

## Description

The AP3407/A is a 1.4MHz fixed frequency, current mode, PWM synchronous buck (step-down) DC-DC converter, capable of driving a 1.2A load with high efficiency, excellent line and load regulation. The device integrates synchronous P-channel and N-channel power MOSFET switches with low on-resistance. It is ideal for powering portable equipment that runs from a single Li-ion battery.

A standard series of inductors are available from several different manufacturers optimized for use with the AP3407/A. This feature greatly simplifies the design of switch-mode power supplies.

The AP3407/A is available in SOT-23-5.

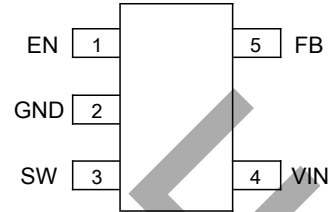
## Features

- Input Voltage Range: 2.5V to 5.5V
- Output Voltage: 0.6V to  $V_{IN}$
- ADJ Output
- Fixed 1.4MHz Frequency
- High Efficiency up to 95%
- Output Current: 1.2A
- Current Mode Control
- 100% Duty Cycle in Dropout
- Built-in Over Current Protection
- Built-in Short Circuit Protection
- Built-in Thermal Shutdown Protection
- Built-in UVLO Function
- Built-in Soft-start
- **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.

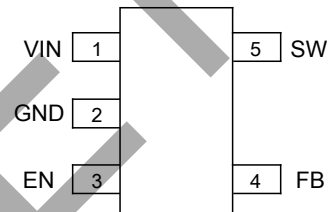
## Pin Assignments

(Top View)



SOT-23-5 for AP3407

(Top View)

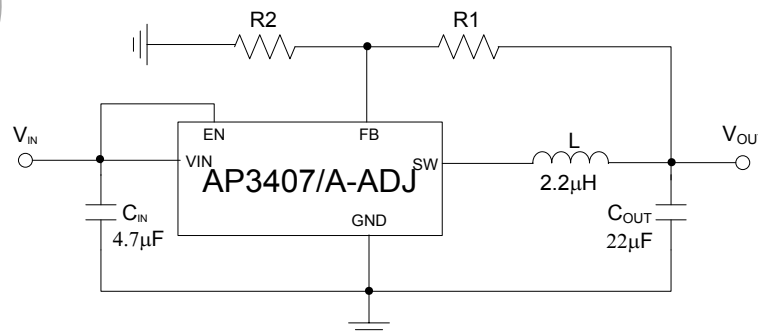


SOT-23-5 for AP3407A

## Applications

- Datacom
- Portable Device
- Smart Phone

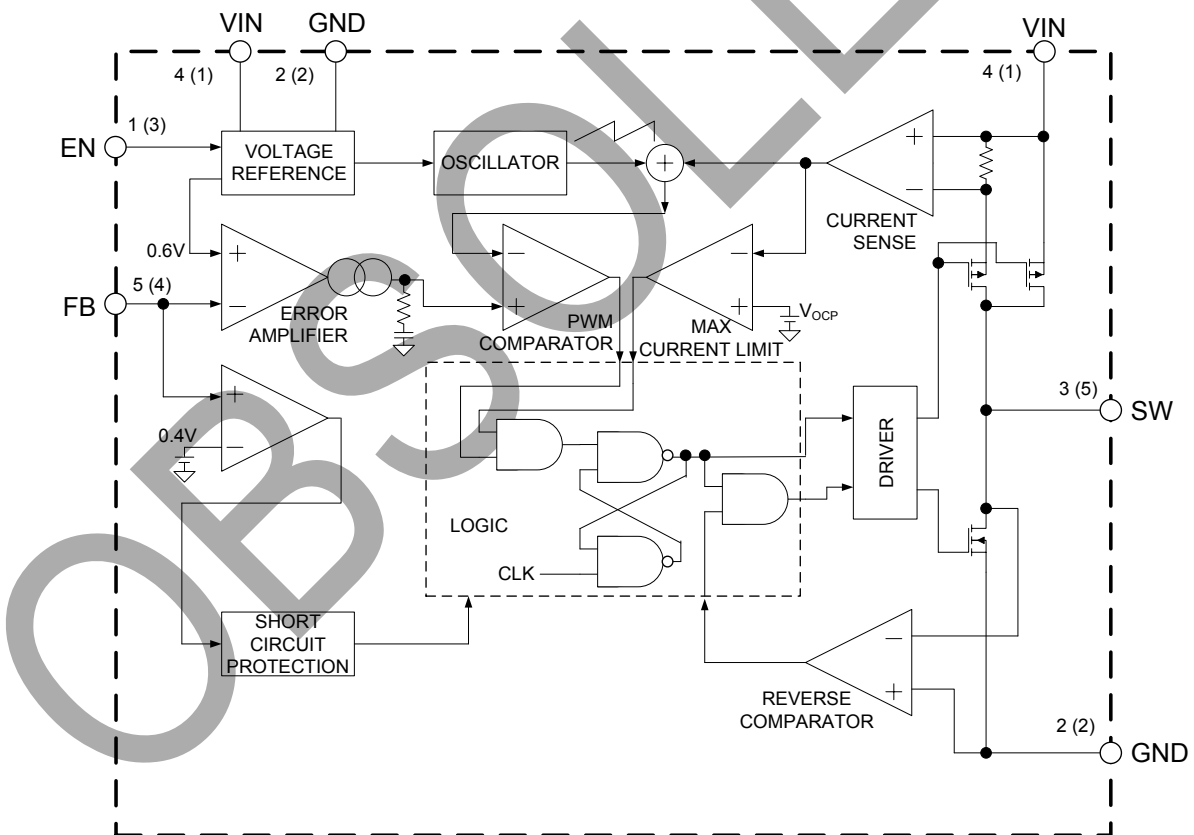
## Typical Applications Circuit



**Pin Descriptions**

Pin Number		Pin Name	Function
AP3407	AP3407A		
1	3	EN	Control input pin. Forcing this pin above 1.5V enables the IC. Forcing this pin below 0.4V shuts down the IC. When the IC is in shutdown mode, all functions are disabled to decrease the supply current below 1.2A
2	2	GND	Ground pin
3	5	SW	Power switch output pin. Inductor connection to drain of the internal PFET and NFET switches
4	1	VIN	Supply input pin. Bypass to GND with a 4.7µF or greater ceramic capacitor
5	4	FB	This is the feedback pin of the device. Connect this pin directly to the output if the fixed output voltage version is used. For the adjustable version an external resistor divider is connected to this pin.

**Functional Block Diagram**



A (B)  
A for AP3407  
B for AP3407A

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**Absolute Maximum Ratings** (Note 4)

Symbol	Parameter	Rating	Unit
$V_{IN}$	Input Voltage	-0.3 to 6.0	V
$V_{FB}$	Feedback Voltage	-0.3 to $V_{IN} + 0.3$	V
$V_{EN}$	EN Pin Voltage	-0.3 to $V_{IN} + 0.3$	V
$V_{SW}$	SW Pin Voltage	-0.3 to $V_{IN} + 0.3$ (Note 6)	V
$\theta_{JA}$	Thermal Resistance (Junction to Ambient)	265	°C/W
$\theta_{JC}$	Thermal Resistance (Junction to Case)	60	°C/W
$P_D$	Power Dissipation	0.377	W
$T_J$	Operating Junction Temperature (Note 5)	+150	°C
$T_{STG}$	Storage Temperature	-65 to +150	°C
$T_{LEAD}$	Lead Temperature (Soldering, 10sec)	+260	°C

- Notes:
- 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.
  - The junction temperature rise is given by  $T_{RISING} = P_D \cdot \theta_{JA}$ , where  $P_D$  is the power dissipated by regulator,  $\theta_{JA}$  is the thermal resistance from junction of the die to the ambient temperature; The junction temperature,  $T_J$  is given by  $T_J = T_A + T_R$ , where  $T_A$  is the ambient temperature.
  - DC voltage rating, for short period of spike voltage, the minimum voltage rating is -1V, in 20nS.

**Recommended Operating Conditions**

Symbol	Parameter	Min	Max	Unit
$V_{IN}$	Input Voltage	2.5	5.5	V
$I_{OUT (MAX)}$	Maximum Output Current	1.2	–	A
$T_A$	Operating Ambient Temperature	-40	+85	°C

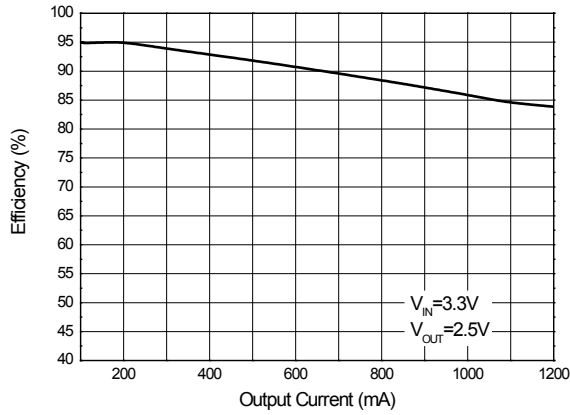
**Electrical Characteristics** (@ $V_{IN} = V_{DD} = V_{PVDD} = 3.3V$ ,  $T_A = +25^{\circ}C$ , unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
$V_{IN}$	Input Voltage	–	2.5	–	5.5	V
$I_Q$	Quiescent Current	$V_{FB} = 0.65V$	–	62	100	$\mu A$
$I_{STBY}$	Shutdown Supply Current	$V_{EN} = GND$	–	0.1	1	$\mu A$
$V_{REF}$	Reference Voltage	For Adjustable Output Voltage	0.588	0.6	0.612	V
$I_{FB}$	Feedback Bias Current	$V_{FB} = V_{IN}$	-0.1	–	0.1	$\mu A$
$\Delta V_{OUT}$	Output Voltage Accuracy	–	-2	–	2	%
$R_{DS(ON)_P}$	PMOSFET $R_{ON}$	$I_{SW} = 200mA$	–	0.28	–	$\Omega$
$R_{DS(ON)_N}$	NMOSFET $R_{ON}$	$I_{SW} = -200mA$	–	0.25	–	$\Omega$
$I_{LIM}$	Switch Current Limit	$V_{FB} = 0.55V$	1.5	2.0	–	A
$V_H$	EN Pin Threshold	–	1.5	–	–	V
$V_L$		–	–	–	0.4	
$V_{UVLO}$	UVLO Threshold	$V_{DD}$ Rising	–	2.3	–	V
$V_{HYS}$	UVLO Hysteresis	–	–	0.2	–	
$f_{OSC}$	Oscillator Frequency	–	1.12	1.40	1.68	MHz
$D_{MAX}$	Max. Duty Cycle	$V_{FB} = 0V$	100	–	–	%
$D_{MIN}$	Min. Duty Cycle	$V_{FB} = 6.5V$	–	–	0	
–	N-MOS SW Leakage Current	$V_{IN} = 3.3V$ , $V_{SW} = 3.3V$	–	0.1	–	$\mu A$
$t$	Soft-start Time	–	–	1	–	ms
$T_{OTSD}$	Thermal Shutdown	–	–	+160	–	$^{\circ}C$
$T_{HYS}$	Thermal Shutdown Hysteresis	–	–	+20	–	$^{\circ}C$

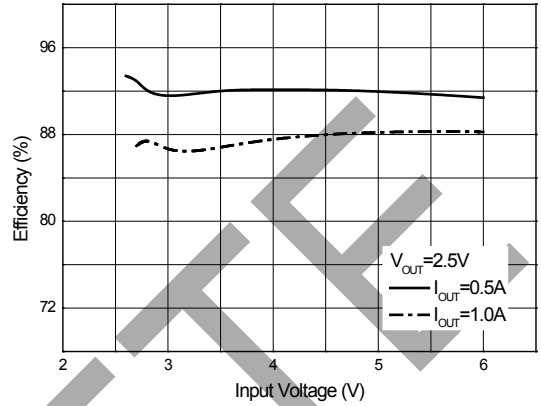
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Performance Characteristics

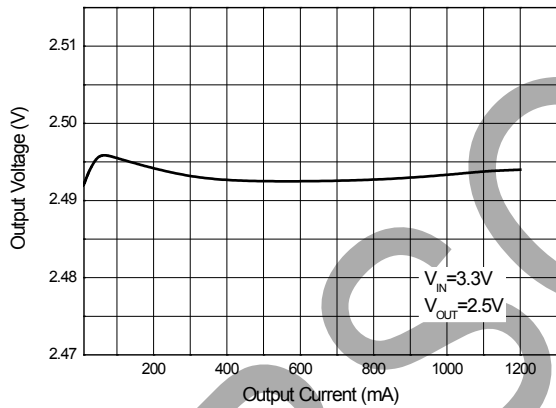
Efficiency vs. Output Current



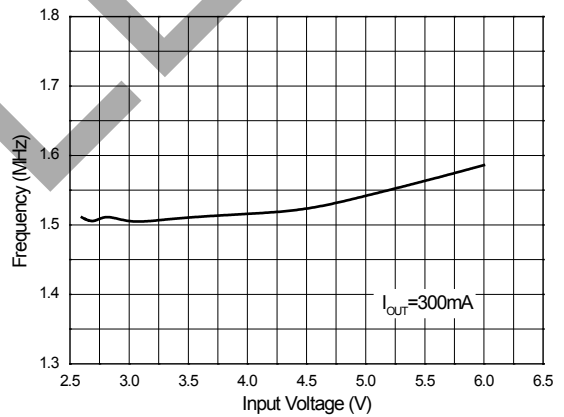
Efficiency vs. Input Voltage



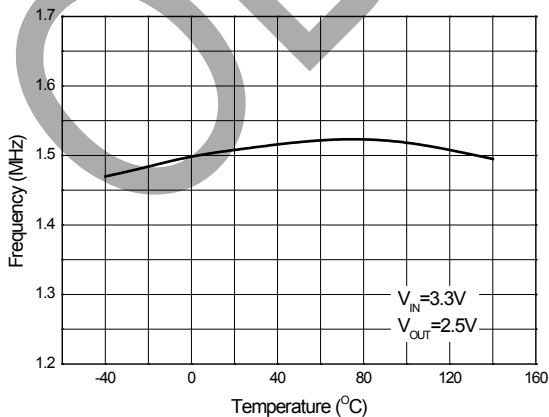
Output Voltage vs. Output Current



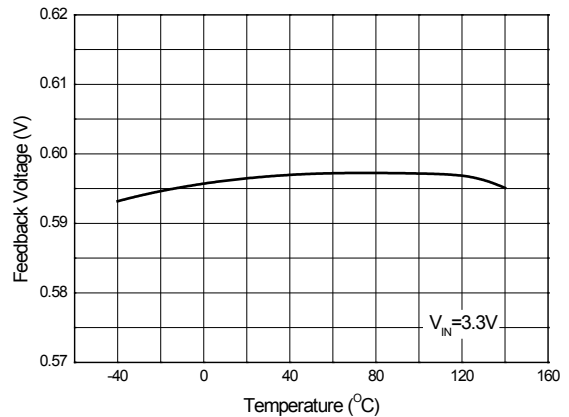
Frequency vs. Input Voltage



Frequency vs. Temperature



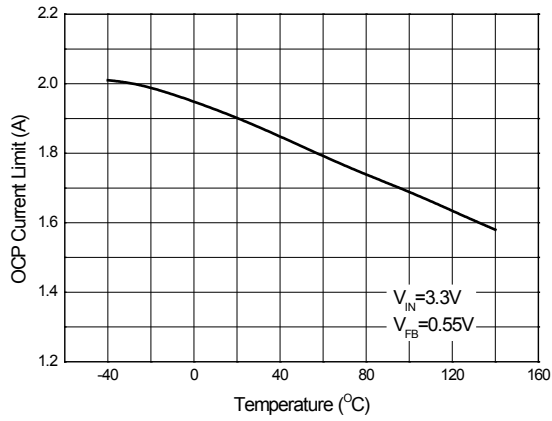
Feedback Voltage vs. Temperature



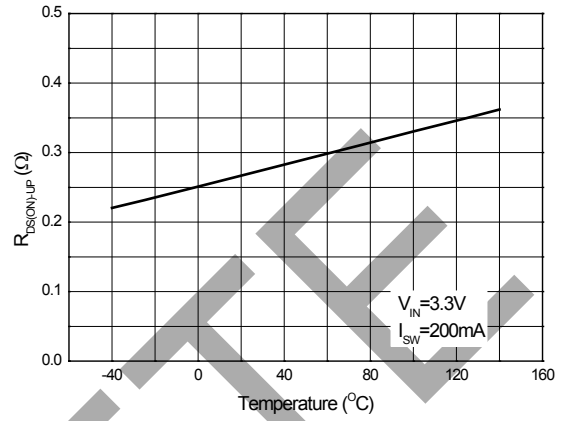
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Performance Characteristics (Cont.)

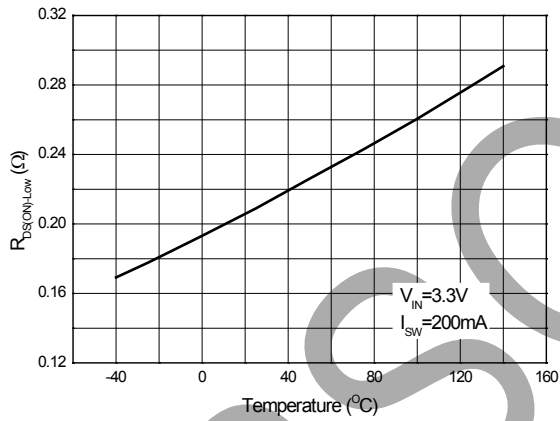
OCP Current Limit vs. Temperature



$R_{DS(ON)_{UP}}$  vs. Temperature



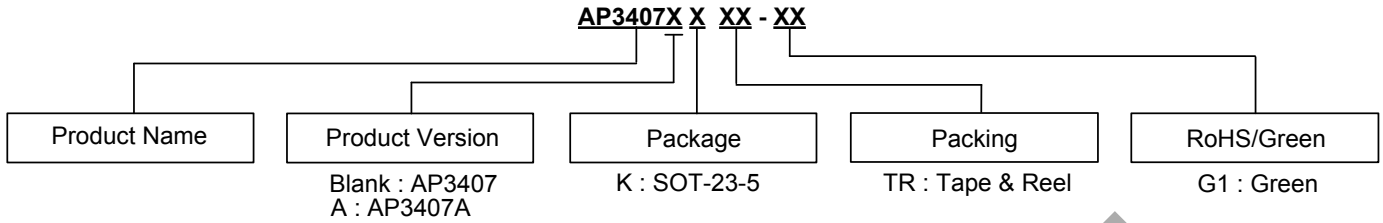
$R_{DS(ON)_{LOW}}$  vs. Temperature



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**Ordering Information**

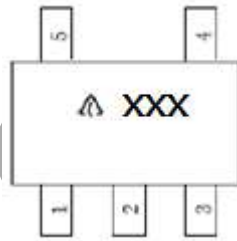


Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-5	-40 to +85°C	AP3407KTR-G1	GJA	3000/Tape & Reel
		AP3407AKTR-G1	GJB	3000/Tape & Reel

**Marking Information**

SOT-23-5

(Top View)

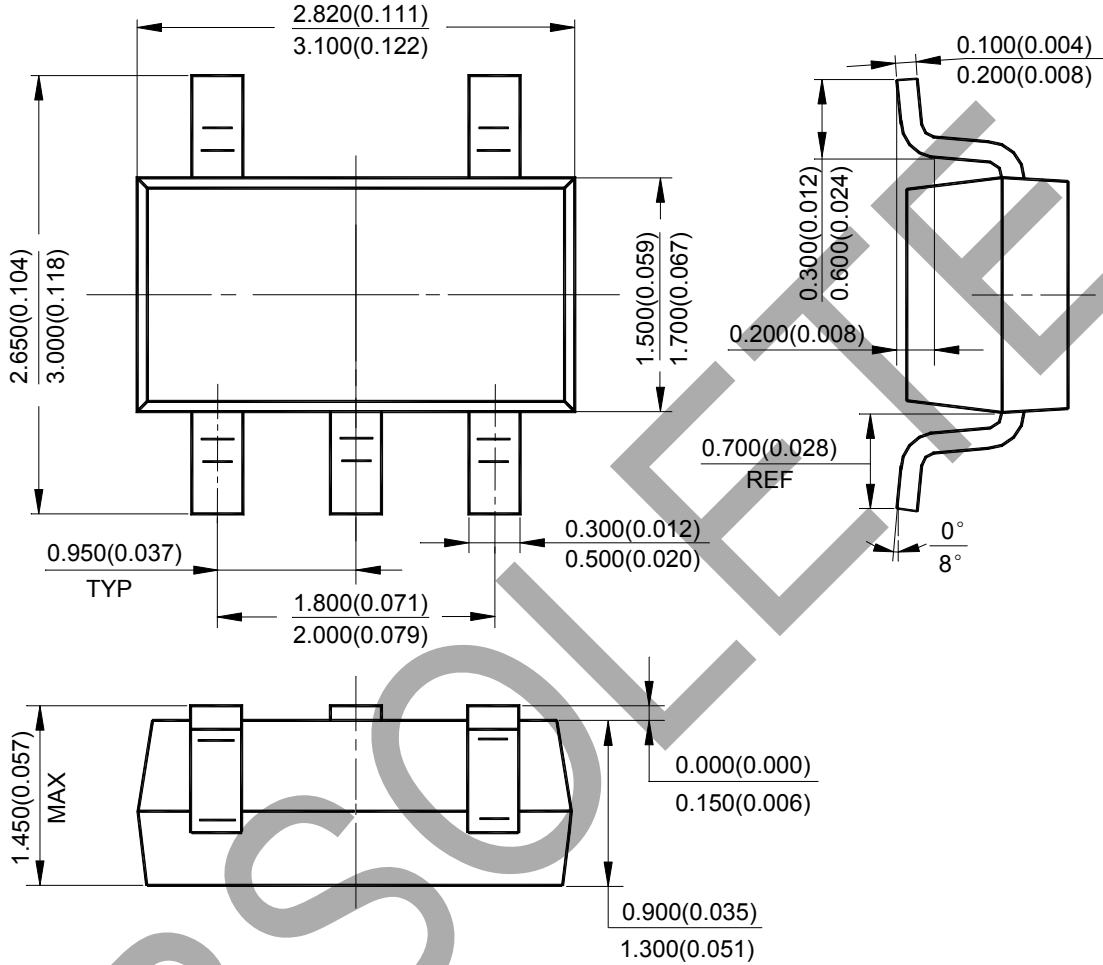


First Line: Logo and Marking ID  
(See Ordering Information)

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

(1) Package Type: SOT-23-5



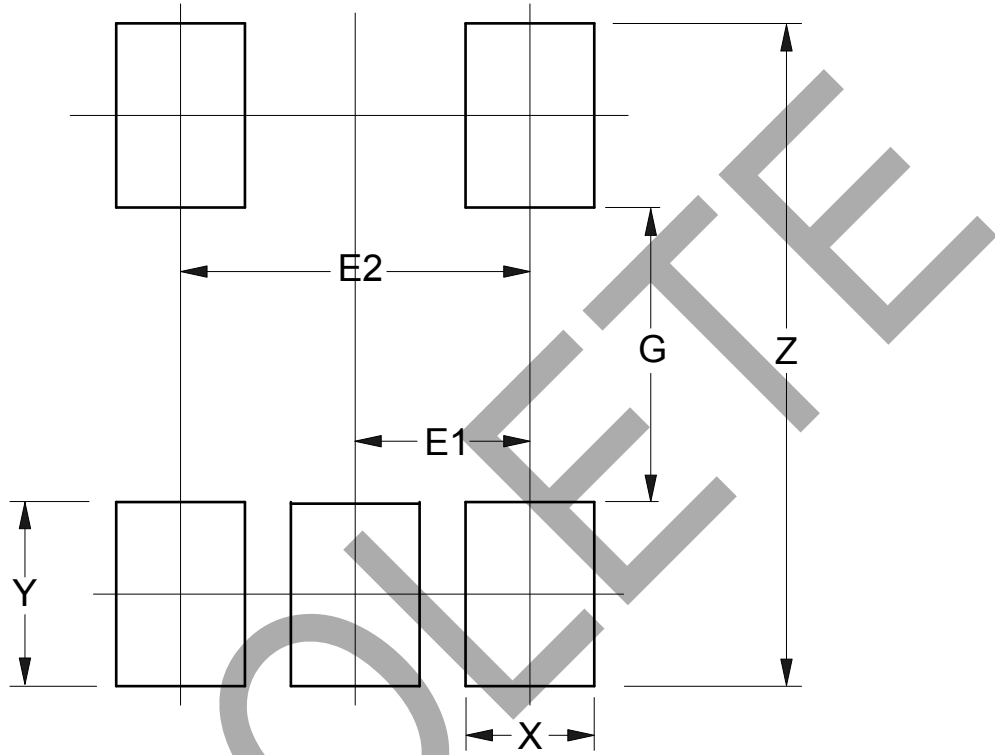
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**Suggested Pad Layout**

(1) Package Type: SOT-23-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

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