

## 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 0.9xV<sub>IN</sub> when input voltage range is from 2.5V to 5.5V, and is able to deliver up to 1A for each output.

The AP3427M is available in standard U-DFN3030-10 package.

## Features

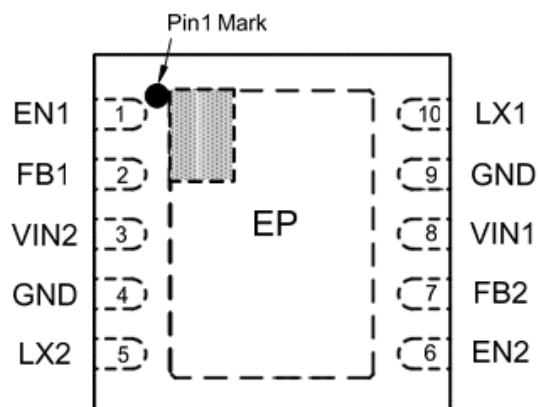
- High Efficiency Buck Power Converter
- Output Current: 1.0A/1.0A
- Low R<sub>DS(ON)</sub> Internal Switches: 200mΩ (V<sub>IN</sub>=5V)
- Adjustable Output Voltages from 0.6V to 0.9xV<sub>IN</sub>
- Wide Operating Voltage Range: 2.5V to 5.5V
- Built-In Power Switches for Synchronous Rectification with 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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Assignments

### Top View

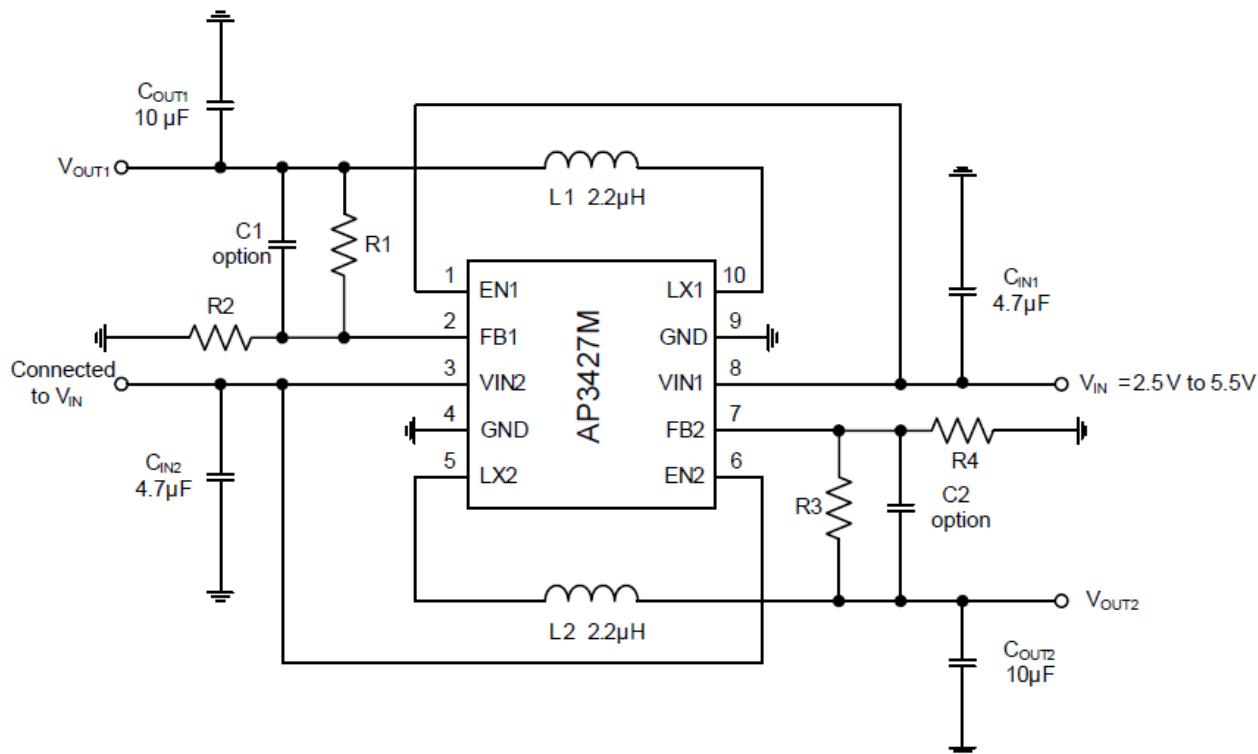


U-DFN3030-10

## Applications

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

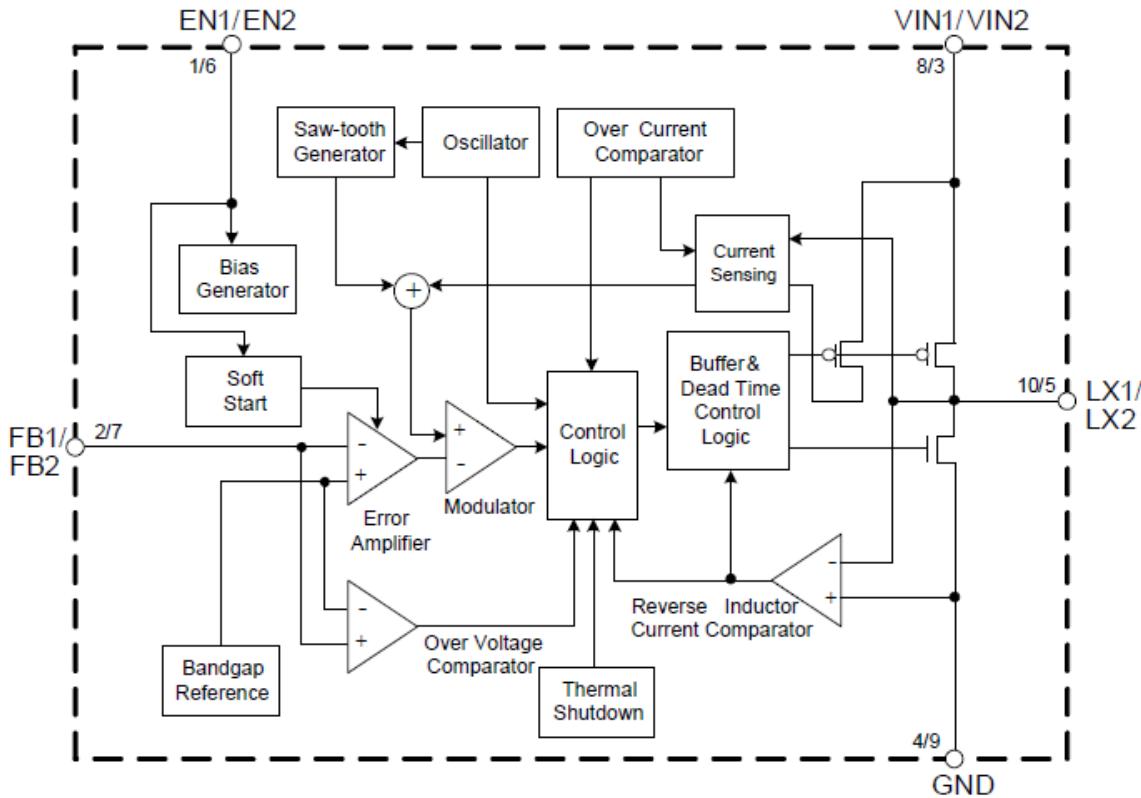
## Typical Applications Circuit



## Pin Descriptions

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

## Functional Block Diagram



## Absolute Maximum Ratings (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.) (Note 4)

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	$V_{EN2}, V_{EN2}$	-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	°C/W
Thermal Resistance (Junction to Case, Simulation)	$\theta_{JC}$	4.2	°C/W
Operating Junction Temperature	$T_J$	+155	°C
Operating Temperature	$T_{OP}$	-40 to +85	°C
Storage Temperature Range	$T_{STG}$	-55 to 150	°C
ESD (Human Body Model)	$V_{HBM}$	2,000	V
ESD (Machine Model)	$V_{MM}$	200	V

Note: 4. 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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

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

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.) ( $V_{IN}=V_{IN1}=V_{IN2}=5\text{V}$ ,  $V_{EN1}=V_{EN2}=5\text{V}$ ,  $V_{FB1}=V_{FB2}=0.6\text{V}$ ,  $L_1=L_2=2.2\mu\text{H}$ ,  $C_{IN1}=C_{IN2}=4.7\mu\text{F}$ ,  $C_{OUT1}=C_{OUT2}=10\mu\text{F}$ ,  $I_{MAX}=1\text{A}$  per Channel, unless otherwise specified.)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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	$V_{OIP}$	—	—	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	—	$^\circ\text{C}$

## Typical Performance Characteristics

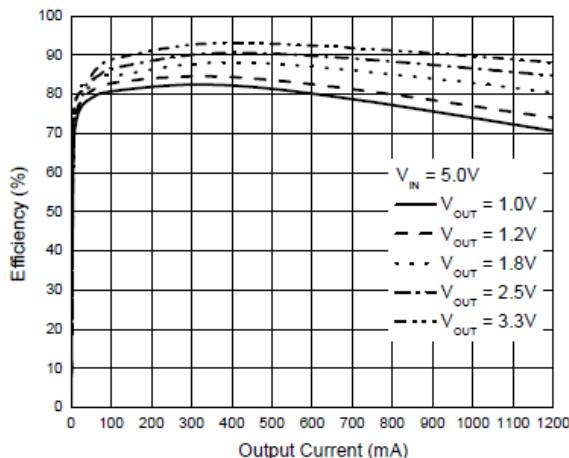


Figure 1 Efficiency vs. Output Current ( $V_{IN} = 5V$ )

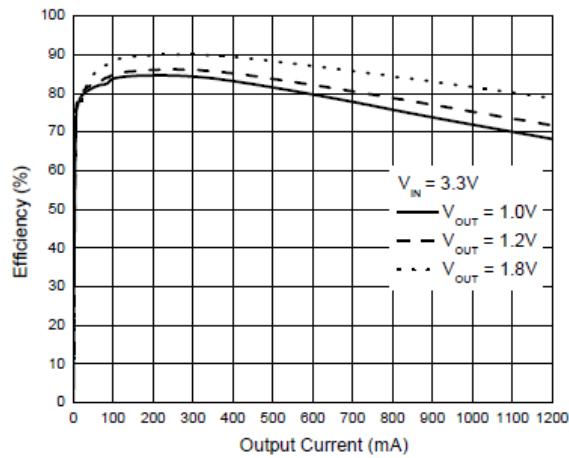


Figure 2 Efficiency vs. Output Current ( $V_{IN} = 3.3V$ )

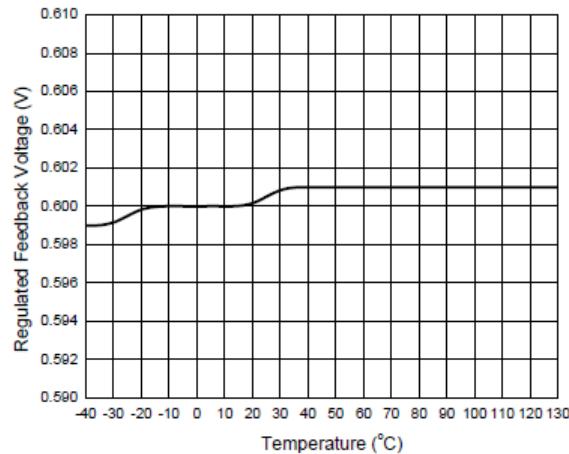


Figure 3 Regulated Feedback Voltage vs. Temperature

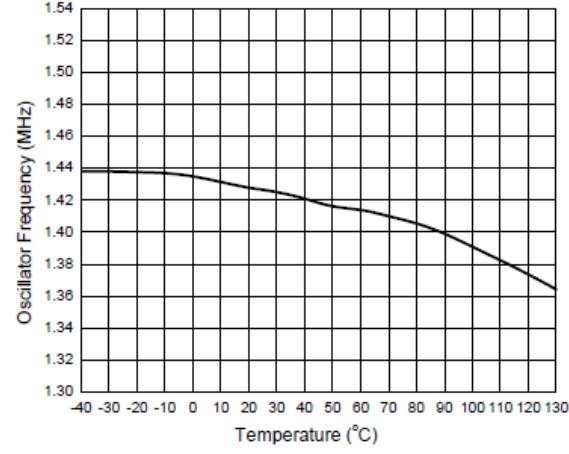


Figure 4 Oscillator Frequency vs. Temperature

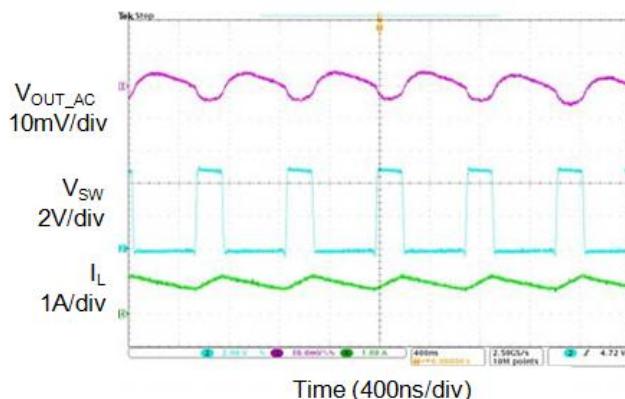


Figure 5 Output Ripple ( $V_{OUT} = 1.2V$ ,  $I_{OUT} = 1A$ )

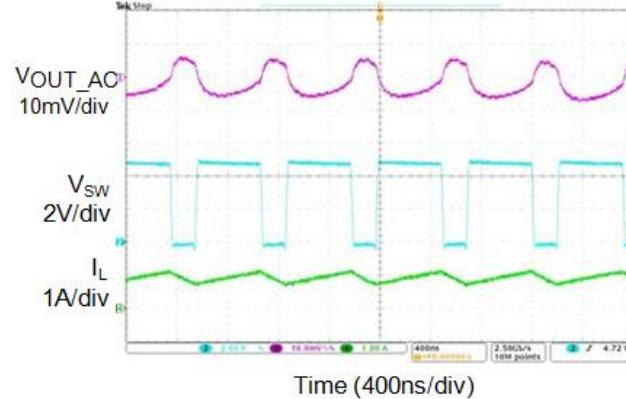


Figure 6 Output Ripple ( $V_{OUT} = 3.3V$ ,  $I_{OUT} = 1A$ )

Typical Performance Characteristics (Cont.)

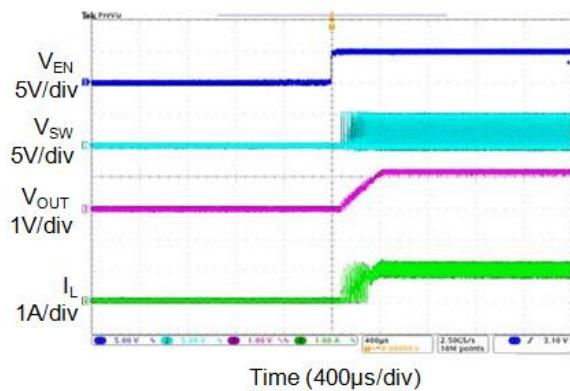


Figure 7 Enable Turn On ( $I_{OUT} = 1A$ )

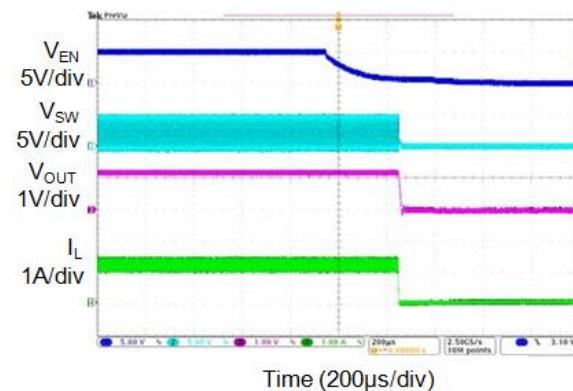


Figure 8 Enable Turn Off ( $I_{OUT} = 1A$ )

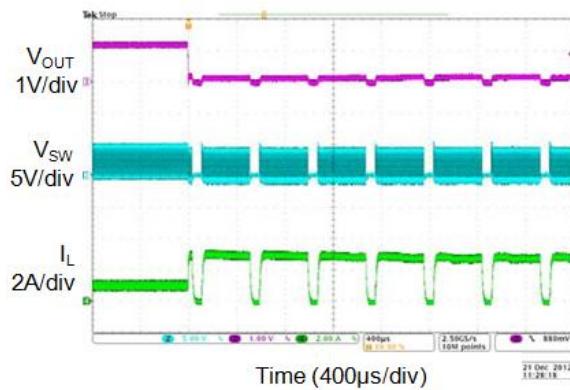


Figure 9 Short Circuit Protection ( $I_{OUT} = 1A$ )

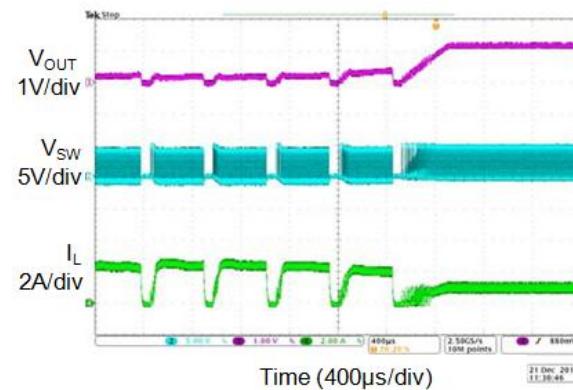
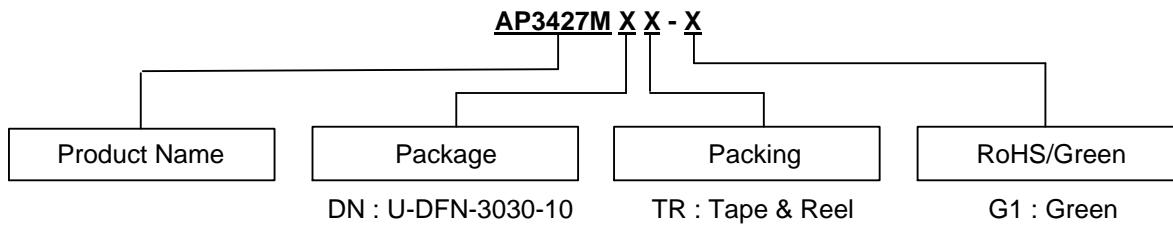


Figure 10 Short Circuit Protection Recovery ( $I_{OUT} = 1A$ )

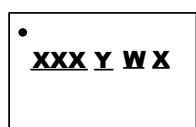
## Ordering Information



Part Number	Marking ID	Package	Temperature Range	13" Tape and Reel	
				Quantity	Part Number Suffix
AP3427MDNTR-G1	BFE	U-DFN3030-10	-40°C to +80°C	5000/Tape & Reel	-13

## Marking Information

### ( Top View )



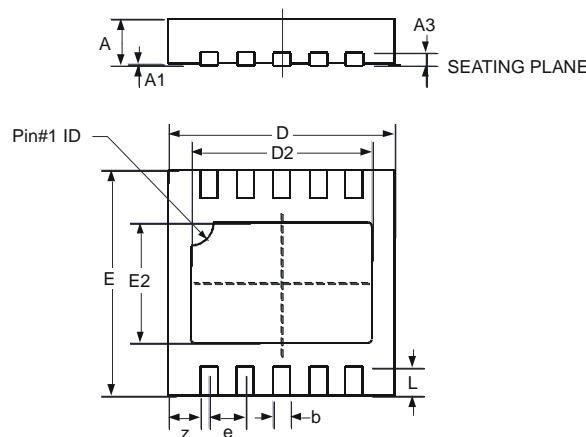
XXX : Identification Code  
 Y : Year 0~9  
 W : Week : A~Z : 1~26 week;  
 a~z : 27~52 week; z represents  
 52 and 53 week  
 X : Internal Code

Part Number	Package	Identification Code
AP3427MDNTR-G1	U-DFN3030-10	BFE

## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN3030-10



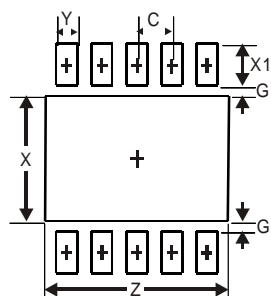
U-DFN3030-10			
Dim	Min	Max	Typ
<b>A</b>	0.57	0.63	0.60
<b>A1</b>	0	0.05	0.02
<b>A3</b>	-	-	0.15
<b>b</b>	0.20	0.30	0.25
<b>D</b>	2.90	3.10	3.00
<b>D2</b>	2.30	2.50	2.40
<b>e</b>	-	-	0.50
<b>E</b>	2.90	3.10	3.00
<b>E2</b>	1.50	1.70	1.60
<b>L</b>	0.25	0.55	0.40
<b>z</b>	-	-	0.375

All Dimensions in mm

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN3030-10



Dimensions	Value (in mm)
<b>Z</b>	2.60
<b>G</b>	0.15
<b>X</b>	1.80
<b>X1</b>	0.60
<b>Y</b>	0.30
<b>C</b>	0.50

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