

### Description

GM9130HV is the monolithic IC designed for a step-down DC/DC converter capable of driving 3A load without an additional transistor. The input voltage range is up to 60V. Its feedback voltage,  $V_{FB}$ , is 200mV. The GM9130HV operates at a switching frequency of 52kHz. The external shutdown function is controlled by a logic level on the  $\overline{ON/OFF}$  pin and then the circuit comes into the standby mode with  $I_{STBY} \sim 50 \mu A$  (typ.).

The  $\overline{ON/OFF}$  pin may be used for the analog dimming. As the voltage on the  $\overline{ON/OFF}$  pin is increased from 0.07V to 0.67V, the voltage on the FB pin falls from 200mV to 0.

The self-protection features include a cycle-by-cycle current limit and a thermal protection.

The GM9130HV is available in standard TO220-5, and TO263-5 packages.

Besides, SOP8 with heat sink and TO252-5 packages are also available. However, these packages are limited to heat dissipation and the  $I_{LED}$  is suggested below 2A.

### Features

- ◆ Maximum input voltage up to 60V
- ◆  $V_{FB}$ : 200mV
- ◆ Frequency: 52KHz
- ◆  $I_{LED} = 3.0A$  maximum
- ◆  $\overline{ON/OFF}$  input may be used for the analog dimming
- ◆ Thermal protection
- ◆ Cycle by cycle current limit

### Typical Application Circuits

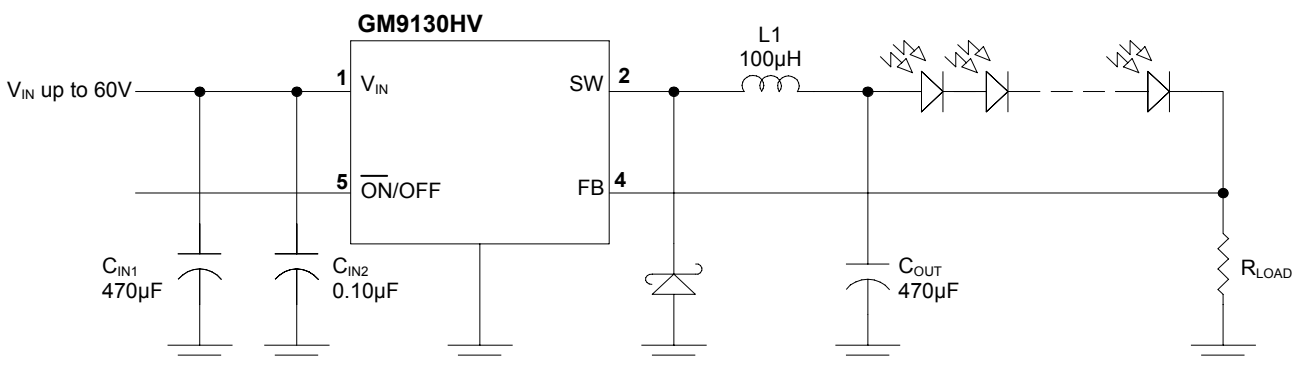
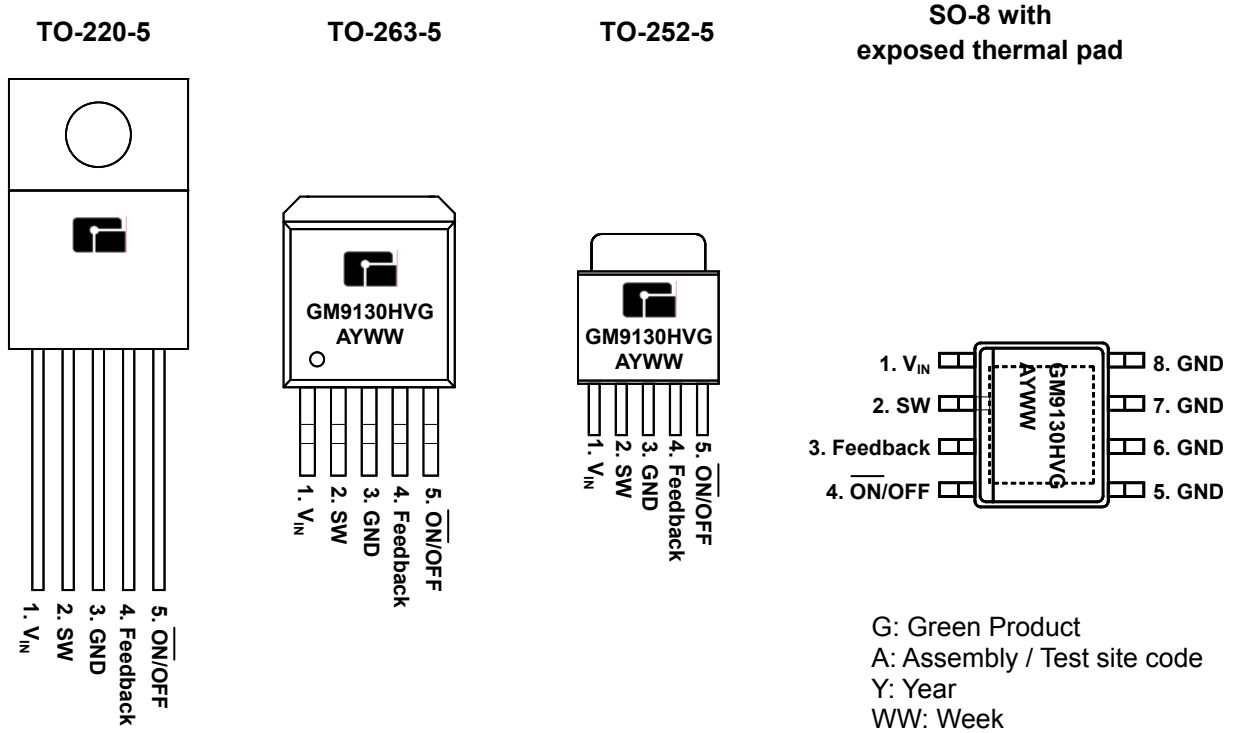


Figure 1. Application for GM9130HV

### Marking Information and Pin Configurations (Top View)



### Ordering Information

Ordering Number	Oscillation Frequency	Package	Shipping
GM9130HVTA5RG	52KHz	TO263-5	800 Units / Reel
GM9130HVTB5TG		TO220-5	50 Units / Tube
GM9130HVTC5RG		TO252-5	2,500 Units / Reel
GM9130HVPS8RG		PSOP8	2,500 Units / Reel

### Absolute Maximum Ratings (Note 1)

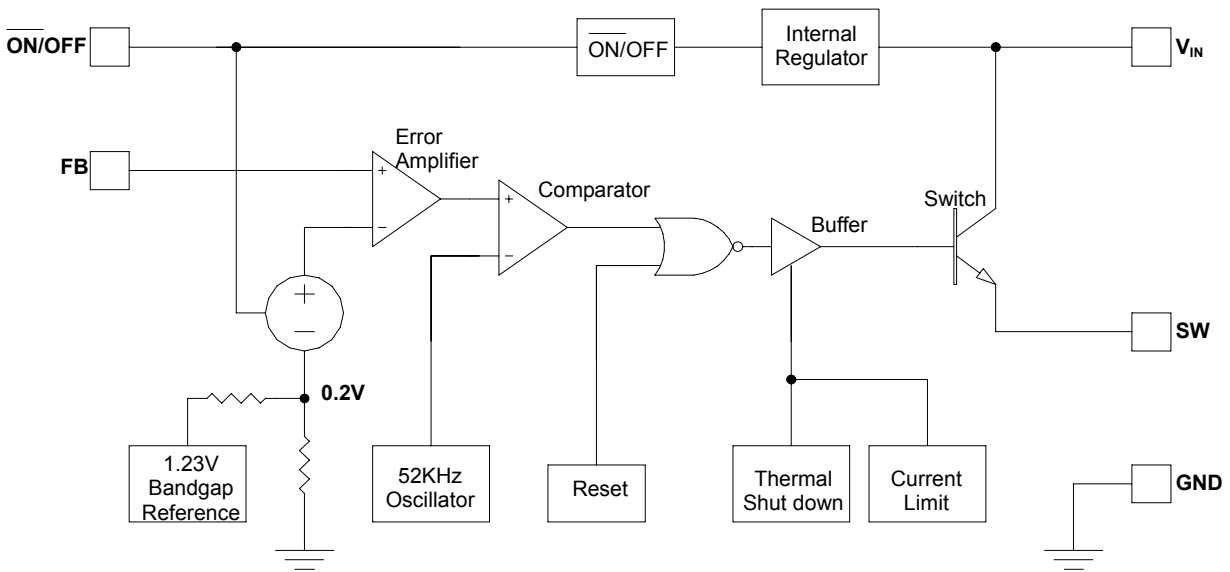
Rating		Symbol	Value	Unit
Maximum Supply Voltage		$V_{IN}$	63	V
$\overline{ON/OFF}$ Pin Input Voltage		$V_{ON/OFF}$	-0.3 to $V_{IN}$	V
Feedback Pin Voltage		$V_{FB}$	-0.3 to $V_{IN}$	V
Minimum SW Voltage		$V_{SW}$	-0.8	V
Power Dissipation		$P_D$	Internally Limited	-
Thermal Resistance	TO220-5	$\Theta_{JA}$	45	°C/W
	TO263-5		50	
	TO252-5		70	
	PSOP8		36.5*	
Storage Temperature Range		$T_{STG}$	- 65 to 150	°C
Maximum Junction Temperature		$T_J$	+ 150	°C
Minimum EDS Rating (Note 2)			2	kV
Lead Temperature (Soldering, 10 sec)			+ 260	°C

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.  
 \* 2 square inch of FR-4, double sided, 1oz. minimum copper weight, is recommended

### Recommended Operating Conditions

Rating	Symbol	Value	Unit
Maximum Supply Voltage	$V_{IN}$	60	V
Operating Temperature Range	$T_{OPR}$	- 40 to 125	°C

### Block Diagram



**Electrical Characteristics** Specifications with standard type face are for  $T_J=25^\circ\text{C}$ , and those with **Bold type** apply over **Full Operating Temperature Range**

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Feedback Voltage	$V_{IN} = 12\text{V}$ , $I_{LOAD} = 350\text{mA}$ , $\overline{\text{ON/OFF}} = 0\text{V}$	$V_{FB}$	190	200	210	mV
			184		216	
			<b>180</b>		<b>220</b>	
Efficiency	$V_{IN} = 12\text{V}$ , $I_{LOAD} = 3.0\text{A}$	$\eta$		65		%
FB input current	$V_{FB} = 250\text{mV}$ , $\overline{\text{ON/OFF}} = 0\text{V}$	$I_{FB}$		50	150	nA
					<b>500</b>	
Oscillator Frequency		$F_{OSC}$	47	52	58	kHz
			<b>42</b>		<b>63</b>	
Saturation Voltage	$I_{SW} = 3\text{A}$	$V_{SAT}$		<b>1.35</b>	<b>1.5</b>	V
					<b>1.7</b>	
Current Limit		CL	3.7	5.0	6.7	A
Maximum Duty Cycle		$DC_{MAX}$	100			%
SW Leakage Current	$V_{IN} = 60\text{V}$ , $V_{SW} = 0\text{V}$ , $V_{FB} = 1.5\text{V}$	$I_{LO}$	-0.3	-0.07		mA
	$V_{IN} = 60\text{V}$ , $V_{SW} = -0.8\text{V}$ , $V_{FB} = 1.5\text{V}$		-30	-8		
Threshold Voltage $\overline{\text{ON/OFF}}$		$V_{TH\ \overline{\text{ON/OFF}}}$	1.0	1.4	2.0	V
			<b>0.8</b>		<b>2.2</b>	
Input Current $\overline{\text{ON/OFF}}$	$V_{\overline{\text{ON/OFF}}} = 2.5\text{V}$	$I_{IH}$	-5	0.01	5	$\mu\text{A}$
	$V_{\overline{\text{ON/OFF}}} = 0\text{V}$	$I_{IL}$	-2	-0.3		
Quiescent Current	$V_{FB} = 1.5\text{V}$	$I_Q$		5.3	10	mA
Standby Current	$V_{\overline{\text{ON/OFF}}} = 5\text{V}$ , $V_{IN} = 60\text{V}$	$I_{STBY}$		50	200	$\mu\text{A}$
Dimming Voltage	$I_{LED} = 0$ , $V_{IN} = 12\text{V}$ , see Fig 1	$V_{\overline{\text{ON/OFF}}}$	600	670	750	V

Note 2 LED must be ensured with load current ( $I_{LOAD}$ ) at  $V_{IN\ MIN}$

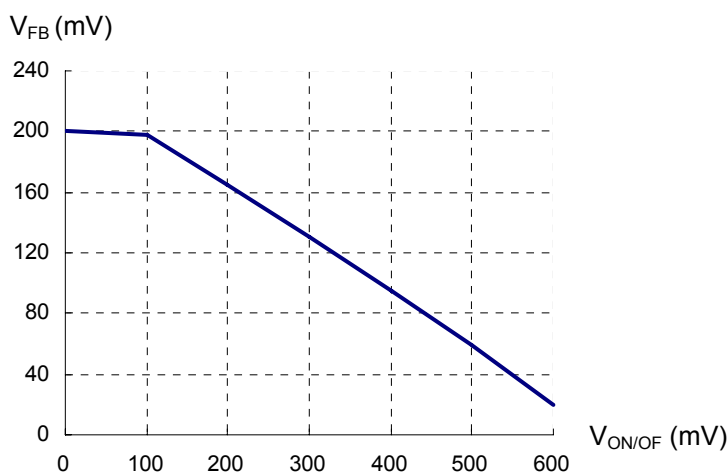


Figure 2 Dimming Voltage vs  $V_{FB}$

### Application Notes

#### Output Current (ILED) Design, refer to Figure 1

The current through the LED's can be set by the formula below.

$$I_{LED} = V_{FB} / R_{LOAD}$$

For example, if 2Ω R<sub>LOAD</sub> is selected, with V<sub>FB</sub> = 200mV typical, then

$$I_{LED} = 200 / 2 = 100mA$$

#### Power / Heat Consideration

Various I<sub>LED</sub> could be obtained by different resistor values as mentioned above. However, taking the TO263-5 as an example, the maximum power rating must be followed.

$$T_J = P_{IC} \times \theta_{JA} + T_A$$

where P<sub>IC</sub> is the power of the IC itself, and θ<sub>JA</sub> is the thermal resistance (junction to ambient). For TO263-5, the θ<sub>JA</sub> is 50°C/W, the safe power will be

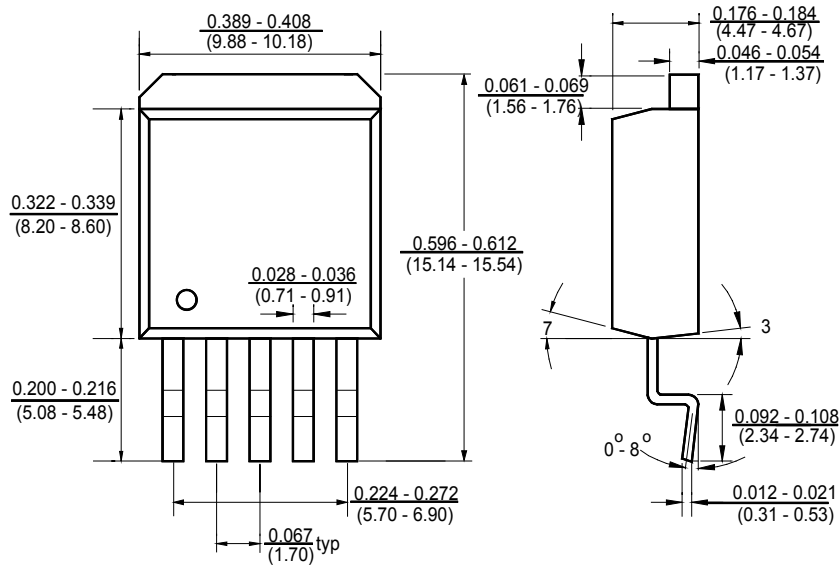
$$P_{IC} = T_J - T_A / \theta_{JA} = (150 - 25) / 50 = 2.5W, \text{ and}$$

$$P_{IC} = P_{IN} - P_{LED}, \text{ Where}$$

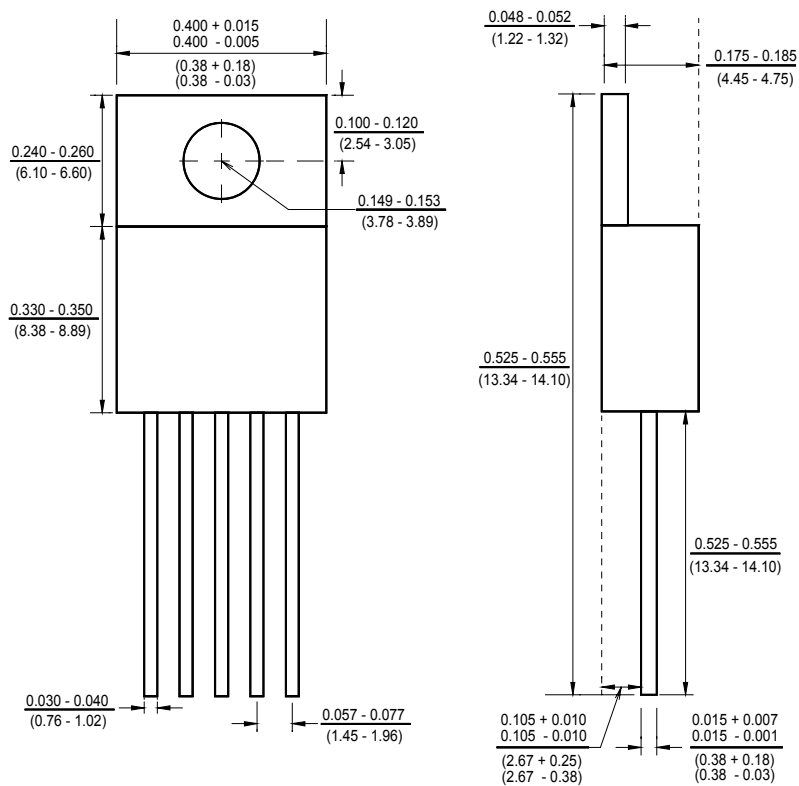
$$P_{IN} = V_{IN} \times I_{IN}, \text{ and}$$

$$P_{LED} = V_{OUT} \times I_{LED} \quad (V_{OUT} = V_F \times \text{number of LED})$$

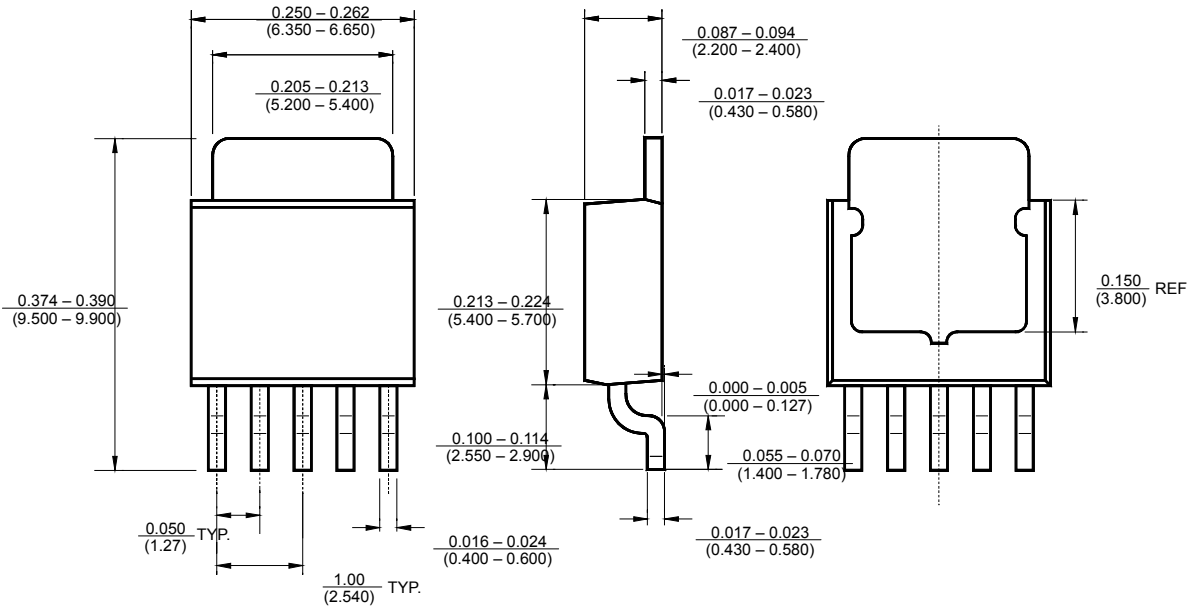
**Package Outline Dimensions – TO-263-5**



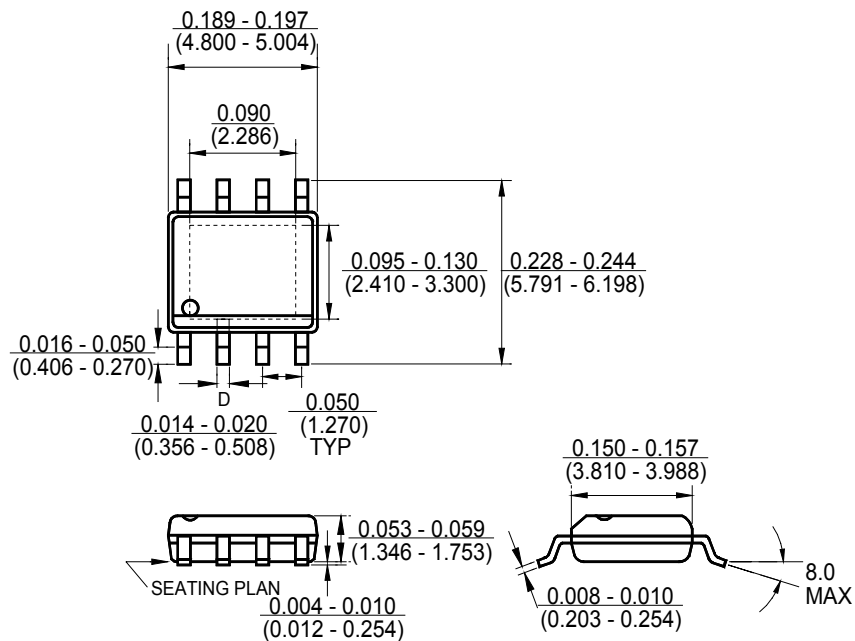
**Package Outline Dimensions – TO-220-5**



### Package Outline Dimensions – TO252-5



### Package Outline Dimensions – PSOP 8





### Ordering Number

<u>GM</u>	<u>9130HV</u>	<u>TA5</u>	<u>R</u>	<u>G</u>
APM Gamma Micro	Circuit Type	Package Type TA5: TO263-5 TB5: TO220-5 TC5: TO252-5 PS8: PSOP8	Shipping Type R:Taping & Reel T:Tube	G: Green

Note:

**Pb-free products:**

- ◆ RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- ◆ Suitable for use in Pb-free soldering processes with 100% matte tin (Sn) plating.

**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)