Features

- Low Supply Current ~ 36uA (Typ.)
- Low Shutdown Current ~0.1uA (Typ.)
- Output Current ~150mA
- High Power Supply Rejection Ratio ~78db@1KHz
- 1.7~6.5V Operation
- ±1.0% Initial Voltage Accuracy
- Low Temperature Drift Coefficient ~50ppm
- Line Regulation ~0.02%/V(Typ.)
- Low ESR Capacitor ~0.47uF ceramic capacitor
- uDFN4-1x1、SOT-23-5、SC-82、MSOT-23 package
- Green Product (RoHS, Lead-Free, Halogen-Free Compliant)

Applications

- Portable communication equipment
- Notebook Computer
- Battery Powered Systems

General Description

The GS7108 is a CMOS linear regulator. It is featuring ultra-high power supply rejection ratio, low output voltage noise, low dropout voltage, low quiescent current and fast transient response. It guarantees delivery of 150mA output current, and supports preset 1.2V, 1.3V, 1.5V, 1.8V, 1.85V, 1.9V, 2.0V, 2.3V, 2.5V, 2.6V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.1V, 3.3V, 3.8V, 4.0V, 4.2V, 4.5V, 4.75V, 4.8V, 5.0V output voltage versions.

Based on its low quiescent current consumption and its less than 1uA shutdown mode, the GS7108 is ideal for battery- powered applications. The high power supply rejection ratio of the GS7108 holds well for low input voltages typically encountered in battery- operated systems. The regulator is stable with small ceramic capacitive loads (0.47µF typical).

Typical Application

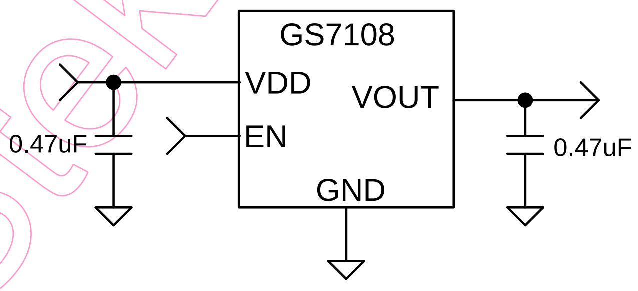


Figure.1 Typical Application of GS7108

Function Block Diagram

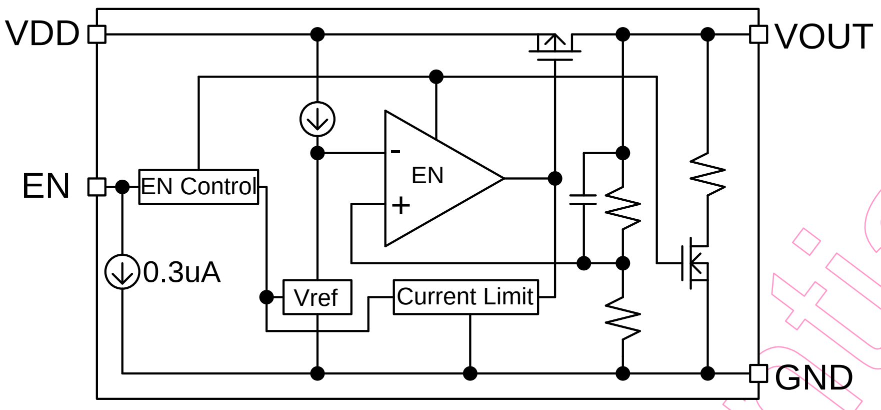


Figure 2a with auto discharge function (default)

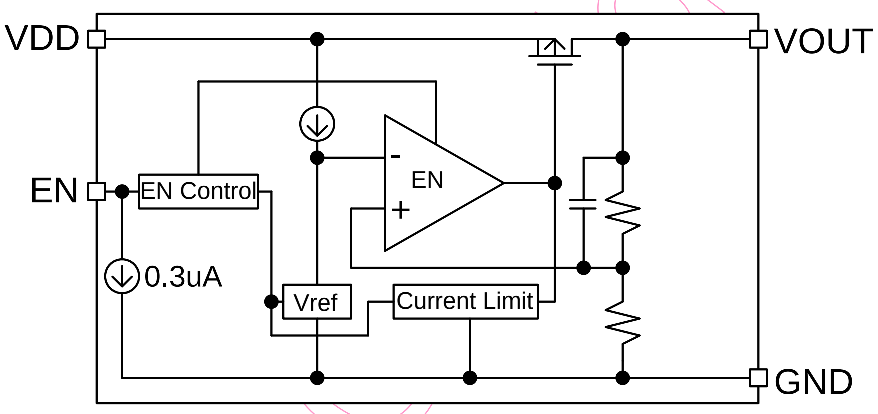


Figure 2b without auto discharge function (special order)

Figure 2 Function Block Diagram

Pin Configuration

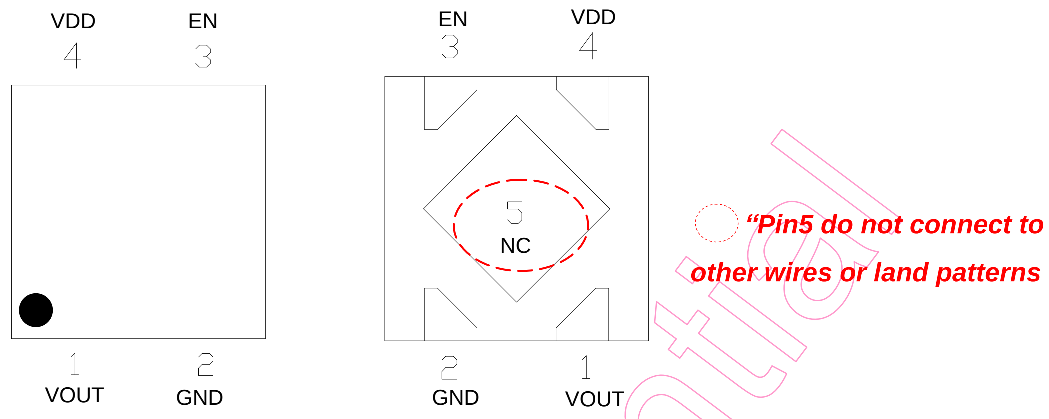


Figure 3a uDFN4-1x1 Package

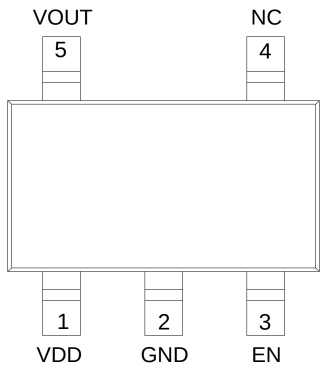


Figure 3b SOT-23-5 Package

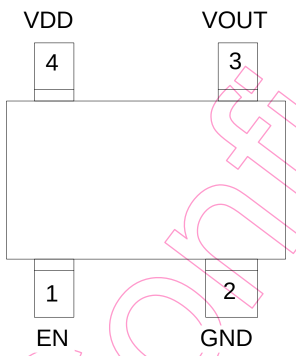


Figure 3c SC-82 Package

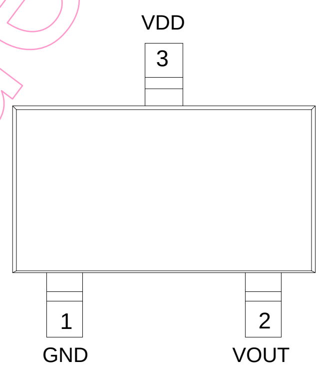


Figure 3d MSOT-23 Package

Pin Descriptions

No				Name	I/O type	Description
uDFN4-1x1	SOT-23-5	SC-82	MSOT-23			
1	5	3	2	VOUT	O	Output pin
2	2	2	1	GND	O	Ground pin
3	3	1		EN	I	Enable Pin
4	1	4	3	VDD	I	Input Pin
5	4			NC		

Ordering Information

GS7108PP-XXX- R

1. Package
2. Output Voltage
3. Shipping

No	Item	Contents
1	Package	UD: uDFN4-1x1 ST: SOT-23-5 SC: SC-82 SR: MSOT-23
2	Output Voltage	1P2: 1.2V, 1P3: 1.3V, 1P5: 1.5V, 1P8: 1.8V, 185: 1.85V, 1P9: 1.9V, 2P0: 2.0V, 2P3: 2.3V, 2P5: 2.5V, 2P6: 2.6V, 2P7: 2.7V, 2P8: 2.8V, 285: 2.85V, 2P9: 2.9V, 3P0: 3.0V, 3P1: 3.1V, 3P3: 3.3V, 3P8: 3.8V, 4P0: 4.0V, 4P2: 4.2V, 4P5: 4.5V, 475: 4.75V, 4P8: 4.8V, 5P0: 5.0V
3	Shipping	R: Tape & Reel

Example: GS7108 SC-82 2.5V Tape & Reel ordering information is “GS7108SC-2P5-R”

Absolute Maximum Rating (Note 1)

Parameter	Symbol	Limits	Units
VIN to GND	V_{IN}	$-0.3 < V_{IN} < 7$	V
VEN to GND	V_{EN}	$-0.3 < V_{EN} < 7$	V
Output Voltage	V_{OUT}	$-0.3 < V_{OUT} < V_{IN}+0.3$	V
Output Current	I_{OUT}	200	mA
Package Power Dissipation at $T_A \leq 25°C$	$P_{D\_uDFN4-1x1}$	400	mW
Package Power Dissipation at $T_A \leq 25°C$	$P_{D\_SOT-23-5}$	420	mW
Package Power Dissipation at $T_A \leq 25°C$	P_{D_SC82}	380	mW
Package Power Dissipation at $T_A \leq 25°C$	$P_{D\_MSOT-23}$	380	mW
Junction Temperature	T_J	- 45 ~ 150	°C
Storage Temperature	T_{STG}	- 65 ~ 150	°C
Lead Temperature (Soldering) 10S	T_{LEAD}	260	°C
ESD (Human Body Mode) (Note 2)	V_{ESD_HBM}	4K	V
ESD (Machine Mode) (Note 2)	V_{ESD_MM}	400	V

Thermal Information (Note 3)

Parameter	Symbol	Limits	Units
Thermal Resistance Junction to Ambient	$\theta_{JA\_uDFN4\text{-}1x1}$	250	°C/W
Thermal Resistance Junction to Case	$\theta_{JC\_uDFN4\text{-}1x1}$	67	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_SOT\text{-}23\text{-}5}$	238	°C/W
Thermal Resistance Junction to Case	$\theta_{JC\_SOT\text{-}23\text{-}5}$	110	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_SC\text{-}82}$	263	°C/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_MSOT\text{-}23}$	263	°C/W
Thermal Resistance Junction to Case	$\theta_{JC\_MSOT\text{-}23}$	140	°C/W

Recommend Operating Condition (Note 4)

Parameter	Symbol	Limits	Units
VIN to GND	V_{IN}	1.7 to 6.5	V
Junction Temperature Range	T_J	-40 ~ 125	°C
Operating Temperature Range	T_A	-40 ~ 85	°C

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V, T_A = -40°C to +85°C, C_{IN}=C_L=0.47uF, I_{OUT}=1mA, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
SUPPLY VOLTAGE SECTION							
Supply Voltage	V_{IN}			1.7		6.5	V
Supply Current	I_{VIN}	Unload			36	60	uA
Standby Current	I_{STBY}	V_{EN}=0			0.1	1.0	uA
EN Input Current	I_{EN}	V_{EN}=V_{IN}=7V			0.3		uA
Output Current	I_{OUT}			150			mA
OUTPUT SECTION							
Output Voltage	V_{OUT}	T_A = 25°C	V_{OUT}>2.0V	x0.99		x1.01	V
			V_{OUT}≤2.0V	-20		20	mV
		T_A = -40°C to +85°C	V_{OUT}>2.0V	x0.985		x1.015	V
			V_{OUT}≤2.0V	-30		30	mV

Dropout Voltage (Note 5)	V_{DROP}	I_{OUT}=150mA	1.2V≤V_{OUT}<1.5V		0.50	0.62	V
			1.5V≤V_{OUT}<1.7V		0.38	0.47	
			1.7V≤V_{OUT}<2.0V		0.34	0.42	
			2.0V≤V_{OUT}<2.5V		0.28	0.36	
			2.5V≤V_{OUT}<2.8V		0.22	0.30	
			2.8V≤V_{OUT}≤3.3V		0.21	0.27	
			3.3V≤V_{OUT}≤4.0V		0.20	0.26	
			4.0V≤V_{OUT}≤5.0V		0.19	0.25	
Line Regulation	$\triangle V_{LNR}$	V_{IN} = V_{OUT} +0.5V to 6.5V, I_{OUT}=1mA			0.02	0.10	%/V
Load Regulation	$\triangle V_{LDR}$	V_{IN} = V_{OUT}+1V, I_{OUT}=1mA to 150mA			15	30	mV
Ripple Rejection Rate	PSRR	V_{IN}=MAX{V_{OUT}+1.0V, 3V}, Ripple 0.2Vp-p, I_{OUT}=30mA, f=1KHz			78		dB
Limit Current	Ilim	V_{EN}=V_{IN}			260		mA
Short Current	Ishort	V_{OUT}=0V			35		mA
EN Input Voltage High	V_{ENH}			1.5			V
EN Input Voltage Low	V_{ENL}					0.3	V
CL Auto-Discharge Resistance (Note 6)	Rdischg	V_{IN}=4.0V, V_{EN}=0V			100		Ω
Temperature Drift	$\triangle V_{OUT}$ /$\triangle T_A$	I_{OUT}=1mA, T_A = -40°C to +85°C			50		ppm/°C

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2. Devices are ESD sensitive. Handling precaution recommended.

Note 3. θ_{JA} is measured in the natural convection at T_A=25°C on a high effective thermal conductivity test board (4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.

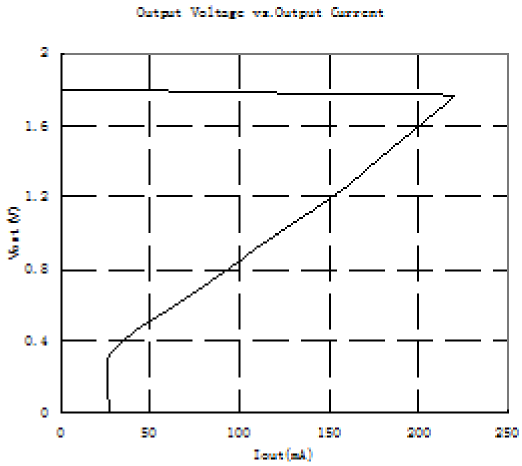
Note 4. The device is not guaranteed to function outside its operating conditions.

Note 5. The dropout voltage is defined as V_{IN} - V_{OUT}, which is measured when V_{OUT} is 98%*V_{OUT}.

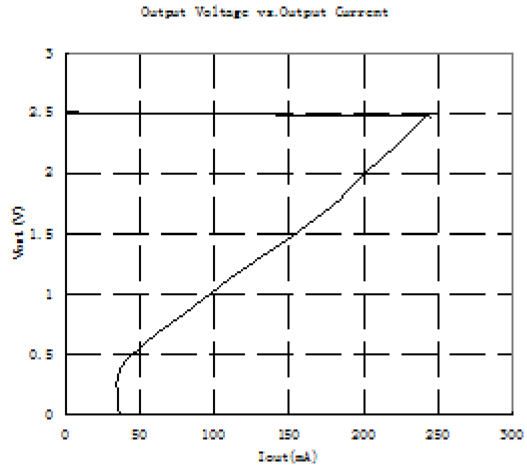
Note 6. The output voltage Auto discharge function is optional.

Typical Characteristics

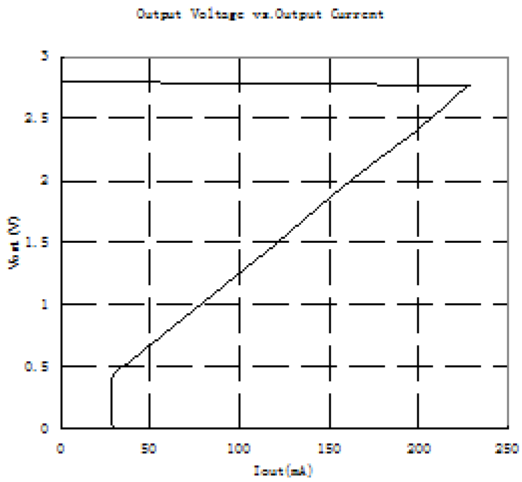
Output Voltage vs. Output Current



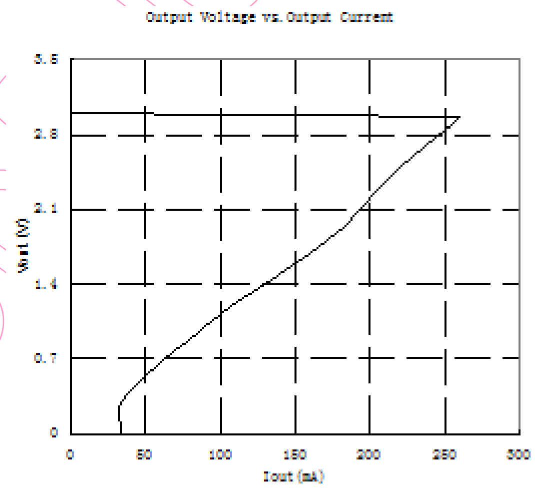
V_{OUT}=1.8V, V_{DD}=2.8V



V_{OUT}=2.5V, V_{DD}=3.5V

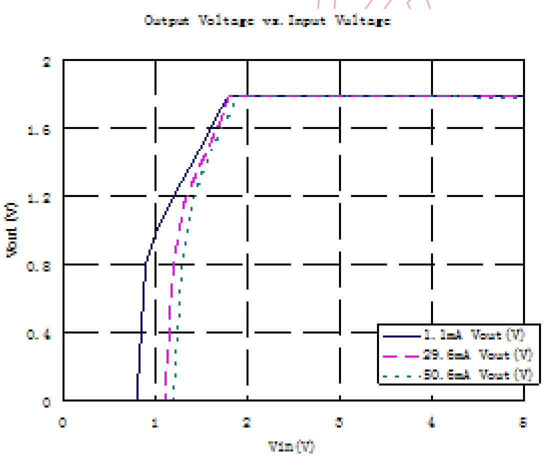


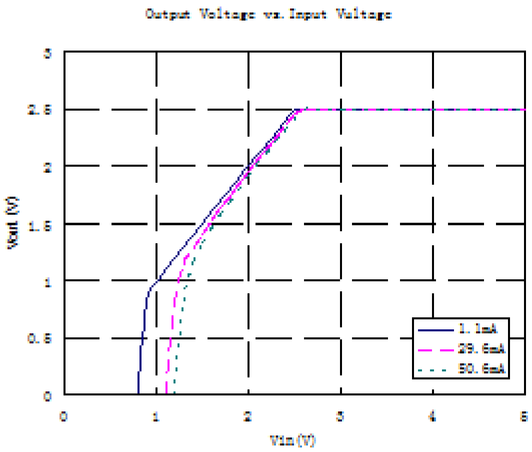
V_{OUT}=2.8V, V_{DD}=3.8V



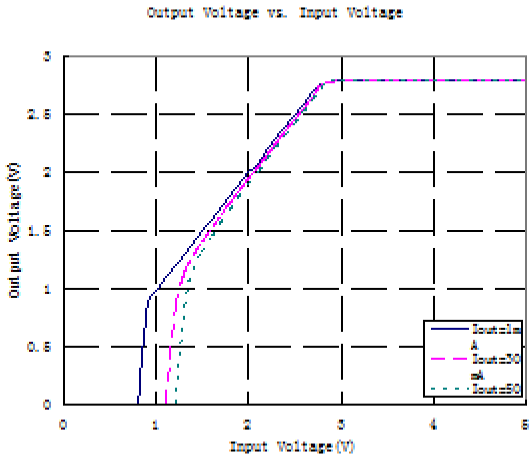
V_{OUT}=3.3V, V_{DD}=4V

Output Voltage vs. Input Voltage

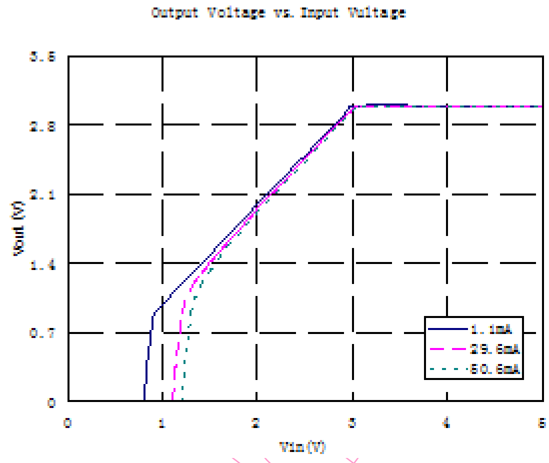




V_{OUT}=1.8V, I_{OUT}=1mA,30mA,50mA



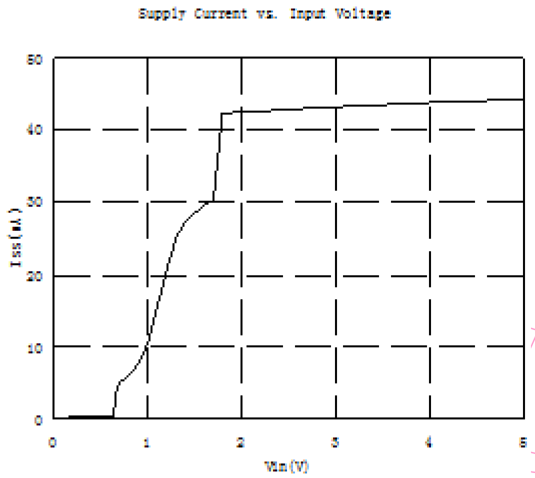
V_{OUT}=2.5V, I_{OUT}=1mA,30mA,50mA

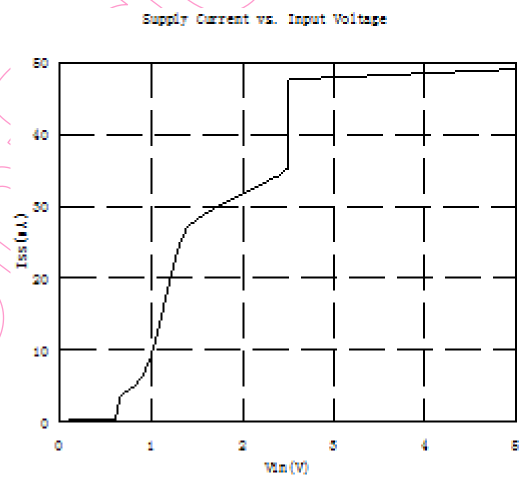


V_{OUT}=2.8V, I_{OUT}=1mA,30mA,50mA

V_{OUT}=3.0V, I_{OUT}=1mA,30mA,50mA

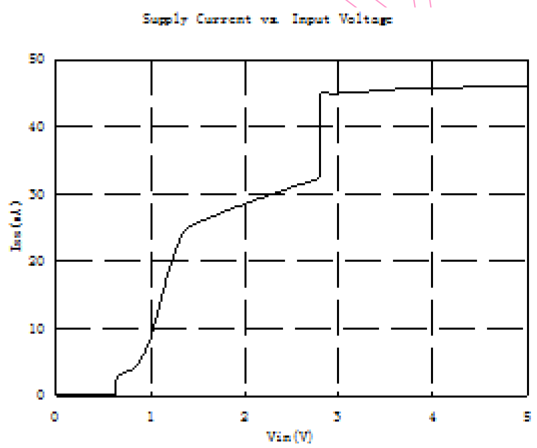
Supply Current vs. Input Voltage

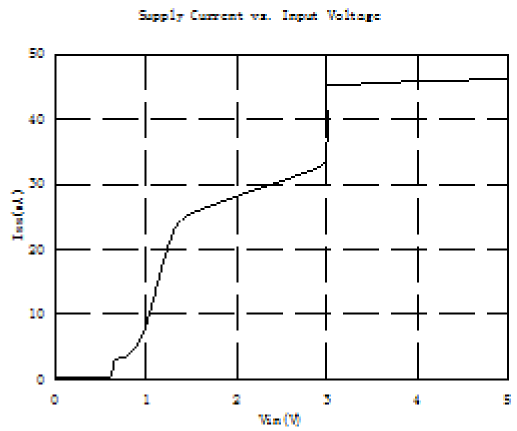




V_{OUT}=1.2V, I_{OUT}=unload

V_{OUT}=2.5V, I_{OUT}=unload

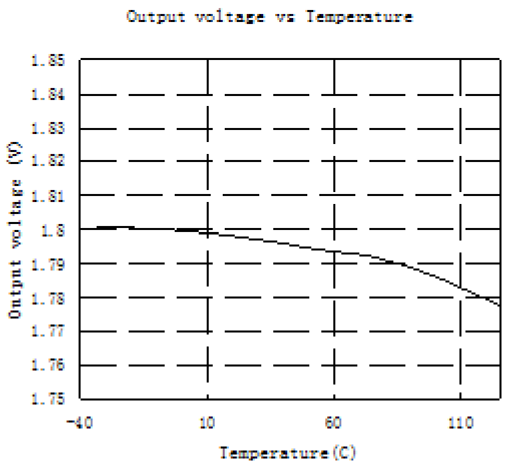




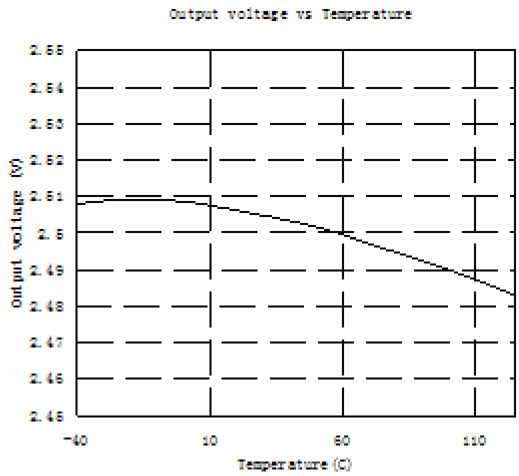
V_{OUT}=3.3V, I_{OUT}=unload

V_{OUT}=2.8V, IO_{UT}=unload

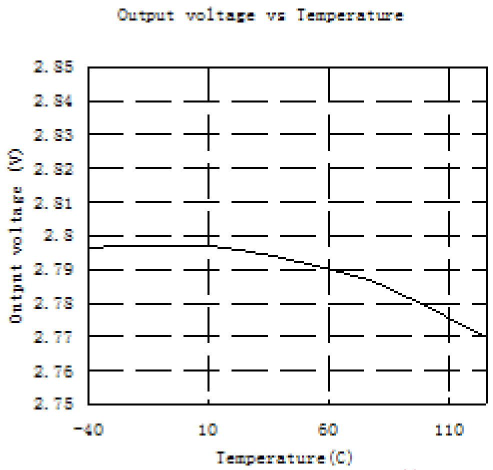
Output Voltage vs. Temperature



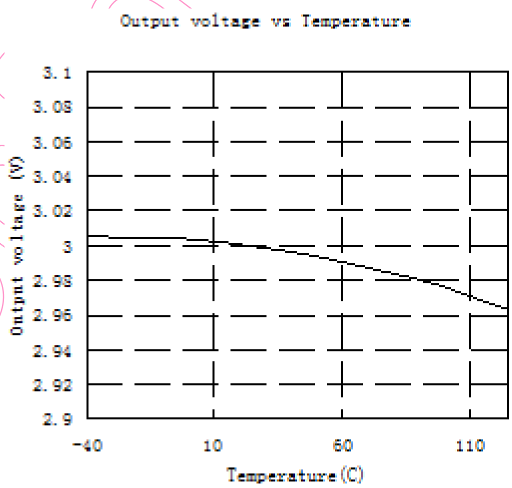
V_{OUT}=1.8V, I_{OUT}=1mA, V_{DD}=2.8V



V_{OUT}=2.5V, I_{OUT}=1mA, V_{DD} =3.5V

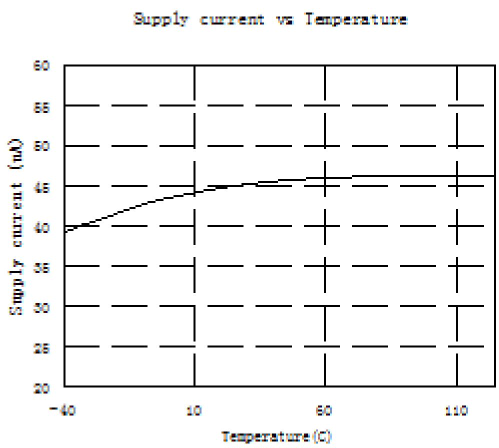


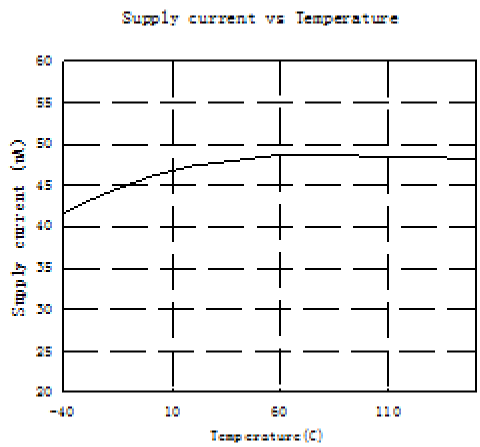
V_{OUT}=2.8V, I_{OUT}=1mA, V_{DD}=3.8V



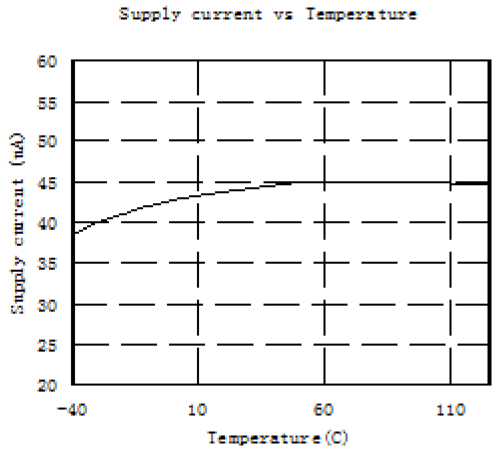
V_{OUT}=3.0V, I_{OUT}=1mA, V_{DD}=4.0V

Supply Current vs. Temperature

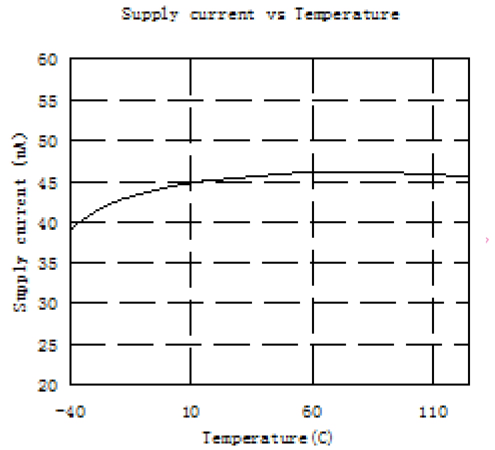




V_{OUT}=1.8V, I_{OUT}=1mA, V_{DD}=2.8V



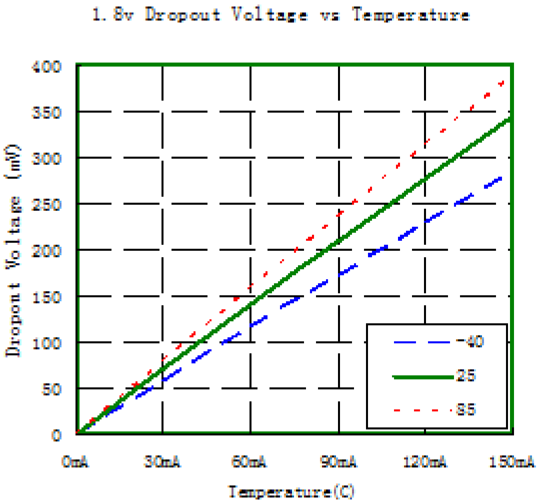
V_{OUT}=2.5V, I_{OUT}=1mA, V_{DD} =3.5V



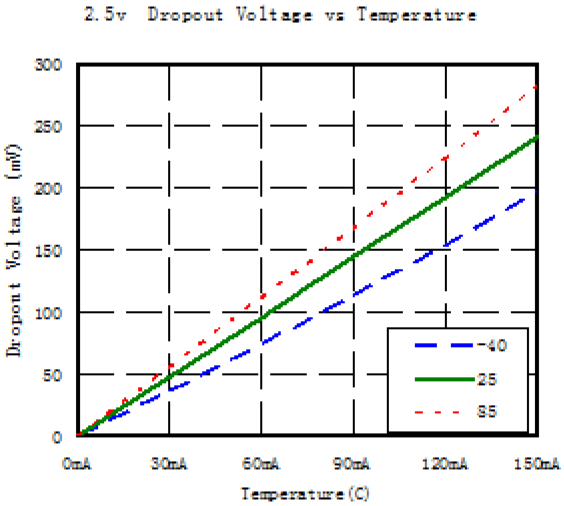
V_{OUT}=2.8V, I_{OUT}=1mA, V_{DD}=3.8V

V_{OUT}=3.0V, I_{OUT}=1mA, V_{DD}=4.0V

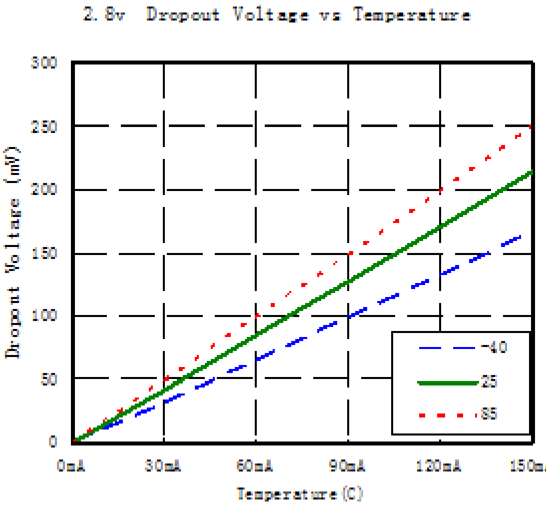
Dropout Voltage vs. Output Current

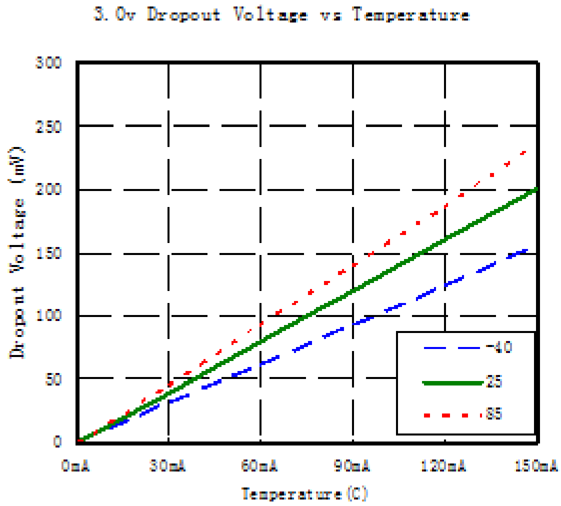


V_{OUT}=1.8V,Temp=-40℃,25℃,85℃



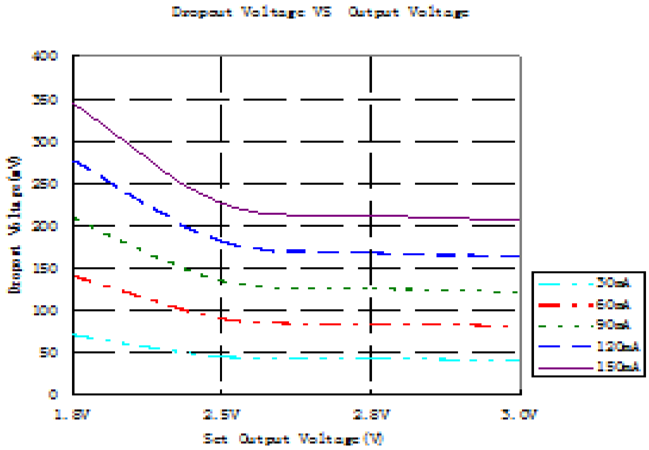
V_{OUT}=2.5V,Temp=-40℃,25℃,85℃





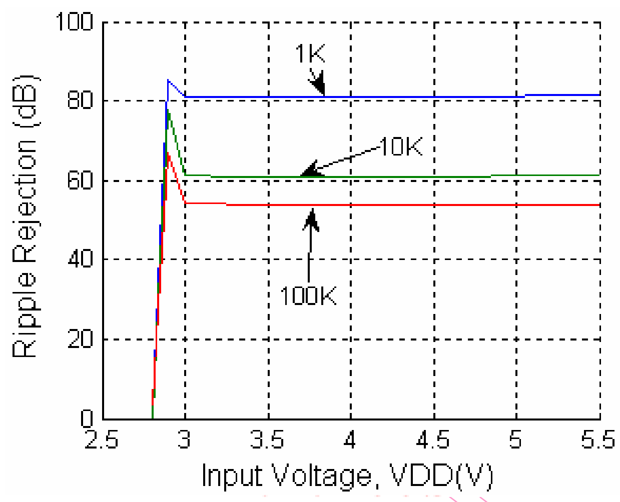
V_{OUT}=2.8V,Temp=-40℃,25℃,85℃ V_{OUT}=3.0V,Temp=-40℃,25℃,85℃

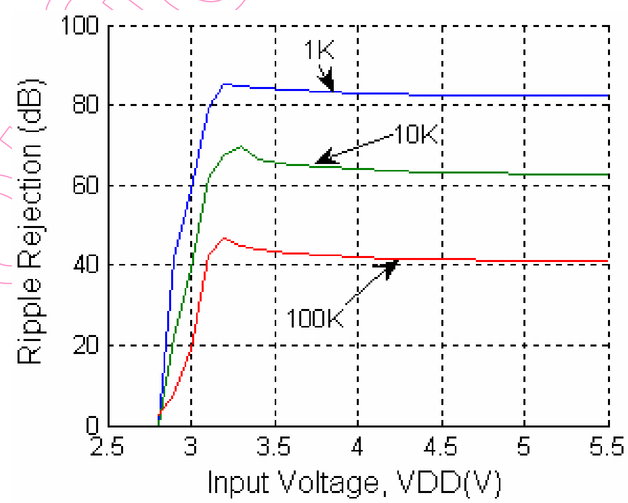
Dropout Voltage vs. Set Output Voltage



I_{OUT}=30mA,60mA, 90mA, 120mA,150mA, Temp = 25°C

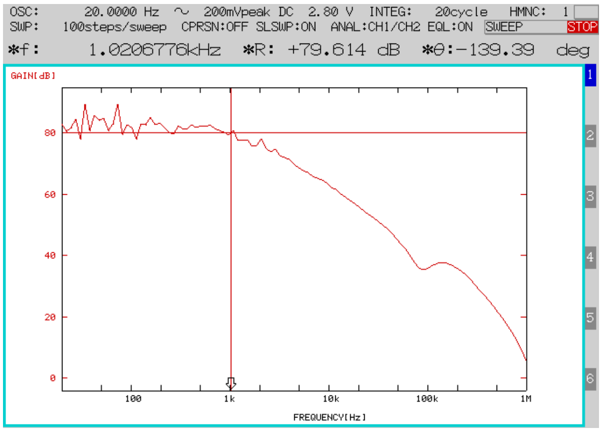
Ripple Rejection vs. Input Bias Voltage



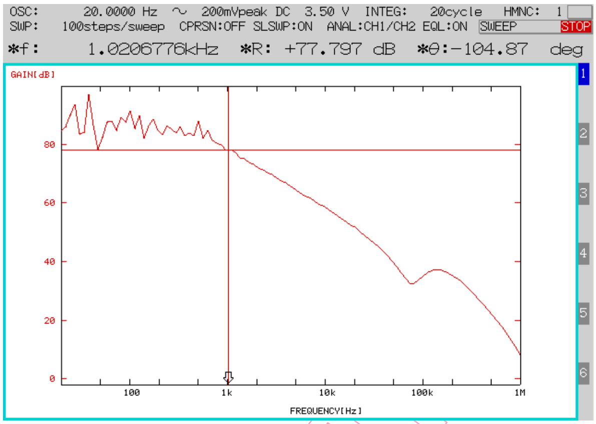


I_{OUT}=1mA, V_{OUT}=2.8V, Freq=1kHz,10kHz,100kHz I_{OUT}=30mA, V_{OUT}=2.8V, Freq=1kHz,10kHz,100kHz

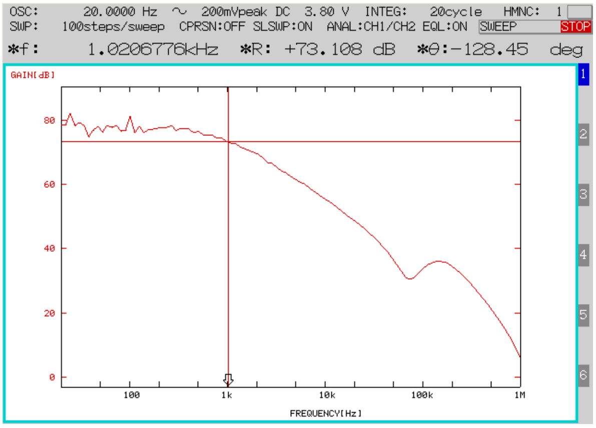
Ripple Rejection vs. Frequency



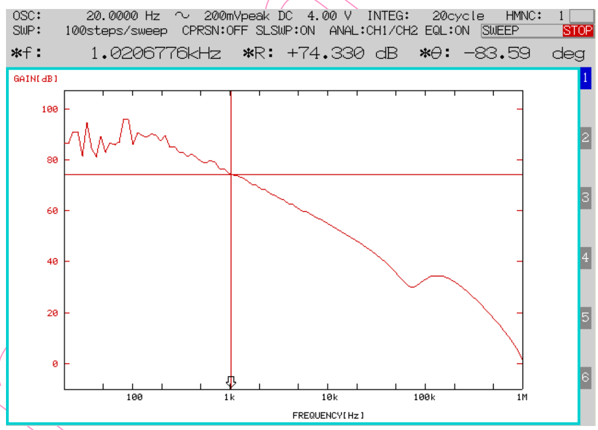
V_{OUT}=1.8V, V_{DD}=2.8V, I_{OUT}=1mA



V_{OUT}=2.5V, V_{DD}=3.5V, I_{OUT}=1mA

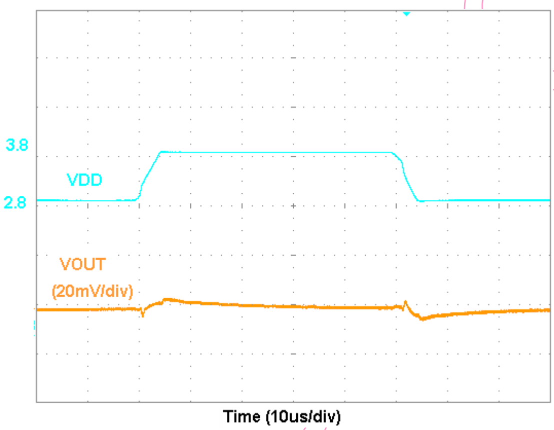


V_{OUT}=2.8V, V_{DD}=3.8V, I_{OUT}=1mA



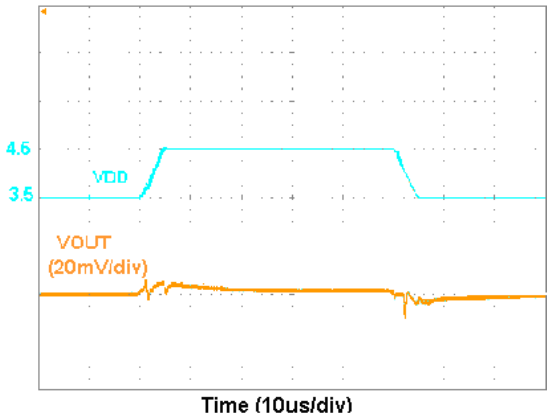
V_{OUT}=3.0V, V_{DD}=4.0V, I_{OUT}=1mA

Input Transient Response



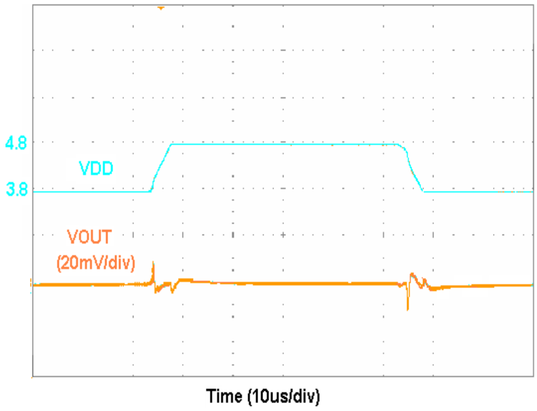
V_{OUT}=1.8V, V_{DD}=2.8V~3.8V~2.8V, I_{OUT}=30mA

tr=tf=5us



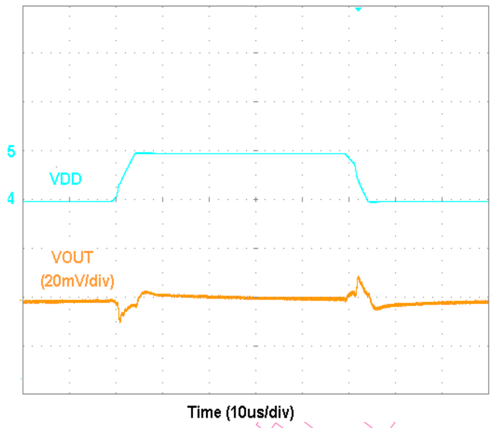
V_{OUT}=2.5V, V_{DD}=3.5V~4.5V~3.5V, I_{OUT}=30mA

tr=tf=5us



V_{OUT}=2.8V, V_{DD}=3.8V~4.8V~3.8V, I_{OUT}=30mA

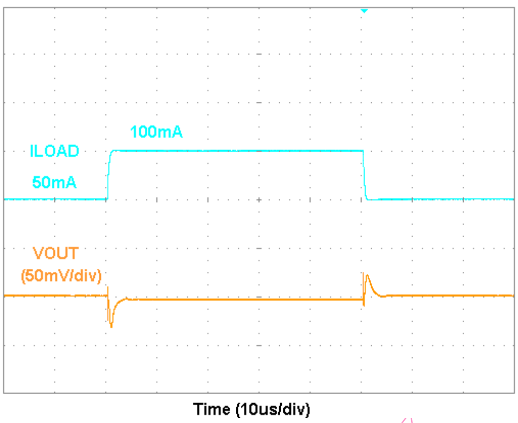
tr=tf=5us



V_{OUT}=3.0V, V_{DD}=4.0V~5.0V~4.0V, I_{OUT}=30mA

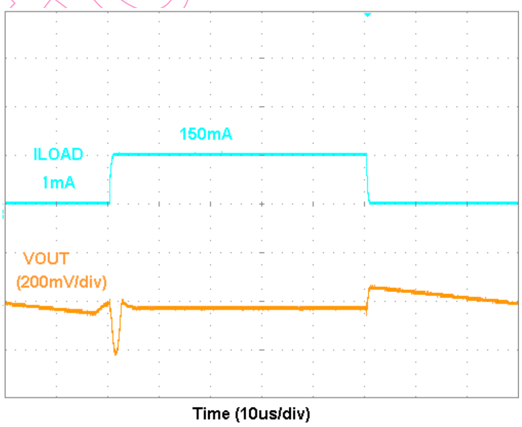
tr=tf=5us

Load Transient Response



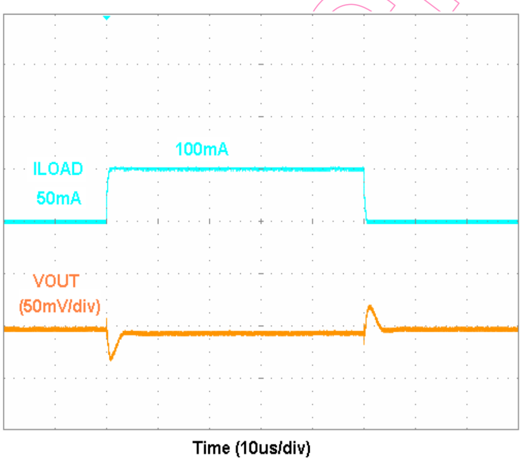
V_{OUT}=1.8V, I_{OUT}=50mA~100mA~50mA, V_{DD}=2.8V

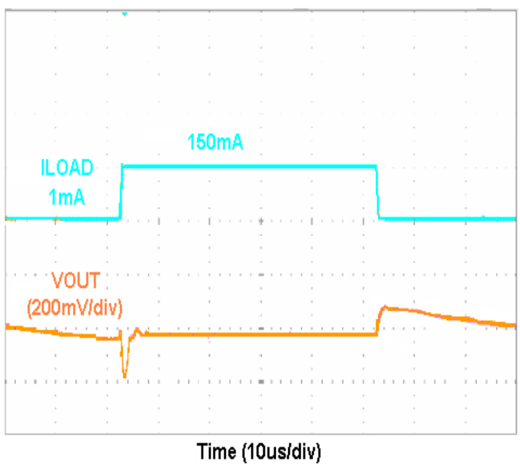
tr=tf=0.5us



V_{OUT}=1.8V, I_{OUT}=1mA~150mA~1mA, V_{DD}=2.8V

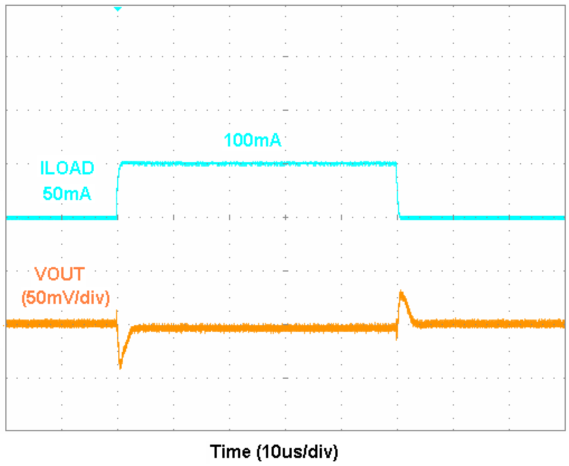
tr=tf=0.5us





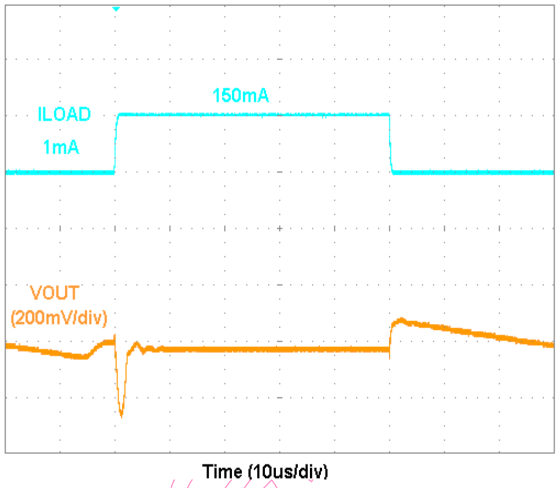
V_{OUT}=2.5V, I_{OUT}=50mA~100mA~50mA, V_{DD}=3.5V

tr=tf=0.5us



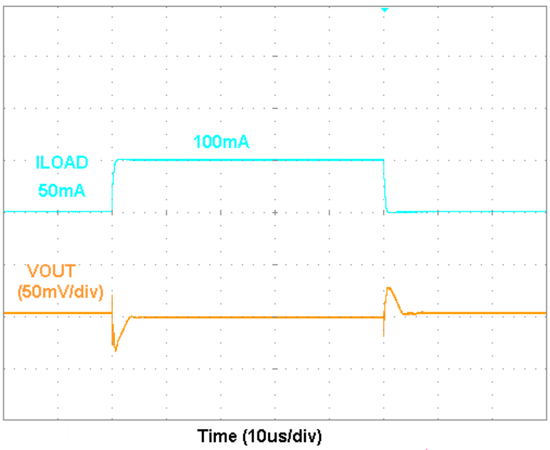
V_{OUT}=2.5V, I_{OUT}=1mA~150mA~1mA, V_{DD}=3.5V

tr=tf=0.5us



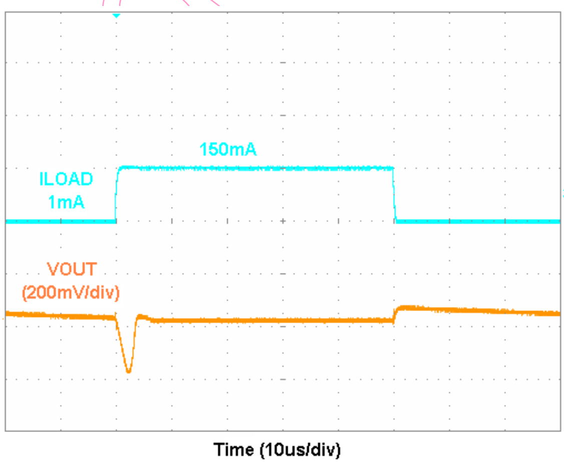
V_{OUT}=2.8V, I_{OUT}=50mA~100mA~50mA, V_{DD}=3.8 V

tr=tf=0.5us



V_{OUT}=2.8 V, I_{OUT}=1mA~150mA~1mA, V_{DD}=3.8V

tr=tf=0.5us



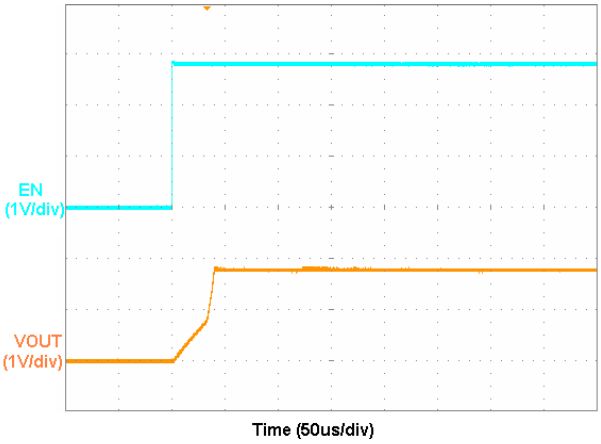
V_{OUT}=3.0V, I_{OUT}=50mA~100mA~50mA, V_{DD}=4.0 V

tr=tf=0.5us

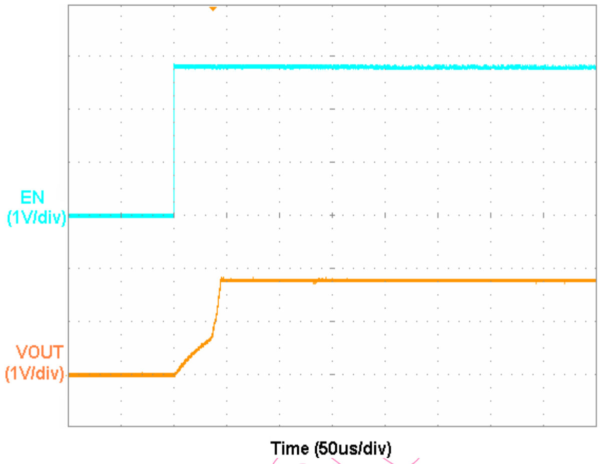
V_{OUT}=3.0 V, I_{OUT}=1mA~150mA~1mA, V_{DD}=4.0V

tr=tf=0.5us

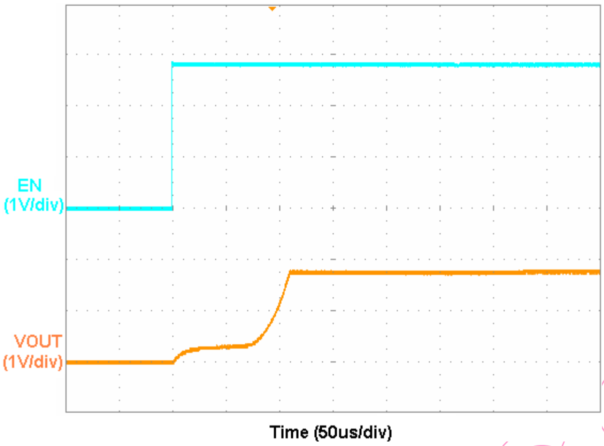
Turn On Speed with EN pin



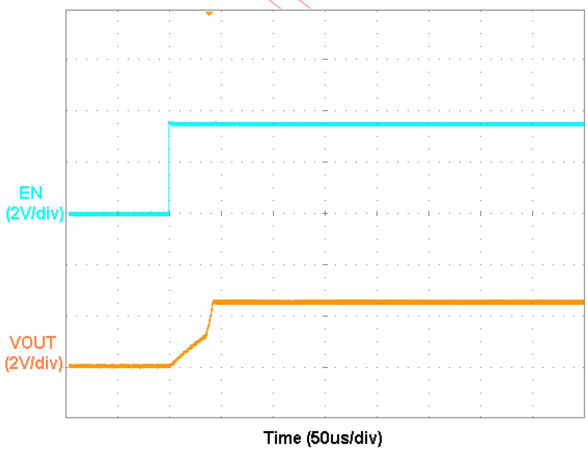
V_{OUT}=1.8V, I_{OUT}=0MA, V_{DD}=2.8V



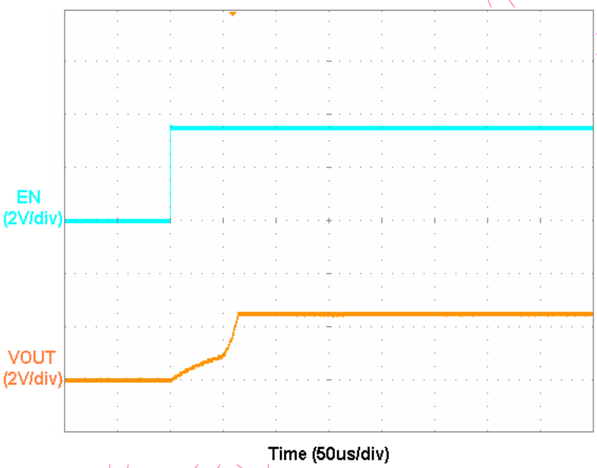
V_{OUT}=1.8V, I_{OUT}=30MA, V_{DD}=2.8V



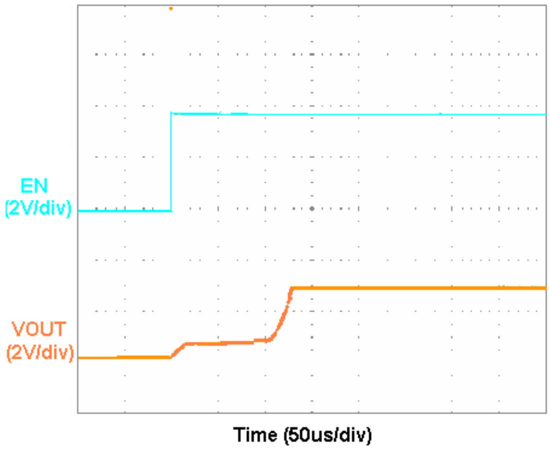
V_{OUT}=1.8V, I_{OUT}=150MA, V_{DD}=2.8V



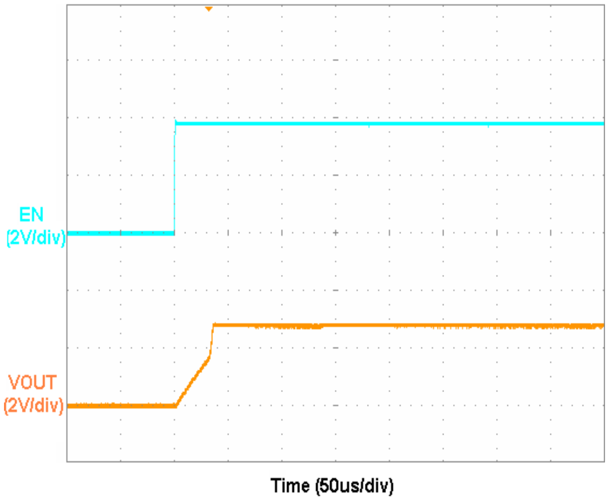
V_{OUT}=2.5V, I_{OUT}=0MA, V_{DD}=3.5V



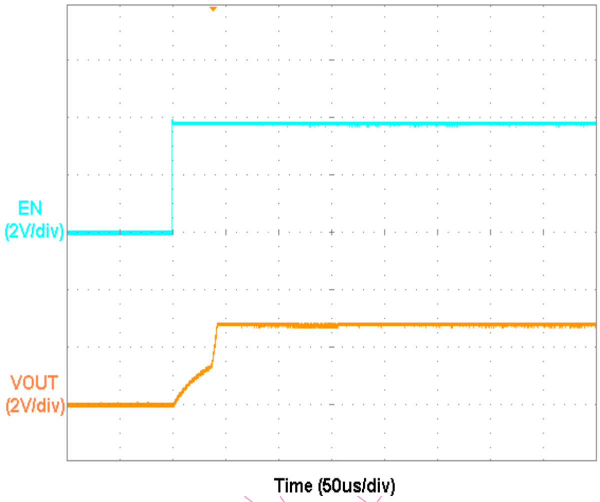
V_{OUT}=2.5V, I_{OUT}=30MA, V_{DD}=3.5V



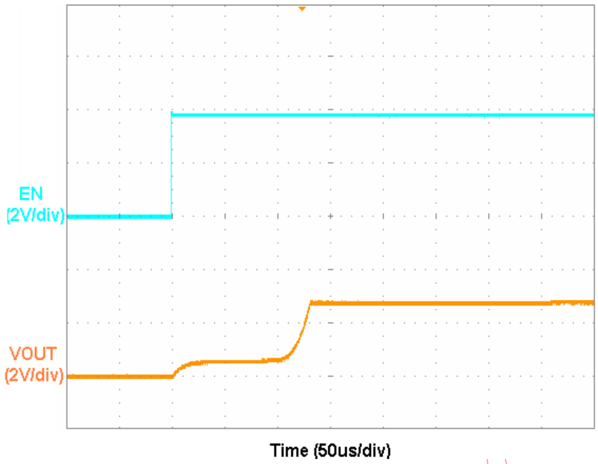
V_{OUT}=2.5V, I_{OUT}=150MA, V_{DD}=3.5V



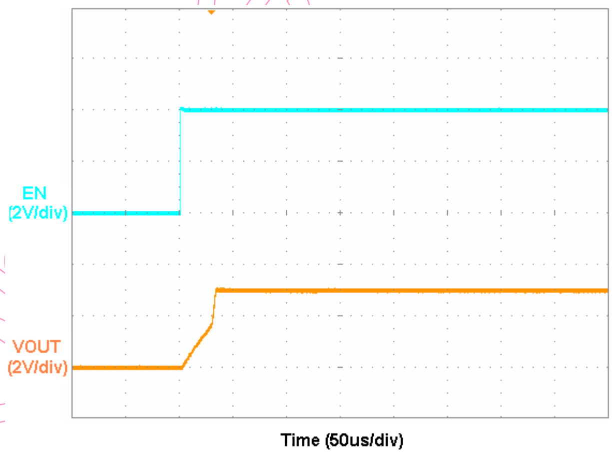
V_{OUT}=2.8V, I_{OUT}=0MA, V_{DD}=3.8V



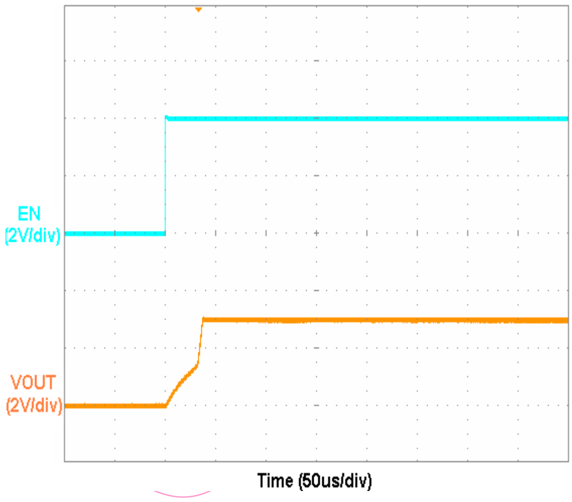
V_{OUT}=2.8V, I_{OUT}=30MA, V_{DD}=3.8V



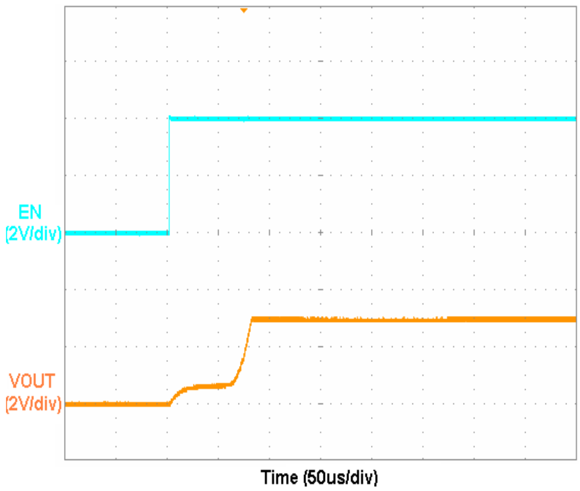
V_{OUT}=2.8V, I_{OUT}=150MA, V_{DD}=3.8V



V_{OUT}=3.0V, I_{OUT}=0mA, V_{DD}=4.0V

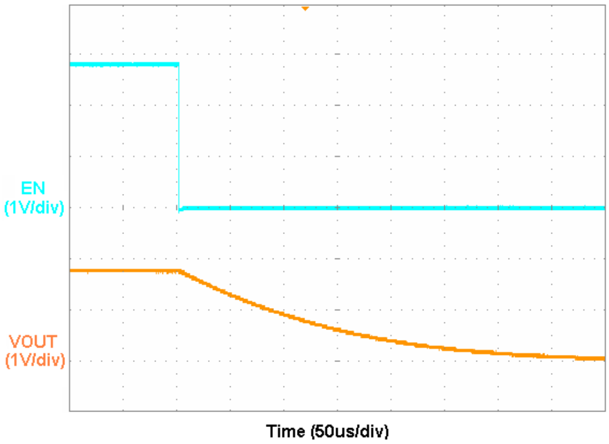


V_{OUT}=3.0V, I_{OUT}=30mA, V_{DD}=4.0V

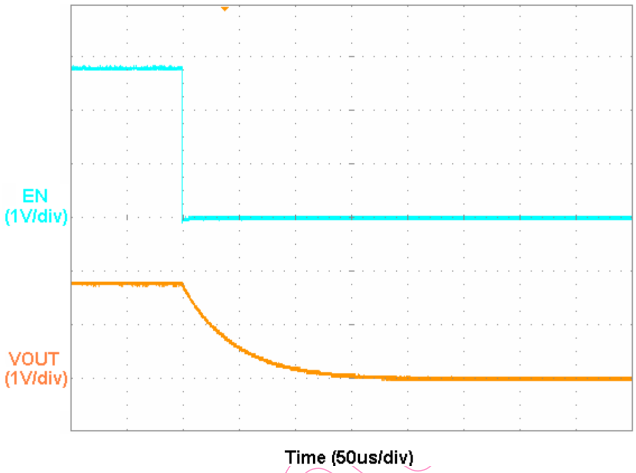


V_{OUT}=3.0V, I_{OUT}=150mA, V_{DD}=4.0V

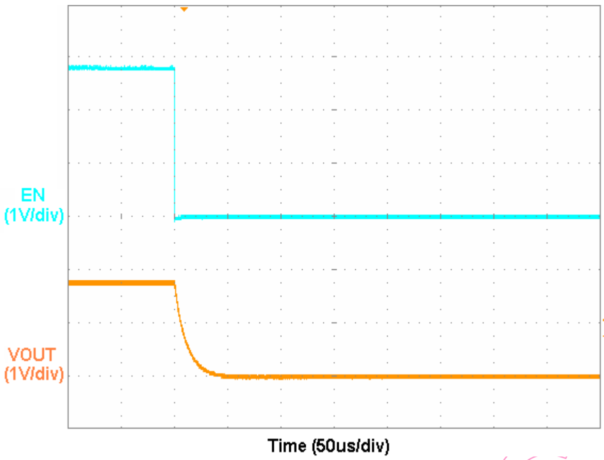
Turn Off Speed with EN pin



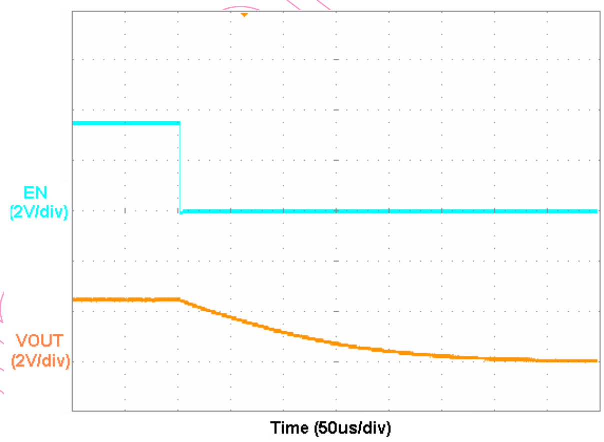
V_{OUT}=1.8V, I_{OUT}=0mA, V_{DD}=2.8V



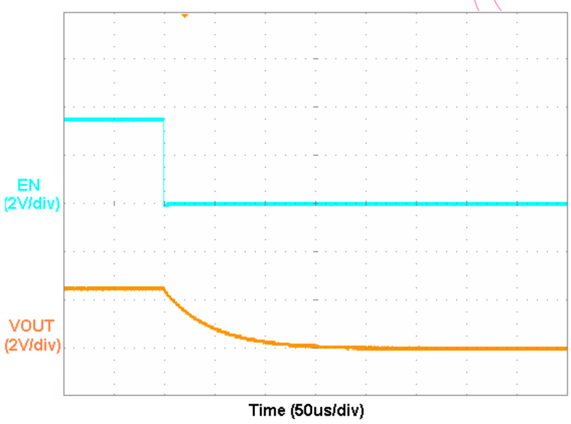
V_{OUT}=1.8V, I_{OUT}=30mA, V_{DD}=2.8V



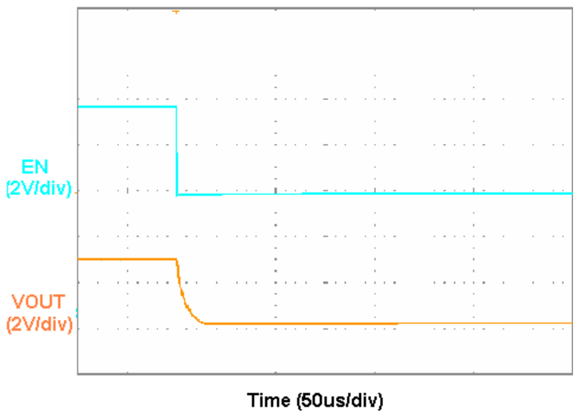
V_{OUT}=1.8V, I_{OUT}=150mA, V_{DD}=2.8V



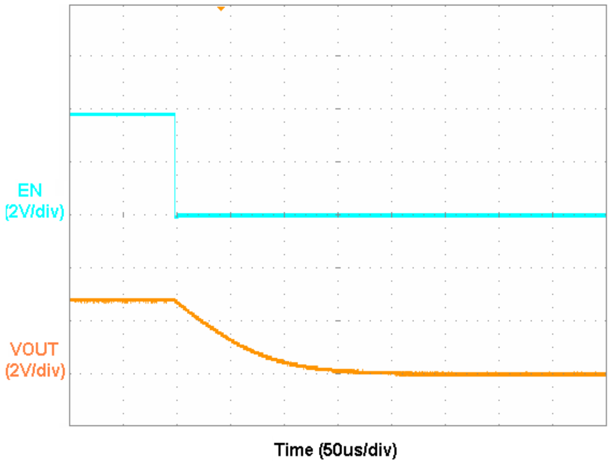
V_{OUT}=2.5V, I_{OUT}=0mA, V_{DD}=3.5V



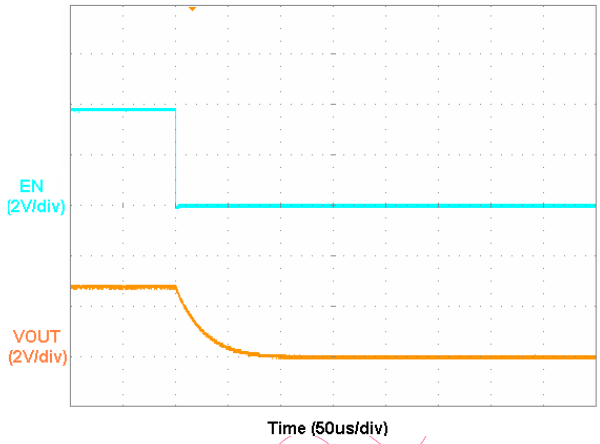
V_{OUT}=2.5V, I_{OUT}=30mA, V_{DD}=3.5V



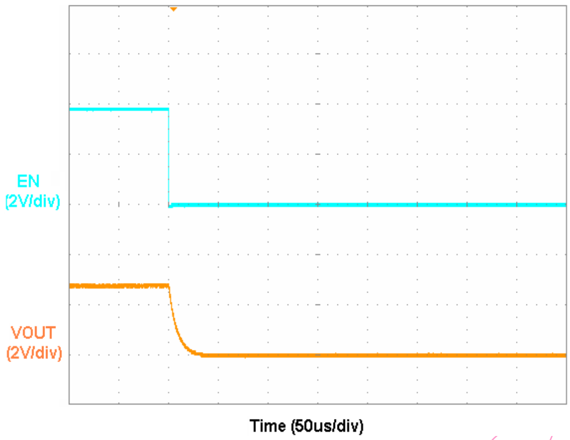
V_{OUT}=2.5V, I_{OUT}=150mA, V_{DD}=3.5V



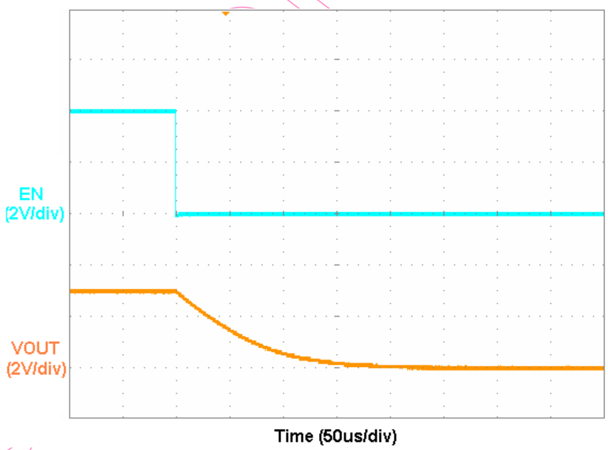
V_{OUT}=2.8V, I_{OUT}=0mA, V_{DD}=3.8V



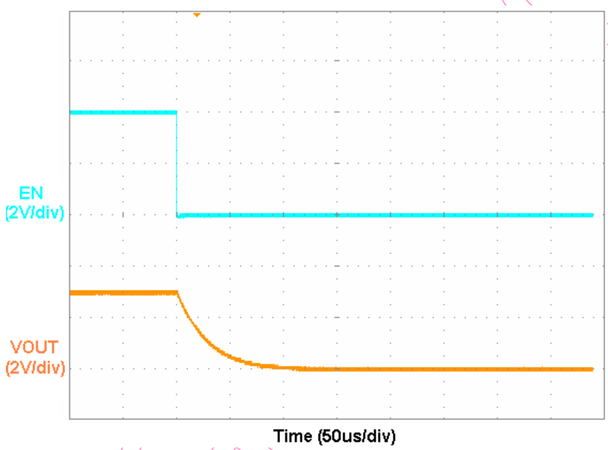
V_{OUT}=2.8V, I_{OUT}=30mA, V_{DD}=3.8V



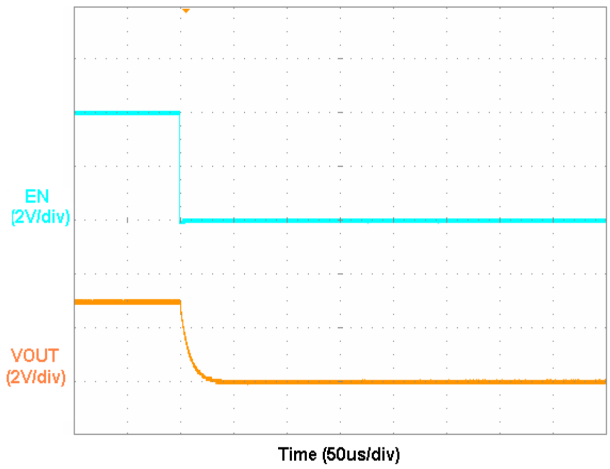
V_{OUT}=2.8V, I_{OUT}=150mA, V_{DD}=3.8V



$V_{OU}T$=3.0V, I_{OUT}=0mA, V_{DD}=4.0V

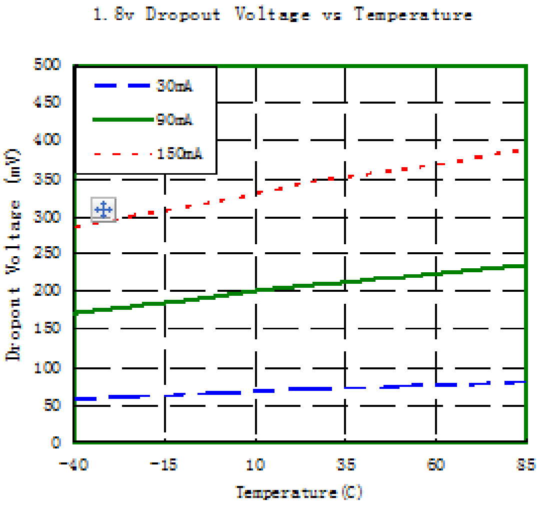


V_{OUT}=3.0V, I_{OUT}=30mA, V_{DD}=4.0V

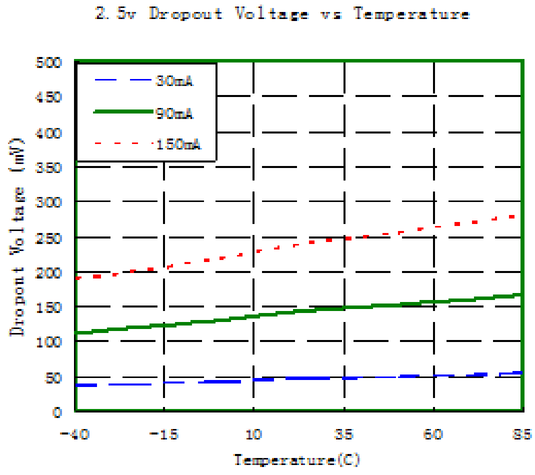


V_{OUT}=3.0V, I_{OUT}=150mA, V_{DD}=4.0V

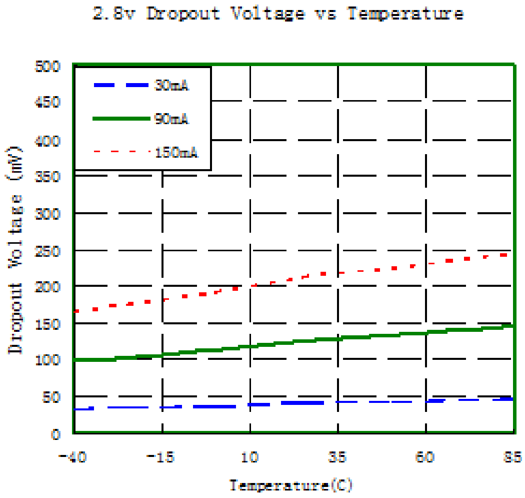
Dropout Voltage vs. Temperature



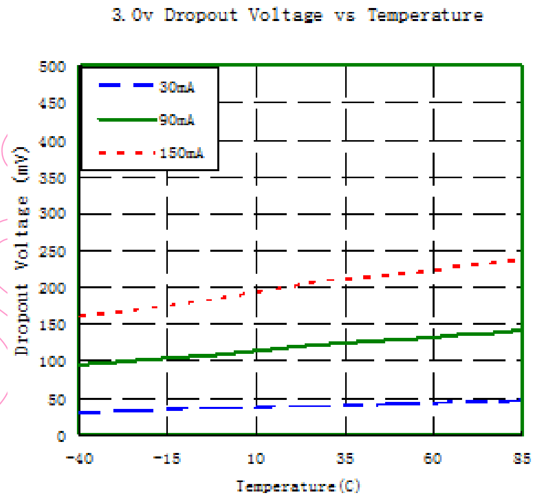
V_{OUT}=1.8V, I_{OUT}=30mA,90mA,150mA



V_{OUT}=2.5V, I_{OUT}=30mA,90mA,150mA



V_{OUT}=2.8V, I_{OUT}=30mA,90mA,150mA



V_{OUT}=3.0V, I_{OUT}=30mA,90mA,150mA

Application Information

Enable

The GS7108 has a dedicated enable pin(EN). When the EN pin is in the logic low (VEN<0.3V), the regulator will be turned off, reducing the supply current to less than 1uA.

When the EN pin is in the logic high (VEN>1.5V), the regulator will be turned on. Left open, the EN pin is pulled down by a internal resistor to shut down the regulator.

Current Limit

The GS7108 contains an independent current limit and short circuit current protection to prevent unexpected applications. The current limit monitors and controls the pass transistor's gate voltage, limiting the output current to higher than 260mA typical. When the output voltage is less than 0.4V, the short circuit current protection starts the current fold back function and maintains the loading current 35mA. The output can be shorted to ground indefinitely without damaging the part.

Output Capacitor

The GS7108 is specifically designed to employ ceramic output capacitors as low as 0.47uF (X7R). The ceramic capacitors offer significant cost and space savings, along with high frequency noise filtering. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Ceramic capacitors have different temperature characteristics and bias characteristics which depend on their dimensions and manufacturers. If the setting voltage is 2.5V or more and the capacitor's dimensions for V_{OUT} equal to 1.0mm by 0.5mm or smaller than that, the capacitance value might be extremely low. As a result, the capacitance might be much less than expected value. In such cases, the operation might be unstable at low temperature (-25°C or less). In that case, use a larger capacity, or a large dimensions' capacitor. (For example 1.6mm by 0.8mm)

Input Capacitor

Good bypassing is recommended from input to ground to help improve AC performance. A 0.47uF (X7R) input capacitor or greater located as close as possible to the IC is recommended. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Power Dissipation and Layout Considerations

Excessive power dissipation may cause thermal overload, and hence the increase of the IC junction temperature beyond a safe operating level. For continuous operation, it is highly recommended to keep the junction temperature below the maximum operation junction temperature 125°C for maximum reliability.

The relationship between θ_{JA} and $T_{J(MAX)}$ can be calculated as:

$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$

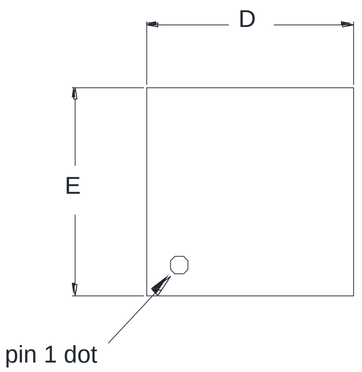
Where $T_{J(MAX)}$ is the maximum operation junction temperature 125°C, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

The power dissipation definition in device is:

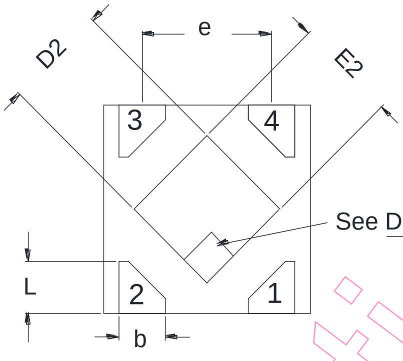
$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} + V_{DD} \times I_Q$

As the above equations indicate, it is desirable to work ICs whose θ_{JA} values are small such that $T_{J(MAX)}$ does not increase strongly with P_D. To avoid thermally overloading the GS7108, refrain from exceeding the absolute maximum junction temperature rating of 150°C under continuous operating condition. Overstressing the regulator with high loading currents and elevated input-to-output differential voltages can increase the IC die temperature significantly.

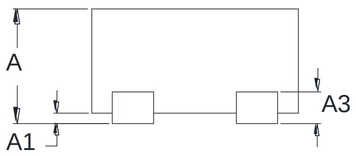
Package Dimensions, uDFN4-1x1



Top View



Bottom View



Side View

Detail A

Pin #1 ID Options
Note:The configuration of the Pin#1 identifier is optional,but must be located within the zone indicated.

Symbol	Dimensions in Millimeters	
	Min	Max
A	0.45	0.60
A1	0.00	0.05
A3	0.10	0.152
b	0.15	0.30
D	0.90	1.10
D2	0.40	0.60
E	0.90	1.10
E2	0.40	0.60
e	0.65 REF.	
L	0.20	0.30

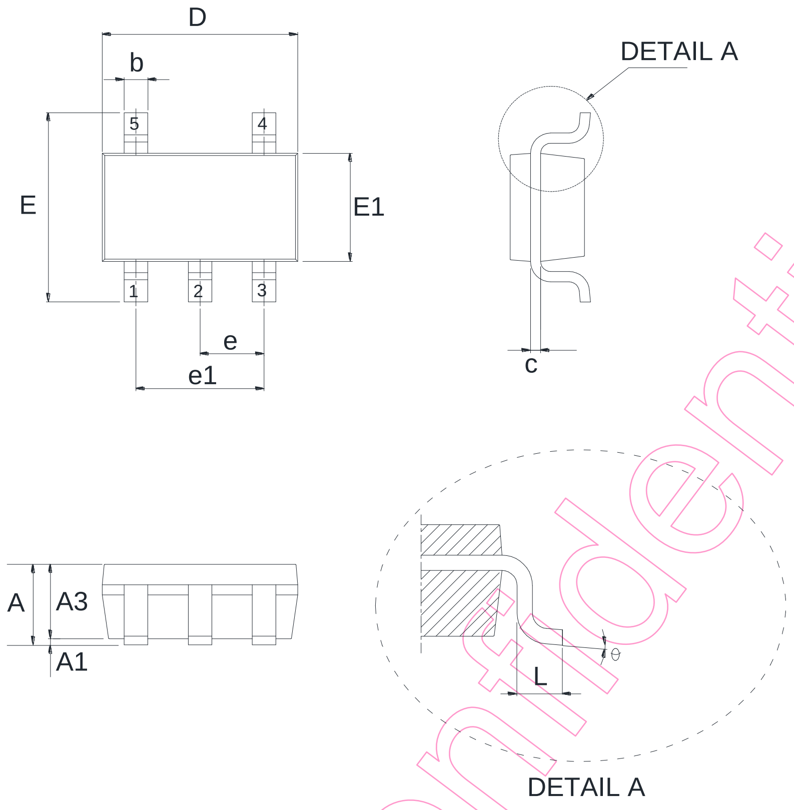
Note

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, SOT-23-5



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
A3	0.90	1.30
b	0.30	0.50
c	0.08	0.25
e	0.95 REF.	
e1	1.90 REF.	
D	2.90 REF.	
E	2.80 REF.	
E1	1.60 REF.	
L	0.30	0.60
θ	0^o	8^o

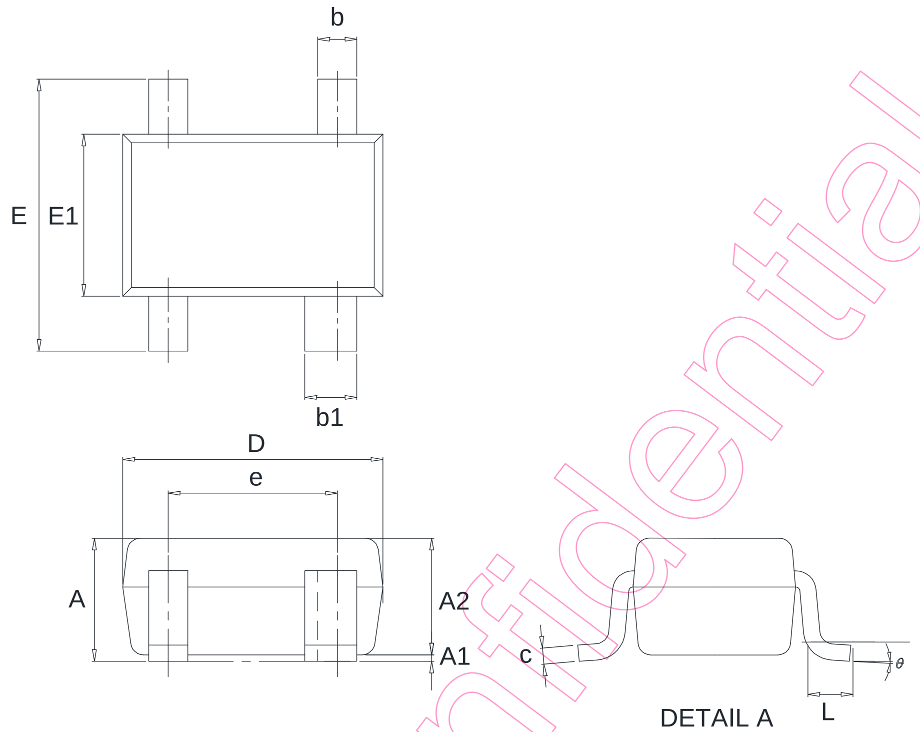
Note:

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, SC-82



Symbol	Dimensions in Millimeters	
	Min	Max
A	0.70	1.10
A1	0.00	0.10
A2	0.70	1.00
b	0.15	0.40
b1	0.30	0.50
c	0.08	0.26
e	1.30 REF.	
D	1.80	2.20
E	1.80	2.45
E1	1.15	1.45
L	0.36 REF.	
θ	0^{o}	10^{o}

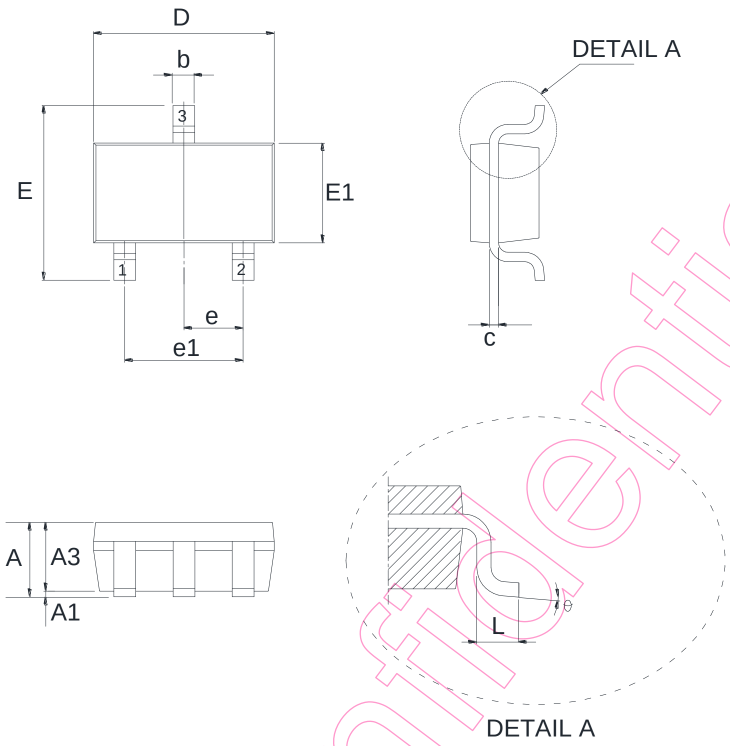
Note:

1.Min: Minimum dimension specified.

2.Max: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, MSOT-23



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.90	1.15
A1	0.00	0.10
A2	0.90	1.05
b	0.30	0.50
c	0.08	0.15
e	0.95 REF.	
e1	1.90 REF.	
D	2.90 REF.	
E	2.40 REF.	
E1	1.30 REF.	
L	0.30	0.50
θ	0^{o}	8^{o}

Note:

1. Min.: Minimum dimension specified.
2. Max.: Maximum dimension specified.
3. REF.: Reference. Normal/Regular dimension specified for reference.

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