

Voltage and Current Control (dual op-amp and shunt regulator) (quad op-amp and shunt regulator) Monolithic IC MM1377, 1378

Outline

The MM1377 incorporates an op-amp with a dual low-input offset voltage and a shunt regulator; the MM1378 combines a quad low-input offset voltage op-amp and shunt regulator. They are appropriate for use in battery chargers, switching power supplies and other voltage and current control applications. Op-amps with low input offset voltage are particularly well-suited for handling current detection signals and other low-amplitude signals.

Features

Op-amp unit

- | | |
|------------------------------------|-----------------------|
| 1. Input offset voltage | 0.2mV typ. |
| 2. Input offset current | 5nA typ. |
| 3. Input bias current | 30nA typ. |
| 4. Common-mode input voltage range | 0~V _{CC} -1V |
| 5. Power supply current | 0.6mA typ. |

Shunt regulator unit

- | | |
|--|------------|
| 1. Reference voltage | 2.5V typ. |
| 2. Reference voltage fluctuation (-20~+80°C) | 5mV typ. |
| 3. Minimum cathode current | 0.4mA typ. |

Package

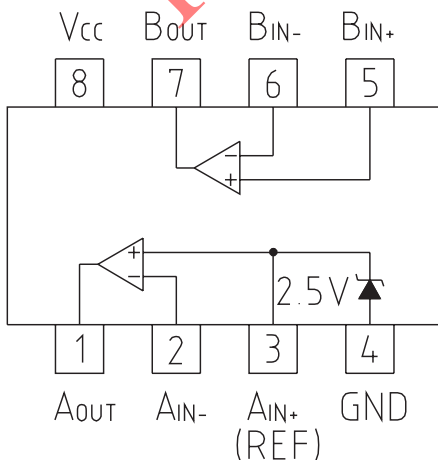
SOP-8C, SOP-8E (MM1377)
SOP-14B (MM1378)

Applications

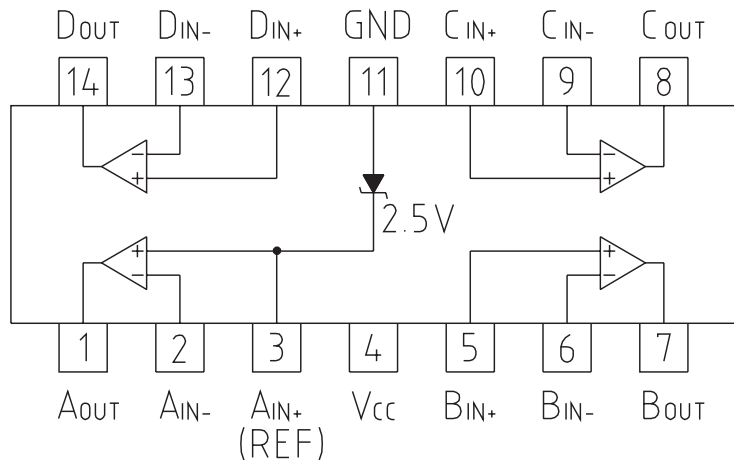
1. Charger
2. Switching power supply
3. AC adapter

Block Diagram

MM1377

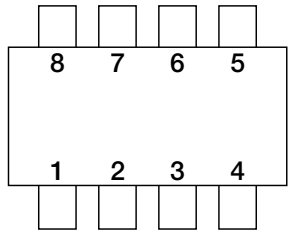


MM1378



Pin Assignment

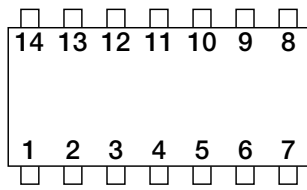
MM1377



SOP-8C, SOP-8E

| | |
|---|------------------------|
| 1 | AOUT |
| 2 | A _{IN-} |
| 3 | A _{IN+} (REF) |
| 4 | GND |
| 5 | B _{IN+} |
| 6 | B _{IN-} |
| 7 | BOUT |
| 8 | V _{CC} |

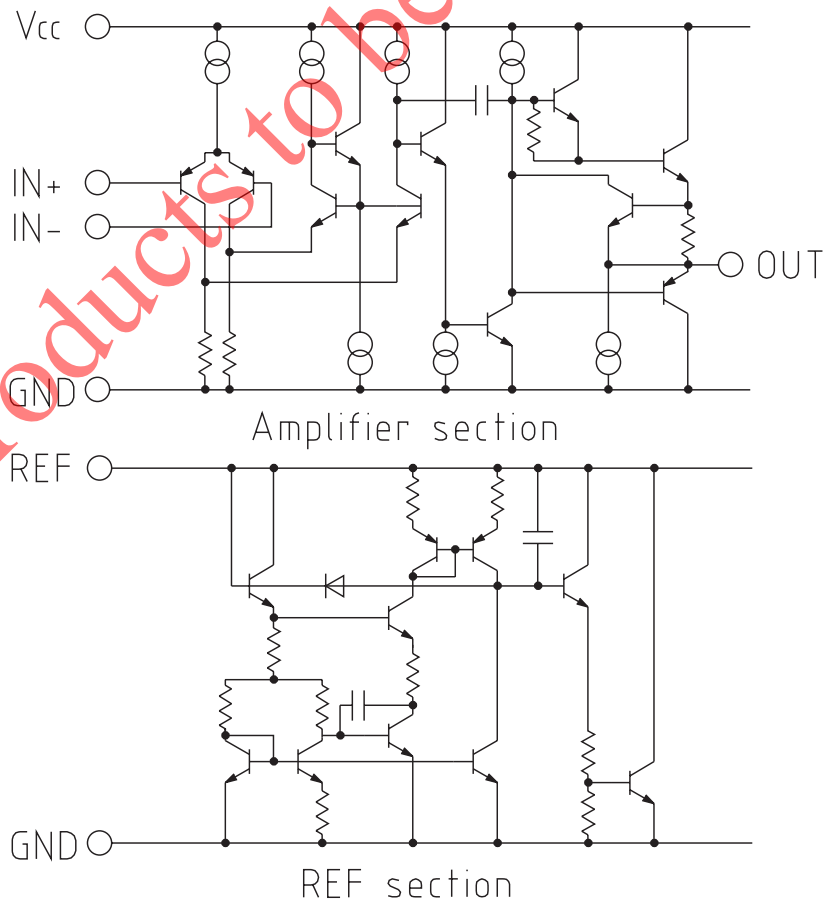
MM1378



SOP-14B

| | | | |
|---|------------------------|----|------------------|
| 1 | AOUT | 8 | C _{OUT} |
| 2 | A _{IN-} | 9 | C _{IN-} |
| 3 | A _{IN+} (REF) | 10 | C _{IN+} |
| 4 | V _{CC} | 11 | GND |
| 5 | B _{IN+} | 12 | D _{IN+} |
| 6 | B _{IN-} | 13 | D _{IN-} |
| 7 | BOUT | 14 | DOUT |

Equivalent Circuit Diagram



Absolute Maximum Ratings

| Item | Symbol | Ratings | Units |
|-----------------------|----------------------|------------------------------|-------|
| Storage temperature | T _{STG} | -40~+125 | °C |
| Operating temperature | T _{OPR} | -20~+85 | °C |
| Power supply voltage | V _{CC max.} | -0.3~+24 | V |
| Allowable loss | P _D | 300 (MM1377) 350 (MM1378) | mW |

Recommended Operating Conditions

| Item | Symbol | Ratings | Units |
|-----------------------|------------------|----------|-------|
| Operating temperature | T _{OPR} | -15~+80 | °C |
| Operating voltage | V _{OPR} | +2~+20 * | V |

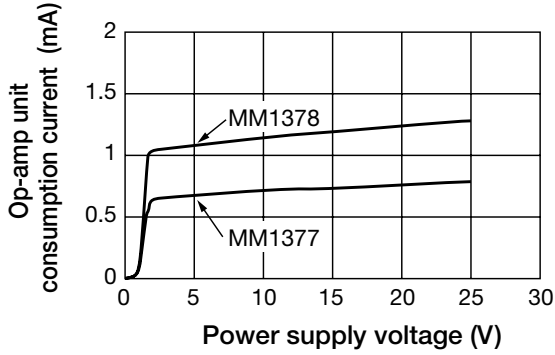
*Minimum value of operating voltage is for amp unit only

Electrical Characteristics (Except where noted otherwise, V_{CC}=5V, T_a=25°C)

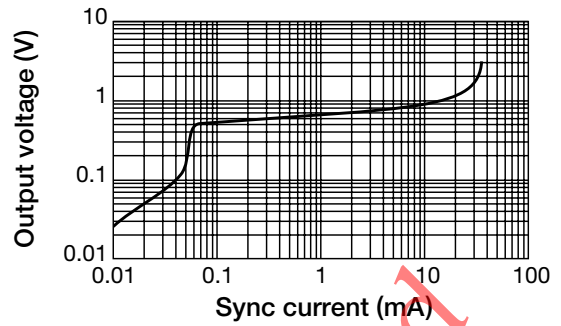
| Item | Symbol | Measurement conditions | Min. | Typ. | Max. | Units |
|--|-------------------|--------------------------------------|----------------------|----------------------|--------------------|-------|
| Op-amp unit | | | | | | |
| Input offset voltage | V _{IO} | | | 0.2 | 0.9 | mV |
| Input offset current | I _{IO} | Excluding amp A | | 5 | 50 | nA |
| Input bias current | I _B | | | 30 | 150 | nA |
| Common-mode input voltage range | V _I | Excluding amp A | 0 | | V _{CC} -1 | V |
| Power supply current | I _{CC} | R _L =∞, for two circuits | MM1377 | 0.6 | 1.0 | mA |
| | | R _L =∞, for four circuits | MM1378 | 1.2 | 2.0 | |
| Voltage gain | A _V | | | 100 | | dB |
| Output voltage L | V _{OL} | R _L =∞ | | 10 | 100 | mV |
| Output voltage H | V _{OH} | R _L =∞ | V _{CC} -1.1 | V _{CC} -0.8 | | V |
| Common-mode signal rejection ratio | CMRR | | 65 | 85 | | dB |
| Power supply voltage rejection ratio | PSRR | | 65 | 100 | | dB |
| Output outflow current | I _{SO} | | 20 | 35 | | mA |
| Output inflow current | I _{SI} | | 10 | 20 | | mA |
| Shunt regulator | | | | | | |
| Reference voltage | V _{REF} | | 2.450 | 2.500 | 2.550 | V |
| Reference voltage fluctuation within operating temperature range | ΔV _{REF} | | | 5 | 17 | mV |
| Minimum cathode current | I min. | | | 0.4 | 1.0 | mA |
| Dynamic impedance | Z _{KA} | | | 0.4 | 0.7 | Ω |

Characteristics

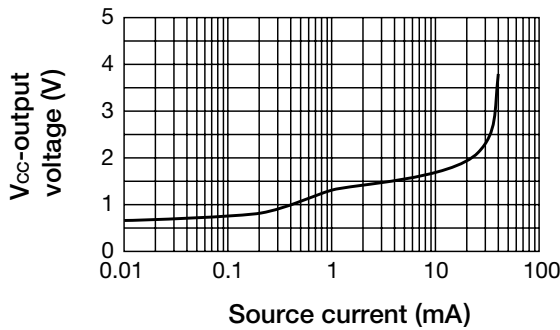
■ Consumption current vs power supply voltage (Ta=25°C)



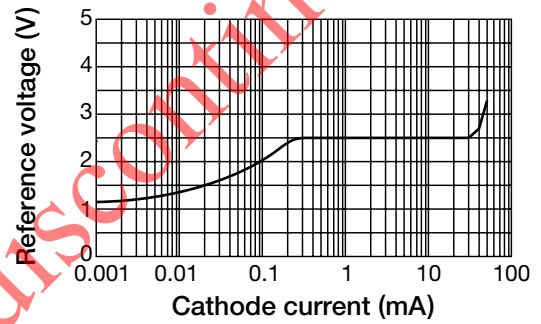
■ Output voltage vs sync current (Ta=25°C)



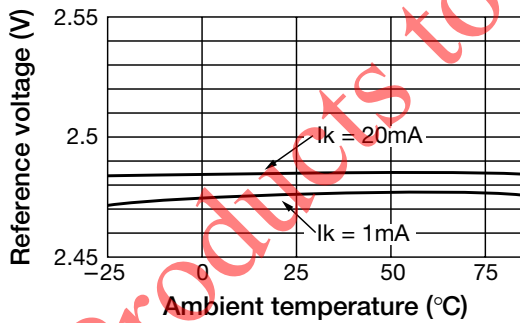
■ (V_{CC}-output voltage) vs source current (Ta=25°C)



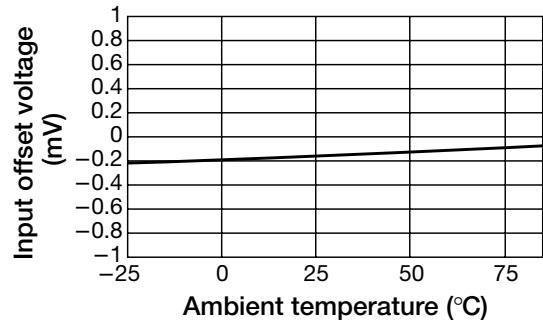
■ Reference voltage vs cathode current (Ta=25°C)



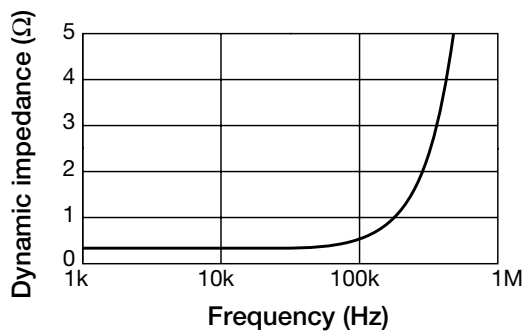
■ Reference voltage vs Ambient temperature



■ Input offset voltage vs Ambient temperature



■ Dynamic impedance vs frequency (Ta=25°C)



■ Voltage gain vs frequency (Ta=25°C)

