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Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

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

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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.

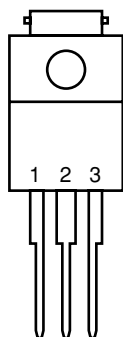
The power dissipation of the μ PC29Mxx series can be drastically reduced compared with the conventional three terminal positive voltage regulators that is constructed with NPN output transistor. Also, this series corresponds to the low voltage output (3.0 V, 3.3 V) which is not in the conventional low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

FEATURES

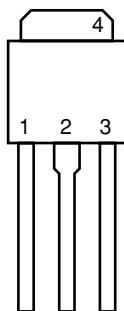
- Output current in excess of 0.5 A
- Low dropout voltage
 $V_{DIF} = 0.5 \text{ V TYP. (} I_o = 0.5 \text{ A)}$
- On-chip over-current and thermal protection circuit
- On-chip output transistor safe operating area protection circuit

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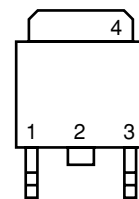
PIN CONFIGURATIONS (Marking Side)

 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)

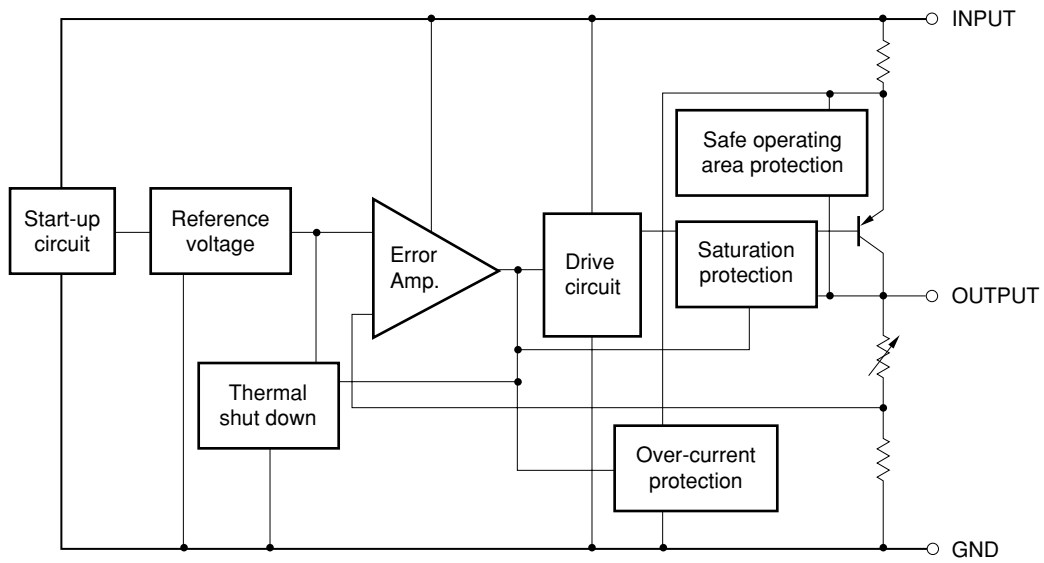
Notes 1. No.2 pin and No.4 fin are common GND.

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

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BLOCK DIAGRAM



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ORDERING INFORMATION

Part Number	Package	Output Voltage	Marking
μ PC29M03HF	Isolated TO-220 (MP-45G)	3.0 V	29M03
μ PC29M03HB	SC-64 (MP-3)	3.0 V	29M03
μ PC29M03T	SC-63 (MP-3Z)	3.0 V	29M03
μ PC29M33HF	Isolated TO-220 (MP-45G)	3.3 V	29M33
μ PC29M33HB	SC-64 (MP-3)	3.3 V	29M33
μ PC29M33T	SC-63 (MP-3Z)	3.3 V	29M33
μ PC29M05HF	Isolated TO-220 (MP-45G)	5.0 V	29M05
μ PC29M05HB	SC-64 (MP-3)	5.0 V	29M05
μ PC29M05T	SC-63 (MP-3Z)	5.0 V	29M05
μ PC29M06HF	Isolated TO-220 (MP-45G)	6.0 V	29M06
μ PC29M06HB	SC-64 (MP-3)	6.0 V	29M06
μ PC29M06T	SC-63 (MP-3Z)	6.0 V	29M06
μ PC29M07HF	Isolated TO-220 (MP-45G)	7.0 V	29M07
μ PC29M07HB	SC-64 (MP-3)	7.0 V	29M07
μ PC29M07T	SC-63 (MP-3Z)	7.0 V	29M07
μ PC29M08HF	Isolated TO-220 (MP-45G)	8.0 V	29M08
μ PC29M08HB	SC-64 (MP-3)	8.0 V	29M08
μ PC29M08T	SC-63 (MP-3Z)	8.0 V	29M08
μ PC29M09HF	Isolated TO-220 (MP-45G)	9.0 V	29M09
μ PC29M09HB	SC-64 (MP-3)	9.0 V	29M09
μ PC29M09T	SC-63 (MP-3Z)	9.0 V	29M09
μ PC29M10HF	Isolated TO-220 (MP-45G)	10.0 V	29M10
μ PC29M10HB	SC-64 (MP-3)	10.0 V	29M10
μ PC29M10T	SC-63 (MP-3Z)	10.0 V	29M10
μ PC29M12HF	Isolated TO-220 (MP-45G)	12.0 V	29M12
μ PC29M12HB	SC-64 (MP-3)	12.0 V	29M12
μ PC29M12T	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
μ PC29MxxHF	Isolated TO-220 (MP-45G)	• Packed in envelop
μ PC29MxxHF-AZ ^{Note2}	Isolated TO-220 (MP-45G)	• Packed in envelop
μ PC29MxxHB	SC-64 (MP-3)	• Packed in envelop
μ PC29MxxHB-AZ ^{Note2}	SC-64 (MP-3)	• Packed in envelop
μ PC29MxxHB-AY ^{Note3}	SC-64 (MP-3)	• Packed in envelop
μ PC29MxxT-E1	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μ PC29MxxT-E1-AZ ^{Note2}	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μ PC29MxxT-E1-AY ^{Note3}	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μ PC29MxxT-E2	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel
μ PC29MxxT-E2-AZ ^{Note2}	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel
μ PC29MxxT-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.)

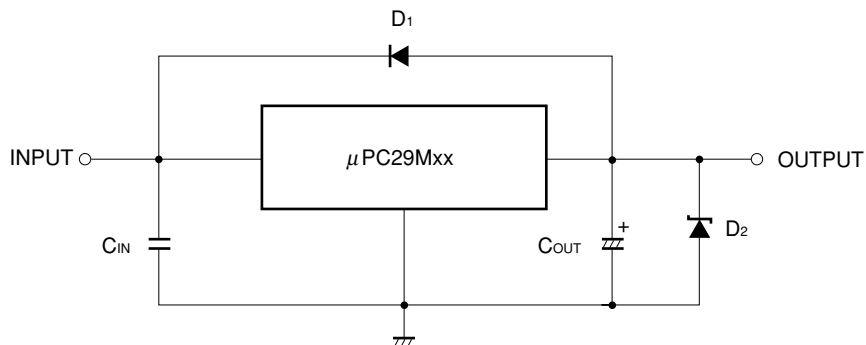
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, Unless otherwise specified.)

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 ($T_J = 25^\circ\text{C}$, $V_{IN} = 5\text{ V}$, $I_o = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_o		3.17	3.3	3.43	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $4.3\text{ V} \leq V_{IN} \leq 16\text{ V}$, $0\text{ A} \leq I_o \leq 350\text{ mA}$	3.14		3.46	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_o \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$4.3\text{ V} \leq V_{IN} \leq 16\text{ V}$		8	33	mV
Load Regulation	REG_L	$0\text{ A} \leq I_o \leq 0.5\text{ A}$		10	33	mV
Quiescent Current	I_{BIAS}	$I_o = 0\text{ A}$		1.8	4.0	mA
		$I_o = 0.5\text{ A}$		15	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 3.1\text{ V}$, $I_o = 0\text{ A}$		9	30	mA
		$V_{IN} = 3.1\text{ V}$, $I_o = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $4.3\text{ V} \leq V_{IN} \leq 16\text{ V}$		2.9	20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		56		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$, $4.3\text{ V} \leq V_{IN} \leq 16\text{ V}$	48	64		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\text{ short}}$	$V_{IN} = 4.5\text{ V}$	0.7	1.1	1.5	A
		$V_{IN} = 16\text{ V}$		0.6		
Peak Output Current	$I_{O\text{ peak}}$	$V_{IN} = 4.5\text{ V}$	0.7	1.2	1.5	A
		$V_{IN} = 16\text{ V}$	0.6	1.0	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 5\text{ mA}$		-0.4		mV/°C

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

μPC29M06 ($T_J = 25^\circ\text{C}$, $V_{IN} = 9\text{ V}$, $I_O = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		5.76	6.0	6.24	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $7\text{ V} \leq V_{IN} \leq 16\text{ V}$, $0\text{ A} \leq I_O \leq 350\text{ mA}$	5.70		6.30	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_O \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$7\text{ V} \leq V_{IN} \leq 16\text{ V}$		30	60	mV
Load Regulation	REG_L	$0\text{ A} \leq I_O \leq 0.5\text{ A}$		30	60	mV
Quiescent Current	I_{BIAS}	$I_O = 0\text{ A}$		2.0	4.0	mA
		$I_O = 0.5\text{ A}$		16	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 5.5\text{ V}$, $I_O = 0\text{ A}$		10	30	mA
		$V_{IN} = 5.5\text{ V}$, $I_O = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $7\text{ V} \leq V_{IN} \leq 16\text{ V}$		2.5	20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		126		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$, $7\text{ V} \leq V_{IN} \leq 16\text{ V}$	42	58		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_O = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\text{ short}}$	$V_{IN} = 7.5\text{ V}$	0.7	1.1	1.5	A
		$V_{IN} = 16\text{ V}$		0.6		
Peak Output Current	$I_{O\text{ peak}}$	$V_{IN} = 7.5\text{ V}$	0.7	1.1	1.5	A
		$V_{IN} = 16\text{ V}$	0.6	1.1	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_O = 5\text{ mA}$		0.44		mV/°C

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

μPC29M08 ($T_J = 25^\circ\text{C}$, $V_{IN} = 11\text{ V}$, $I_o = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_o		7.68	8.0	8.32	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $9\text{ V} \leq V_{IN} \leq 18\text{ V}$, $0\text{ A} \leq I_o \leq 350\text{ mA}$	7.6		8.4	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_o \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$9\text{ V} \leq V_{IN} \leq 18\text{ V}$		40	80	mV
Load Regulation	REG_L	$0\text{ A} \leq I_o \leq 0.5\text{ A}$		40	80	mV
Quiescent Current	I_{BIAS}	$I_o = 0\text{ A}$		2.0	4.0	mA
		$I_o = 0.5\text{ A}$		15	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 7.5\text{ V}$, $I_o = 0\text{ A}$		10	30	mA
		$V_{IN} = 7.5\text{ V}$, $I_o = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $9\text{ V} \leq V_{IN} \leq 18\text{ V}$		3.0	20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		150		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$, $9\text{ V} \leq V_{IN} \leq 18\text{ V}$	42	58		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\ short}$	$V_{IN} = 9.5\text{ V}$		1.0		A
		$V_{IN} = 18\text{ V}$		0.55		
Peak Output Current	$I_{O\ peak}$	$V_{IN} = 9.5\text{ V}$	0.7	1.2	1.5	A
		$V_{IN} = 18\text{ V}$	0.6	1.1	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 5\text{ mA}$		0.7		mV/°C

μ PC29M09 ($T_J = 25^\circ\text{C}$, $V_{IN} = 12\text{ V}$, $I_o = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_o		8.64	9.0	9.36	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $10\text{ V} \leq V_{IN} \leq 18\text{ V}$, $0\text{ A} \leq I_o \leq 350\text{ mA}$	8.55		9.45	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_o \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$10\text{ V} \leq V_{IN} \leq 18\text{ V}$		45	90	mV
Load Regulation	REG_L	$0\text{ A} \leq I_o \leq 0.5\text{ A}$		45	90	mV
Quiescent Current	I_{BIAS}	$I_o = 0\text{ A}$		2.0	4.0	mA
		$I_o = 0.5\text{ A}$		15	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 8.5\text{ V}$, $I_o = 0\text{ A}$		10	30	mA
		$V_{IN} = 8.5\text{ V}$, $I_o = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $10\text{ V} \leq V_{IN} \leq 18\text{ V}$			20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		170		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R-R	$f = 120\text{ Hz}$, $10\text{ V} \leq V_{IN} \leq 18\text{ V}$	41	57		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\ short}$	$V_{IN} = 10.5\text{ V}$		1.0		A
		$V_{IN} = 18\text{ V}$		0.55		
Peak Output Current	$I_{o\ peak}$	$V_{IN} = 10.5\text{ V}$	0.7	1.2	1.5	A
		$V_{IN} = 18\text{ V}$	0.6	1.1	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 5\text{ mA}$		0.8		$\text{mV}/^\circ\text{C}$

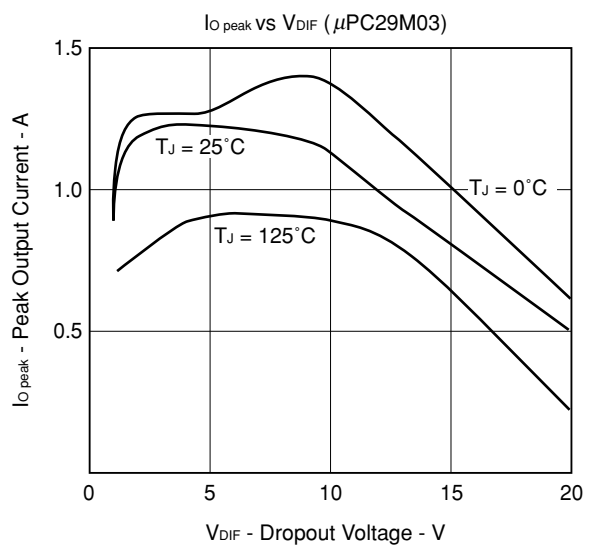
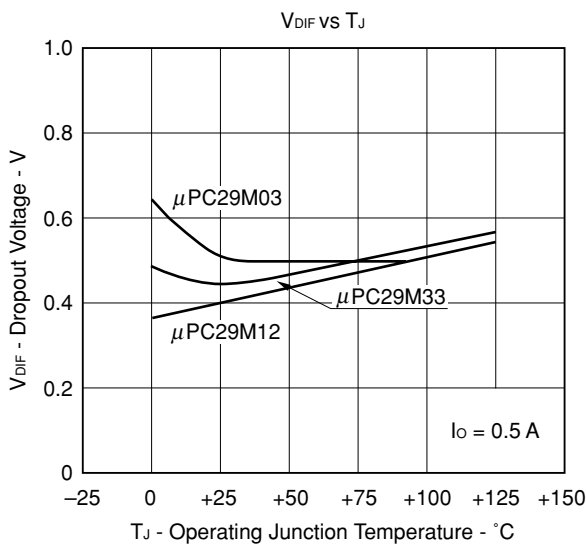
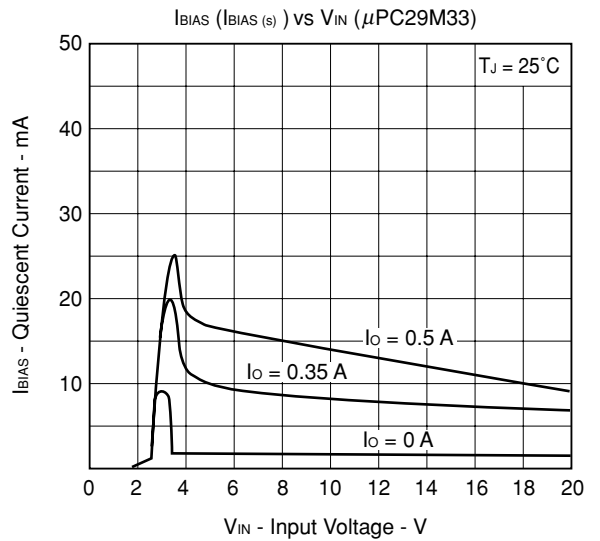
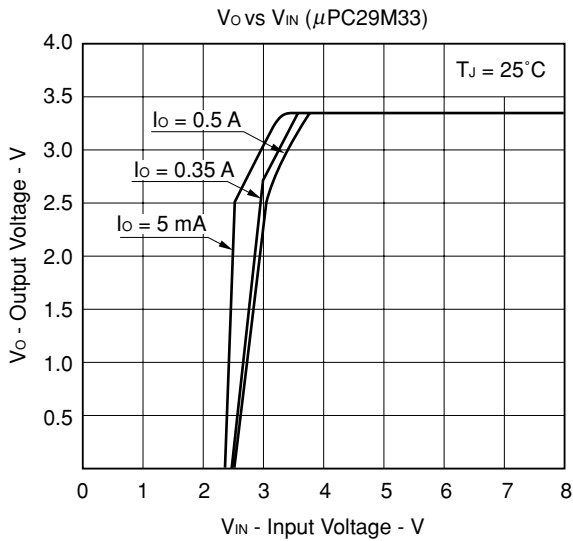
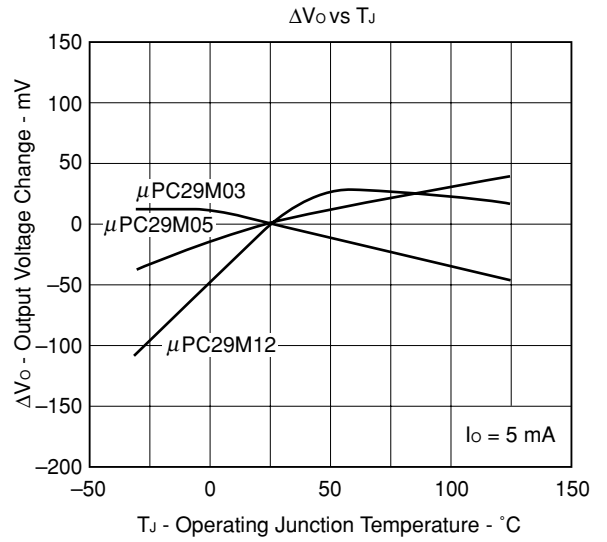
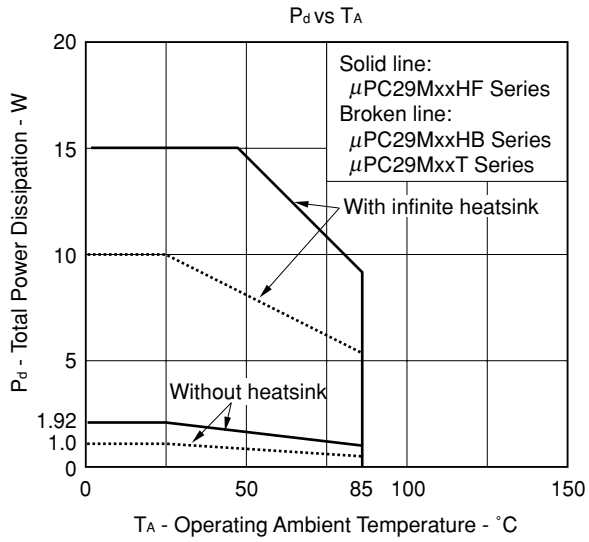
μPC29M10 ($T_J = 25^\circ\text{C}$, $V_{IN} = 13\text{ V}$, $I_O = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

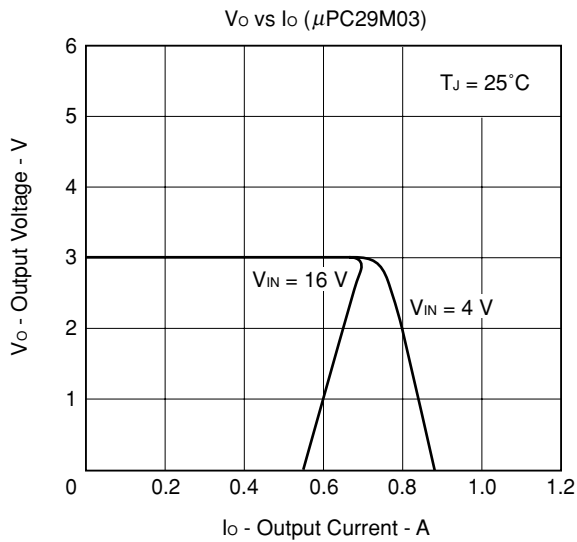
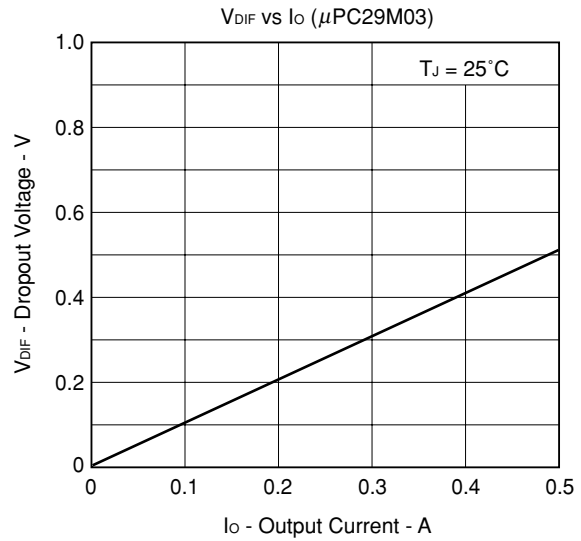
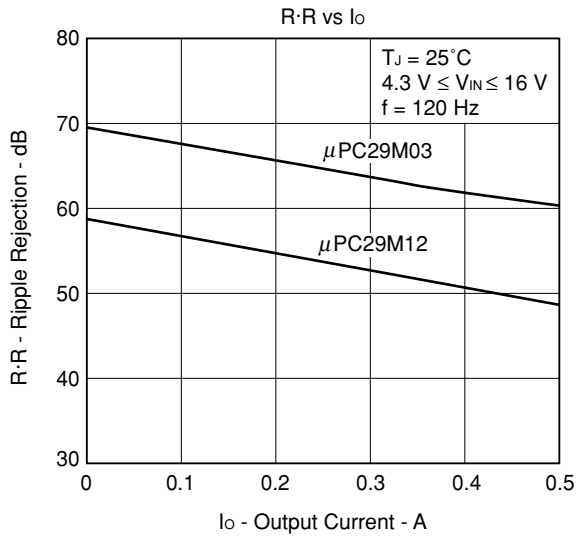
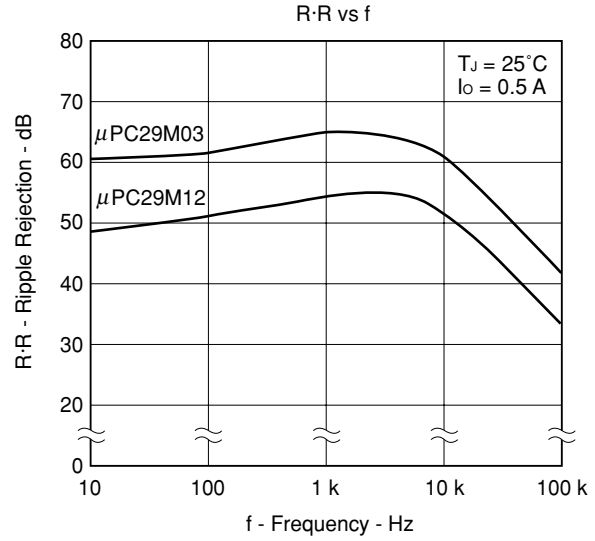
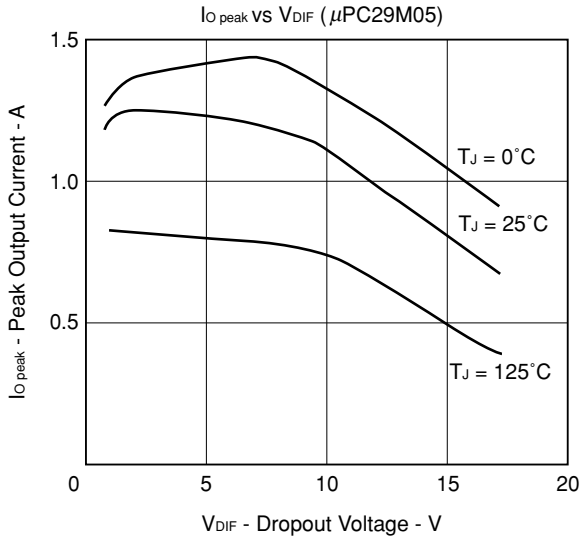
Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		9.6	10.0	10.4	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $11\text{ V} \leq V_{IN} \leq 18\text{ V}$, $0\text{ A} \leq I_O \leq 350\text{ mA}$	9.5		10.5	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_O \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$11\text{ V} \leq V_{IN} \leq 18\text{ V}$		34	100	mV
Load Regulation	REG_L	$0\text{ A} \leq I_O \leq 0.5\text{ A}$		10	100	mV
Quiescent Current	I_{BIAS}	$I_O = 0\text{ A}$		2.1	4.0	mA
		$I_O = 0.5\text{ A}$		16	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 9.5\text{ V}$, $I_O = 0\text{ A}$		10	30	mA
		$V_{IN} = 9.5\text{ V}$, $I_O = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $11\text{ V} \leq V_{IN} \leq 18\text{ V}$		1.9	20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		180		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$, $11\text{ V} \leq V_{IN} \leq 18\text{ V}$	40	53		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_O = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\text{ short}}$	$V_{IN} = 11.5\text{ V}$		0.9		A
		$V_{IN} = 18\text{ V}$		0.5		
Peak Output Current	$I_{O\text{ peak}}$	$V_{IN} = 11.5\text{ V}$	0.7	1.2	1.5	A
		$V_{IN} = 18\text{ V}$	0.6	1.2	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_O = 5\text{ mA}$		0.9		mV/°C

μPC29M12 ($T_J = 25^\circ\text{C}$, $V_{IN} = 15\text{ V}$, $I_o = 350\text{ mA}$, $C_{IN} = 0.22\ \mu\text{F}$, $C_{OUT} = 47\ \mu\text{F}$, unless otherwise specified.)

Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_o		11.52	12	12.48	V
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $13\text{ V} \leq V_{IN} \leq 18\text{ V}$, $0\text{ A} \leq I_o \leq 350\text{ mA}$	11.4		12.6	
		$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $0\text{ A} \leq I_o \leq 0.5\text{ A}$				
Line Regulation	REG_{IN}	$13\text{ V} \leq V_{IN} \leq 18\text{ V}$		25	120	mV
Load Regulation	REG_L	$0\text{ A} \leq I_o \leq 0.5\text{ A}$		13	120	mV
Quiescent Current	I_{BIAS}	$I_o = 0\text{ A}$		2.1	4.0	mA
		$I_o = 0.5\text{ A}$		14	30	
Startup Quiescent Current	$I_{BIAS(s)}$	$V_{IN} = 11.5\text{ V}$, $I_o = 0\text{ A}$		10	30	mA
		$V_{IN} = 11.5\text{ V}$, $I_o = 0.5\text{ A}$			80	
Quiescent Current Change	ΔI_{BIAS}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $13\text{ V} \leq V_{IN} \leq 18\text{ V}$		1.7	20	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		210		$\mu\text{V}_{r.m.s.}$
Ripple Rejection	R-R	$f = 120\text{ Hz}$, $13\text{ V} \leq V_{IN} \leq 18\text{ V}$	40	53		dB
Dropout Voltage	V_{DIF}	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 0.5\text{ A}$		0.5	1.0	V
Short Circuit Current	$I_{O\ short}$	$V_{IN} = 14\text{ V}$		0.7		A
		$V_{IN} = 18\text{ V}$		0.5		
Peak Output Current	$I_{o\ peak}$	$V_{IN} = 14\text{ V}$	0.7	1.2	1.5	A
		$V_{IN} = 18\text{ V}$	0.6	1.1	1.5	
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$, $I_o = 5\text{ mA}$		1.2		$\text{mV}/^\circ\text{C}$

TYPICAL CHARACTERISTICS

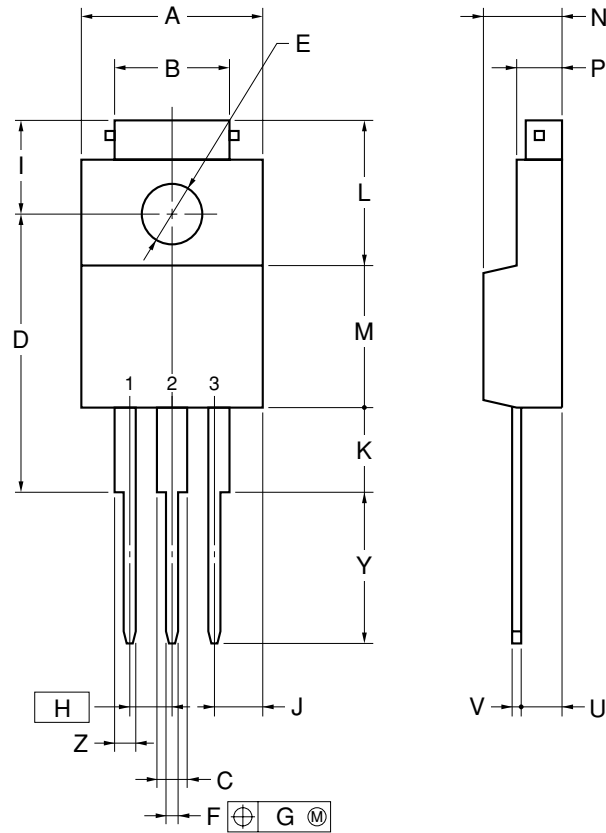




PACKAGE DRAWINGS

μPC29MxxHF Series

3PIN PLASTIC SIP (MP-45G)



NOTE

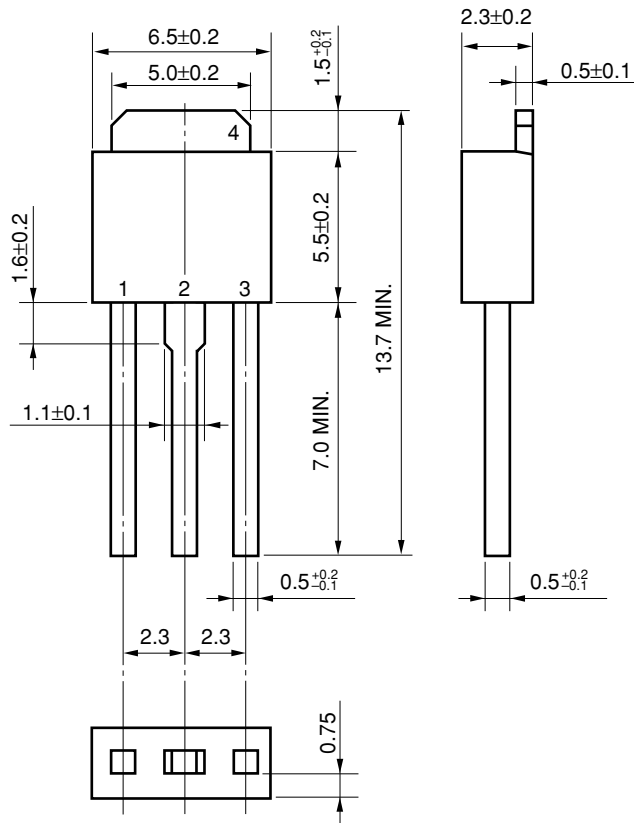
Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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

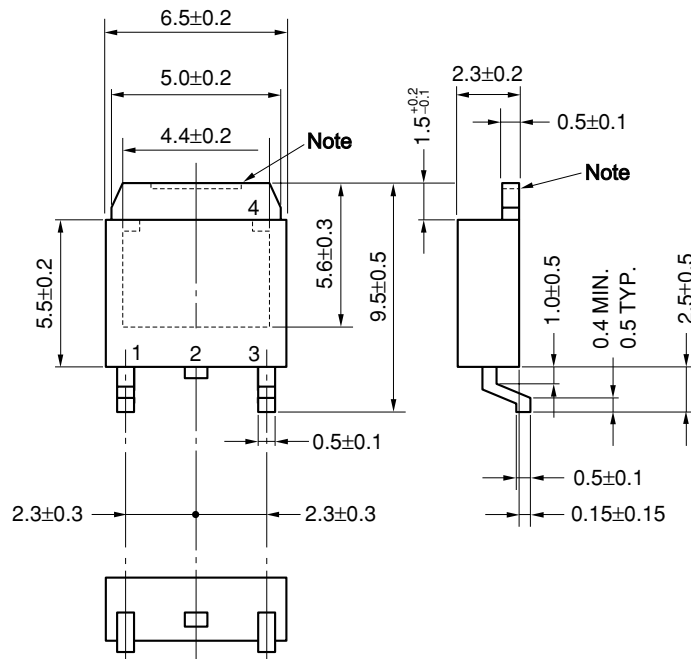
μPC29MxxHB Series

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



μPC29MxxT Series

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



<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 sith 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 sith 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 “**I_{BIAS} (I_{BIAS(s)}) vs V_{IN} 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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- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

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"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

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