NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC29M00 Series

THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR

The μPC29M00 series of low dropout voltage three terminal positive regulators is constructed with PNP output transistor. The μPC29M00 series feature the ability to source 0.5 A of output current with a low dropout voltage of typically 0.5 V.

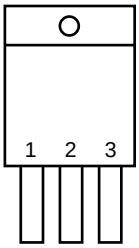
The power dissipation of the μPC29M00 series can be drastically reduced compared with the conventional three terminal positive voltage regulators that is constructed with NPN output transistor. Also, this series corresponds to the low voltage output (3 V, 3.3 V) which is not in the conventional low dropout regulators (μPC24M00A series).

FEATURES

- Output current in excess of 0.5 A
- Low dropout voltage V_{DIF} = 0.5 V TYP. (at I_O = 0.5 A)
- On-chip overcurrent and thermal protection circuit
- On-chip output transistor safe area protection circuit

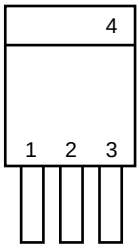
PIN CONFIGURATION (Marking Side)

μPC29M00HF Series: MP-45G



1: INPUT
2: GND
3: OUTPUT

μPC29M00HB Series: MP-3
μPC29M00T Series: MP-3Z



1: INPUT
2: GND
3: OUTPUT
4: GND (Fin)

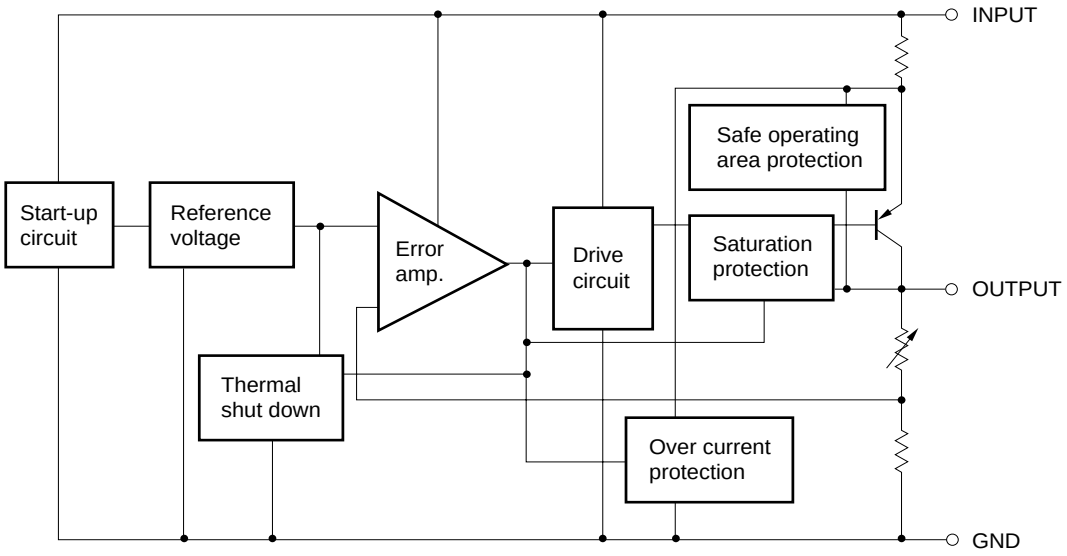
The information in this document is subject to change without notice.

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The mark ★ shows major revised points.

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BLOCK DIAGRAM



ORDERING INFORMATION

	Part Number	Package	Output Voltage
	μPC29M03HF	MP-45G (Isolated TO-220)	3.0 V
	μPC29M03HB	MP-3 (SC-64)	3.0 V
	μPC29M03T	MP-3Z (SC-63)	3.0 V
	μPC29M33HF	MP-45 (Isolated TO-220)	3.3 V
	μPC29M33HB	MP-3 (SC-64)	3.3 V
	μPC29M33T	MP-3Z (SC-63)	3.3 V
	μPC29M05HF	MP-45G (Isolated TO-220)	5.0 V
	μPC29M05HB	MP-3 (SC-64)	5.0 V
	μPC29M05T	MP-3Z (SC-63)	5.0 V
★	μPC29M06HF	MP-45G (Isolated TO-220)	6.0 V
★	μPC29M06HB	MP-3 (SC-64)	6.0 V
★	μPC29M06T	MP-3Z (SC-63)	6.0 V
★	μPC29M07HF	MP-45G (Isolated TO-220)	7.0 V
★	μPC29M07HB	MP-3 (SC-64)	7.0 V
★	μPC29M07T	MP-3Z (SC-63)	7.0 V
	μPC29M08HF	MP-45G (Isolated TO-220)	8.0 V
	μPC29M08HB	MP-3 (SC-64)	8.0 V
	μPC29M08T	MP-3Z (SC-63)	8.0 V
	μPC29M09HF	MP-45G (Isolated TO-220)	9.0 V
	μPC29M09HB	MP-3 (SC-64)	9.0 V
	μPC29M09T	MP-3Z (SC-63)	9.0 V
	μPC29M10HF	MP-45G (Isolated TO-220)	10.0 V
	μPC29M10HB	MP-3 (SC-64)	10.0 V
	μPC29M10T	MP3Z (SC-63)	10.0 V
	μPC29M12HF	MP-45G (Isolated TO-220)	12.0 V
	μPC29M12HB	MP-3 (SC-64)	12.0 V
	μPC29M12T	MP-3Z (SC-63)	12.0 V

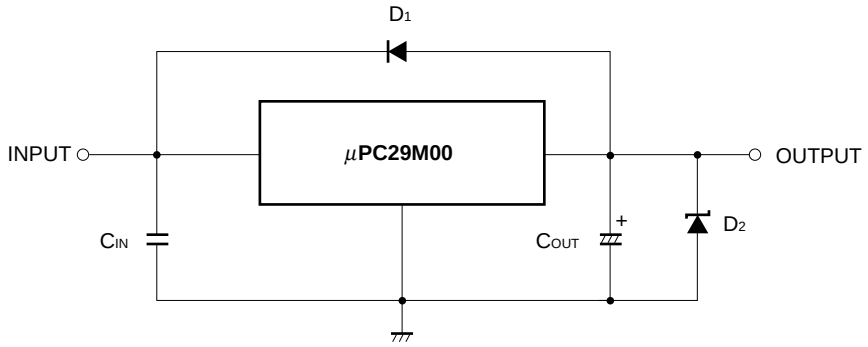
ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, Unless otherwise specified.)

Parameter	Symbol	Rating		Unit
		μPC29M00HF	μPC29M00HB, μPC29M00T	
Input Voltage	V_{IN}	20		V
Internal Power Dissipation[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 T_C = 25 °C, Internally limited
When operating junction temperature rises up to 150 °C, the internal circuit shutdown output voltage.

Caution Exposure to Absolute Maximum Ratings for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The parameters apply independently. The device should be operated within the limits specified under DC and AC Characteristics.

TYPICAL CONNECTION



C_{IN} : More than 0.1 μF. Required if regulator is located an appreciable distance from power supply filter. You must use to prevent from the parasitic oscillation.

C_{OUT} : More than 47 μF. You must use the Low-impedance-type (low ESR) capacitor.

D_1 : Need for $V_O > V_{IN}$

D_2 : Need a shottky barrier diode for V_O < GND.

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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		–0.3		mV/°C

ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		–0.4		mV/°C

ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.7		mV/°C

★ **ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.44		mV/°C

★ **ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.7		mV/°C

ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.7		mV/°C

ELECTRICAL CHARACTERISTICS 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.8		mV/°C

ELECTRICAL CHARACTERISTICS 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.)

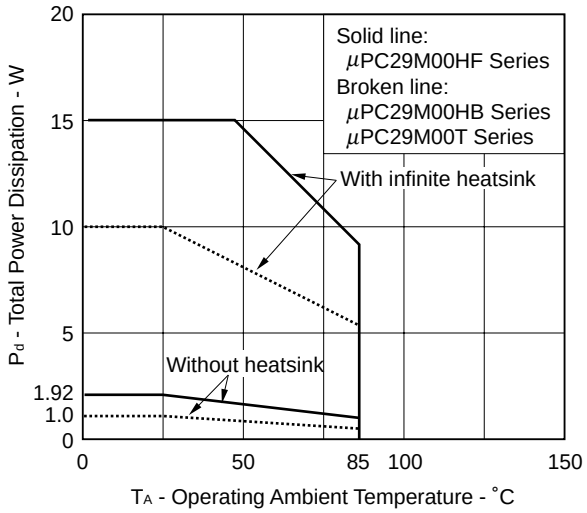
Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		9.6	10.0	10.4	V
		0 °C ≤ T_J ≤ 125 °C, 11 V ≤ V_{IN} ≤ 18 V, 0 A ≤ I_O ≤ 350 mA	9.5		10.5	
		0 °C ≤ T_J ≤ 125 °C, 0 A ≤ I_O ≤ 0.5 A				
Line Regulation	REG_{IN}	11 V ≤ V_{IN} ≤ 18 V		34	100	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 0.5 A		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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		0.9		mV/°C

ELECTRICAL CHARACTERISTICS 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.)

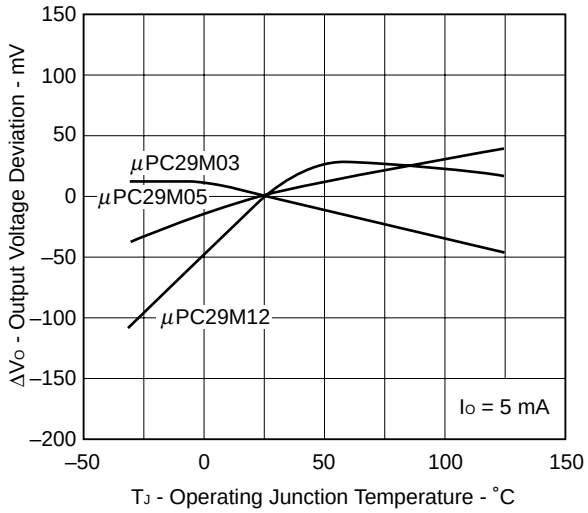
Parameters	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		11.52	12	12.48	V
		0 °C ≤ T_J ≤ 125 °C, 13 V ≤ V_{IN} ≤ 18 V, 0 A ≤ I_O ≤ 350 mA	11.4		12.6	
		0 °C ≤ T_J ≤ 125 °C, 0 A ≤ I_O ≤ 0.5 A				
Line Regulation	REG_{IN}	13 V ≤ V_{IN} ≤ 18 V		25	120	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 0.5 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		$\mu V_{r.m.s.}$
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	$\Delta V_O/\Delta T$	0 °C ≤ T_J ≤ 125 °C, I_O = 5 mA		1.2		mV/°C

TYPICAL CHARACTERISTICS

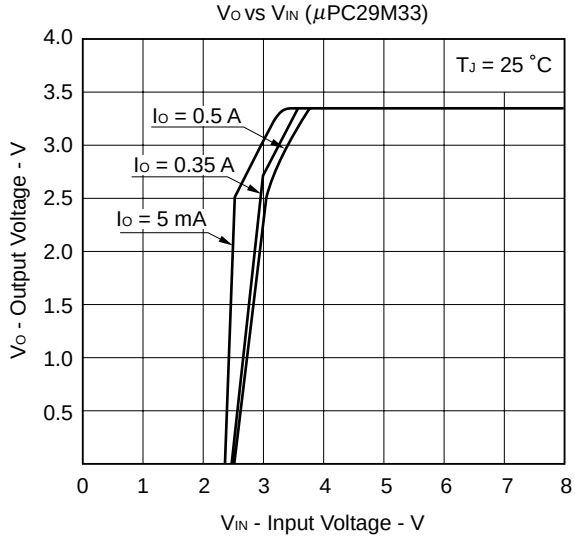
P_d vs T_A



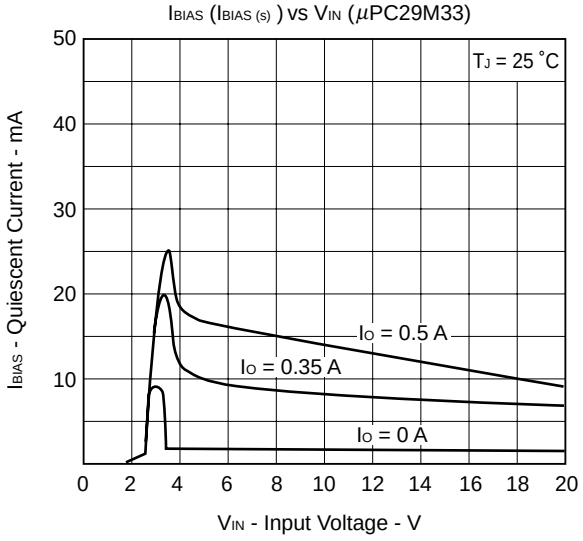
ΔV_O vs T_J



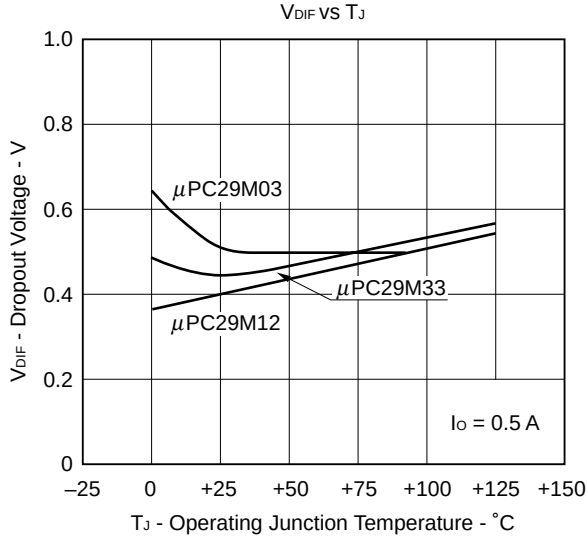
V_O vs V_{IN} (μPC29M33)



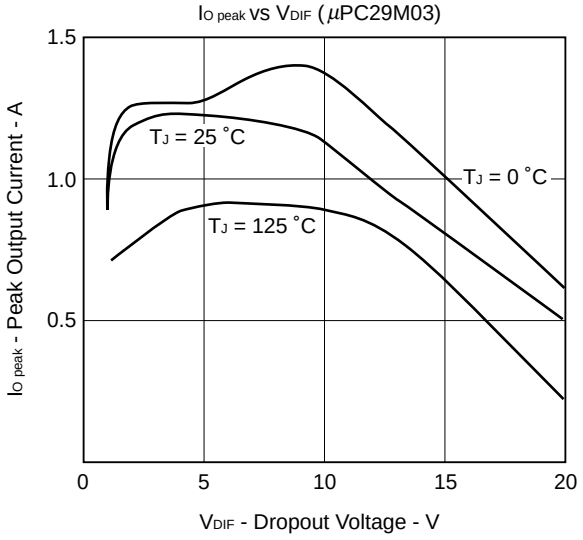
I_{BIAS} ($I_{BIAS\ (S)}$) vs V_{IN} (μPC29M33)



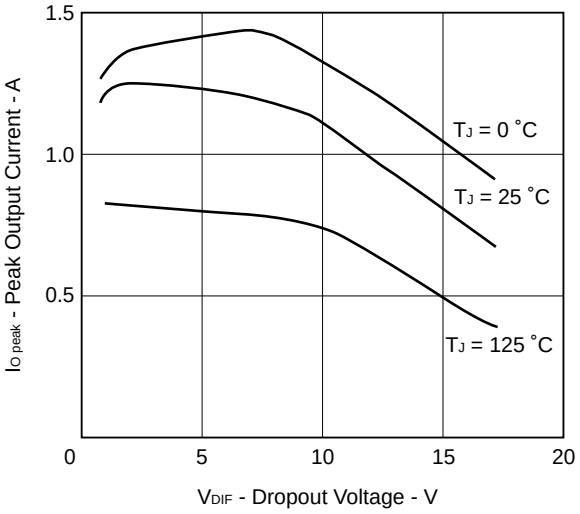
V_{DIF} vs T_J



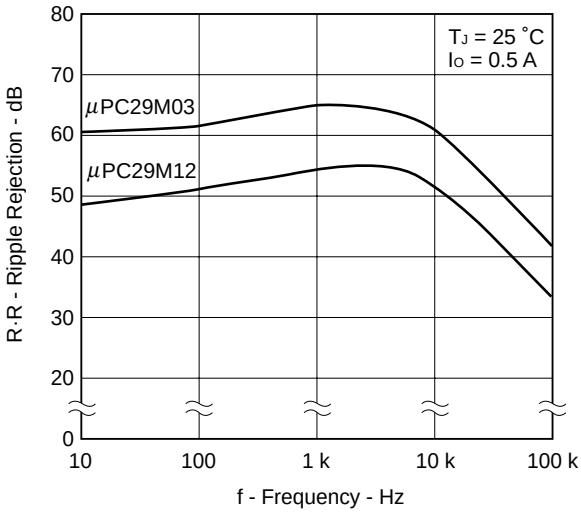
$I_{O\ peak}$ vs V_{DIF} (μPC29M03)



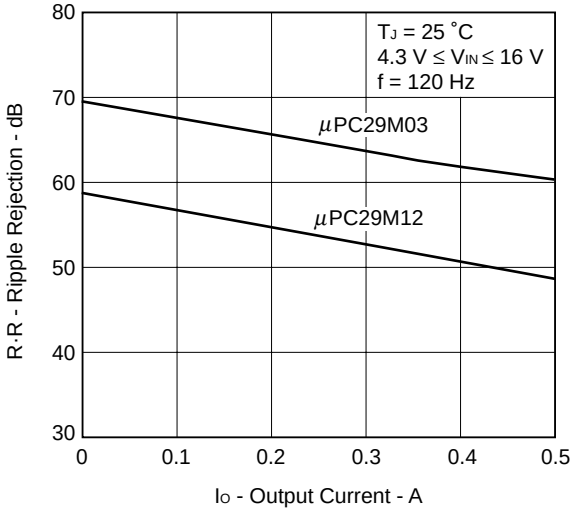
$I_{O\ peak}$ vs V_{DIF} (μPC29M05)



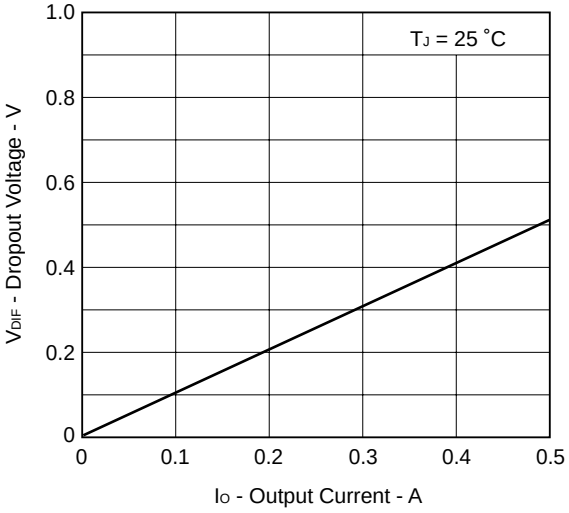
R·R vs f



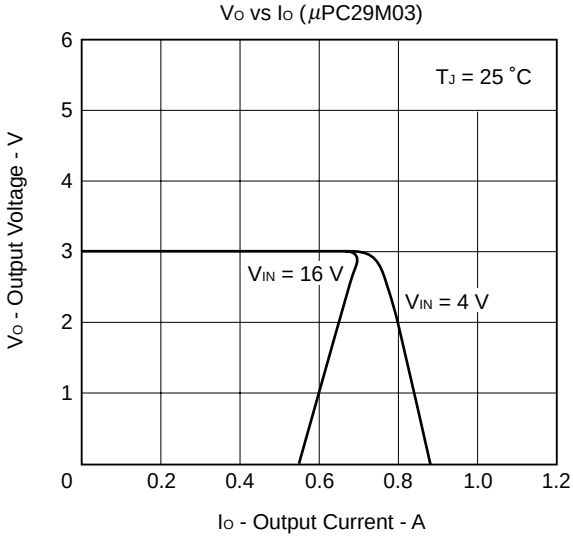
R·R vs I_O



V_{DIF} vs I_O (μPC29M03)



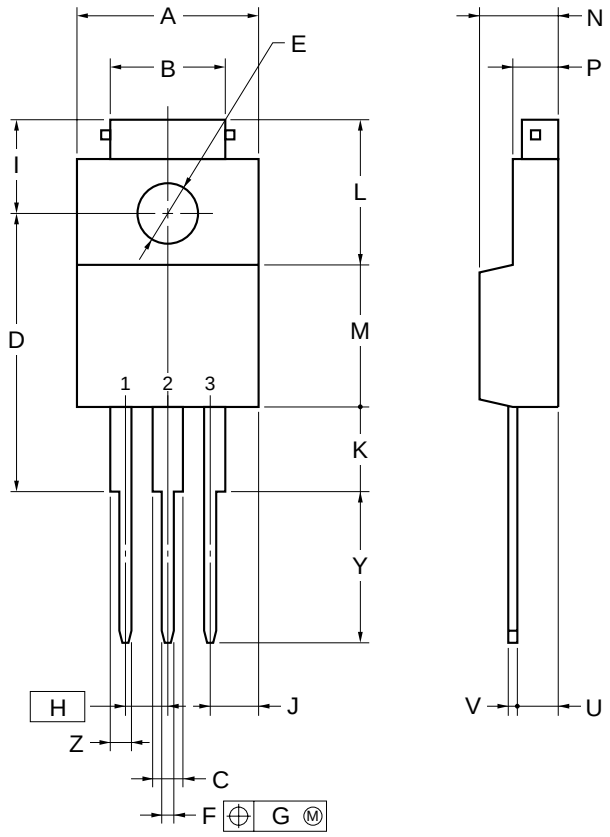
V_O vs I_O (μPC29M03)



PACKAGE DRAWINGS

μPD29M00HF Series

3PIN PLASTIC SIP (MP-45G)



NOTE

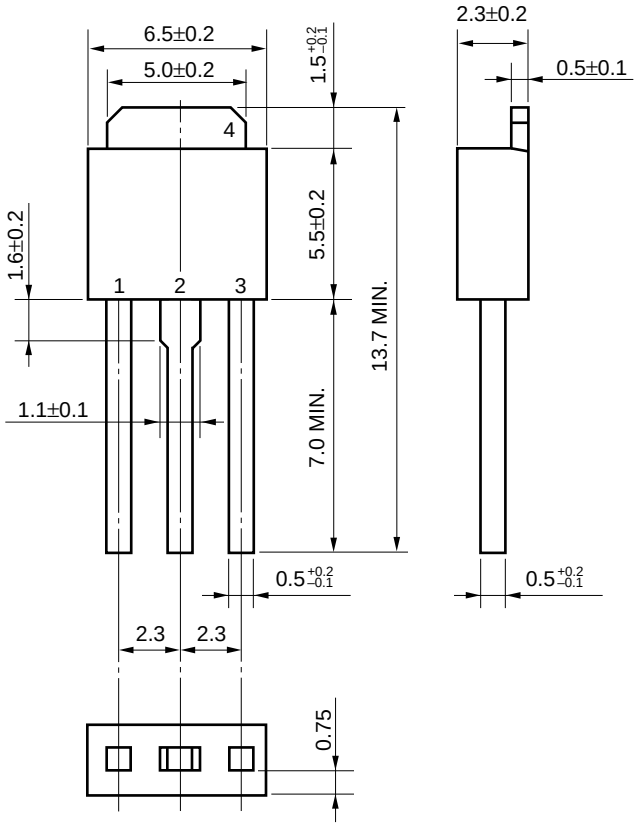
Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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

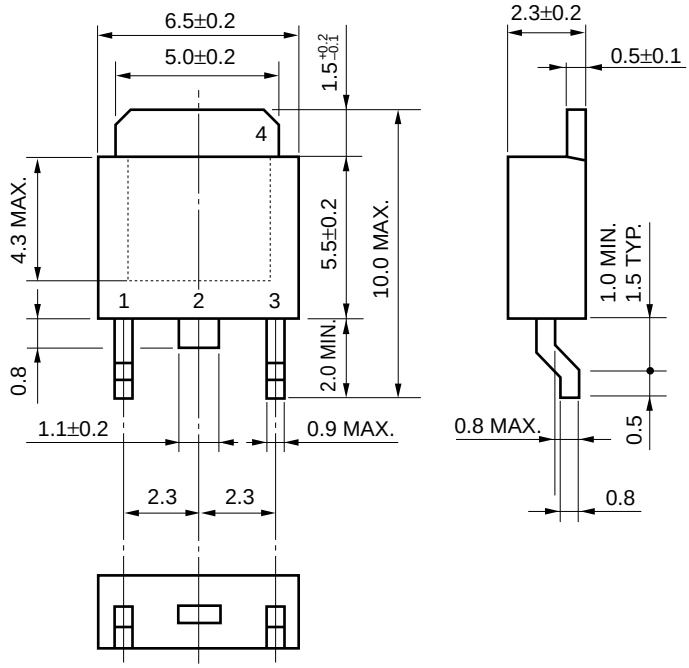
μPC29M00HB Series

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



μPC29M00T Series

MP-3Z (SC-63) (Unit: mm)



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 perfomed under different condition, please make sure to consult with our sales offices.

Fof more details, refer to our document **"SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E)**.

Surface mount devices

μPC29M00T Series: 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: 2 times.	IR35-00-2
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: 2 times.	VP15-00-2
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120 °C or below (Package surface temperature).	WS60-00-1
★ Partial heating method	Pin temperature: 300 °C or below, Heat time: 3 seconds or less (Per each side of the device).	—

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.

Through-hole devices

μPC29M00HF Series: MP-45G
μPC29M00HB Series: MP-3

Process	Conditions
Wave soldering (only to leads)	Solder temperature: 260 °C or below, Flow time: 10 seconds or less.
★ Partial heating method	Pin temperature: 300 °C or below, Heat time: 3 seconds or less (Per each pin).

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 μPC29M00 series at the input voltage which is lower than in the recommended operating condition, the big 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 μPC29M00 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.

REFERENCE DOCUMENTS

★ QUALITY GRADE ON NEC SEMICONDUCTOR DEVICES	C11531E
SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL	C10535E
IC PACKAGE MANUAL	C10943X
GUIDE TO QUALITY ASSUARANCE FOR SEMICONDUCTOR DEVICES	MEI-1202
SEMICONDUCTORS SELECTION GUIDE	X10679E
NEC SEMICONDUCTOR DEVICE RELIABILITY/QUALITY CONTROL SYSTEM-THREE TERMINAL REGULATOR	IEI-1212

[MEMO]

[MEMO]

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NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

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: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.

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