

100V 50mA Very High Voltage Linear Regulator

General Description

The MX5709T 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 MX5709T device is stable with output capacitance greater than 2.2 μ F and any input capacitance greater than 0.47 μ F. Therefore, implementations of this device require minimal board space because of its miniaturized packaging (PSOP8) and a potentially small output capacitor. In addition, the MX5709T device offers an enable pin (EN) compatible with standard CMOS logic to enable a low-current shutdown mode.

The MX5709T device has an internal thermal shutdown and current limiting to protect the system during fault conditions. The SOP8-EP and VSSOP8-EP packages have an operating temperature range of $T_J = -40^{\circ}\text{C}$ to 125°C . In addition, the MX5709T 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	Body Size
MX5709	SOP8-EP VSSOP8-EP SOT23-5	

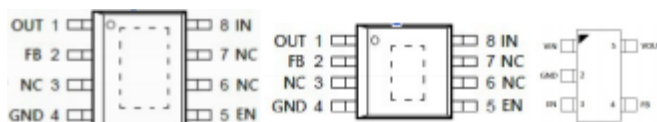
Features

- VIN Range 7 to 100V
- Output Voltage Tolerances of $\pm 1.5\%$
- Output Current of 50 mA
- Low Quiescent Current 23 μ A
- Quiescent Current at Shutdown 8 μ A
- Dropout Voltage 2.8V at $I_{OUT} = 50$ mA
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limit
- Adjustable Output Voltage from 1.2 to 90V

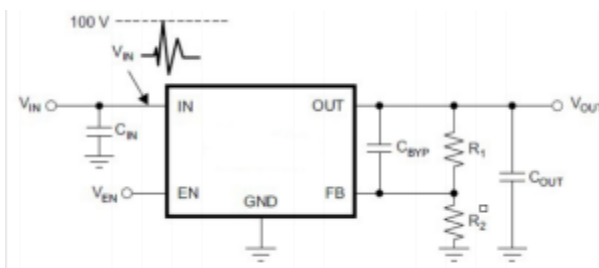
Applications

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

Pin Configuration



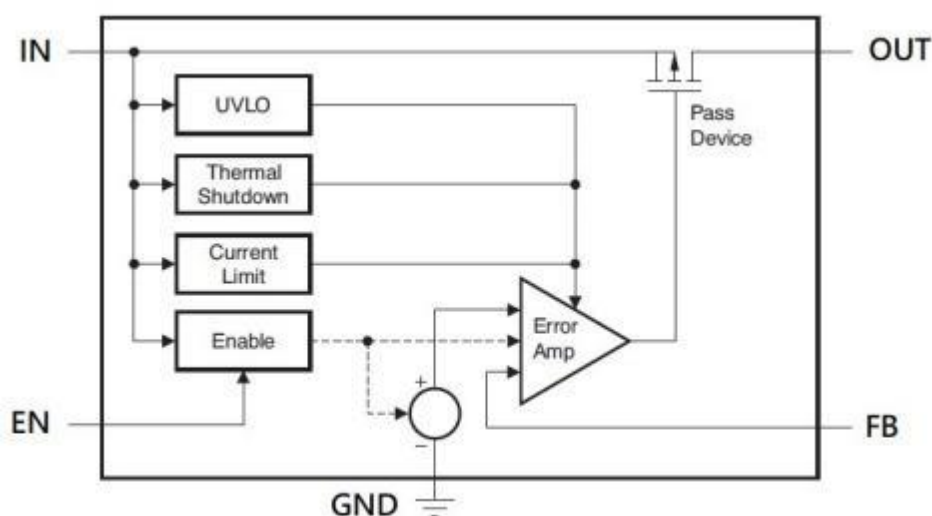
Typical Application Circuit



Pin Assignment

Pin Name	SOP8-EP Pin No	VSSOP8-EP Pin No	SOT235 Pin No	Pin Function
OUT	1	1	5	Output Voltage Pin
FB	2	2	4	Feedback
NC	3,6,7	3,6,7	-	Non Connect
GND	4,EP	4, EP	2	Ground
EN	5	5	3	Enable
IN	8	8	1	Input Voltage pin.

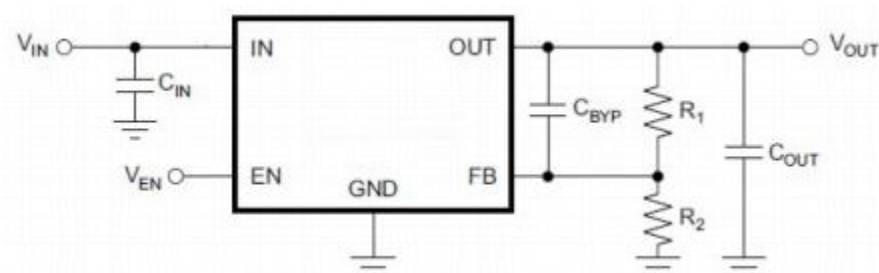
Function Block Diagram



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.



- $V_{out} = 0.8V * (R1+R2) / R2$
- $10\mu A < V_{out} / (R1+R2) < 30\mu A$

Absolute Maximum Ratings (Note1)

. V_{IN}	0.3V to 110V
. V_{OUT}	0.3V to 110V
. FB	0.3V to 5.5V
. EN	0.3V to 110V
. Junction Temperature	125. C
. Lead Temperature (Soldering, 10 sec.)	300. C
. Storage Temperature	-65. C to 150. C

Recommended Operating Conditions

. Input Voltage, V_{IN}	7V to 100V
. Output Voltage, V_{OUT}	1.2V to 90V
. Enable Voltage, V_{EN}	0V to 100V
. Output Current, I_{OUT}	0mA to 50mA
. Junction Temperature	40. C to 125. C

Electrical Characteristics

$V_{IN}=V_{OUT} + 3V$ or $V_{IN}=7V$ (whichever is greater), $I_{OUT}=100\mu A$, $C_{IN}=1\mu F$, $C_{OUT}=4.7\mu F$, $T_J=25^\circ C$, 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	ΔV_{LINE}	$V_{IN}=7V$ to 100V,		3	20	mV
Load Regulation	ΔV_{LOAD}	$100\mu A < I_{OUT} < 50mA$		20	50	mV
Dropout Voltage	V_{DROP}	$I_{OUT}=20mA$		1000		mV
		$I_{OUT}=50mA$		2800		mV
Quiescent Current	I_Q	$I_{OUT} = 0mA$		23	40	μA
Shutdown Current	I_{SD}	$V_{EN} = 0V$		8	15	μA
Current Limit	I_{CL}	$V_{OUT} = 90\% V_{OUT(NOM)}$	55	120	200	mA
Enable High Low Level	V_{ENHI}		1.0		V_{IN}	V
	V_{ENLO}		0		0.4	V
Enable Pin Current	I_{EN}	$7V < V_{IN} < 100V$, $V_{IN}=V_{EN}$		0.02	1	μA
Feedback Pin Current	I_{FB}			0.01	0.11	μA
Thermal Shutdown	T_{SD}	Shutdown, temperature increasing		160		$^\circ C$
		Reset, temperature decreasing		140		$^\circ C$

Typical Characteristics

$V_{IN}=12V$, $V_{OUT}=5V$ $I_{OUT}=1mA$, $C_{IN}=0.47\mu F$, $C_{OUT}=2.2\mu F$, $T_J=25^\circ C$, unless otherwise specified

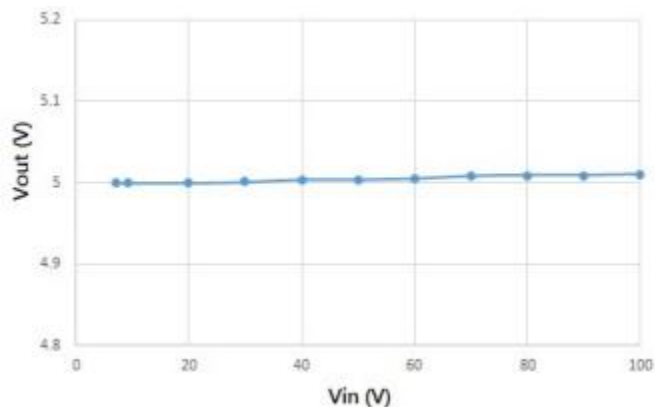


Fig1 V_{out} vs V_{in}

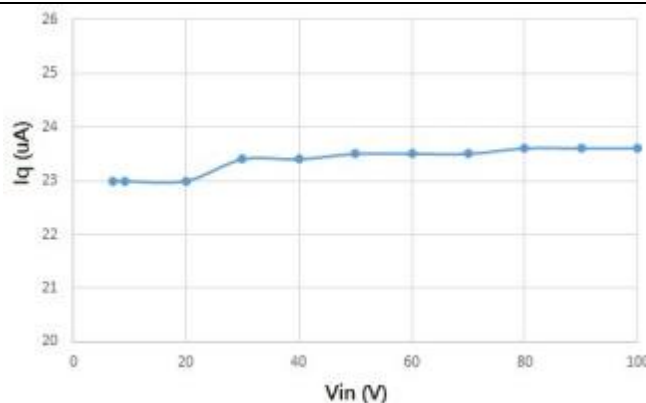


Fig2 I_q vs V_{in}

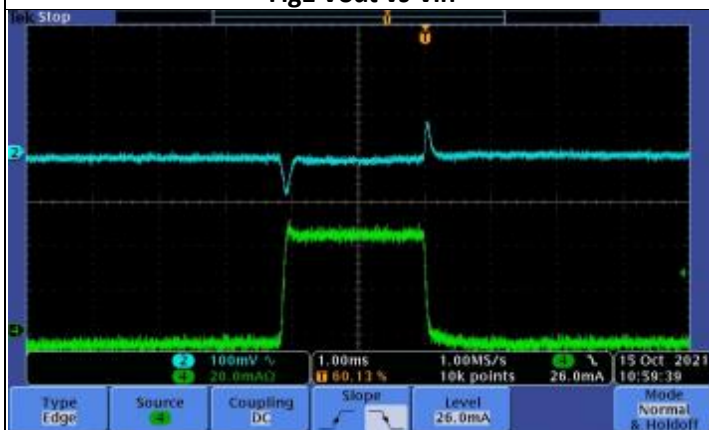


Fig3 Load transient 0 to 50mA

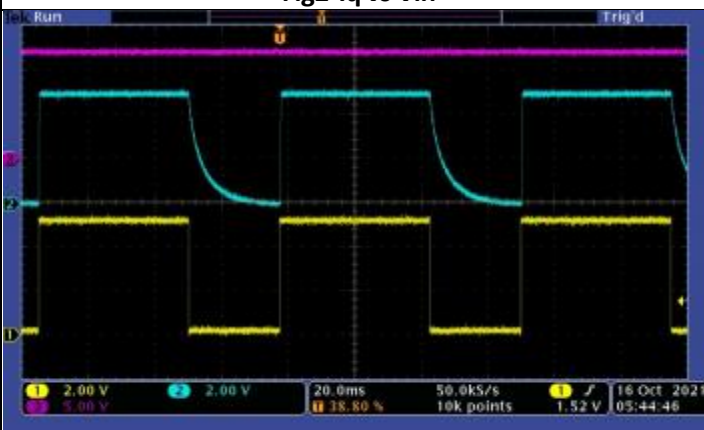


Fig4 Enable ON/OFF

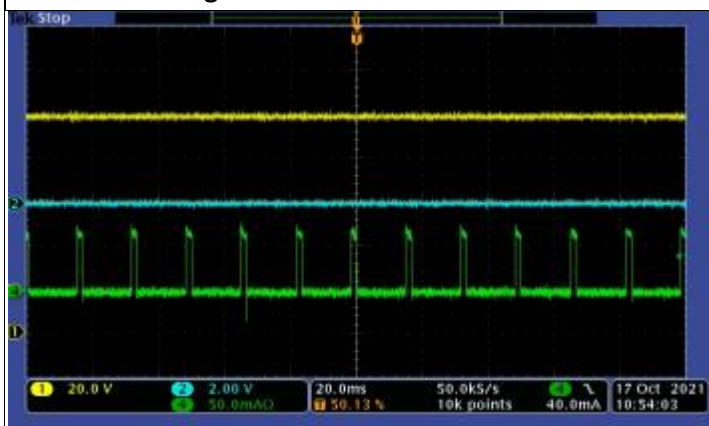


Fig5 $V_{IN}=100V$, V_{OUT} short to GND

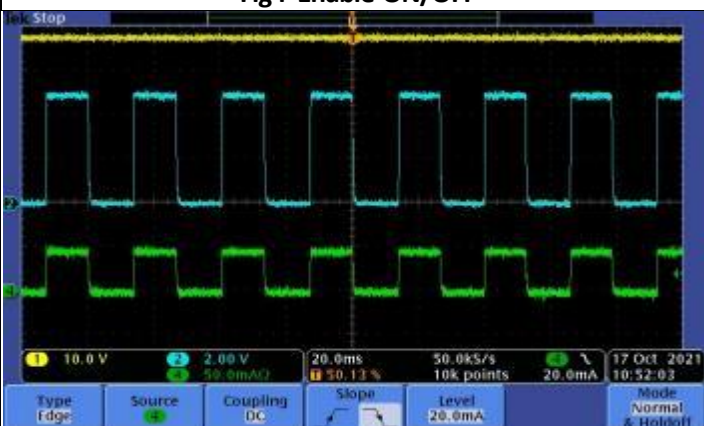


Fig6 $V_{IN}=36V$, $V_{OUT}=5V$, $R_{LOAD}=100\Omega$, thermal protect