

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC4081

J-FET INPUT OPERATIONAL AMPLIFIER

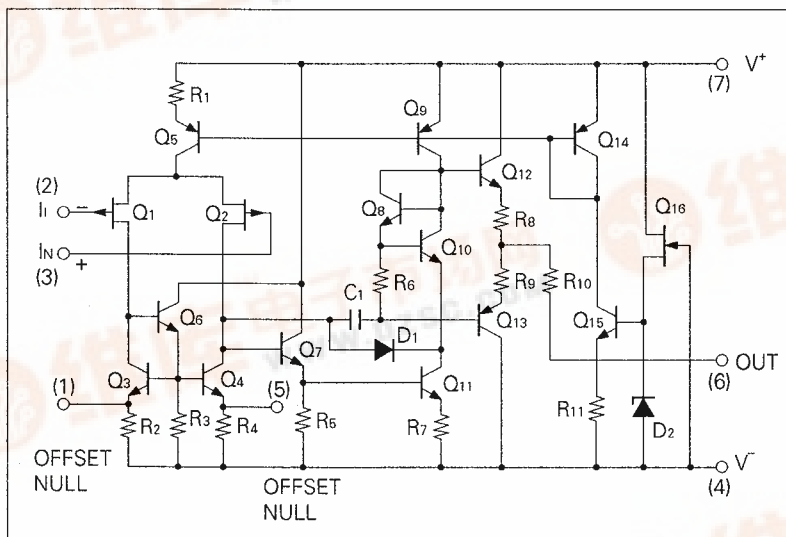
DESCRIPTION

The μ PC4081 is a single operational amplifier incorporating well matched ion implant P-channel J-FET on the same chip with standard bipolar transistors. The key features of this op amp is very low input bias current and high slew rate ten times faster than conventional general purpose op amps. By these features μ PC4081 is excellent choice for wide variety of applications including integrator, active filter, pulse amp etc.

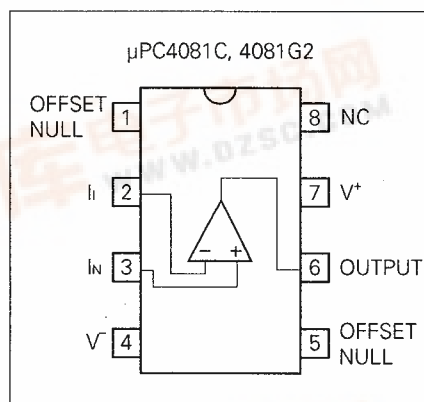
FEATURES

- Very low input bias and offset currents
- High input impedance...J-FET Input Stage
- High slew rate: 13 V/ μ s (TYP.)
- Offset voltage null capability
- Internal frequency compensation
- Output short circuit protection

EQUIVALENT CIRCUIT (1/4 Circuit)



CONNECTION DIAGRAM (Top View)



ORDERING INFORMATION

| PART NUMBER | PACKAGE | QUALITY GRADE |
|----------------|-----------------------------|---------------|
| μ PC4081C | 8 PIN PLASTIC DIP (300 mil) | Standard |
| μ PC4081G2 | 8 PIN PLASTIC SOP (225 mil) | Standard |

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

| PARAMETER | | SYMBOL | μ PC4081 | UNIT |
|--|---------------------|--------------------------------|--|------|
| Voltage between V ⁺ and V ⁻ (Note 1) | | V ⁺ -V ⁻ | -0.3 to +36 | V |
| Differential Input Voltage | | V _{ID} | ±30 | V |
| Input Voltage (Note 2) | | V _I | V ⁻ -0.3 to V ⁺ +0.3 | V |
| Output Voltage (Note 3) | | V _O | V ⁻ -0.3 to V ⁺ +0.3 | V |
| Power Dissipation | C Package (Note 4) | P _T | 350 | mW |
| | G2 Package (Note 5) | | 440 | mW |
| Output Short Circuit Duration (Note 6) | | | Indefinite | sec |
| Operating Temperature Range | | T _{opt} | -20 to +80 | °C |
| Storage Temperature Range | | T _{stg} | -55 to +125 | °C |

Note 1. Reverse connection of supply voltage can cause destruction.

Note 2. The input voltage should be allowed to input without damage destruction. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The normal operation will establish when the both inputs are within the Common Mode Input Voltage Range of electrical characteristics.

Note 3. This specification is the voltage which should be allowed to supply to the output terminal from external without damage or destructive. Even during the transition period of supply voltage, power on/off etc., this specification should be kept. The output voltage of normal operation will be the Output Voltage Swing of electrical characteristics.

Note 4. Thermal derating factor is -5.0 mW / °C when ambient temperature is higher than 55 °C.

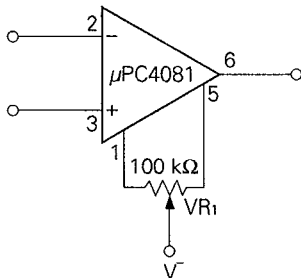
Note 5. Thermal derating factor is -4.4 mW / °C when ambient temperature is higher than 25 °C.

Note 6. Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4 and Note 5.

RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|----------------|----------------|------|------|------|------|
| Supply Voltage | V [±] | ± 5 | | ± 16 | V |

OFFSET VOLTAGE NULL CIRCUIT



ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V[±] = ±15 V)

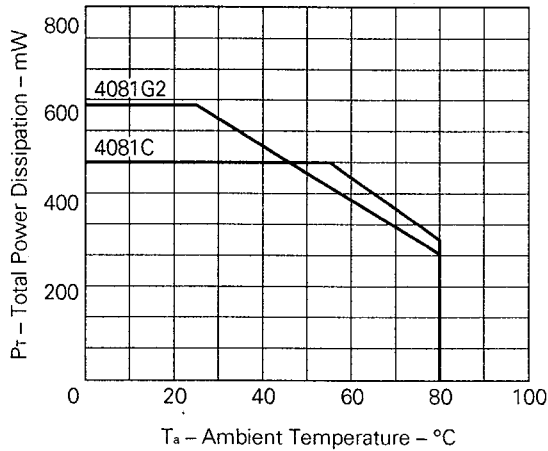
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITION |
|---|----------------------|------|--------------|-------|--------|--|
| Input Offset Voltage | V _{io} | | ±5.0 | ±15.0 | mV | R _s ≤ 50 Ω |
| Input Offset Current (Note7) | I _{io} | | ±5 | ±200 | pA | |
| Input Bias Current (Note7) | I _b | | 30 | 400 | pA | |
| Large Signal Voltage Gain | A _v | 25 | 200 | | V/mV | R _L ≥ 2 kΩ, V _o = ±10 V |
| Supply Current | I _{cc} | | 2.0 | 2.8 | mA | I _o = 0 A |
| Common Mode Rejection Ratio | CMR | 70 | 76 | | dB | |
| Supply Voltage Rejection Ratio | SVR | 70 | 76 | | dB | |
| Output Voltage Swing | V _{om} | ±12 | +13.5 | | V | R _L ≥ 10 kΩ |
| Output Voltage Swing | V _{om} | ±10 | ±12 | | V | R _L ≥ 2 kΩ |
| Common Mode Input Voltage Range | V _{icm} | ±10 | +15 -12.7 | | V | |
| Slew Rate | SR | | 13 | | V/μs | A _v = 1 |
| Unity Gain Frequency | f _{unity} | | 3 | | MHz | |
| Input Equivalent Noise Voltage Density | e _n | | 25 | | nV/√Hz | f = 1 kHz, R _s = 100 Ω |
| Input Offset Voltage | V _{io} | | | ±20 | mV | R _s ≤ 50 Ω, T _a = -20 to +70°C |
| Average V _{io} Temperature Drift | ΔV _{io} /ΔT | | ±10 | | μV/°C | T _a = -20 to +70 °C |
| Input Offset Current (Note7) | I _{io} | | | ±5 | nA | T _a = -20 to +70 °C |
| Input Bias Current (Note7) | I _b | | | 10 | nA | T _a = -20 to +70 °C |

Note 7. Input bias currents flow into IC. Because each currents are gate leak current of P-channel J-FET on input stage.

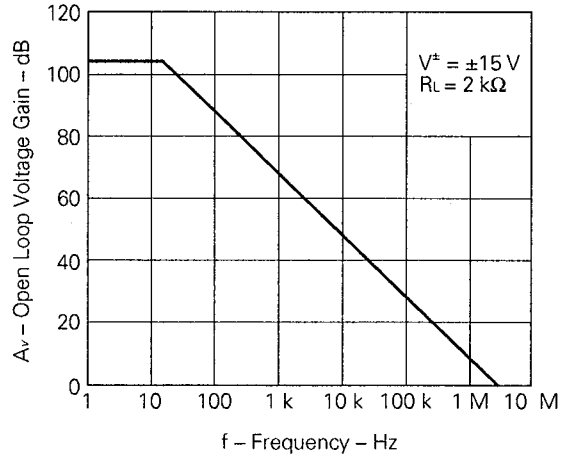
And that are temperature sensitive. Short time measuring method is recommendable to maintain the junction temperature close to the ambient temperature.

TYPICAL PERFORMANCE CHARACTERISTICS ($T_a = 25^\circ\text{C}$, TYP.)

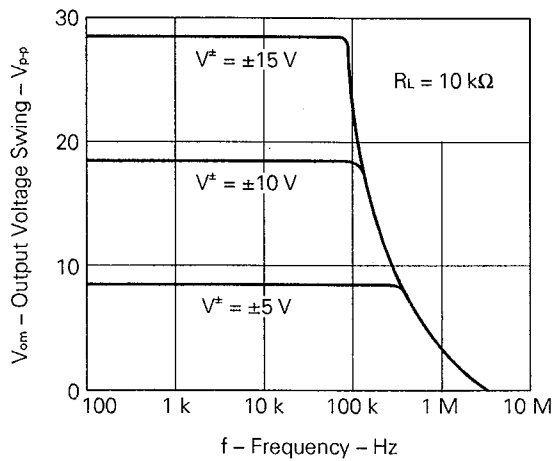
POWER DISSIPATION



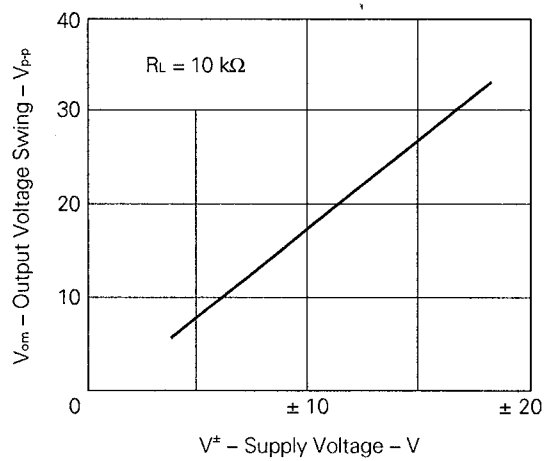
OPEN LOOP FREQUENCY RESPONSE



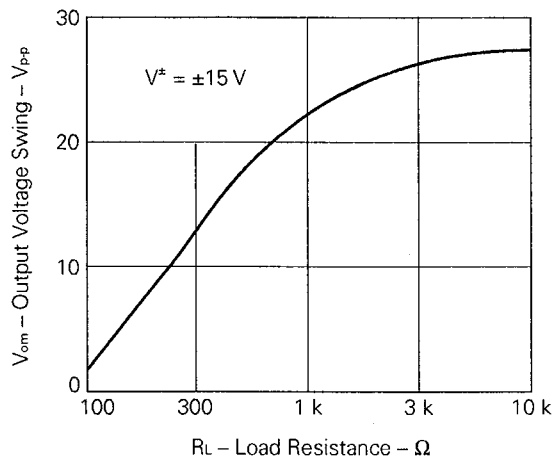
LARGE SIGNAL FREQUENCY RESPONSE



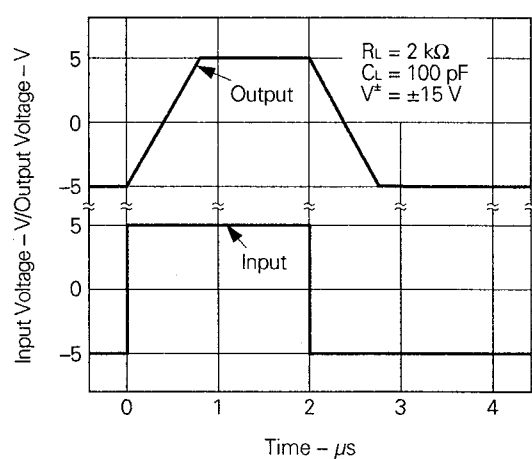
OUTPUT VOLTAGE SWING



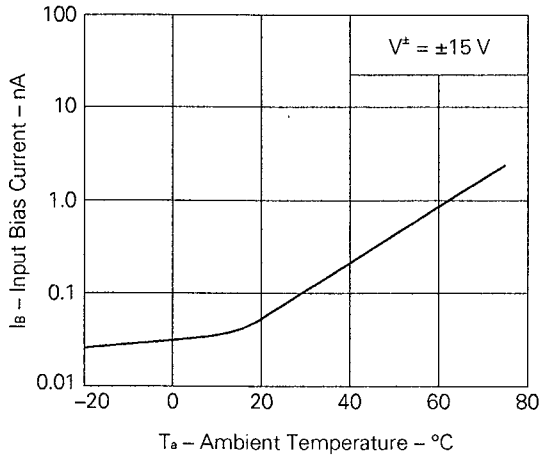
OUTPUT VOLTAGE SWING



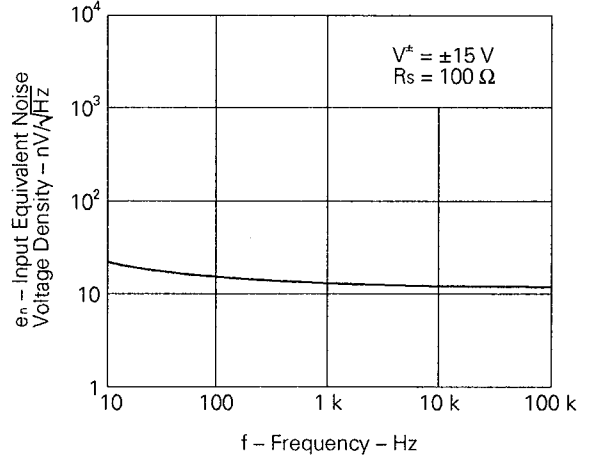
VOLTAGE FOLLOWER PULSE RESPONSE



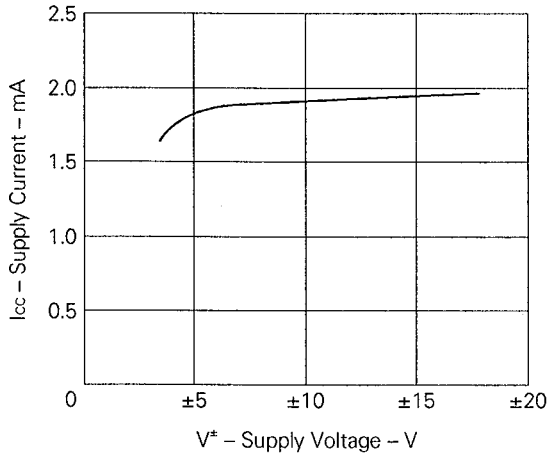
INPUT BIAS CURRENT



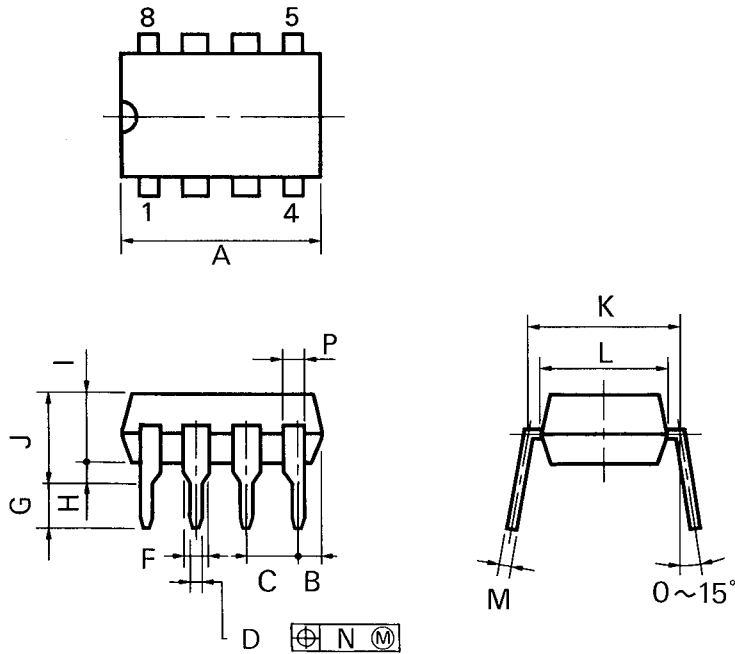
INPUT EQUIVALENT NOISE VOLTAGE DENSITY



SUPPLY CURRENT



8PIN PLASTIC DIP (300 mil)



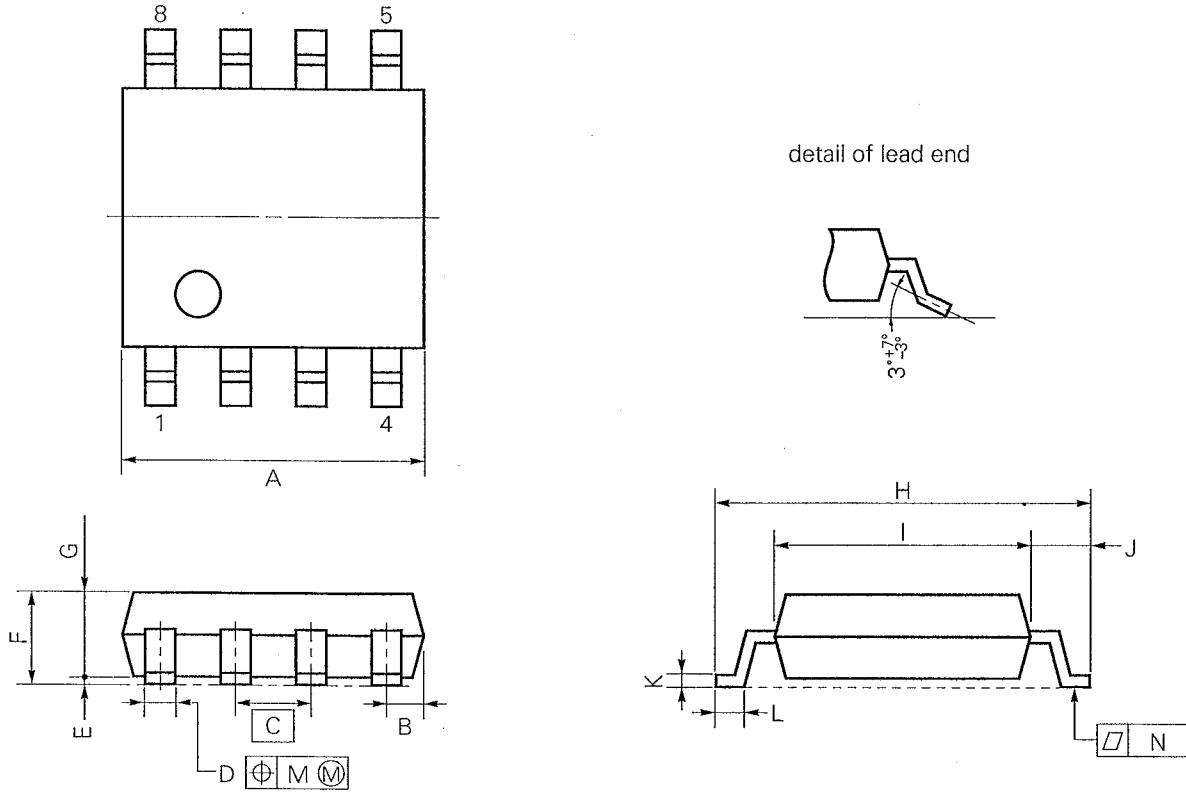
P8C-100-300B,C

NOTES

- 1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

| ITEM | MILLIMETERS | INCHES |
|------|--|---|
| A | 10.16 MAX. | 0.400 MAX. |
| B | 1.27 MAX. | 0.050 MAX. |
| C | 2.54 (T.P.) | 0.100 (T.P.) |
| D | 0.50 ^{+0.10} | 0.020 ^{+0.004} _{-0.005} |
| F | 1.4 MIN. | 0.055 MIN. |
| G | 3.2 ^{±0.3} | 0.126 ^{±0.012} |
| H | 0.51 MIN. | 0.020 MIN. |
| I | 4.31 MAX. | 0.170 MAX. |
| J | 5.08 MAX. | 0.200 MAX. |
| K | 7.62 (T.P.) | 0.300 (T.P.) |
| L | 6.4 | 0.252 |
| M | 0.25 ^{+0.10} _{-0.05} | 0.010 ^{+0.004} _{-0.003} |
| N | 0.25 | 0.01 |
| P | 0.9 MIN. | 0.035 MIN. |

8 PIN PLASTIC SOP (225 mil)



NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

S8GM-50-225B-2

| ITEM | MILLIMETERS | INCHES |
|------|--|---|
| A | 5.37 MAX. | 0.212 MAX. |
| B | 0.78 MAX. | 0.031 MAX. |
| C | 1.27 (T.P.) | 0.050 (T.P.) |
| D | 0.40 ^{+0.10} _{-0.05} | 0.016 ^{+0.004} _{-0.003} |
| E | 0.1±0.1 | 0.004±0.004 |
| F | 1.8 MAX. | 0.071 MAX. |
| G | 1.49 | 0.059 |
| H | 6.5±0.3 | 0.256±0.012 |
| I | 4.4 | 0.173 |
| J | 1.1 | 0.043 |
| K | 0.15 ^{+0.10} _{-0.05} | 0.006 ^{+0.004} _{-0.002} |
| L | 0.6±0.2 | 0.024 ^{+0.008} _{-0.009} |
| M | 0.12 | 0.005 |
| N | 0.15 | 0.006 |

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

[μPC4081G2]

| Soldering method | Soldering conditions | Recommended condition symbol |
|------------------------|--|------------------------------|
| Infrared ray reflow | Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None | IR30-00-1 |
| VPS | Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None | VP15-00-1 |
| Wave soldering | Solder temperature: 260 °C or below, Flow time: 10 seconds or below Number of flow process: 1, Exposure limit*: None | WS15-00-1 |
| Partial heating method | Terminal temperature: 300 °C or below, Flow time: 10 seconds or below, Exposure limit*: None | |

*: Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Note: Do not apply more than a single process at once, except for "Partial heating method."

TYPES OF THROUGH HOLE DEVICE

[μPC4081C]

| Soldering method | Soldering conditions | Recommended condition symbol |
|------------------|--|------------------------------|
| Wave soldering | Solder temperature: 260 °C or below, Flow time: 10 seconds or below | |

[MEMO]

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Application examples recommended by NEC Corporation.

Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.