杰力科技股份有限公司
Excelliance MOS Corporation

EM1109A

1A Low Dropout and Adjustable Mode Regulator

General Description

The EM1109AV-AD performs ultra- low drop voltage, high power supply rejection ratio (PSRR), fast response, low noise linear regulator, and designed to continuously deliver up to 1A output current. The EM1109AV-AD has wide adjustable output voltage range and high output accuracy to 1.0%.

No by-pass capacitor is needed for this device and only 4.7uF ceramic capacitor is required for stability in any loading conditions. It reduces the amount of board space necessary for power applications.

The other features include soft start, current limit protection, Power-On-Reset function, and over temperature protection. The EM1109AV-AD is available in DFN3.0X3.0-08 package.

Ordering Information

Part Number	Package
EM1109AV- AD	DFN3.0X3.0-08

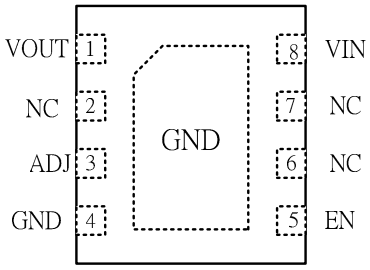
Features

- Ultra Fast Response in Line/Load Transient
- Wide V_{IN} Range from 2.5V to 5.5V
- Adjustable Output Voltage from 1V to 3.3V
- Ultra Low Dropout Voltage: 450mV @1A
- Low Shutdown Current < 1uA
- Only 4.7uF Ceramic Capacitor required for stability
- Over Temperature Protection
- Current Limit Protection
- RoHS Compliant and 100% Lead (Pb)-Free

Applications

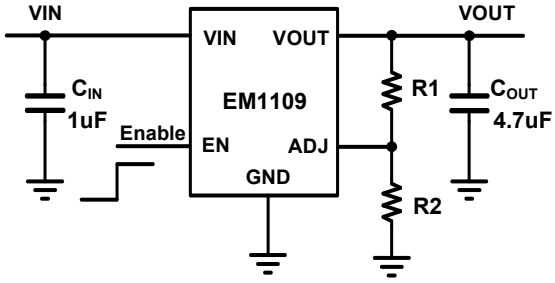
- Cellular Handsets
- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Hand-Held Instruments
- PCMCIA Cards
- Portable Information Applications

Pin Configuration



DFN3.0X3.0-08

Typical Application Circuit

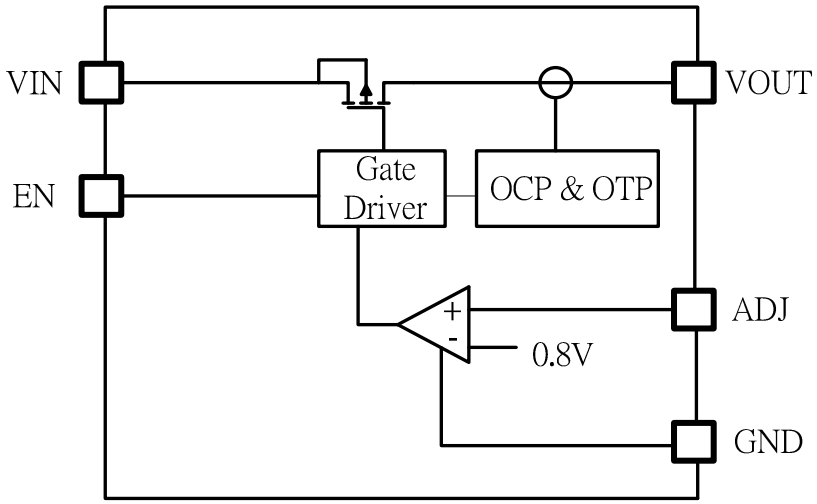


Adjustable Output

Pin Assignment

Pin Name	Pin No DFN3.0X3.0-08	Pin Function
VIN	8	**Input Voltage.** This is the source input to the power device that supplies current to the output pin.
GND	4	**Ground.**
EN	5	**Chip Enable Input** (Active high)**.**
VOUT	1	**Output Voltage.** VOUT is power output pin. An internal pull low resistance exists when the device is disabled. Minimum 4.7uF low ESR ceramic capacitor is required at this pin for stabilizing VOUT voltage.
NC	2,6,7	**No Connection.**
ADJ	3	**Feedback.** Error amplifier input. This pin should be connected to external resistive divider from output voltage.

Function Block Diagram



Absolute Maximum Ratings (Note1)

- V_{IN} ---------- -0.3V to +6.0V
- Other Pins ---------- 6V
- Power Dissipation, P_D @ T_A = 25°C, DFN3.0X3.0-08---------- 1.7W
- Package Thermal Resistance, θ_{JA}, DFN3.0X3.0-08 (Note 2) ---------- 70°C/W
- Package Thermal Resistance, θ_{JC}, DFN3.0X3.0-08 (Note 2) ---------- 5°C/W
- Junction Temperature ---------- 150°C
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C
- Storage Temperature Range ---------- -65°C to 150°C
- ESD susceptibility (Note3)

  HBM (Human Body Mode) ---------- 2KV

  MM (Machine Mode) ---------- 200V

  CDM (Charge Device Mode) ---------- 1KV

Recommended Operating Conditions (Note4)

- Supply Input Voltage, V_{IN} ---------- +2.5 to +5.5V
- Junction Temperature ---------- –40°C to 125°C
- Ambient Temperature ---------- –40°C to 85°C

Electrical Characteristics

V_{IN}=V_{OUT}+1V, T_A=25℃, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reference Voltage	V_{REF}	V_{OUT}=V_{REF}, I_{OUT}=1mA	0.792	0.8	0.808	V
Feedback Leakage Current	I_{ADJ}	-	-	0.1	0.5	uA
Power Input Voltage	V_{IN}	I_{OUT}=0 to 1A	2.5	-	5.5	V
POR Threshold	V_{PORTH}	I_{OUT}=0 to 1A	-	2.1	2.4	V
POR Hysteresis	V_{PORHYS}	I_{OUT}=0 to 1A	-	0.2	-	V
Quiescent Current	I_Q	V_{IN}=V_{EN}=5V, I_{OUT}=0A	-	80		uA
Shutdown Current	I_{SD}	V_{IN}=5V, V_{EN}=0V	-	0.1	1	uA
Line Regulation	$V_{OUT(LINE)}$	2.5V < V_{IN} < 5.5V, I_{OUT}=1mA	-	-	0.2	%/V
Load Regulation	$V_{OUT(LOAD)}$	1mA < I_{OUT} < 1A, V_{IN}=V_{OUT}+0.5V	-	0.5	1	%/A
Power Supply Rejection Ratio	PSRR	I_{OUT}=10mA,1kHz	-	70	-	dB
		I_{OUT}=10mA,10kHz	-	60	-	
		I_{OUT}=10mA,100kHz	-	40	-	
Dropout Voltage (I_{OUT}=300mA)	V_{DROP}	2V ≤ V_{OUT} ≤ 2.5V	-	200	250	mV
		2.6V ≤ V_{OUT} ≤ 3.5V	-	100	150	
Dropout Voltage (I_{OUT}=1A)	V_{DROP}	2V ≤ V_{OUT} ≤ 2.5V	-	450	-	mV
		2.6V ≤ V_{OUT} ≤ 3.5V	-	360	-	
Enable High Level	V_{EN}	-	1.2	-	-	V
Disable Low Level	V_{SD}	-	-	-	0.3	V
Enable Input Current	I_{EN}	V_{EN}=5V or 0V	-1	-	1	uA
Output Voltage Ramp Up Time		C_{OUT}=1uF, V_{OUT}=V_{REF}	-	200	-	us
OCP Threshold Level	I_{OCP}		1.55	-	-	A
Thermal Shutdown Temperature	T_{SD}	V_{IN}=V_{EN}=5V, V_{OUT}=V_{REF}, I_{OUT}=0A	-	160	-	°C
Thermal Shutdown Hysteresis	T_{SDHYS}	V_{IN}=V_{EN}=5V, V_{OUT}=V_{REF}, I_{OUT}=0A	-	30	-	°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.

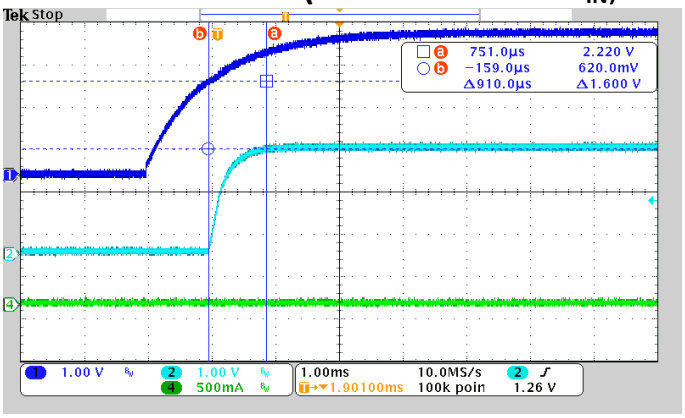
Note 2. θ_{JA} is measured in the natural convection at T_A=25°C on a low effective thermal conductivity test board (2Layer PCB) of JEDEC 51-3 thermal measurement standard.

Note 3. Devices are ESD sensitive. Handling precaution is recommended.

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

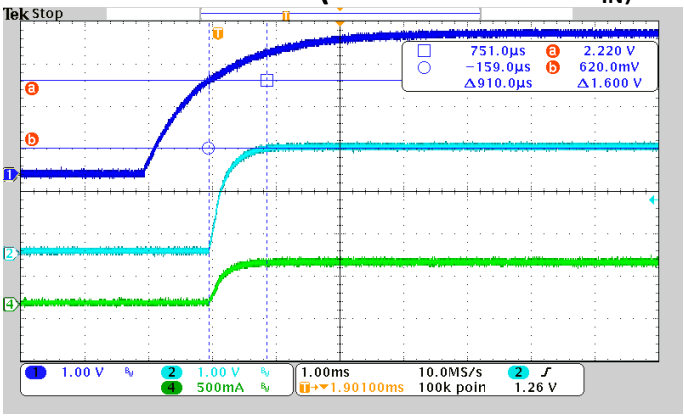
Typical Operating Characteristics

START UP Time (Power On From V_{IN})



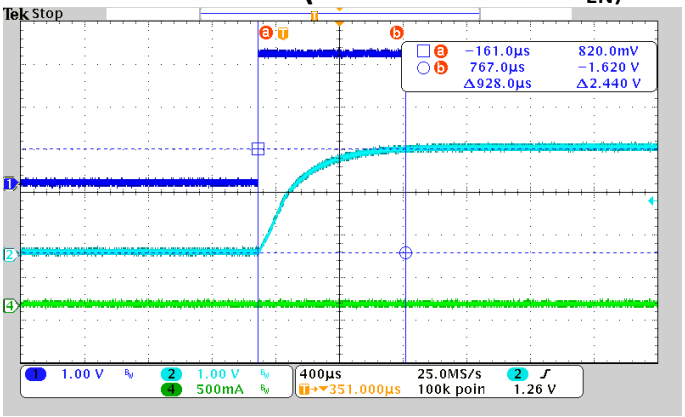
CH1:V_{IN}, CH2:V_{OUT}, CH4:I_{OUT}
V_{IN}=3.3V, V_{OUT}=2.5V, I_{OUT}=0A

START UP Time (Power On From V_{IN})



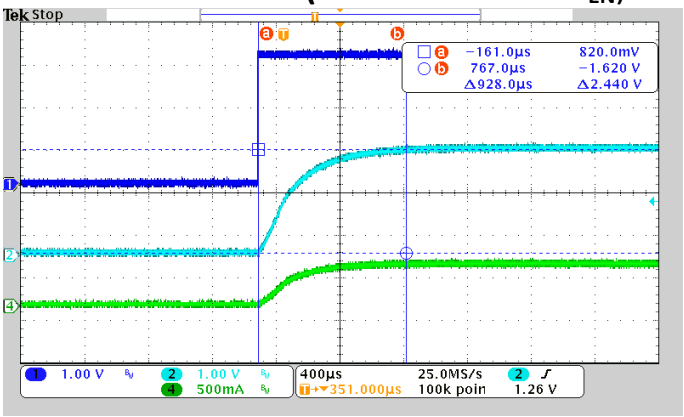
CH1:V_{IN}, CH2:V_{OUT}, CH4:I_{OUT}
V_{IN}=3.3V, V_{OUT}=2.5V, I_{OUT}=500mA

START UP Time (Power On From V_{EN})



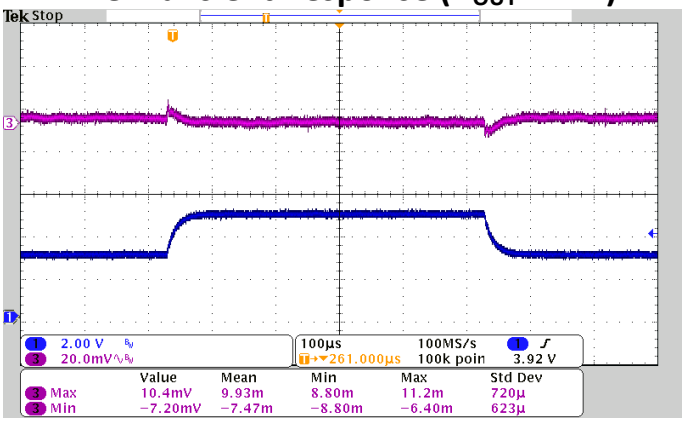
CH1:V_{EN}, CH2:V_{OUT}, CH4:I_{OUT}
V_{IN}=3.3V, V_{OUT}=2.5V, I_{OUT}=0A

START UP Time (Power On From V_{EN})



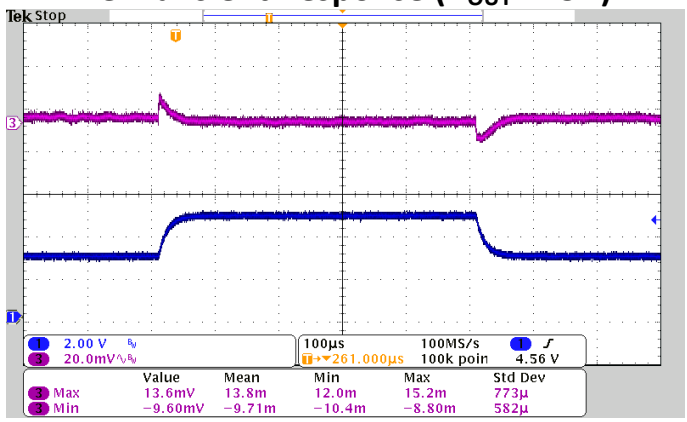
CH1:V_{EN}, CH2:V_{OUT}, CH4:I_{OUT}
V_{IN}=3.3V, V_{OUT}=2.5V, I_{OUT}=500mA

Line Transient Response (V_{OUT}=1.2V)



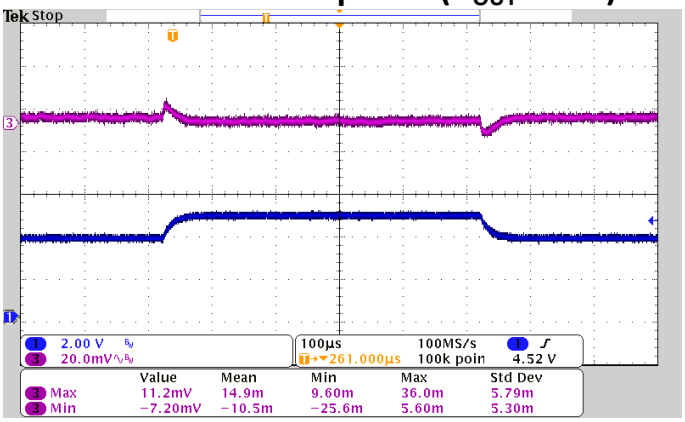
CH1:V_{IN}, CH3:V_{OUT}
V_{IN}=2.5~5V, I_{OUT}=100mA

Line Transient Response (V_{OUT}=2.5V)



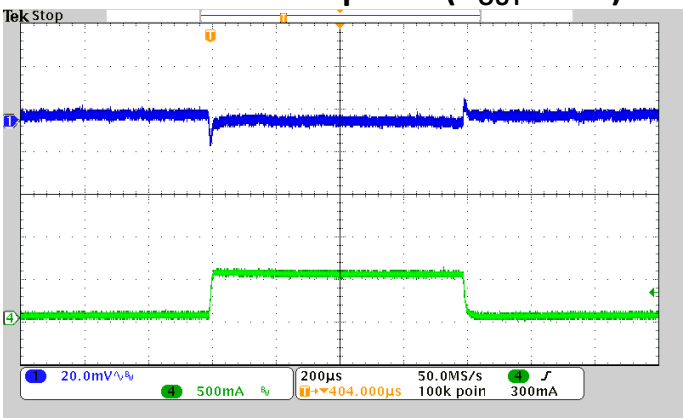
CH1:V_{IN}, CH3:V_{OUT}
V_{IN}=2.5~5V, I_{OUT}=100mA

Line Transient Response (V_{OUT}=3.3V)



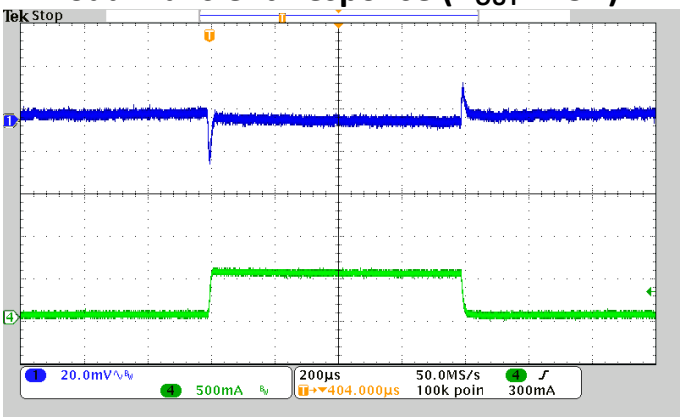
CH1:V_{IN}, CH3:V_{OUT}
V_{IN}=2.5~5V, I_{OUT}=100mA

Load Transient Response (V_{OUT}=1.2V)



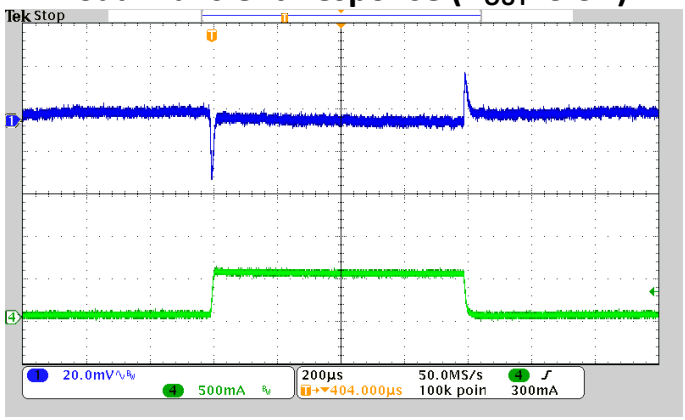
CH1:V_{OUT}, CH4:I_{OUT}
V_{IN}=2.5V, I_{OUT}=10mA~500mA

Load Transient Response (V_{OUT}=2.5V)



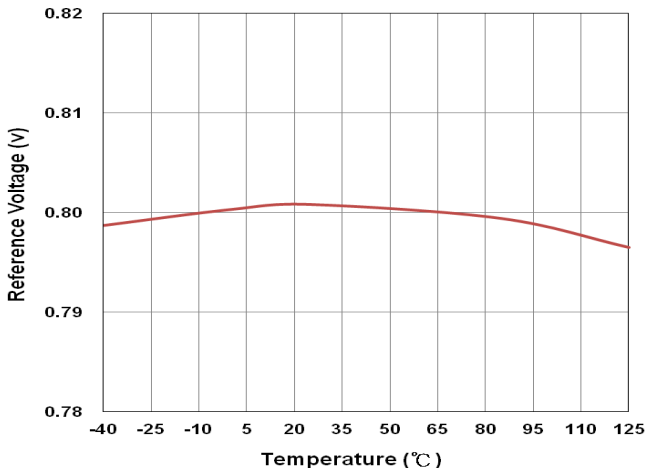
CH1:V_{OUT}, CH4:I_{OUT}
V_{IN}=3.5V, I_{OUT}=10mA~500mA

Load Transient Response (V_{OUT}=3.3V)

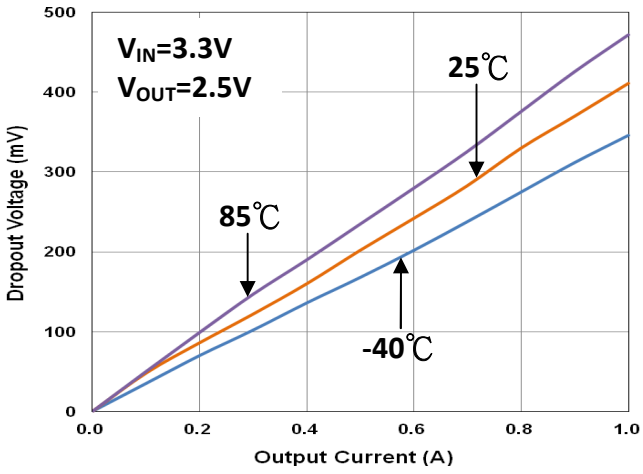


CH1:V_{OUT}, CH4:I_{OUT}
V_{IN}=4.3V, I_{OUT}=10mA~500mA

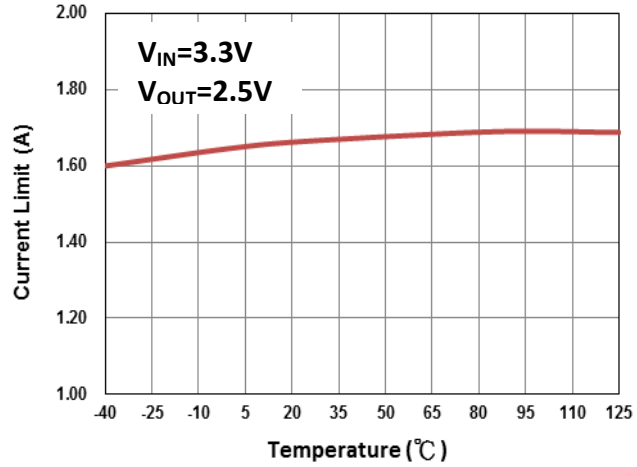
Reference Voltage VS Temperature



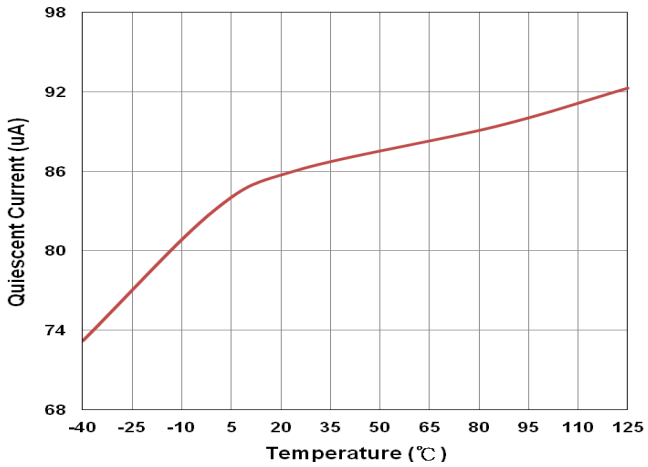
Dropout Voltage VS Output Current



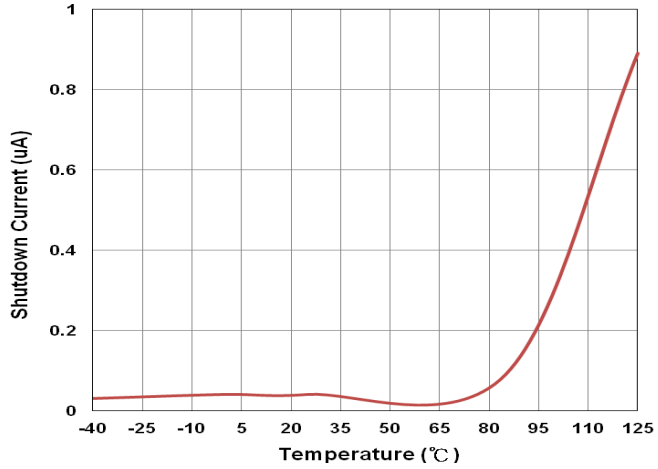
Current Limit VS Temperature



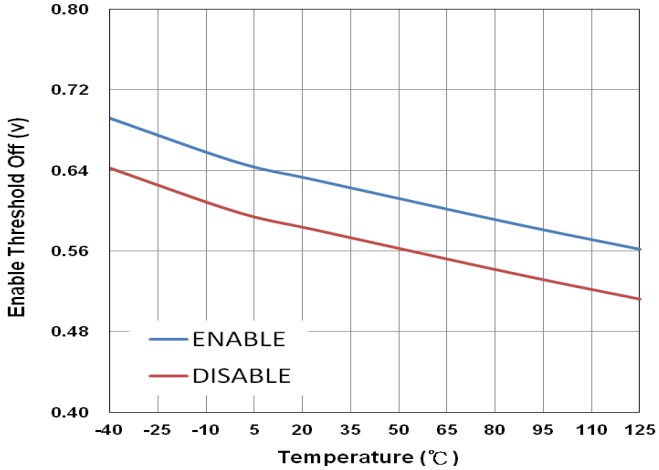
Quiescent Current VS Temperature



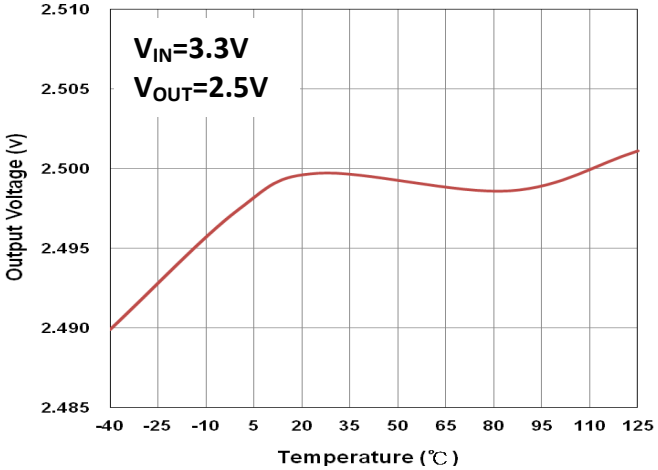
Shutdown Current VS Temperature



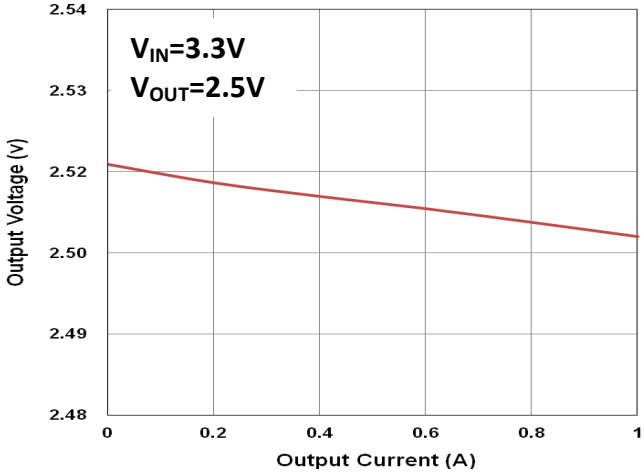
Enable Threshold VS Temperature



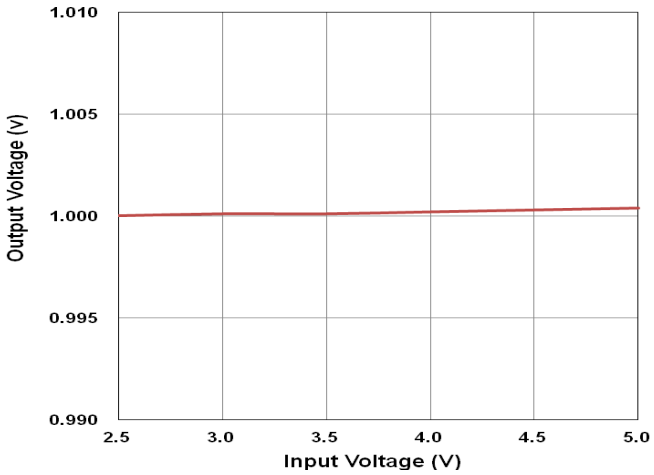
Output Voltage VS Temperature



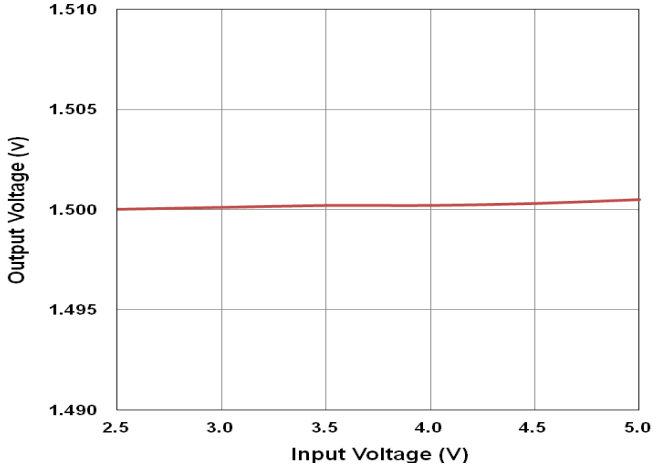
Load Regulation (V_{OUT} VS I_{OUT})



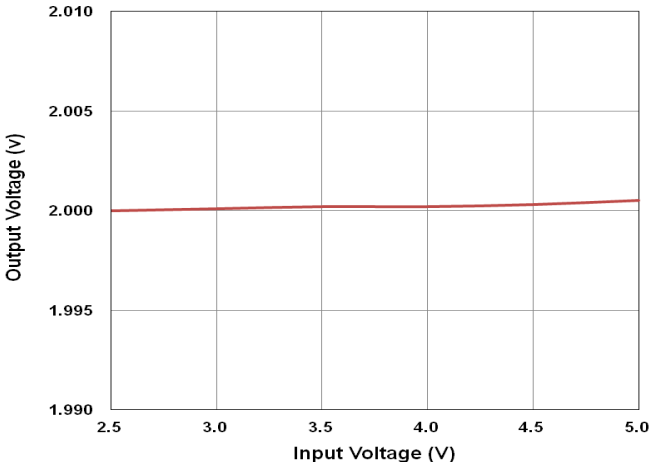
Line Regulation (V_{OUT}=1V)



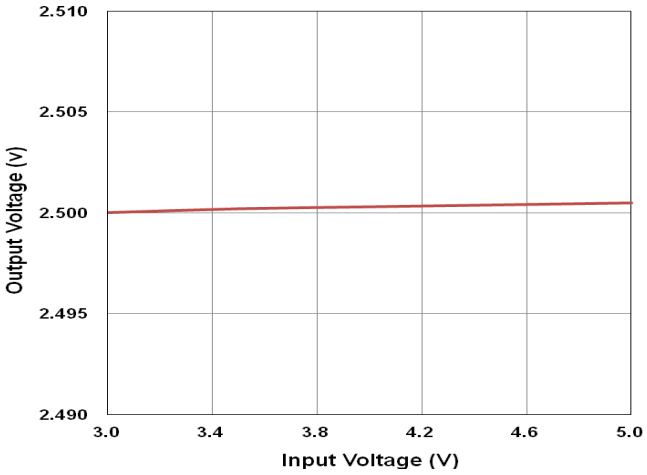
Line Regulation (V_{OUT}=1.5V)



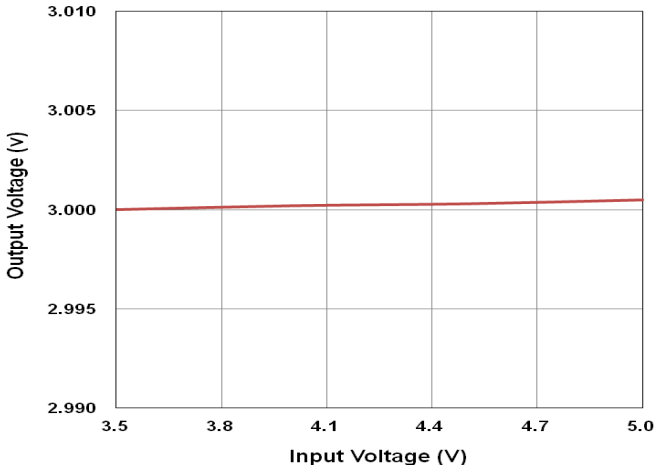
Line Regulation (V_{OUT}=2V)



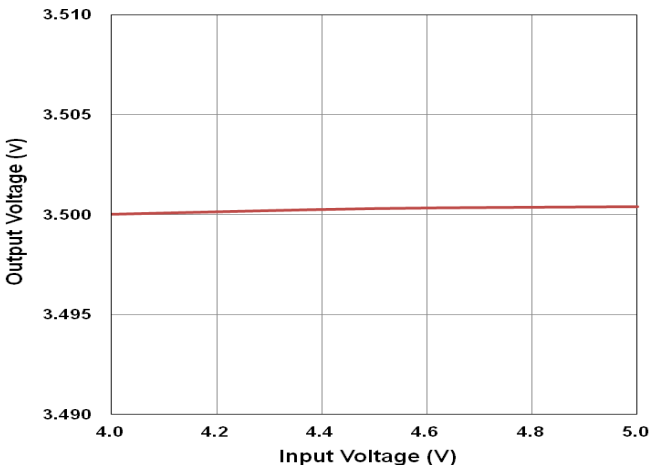
Line Regulation (V_{OUT}=2.5V)



Line Regulation (V_{OUT}=3V)



Line Regulation (V_{OUT}=3.5V)



Functional Description

Enable Function

EM1109AV-AD is enabled if the voltage of the EN pin is greater than 1.2V. If the voltage of the EN pin is less than 0.3V, the IC will be disabled.

POR – Power ON Reset

To let EM1109AV-AD start to operation, input voltage must be higher than its POR voltage even when EN voltage is pulled higher than enable high voltage. Typical POR voltage is 2.1V.

Over Current Limit Function

EM1109AV-AD features over current limiting function which can limit its output current to 1.5A.

Input and Output Capacitor Selection

For VIN pin, 1uF or larger ceramic capacitor is required to provide bypass path in transient current demand. VOUT pin is also recommended to have 4.7uF or larger ceramic capacitor to be stable and reduce the VOUT voltage dip when fast loading transient is happened.

Thermal and Layout Consideration

EM1109AV-AD is designed to maintain a constant output load current. Due to physical limitations of the chip layout and assembly of the device the maximum switch current is 1A. All copper traces for the VIN and Vo pin should be widely and short to carry the maximum continuous current and obtain the best effect. The maximum IC junction temperature should be restricted to 125℃ under normal operating conditions. To calculate the maximum allowable dissipation, $P_{D(MAX)}$ for a given output current and ambient temperature, used the following equation:

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

Where:

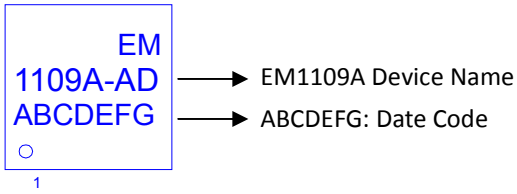
$P_{D(MAX)}$=Maximum allowable power dissipation

$T_{J(MAX)}$=Maximum allowable junction temperature (125 ℃ for the EM1109AV-AD)

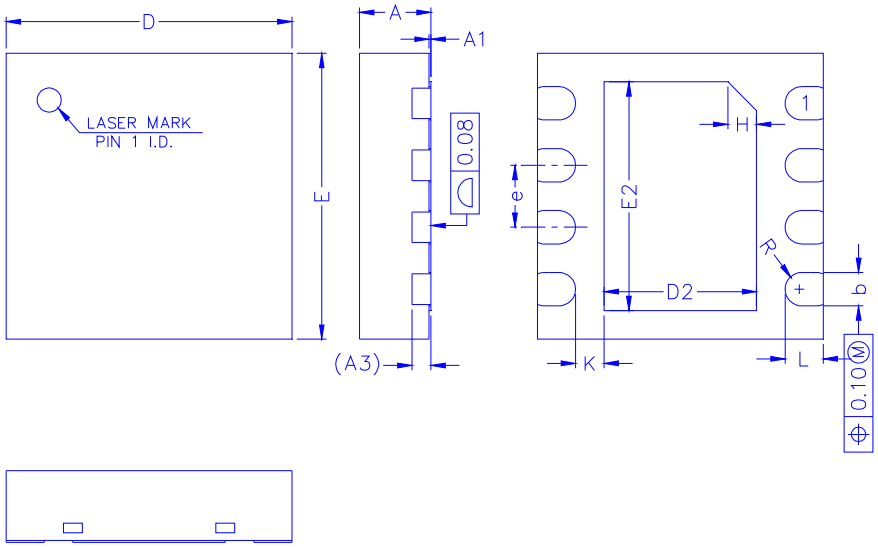
T_A=Ambient Temperature of the device

Ordering & Marking Information

Device Name: EM1109AV-AD for DFN3.0X3.0-08



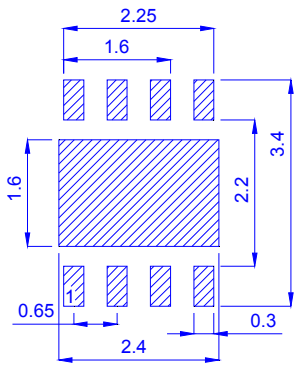
Outline Drawing



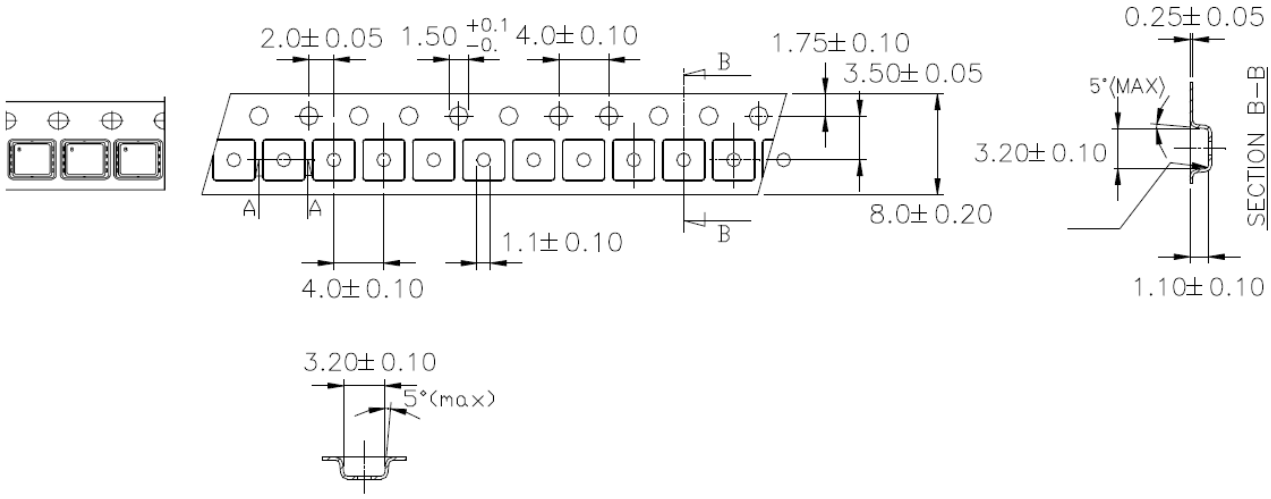
Dimension in mm

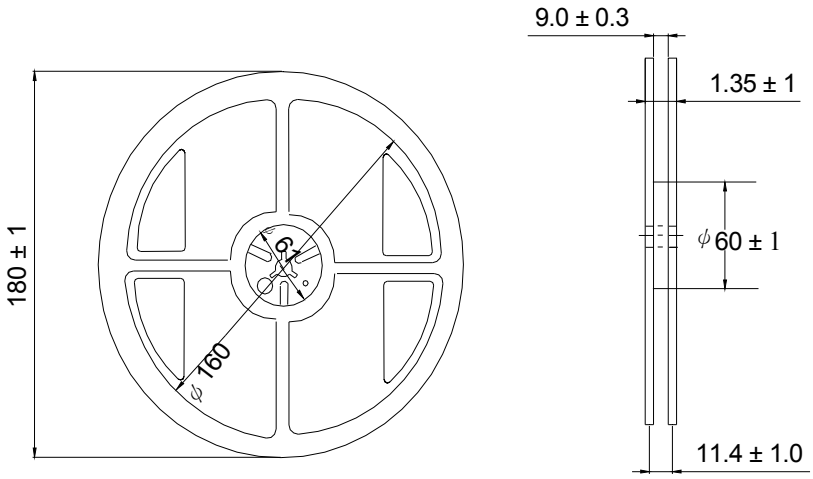
Dimension	A	A1	A3	b	D	E	D2	E2	e	H	K	L	R
Min.	0.7	0.00		0.3	2.9	2.9	1.5	2.3	0.55		0.2	0.3	0.16
Typ.	0.75	0.02	0.2 REF	0.35	3.0	3.0	1.6	2.4	0.65	0.3REF	0.3	0.4	
Max.	0.8	0.05		0.4	3.1	3.1	1.7	2.5	0.75		0.4	0.5	

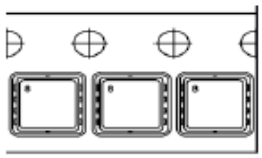
Recommended minimum pads



◆ Tape&Reel Information: 3000pcs/Reel





產品別	DFN3.0X3.0-08 (EM1109AV-AD)
Reel 尺寸	7”
編帶方式	
前空格	50
後空格	50
裝箱數	
滿捲數量	3K
捲/內盒比	5 : 1
內盒滿箱數	15K
內/外箱比	12 : 1
外箱滿箱數	180K