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SEMICONDUCTOR

ESD TVS TSS MOV GDT PLED

MSDB628

Product specification

GENERAL DESCRIPTION

The MSDB628 is a constant frequency,6-pin SOT23 current mode step-up converter intended for small,low power applications.The MSDB628 switches at 1.2MHz and allows the use of tiny,low cost capacitors and inductors 2mm or less in height.Internal soft-start results in small inrush current and extends battery life. The SDB628 features automatic shifting to pulse frequency modulation mode at light loads.

The MSDB628 includes under-voltage lockout,current limiting,and thermal overload protection to prevent damage in the event of an output overload.The MSDB628 is available in a small 6-pin SOT-23 package.

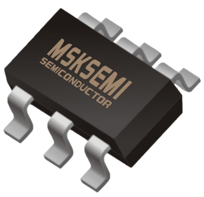
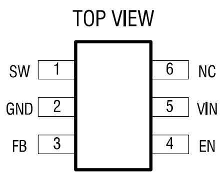
Features

- Integrated 80mΩ Power MOSFET
- 2.5V to 24V Input Voltage
- 1.2MHz Fixed Switching Frequency
- Internal 4A Switch Current Limit
- Adjustable Output Voltage
- Internal Compensation
- Up to 28V Output Voltage
- Automatic Pulse Frequency Modulation Mode at Light Loads
- up to 93%Efficiency
- Available in a 6-Pin SOT23-6 Package

Applications

- Battery-Powered Equipment
- Set-Top Boxed
- LCD Bais Supply
- DSL and Cable Modems and Routers
- Networking cards powered from PCI or PCI express slots

Pin Description AND MARKING

SOT-23-6	Pin Configuration	Marking
		 device code:B628, **= Internalproduction code

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PIN DESCRIPTION

Pin Name	Pin Number	Description
SW	1	Power Switch Output. SW is the drain of the internal MOSFET switch. Connect the power inductor and output rectifier to SW.
GND	2	Ground Pin
FB	3	Feedback Input. The FB voltage is 0.6V. Connect a resistor divider to FB.
EN	4	Regulator On/Off Control Input. A high input at EN turns on the converter, and a low input turns it off. When not used, connect EN to the input supply for automatic startup.
VIN	5	Input Supply Pin. Must be locally bypassed.
NC	6	No Connect

Order Information

Model	Package	MOQ
MSDB628	SOT23-6	3000

Typical Application Circuit

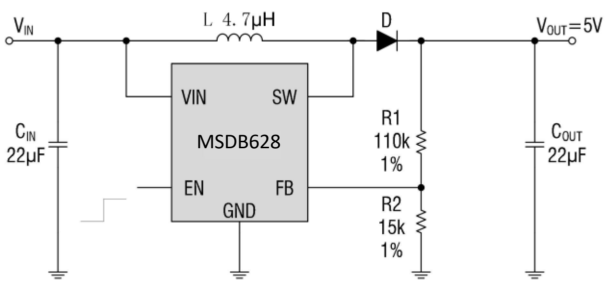
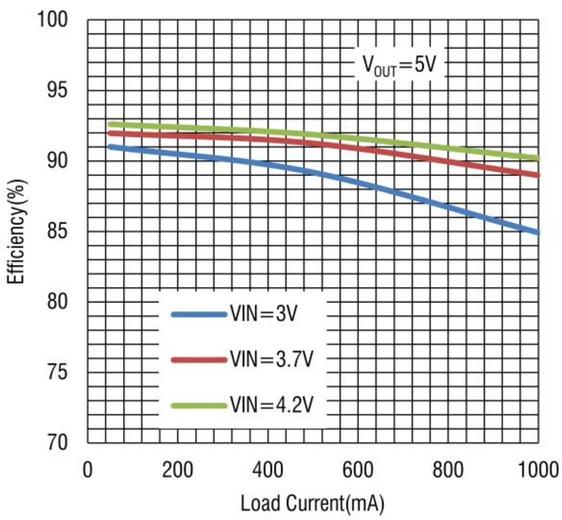


Figure 1. Basic Application Circuit



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ABSOLUTE MAXIMUM RATINGS (Note 1)

VIN,EN voltages……………………-0.3V to 26V
FB Voltages……………...............-0.3V to 6V
SW Voltage………………………...-0.3V to 30V
Power Dissipation…………………………...0.6W
Thermal Resistance θ_{JC}………………...130°C/W
Thermal Resistance θ_{JA}………………...250°C/W

Junction Temperature(Note2)……............160°C
Operating Temperature Range…..-40°C to 85°C
Lead Temperature(Soldering,10s)……......300°C
Storage Temperature Range…...-65°C to 150°C
ESD HBM(Human Body Mode)……………...2kV
ESD MM(Machine Mode)…………..…….200V

ELECTRICAL CHARACTERISTICS (Note 3)

(V_{IN}=V_{EN}=5V,T_A = 25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Input Voltage		2.5		24	V
Under Voltage Lockout				2.4	V
Under Voltage Lockout Hysteresis			100		mV
Current (Shutdown)	V_{EN}= 0V		0.1	1	μA
Quiescent Current (PFM)	V_{FB}=0.7V，No switch		70	150	μA
Quiescent Current (PWM)	V_{FB}=0.5V，switch		1.0	2.0	mA
Switching Frequency			1.2		MHz
Maximum Duty Cycle	V_{FB} = 0V	90			%
EN Input High Voltage		1.5			V
EN Input Low Voltage				0.4	V
FB Voltage		0.588	0.6	0.612	V
SW On Resistance			80	150	mΩ
SW Current Limit	V_{IN}= 5V, Duty cycle=50%		4		A
SW Leakage	V_{SW} = 20V			1	μA
Thermal Shutdown			155		℃

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.
Note 2: T_J is calculated from the ambient temperature T_A and power dissipation P_D according to the following formula: $T_J = T_A + (P_D) \times (250°C/W)$.
Note 3: 100% production test at 25°C. Specifications over the temperature range are guaranteed by design and characterization.

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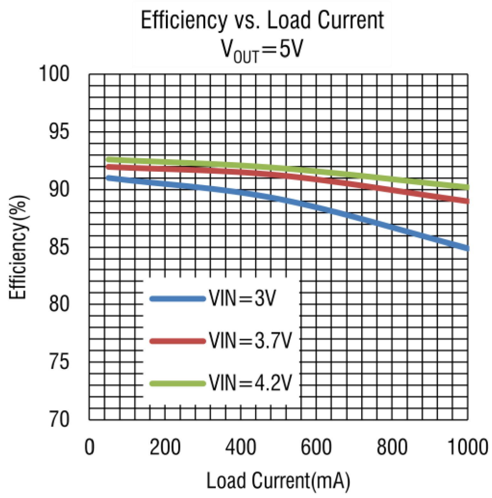
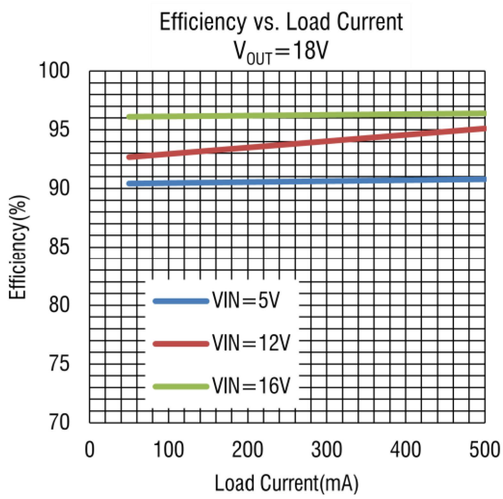
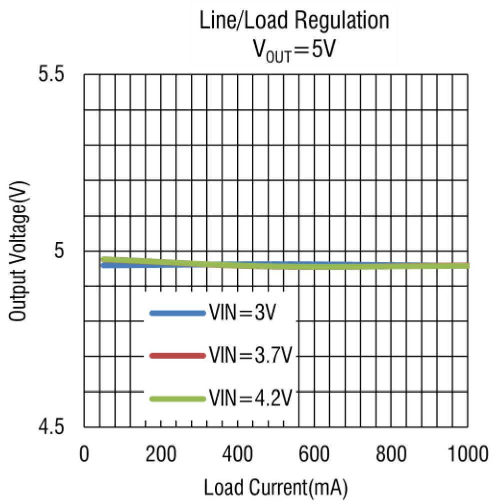
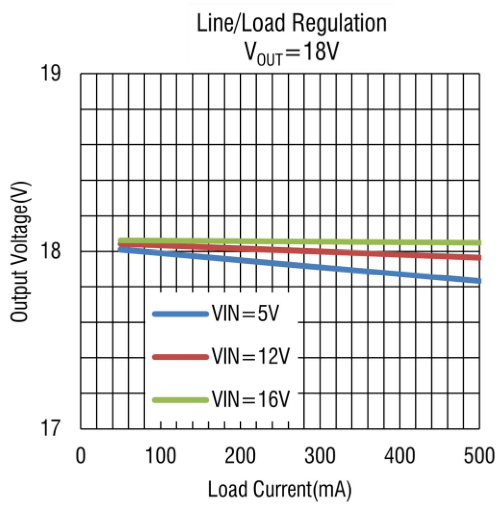
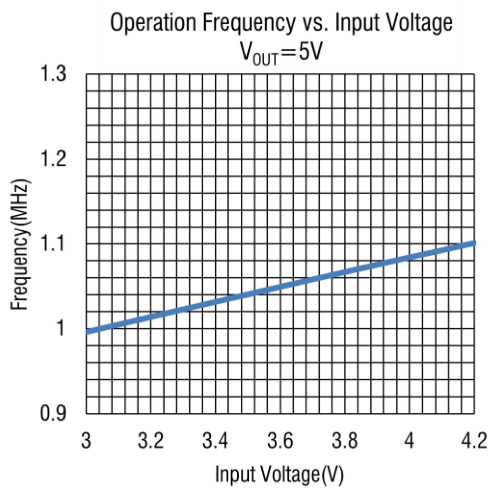
TYPICAL PERFORMANCE CHARACTERISTICS

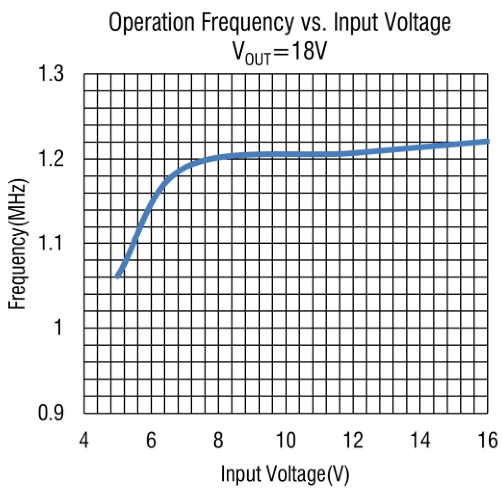












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FUNCTIONAL BLOCK DIAGRAM

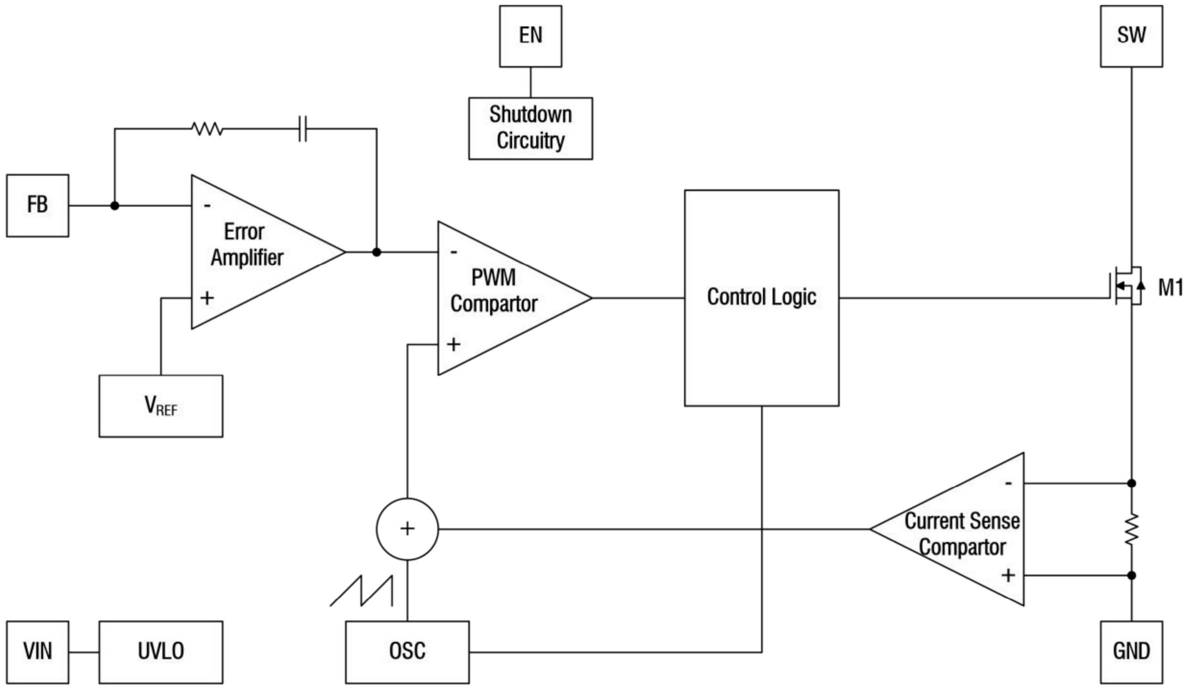

Figure 2. MSDB628 Block Diagram

FUNCTIONAL DESCRIPTION

The MSDB628 uses a fixed frequency, peak current mode boost regulator architecture to regulate voltage at the feedback pin. The operation of the MSDB628 can be understood by referring to the block diagram of Figure 2. At the start of each oscillator cycle the MOSFET is turned on through the control circuitry. To prevent sub-harmonic oscillations at duty cycles greater than 50 percent, a stabilizing ramp is added to the output of the current sense amplifier and the result is fed into the negative input of the PWM comparator. When this voltage equals The output voltage of the error amplifier the power MOSFET is turned off. The voltage at the output of the error amplifier is an amplified version of the difference between the 0.6V bandgap reference voltage and the feedback voltage. In this way the peak current level keeps the output in regulation. If the feedback voltage starts to drop, the output of the error amplifier increases. These results in more current to flow through the power MOSFET, thus increasing the power delivered to the output.The MSDB628 has internal soft start to limit the amount of input current at startup and to also limit the amount of overshoot on the output.

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APPLICATIONS INFORMATION

Setting the Output Voltage

The internal reference V_{REF} is 0.6V (Typical).The output voltage is divided by a resistor divider,R1 and R2 to the FB pin. The output voltage is given by

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_1}{R_2}\right)$$

Inductor Selection

The recommended values of inductor are 4.7 to 22μH. Small size and better efficiency are the major concerns for portable device, such as MSDB628 used for mobile phone. The inductor should have low core loss at 1.2MHz and low DCR for better efficiency. To avoid inductor saturation current rating should be considered.

Capacitor Selection

Input and output ceramic capacitors of 22μF are recommended for MSDB628 applications. For better voltage filtering, ceramic capacitors with low ESR are recommended. X5R and X7R types are suitable because of their wider voltage and temperature ranges.

Diode Selection

Schottky diode is a good choice for MSDB628 because of its low forward voltage drop and fast reverses recovery. Using Schottky diode can get better efficiency. The high speed rectification is also a good characteristic of Schottky diode for high switching frequency. Current rating of the diode must meet the root mean square of the peak current and output average current multiplication as following

$$I_D(RMS) \approx \sqrt{I_{OUT} \times I_{PEAK}}$$

The diode' s reverse breakdown voltage should be larger than the output voltage.

Layout Consideration

For best performance of the SDB628, the following guidelines must be strictly followed.

- Input and Output capacitors should be placed close to the IC and connected to ground plane to reduce noise coupling.
- The GND should be connected to a strong ground plane for heat sinking and noise protection.
- Keep the main current traces as possible as short and wide.
- SW node of DC-DC converter is with high frequency voltage swing. It should be kept at a small area.
- Place the feedback components as close as possible to the IC and keep away from the noisy devices.

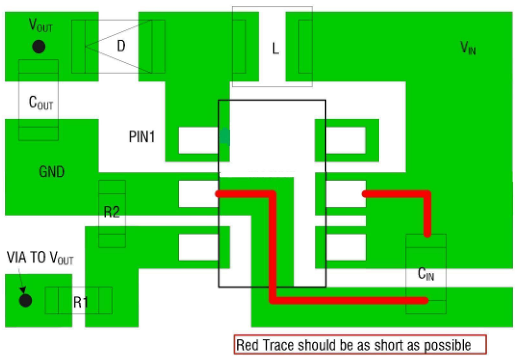

Figure 3. MSDB628 Suggested Layout

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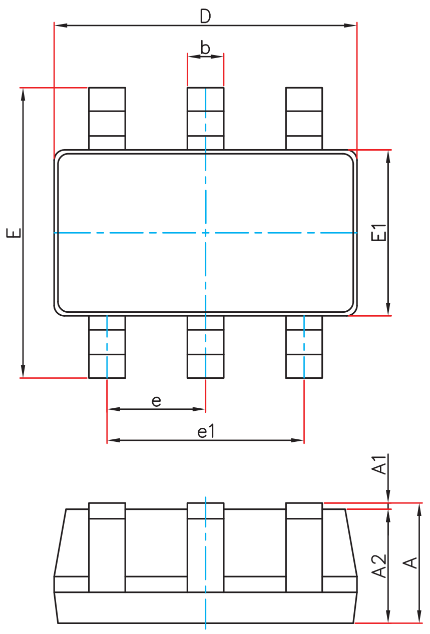
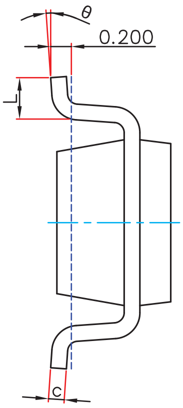
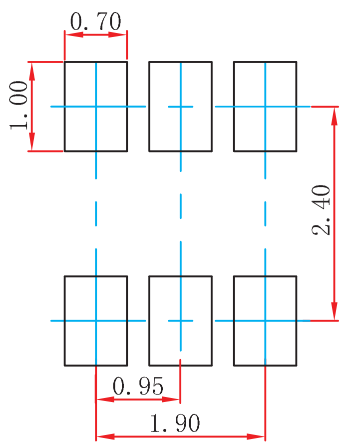
Package Outline Dimensions





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Suggested Pad Layout



Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

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