SGM2221
300mA, 0.9μA Low Quiescent Current, Low Dropout and High Voltage Regulator

GENERAL DESCRIPTION

The SGM2221 is a low quiescent current, low dropout and high input voltage linear regulator. It is capable of supplying 300mA output current with typical dropout voltage of 330mV. The operating input voltage range is from 2.2V to 13V and fixed output voltage range is from 1.2V to 5.0V.

Other features include logic-controlled shutdown mode, short-circuit current limit and thermal shutdown protection. The SGM2221 has automatic discharge function to quickly discharge V_{OUT} in the disabled status.

The SGM2221 is available in Green SOT-23-5 and TDFN-2×2-6AL packages. It operates over an operating temperature range of -40℃ to +125℃.

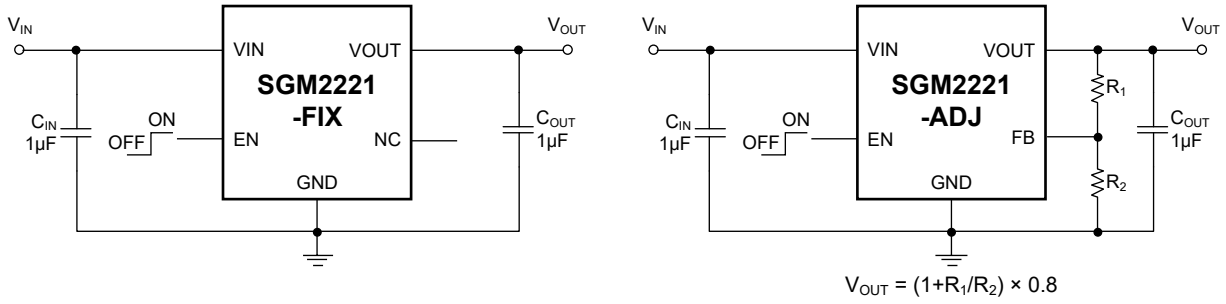
FEATURES

- **Operating Input Voltage Range: 2.2V to 13V**
- **Fixed Output from 1.2V to 5.0V**
- **Adjustable Output from 0.8V to 5.0V**
- **Low Power Consumption:**
  0.9μA (TYP) at No Load
- **Low Dropout Voltage:**
  330mV (TYP) at 300mA, V_{OUT} = 5V
- **Current Limiting and Thermal Protection**
- **With Output Automatic Discharge**
- **Stable with Small Case Size Ceramic Capacitors**
- **Shutdown Supply Current: 0.2μA (TYP)**
- **UVLO with Hysteresis**
- **Reverse Current Protection when V_{OUT} > V_{IN}**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SOT-23-5 and TDFN-2×2-6AL Packages**

APPLICATIONS

Portable Electronics
Smartphone
Industrial and Medical Equipment
Digital Cameras and Audio Devices

TYPICAL APPLICATION



Fixed Output Voltage Version **Adjustable Output Voltage Version**

Figure 1. Typical Application Circuits

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2221-1.2	SOT-23-5	-40℃ to +125℃	SGM2221-1.2XN5G/TR	16UXX	Tape and Reel, 3000
SGM2221-1.5	SOT-23-5	-40℃ to +125℃	SGM2221-1.5XN5G/TR	16VXX	Tape and Reel, 3000
SGM2221-1.8	SOT-23-5	-40℃ to +125℃	SGM2221-1.8XN5G/TR	02CXX	Tape and Reel, 3000
SGM2221-2.5	SOT-23-5	-40℃ to +125℃	SGM2221-2.5XN5G/TR	16WXX	Tape and Reel, 3000
SGM2221-2.8	SOT-23-5	-40℃ to +125℃	SGM2221-2.8XN5G/TR	02DXX	Tape and Reel, 3000
SGM2221-3.0	SOT-23-5	-40℃ to +125℃	SGM2221-3.0XN5G/TR	02EXX	Tape and Reel, 3000
SGM2221-3.3	SOT-23-5	-40℃ to +125℃	SGM2221-3.3XN5G/TR	00IXX	Tape and Reel, 3000
SGM2221-3.6	SOT-23-5	-40℃ to +125℃	SGM2221-3.6XN5G/TR	02FXX	Tape and Reel, 3000
SGM2221-3.9	SOT-23-5	-40℃ to +125℃	SGM2221-3.9XN5G/TR	02GXX	Tape and Reel, 3000
SGM2221-4.0	SOT-23-5	-40℃ to +125℃	SGM2221-4.0XN5G/TR	02HXX	Tape and Reel, 3000
SGM2221-4.1	SOT-23-5	-40℃ to +125℃	SGM2221-4.1XN5G/TR	02IXX	Tape and Reel, 3000
SGM2221-4.2	SOT-23-5	-40℃ to +125℃	SGM2221-4.2XN5G/TR	02JXX	Tape and Reel, 3000
SGM2221-5.0	SOT-23-5	-40℃ to +125℃	SGM2221-5.0XN5G/TR	00JXX	Tape and Reel, 3000
SGM2221-ADJ	SOT-23-5	-40℃ to +125℃	SGM2221-ADJXN5G/TR	00KXX	Tape and Reel, 3000
SGM2221-1.2	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-1.2XTDI6G/TR	16X XXXX	Tape and Reel, 3000
SGM2221-1.5	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-1.5XTDI6G/TR	16Y XXXX	Tape and Reel, 3000
SGM2221-1.8	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-1.8XTDI6G/TR	00B XXXX	Tape and Reel, 3000
SGM2221-2.5	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-2.5XTDI6G/TR	16Z XXXX	Tape and Reel, 3000
SGM2221-2.8	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-2.8XTDI6G/TR	02K XXXX	Tape and Reel, 3000
SGM2221-3.0	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-3.0XTDI6G/TR	02L XXXX	Tape and Reel, 3000
SGM2221-3.3	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-3.3XTDI6G/TR	00C XXXX	Tape and Reel, 3000
SGM2221-3.6	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-3.6XTDI6G/TR	02M XXXX	Tape and Reel, 3000
SGM2221-3.9	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-3.9XTDI6G/TR	02N XXXX	Tape and Reel, 3000
SGM2221-4.0	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-4.0XTDI6G/TR	02P XXXX	Tape and Reel, 3000

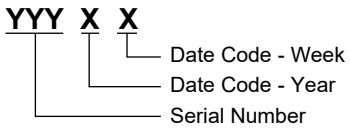
PACKAGE/ORDERING INFORMATION (continued)

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2221-4.1	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-4.1XTDI6G/TR	02Q XXXX	Tape and Reel, 3000
SGM2221-4.2	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-4.2XTDI6G/TR	02R XXXX	Tape and Reel, 3000
SGM2221-5.0	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-5.0XTDI6G/TR	00D XXXX	Tape and Reel, 3000
SGM2221-ADJ	TDFN-2×2-6AL	-40℃ to +125℃	SGM2221-ADJXTDI6G/TR	00E XXXX	Tape and Reel, 3000

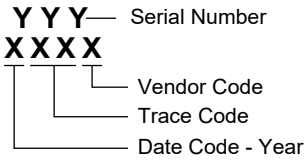
MARKING INFORMATION

NOTE: XX = Date Code. XXXX = Date Code, Trace Code and Vendor Code.

SOT-23-5



TDFN-2×2-6AL



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

VIN, EN to GND ..... -0.3V to 16V
VOUT to GND ..... -0.3V to 6V
Package Thermal Resistance
SOT-23-5, θ_{JA} ..... 161℃/W
SOT-23-5, θ_{JB} ..... 39℃/W
SOT-23-5, $\theta_{JC(TOP)}$ ..... 111℃/W
TDFN-2×2-6AL, θ_{JA} ..... 82℃/W
TDFN-2×2-6AL, θ_{JB} ..... 41℃/W
TDFN-2×2-6AL, $\theta_{JC(TOP)}$ ..... 89℃/W
TDFN-2×2-6AL, $\theta_{JC(BOT)}$ ..... 17℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 6000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range ..... 2.2V to 13V
Input Effective Capacitance, C_{IN} ..... 0.5μF (MIN)
Output Effective Capacitance, C_{OUT} ..... 0.47μF to 10μF
Operating Junction Temperature Range ..... -40℃ to +125℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

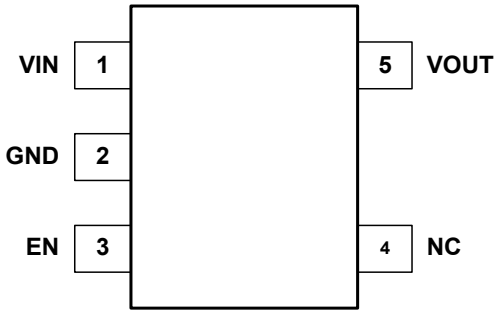
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

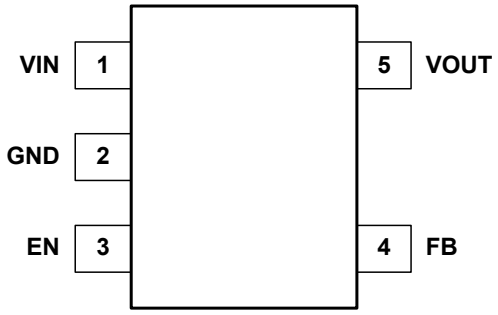
PIN CONFIGURATIONS

SGM2221-FIX
(TOP VIEW)



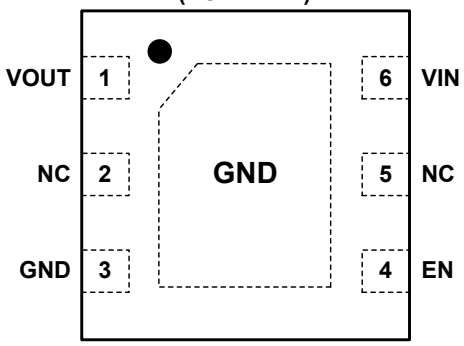
SOT-23-5

SGM2221-ADJ
(TOP VIEW)



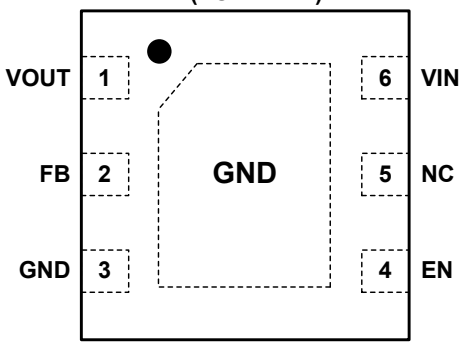
SOT-23-5

SGM2221-FIX
(TOP VIEW)



TDFN-2×2-6AL

SGM2221-ADJ
(TOP VIEW)



TDFN-2×2-6AL

PIN DESCRIPTION

PIN		NAME	FUNCTION
SOT-23-5	TDFN-2×2-6AL		
1	6	VIN	Input Supply Voltage Pin. It is recommended to use a 1μF or larger ceramic capacitor from VIN pin to ground to get good power supply decoupling. This ceramic capacitor should be placed as close as possible to VIN pin.
2	3	GND	Ground.
3	4	EN	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.
4	2	NC	No Connection (fixed voltage version only).
		FB	Feedback Voltage Input Pin (adjustable voltage version only). Connect this pin to the midpoint of an external resistor divider to adjust the output voltage. Place the resistors as close as possible to this pin.
5	1	VOUT	Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 0.47μF to 10μF to ensure stability. This ceramic capacitor should be placed as close as possible to VOUT pin.

FUNCTIONAL BLOCK DIAGRAMS

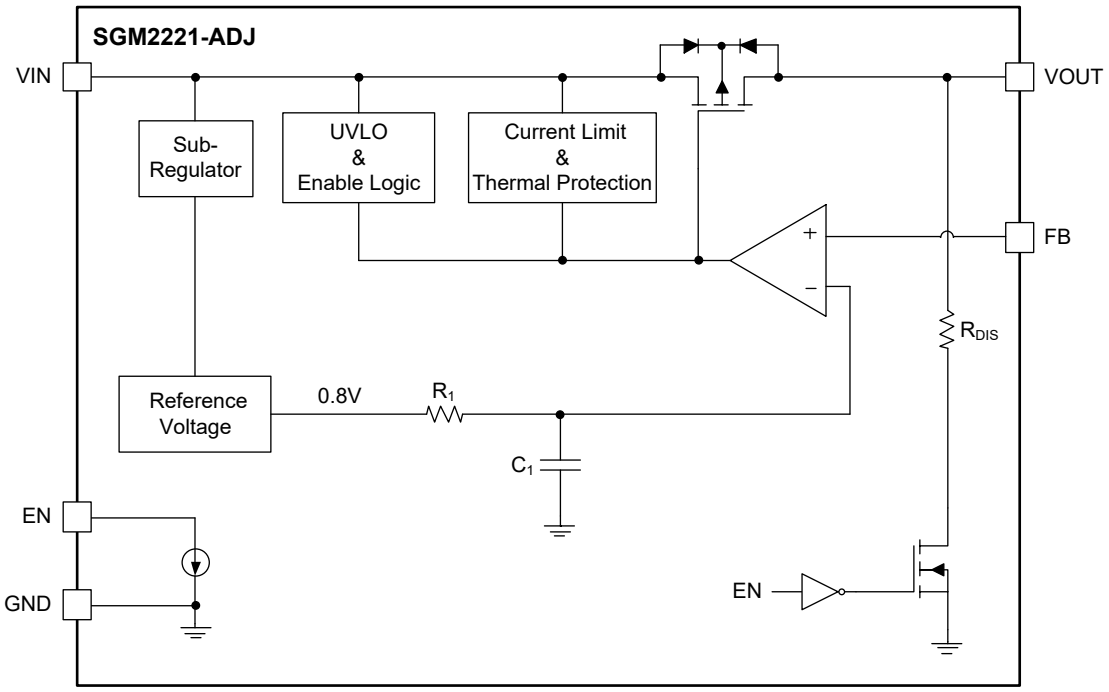


Figure 2. Internal Block Diagram of Adjustable Output Voltage

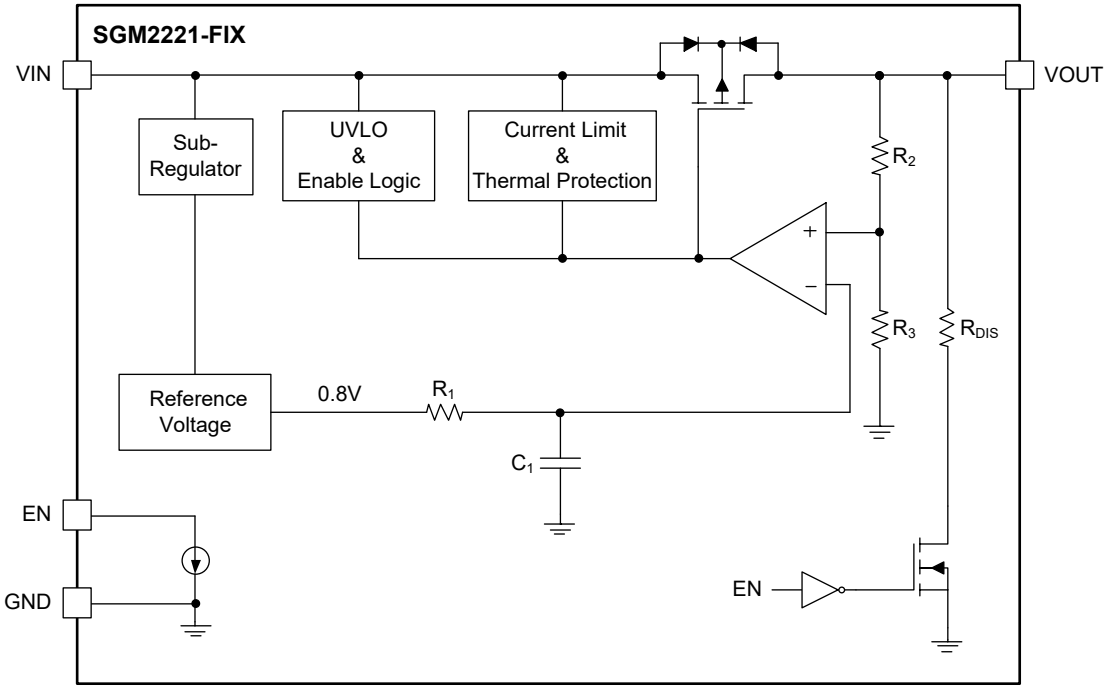


Figure 3. Internal Block Diagram of Fixed Output Voltage

ELECTRICAL CHARACTERISTICS

(SGM2221-FIX, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, T_J = -40℃ to +125℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage Range	V_{IN}			2.2		13	V
Output Voltage Accuracy	V_{OUT}	I_{OUT} = 0.1mA	T_J = +25℃	-1.5		1.5	%
			T_J = -40℃ to +85℃	-2		2	
			T_J = -40℃ to +125℃	-2.5		2.5	
Maximum Output Current				300			mA
Under-Voltage Lockout	V_{UVLO}	V_{IN} rising			1.8		V
		Hysteresis			0.35		
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	V_{IN} = ($V_{OUT(NOM)}$ + 1V) to 13V, I_{OUT} = 0.1mA			0.01	0.045	%/V
Load Regulation	$\Delta V_{OUT}/V_{OUT}$	I_{OUT} = 0.1mA to 300mA			0.5	4	%
Dropout Voltage	V_{DROP}	I_{OUT} = 300mA, V_{OUT} falls to 95% × $V_{OUT(NOM)}$	V_{OUT} = 1.8V		590	830	mV
			V_{OUT} = 3.3V		390	590	
			V_{OUT} = 5V		330	530	
Output Current Limit	I_{LIMIT}	V_{IN} = V_{OUT} + 2V, V_{OUT} forced at 95% × $V_{OUT(NOM)}$		350	720		mA
Short-Circuit Current Limit	I_{SHORT}	V_{OUT} = 0V			370		mA
Ground Pin Current	I_{GND}	No load			0.9	2.2	μA
		I_{OUT} = 50mA			70	93	
		I_{OUT} = 300mA			280	335	
Shutdown Current	I_{SHDN}	V_{EN} = 0V			0.2	1	μA
EN Pin Threshold Voltage	V_{IH}	EN input voltage “H”		1.5			V
	V_{IL}	EN input voltage “L”				0.4	
EN Input Bias Current	I_{BH}	V_{EN} = V_{IN}			30	500	nA
	I_{BL}	V_{EN} = 0V			10	500	
Output Discharge Resistance	R_{DIS}	V_{IN} = 2.2V		150	245	350	Ω
Enable Time	t_{EN}	From assertion of V_{EN} to V_{OUT} = 90% × $V_{OUT(NOM)}$			540		μs
Reverse Leakage Current	I_{RL}	V_{OUT} = 5.2V, V_{IN} = 2.2V			10	30	μA
		V_{OUT} = 5.2V, V_{IN} = 0V			22	40	μA
Power Supply Rejection Ratio	PSRR	V_{OUT} = 3.3V, V_{IN} = $V_{OUT(NOM)}$ + 1V, ΔV_{RIPPLE} = 0.2V_{P-P}, I_{OUT} = 40mA	f = 217Hz		61		dB
			f = 1kHz		51		
Output Voltage Noise	e_n	f = 10Hz to 100kHz, I_{OUT} = 40mA	V_{OUT} = 0.8V		40		μV_{RMS}
			V_{OUT} = 3.3V		74		
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				30		℃

ELECTRICAL CHARACTERISTICS (continued)

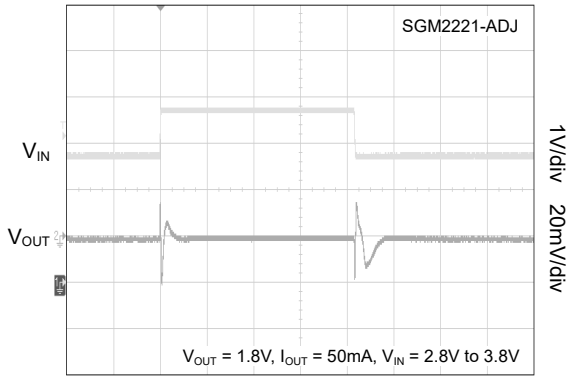
(SGM2221-ADJ, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, T_J = -40℃ to +125℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage Range	V_{IN}			2.2		13	V
Output Voltage Accuracy	V_{OUT}	I_{OUT} = 0.1mA	T_J = +25℃	-1.5		1.5	%
			T_J = -40℃ to +85℃	-3.5		3.5	
Maximum Output Current				300			mA
Adjustable Reference Voltage	V_{ADJ}				0.8		V
FB Input Bias Current	I_{ADJ}	V_{ADJ} = 0.9V		-10	0.02	10	nA
Under-Voltage Lockout	V_{UVLO}	V_{IN} rising			1.8		V
		Hysteresis			0.35		
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	V_{IN} = ($V_{OUT(NOM)}$ + 1V) to 13V, I_{OUT} = 0.1mA			0.01	0.045	%/V
Load Regulation	$\Delta V_{OUT}/V_{OUT}$	I_{OUT} = 0.1mA to 300mA			0.5	4	%
Dropout Voltage	V_{DROP}	I_{OUT} = 300mA, V_{OUT} falls to 95% × $V_{OUT(NOM)}$	V_{OUT} = 1.8V		590	830	mV
			V_{OUT} = 3.3V		390	590	
			V_{OUT} = 5V		330	530	
Output Current Limit	I_{LIMIT}	V_{IN} = V_{OUT} + 2V, V_{OUT} forced at 95% × $V_{OUT(NOM)}$		350	720		mA
Short-Circuit Current Limit	I_{SHORT}	V_{OUT} = 0V			370		mA
Ground Pin Current	I_{GND}	No load			0.9	2.2	μA
		I_{OUT} = 50mA			70	93	
		I_{OUT} = 300mA			280	335	
Shutdown Current	I_{SHDN}	V_{EN} = 0V			0.2	1	μA
EN Pin Threshold Voltage	V_{IH}	EN input voltage “H”		1.5			V
	V_{IL}	EN input voltage “L”				0.4	
EN Input Bias Current	I_{BH}	V_{EN} = V_{IN}			30	500	nA
	I_{BL}	V_{EN} = 0V			10	500	
Output Discharge Resistance	R_{DIS}	V_{IN} = 2.2V		150	245	350	Ω
Enable Time	t_{EN}	From assertion of V_{EN} to V_{OUT} = 90% × $V_{OUT(NOM)}$			540		μs
Reverse Leakage Current	I_{RL}	V_{OUT} = 5.2V, V_{IN} = 2.2V			10	30	μA
		V_{OUT} = 5.2V, V_{IN} = 0V			22	40	μA
Power Supply Rejection Ratio	PSRR	V_{OUT} = 3.3V, V_{IN} = $V_{OUT(NOM)}$ + 1V, ΔV_{RIPPLE} = 0.2V_{P-P}, I_{OUT} = 40mA	f = 217Hz		62		dB
			f = 1kHz		57		
Output Voltage Noise	e_n	V_{OUT} = 0.8V, f = 10Hz to 100kHz, I_{OUT} = 40mA			34		μV_{RMS}
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				30		℃

TYPICAL PERFORMANCE CHARACTERISTICS

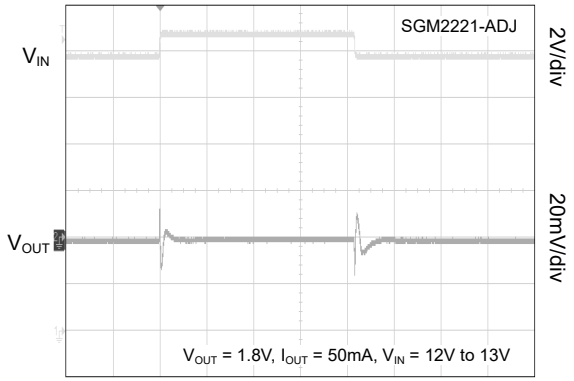
T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

Line Transient Response



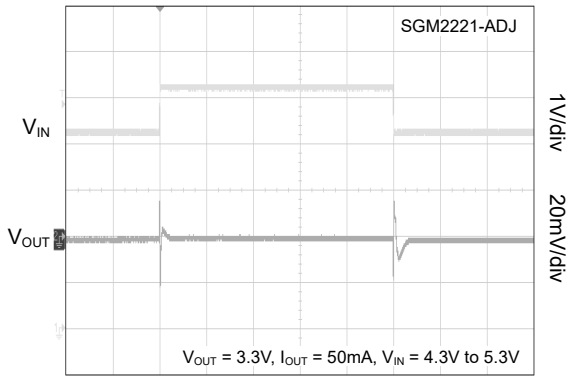
Time (200μs/div)

Line Transient Response



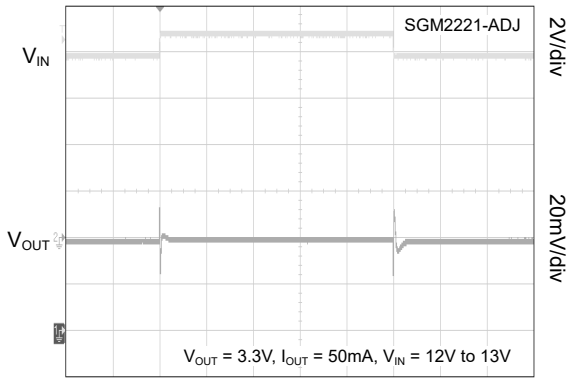
Time (200μs/div)

Line Transient Response



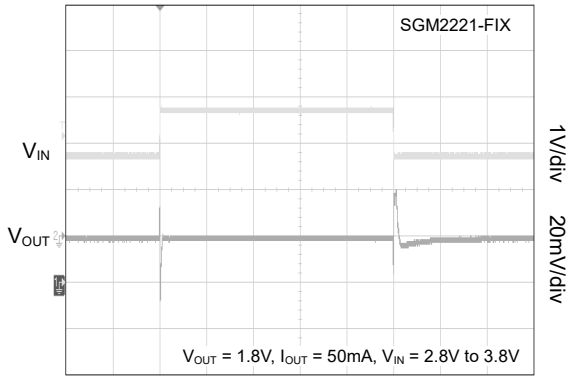
Time (500μs/div)

Line Transient Response



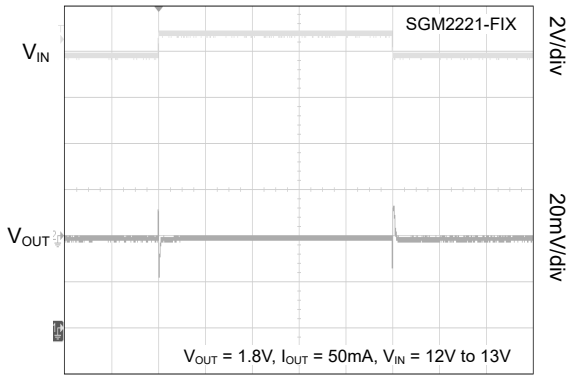
Time (500μs/div)

Line Transient Response



Time (500μs/div)

Line Transient Response

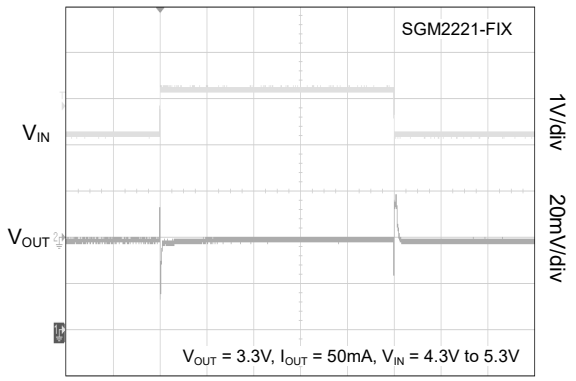


Time (500μs/div)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

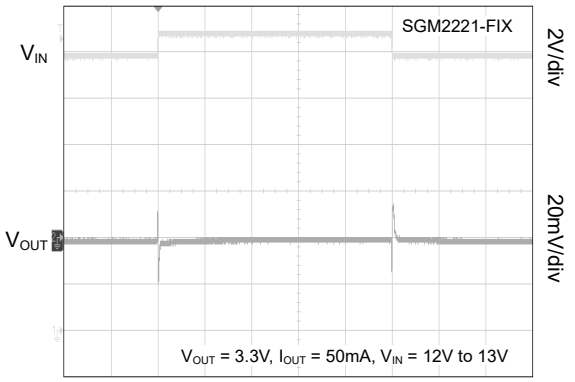
T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

Line Transient Response



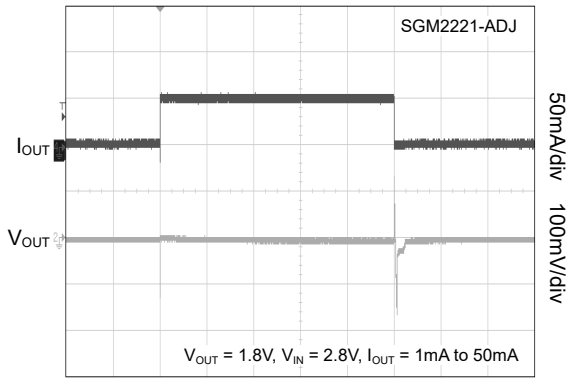
Time (500μs/div)

Line Transient Response



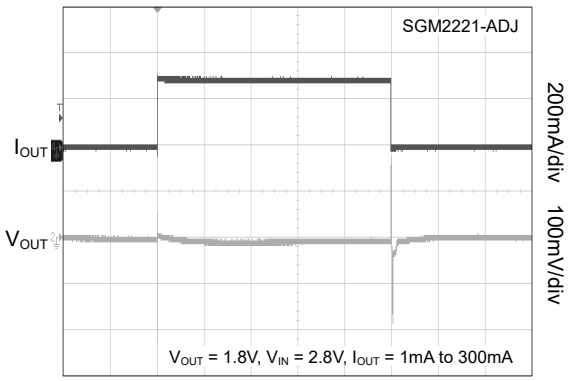
Time (500μs/div)

Load Transient Response



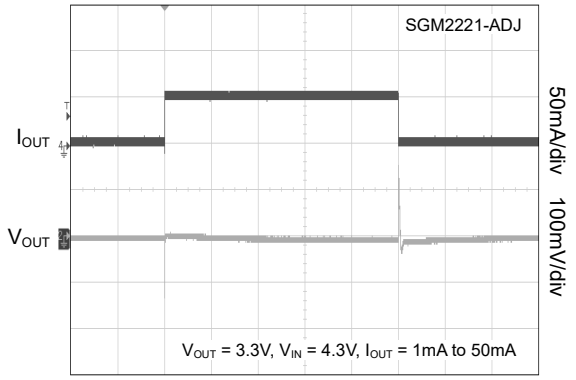
Time (5ms/div)

Load Transient Response



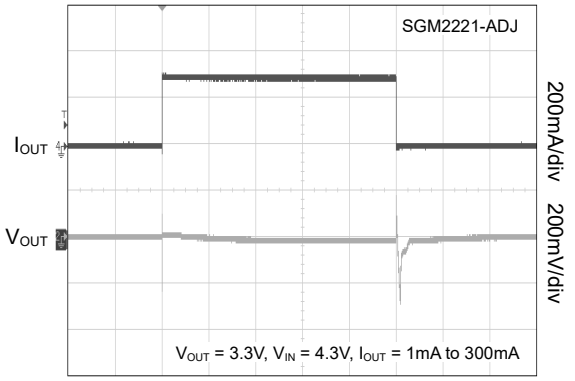
Time (10ms/div)

Load Transient Response



Time (5ms/div)

Load Transient Response

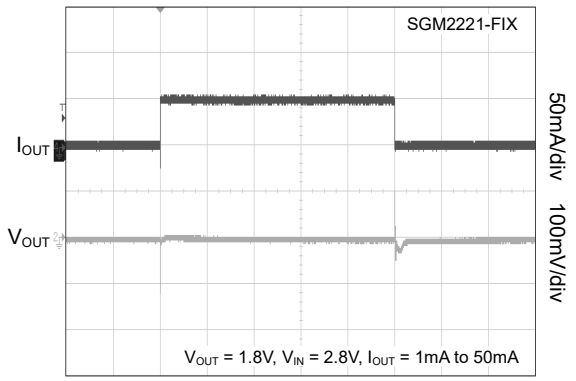


Time (5ms/div)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

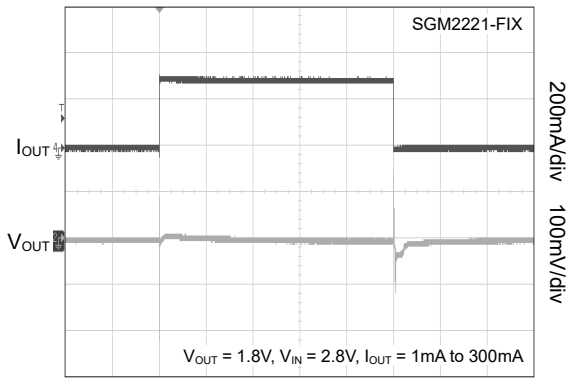
T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

Load Transient Response



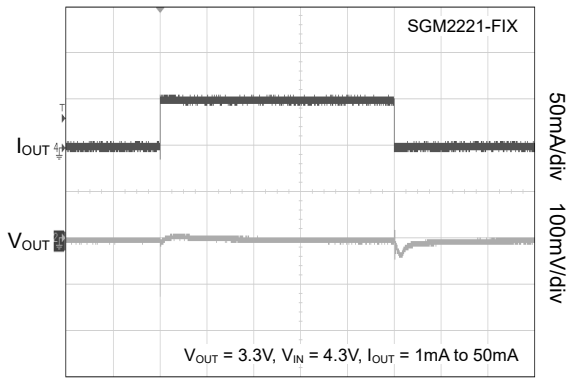
Time (5ms/div)

Load Transient Response



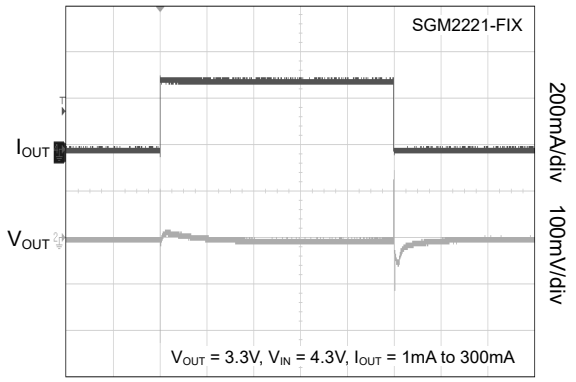
Time (5ms/div)

Load Transient Response



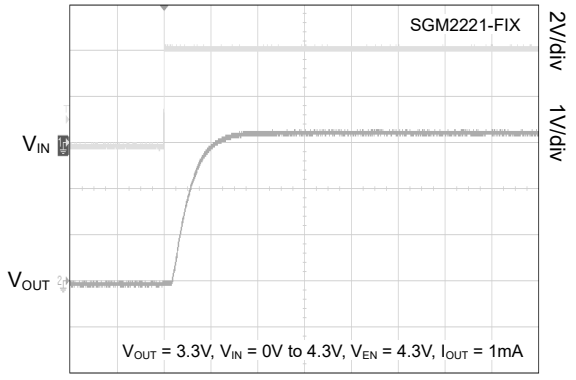
Time (5ms/div)

Load Transient Response



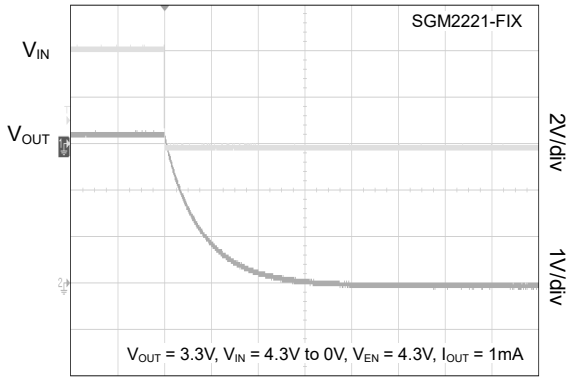
Time (10ms/div)

Power-On Time



Time (500μs/div)

Power-Off Time

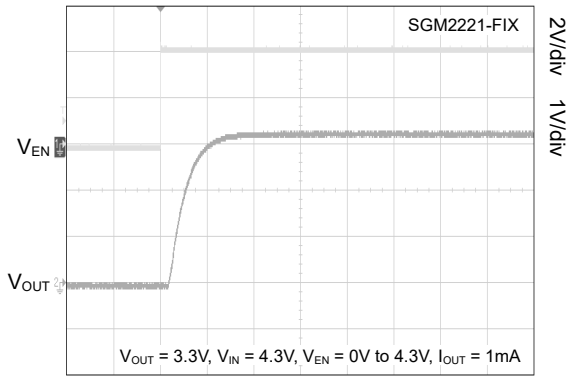


Time (5ms/div)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

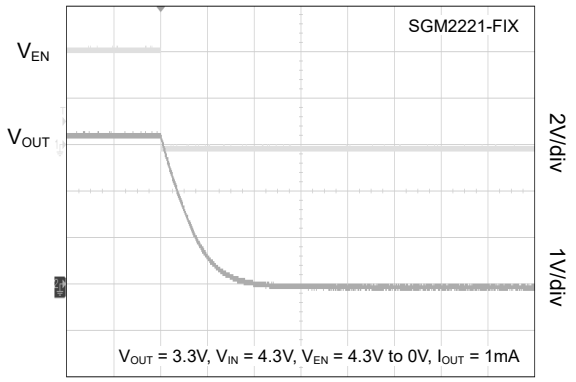
T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

Enable On Time



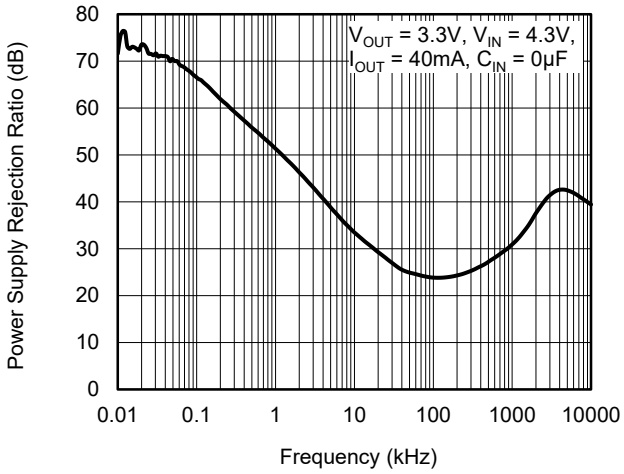
Time (500μs/div)

Enable Off Time

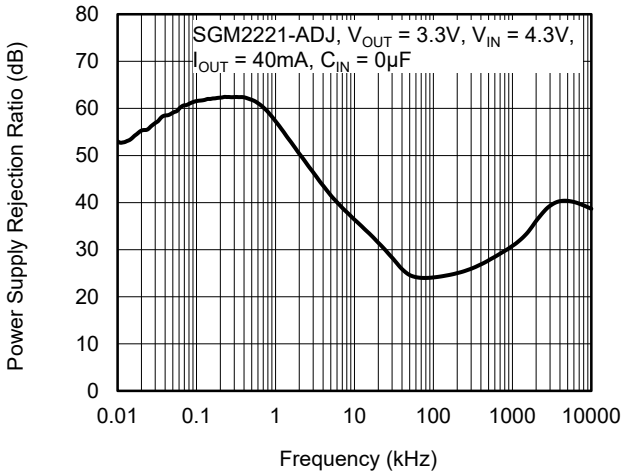


Time (500μs/div)

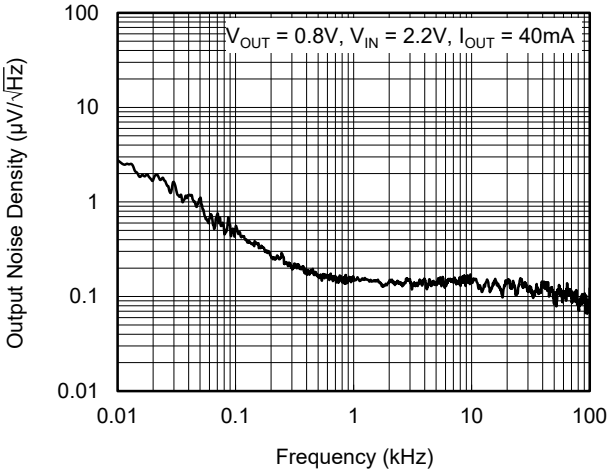
Power Supply Rejection Ratio vs. Frequency



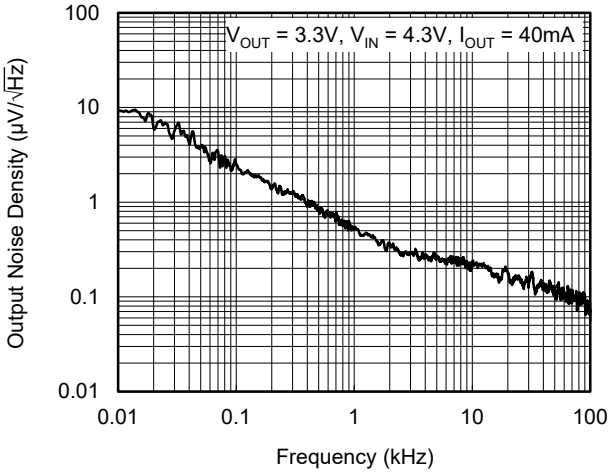
Power Supply Rejection Ratio vs. Frequency



Output Noise Density vs. Frequency



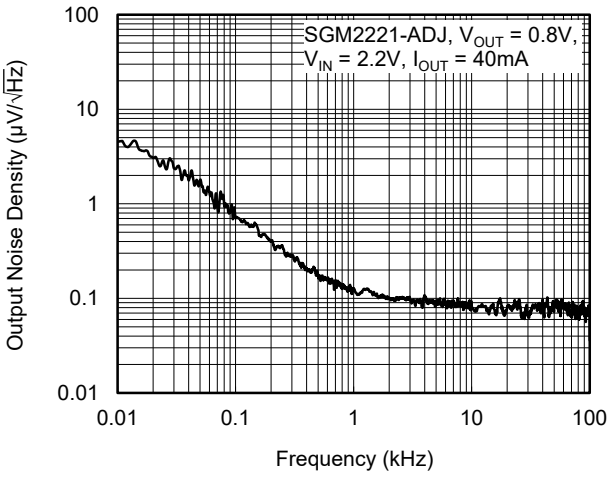
Output Noise Density vs. Frequency



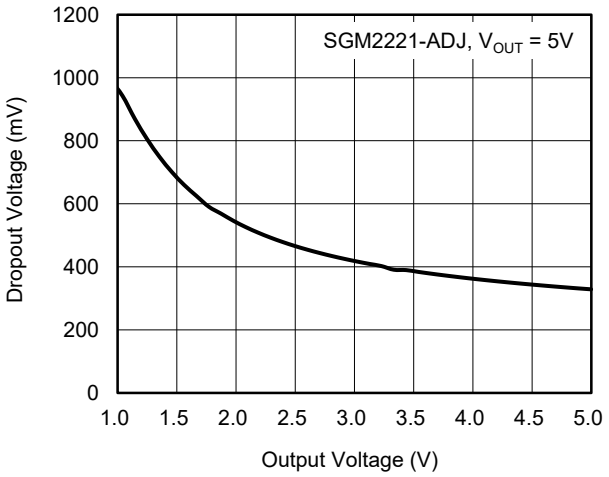
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

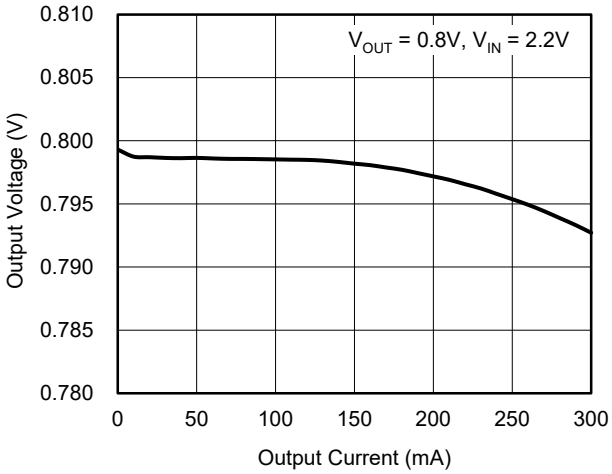
Output Noise Density vs. Frequency



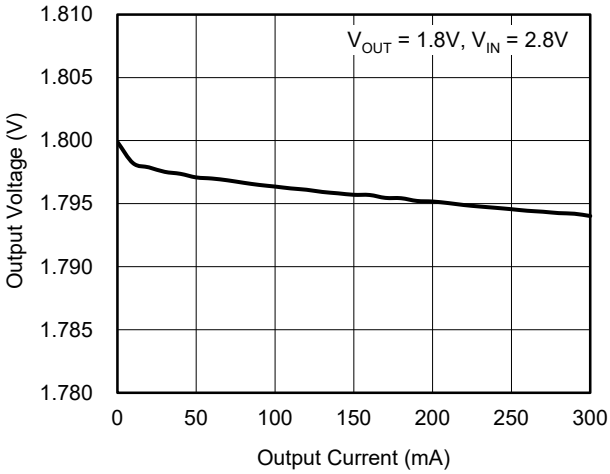
Dropout Voltage vs. Output Voltage



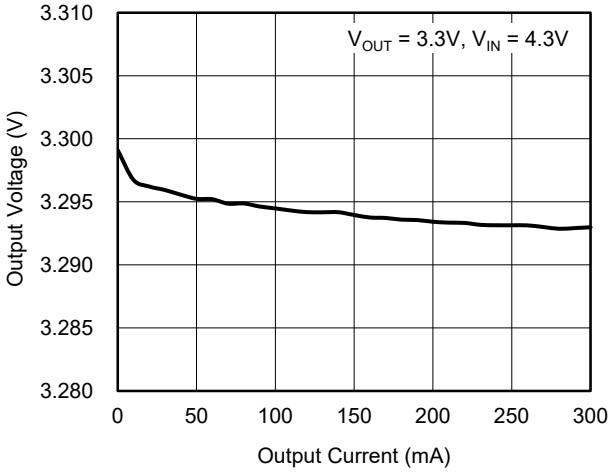
Output Voltage vs. Output Current



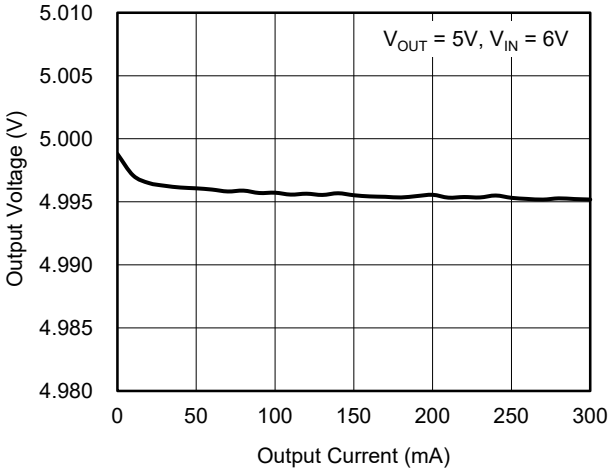
Output Voltage vs. Output Current



Output Voltage vs. Output Current



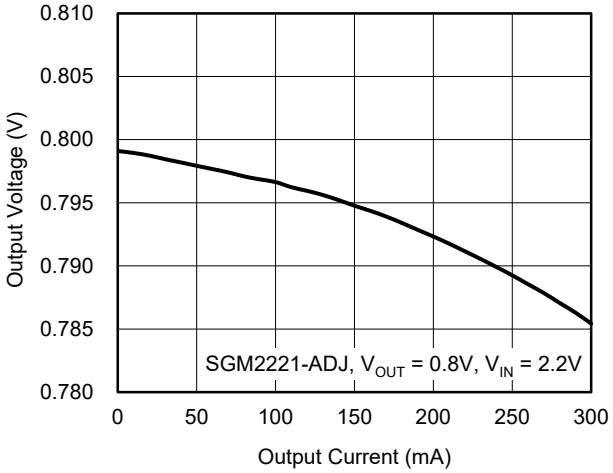
Output Voltage vs. Output Current



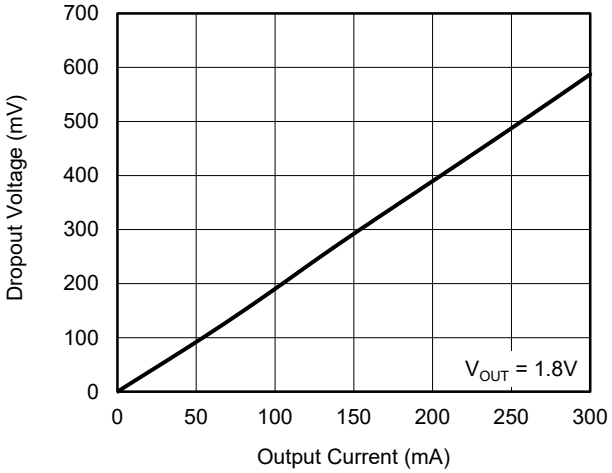
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

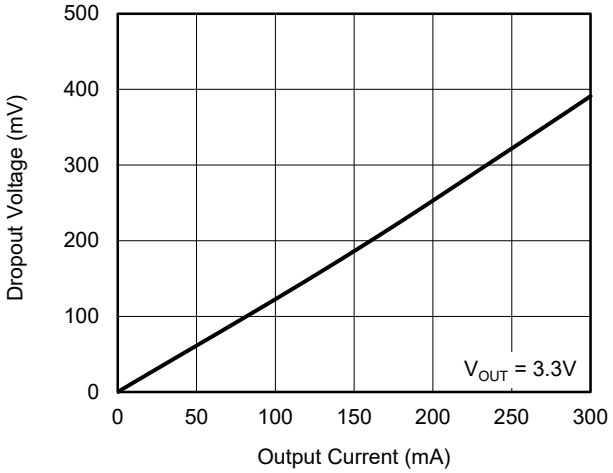
Output Voltage vs. Output Current



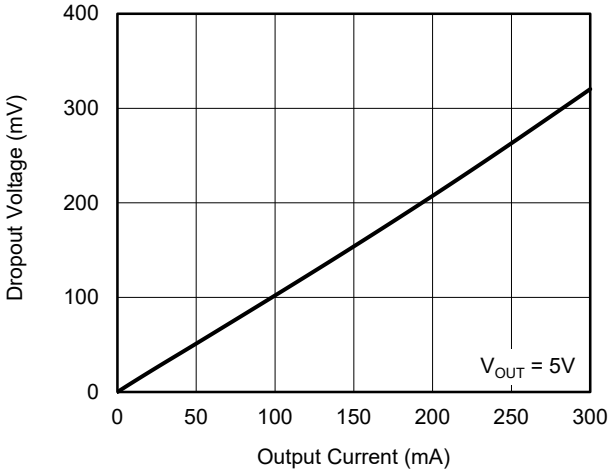
Dropout Voltage vs. Output Current



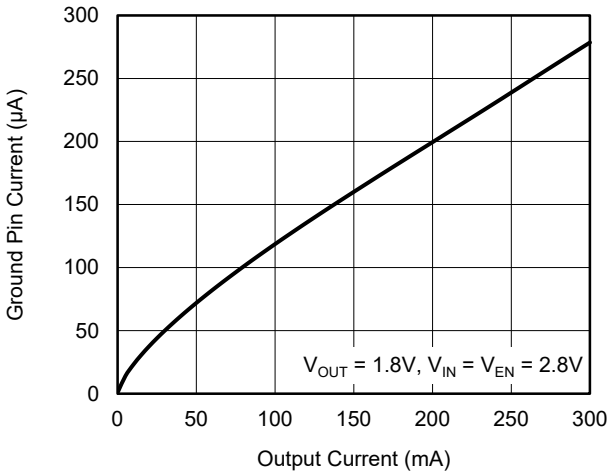
Dropout Voltage vs. Output Current



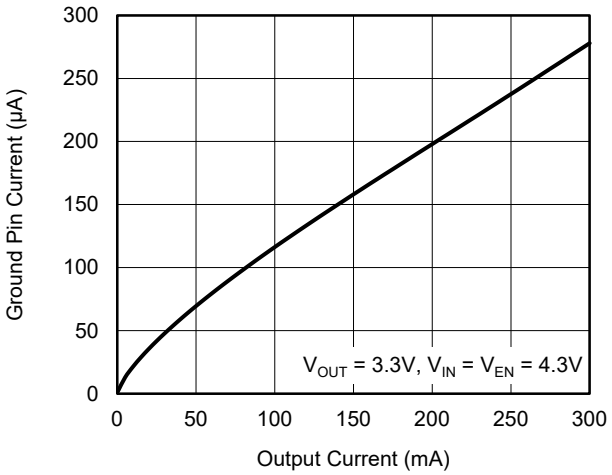
Dropout Voltage vs. Output Current



Ground Pin Current vs. Output Current



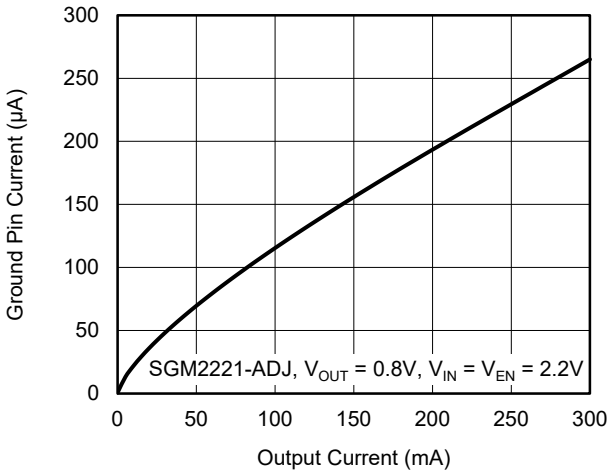
Ground Pin Current vs. Output Current



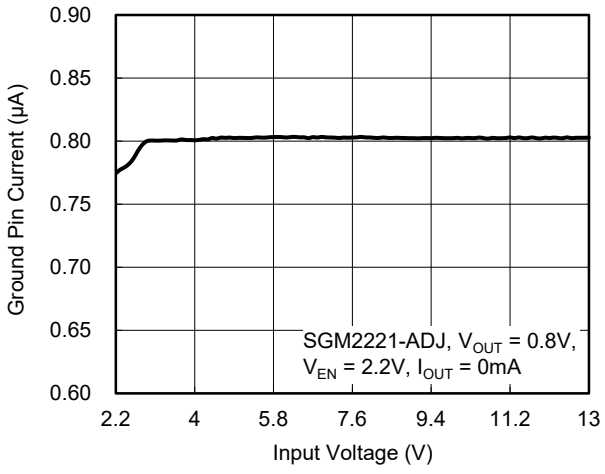
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

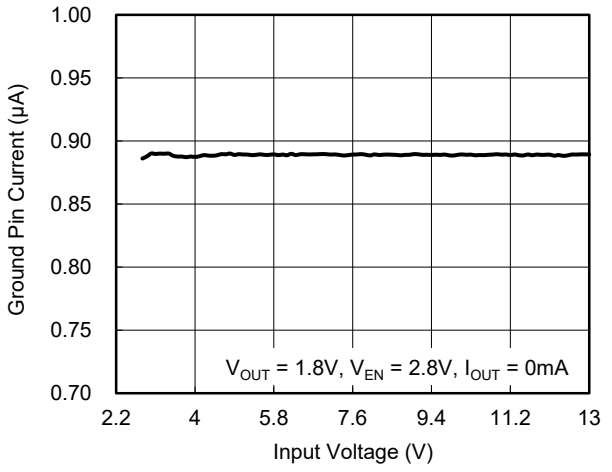
Ground Pin Current vs. Output Current



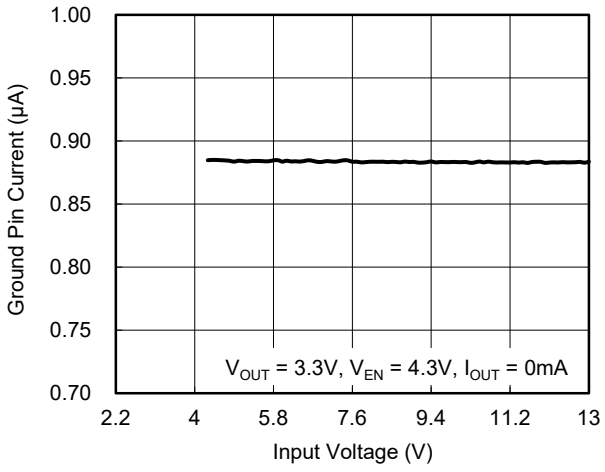
Ground Pin Current vs. Input Voltage



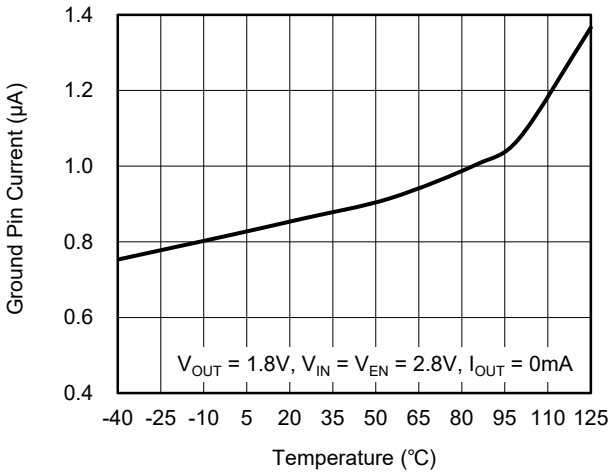
Ground Pin Current vs. Input Voltage



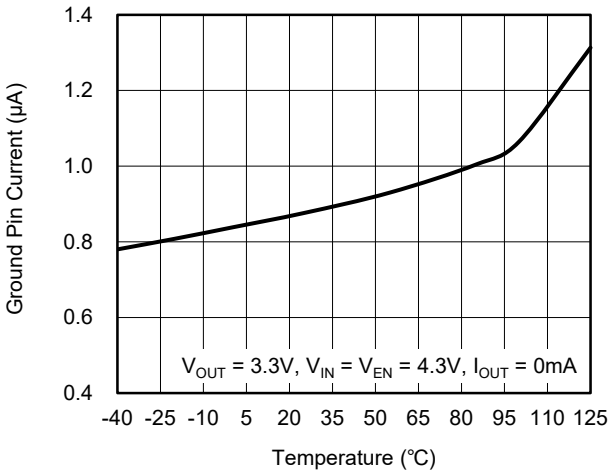
Ground Pin Current vs. Input Voltage



Ground Pin Current vs. Temperature



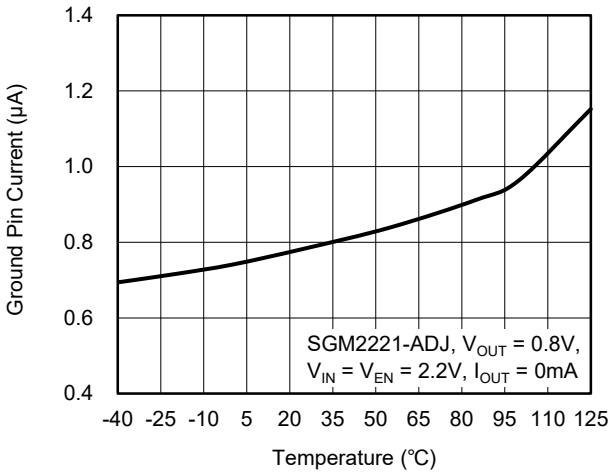
Ground Pin Current vs. Temperature



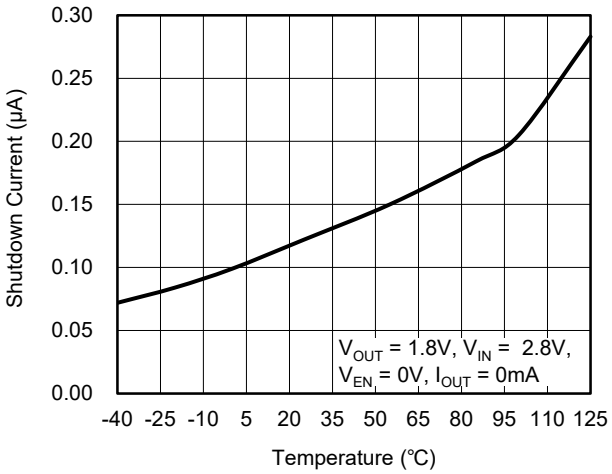
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

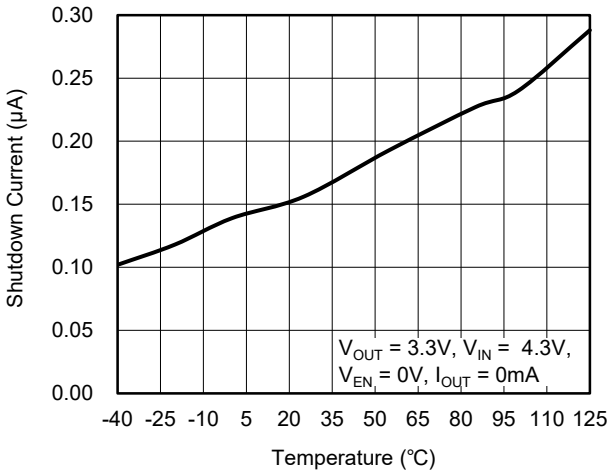
Ground Pin Current vs. Temperature



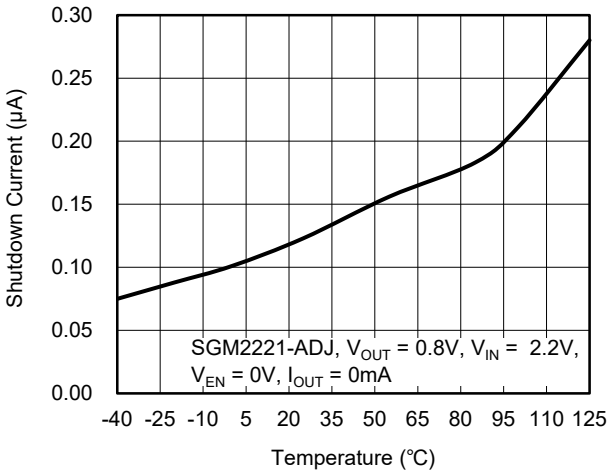
Shutdown Current vs. Temperature



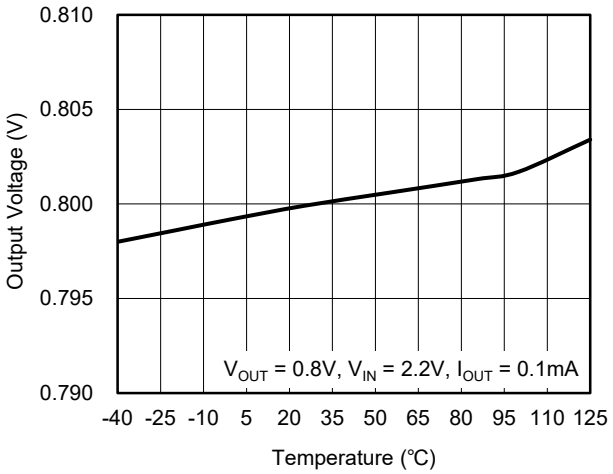
Shutdown Current vs. Temperature



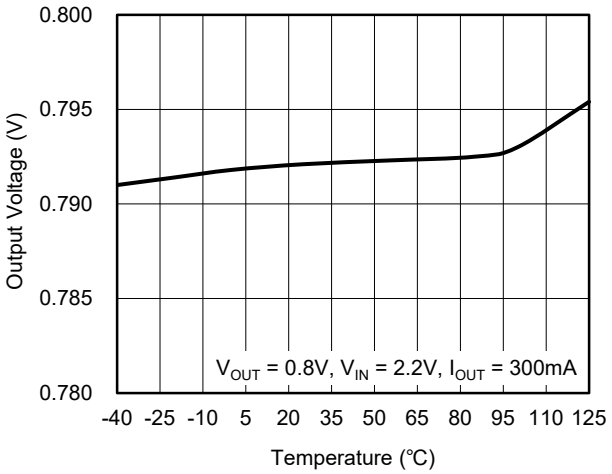
Shutdown Current vs. Temperature



Output Voltage vs. Temperature



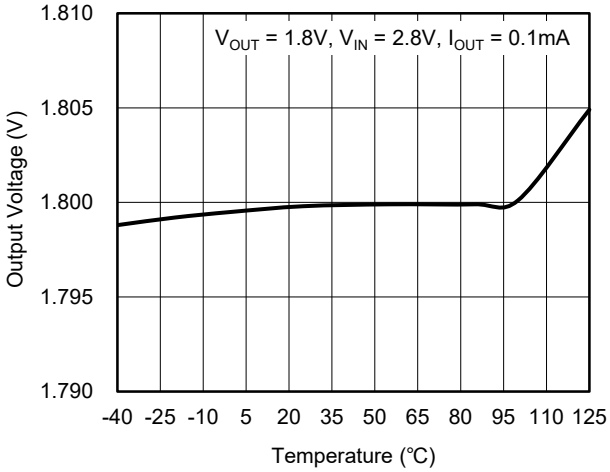
Output Voltage vs. Temperature



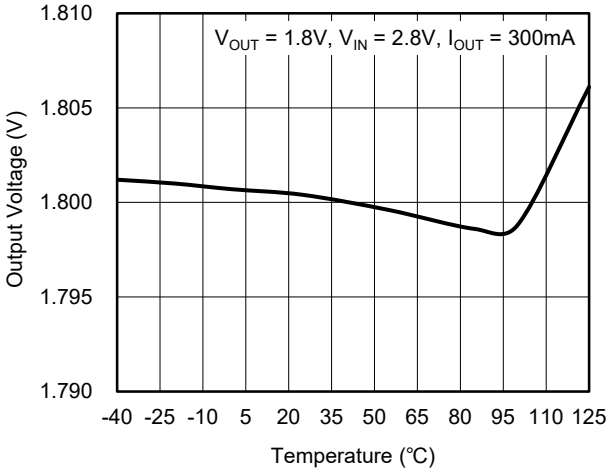
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

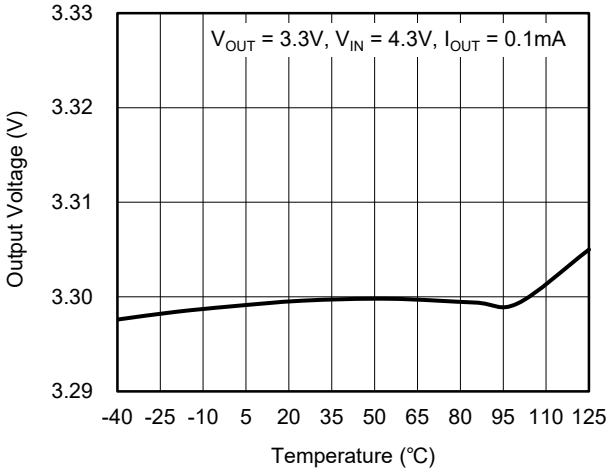
Output Voltage vs. Temperature



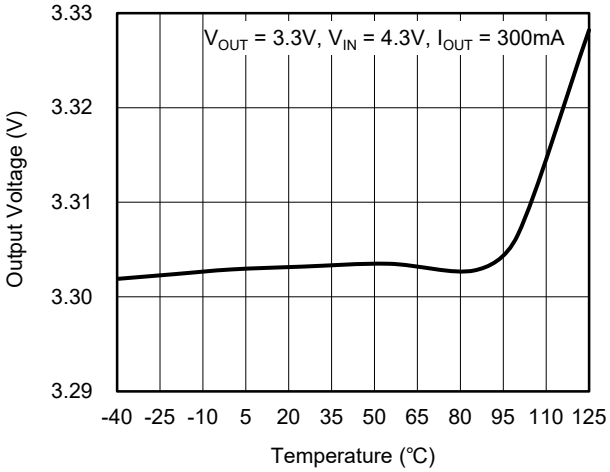
Output Voltage vs. Temperature



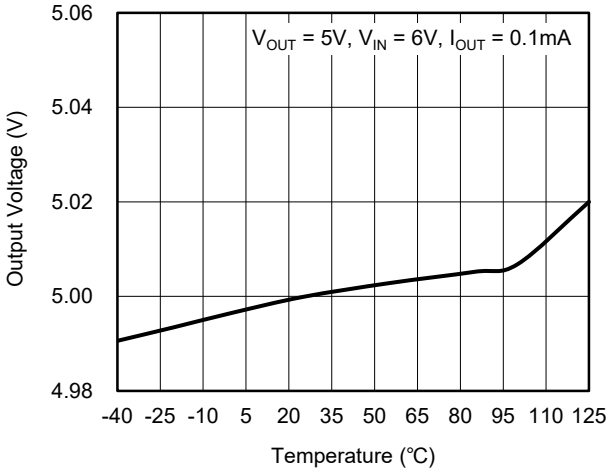
Output Voltage vs. Temperature



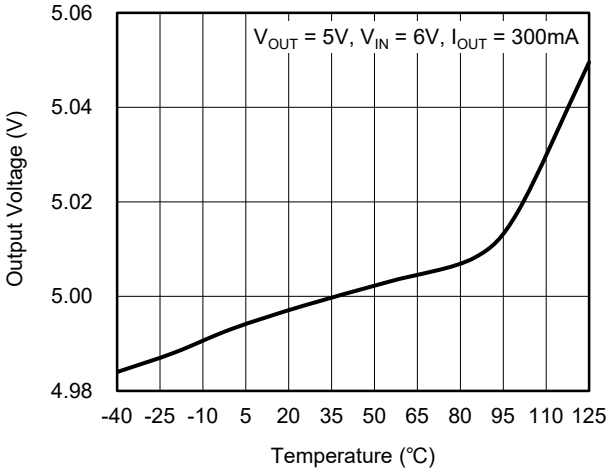
Output Voltage vs. Temperature



Output Voltage vs. Temperature



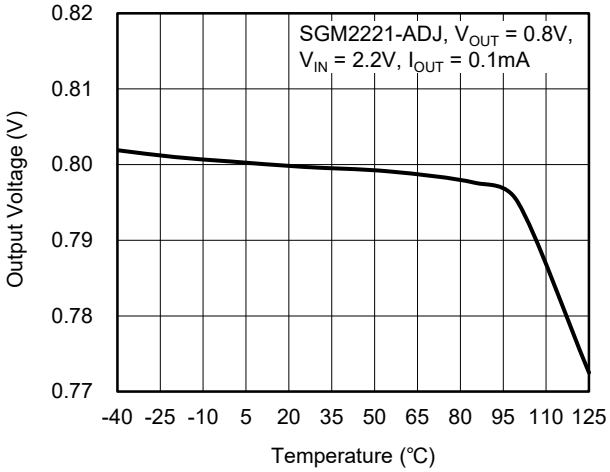
Output Voltage vs. Temperature



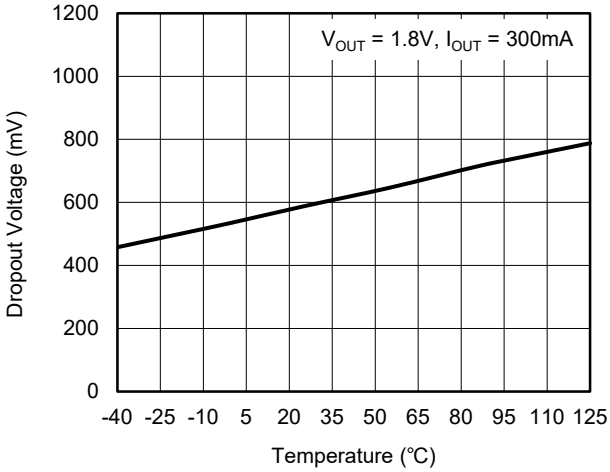
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, V_{IN} = ($V_{OUT(NOM)}$ + 1V) or 2.2V (whichever is greater), V_{EN} = V_{IN}, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise noted.

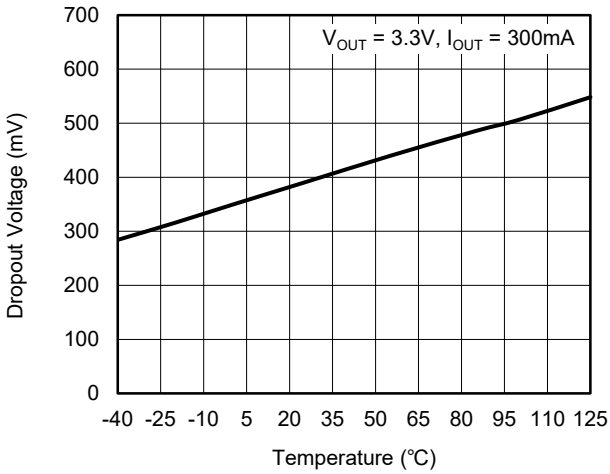
Output Voltage vs. Temperature



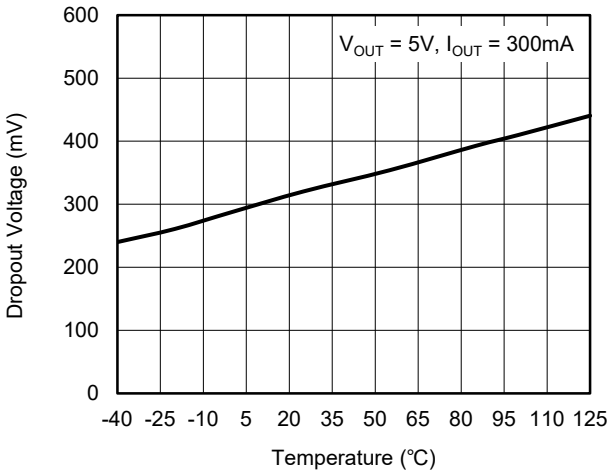
Dropout Voltage vs. Temperature



Dropout Voltage vs. Temperature



Dropout Voltage vs. Temperature



APPLICATION INFORMATION

The SGM2221 is a low quiescent current, low dropout and high input voltage LDO and provides 300mA output current. These features make the device a reliable solution to solve many challenging problems in the generation of clean and accurate power supply. The high performance also makes the SGM2221 useful in a variety of applications.

The SGM2221 provides an EN pin as an external chip enable control to enable/disable the device. When the regulator is in shutdown state, the shutdown current consumes as low as 0.2μA (TYP).

Input Capacitor Selection (C_{IN})

The input decoupling capacitor should be placed as close as possible to the VIN pin for ensuring the device stability. A 1μF to 10μF X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When V_{IN} is required to provide large current instantaneously, a large effective input capacitor is required. Multiple input capacitors can limit the input tracking inductance. Adding more input capacitors is available to restrict the ringing and to keep it below the device absolute maximum ratings. For C_{OUT} with larger capacitance, it is recommended to choose the larger capacitance C_{IN}.

Output Capacitor Selection (C_{OUT})

The output capacitor should be placed as close as possible to the VOUT pin. A 1μF to 10μF X7R or X5R ceramic capacitor is selected to get good dynamic performance. For ceramic capacitor, temperature, DC bias and package size will change the effective capacitance, so enough margin of C_{OUT} must be considered in design. Additionally, C_{OUT} with larger capacitance and lower ESR will help increase the high frequency PSRR and improve the load transient response.

Adjustable Regulator

The output voltage of the SGM2221-ADJ can be adjusted from 0.8V to 5.0V. The FB pin will be connected to two external resistors as shown in Figure 4. The output voltage is determined by the following equation:

$$V_{OUT} = V_{ADJ} \times \left(1 + \frac{R_1}{R_2}\right) \quad (1)$$

where:

V_{OUT} is output voltage and V_{ADJ} is the adjustable reference voltage, V_{ADJ} = 0.8V. The maximum resistance of R_2 is 800kΩ.

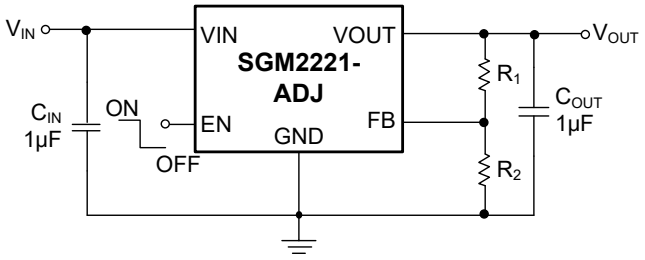


Figure 4. Adjustable Output Voltage Application

Enable Operation

The EN pin of the SGM2221 is used to enable/disable the device and to deactivate/activate the output automatic discharge function.

When the EN pin voltage is lower than 0.4V, the device is in shutdown state. There is no current flowing from VIN to VOUT pins. In this state, the automatic discharge transistor is active to discharge the output voltage through a 245Ω (TYP) resistor.

When the EN pin voltage is higher than 1.5V, the device is in active state. The output voltage is regulated to the expected value and the automatic discharge transistor is turned off.

Thermal Shutdown

When the die temperature exceeds the threshold value of thermal shutdown, the SGM2221 will be in shutdown state and it will remain in this state until the die temperature decreases to +130℃.

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

NOVEMBER 2024 – REV.A.2 to REV.A.3	Page
Updated Electrical Characteristics section	6, 7

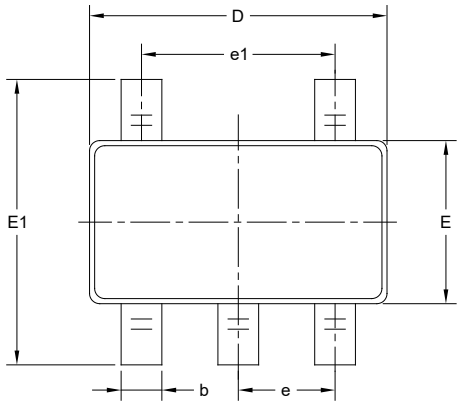
MARCH 2024 – REV.A.1 to REV.A.2	Page
Added SGM2221-1.2/1.5/2.5 to Package/Ordering Information section	2

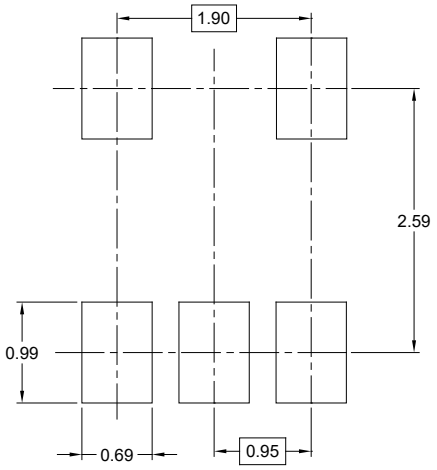
OCTOBER 2023 – REV.A to REV.A.1	Page
Updated Package/Ordering Information section	2

Changes from Original (JULY 2023) to REV.A	Page
Changed from product preview to production data	All

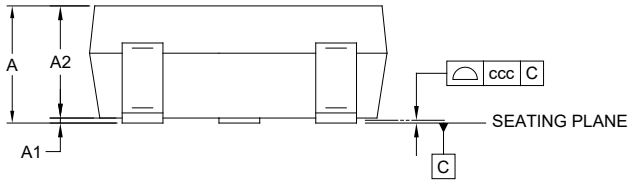
PACKAGE OUTLINE DIMENSIONS

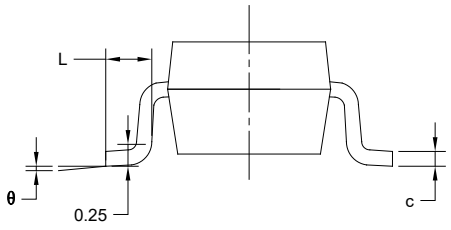
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)



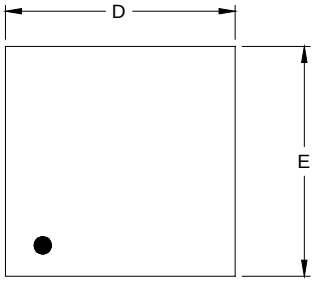


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.450
A1	0.000	-	0.150
A2	0.900	-	1.300
b	0.300	-	0.500
c	0.080	-	0.220
D	2.750	-	3.050
E	1.450	-	1.750
E1	2.600	-	3.000
e	0.950 BSC		
e1	1.900 BSC		
L	0.300	-	0.600
θ	0°	-	8°
ccc	0.100		

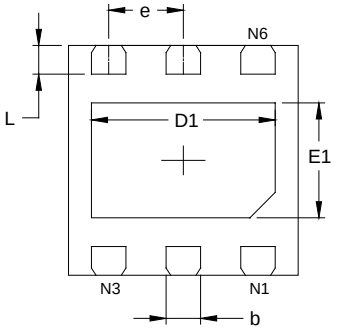
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

PACKAGE OUTLINE DIMENSIONS

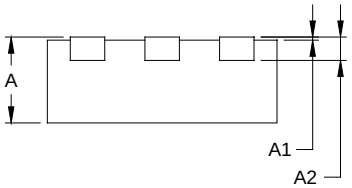
TDFN-2×2-6AL



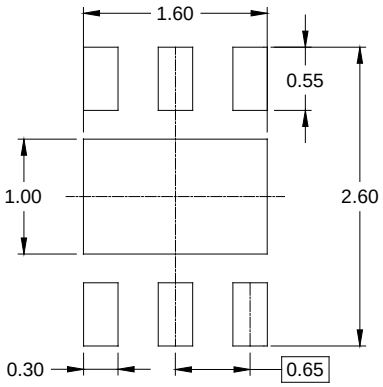
TOP VIEW



BOTTOM VIEW



SIDE VIEW



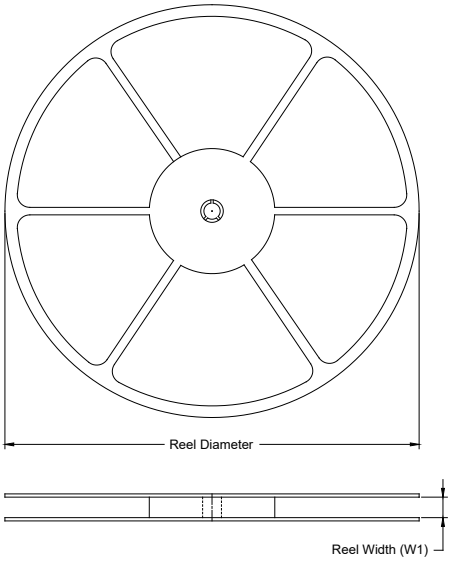
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.500	1.700	0.059	0.067
E	1.900	2.100	0.075	0.083
E1	0.900	1.100	0.035	0.043
b	0.250	0.350	0.010	0.014
e	0.650 BSC		0.026 BSC	
L	0.174	0.326	0.007	0.013

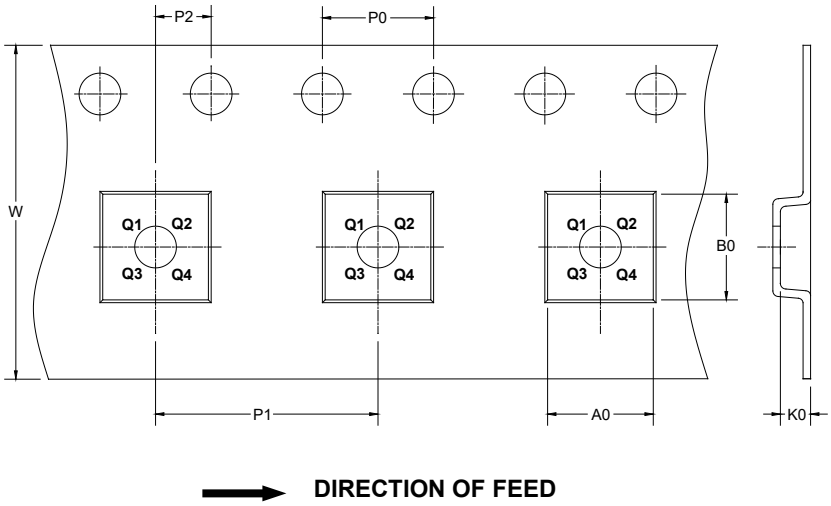
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



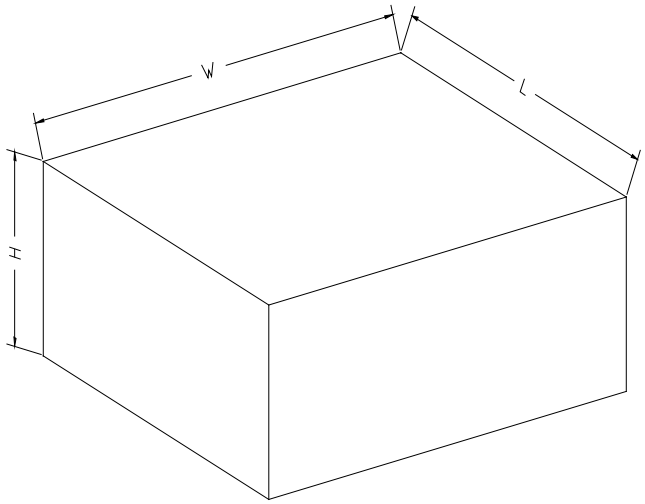
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7″	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
TDFN-2×2-6AL	7″	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002