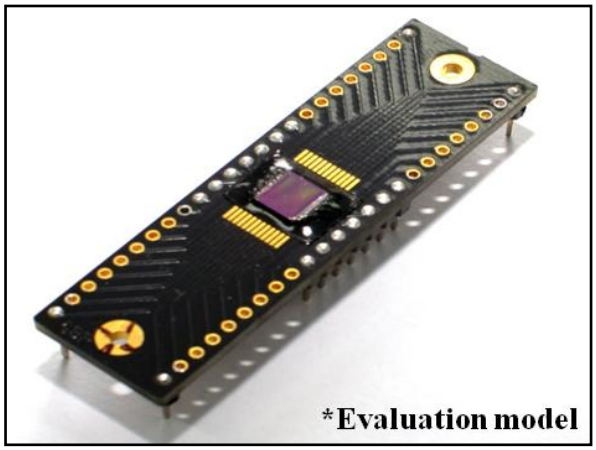
RH-LDO Linear Voltage Regulator 1.8V/1.6A (SC1026-0)



DATASHEET

Version 1.0, June 2022

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PRODUCT DESCRIPTION:

This LDO provides a fixed output voltage of 1.8V at 1.6A full load current. The LDO is stable with an external capacitor not lower than 10uF of ESR 1 ohm to 10 ohm. It supplies a nominal voltage of 1.8V to a circuit or load. The output voltage of the voltage regulator is regulated by the internal circuitry of the regulator to be relatively independent of the current drawn by the load, the supply or line voltage, and the ambient temperature. In order to protect voltage regulator from excessive temperatures or accidental short circuit, Over-temperature and Over-current protection circuit are included in this chip. Power good pin indicates whether output is within range of -5% of nominal output. The LDO can operate over a large temperature (T_A) range of -55°C to +100°C.

FEATURES:

- **Nominal V_{OUT}: 1.8V**
- **Maximum output current (FL): 1.6A**
- **Dropout Voltage: < 400mV at 1.6A load**
- **Initial voltage accuracy: -1% to +3%**
- **Voltage accuracy over line and load: <±1%**
- **Quiescent current (I_{GND}): <10mA at 1.6A load**
- **Lower (-5%) Power Good feature**
- **Over temperature shut down mechanism**
- **Short circuit current limiting feature**
- **Over current shutdown feature**
- **SCL 0.18µ CMOS technology**

APPLICATION:

- Integrated solutions for analog and digital chips

DEVICE SUMMARY:

Table 1: Device Summary

DEVICE	DIE SIZE	PACKAGE	PINS	DESCRIPTION	TEMPERATURE RANGE
SC1026-0	5.6mm X 5.8mm	COB	Minimum 7	Evaluation Model	-55°C to +100°C

*Die available for usage of the customer.

BLOCK DIAGRAM:

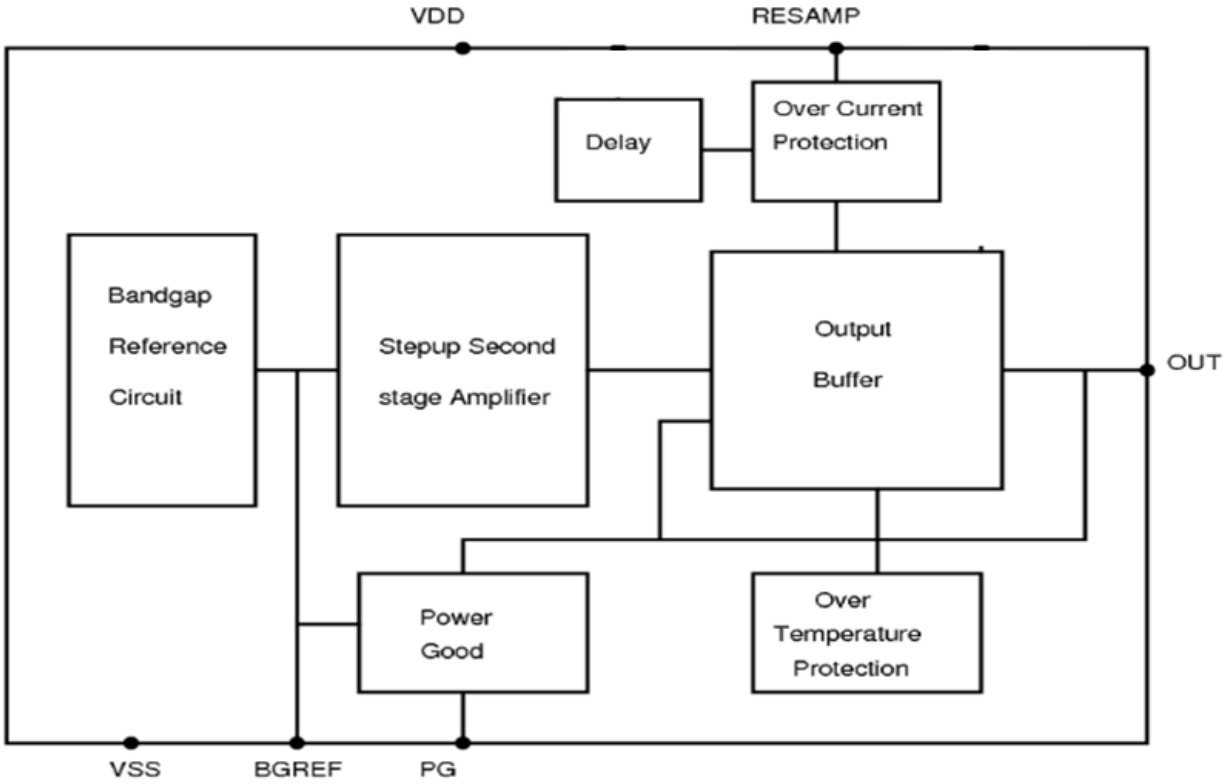


Figure 1: Block Diagram

PIN CONFIGURATION (48 Pin COB):

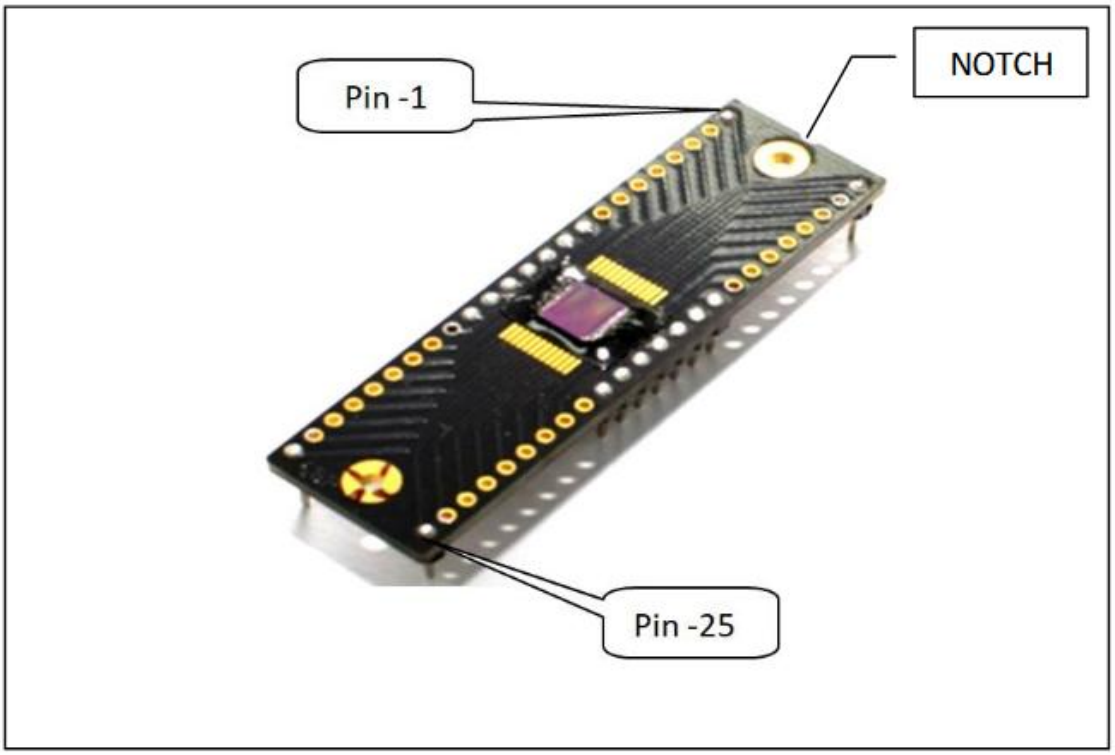


Figure 2: Pin Configuration

PIN DESCRIPTION:

The pin description in accordance to the COB are provide in the below table.

Table 2: COB Pin Details

PIN NO	PIN NAME	PIN DESCRIPTION
9	Vout	Output sense (for 4-wire testing methodology)
10	Vout	Output
11		
12		
13	BGR	NC
14	VSS	Ground
15	PG	Power Good out
34	Enable	NC
35	VSS	Ground
36	Resamp	Controls the short circuit current, 3.3kΩ resistance (for 3.6A SCC; 1.6A FL) b/w Resamp pin and VSS
37	Vin	Input
38		
39		
40	Vin	Input sense (for 4-wire testing methodology)

*SCC -> Short circuit current; FL -> Full Load

ABSOLUTE MAXIMUM RATING (1):

Over operating free-air temperature range (unless otherwise stated).

Table 3: Absolute Maximum Rating

PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
VDD	AVSS	-0.3	4.3	V
Storage Temperature	Different package types may have different limitations on the storage temperatures. Customer needs to consult with the assembly house.	-55	150	℃
ESD Tolerance (HBM)		2000	-	V
Operating Ambient Temperature Range		-55	+100	℃

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS:

Table 4: Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{IN}	Supply voltage	2.3	2.5	2.8	V
I_{LOAD}	Output drive current	-	-	1.6	A
T_A	Ambient temperature range	-55	-	+100	ºC

DC ELECTRICAL SPECIFICATIONS:

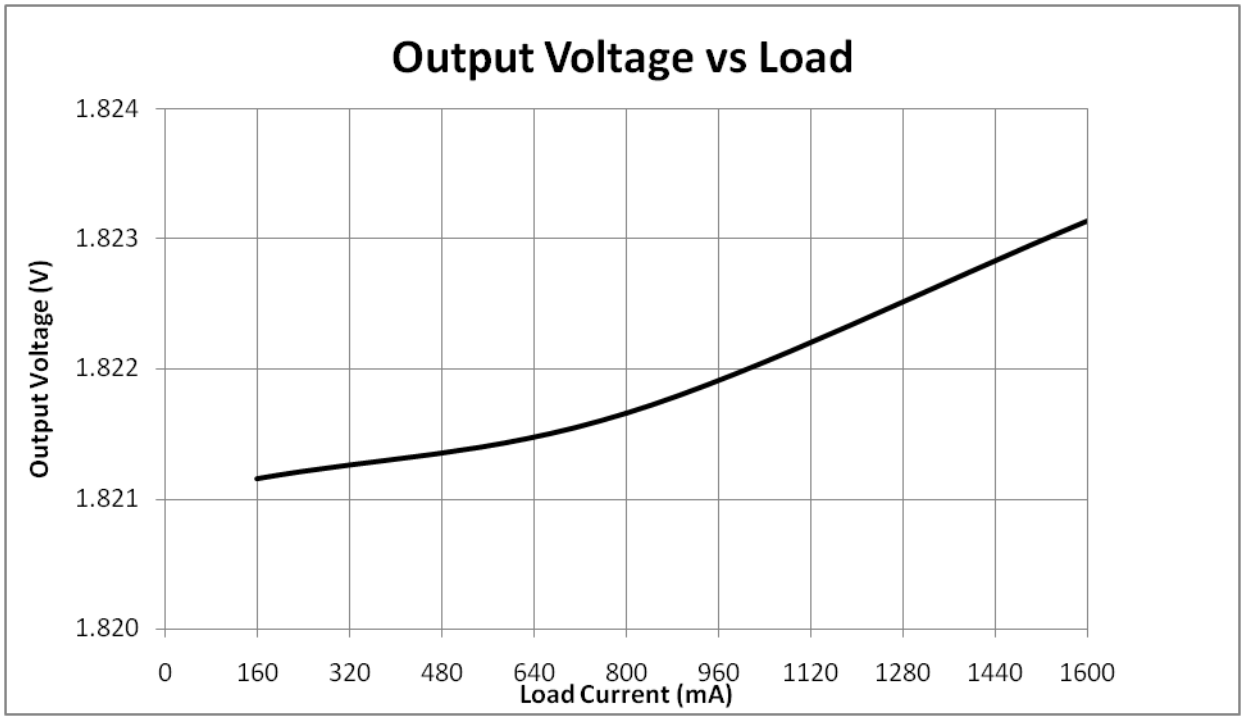
Test condition: All Specifications: V_{IN} =2.3V to 2.8V, C_{IN} = 1uF, C_{OUT} = 10µF, Resamp = 3.3kΩ, T_A = -55°C to +100°C. Full Load (FL) = 1.6A

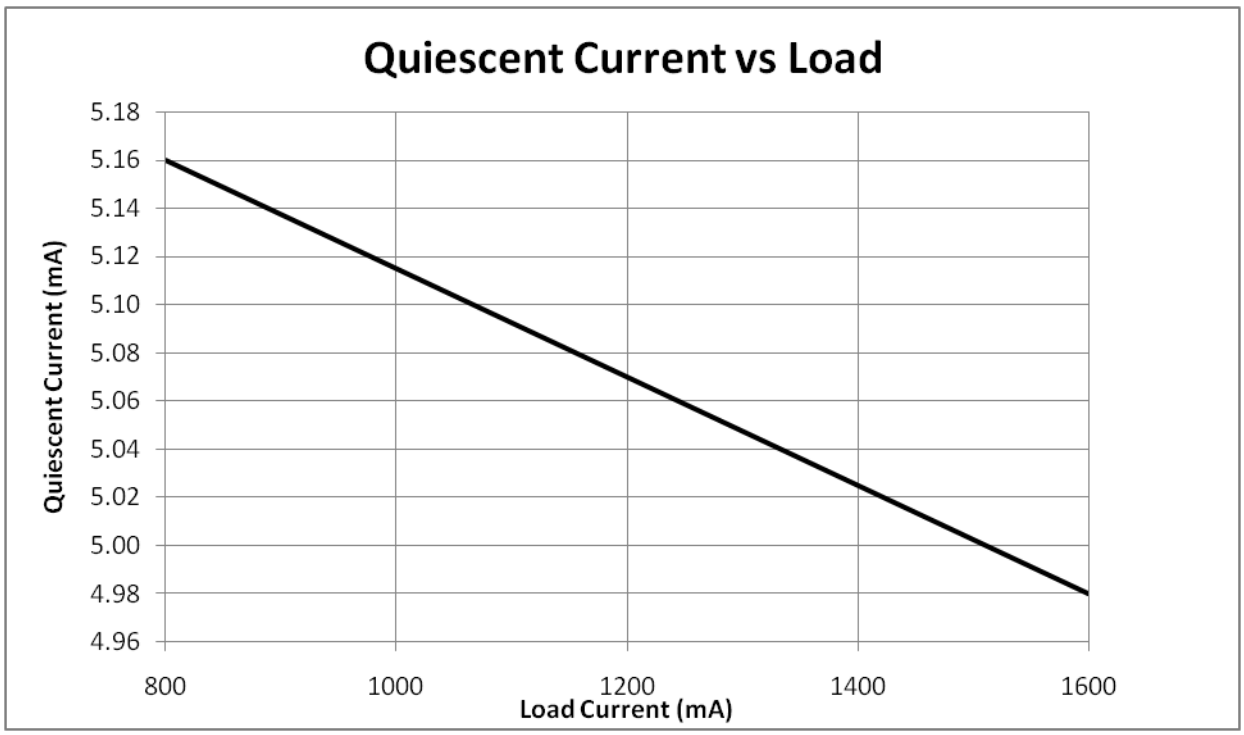
Table 5: DC Electrical Specification

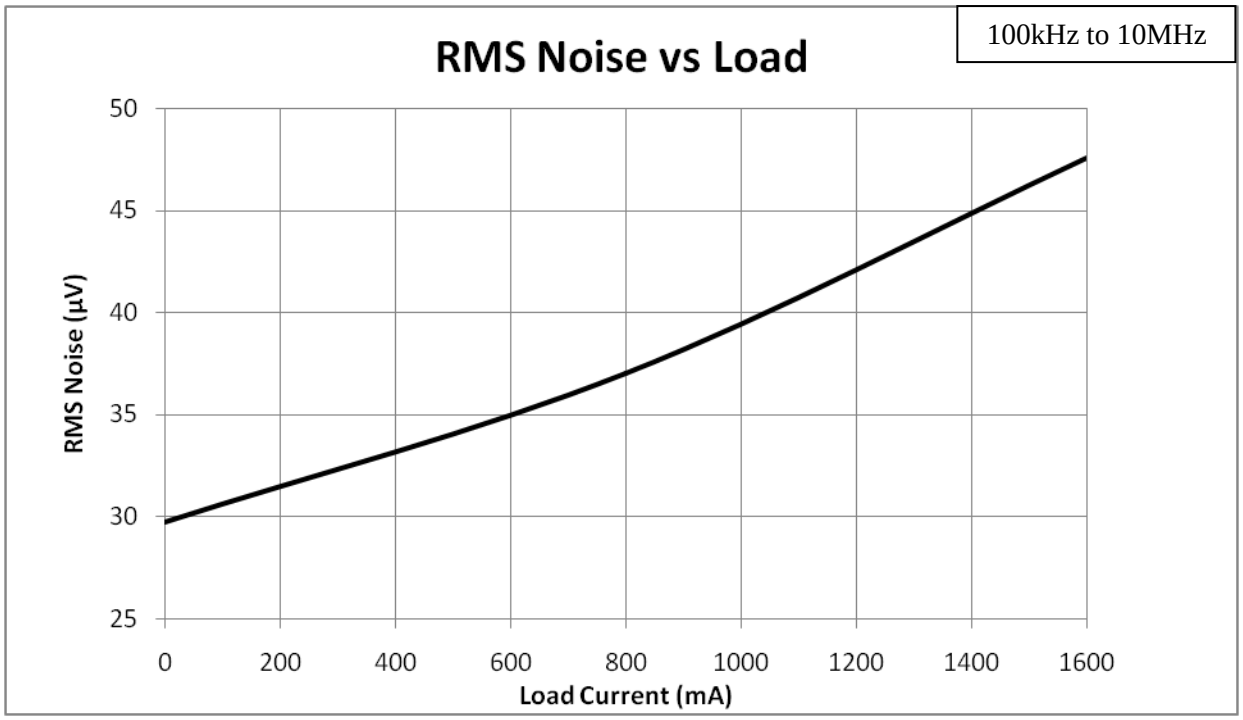
PARAMETER	TEST CONDITIONS		SC1026-0			UNITS
			MIN	TYP	MAX	
Nominal Voltage	I_{LOAD} = FL		1.79	1.82	1.84	V
	Vin = 2.8V, (I_{LOAD} = FL)		1.79	1.83	1.85	
Initial Accuracy	I_{LOAD} = FL		-1	-	3	%
Temperature Coefficient	I_{LOAD} = FL		-	88	100	ppm/°C
Load Regulation	10% of FL ≤ I_{LOAD} ≤ 100% of FL		-	0.3	0.95	%
Line Regulation	2.3V ≤ V_{IN} ≤ 2.8V,	I_{LOAD} = 50% of FL	-	0.10	0.40	%
		I_{LOAD} = 100% of FL	-	0.15	0.60	
Dropout Voltage	I_{LOAD} = 50% of FL		0.130	0.135	0.200	V
	I_{LOAD} = 100% of FL		0.250	0.270	0.400	
Quiescent Current	I_{LOAD} = 50% of FL		5.5	5.9	6.3	mA
	I_{LOAD} = 100% of FL		6.0	6.5	7.5	
Output Noise	I_{LOAD} = FL (100 kHz to 10 MHz)		45	55	70	µVrms
Temperature Shutdown	I_{LOAD} = No Load		-	120	-	°C
Power Good	I_{LOAD} = Incremental		-	-5%	-	%
Power Good Response time	I_{LOAD} = Incremental		-	50	-	ms
Short circuit current	I_{LOAD} = Short circuit current Resamp = 3.3kΩ		3.2	3.4	3.8	A
Over Current shutdown delay	I_{LOAD} = Short circuit current		1	1.2	1.5	s

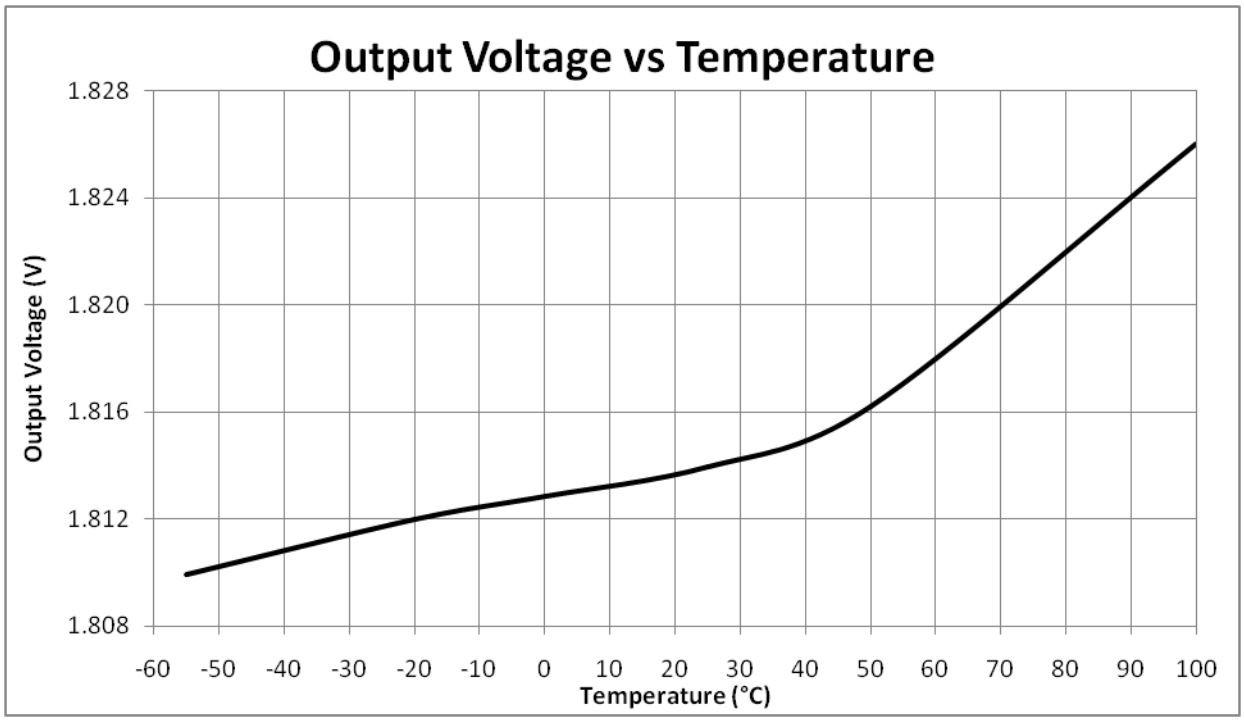
TYPICAL CHARACTERISTICS:

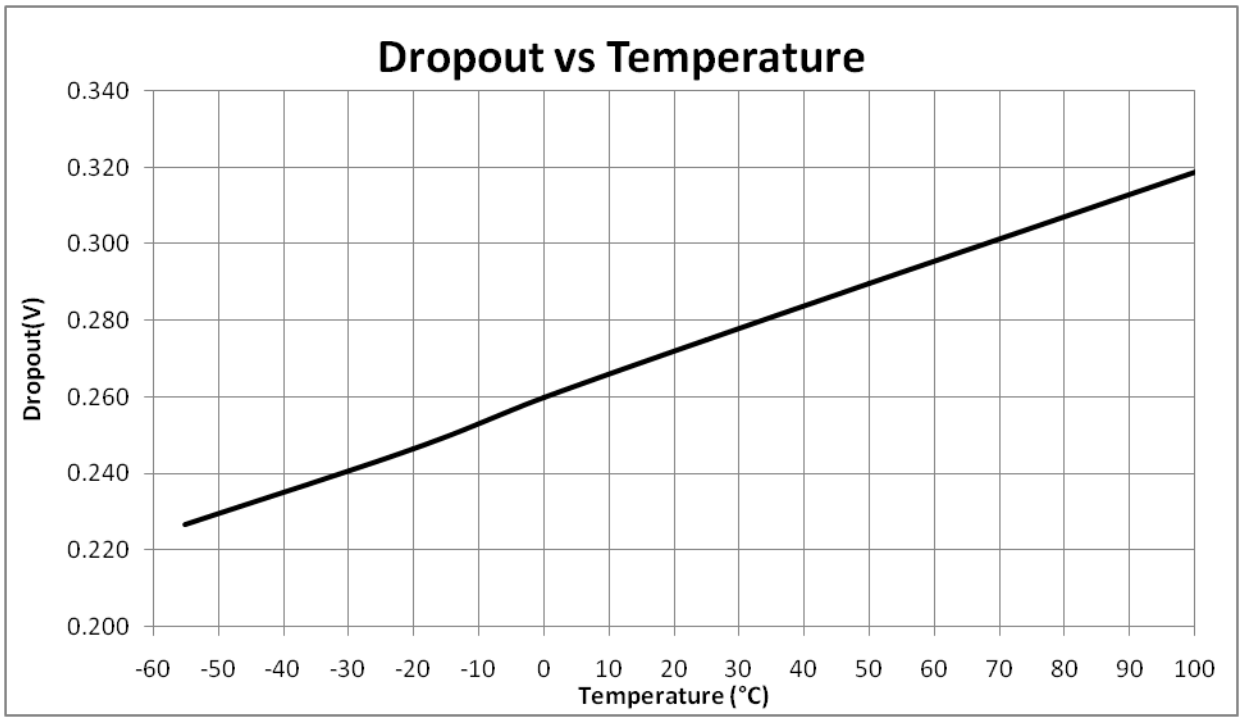
V_{IN} =2.3V, C_{IN} = 1µF, C_{OUT} = 10µF, T_A = 23±2°C, Full Load (FL) = 1.6A unless otherwise specified.

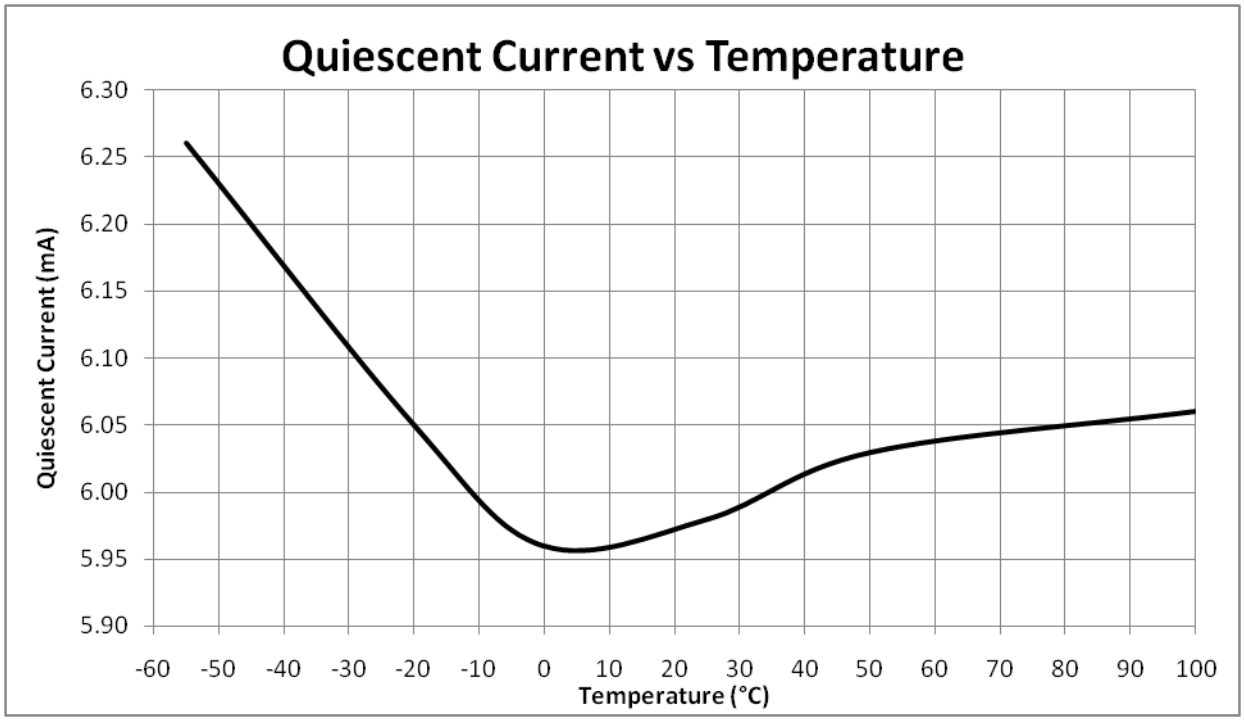





RMS Noise vs Load
100kHz to 10MHz
RMS Noise (µV)
50
45
40
35
30
25
0
200
400
600
800
1000
1200
1400
1600
Load Current (mA)


Output Voltage vs Temperature
Output Voltage (V)
1.828
1.824
1.820
1.816
1.812
1.808
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
Temperature (°C)


Dropout vs Temperature
Dropout(V)
0.340
0.320
0.300
0.280
0.260
0.240
0.220
0.200
-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100
Temperature (°C)


Quiescent Current vs Temperature
Quiescent Current (mA)
6.30
6.25
6.20
6.15
6.10
6.05
6.00
5.95
5.90
-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100
Temperature (°C)

KEY TERMS:

i) Load Regulation

It measures the ability of the regulator to maintain the specified output voltage under different load conditions. It is specified as the percentage change in the output voltage relative to the nominal output voltage (V_{NOM}).

$$\text{Load Regulation} = \frac{\Delta Vout}{Vnom} 100\ \%$$

ii) Line Regulation

It measures the ability of the regulator to maintain the specified output voltage over a range of input voltages. It is specified as percentage per Volt change in the output voltage as the input line voltage changes over its largest allowable range.

$$\text{Line Regulation} = \frac{\Delta Vout}{\Delta Vin} \text{ X } \frac{100}{Vnom} \frac{\%}{\text{V}}$$

iii) Temperature Coefficient

It measures the ability of the regulator to maintain the specified output voltage over a range of temperature. It is specified as ppm per °C change in the input voltage over its full allowable temperature range.

$$\text{TC} \equiv \frac{\Delta Vout}{\Delta T} \text{ X } \frac{10^6}{Vnom} \frac{\text{ppm}}{^\circ\text{C}}$$

iv) Dropout Voltage

It is the minimum voltage drop between input line voltage and output voltage, until the output voltage remains within 1% of its nominal value.

v) Bias current or Quiescent Current Test

It is the total bias current (different from load current) consumed by different blocks of voltage regulator for their operation.

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