1µA Quiescent Current, 150mA LDO Regulator

DESCRIPTION

The EUP7180 is CMOS-based voltage regulator IC with extremely low supply current which is typically 1µA. Dropout voltage is also very low. The EUP7180 has output short circuit and over current protection features.

The EUP7180 is available in 1.5V, 2.3V, 2.5V and 3.0V versions.

FEATURE

- Low Ground Current at 1µA
- Low Dropout Voltage of 230mV at Output Current 100mA
- Guaranteed 150mA Output Current
- Stable with low ESR Ceramic Capacitors
- Current-limiting
- SOT23 3-pin and SOT89 Package
- RoHS Compliant and 100% Lead (Pb)-Free

APPLICATIONS

- Stable Voltage reference.
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for battery-powered equipment

Block Diagram

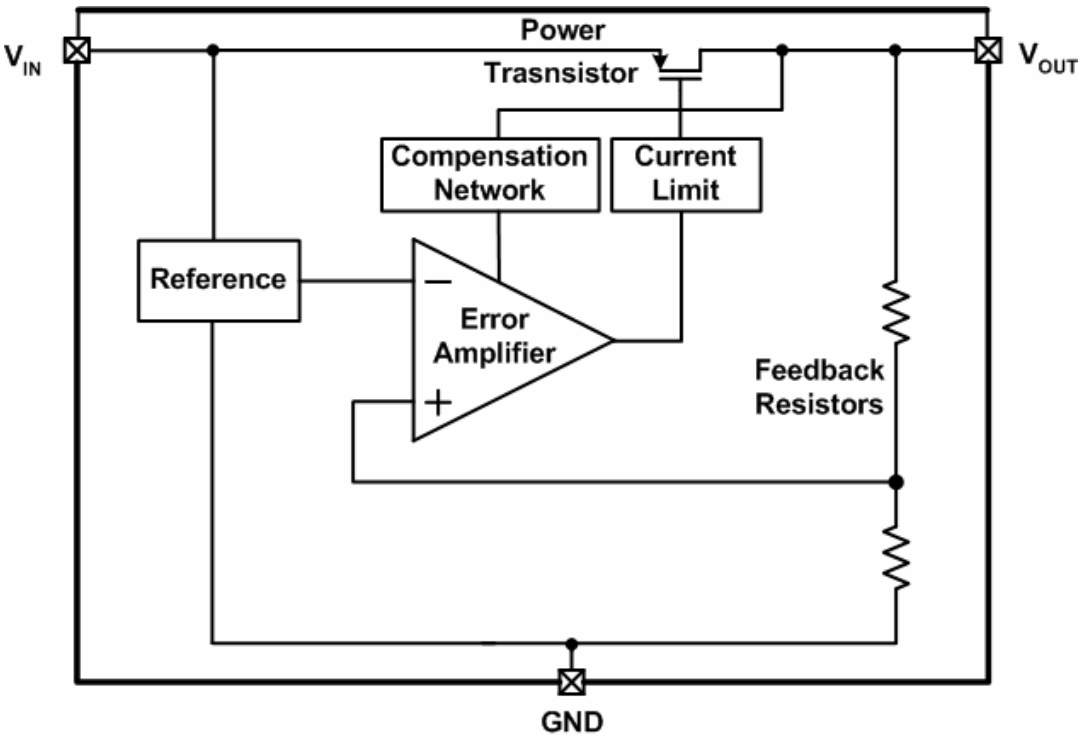


Figure 1.

Typical Application Circuit

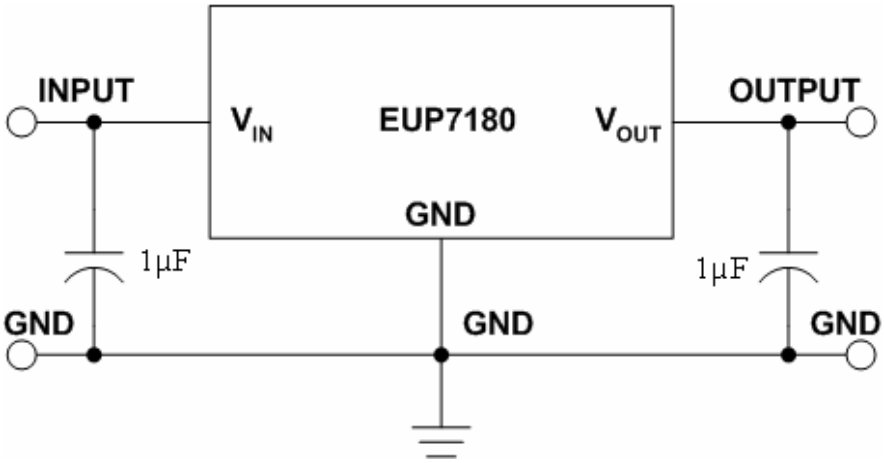
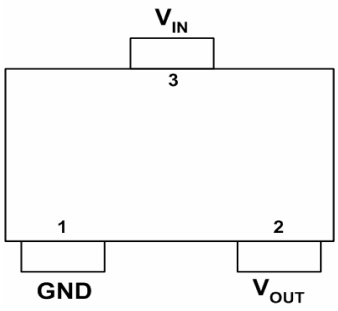
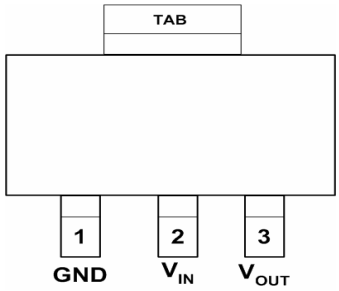


Figure 2.

Pin Configurations

Package Type	Pin Configurations	Package Type	Pin Configurations
SOT23-3		SOT89-3	

Pin Description

PIN	SOT23-3	SOT89-3	DESCRIPTION
V_{IN}	3	2	Input voltage of the LDO
GND	1	1	Common Ground
V_{OUT}	2	3	Output voltage of the LDO

Ordering Information

Order Number	Package Type	Marking	Operating Junction Temperature range
EUP7180-15VIR1	SOT23-3	KC xxxx	-40°C to 150°C
EUP7180-23VIR1	SOT23-3	KS xxxx	-40°C to 150°C
EUP7180-25VIR1	SOT23-3	KB xxxx	-40°C to 150°C
EUP7180-30VIR1	SOT23-3	KG xxxx	-40°C to 150°C
EUP7180-23CIR1	SOT89-3	xxxxx P7180S	-40°C to 150°C
EUP7180-25CIR1	SOT89-3	xxxxx P7180B	-40°C to 150°C
EUP7180-30CIR1	SOT89-3	xxxxx P7180G	-40°C to 150°C

EUP7180 -□ □ □ □ □ □

Lead Free Code
1: Lead Free 0: Lead

Packing R: Tape & Reel

Operating temperature range
I: Industry Standard

Package Type
V: SOT-23
C: SOT-89

Output Voltage
15: 1.5V
23: 2.3V
25: 2.5V
30: 3.0V

Absolute Maximum Ratings

- Input Voltage ---------- -0.3V to 6V
- Operating Junction Temperature Range ---------- -40°C to 150°C
- Storage Temperature Range ---------- -65°C to 150°C
- Power Dissipation ,P_D @ T_A=25°C
  SOT-23 ---------- 0.4W
  SOT-89 ---------- 0.57W
- Package Thermal Resistance
  SOT-23, θ_{JA} ---------- 250°C/W
  SOT-89, θ_{JA} ---------- 175°C/W
- ESD Rating
  Human Body Mode ---------- 2kV

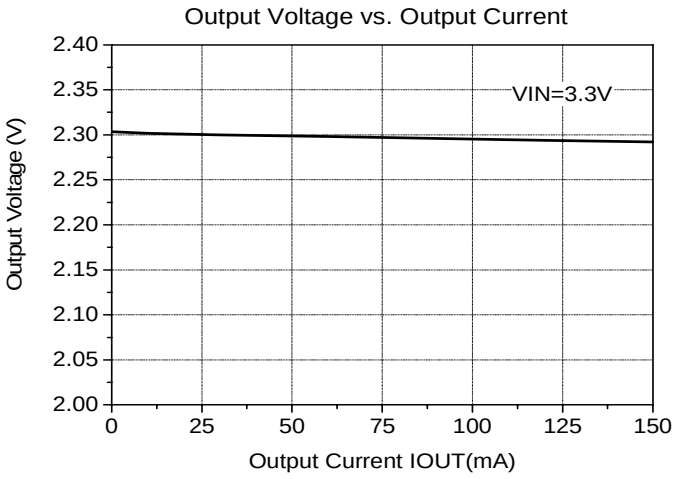
Electrical Characteristics

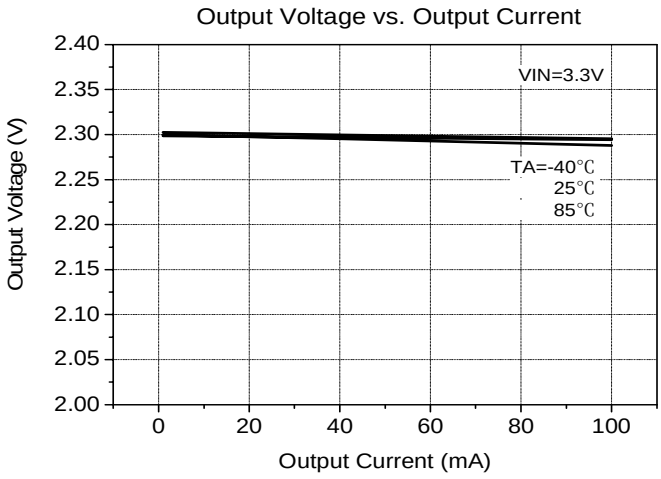
V_{IN}=V_{OUT}+1V,C_{IN}=1uF,C_{OUT}=1uF(Ceramic),T_A=25℃,Unless otherwise specified.

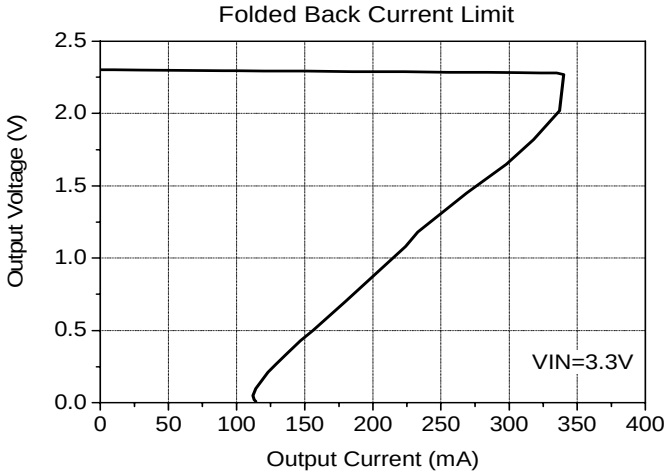
Symbol	Parameter	Conditions	EUP7180			Unit
			Min	Typ	Max.	
	Input Voltage		2.3		5.5	V
ΔV_{OUT}	Output Voltage Accuracy	I_{OUT}=1mA	-3		3	%
I_{OUTMAX}	Output Current		150			mA
V_{LDR}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA		10	25	mV
V_{DROP1}	Dropout Voltage (Note1)	I_{OUT}=30mA		70	140	mV
V_{DROP2}		I_{OUT}=100mA		230	400	
I_Q	Ground Current	No Load		1	1.7	μA
		I_{OUT}=150mA		2.5		
V_{LNR}	Line Regulation	V_{IN}=(V_{OUT}+1V) to 5.5V, I_{OUT}=1mA		0.06	0.2	%/V
TC_{OUT}	V_{OUT} Temp. Coeff.	I_{OUT}=1mA,T_A=-40℃ to 85℃		70		ppm/℃
Ishort	Short Circuit Current	V_{OUT}=GND		100		mA

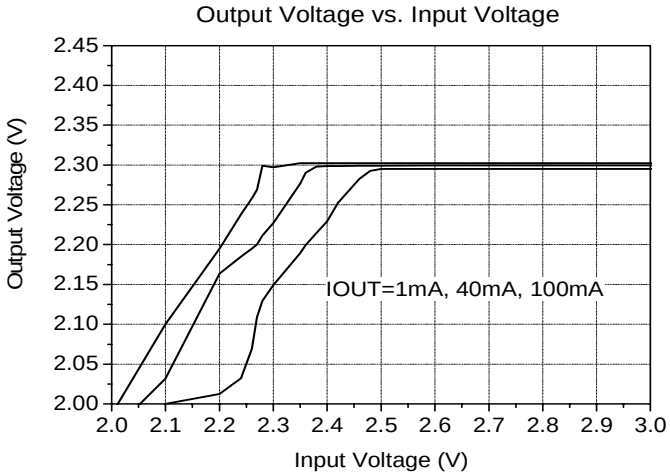
Note 1: Dropout is defined as V_{IN}-V_{OUT} when V_{OUT} is 2% below the value of V_{OUT} for V_{IN}=V_{OUT}+1V. This characteristics is suitable for V_{OUT} ≥ 2.3V.

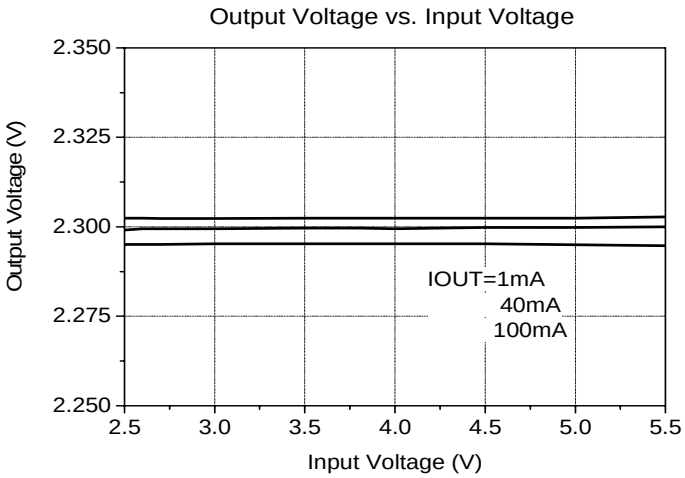
Typical Operating Characteristics

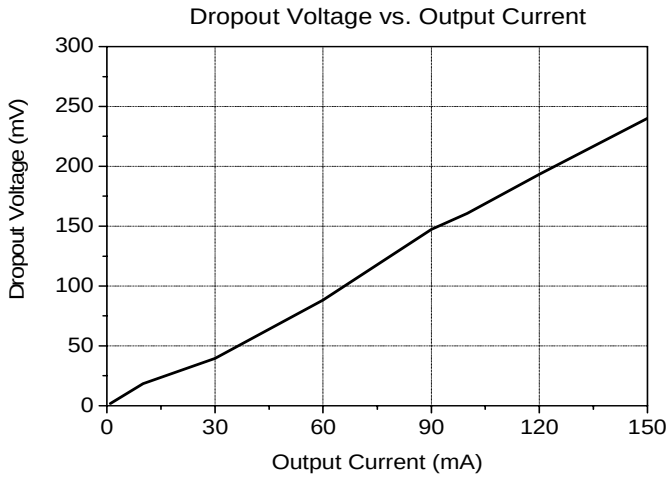


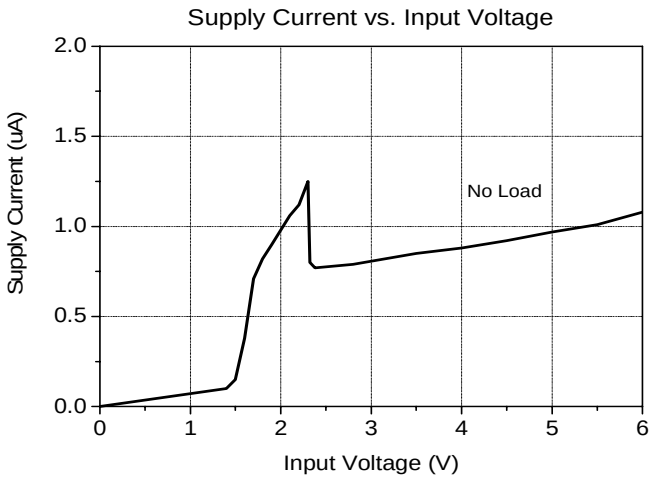


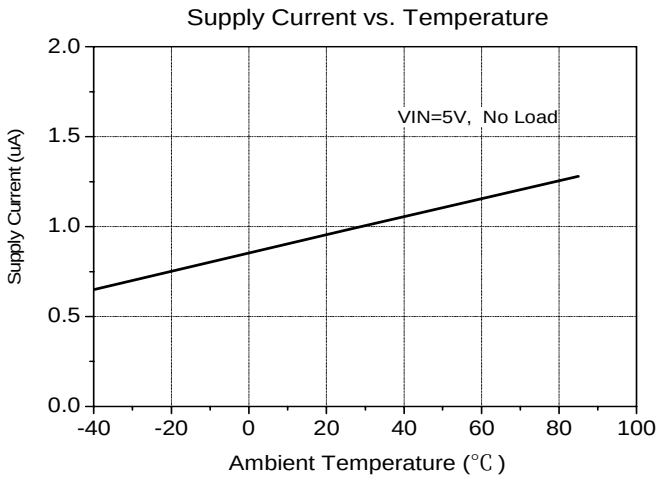


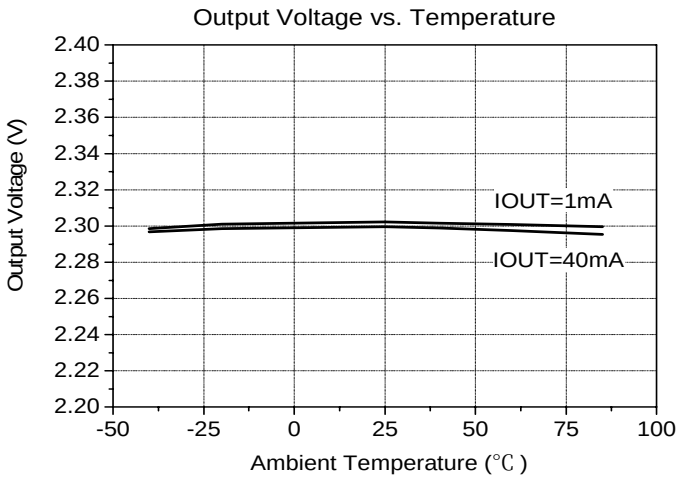


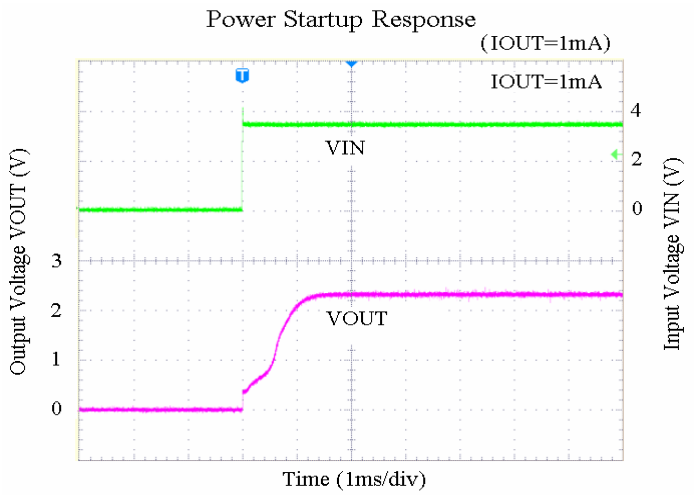


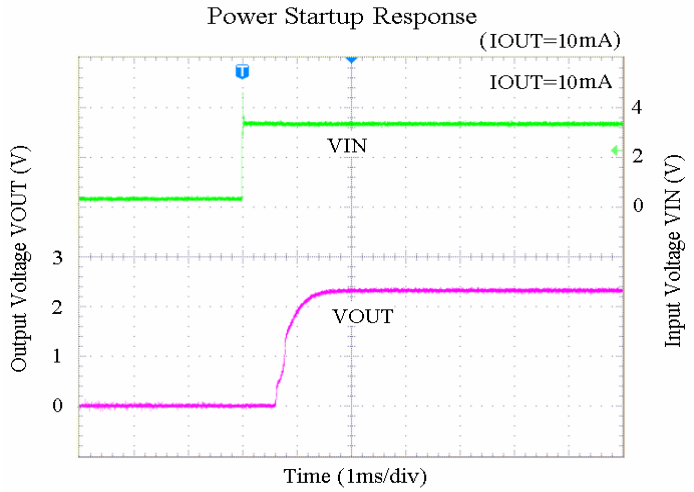


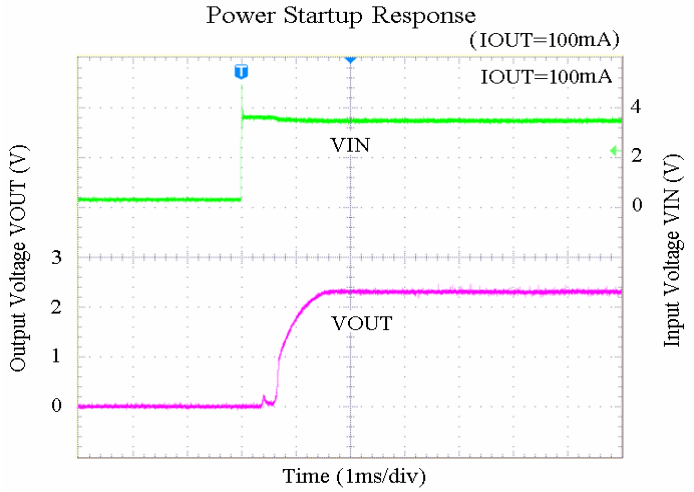

Supply Current vs. Input Voltage
Supply Current (uA)
Input Voltage (V)
No Load
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6


Supply Current vs. Temperature
Supply Current (uA)
Ambient Temperature (℃)
VIN=5V, No Load
2.0
1.5
1.0
0.5
0.0
-40
-20
0
20
40
60
80
100

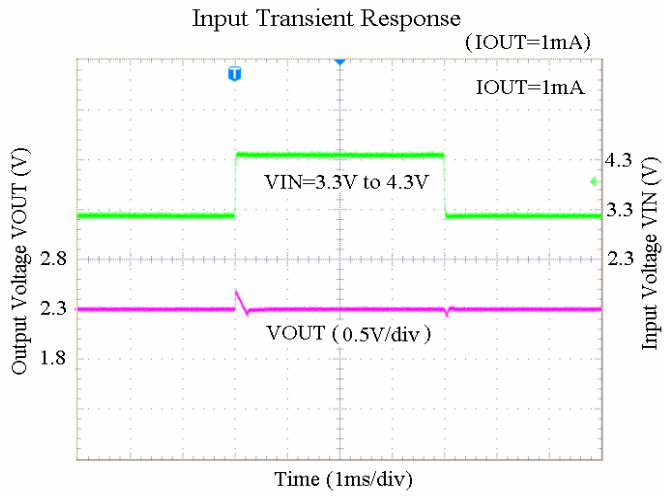

Output Voltage vs. Temperature
Output Voltage (V)
Ambient Temperature (℃)
IOUT=1mA
IOUT=40mA
2.40
2.38
2.36
2.34
2.32
2.30
2.28
2.26
2.24
2.22
2.20
-50
-25
0
25
50
75
100


Power Startup Response
(IOUT=1mA)
IOUT=1mA
VIN
VOUT
Output Voltage VOUT (V)
Input Voltage VIN (V)
Time (1ms/div)

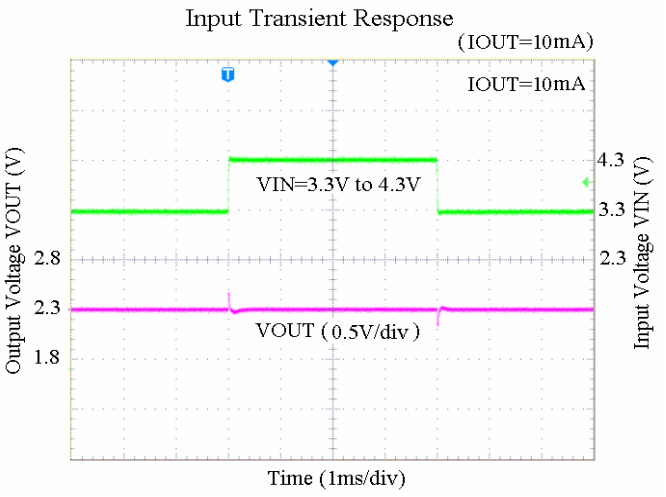

Power Startup Response
(IOUT=10mA)
IOUT=10mA
VIN
VOUT
Output Voltage VOUT (V)
Input Voltage VIN (V)
Time (1ms/div)


Power Startup Response
(IOUT=100mA)
IOUT=100mA
VIN
VOUT
Output Voltage VOUT (V)
Input Voltage VIN (V)
Time (1ms/div)

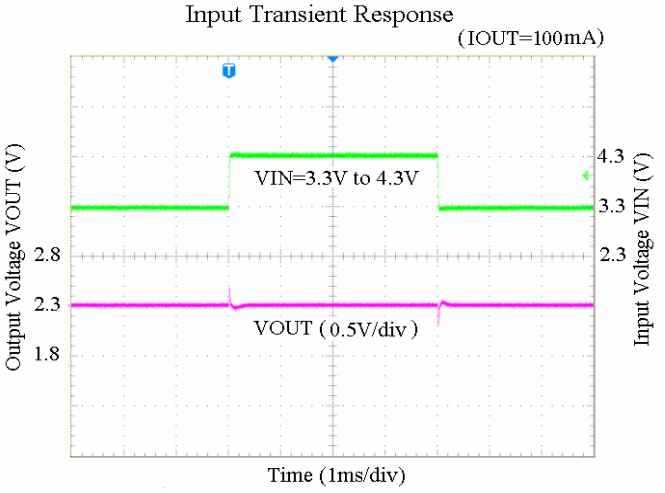
Input Transient Response



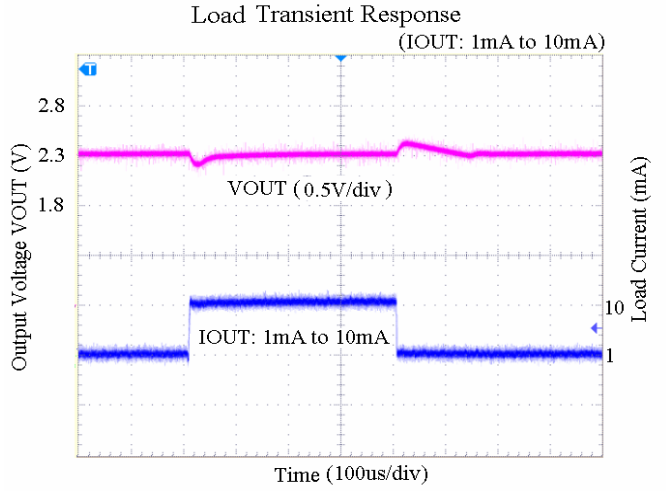
Input Transient Response



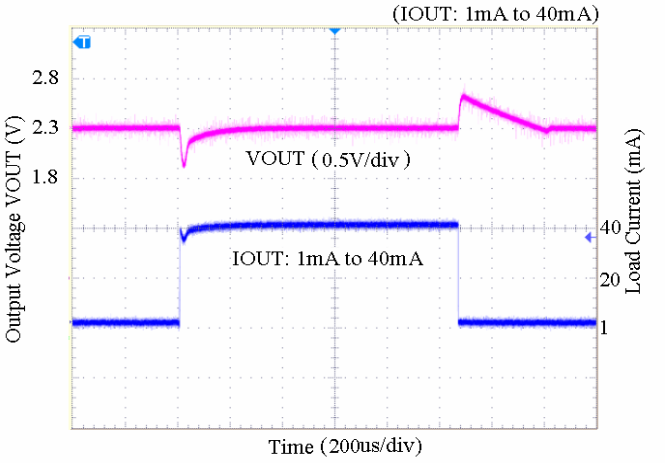
Input Transient Response



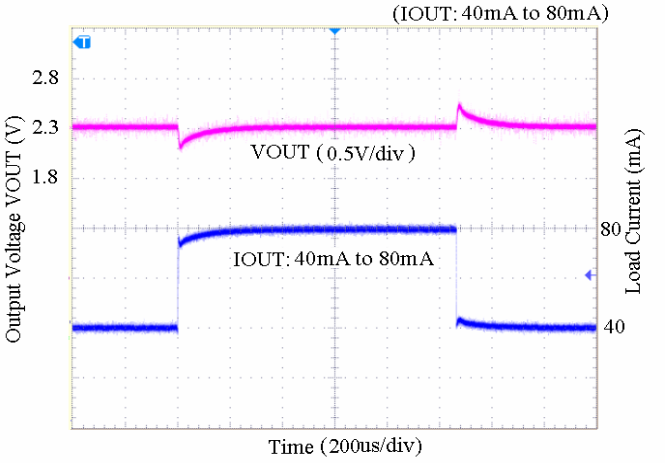
Load Transient Response

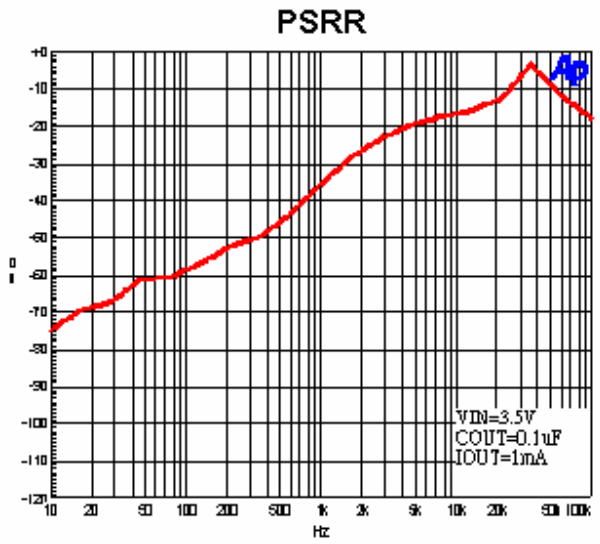


Load Transient Response



Load Transient Response




PSRR
VIN=3.5V
COUT=0.1uF
IOUT=1mA
Hz

Application Information

External Capacitors

Like any low-dropout regulator, the EUP7180 requires external capacitors for regulator stability. The EUP7180 is specifically designed for portable applications requiring minimum board space and smallest components. These capacitors must be correctly selected for good performance.

Input Capacitor

A minimum input capacitance of 1µF is required between the EUP7180 input pin and ground (the amount of the capacitance may be increased without limit).This capacitor must be located a distance of not more than 1cm from the input pin and returned to a clean analog ground.

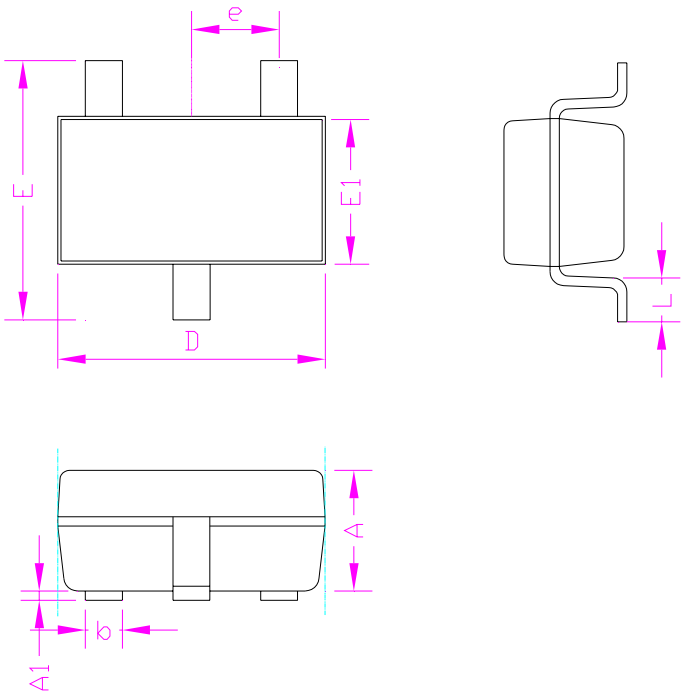
Any good quality ceramic, tantalum, or film capacitor may be used at the input. If a tantalum capacitor is used at the input, it must be guaranteed by the manufacturer to have a surge current rating sufficient for the application.

Output Capacitance

The EUP7180 is specifically designed to employ ceramic output capacitors as low as 1µF. Ceramic capacitors below 10µF offer significant cost and space savings, along with high frequency noise filtering. Higher values and other types and of capacitor may be used, but their equivalent series resistance (ESR) should be maintained below 0.5Ω. Ceramic capacitor of the value required by the EUP7180 are available in the following dielectric types: Z5U, Y5V, X5R, and X7R. The Z5U and Y5V types exhibit a 50% or more drop in capacitance value as their temperature increase from 25°C, an important consideration. The X5R generally maintain their capacitance value within ± 20%. The X7R type are desirable for their tighter tolerance of 10% over temperature.

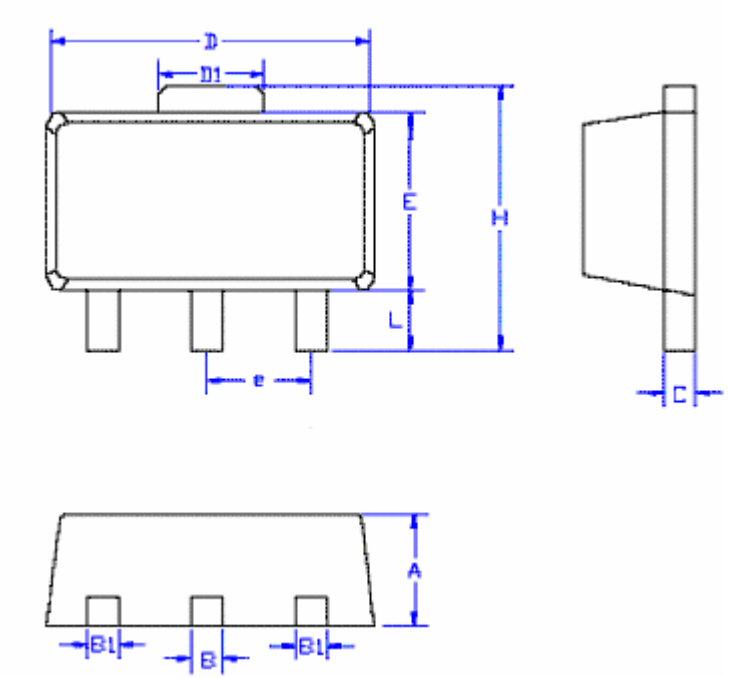
Packaging Information

SOT23-3



SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	1.30	-	0.052
A1	0.00	0.15	0.000	0.006
D	2.90		0.114	
E1	1.60		0.063	
E	2.60	3.00	0.102	0.118
L	0.30	0.60	0.012	0.024
b	0.30	0.50	0.012	0.020
e	0.95		0.037	

SOT89-3



SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.40	1.60	0.055	0.063
L	0.89	1.20	0.035	0.047
B1	0.36	0.48	0.014	0.019
B	0.44	0.56	0.017	0.022
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
H	3.94	4.25	0.155	0.167
E	2.29	2.60	0.090	0.102
e	1.50		0.059	