LDO Linear Voltage Regulator 1.8V/0.8A

(SC1021-0)

*Evaluation model

DATASHEET

Version 1.0, Oct 2020

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PRODUCT DESCRIPTION:

This LDO provides a fixed output voltage of 1.8V, 800mA 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% and +10% of nominal output. The LDO can operate over a large temperature (T_A) range of -55°C to +125°C.

FEATURES:

- **Nominal V_{OUT}: 1.8V**
- **Maximum output current: 800mA**
- **Dropout Voltage: < 200mV at 800mA load**
- **Initial voltage accuracy: ± 3%**
- **Voltage accuracy over line and load: <±1%**
- **Both upper and lower Power Good feature**
- **Over temperature shut down mechanism**
- **Short circuit current limiting feature**
- **Quiescent current (I_{GND}): 10mA at 800mA load**
- **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
SC1021-0	6.276mm X 8.392mm	CERQUAD	80	Evaluation Model	-55°C to +125°C

*Die available for usage of the customer.

BLOCK DIAGRAM:

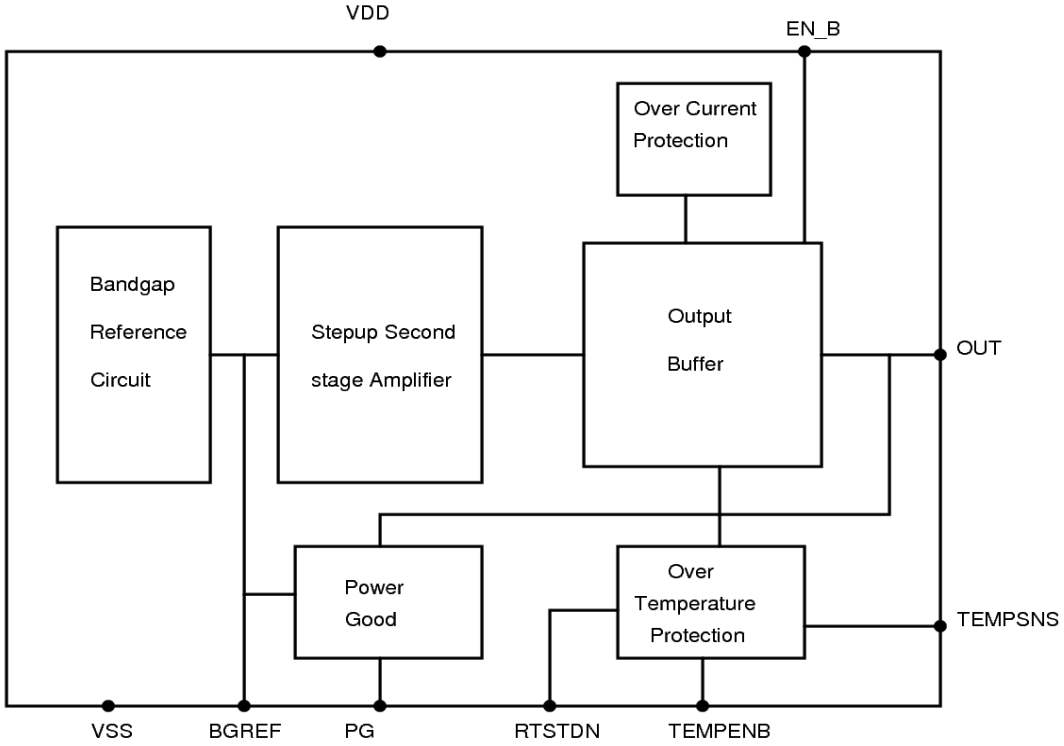


Figure 1: Block Diagram

PIN CONFIGURATION (80 Pin CERQUAD):

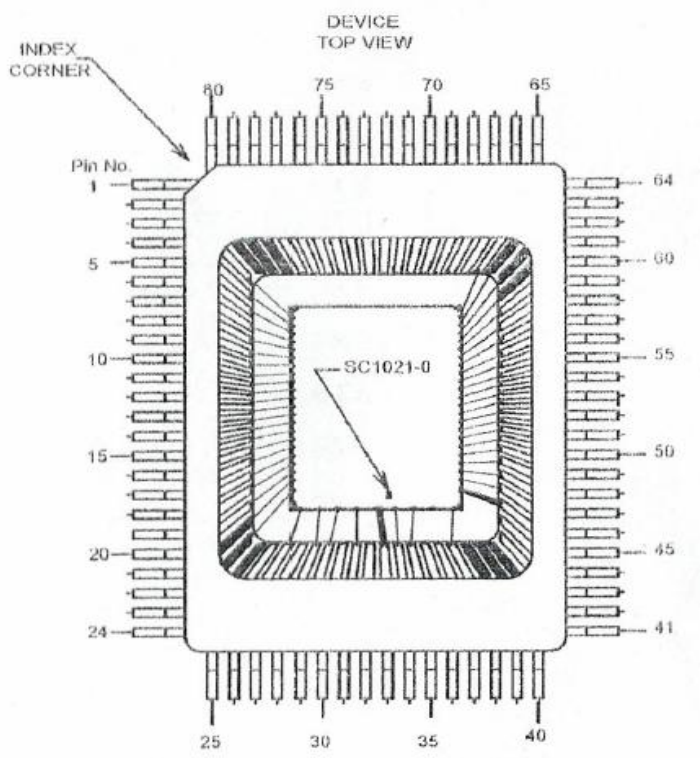


Figure 2: Pin Configuration

PIN DESCRIPTION:

Table 2: Pin Details

PIN NO	PIN NAME	PIN DESCRIPTION
1	NC	NC
2	VOUT	LDO regulated output voltage
3	VOUT	LDO regulated output voltage
4	VOUT	LDO regulated output voltage
5	VOUT	LDO regulated output voltage
6	VOUT	LDO regulated output voltage
7	VOUT	LDO regulated output voltage
8	VOUT	LDO regulated output voltage
9	VOUT	LDO regulated output voltage
10	VOUT	LDO regulated output voltage
11	VOUT	LDO regulated output voltage
12	VOUT	LDO regulated output voltage
13	VOUT	LDO regulated output voltage
14	VOUT	LDO regulated output voltage
15	VOUT	LDO regulated output voltage
16	VOUT	LDO regulated output voltage
17	VOUT	LDO regulated output voltage
18	VOUT	LDO regulated output voltage
19	VOUT	LDO regulated output voltage
20	VOUT	LDO regulated output voltage
21	VOUT	LDO regulated output voltage
22	VOUT	LDO regulated output voltage
23	INNEG	0 Ω (short) to 500 Ω to LDO out. 10 KΩ to ground.
24	VIN	LDO input voltage
25	NC	NC
26	RESAMP	Resistor in the range of 1 KΩ to 10 KΩ to ground
27	NC	NC
28	RTSTDN	510 Ω resistor to ground to monitor Current
29	PG	Logic 0 (0V) when LDO output voltage goes below 5% and above 10% of nominal value, otherwise logic 1(LDO out nominal value).
30	NC	NC
31	TEMPSNS	Output of BJT based temperature Sensor
32	NC	NC
33	VSS	LDO ground

PIN NO	PIN NAME	PIN DESCRIPTION
34	TEMPEN_B	Logic 1(LDO I/P Voltage) for disabling over-temperature Shutdown circuit otherwise logic 0 (0.0V)
35	BGREF	Bandgap reference output
36	NC	NC
37	VSS	LDO ground
38	EN_B	Logic 1 (LDO i/p Voltage) for disabling LDO otherwise Logic 0 (0.0V)
39	NC	NC
40	NC	NC
41	NC	NC
42	NC	NC
43	NC	NC
44	VIN	LDO input voltage
45	VIN	LDO input voltage
46	VIN	LDO input voltage
47	VIN	LDO input voltage
48	VIN	LDO input voltage
49	VIN	LDO input voltage
50	VIN	LDO input voltage
51	VIN	LDO input voltage
52	VIN	LDO input voltage
53	VIN	LDO input voltage
54	VIN	LDO input voltage
55	VIN	LDO input voltage
56	VIN	LDO input voltage
57	VIN	LDO input voltage
58	VIN	LDO input voltage
59	VIN	LDO input voltage
60	VIN	LDO input voltage
61	VIN	LDO input voltage
62	VIN	LDO input voltage
63	VIN	LDO input voltage
64	VIN	LDO input voltage
65	VIN	LDO input voltage
66	NC	NC
67	NC	NC
68	NC	NC
69	NC	NC
70	NC	NC
71	NC	NC

PIN NO	PIN NAME	PIN DESCRIPTION
72	NC	NC
73	NC	NC
74	NC	NC
75	NC	NC
76	NC	NC
77	NC	NC
78	NC	NC
79	NC	NC
80	NC	NC

ABSOLUTE MAXIMUM RATING (1):

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

Table 3: Absolute Maximum Rating

PARAMETER	WITH RESPECT TO	MIN.	MAX.	UNIT
VDD	AVSS	-0.3	4.3	V
Storage Temperature		-65	150	℃
ESD Tolerance (HBM)		1000		V
Operating Ambient Temperature Range		-55	+125	℃

(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	2.6	3.3	3.6	V
I_{LOAD}	Output drive current	-	-	800	mA
T_A	Ambient temperature range	-55	-	+125	ºC

DC ELECTRICAL SPECIFICATIONS:

Test condition: All Specifications: V_{IN} =3.3V, C_{IN} = 1uF, C_{OUT} = 10µF, T_A = -55°C to +125°C, TEMPENB pin = Logic 1 (disable over temperature shutdown feature); unless otherwise specified. Full Load (FL) = 800mA

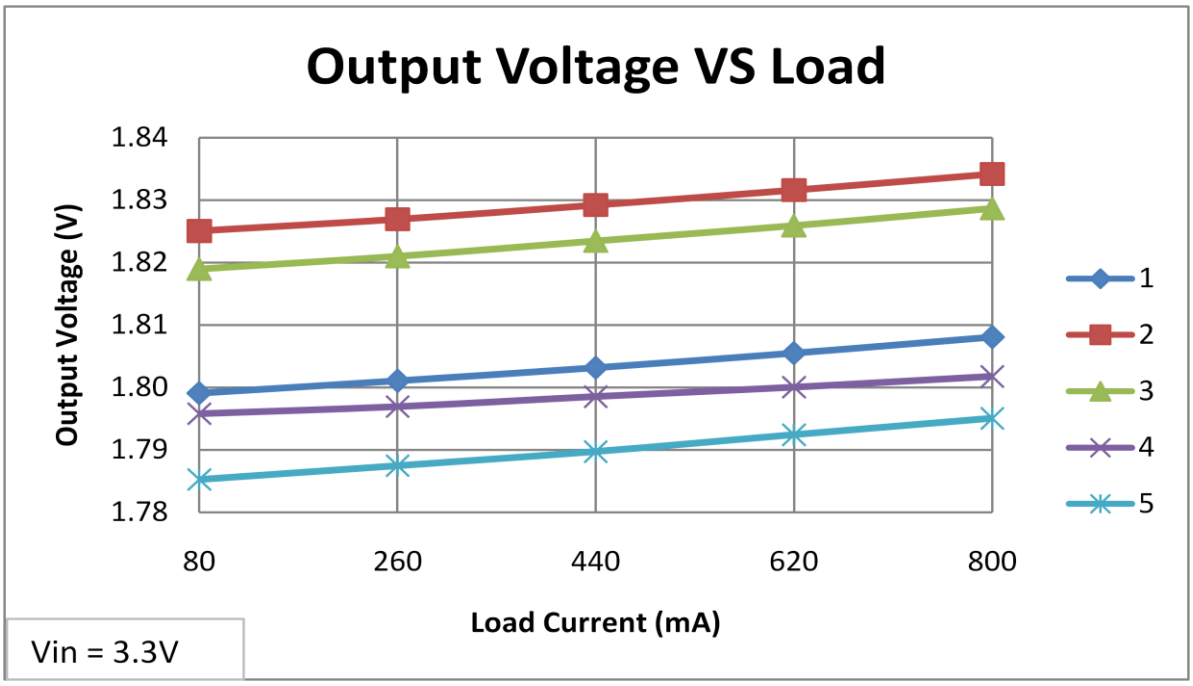
Table 5: DC Electrical Specification

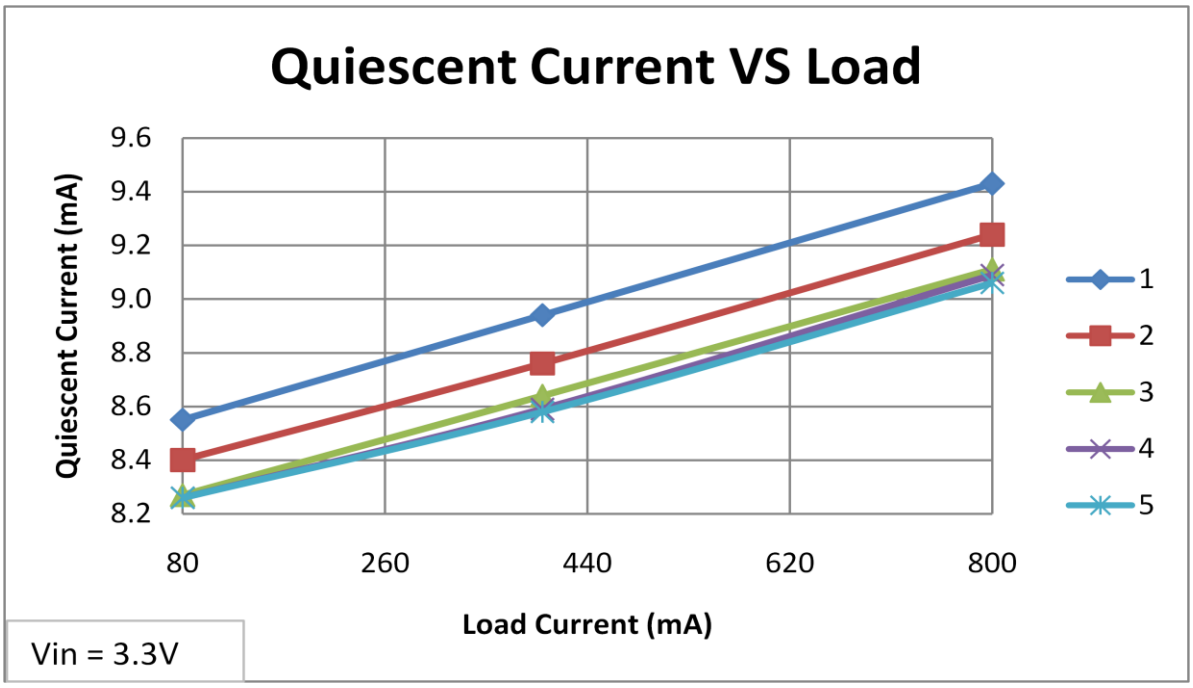
PARAMETER	TEST CONDITIONS		SC1021-0			UNITS
			MIN	TYP	MAX	
Nominal Voltage	I_{LOAD} = 10% of FL		1.76	1.8	1.85	V
	Vin = 3.6V, I_{LOAD} = 10% of FL		1.74	1.8	1.86	
Initial Accuracy	I_{LOAD} = 10% of FL		-2.8	-	2.8	%
Temperature Coefficient	I_{LOAD} = 10% of FL		80	97	120	ppm/°C
Load Regulation	(10% of FL ≤ I_{LOAD} ≤ 100% of FL		-	0.45	0.9	%
Line Regulation	3.0V ≤ V_{IN} ≤ 3.7V,	I_{LOAD} = 10% of FL	-	0.04	0.2	%
		I_{LOAD} = 50% of FL	-	0.03	0.4	
		I_{LOAD} = 100% of FL	-	0.05	0.6	
Dropout Voltage	I_{LOAD} = 50% of FL		0.07	0.08	0.1	V
	I_{LOAD} = 100% of FL		0.1	0.12	0.16	
Quiescent Current	I_{LOAD} = 10% of FL		8.2	8.5	8.8	mA
	I_{LOAD} = 50% of FL		8.6	8.9	9.2	
	I_{LOAD} = 100% of FL		9.1	9.4	9.8	
Temp Sense Out	I_{LOAD} = No Load		1.35	1.62	1.83	V
			-2.34	-2.38	-2.41	mV/°C
Temperature Shutdown	I_{LOAD} = No Load TEMPENB = Logic 0 (0V)		-	115	-	°C
Power Good	Vin = 2.4V, I_{LOAD} = Incremental		-5		+10	%

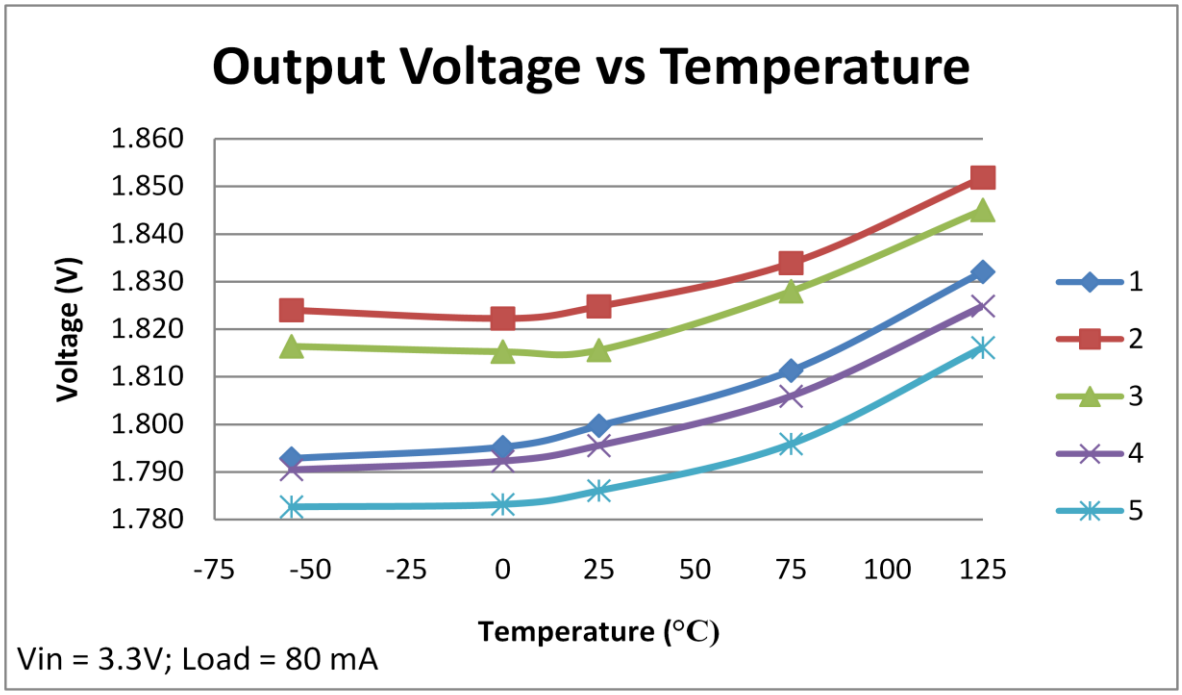
Note: All parameters are calculated by using V_{NOM} at V_{IN} = 3.3V at 10% Load, i.e., 80mA.
Power Good feature (±) was verified at 2.4V input (In order to reduce the power dissipation)

TYPICAL CHARACTERISTICS:

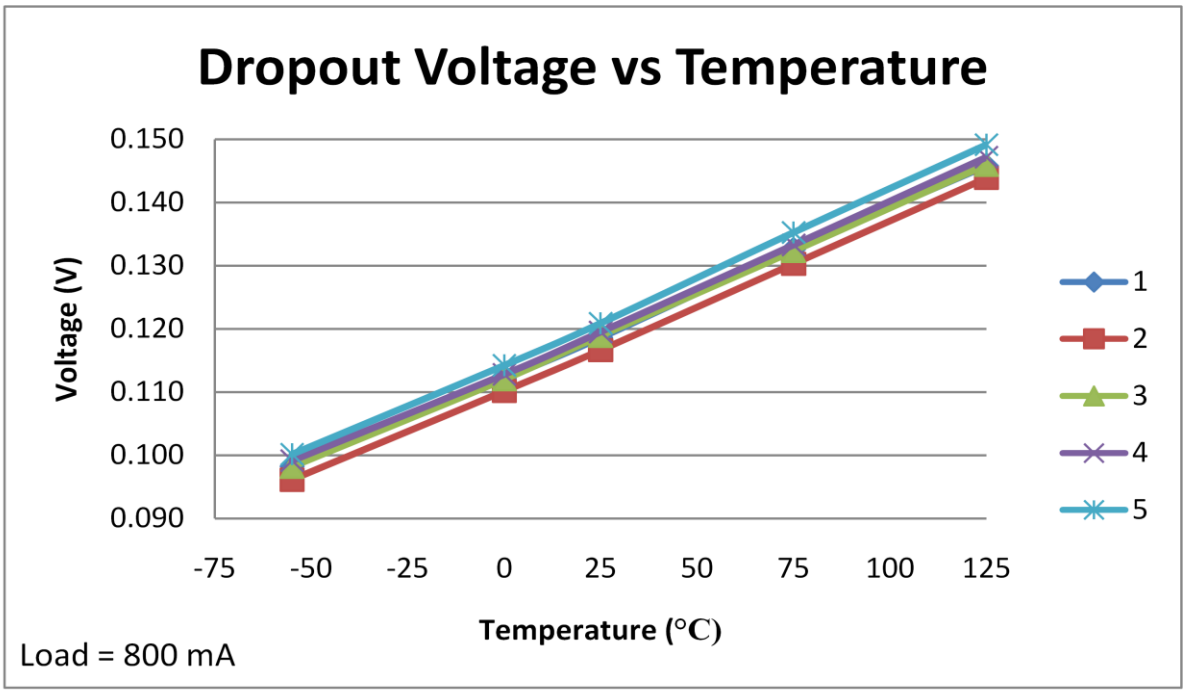
V_{IN} =3.3V-3.6V, C_{IN} = 1uF, C_{OUT} = 10µF, T_A = -55°C to +125°C, TEMPENB = Logic 1 (disable over temperature shutdown feature); unless otherwise specified. Full Load (FL) = 800mA



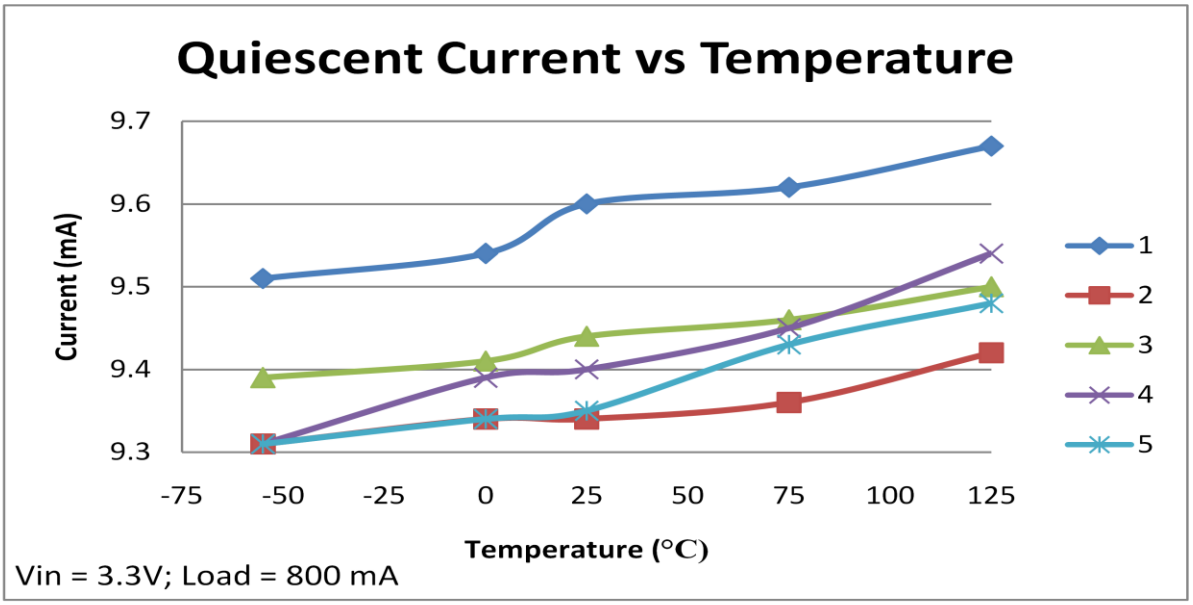


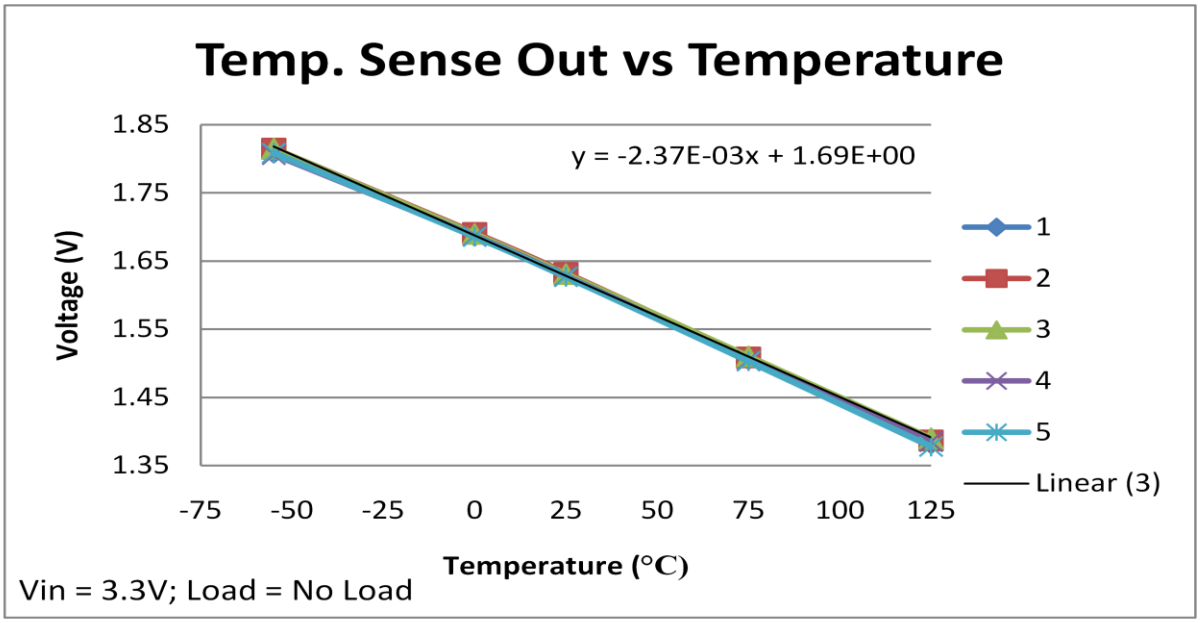


Vin = 3.3V; Load = 80 mA



Load = 800 mA





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 ℃ change in the input voltage over its full allowable temperature range.

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

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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