VFM Step-Up DC/DC Converter

General Description

The RT9261B Series are VFM Step-up DC/DC converter ICs with ultra low supply current by CMOS process and suitable for use with battery-powered instruments.

The RT9261B IC consists of an oscillator, a VFM control circuit, a driver transistor (LX switch), a reference voltage unit, an error amplifier, resistors for voltage detection, and a LX switch protection circuit. A low ripple and high efficiency step-up DC/DC converter can be constructed with the RT9261B IC and only three external components.

The EN pin enables the circuit to set the standby supply current at a maximum of 0.5μA.

Ordering Information

RT9261B-□□□□

Package Type
B : SOT-23-5
X : SOT-89

Lead Plating System
P : Pb Free
G : Green (Halogen Free and Pb Free)

Output Voltage
15 : 1.5V
16 : 1.6V
:
49 : 4.9V
50 : 5.0V

Note :

Richtek products are :

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- Suitable for use in SnPb or Pb-free soldering processes.

Marking Information

For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

Features

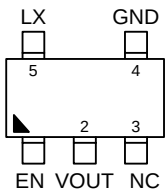
- **Minimal Number of External Components (Only an Inductor, a Diode, and a Capacitor)**
- **Ultra Low Input Current (6.5μA at Switch Off)**
- **Capable of Supplying 50mA Output Current with Internal Switch**
- **± 2% Output Voltage Accuracy**
- **Low Ripple and Low Noise**
- **Low Start-up Voltage, 0.8V at 1mA**
- **80% Efficiency with Low Cost Inductor**
- **+50 ppm/°C Low Temperature-Drift**
- **SOT-89 and SOT-23-5 Small Packages**
- **RoHS Compliant and 100% Lead (Pb)-Free**

Applications

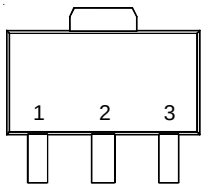
- Power source for battery-powered equipment
- Power source for cameras, camcorders, VCRs, PDAs, pagers, electronic data banks, and hand-held communication equipment
- Power source for appliances, which require higher voltage than that of batteries used in the appliances

Pin Configurations

(TOP VIEW)

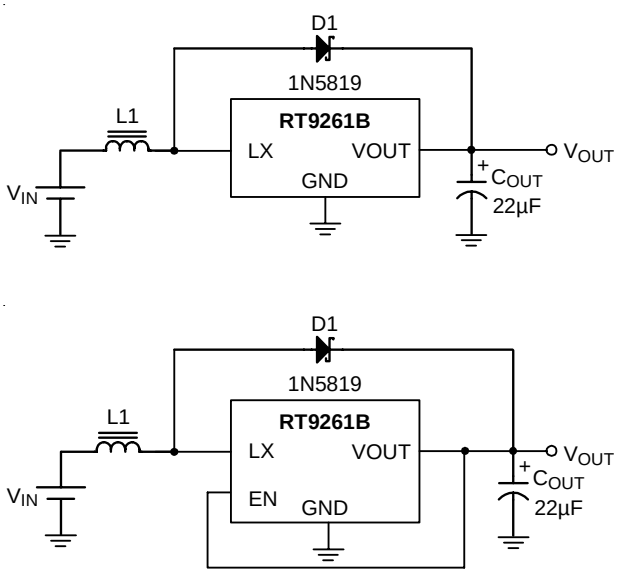


SOT-23-5



SOT-89

Typical Application Circuit

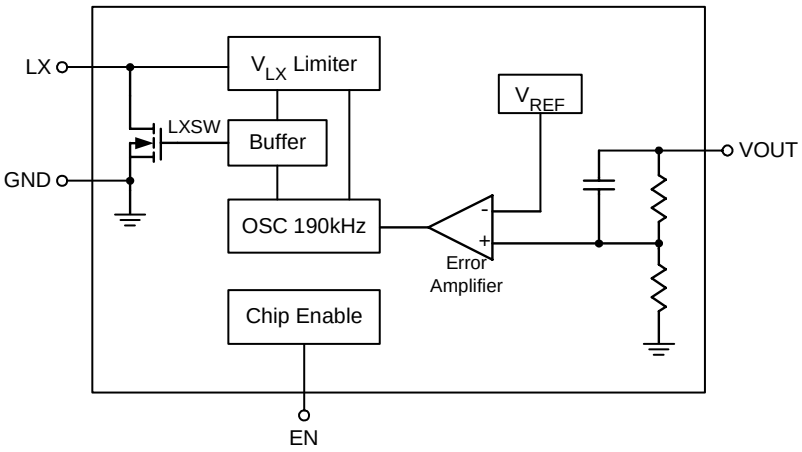


* L1 ranges from 27µH to 120µH

Functional Pin Description

Pin No.		Pin Name	Pin Function
SOT-23-5	SOT-89		
1	--	EN	Chip Enable (Active High).
2	2	VOUT	Output Voltage.
3	--	NC	No Internal Connection.
4	1	GND	Ground.
5	3	LX	Pin for Switching.

Function Block Diagram



Absolute Maximum Ratings

- Output Voltage ---------- 8V
- LX Pin Voltage ---------- 8V
- EN Pin Voltage(1) ---------- −0.3 to V_{OUT} +0.3V
- LX Pin Output Current ---------- 400mA
- Power Dissipation, P_D @ T_A = 25°C
  - SOT-89 ---------- 0.5W
  - SOT-23-5 ---------- 0.25W
- Package Thermal Resistance
  - SOT-89, θ_{JC} ---------- 100°C/W
  - SOT-89, θ_{JA} ---------- 300°C/W
  - SOT-23-5, θ_{JA} ---------- 250°C/W
- Operating Temperature Range ---------- −20 to +85°C
- Storage Temperature Range ---------- −65°C to 150°C
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C

Notes: (1) Applicable to RT9261B-xxCB

Electrical Characteristics (Refer to Figure 1)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Output Voltage Accuracy	ΔV_{OUT}			-2	--	+2	%
Input Voltage	V_{IN}			--	--	7	V
Start-up Voltage	V_{ST}	I_{OUT} = 1mA, V_{IN}: 0 → 2V		--	0.8	1	V
Hold-on Voltage	V_{HO}	I_{OUT} = 1mA, V_{IN}: 2 → 0V		0.7	--	--	V
Input Current 1		V_{IN} in continuous switching	$V_{OUT} \le 3.5V$ (1)	--	24	36	μA
			$3.5V < V_{OUT} \le 5V$ (2)	--	36	45	
Input Current 2 (1) (2)		V_{OUT} in switch off condition		--	6.5	10	μA
Input Current 3 (guaranteed by I_1 and I_2)		V_{IN} in no load	$V_{OUT} \le 3.5V$ (1)	--	18	36	μA
			$3.5V < V_{OUT} \le 5V$ (2)	--	20	45	
LX Switching Current	$I_{SWITCHING}$	V_{LX} = 0.4V	$V_{OUT} \le 3.5V$ (1)	120	--	--	mA
			$3.5V < V_{OUT} \le 5V$ (2)	160	--	--	
LX Leakage Current	$I_{LEAKAGE}$	V_{LX} = 6V		--	--	0.5	μA
Maximum Oscillator Frequency	F_{MAX}	V_{OUT} = 2.5V to 5V		140	190	240	kHz
		V_{OUT} = 1.5V to 2.4V		140	190	320	kHz
Oscillator Duty Cycle	D_{OSC}	On (V_{LX} "L") side	V_{OUT} = 2.5V to 5V	65	75	85	%
			V_{OUT} = 1.5V to 2.4V	60	70	80	%
Efficiency				--	80	--	%
V_{LX} Voltage Limit		LX switch on		0.65	0.8	1.0	V

Notes:

(1) V_{IN} = 1.8V, V_{SS} = 0V, I_{OUT} = 1mA, Topt = 25°C, and use External Circuit of Typical Application

(2) V_{IN} = 3V, V_{SS} = 0V, I_{OUT} = 1mA, Topt= 25°C, and External Circuit of Typical Application

Electrical Characteristics (Refer to Figure 2)

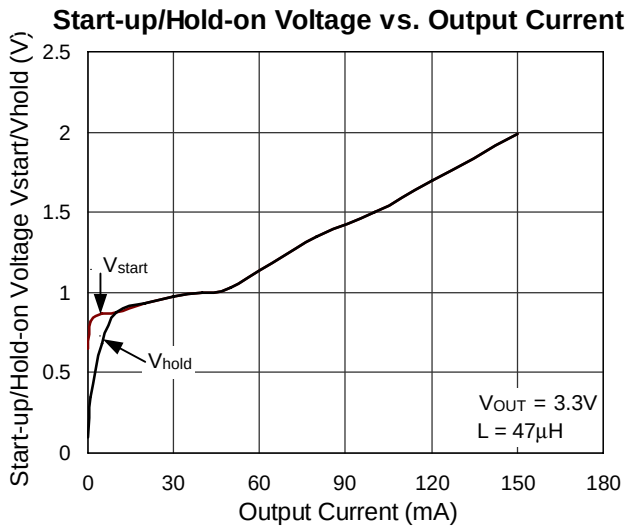
Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Output Voltage Accuracy	ΔV_{OUT}			–2	--	+2	%
Input Voltage	V_{IN}			--	--	7	V
Start-up Voltage	V_{ST}	I_{OUT} = 1mA, V_{IN}: 0 → 2V		--	0.8	1	V
Hold-on Voltage	V_{HO}	I_{OUT} = 1mA, V_{IN}: 2 → 0V		0.7	--	--	V
Efficiency				--	80	--	%
Input Current 1		V_{IN} in continuous switching	$V_{OUT} \leq 3.5V$ (1)	--	24	36	µA
			$3.5V < V_{OUT} \leq 5V$ (2)	--	36	45	
Input Current 2 (1) (2)		V_{OUT} in switch off condition		--	6.5	10	µA
Input Current 3 (guaranteed by I_1 and I_2)		V_{IN} in no load	$V_{OUT} \leq 3.5V$ (1)	--	18	36	µA
			$3.5V < V_{OUT} \leq 5V$ (2)	--	20	45	
LX Switching Current	$I_{SWITCHING}$	V_{LX} = 0.4V	$V_{OUT} \leq 3.5V$ (1)	120	--	--	mA
			$3.5V < V_{OUT} \leq 5V$ (2)	160	--	--	
LX Leakage Current	$I_{LEAKAGE}$	V_{LX} = 6V		--	--	0.5	µA
EN “H” Level		$V_{IN} = V_{OUT} * 0.9$		0.4 x V_{OUT}	--	--	V
EN “L” Level		$V_{IN} = V_{OUT} * 0.9$		--	--	0.2	V
EN “H” Input Current		EN = V_{OUT}		--	--	0.5	µA
EN “ L” Input Current		EN = 0V		–0.5	--	--	µA
Maximum Oscillator Frequency	F_{MAX}	V_{OUT} = 2.5V to 5V		140	190	240	kHz
		V_{OUT} = 1.5V to 2.4V		140	190	320	kHz
Oscillator Duty Cycle	D_{OSC}	On (V_{LX} “L”) side	V_{OUT} = 2.5V to 5V	65	75	85	%
			V_{OUT} = 1.5V to 2.4V	60	70	80	%
V_{LX} Voltage Limit		LX switch on		0.65	0.8	1.0	V

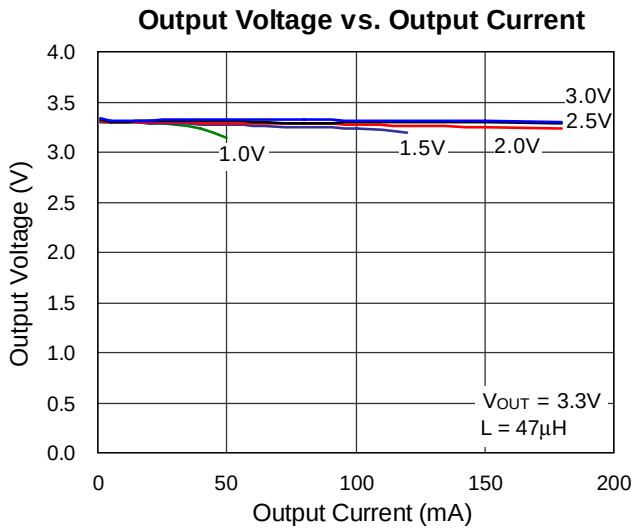
Notes:

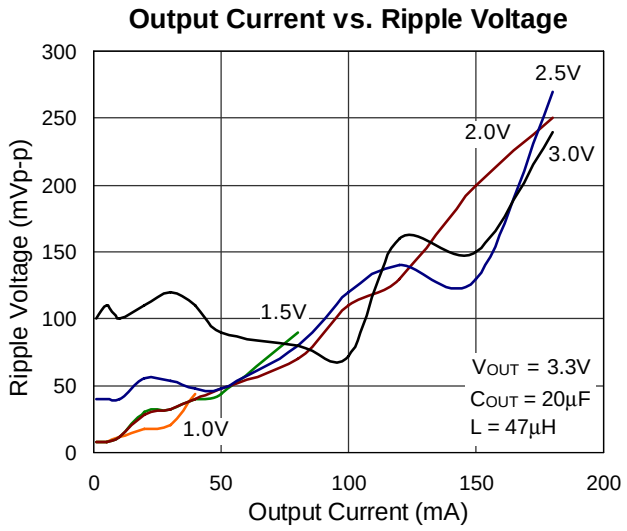
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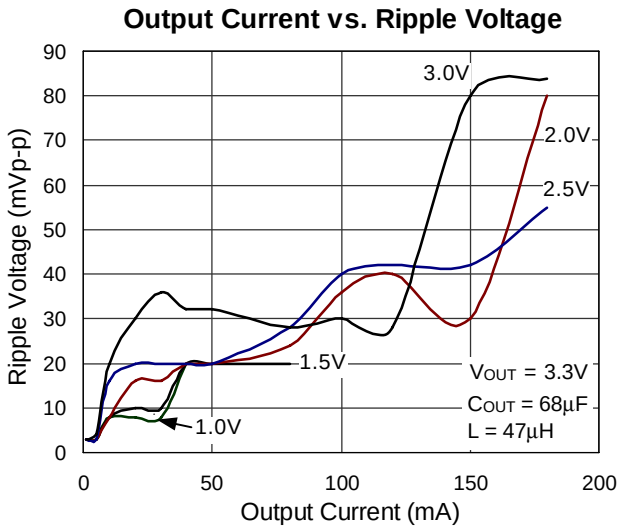
(2) V_{IN} = 3V, V_{SS} = 0V, I_{OUT} = 1mA, Topt= 25°C, and External Circuit of Typical Application

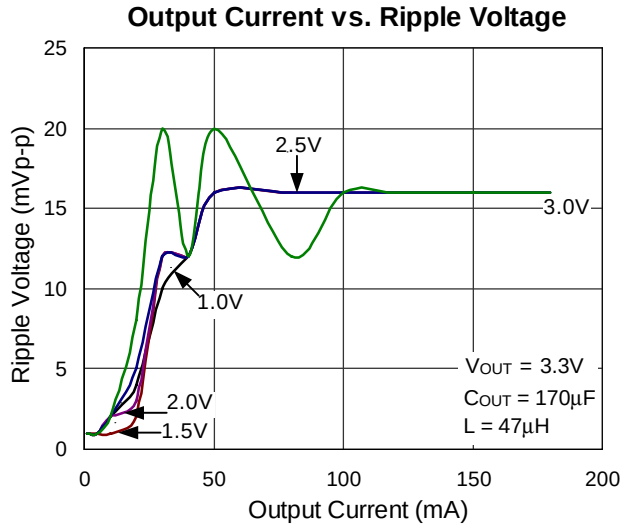
Typical Operating Characteristics

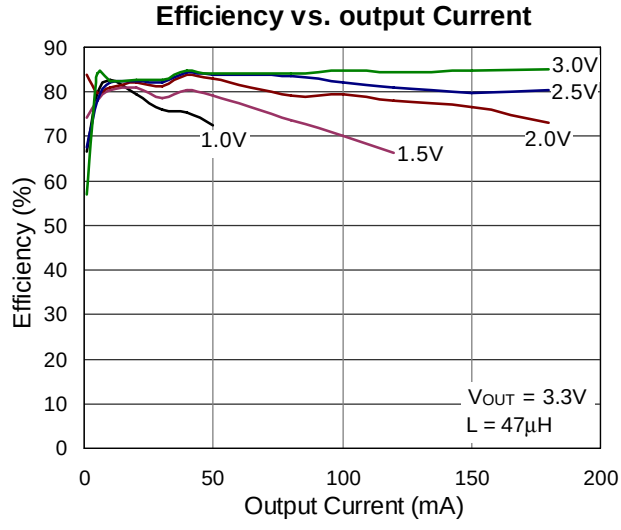


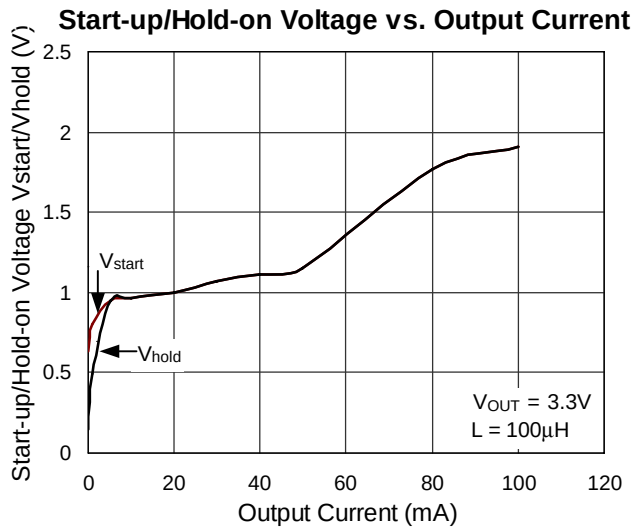


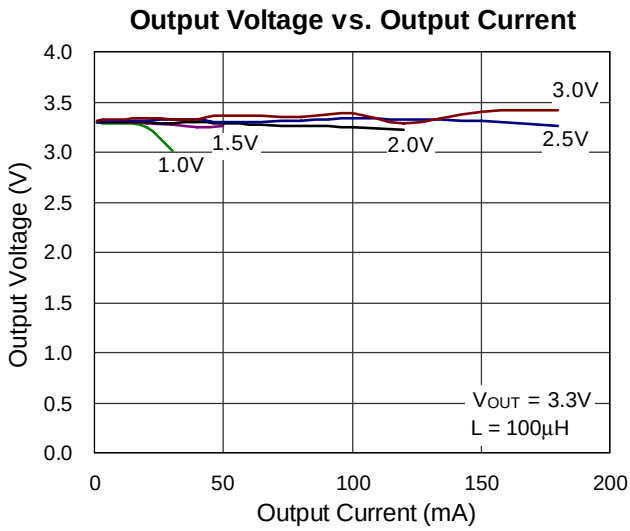


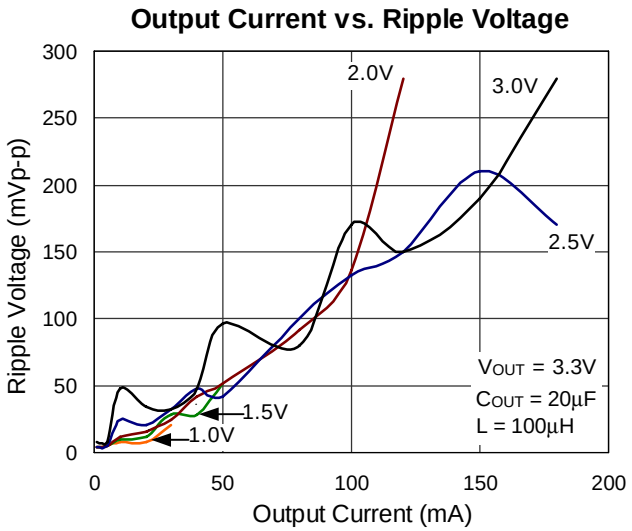


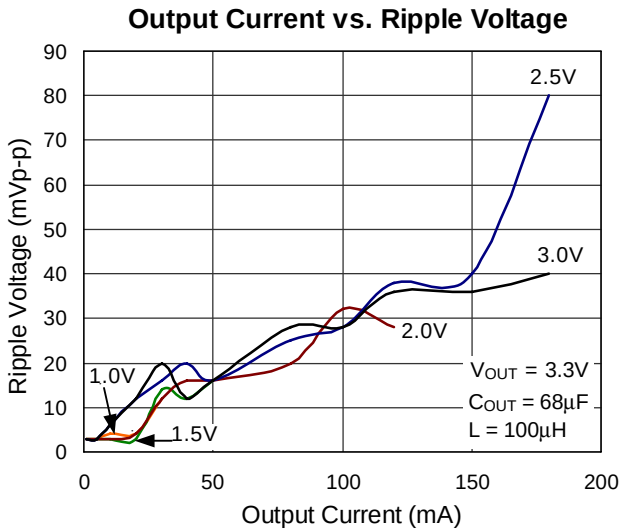


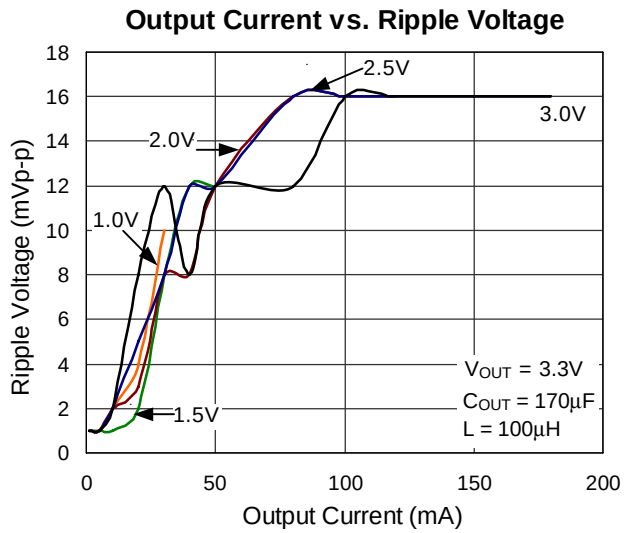


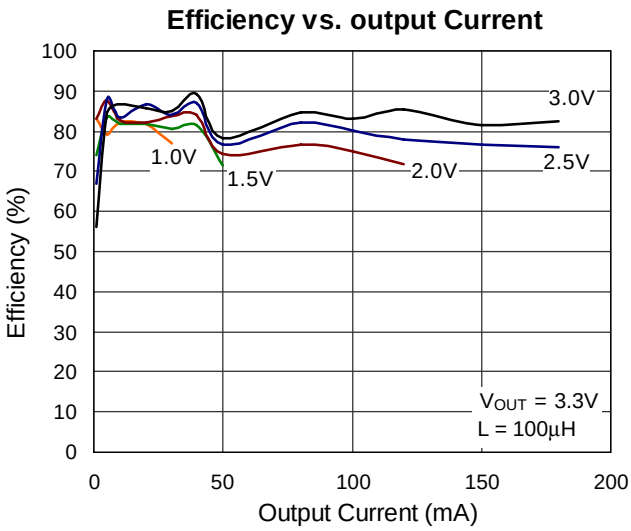

Start-up/Hold-on Voltage vs. Output Current
Start-up/Hold-on Voltage Vstart/Vhold (V)
Output Current (mA)
Vstart
Vhold
VOUT = 3.3V
L = 100µH


Output Voltage vs. Output Current
Output Voltage (V)
Output Current (mA)
3.0V
2.5V
2.0V
1.5V
1.0V
VOUT = 3.3V
L = 100µH

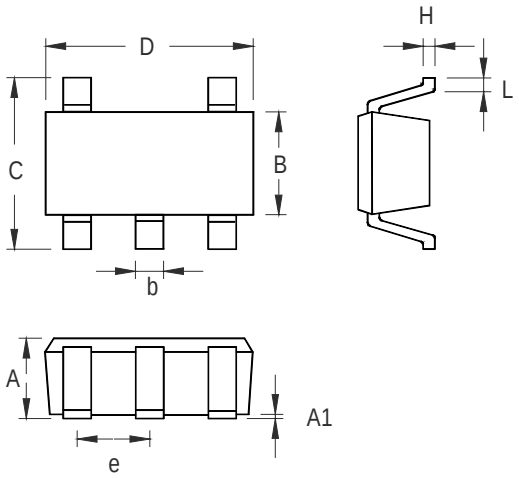

Output Current vs. Ripple Voltage
Ripple Voltage (mVp-p)
Output Current (mA)
2.0V
3.0V
2.5V
1.5V
1.0V
VOUT = 3.3V
COUT = 20µF
L = 100µH


Output Current vs. Ripple Voltage
Ripple Voltage (mVp-p)
Output Current (mA)
2.5V
3.0V
2.0V
1.0V
1.5V
VOUT = 3.3V
COUT = 68µF
L = 100µH


Output Current vs. Ripple Voltage
Ripple Voltage (mVp-p)
Output Current (mA)
2.5V
3.0V
2.0V
1.0V
1.5V
VOUT = 3.3V
COUT = 170µF
L = 100µH

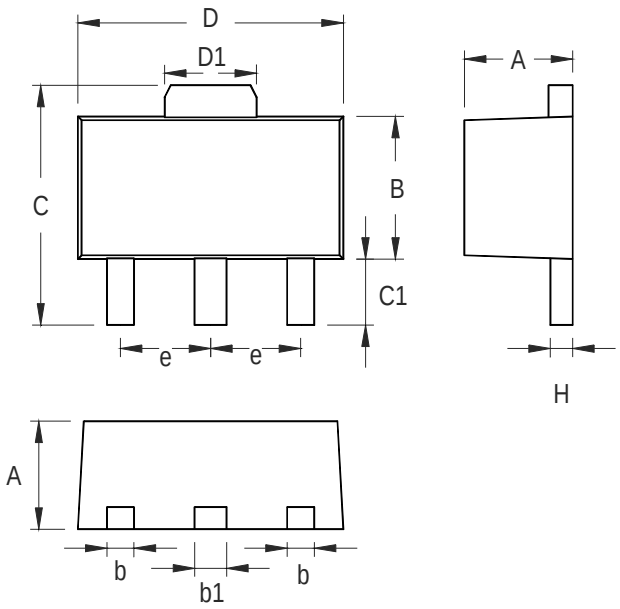

Efficiency vs. output Current
Efficiency (%)
Output Current (mA)
3.0V
1.0V
1.5V
2.0V
2.5V
VOUT = 3.3V
L = 100µH

Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.559	0.014	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

SOT-23-5 Surface Mount Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	3.937	4.242	0.155	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.356	0.432	0.014	0.017

3-Lead SOT-89 Surface Mount

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