GS2231A

3A Ultra-Low Dropout Voltage Regulator

Product Description

The GS2231A is a 3A low dropout linear regulator designed for low dropout and high current applications. This device works with dual supplies, a control input for the control circuitry and a power input as low as 1.05V for providing current to output. It features 3A output current and ultra-low-drop output voltage as well as full protection functions. V_{OUT} can be as low as 0.8V. The other features include soft start, under voltage protection, current limit protection, Power-On-Reset function, and over temperature protection. The GS2231A is available in DFN3x3-10L and PSOP8 packages.

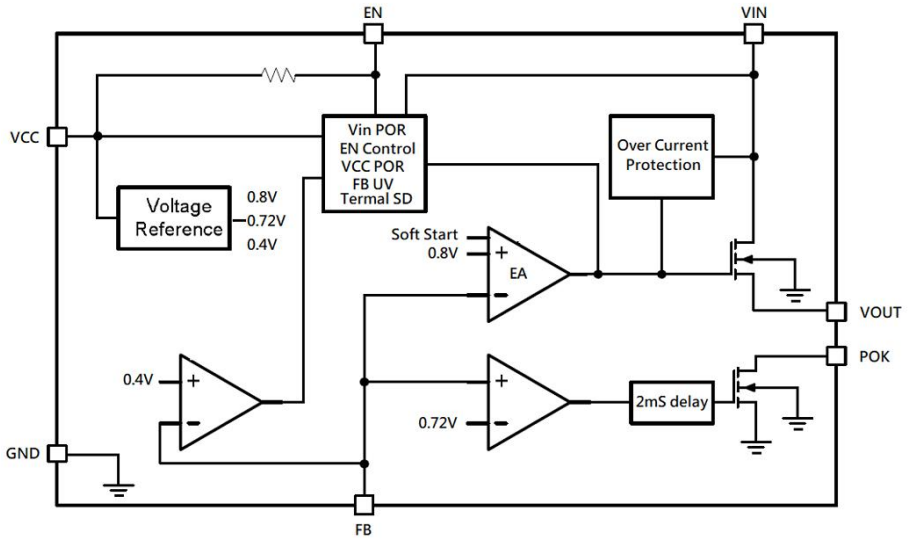
Features

- V_{IN} Range 1.05V to 5.5V
- Adjustable Output Voltages to 0.8V Min
- 250mV Typical Dropout at 3A
- Current Limit Protection
- Thermal Shutdown Protection
- V_{OUT} Power OK Signal
- V_{OUT} Pull Low Resistance when Disabled
- RoHS Compliant

Applications

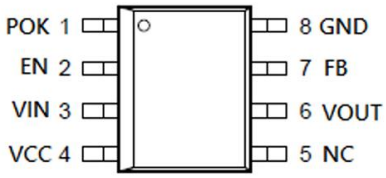
- Notebook, Netbook, Graphic Cards
- Low Voltage Logic Supplies
- Chipset Supplies
- SMPS Post Regulators

Function Block Diagram

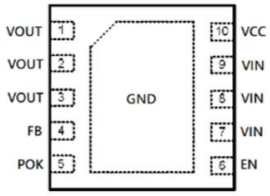


Pin Configuration & Description

TOP VIEW



PSOP-8



DFN3x3-10L

Pin Name	Pin No. (PSOP-8)	Pin No. (DFN3x3-10L)	Pin Function
P_{OK}	1	5	Power OK indication, open drain output.
EN	2	6	Enable pin. Internal pull high to V_{CC}
V_{IN}	3	7, 8 & 9	Supply input of power.
V_{CC}	4	10	Supply input of control circuit.
N.C.	5	-	Non connection
V_{OUT}	6	1, 2 & 3	Output Voltage
FB	7	4	Feedback Pin
GND	8 & 9 (Exposed Pad)	11 (Exposed Pad)	Ground Pin (The exposed pad must be soldered to a PCB and be connected to GND for maximum power dissipation.)

Ordering and Marking Information

Part Number	Package	Marking Information			
		Product Code	Package Code	Lead Free	GS Code
GS2231APSF	PSOP-8	GS2231A	PS	F	XXXX
GS2231AZFF	DFN3x3-10L	GS2231A	ZF	F	XXXX

Absolute Maximum Ratings

Supply Voltage, V_{IN}		-0.3V ~ 6V
Supply Voltage for Control Circuit, V_{CC}		-0.3V ~ 6V
Other Pins		-0.3V ~ (V_{CC} + 0.3V)
Maximum Junction Temperature, T_J		150°C
Power Dissipation, P_D		2.2W
Junction-to-Ambient Thermal Resistance, θ_{JA}		55°C/W
Junction-to-Case Thermal Resistance, θ_{JC}		20 ºC/W
Lead Temperature (Soldering, 10 sec)		300°C
Storage Temperature Range		-65°C to 150°C
ESD Rating	HBM	2KV
	MM	200V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

Symbol	Parameter	Range	Unit
V_{IN}	Supply Voltage	1.05 ~ V_{CC}	V
V_{CC}	Supply Voltage for Control Circuit (V_{CC} > V_{OUT} + 1.5V)	3.0 ~ 5.5	V
I_{OUT}	Output Current	0 ~ 3	A
R2	Refer to Typical Application Circuit	10K	Ω
T_A	Ambient Temperature Range	-40 ~ 85	ºC

Electrical Characteristics

V_{CC}= 5V and T_A= 25ºC, unless otherwise specified.

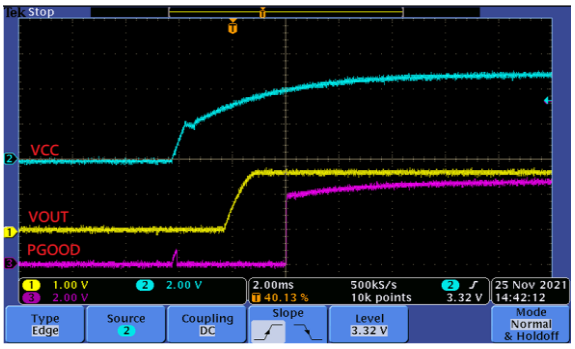
Symbol	Parameters	Condition	Min	Typ	Max	Units
V_{CC}	V_{CC} Operating Range		3.0		5.5	V
V_{CC_POR}	V_{CC} POR Threshold	V_{CC} Rising	2.2	2.8	3.0	V
ΔV_{CC_POR}	V_{CC} POR Hysteresis	V_{CC} Falling	-	0.4	-	V
V_{IN}	V_{IN} Operating Range		1.05		V_{CC}	V
V_{IN_POR}	V_{IN} POR Threshold	V_{IN} Rising	0.8	-	1.0	V
ΔV_{IN_POR}	V_{IN} POR Hysteresis	V_{IN} Falling	-	0.35	-	V
I_Q	Quiescent Current	V_{IN}=V_{CC}=V_{EN}=5.0V I_{OUT}=0A	-	0.9	1.5	mA
I_{CC_SD}	Control Input Current in Shutdown	V_{IN}=V_{CC}=5.0V V_{EN}=0V	-	10	30	μA
V_{REF}	Reference Voltage of FB		0.785	0.8	0.815	V
ΔV_{LOAD}	Load Regulation	V_{IN}=V_{CC}=V_{EN}=5.0V I_{OUT}=0 to 3A	-	0.1	0.5	%/A
ΔV_{LINE}	Line Regulation	V_{CC}=V_{EN}=5.0V I_{OUT}=1mA V_{IN}=1.05 to 5.0V	-	0.01	0.1	%/V

Electrical Characteristics (Continued)

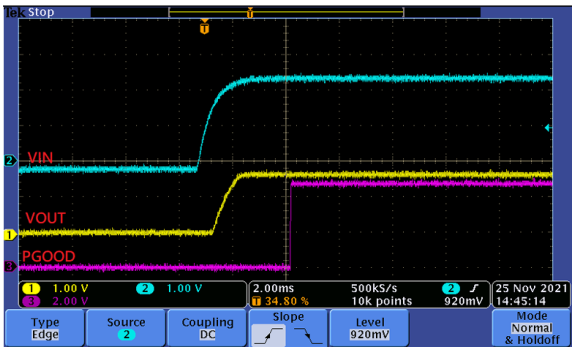
Symbol	Parameters	Condition	Min	Typ	Max	Units
V_{DROP}	Dropout Voltage	V_{OUT}=1.6V I_{OUT}=3A	-	250	360	mV
I_{LIM}	Current Limit	-		5.5	-	A
R_{PULL}	V_{OUT} Pull-Low Resistance	V_{EN}=0V	-	-	150	Ω
t_{SS}	Output Voltage Ramp Up Time		0.6	1	2	ms
Enable						
I_{EN}	EN Input Bias Current	V_{EN}=0V	-	5	10	μA
V_{ENL}	Enable Threshold	Logic-Low Voltage	-	-	0.3	V
V_{ENH}		Logic-High Voltage	1.1	-	-	
Power OK						
POK_H	POK High Threshold	V_{FB} Rising	-	92	-	%
POK_L	POK Low Threshold	V_{FB} Falling	-	82	-	%
V_{POKL}	POK Sink Voltage	Sink Current 5mA	-	-	0.4	V
t_{POK_DT}	POK Delay Time	-	0.5	1.5	5	ms
Thermal Protection						
T_{SD}	Thermal Shutdown Temperature	-	-	165	-	°C
ΔT_{SD}	Thermal Shutdown Hysteresis	-	-	30	-	°C

Typical Performance Characteristics

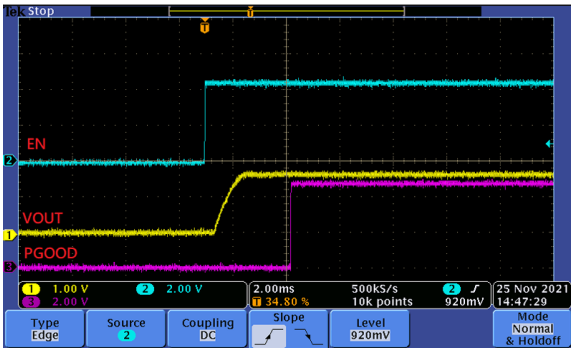
V_{IN}= V_{CC}= 5V, V_{OUT}= 0.8V, C_{IN}=C_{OUT}=10μF and T_A= 25ºC, unless otherwise specified.



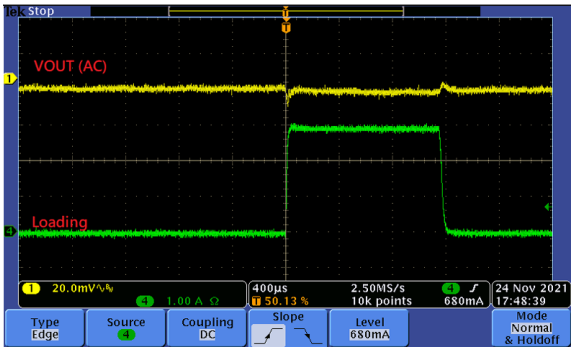
V_{CC} Power ON, I_{OUT} = 200mA



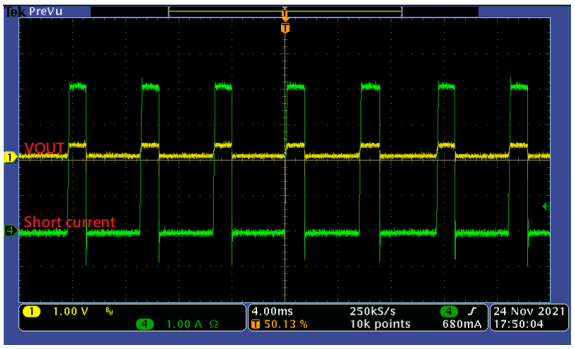
V_{IN} Power ON, I_{OUT} = 200mA



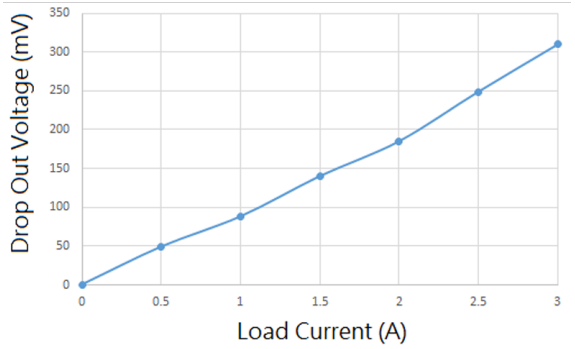
Enable ON, I_{OUT} = 200mA



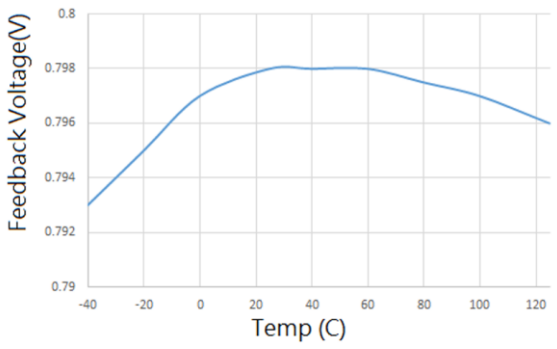
Load Transient, I_{OUT} = 0 to 3A



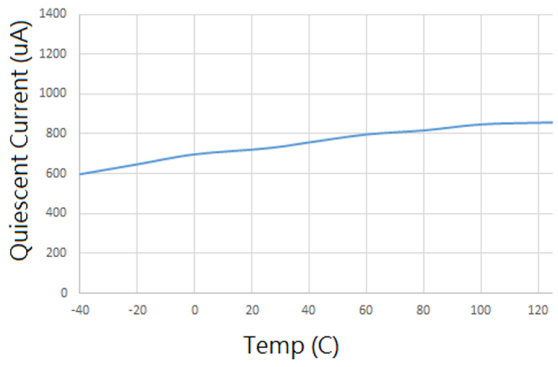
Short Circuit Waveform



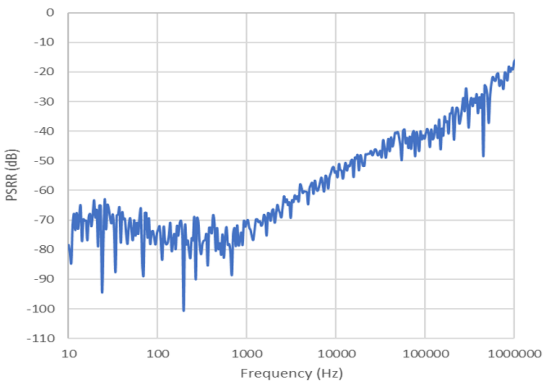
V_{DROP} vs. I_{OUT}



V_{FB} vs. Temperature



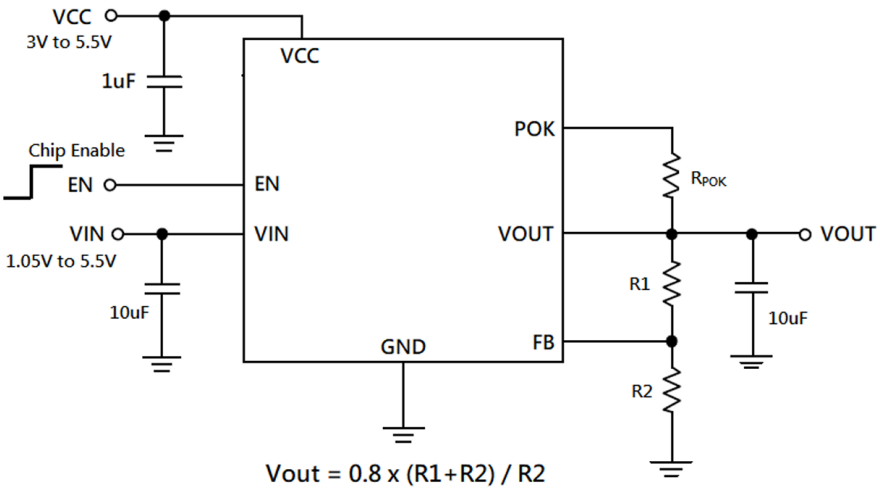
IQ vs. Temperature



PSRR

(V_{CC}=5V, V_{IN}=3.3V, V_{OUT}=1.6V and I_{OUT}=1mA)

Typical Application Circuit



Vout = 0.8 x (R1+R2) / R2

Application Information

Output Voltage Setting

The output voltage is programmed by the resistor divider connected to the FB pin. The preset output voltage is calculated by the following equation :

$$V_{OUT} = 0.8 \cdot \left(1 + \frac{R1}{R2}\right) \quad \text{..... (V)}$$

Where R1 is the resistor connected from V_{OUT} to FB with Kelvin sensing connection and R2 is the resistor connected from FB to GND and the 10Kohm is recommended typically.

Enable Control

A logic Low signal applied to this pin shuts down the output. A logic High signal enables the device to output a regulated power when V_{CC} and V_{IN} power supplies are ready. Enable pin is pulled high to V_{CC} internally.

Power-OK and Delay

The power okay pin is an open-drain output and a 100kΩ pull up resistor has to be used to connect between POK pin to V_{OUT} to obtain an effective signal.
As the V_{FB} rises and reaches the rising Power-OK voltage threshold, an internal delay function starts to work. At the end of the delay time, the POK output HIGH to indicate the output is ok.
As the V_{FB} falls and reaches the falling Power-OK voltage threshold, the POK output LOW.

Application Information (Continued)

Power-On-Reset

A Power-On-Reset (POR) circuit monitors both of supply voltages on V_{CC} and V_{IN} pins to prevent wrong logic controls. The POR function initiates a soft-start process after both of the supply voltages exceed their rising POR voltage thresholds during powering on.

Soft-Start

An internal soft-start function controls rise rate of the output voltage to limit the current surge during start-up. The typical soft-start interval is about 1.0ms.

Current-Limit Protection

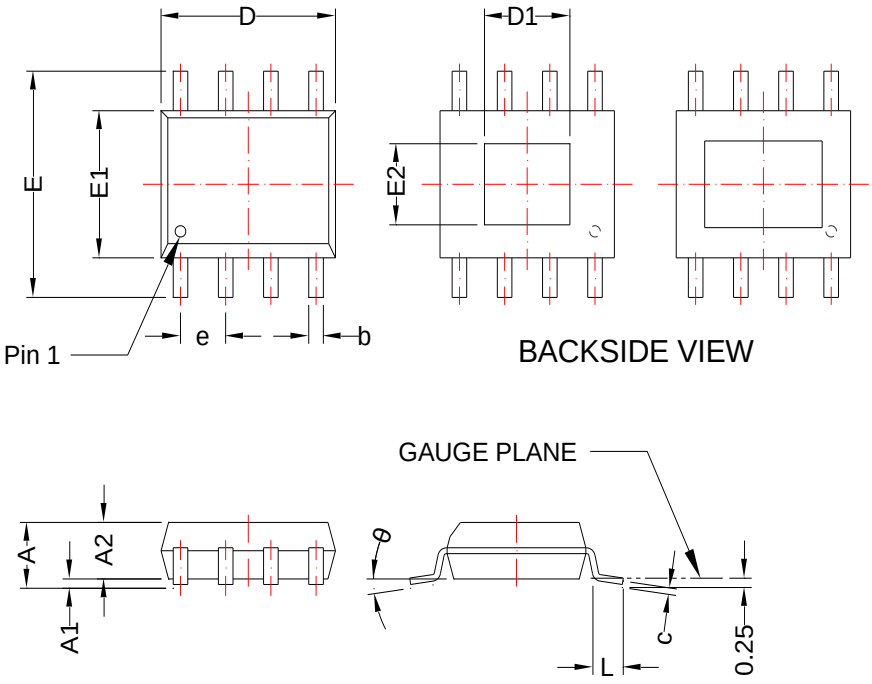
The GS2231A monitors the current flowing through the output NMOS and limits the maximum current to prevent load and GS2231A from damages during current overload conditions.

Thermal Shutdown Protection

Thermal protection limits power dissipation to prevent IC over temperature.
When the junction temperature exceeds 165°C, the over temperature protection circuit starts the thermal shutdown function and turns the pass transistor off. The pass transistor turns on again after the junction temperature cools by 30°C.

Package Information

PSOP-8

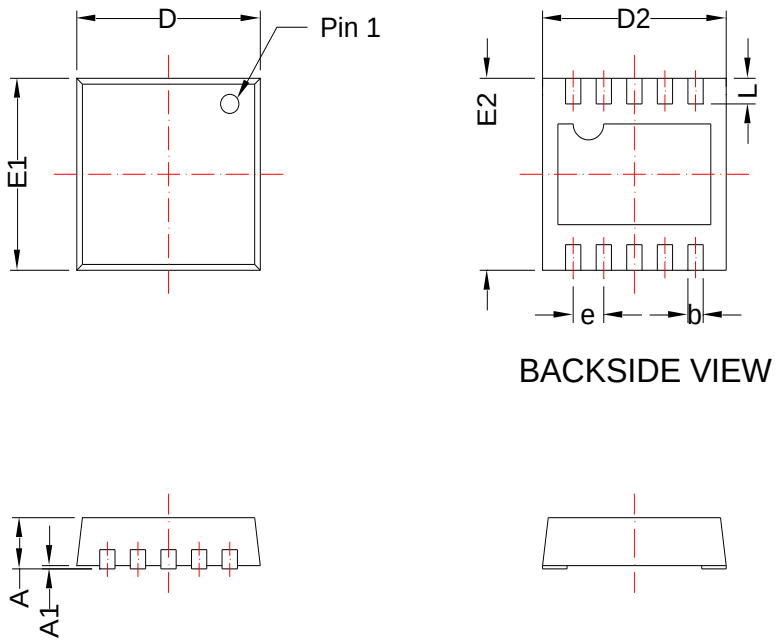


DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 mm PER SIDE.

Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	---	1.75	---	0.069
A1	0.10	0.15	0.004	0.006
A2	1.25	---	0.049	---
b	0.31	0.51	0.012	0.020
c	0.10	0.25	0.004	0.010
D	4.70	5.10	0.185	0.201
D1	1.50	---	0.059	---
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
E2	1.00	---	0.039	---
e	1.27 BSC		0.050 BSC	
L	0.4	1.27	0.016	0.050
θ	0°	8°	0°	8°

Package Information

DFN3X3-10



DIMENSION D AND E1 DO NOT INCLUDE MOLD FLASH,TIE BAR BURRS，GATE BURRS，AND INTERLEAD FLASH,NOT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY

Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
b	0.18	0.30	0.007	0.012
D	2.90	3.10	0.114	0.122
D2	2.20	2.70	0.087	0.106
E1	2.90	3.10	0.114	0.122
E2	1.40	1.80	0.055	0.071
e	0.50 BSC		0.020 BSC	
L	0.30	0.50	0.012	0.020

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