



**600mA LOW DROPOUT LINEAR REGULATOR**

**FEATURES**

- Application for Extreme Low 1.0 & 1.2V Output Voltage
- Guaranteed 600mA Output Current
- Very Low Quiescent Current at about 30uA
- ±2% Output Voltage Accuracy for 1V~3.3V
- Needs Only 1µF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Low-ESR Ceramic Capacitor for Output Stability.
- Tiny SOT-23-5L & SC-70-5L, SOT-223, SOT-89(R) & TO-252 Package type
- RoHS Compliant & Halogen Free
- High PSRR

**DESCRIPTION**

The APE8862 series are low dropout, positive linear regulators with very low quiescent current. The APE8862 can supply 600mA output current with a low dropout voltage & very low output voltage.

The APE8862 regulator is able to operate with output capacitors as small as 1µF for stability. Other than the current limit protection APE8862 also offers on chip thermal shutdown feature providing protection against overload or any condition when the ambient temperature exceeds the junction temperature.

The APE8862 series are offering several fixed output voltage types including 1.0V ~ 1.5V.

The APE8862 series are available in low-profile, space-saving SOT-23-5L, SC-70-5L, SOT-223, SOT-89(R) & TO-252 packages.

**APPLICATIONS**

- DVD/CD-ROMs, CD/RWs
- Wireless Devices
- LCD Modules
- Battery Power Systems
- Card Readers
- XDSL Routers

**TYPICAL APPLICATION**

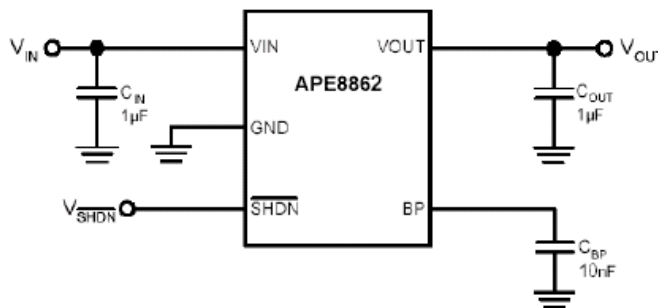


Figure 1. Typical Application Circuit of APE8862

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

**PACKAGE ORDERING INFORMATION**

APE8862X-XX	
Package Type	Vout
Y5 : SOT-23-5L	10 : 1.0V
U5 : SC-70-5L	12 : 1.2V
K : SOT-223	15 : 1.5V
G/GR : SOT-89	18 : 1.8V
H : TO-252	25 : 2.5V
	28 : 2.8V
	30 : 3.0V
	33 : 3.3V



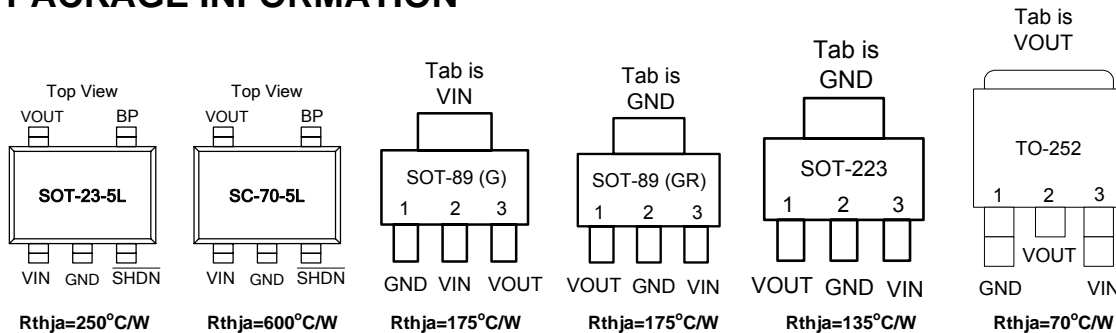
## ABSOLUTE MAXIMUM RATINGS

Input Voltage (VIN) .....	6V
Power Dissipation (SOT-23-5L) .....	0.4W
(SC-70-5L) .....	0.16W
(SOT-89) .....	0.57W
(SOT-223) .....	0.74W
(TO-252) .....	1.42W
Storage Temperature Range .....	-65°C To 150°C
Maximum Junction Temperature .....	150°C

## RECOMMENDED OPERATING CONDITIONS

Input Voltage (VIN) .....	2.8 to 5.5V
Operating Junction Temperature Range (T <sub>j</sub> ) .....	-40 to 125°C
Ambient Temperature (T <sub>A</sub> ) .....	-40 to 85°C

## PACKAGE INFORMATION



## ELECTRICAL SPECIFICATIONS

(V<sub>IN</sub>=V<sub>OUT</sub>+1V or V<sub>IN</sub>=2.8V whichever is greater, C<sub>IN</sub>=1uF, C<sub>OUT</sub>=1uF, T<sub>A</sub>=25°C, unless otherwise specified)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Output Voltage Accuracy	ΔV <sub>OUT</sub>	I <sub>O</sub> = 1mA	-2		2	%
Current Limit	I <sub>LIMIT</sub>	R <sub>Load</sub> =1Ω	600	650		mA
Quiescent Current	I <sub>Q</sub>	I <sub>O</sub> = 0mA		30	50	μA
Dropout Voltage (Note 1)	V <sub>DROP</sub>	I <sub>O</sub> =100mA, V <sub>O</sub> =1V		1200	1350	mV
		I <sub>O</sub> =600mA, V <sub>O</sub> =1V		1350	1500	
Line Regulation	ΔV <sub>LINE</sub>	I <sub>O</sub> =1mA, V <sub>IN</sub> =V <sub>OUT</sub> +1.5V to 5V		1	5	mV
Load Regulation (Note 2)	ΔV <sub>LOAD</sub>	I <sub>O</sub> =0mA to 600mA		50	100	mV
Ripple Rejection	PSRR	I <sub>O</sub> =1mA, C <sub>OUT</sub> =1uF, f <sub>RIPPLE</sub> = 1KHz f <sub>RIPPLE</sub> = 10KHz		-60		dB
				-40		
Temperature Coefficient	TC	I <sub>OUT</sub> = 1mA, V <sub>IN</sub> = 5V		50		ppm/ °C
Thermal Shutdown Temperature	TSD			160		°C
Thermal Shutdown Hysteresis	ΔTSD			25		°C
Shutdown Pin Current	I <sub>SHDN</sub>				0.1	μA
Shutdown Pin Voltage (ON)	V <sub>SHDN(ON)</sub>		1.4			V
Shutdown Pin Voltage (OFF)	V <sub>SHDN(OFF)</sub>				0.4	V

Note 1 : The dropout voltage is defined as V<sub>IN</sub>-V<sub>OUT</sub>, which is measured when V<sub>OUT</sub> drop about 100mV.

Note 2 : Regulation is measured at a constant junction temperature by using 30ms current pulse and load regulation in the load range from 0mA to 600mA.



## 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 1 $\mu$ F to 10 $\mu$ F is sufficient.
VOUT	The output supplies power to loads. The output capacitor is required to prevent output voltage unstable. The APE8862 is stable with an output capacitor 1 $\mu$ F or greater. The larger output capacitor will be required for application with large transit load to limit peak voltage transits, besides could reduce output noise, improve stability, PSRR.
GND	Common ground pin
BP	Reference Noise Bypass ( the Bypass Capacitor $\geq$ 1nF )
SHDN	Chip Enable (Active High)

## BLOCK DIAGRAM

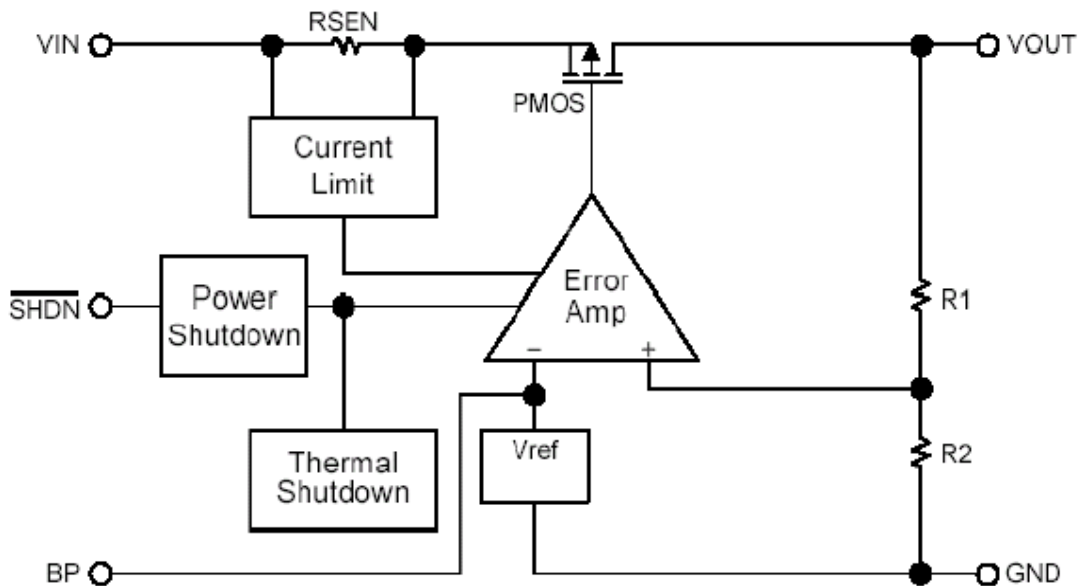


Figure 3. Block Diagram of APE8862



## Application Information

The APE8862 series are low dropout linear regulators that could provide 600mA output current at dropout voltage about 300mV. Besides, current limit and on chip thermal shutdown features provide protection against any combination of overload or ambient temperature that could exceed junction temperature.

### 1. Output and Input Capacitor

The APE8862 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 provides to improve transition 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 X5R or X7R dielectric ceramic capacitors with 30mΩ to 50mΩ ESR range between device outputs to ground for transient stability. The APE8862 is designed to be stable with low ESR ceramic capacitors and higher values of capacitors and ESR could improve output stability.

So 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.

### 2. Protection Features

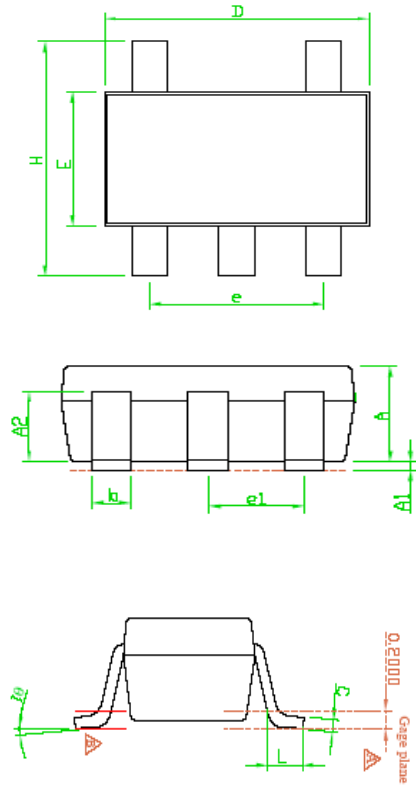
In order to prevent overloading or thermal condition from damaging the device, APE8862 regulator has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

### 3. Thermal Consideration

The power handling capability of the device will be limited by maximum operation junction temperature (125°C). The power dissipated by the device will be estimated by  $PD = I_{OUT} \times (V_{IN} - V_{OUT})$ . The power dissipation should be lower than the maximum power dissipation listed in "Absolute Maximum Ratings" section.



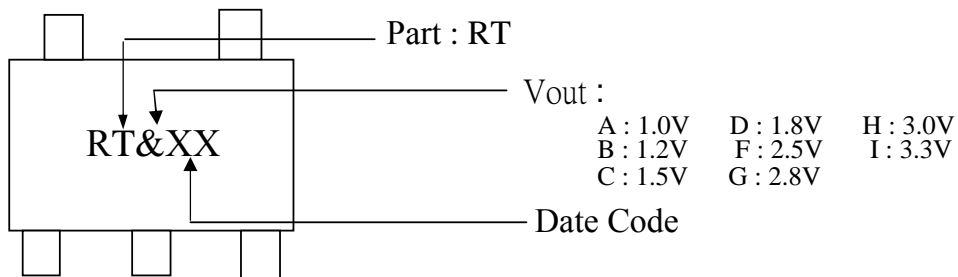
Package Outline : SOT-23-5L



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)	---

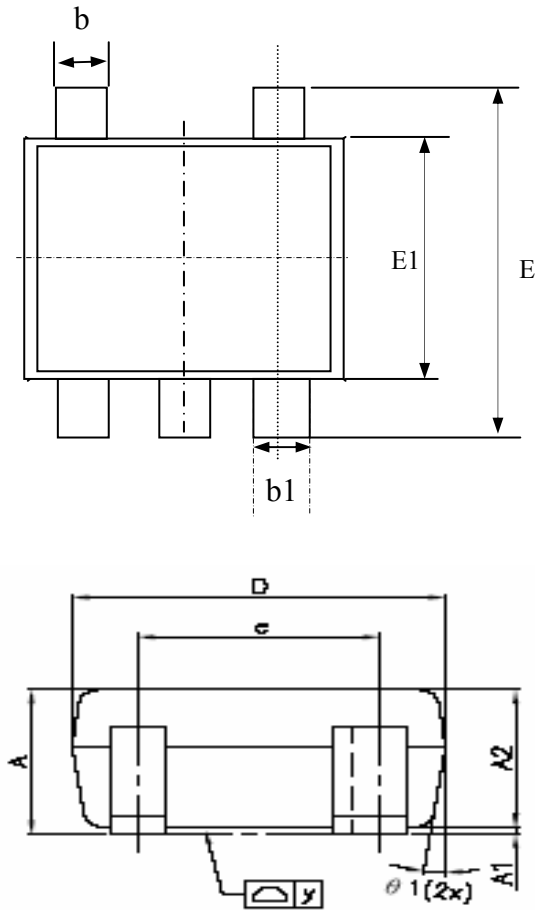
- Note 1 : Package Body Sizes Exclude Mold Flash Protrusions or Gate Burrs.
- Note 2 : Tolerance ± 0.1000 mm(4mil) Unless Otherwise Specified.
- Note 3 : Coplanarity : 0.1000 mm
- Note 4 : Dimension L Is Measured in Gage plane.

Part Marking Information & Packing : SOT-23 -5L

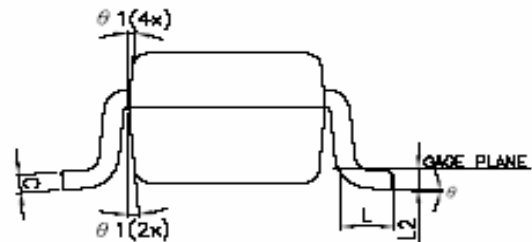




Package Outline : SC-70-5L

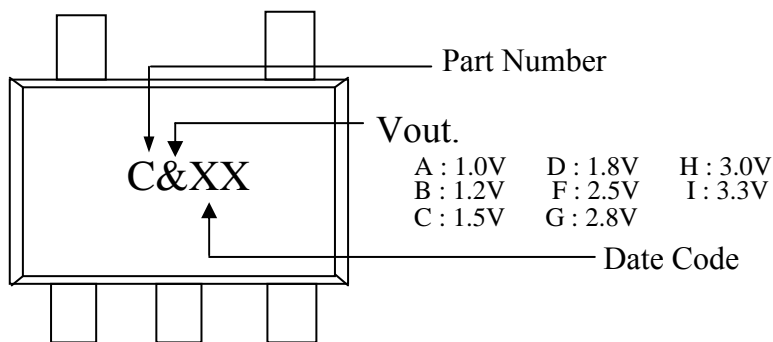


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.80	—	1.10
A1	0.00	—	0.10
A2	0.70	0.90	1.00
b	0.25	0.30	0.40
b1	—	0.38	—
C	0.10	—	0.26
D	1.80	2.00	2.20
E1	1.15	1.25	1.35
E	1.80	2.10	2.40
e	—	1.30	—
L	0.15	0.30	0.45
L2	—	0.15	—
y	—	—	0.10
$\theta$	0°	—	8°
$\theta 1$	4°	—	12°



- 1.All Dimension Are In Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.

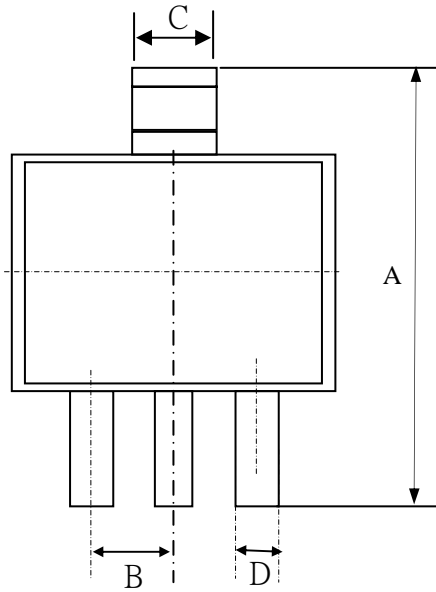
Part Marking Information & Packing : SC-70-5L



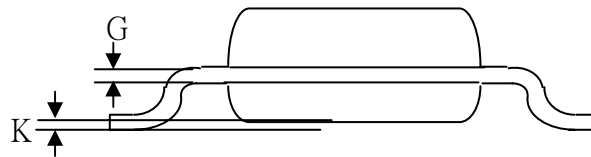
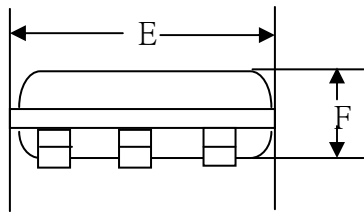




**Package Outline : SOT-223**

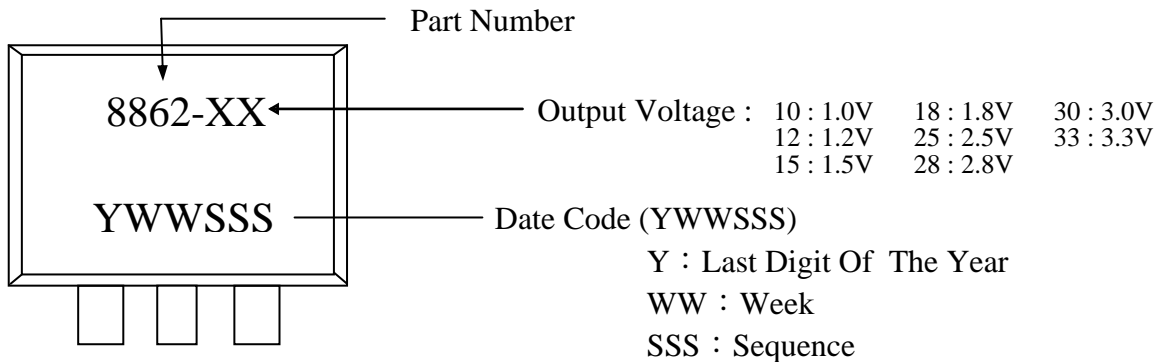


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	6.70	7.00	7.30
B	---	2.3	---
C	2.90	3.00	3.10
D	0.60	0.70	0.80
G	0.25	0.30	0.35
E	6.30	6.50	6.70
F	1.40	1.60	1.80
K	0.02	0.06	0.10



- 1.All Dimension Are In Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.

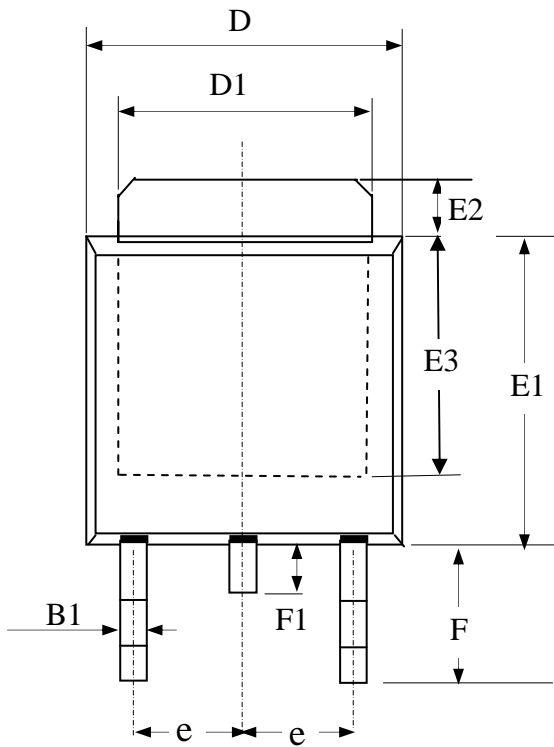
**Part Marking Information & Packing : SOT-223**





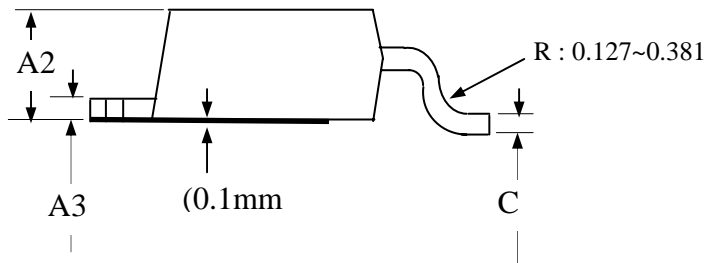


Package Outline : TO-252



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A2	1.80	2.30	2.80
A3	0.40	0.50	0.60
B1	0.40	0.70	1.00
D	6.00	6.50	7.00
D1	4.80	5.35	5.90
E3	3.50	4.00	4.50
F	2.20	2.63	3.05
F1	0.50	0.85	1.20
E1	5.10	5.70	6.30
E2	0.50	1.10	1.80
e	--	2.30	--
C	0.35	0.50	0.65

- 1.All Dimensions Are in Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.



Part Marking Information & Packing : TO-252

Laser Marking

