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## Description

The AP3408 is a current mode, PWM synchronous buck DC/DC converter, capable of driving a 2A load with high efficiency, excellent line and load regulation. It operates in continuous PWM mode.

The AP3408 integrates synchronous P-channel and N-channel power MOSFET switches with low on-resistance. It is ideal for portable applications powered from a single Li-ion battery. 100% duty cycle and low on-resistance P-channel internal power MOSFET can maximize the battery life.

The switching frequency of AP3408 can be programmable from 300kHz to 4MHz, which allows small-sized components, such as capacitors and inductors. A standard series of inductors from several different manufacturers are available. This feature greatly simplifies the design of switch-mode power supplies.

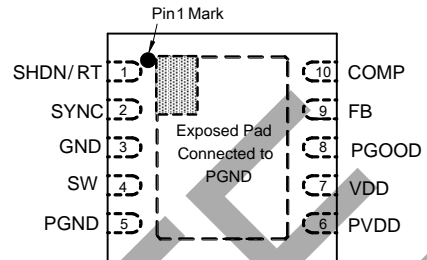
The AP3408 is available in DFN-3x3-10 and PSOP-8 packages.

## Features

- Input Voltage Range: 2.6 to 5.5V
- Adjustable Output from 0.8 to 5V
- 0.8V Reference Voltage with  $\pm 2\%$  Precision
- Output Current: 2A
- High Efficiency up to 95%
- Low  $R_{DS(on)}$  Internal Switches
- Programmable Frequency: 300kHz to 4MHz
- Current Mode Control
- Forced Continuous-Mode Operation
- 100% Duty Cycle
- Synchronizable Switching Frequency
- Power Good Output Voltage Monitoring
- Built-In Soft-Start
- Built-In Short Circuit Protection
- Built-In Thermal Shutdown Protection
- Built-In Current Limit Function
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative.**  
<https://www.diodes.com/quality/product-definitions/>

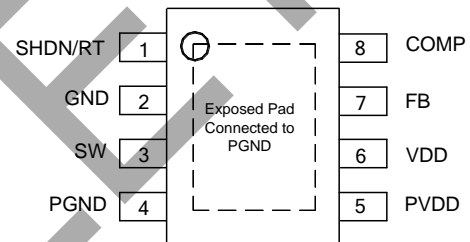
## Pin Assignments

(Top View)



DFN-3x3-10

(Top View)

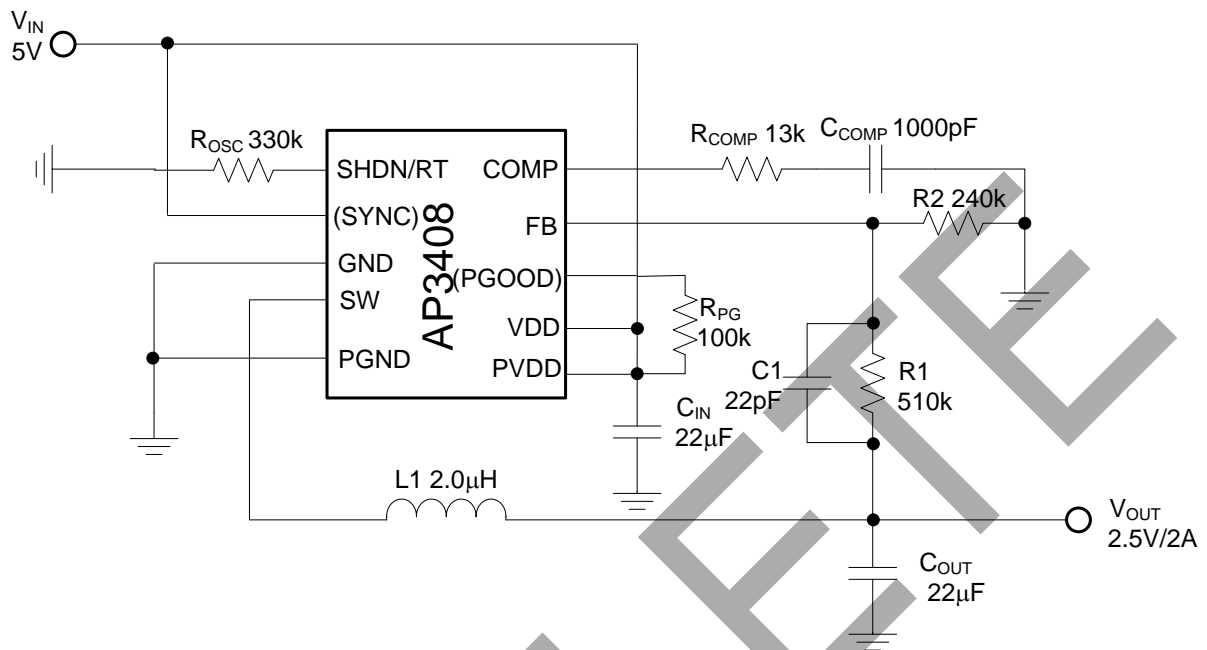


PSOP-8

## Applications

- Portable Media Player
- Digital Still and Video Cameras
- Notebook

**Typical Applications Circuit**

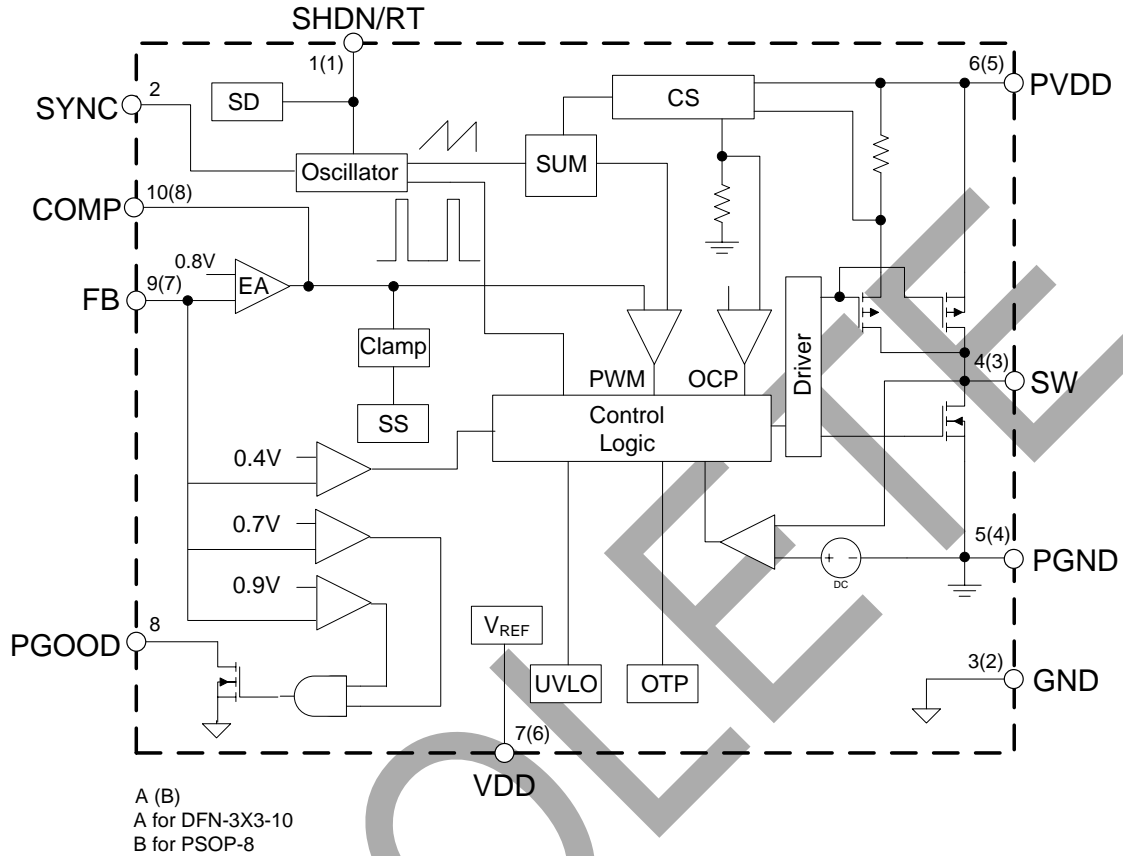


**Pin Description**

Pin Number		Pin Name	Description
DFN-3x3-10	PSOP-8		
1	1	SHDN/RT	Oscillator resistor input. Connect a resistor to GND from this pin to set the switching frequency. Forcing this pin to VDD to shutdown the device
2	-	SYNC	External clock synchronization input. The oscillation frequency can be synchronized to an external oscillation applied to this pin. When tied to VDD, the internal oscillator is selected
3	2	GND	Signal ground. All small-signal ground, such as the compensation components and the exposed pad should be connected to this pin, which in turn connects to PGND at one point
4	3	SW	Internal power switch output. Connect this pin with one terminal of the inductor
5	4	PGND	Power ground. Connect this pin as close as possible to CIN and COUT
6	5	PVDD	Power input supply. Decouple this pin to PGND with a capacitor
7	6	VDD	Signal input supply. Decouple this pin to GND with a capacitor. Normally VDD is equal to VPVDD
8	-	PGOOD	Power Good Indicator. Open-drain logic output that is pulled to ground when the output voltage is not within ±12.5% of regulation point
9	7	FB	Feedback voltage. This pin is the inverting input of internal error amplifier. It senses the converter output voltage through an external resistor divider. The internal reference voltage is 0.8V, which determines the output voltage through the resistor divider
10	8	COMP	Compensation input. This pin is the output of internal error amplifier. Connect external compensation elements to this pin to stabilize the control loop

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**Functional Block Diagram**



**Absolute Maximum Ratings** (Note 1)

Symbol	Parameter	Value		Unit
V <sub>D</sub>	VDD Pin Voltage	-0.3 to 6		V
V <sub>PVDD</sub>	PVDD Pin Voltage	-0.3 to 6		V
V <sub>FB</sub>	FB Pin Voltage	-0.3 to 6		V
V <sub>COMP</sub>	COMP Pin Voltage	-0.3 to 6		V
V <sub>SW</sub>	SW Pin Voltage	-0.3 to V <sub>IN</sub> +0.3		V
V <sub>SHDN/RT</sub>	SHDN/RT Pin Voltage	-0.3 to 6		V
θ <sub>JA</sub>	Thermal Resistance	DFN-3x3-10	110	°C/W
		PSOP-8	75	
T <sub>J</sub>	Operating Junction Temperature	+150		°C
T <sub>STG</sub>	Storage Temperature	-65 to +150		°C
T <sub>LEAD</sub>	Lead Temperature (Soldering, 10 sec)	+260		°C
-	ESD (Machine Model)	200		V
-	ESD (Human Body Model)	2000		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**

Symbol	Parameter	Min	Max	Unit
V <sub>IN</sub>	Input Voltage	2.6	5.5	V
I <sub>OUT (MAX)</sub>	Maximum Output Current	2	–	A
T <sub>J</sub>	Operating Junction Temperature	-40	+125	°C

**Electrical Characteristics** (@V<sub>IN</sub> = V<sub>DD</sub> = V<sub>PVDD</sub> = 3.3V, T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
<b>INPUT SECTION</b>						
V <sub>DD</sub>	Input Voltage Range	–	2.6	–	5.5	V
I <sub>Q</sub>	Supply Current	V <sub>FB</sub> = 0.75V, No Switching	–	460	–	μA
I <sub>SHDN</sub>	Shutdown Supply Current	Shutdown, V <sub>IN</sub> = 5.5V	–	–	1	μA
V <sub>UVLO</sub>	Under Voltage Threshold Lockout	V <sub>DD</sub> Rising	–	2.2	–	V
V <sub>HUVLO</sub>	Under Voltage Hysteresis Lockout	–	–	300	–	mV
<b>FEEDBACK SECTION</b>						
V <sub>FB</sub>	Feedback Voltage	–	0.784	0.8	0.816	V
I <sub>FB</sub>	FB Pin Bias Current	–	–	0.1	0.4	μA
R <sub>T</sub>	Current Sense Transresistance	–	–	0.2	–	Ω
–	Switching Leakage Current	V <sub>SHDN/RT</sub> = V <sub>IN</sub> = 5.5V	–	–	1	μA
G <sub>V</sub>	Error Gain Amplifier Voltage	–	–	800	–	–
G <sub>S</sub>	Error Amplifier Transconductance	–	–	800	–	μA/V
<b>OSCILLATOR SECTION</b>						
V <sub>RT</sub>	RT Pin Voltage	–	–	0.8	–	V
f <sub>OSC</sub>	Switching Frequency	R <sub>OSC</sub> = 330kΩ	0.8	1	1.2	MHz
–	–	ADJ Frequency	0.3	–	4	MHz
D <sub>MAX</sub>	Maximum Duty Cycle	V <sub>FB</sub> = 0.75V	100	–	–	%
<b>POWER SWITCH SECTION</b>						
I <sub>LIMIT</sub>	Switch Current Limit	V <sub>FB</sub> = 0.75V	2.2	3.8	–	A
R <sub>PDSON</sub>	Internal P-FET On Resistance	I <sub>SW</sub> = 500mA	–	0.11	0.16	Ω
R <sub>NDSON</sub>	Internal N-FET On Resistance	I <sub>SW</sub> = -500mA	–	0.11	0.17	Ω

**Electrical Characteristics** (Cont. @ $V_{IN} = V_{DD} = V_{PVDD} = 3.3V$ ,  $T_A = +25^{\circ}C$ , unless otherwise specified.)

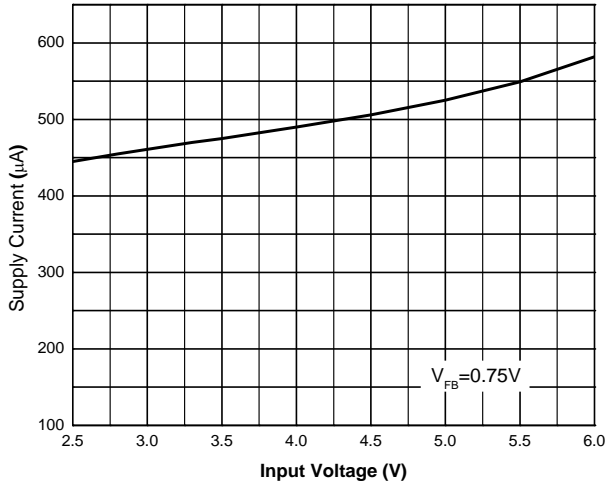
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
<b>SHDN/RT SECTION</b>						
–	Shutdown Threshold	–	–	$V_{DD}-0.7$	$V_{DD}-0.4$	V
<b>PGOOD SECTION</b>						
–	PGOOD Voltage Range	–	–	$\pm 12.5$	$\pm 15$	%
–	PGOOD Pull Down Resistance	–	–	–	120	$\Omega$
<b>TOTAL DEVICE</b>						
$I_{OUT}$	Output Current	$V_{DD} = 2.6$ to $5.5V$ , $V_{OUT} = 2.5V$	2	–	–	A
LNR	Output Voltage Line Regulation	$V_{DD} = 2.7$ to $5.5V$ , $I_{OUT} = 100mA$	–	0.4	–	%/V
LOD	Output Voltage Load Regulation	$I_{OUT} = 0.01$ to $2A$	–	$\pm 0.2$	–	%
t <sub>SS</sub>	Soft-start Time	$I_{OUT} = 10mA$	–	1.5	–	ms
T <sub>OTSD</sub>	Thermal Shutdown Temperature	–	–	+160	–	$^{\circ}C$
T <sub>HYS</sub>	Thermal Shutdown Temperature Hysteresis	–	–	+20	–	$^{\circ}C$

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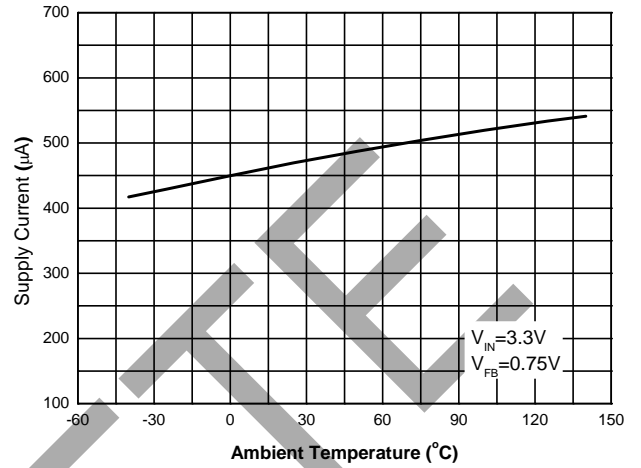
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**Performance Characteristics** (@ $V_{IN} = V_{DD} = V_{PVD} = 3.3V$ ,  $T_A = +25^\circ C$ , unless otherwise specified.)

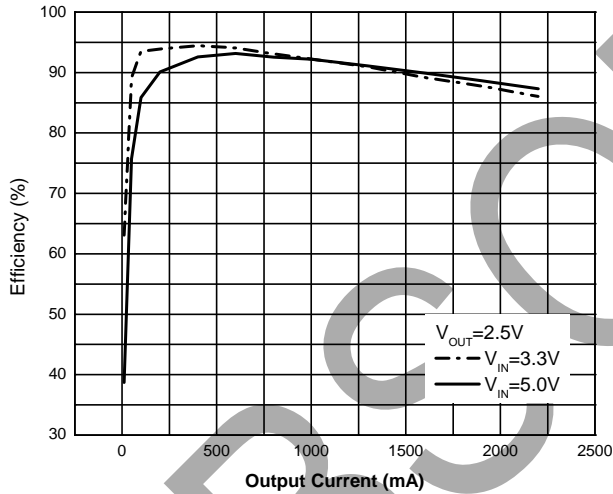
**Supply Current vs. Input Voltage**



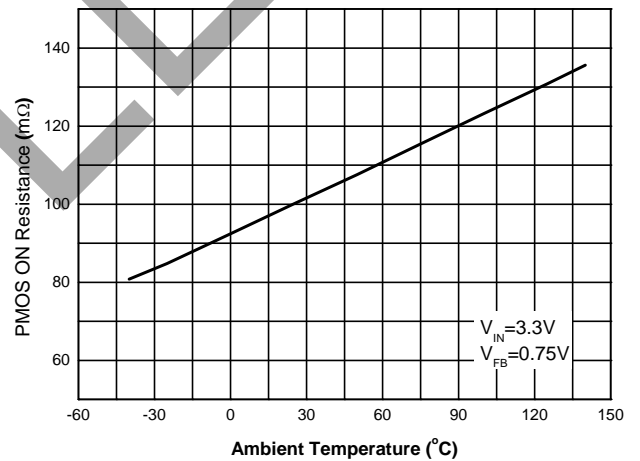
**Supply Current vs. Ambient Temperature**



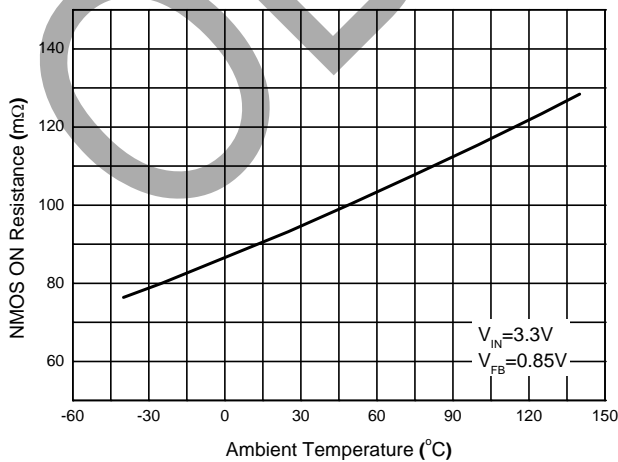
**Efficiency vs. Output Current**



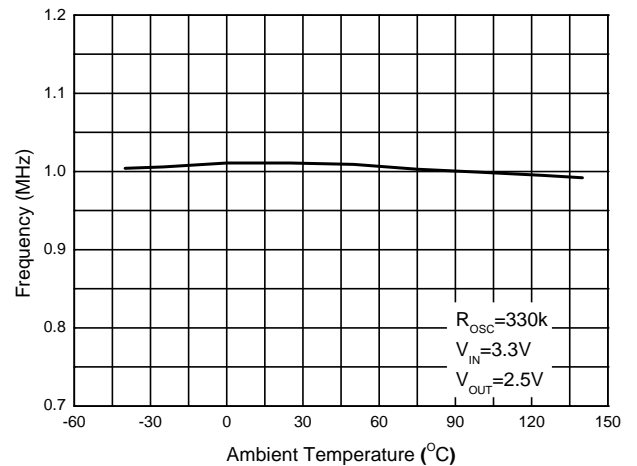
**PMOS ON Resistance vs. Ambient Temperature**



**NMOS ON Resistance vs. Ambient Temperature**



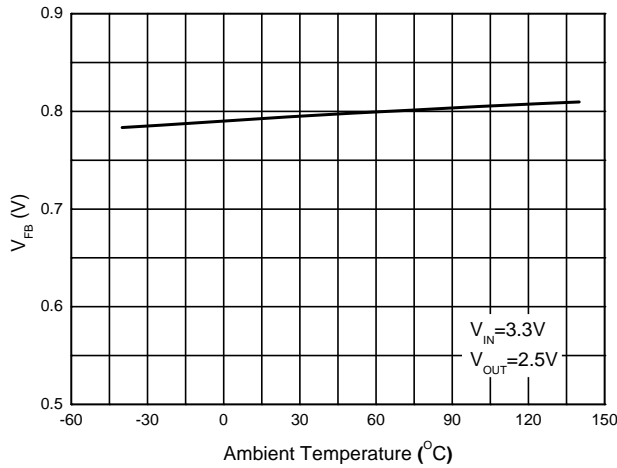
**Frequency vs. Ambient Temperature**



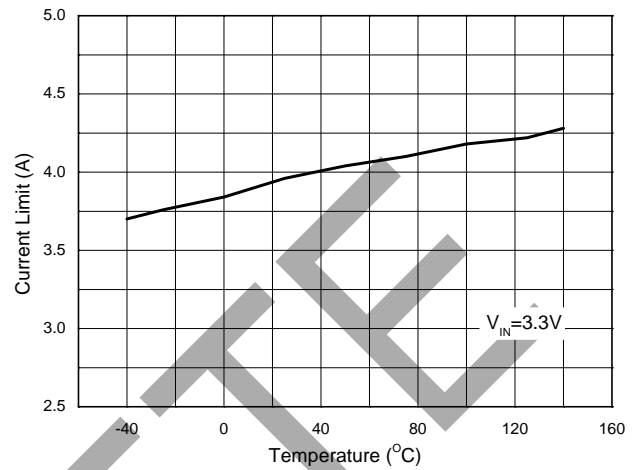
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**Performance Characteristics** (Cont. @  $V_{IN} = V_{DD} = V_{PVDD} = 3.3V$ ,  $T_A = +25^\circ C$ , unless otherwise specified.)

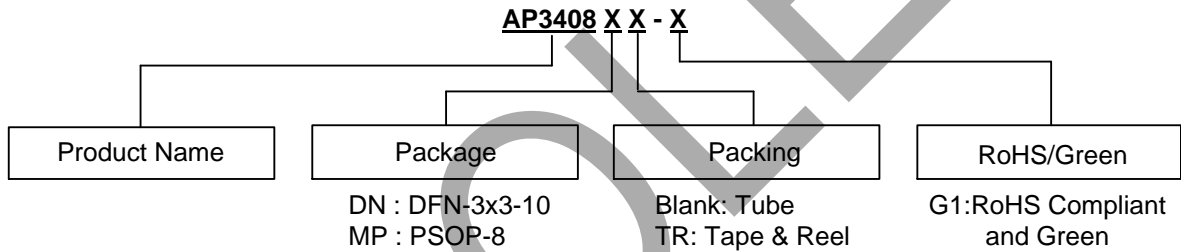
**$V_{FB}$  vs. Ambient Temperature**



**Current Limit vs. Ambient Temperature**



**Ordering Information**



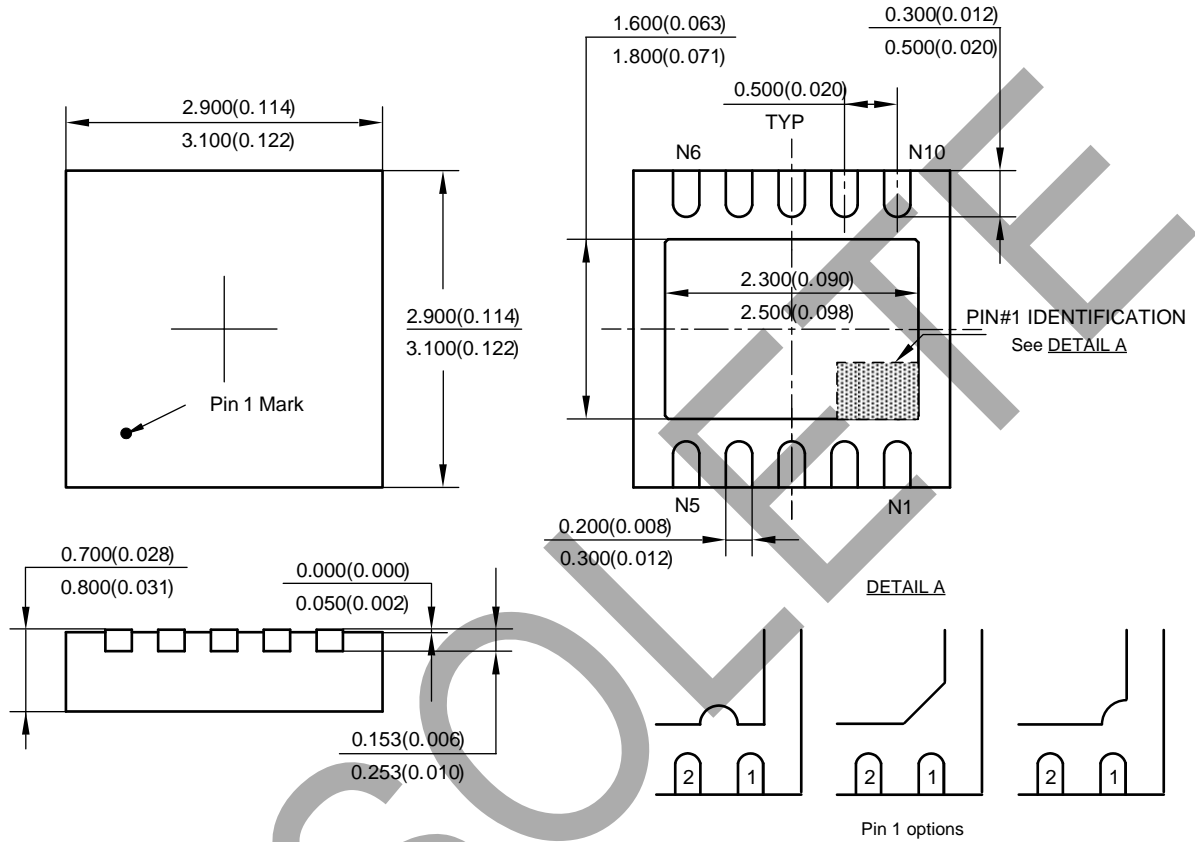
Package	Temperature Range	Part Number	Marking ID	Packing
DFN-3x3-10	-40 to +125°C	AP3408DNTR-G1	BFA	Tape & Reel
PSOP-8		AP3408MP-G1	3408MP-G1	Tube
		AP3408MPTR-G1	3408MP-G1	Tape & Reel

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**Package Outline Dimensions** (All dimensions in mm(inch).)

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

(1) Package Type: DFN-3x3-10



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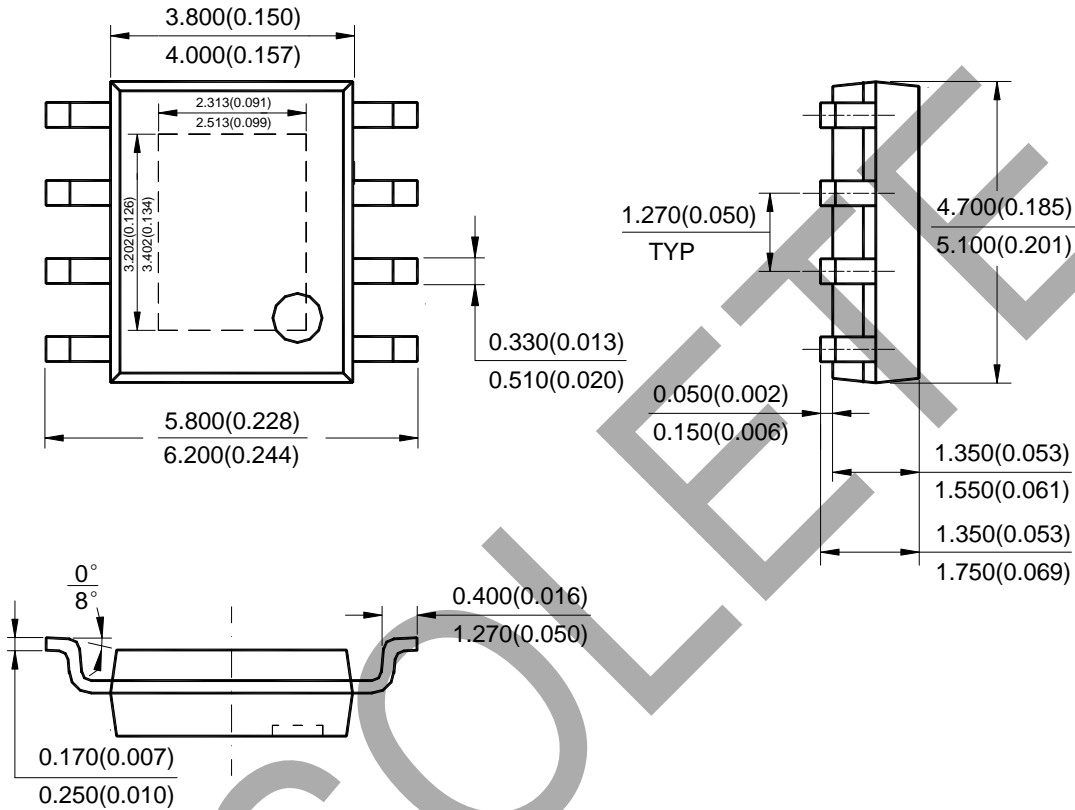
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**Package Outline Dimensions** (Cont. All dimensions in mm(inch).)

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

(2) Package Type: PSOP-8



Note: Eject hole, oriented hole and mold mark is optional.

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