GS78Lxx

3-Terminal Positive Voltage Regulator

Product Description

The GS78Lxx Series of positive voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100mA. Like their higher-powered GS78xx Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the GS78Lxx devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.

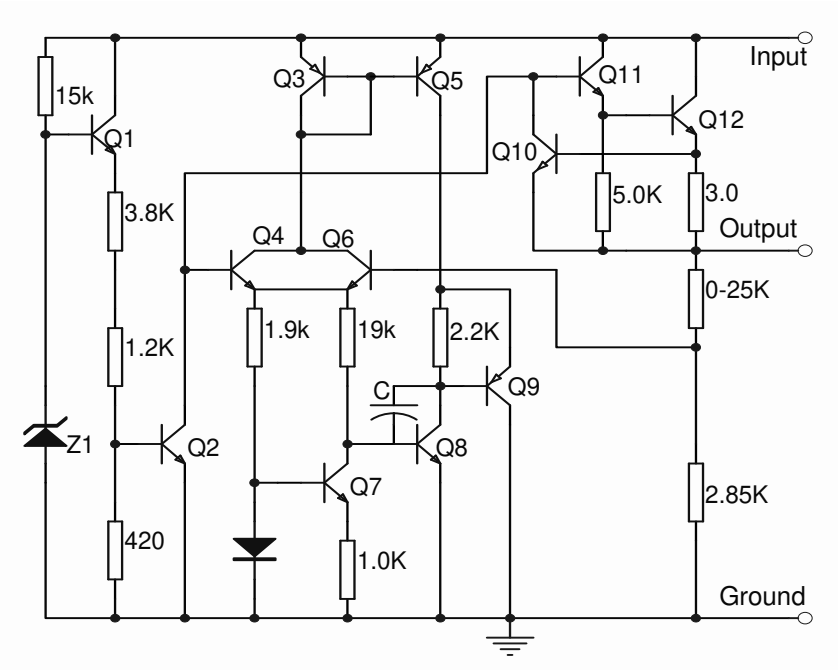
Features

- Wide Range of Available, Fixed Output Voltages
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (GS79Lxx Series)
- Available in ±5% Accuracy
- RoHS and Halogen Free Compliant and 100% Lead(Pb)-Free

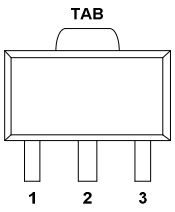
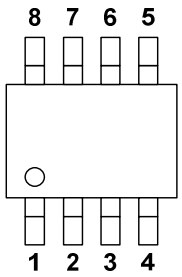
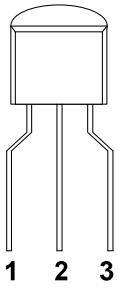
Applications

- Battery Powered Systems
- Portable Consumer Equipment
- Portable Computer
- Radio Control Systems
- Logic Systems
- Power Adapter

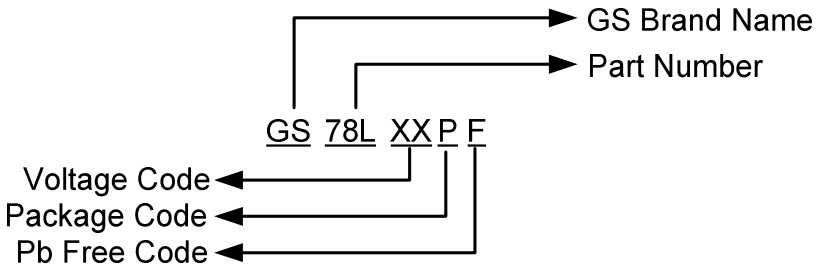
Representative Schematic Diagram



Packages & Pin Assignments

GS78LxxYF (SOT-89)			GS78LxxSF (SOP-8)		GS78LxxNF (TO-92)	
						
PIN NO.	**GS78L05YF GS78L12YF**	**GS78L05YUF GS78L12YUF**	**PIN NO.**	**GS78L05SF GS78L12SF**	**PIN NO.**	**GS78L05NF GS78L12NF**
1	V_{IN}	V_{OUT}	**1**	V_{OUT}	**1**	V_{OUT}
2	GND	GND	**8**	V_{IN}	**2**	G_{ND}
3	V_{OUT}	V_{IN}	**2,3,6,7**	GND	**3**	V_{IN}
			4,5	NC		

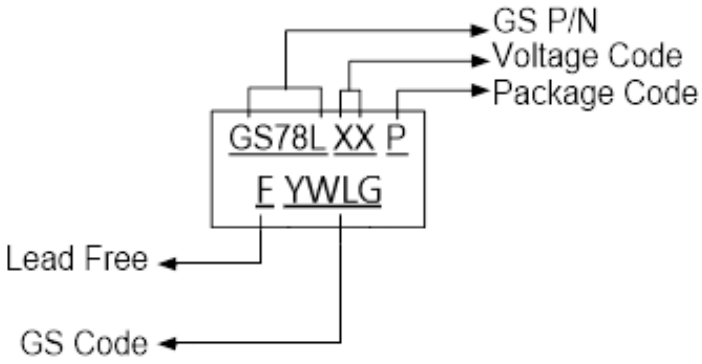
Ordering Information



GS78Lxx				
SOT-89		**SOP-8**	**TO-92**	**Output**
GS78L05YF	GS78L05YUF	GS78L05SF	GS78L05NF	5V
GS78L12YF	GS78L12YUF	GS78L12SF	GS78L12NF	12V

*Request for other voltages, please contact factory directly.

Marking Information



Absolute Maximum Ratings

T_A=+25ºC, unless otherwise noted.)

Symbol	Parameter	Maximum		Unit
V_{IN}	Input Voltage	30		V
P_D	Power Dissipation	SOT-89	0.5	W
		SOP-8	0.625	
		TO-92	0.5	
θ_{JA}	The Junction-To-Ambient Thermal Resistance	SOT-89	200	ºC/W
		SOP-8	160	
		TO-92	200	
T_J	Operating Junction Temperature Range	-20 to +120		ºC
T_{STG}	Storage Temperature Range	-55 to +150		ºC

Operating Ratings

Parameter	Value	Unit
Temperature Range	0 ≤T_J ≤125	ºC
Supply Voltage	7 to 27	V

GS78L05 Electrical Characteristics

(V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33μ F, C_{OUT}=0.1μ F, 0ºC <T_J<+125ºC, unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	T_J=+25ºC	4.8	5.0	5.2	V
Reg_{LINE}	Line Regulation	T_J=+25ºC, I_{OUT} =40mA 7.0V ≤ V_{IN} ≤20V, 8.0V ≤ V_{IN} ≤20V	-- --	32 26	150 100	mV mV
Reg_{LOAD}	Load Regulation	T_J=+25ºC, 1.0mA ≤I_{OUT} ≤100mA T_J=+25ºC, 1.0mA ≤ I_{OUT} ≤40mA	-- --	15 8	60 30	mV mV
V_{OUT}	Output Voltage	7.0V ≤V_{IN} ≤20V, 1.0mA ≤ I_{OUT} ≤40mA V_{IN} =10V, 1.0mA ≤I_{OUT} ≤70mA	4.75 4.75	-- --	5.25 5.25	V
I_B	Input Bias Current	T_J=+25ºC T_J=+125ºC	-- --	2.6 --	6.0 5.5	mA
△I_B	Input Bias Current Change	8.0V ≤V_I ≤20V 1.0mA ≤Io ≤40mA	-- --	-- --	1.5 0.1	mA
V_N	Output Noise Voltage	T_A=+25ºC, 10Hz ≤f ≤100kHz	--	42	--	μV
RR	Ripple Rejection	I_{OUT}=40mA, f=120Hz, 8.0V ≤V_{IN} ≤18V, T_J=+25ºC	41	49	--	dB
V_{IN}-V_{OUT}	Dropout Voltage	T_J=+25ºC	--	1.7	--	V

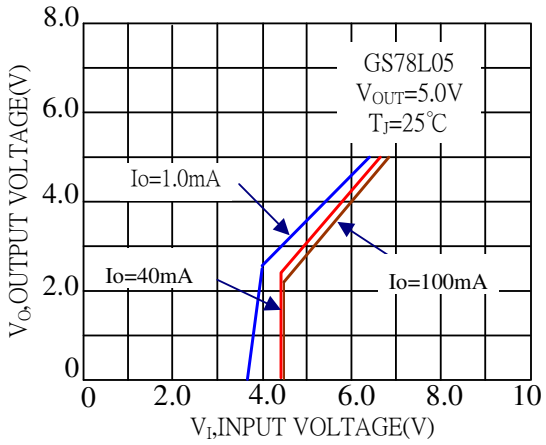
GS78L12 Electrical Characteristics

(V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33μ F, C_{OUT}=0.1μ F, 0ºC <T_J<+125ºC, unless otherwise noted.)

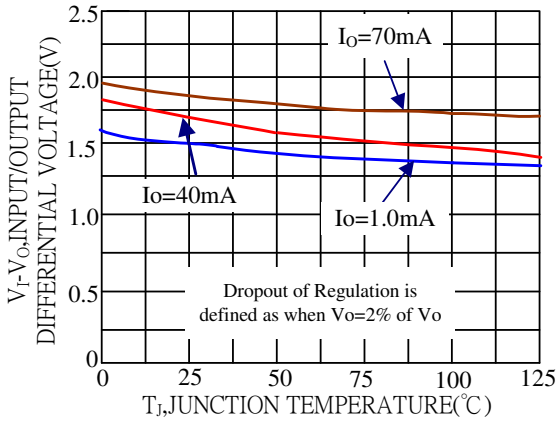
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	T_J=+25ºC	11.5	12	12.6	V
Reg_{LINE}	Line Regulation	T_J=+25ºC, I_{OUT} =40mA 14.5V ≤ V_{IN} ≤27V, 16V ≤ V_{IN} ≤27V	-- --	25 20	300 250	mV mV
Reg_{LOAD}	Load Regulation	T_J=+25ºC, 1.0mA ≤I_{OUT} ≤100mA T_J=+25ºC, 1.0mA ≤ I_{OUT} ≤40mA	-- --	25 12	150 75	mV mV
V_{OUT}	Output Voltage	14.5V ≤V_{IN} ≤27V, 1.0mA ≤ I_{OUT} ≤40mA 14.5V ≤V_{IN} ≤Vmax, 1.0mA ≤I_{OUT} ≤70mA	11.4 11.4	-- --	12.6 12.6	V
I_B	Input Bias Current	T_J=+25ºC T_J=+125ºC	-- --	2.0 --	6.0 5.5	mA
△I_B	Input Bias Current Change	16V ≤V_I ≤27V 1.0mA ≤Io ≤40mA	-- --	-- --	1.5 0.1	mA
V_N	Output Noise Voltage	T_A=+25ºC, 10Hz ≤f ≤100kHz	--	80	--	μV
RR	Ripple Rejection	I_{OUT}=40mA, f=120Hz, 15V ≤V_{IN} ≤25V, T_J=+25ºC	36	41	--	dB
V_{IN}-V_{OUT}	Dropout Voltage	T_J=+25ºC	--	1.7	--	V

Typical Performance Characteristics

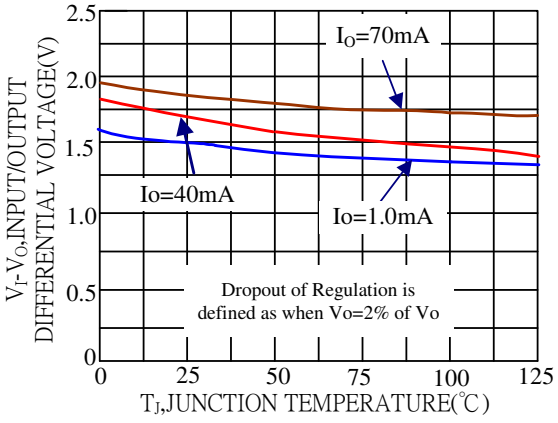
Dropout Characteristics



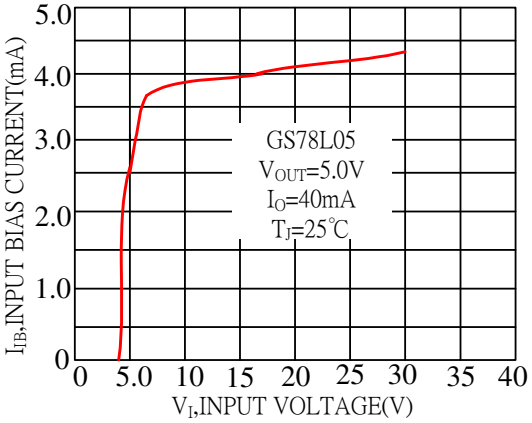
Dropout Voltage versus Junction Temperature



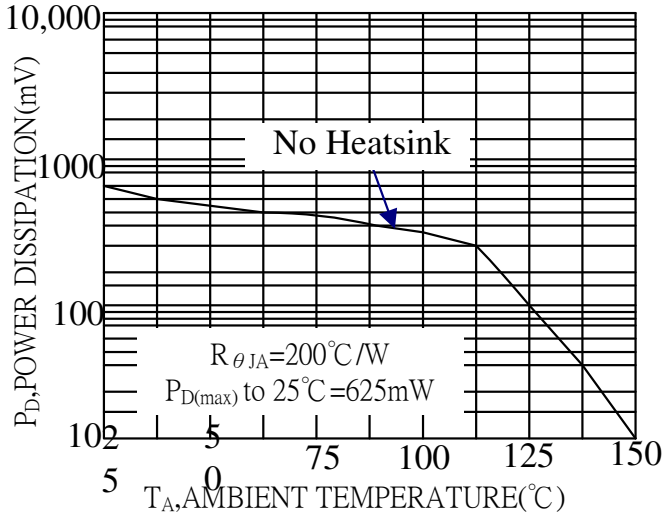
Input Bias Current versus Ambient Temperature



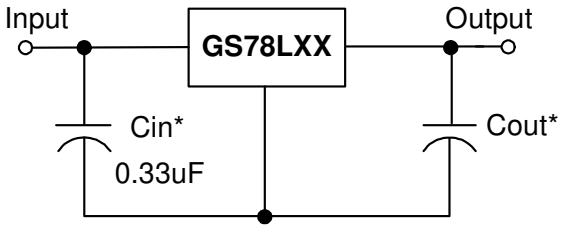
Input Bias Current versus Input Voltage



Maximum Average Power Dissipation versus Ambient Temperature TO-92 Type Package



Typical Applications



A common ground is required between the input and the output voltages.
* C_{IN} is required if regulator is located an appreciable distance form power supply filter.
**C_{OUT} is not needed for stability, however, it does improve transient response.

Design Considerations

The GS78LXX Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition. Internal Short Circuit Protection Limits the maximum current the circuit will pass.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. The input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33 µF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead. Bypassing the output is also recommended.

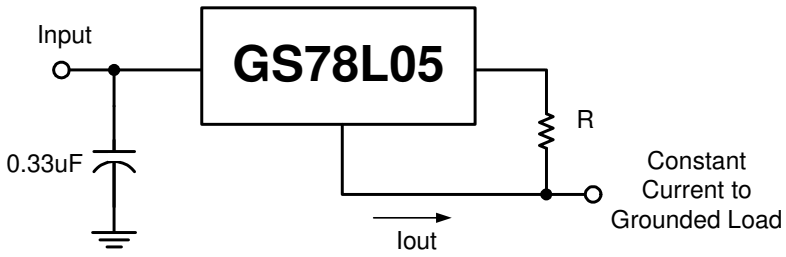
Current Regulator

The GS78LXX regulators can also be used as a current source when connected as above. In order to minimize dissipation the GS78L05 is chosen in this application. Resistor R determines the current as follows:

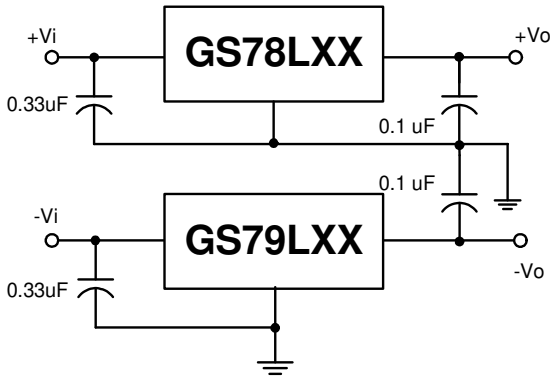
$$\text{Iout} = \frac{5.0V}{R} + I_B$$

I_B=3.8mA over line and load changes

For example, a 100mA current source would require R to be a 50Ω, 1/2 W resistor and the output voltage compliance would be the input voltage less 7V.

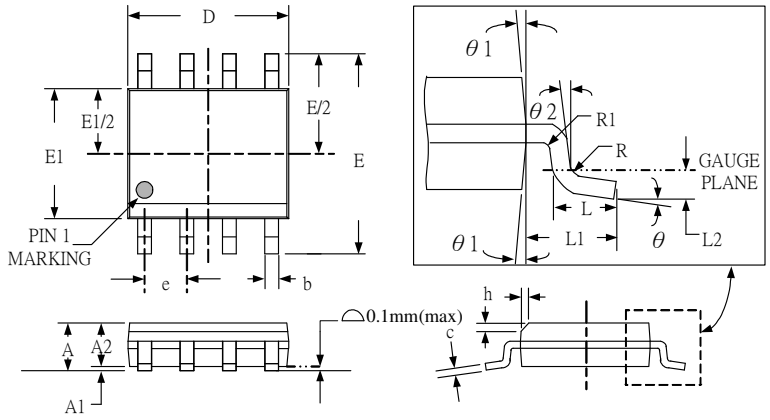


Positive and Negative Regulator



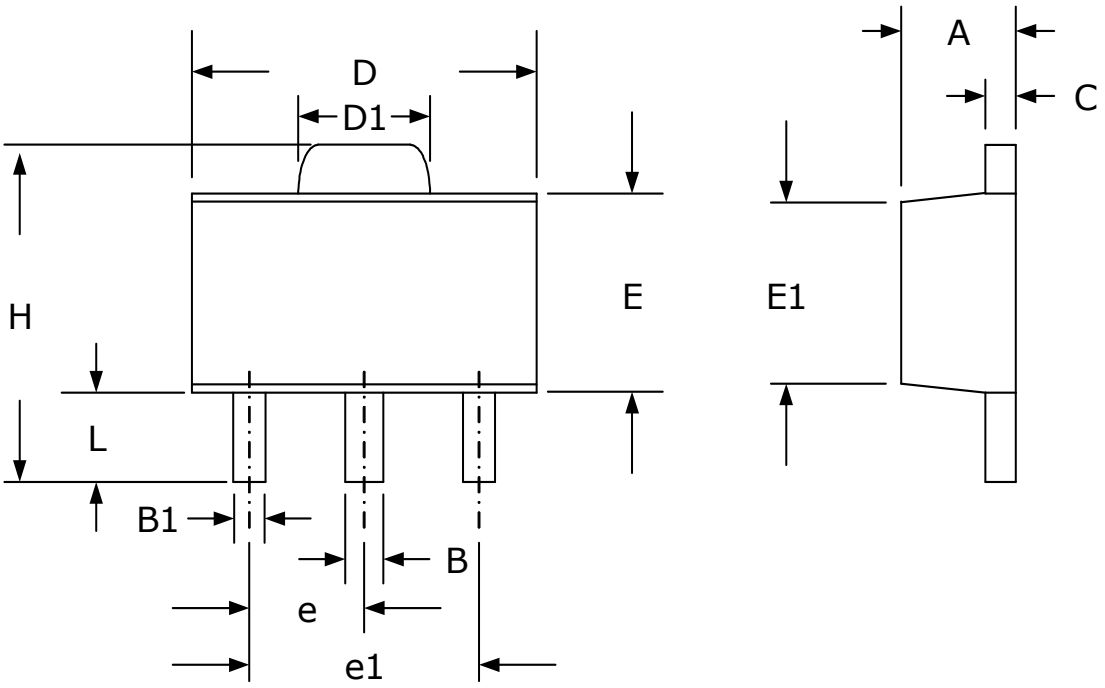
Package Dimension

SOP-8 PLASTIC PACKAGE



Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	.053	.069
A1	0.10	0.25	.004	.010
A2	1.25	1.65	.049	.065
b	0.31	0.51	.012	.020
c	0.17	0.25	.007	.010
D	4.90 (TYP)		.193 (TYP)	
E	6.00 (TYP)		.236 (TYP)	
E1	3.90 (TYP)		.154 (TYP)	
e	1.27 (TYP)		.050 (TYP)	
L	0.40	1.27	.016	.050
L1	1.04 (TYP)		.041 (TYP)	
L2	0.25 (TYP)		.010 (TYP)	
R	0.07	-	.003	-
R1	0.07	-	.003	-
h	0.25	0.50	.010	.020
θ	0°	8°	0°	8°
θ1	5°	15°	5°	15°
θ2	0°	-	0°	-

SOT-89 PLASTIC PACKAGE



Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.40	1.60	.055	.063
B	0.44	0.56	.017	.022
B1	0.36	0.48	.014	.019
C	0.35	0.44	.014	.017
D	4.40	4.60	.173	.181
D1	1.62	1.83	.064	.072
E	2.29	2.60	.090	.102
E1	2.13	2.29	.084	.090
e	1.50 (TYP)		.059 (TYP)	
e1	3.00 (TYP)		.118 (TYP)	
H	3.94	4.25	.155	.167
L	0.89	1.20	.035	.047

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CONTACT US

GS Headquarter	
	4F.,No.43-1,Lane11,Sec.6,Minquan E.Rd Neihu District Taipei City 114, Taiwan (R.O.C)
	886-2-2657-9980
	886-2-2657-3630
@	sales_twn@gs-power.com

RD Division	
	824 Bolton Drive Milpitas. CA. 95035
	1-408-457-0587