

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M****General Description**

The AP3427M is a high efficiency step-down dual channel DC-DC voltage converter. The chip operation is optimized by peak-current mode architecture with built-in synchronous power MOSFET switchers. The oscillator and timing capacitors are all built-in providing an internal switching frequency of 1.5MHz that allows the use of small surface mount inductors and capacitors for portable product implementations.

Integrated Soft Start (SS), Under Voltage Lock Out (UVLO), Thermal Shutdown Detection (TSD) and Short Circuit Protection are designed to provide reliable product applications.

The device is available in adjustable output voltage ranging from 0.6V to  $0.9 \times V_{IN}$  when input voltage range is from 2.5V to 5.5V, and is able to deliver up to 1A.

The AP3427M is available in standard DFN-3×3-10 package.

**Features**

- High Efficiency Buck Power Converter
- Output Current: 1.0A
- Low  $R_{DS(ON)}$  Internal Switches: 200m $\Omega$  ( $V_{IN}=5V$ )
- Adjustable Output Voltage from 0.6V to  $0.9 \times V_{IN}$
- Wide Operating Voltage Range: 2.5V to 5.5V
- Built-in Power Switches for Synchronous Rectification with High Efficiency
- Feedback Voltage: 600mV
- 1.5MHz Constant Frequency Operation
- Thermal Shutdown Protection
- Low Drop-out Operation at 100% Duty Cycle
- Input Over Voltage Protection
- No Schottky Diode Required

**Applications**

- Post DC-DC Voltage Regulation
- PDA and Notebook Computer

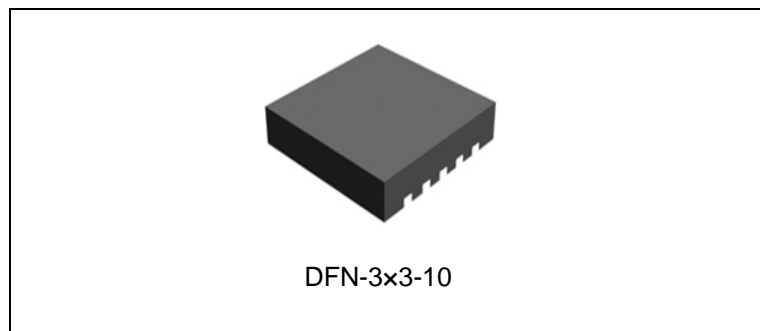


Figure 1. Package Type of AP3427M

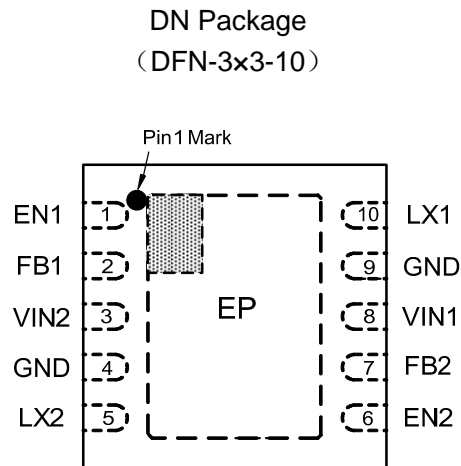
**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**
**Pin Configuration**


Figure 2. Pin Configuration of AP3427M (Top View)

**Pin Description**

Pin Number	Pin Name	Function
1	EN1	Enable signal input of channel 1, active high
2	FB1	Feedback voltage of channel 1
3	VIN2	Power supply input of channel 2
4, 9, Exposed Pad	GND	GND. It should be connected to system ground
5	LX2	Connected from channel 2's Power MOSFET to inductor
6	EN2	Enable signal input of channel 2, active high
7	FB2	Feedback voltage of channel 2
8	VIN1	Power supply input of channel 1
10	LX1	Connected from channel 1's Power MOSFET to inductor

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**

**Functional Block Diagram**

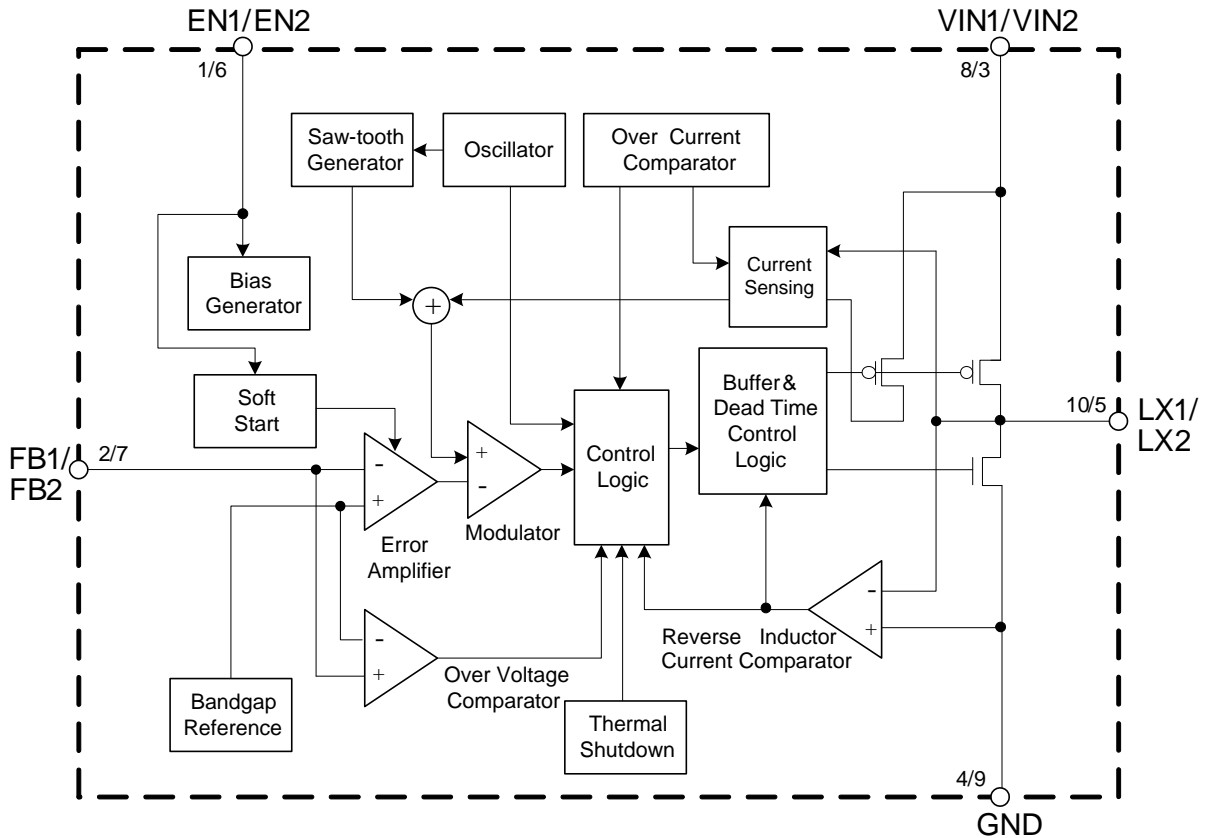
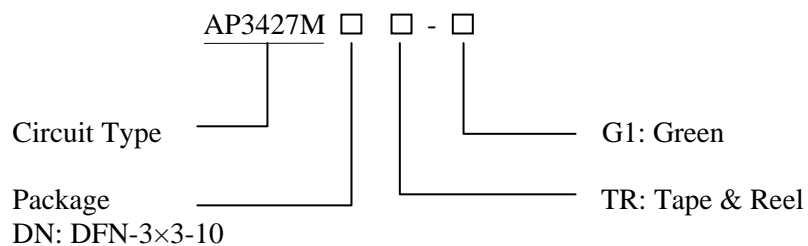


Figure 3. Functional Block Diagram of AP3427M

**Ordering Information**



Package	Temperature Range	Part Number	Marking ID	Packing Type
DFN-3x3-10	-40 to 80°C	AP3427MDNTR-G1	BFE	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Supply Input Voltage for the MOSFET Switch	$V_{IN1}, V_{IN2}$	0 to 6.5	V
LX Pin Switch Voltage	$V_{LX1}, V_{LX2}$	-0.3 to $V_{IN}+0.3$	V
Enable Input Voltage	$V_{EN1}, V_{EN2}$	-0.3 to $V_{IN}+0.3$	V
LX Pin Switch Current	$I_{LX1}, I_{LX2}$	1.8	A
Power Dissipation (on PCB, $T_A=25^{\circ}\text{C}$ )	$P_D$	2.44	W
Thermal Resistance (Junction to Ambient, Simulation)	$\theta_{JA}$	41	$^{\circ}\text{C}/\text{W}$
Thermal Resistance (Junction to Case, Simulation)	$\theta_{JC}$	4.2	$^{\circ}\text{C}/\text{W}$
Operating Junction Temperature	$T_J$	155	$^{\circ}\text{C}$
Operating Temperature	$T_{OP}$	-40 to 85	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to 150	$^{\circ}\text{C}$
ESD (Human Body Model)	$V_{HBM}$	2000	V
ESD (Machine Model)	$V_{MM}$	200	V

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Input Voltage	$V_{IN}$	2.5	5.5	V
Operating Junction Temperature	$T_J$	-40	125	$^{\circ}\text{C}$
Ambient Temperature	$T_A$	-40	80	$^{\circ}\text{C}$

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M****Electrical Characteristics**

$T_A=25^\circ\text{C}$ ,  $V_{IN}=V_{IN1}=V_{IN2}=5\text{V}$ ,  $V_{EN1}=V_{EN2}=5\text{V}$ ,  $V_{FB1}=V_{FB2}=0.6\text{V}$ ,  $L1=L2=2.2\mu\text{H}$ ,  $C_{IN1}=C_{IN2}=4.7\mu\text{F}$ ,  $C_{OUT1}=C_{OUT2}=10\mu\text{F}$ ,  $I_{MAX}=1\text{A}$  per Channel, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage Range	$V_{IN}$	$V_{IN}=V_{IN1}=V_{IN2}$	2.5		5.5	V
Shutdown Current	$I_{OFF}$	$V_{EN1}=V_{EN2}=0$		0.1	1	$\mu\text{A}$
Active Current	$I_{ON}$	$V_{FB1}=V_{FB2}=0.7\text{V}$ , $I_{OUT1}=I_{OUT2}=0\text{A}$		220		$\mu\text{A}$
Regulated Feedback Voltage	$V_{FB}$	For Adjustable Output Voltage	0.588	0.6	0.612	V
Regulated Output Voltage Accuracy	$\Delta V_{OUT}/V_{OUT}$	$V_{IN}=2.5\text{V}$ to $5.5\text{V}$ , $I_{OUT1}$ or $I_{OUT2}=0$ to $1\text{A}$	-3		3	%
Peak Inductor Current	$I_{PK}$		1.5			A
Oscillator Frequency	$f_{OSC}$	$V_{IN}=2.5\text{V}$ to $5.5\text{V}$	1.2	1.5	1.8	MHz
PMOSFET $R_{DS(ON)}$	$R_{DS(ON)P}$	$V_{IN}=5\text{V}$		200		$\text{m}\Omega$
NMOSFET $R_{DS(ON)}$	$R_{DS(ON)N}$	$V_{IN}=5\text{V}$		200		$\text{m}\Omega$
EN High-level Input Voltage	$V_{EN\_H}$		1.5			V
EN Low-level Input Voltage	$V_{EN\_L}$				0.4	V
EN Input Current	$I_{EN}$				0.1	$\mu\text{A}$
Soft Start Time	$t_{SS}$			400		$\mu\text{s}$
Maximum Duty Cycle	$D_{MAX}$		100			%
Input Over Voltage Protection	$V_{IOVP}$			6.2		V
Under Voltage Lock Out Threshold	$V_{UVLO}$	Rising		2.3		V
		Falling		2.1		
		Hysteresis		0.2		
Thermal Shutdown	$T_{SD}$	Hysteresis= $30^\circ\text{C}$		155		$^\circ\text{C}$



**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**

**Typical Performance Characteristics**

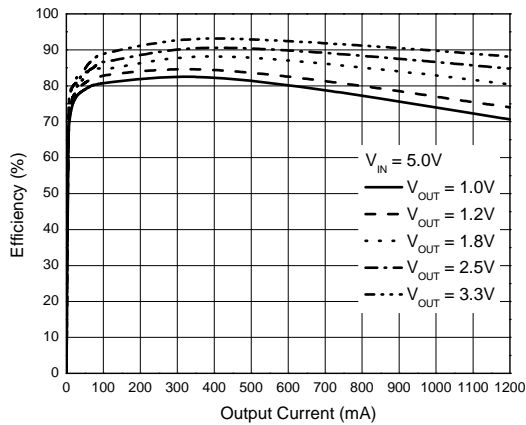


Figure 4. Efficiency vs. Output Current ( $V_{IN}=5V$ )

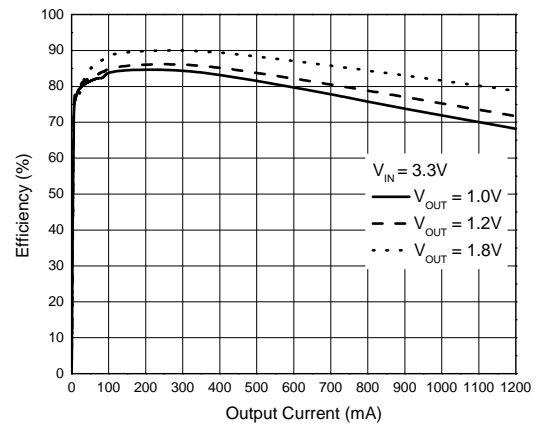


Figure 5. Efficiency vs. Output Current ( $V_{IN}=3.3V$ )

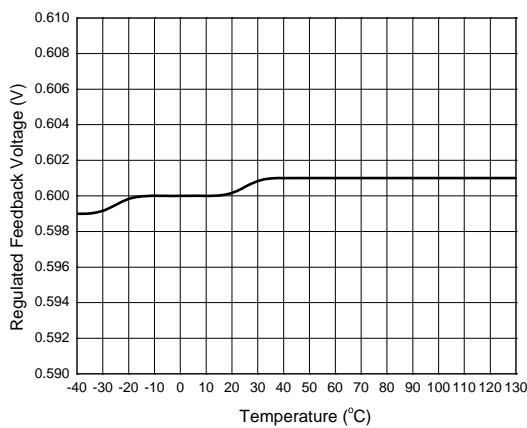


Figure 6. Regulated Feedback Voltage vs. Temperature

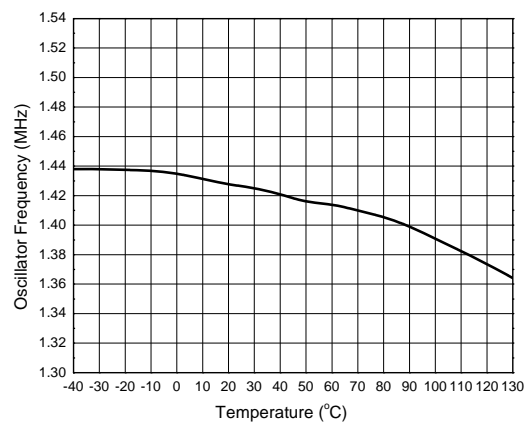


Figure 7. Oscillator Frequency vs. Temperature

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**

**Typical Performance Characteristics (Continued)**

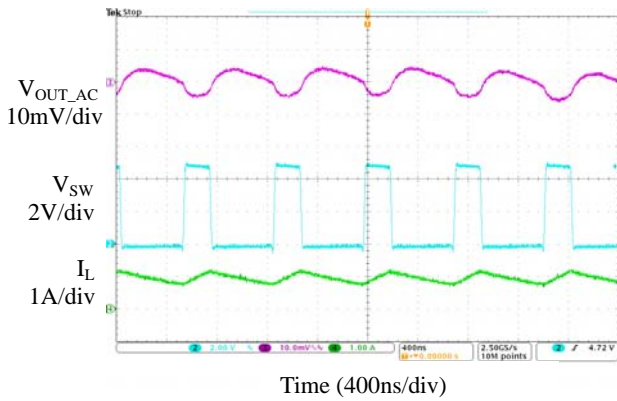


Figure 8. Output Ripple ( $V_{OUT}=1.2V$ ,  $I_{OUT}=1A$ )

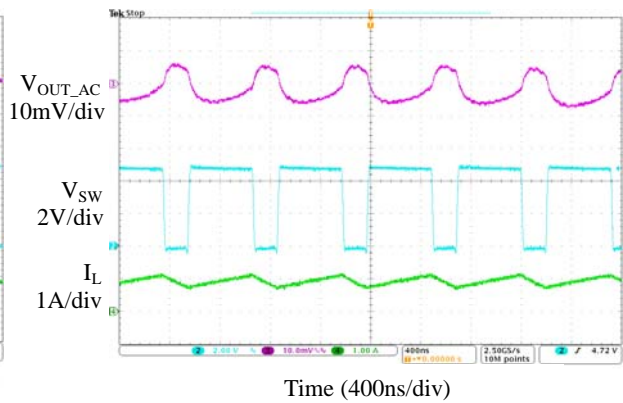


Figure 9. Output Ripple ( $V_{OUT}=3.3V$ ,  $I_{OUT}=1A$ )

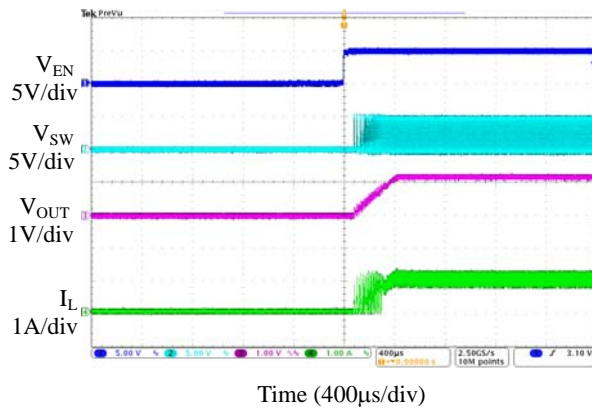


Figure 10. Enable Turn On ( $I_{OUT}=1A$ )

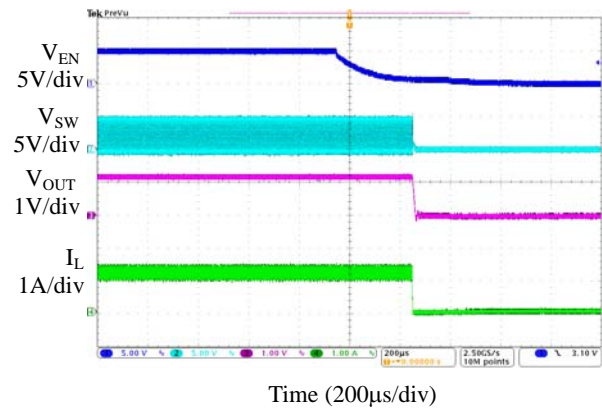


Figure 11. Enable Turn Off ( $I_{OUT}=1A$ )

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**

**Typical Performance Characteristics (Continued)**

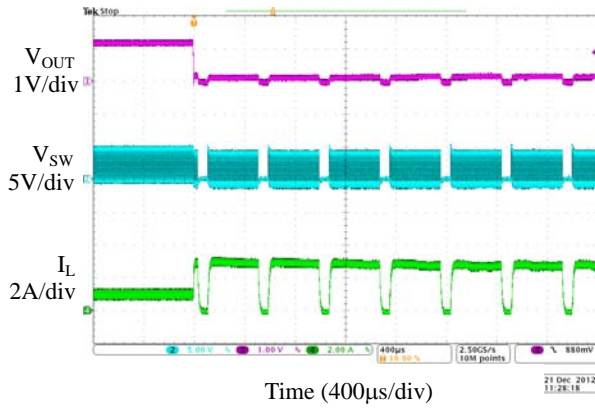


Figure 12. Short Circuit Protection ( $I_{OUT}=1A$ )

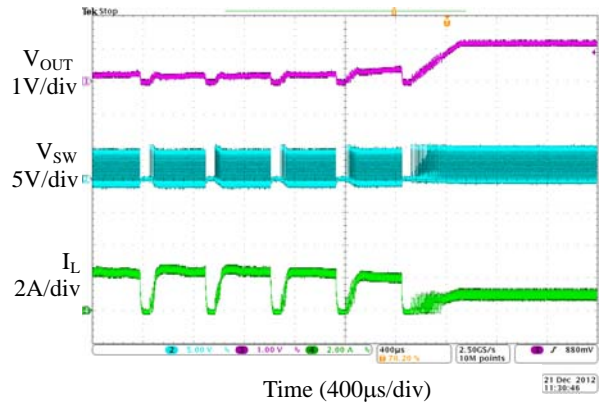
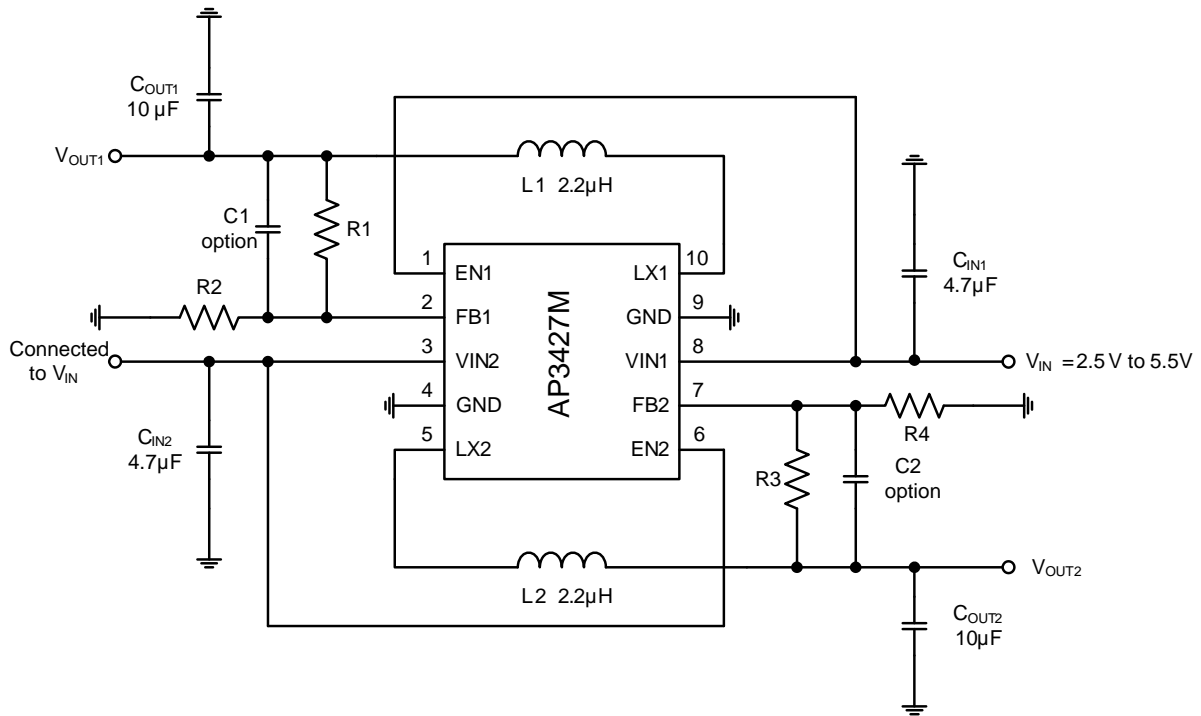


Figure 13. Short Circuit Protection Recovery ( $I_{OUT}=1A$ )



**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**
**Typical Application**


Note 2:  $V_{OUT1} = V_{FB1} \times (1 + R_1/R_2)$ ;  $V_{OUT2} = V_{FB2} \times (1 + R_3/R_4)$ , and  $R_2 = R_4 = 10k\Omega$  is recommended.

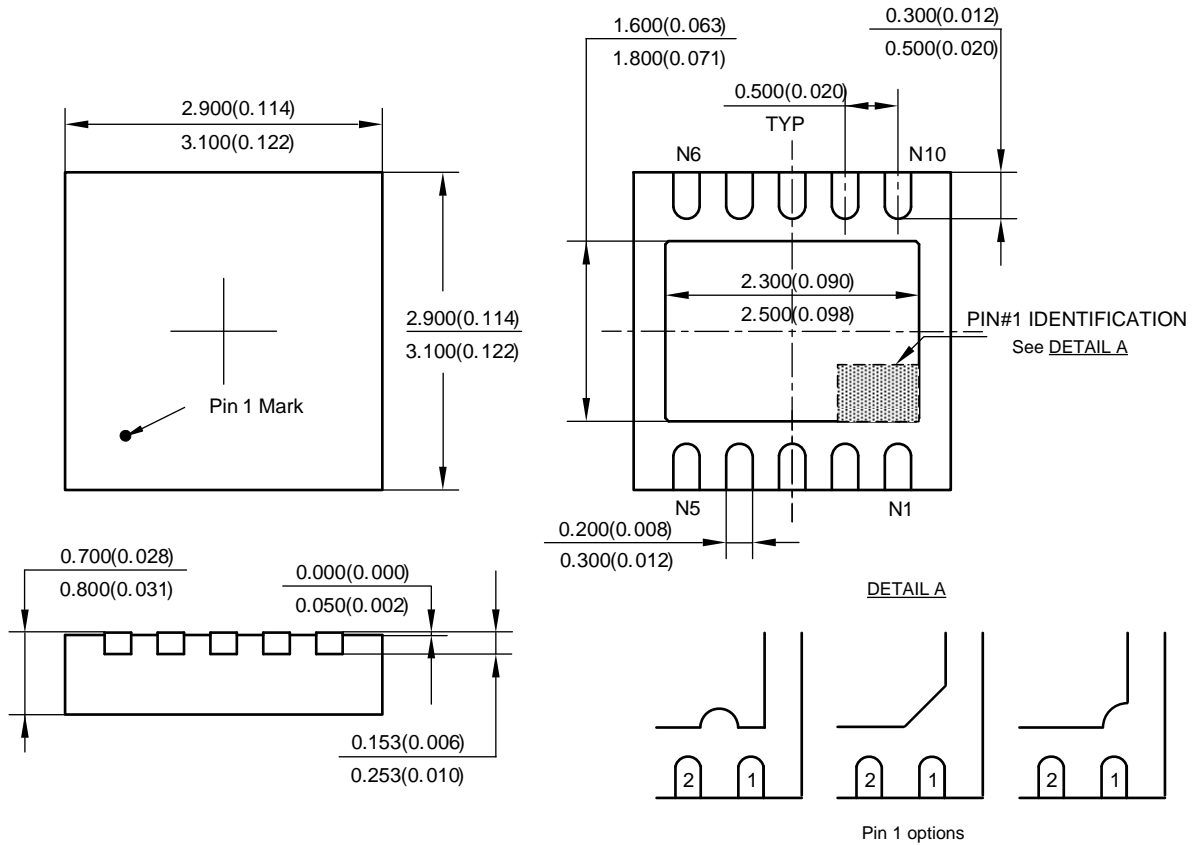
Figure 14. Typical Application of AP3427M (Note 2)

**Dual 1A, 1.5MHz Synchronous Step-down DC-DC Converter AP3427M**

**Mechanical Dimensions**

**DFN-3x3-10**

**Unit: mm(inch)**





## BCD Semiconductor Manufacturing Limited

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