



LD2117/A

LINEAR INTEGRATED CIRCUIT

LOW DROPOUT FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

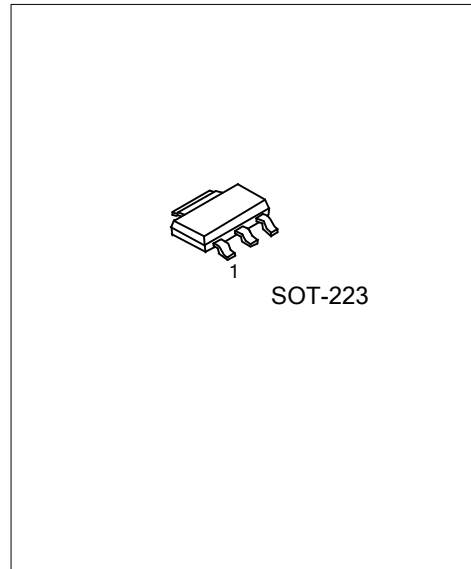
DESCRIPTION

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 $\pm 1\%$ (at 25°C) and 2% in all temperature range
- * Ultra low current consumption (0.35mA typ.)
- * Ultra low Adjustment Current (7 μ A 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

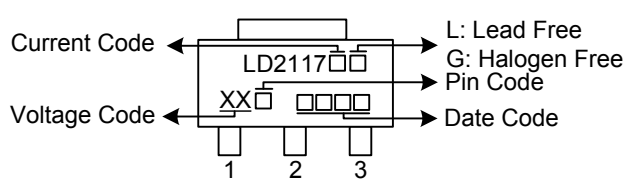
Note: Pin Assignment: I: V_{IN} O: V_{OUT} A: ADJ

<p>LD2117①L-xx-AA3-②-R</p>	<p>(1) Packing Type (1) R: Tape Reel</p> <p>(2) Pin Assignment (2) refer to Pin Assignment</p> <p>(3) Package Type (3) AA3: SOT-223</p> <p>(4) Output Voltage Code (4) xx: refer to Marking Information</p> <p>(5) Lead Free (5) G: Halogen Free, L: Lead Free</p> <p>(6) Current Code (6) Blank: 800mA, A: 1A</p>
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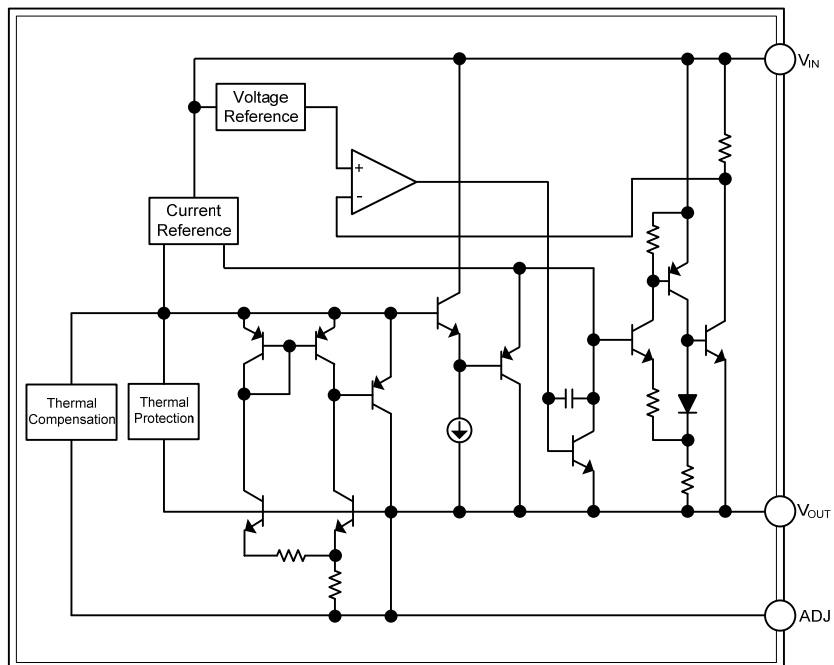
LD2117/A

LINEAR INTEGRATED CIRCUIT

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	 <p> Current Code ← Voltage Code ← L: Lead Free G: Halogen Free Pin Code Date Code </p>

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} ≤10V		0.35	0.5	mA
Current Limit	I _{LIMIT}	V _{IN} =6.2V, T _J =25°C	LD2117 800 LD2117A 1000			mA
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 I _{OUT} =500mA I _{OUT} =800mA I _{OUT} =1A		1.05 1.15 1.18 1.22	1.15 1.25 1.28 1.35	V
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}	$V_{IN}=3.5V, I_{OUT}=10mA, T_J=25^{\circ}C$	1.485	1.500	1.515	V
Output Voltage	V_{OUT}	$V_{IN}=3 \sim 8V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$	1.485	1.500	1.515	V
Line Regulation	ΔV_{OUT}	$V_{IN}=3 \sim 8V, I_{OUT}=0mA$		1	6	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=3V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$		1	10	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=6.5V, T_J=25^{\circ}C$				mA
			LD2117	800		
			LD2117A	1000		
Output Noise Voltage	e_N	$B=10Hz \sim 10KHz, T_J=25^{\circ}C$		100		μV
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=4.5V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms$ Pulse		0.01	0.10	%/W
Thermal Shutdown	OTP			150		$^{\circ}C$

For LD2117/A-1.8

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$V_{IN}=3.8V, I_{OUT}=10mA, T_J=25^{\circ}C$	1.782	1.800	1.818	V
Output Voltage	V_{OUT}	$V_{IN}=3.3 \sim 8V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$	1.782	1.800	1.818	V
Line Regulation	ΔV_{OUT}	$V_{IN}=3.3 \sim 8V, I_{OUT}=0mA$		1	6	mV
Load Regulation	ΔV_{OUT}	$V_{IN}=3.3V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$		1	10	mV
Temperature stability	ΔV_{OUT}			0.5		%
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=6.8V, T_J=25^{\circ}C$				mA
			LD2117	800		
			LD2117A	1000		
Output Noise Voltage	e_N	$B=10Hz \sim 10KHz, T_J=25^{\circ}C$		100		μV
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=5.5V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms$ Pulse		0.01	0.10	%/W
Thermal Shutdown	OTP			150		$^{\circ}C$

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-3.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V_{OUT}	$V_{IN}=5V, I_{OUT}=10mA, T_J=25^{\circ}C$	2.970	3.000	3.030	V	
Output Voltage	V_{OUT}	$V_{IN}=4.5 \sim 10V$ LD2117 : $I_{OUT}=0 \sim 800mA$ LD2117A : $I_{OUT}=0 \sim 1000mA$	2.970	3.000	3.030	V	
Line Regulation	ΔV_{OUT}	$V_{IN}=4.5 \sim 12V, I_{OUT}=0mA$		1	6	mV	
Load Regulation	ΔV_{OUT}	$V_{IN}=4.5V$ LD2117 : $I_{OUT}=0 \sim 800mA$ LD2117A : $I_{OUT}=0 \sim 1000mA$		1	10	mV	
Temperature stability	ΔV_{OUT}			0.5		%	
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=8V, T_J=25^{\circ}C$	LD2117	800		mA	
			LD2117A	1000			
Output Noise Voltage	e_N	$B=10Hz \sim 10KHz, T_J=25^{\circ}C$		100		μV	
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=6V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms$ Pulse		0.01	0.10	%/W	
Thermal Shutdown	OTP			150		$^{\circ}C$	

For LD2117/A-3.3

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V_{OUT}	$V_{IN}=5.3V, I_{OUT}=10mA, T_J=25^{\circ}C$	3.267	3.300	3.333	V	
Output Voltage	V_{OUT}	$V_{IN}=4.75 \sim 10V$ LD2117 : $I_{OUT}=0 \sim 800mA$ LD2117A : $I_{OUT}=0 \sim 1000mA$	3.267	3.300	3.333	V	
Line Regulation	ΔV_{OUT}	$V_{IN}=4.75 \sim 15V, I_{OUT}=0mA$		1	6	mV	
Load Regulation	ΔV_{OUT}	$V_{IN}=4.75V$ LD2117 : $I_{OUT}=0 \sim 800mA$ LD2117A : $I_{OUT}=0 \sim 1000mA$		1	10	mV	
Temperature stability	ΔV_{OUT}			0.5		%	
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=8.3V, T_J=25^{\circ}C$	LD2117	800		mA	
			LD2117A	1000			
Output Noise Voltage	e_N	$B=10Hz \sim 10KHz, T_J=25^{\circ}C$		100		μV	
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=6.3V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms$ Pulse		0.01	0.10	%/W	
Thermal Shutdown	OTP			150		$^{\circ}C$	

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-3.6

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V_{OUT}	$V_{IN}=5.6V, I_{OUT}=10mA, T_J=25^{\circ}C$	3.564	3.600	3.636	V	
Output Voltage	V_{OUT}	$V_{IN}=5 \sim 10V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$	3.564	3.600	3.636	V	
Line Regulation	ΔV_{OUT}	$V_{IN}=5 \sim 15V, I_{OUT}=0mA$		1	6	mV	
Load Regulation	ΔV_{OUT}	$V_{IN}=5V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$		1	10	mV	
Temperature stability	ΔV_{OUT}			0.5		%	
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=8.6V, T_J=25^{\circ}C$	LD2117	800		mA	
			LD2117A	1000			
Output Noise Voltage	e_N	$B=10Hz \text{ to } 10KHz, T_J=25^{\circ}C$		100		μV	
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=6.6V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms \text{ Pulse}$		0.01	0.10	%/W	
Thermal Shutdown	OTP			150		$^{\circ}C$	

For LD2117/A-5.0

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V_{OUT}	$V_{IN}=7V, I_{OUT}=10mA, T_J=25^{\circ}C$	4.950	5.000	5.050	V	
Output Voltage	V_{OUT}	$V_{IN}=6.5 \sim 15V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1.0A$	4.950	5.000	5.050	V	
Line Regulation	ΔV_{OUT}	$V_{IN}=6.5 \sim 15V, I_{OUT}=0mA$		1	6	mV	
Load Regulation	ΔV_{OUT}	$V_{IN}=6.5V$ LD2117 : $I_{OUT}=0\sim 800mA$ LD2117A : $I_{OUT}=0\sim 1000mA$		1	15	mV	
Temperature stability	ΔV_{OUT}			0.5		%	
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		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}	$V_{IN}=10V, T_J=25^{\circ}C$	LD2117	800		mA	
			LD2117A	1000			
Output Noise Voltage	e_N	$B=10Hz \text{ to } 10KHz, T_J=25^{\circ}C$		100		μV	
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}=8V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms \text{ Pulse}$		0.01	0.10	%/W	
Thermal Shutdown	OTP			150		$^{\circ}C$	

■ ELECTRICAL CHARACTERISTICS(Cont.)

For LD2117/A-ADJ

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Voltage	V_{REF}	$V_{IN}-V_{OUT}=2V, I_{OUT}=10mA, T_J=25^{\circ}C$	1.125	1.25	1.375	V
Reference Voltage	V_{REF}	$V_{IN}-V_{OUT}=1.4\sim 10V$ LD2117A : $I_{OUT}=10\sim 1000mA$	1.125	1.25	1.375	V
Line Regulation	ΔV_{OUT}	$V_{IN}-V_{OUT}=1.5 \sim 13.75V, I_{OUT}=10mA$		0.035	0.2	%
Load Regulation	ΔV_{OUT}	$V_{IN}-V_{OUT}=3V$ LD2117 : $I_{OUT}=10\sim 800mA$ LD2117A : $I_{OUT}=10\sim 1000mA$		0.1	0.4	%
Temperature stability	ΔV_{OUT}			0.50		%
Long Term Stability	ΔV_{OUT}	1000 hrs, $T_J=125^{\circ}C$		0.3		%
Operating Input Voltage	V_{IN}				15	V
Adjustment Pin Current	I_{ADJ}	$V_{IN}\leq 15V$		7	10	μA
Adjustment Pin Current Change	ΔI_{ADJ}	$V_{IN}-V_{OUT}=1.4\sim 10V,$ LD2117A : $I_{OUT}=10 \sim 1000mA$		0.3	2	μA
Minimum Load Current	$I_{O(MIN)}$	$V_{IN}=15V$		0.3	1	mA
Current Limit	I_{LIMIT}	$V_{IN}-V_{OUT}=5V, T_J=25^{\circ}C$	LD2117	800		mA
			LD2117A	1000		
Output Noise (% V_O)	e_N	$B=10Hz \sim 10KHz, T_J=25^{\circ}C$		0.003		%
Supply Voltage Rejection	SVR	$I_{OUT}=40mA, f=120Hz, T_J=25^{\circ}C,$ $V_{IN}-V_{OUT}=3V, V_{RIPPLE}=1V_{PP}$	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		$T_A=25^{\circ}C, 30ms$ Pulse		0.01	0.10	%/W
Thermal Shutdown	OTP			150		$^{\circ}C$

■ APPLICATION NOTE of LD2117/A ADJUSTABLE

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

R_1 is normally fixed to $1.2k\Omega$.

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 $K\Omega$, 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 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 $10\mu F$ 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

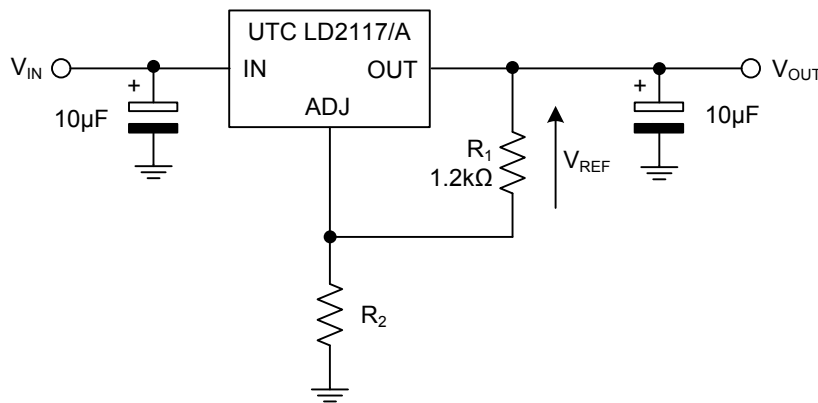


Fig.4 Adjustable Output Voltage Application Circuit

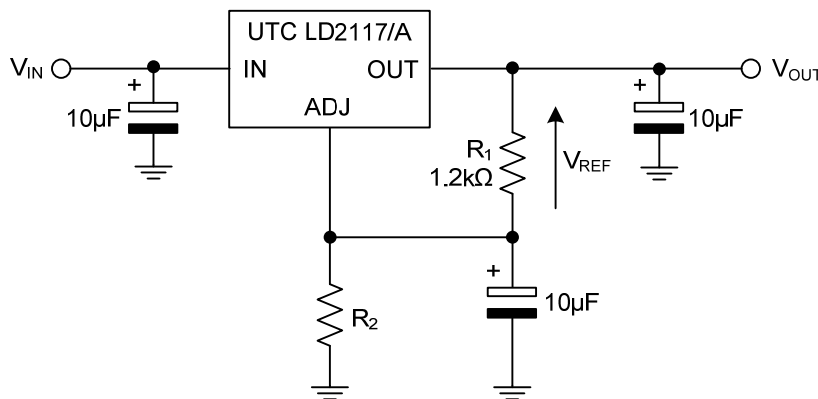


Fig.5 Adjustable Output Voltage Application with improved Ripple Rejection.

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

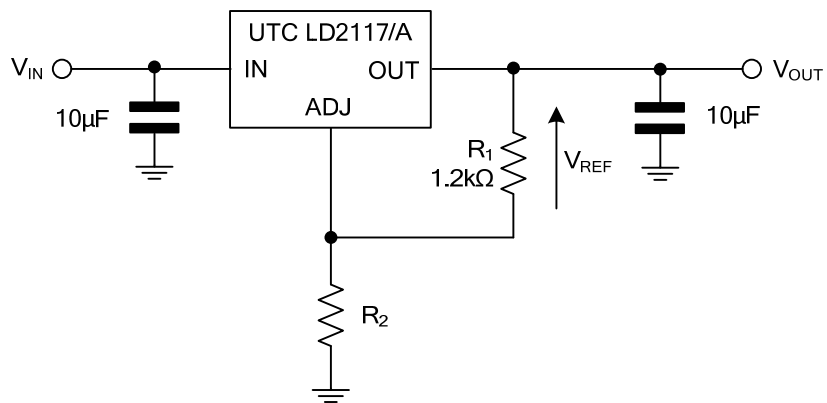


Fig.6 Adjustable Output Voltage Application Circuit for MLCC

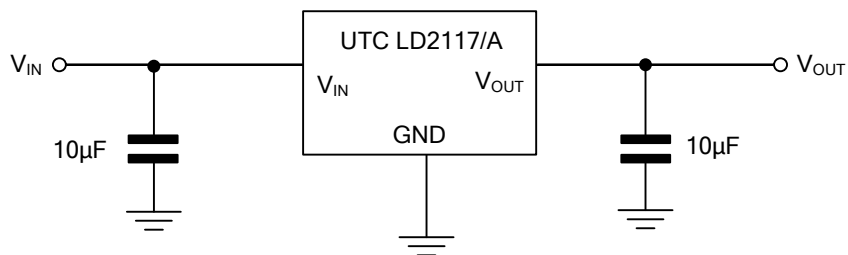
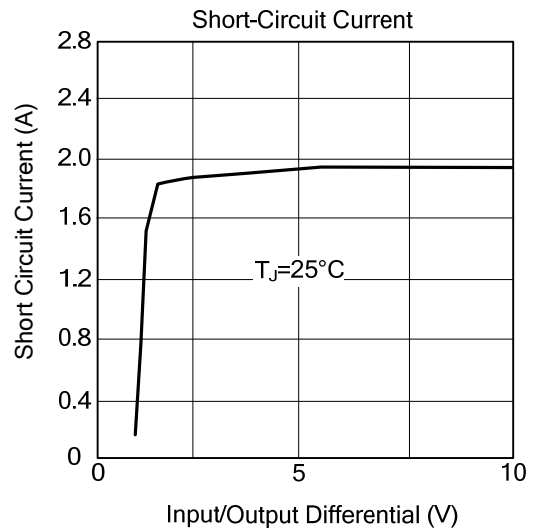
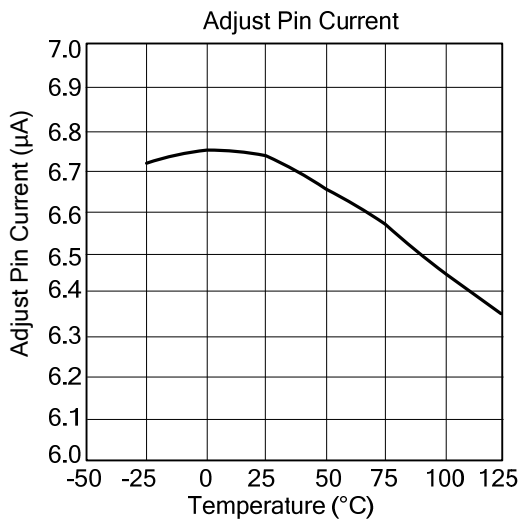
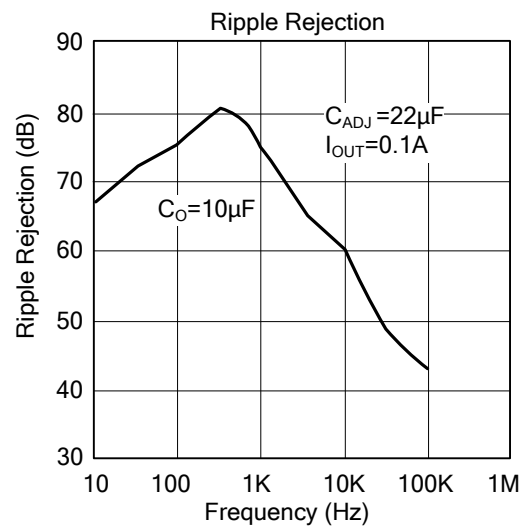
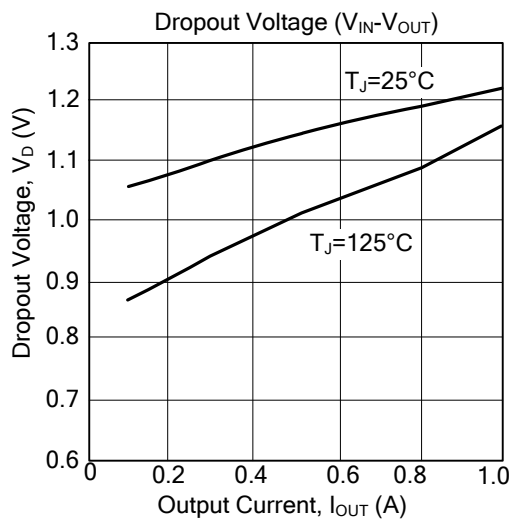
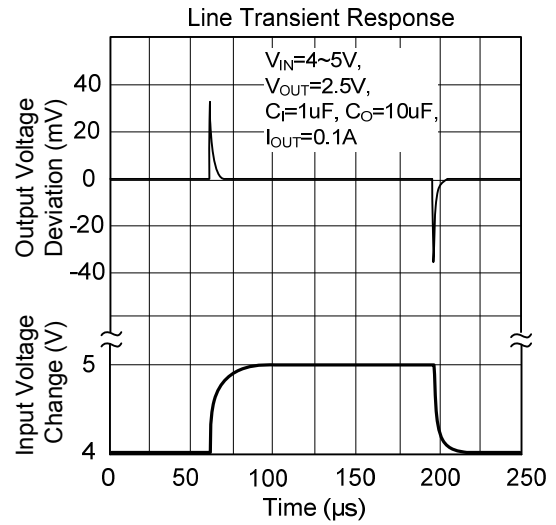
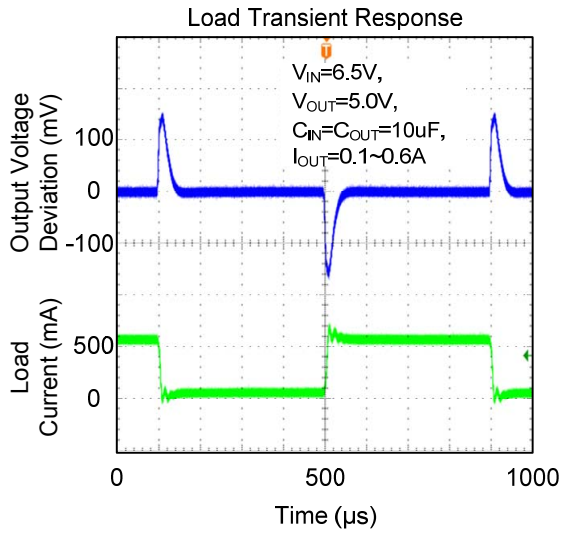
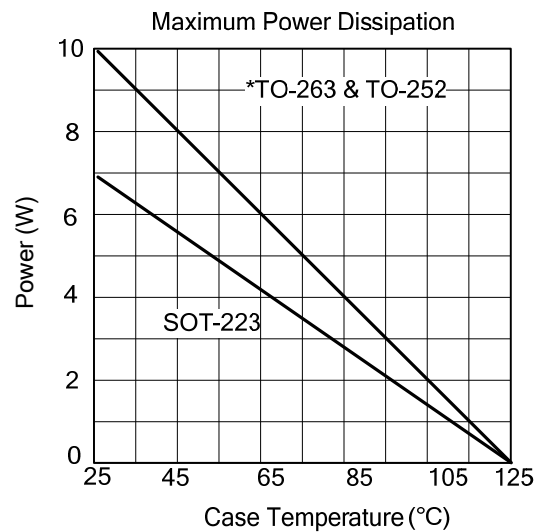
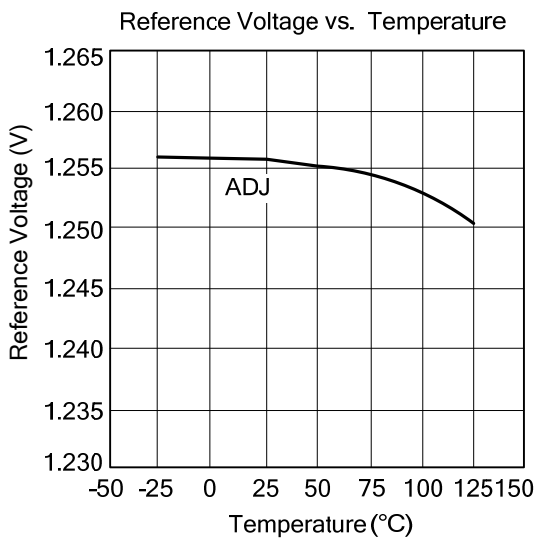
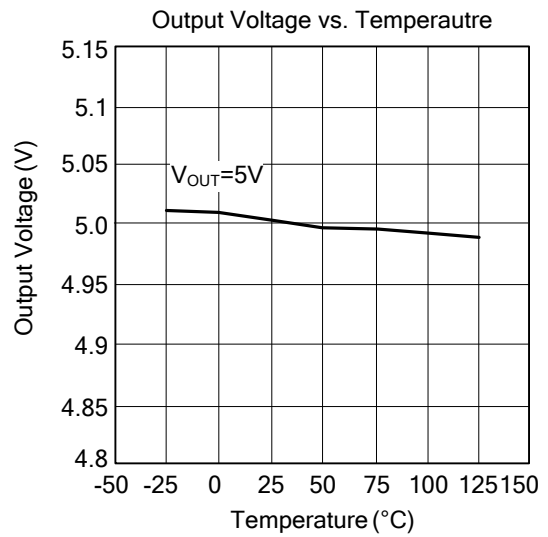
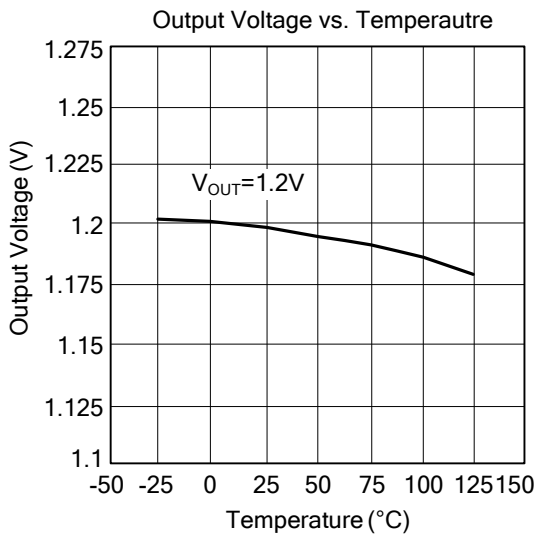
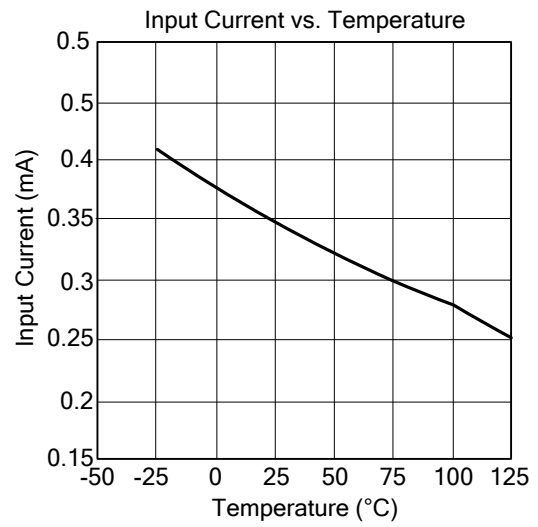
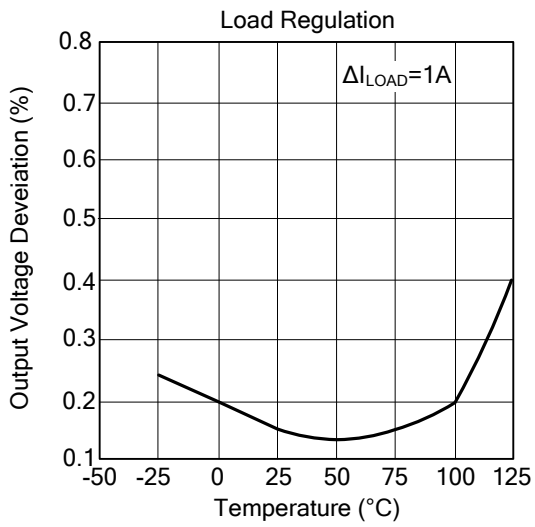


Fig.7 Fixed Output Voltage Application Circuit for MLCC

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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