To our customers,

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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# μPC24M00A Series

## THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR

### DESCRIPTION

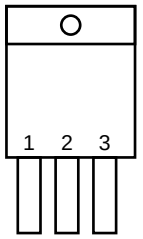
μPC24M00A Series are low dropout regulators which have 500 mA capable for output current.
These ICs are built-in the saturation protection circuit of the output transistor.

### FEATURES

- Built-in the saturaiton protection circuit of the output transistor.
- The capability of output current is 500 mA.
- High accuracy of output voltage.
  $|\Delta V_O| \leq \pm 2$ % ($T_J$ = 25 ˚C)
  $|\Delta V_O| \leq \pm 3$ % (0 ˚C ≤ $T_J$ ≤ 125 ˚C)
- Low dropout voltage.
  $V_{DIF} \leq 1$ V ($I_O \leq$ 500 mA, $T_J \leq$ 125 ˚C)
- Built-in overcurrent protection circuit, thermal shut-down circuit.
- Built-in Safe Operating Area protection circuit.
- Compatible for μPC24M00 Series.

### CONNECTION DIAGRAM

**(TOP VIEW)**




1 : INPUT
2 : GND
3 : OUTPUT

### ORDERING INFORMATION

| Output Voltage | Type Number | Package |
|---|---|---|
| 5 V | μPC24M05AHF | MP-45G (Isolated TO-220) |
| 6 V | μPC24M06AHF | |
| 7 V | μPC24M07AHF | |
| 8 V | μPC24M08AHF | |
| 9 V | μPC24M09AHF | |
| 10 V | μPC24M10AHF | |
| 12 V | μPC24M12AHF | |
| 15 V | μPC24M15AHF | |
| 18 V | μPC24M18AHF | |

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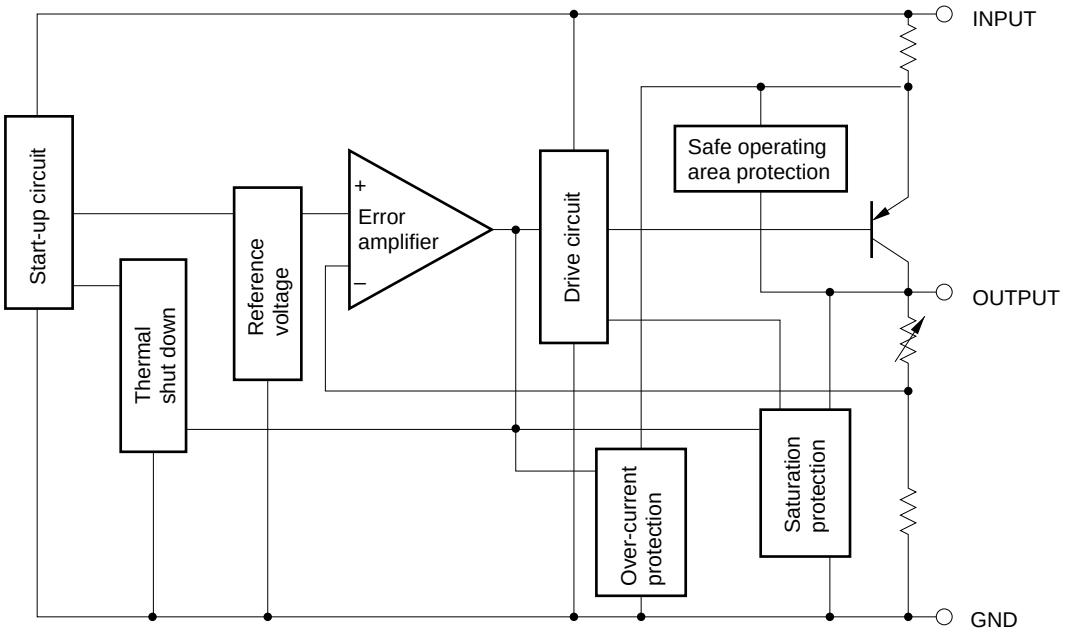
**BLOCK DIAGRAM**

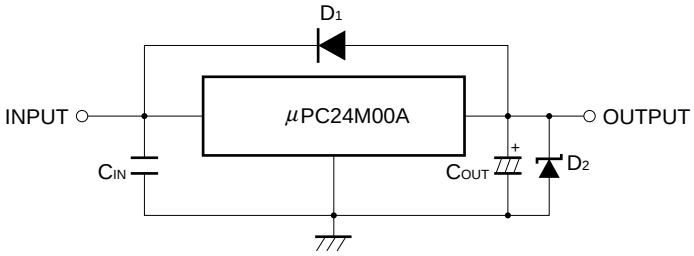


## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 ˚C, Unless otherwise specified.)

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | 36 | V |
| Internal Power Dissipation | $P_T$ | 15 **Note** | W |
| Operating Ambient Temperature Range | $T_A$ | –20 to +85 | ˚C |
| Operating Junction Temperature Range | $T_J$ | –20 to +150 | ˚C |
| Storage Temperature Range | $T_{stg}$ | –55 to +150 | ˚C |
| Thermal Resistance (Junction to Case) | $R_{th(J-C)}$ | 7.0 | ˚C/W |
| Thermal Resistance (Junction to Ambient) | $R_{th(J-A)}$ | 65 | ˚C/W |

**Note** Internally limited.

## TYPICAL CONNECTION




$C_{IN}$ : 0.1 to 0.47 μF.
$C_{OUT}$ : More than 47 μF.
$D_1$ : Need for $V_O > V_{IN}$.
$D_2$ : Need for $V_O <$ GND.

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | TYPE NUMBER | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | μPC24M05AHF | 6 | 9 | 20 | V |
| | | μPC24M06AHF | 7 | 10 | 21 | |
| | | μPC24M07AHF | 8 | 11 | 22 | |
| | | μPC24M08AHF | 9 | 13 | 23 | |
| | | μPC24M09AHF | 10 | 14 | 24 | |
| | | μPC24M10AHF | 11 | 15 | 25 | |
| | | μPC24M12AHF | 13 | 18 | 27 | |
| | | μPC24M15AHF | 16 | 22 | 27 | |
| | | μPC24M18AHF | 19 | 25 | 28 | |
| Output Current | $I_O$ | All | 0 | | 500 | mA |
| Operating Ambient Temperature Range | $T_A$ | All | –20 | | +85 | ˚C |
| Operating Junction Temperature Range | $T_J$ | All | –20 | | +125 | ˚C |

## ELECTRICAL CHARACTERISTICS

**μPC24M05A ($V_{IN}$ = 9 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 4.9 | 5.0 | 5.1 | V | |
| | | 4.85 | | 5.15 | | 6 V ≤ $V_{IN}$ ≤ 20 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 4.85 | | 5.15 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 5 | 50 | mV | 6.5 V ≤ $V_{IN}$ ≤ 20 V |
| Load Regulation | $REG_L$ | | 3 | 25 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.3 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 4.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 4.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 6.5 V ≤ $V_{IN}$ ≤ 20 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 90 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 55 | 60 | | dB | f = 120 Hz, 6.5 V ≤ $V_{IN}$ ≤ 16.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.6 | | A | $V_{IN}$ = 20 V |
| Peak Output Current | $I_{Opeak}$ | 0.75 | 1.0 | 1.63 | A | $V_{IN}$ = 9 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 0.2 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M06A ($V_{IN}$ = 10 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 5.88 | 6.0 | 6.12 | V | |
| | | 5.82 | | 6.18 | | 7 V ≤ $V_{IN}$ ≤ 21 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 5.82 | | 6.18 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 6 | 60 | mV | 7.5 V ≤ $V_{IN}$ ≤ 21 V |
| Load Regulation | $REG_L$ | | 4 | 30 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.3 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 5.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 5.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 7.5 V ≤ $V_{IN}$ ≤ 21 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 110 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 53 | 58 | | dB | f = 120 Hz, 7.5 V ≤ $V_{IN}$ ≤ 17.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.6 | | A | $V_{IN}$ = 21 V |
| Peak Output Current | $I_{Opeak}$ | 0.75 | 1.0 | 1.63 | A | $V_{IN}$ = 10 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | –0.4 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M07A ($V_{IN}$ = 11 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 6.86 | 7.0 | 7.14 | V | |
| | | 6.79 | | 7.21 | | 8 V ≤ $V_{IN}$ ≤ 22 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 6.79 | | 7.21 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 7 | 70 | mV | 8.5 V ≤ $V_{IN}$ ≤ 22 V |
| Load Regulation | $REG_L$ | | 4 | 35 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.3 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 6.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 6.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 8.5 V ≤ $V_{IN}$ ≤ 22 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 130 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 52 | 57 | | dB | f = 120 Hz, 8.5 V ≤ $V_{IN}$ ≤ 18.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.6 | | A | $V_{IN}$ = 22 V |
| Peak Output Current | $I_{Opeak}$ | 0.75 | 1.0 | 1.63 | A | $V_{IN}$ = 11 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 0.4 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M08A ($V_{IN}$ = 13 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 7.85 | 8.0 | 8.15 | V | |
| | | 7.75 | | 8.25 | | 9 V ≤ $V_{IN}$ ≤ 23 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 7.75 | | 8.25 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 8 | 80 | mV | 9.5 V ≤ $V_{IN}$ ≤ 23 V |
| Load Regulation | $REG_L$ | | 5 | 40 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.3 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 7.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 7.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 9.5 V ≤ $V_{IN}$ ≤ 23 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 150 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 51 | 56 | | dB | f = 120 Hz, 9.5 V ≤ $V_{IN}$ ≤ 19.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.5 | | A | $V_{IN}$ = 23 V |
| Peak Output Current | $I_{Opeak}$ | 0.74 | 1.0 | 1.62 | A | $V_{IN}$ = 13 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 0.8 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M09A ($V_{IN}$ = 14 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 8.82 | 9.0 | 9.18 | V | |
| | | 8.73 | | 9.27 | | 10 V ≤ $V_{IN}$ ≤ 24 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 8.73 | | 9.27 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 9 | 90 | mV | 10.5 V ≤ $V_{IN}$ ≤ 24 V |
| Load Regulation | $REG_L$ | | 5 | 45 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.4 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 8.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 8.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 10.5 V ≤ $V_{IN}$ ≤ 24 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 170 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 50 | 55 | | dB | f = 120 Hz, 10.5 V ≤ $V_{IN}$ ≤ 20.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.5 | | A | $V_{IN}$ = 24 V |
| Peak Output Current | $I_{Opeak}$ | 0.74 | 1.0 | 1.62 | A | $V_{IN}$ = 14 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 1.0 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M10A ($V_{IN}$ = 15 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 9.8 | 10 | 10.2 | V | |
| | | 9.7 | | 10.3 | | 11 V ≤ $V_{IN}$ ≤ 25 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 9.7 | | 10.3 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 10 | 100 | mV | 11.5 V ≤ $V_{IN}$ ≤ 25 V |
| Load Regulation | $REG_L$ | | 6 | 50 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.4 | 3.2 | mA | $I_O$ = 0 |
| | | | 7 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 9.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 9.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 11.5 V ≤ $V_{IN}$ ≤ 25 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 190 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 49 | 54 | | dB | f = 120 Hz, 11.5 V ≤ $V_{IN}$ ≤ 21.5 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.4 | | A | $V_{IN}$ = 25 V |
| Peak Output Current | $I_{Opeak}$ | 0.74 | 1.0 | 1.62 | A | $V_{IN}$ = 15 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 1.6 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M12A ($V_{IN}$ = 18 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 11.75 | 12 | 12.25 | V | |
| | | 11.65 | | 12.35 | | 13 V ≤ $V_{IN}$ ≤ 27 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 11.65 | | 12.35 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 12 | 120 | mV | 14 V ≤ $V_{IN}$ ≤ 27 V |
| Load Regulation | $REG_L$ | | 7 | 60 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.4 | 3.2 | mA | $I_O$ = 0 |
| | | | 8 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 11.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 11.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 14 V ≤ $V_{IN}$ ≤ 27 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 230 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 47 | 52 | | dB | f = 120 Hz, 14 V ≤ $V_{IN}$ ≤ 24 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.4 | | A | $V_{IN}$ = 27 V |
| Peak Output Current | $I_{Opeak}$ | 0.73 | 1.0 | 1.61 | A | $V_{IN}$ = 18 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 0.7 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M15A ($V_{IN}$ = 22 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

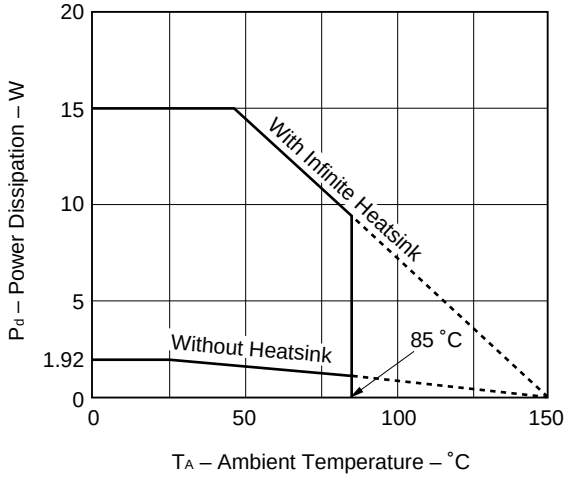
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 14.7 | 15 | 15.3 | V | |
| | | 14.55 | | 15.45 | | 16 V ≤ $V_{IN}$ ≤ 27 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 14.55 | | 15.45 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 15 | 150 | mV | 17 V ≤ $V_{IN}$ ≤ 27 V |
| Load Regulation | $REG_L$ | | 9 | 75 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.5 | 3.2 | mA | $I_O$ = 0 |
| | | | 8 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 14.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 14.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 17 V ≤ $V_{IN}$ ≤ 27 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 290 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 46 | 51 | | dB | f = 120 Hz, 17 V ≤ $V_{IN}$ ≤ 27 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.4 | | A | $V_{IN}$ = 27 V |
| Peak Output Current | $I_{Opeak}$ | 0.72 | 1.0 | 1.6 | A | $V_{IN}$ = 22 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 1.6 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

**μPC24M18A ($V_{IN}$ = 25 V, $I_O$ = 350 mA, $T_J$ = 25 ˚C, Unless otherwise specified)**

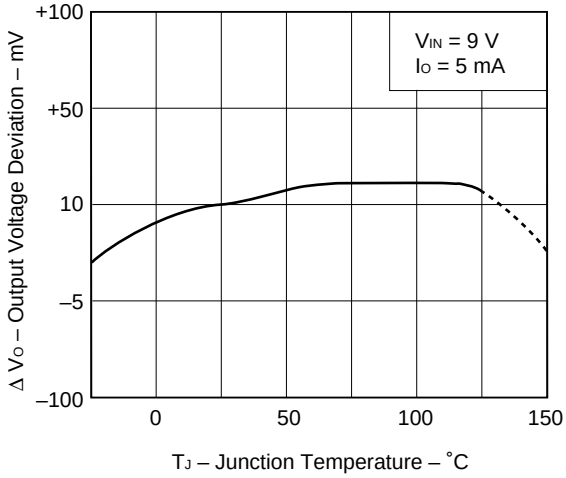
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | 17.64 | 18 | 18.36 | V | |
| | | 17.46 | | 18.54 | | 19 V ≤ $V_{IN}$ ≤ 28 V, 5 mA ≤ $I_O$ ≤ 350 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| | | 17.46 | | 18.54 | | 5 mA ≤ $I_O$ ≤ 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Line Regulation | $REG_{IN}$ | | 18 | 180 | mV | 20 V ≤ $V_{IN}$ ≤ 28 V |
| Load Regulation | $REG_L$ | | 11 | 90 | mV | 5 mA ≤ $I_O$ ≤ 500 mA |
| Quiescent Current | $I_{BIAS}$ | | 2.5 | 3.2 | mA | $I_O$ = 0 |
| | | | 8 | 30 | | $I_O$ = 500 mA |
| Start-up Current | $I_{BIAS(S)}$ | | | 15 | mA | $V_{IN}$ = 17.5 V, $I_O$ = 0 mA |
| | | | | 45 | | $V_{IN}$ = 17.5 V, $I_O$ = 500 mA |
| Quiescent Current Change | $\Delta I_{BIAS}$ | | | 10 | mA | 20 V ≤ $V_{IN}$ ≤ 28 V, $I_O$ = 500 mA |
| Output Noise Voltage | $V_n$ | | 350 | | $\mu V_{rms}$ | 10 Hz ≤ f ≤ 100 kHz |
| Ripple Rejection | R·R | 44 | 49 | | dB | f = 120 Hz, 20 V ≤ $V_{IN}$ ≤ 28 V |
| Dropout Voltage | $V_{DIF}$ | | 0.5 | 1.0 | V | $I_O$ = 500 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |
| Short Circuit Current | $I_{Oshort}$ | | 0.4 | | A | $V_{IN}$ = 28 V |
| Peak Output Current | $I_{Opeak}$ | 0.72 | 1.0 | 1.6 | A | $V_{IN}$ = 25 V |
| Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | | 2.2 | | mV/˚C | $I_O$ = 5 mA, 0 ˚C ≤ $T_J$ ≤ 125 ˚C |

## TYPICAL CHARACTERISTICS

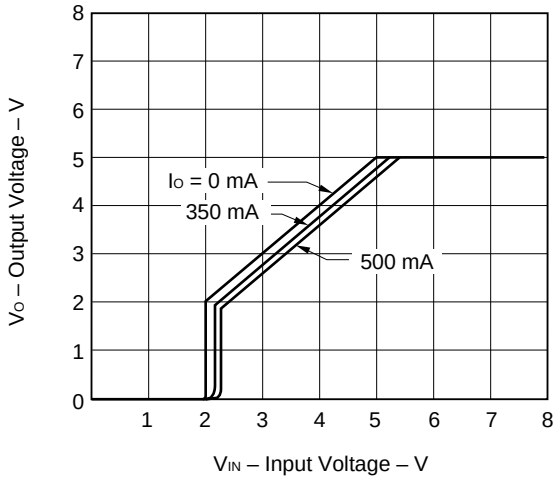
$P_d$ - $T_A$



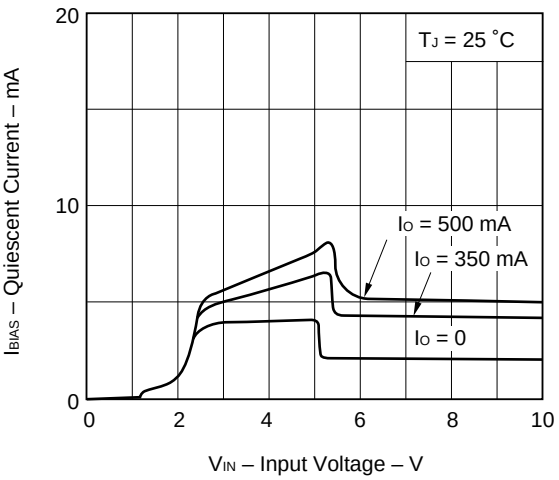

Δ $V_O$ - $T_J$ ( μPC24M05A)




$V_O$ - $V_{IN}$ ( μPC24M05A)

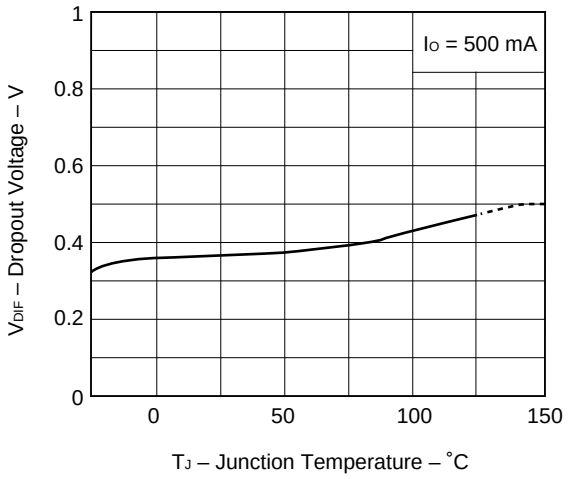



$I_{BIAS}$($I_{BIAS(S)}$) - $V_{IN}$ ( μPC24M05A)

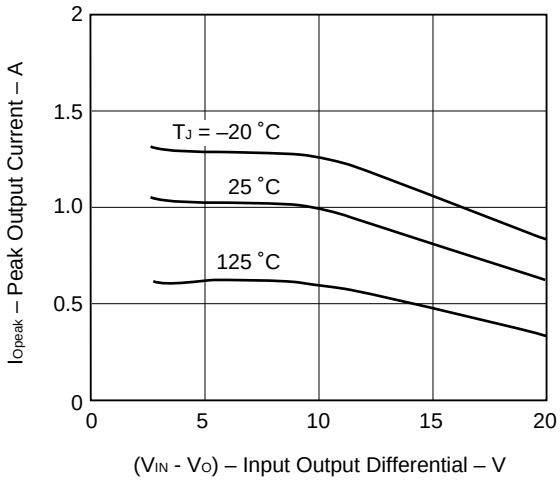


## TYPICAL CHARACTERISTICS

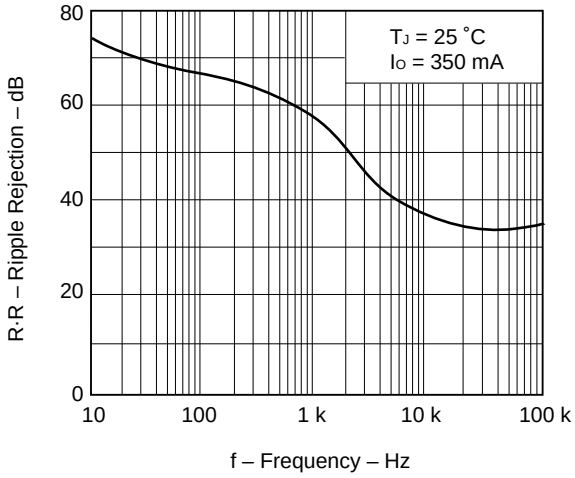
$V_{DIF}$ - $T_J$




$I_{Opeak}$ - ($V_{IN}$ - $V_O$)



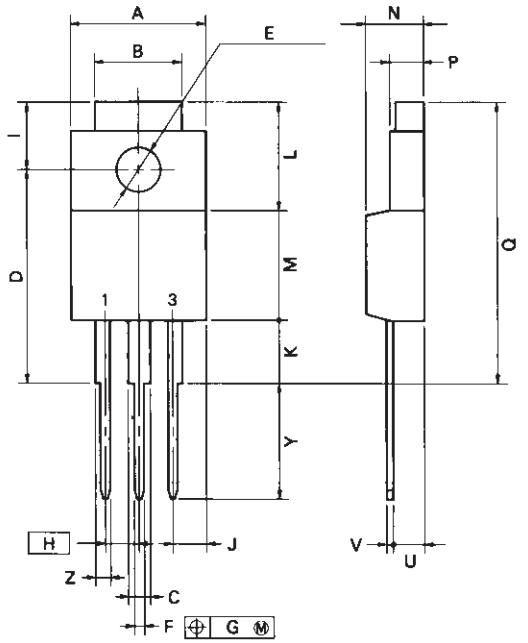

R·R - f ($\mu$PC24M05A)



## PACKAGE DIMENSIONS (Unit: mm)

**μPC24M00AHF Series**

**3PIN PLASTIC SIP (MP-45G)**




P3HF-254B-1

**NOTE**

Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS | INCHES |
|---|---|---|
| A | 10.4 MAX. | 0.410 MAX. |
| B | 7.0 | 0.276 |
| C | 1.2 MIN. | 0.047 MIN. |
| D | $17.0^{\pm 0.3}$ | $0.669^{+0.013}_{-0.012}$ |
| E | $\phi 3.3^{\pm 0.2}$ | $\phi 0.130^{\pm 0.008}$ |
| F | $0.75^{\pm 0.10}$ | $0.030^{+0.004}_{-0.005}$ |
| G | 0.25 | 0.010 |
| H | 2.54 (T.P.) | 0.100 (T.P.) |
| I | $5.0^{\pm 0.3}$ | $0.197^{\pm 0.012}$ |
| J | 2.66 MAX. | 0.105 MAX. |
| K | 4.8 MIN. | 0.188 MIN. |
| L | 8.5 | 0.335 |
| M | 8.5 | 0.335 |
| N | $4.5^{\pm 0.2}$ | $0.177^{\pm 0.008}$ |
| P | $2.8^{\pm 0.2}$ | $0.110^{+0.009}_{-0.008}$ |
| Q | 22.4 MAX. | 0.882 MAX. |
| U | $2.4^{\pm 0.5}$ | $0.094^{+0.021}_{-0.020}$ |
| V | $0.65^{\pm 0.10}$ | $0.026^{+0.004}_{-0.005}$ |
| Y | $8.9^{\pm 0.7}$ | $0.350^{\pm 0.028}$ |
| Z | 1.0 MIN. | 0.039 MIN. |

## 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 THROUGH HOLE MOUNT DEVICE

**μPC24M00AHF Series**

| Soldering Process | Soldering Conditions | Symbol |
|---|---|---|
| Wave soldering | Solder temperature: 260 °C or below.<br>Flow Time: 10 seconds or below. | |

## REFERENCE

| Document Name | Document No. |
|---|---|
| NEC semiconductor device reliability/quality control system | IEI-1212 |
| Quality grade on NEC semiconductor devices | IEI-1209 |
| Semiconductor device mounting technology manual | IEI-1207 |
| Semiconductor device package manual | IEI-1213 |
| Guide to quality assurance for semiconductor devices | MEI-1202 |
| Semiconductor selection guide | MF-1134 |

**[MEMO]**

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