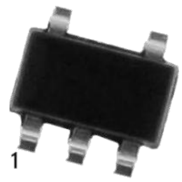
HG763xx 低功耗 150mA 抵压降线性稳压器

特性

- 150mA 低压降稳压器。
- 输出电压：5V、3.8V、3.3V、3V、2.8V、2.7V、2.5V、1.8V、1.6V 以及可变电压。
- 150mA 时压降电压典型值为 300mV。
- 过热保护。
- 过流限制。
- 关断模式下静态电流小于 2μA。
- -40°C 至 125°C 的工作结温范围。
- 5 引脚 SOT-23 封装。



SOT-23-5

产品订购信息

产品名称	封装	打印名称	包装	包装数量
HG76350M5/TR	SOT-23-5	PBGI	REEL	3000pcs/Reel
HG76338M5/TR	SOT-23-5	PBFI	REEL	3000pcs/Reel
HG76333M5/TR	SOT-23-5	PBEI	REEL	3000pcs/Reel
HG76330M5/TR	SOT-23-5	PBII	REEL	3000pcs/Reel
HG76328M5/TR	SOT-23-5	PBDI	REEL	3000pcs/Reel
HG76327M5/TR	SOT-23-5	PBCI	REEL	3000pcs/Reel
HG76325M5/TR	SOT-23-5	PBBI	REEL	3000pcs/Reel
HG76318M5/TR	SOT-23-5	PBAI	REEL	3000pcs/Reel
HG76316M5/TR	SOT-23-5	PBHI	REEL	3000pcs/Reel
HG76301M5/TR	SOT-23-5	PAZI	REEL	3000pcs/Reel

概述

HG763xx 系列低压降(LDO)稳压器具有低压降电压、低功耗运行以及小型化封装等优点。与传统 LDO 稳压器相比，这些稳压器具有低压降电压和地静态电流、HG763xx 系列器采用 5 引脚、小外形集成电路 SOT-23 封装。非常适合成本敏感型设计和需要优先考虑布板空间的应用。

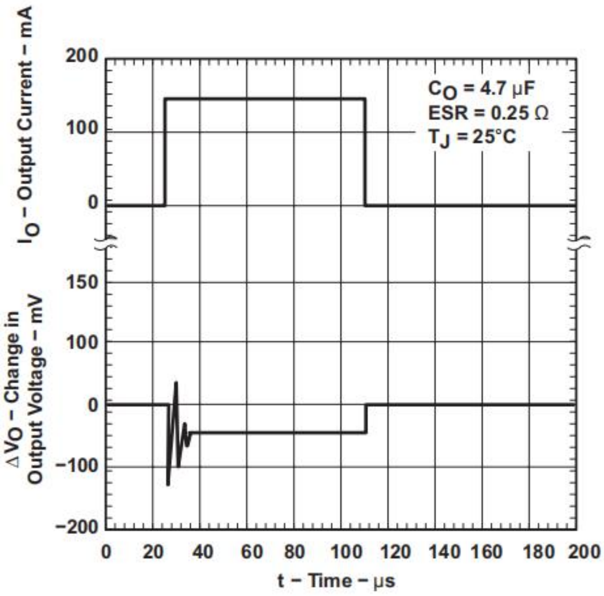
通过结合全新的电路设计和工艺创新，使用 PMOS 通道元件来替代普通的 PNP 通道晶体管。因为 PMOS 通道元件可用作低阻电阻器，其压降电压较低(通常在 150mA 负载电流（HG76333)下位 300MV），并且与负载电流成正比。因为 PMOS 通道元件是电压驱动型器件，其静态电流较低(最大值为 140μA)，并且在整个输出电流范围(0mA 至 150mA)内可保存稳定。该器件旨在用于笔记本电脑和手机等便携式系统，其低压降电压特性和低功耗运放可显著提高系统电池使用寿命。

HG763xx 还支持使用逻辑睡眠模式关闭稳压器，从而可将 TJ=25°C 时的静态电流最大值降至 1μA。HG763xx 具有 1.6V、1.8V、2.5V、2.7V、2.8V、3V、3.3V、3.8V 和 5V 固定电压版本和变电压版本(可在 1.5V 至 6.5 范围内编程)。

应用

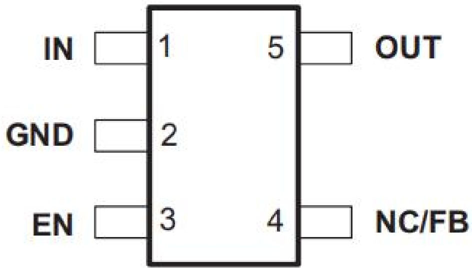
- 电表
- 光伏逆变器
- HVAC 系统
- 伺服驱动器和运动控制
- 传感器变送器

HG76350 负载瞬态响应



Pin Configuration and Functions

SOT-23-5



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	IN	I	Input supply voltage
2	GND	—	Ground
3	EN	I	Enable input
4	NC/FB	—/I	No connection (fixed-voltage option only) or feedback voltage (HG76301 only)
5	OUT	O	Regulated output voltage

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

PARAMETER	MIN	MAX	UNIT
Input voltage	–0.3	10	V
Voltage at EN	–0.3	VI + 0.3	V
Voltage on OUT, FB		7	V
Peak output current	Internally limited		
Operating junction temperature, TJ	–40	150	°C
Storage temperature, Tstg	–65	150	°C
Lead Temperature (Soldering, 10 seconds)	-	245	°C

(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 specific performance is not ensured.

(2)JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(3)JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	MAX	UNIT
V_I	Input voltage(1)	2.7	10	V
I_O	Continuous output current	0	150	mA
T_J	Operating junction temperature	–40	125	°C

(1) To calculate the minimum input voltage for your maximum output current, use the following equation: $V_{I(min)} = V_{O(max)} + V_{DO(max\ load)}$

Thermal Information

THERMAL METRIC(1)		HG763xx (SOT23-5)	UNIT
$R_{θJA}$	Junction-to-ambient thermal resistance	205.3	°C/W
$R_{θJC(top)}$	Junction-to-case (top) thermal resistance	125.1	°C/W
$R_{θJB}$	Junction-to-board thermal resistance	34.6	°C/W
$ψ_{JT}$	Junction-to-top characterization parameter	15.2	°C/W
$ψ_{JB}$	Junction-to-board characterization parameter	33.8	°C/W
$R_{θJC(bot)}$	Junction-to-case (bottom) thermal resistance	—	°C/W

Electrical Characteristics

over recommended operating free-air temperature range, $V_I = V_{O(typ)} + 1V$, I_O = 1mA, EN =IN, and C_O = 4.7μF (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_O	Output voltage	HG76301	3.25 V > VI ≥ 2.7 V, 2.5 V ≥ VO ≥ 1.5 V, IO = 1 mA to 75 mA, T_J = 25°C	0.98 × V_O	V_O	1.02 × V_O	V
			3.25V> VI ≥2.7 V, 2.5V≥VO≥1.5 V, IO =1 mA to 75mA	0.97 × V_O	V_O	1.03 × V_O	
			VI ≥ 3.25 V, 5 V ≥ VO ≥ 1.5 V, IO = 1 mA to 100 mA, T_J=25°C	0.98 × V_O	V_O	1.02 × V_O	
			VI ≥ 3.25 V, 5 V ≥ VO ≥ 1.5 V, IO = 1 mA to 100 mA	0.97 × V_O	V_O	1.03 × V_O	
			VI ≥ 3.25 V, 5 V ≥ VO ≥ 1.5 V, IO = 1 mA to 150 mA, T_J = 25°C	0.975 × V_O	V_O	1.025 × V_O	
			VI ≥ 3.25 V, 5 V ≥ VO ≥ 1.5 V, IO = 1 mA to 150 mA	0.9625 × V_O	V_O	1.0375 × V_O	
		HG76316	VI = 2.7 V, 1 mA < IO < 75 mA, T_J = 25°C	1.568	1.6	1.632	
			VI = 2.7 V, 1 mA < IO < 75 mA	1.552	1.6	1.648	
			VI = 3.25 V, 1 mA < IO < 100 mA, T_J = 25°C	1.568	1.6	1.632	
			VI = 3.25 V, 1 mA < IO < 100 mA	1.552	1.6	1.648	
			VI = 3.25 V, 1 mA < IO < 150 mA, T_J = 25°C	1.56	1.6	1.64	
			VI = 3.25 V, 1 mA < IO < 150 mA	1.536	1.6	1.664	
		HG76318	VI = 2.7 V, 1 mA < IO < 75 mA, T_J = 25°C	1.764	1.8	1.836	
			VI = 2.7 V, 1 mA < IO < 75 mA	1.746	1.8	1.854	
			VI = 3.25 V, 1 mA < IO < 100 mA, T_J = 25°C	1.764	1.8	1.836	
			VI = 3.25 V, 1 mA < IO < 100 mA	1.746	1.8	1.854	
			VI = 3.25 V, 1 mA < IO < 150 mA, T_J = 25°C	1.755	1.8	1.845	
			VI = 3.25 V, 1 mA < IO < 150 mA	1.733	1.8	1.867	

Electrical Characteristics (continued)

over recommended operating free-air temperature range, $V_I = V_{O(typ)} + 1V$, $I_O = 1mA$, EN = IN, and $C_O = 4.7μF$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_O	Output voltage (continued)	HG76325	I_O = 1 mA to 100 mA, T_J = 25°C	2.45	2.5	2.55	V
			I_O = 1 mA to 100 mA	2.425	2.5	2.575	
			I_O = 1 mA to 150 mA, T_J = 25°C	2.438	2.5	2.562	
			I_O = 1 mA to 150 mA	2.407	2.5	2.593	
		HG76327	I_O = 1 mA to 100 mA, T_J = 25°C	2.646	2.7	2.754	
			I_O = 1 mA to 100 mA	2.619	2.7	2.781	
			I_O = 1 mA to 150 mA, T_J = 25°C	2.632	2.7	2.767	
			I_O = 1 mA to 150 mA	2.599	2.7	2.801	
		HG76328	I_O = 1 mA to 100 mA, T_J = 25°C	2.744	2.8	2.856	
			I_O = 1 mA to 100 mA	2.716	2.8	2.884	
			I_O = 1 mA to 150 mA, T_J = 25°C	2.73	2.8	2.87	
			I_O = 1 mA to 150 mA	2.695	2.8	2.905	
		HG76330	I_O = 1 mA to 100 mA, T_J = 25°C	2.94	3	3.06	
			I_O = 1 mA to 100 mA	2.91	3	3.09	
			I_O = 1 mA to 150 mA, T_J = 25°C	2.925	3	3.075	
			I_O = 1 mA to 150 mA	2.888	3	3.112	
		HG76333	I_O = 1 mA to 100 mA, T_J = 25°C	3.234	3.3	3.366	
			I_O = 1 mA to 100 mA	3.201	3.3	3.399	
			I_O = 1 mA to 150 mA, T_J = 25°C	3.218	3.3	3.382	
			I_O = 1 mA to 150 mA	3.177	3.3	3.423	
		HG76338	I_O = 1 mA to 100 mA, T_J = 25°C	3.724	3.8	3.876	
			I_O = 1 mA to 100 mA	3.705	3.8	3.895	
			I_O = 1 mA to 150 mA, T_J = 25°C	3.686	3.8	3.914	
			I_O = 1 mA to 150 mA	3.667	3.8	3.933	
		HG76350	I_O = 1 mA to 100 mA, T_J = 25°C	4.875	5	5.125	
			I_O = 1 mA to 100 mA	4.825	5	5.175	
			I_O = 1 mA to 150 mA, T_J = 25°C	4.85	5	5.15	
			I_O = 1 mA to 150 mA	4.8	5	5.2	
$I_{(Q)}$	Quiescent current (GND pin current)	I_O = 1 mA to 150 mA, TJ = 25°C(1)			85	100	μA
		I_O = 1 mA to 150 mA(2)				140	
	Standby current	EN < 0.5 V, TJ = 25°C			0.5	1	μA
		EN < 0.5 V				2	
Vn	Output noise voltage	BW=300 Hz to 50 kHz,TJ = 25°C, CO=10 μF(2)			140		μV
PSRR	Ripple rejection	f = 1 kHz, CO = 10 μF, TJ = 25°C(2)			60		dB
	Current limit	TJ = 25°C(3)		0.5	0.8	1.5	A
	Output voltage line regulation (ΔVO/VO)(3)	V_O + 1 V < VI ≤ 10 V, VI ≥ 3.5 V, TJ = 25°C			0.04%	0.07%	V
		V_O + 1 V < VI ≤ 10 V, VI ≥ 3.5 V				0.1%	
V_{IH}	EN high level input(2)				1.4	2	V
V_{IL}	EN low level input(2)			0.5	1.2		V

(1) Minimum IN operating voltage is 2.7 V or $V_{O(typ)}$ + 1 V, whichever is greater.

(2) Test conditions includes output voltage V_O = 0 V (for variable device FB is shorted to V_O), and pulse duration = 10 mS

(3) If VO < 2.5 V and V_{Imax} = 10 V, V_{Imin} = 3.5 V: $\text{Line Reg.(mV)} = (\%/V) \times \frac{VO(Vimax - 3.5V)}{100} \times 1000$

If VO < 2.5 V and V_{Imax} = 10 V, V_{Imin} = VO+1V: $\text{Line Reg.(mV)} = (\%/V) \times \frac{VO(Vimax - (VO+1))}{100} \times 1000$

Electrical Characteristics (continued)

over recommended operating free-air temperature range, $V_I = V_{O(typ)} + 1$ V, $I_O = 1$ mA, EN = IN, and $C_O = 4.7$ μF (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
II	EN input current	EN = 0 V			-0.01	-0.5	μA
		EN = IN			-0.01	-0.5	
VDO	Dropout voltage	HG76325	I_O = 0 mA, T_J = 25°C		0.2		mV
			I_O = 1 mA, T_J = 25°C		3		
			I_O = 50 mA, T_J = 25°C		120	150	
			I_O = 50 mA			200	
			I_O = 75 mA, T_J = 25°C		180	225	
			I_O = 75 mA			300	
			I_O = 100 mA, T_J = 25°C		240	300	
			I_O = 100 mA			400	
			I_O = 150 mA, T_J = 25°C		360	450	
			I_O = 150 mA			600	
		HG76333	I_O = 0 mA, T_J = 25°C		0.2		
			I_O = 1 mA, T_J = 25°C		3		
			I_O = 50 mA, T_J = 25°C		100	125	
			I_O = 50 mA			166	
			I_O = 75 mA, T_J = 25°C		150	188	
			I_O = 75 mA			250	
			I_O = 100 mA, T_J = 25°C		200	250	
			I_O = 100 mA			333	
			I_O = 150 mA, T_J = 25°C		300	375	
			I_O = 150 mA			500	
		HG76350	I_O = 0 mA, T_J = 25°C		0.2		
			I_O = 1 mA, T_J = 25°C		2		
			I_O = 50 mA, T_J = 25°C		60	75	
			I_O = 50 mA			100	
			I_O = 75 mA, T_J = 25°C		90	113	
			I_O = 75 mA			150	
			I_O = 100 mA, T_J = 25°C		120	150	
			I_O = 100 mA			220	
			I_O = 150 mA, T_J = 25°C		180	225	
			I_O = 150 mA			300	

Typical Characteristics

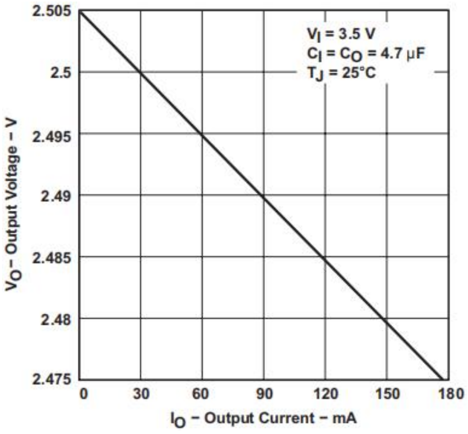


Figure 1. HG76325 Output Voltage vs Output Current

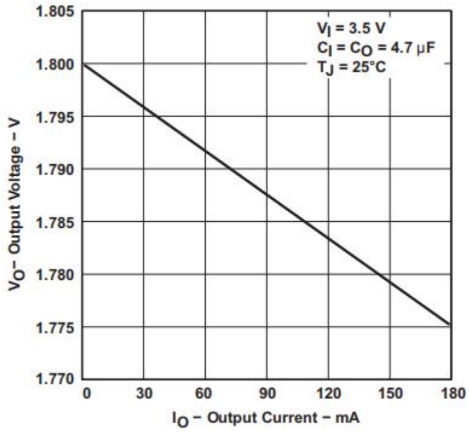


Figure 2. HG76318 Output Voltage vs Output Current

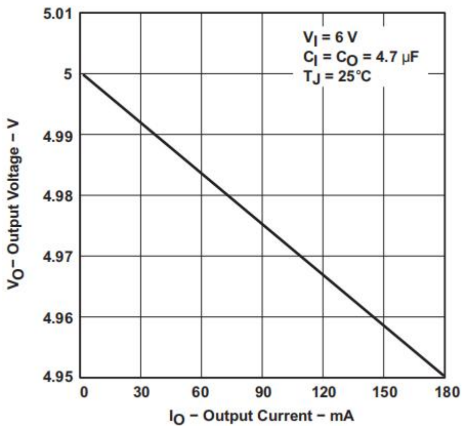


Figure 3. HG76350 Output Voltage vs Output Current

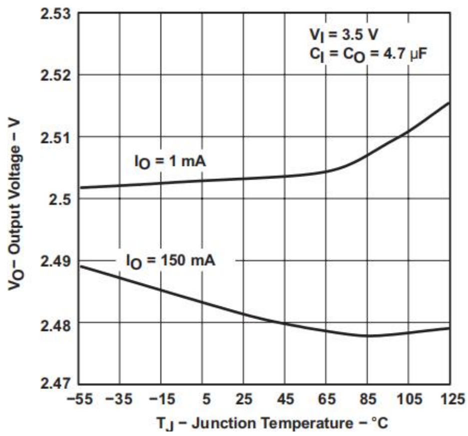


Figure 4. HG76325 Output Voltage vs Output Current

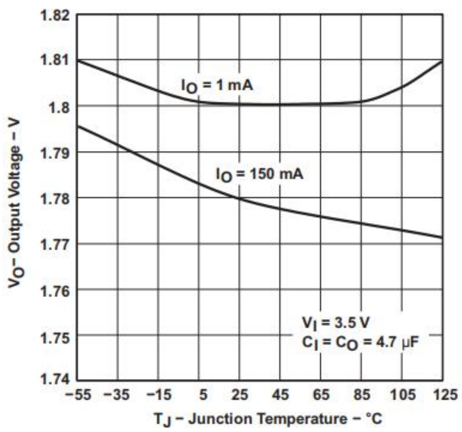


Figure 5. HG76318 Output Voltage vs Free-Air Temperature

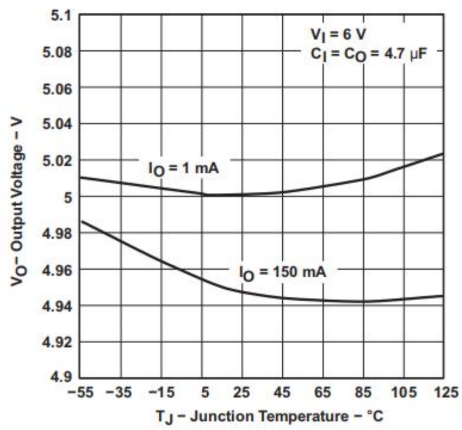


Figure 6. HG76350 Output Voltage vs Free-Air Temperature

Typical Characteristics(continued)

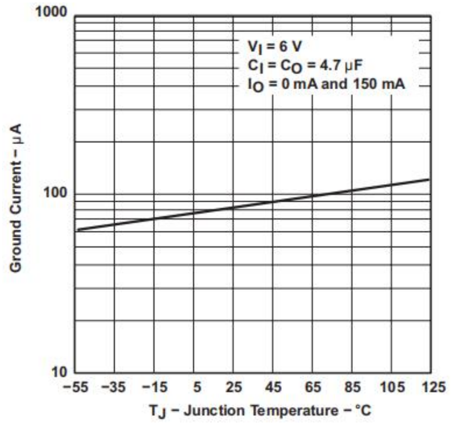


Figure 7. HG76350 Ground Current vs Free-Air Temperature

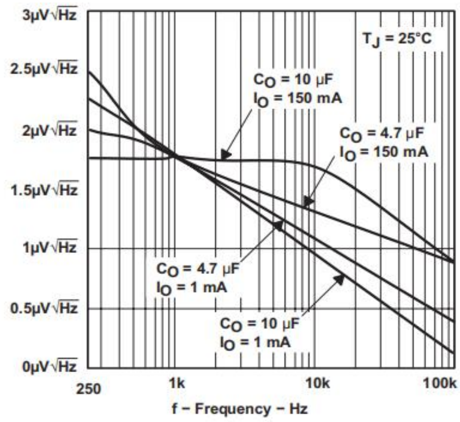


Figure 8. Output Noise vs Frequency

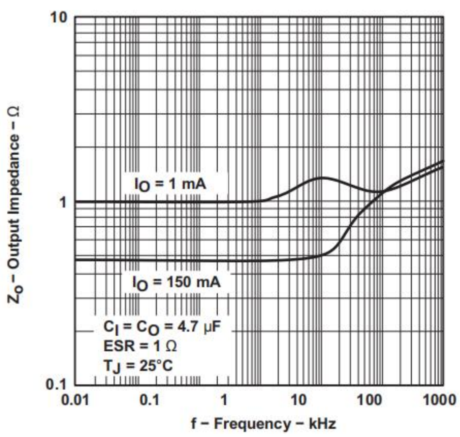


Figure 9. Output Impedance vs Frequency

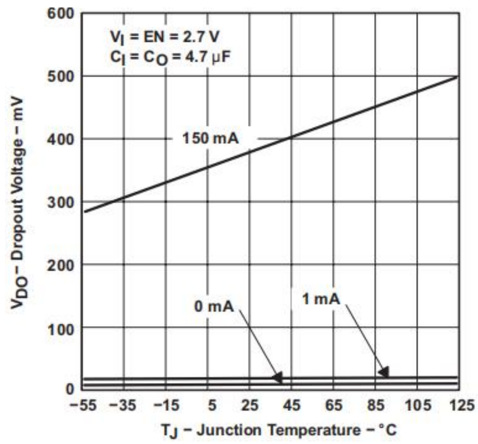


Figure 10. HG76325 Dropout Voltage vs Free-Air Temperature

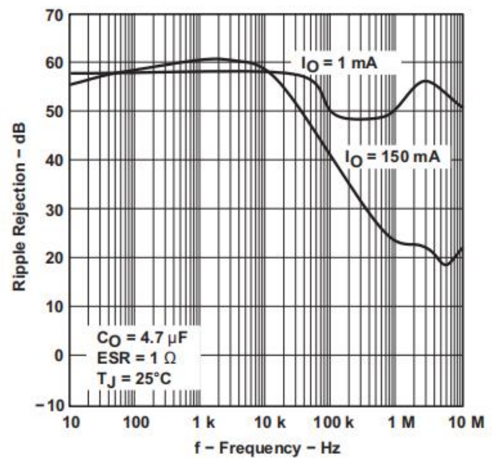


Figure 11. HG76325 Ripple Rejection vs Frequency

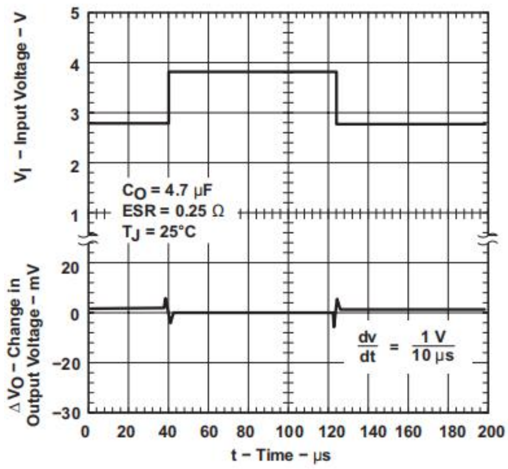


Figure 12. HG76318 Line Transient Response

Typical Characteristics(continued)

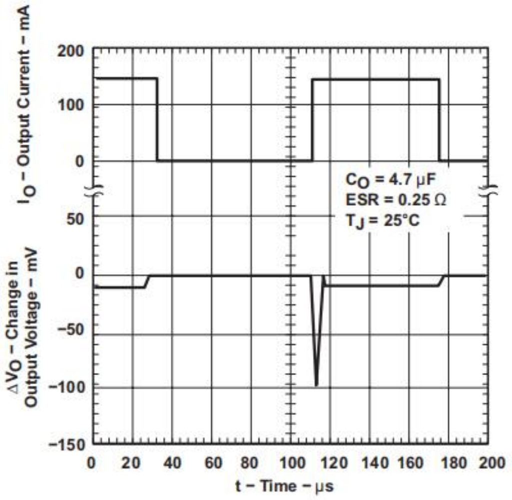


Figure 13. HG76318 Load Transient Response

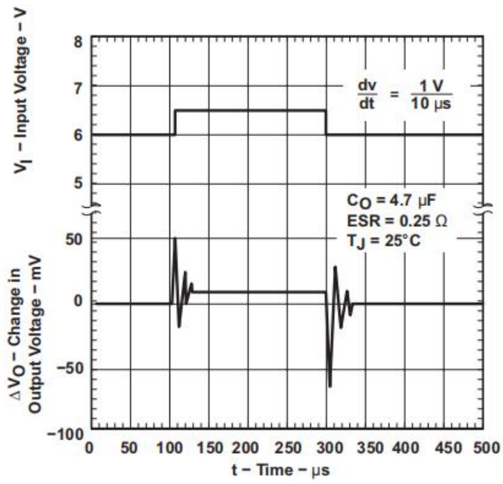


Figure 14. HG76350 Line Transient Response

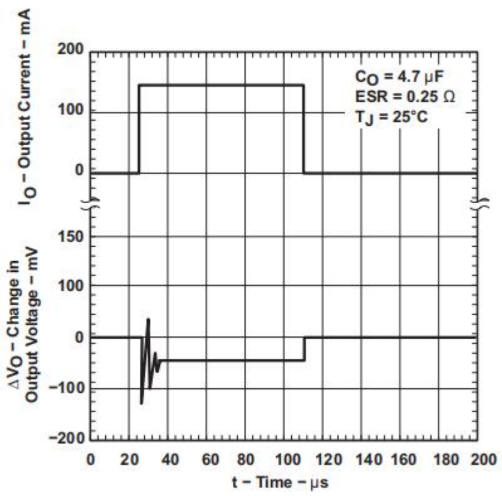


Figure 15. HG76350 Load Transient Response

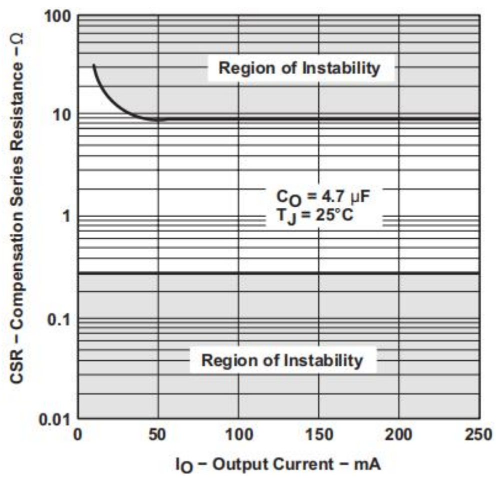


Figure 16. Compensation Series Resistance (CSR) vs Output Current

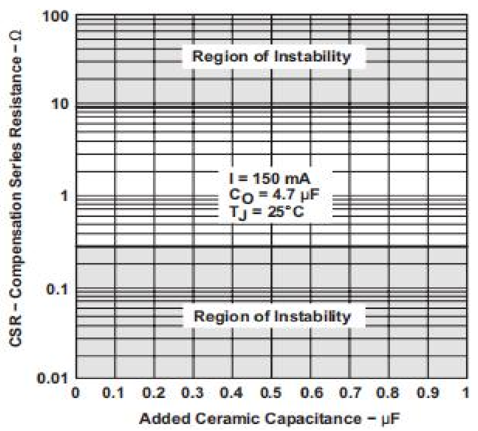


Figure 17. Compensation Series Resistance (CSR) vs Added Ceramic Capacitance

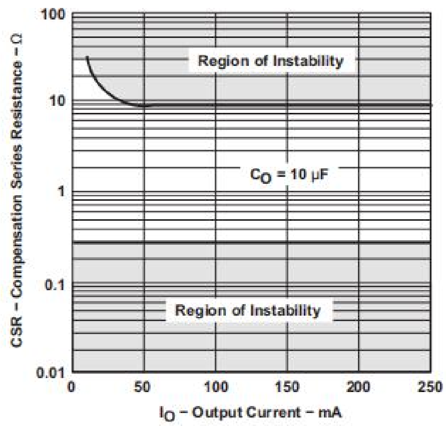


Figure 18. Compensation Series Resistance (CSR) vs Output Current

Typical Characteristics(continued)

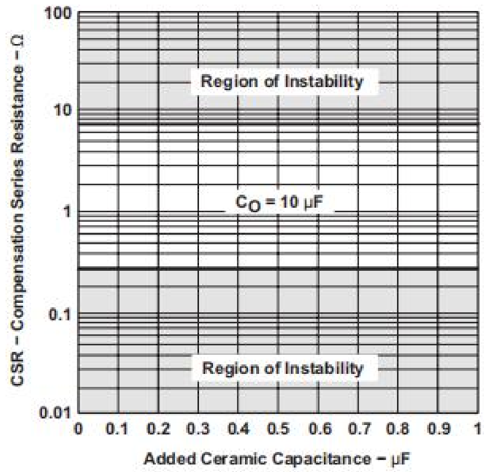


Figure 19. Compensation Series Resistance (CSR) vs Added Ceramic Capacitance

Detailed Description

Overview

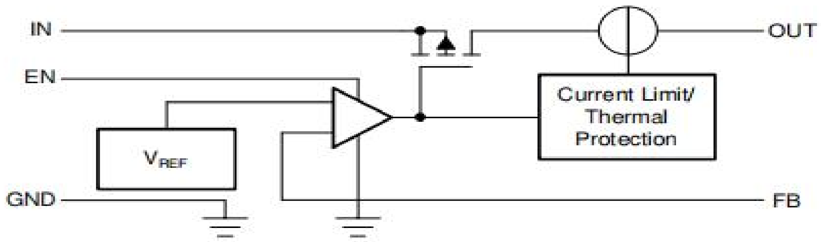
The HG763xx devices uses a PMOS pass element to dramatically reduce both dropout voltage and supply current over more conventional PNP pass element LDO designs. The PMOS pass element is a voltagecontrolled device that, unlike a PNP transistor, does not require increased drive current as output current increases. Supply current in the HG763xx is essentially constant from no-load to maximum load.

Current limiting and thermal protection prevent damage by excessive output current and/or power dissipation. The device switches into a constant-current mode at approximately 1 A; further load reduces the output voltage instead of increasing the output current. The thermal protection shuts the regulator off if the junction temperature rises above 165°C. Recovery is automatic when the junction temperature drops approximately 25°C below the high temperature trip point. The PMOS pass element includes a back diode that safely conducts reverse current when the input voltage level drops below the output voltage level.

A logic low on the enable input, EN shuts off the output and reduces the supply current to less than 2 μA. EN must be tied high in applications where the shutdown feature is not used.

Functional Block Diagram

HG76301



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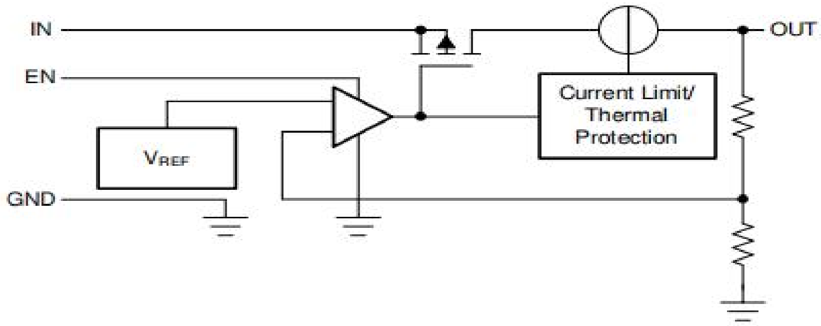


Feature Description

Regulator Protection

The HG763xx features internal current limiting and thermal protection. During normal operation, the HG763xx limits output current to approximately 800 mA. When current limiting engages, the output voltage scales back linearly until the over current condition ends. While current limiting is designed to prevent gross device failure, take care not to exceed the power dissipation ratings of the package. If the temperature of the device exceeds 165°C, thermal-protection circuitry shuts it down. Once the device has cooled down to below 140°C, regulator operation resumes.

Enable

The enable signal (V_{EN}) is an active-high digital control that enables the LDO when the enable voltage is past the rising threshold ($V_{EN} \geq V_{IH(EN))}$ and disables the LDO when the enable voltage is below the falling threshold ($V_{EN} \leq V_{IL(EN))}$. The exact enable threshold is between VIH(EN) and $V_{IL(EN)}$ because EN is a digital control. In applications that do not use the enable control, connect EN to V_{IN}.

Device Functional Modes

Table 1 provides a quick comparison between the regulation and disabled operation.

Table 1. Device Functional Modes Comparison

OPERATING MODE	PARAMETER			
	V_{IN}	EN	I_{OUT}	T_J
Regulation(1)	$V_{IN} > V_{OUT(nom)} + V_{DO}$	$V_{EN} > V_{IH(EN)}$	$I_{OUT} < I_{CL}$	$T_J < T_{sd}$
Disabled(2)	—	$V_{EN} < V_{IL(EN)}$	—	$T_J > T_{sd}$

(1) All table conditions must be met.

(2) The device is disabled when any condition is met.

Regulation

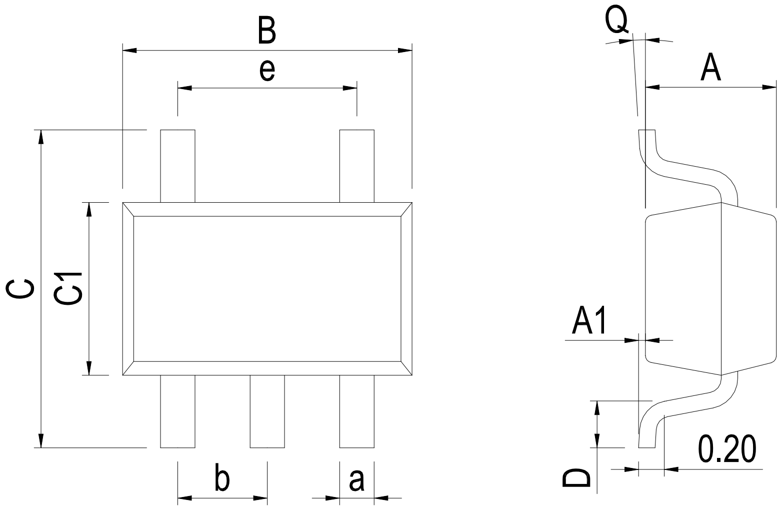
The device regulates the output to the targeted output voltage when all the conditions in Table 1 are met.

Disabled

When disabled, the pass device is turned off, the internal circuits are shutdown.

Physical Dimensions

SOT-23-5



Dimensions In Millimeters(SOT-23-5)										
Symbol:	A	A1	B	C	C1	D	Q	a	b	e
Min:	1.05	0.00	2.82	2.65	1.50	0.30	0°	0.30	0.95 BSC	1.90 BSC
Max:	1.15	0.15	3.02	2.95	1.70	0.60	8°	0.40		

Revision History

DATE	REVISION	PAGE
2014-6-8	New	1-15
2023-9-11	Update encapsulation type 、 Update Lead Temperature 、 Add annotation for Maximum Ratings.	1、3

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