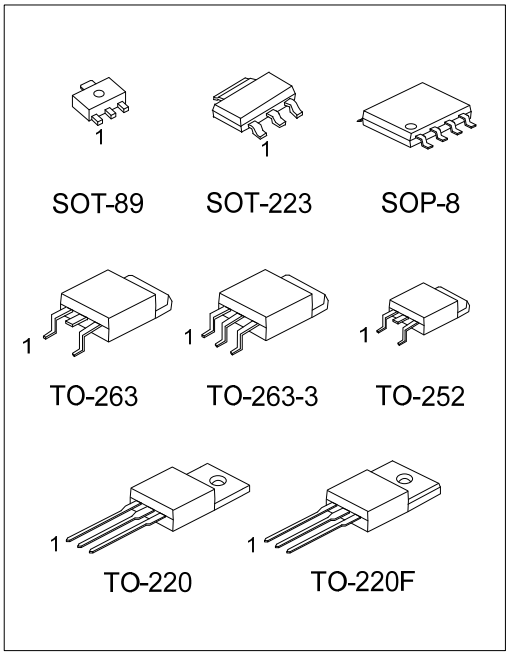
LD1117E

LINEAR INTEGRATED CIRCUIT

LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS



■ DESCRIPTION

The UTC **LD1117E** is a low dropout, 3-terminal positive voltage regulator designed to provide output current up to 1A. There are adjustable voltage version (V_{REF}=1.25V) and various fixed voltage versions.

■ FEATURES

* Low Dropout Voltage
* Suitable For SCSI-2 Active Termination If V_{OUT} Set To 2.85V
* Output Current Up To 1.0A
* Built-In Current Limit And Over Temperature Protection
* Available In ±1%(at 25°C) And 2% In All Temperature Range
* Low Current Consumption

■ ORDERING INFORMATION

Ordering Number		Package	② Pin Assignment	Packing
Lead Free	Halogen Free			
LD1117EL-xx-AA3-①-②	LD1117EG-xx-AA3-①-②	SOT-223	A: GOI B: OGI C: GIO D: IGO	R: Tape Reel T: Tube
LD1117EL-xx-AB3-①-②	LD1117EG-xx-AB3-①-②	SOT-89		
LD1117EL-xx-TA3-①-②	LD1117EG-xx-TA3-①-②	TO-220		
LD1117EL-xx-TF3-①-②	LD1117EG-xx-TF3-①-②	TO-220F		
LD1117EL-xx-TN3-①-②	LD1117EG-xx-TN3-①-②	TO-252		
LD1117EL-xx-TQ2-①-②	LD1117EG-xx-TQ2-①-②	TO-263		
LD1117EL-xx-TQ3-①-②	LD1117EG-xx-TQ3-①-②	TO-263-3		
LD1117EL-xx-S08-①-②	LD1117EG-xx-S08-①-②	SOP-8	GOOIxOOx	

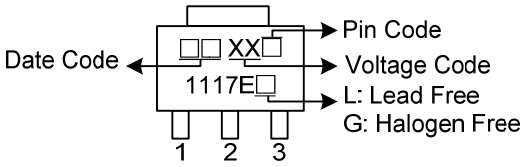
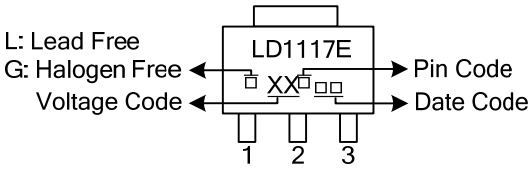
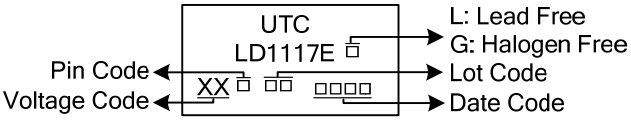
Note: Pin Assignment: I:V_{IN} O:V_{OUT} G:GND

LD1117EL-xx-AA3-①-②

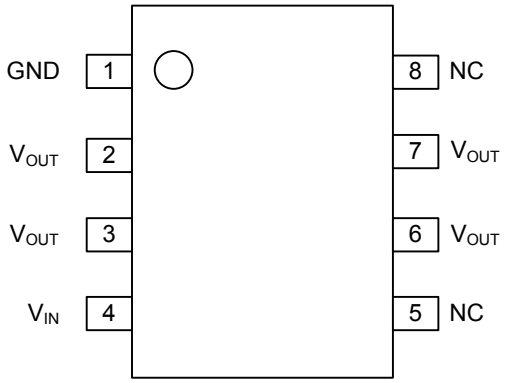
(1)Packing Type
(2)Pin Assignment
(3)Package Type
(4)Output Voltage Code
(5)Lead Plating

(1) R: Tape Reel, T: Tube
(2) refer to Pin Assignment
(3) AA3: SOT-223, AB3: SOT-89, TA3:TO-220,
(3) TF3: TO-220F, TN3: TO-252, TQ2: TO-263,
(3) TQ3: TO-263-3, S08: SOP-8
(4) xx: refer to Marking Information
(5) G: Halogen Free, L: Lead Free

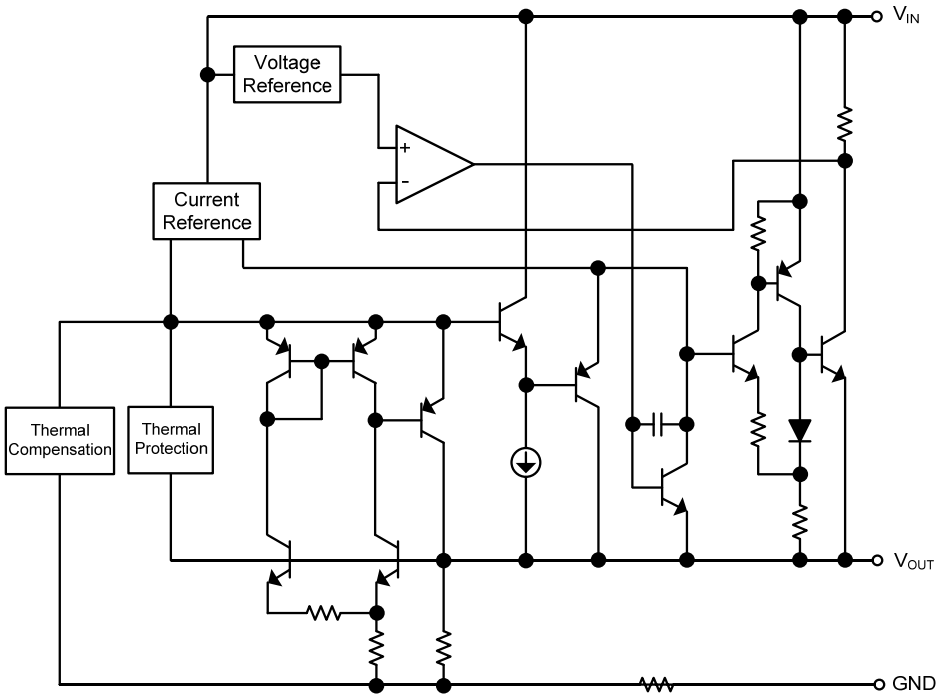
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-89	12 :1.2V 15 :1.5V 18 :1.8V 25 :2.5V 2J :2.85V 30 :3.0V 33 :3.3V 36 :3.6V 50 :5.0V AD :ADJ	
SOT-223		
TO-220 TO-220F TO-252 TO-263 TO-263-3		

■ PIN CONFIGURATION of SOP-8



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (T_a=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Input Voltage	V_{IN}	18	V
Power Dissipation	P_D	Internally limited	
Junction Temperature	T_J	+150	°C
Storage temperature	T_{STG}	-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	15	V
Operating Junction Temperature	T_J	0 ~ +125	°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	165	°C/W
	SOT-89		180	°C/W
	SOP-8		150	°C/W
	TO-252		112	°C/W
	TO-220		54	°C/W
	TO-263		64	°C/W
Junction to Case	SOT-223	θ_{JC}	15	°C/W
	SOT-89		50	°C/W
	SOP-8		20	°C/W
	TO-252		12	°C/W
	TO-220		4	°C/W
	TO-263		4	°C/W

■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, refer to the test circuits, T_J=0 to 125°C, Co=10μF unless otherwise specified)

For LD1117E-1.2

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	V_{IN}=3.2V, I_{OUT}=10mA, T_J=25°C	1.176	1.200	1.224	V
Output Voltage	V_{OUT}	V_{IN}=2.7 to 8V I_{OUT}=10~1000mA	1.176	1.200	1.224	V
Line Regulation	ΔV_{OUT}	V_{IN}=2.7 to 8V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=2.7 I_{OUT}=10~1000mA		9	12	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤10V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=6.2V, T_J=25°C	1000			mA
Minimum Load Current	$I_{O(MIN)}$	V_{IN}=15V		2	5	mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=4.2V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

For LD1117E-1.5

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	V_{IN}=3.5V, I_{OUT}=10mA, T_J=25°C	1.470	1.500	1.530	V
Output Voltage	V_{OUT}	V_{IN}=3 to 8V I_{OUT}=10~1000mA	1.470	1.500	1.530	V
Line Regulation	ΔV_{OUT}	V_{IN}=3 to 8V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=3V I_{OUT}=10~1000mA		12	15	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤10V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=6.5V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=4.5V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD1117E-1.8

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=3.8V, I_{OUT}=10mA, T_J=25°C	1.764	1.800	1.836	V
Output Voltage	V_{OUT}	V_{IN}=3.3 to 8V I_{OUT}=10~1000mA	1.764	1.800	1.836	V
Line Regulation	ΔV_{OUT}	V_{IN}=3.3 to 8V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=3.3V I_{OUT}=10~1000mA		15	18	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤10V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=6.8V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=5.5V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

For LD1117E-2.5

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=4.5V, I_{OUT}=10mA, T_J=25°C	2.450	2.500	2.550	V
Output Voltage	V_{OUT}	V_{IN}=3.9 to 10V I_{OUT}=10~1000mA	2.450	2.500	2.550	V
Line Regulation	ΔV_{OUT}	V_{IN}=3.9 to 10V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=3.9V I_{OUT}=10~1000mA		20	25	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤10V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=7.5V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=5.5V, V_{RIPPLE} =1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD1117E-2.85

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	V_{IN}=4.85V, I_{OUT}=10mA, T_J=25°C	2.793	2.850	2.907	V
Output Voltage	V_{OUT}	V_{IN}=4.25 to 10V I_{OUT}=10~1000mA	2.793	2.850	2.907	V
Line Regulation	ΔV_{OUT}	V_{IN}=4.25 to 10V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=4.25V I_{OUT}=10~1000mA		23	28	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤10V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=7.85V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=5.85V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

For LD1117E-3.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=5V, I_{OUT}=10mA, T_J=25°C	2.940	3.000	3.060	V
Output Voltage	V_{OUT}	V_{IN}=4.5 to 10V I_{OUT}=10~1000mA	2.940	3.000	3.060	V
Line Regulation	ΔV_{OUT}	V_{IN}=4.5 to 12V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=4.5V I_{OUT}=10~1000mA		24	30	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤15V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=8V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=6V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_a=25°C, 30ms Pulse		0.01	0.10	%/W

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD1117E-3.3

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=5.3V, I_{OUT}=10mA, T_J=25°C	3.234	3.300	3.366	V
Output Voltage	V_{OUT}	V_{IN}=4.75 to 10V I_{OUT}=10~1000mA	3.234	3.300	3.366	V
Line Regulation	ΔV_{OUT}	V_{IN}=4.75 to 15V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=4.75V I_{OUT}=10~1000mA		26	33	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤15V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=8.3V, T_J=25°C	1000			mA
Output Noise Voltage	eN	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=6.3V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_A=25°C, 30ms Pulse		0.01	0.10	%/W

For LD1117E-3.6

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=5.6V, I_{OUT}=10mA, T_J=25°C	3.528	3.600	3.672	V
Output Voltage	V_{OUT}	V_{IN}=5 to 10V I_{OUT}=10~1000mA	3.528	3.600	3.672	V
Line Regulation	ΔV_{OUT}	V_{IN}=5 to 15V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=5V I_{OUT}=10~1000mA		28	36	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤15V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=8.6V, T_J=25°C	1000			mA
Output Noise Voltage	e_N	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=6.6V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_A=25°C, 30ms Pulse		0.01	0.10	%/W

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD1117E-5.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=7V, I_{OUT}=10mA, T_J=25°C	4.900	5.000	5.100	V
Output Voltage	V_{OUT}	V_{IN}=6.5 to 15V I_{OUT}=10~1000mA	4.900	5.000	5.100	V
Line Regulation	ΔV_{OUT}	V_{IN}=6.5 to 15V, I_{OUT}=0mA		1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=6.5V I_{OUT}=10~1000mA		40	50	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}	I_{OUT}=100mA			15	V
Quiescent Current	I_Q	V_{IN}≤15V		5	10	mA
Current Limit	I_{LIMIT}	V_{IN}=10V, T_J=25°C	1000			mA
Output Noise Voltage	e_N	B=10Hz to 10KHz, T_J=25°C		100		μV
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}=8V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_A=25°C, 30ms Pulse		0.01	0.10	%/W

For LD1117E-ADJ

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Voltage	V_{REF}	V_{IN}-V_{OUT}=2V, I_{OUT}=10mA, T_J=25°C	1.225	1.25	1.275	V
Reference Voltage	V_{REF}	V_{IN}-V_{OUT}=1.4 to 10V I_{OUT}=10~1000mA	1.225	1.25	1.275	V
Line Regulation	ΔV_{OUT}	V_{IN}-V_{OUT}=1.5 to 13.75V, I_{OUT}=10mA		0.035	0.2	%
Load Regulation	ΔV_{OUT}	V_{IN}-V_{OUT}=1.5V I_{OUT}=10~1000mA			1	%
Temperature stability	ΔV_{OUT}			0.50		%
Long Term Stability	ΔV_{OUT}	1000 hrs, T_J=125°C		0.3		%
Operating Input Voltage	V_{IN}				15	V
Adjustment Pin Current	I_{ADJ}	V_{IN}≤15V		60	120	μA
Adjustment Pin Current Change	ΔI_{ADJ}	V_{IN}-V_{OUT}=1.4 to 10V, I_{OUT}=10~1000mA		1	5	μA
Minimum Load Current	$I_{O(MIN)}$	V_{IN}=15V		2	5	mA
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT}=5V, T_J=25°C	1000			mA
Output Noise (%Vo)	eN	B=10Hz to 10KHz, T_J=25°C		0.003		%
Supply Voltage Rejection	SVR	I_{OUT}=40mA, f=120Hz, T_J=25°C, V_{IN}-V_{OUT}=3V, V_{RIPPLE}=1Vpp	60	75		dB
Dropout Voltage	V_D	I_{OUT}=100mA		1.00	1.10	V
		I_{OUT}=500mA		1.15	1.25	
		I_{OUT}=800mA		1.20	1.30	
		I_{OUT}=1A		1.20	1.30	
Thermal Regulation		T_A=25°C, 30ms Pulse		0.01	0.10	%/W

■ TYPICAL APPLICATIONS

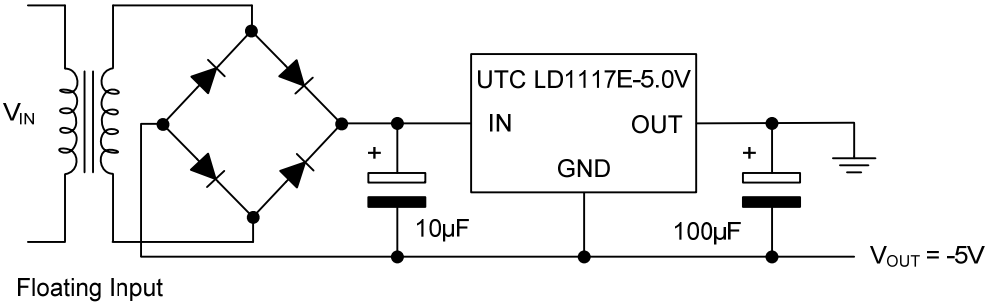


Fig.1 Negative Supply

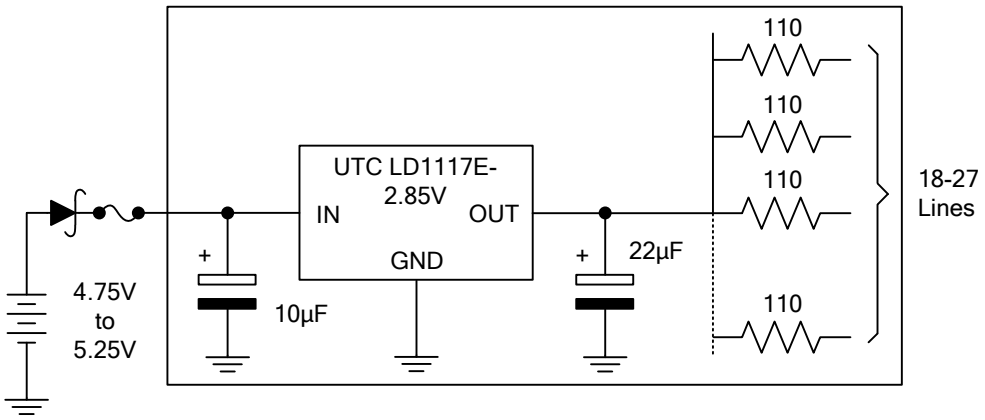


Fig.2 Active Terminator for SCSI-2 BUS

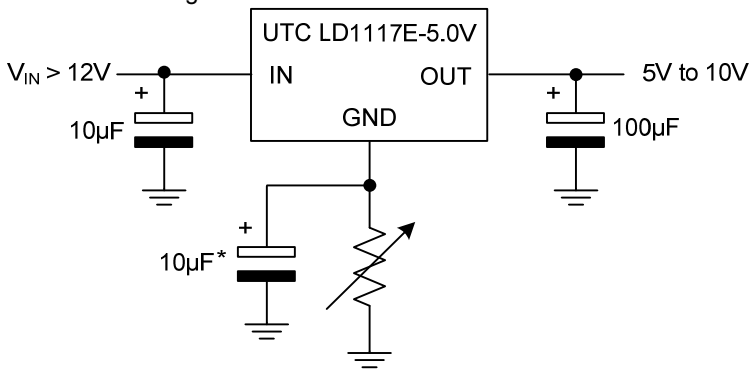


Fig.3 Circuit for Increasing Output Voltage

APPLICATION NOTE of LD1117E ADJUSTABLE

The **LD1117E** adjustable has a reference voltage of between the OUT and ADJ pins. I_{ADJ} is 60μA typ. (120μA max.) and ΔI_{ADJ} is 1μA typ. (5μA max.).
R_1 is normally fixed to 120Ω.
From figure 4 we obtain:
$V_{OUT}=V_{REF}+R_2(I_{ADJ}+I_{R1})=V_{REF}+R_2(I_{ADJ}+V_{REF}/R_1)=V_{REF}(1+R_2/R_1)+R_2 \times I_{ADJ}$.
Usually R_2 value is in the range of few KΩ, so the R_2 X I_{ADJ} product could be neglected; then the above expression becomes: $V_{OUT}=V_{REF}(1+R_2/R_1)$
For better load regulation, realize a good Kelvin connection of R_1 and R_2 is important. Particularly R_1 connection must be realized very close to OUT and ADJ pin, while R_2 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 R_2 resistor (See Fig. 5)

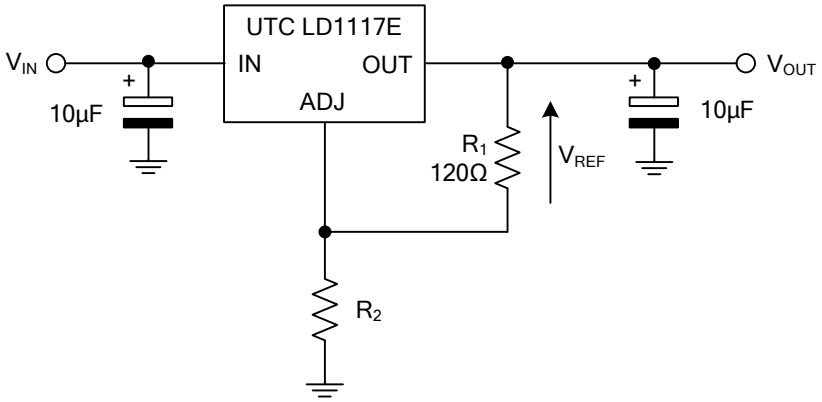


Fig.4 Adjustable Output Voltage Application Circuit

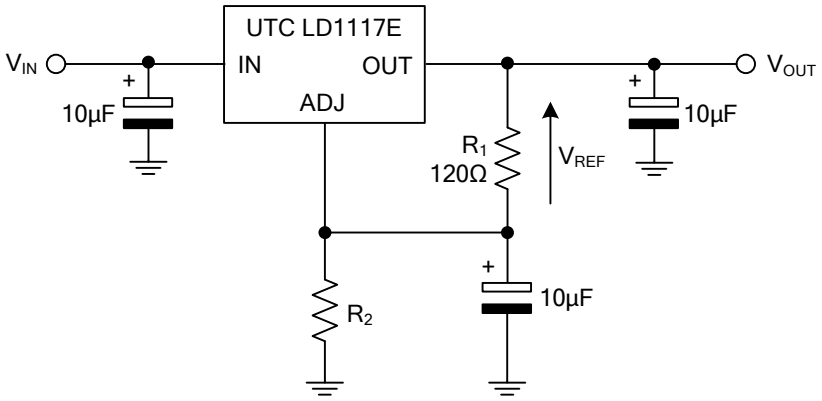
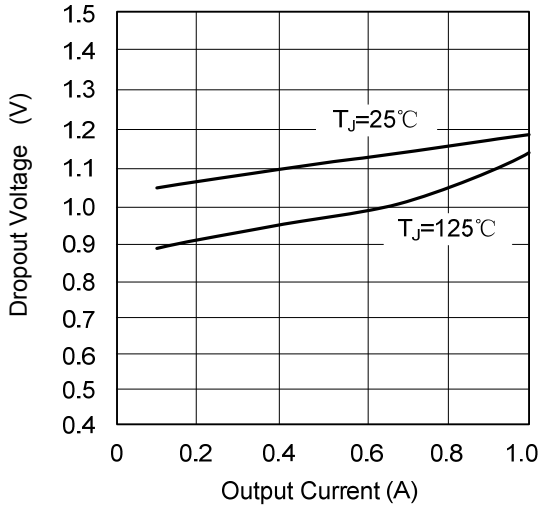


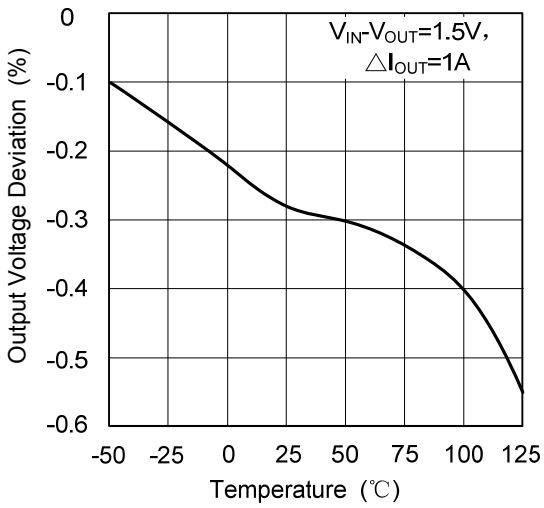
Fig.5 Adjustable Output Voltage Application with improved Ripple Rejection.

■ TYPICAL CHARACTERISTICS

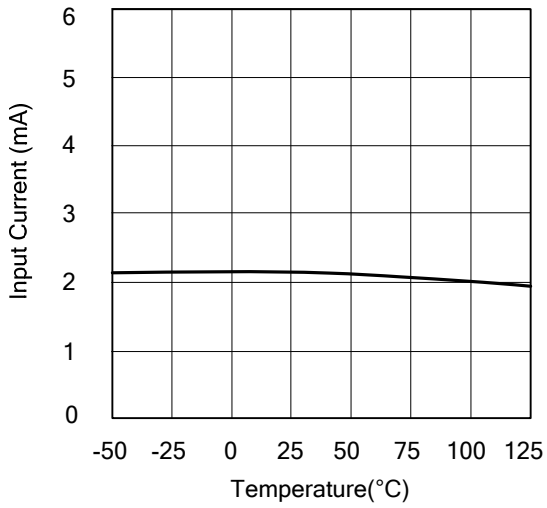
Dropout Voltage vs. Output Current



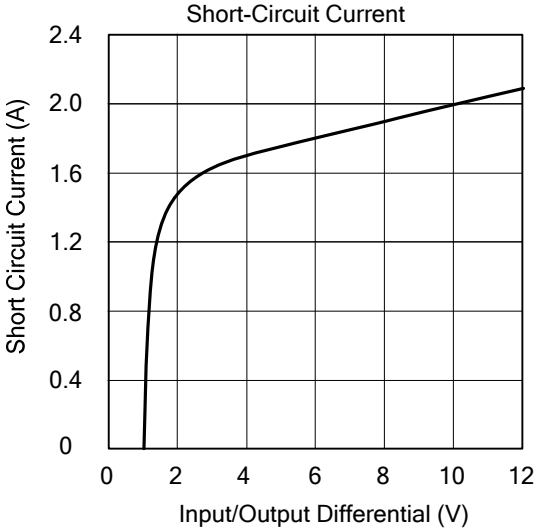
Load Regulation



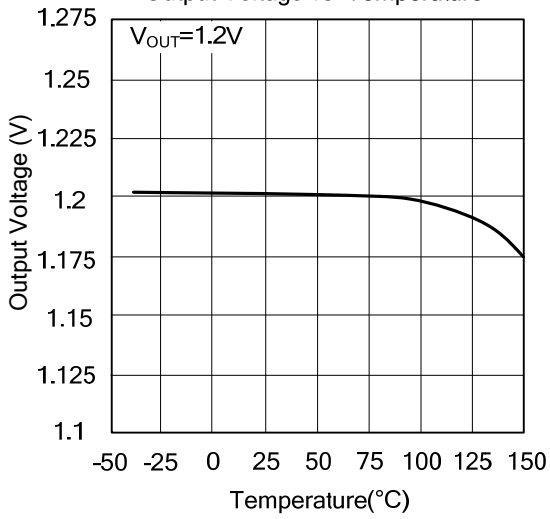
Input Current vs. Temperature



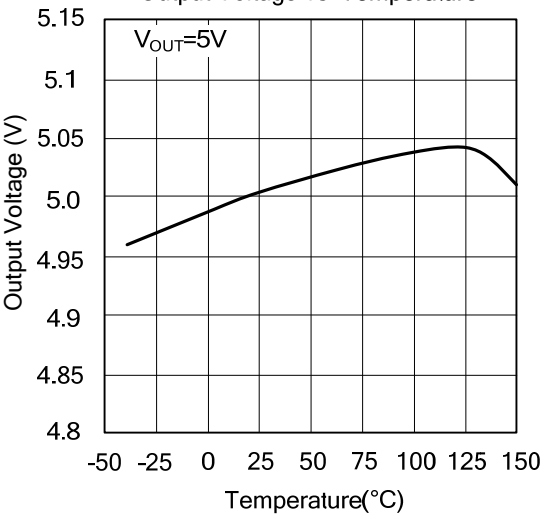
Short-Circuit Current



Output Voltage vs. Temperature

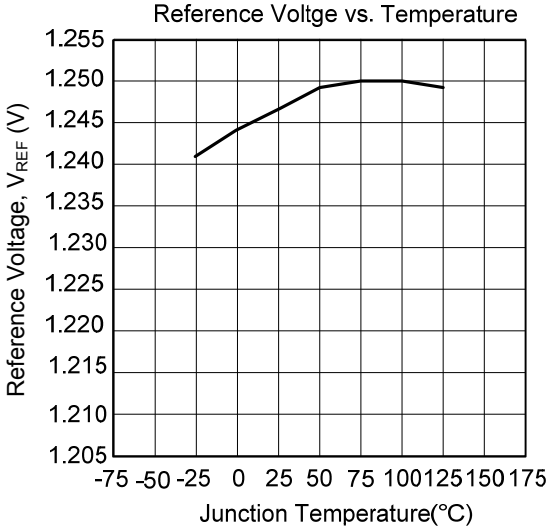


Output Voltage vs. Temperature

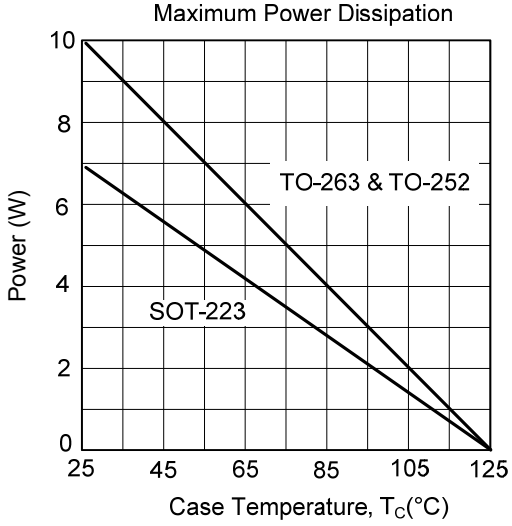


■ TYPICAL CHARACTERISTICS (Cont.)

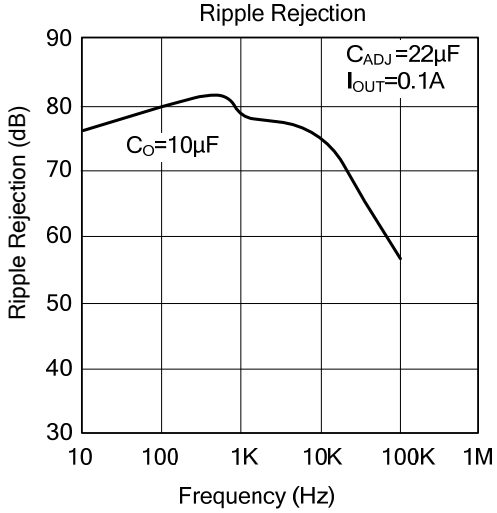
Reference Voltge vs. Temperature



Maximum Power Dissipation



Ripple Rejection



Adjust Pin Current