400mA Output Voltage Adjustable High Speed LDO Regulators HM6225 Series

General Description

The HM6225 series are highly accurate, low noise, LDO Voltage Regulators .The output voltage can be set via the external resistor. On chip trimming adjusts the reference/output voltage to within ±2% accuracy. Internal protection features consist of output current limiting, safe operating area compensation, and thermal shutdown. The current limiter's feedback circuit also operates as a short protect for the output current limiter and the output pin. The CE function allows the output of regulator to be turned off, resulting in greatly reduced power consumption. The HM6225 series can operate with up to 18V input.

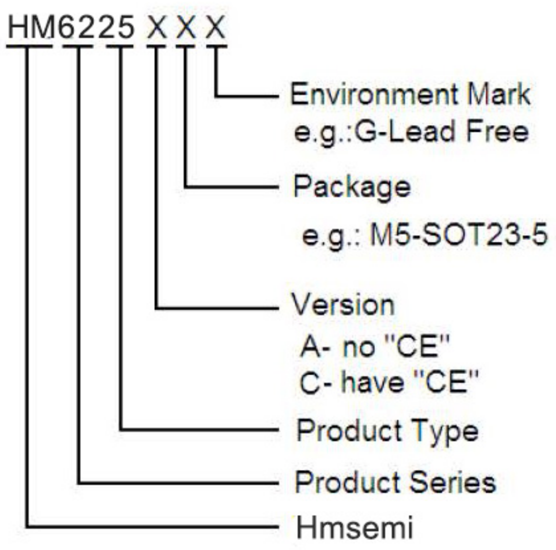
Features

- Maximum Output Current: 400mA
- Voltage Setting via External Resistor:1.25V~8V
- Dropout Voltage:125mV@ I_{OUT} =100mA (Vout=3.3V)
- Operating Voltage Range: 2.8V～18V
- Highly Accuracy: ±2％
- Standby Current: 45uA（TYP.）
- Line Regulation: 30mV（TYP.）
- Temperature Stability≤0.5%
- Thermal Shutdown Protection：165℃
- Packages:SOT23-5

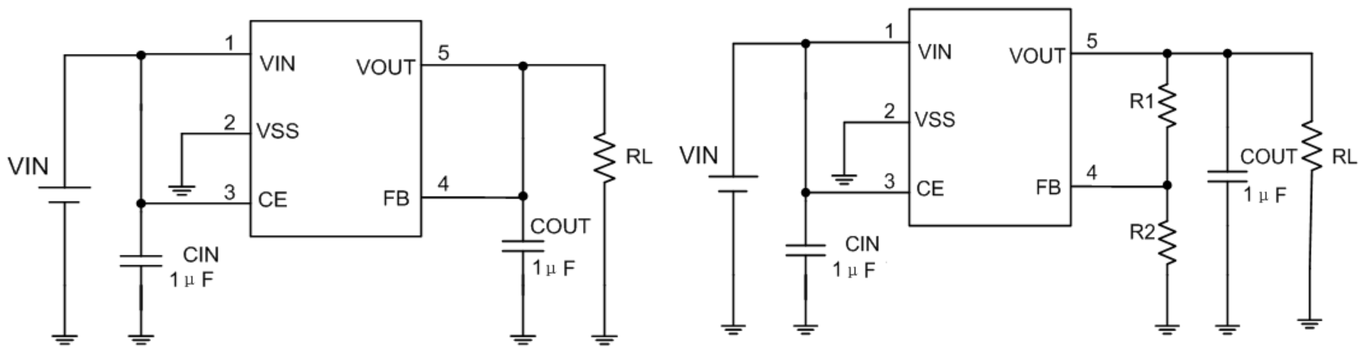
Typical Application

- Consumer and Industrial Equipment Point of Regulation
- Switching Power Supply Post Regulation
- Hard Drive Controllers
- Battery Chargers

Selection Guide



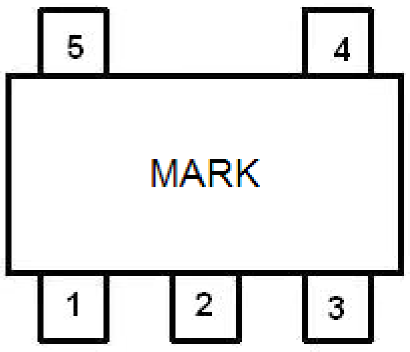
Typical Application Circuit



1. $V_{OUT} = 1.25V$

2. $V_{OUT} = 1.25 \times \left(1 + \frac{R_1}{R_2}\right)$

Pin Configuration



SOT23-5

Pin Assignment

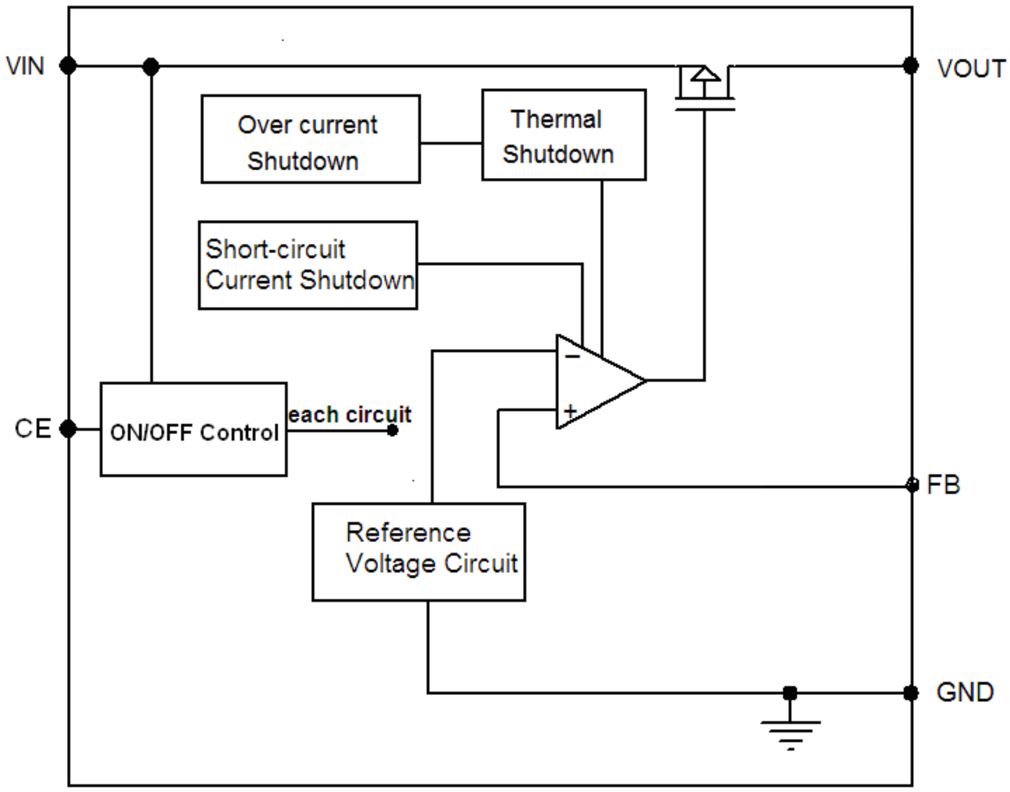
HM6225

Pin Number	Pin Name	Functions
SOT23-5		
1	V_{IN}	Power Input
2	V_{SS}	Ground
3	CE	ON / OFF Control
4	FB	Adjust Output
5	V_{OUT}	Output

Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	18	V
Output Current		I_{OUT}	500	mA
Output Voltage		V_{OUT}	Vss-0.3～V_{IN} +0.3	V
CE Pin Voltage		V_{CE}	Vss-0.3～V_{IN} +0.3	V
FB Pin Voltage		V_{FB}	Vss-0.3～V_{IN} +0.3	V
Power Dissipation	SOT23-5	P_D	300	mW
Operating Temperature Range		T_{OPR}	－40～＋125	℃
Storage Temperature Range		T_{STG}	－40～＋150	℃
Lead Temperature			260℃，4sec	

Block Diagram



Electrical Characteristics

HM6225

(V_{IN}= Vout+1，V_{CE}＝V_{IN} ，V_{OUT}=V_{FB}, C_{IN}=C_{OUT}=1uF，Ta=25^{O}C，unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=30mA,	X 0.98	V_{OUT} (T) (Note 1)	X 1.02	V
Output Voltage Range	V_{ROUT}	V_{IN}= V_{OUT}(T)+1V，V_{CE}＝V_{IN} Using test circuit 2	1.25		8	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1V（Note1）		400	550	mA
Load Regulation	ΔV_{OUT}	1mA≤I_{OUT}≤100mA		4	10	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA		125	140	mV
	V_{DIF2}	I_{OUT} =200mA		250	270	mV
Supply Current	I_{SS}	V_{IN}= 3V, V_{CE}＝V_{IN}		45	60	μA
Stand-by Current	I_{CEL}	V_{IN}= 3V,V_{CE}＝0V		0	1	μA
Line Regulation (Note 1)	ΔV_{OUT}	I_{OUT} =30mA Vout+1V ≤V_{IN}≤18V		4	15	mV
CE “High” Voltage	VCEH	RL=1.0KΩ	1.3		18	V
CE “Low” Voltage	VCEL	RL=1.0KΩ	0		0.7	V
CE “High” Current	ISH	VCE=7V	-0.1		0.1	μA
CE “Low” Current	ISL	VCE=0V	-0.1		0.1	μA
Short-circuit Current	I_{SHORT}	V_{OUT}＝0V		70		mA
Thermal Shutdown Protection	T_{sd}	I_{OUT}=1mA,		165		℃
Over Current Protection	I_{limit}			600		mA

Note ：

1. V_{OUT} (T) ： Output Voltage less than 1.8V, the input Voltage should be 2.8V at least, and the others fulfil the rule of Vin=Vout+1.

2.V_{OUT} (E) ： Effective Output Voltage (Ie. The output voltage when “V_{OUT} (T)+1.0V”is provided at the Vin pin while maintaining a certain I_{OUT} value.)

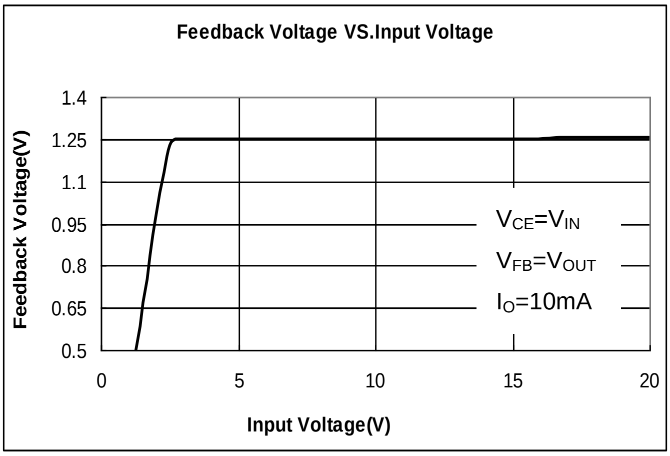
3.V_{DIF}：V_{IN1} –V_{OUT} (E)’

V_{IN1} ： The input voltage when V_{OUT}(E)’ appears as input voltage is gradually decreased.

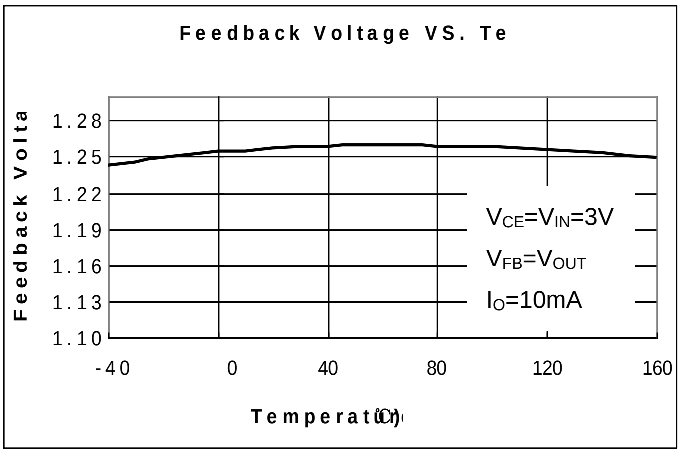
V_{OUT} (E)’=A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} {V_{OUT} (T)+1.0V} is input.

Type Characteristics

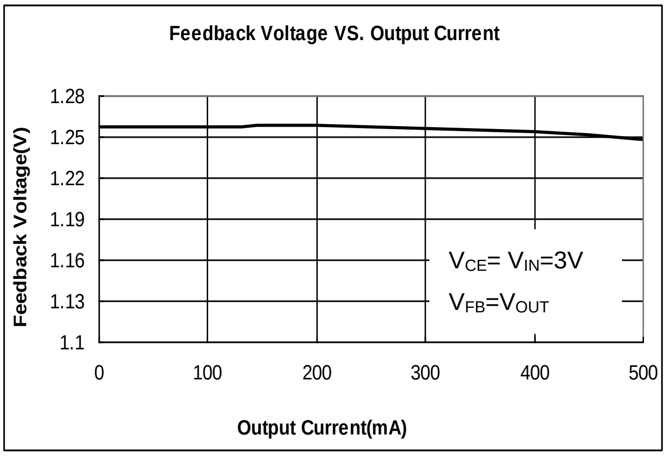
(1) Feedback Voltage VS. Input Voltage



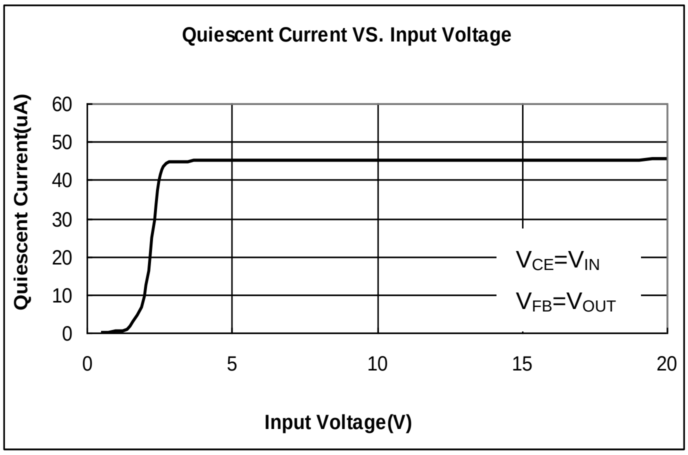
(2) Feedback Voltage VS. Temperature



(3) Feedback Voltage VS. Output Current

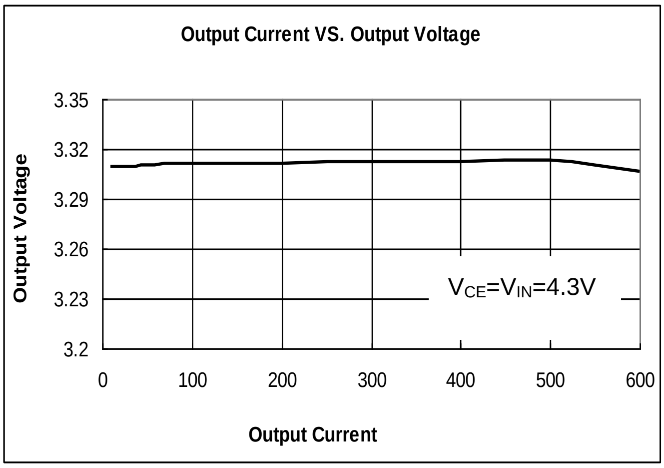


(4) Quiescent Current VS. Input Voltage



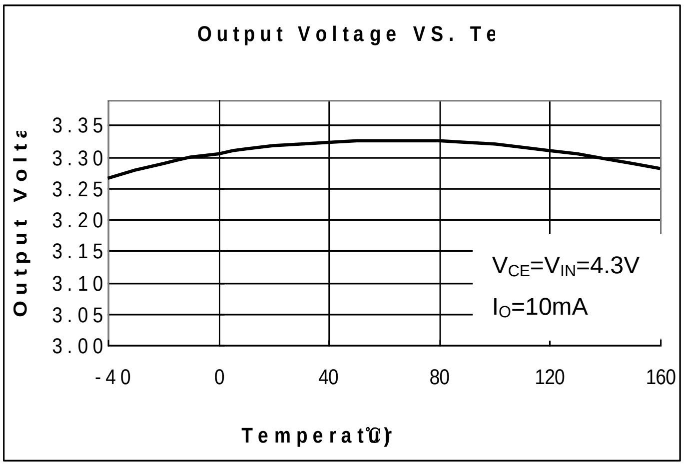
(5)Output Voltage VS. Output Current

（VIN=V_{OUT}+1V, V_{OUT}=3.3V）

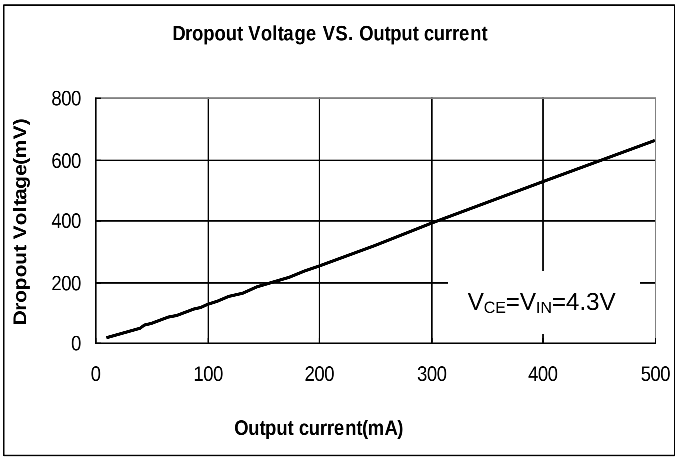


(6) Output Voltage VS. Temperature

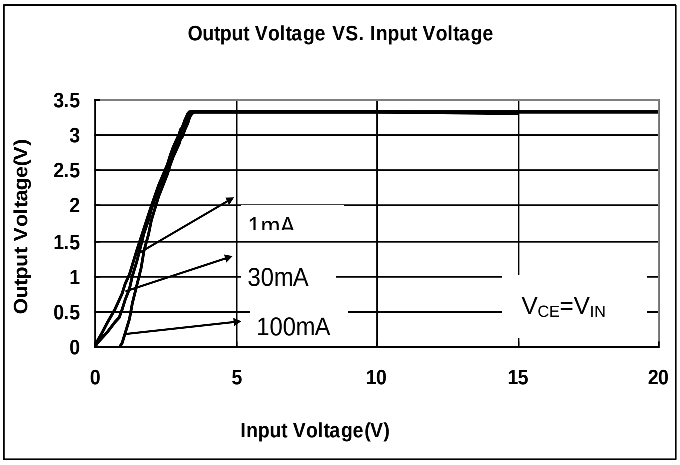
（VIN=V_{OUT}+1V , V_{OUT}=3.3V, I_{OUT}=10mA）



(7)Dropout Voltage VS. Output Current
（$V_{IN}=V_{OUT}+1V, V_{OUT}=3.3V$）



（8）Output Voltage VS. Input Voltage
（$V_{OUT}=3.3V$）



Applications Information

1. Setting the Output Voltage

HM6225 series output voltage can be set via a external resistor. AS the internal reference is 1.25V (Typical), the external voltage can optionally set between 1.25V and 8.2V by connecting a extra resistor between the Vout and V_{FB} pins and a resistor between the V_{FB} and V_{SS} pins.

The output voltage is calculated as below:

$$V_{OUT} = 1.25 \times \left(1 + \frac{R_1}{R_2}\right)$$

Table 1: Resistor selection for output voltage setting (e.g.)

V_O (V)	R1 (KΩ)	R2 (KΩ)
1.8	53	120
2.5	120	120
3.0	168	120
3.3	197	120
3.6	225	120
5.0	360	120

Caution: The value of R2 is more than 100K in the best.

2. Input Bypass Capacitor

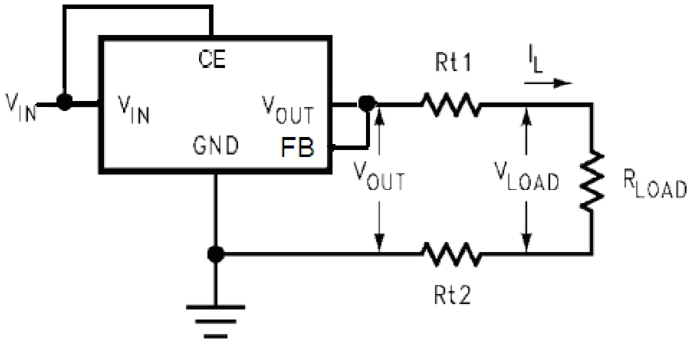
An input capacitor is recommended. A 1uFor more tantalum on the input is a suitable input bypassing for almost all applications.

3. Output Capacitor

The output capacitor is critical in maintaining regulator stability, and must meet the required conditions for both minimum amount of capacitance and ESR (Equivalent Series Resistance).The output capacitance required by the HM6225 is 2.2µF or more, If a tantalum capacitor is used. Any increase of the output capacitance will merely improve the loop stability and transient response. The ESR of the output capacitor should be less than 1Ω .

4. Load Regulation

The HM6225 regulates the voltage that appears between its output and adjust pins. In some cases, line resistances can introduce errors to the voltage across the load. To obtain the best load regulation, a few precautions are needed. Figure 1, shows a typical application. The Rt1 and Rt2 are the line resistances. It is obvious that the V_{LOAD} is less than the V_{OUT} by the sum of the voltage drops along the line resistances. In this case, the load regulation seen at the R_{LOAD} would be degraded from the datasheet specification. To improve this , the load should be tied directly to the output terminal on the positive side and directly tied to the ground terminal on the negative side.

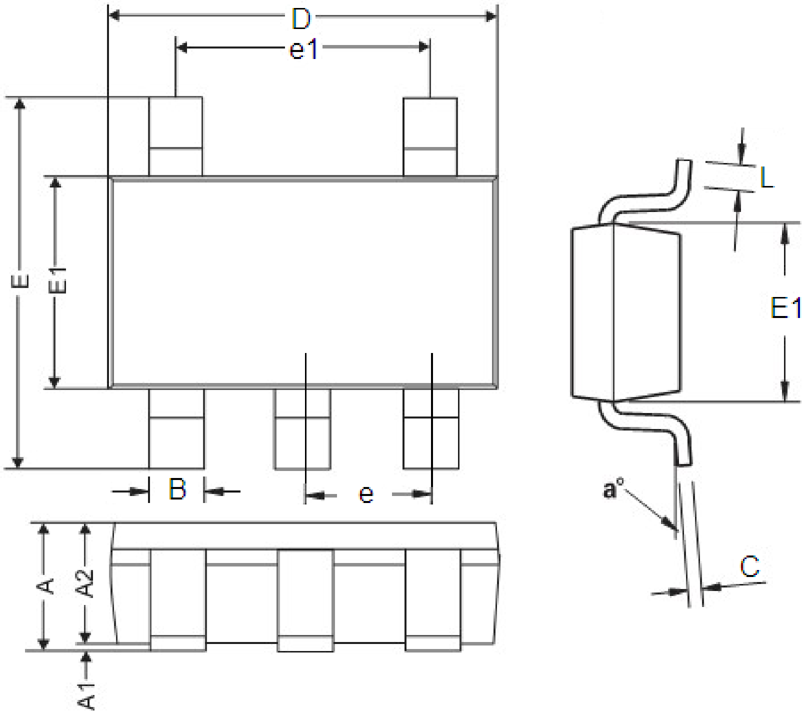


$$V_{LOAD} = V_{OUT} - I_L (Rt1+Rt2)$$

Figure 1. Typical Application

Packaging Information

● SOT23-5 Unit: mm（inch）



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.45	0.0354	0.0570
A1	0	0.15	0	0.0059
A2	0.9	1.3	0.0354	0.0511
B	0.2	0.5	0.0078	0.0196
C	0.09	0.26	0.0035	0.0102
D	2.7	3.10	0.1062	0.1220
E	2.2	3.2	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
e	0.95REF		0.0374REF	
e1	1.90REF		0.0748REF	
L	0.10	0.60	0.0039	0.0236
a^0	0^0	30^0	0^0	30^0