

Description

The OSU29016 series are high accuracy, CMOS LDO Voltage Regulators, offering Low Power Consumption, high ripple rejection ratio and low dropout. Internally, the OSU29016 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators. The OSU29016's current limiters' foldback circuit also operates as a short protect for the output current limiter and the output pin.

The OSU29016 series is also fully compatible with low ESR ceramic capacitors, reducing cost and improving output stability. This high level of output stability is maintained even during frequent load fluctuations, due to the excellent transient response performance and high PSRR achieved across a broad range of frequencies. The CE function allows the output of regulator to be turned off, resulting in greatly reduced power consumption, ideal for powering the battery equipment to a longer service life.

Features

- Low Power Consumption: 0.7 μ A (Typ)
- Maximum Output Current: 600mA
- Low Dropout Voltage: 110mV@100mA ($V_{OUT}=3.3V$)
- Operating Voltage Range: 2.5V ~ 18V
- Output Voltage Accurate: $\pm 1\%$
- High PSRR: 85dB @1kHz
- Good Transient Response
- Integrated Short-Circuit Protection
- Over-Temperature Protection
- Output Current Limit
- Low Temperature Coefficient
- Stable with Ceramic Capacitor
- RoHS Compliant and Lead (Pb) Free
- -40°C to +85°C Operating Temperature Range
- Fixed Output Voltage Versions: 1.8, 2.5, 2.8, 3.0, 3.3, 3.6, 4.0, 4.2, 4.4 and 5.0V
- Available in Green SOT23-3, SOT23-5, SOT89-3, SOT89-5, DFN2x2-6L, SOT223-3L Packages

Applications

- Portable, Battery Powered Equipment
- Smoke detector and sensor
- Audio/Video Equipment
- Weighting Scales
- Home Automation
- Electronic fingerprint lock

Application Circuits

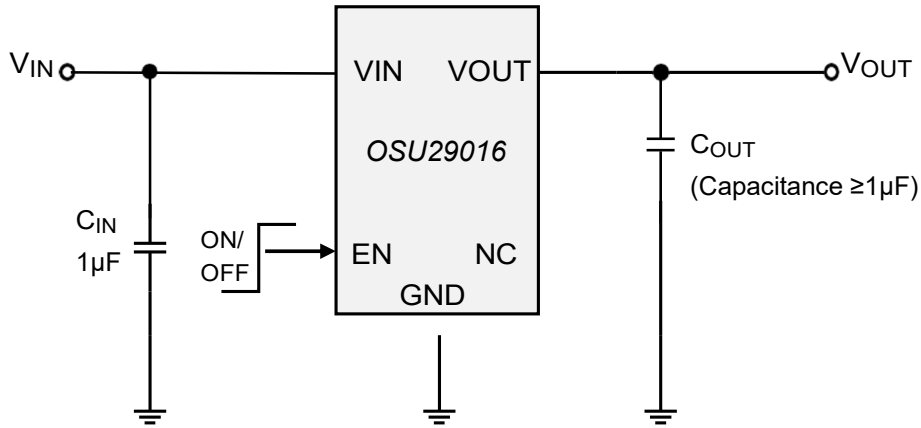
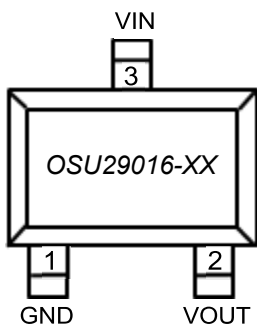
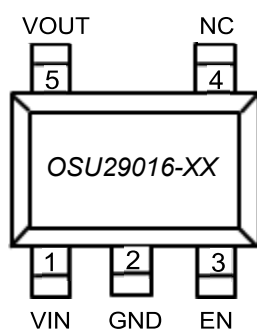


Figure 1. OSU29016 Typical Application Circuit

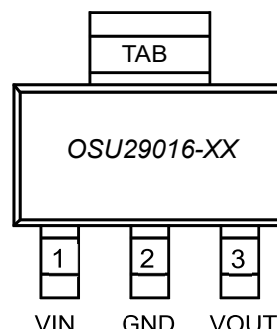
Pin Configuration (TOP VIEW)



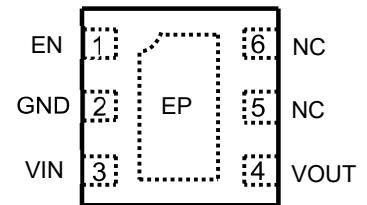
SOT23-3



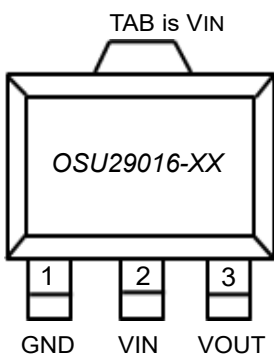
SOT23-5



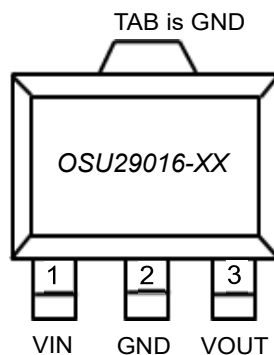
SOT223-3L



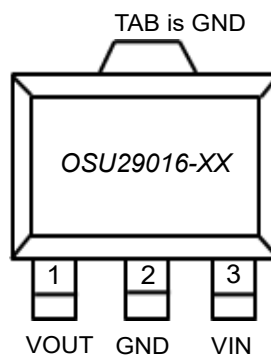
OSU29016D6-XX
DFN-6L (2mm × 2mm)
0.8mm height(max), 0.65mm pitch



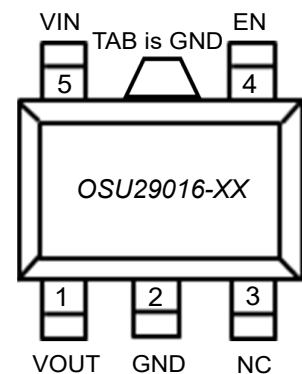
SOT89-3



SOT89-3(B-Type)



SOT89-3(C-Type)



SOT89-5

Pin Description

Pin No.								Pin Name	Pin Function
SOT23-3	SOT223	SOT89-3			SOT23-5	SOT89-5	DFN2X2-6		
TE	TH	TS	T1	T2	TG	TU	F6		
1	2	1	2	2	2	2	2	GND	Ground
3	1	2	1	3	1	5	3	VIN	Power Input
2	3	3	3	1	5	1	4	VOOUT	Output Voltage
----	----	----	----	----	3	4	1	EN	Enable Control Input
----	----	----	----	----	4	3	5、6	NC	No Connect
EP / TAB	In PCB layout, prefer to use large copper area to cover this pad for better thermal dissipation								

Order Information

OSU29016①②-③④

Designator	Symbol	Description
①②	TE, TG, TH, F6, TS, TU	SOT23-3L, SOT23-5L, SOT223-3L, DFN6L, SOT89-3L, SOT89-5L
③④	Integer e.g. 1.8=18	Output Voltage 1.8,2.5,2.8,3.0,3.3,3.6,4.0,4.2,4.4 and 5.0V

Part NO.	Description	Package	T/R Qty
OSU29016TE-XX	OSU29016 18V ,0.7 μ A I _Q , High PSRR ,600mA Low-Dropout LDO	SOT23-3L	3,000 PCS
OSU29016TG-XX		SOT23-5L	3,000 PCS
OSU29016F6-XX		DFN2X2-6L	3,000 PCS
OSU29016TS-XX		SOT89-3L	1,000 PCS
OSU29016TH-XX		SOT223-3L	3,000 PCS
OSU29016TU-XX		SOT89-5L	1,000 PCS

Marking Information

For marking information, contact our sales representative directly



All OS parts are Pb-Free and adhere to the RoHS directive.

Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Input Voltage	V _{IN}	-0.3 ~ 20	V
EN to GND	V _{EN}	-0.3 ~ 20	V
Regulated Output Voltage	V _{OUT}	-0.3 ~ 7.0	V
Output Current	I _{OUT}	Internally limited	mA
Power Dissipation P _D @T _A =+25°C	SOT23-3L	450	mW
	SOT23-5L	500	
	SOT223-3L	1450	
	SOT89-3L	700	
	SOT89-3L(B/C-Type)	950	
	SOT89-5L	1000	
	DFN2X2-6L	500	
Thermal Resistance (Junction to air)	SOT23-3L	275	°C /W
	SOT23-5L	250	
	SOT223-3L	85	
	SOT89-3L	180	
	SOT89-3L(B/C-Type)	130	
	SOT89-5L	125	
	DFN2X2-6L	250	
Human Body Model (HBM)		±8000	V
Machine Mode (MM)		200	V
Storage Temperature Range	T _{STG}	-65 ~ +150	°C
Operating Junction Temperature	T _J	+150	°C
Lead Temperature (Soldering 10s)	T _{LEAD}	+260	°C

Note:

- Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to absolute-maximum-rated conditions for extended period may affect device reliability.
- Ratings apply to ambient temperature at +25°C
- The package thermal impedance is calculated in accordance to JESD 51-7.

Recommended Operating Conditions

Item	Min	Max	Unit
Operating Ambient Temperature	-40	+85	°C
Input Voltage	2.5	12	V
Output Voltage	1.8	5.0	V

Electronic Characteristics

 Test Conditions: V_{IN} = V_{OUT} + 1V, C_{IN}=C_{OUT}=1 μ F, T_A=25°C, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input Voltage	V _{IN}		2.5	—	18	V	
Quiescent Current	I _Q	V _{IN} =12V, I _{LOAD} =0mA	—	0.7	1	μ A	
Shutdown Current	I _{SHDN}	EN=0 V, V _{OUT} = 0 V		0	0.001	μ A	
Output Voltage	V _{OUT}	V _{IN} = V _{OUT} + 2V I _{LOAD} = 10mA	V _{OUT} x 0.99	—	V _{OUT} x 1.01	V	
Output Current	I _{OUT}	V _{IN} = V _{OUT} + 1V	600	—	—	mA	
Dropout Voltage V _{OUT} = 3.3V	V _{DROP}	I _{LOAD} = 100mA	—	110	—	mV	
		I _{LOAD} = 600mA	—	900	—		
Line Regulation	Δ V _{LINE}	I _{LOAD} = 10mA V _{OUT} + 1.0V \leq V _{IN} \leq 12V	—	0.05	—	% / V	
Load Regulation	Δ V _{LOAD}	V _{IN} = V _{OUT} + 2V 1mA \leq I _{LOAD} \leq 100mA	—	5	10	mV	
EN Threshold Voltage	V _{CEH}	CE "High" Voltage	0.9	—	—	V	
	V _{CEL}	CE "Low" Voltage	—	—	0.4	V	
EN PIN Current	I _{EN}		—	—	0.01	μ A	
Current Limit	I _{LIMIT}		—	—	1000	mA	
Short Current	I _{SHORT}	V _{OUT} = GND	—	160	—	mA	
Output Noise Voltage	V _{ON}	C _{OUT} = 1 μ F, I _{LOAD} = 10mA BW = 10Hz~100kHz	—	83	—	μ V _{rms}	
Power Supply Rejection Rate	PSRR	V _{IN} = 5.3V V _{OUT} = 3.3V	I _{LOAD} = 10mA f = 1KHz	—	85	—	dB
			I _{LOAD} = 100mA f = 1KHz	—	72	—	dB
Thermal Shutdown Temperature	T _{SHDN}	—	—	160	—	°C	
Thermal Shutdown Hysteresis	Δ T _{SHD}	—	—	20	—	°C	

Note : All limits specified at room temperature (T_A = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

Functional Block Diagram

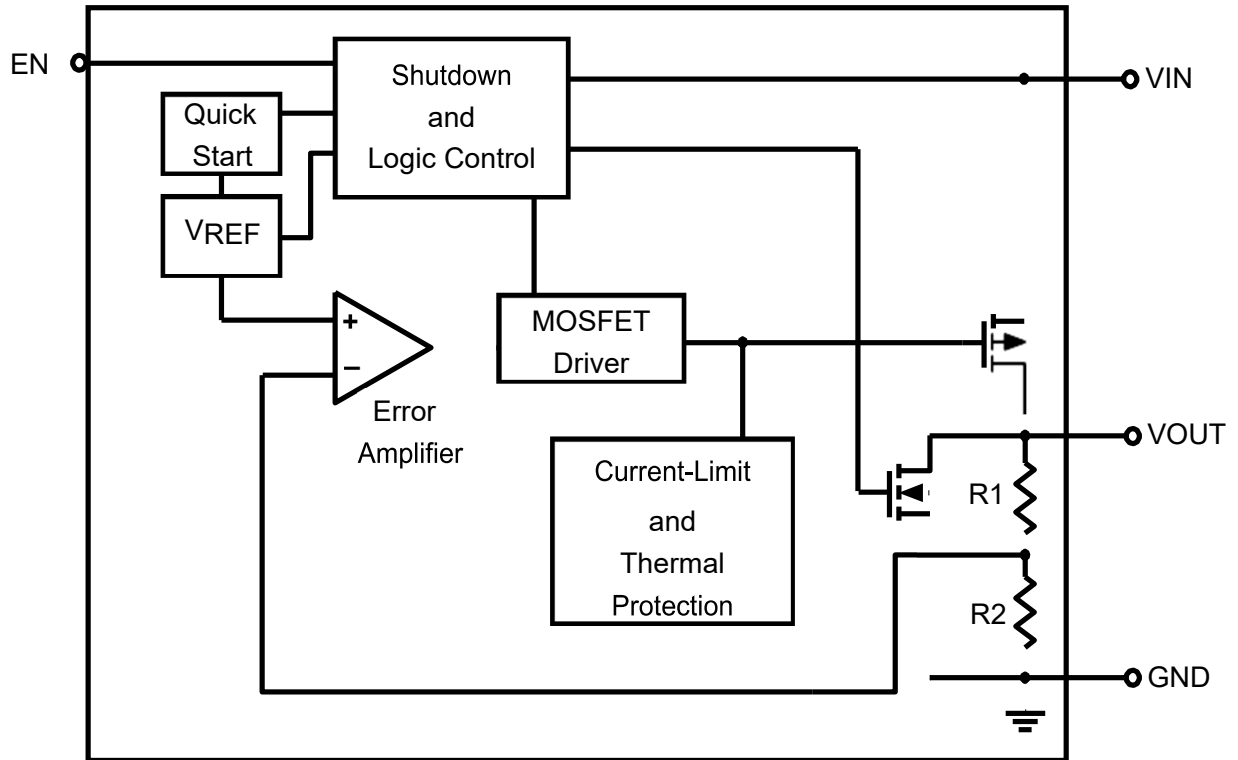


Figure 2. OSU29016 Block Diagram

Application Guideline

■ Input Capacitor

A $\geq 1\mu\text{F}$ 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 $\geq 1\mu\text{F}$, ceramic capacitor is recommended, and temperature characteristics are 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 VOUT and GND pins.

■ Dropout Voltage

The dropout voltage refers to the voltage difference between the VIN and VOUT pins while operating at specific output current. The dropout voltage V_{DROP} also can be expressed as the voltage drop on the pass-FET at specific output current (I_{RATED}) while the pass-FET is fully operating at ohmic region and the pass-FET can be characterized as an resistance $R_{\text{DS(ON)}}$. Thus, the dropout voltage can be defined as ($V_{\text{DROP}} = V_{\text{IN}} - V_{\text{OUT}} = R_{\text{DS(ON)}} \times I_{\text{RATED}}$). For normal operation, the suggested LDO operating range is ($V_{\text{IN}} > V_{\text{OUT}} + V_{\text{DROP}}$) for good transient response and PSRR ability. Vice versa, while operating at the ohmic region will degrade the performance severely.

■ Thermal Application

For continuous operation, do not exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated as below:

$T_{\text{A}}=25^{\circ}\text{C}$, OS DEMO PCB

The max $P_{\text{D}} = (T_{\text{j}} - T_{\text{A}}) / \theta_{\text{JA}}$.

Power dissipation (P_D) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

■ **Layout Consideration**

By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the OSU29016 ground pin using as wide and as short of a copper trace as is practical. Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

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