NCP698

150 mA CMOS Ultra Low Iq and I_{GND} LDO Regulator with Enable

This series of fixed output low−dropout linear regulators are designed for handheld communication equipment and portable battery powered applications which require low quiescent and ground current. This series features an ultra−low quiescent current of 2.5 μA. Each device contains a voltage reference unit, an error amplifier, a PMOS power transistor, resistors for setting output voltage, current limit, and temperature limit protection circuits. The NCP698 series provides an enable pin for ON/OFF control.

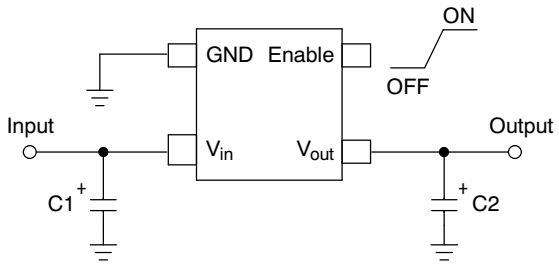
The NCP698 has been designed to be used with low cost ceramic capacitors and requires a minimum output capacitor of 0.1 μF. The device is housed in the micro−miniature SC82−AB surface mount package. Standard voltage versions are 1.3, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3, 3.5 and 5.0 V. Other voltages are available in 100 mV steps.

Features

- Ultra Low Quiescent Current of 2.5 μA Typical
- Output Voltage Accuracy of 2.0%
- Operating Temperature Range of −40°C to 85°C
- Enable Function
- This is a Pb−Free Device

Typical Applications

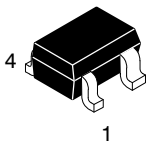
- Battery Powered Instruments
- Hand−Held Instruments
- Camcorders and Cameras



This device contains 28 active transistors

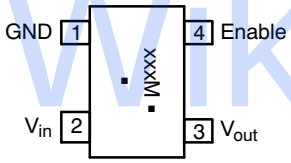
Figure 1. Typical Application Diagram

ON Semiconductor®



SC82−AB (SC70−4)
SQ SUFFIX
CASE 419C

PIN CONNECTIONS & MARKING DIAGRAMS



Top View)

xxx = Specific Device Code
M = Month Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position and underbar may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

Datasheet.Wiki

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Publication Order Number:
NCP698/D

PIN FUNCTION DESCRIPTION

Pin No.	Pin Name	Description
1	GND	Power supply ground.
2	Vin	Positive power supply input voltage.
3	Vout	Regulated output voltage.
4	Enable	This input is used to place the device into low−power standby. When this input is pulled low, the device is disabled. If this function is not used, Enable should be connected to Vin.
−	N/C	No internal connection.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage	V_{in}	6.0	V
Enable Voltage	Enable	−0.3 to V_{in} +0.3	V
Output Voltage	V_{out}	−0.3 to V_{in} +0.3	V
Power Dissipation and Thermal Characteristics (Note 1) Power Dissipation Thermal Resistance, Junction−to−Ambient (1 oz copper, 1 in^2 copper area)	 P_D $R_{\theta JA}$	 Internally Limited 235	 W °C/W
Operating Junction Temperature	T_J	+150	°C
Operating Ambient Temperature	T_A	−40 to +85	°C
Storage Temperature	T_{stg}	−55 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Refer to Electrical Characteristics and Application Information for Safe Operating Area.
2. This device series contains ESD protection and exceeds the following tests:
   Human Body Model 2000 V per MIL−STD−883, Method 3015
   Machine Model Method 200 V
3. Latch up capability (85°C) ± 100 mA DC with trigger voltage.

ELECTRICAL CHARACTERISTICS

(V_{in} = $V_{out(nom.)}$ + 1.0 V, V_{enable} = V_{in}, C_{in} = 1.0 μF, C_{out} = 1.0 μF, T_A = 25°C, unless otherwise noted. Note 4)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (I_{out} = 1.0 mA)	V_{out}				V
1.3 V		1.261	1.3	1.339	
1.5 V		1.455	1.5	1.545	
1.8 V		1.746	1.8	1.854	
2.5 V		2.425	2.5	2.575	
2.8 V		2.744	2.8	2.856	
3.0 V		2.940	3.0	3.060	
3.3 V		3.234	3.3	3.366	
3.5 V		3.430	3.5	3.570	
5.0 V		4.900	5.0	5.100	
Output Voltage (T_A = −40 to +85°C, I_{out} = 1.0 mA)	V_{out}				V
1.3 V		1.261	1.3	1.339	
1.5 V		1.455	1.5	1.545	
1.8 V		1.746	1.8	1.854	
2.5 V		2.425	2.5	2.575	
2.8 V		2.716	2.8	2.884	
3.0 V		2.910	3.0	3.090	
3.3 V		3.201	3.3	3.399	
3.5 V		3.430	3.5	3.570	
5.0 V		4.900	5.0	5.100	
Line Regulation	Reg_{line}				mV
1.5 V−4.4 V (V_{in} = $V_{o(nom.)}$ + 1.0 V to 6.0 V		−	10	20	
4.5 V−5.0 V (V_{in} = 5.5 V to 6.0 V)		−	10	20	
Load Regulation (I_{out} = 10 mA to 150 mA)	Reg_{load}	−	20	60	mV
Output Current (V_{out} = (V_{out} at I_{out} = 150 mA) −3.0%)	$I_{o(nom.)}$				mA
1.3 V to 3.9 V (V_{in} = $V_{out(nom.)}$ + 2.0 V)		150	280	−	
4.0 V−5.0 V (V_{in} = 6.0 V)		150	280	−	
Dropout Voltage (T_A = −40°C to 85°C, I_{out} = 80 mA, Measured at V_{out} −3.0%)	V_{in}−V_{out}				mV
1.3 V		−	750	1200	
1.5 V		−	550	800	
1.8 V		−	400	550	
2.5 V−2.8 V		−	250	400	
3.0 V−3.5 V		−	200	350	
5.0 V		−	140	200	
Dropout Voltage (T_A = −40°C to 85°C, I_{out} = 150 mA, Measured at V_{out} −3.0%)	V_{in}−V_{out}				mV
1.3 V		−	1050	1500	
1.5 V		−	870	1070	
1.8 V		−	700	900	
2.5 V−2.8 V		−	520	700	
3.0 V−3.5 V		−	370	525	
5.0 V		−	280	400	
Disable Current (Enable Input = 0 V)	I_{DIS}	−	0.1	1.0	μA
Quiescent Current (Enable Input = V_{in}, I_{out} = 0 mA)	I_Q	−	2.5	−	μA
Ground Current (Enable Input = V_{in}, I_{out} = 1.0 mA to 150 mA)	I_{GND}	−	2.5	6.0	μA
Output Short Circuit Current	$I_{out(max)}$				mA
1.3 V to 3.9 V (V_{in} = V_{nom} + 2.0 V)		150	300	600	
4.0 V−5.0 V (V_{in} = 6.0 V)		150	300	600	
Output Voltage Noise (f = 100 Hz to 100 kHz, V_{out} = 3.0 V)	V_n	−	100	−	μVrms

ELECTRICAL CHARACTERISTICS (continued)
(V_{in} = $V_{out(nom.)}$ + 1.0 V, V_{enable} = V_{in}, C_{in} = 1.0 μF, C_{out} = 1.0 μF, T_A = 25°C, unless otherwise noted. Note 4)

Enable Input Threshold Voltage (Voltage Increasing, Output Turns On, Logic High) (Voltage Decreasing, Output Turns Off, Logic Low)	$V_{th(en)}$	 1.3 –	 – –	 – 0.3	V
Output Voltage Temperature Coefficient	T_C	–	±100	–	ppm/°C

4. Performance guaranteed over the indicated operating temperature range by design and/or characterization, production tested at T_J = T_A = 25°C. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.
5. Maximum package power dissipation limits must be observed.

$$PD = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

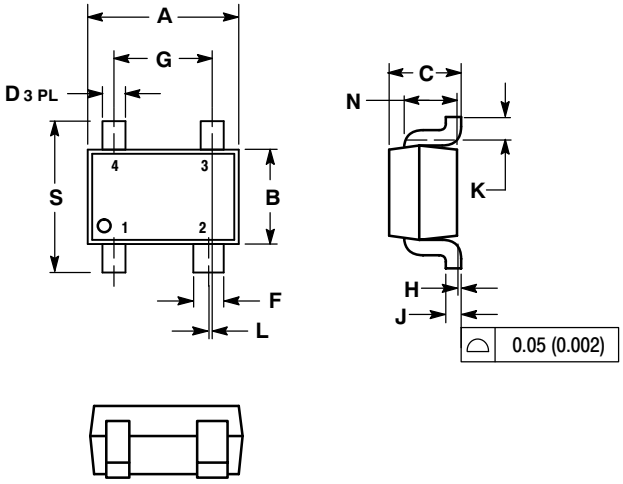
ORDERING INFORMATION

Device	Nominal Output Voltage	Marking	Package	Shipping†
NCP698SQ13T1G	1.3	LJW	SC82−AB	3000 / Tape & Reel
NCP698SQ15T1G	1.5	LJX		
NCP698SQ18T1G	1.8	LJY		
NCP698SQ25T1G	2.5	LJZ		
NCP698SQ28T1G	2.8	LKD		
NCP698SQ30T1G	3.0	LKA		
NCP698SQ33T1G	3.3	LKB		
NCP698SQ35T1G	3.5	LKE		
NCP698SQ50T1G	5.0	LKC		

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

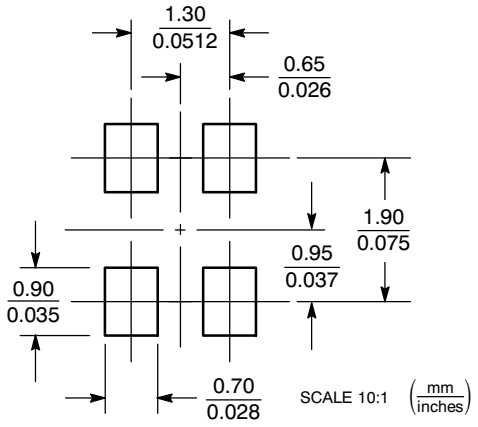
SC−82AB
CASE 419C−02
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. 419C−01 OBSOLETE. NEW STANDARD IS 419C−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	1.8	2.2	0.071	0.087
B	1.15	1.35	0.045	0.053
C	0.8	1.1	0.031	0.043
D	0.2	0.4	0.008	0.016
F	0.3	0.5	0.012	0.020
G	1.1	1.5	0.043	0.059
H	0.0	0.1	0.000	0.004
J	0.10	0.26	0.004	0.010
K	0.1	---	0.004	---
L	0.05 BSC		0.002 BSC	
N	0.2 REF		0.008 REF	
S	1.8	2.4	0.07	0.09

SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.