



LL1117/A

LINEAR INTEGRATED CIRCUIT

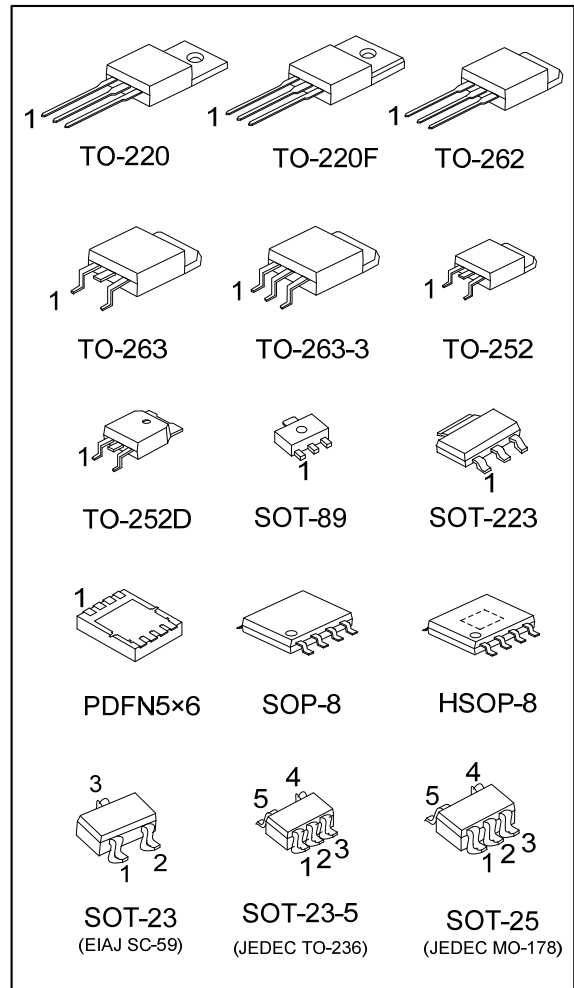
LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

■ DESCRIPTION

The UTC LL1117/A is a low dropout, 3-terminal positive voltage regulator designed to provide output current up to 800mA/1A, There are adjustable version ($V_{REF}=1.25V$) and various fixed versions.

■ FEATURES

- * Low dropout voltage
- * Output current up to 0.8A for LL1117 and 1.0A for LL1117A
- * Built-in current limit and over temperature protection
- * Low current consumption
- * No short-circuit protection
- * Support MLCC



■ ORDERING INFORMATION

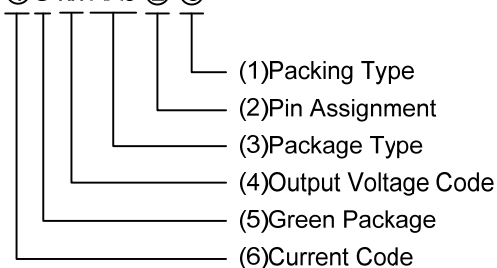
Ordering Number		Package	②				③																				
Lead Free	Halogen Free		Pin Assignment				Packing																				
LL1117①L-xx-AA3-②-③	LL1117①G-xx-AA3-②-③	SOT-223	<table><tr><td>Pin Code</td><td>1</td><td>2</td><td>3</td></tr><tr><td>A</td><td>G</td><td>O</td><td>I</td></tr><tr><td>B</td><td>O</td><td>G</td><td>I</td></tr><tr><td>C</td><td>G</td><td>I</td><td>O</td></tr><tr><td>D</td><td>I</td><td>G</td><td>O</td></tr></table>				Pin Code	1	2	3	A	G	O	I	B	O	G	I	C	G	I	O	D	I	G	O	R: Tape Reel T: Tube
Pin Code	1	2					3																				
A	G	O					I																				
B	O	G					I																				
C	G	I					O																				
D	I	G					O																				
LL1117①L-xx-AB3-②-③	LL1117①G-xx-AB3-②-③	SOT-89																									
LL1117①L-xx-TA3-②-③	LL1117①G-xx-TA3-②-③	TO-220																									
LL1117①L-xx-TF3-②-③	LL1117①G-xx-TF3-②-③	TO-220F																									
LL1117①L-xx-TN3-②-③	LL1117①G-xx-TN3-②-③	TO-252																									
LL1117①L-xx-TND-②-③	LL1117①G-xx-TND-②-③	TO-252D																									
LL1117①L-xx-T2Q-②-③	LL1117①G-xx-T2Q-②-③	TO-262																									
LL1117①L-xx-TQ2-②-③	LL1117①G-xx-TQ2-②-③	TO-263																									
LL1117①L-xx-TQ3-②-③	LL1117①G-xx-TQ3-②-③	TO-263-3																									
LL1117①L-xx-AE3-②-③	LL1117①G-xx-AE3-②-③	SOT-23	<table><tr><td>Pin Code</td><td>1</td><td>2</td><td>3</td></tr><tr><td>1</td><td>G</td><td>I</td><td>O</td></tr></table>				Pin Code	1	2	3	1	G	I	O	R: Tape Reel T: Tube												
Pin Code	1	2	3																								
1	G	I	O																								
LL1117①L-xx-AE5-②-③	LL1117①G-xx-AE5-②-③	SOT-23-5	<table><tr><td>Pin Code</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>G</td><td>G</td><td>O</td><td>I</td><td>N</td><td>N</td></tr></table>				Pin Code	1	2	3	4	5	G	G		O	I	N	N								
Pin Code	1	2	3	4	5																						
G	G	O	I	N	N																						
LL1117①L-xx-AF5-②-③	LL1117①G-xx-AF5-②-③	SOT-25	<table><tr><td>G</td><td>G</td><td>O</td><td>I</td><td>N</td><td>N</td></tr></table>				G	G	O	I	N	N															
G	G	O	I	N	N																						
LL1117①L-xx-S08-③	LL1117①G-xx-S08-③	SOP-8	GOOIxOOx																								
LL1117①L-xx-SH2-③	LL1117①G-xx-SH2-③	HSOP-8	GOOIxOOx																								
LL1117①L-xx-P5060-A-R	LL1117①G-xx-P5060-A-R	PDFN5×6	GGGIOOOO				Tape Reel																				

Notes: 1. ① : Current code: Blank: 800mA A: 1A

2. Pin Assignment: I: V_{IN} O: V_{OUT} G: GND/ADJ

3. xx: Output Voltage, Refer to Marking Information.

LL1117①G-xx-AA3-②-③



(1) R: Tape Reel, T: Tube

(2) refer to Pin Assignment

(3) AA3: SOT-223, AB3: SOT-89, AE3: SOT-23

TA3: TO-220, TF3: TO-220F, TN3: TO-252,

TND: TO-252D, T2Q: TO-262, TQ2: TO-263,

TQ3: TO-263-3, AE5: SOT-23-5, AF5: SOT-25,

S08: SOP-8, SH2: HSOP-8, P5060: PDFN5×6

(4) xx: refer to Marking Information

(5) G: Halogen Free and Lead Free, L: Lead Free

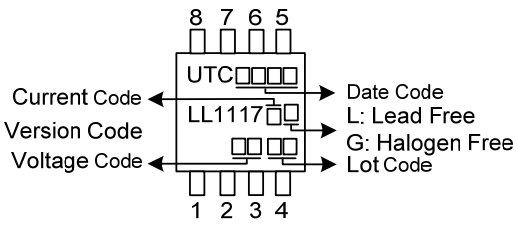
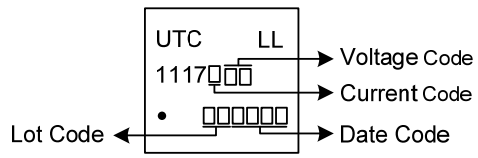
(6) Blank: 800mA, A: 1A

MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	12 :1.2V 15 :1.5V 18 :1.8V 25 :2.5V 30 :3.0V 33 :3.3V 50 :5.0V AD :ADJ	
SOT-89		
SOT-23 (LL1117)		
SOT-23 (LL1117A)		
TO-220 TO-220F TO-252 TO-252D TO-262 TO-263 TO-263-3		
SOT-23-5 SOT-25 (LL1117)		
SOT-23-5 SOT-25 (LL1117A)		

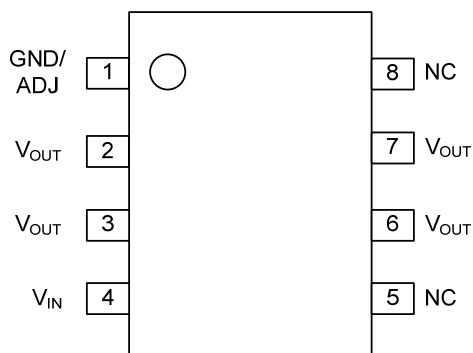
Note: Current code: Blank: 0.8A A: 1A

■ MARKING INFORMATION (Cont.)

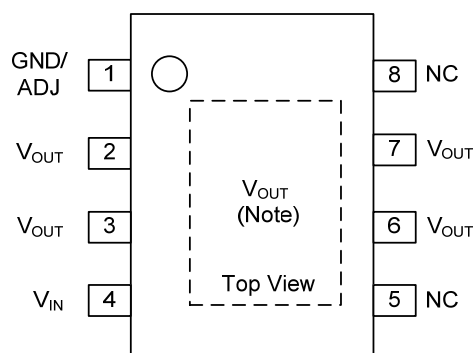
PACKAGE	VOLTAGE CODE	MARKING
SOP-8 HSOP-8	12 :1.2V 15 :1.5V 18 :1.8V 25 :2.5V	 Diagram of SOP-8 package marking. The package is shown with pins 1-8. Markings include: UTC (top left), LL1117 (top center), and two 2-digit codes (top right). Arrows point to: Current Code (left of LL1117), Version Code (below LL1117), Voltage Code (right of LL1117), Date Code (right of top right codes), L: Lead Free (below Date Code), G: Halogen Free (below L), and Lot Code (below G).
PDFN5x6	30 :3.0V 33 :3.3V 50 :5.0V AD :ADJ	 Diagram of PDFN5x6 package marking. The package is shown with markings: UTC (top left), LL (top right), 1117 (center), and a 4-digit code (bottom right). Arrows point to: Voltage Code (right of LL), Current Code (right of 1117), Date Code (right of 4-digit code), and Lot Code (left of 4-digit code).

Note: Current code: Blank: 0.8A A: 1A

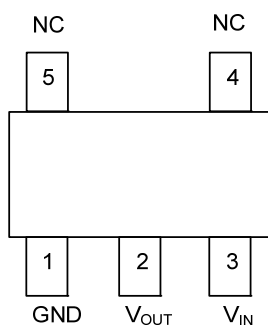
PIN CONFIGURATION



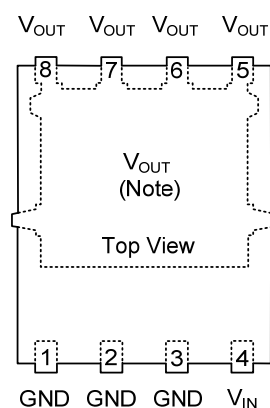
SOP-8



HSOP-8



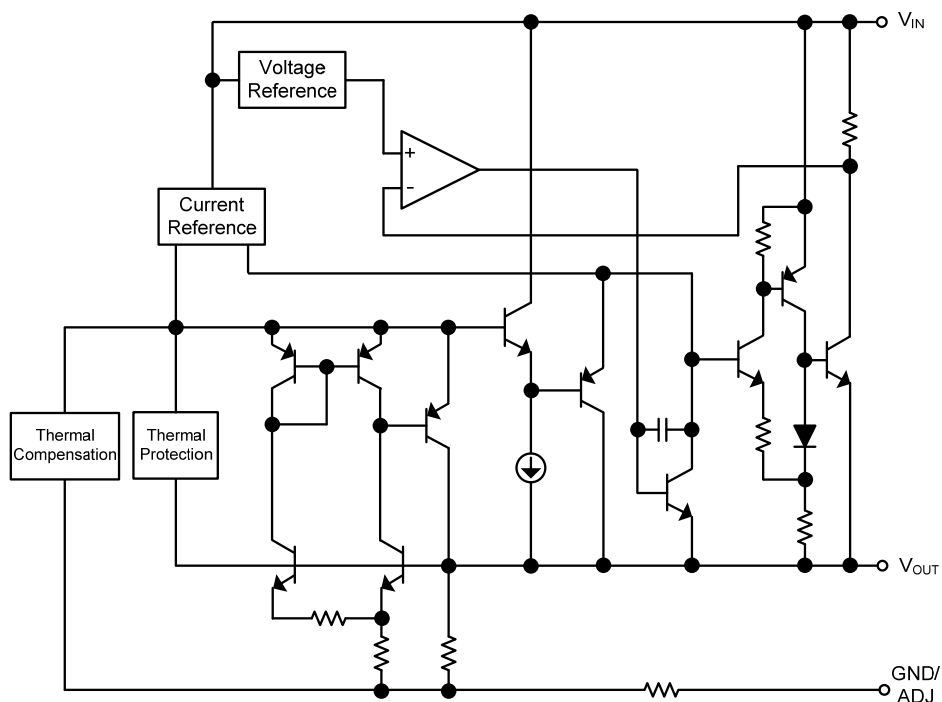
SOT-23-5 / SOT-25



PDFN5x6
(LL1117/A-A)

Note: Connect exposed pad to V_{OUT} .

BLOCK DIAGRAM



■ **ABSOLUTE MAXIMUM RATINGS** ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Input Voltage	V_{IN}	18	V
Power Dissipation	P_D	Internally limited	
Junction Temperature	T_J	+150	$^{\circ}\text{C}$
Operating Temperature (Note 2)	T_{OPR}	-40 ~ +125	$^{\circ}\text{C}$
Storage temperature	T_{STG}	-40 ~ +150	$^{\circ}\text{C}$

Notes: 1. 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.

2. This condition is only determined from design. It can't be 100% tested in mass production.

■ **RECOMMENDED OPERATING RATINGS**

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	15	V

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-89	θ_{JA}	180	$^{\circ}\text{C/W}$
	SOT-223		165	$^{\circ}\text{C/W}$
	SOT-23		300	$^{\circ}\text{C/W}$
	SOT-23-5/SOT-25		280	$^{\circ}\text{C/W}$
	SOP-8/HSOP-8		150	$^{\circ}\text{C/W}$
	TO-252/TO-252D		112	$^{\circ}\text{C/W}$
	TO-220		54	$^{\circ}\text{C/W}$
	TO-262/TO-263		64	$^{\circ}\text{C/W}$
	PDFN5×6		38	$^{\circ}\text{C/W}$
Junction to Case	SOT-89	θ_{JC}	50	$^{\circ}\text{C/W}$
	SOT-223		15	$^{\circ}\text{C/W}$
	SOT-23		120	$^{\circ}\text{C/W}$
	SOT-23-5/SOT-25		90	$^{\circ}\text{C/W}$
	SOP-8/HSOP-8		20	$^{\circ}\text{C/W}$
	TO-252/TO-252D		12	$^{\circ}\text{C/W}$
	TO-220/TO-262		4	$^{\circ}\text{C/W}$
	TO-263			
	PDFN5×6		15.6	$^{\circ}\text{C/W}$

■ ELECTRICAL CHARACTERISTICS

($T_A=25^{\circ}\text{C}$, refer to the test circuits, $C_O=10\mu\text{F}$ unless otherwise specified)

For LL1117/A-1.2

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.2\text{V}$, $I_{OUT}=10\text{mA}$, $T_J=25^{\circ}\text{C}$	1.176	1.200	1.224	V
Output Voltage	V_{OUT}	$V_{IN}=2.7$ to 8V LL1117 : $I_{OUT}=10\sim 800\text{mA}$ LL1117A : $I_{OUT}=10\sim 1000\text{mA}$	1.176	1.200	1.224	V
Line Regulation	ΔV_{OUT}	$V_{IN}=2.7$ to 8V , $I_{OUT}=10\text{mA}$			10	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=2.7\text{V}$, $I_{OUT}=10\sim 800\text{mA}$			10	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100\text{mA}$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 10\text{V}$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=6.2\text{V}$, $T_J=25^{\circ}\text{C}$	LL1117	800		mA
			LL1117A	1000		
Dropout Voltage	V_D	$I_{OUT}=100\text{mA}$			1.25	V
		$I_{OUT}=800\text{mA}$			1.5	V

For LL1117/A-1.5

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.5\text{V}$, $I_{OUT}=10\text{mA}$, $T_J=25^{\circ}\text{C}$	1.470	1.500	1.530	V
Output Voltage	V_{OUT}	$V_{IN}=3$ to 8V LL1117 : $I_{OUT}=0\sim 800\text{mA}$ LL1117A : $I_{OUT}=0\sim 1000\text{mA}$	1.470	1.500	1.530	V
Line Regulation	ΔV_{OUT}	$V_{IN}=3$ to 8V , $I_{OUT}=0\text{mA}$			15	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=3\text{V}$, $I_{OUT}=0\sim 800\text{mA}$			10	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100\text{mA}$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 10\text{V}$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=6.5\text{V}$, $T_J=25^{\circ}\text{C}$	LL1117	800		mA
			LL1117A	1000		
Dropout Voltage	V_D	$I_{OUT}=100\text{mA}$			1.25	V
		$I_{OUT}=800\text{mA}$			1.5	V

For LL1117/A-1.8

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.8\text{V}$, $I_{OUT}=10\text{mA}$, $T_J=25^{\circ}\text{C}$	1.764	1.800	1.836	V
Output Voltage	V_{OUT}	$V_{IN}=3.3$ to 8V LL1117 : $I_{OUT}=0\sim 800\text{mA}$ LL1117A : $I_{OUT}=0\sim 1000\text{mA}$	1.764	1.800	1.836	V
Line Regulation	ΔV_{OUT}	$V_{IN}=3.3$ to 8V , $I_{OUT}=0\text{mA}$			15	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=3.3\text{V}$, $I_{OUT}=0\sim 800\text{mA}$			10	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100\text{mA}$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 10\text{V}$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=6.8\text{V}$, $T_J=25^{\circ}\text{C}$	LL1117	800		mA
			LL1117A	1000		
Dropout Voltage	V_D	$I_{OUT}=100\text{mA}$			1.25	V
		$I_{OUT}=800\text{mA}$			1.5	V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LL1117/A-2.5

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=4.5V$, $I_{OUT}=10mA$, $T_J=25^{\circ}C$	2.450	2.500	2.550	V
Output Voltage	V_{OUT}	$V_{IN}=3.9$ to $10V$ LL1117 : $I_{OUT}=0\sim 800mA$ LL1117A : $I_{OUT}=0\sim 1000mA$	2.450	2.500	2.550	V
Line Regulation	ΔV_{OUT}	$V_{IN}=3.9$ to $10V$, $I_{OUT}=0mA$			20	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=3.9V$, $I_{OUT}=0\sim 800mA$			10	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100mA$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 10V$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=7.5V$, $T_J=25^{\circ}C$				mA
		LL1117	800			
		LL1117A	1000			
Dropout Voltage	V_D	$I_{OUT}=100mA$			1.25	V
		$I_{OUT}=800mA$			1.5	V

For LL1117/A-3.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=5V$, $I_{OUT}=10mA$, $T_J=25^{\circ}C$	2.940	3.000	3.060	V
Output Voltage	V_{OUT}	$V_{IN}=4.5$ to $10V$ LL1117 : $I_{OUT}=0\sim 800mA$ LL1117A : $I_{OUT}=0\sim 1000mA$	2.940	3.000	3.060	V
Line Regulation	ΔV_{OUT}	$V_{IN}=4.5$ to $12V$, $I_{OUT}=0mA$			20	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=4.5V$, $I_{OUT}=0\sim 800mA$			10	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100mA$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 15V$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=8V$, $T_J=25^{\circ}C$				mA
		LL1117	800			
		LL1117A	1000			
Dropout Voltage	V_D	$I_{OUT}=100mA$			1.25	V
		$I_{OUT}=800mA$			1.5	V

For LL1117/A-3.3

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=5.3V$, $I_{OUT}=10mA$, $T_J=25^{\circ}C$	3.234	3.300	3.366	V
Output Voltage	V_{OUT}	$V_{IN}=4.75$ to $10V$ LL1117 : $I_{OUT}=0\sim 800mA$ LL1117A : $I_{OUT}=0\sim 1000mA$	3.234	3.300	3.366	V
Line Regulation	ΔV_{OUT}	$V_{IN}=4.75$ to $15V$, $I_{OUT}=0mA$			25	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=4.75V$, $I_{OUT}=0\sim 800mA$			15	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100mA$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 15V$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=8.3V$, $T_J=25^{\circ}C$				mA
		LL1117	800			
		LL1117A	1000			
Dropout Voltage	V_D	$I_{OUT}=100mA$			1.25	V
		$I_{OUT}=800mA$			1.5	V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LL1117/A-5.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	$V_{IN}=7V, I_{OUT}=10mA, T_J=25^{\circ}C$	4.900	5.000	5.100	V
Output Voltage	V_{OUT}	$V_{IN}=6.5$ to $15V$ LL1117 : $I_{OUT}=0\sim 800mA$ LL1117A : $I_{OUT}=0\sim 1.0A$	4.900	5.000	5.100	V
Line Regulation	ΔV_{OUT}	$V_{IN}=6.5$ to $15V, I_{OUT}=0mA$			30	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=6.5V, I_{OUT}=0\sim 800mA$			20	mV
Operating Input Voltage	V_{IN}	$I_{OUT}=100mA$			15	V
Quiescent Current	I_Q	$V_{IN}\leq 15V$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}=10V, T_J=25^{\circ}C$				
		LL1117	800			mA
		LL1117A	1000			
Dropout Voltage	V_D	$I_{OUT}=100mA$			1.25	V
		$I_{OUT}=800mA$			1.5	V

For LL1117/A-ADJ

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Voltage	V_{REF}	$V_{IN}-V_{OUT}=2V, I_{OUT}=10mA, T_J=25^{\circ}C$	1.225	1.25	1.275	V
Reference Voltage	V_{REF}	$V_{IN}-V_{OUT}=1.4$ to $10V$ LL1117 : $I_{OUT}=10\sim 800mA$ LL1117A : $I_{OUT}=10\sim 1000mA$	1.225	1.25	1.275	V
Line Regulation	ΔV_{OUT}	$V_{IN}-V_{OUT}=1.5$ to $13.75V, I_{OUT}=10mA$			30	mV
Load Regulation	ΔV_{OUT}	$V_{IN}-V_{OUT}=3V, I_{OUT}=0\sim 800mA$			30	mV
Operating Input Voltage	V_{IN}				15	V
Adjustment Pin Current	I_{ADJ}	$V_{IN}\leq 15V$		70	120	μA
Adjustment Pin Current Change	ΔI_{ADJ}	$V_{IN}-V_{OUT}=1.4$ to $10V$, LL1117 : $I_{OUT}=10\sim 800mA$ LL1117A : $I_{OUT}=10\sim 1000mA$		1	5	μA
Minimum Load Current	$I_{O(MIN)}$	$V_{IN}=15V$			10	mA
Current Limit	I_{LIMIT}	$V_{IN}-V_{OUT}=5V, T_J=25^{\circ}C$				
		LL1117	800			mA
		LL1117A	1000			
Dropout Voltage	V_D	$I_{OUT}=100mA$			1.25	V
		$I_{OUT}=800mA$			1.5	V

■ TYPICAL APPLICATIONS

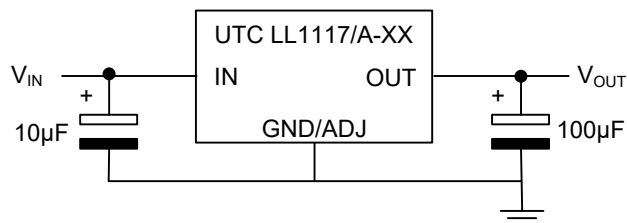


Fig.1 Tynctal Application Circuit

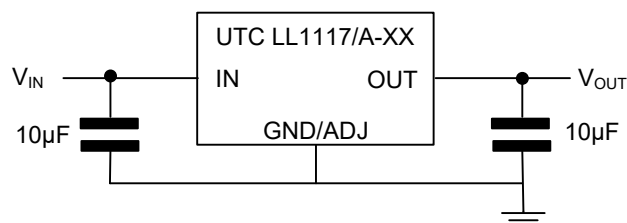


Fig.2 Tynctal Application Circuit (FOR MLCC)

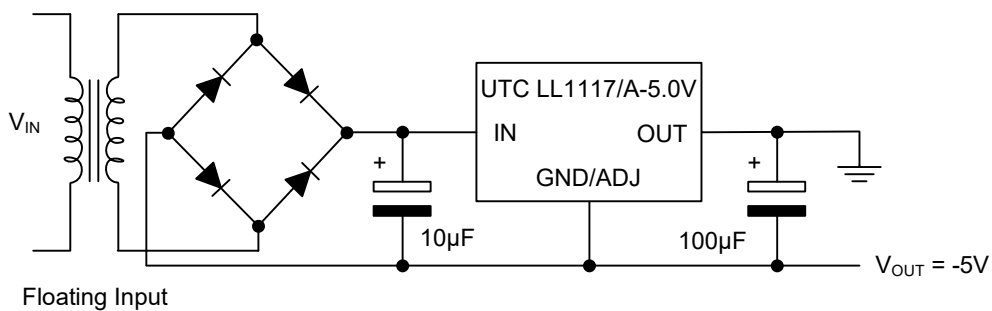


Fig.3 Negative Supply

■ TYPICAL APPLICATIONS (Cont.)

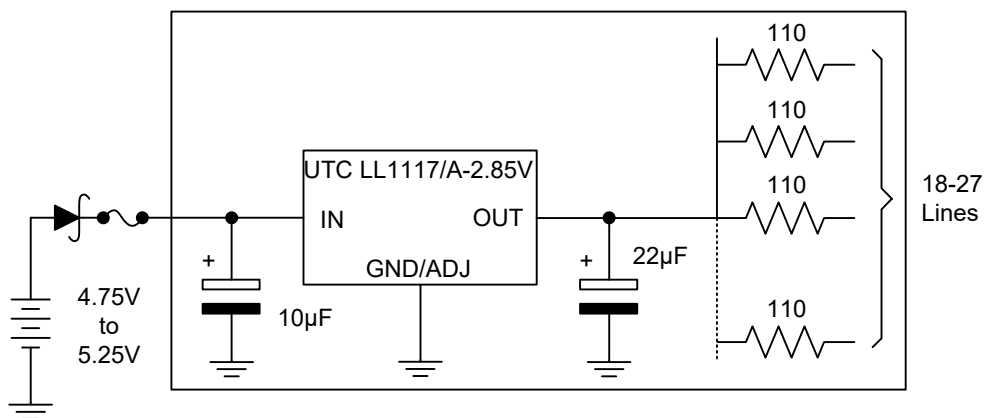


Fig.4 Active Terminator for SCSI-2 BUS

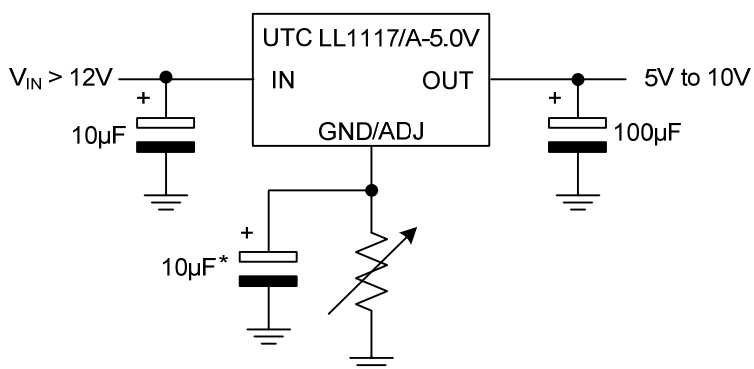


Fig.5 Circuit for Increasing Output Voltage

APPLICATION NOTE

The **LL1117/A** adjustable has a reference voltage of between the OUT and ADJ/GND pins. I_{ADJ} is 60 μ A typ. (120 μ A max.) and ΔI_{ADJ} is 1 μ A typ. (5 μ A max.).

R_1 is normally fixed to 120 Ω .

From figure 1 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 K Ω , so the $R_2 \times I_{ADJ}$ 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/GND 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 10 μ F electrolytic capacitor placed in parallel to the R_2 resistor (See Fig. 3)

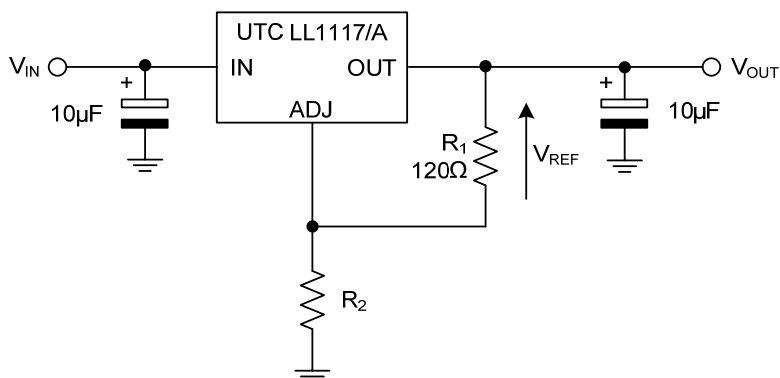


Fig.1 Adjustable Output Voltage Application Circuit

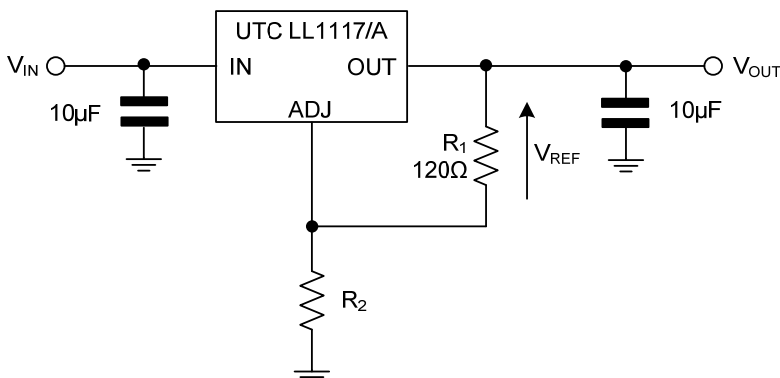


Fig.2 Adjustable Output Voltage Application Circuit (FOR MLCC)

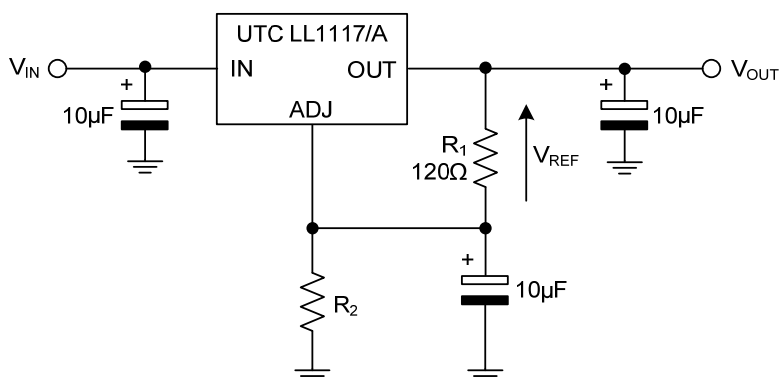
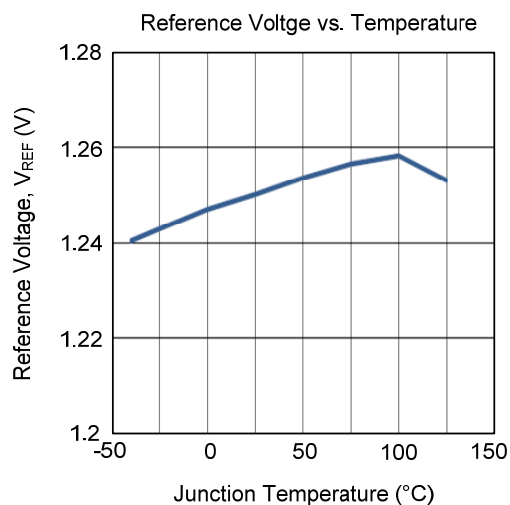
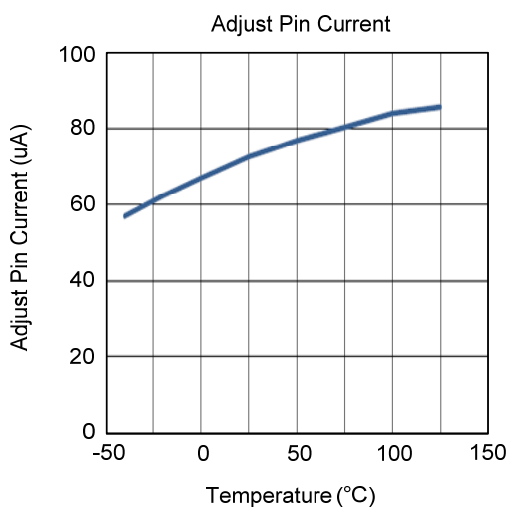
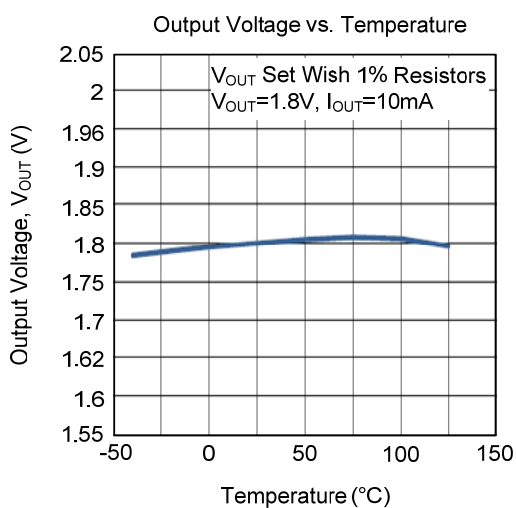
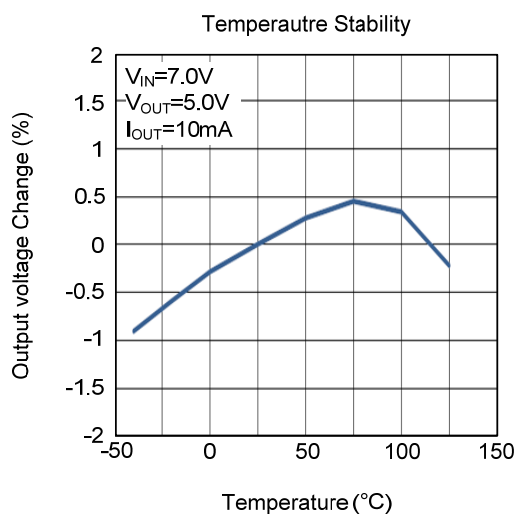
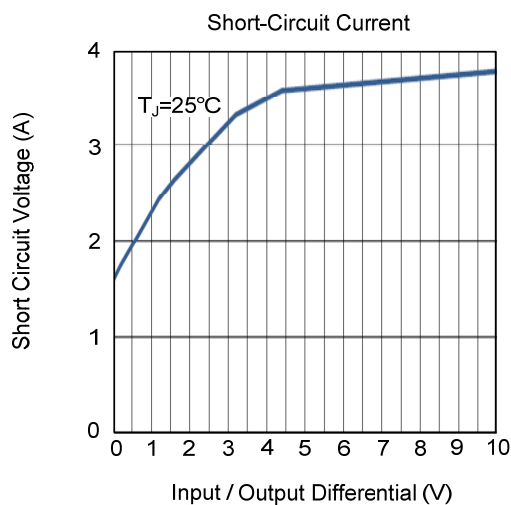
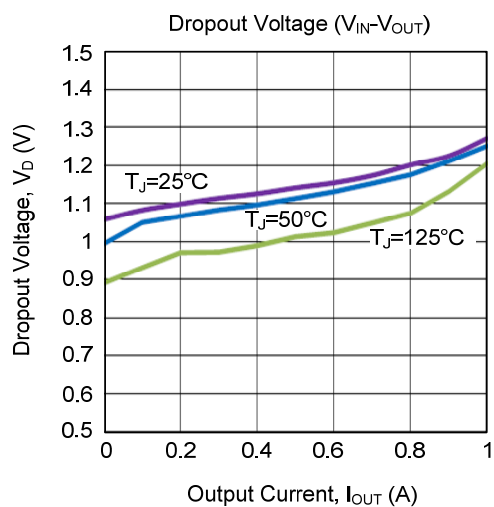
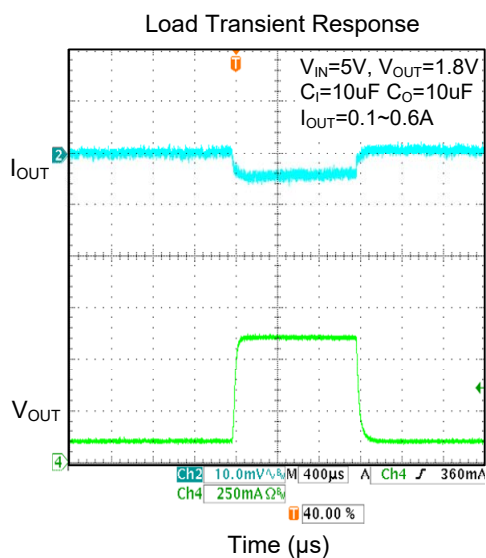
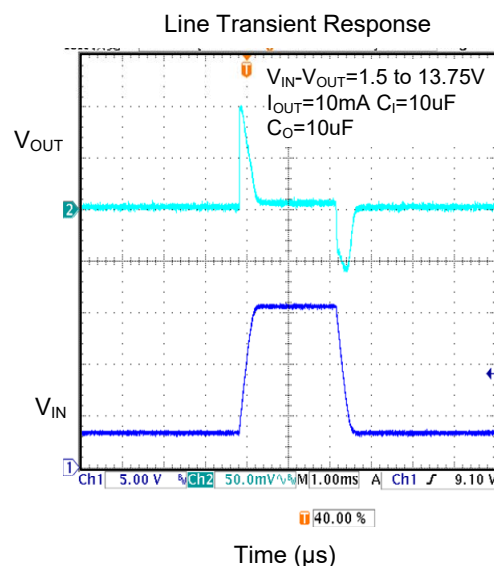
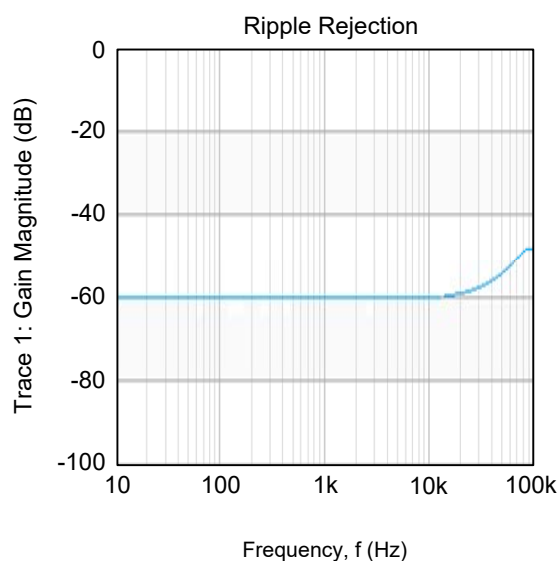


Fig.3 Adjustable Output Voltage Application with improved Ripple Rejection.

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



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