100V 50mA Very High Voltage Linear Regulator

General Description

The MGR2105 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 MGR2105 device is stable with output capacitance greater than 2.2µF and any 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 MGR2105 device offers an enable pin (EN) compatible with standard CMOS logic to enable a low-current shutdown mode.

The MGR2105 device has an internal thermal shutdown and current limiting to protect the system during fault conditions. The SOP8-EP packages have an operating temperature range of TJ = –40°C to 125°C. In addition, the MGR2105 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	
MGR2105	SOP8-EP	MGR2105-S8
	SOT23-5	MGR2105-GB

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 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

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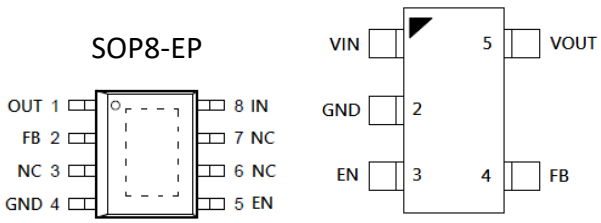
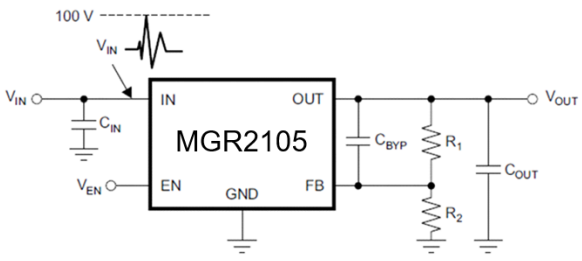


Typical Application Circuit

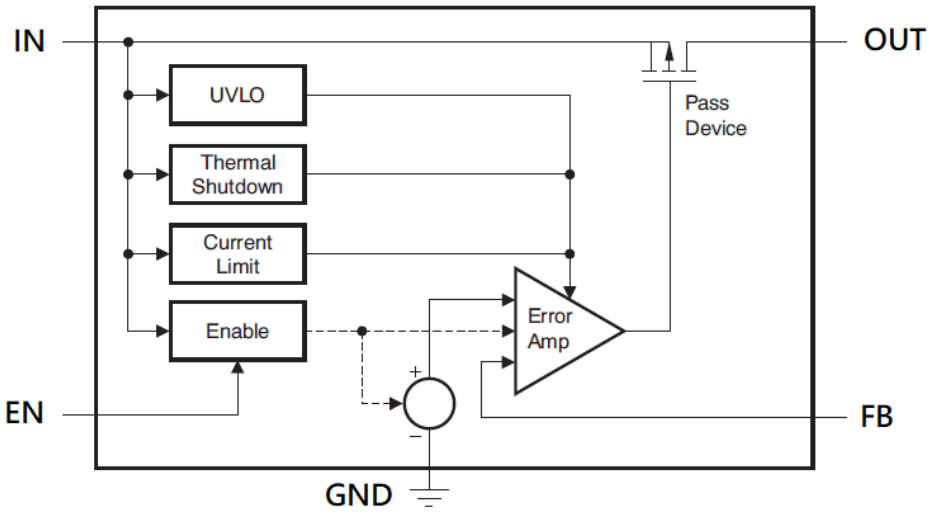


Ceramic Capacitor Stable

Pin Assignment

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

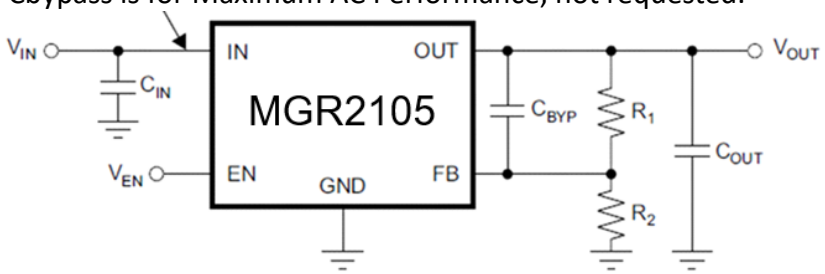
Function Block Diagram



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 (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}=100uA, C_{IN}=1uF, C_{OUT}=4.7uF, T_J=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	$\triangle V_{LINE}$	V_{IN}=7V to 100V,		3	20	mV
Load Regulation	$\triangle V_{LOAD}$	100uA < 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	uA
Shutdown Current	I_{SD}	V_{EN} = 0V		8	15	uA
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	uA
Feedback Pin Current	I_{FB}			0.01	0.11	uA
Thermal Shutdown	T_{SD}	Shutdown, temperature increasing		160		℃
		Reset, temperature decreasing		140		℃

Typical Characteristics

V_{IN}=12V, V_{OUT}=5V I_{OUT}=1mA, C_{IN}=0.47uF, C_{OUT}=2.2uF, T_J=25℃, unless otherwise specified

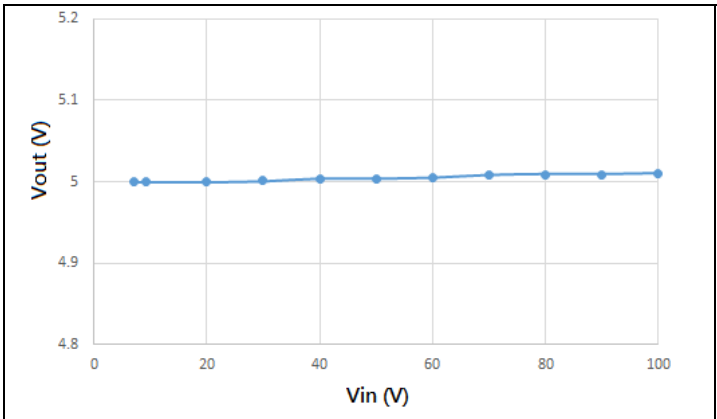


Fig1 Vout vs Vin

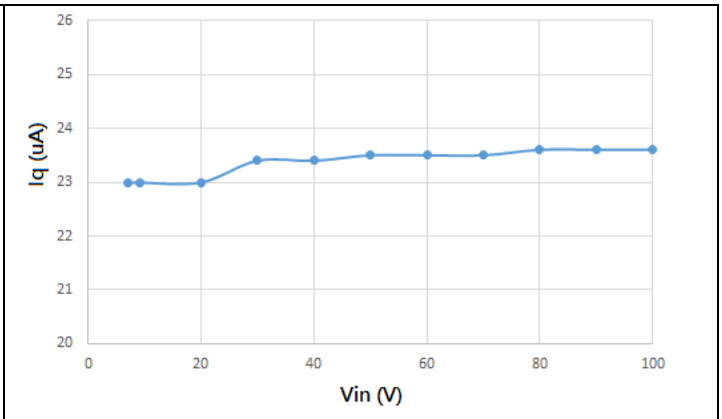


Fig2 Iq vs Vin

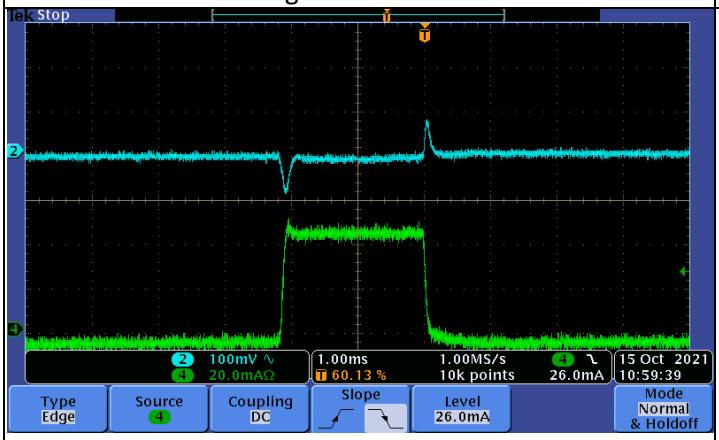


Fig3 Load transient 0 to 50mA

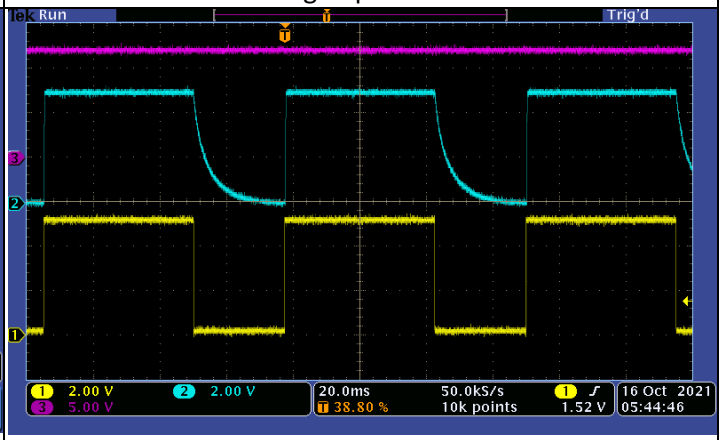


Fig4 Enable ON/OFF

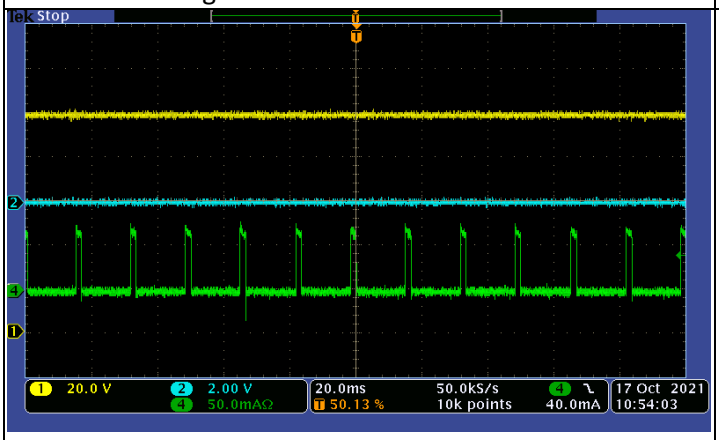


Fig5 V_{IN}=100V, V_{OUT} short to GND

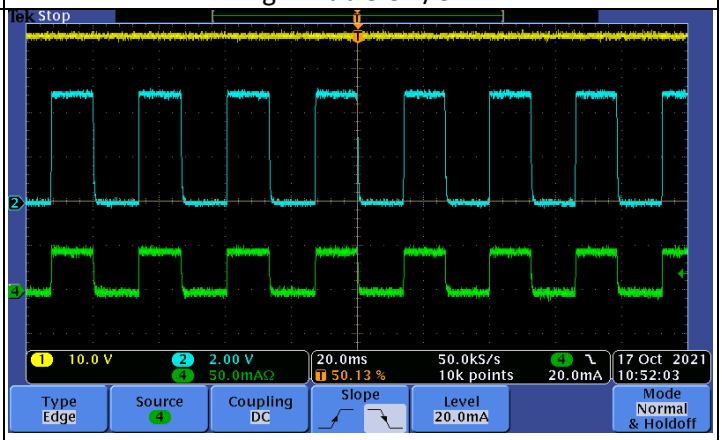
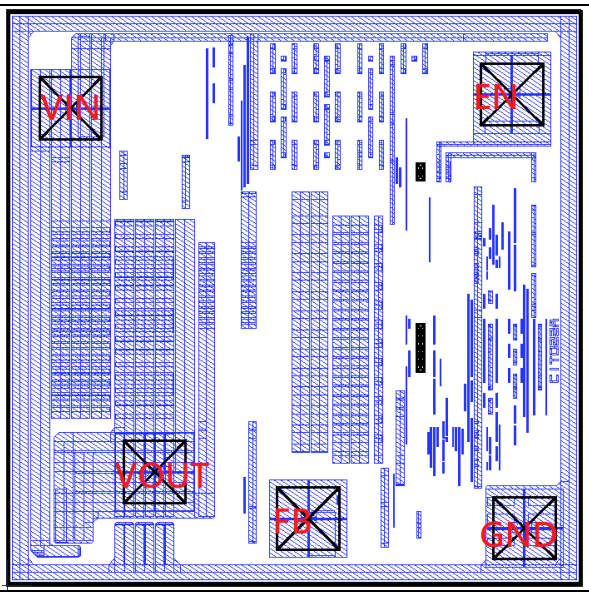


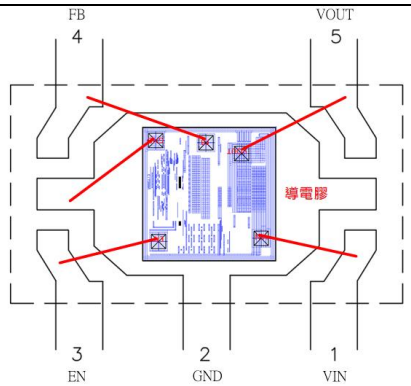
Fig6 V_{IN}=36V, V_{OUT}=5V, R_{LOAD}=100ohm, thermal protect

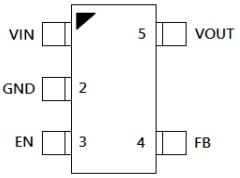
PAD Location and Coordinates

PHYSICAL CHARACTERISTICS		UNIT	CHIP DRAWING
Wafer Size	200	mm	
Die Size (with S/L)	0.800 * 0.800	mm^2	
Scribe line width	60	um	
TOP Metal thickness	3	μm	
Metal layers	3	layers	
Top Metallization	Al		
Wafer Thickness	736	μm	
CUP (circuit under PAD) or not	YES		

PAD NAME	PAD SIZE (μm^2)	Coordinate
VOUT	80*80	(190,146)
FB	80*80	(388,86)
GND	80*80	(666,74)
EN	80*80	(650,632)
VIN	80*80	(82,614)

Bonding Diagram Example





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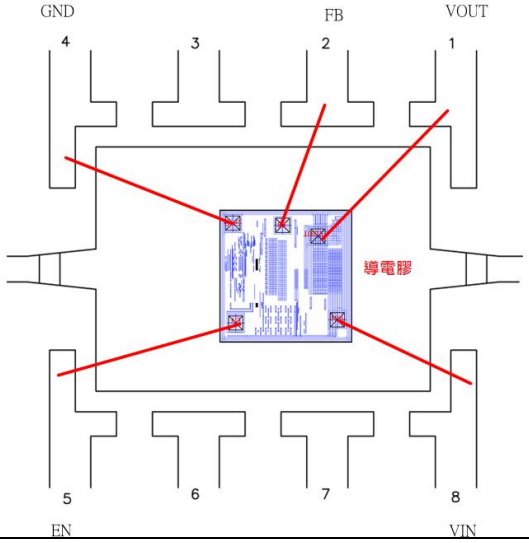

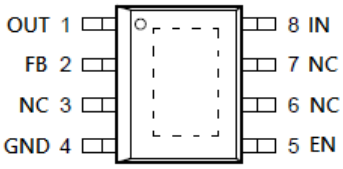

SOP8-EP