

### FEATURES

- Efficiency up to 95% @ V<sub>IN</sub>=2.7V, V<sub>OUT</sub>=3.3V
- Typical 15uA standby current
- 1MHz Switching Frequency allows small inductor and output cap
- Input boost-strapping allows using small or no input cap
- Low V<sub>IN</sub> Start-up Voltage down to 1.1V Ideal for Single Alkaline Cell operations
- Maximum Output Current up to 300mA
- Low Noise PWM control
- Internally Compensated Current Mode Control
- Internal Synchronous Rectifier
- Available in SOT23-3L、 SOT23-5L and SOT89-3L

### APPLICATIONS

- High Voltage Power Conversion
- Automotive Applications
- Industrial distributed power applications
- Battery Powered Equipment
- OA instrument

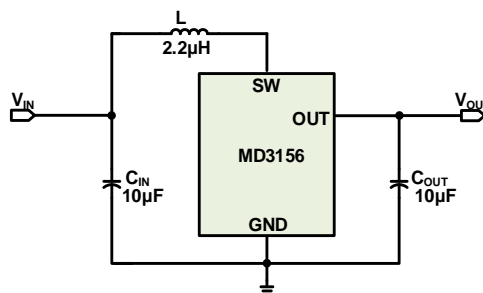
### PRODUCT DESCRIPTION

The MD3156 is a step-up converter that provides a boosted output voltage from a low voltage source. Because of its proprietary design, it starts up at a very low input voltage down to 1.1V, and only consumes 15uA at standby, making it an ideal choice for single cell alkaline/NiMH battery operations.

A switching frequency of 1MHz minimizes solution footprint by allowing the use of tiny, low profile inductors and ceramic capacitors. The current mode PWM design is internally compensated, reducing external parts count.

MD3156 is available in SOT23-3、 SOT23-5 and SOT89-3 Packages.











### TYPICAL APPLICATION



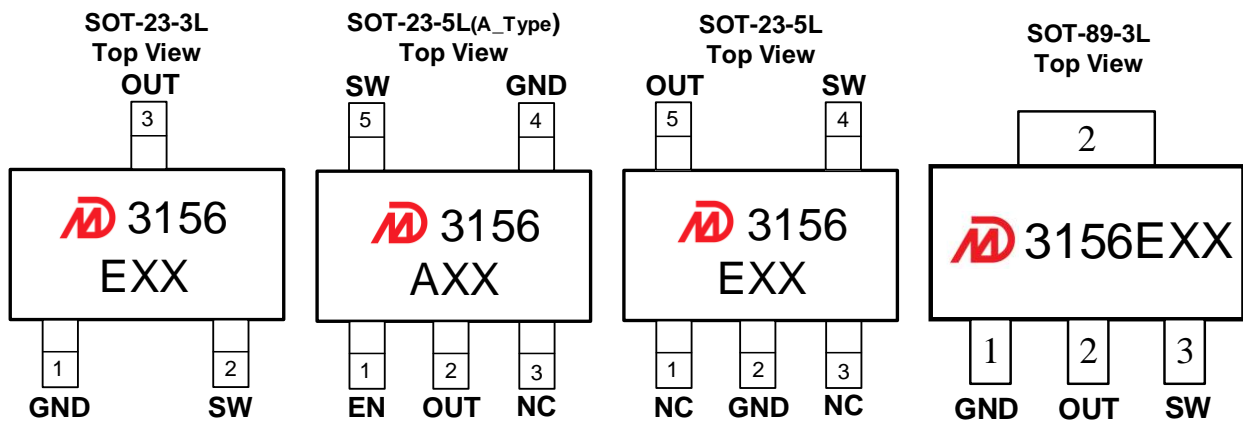
# 1.1V Startup, 1MHz, 300mA I<sub>OUT</sub> Low I<sub>Q</sub> Synchronous Boost Converter

## MD3156

### ORDER INFORMATION

Product Name	V <sub>OUT</sub> (V)	Package	Ordering Name	Marking	Package Information
MD3156E18	1.8	SOT-23-3L	MD3156E18QA3	 3156E18	Tape and Reel, 3000pcs
MD3156E33	3.3	SOT-23-3L	MD3156E33QA3	 3156E33	
MD3156E18	1.8	SOT-23-5L	MD3156E18QC3	 3156E33	
MD3156E30	3.0	SOT-23-5L	MD3156E30QC3	 3156E30	
MD3156E33	3.3	SOT-23-5L	MD3156E33QC3	 3156E33	
MD3156A30	3.0	SOT-23-5L	MD3156A30QC3	 3156A30	
MD3156A33	3.3	SOT-23-5L	MD3156A33QC3	 3156A33	
MD3156A36	3.6	SOT-23-5L	MD3156A36QC3	 3156A36	
MD3156E18	1.8	SOT-89-3L	MD3156E18PA1	 3156E33	Tape and Reel, 1000pcs
MD3156E33	3.3	SOT-89-3L	MD3156E33PA1	 3156E33	

### PACKAGE REFERENCE



**1.1V Startup, 1MHz, 300mA I<sub>OUT</sub>  
Low I<sub>Q</sub> Synchronous Boost Converter**

**MD3156**

**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Ratings		Units
SW Voltage	V <sub>SW</sub>	-0.3~6		V
Output Voltage	V <sub>OUT</sub>	-0.3~6		
Enable Voltage	V <sub>EN</sub>	-0.3~6		
Power Dissipation	P <sub>D</sub>	SOT23-3L	500	mW
		SOT23-5L	500	
		SOT89-3L	1000	
Thermal Resistance	R <sub>θJB</sub> <sup>(1)</sup>	SOT23-3L	180	°C/W
		SOT23-5L	180	
		SOT89-3L	100	
Operating Ambient Temperature	T <sub>opr</sub>	-40 ~ +85		°C
Storage Temperature	T <sub>stg</sub>	-40 ~ +125		
ESD Protection	ESD HBM	8000		V
Lead Temperature & Time		260°C, 10S		

NOTE:

<sup>(1)</sup> Mounted on JEDEC standard 4layer (2s2p) PCB test board

Stresses beyond those listed “Absolute Maximum Ratings” may cause permanent damage to the device.

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## MD3156

### ELECTRICAL CHARACTERISTICS

T<sub>A</sub>=25°C, , unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage Range	V <sub>IN</sub>		1.1		5	V
Startup Voltage	V <sub>START</sub>	I <sub>OUT</sub> =1mA		1.1		V
Hold Voltage	V <sub>HOLD</sub>	I <sub>OUT</sub> =50mA		0.5	0.7	V
Output Voltage Range	V <sub>OUT</sub>		1.8		3.6	V
Output Voltage accuracy		I <sub>OUT</sub> =0mA		2		%
Line regulation		I <sub>OUT</sub> =50mA		0.1	0.2	%/V
Load regulation		I <sub>OUT</sub> =0~300mA		1	2	%
Switching Frequency	F <sub>OSC</sub>	V <sub>OUT</sub> =0.95*V <sub>O</sub> , No inductor	0.7	1	1.4	MHz
Max Duty cycle		V <sub>OUT</sub> =0.95*V <sub>O</sub> , No inductor	85	90	95	%
Quiescent Current at V <sub>OUT</sub>	I <sub>Q</sub>	V <sub>OUT</sub> =1.05*V <sub>O</sub>	5	8	15	μA
Supply current at V <sub>IN</sub>		I <sub>OUT</sub> =0mA			20	μA
Efficiency		I <sub>OUT</sub> =100mA	85			%
PMOS Rdson	R <sub>dsonP</sub>	I <sub>SW</sub> =100mA		400	600	mohm
NMOS Rdson	R <sub>dsonN</sub>	I <sub>SW</sub> =100mA		200	300	mohm
SW Leakage Current	I <sub>SWLK</sub>	V <sub>OUT</sub> =3.6V, V <sub>SW</sub> =0 or 5.2V			1	μA

### PIN FUNCTIONS

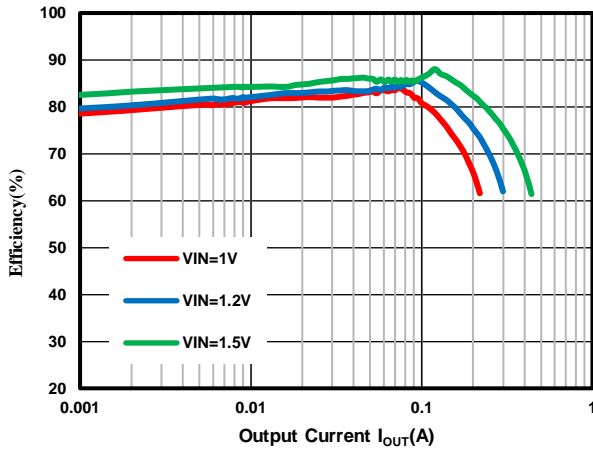
Name	Description
GND	Ground Connection. It should be connected as close as possible to the output capacitor avoiding the high current switch paths
OUT	Output voltage pin, with 10μF ceramic capacitor closely connected to GND
EN	Enable input. Pulling this pin below the specified threshold shuts the chip down. Pulling it above the specified threshold enables the chip. Floating this pin shuts the chip down
SW	To connect inductor to VIN
NC	No connection

# 1.1V Startup, 1MHz, 300mA I<sub>OUT</sub> Low I<sub>Q</sub> Synchronous Boost Converter

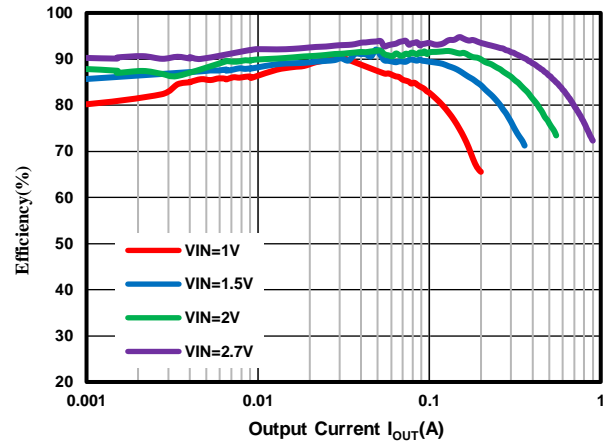
MD3156

## TYPICAL PERFORMANCE CHARACTERISTICS

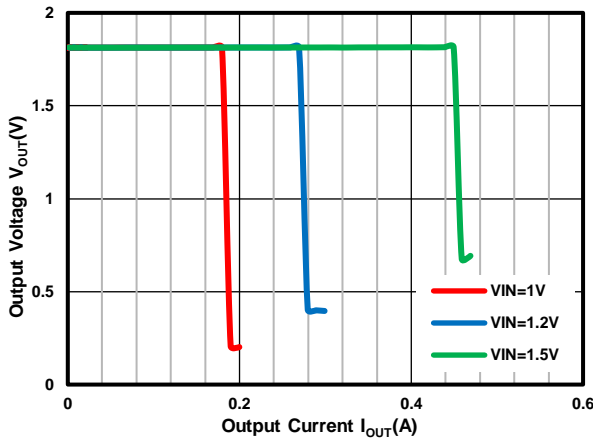
C<sub>IN</sub> = 10uF, C<sub>OUT</sub> = 10uF, L = 2.2uH and T<sub>A</sub>=25°C, unless otherwise noted.



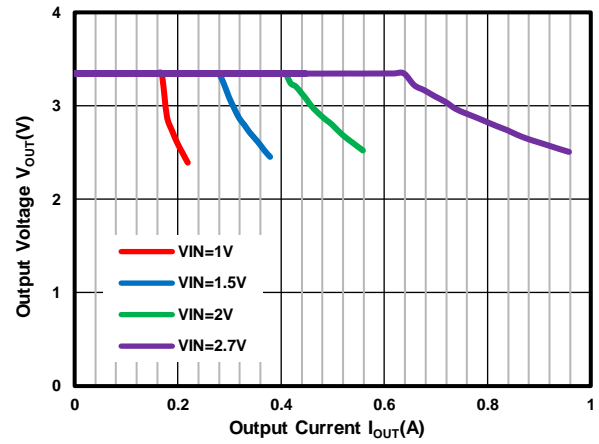
Efficiency vs. Output Current at V<sub>OUT</sub>=1.8V



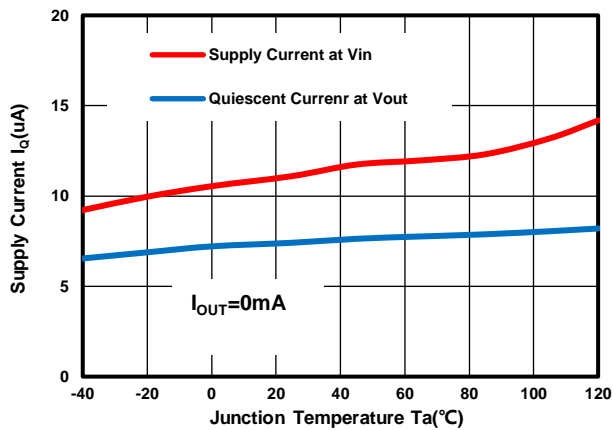
Efficiency vs. Output Current at V<sub>OUT</sub>=3.3V



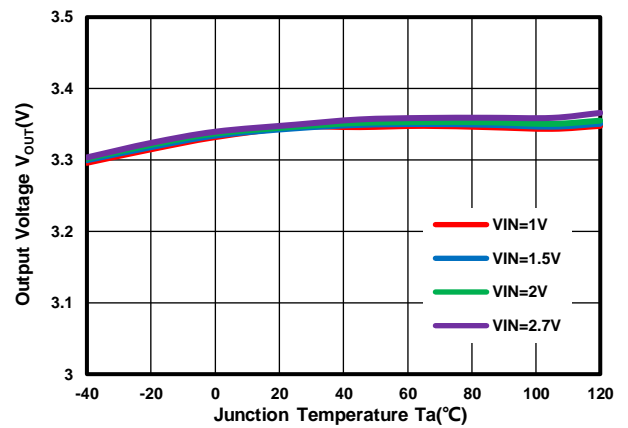
Output Voltage vs. Output Current at V<sub>OUT</sub>=1.8V



Output Voltage vs. Output Current at V<sub>OUT</sub>=3.3V

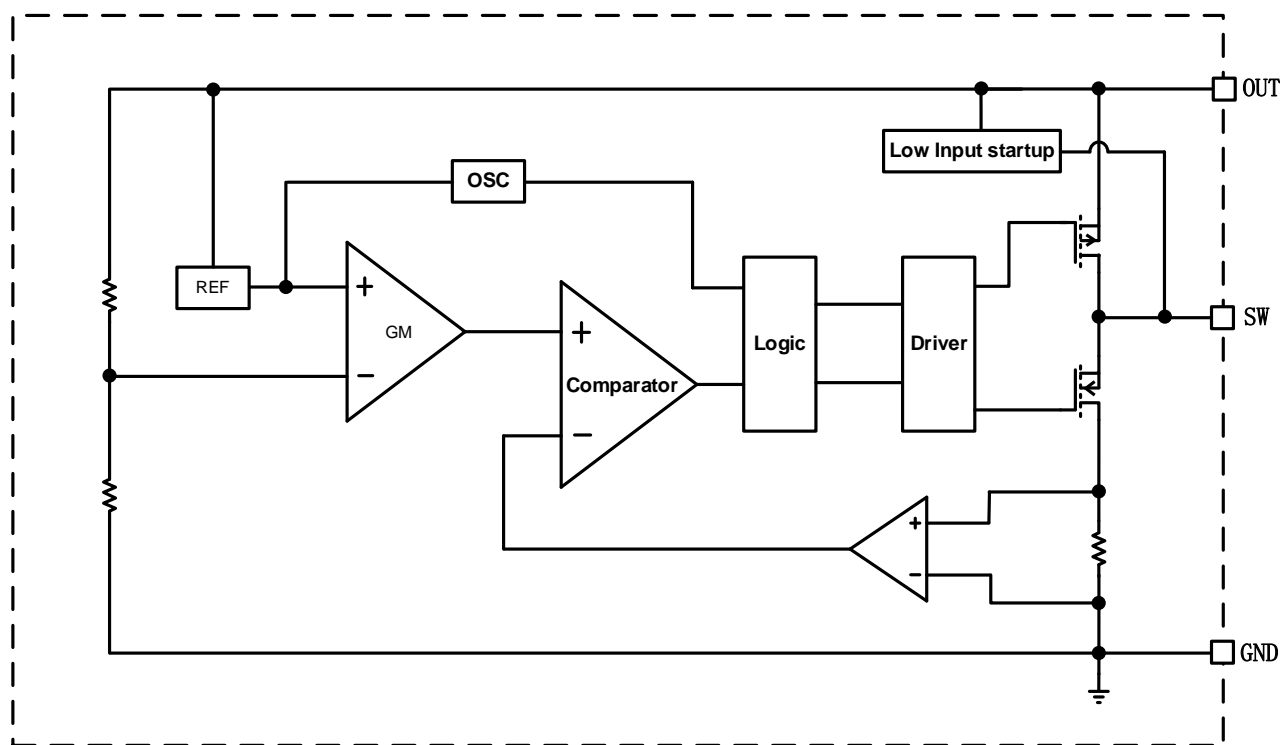


I<sub>Q</sub> vs. Temperature



Output Voltage vs. Temperature at V<sub>OUT</sub>=3.3V

## FUNCTION BLOCK DIAGRAM



## DETAILED DESCRIPTION

MD3156 is a low input voltage start up, current mode DC-DC step up converter. Its operation can be best understood by referring to the block diagram.

Upon starting up, the low voltage startup circuitry drives SW with on-off cycles, transferring energy from input to OUT by storing energy in the inductor during on-time and releasing it to the output during off-time. When OUT reaches 2V, the startup circuit turns off and the main controller takes over.

The main control loop consists of a reference, a GM error amplifier, a PWM controller, a current sense amplifier, an oscillator, a PWM logic control, and its power stage including its driver.

The main control loop is a classic current mode control loop. The GM stage integrates the error between FB and REF, and its output is used to compare with a triangular wave which the summing result of the current sense amplifier output and a slope compensation voltage. The output of the comparator is used to drive the power stage to reach regulation.

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## **APPLICATION INFORMATION**

### **Inductor selection**

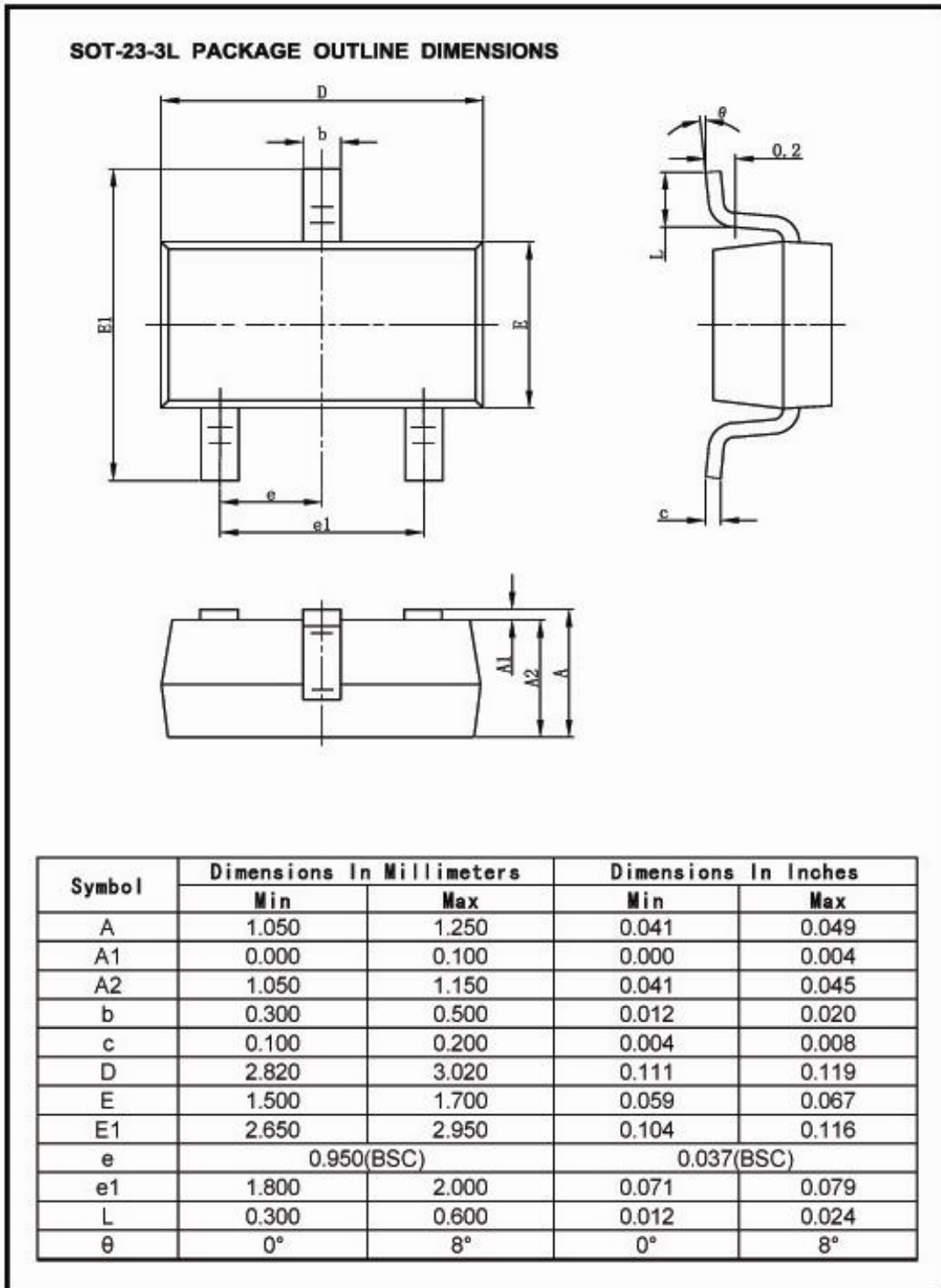
With switching frequency up to 1MHz, small surface mount inductors can be used with values from 2.2uH to 4.7uH. For a given chosen inductor value and application conditions make sure the peak inductor current does not exceed the maximum current rating of the selected vendor's inductor.

### **Input and output capacitor selection**

The MD3156's bootstrap architecture allows the use of very small input capacitor. For applications that only need to drive small output load current, the input capacitor is optional, because once output is started up, the IC's is powered by OUT, a quiet power supply.

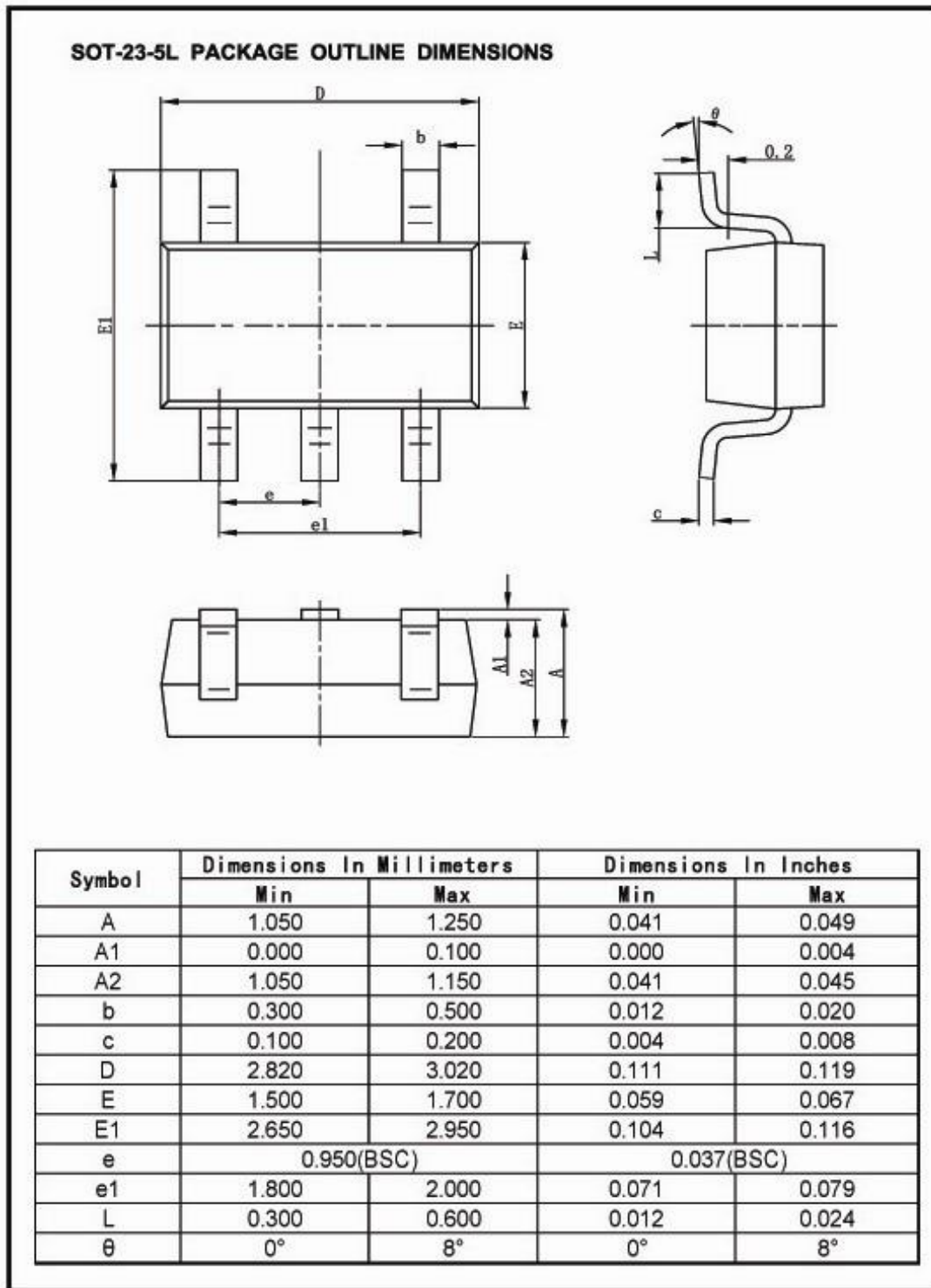
The output capacitor is used to stabilize the loop and provide ac current to the load. A low ESR ceramic cap with values from 2.2uF to 22uF can be used. Smaller value capacitors are generally cheaper with small footprints, while larger capacitor provides lower ripples and better transient load responses. Also, when extreme low startup voltage is needed, larger output capacitors are needed for the part to startup under heavy load condition.

PACKAGE OUTLINE DIMENSIONS

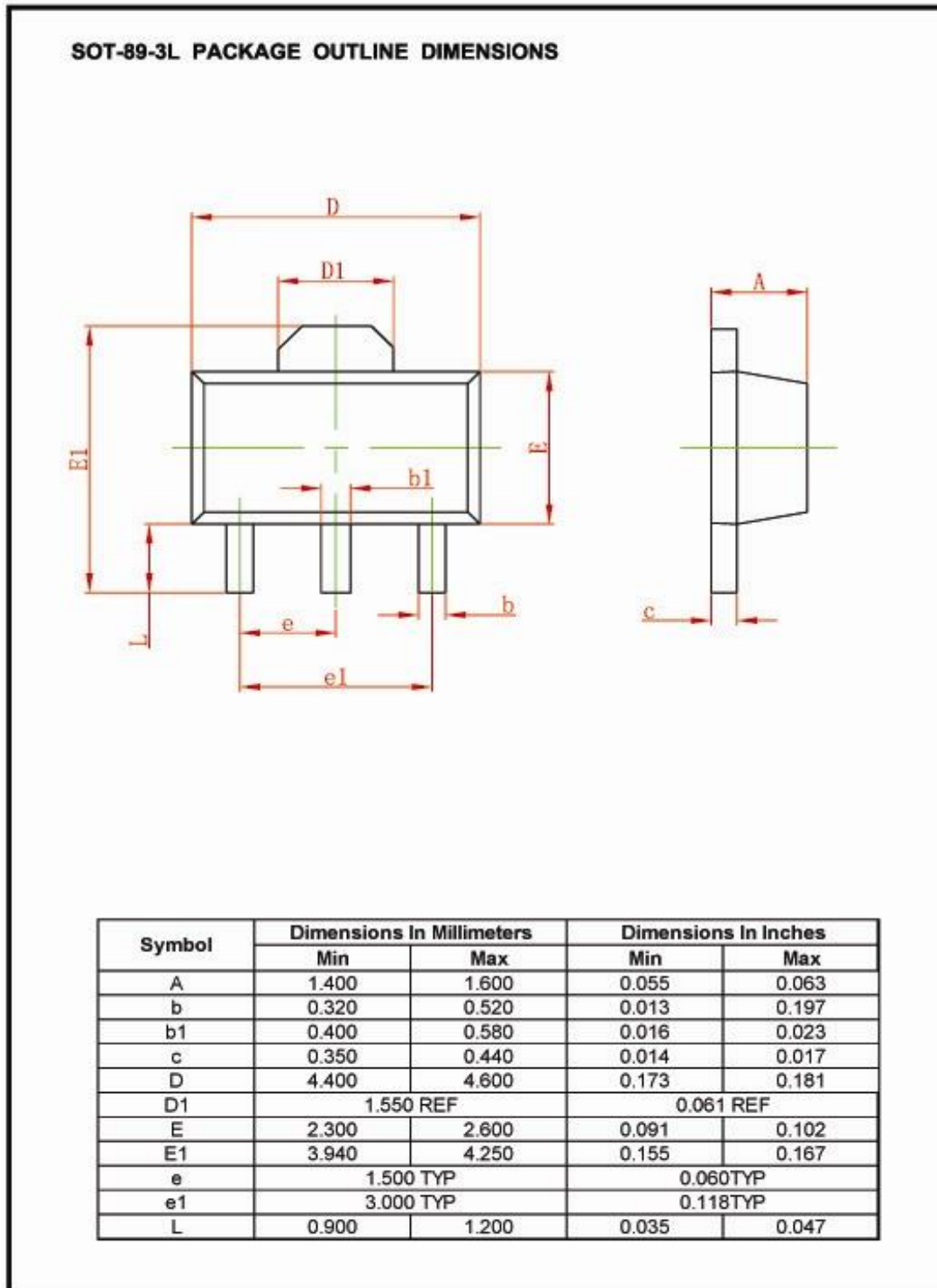




PACKAGE OUTLINE DIMENSIONS (CONTINUED)



PACKAGE OUTLINE DIMENSIONS (CONTINUED)



For the newest datasheet, please see the website:

[www.md-ic.com.cn](http://www.md-ic.com.cn)

Version V1.0: 20210301