



150mA Ultra-Low Dropout Adjustable and Fixed Regulators

Features

- Stable with 2.2μF Low ESR Ceramic Capacitor
- Voltage Reference Accuracy of 2%
- Wide Operating Range: 4.5V ~ 25V
- Quiescent Current in Shutdown of 5μA
- Current Limit and Thermal Shutdown
- Logic Input Enable Pin
- RoHS Compliant halogen-free SOT-89, ESOP-8, J-lead 2021-8, TSOT-23-5 and SOT-23-5 Packages

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 APU8850-3 is available in fixed and adjustable output voltage versions in a small SOT-23-5, TSOT-23-5, J-lead 2021-8, ESOP-8 or SOT-89 package.

Applications

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

Typical Application

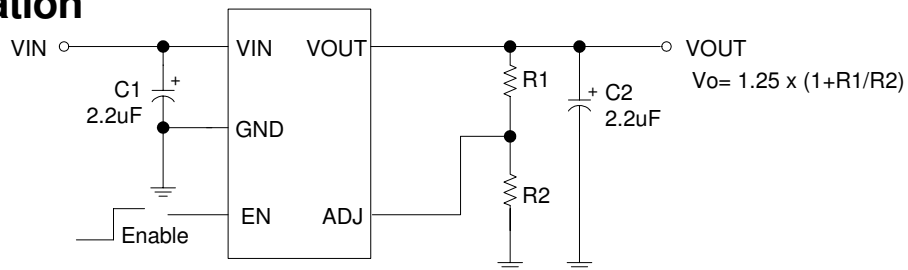


Figure 1 - Typical application of the APU8850-3 adjustable voltage regulator.

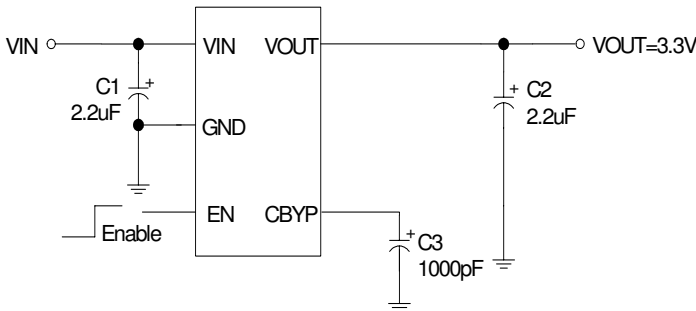


Figure 2 - Typical application of the APU8850-33-3

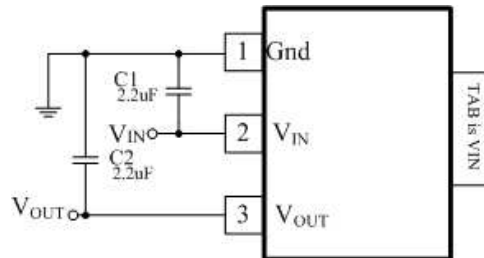


Figure 3 - Typical application of the APU8850-xx-3 in SOT-89

Ordering information

PART NUMBER	OUTPUT VOLTAGE
APU8850xx-3TR	Adj
APU8850xx-15-3TR	1.5V
APU8850xx-18-3TR	1.8V
APU8850xx-25-3TR	2.5V
APU8850xx-28-3TR	2.8V
APU8850xx-30-3TR	3.0V
APU8850xx-33-3TR	3.3V
APU8850xx-50-3TR	5.0V

xx = package code

- Y5: SOT-23-5 TY5: TSOT-23-5
- U: J-lead 2021-8
- G: SOT-89
- MP: ESOP-8

These products are shipped on tape and reel, 3000 pieces per reel (SOT-89 1000pcs/reel). The device is rated MSL3 for moisture sensitivity, and the reel is shipped sealed inside a moisture barrier bag.



Absolute Maximum Ratings

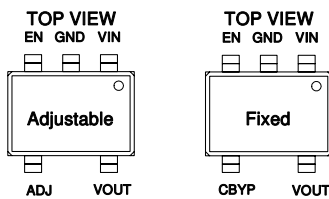
Input Voltage (V_{IN})	27V
Enable Input Voltage	27V
Storage Temperature Range	-65°C to 150°C
Operating Junction Temperature Range	-40°C to 85°C

Thermal Resistance Junction to Ambient (R_{thja})

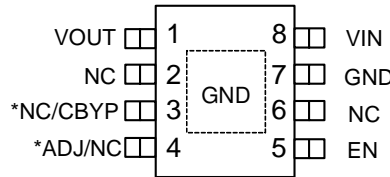
SOT-23-5L/TSOT-23-5L	256°C/W
SOT-89	300°C/W
ESOP-8	150°C/W
J-lead 2021-8	300°C/W

Pin Configuration

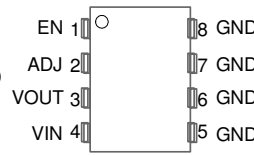
SOT-23-5L/TSOT-23-5L



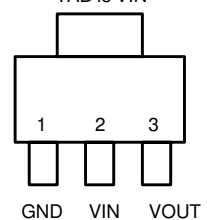
ESOP-8 (*Adj/Fixed)
(Top View)



J-lead 2021-8
(Top View)



SOT-89
(Top View)
TAB is VIN



Electrical Specifications

Unless otherwise specified, these specifications apply over $C_{IN}=C_O=2.2F$, $I_O=100\mu A$, $V_{IN(MIN)}=4.5V$, $C_{BYP}=470pF$ (for fixed voltage devices), $V_{EN}=2V$ and $T_A=25^\circ C$. Typical values refer to $T_A=25^\circ C$. 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	ΔV_L	$V_O + 2V < V_{IN} < 25V$, $I_O=1mA$	-	0.1	-	%/V
Load Regulation (Note 1)	ΔV_L	$V_{IN}=V_O+2V$	-	0.5	-	%
Dropout Voltage (Note 2)	V_{DROP}	$I_O=100\mu A$	-	1	-	V
		$I_O=100mA$	-	1.2	-	
Ground Current (Note 3)	I_Q	$V_{EN}=2V$, $I_O=100\mu A$	-	250	-	μA
Ground Current-SD Activated	$I_{Q(SD)}$	$V_{EN}=0V$ or Open	-	1	-	μA
Adjust Pin Current	I_{ADJ}	$V_{IN}=4.5V$, $V_O=V_{ADJ}$	-	0.1	-	μA
Current Limit	I_{CL}		200	-	-	mA
Short Current	I_Z	$V_O=0V$	-	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		$V_{EN(L)}=0V$	-	0.01	-	μA
Enable Pin Input HI Current		$V_{EN(H)}=2V$	-	10	-	μA
Ripple Rejection	PSRR	$C_{BYP}=1nF$, $C_{OUT}=2.2\mu F$, $f_{RIPPLE}=1kHz$	-	70	-	dB
Over Temperature Shutdown			-	150	-	$^\circ C$
Over Temperature Shutdown Hysteresis			-	10	-	$^\circ C$

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 ensure that the input voltage does not sag below the minimum dropout 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 _{BYP} (Fixed only)	A 470 to 1000pF bypass capacitor connected to this pin reduces the output noise.
VOUT	The output of the regulator. A capacitor with a minimum value of 2.2uF and a maximum ESR of 1Ω must be connected from this pin to ground to ensure stability.

Block Diagram

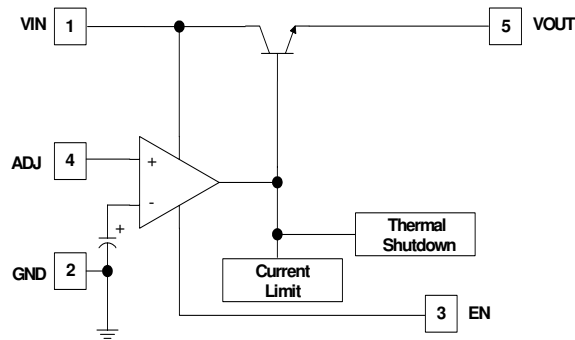


Figure 4 - APU8850Y5 block diagram for adjustable output

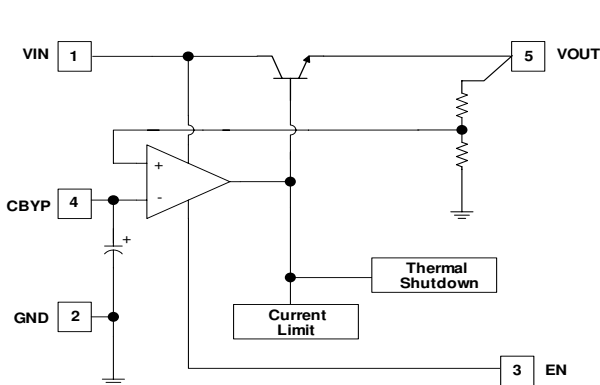


Figure 5 - APU8850Y5 block diagram for fixed output voltage

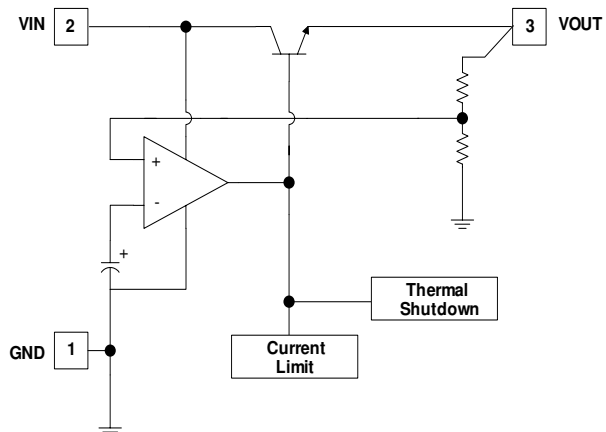


Figure 6 - APU8850G block diagram for fixed output voltage

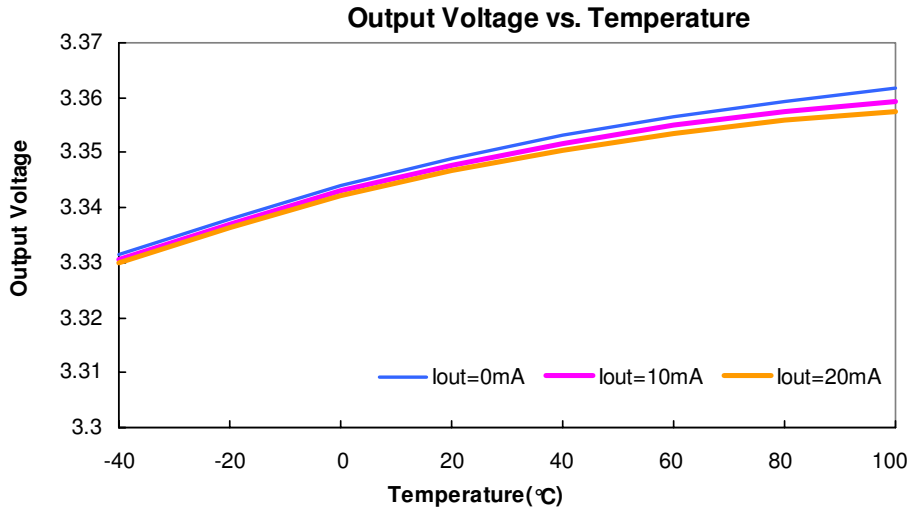
THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED. APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.

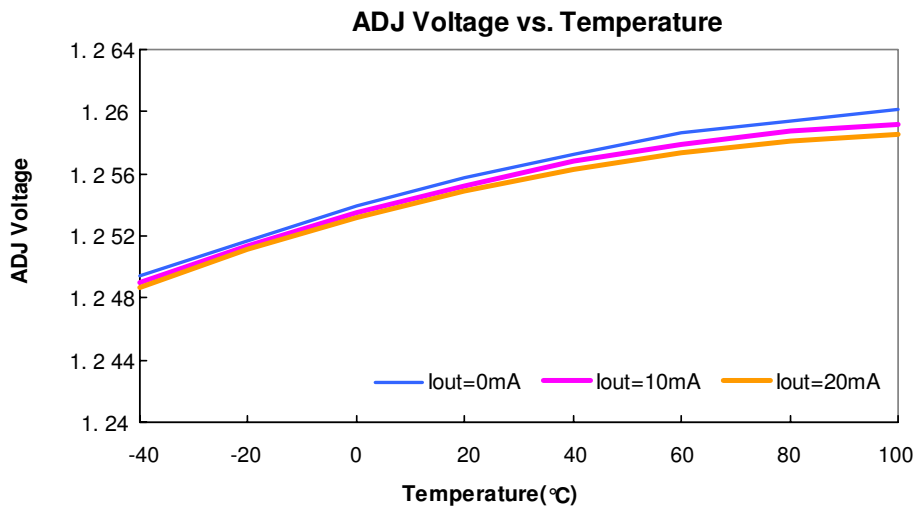


Typical Performance Characteristics

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



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



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

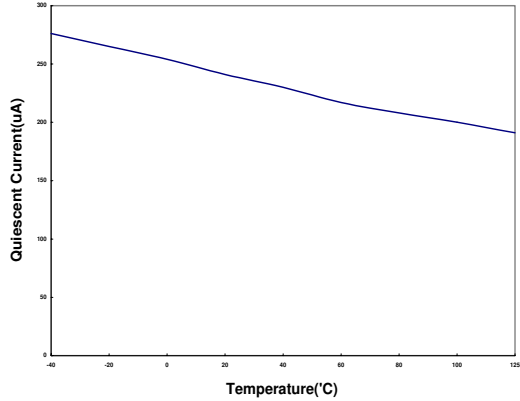
Load Transient



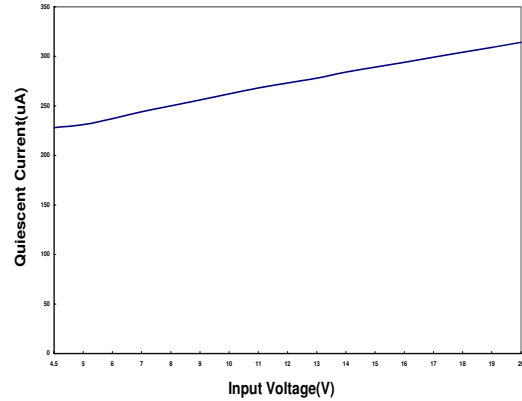


Typical Performance Characteristics (cont.)

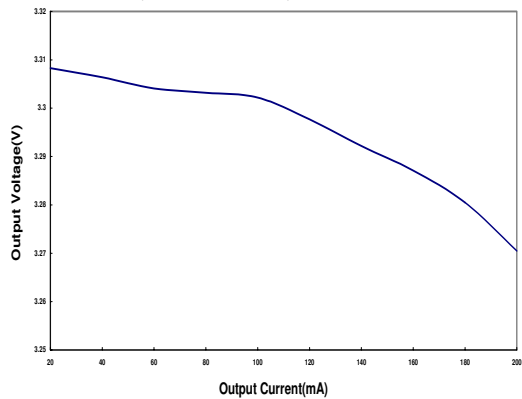
Quiescent Current vs. Temperature
VIN=4.5V, VOUT=3.3V, IOUT=10mA



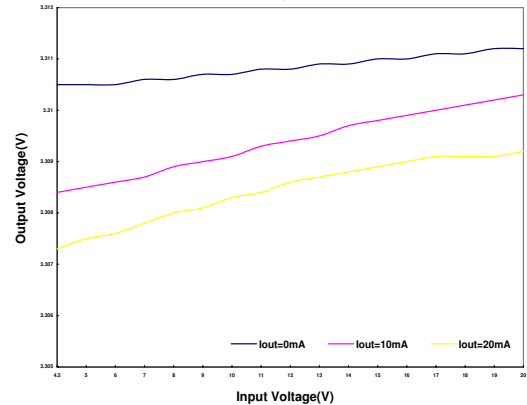
Quiescent Current vs. Input Voltage
VIN=4.5V~20V, VOUT=3.3V



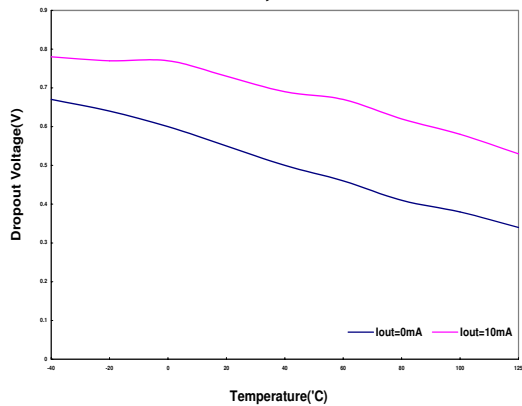
Output Voltage vs. Output Current
VIN=4.5V, VOUT=3.3V, IOUT=10mA~200mA



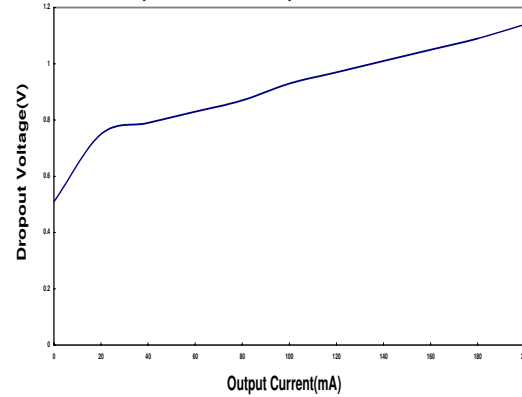
Output Voltage vs. Input Voltage
VIN=4.5V~20V, VOUT=3.3V



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

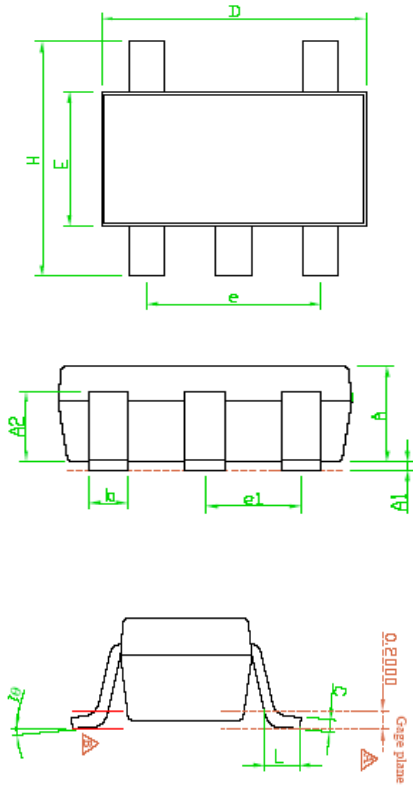


Dropout Voltage vs. Output Current
VIN=4.5V, VOUT=3.3V, IOUT=10mA~200mA





Package Dimensions: SOT-23-5L



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	---	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.50	1.60	1.80
e	---	1.90(TYP)	---
H	2.60	2.80	3.00
L	0.37	---	---
θ1	1°	5°	9°
e2	---	0.95(TYP)	---

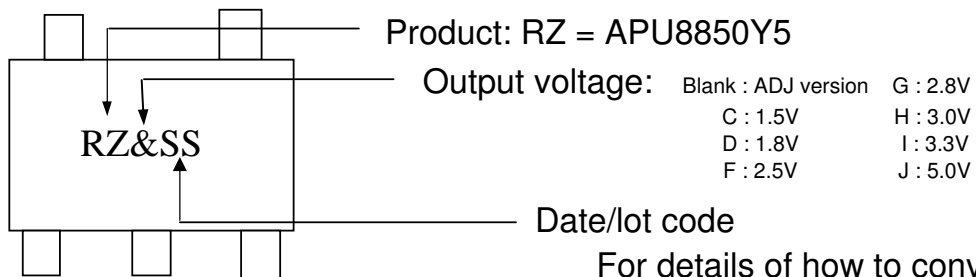
Note 1: Package body sizes exclude mold flash protrusions or gate burrs.

Note 2: Tolerance ± 0.1000 mm (4mil) unless otherwise specified.

Note 3: Coplanarity:0.1000 mm

Note 4: Dimension L is measured in gage plane.

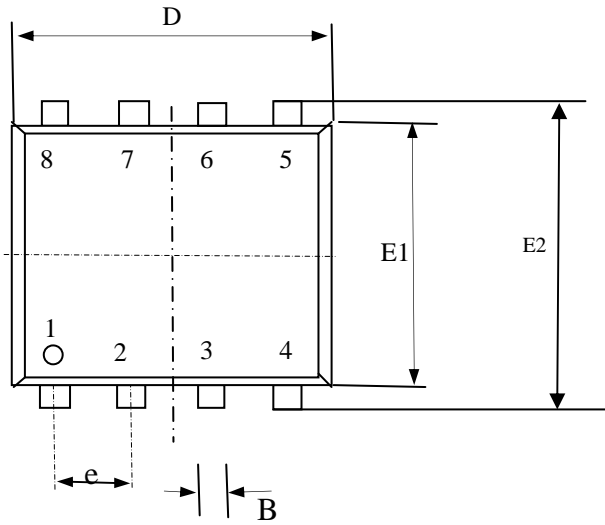
Marking Information



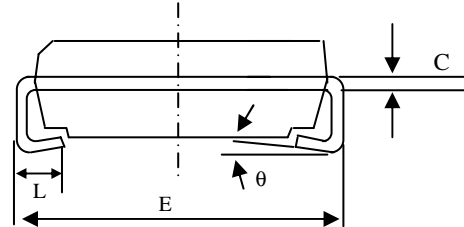
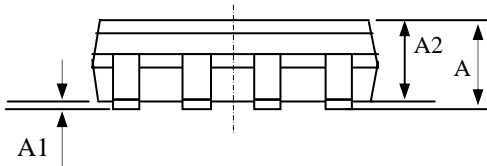
For details of how to convert this to standard YYWW date code format, please contact us directly.



Package Dimensions: J-lead 2021-8

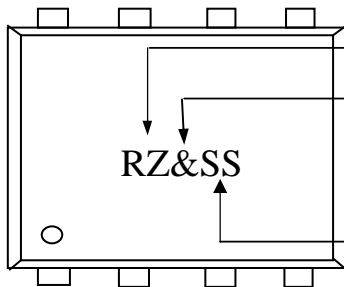


SYMBOLS	Millimeters		
	MIN	NOM	MAX
E	1.80	2.10	2.40
E1	1.65	1.75	1.85
E2	2.00	2.20	2.40
L	0.35	0.45	0.55
A	---	---	1.10
	0.00	---	0.10
A2	0.70	0.90	1.00
D	1.80	2.00	2.20
B	0.15	--	0.35
C	0.10	0.15	0.20
θ	0°	4°	8°
e	0.5bsc		



1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information



Product: RZ = APU8850U

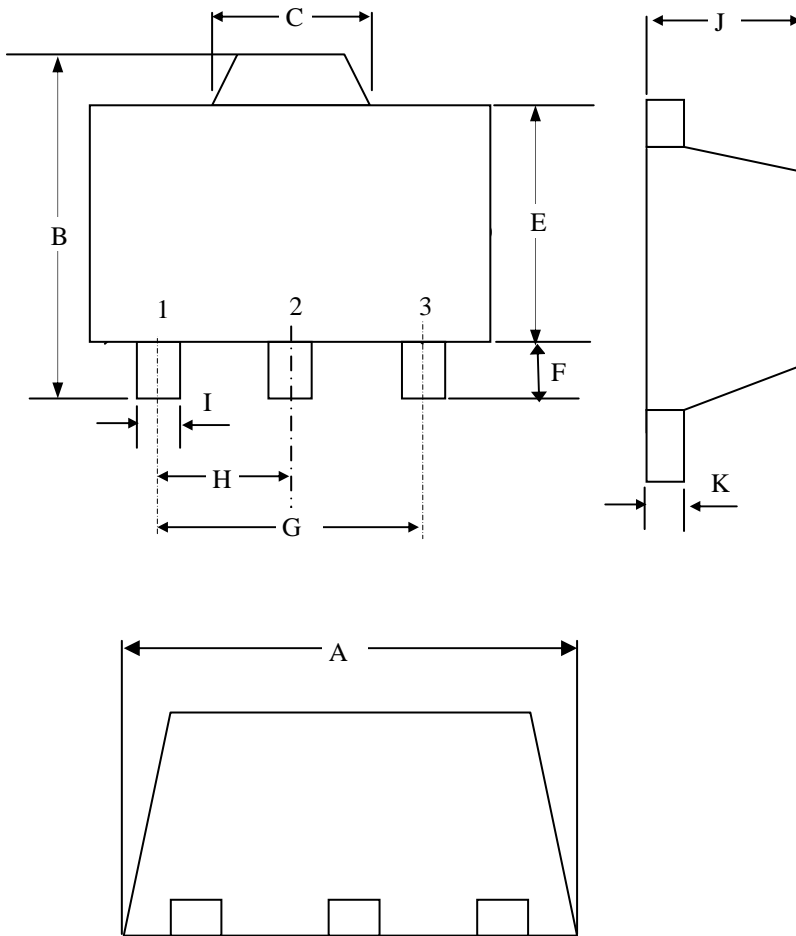
Output voltage: Blank : ADJ version G : 2.8V
 C : 1.5V H : 3.0V
 D : 1.8V I : 3.3V
 E : 2.5V J : 5.0V

Date/lot code

For details of how to convert this to standard YYWW date code format, please contact us directly.



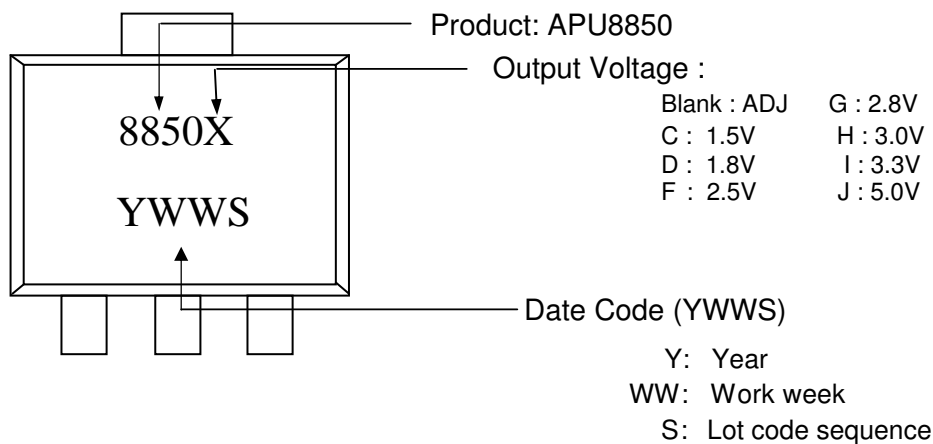
Package Dimensions: SOT-89



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.40	-	4.60
B	4.05	-	4.25
C	1.40	-	1.75
E	2.40	-	2.60
F	0.89	-	1.20
I	0.35	-	0.55
H	----	1.50	----
G	----	3.00	----
J	1.40	-	1.60
K	0.35	-	0.43

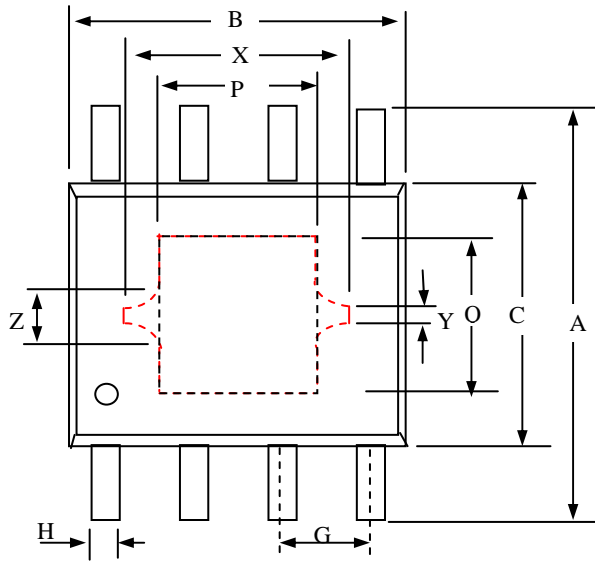
1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information

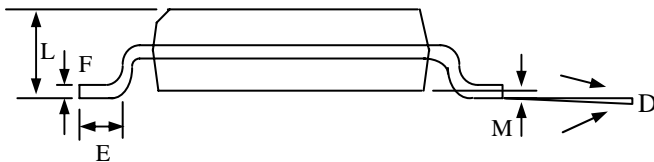




Package Dimensions: ESOP-8



Millimeters			
SYMBOLS	MIN	NOM	MAX
A	5.70	5.95	6.20
B	4.80	4.95	5.10
C	3.80	3.90	4.00
D	0°	4°	8°
E	0.40	0.84	1.27
F	0.19	0.23	0.26
M	0.00	0.13	0.25
H	0.32	0.42	0.51
L	1.35	1.56	1.76
G	1.27 TYP.		
P	1.65	2.13	2.60
Q	1.65	2.13	2.60
X	3.25 REF.		
Y	0.20 REF.		
Z	0.47 REF.		



1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information

