



H1085J Series

3A LOW DROPOUT POSITIVE VOLTAGE REGULATOR

Features

- Low Dropout Voltage 1.2V at 3A
- Adjustable or Fixed Voltage
- Line Regulation Typically 0.015%
- Load Regulation Typically 0.05%
- Adjust Pin Current Less Than 90 μ A
- Over Current Protection
- Thermal Protection

Applications

- High Efficiency Linear Regulators
- Post Regulators For Switching Supplies
- 5V to 3.3V Voltage Converter
- Battery Charger

General Description

The H1085J is a 3A low-dropout positive voltage regulator. It is available in fixed and adjustable output voltage versions. Over Current and thermal protection are integrated onto the chip. Output current will decrease while it reaches the pre-set current or temperature limit. The dropout voltage is specified at 1.2V Maximum at full rated output current. H1085U Series provides excellent regulation over variations due to changes in line, load and temperature. H1085U is three terminal regulator and available in popular packages.

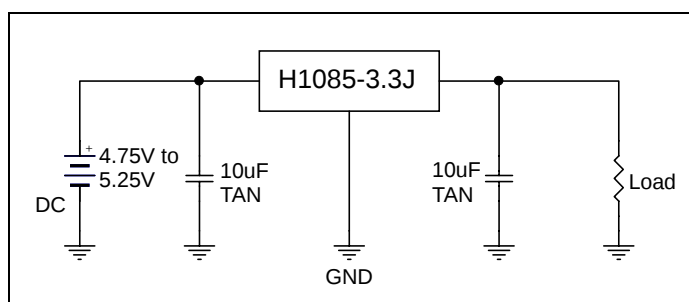
Device Selection Guide

Device	Vout Voltage	Package
H1085J	1.3V to 4V	D-PAK
H1085-3.3J	3.3	TO-252

Absolute Maximum Ratings

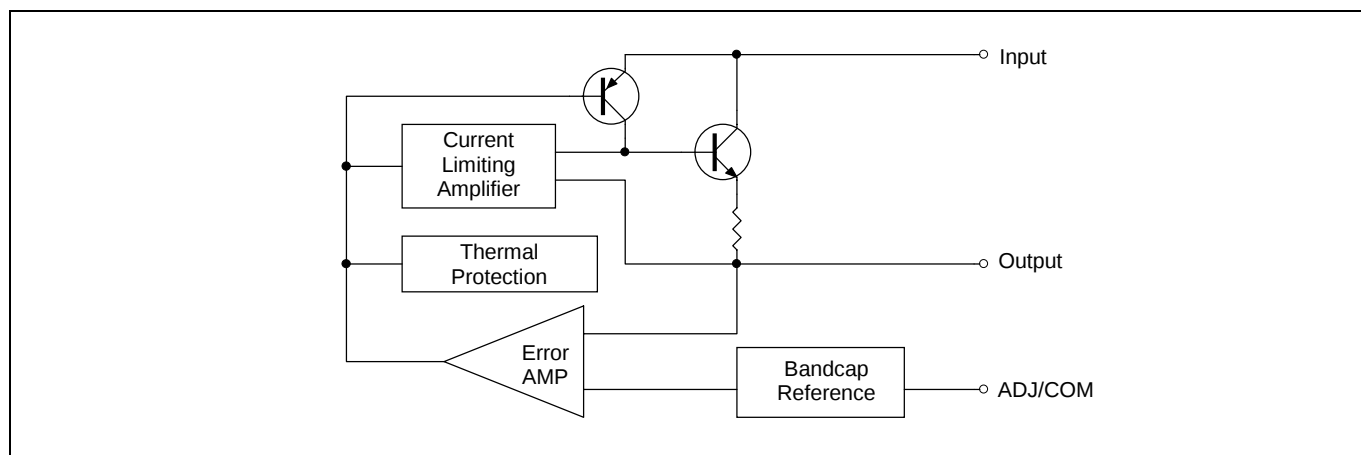
Parameter	Symbol	Maximum	Units
Input Voltage	V_{IN}	7	V
Power Dissipation	P_D	Internally Limited	W
Thermal Resistance Junction To Case TO-252	θ_{JC}	15	$^{\circ}\text{C/W}$
Thermal Resistance Junction To Ambient TO-252	θ_{JA}	156	$^{\circ}\text{C/W}$
Operating Junction Temperature Range	T_j	0 To 125	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-65 To 150	$^{\circ}\text{C}$
Lead Temperature (Soldering) 10 Sec	T_{LEAD}	260	$^{\circ}\text{C}$

Typical Application





Spec. No. : Preliminary Data
 Issued Date : 1998.06.01
 Revised Date : 1999.08.01
 Page No. : 2/5



Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reference Voltage	V _{REF}	V _{IN} =5V, I _O =10mA, T _J =25°C	1.238	1.250	1.262	V
Adj Voltage		V _{IN} =5V, I _O =10mA, Over Temp.	1.225	1.250	1.275	
Line Regulation	Reg _{LINE}	V _{IN} =2.75~7V, I _O =10mA, T _J =25°C	-	0.015	0.2	%
		V _{IN} =2.75~7V, I _O =10mA, Over Temp.	-	0.035	0.2	
Load Regulation	Reg _{LOAD}	V _{IN} =5V, I _O =10mA~3A, T _J =25°C	-	0.05	0.3	%
		V _{IN} =5V, I _O =10mA~3A, Over Temp.	-	0.2	0.4	
Dropout Voltage	V _D	V _{IN} =2.75~7V, I _O =10mA~3A, T _J =25°C	-	1	-	V
ΔV _{OUT} , ΔV _{REF} =1%		V _{IN} =2.75~7V, I _O =10mA~3A, Over Temp.	-	1	1.2	
Current Limit	I _S	V _{IN} =2.75~7V, Over Temp.	3.0	4.5	-	A
Temperature Coeff.	T _C	V _{IN} =2.75~7V, I _O =10mA~3A	-	0.005	-	%/°C
Adjust Pin Current	I _{adj}	V _{IN} =2.75~7V, I _O =10mA~3A, T _J =25°C	-	55	-	uA
		V _{IN} =2.75~7V, I _O =10mA~3A, Over Temp.	-	-	90	
Adjust Pin Current Change	ΔI _{adj}	V _{IN} =2.75~7V, I _O =10mA~3A, Over Temp.	-	0.2	5	
Temperature Stability	T _S	V _{IN} =5V, I _O =500mA, Over Temp.	-	0.5	-	%
Minimum Load Current	I _O	V _{IN} =5V	-	5	10	mA
RMS Output Noise	V _N	T _J =25°C	-	0.003	-	%
Ripple Rejection Ratio	R _A	V _{IN} =5V, I _O =3A, Over Temp.	60	72	-	dB

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage	V _O	V _{IN} =5V, I _O =0A, T _J =25°C	3.267	3.3	3.333	V
Fixed Voltage		V _{IN} =5V, I _O =0A, Over Temp.	3.234	3.3	3.366	
Line Regulation	Reg _{LINE}	V _{IN} =4.5~7V, I _O =0A, T _J =25°C	-	0.015	0.2	%
		V _{IN} =4.5~7V, I _O =0A, Over Temp.	-	0.035	0.2	
Load Regulation	Reg _{LOAD}	V _{IN} =5V, I _O =0A~3A, T _J =25°C	-	0.05	0.3	%
		V _{IN} =5V, I _O =0A~3A, Over Temp.	-	0.2	0.4	
Dropout Voltage	V _D	V _{IN} =4.5~7V, I _O =0A~3A, T _J =25°C	-	1	-	V
ΔV _{OUT} , ΔV _{REF} =1%		V _{IN} =4.5~7V, I _O =0A~3A, Over Temp.	-	1	1.2	
Current Limit	I _S	V _{IN} =4.5~7V, Over Temp.	3	4.5	-	A
Quiescent Current Fixed Model	I _Q	V _{IN} =5V, I _O =0A~3A, Over Temp.	-	12	13	mA
Temperature Coeff.	T _C	V _{IN} =4.5~7V, I _O =0A~3A	-	0.005	-	%/°C
Temperature Stability	T _S	V _{IN} =5V, I _O =500mA, Over Temp.	-	0.5	-	%
RMS Output Noise	V _N	T _J =25°C	-	0.003	-	%
Ripple Rejection Ratio	R _A	V _{IN} =5V, I _O =3A, Over Temp.	60	72	-	dB



Applications Description

• Output Voltage Adjustment

Like most regulators, the H1085J regulates the output by comparing the output voltage to an internally generated reference voltage. On the adjustable version, the V_{REF} is available externally as 1.25V between V_{OUT} and ADJ. The voltage ratio formed by R_1 and R_2 should be set to conduct 10mA (minimum output load). The output voltage is given by the following equation : $V_{OUT} = V_{REF} (1 + R_2/R_1) + I_{ADJ} R_2$. On fixed versions of H1085J, the voltage divider is provided internally.

• Thermal Protection

H1085J has thermal protection which limits junction temperature to 150°C. However, device functionality is only guaranteed to a maximum junction temperature of +125°C.

The power dissipation and junction temperature for H1085J in TO-252 package given by $P_D = (V_{IN} - V_{OUT}) I_{OUT}$, $T_{JUNCTION} = T_{AMBIENT} + (P_D \times \theta_{JA})$, Note : $T_{JUNCTION}$ must not exceed 125°C

• Current Limit Protection

H1085J is protected against overload conditions. Current protection is triggered at typically 4.5A.

• Stability And Load Regulation

H1085J requires a capacitor from V_{OUT} to GND to provide compensation feedback to the internal gain stage. This is to ensure stability at the output terminal. Typically, a 10uF tantalum or 50uF aluminum electrolytic is sufficient. Note : It is important that the ESR for this capacitor does not exceed 0.5Ω.

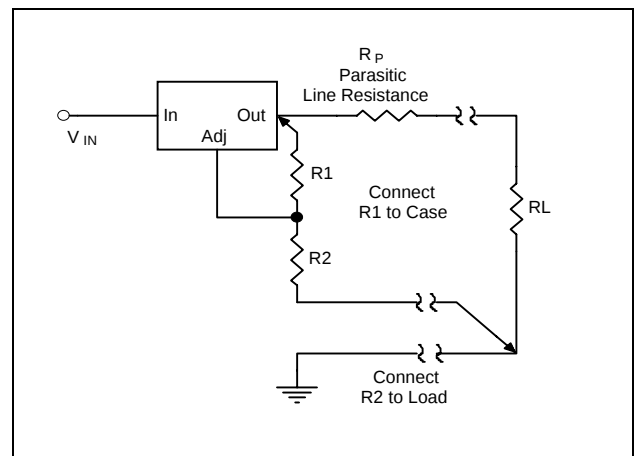
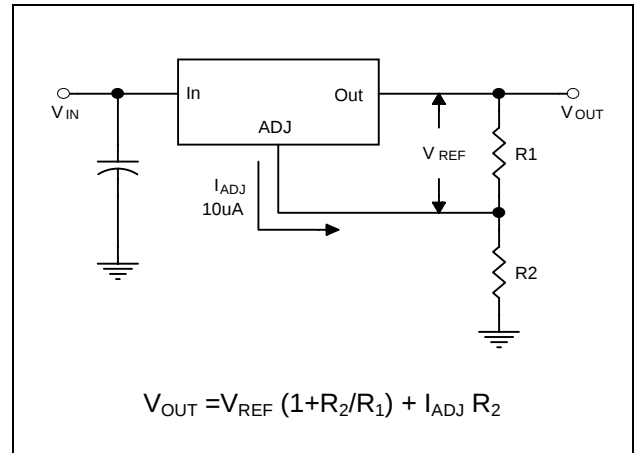
The output capacitor does not have a theoretical upper limit and increasing its value will increase stability. $C_{OUT} = 100 \mu F$ or more is typical for high current regulator design.

H1085J load regulation is limited by the resistance of the wire connecting it to the load (R_P). For the adjustable version, the best load regulation is accomplished when the top of the resistor divider (R_1) is connected directly to the output pin of the H1085J. When so connected, R_P is not multiplied by the divider ratio. For fixed output versions, the top of R_1 is internally connected to the output and ground pin can be connected to low side of the load as a negative side sense if, so desired.

• Thermal Consideration

The H1085J series contain thermal limiting circuitry designed to protect itself for over-temperature conditions. Even for normal load conditions, maximum junction temperature ratings must not be exceeded. As mention in thermal protection section, we need to consider all sources of thermal resistance between junction and ambient. It contains junction-to-case, case-to-heat-sink interface and heat sink resistance itself. An additional heat sink is applied externally sometimes. It can increase the maximum power dissipation. For example, the equivalent junction temperature of 1A output current is 115°C without external heat sink. Under the same junction temperature IC can operates 3A with an adequate heat sink. Therefore, to attach an extra heat sink is recommended.

Junction-to-case thermal resistance is specified from the IC junction to the bottom of the case directly below the die. The bonding wires are appending paths. The former is the lowest resistance path. Proper mounting is required to ensure the best possible thermal flow this area of the package to the heat sink. Thermal compound at the case-to-heat-sink interface is strongly recommended. The case of all devices in this series is electrically connected to the output. Therefore, if the case of the device must be electrically isolated, a thermally conductive spacer can be used, as long its thermal resistance is considered.



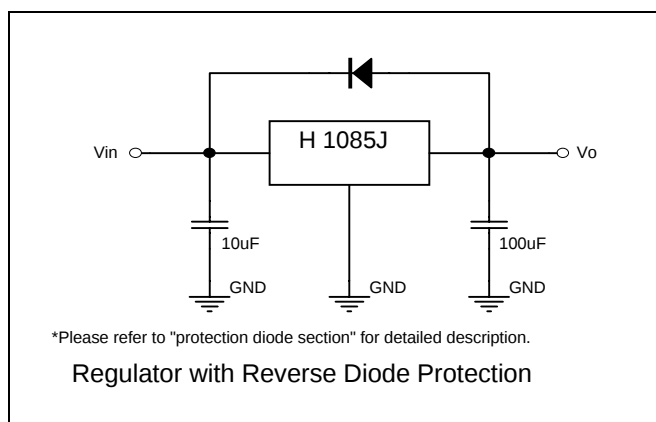
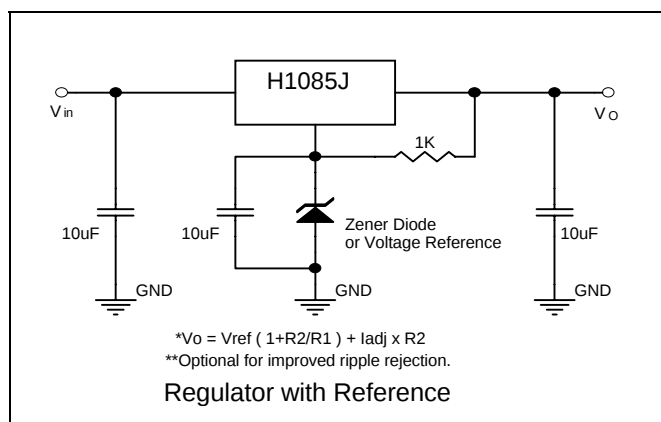
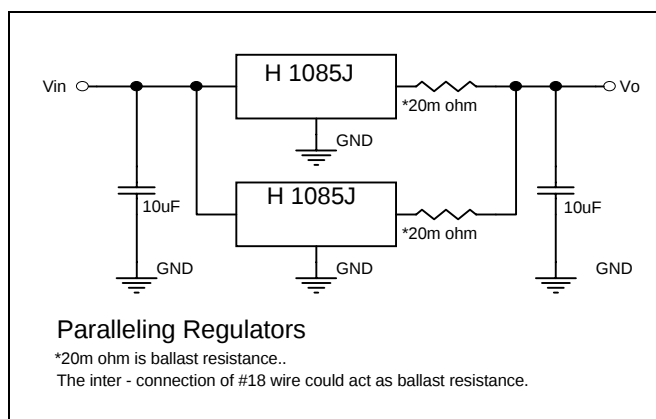
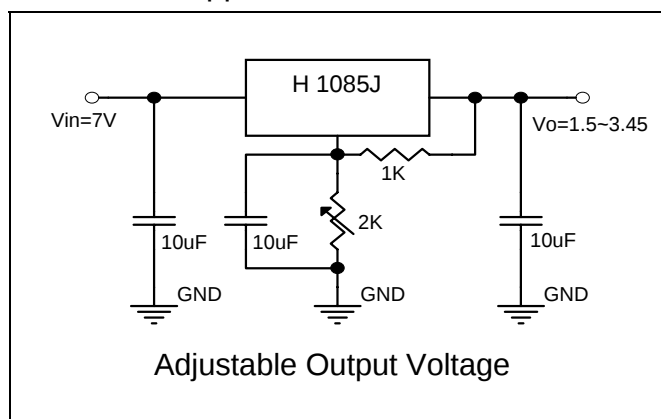


• Protection Diode

(The figure is shown as Regulator with Reverse Diode Protection in advanced applications)

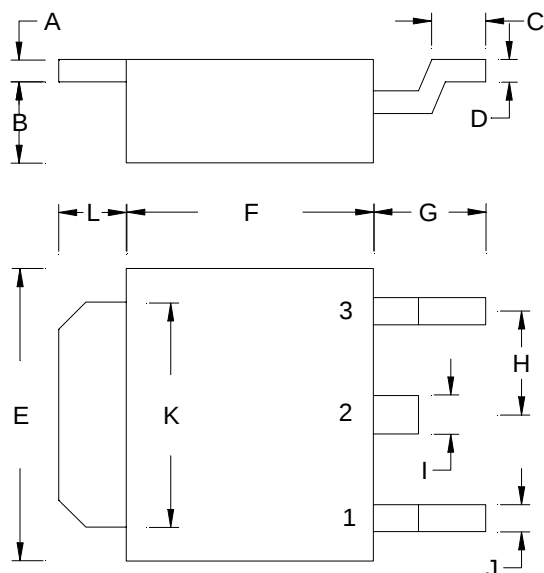
In general operation, H1085J does not need any protection diodes. From the cross-section structure of H1085J, the output pin is connected to P+ substrate, and the input pin is connected to N- well. There is a parasitic reverse diode between them. It can handle microsecond surge currents of 50A to 100A. Even with large output capacitance, it is very difficult to get those values of surge currents in normal operation. Only with high value output capacitors, such as 1000uF. And with the input pin instantaneously shorted to ground. can damage occur. A crowbar circuit at the input of the H1085J can generate those kinds of currents, and a diode from output to input is recommended. Normal power supply cycling or even plugging and unplugging in the system will not generate currents large enough to do any damage.

• Advanced Applications



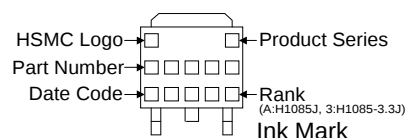


TO-252 Dimension



3-Lead TO-252 Plastic Surface Mount Package
HSMC Package Code : J

Marking :



Style : Pin 1.Ground/ADJ 2.Vout 3.Vin

*:Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.0177	0.0217	0.45	0.55	G	0.0866	0.1102	2.20	2.80
B	0.0650	0.0768	1.65	1.95	H	-	*0.0906	-	*2.30
C	0.0354	0.0591	0.90	1.50	I	-	0.0354	-	0.90
D	0.0177	0.0236	0.45	0.60	J	-	0.0315	-	0.80
E	0.2520	0.2677	6.40	6.80	K	0.2047	0.2165	5.20	5.50
F	0.2125	0.2283	5.40	5.80	L	0.0551	0.0630	1.40	1.60

Notes : 1.Dimension and tolerance based on our Spec. dated May. 05,1996.
2.Controlling dimension : millimeters.
3.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
4.If there is any question with packing specification or packing method, please contact your local HSMC sales office.

Material :

- Lead : 42 Alloy ; solder plating
- Mold Compound : Epoxy resin family, flammability solid burning class:UL94V-0

Important Notice:

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of HSMC.
- HSMC reserves the right to make changes to its products without notice.
- **HSMC semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.**
- HSMC assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.

Head Office And Factory :

- **Head Office** (Hi-Sincerity Microelectronics Corp.) : 10F.,No. 61, Sec. 2, Chung-Shan N. Rd. Taipei Taiwan R.O.C.
Tel : 886-2-25212056 Fax : 886-2-25632712, 25368454
- **Factory 1** : No. 38, Kuang Fu S. Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
Tel : 886-3-5983621~5 Fax : 886-3-5982931
- **Factory 2** : No. 17-1, Ta-Tung Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
Tel : 886-3-5977061 Fax : 886-3-5979220