100V 50mA Very High Voltage Linear Regulator

General Description

The MX5709ES device is a very high voltage-tolerant linear regulator that offers the benefits of a thermally-enhanced package, and is able to withstand continuous DC or transient input voltages of up to 100 V. The MX5709ES device is stable with output capacitance greater than 2.2µF and input capacitance greater than 0.47µF. Therefore, implementations of this device require minimal board space because of its miniaturized packaging and a potentially small output capacitor. In addition, the MX5709ES device offers an enable pin compatible with standard CMOS logic to enable a low-current shutdown mode.

The MX5709ES device has an internal thermal shutdown and current limiting to protect the system during fault conditions. The SOP8-EP package has an operating temperature range of TJ=-40°C to 150°C. In addition, the MX5709ES device is ideal for generating a low-voltage supply from intermediate voltage rails in telecom and industrial applications; not only can it supply a well-regulated voltage rail, but it can also withstand and maintain regulation during very high and fast voltage transients. These features translate to simpler and more cost-effective electrical surge-protection circuitry for a wide range of applications, including PoE, bias supply, and LED lighting.

Ordering Information

Part Number	Package	Marking Information
MX5709ES	SOP8-EP	JY5709

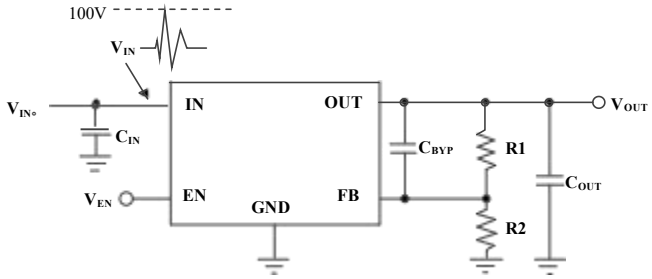
Features

- VIN Range 7 to 100V
- Output Voltage Tolerances of±1.5%
- Output Current of 50 mA
- Low Quiescent Current 23µA
- Quiescent Current at Shutdown 8µA
- Dropout Voltage 2.8V at IOUT=50mA
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limit
- Adjustable Output Voltage from 1.2 to 90V

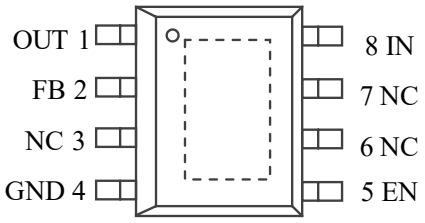
Applications

- Microprocessors, Microcontrollers Powered by Industrial Busses with High Voltage Transients
- Industrial Automation
- Telecom Infrastructure
- Automotive
- Power over Ethernet (PoE)
- LED Lighting

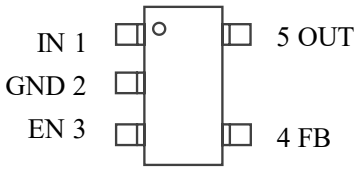
Typical Application Circuit



Pin Configuration



SOP8-EP

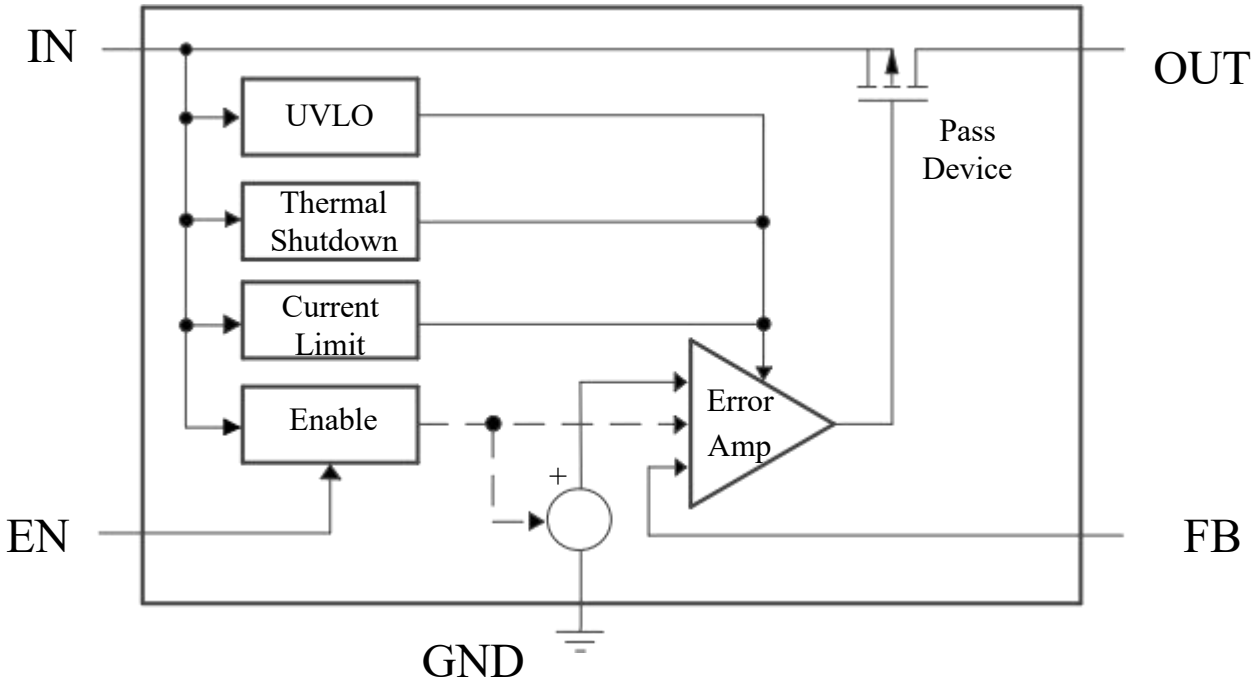


SOT23-5

Pin Assignment

Pin Name	SOP8-EP Pin No	SOT23-5 Pin No	Pin Function
OUT	1	5	Output Voltage Pin
FB	2	4	Feedback
NC	3,6,7	-	No Connect
GND	4, EP	2	Ground
EN	5	3	Enable
IN	8	1	Input Voltage pin.

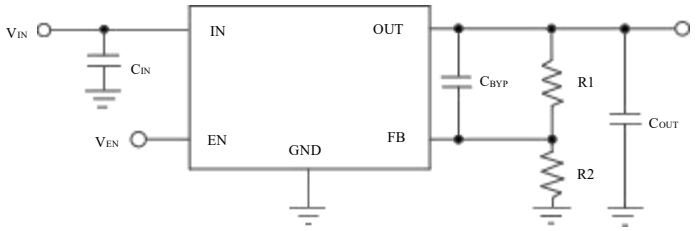
Function Block Diagram



Design Parameters

Vout (V)	Cin (uF)	Cout(uF)	*Cbypass(nF)	R1 (Kohm)	R2 (Kohm)
12	10	10	10	698	49.9
5	10	10	10	262	49.9
3.3	10	10	10	156	49.9
1.8	10	10	10	62.5	49.9

*Cbypass is for Maximum AC Performance, not requested.



1. Vout = 0.8V * (R1+R2) / R2
2. 10uA < Vout / (R1+R2) < 30uA

Absolute Maximum Ratings

Parameter	Value
VIN、VOUT、EN	-0.3V to 110V
FB	-0.3V to 5.5V
Junction Temperature	-40 to 125°C
Lead Temperature (soldering, 10sec)	300°C
Storage Temperature	-65 to 150°C

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.

Recommended Operating Conditions

Parameter	Value
VIN	7V to 100V
VOUT	1.2V to 90V
EN	0V to 100V
IOUT	0mA to 100mA
Junction Temperature	-40 to 125°C

Electrical Characteristics

VIN=VOUT + 3V or VIN=7V (whichever is greater), IOUT=100uA, CIN=1uF, COUT=4.7uF, TJ=25℃, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input Voltage	V_{IN}		7		100	V
Internal Reference	V_{REF}		0.788	0.8	0.812	V
Line Regulation	$\triangle V_{LINE}$	VIN=7V to 100V,		3	20	mV
Load Regulation	$\triangle V_{LOAD}$	100uA < IOUT < 50mA		20	50	mV
Dropout Voltage	V_{DROP}	IOUT=20mA		1000		mV
		IOUT=50mA		2800		mV
Quiescent Current	I_Q	IOUT = 0mA		23	40	uA
Shutdown Current	I_{SD}	VEN = 0V		8	15	uA
Current Limit	I_{CL}	VOUT = 90% VOUT(NOM)	55	120	200	mA
Enable High Low Level	V_{ENHI}		1.0		VIN	V
	V_{ENLO}		0		0.4	V
Enable Pin Current	I_{EN}	7V<VIN<100V, VIN=VEN		0.02	1	uA
Feedback Pin Current	I_{FB}			0.01	0.11	uA
Thermal Shutdown	TSD	Shutdown, temperature increasing		160		℃
		Reset, temperature decreasing		140		℃

Typical Characteristics

VIN=12V, VOUT=5V IOUT=1mA, CIN=0.47uF, COUT=2.2uF, TJ=25τ, unless otherwise specified

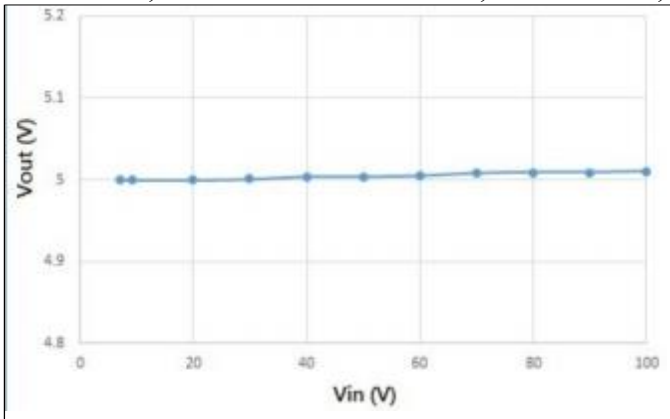


Fig1 Vout vs Vin

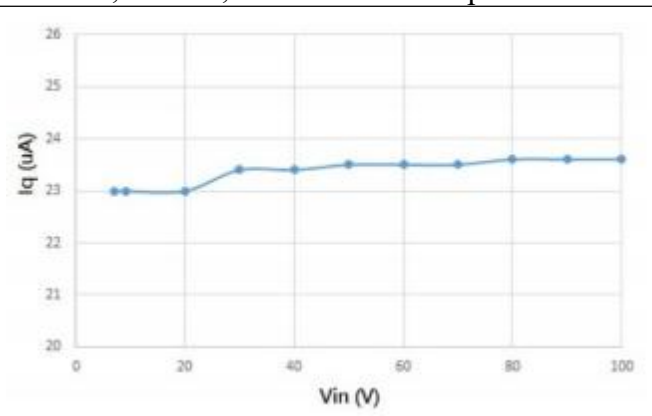


Fig2 Iq vs Vin

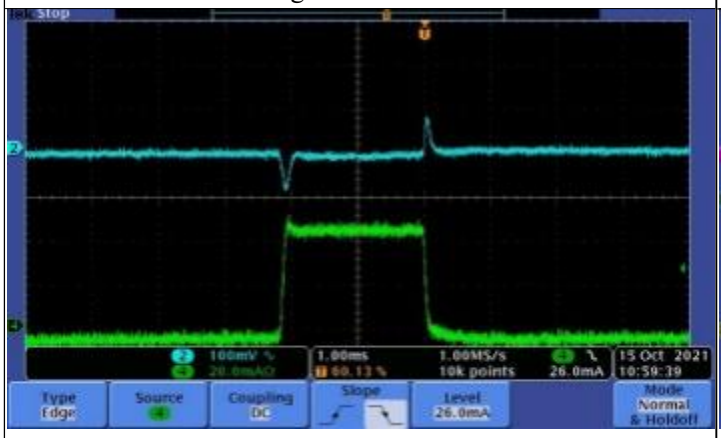


Fig3 Load transient 0 to 50mA

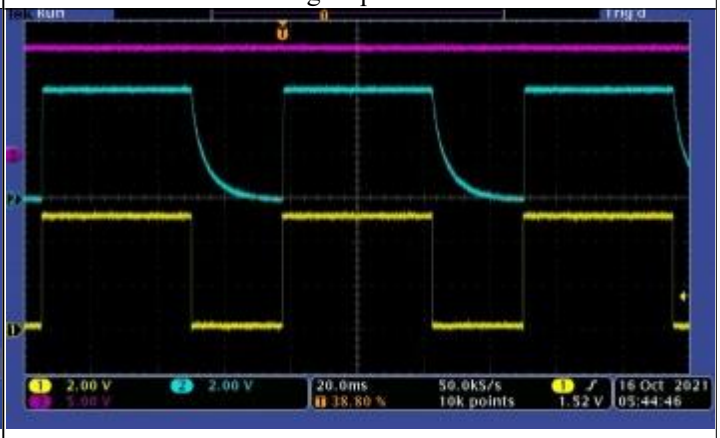


Fig4 Enable ON/OFF

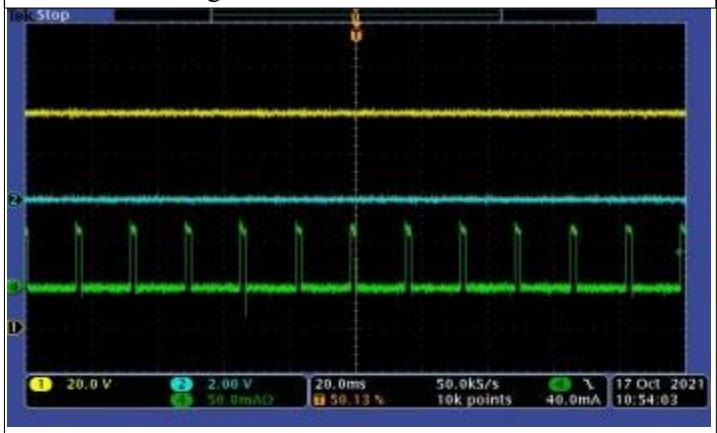


Fig5 VIN=100V, VOUT short to GND

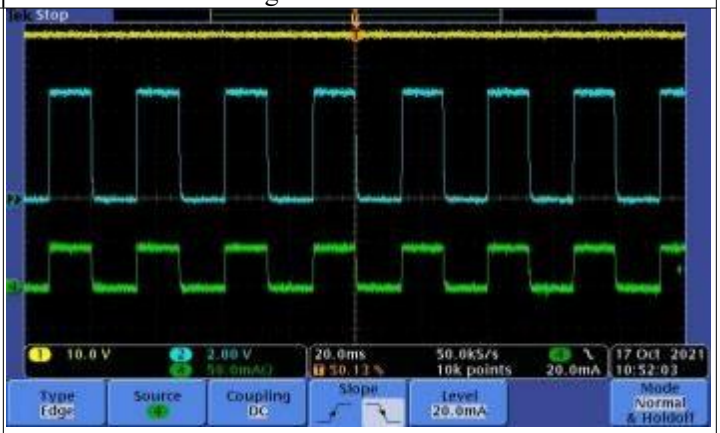
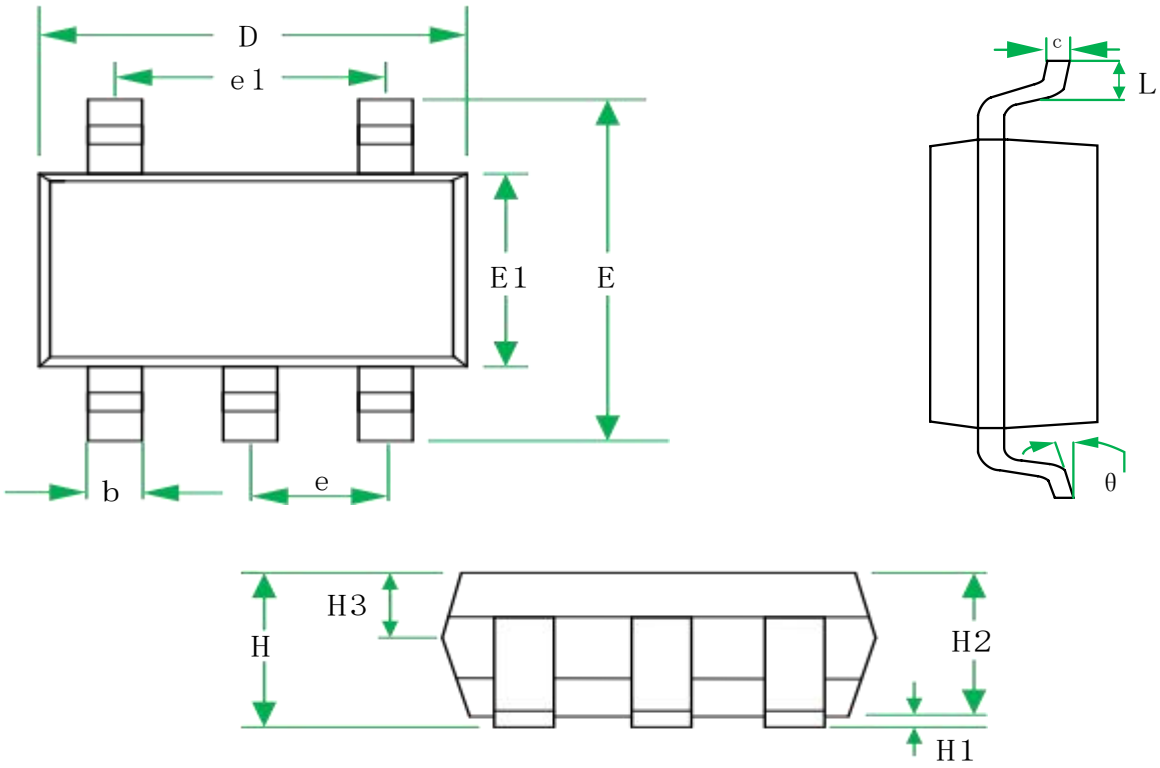


Fig6 VIN=36V, VOUT=5V, RLOAD=100ohm, thermal protect

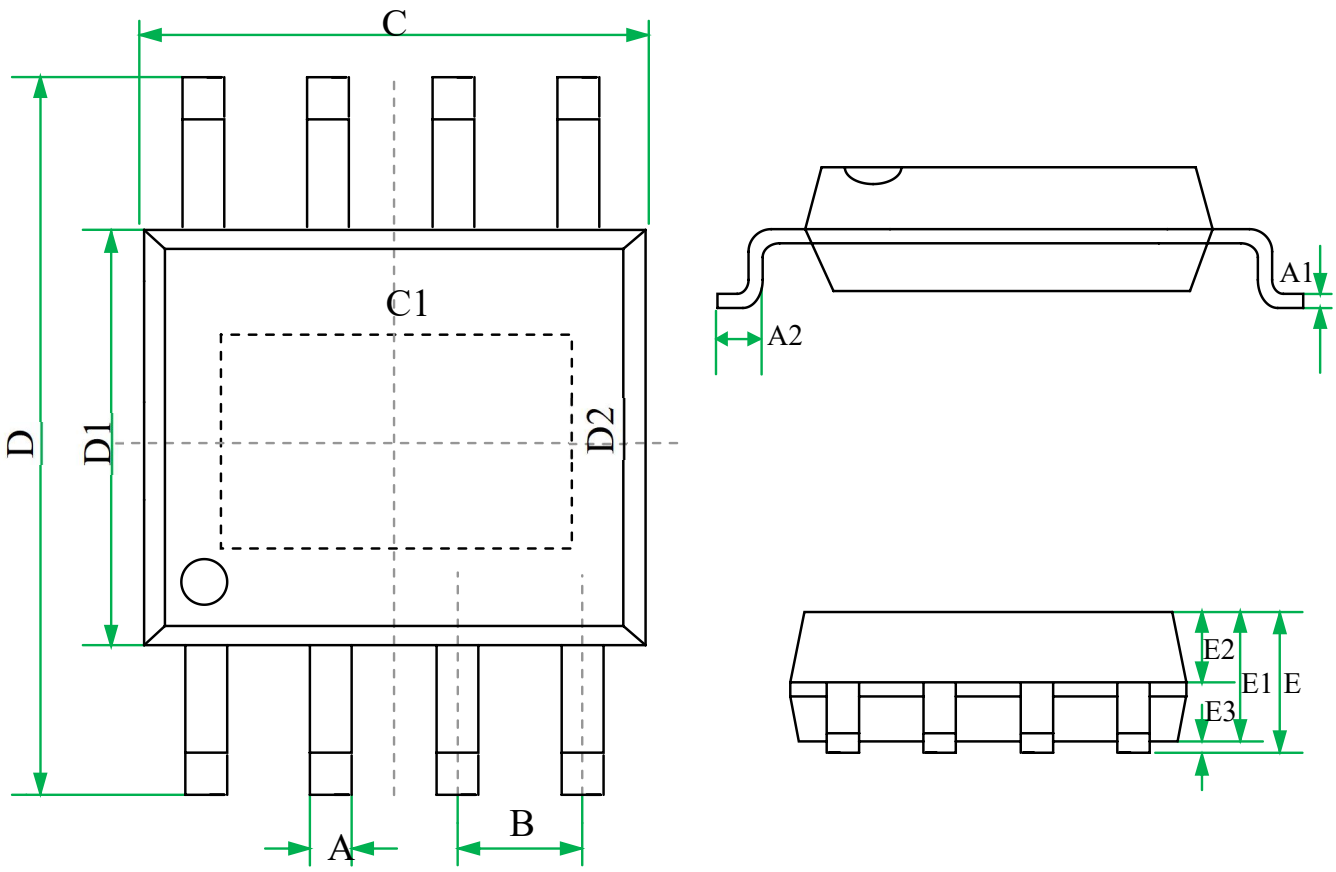
Package Information



SYMBOL	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
H	1.05	1.20	1.25	0.041	0.047	0.049
H1	0.00	0.05	0.10	0.001	0.002	0.004
H2	1.05	1.12	1.18	0.041	0.044	0.046
H3	0.43	0.45	0.47	0.017	0.018	0.019
b	0.30	0.35	0.50	0.012	0.014	0.020
c	0.08	0.13	0.18	0.003	0.005	0.007
D	2.82	2.92	3.02	0.111	0.115	0.119
E	2.70	2.85	3.00	0.106	0.112	0.118
E1	1.50	1.58	1.70	0.059	0.062	0.067
e	0.95BSC			0.037BSC		
e1	1.90BSC			0.075BSC		
L	0.28	0.43	0.58	0.011	0.017	0.023
θ	0		8°	0		8°

SOT23-5 for MX5709T

Package Information



SYMBOL	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.35	0.40	0.45	0.014	0.016	0.018
A1	0.15	0.20	0.25	0.006	0.008	0.010
A2	0.40	0.60	0.80	0.016	0.024	0.031
B		1.27BSC			0.050BSC	
C	4.80	4.90	5.00	0.189	0.193	0.197
C1	3.00	3.20	3.40	0.118	0.126	0.134
D	5.80	6.00	6.20	0.228	0.236	0.244
D1	3.80	3.90	4.00	0.150	0.154	0.157
D2	2.10	2.30	2.50	0.083	0.091	0.098
E	-	-	1.70	-	-	0.067
E1	1.38	1.43	1.48	0.054	0.056	0.058
E2	0.67	0.70	0.73	0.026	0.028	0.029
E3	0.00	0.05	0.10	0.004	-	0.009

ESOP8 for MX5709ES

Restrictions on Product Use

◆ MAXIN micro is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing MAXIN products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such MAXIN products could cause loss of human life, bodily injury or damage to property.

◆ In developing your designs, please ensure that MAXIN products are used within specified operating ranges as set forth in the most recent MAXIN products specifications.

◆ The information contained herein is subject to change without notice.

Version update record:
V10 The original version （preliminary）