

FEATURES

- Efficiency up to 95% @ $V_{IN}=2.7V$, $V_{OUT}=3.3V$
- 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_{IN} 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

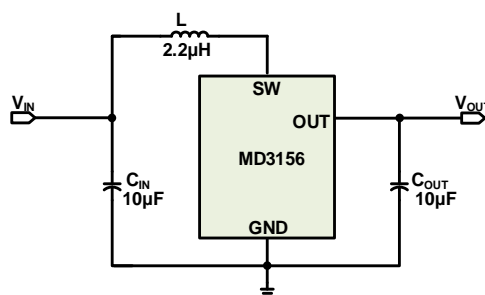
PRODUCT DESCRIPTION

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



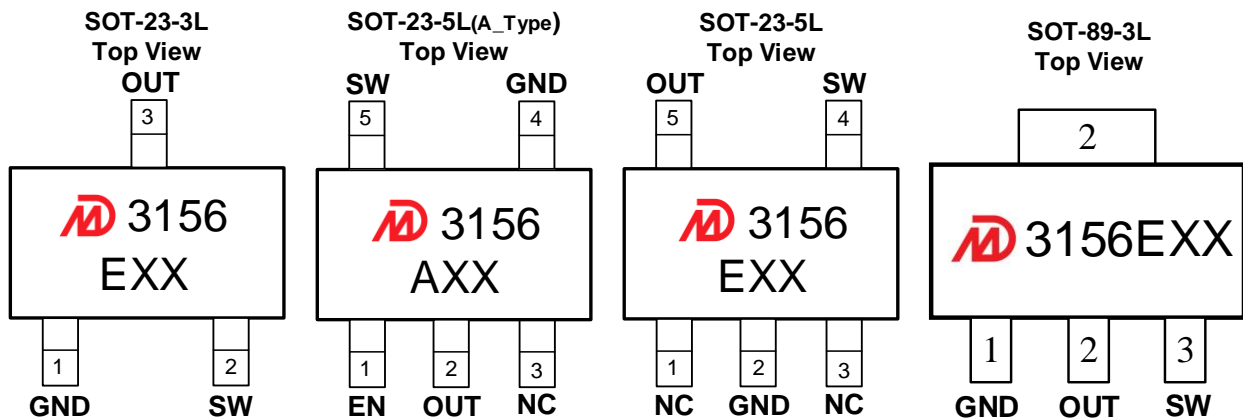
1.1V Startup, 1MHz, 300mA I_{OUT} Low I_Q Synchronous Boost Converter

MD3156

ORDER INFORMATION

| Product Name | V _{OUT} (V) | Package | Ordering Name | Marking | Package Information |
|--------------|----------------------|-----------|---------------|---|------------------------|
| MD3156E18 | 1.8 | SOT-23-3L | MD3156E18QA3 |  3156E18 | Tape and Reel, 3000pcs |
| MD3156E30 | 3.0 | SOT-23-3L | MD3156E30QA3 |  3156E30 | |
| 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 | |
| MD3156E33 | 3.3 | SOT-89-3L | MD3156E33PA1 |  3156E33 | |

PACKAGE REFERENCE



**1.1V Startup, 1MHz, 300mA I_{OUT}
Low I_O Synchronous Boost Converter**

MD3156

ABSOLUTE MAXIMUM RATINGS

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

NOTE:

⁽¹⁾ 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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ELECTRICAL CHARACTERISTICS

T_A=25°C, , unless otherwise noted.

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

PIN FUNCTIONS

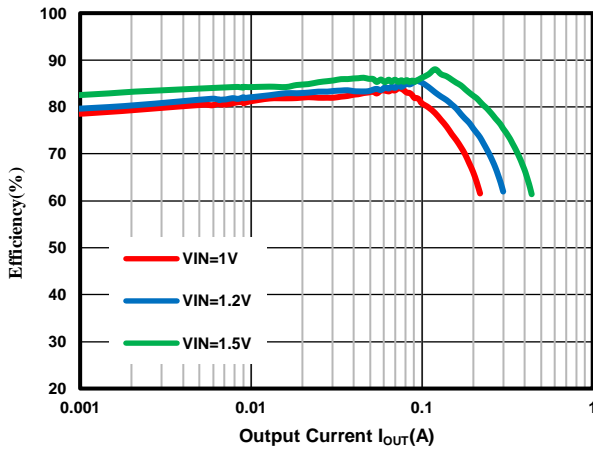
| Name | Description |
|------|--|
| GND | Ground Connection. It should be connected as close as possible to the output capacitor avoiding the high current switch paths |
| OUT | Output voltage pin, with 10μF ceramic capacitor closely connected to GND |
| EN | Enable input. Pulling this pin below the 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_{OUT} Low I_O Synchronous Boost Converter

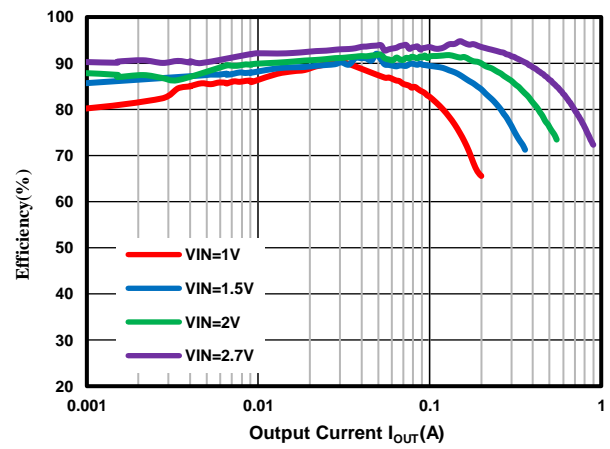
MD3156

TYPICAL PERFORMANCE CHARACTERISTICS

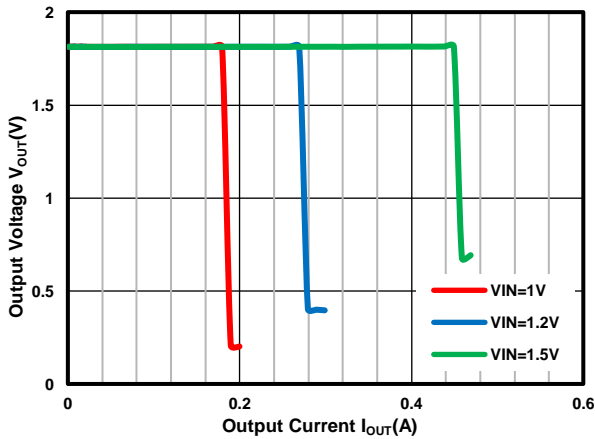
C_{IN} = 10uF, C_{OUT} = 10uF, L = 2.2uH and T_A=25°C, unless otherwise noted.



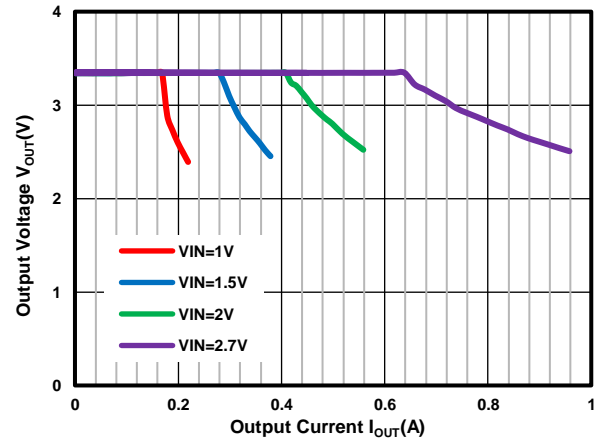
Efficiency vs. Output Current at V_{OUT}=1.8V



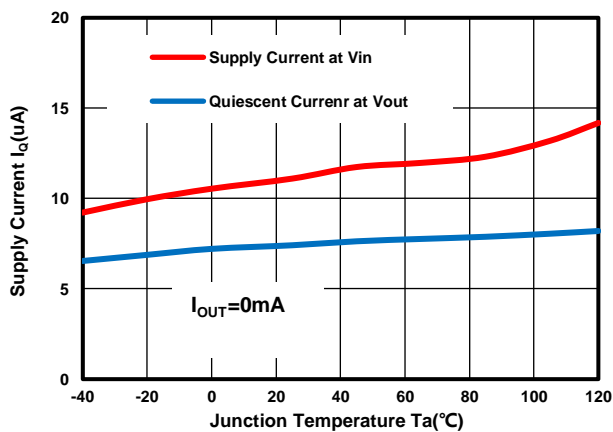
Efficiency vs. Output Current at V_{OUT}=3.3V



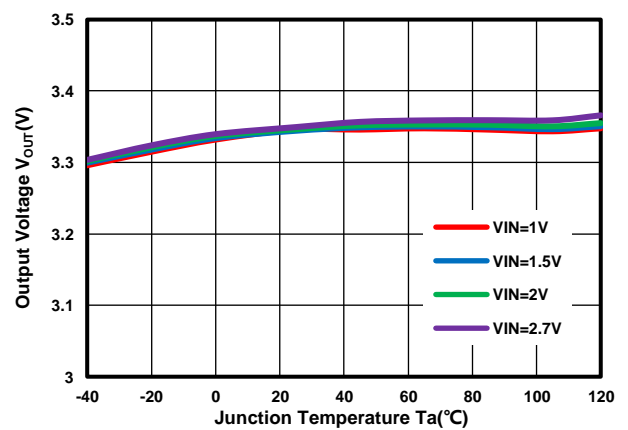
Output Voltage vs. Output Current at V_{OUT}=1.8V



Output Voltage vs. Output Current at V_{OUT}=3.3V

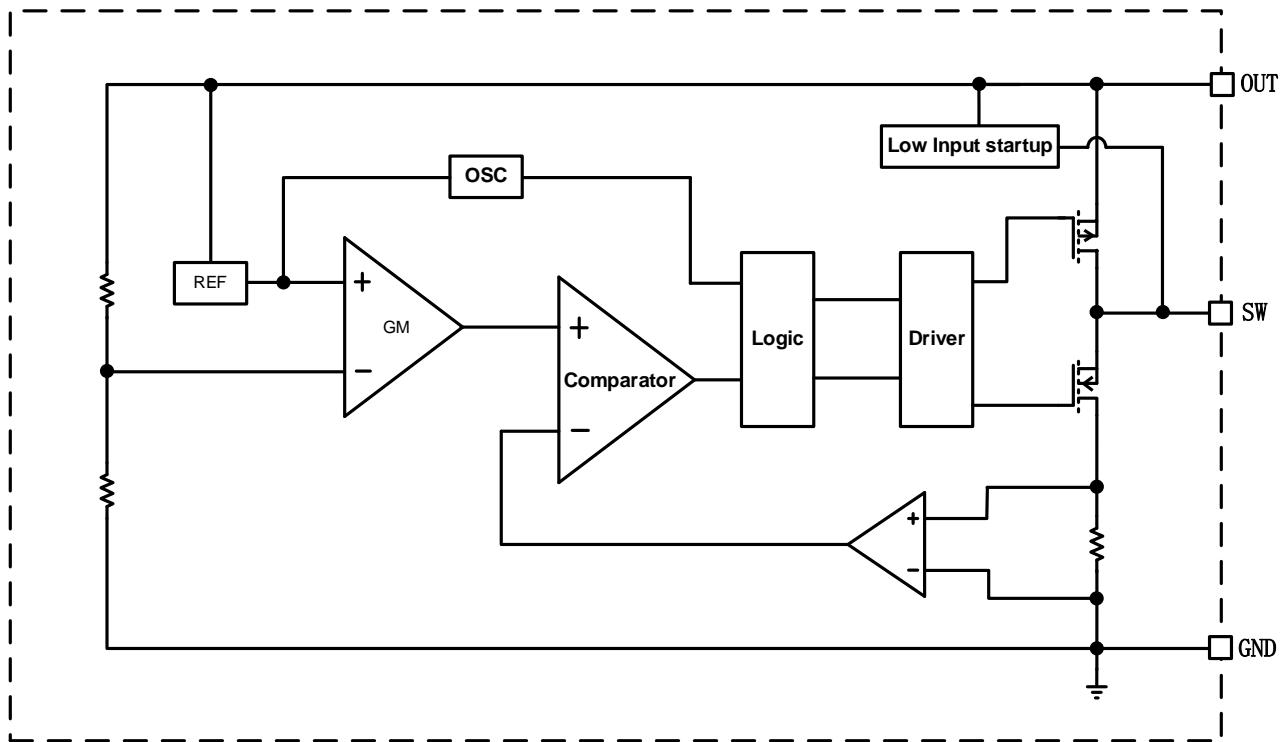


I_Q vs. Temperature



Output Voltage vs. Temperature at V_{OUT}=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.

APPLICATION INFORMATION

Inductor selection

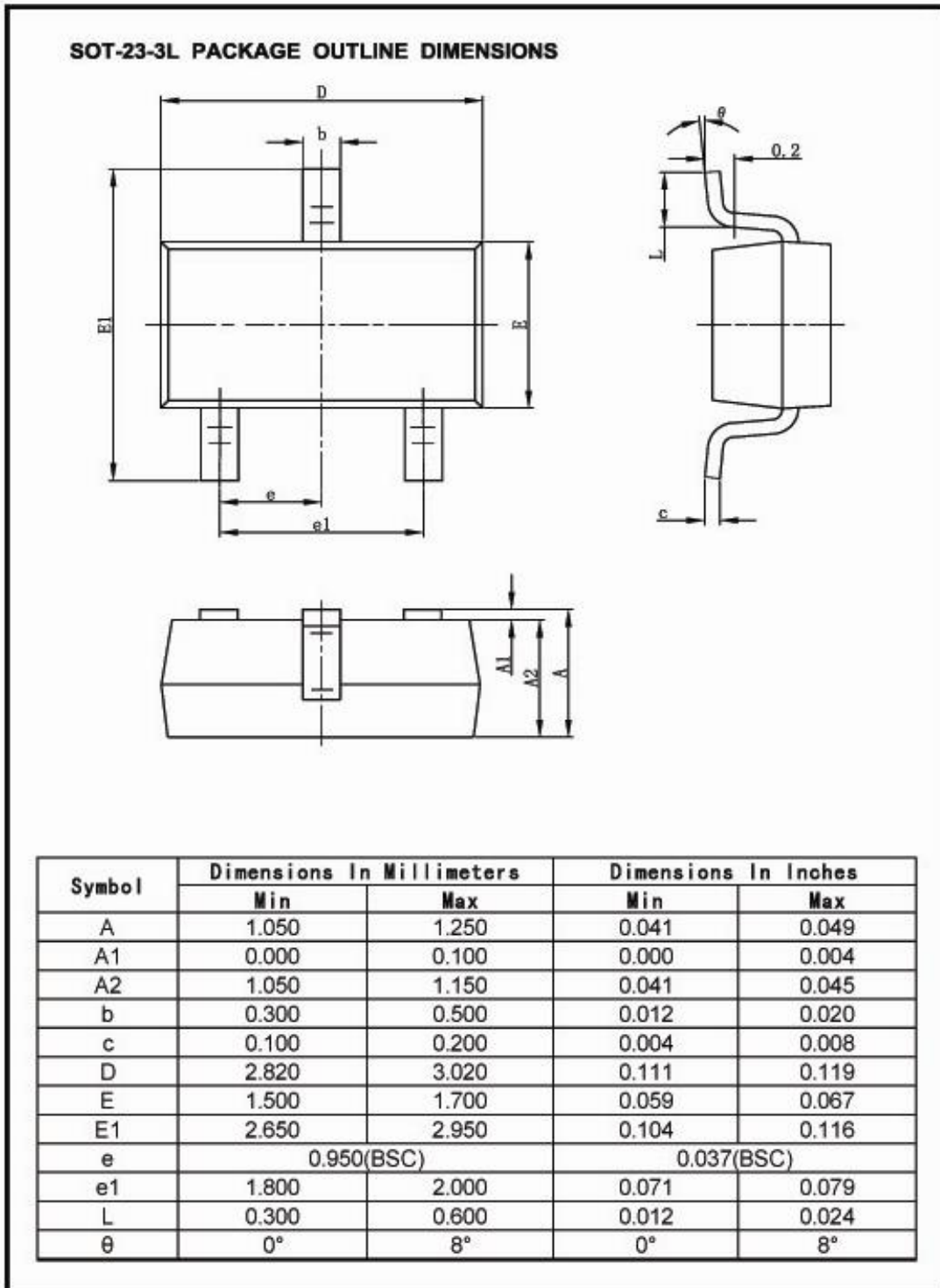
With switching frequency up to 1MHz, small surface mount inductors can be used with values from 2.2uH to 4.7uH. For a given chosen inductor value and application conditions make sure the peak inductor current does not exceed the maximum current rating of the selected vendor's inductor.

Input and output capacitor selection

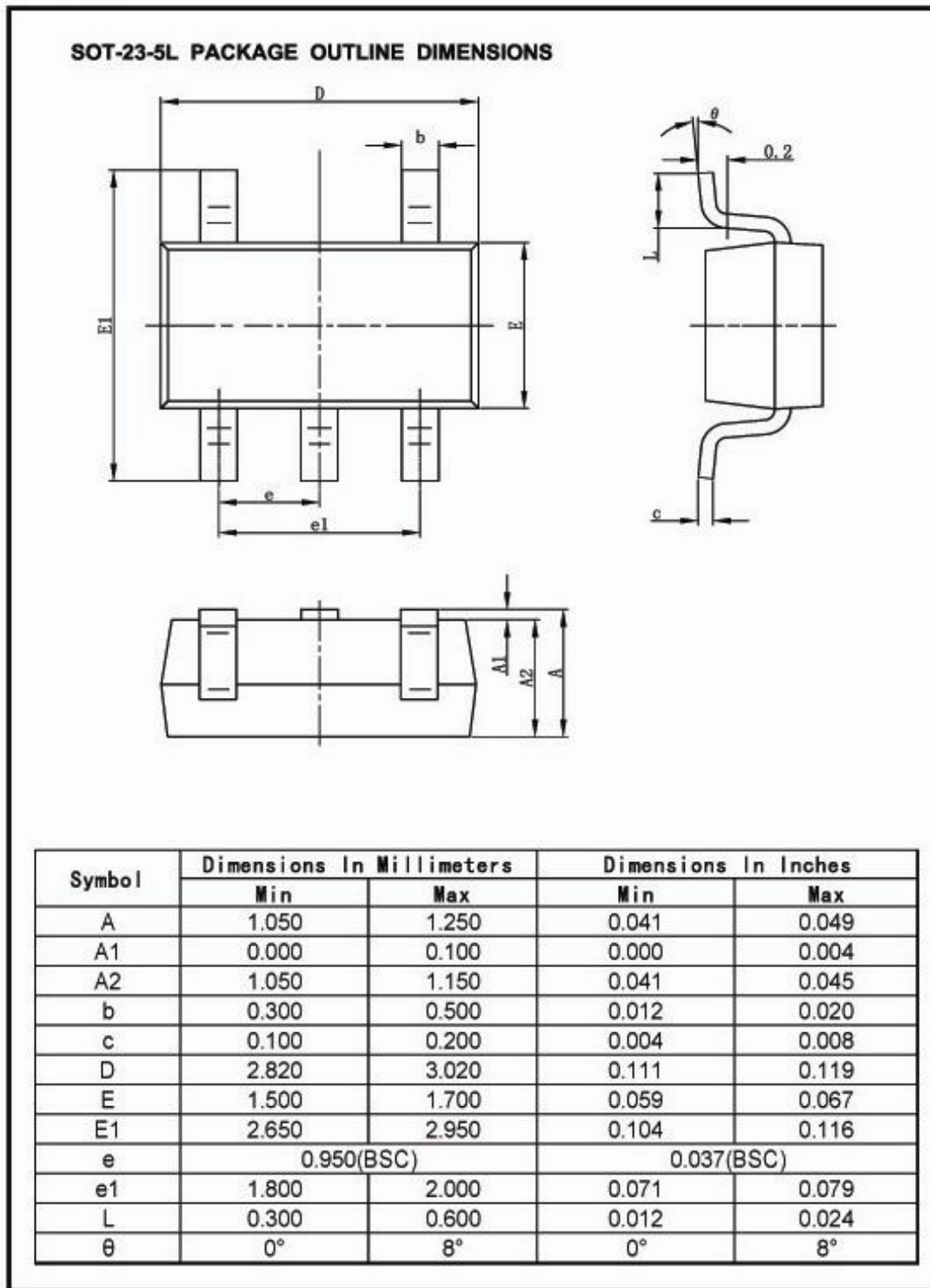
The MD3156's bootstrap architecture allows the use of very small input capacitor. For applications that only need to drive small output load current, the input capacitor is optional, because once output is started up, the IC's is powered by OUT, a quiet power supply.

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.

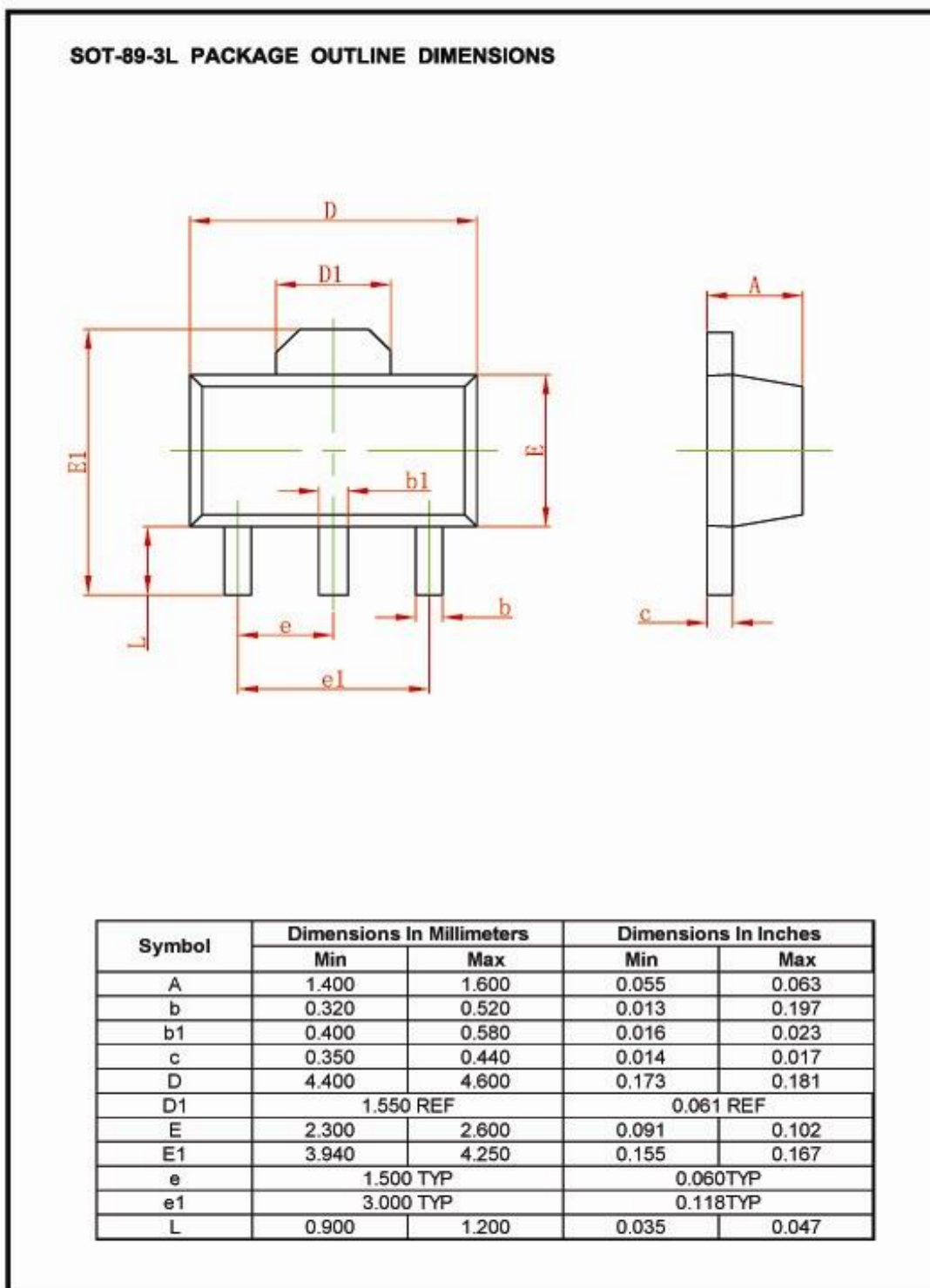
PACKAGE OUTLINE DIMENSIONS



PACKAGE OUTLINE DIMENSIONS (CONTINUED)



PACKAGE OUTLINE DIMENSIONS (CONTINUED)



For the newest datasheet, please see the website:

www.md-ic.com.cn

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