M5135

Micro-Power Boost DC/DC Converter

Features

- **Operating Voltage：2.7V ~ 5.5V**
- **High Operating Frequency：1MHz**
- **Shutdown Current：＜1μA**
- **High Output Voltage：Up to 40V**
- **Soft Start Function**
- **Cycle by Cycle Current Limiting**
- **SOT-23-5 Package**

Applications

- **STN/OLED BIAS**
- **Personal Digital Assistants**
- **DSC**
- **TV Tunner**

General Description

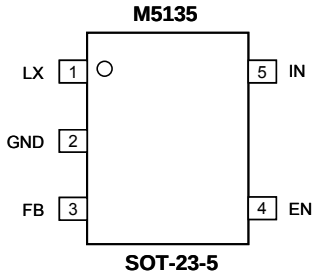
The M5135 boost converter contains a 0.7Ω internal switch. The IC operates at constant frequency 1MHz, allowing the use of tiny, low cost and low height inductors and capacitors. The IC operates from a 2.7V to 5.5V supply voltage and can boost supply voltage up to 40V at the output. High inrush current at start-up is eliminated using the soft-start function. Constant frequency current mode PWM architecture results in low, predictable output noise. The M5135 includes cycle-by-cycle 850mA current limiting to maximum inductor current and over-temperature protection circuit. The M5135 is suitable for small or medium size LCD panel of high bias voltage with a constant current to provide PDAs, and other portable devices. The M5135 is available in SOT-23-5 package.

Ordering Information

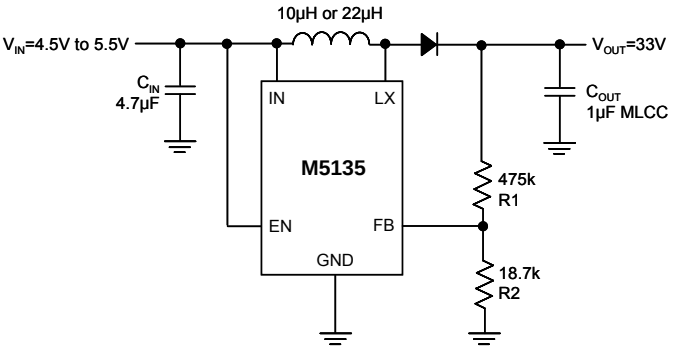
ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
M5135T11U	5125x	-40°C to 85°C	SOT-23-5

Note: T1: SOT-23-5
1 : Bonding Code
U: Tape & Reel
Green : Lead Free / Halogen Free.

Pin Configuration



Typical Application Circuit



Absolute Maximum Ratings

IN to GND . . . . . .-0.3V to 7V
LX to GND. . . . . -0.3V to 45V
EN to GND. . . . . -0.3V to VIN
FB to GND. . . . . -0.3V to VIN
Thermal Resistance Junction to Ambient, (θ_{JA})
SOT-23-5. . . . . .200°C/W

Continuous Power Dissipation (T_A=25°C)
SOT-23-5 . . . . . 470mW
Operating Temperature Range[1] . . . . . -40°C to +85°C
Junction Temperature . . . . . +150°C
Storage Temperature . . . . . -65°C to +150°C
Reflow Temperature (soldering, 10sec) . . . . . 260°C

Note:
1. It is guaranteed to meet performance specifications from 0°C to 85°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with statistical process controls.

Electrical Characteristics

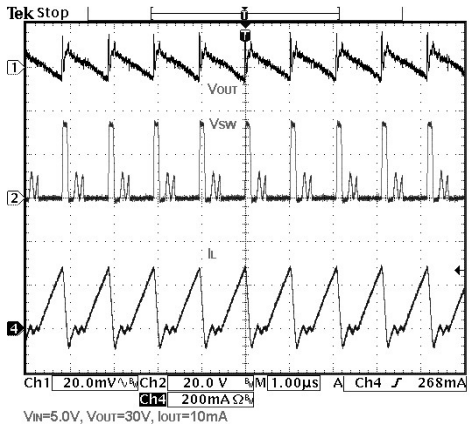
V_{IN}=V_{EN}=3.6V, T_A = 25°C.

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Operating Input Range		V_{OUT} ≥ 30V	4.5	---	5.5	V
		20V ≤ V_{OUT} < 30V	3.6	---	5.5	
		V_{OUT} < 20V	2.7	---	5.5	
Quiescent Current		No Switching	---	0.2	0.3	mA
Shutdown Supply Current		EN=0V	---	0	1	μA
EN Input Level	V_{IH}		1.5	---	---	V
	V_{IL}		---	---	0.8	V
$UVLO_{RISING}$			2	2.25	2.5	V
Oscillator Frequency			---	1	---	MHz
Maximum Duty Cycle			88	90	---	%
Feedback Regulation Voltage			1.225	1.250	1.275	V
NMOS R_{DS-ON}		I_{LX}=200mA	---	700	---	mΩ
LX Leakage Current		EN=0, V_{LX}=45V	---	---	10	μA
Switching Current Limit		duty cycle=80%	500	850	1300	mA
Over Temperature		Trigger	---	120	---	°C
		Hysteresis	---	20	---	°C
Soft Start			---	0.5	---	ms

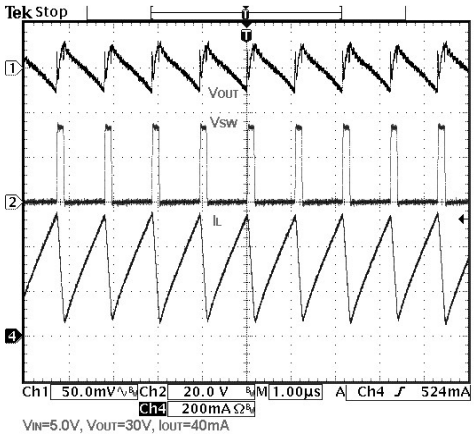
Typical Performance Characteristics

(V_{CC}= 5V, V_{EN}= 5V, L=10μH, T_A=25°C, unless otherwise noted.)

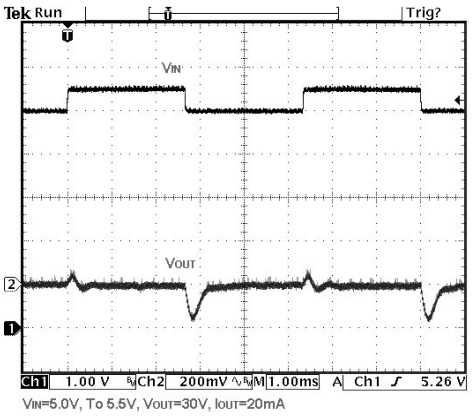
Stability Waveform



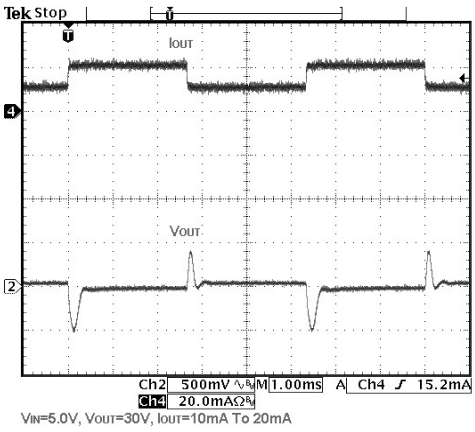
Stability Waveform



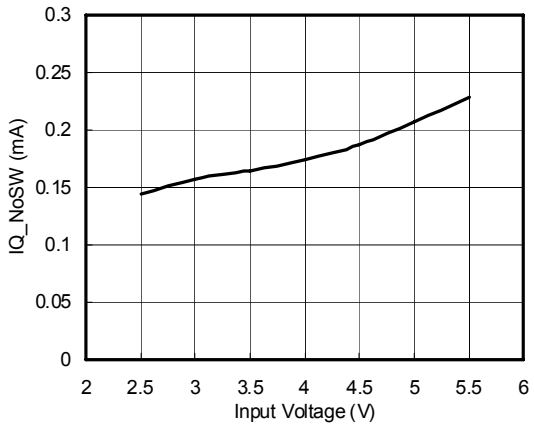
Line Transient



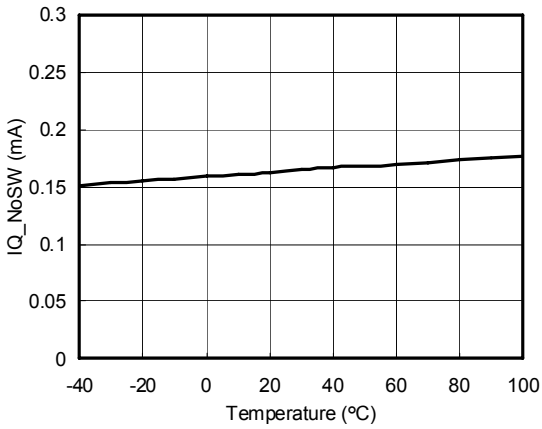
Load Transient



IQ_NoSW vs. Input Voltage

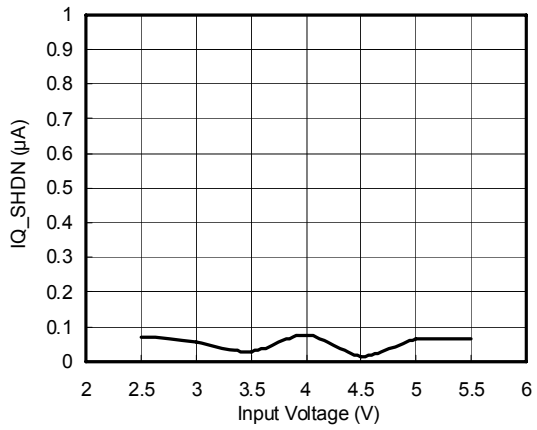


IQ_NoSW vs. Temperature

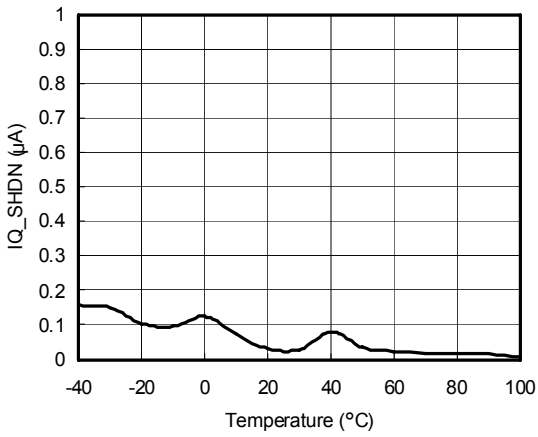


Typical Performance Characteristics (continued)

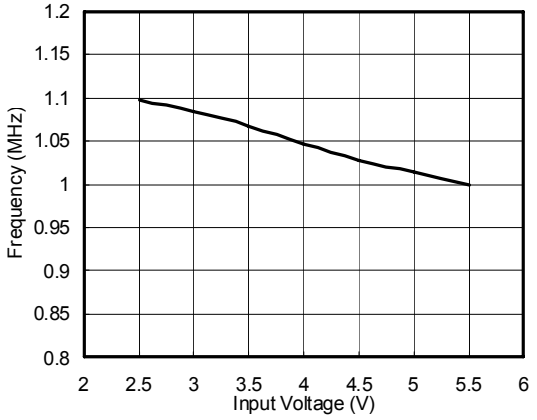
IQ_SHDN vs. Input Voltage



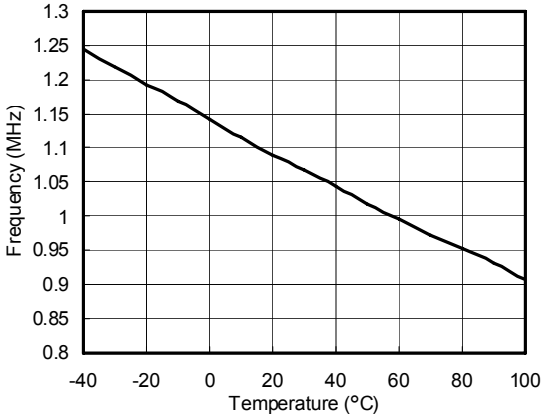
IQ_SHDN vs. Temperature



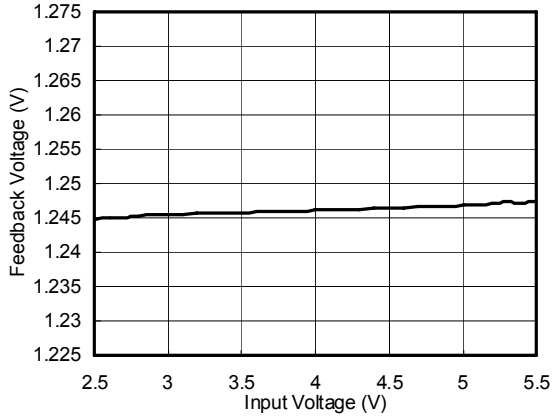
Frequency vs. Input Voltage



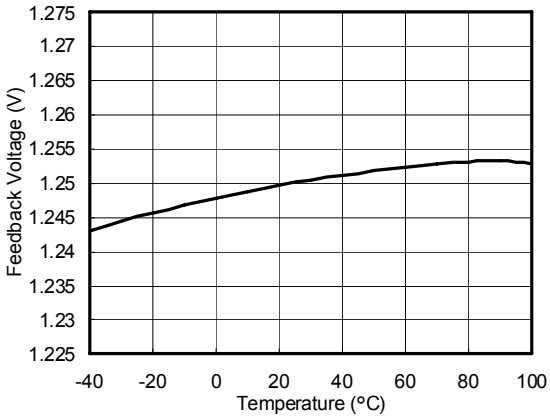
Frequency vs. Temperature



Feedback Voltage vs. Input Voltage

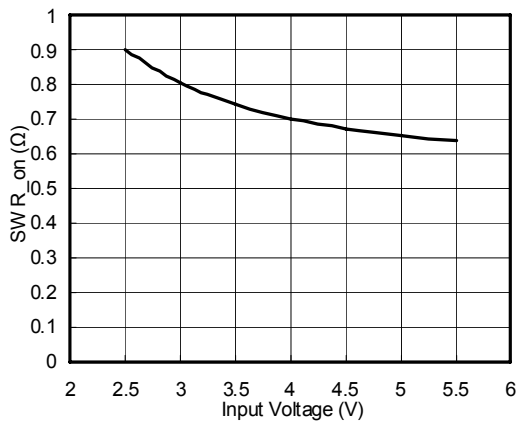


Feedback Voltage vs. Temperature

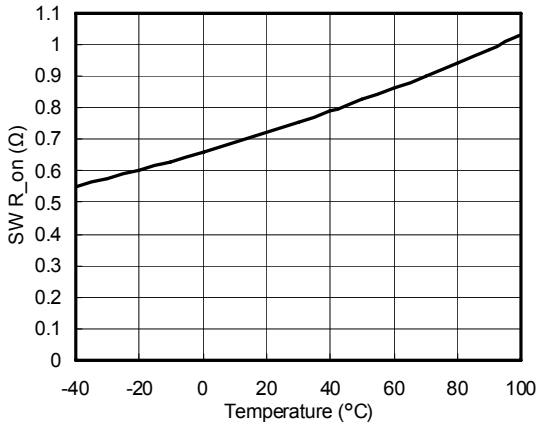


Typical Performance Characteristics (continued)

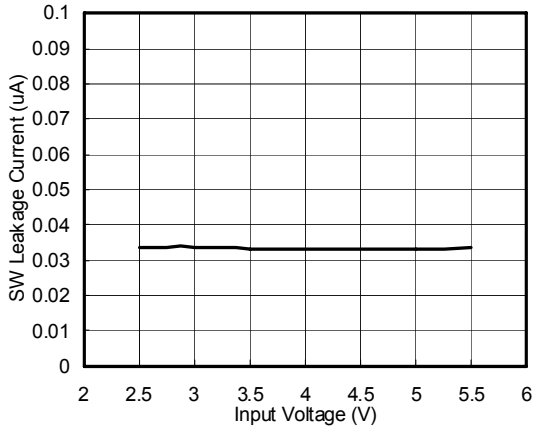
SW R_on vs. Input Voltage



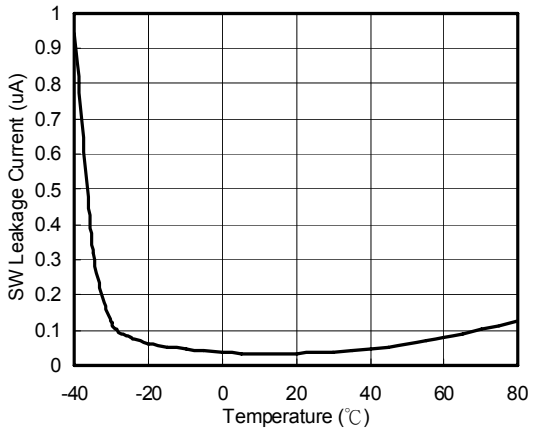
SW R_on vs. Temperature



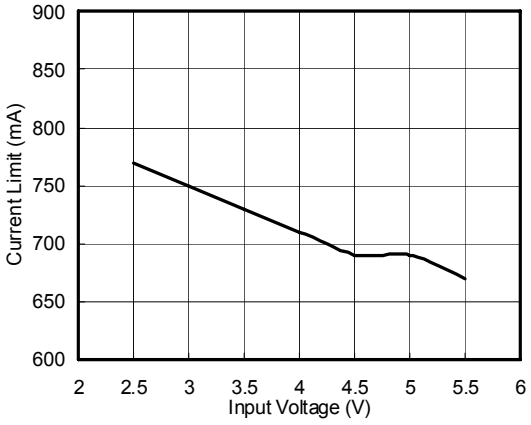
SW Leakage Current vs. Input Voltage



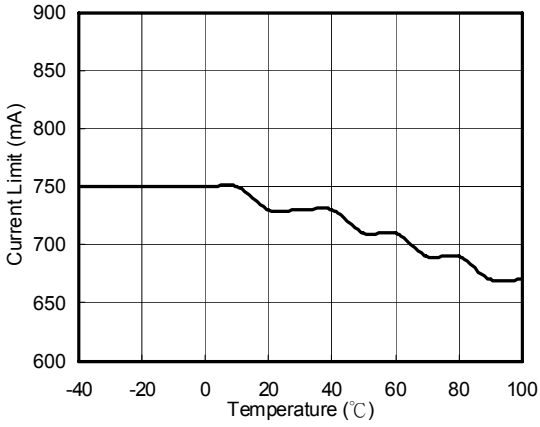
SW Leakage Current vs. Temperature



Current Limit vs. Input Voltage

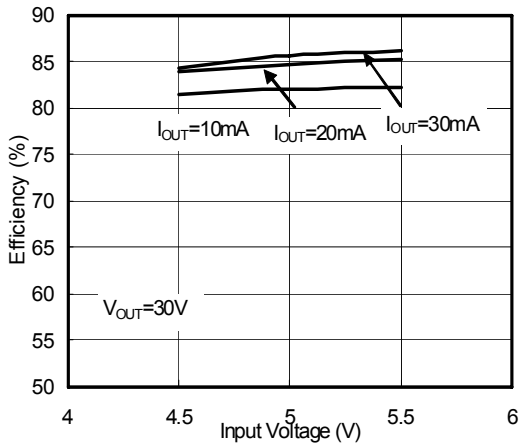


Current Limit vs. Temperature

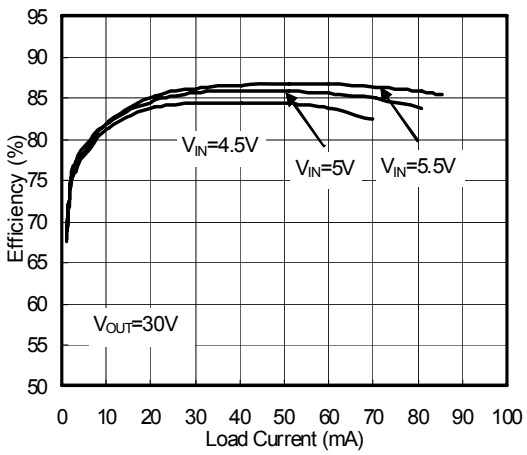


Typical Performance Characteristics (continued)

Efficiency vs. Input Voltage

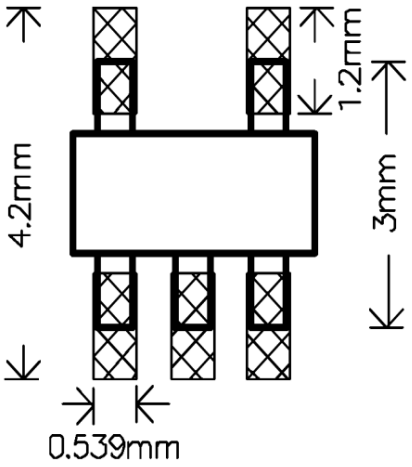


Efficiency vs. Load Current



Minimum Footprint PCB Layout Section

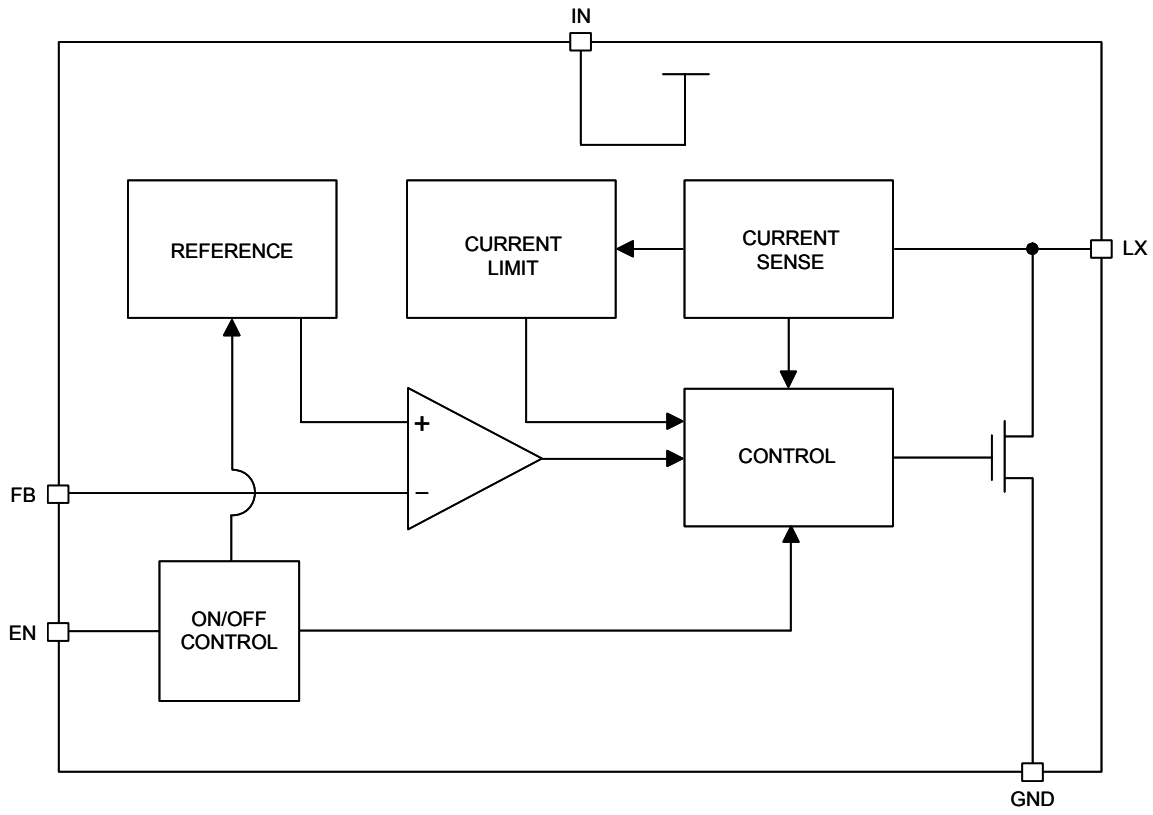
SOT-23-5



Pin Descriptions

PIN	Name	FUNCTION
1	LX	Power Switching Output
2	GND	Ground Pin.
3	FB	Feedback Input.
4	EN	Enable Input. Drive EN high to turn on the regulator, drive it low to turn it off.
5	IN	Power Input Pin. It must be bypassed with a low-ESR capacitor.

Block Diagram



Operating

The M5135 step-up DC-DC converter operates from a 2.7V to 5.5V supply and converts up to 40V. The device includes an internal switching MOSFET with a 0.7Ω on-resistance and consumes 200μA of supply current. During startup, the M5135 limits the maximum on-time to limit initial battery inrush current. Adjust the output voltage by connecting a voltage divider from the output (VOUT) to FB. Select R1 and R2 (see application circuit) to set the voltage of FB (VFB) equaling 1.25V and VOUT may up to 40V. The M5135 built in a cycle-by-cycle 850mA current-limit function to maximum inductor current. The M5135 consumes 0.1μA when voltage of EN is Low.

Application Information

Inductor Selection

The inductor's saturation current rating should be greater than the peak switching current. The large inductance prevents the large inductor's current ripple to induce maximum current limit in on-time period and output voltage ripple can be reduced also. Inductor with low core losses and small DCR (cooper wire resistance) is recommended.

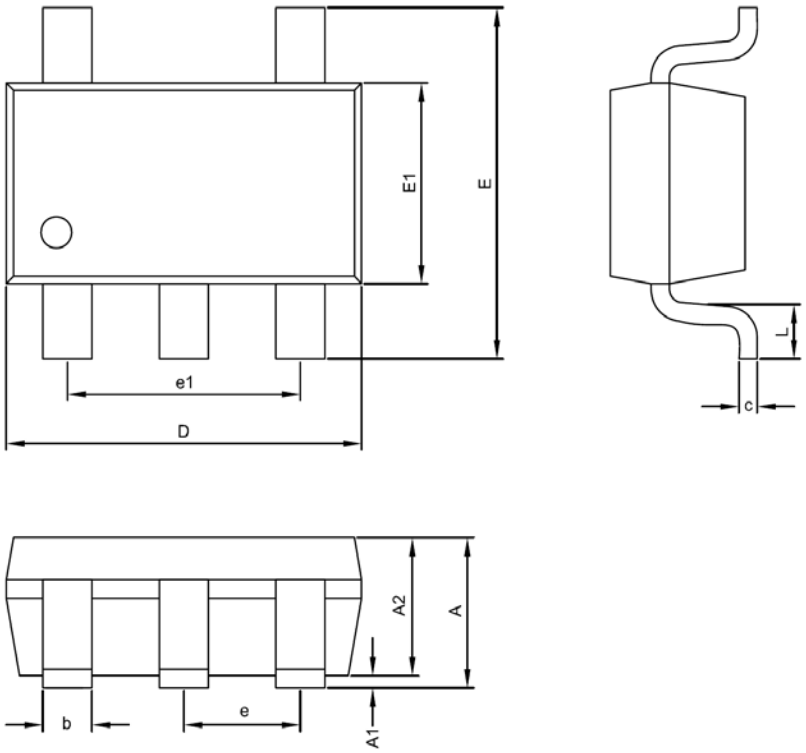
Capacitor Selection

The small size of ceramic capacitors makes them suitable for M5135 applications. X5R and X7R types are recommended because they retain their capacitance over wider voltage and temperature ranges than other types such as Y5V or Z5U. A minimum 1μF capacitor for output is required for most applications. Larger input/output capacitor minimizes input/output ripple.

Diode Selection

Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for M5135 applications. The forward voltage drop of a Schottky diode represents the conduction losses in the diode, while the diode capacitance (C_T or C_D) represents the switching losses. For diode selection, both forward voltage drop and diode capacitance need to be considered. Schottky diodes with higher current ratings usually have lower forward voltage drop and large diode capacitance, which can cause significant switching losses at the 1MHz switching frequency of the M5135.

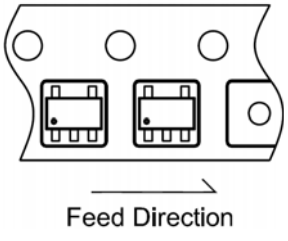
Package Information



SOT-23-5 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.45	0.039	0.043	0.057
A1	0.00	---	0.15	0.000	---	0.006
A2	1.00	1.10	1.30	0.039	0.043	0.051
D	2.70	2.90	3.10	0.106	0.114	0.122
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
c	0.08	0.15	0.25	0.003	0.006	0.010
b	0.30	0.40	0.50	0.012	0.016	0.020
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	0.45	0.60	0.012	0.018	0.024

Taping Specification



PACKAGE	Q'TY/REEL
SOT-23-5	3,000 ea