



# PAM2421, PAM2422, PAM2423 3A, 4.5A, 5.5A PWM Step-Up DC/DC Converter

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## Features

- Greater than 90% Efficiency
- Adjustable Output Voltage Up to 24V
- Internal 24V Power MOSFET
- Peak Current 3A, 4.5A, 5.5A
- 520kHz Frequency
- Built-in Over-Voltage Protection (OVP)
- Open Protection
- Programmable Soft-Start Function
- Thermal Shutdowns
- Under-Voltage-Lockout
- Over-Current Protection
- SOP-8(EP) Package

## Applications

- TFT LCD Monitors
- Battery-Powered Equipment
- Set-Top Boxes
- DSL and Cable Modems and Routers

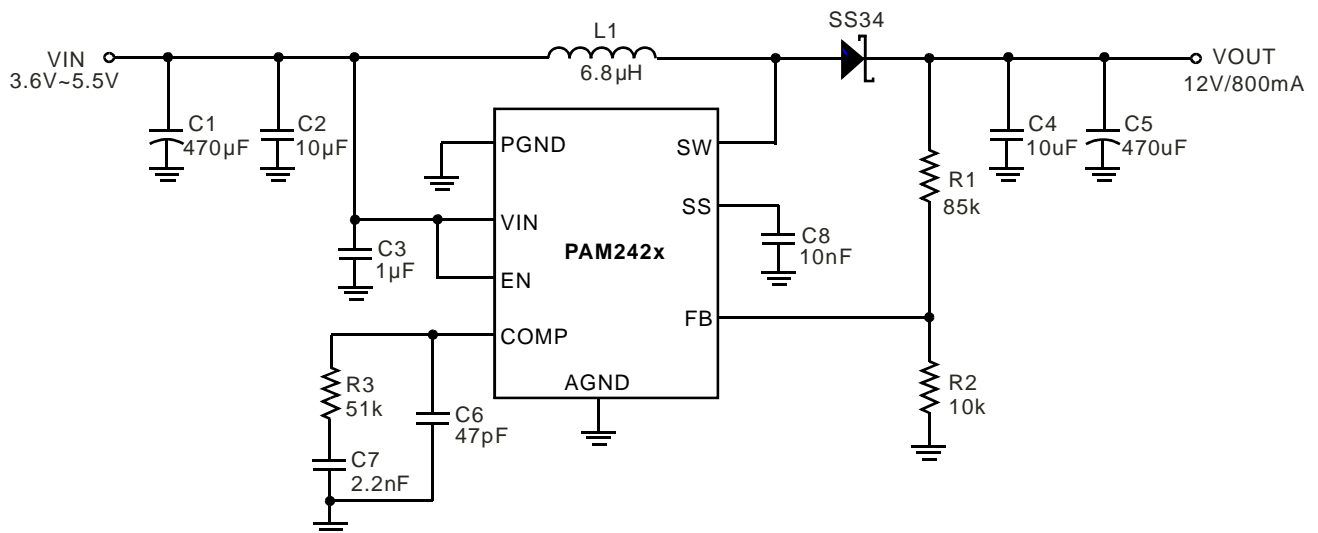
## General Description

The PAM242x devices are high-performance, fixed frequency, current-mode PWM step-up DC/DC converter that incorporate internal power MOSFETs. The PAM242x includes an integrated power MOSFET that supports peak currents of up to 3A/4.5A/5.5A.

The PAM242x utilizes simple external loop compensation allowing optimization between component size, cost, and AC performance across a wide range of applications. Additional functions include an externally programmable soft-start function for easy inrush current control, internal over-voltage protection (OVP), cycle-by-cycle current limit protection, under voltage lock-out and thermal shutdown.

The PAM242x is available in the small SOP-8(EP) package.

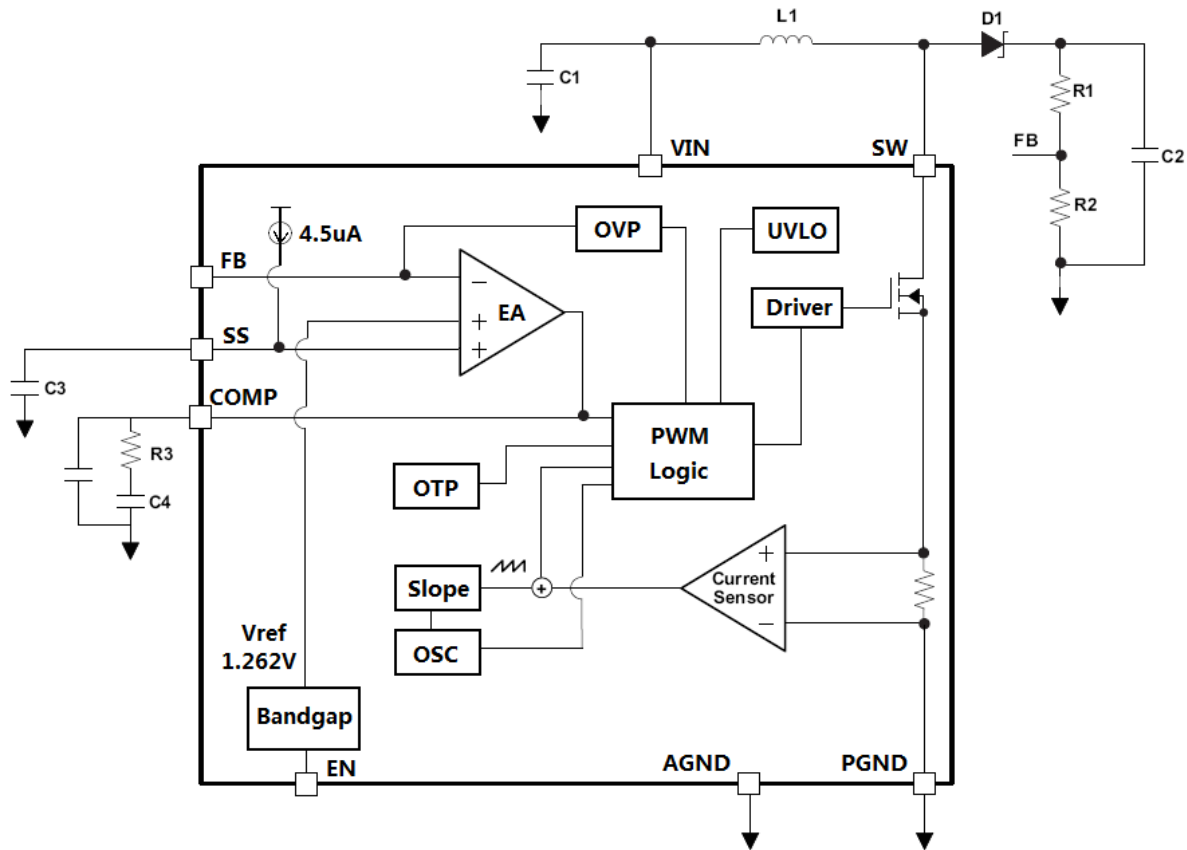
## Typical Application



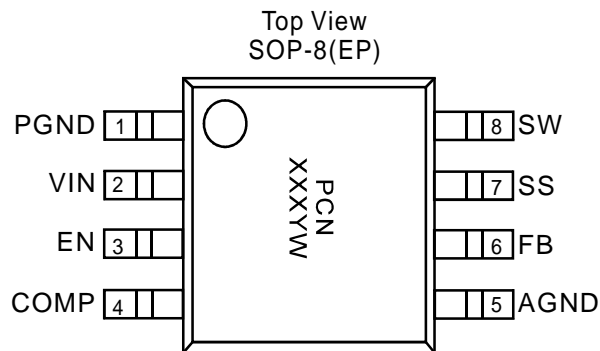


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## Block Diagram



## Pin Configuration & Marking Information



PCN: Product Code of PAM242x  
 XXX: Internal Code  
 V: Voltage Code  
 Y: Year  
 W: Week



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## Pin Descriptions

Pin Number	Name	Function
1	PGND	Power Ground
2	IN	Supply Input.
3	EN	Enable Control. Connect to a logic high level to enable the IC. Connect to a logic low level to disable the IC. When unused, connect EN pin to IN (do not leave pin floating).
4	COMP	Error Amplifier Compensation Node.
5	AGND	Analog Ground
6	FB	Feedback Input. Connect this pin a resistor divider from the output to set the output voltage. FB is regulated to 1.262V.
7	SS	Soft Start Control Input. Connect a capacitor from this pin to Ground to set soft-start timing duration. SS is discharged to ground in shutdown. SS may be left unconnected if soft start is not desired.
8	SW	Switch Output. Connect this pin to the inductor and the schottky diode. To minimize EMI, minimize the PCB trace path between this pin and the input bypass capacitor.
	Exposed PAD	Connected to ground

## Absolute Maximum Ratings

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

SW to Ground.....	-0.3V to 28V	Operating Temperature Range.....	
VIN, EN, FB, SS, COMP to Ground.....		.....	-40°C to 150°C
.....	-0.3V to 6.5V	Storage Temperature Range.....	-55°C to 150°C
Continuous SW Current.....	Internally Limited	Lead Temperature (Soldering, 10 sec).....	300°C

## Recommended Operating Conditions

Junction Temperature.....	-40°C to 125°C	Ambient Temperature.....	-40°C to 85°C
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## Thermal Information

Parameter	Package	Symbol	Maximum	Unit
Thermal Resistance (Junction to Case)	SOP-8(EP)	$\theta_{JC}$	75	°C/W
Thermal Resistance (Junction to Ambient)	SOP-8(EP)	$\theta_{JA}$	180	



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## Electrical Characteristic

At  $T_A=25^\circ\text{C}$ ,  $V_{IN}=V_{EN}=5\text{V}$ , unless otherwise specified.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage			2.7		5.5	V
Under Voltage Lockout Threshold	VIN Rising			2.5		V
Under Voltage Lockout Hysteresis				200		mV
Quiescent Supply Current	VFB = 1.4V, Not Switching			0.25	0.35	mA
	VFB = 1.0V, Switching			3	5	
Supply Current in Shutdown	EN = Ground			0.1	1	uA
Switching Frequency				520		kHz
Maximum Duty Cycle			85			%
FB Feedback Voltage			1.237	1.262	1.287	V
FB Input Current				0	80	nA
FB Voltage Line Regulation	VFB from 2.7V to 5.5V			0.05	0.15	%/V
Switch Current Limit	PAM2421	VIN=3.2V Duty Cycle = 70%	3			A
	PAM2422		4.5			
	PAM2423		5.5			
Switch On Resistance	PAM2421			130		mΩ
	PAM2422			100		
	PAM2423			70		
Switch Leakage Current	VSW = 10V, EN = Ground				15	uA
Soft Start Pin Bias Current	VSS = 1.2V		2	4.5	7	uA
Logic High Threshold	EN Pin		1.4			V
Logic Low Threshold	EN Pin				0.4	V
EN Pull Down Resistor				1		MΩ
Thermal Shutdown Temperature				160		°C
Thermal Shutdown Hysteresis				40		°C

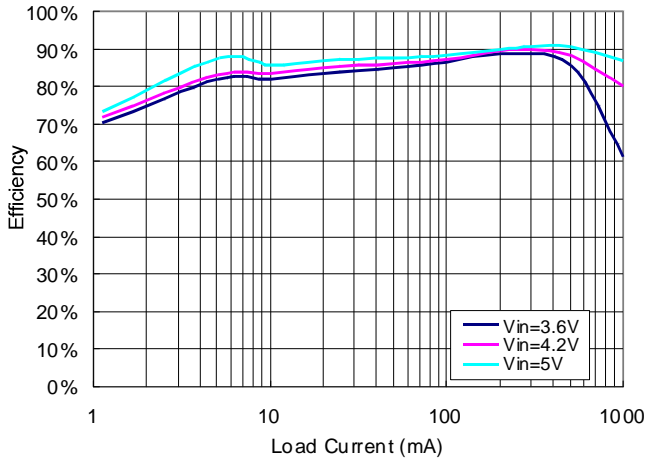


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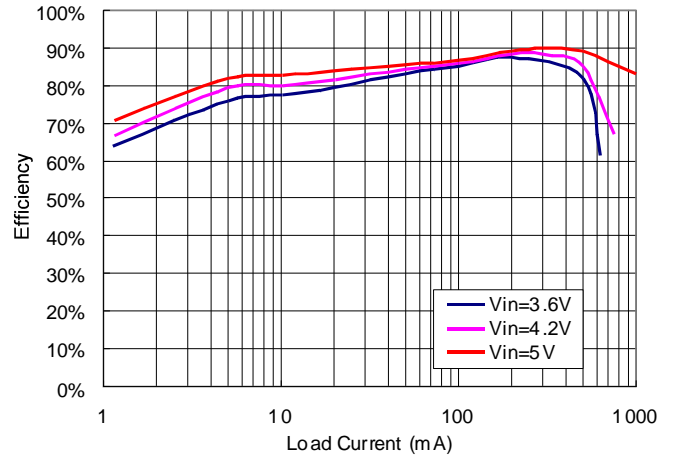
## Typical Operating Characteristics

At  $T_A=25^\circ\text{C}$ ,  $V_{IN}=V_{EN}=5\text{V}$ ,  $V_{FREQ}=0\text{V}$ , unless otherwise specified.

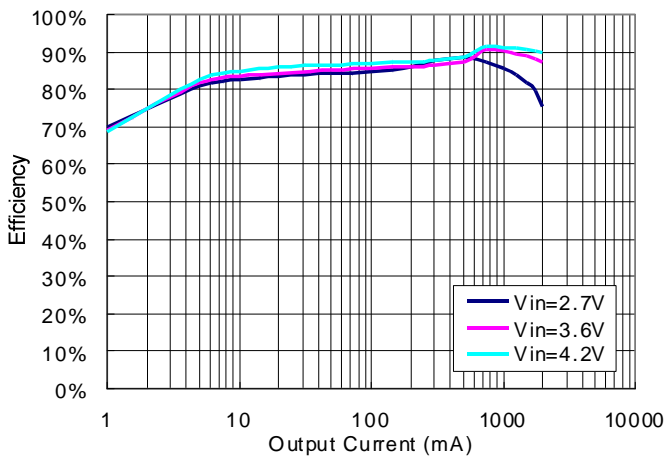
Efficiency vs Output Current ( $V_o=12\text{V}$ )



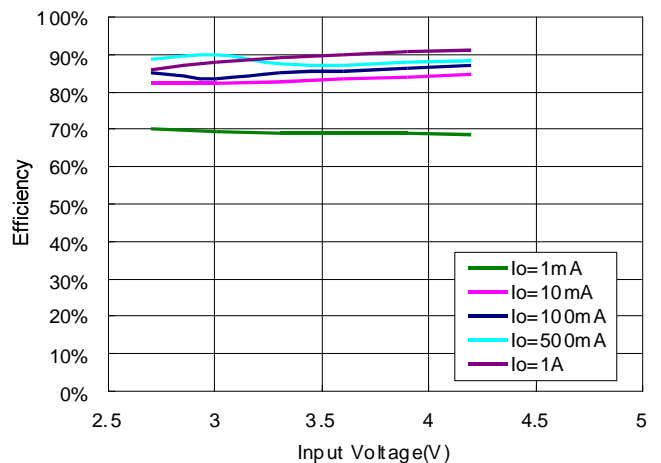
Efficiency vs Output Current ( $V_o=15\text{V}$ )



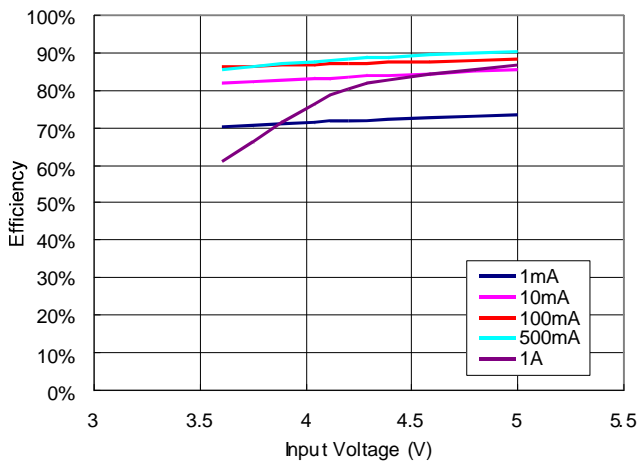
Efficiency vs Output Current ( $V_o=5\text{V}$ )



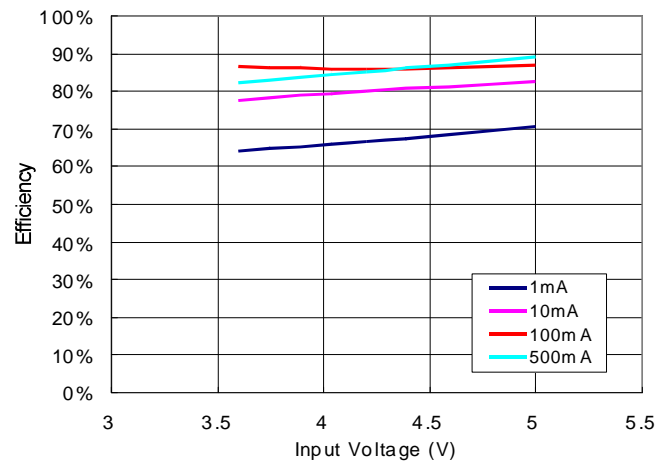
Efficiency vs Input Voltage ( $V_o=5\text{V}$ )



Efficiency vs Input Voltage ( $V_o=12\text{V}$ )



Efficiency vs Input Voltage ( $V_o=15\text{V}$ )



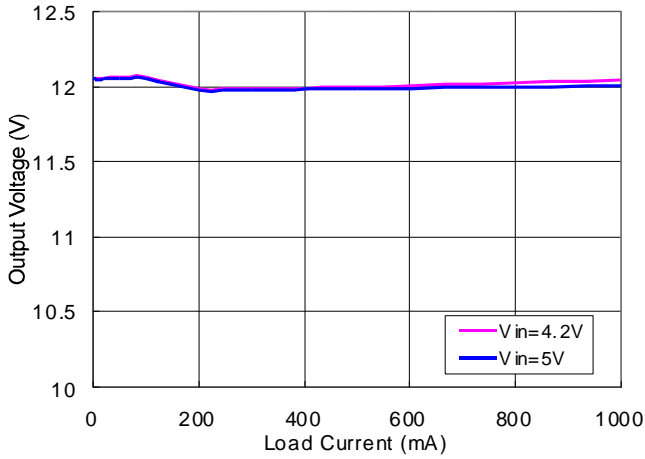


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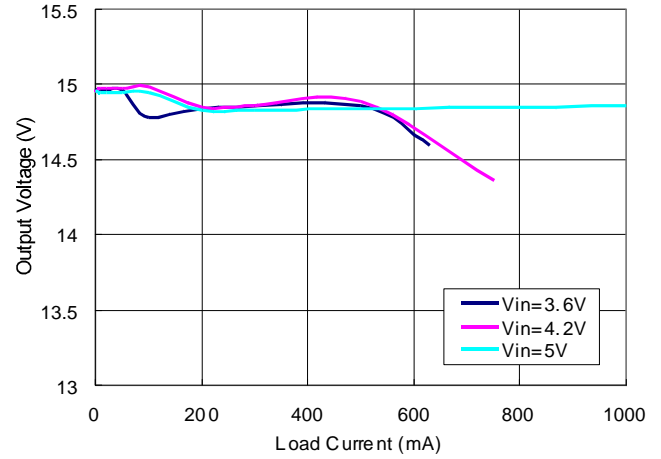
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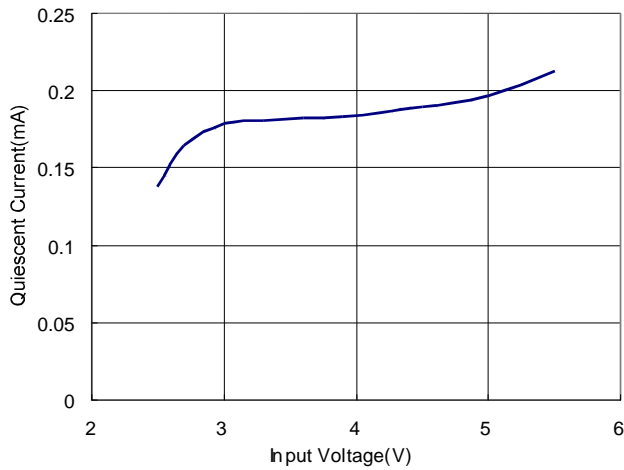
Output Voltage vs Output Current ( $V_o=12\text{V}$ )



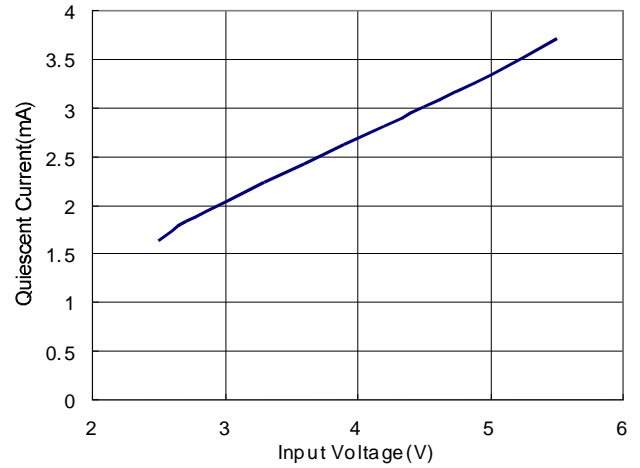
Output Voltage vs Output Current ( $V_o=15\text{V}$ )



Quiescent Current ( $V_{FB}=1.4\text{V}$ )



Quiescent Current ( $V_{FB}=1.0\text{V}$ )





### Application Information

The PAM242x are highly efficient step-up DC/DC converters that employ a currentmode, fixed frequency pulse-width modulation (PWM) architecture with excellent line and load regulation. The PAM242x operate at constant switching frequency under medium to high load current conditions. At light loads, these devices operate in a pulse-skipping mode in order to improve light-load efficiency.

#### Soft-Start

The PAM242x both offer a programmable soft-start function which minimizes inrush current during startup. The soft-start period is programmed by connecting a 10nF capacitor between SS and Ground. Operation of the soft-start function is as follows: when the IC is disabled, SS is actively discharged to Ground. Upon enabling the IC, CSS is charged with a 4.5µA current so that the voltage at SS increases in a controlled manner. The peak inductor current is limited by the voltage at SS, so that the input current is limited until the soft-start period expires, and the regulator can achieve its full output current rating.

#### Setting the Output Voltage

The PAM242x both feature external adjustable output voltages of up to 24V. To program the output voltage, simply connect a resistive voltage divider between the output, FB, and GND, with resistors set according to the following eq

$$R1 = R2 \times \left[ \left( \frac{V_{OUT}}{V_{FB}} \right) - 1 \right]$$

Where VFB is 1.262V.

#### Rectifier Selection

For optimal performance, the rectifier should be a Schottky rectifier that is rated to handle both the output voltage as well as the peak switch current.

#### Over Voltage Protection

The PAM242x features internal automatic over-voltage protection, when feedback voltage is higher than 115%.

#### Open Protection

Once the outputs achieve regulation, if the voltage at FB falls below 0.2V the controller will automatically disable, preventing the controller from running open-loop and potentially damaging the IC and load.

#### Shutdown

Drive EN low to disable the IC and reduce the supply current to just 0.1µA. As with all nonsynchronous step-up DC/DC converters, the external Schottky diode provides a DC path from the input to the output in shutdown. As a result, the output drops to one diode voltage drop below the input in shutdown.

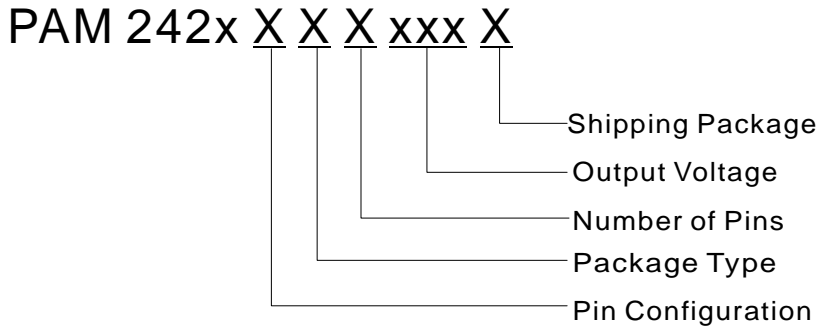
#### Thermal Shutdown

The PAM242x both feature integrated thermal overload protection. Both devices are automatically disabled when their junction temperatures exceed 160°C, and automatically re-enable when the die temperature decreases by 40°C.



**PAM2421,PAM2422,PAM2423  
3A,4.5A,5.5A PWM Step-Up DC/DC Converter**

**Ordering Information**



Pin Configuration	Package Type	Number of Pins	Output Voltage
A Type	E: SOP-8(EP)	C: 8	ADJ: Adjustable

Part Number	Peak Current	Package Type	Shipping Package
PAM2421AECADJR	3A	SOP-8(EP)	2,500 Units/Tape & Reel
PAM2422AECADJR	4.5A	SOP-8(EP)	2,500 Units/Tape & Reel
PAM2423AECADJR	5.5A	SOP-8(EP)	2,500 Units/Tape & Reel

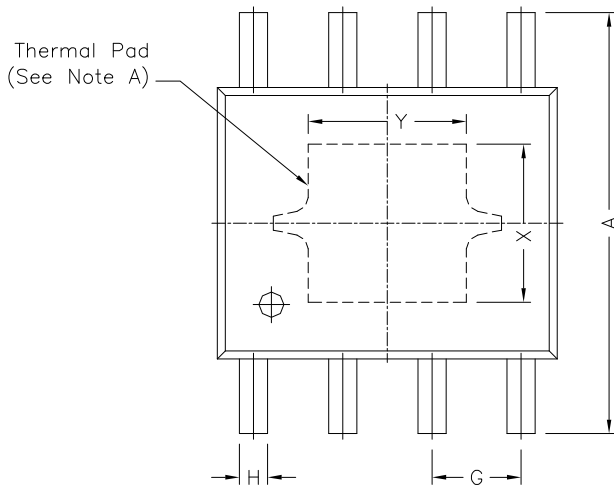




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## Outline Dimension

### SOP-8(EP)



REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	5.80	6.20
B	4.80	5.00
C	3.80	4.00
D	0°	8°
E	0.40	0.90
F	0.19	0.25
M	0	0.15
H	0.35	0.49
L	1.35	1.75
G	1.27 TYP.	
Option1	X	2.28
	Y	2.28
Option2	X	2.41
	Y	3.30

