300mA ULTRA LOW DROPOUT LINEAR REGULATOR

FEATURES

- **Ultra Low Dropout 100mV @ 300mA Output Current for 1.2V Output Voltage**
- **Low ESR Output Capacitor (Multi-layer Chip Capacitors (MLCC)) Applicable**
- **Fast Transient Response**
- **Adjustable Output Voltage by External Resistors**
- **Power-On-Reset Monitoring on Both V_{Bias} and VIN Pins**
- **Internal Soft-Start**
- **Under-Voltage Protection**
- **Thermal Shutdown Protection**
- **TSOT-26 Pb-Free Package**
- **Halogen Free Product**

DESCRIPTION

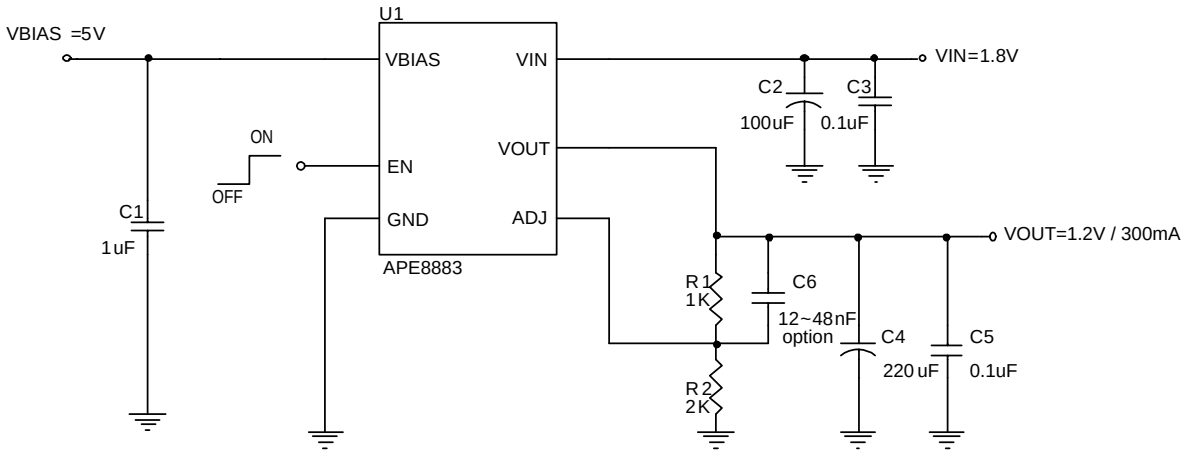
The APE8883 is a 300mA ultra low dropout linear regulator. This product is specifically designed to provide well supply voltage for front-side-bus termination on motherboards and NB applications. The IC needs two supply voltages, a control voltage for the circuitry and a main supply voltage for power conversion, to reduce power dissipation and provide extremely low dropout. The APE8883 integrates many functions. A Power-On-Reset (POR) circuit monitors both supply voltages to prevent wrong operations. A thermal shutdown functions protect the device against thermal and current over-loads.

The APE8883 can be enabled by other power system. Pulling and holding the EN pin below 0.6V shuts off the output.

The APE8883 is available in a TSOT-26 package.

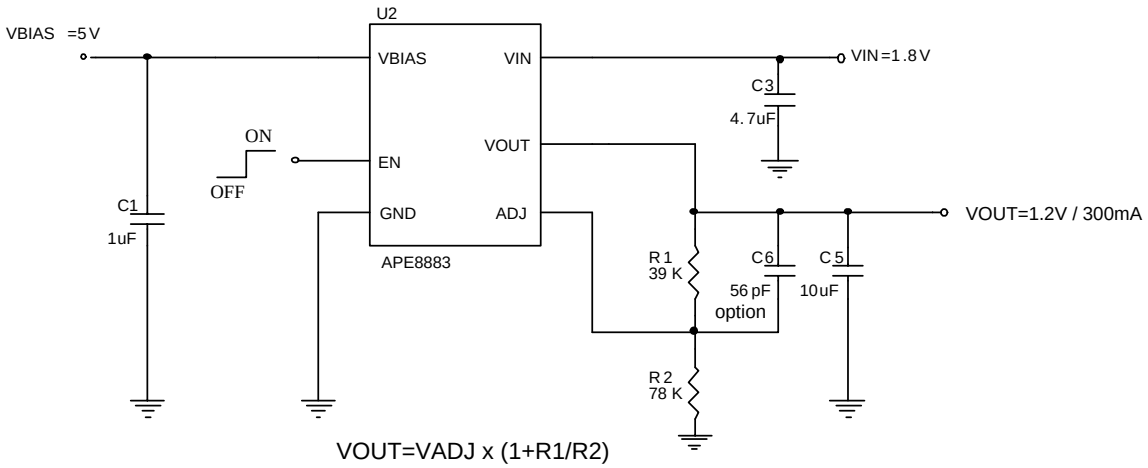
TYPICAL APPLICATION

1. 1. Using an Aluminum Electrolytic Output Capacitor



TYPICAL APPLICATION

2. 2. Using an MLCC Output Capacitor



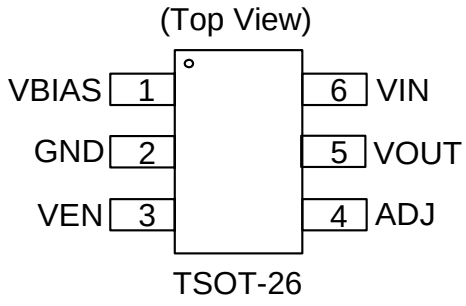
VOUT=VADJ x (1+R1/R2)
VADJ=0.8V

PACKAGE/ORDERING INFORMATION

APE8883X

Package Type

TY : TSOT-26



ABSOLUTE MAXIMUM RATINGS (Note1)

Bias Supply Voltage (V_{Bias})	-0.3V to 6.5V
Input Supply Voltage (V_{IN})	-0.3V to 6.5V
Output Voltage (V_{OUT})	0.8V to 6V
EN & ADJ Pin Voltage (V_{EN}/V_{ADJ})	-0.3V to V_{Bias} + 0.3V
Power Dissipation (P_D)	2.5W
Storage Temperature Range (T_{ST})	-65°C to 150°C
Junction Temperature Range (T_J)	-40°C to 150°C
Thermal Resistance Junction to Ambient (Rth_{ja})^{Note}	250°C/W
Thermal Resistance Junction to Case (Rth_{jc})	180°C/W

Note. Rth_{ja} is measured with the PCB copper area approximately 1.5 in^2 (Multi-layer) that connect to GND Pins.

RECOMMENDED OPERATING CONDITIONS

Operating Junction Temperature Range (T_{OJ})	-40°C To 125°C
Operating Ambient Temperature Range (T_{OA})	-40°C To 85°C
Bias Supply Voltage (V_{Bias})	3V To 6V
Input Supply Voltage (V_{IN})	1.1V To 5.5V
Output Voltage (V_{OUT})@V_{Bias}=5V	0.8V To 2.8V
Output Cunrrent (I_{OUT})	0A To 300mA

ELECTRICAL SPECIFICATIONS

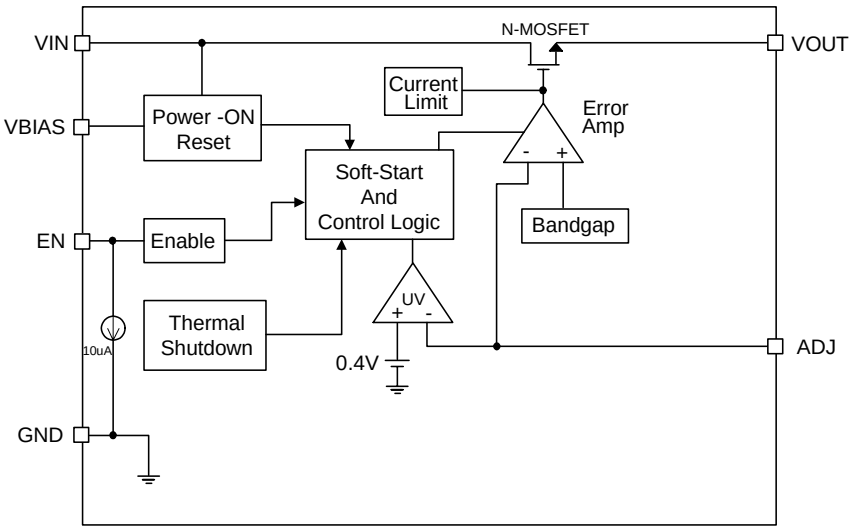
V_{Bias}= 5V, V_{IN}=1.8V, V_{OUT}=1.2V, T_A=25°C unless otherwise specified

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
V_{Bias} POR Threshold	V_{Bias}		2.5	2.7	2.9	V
V_{Bias} POR Hysteresis	$V_{Bias(hys)}$		-	0.4	-	V
V_{IN} POR Threshold	V_{IN}		0.8	0.9	1	V
V_{IN} POR Hysteresis	$V_{IN(hys)}$		-	0.5	-	V
V_{Bias} Nominal Supply Current	I_{Bias}	EN= V_{Bias}	0.4	1	1.5	mA
V_{Bias} Shuntdown Current	I_{SD}	EN=0V	-	-	30	uA
Adjustable Voltage	V_{ADJ}	V_{Bias}=3 ~ 6V, I_{OUT}=10mA, V_{IN}=V_{OUT}+0.5~5.5V	0.784	0.8	0.816	V
Load Regulation		I_{OUT}=0A ~ 300mA	-	0.2	1	%
Dropout Voltage	V_{DROP}	I_{OUT} = 300mA, V_{Bias}=5V, V_{OUT} = 1.2V	-	-	130	mV
V_{OUT} Pull Low Resistance		EN=0V	-	90	-	Ω
Soft Start Time	T_{SS}		-	2	-	ms
EN Pin Logic High Threshold Voltage	V_{ENH}	Enable	1.2	-	-	V
	V_{ENL}	Disable	-	-	0.6	
EN Hysteresis			-	40	-	mV
EN Pin Pull-Up Current	I_{EN}	EN=5V	-	10	20	uA
Ripple Rejection V_{IN}	PSRR	F=120Hz, I_{OUT}=100mA	-	65	-	dB
Ripple Rejection V_{Bias}			-	65	-	
Under-Voltage Threshold		V_{ADJ} Falling	-	0.4	-	V
Thermal Shutdown Temp	TSD		-	160	-	°C
Thermal Shutdown Hysteresis			-	40	-	°C

PIN DESCRIPTIONS

PIN SYMBOL	PIN DESCRIPTION
ADJ	ADJ Pin
EN	EN=High → Enable EN=Low → Shutdown Mode
VIN	Input Voltage.
VBIAS	BIAS Pin Input Voltage
VOUT	Output Voltage
GND	GND Pin

BLOCK DIAGRAM



PIN DESCRIPTION

ADJ

Connecting this pin to an external resistor divider receives the feedback voltage of the regulator. The output voltage set by the resistor divider is determined by:

$$V_{OUT} = 0.8 \cdot \left(1 + \frac{R1}{R2}\right) \quad (V)$$

Where R1 is connected from VOUT to ADJ with Kelvin sensing and R2 is connected from ADJ to GND. A bypass capacitor may be connected with R1 in parallel to improve load transient response. The R2 range in 1K~4.7KΩ for AL output capacitor and 30K~100KΩ for MLCC output capacitor are recommended.

VIN

Main supply input pins for power conversions. The voltage at this pin is monitored for Power-On Reset purpose.

VBIAS

Power input pin of the control circuitry. Connecting this pin to a +5V (recommended) supply voltage provides the bias for the control circuitry. The voltage at this pin is monitored for Power-On Reset purpose.

EN

Enable control pin. Pulling and holding this pin below 0.6V shuts down the output. When re-enabled, the IC undergoes a new soft-start cycle. For APE8883, this pin is internal pulled down to GND voltage, shutdown the regulator. The pull-high or pull-low current is 10uA (typ.)

VOUT

Regulator output pin. Please connect Pin 6 using wide tracks. It is necessary to connect an output capacitor with this pin for closed-loop compensation and improving transient responses.

FUNCTION DESCRIPTION

Power-On-Reset

A Power-On-Reset (POR) circuit monitors both input voltages at VBIAS and VIN pins to prevent wrong logic controls. The POR function initiates a soft-start process after the two supply voltages exceed their rising POR threshold voltages during powering on. The POR function also pulls low the POK pin regardless the output voltage when the VBIAS voltage falls below its falling POR threshold.

Internal Soft-Start

An internal soft-start function controls rise rate of the output voltage to limit the current surge at start-up. The typical soft-start interval is about 2ms.

Output Voltage Regulation

An error amplifier working with a temperature compensated 0.8V reference and an output NMOS regulates output to the preset voltage. The error amplifier designed with high bandwidth and DC gain provides very fast transient response and less load regulation. It compares the reference with the feedback voltage and amplifies the difference to drive the output NMOS which provides load current from VIN to VOUT.

FUNCTION DESCRIPTION

Under-Voltage Protection (UVP)

The APE8883 monitors the voltage on ADJ pin after soft-start process is finished. Therefore the UVP is disabling during soft-start. When the voltage on ADJ pin falls below the under-voltage threshold, the UVP circuit shuts off the output immediately. After a while, the APE8883 starts a new soft-start to regulate output.

Thermal Shutdown

A thermal shutdown circuit limits the junction temperature of APE8883. When the junction temperature exceeds +160°C, a thermal sensor turns off the output NMOS, allowing the device to cool down. The regulator regulates the output again through initiation of a new soft-start cycle after the junction temperature cools by 40°C, resulting in a pulsed output during continuous thermal overload conditions. The thermal shutdown designed.

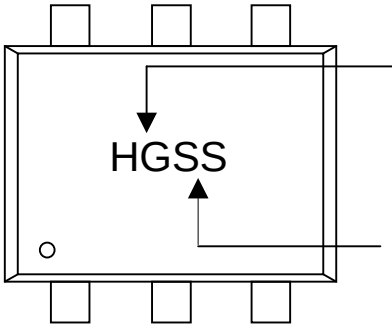
APPLICATION INFORMATION

Capacitor Selection

Normally, use a MLCC capacitor on the input and output of the APE8883. Larger input capacitor values provide better supply-noise rejection and transient response. A higher- value output capacitor may be necessary if large, fast transients are anticipated and the device is located several inches from the power source. The X5R and X7R type in MLCC is recommended. For aluminum electrolytic capacitor application, 100uF in input capacitor and 220uF in output capacitor (30mΩ < ESR < 200mΩ) are recommended. Output capacitor of larger capacitance can reduce noise and improve load transient response, stability, and PSRR.

MARKING INFORMATION

SOT-26



Part Number : HG

Date Code
SS:2004,2008,2012…
SS:2003,2007,2011…
SS:2002,2006,2010…
SS:2001,2005,2009…