Halogens free devices

CHC1084PAGP SERIES

Low Dropout Linear Regulator

■ FEATURES

- 1.5V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Good noise rejection
- 3-Terminal Adjustable or Fixed 1.5V, 1.8V, 2.5V, 3.3V, 5.0V

■ APPLICATIONS

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-video player
- NIC/Switch
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment

■ GENERAL DESCRIPTION

The CHC1084PA is a series of low dropout three-terminal regulators with a dropout of 1.5V at 1A output current.

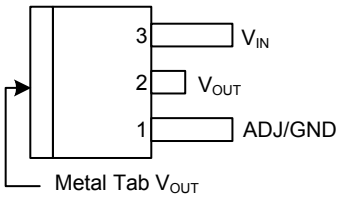
The CHC1084PA series provides current limiting and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within 2% for 1.5V, 1.8V, 2.5V, 3.3.V, 5.0V and adjustable versions. Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal shutdown provides protection against any combination of overload and ambient temperature that would create excessive junction temperature.

The CHC1084PA has an adjustable version that can provide the output voltage from 1.25V to 12V with only two external resistors.

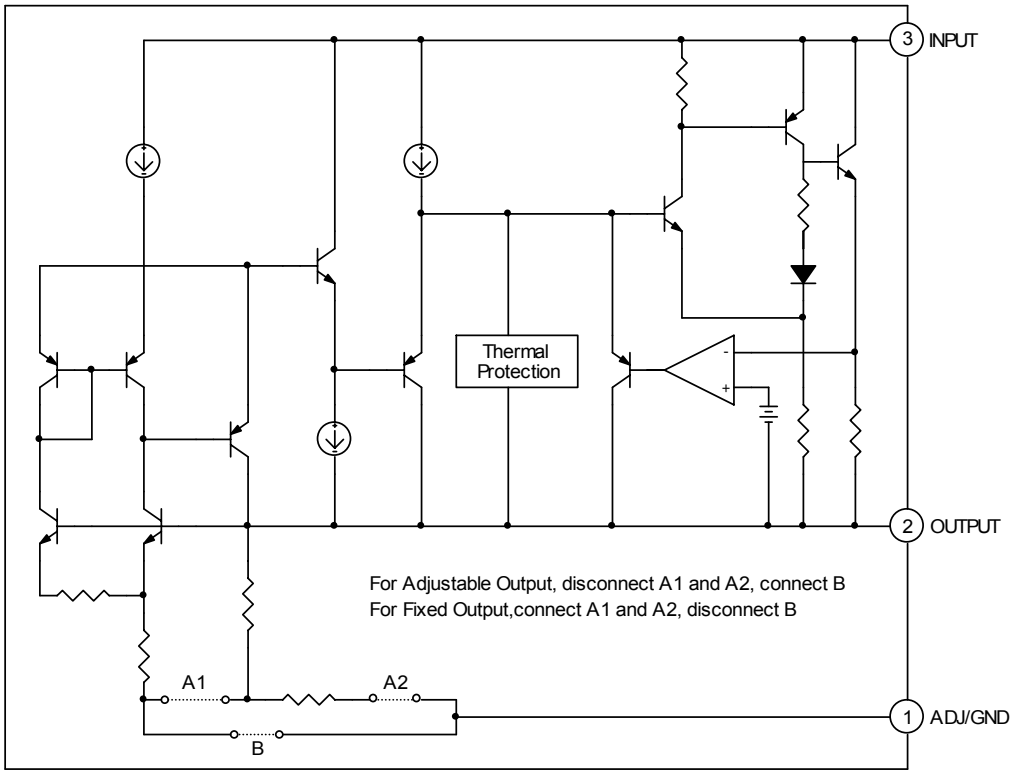
The CHC1084PA series is available in the industry standard TO252-3L package.

■ PIN CONFIGURATION

TO 2 5 2-3L



■ BLOCK DIAGRAM



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■ ABSOLUTE MAXIMUM RATINGS (NOTE 1)

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	12	V
T_J	Maximum Junction Temperature	150	℃
T_S	Storage Temperature	-65~150	℃
T_{LEAD}	Lead Temperature (10 sec.)	300	℃
ESD	ESD (Machine Model)	600	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

■ RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	12	V
T_J	Operating Junction Temperature Range	-20~150	℃

■ ELECTRICAL CHARACTERISTICS

Operating Conditions: V_{IN}≤10V, T_J=25℃, unless otherwise specified

Parameter	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Reference Voltage	V_{REF}	CHC1084PA -Adj	I_O=10mA, V_{IN}-V_{OUT}=1.5V	1.225	1.250	1.275	V
			I_O=10mA,1.5V≤V_{IN}-V_{OUT}≤8V	1.225	1.250	1.275	
Output Voltage	V_{OUT}	CHC1084PA -1.5	I_O=10mA, V_{IN}=3V	1.485	1.5	1.515	V
			I_O=10mA, 3V≤V_{IN}≤10V	1.470	1.5	1.530	
		CHC1084PA -1.8	I_O=10mA, V_{IN}=3.3V	1.782	1.8	1.818	V
			I_O=10mA, 3.3V≤V_{IN}≤10V	1.764	1.8	1.836	V
		CHC1084PA -2.5	I_O=10mA, V_{IN}=4V	2.475	2.5	2.525	V
			I_O=10mA, 4V≤V_{IN}≤10V	2.450	2.5	2.550	V
		CHC1084PA -3.3	I_O=10mA, V_{IN}=4.8V	3.267	3.3	3.333	V
			I_O=10mA, 4.8V≤V_{IN}≤10V	3.235	3.3	3.365	
		CHC1084PA -5.0	I_O=10mA, V_{IN}=6.5V	4.950	5.0	5.050	V
			I_O=10mA, 6.5V≤V_{IN}≤12V	4.900	5.0	5.100	
Line Regulation	Reg_{LINE}	CHC1084PA-XXX	I_O=10mA,1.5V≤V_{IN}-V_{OUT}≤7V		0.2	0.5	%
			I_O=10mA,1.5V≤V_{IN}-V_{OUT}≤10V		0.2	0.5	%
Load Regulation	Reg_{Load}	CHC1084PA -Adj	VIN= 3V, 10mA<Io<5A		1		%
		CHC1084PA -1.5	VIN= 3V, 10mA<Io<5A		12	15	mV
		CHC1084PA -1.8	VIN= 3.3V, 10mA<Io<5A		15	18	mV
		CHC1084PA -2.5	VIN= 4V, 10mA<Io<5A		20	25	mV
		CHC1084PA -3.3	VIN= 5V, 10mA<Io<5A		26	33	mV
		CHC1084PA -5.0	VIN= 6.5V, 10mA<Io<5A		40	50	mV
Dropout Voltage	V_{IN-OUT}	CHC1084PA-XXX	I_{OUT} = 5A ,ΔV_{OUT}=1%V_{OUT}		1.3	1.5	V
Current Limit	I_{LIMT}	CHC1084PA-XXX	V_{IN}-V_{OUT}=3V	5.1			A
Ripple Rejection		CHC1084PA-XXX	F=120Hz,C_{OUT}=25uF Tantalum, V_{IN}-V_{OUT}=3V		60	70	dB
Temperature Stability		CHC1084PA-XXX	I_O=10mA		0.5		%

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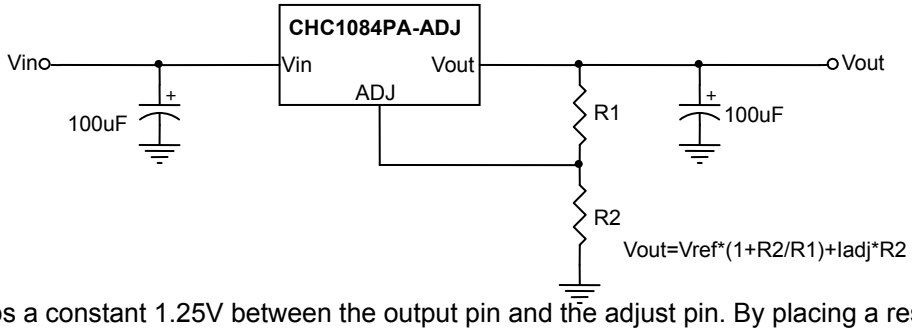
■ ELECTRICAL CHARACTERISTICS (CONTINUED)

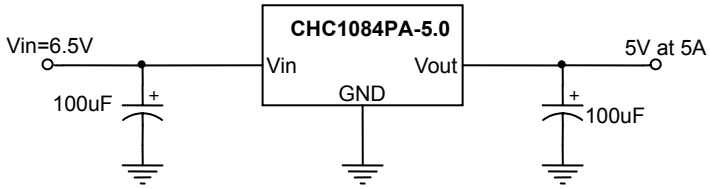
Operating Conditions: V_{IN}≤10V, T_J=25°C, unless otherwise specified

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Adjust Pin Current		I_O=10mA~5A, 1.5V≤V_{IN}-V_{OUT}≤10V		60	120	μA
Adjust Pin Current Change		I_O=10mA~5A, 1.5V≤V_{IN}-V_{OUT}≤10V		0.2	5	μA
Minimum Load Current(ADJ)		CHC1084PA 1.5V≤V_{IN}-V_{OUT}≤10V		5	10	mA
Quiescent Current	Iq	V_{IN}=V_{OUT}+1.25V		5	10	mA
Long-term Stability		T_A=125°C, 1000hrs		0.3		%
RMS Output Noise (% of V_{OUT})		T_A=25°C, 10Hz≤f≤10kHz		0.003		%
Power Dissipation	Pd			1.6		W
Thermal Resistance, Junction to Ambient	θ_{JA}			45		°C/W
Thermal Resistance, Junction to case	θ_{JC}			2.7		°C/W
Thermal Shutdown		Junction Temperature		150		°C
Thermal Shutdown Hysteresis				25		°C

■ TYPICAL APPLICATIONS



The CHC1084PA keeps a constant 1.25V between the output pin and the adjust pin. By placing a resistor R1 across these two pins a constant current flows through R1, adding to the Iadj current and into the R2 resistor producing a voltage equal to the (1.25/R1)*R2+Iadj*R2 which will be added to the 1.25V to set the output voltage. This is summarized in the above equation. Since the minimum load current requirement of the CHC1084PA is 10mA, R1 is typically selected to be 121Ω resistor so that it automatically satisfies the minimum current requirement. Notice that since Iadj is typically in the range of 50uA it only adds a small error to the output voltage and should only be considered when a very precise output voltage setting is required. For example, in a typical 3.3V application where R1=121Ω and R2=200Ω the error due to Iadj is only 0.3% of the nominal set point.



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■ TYPICAL APPLICATIONS (CONTINUED)

Stability

The CHC1084PA requires the use of an output capacitor as part of the frequency compensation in order to make the regulator stable. For most applications a minimum of 100uF aluminum electrolytic capacitor insures both stability and good transient response.

Thermal Design

The CHC1084PA incorporates an internal thermal shutdown that protects the device when the junction temperature exceeds the maximum allowable junction temperature. Although this device can operate with junction temperatures in the range of 150℃, it is recommended that the selected heat sink be chosen such that during maximum continuous load operation the junction temperature is kept below the temperature.

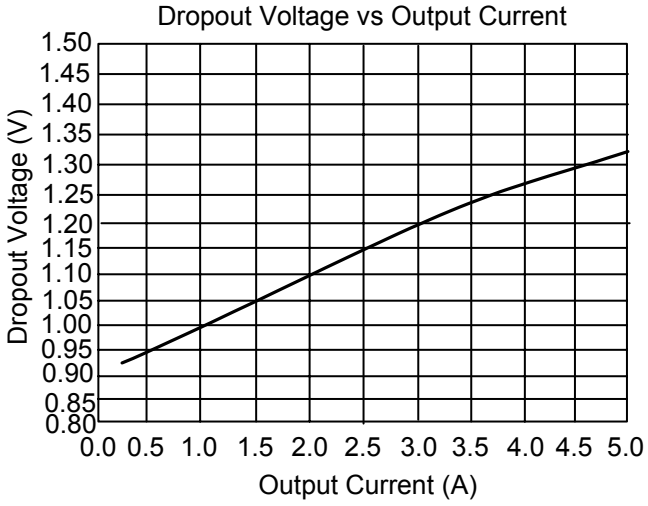
Pd=Vout*Iout

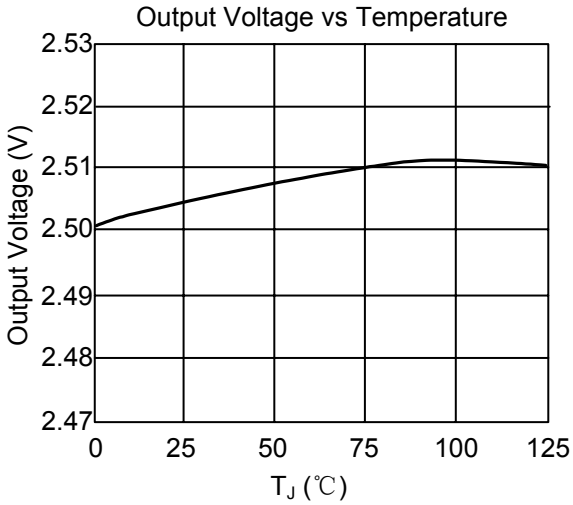
$T_j=T_A+Pd*\theta_{JA}<150℃$

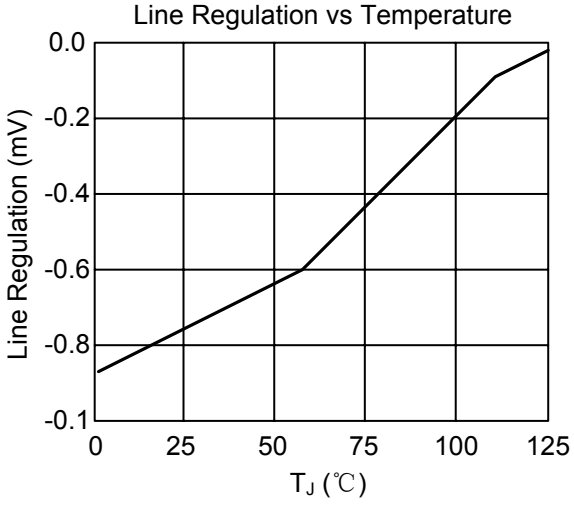
Layout Consideration

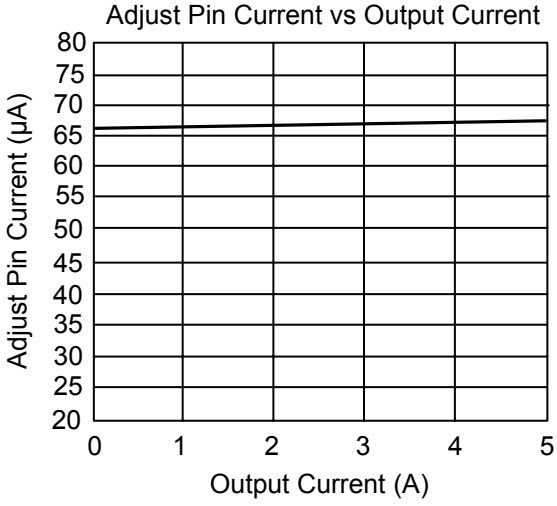
The output capacitors must be located as close to the Vout terminal of the device as possible. It is recommended to use a section of a layer of the PC board as a plane to connect the Vout pin to the output capacitors to prevent any high frequency oscillation that may result due to excessive trace inductance.

■ TYPICAL PERFORMANCE CHARACTERISTICS









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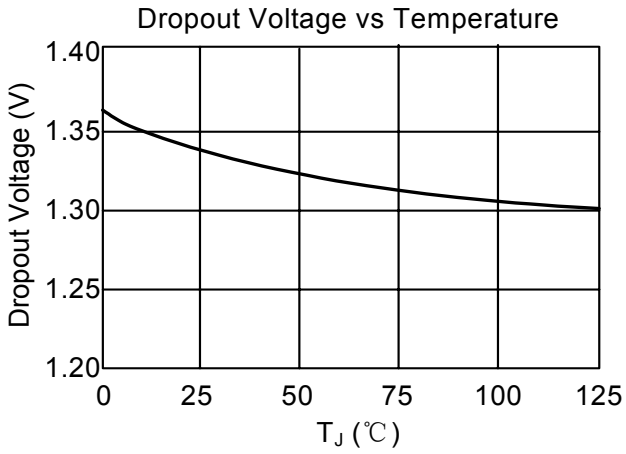
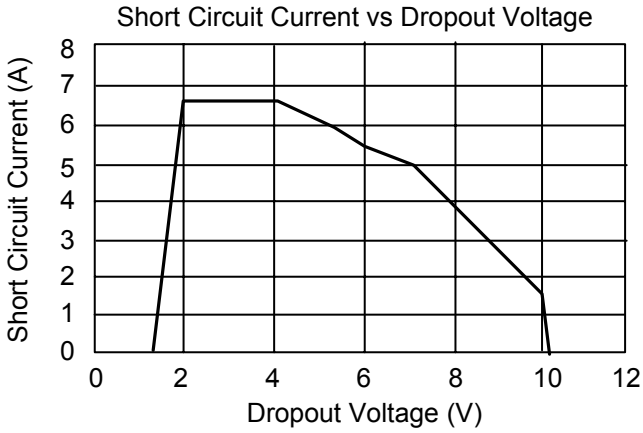
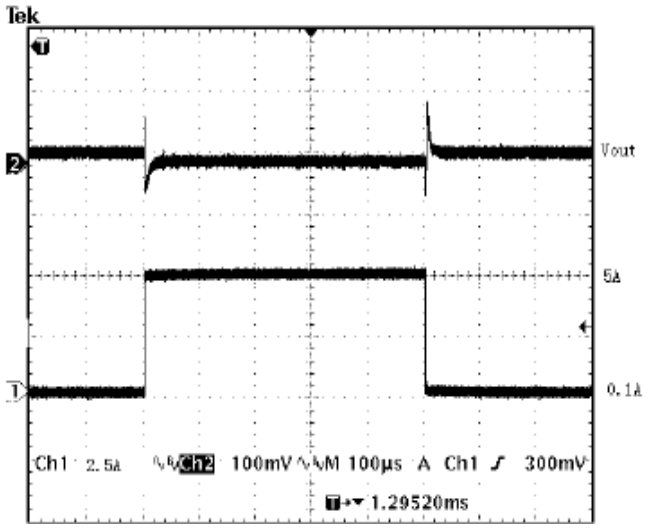
■ TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)



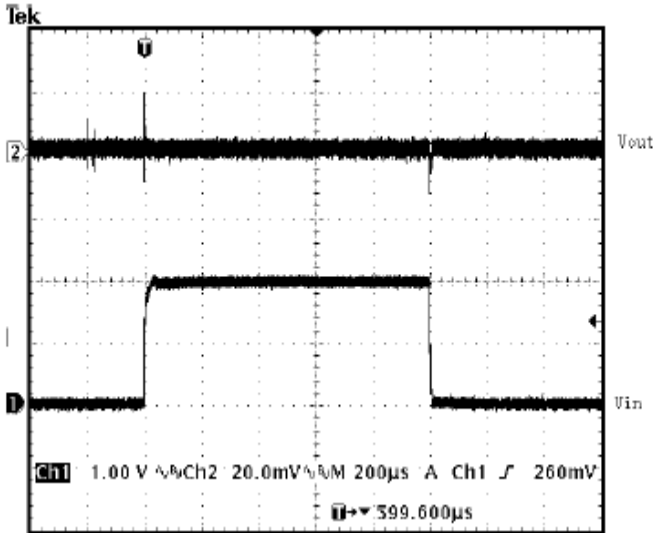


Load Transient Response



Vin=5.5V, Vout=2.5V Io=100mA to 5A Cin=Cout=100µF(tan)

Line Transient Response



Vin=4.5V to 6.5V Vout=2.5V Io=200mA Cin=Cout=100µF(tan)

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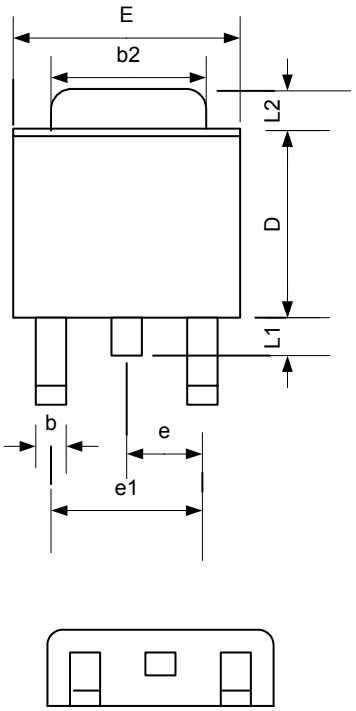
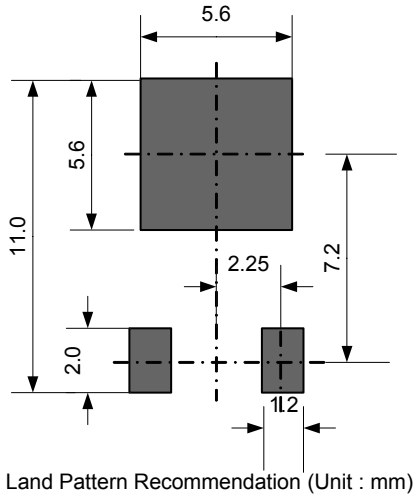
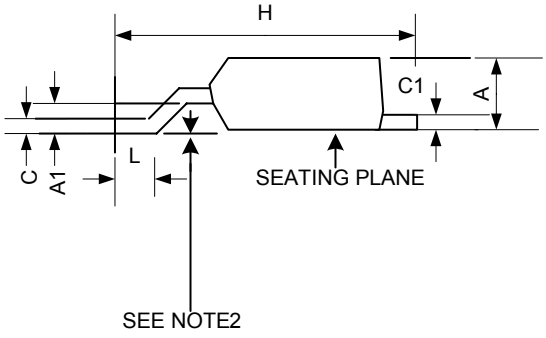
TO252-3L





Land Pattern Recommendation (Unit : mm)



Notes:

1. JEDEC Outline:TO-252 AB
2. Mils suggested for positive contact at mounting

Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.18	2.29	2.38	0.086	0.090	0.094
A1	1.08	1.15	1.32	0.043	0.045	0.052
b	0.64		0.78	0.025		0.031
b2	5.23	5.35	5.43	0.206	0.211	0.214
C		0.51TYP.			0.020TYP.	
C1	0.46	0.52	0.58	0.018	0.020	0.023
D	5.33	5.57	5.80	0.210	0.219	0.228
E	6.38	6.58	6.68	0.251	0.259	0.263
e	2.24		2.34	0.088		0.092
e1	4.48		4.68	0.176		0.184
H	9.00	9.70	10.40	0.354	0.382	0.409
L	0.51			0.020		
L1	0.65	0.83	0.95	0.026	0.033	0.037
L2	1.52	1.78	2.03	0.060	0.070	0.080