40V 150mA Low Power LDO

Features

- Low Power Consumption:2μA
- Low Voltage Drops: 600mV @100mA
- Low Temperature Coefficient
- Fixed Output Voltages: 1.8V, 2.5V, 2.7V, 3.0V 3.3V, 3.6V, 4.0V, 4.4V, 5.0V
- Thermal Shutdown Protection
- High Ripple Rejection: 65dB @100Hz
- High Input Voltage (Up to 40V)
- Output current @V_{IN}-V_{OUT}=2V (Up to 150mA)
- Output Voltage Accuracy: ±2% at 25℃
- SOT23-3/SOT23-5/SOT89-3 Package

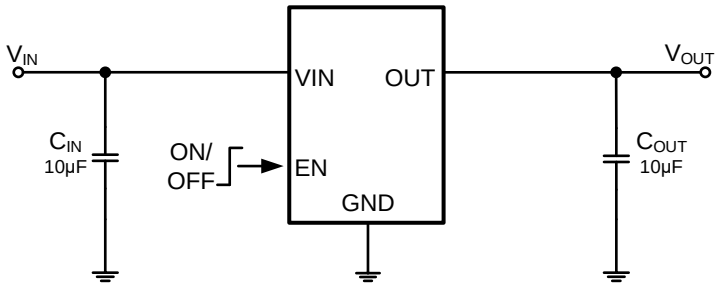
Applications

- Power Meter
- Multicell Battery Powered Equipment
- Communication equipment
- Smoke Detector
- Audio/Video Equipment
- LED Driver

General Description

The RY6313 series is a set of high voltage, high accuracy, low quiescent current, low dropout and low power consumption liner regulators. There are designed primarily as CMOS technology. They allow input voltages as fixed voltage regulators. These devices can be high as 40V. They are available with several fixed used with external components to obtain variable output voltages ranging from 1.8V to 5.0V. The RY6313 series are available in SOT23-3, SOT23-5 and SOT89-3 package.

Typical Application Circuit

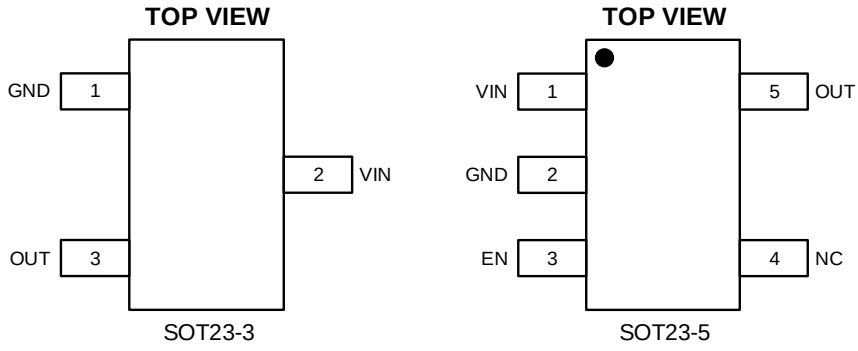


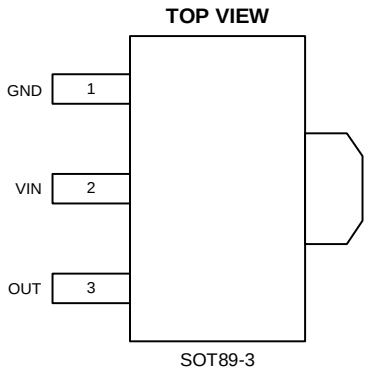
Typical Application Circuit

40V 150mA Low Power LDO

Pin Description

Pin Configuration





Pin Description

Pin No.		Function
SOT23-3	SOT89-3	
1	1	Ground pin.
2	2	Input voltage pin for the regulator.
3	3	Output voltage pin for the regulator.

Order Information

RY6313-①②③④

Designator	Symbol	Description
①②	Integer	Output Voltage
③	M	SOT23-3
	T	SOT23-5
	P	SOT89-3
④	R	RoHS / Pb Free

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Part No.	Model	Description	Package	T/R Qty
70609110	RY6313-18HMR	RY6313-18HMR LDO, 1.8V, SOT23-3	SOT23-3	3000PCS
70609111	RY6313-25HMR	RY6313-25HMR LDO, 2.5V, SOT23-3	SOT23-3	3000PCS
70609112	RY6313-27HMR	RY6313-27HMR LDO, 2.7V, SOT23-3	SOT23-3	3000PCS
70609113	RY6313-28HMR	RY6313-27HMR LDO, 2.8V, SOT23-3	SOT23-3	3000PCS
70609114	RY6313-30HMR	RY6313-30HMR LDO, 3.0V, SOT23-3	SOT23-3	3000PCS
70609115	RY6313-33HMR	RY6313-33HMR LDO, 3.3V, SOT23-3	SOT23-3	3000PCS
70609116	RY6313-36HMR	RY6313-36HMR LDO, 3.6V, SOT23-3	SOT23-3	3000PCS
70609117	RY6313-40HMR	RY6313-40HMR LDO, 4.0V, SOT23-3	SOT23-3	3000PCS
70609118	RY6313-44HMR	RY6313-44HMR LDO, 4.4V, SOT23-3	SOT23-3	3000PCS
70609119	RY6313-50HMR	RY6313-50HMR LDO, 5.0V, SOT23-3	SOT23-3	3000PCS
70609120	RY6313-18HPR	RY6313-18HPR LDO, 1.8V, SOT89-3	SOT89-3	1000PCS
70609121	RY6313-25HPR	RY6313-25HPR LDO, 2.5V, SOT89-3	SOT89-3	1000PCS
70609122	RY6313-27HPR	RY6313-27HPR LDO, 2.7V, SOT89-3	SOT89-3	1000PCS
70609123	RY6313-28HPR	RY6313-27HPR LDO, 2.8V, SOT89-3	SOT89-3	1000PCS
70609124	RY6313-30HPR	RY6313-30HPR LDO, 3.0V, SOT89-3	SOT89-3	1000PCS
70609125	RY6313-33HPR	RY6313-33HPR LDO, 3.3V, SOT89-3	SOT89-3	1000PCS
70609126	RY6313-35HPR	RY6313-35HPR LDO, 3.5V, SOT89-3	SOT89-3	1000PCS
70609127	RY6313-36HPR	RY6313-36HPR LDO, 3.6V, SOT89-3	SOT89-3	1000PCS
70609128	RY6313-40HPR	RY6313-40HPR LDO, 4.0V, SOT89-3	SOT89-3	1000PCS
70609129	RY6313-44HPR	RY6313-44HPR LDO, 4.4V, SOT89-3	SOT89-3	1000PCS
70609130	RY6313-50HPR	RY6313-50HPR LDO, 5.0V, SOT89-3	SOT89-3	1000PCS
70609153	RY6313-18GT5R	RY6313-18GT5R LDO, 1.8V, SOT23-5	SOT23-5	3000PCS
70609154	RY6313-25GT5R	RY6313-25GT5R LDO, 2.5V, SOT23-5	SOT23-5	3000PCS
70609155	RY6313-27GT5R	RY6313-27GT5R LDO, 2.7V, SOT23-5	SOT23-5	3000PCS
70609156	RY6313-28GT5R	RY6313-27GT5R LDO, 2.8V, SOT23-5	SOT23-5	3000PCS
70609157	RY6313-30GT5R	RY6313-30GT5R LDO, 3.0V, SOT23-5	SOT23-5	3000PCS
70609158	RY6313-33GT5R	RY6313-33GT5R LDO, 3.3V, SOT23-5	SOT23-5	3000PCS
70609159	RY6313-35GT5R	RY6313-35GT5R LDO, 3.5V, SOT23-5	SOT23-5	3000PCS
70609160	RY6313-36GT5R	RY6313-36GT5R LDO, 3.6V, SOT23-5	SOT23-5	3000PCS
70609161	RY6313-40GT5R	RY6313-40GT5R LDO, 4.0V, SOT23-5	SOT23-5	3000PCS
70609162	RY6313-44GT5R	RY6313-44GT5R LDO, 4.4V, SOT23-5	SOT23-5	3000PCS
70609163	RY6313-50GT5R	RY6313-50GT5R LDO, 5.0V, SOT23-5	SOT23-5	3000PCS

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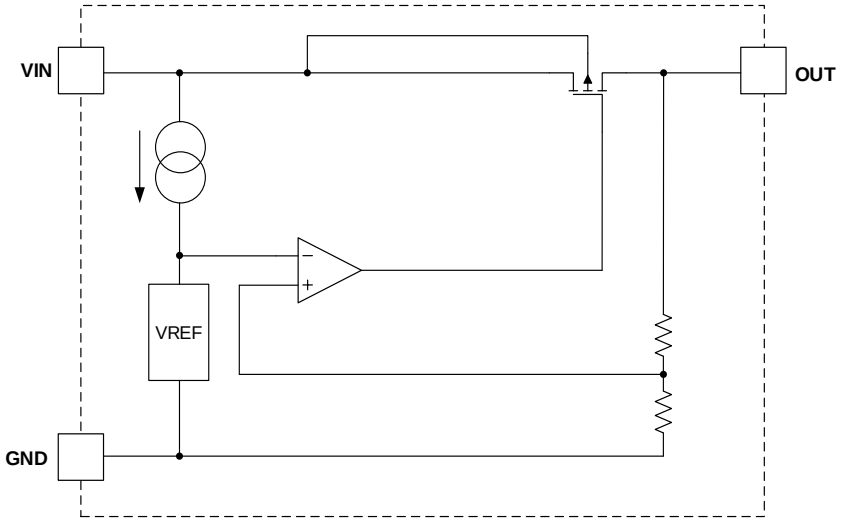
Mark Rule

Voltage (V)	SOT23-3	SOT23-5	SOT89-3
1.8V	7318YL	7G18YL	7P18YL
2.5V	7325YL	7G25YL	7P25YL
2.7V	7327YL	7G27YL	7P27YL
2.8V	7328YL	7G28YL	7P28YL
3.0V	7330YL	7G30YL	7P30YL
3.3V	7333YL	7G33YL	7P33YL
3.5V	7335YL	7G35YL	7P35YL
3.6V	7336YL	7G36YL	7P36YL
4.0V	7340YL	7G40YL	7P40YL
4.4V	7344YL	7G44YL	7P44YL
5.0V	7350YL	7G50YL	7P50YL

Functional Block Diagram



Functional Block Diagram

Specifications

Absolute Maximum Ratings (1) (2)

Item		Min	Max	Unit
V_{IN} voltage		4.5	40	V
V_{OUT} voltage		1.5	6	V
Output Current (3)		200		mA
Power Dissipation	SOT23-3	0.5	0.7	W
	SOT89-3	0.8	1.0	
Operating Ambient Temperature		-40	85	°C
Maximum junction temperature			150	°C
Storage temperature, T_{stg}		–50	85	°C
Lead Temperature (Soldering, 10sec.)			260	°C

Note (1): Exceeding these ratings may damage the device.

Note (2): The device is not guaranteed to function outside of its operating conditions.

Note (3): $I_{OUT(MAX)} = P_D / (V_{IN}-V_{OUT})$.

Recommended Operating Conditions (1)

Item	Min	Max	Unit
Operating junction temperature (1)	–40	125	°C
Operating temperature range	-40	85	°C
Input voltage V_{IN}	4.75	40	V
Output current (2)	0	150	mA
Power Dissipation	Based on the calculation (3)		W

Note (1): All limits specified at room temperature (T_A = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

Note (2): $V_{IN} – V_{OUT}$ = 2V.

Note (3): $P_D = I_{OUT(MAX)} \times (V_{IN}-V_{OUT})$.

Thermal Information

Item	Description	SOT23 3 Pin	SOT23 5 Pin	SOT89 3 Pin	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance (1)(2)	208	195	55	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	112	102	88	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	56	46	9.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	9.2	8.5	6.2	°C/W
ψ_{JB}	Junction-to-board characterization parameter	52	45	9.7	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	7.7	°C/W

Note (1): The package thermal impedance is calculated in accordance to JESD 51-7.

Note (2): Thermal Resistances were simulated on a 4-layer, JEDEC board

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Electrical Characteristics

The following specifications apply for V_{IN} = 12V, T_A=25°C, C_{IN}=C_{OUT}=10μF, unless specified otherwise.

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Units
Input Range	V_{IN}	I_{OUT} = 10mA	4.75		40	V
Output Range	V_{OUT}	I_{OUT} = 10mA	V_{OUT}×0.98	V_{OUT}	V_{OUT}×1.02	V
Output Voltage	ΔV_{OUT}	V_{IN} = 12V, I_{OUT} = 10mA	4.9	5	5.1	V
			3.234	3.3	3.366	
			2.94	3.0	3.06	
Quiescent Current	I_Q	V_{IN} = 6V, V_{OUT} = 5V, 0mA < I_{OUT} < 1mA		2		μA
Maximum Output Current	I_{OUT_PK}	V_{IN} = V_{OUT} + 2V	150			mA
Dropout Voltage	V_{DROP}	I_{OUT} = 1mA		8	12	mV
		I_{OUT} = 100mA		600		
Line Regulation	ΔV_{LINE}	V_{IN}=7 ~ 40V, V_{OUT} = 5V, I_{OUT} = 1mA		0.08		%V
Load Regulation	ΔV_{LOAD}	V_{IN}=7V, I_{OUT}=1~ 100mA		30	50	mV
Short Current	I_{SHORT}	V_{OUT} Short to GND with 1Ω (1ms pulse), V_{IN} = 24V		180		mA
Power Supply Rejection Rate	PSRR	V_{IN} = 10V, V_{PP} = 0.5V, I_{OUT} = 1mA, F = 100Hz		65		dB
		V_{IN} = 10V, V_{PP} = 0.5V, I_{OUT} = 1mA, F = 1kHz		60		
		V_{IN} = 10V, V_{PP} = 0.5V, I_{OUT} = 1mA, F = 10kHz		55		
EN High Input Threshold	V_{ENH}	V_{EN} rising until the output is enabled	1.2			V
EN Low Input Threshold	V_{ENL}	V_{EN} falling until the output is disabled			0.8	V
Output Noise Voltage	e_{NO}	10Hz to 100kHz, C_{OUT} = 10 μF, I_{OUT}=10mA		±100		μVRMS
Thermal Shutdown Protection	T_{SD}	V_{IN} = 12V, I_{OUT} = 1mA		165		°C
Temperature Coefficient	$\Delta V_O/\Delta T$			±0.5		mV/°C

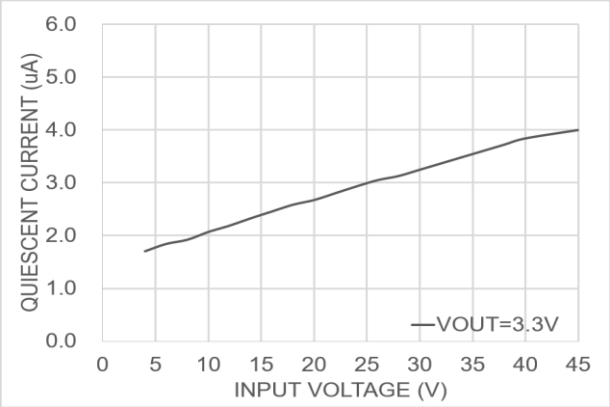
Typical Performance Characteristics

Note (1): Typical performance characteristics below based on T_A = 25°C, unless otherwise noted.

Note (2): V_{OUT}=3.3V, V_{IN}=V_{OUT}+2V, C_{IN}=10μF, C_{OUT}=10μF, package is SOT89-3, unless otherwise noted.

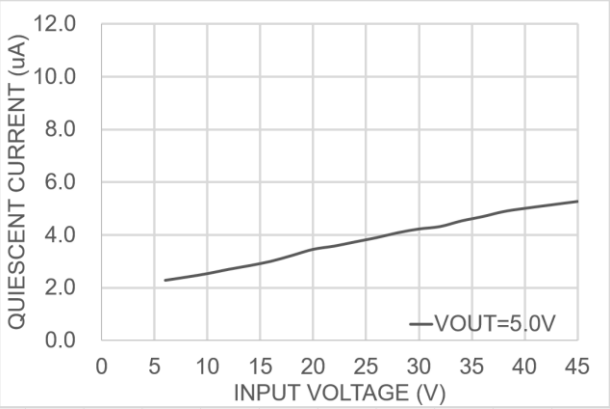
Quiescent Current

V_{OUT}=3.3V



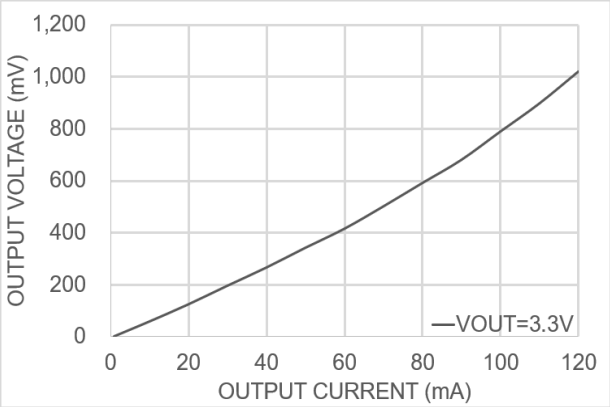
Quiescent Current

V_{OUT}=5V



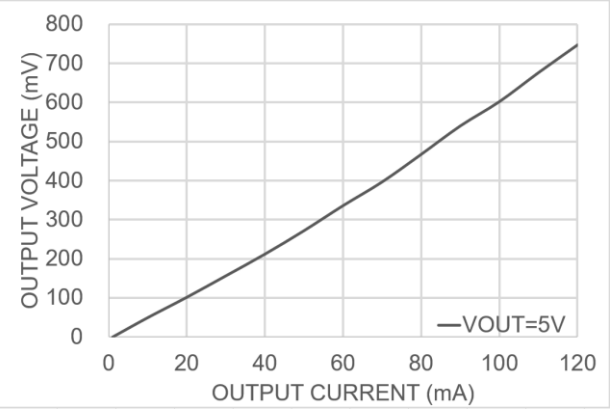
Dropout Voltage vs Output Current

V_{OUT}=3.3V



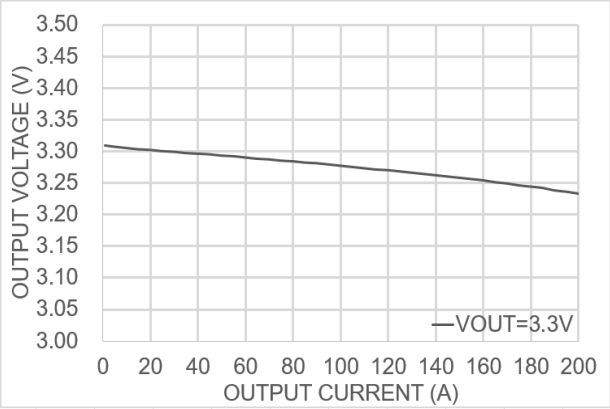
Dropout Voltage vs Output Current

V_{OUT}=5V



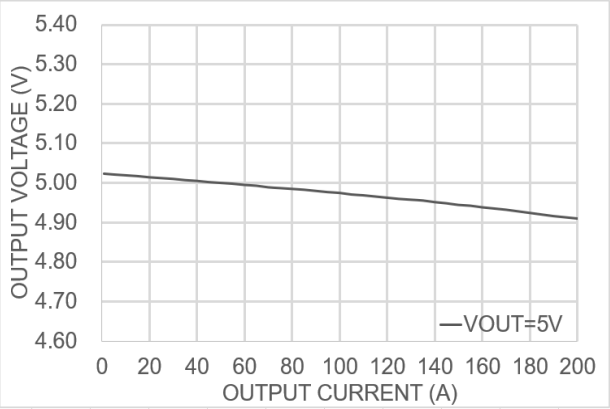
Output Current vs Output Voltage

V_{OUT}=3.3V



Output Current vs Output Voltage

V_{OUT}=5V



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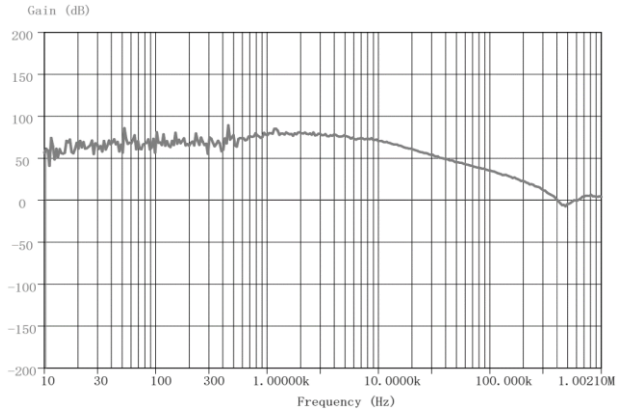
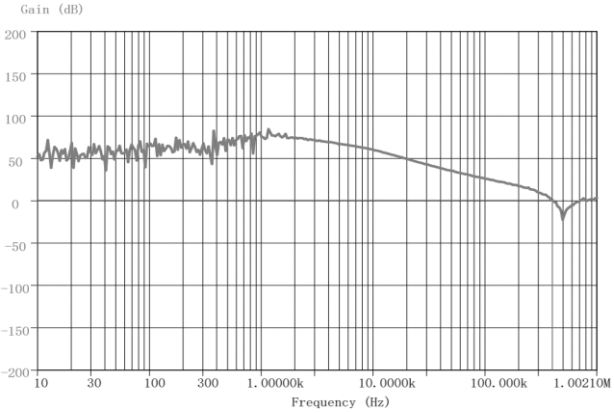
Power Supply Rejection Ratio

V_{OUT}=3.3V



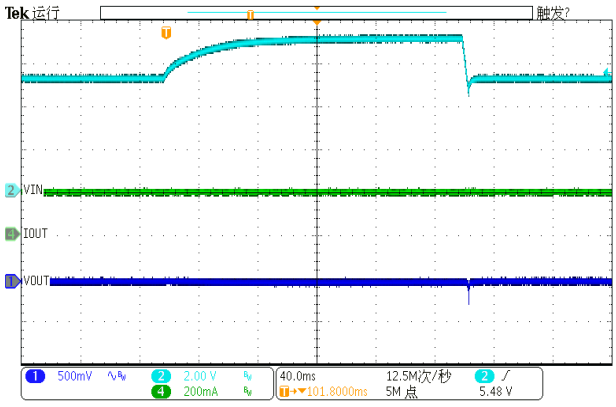
Power Supply Rejection Ratio

V_{OUT}=5V



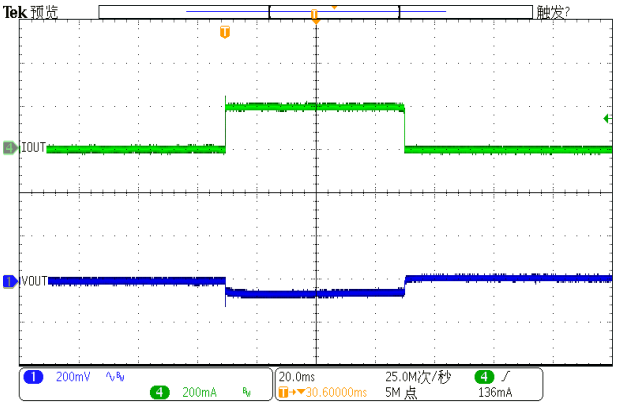
line-Transient Response

V_{OUT}=3.3V



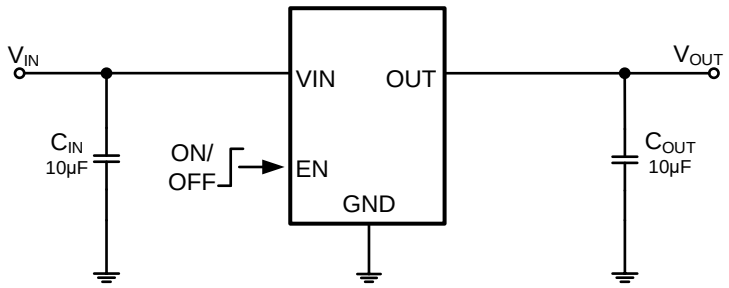
Load-Transient Response

V_{OUT}=3.3V

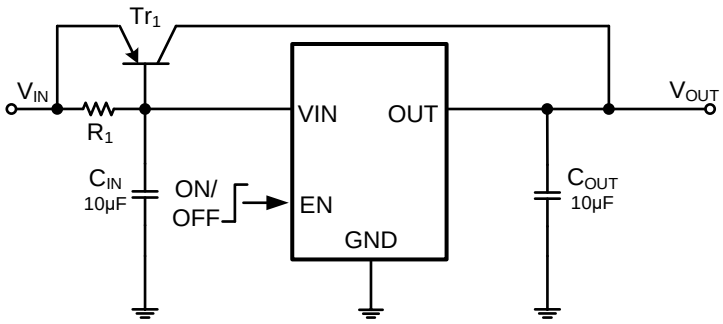


Applications Information

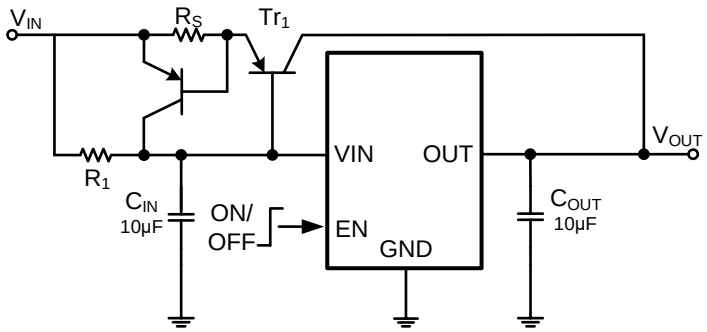
Basic Circuits



High Output Current Positive Voltage Regulator



Short-Circuit Protection by Tr1



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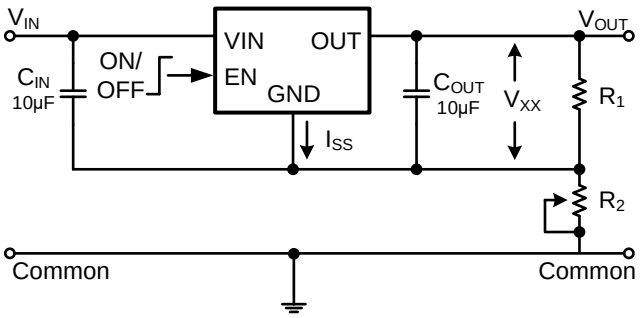
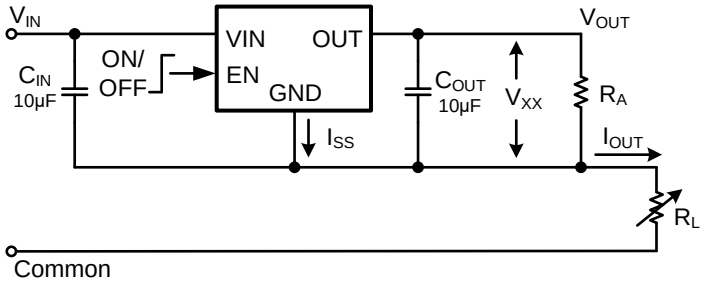
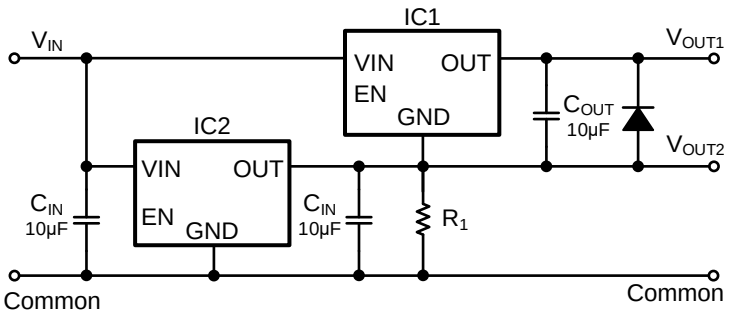
Circuit for Increasing Output Voltage



Constant Current Regulator



Dual Supply



Notes on Use

1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please keep the resistance low between V_{IN} and GND wiring in particular.
3. Please wire the input capacitor (C_{IN}) and the output capacitor (C_{OUT}) as close to the IC as possible.

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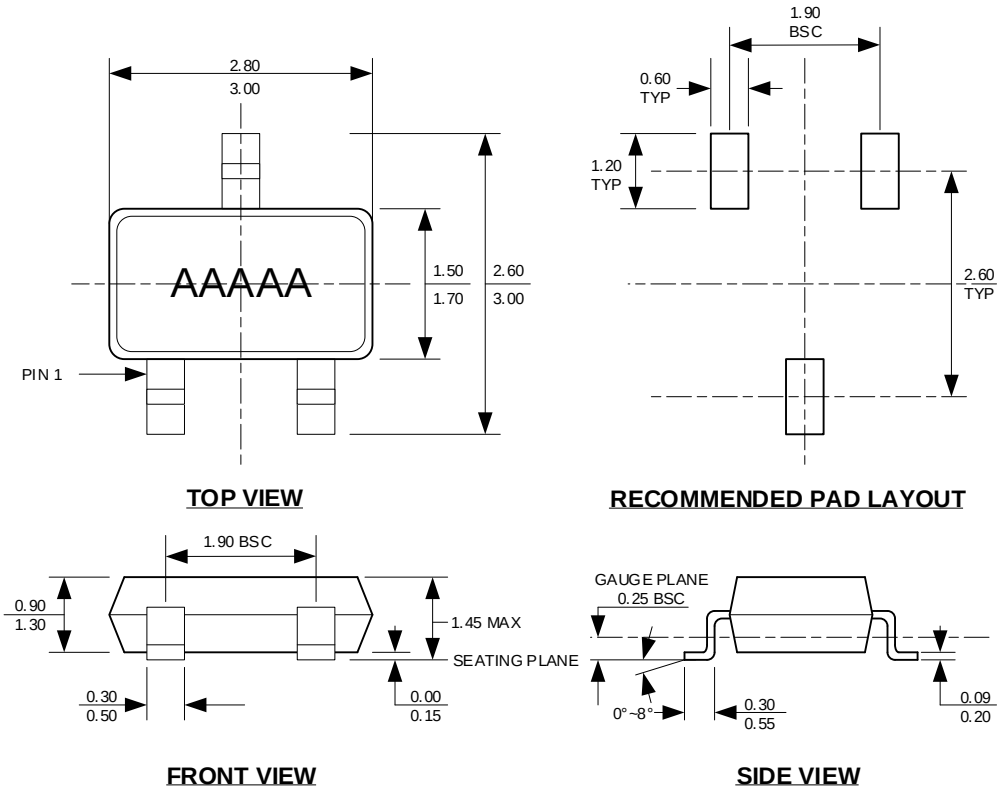
Packaging Information

3-Pin SOT23 Packaging Information

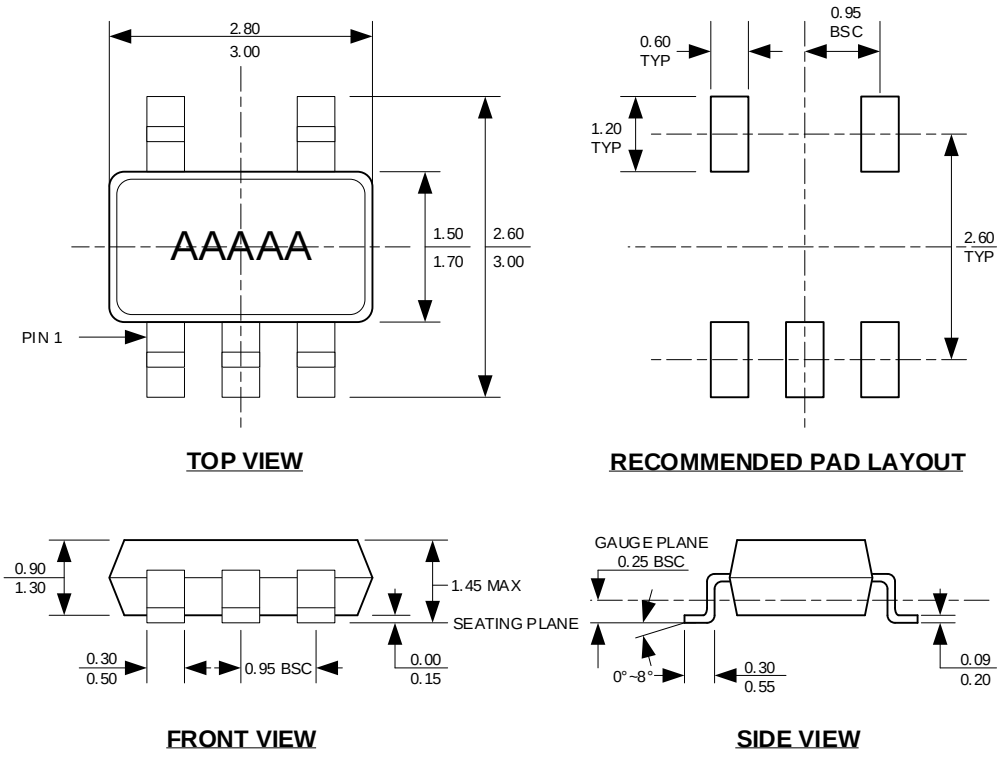
SOT23-3



NOTE:
1. CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2. PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5. DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6. DRAWING IS NOT TO SCALE.

5-Pin SOT23 Packaging Information

SOT23-5



NOTE:
1. CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2. PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5. DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6. DRAWING IS NOT TO SCALE.

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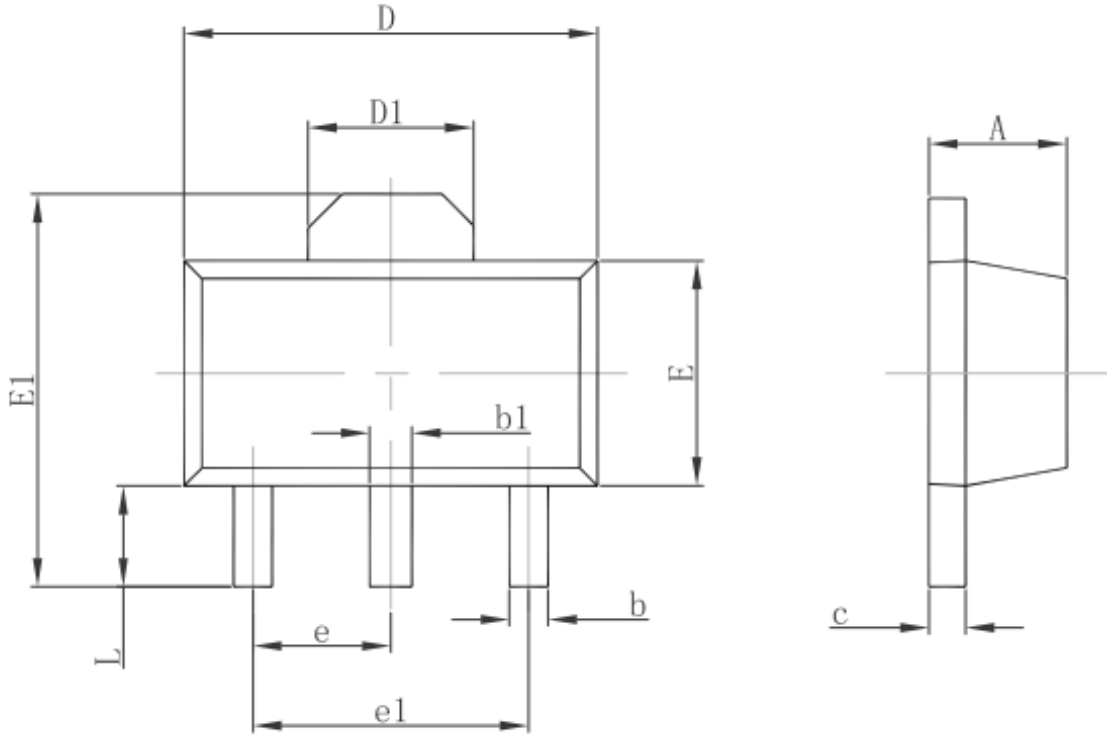
3-Pin SOT89 Packaging Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047