Pin Configuration

MP Package
(PSOP-8)

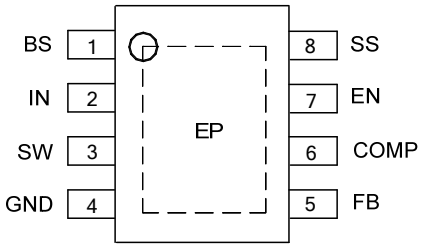


Figure 2. Pin Configuration of AP3503F (Top View)

Pin Description

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 power MOSFET
2	IN	Supply power input pin. A capacitor should be connected between the IN pin and GND pin to keep the input voltage constant
3	SW	Power switch output pin. This pin is connected to the inductor and bootstrap capacitor
4	GND	Ground pin
5	FB	Feedback pin. This pin is connected to an external resistor divider to program the system output voltage. When the FB pin voltage exceeds 1.1V, the over voltage protection is triggered. When the FB pin voltage is below 0.3V, the oscillator frequency is lowered to realize short circuit protection
6	COMP	Compensation pin. This pin is the output of the transconductance error amplifier and the input to the current comparator. It is used to compensate the control loop. Connect a series RC network from this pin to GND. In some cases, an additional capacitor from this pin to GND pin is required
7	EN	Control input pin. EN is a digital input that turns the regulator on or off. Drive EN high/low to turn on/off the regulator. Pull up with 100kΩ resistor for automatic startup
8	SS	Soft-start control input pin. SS controls the soft-start period. Connect a capacitor from SS to GND to set the soft-start period. A 0.1μF capacitor sets the soft-start period to 15ms. To disable the soft-start feature, leave SS unconnected
	EP	Exposed pad. It should be connected to GND in PCB layout

340kHz, 3A Synchronous DC-DC Buck Converter AP3503F

Functional Block Diagram

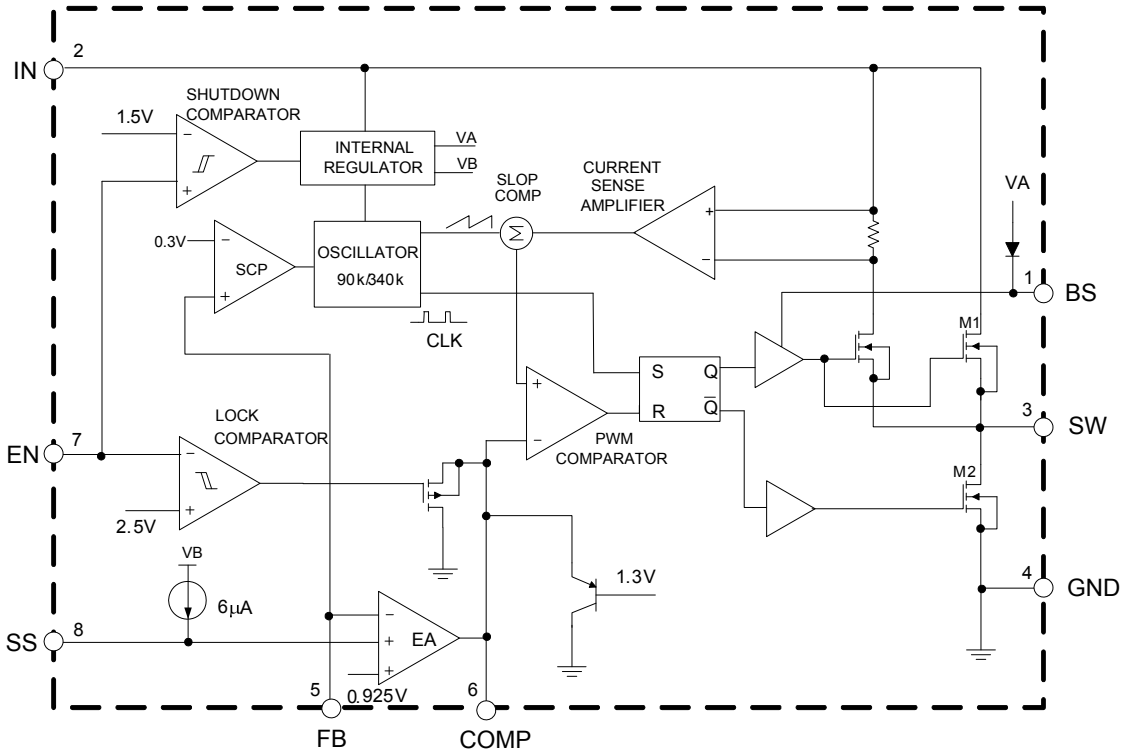
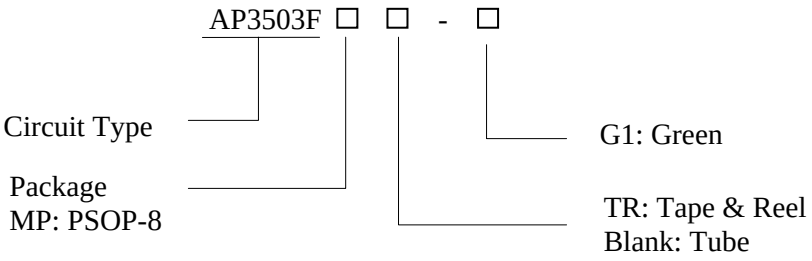


Figure 3. Functional Block Diagram of AP3503F

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
PSOP-8	-40 to 85°C	AP3503FMP-G1	3503FMP-G1	Tube
		AP3503FMPTR-G1	3503FMP-G1	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
IN Pin Voltage	V_{IN}	-0.3 to 20	V
EN Pin Voltage	V_{EN}	-0.3 to V_{IN}	V
SW Pin Voltage	V_{SW}	21	V
BS Pin Voltage	V_{BS}	-0.3 to V_{SW}+6	V
FB Pin Voltage	V_{FB}	-0.3 to 6	V
COMP Pin Voltage	V_{COMP}	-0.3 to 6	V
SS Pin Voltage	V_{SS}	-0.3 to 6	V
Thermal Resistance	θ_{JA}	60	°C/W
Operating Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
ESD (Human Body Model)	V_{HBM}	2000	V
ESD (Machine Model)	V_{MM}	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

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	4.5	18	V
Operating Ambient Temperature	T_A	-40	85	°C

Electrical Characteristics

T_A=25°C, V_{IN}=V_{EN}=12V, V_{OUT}=3.3V, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
SUPPLY VOLTAGE (IN PIN)						
Input Voltage	V_{IN}		4.5		18	V
Quiescent Current	I_Q	V_{FB}=1V,V_{EN}=3V		1.2	1.4	mA
Shutdown Supply Current	I_{SHDN}	V_{EN}=0V		0.1	10	μA
UNDER VOLTAGE LOCKOUT						
Input UVLO Threshold	V_{UVLO}	V_{IN} Rising	3.65	4.00	4.25	V
Input UVLO Hysteresis	V_{HYS}			200		mV
ENABLE (EN PIN)						
EN Shutdown Threshold Voltage			1.1	1.5	2	V
EN Shutdown Threshold Voltage Hysteresis (Note 2)				350		mV
EN Lockout Threshold Voltage			2.2	2.5	2.7	V
EN Lockout Hysteresis				210		mV
VOLTAGE REFERENCE (FB PIN)						
Feedback Voltage	V_{FB}		0.907	0.925	0.943	V
Feedback Over Voltage Threshold	V_{FBOV}			1.1		V
Feedback Bias Current	I_{FB}	V_{FB}=1V	-0.1		0.1	μA
MOSFET						
High-side Switch On-resistance(Note 3)	R_{DSONH}	I_{SW}=0.2A/0.7A		100		mΩ
Low-side Switch On-resistance(Note 3)	R_{DSONL}	I_{SW}=-0.2A/-0.7A		100		mΩ
CURRENT LIMIT						
High-side Switch Leakage Current	I_{LEAKH}	V_{IN}=18V,V_{EN}=V_{SW}=0V		0.1	10	μA
High-side Switch Current Limit	I_{LIMH}		4.3	5.6		A
Low-side Switch Current Limit	I_{LIML}	From drain to Source		1.4		A
SWITCHING REGULATOR						
Oscillator Frequency	f_{OSC1}		280	340	400	kHz
Short Circuit Oscillator Frequency	f_{OSC2}			90		kHz
Max. Duty Cycle	D_{MAX}	V_{FB}=0.85V		90		%
Min. Duty Cycle	D_{MIN}	V_{FB}=1V			0	%
ERROR AMPLIFIER						
Error Amplifier Voltage Gain (Note 2)	A_{EA}			400		V/V
Error Amplifier Transconductance	G_{EA}			800		μA/V
COMP to Current Sense Transconductance	G_{CS}			5.2		A/V
THERMAL SHUTDOWN						
Thermal Shutdown (Note 2)	T_{OTSD}			160		°C
Thermal Shutdown Hysteresis (Note 2)	T_{HYS}			20		°C
SOFT START (SS PIN)						
Soft-start Time (Note 2)	t_{SS}	C_{SS}=0.1μF		15		ms
Soft-start Current		V_{SS}=0V		6		μA

Note 2: Not tested, guaranteed by design.

Note 3: $R_{DSON}=\frac{V_{SW1}-V_{SW2}}{I_{SW1}-I_{SW2}}$.

Typical Performance Characteristics

T_A=25ºC, V_{IN}=12V, V_{OUT}=3.3V, unless otherwise noted.

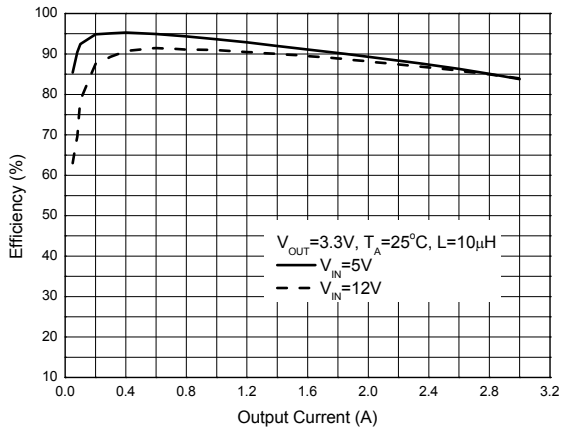


Figure 4. Efficiency vs. Output Current

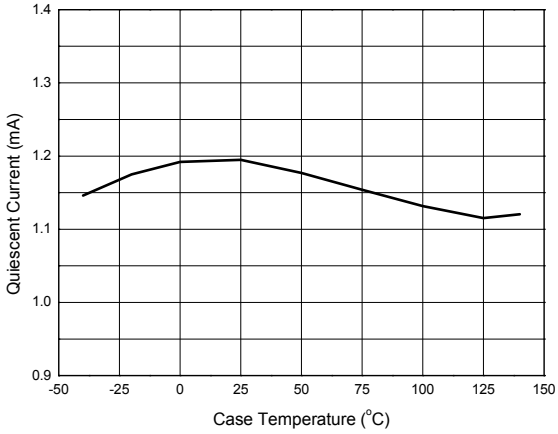


Figure 5. Quiescent Current vs. Case Temperature

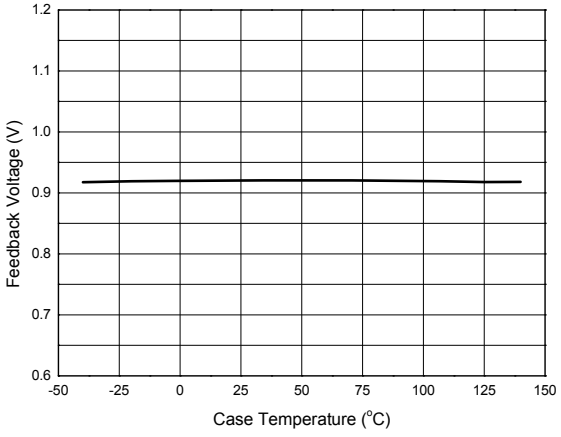


Figure 6. Feedback Voltage vs. Case Temperature

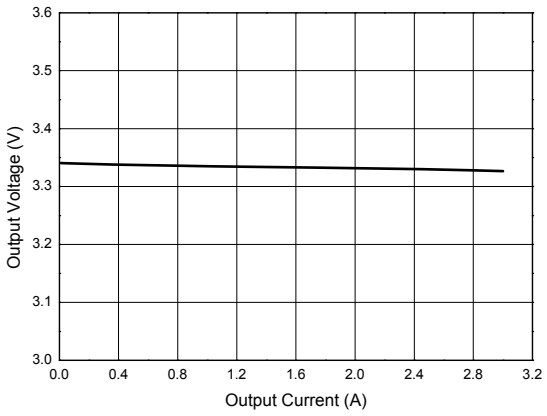


Figure 7. Output Voltage vs. Output Current

Typical Performance Characteristics (Continued)

T_A=25ºC, V_{IN}=12V, V_{OUT}=3.3V, unless otherwise noted.

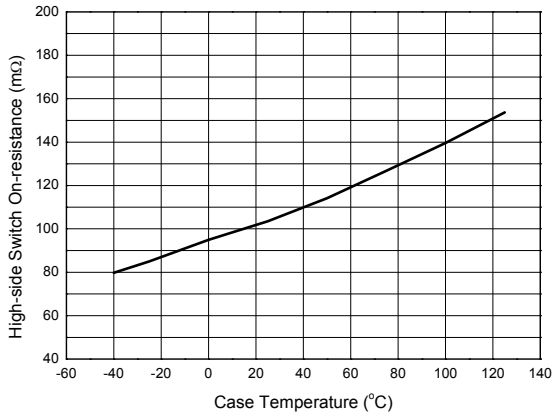


Figure 8. High-side Switch On-resistance vs. Case Temperature

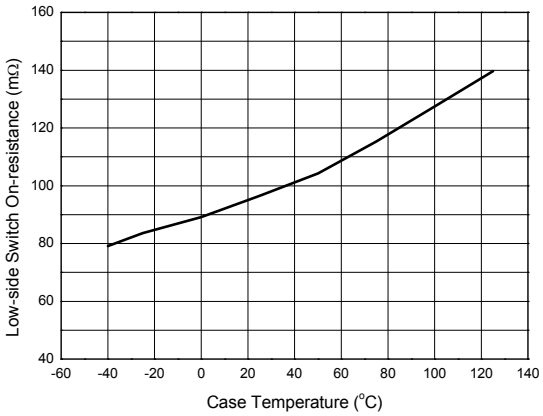


Figure 9. Low-side Switch On-resistance vs. Case Temperature

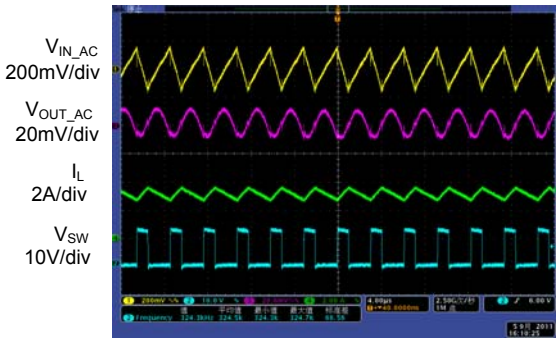


Figure 10. Output Ripple (I_{OUT}=3A)

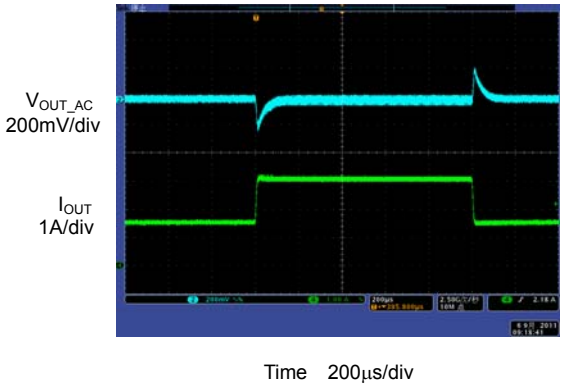


Figure 11. Load Transient (I_{OUT} =1.5A to 3A)

Typical Performance Characteristics (Continued)

T_A=25ºC, V_{IN}=12V, V_{OUT}=3.3V, unless otherwise noted.

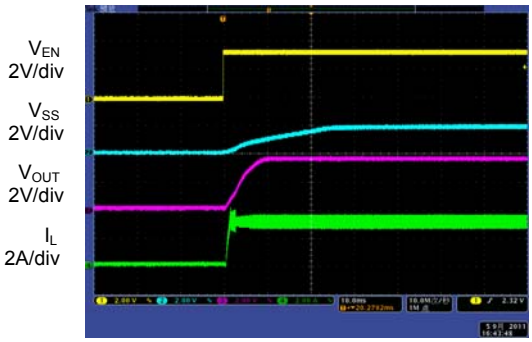


Figure 12. Enable Turn on Characteristic
(V_{IN}=12V, V_{EN}=3.3V, V_{OUT}=3.3V, I_L=3A)

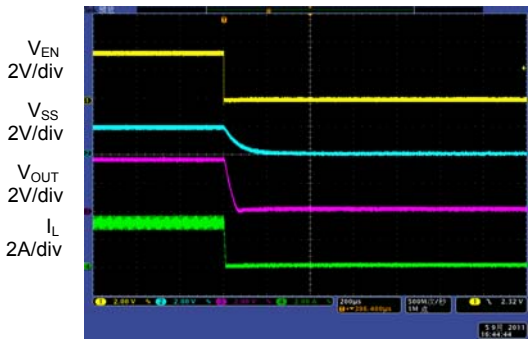


Figure 13. Enable Turn off Characteristic
(V_{IN}=12V, V_{EN}=3.3V, V_{OUT}=3.3V, I_L=3A)

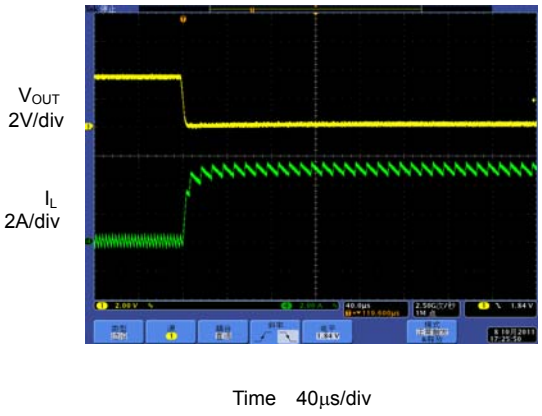


Figure 14. Short Circuit Protection (I_{OUT}=0A)

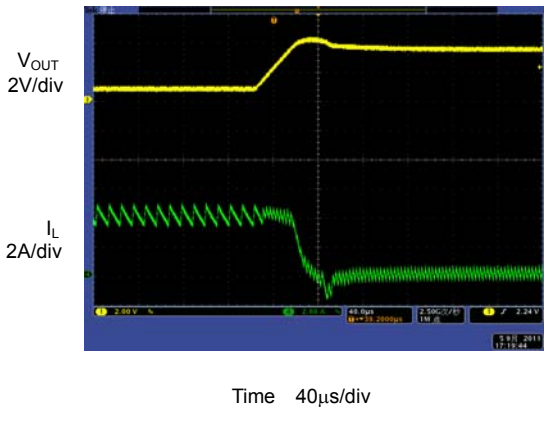


Figure 15. Short Circuit Recovery (I_{OUT}=0A)

Typical Application

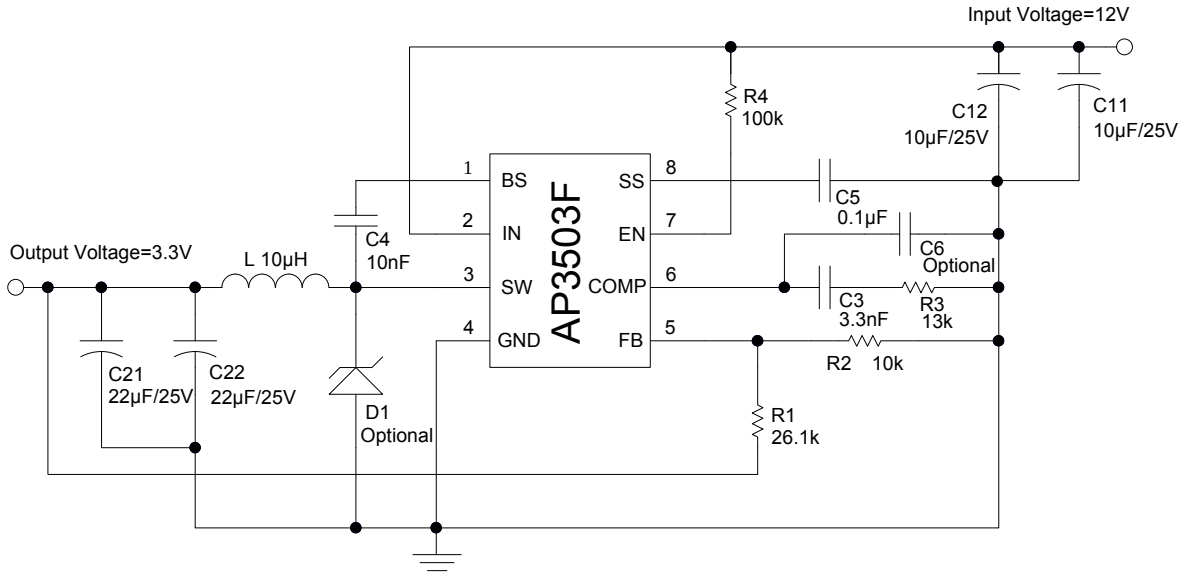
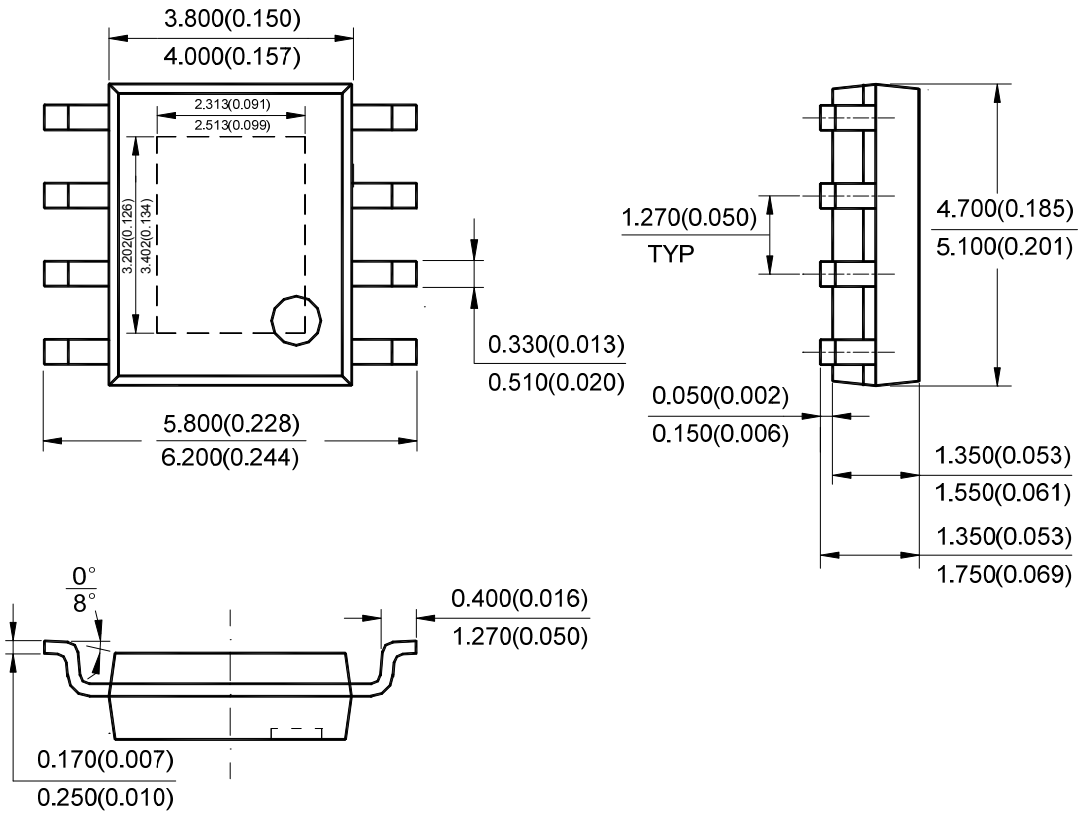


Figure 16. Typical Application of AP3503F

Mechanical Dimensions

PSOP-8 **Unit: mm(inch)**



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

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