THE DATASHEET OF

AP3406AMM-ADJTRG1

1.1MHz, 800mA SYNCHRONOUS DC-DC BUCK CONVERTER AP3406A

General Description

The AP3406A is a 1.1MHz fixed frequency, current mode, PWM synchronous buck (step-down) DC-DC converter, capable of driving a 800mA load with high efficiency, excellent line and load regulation. The device integrates a main switch and a synchronous switch without an external Schottky diode. 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 AP3406A. This feature greatly simplifies the design of switch-mode power supplies.

This IC is available in TSOT-23-5, MSOP-10 and DFN-2×2-6(1) packages.

Features

- High Efficiency: up to 95%
- Output Current: 800mA
- Input Voltage Range: 2.5V to 5.5V
- Fixed 1.1MHz Frequency
- Current Mode Control
- 100% Duty Cycle in Dropout
- Built-in Short Circuit Protection
- Built-in Thermal Shutdown Function
- Built-in Current Limit Function
- Shutdown Current: <1μA

Applications

- GPS
- WiFi Card
- Portable Media Player
- Digital Still and Video Cameras

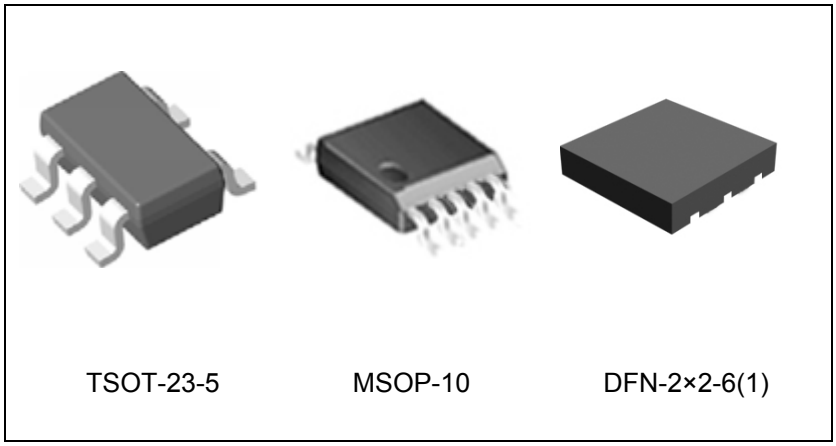
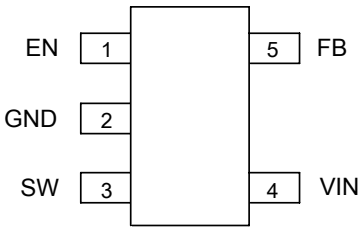


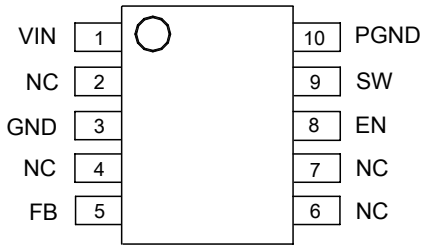
Figure 1. Package Types of AP3406A

Pin Configuration

KT Package
TSOT-23-5



MM Package
MSOP-10



DN Package
DFN-2×2-6(1)

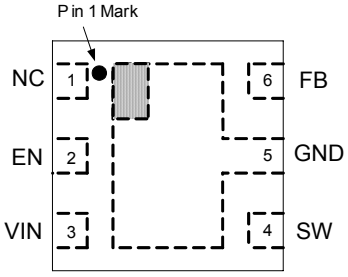


Figure 2. Pin Configuration of AP3406A (Top View)

Pin Description

Pin Number			Pin Name	Function
TSOT-23-5	MSOP-10	DFN-2×2-6(1)		
1	8	2	EN	Control input pin. Forcing this pin above 1.5V enables the IC. Forcing this pin below 0.6V shuts down the IC. When the IC is in shutdown mode, all functions are disabled to decrease the supply current below 1μA
2	3	5	GND	Ground pin
3	9	4	SW	Power switch output pin. Inductor connection to drain of the internal PFET and NFET switches
4	1	3	VIN	Supply input pin. Bypass to GND with a 10μF or greater ceramic capacitor
5	5	6	FB	Feedback pin. Connect it with an external resistor divider network to program the system output voltage
	2, 4, 6, 7	1	NC	No connection
	10		PGND	Power ground pin

Functional Block Diagram

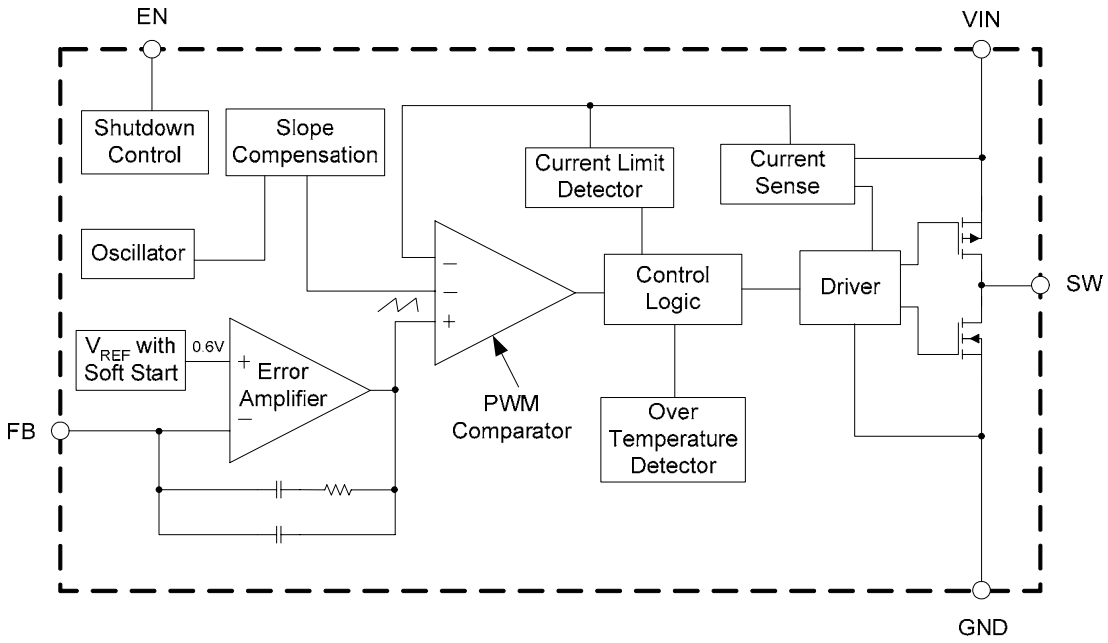
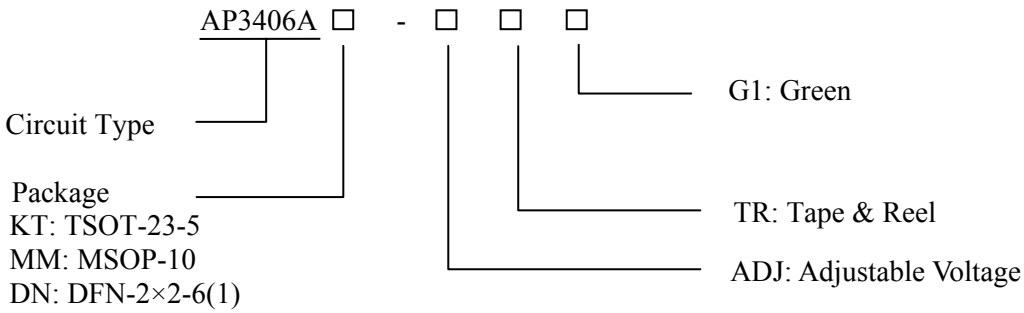


Figure 3. Functional Block Diagram of AP3406A

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
TSOT-23-5	-40 to 85°C	AP3406AKT-ADJTRG1	L2A	Tape & Reel
MSOP-10		AP3406AMM-ADJTRG1	3406AMM-G1	Tape & Reel
DFN-2×2-6(1)		AP3406ADN-ADJTRG1	BA	Tape & Reel

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

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Input Voltage	V_{IN}	-0.3 to 6		V
Feedback Voltage	V_{FB}	-0.3 to V_{IN} +0.3		V
EN Pin Voltage	V_{EN}	-0.3 to V_{IN}+0.3		V
SW Pin Voltage	V_{SW}	-0.3 to V_{IN}+0.3		V
Thermal Resistance	θ_{JA}	TSOT-23-5	250	ºC/W
		MSOP-10	135	
		DFN-2×2-6(1)	100	
Operating Junction Temperature	T_J	150		ºC
Storage Temperature	T_{STG}	-65 to 150		ºC
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260		ºC

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

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.5	5.5	V
Maximum Output Current	$I_{OUT\ (MAX)}$	800		mA
Operating Ambient Temperature	T_A	-40	85	ºC

Electrical Characteristics

V_{IN} =V_{EN}=3.6V, T_A=25℃, unless otherwise specified. Specifications with **boldface type** apply over full operating temperature range from -40 to 85ºC.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
Supply Current	I_{CC}	V_{FB}=0.55V		400	600	μA
Shutdown Supply Current	I_{SHDN}	V_{EN}=0V, V_{IN}=5.5V		0.01	1	μA
Under Voltage Lockout Threshold	V_{UVLO}	Rising edge		2.27		V
Under Voltage Lockout Hysteresis	V_{HUVLO}			200		mV
Feedback Bias Current	I_{FB}	V_{FB}=0.65V	-50	0.5	50	nA
Feedback Voltage	V_{FB}	I_{OUT}=100mA	0.588/ **0.582**	0.600	0.612/ **0.618**	V
Maximum Output Current	$I_{OUT\ (MAX)}$	V_{IN}=2.5V, V_{OUT}=0.9V	800			mA
		V_{IN}=3.6V, V_{OUT}=1.2V	800			
		V_{IN}=4.6V, V_{OUT}=3.3V	800			
Switch Current Limit	I_{LIM}	V_{FB}=0.55V	0.95	1.25		A
Oscillator Frequency	f_{OSC}		0.8	1.1	1.4	MHz
EN Pin Threshold	V_{ENL}				0.6	V
	V_{ENH}		1.5			
EN Pin Input Leakage Current	I_H	V_{EN}=3.6V	-0.1		0.1	μA
	I_L	V_{EN}=0V	-0.1		0.1	μA
Internal PFET On Resistance	R_{DSONP}	I_{SW}=100mA		0.44		Ω
Internal NFET On Resistance	R_{DSONN}	I_{SW}=-100mA		0.29		Ω
Maximum Duty Cycle	D_{MAX}	V_{FB}=0.55V		100		%
Soft-start Time	T_{SS}	V_{EN}=0V to V_{IN} I_{OUT}＝50mA		220		μs
Thermal Shutdown Threshold	T_{OTSD}			160		ºC
Thermal Shutdown Hysteresis	T_{HYS}			30		ºC

Typical Performance Characteristics

L=10μH, C_{IN}=C_{OUT}=10μF, T_A=25°C, unless otherwise noted.

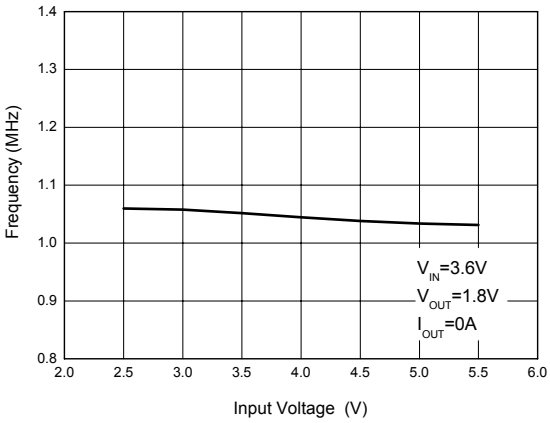


Figure 4. Frequency vs. Input Voltage

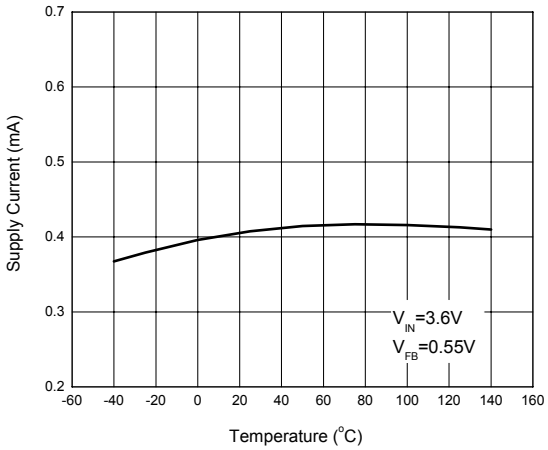


Figure 5. Supply Current vs. Temperature

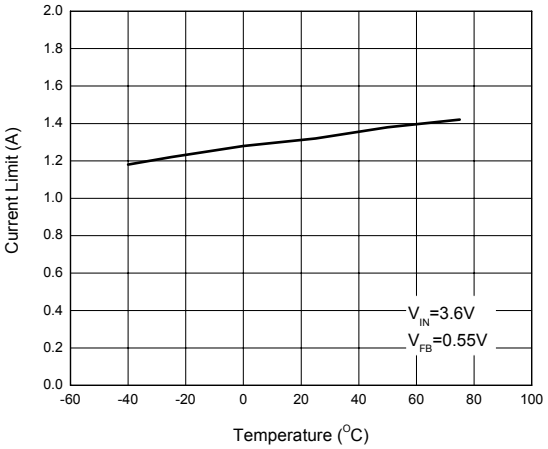


Figure 6. Current Limit vs. Temperature

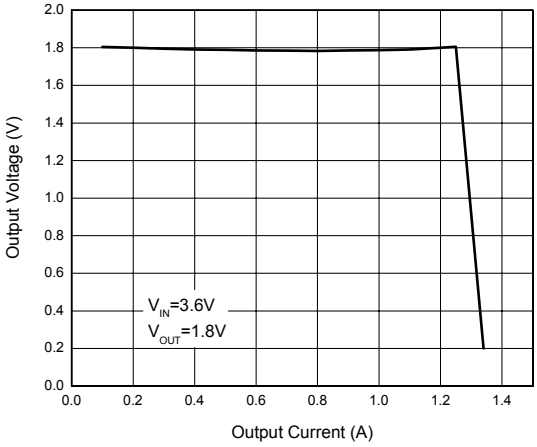


Figure 7. Output Voltage vs. Output Current

Typical Performance Characteristics (Continued)

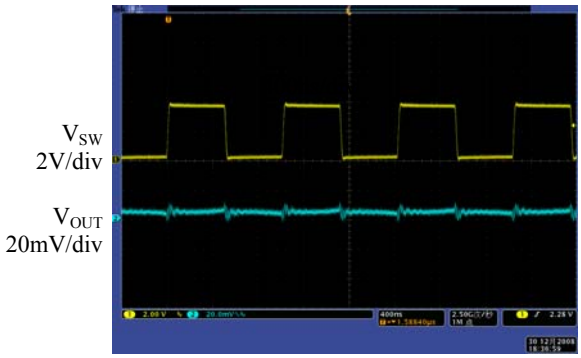


Figure 8. Light Load Operation
(V_{IN}=3.6V, V_{OUT}=1.8V, I_{OUT}=0mA)

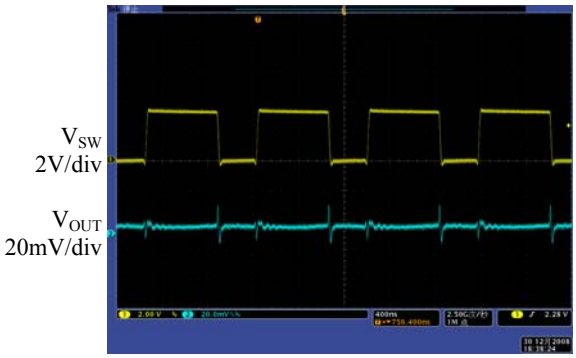


Figure 9. Heavy Load Operation
(V_{IN}=3.6V, V_{OUT}=1.8V, I_{OUT}=800mA)

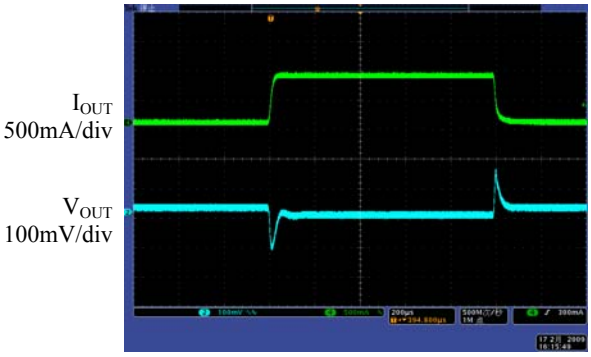


Figure 10. Load Transient
(V_{IN}=3.6V, V_{OUT}=1.8V, I_{OUT}=0mA to 800mA)

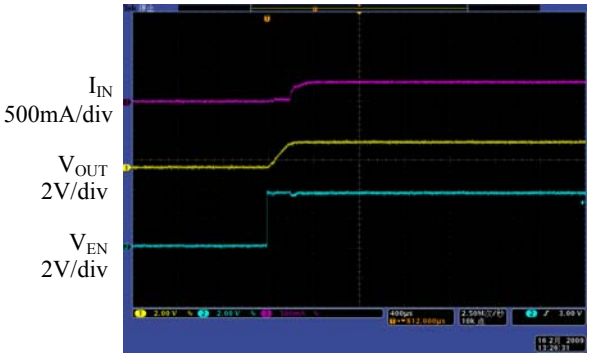


Figure 11. Start up from Shutdown
(V_{IN}=3.6V, V_{OUT}=1.8V, R_{LOAD}=2.5Ω)

Typical Performance Characteristics (Continued)

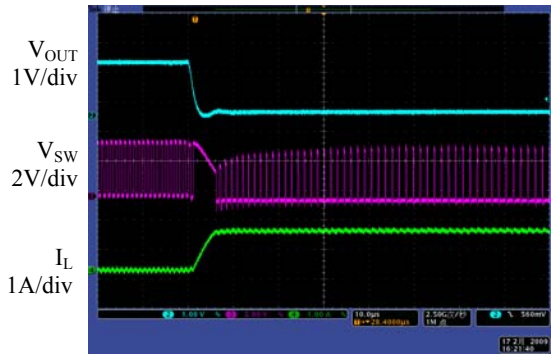


Figure 12. Short Circuit Protection
(V_{IN}=3.6V, V_{OUT}=1.8V, no load)

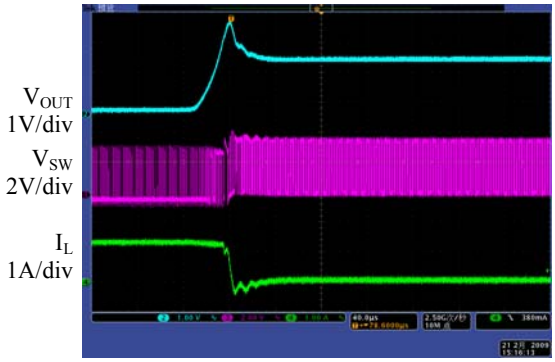


Figure 13. Short Circuit Recovery
(V_{IN}=3.6V, V_{OUT}=1.8V, no load)

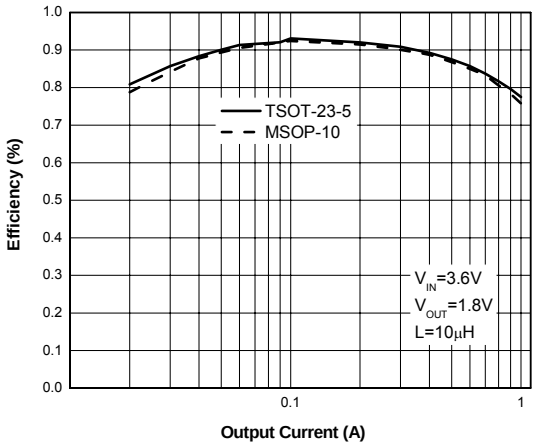


Figure 14. Efficiency vs. Output Current

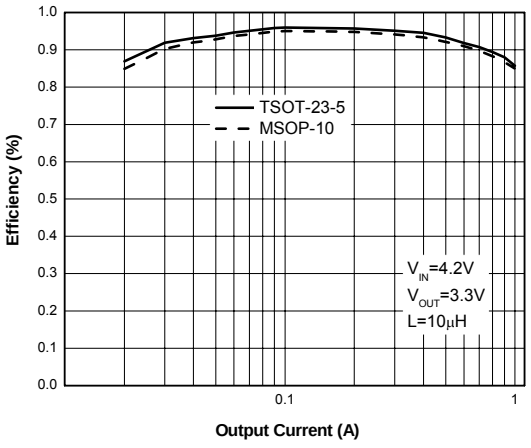


Figure 15. Efficiency vs. Output Current

Typical Performance Characteristics (Continued)

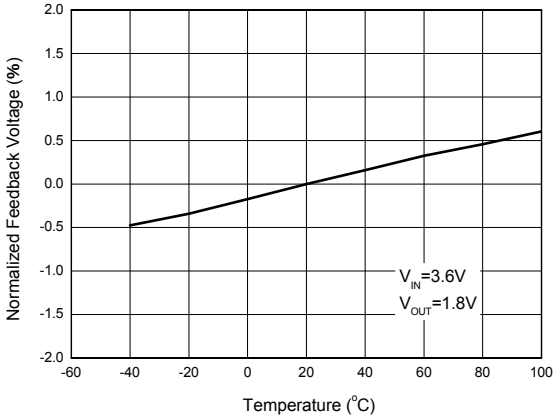


Figure 16. Normalized Feedback Voltage vs. Temperature

Typical Application

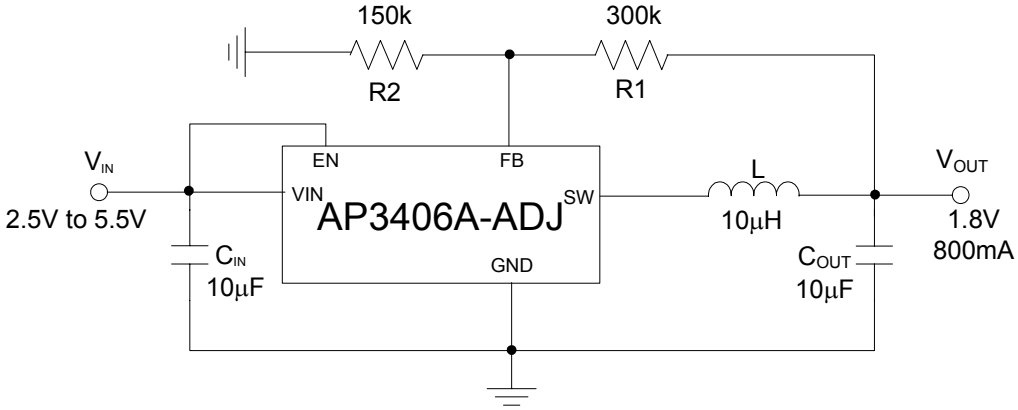
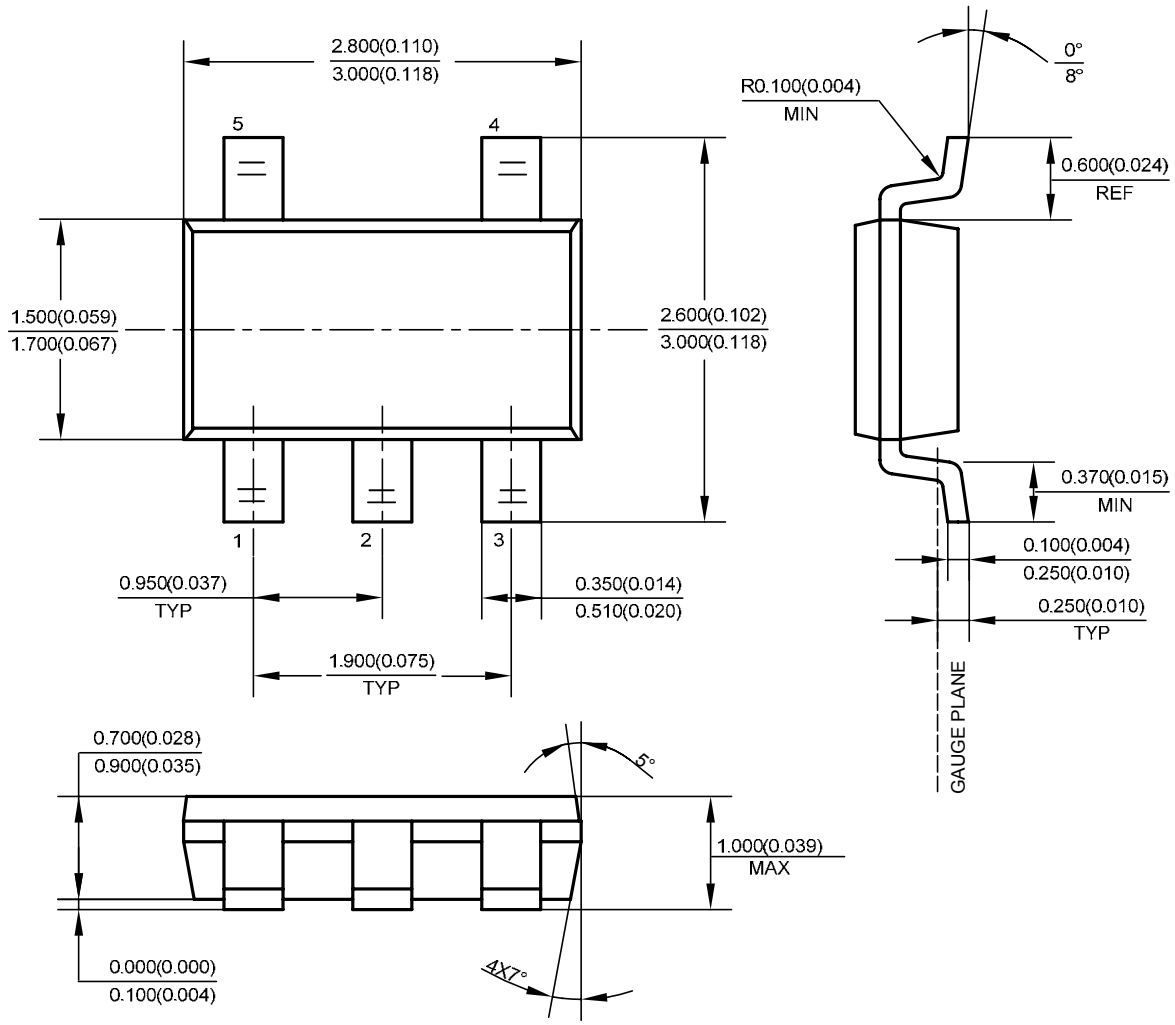


Figure 17. Typical Application of AP3406A

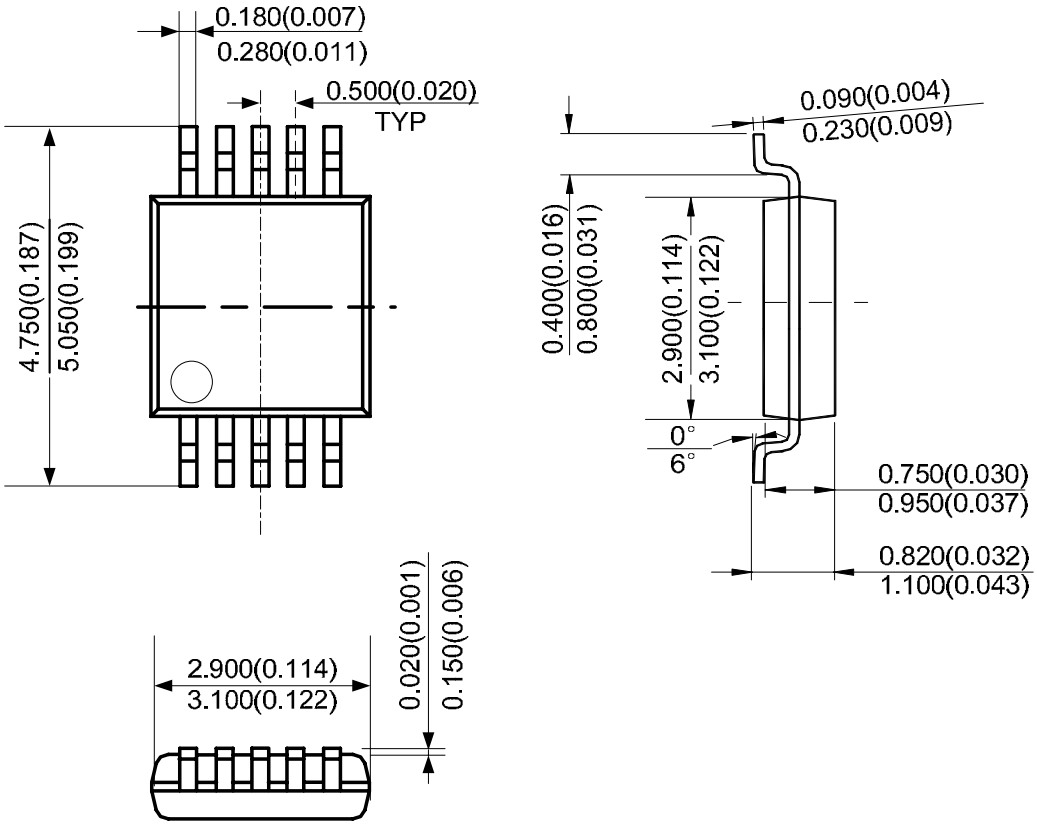
Mechanical Dimensions

TSOT-23-5 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

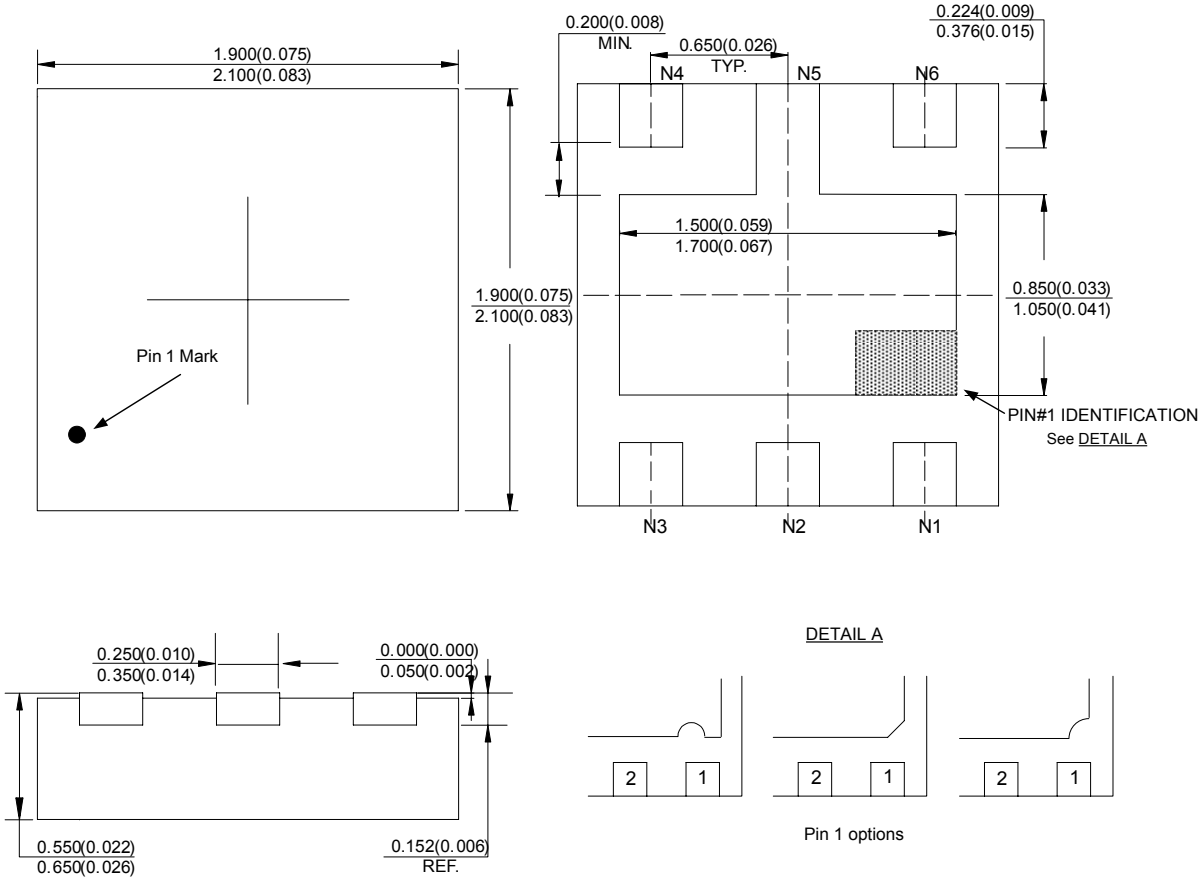
MSOP-10 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

DFN-2×2-6(1) **Unit: mm(inch)**



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