

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A****General Description**

The AP3407/A is a 1.4MHz fixed frequency, current mode, PWM synchronous buck (step-down) DC-DC converter, capable of driving a 1.2A load with high efficiency, excellent line and load regulation. The device integrates synchronous P-channel and N-channel power MOSFET switches with low on-resistance. 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 AP3407/A. This feature greatly simplifies the design of switch-mode power supplies.

The AP3407/A is available in SOT-23-5.

**Features**

- Input Voltage Range: 2.5V to 5.5V
- Output Voltage: 0.6V to  $V_{IN}$
- ADJ Output
- Fixed 1.4MHz Frequency
- High Efficiency up to 95%
- Output Current: 1.2A
- Current Mode Control
- 100% Duty Cycle in Dropout
- Built-in Over Current Protection
- Built-in Short Circuit Protection
- Built-in Thermal Shutdown Protection
- Built-in UVLO Function
- Built-in Soft-start

**Applications**

- Datacom
- Portable Device
- Smart Phone

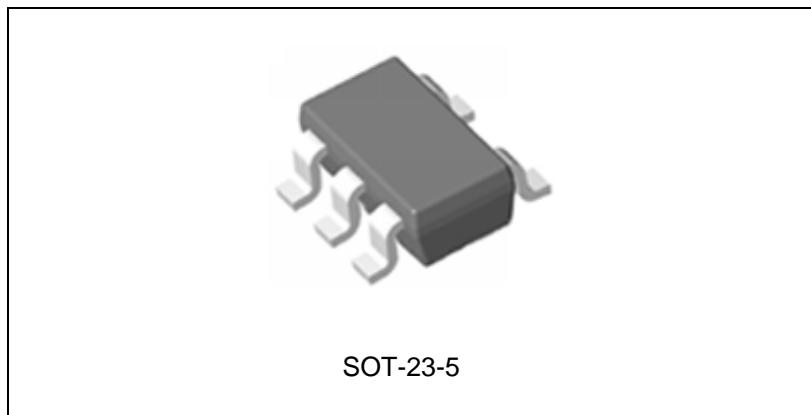
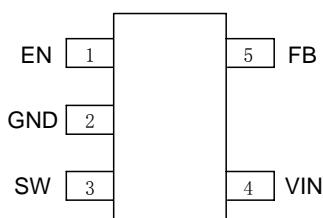


Figure 1. Package Type of AP3407/A

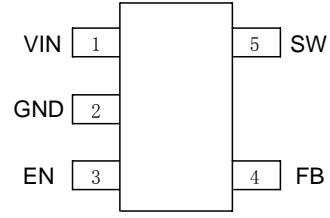
**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A**
**Pin Configuration**

K Package

(SOT-23-5)



(For AP3407)

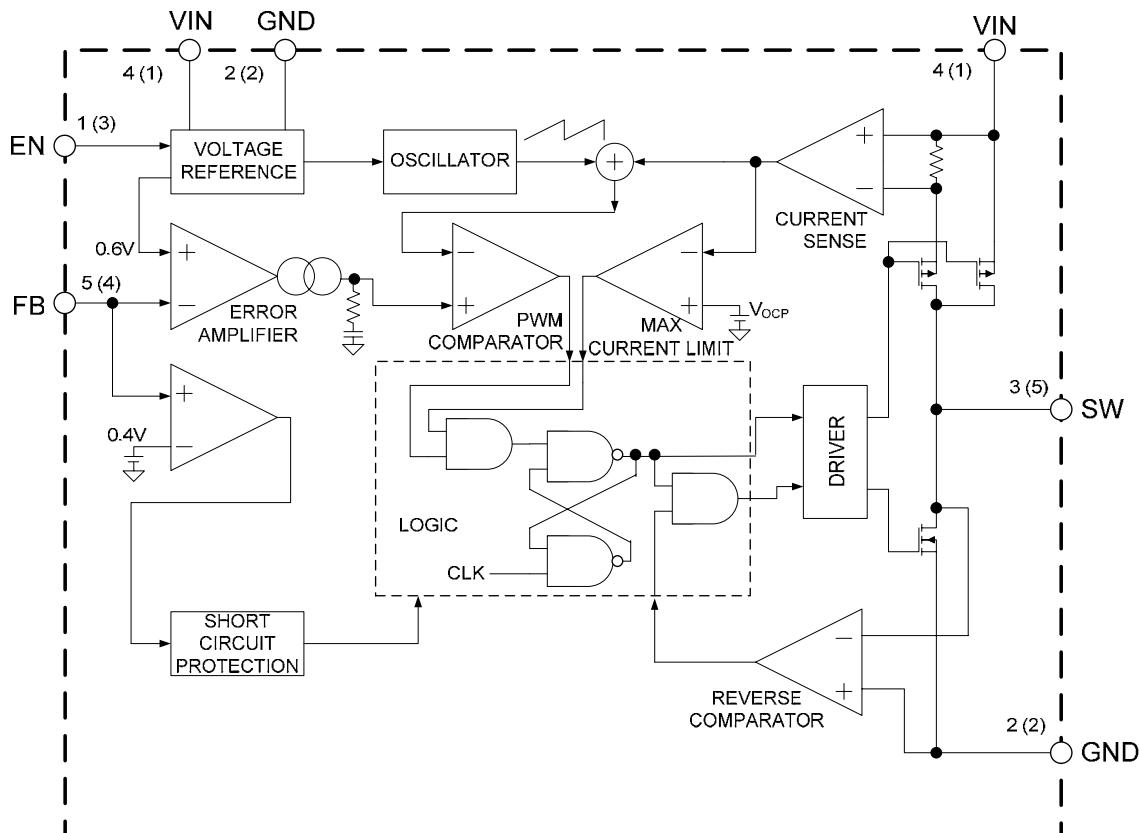


(For AP3407A)

Figure 2. Pin Configuration of AP3407/A (Top View)

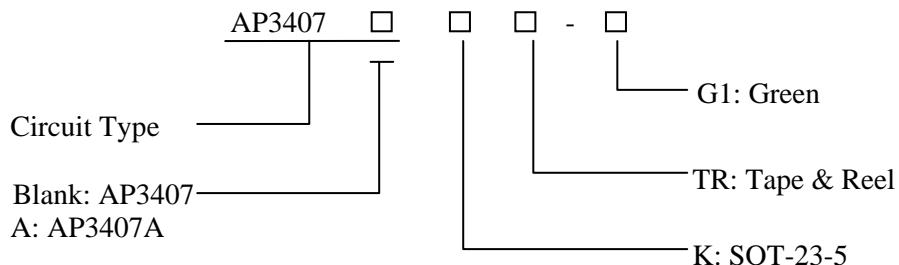
**Pin Description**

Pin Number		Pin Name	Function
AP3407	AP3407A		
1	3	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 1.2A
2	2	GND	Ground pin
3	5	SW	Power switch output pin. Inductor connection to drain of the internal PFET and NFET switches
4	1	VIN	Supply input pin. Bypass to GND with a 4.7µF or greater ceramic capacitor
5	4	FB	This is the feedback pin of the device. Connect this pin directly to the output if the fixed output voltage version is used. For the adjustable version an external resistor divider is connected to this pin.

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A**
**Functional Block Diagram**


A (B)  
A for AP3407  
B for AP3407A

Figure 3. Functional Block Diagram of AP3407/A

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A**
**Ordering Information**


Package	Temperature Range	Part Number	Marking ID	Packing Type
		Green	Green	
SOT-23-5	-40 to 85 °C	AP3407KTR-G1 AP3407AKTR-G1	GJA GJB	Tape & Reel 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 <sub>IN</sub>	-0.3 to 6.0	V
Feedback Voltage	V <sub>FB</sub>	-0.3 to V <sub>IN</sub> +0.3	V
EN Pin Voltage	V <sub>EN</sub>	-0.3 to V <sub>IN</sub> +0.3	V
SW Pin Voltage	V <sub>SW</sub>	-0.3 to V <sub>IN</sub> +0.3	V
Thermal Resistance	θ <sub>JA</sub>	265	°C/W
Thermal Resistance	θ <sub>JC</sub>	60	°C/W
Power Dissipation	P <sub>D</sub>	0.377	W
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature	T <sub>STG</sub>	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T <sub>LEAD</sub>	260	°C

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.

Note 2: The junction temperature rise is given by  $T_{RISING} = P_D * \theta_{JA}$ , where  $P_D$  is the power dissipated by regulator,  $\theta_{JA}$  is the thermal resistance from junction of the die to the ambient temperature; The junction temperature,  $T_J$  is given by  $T_J = T_A + T_R$ , where  $T_A$  is the ambient temperature.

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A****Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Input Voltage	V <sub>IN</sub>	2.5	5.5	V
Maximum Output Current	I <sub>OUT (MAX)</sub>	1.2		A
Operating Ambient Temperature	T <sub>A</sub>	-40	85	°C

**Electrical Characteristics**

V<sub>IN</sub>=V<sub>DD</sub>=V<sub>PVDD</sub>=3.3V, T<sub>A</sub>=25°C, unless otherwise specified.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage	V <sub>IN</sub>		2.5		5.5	V
Quiescent Current	I <sub>Q</sub>	V <sub>FB</sub> =0.65V		62	100	μA
Shutdown Supply Current	I <sub>STBY</sub>	V <sub>EN</sub> =GND		0.1	1	μA
Reference Voltage	V <sub>REF</sub>	For Adjustable Output Voltage	0.588	0.6	0.612	V
Feedback Bias Current	I <sub>FB</sub>	V <sub>FB</sub> =V <sub>IN</sub>	-0.1		0.1	μA
Output Voltage Accuracy	ΔV <sub>OUT</sub>		-2		2	%
PMOSFET R <sub>ON</sub>	R <sub>DS(ON)_P</sub>	I <sub>SW</sub> = 200mA		0.28		Ω
NMOSFET R <sub>ON</sub>	R <sub>DS(ON)_N</sub>	I <sub>SW</sub> = -200mA		0.25		Ω
Switch Current Limit	I <sub>LIM</sub>	V <sub>FB</sub> =0.55V	1.5	2.0		A
EN Pin Threshold	V <sub>H</sub>		1.5			V
	V <sub>L</sub>				0.4	
UVLO Threshold	V <sub>UVLO</sub>	V <sub>DD</sub> Rising		2.3		V
UVLO Hysteresis	V <sub>HYS</sub>			0.2		
Oscillator Frequency	f <sub>OSC</sub>		1.12	1.40	1.68	MHz
Max. Duty Cycle	D <sub>MAX</sub>	V <sub>FB</sub> =0V	100			%
Min. Duty Cycle	D <sub>MIN</sub>	V <sub>FB</sub> =6.5V			0	
N-MOS SW Leakage Current		V <sub>IN</sub> =3.3V, V <sub>SW</sub> =3.3V		0.1		μA
Soft-start Time	t			1		ms
Thermal Shutdown	T <sub>OTSD</sub>			160		°C
Thermal Shutdown Hysteresis	T <sub>HYS</sub>			20		°C

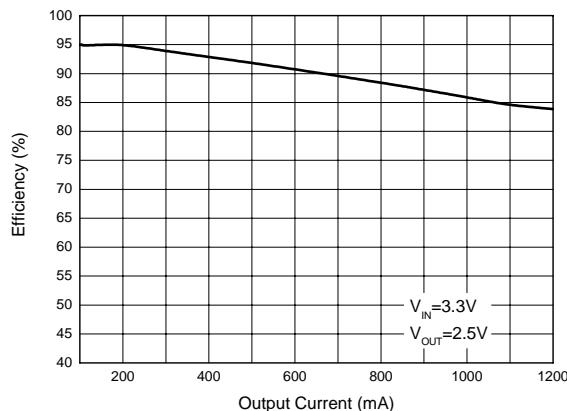
**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A**
**Typical Performance Characteristics**


Figure 4. Efficiency vs. Output Current

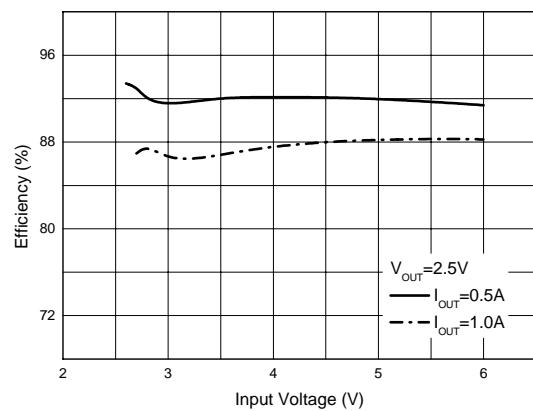


Figure 5. Efficiency vs. Input Voltage

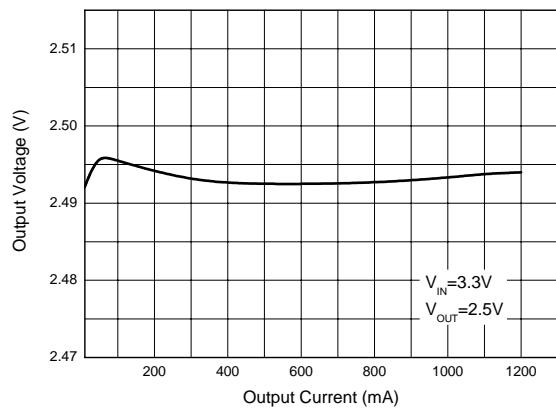


Figure 6. Output Voltage vs. Output Current

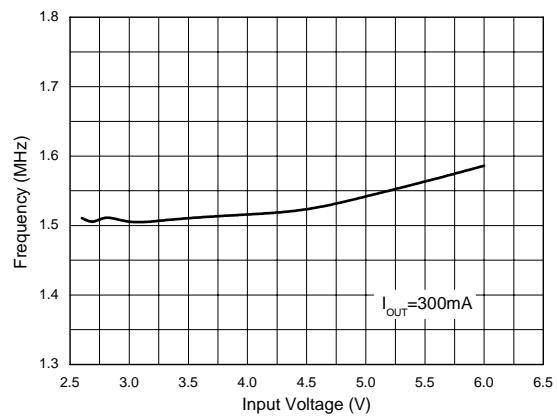
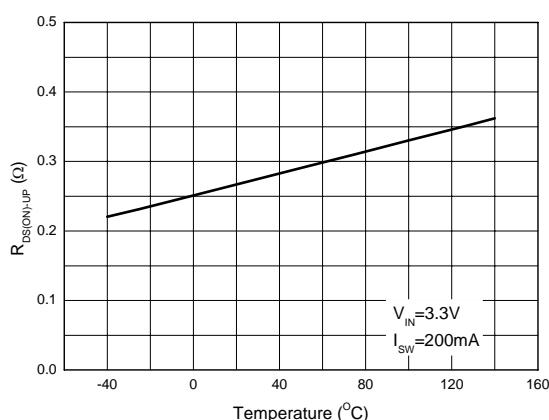
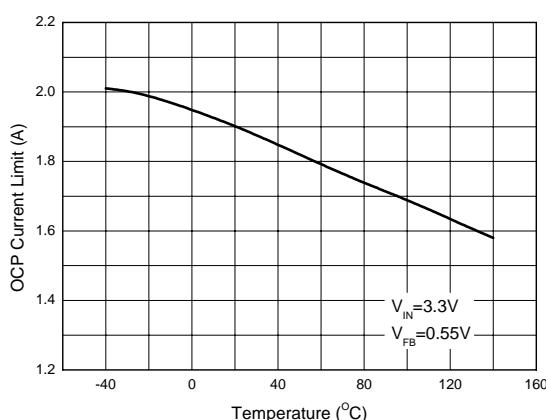
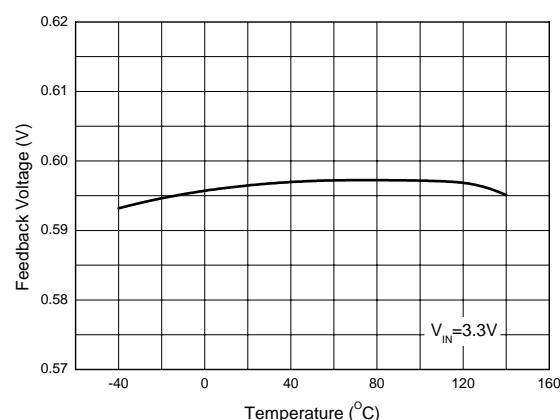
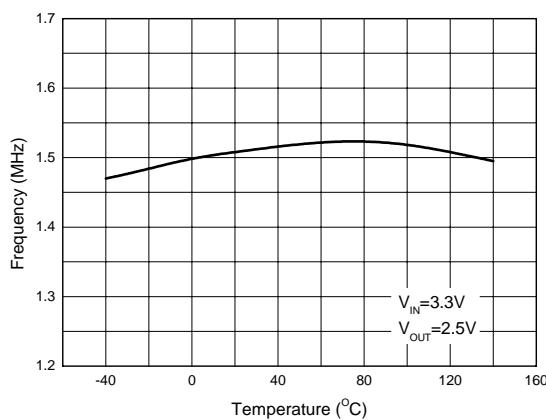


Figure 7. Frequency vs. Input Voltage

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A**
**Typical Performance Characteristics (Continued)**


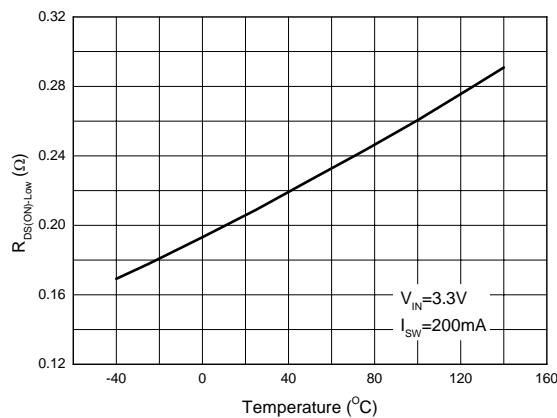
**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A****Typical Performance Characteristics (Continued)**

Figure 12.  $R_{DS(ON)_LOW}$  vs. Temperature

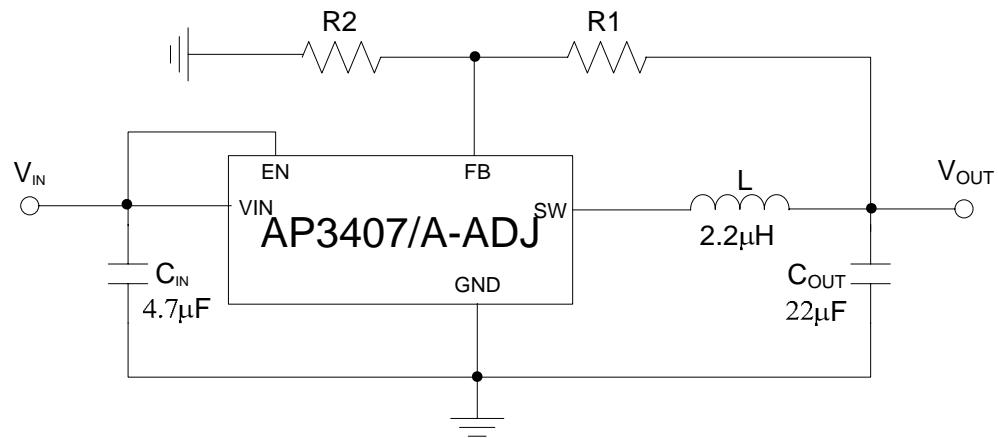
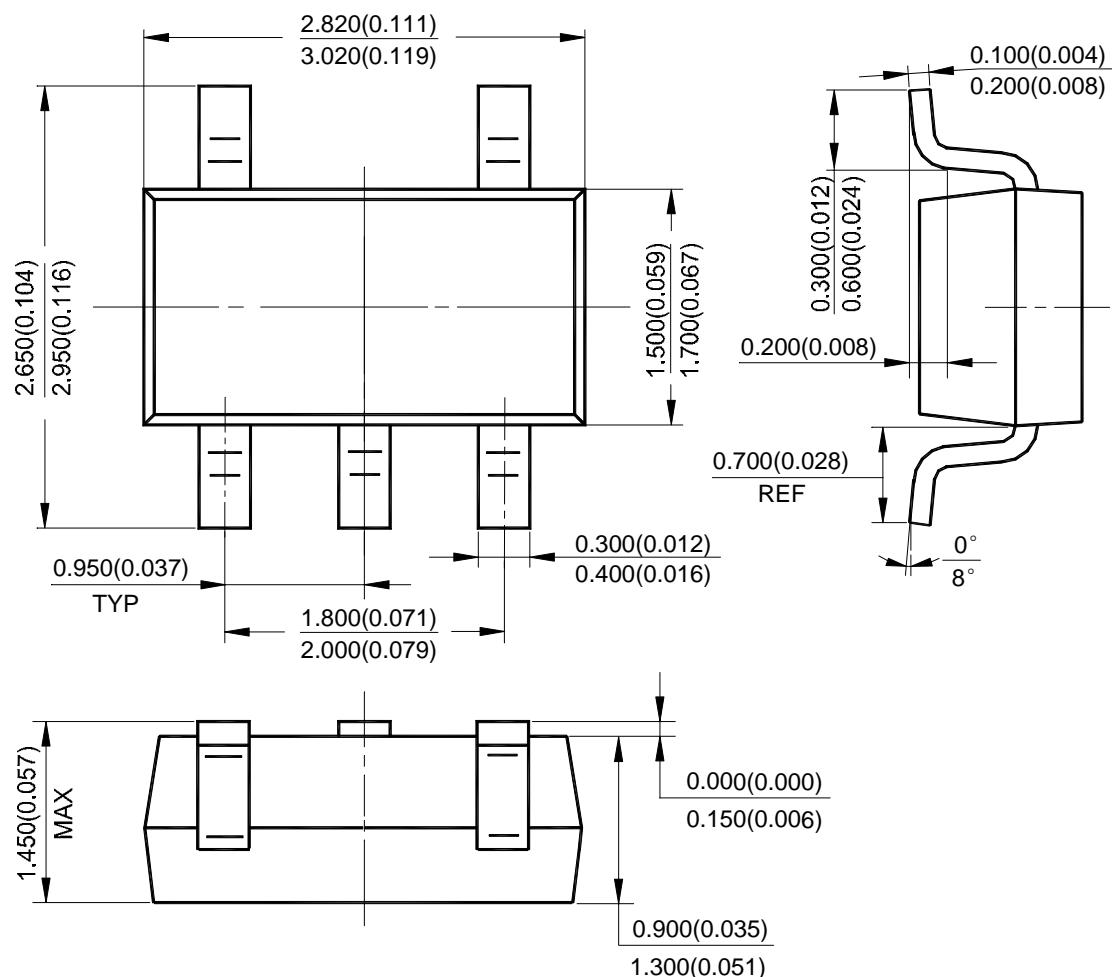
**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A****Typical Application**

Figure 13. Typical Application of AP3407/A

**1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A****Mechanical Dimensions****SOT-23-5****Unit: mm(inch)**



## BCD Semiconductor Manufacturing Limited

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