

**2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F****General Description**

The AM4406/4406F are 2-phase, half-wave motor pre-drivers fabricated for fan motors. These ICs are equipped with lock shutdown and automatic restart functions. The lock shutdown function turns off the output current when the motor is under lock condition. And when the motor is unlocked, the ICs will automatically restart and allow DC fan to run.

In addition, the AM4406 and AM4406F have RD and FG functions respectively. The RD function is to detect the motor status and FG function enables frequency generation.

The AM4406/4406F are available in SOIC-8 package.

Features

- Hall Inputs with a Hysteresis
- Lock Shutdown and Automatic Restart
- Rotation Detection (RD) Output
- Frequency Generation (FG) Output
- Supply Voltage: 4 to 28V
- Output Current: 70mA Max.
- Operating Temperature: -40 to 95°C

Applications

- High Voltage, High Current Brushless DC Fan
- Power Supply and Switchboards
- Communications Facilities
- Industrial Equipment



Figure 1. Package Type of AM4406/4406F

2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Pin Configuration

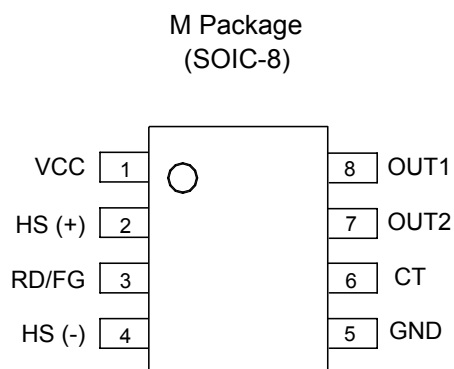


Figure 2. Pin Configuration of AM4406/4406F (Top View)

Pin Description

| Pin Number | Pin Name | | Function |
|------------|----------|---------|---|
| | AM4406 | AM4406F | |
| 1 | VCC | VCC | Power supply |
| 2 | HS (+) | HS (+) | Hall input (+) |
| 3 | RD | FG | Rotation detection/Frequency generation |
| 4 | HS (-) | HS (-) | Hall input (-) |
| 5 | GND | GND | Ground |
| 6 | CT | CT | Timing capacitor |
| 7 | OUT2 | OUT2 | Driver output 2 |
| 8 | OUT1 | OUT1 | Driver output 1 |

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Functional Block Diagram

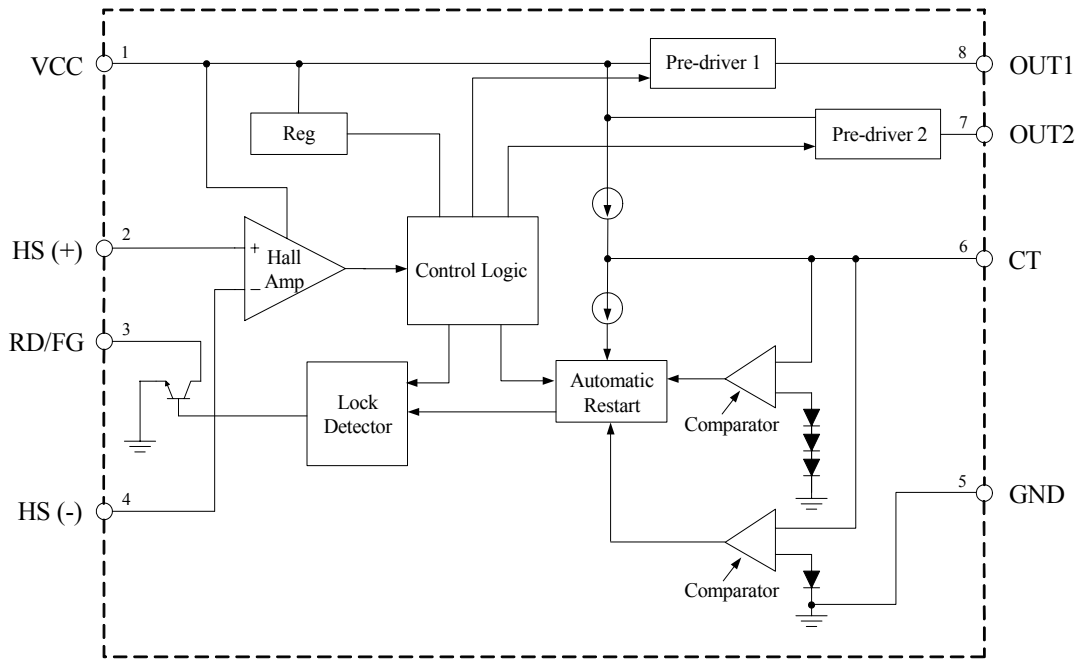
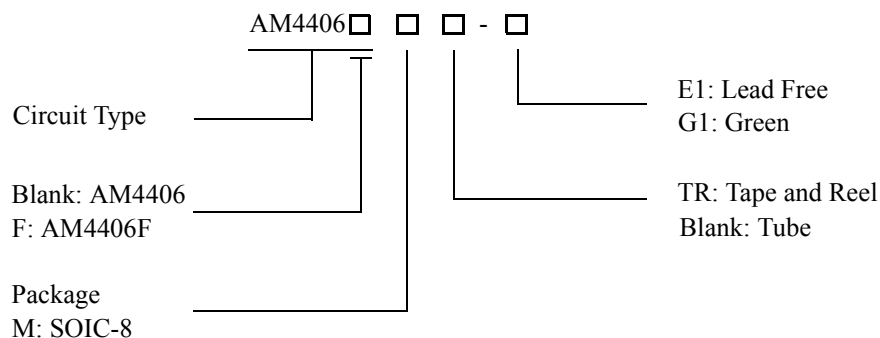


Figure 3. Functional Block Diagram of AM4406/4406F



2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Ordering Information



| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|---------|-------------------|--------------|---------------|------------|-------------|--------------|
| | | Lead Free | Green | Lead Free | Green | |
| SOIC-8 | -40 to 95°C | AM4406M-E1 | AM4406M-G1 | AM4406M | AM4406M-G1 | Tube |
| | | AM4406MTR-E1 | AM4406MTR-G1 | AM4406M | AM4406M-G1 | Tape & Reel |
| | | | AM4406FMTR-G1 | | AM4406FM-G1 | Tape & Reel |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Value | Unit |
|---------------------------|------------------|--------------|------|
| Supply Voltage | V _{CC} | 30 | V |
| Output Current | I _{OUT} | 70 | mA |
| Power Dissipation | P _D | 550 (Note 2) | mW |
| Storage Temperature Range | T _{STG} | -55 to 125 | °C |
| ESD (Human Body Model) | ESD | 3000 | V |
| ESD (Machine Model) | ESD | 300 | 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.

Note 2: Reduced by 5.5mW/°C when T_A is over 25°C.

Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|---------------------------------|---------------------|-----|----------------------|------|
| Supply Voltage | V _{CC} | 4 | 28 | V |
| Hall Input Voltage (+) (Note 3) | V _{HS} (+) | 1.0 | V _{CC} -0.5 | V |
| Hall Input Voltage (-) (Note 3) | V _{HS} (-) | 1.0 | V _{CC} -0.5 | V |
| Operating Temperature | T _A | -40 | 95 | °C |

Note 3: Hall input voltage range includes the amplitude of signal.

**2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F****Electrical Characteristics**(V_{CC}=12V, T_A=25°C, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-------------------------------------|----------------------|--|------|------|------|------|
| Supply Current | I _{CC} | No load | | 3.2 | 5.0 | mA |
| Hall Amplifier Input Hysteresis (+) | V _{HYS} (+) | Zero to peak including offset and hysteresis | 3 | | 15 | mV |
| Hall Amplifier Input Hysteresis (-) | V _{HYS} (-) | Zero to peak including offset and hysteresis | -3 | | -15 | mV |
| CT Charge Current | I _{CHG} | V _{CT} =1.5V | 2 | 3.45 | 5.25 | μA |
| CT Discharge Current | I _{DHG} | V _{CT} =1.5V | 0.35 | 0.8 | 1.45 | μA |
| CT Charge and Discharge Ratio | R _{CD} | I _{CHG} /I _{DHG} | 3 | 4.5 | 8 | |
| CT Clamp Voltage | V _{CL} | | 2.2 | 2.6 | 3 | V |
| CT Comparator Voltage | V _{CP} | | 0.4 | 0.6 | 0.8 | V |
| OUT1 High Level Voltage | V _{OH1} | I _{OUT1} =10mA | 10 | 10.5 | | V |
| OUT2 High Level Voltage | V _{OH2} | I _{OUT2} =10mA | 10 | 10.5 | | V |
| RD Output Low Level Voltage | V _{RDL} | I _{RD} =5mA | | 0.2 | 0.5 | V |
| RD Current Capacity | I _{RD} | V _{RD} =2V | 8 | 18 | | mA |
| FG Output Low Level Voltage | V _{FGL} | I _{FG} =5mA | | 0.2 | 0.5 | V |
| FG Current Capacity | I _{FG} | V _{FG} =2V | 8 | 18 | | mA |



2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Typical Performance Characteristics

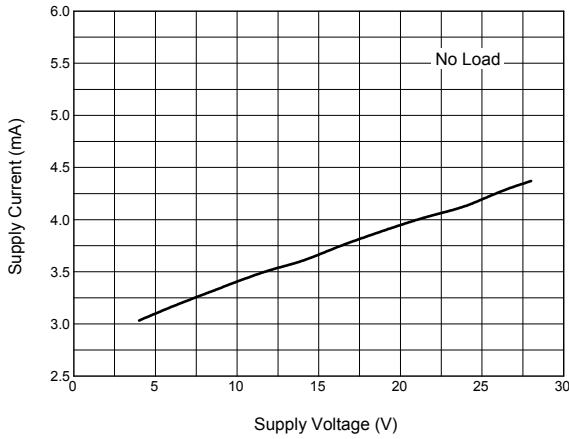


Figure 4. Supply Current vs. Supply Voltage

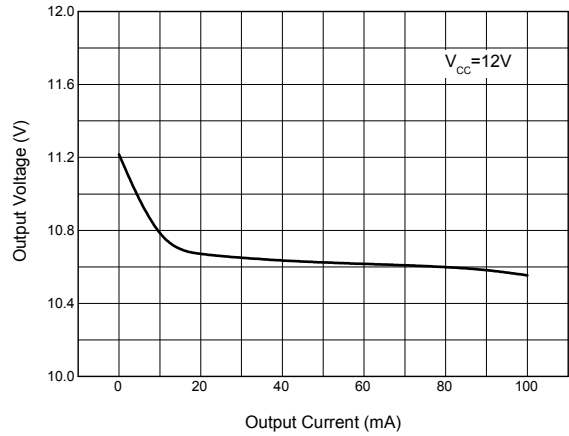


Figure 5. Output Voltage vs. Output Current

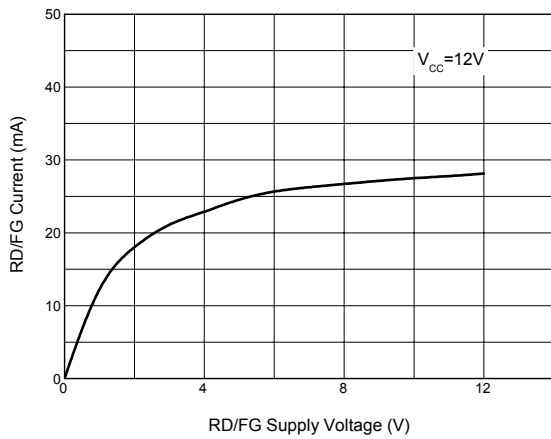


Figure 6. RD/FG Current vs. RD/FG Supply Voltage

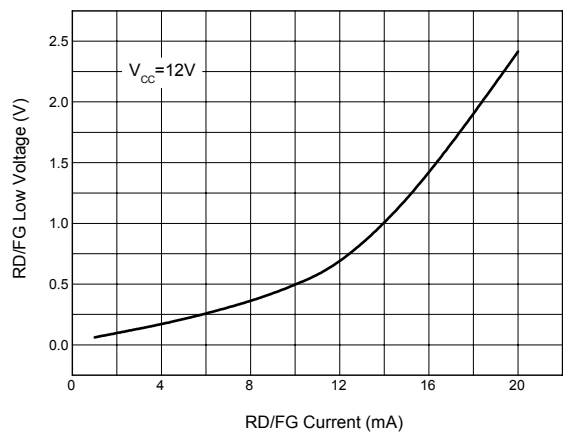


Figure 7. RD/FG Low Voltage vs. RD/FG Current



2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Typical Performance Characteristics (Continued)

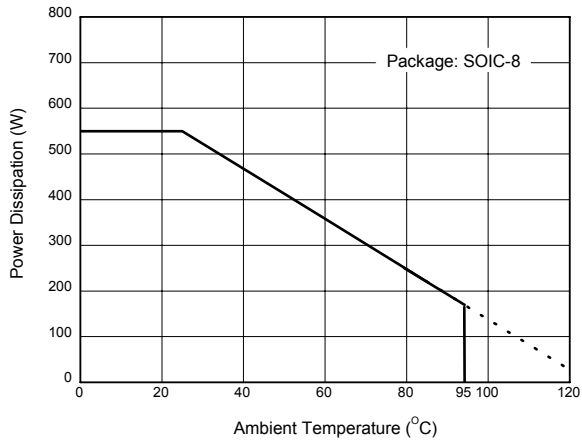
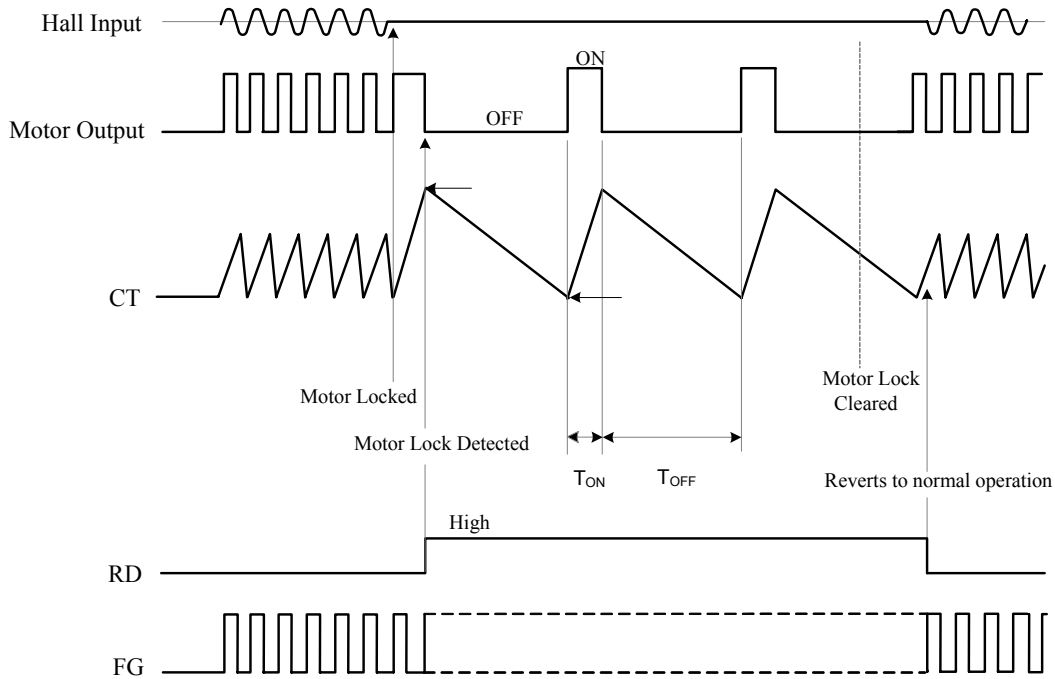


Figure 8. Power Dissipation vs. Ambient Temperature

2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Operating Diagram



Note 4: Automatic restart is performed in the following manner. A motor lock condition is detected when the hall signal stops switching. The output is ON when CT pin is being charged. C2 is the external capacitor of the CT pin. Output ON time and OFF time are determined by the capacitance of C2.

Note 5: RD pin is ON during normal operation, and OFF when the motor is locked. It is an open collector output pin.

$$T_{ON} = \frac{C2 * (V_{CL} - V_{CP})}{I_{CHG}} (\text{Sec.})$$

$$T_{OFF} = \frac{C2 * (V_{CL} - V_{CP})}{I_{DHG}} (\text{Sec.})$$

Note 6: The RD pin may maintain HIGH level for a few hundred milliseconds when the power is turn on.

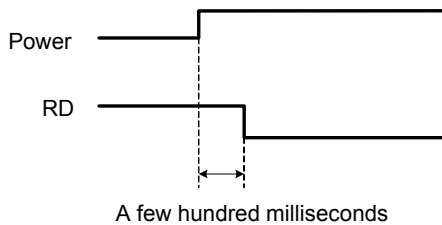
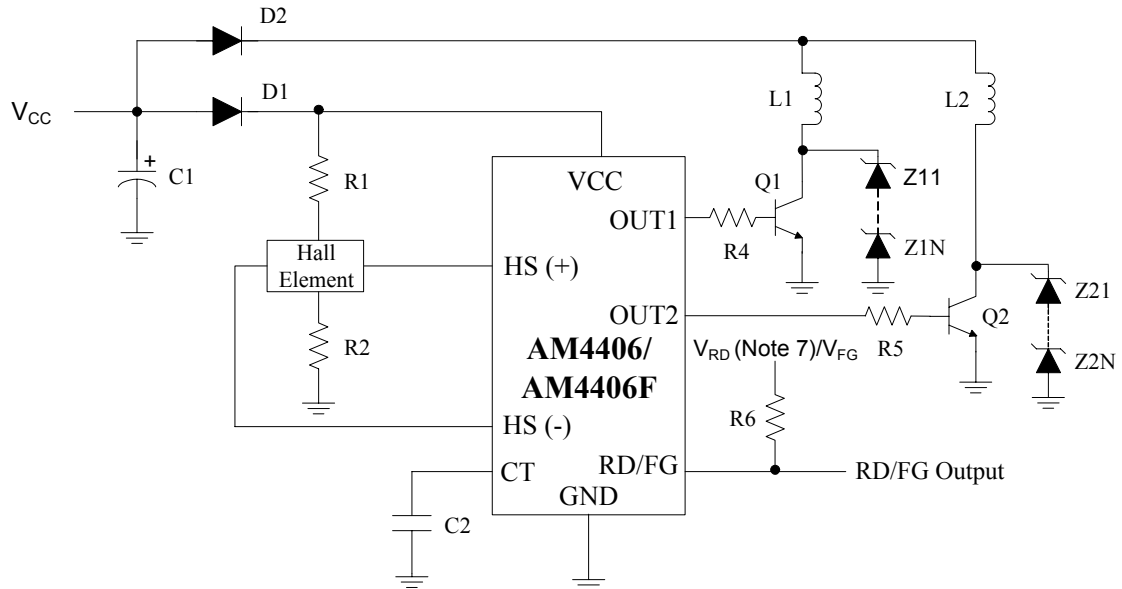


Figure 9. Control Timing Diagram of AM4406/4406F

2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Typical Application



Note 7: V_{RD} should be equal or smaller than V_{CC} .

Figure 10. Typical Application of AM4406/4406F

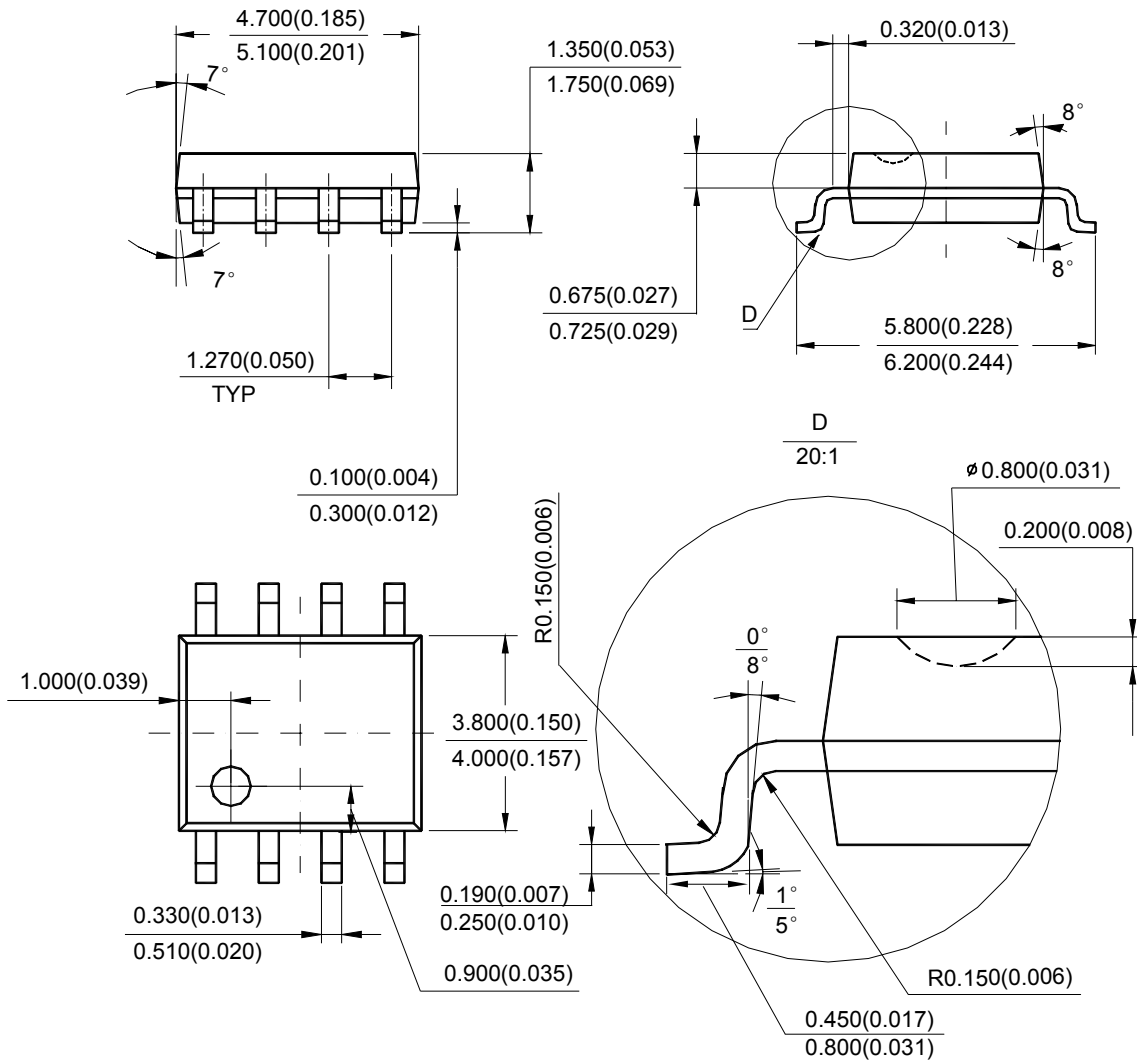


2-PHASE HALF-WAVE HIGH VOLTAGE MOTOR PRE-DRIVER AM4406/4406F

Mechanical Dimensions

SOIC-8

Unit: mm(inch)



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



BCD Semiconductor Manufacturing Limited

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