Ultra-Low I_Q 600mA CMOS LDO Regulator

DESCRIPTION

The SUM3638 series of CMOS low dropout regulators are designed specifically for portable battery-powered applications which require ultra-low quiescent current. The ultra-low consumption of type 0.9 μA ensures long battery life and dynamic transient boost feature improves device transient response for wireless communication applications.

The device is available in SOT-23, SOT23-3, SOT23-5, SOT89-3 and DFN1.0 × 1.0-4 package.

FEATURES

- Operating Input Voltage Range: 2.0 V to 6.5 V
- Output Voltage Range: 1.5 V, 1.8 V, 2.5 V, 2.8 V, 3.0 V, 3.3 V, 3.6 V, 4.0 V, 4.4 V, 5.0 V
- Ultra-Low Quiescent Current Typical 0.9 μA
- Low Dropout: 260 mV Typ. at 150 mA @ V_{OUT} = 1.8 V
- High Output Voltage Accuracy ±2%
- Stable with Ceramic Capacitors 1 μF
- With auto discharge function at off state

APPLICATIONS

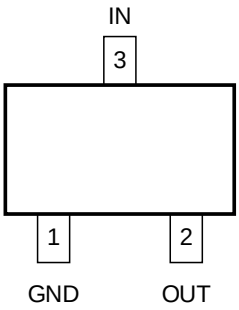
- Battery Powered Equipments
- Portable Communication Equipments
- Cameras, Image Sensors and Camcorders
- Label Information

ORDER INFORMATION

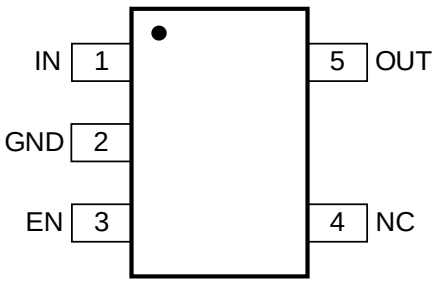
Model	Package	Ordering Number	Packing Option
SUM3638	SOT-23	SUM3638-XXK	Tape and Reel, 3000
	SOT23-3	SUM3638-XXKA3	Tape and Reel, 3000
	SOT23-5	SUM3638-XXKA5	Tape and Reel, 3000
	SOT89-3	SUM3638-XXP	Tape and Reel, 1000
	DFN1.0 × 1.0-4	SUM3638-XXYB	Tape and Reel, 10000

*XX: When expressed as 18, the output voltage is 1.8 V; when expressed as 30 the output voltage is 3.0 V.

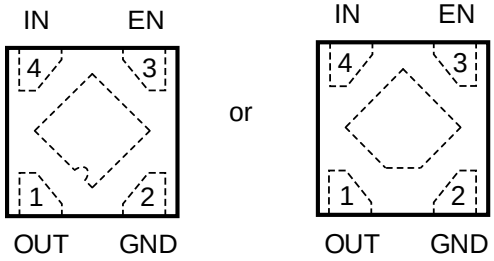
PIN CONFIGURATION (Top View)



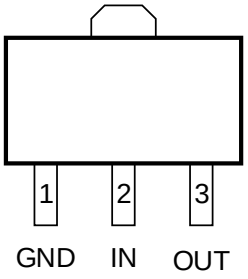
SOT-23/SOT23-3



SOT23-5



DFN1.0 × 1.0-4



SOT89-3

PIN DESCRIPTIONS

Pin Number				Symbol	Function
SOT23-5	SOT89-3	DFN1.0×1.0-4	SOT-23/ SOT23-3		
1	2	4	3	IN	Supply input pin. Must be closely decoupled to GND with a 1μF or greater ceramic capacitor.
2	1	2	1	GND	Ground.
3		3		EN	Enable control input, active high. Do not leave EN floating.
4				NC	No connection.
5	3	1	2	OUT	Output pin. Bypass a 1 μF ceramic capacitor from this pin to ground.

ABSOLUTE MAXIMUM RATINGS(2)

Parameter	Symbol	Value		Unit
Input Voltage	V_{IN}	9		V
Output Voltage	V_{OUT}	−0.3 to V_{IN} + 0.3		V
Chip Enable Input	V_{EN}	−0.3 to V_{CC}		V
Junction Temperature	T_J	150		°C
Storage Temperature	T_{STG}	−65 to 150		°C
Thermal Characteristics, Thermal Resistance, Junction-to-Air(1)	$R_{\theta JA}$	SOT-23	350	°C/W
		SOT23-3	350	
		SOT23-5	250	
		SOT89-3	135	
		DFN1.0 × 1.0-4	280	
Human Body Model	HBM	7000		V
Machine Model	MM	300		V
Current Maximum Rating	Latch up	200		mA

NOTE:

(1) This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate area of copper on the printed circuit board is available for heat-sinking.

(2) Stresses beyond those listed under “ABSOLUTE MAXIMUM RATINGS” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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CAUTION

This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SUMSEMI recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SUMSEMI reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SUMSEMI sales office to get the latest datasheet.

RECOMMENDED OPERATING CONDITIONS

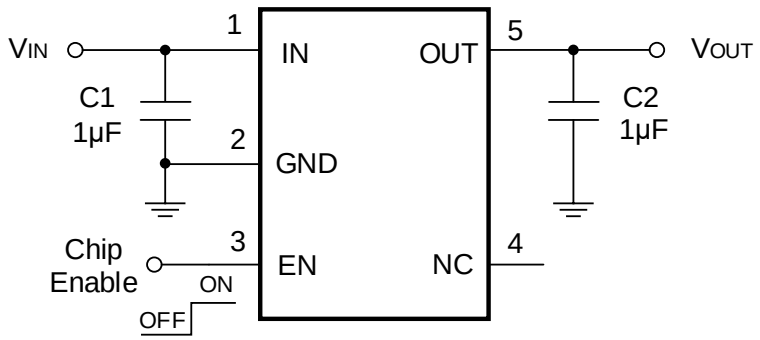
Symbol	Item	Rating	Unit
T_A	Operating Ambient Temperature	-40 to 85	℃
C_{IN}	Effective Input Ceramic Capacitor Value	0.47 to 4.7	μF
C_{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 4.7	μF

ELECTRICAL CHARACTERISTICS

V_{OUT} = 3.3 V, I_{OUT} = 1 mA, C_{IN} = 1 μF, C_{OUT} = 1 μF, T_A = +25 °C, unless otherwise noted.

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{IN}	Operating Input			2.0		6.5	V
V_{OUT}	Output Voltage	T_A = +25 °C		-2		+2	%
I_Q	Quiescent Current	I_{OUT} = 0 mA			0.9	1.1	μA
I_{SD}	Shutdown Current	V_{EN} = 0 V				0.1	μA
LineReg	Line Regulation	4.5 V ≤ V_{IN} ≤ 6.5 V, I_{OUT} = 1 mA			0.1	0.2	%/V
LoadReg	Load Regulation	1 mA ≤ I_{OUT} ≤ 150 mA, V_{IN} = 2.5 V		-40		40	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 300 mA			300		mV
I_{OUT}	Output Current				600		mA
I_{SHORT}	Short Circuit Current	V_{OUT} = 0 V			50		mA
PSRR	Power supply Rejection Ratio	I_{OUT} = 100 mA	f = 1 kHz		-56		dB
			f = 10 kHz		-52		

APPLICATION CIRCUITS



Note: The EN pin can not be suspended.

APPLICATIONS INFORMATION

General

The SUM3638 is a high performance 600mA Linear Regulator with Ultra Low I_Q. This device delivers low Noise and high Power Supply Rejection Ratio with excellent dynamic performance due to employing the Dynamic Quiescent Current adjustment which assure ultra low I_Q consumption at no-load state. These parameters make this device very suitable for various battery powered applications.

Input Decoupling (C_{IN})

It is recommended to connect at least a 1μF Ceramic X5R or X7R capacitor between IN and GND pins of the device. This capacitor will provide a low impedance path for any unwanted AC signals or Noise superimposed onto constant Input Voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Higher capacitance and lower ESR Capacitors will improve the overall line transient response.

Output Decoupling (C_{OUT})

The SUM3638 does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended. There is recommended connect the output capacitor as close as possible to the output pin of the regulator.

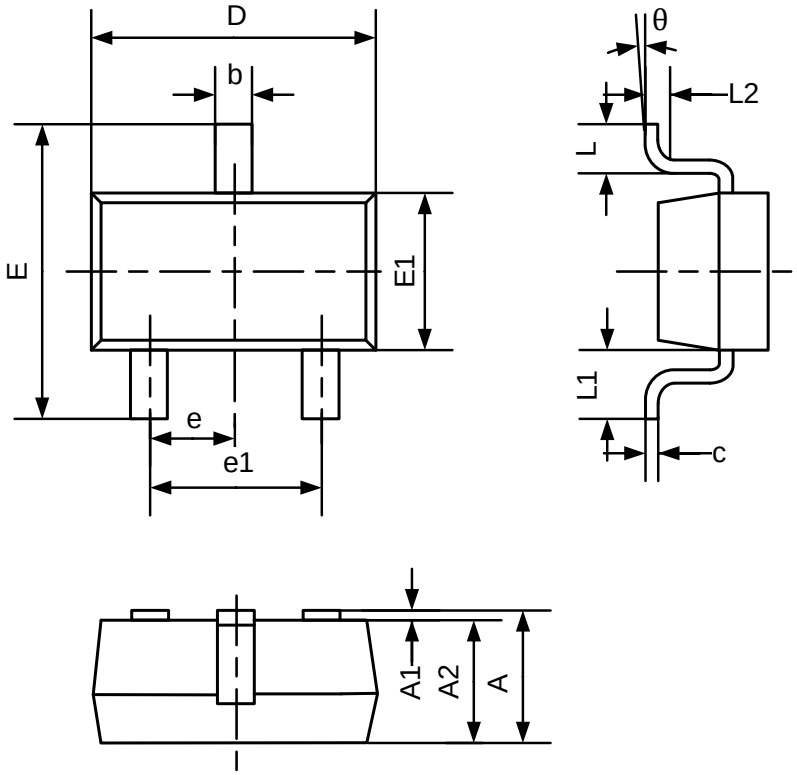
Power Dissipation and Heat sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the SUM3638 device can handle is given by:

$$P_{D(MAX)} = \frac{[T_{J(MAX)} - T_A]}{R_{\theta JA}} \qquad \text{(eq.1)}$$

PACKAGE OUTLINE

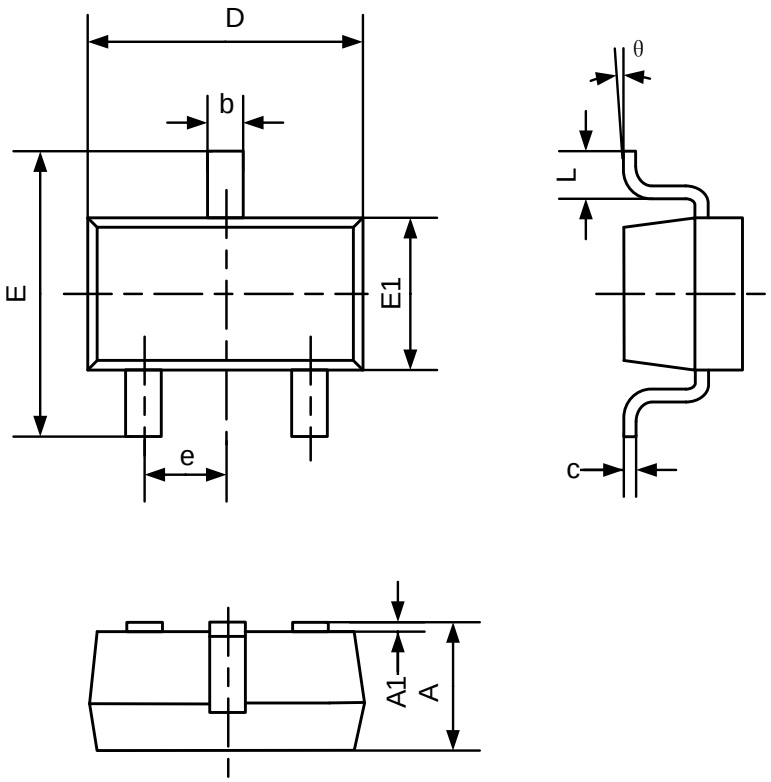
SOT-23



Symbol	Dimensions In Millimeters	
	Min	Max
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	2.250	2.550
E1	1.200	1.400
e	0.950 REF.	
e1	1.800	2.000
L	0.550 REF	
L1	0.300	0.500
θ	0°	8°

PACKAGE OUTLINE

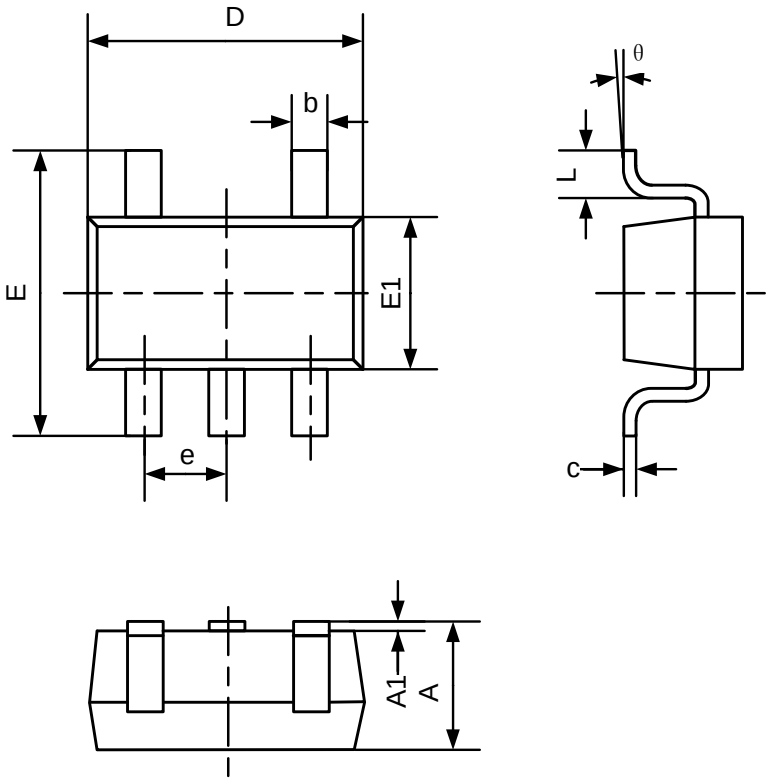
SOT23-3



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.050	1.250
A1	0.000	0.100
b	0.300	0.400
c	0.100	0.200
D	2.820	3.020
E	2.600	3.000
E1	1.500	1.700
e	0.950BSC	
L	0.300	0.600
θ	0°	8°

PACKAGE OUTLINE

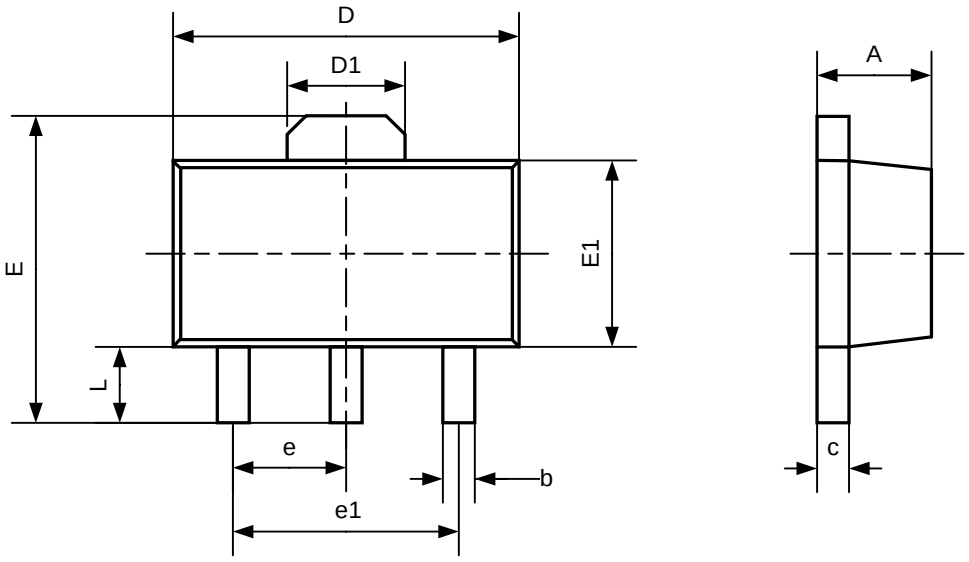
SOT23-5



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.050	1.250
A1	0.000	0.100
b	0.350	0.500
c	0.080	0.200
D	2.820	3.020
E	2.600	3.000
E1	1.600	1.700
e	0.950BSC	
L	0.300	0.600
θ	0°	8°

PACKAGE OUTLINE

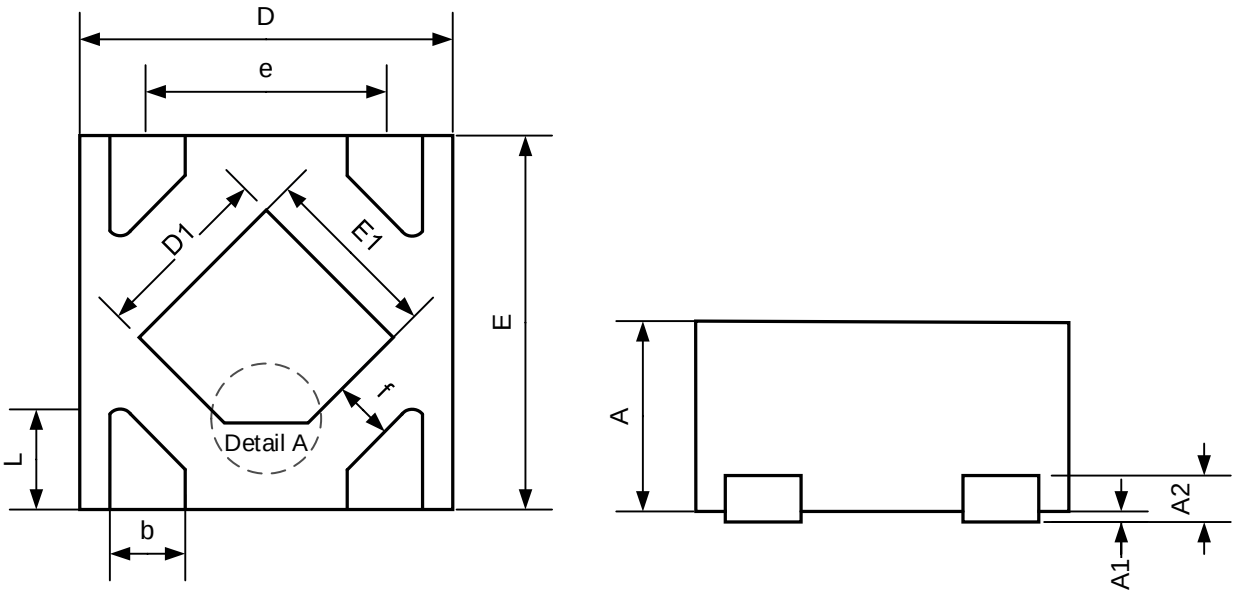
SOT89-3



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.400	1.600
b	0.320	0.520
c	0.350	0.440
D	4.400	4.600
D1	1.550REF	
E	3.940	4.250
E1	2.300	2.600
e	1.500BSC	
e1	3.000BSC	
L	0.900	1.200

PACKAGE OUTLINE

DFN1.0 × 1.0-4



Detail A:

Note: Detail A has two kinds of shapes

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.400	0.500	0.550
A1	0.000	0.025	0.050
A2		0.125REF	
D	0.950	1.000	1.050
D1	0.380	0.480	0.580
E	0.950	1.000	1.050
E1	0.380	0.480	0.580
b	0.150	0.200	0.250
e		0.650BSC	
f	0.190	0.195	0.200
L	0.150	0.250	0.350