

Description

GM7230HV series is designed to provide all the active function for a step-down (buck) switching regulator, and drives a maximum load current as high as 3A line and load regulations. GM7230HV is available in fixed output voltages of 3.3V, 5V, and a versatile Adjustable output version.

These regulators are simple to use and require minimum number of external components. The features include internal frequency compensation and a fixed-frequency oscillator.

The GM7230HV is high-efficiency replacements for popular three-terminal linear regulators, and is requiring a smaller heat sink or even no need heat sink.

GM7230HV performs well with standard inductors from most of manufacturers, and simplifying the design of switch-mode power supplies. External shutdown is included with 80 μ A (typical) standby current. The output switch has cycle-by-cycle current limiting as well as thermal shutdown for full protection under fault conditions.

GM7230HV operates at a switching frequency of 150 kHz which allowing smaller size filter components than what would be needed with lower frequency switching regulators.

GM7230HV series are available in a standard 5-lead TO-220, and TO263 packages.

Features

- ◆ 3.3V, 5V, 12V and Adjustable output versions
- ◆ Adjustable version output voltage range 1.23V to 57V
- ◆ V_{OUT} accuracy is to $\pm 2\%$ under specified input voltage the output load conditions
- ◆ Input voltage range up to 60V
- ◆ Requires only 4 external components with High efficiency
- ◆ TTL shutdown capability, low power standby mode
- ◆ Built-in thermal shutdown, current limit protection
- ◆ Uses standard inductors
- ◆ 150 kHz fixed frequency internal oscillator

Application

Pre-regulator for linear regulators

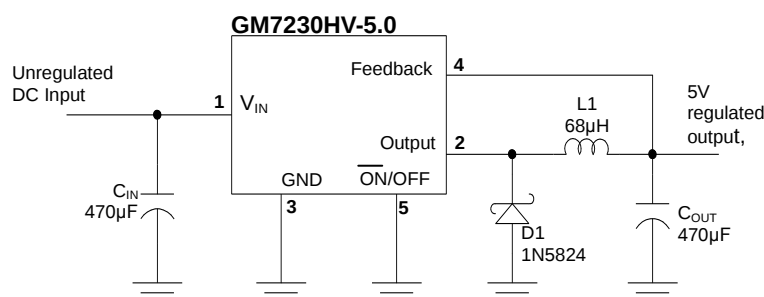
On-card/board switching regulators

High-efficiency step-down buck regulator

Positive to negative converter (buck-boost)

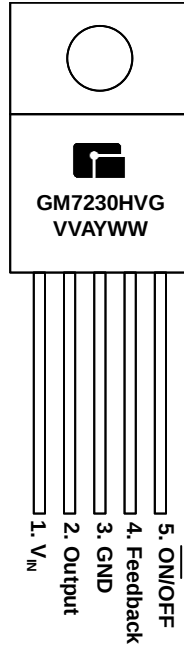
LCD Monitors

Typical Application Circuits

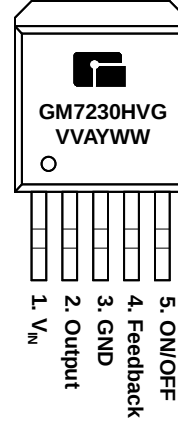


Marking Information and Pin Configurations – Green Products (Top View)

TO-220-5



TO-263-5



G: Green Product

VV: Voltage suffix (15 = 1.5V, 50 = 5.0V...A = Adj)

A: Assembly / Test site code

Y: Year

WW: Week

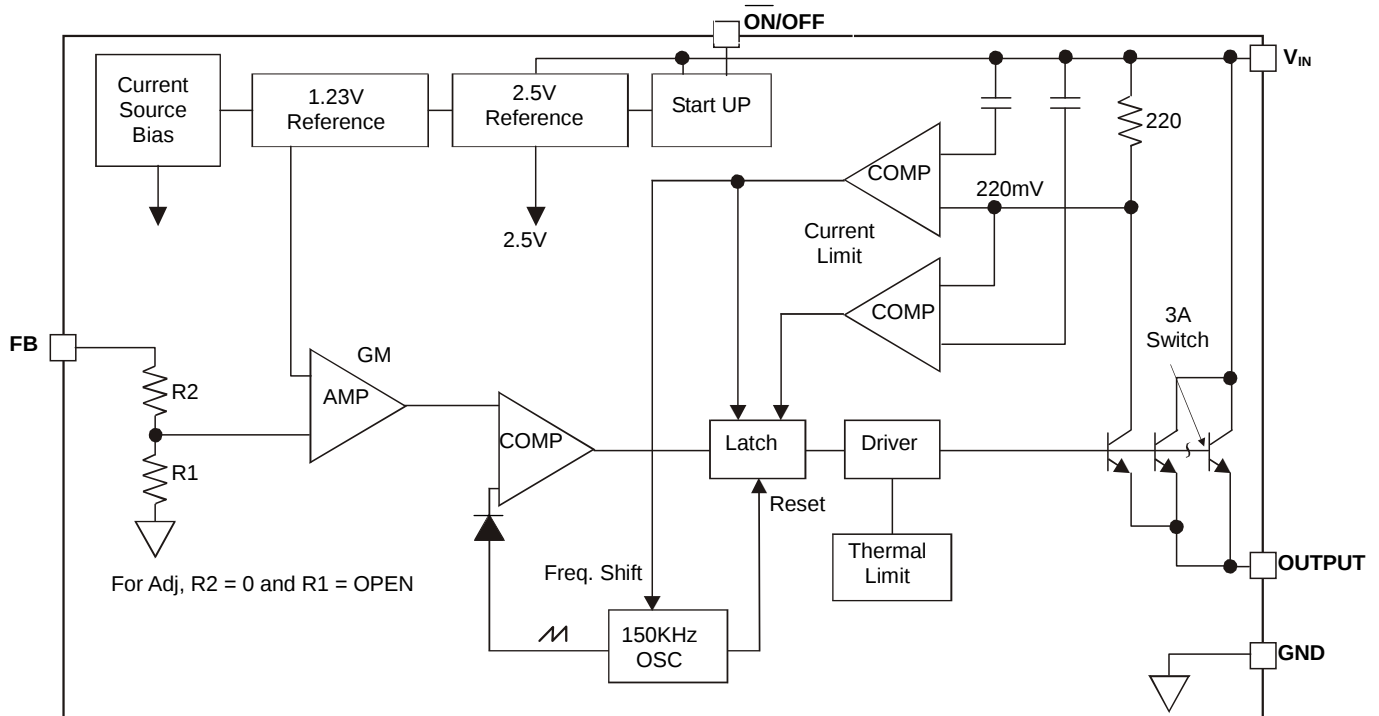
Ordering Information – Green Products

Ordering Number	Output Voltage	Package	Shipping
GM7230HV-ATA5RG	Adj	TO-263-5	800 Units / Reel
GM7230HV-ATB5TG		TO-220-5	50 Units / Tube
GM7230HV-3.3TA5RG	3.3	TO-263-5	800 Units / Reel
GM7230HV-3.3TB5TG		TO-220-5	50 Units / Tube
GM7230HV-5.0TA5RG	5.0	TO-263-5	800 Units / Reel
GM7230HV-5.0TB5TG		TO-220-5	50 Units / Tube
GM7230HV-12TA5RG	12	TO-263-5	800 Units / Reel
GM7230HV-12TB5TG		TO-220-5	50 Units / Tube

Absolute Maximum Ratings (Note 1)

Rating	Value	Unit
Maximum Supply Voltage	63	V
ON/OFF Pin Input Voltage	-0.3 to $V_{IN} + 0.3$	V
Feedback Pin Voltage	-0.3 to $25 + 0.3$	V
Output Voltage to Ground (Steady State)	-1.0	V
Power Dissipation	Internally Limited	-
Thermal Resistance – Junction to Ambient (θ_{JA}) ** 2 square inch of FR-4, double sided, 1oz. minimum copper weight, is recommended	36	$^{\circ}\text{C}/\text{W}$
Storage Temperature Range	- 65 to 150	$^{\circ}\text{C}$
Maximum Junction Temperature	+ 150	$^{\circ}\text{C}$
Operating Temperature Range	- 40 to 125	$^{\circ}\text{C}$
Minimum EDS Rating (Note 2)	2	kV
Lead Temperature (Soldering, 10 sec)	+ 260	$^{\circ}\text{C}$

Block Diagram



Electrical Characteristics: GM7230HV-ADJ

(Specifications with standard type face are for T = 25°C, and those with bold face type apply over full Operating Temperature rage)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Voltage	$8V \leq V_{IN} \leq 60V, 0.2A \leq I_{LOAD} \leq 3A,$ $V_{OUT} = 5V$	V_{OUT}	1.193	1.230	1.267	V
			1.180		1.280	
Efficiency	$V_{IN} = 12V, I_{LOAD} = 3.0A, V_{OUT} = 5V$	η		79		%

Electrical Characteristics: GM7230HV-3.3

(Specifications with standard type face are for T = 25°C, and those with bold face type apply over full Operating Temperature rage)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Voltage	$5.5V \leq V_{IN} \leq 60V, 0.2A \leq I_{LOAD} \leq 3A$	V_{OUT}	3.168	3.300	3.432	V
			3.135		3.465	
Efficiency	$V_{IN} = 12V, I_{LOAD} = 3.0A$	η		77		%

Electrical Characteristics: GM7230HV-5.0

(Specifications with standard type face are for T = 25°C, and those with bold face type apply over full Operating Temperature rage)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Voltage	$8V \leq V_{IN} \leq 60V, 0.2A \leq I_{LOAD} \leq 3A$	V_{OUT}	4.800	5.000	5.200	V
			4.7500		5.250	
Efficiency	$V_{IN} = 12V, I_{LOAD} = 3.0A$	η		79		%

Electrical Characteristics: GM7230HV-12

(Specifications with standard type face are for T = 25°C, and those with bold face type apply over full Operating Temperature rage)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Voltage	$15V \leq V_{IN} \leq 60V, 0.5A \leq I_{LOAD} \leq 3A$	V_{OUT}	11.52	12.00	12.48	V
			11.40		12.60	
Efficiency	$V_{IN} = 15V, I_{LOAD} = 3.0A$	η		83		%

Electrical Characteristics: All Output Voltage Versions

(Specifications with standard type face are for $T_J = 25^\circ\text{C}$, and those with bold face type apply over full Operating Temperature range. Unless otherwise specified, $V_{IN} = 12\text{V}$ for 3.3V, 5V, and Adjustable version, and $V_{IN} = 24\text{V}$ for 12V version, $I_{LOAD} = 500\text{mA}$)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Feedback Bias Current	$V_{FB}=1.3\text{V}$ (Adjustable Version Only)	I_b	-50	-10		nA
			-100			
Line Regulation	$8\text{V} \leq V_{IN} \leq 60\text{V}$, $I_{LOAD} = 0.2\text{A}$	LNR		0.3		%
Load Regulation	$V_{IN} = 12\text{V}$, $0.2\text{A} \leq I_{LOAD} \leq 3\text{A}$	LDR		0.3		%
Oscillator Frequency		f_o	133	150	168	kHz
			120		180	
Oscillator Frequency of Short Circuit Protection (SCP)	$V_{OUT} < 40\%$ from Nominal, $I_{OUT} = CL$			50		kHz
Saturation Voltage	$I_{OUT} = 3\text{A}$, No outside circuit, $V_{FB}=0\text{V}$	V_{SAT}	-	1.35	1.5	V
					1.7	
Max Duty Cycle (ON)	$V_{FB}=0\text{V}$, force driver ON	DC_{MAX}	100		-	%
Min Duty Cycle (OFF)	$V_{FB}=12\text{V}$, force driver OFF, ($V_{FB}=15\text{V}$ for 12V version)	DC_{MIN}			0	%
Current Limit	Peak Current, No outside circuit, $V_{FB}=0\text{V}$	I_{CL}	3.8	5.3	7.0	A
Output Leakage Current	Output=0V, No outside circuit, $V_{FB}=12\text{V}$	I_L	-300	-50		μA
	Output = -1.0V, No outside circuit, $V_{FB}=12\text{V}$		-30	-3		mA
Quiescent Current	$V_{FB}=12\text{V}$, force driver OFF,	I_Q	-	5	8	mA
Standby Quiescent Current	ON/OFF Pin = 5V (OFF), $V_{IN} = 60\text{V}$	I_{STBY}	-	30	220	μA
ON/OFF Pin Logic Input Level	Low (ON)	V_{IH}	-	1.3	0.6	V
	High (OFF)	V_{IL}	2.0	1.3	-	
SD Pin Input Current	$V_{LOGIC} = 2.5\text{V}$ (OFF)	I_H		5	15	μA
	$V_{LOGIC} = 0.5\text{V}$ (ON)	I_L		0.02	5	μA
Thermal Shutdown Temperature		T_J		160		$^\circ\text{C}$

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics.

Note 2: The human body model is a 100pF capacitor discharged through a 1.5K Ω resistor into each pin.

Test Circuit and Layout Guidelines

Careful layout is important with any switching regulators. Rapidly switching currents associated with wiring inductance generate voltage transients which can cause problems. To minimize inductance and ground loops, the lengths of the leads indicated by heavy lines in Figure 1&2 below should be kept as short as possible. Single point grounding (as indicated) or ground plane construction should be used for best results. When using the Adjustable version, place the programming resistors as close as possible to GM7230HV, to keep the sensitive feedback wiring short.

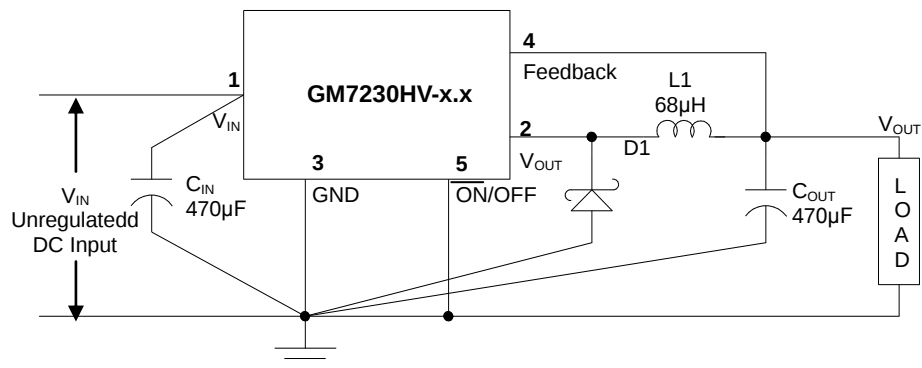


Figure 1 Fixed Output Voltage Versions

$C_{IN} = 470\mu F$, Aluminum Electrolytic
 $C_{OUT} = 470\mu F$, 25V, Aluminum Electrolytic
 $D1 = \text{Schottky}$
 $L1 = 68\mu H$

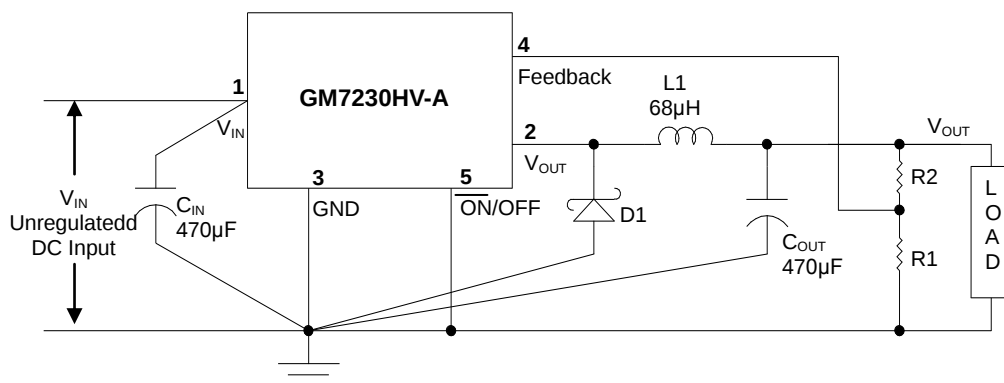
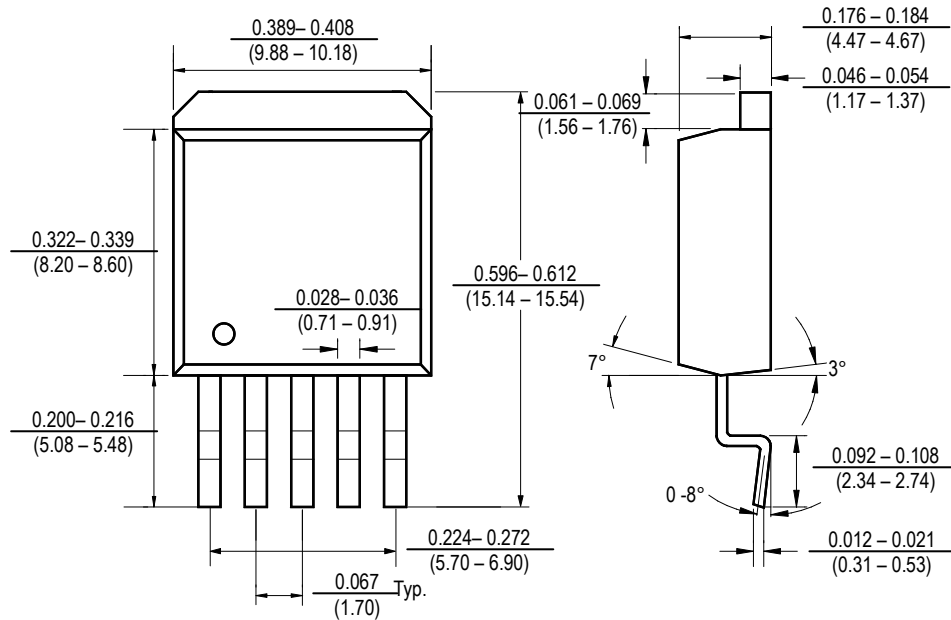


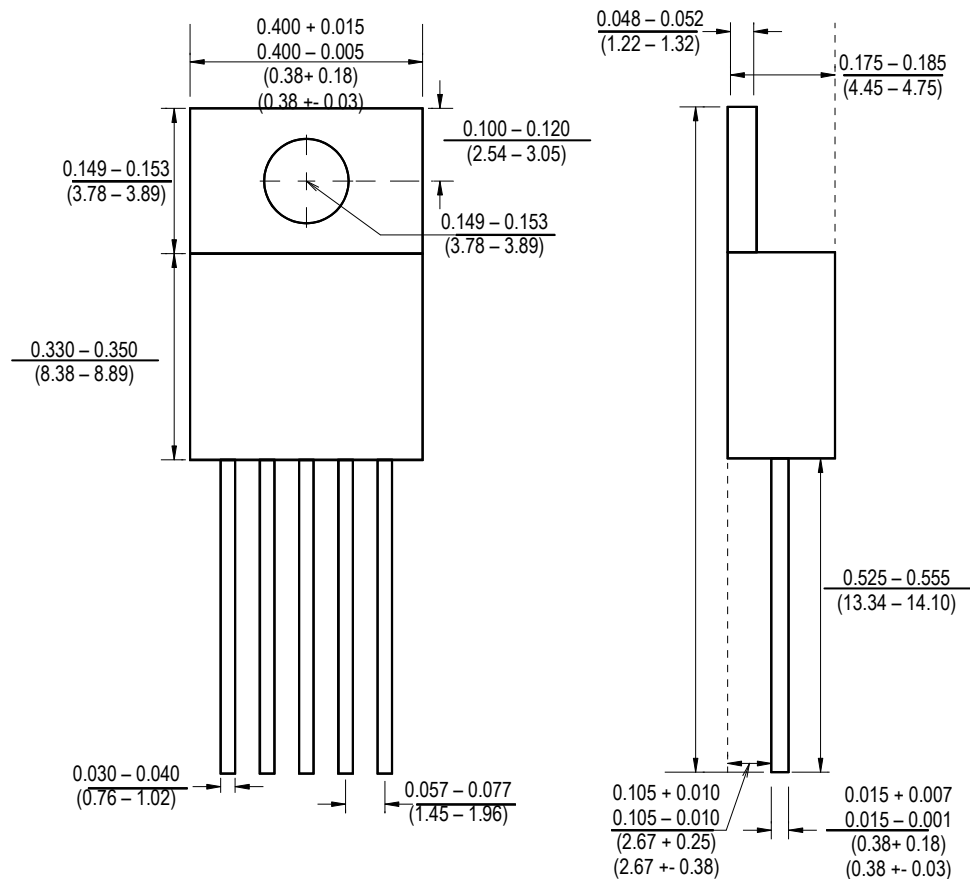
Figure 2 Adjustable Output Voltage Versions

$C_{IN} = 470\mu F$, Aluminum Electrolytic
 $C_{OUT} = 470\mu F$, 25V, Aluminum Electrolytic
 $D1 = \text{Schottky}$
 $L1 = 68\mu H$
 $V_{OUT} = V_{REF} (1 + R2/R1)$

Package Outline Dimensions – TO-263-5



Package Outline Dimensions – TO-220-5



Ordering Number

<u>GM</u>	<u>7230HV</u>	<u>A</u>	<u>TA5</u>	<u>R</u>	<u>G</u>
APM Gamma Micro	Circuit Type	Output Voltage A: Adj 3.3 = 3.3V 5.0 = 5.0V 12 = 12.0V	Package Type TA5: TO263-5 TB5: TO220-5	Shipping Type R: Taping & Reel T: Tube	G: Green

Note:

Green products:

- ◆ Lead-free (RoHS compliant)
- ◆ Halogen free(Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight)