Low Noise, High PSRR 5.5V/500mA Linear Regulator

1 Description

The CN8701M Series is a 5.5V/500mA, high accuracy, low noise, high speed, high PSRR, low dropout, linear regulator with high ripple rejection. The CN8701M has the fold-back maximum output current which depends on the output voltage. So the current limit functions both as a short circuit protection and as an output current limiter.

The CN8701M is available in SOT89-3, SOT23-3, SOT23-5, and DFN1X1-4L packages.

2 Features

- Input Voltage Range：1.4V-5.5V
- Output Voltage Range：0.9V-3.3V，step 0.1V
- Output current：500mA
- Quiescent current：50μA(Typ)
- Shutdown current: < 1μA
- Dropout voltage: 120mV@I_{OUT}=300mA，V_{OUT}=3.3V
- PSRR: 78db@1kHz，V_{OUT}=1.8V
- Low Output Voltage Noise: 29.6uV@V_{OUT}=1.8V
- Output voltage accuracy: 1%
- Short circuit protection
- Thermal shutdown

3 Applications

- Smart Wear
- Portable mobile devices, e.g. mobile phones, cameras, etc.
- Wireless communication devices

4 Ordering information

Product Number	Package	Quantity/Tape
CN8701MXXXAOGR	SOT89-3	1000/Tape
CN8701MXXXOGR	SOT89-3	1000/Tape
CN8701MXXXTGR	SOT23-3	3000/Tape
CN8701MXXXTCR	SOT23-5	3000/Tape
CN8701MXXXDQR	DFN1X1-4L	10000/Tape

5 Marking

Product Number	Marking
CN8701MXXXAOGR	8701MXXX YYWW
CN8701MXXXOGR	8701XXXA YYWW
CN8701MXXXTGR	MXXX YYWW
CN8701MXXXTCR	MXXX YYWW
CN8701MXXXDQR	XX YW

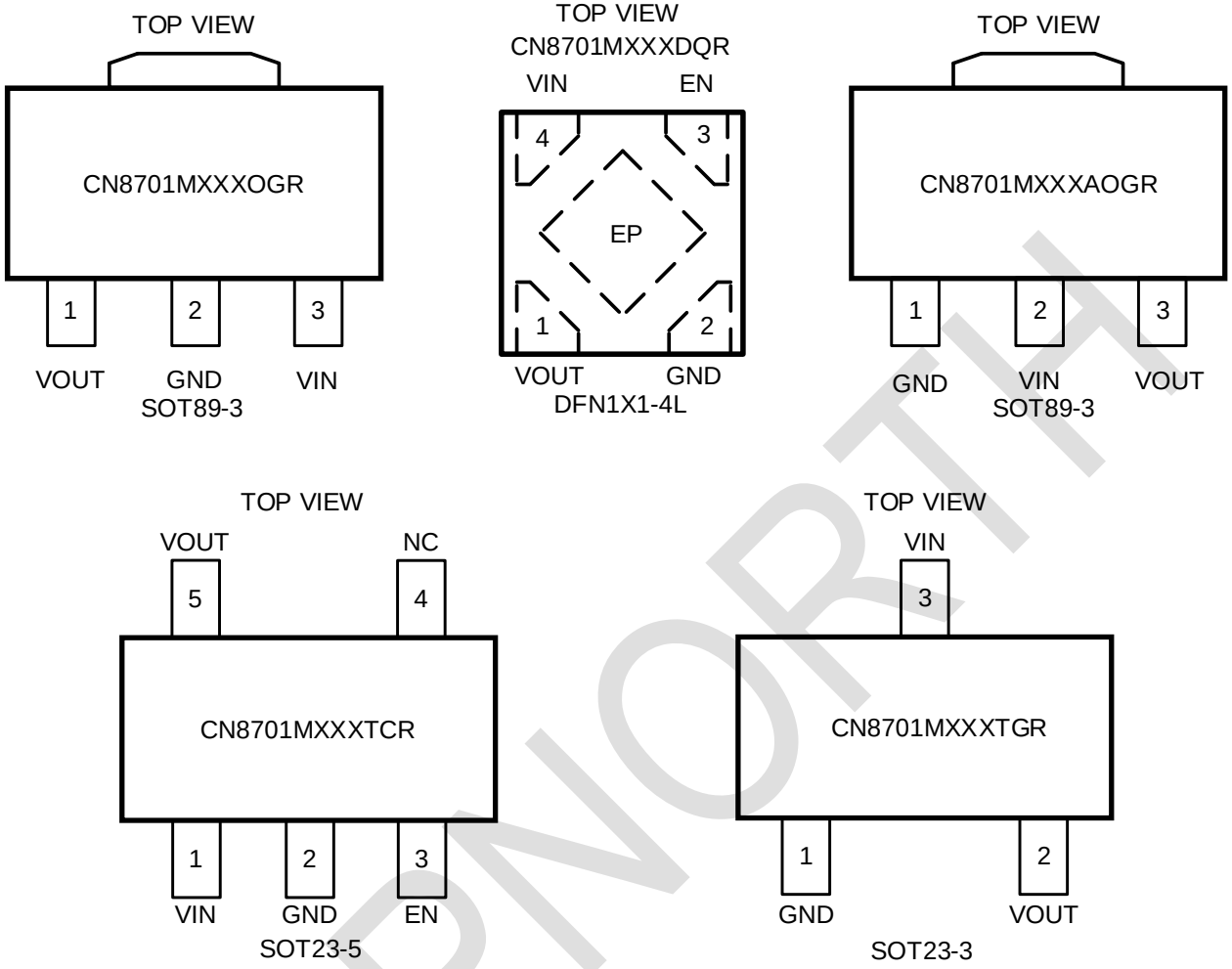
Note: YY=Year WW=Week.

8701MXXX=Product Name, XXX= Output Voltage

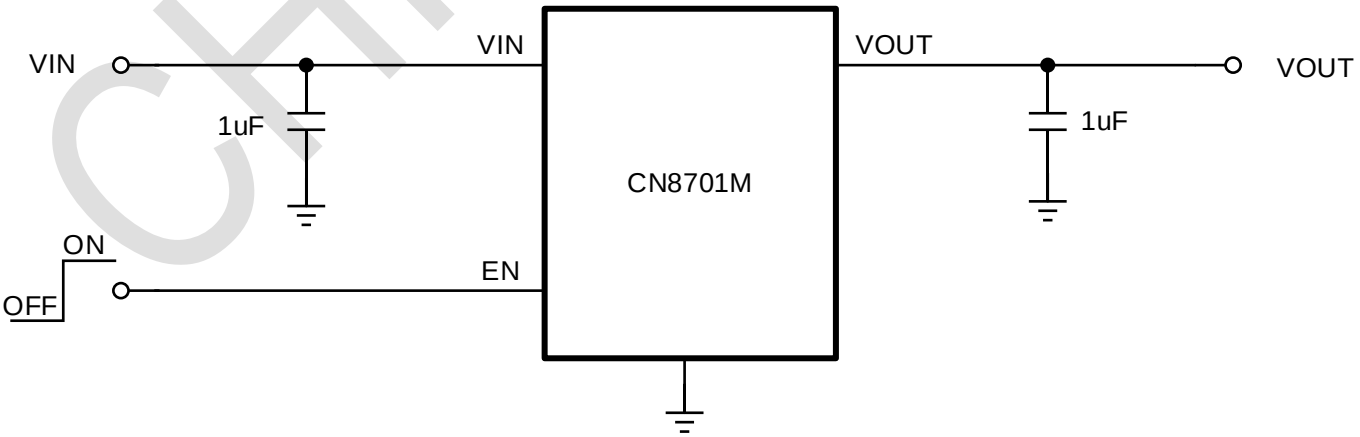
Green (RoHS & HF): CHIPNORTH defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your CHIPNORTH representative directly.

Moisture sensitivity level(MSL):3

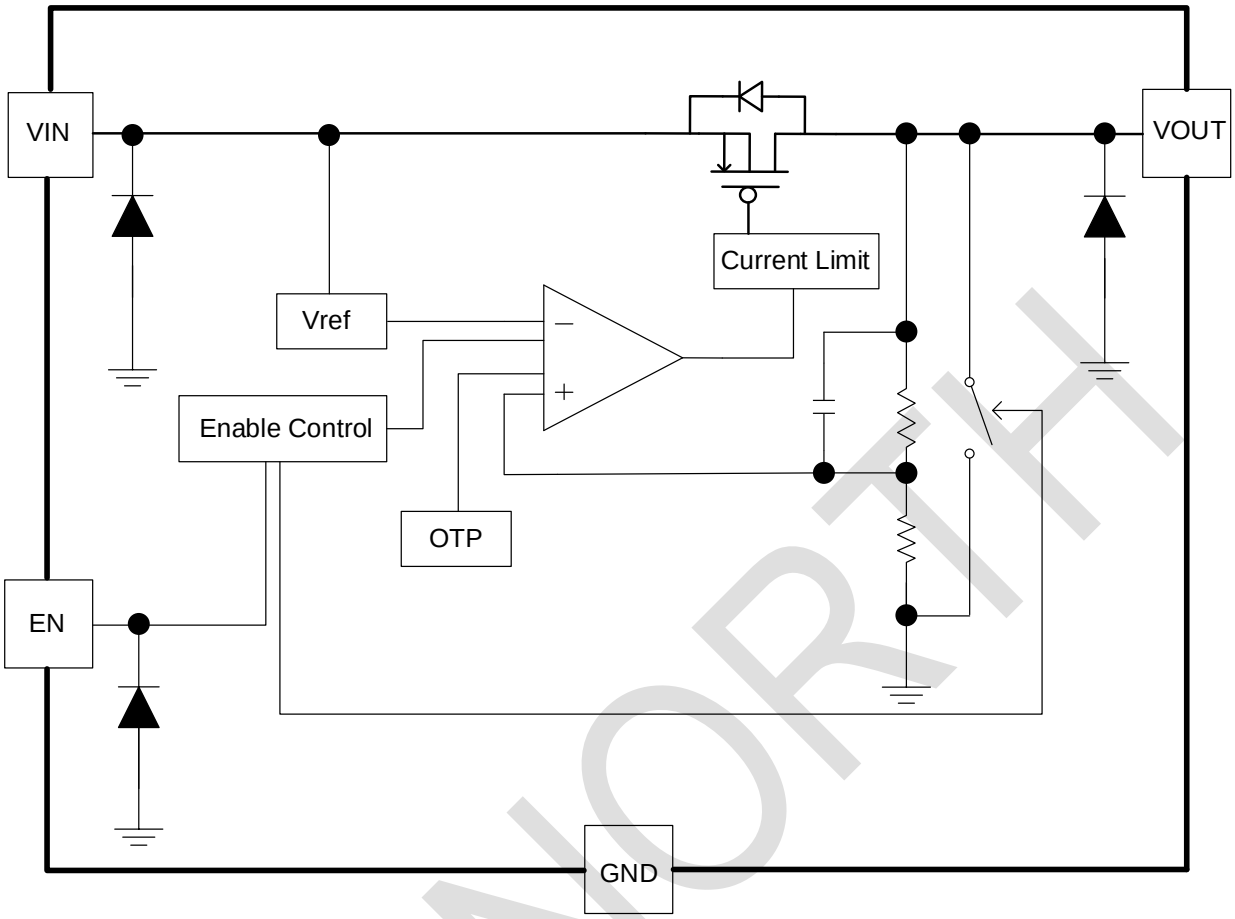
6 Pinout



7 Typical Application



8 Block Diagram



9 Pin Descriptions

Pin No.						Descriptions
Pin Name	CN8701M XXXAOGR	CN8701M XXXOGR	CN8701M XXXTGR	CN8701M XXXDQR	CN8701M XXXTCR	
GND	1	2	1	2	2	GND
VIN	2	3	3	4	1	Input
VOUT	3	1	2	1	5	Output
EN	/	/	/	3	3	Enable (Active high)
EP	/	/	/	5	/	Thermal pad,is pin must connect to GND
NC	/	/	/	/	4	No Connect

10 Specifications

10.1 Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply Input Voltage	V_{IN}	-0.3~6.5	V
Output Voltage	V_{OUT}	-0.3~V_{IN}	V
EN Voltage	V_{EN}	-0.3~V_{IN}	V
Storage Temperature Range	T_{STG}	-55~150	°C
Soldering Temperature	T_{Lead}	260（soldering，10s）	°C

Note：

1.Stress exceeds these ratings listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Expose to absolute-maximum-rated conditions for extended periods may affect device reliability.

2.All voltage values are referenced to the ground terminal.

10.2 ESD Ratings

Discharge mode	Standardize	Value	Units
HBM	JS-001-2023	±6000	V
CDM	JS-002-2012	±2000	V

10.3 Recommended Operating Range

Parameter	Symbol	Min.	Max.	Units
Input Voltage	V_{IN}	1.4	5.5	V
Input Capacitor	C_{IN}	1		μF
Output Capacitor	C_{OUT}	1		μF
Operating Temperature	T_A	-40	105	°C

10.4 Thermal Information

Parameter	Package	Value	Unit
θ_{JA}	SOT23-3	220	°C /W
	SOT23-5	188	
	DFN1X1-4L	250	
	SOT89-3	100	

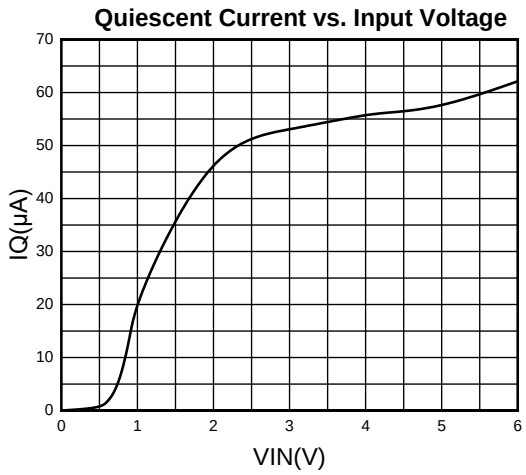
10.5 Electrical Characteristics

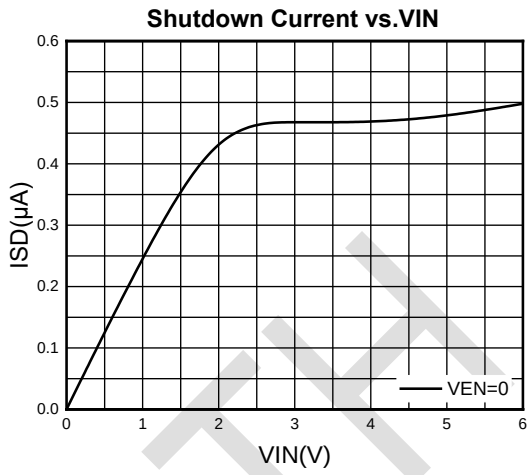
T_A=25°C，V_{IN}=V_{OUT}+1V，C_{IN}=C_{OUT}=1μF，I_{OUT}=1mA, unless otherwise specified.

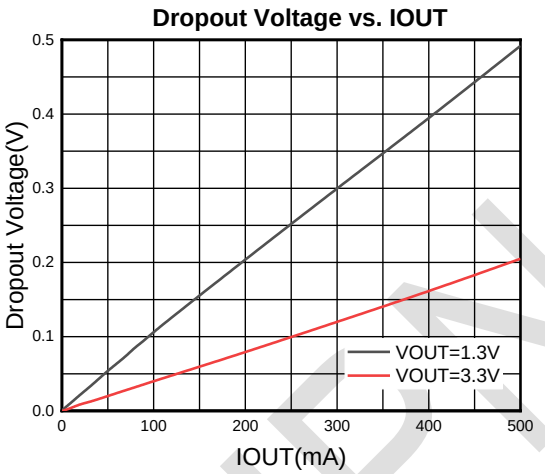
Parameter	Symbol	Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}			1.4		5.5	V
Output Voltage	V_{OUT}	V_{OUT} ≤2V		-20	V_{OUT}	+20	mV
		V_{OUT}>2V		0.99× V_{OUT}	V_{OUT}	1.01× V_{OUT}	V
Quiescent Current	I_Q	V_{OUT}=3.3V, I_{OUT}=0			50	90	μA
Dropout Voltage	V_{DROP}	V_{OUT}=3.3V, I_{OUT}=300mA			120	170	mV
		V_{OUT}=3V, I_{OUT}=300mA			135	204	mV
		V_{OUT}=2.5V, I_{OUT}=300mA			170	320	mV
		V_{OUT}=1.3V, I_{OUT}=300mA			360	450	mV
Current Limit	I_{LIM}	V_{IN}=V_{OUT}+2V		500	800		mA
Short Circuit Current	I_{SHORT}	V_{EN}=V_{IN}, V_{OUT} Short to GND			150		mA
Shutdown Current	I_{SHDN}	V_{EN}=0V				1.0	μA
Line Regulation	△V_{LINE}	V_{IN}=V_{OUT}+0.5V~5.5V			1	5	mV
Load Regulation	△V_{Load}	V_{OUT}=3.3V I_{OUT}=1~300mA			5	15	mV
EN logic high voltage	V_{ENH}	V_{IN}=5.5V, I_{OUT}=1mA		1			V
EN logic low voltage	V_{ENL}	V_{IN}=5.5V, V_{OUT}=0V				0.4	V
EN Input Current	I_{EN}	V_{EN}= 0 to 5.5V			120		nA
Power Supply Rejection Rate	PSRR	V_{IN}=(V_{OUT}+1V) $_{DC}$ +0.5V_{P-P}	f=100Hz		80		dB
			f=1kHz		78		dB
			f=10kHz		65		dB
			f=100kHz		56		dB
			f=1MHz		43		dB
Output Noise Voltage	e_{NO}	10Hz to 100KHz,V_{IN}=2.8V， V_{OUT}=1.8V/1mA			29.6		μV_{RMS}
Thermal shutdown threshold	T_{SD}				160		°C
Thermal shutdown hysteresis	△T_{SD}				30		°C

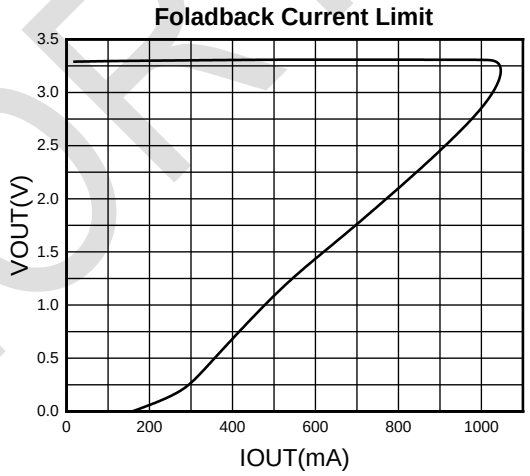
10.6 Characteristics Curve

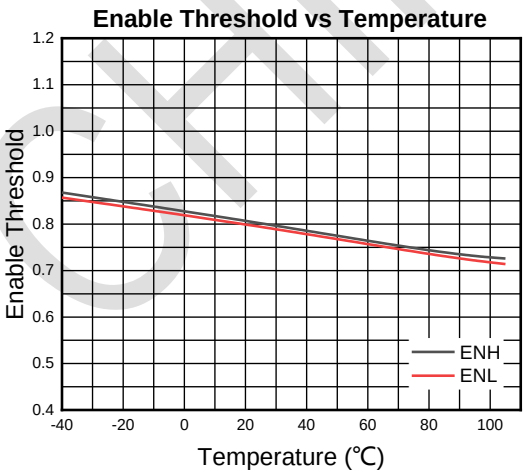
Test conditions：VIN=4.3V，CIN=1uF，COUT=1uF，TA=25°C，unless otherwise specified.

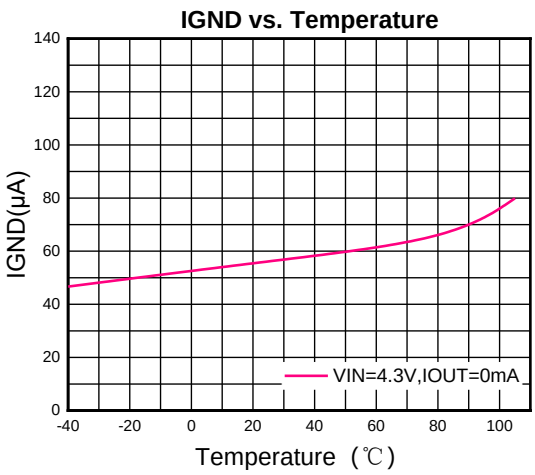




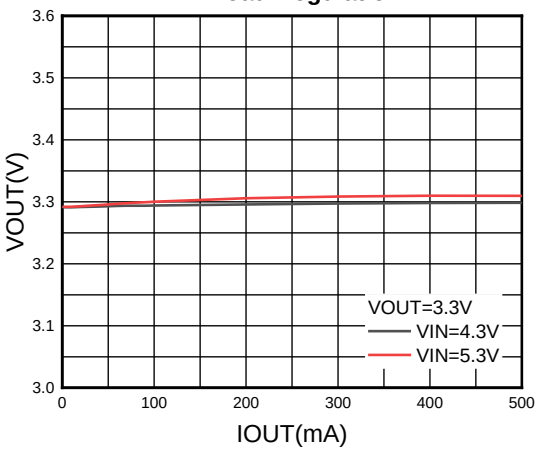




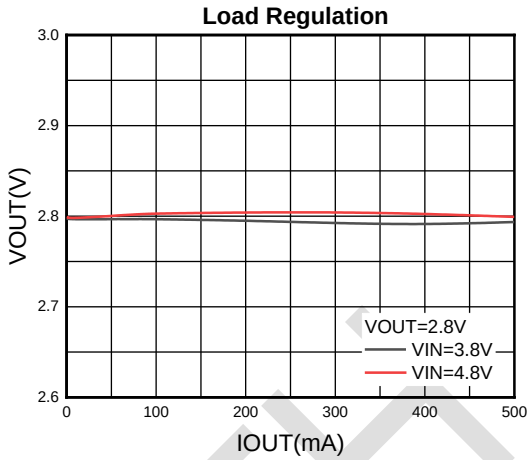




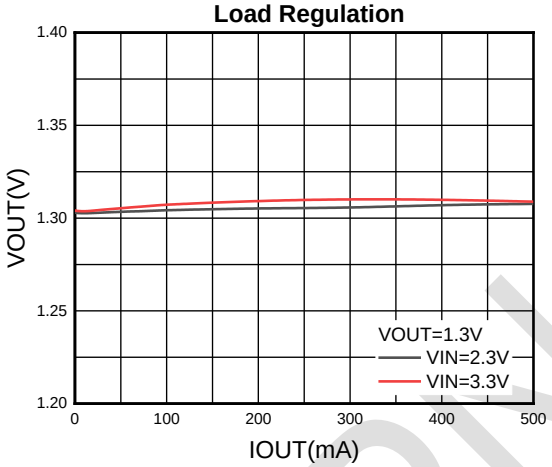
Load Regulation



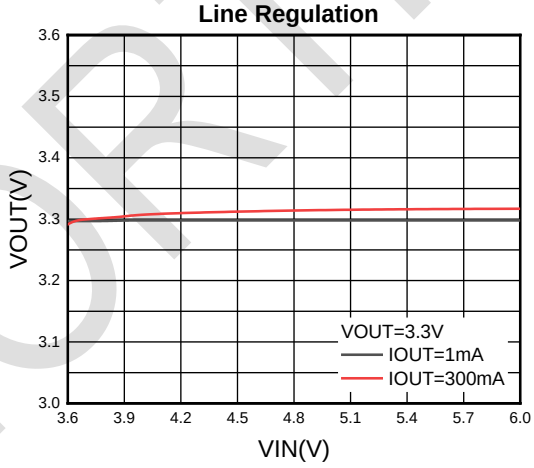
Load Regulation



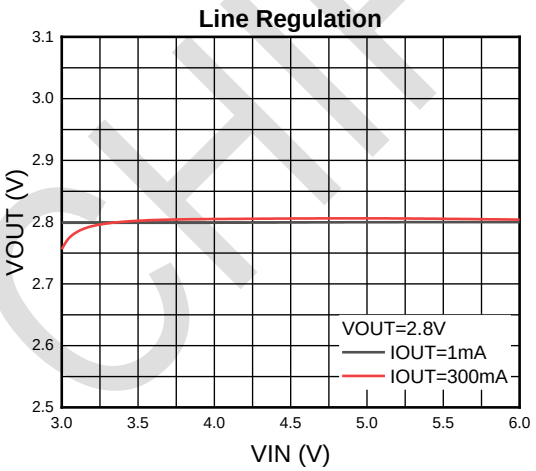
Load Regulation



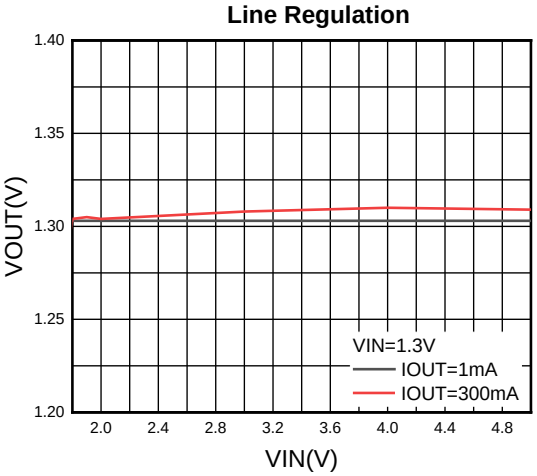
Line Regulation

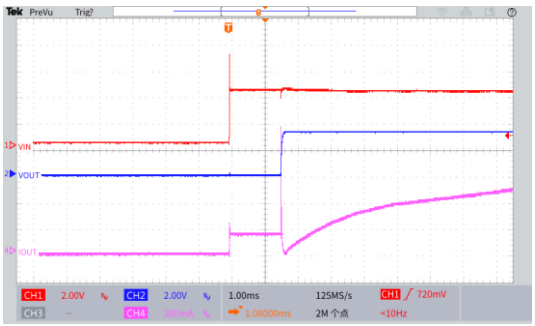


Line Regulation

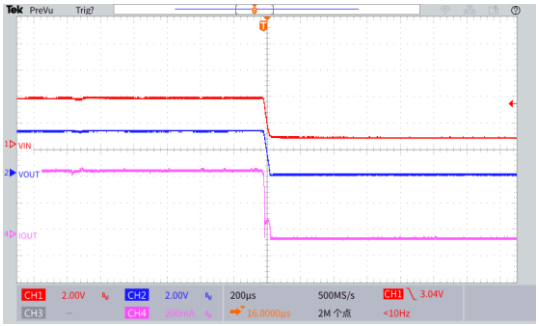


Line Regulation

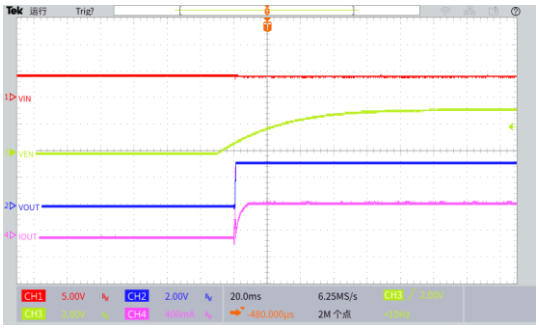




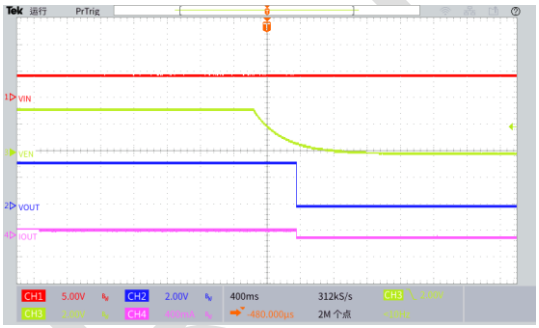
Start by Vin fast，IOUT=500mA



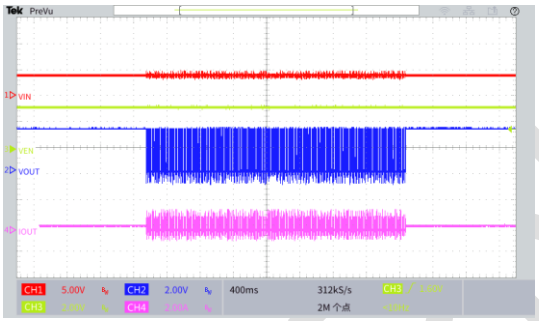
Shutdown by Vin fast，IOUT=500mA



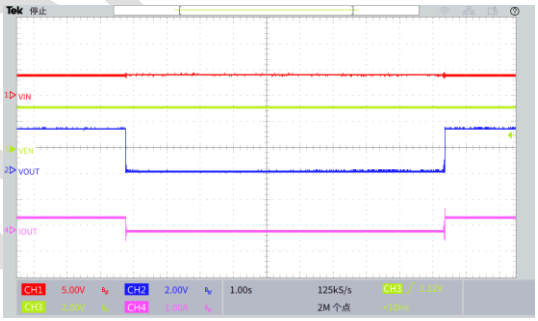
Start by EN，IOUT=500mA



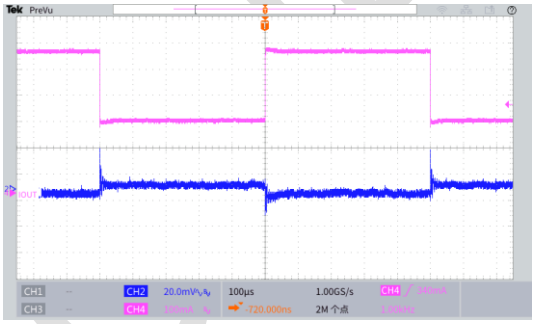
Shutdown by EN，IOUT=500mA



Over current protection



Short circuit protection



Load Transient@3.3V，IOUT=250-500-250mA

Line Transient@3.3V，IOUT=500mA

11 Detailed Description

11.1 Overview

The CN8701M Series is a high accuracy, low noise, high speed, high PSRR, low dropout, linear regulator with high ripple rejection that provides 500mA output current.

The CN8701M has a foldback maximum output current function, which depends on the output voltage. Therefore, the current limit function can be used as short-circuit protection as well as output current limit. The chip also integrates a thermal shutdown protection function to protect the circuit from damage. An EN pin is provided as an external enable control to enable/disable the device.

11.2 Enabling control

The EN pin of the CN8701M acts as an enable control pin. When the EN pin voltage is lower than 0.4V, the device is in the off state. When the EN pin voltage is higher than 1V, the device is in the on state.

11.3 Input power supply

The input supply range is 1.4 V to 5.5 V. V_{IN} must be greater than (V_{OUT}+V_{DROP}). The input ceramic capacitor must be as close as possible to the IN pin. C_{IN} helps to improve the output noise performance of the LDO.

11.4 Output current limiting and short circuit protection

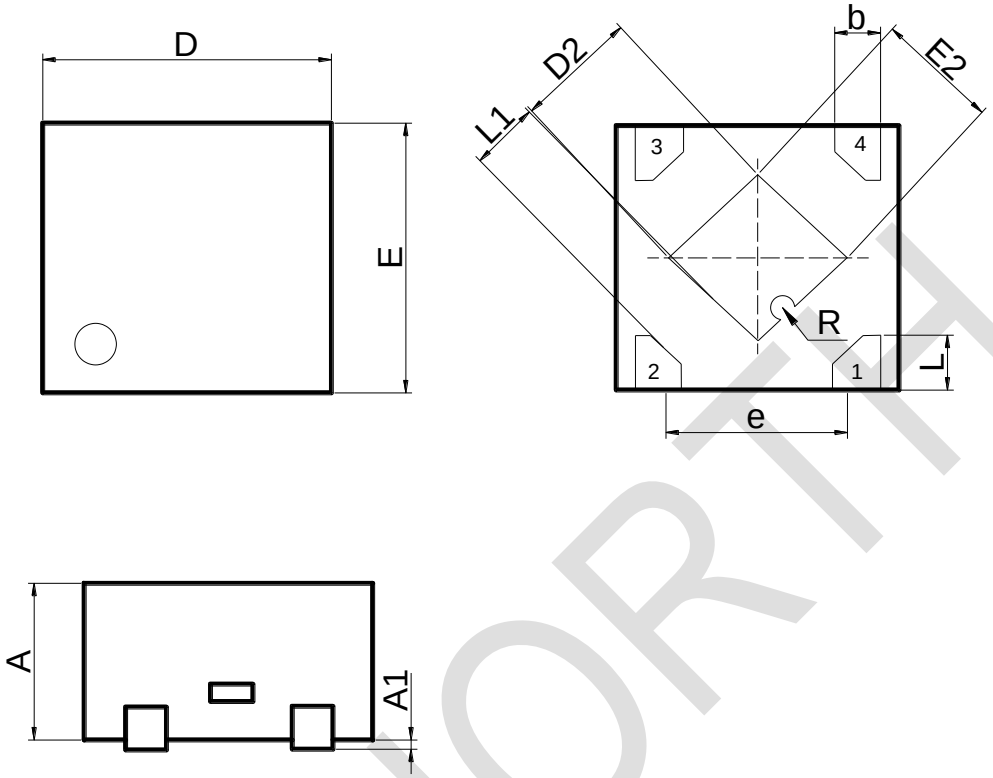
When an overload event occurs, the output current is limited to an internal limit of 800 mA (typical). When an output pin is shorted, short circuit protection limits the output current to 150 mA (typical).

11.5 Thermal shutdown

The CN8701M can detect the chip temperature and when the chip temperature exceeds the thermal shutdown threshold (160°C), the CN8701M will be in the shutdown state and remain in this state until the chip temperature drops to 130°C or lower.

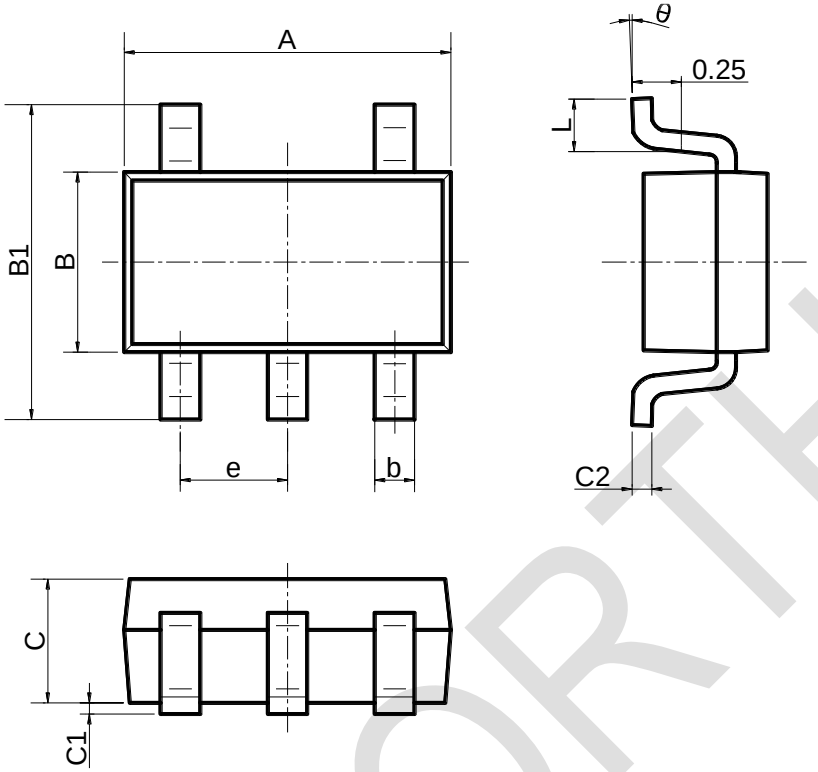
12 Package Information

DFNWB-4



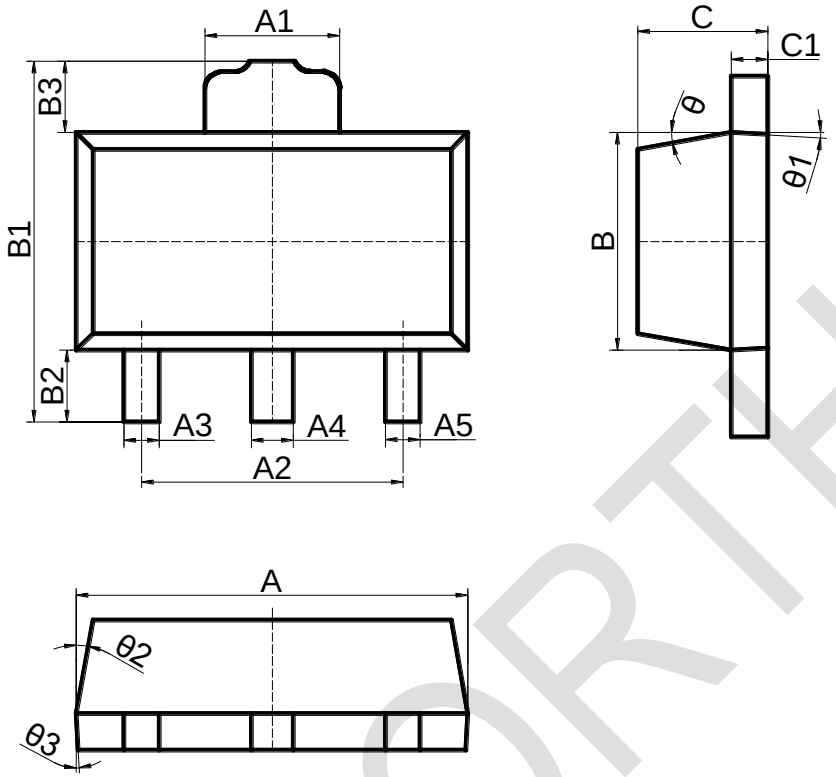
Dimension / Symbol	Min (mm)	Max (mm)	Min (mm)
A	0.35	0.375	0.4
D	0.95	1.00	1.05
E	0.95		
b	0.2	0.25	0.3
L	0.2	0.25	0.3
e	0.6	0.65	0.7
R	/	0.05	/
L1	/	0.20	/
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
A1	0	0.02	0.5

SOT23-5



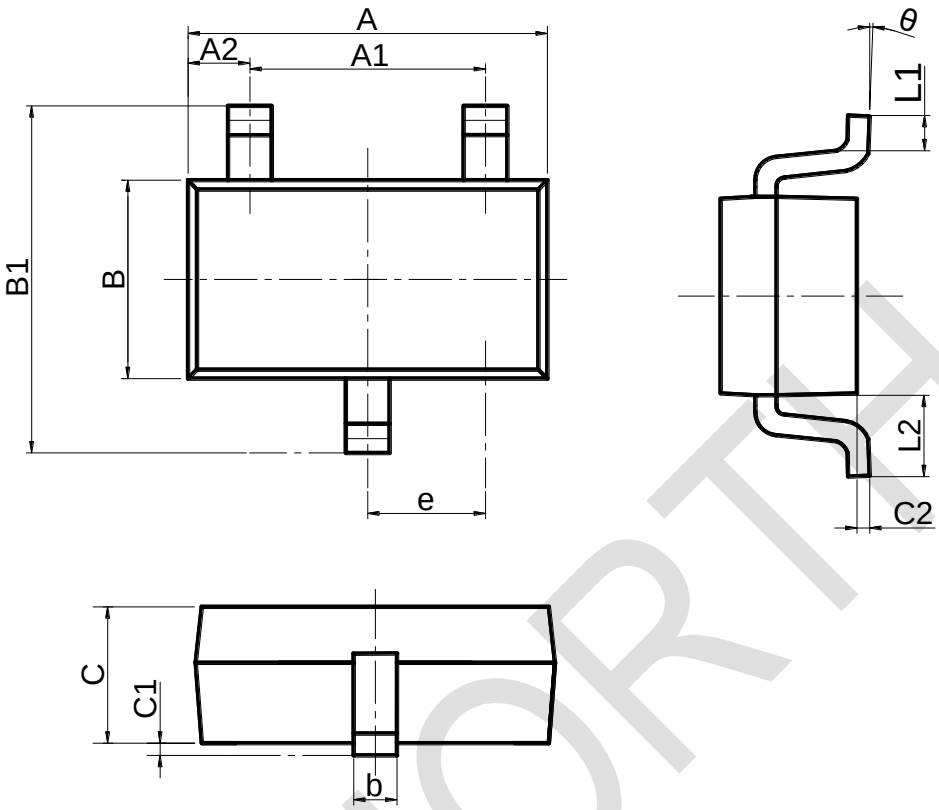
Dimension / Symbol	Min (mm)	Max (mm)
A	2.82	3.02
e	0.95(BSC)	
b	0.27	0.35
B	1.50	1.70
B1	2.60	3.00
C	1.05	1.15
C1	0.03	0.15
C2	0.135	0.23
L	0.35	0.55
θ	0°	8°

SOT-89-3



Dimension / Symbol	Min(mm)	Max(mm)
A	4.40	4.60
A1	1.65	1.75
A2	2.95	3.05
A3	0.35	0.45
A4	0.43	0.53
A5	0.35	0.45
B	2.40	2.60
B1	4.05	4.25
B2	0.82	0.83
B3	0.82	0.83
C	1.40	1.60
C1	0.35	0.45
θ	6°TYP4	
θ1	3°TYP4	
θ2	6°TYP4	
θ3	3°TYP4	

SOT-23-3



Dimension / Symbol	Min (mm)	Nom (mm)	Max (mm)
A	2.70	2.90	3.10
A1	1.70	1.90	2.10
A2			0.60
e	0.85	0.95	1.05
b	0.30	0.40	0.50
B	1.50	1.60	1.80
B1	2.60	2.80	3.00
C	1.00	1.10	1.20
C1			0.10
C2	0.02		0.08
L1	0.20		0.55
L2		0.60	
θ	0°		15°

13 Important Statement

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