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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Not recommended
for new design

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BIPOLAR ANALOG INTEGRATED CIRCUIT
 μ PC29Mxx Series

THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR

The μ PC29Mxx series of low dropout voltage three terminal positive regulators is constructed with PNP output transistor. The μ PC29Mxx series feature the ability to source 0.5 A of output current with a low dropout voltage of typically 0.5 V.

The power dissipation of the μ PC29Mxx series can be drastically reduced compared with the conventional three terminal positive voltage regulators that is constructed with NPN output transistor. Also, this series corresponds to the low voltage output (3.0 V, 3.3 V) which is not in the conventional low dropout regulators (μ PC24MxxA series).

FEATURES

- Output current in excess of 0.5 A
- Low dropout voltage
 $V_{DIF} = 0.5 \text{ V TYP. (I}_o = 0.5 \text{ A)}$
- On-chip over-current and thermal protection circuit
- On-chip output transistor safe operating area protection circuit

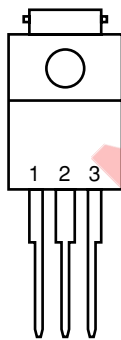
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PIN CONFIGURATIONS (Marking Side)

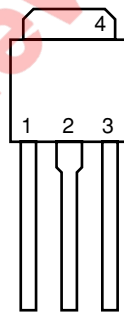
μ PC29MxxHF Series: Isolated TO-220 (MP-45G)

μ PC29MxxHB Series: SC-64 (MP-3)

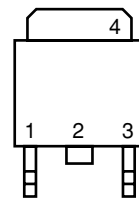
μ PC29MxxT Series: SC-63 (MP-3Z)



1: INPUT
 2: GND
 3: OUTPUT



1: INPUT
 2: GND^{Note1}
 3: OUTPUT
 4: GND (Fin)

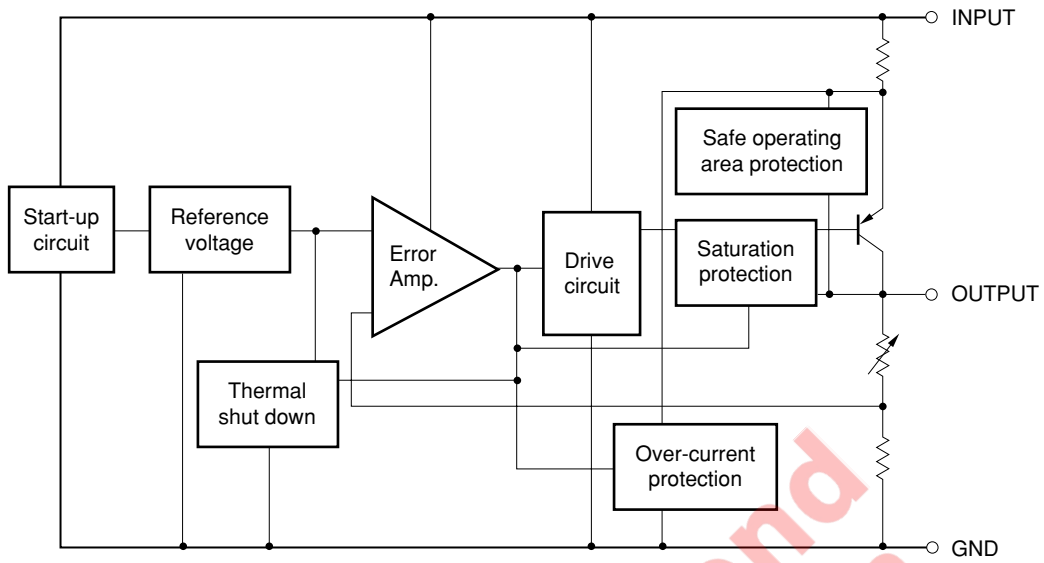


1: INPUT
 2: GND^{Note2}
 3: OUTPUT
 4: GND (Fin)

- Notes 1. No.2 pin and No.4 fin are common GND.
 2. No.2 pin is cut. No.2 pin and No.4 fin are common GND.

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BLOCK DIAGRAM



Not recommended for new design

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ORDERING INFORMATION

| Part Number | Package | Output Voltage | Marking |
|-------------|--------------------------|----------------|---------|
| μPC29M03HF | Isolated TO-220 (MP-45G) | 3.0 V | 29M03 |
| μPC29M03HB | SC-64 (MP-3) | 3.0 V | 29M03 |
| μPC29M03T | SC-63 (MP-3Z) | 3.0 V | 29M03 |
| μPC29M33HF | Isolated TO-220 (MP-45G) | 3.3 V | 29M33 |
| μPC29M33HB | SC-64 (MP-3) | 3.3 V | 29M33 |
| μPC29M33T | SC-63 (MP-3Z) | 3.3 V | 29M33 |
| μPC29M05HF | Isolated TO-220 (MP-45G) | 5.0 V | 29M05 |
| μPC29M05HB | SC-64 (MP-3) | 5.0 V | 29M05 |
| μPC29M05T | SC-63 (MP-3Z) | 5.0 V | 29M05 |
| μPC29M06HF | Isolated TO-220 (MP-45G) | 6.0 V | 29M06 |
| μPC29M06HB | SC-64 (MP-3) | 6.0 V | 29M06 |
| μPC29M06T | SC-63 (MP-3Z) | 6.0 V | 29M06 |
| μPC29M07HF | Isolated TO-220 (MP-45G) | 7.0 V | 29M07 |
| μPC29M07HB | SC-64 (MP-3) | 7.0 V | 29M07 |
| μPC29M07T | SC-63 (MP-3Z) | 7.0 V | 29M07 |
| μPC29M08HF | Isolated TO-220 (MP-45G) | 8.0 V | 29M08 |
| μPC29M08HB | SC-64 (MP-3) | 8.0 V | 29M08 |
| μPC29M08T | SC-63 (MP-3Z) | 8.0 V | 29M08 |
| μPC29M09HF | Isolated TO-220 (MP-45G) | 9.0 V | 29M09 |
| μPC29M09HB | SC-64 (MP-3) | 9.0 V | 29M09 |
| μPC29M09T | SC-63 (MP-3Z) | 9.0 V | 29M09 |
| μPC29M10HF | Isolated TO-220 (MP-45G) | 10.0 V | 29M10 |
| μPC29M10HB | SC-64 (MP-3) | 10.0 V | 29M10 |
| μPC29M10T | SC-63 (MP-3Z) | 10.0 V | 29M10 |
| μPC29M12HF | Isolated TO-220 (MP-45G) | 12.0 V | 29M12 |
| μPC29M12HB | SC-64 (MP-3) | 12.0 V | 29M12 |
| μPC29M12T | SC-63 (MP-3Z) | 12.0 V | 29M12 |

Remark Tape-packaged products have the symbol -E1, or -E2 suffixed to the part number. Pb-free products have the symbol -AZ, or -AY suffixed to the part number. Refer to the following table for details.

| Part Number ^{Note1} | Package | Package Type |
|----------------------------------|--------------------------|---|
| μPC29MxxHF | Isolated TO-220 (MP-45G) | • Packed in envelop |
| μPC29MxxHF-AZ ^{Note2} | Isolated TO-220 (MP-45G) | • Packed in envelop |
| μPC29MxxHB | SC-64 (MP-3) | • Packed in envelop |
| μPC29MxxHB-AZ ^{Note2} | SC-64 (MP-3) | • Packed in envelop |
| μPC29MxxHB-AY ^{Note3} | SC-64 (MP-3) | • Packed in envelop |
| μPC29MxxT-E1 | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel |
| μPC29MxxT-E1-AZ ^{Note2} | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel |
| μPC29MxxT-E1-AY ^{Note3} | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel |
| μPC29MxxT-E2 | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel |
| μPC29MxxT-E2-AZ ^{Note2} | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel |
| μPC29MxxT-E2-AY ^{Note3} | SC-63 (MP-3Z) | • 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel |

Notes 1. xx stands for symbols that indicate the output voltage.

2. Pb-free (This product does not contain Pb in the external electrode.)

3. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

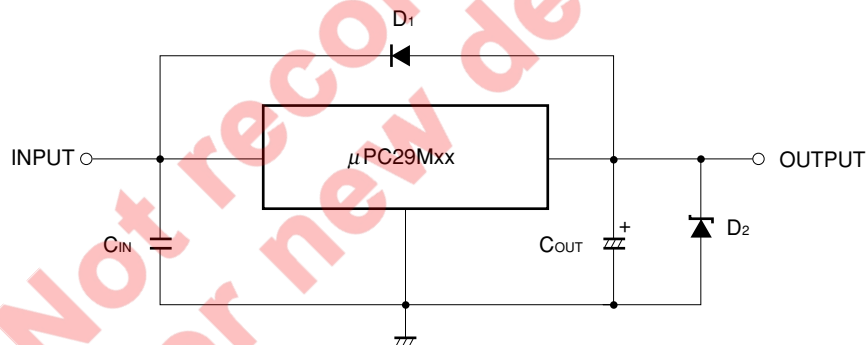
ABSOLUTE MAXIMUM RATINGS (TA = 25°C, Unless otherwise specified.)

| Parameter | Symbol | Rating | | Unit |
|--|-----------------------|-------------|-----------------------|------|
| | | μPC29MxxHF | μPC29MxxHB, μPC29MxxT | |
| Input Voltage | V _{IN} | 20 | | V |
| Internal Power Dissipation (T _c = 25°C) Note | P _T | 15 | 10 | W |
| Operating Ambient Temperature | T _A | -30 to +85 | | °C |
| Operating Junction Temperature | T _J | -30 to +150 | | °C |
| Storage Temperature | T _{stg} | -55 to +150 | | °C |
| Thermal Resistance (Junction to Case) | R _{th (J-C)} | 7 | 12.5 | °C/W |
| Thermal Resistance (Junction to Ambient) | R _{th (J-A)} | 65 | 125 | °C/W |

Note Internally limited. When the operating junction temperature rises above 150°C, the internal circuit shuts down the output voltage.

Caution Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

TYPICAL CONNECTION



- C_{IN} : 0.1 μF or higher. Be sure to connect C_{IN} to prevent parasitic oscillation. Set this value according to the length of the line between the regulator and the INPUT pin. Use of a film capacitor or other capacitor with first-rate voltage and temperature characteristics is recommended. If using a laminated ceramic capacitor, it is necessary to ensure that C_{IN} is 0.1 μF or higher for the voltage and temperature range to be used.
- C_{OUT} : 47 μF or higher. Be sure to connect C_{OUT} to prevent oscillation and improve excessive load regulation. Place C_{IN} and C_{OUT} as close as possible to the IC pins (within 1 to 2 cm). Also, use an electrolytic capacitor with low impedance characteristics if considering use at sub-zero temperatures.
- D₁ : If the OUTPUT pin has a higher voltage than the INPUT pin, connect a diode.
- D₂ : If the OUTPUT pin has a lower voltage than the GND pin, connect a Schottky barrier diode.

Caution Make sure that no voltage is applied to the OUTPUT pin from external.

RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Type Number | MIN. | TYP. | MAX. | Unit |
|--------------------------------|-----------------|-------------|------|------|------|------|
| Input Voltage | V _{IN} | μPC29M03 | 4 | | 16 | V |
| | | μPC29M33 | 4.3 | | 16 | |
| | | μPC29M05 | 6 | | 16 | |
| | | μPC29M06 | 7 | | 16 | |
| | | μPC29M07 | 8 | | 16 | |
| | | μPC29M08 | 9 | | 18 | |
| | | μPC29M09 | 10 | | 18 | |
| | | μPC29M10 | 11 | | 18 | |
| | | μPC29M12 | 13 | | 18 | |
| Output Current | I _o | all | 0 | | 0.5 | A |
| Operating Ambient Temperature | T _A | all | -30 | | +85 | °C |
| Operating Junction Temperature | T _J | all | -30 | | +125 | °C |

ELECTRICAL CHARACTERISTICS

μPC29M03 (T_J = 25°C, V_{IN} = 5 V, I_o = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _o | | 2.88 | 3.0 | 3.12 | V |
| | | 0°C ≤ T _J ≤ 125°C, 4.0 V ≤ V _{IN} ≤ 16 V, 0 A ≤ I _o ≤ 350 mA | 2.85 | | 3.15 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _o ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 4.0 V ≤ V _{IN} ≤ 16 V | | 7 | 30 | mV |
| Load Regulation | REG _L | 0 A ≤ I _o ≤ 0.5 A | | 8 | 30 | mV |
| Quiescent Current | I _{BIAS} | I _o = 0 A | | 1.8 | 4.0 | mA |
| | | I _o = 0.5 A | | 17 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 2.95 V, I _o = 0 A | | 7 | 30 | mA |
| | | V _{IN} = 2.95 V, I _o = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 4.0 V ≤ V _{IN} ≤ 16 V | | 3.2 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 51 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 4.0 V ≤ V _{IN} ≤ 16 V | 48 | 64 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _o = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 4.5 V | 0.65 | 1.0 | 1.5 | A |
| | | V _{IN} = 16 V | | 0.6 | | |
| Peak Output Current | I _{o peak} | V _{IN} = 4.5 V | 0.7 | 1.0 | 1.5 | A |
| | | V _{IN} = 16 V | 0.6 | 0.9 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _o /ΔT | 0°C ≤ T _J ≤ 125°C, I _o = 5 mA | | -0.3 | | mV/°C |

μPC29M33 (T_J = 25°C, V_{IN} = 5 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _O | | 3.17 | 3.3 | 3.43 | V |
| | | 0°C ≤ T _J ≤ 125°C, 4.3 V ≤ V _{IN} ≤ 16 V, 0 A ≤ I _O ≤ 350 mA | 3.14 | | 3.46 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 4.3 V ≤ V _{IN} ≤ 16 V | | 8 | 33 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 10 | 33 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 1.8 | 4.0 | mA |
| | | I _O = 0.5 A | | 15 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 3.1 V, I _O = 0 A | | 9 | 30 | mA |
| | | V _{IN} = 3.1 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 4.3 V ≤ V _{IN} ≤ 16 V | | 2.9 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 56 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 4.3 V ≤ V _{IN} ≤ 16 V | 48 | 64 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 4.5 V | 0.7 | 1.1 | 1.5 | A |
| | | V _{IN} = 16 V | | 0.6 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 4.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 16 V | 0.6 | 1.0 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | -0.4 | | mV/°C |

Not recommended for new design

μPC29M05 (T_J = 25°C, V_{IN} = 8 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _O | | 4.8 | 5.0 | 5.2 | V |
| | | 0°C ≤ T _J ≤ 125°C, 6 V ≤ V _{IN} ≤ 16 V, 0 A ≤ I _O ≤ 350 mA | 4.75 | | 5.25 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 6 V ≤ V _{IN} ≤ 16 V | | 26 | 50 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 17 | 50 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 1.9 | 4.0 | mA |
| | | I _O = 0.5 A | | 16 | 30 | |
| Startup Quiescent Current | I _{BIAS} (s) | V _{IN} = 4.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 4.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 6 V ≤ V _{IN} ≤ 16 V | | 2.4 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 87 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 6 V ≤ V _{IN} ≤ 16 V | 46 | 60 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 6.5 V | 0.65 | 1.1 | 1.5 | A |
| | | V _{IN} = 16 V | | 0.6 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 6.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 16 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.7 | | mV/°C |

Not recommended for new design

μPC29M06 (T_J = 25°C, V_{IN} = 9 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _O | | 5.76 | 6.0 | 6.24 | V |
| | | 0°C ≤ T _J ≤ 125°C, 7 V ≤ V _{IN} ≤ 16 V, 0 A ≤ I _O ≤ 350 mA | 5.70 | | 6.30 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 7 V ≤ V _{IN} ≤ 16 V | | 30 | 60 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 30 | 60 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.0 | 4.0 | mA |
| | | I _O = 0.5 A | | 16 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 5.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 5.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 7 V ≤ V _{IN} ≤ 16 V | | 2.5 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 126 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 7 V ≤ V _{IN} ≤ 16 V | 42 | 58 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 7.5 V | 0.7 | 1.1 | 1.5 | A |
| | | V _{IN} = 16 V | | 0.6 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 7.5 V | 0.7 | 1.1 | 1.5 | A |
| | | V _{IN} = 16 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.44 | | mV/°C |

Not recommended for new design

μPC29M07 (T_J = 25°C, V_{IN} = 10 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _O | | 6.72 | 7.0 | 7.28 | V |
| | | 0°C ≤ T _J ≤ 125°C, 8 V ≤ V _{IN} ≤ 16 V, 0 A ≤ I _O ≤ 350 mA | 6.65 | | 7.35 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 8 V ≤ V _{IN} ≤ 16 V | | 35 | 70 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 35 | 70 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.0 | 4.0 | mA |
| | | I _O = 0.5 A | | 16 | 30 | |
| Startup Quiescent Current | I _{BIAS} (s) | V _{IN} = 6.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 6.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 8 V ≤ V _{IN} ≤ 16 V | | 2.6 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 147 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 8 V ≤ V _{IN} ≤ 16 V | 40 | 56 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 8.5 V | 0.7 | 1.1 | 1.5 | A |
| | | V _{IN} = 16 V | | 0.6 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 8.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 16 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.7 | | mV/°C |

Not recommended for new design

μPC29M08 (T_J = 25°C, V_{IN} = 11 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| Output Voltage | V _O | | 7.68 | 8.0 | 8.32 | V |
| | | 0°C ≤ T _J ≤ 125°C, 9 V ≤ V _{IN} ≤ 18 V, 0 A ≤ I _O ≤ 350 mA | 7.6 | | 8.4 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 9 V ≤ V _{IN} ≤ 18 V | | 40 | 80 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 40 | 80 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.0 | 4.0 | mA |
| | | I _O = 0.5 A | | 15 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 7.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 7.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 9 V ≤ V _{IN} ≤ 18 V | | 3.0 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 150 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 9 V ≤ V _{IN} ≤ 18 V | 42 | 58 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 9.5 V | | 1.0 | | A |
| | | V _{IN} = 18 V | | 0.55 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 9.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 18 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.7 | | mV/°C |

Not recommended for new design

μPC29M09 (T_J = 25°C, V_{IN} = 12 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|---|------|------|------|----------------------|
| Output Voltage | V _O | | 8.64 | 9.0 | 9.36 | V |
| | | 0°C ≤ T _J ≤ 125°C, 10 V ≤ V _{IN} ≤ 18 V, 0 A ≤ I _O ≤ 350 mA | 8.55 | | 9.45 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 10 V ≤ V _{IN} ≤ 18 V | | 45 | 90 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 45 | 90 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.0 | 4.0 | mA |
| | | I _O = 0.5 A | | 15 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 8.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 8.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 10 V ≤ V _{IN} ≤ 18 V | | | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 170 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 10 V ≤ V _{IN} ≤ 18 V | 41 | 57 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 10.5 V | | 1.0 | | A |
| | | V _{IN} = 18 V | | 0.55 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 10.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 18 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.8 | | mV/°C |

Not recommended for new design

μPC29M10 (T_J = 25°C, V_{IN} = 13 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|---|------|------|------|----------------------|
| Output Voltage | V _O | | 9.6 | 10.0 | 10.4 | V |
| | | 0°C ≤ T _J ≤ 125°C, 11 V ≤ V _{IN} ≤ 18 V, 0 A ≤ I _O ≤ 350 mA | 9.5 | | 10.5 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 11 V ≤ V _{IN} ≤ 18 V | | 34 | 100 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 10 | 100 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.1 | 4.0 | mA |
| | | I _O = 0.5 A | | 16 | 30 | |
| Startup Quiescent Current | I _{BIAS (s)} | V _{IN} = 9.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 9.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 11 V ≤ V _{IN} ≤ 18 V | | 1.9 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 180 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 11 V ≤ V _{IN} ≤ 18 V | 40 | 53 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 11.5 V | | 0.9 | | A |
| | | V _{IN} = 18 V | | 0.5 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 11.5 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 18 V | 0.6 | 1.2 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 0.9 | | mV/°C |

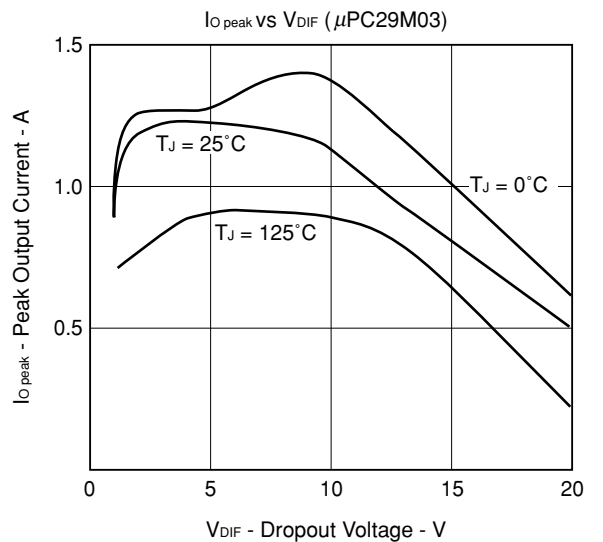
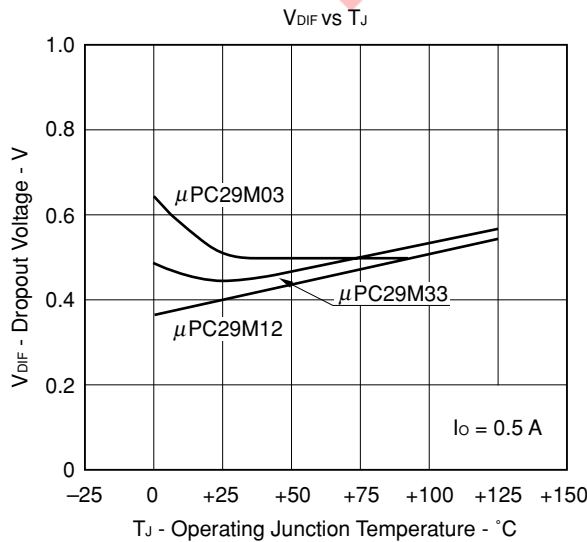
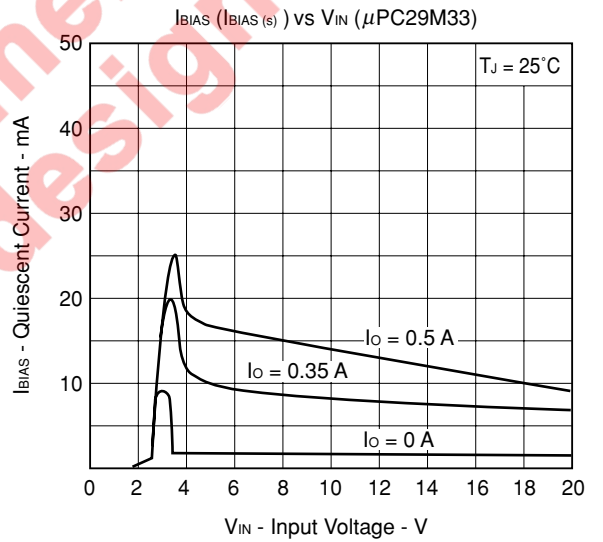
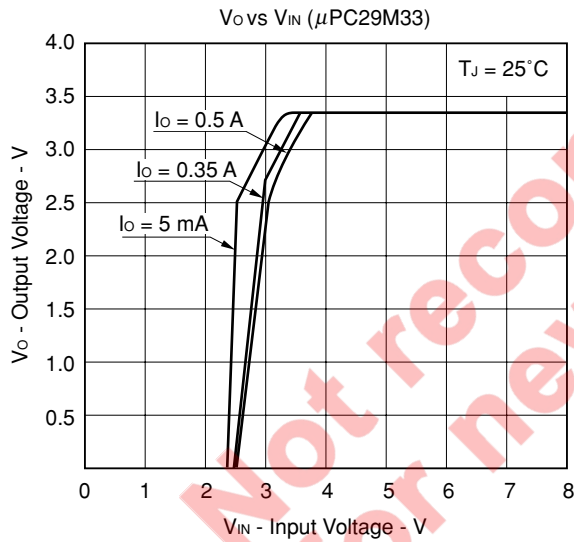
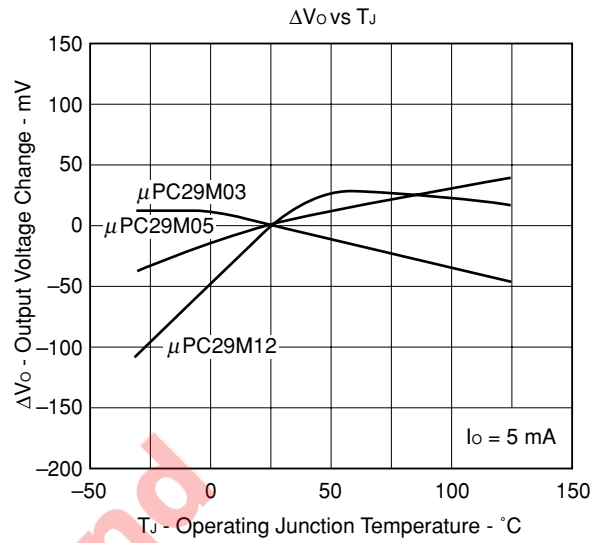
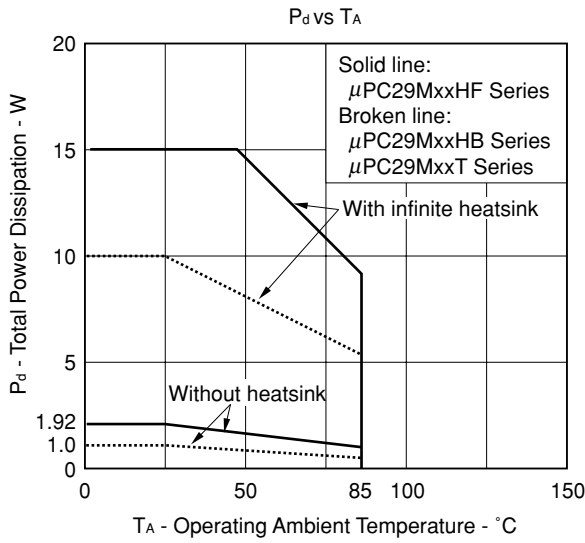
Not recommended for new design

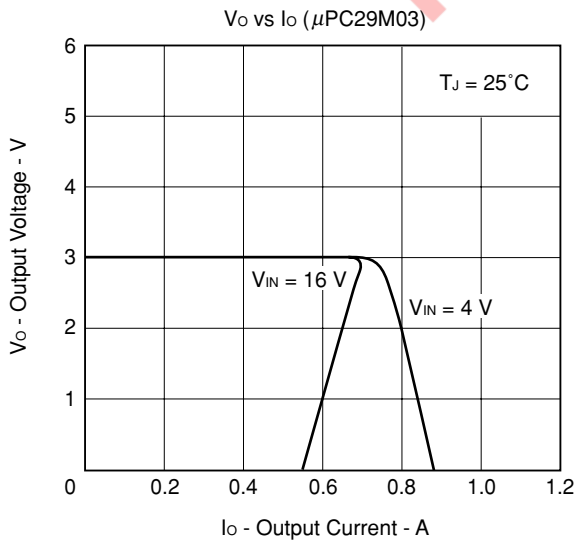
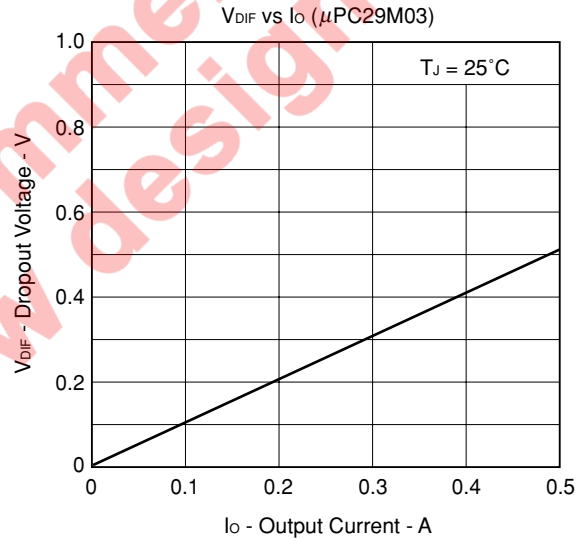
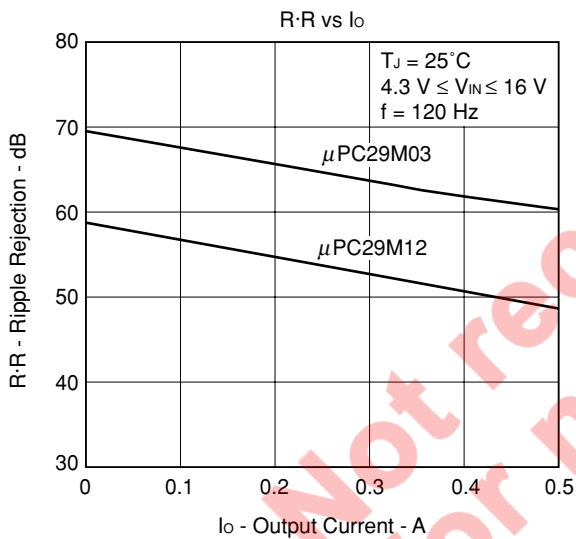
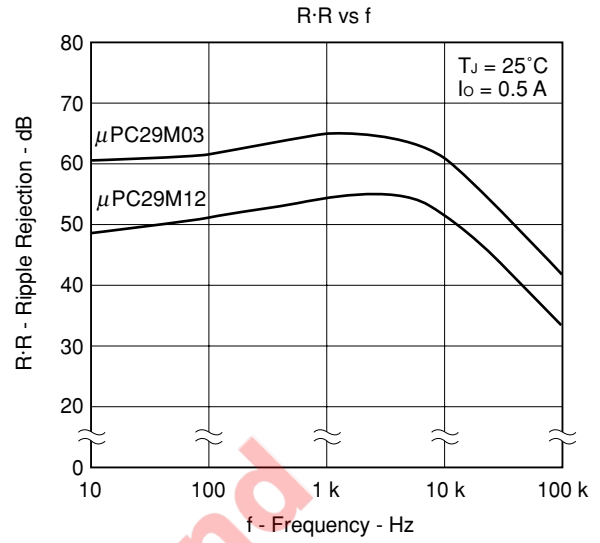
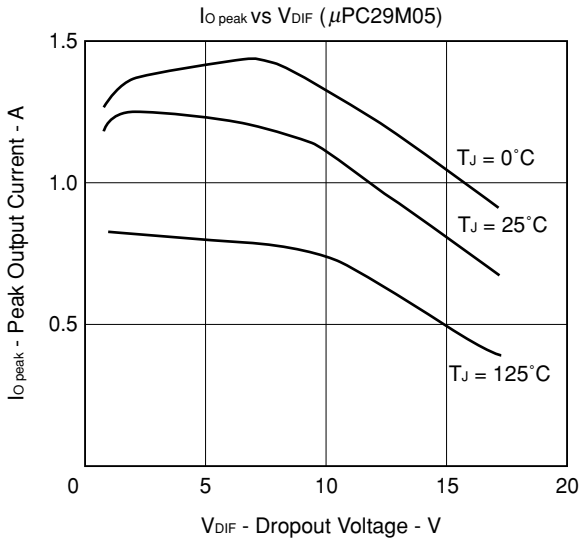
μPC29M12 (T_J = 25°C, V_{IN} = 15 V, I_O = 350 mA, C_{IN} = 0.22 μF, C_{OUT} = 47 μF, unless otherwise specified.)

| Parameters | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|-----------------------|---|-------|------|-------|----------------------|
| Output Voltage | V _O | | 11.52 | 12 | 12.48 | V |
| | | 0°C ≤ T _J ≤ 125°C, 13 V ≤ V _{IN} ≤ 18 V, 0 A ≤ I _O ≤ 350 mA | 11.4 | | 12.6 | |
| | | 0°C ≤ T _J ≤ 125°C, 0 A ≤ I _O ≤ 0.5 A | | | | |
| Line Regulation | REG _{IN} | 13 V ≤ V _{IN} ≤ 18 V | | 25 | 120 | mV |
| Load Regulation | REG _L | 0 A ≤ I _O ≤ 0.5 A | | 13 | 120 | mV |
| Quiescent Current | I _{BIAS} | I _O = 0 A | | 2.1 | 4.0 | mA |
| | | I _O = 0.5 A | | 14 | 30 | |
| Startup Quiescent Current | I _{BIAS} (s) | V _{IN} = 11.5 V, I _O = 0 A | | 10 | 30 | mA |
| | | V _{IN} = 11.5 V, I _O = 0.5 A | | | 80 | |
| Quiescent Current Change | ΔI _{BIAS} | 0°C ≤ T _J ≤ 125°C, 13 V ≤ V _{IN} ≤ 18 V | | 1.7 | 20 | mA |
| Output Noise Voltage | V _n | 10 Hz ≤ f ≤ 100 kHz | | 210 | | μV _{r.m.s.} |
| Ripple Rejection | R·R | f = 120 Hz, 13 V ≤ V _{IN} ≤ 18 V | 40 | 53 | | dB |
| Dropout Voltage | V _{DIF} | 0°C ≤ T _J ≤ 125°C, I _O = 0.5 A | | 0.5 | 1.0 | V |
| Short Circuit Current | I _{O short} | V _{IN} = 14 V | | 0.7 | | A |
| | | V _{IN} = 18 V | | 0.5 | | |
| Peak Output Current | I _{O peak} | V _{IN} = 14 V | 0.7 | 1.2 | 1.5 | A |
| | | V _{IN} = 18 V | 0.6 | 1.1 | 1.5 | |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | 0°C ≤ T _J ≤ 125°C, I _O = 5 mA | | 1.2 | | mV/°C |

Not recommended for new design

TYPICAL CHARACTERISTICS

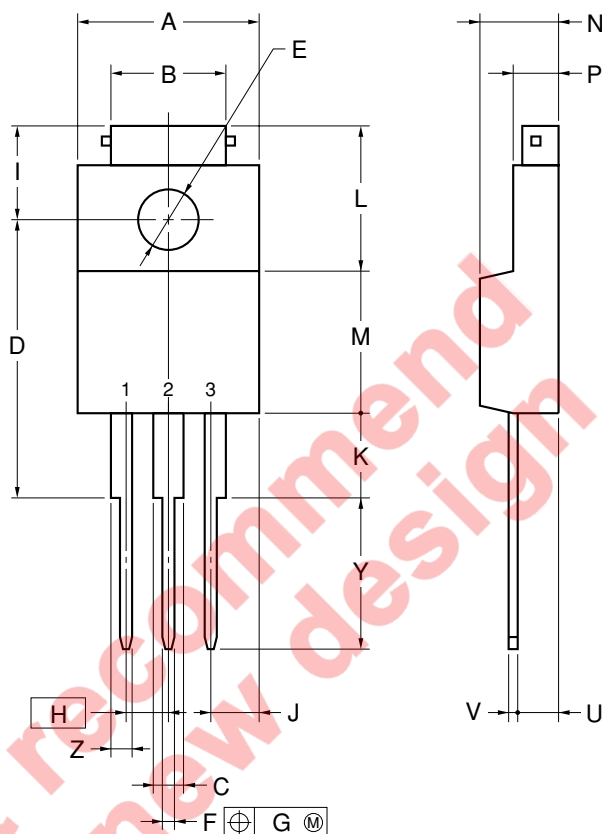




PACKAGE DRAWINGS

μPC29MxxHF Series

3PIN PLASTIC SIP (MP-45G)



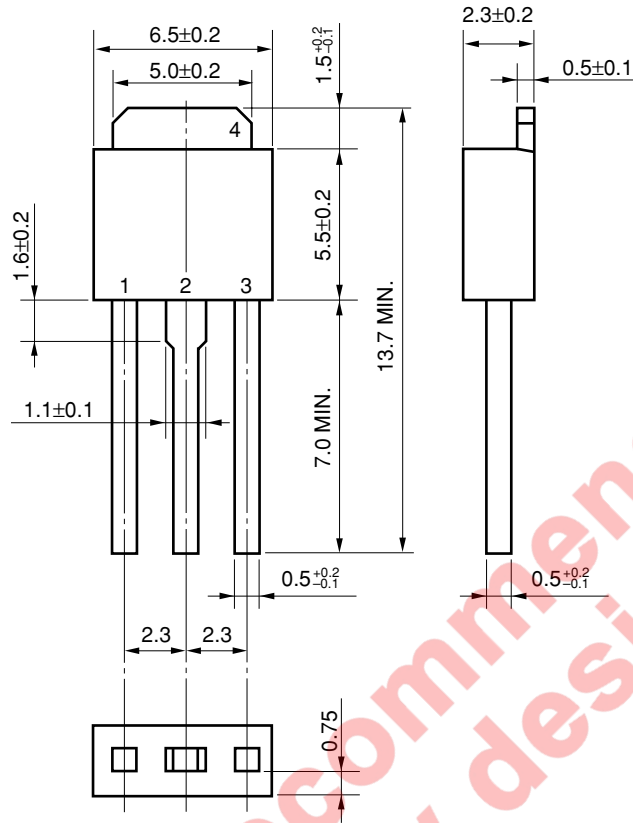
NOTE
 Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS |
|------|-------------|
| A | 10.0±0.2 |
| B | 7.0±0.2 |
| C | 1.50±0.2 |
| D | 17.0±0.3 |
| E | φ3.3±0.2 |
| F | 0.75±0.10 |
| G | 0.25 |
| H | 2.54 (T.P.) |
| I | 5.0±0.3 |
| J | 2.46±0.2 |
| K | 5.0±0.2 |
| L | 8.5±0.2 |
| M | 8.5±0.2 |
| N | 4.5±0.2 |
| P | 2.8±0.2 |
| U | 2.4±0.5 |
| V | 0.65±0.10 |
| Y | 8.9±0.7 |
| Z | 1.30±0.2 |

P3HF-254B-4

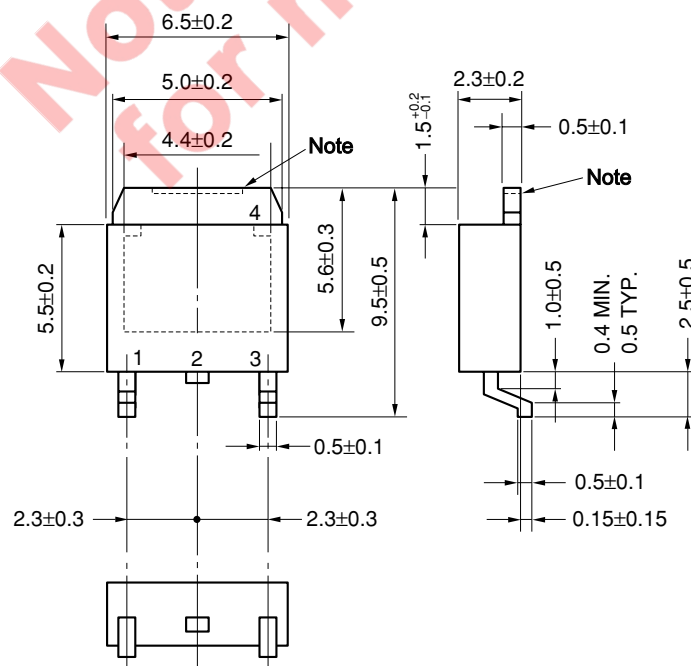
μPC29MxxHB Series

SC-64 (MP-3) (Unit: mm)



μPC29MxxT Series

<R> SC-63 (MP-3Z) (Unit: mm)



Note The depth of notch at the top of the fin is from 0 to 0.2 mm.

<R> **RECOMMENDED SOLDERING CONDITIONS**

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different condition, please make sure to consult with our sales offices.

For more details, refer to the **Semiconductor Device Mount Manual**
 (<http://www.necel.com/pkg/en/mount/index.html>)

Surface mount devices

μPC29MxxT Series: SC-63 (MP-3Z)

| Process | Conditions | Symbol |
|------------------------|--|-----------|
| Infrared ray reflow | Peak temperature: 235°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 3 times or less. | IR35-00-3 |
| VPS | Peak temperature: 215°C or below (Package surface temperature), Reflow time: 40 seconds or less (at 200°C or higher), Maximum number of reflow processes: 3 times or less. | VP15-00-3 |
| Partial heating method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device). | P350 |

Caution Apply only one kind of soldering condition to a device, except for “partial heating method”, or the device will be damaged by heat stress.

Remark Flux: Rosin-based flux with low chlorine content (chlorine 0.2 Wt% or below) is recommended.

μPC29MxxT-AZ Series ^{Note1}, μPC29MxxT-AY Series ^{Note2}: SC-63 (MP-3Z)

| Process | Conditions | Symbol |
|------------------------|--|-----------|
| Infrared ray reflow | Peak temperature: 260°C or below (Package surface temperature), Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 times or less. | IR60-00-3 |
| Partial heating method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device). | P350 |

- Notes**
1. Pb-free (This product does not contain Pb in the external electrode.)
 2. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

Caution Apply only one kind of soldering condition to a device, except for “partial heating method”, or the device will be damaged by heat stress.

Remark Flux: Rosin-based flux with low chlorine content (chlorine 0.2 Wt% or below) is recommended.

Through-hole devices

μPC29MxxHF Series, μPC29MxxHF-AZ Series ^{Note1}: Isolated TO-220 (MP-45G)

μPC29MxxHB Series, μPC29MxxHB-AZ Series ^{Note1}, μPC29MxxHB-AY Series ^{Note2}: SC-64 (MP-3)

| Process | Conditions | Symbol |
|-----------------------------------|--|-----------|
| Wave soldering (only to leads) | Solder temperature: 260°C or below, Flow time: 10 seconds or less. | WS60-00-1 |
| Partial heating method | Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each pin). | P350 |

Notes 1. Pb-free (This product does not contain Pb in the external electrode.)

2. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.

CAUTION ON USE

When using the μPC29Mxx series at the input voltage which is lower than in the recommended operating condition, the high quiescent current flows through devices because the transistor of the output paragraph is saturated (Refer to “IBIAS (IBIAS(s)) vs VIN curves in TYPICAL CHARACTERISTICS”). The μPC29Mxx series have saturation protection circuits, but they sometimes need about 80 mA current. Therefore the power supply on the input needs the enough current capacity to pass this quiescent current when the devices startup.

<R> **REFERENCE DOCUMENTS**

| | |
|--|---|
| USER'S MANUAL USAGE OF THREE TERMINAL REGULATORS | Document No.G12702E |
| REVIEW OF QUALITY AND RELIABILITY HANDBOOK | Document No.C12769E |
| INFORMATION VOLTAGE REGULATOR OF SMD | Document No.G11872E |
| SEMICONDUCTOR DEVICE MOUNT MANUAL | http://www.necel.com/pkg/en/mount/index.html |

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[NCV8664CST33T3G](#) [NCV8752AMX28TCG](#) [L9454](#) [AP7362-HA-7](#) [LX13043CLD](#) [TCR3DF185,LM\(CT](#) [TCR3DF24,LM\(CT](#)
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