SN7101/P

Voltage and Current Controller

KODENSHI AUK

Semiconductor

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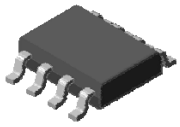
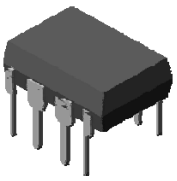


SOP-8



DIP-8

Description

The SN7101 is integrated a high stability band gap voltage reference, two ORed operational amplifiers and a current source.

This IC compares the DC voltage and the current level at the output of a switching power supply to an internal reference. It provides a feedback through an Opto-coupler to the PWM controller IC in the primary side. The controlled current generator can be used to modify the level of current limitation by offsetting the information coming from the current sensing resistor.

Features and Benefits

◈1.24V Series Voltage Reference with 10mA Output Current and 2.5% Precision

◈Two Operational Amplifiers with ORed Output And 1MHz Gain Bandwidth

◈Built-in Current Generator with Enable/Disable Fucntion

◈Wide Range of Supply Voltage [4.5V to 32V]

Application

◈ Battery chargers

◈ AC to DC Power Supply

ORDERING INFORMATION

Product	Marking	Package
SN7101	SN7101	SOP-8
SN7101P	SN7101	DIP-8

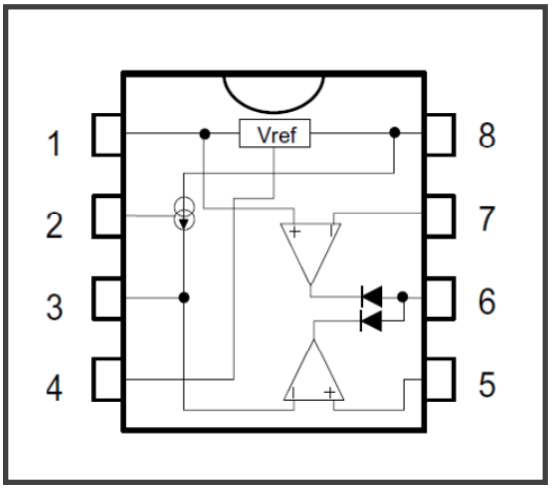
▲ **Marking Detail Information**

SN7101(①)
YYWW(②)

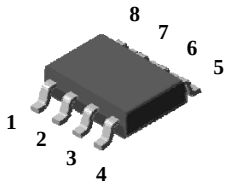
① Device Code

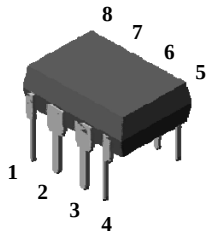
② Week Code

Block Diagram



◈ Pin connection





◈ Pin Configuration

No.	Name	Function
1	Vref	Voltage Reference Output 1.24V (Max. 10mA)
2	Csen	Current Source Enable Input. This current source can be used to offset the voltage measurement on the sense resistor and therefore to modify the charge current. The current source enabled when the input voltage on pin 2 is lower than 0.8V
3	Crref	Current Limitation Reference Input
4	GND	Ground
5	Crin	Current Limitation Loop Input, connected to the sense resistor
6	Output	Output pin common to the voltage regulation and current limitation loops. This output can drive the primary side of an opto-coupler
7	Vrin	Voltage Regulation Loop Input
8	V_{CC}	Supply Voltage Input (4.5V to 32V DC)

◈ Absolute Maximum Ratings (Ta = 25℃)

Parameter	Symbol	Limits		Unit
		SOP-8	DIP-8	
DC Supply Voltage	V_{CC}	36		V
Output Current	I_{OUT}	20		mA
Input Voltage	V_{IN}	-0.3 to Vcc-1.5		V
Power Dissipation	P_D	600	1000	mW
Maximum Junction Temperature	Tj	150		℃
Operating Junction Temperature Range	T_{opr}	-40 ~ +105		℃
Thermal Resistance	R_{thja}	200	130	℃/ W
Storage Temperature Range	T_{stg}	-55 ~ +150		℃

1) The voltage reference is not protected against permanent short circuit.
2) The magnitude of input and output voltages must never exceed -0.3V or Vcc-1.5V.

◈ Operating Condition

Parameter	Symbol	Limits	Unit
Supply Voltage	VCC	4.5 to 32	V

◈ Electrical characteristics

[Operational Amplifier]

(V_{CC}=15V, T_A=25℃ ; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Total Supply Current	I_{CC}	V_{CC}=1.5V	-	-	2.0	mA
Input Voltage Range	V_{IN}	-	0	-	Vcc-1.5	V
Input Offset Voltage	V_{IO}	Ta = 25℃	-5	1	5	mV
		Tmin. < Ta < Tmax	-7	-	7	
Input Bias Current	I_{IB}	Vin=1.2V/Vin=0V, Ta = 25℃	-700	-300	0	nA
		Tmin. < Ta < Tmax	-1000	-	0	
Output Sink Current	I_{SINK}	V_{OL}=2.5V, Ta = 25℃	-	15	-	mA
		Tmin. < Ta < Tmax	8	-	-	
Large Signal Voltage Gain	A_{VO}	R_L=2KΩ, Tmin. < Ta < Tmax	15	-	-	V/mV
Supply Voltage Rejection Ratio	SVR	Tmin. < Ta < Tmax	65	90	-	dB
Common Mode Rejection Ratio	CMR	Tmin. < Ta < Tmax	-	80	-	dB
Gain Bandwidth Product	GBP	Vcc=30V, Vin=10mV R_L=2k, C_L=100pF, f=100kHz,	0.5	0.9	-	MHz
Output Leakage Current	I_O	Ta = 25℃	-	-	2	uA
		Tmin. < Ta < Tmax	-	-	7	

◈ Electrical characteristics

[Voltage Reference]

(V_{CC}=15V, T_A=25℃ ; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Reference Voltage	Vref	Iout=1mA, Ta = 25℃	1.210	1.240	1.270	V
Temperature Stability	Kvt	Tmin. < Ta < Tmax	-	35	120	ppm/℃
Load Regulation	Reglo	1mA < Iout < 10mA	-	5	15	mV
Line Regulation	Regli	5V < Vin < 32V	-	3.5	10	mV

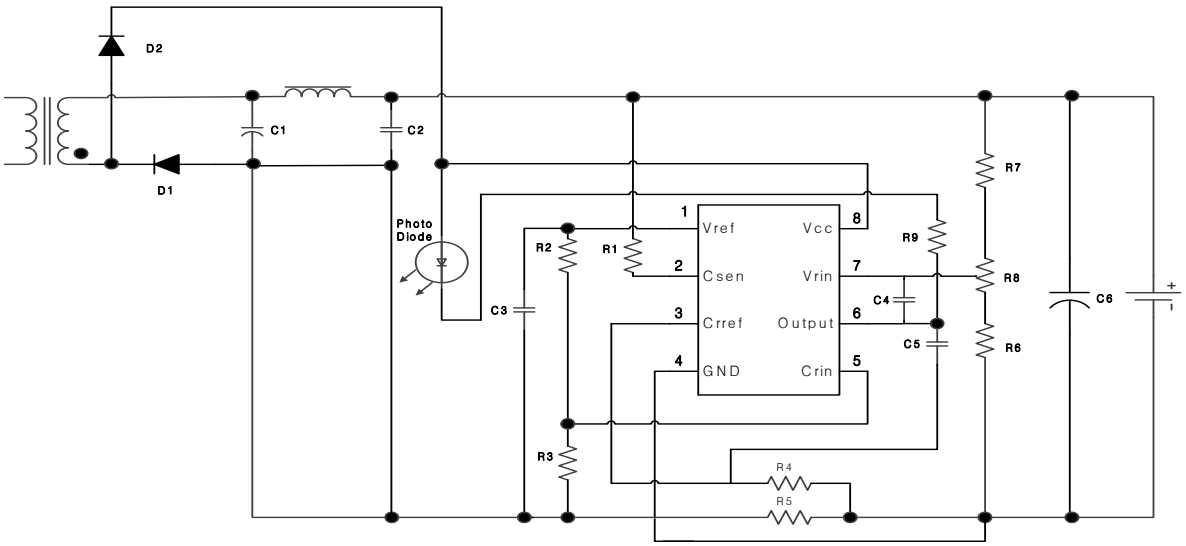
[Current Generator]

(V_{CC}=15V, T_A=25℃ ; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current Source	I_O	Ta = 25℃	-	1.4	-	mA
Temperature Stability	Kcgt	Tmin. < Ta < Tmax	-	600	-	ppm/℃
Line Regulation	Cglir	4.5V < Vcc < 32V	-	0.003	0.03	mA
Current Generator Enable Voltage	Vcsen	Io=1.4mA, Tmin. < Ta < Tmax	-	-	0.6	V
Current Generator Disable Voltage	Vcsdis	Io=0mA, Tmin. < Ta < Tmax	2	-	-	V
Current Generator Input Current @ On the Csen Pin	Icsen	Tmin. < Ta < Tmax	-	-	30	uA
Leakage Current	Icsleak	Vcs=2V, Tmin. < Ta < Tmax	-	0.5	2.0	uA

◈ Typical application circuit

Secondary Block



COMPONENTS CALCULATIONS

The voltage control is given by the choice of the resistor bridge R6/R7 (and the trimmer R8)

Vref = R6/(R6+R7)xVout

where Vref = 1.24V

The current control is given by the choice of the voltage drop through the sense resistor R5 (to be linked to the nominal current of the application) and by the value of the sense resistor itself.

For medium currents (< 1A), a good value for the voltage drop through R5 can be Vsense = 200mV (dissipation < 200mW). The resistor bridge R2/R3 should be chosen following

Vsense = R3/(R2+R3)xVref

The total value of the resistor bridge should be in the range of the kΩ in order to ensure a proper charge for the voltage reference(in the range of themA).

To set the current limit, the senseresistorR5should be chosen following

Ilim = Vsense/R5

The internal current generator (Isce) can be used to offset the current limitation with a lower value.

This current generator is activated by connecting pin 2 to ground. It is inhibited if pin 2 is connected to the positive rail via the pull up resistor R1. The current offset is given by the choice of the resistor R4. If Ilim1 is the current limit calculated in the previous paragraph, and Ilim2 is the current limit that is to be set when pin 2 is connected to ground, R4 should be chosen following

R4 = (Vsense - Ilim2xR5)/Isce

Fig.1 Reference Voltage vs. Ambient Temp.

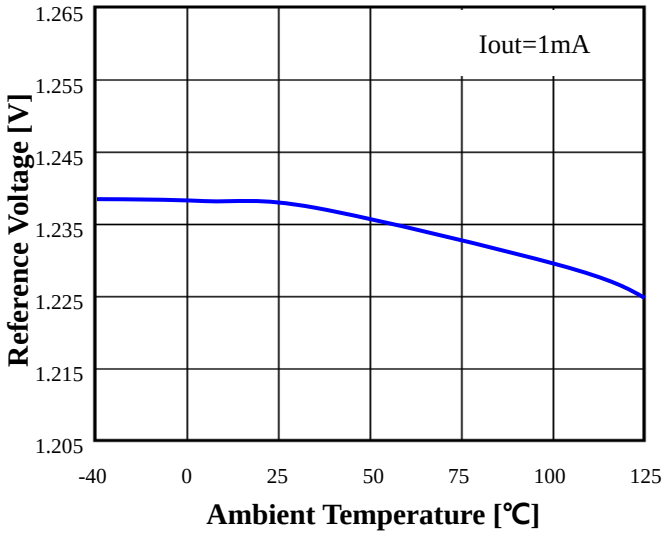


Fig.2 Supply Current vs. Ambient Temp.

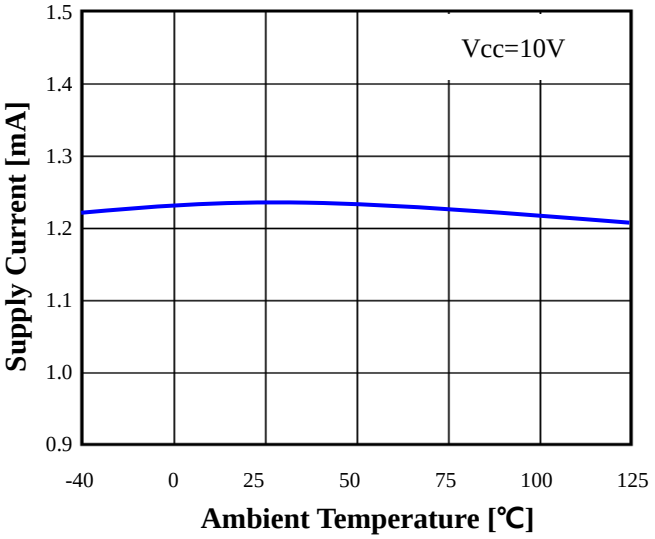


Fig.3 Reference Voltage vs. Cathode Current

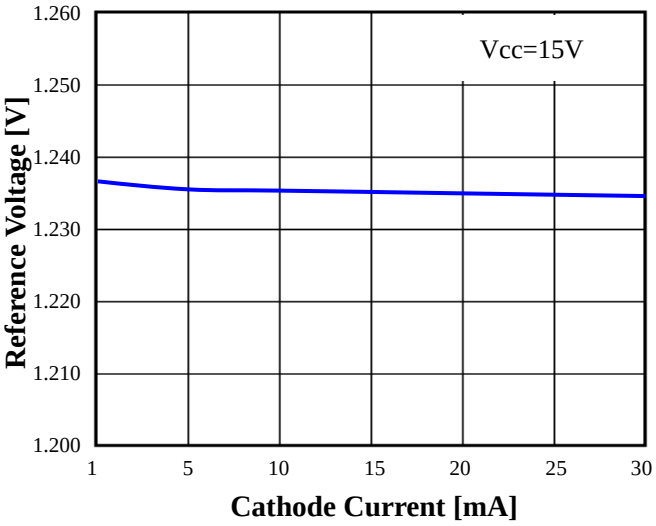


Fig.4 Input Bias Current vs. Ambient Temp.

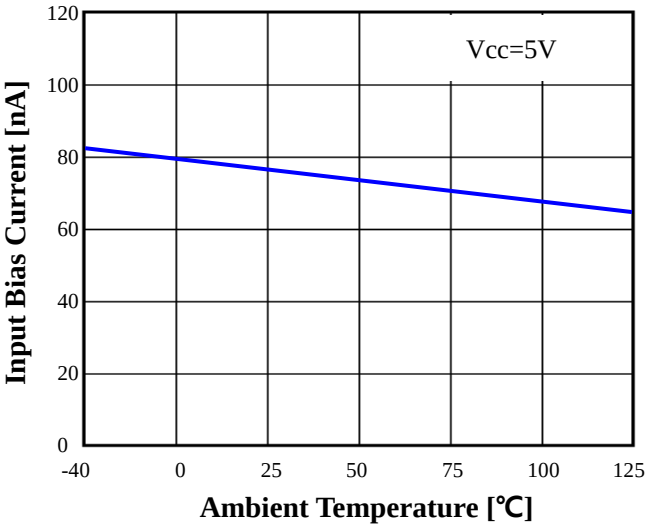
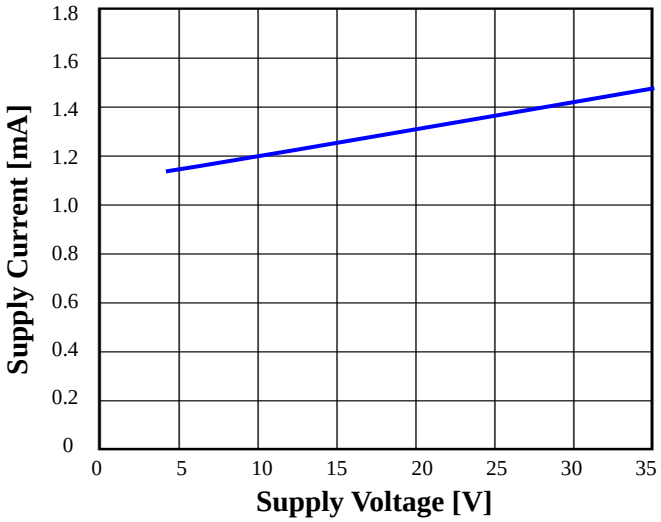
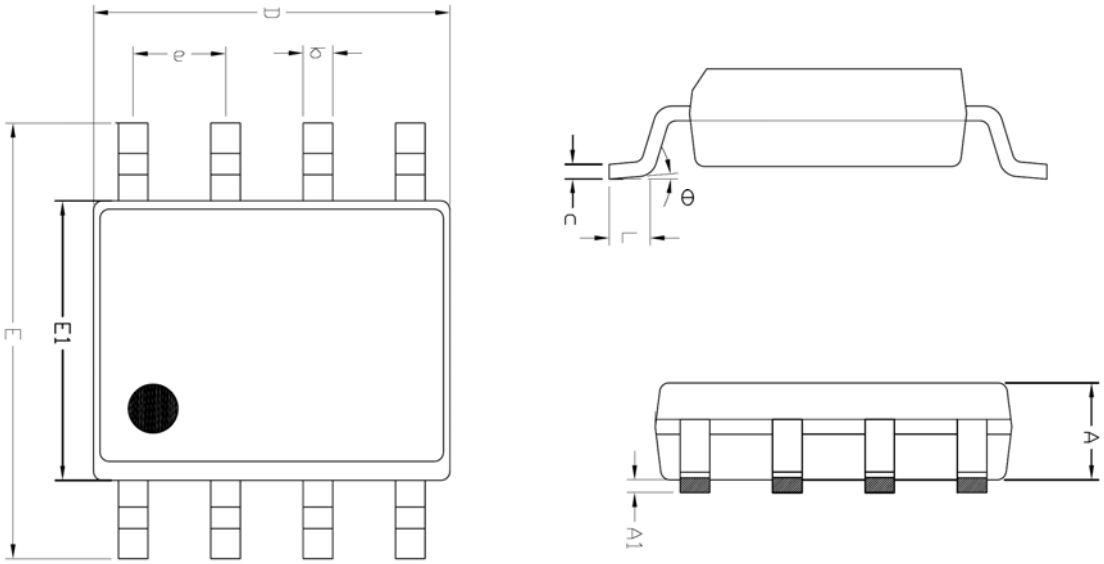


Fig.5 Supply Current vs. Supply Voltage.

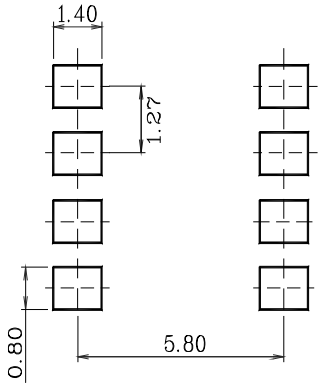


Outline Dimension (Unit : mm)

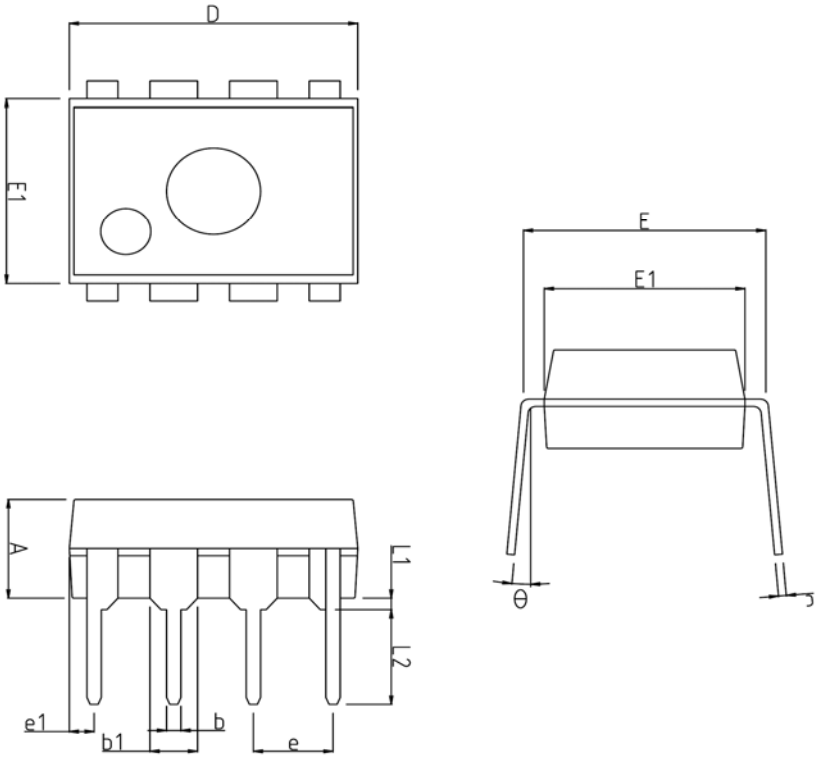


SYMBOL	MILLIMETER(mm)			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	1.245	—	1.445	
A1	0.125	0.175	0.275	
b	0.320	0.420	0.520	
c	0.170	0.220	0.270	
D	4.802	4.902	5.002	
E	5.870	6.020	6.170	
E1	3.761	3.861	3.961	
e	1.270 BSC			
L	0.462	0.562	0.662	
θ	0 °	—	8 °	

※ Recommend PCB solder land (Unit : mm)



Outline Dimension (Unit : mm)



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	3.20	3.40	3.60	
b	0.36	0.46	0.56	
b1	1.42	1.52	1.62	
c	0.20	0.25	0.35	
D	9.00	9.20	9.40	
E	7.37	7.62	7.87	
E1	6.20	6.40	6.60	
e	2.54 TYP			
e1	0.79 TYP			
L1	0.33	–	–	
L2	3.00	3.30	3.60	
θ	0°	–	15°	

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