NEW PRODUCT

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.

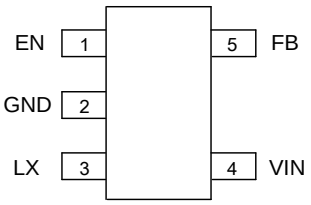
The AP3417C is available in SOT-23-5 and W-DFN2020-6 (Type US) packages.

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
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

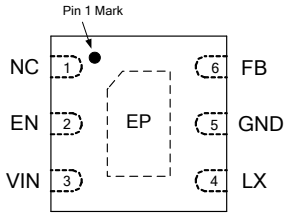
Pin Assignments

(Top View)



SOT-23-5

(Top View)



W-DFN2020-6 (Type US)

Applications

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

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 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.

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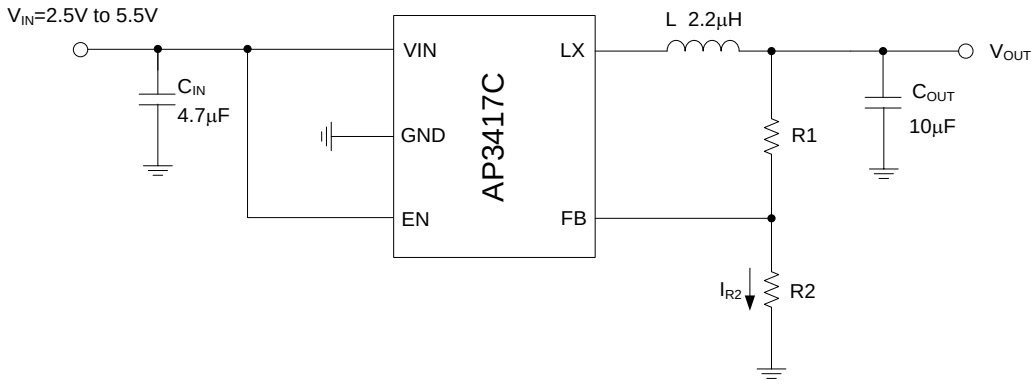
Typical Applications Circuit



Component Guide

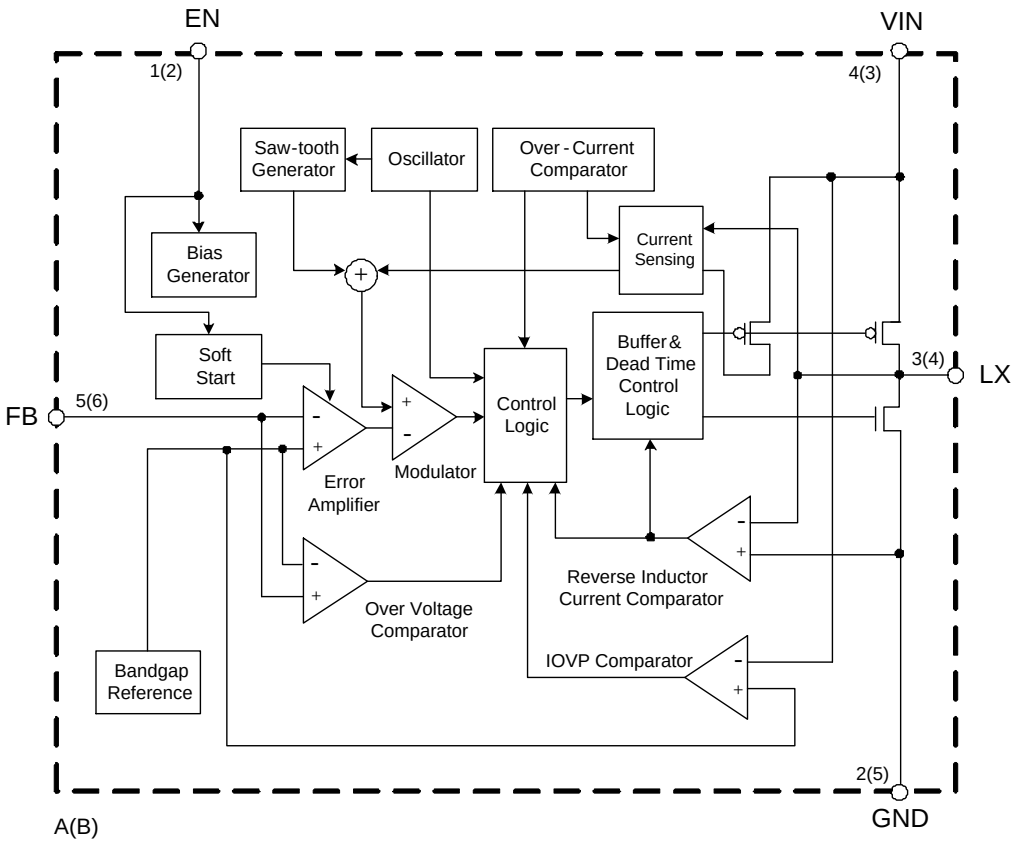
V_{OUT} (V)	R1 (kΩ)	R2 (kΩ)	L (µH)
3.3	450	100	2.2
2.5	320	100	2.2
1.8	200	100	2.2
1.2	100	100	2.2
1.0	66	100	2.2

Pin Descriptions

Pin Number		Pin Name	Function
SOT-23-5	W-DFN2020-6 (Type US)		
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

NEW PRODUCT

Functional Block Diagram



A(B)
A for SOT-23-5
B for W-DFN2020-6 (Type US)

Absolute Maximum Ratings (Note 4)

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
		W-DFN2020-6 (Type US)	1.89	
θ_{JA}	Thermal Resistance (Junction to Ambient, Simulation)	SOT-23-5	250	°C/W
		W-DFN2020-6 (Type US)	53	
θ_{JC}	Thermal Resistance (Junction to Case, Simulation)	SOT-23-5	130	°C/W
		W-DFN2020-6 (Type US)	25	
T_J	Operating Junction Temperature	+155		℃
T_{STG}	Storage Temperature	-55 to +150		℃
T_{OP}	Operating Temperature	-40 to +85		℃
V_{MM}	ESD (Machine Model)	200		V
V_{HBM}	ESD (Human Body Model)	2000		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.

NEW PRODUCT

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

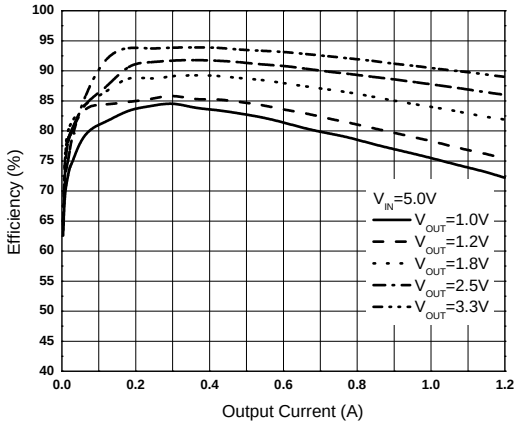
Electrical Characteristics (@V_{IN} = V_{EN} = 5V, V_{OUT} = 1.2V, V_{FB} = 0.6V, L = 2.2µH, C_{IN} = 4.7µF, C_{OUT} = 10µF, T_A = +25°C, unless otherwise specified.)

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	–	0.588	0.6	0.612	V
$\Delta V_{OUT}/V_{OUT}$	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

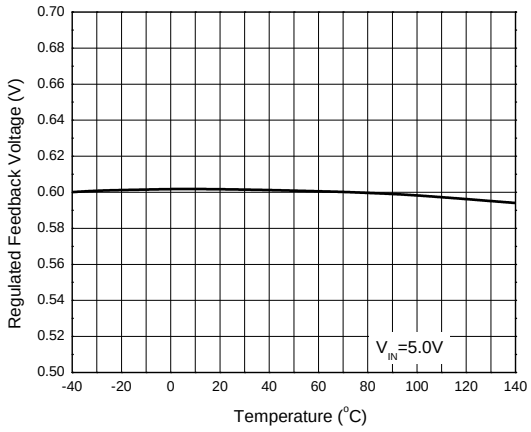
NEW PRODUCT

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

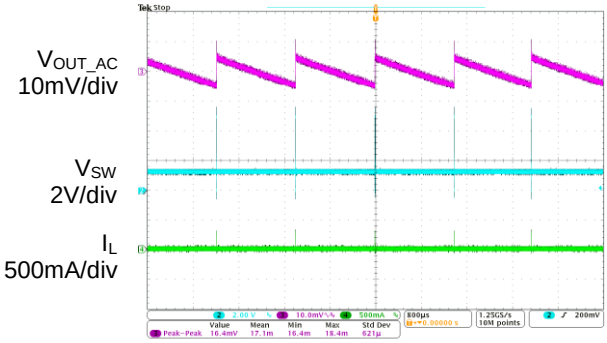
Efficiency vs. Output Current



Regulated Feedback Voltage vs. Temperature

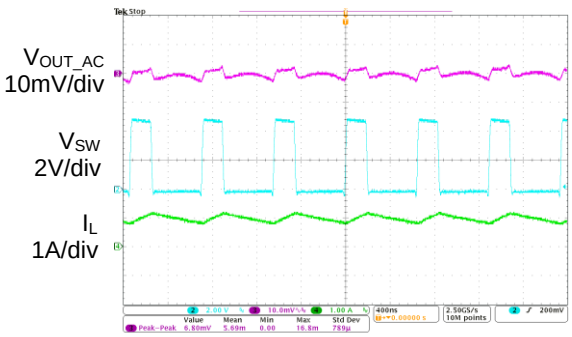


Output Ripple (I_{OUT}=0A)



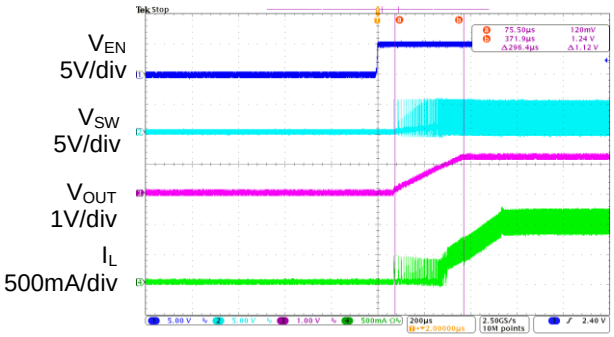
Time 800µs/div

Output Ripple (I_{OUT}=1A)



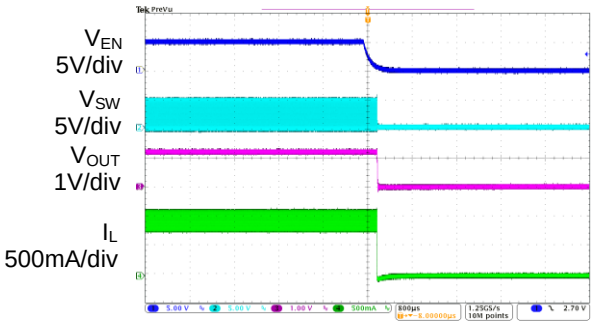
Time 400ns/div

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



Time 200µs/div

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

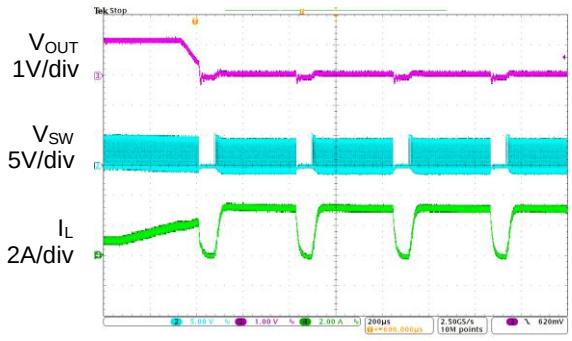


Time 800µs/div

NEW PRODUCT

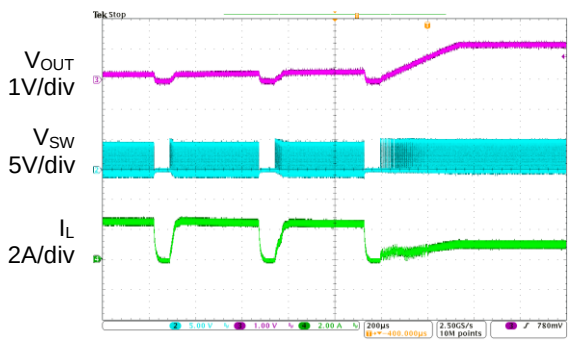
Performance Characteristics (Cont.) (@V_{IN} = 5V, T_A = +25°C, unless otherwise specified.)

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



Time 200µs/div

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



Time 200µs/div

Ordering Information

AP3417C XX XX - XX

Product Name	Package	Packing	RoHS/Green
	K : SOT-23-5 DN : W-DFN2020-6 (Type US)	TR : Tape & Reel	G1 : Green

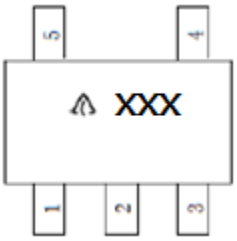
Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-5	-40 to +85ºC	AP3417CKTR-G1	G4I	3000 / Tape & Reel
W-DFN2020-6 (Type US)	-40 to +85ºC	AP3417CDNTR-G1	BH	3000 / Tape & Reel

NEW PRODUCT

Marking Information

(1) SOT-23-5

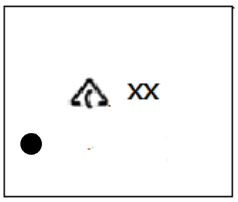
(Top View)



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

(2) W-DFN2020-6 (Type US)

(Top View)

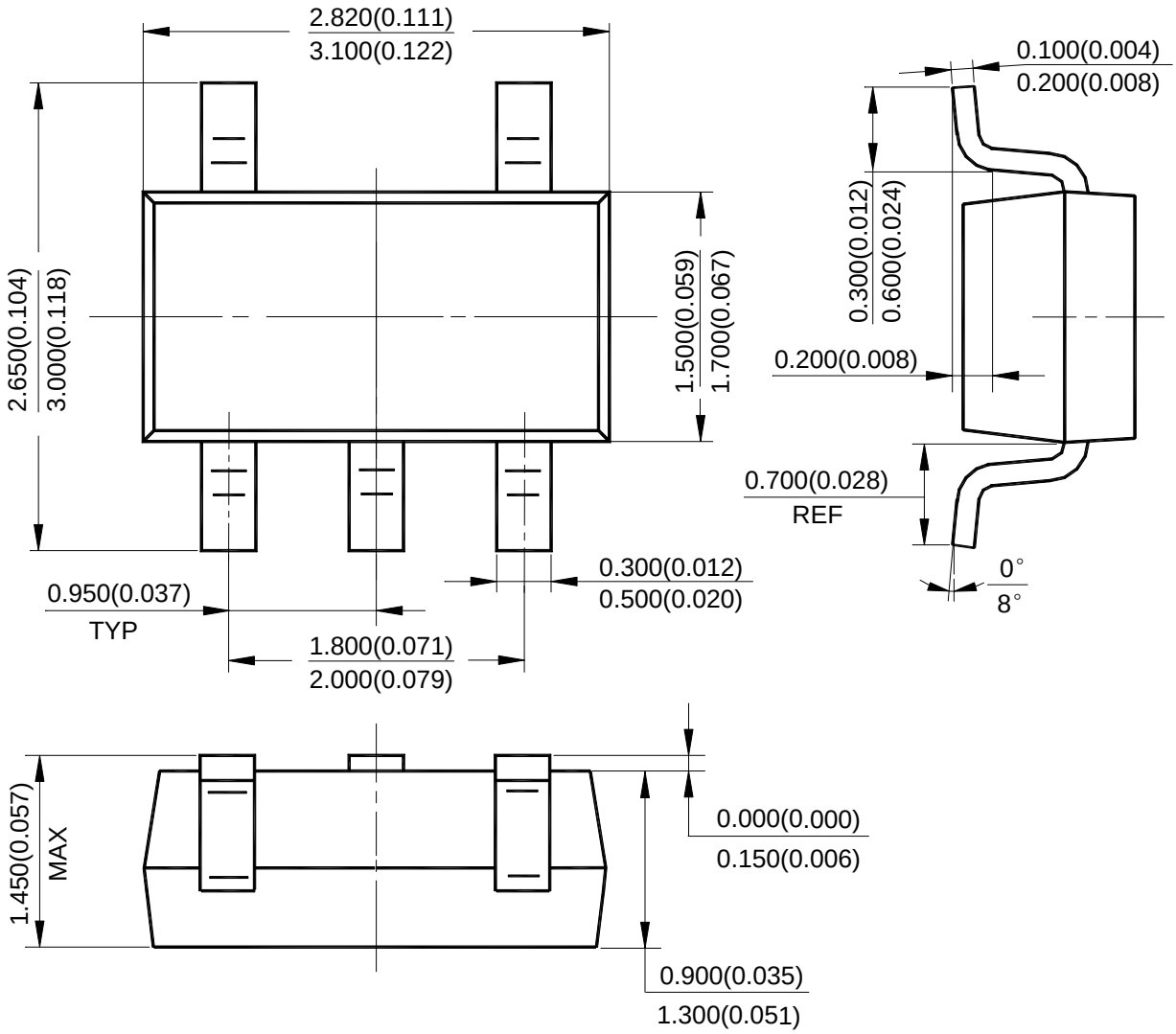


First Line: Logo and Marking ID
(See Ordering Information)

NEW PRODUCT

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

(1) Package Type: SOT-23-5

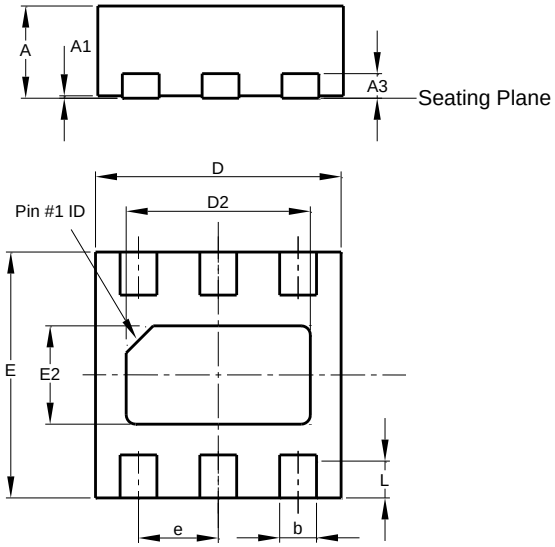


NEW PRODUCT

Package Outline Dimensions (Cont.)

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

(2) Package Type: W-DFN2020-6 (Type US)

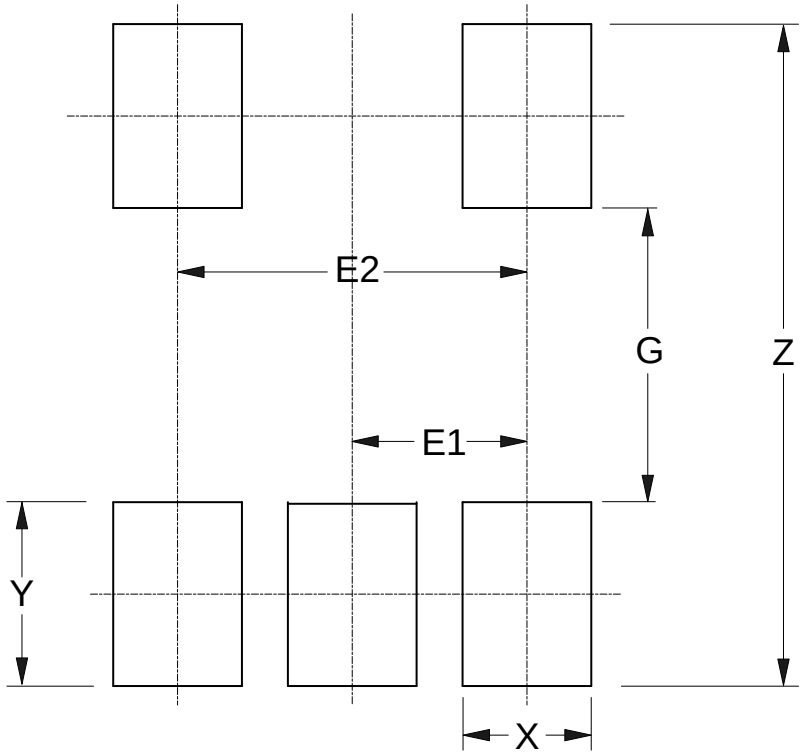


W-DFN2020-6 (Type US)			
Dim	**Min**	**Max**	**Typ**
A	0.70	0.80	0.75
A1	0.00	0.05	--
A3	0.20 REF		
b	0.25	0.35	0.30
D	1.95	2.075	2.00
D2	1.35	1.60	1.50
E	1.95	2.075	2.00
E2	0.65	0.90	0.80
e	0.65 BSC		
L	0.25	0.45	0.35
All Dimensions in mm			

NEW PRODUCT

Suggested Pad Layout

(1) Package Type: SOT-23-5



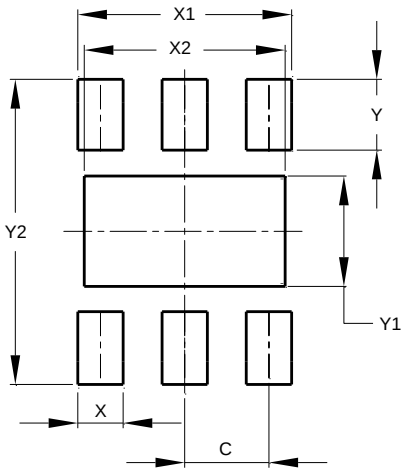
Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

NEW PRODUCT

Suggested Pad Layout (Cont.)

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

(2) Package Type: W-DFN2020-6 (Type US)



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	1.650
X2	1.550
Y	0.545
Y1	0.850
Y2	2.350

NEW PRODUCT

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