

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC29L00 Series

THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR

DESCRIPTION

μ 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.

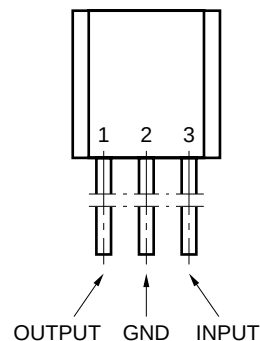
ORDERING INFORMATION

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

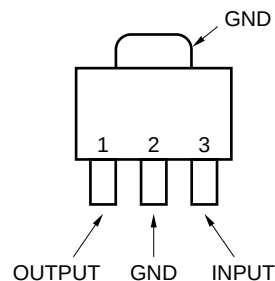
CONNECTION DIAGRAM

(TOP VIEW)

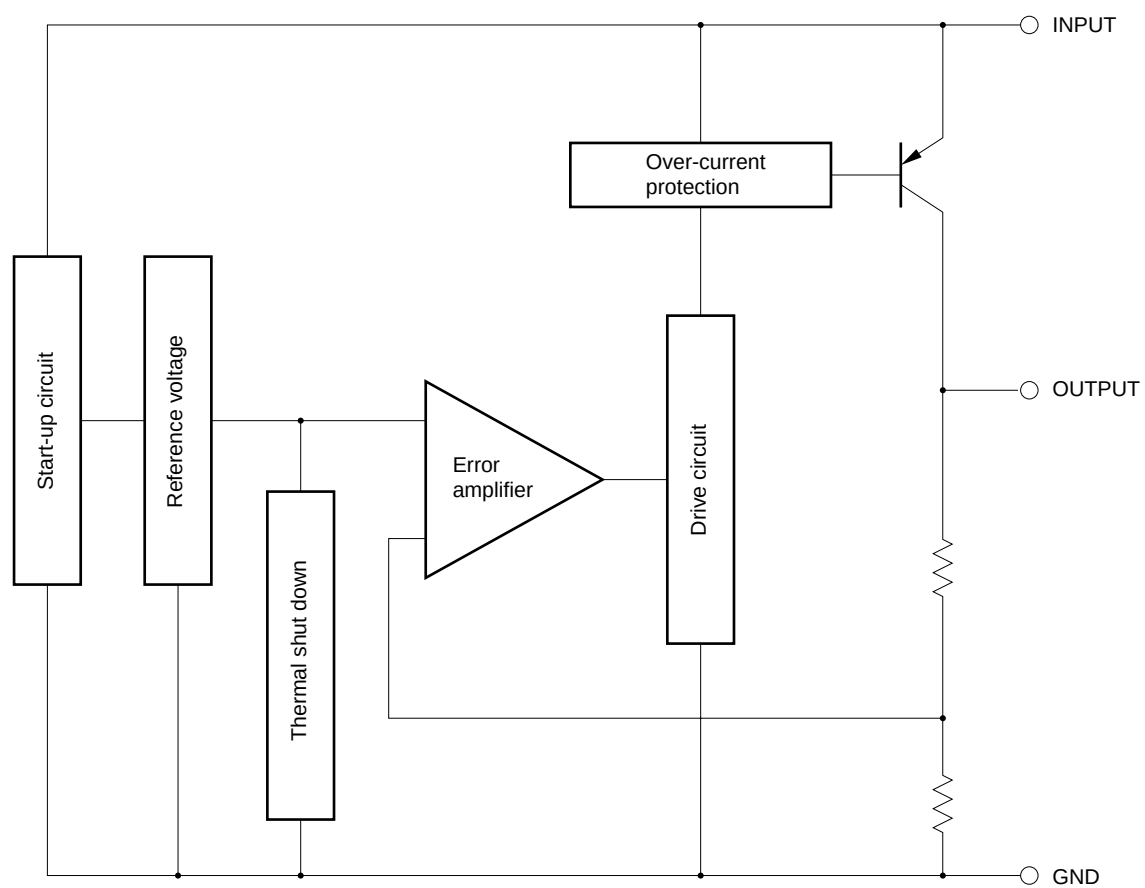
μ PC29L00J Series



μ PC29L00T Series



BLOCK DIAGRAM



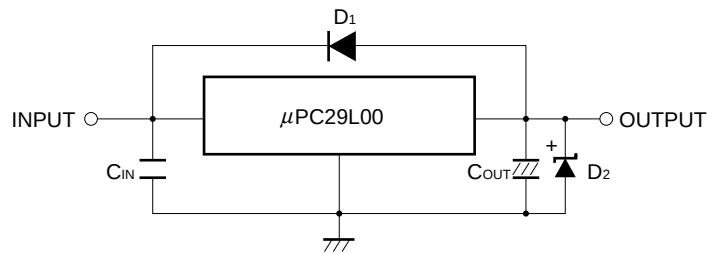
ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, Unless otherwise specified.)

PARAMETER	SYMBOL	RATING		UNIT
Input Voltage	V_{IN}	16		V
Internal Power Dissipation	P_T	J	700 Note 1	mW
		T	400 Note 1	
			2000 Note 1, 2	
Operating Ambient Temperature Range	T_A	-30 to +85		$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	-30 to +150		$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150		$^{\circ}\text{C}$
Thermal Resistance (Junction to Case)	$R_{th(J-C)}$	J	—	$^{\circ}\text{C/W}$
		T	30	
Thermal Resistance (Junction to Ambient)	$R_{th(J-A)}$	J	180	$^{\circ}\text{C/W}$
		T	315	
			62.5 Note 2	

Notes 1. $T_A \leq 25\text{ }^{\circ}\text{C}$

2. With the $16\text{ cm}^2 \times 0.7\text{ mm}$ ceramic substrate

TYPICAL CONNECTION



C_{IN} : 0.1 to 0.47 μF .

C_{OUT} : More than 10 μF .

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

D_2 : Need for $V_O < \text{GND}$.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TYPE NUMBER	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	μPC29L03	3.5		9	V
		μPC29L33	3.8		9	
		μPC29L04	4.5		12	
		μPC29L05	5.5		12	
Output Current	I_O	All	0		40	mA
Operating Ambient Temperature Range	T_A	All	-30		+85	$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	All	-30		+125	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

μPC29L03 ($V_{IN} = 4\text{ V}$, $I_O = 40\text{ mA}$, $T_J = 25\text{ }^{\circ}\text{C}$, 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	ΔI_{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		μV_{rms}
Ripple Rejection	$R \cdot R$	$f = 120\text{ Hz}$, $4\text{ V} \leq V_{IN} \leq 9\text{ V}$	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		$\text{mV}/^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

μPC29L33 ($V_{IN} = 5\text{ V}$, $I_O = 40\text{ mA}$, $T_J = 25\text{ °C}$, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		3.17	3.3	3.43	V
		$3.8\text{ V} \leq V_{IN} \leq 10\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$, $0\text{ °C} \leq T_J \leq 125\text{ °C}$	3.14		3.46	
		$4.5\text{ V} \leq V_{IN} \leq 5.5\text{ V}$, $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $0\text{ °C} \leq T_J \leq 125\text{ °C}$	3.14		3.46	
Line Regulation	REG_{IN}	$3.8\text{ V} \leq V_{IN} \leq 12\text{ V}$		4	50	mV
		$3.8\text{ V} \leq V_{IN} \leq 9\text{ V}$		2	20	
Load Regulation	REG_L	$1\text{ mA} \leq I_O \leq 100\text{ mA}$		37	50	mV
		$1\text{ mA} \leq I_O \leq 40\text{ mA}$		16	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		19	30	mA
Quiescent Current Change	ΔI_{BIAS}	$4.3\text{ V} \leq V_{IN} \leq 12\text{ V}$, $0\text{ °C} \leq T_J \leq 125\text{ °C}$			1.0	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		28		μV_{rms}
Ripple Rejection	$R \cdot R$	$f = 120\text{ Hz}$, $4.3\text{ V} \leq V_{IN} \leq 9\text{ V}$	48	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}	$V_{IN} = 5\text{ V}$		190		mA
Short Circuit Current	I_{Oshort}	$V_{IN} = 12\text{ V}$		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	$I_O = 5\text{ mA}$, $0\text{ °C} \leq T_J \leq 125\text{ °C}$		-0.6		mV/°C

ELECTRICAL CHARACTERISTICS

μ PC29L04 ($V_{IN} = 6\text{ V}$, $I_O = 40\text{ mA}$, $T_J = 25\text{ }^{\circ}\text{C}$, Unless otherwise specified)

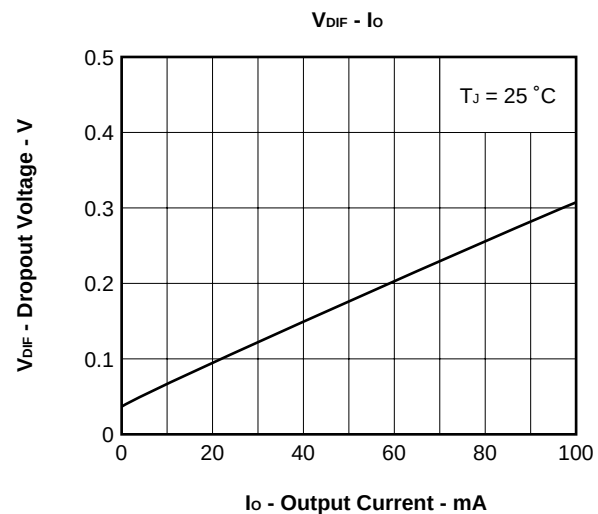
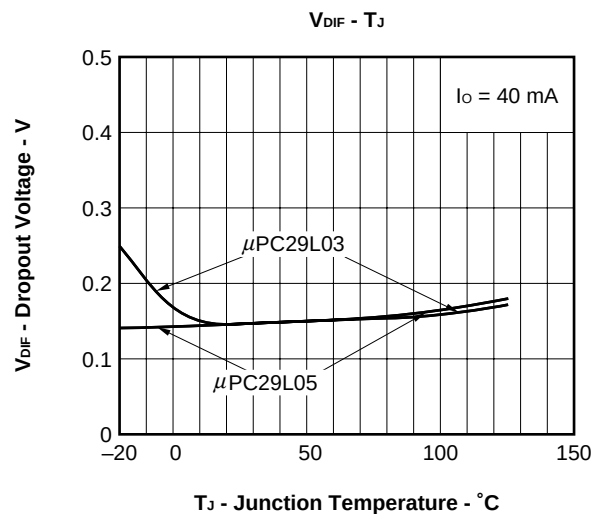
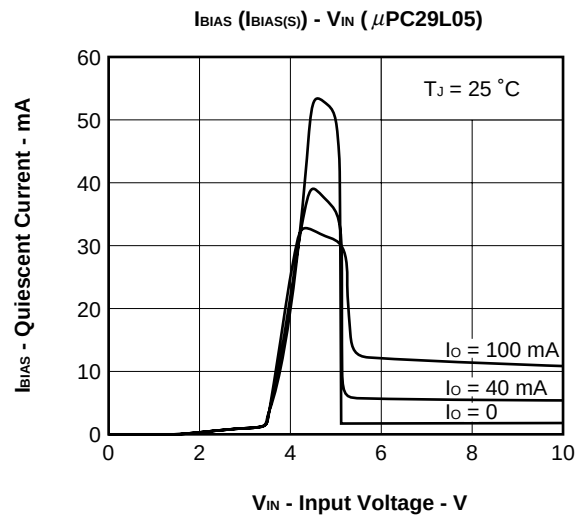
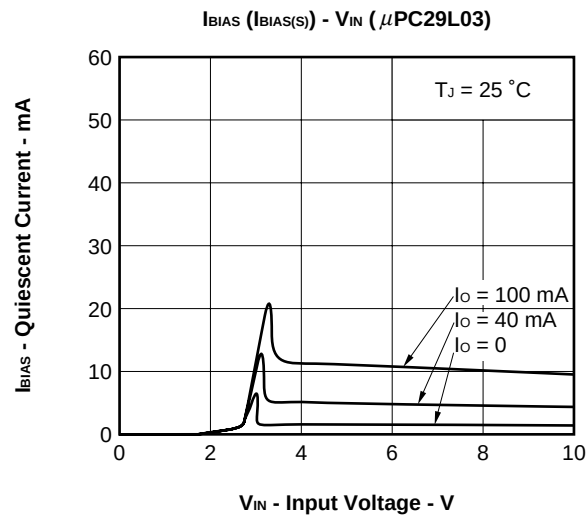
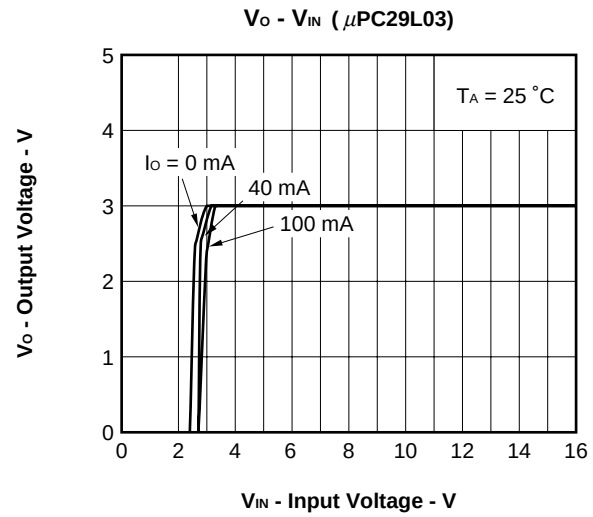
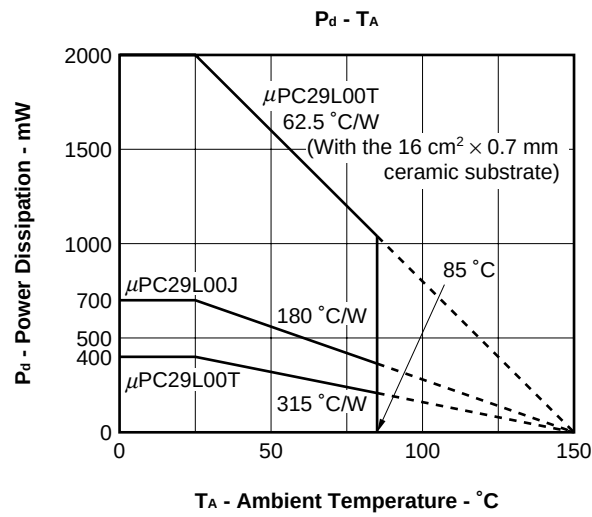
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		3.84	4.0	4.16	V
		$4.5\text{ V} \leq V_{IN} \leq 12\text{ V}$, $1\text{ mA} \leq I_O \leq 40\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq 125\text{ }^{\circ}\text{C}$	3.80		4.20	
		$V_{IN} = 6\text{ V}$, $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq 125\text{ }^{\circ}\text{C}$	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	ΔI_{BIAS}	$4.5\text{ V} \leq V_{IN} \leq 12\text{ V}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq 125\text{ }^{\circ}\text{C}$			1.0	mA
Output Noise Voltage	V_n	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		35		μV_{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}	$I_O = 40\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq 125\text{ }^{\circ}\text{C}$		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	$\Delta V_O/\Delta T$	$I_O = 5\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq 125\text{ }^{\circ}\text{C}$		0.2		mV/ $^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

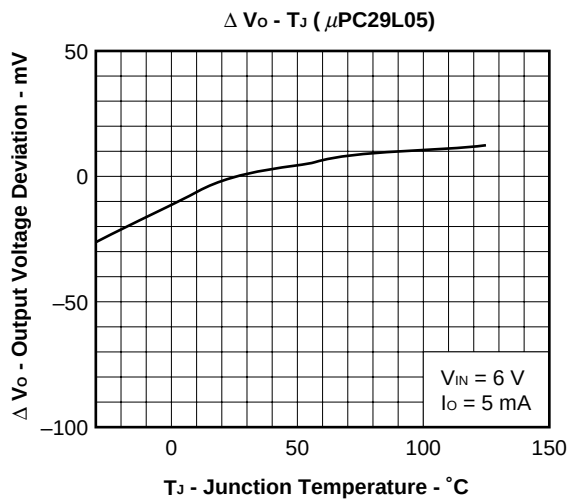
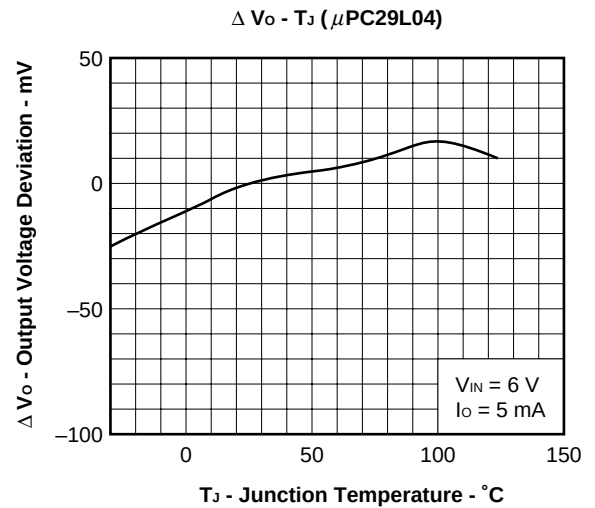
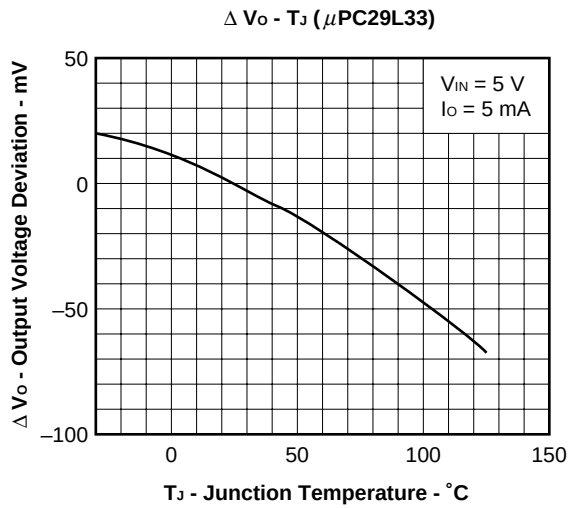
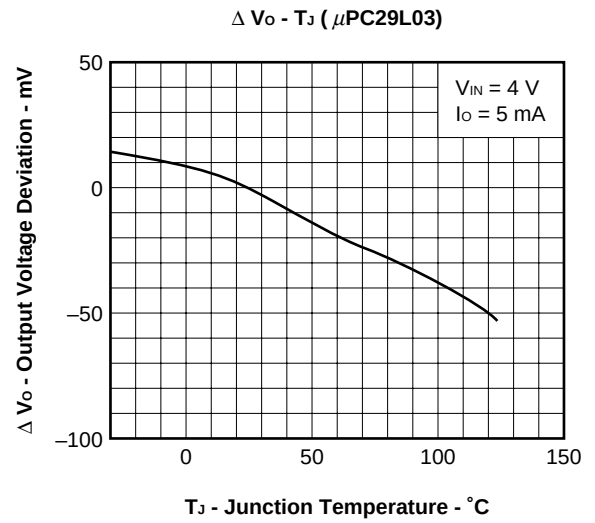
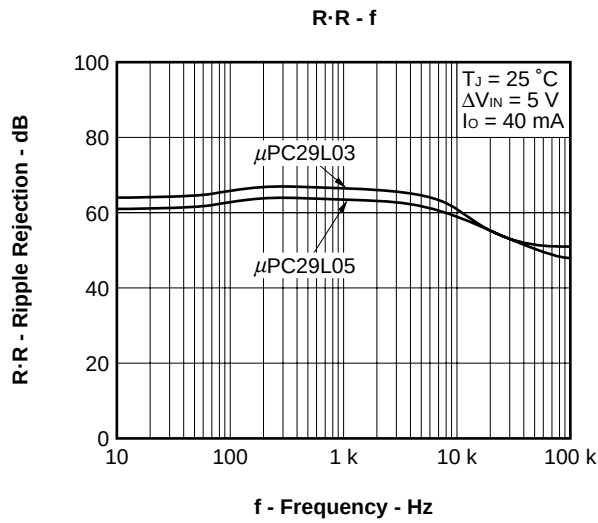
μPC29L05 ($V_{IN} = 6\text{ V}$, $I_O = 40\text{ mA}$, $T_J = 25\text{ °C}$, Unless otherwise specified)

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	ΔI_{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		μV_{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



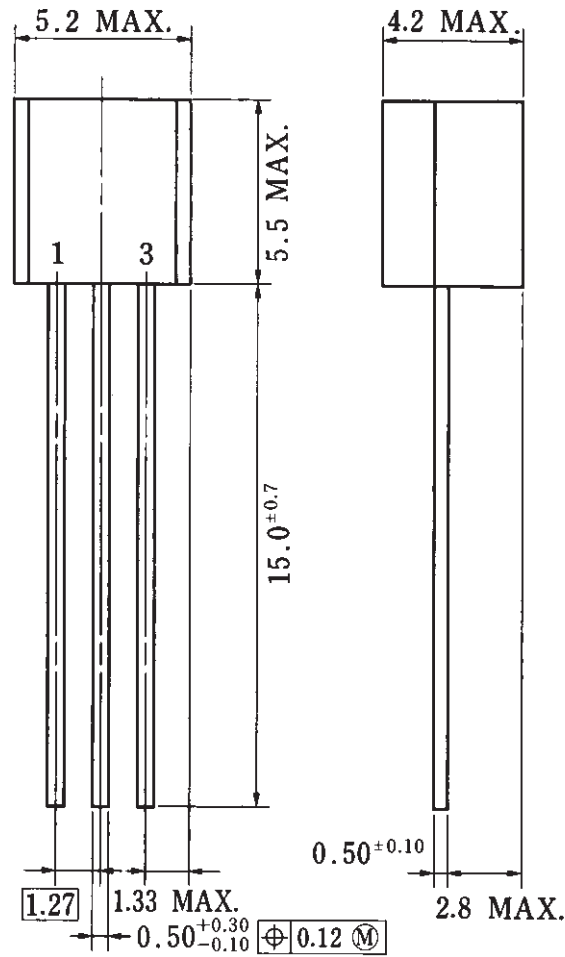
TYPICAL CHARACTERISTICS



PACKAGE DIMENSIONS (Unit: mm)

μPC29L00J Series

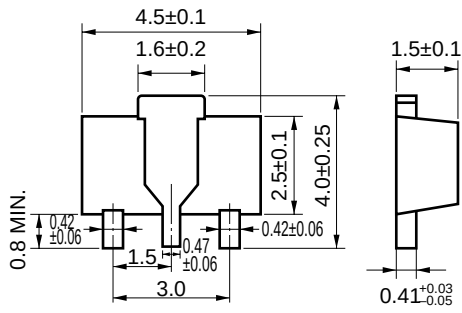
3PIN PLASTIC SIP (TO-92)



P3J-127B

μPC29L00T 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 Note : 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 Note : 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 Note : 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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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 in “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 NEC Sales Representative in advance.

Anti-radioactive design is not implemented in this product.