AP3417C

1.5MHZ SYNCHRONOUS STEP-DOWN DC-DC CONVERTER

Description

The AP3417C is a high efficiency step-down 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 version ranging from 0.6V to 0.9×V_{IN} when input voltage range is from 2.5V to 5.5V, and is able to deliver up to 1A. It is also available in fixed voltage versions of 1.2V, 1.8V and 3.3V without external feedback resistance.

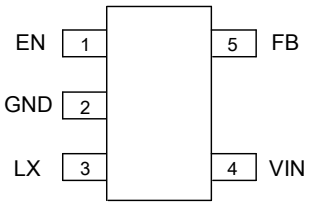
The AP3417C is available in SOT-23-5 and DFN-2×2-6 packages.

Features

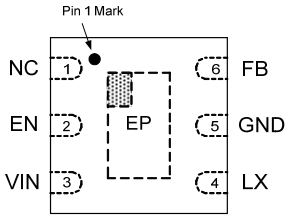
- High Efficiency Buck Power Converter
- Wide Input Voltage Range: 2.5V to 5.5V
- Adjustable Output Voltage: 0.6V to 0.9×V_{IN}
- Low $R_{DS(ON)}$ Internal Switches:200mΩ (V_{IN} = 5V)
- Built-in Power Switches for Synchronous Rectification with High Efficiency
- Output Current: 1.0A
- Feedback Voltage: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

Pin Assignments

K Package
(SOT-23-5)



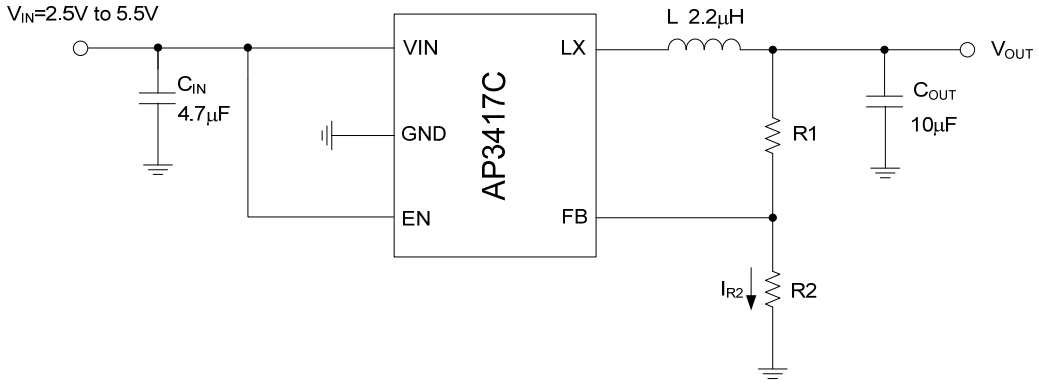
DN Package
(DFN-2×2-6)



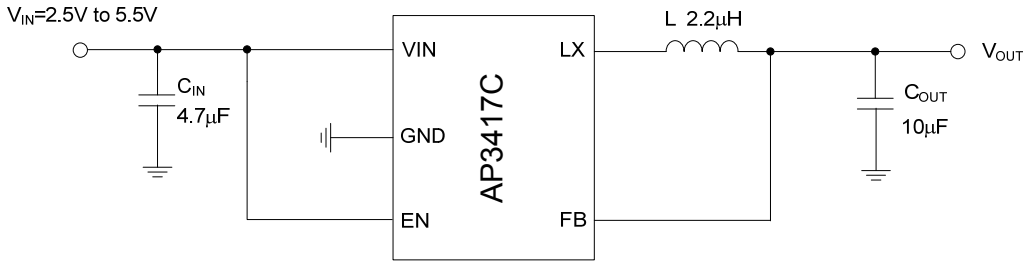
Applications

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

Typical Applications Circuit



Typical Applications Circuit (cont.)



For Fixed Versions

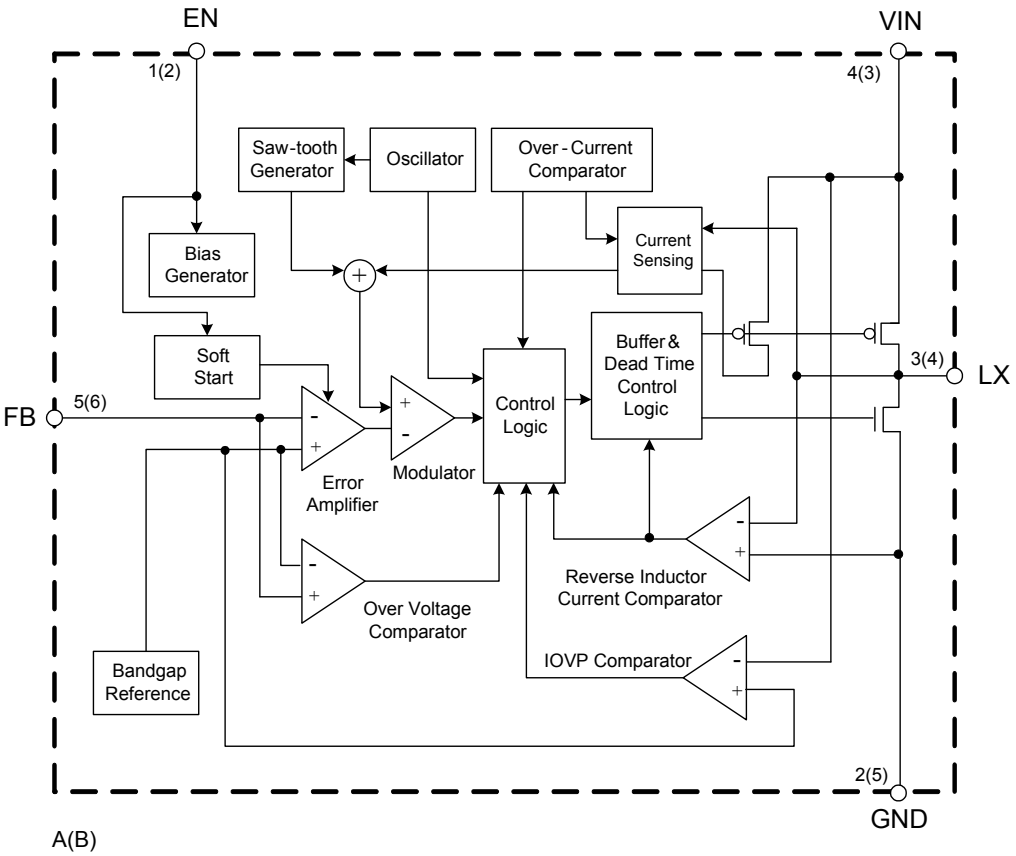
Component Guide

V_{OUT} (V)	R1 (kΩ)	R2 (kΩ)	L (µH)
3.3	450	100	2.2
2.5	320	100	2.2
1.8	200	100	2.2
1.2	100	100	2.2
1.0	66	100	2.2

Pin Descriptions

Pin Number		Pin Name	Function
SOT-23-5	DFN-2×2-6		
1	2	EN	Chip enable pin. Active high
2	5	GND	Ground pin
3	4	LX	Switch output pin
4	3	VIN	Power supply
5	6	FB	Feedback voltage of output
	1	NC	No internal connection

Functional Block Diagram



A(B)
A for SOT-23-5
B for DFN-2×2-6

Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Rating		Unit
V_{IN}	Input Voltage for the MOSFET Switch	0 to 6.0		V
V_{EN}	Enable Input Voltage	-0.3 to V_{IN} +0.3		V
I_{LX}	LX Pin Switch Current	1.8		A
P_D	Power Dissipation (On PCB, T_A = +25°C)	SOT-23-5	0.4	W
		DFN-2×2-6	1.89	
θ_{JA}	Thermal Resistance (Junction to Ambient, Simulation)	SOT-23-5	250	°C/W
		DFN-2×2-6	53	
θ_{JC}	Thermal Resistance (Junction to Case, Simulation)	SOT-23-5	130	°C/W
T_J	Operating Junction Temperature	155		°C
T_{STG}	Storage Temperature	-55 to +150		°C
T_{OP}	Operating Temperature	-40 to +85		°C
V_{MM}	ESD (Machine Model)	200		V
V_{HBM}	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

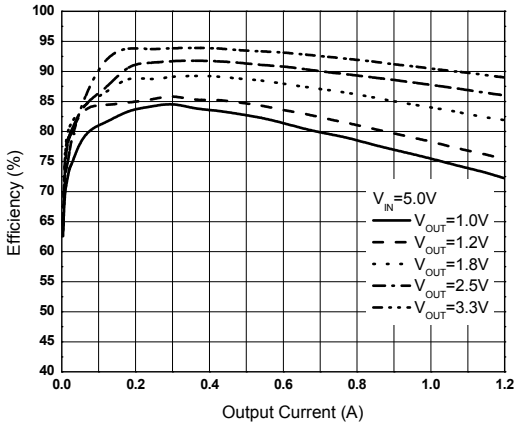
Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Input Voltage	2.5	5.5	V
T_A	Operating Ambient Temperature	-40	85	ºC
T_J	Operating Junction Temperature	-40	125	ºC

Electrical Characteristics (@V_{IN} = V_{EN} = 5V, V_{OUT} = 1.2V, V_{FB} = 0.6V, L = 2.2µH, C_{IN} = 4.7µF, C_{OUT} = 10µF, T_A = +25°C, unless otherwise specified.)

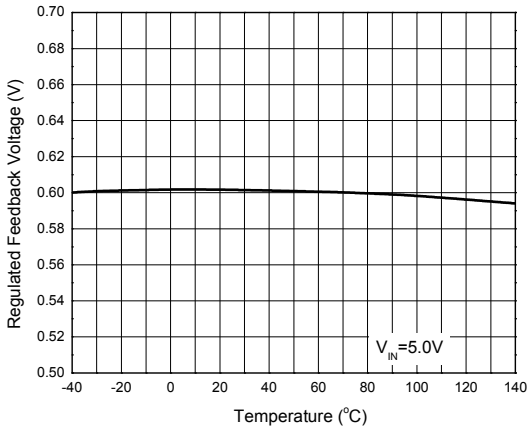
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range		2.5		5.5	V
I_{OFF}	Shutdown Current	V_{EN} = 0			0.1	µA
I_{ON}	Active Current	V_{FB} = 0.55V		220		µA
V_{FB}	Regulated Feedback Voltage	For Adjustable Output Voltage	0.588	0.6	0.612	V
V_{OUT}	Output Voltage	Fixed Output 1.2V	1.176	1.2	1.224	V
		Fixed Output 1.8V	1.764	1.8	1.836	
		Fixed Output 3.3V	3.234	3.3	3.366	
$\Delta V_{OUT}/V_{OUT}$	Regulated Output Voltage Accuracy	V_{IN} = 2.5V to 5.5V, I_{OUT} = 0 to 1.0A	-3		3	%
I_{PK}	Peak Inductor Current		1.5	1.9		A
f_{OSC}	Oscillator Frequency	V_{IN} = 2.5V to 5.5V	1.2	1.5	1.8	MHz
$R_{DS(ON)P}$	PMOSFET $R_{DS(ON)}$	V_{IN} = 5V		200		mΩ
$R_{DS(ON)N}$	NMOSFET $R_{DS(ON)}$	V_{IN} = 5V		200		mΩ
V_{EN_H}	EN High Level Input Voltage		1.5			V
V_{EN_L}	EN Low Level Input Voltage				0.4	V
I_{EN}	EN Input Current				0.1	µA
t_{SS}	Soft Start Time			400		µs
D_{MAX}	Maximum Duty Cycle		100			%
V_{UVLO}	Under Voltage Lock Out Threshold	Rising		2.3		V
		Falling		2.1		
		Hysteresis		0.2		
T_{SD}	Thermal Shutdown	Hysteresis = 30°C		155	160	°C

Performance Characteristics (@V_{IN} = 5V, T_A = +25°C, unless otherwise specified.)

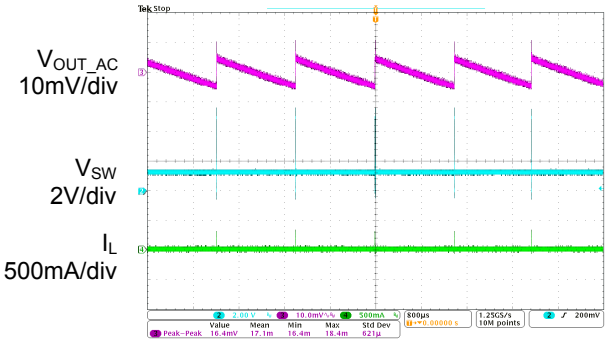
Efficiency vs. Output Current



Regulated Feedback Voltage vs. Temperature

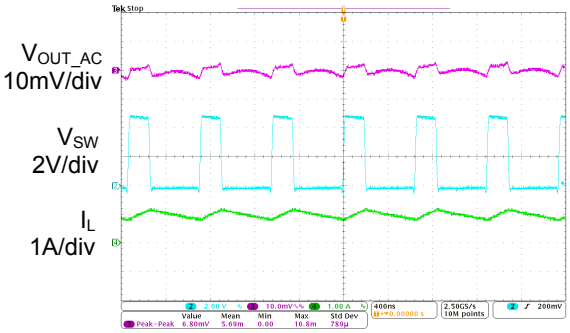


Output Ripple (I_{OUT}=0A)



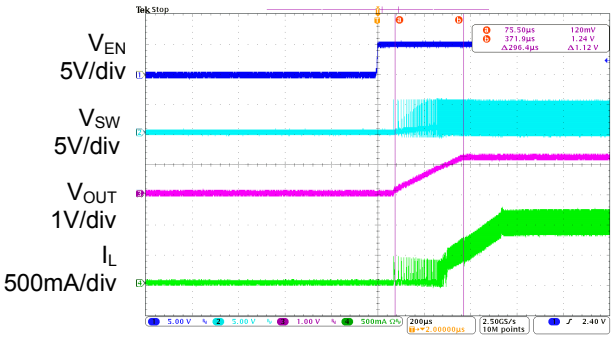
Time 800µs/div

Output Ripple (I_{OUT}=1A)



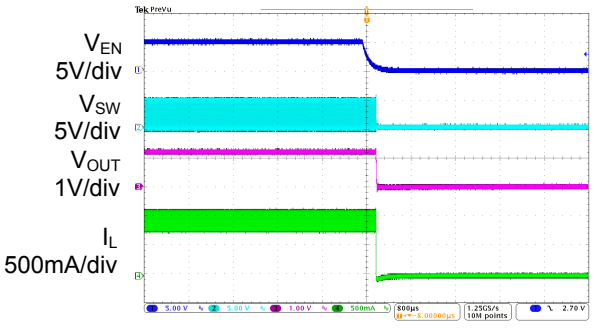
Time 400ns/div

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



Time 200µs/div

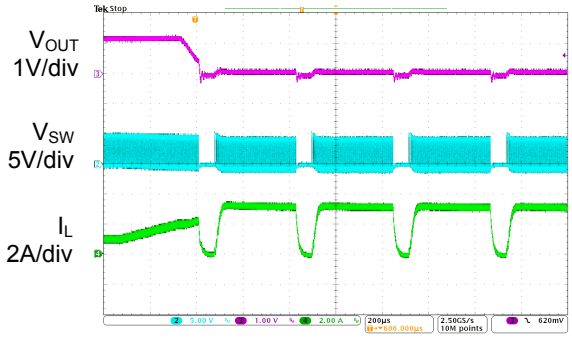
Enable Turn Off (I_{OUT}=1A)



Time 800µs /div

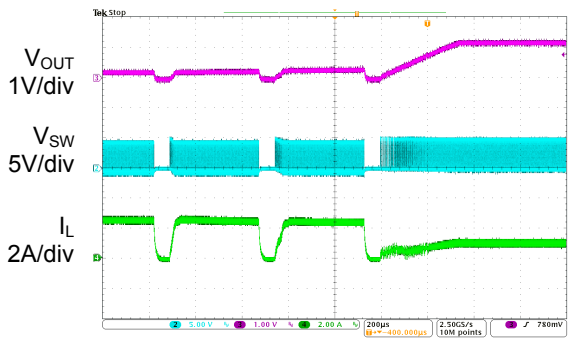
Performance Characteristics (cont.) (@V_{IN} = 5V, T_A = +25°C, unless otherwise specified.)

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



Time 200μs/div

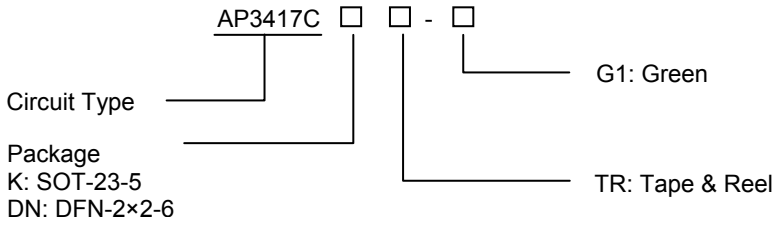
Short Circuit Protection Recovery (I_{OUT}=1A)



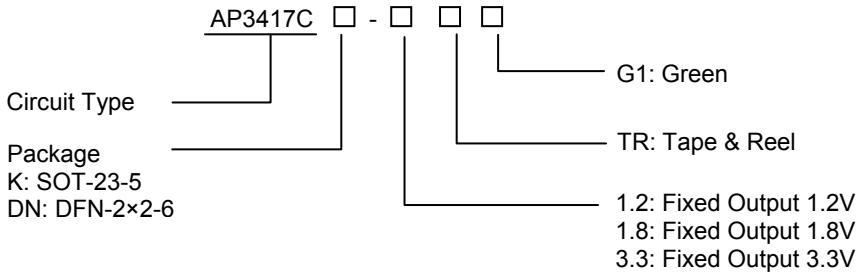
Time 200μ s /div

Ordering Information

For ADJ Version



For Fixed Versions

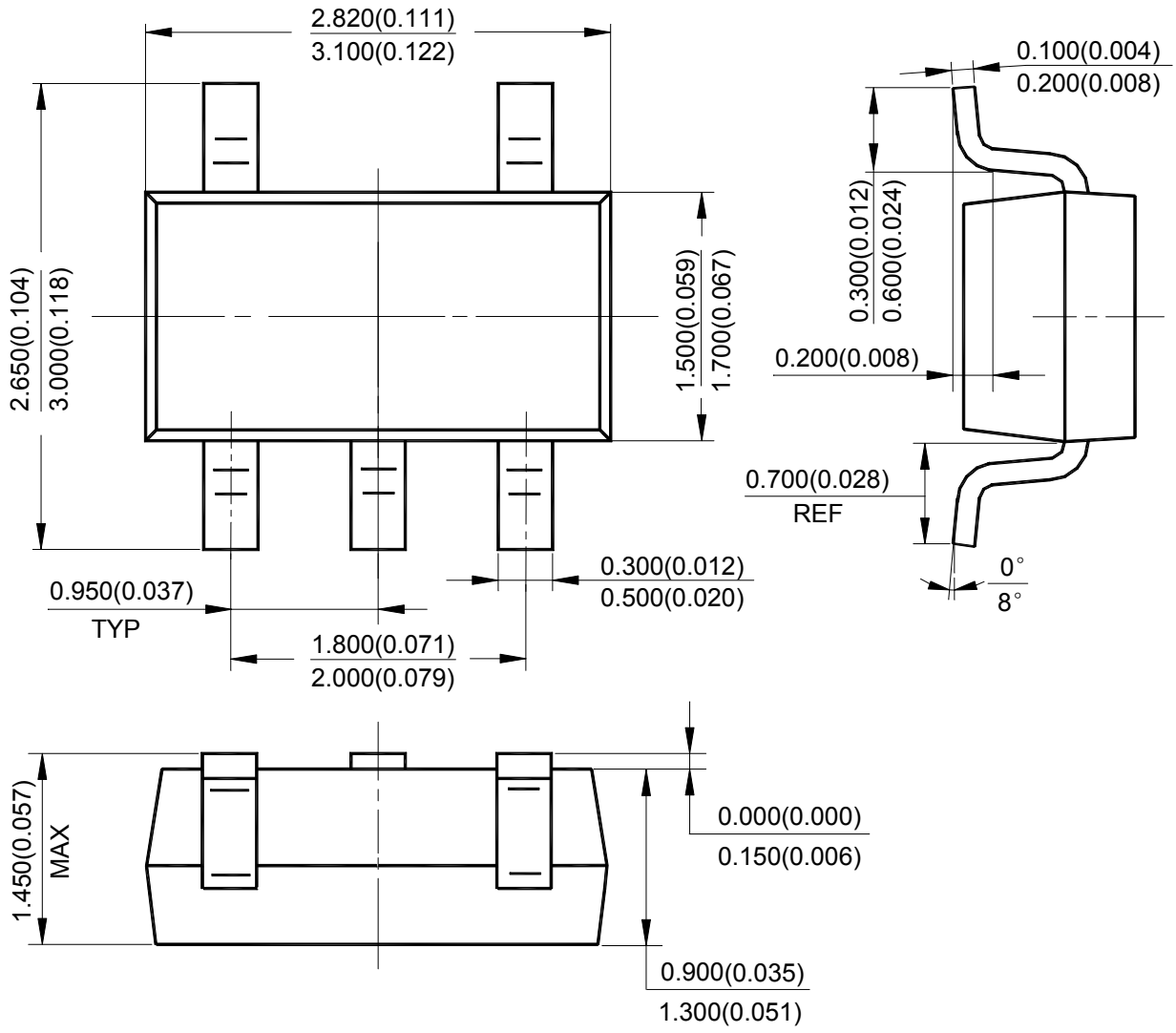


Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-5	-40 to 85ºC	AP3417CKTR-G1	G4I	Tape & Reel
		AP3417CK-1.2TRG1	G4U	Tape & Reel
		AP3417CK-1.8TRG1	G4V	Tape & Reel
		AP3417CK-3.3TRG1	G4W	Tape & Reel
DFN-2×2-6	-40 to 85ºC	AP3417CDNTR-G1	BH	Tape & Reel
		AP3417CDN-1.2TRG1	BL	Tape & Reel
		AP3417CDN-1.8TRG1	BM	Tape & Reel
		AP3417CDN-3.3TRG1	BN	Tape & Reel

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

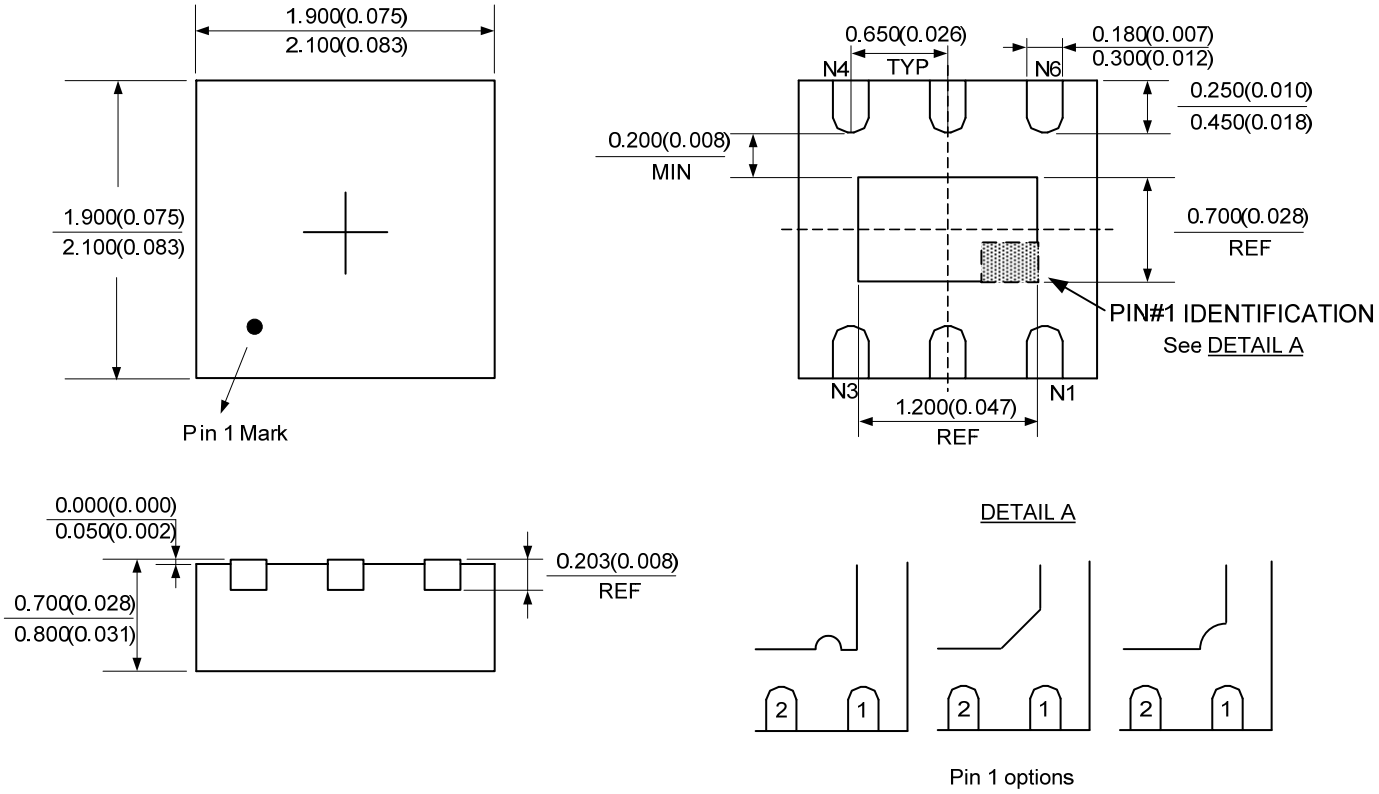
Package Outline Dimensions (All dimensions in mm(inch).)

SOT-23-5



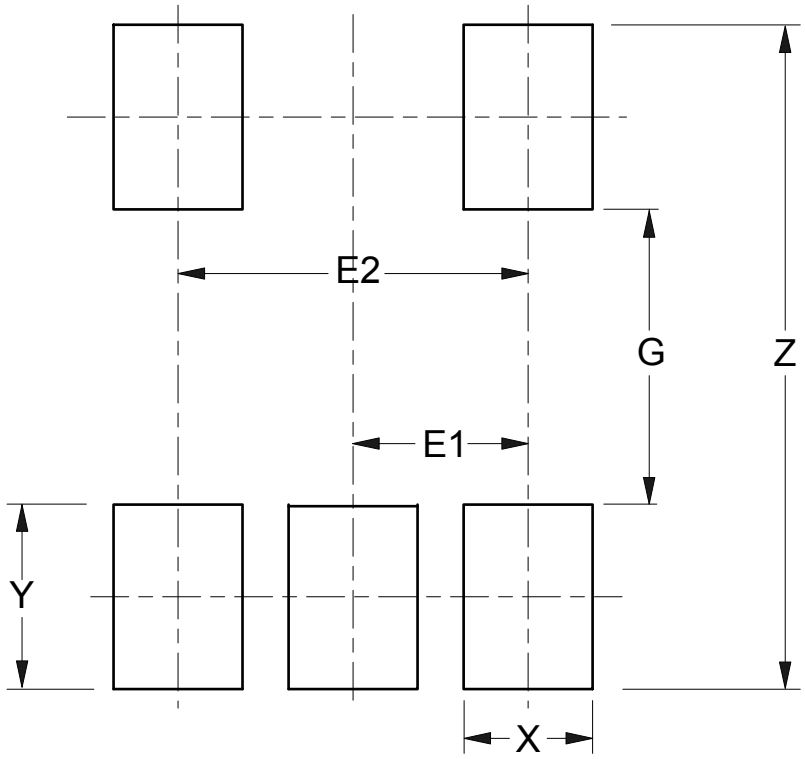
Package Outline Dimensions (cont.) (All dimensions in mm(inch).)

DFN-2×2-6



Suggested Pad Layout

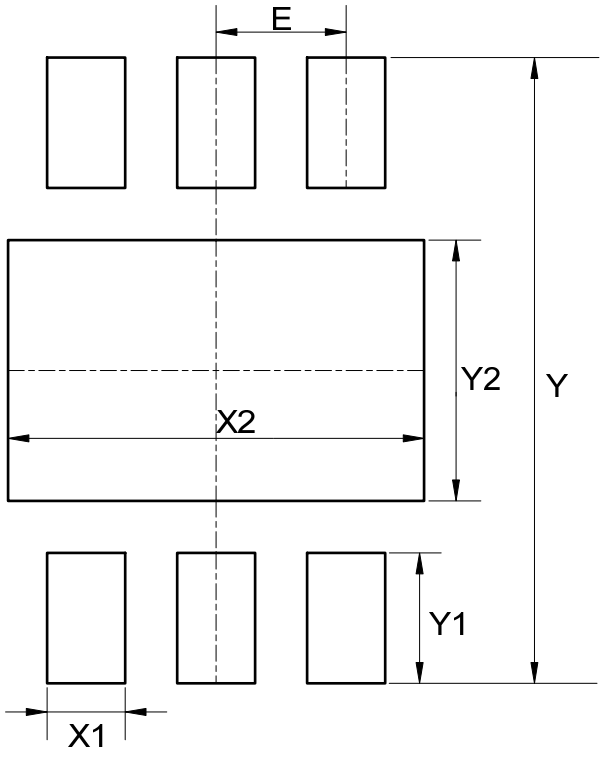
SOT-23-5



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

Suggested Pad Layout (cont.)

DFN-2×2-6



Dimensions	Y (mm)/(inch)	X1 (mm)/(inch)	Y1=E (mm)/(inch)	X2 (mm)/(inch)	Y2 (mm)/(inch)
Value	2.400/0.094	0.300/0.012	0.500/0.020	1.600/0.063	1.000/0.039

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- Консультации по применению компонента;
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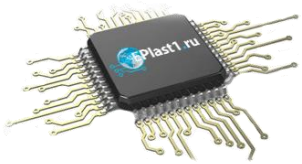

Как с нами связаться

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