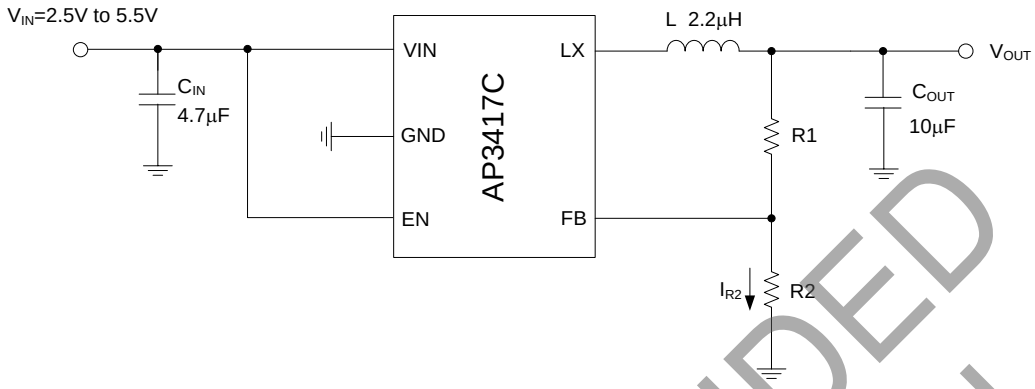
Typical Applications Circuit



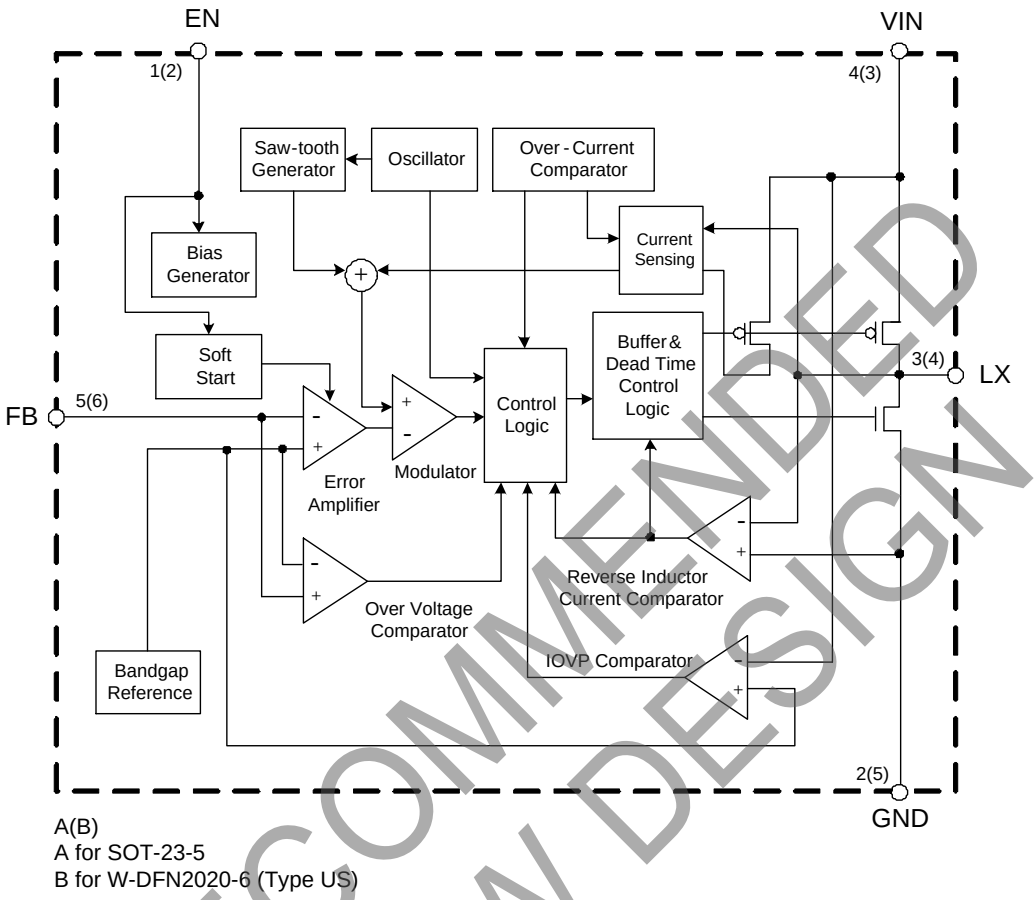
Component Guide

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

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		°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 4: Stresses greater than those listed under "*Absolute Maximum Ratings*" can 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 can affect device reliability.

Recommended Operating Conditions

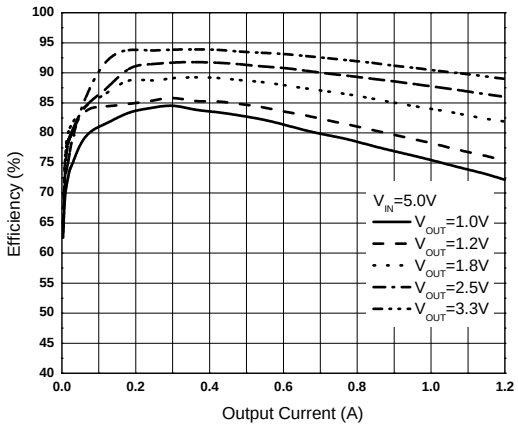
Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Input Voltage	2.5	5.5	V
T_A	Operating Ambient Temperature	-40	+85	°C
T_J	Operating Junction Temperature	-40	+125	°C

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.)

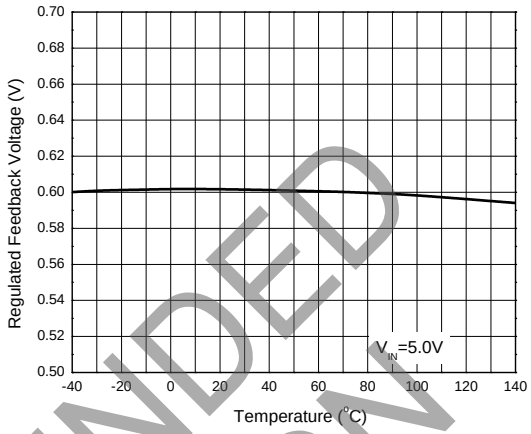
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range	—	2.5	—	5.5	V
I_{OFF}	Shutdown Current	V_{EN} = 0	—	—	0.1	µA
I_{ON}	Active Current	V_{FB} = 0.55V	—	220	—	µA
V_{FB}	Regulated Feedback Voltage	—	0.588	0.6	0.612	V
$\Delta V_{OUT}/V_{OUT}$	Regulated Output Voltage Accuracy	V_{IN} = 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

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

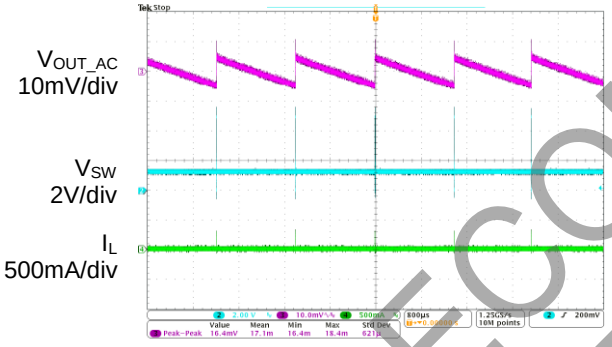
Efficiency vs. Output Current



Regulated Feedback Voltage vs. Temperature

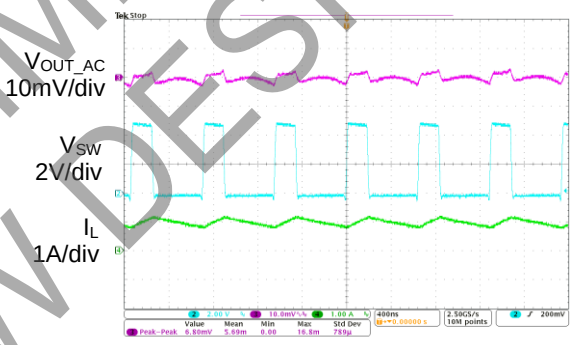


Output Ripple (I_{OUT}=0A)



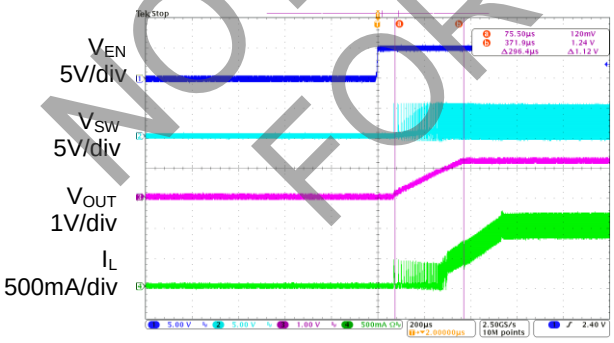
Time 800µs/div

Output Ripple (I_{OUT}=1A)



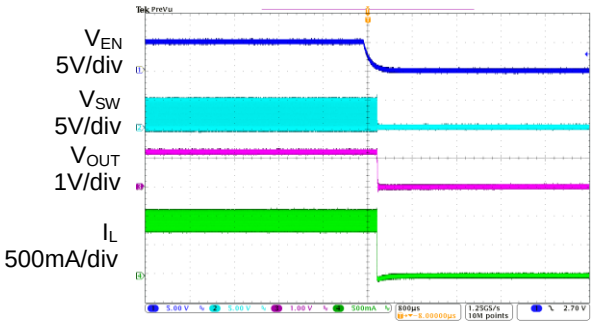
Time 400ns/div

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



Time 200µs/div

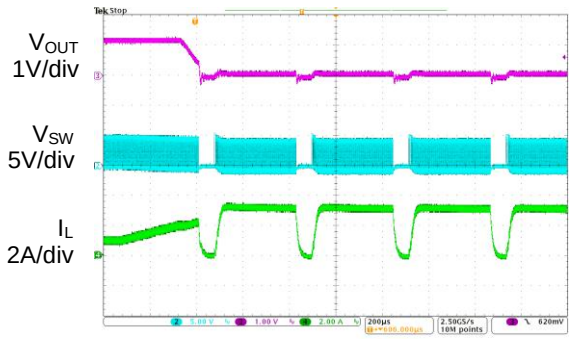
Enable Turn Off (I_{OUT}=1A)



Time 800µs/div

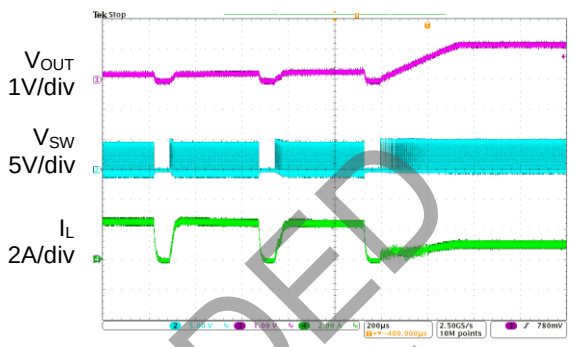
Performance Characteristics (continued) (@V_{IN} = 5V, T_A = +25°C, unless otherwise specified.)

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



Time 200µs/div

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



Time 200µs/div

Application Information

Typical application circuit is shown in the *Typical Applications Circuit* and for the circuit parameters setting please refers to the following descriptions.

Under Voltage Lockout (UVLO) Circuit

When the V_{IN} drops lower than the UVLO detector threshold, the UVLO circuit starts to operate, V_{REF} stops, and high-side switch and low-side switch built-in switch transistors turn "OFF". As a result, V_{OUT} drops according to the C_{OUT} capacitance value and the load. When the V_{IN} is rising higher than UVLO released voltage, the IC will restart the operation.

Short Circuit Protection and Recovery

When the AP3417C output node is shorted to GND that V_{FB} drops under 0.42V, AP3417C will enter hiccup mode to protect itself. If short circuit is removed, and V_{FB} rises over 0.42V, the AP3417C recovers to normal operation again. If the AP3417C reaches OCP threshold while short circuit, the AP3417C will enters cycle by cycle current limit mode until the current under OCP threshold.

Over Temperature Protection

The internal thermal temperature protection circuitry is provided to protect the integrated circuit in the event that the maximum junction temperature is exceeded. When the junction temperature exceeds +160°C, it shuts down the internal control circuit and switching power MOSFET. The AP3417C will restart automatically under the control of soft start circuit when the junction temperature decreases to +145°C.

Setting the Output Voltage

The output voltage can be adjusted from 0.6V to 0.9*V_{IN} using an external resistor divider. Table 1 shows a list of resistor selections for common output voltages. Resistor R1 is selected based on a design tradeoff between efficiency and output voltage accuracy. For high values of R1 there is less current consumption in the feedback network. However the tradeoff is output voltage accuracy due to the bias current in the error amplifier. Meanwhile, the input capacitor should close to IC for preventing unexpected influences.

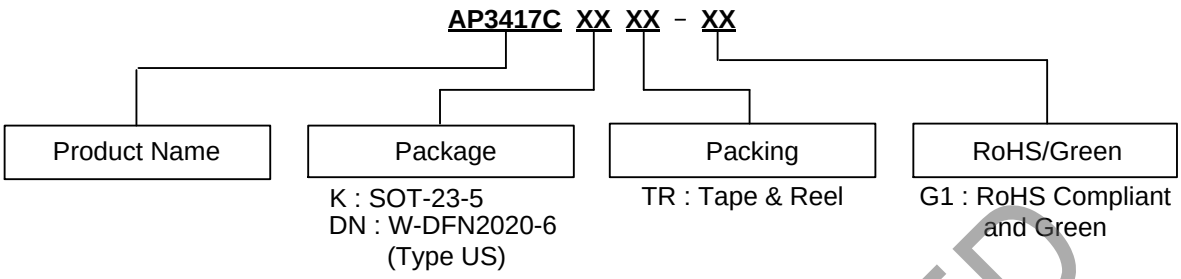
V_{OUT} (V)	R1 (kΩ)	R2 (kΩ)	L (μH)
3.3	450	100	2.2
2.5	320	100	2.2
1.8	200	100	2.2
1.2	100	100	2.2
1.0	66	100	2.2

Table1. Resistor Selection for Common Output

Enable Control Input

Force this pin voltage above 1.5V enables the chip, and below 0.4V shuts down the device. When using this function to control input, please note the following information. Pay attention to input voltage, if input voltage is less than 5.2V, all functions work well without other concerns. If input voltage is higher than 5.2V, please confirm that EN pin must be connected to V_{IN} directly without the capacitor from EN to GND.

Ordering Information

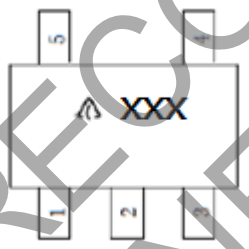


Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-5	-40 to +85ºC	AP3417CKTR-G1	G4I	3000 / Tape & Reel
W-DFN2020-6 (Type US)	-40 to +85ºC	AP3417CDNTR-G1	BH	3000 / Tape & Reel

Marking Information

(1) SOT-23-5

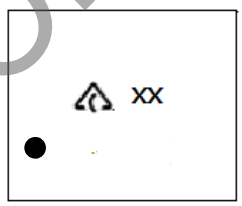
(Top View)



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

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

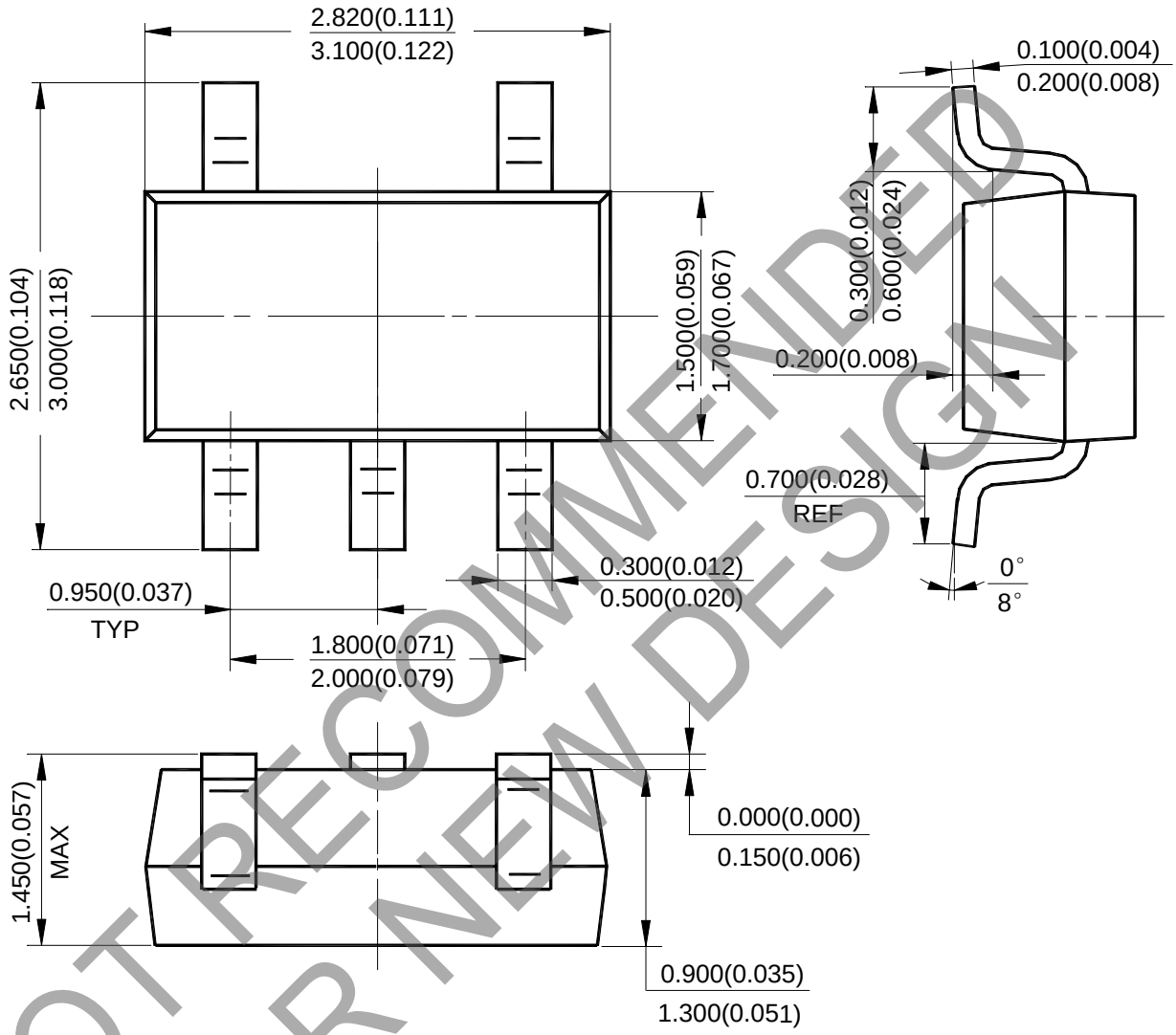
(Top View)



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

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

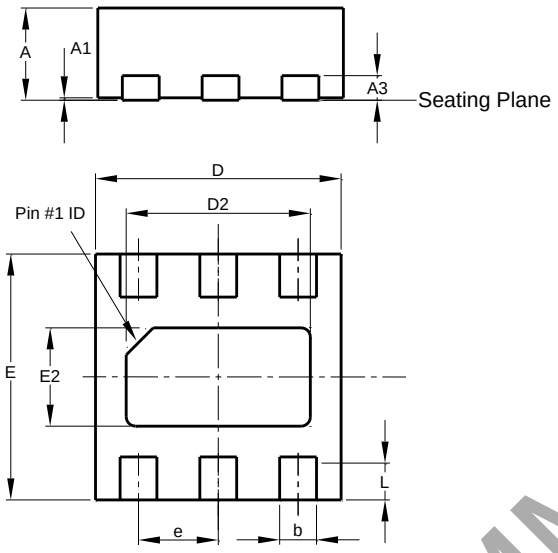
(1) Package Type: SOT-23-5



Package Outline Dimensions (continued)

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

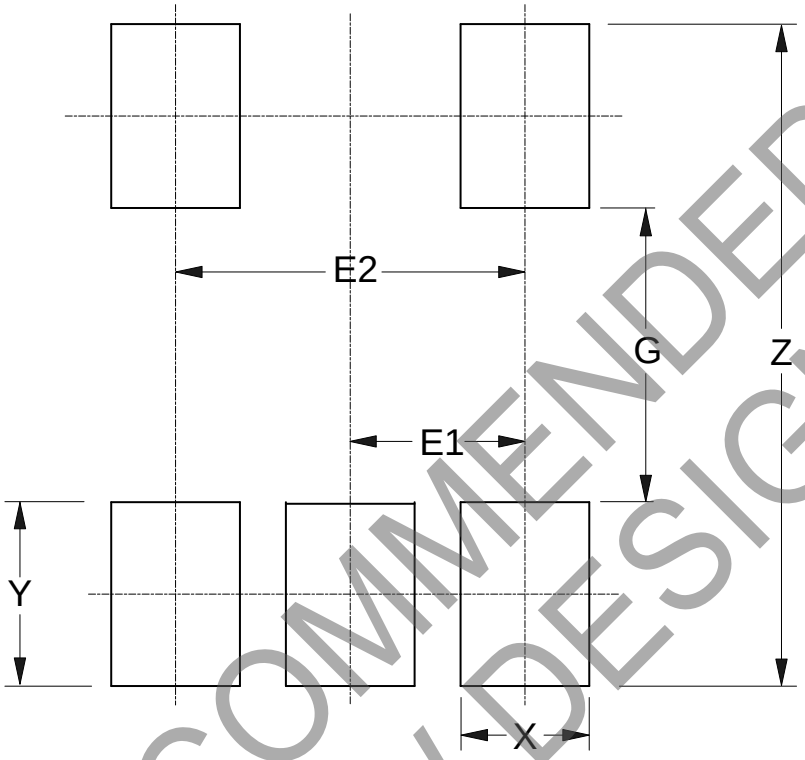
(2) Package Type: W-DFN2020-6 (Type US)



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			

Suggested Pad Layout

(1) Package Type: SOT-23-5

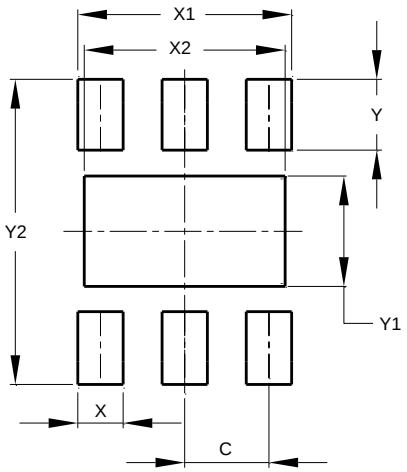


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

Suggested Pad Layout (continued)

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

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