

## VFM Step-up DC/DC Converter

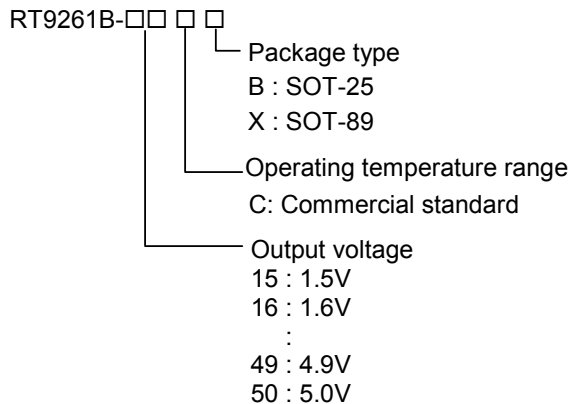
### General Description

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 CE pin enables the circuit to set the standby supply current at a maximum of 0.5 $\mu$ A.

### Ordering Information



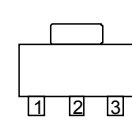
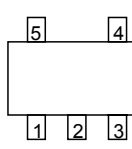
### Features

- Minimal Number of External Components (Only an Inductor, a Diode, and a Capacitor)
- Ultra Low Input Current (6.5 $\mu$ A at Switch Off)
- Capable of Supplying 50mA Output Current with Internal Switch
- $\pm 2\%$  Output Voltage Accuracy
- Low Ripple and Low Noise
- Low Start-up Voltage, 0.8V at 1mA
- 80% Efficiency with Low Cost Inductor
- +50 ppm/ $^{\circ}$ C Low Temperature-Drift
- SOT-89 and SOT-25 Small Packages

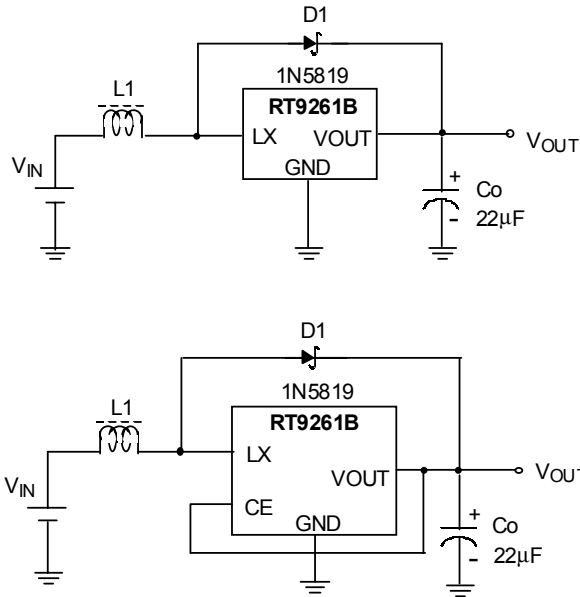
### Applications

- 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

Part Number	Pin Configurations
RT9261B-□□CX (Plastic SOT-89)	<p>TOP VIEW</p>  <p>1. GND 2. VOUT (TAB) 3. LX</p>
RT9261B-□□CB (Plastic SOT-25)	<p>TOP VIEW</p>  <p>1. CE 2. VOUT 3. NC 4. GND 5. LX</p>

Typical Application Circuit

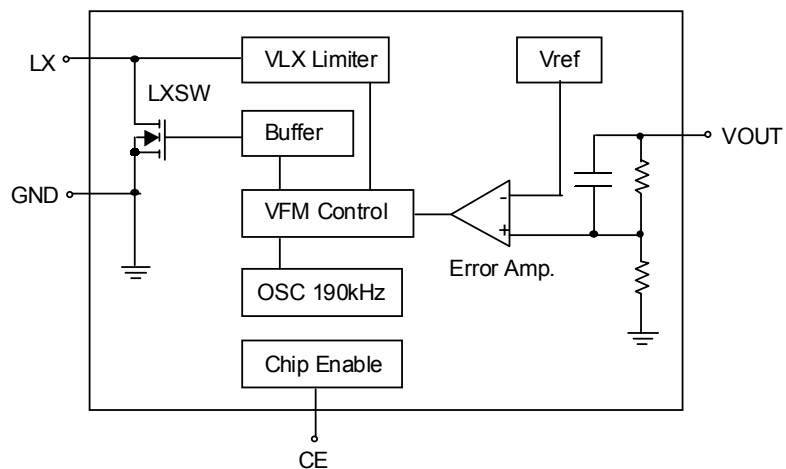


\* L1 ranges from 27µH to 120µH

Pin Description

Pin No.		Pin Name	Pin Function
-xxCX	-xxCB		
1	4	GND	Ground
2	2	VOUT	Output Voltage
3	5	LX	Pin for Switching
--	1	CE	Chip Enable (Active High)
--	3	NC	No Connection

Function Block Diagram



**Absolute Maximum Ratings**

- Output Voltage ----- 8V
- LX Pin Voltage ----- 8V
- CE Pin Voltage<sup>(1)</sup> ----- -0.3 to V<sub>OUT</sub> +0.3V
- LX Pin Output Current ----- 400mA
- Power Dissipation, P<sub>D</sub> @ T<sub>A</sub> = 25°C
  - SOT-89 ----- 0.5W
  - SOT-25 ----- 0.25W
- Package Thermal Resistance
  - SOT-89, θ<sub>JC</sub> ----- 100°C/W
  - SOT-89, θ<sub>JA</sub> ----- 300°C/W
  - SOT-25, θ<sub>JA</sub> ----- 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 Fig. 1)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		ΔV <sub>OUT</sub>		-2	--	+2	%
Input Voltage		V <sub>IN</sub>		--	--	7	V
Start-up Voltage		V <sub>ST</sub>	I <sub>OUT</sub> = 1mA, V <sub>IN</sub> : 0 → 2V	--	0.8	1	V
Hold-on Voltage		V <sub>HO</sub>	I <sub>OUT</sub> = 1mA, V <sub>IN</sub> : 2 → 0V	0.7	--	--	V
Input Current 1	V <sub>OUT</sub> ≤ 3.5V <sup>(1)</sup>		To be measured at V <sub>IN</sub> in continuous switching	--	24	36	μA
	3.5V < V <sub>OUT</sub> ≤ 5V <sup>(2)</sup>			--	36	45	
Input Current 2 <sup>(1)(2)</sup>			To be measured at V <sub>OUT</sub> in switch off condition	--	6.5	10	μA
Input Current 3	V <sub>OUT</sub> ≤ 3.5V <sup>(1)</sup>		To be measured at V <sub>IN</sub> in no load (guaranteed by I <sub>1</sub> and I <sub>2</sub> )	--	18	36	μA
	3.5V < V <sub>OUT</sub> ≤ 5V <sup>(2)</sup>			--	20	45	
LX Switching Current	V <sub>OUT</sub> ≤ 3.5V <sup>(1)</sup>	I <sub>SWITCHING</sub>	V <sub>LX</sub> = 0.4V	120	--	--	mA
	3.5V < V <sub>OUT</sub> ≤ 5V <sup>(2)</sup>			160	--	--	
LX Leakage Current		I <sub>LEAKAGE</sub>	V <sub>LX</sub> = 6V	--	--	0.5	μA
Maximum Oscillator Frequency		F <sub>MAX</sub>		140	190	240	KHz
Oscillator Duty Cycle		D <sub>OSC</sub>	On (V <sub>LX</sub> "L") side	65	75	85	%
Efficiency				--	80	--	%
V <sub>LX</sub> Voltage Limit			LX switch on	0.65	0.8	1.0	V

Notes:

(1) V<sub>IN</sub> = 1.8V, V<sub>SS</sub> = 0V, I<sub>OUT</sub> = 1mA, T<sub>opt</sub> = 25°C, and External Circuit of Typical Application

(2) V<sub>IN</sub> = 3V, V<sub>SS</sub> = 0V, I<sub>OUT</sub> = 1mA, T<sub>opt</sub> = 25°C, and External Circuit of Typical Application

**Electrical Characteristics** (Refer to Fig. 2)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		$\Delta V_{OUT}$		-2	--	+2	%
Input Voltage		$V_{IN}$		--	--	7	V
Start-up Voltage		$V_{ST}$	$I_{OUT} = 1mA, V_{IN}: 0 \rightarrow 2V$	--	0.8	1	V
Hold-on Voltage		$V_{HO}$	$I_{OUT} = 1mA, V_{IN}: 2 \rightarrow 0V$	0.7	--	--	V
Efficiency				--	80	--	%
Input Current 1	$V_{OUT} \leq 3.5V^{(1)}$		To be measured at $V_{IN}$ in continuous switching	--	24	36	$\mu A$
	$3.5V < V_{OUT} \leq 5V^{(2)}$			--	36	45	
Input Current 2 <sup>(1) (2)</sup>			To be measured at $V_{OUT}$ in switch off condition	--	6.5	10	$\mu A$
Input Current 3	$V_{OUT} \leq 3.5V^{(1)}$		To be measured at $V_{IN}$ in no load (guaranteed by $I_1$ and $I_2$ )	--	18	36	$\mu A$
	$3.5V < V_{OUT} \leq 5V^{(2)}$			--	20	45	
LX Switching Current	$V_{OUT} \leq 3.5V^{(1)}$	$I_{SWITCHING}$	$V_{LX} = 0.4V$	120	--	--	mA
	$3.5V < V_{OUT} \leq 5V^{(2)}$			160	--	--	
LX Leakage Current		$I_{LEAKAGE}$	$V_{LX} = 6V$	--	--	0.5	$\mu A$
CE "H" Level			$V_{IN} = V_{OUT} * 0.9$	$0.4 \times V_{OUT}$	--	--	V
CE "L" Level			$V_{IN} = V_{OUT} * 0.9$	--	--	0.2	V
CE "H" Input Current			$CE = V_{OUT}$	--	--	0.5	$\mu A$
CE "L" Input Current			$CE = 0V$	-0.5	--	--	$\mu A$
Maximum Oscillator Frequency		$F_{MAX}$		140	190	240	KHz
Oscillator Duty Cycle		$D_{OSC}$	On ( $V_{LX}$ "L" side)	65	75	85	%
$V_{LX}$ Voltage Limit			LX switch on	0.65	0.8	1.0	V

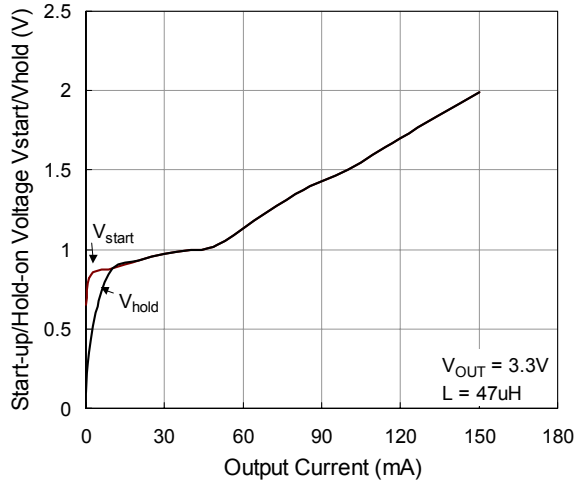
## Notes:

(1)  $V_{IN} = 1.8V, V_{SS} = 0V, I_{OUT} = 1mA, T_{opt} = 25^{\circ}C$ , and External Circuit of Typical Application

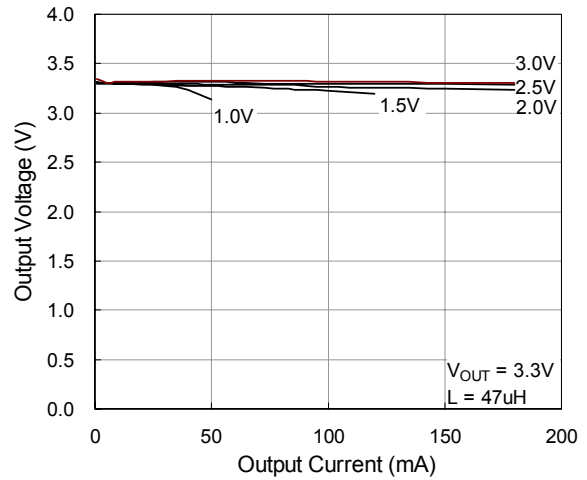
(2)  $V_{IN} = 3V, V_{SS} = 0V, I_{OUT} = 1mA, T_{opt} = 25^{\circ}C$ , and External Circuit of Typical Application

**Typical Operating Characteristics**

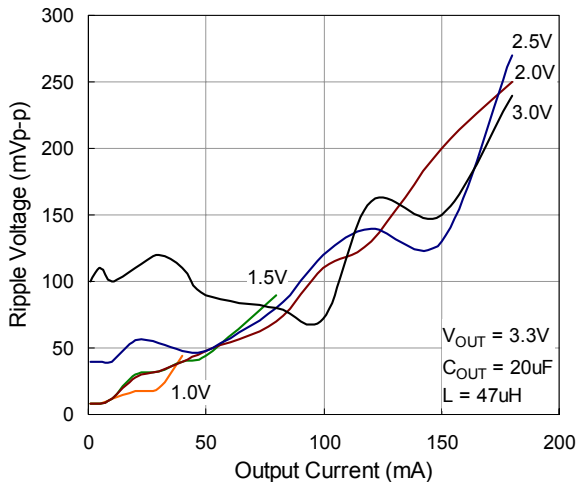
**Start-up/Hold-on Voltage vs. Output Current**



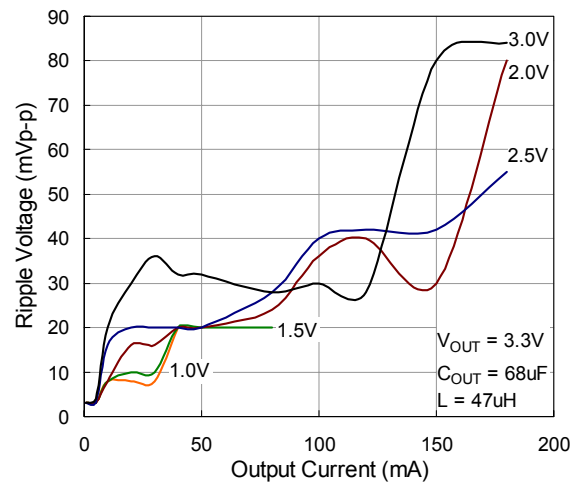
**Output Voltage vs. Output Current**



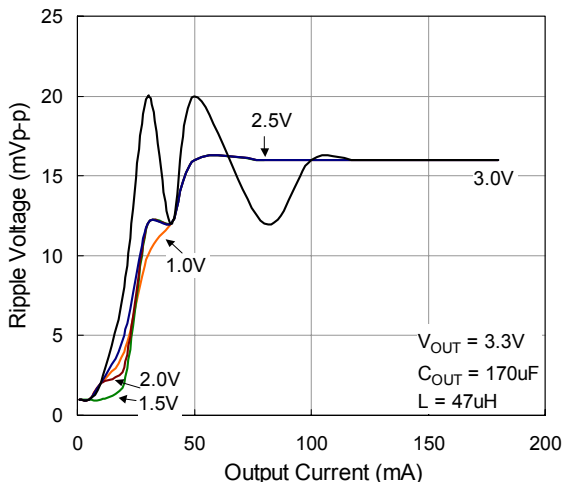
**Output Current vs. Ripple Voltage**



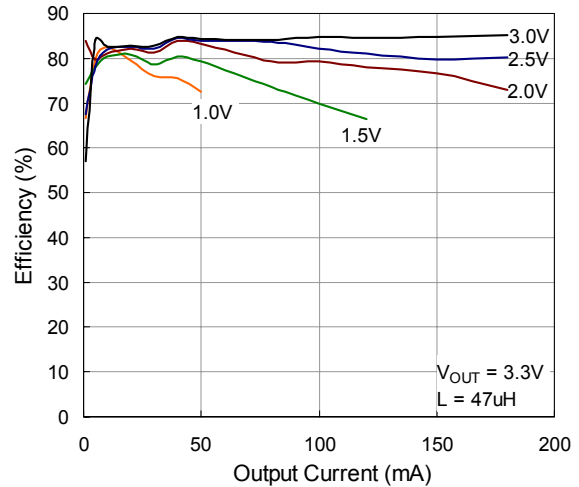
**Output Current vs. Ripple Voltage**



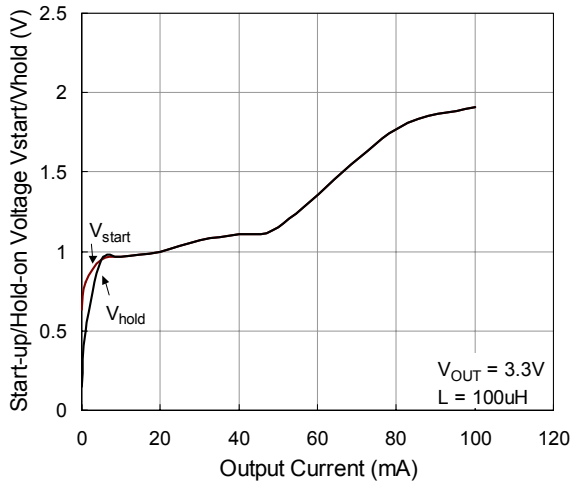
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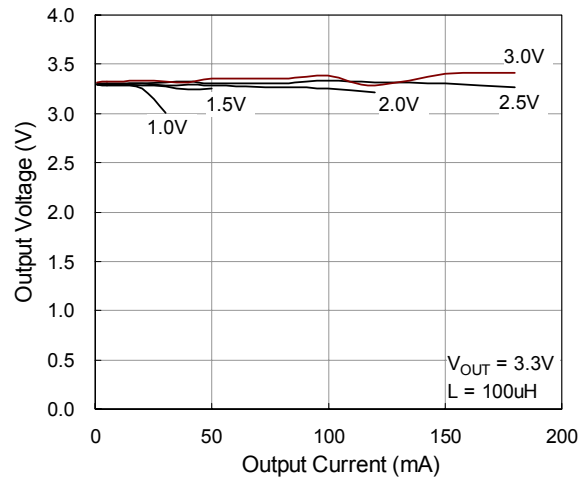
**Efficiency vs. output Current**



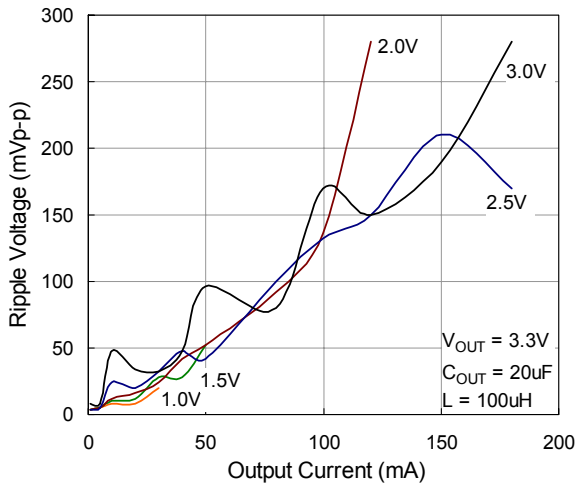
Start-up/Hold-on Voltage vs. Output Current



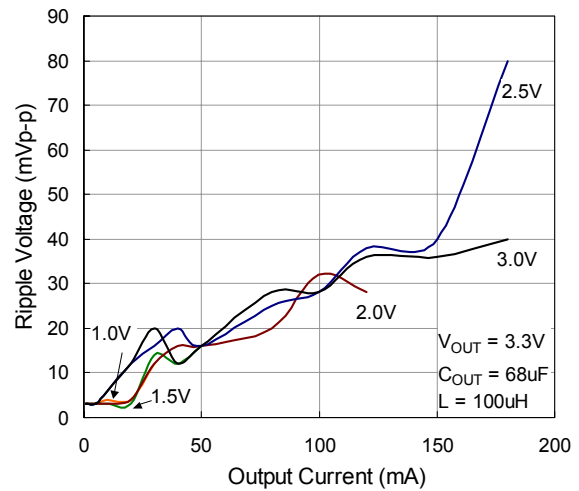
Output Voltage vs. Output Current



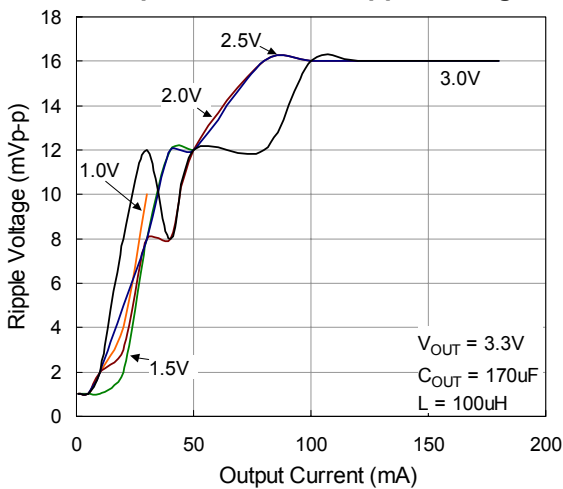
Output Current vs. Ripple Voltage



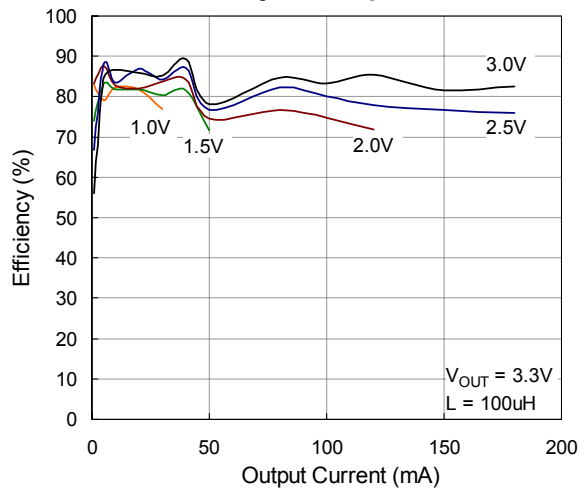
Output Current vs. Ripple Voltage



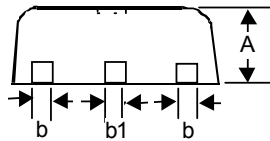
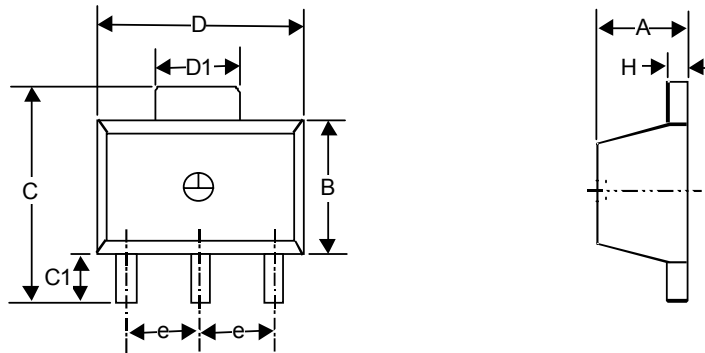
Output Current vs. Ripple Voltage



Efficiency vs. output Current

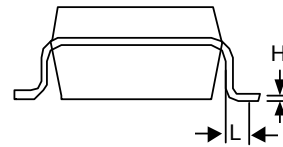
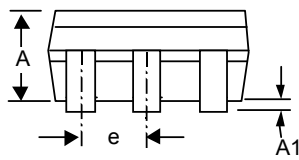
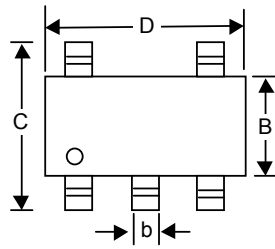


**Package Information**



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	--	4.242	--	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	0.381	0.432	0.015	0.017

**3-Lead SOT-89 Surface Mount**



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	0.102	0.254	0.004	0.010
L	0.356	0.610	0.014	0.024

SOT-25 Surface Mount Package





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