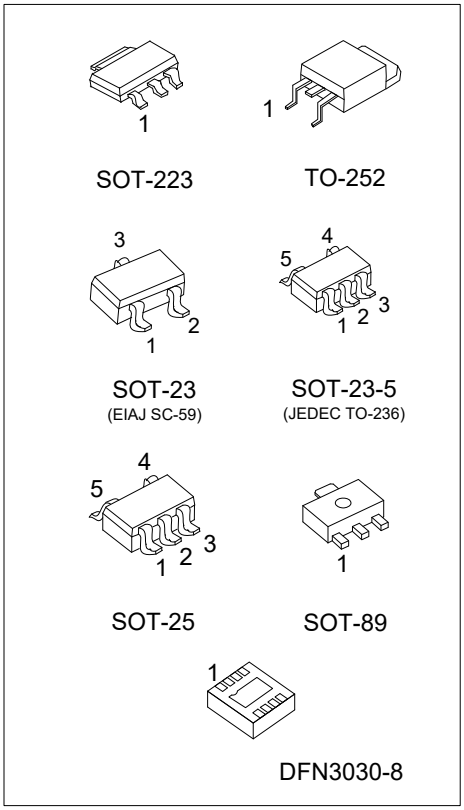
LR1108/E/N

CMOS IC

1A FAST ULTRA LOW DROPOUT LINEAR REGULATOR



■ DESCRIPTION

The UTC **LR1108/E/N** is an ultra low-dropout linear regulators. Wide output voltage range options are available. The fast response characteristic to make UTC **LR1108/E/N** suitable for low voltage microprocessor application. The low quiescent current operation and low dropout quality caused by the CMOS process.

The UTC **LR1108/E/N** has ultra low dropout voltage 300mV at 1A load current typically.

The ground pin current is typically 150uA at 1mA load current. $\overline{\text{ERROR}}$ Flag: When the output voltage drops 10% below nominal value Error flag goes low.

SET/ADJ Mode (for **LR1108**): Connect an external resistive voltage-divider from V_{OUT} to this pin to set the output voltage from 1.145V to 5V.

Output Voltage Precision: Multiple output voltage options are available and ranging from 1.2V ~ 5.0V at room temperature with a guaranteed accuracy of ±1.5%, and ±3.0% when varying line, load and temperature.

■ FEATURES

* Ultra Low Dropout Voltage
* Low Ground Pin Current
* 0.65% Load Regulation
* The Guaranteed Output Current is 1A DC
* Output Voltage Accuracy ± 1.5%
* $\overline{\text{ERROR}}$ Flag Indicates Output Status
* Sense option improves better load regulation
* Low Output Capacitor Required
* Over temperature Protection And Over current Protection

■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment ①								Packing
Lead Free	Halogen Free										
LR1108L-xx-AA3-①-R	LR1108G-xx-AA3-①-R	SOT-223	A: GOI B: OGI C: GIO D: IGO								Tape Reel
LR1108L-xx-AB3-①-R	LR1108G-xx-AB3-①-R	SOT-89									
LR1108L-xx-TN3-①-R	LR1108G-xx-TN3-①-R	TO-252									
LR1108L-xx-AE3-①-R	LR1108G-xx-AE3-①-R	SOT-23	1: GIO 3: GOI 5: OGI 6: IGO								Tape Reel
LR1108L-xx-AE5-R	LR1108G-xx-AE5-R	SOT-23-5	$\overline{SD}$	G	I	O	N	-	-	-	Tape Reel
LR1108L-xx-AF5-R	LR1108G-xx-AF5-R	SOT-25	I	G	$\overline{SD}$	S	O	-	-	-	Tape Reel
LR1108EL-xx-AF5-R	LR1108EG-xx-AF5-R	SOT-25	I	G	$\overline{SD}$	E	O	-	-	-	Tape Reel
LR1108NL-xx-AF5-K-R	LR1108NG-xx-AF5-K-R	SOT-25	I	G	$\overline{SD}$	N	O	-	-	-	Tape Reel
LR1108L-xx-K08-3030-R	LR1108G-xx-K08-3030-R	DFN3030-8	O	N	ADJ	G	$\overline{SD}$	N	N	I	Tape Reel

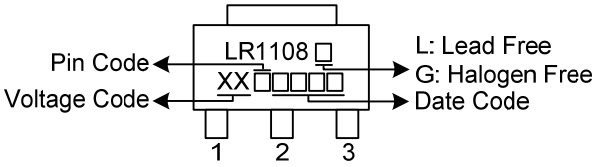
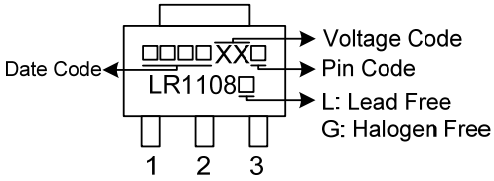
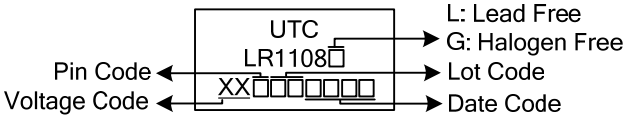
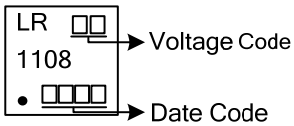
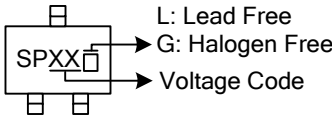
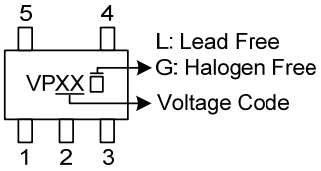
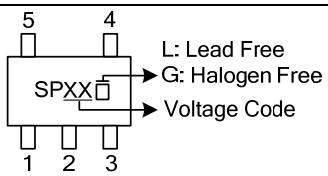
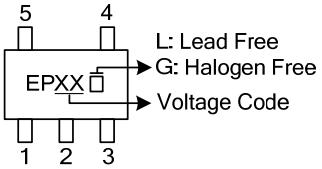
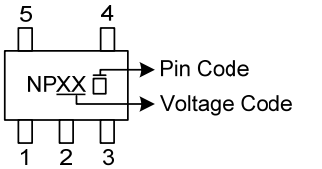
Note: Pin Assignment: I:V_{IN} O:V_{OUT} G:GND SD:$\overline{SD}$ E: $\overline{ERROR}$ S：SET/ADJ N: NC

LR1108NG-xx-AF5-K-R

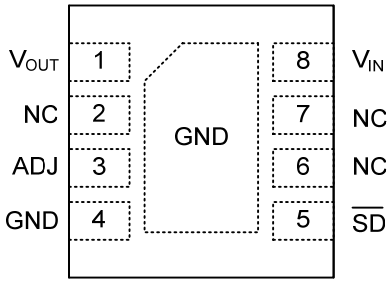
(1) Packing Type
(2) Pin Assignment
(3) Package Type
(4) Voltage Code
(5) Green Package
(6) Pin Situation

(1) R: Tape Reel
(2) refer to Pin Assignment
(3) AA3: SOT-223, AB3: SOT-89, AE3: SOT-23, AF5: SOT-25
AE5: SOT-23-5, TN3: TO-252, K08-3030: DFN3030-8
(4) xx: reference to Marking Information
(5) G: Halogen Free and Lead Free, L: Lead Free
(6) Refer to PIN CONFIGURATION

■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	12: 1.2V 15: 1.5V 18: 1.8V 25: 2.5V 2J: 2.85V 30: 3.0V 33: 3.3V 50: 5.0V	
SOT-89		
TO-252		
DFN3030-8		
SOT-23		
SOT-23-5		
SOT-25 (LR1108)		
SOT-25 (LR1108E)		
SOT-25 (LR1108N)		

■ PIN CONFIGURATION



DFN3030-8
(Top View)

■ PIN DESCRIPTION

For SOT-223/SOT-89/TO-252 Package

PIN CODE & NO				PIN NAME	DESCRIPTION
A	B	C	D		
2	1	3	3	V_{OUT}	Output Voltage
1	2	1	2	GND	Ground
3	3	2	1	V_{IN}	Input Supply

For SOT-23 Package

PIN CODE & NO				PIN NAME	DESCRIPTION
1	3	5	6		
1	1	2	2	GND	Ground
2	3	3	1	V_{IN}	Input Supply
3	2	1	3	V_{OUT}	Output Voltage

For SOT-23-5 Package

PIN NO	PIN NAME	DESCRIPTION
1	$\overline{SD}$	Active low shutdown input.
2	GND	Ground
3	V_{IN}	Input supply
4	V_{OUT}	Output voltage
5	NC	No Connected

For SOT-25 Package

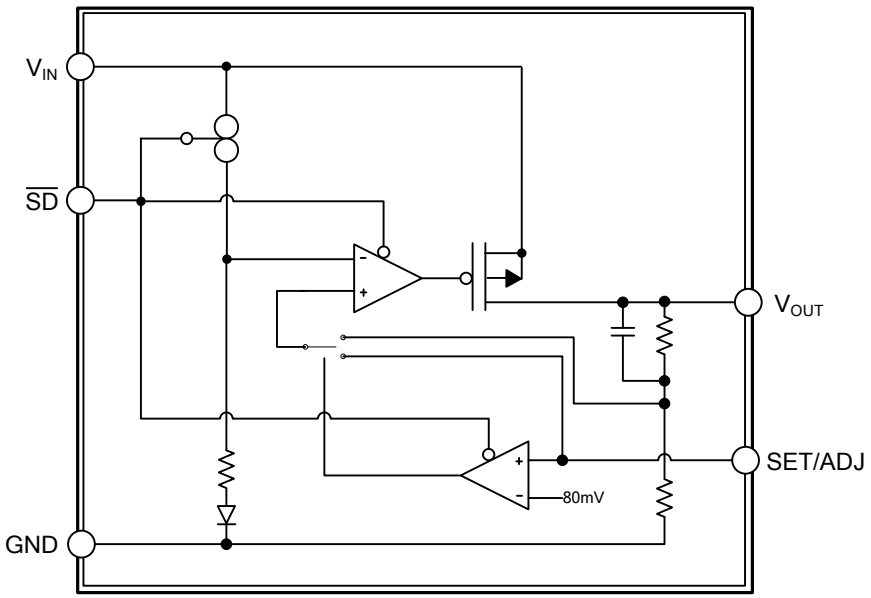
PIN NO	PIN NAME	DESCRIPTION
1	V_{IN}	Input supply
2	GND	Ground
3	$\overline{SD}$	Active low shutdown input.
4	SET/ADJ (For LR1108)	Voltage-Setting Input. Connect an external resistive voltage-divider from V_{OUT} to this pin to set the output voltage. Connect to GND for Preset output
	$\overline{ERROR}$ (For LR1108E)	$\overline{ERROR}$ flag, active low; when the output dropout of regulation due to low input voltage, the **LR1108E** produces a logic low signal at the $\overline{ERROR}$ pin.
	NC (For LR1108N)	No Connected
5	V_{OUT}	Output voltage

■ PIN DESCRIPTION (Cont.)

For DFN3030-8 Package

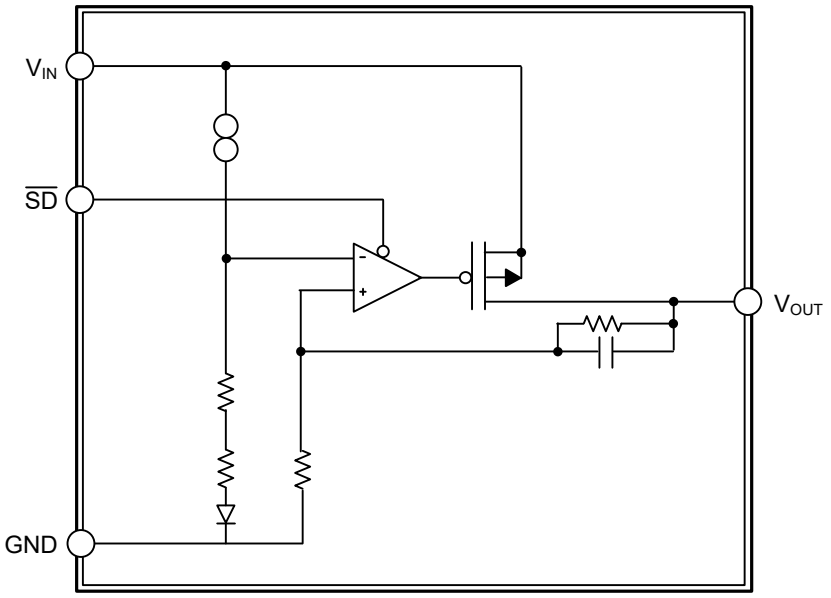
PIN NO	PIN NAME	ESCRIPTION
1	V_{OUT}	Output voltage
2, 6, 7	NC	No Connected
3	ADJ	Voltage-Setting Input. Connect an external resistive voltage-divider from V_{OUT} to this pin to set the output voltage.
4	GND	Ground
5	$\overline{SD}$	Active high Enable input.
8	V_{IN}	Input supply
Exposed Pad	GND	Connect exposed pad to GND.

■ BLOCK DIAGRAM

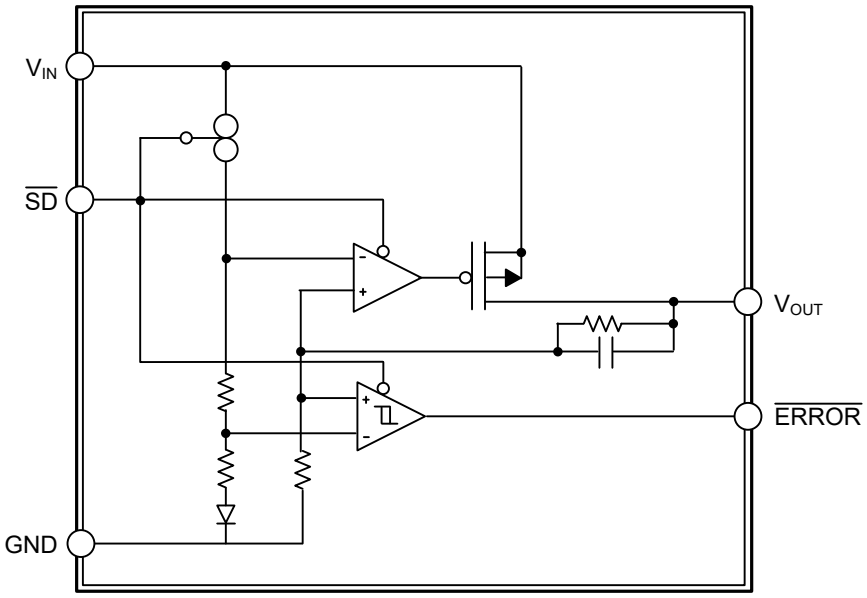


LR1108

■ BLOCK DIAGRAM (Cont.)



LR1108N



LR1108E

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage (Operating) (Note 8)	V_{IN}	2.5 ~ 7.0	V
Shutdown Input Voltage	$V_{IN(SHDN)}$	-0.3 ~ V_{IN}+0.3	V
I_{OUT} (Survival)		Short Circuit Protected	
Maximum Voltage for $\overline{\text{ERROR}}$ Pin		V_{IN}+0.3	V
Maximum Operating Current (DC)		1	A
Power Dissipation (Note 2)	P_D	Internally Limited	
Junction Temperature	T_J	+150	°C
Operating Temperature	T_{OPR}	-40 ~ +125	°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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	165	°C/W
	SOT-89		179	
	SOT-23		325	
	SOT-23-5 SOT-25		260	
	TO-252		112	
	DFN3030-8		64 (Note)	
Junction to Case	SOT-223	θ_{JC}	15	°C/W
	SOT-89		47	
	SOT-23		130	
	SOT-23-5 SOT-25		110	
	TO-252		12	
	DFN3030-8		9 (Note)	

Note: The data tested by surface mounted on a 2 inch2 FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS

Limits in standard typeface are for T_J = 25°C, and limits in **boldface type** apply over the full operating temperature range. (T_J = 25°C, V_{IN} = $V_{O(NOM)}$ + 1V, I_L = 10mA, C_{OUT} = 22μF, V_{SD} = V_{IN}-0.3V, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}				6.0	V
Output Voltage Tolerance (Note 4)	V_{OUT}	0mA ≤ I_L ≤ 1A V_{OUT} +1 ≤ V_{IN}≤ 6.0V	-1.5 -3	0	+1.5 +3	%
Output Voltage Line Regulation (Note 4)	$\triangle V_{OUT}$	V_{OUT}+1V<V_{IN}<6.0V		0.6		%
Output Voltage Load Regulation (Note 4)	$\triangle V_{OUT}/\triangle I_{OUT}$	10mA < I_L < 1A		0.65		%
Dropout Voltage (Note 6)	V_D	I_L = 1A		325	500	mV
Ground Pin Current In Normal Operation Mode	I_{GND}	I_L = 0mA		150		uA
		I_L = 1A		300		
Peak Output Current	$I_{O(PEAK)}$	(Note 2)	1			A
SHORT CIRCUIT PROTECTION						
Short Circuit Current	I_{SC}			2		A
OVER TEMPERATURE PROTECTION						
Shutdown Threshold	$T_{SHDN(THR)}$			165		°C
Thermal Shutdown Hysteresis	$T_{SHDN(HYS)}$			10		°C

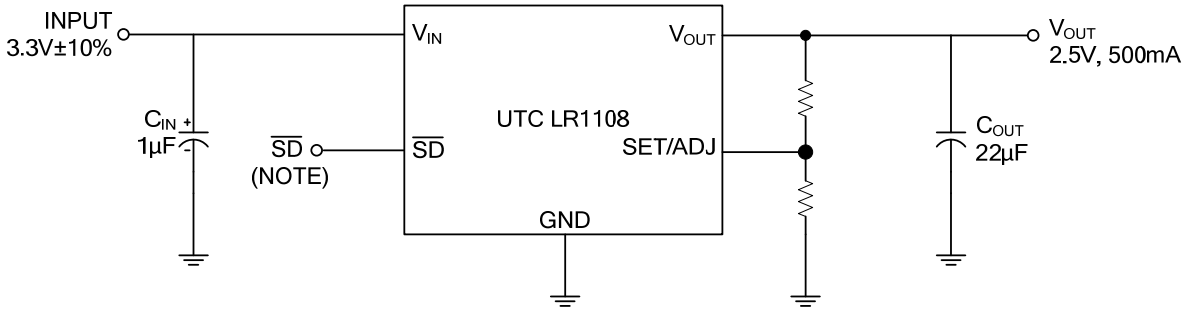
■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SHUTDOWN INPUT							
Shutdown Threshold		V_{SHDN}	Output=High	V_{IN}-0.3	V_{IN}		V
			Output=Low		0	0.2	
Turn-off Delay		$t_{D(OFF)}$	I_L=1A		20		μs
Turn-on Delay		$t_{D(ON)}$	I_L=1A		25		μs
$\overline{SD}$ Input Current		I_{SD}	V_{SD}=V_{IN}		1		nA
ERROR FLAG COMPARATOR (LR1108E)							
$\overline{ERROR}$ Flag Saturation		$V_{EF(SAT)}$	I_{SINK}=100μA		0.02	0.1	V
$\overline{ERROR}$ Flag Pin Leakage Current		$I_{I(LEAK)}$			1		nA
Threshold		V_T	(Note 5)	5	10	16	%
Threshold Hysteresis		V_{THR}	(Note 5)	2	5	8	%
Flag Reset Delay		t_D			1		μs
ADJ Voltages @ Set/ADJ Mode (connect to GND for Preset V_{OUT})							
ADJ Voltage	@ Preset V_O=1.2 ~ 1.5V @ Preset V_O=3.4 ~ 5.0V	V_{ADJ}	Measured on ADJ, I_{OUT}=10mA	1.176	1.2	1.224	V
	@ Preset V_O=1.8 ~ 3.3V			1.122	1.145	1.168	V
AC PARAMETERS							
Ripple Rejection		PSRR	V_{IN}=V_{OUT}+1.5V C_{OUT}=100uF, V_{OUT}=3.3V		60		dB
			V_{IN}=V_{OUT}+0.3V C_{OUT}=100uF, V_{OUT}=3.3V		40		
Output Noise Density		$\rho_{N(L/F)}$	f=120Hz		0.8		μV
Output Noise Voltage		e_N	BW=10Hz ~ 100kHz		150		μV_{RMS}
			BW=300Hz ~ 300kHz		100		

Notes: 1. Conditions for which the device is intended to be functional is indicated by operating ratings, but specific performance limits isn't be guaranteed. To make sure of specifications and test conditions, read Electrical Characteristics. Only for the test conditions listed the guaranteed specifications can be applied. When the device is not operated under the listed test conditions some performance characteristics may degrade.

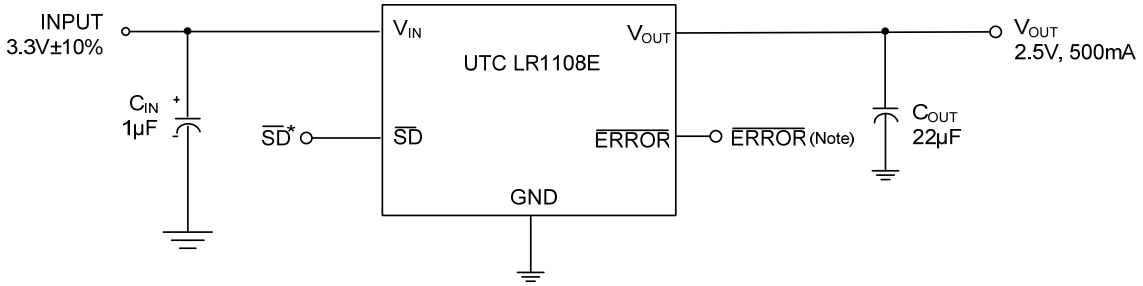
2. Devices must be derated based on package thermal resistance at elevated temperatures.
3. The most likely parametric norm represents at 25°C.
4. Output voltage line regulation is the change in output voltage from the nominal value which is due to change in the input line voltage. Which is defined as the change in output voltage from the nominal value due to change in load current is output voltage load regulation. The load regulation and line regulation specification include the typical number only. But, the limits for load and line regulation are included in the output voltage tolerance specification.
5. $\overline{ERROR}$ Flag hysteresis and threshold are specified as regulated output voltage's percentage.
6. At which the output drops 2% below the normal value dropout voltage is defined as the minimum input to output differential voltage. Only to output voltages of 2.5V and above dropout voltage specification applies. For output voltages below 2.5V, since the minimum input voltage is 2.5V, the drop-out voltage is nothing but the input to output differential.
7. Specification has been tested at -40°C ≤ T_J ≤ +85°Ccause under shutdown conditions the temperature rise of the device is negligible.
8. The minimum operating V_{IN} value is equal to [$V_{OUT(NOM)}$ + $V_{DROPOUT}$] or 2.5V, just the greater.

■ TYPICAL APPLICATION CIRCUIT

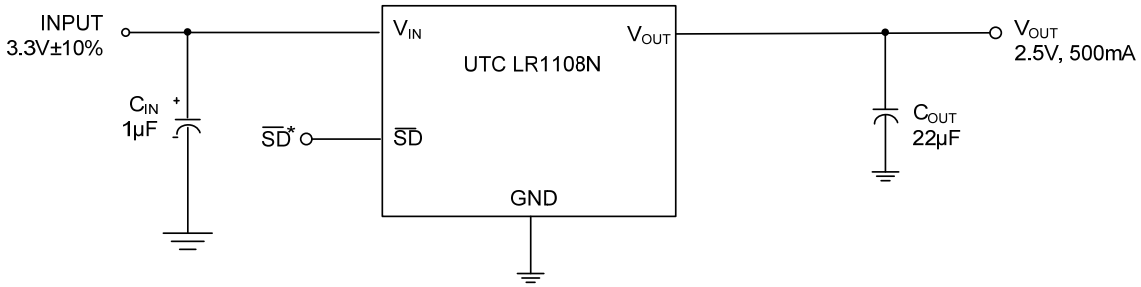


Notes: 1. $\overline{SD}$ pins must be pulled high through a 10kΩ pull-up resistor.
2. Connect the SET/ADJ pin to ground if this function is not used.
3. The output voltage is calculated by:

$$V_{OUT} = V_{REF}(1+\frac{R_1}{R_2})$$



Note: $\overline{SD}$ and $\overline{ERROR}$ pins must be pulled high through a 10kΩ pull-up resistor. Connect the $\overline{ERROR}$ pin to ground if this function is not used.



Note: $\overline{SD}$ pins must be pulled high through a 10kΩ pull-up resistor.

■ TYPICAL CHARACTERISTICS