

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

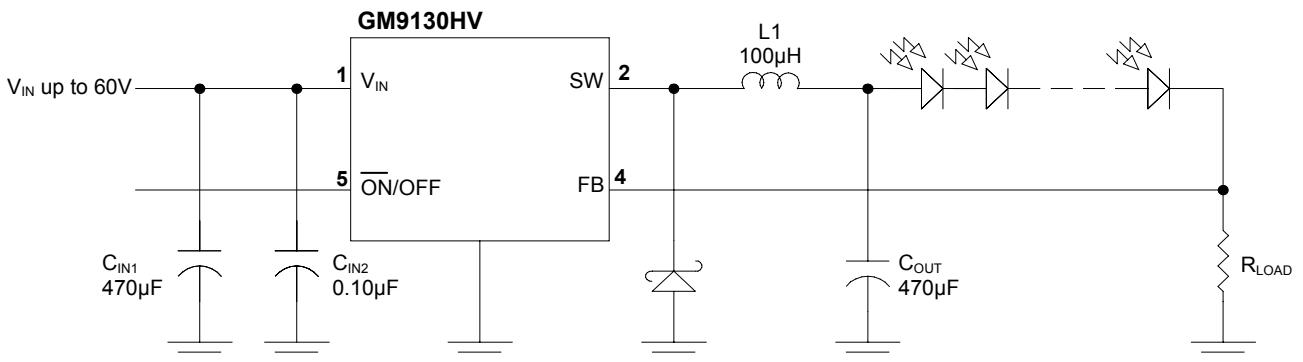
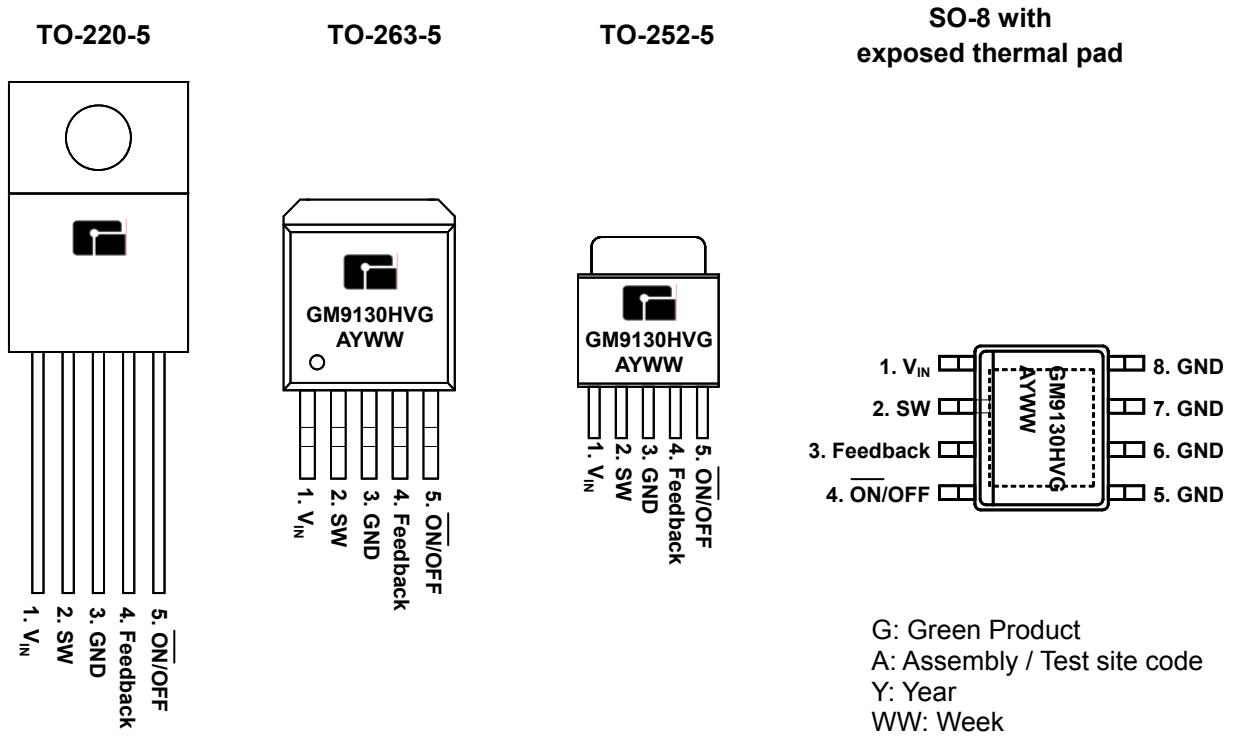


Figure 1. Application for GM9130HV

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 | θ_{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 |

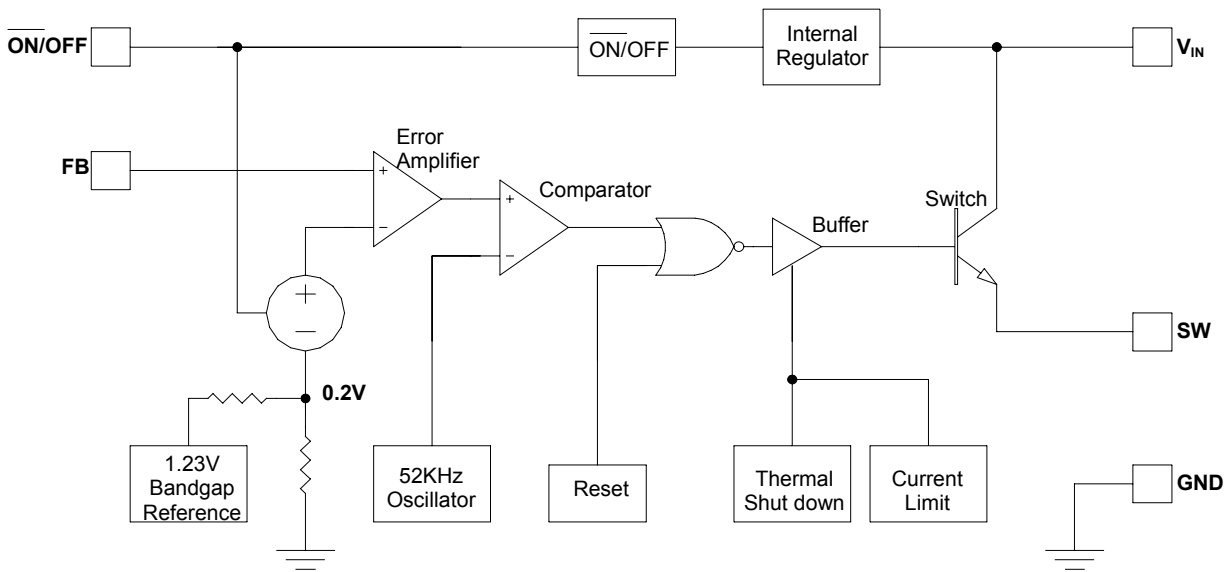
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.

* 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 | |
| | | | 180 | | 220 | |
| Efficiency | $V_{IN} = 12\text{V}, I_{LOAD} = 3.0\text{A}$ | η | | 65 | | % |
| FB input current | $V_{FB} = 250\text{mV}, \overline{\text{ON/OFF}} = 0\text{V}$ | I_{FB} | | 50 | 150 | nA |
| | | | | | 500 | |
| Oscillator Frequency | | F_{OSC} | 47 | 52 | 58 | kHz |
| | | | 42 | | 63 | |
| Saturation Voltage | $I_{SW} = 3\text{A}$ | V_{SAT} | | 1.35 | 1.5 | V |
| | | | | | 1.7 | |
| 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 |
| | | | 0.8 | | 2.2 | |
| Input Current $\overline{\text{ON/OFF}}$ | $V_{\overline{\text{ON/OFF}}} = 2.5\text{V}$ | I_{IH} | -5 | 0.01 | 5 | μA |
| | $V_{\overline{\text{ON/OFF}}} = 0\text{V}$ | 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 | μA |
| 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 $V_{IN \text{ MIN}}$

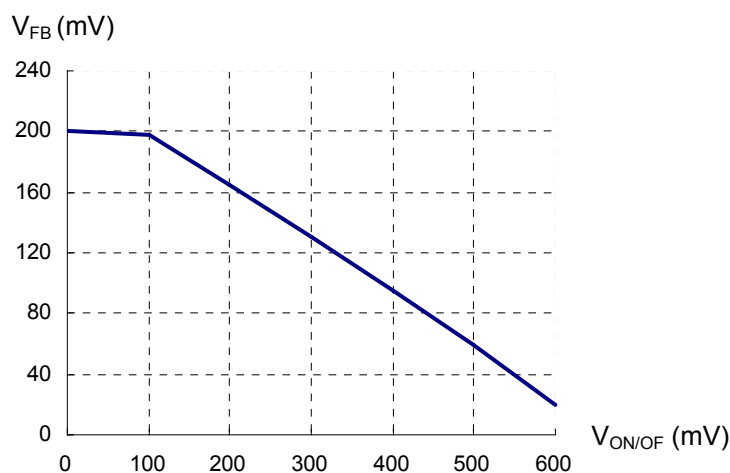


Figure 2 Dimming Voltage vs V_{FB}

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_{LOAD} is selected, with V_{FB} = 200mV typical, then

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

Power / Heat Consideration

Various I_{LED} 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_{IC} is the power of the IC itself, and θ_{JA} is the thermal resistance (junction to ambient). For TO263-5, the θ_{JA} is 50°C/W, the safe power will be

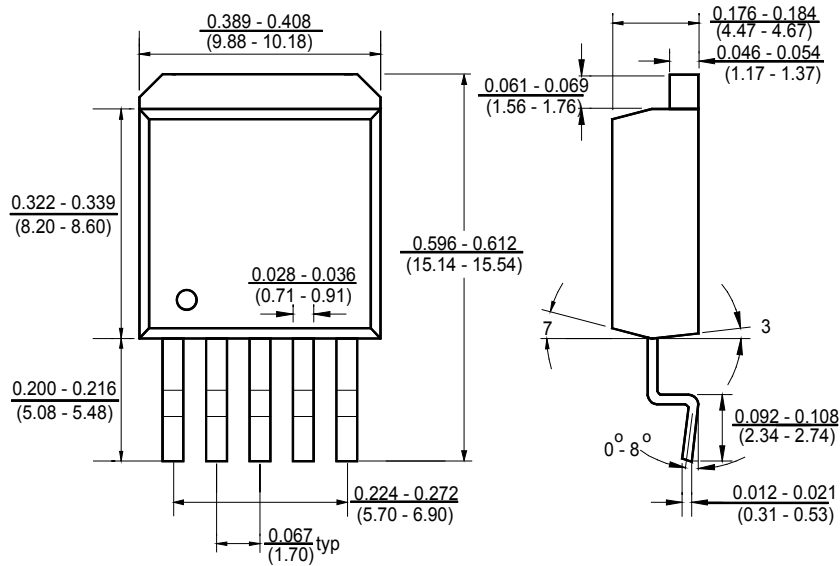
$$P_{IC} = T_J - T_A / \theta_{JA} = (150 - 25) / 50 = 2.5W, \text{ and}$$

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

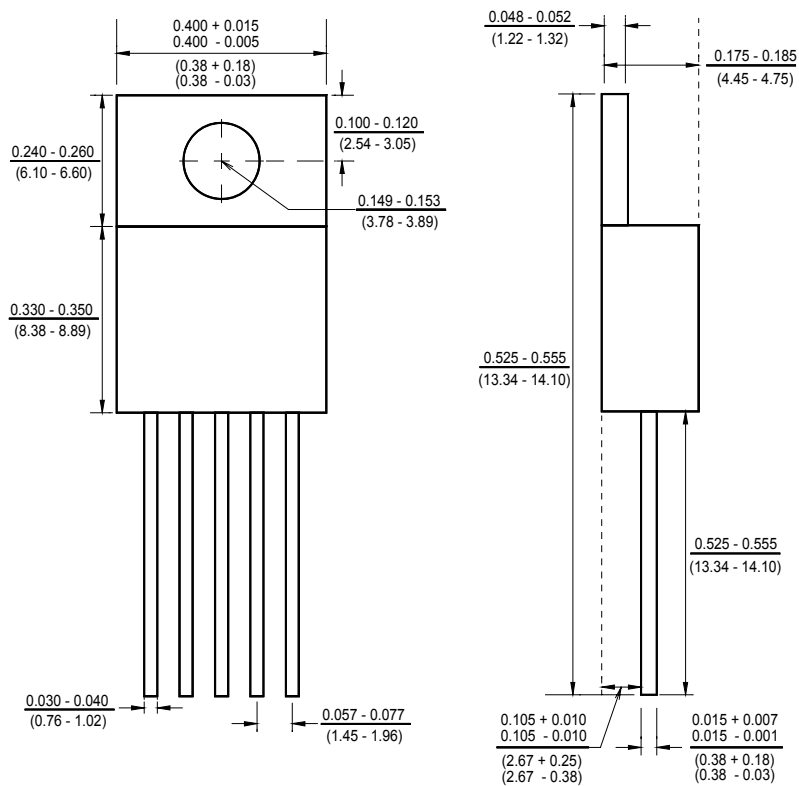
$$P_{IN} = V_{IN} \times I_{IN}, \text{ and}$$

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

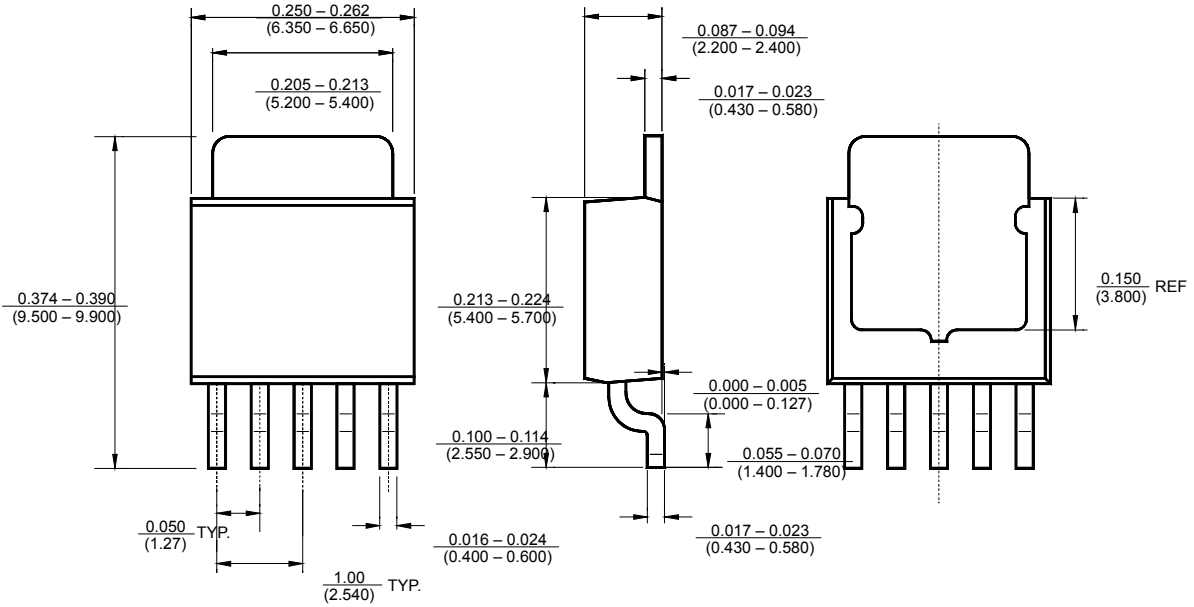
Package Outline Dimensions – TO-263-5



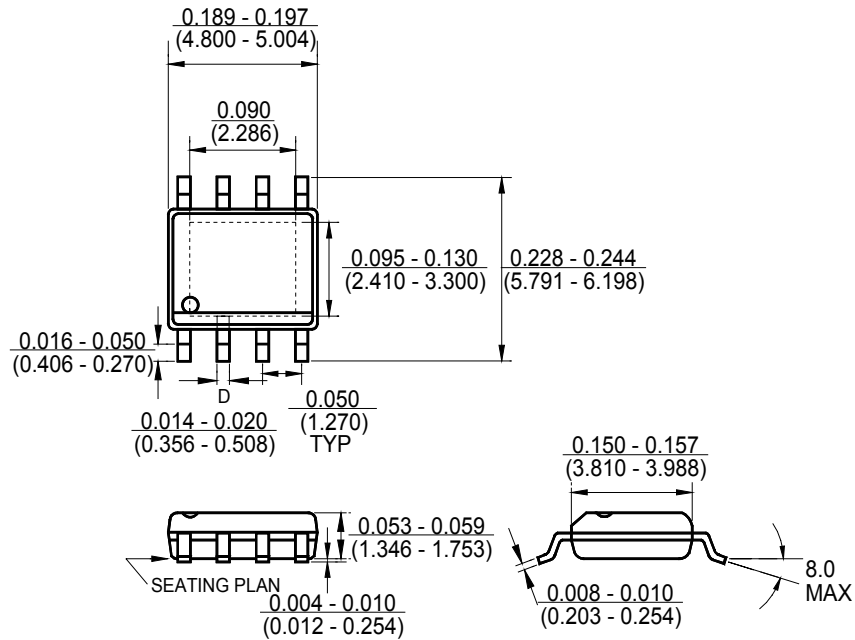
Package Outline Dimensions – TO-220-5



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)