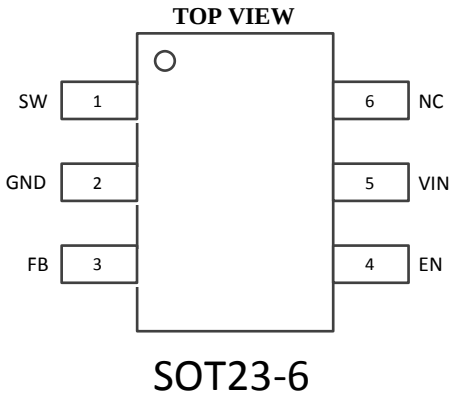
■ General Description

The JTM1558 is a high efficiency current-mode boost converter with a fixed operation frequency. The JTM9225 integrates a very low Rds-on NMOSFTET to reduce power loss and achieve high efficiency. The maximum efficiency is up to 93%. JTM1558 can output 2A current when VIN is higher than 3.3V and output is 5V. 1.2MHz operation frequency minimizes L and C value, and internal compensation network reduces external component counts. SOT23-6 package provides the best solution for PCB layout area.

■ Features

· Wide Input Range: 2.5-6V Input,·
· Up to 2A Output Current
· Maximum 8V Output Voltage
· 1.2MHz Switching Frequency
· Low RDS(ON): 70mΩ
· Up to 93% Efficiency
· Under-Voltage Lockout Protection
· Over-Temperature Protection
· Internal Soft Start
· 1uA Shutdown Current
· Accurate Reference: 0.6V VREF
· Compact package: SOT23-6

■ Pin Configuration

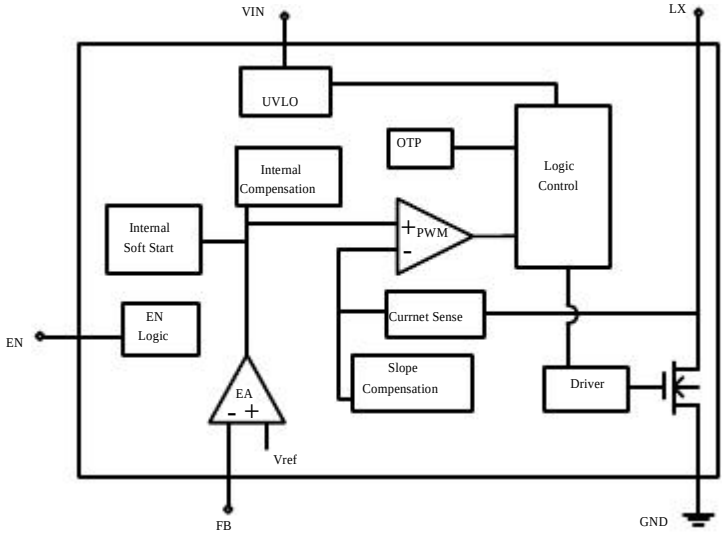


SOT23-6

■ Pin Descriptions

Pin Name		Pin Function
1	SW VIN	Power Switch Output. Connect the inductor and the blocking Schottky diode to SW.
2	GND	GND
3	FB	Feedback
4	EN	Enable pin. A high input at EN enables the device and a low input disables the devices. When not used, connect EN to the input source for automatic startup.
5	VIN	Input Supply Pin. Must be locally bypassed.
6	NC	No Internal Connection

■ Block Diagram



Absolute Maximum Ratings

-39■

SYMBOL	NAME	VALUE	UNIT
V_{IN}	Input Voltage	-0.3～6.5	V
V_{SW}	Voltage at SW Pin	-0.5～12	V
V_{IO}	All Other I/O Pins	GND-0.3 to VDD+0.3	V
P_{TR1}	Thermal Resistance(SOT23-6) Θ_{JA}	220	℃/W
T_{stg}	Storage Temperature	-55 to 150	℃
T_{solder}	Package Lead Soldering Temperature	260℃, 10s	
ESD Susceptibility	HBM(Human Body Mode)	2	kV

Note1: Exceeding these ratings may damage the device.

Recommended Operating Conditions(Note 2)

■

SYMBOL	NAME	VALUE	UNIT
V_{IN}	VIN Supply Voltage	2.5 to +6	V
V_{SW}	Output Voltage	V_{IN} to 10	V
T_{OTP}	Operating Temperature	-40 to +85	℃

Note2: The device is not guaranteed to function outside of its operating rating.

■ Electrical Characteristics

(VIN = 3.3V, VOUT=5V, IOUT=100mA, TA = 25°C unless otherwise specified)

SYMBOL	ITEMS	CONDITIONS	Min.	Typ.	Max.	UNIT
V_{IN}	Input Voltage		2.5		6	V
Feedback						
V_{FB}	Feedback Voltage		588	600	612	mV
I_{bias}	FB Pin Input Bias Current			0.05	1	μA
UVLO						
UVLO	Under Voltage Lock Out			2.1		V
Operating Current						
I_{off}	Operating Current（Shutdown）			0.1	1	μA
I_{sby}	No Switching	Vin=3V VFB=0.7V		100		μA
F_{sw}	Switching Frequency			1.2		MHz
D_{max}	Maximum Duty Cycle	V_{FB}=0V		90		%
Chip Enable						
V_{EN_H}	EN Minimum High Level		1.5			V
V_{EN_L}	EN Maximum Low Level				0.4	V
V_{HYS}	EN Hysteresis			90		mV
I_{EN}	EN Input Bias Current				1	μA
OTP						
OTP				130		^{O}C
OTP Hystersis				20		^{O}C
Output Switch						
R_{ON}	SW On Resistance (Note 3)			70		mΩ
I_{LIMIT}	SW Current Limit			5		A
I_{LEAK}	SW Leakage Current	V_{sw}=5V		0.01	1	μA
Open Circuit Protection						
V_{OV}	JTM1558	V_{OV} Rising		10		V
Soft Start						
t_{ss}	Soft Start Time (Note 3)	V_{IN} Power On		400		μS

Note3: Guaranteed by design.

Typical Performance Characteristics

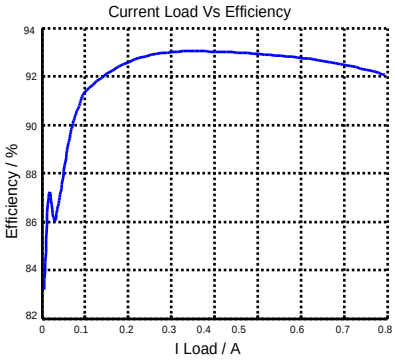


Fig 1 Efficiency Vs Light Load

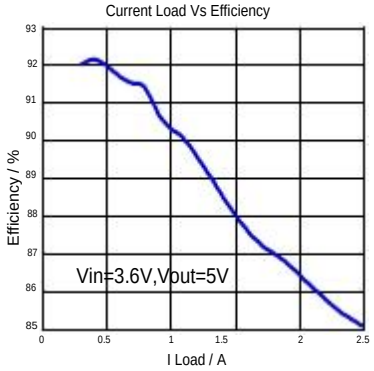


Fig 2 Efficiency Vs Heavy Load

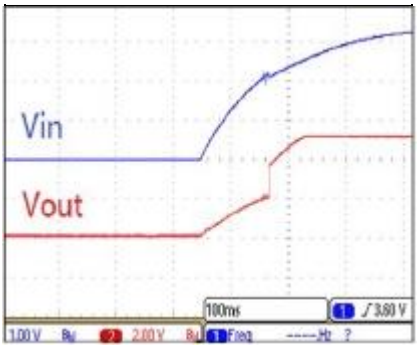


Fig 3 Startup with V_{in}

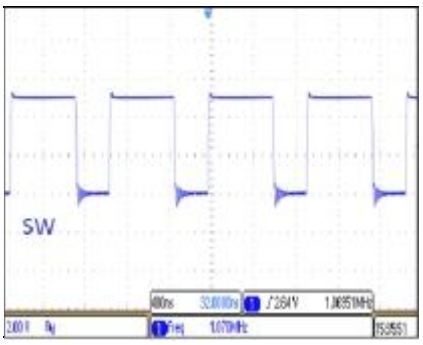


Fig 4 SW Waveform

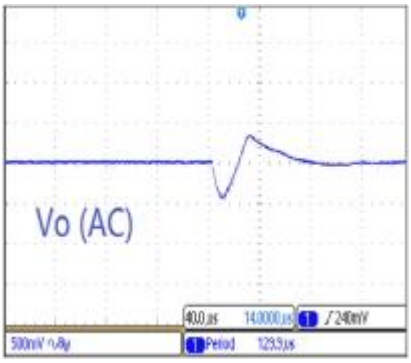
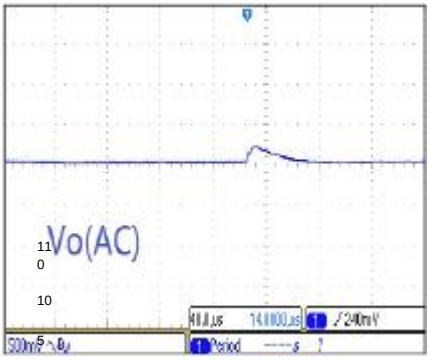


Fig 5 Transient Response
(V_{IN}=3.6V, Vout=5V, I_{load}=0.15A to 0.9A)



F ig 6 Transient Response
(V_{IN}=3.6V, Vout=5V, I_{load}=0.9A to 0.15A)

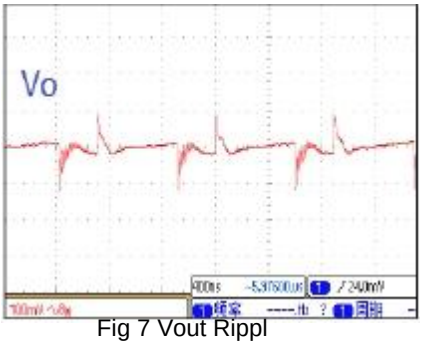
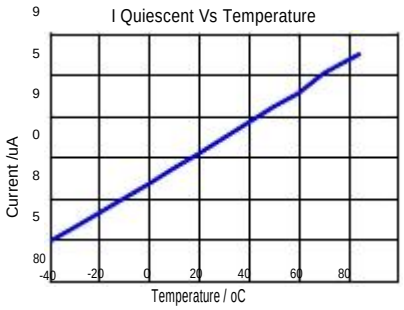
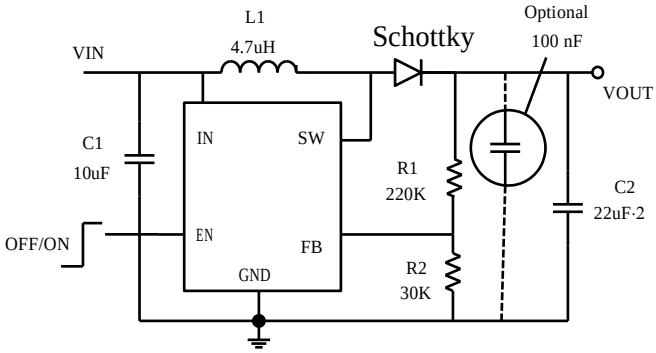


Fig 7 Vout Rippl



F ig 8 Q uiescent Current Vs Temperature

■ Typical Application Circuit



Typical application

■ Operation Description

The JTM1558 adopts fixed frequency, peak current mode boost regulator architecture to regulate output voltage. The operating principle of the JTM1558 can be easily understood by referring to the functional block diagram. At the beginning of each oscillator cycle the MOSFET is turned on by the control circuit. To prevent sub-harmonic oscillations at duty cycle larger 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 result of the difference between the 0.6V reference voltage and the feedback voltage. In this way the peak current level keeps the output voltage in regulation. If the feedback voltage starts to drop, the output of the error amplifier increases, resulting in more current to flow through the power MOSFET, thus increasing the power delivered to the output. The JTM1558 has internal soft start to avoid rush input current during the startup and also to avoid overshoot on the output.

■ Application Information

Because of the high integration in the JTM1558, the application circuit based on this regulator IC is rather simple. Only input capacitor CIN, output capacitor COUT, inductor L, schottky diode and feedback resistors (R1 and R2) need to be selected for the targeted applications.

Feedback Resistor Divider R1 and R2:

Choose R1 and R2 to program the proper output voltage. To minimize the power consumption under light loads, it is desirable to choose large resistance values for both R1 and R2. A value of between 10KΩ and 1MΩ is recommended for both resistors. If R1=220 KΩ is chosen, then R2 can be calculated to be 30KΩ based on the following equation:

$R2 = (R1 \times 0.6V)/(VOUT - 0.6V)$

Input Capacitor CIN:

To minimize the potential noise problem, place a typical X5R or better grade ceramic capacitor really close to the IN and GND pins. Care should be taken to minimize the loop area formed by CIN, and IN/GND pins. In this case a 10uF low ESR ceramic is recommended.

Output Capacitor COUT:

The output capacitor is selected to meet the output ripple noise requirements. Both steady state ripple and transient requirements must be taken into consideration when selecting this capacitor. For the best performance, it is recommended to use X5R or better grade ceramic capacitor with 10V rating and more than two pieces of 22uF Capacitor. The ESR of the capacitor COUT is critical for low ripple and noise in the output voltage.

Boost Inductor L:

The recommended values of inductor is 2.2uH to 10 u H. Small size and better efficiency are the major concerns for portable devices. 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.

Diode Selection:

Schottky diode is a good choice for JTM1558 because of its low forward voltage drop and fast reverses recovery in order to get better efficiency. The high speed rectification is also a g ood characteristic of Schottky diode for high switching frequency. The diode reverse breakdown voltage should be larger than the output voltage.

Start-up and Inrush Current:

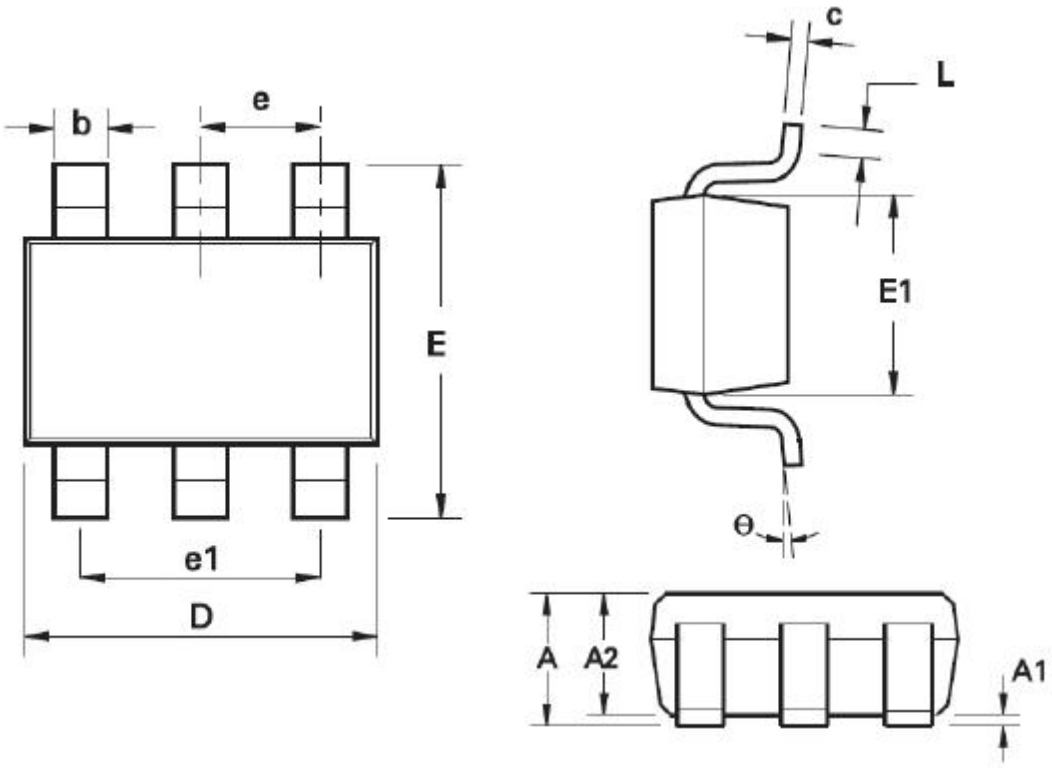
The JTM1558 has internal soft start to limit the value of current through VIN during the startup and also to avoid overshoot on the output. The soft start is realized by gradually increasing the output of error amplify during start-up.

■ Ordering Information

Part Number	OVP(V)	Package	Marking
JTM1558	10	SOT23-6	BC4XX

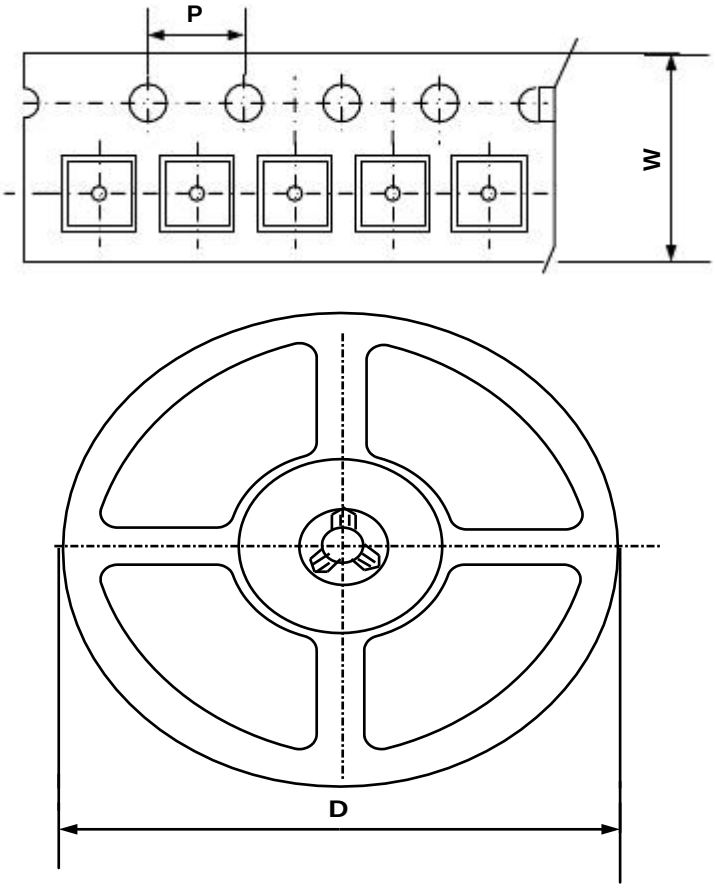
Package Outlines

SOT23-6



SYMBOL	MILLMETER			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	--	--	1.35	--	--	0.053
A1	0.04	--	0.15	0.002	--	0.006
A2	1.00	1.10	1.20	0.039	0.043	0.047
b	0.34	--	0.43	0.013	--	0.017
c	0.15	--	0.21	0.006	--	0.008
D	2.72	2.92	3.12	0.107	0.115	0.123
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.40	1.60	1.80	0.055	0.063	0.071
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	--	0.60	0.012	--	0.024
θ	0	--	8°	0	--	8°

■ Packing Information



Package Type	Carrier Width (W)	Pitch (P)	Reel Size(D)	Packing Minimum
SOT23-6	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs

Note: Carrier Tape Dimension, Reel Size and Packing Minimum