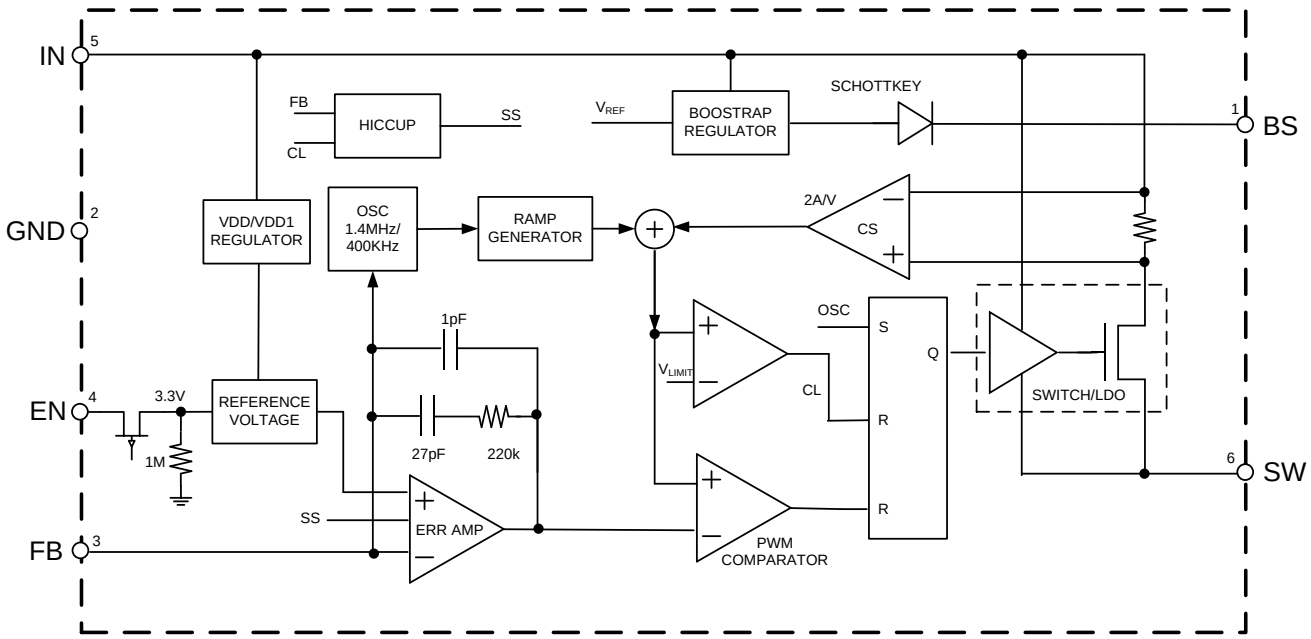
Pin Descriptions

Pin Number	Pin Name	Function
1	BS	Bootstrap pin. A bootstrap capacitor is connected between the BS pin and SW pin. The voltage across the bootstrap capacitor drives the internal high-side NMOS switch.
2	GND	Ground pin
3	FB	Feedback pin. This pin is connected to an external resistor divider to program the system output voltage. When V_{FB} exceeds 20% of the nominal regulation value of 0.81V, the OVP is triggered. When V_{FB} < 0.25V, the oscillator frequency is lowered to realize short circuit protection.
4	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 1μA.
5	IN	Supply input pin. A capacitor should be connected between the IN pin and GND to keep the DC input voltage constant.
6	SW	Power switch output pin. This pin is connected to the inductor and bootstrap capacitor.

Functional Block Diagram



Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Rating	Unit
V_{IN}	Input Pin Voltage	-0.3 to 20	V
V_{EN}	EN Pin Voltage	-0.3 to V_{IN}+0.3	V
V_{SW}	SW Pin Voltage	21	V
V_{BS}	Bootstrap Pin Voltage	-0.3 to V_{SW}+6	V
V_{FB}	Feedback Pin Voltage	-0.3 to 6V	V
θ_{JA}	Thermal Resistance	220	°C/W
T_J	Operating Junction Temperature	+150	°C
T_{STG}	Storage Temperature	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10sec)	+260	°C
–	ESD (Human Body Model)	2000	V
–	ESD (Machine Model)	200	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}	Input Voltage	4.5	18	V
$I_{OUT\ (MAX)}$	Maximum Output Current	1.5	–	A
T_A	Operating Ambient Temperature	-40	+85	°C

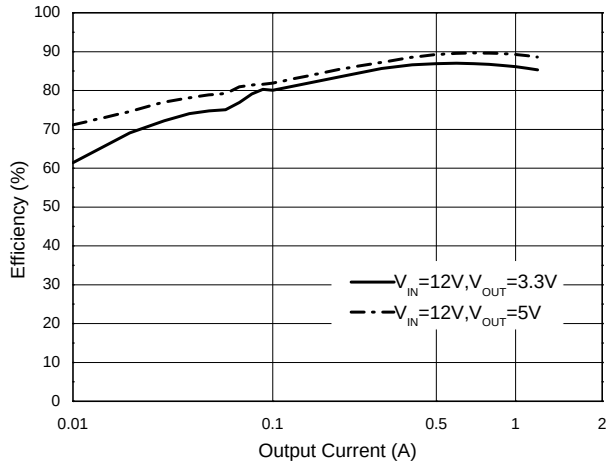
Electrical Characteristics (V_{IN} = V_{EN} = 12V, V_{OUT} = 3.3V, T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage	–	4.5	–	18	V
I_Q	Quiescent Current	V_{FB} = 0.9V	–	0.8	1.1	mA
I_{SHDN}	Shutdown Supply Current	V_{EN} = 0V	–	0.1	1.0	μA
V_{FB}	Feedback Voltage	–	0.785	0.810	0.835	V
V_{FBOV}	Feedback Over Voltage Threshold	–	–	0.972	–	V
I_{FB}	Feedback Bias Current	V_{FB} = 0.85V	-0.1	–	0.1	μA
R_{DSON}	Switch On-resistance	I_{SW} = 1A	–	0.35	–	Ω
I_{LEAK}	Switch Leakage Current	V_{IN} = 18V, V_{EN} = 0V	–	0.1	10	μA
I_{LIM}	Switch Current Limit	–	1.8	2.4	–	A
V_{ENH}	EN Pin Threshold	–	1.5	–	–	V
V_{ENL}		–	–	–	0.4	
V_{UVLO}	Input UVLO Threshold	V_{IN} Rising	3.3	3.8	4.3	V
V_{HYS}	Input UVLO Hysteresis	–	–	0.2	–	V
f_{OSC1}	Oscillator Frequency	–	1.1	1.4	1.7	MHz
f_{OSC2}		Short Circuit	–	460	–	kHz
D_{MAX}	Max. Duty Cycle	V_{FB} = 0.6V	–	90	–	%
D_{MIN}	Min. Duty Cycle	V_{FB} = 0.9V	–	–	0	%
t_{ON}	Minimum On Time	–	–	100	–	ns
T_{OTSD}	Thermal Shutdown	–	–	+160	–	ºC
T_{HYS}	Thermal Shutdown Hysteresis	–	–	+20	–	ºC
t_{SS}	Soft-start Time	–	–	200	–	μs

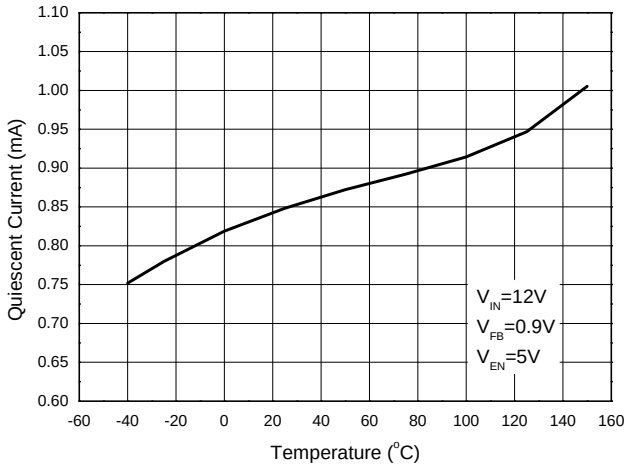
Note 2: R_{DSON}, t_{ON}, T_{OTSD}, T_{HYS} and t_{SS} are guaranteed by design.

Performance Characteristics (T_A = +25ºC, V_{IN} = 12V, V_{EN} = 5V, V_{OUT} = 3.3V, unless otherwise noted.)

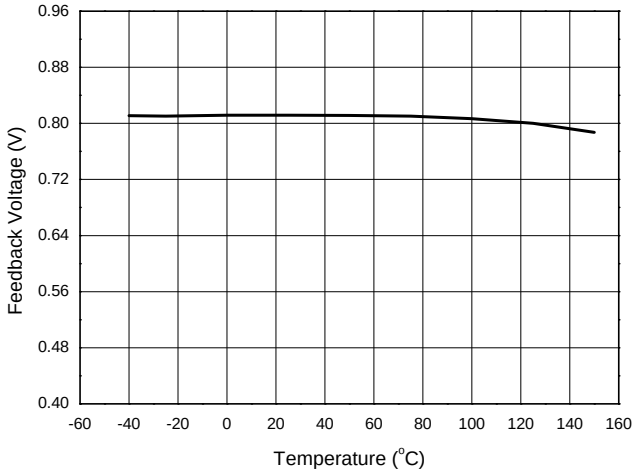
Efficiency vs. Output Current



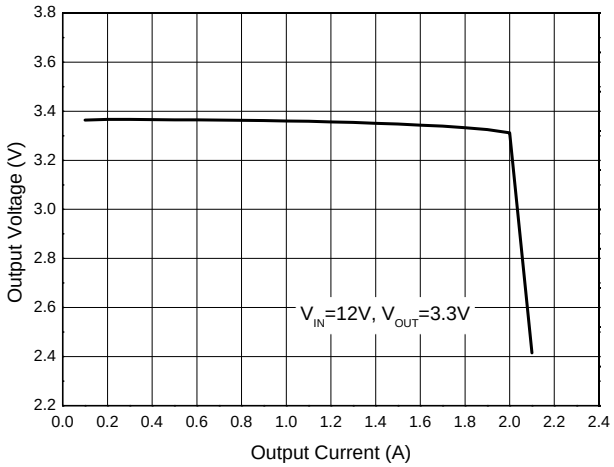
Quiescent Current vs. Temperature



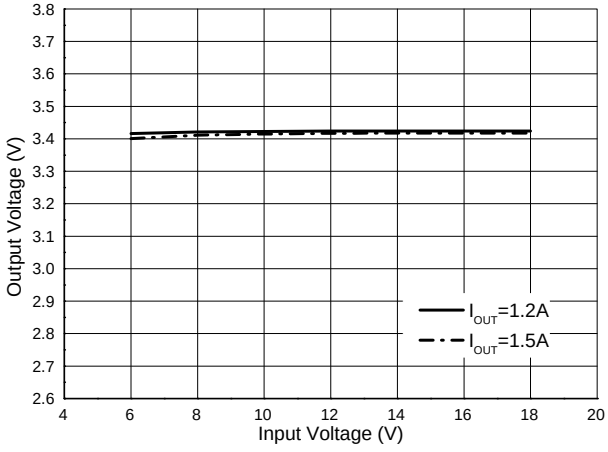
Feedback Voltage vs. Temperature



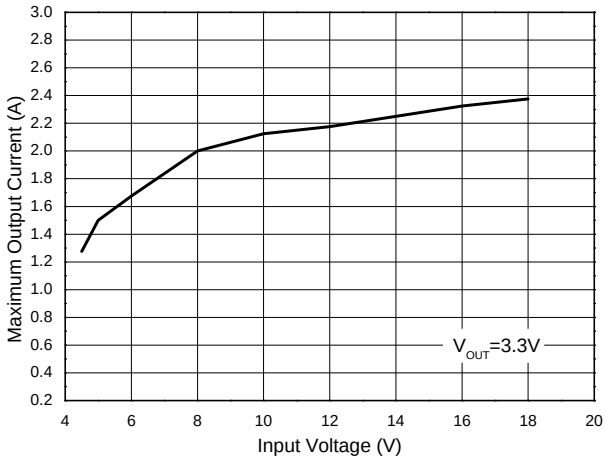
Output Voltage vs. Output Current



Output Voltage vs. Input Voltage

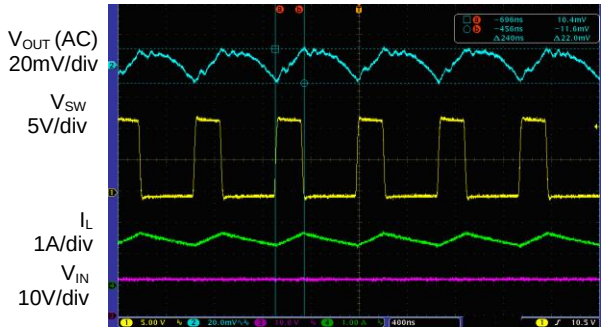


Maximum Output Current vs. Input Voltage



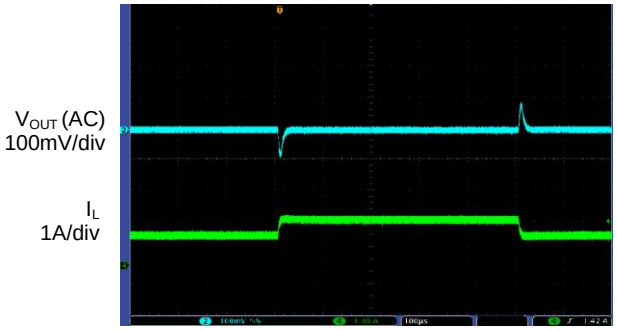
Performance Characteristics (Cont. T_A = +25ºC, V_{IN} = 12V, V_{EN} = 5V, V_{OUT} = 3.3V, unless otherwise noted.)

Output Ripple (I_{OUT}=1.5A)



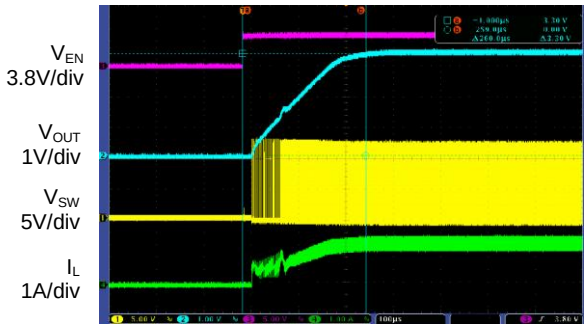
Time (400ns/div)

Load Transient (I_{OUT}=1 to 1.5A)



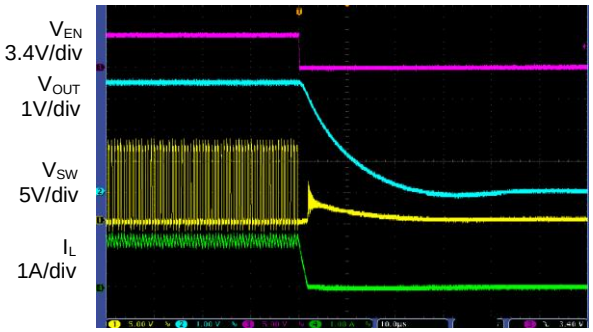
Time (100µs/div)

Enable Turn-on Characteristic (Resistance Load, R_{LOAD}=2.6Ω)



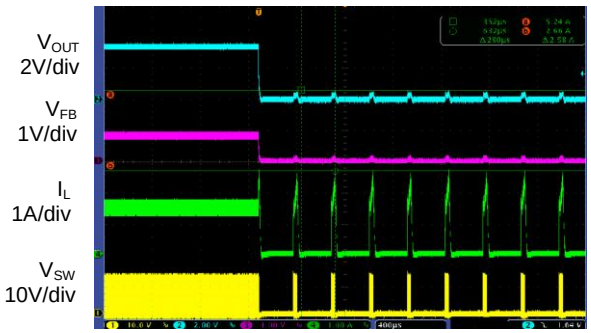
Time (100µs/div)

Enable Turn-off Characteristic (Resistance Load, R_{LOAD}=2.6Ω)



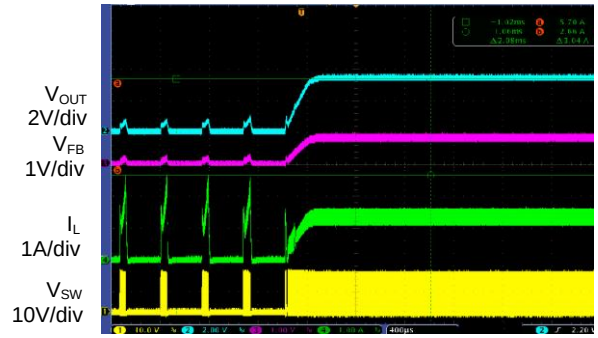
Time (10µs/div)

Short Circuit Protection (I_{OUT}=1.5A)



Time (400µs/div)

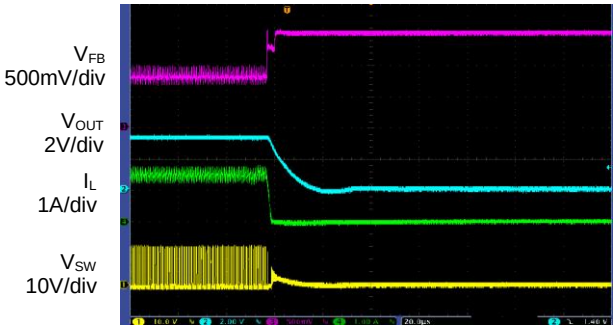
Short Circuit Recovery (R_{LOAD}=2.6Ω)



Time (400µs/div)

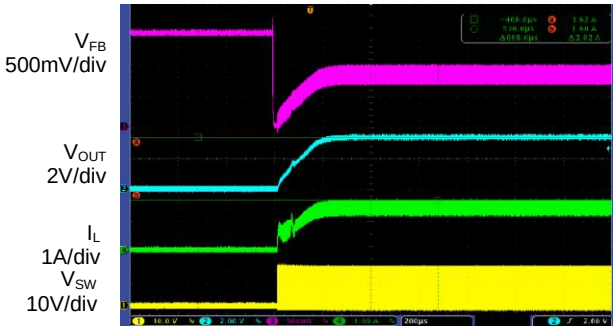
Performance Characteristics (Cont. T_A = +25ºC, V_{IN} = 12V, V_{EN} = 5V, V_{OUT} = 3.3V, unless otherwise noted.)

Over Voltage Protection (I_{OUT}=1.5A)



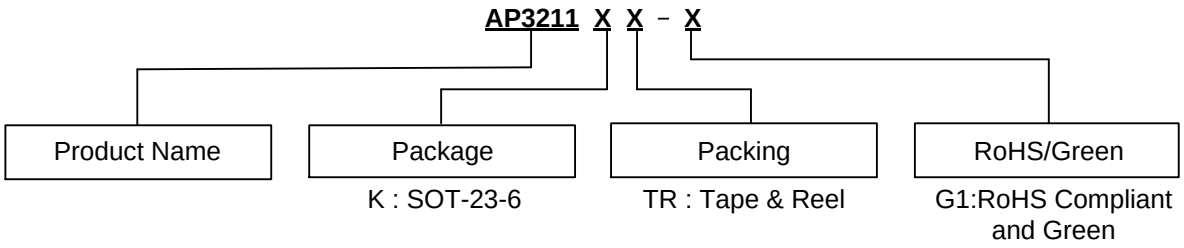
Time (20μs/div)

Over Voltage Recovery (I_{OUT}=1.5A)



Time (200μs/div)

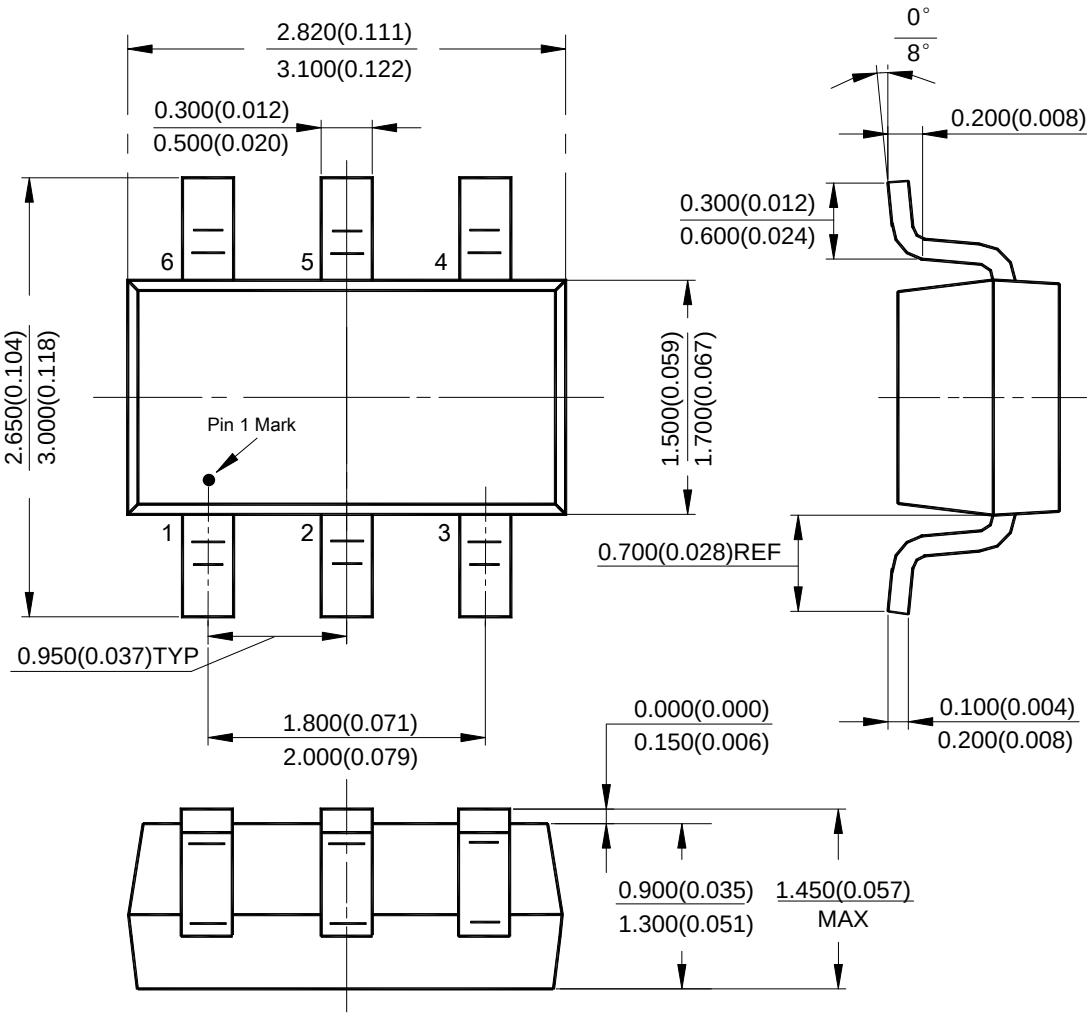
Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-6	-40 to +85°C	AP3211KTR-G1	GCI	Tape & Reel

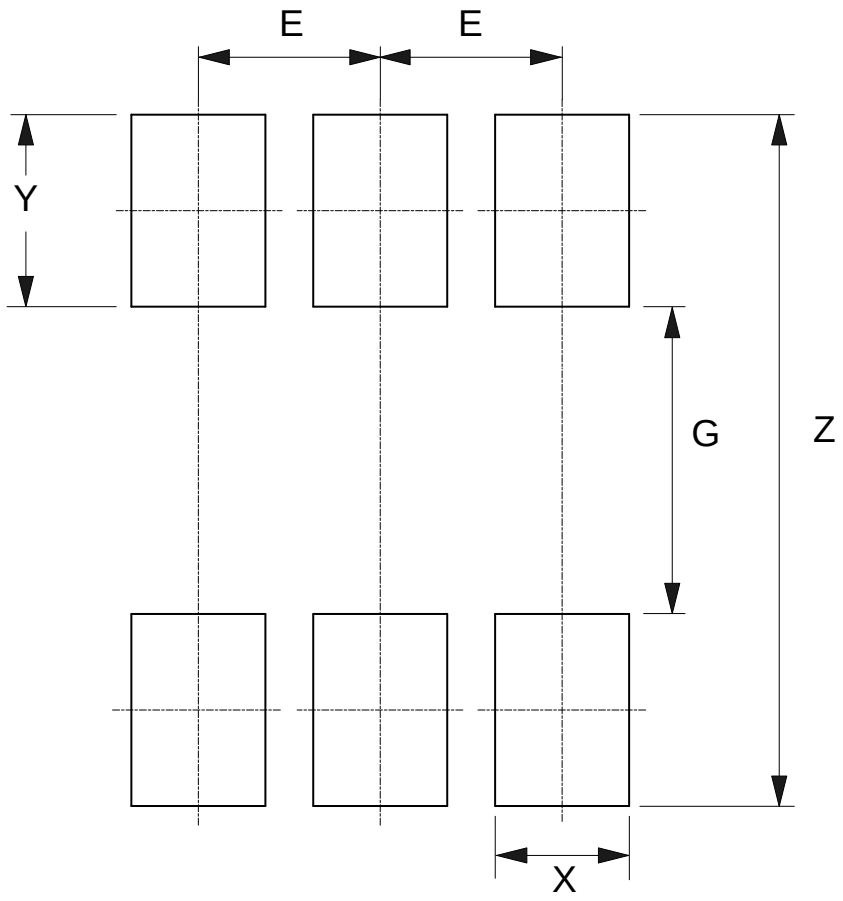
Package Outline Dimensions (All dimensions in mm(inch).)

(1) Package Type: SOT-23-6



Suggested Pad Layout

(1) Package Type: SOT-23-6



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

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