LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

DESCRIPTION

The LRC LR1117/A is a LOW DROP Voltage Regulator able to provide up to 0.8/1.0A of Output Current, available even in adjustable version (Vref=1.25V). Concerning fixed versions, are offered the following Output Voltages: 1.5V, 1.8V, 2.5V, 2.85V, 3.0V, 3.3V, 3.6V and 5.0V. The 2.85V type is ideal for SCSI-2 lines active termination. High efficiency is assured by NPN pass transistor. In fact in the case, unlike than PNP one, the Quiescent Current flows mostly into the for stability. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within ±1% at 25°C. The ADJUSTABLE LR1117/A is pin to pin compatible with the other standard Adjustable voltage regulators maintaining the better performances in terms of Drop and Tolerance.

FEATURES
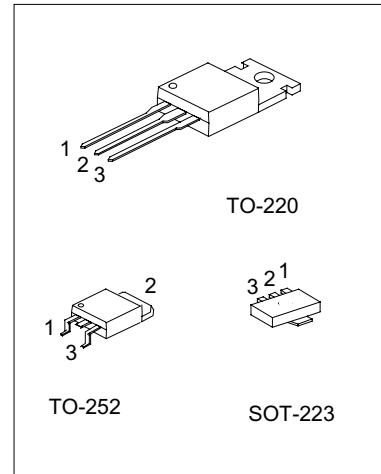
*Low dropout voltage (1V Typ.)
*2.85V device performances are suitable for SCSI-2 active termination
*Output current up to 0.8/1.0A
*Fixed output voltage of: 1.5V, 1.8V, 2.5V, 2,85V, 3.0V, 3.3V, 3.6V, 5.0V
*Adjustable version availability (Vref=1.25V)
*Internal current and thermal limit
*Available in ±1%(at 25°C) and 2% in all temperature range
*Supply voltage rejection: 75dB (TYP)
*Temperature range: 0°C to 125°C

TO-220

TO-252   SOT-223

1: GND   2: Output   3: Input

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
DC Input Voltage	VIN	9 , 15	V
Power Dissipation	Ptot	12	W
Storage temperature	Tstg	-65 ~ +150	°C
Operating Junction Temperature	Top	0 ~ +125	°C
Thermal Resistance Junction ambien	Rthj-amb	50	°C/W

Note: 1. Absolute Maximum Ratings are those value beyond which damage to the device may occur. Functional operation under there condition is not implied. Over the above suggested Max Power Dissipation a Short Circuit could definitively damage the device.

2 .Marking=DFXXX=15V; Marking=LRXXX.=15V; Marking=LRXXX=9V.

LR1117/A-1.5 ELECTRICAL CHARACTERISTICS
(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=3.5V, Io=10mA, Tj=25°C	1.485	1.500	1.515	VV
Output Voltage	Vo	Io=0 to 800/1000mA, Vin=3 to 8V	1.470	1.500	1.530	V
Line Regulation	∆Vo	Vin=3 to 8V, Io=0mA		1	6	mV
Load Regulation	∆Vo	Vin=3V, Io=0 to 800/1000mA		1	10	mV
Temperature stability	∆Vo			0.5		%
Long Term Stability	∆Vo	1000 hrs, Tj=125°C		0.3		%
Operating Input Voltage	Vin	Io=100mA			15	V
Quiescent Current	Id	Vin≤8V		5	10	mA
Output Current	Io	Vin=6.5V, Tj=25°C	800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C		100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=4.5V, Vripple=1Vpp	60	75		dB
Dropout Voltage	Vd	Io=100mA		1.00	1.10	V
		Io=500mA		1.05	1.15	V
		Io=800mA		1.10	1.20	V
		Io=1000 mA		1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse		0.01	0.10	%/W

LR1117/A-1.8 ELECTRICAL CHARACTERISTICS
(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=3.8V, Io=10mA, Tj=25°C	1.780	1.800	1.820	V
Output Voltage	Vo	Io=0 to 800/1000mA, Vin=3.3 to 8V	1.760		1.840	V
Line Regulation	∆Vo	Vin=3.3 to 8V, Io=0mA		1	6	mV
Load Regulation	∆Vo	Vin=3.3V, Io=0 to 800/1000mA		1	10	mV
Temperature stability	∆Vo			0.5		%
Long Term Stability	∆Vo	1000 hrs, Tj=125°C		0.3		%
Operating Input Voltage	Vin	Io=100mA			10	V
Quiescent Current	Id	Vin≤8V		5	10	mA
Output Current	Io	Vin=6.8V, Tj=25°C	800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C		100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=5.5V, Vripple=1Vpp	60	75		dB
Dropout Voltage	Vd	Io=100mA		1.00	1.10	V
		Io=500mA		1.05	1.15	V
		Io=800mA		1.10	1.20	V
		Io=1000mA		1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse		0.01	0.10	%/W

LR1117/A-2.5 ELECTRICAL CHARACTERISTICS

(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=4.5V, Io=10mA, Tj=25°C	±1%	2.475	2.500	2.525	V
			±2%	2.450	2.500	2.550	V
Output Voltage	Vo	Io=0 to 800/1000mA,	±2%	2.450		2.550	V
		Vin=3.9 to 8 V	±4%	2.400		2.600	V
Line Regulation	ΔVo	Vin=3.9 to 8V, Io=0mA			1	6	mV
Load Regulation	ΔVo	Vin=3.9V, Io=0 to 800/1000mA			1	10	mV
Temperature stability	ΔVo				0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C			0.3		%
Operating Input Voltage	Vin	Io=100mA				15	V
Quiescent Current	Id	Vin≤8V			5	10	mA
Output Current	Io	Vin=7.5V, Tj=25°C		800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C			100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=5.5V, Vripple=1Vpp		60	75		dB
Dropout Voltage	Vd	Io=100mA			1.00	1.10	V
		Io=500mA			1.05	1.15	V
		Io=800mA			1.10	1.20	V
		Io=1000mA			1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse			0.01	0.10	%/W

LR1117/A-2.85 ELECTRICAL CHARACTERISTICS

(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=4.85V, Io=10mA, Tj=25°C	2.82	2.85	2.88	V
Output Voltage	Vo	Io=0 to 800/1000mA,Vin=4.25 to 8V	2.79		2.91	V
Line Regulation	ΔVo	Vin=4.25 to 10V, Io=0mA		1	6	mV
Load Regulation	ΔVo	Vin=4.25V, Io=0 to 800/1000mA		1	10	mV
Temperature stability	ΔVo			0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C		0.3		%
Operating Input Voltage	Vin	Io=100mA			15	V
Quiescent Current	Id	Vin≤8V		5	10	mA
Output Current	Io	Vin=7.85V, Tj=25°C	800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C		100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=5.85V, Vripple=1Vpp	60	75		DB
Dropout Voltage	Vd	Io=100mA		1.00	1.10	V
		Io=500mA		1.05	1.15	V
		Io=800mA		1.10	1.20	V
		Io=1000mA		1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse		0.01	0.10	%/W

LR1117/A-3.0 ELECTRICAL CHARACTERISTICS

(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=5V, Io=10mA, Tj=25°C	±1%	2.97	3.00	3.03	V
			±2%	2.94	3.00	3.06	V
Output Voltage	Vo	Io=0 to 800/1000mA,	±2%	2.94		3.06	V
		Vin=4.5 to 8V	±4%	2.88		3.12	V
Line Regulation	ΔVo	Vin=4.5 to 8V, Io=0mA			1	6	mV
Load Regulation	ΔVo	Vin=4.5V, Io=0 to 800/1000mA			1	10	mV
Temperature stability	ΔVo				0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C			0.3		%
Operating Input Voltage	Vin	Io=100mA				15	V
Quiescent Current	Id	Vin≤8V			5	10	mA
Output Current	Io	Vin=8V, Tj=25°C		800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C			100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=6V, Vripple=1Vpp		60	75		dB
Dropout Voltage	Vd	Io=100mA			1.00	1.10	V
		Io=500mA			1.05	1.15	V
		Io=800mA			1.10	1.20	V
		Io=1000mA			1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse			0.01	0.10	%/W

LR1117/A-3.3 ELECTRICAL CHARACTERISTICS

(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=5.3V, Io=10mA, Tj=25°C	±1%	3.267	3.300	3.333	V
			±2%	3.235	3.300	3.365	V
Output Voltage	Vo	Io=0 to 800/1000mA,	±2%	3.235		3.365	V
		Vin=4.75 to 8 V	±4%	3.160		3.440	V
Line Regulation	ΔVo	Vin=4.75 to 8V, Io=0mA			1	6	mV
Load Regulation	ΔVo	Vin=4.75V, Io=0 to 800/1000mA			1	10	mV
Temperature stability	ΔVo				0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C			0.3		%
Operating Input Voltage	Vin	Io=100mA				15	V
Quiescent Current	Id	Vin≤8V			5	10	mA
Output Current	Io	Vin = 8V, Tj=25°C		800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C			100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=6.3V, Vripple=1Vpp		60	75		DB
Dropout Voltage	Vd	Io=100mA			1.00	1.10	V
		Io=500mA			1.05	1.15	V
		Io=800mA			1.10	1.20	V
		Io=1000mA			1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse			0.01	0.10	%/W

LR1117/A-3.6 ELECTRICAL CHARACTERISTICS
(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=5.6V, Io=10mA, Tj=25°C	3.564	3.600	3.636	V
Output Voltage	Vo	Io=0 to 800/1000mA, Vin=5 to 8 V	3.528	3.600	3.672	V
Line Regulation	ΔVo	Vin=5 to 8V, Io=0mA		1	6	mV
Load Regulation	ΔVo	Vin=5V, Io=0 to 800/1000mA		1	10	mV
Temperature stability	ΔVo			0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C		0.3		%
Operating Input Voltage	Vin	Io=100mA			15	V
Quiescent Current	Id	Vin≤8V		5	10	mA
Output Current	Io	Vin=8V, Tj=25°C	800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C		100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=6.6V, Vripple=1Vpp	60	75		DB
Dropout Voltage	Vd	Io=100mA		1.00	1.10	V
		Io=500mA		1.05	1.15	V
		Io=800mA		1.10	1.20	V
		Io=1000mA		1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse		0.01	0.10	%/W

LR1117/A-5.0 ELECTRICAL CHARACTERISTICS
(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Vin=7V, Io=10mA, Tj=25°C	±1%	4.95	5.00	5.05	V
			±2%	4.90	5.00	5.10	V
Output Voltage	Vo	Io=0 to 800/1000mA,	±2%	4.90		5.10	V
		Vin=6.5 to 8 V	±4%	4.80		5.20	V
Line Regulation	ΔVo	Vin=6.5 to 8V, Io=0mA			1	10	mV
Load Regulation	ΔVo	Vin=6.5V, Io=0 to 800/1000mA			1	15	mV
Temperature stability	ΔVo				0.5		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C			0.3		%
Operating Input Voltage	Vin	Io=100mA				15	V
Quiescent Current	Id	Vin≤8V			5	10	mA
Output Current	Io	Vin=10V, Tj=25°C		800	950	1200	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, Tj=25°C			100		μV
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin=8V, Vripple=1Vpp		60	75		dB
Dropout Voltage	Vd	Io=100mA			1.00	1.10	V
		Io=500mA			1.05	1.15	V
		Io=800mA			1.10	1.20	V
		Io=1000mA			1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse			0.01	0.10	%/W

LR1117/A-ADJUSTABLE ELECTRICAL CHARACTERISTICS

(refer to the test circuits, Tj=0 to 125°C, Co=10μF unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage	Vref	Vin-VO=2V, Io=10mA, Tj=25°C	1.238	1.25	1.262	V
Reference Voltage	Vref	Io=10 to 800/1000mA, Vin-Vo=1.4 to 8V	1.225		1.275	V
Line Regulation	ΔVo	Vin-Vo=1.5 to 8V, Io=10mA		0.035	0.200	%
Load Regulation	ΔVo	Vin-Vo=3V, Io=10 to 800/1000mA		0.10	0.400	%
Temperature stability	ΔVo			0.50		%
Long Term Stability	ΔVo	1000 hrs, Tj=125°C		0.3		%
Operating Input Voltage	Vin				15	V
Adjustment Pin Current	Iadj	Vin≤8V		60	120	μA
Adjustment Pin Current Change	ΔIadj	Vin-Vo=1.4 to 8V, Io=10 to 800/1000mA		1	5	μA
Minimum Load Current	Io(min)	Vin=8V		2	5	mA
Output Current	Io	Vin-Vo=5V, Tj=25°C	800	950	1200	mA
Output Noise (%Vo)	eN	B=10Hz to 10KHz, Tj=25°C		0.003		%
Supply Voltage Rejection	SVR	Io=40mA, f=120Hz, Tj=25°C, Vin-Vo=3V, Vripple=1Vpp	60	75		dB
Dropout Voltage	Vd	Io=100mA		1.00	1.10	V
		Io=500mA		1.05	1.15	V
		Io=800mA		1.10	1.20	V
		Io=1000mA		1.15	1.25	V
Thermal Regulation		Ta=25°C, 30ms Pulse		0.01	0.10	%/W
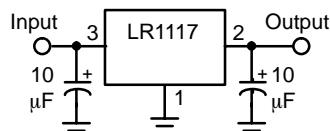
TYPICAL APPLICATIONS

Fig 1. Fixed Output Regulator
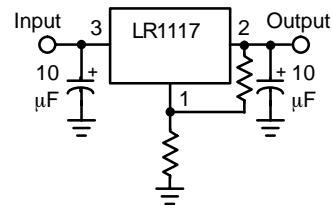
Fig 2. Adjustable Output Regulator
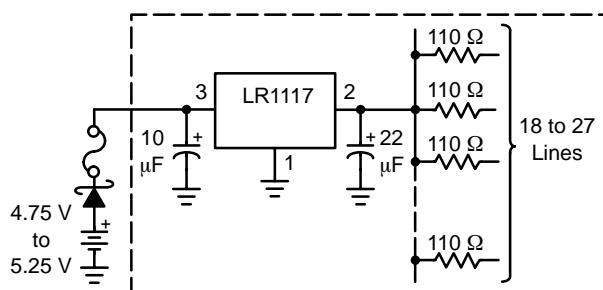
Fig 3. Active SCSI Bus Terminator

LR1117/A ADJUSTABLE APPLICATION NOTE

The LR1117/A ADJUSTABLE has a thermal stabilized 1.25±0.012V reference voltage between the OUT and ADJ pins. I_{ADJ} is 60μA typ. (120μA max.) and ΔI_{ADJ} is 1μA typ. (5μA max.).

R1 is normally fixed to 120Ω. From figure 7 we obtain:

$V_{OUT}=V_{REF}+R2(I_{ADJ} + I_{R1})=V_{REF} + R2(I_{ADJ} + V_{REF} / R1)=V_{REF}(1+R2/R1) + R2 \times I_{ADJ}$.

In normal application R2 value is in the range of few Kohm,, so the R2 X I_{ADJ} product could not be considered in the V_{OUT} calculation; then the above expression becomes: $V_{OUT}=V_{REF}(1+R2/R1)$

In order to have the better load regulation it is important to realize a good Kelvin connection of R1 and R2 resistors. In particular R1 connection must be realized very close to OUT and ADJ pin, while R2 ground connection must be placed as near as possible to the negative Load pin. Ripple rejection can be improved by introducing a 10μF electrolytic capacitor placed in parallel to the R2 resistor (See Fig. 6)
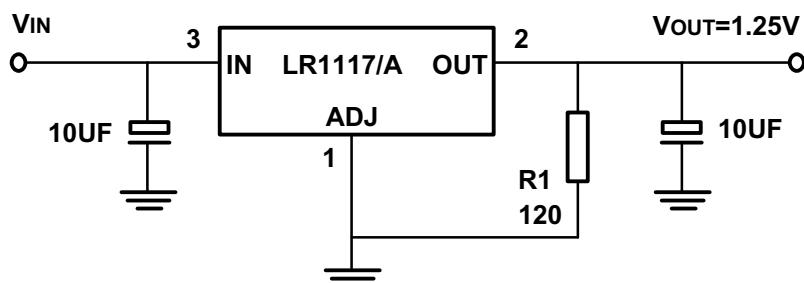

FIG.4 Adjustable Output 1.25 Voltage Application Circuit
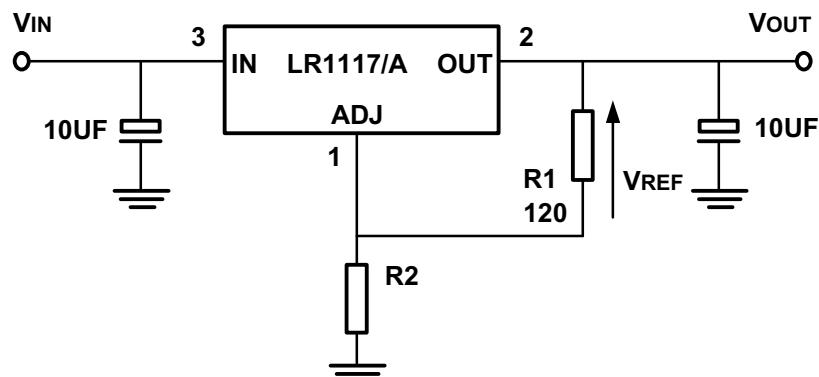

FIG.5 Adjustable Output Voltage Application Circuit
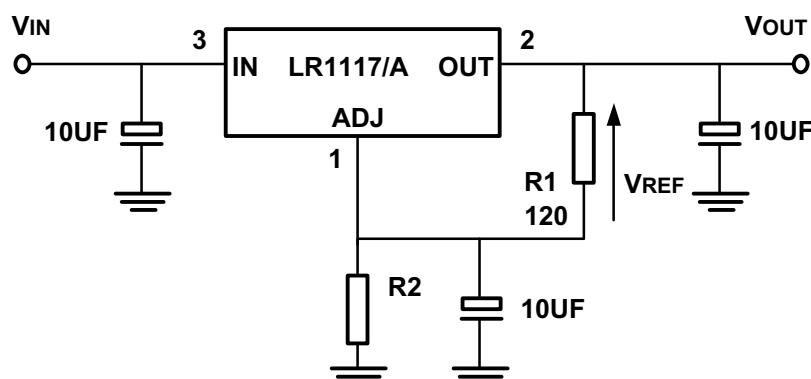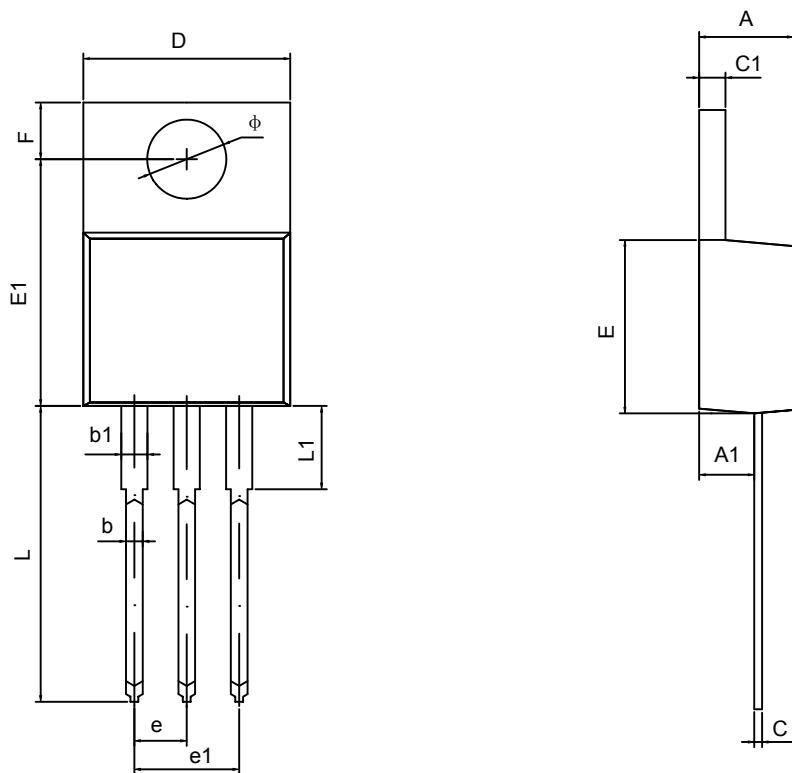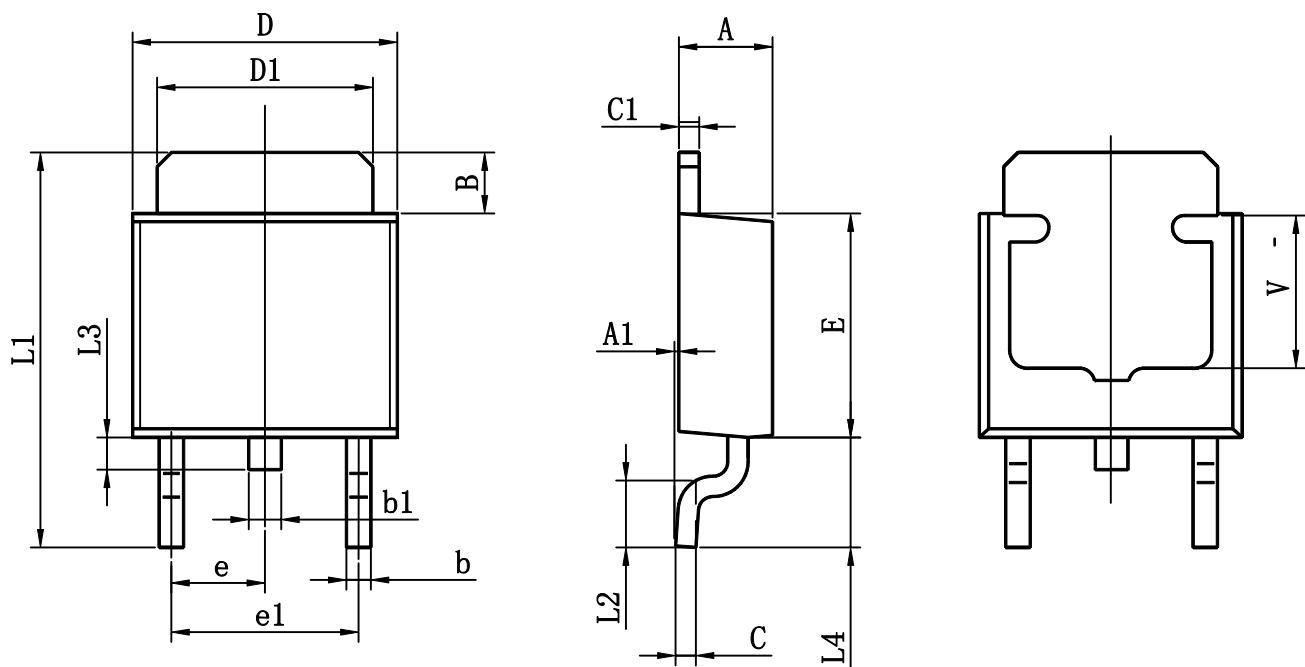
FIG.6 Adjustable Output Voltage Application with improved Ripple Rejection.
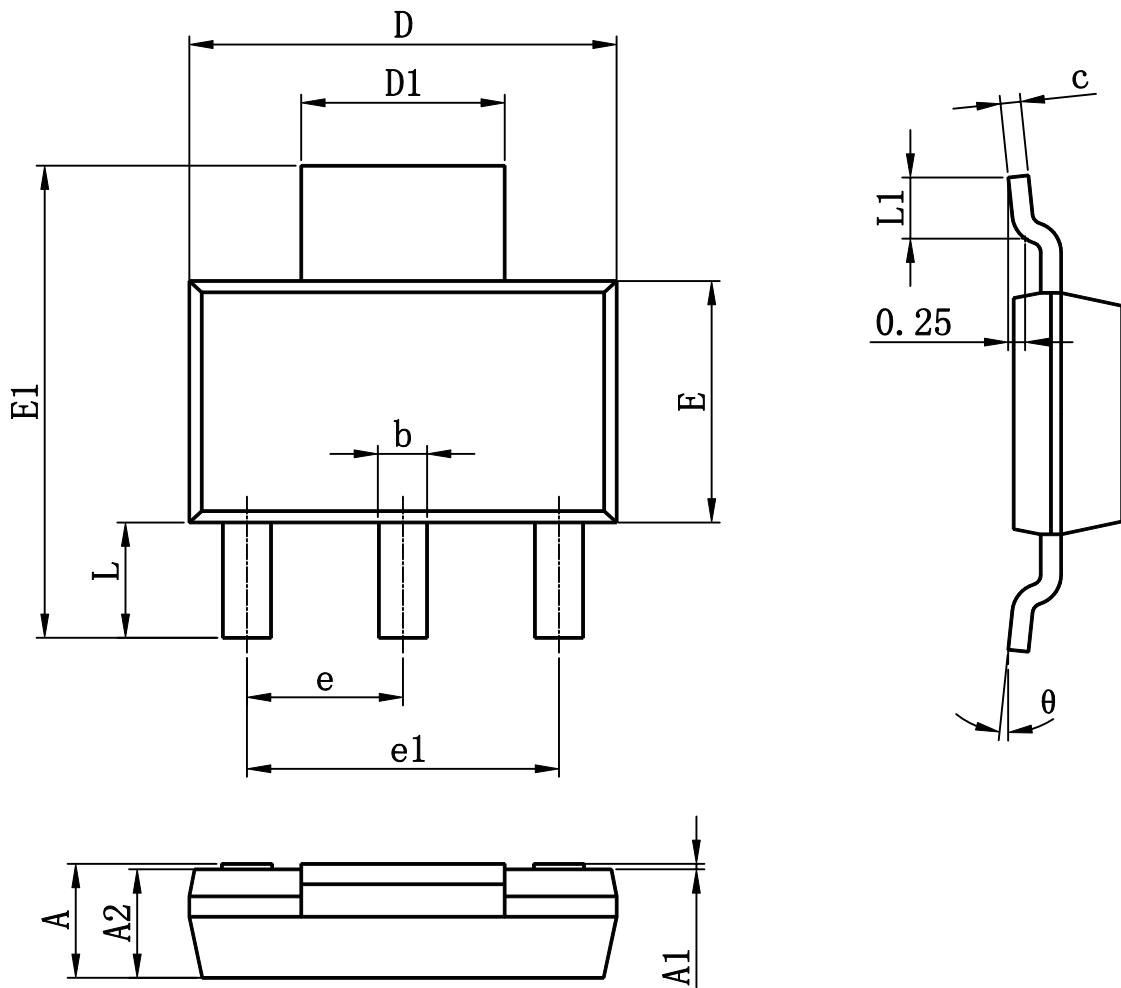
TO-220-3L PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.168	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540TYP		0.100TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
φ	3.790	3.890	0.149	0.153

TO-252-2 PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300TYP		0.091TYP	
e1	4.500	4.700	0.177	0.185
L1	9.500	9.900	0.374	0.390
L2	1.400	1.780	0.055	0.070
L3	0.650	0.950	0.026	0.037
L4	2.550	2.900	0.100	0.114
V	3.80REF		0.150REF	

SOT-223 PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.500	1.850	0.059	0.073
A1	0.020	0.100	0.001	0.004
A2	1.500	1.750	0.059	0.069
b	0.660	0.810	0.026	0.032
c	0.240	0.350	0.010	0.014
D	6.200	6.800	0.244	0.268
D1	2.800	3.200	0.110	0.126
E	3.300	3.700	0.130	0.146
E1	6.600	7.400	0.260	0.291
e	2.300TYP		0.091TYP	
e1	4.500	4.700	0.177	0.185
L	1.750TYP		0.069TYP	
L1	0.900		0.035	
θ	0°	10°	0°	10°