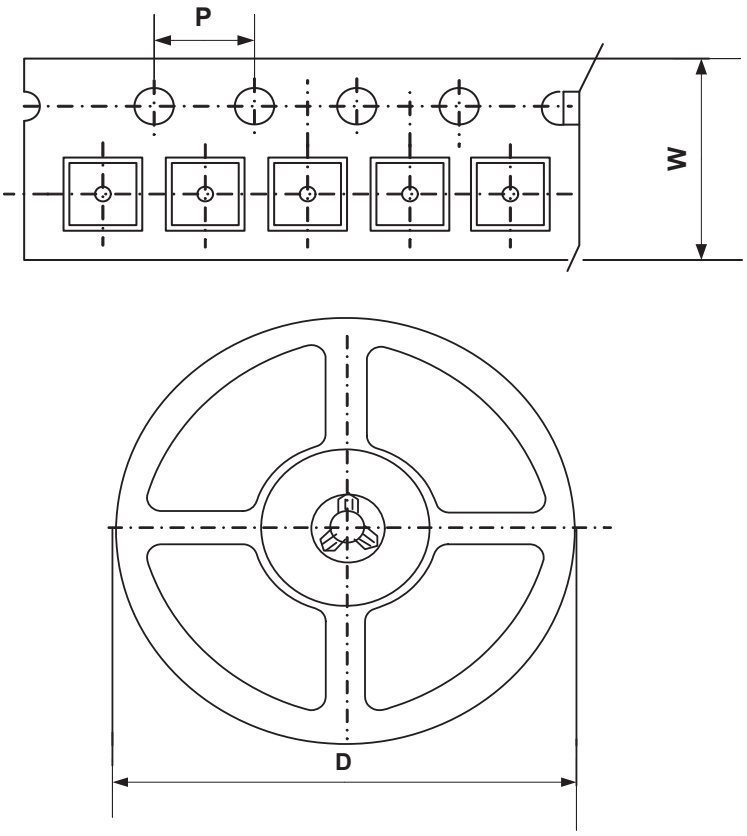
REF	Millimeter		
	Min.	Typ.	Max.
A	0.45	0.50	0.55
	0.50	0.55	0.60
A1	0.00	--	0.05
A2	0.152 TIY		
b	0.17	0.22	0.27
D	0.95	1.00	1.05
D1	0.43	0.48	0.53
E	0.95	1.00	1.05
E1	0.43	0.48	0.53
E2	0.065 TIY		
e	0.65 BSC		
k	0.20 BSC		
L	0.20	0.25	0.30

SOT23-3



REF.	Millimeter	
	Min.	Max.
A	1.05	1.25
A1	0	0.1
A2	1.05	1.15
b	0.30	0.50
b1	0.29	0.47
c	0.10	0.20
c1	0.10	0.18
D	2.85	3.05
E	1.50	1.70
E1	2.65	2.95
e	0.95(BSC)	
e1	1.80	2.00
L	0.30	0.60
L1-L1`	-	0.12
θ	0°	8°

Packing Information



Type	W(mm)	P(mm)	D(mm)	Qty (pcs)
SOT23-5	8.0mm	4.0mm	178.0mm	3000pcs
SOT89-3	12.0mm	4.0mm	178.0mm	1000pcs
DFN1×1	8.0mm	4.0mm	178.0mm	10000pcs
SOT23-3	8.0mm	4.0mm	178.0mm	3000pcs

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