300mA LOW DROPOUT LINEAR REGULATOR WITH SHUTDOWN

FEATURES

- **Low Dropout Voltage of 250mV at 300mA**
- **Guaranteed 300mA Output Current**
- **Very Low Quiescent Current at 30μA**
- **±2% Output Voltage Accuracy**
- **Needs Only 1μF Capacitor for Stability**
- **Thermal Shutdown Protection**
- **Current Limit Protection**
- **Active Low Shutdown Control**
- **Low-ESR Ceramic Capacitor for Output Stability.**
- **Tiny Package: SOT-23-5L & TSOT-23-5L**
- **RoHS Compliant & Halogen Free**

APPLICATIONS

- **DSC**
- **Wireless Devices**
- **LCD Modules**
- **Battery Power Systems**
- **Card Readers**
- **PDA**

DESCRIPTIOON

The JTMA8800A is a low dropout, positive linear regulator with very low quiescent current. The JTMA8800A can supply 300mA output current with low dropout voltage at about 250mV. The BP pin with a 10nF bypass capacitor can help reduce the output noise level. The shutdown function can provide remote control for the external signal to decide the on/off state of JTMA8800A. With a logic high level at $\overline{SHDN}$ pin, the device is in the on state, and vice versa.

The JTMA8800A regulator is able to operate with output capacitors as small as 1 μ F for stability. Other than the current limit protection, JTMA8800A also offers the on chip thermal shutdown feature providing protection against overload or any condition when the ambient temperature exceeds the maximum junction temperature.

The JTMA8800A offers high precision output voltage of ±2%. It is available in fixed output voltages including 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.1V, 3.3V, 3.6V, 4.5V and 5.0V. The JTMA8800A is housed in low-profile, space-saving SOT-23-5L & TSOT-23-5L package.

TYPICAL APPLICATION

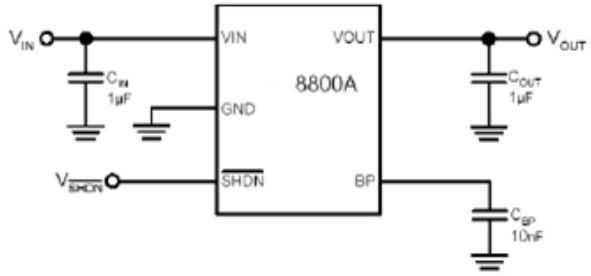


Figure 1. Typical Application Circuit of JTMA8800A

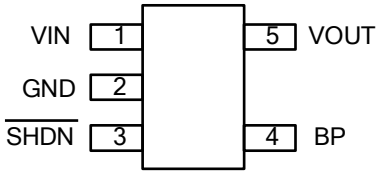
Note：To prevent oscillation, it is recommended to use minimum 1μF X7R or X5R dielectric capacitors if ceramics are used as input/output capacitors.

ORDERING / PACKAGE INFORMATION

JTMA8800A - X X X

- **P: Pb Free with Commercial Standard (RoHS Compliant)**
- **Output Voltage**
  - **12 : 1.2V**
  - **15 : 1.5V**
  - **18 : 1.8V**
  - **25 : 2.5V**
  - **28 : 2.8V**
  - **30 : 3.0V**
  - **31 : 3.1V**
  - **33 : 3.3V**
  - **36 : 3.6V**
  - **45 : 4.5V**
  - **50 : 5.0V**
- **Package Type**
  - **Y5 : SOT-23-5L**
  - **TY5 :TSOT-23-5L**

(Top View)



SOT-23-5L (Y5)
TSOT-23-5L (TY5)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (V_{IN}) ---------- 6V

Power Dissipation ---------- 0.4W

Storage Temperature Range (T_{stg}) ---------- -65°C To 150°C

Maximum Junction Temperature (T_J) ---------- 150°C

Lead Temperature (Soldering, 10sec, T_{LEAD}) ------- 260°C

Thermal Resistance Junction to Ambient (Rth_{ja}) 250°C/W

Note：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

RECOMMENDED OPERATING CONDITIONS

Input Voltage (V_{IN}) ---------- 2.8 to 5.5V

Operating Junction Temperature Range (T_J) ------- -40 to 125°C

Ambient Temperature (T_A) ---------- -40 to 85°C

ELECTRICAL SPECIFICATIONS

(V_{IN}=V_{OUT}+1V or V_{IN}=2.8V whichever is greater, $\overline{SHDN}$ pin connected to V_{IN} , C_{IN}=1μF, C_{OUT}=1μF, T_A=25 °C, unless otherwise specified)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Output Voltage Accuracy	ΔV_{OUT}	I_O=1mA	-2	-	2	%
Current Limit	I_{LIMIT}	R_{Load}=1Ω	300	-	-	mA
Quiescent Current	I_Q	I_O= 0mA	-	30	55	μA
Standby Current	I_{STBY}	VIN=2.8 ~ 5V, Output Off	-	-	1.5	μA
Dropout Voltage (Note 1)	V_{DROP}	I_O=300mA, 1.2V ≦ V_{OUT} ≦ 2.0V	-	1100	-	mV
		I_O=300mA, 2.0V < V_{OUT} ≦ 2.8V	-	350	-	
		I_O=300mA, 2.8V < V_{OUT} ≦ 4.5V	-	250	-	
Line Regulation	ΔV_{LINE}	I_O=1mA, V_{IN}=V_{OUT} +1V or 5V	-	1	5	mV
Load Regulation (Note 2)	ΔV_{LOAD}	I_O=0mA to 300mA	-	6	20	mV
Ripple Rejection	PSRR	V_{IN}=V_{OUT}+1V C_{OUT}=1uF, f_{RIPPLE} = 120Hz	-	60	-	dB
Output Noise	Δn	C_{BP}=10nF, f=1KHz, V_{IN}=5V	-	0.4	-	uV/√Hz
Temperature Coefficient	TC	I_{OUT} = 1mA, V_{IN} = 5V	-	50	-	ppm/°C
Thermal Shutdown Temperature	TSD		-	160	-	°C
Thermal Shutdown Hysteresis	ΔTSD		-	25	-	°C
Shutdown Pin Current	$I_{\overline{SHDN}}$		-	-	0.1	μA
Noise Bypass Terminal Voltage	V_{REF}		-	1.2	-	V
Shutdown Pin Voltage (ON)	$V_{\overline{SHDN}(ON)}$		1.4	-	-	V
Shutdown Pin Voltage (OFF)	$V_{\overline{SHDN}(OFF)}$		-	-	0.4	V
Shutdown Exit Delay Time	ΔT	C_{BP}=10nF, C_{OUT}=1uF, I_O=30mA	-	300	-	μs

Note 1：The dropout voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} drop about 100mV.

Note 2：Regulation is measured at a constant junction temperature by using 40ms current pulse and load regulation in the load range from 0mA to 300mA.

PIN DESCRIPTIONS

PIN SYMBOL	PIN DESCRIPTION
VIN	Power is supplied to this device from this pin which is required an input filter capacitor. In general, the input capacitor in the range of 1μF to 10μF is sufficient.
VOUT	The output supplies power to loads. The output capacitor is required to prevent output voltage from oscillation. The JTMA8800A is stable with an output capacitor 1μF or greater. The larger output capacitor will be required for application with larger load transients. The large output capacitor could reduce output noise, improve stability, and PSRR.
GND	Common ground pin
BP	Reference Noise Bypass , the Bypass Capacitor ≥ 1nF
$\overline{SHDN}$	Chip Enable (Active High)

BLOCK DIAGRAM

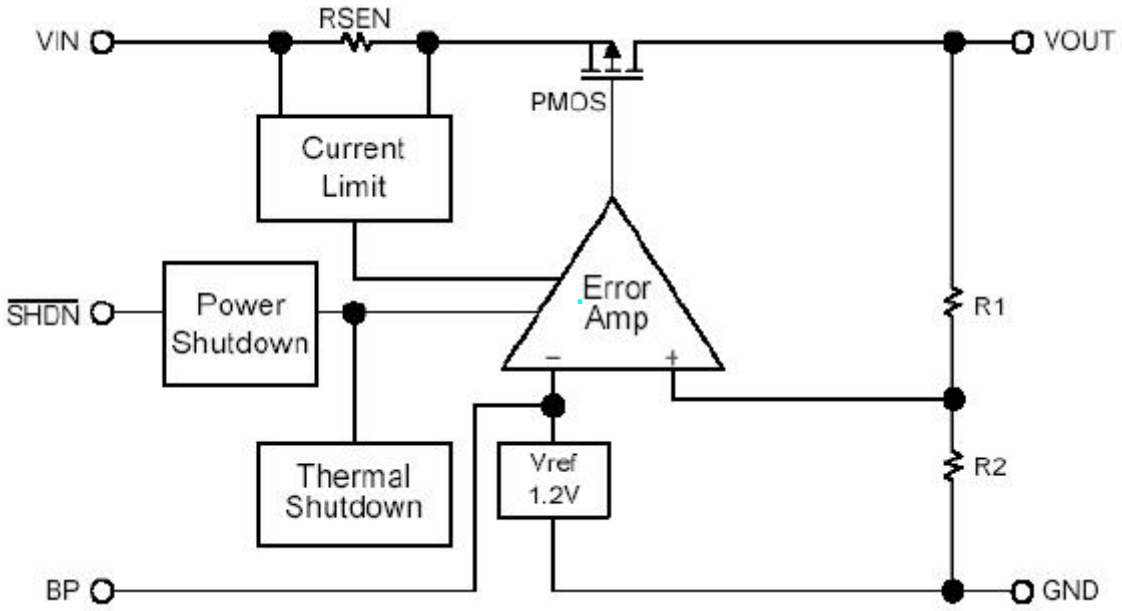


Figure 2. Block Diagram of JTMA8800A

APPLICATION INFORMATIO

The JTMA8800A is a low dropout linear regulator that could provide 300mA output current at dropout voltage about 250mV. Current limit and on chip thermal shutdown features provide protection against any combination of overload or ambient temperature that could exceed maximum junction temperature

Output & Input Capacitor

The JTMA8800A regulator is designed to be stable with a wide range of output capacitors. The ESR of the output capacitor affects stability. Larger value of the output capacitor decreases the peak deviations and improves transient response for larger current changes.

The capacitor types (aluminum, ceramic, and tantalum) have different characterizations such as temperature and voltage coefficients. All ceramic capacitors are manufactured with a variety of dielectrics, each with different behavior across temperature and applications. Common dielectrics used are X5R, X7R and Y5V. It is recommended to use 1uF to 10uF X5R or X7R dielectric ceramic capacitors with 30m Ω to 50m Ω ESR range between device outputs and ground for stability. The JTMA8800A is designed to be stable with low ESR ceramic capacitors and higher values of capacitors and ESR could improve output stability. The ESR of output capacitor is very important because it generates a zero to provide phase lead for loop stability.

There are no requirements for the ESR on the input capacitor, but its voltage and temperature coefficient have to be considered for device application environment.

Protection Features

In order to prevent overloading or thermal condition from damaging the device, JTMA8800A has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

Thermal Consideration

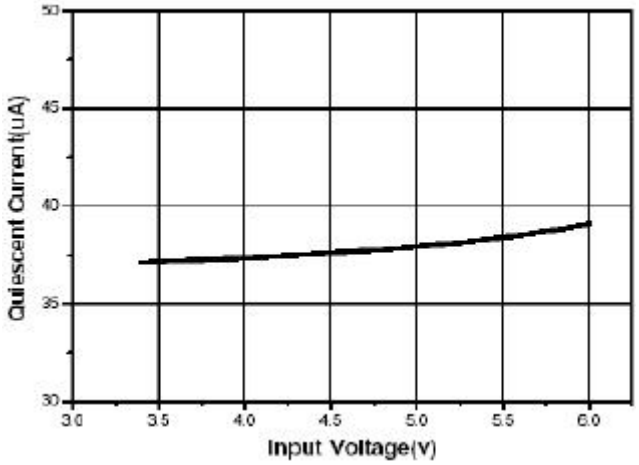
The power handling capability of the device will be limited by maximum operation junction temperature. The power dissipated by the device will be estimated by $P_D = I_{OUT} \times (V_{IN}-V_{OUT})$. The power dissipation should be lower than the maximum power dissipation listed in “Absolute Maximum Ratings” section.

Shutdown Operation

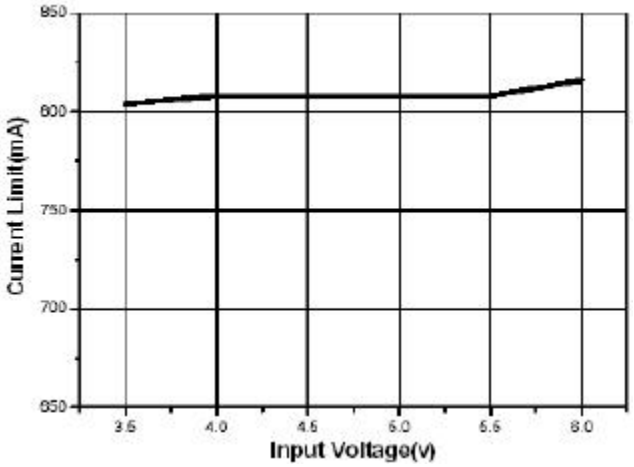
The JTMA8800A is shutdown by pulling the $\overline{SHDN}$ input low, and turned on by driving the $\overline{SHDN}$ high. If this function is not used, the $\overline{SHDN}$ input should be tied to V_{IN} to keep the regulator on at all times (the $\overline{SHDN}$ must not be left floating).

TYPICAL PERFORMANCE CHARACTERISTICS

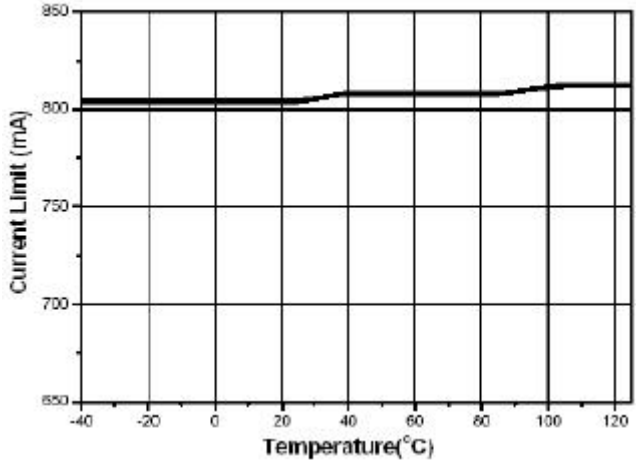
Quiescent Current vs. Input Voltage



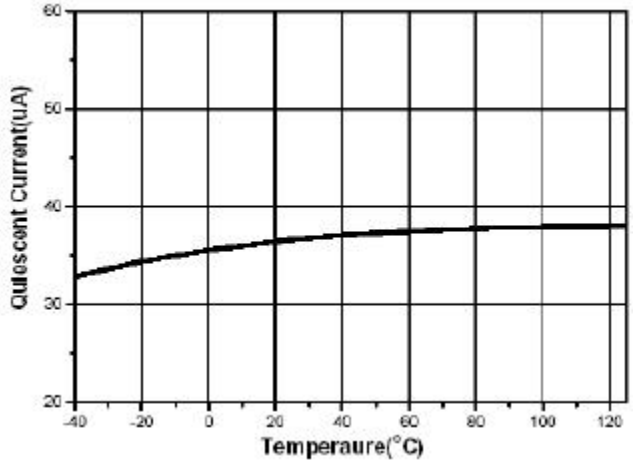
Current Limit vs. Input Voltage



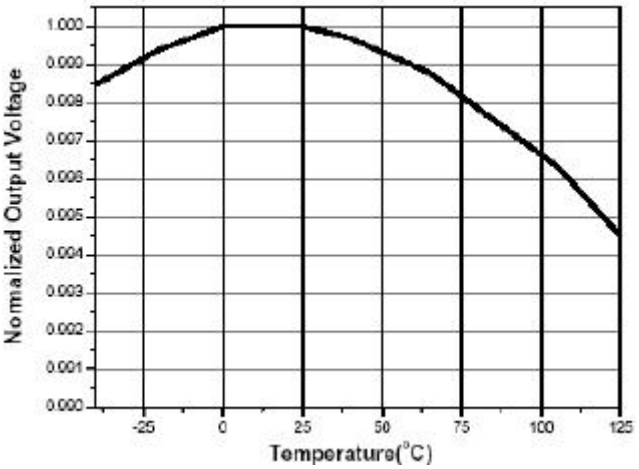
Current Limit vs. Temperature



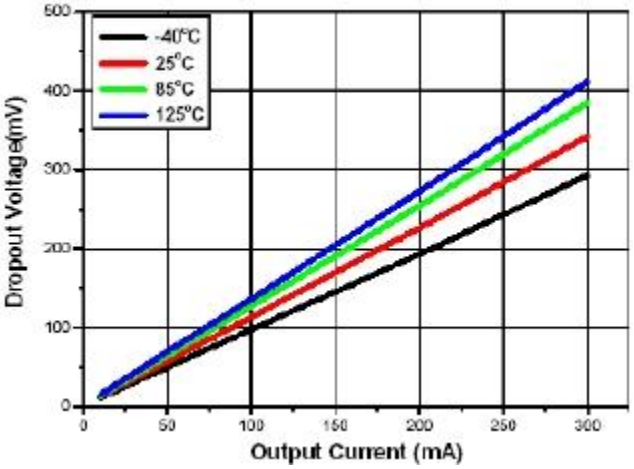
Quiescent Current vs. Temperature



Output Voltage vs. Temperature

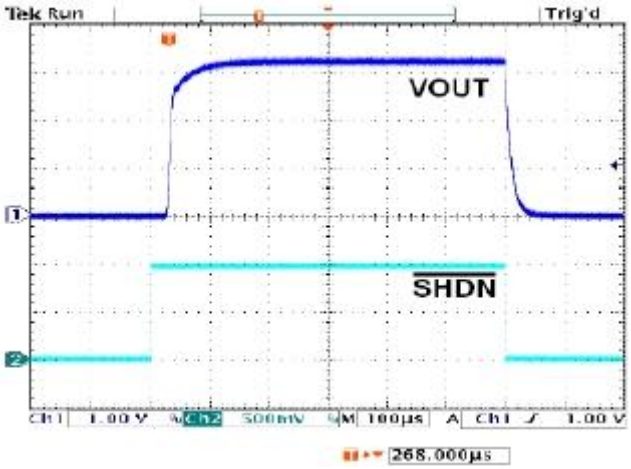


Dropout Voltage vs. Temperature



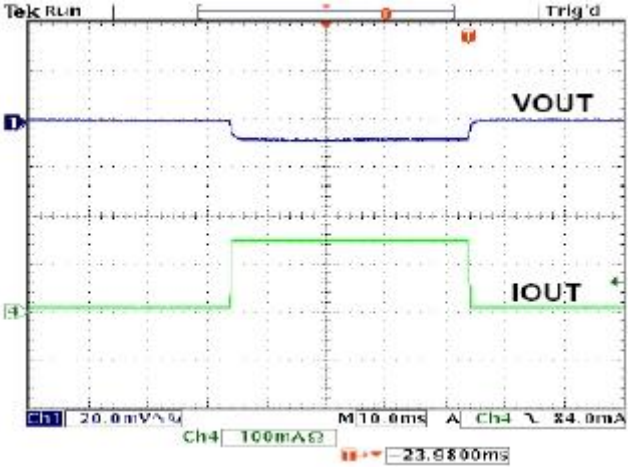
TYPICAL PERFORMANCE CHARACTERISTICS

Shutdown Function



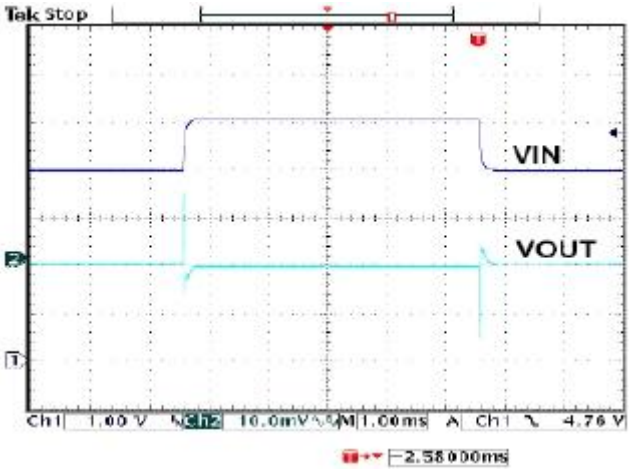
Load Transient Response

(V_{IN}=5V, I_{OUT}=150mA, C_{IN}=1uF, C_{OUT}=1uF)



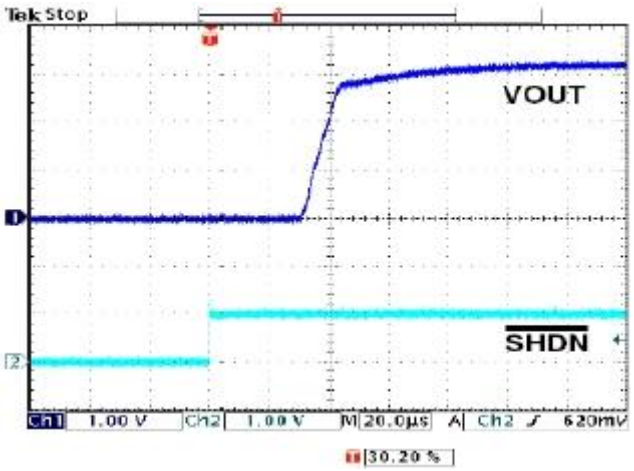
Line Transient Response

(V_{IN}=4~5V I_{OUT}=10mA C_{IN}=1uF C_{OUT}=1uF)



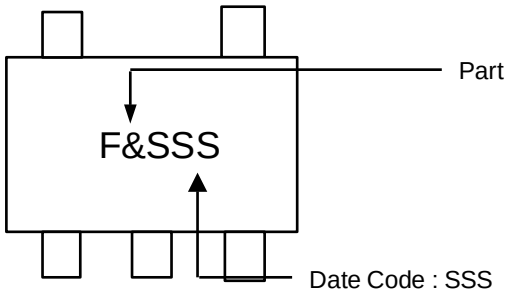
Shutdown Exit Delay Time

(V_{IN}=5V I_{OUT}=1mA C_{IN}=1uF C_{OUT}=1uF)



MARKING INFORMATION

SOT-23-5L / TSOT-23-5L



Output Voltage	Identification Code	Output Voltage	Identification Code
1.2V	Fa	3.1V	Fx
1.5V	Fc	3.3V	Fh
1.8V	Fb	3.6V	Fw
2.5V	Fd	4.5V	FM
2.8V	Fe	5.0V	Fv
3.0V	Ff		