

**150mA ULTRA LOW DROPOUT POSITIVE ADJUSTABLE AND FIXED REGULATORS**

**FEATURES**

- Stable with 2.2uF Low ESR Ceramic Capacitor
- 2% Voltage Reference Accuracy
- Wide Operating Range: 4.5V ~ 25V
- 5uA Quiescent Current in Shutdown
- Current Limit and Thermal Shutdown
- Logic Input Enable Pin
- RoHS Compliant & Halogen Free
- SOT-89, ESOP-8, J-lead 2021-8, SOT-23-5L & TSOT-23-5L Package

**DESCRIPTION**

The APU8850 device is an efficient linear voltage regulator with better than 2% initial voltage accuracy, very low dropout voltage and very low ground current designed especially for hand held, battery powered applications. Other features of the device are: TTL compatible enable/shutdown control input, current limiting and thermal shutdown.

The APU8850 is available in fixed and adjustable output voltage versions in a small SOT-23-5L, TSOT-23-5L, J-lead 2021-8, ESOP-8 & SOT-89 package.

**APPLICATIONS**

- Laptop, Notebook & Palmtop Computers
- Battery Powered Equipments
- PCMCIA Vcc & Vpp Regulator
- Consumer Electronics
- High Efficiency Linear Power Supplies

**TYPICAL APPLICATION**

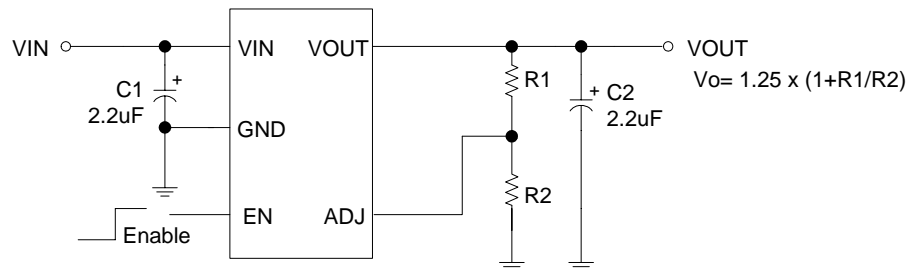


Figure 1 - Typical application of the APU8850 adjustable voltage regulator.

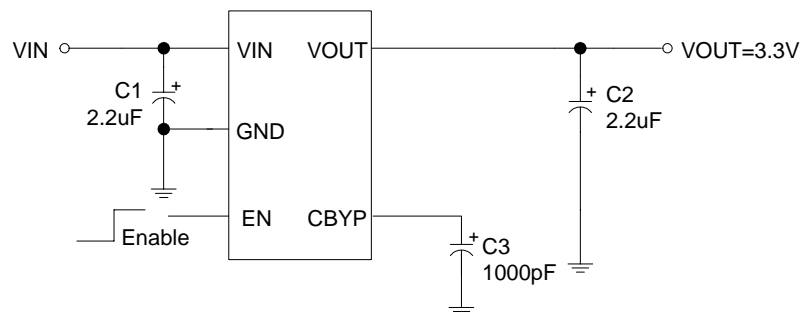


Figure 2 - Typical application of the APU8850-33 fixed voltage regulator.

**ORDERING INFORMATION**

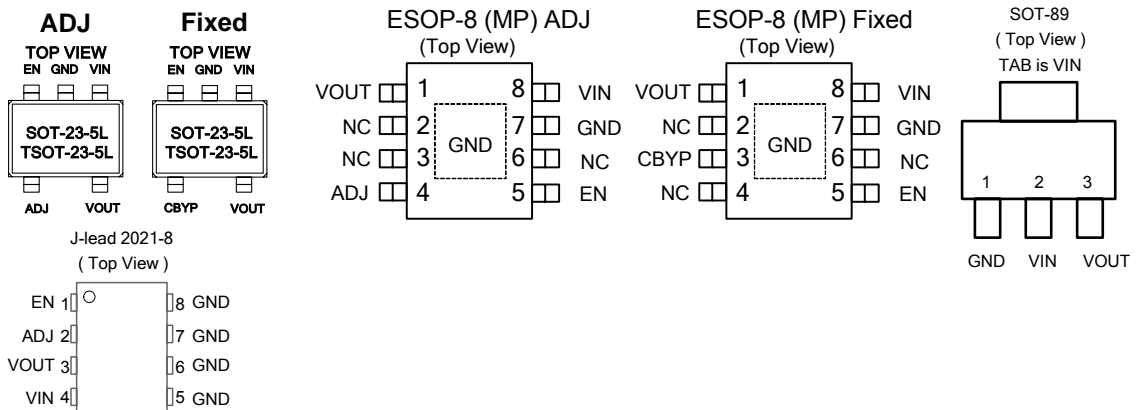
APU8850X-XX-HF ← Halogen Free

Package	Output Voltage
Y5 : SOT-23-5L	Blank : ADJ
TY5 : TSOT-23-5L	15 : 1.5V
U : J-lead 2021-8	18 : 1.8V
G : SOT-89	25 : 2.5V
MP : ESOP-8	28 : 2.8V
	30 : 3.0V
	33 : 3.3V
	50 : 5.0V

**ABSOLUTE MAXIMUM RATINGS** ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified.)

Input Voltage ( $V_{IN}$ )	27V
Enable Input Voltage ( $V_{EN}$ )	27V
Storage Temperature Range ( $T_{ST}$ )	-65 to 150 $^{\circ}\text{C}$
Operating Junction Temperature Range ( $T_J$ )	-40 to 85 $^{\circ}\text{C}$
Thermal Resistance Junction to Ambient ( $R_{thja}$ )	
SOT-23-5L/TSOT-23-5L	256 $^{\circ}\text{C}/\text{W}$
SOT-89	250 $^{\circ}\text{C}/\text{W}$
ESOP-8	150 $^{\circ}\text{C}/\text{W}$
J-lead 2021-8	300 $^{\circ}\text{C}/\text{W}$

**PACKAGE INFORMATION**



**ELECTRICAL SPECIFICATIONS**

Unless otherwise specified, these specifications apply over  $C_{IN}=C_O=2.2\text{F}$ ,  $I_O=100\mu\text{A}$ ,  $V_{IN(MIN)}=4.5\text{V}$ ,  $C_{BYP}=470\text{pF}$  (for fixed voltage devices),  $V_{EN}=2\text{V}$  and  $T_A=25^{\circ}\text{C}$ . Typical values refer to  $T_A=25^{\circ}\text{C}$ . Low duty cycle pulse testing is used which keeps junction and case temperatures equal to the ambient temperature.

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Reference Voltage	$V_O$		-2	-	2	%
Line Regulation	$\Delta V_L$	$V_O + 2\text{V} < V_{IN} < 25\text{V}$ , $I_O=1\text{mA}$	-	0.1	-	%/V
Load Regulation (Note 1)	$\Delta V_L$	$V_{IN}=V_O+2\text{V}$	-	0.5	-	%
Dropout Voltage (Note 2)	$V_{DROPO}$	$I_O=100\mu\text{A}$	-	1	-	V
		$I_O=100\text{mA}$	-	1.2	-	V
Ground Current (Note 3)	$I_Q$	$V_{EN}=2\text{V}$ , $I_O=100\mu\text{A}$	-	250	-	$\mu\text{A}$
Ground Current-SD Activated	$I_{Q(SD)}$	$V_{EN}=0\text{V}$ or Open	-	1	-	$\mu\text{A}$
Adjust Pin Current	$I_{ADJ}$	$V_{IN}=4.5\text{V}$ , $V_O=V_{ADJ}$	-	0.1	-	$\mu\text{A}$
Current Limit	$I_{CL}$		200	-	-	mA
Short Current	$I_Z$	$V_O=0\text{V}$	-	175	-	mA
Enable Pin Input LO Voltage	$V_{EN(L)}$	Regulator OFF	-	-	0.8	V
Enable Pin Input HI Voltage	$V_{EN(H)}$	Regulator ON	2	-	-	V
Enable Pin Input LO Current		$V_{EN(L)}=0\text{V}$	-	0.01	-	$\mu\text{A}$
Enable Pin Input HI Current		$V_{EN(H)}=2\text{V}$	-	10	-	$\mu\text{A}$
Ripple Rejection	PSRR	$C_{BYP}=1\text{nF}$ , $C_{OUT}=2.2\mu\text{F}$ , $f_{RIPPLE} = 1\text{kHz}$	-	70	-	dB
Over Temperature Shutdown			-	150	-	$^{\circ}\text{C}$
Over Temperature Shutdown Hysteresis			-	10	-	$^{\circ}\text{C}$

**Note 1:** Low duty cycle pulse testing with Kelvin connections is required in order to maintain accurate data.

**Note 2:** Dropout voltage is defined as the minimum differential voltage between  $V_{IN}$  and  $V_{OUT}$  required to maintain regulation at  $V_{OUT}$ .

It is measured when the output voltage drops 1% below its nominal value.

**Note 3:** Ground current is the regulator quiescent current plus the pass transistor current. The total current from the supply is the sum of the load current plus the ground pin current.



**PIN DESCRIPTIONS**

PIN SYMBOL	PIN DESCRIPTION
VIN	The input pin of the regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum drop out voltage during the load transient response. This pin must always be higher than VOUT by at least the amount of the dropout voltage and some margin in order for the device to regulate properly.
GND	Ground pin. This pin must be connected to the lowest potential in the system and all other pins must be at higher potential with respect to this pin.
EN	Enable pin. A low signal or left open on this pin shuts down the output. This pin must be tied HI or to VIN for normal operation.
Adj (Adjustable only)	A resistor divider from this pin to the VOUT pin and ground sets the output voltage.
C <sub>BYP</sub> (Fixed only)	A 470 to 1000pF bypass capacitor connected to this pin reduces the output noise.
VOUT	The output of the regulator. A minimum of 2.2uF with max ESR of 1 Ω capacitor must be connected from this pin to ground to insure stability.

**BLOCK DIAGRAM**

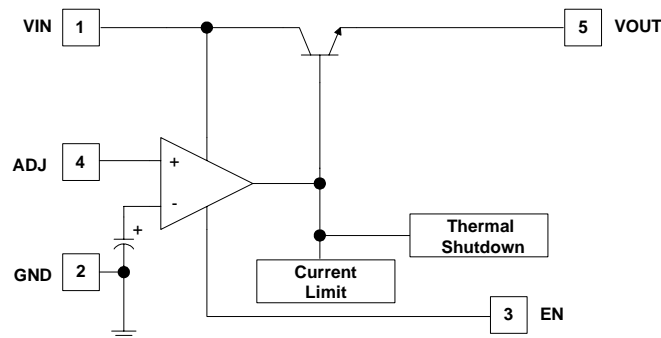


Figure 3 - APU8850Y5 Adjustable output block diagram.

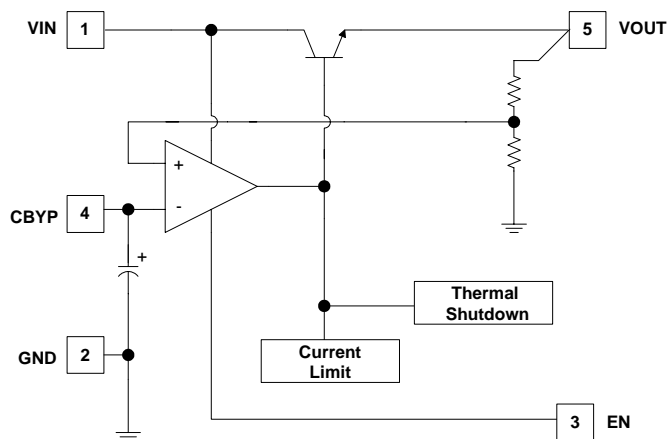


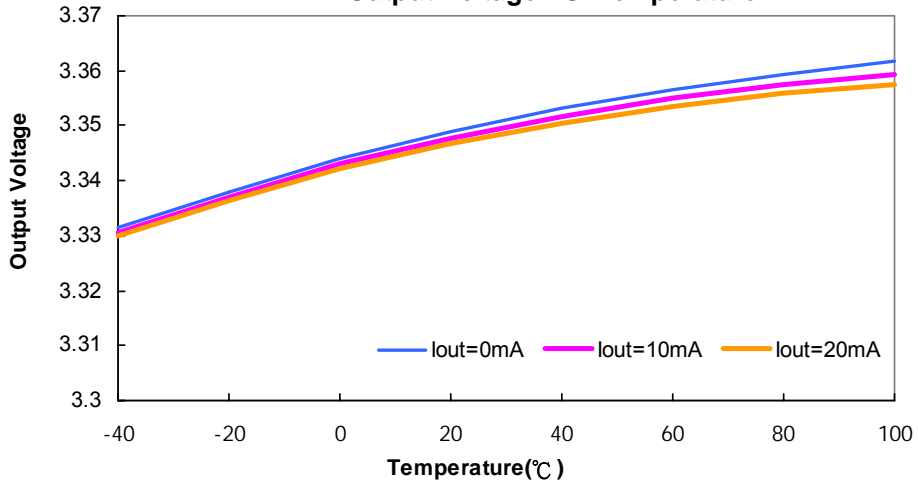
Figure 4 - APU8850Y5 Fixed Mode output block diagram.



TYPICAL PERFORMANCE CHARACTERISTICS

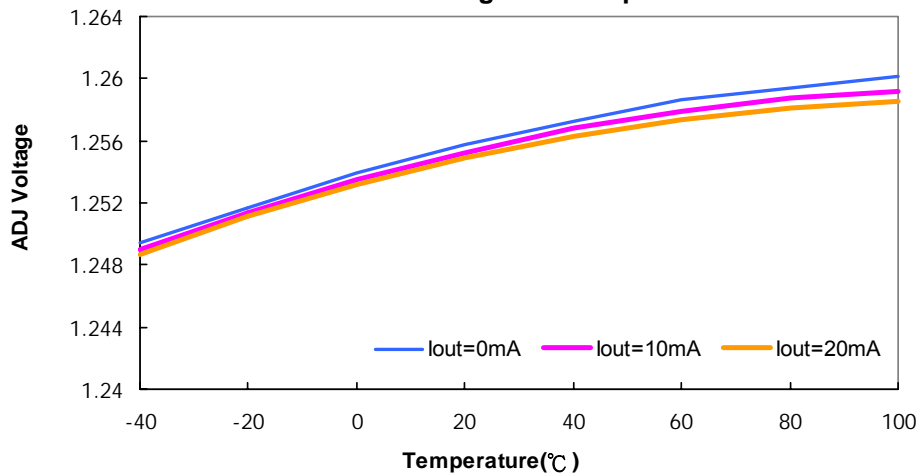
VIN=5V , VEN=5V , VOUT=3.3V

Output Voltage VS. Temperature



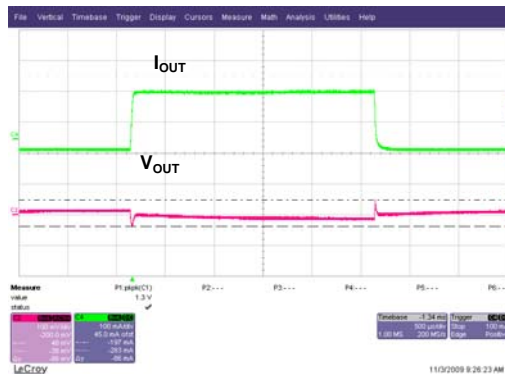
VIN=5V , VEN=5V , VOUT=3.3V

ADJ Voltage VS. Temperature



VIN=4.5V , VOUT=3.3V IOU=10mA~200mA

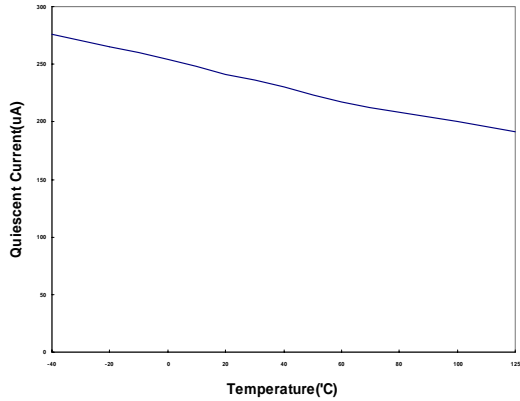
Load Transient



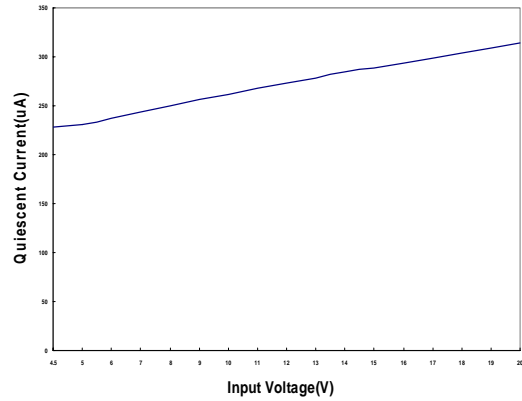


## TYPICAL PERFORMANCE CHARACTERISTICS

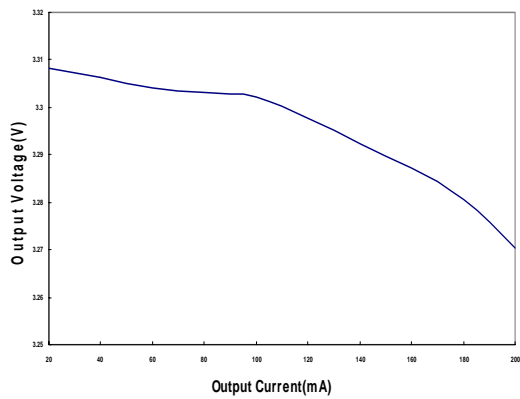
Quiescent Current vs. Temperature  
VIN=4.5V , VOUT=3.3V , IOUT=10mA



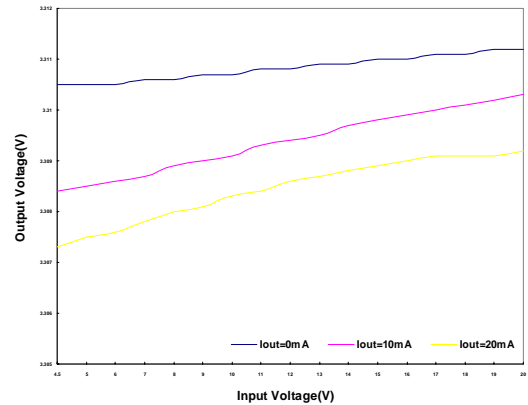
Quiescent Current vs. Input Voltage  
VIN=4.5V~20V , VOUT=3.3V



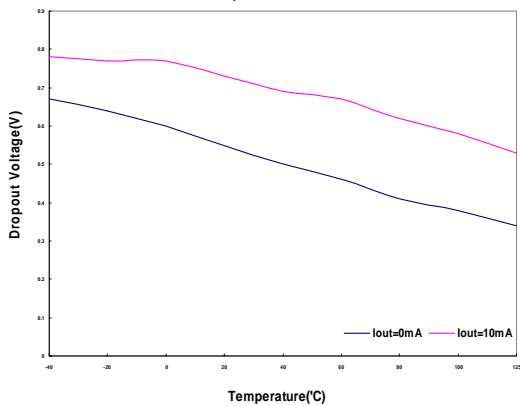
Output Voltage vs. Output Current  
VIN=4.5V , VOUT=3.3V , IOUT=10mA~200mA



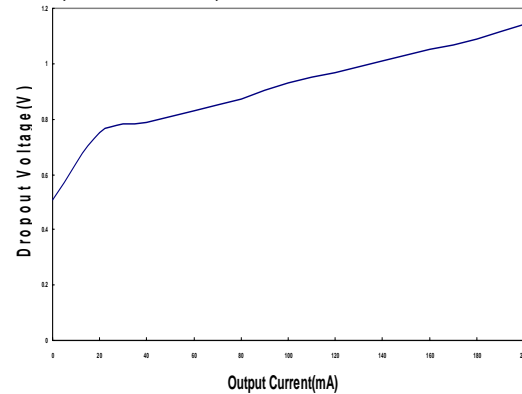
Output Voltage vs. Input Voltage  
VIN=4.5V~20V , VOUT=3.3V



Dropout Voltage vs. Temperature  
VIN=4.5V , VOUT=3.3V



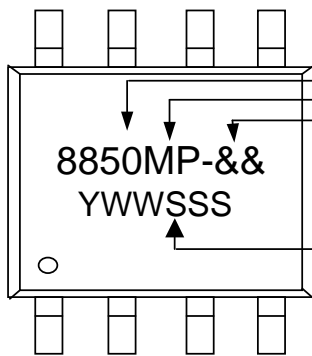
Dropout Voltage vs. Output Current  
VIN=4.5V , VOUT=3.3V , IOUT=10mA~200mA





MARKING INFORMATION

ESOP-8

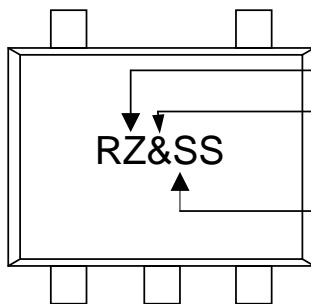


Part Number  
Package Code  
Output Voltage :

Identification Code	V <sub>OUT</sub>	Identification Code	V <sub>OUT</sub>
Blank	ADJ	28	2.8V
15	1.5V	30	3.0V
18	1.8V	33	3.3V
25	2.5V	50	5.0V

Date Code (YWWSSS)  
Y : Last Digit Of The Year  
WW : Week  
SSS : Sequence

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

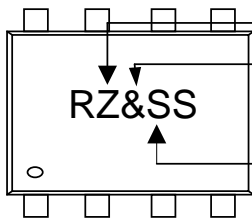


Part Number : RZ  
Output Voltage :

Identification Code	V <sub>OUT</sub>	Identification Code	V <sub>OUT</sub>
Blank	ADJ	G	2.8V
C	1.5V	H	3.0V
D	1.8V	I	3.3V
F	2.5V	J	5.0V

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

J-lead 2021-8

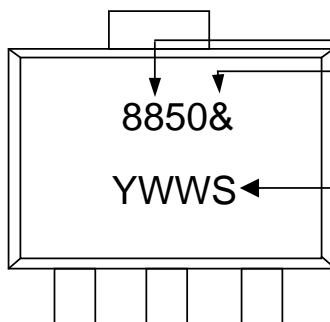


Part Number : RZ  
Output Voltage :

Identification Code	V <sub>OUT</sub>	Identification Code	V <sub>OUT</sub>
Blank	ADJ	G	2.8V
C	1.5V	H	3.0V
D	1.8V	I	3.3V
F	2.5V	J	5.0V

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

SOT-89



Part Number  
Output Voltage :

Identification Code	V <sub>OUT</sub>	Identification Code	V <sub>OUT</sub>
Blank	ADJ	G	2.8V
C	1.5V	H	3.0V
D	1.8V	I	3.3V
F	2.5V	J	5.0V

Date Code (YWWS)  
Y:Year  
WW : Week  
S : Sequence