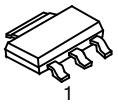
LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS



SOT-223

■ DESCRIPTION

The UTC **LD2117/A** is a low dropout, 3-terminal positive voltage regulator designed to provide output current up to 800mA/1A, There are adjustable versions (V_{REF}=1.25V) and various fixed versions.

■ FEATURES

* Low dropout voltage
* Suitable for SCSI-2 active termination if V_{OUT} set to 2.85V
* Output current up to 0.8A for 2117 and 1.0A for 2117A
* Built-in current limit and over temperature protection
* Available in ±1%(at 25°C) and 2% in all temperature range
* Ultra low current consumption (0.35mA typ.)
* Ultra low Adjustment Current (7μA typ.)
* Ultra low minimum Load (0.3mA typ.)
* Stable with low ESR ceramic output capacitor (MLCC)

■ ORDERING INFORMATION

Ordering Number		Package	② Pin Assignment	Packing
Lead Free	Halogen Free			
LD2117①L-xx-AA3-②-R	LD2117①G-xx-AA3-②-R	SOT-223	A: AOI B: OAI C: AIO D: IAO	Tape Reel

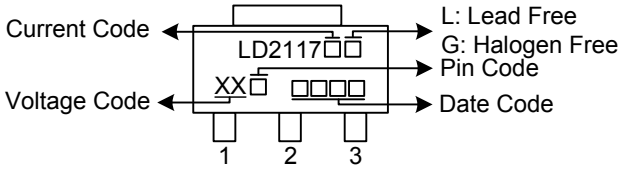
Note: Pin Assignment: I: V_{IN} O: V_{OUT} A: ADJ

LD2117①L-xx-AA3-②-R

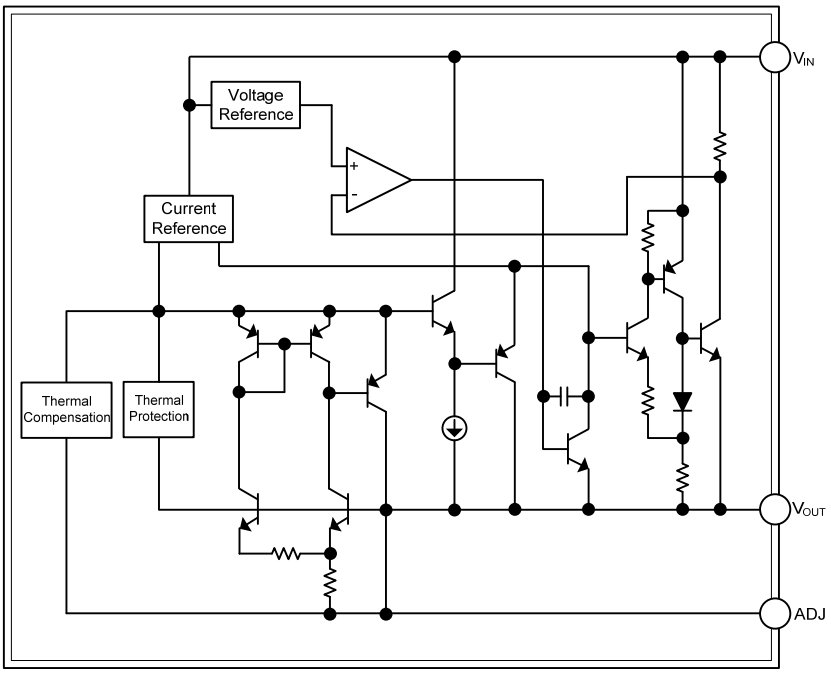
(1)Packing Type
(2)Pin Assignment
(3)Package Type
(4)Output Voltage Code
(5)Lead Free
(6)Current Code

(1) R: Tape Reel
(2) refer to Pin Assignment
(3) AA3: SOT-223
(4) xx: refer to Marking Information
(5) G: Halogen 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 30 :3.0V 33 :3.3V 36 :3.6V 50 :5.0V AD :ADJ	

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Input Voltage	V_{IN}	18	V
Power Dissipation	P_D	Internally limited	W
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	θ_{JA}	165	°C/W
Junction to Case	θ_{JC}	15	°C/W

■ ELECTRICAL CHARACTERISTICS

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

For LD2117/A-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		1.188	1.200	1.212	V
Output Voltage	V_{OUT}	V_{IN}=2.7 ~ 8V LD2117 : I_{OUT}=10~800mA LD2117A : I_{OUT}=10~1000mA		1.188	1.200	1.212	V
Line Regulation	ΔV_{OUT}	V_{IN}=2.7 ~ 8V, I_{OUT}=10mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=2.7V LD2117 : I_{OUT}=10~800mA LD2117A : I_{OUT}=10~1000mA			1	10	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}\leq$10V			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=6.2V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise Voltage	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-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		1.485	1.500	1.515	V
Output Voltage	V_{OUT}	V_{IN}=3 ~ 8V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA		1.485	1.500	1.515	V
Line Regulation	ΔV_{OUT}	V_{IN}=3 ~ 8V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=3V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	10	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			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=6.5V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise Voltage	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

For LD2117/A-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		1.782	1.800	1.818	V
Output Voltage	V_{OUT}	V_{IN}=3.3 ~ 8V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA		1.782	1.800	1.818	V
Line Regulation	ΔV_{OUT}	V_{IN}=3.3 ~ 8V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=3.3V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	10	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			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=6.8V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise Voltage	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-3.0

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=5V, I_{OUT}=10mA, T_J=25°C		2.970	3.000	3.030	V
Output Voltage	V_{OUT}	V_{IN}=4.5 ~ 10V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA		2.970	3.000	3.030	V
Line Regulation	ΔV_{OUT}	V_{IN}=4.5 ~ 12V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=4.5V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	10	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}\leq$15V			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=8V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise Voltage	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

For LD2117/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°C		3.267	3.300	3.333	V
Output Voltage	V_{OUT}	V_{IN}=4.75 ~ 10V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA		3.267	3.300	3.333	V
Line Regulation	ΔV_{OUT}	V_{IN}=4.75 ~ 15V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=4.75V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	10	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}\leq$15V			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=8.3V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise Voltage	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-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		3.564	3.600	3.636	V
Output Voltage	V_{OUT}	V_{IN}=5 ~ 10V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA		3.564	3.600	3.636	V
Line Regulation	ΔV_{OUT}	V_{IN}=5 ~ 15V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=5V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	10	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			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=8.6V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

For LD2117/A-5.0

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN}=7V, I_{OUT}=10mA, T_J=25°C		4.950	5.000	5.050	V
Output Voltage	V_{OUT}	V_{IN}=6.5 ~ 15V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1.0A		4.950	5.000	5.050	V
Line Regulation	ΔV_{OUT}	V_{IN}=6.5 ~ 15V, I_{OUT}=0mA			1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN}=6.5V LD2117 : I_{OUT}=0~800mA LD2117A : I_{OUT}=0~1000mA			1	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}≤15V			0.35	0.5	mA
Current Limit	I_{LIMIT}	V_{IN}=10V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/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°C		1.125	1.25	1.375	V
Reference Voltage	V_{REF}	V_{IN}-V_{OUT}=1.4~10V LD2117A : I_{OUT}=10~1000mA		1.125	1.25	1.375	V
Line Regulation	ΔV_{OUT}	V_{IN}-V_{OUT}=1.5 ~ 13.75V, I_{OUT}=10mA			0.035	0.2	%
Load Regulation	ΔV_{OUT}	V_{IN}-V_{OUT}=3V LD2117 : I_{OUT}=10~800mA LD2117A : I_{OUT}=10~1000mA			0.1	0.4	%
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			7	10	μA
Adjustment Pin Current Change	ΔI_{ADJ}	V_{IN}-V_{OUT}=1.4~10V, LD2117A : I_{OUT}=10 ~ 1000mA			0.3	2	μA
Minimum Load Current	$I_{O(MIN)}$	V_{IN}=15V			0.3	1	mA
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT}=5V, T_J=25°C	LD2117	800			mA
			LD2117A	1000			
Output Noise (%V_O)	e_N	B=10Hz ~ 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}=1V_{PP}		75			dB
Dropout Voltage	V_D	I_{OUT}=100mA			1.05	1.15	V
		I_{OUT}=500mA			1.15	1.25	
		I_{OUT}=800mA			1.18	1.28	
		I_{OUT}=1A			1.22	1.35	
Thermal Regulation		T_A=25°C, 30ms Pulse			0.01	0.10	%/W
Thermal Shutdown	OTP				150		°C

■ APPLICATION NOTE of LD2117/A ADJUSTABLE

The **LD2117/A** adjustable has a reference voltage of between the OUT and ADJ pins. I_{ADJ} is 7μA typ. (10μA max.) and ΔI_{ADJ} is 0.3μA typ. (2μA max.).

R_1 is normally fixed to 1.2kΩ.

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)

The UTC **LD2117/A** also supports MLCC. See Fig.6 for adjustable output and Fig.7 for fixed Output

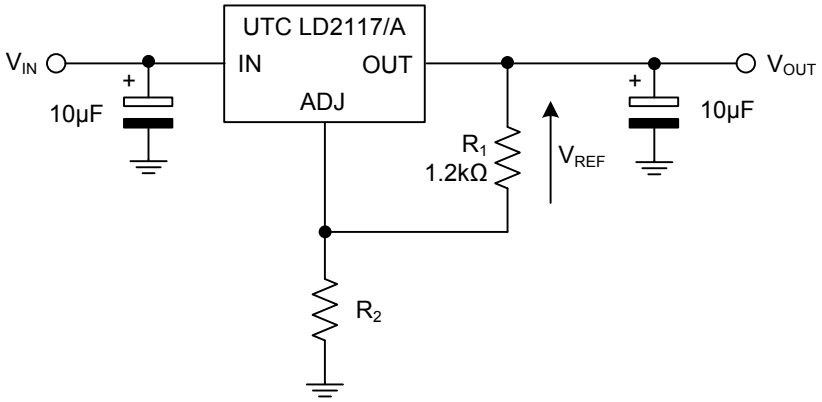


Fig.4 Adjustable Output Voltage Application Circuit

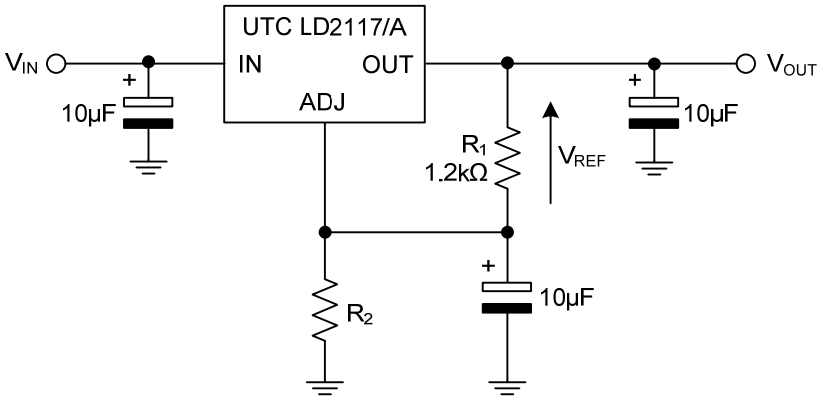


Fig.5 Adjustable Output Voltage Application with improved Ripple Rejection.

■ APPLICATION NOTE of LD2117/A ADJUSTABLE(Cont.)

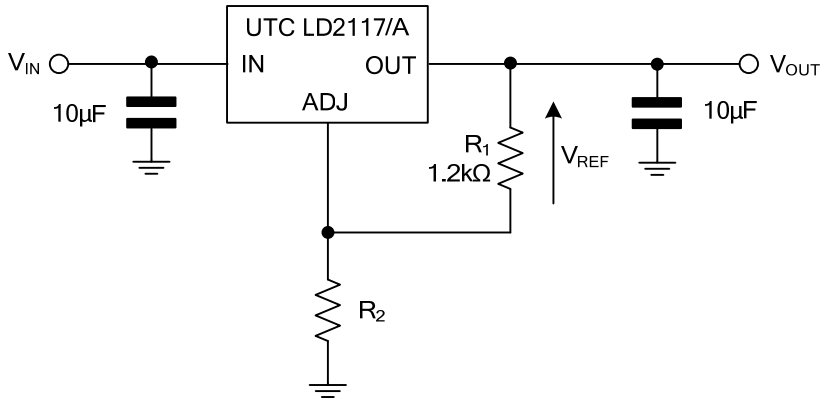


Fig.6 Adjustable Output Voltage Application Circuit for MLCC

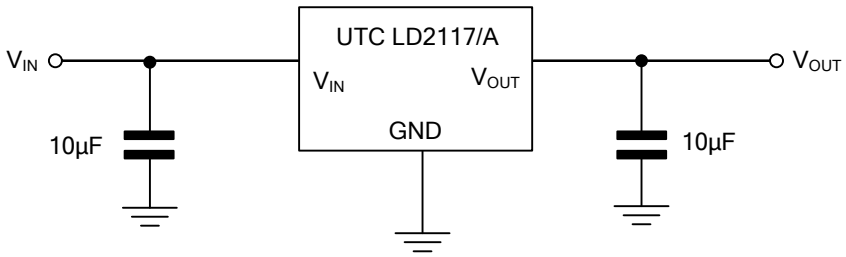
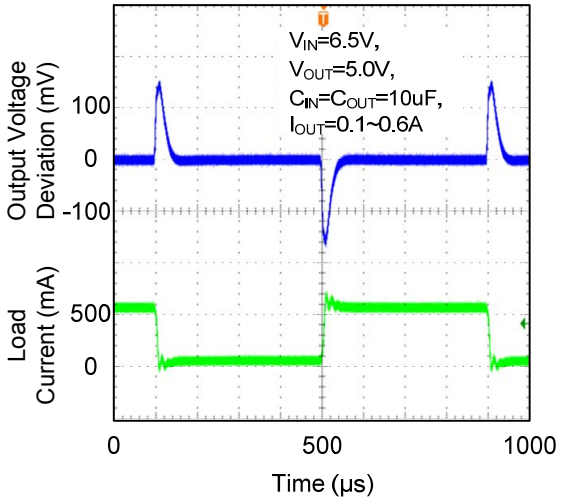


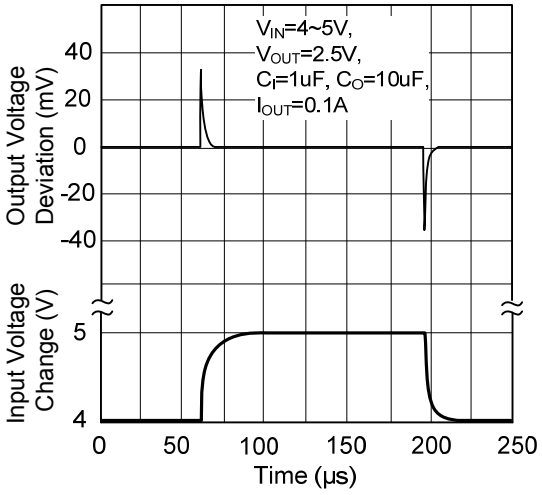
Fig.7 Fixed Output Voltage Application Circuit for MLCC

■ TYPICAL CHARACTERISTICS

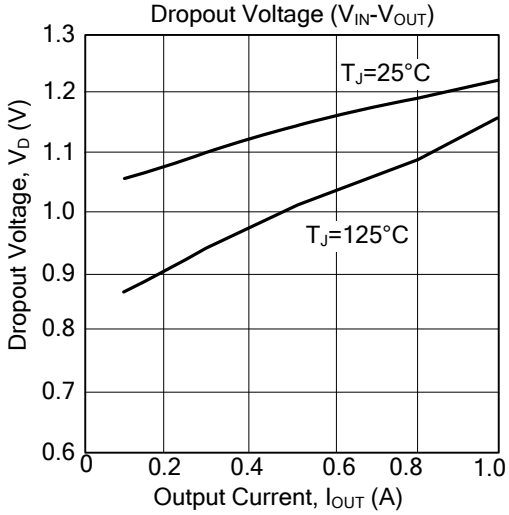
Load Transient Response



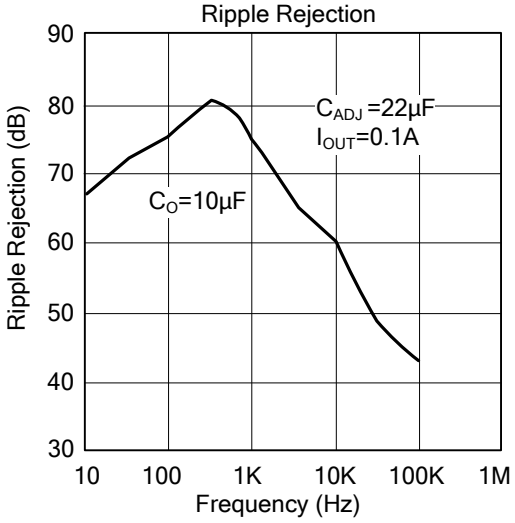
Line Transient Response



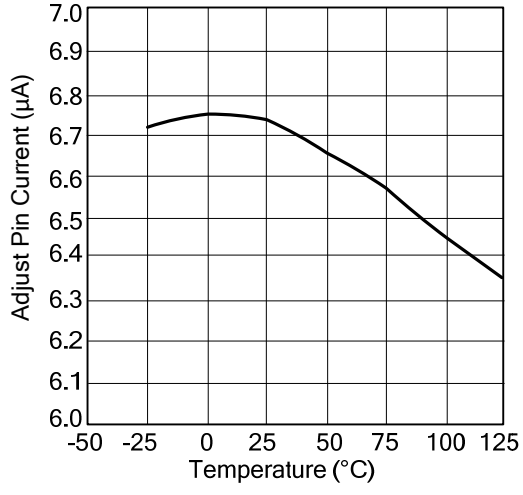
Dropout Voltage (V_{IN}-V_{OUT})



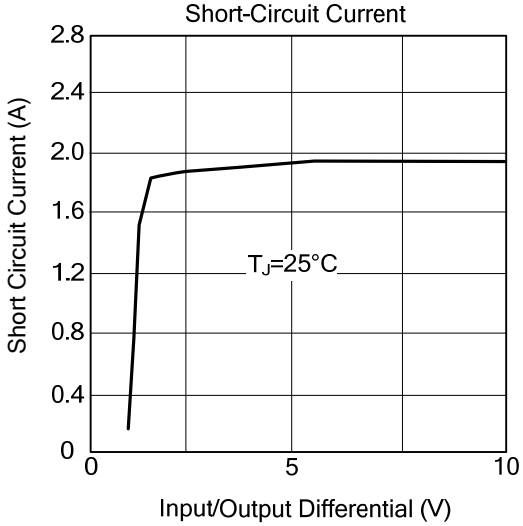
Ripple Rejection



Adjust Pin Current

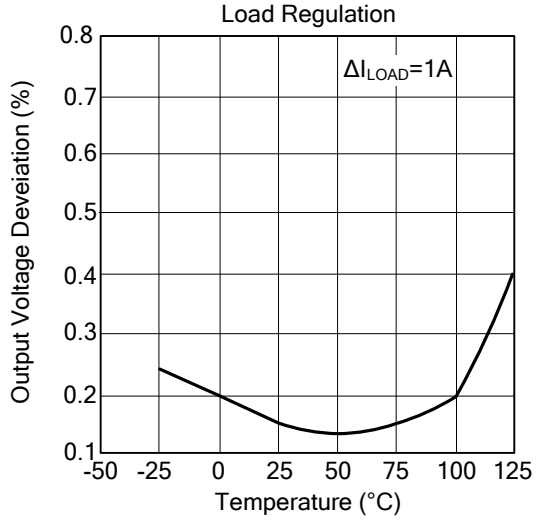


Short-Circuit Current

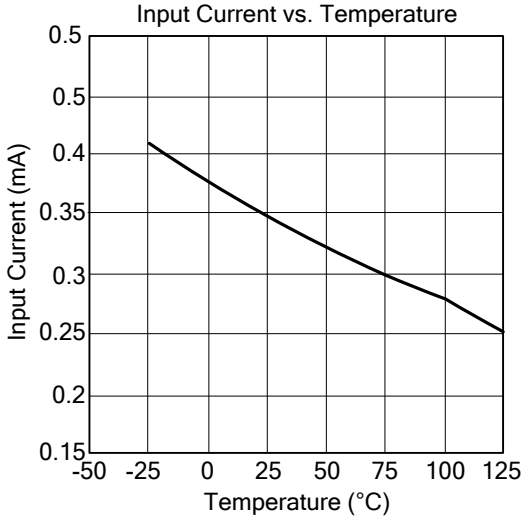


■ TYPICAL CHARACTERISTICS(Cont.)

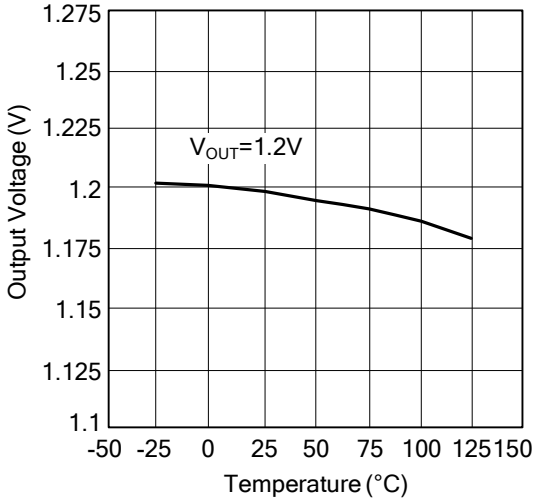
Load Regulation



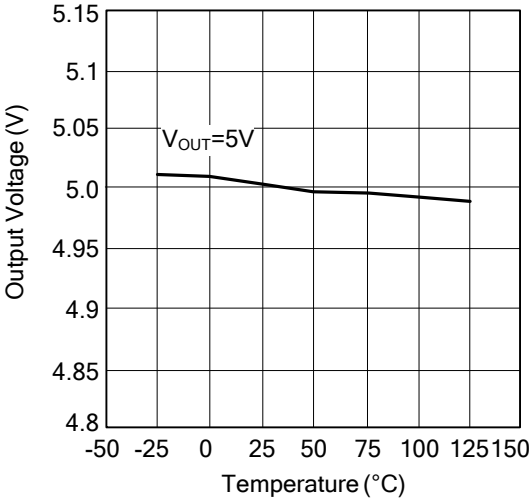
Input Current vs. Temperature



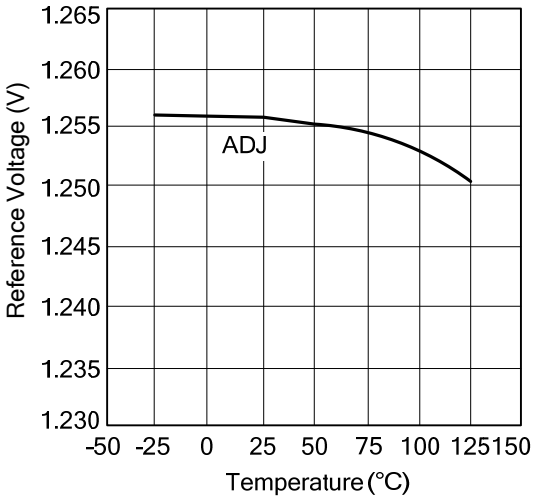
Output Voltage vs. Temperautre



Output Voltage vs. Temperautre



Reference Voltage vs. Temperature



Maximum Power Dissipation