

Description

The GM66150 series of positive fixed and adjustable regulators is designed to provide up to 1.5A output with high current, high accuracy, and extremely low dropout voltage performance. These regulators feature 300 to 350mV (full load) dropout voltages, and very low ground current. Although designed for high current loads, these devices are also useful in lower current, extremely low dropout critical systems, where the minimal dropout voltage and ground current values are important characteristics.

The GM66150 is fully protected against over current, reversed input polarity (or reversed battery connection), reversed lead insertion, over temperature operation, and transient voltage spikes (positive or negative).

Five lead fixed voltage versions feature logic level ON/OFF control and an error flag which signals whenever the output falls out of regulation.

For GM66151 and GM66152, the ENABLE pin may be tied to V_{IN} if it is not required for ON/OFF control. The GM66150 series is available in 3-pin and 5-pin TO-220 and surface mount SOT-223 and TO-263 packages.

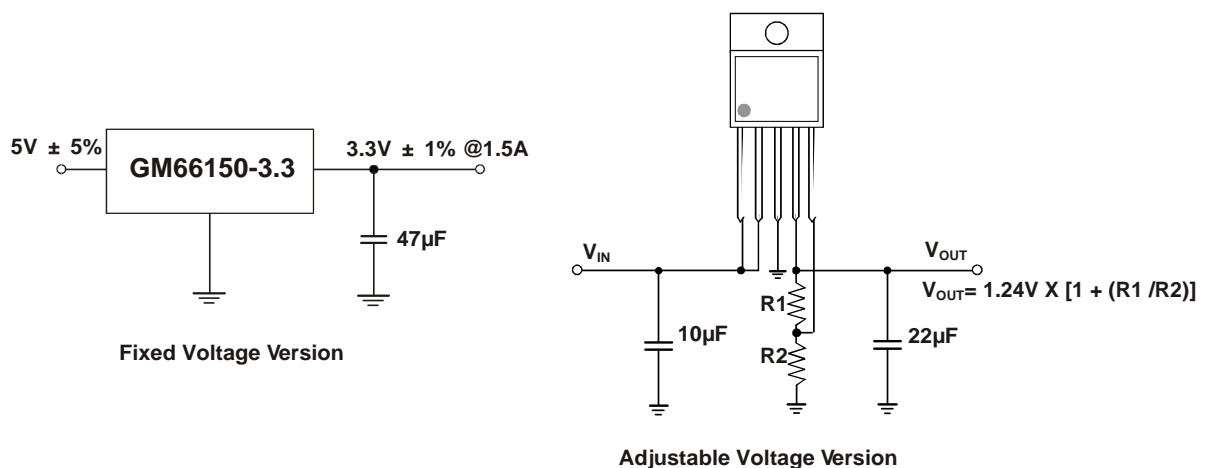
Features

- ◆ Ultra Low Dropout Voltage of 350mV @ 1.5A with Low Ground Current
- ◆ Fixed and Adjustable Voltage Versions
- ◆ Output Current up to 1.5A
- ◆ Guaranteed 1% Accurate Tolerance
- ◆ Extremely Fast Transient Response
- ◆ Reverse-battery Protection
- ◆ "Load Dump" Protection
- ◆ Zero-Current shutdown mode(5-pin versions) Error flag signals output out-of-regulation (5-pin versions)

Application

- High Efficiency Linear Regulators
- Post Regulators for Switching Supplies
- High Efficiency "Green" Computer Systems
- Battery Powered Equipment
- Automotive Electronics

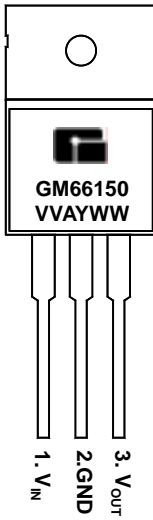
Typical Application Circuits



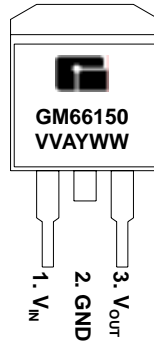
Marking Information and Pin Configurations (Top View)

GM66150

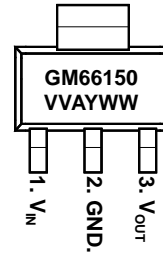
TO 220



TO 263
(D²-PAK)

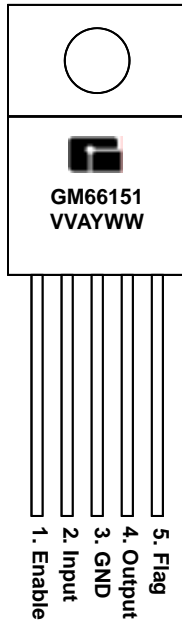


SOT223

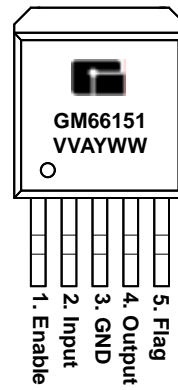


GM66151

TO-220-5

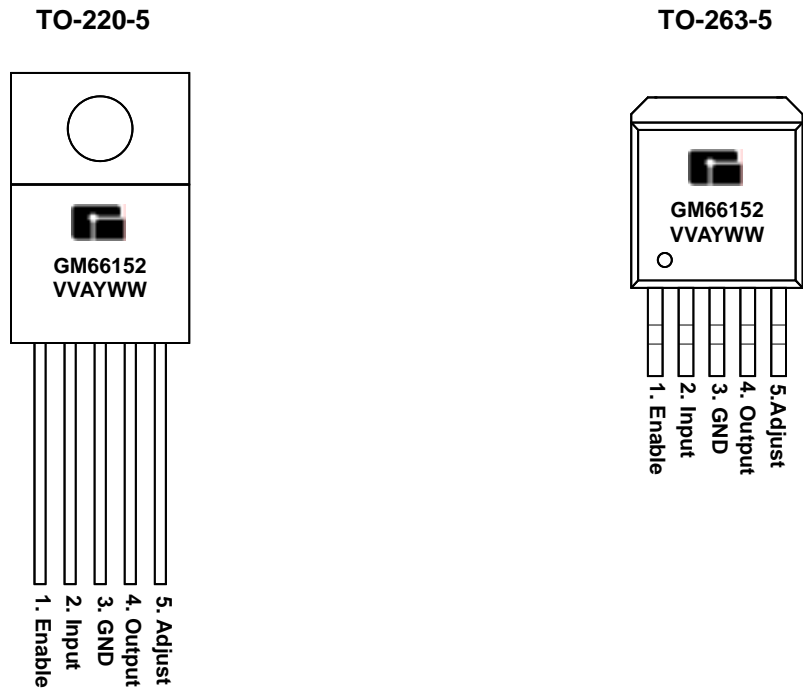


TO-263-5

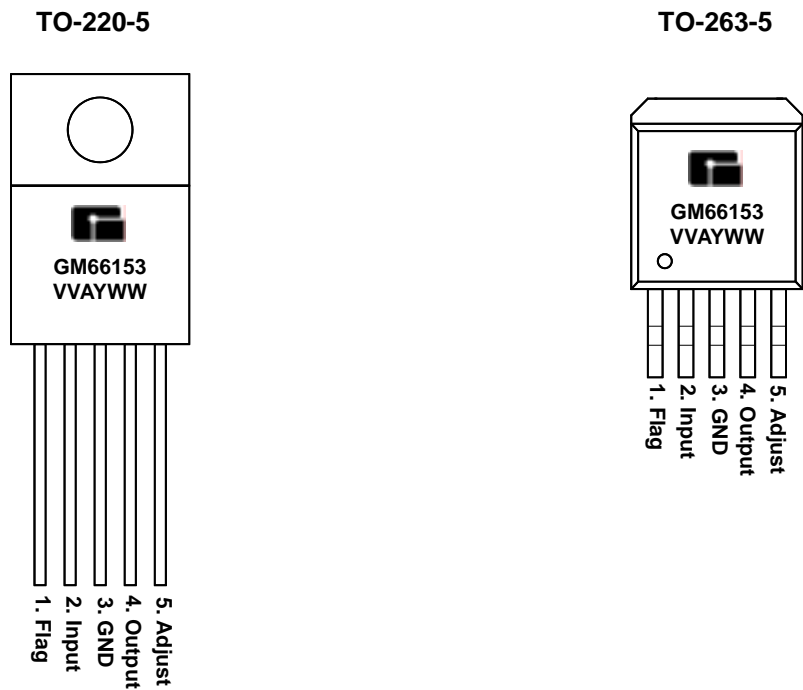


Marking Information and Pin Configurations (Top View)

GM66152



GM66153



VV: Voltage suffix (15 = 1.5V, 50 = 5.0V...A = Adj)
 A: Assembly / Test site code
 Y: Year
 WW: Week

Ordering Information

Ordering Number	Output Voltage	Package	Shipping
GM66150			
GM66150-1.5TA3T	1.5V	TO-263	50 Units/Tube
GM66150-1.5TA3R	1.5V	TO-263	800 Units / Reel
GM66150-1.5TB3T	1.5V	TO-220	50 Units/Tube
GM66150-1.5ST3T	1.5V	SOT-223	80 Units/Tube
GM66150-1.5ST3R	1.5V	SOT-223	2,500 Units / Tape & Reel
GM66150-1.8TA3T	1.8V	TO-263	50 Units/Tube
GM66150-1.8TA3R	1.8V	TO-263	800 Units / Reel
GM66150-1.8TB3T	1.8V	TO-220	50 Units/Tube
GM66150-1.8ST3T	1.8V	SOT-223	80 Units/Tube
GM66150-1.8ST3R	1.8V	SOT-223	2,500 Units / Tape & Reel
GM66150-2.5TA3T	2.5V	TO-263	50 Units/Tube
GM66150-2.5TA3R	2.5V	TO-263	800 Units / Reel
GM66150-2.5TB3T	2.5V	TO-220	50 Units/Tube
GM66150-2.5ST3T	2.5V	SOT-223	80 Units/Tube
GM66150-2.5ST3R	2.5V	SOT-223	2,500 Units / Tape & Reel
GM66150-3.0TA3T	3.0V	TO-263	50 Units/Tube
GM66150-3.0TA3R	3.0V	TO-263	800 Units / Reel
GM66150-3.0TB3T	3.0V	TO-220	50 Units/Tube
GM66150-3.0ST3T	3.0V	SOT-223	80 Units/Tube
GM66150-3.0ST3R	3.0V	SOT-223	2,500 Units / Tape & Reel
GM66150-3.3TA3T	3.3V	TO-263	50 Units/Tube
GM66150-3.3TA3R	3.3V	TO-263	800 Units / Reel
GM66150-3.3TB3T	3.3V	TO-220	50 Units/Tube
GM66150-3.3ST3T	3.3V	SOT-223	80 Units/Tube
GM66150-3.3ST3R	3.3V	SOT-223	2,500 Units / Tape & Reel
GM66150-5.0TA3T	5.0V	TO-263	50 Units/Tube
GM66150-5.0TA3R	5.0V	TO-263	800 Units / Reel
GM66150-5.0TB3T	5.0V	TO-220	50 Units/Tube
GM66150-5.0ST3T	5.0V	SOT-223	80 Units/Tube
GM66150-5.0ST3R	5.0V	SOT-223	2,500 Units / Tape & Reel
GM66150-12TA3T	12V	TO-263	50 Units/Tube
GM66150-12TA3R	12V	TO-263	800 Units / Reel
GM66150-12TB3T	12V	TO-220	50 Units/Tube

Ordering Information

Ordering Number	Output Voltage	Package	Shipping
GM66151			
GM66151-1.5TA5T	1.5V	TO-263-5	50 Units/Tube
GM66151-1.5TA5R	1.5V	TO-263-5	800 Units / Reel
GM66151-1.5TB5T	1.5V	TO-220-5	50 Units/Tube
GM66151-1.8TA5T	1.8V	TO-263-5	50 Units/Tube
GM66151-1.8TA5R	1.8V	TO-263-5	800 Units / Reel
GM66151-1.8TB5T	1.8V	TO-220-5	50 Units/Tube
GM66151-2.5TA5T	2.5V	TO-263-5	50 Units/Tube
GM66151-2.5TA5R	2.5V	TO-263-5	800 Units / Reel
GM66151-2.5TB5T	2.5V	TO-220-5	50 Units/Tube
GM66151-3.0TA5T	3.0V	TO-263-5	50 Units/Tube
GM66151-3.0TA5R	3.0V	TO-263-5	800 Units / Reel
GM66151-3.0TB5T	3.0V	TO-220-5	50 Units/Tube
GM66151-3.3TA5T	3.3V	TO-263-5	50 Units/Tube
GM66151-3.3TA5R	3.3V	TO-263-5	800 Units / Reel
GM66151-3.3TB5T	3.3V	TO-220-5	50 Units/Tube
GM66151-5.0TA5T	5.0V	TO-263-5	50 Units/Tube
GM66151-5.0TA5R	5.0V	TO-263-5	800 Units / Reel
GM66151-5.0TB5T	5.0V	TO-220-5	50 Units/Tube
GM66151-12TA5T	12V	TO-263-5	50 Units/Tube
GM66151-12TA5R	12V	TO-263-5	800 Units / Reel
GM66151-12TB5T	12V	TO-220-5	50 Units/Tube

Ordering Information

Ordering Number	Output Voltage	Package	Shipping
GM66152			
GM66152TA3T	Adj	TO-263-5	50 Units/Tube
GM66152TA3R	Adj	TO-263-5	800 Units / Reel
GM66152TB3T	Adj	TO-220-5	50 Units/Tube
GM66153			
GM66153TA3T	Adj	TO-263-5	50 Units/Tube
GM66153TA3R	Adj	TO-263-5	800 Units / Reel
GM66153TB3T	Adj	TO-220-5	50 Units/Tube

Absolute Maximum Ratings

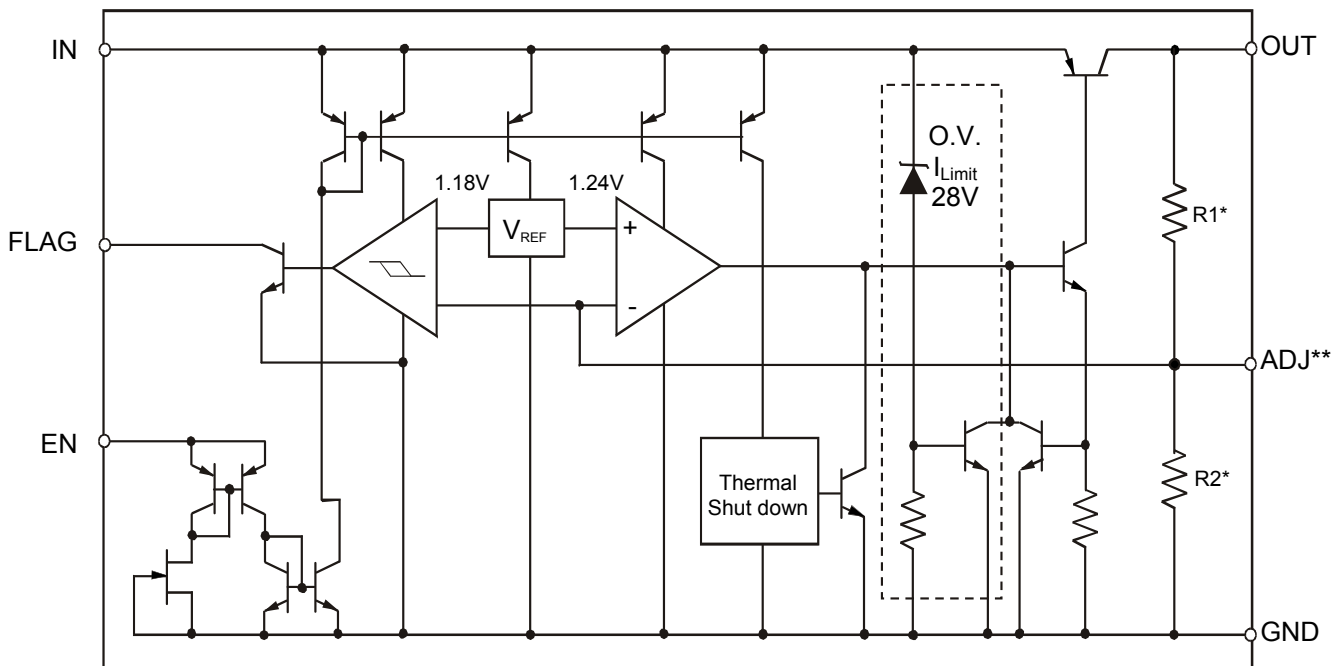
Parameter	Symbol	Value	Unit
Power Dissipation	P_D	Internally Limited	W
Input Power Supply Voltage (Note 1)	V_{IN}	-20 to +60	V
Storage Temperature Range	T_{STG}	- 65 to 150	
Lead Temperature (Soldering, 5 sec)		+ 260	

Note 1: Maximum positive supply voltage of 60V must be of limited duration (<100msec) and duty cycle (< 1%). The maximum continuous supply voltage is 26V.

Operating Ratings

Parameter	Symbol	Value	Unit
Maximum Operating Input Voltage	V_{IN}	26	V
Operating Junction Temperature	T_J	-40 to +125	

Block Diagram



* Feedback network in fixed versions only
 ** Adjustable version only

Electrical Characteristics:

(Unless otherwise specified: $T_J = 25^\circ\text{C}$, Bold values are guaranteed across the full operating temperature range. Adjustable versions are programmed to 5.0V)

Parameter	Condition	Symbol	Min	Typ	Max	Unit	
Output Voltage	$I_O = 10\text{mA}$	V_{OUT}	-1		1	%	
	$10\text{mA} \leq I_O \leq 1.5\text{A}$, $V_{OUT} + 1\text{V} \leq V_{IN} \leq 26\text{V}$, (Note 2, 6)		-2		2		
Line Regulation	$I_O = 10\text{mA}$, $V_{OUT} + 1\text{V} \leq V_{IN} \leq 26\text{V}$	ΔV_{OI}		0.06	0.5	%	
Load Regulation	$V_{IN} = V_{OUT} + 5\text{V}$, $10\text{mA} \leq I_O \leq 1.5\text{A}$, (Note 6)	ΔV_{OL}		0.2	1.0	%	
Output Temperature Coefficient	(Note 6)	$\Delta V_{OUT} / \Delta T$		20	100	ppm/	
Dropout Voltage	$\Delta V_{OUT} = -1\%$ (Note 3)	V_{DO}		80	200	mV	
			$I_O = 100\text{mA}$		220		
			$I_O = 750\text{A}$		350		600
Ground Current (Note 5)	$I_O = 750\text{mA}$, $V_{IN} = V_{OUT} + 1\text{V}$	I_{GND}		8	20	mA	
	$I_O = 1.5\text{A}$			22			
Ground Pin Current at Dropout	$V_{IN} = 0.5\text{V}$ less than specified V_{OUT} , $I_O = 10\text{mA}$	I_{GNDDO}		20		mA	
Current Limit	GM66150, $V_{OUT} = 0\text{V}$, (Note 4)	I_{CL}		2.1	3.5	A	
Output Noise Voltage	10Hz to 100kHz, $I_L = 100\text{mA}$	e_n		400		μV_{RMS}	
			$C_L = 10\ \mu\text{F}$		260		
	$C_L = 33\ \mu\text{F}$						
Reference GM66152							
Reference Voltage		V_{REF}	1.228	1.240	1.252	V	
			1.215		1.265		
	(Note 8)		1.203		1.277		
Adjust Pin Bias Current		I_{ADJB}		40	80	nA	
					120		
V_{REF} Temperature Coefficient	(Note 7)	$\Delta V_{REF} / \Delta T$		20		ppm/	
Adjust Pin Bias Current Temperature Coefficient				0.1		nA/	

Electrical Characteristics (continued):

(Unless otherwise specified: $T_J = 25^\circ\text{C}$, Bold values are guaranteed across the full operating temperature range. Adjustable versions are programmed to 5.0V)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Flag Output (Error Comparator) GM66151/GM66153						
Output Leakage Current	$V_{OH} = 26\text{V}$	I_{OLEAK}		0.01	1 2	μA
Output Low Voltage	Device set for 5V, $V_{IN} = 4.5\text{V}$ $I_{OL} = 250\mu\text{A}$	V_{OL}		220	300 400	mV
Upper Threshold Voltage	Device set for 5V (Note 9)	V_{THU}	40 25	60		mV
Lower Threshold Voltage	Device set for 5V (Note 9)	V_{THL}		75	95 140	mV
Hysteresis	Device set for 5V (Note 9)	V_{HYS}		15		mV
Enable Input GM66151/GM66152						
Input Logic Voltage	Low (Off)				0.8	V
	High (On)		2.4			
Enable Pin Input Current	$V_{EN} = 26\text{V}$	I_{EN}		100	600 750	μA
	$V_{EN} = 0.8\text{V}$				2.5 5.0	
Regulator Output Current in Shutdown	(Note 10)	I_{OSD}		10	500	μA

Note 2: Full Load current (I_{FL}) is defined as 1.5A.

Note 3: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its nominal value with V_{OUT} to V_{IN}

Note 4: $V_{IN} = V_{OUT} (\text{nominal}) + 1\text{V}$. For example, use $V_{IN} = 4.3\text{V}$ for a 3.3V regulator or use 6V for a 5V regulator. Employ pulse testing procedures to minimize temperature rise.

Note 5: Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the load current plus the ground pin current.

Note 6: Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.

Note 7: Thermal regulation is defined as the change in output voltage at a time T after a change in power dissipation is applied, excluding load or line regulation effects. Specifications are for a 200mA load pulse at $V_{IN} = 20\text{V}$ (a 4W pulse) for T = 10ms.

Note 8: $V_{REF} \leq V_{OUT} \leq (V_{IN} - 1\text{V})$, $2.3\text{V} \leq V_{IN} \leq 26\text{V}$, $10\text{mA} \leq I_L \leq I_{FL}$, $T_J \leq T_{J\text{MAX}}$.

Note 9: $V_{EN} \leq 0.8\text{V}$ and $V_{IN} \leq 26\text{V}$, $V_{OUT} = 0$

Note 10: When used in dual supply systems where the regulator load is returned to a negative supply, the output voltage must be diode clamped to ground.

Typical Characteristics (GM66150)

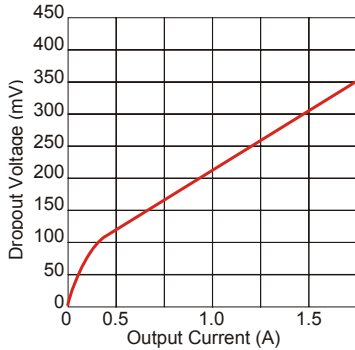


Figure 1. GM66150 Dropout Voltage vs. Output Current

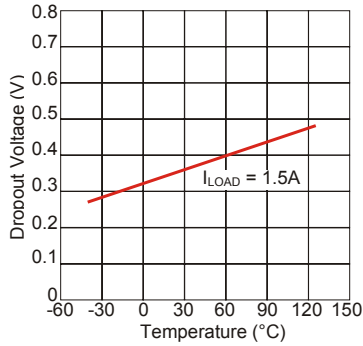


Figure 2. GM66150 Dropout Voltage vs. Temperature

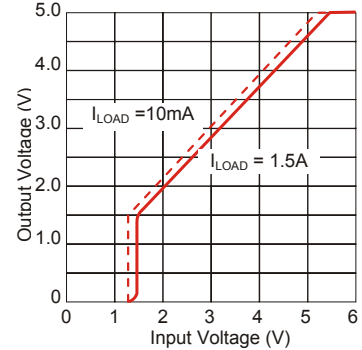


Figure 3. GM66150-5.0 Dropout Characteristics

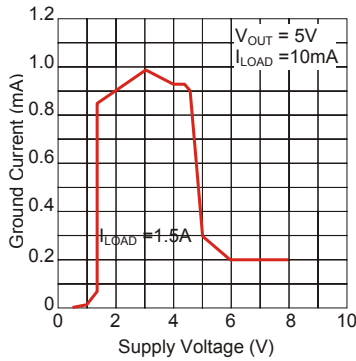


Figure 4. GM66150 Ground Current vs. Supply Voltage

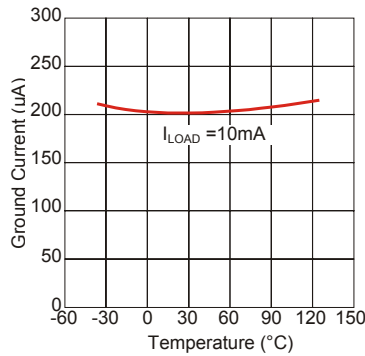


Figure 5. GM66150 Ground Current vs. Temperature

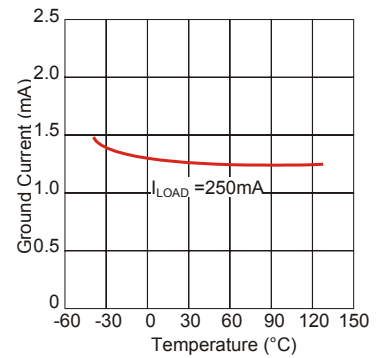


Figure 6. GM66150 Ground Current vs. Temperature

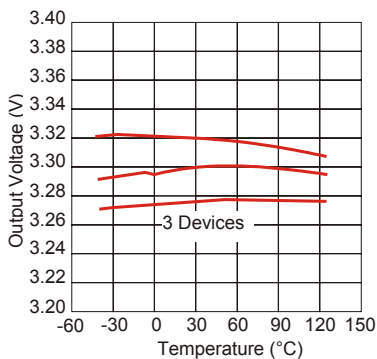


Figure 7. GM66150-3.3 Output Voltage vs. Temperature

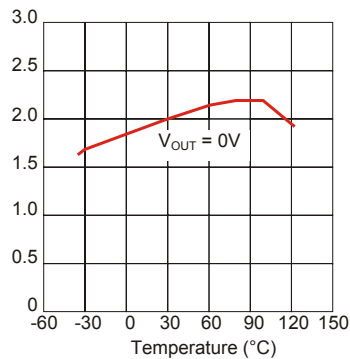


Figure 8. GM66150-3.3 Short Circuit Current vs. Temperature

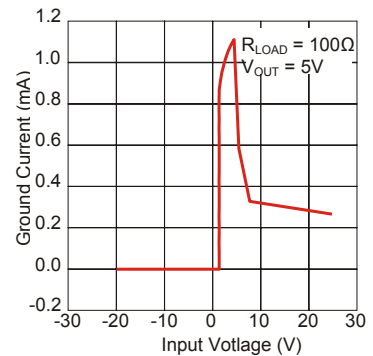
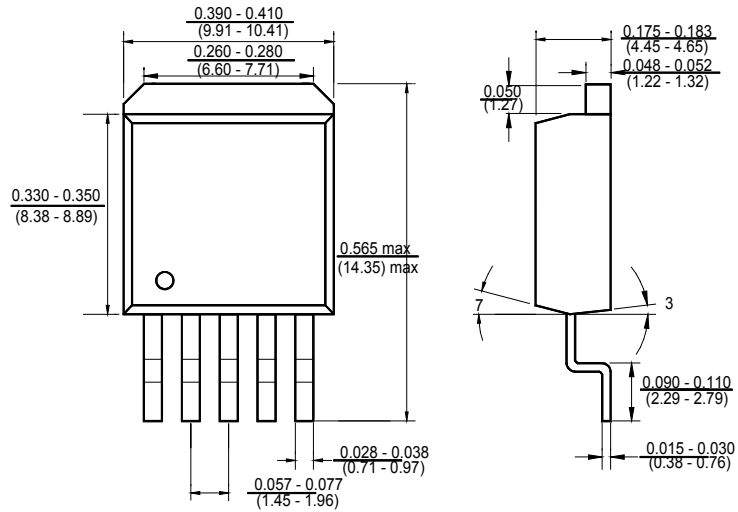
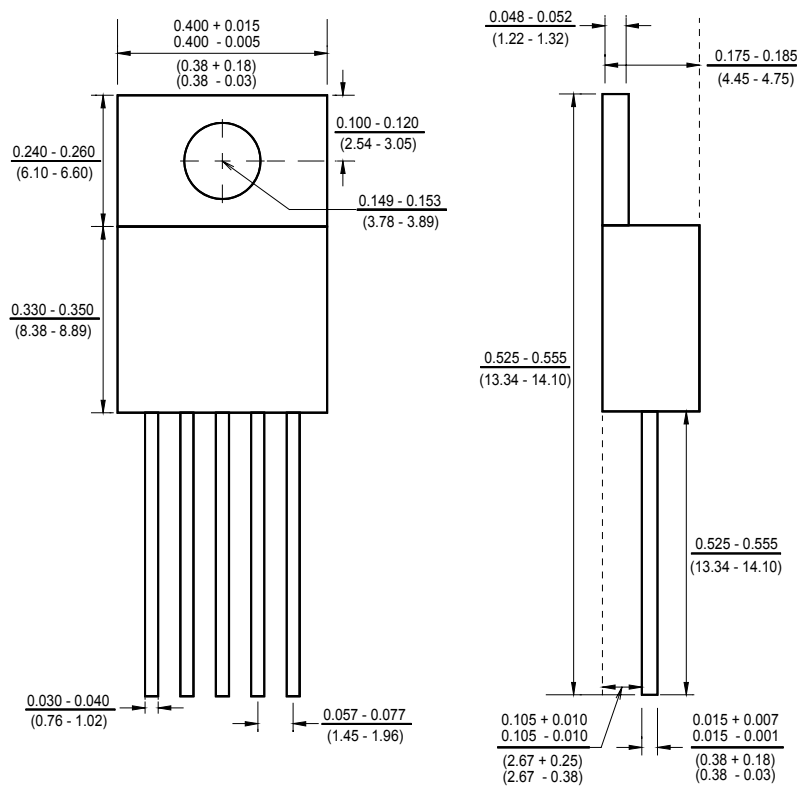


Figure 9. GM66150 Ground Current vs. Input Voltage

Package Outline Dimensions – TO-263-5



Package Outline Dimensions – TO-220-5



Ordering Number

<u>GM 66150</u>		<u>-1.5</u>	<u>TA3</u>	<u>R</u>
APM Gamma Micro	Circuit Type	Output Voltage 1.5 = 1.5V 1.8 = 1.8V 2.5 = 2.5V 3.0 = 3.0V 3.3 = 3.3V 5.0 = 5.0V 12 = 12.0V	Package Type TA3: TO263 TB3: TO220	Shipping Type R: Taping & Reel T: Tube

<u>GM 66151</u>		<u>-1.5</u>	<u>TA5</u>	<u>R</u>
APM Gamma Micro	Circuit Type	Output Voltage 1.5 = 1.5V 1.8 = 1.8V 2.5 = 2.5V 3.0 = 3.0V 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

<u>GM 66152</u>		<u>-A</u>	<u>TA5</u>	<u>R</u>
APM Gamma Micro	Circuit Type	Output Voltage Adj	Package Type TA3: TO263-5 TB3: TO220-5	Shipping Type R: Taping & Reel T: Tube

<u>GM 66153</u>		<u>-A</u>	<u>TA5</u>	<u>R</u>
APM Gamma Micro	Circuit Type	Output Voltage Adj	Package Type TA3: TO263-5 TB3: TO220-5	Shipping Type R: Taping & Reel T: Tube