

**BIPOLAR ANALOG INTEGRATED CIRCUIT**  
 **$\mu$ PC29L00 Series**

**THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR**

**DESCRIPTION**

$\mu$ PC29L00 Series are low dropout regulators which have 100 mA capable for the output current.  
 The variation of output voltage is 3 V, 3.3 V, 4 V and 5 V.

**FEATURES**

- Low dropout voltage.  $V_{DIF} \leq 0.3$  V
- Built-in overcurrent protection circuit.
- Built-in thermal shut-down circuit.

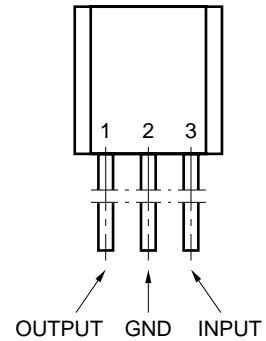
**ORDERING INFORMATION**

Output Voltage	Type Number	Package
3 V	$\mu$ PC29L03J	TO-92
	$\mu$ PC29L03T	SOT-89
3.3 V	$\mu$ PC29L33J	TO-92
	$\mu$ PC29L33T	SOT-89
4 V	$\mu$ PC29L04J	TO-92
	$\mu$ PC29L04T	SOT-89
5 V	$\mu$ PC29L05J	TO-92
	$\mu$ PC29L05T	SOT-89

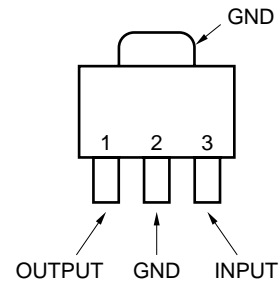
**CONNECTION DIAGRAM**

(TOP VIEW)

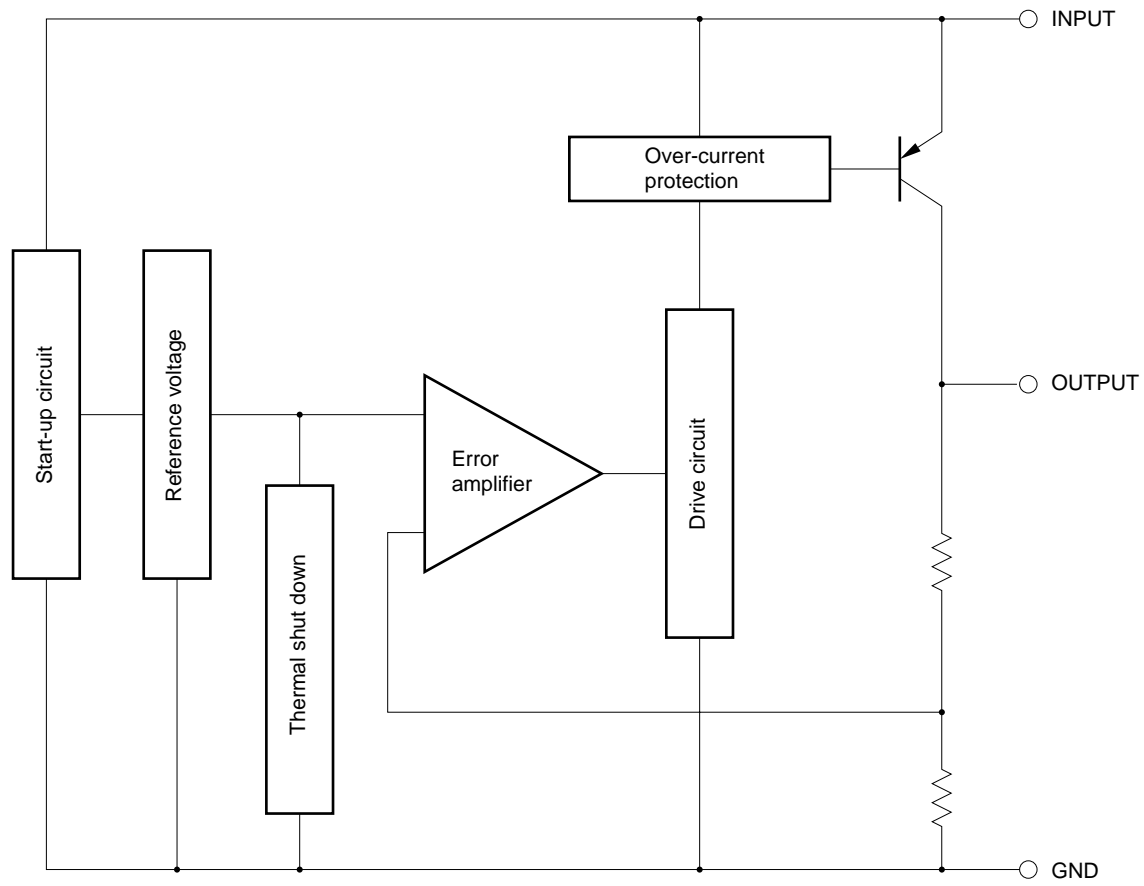
$\mu$ PC29L00J Series



$\mu$ PC29L00T Series



BLOCK DIAGRAM



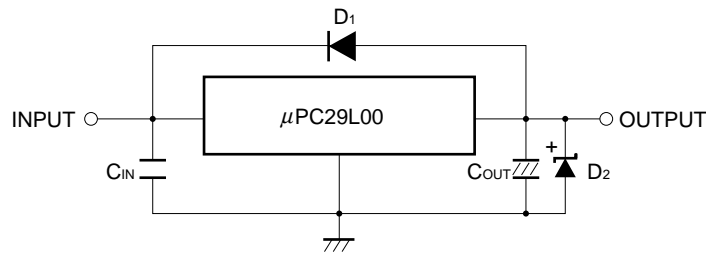
**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, Unless otherwise specified.)**

PARAMETER	SYMBOL	RATING		UNIT
Input Voltage	V <sub>IN</sub>	16		V
Internal Power Dissipation	P <sub>T</sub>	J	700 <b>Note 1</b>	mW
		T	400 <b>Note 1</b>	
			2000 <b>Note 1, 2</b>	
Operating Ambient Temperature Range	T <sub>A</sub>	-30 to +85		°C
Operating Junction Temperature Range	T <sub>J</sub>	-30 to +150		°C
Storage Temperature Range	T <sub>stg</sub>	-55 to +150		°C
Thermal Resistance (Junction to Case)	R <sub>th(J - C)</sub>	J	-	°C/W
		T	30	
Thermal Resistance (Junction to Ambient)	R <sub>th(J - A)</sub>	J	180	°C/W
		T	315	
			62.5 <b>Note 2</b>	

**Notes 1.** T<sub>A</sub> ≤ 25 °C

**2.** With the 16 cm<sup>2</sup> × 0.7 mm ceramic substrate

**TYPICAL CONNECTION**



C<sub>IN</sub> : 0.1 to 0.47 μF.

C<sub>OUT</sub> : More than 10 μF.

D<sub>1</sub> : Need for V<sub>O</sub> > V<sub>IN</sub>.

D<sub>2</sub> : Need for V<sub>O</sub> < GND.

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	TYPE NUMBER	MIN.	TYP.	MAX.	UNIT
Input Voltage	V <sub>IN</sub>	μPC29L03	3.5		9	V
		μPC29L33	3.8		9	
		μPC29L04	4.5		12	
		μPC29L05	5.5		12	
Output Current	I <sub>o</sub>	All	0		40	mA
Operating Ambient Temperature Range	T <sub>A</sub>	All	-30		+85	°C
Operating Junction Temperature Range	T <sub>J</sub>	All	-30		+125	°C

## ELECTRICAL CHARACTERISTICS

 $\mu$ PC29L03 ( $V_{IN} = 4\text{ V}$ ,  $I_o = 40\text{ mA}$ ,  $T_J = 25\text{ }^\circ\text{C}$ , Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$		2.88	3.0	3.12	V
		$3.5\text{ V} \leq V_{IN} \leq 9\text{ V}$ , $1\text{ mA} \leq I_o \leq 40\text{ mA}$ , $0\text{ }^\circ\text{C} \leq T_J \leq 125\text{ }^\circ\text{C}$	2.85		3.15	
		$4.5\text{ V} \leq V_{IN} \leq 5.5\text{ V}$ , $1\text{ mA} \leq I_o \leq 100\text{ mA}$ , $0\text{ }^\circ\text{C} \leq T_J \leq 125\text{ }^\circ\text{C}$	2.85		3.15	
Line Regulation	$REG_{IN}$	$3.5\text{ V} \leq V_{IN} \leq 12\text{ V}$		4	50	mV
		$3.5\text{ V} \leq V_{IN} \leq 9\text{ V}$		2	20	
Load Regulation	$REG_L$	$1\text{ mA} \leq I_o \leq 100\text{ mA}$		37	50	mV
		$1\text{ mA} \leq I_o \leq 40\text{ mA}$		15	20	
Quiescent Current	$I_{BIAS}$	$I_o = 0$		1.5	2.0	mA
		$I_o = 100\text{ mA}$		10	20	mA
Start-up Current	$I_{BIAS(S)}$	$I_o = 0\text{ mA}$ , before $V_o$ regulation		6	20	mA
Quiescent Current Change	$\Delta I_{BIAS}$	$4\text{ V} \leq V_{IN} \leq 12\text{ V}$ , $0\text{ }^\circ\text{C} \leq T_J \leq 125\text{ }^\circ\text{C}$			1.0	mA
Output Noise Voltage	$V_n$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		25		$\mu\text{V}_{rms}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$ , $4\text{ V} \leq V_{IN} \leq 9\text{ V}$	48	66		dB
Dropout Voltage	$V_{DIF}$	$I_o = 40\text{ mA}$ , $0\text{ }^\circ\text{C} \leq T_J \leq 125\text{ }^\circ\text{C}$		0.15	0.3	V
Peak Output Current	$I_{Opeak}$	$V_{IN} = 5\text{ V}$		190		mA
Short Circuit Current	$I_{Oshort}$	$V_{IN} = 12\text{ V}$		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{ mA}$ , $0\text{ }^\circ\text{C} \leq T_J \leq 125\text{ }^\circ\text{C}$		-0.5		mV/°C

**ELECTRICAL CHARACTERISTICS**

μPC29L33 (V<sub>IN</sub> = 5 V, I<sub>o</sub> = 40 mA, T<sub>J</sub> = 25 °C, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V <sub>o</sub>		3.17	3.3	3.43	V
		3.8 V ≤ V <sub>IN</sub> ≤ 10 V, 1 mA ≤ I <sub>o</sub> ≤ 40 mA, 0 °C ≤ T <sub>J</sub> ≤ 125 °C	3.14		3.46	
		4.5 V ≤ V <sub>IN</sub> ≤ 5.5 V, 1 mA ≤ I <sub>o</sub> ≤ 100 mA, 0 °C ≤ T <sub>J</sub> ≤ 125 °C	3.14		3.46	
Line Regulation	REG <sub>IN</sub>	3.8 V ≤ V <sub>IN</sub> ≤ 12 V		4	50	mV
		3.8 V ≤ V <sub>IN</sub> ≤ 9 V		2	20	
Load Regulation	REG <sub>L</sub>	1 mA ≤ I <sub>o</sub> ≤ 100 mA		37	50	mV
		1 mA ≤ I <sub>o</sub> ≤ 40 mA		16	20	
Quiescent Current	I <sub>BIAS</sub>	I <sub>o</sub> = 0		1.5	2.0	mA
		I <sub>o</sub> = 100 mA		10	20	mA
Start-up Current	I <sub>BIAS(S)</sub>	I <sub>o</sub> = 0 mA, before V <sub>o</sub> regulation		19	30	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	4.3 V ≤ V <sub>IN</sub> ≤ 12 V, 0 °C ≤ T <sub>J</sub> ≤ 125 °C			1.0	mA
Output Noise Voltage	V <sub>n</sub>	10 Hz ≤ f ≤ 100 kHz		28		μV <sub>rms</sub>
Ripple Rejection	R·R	f = 120 Hz, 4.3 V ≤ V <sub>IN</sub> ≤ 9 V	48	65		dB
Dropout Voltage	V <sub>DIF</sub>	I <sub>o</sub> = 40 mA, 0 °C ≤ T <sub>J</sub> ≤ 125 °C		0.15	0.3	V
Peak Output Current	I <sub>opeak</sub>	V <sub>IN</sub> = 5 V		190		mA
Short Circuit Current	I <sub>oshort</sub>	V <sub>IN</sub> = 12 V		100		mA
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> = 5 mA, 0 °C ≤ T <sub>J</sub> ≤ 125 °C		-0.6		mV/°C

**ELECTRICAL CHARACTERISTICS**

μPC29L04 ( $V_{IN} = 6\text{ V}$ ,  $I_o = 40\text{ mA}$ ,  $T_J = 25\text{ °C}$ , Unless otherwise specified)

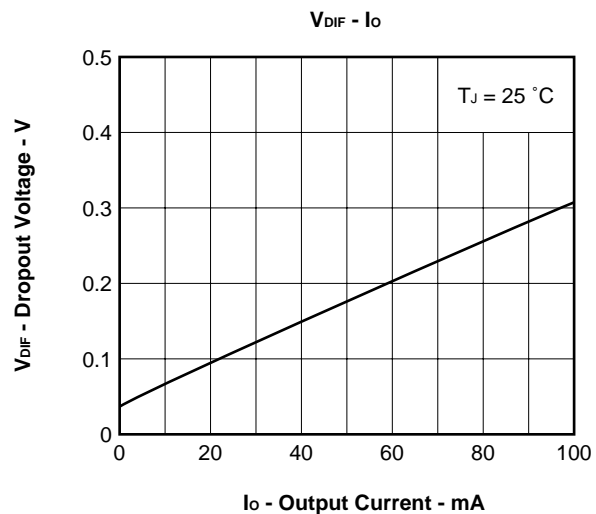
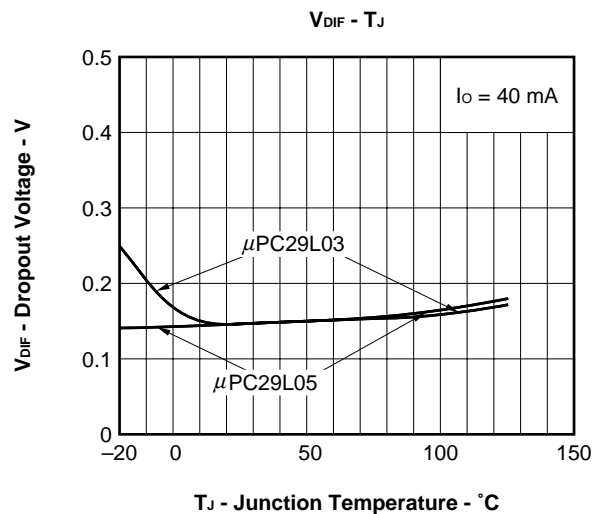
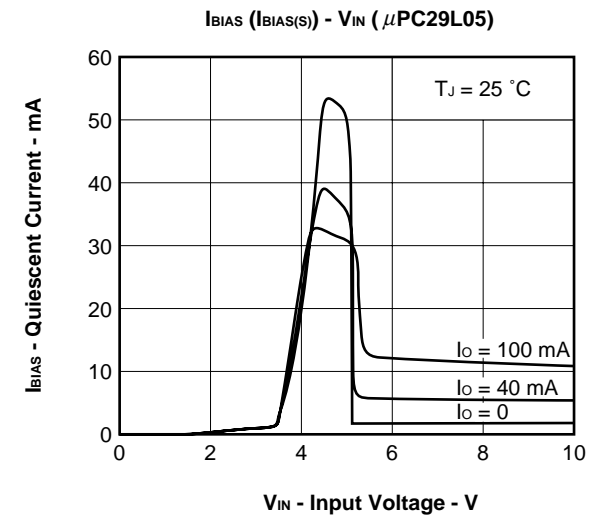
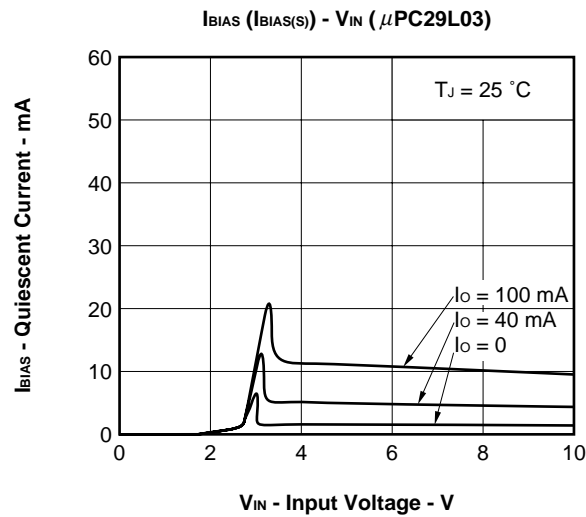
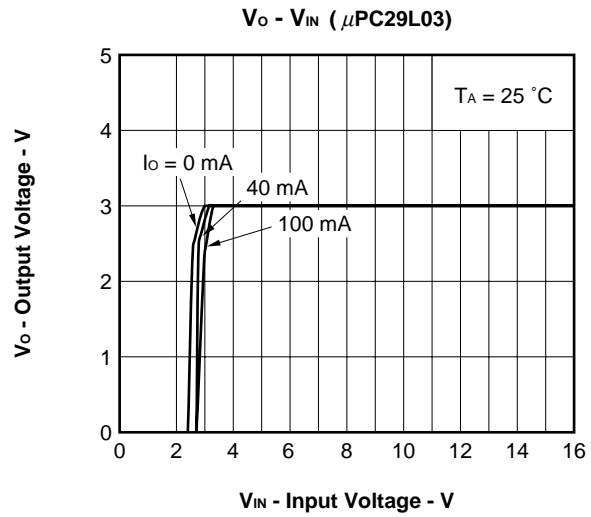
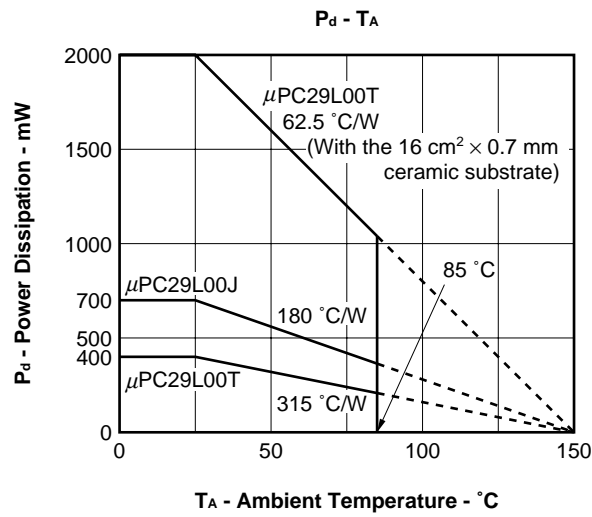
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$		3.84	4.0	4.16	V
		$4.5\text{ V} \leq V_{IN} \leq 12\text{ V}$ , $1\text{ mA} \leq I_o \leq 40\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$	3.80		4.20	
		$V_{IN} = 6\text{ V}$ , $1\text{ mA} \leq I_o \leq 100\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$	3.80		4.20	
Line Regulation	$REG_{IN}$	$4.5\text{ V} \leq V_{IN} \leq 12\text{ V}$		4	30	mV
Load Regulation	$REG_L$	$1\text{ mA} \leq I_o \leq 100\text{ mA}$		33	60	mV
		$1\text{ mA} \leq I_o \leq 40\text{ mA}$		14	30	
Quiescent Current	$I_{BIAS}$	$I_o = 0$		1.6	2.0	mA
		$I_o = 100\text{ mA}$		10	20	mA
Start-up Current	$I_{BIAS(S)}$	$I_o = 0\text{ mA}$ , before $V_o$ regulation		20	50	mA
Quiescent Current Change	$\Delta I_{BIAS}$	$4.5\text{ V} \leq V_{IN} \leq 12\text{ V}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$			1.0	mA
Output Noise Voltage	$V_n$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		35		$\mu V_{rms}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$ , $5\text{ V} \leq V_{IN} \leq 10\text{ V}$	47	65		dB
Dropout Voltage	$V_{DIF}$	$I_o = 40\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$		0.15	0.3	V
Peak Output Current	$I_{Opeak}$	$V_{IN} = 6\text{ V}$		220		mA
Short Circuit Current	$I_{Oshort}$	$V_{IN} = 12\text{ V}$		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$		0.2		$mV/°C$

**ELECTRICAL CHARACTERISTICS**

μPC29L05 ( $V_{IN} = 6\text{ V}$ ,  $I_o = 40\text{ mA}$ ,  $T_J = 25\text{ °C}$ , Unless otherwise specified)

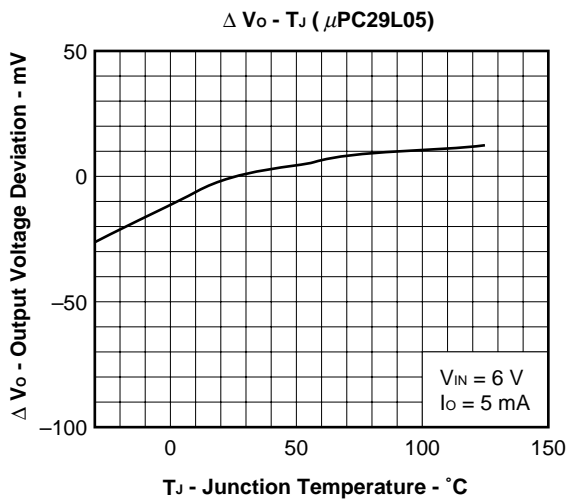
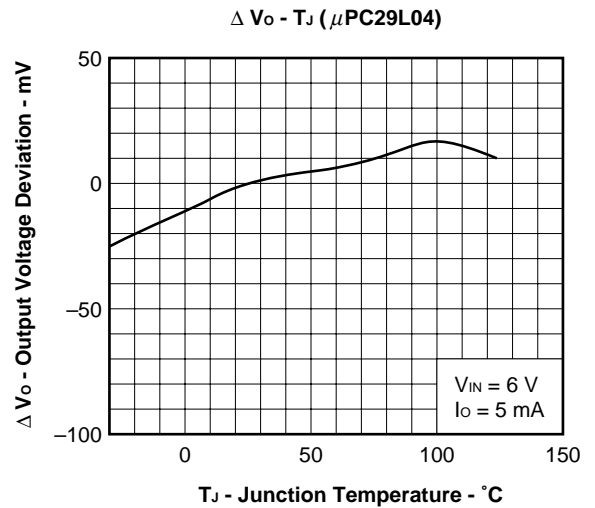
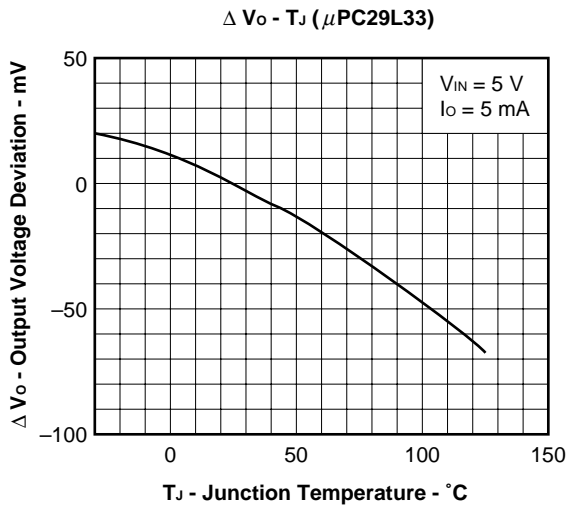
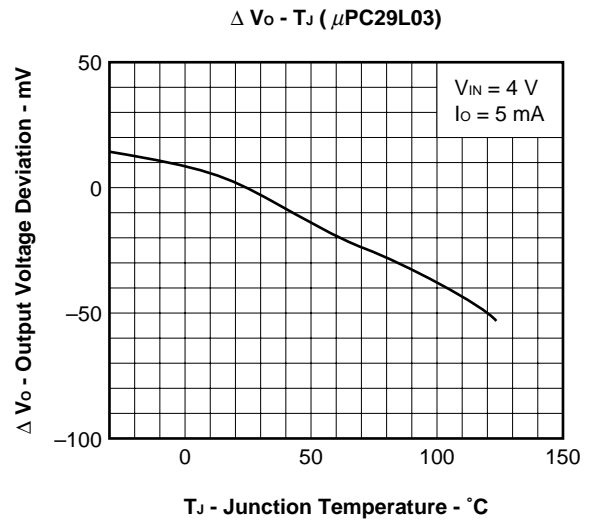
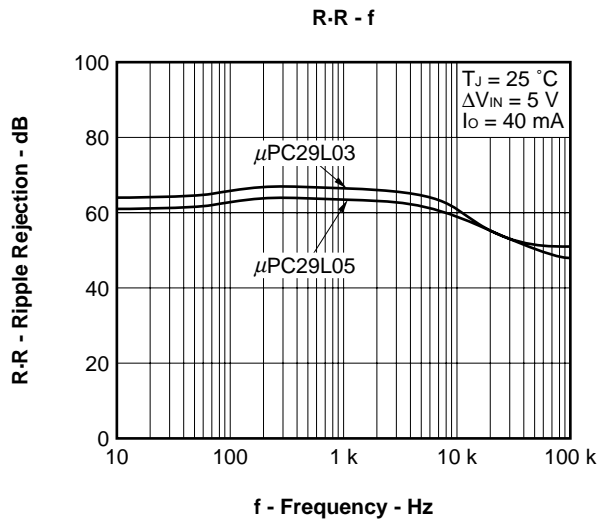
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$		4.8	5.0	5.2	V
		$5.5\text{ V} \leq V_{IN} \leq 12\text{ V}$ , $1\text{ mA} \leq I_o \leq 40\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$	4.75		5.25	
		$V_{IN} = 6\text{ V}$ , $1\text{ mA} \leq I_o \leq 100\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$	4.75		5.25	
Line Regulation	$REG_{IN}$	$5.5\text{ V} \leq V_{IN} \leq 12\text{ V}$		4	30	mV
Load Regulation	$REG_L$	$1\text{ mA} \leq I_o \leq 100\text{ mA}$		35	80	mV
		$1\text{ mA} \leq I_o \leq 40\text{ mA}$		15	30	
Quiescent Current	$I_{BIAS}$	$I_o = 0$		1.6	2.0	mA
		$I_o = 100\text{ mA}$		10	20	mA
Start-up Current	$I_{BIAS(S)}$	$I_o = 0\text{ mA}$ , before $V_o$ regulation		50	90	mA
Quiescent Current Change	$\Delta I_{BIAS}$	$6\text{ V} \leq V_{IN} \leq 12\text{ V}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$			1.0	mA
Output Noise Voltage	$V_n$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		40		$\mu V_{rms}$
Ripple Rejection	R·R	$f = 120\text{ Hz}$ , $6\text{ V} \leq V_{IN} \leq 11\text{ V}$	46	62		dB
Dropout Voltage	$V_{DIF}$	$I_o = 40\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$		0.15	0.3	V
Peak Output Current	$I_{opeak}$	$V_{IN} = 7\text{ V}$		210		mA
Short Circuit Current	$I_{oshort}$	$V_{IN} = 12\text{ V}$		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{ mA}$ , $0\text{ °C} \leq T_J \leq 125\text{ °C}$		0.2		mV/°C

TYPICAL CHARACTERISTICS





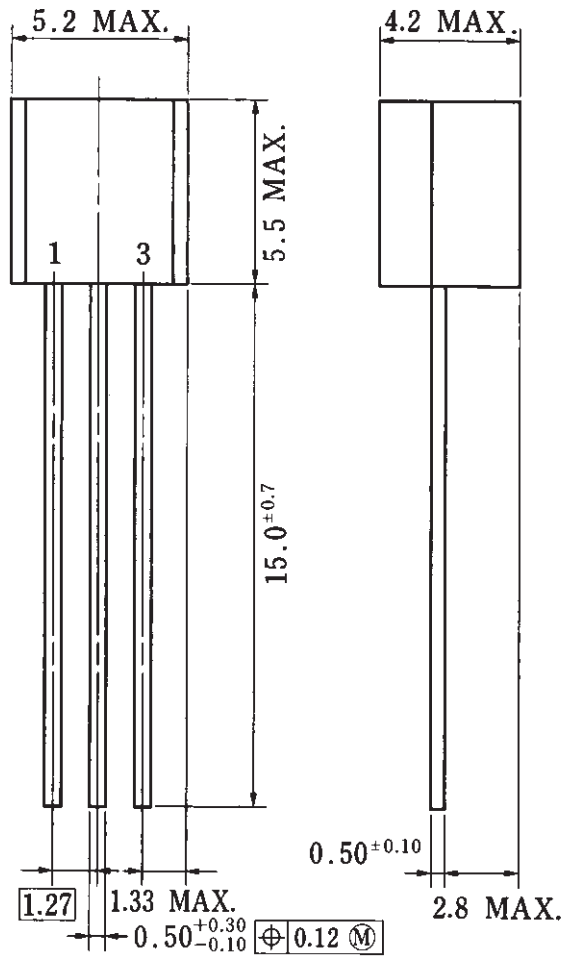
TYPICAL CHARACTERISTICS



PACKAGE DIMENSIONS (Unit: mm)

μPC29L00J Series

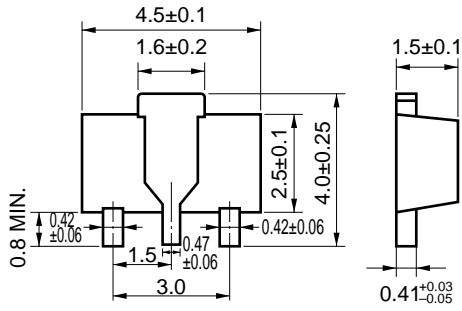
3PIN PLASTIC SIP (TO-92)



P3J-127B

$\mu$ PC29L00T Series

SOT-89



**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**

**μPC29L00J Series**

Soldering Process	Soldering Conditions	Symbol
Wave soldering	Solder temperature: 260 °C or below. Flow Time: 10 seconds or below.	

**TYPES OF SURFACE MOUNT DEVICE**

For more details, refer to our document “Semiconductor Device Mounting Manual” (IEI-1207).

**μPC29L00T Series**

Soldering Process	Soldering Conditions	Symbol
Infrared ray reflow	Peak package’s temperature: 235 °C or below. Reflow time: 30 seconds or below (210 °C or higher). Number of flow process: 2. Exposure limit <b>Note</b> : None.	IR35-00-2
Vapor phase soldering	Peak package’s temperature: 215 °C or below. Reflow time: 40 seconds or below (200 °C or higher). Number of flow process: 2. Exposure limit <b>Note</b> : None.	VP15-00-2
Wave soldering	Solder temperature: 260 °C or below. Flow time: 10 seconds or below. Number of flow process: 1. Exposure limit <b>Note</b> : None.	WS60-00-1

**Note** Exposure limit before soldering after dry-pack package is opened.

**Remark** Storage conditions: 25 °C and relative humidity at 65 % or less.

**Caution** Do not apply more than a single process at once, except for “Partial heating method”.

**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

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Anti-radioactive design is not implemented in this product.